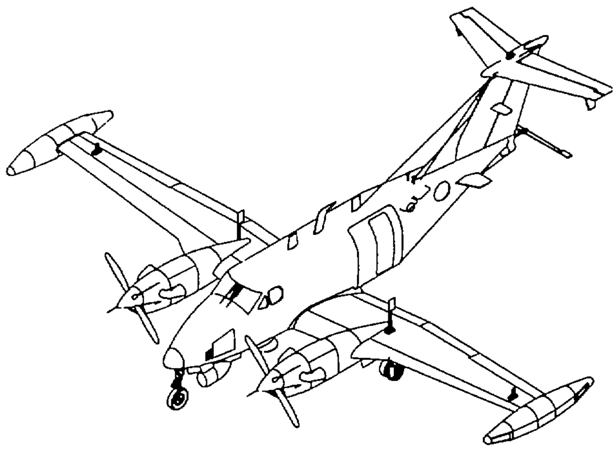
TECHNICAL MANUAL

OPERATOR'S MANUAL FOR ARMY RC-12K AIRCRAFT

NSN 1510-01-235-5839



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TM 55-1510-222-10
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CHANGE

NO. 3

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WASHINGTON, D.C., 28 May 1998

OPERATOR'S MANUAL
FOR
ARMY RC-12K AIRCRAFT

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ARMY RC-12K AIRCRAFT
NSN 1510-01-235-5839

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2-15 and 2-16	2-15 and 2-16
2-73 and 2-74	2-73 and 2-74
2-81 and 2-82	2-81 and 2-82
2-89 and 2-90	2-89 and 2-90
2-93 and 2-94	2-93 and 2-94
3-17 and 3-18	3-17 and 3-18
6-1 and 6-2	6-1 and 6-2
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NO. 1

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OPERATOR'S MANUAL FOR ARMY RC-12K AIRCRAFT

NSN 1510-01-235-5839

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8-15 through 8-18	8-15 through 8-18
8-25 and 8-26	8-25 and 8-26

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WARNING PAGE

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

NOISE LEVELS

Sound pressure levels in this aircraft during some operating conditions exceed the Surgeon General's hearing conservation criteria, as defined in TM MED 501. Hearing protection devices, such as the aviator helmet or ear plugs shall be worn by all personnel in and around the aircraft during its operation.

STARTING ENGINES

Operating procedures or practices defined in this Technical Manual must be followed correctly. Failure to do so may result in personal injury or loss of life. Exposure to exhaust gases shall be avoided since exhaust gases are an irritant to eyes, skin and respiratory system.

HIGH VOLTAGE

High voltage is a potential hazard around AC inverters, ignition exciter units, and strobe beacons.

USE OF FIRE EXTINGUISHERS IN CONFINED AREAS

Monobromotrifluoromethane (CF_3Br) is very volatile, but is not easily detected by its odor. Although non toxic, it must be considered to be about the same as other freons and carbon dioxide, causing danger to personnel primarily by reduction of oxygen available for proper breathing. During operation of the fire extinguisher, ventilate personnel areas with fresh air. The liquid shall not be allowed to come into contact with the skin, as it may cause frostbite or low temperature burns because of its very low boiling point.

VERTIGO

The strobe/beacon lights should be turned off during flight through clouds to prevent sensations of vertigo, as a result of reflections of the light on the clouds.

CARBON MONOXIDE

When smoke, suspected carbon monoxide fumes, or symptoms of lack of oxygen (hypoxia) exist, all personnel shall immediately don oxygen masks, and activate the oxygen system.

FUEL AND OIL HANDLING

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

SERVICING AIRCRAFT

When conditions permit, the aircraft shall be positioned so that the wind will carry fuel vapors away from all possible sources of ignition. The fueling unit shall maintain a distance of 20 feet between unit and filler point. A minimum of 10 feet shall be maintained between fueling unit and aircraft.

Prior to refueling, the hose nozzle static ground wire shall be attached to the grounding lugs that are located adjacent to filler openings.

SERVICING BATTERY

Improper service of the nickel-cadmium battery is dangerous and may result in both bodily injury and equipment damage. The battery shall be serviced in accordance with applicable manuals by qualified personnel only.

Corrosive Battery Electrolyte (Potassium Hydroxide). Wear rubber gloves, apron, and face shield when handling 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.

JET BLAST

Occasionally, during starting, excess fuel accumulation in the combustion chamber causes flames to be blown from the exhausts. This area shall be clear of personnel and flammable materials.

RADIOACTIVE MATERIAL

Instruments contained in this aircraft may contain radioactive material (TB 55-1500-314-25). These items present no radiation hazard to personnel unless seal has been broken due to aging or has accidentally been broken. If seal is suspected to have been broken, notify Radioactive Protective Officer.

RF BURNS

Do not stand near the antennas when they are transmitting.

OPERATION OF AIRCRAFT ON GROUND

At all times during a towing operation, be sure there is a man in the cockpit to operate the brakes. Personnel should take every precaution against slipping or falling. Make sure guard rails are installed when using maintenance stands.

Engines shall be started and operated only by authorized personnel. Reference AR 95-1. Ensure that landing gear control handle is in the DN position.

TECHNICAL MANUAL

No. 55-1510-222-10

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., 30 June 1992

Operator's Manual
ARMY MODELS RC-12K

REPORTING OR ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of any way to improve the procedures, please let use 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 directly to: Commander, U.S. Army Aviation and Missile Command, ATTN: AMSAM-MMC-LS-LP, Redstone Arsenal, AL 35898-5230. A reply will be furnished directly to you. You may also send in your comments electronically to our E-mail address at <ls-lp@redstone.army.mil>. or by fax at (205) 842-6546 or DSN 788-6546. Instructions for sending an Electronic DA Form 2028 may be found at the back of this manual immediately preceding the hard copy DA Forms 2028.

TABLE OF CONTENTS

CHAPTER 1
INTRODUCTION

Section I. GENERAL

1-1. GENERAL.

These instructions are for use by the operator(s). They apply to the RC-12K aircraft.

1-2. WARNINGS, CAUTIONS, AND NOTES.

Warnings, cautions, and notes are used to emphasize important and critical instructions. Explanatory examples are as follows:

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 procedures for the RC-12K aircraft under most circumstances. 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 recognized, and therefore, basic flight principles are not included. **THIS MANUAL SHALL 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. APPENDIX B, ABBREVIATIONS AND TERMS.

Appendix B is a listing of abbreviations and terms used throughout the manual.

1-6. INDEX.

The index lists in alphabetical order, titled paragraphs, figures, and tables contained in this manual.

1-7. ARMY AVIATION SAFETY PROGRAM.

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

1-8. DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE.

For information concerning destruction of Army materiel to prevent enemy use, refer to TM 750-2441-5.

1-9. FORMS AND RECORDS.

Army aviators flight record and aircraft maintenance records which are to be used by crew members are prescribed in DA PAM 738-751 and weight and balance manual TM 55-1500-342-23.

1-10. EXPLANATION OF CHANGE SYMBOLS.

Except as noted in this paragraph, changes 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 an illustration. Change symbols are not utilized to indicate changes in the following:

a. Introductory material.

b. Indexes and tabular data where the change cannot be identified.

c. Blank space resulting from the deletion of text, an illustration or a table.

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

1-11. AIRCRAFT DESIGNATION SYSTEM.

The designation system prescribed by AR 70-50 is used in aircraft designations as follows:

EXAMPLE RC-12K

R - Modified mission symbol (Reconnaissance)
C - Basic mission and type symbol (Cargo)
12 - Design number
K - Series symbol

1-12. USE OF WORDS SHALL, WILL, 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 nonmandatory but preferred method of accomplishment. The word "may" is used to indicate an acceptable method of accomplishment. The word "will" is used to express a declaration of purpose and may also be used where simple futurity is required.

1-13. PLACARD ITEMS.

Where applicable, placarded items (switches, controls, etc.) are shown throughout this manual in capital letters.

CHAPTER 2
AIRCRAFT AND SYSTEMS DESCRIPTION AND OPERATION

Section I. AIRCRAFT

2-1. INTRODUCTION.

The purpose of this chapter is to describe the aircraft, and its systems and controls which contribute to the physical act of operating the aircraft. It does not contain descriptions of avionics or mission equipment covered elsewhere in this manual. This chapter contains descriptive information and does not describe procedures for operation of the aircraft. These procedures are contained within appropriate chapters in the manual. This chapter also contains the emergency equipment installed. This chapter is not designed to provide instructions on the complete mechanical and electrical workings of the various systems; therefore, each is described only in enough detail to make comprehension of that system sufficiently complete to allow for its safe and efficient operation.

2-2. GENERAL.

The RC-12K is a pressurized, low wing, all metal aircraft, powered by two PT6A-67 turboprop engines (fig. 2-1), having all weather capability. Distinguishable features of the aircraft are the slender, streamlined engine nacelles, four-bladed propellers, an aft rotating boom antenna, mission antennas, wing tip pods, stabilons, a T-tail, and a ventral fin below the empennage. The basic mission of the aircraft is radio reconnaissance. Cabin entrance is made through a stair-type door (fig. 2-1) aft of the wing on the left side of the fuselage.

2-3. DIMENSIONS.

Overall aircraft dimensions are shown in figure 2-2.

2-4. GROUND TURNING RADIUS.

Minimum ground turning radius of the aircraft is shown in figure 2-3.

2-5. MAXIMUM WEIGHTS.

a. Takeoff. Maximum gross takeoff weight is 16,000 pounds.

b. Landing. Maximum gross landing weight is 15,200 pounds.

c. Maximum Ramp Weight. Maximum ramp weight is 16,110 pounds.

d. Maximum Zero Fuel Weight. Maximum zero fuel weight is 12,700 pounds.

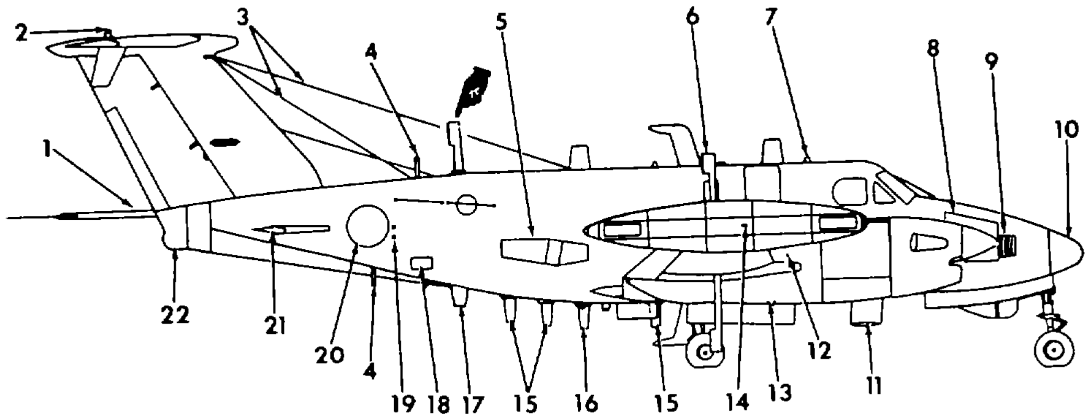
2-6. EXHAUST DANGER AREA.

Danger areas to be avoided by personnel while aircraft engines are being operated on the ground are depicted in figure 2-4. Distance to be maintained with engines operating at idle are also shown. Temperature and velocity of exhaust gases at varying locations aft of the exhaust stacks are shown for maximum power. The danger area extends to 40 feet aft of the exhaust stack outlets. Propeller danger areas are also shown.

2-7. LANDING GEAR SYSTEM.

The retractable tricycle landing gear is electrically controlled and hydraulically actuated. The landing gear -assemblies are extended and retracted by a hydraulic power pack, located in the left wing center section, forward of the main spar. The power pack consists primarily of a hydraulic pump, a 28 VDC motor, a gear selector valve and solenoid, a two section fluid reservoir, filter screens, gear-up pressure switch and low fluid level sensor. Engine bleed air, regulated to 18 to 20 psi, is plumbed into the power pack reservoir, and the system fill reservoir to prevent cavitation of the pump. The fluid level sensor activates an amber caution annunciator, placarded HYD FLUID LOW located in the caution/advisory annunciator panel, whenever the fluid level in the power pack is low. The annunciator is tested by pressing the HYD FLUID SENSOR TEST switch located in pilot's subpanel (fig. 2-5).

Power for the hydraulic power pack is supplied through a landing gear motor relay and a 60-ampere circuit breaker located under the floorboard forward of the main spar. The motor relay is energized by power furnished through a 2-ampere LANDING GEAR CONTROL circuit breaker located in the



1 Aft Rotating Boom Antenna
2 Strobe Beacon
3 HF Long Wire Antenna
4 AN/APR-44 Antennas
5 Flare and Chaff Dispenser
6 Mid Band Dipole Antennas
7 TACAN Antenna
8 Nose Avionics Compartment Access Door
9 Air Conditioner Condenser Air Inlet
10 Radome
11 High Band Vert and Horiz Antenna
12 Ice Light
13 AN/APR-39 Blade Antenna
14 Navigation Light
15 High Band Monopole Antenna
16 INS/TACAN Antenna
17 VHF Comm Antenna
18 Oxygen System Servicing Door
19 Static Air Sources
20 "P" Band Antenna
21 Stabilon
22 Wide Band Data Link Antenna

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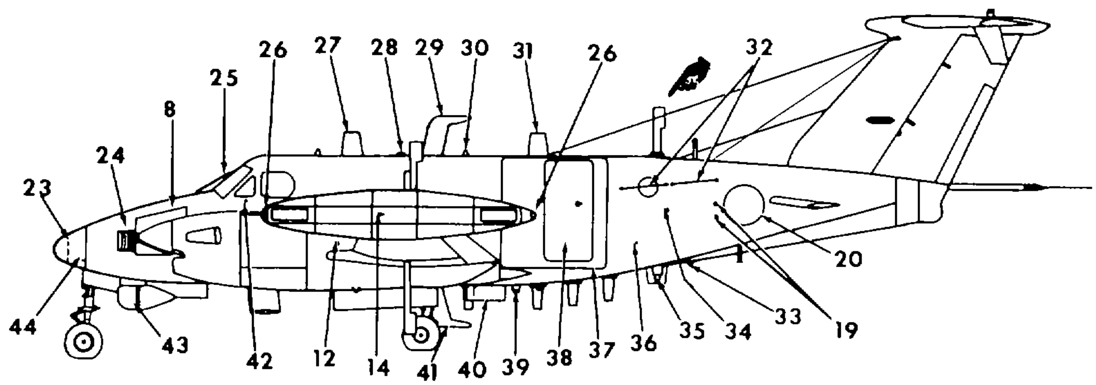
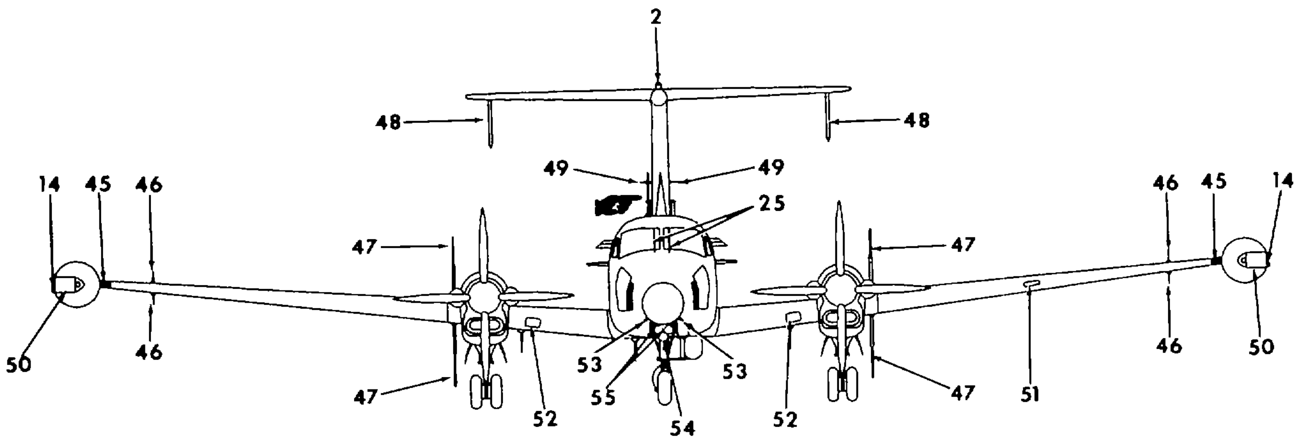
Figure 2-1. General Arrangement - Exterior Right Side (Sheet 1 of 5)



23 Weather Radar Antenna	34 ELT Control Switch
24 Air Conditioner Condenser Air Outlet	35 UHF Transponder
25 Windshield Wipers	36 Emergency Light
26 AN/APR-39 Spiral Antenna	37 Cargo Door
27 SINCGARS Antenna	38 Cabin Door
28 Global Positioning System Antenna	39 Strobe Beacon
29 Low Band Vertical Bent Blade (upper) Antenna	40 Strobe Dams
30 Transponder Antenna	41 Low Band Vert Belt Blade (lower) Antenna
31 VHF COMM Antenna	42 OAT Probe
32 CHAALS Horiz Towel Bar Antenna	43 Wide Band Data Link Fwd Antenna
33 Relief Tube Drain	44 Glideslope Antenna

AP013015 2

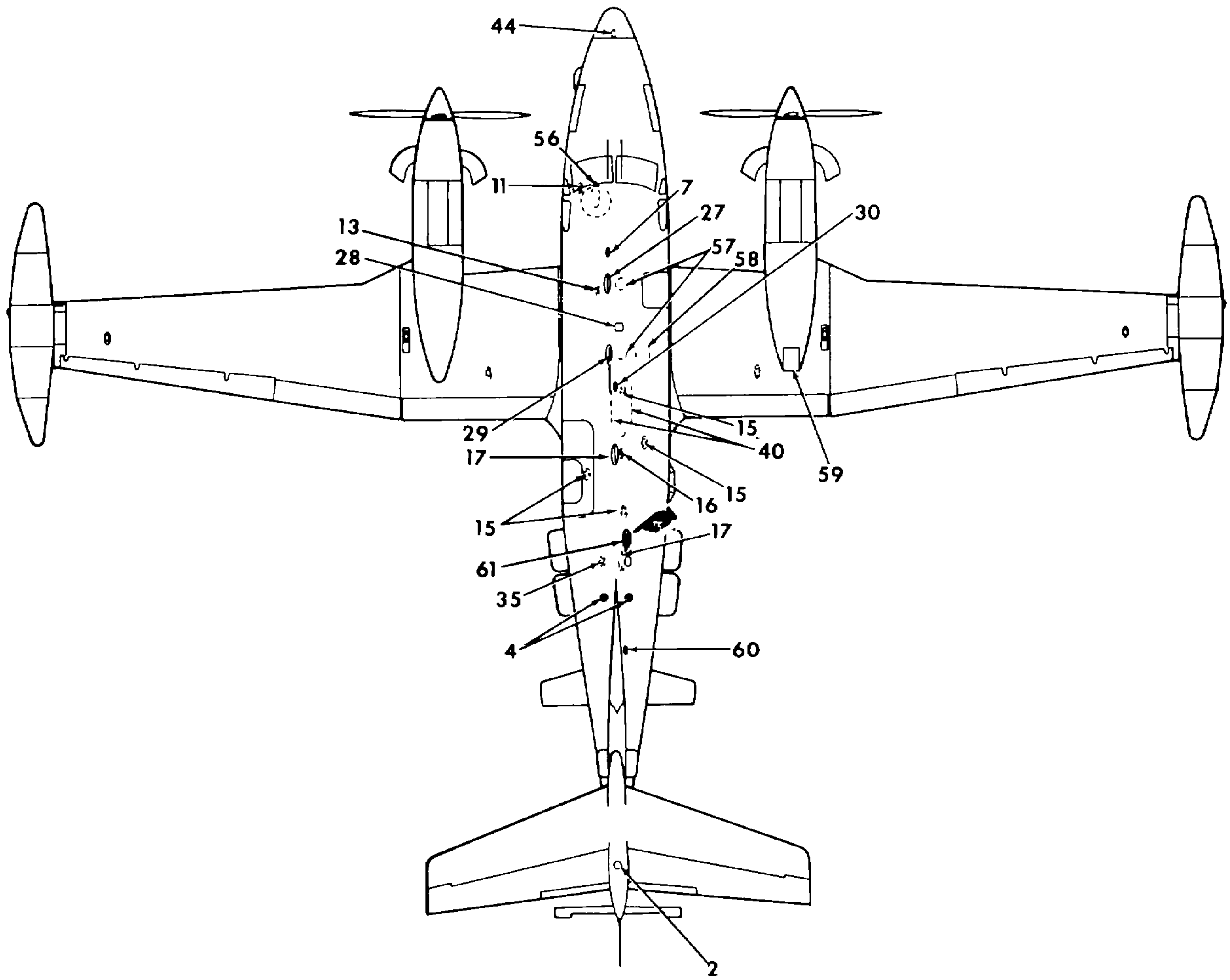
Figure 2-1. General Arrangement - Exterior Left Side (Sheet 2 of 5)



45 Recognition Lights
46 UHF COMM & Intercept Antenna
47 Mid Band Dipole Antenna
48 Taillet
49 VOR NAV/LOC Antenna
50 ELINT & DF Antenna Pod
51 Stall Warning Vane
52 Bleed Air Heat Exchanger Air Inlet
53 Pitot Tubes
54 Taxi Light
55 Landing Lights

AP013015 3

Figure 2-1. General Arrangement - Exterior Front (Sheet 3 of 5)



56 Marker Beacon Antenna
57 Radio Altimeter Antenna
58 ADF Loop Antenna
59 Chaff Dispenser
60 ELT Antenna
61 LOWBAND High Frequency Extension Antenna

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Figure 2-1. General Arrangement - Exterior Top (Sheet 4 of 5)

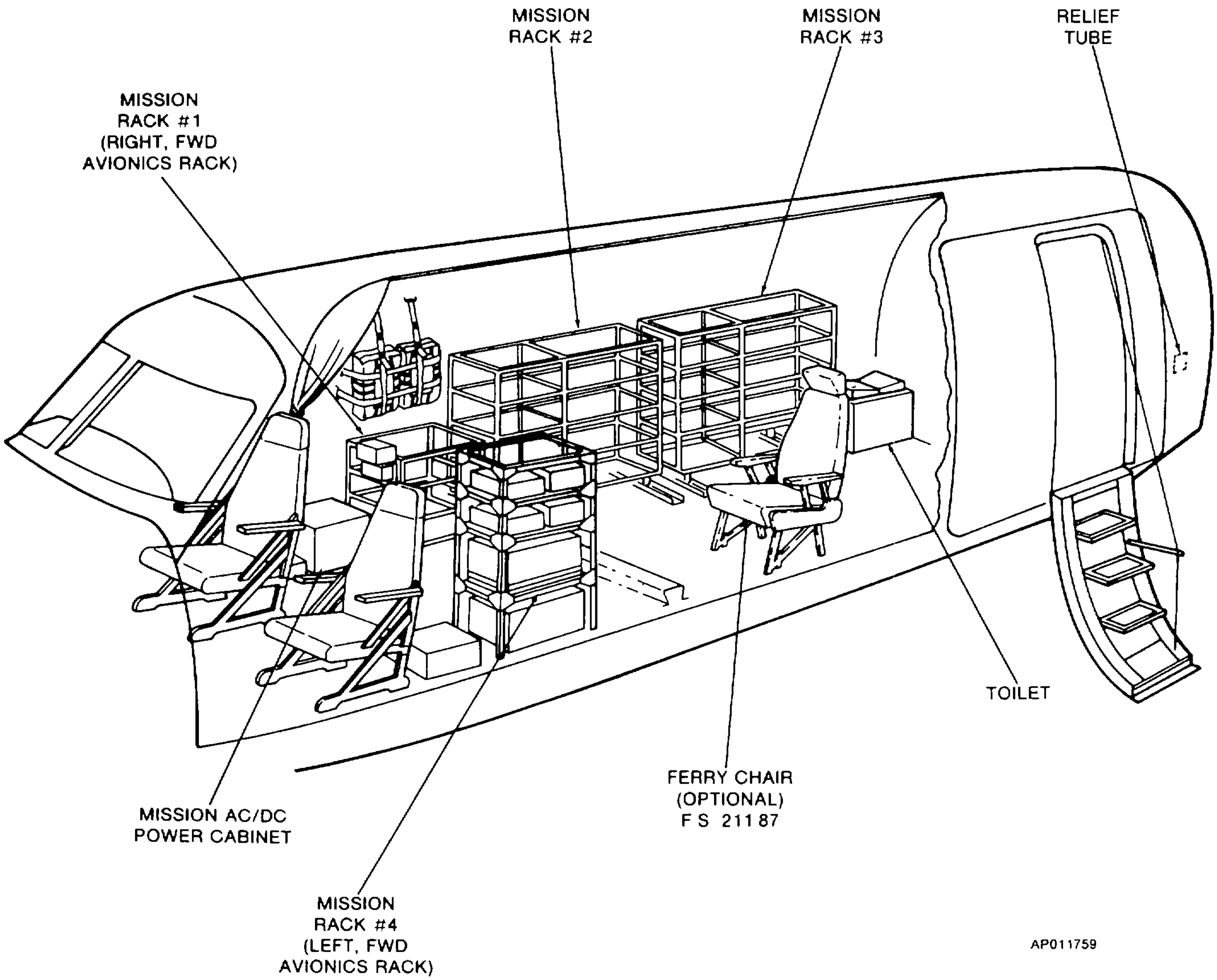


Figure 2-1. General Arrangement - Interior (Sheet 5 of 5)

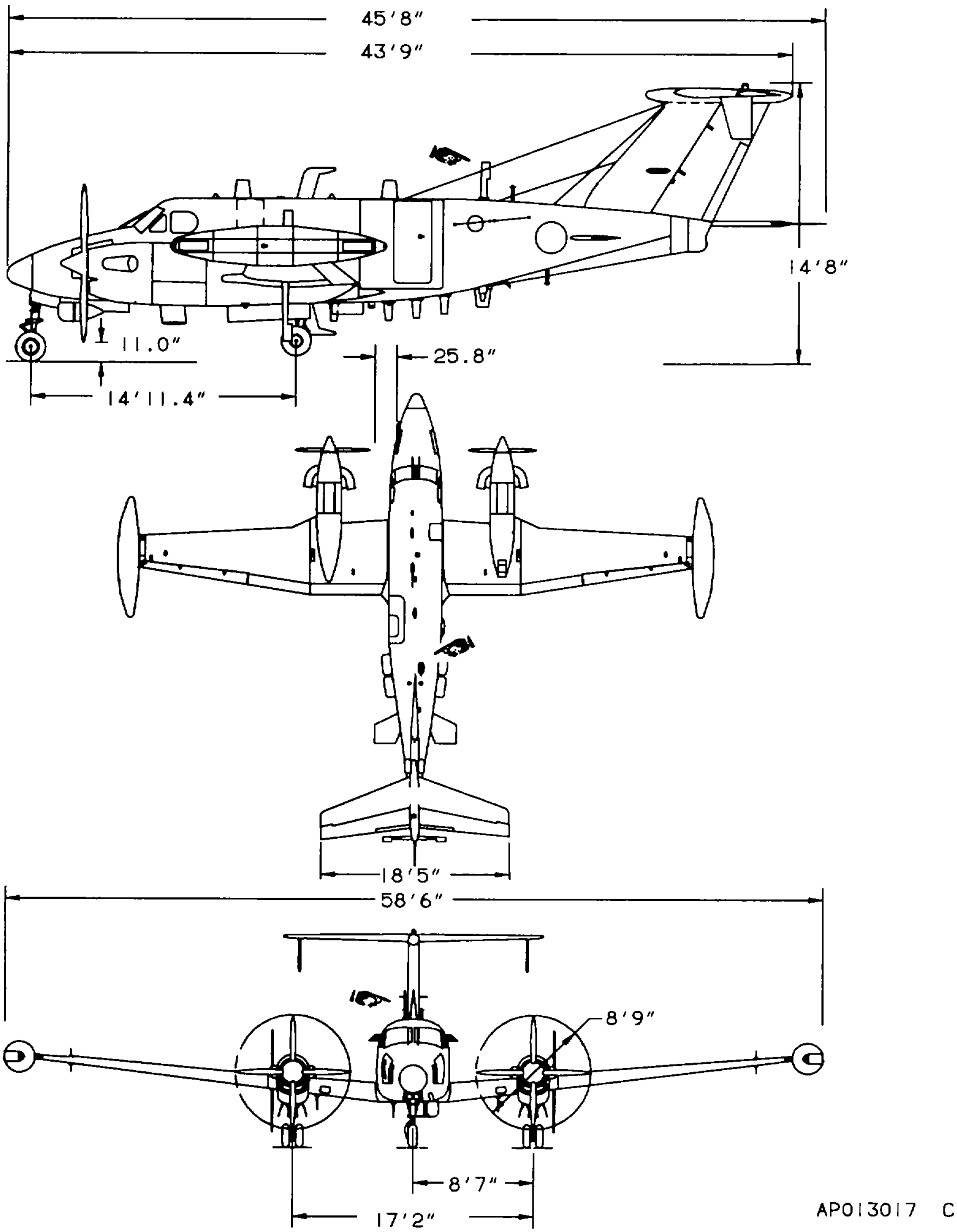


Figure 2-2. Principal Dimensions

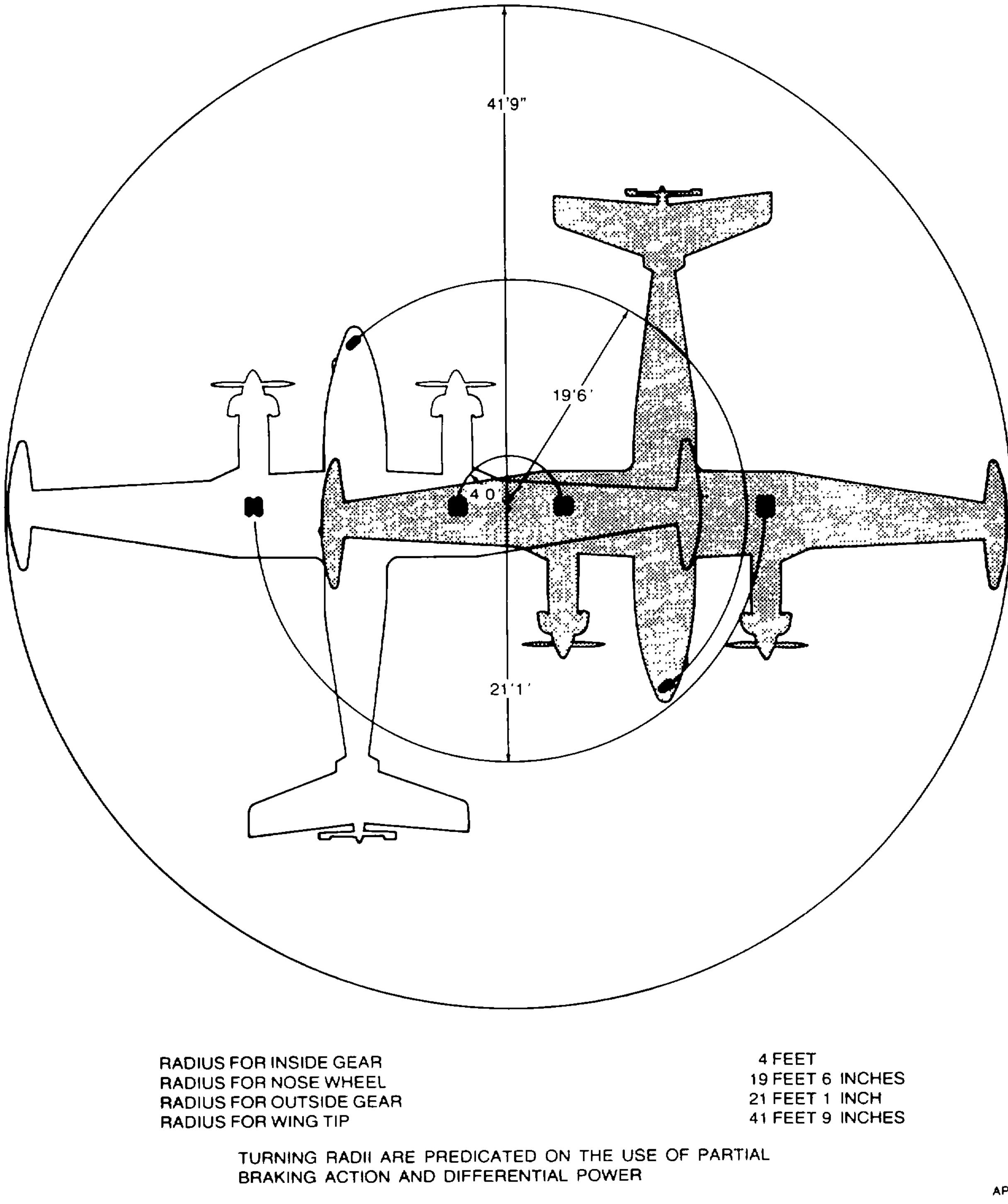


Figure 2-3. Ground Turning Radius

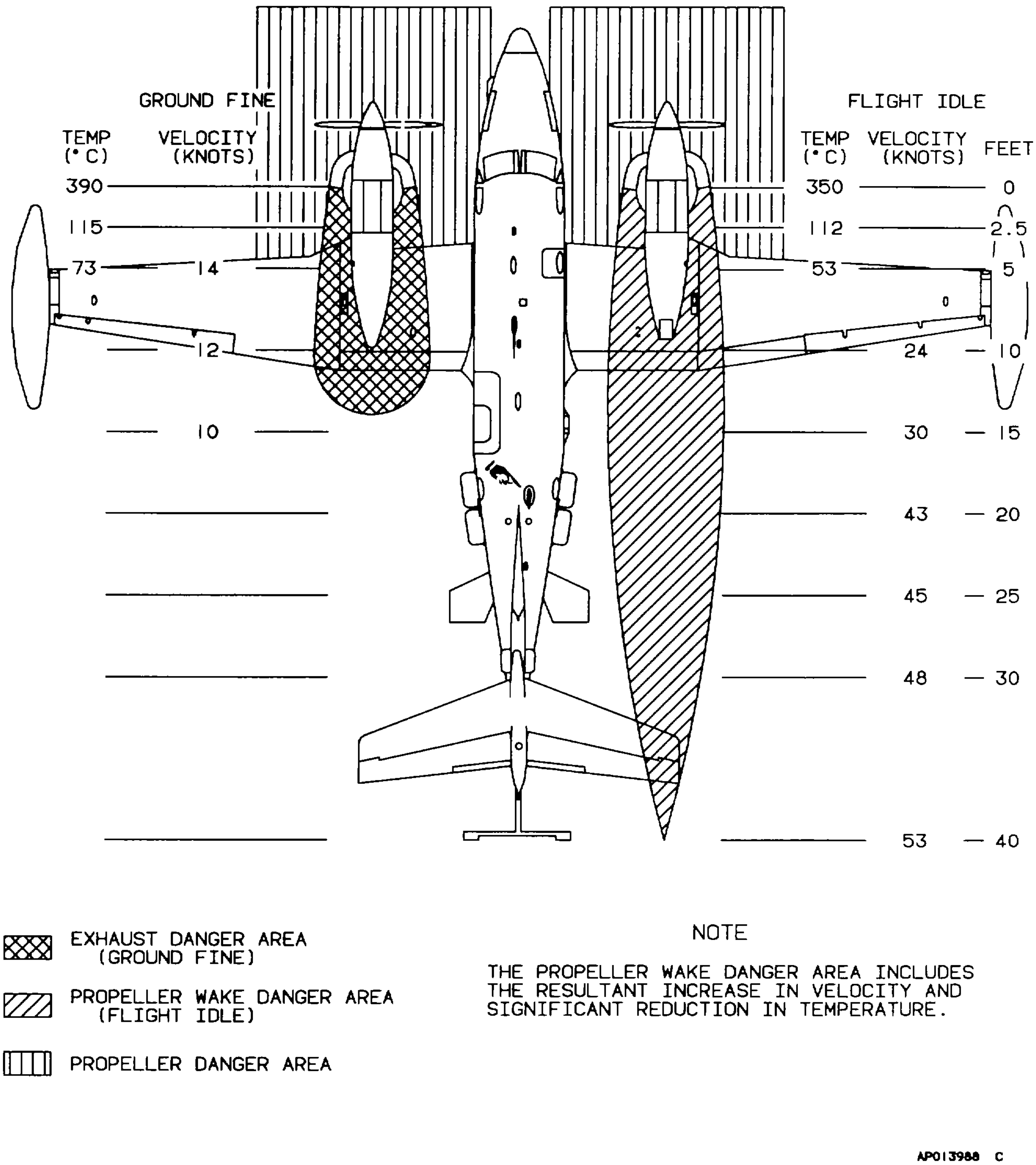
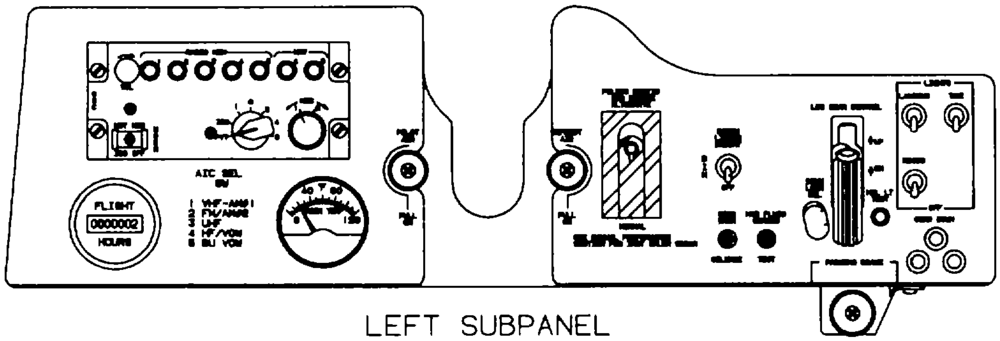
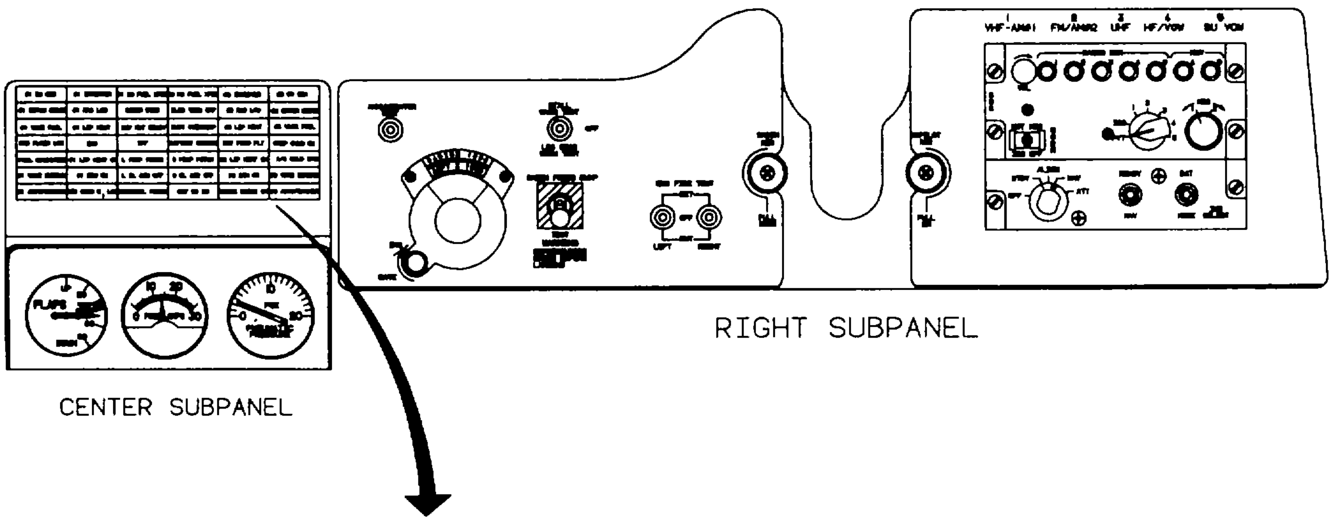


Figure 2-4. Exhaust Danger Area



LEFT SUBPANEL



CENTER SUBPANEL

RIGHT SUBPANEL

#1 DC GEN	#1 INVERTER	#1 NO FUEL XFR	#2 NO FUEL XFR	#2 INVERTER	#2 DC GEN
#1 EXTGH DISCH	#1 NAC LOW	CABIN DOOR	ELEC TRIM OFF	#2 NAC LOW	#2 EXTGH DISCH
#1 VANE FAIL	#1 LIP HEAT	REV NOT READY	DUCT OVERTEMP	#2 LIP HEAT	#2 VANE FAIL
HYD FLUID LOW	INS	IFF	BATTERY CHARGE	BAT FEED FLT	PROP SYNC ON
FUEL CROSSFEED	#1 LIP HEAT ON	L PROP PITCH	R PROP PITCH	#2 LIP HEAT ON	A/C COLD OPN
#1 VANE EXTEND	#1 IGN ON	L BL AIR OFF	R BL AIR OFF	#2 IGN ON	#2 VANE EXTEND
#1 AUTOFEATHER	AIR COND N_1 LOW	EXTERNAL POWER	EXT DC ON	BRAKE DEICE ON	#2 AUTOFEATHER

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CAUTION ADVISORY-
ANNUNCIATOR PANEL

Figure 2-5. Subpanels

overhead circuit breaker panel (fig. 2-6), and the downlock switches. The power pack motor is protected by a time delay module which senses operation voltage through a 5-ampere circuit breaker. Both are located beneath the aisleway floorboards, forward of the main spar. Landing gear extension or retraction is normally accomplished in 6 to 7 seconds. Voltage to the power pack is terminated after the fully extended or retracted position is reached. If electrical power has not terminated within 14 seconds, a relay and 2-ampere landing gear circuit breaker will open and electrical power to the system power pack will be interrupted.

The landing gear system utilizes folding braces called drag legs, that lock in place when the gear is fully extended. The nose landing gear actuator incorporates an internal down-lock to hold the gear in the fully extended position. However, the two main landing gear are held in the fully extended position by mechanical hook and pin locks. The landing gear is held in the up position by hydraulic pressure. The pressure is controlled by the power pack pressure switch and an accumulator that is precharged with nitrogen to 800 + 50 psi. Gear doors are opened and closed through a mechanical linkage connected to the landing gear. The nose wheel steering mechanism is automatically centered and the rudder pedals relieved of the steering load when the landing gear is retracted. Air-oil type shock struts, filled with compressed nitrogen and hydraulic fluid, are incorporated with the landing gear.

a. Landing Gear Control Switch. Landing gear system operation is controlled by a manually actuated wheel-shaped switch placarded LDG GEAR CONTR UP DN, on the pilot's subpanel (fig. 2-5). The control switch and associated relay circuits are protected by a 2-ampere circuit breaker, placarded LANDING GEAR CONTROL located in the overhead circuit breaker panel (fig. 2-6).

b. Landing Gear Down Position Annunciators. Visual indication of the landing gear position is provided by three, individual, green GEAR DOWN annunciators located in the left subpanel. Testing of the annunciators is accomplished by pressing the annunciator test switch. The circuit is protected by a 5-ampere circuit breaker, placarded LANDING GEAR IND, on the overhead circuit breaker panel (fig. 2-6).

c. Landing Gear Position Warning Annunciators. Two red parallel-wired annunciators, located in the LDG GEAR CONTROL switch handle, illuminate to show that the gear is in transit or unlocked. The red annunciator in the handle also illuminates when the landing gear warning horn is actuated. Both red annunciators indicate the same warning conditions, but two are provided for a fail-safe indication in the event one bulb burns out. The circuit is protected by a 5-ampere circuit breaker, placarded LANDING GEAR IND, on the overhead circuit breaker panel (fig. 2-6).

d. Landing Gear Warning Annunciator Test Switch. A test switch, placarded HDL LT TEST, is located in the pilot's subpanel (fig. 2-5). Failure of the landing gear handle to illuminate red, when this test switch is pressed, indicates two defective bulbs or a circuit fault. The circuit is protected by a 5-ampere circuit breaker, placarded LANDING GEAR HORN, on the overhead circuit breaker panel (fig. 2-6).

e. Landing Gear Warning System. The landing gear warning system is provided to warn the pilot that the landing gear is not down and locked during specific flight regimes. Various warning modes result, depending upon the position of the flaps.

At airspeeds above 140 KIAS with flaps in the UP or APPROACH position and either or both power levers retarded below approximately 84% N., the landing gear switch handle annunciator will illuminate. The horn is automatically silenced by an altitude sensing switch, provided to silence the landing gear warning horn when above 12,500 feet. This prevents the horn from sounding above 12,500 feet when either power lever is pulled back, provided the flaps are at the approach position or above.

At airspeeds below 140 KIAS with flaps in the UP or APPROACH positions with either or both power levers retarded below approximately 84% N1, the warning horn will sound and the landing gear switch handle annunciators will illuminate. The horn can be silenced by actuating the GEAR WARN SILENCE switch located adjacent to the landing gear switch handle, to the up position. However, the annunciators in the landing gear switch handle cannot be cancelled. The gear warning silence switch is a magneticlly held switch. Once actuated it will stay in the up position until both power levers are advanced above 86% N. and/or airspeed increases above approximately 153 KIAS.

In either case (airspeeds above or below 140

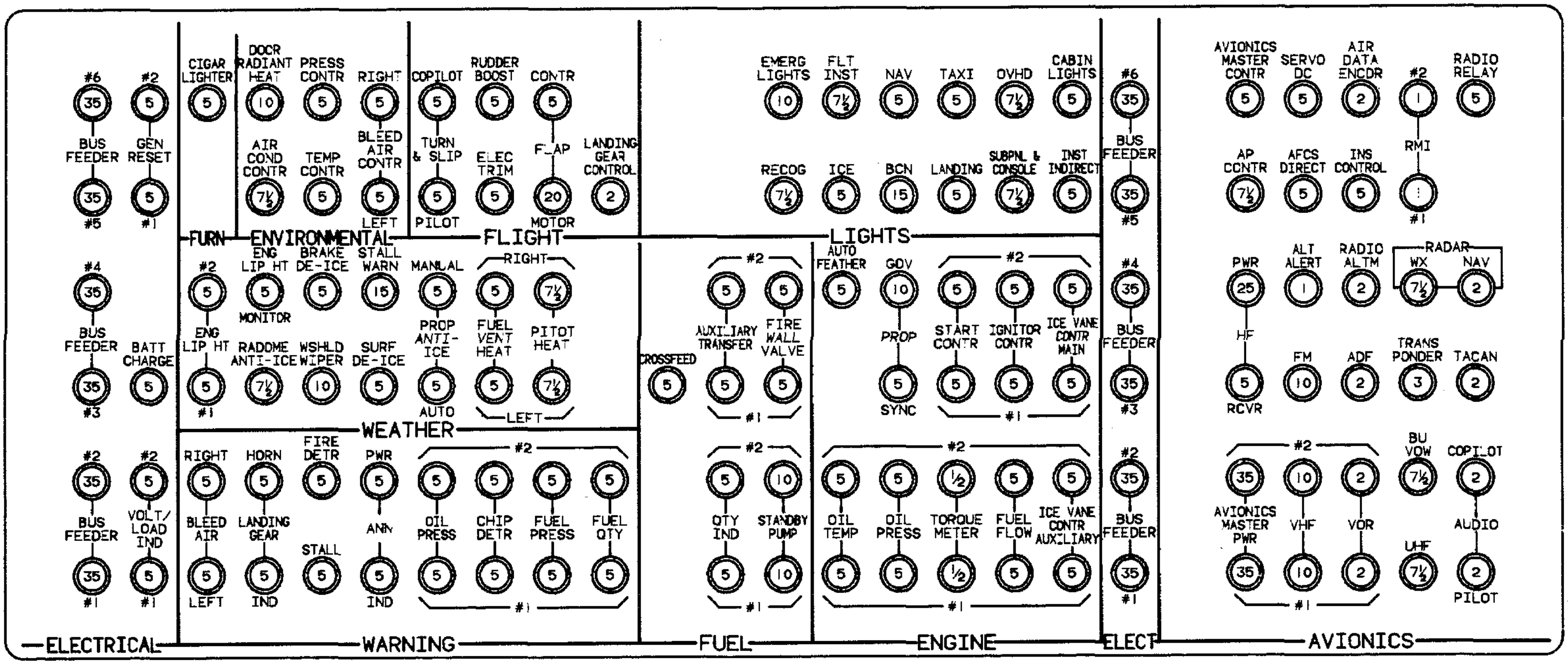

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Figure 2-6. Overhead Circuit Breaker Panel

KIAS) the landing gear warning system will be rearmed if both power levers are advanced above 86% N_1.

With the flaps beyond the APPROACH position, the warning horn and landing gear switch handle annunciators will be activated regardless of the power setting. The horn cannot be silenced in this case, until either the landing gear is lowered, or the flaps are retracted to the UP or APPROACH position.

f. Landing Gear Warning Horn Test Switch. The warning horn and gear handle annunciators can be tested by placing the switch placarded STALL WARN TEST OFF LDG GEAR WARN TEST to the LDG GEAR WARN TEST position (fig. 2-5). The gear handle annunciators will illuminate, and warning horn will sound. Releasing the LDG GEAR WARN TEST switch to the OFF position will extinguish the gear handle annunciators, and silence the warning horn. The landing gear warning horn circuit is protected by a 5-ampere circuit breaker, placarded LANDING GEAR HORN, located in the overhead circuit breaker panel (fig. 2-6).

g. Landing Gear Safety Switches. A safety switch on each main landing gear shock strut controls the operation of various aircraft systems that function only during flight or only during ground operation. These switches are mechanically actuated whenever the main landing gear shock struts are extended (normally after takeoff), or compressed (normally after landing). The safety switch on the right main landing gear strut deactivates the landing gear control circuits, cabin pressurization circuits and the flight hour meter when the shock strut is compressed. This switch also activates a downlock hook, preventing the landing gear from being raised while the aircraft is on the ground. The hook, which unlocks automatically after takeoff, can be manually overridden by pressing down on the red button, placarded DOWN LOCK REL located adjacent to the landing gear handle (fig. 2-5). If the override is used, the landing gear warning horn will sound intermittently and two, red, parallel-wired annunciators located in the landing gear control switch handle will illuminate, provided the battery switch is on. The safety switch on the left main landing gear strut activates the left and right engine ambient air shut-off valves when the strut is extended.

h. Landing Gear Alternate Extension.

WARNING

After an emergency landing gear extension has been made, do not move any landing gear controls, or reset any switches or circuit breakers until the aircraft is on jacks. The failure may have been in the gear-up circuit which could cause the gear to retract while the aircraft is on the ground.

An extension lever, placarded LANDING GEAR ALTERNATE EXTENSION, is located on the floor between the crew seats. A manual pumping action with the handle lowers the landing gears. The hydraulic pump utilized to manually lower the gear is located under the floor.

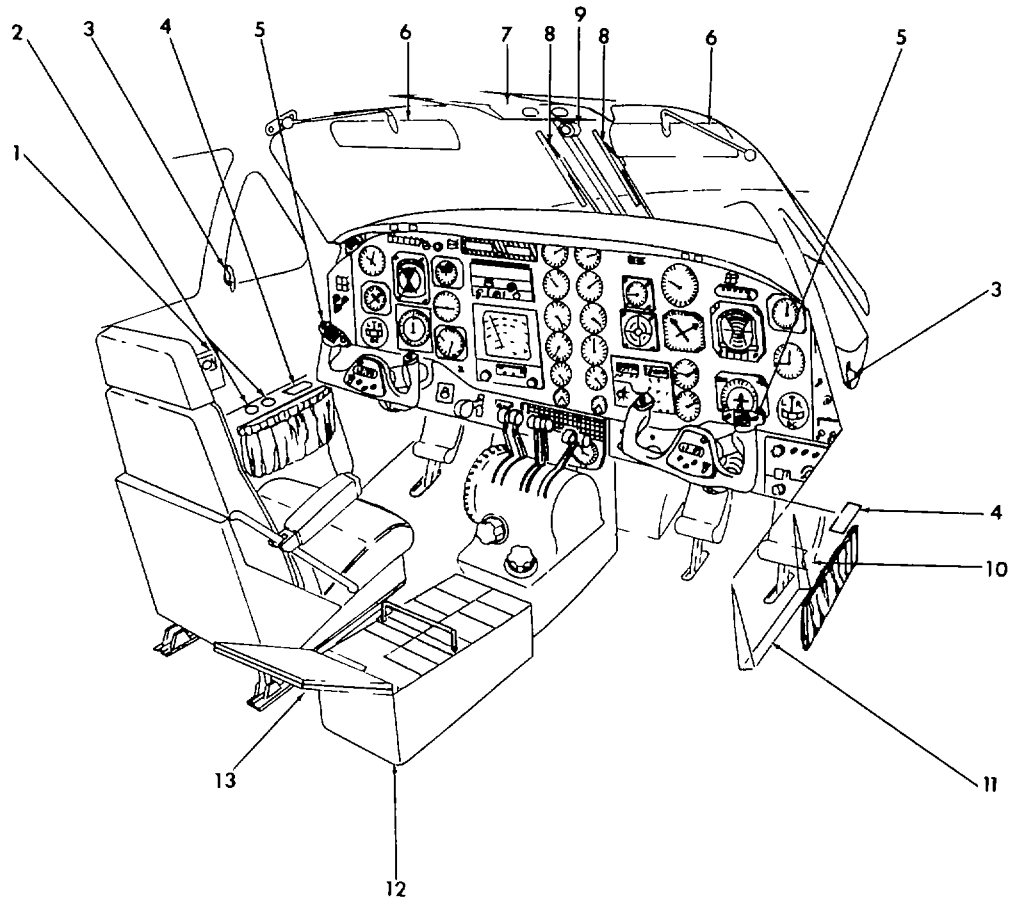
To engage the system, pull the LANDING GEAR CONTROL circuit breaker, located in the overhead circuit breaker panel (fig. 2-6), and ensure that the LDG GEAR CONTR handle is in the DN position. Remove the extension lever from the securing clip and pump the lever up and down until the three green GEAR DOWN annunciators illuminate. As the handle is moved, hydraulic fluid is drawn from the hand pump suction port of the power pack and routed through the hand pump pressure port to the actuators. After an alternate extension of the landing gears, ensure the extension lever is in the full down position prior to stowing the pump handle in the retaining clip. When the pump handle is stowed, an internal relief valve is actuated to relieve the hydraulic pressure in the pump.

NOTE

If for any reason the three green GEAR DOWN indicators do not illuminate (e.g., in case of an electrical system failure), continue pumping until sufficient resistance is felt to ensure that the gear is down and locked. The extension lever should then be stowed.

After a practice alternate extension, stow the extension handle, reset the LANDING GEAR CONTROL circuit breaker, and retract the gear in the normal manner with the landing gear control handle.

i. Tires. The aircraft is equipped with dual 22 x 6.75 x 10, 8 ply rated, tubeless, rim inflation tires on each main gear and a 22 x 6.75 x 10, 8 ply rated, tubeless tire on the nose wheel.



1 Free Air Temperature Gage
2 Oxygen System Pressure Gage
3 Storm Window Lock
4 Oxygen Regulator Control Panel
5 Control Wheel
6 Sun Visor
7 Overhead Circuit Breaker and Control Panel
8 Windshield Wiper
9 Magnetic Compass
10 Rudder Pedals
11 Mission Control Panel
12 Pedestal Extension
13 Assist Step

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Figure 2-7. Cockpit

j. Steerable Nose Wheel. The aircraft is maneuvered on the ground by the steerable nose wheel system. Direct linkage from the rudder pedals (fig. 2-7) to the nose wheel steering linkage allows the nose wheel to be turned 12° to the left of center or 14° to the right. When rudder pedal steering is augmented by the main wheel braking action, the nose wheel can be deflected up to 48° either side of center. Shock loads which would normally be transmitted to the rudder pedals are absorbed by a spring mechanism in the steering linkage. Retraction of the landing gear automatically centers the nose wheel and disengages the steering linkage from the rudder pedals.

k. Wheel Brake System. The main wheels are equipped with multiple-disc hydraulic brakes, actuated by master cylinders attached to the toe brake sections of the rudder pedals. Brake fluid is supplied to the system from a reservoir in the nose compartment. Braking is permitted from either set of rudder pedals. No emergency brake system is provided. Repeated application of brakes, with insufficient cooling time between applications, will cause a loss of braking efficiency, and may cause brake or wheel failure, tire blowout, or destruction of wheel assembly by fire.

2-8. PARKING BRAKE.

Dual parking brake valves are installed below the cockpit floor. Both valves can be closed simultaneously by pressing both brake pedals to build up pressure, then pulling out the handle placarded PARKING BRAKE, on the left subpanel. Pulling the handle full out sets the check valves in the system and any pressure being applied by the toe brakes is maintained. The parking brake is released when the brake handle is pushed in. The parking brake may be set from either cockpit position. Parking brake shall not be set during flight.

2-9. ENTRANCE AND EXIT PROVISIONS.

NOTE

Two keys are provided in the loose tools and equipment bag. Both keys will fit the locks on the cabin door, emergency hatch, tailcone access door and the right and left nose avionics compartment doors.

a. Cabin Door.

CAUTION

Structural damage may occur if more than one person is present on the airstair cabin door at one time. The door is weight limited to 300 pounds.

An airstair door (fig. 2-8), hinged at the bottom, provides a stairway for normal and emergency entrance and exit. Two of the steps fold flat against the door in the closed position. A step folds down over the door sill when the door opens to provide a platform (step) for door seal protection. A plastic encased cable provides a handhold and support for the door in the open position and a convenience for closing the door from inside. A hydraulic damper permits the door to lower gradually during opening. A rubber seal around the door, seals the pressure vessel while the aircraft is in flight. The door locking mechanism is operated by either of the two mechanically interconnected handles, one inside and the other outside the door. When either handle is rotated, three rotating cam-type latches on either side of the door, capture posts mounted on the cargo door. In the closed position, the door becomes an integral part of the cargo door. A button adjacent to the door handle must be depressed before the handle can be rotated to open the door. A bellows behind the button is inflated when the aircraft is pressurized to prevent accidental unlatching and/or opening of the door. A placard adjacent to the window instructs the operator that the safety lock arm is in position around the bellows shaft which indicates a properly locked door. Pushing the red button adjacent to the window will illuminate the inside door mechanism. A CABIN DOOR annunciator on the caution/ advisory panel will illuminate if the door is not closed and all latches fully locked. The cabin door opening is 21.5 inches wide by 50.0 inches high.

b. Cargo Door. A swing-up door (fig. 2-8), hinged at the top, provides access for loading cargo or bulky items. The cargo door opening is 52.0 inches wide by 52.0 inches high. After initial opening force is applied, gas springs will completely open the cargo door automatically. The door is counterbalanced and will remain in the open position. A door support rod is used to hold the door in the open position, and to aid in overcoming the pressure of the gas spring assemblies when closing the door. Once closed, the gas springs apply a closing force to assist in latching the door. A rubber seal around the door seals the

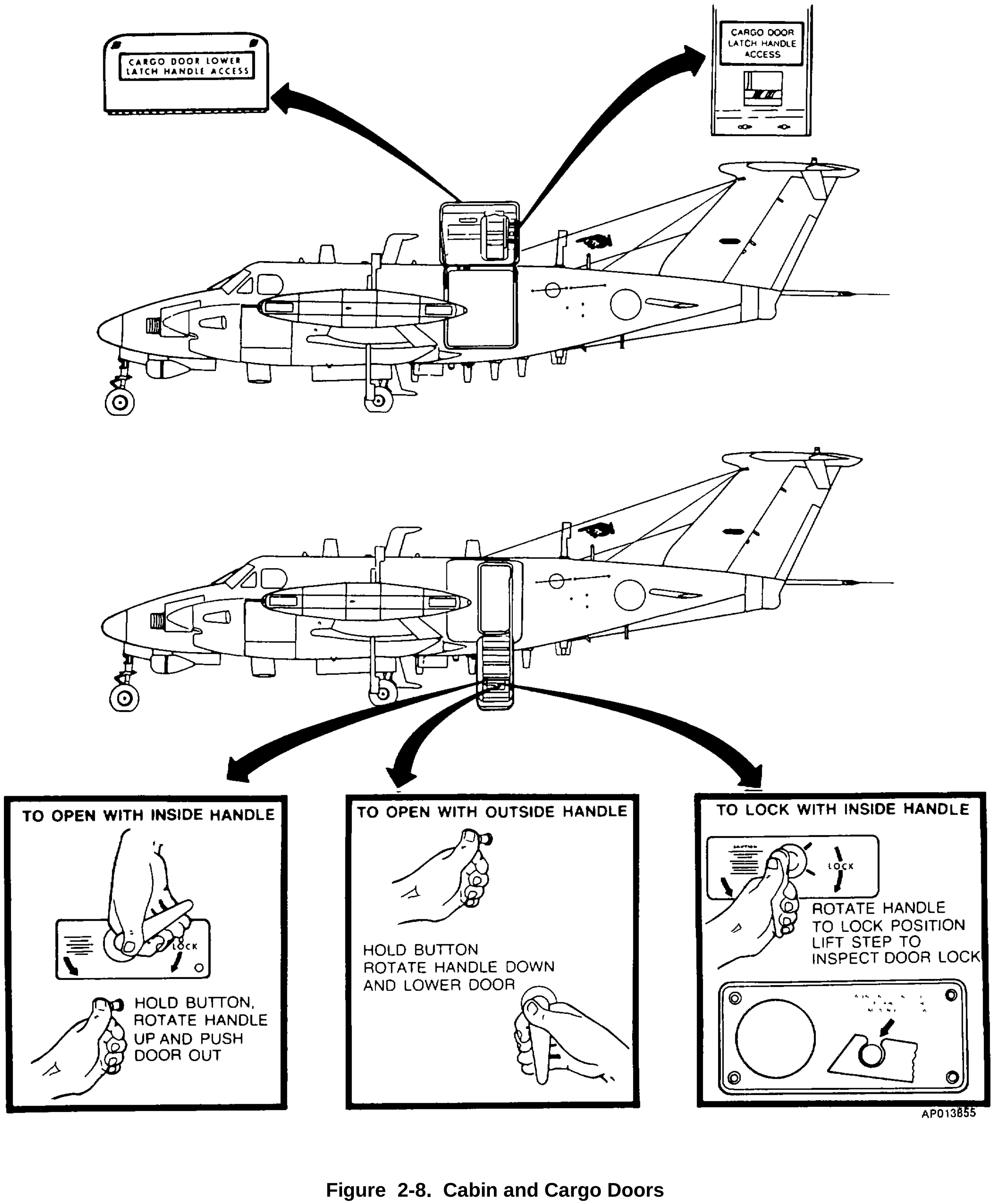


Figure 2-8. Cabin and Cargo Doors

pressure vessel while in flight. The door locking mechanism is operated only from inside the aircraft, and is operated by two handles, one in the bottom forward portion of the door and the other in the upper aft portion of the door. When the upper aft handle is operated per placard instructions, two rotating cam-type latches on the forward side of the door and two on the aft side, rotate, capturing posts mounted on the fuselage side of the door opening. The bottom handle, when operated per placard instructions, actuates four pin lug latches across the bottom of the door. A button on the upper aft handle must be pressed before the handle can be released to open or latch the door. A latching lever on the bottom handle must be lifted to release the handle before the lower latches can be opened. These act as additional aids in preventing accidental opening or unlatching of the door. The cabin and cargo doors are equipped with dual sensing circuits to provide the crew with remote indication of cabin/cargo door security. An annunciator placarded CABIN DOOR will illuminate if the cabin or cargo door is open and the battery switch is on. If the battery switch is off, the annunciator will illuminate only if the cabin door is not securely closed and latched. The cabin/cargo door sensing circuit receives power from the hot battery bus.

CAUTION

When operating the cargo door, ensure that the cabin door is closed and locked. Operating the cargo door while the cabin door is open may damage the door hinge and adjacent structure.

(1) Opening the cargo door.

CAUTION

Avoid side loading of the gas springs to prevent damage to the mechanism.

1. Handle access door (lower forward corner of door) Unfasten and open.
2. Handle Lift hook and move to OPEN position.
3. Handle access door Secure.
4. Handle access door (upper aft corner of door) Unfasten and open.
5. Handle Press button and lift to OPEN position then latch in place.
6. Handle access door Secure.
7. Door support rod Attach one end to cargo door ball stud (on forward side of door).
8. Support rod detent pin Check in place.
9. Cabin door sill step Push out on and allow cargo door to swing open. Gas springs will automatically open the door.
10. Door support rod Attach free end to ball stud on forward fuselage door frame.

(2) Closing the cargo door.

CAUTION

Avoid side loading of the gas springs to prevent damage to the mechanism.

1. Door support rod Detach from-fuselage door frame ball stud, then firmly grasp free end of rod while exerting downward force to overcome the pressure of gas spring assemblies, then remove support rod from door as gas spring assemblies pass the over-center position.

2. Cargo door Pull closed, using finger hold cavity in fixed cabin door step.
3. Handle access door (upper aft corner of door) Unfasten and open.
4. Handle Press button and pull handle down until it latches in closed position.
5. Handle access door Secure.
6. Handle access door (lower forward corner of door) Unfasten and open.
7. Handle Move to full forward position.
8. Safety hook Check locked in position by pulling aft on handle.
9. Handle access door Secure.

c. Cabin Door Annunciator. As a safety precaution, two illuminated MASTER CAUTION annunciators in the glare shield and a steadily illuminated CABIN DOOR amber caution annunciator in the caution/advisory panel indicate the cabin door is not closed and locked. This circuit is protected by the two. 5-ampere circuit breakers, placarded ANN PWR and ANN IND located in the overhead circuit breaker panel (fig. 2-6.).

d. Cabin Emergency Hatch. The cabin emergency hatch, placarded EXIT PULL, is located in the right cabin sidewall just aft of the copilot's seat. The hatch may be removed from the inside with a pull-down handle. A flush-mounted, pull out handle allows the hatch to be released from the outside. The hatch is of the non-hinged plug type which removes completely from the frame when the latches are released. The hatch can be key locked from the inside to prevent opening from the outside. The inside handle will unlatch the escape hatch whether or not it is locked, by overriding the locking mechanism. The keylock should be unlocked prior to flight to allow removal of the escape hatch from the outside in the event of an emergency. The key remains in the lock when the hatch is locked and can be removed only when the hatch is unlocked. The key slot is in the vertical position when the hatch is unlocked. Removal of the key from the lock before flight assures the pilot that the hatch can be removed from the outside if necessary.

2-10. WINDOWS.

a. Cockpit Windows. The pilot and copilot have side windows, a windshield and storm windows, which provide visibility from the cockpit. The storm windows may be opened on the ground or during unpressurized flight.

b. Cabin Windows. The outer cabin windows, constructed of two-ply stretched acrylic, are of the pressure type and an integral part of the pressure vessel. The windows have flaps which may be removed to permit visibility or installed to black out the windows.

2-11. SEATS.

a. Pilot and Copilot Seats. The controls for vertical height adjustment and fore and aft travel are located under each seat. The forward and aft adjustment handle is located beneath the lower front inboard corner of each seat. Pulling up on the handle allows the seat to move fore or aft. The height adjustment handle is located beneath the lower front outboard corner of each seat. Pulling up on the handle, allows the seat to move up and down. Both seats have adjustable headrests and armrests which will raise and lower for access to the cockpit. Handholds on either side of the overhead panels and a fold-away protective pedestal step are provided for pilot and copilot entry into the cockpit. For the storage of maps and the operator's manual, pilot and copilot seats have an inboard-slanted expandable pocket affixed to the lower portion of the seat back. Pocket openings are held closed by shock cord tension (fig. 2-9).

b. Pilot and Copilot Seat Belts and Shoulder Harnesses. Each pilot and copilot seat is equipped with a lap-type seat belt and shoulder harness connected to an inertia reel. The shoulder harness belt is of the Y configuration with the single strap being contained in an inertia reel attached to the base of the seatback. The two straps are worn with one strap over each shoulder and fastened by metal loops into the seat belt buckle. The spring loading at the inertia reel keeps the harness snug but will allow normal movement required during flight operations. The inertia reel is designed with a locking device that will secure the harness in the event of sudden forward movement or an impact action.

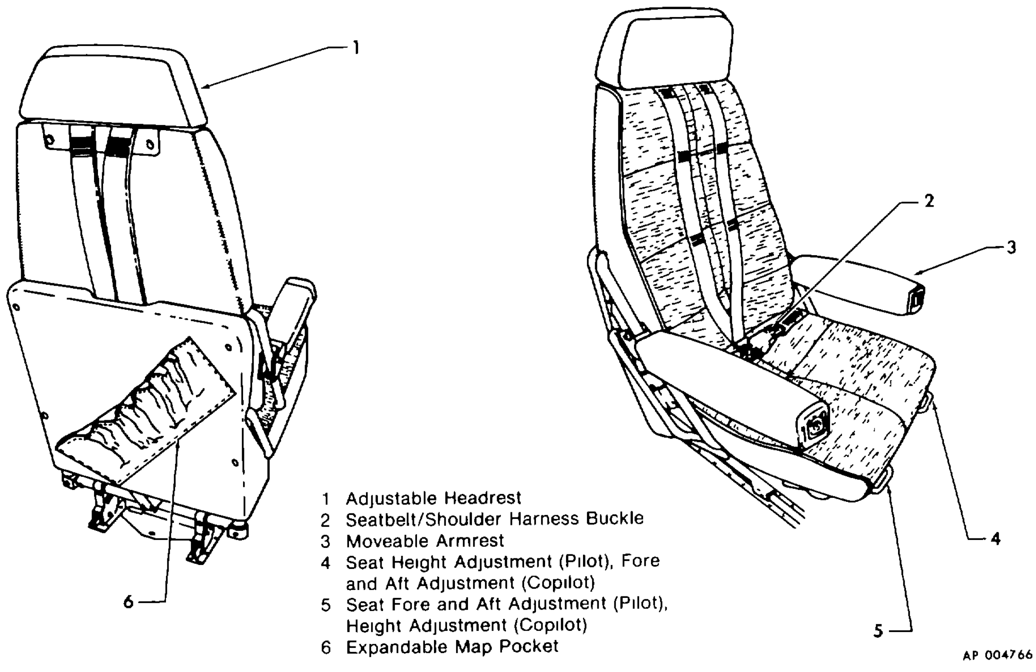


Figure 2-9. Pilot and Copilot Seats

Section II. EMERGENCY EQUIPMENT

2-12. DESCRIPTION.

The equipment covered in this section includes all emergency equipment, except that which forms part of a complete system. For example, landing gear system, etc. Chapter 9 describes the operation of emergency exits and location of all emergency equipment.

2-13. FIRST AID KITS.

Three first aid kits are included in the survival kit.

2-14. HAND-OPERATED FIRE EXTINGUISHER.

WARNING

Repeated or prolonged exposure to high concentrations of monobromotrifluoromethane (CF3Br) or decomposition products should be avoided. The liquid shall not be allowed to come into contact with the skin, as it may cause frost bite or low temperature burns because of its very low boiling point.

One hand-operated fire extinguisher is mounted below the pilot's seat and a second extinguisher is located in the left cabin sidewall, aft of the cabin door. They are of the monobromotrifluoromethane (CF_3Br) type. The extinguisher is charged to a pressure of 150 to 170 PSI and emits a forceful stream. Use an extinguisher with care within the limited area of the cabin to avoid severe splashing.

NOTE

Engine fire extinguisher systems are described in Section III.

2-15. SURVIVAL KITS.

Tie-down provisions for a survival raft and kit are provided just forward of the toilet on the right side of the aft cabin area.

Section III. ENGINES AND RELATED SYSTEMS

2-16. ENGINES.

The aircraft is powered by two PT6A-67 turboprop engines, rated at 1100 SHP (fig. 2-10). Each engine is equipped with a hydraulically controlled, reversible, constant-speed, four-bladed full feathering propeller. The engines are reverse flow, free turbines, employing four-stage axial compressors and single-stage centrifugal compressors in combination, driven by the gas generator turbine. The gas generator turbine and the free power turbine are in line with each other and have opposite rotations. The power turbine is connected through planetary reduction gearing to a flanged propeller shaft. The oil tanks, filler cap and dipstick are an integral part of the engine.

Being a reverse flow engine, the ram air supply enters the lower portion of the nacelle and is drawn in through the aft protective screens. The air is then routed into the compressor. After it is compressed, it is forced into the annular combustion chamber, and mixed with fuel that is sprayed in through 14 nozzles mounted around the gas generator case. A capacitance discharge ignition unit and two spark igniter plugs are used to start combustion. After combustion, the exhaust passes through the compressor turbine and two stages of power turbines, then is routed through two exhaust ports near the front of the engine. A pneumatic fuel control system schedules fuel flow to maintain power set by the gas generator power lever. The accessory drive at the aft end of the engine provides power to drive the fuel pumps, 'fuel control, oilpumps, refrigerant compressor (right engine), starter/generator, and the tachometer generator. The reduction gearbox forward of the power turbine provides gearing for the propeller and drives the propeller tachometer generator, the propeller overspeed governor, and the propeller primary governor.

2-17. ENGINE COMPARTMENT COOLING.

The forward engine compartment including the accessory section is cooled by air entering around the exhaust stack cutouts, the gap between the propeller spinner and forward cowling, and exhausting through ducts in the upper and lower aft cowling.

2-18. AIR INDUCTION SYSTEMS - GENERAL.

Each engine and oil cooler receives ram air, ducted from an air scoop located within the lower section of the forward nacelle. Special components of the engine induction system protect the power plant from icing and foreign object damage.

2-19. FOREIGN OBJECT DAMAGE CONTROL.

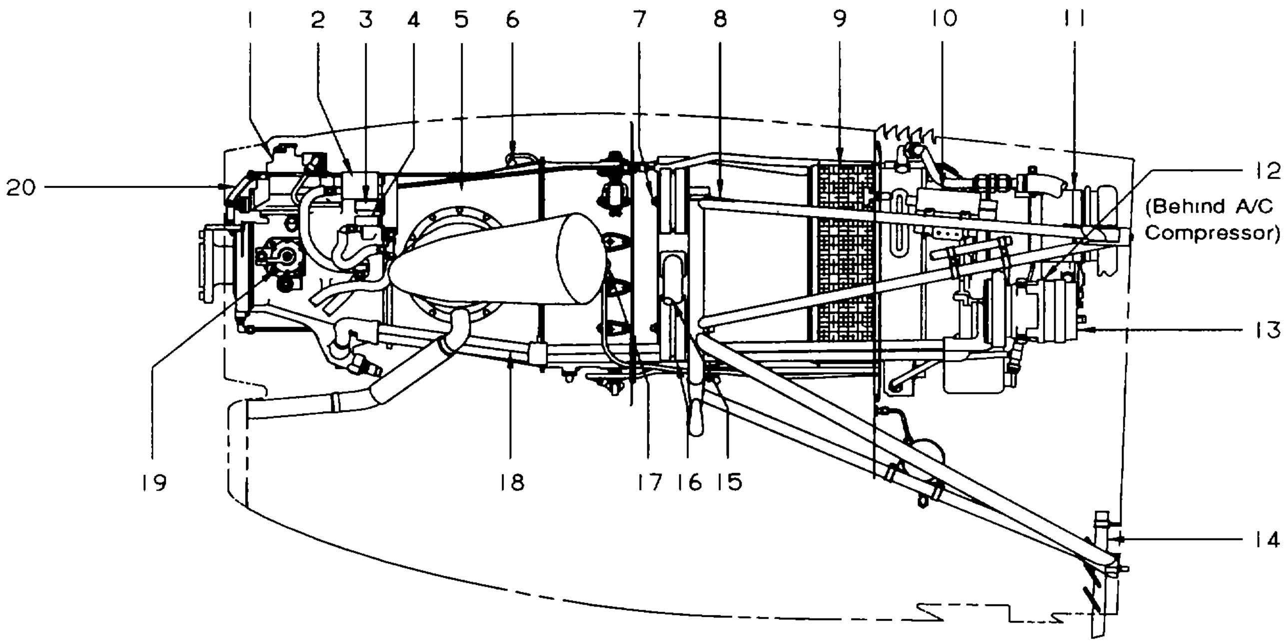
The engine has an integral air inlet screen designed to obstruct objects large enough to damage the compressor.

2-20. ENGINE ICE PROTECTION SYSTEMS.

a. Inertial Separator. An inertial separation system is built into each engine air inlet to prevent moisture particles from entering the engine inlet plenum under icing conditions. A movable vane and a bypass door are lowered into the airstream when operating in visible moisture at 5° C or colder, by energizing electrical actuators with the switches, placarded #1 & #2 ICE VANE POWER SELECT MAIN STBY, located in the overhead control panel. The system incorporates an electrical back-up system which operates identically to the main system. If the main system fails, placing the switch in the STBY position will actuate the back-up system. Electrical protection is provided through two 5-ampere circuit breakers placarded ICE VANE CONTR MAIN and ICE. VANE CONTR AUXILIARY, located in the overhead circuit breaker panel.

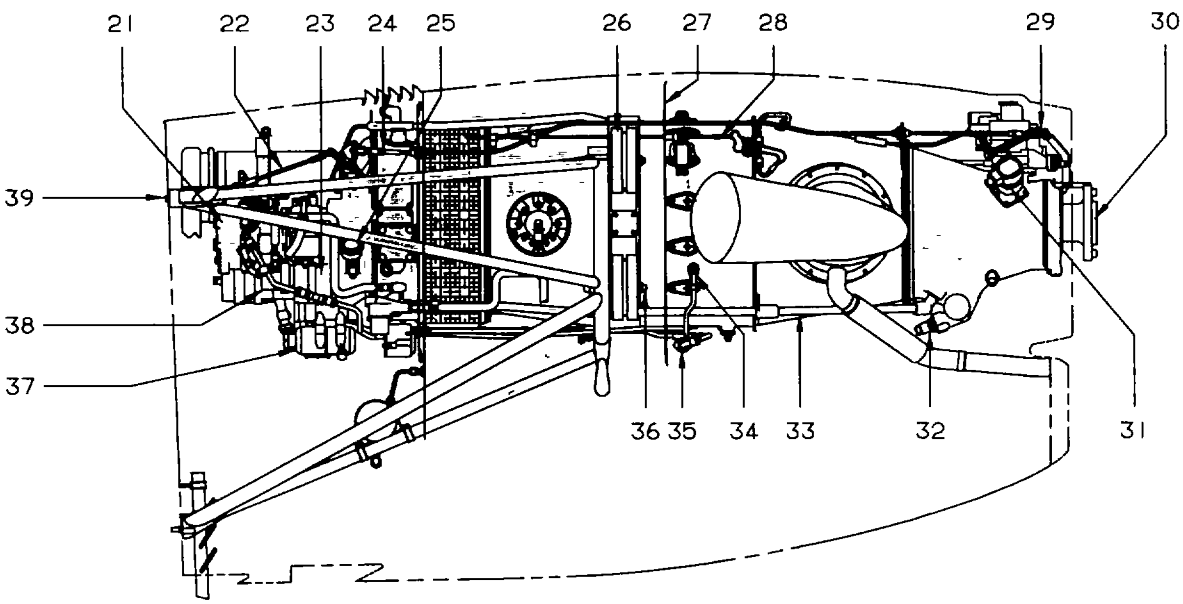
(1) The vane deflects the ram airflow slightly downward to introduce a sudden turn in the airflow to the engine, causing the moisture particles to continue on undeflected, because of their greater momentum, and be discharged overboard.

(2) Once the ice vane system is actuated, the extended position of the vane and bypass door is indicated by green annunciators, placarded #1 VANE EXTEND and #2 VANE EXTEND located in the caution/advisory panel. If for any reason the vane(s) do not attain the selected position within 33 seconds, an amber #1 VANE FAIL or #2 VANE FAIL annunciator(s) illuminates on the caution/ advisory panel. In this event, the appropriate #1 or #2 ICE VANE POWER SELECT switch should be placed in the STBY position. Once the vane is successfully positioned, using the standby (STBY) system, the amber annunciator(s) will extinguish and the applicable green #'l VANE EXTEND or #2 VANE EXTEND annunciator(s) will illuminate.



1 Prop Governor
2 Torque Transmitter
3 Pressure Switch (High)
4 Pressure Switch (Low)
5 Exhaust Duct
6 TGT Wire Harness
7 Engine Mount Bolt
8 Engine Mount Truss Assembly
9 Engine Air Intake Screen
10 Ignition Exciter
11 Starter-Generator
12. Fuel Boost Pump (Behind A/C Compressor)
13. Air Conditioner Compressor (#2 Only)
14 Drain Manifold
15 Bleed Air Line
16 Engine Mount
17 Spark Igniter Plug
18 Oil Scavenge Tubes
19 Overspeed Governor
20 Prop Reverse Linkage Lever

Figure 2-10. PT6A-67 Engine (Sheet 1 of 2)



21. Fuel Control Unit
22 Fuel Control Unit Interconnect Rod
23 Fuel Pump
24 Prop Interconnect Linkage (Aft)
25. Oil Pressure Transducer
26 Engine Mount
27 Fireseal
28 Trim Thermocouple
29 Prop Interconnect Linkage (Fore)
30 Prop Shaft
31 Tach Generator (Prop)
32 Chip Detector
33 Pressure Oil Transfer Tube
34 Spark Igniter Plug
35. Fuel Flow Divider
36 Engine Mount Bolt
37 Oil-To-Fuel Heater
38. Tach Generator
39 Engine Truss Mounting Bolt

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Figure 2-10. PT6A-67 Engine (Sheet 2 of 2) *b. Engine Air Inlet Anti-Ice System.*

(1) Description. A small duct, facing into the exhaust flow of the engine's left exhaust stack, diverts a small portion of the engine exhaust gases to the engine air inlet lip. The gases are circulated through the engine air inlet lip and then exhausted through a duct to the engine's right exhaust stack. The continuous flow of hot engine exhaust gases heats the engine air inlet lip, preventing the formation of ice.

(2) Fuel heater. An oil-to-fuel heat exchanger, located in the engine accessory case, operates continuously and automatically to heat the fuel sufficiently to prevent ice from collecting in the fuel control unit. Each fuel control unit is also protected against ice. Fuel control heat is automatically provided during all engine operations.

2-21. ENGINE FUEL CONTROL SYSTEM.

a. Description. The basic engine fuel system consists of an engine driven fuel pump, a fuel control unit, a fuel flow divider, a dual fuel manifold, fourteen fuel nozzles and a purge system. The fuel purge system forces residual fuel from the manifolds to the combustion chamber where it is consumed.

b. Fuel Control Unit. One fuel control unit is mounted on the accessory case of the engine. This unit is a hydro-pneumatic metering device which determines the proper fuel flow schedule for the engine to produce the amount of power requested by the relative position of its power lever. The control of developed engine power is accomplished by adjusting the engine gas generator (N_1) speed. N_1 speed is controlled by engine gas generator (N_1) speed. N_1 speed is controlled by varying the amount of fuel injected into the combustion chamber through the fuel nozzles. Engine shutdown is accomplished by moving the appropriate condition lever to the full aft FUEL CUTOFF position, which shuts off the fuel supply.

2-22. POWER LEVERS.

CAUTION

Moving the power levers below the flight idle gate without the engines running may result in damage to the reverse mechanism linkage.

The two power levers are located in the control pedestal (fig. 2-11), and are placarded POWER. These levers regulate power in the reverse, idle and forward ranges, operating so that forward movement increases engine power. Power control is accomplished through adjustment of the N_1 speed governor in the fuel control unit. Power is increased when N_1 RPM is increased. The power levers also control propeller reverse pitch. Distinct movement (pulling up and then aft on the power lever) by the pilot is required for operation in the ground fine and reverse ranges. Upper lever travel range is designated INCR (increase), supplemented by an arrow pointing forward. Lever travel range is marked IDLE, LIFT, GROUND FINE, LIFT and REVERSE. A placard below the lever slots reads: CAUTION - REVERSE ONLY WITH ENGINES RUNNING.

2-23. CONDITION LEVERS.

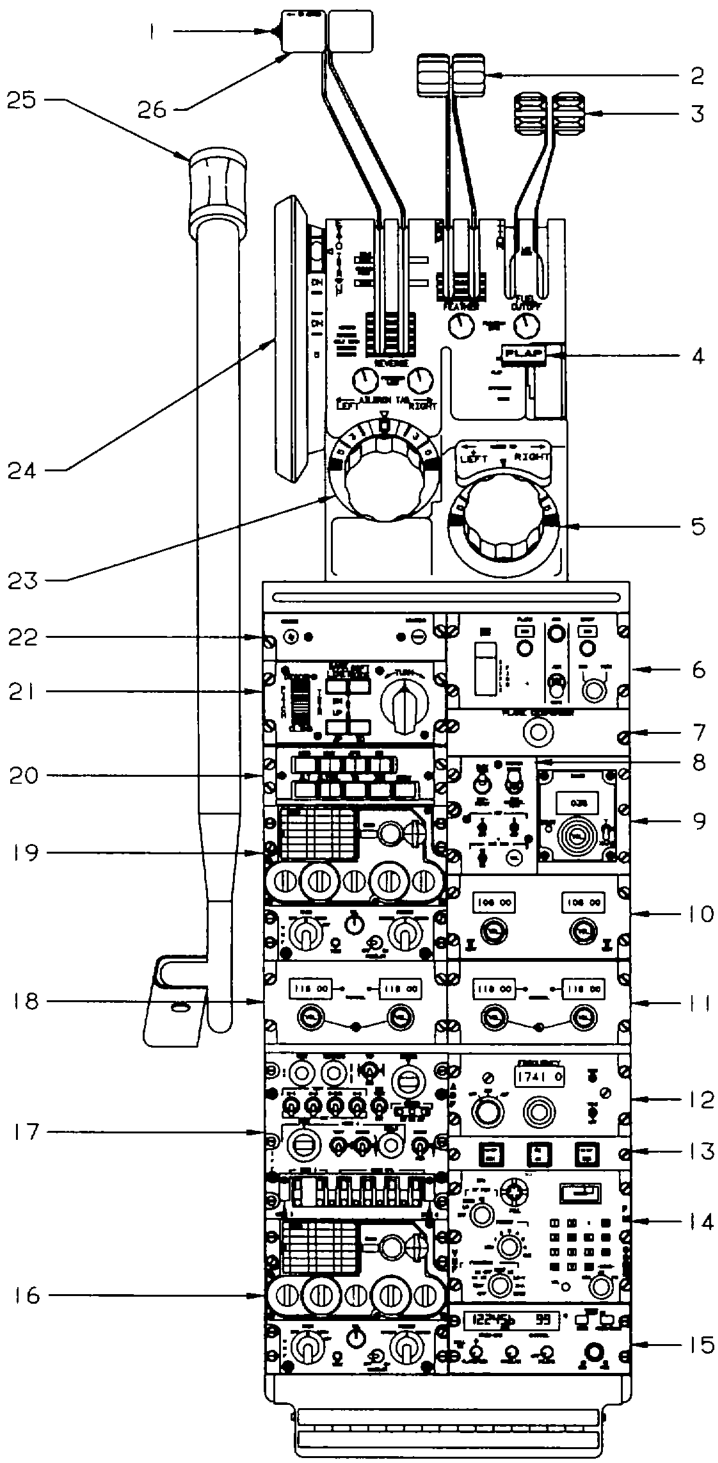
The two condition levers are located in the control pedestal (fig. 2-11). Each lever starts and stops the fuel supply, and controls the idle speed for its engine. The levers have three placarded positions: FUEL CUTOFF, LOW IDLE, and HIGH IDLE. In the FUEL CUTOFF position, the condition lever controls the cutoff function of its engine-mounted fuel control unit. From LOW IDLE to HIGH IDLE, they control the governors of the fuel control units to establish minimum fuel flow levels. LO IDLE position sets the fuel flow-rate to attain 60 to 62% (at sea level) minimum N_1 and HIGH IDLE position sets the rate to attain 71 to 73% minimum N_1. The power lever for the corresponding engine can select N_1 the respective idle setting, up to maximum power. An increase in low idle N_1 will be experienced at high field elevation.

2-24. FRICTION LOCK KNOBS.

Four friction lock knobs (fig. 2-11) are located in the control pedestal to adjust friction drag. One knob is below the propeller levers, one below the condition levers, and two below the power levers. When the knobs are rotated clockwise, friction is increased opposing movement of the affected lever as set by the pilot. Counterclockwise rotation of the knobs will decrease friction, thus permitting free and easy lever movement. Two FRICTION LOCK placards are located in the pedestal adjacent to the knobs.

2-25. ENGINE FIRE DETECTION SYSTEM.

a. Description. A fire detection system is installed to provide an immediate warning in the



1 Go-Around Button
2 Propeller Levers
3 Condition Levers
4 Flap Control
5 Rudder Trim Tab Wheel
6 Chaff/Flare Dispenser Control Panel
7 Flare Dispenser Switch
8 Elevator Trim and Rudder Boost Switches
9 TACAN Control Panel
10 NAV1/NAV2 Control Panel
11 VHF-AM Comm No 2 Control Panel
12 ADF Control Panel
13 Comm Radios Audio Monitor Selector
14 SINCGARS FM Radio
15 HF Command Set Control Panel
16 No 2 UHF Command Set
17 Transponder
18 VHF-AM Comm No. 1
19 No 1 UHF Command Set
20 Flight Director Mode Selector
21 Autopilot Pitch and Turn Control
22 No 1 HSI Course and Heading Knobs
23 Aileron Tab Control and Position Indicator
24 Elevator Tab Control and Position Indicator
25 Emergency Landing Gear Extension Handle
26 Power Levers

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Figure 2-11. Control Pedestal And Pedestal Extension

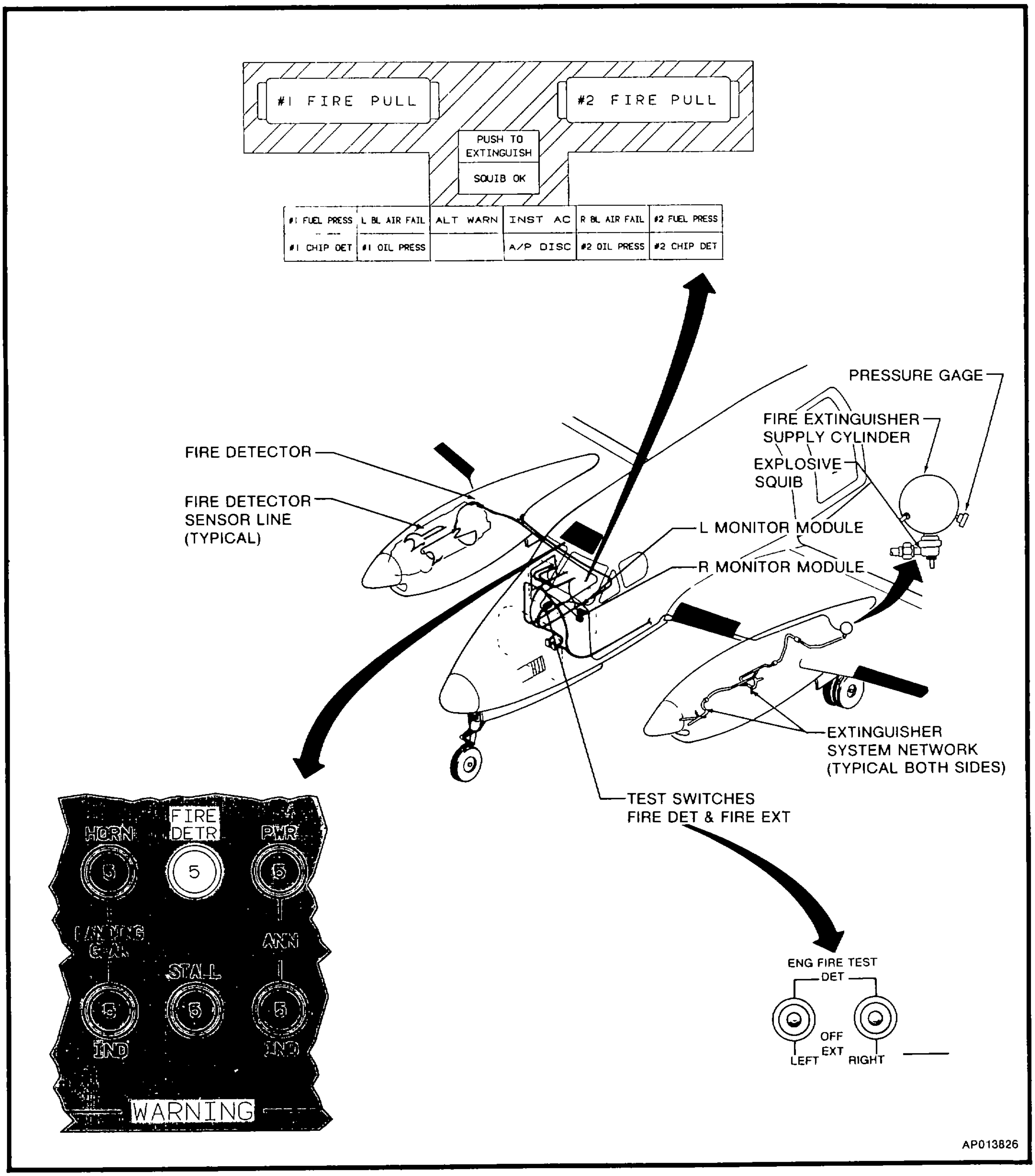

Figure 2-12. Engine Fire Detection/Extinguisher System

event of a fire or overtemperature in the engine compartment (fig. 2-12). The main element of the system is temperature sensing tubing, routed continuously throughout the engine compartment terminating in a responder unit. The responder unit is mounted in the accessory area on the upper left hand engine mount truss, just forward of the engine firewall. The responder unit contains two sets of contacts: a set of integrity switch contacts, for continuity test functions of the fire detection circuitry; and a set of alarm switch contacts, which complete the circuit to activate the fire warning system when the detector (sensing tubing) senses an overtemperature condition in critical areas around the engine. The detector is dual functioning and responds to overall "average" temperature, or a highly localized "discrete" temperature, caused by flames or hot gases. Both the average and discrete temperatures are preset, and cannot be adjusted in the field.

The sensor tubing consists of an outer tube filled with an inert gas, and an inner hybrid core that is filled with an active gas. The gases within the tube form a pressure barrier that keeps the contacts of the responder integrity switch closed for fire alarm continuity test functions. As the temperature around the sensing cable increases, the gases within the tube begin to expand. When the pressure from the expanding gases reaches a preset point, the contacts of the responder alarm switch close, activating the respective fire warning system.

b. Warning System. The fire warning system consists of two lenses, placarded #1 FIRE PULL and #2 FIRE PULL located in the T handles below the glareshield, two MASTER WARNING annunciators located in opposite sides of the glareshield, and two responder units with sensors in the engine compartments. If the detector should develop a leak, the loss of gas pressure would allow the integrity switch to open and signal a lack of detector integrity.

c. Testing. Testing system integrity, availability of power, and the annunciators, (#1 and #2 FIRE PULL and MASTER WARNING) is accomplished by two switches located in the copilot's left subpanel. The switches are placarded ENG FIRE TEST, DET -OFF - EXT, LEFT and RIGHT. When either (LEFT or RIGHT) switch is placed in the DET position, electrical current flows from a 5-ampere circuit breaker placarded FIRE DETR located in the overhead circuit breaker panel, through the engine fire detector circuitry to the integrity switch contacts in the respective responder unit, causing the respective annunciators to illuminate. If the circuit breaker opens, the system will not operate during a test, or activate the annunciators if the detector cable senses an overtemperature condition. The system may be tested either before, after, or in flight as desired.

2-26. ENGINE FIRE EXTINGUISHER SYSTEM.

a. Description. The engine fire extinguisher system is comprised of a supply cylinder, explosive squib, and valve located in each of the main gear wheel wells. A gage calibrated in PSI is provided on each supply cylinder for determining the level of charge. The extinguishing agent charge level should be checked during each preflight. When fired, the explosive squib opens the valve, releasing all of the pressurized extinguishing agent into a plumbing network. The plumbing network terminates in spray nozzles, strategically located in the probable fire areas of the engine compartment.

b. Operation. Fire control T handles used to arm the extinguisher system are centrally located in the instrument panel, immediately below the glareshield. These controls receive power from the hot battery bus. The fire detector system will indicate an engine fire by illuminating the MASTER WARNING annunciators on the glareshield and the respective #-1 or #2 FIRE PULL annunciators in the fire control T handles. Pulling the fire control T handle will electrically arm the: extinguisher system and close the firewall shutoff valve for that particular engine. This will cause the annunciator in the PUSH TO EXTINGUISH switch and the respective #1 and #2 FUEL PRESS annunciators in the warning annunciator panel to illuminate. Pressing the lens of the PUSH TO EXTINGUISH fire switch will fire the squib, expelling all the agent in the cylinder at one time. A hinged plastic guard covers the PUSH TO EXTINGUISH fire switch to prevent inadvertently actuating the fire extinguish switch squib circuit. The respective caution annunciator, #1 and #2 EXTGH DISCH on the caution/advisory annunciator panel and the MASTER CAUTION annunciator on the glareshield will illuminate and remain illuminated, regardless of the master switch position, until the squib is replaced.

c. Testing. The test switches located in the copilot's left subpanel, are placarded ENG FIRE TEST, DET - OFF - EXT, LEFT' and RIGHT, and provide a test of the fire detection and extinguisher circuitry. When either of the switches is placed in the EXT position, the corresponding PUSH TO EXTINGUISH, SQUIB OK and EXTGH DISCH

Table 2-1. Engine Fire Extinguisher Gage Pressure

TEMP°C	-40	-29	-18	-06	04	16	27	38	48
PSI	190 to 240	220 to 275	250 to 315	290 to 365	340 to 420	390 to 480	455 to 550	525 to 635	605 to 730

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annunciators should illuminate. The system may be tested either before, after, or in flight as desired.

A gage calibrated in PSI is mounted on each extinguishing agent supply cylinder for determining the level of charge and should be checked during preflight (table 2-1).

2-27. OIL SUPPLY SYSTEM.

CAUTION

Maximum allowable oil consumption is .3 lb/hr (.45 gallons) per 10 hours of engine operation.

a. The engine oil tank is integral with the air-inlet casting located forward of the accessory gearbox. Oil for propeller operation, lubrication of the reduction gearbox and engine bearings is supplied by an external line from the high pressure pump. Two scavenge lines return oil to the tank from the propeller reduction gearbox. A non-congealing, external oil cooler keeps the engine oil temperature within the operating limits. The capacity of each engine oil tank is 2.5 U.S. gallons. The total system capacity for each engine, which includes the oil tank, oil cooler, lines, etc., is approximately 3.5 U.S. gallons. The oil level is indicated by a dipstick attached to the oil filler cap. Oil grade, specification and servicing points, are described in Section IX, Servicing.

b. The oil system of each engine is coupled to an oil cooler unit (radiator) of fin-and-tube design. These oil cooler units are the only airframe mounted part of the oil system and are located in the lower aft nacelles below the engine air intake. Each oil cooler incorporates a thermal bypass valve which assists in maintaining oil at the proper temperature range for engine operation.

2-28. ENGINE IGNITION SYSTEM.

a. Description. The basic ignition system consists of a solid state ignition exciter unit, two igniter plugs, two shielded ignition cables, pilot controlled ignition and engine start switches and the auto ignition switches. Placing either ENG START switch to START - IGNITION position will cause the respective engine to motor, and igniter plugs to spark, igniting the fuel/air mixture sprayed into the combustion chamber by the fuel nozzles. The ignition system is activated for ground and air starts, but is switched off after combustion light up.

b. Ignition and Engine Starter Switches. Two three-position toggle switches, placarded #1 or #2 ENG START, are located in the overhead control panel (fig. 2-13). These switches will initiate starter motoring and ignition in the START IGNITION position, or will motor the engine in the STARTER ONLY position. The START IGNITION switch position completes the starter circuit for engine rotation, energizes the igniter plugs for fuel combustion, and activates the #1 IGN ON or #2 IGN ON annunciator on the annunciator panel. In the center position the switch is OFF. Two 5-ampere circuit breakers on the overhead circuit breaker panel, placarded IGNITOR CONTR #1 and #2, protect ignition circuits. Two 5-ampere circuit breakers on the overhead circuit breaker panel, placarded START CONTR #1 and #2, protect starter control circuits (fig. 2-6).

2-29. AUTO IGNITION SYSTEM.

If armed, the auto ignition system automatically provides combustion re-ignition of either engine, should an accidental flameout occur. The system is not essential to normal engine operation, but is used to reduce the possibility of power loss due to icing or other conditions. Each engine has a separate auto ignition control switch and a green annunciator placarded #1 IGN ON or #2 IGN ON, on the annunciator panel. Auto ignition is accomplished by energizing both igniter plugs in each engine.

NOTE

The system should be turned OFF during extended ground operation to prolong the life of the igniter plugs.

a. Auto Ignition Switches. Two switches, located in the overhead control panel (fig. 2-13), each placarded AUTO IGNITION - ARM control the

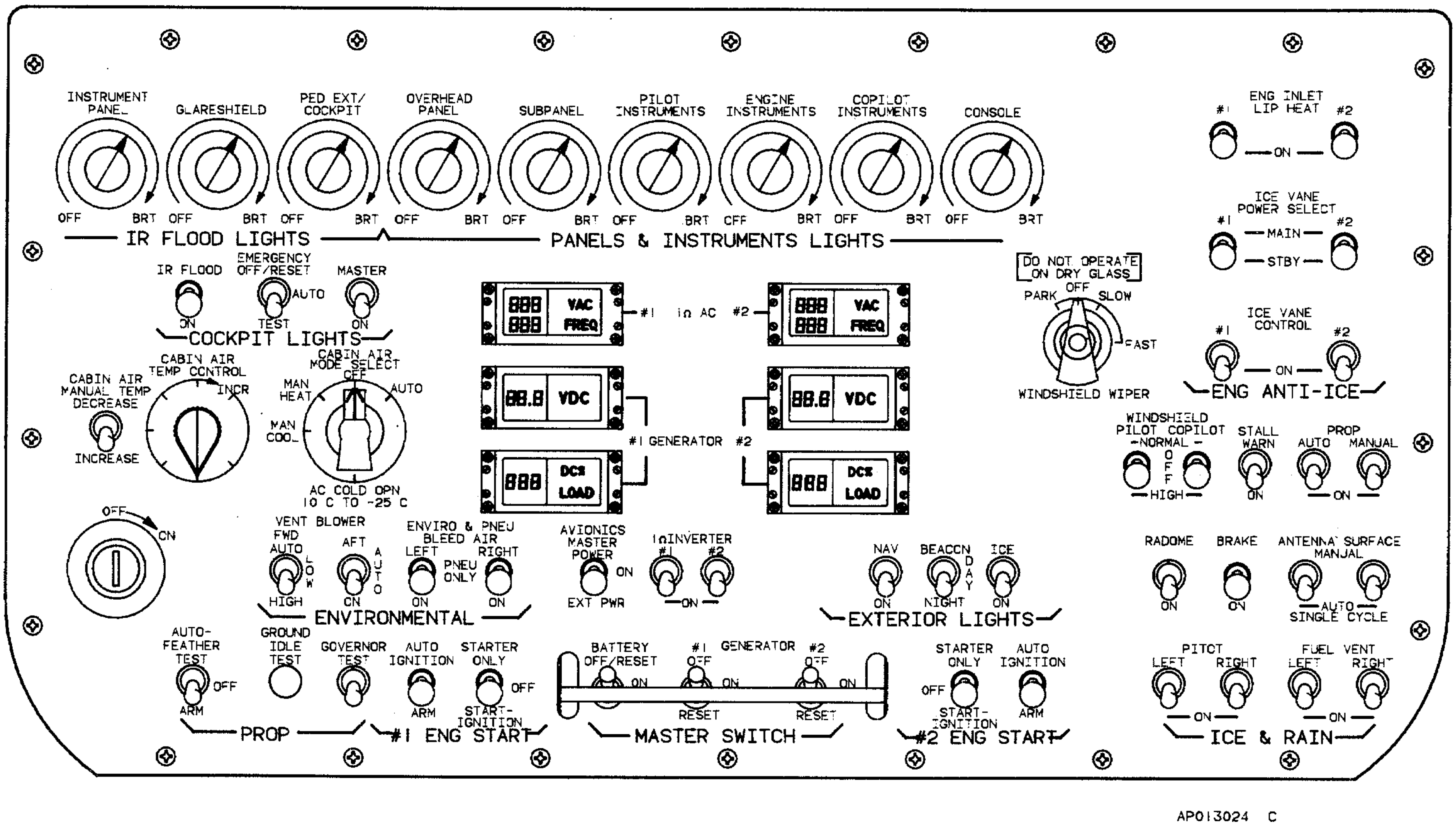

Figure 2-13. Overhead Control Panel

auto ignition systems. The ARM position initiates a readiness mode for the auto ignition system of the corresponding engine. The system is disarmed when in the OFF position. Each circuit is protected by the corresponding START CONTR #1 or #2, 5-ampere circuit breaker on the overhead circuit breaker panel (fig. 2-6).

b. Auto Ignition Annunciators. If an armed auto ignition system changes from a ready condition to an operating condition (energizing the igniter plugs in the engine) the corresponding engine's green annunciator will illuminate. The annunciator is placarded #1 IGN ON or #2 IGN ON and indicates that the igniters are energized. The auto ignition system is triggered from a ready condition to an operating condition when engine torque drops below approxi-mately 20%. Therefore, when an auto ignition system is armed, the igniters will be energized continuously during the time when an engine is operating at a level below approximately 20% torque. The auto ignition annunciators are protected by the 5-ampere IGNITOR CONTR #1 or #2 circuit breakers, located in the overhead circuit breaker panel (fig. 2-6).

2-30. ENGINE STARTER-GENERATORS.

One starter-generator is mounted on the accessory drive section of each engine. Each starter-generator is able to function either as a starter or as a generator. In the starter function, 28 volts DC is required to power rotation. In the generator function, each unit is capable of 400-amperes DC output. When the starting function is selected, the starter control circuit receives power through the respective 5-ampere START CONTR circuit breaker on the overhead circuit breaker panel from either the aircraft battery or an external power source. When the generating function is selected, the starter-generator provides electrical power.

2-31. ENGINE INSTRUMENTS.

The engine instruments are arranged vertically near the center of the instrument panel (fig. 2-14).

a. Turbine Gas Temperature Indicators. The two TGT gages on the instrument panel are calibrated in degrees Celsius (fig. 2-14). Each gage is connected to thermocouple probes located in the hot gases between the turbine wheels. The gages register the temperature present between the compressor turbine and power turbine for the corresponding engine.

b. Engine Torquemeters. The two torquemeters on the instrument panel indicate torque applied to the propeller shafts of the respective engines (fig. 2-14). Each gage shows torque in percent of maximum using two percent graduations and is actuated by an electrical signal from a pressure sensing system located in the respective propeller reduction gear case. The torquemeters are protected by individual 0.5-ampere circuit breakers placarded TORQUE METER #1 or #2 on the overhead circuit breaker panel (fig. 2-6).

c. Turbine Tachometers. The two tachometers on the instrument panel register compressor turbine RPM (N.) for the respective engine (fig. 2-14). These indicators register turbine RPM as a percentage of maximum gas generator RPM. Each instrument is slaved to a tachometer generator attached to the respective engine.

d. Oil Pressure/Oil Temperature Indicators. The two gages on the instrument panel register oil pressure in PSI and oil temperature in° C (fig. 2-14). Oil pressure is taken from the delivery side of the main oil pressure pump. Warning annunciators placarded No. 1 OIL PRESS and No. 2 OIL PRESS are located in the warning annunciator panel. Oil temperature is transmitted by a thermal sensor unit which senses the temperature of the oil as it leaves the delivery side of the oil pressure pump. Each gage is connected to pressure and temperature transmitters installed on the respective engine. Both instruments are protected by 5-ampere circuit breakers, placarded OIL PRESS and OIL TEMP #1 or #2, on the overhead circuit breaker panel (fig. 2-6).

e. Fuel Flow Indicators. The two gages on the instrument panel (fig. 2-14) register the rate of flow for consumed fuel as measured by sensing units coupled into the fuel supply lines of the respective engines. The fuel flow indicators are calibrated in increments of hundreds of pounds per hour. Both circuits are protected by 5-ampere circuit breakers placarded FUEL FLOW #1 or #2, on the overhead circuit breaker panel (fig. 2-6).

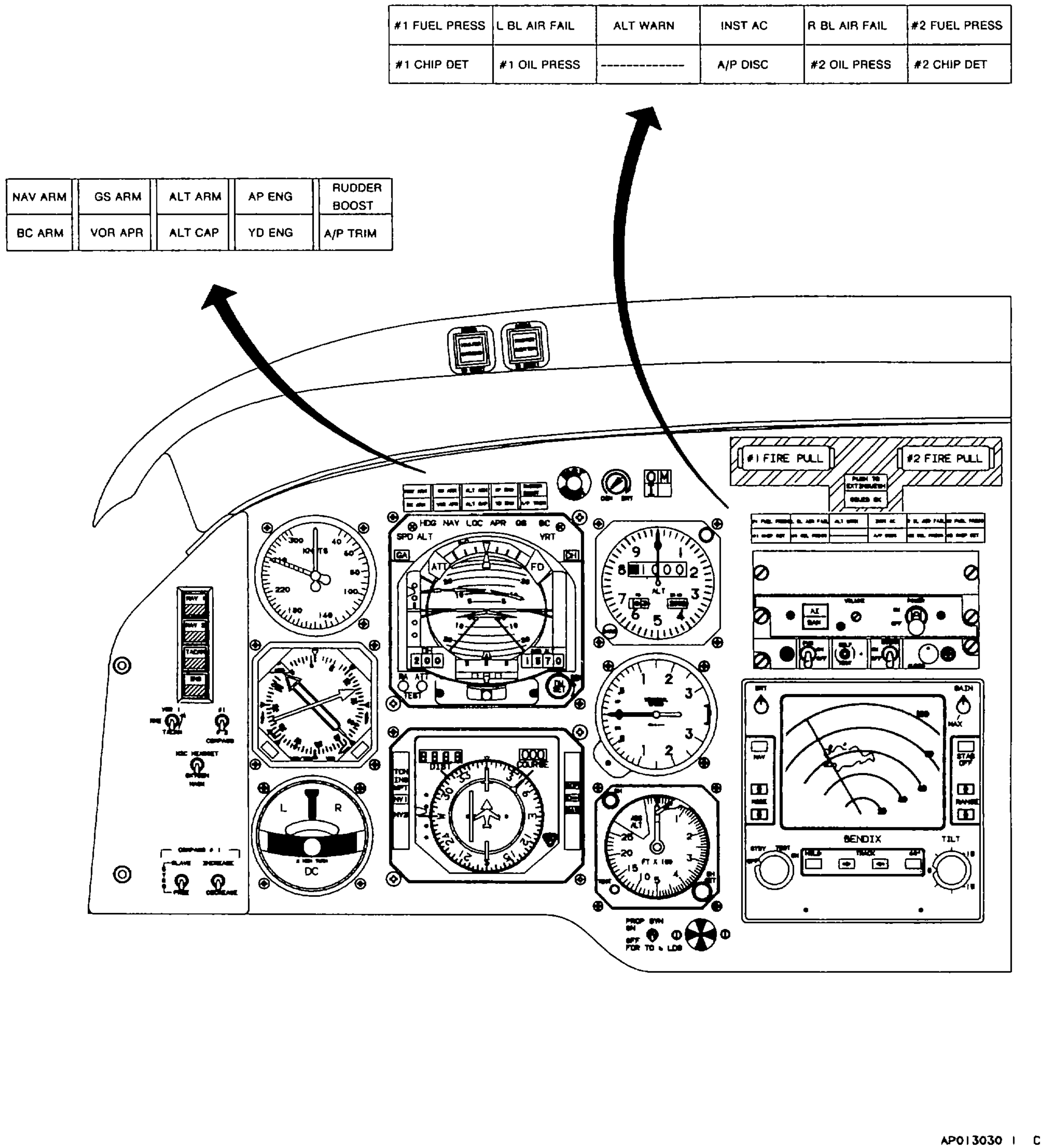

Figure 2-14. Instrument Panels (Sheet 1 of 2)

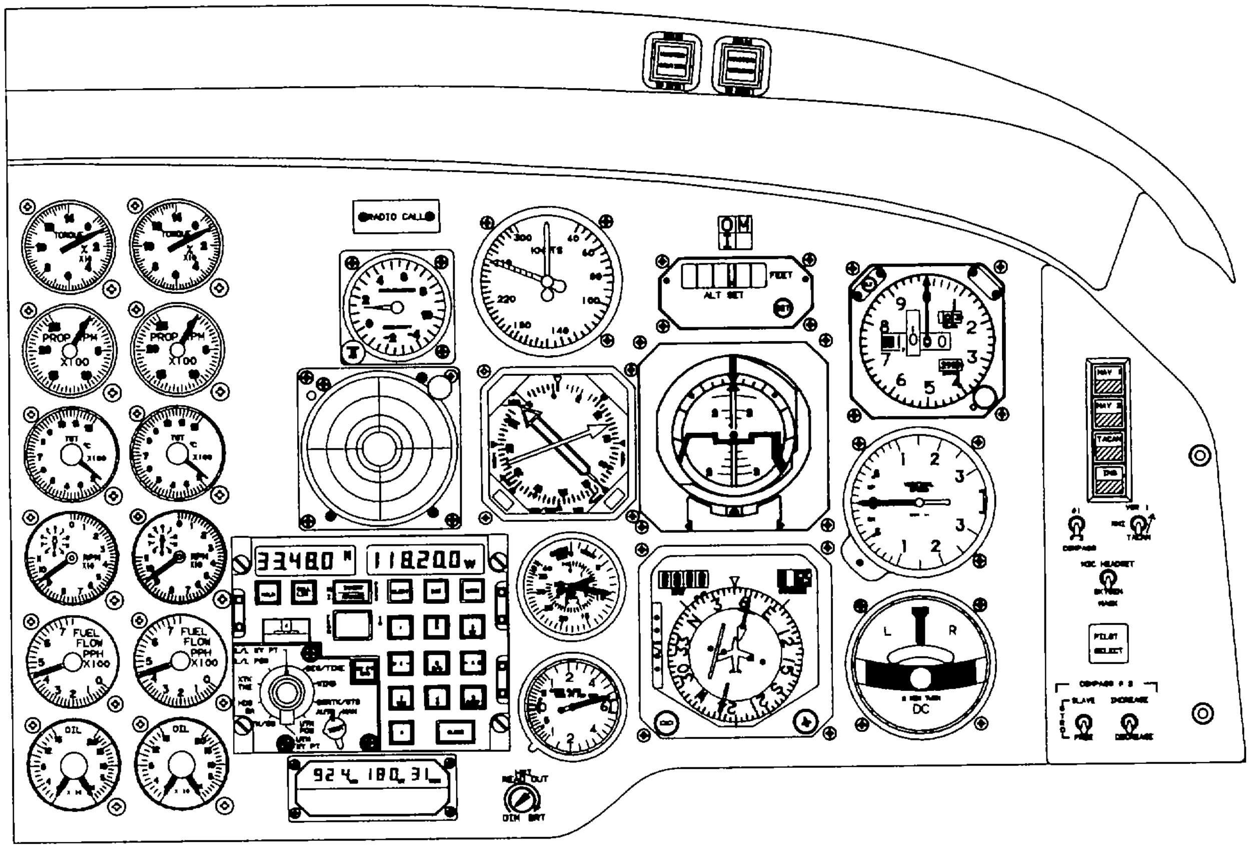

Figure 2-14. Instrument Panels (Sheet 2 of 2)

Table 2-2. Usable Fuel Quantity Data

	TANKS	NUMBER	GALLONS
LEFT ENGINE		Main Tanks	6 192
	Auxiliary Tank	1	78
RIGHT ENGINE	Main Tanks	6	192
	Auxiliary Tank	1	78
*TOTALS		14	540
*Unusable fuel quantity not included in totals.			

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Section IV. FUEL SYSTEM

2-32. FUEL SUPPLY SYSTEM.

The engine fuel supply system (fig. 2-15) consists of two identical systems sharing a common fuel management panel (fig. 2-16) and fuel crossfeed plumbing (fig. 2-17). Each main fuel system consists of five interconnected wing tanks, and a nacelle tank. Each auxiliary fuel system consists of one tank located between the nacelle and the fuselage. A fuel transfer pump is located within each auxiliary tank. Additionally, the system has an engine-driven boost pump, a standby fuel pump located within each nacelle tank, a fuel heater (engine oil-to-fuel heat exchanger unit), a tank vent system, a tank vent heating system and interconnecting wiring and plumbing. Total fuel tank capacity is shown in Table 2-2. Gravity feed fuel flow is shown in figure 2-18.

a. Engine Driven Boost Pumps.

CAUTION

Engine operation using only the engine-driven primary (high pressure) fuel pump without standby pump or engine-driven boost pump fuel pressure is limited to 10 cumulative hours. This condition is indicated by illumination of either the #1 or #2 FUEL PRESS warning annunciator and the simultaneous illumination of both MASTER WARNING annunciators. All time in this category shall be entered on DA Form 2408-13 for the attention of maintenance personnel.

A gear-driven boost pump, mounted on each engine supplies fuel under pressure to the inlet of the engine-driven primary high-pressure pump for engine starting and all normal operations. Either the engine-driven boost pump or standby pump is capable of supplying sufficient pressure to the engine- driven primary high-pressure pump and thus maintain normal engine operation.

b. Standby Fuel Pumps. A submerged, electrically-operated standby fuel pump, located within each nacelle tank, serves as a backup unit for the engine-driven boost pump. The standby pumps are switched off during normal system operations. A standby fuel pump will be operated during crossfeed operation to pump fuel from one system to the oppo-site engine. The correct pump is automatically selected when the CROSSFEED switch is activated. Each standby fuel pump has an inertia switch included in the power supply circuit. When subjected to a 5 to 6 g shock loading, as in a crash situation, the inertia switch will remove electrical power from the standby fuel pumps. The standby fuel pumps are protected by two 10-ampere circuit breakers placarded STANDBY PUMP #1 or #2, located in the overhead circuit breaker panel (fig. 2-6), and four 5-ampere circuit breakers (two each in parallel) on the hot battery bus.

c. Fuel Transfer Pumps. The auxiliary tank fuel transfer system automatically transfers the fuel from the auxiliary tank to the nacelle tank without pilot action. Motive flow to a jet pump mounted in the auxiliary tank sump is obtained from the engine fuel plumbing system downstream from the engine driven boost pump and routed through the transfer control motive flow valve. The motive flow valve is energized to the open position by the control system to transfer auxiliary fuel to the nacelle tank to be consumed by the engine during the initial portion of the flight. When an engine is started, pressure at the engine driven boost pump closes a pressure switch, which after a 30 to 50 second time delay to avoid

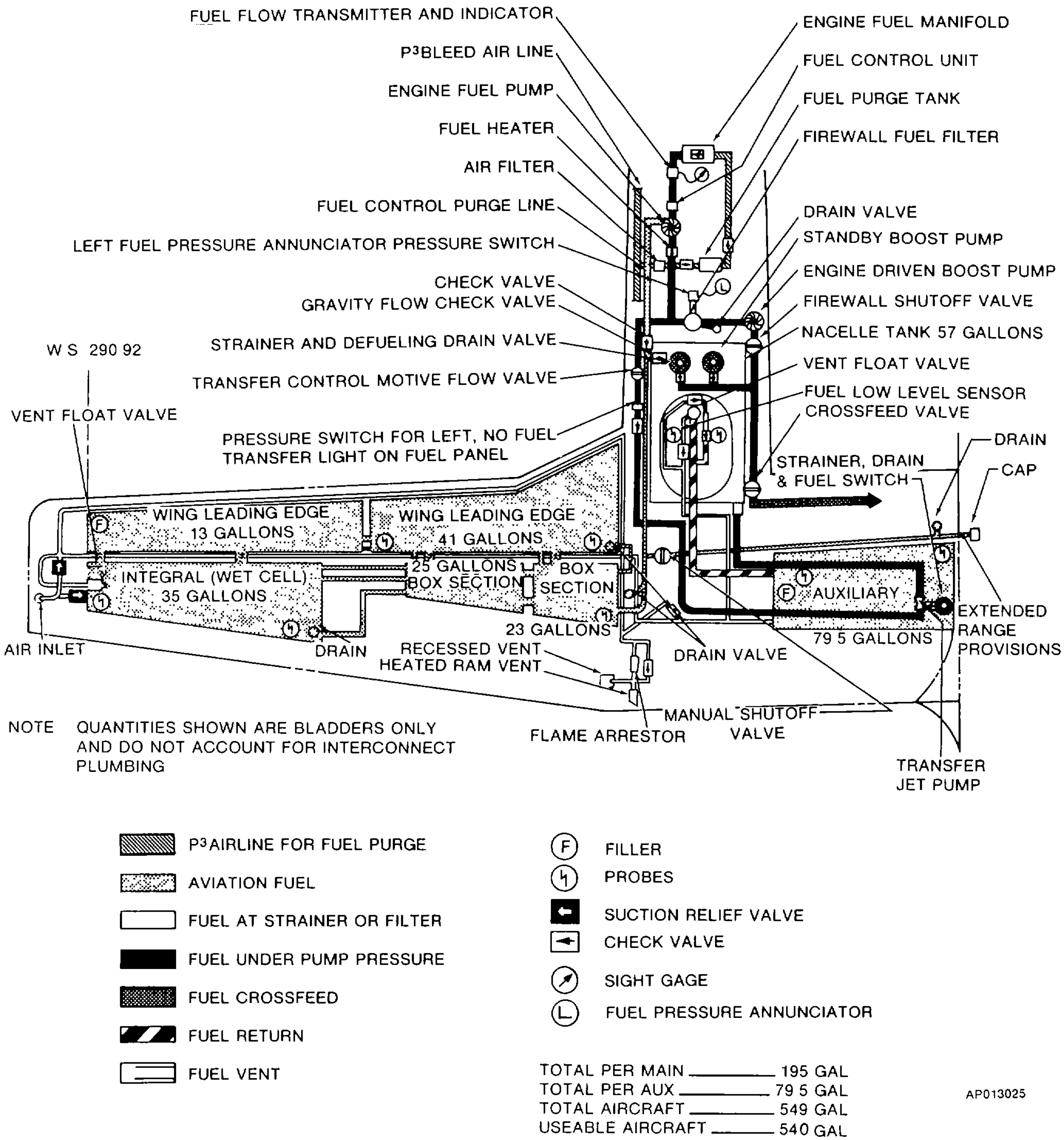
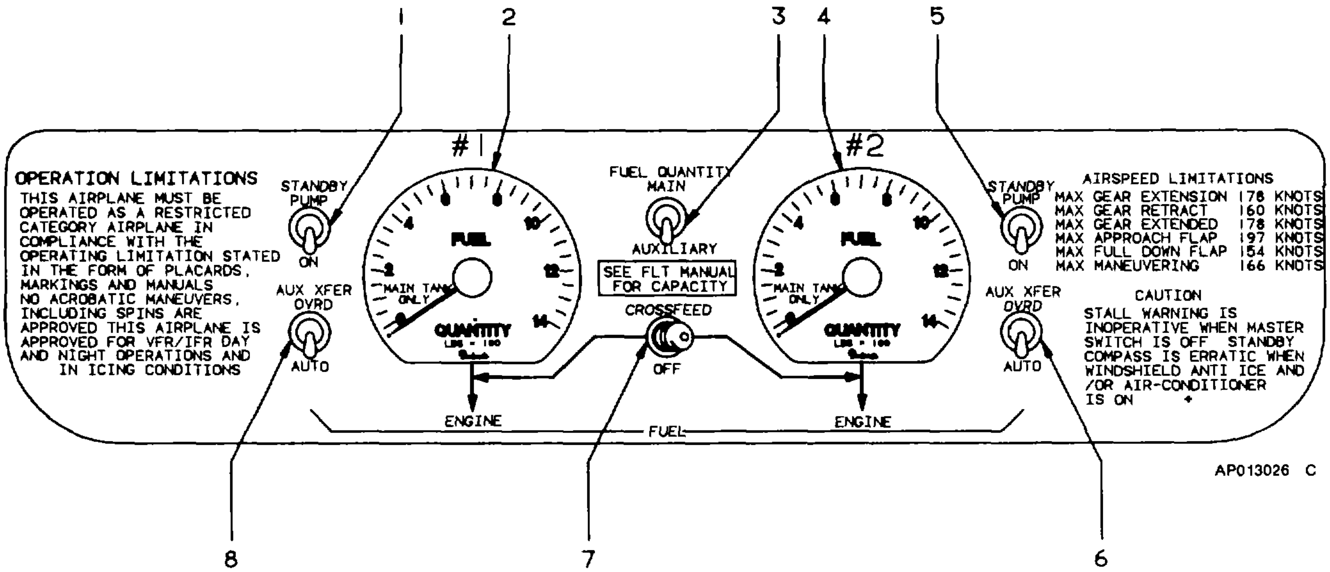


Figure 2-15. Fuel System Schematic



1 STANDBY PUMP Switch (#1 Engine)
2 Fuel Quantity Indicator (#1 Engine)
3 FUEL QUANTITY Gaging System Switch
4 Fuel Quantity Indicator (#2 Engine)
5 STANDBY PUMP Switch (#2 Engine)
6 Auxiliary Transfer Override Switch (#2 Engine)
7 CROSSFEED Valve Switch
8 Auxiliary Transfer Override Switch (#1 Engine)

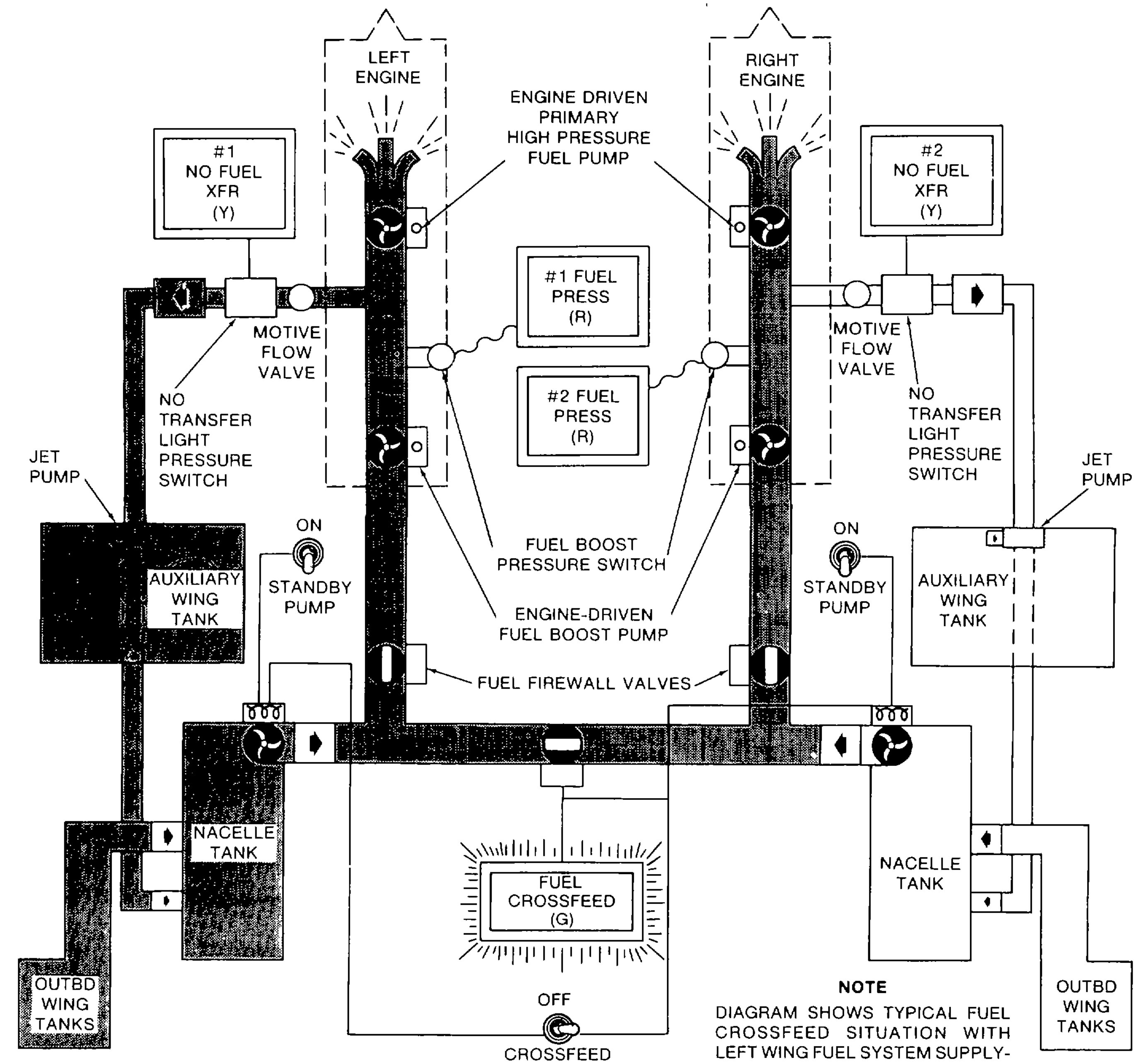
Figure 2-16. Fuel Management Panel

depletion of fuel pressure during starting, energizes the motive flow valve. When auxiliary fuel is depleted, a low level float switch de-energizes the motive flow valve after a 30 to 60 second time delay. This time delay function prevents cycling of the motive flow valve due to sloshing fuel. If the motive flow valve or the associated control circuitry fails, the loss of motive flow pressure when there is still fuel remaining in the auxiliary fuel tank, is sensed by a pressure and float switch which illuminates a caution annunciator placarded #1 NO FUEL XFR or #2 NO FUEL XFR. During engine start, the pilot should note that the NO FUEL XFR annunciator extinguish 30 to 50 seconds after engine start. The NO FUEL XFR annunciator will not illuminate if auxiliary tanks are empty. A manual override is incorporated as a backup for the automatic transfer system. This is initiated by placing the AUX TRANSFER switch, located in the fuel management panel to the OVERRIDE position. This will energize the transfer control motive flow valve. The transfer systems are protected by -ampere circuit breakers placarded AUXILIARY TRANSFER #1 or #2, located in the overhead circuit breaker panel (fig. 2-6).

NOTE

In turbulence or during maneuvers, the NO FUEL XFR annunciators may momentarily illuminate after the auxiliary fuel has completed transfer.

d. Fuel Gaging System. The total fuel quantity in the left or right main system, or left or right auxiliary tank is measured by a capacitance type fuel gaging system. Two fuel gages, one for the left and one for the right fuel system, read fuel quantity in pounds. A maximum of 3% error may be encountered in each system. However, the system is compensated for fuel density changes due to temperature excursions. In addition to the fuel gages, amber #1 NAC LOW or #2 NAC LOW annunciators on the caution/advisory annunciator panel illuminate when there is approximately 30 minutes of fuel (57 gal) per engine remaining (on standard day, at sea level, normal cruise power consumption rate). The fuel gaging system is protected by individual 5-ampere circuit breakers placarded QTY IND and FUEL QTY, #1 and #2, located in the overhead circuit breaker panel (fig. 2-6). A mechanical spiral float gage (fig. 2-19) is installed in each auxiliary fuel tank to provide an indication of fuel level when servicing the tank. The gage is installed on the auxiliary fuel



NO FUEL FLOW FROM RIGHT WING TANKS

NORMAL PRESSURIZED FUEL FLOW FROM LEFT WING TANKS

NOTE

BOTH STANDBY PUMP SWITCHES WILL BE OFF DURING CROSSFEED OPERATION

NOTE

THE ENGINE-DRIVEN PRIMARY (HIGH PRESSURE) FUEL PUMP IS LIMITED TO 10 HOURS OF OPERATION THROUGHOUT ITS TBO PERIOD WITHOUT STANDBY FUEL PUMP OR ENGINE-DRIVEN BOOST PUMP FUEL PRESSURE

NOTE

DIAGRAM SHOWS TYPICAL FUEL CROSSFEED SITUATION WITH LEFT WING FUEL SYSTEM SUPPLYING BOTH ENGINES (ALL BOOST AND STANDBY PUMPS OPERABLE) FOR SELECTION OF RIGHT WING FUEL FOR CROSSFEED REVERSE CROSSFEED SWITCH POSITION EITHER CONFIGURATION WILL SUPPLY EITHER ENGINE DURING SINGLE-ENGINE OPERATIONS FUEL WILL NOT CROSSFEED BETWEEN TANK SYSTEMS

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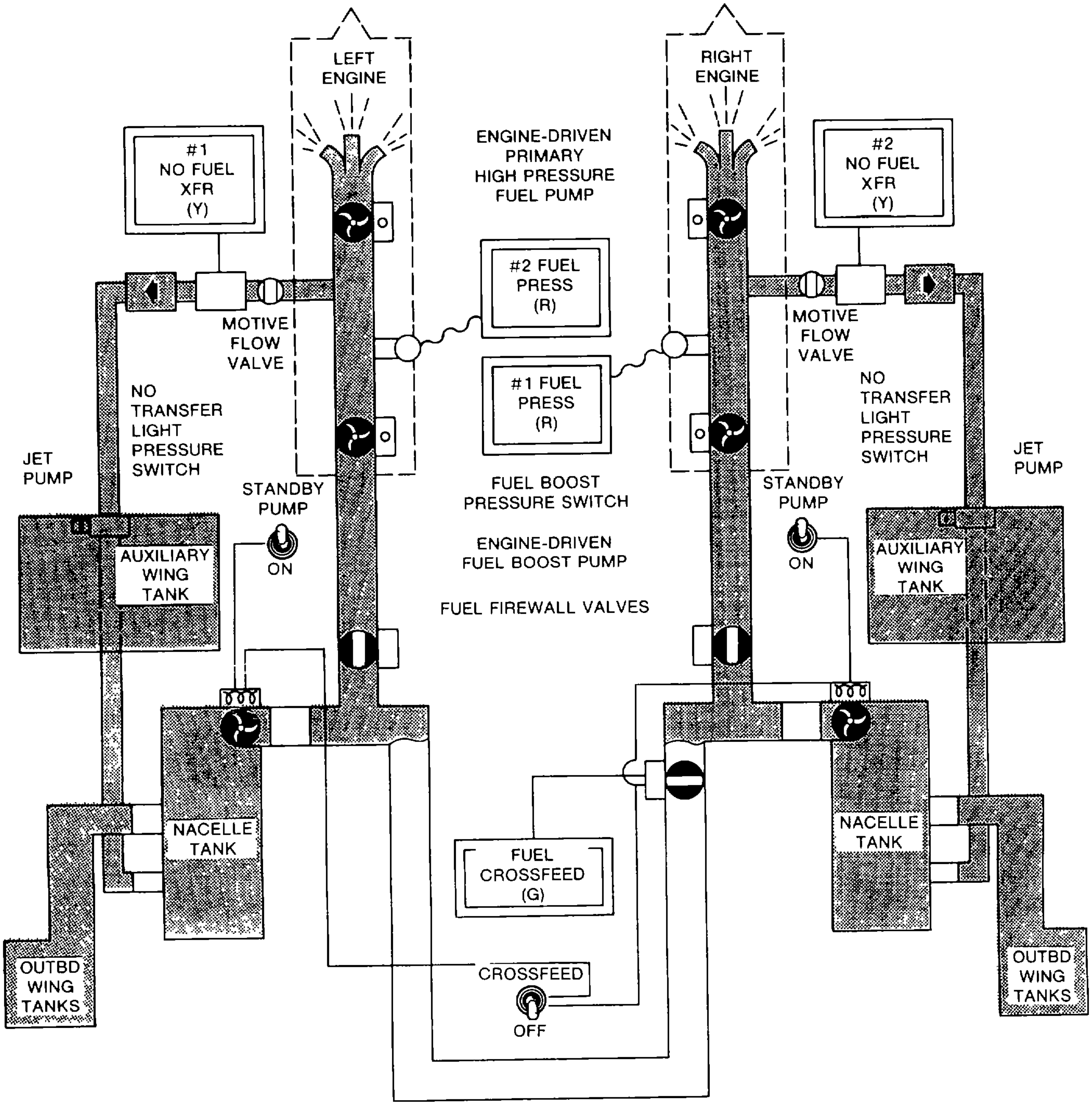
Figure 2-17. Crossfeed Fuel Flow



NOTE

IN THE EVENT THAT AN ENGINE DRIVEN BOOST PUMP FAILS, PRESSURE CAN BE MAINTAINED BY PLACING THE RESPECTIVE STANDBY PUMP SWITCH TO ON

NOTE

THE ENGINE-DRIVEN PRIMARY (HIGH PRESSURE) FUEL PUMP IS LIMITED TO 10 HOURS OF OPERATION, THROUGHOUT ITS TBO PERIOD, WITHOUT STANDBY FUEL PUMP OR ENGINE-DRIVEN BOOST PUMP FUEL PRESSURE

NOTE

THE SYSTEM WILL GRAVITY FEED FUEL ONLY TO ITS RESPECTIVE BOOST PUMP, I E , LEFT OR RIGHT FUEL WILL NOT GRAVITY FEED THROUGH THE CROSSFEED SYSTEM

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Figure 2-18. Gravity Feed Fuel Flow

tank cover, adjacent to the filler neck. A small sight window in the upper wing skin permits observation of the gage.

e. Fuel Management Panel. The fuel management panel is located in the cockpit overhead between the pilot and copilot. It contains the fuel gages, standby fuel pump switches, crossfeed valve switch, fuel gaging system control switch, and transfer control switches.

(1 Fuel gaging system control switch. A switch on the fuel management panel (fig. 2-16) placarded FUEL QUANTITY, MAIN - AUXILIARY, controls the fuel gaging system. When in the MAIN position the fuel gages read the total fuel quantity in the left and right wing fuel system. When in the AUXILIARY position the fuel gages read the fuel quantity in the left and right auxiliary tanks only.

(2) Standby fuel pump switches. Two switches, placarded STANDBY PUMP - ON, located in the fuel management panel (fig. 2-16), individually control a submerged fuel pump located in the corresponding nacelle tank. During normal aircraft operation both switches should be OFF, so long as the engine-driven fuel pumps are operative.

NOTE

Both standby pump switches shall be off during crossfeed operation. The loss of fuel pressure due to failure of an engine driven boost pump, will illuminate the MASTER WARNING annunciators on the glareshield, and will illuminate the respective #1 FUEL PRESS or #2 FUEL PRESS annunciator on the warning annunciator panel. Turning on the STANDBY PUMP will extinguish the FUEL PRESS annunciator. The MASTER WARNING annunciators must be manually reset.

(3) Fuel transfer control switches. Two switches on the fuel management panel (fig. 2-16), placarded AUX XFER OVRD - AUTO individually control operation of the fuel transfer pumps. During normal operation both switches are in AUTO, which allows the system to be automatically actuated by fuel flow to the engine. If either transfer system fails to operate, the fault condition is indicated by the MASTER CAUTION annunciators on the glareshield and a steadily illuminated amber #1 NO FUEL XFR or #2 NO FUEL XFR annunciator on the caution annunciator panel.

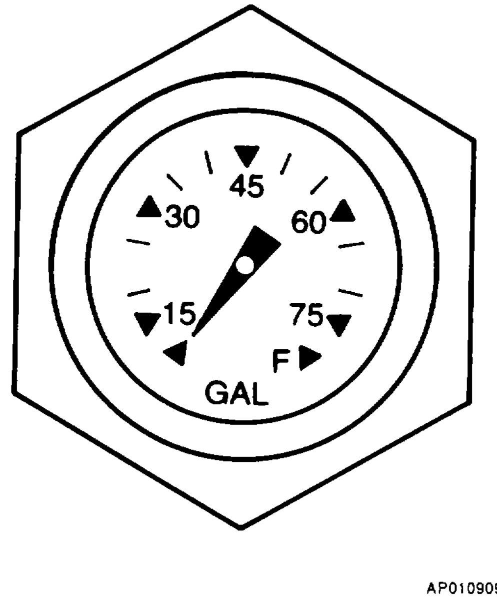

Figure 2-19. Auxiliary Fuel Tank Mechanical Fuel Gage

(4) Fuel crossfeed switch. The fuel crossfeed valve is controlled by a 3-position switch (fig. 2-16), located in the fuel management panel, placarded CROSSFEED - OFF. Under normal flight conditions the switch is left in the OFF position. During emergency single engine operation, it may become necessary to supply fuel to the operative engine from the fuel system on the opposite side. The crossfeed system is placarded for fuel selection with a simplified diagram on the overhead fuel control panel. Place the standby fuel pump switches in the off position when crossfeeding. A lever lock switch, placarded CROSSFEED, is moved from the center OFF position to the left or to the right, depending on direction of fuel flow. This opens the crossfeed valve and energizes the standby pump on the side from which crossfeed is desired. During crossfeed operation with firewall fuel valve closed, auxiliary tank fuel will not crossfeed. When the crossfeed mode is energized, a green FUEL CROSSFEED annunciator on the caution/ advisory panel will illuminate. Crossfeed system operation is described in Chapter 9. The crossfeed valve is protected by a 5-ampere circuit breaker placarded CROSSFEED located in the overhead circuit breaker panel (fig. 2-6).

f. Firewall Shutoff Valves.

CAUTION

Do not use the fuel firewall shutoff valve to shut down an engine, except in an emergency. The engine-driven high- pressure fuel pump obtains essential lubrication from fuel flow. When an engine is operating, this pump may be severely damaged (while cavitating) if the firewall valve is closed before the condition lever is moved to the FUEL CUTOFF position.

The fuel system incorporates a fuel line shutoff valve mounted on each engine firewall. The firewall shutoff valves close when the fire extinguisher T-handles on the instrument panel are pulled out. The firewall shutoff valves receive electrical power from the main buses, and also from the hot battery bus which is connected directly to the battery. The valves are protected by 5-ampere circuit breakers placarded FIREWALL VALVE #1 or #2 on the over- head circuit breaker panel (fig. 2-5), and FIREWALL SHUTOFF #1 or #2 on the hot battery bus circuit breaker board.

g. Fuel Tank Sump Drains. A sump drain wrench is provided in the aircraft loose tools to simplify draining a small amount of fuel from the sump drain.

(1) There are five sump drains and one filter drain in each wing (Table 2-3).

(2) An additional drain for the extended range fuel system line extends through the bottom of the wing center section adjacent to the fuselage. Any time the extended range system is in use, a part of the preflight inspection would consist-of draining a small amount of fuel from this drain to check for fuel contamination. Whenever the extended range system is removed from the aircraft and the fuel line is capped off in the fuselage, the remaining fuel in the line shall be drained.

h. Fuel Purge System. Each engine is provided with a fuel purge system. The system is designed to ensure that any residual fuel in the fuel manifolds is consumed during engine shutdown. During engine operation, compressor discharge air is routed through a filter and check valve, pressurizing a small air tank mounted on the engine truss. On engine shutdown the pressure differential between the air tank and fuel manifolds causes air to be discharged from the air tank, through a check valve, and into manifolds, out through the nozzles and into the combustion chamber. The fuel forced into the combustion chamber is consumed, causing a momentary rise in engine TGT.

i. Fuel Vent System. Each fuel system is vented through two ram vents located in the underside of the wing adjacent to the: nacelle, and a flush vent, located on the underside of the wing adjacent to the wing tip. To prevent icing of the vent system, one vent is recessed into the wing and the other ram vent protrudes out from the wing and contains a heating element. The vent line at the nacelle contains an inline flame arrestor.

j. Engine Oil-to-Fuel Heat Exchanger. An engine oil-to-fuel heat exchanger located on each engine accessory case, operates continuously during engine operation to heat fuel delivered to the engine sufficiently to prevent the freezing of water which it may contain. The temperature of the delivered fuel is thermostatically regulated to remain between 21° C and 32° C.

2-33. FUEL SYSTEM MANAGEMENT.

a. Fuel Transfer System. When the auxiliary tanks are filled, they will be used first. During transfer of auxiliary fuel, which is automatically controlled, the nacelle tanks are maintained full. A check valve in the gravity feed line from the outboard wing prevents reverse fuel flow. Normal gravity transfer of the main wing fuel into the nacelle tanks will begin when auxiliary fuel is exhausted. The system will gravity feed fuel only to its respective nacelle tank, i.e. left or right (fig. 2-18). Fuel will not gravity feed through the crossfeed system.

b. Operation With Failed Engine-Driven Boost Pump or Standby Pump. Two pumps in each fuel system provide inlet head pressure to the engine- driven primary high-pressure fuel pump. If crossfeed is used, a third pump, the standby fuel pump from the opposite system, will supply the required pressure. Operation under this condition will result in an unbalanced fuel load, as fuel from one system will be supplied to both engines. while all fuel from the system with the failed engine driven and standby boost pumps will remain unused.

2-34. FERRY FUEL SYSTEM.

Provisions are installed for connection to long range fuel cells.

Table 2-3. Fuel Sump Drain Locations

NUMBER	DRAINS	LOCATION
1	Leading Edge Tank	Outboard of nacelle, underside of wing
1	Integral Tank	Underside of wing, forward of aileron
1	Firewall Fuel Filter	Underside of cowling forward of firewall
1	Sump Strainer	Bottom center of nacelle forward of wheel well
1	Gravity Feed Line	Aft of wheel well
1	Auxiliary Tank	At wing root, just forward of the flap

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Section V. FLIGHT CONTROLS

2-35. DESCRIPTION.

The aircraft's primary flight control systems consist of conventional rudder, elevator and aileron control surfaces. These surfaces are manually operated from the cockpit through mechanical linkage using a control wheel for the ailerons and elevators, and adjustable rudder/brake pedals for the rudder. Both the pilot and copilot have flight controls. Trim con-trol for the rudder, elevator and ailerons is accomplished through a manually actuated cable-drum system for each set of control surfaces. The autopilot has provisions for controlling the position of the ailerons, elevators, elevator trim tab, and rudder.

2-36. CONTROL WHEELS.

Elevator and aileron control surfaces are operated by manually actuating either the pilot's or copilot's control wheel. These control wheels (fig. 2-20) are installed on each side of the instrument panel. Switches are installed in the outboard grip of each wheel to operate the elevator trim tabs. A microphone switch, chaff dispense switch, and an autopilot/yaw damp/electric trim disconnect switch are also installed in the outboard grip of each control wheel. In addition, a transponder ident switch is installed on top of the inboard grip of each control wheel. Installed in the center of each control wheel is a digital electric clock. A map light switch, and TCS (touch control steering) switch are located adjacent to each digital clock.

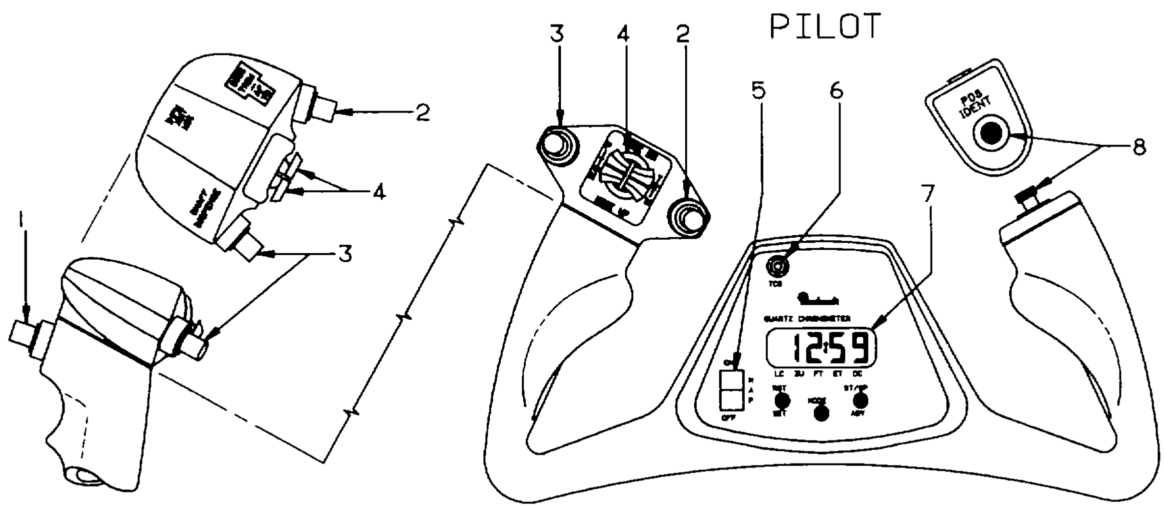
2-37. RUDDER SYSTEM.

a. Rudder Pedals. Aircraft rudder control and nose wheel steering is accomplished by actuation of the rudder pedals from either pilot's or copilot's station (fig. 2-7). The rudder pedals may be individually adjusted, in either a forward or aft position, to provide adequate leg room for the pilot and copilot. Adjustment is accomplished by depressing the lever alongside the rudder pedal arm and moving the pedal, forward or aft, until the locking pin engages in the selected position.

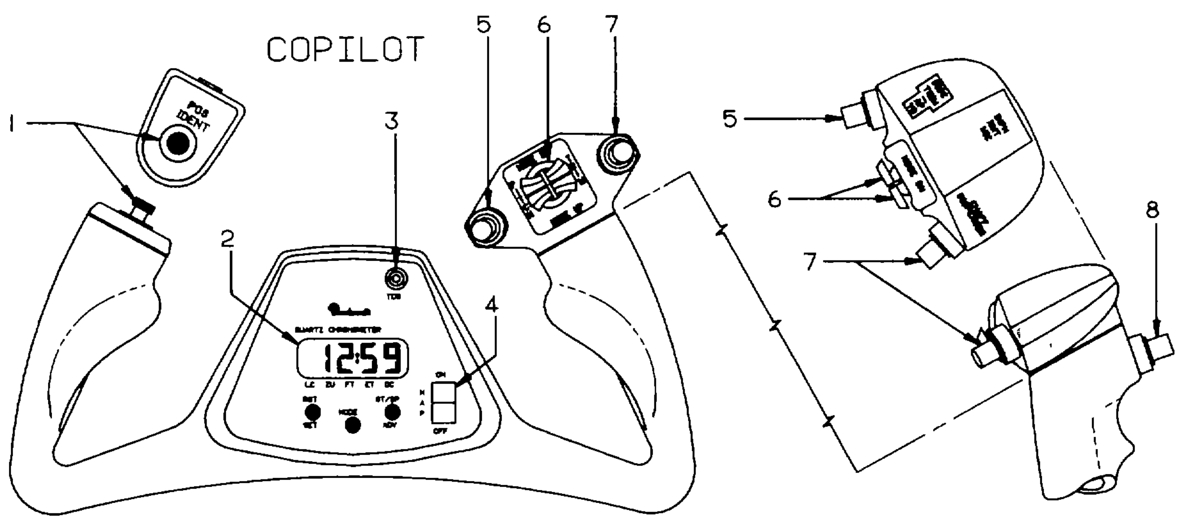
b. Yaw Damper System. A yaw damper system is provided to aid the pilot in maintaining directional stability and increase ride comfort. The system may be used at any altitude, but is required for flight above 17,000 feet. It must be deactivated for takeoff and landing. The yaw damp system is a part of the autopilot. Operating instructions for this system are contained in Chapter 3. The system is controlled by a YAW DAMP switch located in the autopilot control head. An annunciator placarded ELEC TRIM OFF in the caution/advisory annunciator panel indicates failure or disconnect of the electric trim system.

c. Rudder Boost System. The RC- 12K Rudder Boost System is a torque sensing, linear actuating system. The system utilizes a pressure transducer on each engine to sense engine torque oil pressure, a stability augmentation computer to monitor torque levels and the rudder servo to apply boost to aid the pilot.

The stability augmentation computer monitors torque levels and airspeed to determine if boost is required. The level of boost is proportional to the difference in torque between each engine and inversely proportional to airspeed. Boost commences at about 60% torque differential and increases to maximum torque at 100% differential. The level of boost available is inversely proportional to airspeed such that maximum rudder boost is obtained at 100% differential and low airspeed (80 knots), while no rudder boost is available at high airspeeds (above 180 knots).



1 Microphone, Interphone Transmit Switch
2 Trim, Autopilot, Yaw Damp Disconnect Switch
3 Chaff Dispense Switch
4 Pitch-Trim Switches
5 Map Light Switch
6 Touch Control Steering Switch
7 Digital Clock
8 Transponder Identification Switch



1 Transponder Identification Switch
2 Digital Clock
3 Touch Control Steering Switch
4 Map Light Switch
5 Trim, Autopilot, Yaw Damp Disconnect Switch
6 Pitch-Trim Switches
7 Chaff Dispense Switch
8 Microphone, Interphone, Transmit Switch

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Figure 2-20. Control Wheels

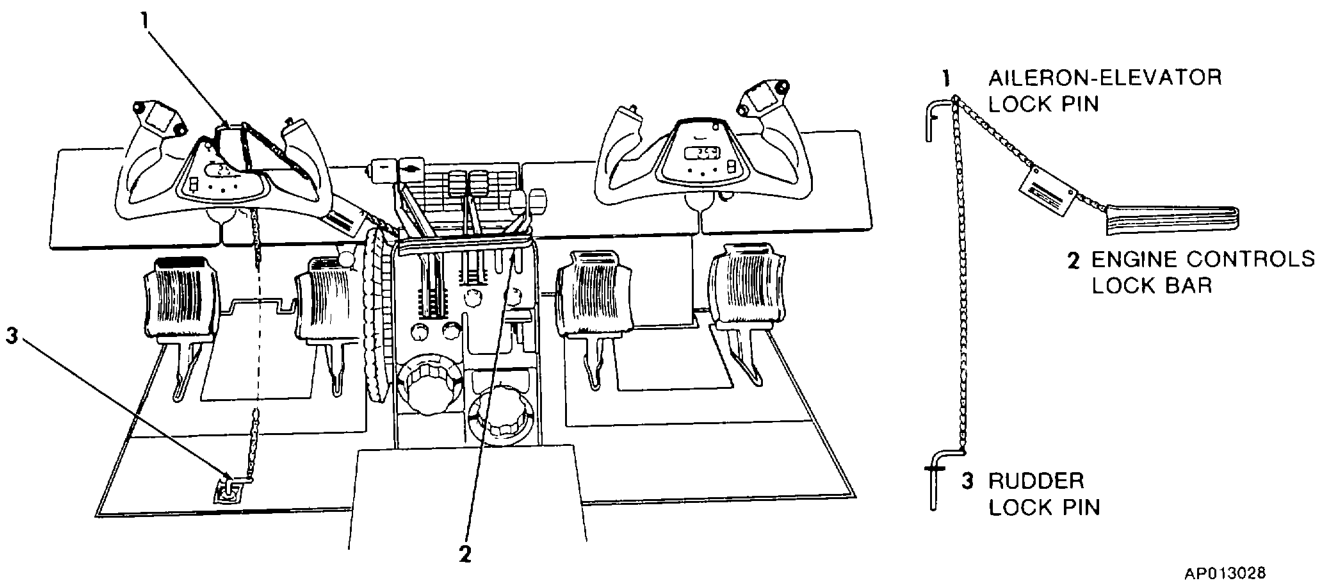

Figure 2-21. Controls Lock

2-38. FLIGHT CONTROLS LOCK.

CAUTION

Remove control locks before towing the aircraft or starting engines. Serious dam- age could result in the steering linkage if towed by a tug with the rudder lock installed.

Positive locking of the rudder, elevator and aileron control surfaces, and engine controls (power levers, propeller levers, and condition levers) is provided by a removable lock assembly (fig. 2-21) consisting of two pins, and an elongated U-shaped strap interconnected by a chain. Installation of the control locks is accomplished by inserting the U-shaped strap around the aligned control levers from the copilot's side; then the aileron/elevator locking pin is inserted through a guide hole in the top of the pilot's control column assembly. The rudder is held in a neutral position by an L-shaped pin which is installed through a guide hole in the floor aft of the pilots rudder pedals. The rudder pedals must be centered to align the hole in the rudder bellcrank with the guide hole in the floor. Remove the locks in reverse order, i.e., rudder pin, control column pin, and power control clamp.

2-39. TRIM TABS.

Trim tabs are provided for all flight control surfaces. These tabs are manually activated, and mechanically controlled by a cable-drum and jackscrew actuator system except the right aileron tab which is of the fixed, bendable type. Elevator and aileron trim tabs incorporate neutral, non-servo action, i.e., as the elevators or ailerons are displaced from the neutral position, the trim tab maintains an as-adjusted position. The rudder trim tab incorporates anti-servo action, i.e., as the rudder is displaced from the neutral position the trim tab moves in the same direction as the control surface. This action increases control pressure as rudder is deflected from the neutral position.

a. Elevator Trim Tab Control. The elevator trim tab control wheel placarded ELEVATOR TAB - DOWN, UP, is on the left side of the control pedestal and controls a trim tab on each elevator (fig. 2-11). The amount of elevator tab deflection, in units from a neutral setting, is indicated by a position arrow.

b. Electric Elevator Trim. The electric elevator trim system is controlled by an ELEV TRIM - OFF/ RESET switch located in the pedestal, dual element thumb switches on the control wheels, a trim disconnect switch on each control wheel and a circuit breaker in the overhead circuit breaker panel. The ELEV TRIM - OFF - RESET switch must be in the ELEV TRIM (on) position to operate the system. The dual element thumb switch is moved forward for trimming nose down, aft for nose up, and when released returns to the center (off) position. Any activation of the trim system through the copilot's trim switch can be over-ridden by activation of the pilot's switch. Operating the pilot's and copilot's switches in opposing directions simultaneously results in the pilot having priority.

A preflight check of the switches should be accomplished before flight by moving the switches individually on both control wheels. No one switch alone should operate the system; operation of elevator trim should occur only by movement of pairs of switches. The trim system disconnect is a bi-level, r12pushbutton, momentary type switch, located on the outboard grip of each control wheel. Depressing the switch to the first of two levels disconnects the autopilot and yaw damp system, and the second level disconnects the electric trim system. The system can be reset by moving the ELEV TRIM switch toggle on the pedestal (fig. 2-11) to OFF/RESET position, then back to ELEV TRIM again.

c. Aileron Trim Tab Control. The aileron trim tab control, placarded AILERON TAB LEFT, RIGHT, located in the control pedestal, adjusts the aileron trim tab (fig. 2-11). The amount of aileron tab deflection from a neutral setting, as indicted by a position indicator, is relative only and is not in degrees.

d. Rudder Trim Tab Control. The rudder trim tab control knob, placarded RUDDER TAB LEFT, RIGHT, located in the control pedestal, controls adjustment of the rudder trim tab (fig. 2-11). The amount of rudder tab deflection, in units from a neutral setting, is indicated by a position indicator.

2-40. WING FLAPS.

The slot-type wing flaps are electrically operated and consist of two sections for each wing. These sections extend from the inboard end of each aileron to the junction of the wing and fuselage. During extension, or retraction, the flaps are operated as a single unit, each section being actuated by a separate jackscrew actuator. The actuators are driven through flexible shafts by a single reversible electric motor. Wing flap position is indicated in percent of travel by a flap position indicator on the center subpanel. Full flap extension and retraction time is approximately 11 seconds. The flap control switch is located in the control pedestal. No emergency wing flap actuation system is provided. With flaps extended beyond the APPROACH position, the landing gear warning horn will sound, unless the landing gear is down and locked. The circuit is protected by a 20-ampere circuit breaker, placarded FLAP MOTOR, located in the overhead circuit breaker panel (fig. 2-6).

a. Wing Flap Control Switch. Flap operation is controlled by a three-position switch with a flapshaped handle on the control pedestal (fig. 2-11). The handle of this switch is placarded FLAP. Switch positions are placarded: FLAP UP, APPROACH and DOWN. The amount of extension of the flaps is established by position of the flap switch as follows: UP 0%, APPROACH 40%, and DOWN 100%. Limit switches, mounted on the right inboard flap, establish the flap travel. The flap control switch, limit switch, and relay circuits are protected by a 5-ampere circuit breaker, placarded FLAP CONTR located in the overhead circuit breaker panel (fig. 2-6). Intermediate flap positions between UP and APPROACH cannot be selected. To return the flaps to full UP, place the flap switch to the UP detent position. To return the flaps to APPROACH, move the flap switch to the UP position and then to the APPROACH detent position. In the event that any two adjacent flap sections extend 3 to 5 degrees out of phase with the other, a safety mechanism is provided to discontinue power to the flap motor.

b. Wing Flap Position Indicator. Flap position in percent of travel from O percent (UP) to 100 percent (DOWN) is shown on an indicator, placarded FLAPS, located in the center subpanel (fig. 2-5). The approach and full down flap positions are 14 and 35 degrees, respectively. The flap position indicator is protected by the 5-ampere circuit breaker, placarded FLAP CONT'R, located in the overhead circuit breaker panel (fig.. 2-6).

Section VI. PROPELLERS

2-41. DESCRIPTION.

A four-blade aluminum propeller is installed on each engine. The propeller is of the full feathering, constant speed, variable-pitch, counterweighted, reversible type; controlled by engine oil pressure through single action, engine driven propeller governors. The propeller is flange mounted to the engine shaft. Centrifugal counterweights, assisted by a feathering spring, move the blades toward the low RPM (high pitch) position and into the feathered position. Governor boosted engine oil pressure moves the propeller to the high RPM (low pitch) hydraulic stop and reverse position. The propellers have no low RPM (high pitch) stops; this allows the blades to feather after engine shutdown. Low pitch propeller position is determined by the low pitch stop which is a mechanically actuated, hydraulic stop. Ground fine and reverse blade angles are controlled by the power levers in the ground fine and reverse range.

2-42. FEATHERING PROVISIONS.

Both manual and automatic propeller feathering systems are provided. Manual feathering is accomplished by pulling the corresponding propeller lever aft, past a friction detent. To unfeather, the propeller lever is pushed forward into the governing range. The automatic feathering system will sense loss of torque and will feather an unpowered propeller. Feathering springs will feather the propeller when it is not turning.

a. Automatic Feathering. The automatic feathering system provides a means of immediately dumping oil from the propeller servo to enable the feathering spring and counterweights to start feathering action of the blades in the event of an engine failure. Although the system is armed by a switch on the overhead control panel, placarded AUTOFEATHER TEST OFF ARM, the completion of the arming phase occurs when both power levers are advanced above 89% N., at which time both annunciators on the caution/advisory annunciator panel indicate a fully armed system. The annunciator panel annunciators are green and placarded #1 AUTOFEATHER (left engine) and #2 AUTOFEATHER (right engine). The system will remain inoperative as long as either power lever is retarded below approximately the 89% N, position, unless TEST position of the AUTOFEATHER switch is selected to disable the power lever limit switches. The system is designed for use only during takeoff or landing, and should be turned off when establishing cruise climb. During takeoff or landing, should the torque for either engine drop to an indication between 20 14%, the autofeather system for the opposite engine will be disarmed. Disarming is confirmed when the AUTOFEATHER annunciator of the opposite engine becomes extinguished. If torque drops further, to a reading between 13 and 7%, oil is dumped from the servo of the affected propeller allowing a feathering spring to move the blades into the feathered position. Feathering also causes the AUTOFEATHER annunciator of the feathered propeller to extinguish. At this time, both the #1 AUTOFEATHER and #2 AUTOFEATHER annunciators are extinguished, the propeller of the defective engine has feathered, and the propeller of the operative engine has been disarmed from autofeathering capability. Only manual feathering control remains for the second propeller.

b. Propeller Autofeather Switch. Autofeathering is controlled by the AUTOFEATHER switch in the overhead control panel (fig. 2-13).

c. Autofeather Annunciators. Autofeather annunciators consist of two green annunciators on the caution/advisory annunciator panel placarded #l AUTOFEATHER and #2 AUTOFEATHER. When illuminated, the annunciators indicate that the autofeather system is armed. Both annunciators will be extinguished if either propeller has been feathered or if the system is disarmed by retarding a power lever. Autofeather circuits are protected by one 5-ampere circuit breaker placarded AUTO FEATHER, located in the overhead circuit breaker panel (fig. 2-6).

2-43. PROPELLER GOVERNORS.

Two governors, a constant speed governor, and an overspeed governor, control propeller RPM. The constant speed governor, mounted on top of the reduction housing, controls the propeller through its entire range. The propeller control lever controls the propeller by means of this governor. If the constant speed governor should malfunction and request more than 1700 RPM, the overspeed governor cuts in at 1802 RPM and dumps oil from the propeller to keep the RPM from exceeding approximately 1802 RPM. A solenoid, actuated by the GOVERNOR TEST switch located in the overhead control panel (fig. 2-13), is provided for resetting the overspeed governor to approximately 1540 to 1580 RPM for test purposes. If the propeller sticks or moves too slowly during a transient condition causing the propeller governor to act too slowly to prevent an overspeed condition, the power turbine governor, contained within the constant speed governor housing, acts as a fuel topping governor. When the propeller reaches 106% of selected N2RPM, the power turbine governor limits the fuel flow to the gas generator, reducing

N_1RPM, which in turn prevents the propeller from exceeding approximately 1802 RPM. During operation in the reverse range, the power turbine governor is reset to approximately 95% of propeller RPM before the propeller reaches a negative pitch angle. This ensures that the engine power is limited to maintain a propeller RPM of somewhat less than that of the constant speed governor setting. The constant speed governor therefore, will always sense an underspeed condition and direct oil pressure to the propeller servo piston to permit propeller operation in beta and reverse ranges.

2-44. LOW PITCH STOP.

Low pitch propeller position is determined by a mechanically monitored, hydraulic low pitch stop. The propeller servo piston is connected by four spring-loaded sliding rods to the Beta collar mounted behind the propeller. A carbon brush block riding in the Beta collar transfers the movement of the collar through the propeller reversing lever to the Beta valve of the governor. The initial forward motion of the Beta valve from its rigged position blocks off the flow of oil to the propeller. Further motion dumps the oil from the propeller into the reduction gear box sump. A mechanical stop limits the forward motion of the Beta valve. Rearward movement of the Beta valve from its rigged position does not affect normal propeller control. When the propeller is rotating at a speed lower than that selected on the governor, the governor pump provides oil pressure to the servo piston decreasing pitch of the propeller blades until the feedback of motion from the Beta collar pulls the Beta valve into a position blocking the supply of oil to the propeller, thus preventing further pitch changes.

2-45. GROUND FINE.

CAUTION

Propeller speeds below 1000 rpm are not authorized, unless the propeller is feathered.

Lifting the power levers and moving them aft, past the flight idle stop, will place the power levers into the ground fine position. Approximately half way back to the ground fine gate, a mechanical linkage at the propeller governor will begin to bleed P_y air from the fuel control unit, provided the propeller levers are positioned to the feather detent. This results in a decrease in both engine N_l torque and propeller rpm. With the power levers at the ground fine gate, engine N_1 should be within the range of 62% to 67%, and propeller rpm should not be less than 1000 rpm.

2-46. PROPELLER AUTOFEATHER TEST SWITCHES.

A switch in the overhead control panel (fig. 2-13) is provided for operational testing of the propeller systems. The AUTOFEATHER TEST OFF ARM switch is used to ARM the autofeather function, and allow for an operational ground test. The TEST position of the switch, enables the pilot to check readiness of the autofeather systems, below 89% N_1.

2-47. PROPELLER SYNCIIROPHASER.

a. Description. The propeller synchrophaser matches left and right propeller RPM as well as propeller phase relationship. This phase relationship is designed to decrease cabin noise, and is not adjustable in flight. A toggle switch, placarded PROP SYN ON OFF installed adjacent to the synchroscope in the pilot's instrument panel, turns the system on/off.

Signal pulses occurring, once per revolution of the propeller are obtained from magnetic pickups (located in the front of the engine on the deice brush mounting bracket) when the target (mounted on the aft side of the spinner bulkhead) passes the magnetic pickup. The signal pulses are sent to a control box installed forward of the pedestal. The control box receives these signal pulses and compares between them for pulse rate and relative position. Differences in pulse rate and/or propeller position causes the control box to vary the voltage in the primary governor coil, which in turn, increases propeller speed until the correct speed and phasing is obtained.

A governor coil increases the speed set by the propeller control lever, but never decreases the speed set by the control lever. The maximum synchrophaser range is approximately 20 RPM. This limited range prevents either propeller from losing more than a limited RPM if the other propeller is feathered with the synchrophaser ON. There is no master or slave engine in this type system. There is a limited range for synchronizing, called the "holding range" which serves to allow one propeller to be feathered without the other decreasing any appreciable RPM. There is a maximum RPM differential (capture range), at which the synchrophaser, when turned on, will begin to synchronize the propellers. For this reason the propeller should be manually synchronized before turning the synchrophaser on.

NOTE

If the synchrophaser is ON but does not adjust properly, the synchrophaser has reached the limits of its range. Turn the system OFF, manually adjust the propeller RPM into synchronization, then turn the synchrophaser ON.

The propeller synchrophaser may be used on takeoff at the pilot's option. If used for takeoff, the limited range of the synchrophaser will be reduced near maximum propeller RPM.

b. Control Box. The control box, located forward of the pedestal, converts pulse rate differences into correction commands. Differences in pulse rate, and/or propeller position, causes the control box to vary the voltage in the primary governor coil, which in turn increases propeller speed until the correct speed and phasing is obtained. The system is protected by a 5-ampere circuit breaker placarded PROP SYNC, located in the overhead circuit breaker panel (fig. 2-6).

c. Synchroscope. The propeller synchroscope indicator, located in the pilot's instrument panel, provides an indication of synchronization of the propellers. If the right propeller is operating at a higher RPM than the left, a black and white cross pattern, spins in a clockwise rotation. Left, or counterclockwise, rotation indicates a higher RPM of the left propeller. This instrument aids the pilot in obtaining complete synchronization of the propellers.

2-48. PROPELLER LEVERS.

Two propeller levers on the control pedestal (fig. 2-11), placarded PROP, are used to regulate propeller speeds. Each lever controls a primary governor, which acts to regulate propeller speeds within the normal operational range. The full forward position of the levers is placarded TAKEOFF, LANDING AND REVERSE HIGH RPM. The full aft position of the levers is placarded FEATHER. When a lever is placed at HIGH RPM, the propeller may attain a static RPM of 1700 depending upon power lever position. As a lever is moved aft, passing through the propeller governing range, but stopping at the feathering detent, the propeller RPM will correspondingly decrease to the lowest limit (approximately 1390 RPM). Moving a propeller lever aft past the detent into FEATHER will feather the propeller.

2-49. PROPELLER REVERSING.

CAUTION

Do not move the power levers below the flight idle gate unless the engine is running. Damage to the reverse linkage mechanisms will occur.

Propeller reversing on unimproved surfaces should be accomplished carefully to prevent propeller erosion from reversed airflow. Consideration should be given to reversing propellers when operating in snow or dusty conditions, to prevent obscuring the operator's vision.

The engine power levers actuate an engine mounted cambox which is connected to the engine FCU (fuel control unit) and the propeller reversing cable. The cambox is arranged so that the reversing cable is not affected by power lever movement forward of the idle stop. When the power levers are lifted over the reversing detent and moved rearward, the reversing cable is pulled aft. This action resets the Beta valve rearward, allowing the governor to pump more oil into the propeller, thus moving the blades through the ground fine range towards reverse pitch. As the blades move, the mechanical feedback collar, is moved forward. This movement is transmitted by a carbon block on the end of the reversing lever to the Beta valve, causing it to move forward. When the Beta valve reaches its initial position, oil flow to the propeller is blocked preventing further blade angle change. As the power levers are moved further rearward (into the striped area), the propeller blades are moved further toward the reverse pitch stop, and the FCU is reset to increase engine speed.

2-50. PROPELLER TACHOMETERS.

The two tachometers on the instrument panel register propeller speed in hundreds of RPM (fig. 2-14). Each indicator is slaved to a tachometer generator unit attached to the corresponding engine.

Section VII. UTILITY SYSTEMS

2-51. DEFROSTING SYSTEM.

a. Description. The defrosting system is an integral part of the heating and ventilation system. The system consists of two warm air outlets connected by ducts to the heating system. One outlet is just below the pilot's windshield and the other is below the copilot's windshield. A push-pull control, placarded DEFROST AIR, on the pilot's subpanel, manually controls airflow to the windshield. When pulled out, defrosting air is ducted to the windshield. As the control is pushed in, there is a corresponding decrease in airflow.

b. Automatic Operation.

1. Vent blower switches As required.
2. Cabin temperature mode selector switch AUTO.
3. Cabin temperature control rheostat As required.
4. Cabin air, copilot air, pilot air, and defrost air controls as required.

c. Manual Operation.

1. Pilot and copilot air controls In.
2. Cabin air and defrost air controls Out
3. Cabin air mode select switch MAN HEAT.
4. Cold air outlets As required.
5. Manual temperature switch as required.

d. Manual Operation. If the automatic temperature control should fail to operate, the temperature of defrost air and cabin air can be controlled manually by setting the CABIN AIR MODE SELECT switch to the MANUAL COOL position, then using the CABIN AIR TEMP CONTROL switch to set the desired temperature. This control is located in the overhead control panel (fig. 2-13).

2-52. SURFACE DEICING SYSTEM.

a. Description. Ice accumulation is removed from each inboard and outboard wing leading edge, both horizontal stabilizers, stabilons and tailets by the flexing of deice boots which are pneumatically actuated. Engine bleed air from the engine compressor is used to supply air pressure to inflate the deice boots, and to supply vacuum through the ejector system. A pressure regulator protects the system from over inflation. When the system is not in operation, a distributor valve keeps the boots held down by vacuum supplied through the ejector system.

CAUTION

Operation of the surface deice system in ambient temperatures below -40" C can cause permanent damage to the deice boots.

b. Operation.

(1) Deice boots are intended to remove ice after it has formed rather than prevent its formation. For the most effective deicing operation, allow at least 1/2 inch of ice to form on the boots before attempting ice removal. Very thin ice may crack and cling to the boots instead of shedding.

NOTE

Never cycle the system rapidly, this may cause the ice to accumulate outside the contour of the inflated boots and prevent ice removal.

(2) A two position deice switch on the overhead control panel placarded SURFACE controls the deicing operation. The switch is spring loaded to return to the off position from SINGLE CYCLE AUTO or MANUAL. When the SINGLE CYCLE AUTO position is selected, the distributor valve opens to inflate the wing boots. After an inflation period of approximately 6 seconds, an electronic timer switches the distributor to deflate the wing boots and a 4 second inflation begins in the horizontal stabilizer, stabilon and tailet boots. When these boots have inflated and deflated, the cycle is complete.

(3) If the switch is held in the MANUAL position, the boots will inflate simultaneously and remain inflated until the switch is released. The switch will return to the OFF position when released. After the cycle, the boots will remain in the vacuum hold down condition until again actuated by the switch.

(4) Either engine is capable of providing sufficient bleed air for all requirements of the surface deice system. Check valves in the bleed air and vacuum lines prevent backflow through the system during single engine operation. Regulated pressure is indicated on the gage, placarded PNEUMATIC PRESSURE, located in the center subpanel.

2-53. ANTENNA DEICE/ANTI-ICE SYSTEM.

a. Description. The antenna deice/anti-ice system removes or prevents ice accumulation on the mission antennas. Pressure regulated bleed air from both engines supply pressure to inflate or heat the boots. To assure operation of the system, in the event of failure of one engine, a check valve is incorporated in the bleed air line from each engine to prevent loss of pressure through the compressor of the inoperative engine. Inflation and deflation phases are controlled by distributor valves.

b. Antenna Deice System Switch. The antenna deice system is controlled by a switch placarded ANTENNA, SINGLE CYCLE MANUAL located in the overhead control panel (fig. 2-13). The switch is spring loaded to return to the off position from the SINGLE CYCLE or MANUAL position. When the switch is set to the single position, the system will run through one timed inflation-deflation cycle. When the switch is held in the MANUAL position the boots will inflate and remain inflated until the switch is released.

c. Forward Wide Band Data Link Antenna Radome Anti-Ice. The forward wide band data link antenna radome anti-ice system utilizes engine bleed air to prevent the formation of ice on the radome. The system is controlled by the switch placarded RADOME located in the overhead control panel. The circuit is protected by the 7 1/2-ampere circuit breaker placarded RADOME ANTI-ICE, located in the overhead circuit breaker panel (fig. 2-6).

d. Operation. Deice boots are intended to remove ice after it has formed rather than prevent its formation. For the most effective deicing operation, allow at least 1/8 to 1/4 inch of ice to form on the boots before attempting the removal. Very thin ice may crack and cling to the boots instead of shedding.

NOTE

Never cycle the system rapidly, this may cause the ice to accumulate outside the contour of the inflated boots and prevent ice removal.

2-54. PROPELLER ELECTRIC DEICE SYSTEM.

a. Description. The propeller electric deice system includes: electrically heated deice boots, slip rings and brush block assemblies, a timer for automatic operation, ammeter, circuit breakers for left and right propeller and control circuit protection, and two switches located in the overhead control panel for automatic or manual control of the system.

b. Automatic Operation. The two position switch located in the overhead control panel, placarded PROP AUTO ON, is provided to activate the automatic system. Upon placing the switch to the ON position the timer diverts power through the brush block and slip ring to all heating elements on one propeller. Subsequently, the timer then diverts power to all heating elements on the other propeller for the same length of time. This cycle will continue as long as the switch is in the ON position. The system utilizes a metal foil type single heating element, energized by DC voltage. The timer switches every 90 seconds, resulting in a complete cycle in approximately 3 minutes.

c. Manual Operation. The manual propeller deice system is provided as a backup to the automatic system. The spring-loaded control switch located in the overhead control panel, placarded PROP MANUAL ON, controls the manual override relay. When holding the switch in the ON position the automatic timer is overridden, and power is supplied to the heating elements of both propellers simultaneously. This switch is of the momentary type and must be held in position for approximately 90 seconds to dislodge ice from the propeller surface. Repeat this procedure as required to avoid significant buildup of ice, which will result in: a loss of performance, vibration, and impingement of ice upon the fuselage. The propeller deice ammeter will not indicate a load while the propeller deice system is being utilized in the manual mode. However, each aircraft loadmeter will indicate an approximate 4% increase in load while the manual prop deice system is operating.

2-55. PITOT AND STALL WARNING HEAT SYSTEM.

a. Pitot Heat.

CAUTION

Pitot heat should not be used for more than 15 minutes while the aircraft is on the ground. Overheating may damage the heating elements.

Heating elements are installed in both pitot masts, located on the nose. Each heating element is controlled by an individual switch placarded PITOT ON LEFT or RIGHT, located in the overhead control panel (fig. 2-13). Circuit protection is provided by the two 7.5-ampere circuit breakers, placarded PITOT HEAT, on the overhead circuit breaker panel (fig. 2-6). The true airspeed temperature probe heat control circuit is also protected by this circuit breaker. If either left or right pitot heat is on, the true airspeed temperature probe heat will be on.

CAUTION

The heating elements protect the stall warning lift transducer vane and face plate from ice. However, a buildup of ice on the wing may change or disrupt the airflow and prevent the system from accurately indicating an imminent stall.

b. Stall Warning Heat The lift transducer is equipped with anti-icing capability on both the mounting plate and the vane. The heat is controlled by a switch located in the overhead control panel placarded STALL WARN. The level of heat is minimal for ground operation but is automatically increased for flight operation through the landing gear safety switch. Circuit protection is provided by a 15-ampere circuit breaker, placarded STALL WARN, on the overhead circuit breaker panel (fig. 2-6).

2-56. STALL WARNING SYSTEM.

The stall warning system consists of a transducer, a lift computer, a warning horn and a test switch. Angle of attack is sensed by aerodynamic pressure on the lift transducer vane located on the left wing leading edge. When a stall is imminent, the output of the transducer activates a stall warning horn. The system has preflight test capability through the use of a switch placarded STALL WARN TEST OFF LDG GEAR WARN TEST on the right subpanel. Holding this switch in the STALL WARN TEST position actuates the warning horn by moving the transducer vane. The circuit is protected by the 5-ampere circuit breaker, placarded STALL, on the overhead circuit breaker panel.

2-57. BRAKE DEICE SYSTEM.

a. Description. The heated air brake deice system may be used in flight with gear retracted or extended, or on the ground. When activated, hot air is diffused by means of a manifold assembly over the brake discs on each wheel. Manual and automatic controls are provided. There are two primary occasions which require brake deicing. The first is when an aircraft has been parked in a freezing atmosphere allowing the brake systems to become contaminated by freezing rain, snow, or ice, and the aircraft must be moved or taxied. The second occasion is during flight through icing conditions with wet brake assemblies presumed to be frozen, which must be thawed prior to landing to avoid possible tire damage and loss of directional control. Hot air for the brake deice system comes from the compressor stage of both engines obtained by means of a solenoid valve attached to the bleed air system which serves both the surface deice system and the pneumatic systems operation.

b. Operation. The switch in the overhead control panel, placarded BRAKE, controls the solenoid valve by routing power through a control module box under the aisleway floorboards. The system is protected by the 5-ampere circuit breaker in the overhead circuit breaker panel placarded BRAKE DEICE. A 10-minute timer limits operation and avoids excessive wheel well temperatures when the landing gear is retracted. The control module also contains a circuit to the green BRAKE DEICE ON annunciator, and has a resetting circuit interlocked with the gear uplock switch. When the system is activated, the BRAKE DEICE ON annunciator should be monitored and the control switch selected OFF after the annunciator extinguishes, otherwise, on the next gear extension the system will restart without pilot action. The control switch should also be selected OFF if deice operation fails to self-terminate after approximately 10 minutes. If the automatic timer has terminated brake deice operation after the last retraction of the landing gear, the landing gear must be extended in order to obtain further operation of the system.

(1) The L BL AIR FAIL or R BL AIR FAIL annunciator may momentarily illuminate during simultaneous operation of the surface and brake deice systems at low N_1 speeds. If the annunciators immediately extinguish, they may be disregarded.

(2) During certain ambient conditions, use of the brake deice system may reduce available engine power, and during flight will result in a TGT rise of approximately 20^o C. Applicable performance charts should be consulted before brake deice system use. If specified power cannot be obtained without exceeding limits, the brake deice system must be selected off until after takeoff is completed. TGT limitations must also be observed when setting climb and cruise power. The brake deice system is not to be operated above 15^o C ambient temperature. During periods of simultaneous brake deice and surface deice operation, maintain 85% N_1 or higher. If inadequate pneumatic pressure is developed for proper surface deice

boot inflation, select the brake deice system off. Both sources of pneumatic bleed air must be in operation during brake deice system use. Select the brake deice system off during single engine operation. Circuit protection is provided by the 5-ampere circuit breaker, placarded BRAKE DEICE, in the overhead circuit breaker panel (fig. 2-6).

2-58. FUEL SYSTEM ANTI-ICING.

a. Description. An oil-to-fuel heat exchanger, located in each engine accessory case, operates continuously and automatically to heat the fuel sufficiently to prevent freezing of any water in the fuel. No controls are involved. Three external fuel vents are provided on each wing. One is recessed to prevent ice formation, while the second is flush mounted so that no ice can collect upon it, the third is electrically heated, the heating is controlled by the two toggle switches on the overhead control panel placarded FUEL VENT ON, LEFT and RIGHT (fig. 2-13). They are protected by the two 5-ampere circuit breakers, placarded FUEL VENT HEAT RIGHT LEFT, located in the overhead circuit breaker panel (fig. 2-6).

CAUTION

To prevent overheat damage to electrically heated anti-ice jackets, the FUEL VENT heat switches should not be turned ON unless cooling air will soon pass over the jackets.

b. Normal Operation. For normal operation, switches for the FUEL VENTS anti-ice circuits are turned ON as required during the BEFORE TAKEOFF procedures.

2-59. WINDSHIELD ELECTROTHERMAL ANTI-ICE SYSTEM.

a. Description. Both pilot and copilot windshields are provided with an electrothermal anti-ice system. Each windshield is part of an independent electrothermal anti-ice system. Each system is comprised of the windshield assembly with heating wires sandwiched between glass panels, a temperature sensor attached to the glass, an electrothermal controller, two relays, a control switch, and two circuit breakers. The two switches, placarded WSHLD ANTI ICE NORMAL OFF HI PILOT and COPILOT, respectively, located in the overhead control panel (fig. 2-13), control system operation. Each switch controls one electrothermal windshield system. The circuits of each system are protected by a 5-ampere circuit breaker and a 50-ampere circuit breaker, which is not accessible to the flight crew. The 50-ampere circuit breakers are located in the power distribution panel under the floor ahead of the main spar.

b. Normal Operation. Two levels of heat are provided through the three position switches, placarded NORMAL, in the aft position, OFF in the center position, and HI after lifting the switch over a detent and moving it to the forward position. In the NORMAL position, heat is provided for the major portion of each windshield. In the HI position, heat is provided at a higher watt density to a smaller portion of the windshield. The lever lock switch feature prevents inadvertent switching to the HI position during system shutdown.

2-60. PRESSURIZATION SYSTEM.

a. Description. A mixture of bleed air from the engines, and ambient air, is available for pressurization to the cabin at a rate of approximately 10 to 17 pounds per minute. The flow control unit of each engine controls bleed air from the engine, to make it usable for pressurization, by mixing ambient air with the bleed air depending upon aircraft altitude and ambient temperature. On takeoff, excessive pressure bumps are prevented by landing gear safety switch actuated solenoids incorporated in the flow control units. These solenoids, through a time delay, stage the input of ambient air flow by allowing ambient air flow introduction through the left flow control unit first, then 4 seconds later air flow through the right flow control unit.

b. Pressure Differential. The pressure vessel is designed for a normal working pressure differential of 6.5 PSI, which will provide a cabin pressure altitude of 8,000 feet at an aircraft altitude of 29,700 feet, and a cabin altitude of 10,000 feet at an aircraft altitude of 34,000 feet.

c. Pressurization Controller. The pressurization controller, located in the copilot's subpanel, provides a display of the selected altitude; an altitude selector, and a rate control selector. The cabin and aircraft altitude display is a mechanically coupled dial. The outer scale, (CABIN ALT) of the display, indicates the selected cabin altitude; the inner scale (ACFT ALT) indicates the corresponding altitude at which the maximum differential pressure would occur. The indicated value on each scale is read per placard ALT FT X 1000. The rate control selector, placarded RATE INC; regulates the rate at which cabin pressure ascends or descends to the selected altitude. The rate change selected may be from 200 to 2000 feet per minute.

d. Cabin Rate-of-Climb Indicator. An indicator, placarded CABIN CLIMB, is located in the copilot's instrument panel. It is calibrated in thousands of feet per minute change in cabin altitude.

e. Cabin Altitude Indicator. An indicator, placarded CABIN ALT, is located in the copilot's instrument panel. The longer needle indicates aircraft altitude in thousands of feet on the outside dial. The shorter needle indicates pressure differential in PSI (pounds per square inch) on the inner dial. Maximum differential is 6.5 ± .10 PSI.

f. Outflow Valve. A pneumatically operated outflow valve, located in the aft pressure bulkhead, maintains the selected cabin altitude and rate-of climb commanded by the cabin rate-of-climb and altitude controller. As the aircraft climbs, the controller modulates the outflow valve to maintain a selected cabin rate of climb and increases the cabin differential pressure until the maximum cabin pressure differential is reached. At a cabin altitude of 12,500 feet, a pressure switch mounted on the back of the overhead control panel completes a circuit to illuminate a red ALT WARN warning annunciator, to warn of operation requiring oxygen.

g. Safety Valve. Before takeoff, the safety valve is open with equal pressure between the cabin and the outside air. The safety valve closes upon lift off if the CABIN PRESS DUMP switch is in the PRESS mode. The safety valve, adjacent to the outflow valve, provides pressure relief in the event of an outflow valve failure. This valve is also used as a dump valve. The safety valve is opened by vacuum, which is controlled by a solenoid valve operated by the CABIN PRESS DUMP switch, located adjacent to the controller. It is wired through the landing gear safety switch. If either of these switches is open, or the vacuum source or electrical power is lost, the safety valve will close to atmosphere except at maximum pressure differential of 6.5 ± .10 PSI. A negative pressure relief diaphragm is also incorporated into the outflow and safety valves to prevent outside atmospheric pressure from exceeding cabin pressure during rapid descent.

h. Drain. A drain in the outflow valve static control line is provided for removal of accumulated moisture. The drain is located behind the lower sidewall upholstery access panel in the baggage section of the aft compartment.

i. Flow Control Unit. A flow control unit, located forward of the firewall in each engine nacelle controls bleed air flow and the mixing of ambient air to make up the total air flow to the cabin for pressurization, heating, and ventilation. An integral electric solenoid firewall shutoff valve is controlled by the ENVIRO & PNEU BLEED AIR valve switches on the overhead control panel (fig. 2-13). A solenoid, operated by the landing gear safety switch, controls the introduction of ambient air to the cabin upon takeoff. Both the ambient air flow control valve and the bleed air flow control valve are motor driven.

(1) The unit receives bleed air from the engine into an ejector which draws ambient air into the venturi of the nozzle. The mixed air is then forced into the bleed air line routed to the cabin.

(2) Bleed air flow is controlled automatically. When the aircraft is on the ground, circuitry from the landing gear safety switch prevents ambient air from entering the flow control unit to provide maximum heating.

(3) The bleed air firewall shutoff valve in the control unit is a spring loaded, bellows operated valve that is held in the open position by bleed air pressure. When the electric solenoid is shut off, or when bleed air diminishes on engine shutdown (in both cases the pressure to the firewall shutoff valve is cut off), the firewall valve closes.

2-61. OXYGEN SYSTEM.

a. Description. The oxygen system (fig. 2-22) is provided primarily as an emergency system, however, the system may also be used to provide supplemental (first aid) oxygen. Two, 70 cubic foot capacity oxygen supply cylinders, charged with aviator's breathing oxygen, are installed in the unpressurized portion of the aircraft behind the aft pressure bulkhead. The pilot and copilot positions are equipped with diluter demand type regulators, which automatically mix the proper amount of oxygen for a given amount of air at altitude. A first aid oxygen mask is also provided in the cabin. Oxygen system pressure is shown by two gages placarded OXYGEN SUPPLY PRESSURE, located in the pilot and copilot oxygen regulator control panels. Two pressure reducers,

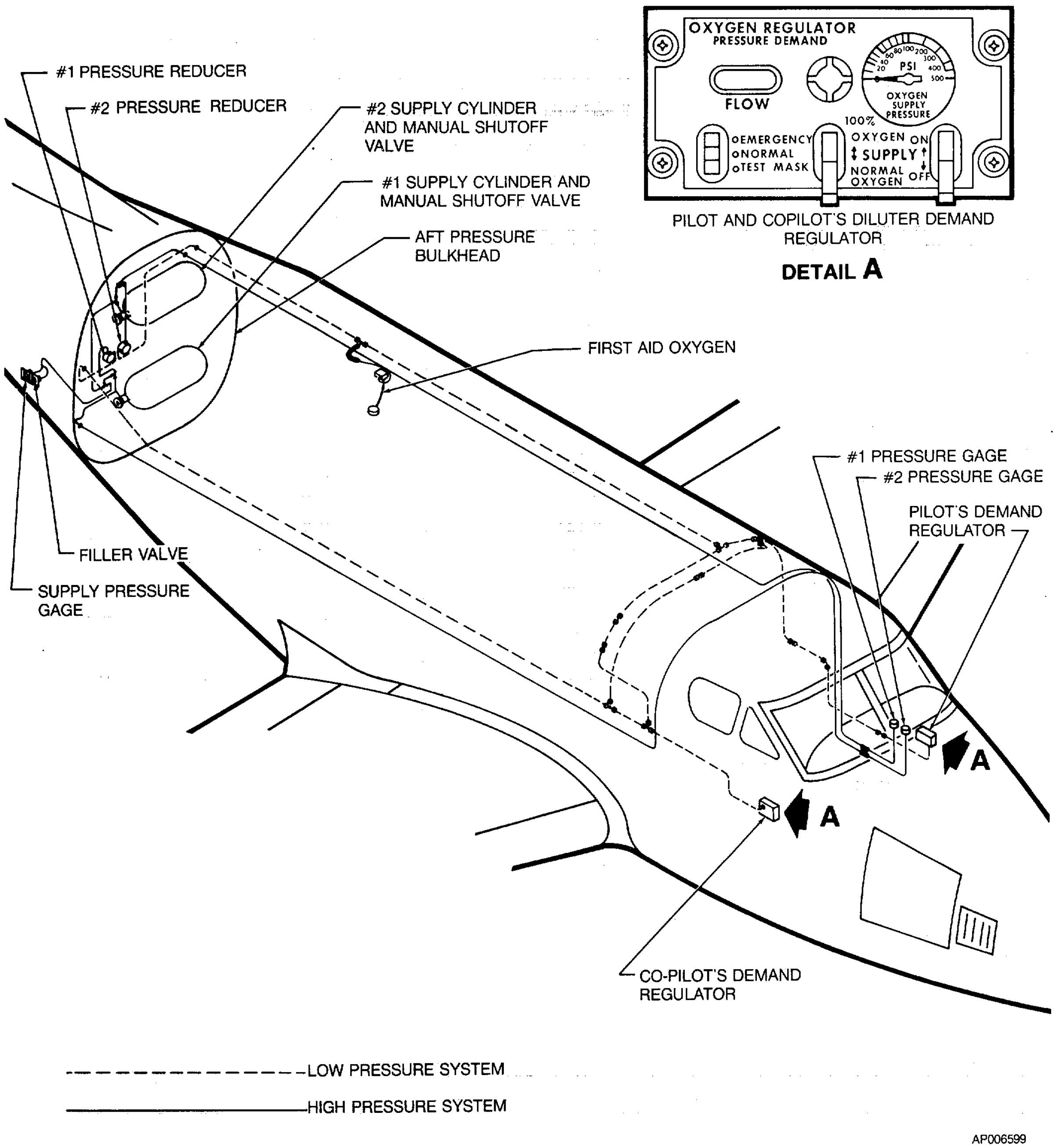

Figure 2-22. Oxygen System Schematic

located in the unpressurized portion of the aircraft behind the aft bulkhead, lower the pressure in the system to 400 PSI, and route oxygen to the regulator control panels. Both cylinders are interconnected, so refilling can be accomplished through a single filler valve located in the aft right side of the fuselage exterior. A pressure gage is mounted in conjunction with the filler valve, and each cylinder has a pressure gage. Table 2-4 shows oxygen flow planning rates vs. altitude. Table 2-5 shows oxygen duration capacities of the system.

Table 2-4. Oxygen Flow Planning Rates vs Altitude (All Flows In LPM Per Mask At NTPD)

CABIN PRESSURE ALTITUDE IN FEET	CREW MASK NORMAL (DILUTER DEMAND) (1)	CREW MASK 100% (1)	PASSENGER MASK
35,000	-0-(2)	3.1	3.7 (3)
34,000	-0-(2)	3.4	3.7 (3)
33,000	-0-(2)	3.7	3.7 (3)
32,000	-0-(2)	3.9	3.7 (3)
31,000	-0-(2)	4.2	3.7 (3)
30,000	-0-(2)	4.4	3.7 (3)
29,000	-0-(2)	4.7	3.7 (3)
28,000	-0-(2)	5.0	3.7 (3)
27,000	-0-(2)	5.3	3.7 (3)
26,000	-0-(2)	5.6	3.7 (3)
25,000	-0-(2)	5.9	3.7
24,000	-0-(2)	6.2	3.7
23,000	-0-(2)	6.6	3.7
22,000	-0-(2)	6.9	3.7
21,000	-0-(2)	7.2	3.7
20,000	3.6	7.6	3.7
19,000	3.9	7.9	3.7
18,000	4.2	8.3	3.7
17,000	4.5	8.7	3.7
16,000	4.8	9.1	3.7
15,000	5.1	9.5	3.7
14,000	5.4	10.0	3.7
13,000	5.8	10.4	3.7
12,000	6.1	10.9	3.7
11,000	6.5	11.3	3.7
10,000	6.9	11.9	3.7

NOTES:
(1) Based on minute volume of 20 LPM-BTPS (Body Temperature and Pressure Saturated).
(2) Use 100% oxygen above 20,000 feet
(3) Not recommended for other than emergency descent use above 25,000 feet.
If average climb or descent flows are desired, add the values between altitudes and divide by the number c values used.
For example, to determine the average rate for a uniform descent between 25,000 feet and 15,000 feet perform the following:
5.9 + 6.2 + 6.6 + 6.9 + 7.2 + 7.6 + 3.9 + 4.2 + 4.5 + 4.8 + 5.1 ÷ 11 = 5.7 LPM
This method is preferred over averaging the extremes as some flow characteristics vary in such a way as to yield an incorrect answer.

(1) Regulator control panels.

WARNING

A valid cause for alarm would be the rapid loss of oxygen pressure when the aircraft is in level flight or descending; should this condition arise, descend as rapidly as possible to an altitude which does not require the use of oxygen.

Each regulator control panel contains a blinker-type flow indicator, a 500 PSI pressure gage, a red emergency pressure control lever placarded EMERGENCY NORMAL TEST MASK, a white diluter control lever placarded 100% OXYGEN NORMAL OXYGEN, and a green supply control lever placarded ON OFF. The diluter control lever selects either normal or 100% oxygen, but acts to select only when the emergency pressure control lever is in the NORMAL position.

Table 2-5. Oxygen Duration In Minutes (140 Cubic Foot System)

	CABIN PRESSURE ALTITUDE	CREW MASK CONDITION	TOTAL FLOW LPM-NTPD	DURATION IN MINUTES (1)
TWO MAN CREW	35,000	100%	6 3	512 1
	31,000	100%	8 4	384 0
	25,000	100%	11 8	273 3
	20,000	100%	15 2	212 2
	20,000	NORMAL	7 2	448 0
	15,000	100%	19 0	169 7
	15,000	NORMAL	10 2	316 2
	10,000	100%	23 8	135 5
	10,000	NORMAL	13 8	233 7
TWO MAN CREW + ONE PASS	35,000	100%	10 0	323
	31,000	100%	12 1	266 6
	25,000	100%	15 5	208 1
	20,000	100%	18 9	170 7
	20,000	NORMAL	10 9	295 9
	15,000	100%	22 7	142.1
	15,000	NORMAL	13.9	232 1
	10,000	100%	27 5	117 3
	10,000	NORMAL	17 5	184 3
(1) For 100% capacity of useable oxygen, 3,226 L				

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CAUTION

When not in use, the diluter control lever should be left in the 100% OXYGEN position to prevent regulator contamination.

(2) The emergency pressure control lever has three positions. Two positions control oxygen consumption for the individual using oxygen, and the remaining position serves for testing hose and mask integrity. In the EMERGENCY position, the control lever causes 100% oxygen to be delivered at a safe, positive pressure. In the NORMAL position, the lever allows delivery of normal or 100% oxygen, depending upon the selection of the diluter control lever. In TEST MASK position, 100% oxygen at positive pressure is delivered to check hose and mask integrity.

(3) The 500 PSI oxygen pressure gage provided on the oxygen control panels should never indicate over 400 PSI. If the pressure exceeds 400 PSI, a malfunction of the pressure reducer is indicated. Whenever oxygen is inhaled, a blinker-vane slides into view within the flow indicator window, showing that oxygen is being released. When oxygen is exhaled, the blinker vane vanishes from view.

NOTE

Check to ensure that the OXYGEN SUPPLY PRESSURE gage registers adequate pressure before each flight. When oxygen

is in use, a check of the supply pressure should be made at intervals during flight, to note the quantity available and to approximate the supply duration. The outside temperature is reduced as an aircraft ascends to higher altitudes. Oxygen cylinders thus cooled by temperature change will show a pressure drop. This type of drop in pressure will raise again upon return to a lower or warmer altitude.

b. Oxygen masks. Oxygen masks for the pilot and copilot are provided. To connect a mask into the oxygen system, the individual connects the line attached to the mask to the flexible hose which is attached to the cockpit sidewall. The microphone in the oxygen mask is provided with a cord for connecting with the microphone jack. To test mask and hose integrity, the individual places the supply control lever on the regulator control panel to the ON position, puts on and adjusts his mask, selects TEST MASK position, and checks for leaks.

WARNING

Pure oxygen will support combustion. Do not smoke while oxygen is in use.

If any symptoms occur suggestive of the onset of hypoxia, immediately set the emergency pressure control lever to the EMERGENCY position and descend below 10,000 feet. Whenever carbon monoxide or other noxious gas is present or suspected, set the dilutor control lever to 100% OXYGEN and continue breathing undiluted oxygen until the danger is past.

c. Normal Operation. Oxygen pressure is maintained at all times to the regulator control panels if the cylinder shut-off valves are open and if there is pressure in the cylinders. Each individual places the supply lever (green) on his regulator control panel to the ON position, and the diluter lever (white) to the NORMAL OXYGEN position.

d. Emergency Operation. For emergency operation, the affected crew member selects the EMERGENCY position of the emergency pressure control lever (red) on his regulator control panel. This selection provides 100% oxygen at a positive pressure, regardless of the position of the diluter control lever on his panel.

e. First Aid Operation. A first aid oxygen mask is installed in the aft cabin area as a supplemental or emergency source of oxygen. The mask is stowed behind an overhead cover, placarded FIRST AID OXYGEN PULL. Removing the cover allows the mask to drop out of the container, exposing a manual control valve, which releases oxygen to the mask when placed in the ON position. After using the mask, the manual valve in the container must be turned OFF before stowing the mask and replacing the cover.

f. Oxygen Duration Example Problem.

WANTED
Duration in minutes of oxygen at 100% capacity.

KNOWN
Two man crew plus one passenger, cabin pressure altitude = 15,000 feet, crew masks, normal, 100% capacity.

METHOD
Find "two man crew plus one pass" line, move right then down to 15,000 - "normal" read 232.1 minutes.

WANTED
Duration of oxygen for previous example data at 84% of capacity.

KNOWN
232.1 minutes duration at 100%, 84% capacity, total aircraft flow = 13.9 LPM.

METHOD
Multiply 232.1 X 0.84 = 194.9 minutes. or Multiply 3,226 X 0.84 = 2709.8, divide by 13.9 LPM = 194.9 minutes.

WANTED
Duration of oxygen for complement at other cabin pressure altitude, at less than 100% capacity.

KNOWN
Cylinder at 84% capacity, 100% capacity = 3,226 L, cabin pressure altitude = 21,000 feet.
1 crew mask = LPM (100%), 1 passenger mask = LPM

METHOD

Multiply 3,226 L X 0.84 = 2.709.8 L, multiply 2 crew X 7.2 LPM = 14.4 LPM, multiply 1 passenger X 3.7 LPM, add 14.4 LPM crew plus 3.7 LPM passenger = 18.1 LPM. Divide 3,226 L by 18.1 LPM = 178.2 minutes.

g. Oxygen Cylinder Capacity Example Problem. Oxygen cylinder capacity is determined by using figure 2-23.

WANTED

Percent of capacity at known pressure and temperature.

Pressure when temperature decreases.

KNOWN

Pressure = 1,600 PSIG stabilized cylinder temperature is estimated at 20° C decreased stabilized cylinder temperature is estimated at -30° C.

METHOD

Enter 1600 PSIG move up to 20° C line, move right to 84%.

Move left on 84% line to -30° C line, move down to 1250 PSIG.

WANTED

100% capacity pressure at known temperature.

KNOWN

Temperature = -30° C.

METHOD

Move left along 100% line to -30° C line and move down to 1420 PSIG.

2-62. WINDSHIELD WIPERS.

a. Description. Two electrically operated windshield wipers, are provided for use at all flight speeds. The rotary switch (fig. 2-13) placarded WINDSHIELD WIPER, located in the overhead control panel, selects mode of windshield wiper operation. An information placard above the switch states: DO NOT OPERATE ON DRY GLASS. Function positions of the switch, as read clockwise, are placarded: PARK - OFF - SLOW - FAST. When the switch is held in the spring-loaded PARK setting, the blades will return to their normal inoperative position on the glass, then, when released, the switch will return to OFF position terminating windshield wiper operation. The FAST and SLOW switch positions are separate operating speed settings for wiper operation. The windshield wiper circuit is protected by one 10-ampere circuit breaker, placarded WSHLD WIPER, located in the overhead circuit breaker panel (fig. 2-6).

CAUTION

Do not operate windshield wipers on dry glass. Such action can damage the linkage as well as scratch the windshield glass.

*b. Normal Operation. T*o start, turn WINDSHIELD WIPER switch to FAST or SLOW speed, as desired. To stop, turn the switch to the PARK position and release. The blades will return to their normal inoperative position and stop. Turning the switch only to the OFF position will stop the windshield wipers, without returning them to the normal inactive position.

2-63. FERRY CHAIR.

For ferry purposes, a forward facing chair may be attached to the floor tracks at fuselage station 211.87.

2-64. CIGARETTE LIGHTERS AND ASH TRAYS.

The pilot and copilot have individual cigarette lighters and ash trays mounted in escutcheons out-board of their seats. The cigarette lighters are protected by a 5-ampere circuit breaker, placarded CIGAR LIGHTER, on the overhead circuit breaker panel (fig. 2-6).

2-65. CHEMICAL TOILET.

a. Description. A side-facing, chemical toilet is installed in the aft cabin area and can also be used as an additional seat. Two, hinged lid half-sections must be raised to gain access to the toilet. Waste is stored within a removable container located below the seat in the cabinet assembly. This non-flushing system uses a dry chemical preparation to deodorize the stored waste. A toilet tissue dispenser is contained in a slide-out compartment on the forward side of the toilet cabinet. A box of disposable waste container liners and a box of chemical deodorant

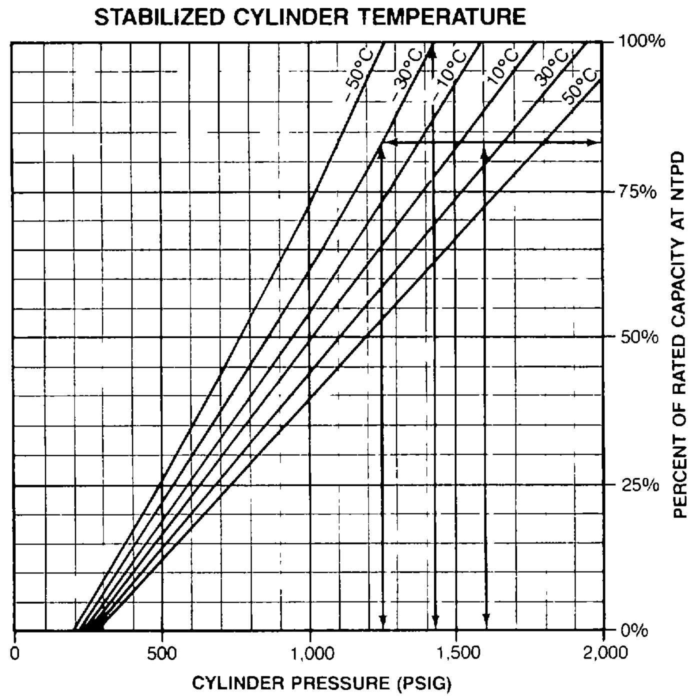

Figure 2-23. Cylinder Capacity vs Pressure and Temperature

packets are also stored in the cabinet.

b. Operation. During use, a removable, throwaway plastic liner is attached to the waste container. After use, dry chemical deodorant obtained from the storage cabinet is deposited on the waste and the hinged lid sections are closed over the cavity. After each flight, the waste container must be removed, emptied, relined, and replaced in the cabinet. Consumable toilet items should be resupplied as needed.

2-66. SUN VISORS.

CAUTION

When adjusting the sun visors, grasp only by the top metal attachment to avoid damage to the plastic shield.

A sun visor is provided for the pilot and copilot respectively (fig. 2-7). Each visor is manually adjustable. When not needed as a sun shield, each visor may be manually rotated to a position flush with the top of the cockpit so that it does not obstruct view through the windows.

2-67. RELIEF TUBE.

One relief tube is provided, located immediately aft of the cargo door on the left side of the fuselage. packets are also stored in the cabinet.

Section VIII. HEATING, VENTILATION, COOLING, AND ENVIRONMENTAL CONTROL SYSTEM

2-68. HEATING SYSTEM.

a. Description. Warm air for heating the cockpit, mission equipment compartment and warm windshield defrosting air is provided by bleed air from both engines. Engine bleed air is combined with ambient air in the heating and pressurization flow control unit in each engine nacelle. If the mixed bleed air is too warm for cockpit comfort, it is cooled by being routed through an air-to-air heat exchanger located in the forward portion of each inboard wing. If the mixed bleed air is not too warm, the air-to-air

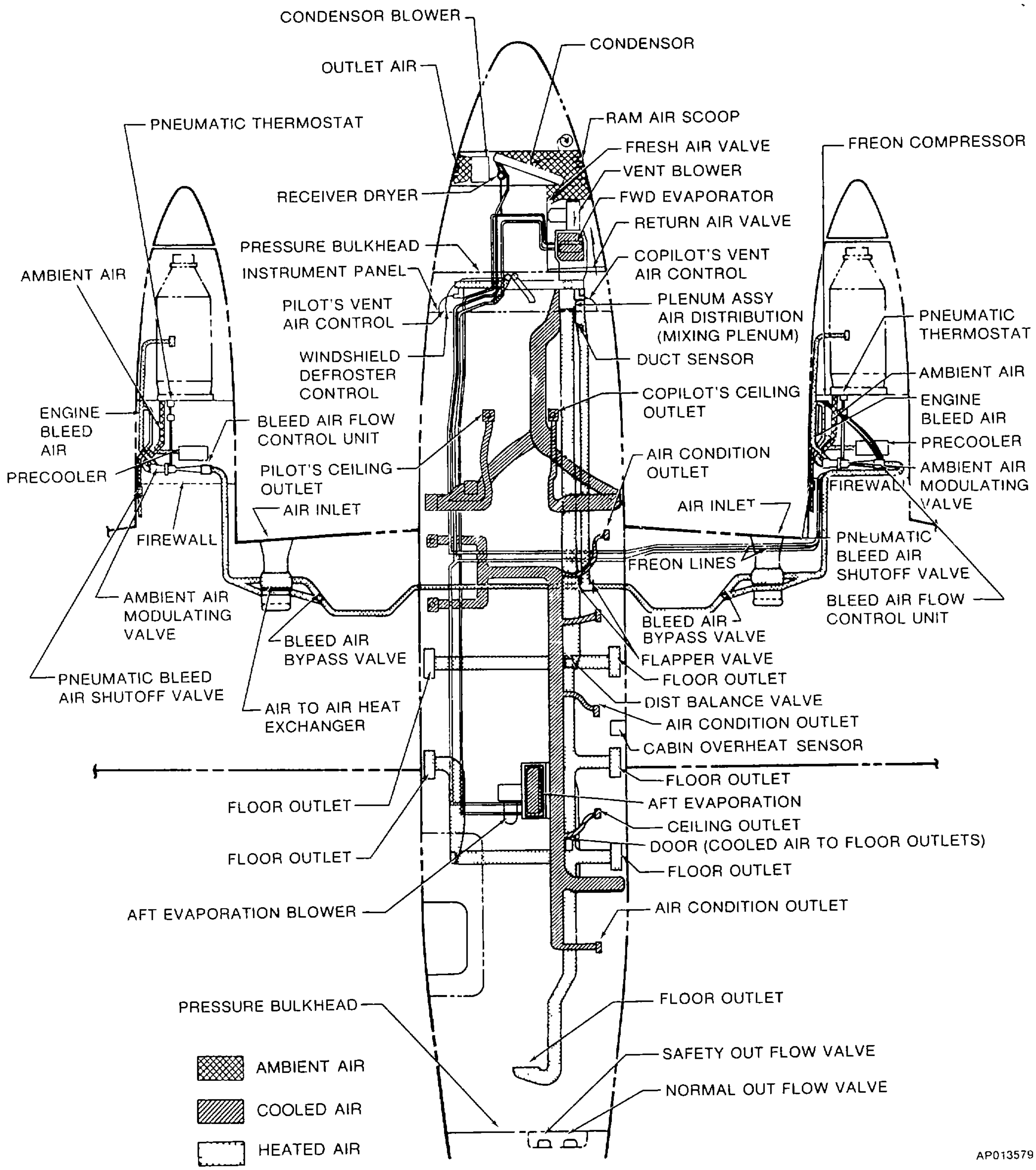

Figure 2-24. Environmental System

heat exchangers are bypassed. The mixed bleed air is then ducted to a mixing plenum, where it is mixed with cabin recirculated air. The warm air is then ducted to the cockpit outlets, windshield defroster outlets, and to the floor outlets in the mission equipment compartment. The environmental system is shown in figure 2-24.

(1) Bleed air flow control unit. A bleed air flow control unit, located forward of the firewall in each engine nacelle controls the flow of bleed air and the mixing of ambient air to make up the total airflow to the cabin for heating, windshield defrosting, pressurization and ventilation. The unit is electronically controlled with an integral electric solenoid firewall shutoff valve, controlled by the bleed air switches located in the overhead control panel (fig. 2-13) and a normally open solenoid valve operated by the right landing gear safety switch.

(2) Pneumatic bleed air shutoff valve. A pneumatic shutoff valve is provided in each engine nacelle to control the flow of bleed air to the surface, antenna and brake deice systems. These valves are controlled by the bleed air valve switches located in the overhead control panel (fig. 2-13).

(3) Bleed air valve switches. The bleed air flow control unit shutoff valve and pneumatic bleed air shutoff valves are controlled by two LEFT and RIGHT switches placarded ENVIRO & PNEU BLEED AIR PNEU ONLY ON, located in the overhead control panel (fig. 2-13). When set to the ON position, both the environmental flow control unit shutoff valve and the pneumatic shutoff valve are open; when set to the PNEU ONLY position, the environmental flow control unit shutoff valve is closed, and the pneumatic bleed air valve is open; in the ENVIRO & PNEU position, both are closed. For maximum cooling on the ground, turn the bleed air valve switches to the PNEU ONLY position.

(4) Cabin temperature mode selector switch. A switch placarded CABIN AIR MODE SELECT OFF AUTO AC COLD OPN 10° to -25° C MAN COOL-MAN HEAT located in the overhead control panel, controls cockpit and mission avionics compartment heating, and air conditioning. When the cabin temperature mode selector switch is set to the AUTO position, the heating and air conditioning systems are automatically controlled. Control signals from the temperature control box are transmitted to the bleed air heat exchanger bypass valves. Here, the temperature of the air flowing to the cabin is regulated by the bypass valves controlling the amount of air bypassing the heat exchangers. When the temperature of the cabin air, has reached the temperature setting of the cabin temperature control rheostat, the automatic temperature control allows hot air to bypass the air-to-air exchangers admitting hot air into the cabin. When the bypass valves are in the fully closed position, allowing no air to bypass the heat exchangers, the air conditioner begins to operate, providing additional cooling. When the cabin temperature mode selector switch is set to the A/C COLD OPN position, the air conditioning system is in continuous operation. The cabin temperature control rheostat, in conjunction with the cabin temperature control sensor, provides regulation of cockpit and mission equipment compartment temperature. Bleed air heat is added as required to maintain the temperature selected by the cabin temperature control rheostat.

(5) Cabin temperature control rheostat. A control knob placarded CABIN AIR TEMP CONTROL INCR located in the overhead control panel (fig. 2-13), provides regulation of cabin temperature when the cabin temperature mode selector switch is set to the AUTO or the AC COLD OPN position. A temperature sensing unit in the cabin, in conjunction with the setting of the cabin temperature control rheostat, initiates a heat or cool command to the temperature controller for the desired cockpit or mission equipment compartment environment.

(6) Manual temperature control switch. A switch placarded CABIN AIR MANUAL TEMP DECREASE INCREASE located in the overhead control panel (fig. 2-13), controls cockpit and mission equipment compartment temperature with the cabin temperature mode selector switch set to the MAN HEAT or MAN COOL position. The manual temperature control switch controls the cockpit and avionics equipment temperature by providing a means of manually changing the amount that the bleed air bypass valves are--opened or closed. To increase cabin temperature, the switch is held to the INCR position. To decrease cabin temperature, the switch is held to the DECR position. Approximately 30 seconds, per valve, is required to drive the bypass valves to the fully open or fully closed position. Only one valve moves at a time.

(7) Forward vent blower switch. The forward vent blower is controlled by the switch placarded VENT BLOWER FWD AUTO LOW HIGH, located in the overhead control panel (fig. 2-13). In

the AUTO position the fan will run at low speed except when the cabin temperature mode selector switch is set to the OFF position, in this case the blower will not operate.

(8) *Aft vent blower switch*. The aft vent blower is controlled by the switch placarded VENT BLOWER AFT AUTO ON, located in the overhead control panel (fig. 2-13). The single speed blower operates automatically through the N_1 switch, when the aft vent blower switch is placed in the AUTO position. The blower operates continuously when the switch is placed in the ON position with the air conditioner compressor operating. In the OFF position, the blower will not operate.

b. Automatic Heating Mode.

1. Bleed air valve switches - OPEN, LEFT and RIGHT.
2. Cabin temperature mode selector switch - AUTO.
3. Cabin temperature control rheostat - As required.
4. Cabin, cockpit and defrost air knobs - As required.

c. Manual heating mode.

1. Bleed air valve switches - OPEN, LEFT and RIGHT.
2. Cabin temperature mode selector switch - MAN HEAT.
3. Vent blower switches - As required.
4. Manual temperature switch - As required.
5. Cabin, cockpit and defrost air knobs - As required.

(1) Cargo Door Radiant Heat. A radiant heat panel is provided inside the cargo door to provide supplemental heating in the aft cabin area. The heat panel is operating whenever the cabin temperature mode switch is in the manual heat mode, or in the automatic mode with the temperature control system in the heat mode.

2-69. AIR CONDITIONING SYSTEM.

a. Description. Cabin air conditioning is provided by a refrigerant gas vapor cycle refrigeration system, consisting of a belt driven, engine mounted compressor, installed on the #2 engine accessory section, refrigerant plumbing, N_1 speed switch, high and low pressure protection switches, condenser coil, condenser under-pressure switch, condenser blower, forward and aft evaporators, receiver-dryer, expansion valve and a bypass valve. The plumbing from the compressor is routed through the right inboard wing leading edge to the fuselage and then forward to the condenser coil, receiver-dryer, expansion valve, bypass valve, and forward evaporator, which are located in the nose of the aircraft. The 7.5-ampere circuit breaker, placarded AIR COND CONTR, located in the overhead circuit breaker panel (fig. 2-6), protects the compressor clutch circuit.

(1) Forward evaporator. The forward evaporator and blower supplies airflow for the cockpit, forward ceiling outlets, and forward floor outlets. The forward evaporator blower has a high speed which can be selected by setting the VENT BLOWER FWD switch, located in the overhead control panel (fig. 2-13), to the HIGH position. The forward vent blower is protected by a circuit breaker located in the DC power distribution panel, located beneath the aisleway.

(2) Aft evaporator. The aft evaporator and blower are located in the fuselage center aisle equipment bay, aft of the rear spar. Environmental air is circulated through the evaporator in either manual or automatic control modes. The rear evaporator supplies airflow for the aft ceiling outlets, rear floor outlets, and toilet compartment. The rear evaporator blower is protected by a circuit breaker located in the DC power distribution panel, located beneath the aisleway.

(3) High and low pressure limit switches. High and low pressure limit switches are provided to prevent compressor operation beyond operational limits. When the low or high pressure switches are activated, compressor operation will be terminated. When compressor operation has been terminated by limit switch activation, the system should be thoroughly checked before returning it to service.

(4) Thermal sense switch. A thermal sense switch is installed on the forward evaporator. This sense switch actuates a hot gas bypass valve which bypasses a portion of the refrigerant from the forward evaporator, thereby preventing icing of the evaporator.

(5) Condenser blower. A vane-axial blower

draws air through the condenser when aircraft is on the ground. The blower is protected by a 50 ampere circuit breaker located beneath the aisleway. When the cabin temperature mode selector switch is set to the AC COLD OPN position during ground operation, the condenser blower will be off initially, and will remain off until compressor discharge pressure equals the pressure setting of the blower control high pressure switch. The blower will remain in operation until system pressure drops to equal the setting of the blower control low pressure switch.

(6) Air conditioning cold operation bypass valve. Selecting the A/C COLD OPN mode on the cabin temperature mode selector switch permits the operation of the air conditioning system by overriding the refrigerant low pressure switch. This allows the air conditioning system to operate in the manual mode. Starting the compressor in this optional mode at low ambient temperature will decrease the operational life of the compressor by five hours each time the air conditioning system is started below 10° C using this mode (AC COLD OPN). If the air conditioning system has been operating in the normal mode during flight, and due to decreasing ambient temperatures make it necessary to switch to the AC cold operation mode, there will be no degradation in the mean time between failure for the compressor.

(7) Air conditioner cold operation. Cold air conditioner operation mode is provided to allow the air conditioner to operate in the event of a hot cabin and an outside air temperature of less than 10° C. At an OAT of less than 10° C, a green advisory annunciator placarded AC COLD OPN, located on the caution/advisory annunciator panel (fig. 2-5), will illuminate. This advises the crew that if air conditioning is required, the cabin temperature mode switch must be in the A/C COLD OPN position. This causes the air conditioner compressor to run continuously and the temperature controller to operate the bypass valve.

b. Normal Operation.

(1) Automatic cooling mode.

1. Bleed air valve switches - OPEN, LEFT and RIGHT.
2. Cabin temperature mode selector switch - AUTO.
3. Cabin temperature control rheostat - As required.
4. Cabin, cockpit and defrost air knobs - As required.

(2) Manual cooling mode.

1. Bleed air valve switches - OPEN, LEFT and RIGHT.

NOTE

For maximum cooling on the ground, set the bleed air valve switches to the PNEU ONLY position.

2. Cabin temperature mode selector switch - MAN COOL.

(3) Air conditioning cold operation mode. (Used if ambient temperature is between 10° C and -25° C).

NOTE

Setting the cabin temperature mode selector switch to the A/C COLD OPN position at ambient temperatures below -25 ° C may cause the air conditioning system to exceed the compressor low pressure limit switch setting, terminating compressor operation, and thereby rendering the system inoperative for the remainder of the flight.

1. Bleed air valve switches - OPEN, LEFT and RIGHT.
2. Cabin temperature mode selector switch - A/C COLD OPN.
3. Cabin temperature control rheostat - As required.
4. Cabin, cockpit and defrost air knobs - As required.

2-70. UNPRESSURIZED VENTILATION.

Ventilation is provided by two sources. One source is through the bleed air heating system in both the pressurized and unpressurized mode. The second source of ventilation is obtained from ram air through the condenser section in the nose through a check valve in the vent blower plenum. Ventilation from this source is in the unpressurized mode only with the CABIN PRESS DUMP switch in the DUMP position. The check valve closes during pressurized operation. Ram air ventilation is distributed through the main ducting system to all outlets. Ventilation air, ducted to each individual eyeball cold air outlet, can be directionally controlled by moving the ball in the socket. Volume is regulated by twisting the outlet to open or close the valve.

2-71. ENVIRONMENTAL CONTROLS.

An environmental control section on the overhead control panel (fig. 2-13) provides for automatic or manual control of the system. This section contains all the major controls of the environmental function including bleed air valve switches, forward and aft vent blower switches, manual temperature switch for control of the heat exchanger valves, a cabin temperature level control, and the cabin temperature mode selector switch for selecting automatic heating/ cooling or manual heating/cooling.

a. Heating Mode.

(1) If the cockpit is too cold:

1. Pilot and copilot air knobs - As required.
2. Defrost air knob - As required.
3. Cabin air knob - Pull out in small increments. Allow 3 - 5 minutes after each adjustment for system to stabilize.

(2) If the cockpit is too hot:

1. Cabin air knob - As required.
2. Pilot and copilot air knobs - In as required.
3. Defrost air knob - In as required.

b. Cooling Mode:

(1) If the cockpit is too cold:

1. Pilot and copilot air knob - In as required.
2. Defrost air knob - In as required.
3. Overhead cockpit outlets - As required.

(2) If the cockpit is too hot:

1. Pilot and copilot air knobs - Out as required.
2. Cabin air knob. Close in small increments. Allow 3 - 5 minutes after each adjustment for system to stabilize. If CABIN AIR knob is completely closed before obtaining satisfactory cockpit comfort, it may be necessary to place the aft vent blower switch in the ON position to activate the aft evaporator to recirculate cabin air.

c. Automatic Mode Control. When the AUTO mode is selected on the cabin temperature mode selector switch, the heating and air conditioning systems are automatically controlled. When the temperature of the cabin has reached the selected setting, the automatic temperature control allows heated air to bypass the air-to-air exchangers in the wing center section. The warm bleed air is mixed with the cooled air. The rear evaporator picks up recirculated cabin air only.

(1) When the automatic control drives the environmental system from a heat mode to a cooling mode, the bypass valves close. When the left bypass valve reaches a fully closed position, the refrigeration system will begin cooling, provided the right engine N_1 speed is above 65%. When the bypass valve is opened to a position approximately 30° from full open, the refrigeration system will turn off.

(2) The CABIN AIR TEMP INCR control provides regulation of the temperature level in the automatic mode. A temperature sensing unit in the cabin, in conjunction with the control setting, initiates a heat or cool command to the temperature controller for desired cockpit and cabin environment.

d. Manual Mode Control. With the cabin temperature mode selector in the MAN HEAT or MAN COOL position, regulation of the cabin temperature is accomplished manually with the MANUAL TEMP switch.

(1) In the MAN HEAT mode, the automatic system is overridden and the system is controlled by opening and closing the bypass valves (two) with the MANUAL TEMP INCR DECR switch. To increase cabin temperature, hold the switch in the INCR position, to decrease cabin temperature, hold the switch in the DECR position. Allow approximately 30 seconds per valve to drive the bypass valves to the fully open or fully closed position. Only one valve moves at a time.

(2) With the cabin temperature selector switch in the MAN COOL position, the automatic temperature control system is bypassed. When the left bypass valve reaches a fully closed position, the refrigeration system will begin cooling, provided the right engine N_1 speed is above 65%. When the bypass valve is opened to a position approximately 30° from full open, the refrigeration system will turn off. Hold the MANUAL TEMP switch in the DECR position approximately one minute to fully close air-to-air heat exchanger bypass valves.

(3) Bleed air entering the cabin is controlled

by LEFT and RIGHT bleed air valve switches placarded ENVIRO & PNEU BLEED AIR PNEU ONLY ON. When the switch is in the ON position, the environmental flow control unit and the pneumatic valve are open. When the switch is in the PNEU ONLY position, the environmental flow control unit is closed and the pneumatic bleed air valve is open; in the ENVIRO & PNEU BLEED AIR position, both are closed. For maximum cooling on the ground, turn the bleed air valve switches to the PNEU ONLY position.

(4) The forward vent blower is controlled by the switch placarded VENT BLOWER FWD AUTO LOW HI. The HI and LOW positions regulate the blower to two speeds of operation. In the AUTO position, the fan will run at low speed except when the CABIN TEMP MODE SELECT switch is placed in the OFF position. In the OFF position, the blower will not operate.

(5) The aft vent blower is controlled by the switch placarded VENT BLOWER AFT AUTO ON. The single speed blower operates automatically through the N_1 speed switch when the aft vent blower switch is placed in the AUTO position. The blower operates continuously when the switch is placed in the ON position with the air conditioner compressor running. In the OFF position, the blower will not operate.

Section IX. ELECTRICAL POWER SUPPLY AND DISTRIBUTION SYSTEM

2-72. DESCRIPTION.

The aircraft employs both direct current (DC) and alternating current (AC) electrical power. The DC electrical power supply (fig. 2-25) is the basic power system energizing most aircraft circuits. Electrical power is used to start the engines, power the landing gear and flap motors, and operate the standby fuel pumps, ventilation blower, lights and electronic equipment. AC power is obtained from the DC power system through inverters. The single phase AC power system is shown in figure 2-26, and the three phase AC power system is shown in figure 2-27. The three sources of DC power consist of one 20 cell 34-ampere/hour battery and two 400-ampere starter-generators. DC power may be applied to the aircraft through an external power receptacle on the underside of the right wing stub, just outboard of the nacelle. The starter-generators are controlled by generator control units. The output of each generator passes through a cable to the respective generator bus (fig. 2-25): Other buses distribute power to aircraft DC loads, deriving power from the generator buses. The generators are paralleled to balance the DC loads between the two units. When one of the generating systems is not on line, and no fault exists, all aircraft DC requirements may be supplied by either the other on-line generating system or by an external power source. The generator system is designed to allow cross starting of the other engine. When one generator is on line, all current limiters are bypassed while starting the other engine. Most DC distribution buses are connected to both generator buses but have isolation diodes to prevent power crossfeed between the generating systems, when connection between the generator buses is lost. Thus, when either generator is lost because of a ground fault, the operating generator will supply power for all aircraft DC loads except those receiving power from the inoperative generator's bus, which cannot be crossfed. When a generator is not operating, reverse current and over-voltage protection is automatically provided. Two inverters operating from DC power produce the required single-phase AC power. Three phase AC electrical power for inertial navigation system and mission avionics is supplied by two DC powered three phase mission inverters (fig. 2-28).

The mission AC/DC power cabinet (fig. 2-29) located in the mission rack, aft of the copilot's seat. AC power may be applied through an external power receptacle located in the underside of the left wing stub, just outboard of the engine nacelle.

2-73. DC POWER SUPPLY.

One nickel-cadmium battery furnishes DC power when the engines are not operating. This 24-volt, 34-ampere/hour battery, located in the right wing center section, is accessible through a panel on the top of the wing. DC power is produced by two engine-driven 28 volt, 400-ampere starter-generators. Controls and indicators associated with the DC supply system are located in the overhead control panel (fig. 2-13) and consist of a single battery switch, two generator switches, two DC digital voltmeters, and two DC digital loadmeters.

a. Battery Switch. The switch, placarded BATTERY OFF RESET ON (fig. 2-13), is located on the overhead control panel under the MASTER SWITCH (gangbar). The BATTERY switch controls DC power to the aircraft bus system through the battery relay, and must be ON to allow external power

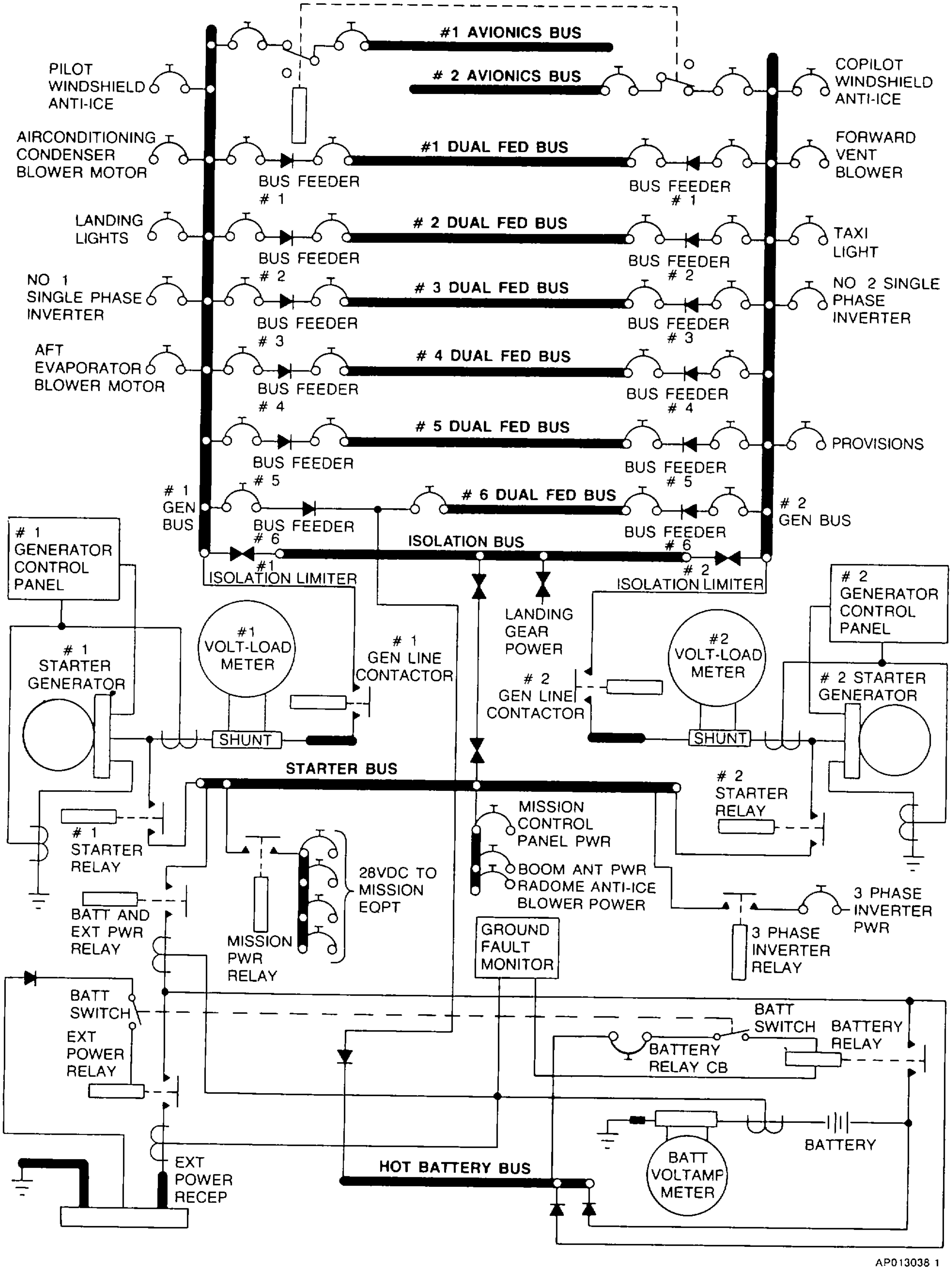

Figure 2-25. DC Electrical System (Sheet 1 of 3)

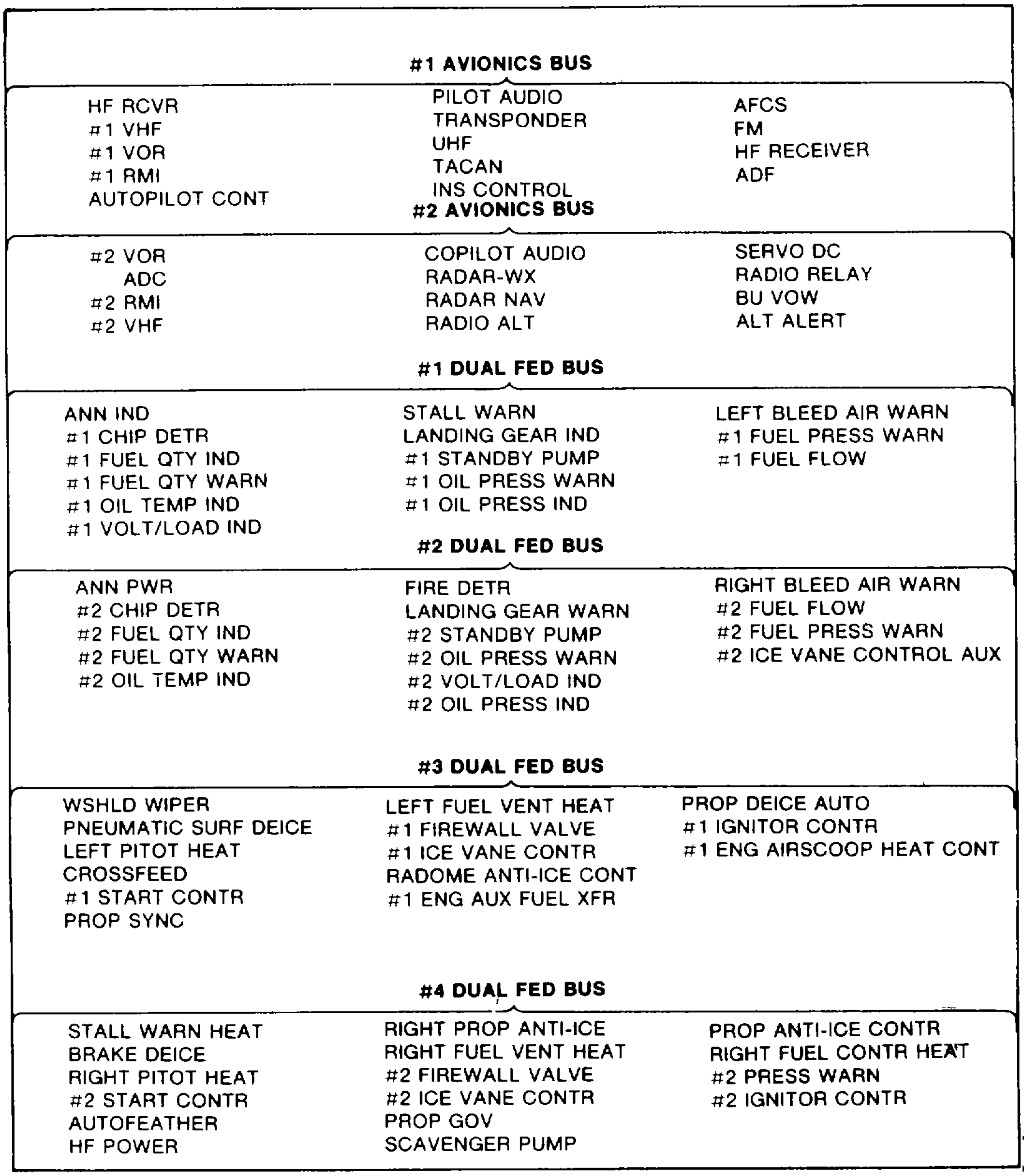

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Figure 2-25. DC Electrical System (Sheet 2 of 3)

#5 DUAL FED BUS

ELEC TRIM
LANDING GEAR CONTROL
ICE LIGHTS
INST INDIRECT LIGHTS
TEMP CONTR

FLAP MOTOR
BCN LIGHTS
LANDING LIGHTS
LEFT BLEED AIR CONTR
PROVISIONS

PILOT TURN & SLIP
SUBPANEL & CONSOLE LIGHTS
RECOGNITION LIGHTS
AIR COND CLUTCH
RESERVED CABIN FURNISHINGS

#6 DUAL FED BUS

RUDDER BOOST
EMERG LIGHTS
OVHD LIGHTS
CABIN PRESS CONTR
CIGAR LIGHTER
AVIONICS MASTER CONTR

FLAP CONTR & IND
FLT INST LIGHTS
RIGHT BLEED AIR CONTR
TAXI LIGHT

COPILOT TURN & SLIP
NAV LIGHTS
CABIN LIGHTS
CARGO DOOR HEAT

HOT BATTERY BUS

#1 FIREWALL SHUTOFF VALVE
#1 ENGINE FIRE EXTINGUISHER
#1 STANDBY FUEL PUMP
TRANSPONDER

CABIN LIGHT
BATTERY RELAY

#2 FIREWALL SHUTOFF VALVE
#2 ENGINE FIRE EXTINGUISHER
#2 STANDBY FUEL PUMP
CRYTO HOLD

STARTER BUS

MISSION DC POWER RELAY
#1 ENGINE START RELAY
BATTERY/EXTERNAL POWER RELAY

#2 3φ INVERTER POWER RELAY
#2 ENGINE START RELAY
#1 3φ INVERTER POWER RELAY

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Figure 2-25. DC Electrical System (Sheet 3 of 3)

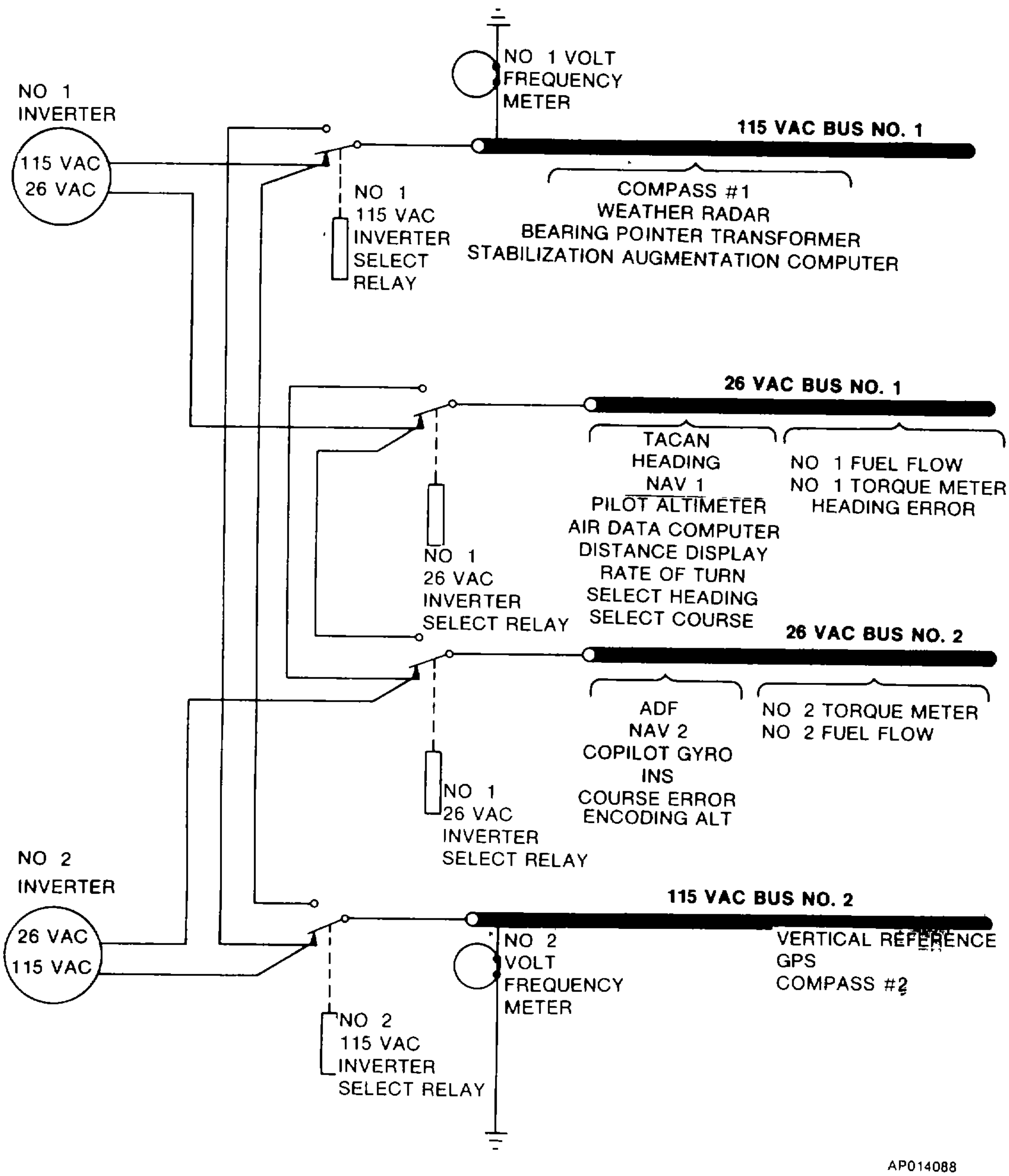


Figure 2-26. Single Phase AC Electrical System

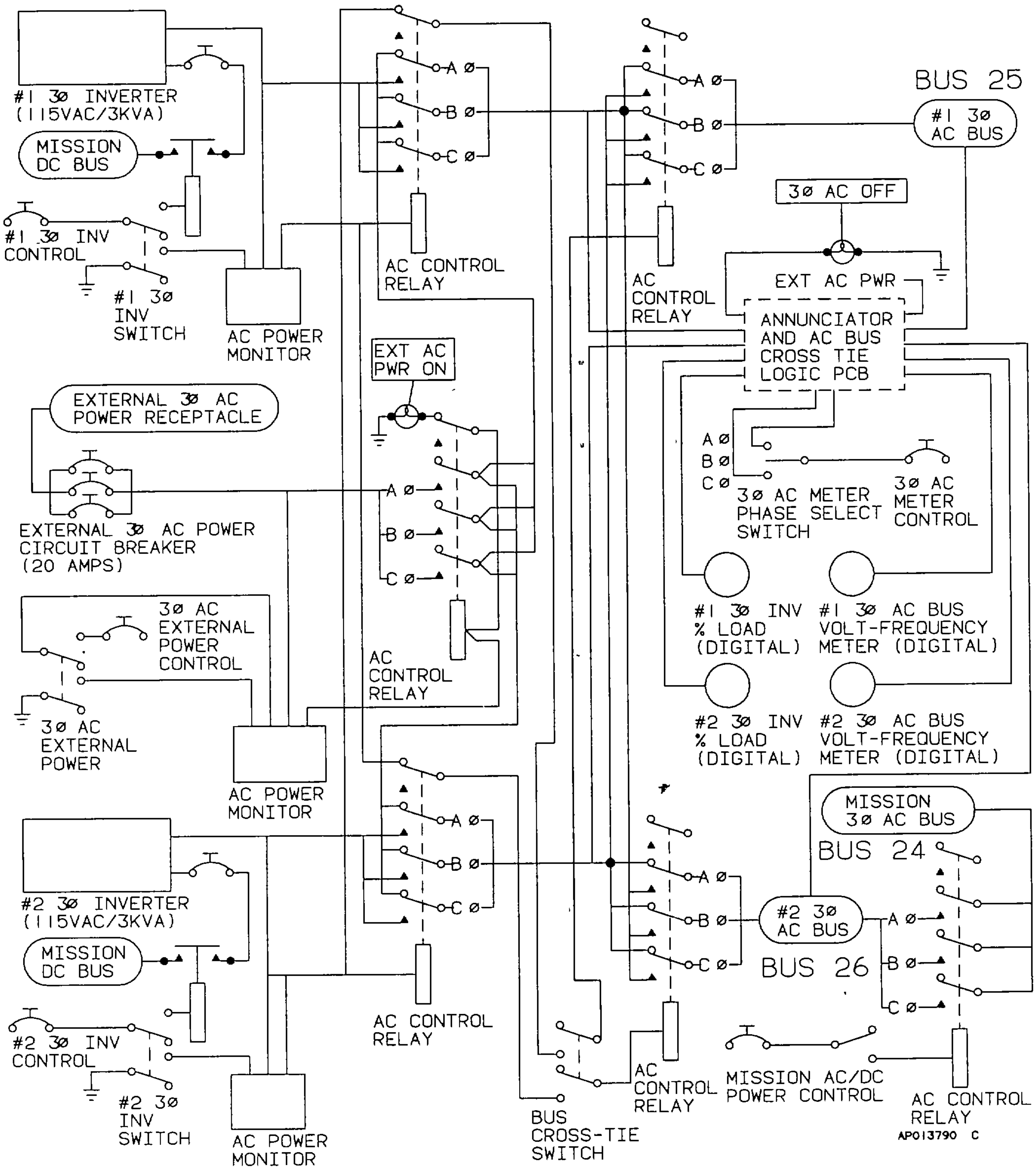


Figure 2-27. Three Phase AC Electrical System

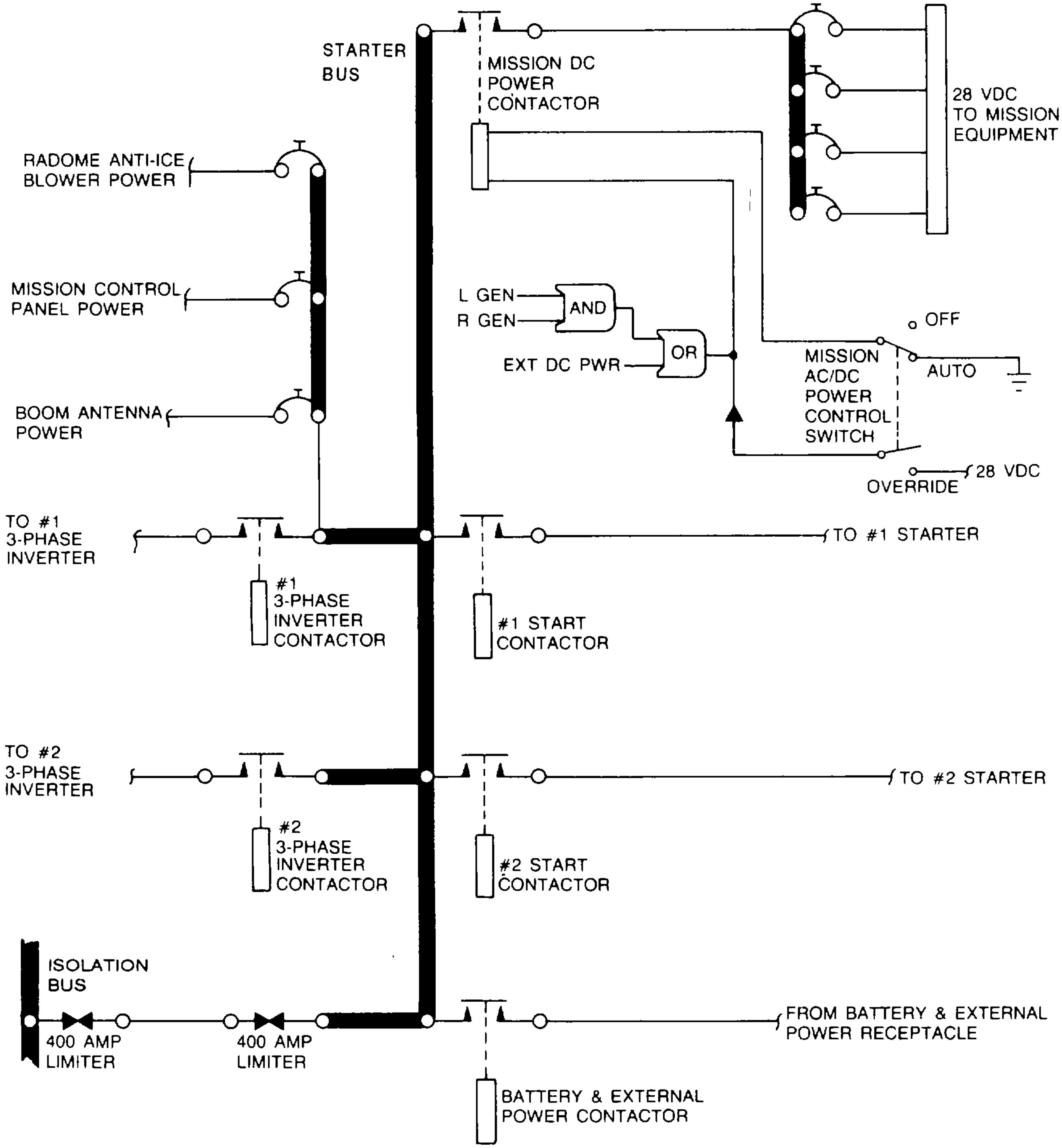


Figure 2-28. Mission Equipment DC Power System

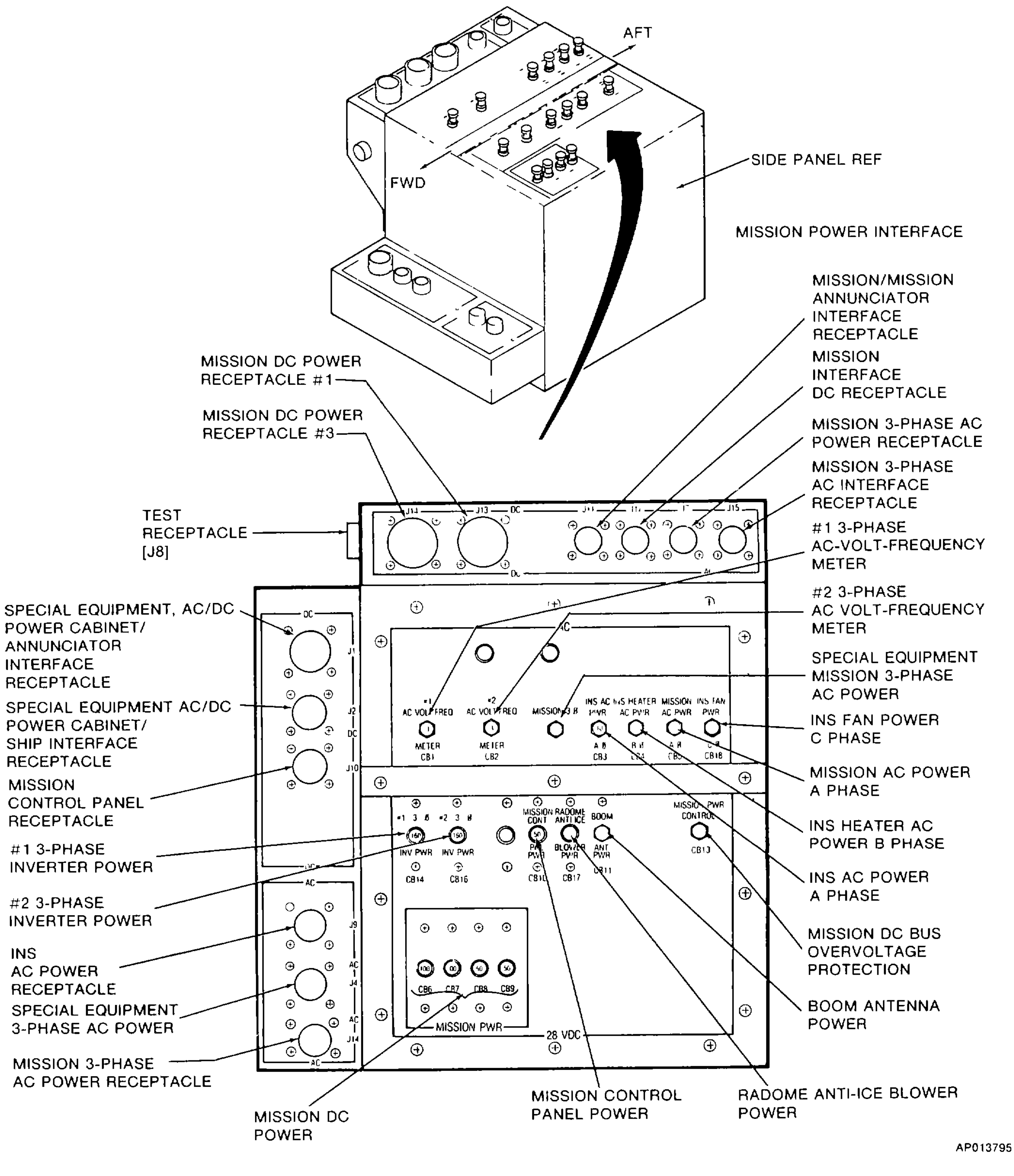


Figure 2-29. Mission AC/DC Power Cabinet

to enter aircraft circuits. When the MASTER SWITCH (gangbar) is placed down, the BATTERY switch is forced OFF.

NOTE

With battery or external power removed from the aircraft electrical system, due to fault, power cannot be restored to the system until the BATTERY switch is moved to OFF/RESET, then ON.

b. Generator Switches. The two switches (fig 2-13), placarded #1 GENERATOR and #2 GENERATOR are located in the overhead control panel. The toggle switches control electrical power from the designated generator to paralleling circuits and the bus distribution system. Switch positions are placarded RESET, ON and OFF. RESET is forward (spring-loaded back to ON), ON is center, and OFF is aft. When a generator is removed from the aircraft electrical system, due either to fault or from placing the GENERATOR switch in the OFF position, the affected unit cannot have its output restored to aircraft use until the GENERATOR switch is moved to RESET, then ON.

c. Master Switch. All electrical current may be shut off using the MASTER SWITCH gangbar (fig 2-13) which extends above the battery and generator switches. The MASTER SWITCH (gangbar) is moved forward when a battery or generator switch is turned on. When moved aft, the bar positions each switch to the OFF position.

d. DC Load and Voltmeters. Four digital meters, located in the overhead panel, display voltage readings and show the rate of current usage from the left and right generating systems. The two load meters indicate output amperage as a percent of rated capacity from the respective generator. Current consumption is indicated as a percentage of total output amperage capacity for the generating system being monitored. The two voltmeters indicate bus voltage for the respective generating system.

e. Battery Volt/Amp Meter. The mission control panel (fig. 4-1), located in the fuselage sidewall adjacent to the copilot's seat, incorporates a digital volt/ amp meter that displays available battery voltage, and amperage. Minimum battery voltage for engine starting is 22 VDC.

f. Battery Charge Monitor. Nickel-cadmium battery overheating will cause the battery charge current to increase if thermal runaway is imminent. The aircraft has a charge-current sensor which will detect a charge current. The charge current system senses battery current through a shunt in the negative lead of the battery. Any time the battery charging current exceeds approximately 7-amperes for 6 seconds or longer, the amber BATTERY CHARGE annunciator and the master fault caution annunciator will illuminate. Following a battery engine start, the caution annunciator will illuminate approximately six seconds after the generator switch is placed in the ON position. The annunciator will normally extinguish within two to five minutes, indicating that the battery is approaching a full charge. The time interval will increase if the battery has a low state of charge, the battery temperature is very low, or if the battery has previously been discharged at a very low rate (i.e., battery operation of radios or lights for prolonged periods). The caution annunciator may also illuminate for short intervals after landing gear and/or flap operation. If the caution annunciator should illuminate during normal steady-state cruise, this indicates that conditions exist that may cause a battery thermal runaway. If this occurs, the battery current should be monitored using the battery ammeter. If battery current continues to increase, the battery is in thermal runaway and should be selected off until the beginning of the approach.

g. Generator Out Warning Annunciators. Two caution/advisory annunciator panel fault annunciators inform the pilot when either generator is not delivering current to the aircraft DC bus system. These annunciators are placarded #1 DC GEN and #2 DC GEN. Illumination of the two MASTER CAUTION annunciators and either fault annunciator indicates that either the identified generator has failed or voltage is not sufficient to keep it connected to the power distribution system.

CAUTION

The GPU shall be adjusted to regulate at 28 volts maximum to prevent damage to the aircraft systems.

h. DC External Power Source. See figure 2-32. External DC power can be applied to the aircraft through an external power receptacle on the underside of the right wing stub, just outboard of the engine nacelle. The receptacle is installed inside of the wing structure and is accessible through a hinged access panel. DC power is supplied through the DC external power plug, through the external power relay, directly to the battery bus. Turn off all external power while connecting the power cable to, or removing it from, the external power supply receptacle. The holding coil circuit of the relay is energized by the external power source when the BATTERY switch is in the ON position. The GPU shall be adjusted to regulate at 28 volts maximum to prevent damage to the aircraft battery. The EXTERNAL POWER annunciator (fig. 2-5) indicates the DC external power plug is connected. The EXT DC ON annunciator indicates external power is connected to the aircraft DC bus.

i. Security Keylock Switch. The aircraft has a security keylock switch (fig. 2-13) installed on the overhead control panel, placarded ON OFF. The switch is connected to the battery relay circuit and must be ON when energizing the battery master power switch. The key cannot be removed from the lock when in the ON position.

j. Circuit Breakers. The overhead circuit breaker panel (fig. 2-6) contains circuit breakers for most aircraft systems. The circuit breakers in the panel are grouped into areas which are placarded as to their general function. A DC power distribution panel is mounted beneath the aisleway, forward of the main spar. This panel contains higher current rated circuit breakers and is not accessible to the flight crew under normal conditions.

2-74. AC POWER SUPPLY.

a. Single Phase AC Power Supply. AC power for the aircraft is supplied by inverter units, numbered #1 and #2 (fig. 2-13) which obtain operational current from the DC power system. Both inverters are rated at 750 volt-amperes and provide single-phase output only. Each inverter provides 115 volts and 26 volts and 400 Hz AC output. The inverters are protected by circuit breakers mounted on the DC power distribution panel mounted beneath the floor. Controls and indicators of the AC power system are located in the overhead control panel and in the caution/advisory annunciator panel.

(1) AC Power WARNING/CAUTION Annunciators. Illumination of the two MASTER CAUTION annunciators, and the illumination of caution annunciator #1 INVERTER and/or #2 INVERTER indicates inverter failure.

(2) Instrument AC Annunciator. A red INST AC warning annunciator, will illuminate if all instrument AC buses should fail.

(3) Inverter Control Switches. Two switches, placarded 1 ⌀ INVERTER #1 and #2 on the overhead control panel (fig. 2-13), control the single-phase AC inverters.

b. Volt-Frequency Meters. The two digital volt-frequency meters (fig. 2-13) are mounted in the overhead control panel to provide continuous monitoring of voltage and frequency on each 115 VAC bus. Normal bus conditions will be indicated by a reading of 115 VAC and 400HZ on each meter.

c. Three Phase AC Power Supply. Three phase AC electrical power for operation of the inertial navigation system and mission avionics is supplied by two, DC powered, 3000 volt-ampere solid state three phase inverters.

(1) Three phase inverter control switches. The two, three-position switches, placarded #1 INV - RESET - ON - OFF and #2 INV RESET ON OFF, located in the mission control panel (fig. 4-1), control three phase inverter operation.

(2) Three phase volt/frequency meters. Two, digital, three phase volt/frequency meters mounted in the mission control panel (fig. 4-1), monitor and display the voltage and frequency outputs of the three phase inverters.

(3) Three phase loadmeters. Two, digital, three phase loadmeters mounted on the mission control panel (fig. 4-1), monitor inverter output level.

(4) Three phase AC off annunciator. The annunciator placarded 3 ⌀ AC OFF, located in the mission annunciator panel (fig. 4-1), indicates a problem with one of the three phase AC power busses.

(5) Three phase AC external power. See figure 2-32. External three phase AC power for operation of the inertial navigation system or mission equipment, can be applied to the aircraft through an external power receptacle located in the underside of the left wing stub just outboard of the engine nacelle. The receptacle is installed inside the wing structure, accessible through a hinged access panel. The AC electrical system is automatically isolated from the external power source if: the external power is over or under voltage, over or under frequency, or has an improper phase sequence.

(a) External AC power Annunciator. The annunciator placarded EXT AC PWR ON, located in the mission annunciator panel (fig. 4-1), indicates that external AC power is connected to the 3 phase busses. The EXTERNAL POWER annunciator in the advisory annunciator panel indicates that an AC GPU plug is mated to the AC external power receptacle.

(b) External AC power control switch. The switch placarded EXT PWR RESET ON OFF, located in the mission control panel (fig. 4-1), controls application of three phase AC power to the aircraft.

Section X. LIGHTING

2-75. EXTERIOR LIGHTING.

a. Description. Exterior lighting (fig. 2-30) consists of: a navigation light on the aft end of the aft portion of the vertical stabilizer; one standard navigation light on the outside of each wing tip pod; two strobe beacons, one on top of the horizontal stabilizer (directly above the vertical stabilizer) and one on the underside of the fuselage section; dual landing lights and a taxi light mounted on the nose gear assembly; a recognition light located in the outboard leading edge of each wing; two ice lights, one light flush mounted in each nacelle positioned to illuminate along the leading edge of each outboard wing; and emergency exit lights aft of the escape hatch and aft of the cabin door.

b. Navigation Lights. The navigation lights are protected by the 5-ampere circuit breaker placarded NAV on the overhead circuit breaker panel (fig. 2-6). Control of the lights is provided by the switch placarded NAV ON, located in the overhead control panel (fig. 2-13).

c. Strobe Beacons. The strobe beacons are dual intensity units. They are protected by the 15-ampere circuit breaker placarded BCN on the overhead circuit breaker panel (fig. 2-6). Control of the lights is provided by the switch located in the overhead control panel placarded BEACON DAY NIGHT (fig. 2-13). Placing the switch in the DAY position will activate the high intensity white section of the strobe lights for greater visibility during daylight operation. Placing the switch in the NIGHT position activates the lower intensity red portion of the strobe lights.

d. Recognition Lights. The recognition lights, which are normally used in the traffic pattern, are operated by the two-position switch placarded RECOG, located in the pilot's subpanel. The lights provide a very bright, steady illumination. They are protected by a 7. 5-ampere circuit breaker, located in the overhead circuit breaker panel.

e. Landing/Taxi Lights. Dual landing lights and a single taxi light are mounted on the nose gear assembly. The lights are controlled by the switches placarded LANDING and TAXI, located in the pilot's subpanel. The landing light circuit its protected by the 5-ampere circuit breaker placarded LANDING, located in the overhead circuit breaker panel (fig. 2-6). The taxi light circuit is protected by a 5-ampere circuit breaker placarded TAXI, located in the overhead circuit breaker panel (fig. 2-6). Landing/Taxi lights are automatically turned off when the landing gear is retracted. The landing lights and taxi light power circuits are protected by 35-ampere and 15-ampere circuit breakers, respectively, located in the DC power distribution panel, beneath the aisleway forward of the wing main spar.

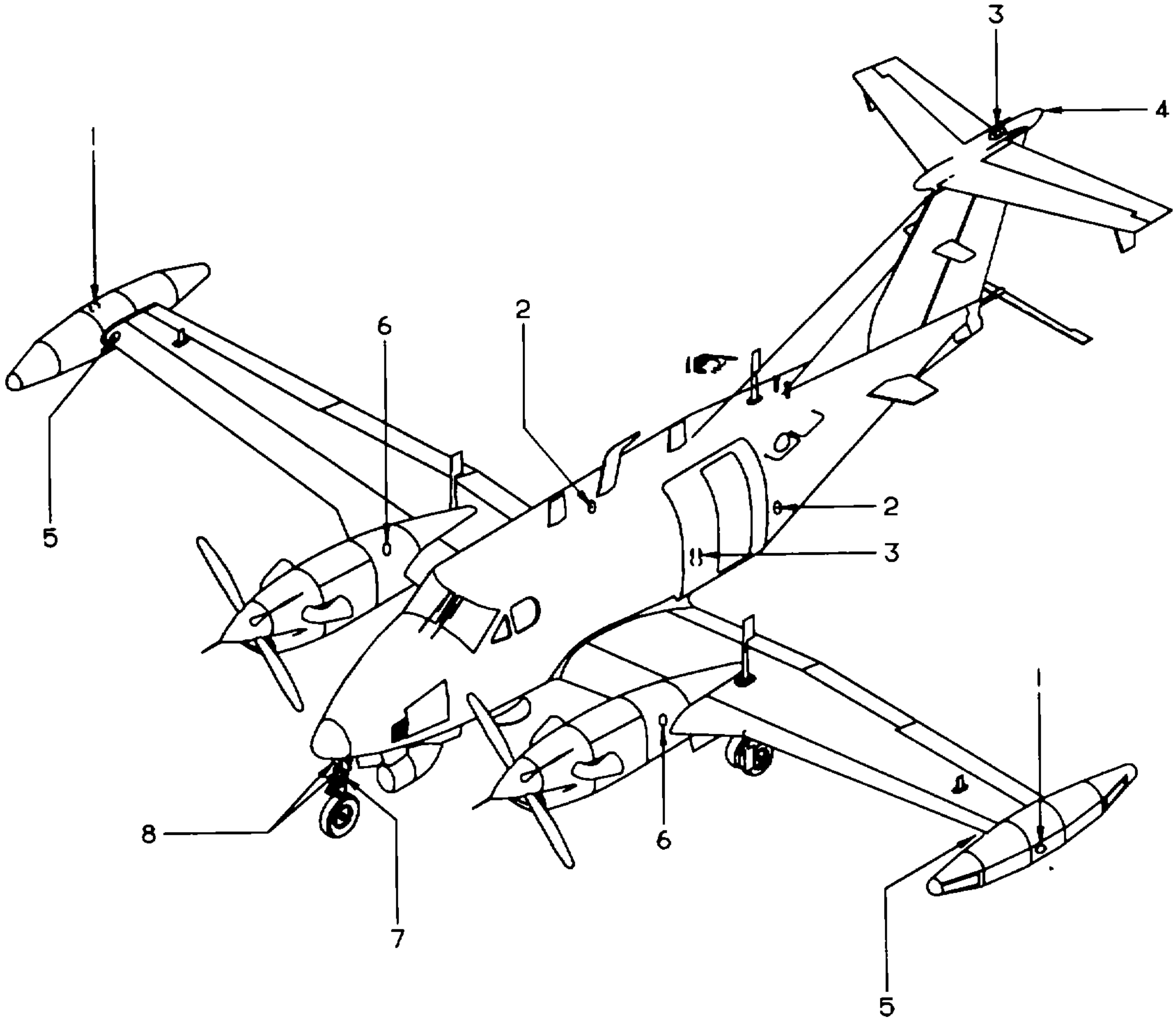
f. Ice Lights. The ice lights circuit is protected by the 5-ampere circuit breaker placarded ICE on the overhead circuit breaker panel (fig. 2-6). Control of the lights is provided by the switch placarded ICE ON on the overhead control panel (fig. 2-13).

2-76. INTERIOR LIGHTING.

Lighting systems are installed for use by the pilot and copilot. The lighting systems in the cockpit, are provided with intensity controls on the overhead control panel. The switch placarded MASTER ON, located in the overhead control panel in the COCKPIT LIGHTING section (fig. 2-13), provides overall control for all engine instrument lights, pilot and copilot instrument lights, overhead panel lights, and subpanel lights. The switch placarded IR FLOOD ON, located on the overhead control panel adjacent to the MASTER ON switch (fig. 2-13), provides overall control for instrument panel, glareshield, and pedestal extension/cockpit lights.

a. Cockpit Lighting.

(1) Utility lights. Two utility lights are located in the cockpit overhead to provide additional instrument panel IR lighting, as required. The lights are



1 Wing Navigation Light
2 Emergency Light
3 Strobe Beacon
4 Tail Navigation Light
5 Recognition Light
6 Ice Light
7 Taxi Light
8 Landing Lights

Figure 2-30. Exterior Lighting

protected by the 7. 5-ampere FLT INST circuit breaker, located in the overhead circuit breaker panel (fig. 2-6). Variable light intensity, for both lights, is provided through the INSTRUMENT PANEL rheostat, located in the IR FLOOD LIGHTS switch section, on the overhead control panel. Individual intensity control is provided by a switch placarded BRT DIM OFF, located in each utility light.

(2) Glareshield lights. Lights are mounted in the glareshield overhang along the top edge of the instrument panel, providing overall instrument panel IR illumination. The circuit is protected by the 5-ampere circuit breaker placarded INST INDIRECT on the overhead circuit breaker panel (fig. 2-6). Control is provided by the rheostat switch placarded GLARESHIELD on the overhead control panel, located in the IR FLOOD LIGHTS switch section (fig. 2-13). Turning the control clockwise from OFF, illuminates the lights and increases their brilliance.

(3) Flood light. A single overhead cockpit flood light is installed. This light provides overall IR illumination of the entire cockpit area. The circuit is protected by the 7.5-ampere circuit breaker placarded FLT INST, located in the overhead control panel. Control is provided by the rheostat/switch, placarded PED EXT/COCKPIT, located in the IR FLOOD LIGHTS switch section of the overhead control panel (fig. 2-13). Turning the control clockwise from OFF, illuminates the light and increases its brilliance.

(4) Flight instrument lights. Each individual flight instrument contains internal lamps for illumination. The circuit is protected by the 7.5-ampere circuit breaker placarded FLT INST on the overhead circuit breaker panel (fig. 2-6). Control is provided by the two rheostat switches placarded PILOT INSTRUMENTS and COPILOT INSTRUMENTS, located in the overhead control panel (fig. 2-13). Turning the control clockwise from OFF, illuminates the lights and increases their brilliance.

(5) Engine instrument lights. Each individual engine instrument contains internal lamps for illumination. The circuit is protected by the 7.5-ampere circuit breaker placarded FLT INST in the overhead circuit breaker panel (fig. 2-6). Control is provided by the rheostat switch placarded ENGINE INSTRUMENTS on the overhead control panel (fig. 2-13). Turning the control clockwise from OFF, illuminates the lights and increases their brilliance.

(6) Overhead panel lights. Lamps illuminating the overhead circuit breaker, control, and fuel management panels are protected by the 7.5-ampere circuit breaker, placarded OVHD in the overhead circuit breaker panel (fig. 2-6). Control is provided by the rheostat switch placarded OVERHEAD PANEL located in the overhead control panel (fig. 2-13). Turning the control clockwise from OFF, illuminates the lights and increases their brilliance.

(7) Subpanel and console lights. Lights on the pilot's and copilot's; subpanels, console edge lighted panels, mission control panel, and pedestal extension panels are protected by the 7.5-ampere circuit breaker, placarded SUBPNL & CONSOLE on the overhead circuit breaker panel (fig. 2-6). Control is provided by the two rheostat switches placarded SUBPANEL or CONSOLE in the overhead control panel (fig. 2-13). Turning the control(s) clockwise from OFF, illuminates the lights and increases their brilliance.

(8) Outside air temperature light. Two post lights are mounted adjacent to the outside air temperature gage on the left cockpit sidewall. The circuit is protected by the 7.5-ampere circuit breaker placarded FLT INST on the overhead circuit breaker panel (fig. 2-6). Control is provided by a pushbutton switch adjacent to the gage. Light intensity is not adjustable.

b. Cabin Lighting.

(1) Threshold and spar cover lights. A threshold light is installed just above floor level on the left side of the cabin, just inside the cabin door. A spar cover light is installed on the left side of the sunken aisle immediately aft of the main spar cover. Both circuits are protected by a 5-ampere circuit breaker located in the battery box, and are connected to the emergency battery bus. Both lights are controlled by the switch mounted adjacent to the threshold light. If the lights are illuminated, closing the cabin door will automatically extinguish them.

(2) Cabin aisle lights. Three cabin aisle lights are installed in the cabin aisle. Control is provided by the CABIN LIGHTS BRIGHT DIM OFF switch located in the pilot's subpanel.

(3) Cabin utility lights. A utility light is located adjacent to each overhead flood light in the cabin area. The utility lights are individually controlled by the rheostat/switch placarded OFF ON BRT located on the back of each light. A momentary

ON switch is located in the center of the rheostat. The light is capable of producing a red or white spotlight by adjusting a diaphragm, located in front of the light. To remove the light from the stationary position, pull down on the light. The light is connected to the light housing by an 11 inch coiled cord that extends to approximately 50 inches. Power for the utility lights is provided through the 5-ampere circuit breaker placarded CABIN LIGHTS, in the overhead circuit breaker panel.

(4) Cabin door latching mechanism light. An annunciator is provided to check the cabin door latching mechanism. It is controlled by a red pushbutton switch located adjacent to the round observation window, which is just above the second step.

2-77. EMERGENCY LIGHTING.

a. Description. An independent, battery operated, emergency lighting system is installed. The system is actuated automatically by shock, such as a forced landing. It provides adequate lighting inside and outside the fuselage to permit the occupants to read instruction placards and locate exits. An inertia switch, when subjected to a 2 G (minimum) shock, will illuminate: interior lights in the cockpit; forward and aft cabin areas; exterior lights aft of the emergency exit and aft of the cabin door. The battery power source is automatically recharged by the aircraft electrical system.

b. Operation. An emergency lights override switch, located in the overhead control panel (fig. 2-13), is provided to turn the system off if it is accidentally actuated. The switch is placarded EMERGENCY OFF - RESET - AUTO - TEST. Should the system accidentally actuate, the emergency lights will illuminate. Placing the switch in the momentary OFF/RESET position will extinguish the lights. To test the system, place the switch in the TEST position. The lights should illuminate. Moving the switch to the OFF/RESET position will turn the system off and reset it.

Section XI. FLIGHT INSTRUMENTS

2-78. PITOT AND STATIC SYSTEM.

a. Description. The pitot and static system (fig. 2-31) provides static pressure for: pilot and copilot's airspeed indicators, copilot altimeter, air data computer, pilot and copilot's vertical speed indicators: and ram air to the airspeed indicators and air data computer. This system consists of two pitot masts (one located on each side of the lower portion of the nose), static air pressure ports in the aircraft's exterior skin on each side of the aft fuselage, and associated system plumbing. The pitot mast is protected from ice formation by internal electric heating elements.

b. Alternate Static Air Source. An alternate static air line, which terminates just aft of the rear pressure bulkhead, provides a source of static air for the pilot's instruments, in the event of source failure from the pilot's static air line. A control on the pilot's subpanel placarded PILOTS STATIC AIR SOURCE, may be actuated to select either the NORMAL or ALTERNATE air source by a two position selector valve. The valve is secured in the NORMAL position by a spring clip.

2-79. TURN-AND-SLIP INDICATORS.

Turn-and-slip indicators are installed separately on the pilot and copilot sides of the instrument panel (fig. 2-14). These indicators are gyroscopically operated. The DC powered gyros are protected by the 5-ampere circuit breakers placarded TURN & SLIP PILOT or COPILOT, located in the overhead circuit breaker panel (fig. 2-6). The inclinometer portion of the turn and slip indicator operates independently of the DC circuit.

2-80. AIRSPEED INDICATORS.

Two, identical, independent, airspeed indicators are installed separately on the pilot and copilot sides of the instrument panel (fig. 2-14). These indicators require no electrical power for operation. The indicator dials are calibrated in knots from 40 to 300. A striped pointer automatically displays the maximum allowable airspeed at the aircraft's present altitude.

2-81. PILOT'S SERVOED ALTIMETER.

The pilot's altimeter is located in the upper left side of the instrument panel (fig. 2-14). It is a servoed unit, displaying aircraft altitude as provided by the air data computer (ADC). The barometric pressure is set manually with the BARO knob, located on the pilot's altimeter, and is displayed in units of inches of mercury and millibars, on the baro counters. Once the BARO knob is manually adjusted, the barometric pressure is inputted to the air data computer. The ADC is supplied outside air temperature, receiving

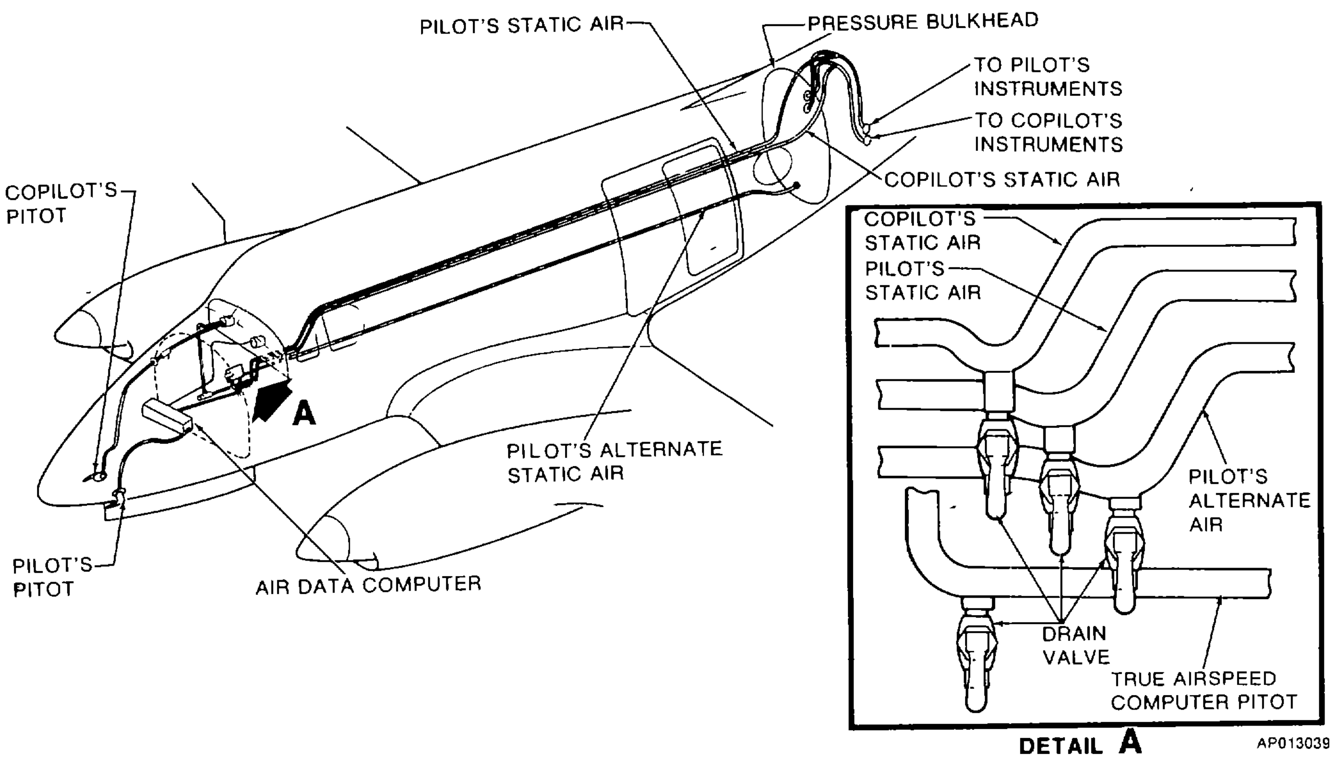


Figure 2-31. Pitot and Static System

pressure inputs from the pilot's pitot and static air sources, from which aircraft altitude above sea level is computed. The computed altitude is simultaneously routed to: the transponder (for encoded transmission to ground stations) and the pilot's altimeter.

The servoed altimeter displays altitude by a 10,000 foot counter, a 1000 foot counter, and a single needle pointer which indicates hundreds of feet on a circular scale in 20 foot increments. Below an altitude of 10,000 feet, a diagonal warning symbol will appear on the 10,000 foot counter. The barometric pressure adjustment knob allows ground supplied pressure values to be adjusted and displayed in inches Hg or millibars. If AC power to the altimeter is lost, a warning flag will appear in the upper center portion of the instrument face to indicate power loss, unreliable altimeter readings, and possible failure of encoder transmissions to ground stations.

2-82. COPILOT'S ENCODING ALTIMETER.

The copilot's altimeter (figure 2-14) is an internally lighted, pneumatic instrument, capable of providing altitude readouts from minus 1,000 to 50,000 feet. Altitude is displayed on the instrument face by 10,000, 1,000, and 100 feet counter drums and a single needle pointer which indicates hundreds of feet in 20 feet increments. A barometric pressure-setting knob is provided to simultaneously adjust the baro counters in inches of mercury (Hg.), and millibars (Mb.). Below an altitude of 10,000 feet, a crosshatch diagonal symbol will appear in the 10,000 foot counter. If the barometric pressure results in an altitude less than sea level, the word NEG (indicating negative altitude) will appear on the 10,000 foot counter. If AC power is lost, a warning flag will appear in the upper center portion of the instrument face to indicate possible failure of encoder transmissions to ground stations.

2-83. VERTICAL SPEED INDICATORS.

Vertical speed indicators are installed separately on the pilot and copilot sides of the instrument panel (fig. 2-14). They indicate the speed at which the aircraft ascends or descends based on changes in atmospheric pressure. The indicator is a direct reading pressure instrument requiring no electrical power for operation.

2-84. ACCELEROMETER.

An internally lighted accelerometer, located in the instrument panel, registers and records positive and negative G loads imposed on the aircraft. One hand moves in the direction of the G load being applied while the other two (one for positive G loads and one for negative g loads), follow the indicating pointer to its maximum travel. The recording pointers remain

Table 2-6. Warning Annunciator Panel Legend

WARNING ANNUNCIATOR		
NOMENCLATURE	COLOR	CAUSE FOR ILLUMINATION
#1 FUEL PRESS	RED	Fuel pressure failure on left side
L BL AIR FAIL	RED	Left bleed air warning line has melted or failed, indicating possible loss of No 1 engine bleed air
ALT WARN	RED	Cabin altitude exceeds 12,500 feet
INST AC	RED	No AC power to engine instruments
R BL AIR FAIL	RED	Right bleed air warning line has melted or failed, indicating possible loss of No 2 engine bleed air
#2 FUEL PRESS	RED	Fuel pressure failure on right side
#1 CHIP DET	RED	Contamination of No 1 engine oil detected
#1 OIL PRESS	RED	Oil pressure failure on left side
A/P DISC	RED	Autopilot has disengaged
#2 OIL PRESS	RED	Oil pressure failure on right side
#2 CHIP DET	RED	Contamination of No 2 engine oil detected

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Table 2-7. Caution/Advisory Annunciator Panel Legend (Sheet 1 of 2)

CAUTION/ADVISORY ANNUNCIATOR		
NOMENCLATURE	COLOR	CAUSE FOR ILLUMINATION
#1 DC GEN	Yellow	No 1 engine generator off the line
#1 INVERTER	Yellow	No 1 inverter inoperative
#1 NO FUEL XFR	Yellow	Auxiliary fuel tank on side of No 1 engine not transferring fuel into nacelle tank
#2 NO FUEL XFR	Yellow	Auxiliary fuel tank on side of No 2 engine not transferring fuel into nacelle tank
#2 INVERTER	Yellow	No 2 inverter inoperative
#2 DC GEN	Yellow	No 2 engine generator off the line
#1 EXTGH DISCH	Yellow	No 1 engine fire extinguisher discharged
#1 NAC LOW	Yellow	No 1 engine has 30 minutes fuel remaining at sea level, normal cruise power consumption rate
CABIN DOOR	Yellow	Cabin/cargo door open or not secure
ELEC TRIM OFF	Green	Electric trim energized by a trim disconnect switch on the control wheel with the system power switch on the pedestal turned on
#2 NAC LOW	Yellow	No 2 engine has 30 minutes fuel remaining at sea level, normal cruise power consumption rate
#2 EXTGH DISCH	Yellow	No 2 engine fire extinguisher discharged

Table 2-7. Caution/Advisory Annunciator Panel Legend (Sheet 2 of 2)

CAUTION/ADVISORY ANNUNCIATOR		
NOMENCLATURE	COLOR	CAUSE FOR ILLUMINATION
#1 VANE FAIL	Yellow	No 1 engine ice vane malfunction Ice vane has not attained proper position
#1 LIP HEAT	Yellow	Failure of No 1 lip heat valve to conform to selected position or in transit
REV NOT READY	Yellow	Propeller levers are not in the high RPM, low pitch position, with the landing gear extended
DUCT OVERTEMP	Yellow	Excessive bleed air temperature in environmental heat ducts
#2 LIP HEAT	Yellow	Failure of No 2 lip heat valve to conform to selected position or in transit
#2 VANE FAIL	Yellow	No 2 engine ice vane malfunction Ice vane has not attained proper position
HYD FLUID LOW	Yellow	Fluid level in power pack is low
INS	Yellow	Inertial navigation system's cooling fan is off or an INS malfunction that illuminates the WARN annunciator on the CDU
IFF	Yellow	Transponder fails to reply to a valid mode 4 interrogation
BATTERY CHARGE	Yellow	Excessive charge rate on battery
BAT FEED FLT	Yellow	Ground fault detected in battery external power line
PROP SYNC ON	Yellow	Synchrophaser turned on with landing gear extended
FUEL CROSSFEED	Green	Crossfeed valve open
#1 LIP HEAT ON	Green	No 1 engine air scoop heat switch is on
#1 PROP PITCH	Yellow	No 1 propeller is below the flight idle stop
#2 PROP PITCH	Yellow	No 2 propeller is below the flight idle stop
#2 LIP HEAT ON	Green	No 2 engine air scoop heat switch is on
A/C COLD OPN	Green	Air conditioner is operating in cold mode, or ambient temperatures require switching to cold mode if air conditioner operation is to be continued
#1 VANE EXTEND	Green	No 1 ice vane extended
#1 IGN ON	Green	No 1 engine ignition/start switch on, No 1 engine autoignition switch armed and engine torque below 20 percent
L BL AIR OFF	Green	Left environmental bleed air valve closed
R BL AIR OFF	Green	Right environmental bleed air valve closed
#2 IGN ON	Green	No 2 engine ignition/start switch on, No 2 engine autoignition switch armed and engine torque below 20 percent
#2 VANE EXTEND	Green	No 2 ice vane extended
#1 AUTOFEATHER	Green	No 1 engine autofeather armed with power levers advanced above 89% N_1
AIR COND N_1 LOW	Green	No 2 engine RPM too low for air conditioning load
EXTERNAL POWER	Green	External power connector plugged in
EXT DC ON	Green	External DC power is on
BRAKE DEICE ON	Green	Brake deice system activated
#2 AUTOFEATHER	Green	No 2 engine autofeather armed with power levers advanced above 89% N_1

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Table 2-8. Mission Control Panel Annunciator Legend

MISSION ANNUNCIATOR		
NOMENCLATURE	COLOR	CAUSE FOR ILLUMINATION
MSN OVERTEMP	Yellow	Mission equipment is overheating
CRYPTO ALERT	Yellow	Mission gear encrypted
PWR SPLY FAULT	Yellow	Mission power out of tolerance
CALL	Yellow	Receiving transmission on VOW
3 PHASE AC OFF	Yellow	Three phase AC power fault
CABIN OVERTEMP	Yellow	Cabin area containing mission equipment is overheating
MISSION POWER	Yellow	Mission power is off
LINK MODE	Yellow	WBDL fault in link or contact
RADOME HOT	Yellow	Radome heat is too high
LINK SYNC	Yellow	WBDL has synchronization fault
SPCL EQPT OVRD	Yellow	Mission power switch is in override
DIPLEXER PRESS	Yellow	Diplexer has lost pressurization
TWTA STANDBY	Yellow	WBDL is in standby mode
ANT MALF	Yellow	Boom antenna is out of position
NO INS UPDATE	Yellow	INS update is not in process
TDOA OVERTEMP	Yellow	TDOA equipment is overheating
LB PS OVERTEMP	Yellow	LB PS equipment is overheating
TDOA FAULT	Yellow	TDOA system has fault
LB PS FAULT	Yellow	LB PS has fault
ELINT FAULT	Yellow	ELINT system has fault
ANT STOWED	Green	Boom antenna is in horizontal position
ANT OPERATE	Green	Boom antenna is in vertical position
RADOME HEAT	Green	Radome heat system is at operating temperature
MISSION AC ON	Green	Mission AC power is on
INS UPDATE	Green	INS update in process
TDOA PWR ON	Green	TDOA power is on
MISSION DC ON	Green	Mission DC power is on
WAVE GUIDE	Green	Wave guide is pressurized
EXT AC PWR ON	Green	External AC power is on

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at the respective maximum travel positions of the G's being applied, providing a record of maximum G loads encountered. Depressing the push-to-reset knob at the lower left corner of the instrument allows the recording pointers to return to the normal position.

2-85. FREE AIR TEMPERATURE (FAT) GAGE.

The free air temperature gage, mounted outboard of the pilot's seat (fig. 2-7), indicates the outside air temperature in degrees celsius.

WARNING

Inaccurate indications on the standby magnetic compass will occur while windshield heat and/or air conditioning is being used.

2-86. STANDBY MAGNETIC COMPASS.

The standby magnetic compass, located in the overhead control panel, is used in the event of failure of the compass system, and for instrument cross check. Readings should be taken only during level flight since errors may be introduced by turning or acceleration. A compass correction chart, indicating deviation factors, is located in the magnetic compass.

2-87. MISCELLANEOUS INSTRUMENTS.

a. Annunciator Panels. Three annunciator panels are installed. One is a warning panel with red fault annunciators, and the others are caution/advisory panels with amber and green annunciators. The warning panel is mounted near the center of the instrument panel, below the glareshield (fig. 2-14). One caution/advisory panel is located in the center subpanel (fig. 2-5). The mission annunciator/ advisory panel is located in the copilot's sidewall. Some flight operations involve indications from the mission control panel (fig. 4-1). Illumination of a red warning annunciator signifies the existence of a hazardous condition requiring immediate corrective action. An amber caution annunciator signifies a condition other than hazardous requiring pilot attention. A green advisory annunciator indicates a functional situation. Tables 2-6, 2-7, and 2-8 provides a list of causes for illumination of the individual annunciators. In frontal view, the panels present rows of small opaque rectangular annunciators. Word printing on the respective indicator identifies the monitored function, situation, or fault condition, but cannot be read until the annunciator is illuminated. Blank annunciators (no word printing) are a non-functioning annunciator. The bulbs of all annunciator panels are tested by activating the ANNUNCIATOR TEST switch, located in the copilot's subpanel near the caution/advisory panel. The system is protected by the 5-ampere circuit breakers placarded ANN PWR and ANN IND in the overhead circuit breaker panel (fig. 2-6). The annunciator system annunciators are dimmed when the MASTER light switch is ON and the pilot's flight instrument lights are illuminated. The annunciators are automatically reset to maximum brightness if:

(1) The main aircraft power (both DC generators) is OFF.

(2) The INSTRUMENT PANEL light switch is rotated clockwise.

(3) The MASTER light switch is off.

(4) The MASTER light switch is ON and the PILOT INSTRUMENTS LIGHT switch is OFF.

(5) Master warning annunciator (red). Two MASTER WARNING annunciators, one located in each side of the glareshield (fig. 2-14), are provided to alert the crew of a hazardous condition. Any time a warning annunciator illuminates, the MASTER WARNING annunciator will illuminate, and will stay illuminated until the MASTER WARNING annunciator is reset. If a new condition occurs, the annunciator will be reactivated, and the applicable annunciator panel annunciator(s) will illuminate.

(6) Master caution annunciator (amber). Two, MASTER CAUTION annunciators, one located in each side of the: glareshield, adjacent to the MASTER WARNING annunciator (fig. 2-14), are provided to alert the crew of a situation, other than hazardous, requiring the crews attention. Whenever a caution annunciator illuminates, the MASTER CAUTION annunciator will illuminate, and stay illuminated until the MASTER CAUTION annunciator is reset. If a new condition occurs, the annunciator will be reactivated and the appropriate annunciator(s) will illuminate.

b. Clocks.

(1) Description. A digital quartz chronometer is mounted in the center of both the control wheels (fig. 2-20). Each quartz chronometer is a five-function, clock/timer that is controlled by three push-button switches, located directly below the six-digit, liquid crystal display.

(2) Operation. The MODE button is pressed to select the desired mode of operation. The mode annunciator is displayed above the mode identifiers, and advances to indicate each of the following modes:

- LC - Local Time
- ZU - Zulu or Greenwich Mean Time
- FT - Trip or Flight Timer
- ET - Elapsed Time
- DC - Downcounter with Alarm

(3) Local Time Mode (LC). Press the MODE button to advance the annunciator to LC. To set the hour, press the RST button once, then press and hold the ADV button until the correct hour is displayed.

To set minutes, press the RST button again, then press and hold the ADV button until the correct minute is displayed. Press the SET button once to display and hold the selected time. Press the ST SP button to resume clock operation and/or synchronize the display with a selected time standard.

(4) Zulu or Greenwich Mean Time Mode (ZU). Press the MODE button to advance the annunciator to ZU and set time as for local time shown above. Minutes and seconds do not need to be reset if local time is correctly set. Press the RST button to display minutes/seconds, then press again to activate the complete display.

When changing time zones, the hour may be changed as above. It is not necessary to change the minutes/seconds. Press the RST button twice to return to the full time display.

(5) Trip/Flight Timer Mode (FT). Press the MODE button to advance the annunciator to FT. Press the ST SP button and verify that the display shows zero. The timer will activate at takeoff and stop at touchdown. To prevent an accidental reset of flight time, the clock cannot be manually reset during flight.

(6) Elapsed Time Mode (ET). Press the MODE button to advance the annunciator to ET. Press the RST button to set the time display to zero. Press the ST-SP button one time. To stop the counting, press the ST SP button a second time. Ending time will be displayed until the RST button is pressed to clear the display. The clock may be used in other modes and the elapsed time display will remain until cleared by pressing the RST button. If the timer is counting when the RST button is pressed, the display will reset to zero and the count will begin again from zero.

(7) Downcounter Mode (DC). Press the MODE button to advance the annunciator to DC. Press the SET button twice to reset the hour display to zero. Press and hold the ADV button until the desired hour is displayed. Press the SET button, again, to reset the minute display to zero. Press and hold the ADV button until the desired minute is displayed. Press the SET button, again, to reset the seconds display to zero. Press and hold the ADV button until the desired second is displayed. Press the SET button, again, to arm the counter. Press the ST SP button to begin countdown. When the countdown reaches zero, the display will flash for approximately one minute and then reset. The countdown may also be reset at any time by pressing the ST SP button.

Section XII. SERVICING, PARKING AND MOORING

2-88. GENERAL.

The following paragraphs include the procedures necessary to service the aircraft except lubrication. The lubrication requirements of the aircraft are covered in the aircraft maintenance manual. Tables 2-9, 2-10, 2-11 and 2-12 are used for identification of fuel, oil, etc. used to service the aircraft. The servicing instructions provide procedures and precautions necessary to service the aircraft.

2-89. FUEL HANDLING PRECAUTIONS.

Table 2-2, Fuel Quantity Data, lists the quantity and capacity of fuel tanks in the aircraft. Service the fuel tanks after each flight to keep moisture out of the tanks and to keep the bladder type cells from drying out. Observe the following precautions: WARNING

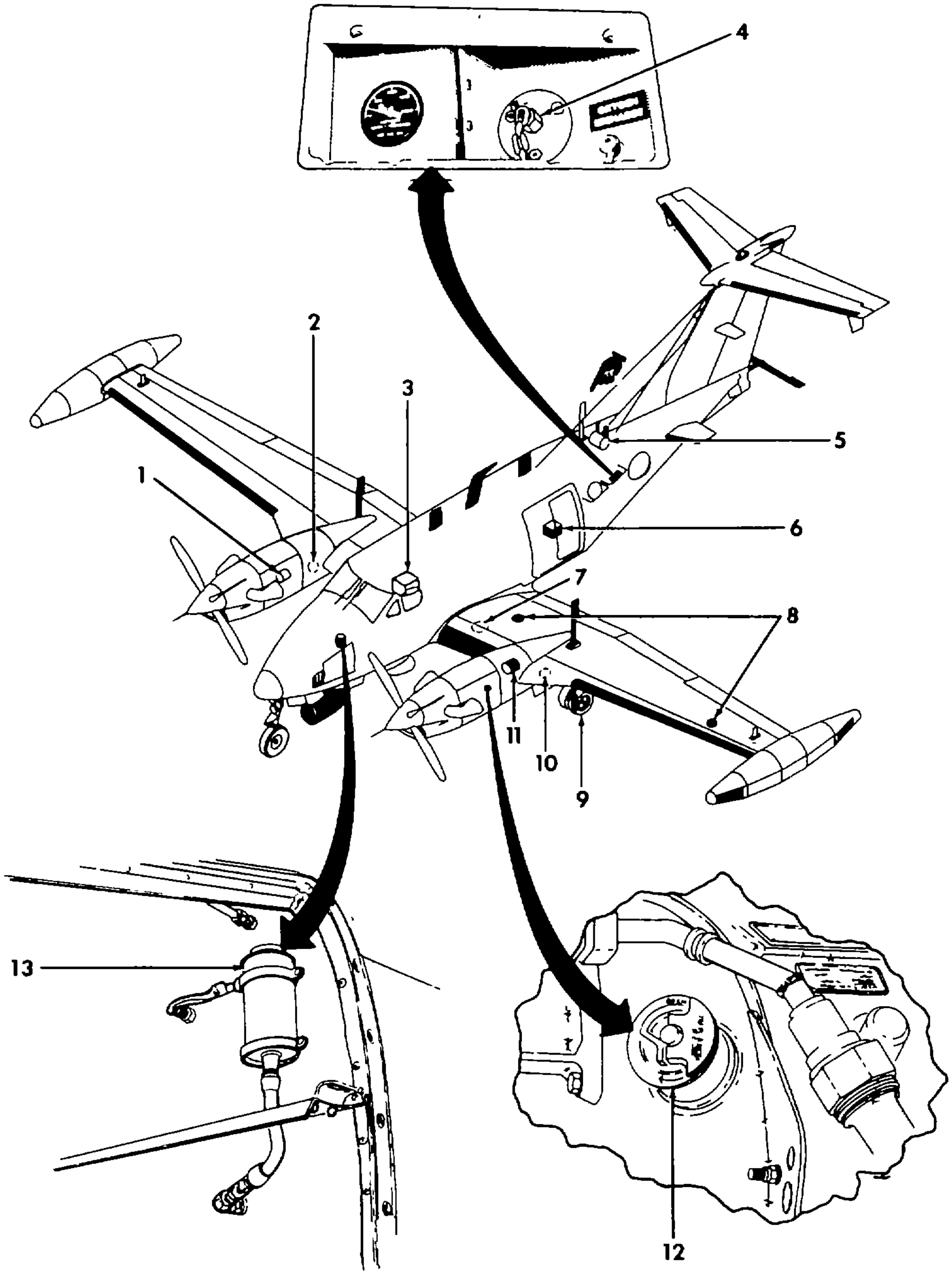
WARNING

During warm weather, open fuel caps slowly to prevent being sprayed with fuel.

Care should be taken to prevent cuts or abrasions while inspecting the exhaust or turbine area of engines that have been operated on aviation gasoline. The exhaust deposits can cause lead poisoning.

CAUTION

Proper procedures for handling aircraft fuels cannot be over stressed. Clean, fresh fuel shall be used and the entrance of water into the fuel storage or aircraft fuel system must be kept to a minimum.



1 Air conditioning compressor
2 DC external power receptacle
3 Battery 24 VDC
4 Oxygen system filler
5 Oxygen cylinders 2 (70 cu ft bottles)
6 Chemical toilet
7 Landing gear hydraulic reservoir
8 Fuel filler caps (typical left and right)
9 Landing gear tires (typical left, right and nose gear)
10 AC external power receptacle
11 Engine fire extinguisher (typical left and right)
12 Engine oil filler cap (typical left and right)
13 Wheel brake fluid reservoir

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Figure 2-32. Servicing Locations

Table 2-9. Approved Military Fuels, Oil, Fluids and Unit Capacities

SYSTEM	SPECIFICATION	CAPACITY
Fuel	MIL-T-5624 (JP-4 and JP-5)	540 U.S. Gals. Useable
Engine Oil	MIL-L-23699	10 U.S. Quarts per engine
Hydraulic Brake System	MIL-H-5606	1 U.S. Pint
Oxygen System	MIL-0-27210	140 Cubic Feet
Toilet Chemical	Monogram DG-19	3 Ounces

Table 2-10. Approved Fuels

SOURCE	PRIMARY OR STANDARD FUEL	ALTERNATE FUEL	
US MILITARY FUEL NATO Code No.	JP4 (MIL-T-5624) NATO F-40 (Wide Cut Type)	JP-5 (MIL-T-5624) NATO F-44 (High Flash Type)	JP-8 (MIL-T-83) NATO F-34
COMMERCIAL FUEL	JET B	JET A	JET A-1
(ASTM-D-1655)	American JP-4	American Type A	
American Oil Co.	American JP-4	American Type A	
Atlantic Richfield	Arcojet B	Arcojet A	Arcojet 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 Kerosene	Jet A-1	Kerosene
Chevron	Chevron B	Chevron A-50	Chevron A-1
Texaco	Texaco Avjet B	Avjet B	Avjet A-1
Union Oil 140,130,234	Union JP-4	76 Turbine Fuel	
Foreign Fuel	NATO F-40	NATO F-44	
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/UTL9130-010	
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	JP4 MIL-T-5624		
United Kingdom (Britain)	D. Eng RD 2498	D. Eng RD 2454	

NOTE

Anti-icing and Biocidal Additive for Commercial Turbine Engine Fuel The fuel system icing inhibitor shall conform to MIL-L-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-L-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.

Table 2-11. Standard, Alternate, and Emergency Fuels

ENGINE	ARMY STANDARD FUEL	ALTERNATE TYPE	EMERGENCY FUEL	
			TYPE	MAX.HOURS ‘
PT6A	MIL-T-5624 Grade JP-4	MIL-T-5624 Grade JP-5 MIL-T-83 Grade JP-8	MIL-G-5572 Any AV Gas	150

* Maximum operating hours with indicated fuel between engine overhauls (TBC)).

CAUTION

When conditions permit, the aircraft shall be positioned so that the wind will carry the fuel vapors away from all possible sources of ignition. The fueling vehicle shall be positioned to maintain a minimum distance of 10 feet from any part of the aircraft, while maintaining a minimum distance of 20 feet between the fueling vehicle and the fuel filler point.

a. Shut off unnecessary electrical equipment in the aircraft, including radar and radar equipment. The master switch may be left on, to monitor fuel quantity gages, but shall not be moved during the fueling operation. Do not allow operation of any electrical tools, such as drills or buffers, in or near the aircraft during fueling.

b. Keep fuel servicing nozzles free of snow, water, and mud at all times.

c. Carefully remove snow, water, and ice from the aircraft fuel filler cap area before removing the filler cap (fig. 2-32). Remove only one aircraft tank filler cap at any one time, and replace each one immediately after the servicing operation is completed.

d. Wipe all frost from fuel filler necks before servicing the aircraft.

e. Drain water from fuel tanks, filter cases, and pumps prior to first flight of the day. Preheat, when required, to ensure free fuel drainage.

f. Avoid dragging the fueling hose where it can damage the soft, flexible surface of the deice boots.

g. Observe NO SMOKING precautions.

h. Prior to transferring the fuel, ensure that the hose is grounded to the aircraft.

i. Wash off spilled fuel immediately.

j. Handle the fuel hose and nozzle cautiously to avoid damaging the wing skin.

k. Do not conduct fueling operations within 100 feet of energized airborne radar equipment or within 300 feet of energized ground radar equipment installations.

l. Wear only nonsparking shoes near aircraft or fueling equipment, as shoes with nailed soles or metal heel plates can be a source of sparks.

WARNING

Prior to removing the fuel tank filler cap, the hose nozzle static ground wire shall be attached to the grounding sockets located adjacent to the filler opening.

2-90. FILLING FUEL TANKS.

Fill tanks as follows:

a. Attach bonding cables to aircraft.

b. Attach bonding cable from hose nozzle to ground socket adjacent to fuel tank being filled.

CAIJTION

Do not insert fuel nozzle completely into fuel cell due to possible damage to bottom of fuel cell. Nozzle should be supported and inserted straight down to prevent damage to the anti-siphon valve.

c. Remove fuel tank: filler cap and fill main tank before filling the corresponding auxiliary tanks.

d. Secure applicable fuel tank filler cap. Make sure latch tab on cap is pointed aft.

e. Disconnect bonding cables from aircraft.

2-91. DRAINING MOISTURE FROM FUEL SYSTEM.

Twelve (12) fuel drains are installed (plus two drains for the ferry fuel system, when installed) to remove sediment from the fuel system.

2-92. FUEL TYPES.

Approved fuel types are as follows:

a. Army Standard Fuels. Army standard fuel is JP-4.

b. Alternate Fuels, Army Alternate fuels are JP-5 and JP-8.

c. Emergency Fuel. Avgas is an emergency fuel and subject to 150 hour time limit.

2-93. USE OF FUELS.

Fuel is used as follows:

a. Fuel limitations. Fuel limitations are outlined in Chapter 5. 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. The use of any fuels other than standard will be entered 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.

b. Use of Kerosene Fuels. 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. Kerosene fuels having a freezing point of -40° C (-40° F), limit the maximum altitude of a mission to 28,000 feet under standard day conditions.

c. Mixing of Fuels in Aircraft Tanks. 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.

d. Fuel Specifications. Fuels having the same NATO code number are interchangeable. Jet fuels conforming to ASTM D-1655 specification 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 refueling 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-I fuels. Most commercial turbine engines will operate satisfactorily on either kerosene or JP-4 type fuel. 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.

2-94. SERVICING OIL SYSTEM.

An integral oil tank occupies the cavity formed between the accessory gearbox housing and the compressor inlet case on the engine. The tank has a calibrated oil dipstick and an oil drain plug. Avoid spilling oil. Any oil spilled must be removed immediately. Use a cloth moistened in solvent to remove oil. Overfilling may cause a discharge of oil through the accessory gearbox breather, during engine operation until, a satisfactory level is reached. Service oil system as follows:

1. Open the access door on the upper cowling to gain access to the oil filler cap and dipstick.

CAUTION

A cold oil check is unreliable. If possible, check oil within 10 minutes after engine shutdown. If over 10 minutes have elapsed, motor the engine for 40 seconds, then check. If over 10 hours have elapsed, start the engine and run for 2 minutes, then check. Add oil as required. Do not overfill.

2. If oil level is over 2 quarts low, motor or run engine as required, and service as necessary.
3. Remove oil filler cap.
4 Insert a clean funnel, with a screen incorporated, into the filler neck.
5. Replenish with oil to within 1 quart below MAX mark or the MAX COLD on dipstick

(cold engine). Fill to MAX or MAX HOT (hot engine).

6. Check oil filler cap for damaged preformed packing, general condition and locking.

CAUTION

Ensure that oil filler cap is correctly installed and securely locked to prevent loss of oil and possible engine failure.

7. Install and secure oil filler cap.
8. Check for any oil leaks.

2-95. SERVICING THE HYDRAULIC SYSTEM.

a. Servicing Hydraulic Brake System Reservoir.

1. Gain access to brake hydraulic system reservoir.
2. Remove brake reservoir cap and fill reservoir to washer on dipstick with hydraulic fluid.
3. Install brake reservoir cap.

b. Servicing Hydraulic Landing Gear System. Servicing the hydraulic landing gear extension/ retraction system consists of maintaining the correct fluid level and maintaining the correct accumulator precharge. The accumulator is located in the reservoir access area and is charged to 800 ± 50 PSI using bottled nitrogen. A charging gage is mounted on the accumulator. A reservoir, located just inboard of the left nacelle and forward of the main spar, has a lid with a dipstick attached marked FLUID TEMP 0° F, 50° F, 100° F. Add MIL-H-5606 hydraulic fluid (consumable materials list) as required to fill the system, corrected for temperature.

2-96. INFLATING TIRES.

Inflate tires as follows:

1. Inflate nose wheel tires to a pressure between 55 and 60 PSI.
2. Inflate main wheel tires to a pressure between 73 and 77 PSI.

2-97. SERVICING THE CHEMICAL TOILET.

The toilet should be seviced during routine ground maintenance of the aircraft following every usage.

The waste storage container should be removed, emptied, its disposable plastic liner replaced, and the container replaced in the toilet cabinet. Toilet paper, waste container plastic liners, and dry chemical deodorant packets should also be resupplied within the toilet cabinet as needed.

2-98. SERVICING THE AIR CONDITIONING SYSTEM.

Servicing the air conditioning system consists of checking and maintaining the correct refrigerant level, compressor oil level, belt tension and condition, system leak detection, and replacement of the evaporator air filters. It is imperative that maintenance of the air conditioning system, except for filter replacement, be accomplished only by qualified refrigerant system technicians.

2-99. ANTI-ICING, DEICING AND DEFROSTING TREATMENT.

NOTE

Do not apply anti-icing, deicing, and defrosting fluid to exposed aircraft surfaces if snow is expected. Melting snow will dilute the defrosting fluid and form a slush mixture which will freeze in place and become difficult to remove.

The aircraft is protected in subfreezing weather by spraying the surfaces (to be covered with protective covers) with defrosting fluid. Spraying defrosting fluid on aircraft surfaces before installing protective covers will permit protective covers to be removed with a minimum of sticking. To prevent freezing rain and snow from blowing under protective covers and diluting the fluid, ensure that protective covers are fitted tightly. As a deicing measure, keep exposed aircraft surface wet with fluid for protection against frost.

Use undiluted anti-icing, deicing, and defrosting fluid (MIL-A-8243) to treat aircraft surfaces for protection against freezing rain and frost. Spray aircraft surface sufficiently to wet area, but without excessive drainage. A fine spray is recommended to prevent waste. Use diluted, hot fluid to remove ice accumulations.

a. Remove frost or ice accumulations from aircraft surfaces by spraying with diluted anti-icing, deicing, and defrosting fluid mixed in accordance with Table 2-12.

Table 2-12. Recommended Fluid Dilution Chart

AMBIENT TEMPERATURE (°F)	PERCENT DEFROSTING FLUID BY VOLUME	PERCENT WATER BY VOLUME	FREEZING POINT OF MIXTURE (°F) APPROXIMATE)
30° and above	20	80	10°
20°	30	70	0°
10°	40	60	-15°
0°	45	55	-25°
-10°	50	50	-35°
-20°	55	45	-45°
-30°	60	40	-55°

NOTES:
1. Use anti-icing and deicing fluid (MIL-A-8243) or commercial fluids.
2. Heat Mixture to a temperature of 82° to 93° C (180° to 200° F).

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b. Spray diluted, hot fluid in a solid stream (not over 15 gallons per minute). Thoroughly saturate aircraft surface and remove loose ice. Keep a sufficient quantity of diluted, hot fluid on aircraft surface coated with ice, to prevent liquid layer from freezing. Diluted, hot fluid should be sprayed at a high pressure, but not exceeding 300 PSI.

c. When facilities for heating are not available and it is deemed necessary to remove ice accumulations from aircraft surfaces, undiluted defrosting fluid may be used. Spray undiluted defrosting fluid at 15 minute intervals to assure complete coverage. Removal of ice accumulations using undiluted defrosting fluid is expensive and slow.

d. If tires are frozen to ground, use undiluted defrosting fluid to melt ice around tire. Move aircraft as soon as tires are free.

2-100. APPLICATION OF EXTERNAL POWER.

CAUTION

Before connecting the power cables from the external power source to the aircraft, ensure that the GPU is not touching the aircraft at any point. Due to the voltage drop in the cables, the two ground systems will be of different potentials. Should they come in contact while the GPU is operating, arcing could occur. Turn off all external power while connecting the power cable to, or removing it from, the external power supply receptacle. Be certain that polarity of the external power source is the same as that of the aircraft before it is connected. Minimum GPU requirements are as follows: 400-amperes, 28V continuous output DC and 11 5V, 3 phase, 400 cycle, 3 KVA continuous output AC.

An external power source is often needed to supply the electric current required to properly ground service the aircraft electrical equipment and to facilitate starting the aircraft's engines. An external DC power receptacle is installed on the underside of the right wing stub, just outboard of the engine nacelle. An external AC power receptacle is installed on the underside of the left wing stub, just outboard of the engine nacelle.

2-101. SERVICING OXYGEN SYSTEM.

The oxygen system furnishes breathing oxygen to the pilot, copilot and first aid position. Oxygen cylinder location is shown in figure 2-22.

a. Oxygen System Safety Precautions.

WARNING

Keep fire and heat away from oxygen equipment. Do not smoke while working with or near oxygen equipment, and take care not to generate sparks with carelessly handled tools when working on the oxygen system.

(1) Keep oxygen regulators, cylinders, gages, valves, fittings, masks, and all other components of the oxygen system free of oil, grease, gasoline, and all other readily combustible substances. The utmost care shall be exercised in servicing, handling, and inspecting the oxygen system.

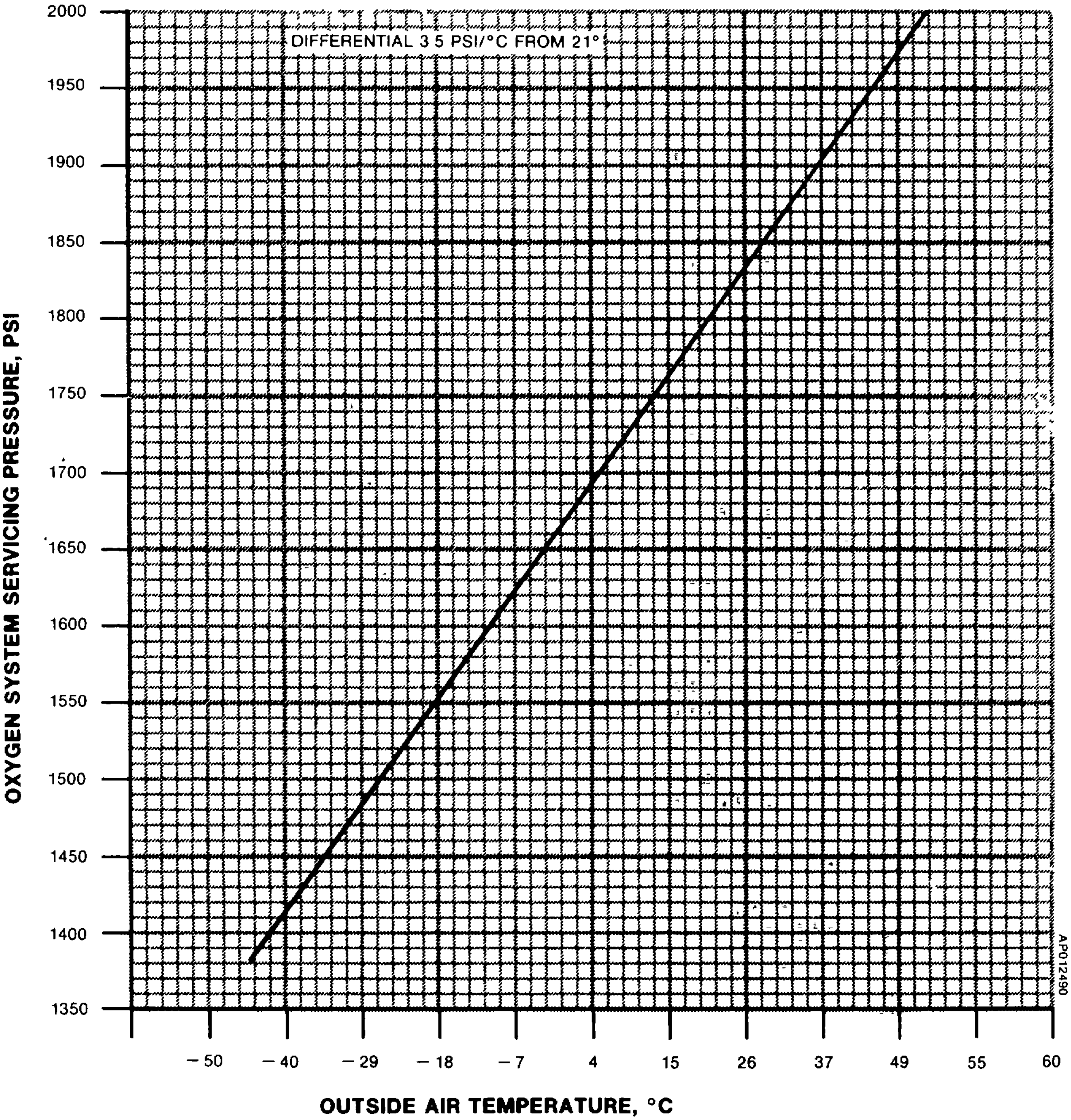


Figure 2-33. Oxygen System Servicing Pressure

(2) Do not allow foreign matter to enter oxygen lines.

(3) Never allow electrical equipment to come in contact with the oxygen cylinder.

(4) Never use oxygen from a cylinder without first reducing its pressure through a-regulator.

b. Replenishing Oxygen System.

(1) Remove oxygen access door on outside of aircraft (fig. 2-22).

(2) Remove protective cap on oxygen system filler valve.

(3) Attach oxygen hose from oxygen servicing unit to filler valve.

WARNING

If the oxygen system pressure is below 200 PSI, do not attempt to service system. Make an entry on DA Form 2408-13.

(4) Ensure that supply cylinder shutoff valves on the aircraft are open.

(5) Slowly adjust the valve position so that pressure increases at a rate not to exceed 200 PSIG per minute.

(6) Close pressure regulating valve on oxygen servicing unit when pressure gage on oxygen system indicates the pressure obtained using the Oxygen System Servicing Pressure Chart (fig. 2-33).

NOTE

To compensate for loss of aircraft cylinder pressure as the oxygen cools to ambient temperature after recharging, the cylinder should be charged initially to approximately 10% over prescribed pressure. Experience will determine what initial pressure should be used to compensate for the subsequent pressure loss upon cooling. A complete recharge will create substantial heating.

The final stabilized cylinder pressure should be adjusted for ambient temperature per figure 2-33.

(7) Disconnect oxygen hose from oxygen servicing unit and filler valve.

(8) Install protective cap on oxygen filler valve.

(9) Install oxygen access door.

2-102. GROUND HANDLING.

Ground handling covers all the essential information concerning movement and handling of the aircraft while on the ground. The following paragraphs give, in detail, the instructions and precautions necessary to accomplish ground handling functions. Parking, covers, ground handling and towing equipment are shown in figure 2-34.

a. General Ground Handling Procedure. Accidents resulting in injury to personnel and damage to equipment can be avoided or minimized by close observance of existing safety standard and recognized ground handling procedures. Carelessness or insufficient knowledge of the aircraft or equipment being handled can be fatal. The applicable technical manuals and pertinent directives should be studied for familiarization with the aircraft, its components, and the ground handling procedures applicable to it, before attempting to accomplish ground handling.

b. Ground Handling Safety Practices. Aircraft equipped with turboprop engines require additional maintenance safety practices. The following list of safety practices should be observed at all times to prevent possible injury to personnel and/or damaged or destroyed aircraft:

(1) Keep intake air ducts free of loose articles such as rags, tools, etc.

(2) Stay clear of exhaust outlet areas.

(3) During ground runup, ensure the brakes are firmly set.

(4) Keep area fore and aft of propellers clear of maintenance equipment.

(5) Do not operate engines with flight control surfaces in the locked position.

(6) Do not attempt towing or taxiing of the aircraft with flight control surfaces in the locked position.

(7) When high winds are present, do not

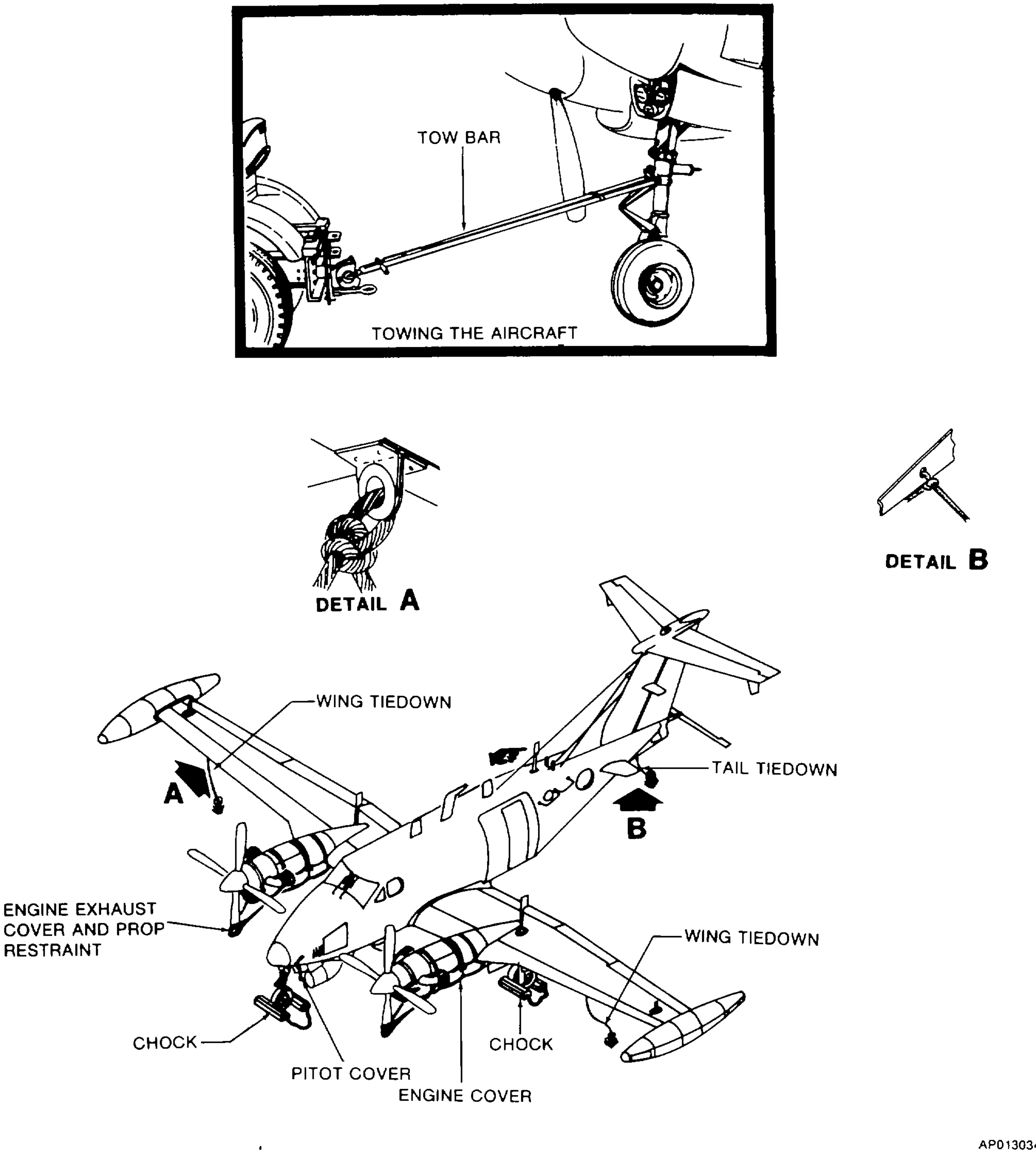


Figure 2-34. Parking, Covers, Ground Handling, and Towing Equipment

unlock the control surfaces until prepared to properly operate them.

(8) Do not operate engines while towing equipment is attached to the aircraft, or while the aircraft is tied down.

(9) Check the nose wheel position. Unless it is in the centered position, avoid operating the engines at high power settings.

(10) Hold control surfaces in the neutral position when the engines are being operated at high power settings.

(11) When moving the aircraft, do not push on propeller deicing boots. Damage to the heating elements may result.

c. Moving Aircraft on Ground. Aircraft on the ground shall be moved in accordance with the following:

(1) Taxiing. Taxiing shall be in accordance with chapter 8.

CAUTION

When the aircraft is being towed, a qualified person must be in the pilot's seat to maintain control by use of the brakes. When towing, do not exceed nose gear turn limits (fig. 2-35). Avoid short radius turns, and always keep the inside or pivot wheel turning during the operation. Do not tow aircraft with rudder locks installed, as severe damage to the nose steering linkage can result. When moving the aircraft backwards, do not apply the brakes abruptly. Tow the aircraft slowly, avoiding sudden stops, especially over snowy, icy, rough, soggy, or muddy terrain. In arctic climates, the aircraft must be towed by the main gears, as an immense breakaway load, resulting from ice, frozen tires, and stiffened grease in the wheel bearings may damage the nose gear. Do not tow or taxi aircraft with deflated shock struts.

(2) Towing. Towing lugs are provided on the upper torque knee fitting of the nose strut. When it is necessary to tow the aircraft with a vehicle, use the vehicle tow bar. Never exceed the turn limit arrows displayed on the placard located on the nose gear assembly (fig. 2-35). In the event towing lines are necessary, use towing lugs on the main landing gear. Use towing lines long enough to clear nose and/or tail by at least 15 feet. This length is required to prevent the aircraft from overrunning the towing vehicle or fouling the nose gear.

d. Ground Handling Under Extreme Weather Conditions. Extreme weather conditions necessitate particular care in ground handling of the aircraft. In hot, dry, sandy, desert conditions, special attention must be devoted to finding a firmly packed parking and towing area. If such areas are not available, steel mats or an equivalent solid base must be provided for these purposes. In wet, swampy areas, care must be taken to avoid bogging down the aircraft. Under cold, icy, arctic conditions, additional mooring is required, and added precautions must be taken to avoid skidding during towing operations.

2-103. PARKING.

Parking is defined as the normal condition under which the aircraft will be secured while on the ground. This condition may vary from the temporary expedient of setting the parking brake and chocking the wheels to the more elaborate mooring procedures described under Mooring. The proper steps for securing the aircraft must be based on the time the aircraft will be left unattended, the aircraft weights, the expected wind direction and velocity, and the anticipated availability of ground and air crews for mooring and/or evacuation. When practical head the aircraft into the wind, especially if strong winds are forecast or if it will be necessary to leave the aircraft overnight. Set the parking brake and chock the wheels securely. Following engine shutdown, position and engage the control locks.

NOTE

Cowlings and loose equipment will be suitably secured at all times when left in an unattended condition.

a. The parking brake system for the aircraft incorporates two lever-type valves, one for each wheel brake. Both valves are closed simultaneously by pulling out the parking brake handle. Operate the parking brake as follows:

1. Depress both brakes.
2. Pull parking brake handle out. This will cause the parking brake valves to lock the hydraulic fluid under pressure in the parking brake system, thereby retaining braking action.

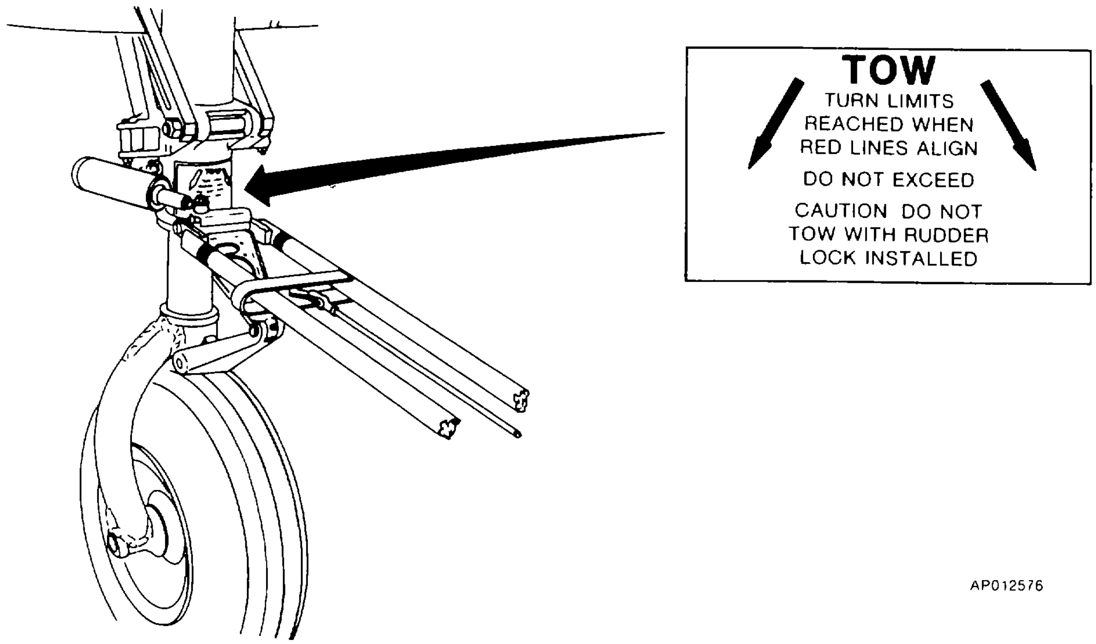


Figure 2-35. Towing, Turn Limits

3. Release brake pedals.

CAUTION

Do not set parking brakes when the brakes are hot, during freezing ambient temperatures. Allow brakes to cool before setting parking brakes.

4. To release the parking brakes push in on the parking brake handle.

b. The control lock (fig. 2-21) holds the engine and propeller control levers in a secure position. The elevator, rudder, and ailerons are secured in a neutral position. Install the control locks as follows:

1. With engine and propeller control levers in secure position, slide lock around the aligned control levers.
2. Install elevator and aileron lockpin through the pilot's control column to lock control wheel.
3. Install rudder lock pin through floor mounted door, forward of pilot's seat, making sure rudder is in neutral position.
4. Reverse steps I through 3 above to remove control lock. Store control lock.

2-104. INSTALLATION OF PROTECTIVE COVERS.

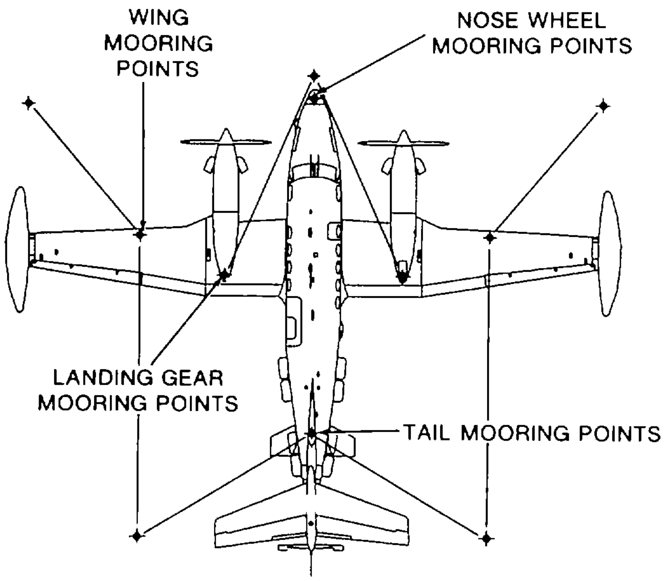
The crew will ensure that the aircraft protective covers are installed when leaving the aircraft.

2-105. MOORING.

The aircraft is moored to ensure its immovability, protection, and security under various weather conditions. The following paragraphs give, in detail, the instructions for proper mooring of the aircraft.

a. Mooring Provisions. Mooring points (fig. 2-36) are provided beneath the wings and tail. Additional mooring cables may be attached to each landing gear. General mooring equipment and procedures necessary to moor the aircraft, in addition to the following, are given in TM 55-1500-204-25/1.

(1) Use mooring cables of 1/4 inch diameter aircraft cable and clamp (clip-wire rope), chain or rope (3/4 inch diameter or larger). Length of the cable or rope will be dependent upon existing circumstances. Allow sufficient slack in ropes, chains, or cable to compensate for tightening action due to



NOTE

IF STRONG WINDS ARE ANTICIPATED OR AIRCRAFT IS TO BE LEFT UNATTENDED, PROPELLER RESTRAINT, PITOT MAST, AND INTAKE COVERS MUST BE INSTALLED, AND THE FLIGHT CONTROLS LOCK ENGAGED

THE USE OF DOUBLE OR SINGLE MOORING POINTS FOR NOSE AND/OR WING TIEDOWNS IS DETERMINED BY LOCAL OPTION DEPENDING ON TYPE AND AVAILABILITY OF AIRCRAFT SECURING EQUIPMENT

USE ROPE ONLY (NYLON TYPE IF AVAILABLE) FOR NOSE TIEDOWN (DETAIL A) ATTACH ROPE(S) TO AIRCRAFT AND GROUND MOORING POINTS IN A MANNER THAT WILL PREVENT ROPE DAMAGE TO AIRCRAFT COMPONENTS

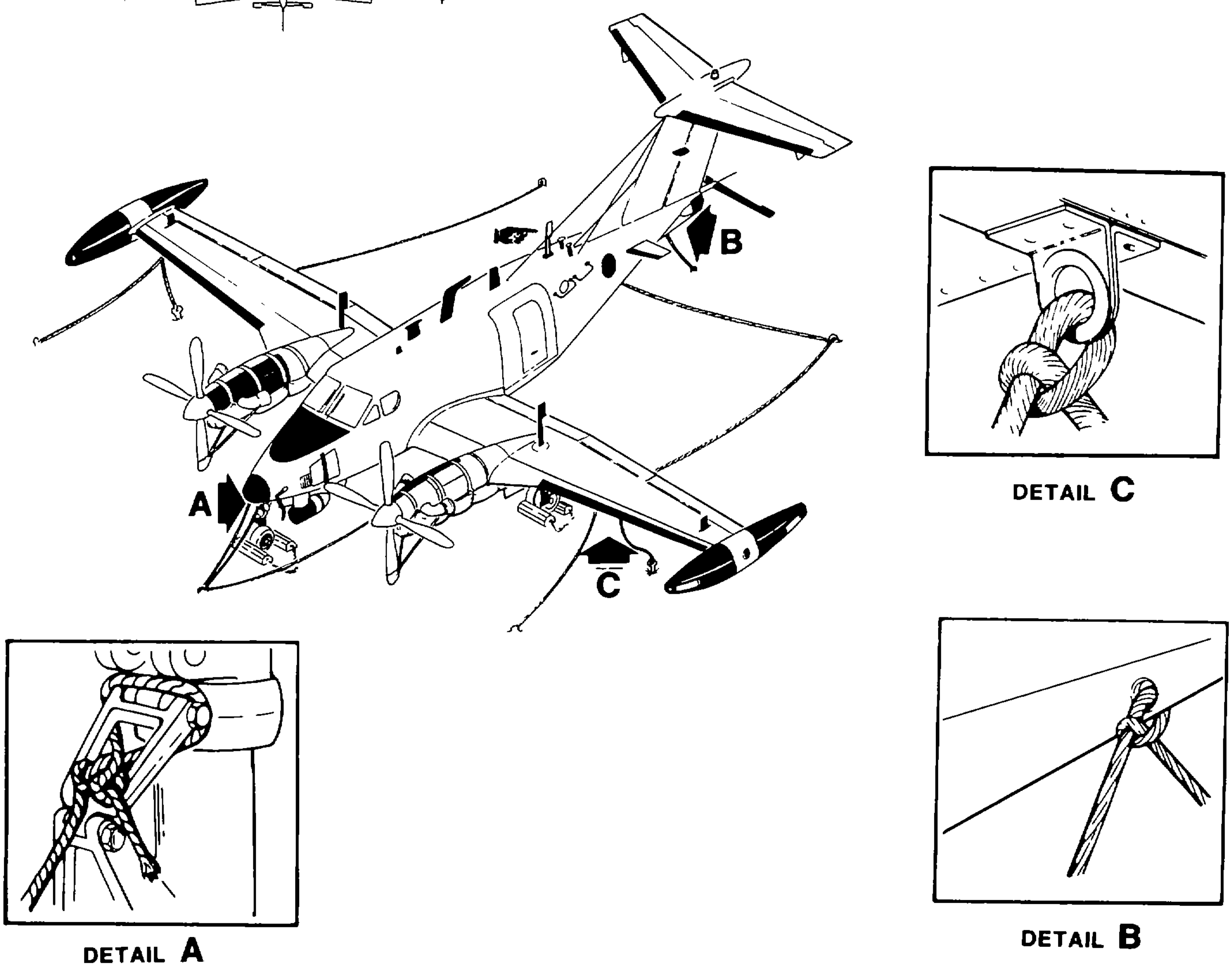


Figure 2-36. Mooring the Aircraft

moisture absorption of rope or thermal contraction of cable or chain. Do not use slip knots. Use bowline knots to secure aircraft to mooring stakes.

(2) Chock the wheels.

b. Mooring Procedures for High Winds. Structural damage can occur from high velocity winds; therefore, if at all possible, the aircraft should be moved to a safe weather area when winds above 75 knots are expected. Moored aircraft condition is shown in figure 2-36. If aircraft must be secured, use the following steps:

1. After aircraft is properly located, place nose wheel in centered position. Point the aircraft into the wind, or as nearly so as is possible within limits determined by locations of fixed mooring rings. When necessary, a 45 degree variation of direction is considered to be satisfactory. Locate each aircraft at slightly more than one wing span distance from all other aircraft. Position nose mooring point approximately 3 to 5 feet downwind from ground mooring anchors.

2. Deflate nose wheel shock strut to within 3/4 inch of its fully deflated position.

3. Fill all fuel tanks to capacity, if time permits.

4. Place wheel chocks fore and aft of main gear wheels and nose wheel. Tie each pair of chocks together with rope or join together with wooden cleats nailed to chocks on either side of wheels. Tie ice grip chocks together with rope. Use sandbags in lieu of chocks when aircraft is moored on steel mats. Set parking brake as applicable.

5. Tie aircraft down by utilizing mooring points shown in figure 2-36. Make tiedown with 1/4 inch aircraft cable using two wire rope clips, or bolts and a chain tested for a 3000 pound pull. Attach tiedowns so as to remove all slack. Use a 3/4-inch or larger manila rope if cable or chain tiedown is not available. If rope is used for tiedown, use anti-slip knots (such as bowline knot) rather than slip knots. In the event tiedown rings are not available on hard surfaced areas, move aircraft to an area where portable tiedowns can be used. Locate anchor rods at point shown in figure 2-36. When anchor kits are not available, use metal stakes or deadman type anchors, providing they can successfully sustain a minimum pull of 3000 pounds.

6. In event nose position tiedown is considered to be of doubtful security due to existing soil condition, drive additional anchor rods at nose tiedown position. Place padded work stand or other suitable support under the aft fuselage tiedown position and secure.

7. Place control surfaces in locked position and trim tab controls in neutral position. Place wing flaps in up position.

8. The requirements for dust excluders, protective covers, and taping of openings will be left to the discretion of the responsible maintenance officer or the pilot of the transient aircraft (fig. 2-34).

9. Secure propellers to prevent windmilling (fig. 2-34).

10. Disconnect battery.

11. During typhoon or hurricane wind conditions, mooring, security can be further increased by placing sandbags along the wings to break up the aerodynamic flow of air over the wing, thereby reducing the lift being applied against the mooring by the wind. The storm appears to pass two times, each time with a different wind direction. This will necessitate turning the aircraft after the first passing.

12. After high winds, inspect aircraft for visible signs of structural damage and for evidence of damage from flying objects. Service nose shock strut and reconnect battery.

CHAPTER 3
AVIONICS

Section I. GENERAL

3-1. INTRODUCTION.

Except for mission avionics, this chapter covers all avionics equipment installed in the RC-12K aircraft. It provides a brief description of the equipment, the technical characteristics and locations. It covers systems, controls, and provides the proper techniques and procedures to be employed when operating the equipment. For more detailed operational information consult the vendor manuals that accompany the aircraft loose tools.

3-2. AVIONICS EQUIPMENT CONFIGURATION.

The aircraft avionics covered, consists of three groups of electronic equipment. The communication group consists of the interphone, UHF command, BU VOW, VHF FM, VHF command and HF command systems. The navigation group provides the pilot and copilot with the instrumentation required to establish and maintain an accurate flight course and position, and to make an approach on instruments under Instrument Meteorological Conditions (IMC). The navigation group includes equipment for determining altitude, attitude, position, destination, range and bearing, heading reference, groundspeed, and drift angle. The transponder and radar group includes an identification, position, emergency tracking system, a radar system to locate potentially dangerous weather areas, and a radar system to differentiate between friendly and unfriendly search radar.

NOTE

All avionics equipment require a 3-minute warmup period. The weather radar has an automatic time delay of 3 to 4 minutes.

3-3. POWER SOURCE.

a. DC Power. DC power for the avionics equipment is provided by four sources: the aircraft battery, left and right generators, and external power. Power is routed through two 50-ampere circuit breakers to the avionics power relay which is controlled by the AVIONICS MASTER POWER switch in the overhead control panel (fig. 2-13). Individual system circuit breakers and the associated avionics busses are shown in figure 2-6. With the switch in the ON (forward) position, the avionics power relay is de-energized and power is applied through both the AVIONICS MASTER POWER No. 1 and No. 2 circuit breakers to the individual avionics circuit breakers in the overhead circuit breaker panel (fig. 2-6). In the OFF (aft) position, the relay is energized and power is removed from the avionics equipment.

NOTE

If the AVIONICS MASTER POWER switch fails to operate, power to the individual avionics circuit breakers can be provided by pulling the 5-ampere circuit breaker, placarded AVIONICS MASTER CONTR, located in the overhead circuit breaker panel (fig. 2-6).

When external power is applied to the aircraft, the avionics power relay is normally energized, removing power from the avionics equipment. To apply external power to the avionics equipment, move the AVIONICS MASTER POWER switch to the EXT PWR position. This will de-energize the avionics power relay and allow power to be applied to the avionics equipment.

b. Single-Phase AC Power. AC power for the avionics equipment is provided by two inverters. The inverters supply 115-volt and 26-volt singlephase AC power when operated by the INVERTER No. 1 or No. 2 switches (fig. 2-13). Either inverter is capable of powering all avionics equipment requiring AC power. AC power from the inverters is routed through fuses located in the nose avionics compartment.

c. Three-Phase AC Power. Three phase AC electrical power for operation of the inertial navigation system and mission avionics is supplied by two DC powered, 3000 volt-ampere, solid state, three phase inverters. The three phase inverters are controlled by two three-position switches located in the mission control panel (fig. 4-1) placarded No. 1 INV OFF ON RESET and No. 2 INV OFF ON RESET.

Section II. COMMUNICATIONS

3-4. DESCRIPTION.

The communications equipment group consists of an interphone system connected to individual audio control panels for the pilot and copilot which interface with VHF, UHF, BU VOW, VHF FM and HF communication units.

3-5. MICROPHONES, SWITCHES AND JACKS.

Boom and oxygen mask microphones can be utilized in the aircraft.

a. Microphone Switches. The pilot and copilot are provided with individual microphone control switches, placarded INTPH-XMIT-MIC, attached to their respective control wheels. A foot-actuated microphone switch is also positioned in the floorboards forward of each pilot's seat.

b. Controls and Functions.

(1) Microphone control wheel switches (fig. 2-20). Keys selected facility.

(a) INTPH (depressed to first detent). Keys interphone facility, disregards position of transmitter selector switch.

(b) XMIT (depressed full down). Keys facility selected by transmitter select switch.

(2) Floorboard transmit switches. Keys facility selected by transmitter select switch.

(a) Held depressed. Keys facility selected by transmitter select switch.

(b) Released. Unkeys selected transmitter.

c. Microphone jack selector switches. Two switches, placarded MIC HEADSET OXYGEN MASK, are located in the extreme left and extreme right of the instrument panel (fig. 2-14). These switches provide a means of selecting whether the headset microphone jack or the oxygen mask microphone jack is connected to the audio system.

d. Controls and Functions.

(1) MIC HEADSET OXYGEN MASK switch. Selects microphone jack 'to connect to audio system.

(a) MIC HEADSET. Connects headset microphone to audio system.

(b) OXYGEN MASK. Connects microphone in oxygen mask to audio system.

3-6. AUDIO CONTROL PANELS.

a. Description. Separate, but identical audio control panels (fig. 3-1), serve the pilot and copilot. The controls and switches of each panel provide the user with a means of selecting desired reception and transmission sources, and also a means to control the volume of audio signals received for interphone, communication and navigation systems. The user selects between the UHF, VHF, BU VOW, VHF FM and HF transceivers. The audio control panels are protected by respective 2-ampere AUDIO PILOT and AUDIO COPILOT circuit breakers located in the overhead circuit breaker panel (fig. 2-6).

b. Controls and Functions.

(1) Master VOL control. Controls sidetone volume to headset. Also serves as final volume adjustment for received audio from any source before admission to headset.

(2) Radios audio monitor controls. Each is a combination rotary control, on-off push-pull switch permitting both receiver selection and volume adjustment.

(a) No. 1. Connects user's headset to audio from VHF-AM #1 transceiver No. 1.

(b) No. 2. Connects user's headset to audio from the FM/AM #2 transceivers.

(c) No. 3. Connects user's headset to audio from UHF transceiver.

(d) No. 4. Connects user's headset to audio from HF/VOW transceivers.

(e) No. 5. Connects user's headset to audio from BU VOW transceiver.

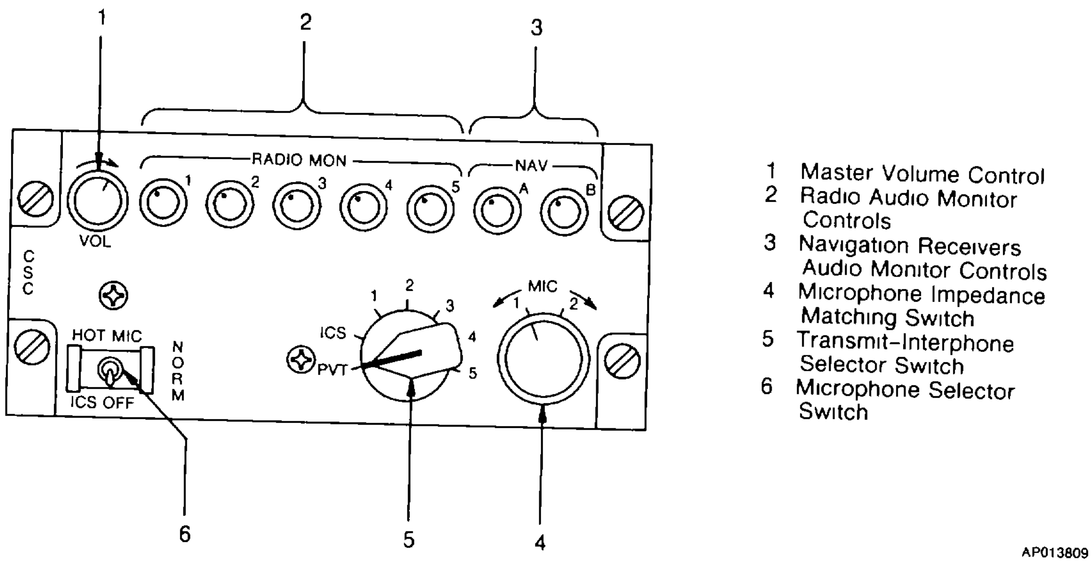


Figure 3-1. Audio Control panel (Typical Pilot, Copilot) (499-0099)

(3) NAV receiver audio monitor controls. Combination volume control and on-off switch for NAV receivers.

(a) NA V-A. Connects user's headset to audio from VOR-1, VOR-2 or marker beacon set in use.

(b) NAV-B. Connects user's headset to audio from TACAN or ADF set in use.

(4) Microphone impedence select switch. The microphone impedence select switch uses a two position rotary switch, which enables selection of an interface circuit with the best impedence match to the microphone in use.

(a) The impedance of MIC 1 position is 5 Ohms.

(b) The impedance of MIC 2 position is 150 Ohms.

(5) Transmitter-interphone selector switch. Connects microphone and headset to selected radio transmitter or interphone line, routing received audio to headset. Bypasses control of respective receiver audio switch.

(a) PVT. Position not used.

(b) ICS. Activates pilot-to-copilot intercom.

(c) No. 1. Permits transmission and audio reception from VHF-AM #1 transceiver.

(d) No. 2. Permits transmission and audio reception from FM/AM #2 transceivers.

(e) No. 3. Permits transmission and audio reception from UHF transceiver.

(f) No. 4. Permits transmission and audio reception from HF/VOW transceivers.

(g) No. 5. Permits transmission and audio reception from BU VOW transceiver.

(6) ICS select switch. Controls activation of microphones.

(a) HOT MIC. Admits speech to interphone system without need to key microphone switch.

(b) NORM. Blocks speech from interphone system unless microphone switch is keyed.

(c) ICS OFF. Deactivates interphone system.

c. Normal Operation.

(1) Turn-on procedure: Both audio control panels are activated when electrical power is applied to aircraft.

NOTE

It is presumed the AVIONICS MASTER POWER switch is ON, and that normally used avionics circuit breakers remain set. The circuit breakers of routinely used avionic systems are normally left set.

(2) Receiver operating procedure:

1. Master volume control Adjust as required for interphone audio level.
2. Receiver audio switches ON and adjusted as required.

NOTE

Audio select switches and volume controls are routinely left in positions of normal use.

3. Move each receiver audio switch on then off, separately, to verify audio presence in headphones for each system. Adjust volume as desired.

(3) Transmitter operating procedure:

1. Transmitter-interphone selector switch Set for transceiver desired.
2. Microphone jack selector switch (fig. 2-14) As desired.
3. Control wheel microphone switch Depress to XMIT position; or depress floorboard transmit switch to transmit.
4. Microphone switch Depress to transmit.

(4) Intercommunication procedure:

1. Transmitter-interphone selector switch ICS.
2. Microphone jack selector switch (fig. 2-14) As desired.
3. ICS select switch (fig. 3-1) As desired.
4. If HOT MIC is selected Speak directly into microphone.
5. If NORM microphone is selected Depress microphone switch and speak into microphone.
6. If ICS OFFE is selected intercom function is switched off.

d. Emergency Operation. Not applicable.

e. Shutdown Procedure.

1. AVIONICS MASTER POWER switch OFF.
2. Leave controls, and circuit breakers positioned for normal operation.

3-7. UHF COMMAND SET (AN/ARC-164).

a. Description. The IJHF command set is a line-of-sight radio transceiver which provides transmission and reception of amplitude modulated (AM) signals in the ultra high frequency range of 225. 000 to 399. 975 MHz for a distance range of approximately 50 miles. Channel selection is spaced at 0. 025 MHz. A separate receiver is incorporated to provide monitoring capability for the UHF guard frequency (243. 0 MHz). UHF audio output is applied to the audio panel where it is routed to the headsets.

NOTE

The PRESET channel selector and manual frequency selectors are inoperative when the mode selector is set to GUARD position. The receiver-transmitter will be set to the emergency frequency only.

Existing capabilities of the HAVE QUICK modified radio are preserved to the maximum extent possible when it is operated in the normal (non-hopping) mode. No new procedures are required for normal radio operation.

To operate in the AJ mode, the radio must first be initialized. This initialization requires the setting of two control entries into the radio, Word-of-Day (WOD) and Time-of-Day (TOD). The WOD defines the choice of frequency hopping pattern for the day. The WOD choice is a mnanagerial function and the same WOD may be used for one or more days. The TOD must be loaded into the clock contained within the radio.

The transmitter and receiver sections of the UHF unit operate independently, but share the same power supply and frequency control circuits. Separate cables route transmit and receive signals to their respective receiver/transmitter.

The UHF command set is protected by the 7 1/2ampere UHF circuit breaker in the overhead circuit breaker panel (fig. 2-6). Figure 3-2 illustrates the UHF command set. The associated blade type antenna is shown in figure 2-1.

b. Controls and Functions. UHF control panel (fig. 3-2):

(1) Manual frequency selector/indicator (hundreds). Selects and indicates hundreds digit of frequency (2 or 3) in MHz.

(2) Manual frequency selector/indicator (tens). Selects and indicates tens digit of frequency (O through 9) in MHz.

(3) Manual frequency selector/indicator (units). Selects and indicates units digit of frequency (O through 9) in MHz.

(4) Preset channel indicator. Displays preset channel.

(5) Manual frequency selector/indicator (tenths). Selects and indicates tenths digit of frequency (O through 9) in MHz.

(6) Preset channel selector. Selects one of 20 preset channel frequencies.

(7) Manual frequency selector (hundredths and thousandths). Selects hundredths and thousandths digits of frequency (00, 25, 50, or 75) in MHz.

(8) Mode selector. Selects operating mode and method of frequency selection.

(a) MANUAL. Enables the manual selection of any one of 7,000 frequencies.

(b) PRESET. Enables selection of any one of 20 preset channels.

(c) GUARD. Selection automatically tunes the main receiver and transmitter to the guard frequency and the guard receiver is enabled.

(9) SQUELCH switch. Turns main receiver squelch on or off.

(10) VOL control. Adjusts volume.

(11) TONE pushbutton. When pressed, transmits a 1,020 Hz tone on the selected frequency.

(12) Function selector. Selects operating function.

(a) OFF. Turns set off.

(b) MAIN. Selects normal transmission with reception on main receiver.

(c) BOTH. Selects normal transmission with reception on both the main receiver and the guard frequency receiver.

(d) ADF. Not used.

c. Normal Operation.

(1) Turn on procedure:

NOTE

It is presumed aircraft power is on and normally used avionic circuit breakers remain depressed.

1. Avionics master power switch ON.
2. Function select switch MAIN or BOTH position, as required.

NOTE

If function selector is at MAIN setting, only the normal UHF communications will be received. If selector is at BOTH position, emergency communications on the guard channel and normal UHF communications will both be received.

(2) Receiver operating procedure:

1. Transmitter-interphone selector switch No. 3 position.
2. UHF audio monitor switch ON, No. 3 position.
3. Volume control Mid position.

(3) To use preset frequency:

1. Mode selector switch PRESET position.

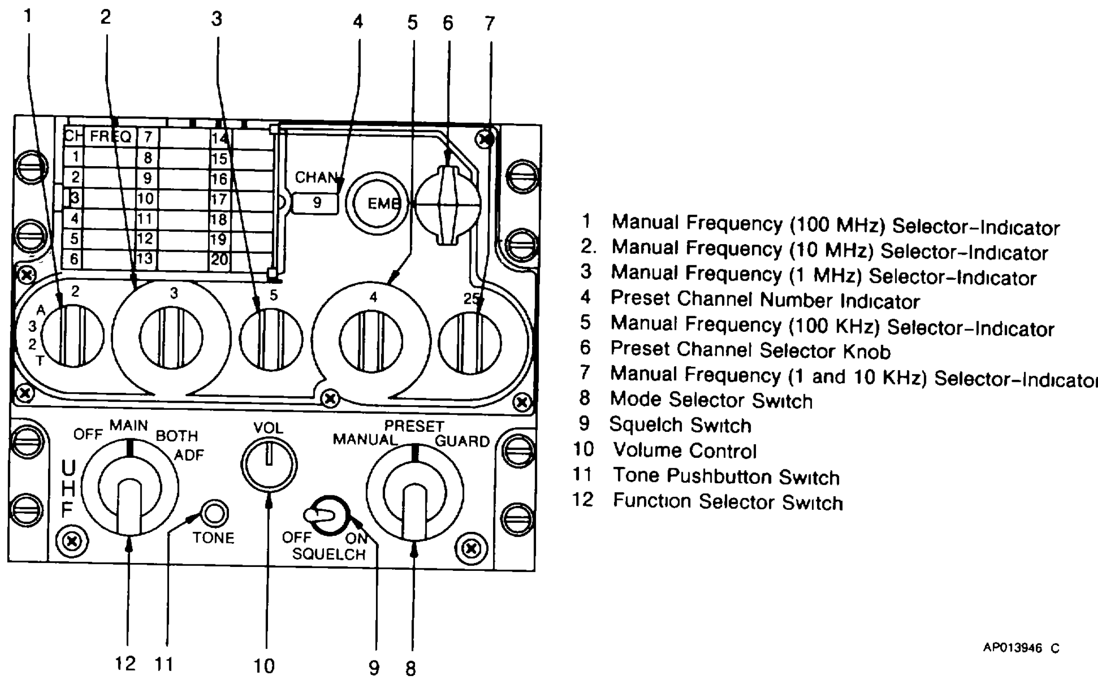


Figure 3-2. UHF Control Panel (AN/ARC-164)

2. Preset channel selector switch Rotate to desired channel.

(4) To use non-preset frequency:

1. Mode selector switch - MANUAL position.

2. Manual frequency selectors (5) - Rotate each knob to set desired frequency digits.

NOTE

The PRESET channel selector and manual frequency selectors are inoperative when the mode selector switch is set to the GUARD position.

3. Volume - Adjust.

NOTE

To adjust volume when audio is not being received, turn squelch switch OFF, adjust volume for comfortable noise level, then turn squelch switch ON.

4. Squelch - As desired.

(5) Transmitter operating procedure:

1. Transmitter-interphone selector - No.

3. position.

2. UHF control panel - Set required frequency using either PRESET CHAN control or MANUAL frequency select controls.

3. Microphone jack selector switch - As desired.

4. Microphone switch - Depress to transmit.

(6) Shutdown procedure: Function selector switch (fig. 3-2) - OFF.

3-8. VOICE SECURITY SYSTEM TSEC/KY-58 (PROVISIONS ONLY).

a. Description. The TSEC/KY-58 voice security system provides secure (ciphered) two-way voice communications for the pilot and copilot in conjunction with the UHF and VHF FM command sets, and the voice order wire set. The control indicators are located in the forward avionics rack behind the pilot.

System circuits are protected by the UHF, VHF FM and BU VOW circuit breakers in the overhead circuit breaker panel (fig. 2-6).

b. Controls/Indicators and Functions.

(1) POWER ON switch. Turns set on or off.

NOTE

The power switch must be in ON position for FM or secure mission operations in either the plain or cipher mode.

(2) PLAIN-CIPHER. Selects unciphered or ciphered communications on FM set.

(a) PLAIN. Enables unciphered communications on FM set.

(b) CIPHER. Enables ciphered communications on FM set.

(3) ZEROIZE switch. Normally OFF. Place in ON position during emergency situations to neutralize and make inoperative the associated cipher equipment.

Illuminates when PLAIN-CIPHER switch is in CIPHER position.

c. VHF FM Set and Voice Security Operation.

(1) Turn-on procedure: Lower switch ON.

NOTE

The power switch must be in ON position, regardless of the mode of the operation, whenever the voice security (CIPHONY) KY-58 is installed in the aircraft.

(*2) Receiver operating procedure:*

1. Squelch control As required.
2. Transmitter-interphone selector switch No. 2 position, or radio monitor control No. 2 ON.
3. FM/AM select switch FM.
4. Mode selector switch TR.
5. Frequency selectors As required.
6. Plain-cipher switch As required.

NOTE

The power switch must be in ON position, regardless of the mode of the operation, whenever the voice security (CIPHONY) KY-58 is installed in the aircraft.

(3) Transmitter operating procedure (PLAIN):

1. Transmitter-interphone selector switch No. 2 position.
2. FM/AM select switch FM.
3. Plain-cipher switch PLAIN.
4. Microphone switch Press.

(4) Transmitter operating procedure (CIPHER):

1. Transmitter-interphone selector No. 2 position.
2. FM/AM select switch FM.
3. Microphone switch Press momentarily (interrupted tone from voice security unit should no longer be heard.)

NOTE

No traffic will be passed if the interrupted tone is still heard after pressing and releasing the microphone switch.

4. Microphone switch Press (do not talk). Wait until beep is heard, then speak into microphone.

(5) Shutdown procedure:

1. Mode selector switch OFF.
2. Power switch OFF.

3-9. BACK-UP VOICE ORDER WIRE (BU VOW) (AN/ARC-164).

A radio set identical in type and performance to the UHF command set (fig. 3-2) is located in the pedestal, to serve as voice order wire. This set provides the pilot and copilot with secure 2-way voice communications. Complete provisions only are provided for a KY-58 voice security device. The voice order wire set is protected by the 7 1/2-ampere BU VOW circuit breaker in the overhead circuit breaker panel (fig. 2-6). The voice order wire shares an antenna mounted on the aircraft belly, with the transponder (fig. 2-1).

3-10. VHF COMMUNICATIONS TRANSCEIVERS (VHF-22B).

a. Description. VHF communications provide transmission and reception of amplitude modulated signals in the very high frequency range of 118. 000 to 151. 975 MHz for a range of approximately 50 miles, varying with altitude. A dual head control panel (fig. 3-3) is mounted in the pedestal extension, accessible to both the pilot and copilot. The panel provides two sets of control indicators, frequency indicators, frequency select knobs, a single volume control, and a single selector switch for quick frequency changing. Transmission audio is routed by pilot and copilot No. transmitter selector switches located in the audio control panel (fig. 3-1). Received audio is routed by pilot and copilot No. 1 receiver audio switches (fig. 3-1), to the respective headsets. The VHF radio is protected by the 10-ampere VHF circuit breaker in the overhead circuit breaker panel (fig. 2-6). The associated antenna is shown in figure 2-1.

b. Controls/Indicators and Functions.

(1) Frequency indicator. Displays the frequency as selected by the frequency selector.

(2) Control frequency indicators. Indicates which frequency has been selected (left or right) for use. Left or right selection is made with the TRANS switch.

(3) COMM TEST switch. The COMM TEST switch when placed in the TEST position overrides the automatic squelch circuit.

(4) Frequency selectors. The frequency selectors are used to select the desired operating frequency. The selected frequency is indicated on the frequency indicator.

(5) TRANS switch. Selects the previously selected left or right frequencies for use.

(6) VOL-OFF control. The VOL-OFF control adjusts the volume of received audio, and turns the set ON or OFF.

c. VHF Set - Normal Operation.

(1) Turn-on procedure: To turn the radio on, turn the volume control clockwise out of the off detent.

(2) Operating procedure:

1. Transmitter-interphone selector switch (fig. 3-1) Select position desired, and turn the respective radio monitor control to the ON position.
2. Frequency selector Set desired frequency.
3. Volume control As required.
4. Microphone switch Press to the desired level to talk.

(3) Shutdown procedure: Volume control Turn counterclockwise, to the off detent.

d. VHF Set Emergency Operation.

NOTE

Transmission on emergency frequency (121. 500 MHz) is restricted to emergencies only. Emergency frequency 243. 000 MHz (guard channel) is also available on the UHF command radio.

1. Transmitter-interphone selector switch Select No. 1 position.
2. Frequency selector 121. 500 MHz (emergency frequency).
3. Microphone switch Press to second level to talk.

3-11. HF COMMUNICATION SET (KHF-950).

a. Description. The HF command set (fig. 3-4) provides long-range voice communications within the frequency range of 2. 0 to 29. 99 MHz and employs either standard amplitude modulation (AM), lower sideband (LSB), or upper sideband (USB) modulation. The distance range of the set is approximately 2,500 miles and varies with atmospheric conditions. With the capability to preset and store 99 frequencies for selection during flight, the system also allows for selection of other frequencies manually (direct tuning), or reprogramming of any preset frequency. The system will automatically match the antenna by keying the microphone. Power to the system is routed through a 25-ampere circuit breaker placarded HF PWR. The receiving portion of the system is protected by a 5-ampere circuit breaker placarded HF RCVR. Both circuit breakers are located in the overhead circuit breaker panel. The HF system has two methods of frequency

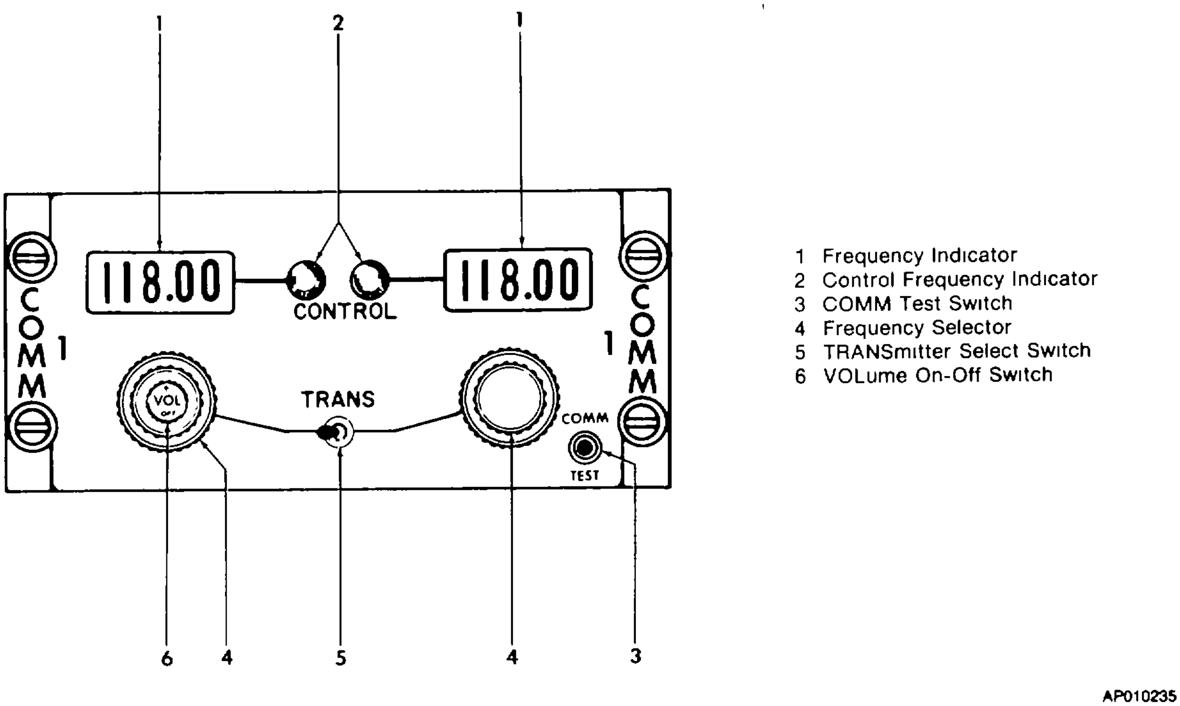


Figure 3-3. VHF Control Panel (COMM 1 - G4583A, COMM 2 - G4584A).

selection. The first method is called direct tuning (frequency agile). The second is a channelized operation in which desired operating frequencies are preset, stored and referenced to a channel number.

b. Controls/Indicators and Functions (fig. 3-4).

(1) FREQ display. Displays frequency selected.

(2) Mode display. Displays mode selected.

(3) CHANNEL display. Displays channel selected.

(4) Light sensor. The light sensor is a photocell which adjust brightness of the display.

(5) MODE switch. The mode switch is a momentary pushbutton switch that selects LSB, AM or USB.

(6) FREQ/CHAN switch. Transfers the HF system from a direct frequency operation to a channelized form of operation.

(7) PGM (Program) recessed switch. Enables channelized data to be modified. The PGM message will be displayed whenever this switch is depressed.

NOTE

The program mode must be used for setting or changing any of the 99 preset frequencies. Each of the 99 channels may be preset to receive and transmit on separate frequencies (semi-duplex), receive only, or transmit and receive on the same frequency (simplex). The operating mode (LSB, USB or AM) must be the same for both receive and transmit and can also be preset.

(8) Frequency/channel selector. This selector consists of two concentric knobs that control the channel and frequency digits, plus the lateral position of the cursor.

(a) Frequency control. The outer knob becomes a cursor (flashing digit) control with the FREQ/CHAN switch in the FREQ position. The flashing digit is then increased/decreased with the inner knob.

(b) Channel control. The outer knob is

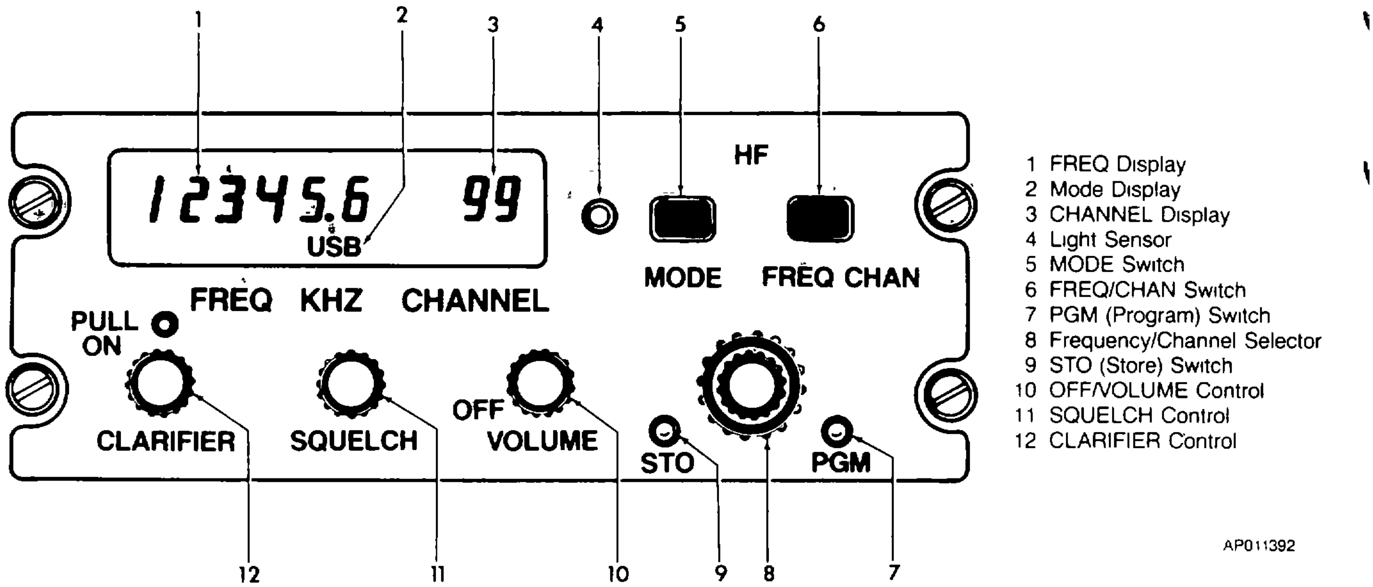


Figure 3-4. HF Control Panel (KCU-951)

not functional when the FREQ/CHAN switch is in the CHAN position. The inner knob will provide channel control from 1 through 99, displayed at the right end of the display window.

(9) STO (Store) recessed switch. Stores displayed data when programming preset channels.
(10) OFF-VOLUME control. Applies power to the unit and controls the audio output level.

(11) SQUELCH control. Provides variable squelch threshold control.

(12) CLARIFIER control. Provides 250 Hz of local oscillator adjustment.

c. Normal Operation.

(1) Turn on procedure:

NOTE

It is presumed aircraft power is on and normally used avionic circuit breakers remain set.

1. Avionics master power switch ON.

2. OFF-VOI,UME switch Turn clockwise out of OFF position. Adjust volume as desired.

(2) Frequency operation (simplex only): OFF-VOLUME Switch -. Turn clockwise out of OFF position. Adjust volume as desired.

NOTE

Each digit of the frequency may be selected instead of dialing up or down to a frequency. The larger concentric knob is used to select the digit to be changed. This digit will flash when selected. Rotation of the knob moves the flashing cursor in the direction of rotation. After the digit to be changed is flashing, the smaller concentric knob is used to select the numeral desired. This process is repeated until the new frequency has been ;elected. The flashing cursor may then be stowed by moving it to the extreme left or right of the display and then one more click. This stows the cursor behind the display until needed again. The cursor may be recalled by turning the concentric knob one click left or right.

(3) Direct frequency tuning (simplex only).

1. FREQ/CHAN button out (FREQ).
2. Select desired mode (USB, LSB, or AM).
3. Select digit to be changed (outer knob), digit (cursor) will flash.
4. Select numerical value of digit (inner knob).
5. Stow cursor (or repeat procedure for additional changes).
6. Tune antenna coupler (press microphone button).

(4) Channel Programming.

NOTE

There are three ways to set up a channel: Receive only, simplex, and semi-duplex. To gain access to channelized operation, depress FREQ/CHAN button. To utilize the existing programmed channels (i. e. no programming required) use the small control knob to select the desired channel number. Then momentarily key the microphone to tune the antenna coupler. If channel programming is required, it is necessary to activate the program mode as follows. With the FREQ/CHAN button in (CHAN), use a pencil or other pointed object to push the PGM button in. The button is an alternate action switch: pushon, push-off. The letters PGM will appear in the lower part of the display window and the system will remain in the program mode until the PGM button is pressed again.

(5) Receiver operating procedure:

1. Stow the cursor if a frequency digit is flashing.
2. Select the channel to be preset.
3. Set the desired operating mode (LSB, USB or AM).
4. Set the desired frequency. (Refer to frequency tuning)
5. Push and release STO button once.

NOTE

- **TX will flash in the display window, however a receive only frequency is being set. The flashing TX should be ignored.**
- **If another channel is to be set, the cursor must be stowed before a new channel can be selected. Use the smaller concentric knob to select the channel and repeat the steps for selecting a new frequency.**

6. To return to an operating mode, push the PGM button.
7. Simplex operation: Setting a channel up for simplex operation (receive and transmit on the same frequency).
8. FREQ/CHAN button In (cursor stowed).
9. PGM button In (PGM displayed).
10. Select channel to be preset.
11. Set mode (LSB, USB or AM).
12. Set desired frequency. (Refer to frequency tuning)
13. Push and release STO button twice. The first press of the STO button stores the frequency in the receive position and the second press stores the same frequency in the transmit position. The second push also stores the cursor. If another channel is to be reset, use the smaller concentric knob to select the channel and repeat the steps for selecting a new frequency. The cursor was automatically stowed. To return to one of the operating modes, push the PGM button again.
14. Semi-duplex operation: Setting a channel for semi-duplex (transmit on one frequency and receive on another).
15. Select channel to be preset.
16. Set desired frequency. (Refer to frequency selection)
17. Set mode (LSB, USB or AM).
18. Push STO button once.
19. Set transmit frequency.
20. Push STO button again. If another channel is to be reset, use the smaller

concentric knob to select the channel and repeat the steps.

21. To return to an operating mode, push the PGM button.

NOTE

The mode for each channel (LSB, USB or AM) is stored along with the frequency. If the mode is changed, the system will receive and transmit in the mode selected for transmit.

d. Shutdown. OFF/VOLUME switch OFF.

e. HF Command Set Emergency operation. Not applicable.

3-12. SINCGARS AN/ARC-201(V).

a. Description. The Sincgars AN/ARC-201(V) radio system (fig. 3-5) provides VHF-FM radio communications, in single channel and ECCM mode of operation. The frequency range is 30 to 87. 975 MHz channelized in tuning increments of 25 kHz. In addition a frequency offset tuning capability of -10 kHz, -5 kHz, ÷5 kHz and ÷10 kHz is provided in both receive and transmit modes; this capability is not used in the ECCM mode. The system provides improved immunity from the threat of electronic warfare, and provides for secure communication of voice and data signals through interfacing with the KY-58. The system is protected by a 10-ampeire circuit breaker, placarded FM, located on the overhead circuit breaker panel.

The Sincgars FM radio set is a combination control/transceiver, installed in the pedestal extension for convenient operation by the pilot or copilot. The front panel control allows the pilot or copilot to instantly switch to any one of 20 preset channels.

b. Controls and functions.

NOTE

The IFM RF PWR switch is not used on this installation

(1) Function Switch. The function switch is used to select the basic operational condition within the radio transceiver (RT). It is a nine-position switch with positions one, eight, and nine being isolated switch positions. Isolated switch positions require a pull and turn operation to actuate. Position one is OFF, eight is Z-A (zero all) and position nine is STOW (storage). Actions initiated by these switch settings are sensitive to the operation of the RT and are therefore designed to require a conscious effort of the operator to actuate. Operative positions of the function switch are as follows:

(a) OFF. All primary power is removed from the RT. The memory holding battery, however, is connected to its associated circuitry, providing the retention of stored frequency hop (FH) parameters, time and preset frequencies.

(b) TEST. When selected, the major components of the subsystem are examined to verify their operation. The RT and the ECCM module are both tested under micro-processor control. The results of the self-tests, as well as the presence of the ECCM module, are presented on the front panel displays.

(c) SQ ON (Squelch On). Primary power is applied and operation will be by normal, locally controlled actions. The squelch is enabled and the RT operation modified by other front panel controls. The radio's receiver audio output is connected to the No. 2 communications receiver switch of the audio control panel. Keying of' the transmitter is accomplished by pressing the Control Wheel switch, placarded INPH XMT MIC, to the second (XMT) level.

(d) SQ OFF (Squelch Off). Operation of the RT with the switch in this position is identical to the ON position except the squelch circuits are disabled. This position provides the capability to communicate at extremely low input levels if required.

(e) LD (Load). In this switch position, all primary power is applied to the RT and the transmitter is enabled. With the function switch in LD, loading of preset frequencies is accomplished by normal keyboard entry in conjunction with the PRESET switch. Also, time may be set with the switch in LD. ECCM net parameters and lockout channels are also filled with the switch in this position, providing an ECCM module is in the RT, by connecting the appropriate fill device to the FILL connector and pressing the keyboard H LD button once.

(f) LD-V (Load Variable). When selected the TRANSEC variable is loaded into the RT providing an ECCM module is in the RT. The fill device is connected as in LD and the keyboard H LD button pressed once to initiate the transfer.

(g) Z-A (Zero All). This switch position is

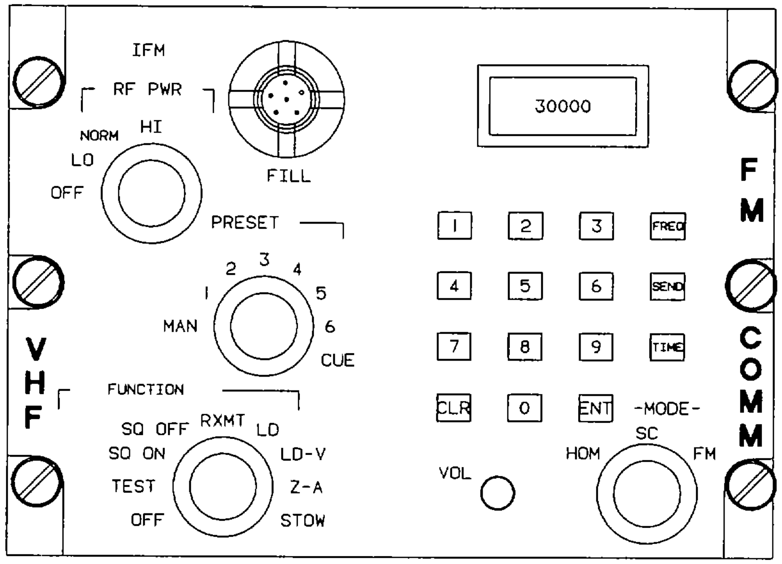


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Figure 3-5. SINCGARS AN/ARC-201(V)

an isolated, or guarded position requiring a pull and turn operation to select. All primary power is applied; however, transmitter keying is inhibited. When the switch position is activated, the ECCM variables are zeroed. The non-volatile RAM in the ECCM and control modules are tested and the results displayed. This is not an operational position but is used to clear the TRANSEC variable.

(h) STOW. In this position all power is removed from the RT circuits including those circuits energized by the holding battery. All functional circuits and the non-volatile memory circuits are inactive. This switch position is an isolated position, requiring a pull and turn operation to select.

(2) MODE Switch. The MODE switch is used to select one of four basic operational modes. It is a four-position switch with the fourth position used to select a variation of the third or frequency hop (FH) position.

The HOME switch position is not operable in this installation.

When operating in the SC (single channel) position the single channel mode of operation is selected with the function switch in an operational position. Manual selection of operating frequencies is determined by the setting of the PRESET switch. With the PRESET switch in MAN, frequencies are selected via keyboard entry. With the PRESET switch in any of the numbered positions (1 through 6) or CUE, preset frequencies are selected. Offsets may be applied to either manual or preset frequencies while in the SC mode. The MODE switch must also be in the SC position when loading preset frequencies. In this case, however, the function switch must be in the LD (load) position.

With the switch in the FH (frequency hopping) position, the frequency hopping mode of operation is selected. The PRESET switch positions (1 through 6) now select a particular set of frequency hopping net parameters. Position MAN and CUE of the PRESET switch are invalid operating positions in the FH mode. In MAN, the display will show "cold", and in CUE, the display will show the frequency as though in SC. The function switch must be in an operational position. Switching positions of the PRESET switch will facilitate rapid change in operating nets.

When the switch is in the FH-M (frequency hopping/master) position, operationally this position is identical to the FH position, except that it is a guarded, pull and turn switch position.

(3) PRESET Switch. The RT PRESET switch is used to select specific predetermined operating conditions within the RT. The switch is an eight position switch whose function is actually two-fold. In a normal single channel mode, (SC on the MODE switch), either manual or preset frequencies are selected. In a frequency hopping mode (FH or FH-M on the MODE switch) frequency hopping nets are selected. The switch is also used in single channel loading of preset frequencies. The switch positions are indicated by MAN 1, 2, 3, 4, 5, 6 and CUE. The CUE frequency can serve as a special signaling frequency in the FH modes, or as a seventh preset in single channel operation.

The MAN (manual) position is used in the single channel mode to select any operating frequency, within the prescribed band, in 25 kHz increments. Frequencies are entered directly by the keyboard. Offsets of± 5 or ± 10 kHz may be applied to any selected frequency. Offsets applied to manually selected frequencies will be retained until a new frequency is selected or until offsets are cancelled. Retention of offsets to manually selected frequency will be in effect even through the PRESET switch is moved from MAN to a preset frequency and returned to MAN. The MAN position is invalid for other positions of the MODE switch (FH or FH-M) and an indication of "cold" will be in evidence on the display.

The CUE frequency can serve as a seventh preset in single channel operation or as a special signaling frequency in the FH modes. In the single channel (SC) mode, preset frequencies are selected or loaded. Frequency selection occurs if the function switch is in an operational position; and preset loading occurs if the function switch is in the LD (load) position. The display will indicate the preset frequency selected, providing a frequency had been loaded previously. If frequency data had not been loaded in the preset position, or if it had been zeroized, the display will indicate FILL, and the position number. Offset of ±5 or ± 10 kHz may be applied to any preset and will be retained, even when switching between presets, until cancelled. In the FH or FH-M mode, frequency hopping nets are selected according to predetermined preloading data. It is not necessary to use the PRESET switch when loading FH parameters; however, it is when selecting particular nets. When a FH net is selected, the display will indicate FH followed by a number corresponding to the valid FH data which had been loaded previously. If valid data is not available for the net selected, the display will indicate FILLn (n = preset number).

The CUE position is a special signaling channel used by a non-ECCM radio to signal, or CUE, an ECCM radio. The CUE channel in single channel (SC) operation is, in effect a seventh preset. In a typical ECCM CUE operation, a radio operator with a non-ECCM radio attempting a contact within an ECCM net would place this switch to CUE and key the transmitter. The ECC'M radio provides an audible tone and a visual indication that contact is desired. The display will indicate CUE for a period of 7 seconds and a tone will be apparent for 2 seconds, each time the non-ECCM radio is keyed. The non-ECCM radio must be keyed for at least 4 seconds to ensure reception by the ECCM radio. The ECCM radio would then be switched to the single channel CUE or some other pre-determined frequency to establish contact. The CUE channel is an invalid position in the FIH mode and the radio will operate in SC mode.

(4) VOL Control. 'The VOL (volume) control is a potentiometer which serves to vary the receiver volume. The volume control is used to adjust receiver volume to a comfortable level.

(5) Display. The display is a five digit, seven segment LCD readout. The display will be illuminated continuously and the information presented will be a function of other switch settings or keyboard entries. With the function switch in an operational mode, the MODE switch in SC, the frequency stored at a particular location of the PRESET switch will be displayed. Changing the PRESET switch position will automatically cause the new frequency corresponding to the new switch location to be displayed. Frequency, or hopset number is normally visible on the display. Depression of the FREQ button on the keyboard will display the current operating frequency or hopset number after such times. The frequency offsets (±5 or ± 10 kHz) are operative in either MAN or a numbered preset position of the PRESET switch. These offsets, once applied, will be displayed as the true operating frequency when FREQ is pressed. Time is also available for display in any operational mode. Time is indicated in a 24-hour system by days, hours/minutes, and minutes/seconds. CUE will also be displayed in an

ECCM operational mode. Available also are a number of built-in test and status words indicative of internal conditions within the RT.

(6) Keyboard. The 15-button keyboard is used to insert or display data, depending on the key switch actuated, and the positions of the MODE and function switches. The keyboard is comprised of 10 numerical buttons, three special function buttons, and two command buttons. The three special function buttons are located on the right side of the keyboard. The two command buttons (CLR and ENT) are located on either side of the numerical zero button. The special function buttons will always initiate a display according to the function of the button pressed. Pressing TIME, will display time, pressing FREQ, will display frequency, etc. Pressing CLR will clear only the displayed data. Pressing ENT will enter the displayed data into the system and is always signaled by a momentary blink of the display. When the CLR button is pressed, the displayed digits (two, four or five dependent upon the displayed information) will have the number replaced by a horizontal line at the bottom of each digit. This underline feature aids the operator in knowing where entered data will appear.

(a) Switches 1 through 9. Digital inputs are used to key in frequency, load time information, or offsets. Entry of information is normally digit-by-digit displayed left to right on the readout. It is to be noted that operation of the RT is not altered until complete, valid data is registered on the readout, and the keyboard ENT button depressed within the seven second time-out period. Incomplete entries will not be accepted when ENT is pressed. Acceptance of valid data is signaled by a momentary blink of the display when ENT is pressed. Partial or mistaken data may be erased at any time by pressing CLR, at which time the last readout will be cleared. Manual frequencies can only be selected with the function switch in an operational position and the MODE switch in SC. With the function switch in LD and the MODE switch in SC, new preset frequencies may be entered in conjunction with the numbered positions of the PRESET switch. With the function switch in LD; TIME may be entered or altered by pressing TIME, then CLR.

(b) 0 (H LD). The 0 (zero) switch is used to enter zeros in the same manner as defined in switches I through 9. However, it has a second function; (H LD) which initiates transfer of ECCM parameters.

(c) CLR. The CLR button is used to zeroize the display. CLR must be pressed to remove the old data from the display prior to entering new data during LD, or changing frequencies during a manual operation.

(d) STO/ENT. The STO/ENT button is used to initiate entry of all data by keyboard entry. In all cases, only valid, complete entries will enable the STO/ENT button. Successful initiation of the entry action will always be signaled by a blink of the display.

STO/ENT has a second function of storing a received hopset or lockout set held in holding memory. Selection of the preset (I through 6) is necessary.

(e) FREQ. The FREQ button is used to display the current operating frequency during single channel (manual or preset) operation. It is also used in loading preset frequencies, however, the function switch must be in the LD (load) position. Whenever the button is pressed, frequency is displayed, and an entry sequence is initiated involving frequency. If the frequencies stored within the radio had been zeroized (ZA on the function switch), FILL and the preset number will be displayed when FREQ is pressed, until new valid frequencies are entered. If the operating frequency currently in use has been offset, the true operating frequency (plus or minus offset) will be displayed.

(f) SEnd/OFST. The SEnd/OFST (offset) button is used to modify a single channel operating frequency, manually selected or preset, to include offsets of ± 5 or ± 10 kHz. The offset to be applied to the basic frequency is displayed by itself in the two right digits of the display. The function switch can be in any operational position, however, the MODE switch must be in SC to apply offsets. Pressing OFST will immediately display any current valid offset applied to the selected single channel frequency. Negative offsets are indicated by a negative sign (-) appearing in the center digit position. Positive offsets are indicated by no prefix. No offset is indicated by 00 in the two right digits. To apply an offset, the OFST button is first pressed. The CLR button must then be pressed. If a negative offset is desired, OFST button is first pressed. A negative sign will appear in the center digit position. Repeated pressing of OFST will alternate between plus and minus offsets. The keyboard must now be used to insert either five or ten. If five is pressed, 05 will automatically appear. If 10 is required, 1 then 0 must be pressed. All other

buttons will be inactive and nothing will be registered if accidentally pressed. Once the valid offset is registered on the display, along with a plus, (no indication) or minus sign, the ENT button is pressed. The display will momentarily blink, signaling acceptance and initiating frequency offset immediately. If the FREQ button is pressed at this point, it will display the original operating frequency with the offset subtracted or added to it. To cancel an offset, press OFST first to display existing offsets. Then press CLR followed by 0, which will cause 00 to be displayed. When ENT is pressed, an offset of 00 is entered returning the operating frequency to its nonoffset condition.

SEnd/OFST has a second function of initiating an ERF transmission if a hopset or lockout set is in the holding memory and the mode switch is in the FH-M position.

(g) TIME. The TIME button on the keyboard is used to display or change the time setting maintained within each RT. Time is displayed in three separate individual fields in days (O through 99) hours and minutes hours (O through 23), minutes (O through 59) and seconds (O through 59). Days are displayed in the two left digits immediately when TIME is pressed. Pressing TIME again will cause the field to change to the hours/minutes field. Hours are displayed in the two left digits of the second field, minutes in the two right digits. Pressing TIME the third time results in the third (minutes/seconds) field being displayed. Minutes are displayed in the two left digits and seconds are displayed on the two right digits of the display. When TIME is displayed and CLR has not been pressed, the seconds will be running. When CLR is pressed, the internal clock continues to run, but the display will be static, displaying entry information only. To set or reset time, requires that the function switch be in the LD (load) position. The positions of the MODE and PRESET switches are of no consequence. With the function switch in LD, the TIME button is pressed once, displaying days in the two left digits. Press CLR (clear) and the two digits will be removed. The new days numbers may then be inserted by keyboard entry. Once the new days numbers have been registered, the ENT button is pressed and the display caused to blink momentarily. The new days numbers are now entered and stored. Once the new days have been entered, the TIME button must again be pressed to change to the second field (hours and minutes). The previous hours and minutes are displayed in the two extreme left and right digits, respectively. CLR is then pressed to remove the old hours/minutes display and is replaced by underlines at the bottom of each digit previously displaying a number. The new hour and minute numbers (four digits) are then entered by keyboard entry. Once ENT is pressed, the display blinks and the new data is registered. When the new hours/minutes numbers are registered, the registered numbers are static and displayed time is not changing. When ENT is pressed, time keeping is started, and the seconds are zeroed prior to the new time keeping procedure. The third display field (minutes/seconds) is available for display, but cannot be set by keyboard entry. Only when a valid four digit hours/minutes entry has been completed by pressing ENT is the old seconds erased to zero and new time started. This is to accommodate presetting and display of time prior to a time mark. If an error occurs during any entry sequence, pressing CLR erases the display and starts the sequence over.

(7) FILL. This connector is used to fill ECCM parameters from an external fill device. Entry of ECCM parameters is initiated by the H LD button on the keyboard with the function switch in LD or LD-V. The RT will recognize the attachment of a fill device and respond accordingly.

3-13. EMERGENCY LOCATOR TRANSMITTER (ELT).

a. Description. An emergency locator transmitter is provided to assist in locating an aircraft and crew in the event an emergency landing is necessitated. The output frequency is 121. 5 and 243 MHz simultaneously. Range is approximately line-of-sight. The transmitter unit has separate function control switches located on one end of the case. In the event the impact switch has been inadvertently actuated, the beacon can be reset by firmly pressing the pushbutton RESET switch on the front of the case. The RESET switch and a 3-position toggle switch, placarded ARM, OFF and ON, also on the transmitter case, may be actuated by inserting one finger through a small, round, spring-loaded door on the left side of the aft fuselage (fig. 3-6). The transmitter unit is accessible through a service panel located on the bottom of the aft fuselage.

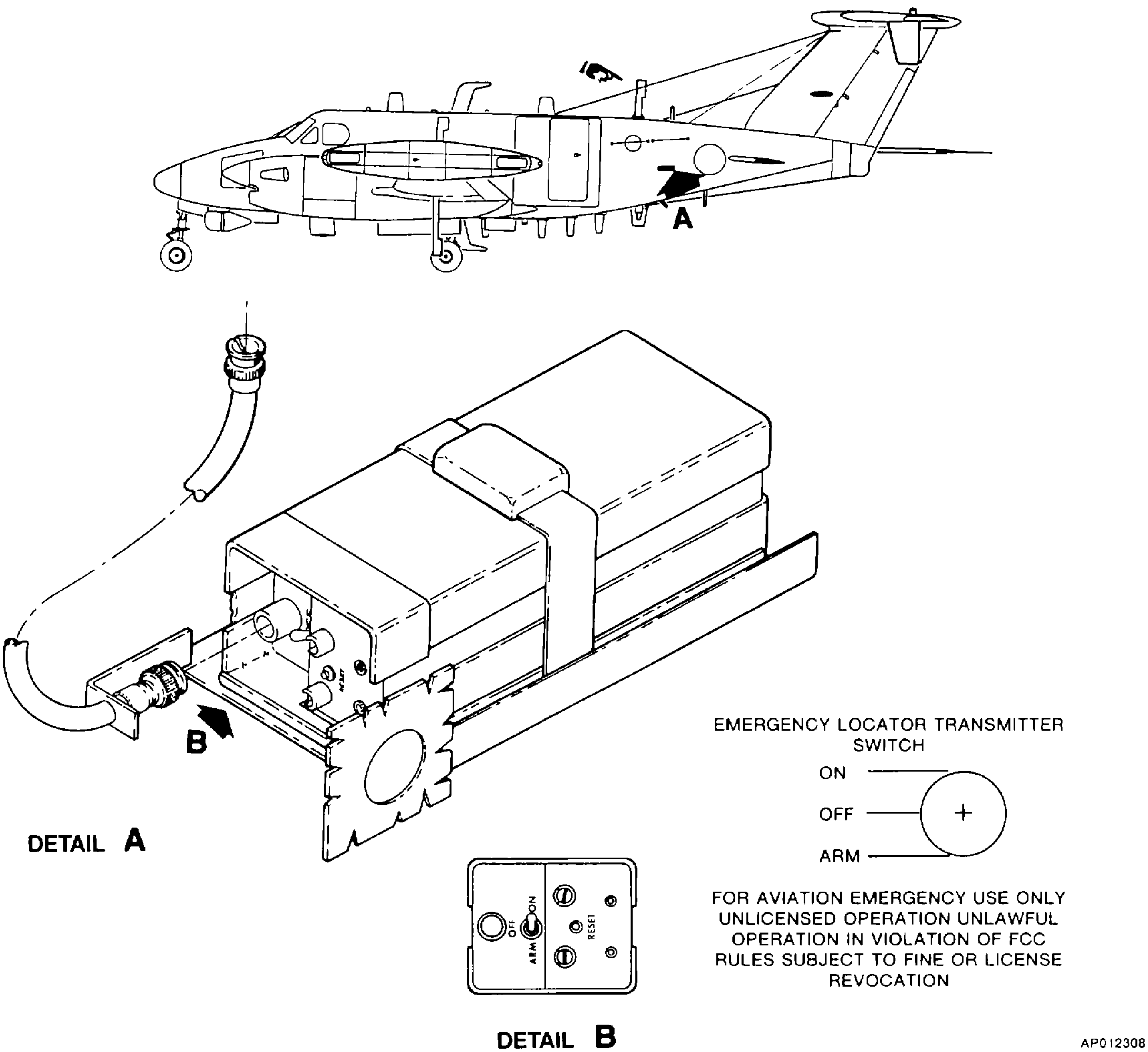


Figure 3-6. Emergency Locator Transmitter (Narco 03716-0300)

b. Control and Functions.

(1) RESET switch. When pressed, resets transmitter.

(2) Function switch. Selects operating mode of set.

(a) ARM. Arms set to be actuated by impact switch (normal mode).

(b) OFF. Turns set off.

(c) ON. Manually activates transmitter for test or emergency purposes.

Section III. NAVIGATION

3-14. DESCRIPTION.

The navigation equipment group provides the pilot and copilot with instrumentation required to establish and maintain an accurate flight course and position, and to make an approach on instruments under Instrument Meteorological Conditions (IMC). The navigation configuration includes equipment for determining attitude, position, destination range and bearing, heading reference and groundspeed.

3-15. RADIO MAGNETIC INDICATORS (RMI-30).

a. Description. Two identical radio magnetic indicators (fig. 3-7) (RMI) provide aircraft heading and radio bearing information to or from a VOR, TACAN, or ADF station. The pilot's and copilot's RMIs are protected by 1-ampere circuit breakers, placarded RMI No. 1 and No. 2 located in the overhead circuit breaker panel.

b. RMI Controls, Indicators, and Functions.

(1) Single-Needle Switch-indicators. Two single-needle pointer switches (placarded with a single-needle symbol), located on the extreme left and right sides of the instrument panel (fig. 2-14), are provided to the pilot and copilot to select which bearing information source is being used by the single-needle pointer of its respective RMI. When the switch is in the up position, placarded VOR 1, the RMI single needle displays bearing information from the #1 VOR if the single-needle selector switch on the RMI is set to the VOR/TACAN position; or information from the INS, if the single-needle selector switch is set to the INS position. When the switch is in the down position, placarded TACAN, the,single needle displays bearing information from TACAN, if the single needle selector switch on the RMI is set to the VOR/TACAN position, or INS if the single-needle selector switch is set to the INS position.

(2) Single-needle pointer. The arrow of this pointer indicates the magnetic heading to a VOR or TACAN station, or INS bearing to waypoint. The pilot's single-needle pointer can display bearing information from VOR 1, TACAN, or the INS, depending upon the position of the single-needle pointer selector switch on the RMI, and the position of the single needle switch (located on the left side of the instrument panel).

The copilot's single needle pointer can display bearing information from VOR 1, TACAN, or the INS, depending upon the position of the singleneedle selector switch on the RMI, and the copilot's single-needle switch (located on the right side of the instrument panel).

(3) Lubber line. Aircraft heading is read from the compass card under the lubber line.

(4) Heading Warning Flag. The heading warning flag, located on the upper right portion of each RMI, comes into view whenever the compass system determines that the heading information displayed on the compass card is invalid.

(5) Double-needle pointer. The arrow of this pointer indicates the magnetic heading to a VOR or ADF station.

The pilot's double-needle pointer can display bearing information from VOR 2 or the ADF, depending upon the position of the double-needle selector switch on the RMI.

The copilot's double-needle pointer can display bearing information from VOR 2 or the ADF, depending upon the position of the double-needle selector switch on the RMI.

(6) Double-needle pointer selector switch. This is a two-position, press to change, selector switch, located on the lower right corner of each RMI. When depressed to the in position, ADF bearing information is supplied to the double needle, and the double-needle indicator on the RMI, points to the ADF station. Depressing the switch when it is in

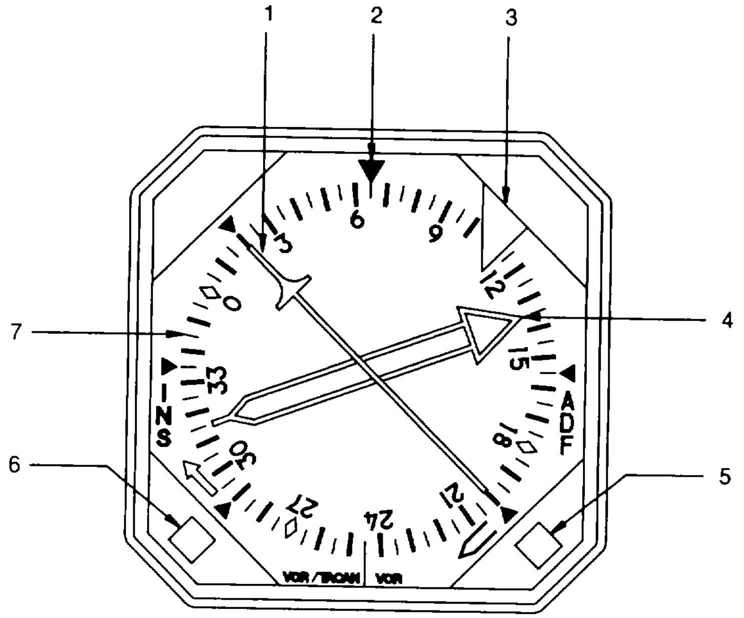


Figure 3-7. Radio Magnetic Indicator (RMI-30)

the in position returns it to the out position. When in the out position, VOR 2 bearing information is supplied to the double-needle pointer, and the doubleneedle indicator, points to the VOR station.

(7) Single-needle pointer selector switch. This is a two-position, press to change selector switch, located on the lower left corner of the RMI. When depressed to the in position, INS bearing information is supplied to the single needle, and the single-needle indicator on the RMI points to INS. Depressing the switch when it is in the in position returns it to the out position. When in the out position, VOR 1 or TACAN bearing information is supplied to the single-needle pointer, and the singleneedle indicator points to VOR/TACAN.

(8) Compass card. This rotating card repeats gyro stabilized magnetic compass information.

3-16. HORIZONTAL SITUATION INDICATORS.

a. Description. The pilot and copilot have separate HSI instruments on respective instrument panel sections (fig. 2-14). Each HSI combines displays to provide a map-like presentation of the aircraft position with respect to magnetic heading. Each indicator displays aircraft heading, course deviation, and glideslope data. The pilot's HSI allows the desired course and heading to be input to the autopilot. Course deviation data is supplied to the HSI by the VOR 1 or VOR 2 systems, the TACAN, or the INS. Glideslope data is supplied by the VOR 1 or VOR 2 systems. The HSI displays warning flags when the VOR, TACAN, INS or glideslope signals are lost or become unreliable.

b. Controls/Indicators and Functions, Pilot's HSI (fig. 3-8) (RD-650B).

(1) Distance display. Provides digital displays of TACAN or INS waypoint distance. TACAN distance is displayed in 1/10 mile increments. INS distance to waypoint is displayed in whole mile increments. The display will show dashes when the distance input data is invalid or absent.

(2) Rotating heading (azimuth) dial. Displays gyro stabilized magnetic compass information on a dial which rotates with the aircraft throughout 360 degrees. The azimuth ring is graduated in 5 degree increments.

(3) Lubber line. Fixed heading marks located

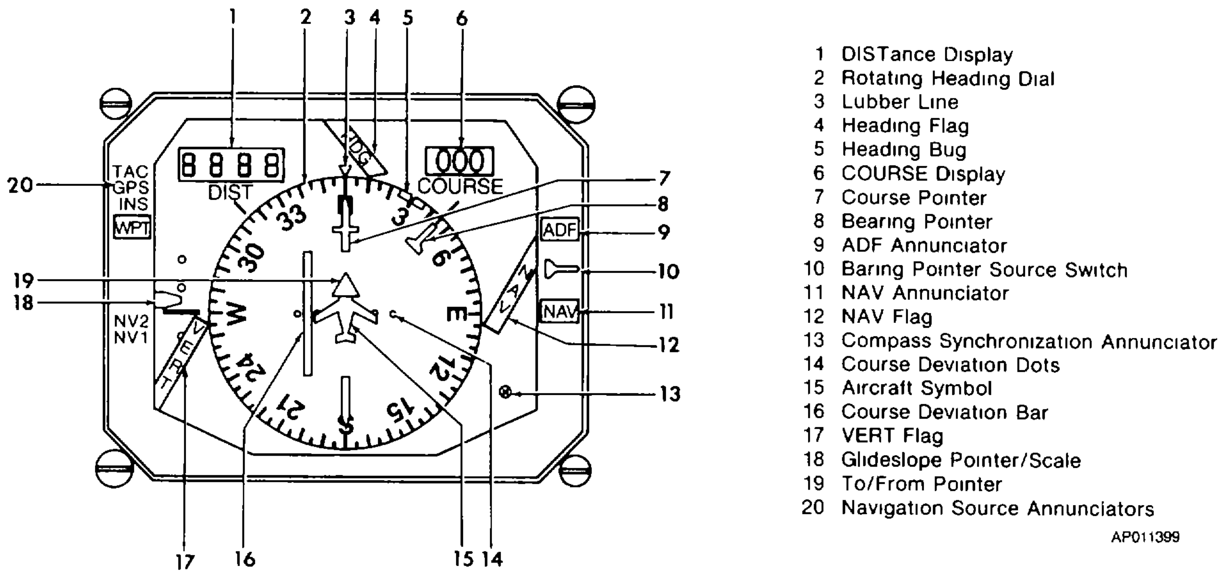


Figure 3-8. Pilot's Horizontal Situation Indicator (RD-650B)

at the fore (upper) and aft (lower) position.

(4) HDG flag. Indicates loss of reliable heading information.

(5) Heading bug. The notched orange heading bug is positioned on the rotating heading dial by the remote heading knob, to select and display a preselected compass heading. Once set to the desired heading, the heading bug maintains its position on the heading dial. The difference between the bug and the fore (upper) lubber line index is the amount of heading select error applied to the flight director computer. In the heading mode the ADI will display the proper bank commands to turn to and maintain this selected heading.

(6) Course display. Provides a digital readout of selected magnetic course.

(7) Course pointer. The yellow course pointer is positioned on the heading dial by the remote course knob, to a magnetic bearing that coincides with the selected course being flown. The course pointer rotates with the heading dial to provide a continuous readout of course error to the computer.

(8) Bearing pointer. Indicates ADF or NAV relative bearing as selected by the bearing pointer source switch.

(9) ADF annunciator. When illuminated, indicates ADF bearing information is being displayed.

(10) Bearing pointer source switch. The bearing pointer source switch, located on the pilot's HSI, provides for selecting between ADF or NAV bearing information as presented by the bearing pointer. Each push of the select switch alternates selection of ADF or NAV. Upon power-up, or following long-term power interruption, NAV is displayed.

(11) NAV annunciator. When illuminated, indicates NAV bearing information is being displayed.

(12) NAV/ flag. Indicates loss of VOR, TACAN or INS information, or unreliable navigation signal.

(13) Compass synchronization annunciator. The compass synchronization annunciator consists of a dot and X symbol display. When the compass system is in the slaved mode, the display will oscillate between the dot and X symbol, indicating the heading dial is synchronized with a gyro stabilized magnetic heading.

(14) Course deviation dots. In VOR or TACAN operation, each dot represents 5 degree deviation from the centerline (±10 degrees). In ILS operation, each dot represents 1 degree deviation from the centerline. In INS operation, each dot represents 3. 75 nautical miles deviation from centerline.

(15) Aircraft symbol. The fixed miniature aircraft symbol corresponds to the longitudinal axis of the aircraft and lubber line markings. The symbol shows aircraft position and heading with respect to a radial course and the rotating heading (azimuth) dial.

(16) Course deviation bar. The course deviation bar represents the centerline of the selected VOR, TACAN, INS or localizer course. The miniature aircraft symbol pictorially shows actual aircraft position in relation to this selected course.

(17) VERT flag. Covers glideslope pointer when not receiving glideslope information.

(18) Glideslope pointer/scale. The glideslope pointer displays glideslope deviation. The pointer is in view only when tuned to a localizer frequency. If the aircraft is below glideslope path, the pointer is displayed upward on the scale. Each dot on the scale represents approximately 0.4 degree displacement.

(19) To-From pointer. The to-from pointers aligned on the course pointer, are located 180 degrees apart. One always points in the direction of the station, along the selected VOR radial or towards the INS waypoint.

(20) Navigation source annunciators. Five different annunciators display navigation data sources. They are: TAC for TACAN, GPS, INS, NV2 for VOR 2, NV1 for VOR 1. WPT indicates arrival at INS waypoint.

(21) Course knob. Positions the course pointer.

(22) Heading knob. Positions the heading bug to a preselected heading.

(23) Pilot's COURSE INDICATOR selector switch (fig. 2-14). Selects desired source of data for display on pilot's HSI and input to autopilot flight computer.

(a) NA V 1. Selects data from VOR 1 system.

(b) NA V 2. Selects data from VOR 2 system.

(c) TACAN. Selects data from TACAN system.

(d) INS. Selects data from INS.

c. Controls/Indicators and Functions, Copilot's HSI (fig. 3-9) (RD550R)

NOTE

If both the pilot and copilot COURSE INDICATOR select switches are in the same position, except INS, the pilot has sole control of course select functions. The copilot can only monitor deviation displays from the selected system. A PILOT SELECT annunciator will illuminate to notify the copilot that both pilots have selected the same receiver.

(1) Distance display. Provides digital distance of TACAN or INS waypoint distance. TACAN distance is displayed in 1/10 mile increments. INS distance to waypoint is displayed in whole mile increments. The display will show dashes when the distance input data is invalid or absent.

(2) Compass card. Displays gyro stabilized magnetic compass information on a dial which rotates with the aircraft throughout 360 degrees. The azimuth ring is graduated in 5 degree increments.

(3) Lubber line marks. Fixed heading mark.

(4) HDG flag. Indicates loss of reliable heading information.

(5) Digital COURSE counter. Provides a digital readout of selected magnetic course.

(6) Course pointer. The yellow course pointer is positioned on the heading dial by the course knob to select a magnetic bearing that coincides with the desired VOR or TACAN radial, or INS or localizer course. The course pointer rotates with the heading

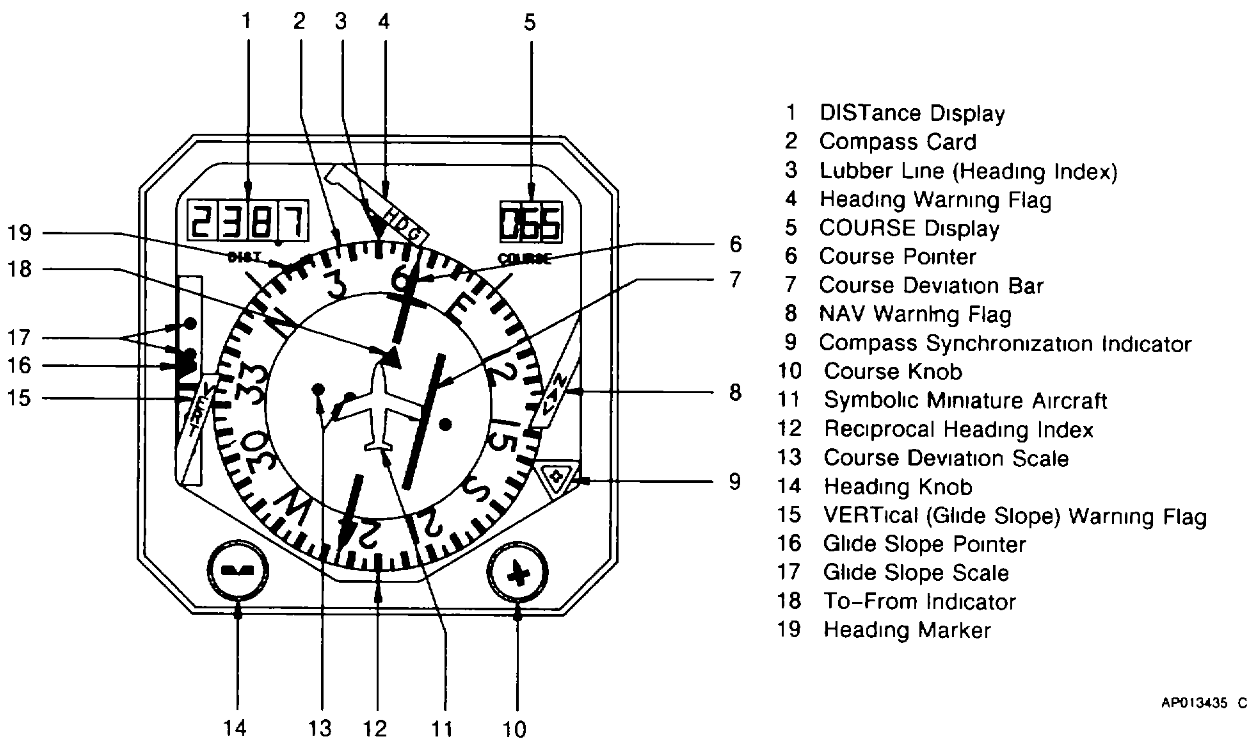


Figure 3-9. Copilot's Horizontal Situation Indicator (RD-550R)

dial to provide a continuous readout of course error to the computer.

(7) Course deviation bar. The course deviation bar represents the centerline of the selected VOR, TACAN, INS or localizer course. The miniature aircraft symbol pictorially shows actual aircraft position in relation to this selected course.

(8) NAV flag. Indicates that information derived from the selected navigational source (VOR, TACAN or INS) is invalid and should not be used.

(9) Compass synchronization annunciator. The compass synchronization annunciator consists of a dot and X symbol display. When the compass system is in the slaved mode, the display will oscillate between the dot and X symbol, indicating the heading dial is synchronized with a gyro stabilized magnetic heading.

(10) Course knob. Positions the course indicator.

(11) Aircraft symbol. The fixed miniature aircraft symbol corresponds to the longitudinal axis of the aircraft and lubber line markings. The symbol shows aircraft position and heading with respect to a radio course and the rotating heading (azimuth) dial.

(12) Reciprocal heading index. Fixed heading mark.

(13) Course deviation dots. In VOR, TACAN, or INS operation, each dot represents a 5 degree deviation from the centerline (± 10 degrees). In ILS operation, each dot represents 1 degree deviation from the centerline. In INS operation, each dot represents a 3.75 nautical miles deviation from centerline.

(14) Heading knob. Positions the heading marker to a preselected compass heading.

(15) VERT flag. Indicates that the information displayed by the glideslope pointer is invalid and should not be use.

(16) Glideslope pointer. Displays glideslope deviation. The pointer is in view only when tuned to a localizer frequency. If the aircraft is below glideslope path, the pointer is displayed upward on the scale.

(17) Glideslope scale. Each dot represents approximately 0. 4 degree displacement.

(18) To-From pointers. The to-from pointers aligned on the course pointer, are located 180 degrees apart. One always points in the direction of the station, along the selected VOR or TACAN radial or toward INS waypoint.

(19) Heading marker. The notched orange heading marker is positioned on the rotating heading dial by the heading knob, and displays preselected compass heading. The marker rotates with the heading dial.

(20) Copilot's COURSE INDICATOR switch (fig. 2-14). Selects desired source of data for display on copilot's HSI.

(a) NA V 1. Selects data from VOR I system.

(b) NA V 2. Selects data from VOR 2 system.

(c) TACAN. Selects data from TACAN system.

(d) INS. Selects data from INS.

3-17. PILOT'S ATTITUDE DIRECTOR INDICATOR (AD-650B).

a. Description. The pilot's attitude director indicator (ADI) (fig. 3-10) combines the attitude sphere display with computed steering information to provide the commands required to intercept and maintain a desired flight path. It also contains an eyelid display, expanded localizer, glideslope, radio altitude display, mode annunciators, go-around and decision height annunciators, and inclinometer. Any warning flag in view indicates that portion of information is unreliable.

b. Controls/lndicators and Functions.

(1) Attitude sphere. Moves with respect to the symbolic aircraft reference to display actual pitch and roll attitude. Pitch attitude marks are in 5 degree increments on a blue and brown sphere.

(2) Roll attitude index. Displays actual roll attitude through a movable index and fixed scale reference marks at 0, 10, 20, 30, 45, 60 and 90 degrees.

(3) GA (go-around) annunciator. Illuminates when go-around mode has been selected.

(4) SPD annunciator. Illuminates when airspeed is being held by the flight director, in the IAS mode.

(5) ALT annunciator. Illuminates when altitude is being held by the flight director.

(6) HDG annunciator. Illuminates when heading is being held by the flight director, in the NAV ARM, BC ARM mode.

(7) NAV annunciator. Illuminates when a NAV source is controlling the flight director, in the NAV CAP, VOR APR mode.

(8) LOC annunciator. Illuminates whenever the flight director is controlling a localizer approach, in the NAV CAP mode.

(9) APR annunciator. Illuminates whenever the flight director is controlling an approach, in the NAV CAP, VOR APR mode.

(10) GS annunciator. Illuminates whenever the flight director is in GS CAP mode, and glideslope has been captured.

(11) BC annunciator. Illuminates whenever the flight director is in BC CAP mode, and has captured the back course approach heading.

(12) VRT annunciator. Illuminates when vertical speed is being held by the flight director, in the VS mode.

(13) DH annunciator. Illuminates when aircraft descends below selected decision height as set on the radio altimeter indicator.

(14) Eyelid display. Surrounds the attitude sphere and provides positive attitude identification by means of a blue eyelid which always shows the relative position of the sky, and a brown eyelid which always shows the relative position of the ground. The eyelids maintain the proper ground-sky relationship, regardless of sphere position.

(15) Speed command display. The pointer indicates relative airspeed provided by the angle-ofattack/speed command system.

(16) Flight director command cue. Displays

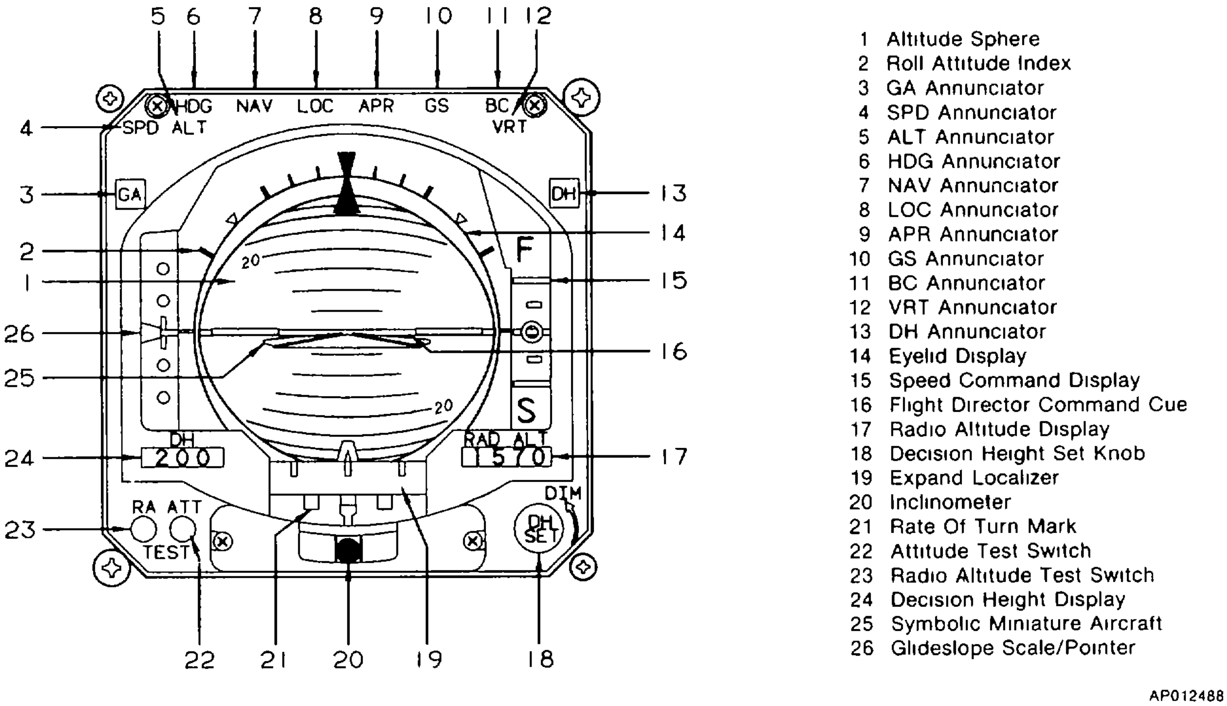


Figure 3-10. Pilot's Attitude Director Indicator (AD-650B)

computed commands to capture and maintain a desired flight path. Always fly the symbolic miniature aircraft to the flight director cue. The cue will bias from view should a failure occur in either the pitch or roll channel.

(17) Radio altitude display. Radio altitude is digitally displayed. The range capability of the display is from -20 to 2500 feet AGL. The display resolution between 200 and 2500 feet is in 10 foot increments. The display resolution below 200 feet is 5 feet. The display will be blank at altitudes over 2500 feet AGL. Dashes are displayed whenever invalid radio altitude is being received.

(18) DH SET control knob. Sets decision height from 0 to 990 feet. Decision height displays in the DH window on lower left corner of ADI. The brightness of the digital radio altitude and decision height display is controlled by the dimming knob which is concentric with the DH SET knob. The dimming knob also dims the distance and course display on the pilot's HSI, and the altitude alert display.

(19) Expanded localizer. Raw localizer displacement data from the navigation receiver (HSI display) is amplified approximately 7 1/2 times to permit the expanded localizer pointer to be used as a sensitive reference indicator of the aircraft's position, with respect to the center of the localizer. It is normally used for assessment only, since the pointer is very sensitive and difficult to fly throughout the entire approach. During final approach, the pointer serves as an indicator of the Category II window. Full scale deflection of the expanded localizer pointer is equal to 1/4 degree of beam signal. The expanded localizer is displayed by the localizer pointer only when a valid localizer signal is available.

(20) Inclinometer. Gives the pilot a conventional display of aircraft slip or skid, and is used as an aid to coordinated maneuvers.

(21) Rate of turn. Rate of turn is displayed by the pointer at the bottom of the ADI. The marks at the extreme left and right sides of the scale represent a standard rate turn.

(22) Attitude (OTT) test switch. When depressed, the sphere will show an approximate attitude change of 20 degree,; of right bank at i 0 degrees pitch-up. The ATT warning flag will appear.

(23) Radio altitude (RA) test switch. Pressing

the RA test button causes the following displays on the radio altitude readout: all digits display 8 then dashes, and then the preprogrammed test altitude as set in the radio altimeter R/T unit, until the test button is released at which time the actual altitude is displayed. The DH display during the test displays all 8's with the altitude display and then displays the current set altitude for the remainder of the test. RA test is inhibited as a function of APR CAP.

(24) Decision height (DH) display. The digital DH display, presents decision height range from 0 to 990 feet in 10 foot increments. The decision height is set by the knob in the lower right corner of the ADI.

(25) Symbolic miniature aircraft. Serves as a stationary symbol of the aircraft. Aircraft pitch and roll attitudes are displayed by the relationship between the fixed miniature aircraft and the movable sphere. The symbolic aircraft is flown to align the command cue to the aircraft symbol in order to satisfy the commands of the selected flight director mode.

(26) Glideslope scale and pointer. Displays aircraft deviation from glideslope beam center only when tuned to an ILS frequency and a valid glideslope signal is present. The aircraft is below glideslope if pointer is displaced upward. The glideslope dot represents approximately 0. 4 degree deviation from the beam centerline.

3-18. COPILOT'S GYRO HORIZON INDICATOR (GH-14B).

a. Description. The copilot's gyro horizon indicator (fig. 3-11) is a flight aid which indicates the aircraft's attitude. The attitude given is in relationship to an artificial horizon. There are no front panel fuses or circuit breakers provided for the copilot's gyro horizon indicator. b. Indicators and Functions.

(1) Bank angle scale. Indicates aircraft bank angle from zero to 90 degrees with marks at 10, 20, 30, 45, 60, and 90 degrees.

(2) Bank angle pointer. Indicates aircraft bank angle.

(3) Bank angle index. Reference indicating zero-degree bank.

(4) Horizon line. Affixed to sphere, remains parallel to the earth's horizon at all times.

(5) G flag. Presence announces loss of power.

(6) Sphere. Indicates orientation with earth's axis at all times.

(7) Inclinometer. Assists the copilot in making coordinated turns.

(8) Miniature aircraft. Indicates attitude of aircraft with respect to the earth's horizon.

3-19. TURN AND SLIP INDICATORS.

a. Description. The pilot and copilot have identical turn and slip indicators (fig. 3-12) protected by two 5-ampere circuit breakers placarded TURN & SLIP PILOT and TURN & SLIP COPILOT on the overhead circuit breaker panel (fig. 2-6).

b. Controls/Indicators and Functions.

(1) Two-minute turn marks. Fixed markers indicate two-minute turn rate when covered by turn rate indicator.

(2) Turn rate indicator. Deflects to indicate rate of turn.

(3) Inclinometer. Indicates lateral acceleration (side slip) of aircraft.

3-20. GYROMAGNETIC COMPASS SYSTEMS.

a. Description. Two identical compass systems provide accurate directional information for the aircraft at all latitudes of the earth. As a heading reference, two modes of operation are used: directional gyro (FREE) mode, or slaved (SLAVE) mode. In polar regions of the earth where magnetic heading references are not reliable, the system is operated in the FREE mode. In this mode, the system furnishes an inertial heading reference, with latitude corrections introduced manually. In areas where magnetic heading references are reliable, the system is operated in the SLAVE mode. In this mode, the directional gyro is slaved to the magnetic flux detector, which supplies long-term magnetic reference to correct the apparent drift of the gyro. Magnetic heading information from both systems is applied to various aircraft systems through pilot and copilot COMPASS No. 1 No. 2 switches.

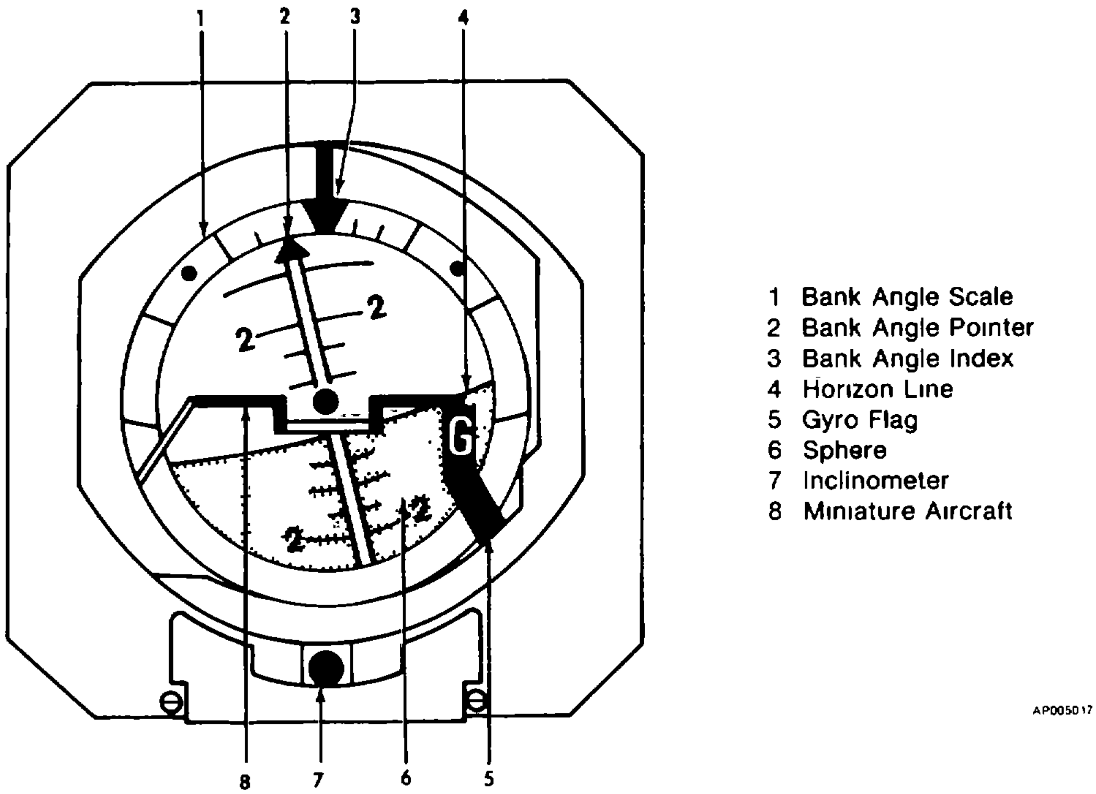


Figure 3-11. Copilot's Gyro Horizon Indicator (GH-14B)

b. Vertical Gyro. A vertical gyro provides line-of-sight stabilization to the weather radar and roll and pitch information to the autopilot. A FAST ERECT switch at the top of the pilot's instrument panel (fig. 2-14) provides a means for fast erection of the gyros. Pressing and holding the FAST ERECT switch will erect the gyro to within 1. 0° of pitch and roll within 60 seconds of power application, and erect to within 0. 5° within 2 minutes. Normal operation of the vertical gyro system will not require use of the fast erect switch.

c. Controls and Functions.

(1) Pilot's COMPASS No. 1 No. 2 switch. Selects desired source for magnetic heading information to display on pilot's HSI and copilot's RMI.

(a) No. 1. Selects compass system No. 1 for display.

(b) No. 2. Selects compass system No. 2 for display.

(2) Copilot's COMPASS No. 1 No. 2 switch. Selects desired source for magnetic heading information to display on pilot's RMI and INS, and copilot's HSI.

(a) No. 1. Selects compass system No. 1 for display.

(b) No. 2. Selects compass system No. 2 for display.

(3) GYRO SLAVE-FREE switch. Selects system mode of operation.

(a) SLAVE. Selects slaved mode. Compass flux valve connects to azimuth card.

(b) FREE. Selects free mode. Flux valve is not connected to azimuth card.

(4) INCREASE-DECREASE switch. Provides manual fast synchronization of the system.

(a) INCREASE. Causes gyro heading output to increase (move in clockwise direction).

(b) DECREASE. Causes gyro heading

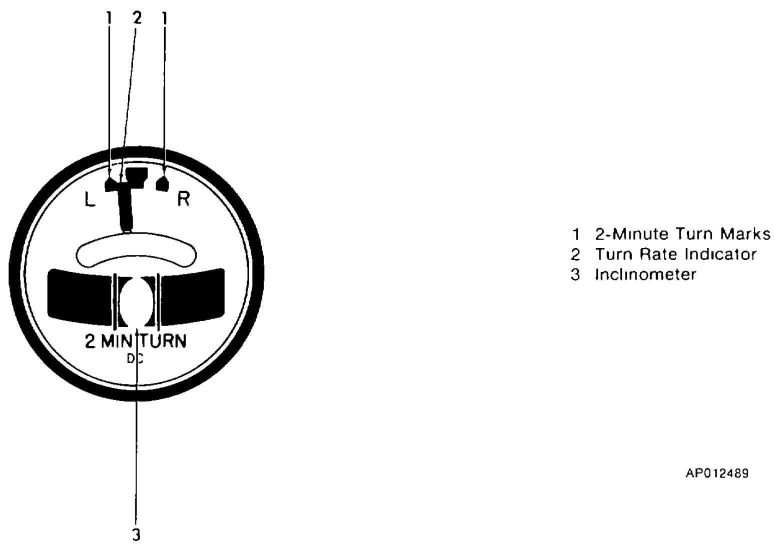


Figure 3-12. Turn and Slip Indicator

output to decrease (move in counter-clockwise direction).

d. Normal Operation.

(1) Alignment procedure:

1. Gyro compass slave-free switch SLAVE.
2. Gyro compass increase-decrease switch Hold switch momentarily in the direction desired, and then release. This will place system in fast erect mode. The gyro will then erect at approximately 30 degrees per minute. While in the fast erect mode, the HEADING flag (HSI) will be in view. When the HEADING flag retracts from view, the heading displayed will be the magnetic heading.

(2) To determine magnetic heading:

1. Gyro compass slave-free switch SLAVE.
2. RMI rotating heading dial (compass card) - Read heading.

(3) To determine directional gyro heading:

1. Gyro compass slave-free switch FREE.
2. Gyro compass increase-decrease switch Hold until the RMI compass card aligns with the magnetic heading, then release.
3. Read heading. The heading will agree with the appropriate HSI.

e. Shutdown Procedure. Both compass systems are shut down when both the INVERTER NO. 1 and INVERTER NO. 2 switches are turned off. (If either inverter is on, both compass sets will be energized.)

3-21. ALTITUDE SELECT CONTROLLER (AL-800).

a. Description. The Altitude Select Controller (FIG. 3-13) provides a means for setting the desired altitude reference for the altitude alerting and altitude preselect system.

(1) Selected altitude display. Displays selected value.

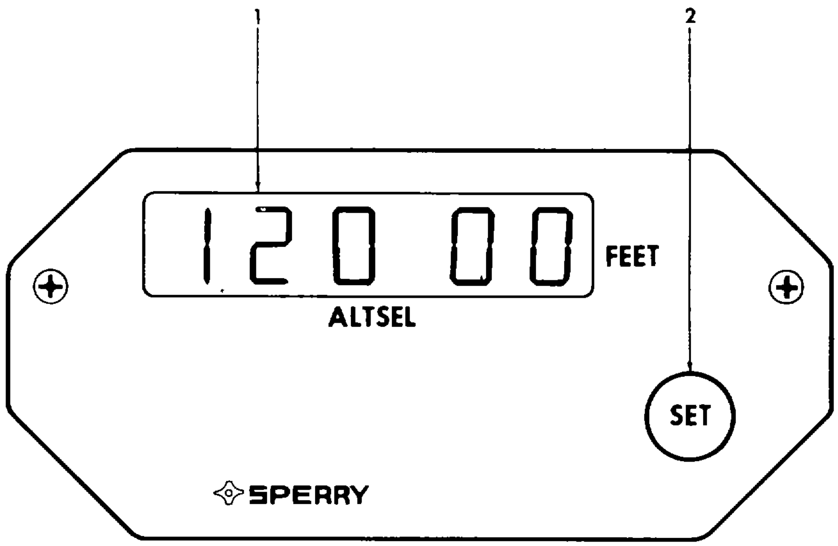


Figure 3-13. Altitude Select Controller (AL-800)

(2) *Altitude selector knob*. Selects desired altitude.

b. *Altitude preselect*. The altitude is selected by turning the selector knob until the altitude display reads the desired value. No further action is taken on the controller. To initiate altitude preselect, the ALTSEL button is selected on the flight director controller. The pilot must initiate a maneuver to fly toward the preselected altitude. Any of the following pitch modes may be engaged: Pitch Hold, Airspeed Hold or Vertical Speed Hold. Upon initiation of altitude preselect capture, the previously selected pitch mode is automatically reset.

3-22. RADIO ALTIMETER INDICATOR (RA-315).

a. *Description*. The radio altimeter indicator (FIG. 3-14) displays radio altitude information from 2500 feet to touchdown with an expanded linear scale below 500 feet.

b. *Controls/Indicators and Functions*.

(1) *DH annunciator*. Annunciator illuminates to alert pilot that aircraft is at or below selected DH.

(2) *Decision height bug*. Manually set by knob to establish DH.

(3) *Failure warning flag*. When visible, indicates that system information is unreliable.

(4) *Altitude pointer*. Points to dial reading for current radio altitude from 0 to '2500 feet.

(5) *Decision height set knob*. Used to manually set DH.

(6) *TEST pushbutton*. Pressed to check indicator R/T unit and flag operation.

Operating the test button causes the flag to come into view and altitude pointer to indicate approximately 100 feet. Release of button causes pointer to return to existing altitude, and flag to retract.

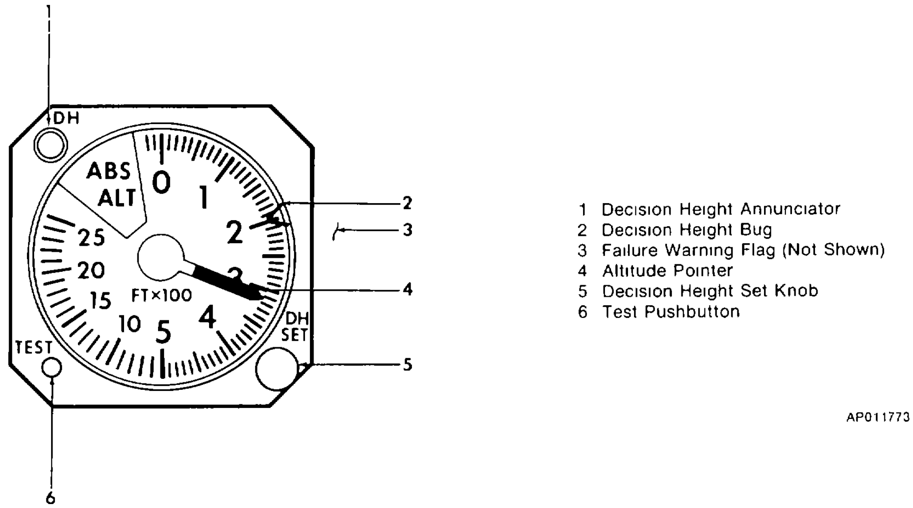


Figure 3-14. Radio Altimeter Indicator (RA-315)

3-23. VHF NAVIGATION RECEIVERS (VIR-32).

a. Introduction. The VHF navigation receivers (FIG. 3-15) provide 200, 50-kHz spaced, VOR/ localizer channels from 108.00 through 117.95 MHz, 40 glideslope channels, automatically paired with localizer channels, and a marker beacon receiver. The digital navigation receiver provides VOR, LOC, and GS deviation outputs, high and low level flag signals, magnetic bearing to the station, to-from information, marker beacon lamp signals, and VOR and marker beacon audio outputs. The navigation receivers are powered through the 2-ampere VOR NO. 1 and VOR NO. 2 circuit breakers which are located in the overhead circuit breaker panel (FIG. 2-6).

b. Operating Controls. All operating controls for the navigation receiver are located on the navigation receiver control unit.

(1) Frequency Indicator. Indicates the operating frequency of the receiver.

(2) Frequency Control. Two concentric tuning knobs control the operating frequency. The larger knob changes the three digits to the left of the decimal point in 1-MHz steps. The smaller knob changes the two digits to the right of the decimal point in 0.05 MHz steps. The two, frequency select switches are independent of each other so that the upper and lower rollover of the 0.1 MHz digit will not cause the 1.0 MHz digit to change.

(3) NAV TEST Pushbutton. When pressed, the following indications are presented:

(a) RMI. Single needle indicates 5°.

(b) CDI. Lateral deviation to the right. Glideslope deviation down.

c. VOR Receiver Operation.

(1) Equipment Turn-On. The VIR-32 receiver and the NAV control are turned on by rotating the VOL/OFF control clockwise.

(2) VOR Operating Procedures.

1. Frequency controls Set desired frequency.

2. VOL control - As required.

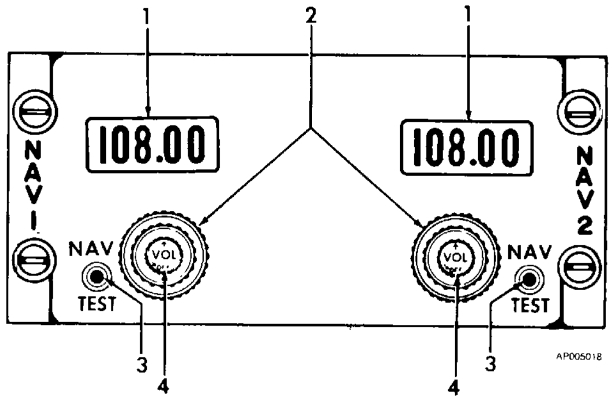


Figure 3-15. Navigation Receiver Control Unit (VIR-32)

3. To determine course to station on horizontal situation indicator:

   a. VOR #1, #2 switch - As required.

   b. Course knob Rotate knob until course deviation bar is centered and TO-FROM arrow indicates TO.

   c. Course readout Read bearing to station.

4. To determine course to station on RMI:

   a. Single or double needle pointer switches As required (depending upon whether VOR #1 or VOR #2 is in use).

   b. Single or double needle on RMI Read course to station.

5. Localizer receiver operation procedure:

   a. Frequency controls Set desired frequency.

   b. VOR #1, #2 switch - As required.

   c. Horizontal situation indicator Steer aircraft as required to center course deviation bar.

6. Marker beacon operating procedure:

   a. Marker beacon indicator annunciators Observe for beacon indication..

   b. Marker beacon HI-LO sensitivity switch - As required

   c. Marker beacon VOL control As required.

7. Glideslope operating procedure:

   a. Frequency controls Set desired localiz2:er frequency.

   b. VOR #1, #2 switch - As required.

   c. Glideslope pointer Steer aircraft as required to center pointer.

8. VHF communications receiver operating procedure:

   a. Frequency controls Set desired frequency.

b. VOL control - As required.

9. Shutdown procedure:

a. VOL/OFF control Turn counterclockwise.

3-24. ADF RECEIVER (ADF-60).

a. Introduction. The ADF receiver (FIG. 3-16) provides aural reception of signals from a selected ground station and indicates relative bearing to that station. The ground station must be within the frequency range of 190.0 to 1749.5 kHz. The ADF receiver has three functional modes of operation. In the antenna (ANT) mode the ADF receiver functions as an aural receiver, providing only an aural output of the received signal. In automatic direction finder (ADF) mode, it functions as an automatic direction finder receiver in which relative bearing to the station is presented on an associated bearing indicator, and an aural output of the received signal is provided. The tone (TONE) mode provides a 1000-Hz aural output tone when a signal is being received to identify keyed continuous wave (CW) signals. The ADF receiver is powered through the 2-ampere ADF circuit breaker located on the overhead circuit breaker panel.

b. ADF Control Unit Operating Controls, Indicators, and Functions. All operating controls for the ADF receiver are located on the ADF control unit.

(1) Frequency Display. Indicates the frequency to which the ADF receiver is tuned.

(2) TEST Button. Activates diagnostic self-test when pressed.

(3) TONE/OFF Switch. Permits operation of output tone when signal is received.

(4) Tuning Control. Selects operating frequency.

(5) OFF/ANT/ADF Switch. The OFF position removes power from the system. ANT permits operation as an audio receiver only. ADF permits automatic direction finding or homing operation.

c. Normal Operation.

1. Power and mode switch - ANT or ADF.

2. Tuning knobs - Set desired frequency.

a. ANT function Position the power and mode switch to ANT. The RMI pointer will park horizontally. Select ADF on the audio system and adjust the volume.

b. ADF function Position the power and mode switch to ADF. The RMI pointer will indicate relative bearing to the tuned station.

NOTE

When the ADF system is not receiving a reliable signal, the RMI pointer will remain parked in the ADF mode. The ADF may momentarily park during station crossings due to signal loss. c. TONE function Position the TONE/ OFF switch to TONE. A 1000-Hz tone will identify keyed CW stations.

3. Self-Test.

a. Power and mode switch - ADF.

b. Tuning knobs Tune a nearby NDB, outer marker, or broadcast station.

c. TEST switch Depress. RMI pointer will rotate 90 degrees from the previous valid indication. Release the TEST switch and verify that the RMI pointer returns to that indication.

NOTE

If the signal received is weak or of poor quality, the bearing pointer rotation will be slow.

3-25. TACAN SYSTEM (AN/ARN-154).

a. Description. The TACAN (FIG. 3-17) system operates in conjunction with TACAN and VORTAC ground stations to provide distance, groundspeed, time to station, and bearing to station. It operates in the L band 1000 MHz frequency range on one of 252 preselected frequencies, 126 X mode and 126 Y mode channels. Course deviation and distance to TACAN or VORTAC stations are displayed on the HSI. Distance, time to station, and groundspeed are displayed on the TACAN digital display. The groundspeed and time to station, are accurate only if the aircraft is flying directly toward the ground station at a sufficient distance that the slant range and ground range are nearly equal. The system is protected a 2-ampere circuit breaker in the AVIONICS portion of the overhead circuit breaker panel labeled TACAN.

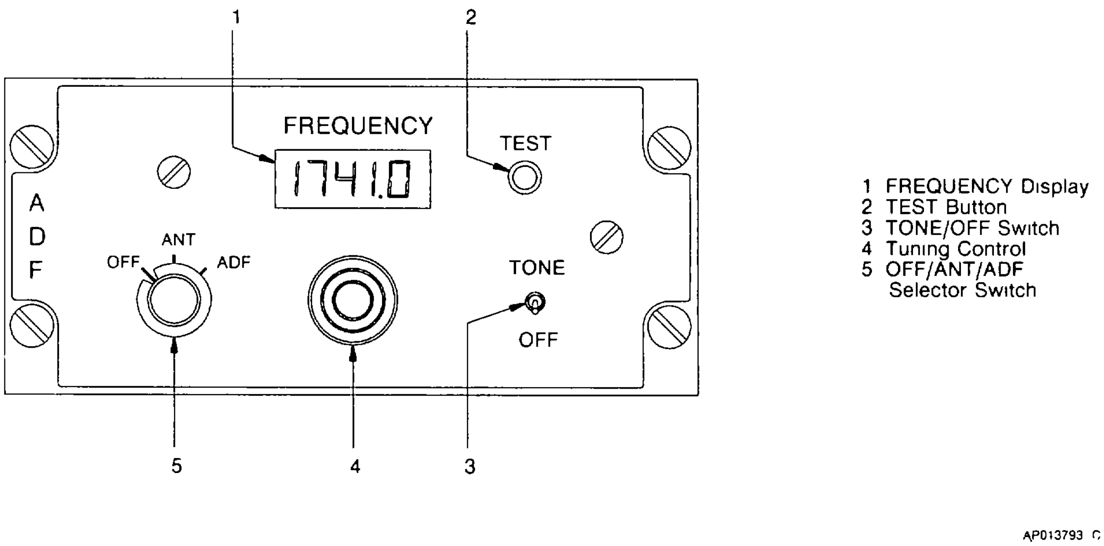


Figure 3-16. ADF Control Unit (ADF-60)

NOTE

The TACAN portion of a VORTAC station will be read on the HSI only when the proper channel is selected on the TACAN control panel and TACAN is selected with the HSI selector switch. TACAN range information is displayed on the HSIs when NAV 1, NAV 2, or TACAN is selected as the navigation source. Distance information accuracy is dependent upon the selection of the proper TACAN station.

The TACAN system may be operated on the flight director system and connected to and used with the autopilot system. When employed as the primary means of navigation, aircraft flight may be controlled manually or by the autopilot. Magnetic bearing to TACAN stations may be shown on the RMIs when the VOR/TACAN switch to the lower left of the pilots' RMI and to the far right of the copilot's instrument panel are set to the TACAN position. Also the VOR/TACAN switch for the #1 (yellow) needle on the RMIs must be selected to the VOR/TACAN position. Course deviation only may be shown on the HSIs when the TACAN selector for the HSI is depressed. TACAN slant range is displayed on each HSI range in the digital distance display. TACAN distance, groundspeed, and time to station are all displayed in the TACAN indicator located on the copilot's instrument panel.

The TACAN control panel enables selection of the TACAN frequency (channel) to be used, and provides self-test of TACAN circuits. X, Y or XA/A channel is selected by the X-Y-XA/A switch. Y channels differ from X channels in frequency assignment and pulse spacing. Y channels were developed to relieve frequency congestion. Use of the Y channels has been implemented along with 0.05 MHz spacing for VOR/VORTAC stations and Y channels are paired with these new frequencies (for example, VOR frequency 113.1 is TACAN channel 78X; VOR 113.15 is TACAN channel 78Y). DOD FLIP charts will include the Y designation in the Data Block for Radio Aids to Navigation. The XA/A position enables air to air ranging with other similarly equipped aircraft. Tuning channels for the two aircraft must be 63 channels apart. The small (outer) control provides system power ON/OFF and station identity tone volume control. TACAN circuits are protected by a TACAN circuit breaker in AVIONICS portion of the copilot's right sidewall panel.

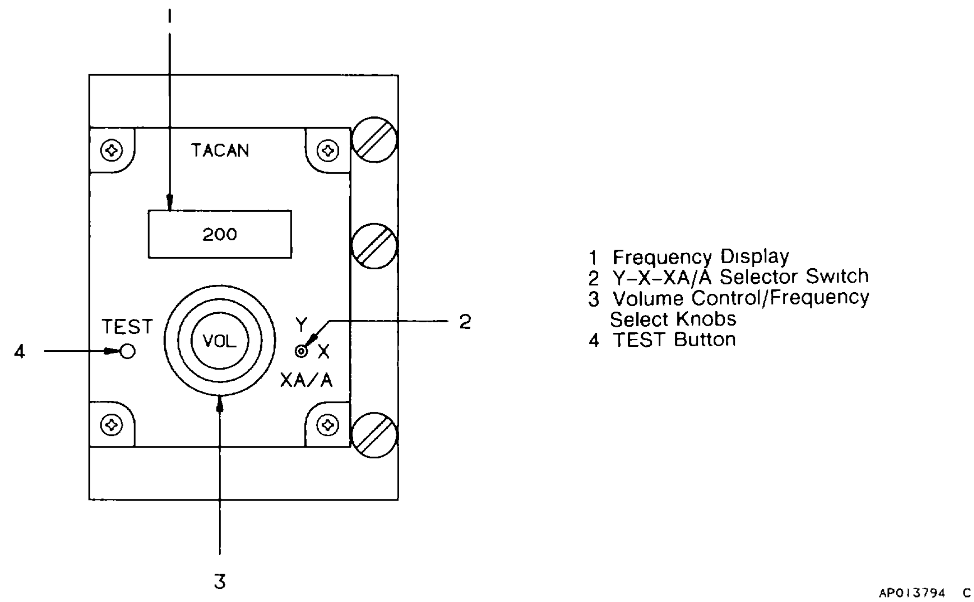


Figure 3-17. TACAN Control Panel

b. Control Panel Controls and Functions.

(1) TACAN Channel Display. Indicates selected channel.

(2) X-Y-XA/A Switch. Selects either X, Y, or XA/A mode.

(3) Channel Selectors. Selects desired channel.

(4) TEST Pushbutton. When pressed, activates functional self-test.

(5) VOL(ON)/OFF Knob. Provides system power and volume control.

c. TACAN Indicator Controls and Functions (FIG. 3-18).

(1) NM. Displays slant range distance in nautical miles from aircraft to ground station.

(2) KT. Displays groundspeed in knots.

(3) MIN. Displays time to TACAN station in minutes.

d. Operation.

(1) TURN-ON.

NOTE

It is assumed the Avionics Master Power switch is on, and that normally used avionics circuit breakers remain depressed.

1. TACAN control panel Turn VOL(ON)/OFF knob ON.
2. VOR/TACAN switch Select TACAN.
3. RMI selector for #1 needle (yellow) Selector VOR/TACAN.
4. HSI switches - Depress TACAN.
5. Self-test procedure Course knob on HSI - Set 180-degree course.
6. TACAN control panel Hold test switch engaged while confirming following results:

HSI course indicator centers on a 180±2 degrees TO indication. Using course knob, increase selected course. Deviation bar will move to left. Decrease

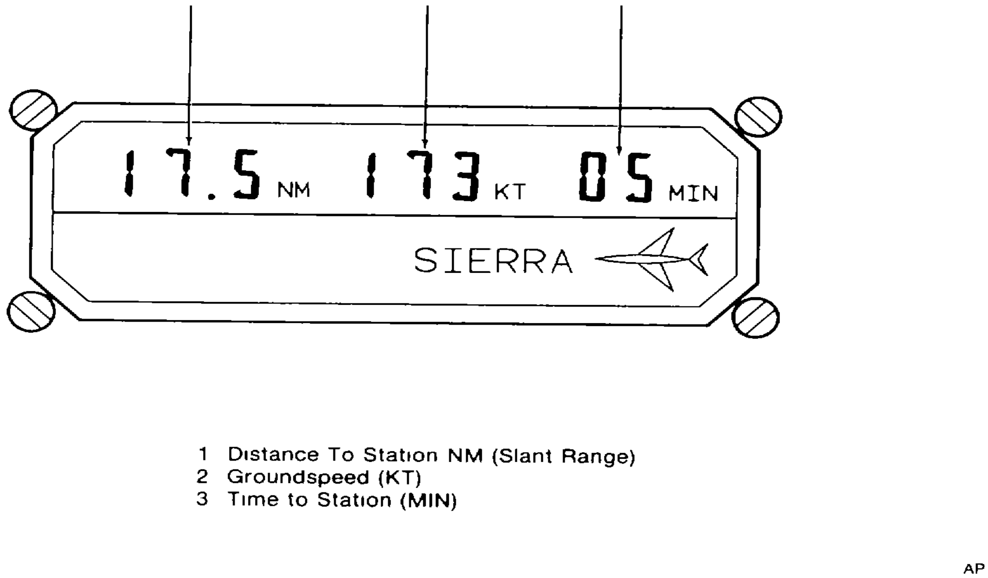


Figure 3-18. TACAN Indicator

selected course: deviation bar will center and move to right of center. Full scale deflection will be 10 degrees, ± 1 degree.

(2) Normal Operation.

1. VOR/TACAN switch Select TACAN/ADF

2. RMI selector for #1 needle single (yellow) - Select VOR

3. HSI switches - Depress TACAN.

4. Mode switch (X-Y-XA/A) As required.

5. TACAN control panel Select desired channel.

6. Wait 5 seconds for signal acquisition and lock-on. If bearing signal lock-on does not occur, the TACAN remains in the bearing search mode. If bearing lock-on is not obtained, perform an inflight self test to ensure correct operation of the system. Any time the course indicator's flag is in view, the bearing, course deviation, and the TO-FROM information may be inaccurate and should be disregarded.

NOTE

On the RMI, there is no warning flag to indicate failure to receive the station. Instead, the RMI needle will drive to the park or 3 o'clock position. Always cross-check the RMI with the HSI course indicator for a possible warning flag.

7. Ensure that audio station identification signal is correct for the ground station selected.

8. COURSE knob (HSI) Set course desired. Verify proper TO or FROM pointer indication.

9. Intercept course as required. Verify intercept heading by reference to the RMI. Use applicable RMI procedures.

10. Course deviation bar (HSI) Read deviation from selected course. The difference between the aircraft's heading and the course pointer, when the course deviation bar is centered and the aircraft is tracking the selected course, will show the wind correction angle.

11. TACAN indicator Read range (NM). Verify proper range is represented on

HSI distance readout.

12. To proceed directly TO or FROM a TACAN station or to determine the course, rotate the course knob until the course deviation bar is centered and the TO-FROM pointer indicates TO or FROM.

NOTE

Always cross-check the HSI with the RMI and other available navaids to determine position.

13. To use TACAN during pilot controlled flight, control aircraft by manual controls, responding to information displayed on the flight director, RMI, HSI and other instruments.

14. To use TACAN with the autopilot, depress A/P ENGAGE and monitor autopilot performance on flight director, RMI, and TACAN indicators. Verify adherence to preset heading and course, and confirm the execution of displayed steering commands.

NOTE

The TACAN groundspeed reading will be accurate only when the aircraft is on a course directly to or from the TACAN station. When headed away from the station, the TACAN indicator minutes reading will be in error.

(3) Emergency Operations. Not applicable.

(4) Shutdown. Turn VOL(ON)/OFF knob OFF.

3-26. AUTOMATIC FLIGHT CONTROL SYSTEM.

a. Description. The Automatic Flight Control System is a completely integrated autopilot/flight director/air data system which has a full complement of horizontal and vertical flight guidance modes. These include all radio guidance modes, and air data oriented vertical modes. When engaged and coupled to the flight director (FD) commands, the system will control the aircraft using the same commands displayed on the attitude director indicator. When engaged and uncoupled from the flight director commands, manual pitch and roll commands may be inserted using the pitch wheel, turn knob, and/or heading bug.

When the autopilot is coupled, the flight director instruments act as a means to monitor the performance of the autopilot. When the autopilot is not engaged, the same . modes of operation are available for flight director only. The pilot maneuvers the aircraft to satisfy the Flight Director commands, as does the autopilot when it is engaged.

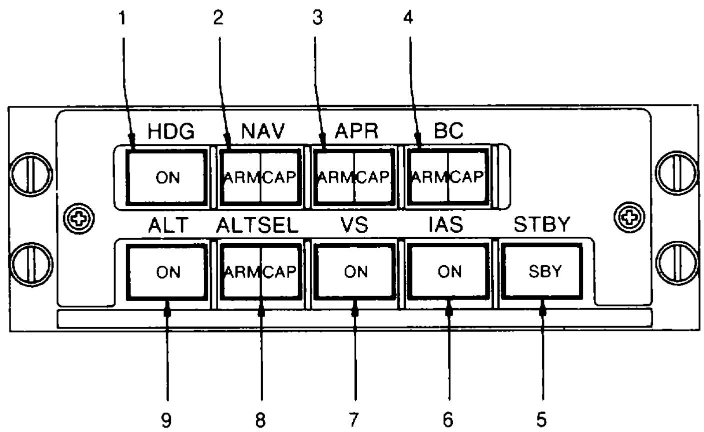
b. Air Data Computer. A digital air data computer, located in the forward avionics compartment provides the altitude information for the pilot's altimeter, altitude alerter, and transponder. The computer also provides altitude and airspeed hold function data to the flight control computers. The air data computer receives 28 VDC power through and is protected by the 2-ampere circuit breaker placarded AIR DATA ENCDR located in the AVIONICS section of the overhead circuit breaker panel. All air data computer functions are automatic in nature and require no flight crew action.

c. *Flight Director Mode Selector*. The Flight Director Mode Selector (FIG. 3-19), located in the pedestal, provides for selection of all modes (except go-around, which is initiated by a remote switch located on the left power lever) for the flight director. The top row of split annunciated pushbuttons contains the lateral modes and the bottom row contains the vertical modes. The mode buttons will illuminate when manually selected, or automatically selected through other modes.

The split pushbutton annunciators, illuminate amber for armed conditions and green for captured. When more than one lateral or vertical mode is selected, the flight director system automatically arms and captures the submode. Mode annunciations are also presented on remote annunciator blocks, located above the pilot's Attitude Director Indicator (ADI), and on the pilot's ADI. Operating modes and annunciation events of the Flight Director system are detailed in figure 3-20.

d. Controls/Indicators and Functions (FIG. 3-19):

(1) Heading Select Mode Switch (HDG). The Heading Select Mode is selected by depressing the HDG button on the mode selector. In the HDG mode the flight director computer provides inputs to the command cue, to command a turn to the heading indicated by the heading bug on the HSI. The heading select signal is gain programmed as a function of airspeed. When HDG is selected, it overrides the NAV, BC APR and VOR APR modes. In the event



1 Heading Mode Pushbutton Switch
2 Navigation Mode Pushbutton Switch
3 Approach Mode Pushbutton Switch
4 Back Course Mode Pushbutton Switch
5 Standby Mode Pushbutton Switch
6 Indicated Airspeed Hold Mode Pushbutton Switch
7 Vertical Speed Hold Mode Pushbutton Switch
8 Altitude Preselect Mode Pushbutton Switch
9 Altitude Hold Mode Pushbutton Switch

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Figure 3-19. Flight Director Mode Selector (MS-400)

of a loss of valid signal from the gyro or compass, the command cue on the ADI is biased out of view.

(2) Navigation Mode Switch (NAV). When depressed, selects the navigation mode. The Navigation Mode represents a family of modes for various navigation systems including VOR, Localizer, TACAN and INS.

(3) VOR Mode. The VOR Mode is selected by selecting either NAV 1 or NAV 2 on the Course Indicator select switch on the pilot's instrument panel, and then depressing the NAV button on mode selector with the navigation receiver tuned to a VOR frequency. (A VOR indicator, NV1 or NV2 on the pilot's HSI, will illuminate. VOR NAV information will display on the pilot's HSI and RMI). Prior to VOR capture, the command cue receives a heading select command as described above and the HDG mode switch is illuminated along with the NAV ARM annunciators. Upon VOR capture, the system automatically: switches to the VOR mode; HDG and NAV ARM annunciators extinguish; and NAV capture (NAV CAP) annunciators will illuminate. At capture, a command is generated to capture and track the VOR radial. The course error signal is gain programmed as a function of airspeed. Crosswind washout is included which maintains the aircraft on radial center in the presence of crosswind. The intercept angle is used in determining the capture point to ensure smooth and comfortable performance during bracketing.

When passing over the station, an overstation sensor detects station passage, removing the VOR deviation signal from the command until it is no longer erratic. While over the station, course changes may be made by selecting a new course on the HSI.

If the NAV receiver is not valid prior to the capture point, the lateral radial sensor will not trip and the system will remain in the HDG mode. After capture, if the NAV receiver, compass data or vertical gyro become invalid, the ADI command cue will bias out of view. Also, the NAV CAP annunciators will extinguish if the NAV receiver becomes invalid.

(4) VOR Approach Mode. The VOR Approach Mode is selected by depressing the APR button on the mode selector with the navigation receiver tuned to a VOR frequency. The mode operates identically to the VOR mode with the gains optimized for a VOR approach.

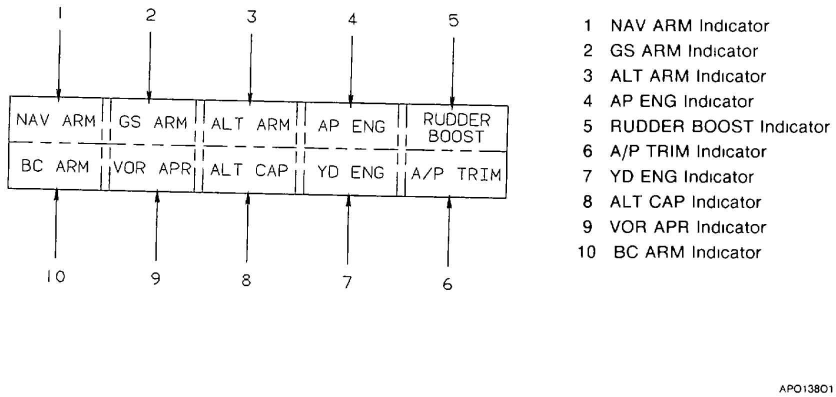


Figure 3-20. Flight Director Modes and Annunciators

(5) Localizer Mode. The Localizer Mode is selected by depressing the NAV button on the mode selector with the navigation receiver tuned to a LOC frequency. Mode selection and annunciation in the LOC mode is similar to the VOR mode. The localizer deviation signal is gain programmed as a function of radio altitude, time and airspeed. If the radio altimeter is invalid, gain programming is a function of glideslope capture, time and airspeed. Other valid logic is the same as the VOR mode.

(6) Back Course Mode (BC). The back course mode is selected by pressing the BC button on the mode selector. Back course operates the same as the LOC mode with the deviation and course signals reversed to make a back course approach on the localizer. When BC is selected, and outside the lateral radial sensor trip point, BC ARM and HDG annunciators will illuminate. At the capture point, BC CAP will be annunciated with BC ARM and HDG annunciators extinguished. When BC is selected, the glideslope circuits are locked out.

(7) Localizer Approach Mode (APR). The approach mode is used to make an ILS approach. Pressing the APR button with a ILS frequency tuned, arms both the NAV and APR modes to capture the localizer and glideslope respectively. No alternate NAV source can be selected. Operating LOC mode is the same as described above except, if the radio altimeter is invalid in APR mode, gain programming is a function of glideslope capture, time, and airspeed.

With the APR mode armed, the pitch axis can be in any one of the other pitch modes except go-around. When reaching the vertical beam sensor trip point, the system automatically switches to the glideslope mode. The pitch mode and APR ARM annunciators extinguish and APR CAP annunciator illuminates on the controller. At capture, a command is generated to make a gradual interception of the glideslope beam. Capture can be made from above or below the beam. The glideslope gain is programmed as a function of radio altitude, time and airspeed. The APR CAP annunciator in the Mode Selector will extinguish if the GS receiver becomes invalid after capture.

Glideslope capture is interlocked so that the localizer must be captured prior to glideslope capture. If the glideslope receiver is not valid prior to capture, the vertical sensor will not trip and the system will remain in the pitch mode. After capture, if the NAV receiver, GS receiver, compass data or vertical gyro becomes invalid, ADI command cue will bias out of view. If the radio altimeter is not valid, the glideslope gain programming will be a function of GS capture, time, airspeed, and the middle marker.

(8) Pitch Hold Mode. Whenever a roll mode is selected without a pitch mode, the ADI command cue will display a pitch attitude hold command. The pitch attitude can be changed by pressing the CWS button on the control wheel and maneuvering the aircraft. The command cue will be synchronized to zero while the button is depressed. Upon release of the button, the pitch command will be such as to maintain the new pitch attitude. In the pitch hold mode, the ADI command cue will be biased out of view if the VG is not valid.

(9) TACAN Mode. The TACAN mode is selected by positioning the selector switch, located in the pilot's instrument panel to TACAN. A TACAN annunciator, placarded TAC, located in the pilot's HSI, will illuminate. TACAN navigation information will display on the pilot's HSI and RMI.

NOTE

The TACAN receiver must be tuned to a valid TACAN frequency. TACAN functions are identical to VOR using TACAN information rather then VOR signals. The ARM/CAP annunciation is the same as in VOR mode.

(10) Altitude Hold Mode (ALT). The Altitude Hold Mode is selected by depressing the ALT button in the mode selector. When ALT mode is selected, it overrides the APR CAP, GA, IAS, VS, and ALTSEL CAP modes. In the ALT mode the pitch command is proportional to the altitude error provided by the air data computer. The altitude error signal is gain programmed as a function of airspeed. Depressing and holding the CWS button allows the pilot to maneuver the aircraft to a new Altitude Hold reference without disengaging the mode. Once engaged in the Altitude Hold Mode, the mode will be reset if the air data computer is not valid and the ADI command cue will bias out of view if the VG is not valid.

NOTE

If the barometric setting of the altimeter is changed, a command is generated to fly the aircraft back to the original altitude reference.

(11) Indicated Airspeed Hold Mode (IAS). The Indicated Airspeed Hold Mode is selected by depressing the IAS button in the mode selector. When IAS is selected, it overrides the APR CAP, GA, ALT, VS, and ALTSEL CAP modes. In the IAS mode the pitch command is proportional to airspeed error provided by the air data computer. Depressing and holding the CWS button allows the pilot to maneuver the aircraft to a new Airspeed Hold reference without disengaging the mode. Once engaged in the IAS mode, the mode will be reset if the air data computer is not valid. The ADI command cue will bias out of view if the VG is not valid.

(12) Vertical Speed Hold Mode (VS). The Vertical Speed Hold Mode is selected by depressing the VS button in the mode selector. When VS is selected, it overrides the APR CAP, GA, ALT, ALTSEL CAP, and IAS modes. In the VS mode, the pitch command is proportional to VS error provided by the air data computer. Depressing and holding the CWS button allows the pilot to maneuver the aircraft to a new Vertical Speed Hold reference without disengaging the mode. Once engaged in the VS mode, the mode will be reset if the air data computer is not valid. The ADI command cue will bias out of view if the VG is not valid.

(13) Altitude Preselect Mode (ALTSEL). The Altitude Preselect Mode is selected by pressing the ALTSEL button in the mode selector. The desired altitude is selected on the altitude preselect controller. Pitch hold, VS or IAS may be selected as a mode to fly to the selected altitude. When outside the altitude bracket trip point, the ALTSEL ARM annunciator along with the selected pitch mode is illuminated on the mode selector. When reaching the bracket altitude, the system automatically switches to the ALTSEL CAP mode and the previously selected pitch mode is cancelled. When the altitude is reached, the ALTSEL CAP mode is automatically cancelled and the Flight Director switches to the ALT hold mode. If the air data computer is not valid, the altitude preselect mode cannot be selected. The ADI command cue will bias out of view if the VG is not valid.

(14) Standby Mode (SBY). The Standby Mode is selected by depressing the SBY button in the mode selector. This resets all the other flight director modes and biases the ADI command cue from view. While depressed, SBY acts as a lamp test causing all mode annunciators to illuminate and the flight director warning flag on the ADI to come in view. When the button is released, the mode annunciators extinguish and the flight director warning flag retracts from view.

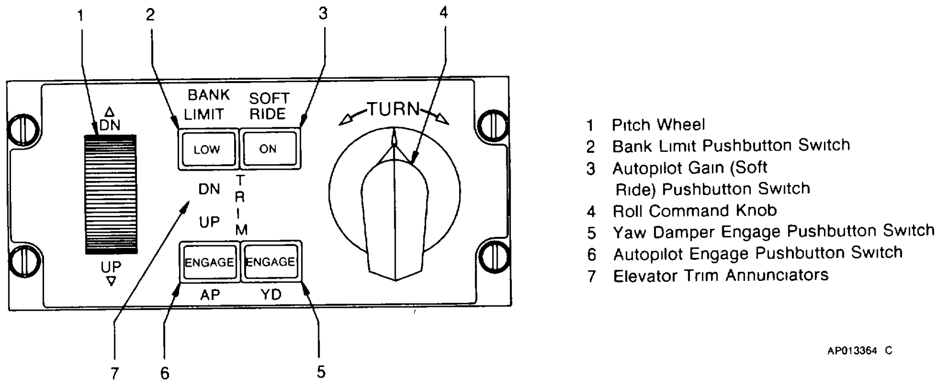


Figure 3-21. Autopilot Controller (PC-400)

(15). Go-Around Mode. The Go-Around Mode is selected by depressing the remote go-around switch. When selected, all other modes are reset, and the remote go-around (GA) and yaw damp engaged (YD ENG) annunciators will be illuminated. The ADI command cue receives a wings level command (zero command when roll is zero). The command cue also receives the go-around command which is a 7-degree visual pitch up attitude command. Selecting GA disconnects the autopilot. However, the yaw damper remains on.

Once go-around is selected, any roll mode can be selected. The wings level roll command will cancel. The go-around mode is cancelled by selecting another pitch mode, or CWS.

e. Autopilot Controller.

(1) Description. The autopilot controller (FIG. 3-21), provides the means of engaging the autopilot and yaw damper as well as manually controlling the autopilot through the turn knob and pitch wheel. The autopilot system limits are shown in Table 3-1.

(2) Controls/Indicators and Functions (FIG. 3-21):

(a) UP/DN Pitch Wheel. Movement of the pitch wheel will cancel only ALT HOLD, and ALTSEL CAP modes. With vertical modes of VS or IAS selected on the mode selector, rotation of the pitch wheel will change the respective displayed vertical mode reference. VS or IAS modes may be cancelled by pressing the mode button in the mode selector. If VS or IAS are not selected, the pitch wheel works as described above. The pitch wheel is always disabled during a coupled glideslope approach.

(b) BANK LIMIT Annunciator/Pushbutton Switch. Selection of the Bank Limit mode on the autopilot controller provides a lower maximum bank angle while in the Heading Select mode. LOW will illuminate on the Bank Limit switch. The lower bank limit is inhibited and LOW is extinguished during NAV mode captures. If Heading Select is again engaged, Bank Limit will again be illuminated. Pressing Bank Limit when illuminated will return autopilot to normal bank limits.

Table 3-1. Autopilot System Limits (Sheet 1 of 2)

MODE	CONTROL OR SENSOR	PARAMETER	VALUE
Yaw Damper	yaw Control	Engage Limit	Unlimited
Autopilot Engage	Engage Limit		Roll Up to ±90° Pitch Up to ±30°
Basic Autopilot	Touch Control Steering TCS	Roll Control Limit Pitch Control Limit	Up to ±45° Roll Up to ±20°Pitch
Turn Knob Roll Rate Limit		Roll Angle Limit	±30° ±15°/sec
	Pitchwheel .	Pitch Angle Limit	±15° Pitch
	Heading Hold	Roll Angle Limit	Less than 60 and No Roll Mode selected
Heading Select	Heading SEL Knob on HSI	Roll angle Limit Roll Rate Limit	±25° ±3.5°/sec
VOR	Course Knob, NAV Receiver and TACAN Receiver	**Capture** Beam Angle Intercept (HDG SEL) Roll Angle Limit Course Cut Limit at Capture Capture Point	 Up to ±90° ±25° ±45° Course Function of Beam, Beam Rate, Course Error, and DME distance
		On Course Roll Angle Limit Crosswind Correction	 ±136 Roll Up to ±45° Course Error
		Over Station Course Change Roll Angle Limit	 Up to ±90° ±17°
LOC or APR or BC	Course Knob and NAV Receiver	**LOC Capture** Beam Intercept Roll Angle Limit Roll Rate Limit Capture Point	 Up to ±90° +25° ±5°/sec Function of Beam, Beam Rate and Course Error.
		NAV On-Course Roll Angle Limit Crosswind Correction Limit Gain Programming	 ±17° of Roll ±30° of Course Error Function of time and (TAS) Starts at 1200 Ft Radio Alti-tude.
LOC or APR or BC (cont.)	GS Receiver and Air Data Computer	**Glideslope Capture** Beam Captaure	 Function of Beam and Bean Rate.
		Pitch Command Limit Glideslope Damping	±10° Vertical velocity
		Pitch Rate Limit Gain Programming	Function of (TAS) Function of Time and (TAS) STARTS AT 1200 FT radio Altitude. Function of (Radio Alt) Starts at 250 FT

Table 3-1. Autopilot System Limits (Sheet 2 of 2)

MODE	CONTROL OR SENSOR	PARAMETER	VALUE
GA	Control Switch on Throttles	Fixed Pitch-Up Command, Wings Level	7° Pitch Up
Pitch Sync	TCS Switch on Control Wheel	Pitch Altitude Command ±20° Maximum	
ALT Hold	Air Data Computer	ALT Hold Engage Range	0 to 50,000 ft
		ALT Engage Error	±20 ft.
		Pitch Limit	±20°
		Pitch Rate Limit	Function of (TAS)
VS Hold	Air Data Computer	VERT Speed Engage Range	0 to ±6,000 ft/min
		ALT Speed Hold Engage Error	
		Pitch Limit	±30 ft/min
			±20°
		Pitch Rate Limit	Function of (TAS)
IAS Hold	Air Data Computer	IAS Engage Range	80 to 45 knots
		IAS Hold Engage Error	±5 knots
		Pitch Limit	±20°
		Pitch Rate Limit	Function of (TAS)
ALT Prese-lect	Air Data Computer	Preselect Capture Range	0 to 50,000 ft
		Maximum Vertical Speed for Capture	±400 ft/min
		Maximum Gravitational Force During Capture	±20g
		Maneuver	NL±20°
		Pitch Limit	Function of (TAS)
		Pitch Rate Limit	

(c) SOFT RIDE Annunciator/Pushbutton Switch. Soft ride reduces autopilot gains while still maintaining stability in rough air. This mode may be used with any Flight Director mode selected.

(d) TURN Knob. Rotation of the turn knob out of detent results in a roll command. The roll angle is proportional to and in the direction of the turn knob rotation. The turn knob must be in detent (center position) before the autopilot can be engaged. Rotation of the turn knob cancels any other previously selected lateral mode.

(e) YD ENGAGE Pushbutton Switch. When the autopilot is not engaged, the yaw damper may be utilized by depressing the YD ENGAGE pushbutton.

(f) AP ENGAGE Pushbutton Switch. The AP ENGAGE switch is used to engage the autopilot. Engaging the autopilot automatically engages the yaw damper. The autopilot may be engaged with the aircraft in any reasonable attitude.

(g) Elev TRIM Annunciators. The elevator trim annunciator indicates UP or DN when a sustained signal is being applied to the elevator servo. The annunciator should not be illuminated when engaging the autopilot.

(3) Autopilot Disengagement. The autopilot is normally disengaged by momentarily depressing the control wheel AP DISC switch. The autopilot may however be disengaged by any of the following:

1. Actuation of the control wheel AP DISC button. Disengagement is confirmed by 5 flashes of the AP ENG annunciator.
2. Pressing the respective vertical gyro FAST ERECT button.
3. Actuation of respective compass INCREASE-DECREASE switch.
4. Selection of Go-Around mode. Disengagement is confirmed by the AP ENG annunciator flashing 5 times and illumination of the GA and YD ENG annunciators.
5. Pulling the autopilot CONTROL & AFCS DIRECT circuit breaker.
6. Pressing the autopilot AP ENGAGE pushbutton.
7. Any of the following malfunctions will

cause the autopilot to automatically disengage:

a. Vertical gyro failure.

b. Directional gyro failure.

c. Autopilot power or circuit failure.

d. Torque limiter failure.

NOTE

Disengaging under any, of the previous four conditions will illuminate the AP DISC annunciator and the MASTER WARNING annunciator. Pressing the control wheel AP DISC switch will extinguish the AP DISC annunciator.

(4) Pitch Sync & Control Wheel Steering (CWS). The CWS push button located in the control wheel (FIG. 2-20) allows the pilot to manually change aircraft attitude, altitude, vertical speed and/or airspeed without disengaging the autopilot. After completing the manual maneuver, the CWS pushbutton is released, and the autopilot will automatically resynchronize to the vertical mode. Example: with IAS mode selected, the pilot may depress the CWS pushbutton and manually change airspeed. Once trimmed at the new airspeed the CWS pushbutton is released, and the autopilot will hold this airspeed. If a large pitch attitude change is made, the pilot should trim the aircraft normally before releasing the CWS button.

NOTE

Either pilot's CWS button will permit changing of the autopilot regardless of which pilot has control of the autopilot. However, use of the CWS will cancel the other pilot's flight director GA mode.

3-27. INERTIAL NAVIGATION SYSTEM.

a. Description. The Inertial Navigation System (INS) is a self-contained navigation and attitude reference system. It is aided by (but not dependent upon) data obtained from its own TACAN system, the GPS, the aircraft encoding altimeter and the gyromagnetic compass system. The position and attitude information computed by the INS is supplied to the automatic flight control system, weather radar system, horizontal situation indicator, and radio magnetic indicators. In conjunction with other aircraft equipment, the INS permits operation under Instrument Meteorological Conditions (IMC). The INS provides a visual display of present position data in Universal Transverse Mercator (UTM) coordinates or conventional geographic (latitude-longitude) coordinates during all phases of flight. When approaching the point selected for a leg switch, an ALERT annunciator will illuminate informing the pilot of an imminent automatic leg switch or the need to manually insert course change data. The INS may be manually updated for precise aircraft present position accuracy by flying over a reference point of known coordinates. The INS may be updated automatically by the TACAN system or the GPS. Altitude information is automatically inserted into the INS computer by an encoding altimeter whenever the INS is operational.

The Mode Selector Unit (MSU) (FIG. 3-22) controls system activation and selects operating modes.

The Control Display Unit (CDU) (FIG. 3-23) provides controls and indicators for entering data into the INS and displaying navigation and system status information.

The INS system is protected by the 10-ampere INS AC POWER and the 5-ampere INS HTR AC POWER circuit breakers in the mission AC/DC power cabinet, by the 5-ampere INS CONTROL circuit breaker in the overhead circuit breaker panel and by the 20-ampere circuit breaker in the front of the INS battery unit.

b. Controls/Indicators and Functions, INS mode selector unit. (FIG. 3-22).

(1) READY NAV lamp. Illuminates to indicate INS high accuracy alignment has been attained. If attained during ALIGN mode, annunciator remains illuminated until NAV mode is selected. Annunciator illuminates momentarily during alignment, if alignment is accomplished while in NAV mode.

(2) BAT lamp. Illuminates to indicate INS shutdown due to low battery unit voltage.

(3) Mode select knob. Controls INS activation and selects operating modes.

(a) OFF. Deactivates INS.

(b) STBY. Moving to STBY from OFF mode: Starts fast warm-up of system to operating conditions; activates computer so information may be inserted; all INS controlled warning flags will indicate warning.

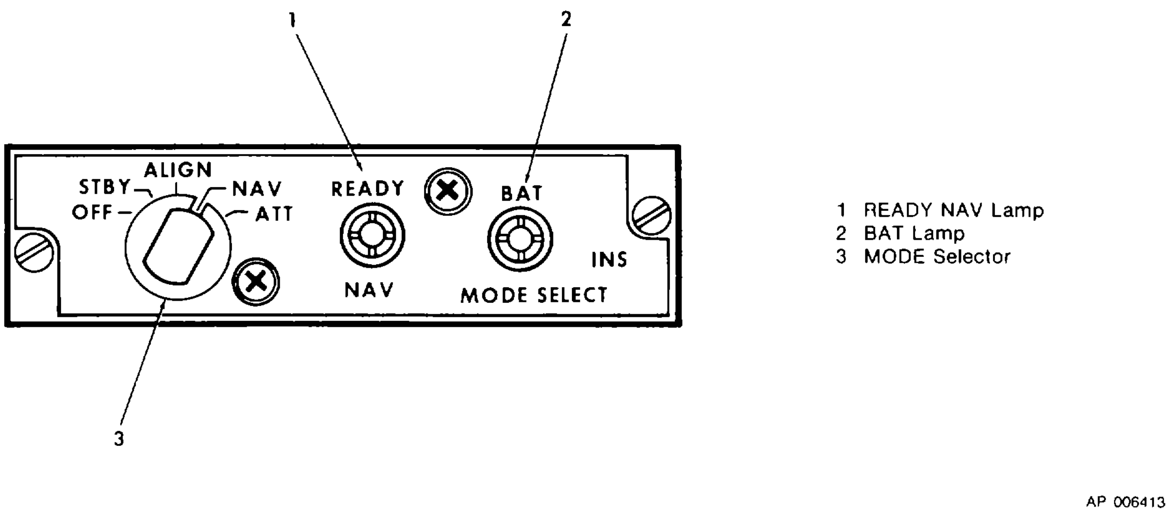


Figure 3-22. INS Mode Selector Unit (7883470-011)

Moving to STBY from any other mode: INS operates as if in attitude reference mode.

(c) ALIGN (ground use only, parked). Moving to ALIGN from OFF mode: Leveling starts after fast warm-up heaters are off. Moving to ALIGN from STBY: Alignment starts if fast warm-up heaters are off. Moving to ALIGN from NAV mode: INS is not downmoded, but will allow automatic shutdown if overtemperature is detected.

(d) NAV. Activates normal navigation mode after automatic alignment is completed; must be selected before moving aircraft. Moving to NAV from STBY mode causes INS to automatically sequence through STBY and ALIGN to NAV mode, if present position is inserted and aircraft is parked. NAV mode is used to shorten time in STBY and to bypass battery test, if stored heading is valid.

(e) ATT. Activates attitude reference mode. Used to provide only INS attitude signals. Shuts down computer and CDU leaving only BAT and WARN annunciators operative. Once selected, INS alignment is lost.

c. Controls/Indicators and Functions, INS Control Display Unit. (FIG. 3-23).

(1) HOLD key. Used with other CDU controls to stop present position display from changing, in order to update position and to display recorded malfunction codes. Illuminates, when pressed the first time; extinguishes when pressed second time or when inserted data is accepted by computer. When pressed second time, allows displays to resume showing changing current present position.

(2) ROLL LIM key. Allows selection of Roll Limited steering mode. Press to select mode, key annunciators. Roll steering output is limited to 10 degrees. Press second time to exit mode, key annunciator extinguishes. Roll steering output returns to normal limit of 25 degrees.

(3) Data display, left and right. Composed of annunciators which illuminate to display numbers, decimal points, degree symbols, left and right directions, and latitude or longitude directions.

(4) INSERT/ADVANCE/HI PREC key. Allows insertion of loaded data into computer. Enters displayed data into INS. When pressed before pressing

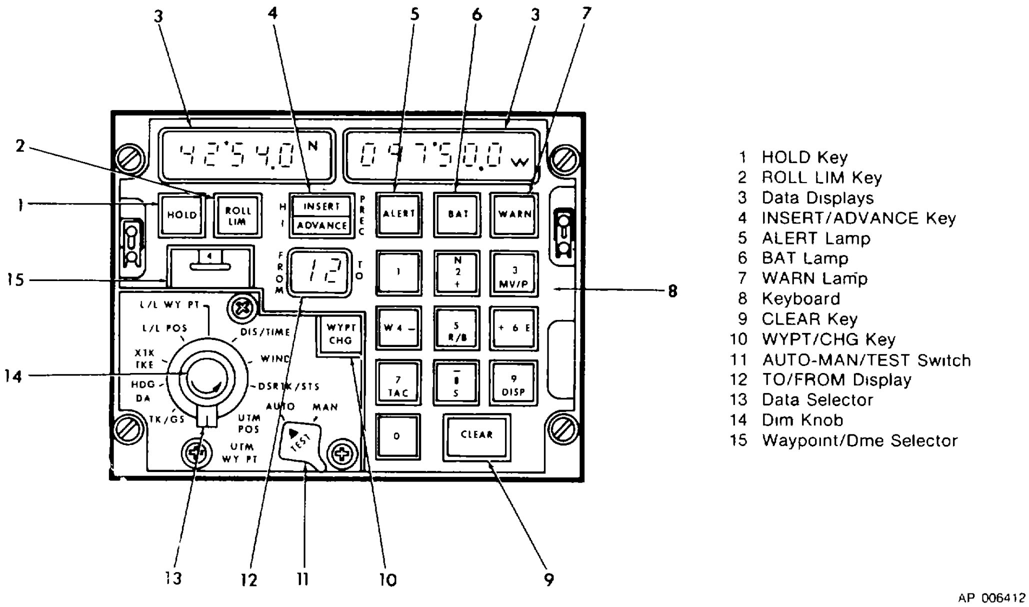


Figure 3-23. INS Control Display Unit (7564978-021)

any numerical key, alternates display of normal and high precision data.

(*5) ALERT lamp*. Illuminates amber to alert pilot 1.3 minutes before impending automatic course leg change. Extinguishes when switched to new leg, if AUTO-MAN switch is set to AUTO. Flashes on and off when passing way-point, if AUTO-MAN switch is set to MAN. Annunciator will extinguish if AUTO is selected or if a course change is inserted.

(6) BAT lamp. Illuminates amber to indicate loss of 115 VAC power and INS operation using INS battery power.

(7) WARN lamp. Illuminates red to alert pilot INS self test circuits have detected a system fault. Illumination may be caused by continuous or intermittent condition. Intermittent conditions illuminate WARN annunciator until reset by TEST switch. If continuous condition does not degrade attitude operation, annunciator extinguishes when mode selector is set to ATT.

(8) Keyboard. Consists of 10 keys for entering load data into data and TO-FROM displays. N, S, E, and W (on keys 2,8,6 and 4) indicate direction of latitude and longitude. TAC and DISP (on keys 7 and 9) enable loading and display of TACAN station data. MV/P and DISP (on keys 3 and 9) are associated with loading and display of magnetic variation and magnetic heading. R/B and DISP (on keys 5 and 9) are associated with loading and display of UTM coefficients and way-point move parameters.

(9) CLEAR key. When pressed, illuminates and erases data loaded into data displays or TO-FROM display. Used to cancel, erroneous data. After clearing, data loading can be resumed.

(*10) WYPT CHG key*. When pressed, enables numbers in TO-FROM display to be changed. If INSERT/ADVANCE key is pressed, computer will use navigation leg defined by new number in all navigation computations. If INSERT/ADVANCE key is not pressed, computer will continue using original numbers in all navigation computations; but distance/time information, based on new leg, may be called up and read in data displays (in case of way-points). When not in TACAN mix mode, TACAN station number is inserted to display DIS/TIME information.

(11) AUTO-MAN TEST switch. This is a dual

purpose control. When the knob is pressed inward, the TEST switch function is engaged. When the knob is rotated to either the AUTO or MAN setting, the control serves as a selector between those modes.

(a) AUTO. Selects automatic leg switching mode. Computer switches from one leg to the next whenever way-point in TO side of the TO-FROM display is reached.

(b) MAN. Selects manual leg switching mode. Pilot must make way-point changes manually.

(c) TEST. When pressed, performs test of INS annunciators and displays, remote annunciators and indicators controlled by INS, and computer input/output operations.

Used with other controls to activate display of numerical codes denoting specific malfunctions and resets malfunction warning circuits.

During alignment, activates the HSI test. Continued pressing of switch provides constant INS outputs to drive cockpit displays in a predetermined fashion.

NOTE

The INS can provide test signals to the Horizontal Situation Indicator (HSI) and connected displays. Pressing TEST switch during STBY, ALIGN, or NAV modes will cause all digits on connected digital displays to indicate 8's and illuminates the HSI WAYPOINT and ALERT annunciators. Additional HSI test signals are provided when INS is in ALIGN and the data selector is at any position other than DSRTK/STS. Under those conditions, pressing TEST switch causes the HSI to indicate heading, drift angle, and track angle error, all at 0° or 30°. At the same time, cross track deviation is indicated at 3.75 nautical miles (one dot) right or left and INS controlled HSI flags are retracted from view.

Output test signals are also supplied to the autopilot when INS steering is selected. Rotating AUTOMAN switch to AUTO and pressing TEST during align furnishes a 15° left bank steering command. A 15° right bank steering command is furnished when the AUTO/MAN switch is set to MAN.

(12) TO-FROM display. Display numbers defining way-points of navigation leg being flown or, in the case of a flashing display, displays TACAN station being used.

Way-point numbers automatically change each time a way-point is reached. Unless flight plan changes during flight, the automatic leg switching sequence will always be 1 2, 2 3, 3 4...8 9, 9 1, 1 2, etc.

(13) Data selector. Selects data to be displayed in data displays or entered into INS. The rotary selector has 10 positions. Five positions (L/L POS, L/L WY PT, UTM POS, UTM WY PT and DSRTK/STS) also allow data to be loaded into data display then inserted into computer memory.

(a) TK/GS. Displays aircraft track angle in left display and groundspeed in right display.

(b) HDG/DA. Displays aircraft true heading in left display and drift angle in right display.

(c) XTK/TKE. Displays cross track distance in left display and track angle in right display.

(d) L/L POS. Displays or enters present aircraft position latitude in left data display and longitude in right data display. Both displays indicate degrees and minutes to nearest tenth of a minute. This position also enables the insertion of present position coordinates during alignment and present position updates.

(e) L/L WY PT. Displays or enters way-point and TACAN station data, if used in conjunction with the way-point/TACAN selector. This position will also cause display of inertial present position data when the HOLD key is illuminated.

(f) DIS/TIME. Displays distance from aircraft to TACAN station or any way-point, or between any two way-points in left display. Displays time to TACAN station or any way-point, or between any two way-points, in right display.

(g) WIND. Displays wind direction in left display and wind speed in right display, when true airspeed is greater than the air data system lower limit (80 KIAS).

(h) DSRTK/STS. Displays desired track angle to nearest degree in the left data display, and INS system status in right data display.

(i) UTM POS. Displays or enters aircraft position in Universal Transverse Mercator (UTM)

coordinates, with nothing data in kilometers in left display and easting data in kilometers in right display. The extra precision display indicates in meters.

(j) UTM WY PT. Displays or enters way-point and TACAN station data in UTM coordinates. Also enables loading and display of spheroid coefficients if GRID and DISP keys are pressed simultaneously.

(14) Dim knob. Controls intensity of CDU key annunciators and displays.

(15) Waypoint/DME selector. Thumbwheel switch, used to select waypoints for which data is to be inserted or displayed. Waypoint station 0 is for display only and cannot be loaded with usable data.

d. INS - Normal Operating Procedures.

NOTE

- **The following data will be required prior to operating the INS: latitude and longitude (Geographical) or Universal Transverse Mercator (UTM) coordinates of aircraft during INS alignment. This information is necessary to program the INS computer during alignment procedure.**
- **When inserting data into INS computer, always start at left and work to right. The first digit inserted will appear in right position of applicable display. It will step to left as each subsequent digit is entered. The degree sign, decimal point, and colon (if applicable) will appear automatically.**

(1) Preflight Procedure.

CAUTION

Ensure that cooling air is available to navigation unit before turning the INS on.

NOTE

Aircraft must be connected to a ground power unit if INS alignment is performed prior to engine starting. In this event, the engines must not be started until after the INS is placed in the NAV mode.

1. Applicable circuit breakers Check depressed.
2. Mode selector switch (FIG. 3-22) - ALIGN. Confirm following:

a. TO-FROM display (FIG. 3-23) indicates 1 2..

b. INSERTI/ADVANCE pushbutton annunciator (CDU) illuminates.

c. BAT annunciator (FIG. 3-22) illuminates for approximately 12 seconds at alignment state 8, then extinguishes.

3. Dim knob (C'DU) Adjust for optimum brightness of CDU displays.
4. AUTO-MAN TEST switch (CDU) AUTO.
5. Data selector (CDU) L/L POS or UTM POS, as desired.

Observe coordinates of last present position prior to INS shutdown appear in data displays.

NOTE

- **Aircraft must not be towed or taxied during INS alignment. Movement of this type during alignment causes large navigation errors. If aircraft is moved during alignment, restart alignment by setting mode selector switch to STBY, then back to ALIGN and reinserting present position.**
- **Passenger or cargo loading in the aircraft could cause the type of motion which affects the accuracy of alignment. Any activity which causes the aircraft to change attitude shall be avoided during the alignment period.**

6. AUTO-MAN TEST switch (CDU) Press and hold for test. Confirm following on CDU:
7. Left and right data displays indicate 88° 88.8 N/S and 88° 88.8 E/W respectively.
8. TO-FROM display indicates 8.8.
9. The following pushbuttons and annunciators illuminate: ROLL LIM, HOLD, INSERT/ADVANCE, WYPT CHG, ALERT, BAT (on CDU and MSU), WARN, READY NAV and WYPT on pilot's HSI.
10. AUTO-MAN TEST switch (CDU) Release. Confirm data displays indicate coordinates in computer memory.

11. If UTM coordinates are to be used, verify that appropriate grid coefficients have been loaded.

(2) Insert present position:

NOTE

- **Prior to pressing INSERT/ADVANCE pushbutton, any incorrectly loaded data can be corrected by pressing the CLEAR pushbutton and reloading correct data.**
- **While parked aircraft is undergoing alignment, encoding altimeter will supply the field elevation (aircraft pressure altitude) into INS.**
- **Once present position has been inserted and computer has advanced to alignment state 7, present position cannot be reinserted without downmoding to STBY and restarting alignment.**
- **If longitude and latitude coordinates are being used, skip following step (a) 2 and proceed with step (b) 2.**

1. Insert UTM coordinates of aircraft present position:

a. Data selector UTM POS. Observe that prior to initial load, INSERT/ ADVANCE pushbutton annunciator illuminates.

b. To load zone and easting values Press keys in sequence, starting with E. Example: Zone 16, 425 km East = El6 425. Observe that zone and easting in kilometers appear in right data display as keys are pressed.

c. INSERT/ADVANCE pushbutton Press. Observe pushbutton annunciator remains illuminated.

d. To load nothing data Press keys in sequence, starting with N or S to indicate north or south hemisphere. Example: 4749 km North = N 4749. Observe nothing kilometers appear in left data display as keys are pressed.

e. INSERT/ADVANCE pushbutton Press. Observe that the pushbutton annunciator remains illuminated.

f. INSERT/ADVANCE pushbutton Press. Observe extra precision display for present position nothing and easting, to the nearest meter, appears in left and right data displays, respectively.

g. To load extra precision easting data Press keys in sequence, starting with E. Example: 297 m East =E 297. Observe that easting meters appear in right data display as keys are pressed.

h. INSERT/ADVANCE pushbutton Press. Observe pushbutton annunciator remains illuminated.

i. To load extra precision nothing data Press keys in sequence, starting with N or S.

Example: 901 m North =N 901. Observe that nothing meters appear in left data displays as keys are pressed.

NOTE

Extra precision values are always added to normal values regardless of which key (N/S) is pressed to initiate the entry. The normal entry establishes the hemisphere.

j. INSERT/ADVANCE pushbutton Press.

Observe latitude and longitude data is displayed in UTM and INSERT/ADVANCE pushbutton annunciator extinguishes.

NOTE

- **The computer will convert coordinates in the overlap area; however display values will reference appropriate zone.**
- **The W key may be used to initiate easting entries; however computer will always interpret such entries as an E input. E will be displayed in normal UTM display.**
- **Extra precision values are always added to normal values. As an example, South 4,476. 995 m will display 4476S in normal display and 995 in extra precision display. There is no rounding between the two displays.**

2. To insert geographic coordinates of aircraft present position:

NOTE

Prior to pressing INSERT/ADVANCE

pushbutton, any incorrectly loaded data can be corrected by pressing the CLEAR pushbutton and loading correct data.

a. Data selector L/L POS.

Observe that, prior to initial load, the INSERT/ ADVANCE pushbutton annunciator is illuminated.

b. To load latitude data Press keys in sequence, starting with N or S to indicate north or south.

Example: 42° 54.0' North = N 4 2 5 4 0. Observe that latitude appears in left data display as keys are pressed.

c. INSERT/ADVANCE pushbutton Press.

Observe pushbutton annunciator remains illuminated.

d. To load longitude data Press keys in sequence, starting with W or E to indicate west or east.

Example: 87° 54.9' West = W 8 7 5 4 9. Observe that longitude appears in right data display as keys are pressed.

e. INSERT/ADVANCE pushbutton Press. Observe pushbutton annunciator extinguishes.

f. Data selector DSRTK/STS. Confirm:

(1) Left data display indicates desired track angle in computer memory.

(2) Right data display indicates ---84, ---74, ---64, or ---54, depending on which alignment state the computer has reached.

NOTE

After present position has been inserted and computer has advanced to state 7, present position cannot be reinserted without downmoding to STBY and restarting alignment.

g. Data selector (CDU) DSRTK/STS. Observe left-hand data display indicates the desired track in computer memory and right data display indicates status --194-.

NOTE

If fourth digit from right is blank, a valid heading has not been stored. Proceed with normal preflight procedure.

h. Monitor data display for system alignment state 9 to alignment state 8. Observe right data display will be ---- 184-.

i. Monitor data display for malfunction codes.

Observe if the 26V 400 Hz power is off, .03184 will appear in the right data display and WARN annunciator illuminates. If magnetic compass system is off, .03184 will appear in right data display and WARN annunciator is extinguished.

j. If there are malfunction codes, proceed to ABNORMAL PROCEDURES in this chapter.

NOTE

To achieve best accuracy, engine start and heavy loading activity should be delayed until entry into NAV mode.

NOTE

Way-point data and TACAN station data may be loaded any time after turn-on.

(3) Verify UTM Grid Coefficients:

1. Data selector (CDU) - UTM WY PT.

2. Keys 5 and 9 - Press simultaneously.

Observe TO-FROM display is blank. Earth flatness coefficient appears in left display. The relative earth radius, in meters, appears in right display.

NOTE

These values are retained from turn-on to turn-on unless changed by operator.

3. Verify that values correspond to those required for spheroid being used.

NOTE

Values for various spheroids are listed in table 3-2.

4. If values are correct, return CDU to normal display mode by momentarily setting data selector to any position except UTM WY PT. If values are to be changed, continue with following steps:

Table 3-2. Various Values For UTM Grid Coefficients

SPHEROID	COEFFICIENT	RADIUS
International	29700	8388 m
Clark 1866	29498	8206 m
Clark 1880	29346	8429 m
Everest	30080	7276 m
Bessel	29915	7397 m
Modified Everest	30080	7304 m
Australian National	29825	8160 m
Airy	29932	7563 m
Modified Airy	29932	7340 m
Source: Universal Transverse Mercator Grid Technical Manual TM 5-241-8, Headquarters Department of the Army. 30 April 1973, page 4		
Flatness Coefficient:: 100 (1/f)		
Relative Radius: a-6,3700.000		

(4) Abbreviated INS Interface Test As required.

NOTE

Assuming a level aircraft, attitude indicators will become level during alignment state 8 and remain level in all modes until INS is shut down. Warning indicators for INS attitude signals from the INS are valid while attitude sphere display is level.

NOTE

- **The INS can provide test signals to the Horizontal Situation Indicator (HSI) and connected displays. Pressing TEST switch during STBY, ALIGN, or NAV mode causes all digits on connected digital displays to indicate 8's, and illuminates the WYPT on the pilot's HSI and the ALERT annunciator. Additional HSI test signals are provided when INS is in ALIGN and data selector is at any position other than DSRTK/STS. Under those conditions, pressing TEST switch causes HSI to indicate heading, drift angle, and track angle error, all at 0° or 30°. At the same time, cross track deviation is indicated at 3.75 nautical miles (one dot) right or left and INS-controlled HSI flags are retracted from view.**
- **Output test signals are supplied to the autopilot when INS steering is selected. Rotating AUTO/MAN switch to AUTO and pressing TEST during alignment furnishes a 15° left bank steering command. A 15° right bank steering command is furnished when AUTO/MAN switch is set to MAN.**
- **The autopilot will not engage until after the CDU test switch is pressed and the NAV flags are pulled out of view.**
- **The quick test procedure may be performed any time after alignment state 8 is reached and prior to entry into NAV.**

1. Mode selector (MSU) - ALIGN.

Observe CDU displays are illuminated.

2. Data selector (CDU) DSRTK/STS. Monitor right data display until state 8 (or lower) is reached. Observe right data display is ---N4, where N is not 9.
3. AUTO-MAN switch (CDU) - MAN.
4. Data selector Set to any position except DSRTK/STS.
5. CDU test switch - Hold depressed.
6. INS Couple to flight director and autopilot, as applicable.

After performing the preceeding step, observe:

a. All annunciators in MSU Check illuminated.
b. All annunciators in CDU - Check

illuminated. All 8's displayed.

c. HSI All angles 30°. Cross-track deviation bar one dot right. All INS flags retracted.

d. Flight Director/Autopilot A 15° steering command is issued.

e. Mission Control Panel INS UPDATE and NO INS UPDATE annunciator illuminated.

7. CDU TEST switch Hold depressed, and rotate AUTO-MAN switch to AUTO. Observe all indications are as in step 6 except a 15° left steering command is issued. On HSI, all angles are 0° and cross-track deviation bar is one dot left.

8. CDU TEST switch Release. If desired, decouple INS. Observe that operation returns to normal.

(5) To program destinations or TACAN coordinates:

NOTE

If latitude and longitude (Geographic) coordinates are being used, skip following procedure (5) (a.) and execute next procedure (5)(b.). Enter all of the data for a given destination or TACAN before starting to enter data for another.

(a) Insertion of UTM way-point coordinates:

1. Data selector UTM WY PT. Data displays will indicate last coordinates inserted into related way-point.
2. Thumbwheel Set to way-point number to be loaded.

NOTE

UTM data may be loaded in any order and, until final entry, a value may be reloaded.

3. To load zone and easting Press keys in sequence, starting with E.

Example: Zone 16, 425 km East = E16 425. Observe that zone and easting in kilometers appear in the right data display as keys are pressed.

4. INSERT/ADVANCE pushbutton - Press.

Observe pushbutton annunciator is illuminated.

5. To load northing Press keys in sequence, starting with N or S to indicate north or south hemisphere.

Example: 4749 km North = N 4749. Observe that northing kilometers appear in the left data display as keys are pressed.

6. INSERT/ADVANCE pushbutton - Press.

Observe pushbutton annunciator remains illuminated.

7. INSERT/ADVANCE pushbutton - Press.

Observe that an extra precision display related to resident value of northing and easting, to the nearest meter, appears in left and right data displays, respectively.

8. To load extra precision easting value! Press keys in sequence, starting with E.

Example: 297 m East . = E 297. Observe that easting meters appear in the right data display as keys are pressed.

9. INSERT/ADVANCE pushbutton - Press.

Observe pushbutton annunciator remains illuminated.

10. To load extra precision northing value Press keys in sequence, starting with N or S.

Example: 901 m North = N 901. Observe that northing meters appear in left data display as keys are pressed. The value is always added to the normal value regardless of which key (N/S) is pressed to initiate the entry. The normal entry establishes the hemisphere.

11. INSERT/ADVANCE pushbutton - Press.

Within 3 seconds computer converts input into latitude and longitude for storage in memory. The stored value is again converted to UTM for display. The INSERT/ADVANCE pushbutton annunciator extinguishes. Conversion routines may cause displays to change by up to 10 m.

NOTE

- **The computer will convert coordinates in overlap area; however, data display values will reference appropriate zone.**
- **The W key may be used to initiate easting entries; however, the computer will always interpret such entries as an E input. E will be displayed in normal UTM data display.**
- **The extra precision values are always added to normal values. As an example, South 4,476.995 m will display 44765 (S) in the normal display and 995 in extra precision display. In other words, there is no rounding between the two displays.**

12. Repeat steps 2 through 11 for each way-point to be loaded.

NOTE

A load cycle may be terminated prior to insertion of all four values by moving data selector or thumbwheel.

(b) Insertion of geographic way-point coordinates:

a. Data selector - L/L WY PT.

Data displays indicate last coordinates inserted into the selected way-point.

b. Thumbwheel Set to way-point number to be loaded.

c. To load latitude Press keys in sequence, starting with N or S to indicate north or south.

Example: 42° 54.0' North = N 4 2 5 4 0. Observe that INSERT/ADVANCE pushbutton annunciator illuminates when first key is pressed, and latitude appears in left data display as keys are pressed.

d. INSERT/ADVANCE pushbutton Press. Observe pushbutton annunciator extinguishes.

e. To load longitude Press keyboard keys in sequence, starting with W or E indicating west or east.

Example: 87° 54.9' West = W 8 7 5 4 9. Observe that INSERT/ADVANCE pushbutton annunciator illuminates when first key is pressed, and longitude appears in display as keys are pressed.

f. INSERT/ADVANCE pushbutton Press.

Observe pushbutton annunciator extinguishes.

g. If desired to insert extra precision coordinate data Press INSERT/ ADVANCE pushbutton.

Observe that arc-seconds for loaded latitude and longitude, to nearest tenth of a second, appear in left and right data displays, respectively.

h. To load related arc-second values for latitude Press keys in sequence, starting with N.

Example: 35.8 North =N 358.

i. INSERT/ADVANCE pushbutton Press.

Observe pushbutton annunciator extinguishes.

j. To load related arc-second values for longitude Press keys in sequence, starting with E.

Example: 20.1 East = E 201.

k. INSERT/ADVANCE pushbutton Press.

Observe pushbutton annunciator extinguishes.

l. Repeat steps 2 through 11 for each way-point to be loaded.

NOTE

- **In above example, if INSERT/ ADVANCE pushbutton was pressed, the following normal display would appear: 42° 54. 5 (N) and 87° 54. 3(W). The extra precision values are added to normal values and normal data displays are not rounded off.**
- **The normal geographic coordinates must always be loaded prior to extra precision values.**
- **The directions N or S and E or W are established during normal coordinate entry. Either key may be used to initiate entry during extra precision, loads and values will be added to the extra precision value without affecting direction.**
- **It is characteristic of the computer display routine to add 0.2 arc-seconds to**

any display of 59. 9 arc-seconds. The value in computer is as loaded by operator.

(6) To insert TACAN coordinates:

(a) Insertion of UTM TACAN station data:

NOTE

Prior to pressing the INSERT/ADVANCE pushbutton, any incorrectly loaded data can be corrected by pressing CLEAR pushbutton and loading correct data.

1. Data selector - UTM WY PT.
2. Keys 7 and 9 Press simultaneously. Observe that number of TACAN station being used for navigation flashes on and off in TO-FROM display and data displays indicate coordinates of station selected by thumbwheel.
3. Thumbwheel Set to number of station to be loaded. Confirm thumbwheel is in detent.
4. Station 0 cannot be loaded.

Observe that if number of station to be loaded is same as number of the TACAN station currently being used, number in-TO-FROM display will be set to 0 when TACAN data is loaded.

5. To load zone and easting Press keys in sequence, starting with E.

Example: Zone 16, 425 km East =E16 425.

Observe that zone and easting in kilometers appear in the right display as keys are pressed.

6. INSERT/ADVANCE pushbutton - Press.

Observe that pushbutton annunciator is illuminated.

7. To load northing Press keys in sequence, starting with N or S to indicate north or south hemisphere.

Example: 4749 km North = N 4749. Observe that northing kilometers appear in left data display as keys are pressed.

8. INSERT/ADVANCE pushbutton - Press.

Observe pushbutton annunciator remains illuminated.

9. INSERT/ADVANCE pushbutton - Press.

Observe that extra precision display related to the resident value of northing and easting, to nearest meter, appears in left and[right data displays, respectively.

NOTE

UTM data may be loaded in any order. Until final fourth entry, actuation of INSERT/ADVANCE pushbutton without a prior data entry 'will cause normal and extra precision UTM data to be alternately displayed.

10. To load extra precision easting value Press keys in sequence, starting with E.

Example: 297 m East = E 297. Observe that easting meters appear in right data display as keys are pressed.

11. INSERT/ADVANCE pushbutton - Press.

Observe pushbutton remains illuminated.

12. To load extra precision northing value Press keys in sequence, starting with N or S.

Example: 901 m North = N 901. Observe that northing meters appear in left data display as keys are pressed. The value is always added to normal value regardless of which key (N/S) is pressed to initiate entry. The normal entry establishes hemisphere.

13. INSERT/ADVANCE pushbutton - Press.

Observe that during the next I to 3 seconds, the computer converts input into latitude and longitude for storage in memory. The stored value is again converted back to UTM for display to operator. The INSERT/ADVANCE pushbutton annunciator extinguishes. The conversion routines may cause data displays to change by up to 10 m.

NOTE

- **The computer will convert coordinates in overlap area; however, data display values will reference appropriate zone.**
- **The W key may be used to initiate easting entries; however, the computer will**

always interpret such entries as an E input. E will be displayed in normal UTM data display.

- **The extra precision values are always added to normal values. As an example, South 4,476. 995 m will display 4476 S in normal display and 995 in extra precision display. In other words, there is no rounding between the two displays.**

14. INSERT/ADVANCE pushbutton - Press.

Observe right data display indicates last previously inserted altitude, and left data display is blank.

15. To indicate the following load is altitude - Press keys 4 or 6.

Observe INSERT/ADVANCE pushbutton annunciator illuminates.

16. To load altitude in feet Press keys in sequence.

Example: 1230 ft = 1230. Observe that numbers appear in right data display as keys are pressed.

NOTE

Altitude inputs are limited to 15,000 feet.

17. INSERT/ADVANCE pushbutton - Press.

Observe pushbutton annunciator extinguishes.

18. INSERT/ADVANCE pushbutton - Press.

Observe that left data display indicates last previously inserted channel number, and right display is blank.

19. To indicate following load is channel number - Press keys 2 or 8.

Observe INSERT/ADVANCE pushbutton annunciator illuminates.

20. To load channel number Press keys in sequence.

Example: 109 = 109. Observe number appears in left data display as keys are pressed.

21. INSERT/ADVANCE pushbutton - Press.

Observe pushbutton annunciator extinguishes.

NOTE

- **Any number will be accepted by INS; however, only stations with a channel number within range of 1 through 126 will be used for TACAN mixing.**
- **Channel number has an implied X suffix.**
- **Degree symbol (°) should be disregarded when reading altitude and data display.**

22. INSERT/ADVANCE pushbutton - Press.

Observe station northing, zone, and easting reappear.

23. Repeat steps 1 through 22 for each TACAN station.
24. To return INS to normal mode, momentarily set data selector to UTM POS.

(b) Insertion of geographic TACAN station data:

NOTE

Prior to pressing INSERT/ADVANCE pushbutton, any incorrectly loaded data can be corrected by pressing CLEAR pushbutton and loading correct data.

1. Data selector - L/L WY PT.

NOTE

If number of station to be loaded is same as number of TACAN station currently being used, number in TO-FROM display will be set to 0 when TACAN data is loaded.

2. Keys 7 and 9 Press simultaneously.

Observe that number of TACAN station being used for navigation, flashes on and off in TO-FROM display. Data displays indicate coordinates of station selected via thumbwheel.

3. Thumbwheel Set to number of station being loaded. (Ensure thumbwheel is in detent.)

NOTE

Station 0 cannot be loaded.

4. To load latitude - Press keys in

sequence, starting with N or S to indicate north or south.

Example: 42° 54.0' North =4 2 5 4 0. Observe that INSERT/ADVANCE pushbutton annunciator illuminates when first key is pressed.

5. INSERT/ADVANCE pushbutton Press, observe pushbutton annunciator extinguishes.
6. To load longitude Press keys in sequence, starting with W or E indicating west or east.

Example: 87° 54.9' West = W 8 7 5 4 9. Observe that INSERT/ADVANCE pushbutton annunciator illuminates when first key is pressed, and longitude appears in data display as keys are pressed.

7. INSERT/ADVANCE pushbutton - Press.

Observe pushbutton annunciator extinguishes.

8. INSERT/ADVANCE pushbutton - Press.

Observe that the arc-seconds related to loaded latitude and longitude, to nearest tenth of a second, appear in left and right data display, respectively.

9. If extra precision coordinate data is to be inserted Press keys in sequence, starting with N, to load related arc-second values for latitude.

Example: 35.8 North = N 358.

10. INSERT/ADVANCE pushbutton - Press.

Observe pushbutton annunciator extinguishes.

11. To load related arc-second values for longitude Press keys in sequence, starting with E.

Example: 20.1 East = E 201.

12. INSERT/ADVANCE pushbutton - Press.

Observe pushbutton annunciator extinguishes.

NOTE

In above example, if INSERT/ ADVANCE pushbutton is pressed, the following normal display would appear: 42° 54.5 N and 87° 54.3 W. The extra precision values are added to normal values and normal displays are not rounded off.

- **The normal geographic coordinates must always be loaded prior to extra precision values.**
- **The directions N or S and E or W are established during normal coordinate entry. Either key may be used to initiate entry during, extra precision loads and the values will be added to extra precision value without affecting direction.**
- **It is characteristic of the computer display routine to add 0.2 arc-seconds to any display of 59.9 arc-seconds. The value in computer is as loaded by operator.**

13. INSERT/ADVANCE pushbutton - Press.

Observe that right data display indicates last previously inserted altitude, and left data display is blank.

14. To indicate the following load is altitude - Press key 4 or 6.

Observe INSERT/ADVANCE pushbutton annunciator illuminates.

15. To load altitude first Press keys in sequence.

Example: 1230 ft = 1230. Numbers appear in right data display as keys are pressed.

NOTE

Altitude inputs are limited to 15,000 feet.

16. INSERT/ADVANCE pushbutton - Press.

Observe pushbutton annunciator extinguishes.

17. INSERT/ADVANCE pushbutton - Press.

Observe that left data display indicates last previously inserted channel number, and right data display is blank.

18. To indicate the following load is channel number Press key 2 or 8.

Observe INSERT/ADVANCE pushbutton annunciator illuminates.

19. To load channel number Press keys in sequence.

Example: 109 = 109. Numbers appear in left data display as keys are pressed.

20. INSERT/ADVANCE pushbutton - Press.

Observe pushbutton annunciator extinguishes.

NOTE

- **Any number will be accepted by the INS; however only stations with a channel number within the range of 1 through 126 will be used for TACAN mixing.**
- **The channel number has an implied X suffix.**
- **Decimal points and degree symbols should be disregarded when reading altitude and channel number displays.**

21. INSERT/ADVANCE pushbutton - Press.

Observe station latitude and longitude reappear.

22. Repeat steps 3 through 19 for each TACAN station.
23. To return INS to normal display modes, momentarily set data selector to L/L POS.

(7) Designating fly-to destinations:

1. Data selector L/L WY PT or UTM WY PT, as required.

2. Waypoint thumbwheel Select destination number.

Observe number of destination way-point appears in TO part of TO-FROM display.

3. Data selector - HDG/DA.

Observe present aircraft heading appears, to nearest tenth of degree, in left data display; also drift angle, to nearest degree, appears in right data display.

NOTE

Navigation information is now available from the INS for display in the pilot and copilot RMI's and on the pilot and copilot HSI's, as determined by the COURSE INDICATOR and RMI select switches.

(8) To fly selected INS course:

1. Pilot's COURSE INDICATOR switch INS.
2. Pilot's RMI select switch - INS.
3. Horizontal Situation Indicators (pilot's and/or copilot's HSI) Steer toward indicators.
4. CDU ALERT annunciator - Monitor.

Observe illumination approximately 1.3 minutes before reaching point for automatic leg switch. Indicator flashes on and off after passing a way-point, if AUTO-MAN switch is in MAN.

(9) Aided TACAN operation:

NOTE

If high accuracy alignment is required, wait for the READY NAV light before selecting NAV mode.

1. Mode selector - NAV.
2. Data selector - DSRTK/STS.
3. Key 4 - Press.

Observe right data display is 000004 and INSERT/ADVANCE pushbutton light is illuminated.

4. INSERT/ADVANCE pushbutton Press.

Observe right data display is 1-XX4 and INSERT/ ADVANCE pushbutton light is extinguished.

NOTE

Every 30 seconds, the INS will select next eligible TACAN station in sequence for updating. To be eligible, TACAN station range must be between 5 and 150 nm and channel between 1 and 126.

5. Data selector L/L WY PT or UTM WY PT.
6. Keys 7 and 9 - Press simultaneously.

Observe channel number of the TACAN station being used for navigation flashes on and off. Data displays indicate coordinates of station, selected via thumbwheel.

7. To monitor station selection Observe TO-FROM data display.

Observe only the number of stations eligible for mixing will be displayed. A 0 indicates that none of the 9 stations are eligible for selection.

8. Monitor INS UPDATE annunciator.

NOTE

Mixing will not be annunciated if: (a) TACAN control is inappropriately set; (b) TACAN station data loaded in error; (c) aircraft look-down angle is greater than 30°; (d) horizontal ground distance is less than two times the altitude. When 2 minutes elapse without an update, the NO INS UPDATE annunciator will illuminate.

9. To return INS display to normal Set data selector to any position except WYPT or DIS/TIME.
10. To monitor program of mix Set data selector to DSRTK/STS. (Observe Accuracy Index (A1) will decrement to 0.)

NOTE

To ensure favorable geometry during the update process, the following TACAN station criteria should be observed:

- **One station must be at least 15 nm off course.**
- **For optimum single TACAN updating, update should continue until aircraft has passed the station.For optimum dual TACAN updating, use one off-track TACAN station and one on-track station.**
- **For optimum multiple TACAN station updating, the stations should be evenly distributed in azimuth around the aircraft.**

11. Waypoint thumbwheel Set to number of first TACAN station to be used.

Observe selected station number is displayed on the TO side of TO-FROM data display.

(10) Switching from aided to unaided inertial operation.

1. Data selector - DSRTK/STS.
2. Key 5 - Press.

Observe INSERT/ADVANCE pushbutton annunciator illuminates; 000005 appears in right data display.

3. INSERT/ADVANCE pushbutton Press.

Observe INSERT/ADV'ANCE pushbutton annunciator extinguishes. Data display returns to normal with 5 appearing in first digit of right display.

NOTE

Benefits of previous aiding are maintained but no additional automatic updates will be made.

(11) To obtain readouts from INS:

NOTE

The computer is assumed to be in the NAV mode for all data displays.

(a) System status: Data selector DSRTK/STS.

Observe numbers indicating system status appear in right data display.

(b) Geographic present position: Data selector - L/L POS.

Observe latitude and longitude of present position appear in left and right data displays, respectively. Both displays are to tenth of a minute.

(c) UTM position: Data selector UTM POS.Observe northing and zone with easting of present position appear in left and right displays, respectively. Both displays are in kilometers.

(d) True heading and MAG heading: Data selector - HDG/DA.

Observe aircraft true heading appears in left data display to nearest tenth of a degree. Press and hold keys 3 and 9 simultaneously. MAG heading appears in left data display to nearest tenth of a degree. Release keys 3 and 9. Left display reverts to true heading.

(e) Groundspeed: Data selector - TK/GS.

Observe groundspeed appears in right data display to nearest knot.

(f) Ground track angle: Data selector TK/GS.

Observe ground track angle appears in left data display to nearest tenth of a degree.

(g) Drift angle: Data selector - HDG/DA.

Observe drift angle appears in right data display to nearest degree.

(h) Wind speed and direction: Data selector - WIND.

Wind direction appears in left data display to nearest degree and wind speed appears in right display to nearest knot.

(i) Desired track angle: Data selector - DSRTK/STS.

Observe desired track angle in right data display to nearest degree.

(j) Track angle error: Data selector - XTK/TKE.

Observe track angle error appears in right data display to nearest degree.

(k) Cross track distance: Data selector - XTK/TKE.

Observe cross track distance appears in left data display to nearest nautical mile.

(l) Distance and time to next waypoint: Data selector - DIS/TIME.

Observe distance to next waypoint, shown in TO side of TO-FROM display, appears in left data display to nearest nautical mile. Observe time to reach next waypoint at present groundspeed, appears in right data display to nearest tenth of a minute.

(m) Extra precision geographic present position display:

1. Data selector - L/L POS. Latitude and longitude of present position, to nearest tenth of a minute, appears in left and right data displays, respectively.
2. INSERT/ADVANCE pushbutton - Press.

Observe arc-seconds related to present position latitude and longitude, to nearest tenth of a second, appear in left and right data displays, respectively.

(n) Geographic present inertial position display.

1. Data selector - L/L WY PT.
2. HOLD pushbutton - Press. Observe HOLD pushbutton annunciator illuminates, latitude and longitude of present inertial position to a tenth of degree appear in left and right data displays, respectively.

NOTE

While HOLD pushbutton annunciator is extinguished, TACAN updates are inhibited.

3. INSERT/ADVANCE pushbutton - Press.

Observe arc-second related to present inertial position latitude and longitude, to nearest tenth of a second, appears in left and right data displays, respectively.

4. HOLD pushbutton - Press.

Observe INS returns to normal operation and HOLD pushbutton annunciator extinguishes.

(o) UTM present inertial position display:

1. Data selector - UTM WY PT.
2. HOLD pushbutton - Press.

Observe HOLD pushbutton annunciator illuminates. Northing and zone with easting of the present inertial position in kilometers appear in left and right data displays, respectively.

NOTE

While HOLD pushbutton annunciator is illuminated, TACAN updates are inhibited.

3. INSERT/ADVANCE pushbutton - Press.

Observe extra precision values related to present inertial position northing and easting, to nearest meter, appear in left and right data displays, respectively.

4. HOLD pushbutton - Press.

Observe INS returns to normal operation and HOLD pushbutton annunciator extinguishes.

(p) Distance and time to waypoint other than next waypoint

1. WYPT CHG pushbutton - Press.

Observe WYPT CHG and INSERT/ADVANCE pushbutton annunciator illuminates.

2. Key 0 - Press.

Observe FROM side of TO-FROM data display changes to 0.

3. Key corresponding to desired waypoint - Press.

Observe TO side of TO-FROM data display changes to desired waypoint number.

NOTE

Do not press INSERT/ADVANCE push- button. This would cause an immediate flight plan change.

4. Data selector - DIS/TIME.

Observe distance to desired waypoint appears in left data display to nearest nautical mile. Time to reach desired waypoint at present groundspeed appears in right data display to nearest tenth of a minute.

5. CLEAR pushbutton - Press.

Observe INS returns to normal operation. Observe INSERT/ADVANCE and WYPT CHG pushbutton annunciators extinguish. Waypoints defining current navigation leg appear in TO-FROM display.

(q) Distance and time between any two waypoints:

1. WYPT CHG pushbutton - Press.

Observe WYPT CHG and INSERT/ADVANCE pushbutton annunciators illuminate.

2. Keys corresponding to desired waypoints - Press in sequence.

Observe desired waypoint numbers appear in TO-FROM data display as keys are pressed.

NOTE

Do not press INSERT/ADVANCE pushbutton. This would cause an immediate flight plan change.

3. Data selector - DIS/TIME.

Observe distance between desired waypoints appears in left data display to nearest nautical mile. Time to travel between desired waypoints at present groundspeed appears in right data display to nearest tenth of a minute.

4. CLEAR pushbutton - Press.

Observe INS returns to normal operation. Observe WYPT CHG and INSERT/ADVANCE pushbutton annunciator extinguishes;. Waypoints defining current navigation leg appear in TO-FROM data display.

(r) Distance to any TACAN station:

1. Data selector - DIS/TIME.

Observe distance to next waypoint to nearest nautical mile is in left data display. Time to next waypoint to nearest tenth of a minute is in right data display.

2. Keys 7 and 9 - Press simultaneously.

Observe number of TACAN station being used for navigation flashes on and off in TO-FROM display. Distance to TACAN station to nearest nautical mile is in left data display. Time to next waypoint is in right data display.

3. If in aided TACAN operation - Monitor display.

Observe station number is selected every 30 seconds.

4. If not in aided TACAN operation - Perform steps 5 through 7.

5. WYPT CHG pushbutton - Press.

Observe INSERT/ADVANCE and WYPT CHG pushbutton annunciators illuminate. Station number flashing discontinues.

6. Key indicating desired TACAN station number - Press.

Observe number will appear in left digit location of TO-FROM data display.

NOTE

If wrong key is pressed, press CLEAR; displays will revert to that indicated in step 2.

7. INSERT/ADVANCE pushbutton -- Press.

Observe INSERT/ADVANCE and WYPT CHG pushbutton annunciators extinguish. The loaded digit will appear in right position of TO-FROM display and will be flashing on and off. Distance to that station to nearest nautical mile appears in left data display. The right display continues to display time to next waypoint.

8. Data selector - WIND, momentarily.

Returns INS to normal display mode.

NOTE

If in aided TACAN operation and if the desired station is not being selected, exit aided operation per procedure: Switching From Aided to Unaided Inertial Operation, perform steps 1 thru 8, and then return to aided operation per procedure: Aided TACAN Operation.

(s) Coordinates of any waypoint:

1. Data selector - L/L WY PT or UTM WY PT.

2. Waypoint thumbwheel - Set desired waypoint. Observe following:

a. L/L WY PT: latitude and longitude of desired waypoint, to a tenth of a minute, appear in left and right data displays respectively.

b. UTM WY PT: Northing and zone with easting of desired waypoint, to a kilometer, appear in left and right data displays respectively.

3. INSERT/ADVANCE pushbutton - Press. Observe the following:

a. L/L WY PT: The arc-seconds related to desired waypoint latitude and longitude, to a tenth of an arc-second appear, in left and right displays respectively.

b. UTM WY PT: The extra precision display related to desired waypoint northing and easting, in meters, appear in left and right data displays respectively.

- L/L WY PT: A coordinate is the addition of values for degrees, whole minutes and seconds.
- Example: W $^{87°}$ 54' 58.6 = $^{87°}$ 54.9W and 58.6.
- UTM WY PT: A coordinate is the addition of the values for kilometers and meters.
- Example: S 2,474,706m = 2474S and 706.

(t) TACAN station data:

1. Keys 7 and 9 - Press simultaneously.

2. Waypoint thumbwheel - Set to desired TACAN station.

Observe number of TACAN station being used for navigation flashes on and off.

a. L/L WY PT:

Latitude and longitude of desired TACAN station, to tenth of minute, appears in left and right data displays, respectively.

b. UTM WY PT: Northing and zone with easting of desired TACAN station, to a kilometer, appear in left and right data displays, respectively.

3. INSERT/ADVANCE PUSHBUTTON - Press. Observe the following:

a. L/L WY PT:

The arc-seconds related to desired TACAN station, to tenth of an arc-second, appear in left and right data displays respectively.

b. UTM WY PT:

The extra precision display related to desired TACAN station northing and easting, in meters, appear in left and right data displays respectively.

NOTE

Direction is indicated in normal data displays.

- L/L WY PT: A coordinate is the addition of values for degrees, whole minutes, and seconds.
- Example: W 87° 54' 58.6 will be displayed as 87° 54.9W and 58.6.
- UTM WY PT: A coordinate is the addition of values for kilometers and meters.
- Example: S 2,474,706 m will be displayed as 2474 S and 706.

4. INSERT/ADVANCE pushbutton - Press.

Observe TACAN station altitude, in feet, will appear in right data display; degree symbol and decimal points should be disregarded. Left data display is blank.

5. INSERT/ADVANCE pushbutton- Press.

Observe TACAN station channel number, in whole numbers, will appear in left data display; degree symbol and decimal point should be disregarded. Right data display is blank.

NOTE

- **If INSERT/ADVANCE pushbutton is pressed, the normal coordinates indicated in step 3 will be displayed.**
- **Waypoint thumbwheel may be moved at any time and normal coordinates for new TACAN station will be displayed.**

6. Data selector - Momentarily to any position other than L/L WY PT, UTM WY PT or DIS/TIME. (Returns INS to normal operation.)

(u) Magnetic heading.

1. Data selector - HDG/DA.

Observe true heading to nearest tenth degree appears in right data display.

2. Keys 3 and 9 - Press simultaneously and hold.

Observe magnetic heading to nearest tenth of a degree appears in left data display. Drift angle continues to be displayed in right data display.

3. Keys 3 and 9 - Release.

Observe left data display reverts to true heading.

(12) INS updating:

(a) Normal geographic present position check and update:

1. Data selector - L/L POS.

Observe latitude and longitude of present position appear in left and right data displays, respectively.

2. Illuminated HOLD pushbutton - Press.

Observe latitude and longitude in data displays freeze at values present when HOLD pushbutton is pressed.

NOTE

While HOLD pushbutton annunciator is illuminated, TACAN, GPS and data link updates are inhibited.

3. Keys - Press in sequence to load latitude of position reference, starting with N or S to indicate north or south.

Example: 42 ° 54.0' north = N 4 2 5 4 0.

Observe INSERT/ADVANCE pushbutton annunciator illuminates when first key is pressed, and latitude appears in left data display as keys are pressed.

4. INSERT/ADVANCE pushbutton - Press.

Observe INSERT/ADVANCE pushbutton annunciator remains illuminated, and previous value of latitude reappears.

5. Keys - Press in sequence to load longitude of position reference, starting with W or E to indicate west or east.

Example: 87° 54.9' west = W 8 7 5 4 9. Observe longitude appears in right data display as keys are pressed.

6. INSERT/ADVANCE pushbutton - Press.

Observe INSERT/ADVANCE and HOLD pushbutton annunciators remain illuminated. North position error and east position error, in tenth of a nautical mile, will appear in left and right data displays, respectively.

NOTE

If WARN annunciator illuminates, proceed to step 7; otherwise proceed to step 8.

7. Data selector - DSRTK/STS.

Observe action code 02 and malfunction code 49. This indicates that the radial error between the loaded position and the INS position exceeds 33 nautical miles. Operator must evaluate possibility that either INS is in error or reference point position is incorrect. It is possible to force INS to accept updated position by setting data selector to L/L POS and proceeding to step 8).

8. If displayed values are within tolerance, press HOLD pushbutton to return INS to normal operation. If one or both values are out of tolerance, proceed to step 9.

9. Key 2 - Press.

Observe left data display is 00000 N; INSERT/ADVANCE and HOLD pushbutton annunciators are illuminated.

10. INSERT/ADVANCE pushbutton - Press.

Observe INSERT/ADVANCE and HOLD pushbutton annunciators extinguish. Present position appears in data displays. Present position check and update is complete.

NOTE

Within 30 seconds, computer will process correction and revised present position will appear in data display. If AI prior to position update is 1 or greater, computer will accept over 95 percent of correction shown in difference display. If AI is 0, amount of correction accepted will be less and is a function of time in NAV mode and number of updates which have been made.

(b) Extra precision geographic present position check and update:

1. Data selector - DSRTK/STS.
2. Key 2 - Press.

Observe INSERT/ADVANCE pushbutton annunciator illuminates, 000002 appears in right data display.

3. INSERT/ADVANCE pushbutton - Press.

Observe right data display is 1--XX2, INSERT/ADVANCE pushbutton light is extinguished, and any TACAN, GPS or data link updating is discontinued.

4. Data selector - L/L POS.

Observe latitude and longitude of present position appears in left and right data displays, respectively.

5. HOLD pushbutton - Press (when aircraft passes over known position reference.) Observe HOLD pushbutton annunciator illuminates. Latitude and longitude in data displays freeze at values present when HOLD pushbutton was pressed.

6. Load latitude by pressing keys in sequence, starting with N or S to indicate north or south.

Example: 42° 54.0' North = N 4 2 5 4 0. Observe latitude appears in left data display as keys are pressed.

7. INSERT/ADVANCE pushbutton - Press, observe INSERT/ADVANCE and HOLD pushbuttons remain illuminated.

8. Load longitude by pressing keys in sequence, starting with W or E indicating west or east.

Example: 87° 54.9' West = W 8 7 5 4 9.

9. INSERT/ADVANCE pushbutton - Press.

Observe INSERT/ADVANCE and HOLD pushbutton annunciators remain illuminated.

10. INSERT/ADVANCE pushbutton - Press.

Observe arc-seconds related to present position latitude and longitude, to nearest tenth of a second, appear in left and right data displays, respectively.

11. Load related arc-second values for latitude in sequence, starting with N.

Example: 35.8° North = N 3 5 8.

12. INSERT/ADVANCE pushbutton - Press.

Observe INSERT/ADVANCE and HOLD pushbuttons remain illuminated.)

13. Load related arc-second values for longitude in sequence, starting with E.

Example: 20.1° East = E 2 0 1.

NOTE

- **Extra precision values are added to normal values and normal displays are not rounded off.**
- **Normal longitude-latitude coordinates must always be loaded prior to extra precision values.**
- **Directions N or S and E or W are established during normal coordinate entry. Either key may be used to initiate entry during extra precision loads and values will be added to extra precision values without affecting direction.**
- **It is characteristic of the computer display routine to add 0.2 arc-seconds to any display of 59.9 arc-seconds. Value in computer is loaded by operator.**

14. Proceed to step 6 in procedure: Normal Geographic Present Position Check and Update.

(c) UTM present position check and update:

NOTE

UTM data may be loaded in any order and, until final entry, a value may be reloaded.

1. Data selector - UTM POS.

Observe UTM coordinates of present position appear in data displays.

2. HOLD pushbutton - Press (when aircraft passes over known position reference.)

Observe HOLD pushbutton annunciator illuminates. Coordinates in data display freezes at values present when HOLD pushbutton was pressed.

NOTE

While HOLD pushbutton annunciator is illuminated, TACAN, GPS and data link updates are inhibited.

3. Load zone and easting by pressing keys in sequence, starting with E.

Example: Zone 16, 425 km East =E16 425.

Observe zone and easting in kilometers appear in right data display as keys are pressed.

4. INSERT/ADVANCE pushbutton - Press.

Observe INSERT/ADVANCE pushbutton annunciator remains illuminated.

5. Load northing by pressing keys in sequence, starting with N or S to indicate north or south hemisphere.

Example: North 4749 km =N 4749. Observe northing kilometers appear in left data display as keys are pressed.

6. INSERT/ADVANCE pushbutton - Press.

Observe INSERT/ADVANCE pushbutton annunciator remains illuminated.

7. INSERT/ADVANCE pushbutton - Press.

Observe extra precision display related to present position northing and easting, to nearest meter, appears in left and right data displays, respectively.

8. Load extra precision easting value by pressing keys in sequence, starting with E.

Example: 297 m East = E 297. Observe easting meters appear in right data display as keys are pressed.

9. INSERT/ADVANCE pushbutton - Press.

Observe INSERT/ADVANCE pushbutton annunciator remains illuminated.

10. Load extra precision northing value by pressing keys in sequence, starting with N or S.

Example: 901 m North =N 901. Observe northing meters appear in left data display as keys are pressed. The value is always added to normal value regardless of which key (N/S) is pressed to initiate entry. Normal entry establishes the hemisphere.

NOTE

- **The W key may be used to initiate easting entries; however, the computer will always interpret such entries as an E input.**
- **The extra precision values are always added to normal values.**
- **Any data inserted when HOLD pushbutton annunciator is not illuminated**

will be rejected by computer.

11. INSERT/ADVANCE pushbutton - Press.

Observe INSERT/ADVANCE and HOLD pushbutton annunciators remain illuminated. North position error and east position error in kilometers will appear in left and right data displays, respectively.

12. If WARN annunciator illuminates, proceed to step 13; otherwise proceed to step 9 in procedure: Extra Precision Geographic Present Position Check and Update.

13. Data selector - DSRTK/STS.

Observe action code 02 and malfunction code 49. This indicates radial error between loaded position and INS position exceeds 62 kilometers. Operator must evaluate possibility that INS is in error or reference point position is incorrect. It is possible to force INS to accept updated position by setting data selector to UTM POS and proceeding to step 10 of procedure: Extra Precision Geographic Present Position Check and Update.

14. If updating is to be rejected - Press HOLD pushbutton.

Observe HOLD and INSERT/ADVANCE pushbutton annunciators extinguish. INS returns to normal operation.

(d) Position update eradication:

NOTE

This procedure is not considered common. Its use is limited to those times where an operational error has resulted in an erroneous position fix.

1. Data selector - DSRTK/STS.
2. Key 1 - Press. Observe INSERT/ADVANCE pushbutton annunciator illuminates, 000001 appears in right data display.
3. INSERT/ADVANCE pushbutton - Press.

Observe INSERT/ADVANCE pushbutton annunciator extinguishes. Within 30 seconds, data displays return to normal with 0 (normal inertial mode) in last digit of right display. AI will be set to approximately three times the number of hours in NAV.

(13) Flight course changes.

(a) Manual flight plan change insertion:

1. WYPT CHG pushbutton - Press.

Observe WYPT CHG and INSERT/ADVANCE pushbuttons illuminate.

2. Select new TO and FROM waypoints by pressing corresponding keys
3. WYPT CHG pushbutton - Press.

Observe new waypoint numbers appear in TO-FROM data displays as keys are pressed.

NOTE

Selecting zero as FROM waypoint will cause desired track to be, defined by computed present position (inertial present position plus fixes) and TO waypoint.

4. INSERT/ADVANCE pushbutton - Press.

Observe WYPT CHG and INSERT/ADVANCE pushbuttons extinguish.

NOTE

Waypoint zero always contains ramp coordinates if no manual flight plan changes are made. When a manual flight plan change is made, present position at instant of insertion is stored in waypoint zero.

(14) After landing procedures:

CAUTION

- **If INS will be unattended for an extended period, it should be shut down.**
- **Do not leave INS operating unless aircraft or ground power and cooling air are available to system.**

NOTE

- **The INS may be shut down, downmoded to STBY or ALIGN mode, or operated in the navigation mode after landing. The determining factor in choosing course of action is expected length of time before the next takeoff.**
- **Do not tow or taxi aircraft during INS**

alignment. Movement during alignment requires restarting alignment.

(a) Transient stops.

NOTE

Action to be taken during a transient stop depends upon time available and on availability of accurate parking coordinates (latitude and longitude.)

1. Realignment - INS operating.

(Recommended if sufficient time and accurate parking coordinates are available.)

NOTE

INS can be downmoded to perform a realignment and azimuth gyro calibration. Alignment to produce an alignment state number of 5 can be accomplished in approximately 17 minutes. During the 17 minute period, an automatic azimuth gyro recalibration is determined on basis of difference between inertial present position before downmoding and inserted present position. To obtain further refinement of azimuth gyro drift rate, calculated on basis of newly computed error data, INS can be left in alignment mode for a longer period, allowing the alignment state number to attain some value lower than 5.

2. Data selector - STBY, then to ALIGN.
3. Present position coordinates - Insert, according to procedure: Geographic Present Position Insertion or UTM Present Position Insertion.
4. Realignment - INS shutdown.

Perform complete alignment procedures.

5. Position update.

Recommended if time is not available for realignment.

- Perform position update using parking coordinates in accordance with procedure: Insertion of Geographic Waypoint Coordinates. If parking coordinates are not available, proceed as follows:
- Continue operation in NAV, if INS accuracy appears acceptable.
- Perform position update using best estimate of parking coordinates.

NOTE

INS can be downmoded to standby operation which will maintain navigation unit at operating temperature with gyro wheels running. INS is downmoded to standby as follows:

f. Downmoding to standby:

Mode selector - STBY.

CAUTION

Do not leave INS operating unless aircraft or ground power and cooling air are available to system.

g. Shutdown:

Mode selector - OFF.

NOTE

INS will retain inertial present position data computed at time INS is downmoded. This value is compared with present position inserted for next alignment and difference is used to determine azimuth gyro drift rate.

e. Abnormal Procedures:

(1) General. INS contains self-testing features which provide one or more warning indications when a failure occurs. The WARN annunciator in the CDU provides a master warning for most malfunctions occurring in the navigation unit. Malfunctions in the MSU or CDU will normally be obvious because of abnormal indications of displays and annunciators. A battery unit malfunction will shut down INS when battery power is used.

(2) Automatic IN: shutdown.

(a) Overtemperature. An overtemperature in navigation unit will cause INS to shut down (indicated by blank CDU displays) when mode selector is at STBY or ALIGN during ground operation. The WARN annunciator in CDU will illuminate and will not extinguish until mode selector is rotated to OFF. The cooling system should be checked and corrected if faulty. If cooling system is satisfactory, navigation unit should be replaced.

(b) Low battery charge. A low battery unit charge will cause INS to shut down when INS is operating on battery unit power. Both WARN annunciator on CDU and BAT annunciator inMSU

will illuminate and not extinguish until the mode selector is set to OFF. The battery unit should be replaced when this failure occurs.

(c) Interpretation of failure indications. It is important to be able to correctly interpret failure indications in order to take effective action. Failure indications are listed below under two main categories: WARN light illuminated, and WARN light extinguished. Under each of these categories are listed other indications which will give the operator sufficient information to take action.

1. WARN annunciator illuminated.

Take the following action:

a. If action codes 01,02,03,04 or 05 are displayed - See table 3-2.

b. No action or malfunction codes displayed - Indicates computer failure.

c. Improper displays - Indicates NU computer failure.

2. WARN annunciator extinguished.

If CDU displays are blank, incorrect or frozen - CDU failure is indicated.

NOTE

If it is not possible to load displays from the keyboard. A temporary failure of a numerical key may prevent data loading. If a number cannot be loaded into latitude or longitude displays, after pressing/wiggling the key several times, the cause may be the momentary hang-up of another key. To identify the faulty key, rotate the data selector to DSRTK/STS. The right digit in right display will indicate suspect key. Press and release suspect key several times. To test whether the keyboard problem is corrected, try pressing any other numerical key. Its number should now appear as the right digit. If this test is successful, press the CLEAR key and return data selector to original data loading position. Otherwise, a CDU failure is indicated.

Table 3-3. Malfunction Code Check

Step Indication	Control	Operation	Indicator or Display	Indication
1			WARN light	Lights
2	Data Selector	Rotate to DSRTK/STS	RH data display	Action code second and third digits
3	TEST switch	Press and release	RH data display	Lowest number malfunction code which has occurred since this procedure was performed replaces action code.
4	Repeat Step 3 repeatedly, recording all malfunction codes until second and third digits again indicate an action code or go blank. Refer to Table 3-4 for action codes and recommended action and to Table 3-5 for malfunction code definition.			
5	If WARN light extinguishes and two digits go blank, failure was intermittent and has been cleared. If digits do not go blank, perform action according to displayed recommended action code.			

Table 3-4. Malfunction Indications and Procedures

Mode of Operation	Malfunction Indication	Procedure	Probable Cause
STBY or ALIGN	WARN on, CDU blank(DIM control clockwise. MSU BAT off	1. Rotate MSU mode selector OFF. 2. Check aircraft cooling system and correct if faulty. 3. Realign INS.	Automatic shutdown caused by overtemperature.-
STBY, ALIGN, NAV	WARN on, MSU BAT on, CDU blank.	1. Rotate MSU mode selector OFF. 2. Insure all switches and circuit breakers applicable to INS operation are set properly. 3. If in flight, rotate MSU mode selector OFF. 4. If on ground, replace battery unit. Battery unit test may be bypassed by rotating mode selector to OFF, then to NAV and reloading position coordinates. When INS advances to alignment State 7 (PI = 7) rotate mode selector to ALIGN.	Loss of INS power and low battery. Unit (BU).
STBY, ALIGN, or NAV	WARN on, CDU is operating	Perform Malfunction Code Check as described in Table 3-3.	Navigation failure or interfacing system problem.

Table 3-5. Action Codes and Recommended Actions

Code	Recommended Action
01	Shut down INS.
02	Watch for degradation (NAV). During ground operation, downmode to STBY and restart alignment.
03	INS may be used for navigation. One or more analog outputs are not functioning properly. Check 26 VAC circuit breakers, HSI and autopilot.
04	Downmode to STBY and restart alignment (ground operation only).
05	Correct problem in interfacing system (could be INS). Will not seriously affect performance.

Table 3-6. INS Malfunction Codes

Malf Code	Failed Test	Modes of Operation	Recommended Action Code
10	Invalid heading	ALIGN	04
11	GR/CS program pin connected in error	ALIGN	01
12*	Canned altitude profile in use (input altitude invalid)	ALIGN, NAV	05
13	Y velocity change	NAV	02
14	X velocity change	NAV	02
15	Torque limited	ALIGN, NAV	02
16	Invalid pitch and roll	ALIGN, NAV	05
17	Invalid magnetic heading	ALIGN, NAV	05
18	Excessive saturation time	ALIGN	04
20*	Bearing to waypoint	ALIGN, NAV	03
22*	Bearing to waypoint	ALIGN, NAV	03
23*	Drift angle	ALIGN, NAV	03
24*	Steering converter	ALIGN, NAV	03
25*	True heading converter	ALIGN, NAV	03
26*	XTK converter	ALIGN, NAV	03
27*	Tick mark too fast	STBY	01
31	Ground speed	NAV	02
32	Memory parity	STBY, ALIGN, NAV NAV	02
33	Azimuth stabilization loop	ALIGN, NAV	01
34	Inner roll stabilization loop	ALIGN, NAV	01
35	Pitch stabilization loop	ALIGN, NAV	01
36	Accelerometer loop	ALIGN, NAV	01
37	Z platform overtemperature	NAV	01
38	XY platform overtemperature	NAV	01
40	Heading error	ALIGN	04
42	Drift angle 450	NAV	02
44	Azimuth gyro drift rate	ALIGN	02
45	Gyro scale factor or loaded altitude	ALIGN	04
47	15-second loop	NAV	02
49	Fix measurement too large	NAV	02
51*	Excessive wind	ALIGN, NAV	05
54*	Incomplete conversion from UTM to L/L	STBY, ALIGN, STBY, ALIGN	05
57	XY platform rotation rate	ALIGN	02
59	600 millisecond loop	STBY, ALIGN, NAV	02
60	X or Y sample and hold change	ALIGN	04
62	XY platform rotation rate	NAV	02
63	CDU self-checks	STBY, ALIGN, STBY, ALIGN, NAV	02

* Failed test does not Illuminate WAHN light on CDU.

(d) CDU BAT annunciator is illuminated.

Operation on battery is an indication that there may be no aircraft power to blower motor with resultant loss of cooling. The INS can operate only a limited time (normally 15 minutes) on battery power before a low voltage shutdown will occur. Then, immediate corrective action must be taken.

NOTE

- **CDU BAT indicator will illuminate for 12 seconds in alignment State 8 (about 5 minutes after turn-on). This is normal and indicates a battery test is in progress. No corrective action is required.**
- **During ground operation, it is recommended that operation on battery power not exceed 5 minutes.**

1. To determine corrective action:

(Monitor CDU displays while rotating the CDU selector switch.)

a. If displays are frozen (do not change while data selector is being rotated), problem is normally in the navigation unit.

b. If displays respond normally to the data selector, the problem is normally absence of 11 5V AC power to INS.

(e) For corrective action: Check to assure proper settings of the following switches and circuit breakers essential to INS operation:

1. Overhead circuit breaker panel (fig. 2-6) - Circuit breakers in:

(1) AVIONICS MASTER CONTR
(2) INS CONTROL
(3) AVIONICS MASTER PWR No. 1
(4) AVIONICS MASTER PWR No. 2

2. Overhead control panel (fig. 2-13): INVERTER No. 1 or INVERTER No 2 switch - ON (either).

3. Mission control panel (fig. 4-1):

(1) #1 INV or #2 INV switch - ON.
(2) Bus cross tie switch - ON/AUTO.

4. Mission AC/DC Power Cabinet (fig. 2-29): INS AC PWR circuit breaker - In.

NOTE

CDU BAT indicator should extinguish after above corrective action. If it remains illuminated, INS will eventually shut down when batter), voltage drops below approximately 19VDC. Flight crew should prepare for shutdown.

(3) Malfunction indications and procedures: Table 3-3 details the procedure for a Malfunction Code Check. Table 3-4 lists a number of malfunction indications which occur under given modes of operation. Table 3-5 details, action codes and recommended action. Follow procedure given. Table 3-6 lists failed test symptoms by malfunction codes and lists codes for recommended actions.

3-28. GLOBAL POSITIONING SYSTEM (AN/ASN-149 (B)3).

a. Description. Complete provisions are installed for a global positioning system (GPS). The GPS is used to provide updated position information to the inertial navigation system. The GPS system consists of a control/display unit, receiver, observer headset and GPS key panel, antenna electronics unit, and an antenna.

(1) Control/display unit (CDU). The control/display unit (fig. 3-23A), located on the electronics rack located in the cabin, accomplishes all display and control functions necessary for the operation of the GPS receiver.

(2) Observer Headset and GPS Key Panel. The observer headset and GPS key panel (fig. 3-23B), located on the electronics rack in the cabin, contains a headset connector and GPS key and loading controls.

b. GPS Controls, Indicators, and Functions.

(1) GPS control/display unit (fig. 3-23A).

(a) Line selection keys. Four line selection keys, located to the left of the CDU display screen, are used to initiate and terminate data entries, and to select various system options.

(b) Display screen. System information is shown on the cathode ray tube display screen. The display screen can show four lines of text with 13 alphanumeric characters on each.

(c) Mode selector switch. The four-position mode selector switch, placarded PULL OFF, INIT, NAV, and PULL TEST, is used to select the operating mode of the GPS system.

(d) Display brightness control. A control knob placarded BRT is provided to control the brightness of the cathode ray tube display screen. Clockwise rotation of the control increases brightness.

(e) Data entry keys (0 through 9). The data entry keys are used to enter alphanumeric data.

(f) USE LTR key. The use letter key, placarded USE LTR, is used to select alphabetic prompt in free format data entry. The USE LTR key terminates alphabetic entry when pressed.

(g) Clear key. The clear key, placarded CLR, is used to clear erroneous data entry and message displays.

(h) Slew key. The slew key is used to access additional pages within a data display selected by the data select switch. If more than one page is available a double arrow is displayed in the lower right corner of the display. Pressing the slew key will access the next page. Repeated pressing of the slew key will return the display to the first page after the last page has been accessed.

(i) Data selector switch. For all data selector switch positions there are two modes of displayed data:

1. Destination mode (active waypoint as destination)

2. Waypoint (WP) examine mode (any waypoint)

Pressing the WP key switches the CDU between the two modes.

The 10 position data select switch is used to select the type of information to be displayed on the CDU:

POS.	Position data is displayed.
MSN.	Mission data is displayed.
OPT.	Option data is displayed. Six pages of information pertaining to the GPS receiver are made available when the OPT position is selected.
STAT.	Status data is displayed.
VAR-DTM.	Magnetic variation and map datum data is displayed.
ERR.	Error data is displayed.
WIND.	Wind data is displayed.
DIS-TG.	Distance and time to go data is displayed.
TRK-GS.	Track and ground speed data is displayed.
DTK-VA.	Desired track and vertical angle data is displayed.

(j) Waypoint key. The waypoint key, placarded WP, is used to enter and examine waypoint data.

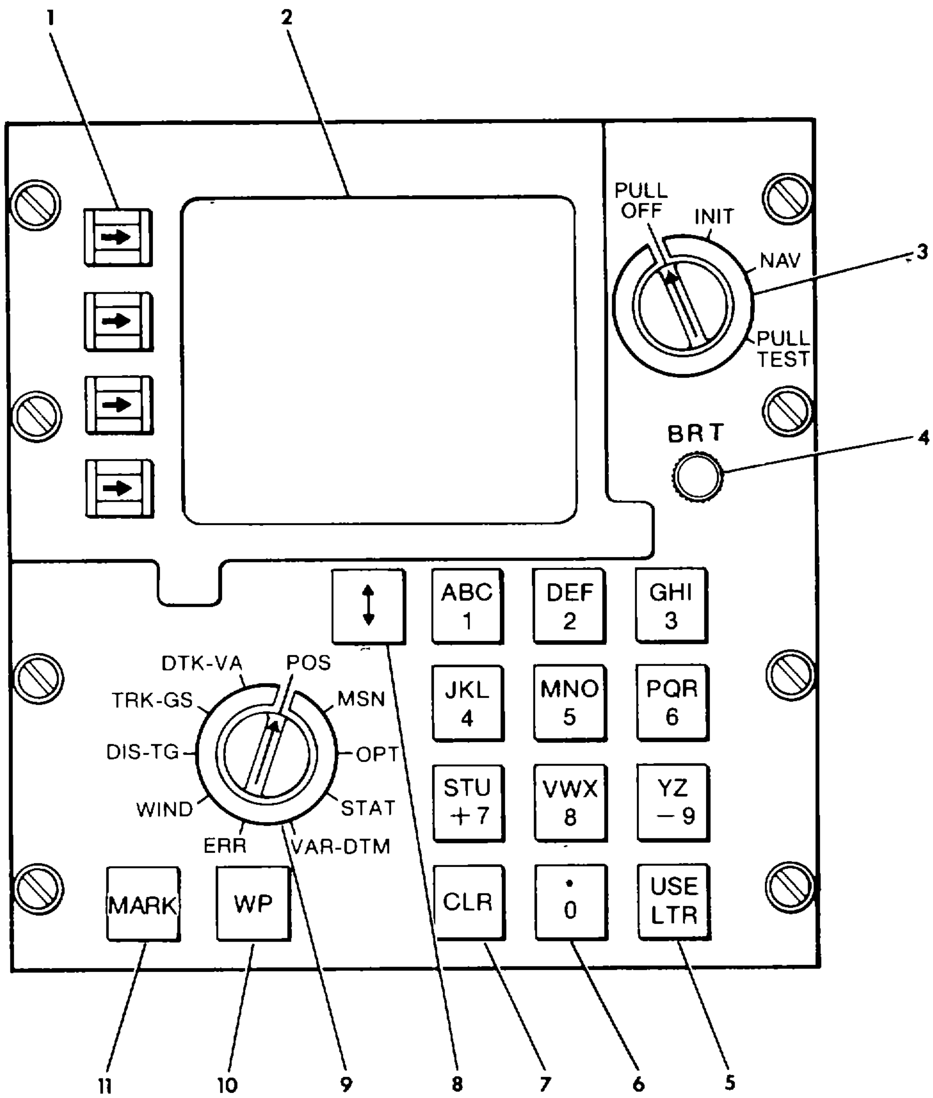
(k) Mark key. The MARK key is used for MARK and FREEZE functions.

(2) Observer Headset and GPS Key Panel Controls, Indicators, and Functions (fig. 3-28B).

(a) Interphone hot microphone, normal, key radio switch. This switch, placarded INTPH HOT MIC - NORM - KEY RADIO allows selection of hot microphone intercom, normal, and key radio positions.

(b) Observer headset connector. Allows connection of observer headset.

(c) GPS Zeroize switch. Actuating the guarded switch, placarded ZEROIZE GPS, will declassify the GPS receiver.



1 Line Selection Keys
2 Display
3 Mode Selector Switch
4 Display Brightness Control
5 Use Letter Key
6 Data Entry Keys (0 through 9)
7 Clear Key
8 Slew Key
9 Data Selector Switch
10 Waypoint Key
11 Mark Key

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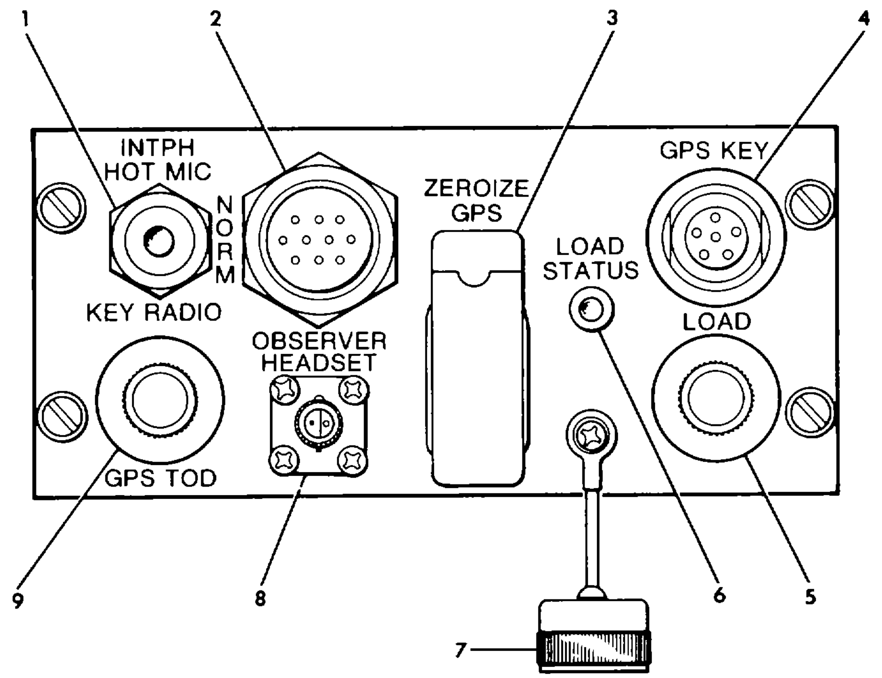
3-23A. GPS Control/Display Unit (CDU)



1 Interphone, Hot Microphone - Normal - Key Radio Switch
2 Observer Headset Connector
3 Zeroize GPS Switch
4 GPS Key Connector
5 Load Switch
6 Load Status Indicator Light
7 Dust Cap
8 Observer Microphone Connector
9 GPS Time of Day Switch

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3-23B. Observer Headset and GPS Key Panel

(d) GPS key connector. Connects GPS key.

(e) Load switch. This pushbutton switch initiates loading process.

(f) Load status indicator light. Illuminates to indicate load status.

(g) Dust cap. Covers GPS key connector when not in use.

(h) Observer microphone connector. Connects observer microphone.

(i) GPS time of day switch. This pushbutton switch is used to transmit GPS time of day to Have Quick II radios.

c. GPS System Modes of Operation.

(1) Off Mode. When the PULL OFF mode has been selected, power is removed from the system, except panel lighting.

NOTE

Critical memory and other circuits which cannot be turned off remain powered by batteries in the receiver.

(2) Initialize Mode. When the INIT (initialize) mode has been selected, position and time estimates can be entered via the keypad. Waypoint data may be entered and examined, and option selections made. No navigation functions can be performed.

(3) Navigation Mode. Selection of the NAV (navigation) mode enables normal GPS functions (satellite tracking and navigation), including data transfer to and from other aircraft systems.

(4) Test Mode. Selection of the PULL TEST mode initiates a full command test of GPS user equipment for line replaceable unit (LRU) fault identification and isolation.

d. GPS Normal Operation.

(1) GPS Start Procedures. The GPS must be initialized prior to being used for navigation. There are three types of start: normal, quick, and cold. A position estimate, time estimate, and almanac (or ephemeris) data are required for a normal start. A quick start uses stored position, time, and recent ephemeris information. A cold start is used only when the GPS is unable to perform a normal start-up.

(a) GPS Normal Start.

1. Mode selector switch - INIT. When built-in-test is complete the display will show data corresponding to the data selector switch position.

NOTE

Data display will not be illuminated for about 30 seconds after GPS has been turned on. Ensure that the display bright- ness control has been set to the full clockwise position to receive the INIT display, then adjust as desired.

NOTE

If the GPS has been OFF for more than 30 seconds when INIT mode was selected, the set will perform the initial built-in-test which takes approximately 30 seconds.

2. Data selector switch - POS. If ENTER POS message is displayed press line select key 3 next to message. Position must be entered.
3. Displayed position - Check. Verify or enter new updated position and altitude as required.
4. Data selector switch - TRK-GS. Verify correct track and groundspeed are displayed. If not valid, enter correct values.
5. Slew key - Press. Enter current time, year, and day of year on page 2.

NOTE

Prior to next step; ensure all required initialization data has been entered correctly, as they cannot be changed after selection of NAV mode.

6. Mode selector switch - NAV. GPS will begin to search for satellite signals.

NOTE

If COLD alternates with the figure of merit display, the GPS is performing a cold start.

7. Data selector switch - STAT.

NOTE

The number of satellites (SAT) being acquired and tracked can be observed. Estimated position error (EPE) and figure of merit (FM) can be monitored. The GPS will be ready for use when SAT 3 or SAT 4 is displayed on STAT page 1.

8. Select page 2 of STAT. Check almanac age (ALM). If greater than 5000 hours, force a cold start.
9. While the GPS is acquiring satellites, periodically check STAT page 1 for SAT 3 or SAT 4 message. Figure of merit (FM) is another indication of a converging position fix and can be directly monitored from page 1 of any data selection, where FM alternates with the system map datum and other alerts.
10. SAT 3 or SAT 4 should be displayed within five minutes. If not, check that position, time, track, and groundspeed have been entered correctly. Also check that satellites are available. If all information is correct and satellites are available, force a cold start.

(b) GPS Quick Start.

1. Mode selector switch - Set to NAV directly from OFF. After power-on test has been completed, the GPS uses velocity estimates from the aircraft's sensors (if available). If velocity is not available from the aircraft, zero velocity is assumed. If position and time are not available from the aircraft, the position estimate from GPS memory is used, and the internal low power time source (LPTS) is uses to initialize time.
2. As the GPS is acquiring satellites, position, time, and velocity estimates can be checked to ensure that they are within start-up error limits. If so, monitor STAT page 1. If not, a normal start is required.
3. After SAT 4 is achieved with good EPE (estimated position error), and FM (figure of merit) of FM3 or below, check position, velocity, and time.
4. GPS is now ready for normal navigation.

(c) GPS Cold Start.

1. Mode selector switch - INIT.
2. Data selector switch - OPT.
3. Slew key - Select page 4.
4. Enter 04 on line 1.
5. Line select key 2 - Press next to COLD START to initiate.
6. Line select key 3 - Press next to COLD START to clear cold start message and resume normal display.
7. Mode selector switch - NAV.

e. CHAALS Use of GPS and INS.

(1) CHAALS Concept. CHAALS (Coherent High Accuracy Airborne Location System), is an emitter location system that provides timely, high accuracy locations required for targeting and to support emitter associations and battlefield situation assessment. CHAALS provides this capability through coherent processing of differential doppler (DD) and time difference of arrival (TDOA) information received at a ground facility from the aircraft. CHAALS receivers aboard the aircraft will receive and digitize emitter signals. The data will be transmitted over the data link to the GR/CS integrated processing facility (IPF). There, CHAALS processors will perform the required computations to produce accurate emitter locations. The precise navigation required will be provided by the inertial navigation system (INS) and the global positioning system (GPS). GPS also provides the primary means of time synchronizing the CHAALS receivers (signal conditioners or SC's) aboard the aircraft. A backup for the GPS will be provided by the data link. The resultant emitter reports will be sent to GR/CS by CHAALS.

(2) GPS (and INS) Involvement. The accurate and timely navigation (position and velocity) is provided by integrating an INS with a GPS, and integrating both (through a series of intermediaries) with a CHAALS ground based navigation processor (NP). The SC, data link, and CHAALS HSSP (high speed signal processor) form the communication link. The critical airborne interfaces for CHAALS navigation and time synchronization include the following:

1. INS to GPS:
   a. Acceleration
   b. Velocity
   c. Position
   d. Altitude
2. INS to CHAALS: Same as INS to GPS
3. GPS to CHAALS:
   a. Time mark pulse (time synchronization)
   b. Navigation data block (position, velocity, and time)
   c. Error state vector data block (9 element ESV, time)
   d. TM/covariance data block (time, TM time, covariance)

e. Status data block (status including DOP's and FOMN)

3-29. USE OF GPS FOR CHAALS.

Not applicable.

3-30. NAVIGATION CONCEPT

Not applicable.

Section IV. RADAR AND TRANSPONDER

3-31. WEATHER RADAR SET (AN/APN-215).

a. Description. The weather radar set (fig. 3-24), provides a visual sweep, 120 ° around the nose of the aircraft, extending to a distance of 240 nautical miles. The presentation on the screen shows the location of potentially dangerous areas, such as thunderstorms and hailstorms, in terms of distance and azimuth with respect to the aircraft. The radar is also capable of ground mapping operations. The weather radar set is protected by a 7 1/2-ampere RADAR circuit breaker located in the overhead circuit breaker panel (fig. 2-6).

b. Controls/Indicators and Functions.

(1) GAIN control. Used to adjust radar receiver gain in the MAP mode only.

(2) STAB OFF switch. Push type on/off switch. Used to control antenna stabilization signals.

(3) Range switches. Momentary action type switches. When pressed, clears the screen and increases or decreases the range depending on switch pressed.

(4) TILT control. Varies the elevation angle of radar antenna a maximum of 15 degrees up or down from horizontal attitude of aircraft.

(*5) 60° switch.* Push type on/off switch. When activated, reduces antenna scan from 120° to 60 degrees.

(6) TRACK switches. Momentary action type switches. When activated, a yellow track line extending from the apex of the display through top range mark appears and moves either left or right, depending on the switch pressed. The track line position will be displayed in degrees in the upper left corner of the screen. The line will disappear approximately 15 seconds after the switch is released. It will then automatically return to 0 degrees.

(7) HOLD switch. Push type on/off switch. When activated, the last image presented before pressing the switch is displayed and held. The word HOLD will flash on and off in the upper left corner of the screen. Pressing the switch again will update the display and resume normal scan operation.

(8) Function switch. Controls operation of the radar set.

(a) OFF. Turns set off.

(b) STBY. Places set in standby mode. This position also initiates a 90-second warm-up delay when first turned on.

(c) TEST. Displays test pattern to check for proper operation of the set. The transmitter is disabled during this mode.

(d) ON. Places set in normal operation.

(9) MODE switches. Momentary action type switches. Pressing and holding either switch will display an information list of operational data on the screen. The data heading will be in blue, all data except present data will be in yellow, and present selected data will show in blue. The three weather levels will be displayed in red, yellow, and green. If WXA mode has been selected, the red bar will flash on and off. If the switch is released and immediately pressed again, the mode will increase or decrease depending on switch pressed. When either top or bottom mode is reached, the opposite switch must be pressed to further change the mode.

(10) NAV switch. If pressed with the INS operating and the weather radar operating in a weather depiction mode, the screen will display INS waypoints that are located within the range displayed and within the degree of coverage left or right of the present heading of the aircraft.

(11) BRT control. Used to adjust screen brightness.

c. Weather Radar - Normal Operation.

WARNING

Do not operate the weather radar set while personnel or combustible materials are within 18 feet of the antenna reflector. When the weather radar set is operating, radio frequency energy is emitted from the antenna reflector, which can have harmful effects on the human body and can ignite combustible materials.

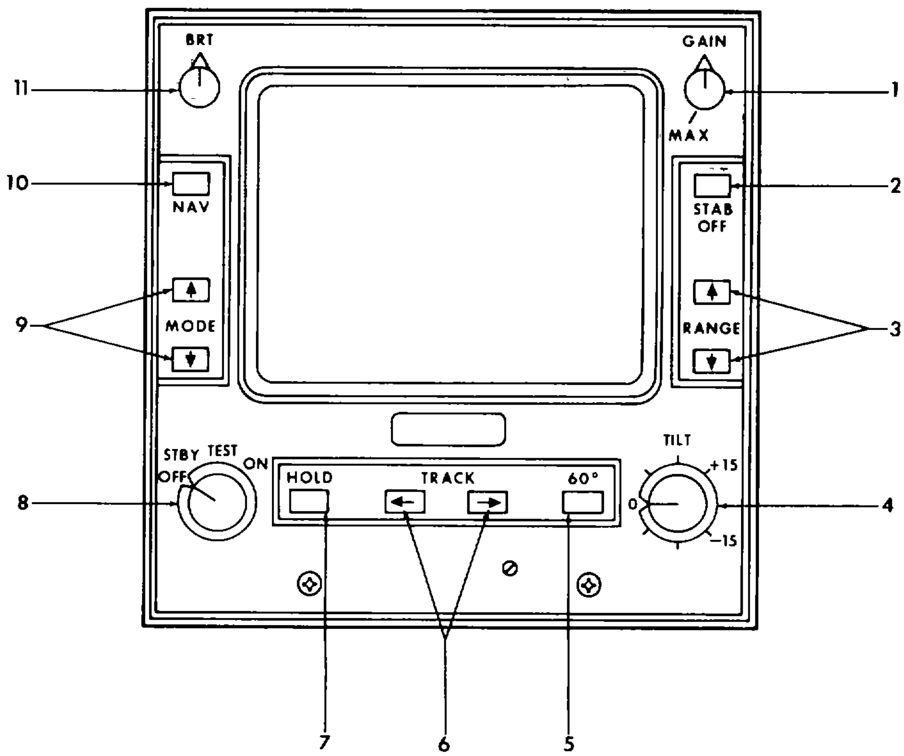
CAUTION

Do not operate the weather radar set in a confined space where the nearest metal wall is 50 feet or less from the antenna reflector. Scanning such surfaces may damage receiver crystals.

(1) Turn-on procedure: Function switch - TEST or ON, as required. (Information will appear after time delay period has elapsed.)

(2) Initial adjustment operating procedure:

1. BRT control - As required.
2. MODE switches - Press and release as required.



1 GAIN Control
2 STAB OFF Switch
3 RANGE Switches
4 TILT Control
5 60° Scan Switch
6 TRACK Switches
7 HOLD Switch
8 Function Switch
9 MODE Switches
10 NAV Switch
11 BRT Switch

Figure 3-24. Weather Radar Control-Indicator (AN/APN-215)

3. RANGE switches - Press and release as required.

4. TILT control - Move up or down to observe targets above or below aircraft level. The echo display will change in shape and location only.

(3) Test procedure:

1. Function switch - TEST.

2. RANGE switches _ Press and release as required to obtain 80-mile display.

3. BRT control - As required.

4. Screen - Verify proper display. (The test display consists of two green bands, two, yellow bands, and a red band on a 120-degree scan. The word TEST will be displayed in the upper right corner. The operating mode selected by the MODE switches, either MAP, WX, or WXA, will be displayed in the lower left corner. If WXA has been selected, the red band in the test pattern will flash on and off. The range will be displayed in the upper right corner beneath the word TEST and appropriate range mark distances will appear along the right edge of the screen.)

(4) Weather observation operating procedure:

1. Function switch - ON.

2. MODE switches - Press and release as required to select WX.

3. BRT control - As required.

4. TILT control - Adjust until weather pattern is displayed. Include the areas above and below the rainfall areas to obtain a complete display.

5. MODE switches - Press and release to select WXA. Areas of intense rainfall will appear as flashing red. These areas must be avoided.

6. TRACK switches - Press to move track line through area of least weather intensity. Read relative position in degrees in upper left corner of screen.

NOTE

Refer to FM 1-30 for weather observation, interpretation and application.

(5) Ground mapping operating procedure:

1. Function switch - ON.

2. MODE switches - Press and release as required to select MAP.

3. BRT control - As required.

4. GAIN control - As required to present usable display.

(6) Standby procedure: Function switch - STBY.

(7) Shutdown procedure: Function switch - OFF.

(8) Weather radar emergency operation. Not applicable.

3-32. TRANSPONDER SET (APX-100).

a. Description. The transponder system receives, decodes, and responds to interrogations from Air Traffic Control (ATC) radar to allow aircraft identification, altitude reporting, position tracking, and emergency tracking. The system receives a radar frequency of 1030 MHz and transmits preset coded reply pulses on a radar frequency of 1090 MHz at a minimum peak power of 200 watts. The range of the system is limited to line-of-sight. The transponder system consists of a combined receiver/transmitter/control panel (fig. 3-25) located in the pedestal extension; a pair of remote switches, one in each control wheel; and two antennas, located on the underside and top of the fuselage. The system is protected by the 3-ampere TRANSPONDER, and 35-ampere AVIONICS MASTER PWR No. 1 circuit breakers on the overhead circuit breaker panel (fig. 2-6).

b. Controls/Indicators and Functions.

(1) TEST-GO indicator. Illuminates to indicate successful completion of built-in-test (BIT).

(2) TEST-MON indicator. Illuminates to indicate system malfunction or interrogation by a ground station.

(3) ANT switch. Selects desired antenna for signal input.

(a) TOP. Selects upper antenna.

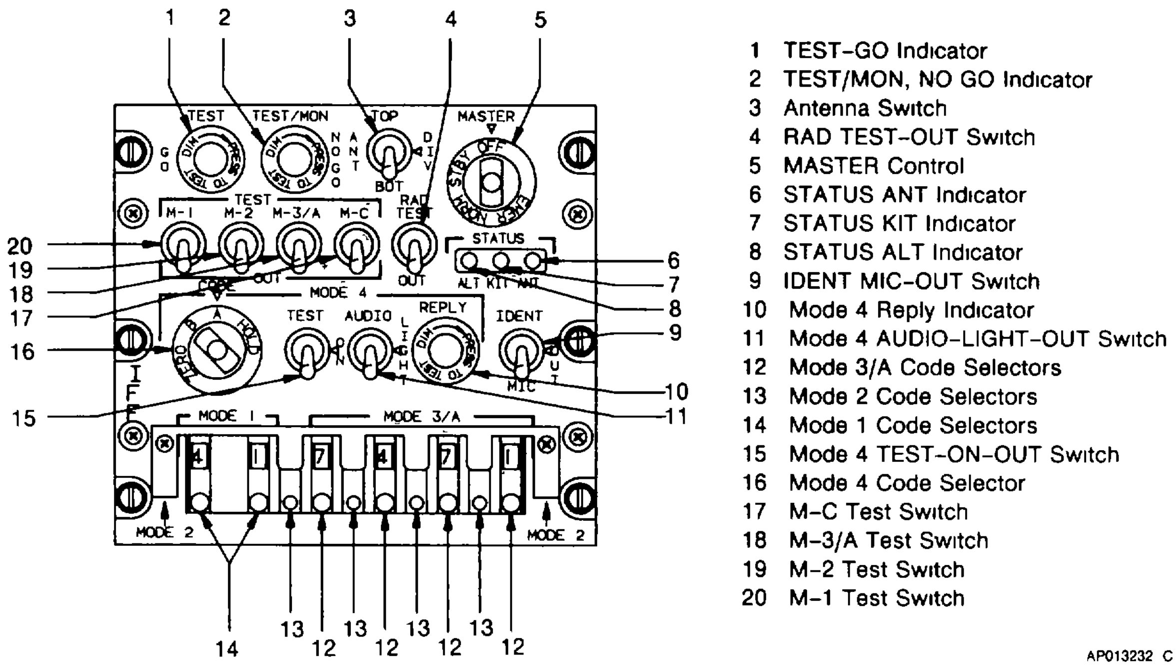


Figure 3-25. Transponder Control Panel (AN/APX-100)

(b) DIV. Selects diverse (both) antennas.

(c) BOT. Selects lower antenna.

(4) RAD TEST-OUT switch. Enables reply to TEST mode interrogations from test set.

(5) MASTER CONTROL. Selects system operating mode.

(a) OFF. Deactivates system.

(b) STBY. Activates system warm-up (standby) mode.

(c) NORM. Activates normal operating mode.

(d) EMER. Transmits emergency reply code.

(6) STATUS ANT indicator. Illuminates to indicate the BIT or MON fault is caused by high VSWR in antenna.

(7) STATUS KIT indicator. Illuminates to indicate the BIT or MODN fault is caused by external computer.

(8) STATUS ALT indicator. Illuminates to indicate the BIT or MON fault is caused by the altitude digitizer.

(9) IDENT-MIC-OUT switch. Selects source of aircraft identification signal.

(a) IDENT. Activates transmission of identification pulse (IP).

(b) MIC. Enables either control wheel POS IDENT switch to activate transmission of ident signal from transponder.

(c) OUT. Disallows outgoing signal.

(10) MODE 4 reply annunciator light. Illuminates to indicate a reply has been made to a valid Mode 4 interrogation.

(11) MODE 4 AUDIO OUT switch. Selects monitor mode for mode ,4 operation.

(a) AUDIO. Enables sound and sight monitoring of mode 4 operation.

(b) LIGHT. Enables monitoring REPLY indicator for mode 4 operation.

(c) OUT. Deactivates monitor mode.

(12) MODE 3/A code selectors. Select desired reply codes for mode 3/A operation.

(13) MODE 2 code selectors. Select desired reply codes for mode 2 operation. The cover over mode select switches must be slid forward to display the selected mode 2 code.

(14) MODE 1 code selectors. Select desired reply codes for mode 1 operation.

(15) MODE 4 TEST-ON-OUT switch. Selects test mode of Mode 4 operation.

(a) TEST. Activates built-in-test of mode 4 operation.

(b) ON. Activates mode 4 operation.

(c) OUT. Disables mode 4 operation.

(16) MODE 4 code control. Selects preset mode 4 code.

(17) M-C, M-3A, M-2, and M-1 switches. Select test or reply mode of respective codes.

(a) TEST. Activates self-test of selected code. Transponder can also reply.

(b) ON. Activates normal operation.

(c) OUT. Deactivates operation of selected code.

(18) POS IDENT pushbutton. When pressed, activates transponder identification reply.

c. Transponder - Normal Operation.

(1) Turn-on procedure: MASTER switch - STBY. Depending on the type of receiver installed, the TEST/MON NO GO indicator may illuminate. Disregard this signal.

(2) Test procedure:

NOTE

Make no checks with the master switch in EMER, or with M-3/A codes 7600 or 7700 without first obtaining authorization from the interrogating station(s).

1. Allow set two minutes to warm up.
2. Select codes assigned for use in modes 1 and 3/A by depressing and releasing the pushbutton for each switch until the desired number appears in the proper window.
3. Lamp indicators - Operate press-to-test feature.
4. M-1 switch - Hold in TEST. Observe that no annunciators illuminate.
5. M-1 switch - Return to ON.
6. Repeat steps 4 and 5 for the M-2, M-3/A and M-C mode switches.
7. MASTER control - NORM.
8. MODE 4 code control - A. Set a code in the external computer.
9. MODE 4 AUDIO OUT switch - OUT.

(3) Modes 1, 2, 3/A, and/or 4 operating procedure:

NOTE

If the external security computer is not installed, a NO GO annunciator will illuminate any time the Mode 4 switch is moved out of the OFF position.

1. MASTER control - NORM.
2. M-1, M-2, M-3/A, and/or MODE 4 ON-OUT switches - ON. actuate only those switches corresponding to the required codes. The remaining switches should be left in the OUT position.
3. MODE 1 code selectors - Set (if applicable).
4. MODE 3/A code selectors - Set (if applicable).
5. MODE 4 code control - Set (if required).
6. MODE 4 REPLY indicator - Monitor to determine when transponder set is replying to a SIF interrogation.
7. MODE 4 AUDIO OUT switch - Set (as required to monitor Mode 4 interrogations and replies).
8. MODE 4 audio and/or indicator - Listen

and/or observe (for Mode 4 interrogations and replies).

9. IDENT-MIC-OUT switch - Press to IDENT momentarily.

10. MODE 4 TEST-ON-OUT switch - TEST.

11. Observe that the TEST GO annunciator illuminates.

12. MODE 4 TEST-ON-OUT switch - ON.

13. ANT switch - BOT.

14. Repeat steps 4, 5 and 6. Observe that the TEST GO indicator illuminates.

15. TOP-DIV-BOT-ANT switch - TOP.

16. Repeat step 14.

17. TOP-DIV-BOT-ANT switch - DIV.

18. Repeat step 14.

19. When possible, obtain the cooperation of an interrogating station to exercise the TEST mode. Execute the following steps:

a. RAD TEST-OUT switch - RAD TEST.

b. Obtain verification from interrogating station that a TEST MODE reply was received.

c. RAD TEST-OUT switch - OUT.

(4) Transponder set identification-position operating procedure: The transponder set can make identification-position replies while operating in code Modes 1, 2, and/or 3/A, in response to ground station interrogations. This type of operation is initiated by the operator as follows:

1. Modes 1, 2 and/or 3/A - ON, as required.

2. IDENT-OUT-MIC switch - Press momentarily to IDENT, when directed.

NOTE

- **Holding circuits within the transponder receiver-transmitter will transmit identification-position signals for 15 to 30 seconds. This is normally sufficient time for ground control to identify the aircraft's position. During the 15 to 30 second period, it is normal procedure to acknowledge via the aircraft communications set that identification/position signals are being generated.**
- **Set any of the MI, M2, M3/A, M-C, or MODE 4 switches to OUT to inhibit transmission of replies in undesired modes.**
- **With the IDENT-OUT-MIC switch set to the MIC position, the POS IDENT button must be depressed to transmit identification pulses.**

(5) Shutdown procedure:

1. To retain Mode 4 code in external computer during a temporary shutdown:

a. MODE 4. CODE switch - Rotate to HOLD.

b. Wait 15 seconds.

c. MASTER control - OFF.

2. To zeroize the Mode 4 code in the external computer, turn MODE 4 CODE switch to ZERO.

3. MASTER control - OFF. This will automatically zeroize the external computer unless codes have been retained (step 1 above).

d. Transponder - Emergency Operation. Not applicable.

3-33. PILOT'S ALTIMETER INDICATOR.

The pilot's altimeter (fig. 3-26), in the upper left side of the instrument panel, is a servoed unit, under control of the Air Data Computer and is part of the Flight Director/Autopilot system. Altitude is displayed by a 10,000 foot counter, a 1000 foot counter, a 100 foot counter, and a. single needle pointer (coupled with the 100 foot counter) which indicates hundreds of feet on a circular scale in 20 foot increments. Below an altitude: of 10,000 feet, a diagonal striped symbol will appear on the 10,000 foot counter. The barometric pressure knob allows ground supplied pressure values to be adjusted and displayed in inches Hg or millibars. If AC power to the altimeter is lost, a warning OFF flag will appear in the upper counter drum display window to indicate power loss, unreliable altimeter readings, and possible loss of encoder transmissions to ground stations. Circuits are protected by a 3-ampere fuse in the junction box. When the BARO knob is adjusted to ground supplied instructions, the updated altitude pressure is

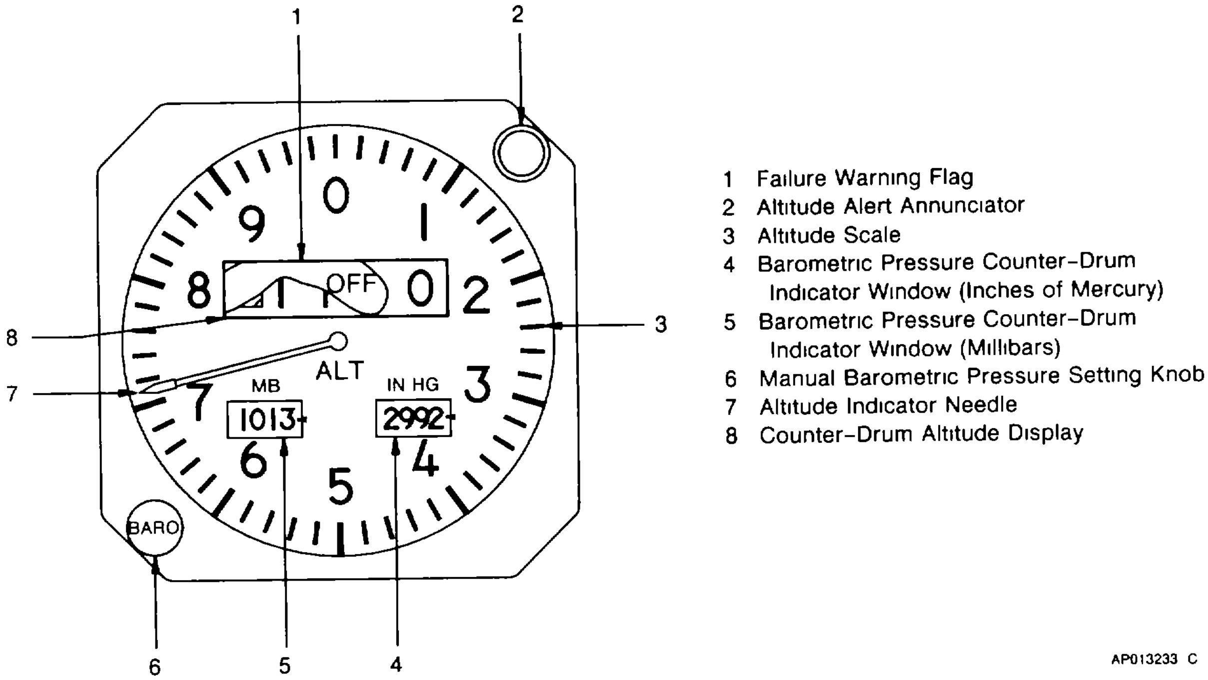


Figure 3-26. Pilot's Altitude Indicator (BA-141).

routed to the Air Data Computer. The ADC recomputes all data on hand, sends corrected altitude pressure information to the Flight Director and autopilot, servo commands to correct the display on the pilot's altimeter, and applies altitude information to the transponder (for transmission to ground stations).

a. Controls/Indicators and Functions.

(1) OFF Flag. Presence indicates loss of power to instrument and unreliable readings.

(2) ALT alert annunciator. Illuminates when aircraft is within 1000 feet of preselected altitude during capture maneuver and extinguishes when aircraft is within 250 feet of preselected altitude. After capture, annunciator will illuminate if aircraft departs more than 250 feet from the selected altitude.

(3) Altitude Scale. Used with needle to indicate aircraft altitude in hundreds of feet. Subdivided into 20 foot increments.

(4) IN HG Indicator. Indicates local barometric pressure in inches of mercury. Adjusted by use of BARO knob.

(5) MB Indicator. Indicates local barometric pressure in millibars. Adjusted by use of BARO knob.

(6) BARO Knob. Used to manually set barometric pressure displayed in the MB and IN HG windows.

(7) Needle indicator. Used with altitude scale to display aircraft altitude in hundreds of feet.

(8) Altitude counter drums. Indicates aircraft altitude in tens of thousands, thousands, and hundreds of feet above sea level.

NOTE

If the OFF flag is visible, either DC power is off, the fuse has blown, or there is an altimeter encoder failure. Since the OFF flag monitors only the encoder input to the altimeter and not transponder condition, the altitude reporting function may be inoperative without the OFF flag showing, in the case of transponder failure or

improper control settings. It is also possible to get a good Mode C test on the transponder control with the OFF flag showing. If the OFF flag remains visible, radio contract should be made with a ground radar site to determine if the altitude reporting function is operative.

b. Pilot's Altimeter - Normal Operation.

(1) Turn-on procedure: Servoed altimeter will operate when avionics master switch is turned on and single phase AC is on.

(2) Operating procedure:

1. Barometric set knob - Set desired altimeter setting in IN. HG. window.
2. OFF flag - Check not visible.
3. Needle indicator - Check operation.

NOTE

If the altimeter does not read within 70 feet of field elevation, when the correct local barometric setting is used, the altimeter needs calibration or internal failure has occurred. An error of greater than 70 feet also nullifies use of the altimeter for IFR flight.

c. Pilot's Altimeter - Emergency Operation. Disregard pilot's altimeter and utilize copilot's altimeter.

3-34. COPILOT'S ENCODING ALTIMETER.

a. Description. The copilot's altimeter (fig. 3-27), provides an indication of present aircraft pressure altitude above sea level. It also supplies information to the INS and GPS. The air data computer supplies altitude information to the transponder.

b. Controls/Indicators and Functions.

(1) ALT alert indicator. Not used.

(2) Altitude pointer display. Displays aircraft altitude in hundreds of feet. Subdivided into 20-foot intervals.

(3) MILLIBARS window. Indicates local barometric pressure in millibars. Adjusted by use of set knob.

(4) IN HG window. Indicates local barometric pressure in inches of mercury. Adjusted by use of set knob.

(5) BARO knob. Used to manually set barometric pressure displayed in the MB an IN HG windows.

(6) Test button. Used to test altimeter operation.

(7) Drum indicator. Indicates aircraft altitude in ten-thousands, thousands, and hundreds of feet above sea level.

(8) CODE OFF flag. Indicates possible failure of encoder transmission.

c. Encoding Altimeter - Normal Operation.

(1) Turn-on procedure: Encoding altimeter will operate when avionics master switch is turned on and single phase AC power is on.

(2) Operating procedure:

1. Barometric set knob - Set desired altimeter setting in IN. HG. window.
2. CODE OFF flag - Check not visible.
3. Needle indicator - Check operation.
4. TEST button -
   a. Push - Reading decreases by 500 feet.
   b. Release -. Returns to original reading.

NOTE

If the altimeter does not read within 70 feet of field elevation, when the correct local barometric setting is used, the altimeter needs calibration or internal failure has occurred. An error of greater than 70 feet also nullifies use of the altimeter for IFR flight.

d. Encoding Altimeter - Emergency Operation. Altimeter circuit breaker - Pull (if encoder fault occurs).

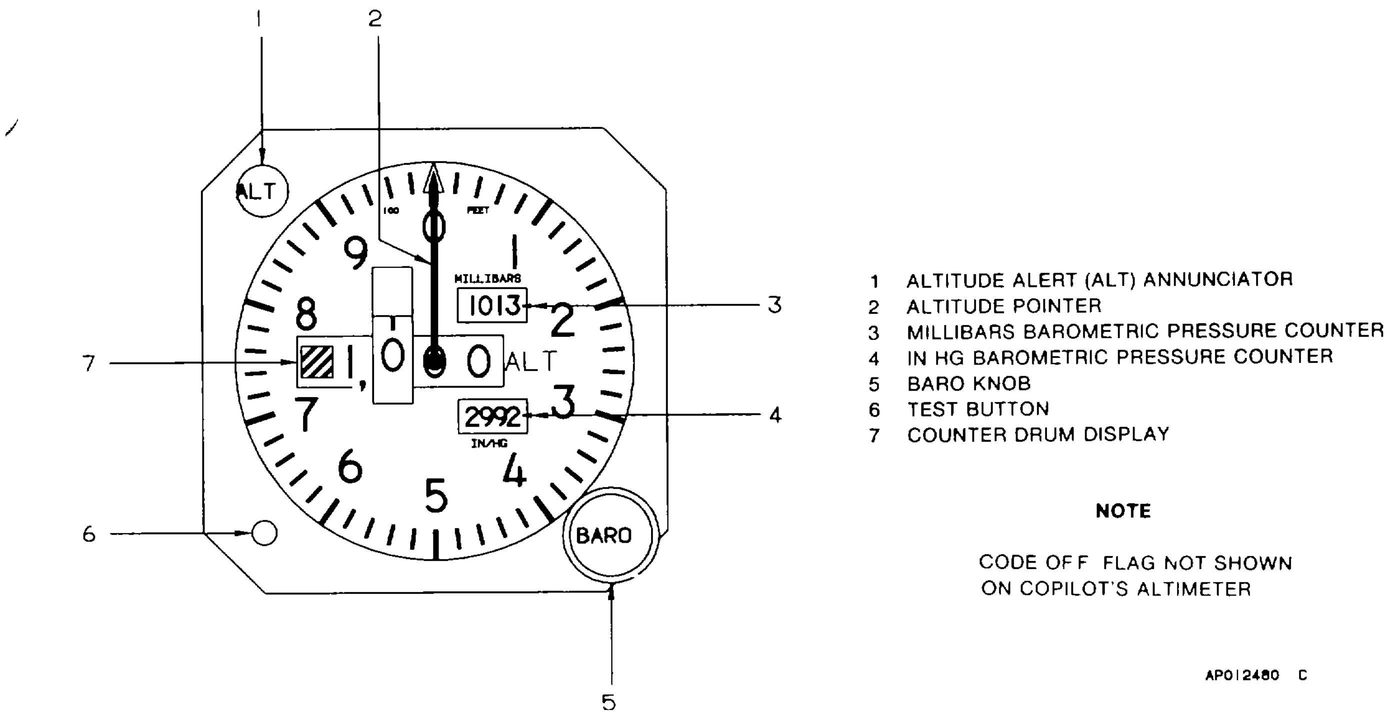


Figure 3-27. Copilot's Encoding Altimeter (IDC 518)

CHAPTER 4
MISSION EQUIPMENT

Section I. MISSION AVIONICS

4-1. MISSION AVIONICS COVERAGE.

Complete provisions only are installed for the GPS, CHAALS and ALQ mission systems. Equipment descriptions and operating instructions are to be obtained from appropriate vendor and Army Technical manuals.

4-2. MISSION CONTROL PANEL.

The mission control panel (fig. 4-1), mounted on the copilot's sidewall, consists of three sections. The top section contains the mission caution/advisory annunciator panel. The annunciator panel incorporates all mission annunciators along with three aircraft system annunciators (CABIN OVERTEMP, NO INS UPDATE and INS UPDATE). The center section contains one digital DC volt/ammeter, two digital AC volt/frequency meters, two AC digital load meters, one antenna steering synchronizer control and the antenna steering mode selector switch. The bottom section contains the mission equipment control switches and the mission equipment circuit breakers.

Section II. AIRCRAFT SURVIVABILITY EQUIPMENT

4-3. M-130 FLARE AND CHAFF DISPENSING SYSTEM

a. Description. The M-130 flare and chaff dispensing system provides effective survival countermeasures against radar guided weapons systems and infrared seeking missile threats. The system consists of two dispenser assemblies with payload module assemblies, a dispenser control panel, a flare dispense switch, two control wheel mounted chaff dispensing switches, an electronic module assembly and associated wiring. The flare and chaff dispensing system is protected by the 5-ampere circuit breaker, placarded Ml 30 located on the mission control panel (fig. 4-1).

<u>WARNING</u>

Right engine nacelle dispenser is for chaff only.

(1) Dispenser assemblies. Two interchangeable dispenser assemblies are mounted on the aircraft. One is located in the aft portion of the right nacelle and the other is mounted on the right side of the fuselage. On this aircraft the dispenser in the nacelle will be used for chaff only while the dispenser mounted on the fuselage can be used for either flares or chaff. The selector switch (placarded C-F) on the dispenser can be set for either chaff or flares. The unit also contains the sensor for the flare detector and the sequencing mechanism. The dispenser assembly breech plate has the electrical contact pins which fire the impulse cartridges.

(2) Payload module assemblies. A removable payload module assembly is provided for each dispenser assembly. Each payload module has 30 chambers which will accept either flares or chaffs. Flares or chaffs are loaded into the rear-end (studded end) of the payload module, and secured in place by a retaining plate.

(3) Electronic module assembly (EM). The electronic module assembly contains the programmer, the flare detector and a safety switch. The unit is located behind the pilot's seat.

(a) Flare detector. The flare detector is provided to ensure that a flare is burning when it is ejected from the dispenser payload module. If the initial flare fails to ignite, the detector automatically fires another flare within 75 milliseconds. If the second flare fails to ignite, the detector will fire a third flare. If the third flare ignition is not detected, the detector will not fire another flare until the system is activated again by pressing the FLARE DISPENSE switch.

(b) Programmer. The programmer is used for the chaff mode only. It has four switches for setting count and interval of salvo and burst.

(c) Safety switch. The safety switch (with safety pin and yellow flag) prevents firing of chaff or

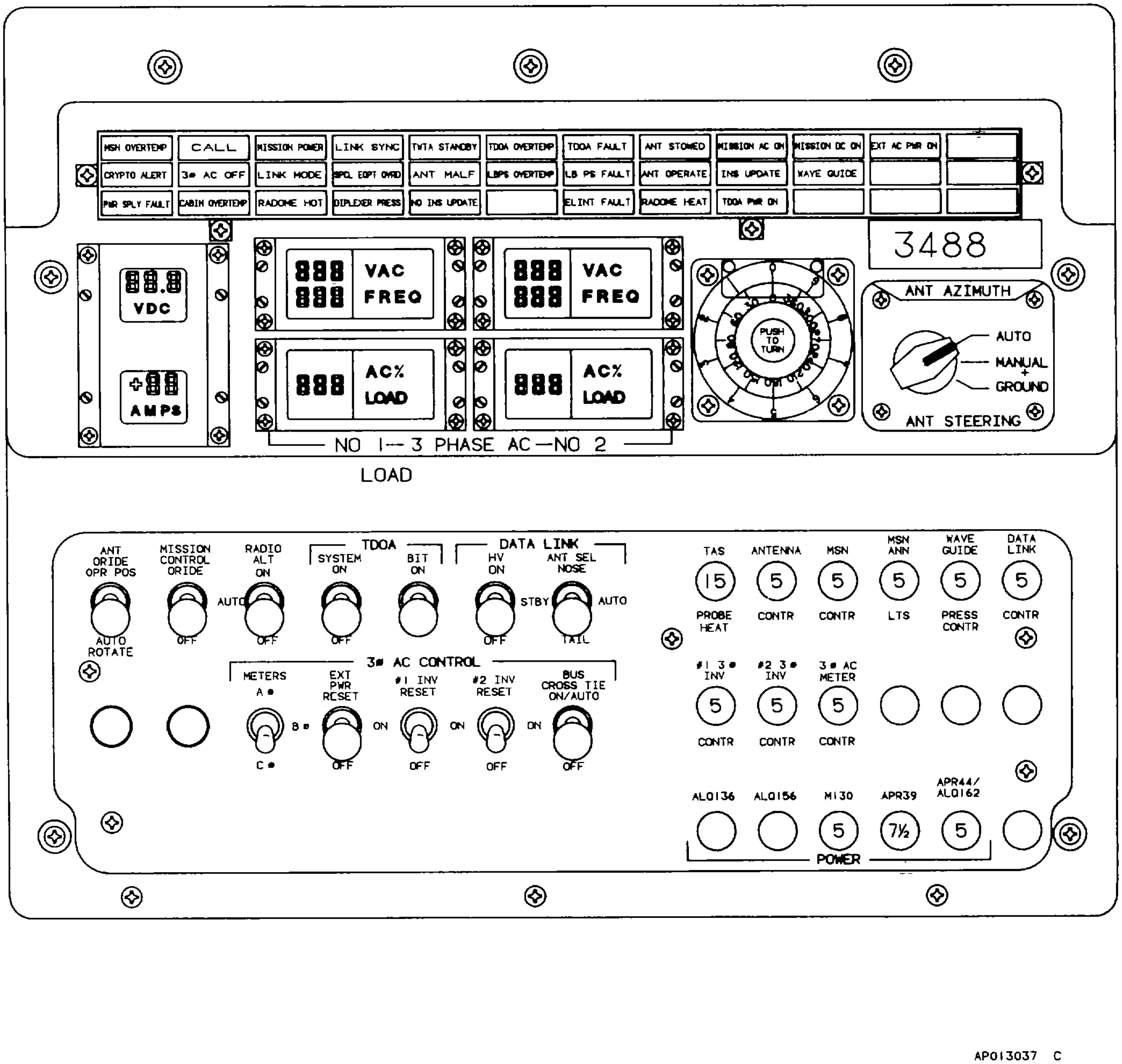


Figure 4-1. Mission Control Panel

flares when the safety pin is inserted. The safety pin shall be removed only while the aircraft is in flight or during test of the system.

(4) Flare dispenser switch. The single push button switch (fig. 4-2), placarded FLARE DISPENSE, located in the extended control pedestal, will fire a flare from the dispenser payload module each time it is pressed. If the FLARE DISPENSE switch is held down, it will dispense a flare every 2.3 seconds until all flares are expended.

(5) Control wheel mounted chaff dispense switches. Two pushbutton switches placarded CHAFF DISPENSER, one located on the top left portion of the pilot's control wheel and the other located on the top right portion of the copilot's control wheel, activates the chaff dispensing system when pressed.

(6) Wing mounted safety switch. A wing mounted safety switch (with safety pin and yellow flag), located on top of the right wing, just aft of the nacelle, prevents the firing of chaff or flares when the pin is inserted. This safety pin shall be inserted while the aircraft is on the ground and removed prior to flight or during system test.

(7) Dispenser control panel (DCP). The flare dispenser control panel (fig. 4-3) is mounted in the control pedestal. Control functions are as follows:

(a) RIPPLE FIRE switch. A guarded switch placarded RIPPLE FIRE, fires all remaining flares when moved to the up position. It is used in the event of an inflight emergency to dispense all flares from the dispenser payload module.

(b) FLARE counter RESET knob. The flare counter reset knob is used to set the flare counter to the number of flares in the payload module before flight.

(c) FLARE counter. Indicates the number of flares remaining in the dispenser payload module.

(d) ARM light. An amber, press to test annunciator, placarded ARM, illuminates when the ARM-SAFE switch is in the ARM position, when the safety pins are removed from the electronic module and the wing safety switch. Clockwise rotation will dim the annunciator.

(e) CHAFF counter. Indicates the number of chaffs remaining in the payload module.

(f) CHAFF counter RESET knob. The chaff counter reset knob is used to reset the chaff counter to the number of chaff rounds in the payload module before flight.

(g) MAN-PGRM Selector Switch. Selects manual or programmed chaff dispense.

<u>1</u>*. MAN.* Bypasses the programmer and fires one chaff each time one of the chaff dispense switches is pressed.

<u>2.</u> *PGRM.* Chaff is fired in accordance with the preset chaff program as set into the electronic module (count and interval of bursts and salvo).

(h) ARM-SAFE switch. When in the SAFE position, power is removed from the M-130 system. When in the ARM position, power is applied to the M-130 system.

(i) RIPPLE FIRE switch cover. Prevents accidental switch activation.

(8) Ammunition for dispenser. Ammunition for the system consists of countermeasure chaff M1 and countermeasure flares M206. An impulse cartridge M796, fits into the base of either the flare or chaff and is electrically initiated to eject flares or chaff from the dispenser payload module.

(a) Countermeasure chaff M1. These units consist of a plastic case 8 inches in length and 0.97 inches square. The base of the chaff case is flanged to provide one-way assembly into the dispenser payload module. The chaff consists of aluminum coated fiberglass strands.

(b) Countermeasure flare M206. These units consist of an aluminum case 8 inches in length and 0.97 inches square. The base of the flare is flanged to provide one-way assembly into the payload module. The flare material consists of a magnesium and teflon composition. A preformed packing is required in the base of the flare unit prior to inserting the impulse cartridge.

(c) Impulse cartridge M796. This cartridge fits into the base of either the flare or chaff and is electrically initiated to eject flares or chaff from the dispenser payload module.

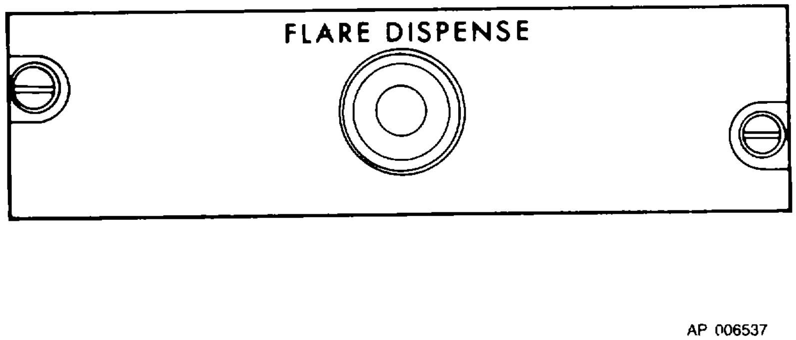


Figure 4-2. Flare Dispense Switch

b. Normal Operation.

NOTE

The fairing should be removed from the fuselage if the aircraft is to be flown with the flare dispenser assembly removed.

(1) General. At the present time surface-to-air, intermediate range guided missiles, launched against the aircraft must be visually detected by the aircraft crew. Crew members must ensure visual coverage over the ground area where a missile attack is possible. The aircraft radar warning system will only alert the pilot and copilot when the aircraft is being tracked by radar-guided anti-aircraft weapons systems. It will not indicate the firing of weapons against the aircraft.

(2) Crew responsibilities. The pilot, or designated crew member, is responsible for removing the safety pin from the right wing before flight, and for replacing it immediately after flight. After the aircraft is airborne, the pilot is responsible for removing the safety pin from the electronic module and moving the ARM-SAFE switch on the dispenser control panel to ARM. Before landing, he is responsible for re-inserting the safety pin in the electronic module and moving the ARM-SAFE switch to SAFE. While airborne, the pilot and copilot are responsible for scanning the terrain for missile threats. When either pilot recognizes a missile launch, he will press the FLARE DISPENSE button to eject flares.

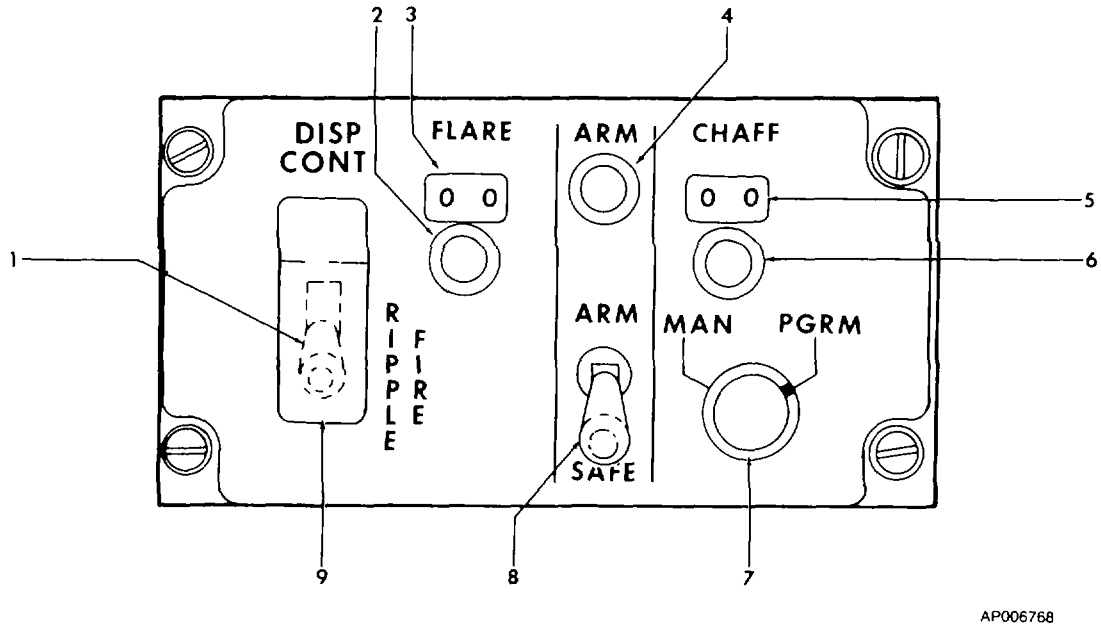
WARNING

Aircraft must be in flight to dispense flares.

(3) Conditions for firing. The dispenser system should not be fired unless a missile launch is observed or radar guided weapons systems is detected and locked on. If a system malfunction is suspected, aircraft commander may authorize attempts to dispense flares or chaff as a test in a non-hostile area.

(a) Firing procedure.

1. *Flares*. Upon observing a missile launch the pilot or copilot (whoever sights the launch first) will fire a flare. If more than one missile launch is observed, the firing sequence should be continued until the aircraft has cleared the threat area.



1. RIPPLE FIRE Switch
2. Flare Counter Setting Knob
3 Flare Counter Indicator
4. ARM Light
5. CHAFF Counter Indicator
6. Chaff Counter Setting Knob
7. MAN/PGRM Selector Switch
8. ARM-SAFE Switch
9. RIPPLE FIRE Switch Cover

Figure 4-3. Flare Dispenser Control Panel

2. *Chaff*. Upon receiving an alert from the aircraft radar warning system, the pilot or copilot will fire the chaff and initiate an evasive maneuver. The number of burst/salvo and number of salvo/program and their intervals is established by training doctrine and will be set into the programmer prior to takeoff (refer to TM 9-1095-206-13 & P for procedures on setting programmer). If desired, the operator may override the programmed operational mode and fire chaff countermeasures manually by moving the dispenser function selector switch to MANUAL and pressing the dispenser switch.

(b) Firing responsibility. When the pilot or copilot observes a missile launch or radar warning indication, he fires flares or chaff as required and assumes command of the dispenser system. He will then advise the other pilot that a missile launch has been observed or a radar warning signal has been received, and announce that flares or chaff have been fired.

4-4.SYSTEM DAILY PREFLIGHT/RE-ARM TEST.

The following test procedures shall be conducted prior to the first flight of each day and prior to each re-arming of the dispensers. The first dispenser tested shall be the one used to dispense flares, the second shall be the one used to dispense chaff. Notify AVUM if any improper indications occur during the tests.

WARNING

Ensure payload module is not connected to dispenser assembly at any time during the following test procedure.

1. On the flare dispenser assembly, ensure the C-F selector switch is in the F (flare) position.
2. Obtain M-91 test set and ensure that TEST SEQUENCE switch is in the START/HOME position.
3. Connect base plate of test set to breech of dispenser assembly. Secure both mounting studs uniformly, using 5/32-inch hexagonal wrench provided in test set carrying case.
4. Obtain test set power cable from loose tools and connect cable between exterior connection J1 (28V DC) on aircraft and aircraft power + 28V DC (J 1) of test set.

5. Remove safety pins from EM, and on the top skin of the right wing.

CAUTION

On DCP, ensure that RIPPLE FIRE switch guard is in down position.

6. Provide aircraft power to DCP by resetting the M-130 POWER circuit breaker.

7. On DCP, press ARM annunciator. Annunciator will illuminate. Release ARM annunciator. Annunciator will extinguish.

8. On DCP, set FLARE counter to 30, CHAFF counter to 30 and MAN-PGRM switch to MAN position.

9. On DCP, set ARM-SAFE switch to ARM. ARM annunciator will illuminate.

NOTE

- **When the test set is installed on the dispenser assembly and 28 volts DC aircraft power has been applied, the sequencer switch inside of dispenser assembly resets, making an audible sound as it rotates. There will be no such sound if the sequencer switch has been previously reset or if switch is in position 12 or 24.**
- **On test set, TS PWR ON annunciator (clear) illuminates and remains illuminated throughout the test sequence until aircraft power to test set (via test set power cable) is disconnected or shut off.**

10. Set mission chaff program on EM.

11. Perform the following operations on the M-91 test set:

a. Press to test the remaining three annunciators on test set. Each annunciator will illuminate.

NOTE

Replace any annunciator that does not illuminate when pressed. If none of the indicating annunciators illuminate, return test set to AVUM.

b. Rotate TEST SEQUENCE switch clockwise to the TS RESET position. No visual indication will occur.

c. Rotate TEST SEQUENCE switch clockwise to SV SELF TEST position. STRAY VOLTAGE annunciator (red) will illuminate.

d. Rotate TEST SEQUENCE switch clockwise to TS RESET position. STRAY VOLTAGE annunciator (red) will extinguish.

e. Rotate TEST SEQUENCE switch clockwise to STRAY VOLT position. STRAY VOLTAGE annunciator (red) should not illuminate.

f. Rotate TEST SEQUENCE switch clockwise to SYS NOT RESET position. SYS NOT RESET annunciator (amber) should not illuminate. If annunciator illuminates, press and release MANUAL SYSTEM RESET switch and SYS NOT RESET annunciator should then extinguish.

NOTE

When the MANUAL SYSTEM RESET switch is pressed and released, and 28 volts DC power has been applied, the sequencer switch inside the dispenser assembly resets, making an audible sound as it rotates. If the sequencer switch has been previously reset or if the switch is in position 12 or 24, there will be no such sound.

g. Rotate TEST SEQUENCE switch clockwise to next position, DISP COMP.

12. Press FLARE DISPENSE switch once. For each depressing, the FLARE counter on DCP should count down in groups of three.

13. On DCP, raise RIPPLE FIRE switch guard and set toggle switch to up position until FLARE counter counts down to 00. Return switch guard to down position. On DCP, reset FLARE counter back to 30. DISPENSER COMPLETE annunciator (green) on test set will illuminate.

14. Perform the following operations on the M-91 test set:

a. Rotate TEST SEQUENCE switch counterclockwise to SYS NOT RESET position. SYS NOT RESET annunciator (amber) will illuminate. DISPENSER COMPLETE annunciator (green) will remain illuminated.

b. Press and release MANUAL SYSTEM RESET switch. SYS NOT RESET annunciator (amber) will extinguish.

NOTE

When the MANUAL SYSTEM RESET switch is pressed and released, and 28 volts DC power is being applied, the sequencer switch inside the dispenser

assembly resets, making an audible sound as it rotates. If the sequencer switch has been previously reset or if the switch is in position 12 or 24, there will be no such sound.

c. Rotate TEST SEQUENCE switch counterclockwise to STRAY VOLT position. STRAY VOLTAGE annunciator (red) should not illuminate.

d. Rotate TEST SEQUENCE switch counterclockwise to START/HOME position.

NOTE

When the TEST SEQUENCE switch is turned to the START/HOME position, the DISPENSER COMPLETE annunciator will extinguish, the STRAY VOLTAGE annunciator will illuminate and then will extinguish when passing through the TS RESET position.

15. On CHAFF dispenser assembly, ensure that C-F selector switch is in C (chaff) position.

16. Remove M-91 test set from first dispenser assembly.

17. Connect M-91 test set to breech assembly of second dispenser assembly. Secure both mounting studs uniformly tight using ball hexagonal key screwdriver provided in test set carrying case.

NOTE

- **When the test set is installed on the dispenser assembly and 28 volts DC aircraft power is being applied, the sequence switch inside the dispenser assembly resets, making an audible sound as it rotates. There will be no such sound if the sequencer switch has been previously reset or if switch is in position 12 or 24.**
- **On test set, TS PWR ON annunciator (clear) illuminates and remains illuminated through the test sequence until aircraft power to test set (via test set power cable) is disconnected or shut off.**

18. Perform the following operations on the M-91 test set:

a. Press to test all four annunciators on test set. Each annunciator will illuminate.

NOTE

Replace any annunciator that does not illuminate when pressed. If none of the indicating annunciators illuminate, return test set to AVUM.

b. Rotate TEST SEQUENCE switch clockwise to TS RESET position. No visual indication will occur.

c. Rotate TEST SEQUENCE switch clockwise to SV SELF TEST position. STRAY VOLTAGE annunciator (red) will illuminate.

d. Rotate TEST SEQUENCE switch clockwise to next position, TS RESET. STRAY VOLTAGE annunciator (red) will extinguish.

e. Rotate TEST SEQUENCE switch clockwise to next position, STRAY VOLT. STRAY VOLTAGE annunciator (red) should not illuminate.

f. Rotate TEST SEQUENCE switch clockwise to next position, SYS NOT RESET. SYS NOT RESET annunciator (amber) should not illuminate. If annunciator illuminates, press and release MANUAL SYSTEM RESET switch and SYS NOT RESET annunciator should then extinguish.

NOTE

When the MANUAL SYSTEM RESET switch is pressed and released, and 28 volts DC power is being applied, the sequencer switch inside the dispenser assembly resets, making an audible sound as it rotates. If the sequencer switch has been previously reset or if the switch is in position 12 or 24, there will be no such sound.

g. Rotate TEST SEQUENCE switch clockwise to next position, DISP COMPL.

19. Press pilot CHAFF DISPENSER switch once. Press copilot CHAFF DISPENSER switch once. On DCP, for each depressing, the CHAFF counter should count down by an increment of one.

20. On DCP, set MAN-PGRM switch to PGRM position.

21. Press any one of CHAFF DISPENSER switches in aircraft. On DCP, the number shown on CHAFF counter should decrease in accordance with the program set on the EM.

22. Repeatedly press other CHAFF DISPENSER switch until CHAFF counter on DCP reads 00.

23. On test set, observe DISPENSER COMPLETE annunciator (green) is illuminated and then perform the following operations:

a. Rotate TEST SEQUENCE switch counterclockwise to SYS NOT RESET position. SYS NOT RESET annunciator (amber) will illuminate.

b. Press and release MANUAL SYSTEM RESET switch. SYS NOT RESET annunciator (amber) will extinguish.

NOTE

When the MANUAL SYSTEM RESET switch is pressed and released, and 28 volts DC power is being applied, the sequencer switch inside the dispenser assembly resets, making an audible sound as it rotates. If the sequencer switch has been previously reset or if the switch is in position 12 or 24, there will be no such sound.

c. Rotate TEST SEQUENCE switch counterclockwise to STRAY VOLT position. STRAY VOLTAGE annunciator (red) should not illuminate.

d. Rotate TEST SEQUENCE switch counterclockwise to START/HOME position.

NOTE

When turning the TEST SEQUENCE switch to the OFF position, the DISPENSER COMPLETE annunciator will extinguish, the STRAY VOLTAGE annunciator will illuminate and then will extinguish when the OFF position is reached.

24. Install safety pins.

25. Disconnect test set power cable.

26. Remove M-91 test set from dispenser assembly and restore in carrying case along with the power cable and hexagonal wrench.

27. On DCP, set ARM-SAFE switch to SAFE position.

28. On DCP, reset CHAFF counter to 30.

29. Disconnect aircraft power by pulling the 5-ampere Ml30 circuit breaker located on the mission control panel (fig. 4-1).

30. Proceed immediately to ammunition loading procedures.

4-5. AMMUNITION.

a. Ammunition Loading Procedure.

WARNING

Only one shipping container is to be opened at a time. If a shipping container has been opened and only partially emptied, the remaining contents will be secured in the container with an appropriate type of packaging material or filler to adequately prevent jostling. All munitions in storage must be in their original shipping containers.

1. Place payload module assembly on work bench in approved safe area so that the retaining plate is facing up.

2. Remove retaining plate by unscrewing two retaining bolts.

3. Insert one flare (or chaff) at a time into each chamber of payload module.

4. Remove plastic dust cap from each chaff or flare.

CAUTION

Prior to insertion of an impulse cartridge, be sure there is a preformed packing in the flare cartridge. (There will be no pre-formed packing in chaff cartridges.) Reinstall any preformed packing that is inadvertently removed with dustcap. The loading of impulse cartridges into a flare or chaff shall be accomplished one at a time.

5. Insert one impulse cartridge into each flare (or chaff).

6. Install retainer plate assembly by screwing the two retainer bolts into payload module.

WARNING

The system must have been tested to ensure that there is no stray voltage and all aircraft power must be removed from the system prior to loading the payload module.

7. On the dispenser control panel, ensure ARM-SAFE switch is in SAFE position.

8. On the electronic module and right wing, ensure safety pins and flag assemblies are installed.

9. Slide payload module assembly into dispenser assembly and secure two stud bolts, using 5/32-inch hexagonal wrench.

b. Ammunition Unloading Procedure.

WARNING

All aircraft power to the dispenser system must be turned off prior to removal of payload module from dispenser assembly. Safety pin flag shall be installed in the electronic module prior to landing and the safety pin flag shall be installed in the wing-mounted safety switch immediately after landing.

1. On dispenser control panel, ensure ARM-SAFE switch is in SAFE position.

2. Assure safety pin and flag are inserted into electronic module and in the wing mounted safety switch.

WARNING

If there is an indication that a misfire occurred, notify emergency ordnance disposal personnel for disposition and disposal.

3. Remove module from dispenser assembly by unscrewing the two stud bolts with a 5/32-inch hexagonal wrench and slide dispenser assembly out.

4. Remove retaining plate from payload module by unscrewing two retaining bolts.

5. Remove expended and unexpended impulse cartridges and flares (or chaff) from payload module.

6. Repack unexpended items in original containers and return to stores.

NOTE

Cracking of the chaff cartridge case upon firing is not unusual. This does not effect performance of the item and should not be reported as a malfunction.

4-6. RADAR SIGNAL DETECTING SET (AN/APR-39(V) 1).

The radar signal detecting set control panel (fig. 4-4), located on the instrument panel indicates the relative position of search radar stations. Audio warning signals are applied to the pilot's and copilot's headsets. The radar signal detecting set is protected by the 7.5-ampere circuit breaker placarded APR39, located on the mission control panel (fig. 4-1). The associated antennas are shown in figure 2-1. For operating instructions, refer to TM 11-5841-283-20.

a. Radar Signal Detecting Set Control Panel Functions (AN/APR-39(V)l) (fig. 4-4).

CAUTION

To prevent damage to the receiver detector crystals, assure that the AN/APR-39(V)l antennas are at least 60 meters from active ground radar antennas or 6 meters from active airborne radar antennas. Allow an extra margin for new, unusual, or high power antennas.

(1) PWR switch. ON, allow 1 minute for warmup.

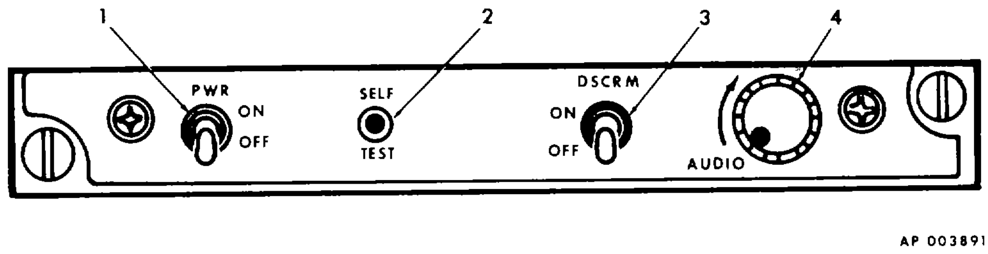
(2) SELF TEST. Allows self test of control panel.

(3) AUDIO control. Adjust volume as desired.

(4) DSCRM switch. Set for mission requirement.

4-7. RADAR SIGNAL DETECTING SET (AN/APR-39(V)2).

The radar signal detecting set control panel (fig. 4-5), located on the instrument panel indicates the relative position of search radar emitters. Through graphic symbology, the type of tracking radar emitters may be identified. Unknown emitter origins are also depicted. Audio warning signals are applied to the pilot's and copilot's headsets. The radar signal detecting set is protected by the 7.5-ampere circuit breaker placarded APR39, located on the mission control panel (fig. 4-1). The associated antennas are shown in figure 2-1. Complete operating instructions are to be obtained from the appropriate vendor manuals.



1. Power Switch
2. Self Test Switch
3. Discriminate Function Switch
4. Audio Control

Figure 4-4. Radar Signal Detecting Set Control Panel (AN/APR-39(V)1)

a. Radar Signal Detecting Set Control Panel Functions (AN/APR-39(V)2) (fig. 4-5).

To prevent damage to the receiver detector crystals, assure that the AN/APR-39(V)2 antennas are at least 60 meters from active airborne radar antennas. Allow an extra margin for new, unusual or high power antennas.

(1) PWR switch. ON, allow I minute for warmup.

(2) SELF TEST switch. Allows self test of the control panel.

(3) AUDIO control. Adjust volume as desired.

(4) MODE switch. Set for mission requirement.

b. Radar Signal Detecting Set Indicator Functions (fig. 4-6).

(1) MA indicator. Illuminates to indicate the presence of an MA threat.

(2) Display. Indicates relative position of search radar emitters.

(3) BRIL control. Adjusts brilliance.

(4) DAY-NIGHT control. Rotate to adjust intensity of display.

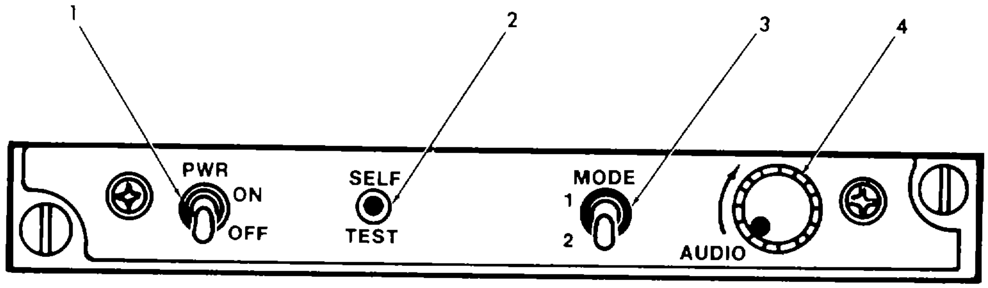
4-8. RADAR WARNING RECEIVER (AN/APR-44(V)3).

The radar warning receiver control panel (fig. 4-7), located in the instrument panel, indicates the presence of certain types of search radar signals. The radar warning receiver is protected by the 5-ampere circuit breaker placarded APR44/ALQ162, located on the mission control panel (fig. 4-1). For operating instructions, refer to TM 11-5841-291-12.

a. Radar warning indicator. Illuminates to indicate the presence of an All or SAM threat, and is also utilized to self test the annunciator light.

b. VOLUME control. Adjusts volume.

c. POWER switch. Turns set on and off.



1. Power Switch
2. Self Test Switch
3. Mode Function Switch
4. Audio Control

Figure 4-5. Radar Signal Detecting Set Control Panel (AN/APR-39(V)2)

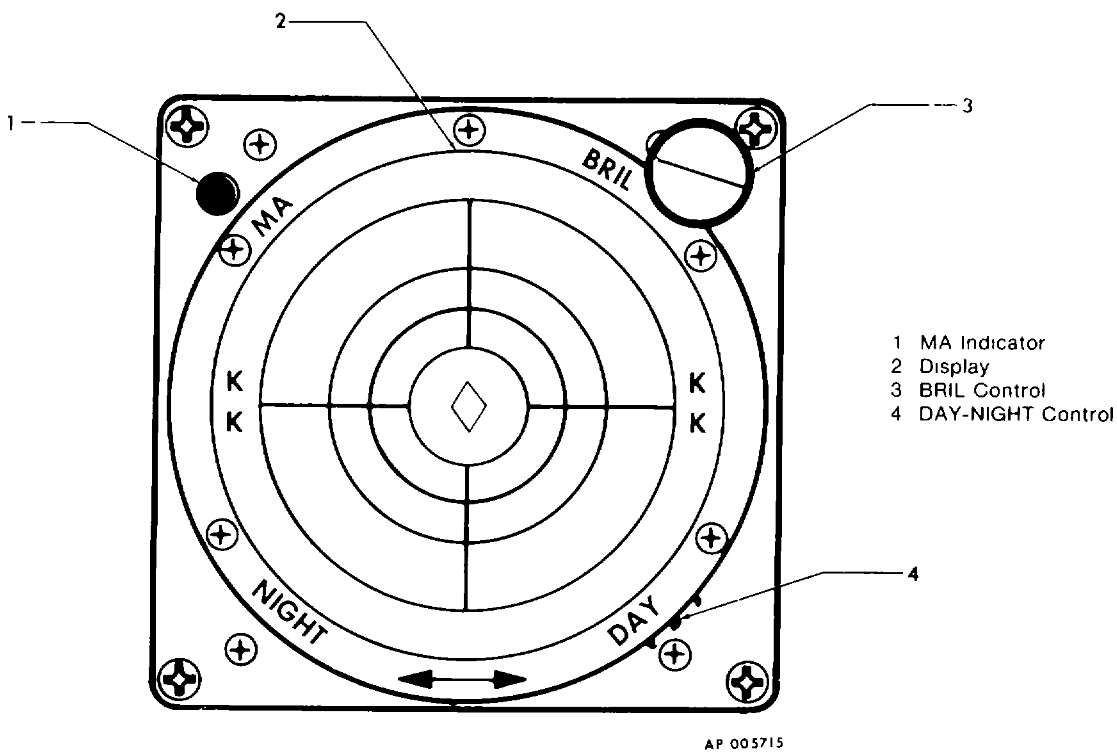
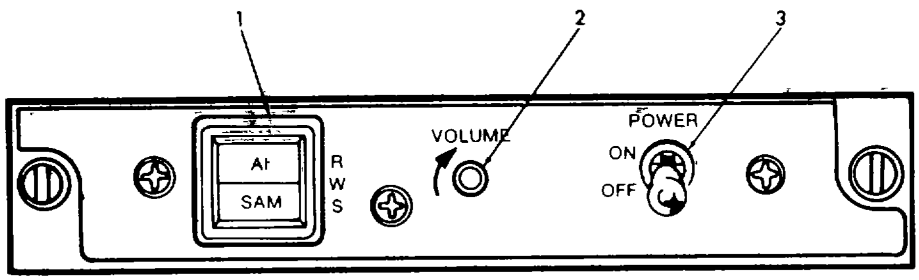


Figure 4-6. Radar Signal Detecting Set Indicator (IP-1150)



1. Radar Warning Indicator
2. VOLUME Control
3. POWER Switch

Figure 4-7. Radar Warning Receiver Control Panel (AN/APR-44(V)3)

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 result 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 are also covered in this chapter.

5-3. EXCEEDING OPERATIONAL LIMITS.

Anytime 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 beyond limits, and any additional data that would aid maintenance personnel in the maintenance action that may be required.

Section II. SYSTEM LIMITS

5-4. MINIMUM CREW REQUIREMENTS.

The minimum crew required for aircraft operation is two pilots. Additional crewmembers as required, will be added at the discretion of the commander, in accordance with pertinent Department of the Army regulations.

5-5. INSTRUMENT MARKINGS.

Instruments which display operating limitations are illustrated in figure 5-1. The operating limitations are color coded on the instrument faces. Color coding of each instrument is explained in the illustration.

5-6. INSTRUMENT MARKING COLOR CODES.

Operating limitations and ranges are illustrated by the colored markings which appear on the dial faces of engine, flight, and utility system instruments. Red markings indicate the limit above or below which continued operation is likely to cause damage or shorten life. The green markings indicate the safe or normal range of operation. The yellow markings indicate the range when special attention should be given to the operation covered by the instrument. Operation is permissible in the yellow range, but should be avoided. White markings on the airspeed indicator denote the flap operating range. The blue marking on the airspeed indicator denotes best rate of climb with one engine inoperative, at maximum gross weight, maximum forward c.g., sea level standard day conditions.

5-7. PROPELLER LIMITATIONS.

The maximum propeller overspeed limit is 1870 RPM (transient, 20 seconds maximum). Propeller speeds above 1700 RPM indicate failure of the constant speed governor. Propeller speeds above 1802 RPM indicates-failure of both the constant speed and overspeed governors.

5-8. STARTER LIMITATIONS.

The starters are limited to an operating period of 40 seconds ON, then 15 minutes OFF, 40 seconds ON, then 30 minutes OFF. Contact maintenance personnel for assistance if no engine start occurs during cycle noted in this paragraph.

5-9. AUTOPILOT LIMITATIONS.

a. An autopilot preflight check must be conducted and found satisfactory prior to each flight on which the autopilot is to be used.

b. A pilot must be seated at the flight controls with the seat belt fastened when the autopilot is in operation.

c. Operation of the autopilot and yaw damper is prohibited during takeoff and landing, and below 200 feet above terrain. Maximum speed for autopilot operation is 246 KIAS to 11,500 feet, then 0.47 Mach to 35,000 feet.

TORQUE

0 - 100% NORMAL OPERATING RANGE

100% MAXIMUM
150% TRANSIENT (20 SECONDS)

PROPELLER TACHOMETER

1450 - 1700 RPM NORMAL OPERATING RANGE
1650 RPM MAXIMUM REVERSE (1 MINUTE)

1700 RPM MAXIMUM
1870 RPM TRANSIENT (20 SECONDS)

TURBINE GAS TEMPERATURE

400 - 830°C NORMAL OPERATING RANGE
750°C MAXIMUM LOW IDLE

840°C MAXIMUM TAKEOFF
760°C MAXIMUM REVERSE

870°C MAXIMUM TRANSIENT (20 SECONDS)
1000°C MAXIMUM STARTING (5 SECONDS)

TURBINE TACHOMETER (N1 SPEED)

62 - 104% NORMAL OPERATING RANGE

104% MAXIMUM

OIL TEMPERATURE AND PRESSURE

OIL TEMPERATURE SCALE

10 - 105°C NORMAL OPERATING RANGE
10 - 105°C CRUISE CLIMB AND RECOMMENDED SPEED
−40 - 105°C STARTING, LOW IDLE, HIGH IDLE

105°C MAXIMUM
110°C TRANSIENT (10 MINUTES)

OIL PRESSURE SCALE

60 PSI MINIMUM

60 - 90 PSI, 59% TORQUE MAXIMUM

90 - 135 PSI NORMAL OPERATING RANGE

200 PSI MAXIMUM STARTING WITH COLD OIL

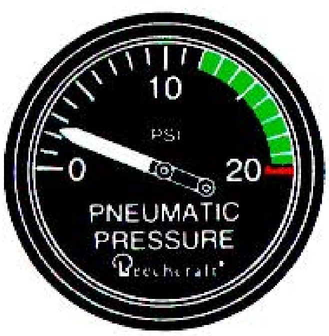
G R Y

NOTE: ± 10 PSI FLUCTUATIONS ARE ACCEPTABLE

AP014611.1

Figure 5-1. Instrument Markings (Sheet 1 of 3)

(red/white striped)	246 KIAS MAXIMUM V_{mo} (.47 MACH)
	NOTE: MAXIMUM ALLOWABLE AIRSPEED (RED STRIPED) POINTER IS SELF ADJUSTING WITH ALTITUDE
(red)	104 KIAS MINIMUM SINGLE-ENGINE CONTROL SPEED (V_{mca})
(blue)	121 KIAS ONE-ENGINE INOPERATIVE BEST RATE-OF-CLIMB (V_{yse})
(white)	79-154 KIAS FULL FLAP OPERATING RANGE
(black triangle)	197 KIAS MAXIMUM APPROACH FLAP EXTENSION SPEED



PNEUMATIC PRESSURE

(green)	12-20 PSI NORMAL OPERATING RANGE
(red)	20 PSI MAXIMUM

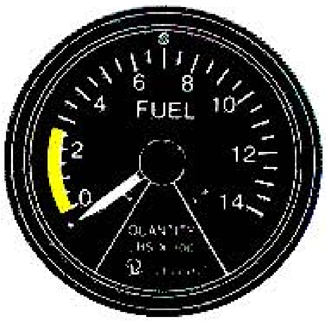
PROPELLER DEICER AMMETER

(green)	26-32 AMPERES NORMAL OPERATION

R
B
G

AP014611.2

Figure 5-1. Instrument Markings (Sheet 2 of 3)

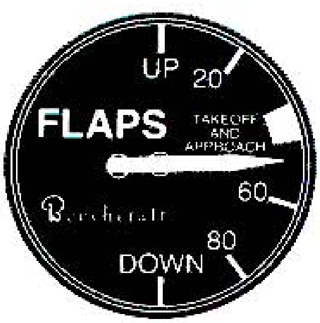


FUEL QUANTITY

Yellow	0-265 LBS NO TAKEOFF RANGE

CABIN ALTIMETER AND DIFFERENTIAL PRESSURE

Green	0-6.5 PSI NORMAL RANGE
Red	6.5 PSI MAXIMUM



FLAP POSITION INDICATOR

White	40% TAKEOFF AND APPROACH

R
Y
G

AP014811.3

Figure 5-1. Instrument Markings (Sheet 3 of 3)

5-10. FUEL SYSTEM LIMITS.

NOTE

Aviation gasoline (AVGAS) contains a form of lead which has an accumulative adverse effect on gas turbine engines. The lowest octane AVGAS available (less lead content) should be used. If any AVGAS is used, the total operating time must be entered on DA Form 2408-13. Operating time on AVGAS is computed on the basis of quantity used and average consumption.

a. Operating Limits.

(1) Operation with FUEL PRESS light on is limited to 10 hours. Log time (duration) FUEL PRESS light is illuminated on DA Form 2408-13.

(2) Crossfeed of AVGAS to an engine with a failed engine boost pump is not authorized.

(3) Takeoff torque may not be attainable during operations with AVGAS.

(4) AVGAS operation is limited to 150 hours.

(5) Crossfeed of AVGAS to an engine with a failed engine-driven boost pump will result in less than minimum fuel pressure to the high pressure pump on that side.

(6) Crossfeed fuel will not be available from the side with an inoperative standby boost pump.

(7) The use of AVGAS requires the standby boost pumps to be used during all operations above 15,000 feet.

(8) Operation with JP4 requires the use of standby pumps above 30,000 feet.

b. Fuel Management. Auxiliary tanks will not be filled for flight unless the main tanks are full. Maximum allowable fuel imbalance is 200 lbs. Do not take off if fuel quantity gages indicate in yellow arc (less than 265 lbs. of fuel in each main tank). Crossfeed only during single engine operation.

CAUTION

- **Anti-icing additive must be properly blended with the fuel to avoid deterioration of the fuel cell. The additive concentration by volume shall be a minimum of 0.060% and a maximum of 0.15%.**
- **JP-4 fuel per MIL-T-5624 has anti-icing additive per MIL-I-27686 blended in the fuel at the refinery and no further treatment is necessary. Some fuel suppliers blend in anti-icing additive, in their storage tanks. Prior to refueling, check with the fuel supplier to determine if fuel has been blended. To assure proper concentration by volume of fuel on board, blend only enough additive for the unblended fuel.**

c. Fuel System Anti-Icing. Icing inhibitor conforming to MIL-I-27686 will be added to commercial fuel, not containing an icing inhibitor, during fueling operations, regardless of ambient temperatures. The additive provides anti-icing protection and also functions as a biocide to kill microbiological growth in the aircraft fuel system.

5-11. LANDING GEAR CYCLING AND BRAKE DEICE LIMITATIONS.

a. Hydraulic Landing Gear. While conducting training operations, the landing gear cyclic rate shall not exceed 5 complete (extension and retraction) cycles equally spaced in a 20 minute period, without allowing a 10 to 15 minute interval between the 20 minute time groupings. It is suggested the cycle rate should not exceed 10 cycles equal spaced in one (1) hour. This rate is to keep the power pack motor operations within an intermittent duty class.

b. Brake Deice. The following limitations apply to the brake deice system:

(1) The brake deice system shall not be operated at ambient temperatures above 15°C

(2) The brake deice system shall not be operated longer than 10 minutes (one timer cycle) with the landing gear retracted. If operation does not automatically terminate approximately 10 minutes after gear retraction, turn the brake deice switch OFF.

(3) Maintain 85% N. or higher during simultaneous operation of the brake deice and surface deice systems. If adequate pneumatic pressure cannot be provided for simultaneous operation of the brake deice and surface deice systems, turn OFF the brake deice system.

(4) The brake deice system shall be turned OFF during single engine operation, in order to

maintain an adequate supply of systems pneumatic bleed air.

5-12. PITOT HEAT LIMITATIONS.

a. Pitot heat should not be used for more than 15 minutes while the aircraft is on the ground.

Section III. POWER LIMITS

5-13. ENGINE LIMITATIONS.
Observe limitations found in Table 5-1 during operation of this aircraft, equipped with two Pratt and Whitney of Canada, Ltd. PT6A-67 engines. Each column is a separate limitation. The limits presented do not necessarily occur simultaneously. Whenever operating limits are exceeded, the pilot should record the value and duration of' the condition encountered, in the aircraft log. Operation of the engines is monitored by instruments, with reference to the operating limits marked on the face of each instrument.

Table 5-1. Engine Operating Limitations

OPERATING CONDITION	TORQUE %	MAXIMUM OBSERVED TGT°C	GAS GENERATOR RPM N,	PROP RPM N2	OIL PRESS PSI	OIL TEMP (2) (3)
STARTING	(1)	1000(4)	-	-	200 (max)	-40 (min)
LOW IDLE	-	750(5)	62 (min)	1000 (min)	60 (min)	-40 to 110
HIGH IDLE	-	-	(6)	1000 (min)	-	
TAKEOFF (5 MIN.)	100	840	104	1700	90 to 135	10 to 110
MAX. CONT.	100	830	104	1700	90 to 135	10 to 105
MAX. CRUISE and (7) MAX CLIMB	(9)	810	104	(9)	90 to 135	10 to 105
NORMAL CRUISE and (7) NORMAL CLIMB	(9)	800	104	(9)	90 to 135	10 to 105
MAX REVERSE	81	760	88%	1650	90 to 135	10 to 105
TRANSIENT	150(8)	870(8)	104	1870(8)	40 (min) 200 (max) (8)	-40 to 110

BT00191

NOTES:
The limits presented do not necessarily occur simultaneously. Whenever operation limits are exceeded the pilot will record the value and duration of the condition encountered on DA Form 2408-13.

(1) Torque limit applies within range of 1000 to 1700 propeller RPM (N2). Below 11000 RPM, torque is limited to 59%.
(2) An engine oil temperature of 74° C to 80° C is recommended.
(3) Oil temperature limits are -40° C to 105° C. However, temperatures of up to 110° C are permitted for a maximum time of 10 minutes.
(4) These values are time limited to 5 seconds.
(5) High TGT at ground idle may be corrected by reducing accessory load and/or increasing N_1 RPM.
(6) At approximately 72% N_1.
(7) Cruise torque values to be set per Chapter 7.
(8) These values are time limited to 20 seconds.
(9) Torque limited to 100% when operating at 1500 RPM(N2). Torque limited to 91% when operating at 1700 RPM (N_2).

CAUTION

- **Engine operation using only the engine-driven fuel pump without boost pump fuel pressure is limited to 10 cumulative hours. All time in this category shall be entered on DA Form 2408-13 for the attention of maintenance personnel.**
- **Use of aviation gasoline is time-limited to 150 hours of operation during any Time-Between-Overhaul (TBO) period. It may be used in any quantity with primary or alternate fuel.**

5-14. OVERTEMPERATURE AND OVERSPEED LIMITATIONS.

a. Whenever limiting temperatures, listed in the Engine Operating Limitations chart (Table 5-1), are exceeded and cannot be controlled by retarding the power levers, the engine will be shut down and a landing made as soon as possible.

b. During engine starting the temperatures and time limits listed in the Engine Operating Limitations chart (Table 5-1) must be observed. When these limits are exceeded, the incident will be entered as an engine discrepancy in the appropriate maintenance forms. It is particularly important to record the amount and duration of over temperature.

c. Whenever the prescribed engine overspeed limit or engine RPM operating limit is exceeded, the incident must be reported as an engine discrepancy in the appropriate maintenance forms. It is particularly important to record the maximum percent of RPM registered by the tachometer, and the duration of overspeed.

d. Continued engine operation above 810°C will reduce engine life.

5-15. POWER DEFINITIONS FOR ENGINE OPERATIONS.

The following definitions describe the engine power ratings.

a. Takeoff Power. The maximum power permissible, limited to periods of five minutes duration.

b. Maximum Continuous Power. Maximum continuous power is the highest power rating not limited by time. Use of this rating is intended for emergency situations at the discretion of the pilot.

5-16. GENERATOR LIMITS.

Maximum generator load is limited for flight and variable during ground operations. Observe the limits shown in Table 5-2 during ground operation.

Table 5-2. Generator Load Limits

GENERATOR LOAD	MINIMUM GAS GENERATOR RPM N_1
0 to 95%	65%
95 to 100%	70%

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Section IV. LOADING LIMITS

5-17. CENTER OF GRAVITY LIMITATIONS.

Center of gravity limits and instructions for computation of the center of gravity are contained in Chapter 6. The center of gravity range will remain within limits, providing the aircraft loading is accomplished according to instructions in Chapter 6.

5-18. WEIGHT LIMITATIONS.

WARNING

The ability to experience loss of engine power and successfully stop, continue the takeoff, or climb, before or after gear retraction is not assured for all conditions. Thorough mission planning must be accomplished prior to takeoff by analysis of maximum takeoff weight permitted by takeoff distance, accelerate-stop, positive one engine inoperative climb at lift off, accelerate-go, takeoff climb gradient, and climb performance. This data will describe performance capabilities for critical mission decisions.

Max. Ramp Weight	**16,110 lbs**
Max. Takeoff Weight	**16,000 lbs**
Max. Landing Weight	**15,200 lbs**
Max. Zero Fuel Weight	**12,700 lbs**

5-19. CABIN AIRSTAIR DOOR WEIGHT LIMITATION.

The maximum weight that may be placed on the steps of the cabin airstair door is 300 pounds.

5-20. TOILET WEIGHT LIMITATION.

The maximum weight of a person occupying the toilet during takeoff or landing shall not exceed 238 pounds.

Section V. AIRSPEED LIMITS, MAXIMUM AND MINIMUM

5-21. AIRSPEED LIMITATIONS.

All placarded airspeeds, and airspeed indicator readings contained in procedures, text, and illustrations throughout this Operator's Manual are given as indicated airspeed (IAS) unless otherwise noted.

5-22. MAXIMUM ALLOWABLE AIRSPEED.

Refer to Flight Envelope Chart (fig. 5-2) to determine limiting airspeeds at maximum gross weight under various conditions. The maximum allowable airspeed is 246 KIAS below 11,500 feet, and Mmo of 0.47 Mach as indicated by the maximum allowable airspeed pointer (red striped) between 11,500 feet to 35,000 feet.

5-23. LANDING GEAR EXTENSION/EXTENDED SPEED.

The airspeed limit for extending the landing gear and for flight with the landing gear extended is 178 KIAS.

5-24. LANDING GEAR RETRACTION SPEED.

The airspeed limit for retracting the landing gear is 160 KIAS.

5-25. WING FLAP EXTENSION SPEEDS.

The airspeed limit for APPROACH extension (40%) of the wing flaps is 197 KIAS. The airspeed limit for full DOWN extension (100%) of the wing flaps is 154 KIAS. If wing flaps are extended above these speeds, the flaps or their operating mechanisms may be damaged.

5-26. MINIMUM SINGLE ENGINE CONTROL AIRSPEED (V_{MCA}).

The minimum single engine control airspeed (V_{MCA}) at sea level standard conditions is 104 KIAS.

5-27. MAXIMUM DESIGN MANEUVERING SPEED.

The maximum design maneuvering speed is 166 KIAS.

FLIGHT ENVELOPE CHART

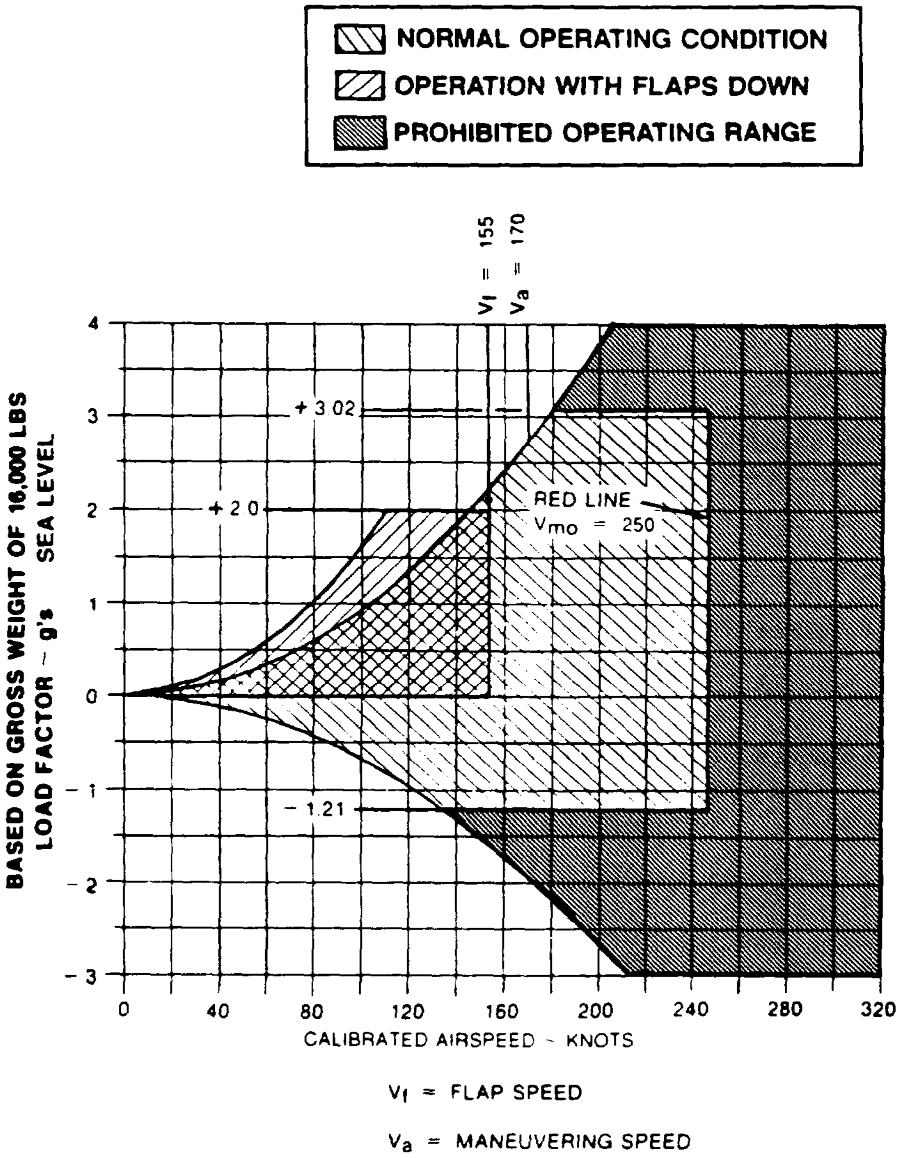

Figure 5-2. Flight Envelope

Section VI. MANUEVERING LIMITS

5-28. MANEUVERS.

a. The following maneuvers are prohibited:

(1) Spins.

(2) Aerobatics of any kind.

(3) Abrupt maneuvers above 166 KIAS.

(4) Any maneuver which results in a positive load factor of 3.02 g's or a negative load factor of 1.21 g's with wing flaps in up or approach, or a positive load factor of 2.0 g's or 0 g's with wing flaps down.

b. Recommended turbulent air penetration airspeed is 150 KIAS.

5-29. BANK AND PITCH LIMITS.

a. Bank limits are 60° left or right.

b. Pitch limits are 30° above or below the horizon.

Section VII. ENVIRONMENTAL RESTRICTIONS

5-30. ALTITUDE LIMITATIONS.

The maximum altitude that the aircraft may be operated at is 35,000. When operating with inoperative yaw damp, the altitude limit is 17,000 feet.

5-31. TEMPERATURE LIMITS.

a. The aircraft shall not be operated when the ambient temperatures are warmer than ISA +37°C at sea level to 25.000 feet, or ISA +31°C. above 25,000 feet.

b. The ice vanes shall be extended for operations in ambient temperatures of 5°C or below when flight free of visible moisture cannot be assured.

c. Minimum free air temperature for operation of deicing boots shall be -40°C.

5-32. FLIGHT UNDER IMC (INSTRUMENT METEOROLOGICAL CONDITIONS).

This aircraft is qualified for operation in instrument meteorological conditions.

5-32A. ICING LIMITATIONS (TYPICAL).

WARNING

While in icing conditions, if there is an unexplained 30% increase of torque needed to maintain airspeed in level flight, a cumulative total of two or more inches of ice accumulation on the wing, an unexplained decrease of 15 knots IAS, or an unexplained deviation between pilot's and copilot's airspeed indicators, the icing environment should be exited as soon as practicable. Ice accumulation on the pitot tube assemblies could cause a complete loss of airspeed indication.

The following conditions indicate a possible accumulation of ice on the pitot tube assemblies and unprotected airplane surfaces. If any of these conditions are observed, the icing environment should be exited as soon as practicable.

1. Total ice accumulation of two inches or more on the wing surfaces. Determination of ice thickness can be accomplished by summing the estimated ice thickness on the wing prior to each pneumatic boot deice cycle (e.g. four cycles of minimum recommended ½-inch accumulation.

2. A 30 percent increase in torque per engine required to maintain a desired airspeed in level flight (not to exceed 85 percent torque) when operating at recommended holding speed.

3. A decrease in indicated airspeed of 15 knots after entering the icing condition (not slower than 1.4 power off stall speed) if maintaining original power setting in level flight. This can be determined by comparing pre-icing condition entry speed to the indicated speed after a surface and antenna deice cycle is completed.

4. Any variations from normal indicated airspeed between the pilot's and copilot's airspeed indicators.

5-32B. ICING LIMITATIONS (SEVERE).

WARNING

Severe icing may result from environmental conditions outside of those for which the airplane is certificated. Flight in freezing rain, freezing drizzle, or mixed icing conditions (supercooled liquid water and ice crystals) may result in a build-up on protective surfaces exceeding the capability of the ice protection system, or may result in ice forming aft of these protected surfaces. This ice may not shed using ice protection systems, and may seriously degrade the performance and controllability of the airplane.

a. During flight, severe icing conditions that exceed those for which the airplane is certificated shall be determined by the following visual cues. If one or more of these visual cues exists, immediately request priority handling from air traffic control to facilitate a route or an altitude change to exit the icing conditions:

(1) Unusually extensive ice accreted on the airframe in areas not normally observed to collect ice.

(2) Accumulation of ice on the upper (or lower, as appropriate) surface of the wing aft of the protected area.

(3) Accumulation of ice on the propeller spinner farther aft than normally observed.

b. Since the autopilot may mask tactile cues that indicate adverse changes in handling characteristics, use of the autopilot is prohibited when any of the visual cues specified above exist, or when unusual lateral trim requirements or autopilot trim warnings are encountered while the airplane is in icing conditions.

NOTE

All icing detection lights must be operative prior to flight into icing conditions at night. This supersedes any relief provided by the master minimum equipment list (MMEL) or equivalent.

5-33. OXYGEN REQUIREMENTS.

a. Oxygen requirements will be in accordance with AR 95-1.

b. Oxygen system data/duration tables are found in Chapter 2.

5-34. CABIN PRESSURE LIMITS.

Maximum cabin differential pressure is 6.5 PSI.

5-35. CRACKED CABIN WINDOW / WINDSHIELD.

If a crack occurs in a single ply of a cabin exterior window, the aircraft is limited to unpressurized flight. If a crack occurs in both outer and inner plys of the cabin exterior window, the aircraft shall not be flown unless proper authorization is obtained for an unpressurized ferry flight. If an outer ply crack occurs in a windshield, no action is required in flight.

If an inner ply crack occurs in a windshield, or if either/both plys of a cabin window becomes cracked in flight, refer to Chapter 9, Emergency Procedures.

Section VIII. OTHER LIMITATIONS

5-36. MAXIMUM DESIGN SINK RATE.
The maximum design landing sink rate is 500 feet per minute, with a normal flare initiated just prior to touchdown.

5-37. INTENTIONAL ENGINE OUT SPEED.
Intentional inflight engine cuts below the safe one engine inoperative speed (V_{SSE} - 109 KIAS) are prohibited.

5-38. LANDING ON UNPREPARED RUNWAY.

CAUTION

Except in an emergency, propellers should be moved out of reverse below 40 knots to minimize propeller blade erosion, and during crosswind to minimize stress imposed on propeller, engine and airframe. Care must be exercised when reversing on runways with loose sand or dust on the surface. Flying gravel will damage propeller blades and dust may impair the pilot's forward visibility at low aircraft speeds. The aircraft has demonstrated landings on hard, smooth runways. Hard braking, i.e., skidding tires while operating on other than smooth runways, can result in damage to the landing gear. Operations from unimproved runways (rocks, potholes, mud, deteriorated surfaces) are prohibited. When landing on other than dry surfaces, use discretionary propeller reverse to stop the aircraft on the available runway.

Section IX REQUIRED EQUIPMENT FOR VARIOUS CONDITIONS OF FLIGHT

5-39. REQUIRED EQUIPMENT LISTING.

a. A Required Equipment for Various Conditions of Flight listing (Table 5-3), is provided to enable the pilot to identify those systems/components required for flight. For the sake of brevity, the listing does not include obviously required items such as wings, rudder, flaps, engines, landing gear, etc. It is important to note that ALL ITEMS WHICH ARE RELATED TO THE AIRWORTHINESS OF THE AIRCRAFT AND NOT INCLUDED ON THE LIST ARE AUTOMATICALLY REQUIRED TO BE OPERATIVE.

b. It is the final responsibility of the pilot to determine whether the lack of, or inoperative status of a piece of equipment on the aircraft will limit the conditions under which the aircraft may be operated.

1. (-) Indicates item may be inoperative for the specified flight condition.

2. (*) refers to remarks and/or exceptions column for explicit information or reference.

3. Numbered items indicate the number of items required for flights by AR 95-1.

c. The pilot is responsible for exercising the necessary operational control to assure that no aircraft is flown with multiple items inoperative, without first determining that any interface or interrelationship between inoperative systems or components will not result in a degradation in the level of safety and/or cause an undue increase in crew workload.

d. The exposure to additional failures during continued operation with inoperative systems or components must also be considered in determining that an acceptable level of safety is being maintained. The list may not deviate from requirements of the Operators Manual limitations section, emergency procedures or safety of flight messages.

Table 5-3. Required Equipment Listing (Sheet 1 of 4)

SYSTEM and/or COMPONENT	VFR DAY	VFR NIGHT	IFR DAY	IFR NIGHT	ICING CONDITIONS	Remarks and/or Exceptions
ELECTRICAL POWER						
1 AC Volts/Frequency Meter	2	2	2	2	2	
2 Battery	1	1	1	1	1	
3 Battery Charge Annunciator	1	1	1	1	1	
4 DC Generator	2	2	2	2	2	
5 DC Generator Annunciator	2	2	2	2	2	
6 DC Load Meter	2	2	2	2	2	One may be inoperative provided corresponding load meter is monitored
7 Inverter	2	2	2	2	2	
8 Inverter Annunciator	1	1	1	1	1	May be inoperative provided both inverters are operative
9 DC Voltmeter	2	2	2	2	2	
ENVIRONMENTAL						
1 Bleed Air Fail Annunciators	2	2	2	2	2	Provided bleed air is not used from side of failed light
2 Altitude Warning Annunciator (Cabin)	1	1	1	1	1	May be inoperative provided aircraft remains unpressurized
3 Cabin Rate of Climb Indicator	1	1	1	1	1	
4 Differential Pressure/Cabin Altitude Indicator	1	1	1	1	1	
5 Duct Overtemp Annunciator	1	1	1	1	1	May be inoperative provided bleed air is not used
6 Outflow Valve	1	1	1	1	1	
7 Pressurization Controller	1	1	1	1	1	
8 Safety Valve	1	1	1	1	1	
9 Bleed Air Shutoff Valve	2	2	2	2	2	
FIRE PROTECTION						
1 Engine Fire Detector System Including Annunciators	2	2	2	2	2	
2 Engine Fire Extinguishers	2	2	2	2	2	
FLIGHT CONTROLS						
1 Flap Position Indicator	1	1	1	1	1	May be inoperative provided that the flap travel is visually inspected prior to takeoff
2 Flap System	1	1	1	1	1	
3 Stall Warning Horn	1	1	1	1	1	

Table 5-3. Required Equipment Listing (Sheet 2 of 4)

SYSTEM and/or COMPONENT	VFR DAY	VFR NIGHT	IFR DAY	IFR NIGHT	ICING CONDITIONS	Remarks and/or Exceptions
4 Trim Tab Position Indicator (Rudder, Aileron, Elevator)	3	3	3	3	3	May be inoperative provided that the trim tabs are checked in the neutral position prior to each takeoff and checked for full range of operation
5 Yaw Damp System	1	1	1	1	1	May be inoperative for flight at and below 17,000 feet
6 Rudder Boost System	1	1	1	1	1	
7 Vortex Generators	19	19	19	19	19	Left outboard flap
FUEL						
1 Engine Driven Boost Pump	2	2	2	2	2	
2 Fuel Crossfeed System Including Annunciator	1	1	1	1	1	
3 Standby Fuel Boost Pump	2	2	2	2	2	Both required for operation on aviation gasoline above 15,000 feet
4 Fuel Pressure Annunciator	2	2	2	2	2	
5 Fuel Quantity Indicating System Including Annunciators	2	2	2	2	2	One may be inoperative provided other side is operative and amount of fuel on board can be established to be adequate for intended flight Fuel Flow on affected side must be operational and monitored
6 Firewall Fuel Shutoff System Including Annunciators	2	2	2	2	2	
7 Jet Transfer Pump	2	2	2	2	2	
8 Motive Flow Valve	2	2	2	2	2	
9 Fuel Flow Indicator	2	2	2	2	2	One may be inoperative provided fuel quantity gages are operative
ICE AND RAIN PROTECTION						
1 Antenna Deice System	0	0	0	0	1	
2 Alternate Static Air Source	1	1	1	1	1	
3 Engine Auto Ignition and Annunciators	2	2	2	2	2	
4 Engine Anti-Ice System and Annunciators	2	2	2	2	2	
5 Heated Fuel Vent	0	0	2	2	2	
6 Heated Windshield (Left)	0	0	0	0	1	Right side may be inoperative

Table 5-3. Required Equipment Listing (Sheet 3 of 4)

SYSTEM and/or COMPONENT	VFR DAY	VFR NIGHT	IFR DAY	IFR NIGHT	ICING CONDITIONS	Remarks and/or Exceptions
7 Pitot Heat	0	0	2	2	2	Right side may be inoperative.
8 Pneumatic Pressure Indicator	0	0	1	1	1	
9 Propeller Deicer System	0	0	0	0	1	
10 Stall Warning Heater	0	0	0	0	1	
11 Surface Deicer System	0	0	0	0	1	
12 Wing Ice Light (Left)	0	0	0	0	1	
LANDING GEAR						
1 Landing Gear Position Indicator Lights	3	3	3	3	3	One of the three may be inoperative provided gear handle light is monitored
2 Landing Gear Handle Light	1	1	1	1	1	
3 Landing Gear Aural Warning	1	1	1	1	1	
4 Landing Gear Hydraulic Power Pack	1	1	1	1	1	
5 Brake Deice Shutoff Valve	2	2	2	2	2	
6 Hydraulic Fluid Low Annunciator	1	1	1	1	1	
7 Emergency Extension Hand Pump	1	1	1	1	1	
LIGHTS						
1 Cockpit and Instrument Lighting System	0	1	0	1	0	Lights must illuminate all instruments and controls
2 Cabin Door Annunciator	1	1	1	1	1	
3 Landing Lights	0	1	0	1	0	
4 Position Lights	0	3	0	3	0	
5 Anti-collision Light System	0	1	0	1	0	
NAVIGATION INSTRUMENTS						
1 Airspeed Indicator (Left)	1	1	1	1	1	Right side may be inoperative
2 Altimeter (Left)	1	1	1	1	1	Right side may be inoperative
3 Magnetic Compass	1	1	1	1	1	
4 Outside Air Temperature Gage	1	1	1	1	1	
5 Gyroscopic Bank and Pitch Indicator	0	0	1	1	1	
6 Gyroscopic Rate of Turn with Slip and Skid Indicator	0	0	1	1	1	
7 Gyroscopic Direction Indicator	0	0	1	1	1	
OXYGEN						
1 Oxygen System	1	1	1	1	1	

Table 5-3. Required Equipment Listing (Sheet 4 of 4)

SYSTEM and/or COMPONENT	VFR DAY	VFR NIGHT	IFR DAY	IFR NIGHT	ICING CONDITIONS	Remarks and/or Exceptions
PROPELLER						
1 Autofeather System Including Annunciators	1	1	1	1	1	
2 Propeller Reversing System Including Annunciators	2	2	2	2	2	
3 Propeller Governor Test Switch	1	1	1	1	1	
4 Propeller Overspeed Governor	2	2	2	2	2	
5 Propeller Pitch Annunciators	2	2	2	2	2	
ENGINE INDICATIONS						
1 TGT Indicator	2	2	2	2	2	
2 Tachometer (Gas Generator)	2	2	2	2	2	
3 Tachometer (Propeller)	2	2	2	2	2	
4 Torque Indicator	2	2	2	2	2	
ENGINE OIL						
1 Chip Detector System Including Annunciators	2	2	2	2	2	
2 Oil Pressure	2	2	2	2	2	
3 Oil Temperature Indicator	2	2	2	2	2	
4 Oil Pressure Annunciator	2	2	2	2	2	

NOTE

The above equipment list does not include all specific flight instruments and communications/navigation equipment required by FAR Parts 91 and 135 Operating Requirements

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CHAPTER 6
WEIGHT/BALANCE AND LOADING

Section I. GENERAL

6-1. EXTENT OF COVERAGE.

Sufficient data has been provided so that, knowing the basic weight and moment of the aircraft, any combination of weight and balance can be computed.

6-2. CLASS.

Army model RC-12K aircraft are in Weight and Balance Class 1. Additional directives governing weight and balance of Class 1 aircraft forms and records are contained in AR 95-3, TM 55-1500-342-23 and DA PAM 738-751.

6-3. AIRCRAFT COMPARTMENTS AND STATIONS.

The Aircraft is separated into two compartments associated with loading. These compartments are the cockpit and the cabin. Figure 6-1 shows the general description of aircraft compartments. Figure 6-2 shows the landing gear dimensional data.

Section II. Weight and Balance

6-4. PURPOSE.

The data to be inserted on weight and balance charts and forms are applicable only to the individual aircraft, the serial number of which appears on the title page of the booklet entitled WEIGHT AND BALANCE DATA supplied by the aircraft manufacturer and on the various forms and charts which remain with the aircraft. The charts and forms referred to in this chapter may differ in nomenclature and arrangement from time to time, but the principles on which they are based will not change.

6-5. CHARTS AND FORMS.

The standard system of weight and balance control requires the use of several different charts and forms. Within this chapter, the following are used:

1. Chart C - Basic Weight and Balance Record, DD Form 365-3.
2. Form F - Weight and Balance Clearance Form F, DD Form 365-4 (Tactical).

6-6. RESPONSIBILITY.

The aircraft manufacturer inserts all aircraft identifying data on the title page of the booklet entitled WEIGHT AND BALANCE DATA and on the various charts and forms. All charts, including one sample Weight and Balance Clearance Form F, if applicable, are completed at time of delivery. This record is the basic weight and balance data of the aircraft at delivery. All subsequent changes in weight and balance are compiled by the weight and balance technician.

6-7. CHART C - BASIC WEIGHT AND BALANCE RECORD, DD FORM 365-3.

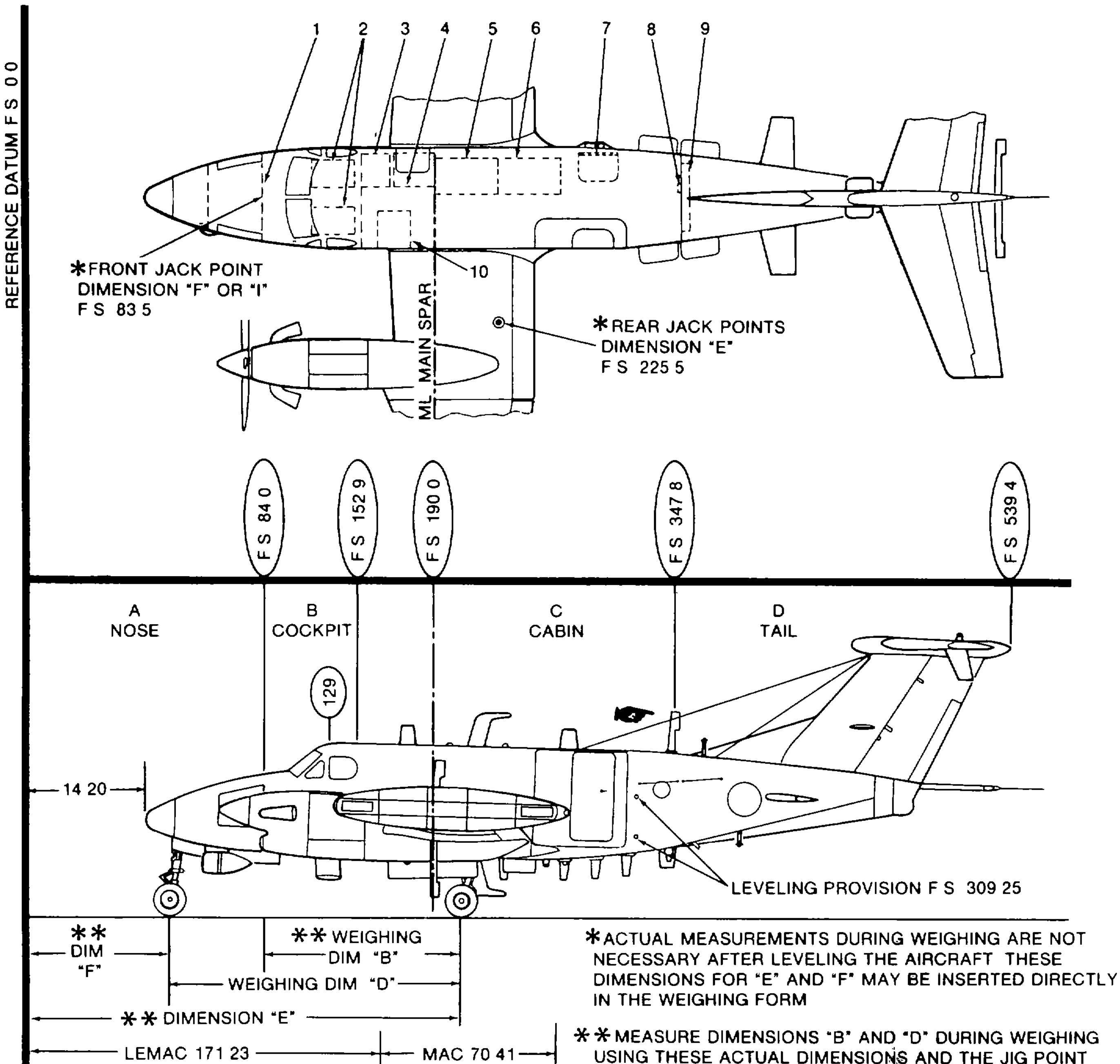
Chart C is a continuous history of the basic weight and moment resulting from structural and equipment changes made in service. At all times, the last weight and moment/100 entry is considered the current weight and balance status of the basic aircraft.

NOTE

Weight and balance data on Extended Band Kits is included with kit drawings and will be accomplished by field installation personnel.

6-8. WEIGHT AND BALANCE CLEARANCE FORM F, DD FORM 365-4 (TACTICAL).

Refer to TM 55-1500-342-23 for Form F, 365-4 instructions. Refer to Table 6-1 through 6-4 for weight and balance data.



1 VHF-22 COMM NO 1 & NO 2 VIR-32 NAV NO 1 & NO 2 AN/ARC-136 TACAN, AN/APN-215 RADAR, INS BATTERY, C-14-43, PC-17A INVERTER (2), AND KIT-1A/TSEC

2 PILOT AND COPILOT SEATS

3 MISSION AC DC POWER CABINET

4 EQUIPMENT RACK - INS, M-130, GPS & TACAN

5 MISSION CONSOLE

6 MISSION CONSOLE

7 TOILET (F S 292 9)

8 ADF-60A ADF RECEIVER AND MOUNT

9 KHF-950 HF EQUIPMENT AND OXYGEN BOTTLES

10 EQUIPMENT RACK - COMM SECURITY, RF PROCESSOR, TUNEABLE DIPLEXER, RADIO ALTIMETER

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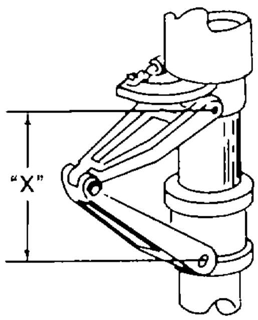
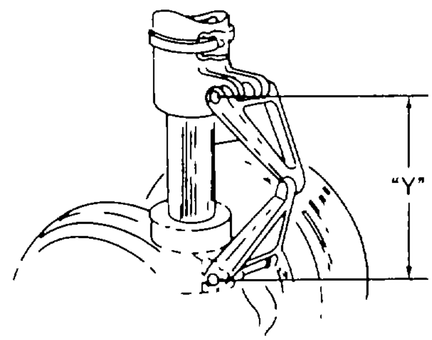
Figure 6-1. Aircraft Compartments and Stations

LANDING GEAR DIMENSION

NOSE WHEEL		MAIN WHEELS	
"X"	***DIM. "F"**	**"Y"**	***DIM. "E"**
Fully Compressed	30.76	Fully Compressed	210.31
Static	30.44	Static	210.08
Fully Extended	29.435	Fully Extended	208.61





DIMENSIONAL DATA

Span (with Antenna Pods)	58 ft.	6.00 in.
Length (with Tailboom Antenna)	45 ft.	8.00 in.
Maximum Height over Fin Static Attitude	14 ft.	8.00 in.
Approximate Wheel Base	14 ft.	11.40 in.
Approximate Tread	17 ft.	2.00 in.

Figure 6-2. Landing Gear Dimensional Data

Table 6-1. Occupants Useful Loads, Weights and Moments

WEIGHT	CREW F.S. 129 MOM/100	CHEMICAL TOILET F.S. 292.2 MOM/100
80	103	234
90	116	263
100	129	292
110	142	321
120	155	350
130	168	380
140	181	409
150	194	438
160	206	467
170	219	496
180	232	526
190	245	555
200	258	584
210	271	613
220	284	642
230	297	672
240	310	
250	323	

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Table 6-2. Fuel Moments Table (Sheet 1 of 2)

GAL	6.4 LB/GAL		6 5 LB/GAL		6 6 LB/GAL		6 7 LB/GAL		6.8 LB/GAL		6 9 LB/GAL		7 0 LB/GAL		7 1 LB/GAL	
	WGT	MOM 100	WGT	MOM 100	WGT	MOM 100	WGT	MOM 100	WGT	MOM 100	WGT	MOM 100	WGT	MOM 100	WGT	MOM 100
10	64	99	65	100	66	102	67	103	68	105	69	107	70	108	71	110
20	128	197	130	200	132	203	134	206	136	209	138	212	140	215	142	218
30	192	305	195	310	198	314	201	319	204	324	207	329	210	334	213	338
40	256	423	260	430	264	436	268	443	272	450	276	457	280	463	284	470
50	320	542	325	550	330	559	335	567	340	575	345	583	350	592	355	600
60	384	662	390	672	396	683	402	693	408	703	414	713	420	724	426	734
70	448	782	455	794	462	807	469	819	476	831	483	843	490	855	497	868
80	512	904	520	918	528	932	536	926	544	960	552	974	560	988	568	1002
90	576	1023	585	1039	594	1055	603	1071	612	1087	621	1103	630	1119	639	1135
100	640	1142	650	1160	660	1178	670	1196	680	1214	690	1232	700	1250	710	1268
110	704	1260	715	1280	726	1300	737	1319	748	1339	759	1359	770	1378	781	1398
120	768	1379	780	1400	792	1422	804	1443	816	1465	828	1487	840	1508	852	1530
130	832	1496	845	1519	858	1543	871	1566	884	1589	897	1612	910	1636	923	1659
140	896	1615	910	1640	924	1665	938	1690	952	1715	966	1740	980	1765	994	1791
150	960	1734	975	1761	990	1788	1005	1815	1020	1842	1035	1869	1050	1896	1065	1923
160	1024	1852	1040	1881	1056	1910	1072	1939	1088	1968	1104	1997	1120	2026	1136	2055
170	1088	1971	1105	2002	1122	2033	1139	2064	1156	2095	1173	2126	1190	2157	1207	2187
180	1152	2090	1170	2122	1188	2155	1206	2188	1224	2221	1242	2254	1260	2286	1278	2319
190	1216	2209	1235	2244	1254	2279	1273	2313	1292	2348	1311	2383	1330	2417	1349	2452
200	1280	2328	1300	2365	1320	2401	1340	2437	1360	2473	1380	2509	1400	2546	1420	2582
210	1344	2447	1365	2486	1386	2524	1407	2562	1428	2600	1449	2638	1470	2676	1491	2715
220	1408	2567	1430	2607	1452	2647	1474	2687	1496	2727	1518	2767	1540	2807	1562	2847
230	1472	2686	1485	2728	1518	2770	1541	2812	2564	2854	1587	2896	1610	2938	1633	2980
240	1536	2806	1560	2850	1584	2894	1608	2938	1632	2982	1656	3026	1680	3070	1704	3114
250	1600	2926	1625	2971	1650	3107	1675	3063	1700	3109	1725	3155	1750	3200	1775	3246
260	1664	3945	1690	3093	1716	3140	1742	3188	1768	3236	1794	3284	1820	3331	1846	3379
270	1728	3164	1755	3213	1782	3263	1809	3312	1836	3361	1863	3410	1890	3460	1917	3509
280	1792	3283	1820	3334	1848	3386	1876	3437	1904	3488	1932	3539	1960	3591	1988	3642
290	1856	3402	1885	3455	1914	3508	1943	3562	1972	3615	2001	3668	2030	3721	2059	3774
300	1920	3521	1950	3576	1980	3631	2010	3686	2040	3741	2070	3796	2100	3851	2130	3906

Table 6-2. Fuel Moments Table (Sheet 2 of 2)

GAL	6 4 LB/GAL WGT	MOM/100	6 5 LB/GAL WGT	MOM/100	6.6 LB/GAL WGT	MOM/100	6 7 LB/GAL WGT	MOM/100	6.8 LB/GAL WGT	MOM/100	6 9 LB/GAL WGT	MOM/100	7 0 LB/GAL WGT	MOM/100	7 1 LB/GAL WGT	MOM/100
310	1984	3641	2015	3698	2046	3754	2077	3811	2108	3868	2139	3925	2170	3982	2201	4039
320	2048	3760	2080	3819	2112	3878	2144	3936	2176	3995	2208	4054	2240	4113	2272	4171
330	2112	3880	2145	3940	2178	4001	2211	4062	2244	4123	2277	4184	2310	4244	2343	4305
340	2176	3999	2210	4062	2244	4124	2278	4187	2312	4249	2346	4311	2380	4374	2414	4436
350	2240	4119	2275	4184	2310	4248	2345	4312	2380	4376	2415	4440	2450	4505	2485	4569
360	2304	4244	2340	4310	2376	4377	2412	4443	2448	4509	2484	4575	2520	4642	2556	4708
370	2368	4365	2405	4434	2442	4502	2479	4570	2516	4638	2553	4706	2590	4774	2627	4843
380	2432	4489	2470	4560	2508	4630	2546	4700	2584	4770	2622	4840	2660	4910	2698	4980
384	2548	4540	2496	4610	2534	4680	2573	4752	2611	4821	2691	4892	2730	4963	2769	5034
400	2560	4748	2600	4822	2640	4896	2680	4970	2720	5043	2760	5117	2800	5191	2840	5265
410	2624	4879	2665	4955	2706	5031	2747	5107	2788	5182	2829	5258	2870	5334	2911	5411
420	2688	5009	2730	5087	2772	5166	2814	5244	2856	5321	2898	5399	2940	5478	2982	5556
430	2752	5140	2795	5220	2838	5300	2881	5380	2924	5460	2967	5540	3010	5621	3053	5701
440	2816	5270	2860	5353	2904	5435	2948	5517	2992	5598	3036	5680	3080	5763	3124	5845
450	2880	5401	2925	5485	2970	5569	3015	5654	3060	5737	3105	5821	3150	5906	3195	5990
460	2944	5531	2990	5618	3036	5704	3082	5790	3128	5876	3174	5962	3220	6049	3266	6135
470	3008	5662	3055	5750	3102	5839	3149	5927	3196	6014	3243	6102	3290	6191	3337	6279
480	3072	5793	3120	5883	3168	5973	3216	6064	3264	6153	3312	6243	3360	6334	3408	6424
490	3136	5923	3185	6016	3234	6108	3283	6200	3332	6292	3381	6385	3430	6477	3479	6570
500	3200	6054	3250	6148	3300	6243	3350	6337	3400	6431	3450	6526	3500	6620	3550	6715
510	3264	6184	3315	6281	3366	6377	3417	6447	3468	6569	3519	6666	3570	6762	3621	6859
520	3328	6315	3380	6413	3432	6512	3484	6610	3536	6708	3588	6807	3640	6905	3692	7004
530	3392	6445	3445	6546	3498	6647	3551	6747	3604	6847	3657	6948	3710	7048	3763	7149
540	3456	6576	3510	6679	3564	6781	3618	6884	3672	6985	3726	7088	3780	7190	3834	7293

Table 6-3. Center of Gravity Limits Table (Sheet 1 of 3)

GROSS WEIGHT POUNDS	FWD LIMIT % MAC MOM/100	% MAC									
		8 2	11 0	14 0	17 0	20.0	23.1	26.0	29 0	32 0	33.9
		ARM									
		177 0	179 0	181 1	183.2	185.3	187 5	189 5	191.6	193.8	195 1
9200		16284	16468	16661	16854	17048	17250	17434	17627	17830	17949
9250		16373	16558	16752	16940	17140	17344	17529	17723	17927	18047
9300		16461	16647	16842	17038	17233	17438	17624	17819	18023	18144
9350		16550	16737	16933	17129	17326	17531	17716	17915	18120	18242
9400		16638	16826	17023	17221	17418	17625	17813	18010	18217	18339
9450		16727	16916	17114	17312	17511	17719	17908	18106	18314	18437
9500		16815	17005	17205	17404	17604	17813	18003	18202	18411	18535
9550		16904	17095	17295	17496	17696	17906	18097	18298	18508	18632
9600		16992	17184	17386	17587	17789	18000	18192	18394	18605	18730
9650		17081	17274	17476	17679	17881	18094	18287	18489	18702	18827
9700		17169	17363	17567	17770	17974	18188	18382	18585	18799	18925
9750		17258	17453	17657	17862	18067	18281	18476	18681	18896	19022
9800		17346	17542	17748	17954	18159	18375	18571	18777	18992	19120
9850		17435	17632	17838	18045	18252	18468	18666	18873	19089	19217
9900		17523	17721	17929	18137	18345	18563	18761	18968	19186	19315
9950		17612	17811	18019	18228	18437	18656	18855	19064	19283	19412
10000		17700	17900	18110	18320	18530	18750	18950	19160	19380	19510
10050		17789	17990	18201	18412	18623	18844	19045	19256	19477	19607
10100		17877	18079	18291	18503	18715	18938	19140	19352	19574	19705
10150		17966	18169	18382	18595	18808	19031	19234	19477	19761	19803
10200		18054	18258	18472	18686	18901	19125	19329	19543	19768	19900
10250		18143	18348	18563	18778	18993	19219	19424	19639	19865	19998
10300		18231	18437	18653	18870	19086	19313	19519	19735	19961	20095
10350		18320	18257	18744	18961	19179	19406	19613	19831	29958	20193
10400		18408	18616	18834	19053	19271	19500	19708	19926	20155	20290
10450		18497	18706	18925	19144	19364	19594	19803	20022	20252	20388
10500		18585	18795	19015	19236	19457	19688	19898	20118	20349	20486
10550		18674	18885	19106	19328	19549	19731	19992	20214	20446	20583
10600		18762	18874	19197	19419	19642	19875	20087	20310	20543	20681
10650		18851	19064	19287	19511	19734	20182	19969	20405	20640	20778
10700		18939	19153	19378	19602	19827	20063	20277	20501	20737	20876
10750		19028	19243	19468	19694	19920	20156	20371	20597	20834	20973
10800		19115	19332	19559	19786	20012	20240	20466	20693	20930	21071
10850		19205	19422	19649	19877	20105	20344	20561	20789	21027	21168
10900		19293	19511	19740	19969	20198	20438	20656	20884	21124	21256
10950		19382	19601	19830	20060	20290	20531	20750	20980	21221	21363
11000		19470	19690	19921	20152	20383	20625	20845	21076	21318	21461
11050		19559	19780	20012	20244	20476	20719	20940	21172	21415	21559
11100		19647	19869	20102	20335	20568	20813	21035	21268	21512	21656
11150		19736	19959	20193	20661	20437	20906	21129	21363	21609	21754
11200		19824	20043	20283	20518	20754	21000	21224	21459	21706	21851
11250		19913	20138	20374	20610	20846	21094	21319	21555	21803	21949
11300		20001	20227	20464	20702	20939	21188	21414	21651	21899	22046
11350		20900	20317	20555	20793	21032	21281	21508	21747	21996	22144
11400		20178	20406	20545	20885	21124	21375	21603	21842	22093	22241

Table 6-3. Center of Gravity Limits Table (Sheet 2 of 3)

GROSS WEIGHT POUNDS	FWD LIMIT % MAC MOM/100	% MAC									
		8.2	11.0	14.0	17.0	20.0	23.1	26.0	29.0	32.0	33.9
		ARM									
		177.0	179.0	181.1	183.2	185.3	187.5	189.5	191.6	193.8	195.1
11450		20267	20496	20786	20976	21217	21469	21698	21938	22190	22339
11500		20355	20585	20827	21068	21310	21563	21793	22034	22287	22437
11550		20444	20675	20917	21160	21402	21887	21887	22130	22384	22534
11600		20532	20764	21008	21251	21495	21750	21982	22226	22481	22632
11650		20621	20854	21098	21343	21587	21844	22077	22321	22578	22719
11700		20709	20943	21189	21434	21680	21938	22172	22417	22675	22837
11750		20798	21033	21279	21526	21773	22061	22266	22513	22772	22924
11800		20855	21122	21370	21618	21865	22125	22361	22609	22868	23022
11850	8.4	20989	21212	21460	21709	21958	22219	22456	22705	22965	23119
11900	8.5	21093	21301	21551	21801	22050	22313	22551	22800	23062	23217
11950	8.7	21196	21391	21641	21892	22143	22406	22645	22896	23159	23314
12000	8.9	21300	21480	21732	21984	22236	22500	22740	22992	23256	23412
12050	9.1	21404	21570	21823	22076	22329	22594	22835	23088	23353	23510
12100	9.3	21508	21659	21913	22167	22421	22688	22930	23184	23450	23607
12150	9.4	21612	21749	22004	22259	22514	22781	23024	23279	23457	23705
12200	9.6	21716	21838	22094	22350	22607	22875	23119	23375	23644	23802
12250	9.8	21820	21928	22185	22442	22699	22969	23214	23471	23741	23900
12300	10.0	21925	22017	22275	22534	22792	23063	23309	23567	23837	23997
12350	10.1	22029	22107	22366	22625	22885	23156	23403	23663	23934	24095
12400	10.3	22134	22196	22456	22717	22977	23250	23498	23758	24031	24192
12450	10.5	22239	22286	22547	22808	23070	23344	23593	23854	24128	24290
12500	10.7	22344	22375	22638	22900	23263	23438	23688	23950	24225	24388
12550	10.9	22449	22465	22728	22922	23255	23531	23782	24064	24322	24485
12600			22554	22819	23083	23348	23625	23877	24142	24419	24583
12650		11.2	22659	22909	23175	23440	23719	23972	24237	24516	24680
12700	MAX ZERO	11.4	22765	23000	23266	23533	23813	24067	24333	24613	24788
12750	FUEL	11.6	22870	23090	23358	23626	23906	24161	24429	24710	24875
12800	WEIGHT	11.7	22976	23181	23450	23718	24000	24256	24525	24806	24973
12850		11.9	23082	23271	23541	23711	24094	24351	24621	24903	25070
12900		12.1	23188	23362	23633	23904	24188	24446	24716	25000	25168
12950		12.3	23294	23452	23724	23996	24281	24540	24812	25097	25265
13000		12.5	23400	23543	23816	24089	24375	24635	24908	25194	25363
13050		12.6	23506	23634	23908	24182	24469	24730	25004	25291	25461
13100		12.8	23613	23724	23999	24274	24563	24825	25100	25388	25558
13150		13.0	23719	23815	24091	24367	24656	24919	25195	25485	25656
13200		13.2	23826	23905	24182	24460	24750	25014	25291	25582	25753
13250		13.3	23933	23996	24274	24552	24844	25109	25387	25679	25851
13300		13.5	24040	24086	24366	24645	24938	25204	25483	25775	25948
13350		13.7	24147	24177	24457	24738	25031	25298	25579	25872	26046
13400		13.9	24254	24267	24549	24930	25125	25393	25674	25969	26143
13450			14.1	24361	24640	24923	25219	25488	25770	26066	26241
13500			14.2	24469	24732	25016	25313	25866	26163	26339	
13550			14.4	24576	24824	25108	25406	25677	25962	26260	26436
13600			14.6	24684	24915	25201	25500	25772	26058	26357	26534
13650			14.8	24792	25007	25293	25594	25867	26153	26454	26631

Table 6-3. Center of Gravity Limits Table (Sheet 3 of 3)

GROSS WEIGHT POUNDS	FWD LIMIT % MAC MOM/100	% MAC 8.2 / ARM 177.0	11.0 / 179.0	14.0 / 181.1	17.0 / 183.2	20.0 / 185.3	23.1 / 187.5	26.0 / 189.5	29.0 / 191.6	32.0 / 193.8	33.9 / 195.1
13700			14.9	24900	25098	25386	25688	25962	26249	26551	26729
13750			15.1	25008	25190	25479	25781	26056	26345	26648	26826
13800			15.5	25116	25282	25571	25875	26151	26441	26744	26924
13850			15.5	25224	25373	25664	25969	26246	26537	26841	27021
13900			15.7	25333	25465	25757	26063	26341	26632	26938	27119
13950			15.8	25441	25556	25849	26156	26435	26728	27035	27216
14000			16.0	25550	25848	25942	26250	26530	26824	27132	27314
14050			16.2	25659	25740	26035	26344	26625	26920	27229	27412
14100			16.4	25768	25831	26127	26438	26720	27016	27326	27509
14150			16.5	25877	25923	26220	26531	26814	27111	27423	27607
14200			16.7	25976	26014	26313	26625	26909	27207	27520	27704
14250			16.9	26095	26106	26405	26719	27004	27303	27617	27802
14300				17.1	26205	26498	26813	27099	27399	27713	27899
14350				17.2	26314	26591	26906	27193	27495	27810	27997
14400				17.4	26424	26683	27000	27288	27590	27907	28094
14450				17.6	26534	26776	27094	27383	27686	28004	28192
14500				17.8	26644	26869	27188	27278	27782	28101	28190
14550				18.0	26754	26961	27261	27572	27878	28198	28287
14600				18.1	26864	27054	27365	27667	27974	28295	28485
14650				18.3	26974	27146	27469	27762	28069	28392	28582
14700				18.5	27085	27239	27563	27857	28165	28489	28680
14750				18.7	27195	27332	27656	27951	28261	28586	28777
14800				18.8	27306	27424	27750	28046	28357	28682	28875
14850				19.0	27417	27517	27844	28141	28453	28779	28972
14900				19.2	27528	27610	27938	28236	28548	28876	29070
14950				19.4	27639	27702	28031	28330	28644	28973	29167
15000				19.6	27750	27795	28125	28425	28740	29073	29625
15050				19.7	27861	27888	28219	28520	28836	29167	29363
15100				19.9	27973	27980	28313	28615	28932	29264	29460
15150					20.1	28084	28406	28709	29027	29361	29588
MAXIMUM LANDING WEIGHT											
15200					20.3	28196	28500	28804	29132	29458	29655
15250					20.4	28308	28594	28899	29219	29555	29753
15300					20.6	28420	28688	28994	28315	29651	29850
15350					20.8	28532	28781	29088	28411	29748	29948
15400					21.0	28644	28875	29183	29506	29845	30045
15450					21.2	28756	28969	29278	29602	29942	30143
15500					21.3	28869	29063	29373	29698	30039	30241
15550					21.5	28981	29156	29467	29794	30136	30388
15600					21.7	29094	29250	29562	29890	30233	30436
15650					21.9	29207	29344	29657	29985	30330	30533
15700					22.0	29320	29438	29752	30081	30427	30631
15750					22.2	29433	29531	29846	30177	30524	30728
15800					22.4	29546	29625	29941	30273	30620	30826
15850					22.6	29659	29719	30036	30369	30717	30923
15900					22.8	29733	29813	30131	30464	30814	31021
15950					22.9	29886	29906	30225	30560	30911	31118
16000							30000	30320	30656	31008	31216

Section III. FUEL/OIL

6-9. FUEL LOAD.

Fuel loading imposes a restriction on the amount of load which can be carried. The required fuel must first be determined, then that weight subtracted from the total weight of crew and fuel. Weight up to and including the remaining allowable capacity can be subtracted directly from the weight of crew and fuel. As the fuel load is increased, the loading capacity is reduced. Figure 6-3 depicts the density variation of aviation fuel.

6-10. FUEL AND OIL DATA

a. Fuel Moment Table. This table (Table 6-2) shows fuel moment/100 given US gallons or pounds for JP-4, JP-5 and JP-8.

b. Oil Data. Total oil weight is 62 pounds and is included in the basic weight of the aircraft.

Section IV. CENTER OF GRAVITY

6-11. CENTER OF GRAVITY LIMITATIONS.

WARNING

It is possible to exceed the forward Center of Gravity limit when the mission gear is removed.

Center of gravity limitations are expressed in ARM inches which refers to a positive measurement from the aircraft's reference datum. The forward CG limit at 11,800 lbs., or less, is 177.0 ARM inches. The forward-sloping CG limit line is a straight line from 11,800 lbs. to 16,000 lbs, ending at fuselage station 187.5. At 16,000 lbs., or less, the aft CG limit is 195.1 ARM inches. The Center of Gravity Limitations Table (Table 6-3) is designed to establish forward and aft CG limitations.

Section V. CARGO LOADING

6-12. LOAD PLANNING.

The basic factors to be considered in any loading situation are as follows:

a. Cargo shall be arranged to permit access to all emergency equipment and exits during flight.

b. Floorboard structural capacity shall be considered in the loading of heavy or sharp-edged containers and equipment. Shorings shall be used to distribute highly condensed weights evenly over the cargo areas.

c. All cargo shall be adequately secured to prevent damage to the aircraft, other cargo, or the item itself.

6-13. LOADING PROCEDURE.

NOTE

The cabin airstair door is weight limited to a maximum of 300 pounds to prevent possible structural damage.

Loading of cargo is accomplished through the cabin door (21.5 in. X 50.0 in.) or the cargo door.

6-14. SECURING LOADS.

All cargo shall be secured with restraints strong enough to withstand the maximum force exerted in any direction. The maximum force can be determined by multiplying the weight of the cargo item by the applicable load factor. These established load factors (the ratio between the total force and the weight of the cargo item) are 1.5 to the side and rear, 3.0 up, 6.6 down, and 9.0 forward.

DENSITY VARIATION OF AVIATION FUEL

BASED ON AVERAGE SPECIFIC GRAVITY

FUEL	AVERAGE SPECIFIC GRAVITY AT 15°C (59°F)
AVIATION KEROSENE JET A, JET A-1 & JP-5	812
JP-8	807
JET B (JP-4)	785
AV GAS GRADE 100/130	703

NOTE The Fuel Quantity Indicator is calibrated for correct indication when using Aviation Kerosene Jet A and Jet A1 When using other fuels, multiply the indicated fuel quantity in pounds by 99 for Jet B (JP-4) or by 98 for Aviation Gasoline (100/130) to obtain actual fuel quantity in pounds

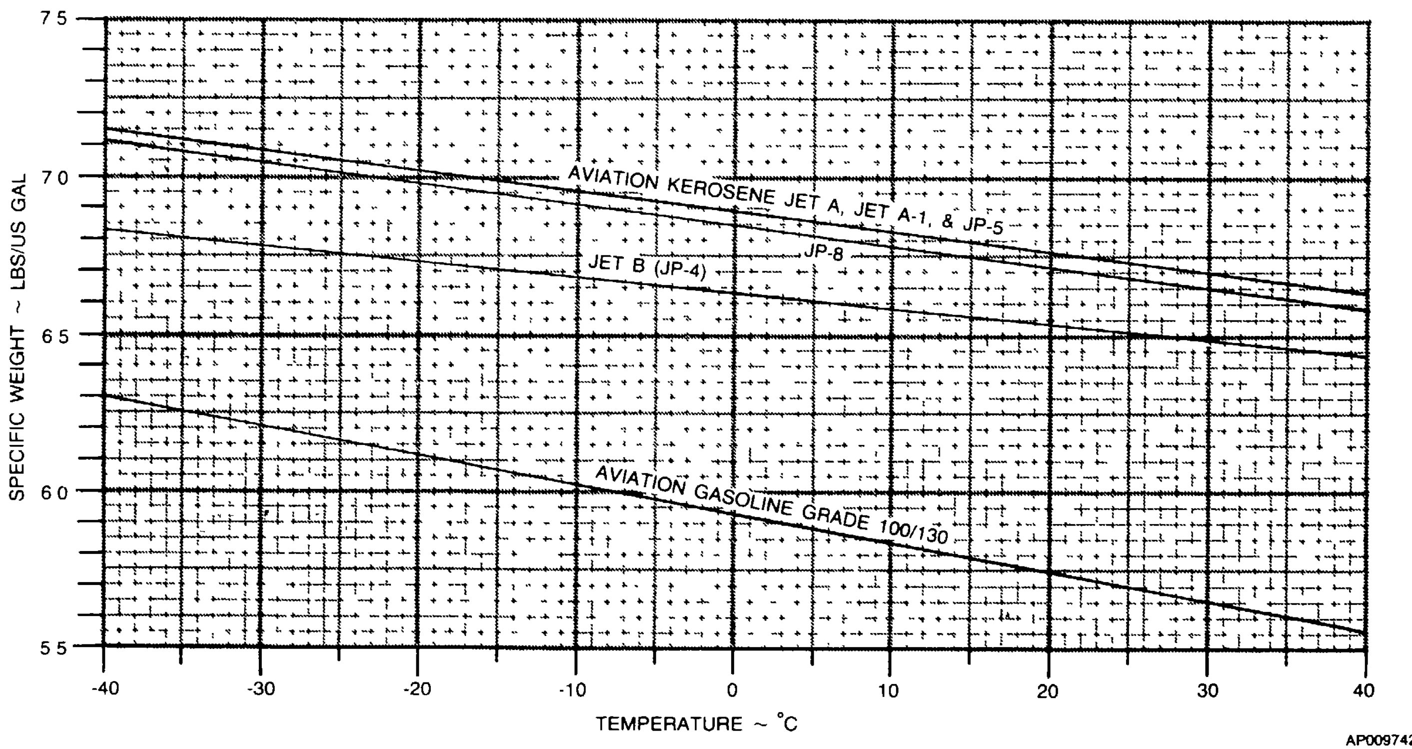

Figure 6-3. Density Variation of Aviation Fuel

Section VI. SURVIVABILITY EQUIPMENT

6-15. FLARE AND CHAFF DISPENSERS.

Refer to table 6-4 for flare and chaff dispenser weight and balance data.

Table 6-4. Aircraft Survivability Equipment

NACELLE DISPENSER		
ITEM	**Weight (lb)**	**Moment (lb)**
Dispenser (Empty)	10	21
Chaff Cartridges (30)	9	19
TOTAL: (Dispenser / 30 chaff cartridges)	19	40
FUSELAGE DISPENSER		
Dispenser (Empty)	10	49
Chaff Cartridges (30)	9	26
TOTAL: (Dispenser / 30 chaff and/or cartridges)	19	75

BT00108

CHAPTER 7
PERFORMANCE

Page Number

7-1 INTRODUCTION TO PERFORMANCE.

The graphs and tables in this Chapter present performance information for takeoff, climb, flight planning and landing at various parameters of weight, power, altitude, and temperature. Examples have been presented on performance graphs.

7-2. HOW TO USE GRAPHS.

1. All airspeeds and references to airspeeds in this Chapter are indicated airspeeds unless otherwise noted.
2. A reference line indicates where to begin following the guidelines. Always project to the reference line first, then follow the guidelines to the next item by maintaining the same PROPORTIONAL DISTANCE between the guideline above and the guideline below the projected line. For instance, if the projected line intersects the reference line in the ratio of 30% down/70% up between the guidelines, then maintain this same 30%/70% relationship between the guidelines all the way to the next item.
3. The AIRSPEED CALIBRATION - NORMAL SYSTEM - TAKEOFF GROUND ROLL graph was used to obtain V_1 and V_R indicated airspeeds (IAS). All other indicated airspeeds were obtained by using the AIRSPEED CALIBRATION - NORMAL SYSTEM graph.
4. The associated conditions define the specific conditions from which performance parameters have been determined. They are not intended to be used as instructions; however, performance values determined from charts can only be achieved if the specified conditions exist.
5. The full amount of usable fuel is available for all approved flight conditions.
6. Notes have been provided to approximate performance with the ice vanes extended. The effect will vary, depending upon airspeed, temperature, and altitude. At lower altitudes, where operation on the torque limit is possible, the effect of ice vane extension will be less, depending upon how much power can be recovered without exceeding the N., TGT, or torque limits.

7-3. EXAMPLES.

The following examples present calculations for flight time, block speed, and fuel required for a proposed flight from Billings, Montana, to Casper, Wyoming, at Flight Level 250, using the conditions listed below, except as noted.

a. Conditions. At Billings-Logan International (BIL):

Free Air Temperature .... 59°F
Field Elevation.................................... 3649 feet[1]
Altimeter Setting .... 30.07 in. Hg
Wind.................................290 DEG at 15 knots
Runway 34 Length............................. 5585 feet[1]
Gradient ....1.9% downhill[1]
[1]Source: DOD TERM USLIAPVO1, 12 JAN 89.

Route of Trip: BIL - V19 - CPR
Route Segment Data: See Table.
At Natrona County International (CPR):
Free Air Temperature .... 68 °F
Field Elevation.................................... 5348 feet[4]
Altimeter Setting .... 29.27 in. Hg
Wind.................................290 DEG at 10 knots
Runway 26 Length .... 8679 feet[4]
Gradient .... Not published; zero assumed[4]
[4]Source: DOD TERM USLIAPV03, 12 JAN 89.

ROUTE SEGMENT DATA[2]

ROUTE SEGMENT	AVERAGE MAGNETIC COURSE	AVERAGE MAGNETIC VARIATION	DISTANCE NM	WIND AT FL 250 DIR/KNOTS	FAT AT FL 250 °C	MEA FEET	FAT AT MEA °C	ALTIMETER SETTING IN. HG
BIL-SHH	117°	15°E	91[3]	010°/45	-40	8000	0	29.97
SHH-C_I	139°	14° E	57	350°/65	-40	9000	-4	29.60
CLI-CPH	161°	13° E	68[3]	310°/50	-30	76000	0	29.48

[2]Source: DOD Low Altitude Enroute Chart L-9, 6 APH 1989.
[3]Includes distance between airport and VORTAC, per DOD US IFR SUPPLEMENT, 6 APR 1989

b. Fahrenheit to Celsius Temperature Conversion. Convert reported field temperatures at the departure and destination airports from Fahrenheit to Celsius using the Fahrenheit to Celsius Temperature Conversion graph. Enter the chart at the appropriate value on the °F scale, read up to the reference line and left to the corresponding value in °C.

Billings-Logan International 59°F............................15°C
Natrona County International 68°F..........................20°C

c. Pressure Altitude. To determine the approximate pressure altitude at origin and destination airports, add 1000 feet to field elevation for each 1.00 in. Hg that the reported altimeter setting value is below 29.92 in. Hg, and subtract 1000 feet for each 1.00 in. Hg above 29.92 in. Hg. Always subtract the reported altimeter setting FROM 29.92 in. Hg. Then multiply the answer by 1000 to find the difference in feet between field elevation and pressure altitude.

Pressure Altitude at BIL:

29.92
-30.07
-0.15
-0.15 x 1000 feet = -150 feet

Field Elevation ....3649 feet
Pressure Altitude Correction........................... - 150 feet
Field Pressure Altitude....................................3499 feet

Pressure Altitude at CPR:

29.92
-29.27
-0.65
0.65 x 1000 feet = 650 feet

Field Elevation ....5348 feet
Pressure Altitude Correction ....+ 650 feet
Field Pressure Altitude....................................5998 feet

d. Wind Components. Determine the headwind (tailwind) and crosswind component for the selected runway. Compute the angle between the reported wind at Billings-Logan International of 290° and the selected runway heading of 340° to be 50 degrees. Locate the line of for 50° angle between wind direction and flight path on the graph. Trace along the 50° line to locate the point midway between. the 10 and 20 wind speed lines. Read left to obtain the headwind component and down to obtain the crosswind component.

Headwind Component...................................... 10 knots
Crosswind Component...................................... 12 knots

e. Takeoff Weight. The following examples illustrate the use of graphs which may restrict takeoff weight.

NOTE

Do not exceed the Maximum Takeoff Weight Limitation of 16,000 pounds.

(1) Maximum Takeoff Weight To Achieve Positive One-Engine-Inoperative Climb at Lift-Off. Enter the graphs at 3499 feet pressure altitude, 15°C, and read:

Flaps Up .... 16,000 lbs
Flaps Approach.. 16,000 lbs

(2) Maximum Enroute Weight For 50-Ft/Minute One-Engine-Inoperative Climb. To determine the maximum takeoff weight, the weight of the fuel used to reach the MEA is added to the maximum enroute weight obtained from the SERVICE CEILING - ONE ENGINE INOPERATIVE graph. Use the TIME, FUEL, AND DISTANCE TO CRUISE CLIMB graph to determine the weight of the fuel used to climb. Use the Cruise Power tables to determine the weight of the fuel used to cruise to each MEA. Enter the SERVICE CEILING - ONE ENGINE INOPERATIVE graph at the conditions for each enroute MEA. For example, enter the graph at the highest MEA altitude of 9000 feet, and trace right; enter again at the MEA FAT of -4°C, and trace up. Read the maximum enroute weight at the MEA at the intersection of the tracings.

Maximum Enroute Weight For 50-Ft/min One-Engine-Inoperative Climb:

8000 ft, 0°C .... Exceeds Structural Limit of 16,000 lbs
9000 ft, -4°C .... Exceeds Structural Limit of 16,000 lbs
7600 ft, 0°C .... Exceeds Structural Limit of 16,000 lbs

Since these weights are all greater than the Maximum Takeoff Weight Limitation of 16,000 lbs, there is no additional limitation to meet enroute weight requirements. Anytime the value is less than 16,000 lbs, add the fuel required to climb, plus any fuel used in cruise before reaching each MEA, to determine the maximum allowable takeoff weight to meet the requirement for each route segment of the trip.

f. Minimum Static Takeoff Power (Flaps Approach). Enter the graph at 15°C FAT and 3499 feet pressure altitude:

Minimum Static Takeoff Power 95%

g. Takeoff Speeds. Tables are provided for the takeoff decision speed (V,), rotation speed (VR), takeoff safety speed (V2.), and all-engines takeoff safety speed (V50). In order to determine the takeoff speeds for 15° C FAT, 3499 feet pressure altitude, and 16,000 pounds takeoff weight, enter the tables at 2000 ft and 4000 ft pressure altitude, 10°C and 20°C FAT, and 16,000 pounds takeoff weight, then interpolate to find the actual values for the specified conditions:

	FLAPS UP	**FLAPS APPROACH**
V_1	116 KTS	111 KTS
V_R	121 KTS	111 KTS
V_2	121 KTS	112 KTS
V_{50}	129 KTS	120 KTS

h. Minimum Field Length. The following example illustrates the use of graphs which may restrict takeoff weight due to field length available under existing conditions.

(1) Takeoff Distance. Enter the graphs at 15°C, 3499 feet pressure altitude, 16,000 pounds, and 10 knots headwind component, and obtain the following results:

Takeoff Distance (FLAPS UP).............................4790 ft
Takeoff Distance (FLAPS DOWN).......................3920 ft

(2) Accelerate-Stop Distance. Enter the graphs at 15°C, 3499 feet pressure altitude, 16,000 pounds, 1.9% downhill runway gradient, and 10 knots headwind component, and obtain the following results:

Accelerate-Stop Distance (FLAPS UP)................ 5480 ft
Accelerate-Stop Distance (FLAPS APPROACH)..5100 ft

(3) Accelerate-Go Distance. Enter the graphs at 15°C, 3499 feet pressure altitude, 16,000 pounds, 1.9% downhill runway gradient, and 10 knots headwind component, and obtain the following results:

Accelerate-Go Distance (FLAPS UP)...................5810 ft
Accelerate-Go Distance (FLAPS APPROACH)....4500 ft

The minimum recommended runway length is the longest of the distances determined above for the selected flap setting.

i. Takeoff Path - One Engine Inoperative. Graphs are provided to estimate the horizontal distance required to reach a height of 1500 feet, or the minimum climb gradient required to clear an obstacle along the takeoff flight path. If clearance of obstacles beyond the runway is required, then these results may restrict takeoff weight accordingly. The Takeoff Distance extends from brake release to Reference Zero, which is the horizontal point along the runway at which the aircraft is 50 feet above the runway. The Net Takeoff Flight Path begins at Lift-off and consists of the following segments:

1. The First Segment Climb extends from Lift-off to the point where the landing gear completes the retraction cycle. The airspeed is maintained at V_2.
2. The Second Segment Climb begins at the end of the First Segment and extends to 500 feet above the runway. The airspeed during the Second Segment is V_2.
3. The Acceleration and Flap Retraction Segment consists of an acceleration from V_2 to V_{ENR} at a constant height of 500 feet. If a flaps-approach takeoff was made, begin flap retraction at V_{ENR}.
4. The Third Segment begins when one-engine-inoperative climb speed is reached and flaps are fully retracted at 500 feet, and extends to 1500 feet above the runway. Airspeed is maintained at V_{ENR} during this segment.

j. Takeoff Path Profile (Flaps Approach). The following examples illustrate the use of the flaps-approach takeoff path graphs. Enter the graphs at

15°C FAT, 3499 feet pressure altitude, 16,000 pounds takeoff weight, 1.9% downhill runway gradient, and a 10-knot headwind component.

(1) Example 1 - Close-In Obstacle Clearance: Given:

Obstacle Height Above Aircraft
at Brake Release ....184 feet
Obstacle Distance from Brake Release.........15,437 feet

1. The obstacle horizontal distance from Reference Zero equals the obstacle distance from brake release less the accelerate-go distance to 50 feet AGL (15,437 ft - 4500 ft) = 10,937 feet = 1.8 nautical miles.
2. Determine the total height required to clear the obstacle by adding to the obstacle height the decrease in aircraft altitude during the takeoff procedure due to a downhill runway gradient.

1.9% gradient x 4500 ft = 85.5 ft = 86 feet

The total height required to clear the obstacle is: 184 ft + 86 ft = 270 feet

3. Obtain the required gradient to clear the obstacle from the DISTANT TAKEOFF FLIGHT PATH graph using the obstacle distance from Reference Zero found in step 1, and the total height determined in step 2: 2.0%.
4. Read the scheduled net gradient of climb from the NET TAKEOFF FLIGHT PATH - SECOND SEGMENT - FLAPS APPROACH graph: 2.4%.

Thus, the calculations indicate that a takeoff weight of 16,000 pounds will result in a net climb gradient greater than that required to clear the obstacle, even if an engine should fail at the most critical takeoff point.

(2) Example 2 - Obstacle Clearance above 500 Feet: Given:

Obstacle Height Above Aircraft
at Brake Release ....860 feet
Obstacle Distance from Brake Release...............6.4 nm

1. Obtain the takeoff distance to 50 feet AGL............................ 4500 feet (0.74 nm)
2. Read the scheduled distance from the HORIZONTAL DISTANCE FROM REFERENCE ZERO TO THIRD SEGMENT CLIMB graph.....................................2.8 nm
3. Add the results of steps 1 and 2 to obtain total distance to start of third segment climb. (0-74 nm + 2.8 nm) = 3.54 nm
4. Distance to obstacle from start of third segment climb is obtained by subtracting results of step 3 from 6.4 nm. (6.4 - 3.54) = 2.86 nm
5. Add to the obstacle height above the aircraft at brake release any decrease in aircraft altitude during the takeoff resulting from a downhill runway gradient.

   The sum is the total height required to clear the obstacle:

   (1.9% gradient + 100) x 4500 ft + 85.5 ft + 86 feet

   The total height required to clear the obstacle is: 860 ft + 86 ft = 946 feet

6. Required climb gradient to clear obstacle is obtained using the following formula:

   % Gradient = (Required Height Above 500 feet x 0.0165) + (Distance to Obstacle from Start of Third Segment in NM)

   % Gradient = ((946 ft - 500 ft) x 0.0165) + 2.86 NM = 2.58 %

7. Obtain the scheduled third segment net gradient of climb of 3.0%. Since this gradient exceeds the required gradient of 2.58%, the calculations indicate that the obstacle will be cleared at a takeoff weight of 16,000 pounds even if an engine should fail at the most critical takeoff point.

k. Climb - Two Engines. Enter the graphs at 15°C, 3499 feet pressure altitude, 16,000 pounds, and obtain the following results:

Climb - Two Engines (FLAPS UP).................2310 ft/min
Climb - Two Engines (FLAPS APPROACH)..2240 ft/min

l. Climb - One Engine Inoperative. Enter the graph at 15°C, 3499 feet pressure altitude, 16,000 pounds, and obtain the following results:

Climb - One Engine Inoperative ....520 ft/min

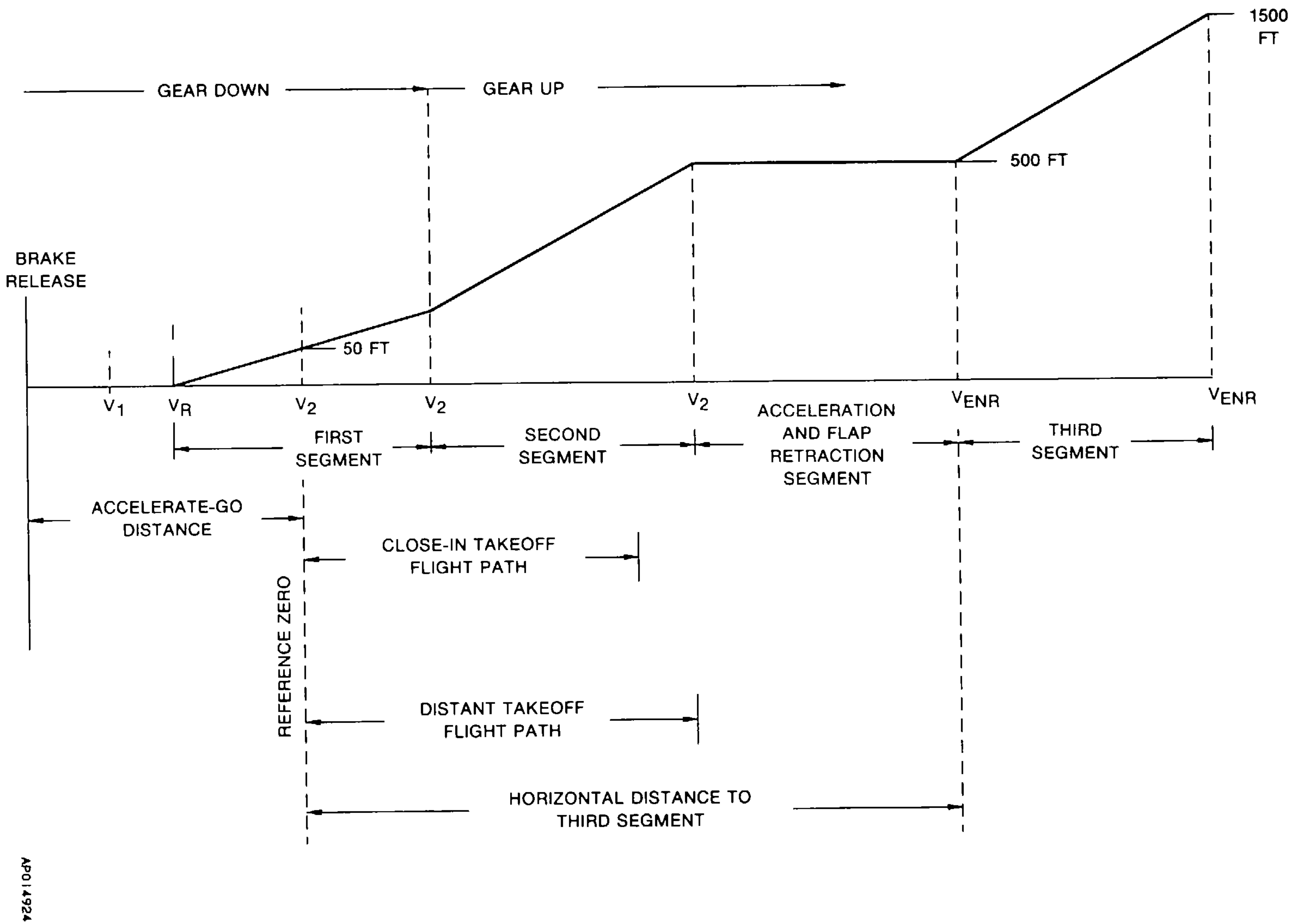

Figure 7-1. Takeoff Path Profile

m. Flight Planning Example. The following calculations provide information for flight planning. Calculations for flight time, block speed, and fuel requirements for the proposed flight are detailed below.

NOTE

For example purposes, the differences between MSL altitudes and pressure altitudes have been ignored in enroute calculations.

(1) ISA Conversion. Enter the graph at the conditions indicated:

BIL
- Pressure Altitude..3499 feet
- FAT ....15°C
- ISA Condition..ISA + 7°C

BIL - CZI
- Pressure Altitude....................................25,000 feet
- FAT .... -40°C
- ISA Condition...ISA -6°C

CZI-CPR
- Pressure Altitude....................................25,000 feet
- FAT .... -30°C
- ISA Condition..ISA + 5°C

CPR
- Pressure Altitude..5998 feet
- FAT ....20°C
- ISA Condition......................................ISA + 17°C

(2) Time, Fuel, and Distance to Cruise Climb. Enter the graph at 15°C, to 3499 feet pressure altitude, and to 16,000 pounds. Enter again at -40°C to 25,000 feet pressure altitude, and to 16,000 pounds. The following results are obtained:

Time to Climb .... 18.3 - 1.4 = 16.9 min
Fuel to Climb .... 310 - 30 = 280 lbs
Distance Traveled........................... 52.5 - 4.3 = 48.2 nm

(3) Time, Fuel, and Distance to Descend. Enter the graph at 25,000 feet, and enter again at 5998 feet, and find

Time to Descend........................... 16.7 - 4.1 = 12.6 min
Fuel Used to Descend......................... 250 - 87 9163 lbs
Distance Traveled..................................84 - 21 = 63 nm

(4) Cruise Weight (Estimated). For the following cruise segment examples, the estimated average cruise weight used was 15,600 pounds.

(5) Cruise Tables.. Enter the tables for NORMAL CRUISE POWER. AT 1500 RPM for ISA - 10°C, ISA, and ISA + 10°C, and read the cruise speeds for 24,000 feet and 26,000 feet at 16,000 pounds and 14,000 pounds. Interpolate between these speeds for 25,000-foot values. See Example Cruise True Airspeeds table for the results.

Interpolate between the 25,000-foot speeds for ISA - 6°C and ISA + 5°C at 15,600 pounds.

Cruise True Airspeed (ISA -6°C) .... 257 knots Cruise True Airspeed (ISA+5°C)................................ 247 knots

Similar computations can be made to interpolate for cruise torque setting and fuel flow.

Cruise Torque (ISA-6°C) 75%
Cruise Total Fuel Flow (ISA-6°C) .... 800 lbs/hr
Cruise Fuel Flow/Eng. (ISA-6°C)..................... 400 lbs/hr
Cruise Torque (ISA + 5°C) 68%
Cruise Total Fuel Flow (ISA + 5°C) .... 740 lbs/hr
Cruise Fuel Flow/Eng. (ISA + 5°C).................. 370 lbs/hr

(6) Cruise Graphs. In addition to the cruise performance presented in tabular form, data representing a cruise weight of 14,000 pounds is presented in graphical form for quick reference.

NOTE

Use of these graphs for flight conditions other than 14,000 pounds gross weight may introduce errors.

a. Cruise Speeds. Enter the NORMAL CRUISE SPEEDS AT 1500 RPM graph at 25,000 feet, and read the true airspeeds for ISA-6°C and ISA + 5°C:

Cruise True Air Speed (ISA-6°C).................... 263 KTAS
Cruise True Air Speed (ISA +5°C).................. 255 KTAS

b. Cruise Power Setting. Enter the NORMAL CRUISE POWER AT 1500 RPM graph at 25,000 feet, and read the recommended torque settings for ISA -6 "C (-34 °C IFAT) and ISA + 5°C (-24°C IFAT):

ISA -6°C (-34°C IFAT)................. 75% torque per engine
ISA + 5°C (-24°C IFAT)............... 68% torque per engine

NOTE

For flight planning, enter the Cruise Power graphs at the forecasted ISA condition; for enroute power settings, enter the graphs at the actual IFAT.

c. *Cruise Fuel Flow*. Enter the FUEL FLOW AT NORMAL CRUISE POWER AT 1500 RPM graph at 25,000 feet, and read the fuel flow for ISA -6°C (-34°C IFAT) and ISA + 5°C (-24°C IFAT):

ISA -6°C (-34°C IFAT)
Fuel Flow Per Engine................................ 400 lbs/hr
Total Fuel Flow.. 800 lbs/hr

ISA + 5°C (-24°C IFAT)
Fuel Flow Per Engine................................ 370 lbs/hr
Total Fuel Flow.. 740 lbs/hr

Time and Fuel Used were calculated at Normal Cruise Power AT 1500 RPM as follows:
Time = Distance + Ground Speed
Fuel Used = (Time) (Total Fuel Flow)

(7) Flight Planning Results. Refer to the EXAMPLE CRUISE RESULTS table for an illustration of the flight planning procedure.

NOTE

For flight planning, enter the Fuel Flow graphs at the forecasted ISA condition; for enroute fuel flow, enter the graphs at the actual IFAT.

Refer to the example TIME - FUEL - DISTANCE table for an illustration of the total flight planning results.

EXAMPLE CRUISE TRUE AIRSPEEDS

ALT FEET	16,000 POUNDS			14,000 POUNDS		
	ISA - 10°C	ISA	ISA + 10°C	ISA - 10°C	ISA	ISA- +10°C
24,000	261	253	243	267	261	253
25,000	258.5	250.5	239.5	265	259	250.5
26,000	256	248	236	263	257	248

EXAMPLE CRUISE RESULTS

ROUTE SEGMENT	[1]DISTANCE	ESTIMATED GROUND SPEED	[2]TIME AT CRUISE ALTITUDE	[3]FUEL USED FOR CRUISE
	NM	KNOTS	MIN	LBS
BIL-SHH	43	277	90.3	124.19
SHR-CLI	57	318	10.8	143.40
CLI-CPH	5	282	1.1	13.12
TOTAL	**105**	**---**	**21.2**	**280.71**

[1]Distance required to climb or descend has been subtracted from segment distance.
[2]Time = Distance divided by Ground Speed.
[3]Fuel Used = Distance divided by Ground Speed, multiplied by Total Fuel Flow.

EXAMPLE- FUEL - DISTANCE

ITEM	TIME MIN	FUEL POUNDS	DISTANCE NM
Start, Runup, Taxi, and Takeoff Acceleration	0.0	110	0
Climb	16.9	280	48
Cruise	21.2	281	105
Descent	12.6	163	63
TOTAL	**50.7**	**834**	**216**
Block Speed 216 NM 9 50.7 minutes = 256 knots			

EXAMPLE FUEL FLOW - LBS/HR

WEIGHT POUNDS	ISA	ISA + 5°C	ISA + 10°C
16,000	645.0	---	680.0
15,000	615.5	662.5	629.5
14,000	586.0	---	579.0
Total Fuel flow = 622.5 lbs/hr Reserve Fuel = 45 minutes x 662.5 lbs/hr = 466.875 = 467 lbs			

(8) Reserve Fuel. Reserve Fuel is the amount of fuel required to fly at cruise altitude for 45 minutes at Maximum Range Power. This example assumes the average cruise weight while using Reserve Fuel to be 15,000 pounds. Enter the MAXIMUM RANGE POWER AT 1500 RPM tables for ISA and for ISA + 10°C and interpolate to find the total fuel flow for 25,000 feet at 16,000 pounds and 14,000 pounds. Interpolate between these values for 15,000 pounds. Refer to the Example FUEL FLOW table for an illustration of the reserve fuel flow determination procedure.

(9) Total Fuel Requirements. Calculated Fuel Usage + Reserve Fuel = Total Fuel Requirement.

(10) Zero Fuel Weight Limitation. For this example, the following conditions were assumed:

Ramp Weight.. 16,110 lbs
Weight of Usable Fuel Onboard........................ 3631 lbs
Zero Fuel Weight =(16,110 - 3631)................ 12,4791bs

Maximum Zero Fuel Weight (from LIMITATIONS Section) .... 12,700 lbs

Maximum Zero Fuel Weight Limitation has not been exceeded.

Anytime the Zero Fuel Weight exceeds the Maximum Zero Fuel Weight Limit, the excess weight must be off-loaded from PAYLOAD ONLY (i.e., not from fuel). If desired, additional fuel may then be added. However, the foregoing calculations will remain unchanged only if the fuel added is equal in weight to the payload off-loaded, since only then will the ramp weight and takeoff weight remain the same as before.

n. Range and Endurance. Estimates of the effect of fuel load and power setting on aircraft range and endurance can be determined from the RANGE and ENDURANCE PROFILE graphs. The range of a mission at normal cruise power can be determined by entering the RANGE PROFILE - NORMAL CRUISE POWER graph at 25,000 feet, reading right to the anticipated fuel load and down to the resulting range. This chart indicates that a fuel load as low as 1500 pounds would be sufficient for the planned 216 nautical mile mission from Billings to Casper. The available range with full main and aux. tanks (3631 pounds) for a flight at 25,000-feet can be determined to be 990 nautical miles. If additional range is required, either a higher altitude or a lower power setting could be selected. To determine the range with a maximum fuel load, enter the RANGE PROFILE - FULL MAIN AND AUX TANKS graph at 25,000 feet, read right to the desired power setting and down to the resulting range. This chart shows that for a full-fuel mission, range can be increased from 990 to 1078 nautical miles by reducing power to Maximum Range power.

The aircraft endurance can be determined from the various endurance profile graphs in a similar manner.

It should be noted that these graphs are all based on standard day temperatures, and the range graphs are also based on zero wind. If forecast temperatures differ from standard values or if headwinds are expected, a more rigorous mission analysis should be accomplished.

o. Landing Example

NOTE

For this example, an expected fuel usage of 834 pounds was assumed.

(1) Weight. The estimated Landing Weight is determined by subtracting the fuel usage expected for the trip from the Ramp Weight:

Ramp Weight.. 16,110 lbs
Fuel Usage Expected for Total Trip.................(-) 834 lbs
Landing Weight... 15,276 lbs

Maximum Landing Weight (from LIMITATIONS Section)
.... 15,200 lbs

Therefore, the Maximum Landing Weight limitation would be exceeded by 76 pounds. In order to meet the requirement, off-load 76 pounds of useful load prior to takeoff, or burn off an additional 76 pounds of excess fuel (i.e., NOT Reserve Fuel) before landing.

Revised Landing Weight
(15,276 lbs - 76 lbs).. 15,200 lbs

(*2) Normal Landing Distance Without Propeller Reversing - Flaps Down*. Enter the graph at 20 DEG C, 5998 feet, 15,200 pounds, zero runway gradient, 10 knots headwind component, and read the following:

Ground Roll ....1740 ft
Total Distance over 50-ft Obstacle.................3350 ft

(3) Abnormal Landing Distances. The landing distances for one engine inoperative or flaps retracted can be determined as shown below. Landing Distance - One Engine Inoperative - Flaps Down. Enter the graph with the normal landing distance determined in paragraph (2) above and read the following:

Landing Distance - One Engine Inoperative -
Over 50-Ft Obstacle - Flaps Down............... 3610 Ft

Landing Distance - Without Propeller Reversing - Flaps Up. Enter the graph with the normal landing distance determined in paragraph (2) above and read the following:

Flaps-Up Landing distance over 50-Ft
Obstacle .... 4710 Ft

(*4) Climb - Balked Landing*. Enter the graph at 20°C, 6400 feet (see note 2 on graph), 15,200 pounds, and read the following results:

Rate of Climb..1620 ft/min
Climb Gradient... 12.6%

p. Enroute Instrument Corrections. Errors are introduced to measured airspeed and temperature readings as a result of the aircraft speed. For this example, it has been assumed that the aircraft is established in level cruise flight between CZI and CPR.

Pilot's Indicated Airspeed..........................162 KIAS
Indicated Pressure Altitude....................25,000 Feet
Indicated Free Air Temperature .... -24°C

Airspeed Calibration - Normal System. Enter the Flaps-Up graph at the indicated airspeed value of 162 knots, read up to the reference line and left to obtain the following result:

Calibrated Airspeed ....166 Knots

Altimeter Correction - Normal System. Enter the Flaps-Up graph at the indicated airspeed value of 162 knots, read up to the seal level and 35,000-foot reference lines and left to obtain the following results:

Altimeter Correction (Sea Level).............. + 55 feet
Altimeter Correction (35,000)....................+ 180 feet

Compute the correction value for 25,000 feet using linear interpolation to obtain the following result:

Altimeter Correction (25,000)....................+ 144 feet

Add this result to the indicated pressure altitude value of 25,000 to obtain the corrected altitude.

Actual Pressure Altitude..........................25,144 feet

Indicated Outside Air Temperature Correction. Enter the graph at the calibrated airspeed value of 166 knots, read right to the actual pressure altitude of 25,144 feet and down to obtain the following result:

Temperature Correction.............................. + 5.6°C

Compute the Free Air Temperature by subtracting the temperature correction of 5.6'C from the indicated temperature of-24°C to obtain:

Free Air Temperature.....................................29.6°C

AIRSPEED CALIBRATION - NORMAL SYSTEM

TAKE-OFF GROUND ROLL

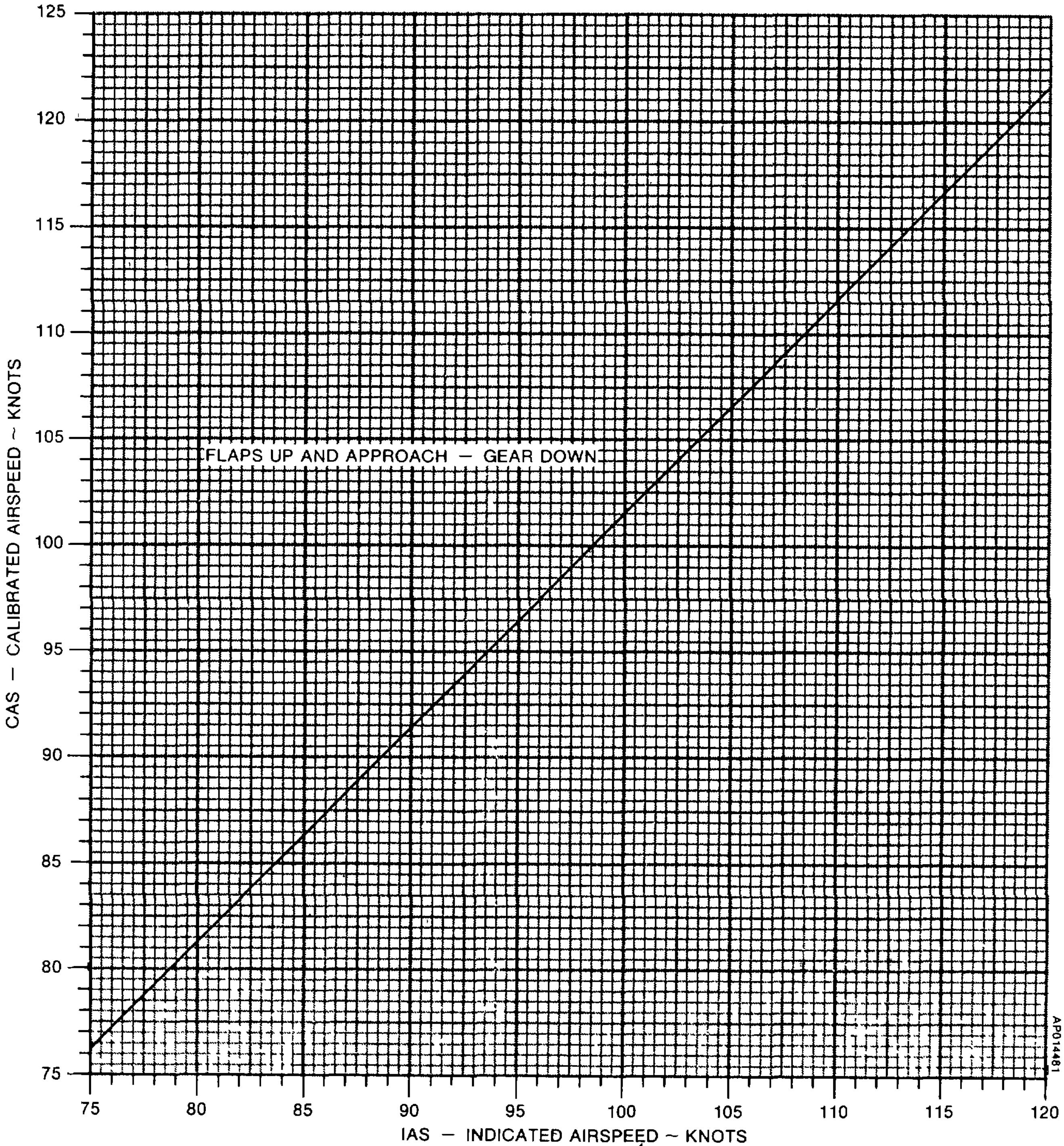

Figure 7-2. Airspeed Calibration - Normal System

AIRSPEED CALIBRATION - NORMAL SYSTEM

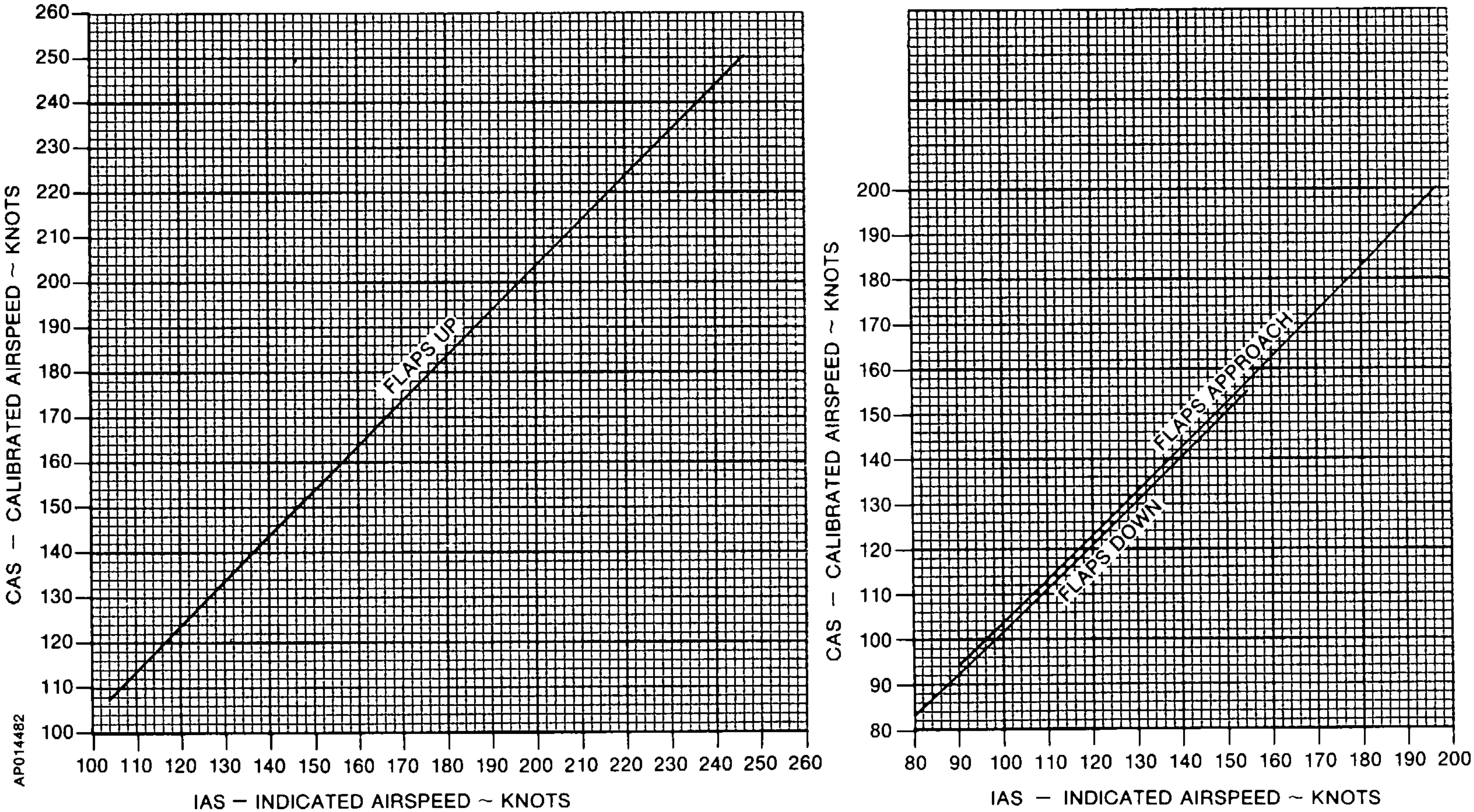

Figure 7-3. Airspeed Calibration - Normal System

ALTIMETER CORRECTIO - NORMAL SYSTEM

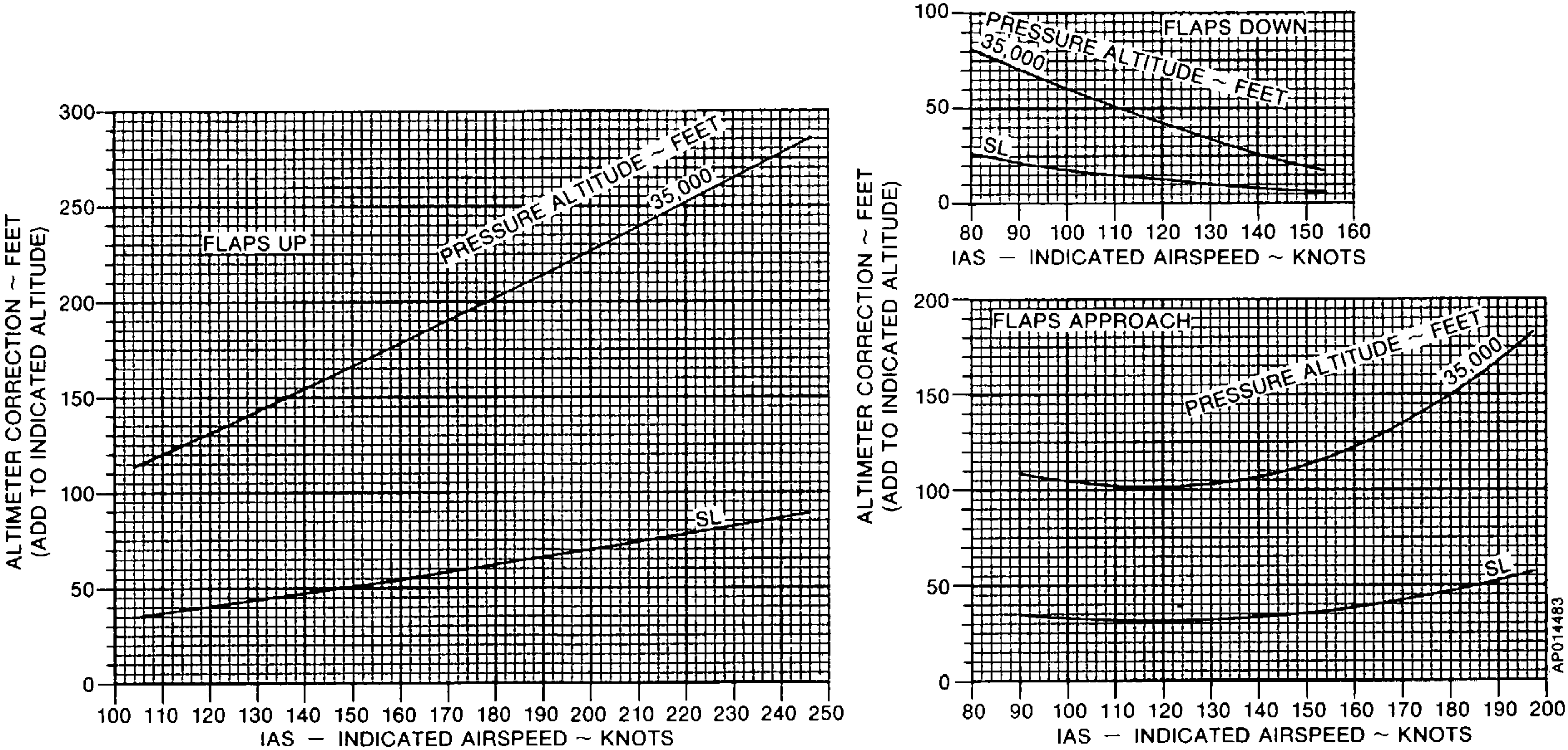

Figure 7-4. Altimeter Correction - Normal System

AIRSPEED CALIBRATION - ALTERNATE SYSTEM

APPLICABLE FOR ALL FLAP POSITIONS

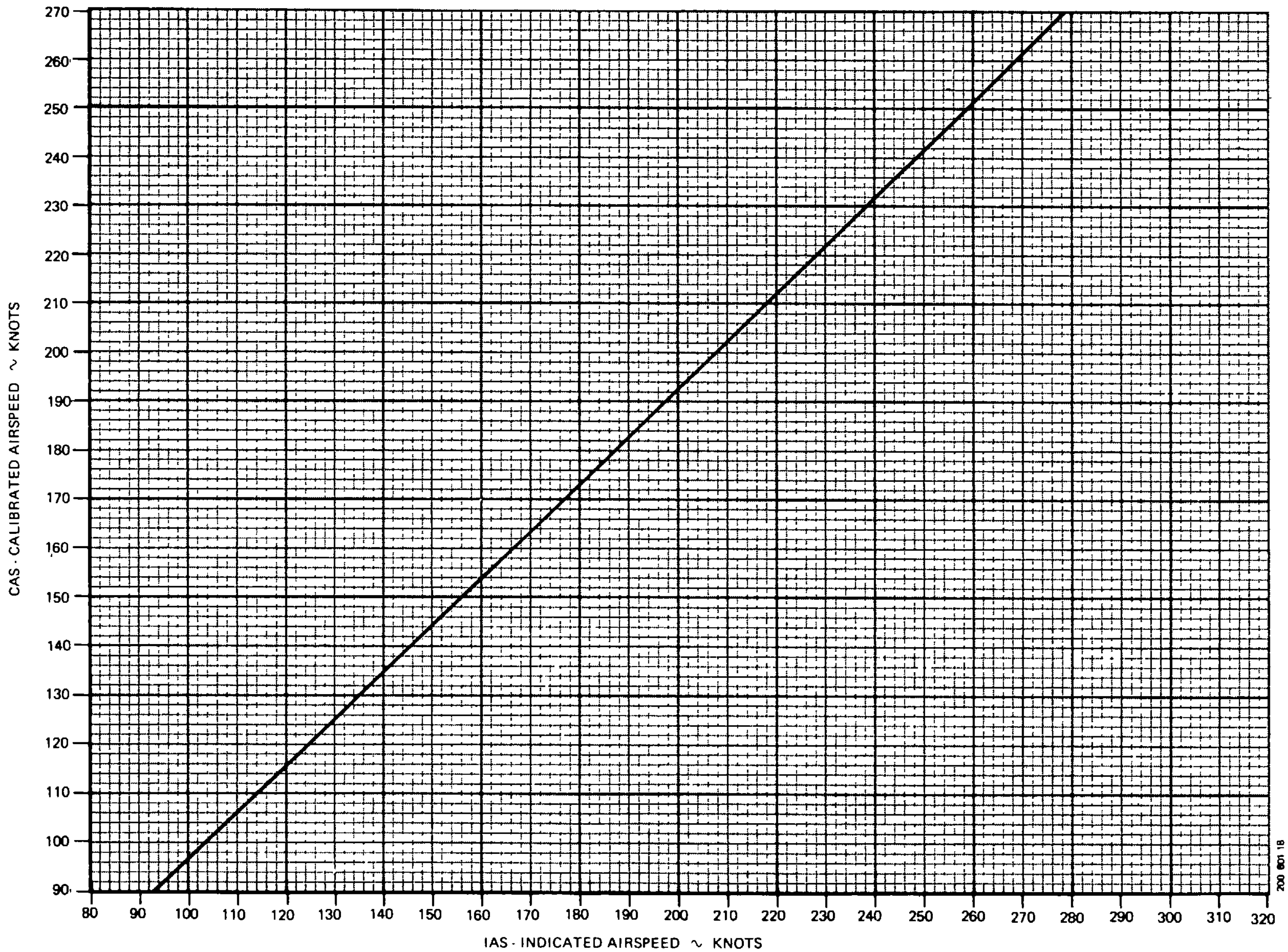

Figure 7-5. Airspeed Calibration - Alternate System

ALTIMETER CORRECTION - ALTERNATE SYSTEM

APPLICABLE FOR ALL FLAP POSITONS

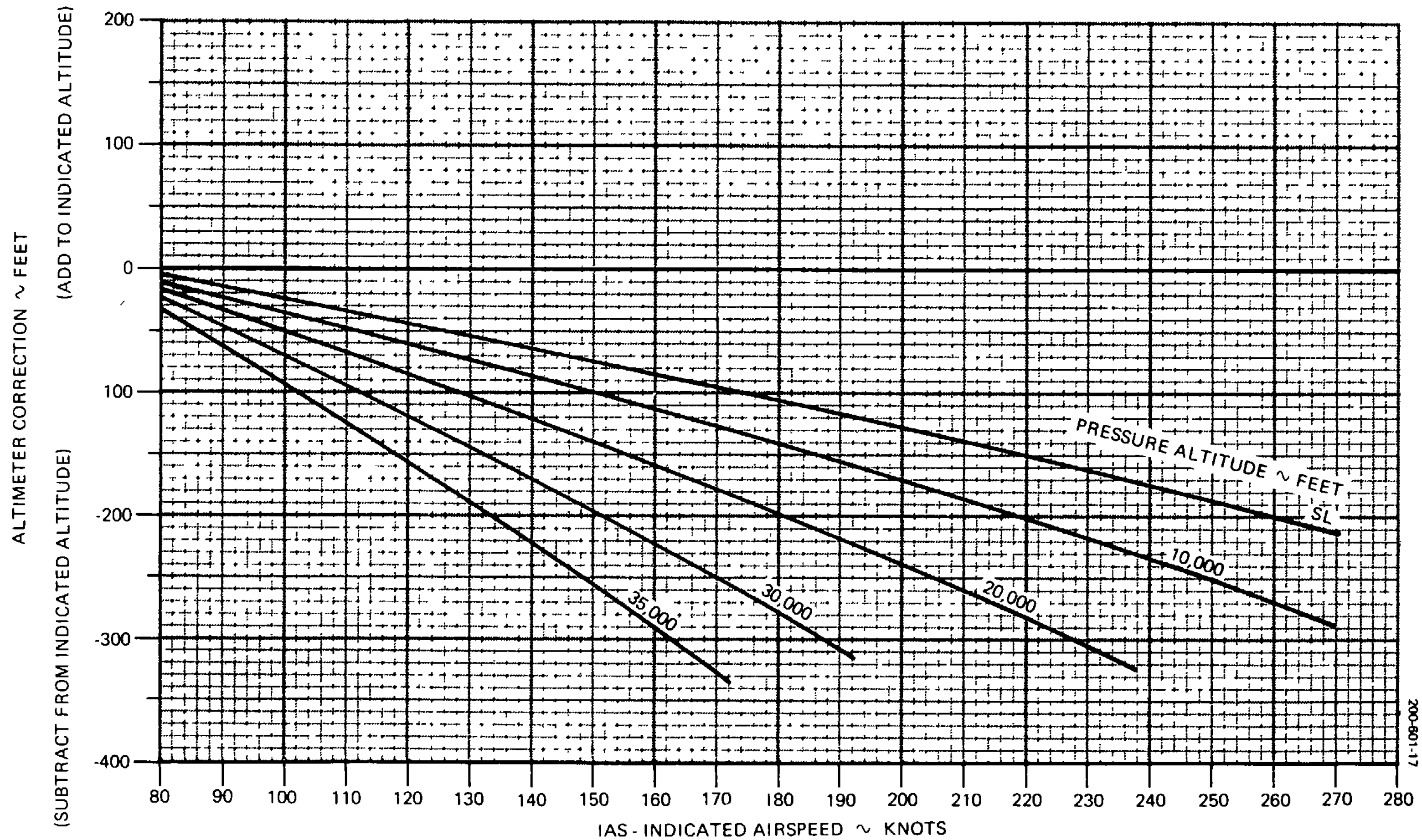

Figure 7-6. Altimeter Correction - Alternate System

INDICATED OUTSIDE AIR TEMPERATURE CORRECTION
STANDARD DAY (ISA)

NOTE: SUBSTRACT ΔT FROM INDICATED (GAGE) ΔAT TO OBTAIN FTUR OAT. (ΔT ASSUMES A RECOVER FACTOR OF 0.7)

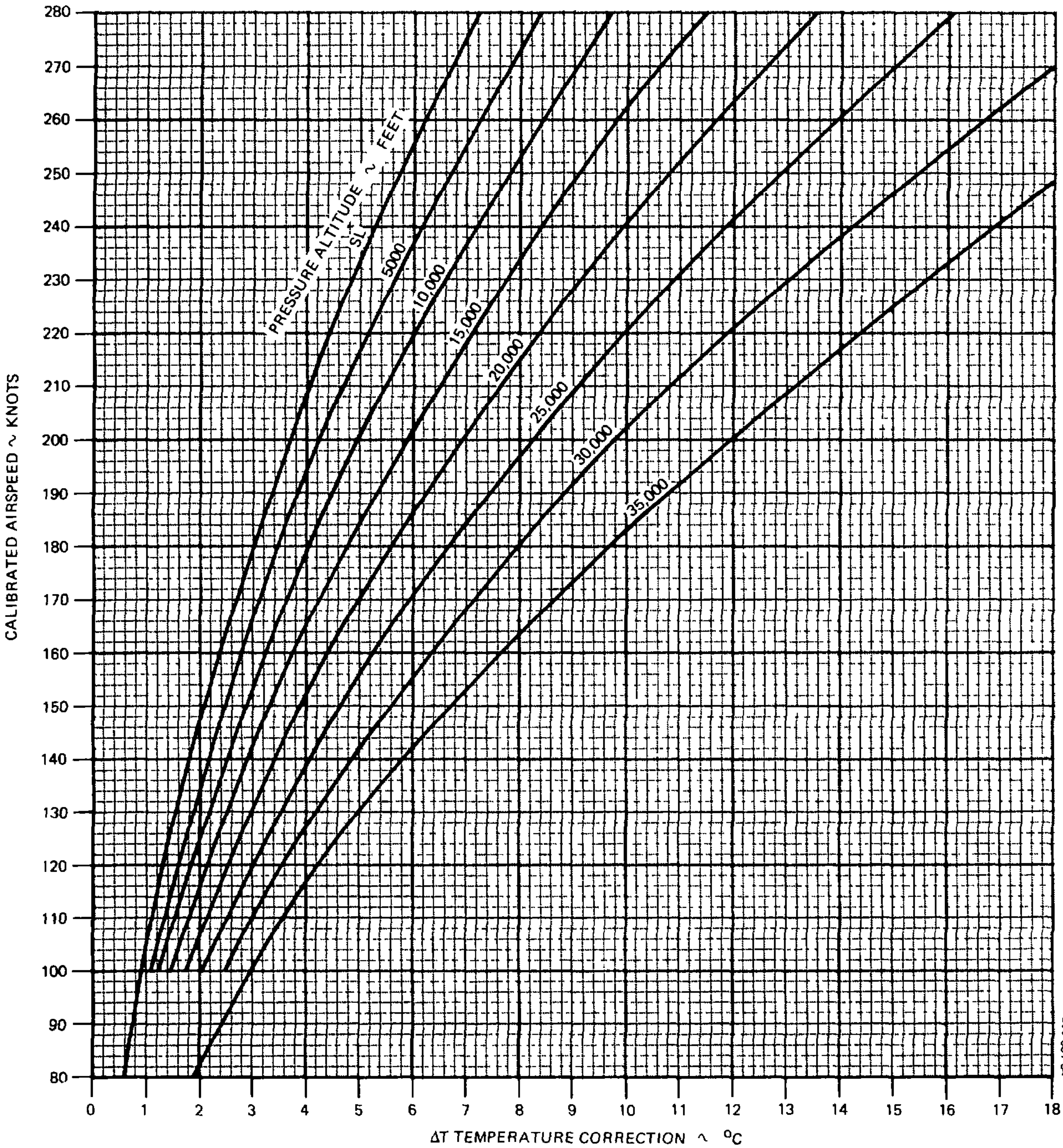

Figure 7-7. Indicated Outside Air Temperature Correction

ISA CONVERSION

PRESSURE ALTITUDE vs. FREE AIR TEMPERATURE

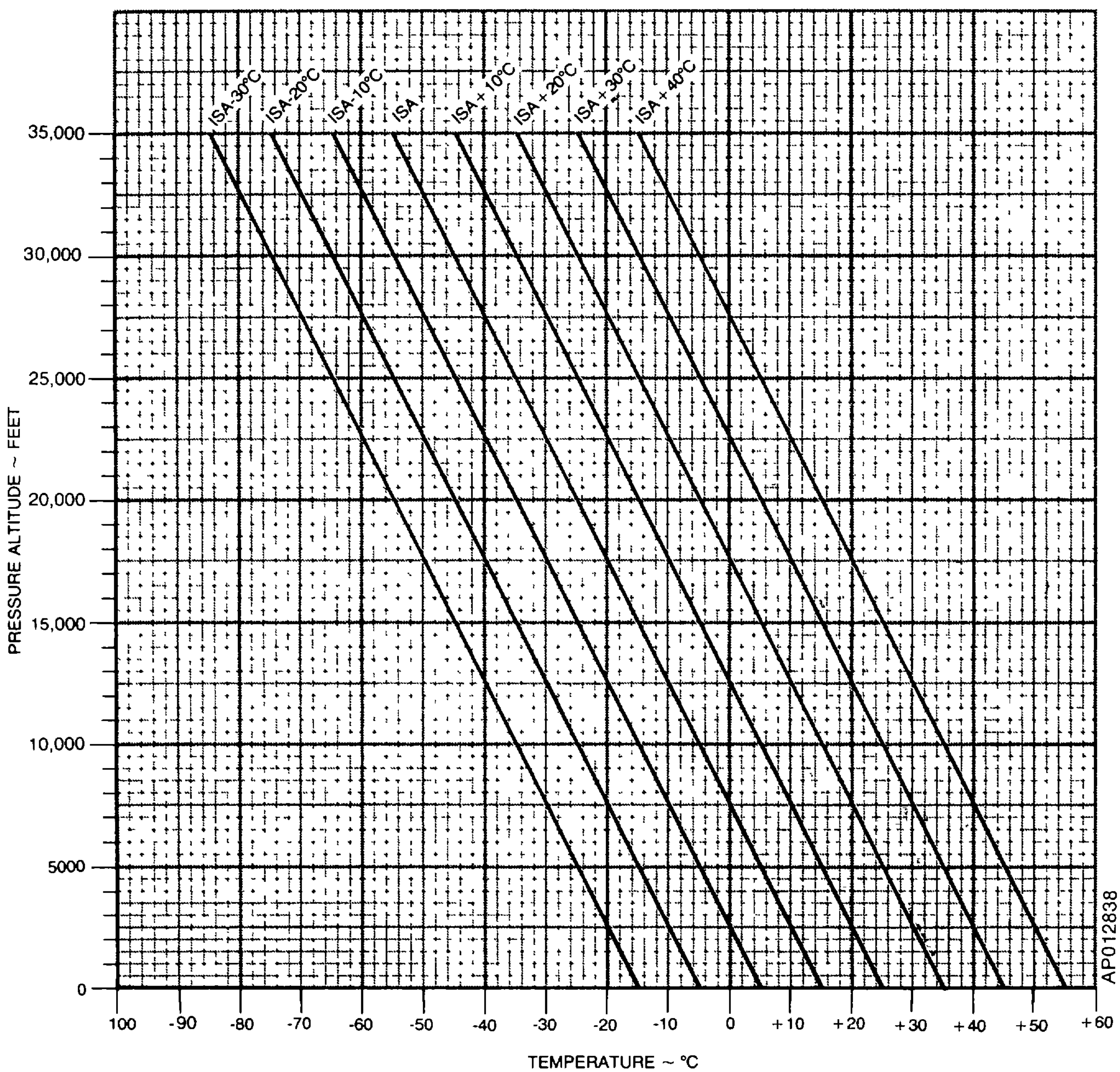

Figure 7-8. ISA Conversion

FHRENHEIT TO CELSIUS TEMPERATURE CONVERSION

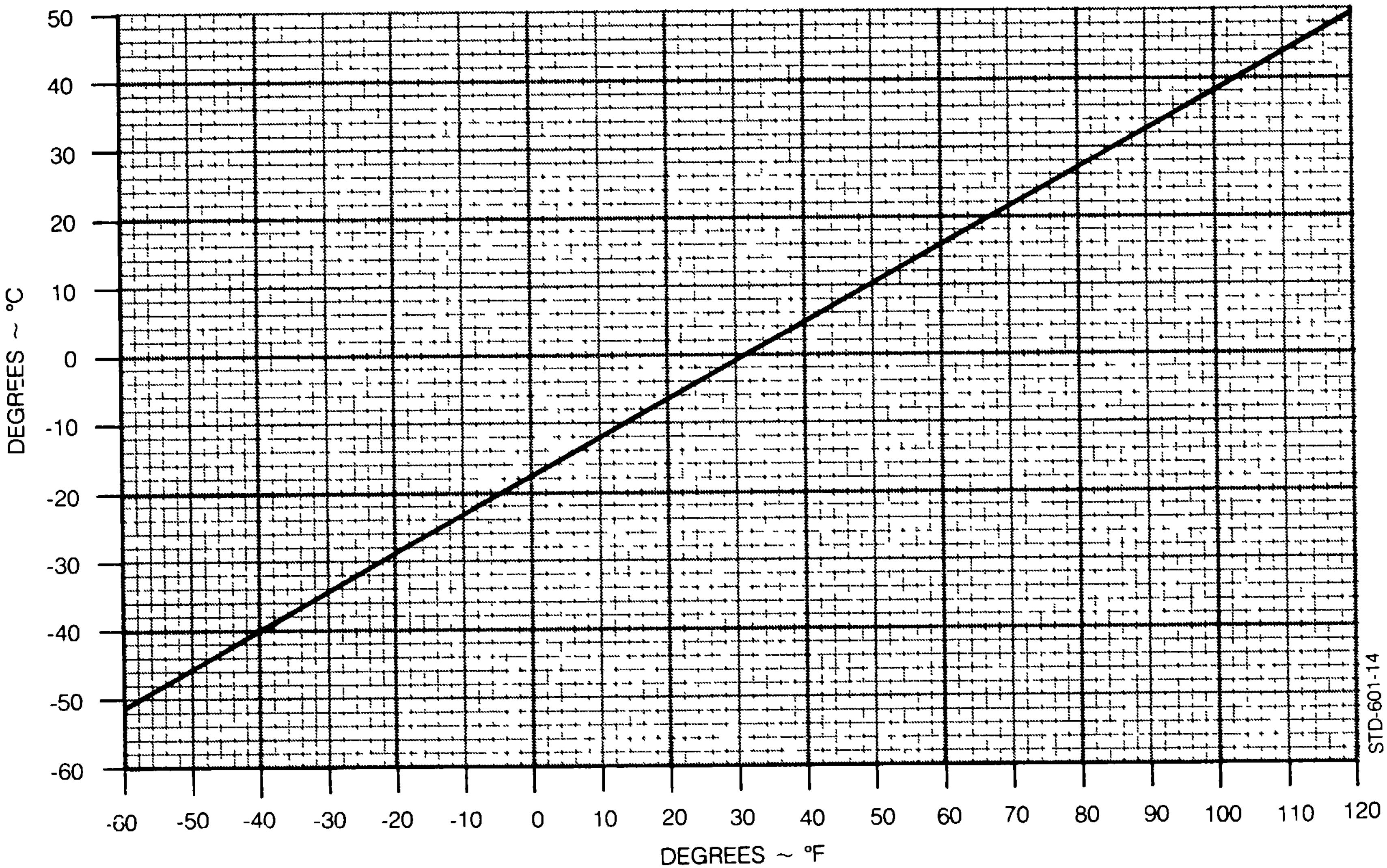

Figure 7-9. Fahrenheit to Celsius Temperature Conversion

MINIMUM STATIC TAKE-OFF POWER AT 17010 RPM -
FLAPS UP

NOTES:
1. TORQUE INCREASES APPROXIMATELY 4% FROM ZERO TO 100 KNOTS.
2. THE TORQUE INDICATED IS THE MINIMUM VALUE BEFORE BRAKE RELEASE AT WHICH TAKE-OFF PERFORMANCE IN THIS SECTION CAN BE OBTAINED. EXCESS POWER WHICH CAN BE DEVELOPED WITHOUT EXCEEDING ENGINE LIMITATIONS SHOULD BE UTILIZED.
3. FOR OPERATION WITH ICE VANES EXTENDED, INCREASE FIELD PRESSURE ALTITUDE 2000 FEET BEFORE ENTERING GRAPH.

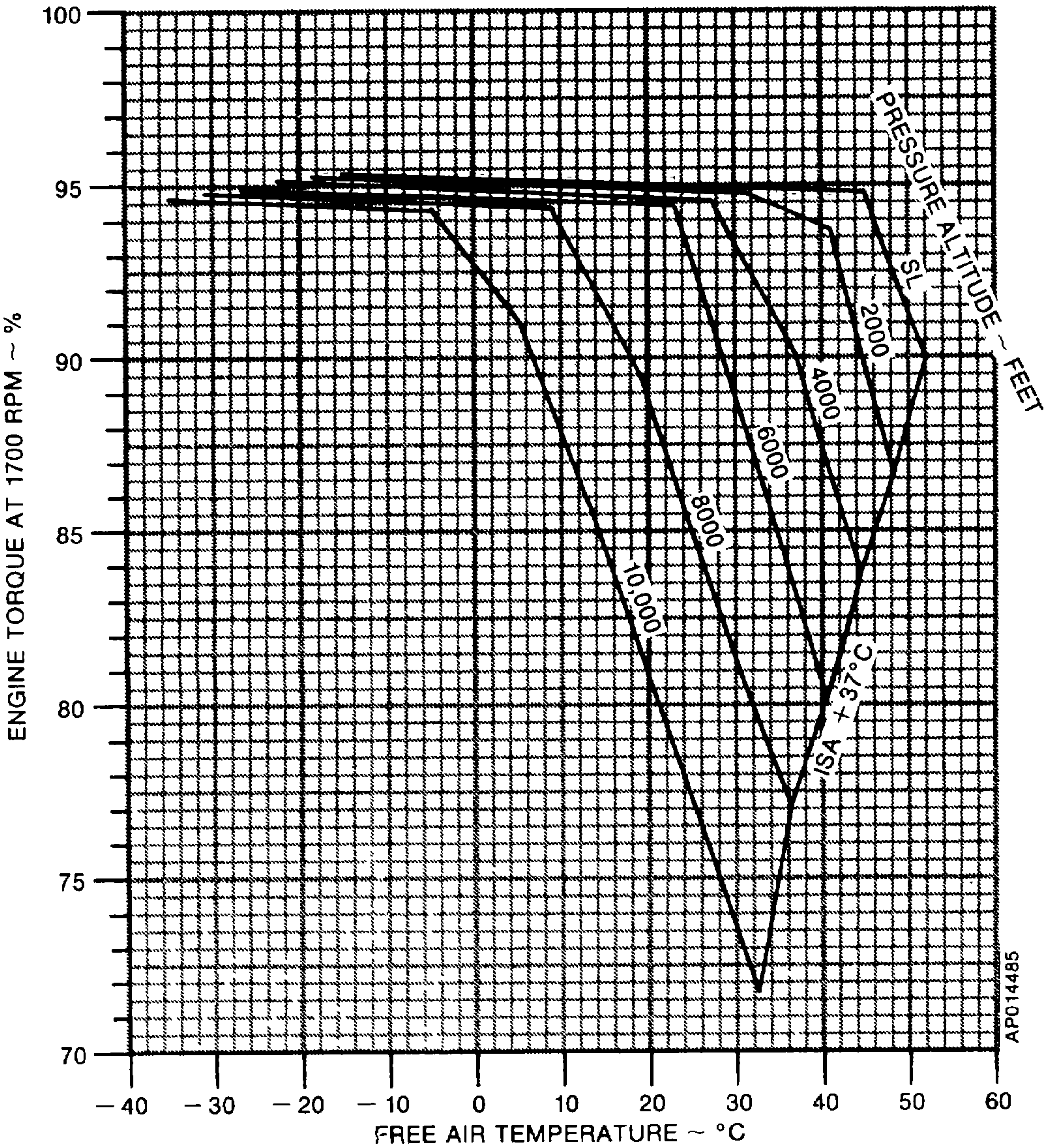

Figure 7-10. Minimum Static Take-Off Power at 1700 RPM - Flaps Up

MINIMUM STATIC TAKE-OFF POWER AT 1700 RPM - FLAPS APPROACH

NOTES:
1. TORQUE INCREASES APPROXIMATELY 4% FROM ZERO TO 100 KNOTS.
2. THE TORQUE INDICATED IS THE MINIMUM VALUE BEFORE BRAKE RELEASE AT WHICH TAKE-OFF PERFORMANCE IN THIS SECTION CAN BE OBTAINED. EXCESS POWER WHICH CAN BE DEVELOPED WITHOUT EXCEEDING ENGINE LIMITATIONS SHOULD BE UTILIZED.
3. FOR OPERATION WITH ICE VANES EXTENDED, INCREASE FIELD PRESSURE ALTITUDE 2000 FEET BEFORE ENTERING GRAPH.

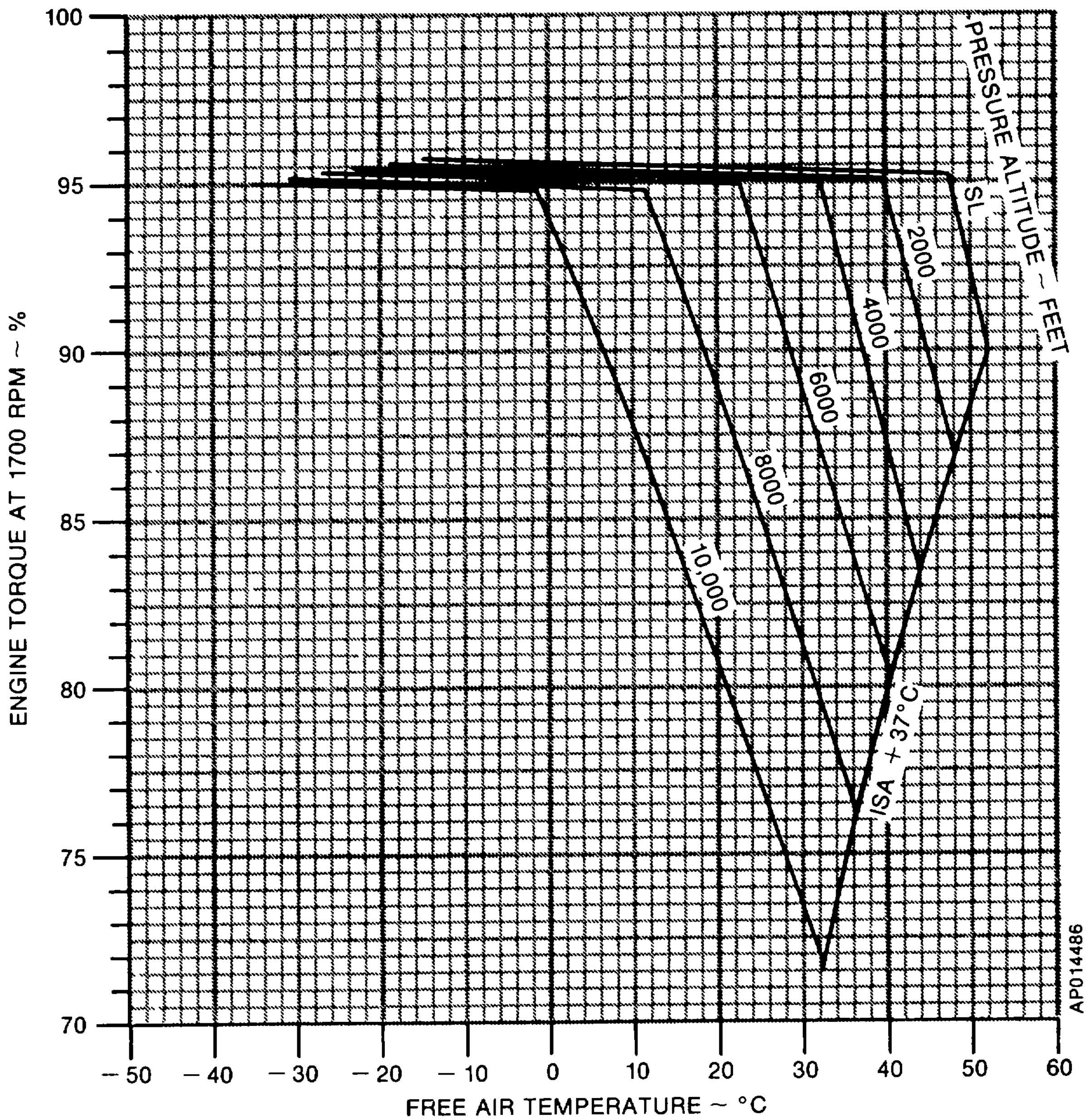

Figure 7-11. Minimum Static Take-Off Power at 1700 RPM - Flaps Approach

WIND COMPONENTS

EXAMPLE:

WIND SPEED	20 KTS
ANGLE BETWEEN WIND DIRECTION AND FLIGHT PATH	50°
HEADWIND COMPONENT	13 KTS
CROSSWIND COMPONENT	15 KTS

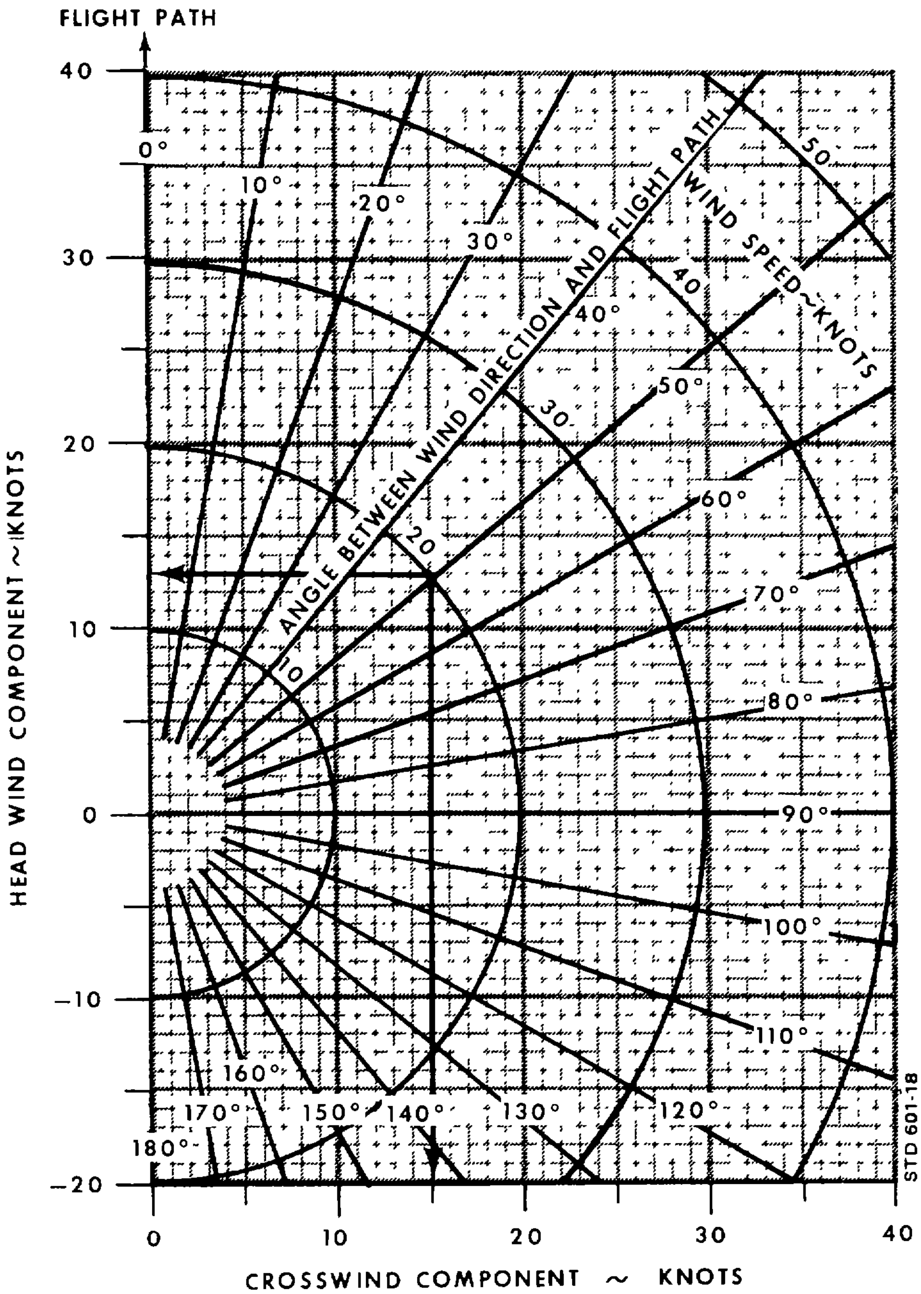

Figure 7-12. Wind Components

MAXIMUM TAKE-OFF WEIGT-FLAPS UP
TO ACHIEVE POSITIVE ONE-ENGINE-INOPERATIVE CLIMB AT LIFT-OFF

ASSOCIATED CONDITIONS	
POWER	TAKE-OFF
FLAPS	UP
LANDING GEAR	DOWN
INOPERATIVE PROPELLER	FEATHERED

EXAMPLE	
PRESSURE ALTITUDE	3499 FT
FAT	15°C
TAKE-OFF WEIGHT	16,000 LBS

NOTE FOR OPERATION WITH ICE VANES EXTENDED, ADD 2000 FEET TO PRESSURE ALTITUDE BEFORE ENTERING GRAPH

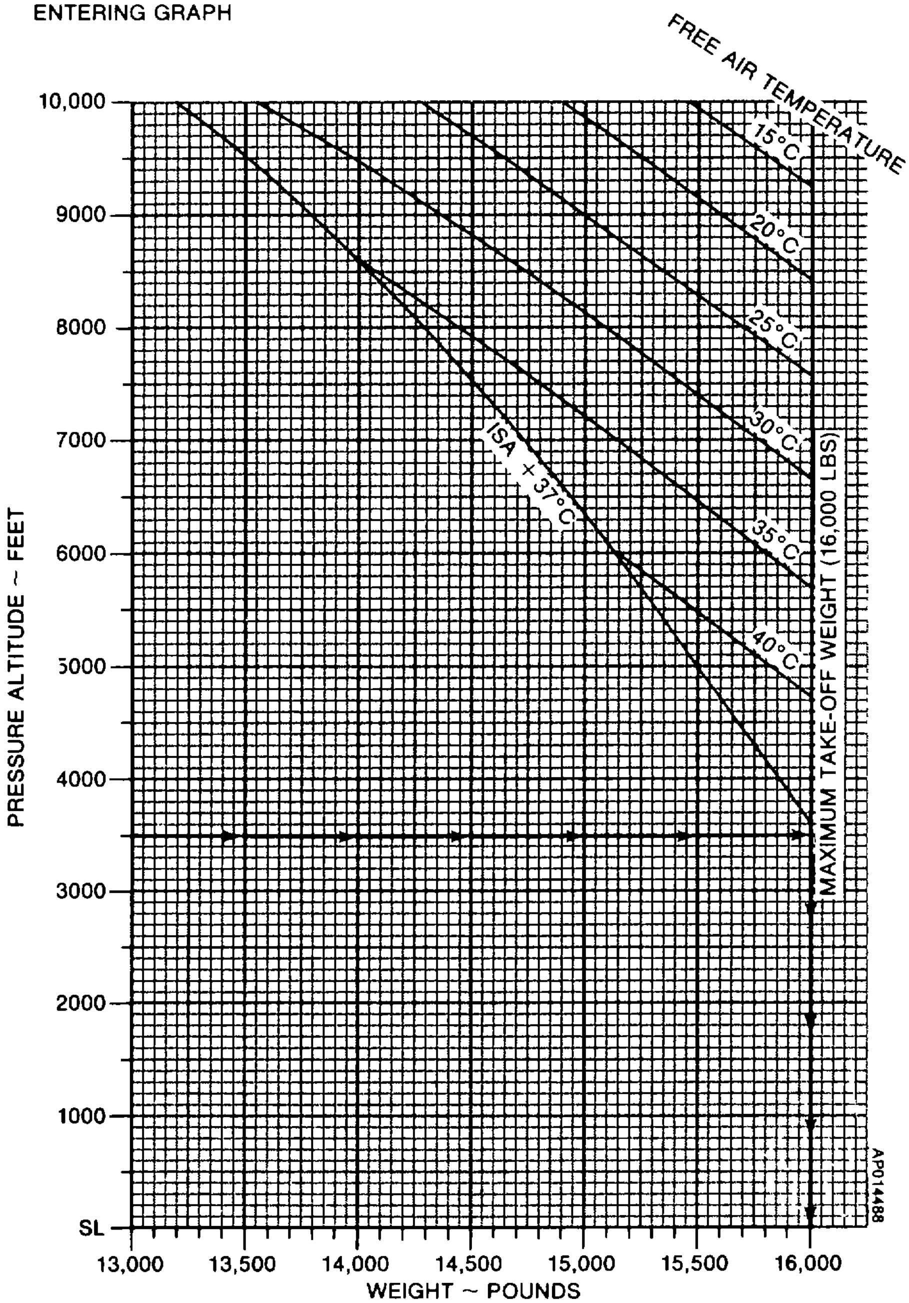

Figure 7-13. Maximum Take-Off Weight - Flaps Up

TAKE OFF SPEEDS (KIAS)-FLAPS UP

PRESS ALT (FT)	T/O WT (LBS)	FREE AIR TEMPERATURE																											
		-30°C				-10°C				0°C				10°C				20°C				40°C				52°C			
		V_1	V_R	V_2	V_{50}	V_1	V_R	V_2	V_{50}	V_1	V_R	V_2	V_{50}	V_1	V_R	V_2	V_{50}	V_1	V_R	V_2	V_{50}	V_1	V_R	V_2	V_{50}	V_1	V_R	V_2	V_{50}
SL	16,000	116	120	121	130	116	120	121	130	116	120	121	129	116	121	121	129	116	121	121	129	116	121	121	129	116	121	121	128
	15,000	116	116	119	127	116	116	118	127	116	116	118	127	116	116	118	126	116	117	118	126	116	116	118	126	116	116	118	125
	14,000	116	116	119	128	116	116	119	128	116	116	119	127	116	116	118	127	116	116	118	127	116	116	118	126	116	116	118	125
	13,000	116	116	120	129	116	116	119	129	116	116	119	128	116	116	119	128	116	116	119	128	116	116	118	127	116	116	118	126
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	11,000	116	116	121	131	116	116	120	131	116	116	120	130	116	116	120	130	116	116	120	130	116	116	120	129	116	116	119	128
	10,000	116	116	121	132	116	116	121	132	116	116	121	131	116	116	121	131	116	116	121	131	116	116	120	130	116	116	120	129
2000	16,000	116	120	121	130	116	121	121	129	116	121	121	129	116	121	121	129	116	121	121	129	116	121	121	129				
	15,000	116	116	118	127	116	116	118	126	116	117	118	126	116	117	118	126	116	117	118	126	116	117	118	125				
	14,000	116	116	119	128	116	116	118	127	116	116	118	127	116	116	118	126	116	116	118	126	116	116	118	126				
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	12,000	116	116	120	130	116	116	120	129	116	116	119	129	116	116	119	128	116	116	119	128	116	116	119	127				
	11,000	116	116	120	131	116	116	120	130	116	116	120	130	116	116	120	129	116	116	120	129	116	116	119	128				
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4000	16,000	116	120	121	129	116	121	121	129	116	121	121	129	116	121	121	129	116	121	121	129								
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	13,000	116	116	118	127	116	116	118	126	116	116	118	126																
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	11,000	116	116	119	129	116	116	119	128	116	116	119	128																
	10,000	116	116	120	130	116	116	120	129	116	116	120	129																
10,000	16,000	116	121	121	128																								
	15,000	116	117	118	125																								
	14,000	116	116	118	125																								
	13,000	116	116	118	126																								
	12,000	116	116	119	127																								
	11,000	116	116	119	128																								
	10,000	116	116	120	129																								

BT01098 RC-12K

Figure 7-14. Takeoff Speeds (KIAS) - Flaps Up

TAKE-OFF DISTANCE - FLAPS UP

ASSOCIATED CONDITIONS

POWER	MINIMUM STATIC TAKE-OFF POWER SET BEFORE BRAKE RELEASE
V_R, V_{50}	AS SCHEDULED IN TABLE OF TAKE-OFF SPEEDS
FLAPS	UP
LANDING GEAR	RETRACT AFTER LIFT-OFF
RUNWAY	PAVED, LEVEL, DRY SURFACE

NOTES
1. FOR OPERATION WITH ICE VANES EXTENDED, INCREASE TOTAL DISTANCE BY 10%
2. ADD 9% TO OR SUBTRACT 4% FROM TOTAL TAKE-OFF DISTANCE FOR EACH 1% OF RUNWAY SLOPE (UP - ADD, DOWN - SUBTRACT)
3. TAKEOFF WITH TAILWIND IS PROHIBITED

EXAMPLE

FAT	15°C
PRESSURE ALTITUDE	3499 FT
TAKE-OFF WEIGHT	16,000 LBS
HEADWIND COMPONENT	10 KTS
GROUND ROLL	3380 FT
TOTAL DISTANCE OVER 50-FT OBSTACLE	4790 FT

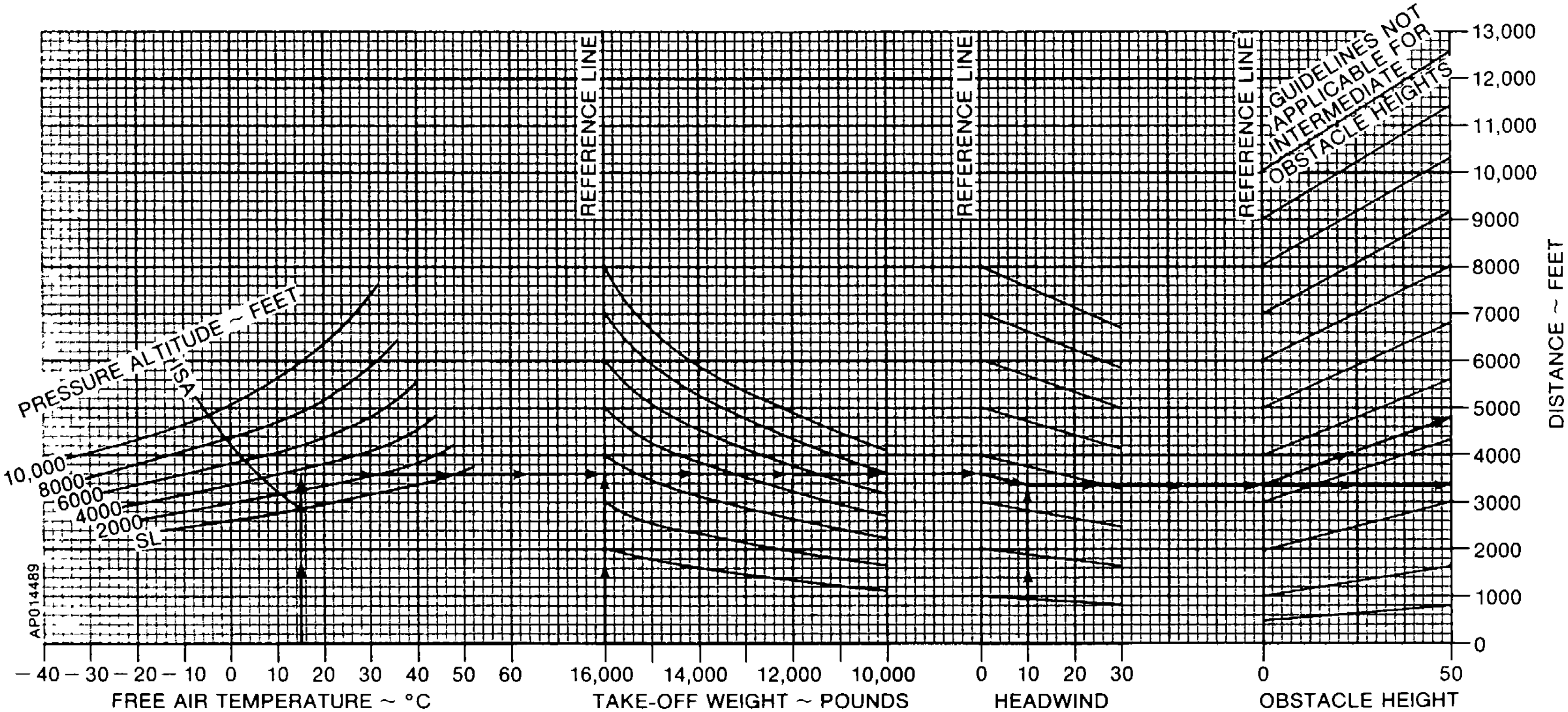

Figure 7-15. Take-Off Distance - Flaps Up

ACCELERATE-STOP - FLAPS UP

ASSOCIATED CONDITIONS

POWER	MINIMUM STATIC TAKE-OFF POWER SET BEFORE BRAKE RELEASE
AUTOFEATHER	ARMED
V_1	AS SCHEDULED IN TABLE OF TAKE-OFF SPEEDS IN THIS FLIGHT MANUAL
POWER LEVERS	GROUND FINE AT V_1
BRAKING	MAXIMUM WITHOUT SLIDING TIRES
RUNWAY	PAVED, DRY SURFACE

NOTES

1. FOR OPERATION WITH ICE VANES EXTENDED, ADD 900 FEET TO PRESSURE ALTITUDE BEFORE ENTERING GRAPH
2. INTERSECTIONS IN SHADED AREA MAY NOT ENSURE COMPLIANCE WITH THE "MAXIMUM TAKE-OFF WEIGHT — FLAPS UP" GRAPH
3. TAKEOFF WITH TAILWIND IS PROHIBITED

EXAMPLE

FAT	15°C
PRESSURE ALTITUDE	3499 FT
WEIGHT	16,000 LBS
RUNWAY GRADIENT	1 9% DN
HEADWIND COMPONENT	10 KTS
ACCELERATE-STOP DISTANCE	5480 FT

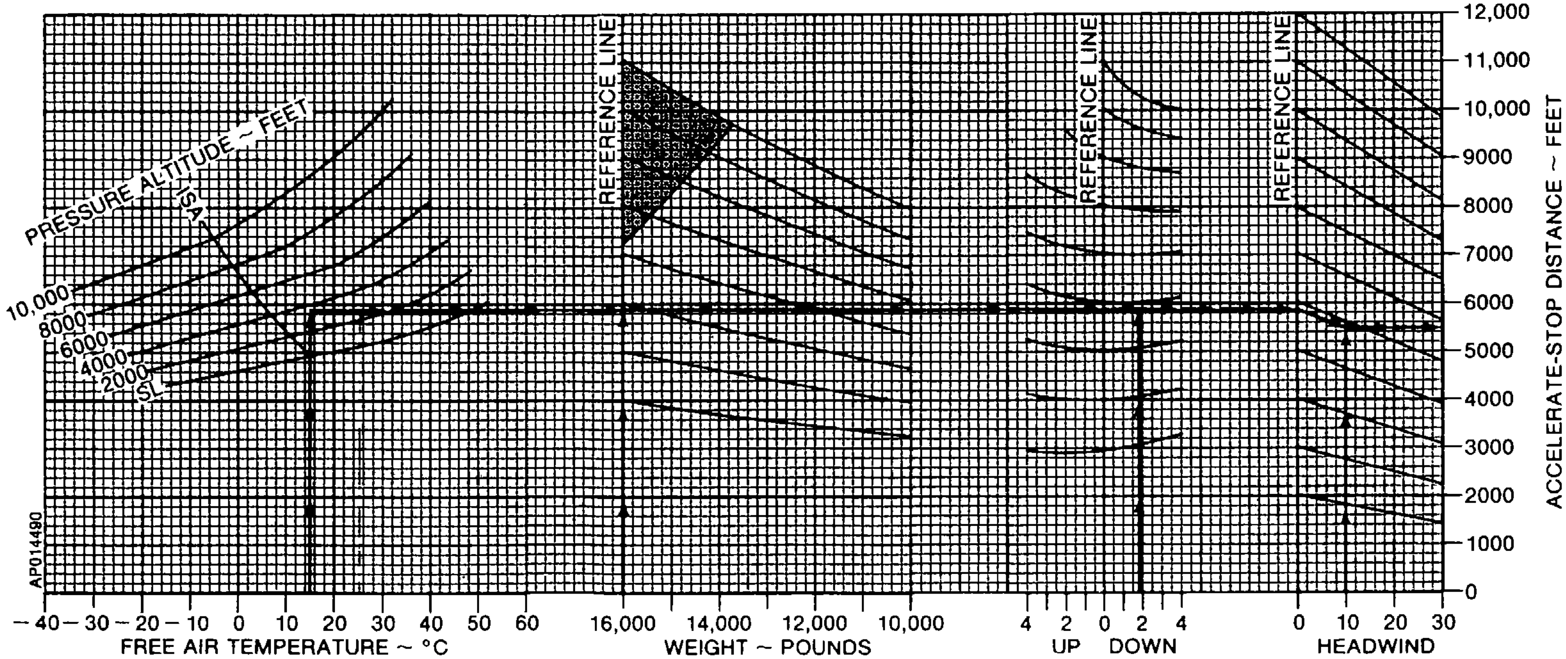

Figure 7-16. Accelerate-Stop - Flaps Up

ACCELERATE-GO DISTANCE - FLAPS UP

ASSOCIATED CONDITIONS

POWER	MINIMUM STATIC TAKE-OFF POWER SET BEFORE BRAKE RELEASE
AUTOFEATHER	ARMED
V_1 AND V_2	AS SCHEDULED IN TABLE OF TAKE-OFF SPEEDS IN THIS FLIGHT MANUAL.
LANDING GEAR	RETRACTED AFTER LIFT-OFF
RUNWAY	PAVED, DRY SURFACE

EXAMPLE

FAT	15°C
PRESSURE ALTITUDE	3499 FT
WEIGHT	16,000 LBS
RUNWAY GRADIENT	1 9% DN
HEADWIND COMPONENT	10 KTS
ACCELERATE-GO DISTANCE	5810 FT

NOTES
1. DISTANCES ASSUME AN ENGINE FAILURE AT ROTATION AND PROPELLER IMMEDIATELY FEATHERED
2. FOR OPERATION WITH ICE VANES EXTENDED, ADD 9°C TO THE ACTUAL FAT BEFORE ENTERING THE GRAPH.
3. INTERSECTIONS IN SHADED AREA MAY NOT ENSURE COMPLIANCE WITH THE "MAXIMUM TAKE-OFF WEIGHT — FLAPS UP" GRAPH
4. TAKEOFF WITH TAILWIND IS PROHIBITED

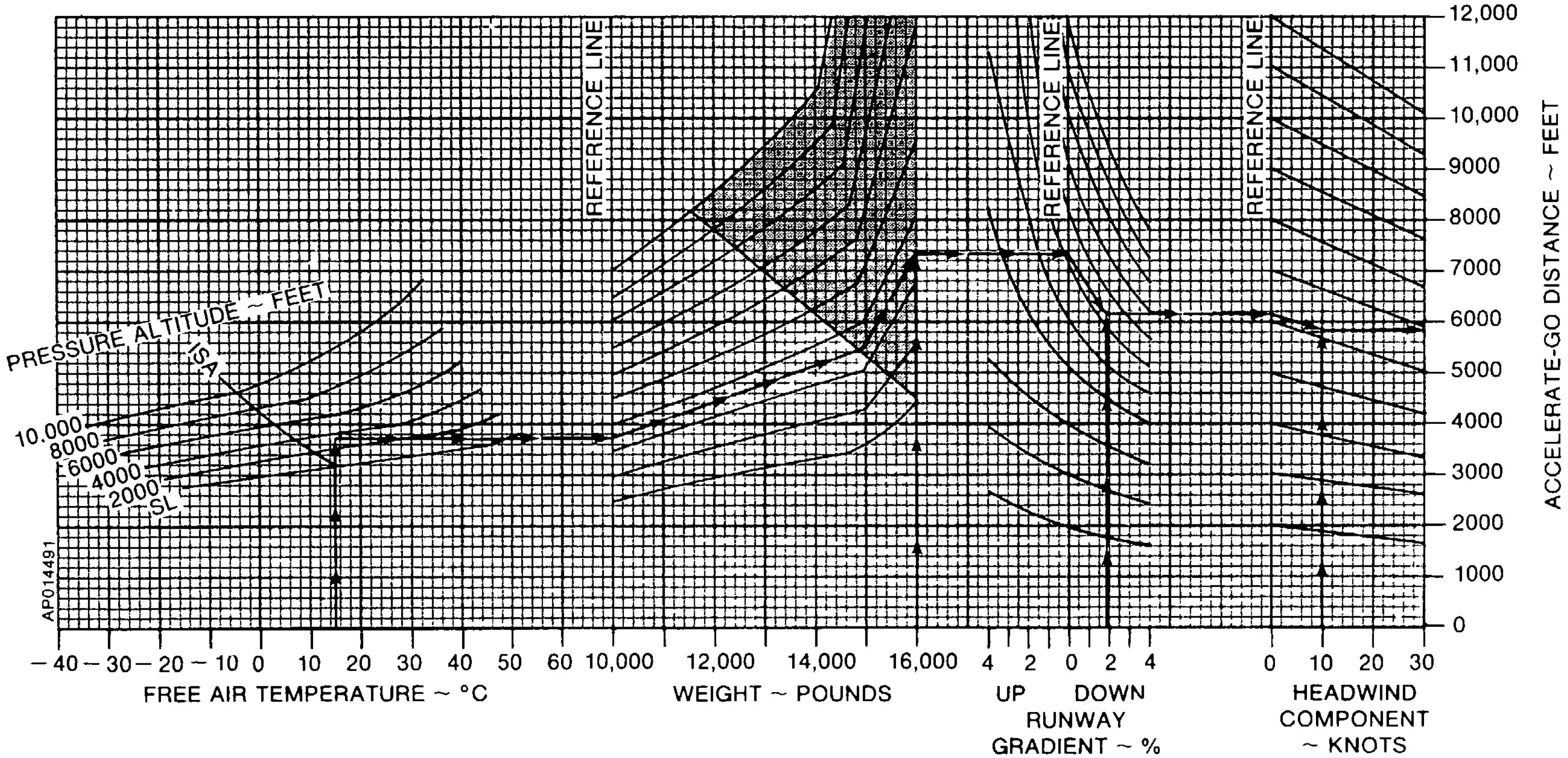

Figure 7-17. Accelerate-Go - Flaps Up

NET TAKE-OFF FLIGHT PATH - FIRST SEGMENT - FLAPS UP

ASSOCIATED CONDITIONS

POWER	NO ADJUSTMENT SINCE SETTING MINIMUM STATIC TAKE-OFF POWER.
INOPERATIVE PROPELLER	FEATHERED
LANDING GEAR	DOWN
SPEED	V_2

EXAMPLE

FAT	15°C
PRESSURE ALTITUDE	3499 FT
WEIGHT	16,000 LBS
HEADWIND COMPONENT	10 KTS
NET CLIMB GRADIENT	1 05%

NOTE FOR OPERATION WITH THE ICE VANES EXTENDED, DECREASE THE NET CLIMB GRADIENT BY 1.4 PERCENTAGE POINTS.

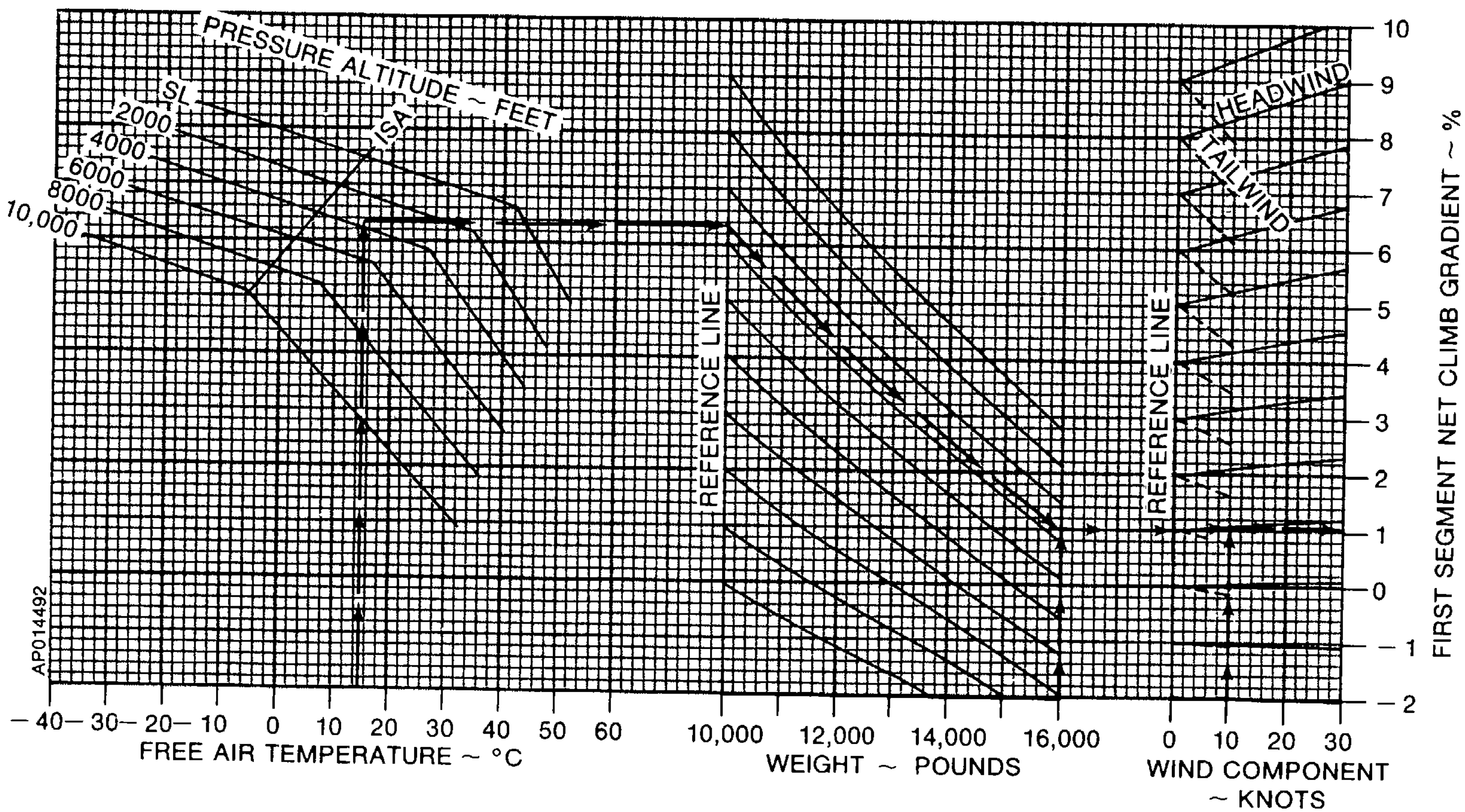

Figure 7-18. Net Take-Off Flight Path - First Segment - Flaps Up

NET TAKE-OFF FLIGHT PATH - SECOND SEGMENT - FLAPS UP
ONE ENGINE INOPERATIVE

ASSOCIATED CONDITIONS

POWER	STATIC TAKE-OFF POWER SET
INOPERATIVE PROPELLER	FEATHERED
LANDING GEAR	UP
CLIMB SPEED	V_2

EXAMPLE

FAT	15°C
PRESSURE ALTITUDE	3499 FT
WEIGHT	16,000 LBS
HEADWIND COMPONENT	10 KTS
NET CLIMB GRADIENT	3 1%

NOTE FOR OPERATION WITH ICE VANES EXTENDED, DECREASE NET CLIMB GRADIENT BY 1 4 PERCENTAGE POINTS

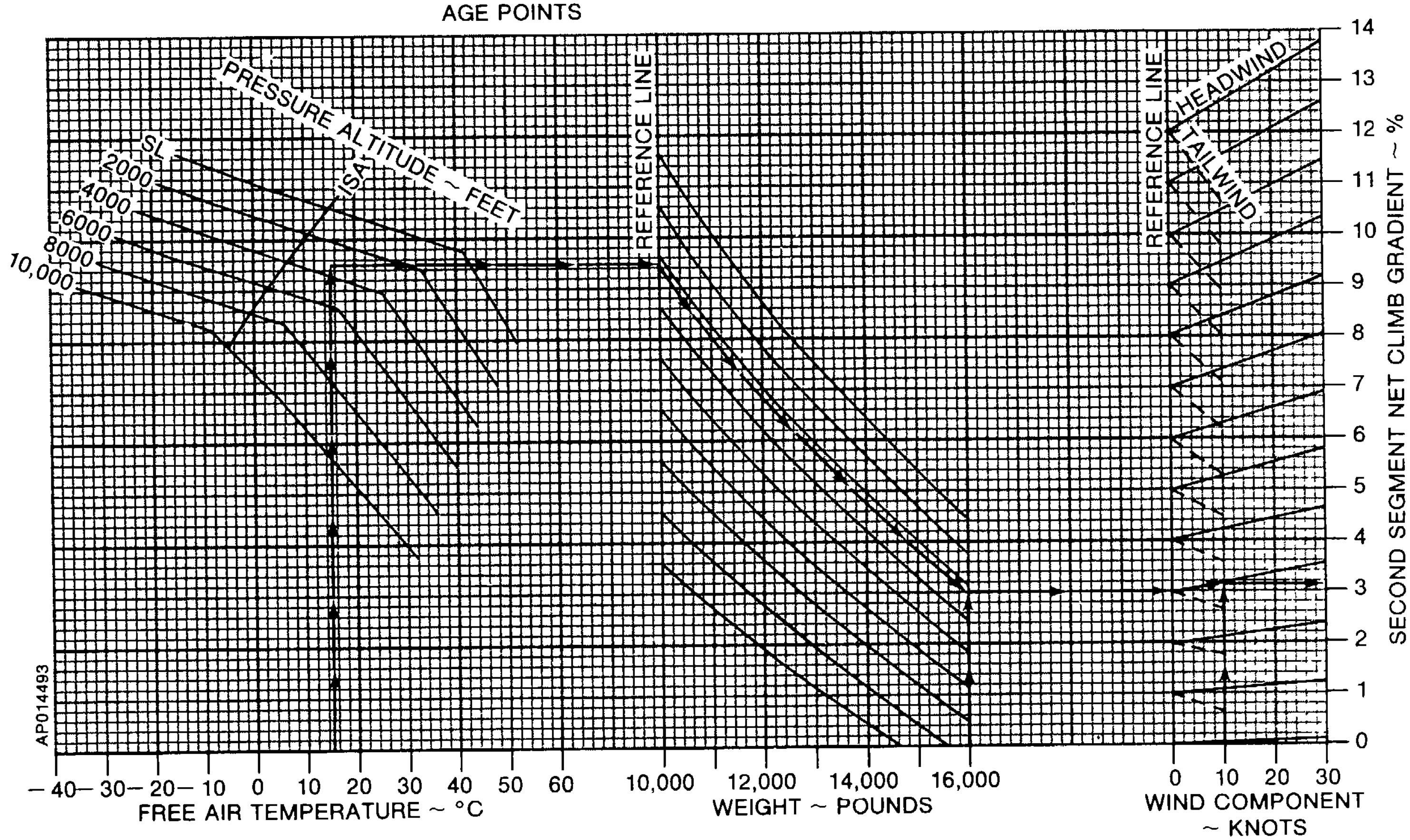

Figure 7-19. Net Take-Off Flight Path - Second Segment - Flaps Up

HORIZONTAL DISTANCE FROM REFERENCE ZERO TO THIRD SEGMENT CLIMB - FLAPS UP

ASSOCIATED CONDITIONS

POWER	
TO 500 FT AGL	MINIMUM STATIC TAKE-OFF POWER SET BEFORE BRAKE RELEASE
AT 500 FT AGL	MAX CONTINUOUS
AIRSPEED.	
TO 500 FT AGL	V_2
AT 500 FT AGL	ACCELERATE TO V_{ENR}
INOPERATIVE PROPELLER	FEATHERED
LANDING GEAR	RETRACTED AFTER LIFT-OFF

EXAMPLE

FAT	15°C
PRESSURE ALTITUDE	3499 FT
WEIGHT	16,000 LBS
HEADWIND COMPONENT	10 KTS
DISTANCE	2 8 NM

NOTE: FOR OPERATION WITH ICE VANES EXTENDED, ADD 1 4 NM TO DISTANCE OBTAINED FROM THIS CHART.

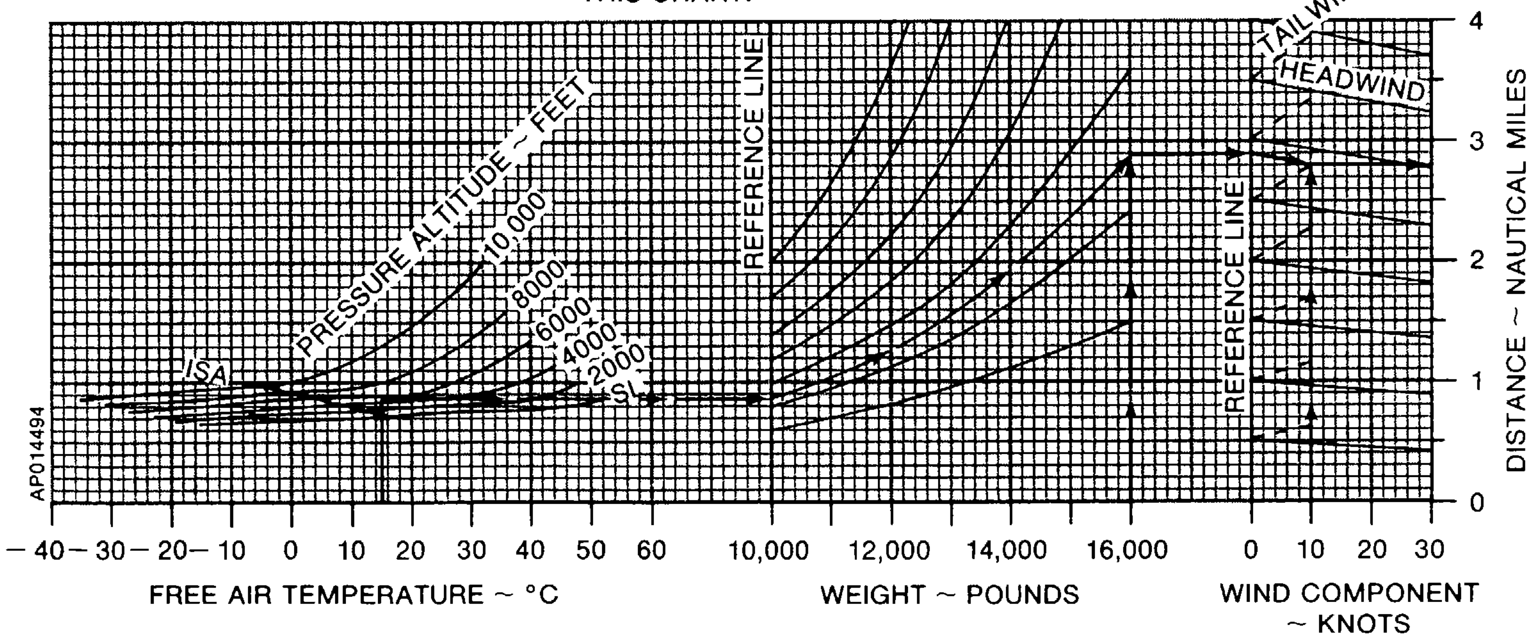

Figure 7-20. Horizontal Distance From Reference Zero To Third Segment Climb - Flaps Up

CLOSE-IN TAKE-OFF FLIGHT PATH

EXAMPLE.

TOTAL HEIGHT REQUIRED	70 FT
OBSTACLE DISTANCE FROM REFERENCE ZERO	920 FT
NET CLIMB GRADIENT REQUIRED	2.2%

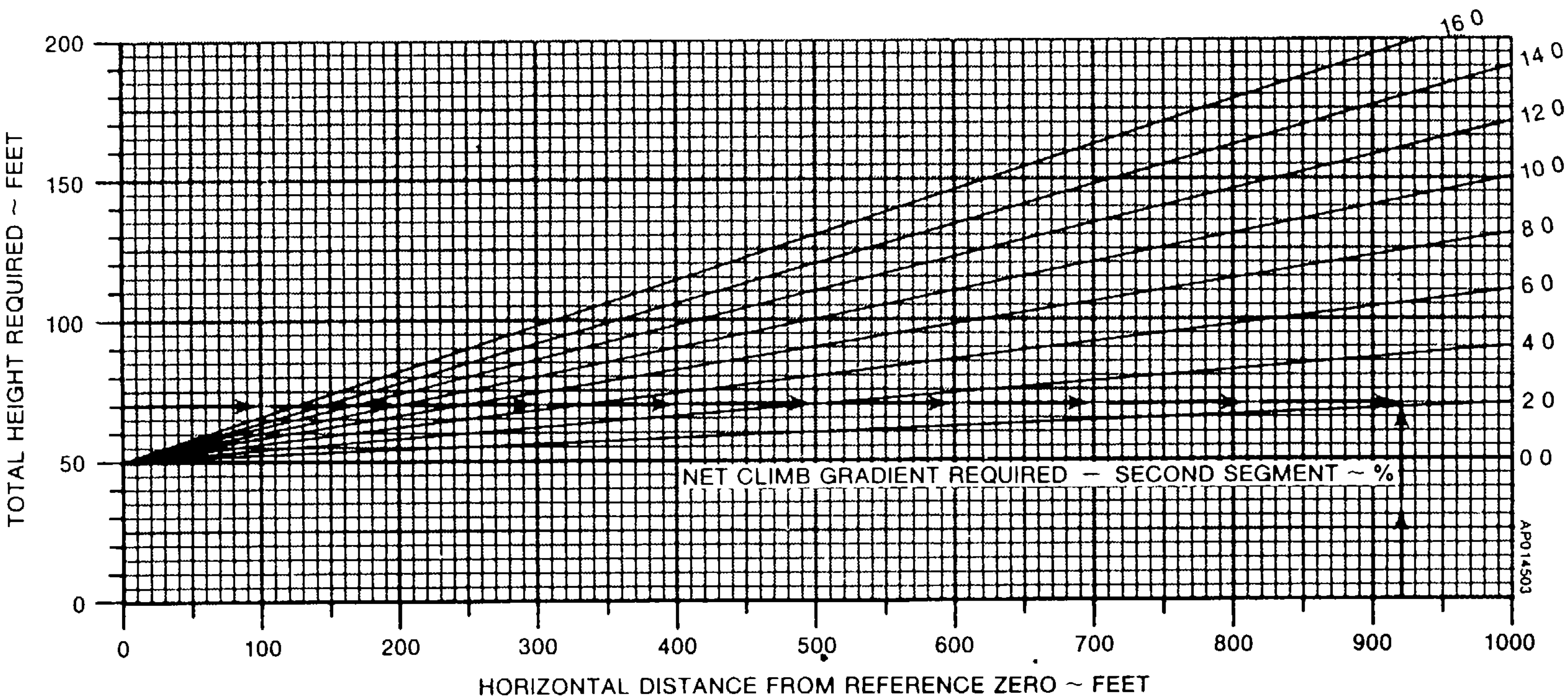

Figure 7-21. Close-In Take-Off Flight Path

DISTANT TAKE-OFF FLIGHT PATH

EXAMPLE:

TOTAL HEIGHT REQUIRED................270 FT
OBSTACLE DISTANCE FROM
REFERENCE ZERO........................1.8 NM
NET CLIMB GRADIENT REQUIRED......2.0%

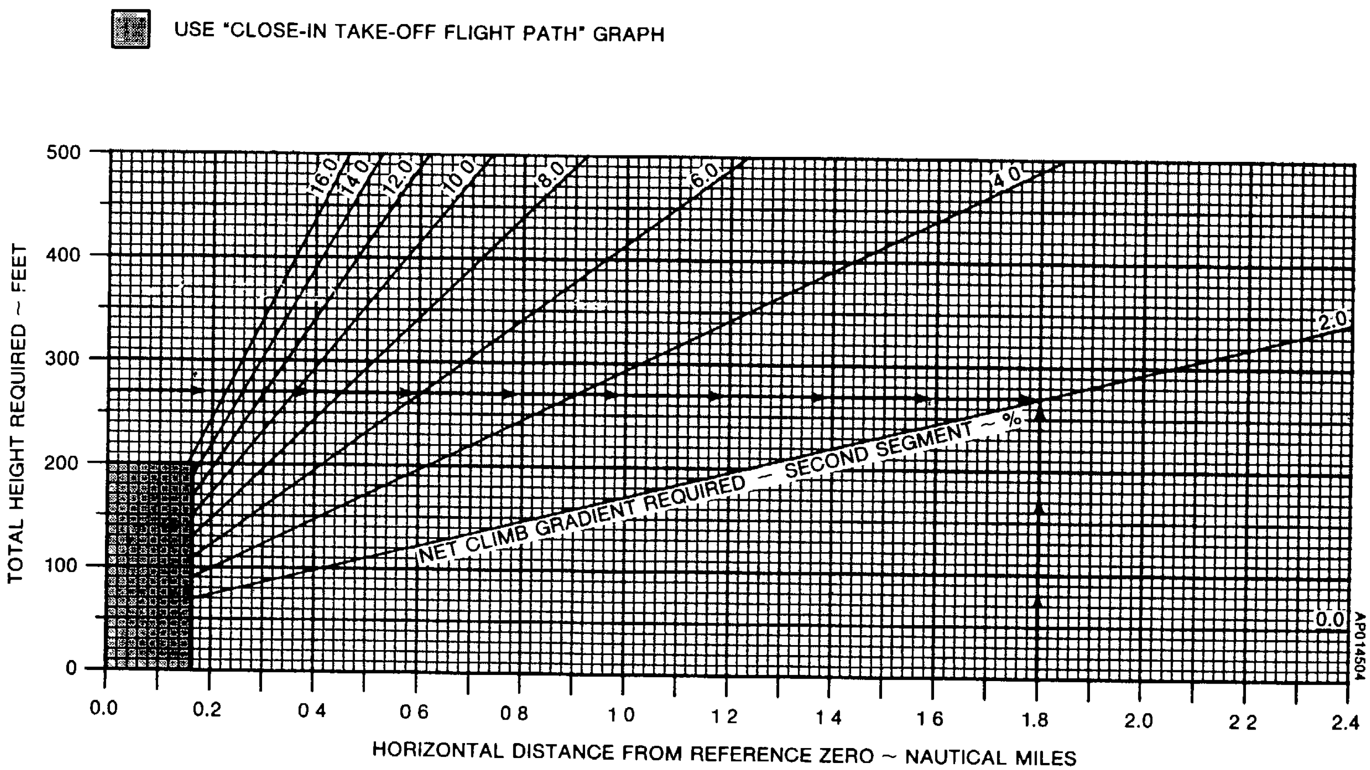

Figure 7-22. Distant Take-Off Flight Path

MAXIMUM TAEOFF WEIGHT - FLAPS APPROACH
TO ACHIEVE POSITIVE ONE-ENGINE-INOPERATIVE CLIMB AT LIFT-OFF

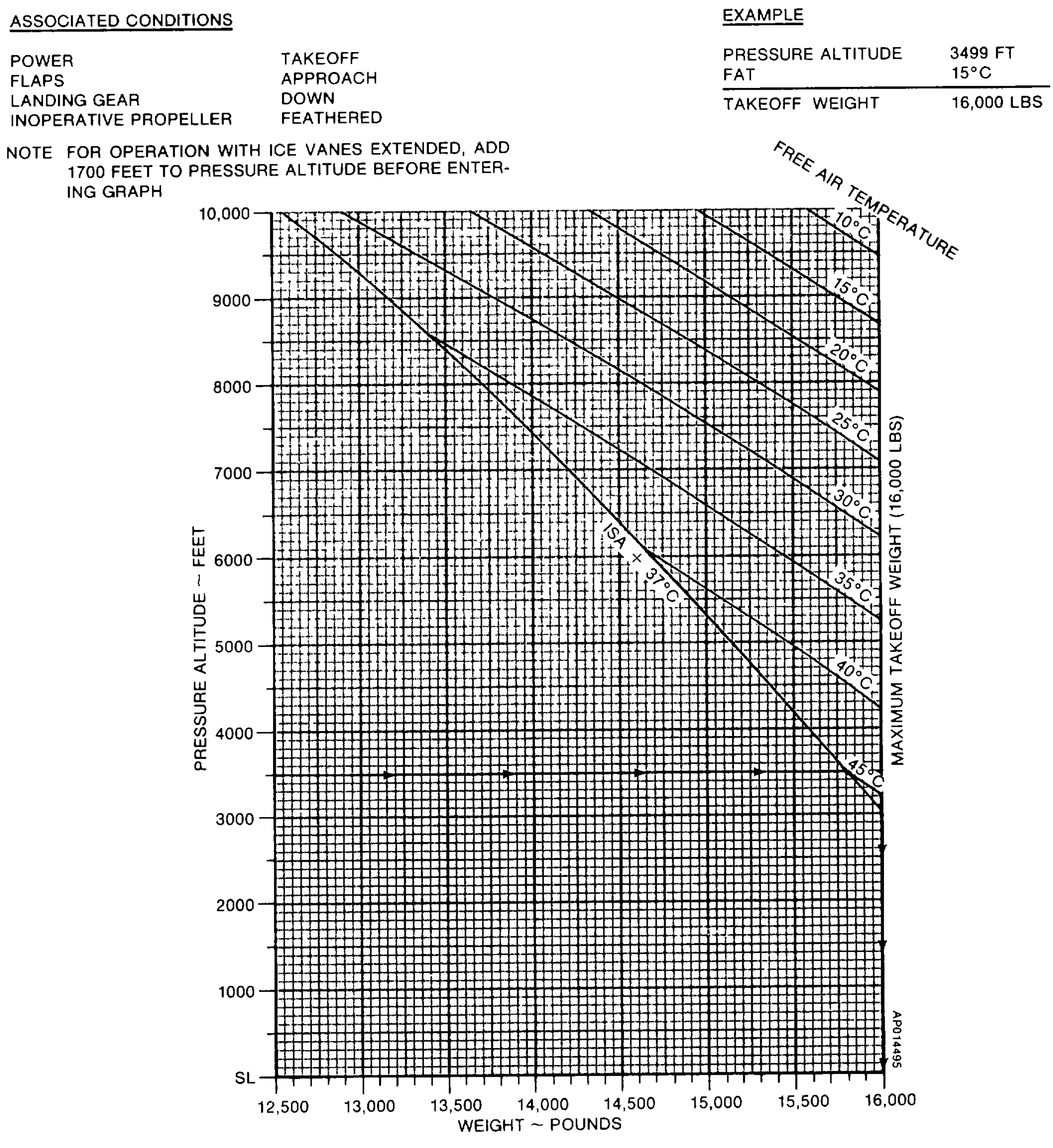

Figure 7-23. Maximum Take-Off Weight - Flaps Approach

TAKE OFF SPEEDS (KIAS) - FLAPS APPROACH

PRESS ALT (FT)	T/O WT (LBS)	FREE AIR TEMPERATURE -30°C				-10°C				0°C				10°C				20°C				40°C				52°C			
		V_1	V_R	V_2	V_{50}	V_1	V_R	V_2	V_{50}	V_1	V_R	V_2	V_{50}	V_1	V_R	V_2	V_{50}	V_1	V_R	V_2	V_{50}	V_1	V_R	V_2	V_{50}	V_1	V_R	V_2	V_{50}
SL	16,000	111	111	113	123	111	111	113	122	111	111	113	122	111	111	112	122	111	111	112	121	111	111	112	121	111	111	111	120
	15,000	111	111	114	124	111	111	113	123	111	111	113	123	111	111	113	122	111	111	113	122	111	111	112	122	111	111	112	121
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	12,000	111	111	115	127	111	111	115	126	111	111	115	126	111	111	115	125	111	111	114	125	111	111	114	124	111	111	114	123
	11,000	111	111	116	128	111	111	116	127	111	111	116	127	111	111	115	126	111	111	115	126	111	111	115	125	111	111	114	124
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2000	16,000	111	111	113	122	111	111	112	122	111	111	112	121	111	111	112	121	111	111	112	121	111	111	112	120				
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	11,000	111	111	116	127	111	111	115	126	111	111	115	126	111	111	115	125	111	111	115	125	111	111	114	125				
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4000	16,000	111	111	112	121	111	111	112	121	111	111	112	121	111	111	112	120	111	111	112	120	111	111	111	119				
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6000	16,000	111	111	112	121	111	111	112	120	111	111	112	120	111	111	111	120	111	111	111	119	111	111	111	117				
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	13,000	111	111	114	124	111	111	113	123	111	111	113	122	111	111	113	122	111	111	113	122	111	111	111	119				
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	11,000	111	111	115	126	111	111	115	125	111	111	114	124	111	111	114	124	111	111	114	124	111	111	113	121				
	10,000	111	111	116	127	111	111	115	126	111	111	115	126	111	111	115	125	111	111	115	125								
8000	16,000	111	111	112	121	111	111	111	120	111	111	111	119	111	111	111	119	111	111	111	118								
	15,000	111	111	112	121	111	111	112	121	111	111	112	120	111	111	112	120	111	111	111	119								
	14,000	111	111	113	122	111	111	112	121	111	111	112	121	111	111	112	121	111	111	112	120								
	13,000	111	111	113	123	111	111	113	122	111	111	113	122	111	111	113	121												
	12,000	111	111	114	124	111	111	114	123	111	111	113	123	111	111	113	122												
	11,000	111	111	115	125	111	111	114	124	111	111	114	124	111	111	114	123												
	10,000	111	111	115	126	111	111	115	125	111	111	115	125																
10,000	16,000	111	111	111	120	111	111	111	119	111	111	111	119																
	15,000	111	111	112	121	111	111	112	120	111	111	111	119																
	14,000	111	111	112	121	111	111	112	121																				
	13,000	111	111	113	122	111	111	113	121																				
	12,000	111	111	114	123	111	111	113	122																				
	11,000	111	111	114	124																								
	10,000	111	111	115	125																								

BT01097 RC-12K

Figure 7-24. Takeoff Speeds (KIAS) - Flaps Approach

TAKE-OFF DISTANCE - FLAPS APPROACH

ASSOCIATED CONDITIONS

POWER	MINIMUM STATIC TAKE-OFF POWER SET BEFORE BRAKE RELEASE
V_R, V_{50}	AS SCHEDULED IN TABLE OF TAKE-OFF SPEEDS
FLAPS	APPROACH
LANDING GEAR	RETRACTED AFTER LIFT-OFF
RUNWAY	PAVED, LEVEL, DRY SURFACE

EXAMPLE

FAT	15°C
PRESSURE ALTITUDE	3499 FT
WEIGHT	16,000 LBS
HEADWIND COMPONENT	10 KTS
GROUND ROLL	2960 FT
TOTAL DISTANCE OVER 50-FT OBSTACLE	3920 FT

NOTES
1. FOR OPERATION WITH ICE VANES EXTENDED, INCREASE TOTAL DISTANCE OVER 50-FT OBSTACLE BY 9%
2. ADD 9% TO OR SUBTRACT 2% FROM TOTAL TAKE-OFF DISTANCE OVER 50-FT OBSTACLE FOR EACH 1% OF RUNWAY SLOPE (UP - ADD, DOWN - SUBTRACT)
3. TAKEOFF WITH TAILWIND IS PROHIBITED

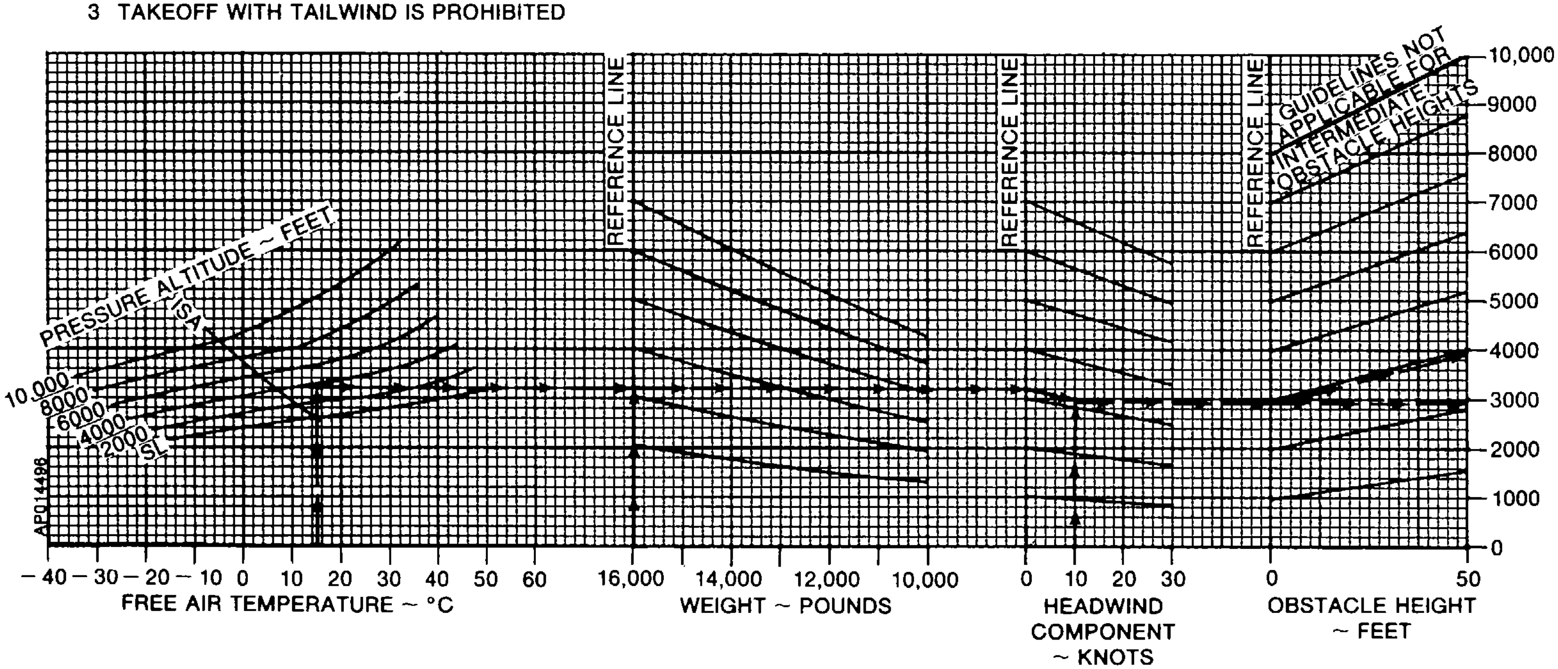


Figure 7-25. Take-Off Distance - Flaps Approach

ACCELERATE-STOP - FLAPS APPROACH

ASSOCIATED CONDITIONS

POWER	MINIMUM STATIC TAKE-OFF POWER SET BEFORE BRAKE RELEASE
AUTOFEATHER	ARMED
V_1	AS SCHEDULED IN TABLE OF TAKE-OFF SPEEDS IN THIS FLIGHT MANUAL
POWER LEVERS	GROUND FINE AT V_1
BRAKING	MAXIMUM WITHOUT SLIDING TIRES
RUNWAY	PAVED, DRY SURFACE

NOTES
1. FOR OPERATION WITH ICE VANES EXTENDED, ADD 800 FEET TO PRESSURE ALTITUDE BEFORE ENTERING GRAPH
2. INTERSECTIONS IN SHADED AREA MAY NOT ENSURE COMPLIANCE WITH THE "MAXIMUM TAKE-OFF WEIGHT — FLAPS APPROACH" GRAPH
3. TAKEOFF WITH TAILWIND IS PROHIBITED

EXAMPLE

FAT	15°C
PRESSURE ALTITUDE	3499 FT
WEIGHT	16,000 LBS
RUNWAY GRADIENT	1 9% DWN
HEADWIND COMPONENT	10 KTS
ACCELERATE-STOP DISTANCE	5100 FT

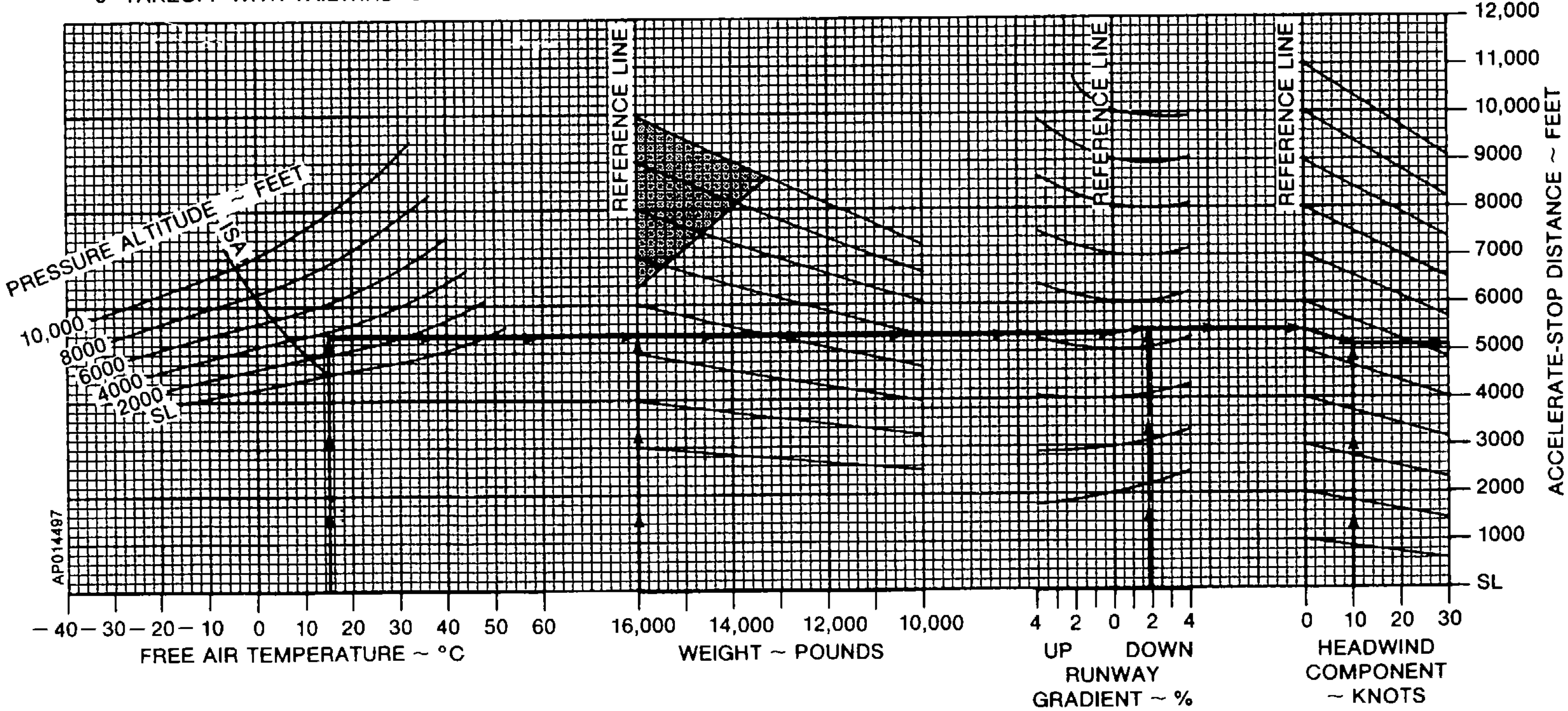


Figure 7-26. Accelerate-Stop - Flaps Approach

ACCELERATE-GO DISTANCE - FLAPS APPROACH

EXAMPLE

FAT	15°C
PRESSURE ALTITUDE	3499 FT
WEIGHT	16,000 LBS
RUNWAY GRADIENT	1 9% DWN
HEADWIND COMPONENT	10 KTS
ACCELERATE-GO DISTANCE	4500 FT

ASSOCIATED CONDITIONS

POWER	MINIMUM STATIC TAKE-OFF POWER SET BEFORE BRAKE RELEASE
AUTOFEATHER	ARMED
V_1 AND V_2	AS SCHEDULED IN TABLE OF TAKE-OFF SPEEDS IN THIS FLIGHT MANUAL
LANDING GEAR	RETRACTED AFTER LIFT-OFF
RUNWAY	PAVED, DRY SURFACE

NOTES
1. DISTANCES ASSUME AN ENGINE FAILURE AT ROTATION AND PROPELLER IMMEDIATELY FEATHERED
2. FOR OPERATION WITH ICE VANES EXTENDED, ADD 17°C TO THE ACTUAL FAT BEFORE ENTERING THE GRAPH
3. INTERSECTIONS IN SHADED AREA MAY NOT ENSURE COMPLIANCE WITH THE "MAXIMUM TAKE-OFF WEIGHT — FLAPS APPROACH" GRAPH
4. TAKEOFF WITH TAILWIND IS PROHIBITED

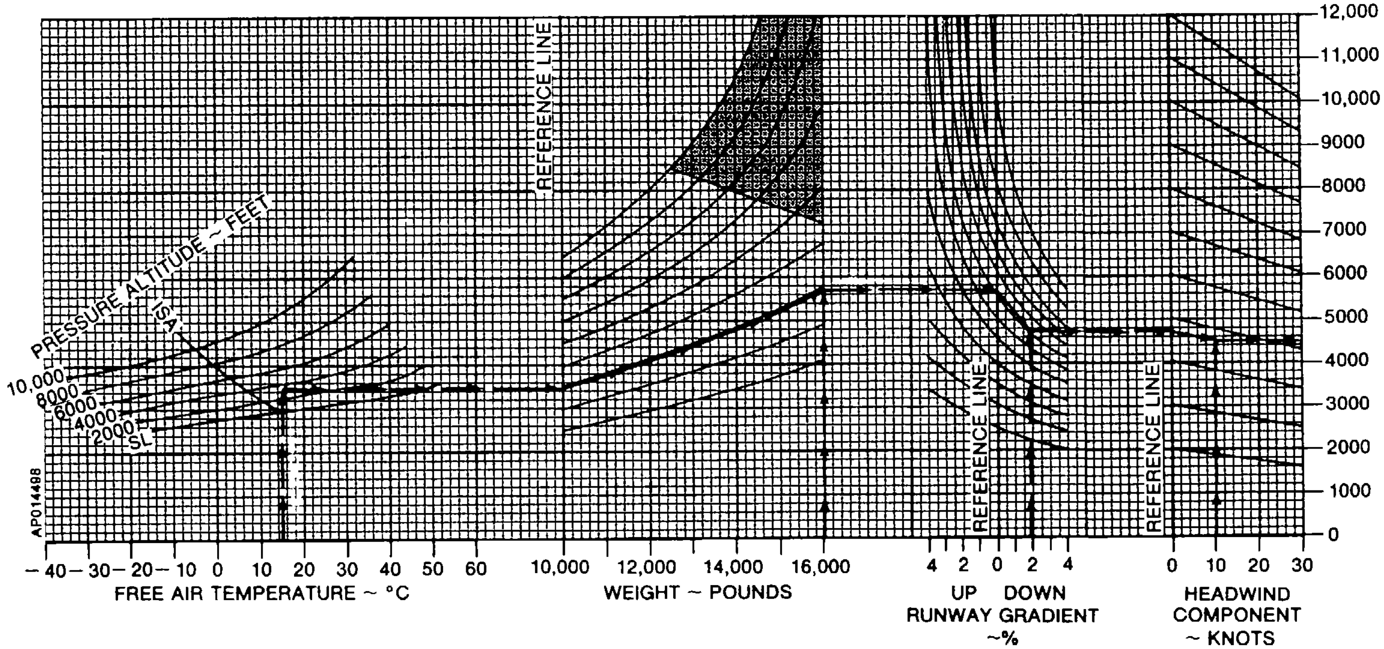


Figure 7-27. Accelerate-Go Distance - Flaps Approach

NET TAKE-OFF FLIGHT PATH - FIRST SEGMENT - FLAPS APPROACH
ONE ENGINE INOPERATIVE

ASSOCIATED CONDITIONS

POWER	NO ADJUSTMENT SINCE SETTING MINIMUM STATIC TAKE-OFF POWER
INOPERATIVE PROPELLER	FEATHERED
LANDING GEAR	DOWN
SPEED	V_2

NOTE FOR OPERATION WITH ICE VANES EXTENDED, DECREASE THE NET CLIMB GRADIENT BY 1 3 PERCENTAGE POINTS

EXAMPLE

FAT	15°C
PRESSURE ALTITUDE	3499 FT
WEIGHT	16,000 LBS
HEADWIND COMPONENT	10 KTS
NET CLIMB GRADIENT	0 8%

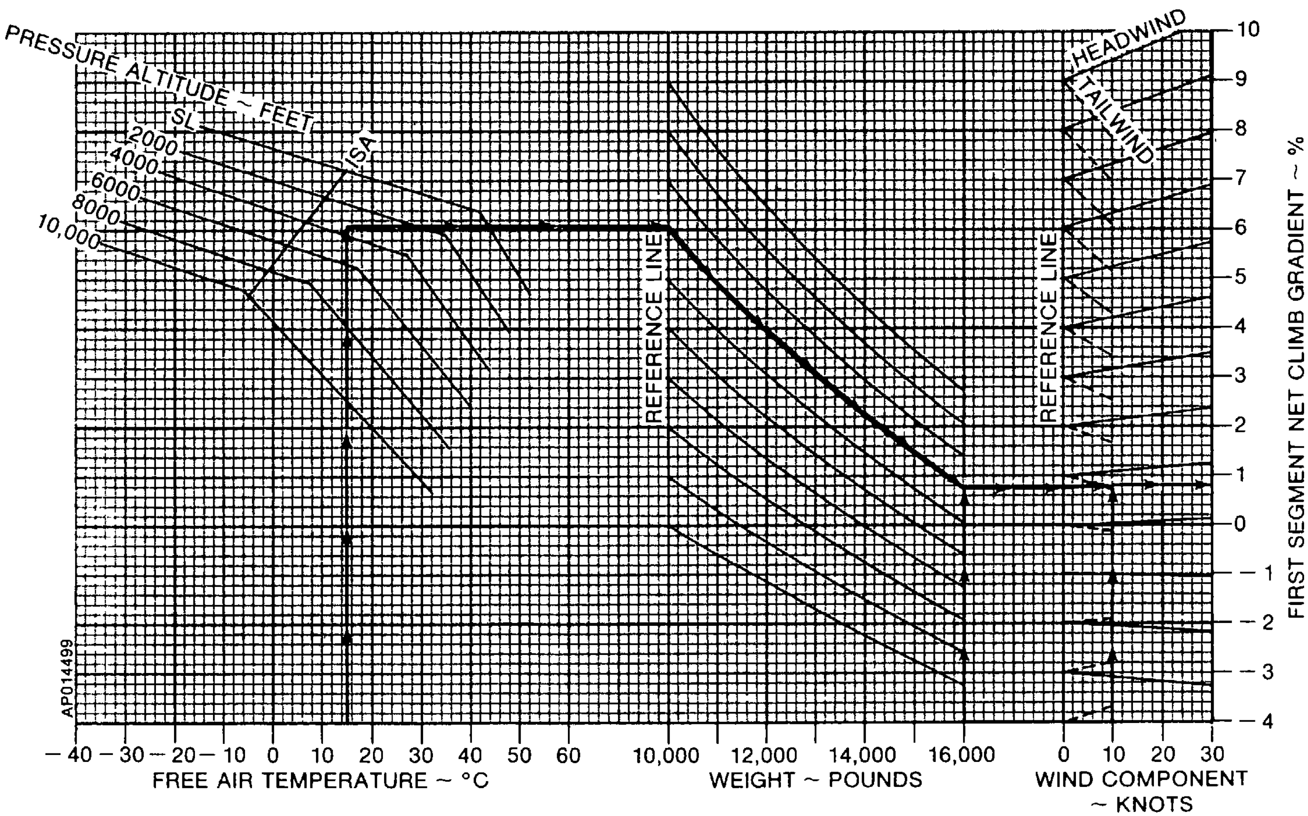


Figure 7-28. Net Take-Off Flight Path - First Segment - Flaps Approach

NET TAKE-OFF FLIGHT PATH - SECOND SEGMENT - FLAPS APPROACH
ONE ENGINE INOPERATIVE

ASSOCIATED CONDITIONS

POWER	STATIC TAKE-OFF POWER SET
INOPERATIVE PROPELLER	FEATHERED
LANDING GEAR	UP
CLIMB SPEED	V_2

EXAMPLE

FAT	15°C
PRESSURE ALTITUDE	3499 FT
WEIGHT	16,000 LBS
HEADWIND COMPONENT	10 KTS
NET CIMB GRADIENT	2 4%

NOTE FOR OPERATION WITH ICE VANES EXTENDED, DECREASE NET CLIMB GRADIENT BY 1 2 PERCENTAGE POINTS

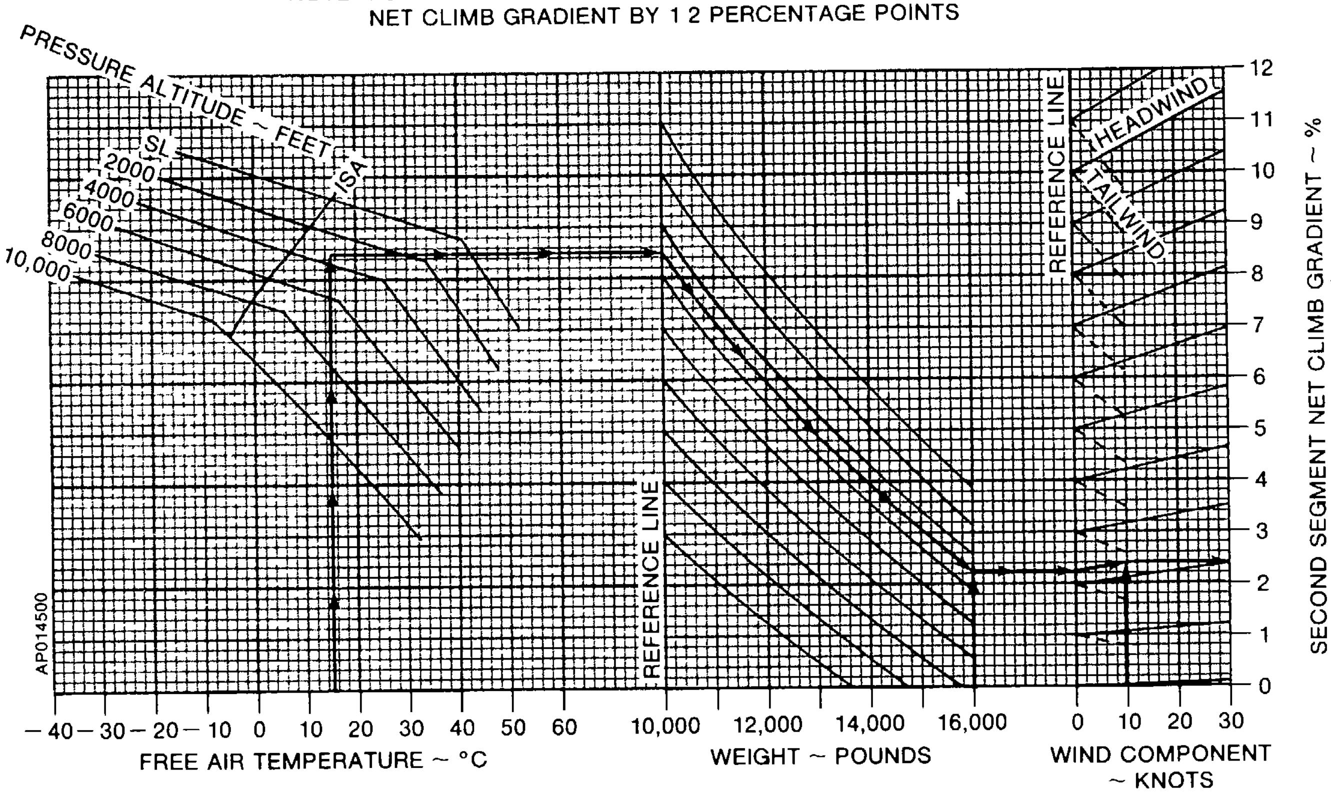


Figure 7-29. Net Take-Off Flight Path - Second Segment - Flaps Approach

HORIZONTAL DISTANCE FROM REFERENCE ZERO TO THIRD SEGMENT CLIMB - FLAPS APPROACH ONE ENGINE INOPERATIVE

ASSOCIATED CONDITIONS

POWER	
TO 500 FT AGL	MINIMUM STATIC TAKE-OFF POWER SET BEFORE BRAKE RELEASE.
AT 500 FT AGL	MAX CONTINUOUS
AIRSPEED	
TO 500 FT AGL	V_2
AT 500 FT AGL	ACCELERATE TO V_{ENR}
INOPERATIVE PROPELLER	FEATHERED
LANDING GEAR	RETRACTED AFTER LIFT-OFF

EXAMPLE

FAT	15°C
PRESSURE ALTITUDE	3499 FT
WEIGHT	16,000 LBS
HEADWIND COMPONENT	10 KTS
DISTANCE	4 33 NM

NOTE FOR OPERATION WITH ICE VANES EXTENDED, ADD 1 4 NM TO DISTANCE OBTAINED FROM THIS GRAPH

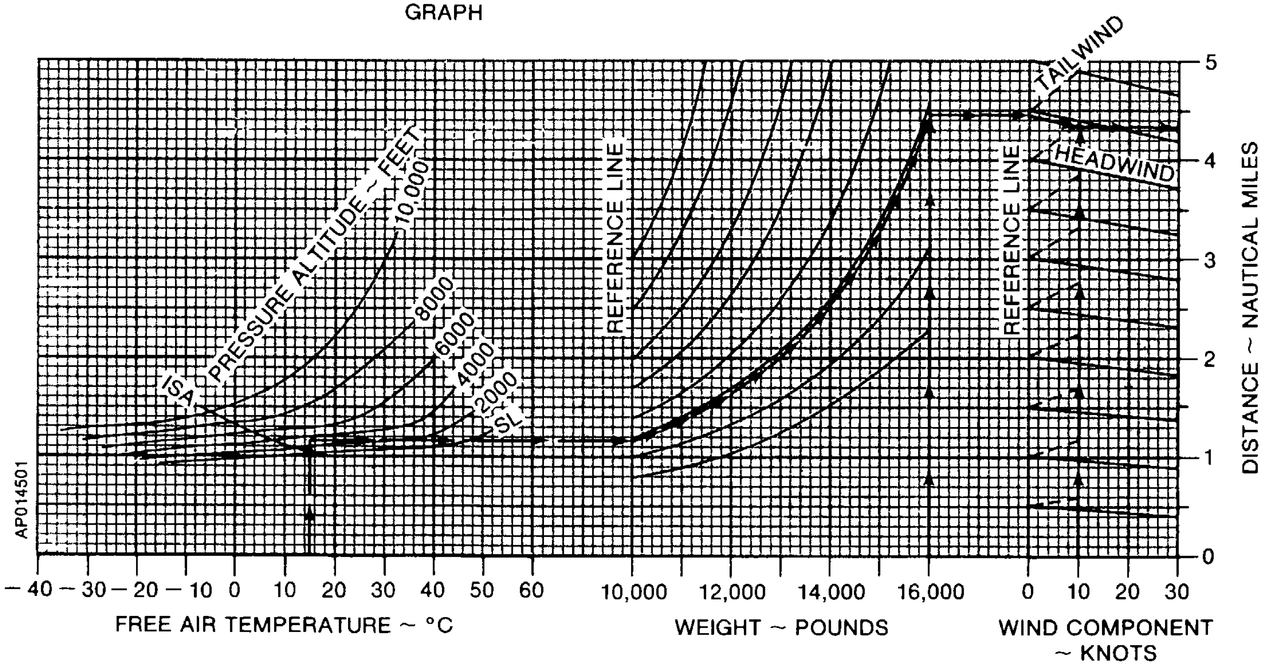


Figure 7-30. Horizontal Distance from Reference Zero to Third Segment Climb - Flaps Approach

NET TAKE-OFF FLIGHT PATH - THIRD SEGMENT
ONE ENGINE INOPERATIVE

V_{ENR} = 121 KNOTS (ALL WEIGHTS)

ASSOCIATED CONDITIONS	
POWER	MAX CONTINUOUS POWER
INOPERATIVE PROPELLER	FEATHERED
LANDING GEAR	UP
FLAPS	UP
CLIMB SPEED	V_{ENR}

EXAMPLE	
FAT	15°C
PRESSURE ALTITUDE	3499 FT
WEIGHT	16,000 LBS
HEADWIND COMPONENT	10 KTS
NET CLIMB GRADIENT	3 0%

NOTE FOR OPERATION WITH ICE VANES EXTENDED, DECREASE NET CLIMB GRADIENT BY 1 5 PERCENTAGE POINTS

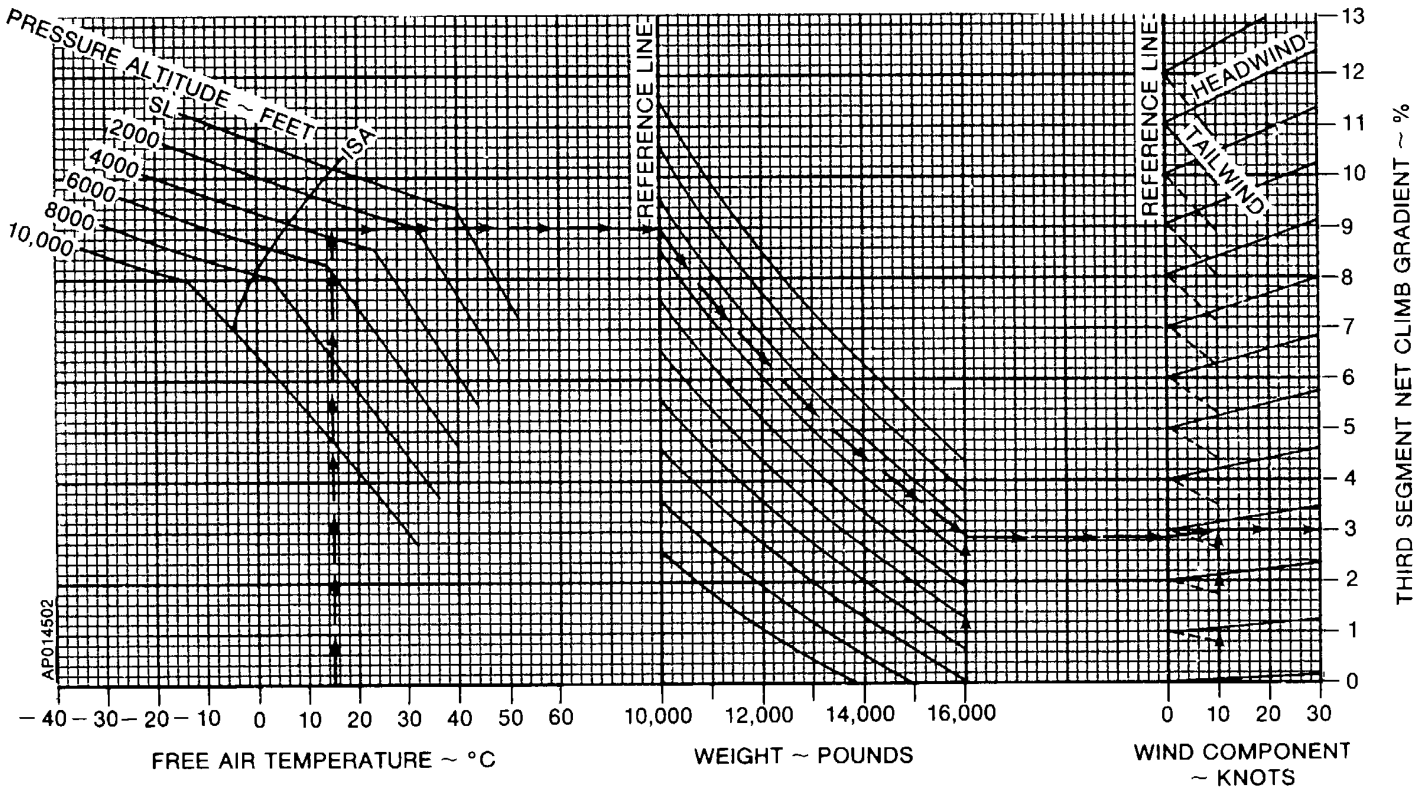


Figure 7-31. Net Takeoff Flight Path - Third Segment

CLIMB - TWO ENGINES - FLAPS UP

ASSOCIATED CONDITIONS

POWER	MAXIMUM CONTINUOUS
FLAPS	UP
LANDING GEAR	UP

NOTE DURING OPERATION WITH ICE VANES EXTENDED, RATE OF CLIMB WILL BE REDUCED APPROXIMATELY 400 FEET PER MINUTE

WEIGHT ~ POUNDS	CLIMB SPEED ~ KNOTS
16,000	135
14,000	131
12,000	126
10,000	122

EXAMPLE

FAT	−4°C
PRESSURE ALTITUDE	9000 FT
WEIGHT	15,500 LBS
RATE OF CLIMB	2365 FT/MIN
CLIMB GRADIENT	12 9%
CLIMB SPEED	134 KTS

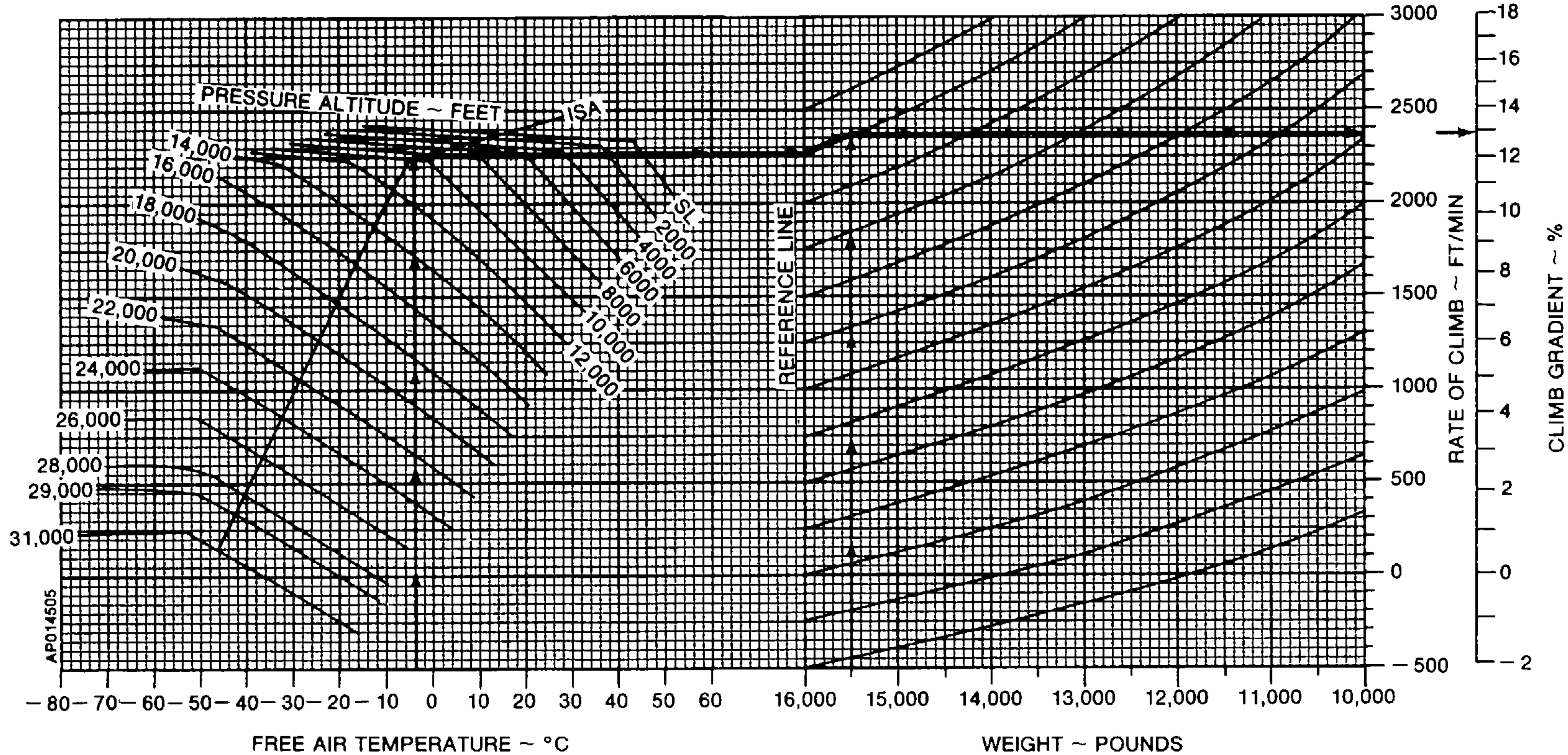


Figure 7-32. Climb - Two Engines - Flaps Up

CLIMB - TWO ENGINES - FLAPS APPROACH

ASSOCIATED CONDITIONS

POWER	MAXIMUM CONTINUOUS
FLAPS	APPROACH
LANDING GEAR	UP

WEIGHT ~ POUNDS	CLIMB SPEED ~ KNOTS
16,000	130
14,000	126
12,000	122
10,000	117

EXAMPLE

FAT	− 4°C
PRESSURE ALTITUDE	3499 FT
WEIGHT	15,500 LBS
RATE OF CLIMB	2395 FT/MIN
CLIMB GRADIENT	15 7%
CLIMB SPEED	129 KTS

NOTE DURING OPERATION WITH ICE VANES EXTENDED, RATE OF CLIMB WILL BE REDUCED APPROXIMATELY 400 FT/MIN

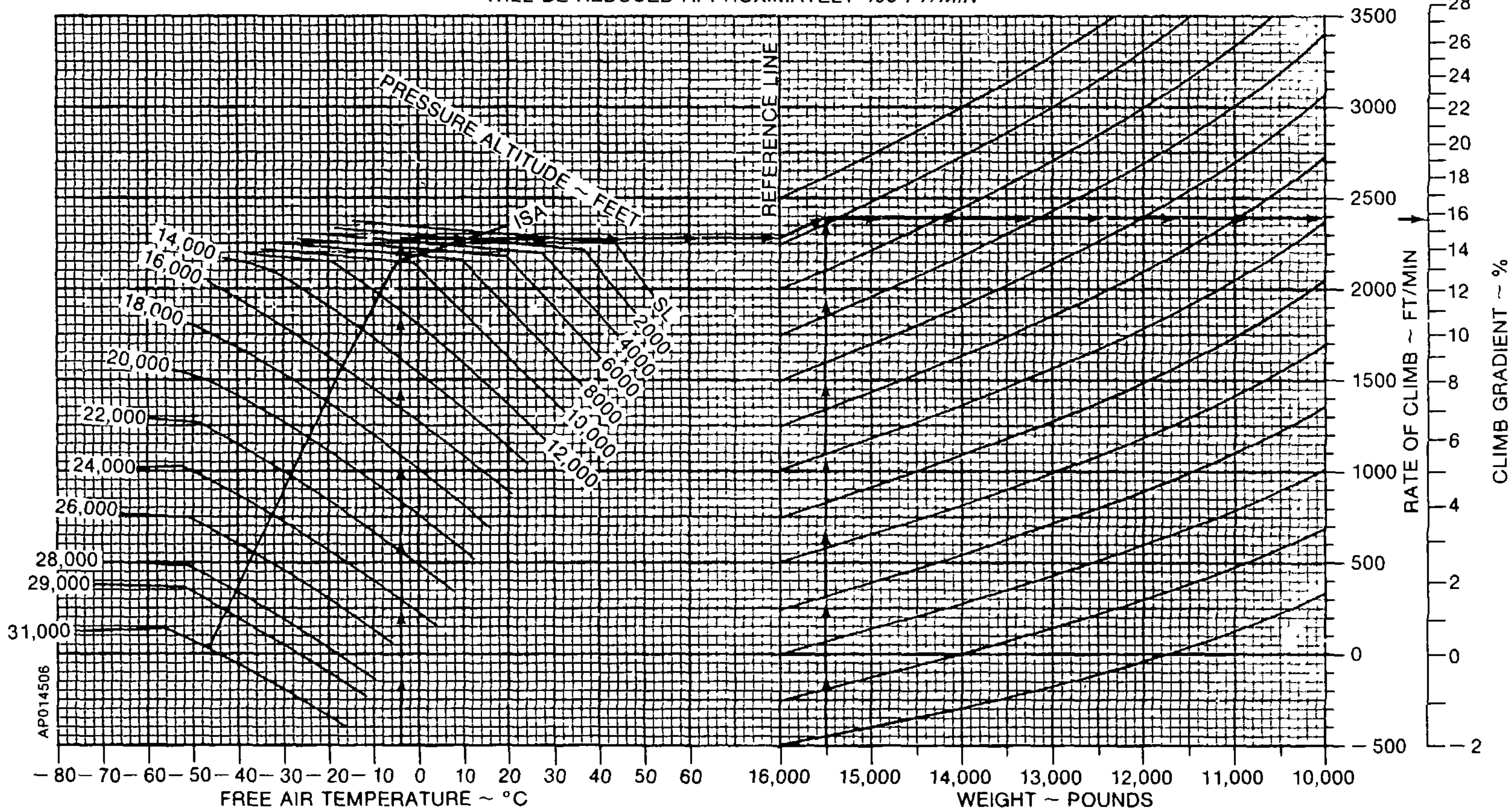


Figure 7-33. Climb - Two Engines - Flaps Approach

CLIMB - ONE ENGINE INOPERATIVE

WEIGHT ~ POUNDS	CLIMB SPEED ~ KNOTS
16,000	121
14,000	117
12,000	113
10,000	109

ASSOCIATED CONDITIONS

POWER	MAXIMUM CONTINUOUS
FLAPS	UP
LANDING GEAR	UP
INOPERATIVE PROPELLER	FEATHERED

EXAMPLE

FAT	−4°C
PRESSURE ALTITUDE	3499 FT
WEIGHT	15,500 LBS
RATE OF CLIMB	608 FT/MIN
CLIMB GRADIENT	3 75%
CLIMB SPEED	120 KTS

NOTE FOR OPERATION WITH ICE VANES EXTENDED, RATE OF CLIMB WILL BE REDUCED APPROXIMATELY 200 FT/MIN

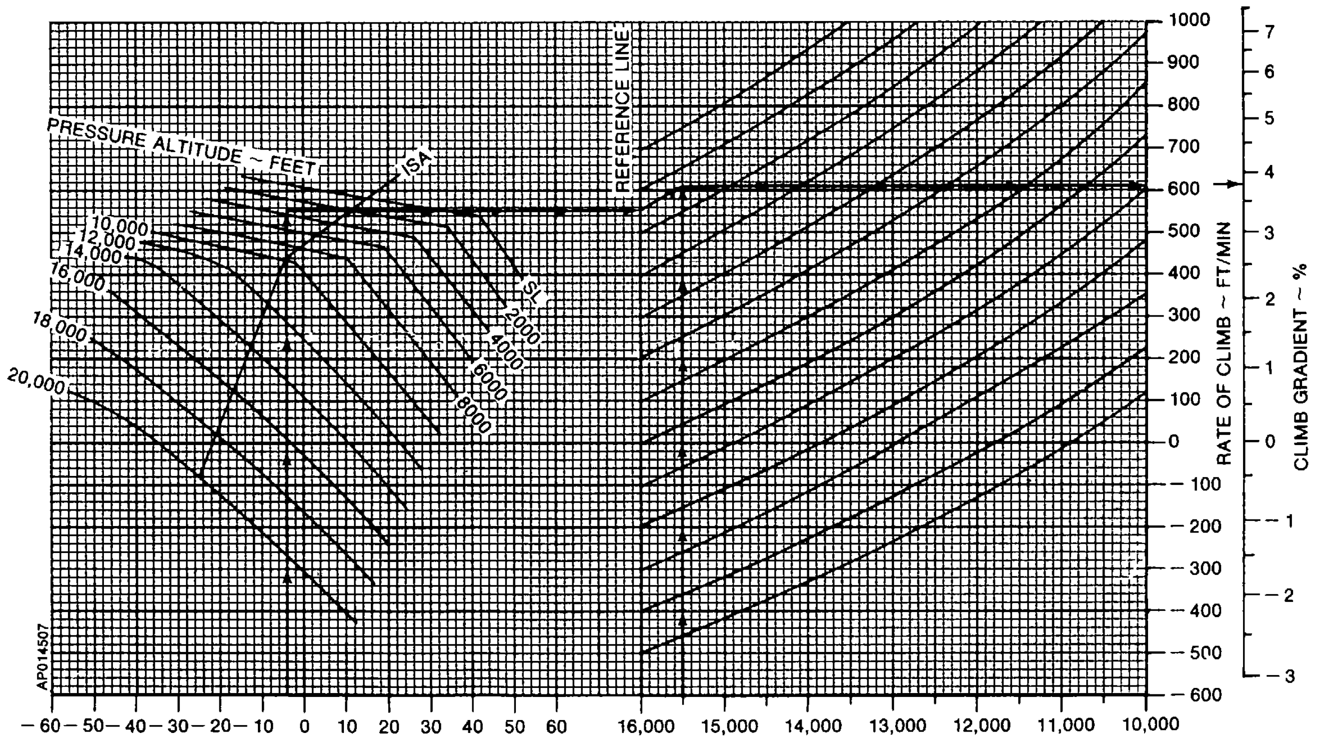


Figure 7-34. Climb - One Engine Inoperative

SERVICE CEILING - ONE ENGINE INOPERATIVE

ASSOCIATED CONDITIONS	
POWER	MAXIMUM CONTINUOUS
LANDING GEAR	UP
INOPERATIVE PROPELLER	FEATHERED
FLAPS	UP

EXAMPLE	
FAT	− 4°C
WEIGHT	15,500 LBS
SERVICE CEILING	16,200 FT

NOTE 1 SERVICE CEILING IS THE MAXIMUM ALTITUDE AT WHICH THE AIRPLANE IS CAPABLE OF CLIMBING 50 FEET PER MINUTE WITH ONE PROPELLER FEATHERED

2 DURING OPERATION WITH ICE VANES EXTENDED, THE SERVICE CEILING WILL BE LOWERED APPROXIMATELY 2000 FEET

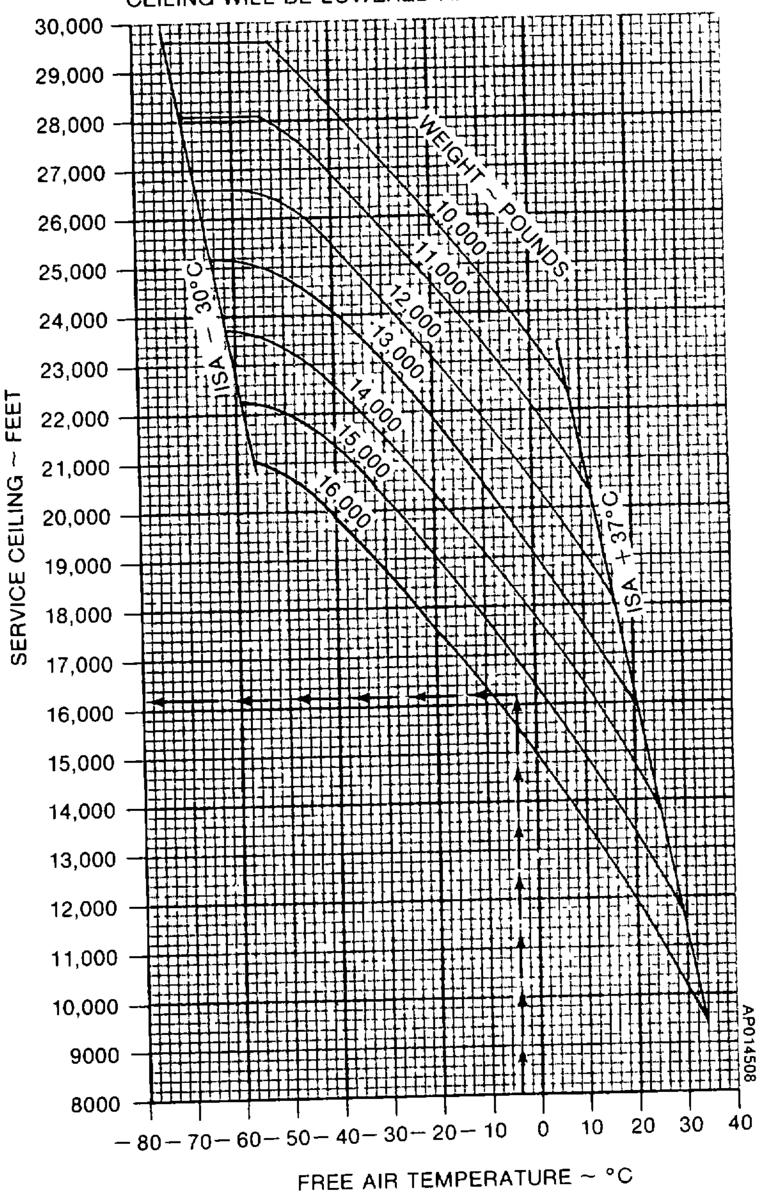


Figure 7-35. Service Ceiling - One Engine Inoperative

TIME, FUEL, AND DISTANCE TO CRUISE CLIMB

ASSOCIATED CONDITIONS

PROPELLER SPEED 1700 RPM
POWER NORMAL CLIMB

ALTITUDE ~ FEET	CLIMB SPEED ~ KNOTS
SL TO 10,000	160
10,000 TO 20,000	140
20,000 TO 25,000	130
25,000 TO 35,000	120

NOTES 1 ADD 110 POUNDS FUEL FOR START, TAXI, AND TAKEOFF
2 FOR OPERATION WITH ICE VANES EXTENDED, ADD 15°C TO THE ACTUAL FAT BEFORE ENTERING GRAPH

EXAMPLE

FAT AT TAKEOFF	15°C
FAT AT CRUISE	−40°C
AIRPORT PRESSURE ALTITUDE	3499 FT
CRUISE ALTITUDE	25,000 FT
INITIAL CLIMB WEIGHT	16,000 LBS
TIME TO CLIMB (18 3 — 1 4)	16 9 MIN
FUEL TO CLIMB (310 — 30)	280 LBS
DISTANCE TO CLIMB (52 5 — 4 3)	48 NM

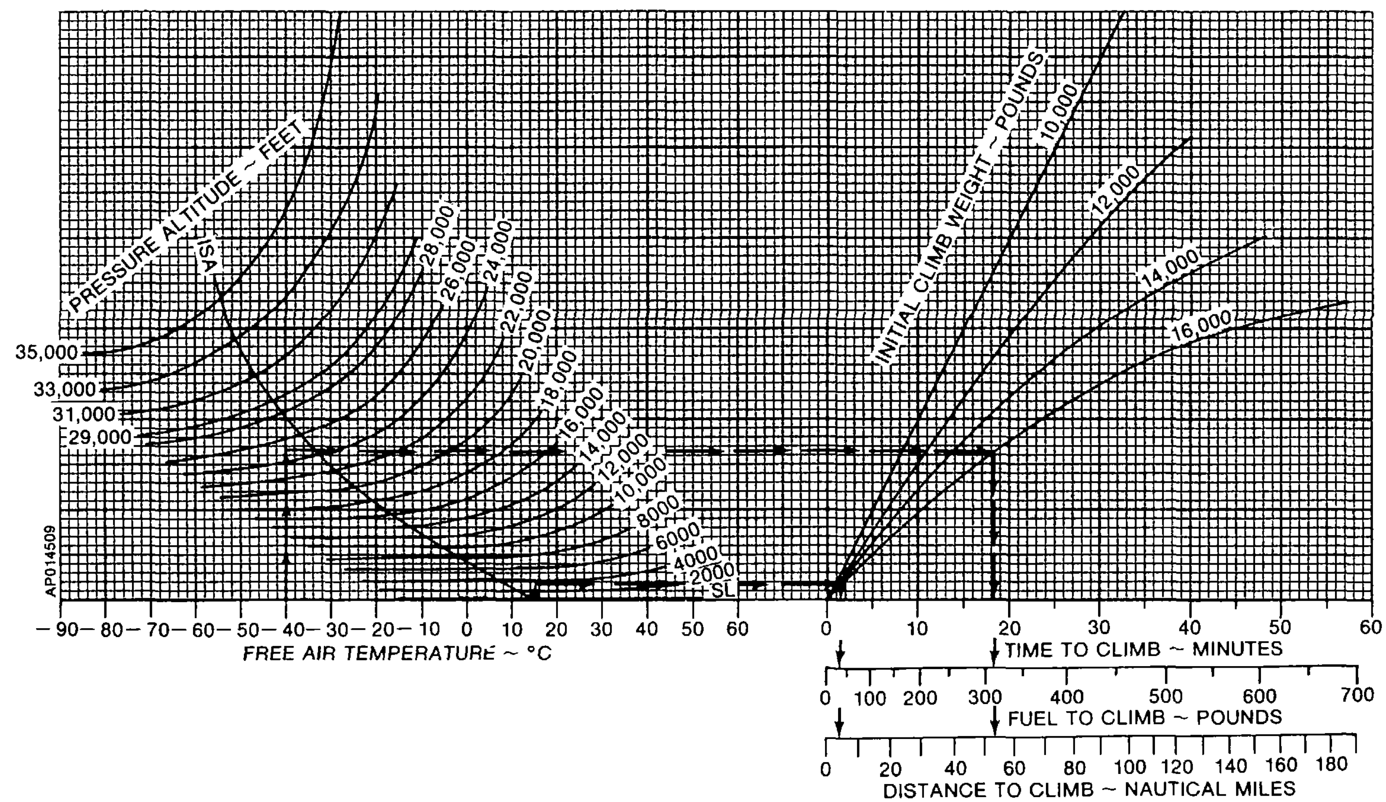


Figure 7-36. Time, Fuel, and Distance to Cruise Climb

MAXIMUM CRUISE POWER
1700 RPM
ISA -30 °C

WEIGHT→			12,000 POUNDS					10,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	-10	-15	91	622	1244	232	223	91	622	1244	233	224
2000	-14	-19	91	603	1206	231	229	91	603	1206	233	230
4000	-18	-23	91	586	1172	231	235	91	586	1172	233	236
6000	-22	-27	91	572	1144	229	240	91	572	1144	231	241
8000	-25	-31	91	560	1120	227	245	91	560	1120	228	246
10,000	-29	-35	91	553	1106	226	251	91	552	1104	228	252
12,000	-33	-39	91	547	1094	225	256	91	547	1094	226	258
14,000	-37	-43	91	544	1088	223	262	91	543	1086	224	263
16,000	-40	-47	91	541	1082	221	268	91	541	1082	223	270
18,000	-44	-51	91	540	1080	219	274	91	539	1078	221	276
20,000	-47	-55	91	539	1078	218	280	91	539	1078	220	282
22,000	-51	-59	88	527	1054	214	284	89	528	1056	215	286
24,000	-55	-63	83	499	998	207	284	83	500	1000	209	287
26,000	-59	-67	77	466	932	198	282	77	467	934	201	285
28,000	-64	-70	70	425	850	188	277	70	427	854	192	281
29,000	-66	-72	66	404	808	183	274	66	406	812	186	279
31,000	-70	-76	59	364	728	172	267	60	367	734	176	273
33,000	-75	-80	52	328	656	161	259	53	331	662	166	267
35,000	-79	-84	46	290	580	147	247	46	294	588	154	258

NOTES:
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points =50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

IFAT based on 14,000 pounds.

Figure 7-37. Maximum Cruise Power - 1700 RPM - ISA -30°C (Sheet 1 of 2)

MAXIMUM CRUISE POWER
1700 RPM
ISA -30 °C

WEIGHT→			16,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	-10	-15	91	623	1246	229	220	91	622	1244	231	222
2000	-14	-19	91	604	1208	228	226	91	604	1208	230	228
4000	-18	-23	91	587	1174	228	232	91	587	1174	230	234
6000	-22	-27	91	573	1146	226	237	91	572	1144	228	238
8000	-25	-31	91	560	1120	224	241	91	560	1120	226	243
10,000	-29	-35	91	554	1108	223	247	91	553	1106	225	249
12,000	-33	-39	91	548	1096	221	252	91	548	1096	223	254
14,000	-37	-43	91	544	1088	219	258	91	544	1088	221	260
16,000	-40	-47	91	542	1084	217	263	91	542	1084	219	266
18,000	-44	-51	91	541	1082	215	269	91	540	1080	218	272
20,000	-47	-55	91	541	1082	214	275	91	540	1080	216	278
22,000	-51	-59	88	526	1052	208	277	88	526	1052	211	281
24,000	-55	-63	83	497	994	201	276	83	498	996	204	280
26,000	-59	-67	76	462	924	191	272	77	464	928	195	278
28,000	-64	-70	68	419	838	179	265	69	422	844	185	272
29,000	-66	-72	65	397	794	173	260	65	401	802	179	268
31,000	-70	-76	57	356	712	159	248	58	361	722	167	259
33,000	-75	-80	51	319	638	143	232	51	323	646	153	248
35,000	-79	-84	---	---	---	---	---	45	287	574	137	232

NOTES:
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points = 50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

IFAT based on 14,000 pounds.

Figure 7-37. Maximum Cruise Power - 1700 RPM - ISA -30°C (Sheet 2 of 2)

MAXIMUM CRUISE POWER
1700 RPM
ISA -20°C

WEIGHT→			12,000 POUNDS					10,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	0	-5	91	624	1248	231	227	91	624	1248	232	228
2000	-4	-9	91	604	1208	231	233	91	604	1208	232	234
4000	-8	-13	91	587	1174	229	238	91	587	1174	231	239
6000	-11	-17	91	572	1144	228	244	91	571	1142	230	245
8000	-15	-21	91	563	1126	226	249	91	563	1126	228	250
10,000	-19	-25	91	556	1112	224	254	91	555	1110	226	255
12,000	-23	-29	91	549	1098	222	259	91	549	1098	224	261
14,000	-26	-33	91	545	1090	221	265	91	544	1088	222	267
16,000	-30	-37	91	541	1082	219	271	91	541	1082	221	273
18,000	-34	-41	91	539	1078	217	278	91	539	1078	219	280
20,000	-37	-45	89	531	1062	214	282	89	531	1062	216	284
22,000	-41	-49	84	501	1002	207	282	84	502	1004	209	284
24,000	-45	-53	79	472	944	200	281	79	473	946	202	284
26,000	-50	-57	73	441	882	192	280	73	442	884	195	283
28,000	-54	-60	67	410	820	183	277	68	411	822	187	281
29,000	-56	-62	65	395	790	179	275	65	396	792	182	280
31,000	-60	-66	59	362	724	170	270	59	364	728	174	276
33,000	-65	-70	52	327	654	158	262	53	330	660	164	270
35,000	-69	-74	46	290	580	145	250	47	295	590	152	262

NOTES:

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points = 50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

IFAT based on 14,000 pounds.

Figure 7-38. Maximum Cruise Power - 1700 RPM - ISA -20°C (Sheet 1 of 2)

MAXIMUM CRUISE POWER
1700 RPM
ISA -20°C

WEIGHT→			16,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	0	-5	91	625	1250	228	224	91	624	1248	230	225
2000	-4	-9	91	605	1210	228	230	91	605	1210	229	231
4000	-8	-13	91	588	1176	226	235	91	587	1174	228	237
6000	-11	-17	91	573	1146	225	240	91	572	1144	227	242
8000	-15	-21	91	564	1128	223	245	91	563	1126	225	247
10,000	-19	-25	91	556	1112	221	250	91	556	1112	223	252
12,000	-23	-29	91	550	1100	219	255	91	550	1100	221	257
14,000	-26	-33	91	545	1090	217	261	91	545	1090	219	263
16,000	-30	-37	91	542	1084	215	266	91	541	1082	217	269
18,000	-34	-41	91	540	1080	213	272	91	540	1080	216	275
20,000	-37	-45	89	530	1060	209	276	89	530	1060	212	279
22,000	-41	-49	84	500	1000	201	274	84	501	1002	204	278
24,000	-45	-53	78	470	940	193	272	78	471	942	197	277
26,000	-50	-57	72	439	878	184	269	73	440	880	189	275
28,000	-54	-60	67	407	814	174	264	67	409	818	179	271
29,000	-56	-62	64	391	782	169	260	64	393	786	175	269
31,000	-60	-66	57	356	712	156	250	58	360	720	164	262
33,000	-65	-70	52	319	638	140	233	52	323	646	151	251
35,000	-69	-74	---	---	---	---	---	45	287	574	135	233

NOTES:
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points = 50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

IFAT based on 14,000 pounds.

Figure 7-38. Maximum Cruise Power - 1700 RPM - ISA -20°C (Sheet 2 of 2)

MAXIMUM CRUISE POWER
1700 RPM
ISA -10 °C

WEIGHT→			12,000 POUNDS					10,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	10	5	91	625	1250	230	230	91	625	1250	232	231
2000	6	1	91	604	1208	230	236	91	604	1208	231	237
4000	2	-3	91	588	1176	229	242	91	587	1174	230	243
6000	-1	-7	91	575	1150	226	246	91	575	1150	228	248
8000	-5	-11	91	565	1130	224	251	91	565	1130	226	253
10,000	-9	-15	91	557	1114	222	257	91	557	1114	224	258
12,000	-13	-19	91	550	1100	221	262	91	550	1100	222	264
14,000	-16	-23	91	545	1090	219	268	91	544	1088	220	270
16,000	-20	-27	91	541	1082	217	275	91	540	1080	219	277
18,000	-24	-31	89	529	1058	213	279	89	529	1058	215	281
20,000	-28	-35	85	504	1008	207	279	85	504	1008	209	282
22,000	-32	-39	79	476	952	200	279	80	476	952	202	282
24,000	-36	-43	74	447	894	193	278	74	447	894	195	281
26,000	-40	-47	69	417	834	185	276	69	418	836	188	280
28,000	-44	-50	64	388	776	177	273	64	388	776	180	278
29,000	-46	-52	61	373	746	172	271	61	374	748	176	277
31,000	-50	-56	56	345	690	163	267	56	347	694	168	274
33,000	-55	-60	51	318	636	154	262	51	320	640	159	270
35,000	-59	-64	46	290	580	143	253	46	293	586	150	265

NOTES:
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points = 50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

IFAT based on 14,000 pounds.

Figure 7-39. Maximum Cruise Power - 1700 RPM - ISA -10°C (Sheet 1 of 2)

MAXIMUM CRUISE POWER
1700 RPM
ISA -20°C

WEIGHT→			16,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	10	5	91	626	1252	227	227	91	625	1250	229	229
2000	6	1	91	605	1210	227	233	91	605	1210	228	235
4000	2	-3	91	589	1178	225	238	91	588	1176	227	240
6000	-1	-7	91	576	1152	223	243	91	576	1152	225	245
8000	-5	-11	91	566	1132	221	247	91	565	1130	223	250
10,000	-9	-15	91	558	1116	219	252	91	557	1114	221	255
12,000	-13	-19	91	551	1102	217	258	91	550	1100	219	260
14,000	-16	-23	91	545	1090	215	264	91	545	1090	217	266
16,000	-20	-27	91	542	1084	213	270	91	541	1082	215	272
18,000	-24	-31	89	529	1058	209	273	89	529	1058	211	276
20,000	-28	-35	84	504	1008	202	272	84	504	1008	205	276
22,000	-32	-39	79	475	950	194	271	79	475	950	197	275
24,000	-36	-43	74	446	892	186	268	74	446	892	190	274
26,000	-40	-47	68	415	830	176	264	69	416	832	181	271
28,000	-44	-50	63	385	770	166	258	63	386	772	172	267
29,000	-46	-52	60	370	740	161	254	61	372	744	167	264
31,000	-50	-56	55	341	682	149	244	55	344	688	157	258
33,000	-55	-60	49	312	624	133	227	50	316	632	146	249
35,000	-59	-64	---	---	---	---	---	45	287	574	132	234

NOTES:

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points = 50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

IFAT based on 14,000 pounds.

Figure 7-39. Maximum Cruise Power - 1700 RPM - ISA -10°C (Sheet 2 of 2)

MAXIMUM CRUISE POWER
1700 RPM
ISA

WEIGHT→			12,000 POUNDS					10,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	20	15	91	626	1252	231	225	91	626	1252	232	236
2000	16	11	91	609	1218	229	239	91	608	1216	230	241
4000	12	7	91	593	1186	227	244	91	592	1184	228	245
6000	9	3	91	579	1158	224	249	91	578	1156	226	250
8000	5	-1	91	567	1134	222	254	91	566	1132	224	256
10,000	1	-5	91	556	1112	221	260	91	556	1112	222	261
12,000	-2	-9	91	548	1096	219	265	91	548	1096	220	267
14,000	-6	-13	91	544	1088	217	272	91	543	1086	219	273
16,000	-10	-17	88	527	1054	213	275	89	528	1056	214	277
18,000	-14	-21	83	497	994	206	274	83	497	994	208	277
20,000	-18	-25	79	471	942	199	275	79	472	944	201	278
22,000	-22	-29	74	446	892	192	274	74	446	892	195	278
24,000	-26	-33	69	420	840	185	274	70	420	840	188	277
26,000	-30	-37	65	394	788	178	272	65	394	788	181	277
28,000	-34	-40	60	367	734	170	269	60	368	736	174	275
29,000	-36	-42	57	354	708	166	267	58	355	710	170	273
31,000	-41	-46	53	328	656	157	263	53	328	656	162	270
33,000	-45	-50	48	302	604	147	256	48	303	606	153	266
35,000	-50	-54	43	276	552	136	246	44	277	554	144	260

NOTES:
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points =50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

IFAT based on 14,000 pounds.

Figure 7-40. Maximum Cruise Power - 1700 RPM - ISA (Sheet 1 of 2)

MAXIMUM CRUISE POWER
1700 RPM
ISA

WEIGHT→			16,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	20	15	91	627	1254	228	231	91	627	1254	229	233
2000	16	11	91	610	1220	226	236	91	609	1218	227	238
4000	12	7	91	594	1188	223	240	91	593	1186	225	242
6000	9	3	91	580	1160	221	245	91	579	1158	223	247
8000	5	-1	91	568	1136	219	250	91	567	1134	221	252
10,000	1	-5	91	557	1114	217	255	91	557	1114	219	257
12,000	-2	-9	91	549	1198	215	261	91	548	1096	217	263
14,000	-6	-13	91	544	1088	213	267	91	544	1088	215	269
16,000	-10	-17	88	526	1052	208	269	88	527	1054	211	272
18,000	-14	-21	83	496	992	200	268	83	497	994	203	271
20,000	-18	-25	78	470	940	193	267	79	471	942	197	271
22,000	-22	-29	74	445	890	186	265	74	445	890	189	270
24,000	-26	-33	69	418	836	177	262	69	419	838	182	269
26,000	-30	-37	64	392	784	168	258	64	393	786	174	266
28,000	-34	-40	59	365	730	158	251	60	366	732	165	262
29,000	-36	-42	57	351	702	152	247	57	353	706	160	259
31,000	-41	-46	51	324	648	139	235	52	326	652	150	252
33,000	-45	-50	---	---	---	---	---	47	300	600	138	241
35,000	-50	-54	---	---	---	---	---	42	273	546	121	221

NOTES:

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points = 50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

IFAT based on 14,000 pounds.

Figure 7-40. Maximum Cruise Power - 1700 RPM - ISA (Sheet 2 of 2)

MAXIMUM CRUISE POWER
1700 RPM
ISA +10°C

WEIGHT→			12,000 POUNDS					10,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	30	25	91	632	1264	229	237	91	632	1264	230	238
2000	26	21	91	613	1226	227	242	91	612	1224	228	243
4000	23	17	91	595	1190	225	246	91	595	1190	226	248
6000	19	13	91	581	1162	223	251	91	580	1160	224	253
8000	15	9	91	568	1136	221	257	91	568	1136	222	258
10,000	11	5	91	557	1114	219	263	91	556	1112	221	264
12,000	8	1	91	548	1096	217	269	91	548	1096	219	270
14,000	4	-3	87	522	1044	212	270	87	523	1046	213	272
16,000	0	-7	82	492	984	205	270	82	492	984	207	272
18,000	-4	-11	77	463	926	198	269	77	464	928	200	272
20,000	-8	-15	73	438	876	191	269	73	439	878	193	272
22,000	-12	-19	68	413	826	184	268	68	414	828	187	272
24,000	-16	-23	64	388	776	177	267	64	388	776	180	271
26,000	-20	-27	59	364	728	169	265	60	364	728	173	270
28,000	-25	-30	55	341	682	162	263	56	342	684	166	269
29,000	-27	-32	53	330	660	158	261	54	331	662	163	268
31,000	-31	-36	49	307	614	149	256	49	308	616	155	265
33,000	-36	-40	45	284	568	139	249	45	285	570	146	261
35,000	-40	-44	40	260	520	128	238	41	262	524	137	254

NOTES:
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points =50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

IFAT based on 14,000 pounds.

Figure 7-41. Maximum Cruise Power - 1700 RPM - ISA +10°C (Sheet 1 of 2)

MAXIMUM CRUISE POWER
1700 RPM
ISA +10°C

WEIGHT→			16,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	30	25	91	633	1266	226	234	91	633	1266	228	236
2000	26	21	91	614	1228	224	238	91	613	1226	225	240
4000	23	17	91	596	1192	221	243	91	596	1192	223	245
6000	19	13	91	582	1164	219	247	91	581	1162	221	250
8000	15	9	91	569	1138	217	252	91	568	1136	219	255
10,000	11	5	91	557	1114	215	258	91	557	1114	217	260
12,000	8	1	91	549	1098	213	264	91	549	1098	215	266
14,000	4	-3	87	521	1042	207	264	87	522	1044	209	267
16,000	0	-7	82	591	982	199	263	82	492	984	202	267
18,000	-4	-11	77	462	924	192	261	77	463	926	195	266
20,000	-8	-15	72	437	874	184	259	72	438	876	188	265
22,000	-12	-19	68	412	824	176	257	68	413	826	181	263
24,000	-16	-23	63	387	774	167	253	63	387	774	173	261
26,000	-20	-27	59	362	724	158	248	59	363	726	165	258
28,000	-25	-30	54	339	678	148	241	55	340	680	156	254
29,000	-27	-32	52	327	654	142	236	53	329	658	151	251
31,000	-31	-36	48	303	606	125	216	49	306	612	141	243
33,000	-36	-40	---	---	---	---	---	44	281	562	127	229
35,000	-40	-44	---	---	---	---	---	---	---	---	---	---

NOTES:

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points =50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

IFAT based on 14,000 pounds.

Figure 7-41. Maximum Cruise Power - 1700 RPM - ISA +10°C (Sheet 2 of 2)

MAXIMUM CRUISE POWER
1700 RPM
ISA +20 ° C

WEIGHT→			12,000 POUNDS					10,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	40	35	91	636	1272	227	239	91	636	1272	229	241
2000	36	31	91	616	1232	225	244	91	615	1230	226	245
4000	33	27	91	596	1192	223	249	91	596	1192	224	250
6000	29	23	91	581	1162	221	254	91	581	1162	223	256
8000	25	19	91	569	1138	219	259	91	569	1138	221	261
10,000	21	15	88	544	1088	214	262	88	544	1088	216	264
12,000	17	11	83	513	1026	208	262	83	513	1026	210	264
14,000	13	7	79	484	968	202	263	79	484	968	204	265
16,000	10	3	75	456	912	196	263	75	456	912	198	266
18,000	6	-1	70	429	858	189	263	71	429	858	191	266
20,000	1	-5	66	402	804	182	261	66	403	806	185	265
22,000	-3	-9	62	379	758	175	260	62	380	760	178	265
24,000	-7	-13	58	355	710	167	258	58	356	712	171	264
26,000	-11	-17	54	334	668	160	256	54	335	670	164	263
28,000	-15	-20	50	315	630	153	254	51	315	630	158	262
29,000	-17	-22	49	305	610	149	252	49	306	612	154	261
31,000	-22	-26	45	284	568	140	246	45	285	570	147	258
33,000	-26	-30	41	262	524	129	237	41	263	526	138	252
35,000	-30	-34	---	---	---	---	---	37	241	482	128	244

NOTES:
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points =50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

IFAT based on 14,000 pounds.

Figure 7-42. Maximum Cruise Power - 1700 RPM - ISA +20°C (Sheet I of 2)

MAXIMUM CRUISE POWER
1700 RPM
ISA +20°C

WEIGHT→			16,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	40	35	91	637	1274	224	236	91	637	1274	226	238
2000	36	31	91	616	1232	222	240	91	616	1232	224	242
4000	33	27	91	597	1194	219	245	91	597	1194	221	247
6000	29	23	91	582	1164	217	250	91	581	1162	219	252
8000	25	19	91	570	1140	215	255	91	570	1140	217	257
10,000	21	15	87	543	1186	210	256	88	543	1086	212	259
12,000	17	11	83	512	1024	203	256	83	512	1024	206	259
14,000	13	7	79	483	966	196	255	79	483	966	199	259
16,000	10	3	74	454	908	189	254	75	455	910	193	259
18,000	6	-1	70	427	854	182	253	70	428	856	186	258
20,000	1	-5	65	401	802	173	250	66	402	804	178	256
22,000	-3	-9	61	377	754	165	246	62	378	756	170	254
24,000	-7	-13	57	354	708	155	241	57	355	710	162	251
26,000	-11	-17	53	332	664	145	233	53	333	666	154	247
28,000	-15	-20	49	311	622	133	222	50	314	628	145	242
29,000	-17	-22	47	301	602	124	212	48	303	606	141	239
31,000	-22	-26	---	---	---	---	---	44	282	564	128	227
33,000	-26	-30	---	---	---	---	---	---	---	---	---	---
35,000	-30	-34	---	---	---	---	---	---	---	---	---	---

NOTES:
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points = 50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

IFAT based on 14,000 pounds.

Figure 7-42. Maximum Cruise Power - 1700 RPM - ISA +20°C (Sheet 2 of 2)

MAXIMUM CRUISE POWER
1700 RPM
ISA +30 °C

WEIGHT→			12,000 POUNDS					10,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	50	45	91	636	1272	226	242	91	636	1272	227	243
2000	47	41	91	617	1234	224	246	91	617	1234	225	248
4000	43	37	89	591	1182	220	249	89	591	1182	221	251
6000	39	33	86	562	1124	215	251	86	562	1124	216	253
8000	35	29	83	534	1068	210	253	83	534	1068	211	255
10,000	31	25	79	506	1012	204	254	79	506	1012	206	256
12,000	27	21	75	475	950	198	254	75	475	950	200	257
14,000	23	17	71	445	890	191	253	71	446	892	194	257
16,000	19	13	66	417	834	184	253	67	418	836	187	256
18,000	15	9	62	390	780	177	252	62	390	780	180	256
20,000	11	5	58	364	728	170	250	58	365	730	173	255
22,000	7	1	54	343	686	163	248	55	344	688	167	254
24,000	3	-3	51	322	644	156	246	51	322	644	161	253
26,000	-1	-7	48	303	606	149	244	48	304	608	154	252
28,000	-6	-10	45	287	574	142	242	45	288	576	148	252
29,000	-8	-12	44	278	556	138	240	44	279	558	145	251
31,000	-11	-16	40	259	518	129	232	41	261	522	138	247
33,000	-15	-20	---	---	---	---	---	37	241	482	128	240
35,000	---	---	---	---	---	---	---	---	---	---	---	---

NOTES:
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points =50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

IFAT based on 14,000 pounds.

Figure 7-43. Maximum Cruise Power - 1700 RPM - ISA +30°C (Sheet 1 of 2)

MAXIMUM CRUISE POWER
1700 RPM
ISA +30°C

WEIGHT→			16,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	50	45	91	638	1276	223	238	91	637	1274	225	240
2000	47	41	91	618	1236	220	242	91	618	1236	222	244
4000	43	37	89	591	1182	216	245	89	591	1182	218	247
6000	39	33	86	562	1124	210	246	86	562	1124	213	249
8000	35	29	82	533	1066	205	247	83	533	1066	207	250
10,000	31	25	79	505	1010	199	248	79	506	1012	202	251
12,000	27	21	74	474	948	192	246	75	474	948	195	251
14,000	23	17	70	444	888	184	245	70	445	890	188	250
16,000	19	13	66	416	832	176	242	66	416	832	181	248
18,000	15	9	61	388	776	168	239	62	389	778	173	246
20,000	11	5	57	362	724	159	234	58	363	726	165	243
22,000	7	1	54	341	682	150	229	54	342	684	158	240
24,000	3	-3	50	320	640	140	222	51	321	642	150	237
26,000	-1	-7	47	301	602	128	210	47	302	604	142	232
28,000	-6	-10	---	---	---	---	---	44	285	570	132	225
29,000	-8	-12	---	---	---	---	---	43	276	552	126	220
31,000	-11	-16	---	---	---	---	---	---	---	---	---	---
33,000	-15	-20	---	---	---	---	---	---	---	---	---	---
35,000	---	---	---	---	---	---	---	---	---	---	---	---

NOTES:

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points = 50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

IFAT based on 14,000 pounds.

Figure 7-43. Maximum Cruise Power - 1700 RPM - ISA t 30°C (Sheet 2 of 2)

MAXIMUM CRUISE POWER
1700 RPM
ISA +37°C

WEIGHT→			12,000 POUNDS					10,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	57	52	86	623	1246	221	238	86	623	1246	222	240
2000	53	48	84	592	1184	216	241	84	592	1184	218	242
4000	49	44	81	563	1126	212	243	82	563	1126	213	245
6000	46	40	79	536	1072	207	245	79	536	1072	209	247
8000	42	36	76	509	1018	202	247	76	509	1018	204	249
10,000	38	32	73	481	962	197	248	73	481	962	199	251
12,000	34	28	69	449	898	190	247	69	449	898	192	250
14,000	30	24	64	419	838	183	246	65	420	840	186	250
16,000	26	20	60	391	782	176	245	60	391	782	179	249
18,000	22	16	56	363	726	168	242	56	364	728	172	247
20,000	17	12	52	337	674	160	239	52	338	676	165	245
22,000	13	8	49	317	634	154	237	49	318	636	158	244
24,000	9	4	46	297	594	147	235	46	298	596	152	243
26,000	5	0	43	281	562	140	232	43	281	562	146	242
28,000	0	-3	41	266	532	133	230	41	267	534	141	242
29,000	-2	-5	40	259	518	129	227	40	260	520	138	242
31,000	-6	-9	---	---	---	---	---	37	244	488	130	238
33,000	---	---	---	---	---	---	---	---	---	---	---	---
35,000	---	---	---	---	---	---	---	---	---	---	---	---

NOTES:
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points = 50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

IFAT based on 14,000 pounds.

Figure 7-44. Maximum Cruise Power - 1700 RPM - ISA +37°C (Sheet 1 of 2)

MAXIMUM CRUISE POWER
1700 RPM
ISA +37°C

WEIGHT→			16,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	57	52	86	623	1246	217	234	86	623	1246	219	236
2000	53	48	83	592	1184	212	236	84	592	1184	214	239
4000	49	44	81	563	1126	207	238	81	563	1126	210	241
6000	46	40	79	535	1070	202	239	79	536	1072	205	242
8000	42	36	76	508	1016	197	240	76	508	1016	200	244
10,000	38	32	73	480	960	191	241	73	481	962	194	245
12,000	34	28	68	448	896	183	238	68	449	898	187	243
14,000	30	24	64	418	836	175	236	64	419	838	180	242
16,000	26	20	59	389	778	167	232	60	390	780	172	239
18,000	22	16	55	361	722	157	226	56	362	724	164	236
20,000	17	12	50	334	668	146	218	51	336	672	155	231
22,000	13	8	47	314	628	136	211	48	316	632	147	227
24,000	9	4	44	295	590	121	196	45	296	592	138	222
26,000	5	0	---	---	---	---	---	42	280	560	129	216
28,000	0	-3	---	---	---	---	---	---	---	---	---	---
29,000	-2	-5	---	---	---	---	---	---	---	---	---	---
31,000	-6	-9	---	---	---	---	---	---	---	---	---	---
33,000	---	---	---	---	---	---	---	---	---	---	---	---
35,000	---	---	---	---	---	---	---	---	---	---	---	---

NOTES:

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points = 50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

IFAT based on 14,000 pounds.

Figure 7-44. Maximum Cruise Power - 1700 RPM - ISA +37°C (Sheet 2 of 2)

MAXIMUM CRUISE SPEEDS

1700 RPM

WEIGHT: 14,000 LBS

NOTE: DURING OPERATION WITH ICE VANES EXTENDED, TRUE AIRSPEED WILL BE REDUCED APPROXIMATELY 30 KNOTS IF ORIGINAL POWER IS NOT OR CANNOT BE RESET, BUT WILL BE UNCHANGED IF THE ORIGINAL POWER IS RESET

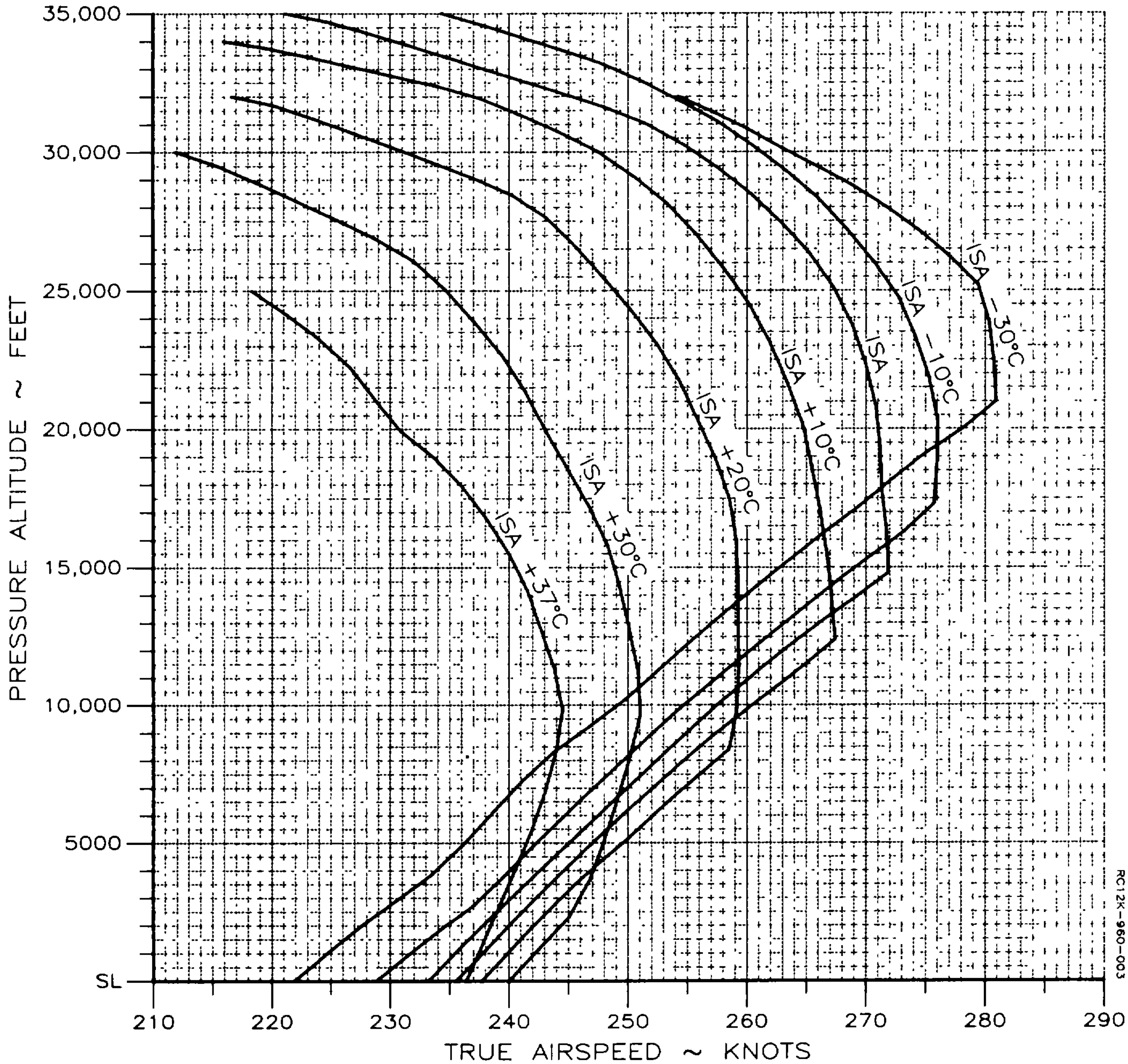


Figure 7-45. Maximum Cruise Speeds

MAXIMUM CRUISE SPEEDS

1700 RPM

WEIGHT: 14,000 LBS

NOTE: DURING OPERATION WITH ICE VANES EXTENDED, TORQUE WILL DECREASE APPROXIMATELY 14 PERCENTAGE POINTS. (EXAMPLE 65% − 14% = 51%.) IF DESIRED, ORIGINAL POWER MAY BE RESET, PROVIDED ITT LIMIT IS NOT EXCEEDED.

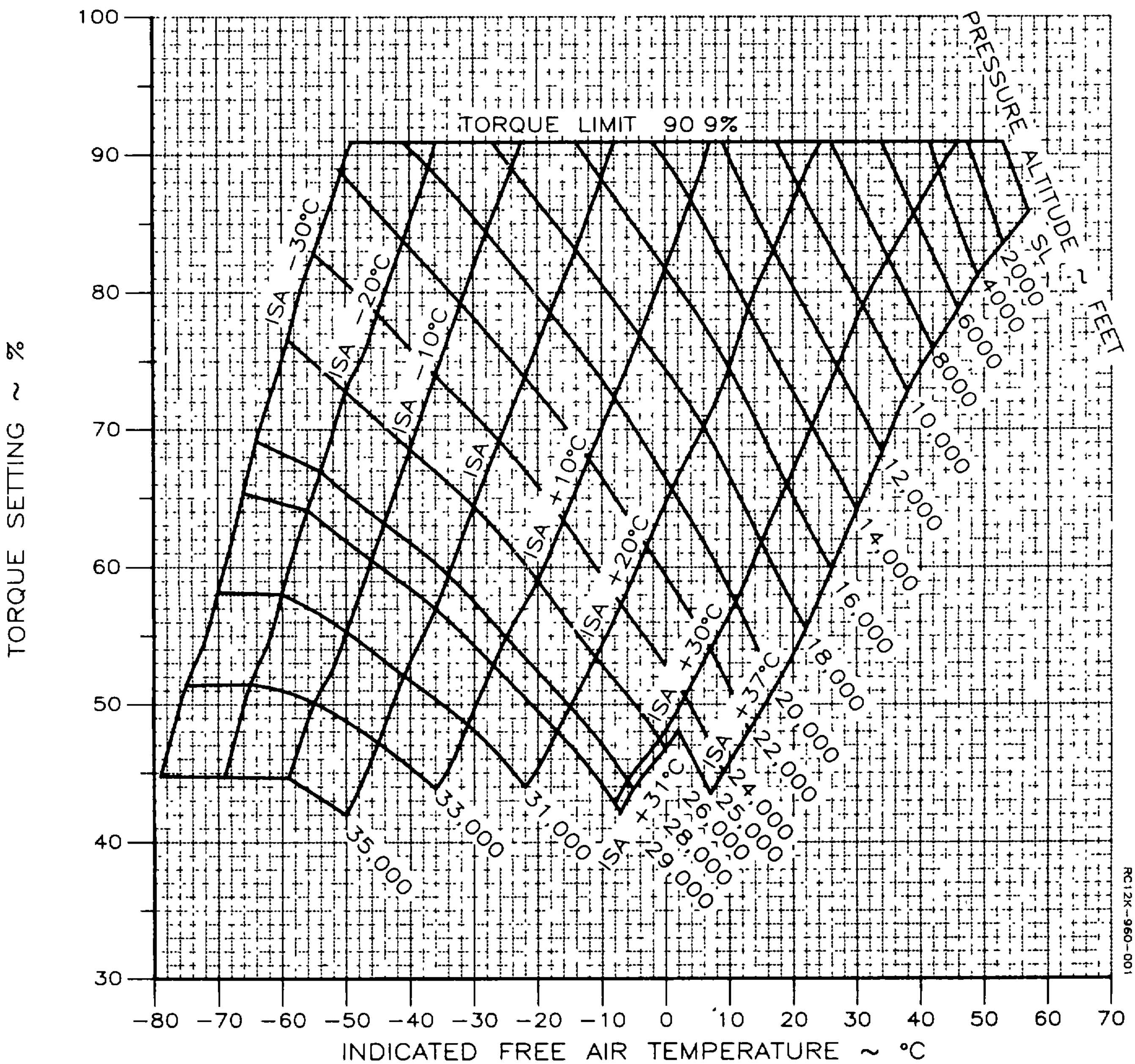


Figure 7-46. Maximum Cruise Power

FUEL FLOW AT MAXIMUM CRUISE POWER

1700 RPM

WEIGHT: 14,000 LBS

NOTE: DURING OPERATION WITH ICE VANES EXTENDED, FUEL FLOW WILL DECREASE APPROXIMATELY 8% IF ORIGINAL POWER IS NOT OR CANNOT BE RESET. IF ORIGINAL POWER IS RESET, FUEL FLOW WILL INCREASE APPROXIMATELY 35 LBS/HR/ENG.

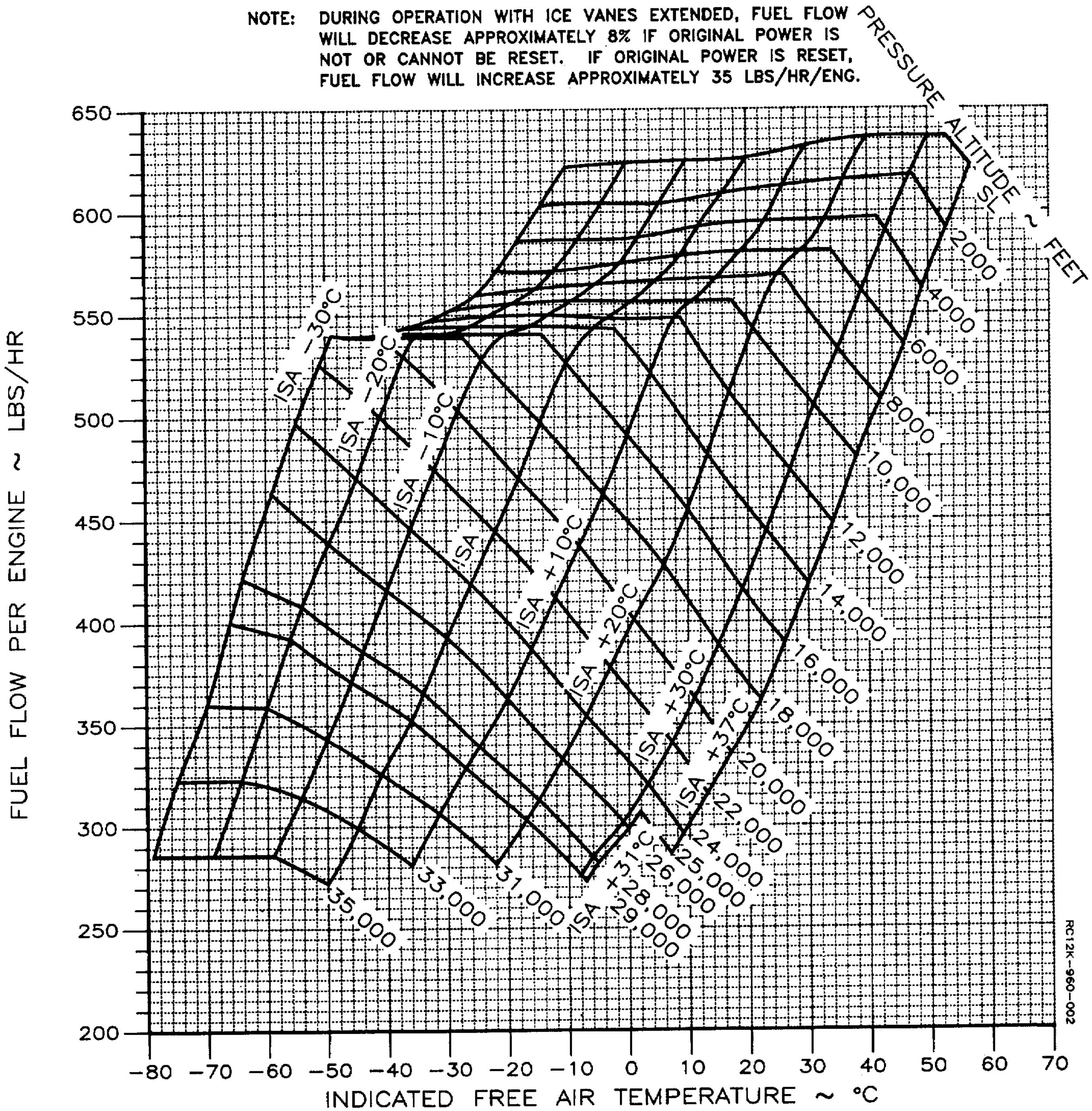


Figure 7-47. Fuel Flow at Maximum Cruise Power

RANGE PROFILE - MAXIMUM CRUISE POWER

1700 RPM

STANDARD DAY (ISA)
ZERO WIND

ASSOCIATED CONDITIONS:
WEIGHT ....*16,110 LBS BEFORE ENGINE START
FUEL...........AVIATION KEROSENE
FUEL DENSITY ....6.7 LBS/GAL
ICE VANES.......RETRACTED

EXAMPLE:
PRESSURE ALTITUDE.....26,000 FT
FUEL................2572 LBS
RANGE...............631 NM

NOTES: 1. RANGE SHOWN ALLOWS FOR START, TAXI, AND RUNUP; INCLUDES CRUISE CLIMB AND DESCENT; AND ALLOWS FOR 45 MINUTES RESERVE FUEL AT MAXIMUM RANGE POWER.

*2. AT 16,110 LBS RAMP WEIGHT, THE MAXIMUM ZERO-FUEL WEIGHT LIMITATION OF 12,700 LBS WOULD BE EXCEEDED AT ALL FUEL LOADINGS LESS THAN 3410 LBS.

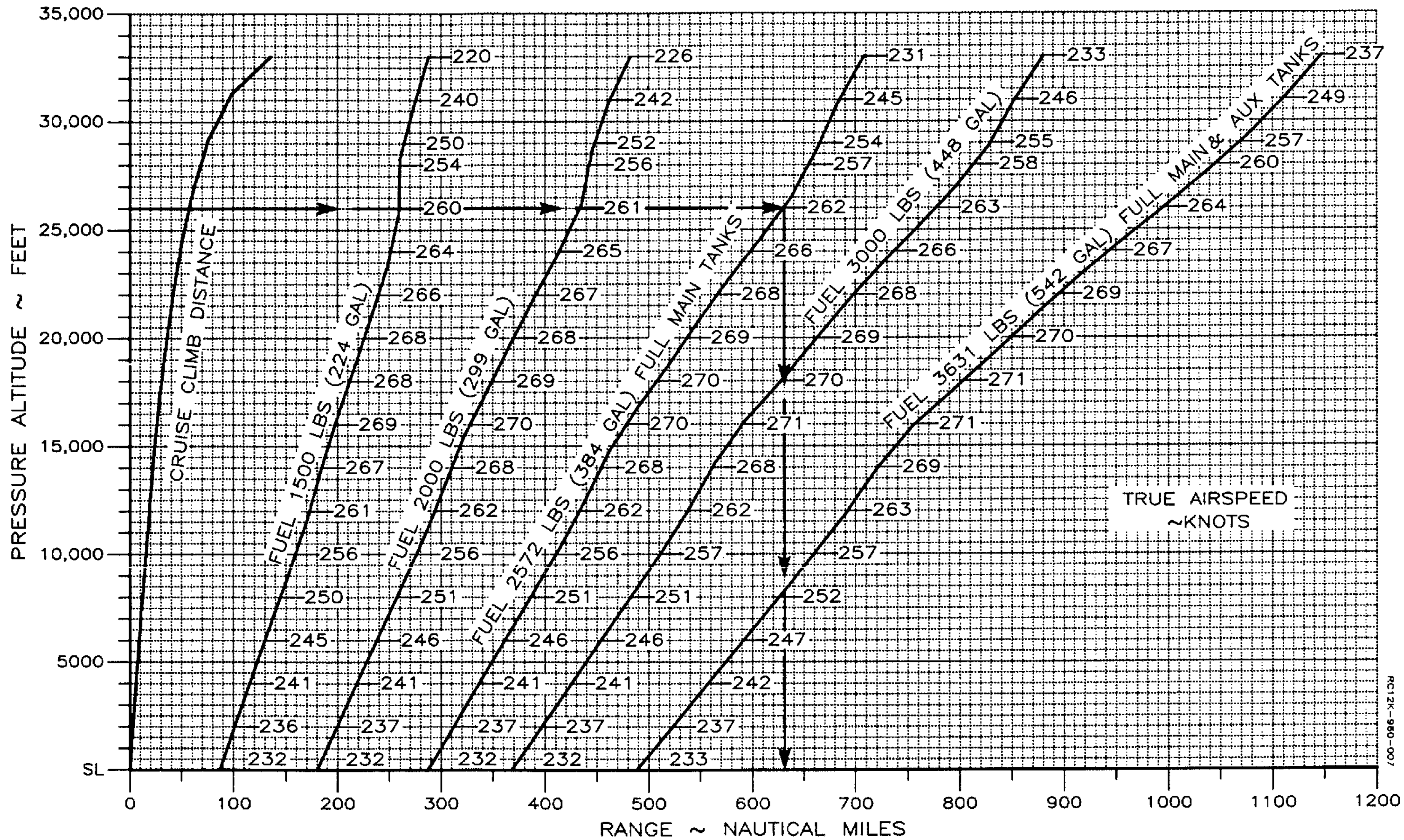


Figure 7-48. Range Profile - Maximum Cruise Power

NORMAL CRUISE POWER
1500 RPM
ISA -30 °C

WEIGHT→			12,000 POUNDS					10,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	-10	-15	100	603	1206	233	224	100	603	1206	234	225
2000	-14	-19	100	586	1172	231	228	100	585	1170	232	229
4000	-18	-23	100	569	1138	229	233	100	569	1138	230	234
6000	-22	-27	100	555	1110	227	238	100	555	1110	229	239
8000	-26	-31	100	544	1088	225	242	100	544	1088	227	244
10,000	-29	-35	100	534	1068	224	249	100	534	1068	226	250
12,000	-33	-39	100	529	1058	222	254	100	529	1058	224	256
14,000	-37	-43	100	526	1052	221	259	100	526	1052	222	261
16,000	-40	-47	100	525	1050	219	265	100	524	1048	220	267
18,000	-44	-51	100	524	1048	216	270	100	523	1046	218	272
20,000	-48	-55	100	524	1048	214	276	100	524	1048	216	278
22,000	-52	-59	96	502	1004	209	278	96	503	1006	211	280
24,000	-56	-63	90	475	950	202	277	90	476	952	204	280
26,000	-60	-67	83	444	888	194	276	84	445	890	197	279
28,000	-64	-70	76	406	812	184	271	76	408	816	187	276
29,000	-66	-72	72	386	772	179	268	72	388	776	182	273
31,000	-71	-76	64	348	696	168	261	65	351	702	172	268
33,000	-75	-80	57	314	628	157	253	58	317	634	162	262
35,000	-80	-84	50	280	560	144	242	51	283	566	151	253

NOTES:
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points = 50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

IFAT based on 14,000 pounds.

Figure 7-49. Normal Cruise Power - 1500RPM - ISA -30°C (Sheet 1 of 2)

NORMAL CRUISE POWER
1500 RPM
ISA -30 °C

WEIGHT→			16,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	-10	-15	100	604	1208	230	221	100	604	1208	231	222
2000	-14	-19	100	587	1174	228	225	100	586	1172	229	227
4000	-18	-23	100	570	1140	226	230	100	570	1140	228	231
6000	-22	-27	100	556	1112	224	234	100	556	1112	226	236
8000	-26	-31	100	545	1090	222	239	100	544	1088	224	241
10,000	-29	-35	100	535	1070	221	245	100	535	1070	223	247
12,000	-33	-39	100	530	1060	219	250	100	530	1060	221	252
14,000	-37	-43	100	527	1054	216	255	100	527	1054	219	257
16,000	-40	-47	100	526	1052	214	260	100	525	1050	217	263
18,000	-44	-51	100	525	1050	212	265	100	524	1048	214	268
20,000	-48	-55	100	525	1050	210	270	100	525	1050	212	274
22,000	-52	-59	95	501	1002	203	270	95	502	1004	206	274
24,000	-56	-63	89	473	946	195	269	90	474	948	199	274
26,000	-60	-67	82	441	882	186	265	83	443	886	190	271
28,000	-64	-70	74	401	802	174	257	75	404	808	180	265
29,000	-66	-72	70	379	758	167	252	71	383	766	174	261
31,000	-71	-76	62	340	680	153	239	63	344	688	161	252
33,000	-75	-80	55	306	612	136	221	56	310	620	149	241
35,000	-80	-84	---	---	---	---	---	49	277	554	133	224

NOTES:

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points =50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

IFAT based on 14,000 pounds.

Figure 7-49. Normal Cruise Power - 1500 RPM - ISA -30°C (Sheet 2 of 2)

NORMAL CRUISE POWER
1500 RPM
ISA -20°C

WEIGHT→			12,000 POUNDS					10,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	0	-5	100	608	1216	231	226	100	607	1214	232	228
2000	-4	-9	100	589	1178	229	231	100	588	1176	230	232
4000	-8	-13	100	572	1144	227	236	100	571	1142	229	237
6000	-12	-17	100	557	1114	225	241	100	556	1112	227	242
8000	-15	-21	100	545	1090	224	247	100	545	1090	226	248
10,000	-19	-25	100	538	1076	222	252	100	538	1076	224	253
12,000	-23	-29	100	532	1064	220	257	100	532	1064	222	259
14,000	-26	-33	100	528	1056	218	262	100	528	1056	220	264
16,000	-30	-37	100	525	1050	216	268	100	525	1050	218	270
18,000	-34	-41	100	524	1048	214	273	100	523	1046	216	275
20,000	-38	-45	97	508	1016	209	276	97	508	1016	211	278
22,000	-42	-49	91	480	960	202	276	91	480	960	205	279
24,000	-46	-53	85	451	902	195	275	85	452	904	198	278
26,000	-50	-57	79	420	840	187	273	79	421	842	190	277
28,000	-54	-60	72	387	774	178	269	72	388	776	181	274
29,000	-56	-62	69	371	742	173	266	69	372	744	177	272
31,000	-61	-66	62	341	682	164	261	63	342	684	168	268
33,000	-65	-70	57	312	624	154	255	57	315	630	159	264
35,000	-70	-74	50	283	566	142	245	51	286	572	150	257

NOTES:
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points =50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

IFAT based on 14,000 pounds.

Figure 7-50. Normal Cruise Power - 1500 RPM - ISA -20°C (Sheet 1 of 2)

NORMAL CRUISE POWER
1500 RPM
ISA -20°C

WEIGHT→			16,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	0	-5	100	608	1216	228	223	100	608	1216	229	225
2000	-4	-9	100	590	1180	226	228	100	589	1178	228	229
4000	-8	-13	100	572	1144	224	232	100	572	1144	226	234
6000	-12	-17	100	557	1114	222	237	100	557	1114	224	239
8000	-15	-21	100	546	1092	221	243	100	545	1090	223	245
10,000	-19	-25	100	539	1078	218	247	100	539	1078	221	250
12,000	-23	-29	100	533	1066	216	252	100	533	1066	218	255
14,000	-26	-33	100	529	1058	214	257	100	529	1058	216	260
16,000	-30	-37	100	526	1052	212	262	100	526	1052	214	265
18,000	-34	-41	100	525	1050	209	268	100	524	1048	212	271
20,000	-38	-45	96	507	1014	204	269	97	508	1016	207	273
22,000	-42	-49	90	479	958	196	268	91	479	958	199	272
24,000	-46	-53	84	449	898	188	265	83	451	902	192	271
26,000	-50	-57	78	417	834	178	261	78	419	838	183	267
28,000	-54	-60	71	383	766	167	253	71	395	770	173	262
29,000	-56	-62	67	366	732	161	249	68	369	738	168	259
31,000	-61	-66	61	335	670	148	238	62	338	676	157	252
33,000	-65	-70	54	305	610	131	219	56	309	618	145	242
35,000	-70	-74	---	---	---	---	---	49	279	558	130	226

NOTES:

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points = 50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

IFAT based on 14,000 pounds.

Figure 7-50. Normal Cruise Power - 1500 RPM - ISA -20°C (Sheet 2 of 2)

NORMAL CRUISE POWER
1500 RPM
ISA -10°C

WEIGHT→			12,000 POUNDS					10,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	10	5	100	610	1220	229	229	100	610	1220	230	230
2000	6	1	100	590	1180	227	234	100	590	1180	229	235
4000	2	-3	100	572	1144	226	239	100	571	1142	227	240
6000	-1	-7	100	558	1116	224	244	100	558	1116	226	246
8000	-5	-11	100	549	1098	222	249	100	548	1096	224	251
10,000	-9	-15	100	541	1082	220	254	100	540	1080	222	256
12,000	-13	-19	100	534	1068	218	260	100	534	1068	220	261
14,000	-16	-23	100	529	1058	216	265	100	529	1058	218	267
16,000	-20	-27	100	526	1052	214	270	100	525	1050	215	272
18,000	-24	-31	96	502	1004	208	272	96	502	1004	210	274
20,000	-28	-35	91	478	956	202	272	91	478	956	204	275
22,000	-32	-39	86	453	906	195	272	86	453	906	198	276
24,000	-36	-43	80	428	856	188	272	81	428	856	191	275
26,000	-40	-47	74	399	798	180	269	75	400	800	183	274
28,000	-44	-50	68	368	736	171	265	68	369	738	175	271
29,000	-46	-52	65	353	706	167	263	65	354	708	171	269
31,000	-51	-56	59	326	652	158	258	60	327	654	163	266
33,000	-55	-60	54	301	602	148	252	55	303	606	154	262
35,000	-60	-64	49	276	552	137	244	50	278	556	145	257

NOTES:
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points = 50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

IFAT based on 14,000 pounds.

Figure 7-51. Normal Cruise Power - 1500 RPM - ISA -10°C (Sheet 1 of 2)

NORMAL CRUISE POWER
1500 RPM
ISA -10 °C

WEIGHT→			16,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	10	5	100	611	1222	226	226	100	611	1222	228	228
2000	6	1	100	591	1182	224	230	100	591	1182	226	232
4000	2	-3	100	573	1146	222	235	100	572	1144	224	237
6000	-1	-7	100	559	1118	221	240	100	559	1118	223	243
8000	-5	-11	100	550	1100	218	245	100	549	1098	221	247
10,000	-9	-15	100	542	1084	216	250	100	541	1082	218	252
12,000	-13	-19	100	535	1070	214	255	100	535	1070	216	257
14,000	-16	-23	100	530	1060	212	260	100	530	1060	214	263
16,000	-20	-27	100	526	1052	209	265	100	526	1052	212	268
18,000	-24	-31	95	501	1002	203	265	95	501	1002	206	269
20,000	-28	-35	90	478	956	196	265	91	478	956	199	269
22,000	-32	-39	85	452	904	188	263	85	452	904	192	268
24,000	-36	-43	80	426	852	180	261	80	427	854	185	267
26,000	-40	-47	74	396	792	171	256	74	398	796	176	263
28,000	-44	-50	67	365	730	159	248	68	367	734	166	258
29,000	-46	-52	64	350	700	153	243	65	352	704	161	255
31,000	-51	-56	58	322	644	139	230	59	324	648	150	247
33,000	-55	-60	---	---	---	---	---	54	299	598	139	237
35,000	-60	-64	---	---	---	---	---	48	274	548	124	220

NOTES:
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points = 50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

IFAT based on 14,000 pounds.

Figure 7-51. Normal Cruise Power - 1500 RPM - ISA -10°C (Sheet 2 of 2)

NORMAL CRUISE POWER
1500 RPM
ISA

WEIGHT→			12,000 POUNDS					10,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	20	15	100	610	1220	229	232	100	609	1218	230	234
2000	16	11	100	593	1186	227	237	100	592	1184	228	239
4000	12	7	100	577	1154	225	242	100	577	1154	226	243
6000	9	3	100	563	1126	223	247	100	563	1126	224	248
8000	5	-1	100	552	1104	220	252	100	551	1102	222	253
10,000	1	-5	100	542	1084	218	257	100	541	1082	220	259
12,000	-3	-9	100	534	1068	216	262	100	533	1066	218	264
14,000	-6	-13	100	528	1056	214	268	100	528	1056	215	270
16,000	-10	-17	95	501	1002	207	268	95	501	1002	209	270
18,000	-14	-21	90	473	946	201	268	90	473	946	203	271
20,000	-18	-25	85	449	898	194	268	85	449	898	197	271
22,000	-22	-29	80	424	848	187	267	80	424	848	190	271
24,000	-26	-33	75	399	798	180	266	75	399	798	183	271
26,000	-30	-37	69	373	746	173	264	69	373	746	176	269
28,000	-35	-40	64	346	692	164	261	64	347	694	168	267
29,000	-37	-42	61	334	668	160	259	62	335	670	165	266
31,000	-41	-46	56	310	620	151	254	57	311	622	157	263
33,000	-46	-50	51	286	572	141	247	52	288	576	148	258
35,000	-49	-54	46	263	526	130	236	47	265	530	139	252

NOTES:
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points =50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

IFAT based on 14,000 pounds.

Figure 7-52. Normal Cruise Power - 1500 RPM - ISA (Sheet 1 of 2)

NORMAL CRUISE POWER
1500 RPM
ISA

WEIGHT→			16,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	20	15	100	611	1222	225	229	100	610	1220	227	231
2000	16	11	100	594	1188	223	234	100	593	1186	225	236
4000	12	7	100	578	1156	221	238	100	577	1154	223	240
6000	9	3	100	564	1128	219	243	100	564	1128	221	245
8000	5	-1	100	553	1106	216	247	100	552	1104	219	250
10,000	1	-5	100	542	1084	214	252	100	542	1084	216	255
12,000	-3	-9	100	534	1068	212	257	100	534	1068	214	260
14,000	-6	-13	100	529	1058	209	262	100	528	1056	212	265
16,000	-10	-17	95	500	1000	202	261	95	500	1000	205	265
18,000	-14	-21	89	462	944	195	260	89	473	946	198	265
20,000	-18	-25	84	448	896	188	259	84	448	896	191	264
22,000	-22	-29	79	422	844	180	257	79	423	846	184	263
24,000	-26	-33	74	397	794	171	253	74	398	796	176	261
26,000	-30	-37	68	370	740	161	248	69	371	742	168	257
28,000	-35	-40	63	343	686	150	239	63	345	690	158	252
29,000	-37	-42	60	330	660	144	234	61	332	664	153	249
31,000	-41	-46	54	304	608	127	215	56	308	616	143	240
33,000	-46	-50	---	---	---	---	---	50	284	568	130	228
35,000	-49	-54	---	---	---	---	---	---	---	---	---	---

NOTES:
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points = 50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

IFAT based on 14,000 pounds.

Figure 7-52. Normal Cruise Power - 1500 RPM - ISA (Sheet 2 of 2)

NORMAL CRUISE POWER
1500 RPM
ISA +10 °C

WEIGHT→			12,000 POUNDS					10,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	30	25	100	618	1236	227	235	100	617	1234	228	236
2000	26	21	100	598	1196	225	240	100	597	1194	226	241
4000	23	17	100	581	1162	223	244	100	580	1160	224	246
6000	19	13	100	566	1132	221	249	100	566	1132	222	251
8000	15	9	100	554	1108	218	254	100	553	1106	220	256
10,000	11	5	100	542	1084	216	259	100	542	1084	218	261
12,000	7	1	98	524	1048	212	263	98	524	1048	214	265
14,000	4	-3	93	496	992	206	263	93	497	994	208	266
16,000	0	-7	88	469	938	200	264	88	470	940	202	266
18,000	-4	-11	83	442	884	193	263	83	443	886	196	266
20,000	-8	-15	78	417	834	186	262	78	418	836	189	266
22,000	-13	-19	73	393	786	179	261	73	394	788	182	266
24,000	-17	-23	68	369	738	172	260	69	370	740	175	265
26,000	-21	-27	63	345	690	164	257	64	346	692	168	263
28,000	-25	-30	59	322	644	156	254	59	323	646	161	261
29,000	-27	-32	57	311	622	152	252	57	312	624	157	260
31,000	-32	-36	52	289	578	143	246	52	290	580	149	257
33,000	-35	-40	47	267	534	133	238	48	269	538	141	252
35,000	-39	-44	---	---	---	---	---	43	248	496	132	245

NOTES:
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points = 50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

IFAT based on 14,000 pounds.

Figure 7-53. Normal Cruise Power - 1500 RPM - ISA +10°C (Sheet 1 of 2)

NORMAL CRUISE POWER
1500 RPM
ISA +10°C

WEIGHT→			16,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	30	25	100	619	1238	224	231	100	618	1236	225	233
2000	26	21	100	599	1198	222	236	100	598	1196	223	238
4000	23	17	100	582	1164	219	240	100	581	1162	221	242
6000	19	13	100	567	1134	217	245	100	567	1134	219	247
8000	15	9	100	555	1110	214	250	100	554	1108	217	252
10,000	11	5	100	543	1086	212	254	100	543	1086	214	257
12,000	7	1	97	523	1046	207	257	98	523	1046	210	260
14,000	4	-3	93	495	990	201	257	93	496	992	204	260
16,000	0	-7	88	468	936	194	256	88	469	938	197	260
18,000	-4	-11	83	441	882	186	254	83	442	884	190	259
20,000	-8	-15	77	416	832	178	252	78	417	834	183	258
22,000	-13	-19	73	392	784	170	248	73	392	784	175	256
24,000	-17	-23	67	367	734	161	243	68	368	736	167	253
26,000	-21	-27	62	342	684	150	236	63	344	688	158	248
28,000	-25	-30	57	319	638	138	225	58	321	642	149	243
29,000	-27	-32	55	307	614	130	217	56	310	620	144	239
31,000	-32	-36	---	---	---	---	---	51	287	574	132	229
33,000	-35	-40	---	---	---	---	---	---	---	---	---	---
35,000	-39	-44	---	---	---	---	---	---	---	---	---	---

NOTES:

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points = 50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

IFAT based on 14,000 pounds.

Figure 7-53. Normal Cruise Power - 1500 RPM - ISA +10°C (Sheet 2 of 2)

NORMAL CRUISE POWER
1500 RPM
ISA +20 °C

WEIGHT→			12,000 POUNDS					10,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	40	35	100	623	1246	226	237	100	623	1246	227	239
2000	36	31	100	602	1204	223	242	100	602	1204	225	243
4000	33	27	100	583	1166	221	246	100	583	1166	222	248
6000	29	23	100	567	1134	219	251	100	567	1134	220	253
8000	25	19	97	541	1082	214	253	97	542	1084	216	255
10,000	21	15	92	512	1024	208	254	93	513	1026	210	257
12,000	17	11	88	486	972	203	255	89	486	972	205	258
14,000	13	7	84	461	922	197	256	85	461	922	199	259
16,000	9	3	80	435	870	191	257	80	436	872	193	260
18,000	5	-1	76	410	820	184	257	76	410	820	187	260
20,000	1	-5	71	385	770	177	255	71	385	770	181	260
22,000	-3	-9	66	361	722	170	254	67	362	724	174	259
24,000	-7	-13	62	338	676	162	251	62	339	678	167	257
26,000	-11	-17	56	317	634	155	248	58	318	636	160	256
28,000	-16	-20	54	298	596	147	245	54	299	598	153	254
29,000	-18	-22	52	288	576	143	242	52	289	578	149	253
31,000	-21	-26	48	268	536	134	236	48	270	540	142	249
33,000	-26	-30	43	247	494	122	224	44	249	498	133	243
35,000	-29	-34	---	---	---	---	---	39	229	458	123	234

NOTES:
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points = 50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

IFAT based on 14,000 pounds.

Figure 7-54. Normal Cruise Power - 1500 RPM - ISA +20°C (Sheet 1 of 2)

NORMAL CRUISE POWER
1500 RPM
ISA +20°C

WEIGHT→			16,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	40	35	100	624	1248	222	234	100	624	1248	224	236
2000	36	31	100	604	1208	220	238	100	603	1206	222	240
4000	33	27	100	584	1168	217	242	100	584	1168	219	245
6000	29	23	100	568	1136	215	247	100	567	1134	217	249
8000	25	19	96	541	1082	209	248	97	541	1082	212	251
10,000	21	15	92	512	1024	203	248	92	512	1024	206	252
12,000	17	11	88	485	970	197	248	88	486	972	200	252
14,000	13	7	84	460	920	191	248	84	460	920	194	253
16,000	9	3	80	434	868	184	247	80	435	870	188	253
18,000	5	-1	75	408	816	176	245	75	409	818	181	252
20,000	1	-5	70	383	766	168	242	71	384	768	173	250
22,000	-3	-9	66	359	718	159	237	66	361	722	165	247
24,000	-7	-13	61	336	672	148	230	61	337	674	157	243
26,000	-11	-17	56	314	628	136	220	57	316	632	148	237
28,000	-16	-20	---	---	---	---	---	53	296	592	138	231
29,000	-18	-22	---	---	---	---	---	51	286	572	133	226
31,000	-21	-26	---	---	---	---	---	---	---	---	---	---
33,000	-26	-30	---	---	---	---	---	---	---	---	---	---
35,000	-29	-34	---	---	---	---	---	---	---	---	---	---

NOTES:
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points = 50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

IFAT based on 14,000 pounds.

Figure 7-54. Normal Cruise Power - 1500 RPM - ISA +20°C (Sheet 2 of 2)

NORMAL CRUISE POWER
1500 RPM
ISA +30°C

WEIGHT→			12,000 POUNDS					10,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	50	45	100	622	1244	224	239	100	622	1244	225	241
2000	46	41	97	592	1184	219	241	97	592	1184	221	243
4000	42	37	93	562	1124	214	243	94	562	1124	216	245
6000	39	33	90	532	1064	209	244	90	532	1064	211	246
8000	35	29	86	503	1006	203	245	86	504	1008	205	247
10,000	31	25	82	475	950	198	246	83	475	950	200	249
12,000	27	21	79	450	900	192	247	79	450	900	195	250
14,000	23	17	76	426	852	187	248	76	427	854	190	251
16,000	19	13	72	402	804	181	248	72	402	804	184	252
18,000	15	9	67	376	752	174	247	68	377	754	177	252
20,000	11	5	62	349	698	166	244	63	350	700	170	249
22,000	6	1	58	328	656	159	242	59	328	656	163	248
24,000	2	-3	54	306	612	151	239	55	307	614	156	247
26,000	-2	-7	51	288	576	144	236	51	289	578	150	246
28,000	-6	-10	48	273	546	137	233	49	274	548	144	245
29,000	-7	-12	47	265	530	133	231	47	266	532	141	244
31,000	-12	-16	43	246	492	122	221	44	248	496	133	240
33,000	-15	-20	---	---	---	---	---	39	229	458	123	231
35,000	---	---	---	---	---	---	---	---	---	---	---	---

NOTES:
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points = 50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

IFAT based on 14,000 pounds.

Figure 7-55. Normal Cruise Power - 1500 RPM - ISA +30°C (Sheet 1 of 2)

NORMAL CRUISE POWER
1500 RPM
ISA +30 °C

WEIGHT→			16,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	50	45	99	622	1244	220	235	100	622	1244	222	237
2000	46	41	96	592	1184	215	237	97	592	1184	217	239
4000	42	37	93	562	1124	209	238	93	562	1124	212	240
6000	39	33	89	532	1064	204	238	90	532	1064	206	241
8000	35	29	86	503	1006	198	239	86	503	1006	201	242
10,000	31	25	82	475	950	192	239	82	475	950	195	243
12,000	27	21	78	449	898	186	239	79	450	900	189	243
14,000	23	17	75	425	850	179	238	75	426	852	183	244
16,000	19	13	71	401	802	172	237	71	401	802	177	243
18,000	15	9	66	374	748	164	233	67	376	752	170	241
20,000	11	5	61	347	694	153	226	62	348	696	161	236
22,000	6	1	57	325	650	143	219	58	327	654	153	233
24,000	2	-3	53	304	608	131	208	54	305	610	144	227
26,000	-2	-7	---	---	---	---	---	50	287	574	135	221
28,000	-6	-10	---	---	---	---	---	47	271	542	124	212
29,000	-7	-12	---	---	---	---	---	---	---	---	---	---
31,000	-12	-16	---	---	---	---	---	---	---	---	---	---
33,000	-15	20	---	---	---	---	---	---	---	---	---	---
35,000	---	---	---	---	---	---	---	---	---	---	---	---

NOTES:
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points = 50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

IFAT based on 14,000 pounds.

Figure 7-55. Normal Cruise Power - 1500 RPM - ISA +30°C (Sheet 2 of 2)

NORMAL CRUISE POWER
1500 RPM
ISA +37°C

WEIGHT→			12,000 POUNDS					10,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	57	52	90	598	1196	215	232	91	598	1196	216	234
2000	53	48	88	567	1134	210	234	88	567	1134	212	236
4000	49	44	85	536	1072	206	236	85	536	1072	208	238
6000	45	40	82	506	1012	201	237	82	506	1012	203	240
8000	41	36	79	478	956	195	238	79	478	956	198	241
10,000	37	32	75	452	904	190	239	76	452	904	192	242
12,000	33	28	73	428	856	185	241	73	428	856	188	244
14,000	29	24	69	404	808	180	241	70	405	810	182	245
16,000	25	20	66	379	758	173	241	66	380	760	177	245
18,000	21	16	61	353	706	166	238	61	353	706	170	244
20,000	17	12	56	324	648	157	234	56	325	650	161	240
22,000	13	8	52	304	608	149	231	53	305	610	155	239
24,000	9	4	49	284	568	142	227	49	285	570	148	237
26,000	4	0	46	268	536	135	224	46	269	538	142	236
28,000	1	-3	44	255	510	128	221	44	256	512	137	236
29,000	-1	-5	42	248	496	123	218	43	249	498	134	235
31,000	-4	-9	---	---	---	---	---	40	233	466	126	230
33,000	---	---	---	---	---	---	---	---	---	---	---	---
35,000	---	---	---	---	---	---	---	---	---	---	---	---

NOTES:
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points = 50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

IFAT based on 14,000 pounds.

Figure 7-56. Normal Cruise Power - 1500 RPM - ISA +37°C (Sheet 1 of 2)

NORMAL CRUISE POWER
1500 RPM
ISA +37 ° C

WEIGHT→			16,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	57	52	90	598	1196	210	227	90	598	1196	213	230
2000	53	48	87	567	1134	205	229	88	567	1134	208	232
4000	49	44	84	536	1072	200	230	85	536	1072	203	233
6000	45	40	81	506	1012	195	231	81	506	1012	198	234
8000	41	36	78	478	956	189	231	78	478	956	193	235
10,000	37	32	75	451	902	183	231	75	452	904	187	236
12,000	33	28	72	427	854	177	231	72	428	856	182	236
14,000	29	24	69	403	806	171	230	69	404	808	176	237
16,000	25	20	65	378	756	163	227	65	379	758	169	235
18,000	21	16	60	350	700	153	220	60	352	704	160	231
20,000	17	12	54	321	642	140	209	55	323	646	150	224
22,000	13	8	50	301	602	126	196	51	303	606	141	219
24,000	9	4	---	---	---	---	---	48	283	566	132	212
26,000	4	0	---	---	---	---	---	45	267	534	121	203
28,000	1	-3	---	---	---	---	---	---	---	---	---	---
29,000	-1	-5	---	---	---	---	---	---	---	---	---	---
31,000	-4	-9	---	---	---	---	---	---	---	---	---	---
33,000	---	---	---	---	---	---	---	---	---	---	---	---
35,000	---	---	---	---	---	---	---	---	---	----	----	---

NOTES:

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points =50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

IFAT based on 14,000 pounds.

Figure 7-56. Normal Cruise Power - 1500 RPM - ISA +37°C (Sheet 2 of 2)

NORMAL CRUISE SPEEDS

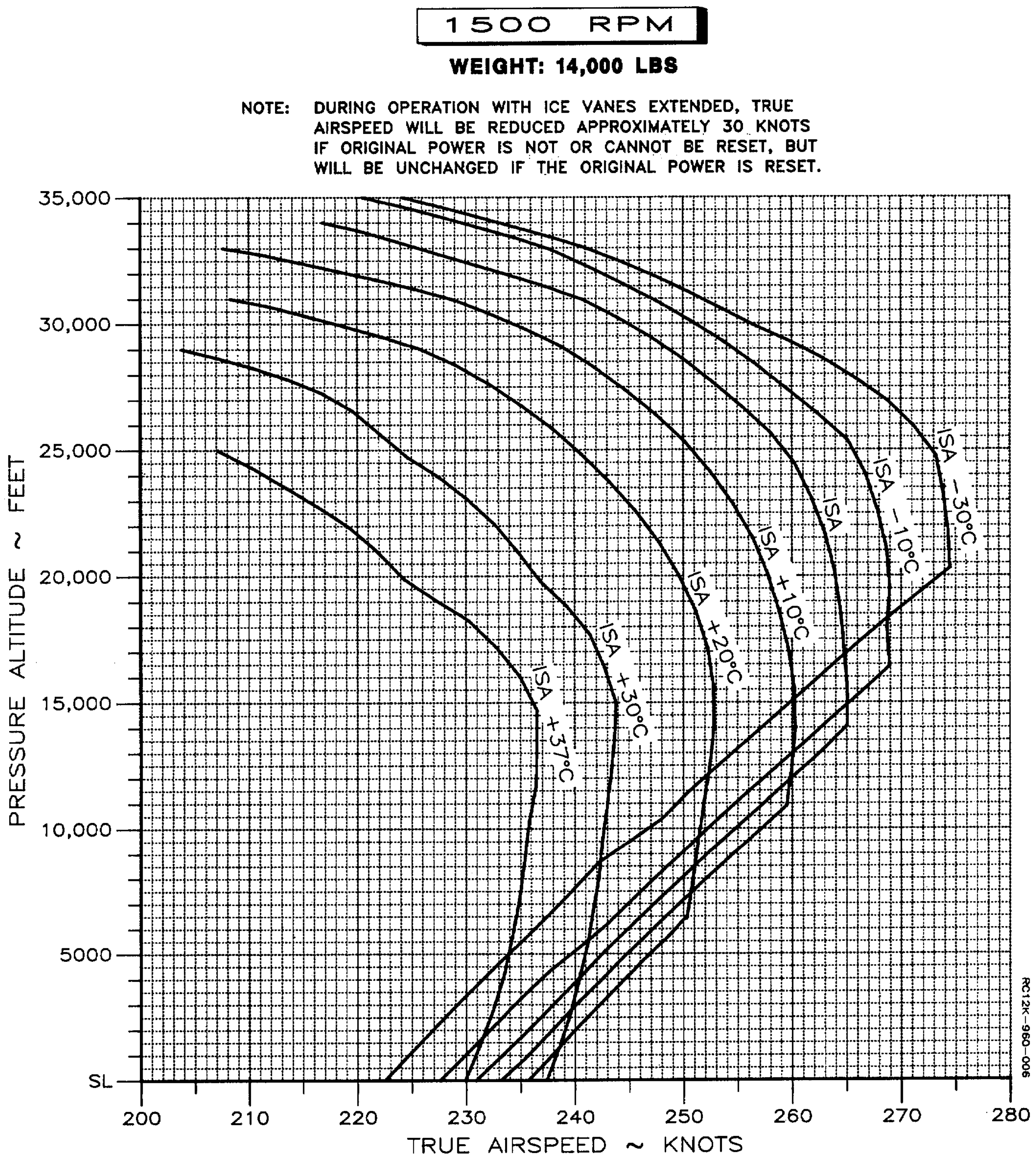


Figure 7-57. Normal Cruise Speeds - 1500 RPM

NORMAL CRUISE SPEEDS

1500 RPM

WEIGHT: 14,000 LBS

NOTE: DURING OPERATION WITH ICE VANES EXTENDED, TORQUE WILL DECREASE APPROXIMATELY 14 PERCENTAGE POINTS. (EXAMPLE: 74% − 14% = 60%.) IF DESIRED, ORIGINAL POWER MAY BE RESET, PROVIDED ITT LIMIT IS NOT EXCEEDED.

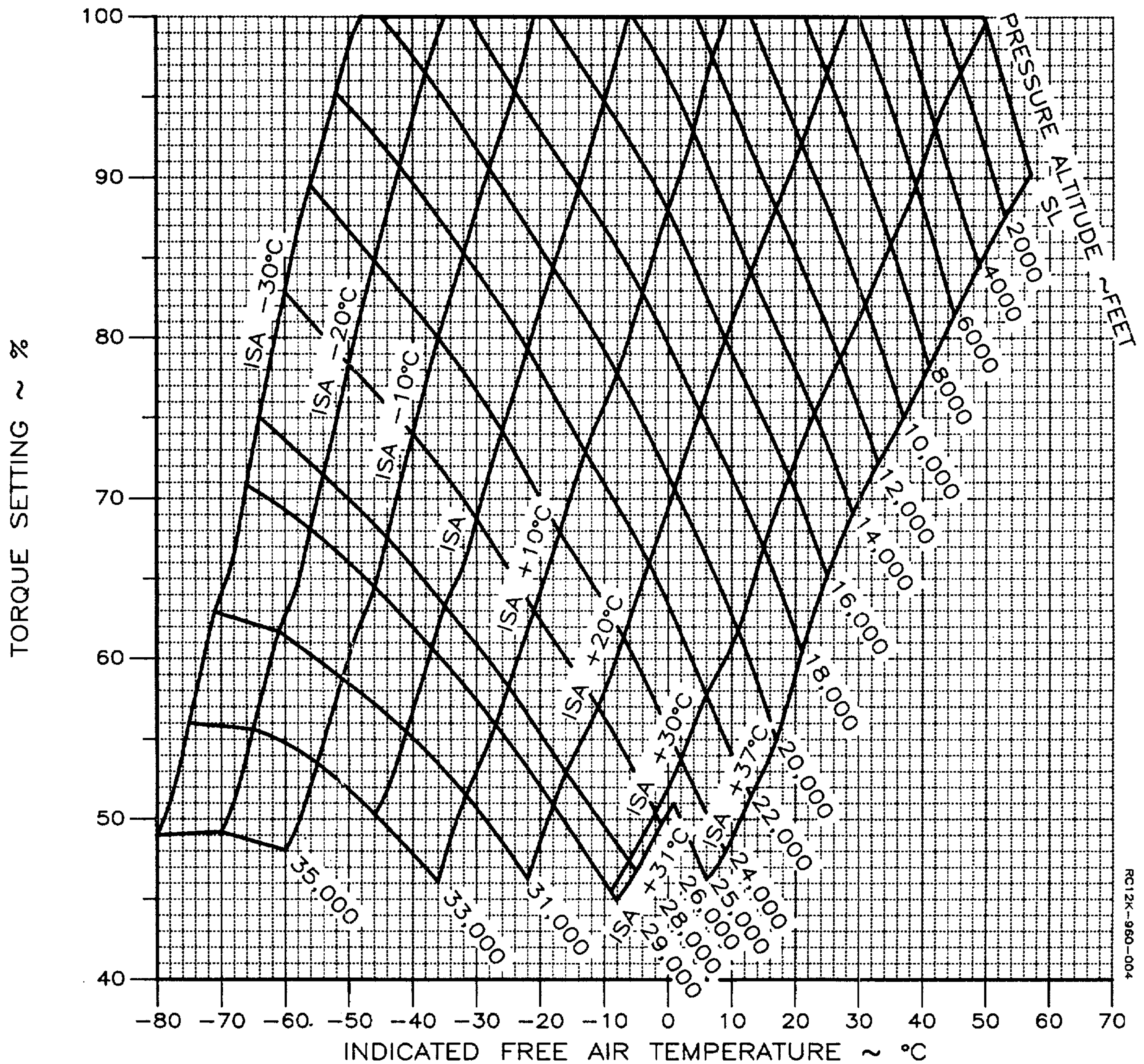


Figure 7-58. Normal Cruise Power - 1500 RPM

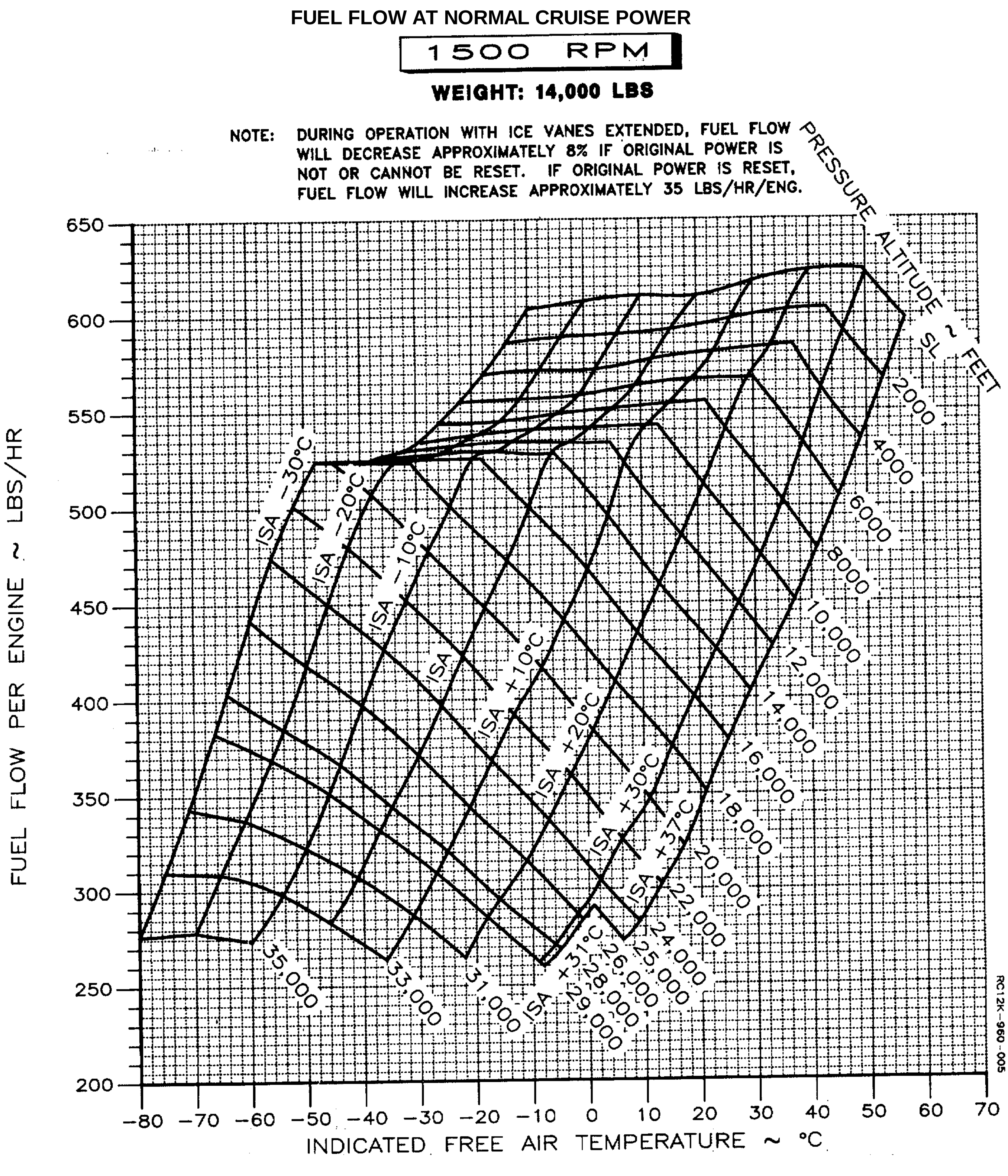


Figure 7-59. Fuel Flow at Normal Cruise Power - 1500 RPM

RANGE PROFILE - NORMAL CRUISE POWER

1500 RPM

STANDARD DAY (ISA)
ZERO WIND

ASSOCIATED CONDITIONS:
WEIGHT ....*16,110 LBS BEFORE ENGINE START
FUEL...........AVIATION KEROSENE
FUEL DENSITY ....6.7 LBS/GAL
ICE VANES.......RETRACTED

EXAMPLE:
PRESSURE ALTITUDE.....26,000 FT
FUEL................2572 LBS
RANGE...............641 NM

NOTES: 1. RANGE SHOWN ALLOWS FOR START, TAXI, AND RUNUP; INCLUDES CRUISE CLIMB AND DESCENT; AND ALLOWS FOR 45 MINUTES RESERVE FUEL AT MAXIMUM RANGE POWER.

*2. AT 16,110 LBS RAMP WEIGHT, THE MAXIMUM ZERO-FUEL WEIGHT LIMITATION OF 12,700 LBS WOULD BE EXCEEDED AT ALL FUEL LOADINGS LESS THAN 3410 LBS.

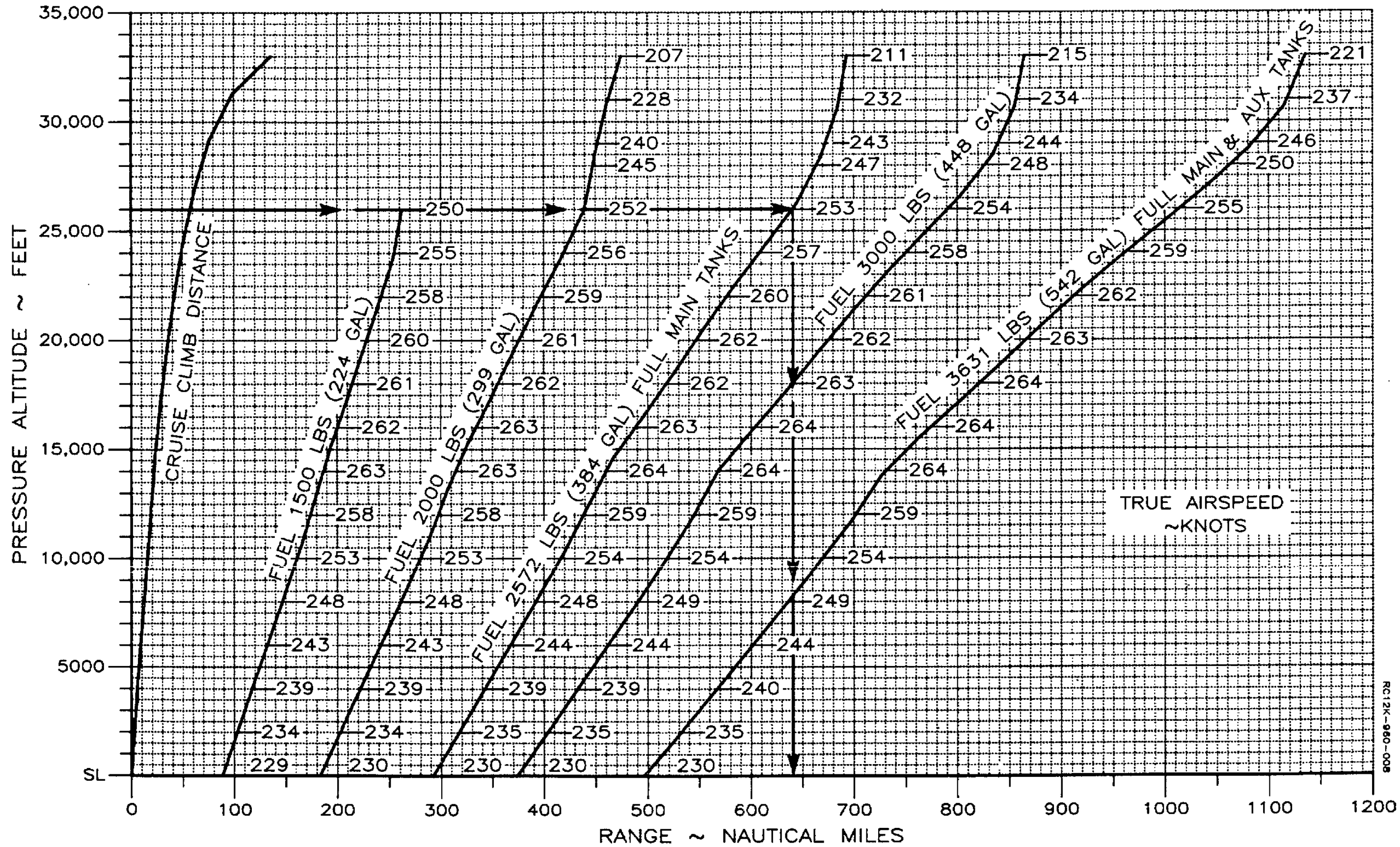


Figure 7-60. Range Profile - Normal Cruise Power - 1500 RPM

MAXIMUM RANGE POWER
1500 RPM
ISA -30°C

WEIGHT→			12,000 POUNDS					10,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	-11	-15	82	540	1080	216	208	78	529	1058	214	206
2000	-15	-19	78	508	1016	210	208	75	498	996	209	207
4000	-19	-23	74	475	950	204	208	72	467	934	203	207
6000	-23	-27	70	444	888	198	208	69	437	874	198	208
8000	-27	-31	66	415	830	192	207	65	409	818	192	208
10,000	-31	-35	62	386	772	185	206	61	381	762	186	207
12,000	-35	-39	59	360	720	178	205	57	354	708	179	206
14,000	-39	-43	55	337	674	172	204	54	330	660	173	205
16,000	-43	-47	52	315	630	166	203	51	309	618	167	204
18,000	-47	-51	49	295	590	159	202	48	290	580	162	205
20,000	-51	-55	47	279	558	154	201	46	273	546	157	205
22,000	-55	-59	44	260	520	146	198	43	257	514	151	203
24,000	-59	-63	41	245	490	140	195	40	239	478	144	201
26,000	-63	-67	40	236	472	135	195	37	223	446	137	198
28,000	-66	-70	42	242	484	136	204	34	205	410	127	190
29,000	-68	-72	43	244	488	137	208	34	206	412	126	193
31,000	-72	-76	44	246	492	137	215	35	207	414	126	199
33,000	-76	-80	42	237	474	131	213	36	209	418	127	207
35,000	-80	-84	42	237	474	127	216	36	208	416	125	212

NOTES

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E G., 64% - 14 percentage points = 50%) If desired, original power may be reset, provided TGT limit is not exceeded If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots

IFAT based on 14,000 pounds

Figure 7-61. Maximum Range Power - 1500 RPM - ISA -30°C (Sheet 1 of 2)

MAXIMUM RANGE POWER
1500 RPM
ISA -30°C

WEIGHT→			16,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	-11	-15	86	557	1114	216	208	84	550	1100	216	208
2000	-15	-19	81	521	1042	209	207	80	515	1030	210	208
4000	-19	-23	77	486	972	202	206	76	481	962	203	207
6000	-23	-27	72	451	902	194	204	71	449	898	197	206
8000	-27	-31	68	422	844	187	203	67	417	834	189	205
10,000	-31	-35	64	395	790	180	201	63	390	780	183	204
12,000	-35	-39	61	370	740	173	199	59	362	724	175	202
14,000	-39	-43	58	348	696	167	198	56	341	682	169	201
16,000	-43	-47	55	329	658	160	196	53	318	636	162	198
18,000	-47	-51	54	317	634	156	197	51	301	602	156	198
20,000	-51	-55	55	314	628	155	202	48	284	568	150	196
22,000	-55	-59	56	316	632	154	208	46	272	544	144	194
24,000	-59	-63	57	316	632	153	213	47	271	542	143	199
26,000	-63	-67	58	316	632	152	218	49	276	552	144	208
28,000	-66	-70	55	304	608	145	216	50	280	560	145	216
29,000	-68	-72	56	309	618	145	219	50	278	556	143	217
31,000	-72	-76	59	323	646	147	230	48	268	536	136	214
33,000	-76	-80	---	---	---	---	---	50	279	558	137	223
35,000	-80	-84	---	---	---	---	---	---	---	---	---	---

NOTES

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E G , 64% - 14 percentage points = 50%) If desired, original power may be reset, provided TGT limit is not exceeded If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots

IFAT based on 14,000 pounds

Figure 7-61. Maximum Range Power - 1500 RPM - ISA -30°C (Sheet 2 of 2)

MAXIMUM RANGE POWER
1500 RPM
ISA -20°C

WEIGHT→			12,000 POUNDS					10,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	-1	-5	76	528	1056	207	203	71	511	1022	203	199
2000	-5	-9	73	499	998	203	205	69	485	970	200	202
4000	-9	-13	70	470	940	198	206	67	458	916	196	204
6000	-13	-17	67	440	880	192	206	64	430	860	191	205
8000	-17	-21	64	411	822	186	206	61	403	806	186	205
10,000	-21	-25	60	382	764	180	205	58	376	752	181	206
12,000	-25	-29	56	355	710	173	203	55	351	702	175	205
14,000	-29	-33	52	330	660	166	201	52	327	654	169	205
16,000	-33	-37	50	310	620	161	201	49	306	612	164	205
18,000	-37	-41	48	292	584	155	201	47	287	574	158	204
20,000	-41	-45	45	274	548	149	199	44	270	540	153	204
22,000	-45	-49	42	258	516	142	197	41	251	502	146	201
24,000	-48	-53	42	249	498	138	198	38	233	466	139	198
26,000	-52	-57	43	249	498	138	204	36	218	436	131	195
28,000	-56	-60	43	249	498	137	210	35	210	420	127	195
29,000	-58	-62	44	249	498	137	213	35	210	420	126	198
31,000	-62	-66	44	247	494	135	217	36	212	424	127	205
33,000	-65	-70	41	236	472	128	214	37	214	428	127	213
35,000	-70	-74	42	243	486	127	220	36	209	418	123	215

NOTES
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E G , 64% - 14 percentage points = 50%) If desired, original power may be reset, provided TGT limit is not exceeded If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots

IFAT based on 14,000 pounds

Figure 7-62. Maximum Range Power - 1500 RPM - ISA -20°C (Sheet 1 of 2)

MAXIMUM RANGE POWER
1500 RPM
ISA -20°C

WEIGHT→			16,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	-1	-5	86	564	1128	214	210	81	547	1094	211	207
2000	-5	-9	82	528	1056	207	209	78	514	1028	205	207
4000	-9	-13	77	493	986	200	208	74	481	962	199	207
6000	-13	-17	72	460	920	193	207	70	449	898	192	206
8000	-17	-21	68	430	860	186	205	65	418	836	185	205
10,000	-21	-25	65	404	808	180	205	61	389	778	178	203
12,000	-25	-29	63	382	764	174	205	58	361	722	171	201
14,000	-29	-33	62	366	732	170	206	55	340	680	166	201
16,000	-33	-37	61	352	704	167	208	52	319	638	159	199
18,000	-37	-41	59	339	678	162	209	50	304	608	154	199
20,000	-41	-45	59	331	662	159	212	48	288	576	148	198
22,000	-45	-49	59	327	654	156	216	50	288	576	148	205
24,000	-48	-53	59	324	648	154	220	50	286	572	147	210
26,000	-52	-57	57	315	630	149	220	51	286	572	146	215
28,000	-56	-60	56	311	622	144	220	51	283	566	144	219
29,000	-58	-62	58	319	638	145	226	50	278	556	140	218
31,000	-62	-66	61	335	670	148	238	49	274	548	135	218
33,000	-65	-70	---	---	---	---	---	52	288	576	138	230
35,000	-70	-74	---	---	---	---	---	---	---	---	---	---

NOTES

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E G , 64% - 14 percentage points = 50%) If desired, original power may be reset, provided TGT limit is not exceeded If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots

IFAT based on 14,000 pounds

Figure 7-62. Maximum Range Power - 1500 RPM - ISA -20°C (Sheet 2 of 2)

MAXIMUM RANGE POWER
1500 RPM
ISA -10°C

WEIGHT→			12,000 POUNDS					10,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	9	5	67	509	1018	195	195	63	491	982	191	192
2000	5	1	69	492	984	196	201	62	468	936	189	195
4000	1	-3	69	470	940	193	205	61	445	890	187	198
6000	-3	-7	66	442	884	189	207	60	422	844	184	201
8000	-7	-11	63	414	828	183	206	58	397	794	180	202
10,000	-11	-15	59	384	768	176	205	55	372	744	175	203
12,000	-15	-19	56	359	718	170	204	53	347	694	169	203
14,000	-19	-23	52	334	668	164	203	50	323	646	164	202
16,000	-23	-27	49	311	622	157	201	47	301	602	158	202
18,000	-27	-31	47	292	584	152	201	44	281	562	152	201
20,000	-30	-35	45	278	556	147	201	42	264	528	147	201
22,000	-34	-39	45	272	544	145	205	39	247	494	140	198
24,000	-38	-43	45	266	532	143	210	38	234	468	135	198
26,000	-42	-47	45	261	522	141	213	37	225	450	131	199
28,000	-46	-50	45	257	514	139	217	37	223	446	131	206
29,000	-48	-52	45	255	510	138	219	38	222	444	131	209
31,000	-52	-56	43	244	488	131	217	38	219	438	129	213
33,000	-55	-60	42	238	476	125	216	38	217	434	127	217
35,000	-60	-64	44	250	500	127	226	36	210	420	122	218

NOTES

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E G , 64% - 14 percentage points = 50%) If desired, original power may be reset, provided TGT limit is not exceeded If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots

IFAT based on 14,000 pounds

Figure 7-63. Maximum Range Power - 1500 RPM - ISA -10°C (Sheet 1 of 2)

MAXIMUM RANGE POWER
1500 RPM
ISA -10°C

WEIGHT→			16,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	9	5	97	601	1202	222	222	84	560	1120	211	211
2000	5	1	90	560	1120	214	220	81	529	1058	206	212
4000	1	-3	84	521	1042	206	218	77	497	994	200	213
6000	-3	-7	79	486	972	198	217	72	463	926	194	211
8000	-7	-11	75	456	912	192	216	68	433	866	187	211
10,000	-11	-15	72	429	858	186	215	64	404	808	180	209
12,000	-15	-19	69	406	812	180	216	61	379	758	174	209
14,000	-19	-23	67	386	772	175	217	59	359	718	169	210
16,000	-23	-27	65	369	738	170	217	57	340	680	165	210
18,000	-27	-31	63	354	708	166	218	55	324	648	160	211
20,000	-30	-35	62	344	688	162	220	54	312	624	156	212
22,000	-34	-39	61	336	672	158	223	54	305	610	153	215
24,000	-38	-43	59	323	646	151	221	53	298	596	150	218
26,000	-42	-47	56	310	620	144	217	53	291	582	146	221
28,000	-46	-50	59	324	648	145	227	50	278	556	139	218
29,000	-48	-52	60	333	666	147	234	49	274	548	135	216
31,000	-52	-56	---	---	---	---	---	51	283	566	136	225
33,000	-55	-60	---	---	---	---	---	53	299	598	139	237
35,000	-55	-64	---	---	---	---	---	---	---	---	---	---

NOTES

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points = 50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

IFAT based on 14,000 pounds

Figure 7-63. Maximum Range Power - 1500 RPM - ISA -10°C (Sheet 2 of 2)

MAXIMUM RANGE POWER
1500 RPM
ISA

WEIGHT→			12,000 POUNDS					10,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	20	15	84	561	1122	212	216	59	482	964	185	189
2000	16	11	79	525	1050	205	215	58	458	916	182	191
4000	12	7	76	495	990	200	216	57	435	870	179	194
6000	8	3	73	468	936	195	217	57	418	836	178	199
8000	4	-1	70	440	880	190	217	58	402	804	178	204
10,000	0	-5	65	407	814	182	215	56	379	758	174	206
12,000	-4	-9	61	379	758	175	214	53	354	708	169	206
14,000	-8	-13	57	354	708	169	214	50	330	660	163	206
16,000	-12	-17	55	333	666	164	213	47	307	614	157	205
18,000	-16	-21	52	314	628	158	213	45	287	574	151	204
20,000	-20	-25	50	298	596	153	214	42	269	538	146	203
22,000	-24	-29	49	288	576	150	216	41	257	514	142	205
24,000	-28	-33	48	278	556	146	218	40	247	494	139	207
26,000	-32	-37	47	270	540	143	221	40	240	480	136	211
28,000	-36	-40	46	260	520	138	222	40	234	468	134	215
29,000	-38	-42	45	253	506	135	220	40	231	462	133	217
31,000	-41	-46	42	241	482	127	216	39	225	450	130	220
33,000	-46	-50	43	247	494	126	222	37	215	430	124	218
35,000	---	---	---	---	---	---	---	---	---	---	---	---

NOTES

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E G , 64% - 14 percentage points =50%) If desired, original power may be reset, provided TGT limit is not exceeded If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots

IFAT based on 14,000 pounds

Figure 7-64. Maximum Range Power - 1500 RPM - ISA (Sheet 1 of 2)

MAXIMUM RANGE POWER
1500 RPM
ISA

WEIGHT→			16,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	20	15	100	613	1226	225	229	97	602	1204	224	228
2000	16	11	96	579	1158	218	229	91	563	1126	216	226
4000	12	7	92	546	1092	212	229	86	528	1056	209	225
6000	8	3	87	513	1026	206	228	81	494	988	202	225
8000	4	-1	82	481	962	199	228	76	461	922	195	223
10,000	0	-5	78	452	904	192	227	71	430	860	187	222
12,000	-4	-9	74	424	848	185	225	67	402	804	181	220
14,000	-8	-13	71	402	804	179	226	64	378	756	175	220
16,000	-12	-17	68	380	760	173	225	62	358	716	169	220
18,000	-16	-21	64	361	722	166	224	59	340	680	164	221
20,000	-20	-25	62	344	688	160	222	57	325	650	159	221
22,000	-24	-29	58	326	652	152	218	56	314	628	155	223
24,000	-28	-33	57	318	636	146	218	54	301	602	149	222
26,000	-32	-37	59	327	654	147	227	51	285	570	141	218
28,000	-36	-40	62	339	678	149	237	50	280	560	136	218
29,000	-38	-42	---	---	---	---	---	51	283	566	136	222
31,000	-41	-46	---	---	---	---	---	53	296	592	138	233
33,000	-46	-50	---	---	---	---	---	---	---	---	---	---
35,000	---	---	---	---	---	---	---	---	---	---	---	---

NOTES

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E G , 64% - 14 percentage points =50%) If desired, original power may be reset, provided TGT limit is not exceeded If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots

IFAT based on 14,000 pounds

Figure 7-64. Maximum Range Power - 1500 RPM - ISA (Sheet 2 of 2)

MAXIMUM RANGE POWER
1500 RPM
ISA + 10°C

WEIGHT→			12,000 POUNDS					10,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	30	25	92	590	1180	219	227	78	546	1092	206	214
2000	26	21	88	555	1110	213	227	78	522	1044	204	218
4000	22	17	83	519	1038	207	227	76	495	990	201	221
6000	18	13	79	486	972	200	227	72	466	932	196	221
8000	14	9	75	457	914	195	227	69	438	876	190	222
10,000	10	5	71	430	860	189	228	65	411	822	184	222
12,000	6	1	67	400	800	182	226	61	381	762	177	221
14,000	2	-3	63	373	746	175	225	57	353	706	170	219
16,000	-2	-7	59	350	700	169	224	53	329	658	164	218
18,000	-6	-11	57	331	662	164	225	50	308	616	158	217
20,000	-10	-15	54	313	626	158	224	48	290	580	153	218
22,000	-14	-19	52	298	596	153	225	46	276	552	149	219
24,000	-18	-23	49	281	562	146	222	44	262	524	144	220
26,000	-22	-27	46	265	530	139	220	43	250	500	140	221
28,000	-26	-30	43	251	502	132	216	41	240	480	136	222
29,000	-27	-32	43	247	494	129	216	40	233	466	132	221
31,000	-32	-36	44	251	502	129	222	38	221	442	126	218
33,000	---	---	---	---	---	---	---	---	---	---	---	---
35,000	---	---	---	---	---	---	---	---	---	---	---	---

NOTES

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E G , 64% - 14 percentage points = 50%) If desired, original power may be reset, provided TGT limit is not exceeded If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots

IFAT based on 14,000 pounds

Figure 7-65. Maximum Range Power - 1500 RPM - ISA + 10C (Sheet 1 of 2)

MAXIMUM RANGE POWER
1500 RPM
ISA + 10°C

WEIGHT→			16,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	30	25	95	603	1206	218	226	94	597	1194	219	227
2000	26	21	91	567	1134	212	226	90	564	1128	213	227
4000	22	17	86	532	1064	206	226	85	527	1054	207	227
6000	18	13	82	501	1002	199	226	81	494	988	201	227
8000	14	9	78	472	944	193	225	77	467	934	195	227
10,000	10	5	75	445	890	187	225	74	439	878	189	227
12,000	6	1	71	418	836	180	224	70	412	824	183	227
14,000	2	-3	68	395	790	174	224	67	388	776	177	227
16,000	-2	-7	65	372	744	167	222	63	365	730	170	226
18,000	-6	-11	61	351	702	160	219	60	345	690	164	225
20,000	-10	-15	59	336	672	154	218	57	324	648	157	223
22,000	-14	-19	59	333	666	151	222	53	305	610	149	219
24,000	-18	-23	61	337	674	150	229	50	290	580	142	216
26,000	-22	-27	62	343	686	150	236	51	289	578	139	220
28,000	-26	-30	---	---	---	---	---	53	295	590	140	228
29,000	-27	-32	---	---	---	---	---	54	300	600	140	233
31,000	-32	-36	---	---	---	---	---	---	---	---	---	---
33,000	---	---	---	---	---	---	---	---	---	---	---	---
35,000	---	---	---	---	---	---	---	---	---	---	---	---

NOTES

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E G , 64% - 14 percentage points = 50%) If desired, original power may be reset, provided TGT limit is not exceeded If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots

IFAT based on 14,000 pounds

Figure 7-65. Maximum Range Power - 1500 RPM - ISA + 10°C (Sheet 2 of 2)

MAXIMUM RANGE POWER
1500 RPM
ISA + 20°C

WEIGHT→			12,000 POUNDS					10,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	40	35	86	580	1160	213	224	84	572	1144	212	223
2000	36	31	82	544	1088	207	224	80	537	1074	206	224
4000	32	27	78	510	1020	201	224	76	503	1006	201	224
6000	28	23	75	477	954	195	225	73	471	942	195	225
8000	24	19	71	447	894	189	225	69	441	882	190	225
10,000	20	15	67	418	836	183	225	65	411	822	184	225
12,000	16	11	64	393	786	178	225	62	385	770	178	225
14,000	12	7	61	370	740	172	225	59	362	724	173	226
16,000	8	3	58	347	694	166	224	56	340	680	167	226
18,000	4	-1	55	326	652	160	224	53	319	638	162	226
20,000	0	-5	51	305	610	153	221	50	299	598	156	225
22,000	-4	-9	48	286	572	146	219	47	280	560	149	224
24,000	-8	-13	46	270	540	139	216	44	263	526	143	222
26,000	-12	-17	44	260	520	134	216	42	247	494	137	221
28,000	-16	-20	45	258	516	132	221	39	231	462	130	217
29,000	-18	-22	45	259	518	132	224	38	226	452	127	217
31,000	-21	-26	47	264	528	132	233	36	216	432	121	214
33,000	---	---	---	---	---	---	---	---	---	---	---	---
35,000	---	---	---	---	---	---	---	---	---	---	---	---

NOTES

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E G , 64% - 14 percentage points = 50%) If desired, original power may be reset, provided TGT limit is not exceeded If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots

IFAT based on 14,000 pounds

Figure 7-66. Maximum Range Power - 1500 RPM - ISA + 20°C (Sheet 1 of 2)

MAXIMUM RANGE POWER
1500 RPM
ISA + 20°C

WEIGHT→			16,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	40	35	92	598	1196	214	225	89	588	1176	213	224
2000	36	31	86	559	1118	206	224	84	551	1102	207	224
4000	32	27	82	524	1048	200	223	80	516	1032	200	224
6000	28	23	77	489	978	192	222	76	483	966	194	223
8000	24	19	74	459	918	186	221	72	452	904	188	223
10,000	20	15	69	427	854	178	219	68	421	842	181	221
12,000	16	11	67	405	810	173	219	65	398	796	175	222
14,000	12	7	64	384	768	167	219	62	375	750	169	222
16,000	8	3	62	366	732	162	219	59	351	702	162	220
18,000	4	-1	63	359	718	160	223	56	332	664	156	219
20,000	0	-5	63	354	708	158	228	54	316	632	151	218
22,000	-4	-9	64	354	708	157	234	53	308	616	147	220
24,000	-8	-13	---	---	---	---	---	54	306	612	145	226
26,000	-12	-17	---	---	---	---	---	55	306	612	144	232
28,000	-16	-20	---	---	---	---	---	---	---	---	---	---
29,000	-18	-22	---	---	---	---	---	---	---	---	---	---
31,000	-21	-26	---	---	---	---	---	---	---	---	---	---
33,000	---	---	---	---	---	---	---	---	---	---	---	---
35,000	---	---	---	---	---	---	---	---	---	---	---	---

NOTES

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E G , 64% - 14 percentage points = 50%) If desired, original power may be reset, provided TGT limit is not exceeded If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots

Figure .7-66.Maximum Range Power - 1500 RPM - ISA + 20°C (Sheet 2 of 2)

MAXIMUM RANGE POWER
1500 RPM
ISA + 30°C

WEIGHT→			12,000 POUNDS					10,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	50	45	85	579	1158	210	225	78	557	1114	205	220
2000	46	41	81	543	1086	204	225	77	530	1060	202	222
4000	42	37	76	506	1012	197	224	73	497	994	196	223
6000	38	33	71	470	940	190	222	69	463	926	190	222
8000	34	29	66	438	876	183	221	65	432	864	184	222
10,000	30	25	63	409	818	177	221	61	403	806	178	222
12,000	26	21	60	382	764	171	221	58	376	752	172	222
14,000	22	17	56	357	714	165	220	55	351	702	166	222
16,000	18	13	53	332	664	158	218	52	327	654	160	221
18,000	14	9	51	314	628	152	217	48	304	608	154	219
20,000	10	5	49	297	594	147	217	46	285	570	148	218
22,000	6	1	48	289	578	144	220	43	267	534	141	216
24,000	3	-3	48	281	562	141	224	40	250	500	135	214
26,000	-2	-7	48	276	552	139	228	39	239	478	130	215
28,000	-5	-10	48	273	546	137	233	38	230	460	127	216
29,000	-7	-12	48	270	540	135	234	38	227	454	125	218
31,000	---	---	---	----	---	---	---	---	---	---	---	---
33,000	---	---	---	---	---	---	---	---	---	---	---	---
35,000	---	---	---	---	---	---	---	---	---	---	---	---

NOTES
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E G , 64% - 14 percentage points =50%) If desired, original power may be reset, provided TGT limit is not exceeded If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots

IFAT based on 14,000 pounds

Figure 7-67. Maximum Range Power - 1500 RPM - ISA + 30°C (Sheet 1 of 2)

MAXIMUM RANGE POWER
1500 RPM
ISA + 30°C

WEIGHT→			16,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	50	45	100	624	1248	220	236	92	598	1196	215	230
2000	46	41	94	585	1170	213	234	86	560	1120	207	228
4000	42	37	88	545	1090	204	232	80	522	1044	199	227
6000	38	33	82	507	1014	196	229	75	484	968	191	224
8000	34	29	77	475	950	189	228	70	450	900	184	222
10,000	30	25	74	447	894	183	228	66	420	840	177	221
12,000	26	21	71	422	844	176	227	63	395	790	171	221
14,000	22	17	68	400	800	171	227	59	368	736	164	219
16,000	18	13	67	387	774	167	230	58	351	702	160	220
18,000	14	9	67	378	756	165	234	57	340	680	157	223
20,000	10	5	---	---	---	---	---	58	332	664	155	228
22,000	6	1	---	---	---	---	---	58	327	654	153	233
24,000	3	3	---	---	---	---	---	57	317	634	148	234
26,000	-2	-7	---	---	---	---	---	---	---	---	---	---
28,000	-5	-10	---	---	---	---	---	---	---	---	---	---
29,000	-7	-12	---	---	---	---	---	---	---	---	---	---
31,000	---	---	---	---	---	---	---	---	---	---	---	---
33,000	---	---	---	---	---	---	--	---	---	---	---	---
35,000	---	---	---	---	---	---	---	---	---	---	---	---

NOTES

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E G , 64% - 14 percentage points =50%) If desired, original power may be reset, provided TGT limit is not exceeded If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots

IFAT based on 14,000 pounds

Figure 7-67. Maximum Range Power - 1500 RPM - ISA + 30°C (Sheet 2 of 2)

MAXIMUM RANGE POWER
1500 RPM
ISA + 37°C

WEIGHT→			12,000 POUNDS					10,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	57	52	78	558	1116	202	219	74	544	1088	200	217
2000	53	48	76	530	1060	199	221	71	513	1026	195	218
4000	49	44	74	504	1008	195	224	69	487	974	191	220
6000	45	40	72	476	952	190	226	67	459	918	187	222
8000	41	36	68	445	890	184	225	63	429	858	181	221
10,000	37	32	63	413	826	177	223	59	399	798	174	220
12,000	33	28	59	383	766	169	221	56	371	742	168	220
14,000	29	24	56	357	714	163	220	52	345	690	162	219
16,000	25	20	54	337	674	158	220	49	320	640	156	217
18,000	21	16	53	323	646	154	223	47	301	602	150	217
20,000	17	12	52	311	622	151	226	44	282	564	145	216
22,000	13	8	51	301	602	148	229	43	269	538	140	217
24,000	9	4	50	290	580	144	231	42	257	514	136	219
26,000	---	---	---	---	---	---	---	---	---	---	---	---
28,000	---	---	---	---	---	---	---	---	---	---	---	---
29,000	---	---	---	---	---	---	---	---	---	---	---	---
31,000	---	---	---	---	---	---	---	---	---	---	---	---
33,000	---	---	---	---	---	---	---	---	---	---	---	---
35,000	---	---	---	---	---	---	---	---	---	---	---	---

NOTES
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E G , 64% - 14 percentage points =50%) If desired, original power may be reset, provided TGT limit is not exceeded If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots

IFAT based on 14,000 pounds

Figure 7-68. Maximum Range Power - 1500 RPM - ISA + 37°C (Sheet 1 of 2)

MAXIMUM RANGE POWER
1500 RPM
ISA + 37°C

WEIGHT→			16,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	57	52	93	607	1214	213	230	84	578	1156	206	223
2000	53	48	92	580	1160	209	233	83	553	1106	204	227
4000	49	44	89	549	1098	204	235	83	531	1062	202	232
6000	45	40	85	518	1036	198	235	80	502	1004	197	233
8000	41	36	81	488	976	192	235	76	470	940	190	232
10,000	37	32	77	461	922	186	234	71	438	876	182	230
12,000	33	28	74	435	870	180	234	67	409	818	175	228
14,000	29	24	---	---	---	---	---	64	385	770	169	228
16,000	25	20	---	---	---	---	---	62	368	736	165	230
18,000	21	16	---	---	---	---	---	61	354	708	161	232
20,000	17	12	---	---	---	---	---	---	---	---	---	---
22,000	13	8	---	---	---	---	---	---	--	---	---	---
24,000	9	4	---	---	---	---	---	---	---	---	---	---
26,000	---	---	---	---	---	---	---	---	---	---	---	---
28,000	---	---	---	---	---	---	---	---	---	---	---	---
29,000	---	---	---	---	---	---	---	---	---	---	---	---
31,000	---	---	---	---	---	---	---	---	---	---	---	---
33,000	---	---	---	---	---	---	---	---	---	---	---	---
35,000	---	---	---	---	---	---	---	---	---	---	---	---

NOTES

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E G , 64% - 14 percentage points = 50%). If desired, original power may be reset, provided TGT limit is not exceeded If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots

IFAT based on 14,000 pounds

Figure 7-68. Maximum Range Power - 1500 RPM - ISA + 37°C (Sheet 2 of 2)

RANGE PROFILE - MAXIMUM RANGE POWER

1500 RPM

STANDARD DAY (ISA)
ZERO WIND

ASSOCIATED CONDITIONS
WEIGHT .... *16,110 LBS BEFORE ENGINE START
FUEL AVIATION KEROSENE
FUEL DENSITY 6.7 LBS/GAL
ICE VANES....... RETRACTED

EXAMPLE:
PRESSURE ALTITUDE... 26,000 FT
FUEL ..2572 LBS
RANGE....... 678 NM

NOTES. 1. RANGE SHOWN ALLOWS FOR START, TAXI, AND RUNUP, INCLUDES CRUISE CLIMB AND DESCENT; AND ALLOWS FOR 45 MINUTES RESERVE FUEL AT MAXIMUM RANGE POWER.

*2 AT 16,110 LBS RAMP WEIGHT, THE MAXIMUM ZERO-FUEL WEIGHT LIMITATION OF 12,700 LBS WOULD BE EXCEEDED AT ALL FUEL LOADINGS LESS THAN 3410 LBS

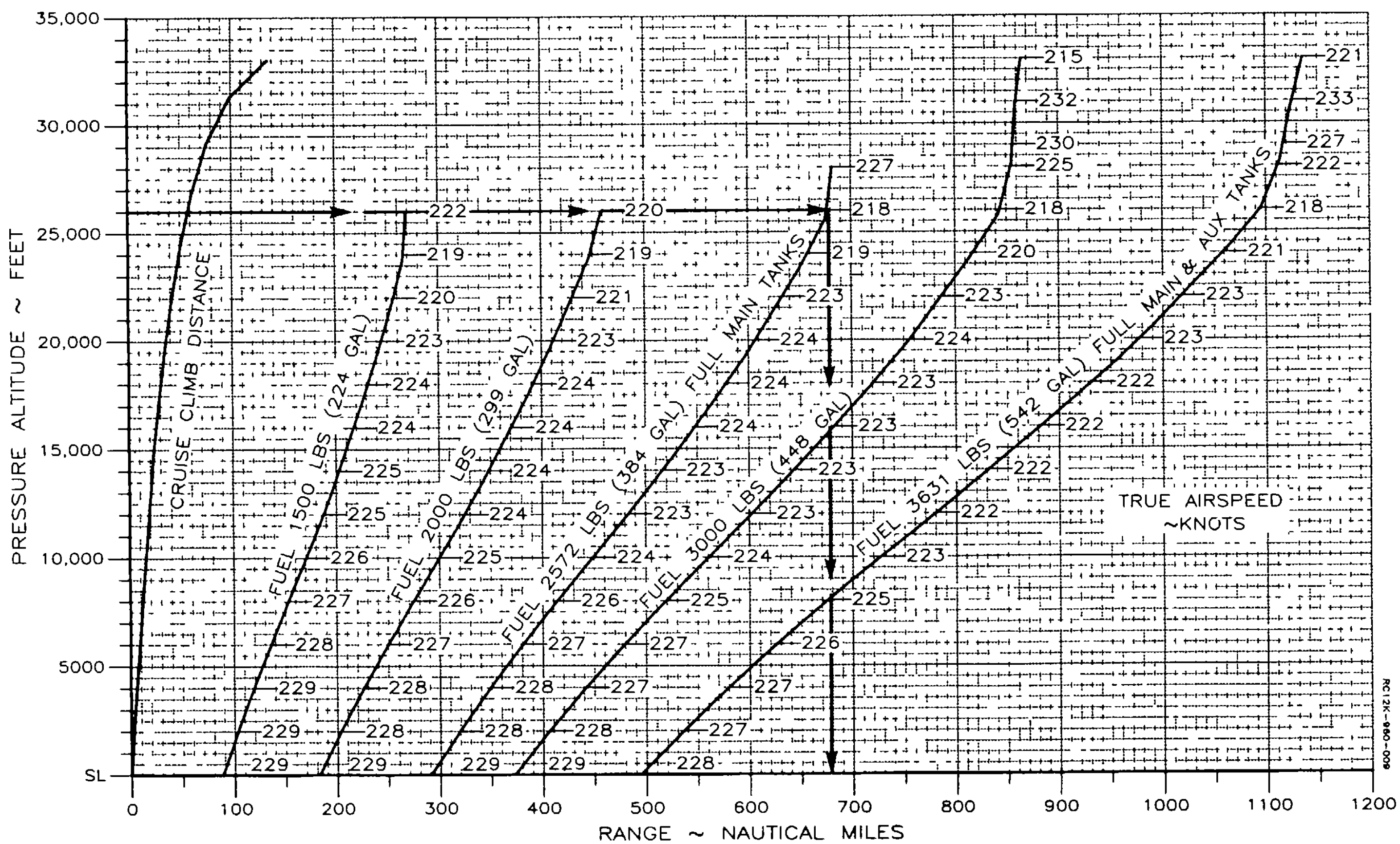


Figure 7-69. Range Profile - Maximum Range Power - 1500 RPM

LOITER POWER
1700 RPM
ISA -30°C

WEIGHT→		13,000 POUNDS					
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	-14	-15	28	388	776	124	121
2000	-18	-19	29	370	740	124	125
4000	-21	-23	29	352	704	124	128
6000	-25	-27	29	336	672	124	132
8000	-29	-31	30	321	642	124	136
10,000	-33	-35	30	306	612	124	140
12,000	-37	-39	30	292	584	124	144
14,000	-41	-43	31	280	560	124	149
16,000	-45	-47	31	269	538	124	153
18,000	-48	-51	32	260	520	124	158
20,000	-52	-55	33	251	502	124	163
22,000	-56	-59	33	245	490	124	169
24,000	-60	-63	34	240	480	124	174
26,000	-63	-67	34	238	476	124	180
28,000	-67	-70	35	237	474	124	186
29,000	-69	-72	35	236	472	124	190
31,000	-73	-76	36	235	470	124	196
33,000	-77	-80	37	239	478	124	203
35,000	-80	-84	38	246	492	124	210

NOTES

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E G , 64% - 14 percentage points = 50%) If desired, original power may be reset, provided TGT limit is not exceeded If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots

Figure 7-70. Loiter Power - 1700 RPM - ISA -30°C (Sheet 1 of 2)

LOITER POWER
1700 RPM
ISA -30°C

WEIGHT→			15,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	-14	-15	31	400	800	124	121	30	394	788	124	121
2000	-18	-19	32	382	764	124	125	30	376	752	124	125
4000	-21	-23	32	365	730	124	128	30	358	716	124	128
6000	-25	-27	32	349	698	124	132	31	342	684	124	132
8000	-29	-31	33	334	668	124	136	31	327	654	124	136
10,000	-33	-35	33	319	638	124	140	32	312	624	124	140
12,000	-37	-39	34	306	612	124	144	32	299	5984	124	144
14,000	-41	-43	34	294	588	124	149	33	287	574	124	149
16,000	-45	-47	35	284	568	124	153	33	276	552	124	153
18,000	-48	-51	36	275	550	124	158	34	267	534	124	158
20,000	-52	-55	37	267	534	124	163	35	254	518	124	163
22,000	-56	-59	37	263	526	124	169	35	253	506	124	169
24,000	-60	-63	38	261	522	124	174	36	250	500	124	174
26,000	-63	-67	39	259	518	124	180	36	248	496	124	180
28,000	-67	-70	39	258	516	124	186	37	247	494	124	186
29,000	-69	-72	39	257	514	124	190	37	246	492	124	190
31,000	-73	-76	40	260	520	124	196	38	245	490	124	196
33,000	-77	-80	41	268	536	124	203	39	253	506	124	203
35,000	-80	-84	42	274	548	124	210	40	259	518	124	210

NOTES

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E G , 64% - 14 percentage points = 50%) If desired, original power may be reset, provided TGT limit is not exceeded If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots

Figure 7-70. Loiter Power - 1700 RPM - ISA -30°C (Sheet 2 of 2)

LOITER POWER
1700 RPM
ISA -20°C

WEIGHT→		13,000 POUNDS					
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	-4	-5	28	389	778	124	123
2000	-7	-9	29	371	742	124	127
4000	-11	-13	29	354	708	124	131
6000	-15	-17	29	338	676	124	135
8000	-19	-21	30	323	646	124	139
10,000	-23	-25	30	308	616	124	143
12,000	-27	-29	31	295	590	124	147
14,000	-31	-33	31	282	564	124	152
16,000	-34	-37	32	272	544	124	157
18,000	-38	-41	32	262	524	124	162
20,000	-42	-45	33	254	508	124	167
22,000	-46	-49	34	248	496	124	173
24,000	-50	-53	34	244	488	124	178
26,000	-53	-57	35	242	484	124	185
28,000	-57	-60	36	241	482	124	191
29,000	-59	-62	36	240	480	124	194
31,000	-63	-66	36	239	478	124	201
33,000	-66	-70	37	243	486	124	208
35,000	-70	-74	38	250	500	124	216

NOTES
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points = 50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

Figure 7-71. Loiter Power - 1700 RPM - ISA -20°C (Sheet 1 of 2)

LOITER POWER
1700 RPM
ISA -20°C

WEIGHT→			15,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	-4	-5	31	402	804	124	123	30	395	790	124	123
2000	-7	-9	32	385	770	124	127	30	378	756	124	127
4000	-11	-13	32	367	734	124	131	31	360	720	124	131
6000	-15	-17	33	352	704	124	135	31	344	688	124	135
8000	-19	-21	33	337	674	124	139	31	329	658	124	139
10,000	-23	-25	34	322	644	124	143	32	315	630	124	143
12,000	-27	-29	34	309	618	124	147	32	301	602	124	147
14,000	-31	-33	35	297	594	124	152	33	289	578	124	152
16,000	-34	-37	36	286	572	124	157	34	279	558	124	157
18,000	-38	-41	36	277	554	124	162	34	270	540	124	162
20,000	-42	-45	37	272	544	124	167	35	262	524	124	167
22,000	-46	-49	38	268	536	124	173	36	258	516	124	173
24,000	-50	-53	39	264	528	124	178	36	254	508	124	178
26,000	-53	-57	39	263	526	124	185	37	252	504	124	185
28,000	-57	-60	40	262	524	124	191	38	251	502	124	191
29,000	-59	-62	40	261	522	124	194	38	250	500	124	194
31,000	-63	-66	41	266	532	124	201	39	251	502	124	201
33,000	-66	-70	42	274	548	124	208	40	258	516	124	208
35,000	-70	-74	44	282	564	124	216	41	265	530	124	216

NOTES:

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64%-14 percentage points=50%). If desired, original power may be reset, provided TGT time is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

Figure 7-71. Loiter Power - 1700 RPM - ISA -20°C (Sheet 2 of 2)

LOITER POWER
1700 RPM
ISA -10°C

WEIGHT→		13,000 POUNDS					
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	6	5	28	390	780	124	126
2000	3	1	29	373	746	124	129
4000	-1	-3	29	356	712	124	133
6000	-5	-7	30	341	682	124	137
8000	-9	-11	30	326	652	124	141
10,000	-13	-15	30	311	622	124	146
12,000	-17	-19	-31	298	596	124	150
14,000	-21	-23	32	286	572	124	155
16,000	-24	-27	32	275	550	124	160
18,000	-28	-31	33	265	530	124	165
20,000	-32	-35	34	257	514	124	171
22,000	-36	-39	34	252	504	124	176
24,000	-39	-43	35	248	496	124	182
26,000	-43	-47	36	245	490	124	189
28,000	-47	-50	36	243	486	124	195
29,000	-49	-52	36	242	484	124	199
31,000	-52	-56	37	242	484	124	206
33,000	-56	-60	38	249	498	124	213
35,000	-60	-64	39	256	512	124	221

NOTES:

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64%-14 percentage points=50%). If desired, original power may be reset, provided TGT time is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

Figure 7-72. Loiter Power - 1700 RPM - ISA -10°C (Sheet 1 of 2)

LOITER POWER
1700 RPM
ISA -10°C

WEIGHT→			15,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	6	5	31	404	808	124	126	30	397	794	124	125
2000	3	1	32	387	774	124	129	30	380	760	124	129
4000	-1	-3	32	371	742	124	133	31	363	726	124	133
6000	-5	-7	33	355	710	124	137	31	348	696	124	137
8000	-9	-11	33	340	680	124	141	32	333	666	124	141
10,000	-13	-15	34	326	652	124	146	32	318	636	124	146
12,000	-17	-19	35	313	626	124	150	33	305	610	124	150
14,000	-21	-23	35	301	602	124	155	33	293	586	124	155
16,000	-24	-27	36	290	580	124	160	34	282	564	124	160
18,000	-28	-31	37	282	564	124	165	35	273	546	124	165
20,000	-32	-35	38	276	552	124	171	35	266	532	124	171
22,000	-36	-39	38	271	542	124	176	36	261	522	124	176
24,000	-39	-43	39	268	536	124	182	37	258	516	124	182
26,000	-43	-47	40	265	530	124	189	38	255	510	124	189
28,000	-47	-50	40	263	526	124	195	38	253	506	124	195
29,000	-49	-52	41	265	530	124	199	38	252	504	124	199
31,000	-52	-56	42	273	546	124	206	40	257	514	124	206
33,000	-56	-60	44	281	562	124	213	41	264	528	124	213
35,000	-60	-64	---	---	---	---	---	42	272	544	124	221

NOTES:

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64%-14 percentage points=50%). If desired, original power may be reset, provided TGT time is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

Figure 7-72. Loiter Power - 1700 RPM- ISA -10°C (Sheet 2 of 2)

LOITER POWER
1700 RPM
ISA

WEIGHT→		13,000 POUNDS					
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	17	15	28	391	782	124	126
2000	13	11	29	374	748	124	132
4000	9	7	29	358	716	124	136
6000	5	3	30	343	686	124	140
8000	1	-1	30	329	658	124	144
10,000	-3	-5	31	315	630	124	149
12,000	-7	-9	31	302	604	124	153
14,000	-10	-13	32	290	580	124	158
16,000	-24	-27	32	279	558	124	163
18,000	-18	-21	33	270	540	124	169
20,000	-22	-25	34	261	522	124	174
22,000	-26	-29	35	256	512	124	180
24,000	-29	-33	35	251	502	124	186
26,000	-33	-37	36	247	494	124	193
28,000	-37	-40	37	244	488	124	200
29,000	-39	-42	37	243	486	124	203
31,000	-42	-46	38	248	496	124	211
33,000	-46	-50	39	255	510	124	218
35,000	-50	-54	40	262	524	124	226

NOTES:

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64%-14 percentage points=50%). If desired, original power may be reset, provided TGT time is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

Figure 7-73. Loiter Power - 1700 RPM - ISA (Sheet 1 of 2)

LOITER POWER
1700 RPM
ISA

WEIGHT→			15,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	17	15	31	405	810	124	128	30	398	796	124	128
2000	13	11	32	389	778	124	132	30	381	762	124	132
4000	9	7	32	373	746	124	136	31	365	730	124	136
6000	5	3	33	359	718	124	140	31	351	702	124	140
8000	1	-1	34	345	690	124	144	32	337	674	124	144
10,000	-3	-5	34	331	662	124	149	32	323	646	124	149
12,000	-7	-9	35	319	638	124	153	33	310	620	124	153
14,000	-10	-13	36	306	612	124	158	34	298	596	124	158
16,000	-14	-17	37	295	590	124	163	34	287	574	124	163
18,000	-18	-21	37	286	572	124	169	35	278	556	124	169
20,000	-22	-25	38	279	558	124	174	36	270	540	124	174
22,000	-26	-29	39	274	548	124	180	37	264	528	124	180
24,000	-29	-33	39	270	540	124	186	37	260	520	124	186
26,000	-33	-37	40	266	532	124	193	38	256	512	124	193
28,000	-37	-40	41	269	538	124	200	39	254	508	124	200
29,000	-39	-42	42	272	544	124	203	39	257	514	124	203
31,000	-42	-46	43	279	558	124	211	41	263	526	124	211
33,000	-45	-50	45	286	572	124	218	42	270	540	124	218
35,000	-50	-54	---	---	---	---	---	42	273	546	121	221

NOTES:

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64%-14 percentage points=50%). If desired, original power may be reset, provided TGT time is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

Figure 7-73. Loiter Power - 1700 RPM - ISA (Sheet 2 of 2)

LOITER POWER
1700 RPM
ISA + 10°C

WEIGHT→		13,000 POUNDS					
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	27	25	28	394	788	124	130
2000	23	21	29	377	754	124	134
4000	19	17	29	360	720	124	138
6000	15	13	30	345	690	124	142
8000	11	9	30	332	664	124	147
10,000	7	5	31	319	638	124	151
12,000	3	1	32	308	616	124	156
14,000	0	-3	32	296	592	124	161
16,000	-4	-7	33	284	568	124	166
18,000	-8	-11	34	273	546	124	172
20,000	-12	-15	34	265	530	124	178
22,000	-15	-19	35	259	518	124	184
24,000	-19	-23	36	253	506	124	190
26,000	-23	-27	36	248	496	124	197
28,000	-27	-30	37	248	496	124	204
29,000	-28	-32	38	249	498	124	208
31,000	-32	-36	39	254	508	124	215
33,000	-36	-40	40	250	520	124	223
35,000	---	---	---	---	---	---	---

NOTES:

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64%-14 percentage points=50%). If desired, original power may be reset, provided TGT time is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

Figure 7-74. Loiter Power - 1700 RPM - ISA + 10°OC (Sheet 1 of 2)

LOITER POWER
1700 RPM
ISA + 10°C

WEIGHT→			15,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	27	25	32	410	820	124	130	30	402	804	124	130
2000	23	21	32	392	784	124	134	30	384	768	124	134
4000	19	17	32	376	752	124	138	31	368	736	124	138
6000	15	13	33	361	722	124	142	31	353	706	124	142
8000	11	9	34	348	696	124	147	32	340	680	124	147
10,000	7	5	35	336	672	124	151	33	328	656	124	151
12,000	3	1	35	323	646	124	156	33	316	632	124	156
14,000	0	-3	36	311	622	124	161	34	303	606	124	161
16,000	-4	-7	37	300	600	124	166	35	291	582	124	166
18,000	-8	-11	38	290	580	124	172	36	281	562	124	172
20,000	-12	-15	38	281	562	124	178	36	273	546	124	178
22,000	-15	-19	39	276	552	124	184	37	267	534	124	184
24,000	-19	-23	40	271	542	124	190	38	261	522	124	190
26,000	-23	-27	41	272	544	124	197	38	258	516	124	197
28,000	-27	-30	42	276	552	124	204	40	261	522	124	204
29,000	-28	-32	43	278	556	124	208	40	263	526	124	208
31,000	-32	-36	44	284	568	124	215	41	269	538	124	215
33,000	-36	-40	---	---	---	---	---	43	275	550	124	223
35,000	---	---	---	---	---	---	---	---	---	---	---	---

NOTES:

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64%-14 percentage points=50%). If desired, original power may be reset, provided TGT time is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

Figure 7-74. Loiter Power - 1700 RPM - ISA + 10°C (Sheet 2 of 2)

LOITER POWER
1700 RPM
ISA + 20°C

WEIGHT→	13,000 POUNDS						
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	37	35	29	401	802	124	132
2000	33	31	29	384	768	124	136
4000	29	27	30	367	734	124	140
6000	25	23	30	352	704	124	145
8000	21	19	31	338	676	124	149
10,000	17	15	31	324	648	124	154
12,000	14	11	32	310	620	124	159
14,000	10	7	33	298	596	124	164
16,000	6	3	33	287	574	124	170
18,000	2	-1	34	277	554	124	175
20,000	-2	-5	35	268	536	124	181
22,000	-5	-9	36	262	524	124	187
24,000	-9	-13	36	255	510	124	194
26,000	-13	-17	37	254	508	124	201
28,000	-16	-20	38	255	510	124	208
29,000	-18	-22	39	256	512	124	212
31,000	-22	-26	40	259	518	124	220
33,000	-26	-30	40	260	520	122	224
35,000	---	---	---	---	---	---	---

NOTES:

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64%-14 percentage points=50%). If desired, original power may be reset, provided TGT time is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

Figure 7-75. Loiter Power - 1700 RPM - ISA + 20°C (Sheet 1 of 2)

LOITER POWER
1700 RPM
ISA + 20°C

WEIGHT→			15,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	-4	-5	31	402	804	124	123	30	395	790	124	123
2000	-7	-9	32	385	770	124	127	30	378	756	124	127
4000	-11	-13	32	367	734	124	131	31	360	720	124	131
6000	-15	-17	33	352	704	124	135	31	344	688	124	135
8000	-19	-21	33	337	674	124	139	31	329	658	124	139
10,000	-23	-25	34	322	644	124	143	32	315	630	124	143
12,000	-27	-29	34	309	618	124	147	32	301	602	132	147
14,000	-31	-33	35	297	594	124	152	33	289	578	124	152
16,000	-34	-37	36	286	572	124	157	34	279	558	124	157
18,000	-38	-41	36	277	554	124	162	34	270	540	124	162
20,000	-42	-45	37	272	544	124	167	35	262	524	124	167
22,000	-46	-49	38	268	536	124	173	36	258	516	124	173
24,000	-50	-53	39	264	528	124	178	36	254	508	124	178
26,000	-53	-57	39	263	526	124	185	37	252	504	124	185
28,000	-57	-60	40	262	524	124	191	38	251	502	124	191
29,000	-59	-62	40	261	522	124	194	38	250	500	124	194
31,000	-63	-66	41	266	532	124	201	39	251	502	124	201
33,000	-66	-70	42	274	548	124	208	40	258	516	124	208
35,000	-70	-74	44	282	564	124	216	41	265	530	124	216

NOTES:

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64%-14 percentage points=50%). If desired, original power may be reset, provided TGT time is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

Figure 7-75. Loiter Power - 1700 RPM - ISA + 20°C (Sheet 2 of 2)

LOITER POWER
1700 RPM
ISA + 30°C

WEIGHT→		13,000 POUNDS					
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	47	45	30	407	814	124	134
2000	43	41	30	392	784	124	138
4000	39	37	31	376	752	124	143
6000	35	33	31	360	720	124	147
8000	31	29	32	344	688	124	152
10,000	27	25	32	329	658	124	157
12,000	24	21	33	314	628	124	162
14,000	20	17	33	301	602	124	167
16,000	16	13	34	289	578	124	173
18,000	12	9	35	279	558	124	178
20,000	9	5	35	271	542	124	185
22,000	5	1	36	267	534	124	191
24,000	1	-3	37	263	526	124	198
26,000	-3	-7	38	259	518	124	205
28,000	-6	-10	39	259	518	124	212
29,000	-8	-12	39	259	518	124	216
31,000	-12	-16	40	258	516	121	219
33,000	---	---	---	---	---	---	---
35,000	---	---	---	---	---	---	---

NOTES:

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64%-14 percentage points=50%). If desired, original power may be reset, provided TGT time is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

Figure 7-76. Loiter Power - 1700 RPM - ISA + 30°C (Sheet 1 of 2)

LOITER POWER
1700 RPM
ISA + 30°C

WEIGHT→			15,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	47	45	33	424	848	124	134	31	416	832	124	134
2000	43	41	34	408	816	124	138	32	400	800	124	138
4000	38	37	34	391	782	124	143	32	383	766	124	143
6000	35	33	35	375	750	124	147	33	367	734	124	147
8000	31	29	35	360	720	124	152	33	352	704	124	152
10,000	27	25	36	344	688	124	157	34	336	672	124	157
12,000	24	21	37	330	660	124	162	35	322	644	124	162
14,000	20	17	37	317	634	124	167	35	309	618	124	167
16,000	16	13	38	305	610	124	173	36	297	594	124	173
18,000	12	9	39	296	592	124	178	37	287	574	124	178
20,000	9	5	40	291	582	124	185	38	281	562	124	185
22,000	5	1	41	287	574	124	191	39	276	552	124	191
24,000	1	-3	42	284	568	124	198	39	273	546	124	198
26,000	-3	-7	43	282	564	124	205	40	270	540	124	205
28,000	-6	-10	44	284	568	124	211	41	270	540	124	212
29,000	-8	-12	---	---	---	---	---	42	272	544	124	216
31,000	-12	-16	---	---	---	---	---	---	---	---	---	---
33,000	---	---	---	---	---	---	---	---	---	---	---	---
35,000	---	---	---	---	---	---	---	---	---	---	---	---

NOTES:

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64%-14 percentage points=50%). If desired, original power may be reset, provided TGT time is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

Figure 7-76. Loiter Power - 1700 RPM - ISA + 30°C (Sheet 2 of 2)

LOITER POWER
1700 RPM
ISA + 37°C

WEIGHT→	13,000 POUNDS						
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	54	52	30	409	818	124	136
2000	50	48	30	392	784	124	140
4000	46	44	31	376	752	124	144
6000	42	40	31	361	722	124	149
8000	38	36	32	346	692	124	154
10,000	35	32	32	332	664	124	158
12,000	31	28	33	318	636	124	164
14,000	27	24	34	304	608	124	169
16,000	23	20	34	293	586	124	175
18,000	19	16	35	283	566	124	181
20,000	16	12	36	275	550	124	187
22,000	12	8	37	269	538	124	193
24,000	8	4	37	264	528	124	200
26,000	5	0	38	260	520	124	207
28,000	0	-3	39	260	520	124	215
29,000	-2	-5	39	258	516	122	216
31,000	----	---	---	---	---	---	---
33,000	---	---	---	---	---	---	---
35,000	---	---	---	---	---	---	---

NOTES:

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64%-14 percentage points=50%). If desired, original power may be reset, provided TGT time is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

Figure 7-77. Loiter Power - 1700 RPM - ISA + 37°C (Sheet 1 of 2)

LOITER POWER
1700 RPM
ISA + 37°C

WEIGHT→			15,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	54	52	33	424	848	124	136	32	416	832	124	136
2000	50	48	34	408	816	124	140	32	400	800	124	140
4000	46	44	34	392	784	124	144	33	384	768	124	144
6000	42	40	35	377	754	124	149	33	369	738	124	149
8000	38	36	36	362	724	124	154	34	354	708	124	154
10,000	35	32	36	348	696	124	158	34	340	680	124	158
12,000	31	28	37	334	668	124	164	35	325	650	124	164
14,000	27	24	38	321	642	124	169	36	312	624	124	169
16,000	23	20	38	309	618	124	175	36	301	602	124	175
18,000	19	16	39	301	602	124	181	37	292	584	124	181
20,000	16	12	40	293	586	124	187	38	284	568	124	187
22,000	12	8	41	288	576	124	193	39	278	556	124	193
24,000	8	4	42	284	568	124	200	39	273	546	124	200
26,000	5	0	---	---	---	---	---	40	271	542	124	207
28,000	0	-3	---	---	---	---	---	---	---	---	---	---
29,000	-2	-5	---	---	---	---	---	---	---	---	---	---
31,000	---	---	---	---	---	---	---	---	---	---	---	---
33,000	---	---	---	---	---	---	---	---	---	---	---	---
35,000	---	---	---	---	---	---	---	---	---	---	---	---

NOTES:

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64%-14 percentage points=50%). If desired, original power may be reset, provided TGT time is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

Figure 7-77. Loiter Power - 1700 RPM - ISA + 37°C (Sheet 2 of 2)

ENDURANCE PROFILE - LOITER POWER

1700 RPM

STANDARD DAY (ISA)

ASSOCIATED CONDITIONS:
WEIGHT ....*16,110 LBS BEFORE ENGINE START
FUEL...........AVIATION KEROSENE
FUEL DENSITY ....6.7 LBS/GAL
ICE VANES.......RETRACTED

EXAMPLE:
PRESSURE ALTITUDE.....26,000 FT
FUEL................2572 LBS
ENDURANCE...........3.37 HRS

NOTES: 1. ENDURANCE SHOWN ALLOWS FOR START, TAXI, AND RUNUP; INCLUDES CRUISE CLIMB AND DESCENT; AND ALLOWS FOR 45 MINUTES RESERVE FUEL AT MAXIMUM RANGE POWER.

*2. AT 16,110 LBS RAMP WEIGHT, THE MAXIMUM ZERO-FUEL WEIGHT LIMITATION OF 12,700 LBS WOULD BE EXCEEDED AT ALL FUEL LOADINGS LESS THAN 3410 LBS.

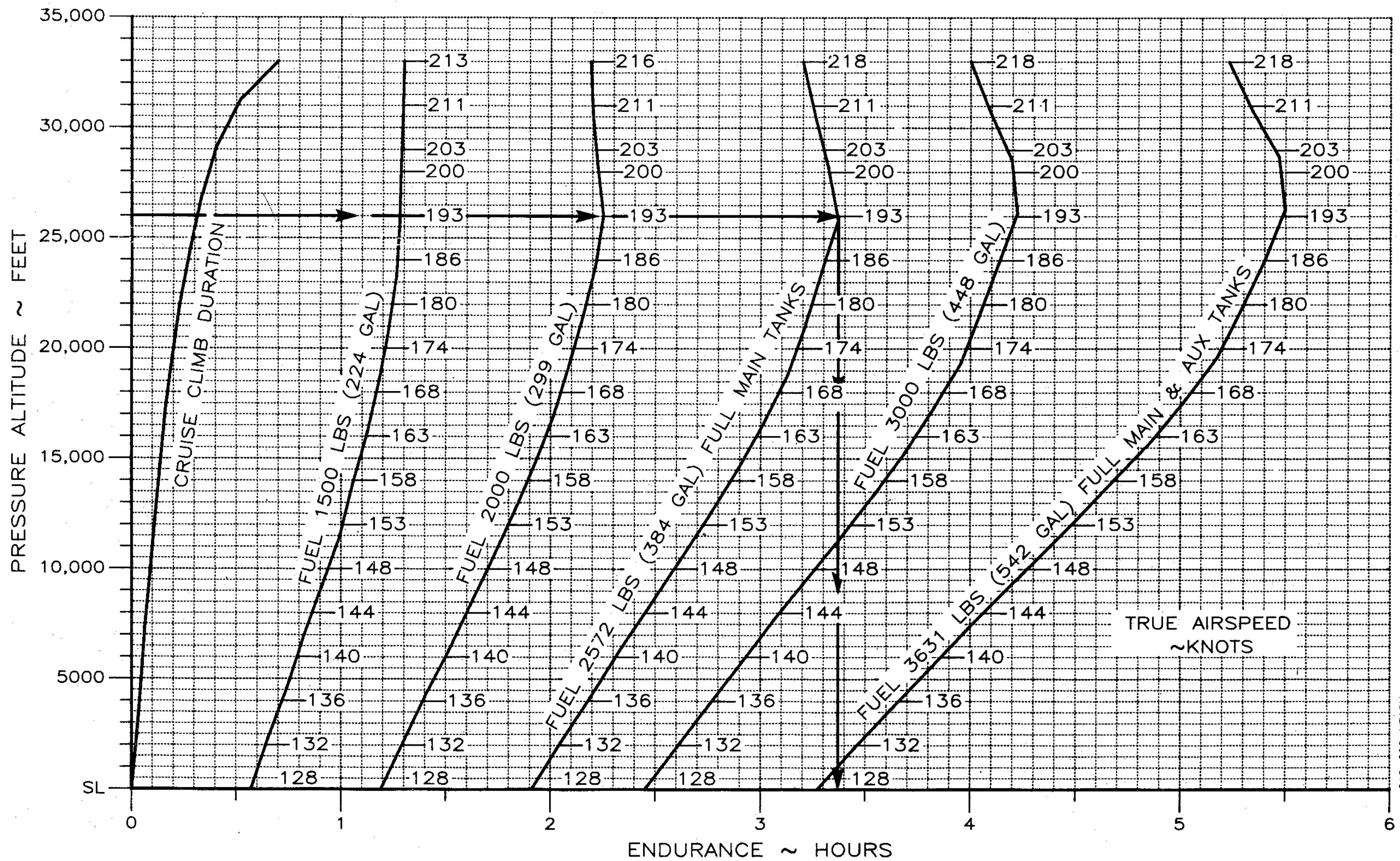


Figure 7- 78. Endurance Profile - Loiter Power 1700 RPM

RANGE PROFILE - FULL MAIN TANKS

STANDARD DAY (ISA)
ZERO WIND

ASSOCIATED CONDITIONS:
WEIGHT ....15,272 LBS BEFORE ENGINE START
FUEL...........AVIATION KEROSENE
FUEL DENSITY ....6.7 LBS/GAL
ICE VANES.......RETRACTED

EXAMPLE:
PRESSURE ALTITUDE...........26,000 FT
RANGE @:
MAXIMUM CRUISE POWER....640 NM
NORMAL CRUISE POWER.....652 NM
MAXIMUM RANGE POWER.....704 NM

NOTE: RANGE SHOWN ALLOWS FOR START, TAXI, AND RUNUP; INCLUDES CRUISE CLIMB AND DESCENT; AND ALLOWS FOR 45 MINUTES RESERVE FUEL AT MAXIMUM RANGE POWER.

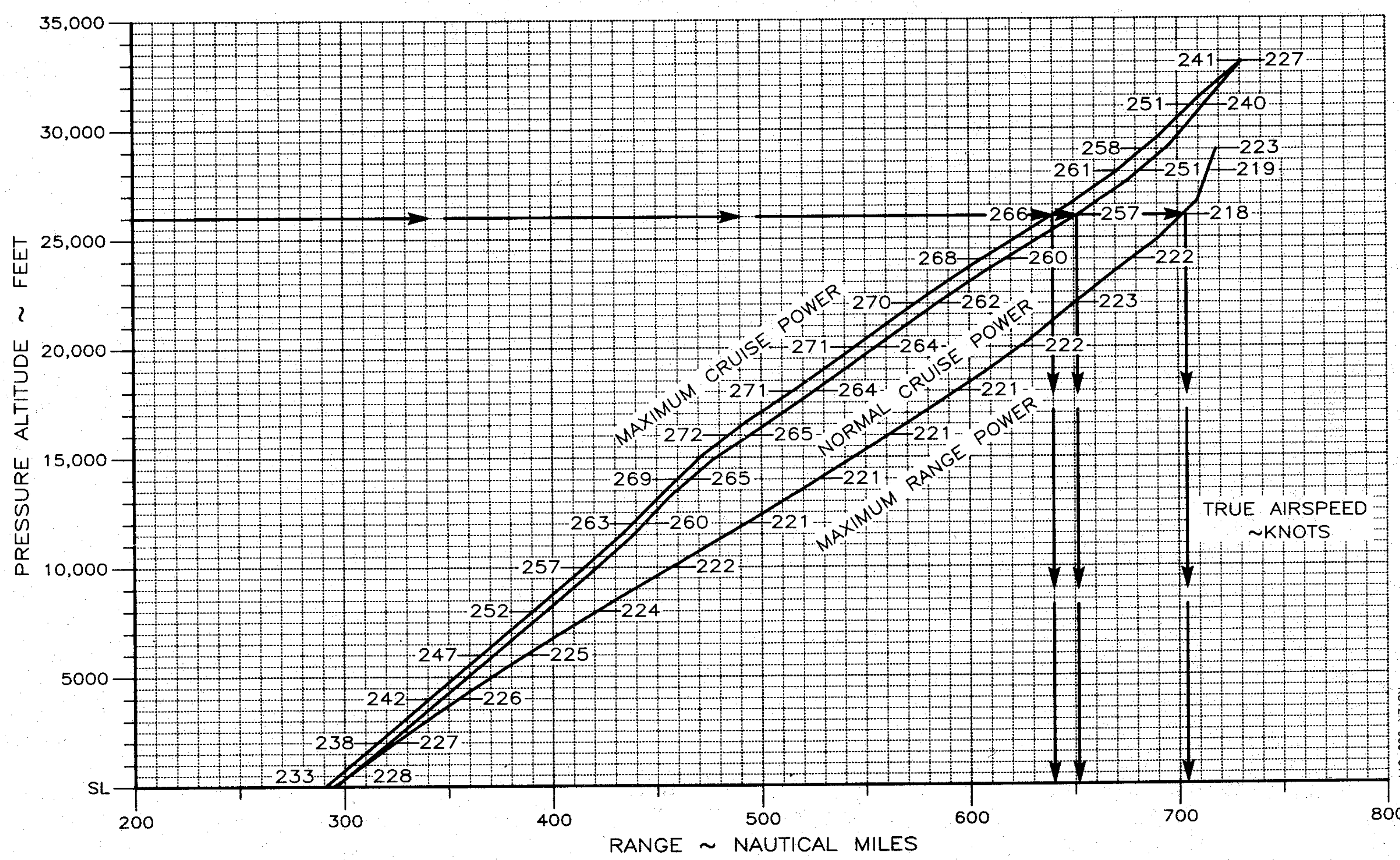


Figure 7-79. Range Profile - Full Main Tanks

ENDURANCE PROFILE - FULL MAIN TANKS

STANDARD DAY (ISA)

ASSOCIATED CONDITIONS:

WEIGHT .... 15,272 LBS BEFORE ENGINE START
FUEL .... AVIATION KEROSENE
FUEL DENSITY .... 6.7 LBS/GAL
ICE VANES .... RETRACTED

EXAMPLE:

PRESSURE ALTITUDE .... 26,000 FT
ENDURANCE @:
MAXIMUM CRUISE POWER .... 2.49 HRS
NORMAL CRUISE POWER ..... 2.60 HRS
LOITER POWER .... 3.48 HRS

NOTE: ENDURANCE SHOWN ALLOWS FOR START, TAXI, AND RUNUP; INCLUDES CRUISE CLIMB AND DESCENT; AND ALLOWS FOR 45 MINUTES RESERVE FUEL AT MAXIMUM RANGE POWER.

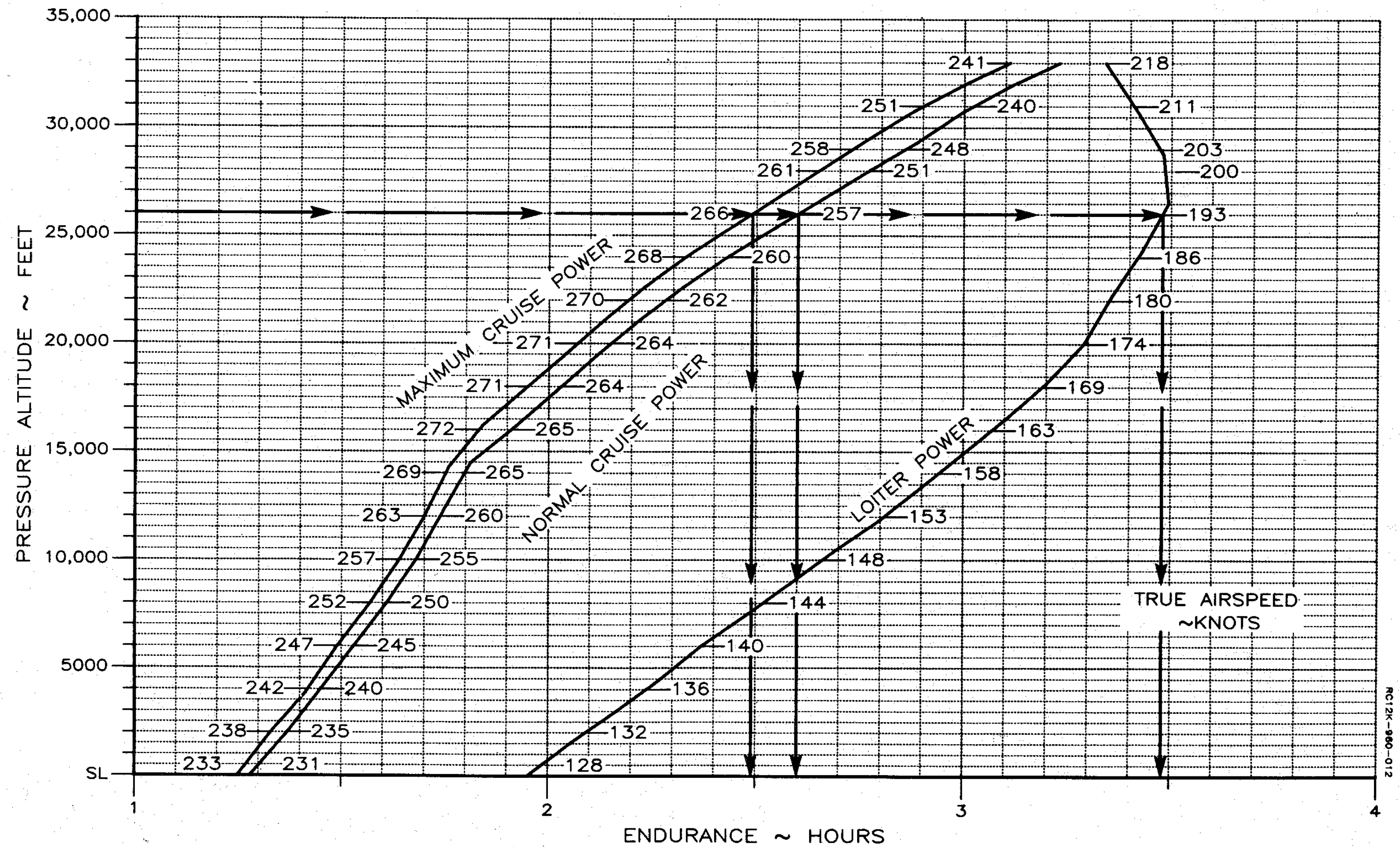


Figure 7-80. Endurance Profile - Full Main Tanks

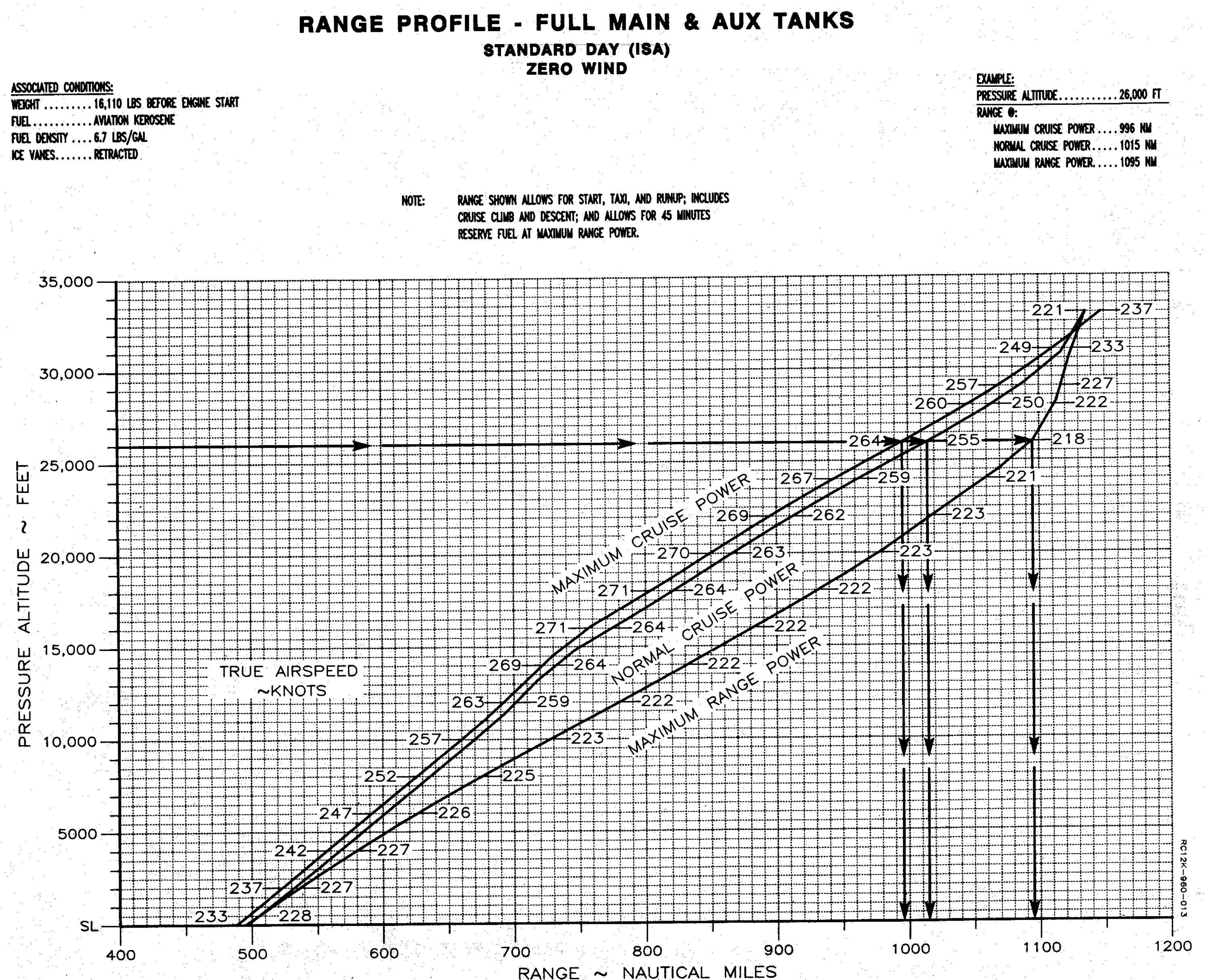


Figure 7-81. Range Profile - Full Main and Aux Tanks

ENDURANCE PROFILE - FULL MAIN & AUX TANKS

STANDARD DAY (ISA)

ASSOCIATED CONDITIONS:
WEIGHT .... 16,110 LBS BEFORE ENGINE START
FUEL .... AVIATION KEROSENE
FUEL DENSITY ..... 6.7 LBS/GAL
ICE VANES....... RETRACTED

EXAMPLE:
PRESSURE ALTITUDE............26,000 FT
ENDURANCE @:
MAXIMUM CRUISE POWER.....3.84 HRS
NORMAL CRUISE POWER......4.03 HRS
LOITER POWER............5.49 HRS

NOTE: ENDURANCE SHOWN ALLOWS FOR START, TAXI, AND RUNUP; INCLUDES CRUISE CLIMB AND DESCENT; AND ALLOWS FOR 45 MINUTES RESERVE FUEL AT MAXIMUM RANGE POWER.

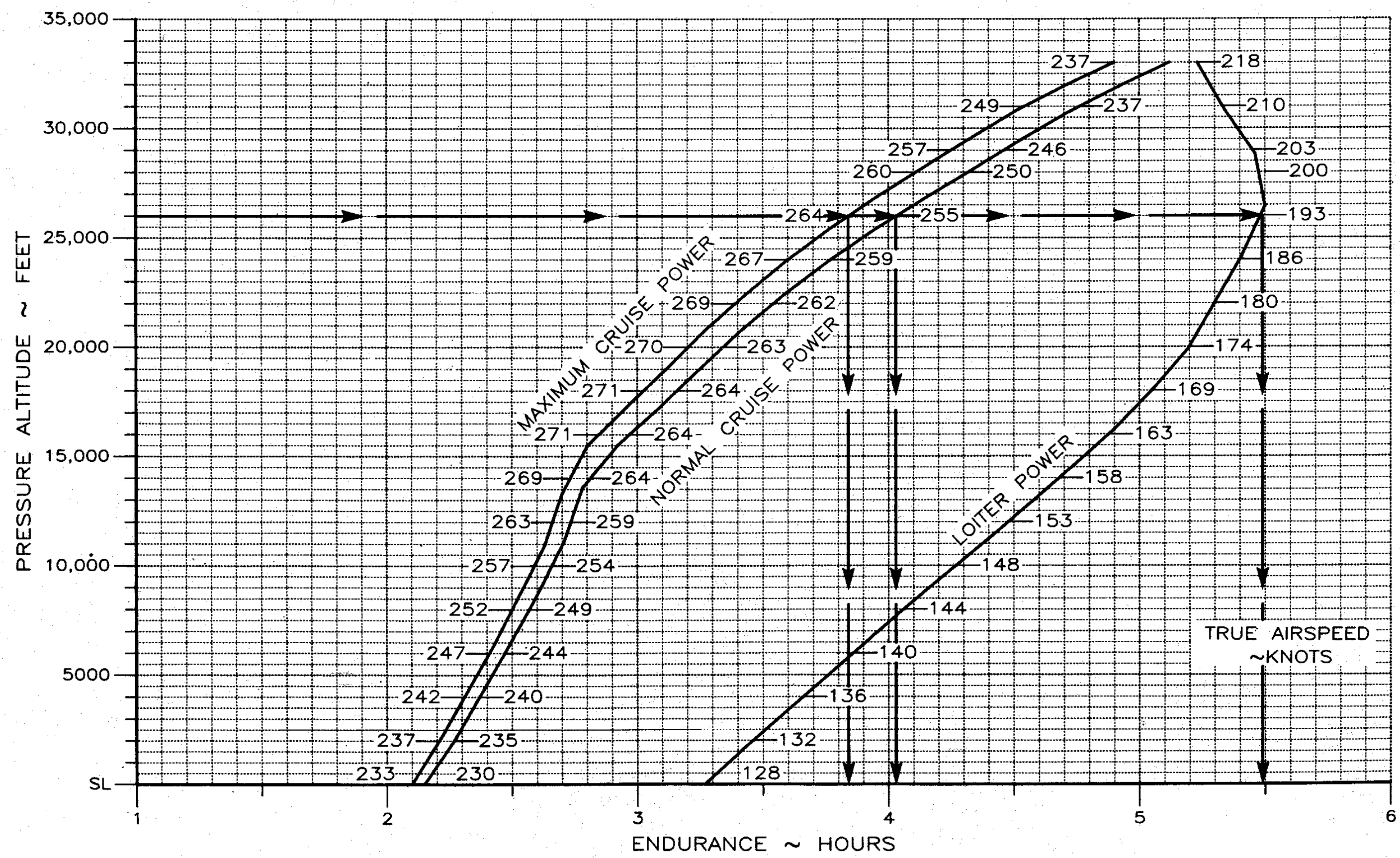


Figure 7-82. Endurance Profile - Full Main and Aux Tanks

ONE-ENGINE-INOPERATIVE MAXIMUM CRUISE POWER
1700 RPM
ISA -30°C

WEIGHT→			12,000 POUNDS					10,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	-12	-15	91	635	635	183	177	91	634	634	185	179
2000	-16	-19	91	616	616	182	181	91	615	615	184	183
4000	-20	-23	91	598	598	181	185	91	598	598	183	187
6000	-24	-27	91	583	583	179	188	91	582	582	181	191
8000	-28	-31	91	573	573	177	192	91	573	573	180	195
10,000	-31	-35	91	566	566	175	196	91	566	566	178	199
12,000	-35	-39	91	560	560	174	200	91	560	560	177	203
14,000	-39	-43	91	555	557	172	204	91	555	555	175	207
16,000	-43	-47	91	553	553	170	207	91	552	552	173	211
18,000	-47	-51	91	553	553	168	212	91	552	552	171	216
20,000	-51	-55	90	546	546	165	214	90	547	547	169	219
22,000	-55	-59	84	512	512	157	212	84	513	513	162	218
24,000	-59	-63	77	476	476	149	208	78	478	478	155	215
26,000	-63	-67	70	435	435	139	202	71	439	439	147	211
28,000	-67	-70	63	393	393	127	191	64	397	397	137	205

NOTES:

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64%-14 percentage points=50%). If desired, original power may be reset, provided TGT time is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

IFAT based on 14,000 pounds.

Figure 7-83. One-Engine-Inoperative Maximum Cruise Power - 1700 RPM - ISA -30°C (Sheet 1 of 2)

ONE-ENGINE-INOPERATIVE MAXIMUM CRUISE POWER
1700 RPM
ISA -30°C

WEIGHT→			16,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	-12	-15	91	636	636	176	170	91	635	635	180	174
2000	-16	-19	91	617	617	174	174	91	616	616	179	178
4000	-20	-23	91	599	599	173	177	91	599	599	177	182
6000	-24	-27	91	584	584	171	180	91	583	583	175	185
8000	-28	-31	91	575	575	169	184	91	574	574	174	188
10,000	-31	-35	91	568	568	167	186	91	567	567	172	192
12,000	-35	-39	91	562	562	164	189	91	561	561	170	195
14,000	-39	-43	91	557	557	162	192	91	556	556	167	199
16,000	-43	-47	91	555	555	159	195	91	554	554	165	202
18,000	-47	-51	91	555	555	157	198	91	554	554	163	206
20,000	-51	-55	89	545	545	152	198	89	546	546	159	208
22,000	-55	-59	82	507	507	140	190	83	510	510	151	204
24,000	-59	-63	75	466	466	122	172	76	473	473	141	197
26,000	-63	-67	---	---	---	---	---	69	430	430	127	184
28,000	-67	-70	---	---	---	---	---	---	---	---	---	---

NOTES:

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64%-14 percentage points=50%). If desired, original power may be reset, provided TGT time is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 30 knots.

IFAT based on 14,000 pounds.

Figure 7-83. One-Engine-Inoperative Maximum Cruise Power - 1700 RPM - ISA -30°C (Sheet 2 of 2)

ONE-ENGINE-INOPERATIVE MAXIMUM CRUISE POWER
1700 RPM
ISA-20°C

WEIGHT→			12,000 POUNDS					10,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	-2	-5	91	637	637	182	179	91	636	636	184	181
2000	-6	-9	91	616	616	181	183	91	616	616	183	186
4000	-10	-13	91	598	598	180	187	91	597	597	182	190
6000	-14	-17	91	586	586	178	191	91	586	586	180	194
8000	-18	-21	91	577	577	176	194	91	576	576	178	197
10,000	-21	-25	91	569	569	174	198	91	568	568	177	201
12,000	-25	-29	91	562	562	172	202	91	561	561	175	205
14,000	-29	-33	91	556	556	170	206	91	556	556	173	209
16,000	-33	-37	91	553	553	168	210	91	552	552	171	214
18,000	-37	-41	91	551	551	165	214	91	552	552	169	218
20,000	-41	-45	85	522	522	159	212	86	523	523	163	218
22,000	-45	-49	80	490	490	152	209	88	491	491	157	216
24,000	-49	-53	74	458	458	144	206	75	460	460	150	214
26,000	-53	-57	68	426	426	135	200	69	427	427	143	211
28,000	-57	-60	62	391	391	124	190	63	394	394	134	206

NOTES:
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points = 50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 15 knots.

IFAT based on 14,000 pounds.

Figure 7-84. One-Engine-Inoperative Maximum Cruise Power - 1700 RPM - ISA -20°C (Sheet 1 of 2)

ONE-ENGINE-INOPERATIVE MAXIMUM CRUISE POWER
1700 RPM
ISA-20°C

WEIGHT→			16,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	-2	-5	91	638	638	174	172	91	637	637	179	176
2000	-6	-9	91	617	617	173	176	91	617	617	177	180
4000	-10	-13	91	600	600	172	180	91	599	599	176	184
6000	-14	-17	91	588	588	170	182	91	587	587	174	187
8000	-18	-21	91	578	578	167	185	91	577	577	172	190
10,000	-21	-25	91	570	570	165	188	91	569	569	170	194
12,000	-25	-29	91	564	564	162	191	91	563	563	168	197
14,000	-29	-33	91	558	558	159	194	91	557	557	165	200
16,000	-33	-37	91	555	555	157	197	91	554	554	163	204
18,000	-37	-41	90	549	549	153	198	90	551	551	160	207
20,000	-41	-45	84	518	518	143	192	85	521	521	153	204
22,000	-45	-49	78	485	485	131	181	79	489	489	144	199
24,000	-49	-53	---	---	---	---	---	73	456	456	134	192
26,000	-53	-57	---	---	---	---	---	---	---	---	---	---
28,000	-57	-60	---	---	---	---	---	---	---	---	---	---

NOTES:
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points = 50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 15 knots.

IFAT based on 14,000 pounds.

Figure 7-84. One-Engine-Inoperative Maximum Cruise Power - 1700 RPM - ISA -200C (Sheet 2 of 2)

ONE-ENGINE -INOPERATIVE MAXIMUM CRUISE POWER
1700 RPM
ISA -10 °C

WEIGHT→			12,000 POUNDS					10,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	8	5	91	638	638	181	181	91	637	637	183	184
2000	4	1	91	620	620	180	186	91	619	619	183	188
4000	0	-3	91	603	603	178	189	91	603	603	181	192
6000	-4	-7	91	589	589	176	193	91	589	589	179	196
8000	-7	-11	91	578	578	174	196	91	577	577	177	200
10,000	-11	-15	91	568	568	172	200	91	567	567	175	203
12,000	-15	-19	91	561	561	170	204	91	560	560	173	208
14,000	-19	-23	91	555	555	168	208	91	555	555	171	212
16,000	-23	-27	90	550	550	165	211	91	550	550	169	216
18,000	-27	-31	85	521	521	159	210	86	522	522	163	216
20,000	-31	-35	81	495	495	153	209	81	496	496	158	215
22,000	-35	-39	75	465	465	146	206	76	466	466	151	213
24,000	-39	-43	70	435	435	137	201	70	436	436	144	211
26,000	-43	-47	64	404	404	127	193	65	406	406	137	207
28,000	-47	-50	---	---	---	---	---	60	376	376	129	202

NOTES:
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points = 50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 15 knots.

IFAT based on 14,000 pounds.

Figure 7-85. One-Engine-Inoperative Maximum Cruise Power - 1700 RPM - ISA -10°C (Sheet 1 of 2)

ONE-ENGINE -INOPERATIVE MAXIMUM CRUISE POWER
1700 RPM
ISA -10 °C

WEIGHT→			16,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	8	5	91	639	639	174	175	91	638	638	178	179
2000	4	1	91	621	621	173	178	91	620	620	177	183
4000	0	-3	91	605	605	170	181	91	604	604	175	186
6000	-4	-7	91	591	591	168	184	91	590	590	172	189
8000	-7	-11	91	580	580	165	186	91	579	579	170	192
10,000	-11	-15	91	570	570	162	189	91	569	569	168	195
12,000	-15	-19	91	562	562	160	192	91	561	561	166	199
14,000	-19	-23	91	558	558	157	195	91	556	556	164	203
16,000	-23	-27	89	547	547	153	196	90	549	549	160	205
18,000	-27	-31	84	518	518	144	191	85	520	520	153	203
20,000	-31	-35	80	491	491	134	183	80	494	494	146	199
22,000	-35	-39	---	---	---	---	---	75	463	463	136	193
24,000	-39	-43	---	---	---	---	---	69	431	431	124	182
26,000	-43	-47	---	---	---	---	---	---	---	---	---	---
28,000	-47	-50	---	---	---	---	---	---	---	---	---	---

NOTES:

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points = 50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 15 knots.

IFAT based on 14,000 pounds.

Figure 7-85. One-Engine-Inoperative Maximum Cruise Power - 1700 RPM - ISA -10°C (Sheet 2 of 2)

ONE-ENGINE -INOPERATIVE MAXIMUM CRUISE POWER
1700 RPM
ISA

WEIGHT→			12,000 POUNDS					10,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	18	15	91	643	643	180	184	91	642	642	183	187
2000	14	11	91	624	624	178	188	91	624	624	181	190
4000	10	7	91	607	607	176	191	91	607	607	179	194
6000	6	3	91	593	593	174	194	91	592	592	177	198
8000	3	-1	91	580	580	172	198	91	579	579	175	202
10,000	-1	-5	91	568	568	170	202	91	568	568	174	206
12,000	-5	-9	91	559	559	168	206	91	559	559	172	210
14,000	-9	-13	89	544	544	165	208	89	545	545	168	212
16,000	-13	-17	84	515	515	158	206	84	516	516	163	212
18,000	-17	-21	79	488	488	152	205	80	489	489	157	211
20,000	-21	-25	75	462	462	145	203	75	463	463	151	210
22,000	-26	-29	70	435	435	138	199	71	436	436	145	209
24,000	-29	-33	65	408	408	129	194	66	410	410	138	206
26,000	-33	-37	---	---	---	---	---	61	383	383	131	203
28,000	-37	-40	---	---	---	---	---	56	356	356	122	197

NOTES:
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points =50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 15 knots.

IFAT based on 14,000 pounds.

Figure 7-86. One-Engine-Inoperative Maximum Cruise Power - 1700 RPM - ISA (Sheet 1 of 2)

ONE-ENGINE -INOPERATIVE MAXIMUM CRUISE POWER
1700 RPM
ISA

WEIGHT→			16,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	18	15	91	645	645	173	177	91	644	644	177	181
2000	14	11	91	626	626	171	180	91	625	625	175	184
4000	10	7	91	609	609	168	182	91	608	608	173	187
6000	6	3	91	594	594	166	185	91	593	593	170	190
8000	3	-1	91	581	581	163	188	91	580	580	168	194
10,000	-1	-5	91	570	570	160	190	91	569	569	166	197
12,000	-5	-9	91	561	561	158	193	91	560	560	164	201
14,000	-9	-13	88	540	540	152	192	88	543	543	159	201
16,000	-13	-17	83	510	510	143	187	83	513	513	152	199
18,000	-17	-21	78	482	482	132	179	79	486	486	144	195
20,000	-21	-25	---	---	---	---	---	74	460	460	136	190
22,000	-26	-29	---	---	---	---	---	69	432	432	125	182
24,000	-29	-33	---	---	---	---	---	---	---	---	---	---
26,000	-33	-37	---	---	---	---	---	---	---	---	---	---
28,000	-37	-40	---	---	---	---	---	---	---	---	---	---

NOTES:

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points = 50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 15 knots.

IFAT based on 14,000 pounds.

Figure 7-86. One-Engine-Inoperative Maximum Cruise Power - 1700 RPM - ISA (Sheet 2 of 2)

ONE-ENGINE -INOPERATIVE MAXIMUM CRUISE POWER
1700 RPM
ISA +10 °C

WEIGHT→			12,000 POUNDS					10,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	*PERCENT*	*LBS/HR*	*LBS/HR*	*KTS*	*KTS*	*PERCENT*	*LBS/HR*	*LBS/HR*	*KTS*	*KTS*
SL	28	25	91	648	648	179	186	91	648	648	182	189
2000	24	21	91	628	628	177	189	91	627	627	180	192
4000	20	17	91	609	609	175	193	91	609	609	178	196
6000	17	13	91	594	594	173	196	91	593	593	176	200
8000	13	9	91	581	581	171	200	91	580	580	174	204
10,000	9	5	91	569	569	169	204	91	569	569	172	208
12,000	5	1	87	542	542	164	204	88	543	543	167	209
14,000	1	-3	82	509	509	157	203	83	510	510	162	208
16,000	-3	-7	77	479	479	151	201	78	480	480	156	207
18,000	-7	-11	73	451	451	143	198	73	453	453	150	206
20,000	-12	-15	68	425	425	136	194	69	427	427	143	204
22,000	-15	-19	64	401	401	128	189	64	403	403	137	202
24,000	-19	-23	---	---	---	---	---	60	379	379	130	199
26,000	-23	-27	---	---	---	---	---	56	355	355	122	194
28,000	----	---	---	---	---	---	---	---	---	---	---	---

NOTES:

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points = 50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 15 knots.

IFAT based on 14,000 pounds.

Figure 7-87. One-Engine-Inoperative Maximum Cruise Power - 1700 RPM - ISA + 1O°C (Sheet 1 of 2)

ONE-ENGINE -INOPERATIVE MAXIMUM CRUISE POWER
1700 RPM
ISA +10 °C

WEIGHT→			16,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	28	25	91	650	650	171	178	91	649	649	176	183
2000	24	21	91	629	629	169	181	91	628	628	173	186
4000	20	17	91	611	611	166	184	91	610	610	171	189
6000	17	13	91	595	595	164	186	91	594	594	169	192
8000	13	9	91	582	582	161	189	91	581	581	167	195
10,000	9	5	91	569	569	158	191	91	570	570	164	199
12,000	5	1	86	538	538	151	188	87	541	541	158	197
14,000	1	-3	81	505	505	141	182	82	508	508	151	195
16,000	-3	-7	75	473	473	129	173	77	477	477	143	191
18,000	-7	-11	---	---	---	---	---	72	449	449	134	185
20,000	-12	-15	---	---	---	---	---	67	422	422	123	176
22,000	-15	-19	---	---	---	---	---	---	---	---	---	---
24,000	-19	-23	---	---	---	---	---	---	---	---	---	---
26,000	-23	-27	---	---	---	---	---	---	---	---	---	---
28,000	---	---	---	---	---	---	---	---	---	---	---	---

NOTES:
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points = 50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 15 knots.

IFAT based on 14,000 pounds.

Figure 7-87. One-Engine-Inoperative Maximum Cruise Power - 1700 RPM - ISA + 10°C (Sheet 2 of 2)

ONE-ENGINE -INOPERATIVE MAXIMUM CRUISE POWER
1700 RPM
ISA +20 °C

WEIGHT→			12,000 POUNDS					10,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	38	35	91	650	650	178	188	91	650	650	180	190
2000	34	31	91	630	630	175	191	91	629	629	178	194
4000	30	27	91	611	611	173	194	91	610	610	176	198
6000	27	23	91	594	594	171	198	91	595	595	174	201
8000	23	29	87	563	563	166	198	87	564	564	170	202
10,000	19	15	83	532	532	160	197	83	533	533	164	202
12,000	14	11	78	501	501	154	196	79	502	502	159	202
14,000	10	7	74	471	471	148	194	75	473	473	153	201
16,000	6	3	70	443	443	141	192	71	445	445	148	200
18,000	3	-1	66	417	417	134	188	66	419	419	142	199
20,000	-2	-5	61	390	390	125	183	62	393	393	135	196
22,000	-5	-9	---	---	---	---	---	58	369	369	128	193
24,000	---	---	---	---	---	---	---	---	---	---	---	---
26,000	---	---	---	---	---	---	---	---	---	---	---	---
28,000	---	---	---	---	---	---	---	---	---	---	---	---

NOTES:
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points = 50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 15 knots.

IFAT based on 14,000 pounds.

Figure 7-88. One-Engine-Inoperative Maximum Cruise Power - 1700 RPM - ISA + 20°C (Sheet 1 of 2)

ONE-ENGINE -INOPERATIVE MAXIMUM CRUISE POWER
1700 RPM
ISA +20 °C

WEIGHT→			16,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	38	35	91	652	652	170	180	91	651	651	174	184
2000	34	31	91	631	631	167	182	91	630	630	172	187
4000	30	27	91	613	613	165	185	91	612	612	170	190
6000	27	23	90	591	591	161	186	90	593	593	167	193
8000	23	19	86	560	560	154	184	86	562	562	161	192
10,000	19	15	81	528	528	146	180	82	531	531	154	190
12,000	14	11	77	495	495	136	174	78	498	498	147	188
14,000	10	7	---	---	---	---	---	73	469	469	140	184
16,000	6	3	---	---	---	---	---	69	440	440	131	179
18,000	3	-1	---	---	---	---	---	---	---	---	---	---
20,000	-2	-5	---	---	---	---	---	---	---	---	---	---
22,000	-5	-9	---	---	---	---	---	---	---	---	---	---
24,000	---	---	---	---	---	---	---	---	---	---	---	---
26,000	---	---	---	---	---	---	---	---	---	---	---	---
28,000	---	---	---	---	---	---	---	---	---	---	---	---

NOTES:
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points =50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 15 knots.

IFAT based on 14,000 pounds.

Figure 7-88. One-Engine-Inoperative Maximum Cruise Power - 1700 RPM - ISA- + 20°C (Sheet 2 of 2)

ONE-ENGINE -INOPERATIVE MAXIMUM CRUISE POWER
1700 RPM
ISA+30 °C

WEIGHT→			12,000 POUNDS					10,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	48	45	89	644	644	174	187	89	645	645	178	191
2000	44	41	86	614	614	170	189	87	615	615	174	192
4000	40	84		584	584	166	189	84	585	585	170	194
6000	36	33	81	555	555	161	190	81	556	556	165	195
8000	32	29	77	524	524	156	190	78	526	526	161	195
10,000	28	25	74	493	493	150	189	74	495	495	156	195
12,000	24	21	69	462	462	144	186	70	464	464	150	194
14,000	20	17	65	433	433	137	183	66	435	435	144	192
16,000	16	13	61	404	404	129	179	62	407	407	137	190
18,000	13	9	---	---	---	---	---	58	379	379	131	187
20,000	9	5	---	---	---	---	---	54	353	353	123	183
22,000	---	---	---	---	---	---	---	---	---	---	---	---
24,000	---	---	---	---	---	---	---	---	---	---	---	---
26,000	---	---	---	---	---	---	---	---	---	---	---	---
28,000	---	---	---	---	---	---	---	---	---	---	---	---

NOTES:
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points =50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 15 knots.

IFAT based on 14,000 pounds.

Figure 7-89. One-Engine-Inoperative Maximum Cruise Power - 1700 RPM - ISA + 30°C (Sheet 1 of 2)

ONE-ENGINE -INOPERATIVE MAXIMUM CRUISE POWER
1700 RPM
ISA +30 °C

WEIGHT→			16,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	48	45	88	642	642	165	178	88	643	643	170	183
2000	44	41	85	612	612	160	178	86	613	613	166	184
4000	40	37	83	582	582	155	177	83	583	583	161	184
6000	36	33	79	552	552	148	175	80	553	553	156	184
8000	32	29	76	520	520	140	170	77	523	523	150	182
10,000	28	25	71	487	487	128	162	73	491	491	143	180
12,000	24	21	---	---	---	---	---	69	459	459	135	175
14,000	20	17	---	---	---	---	---	64	429	429	123	166
16,000	16	13	---	---	---	---	---	---	---	---	---	---
18,000	13	9	---	---	---	---	---	---	---	---	---	---
20,000	9	5	---	---	---	---	---	---	---	---	---	---
22,000	---	---	---	---	---	---	---	---	---	---	---	---
24,000	---	---	---	---	---	---	---	---	---	---	---	---
26,000	---	---	---	---	---	---	---	---	---	---	---	---
28,000	---	---	---	---	---	---	---	---	---	---	---	---

NOTES:
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points =50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 15 knots.

IFAT based on 14,000 pounds.

Figure 7-89. One-Engine-Inoperative Maximum Cruise Power - 1700 RPM - ISA + 30°C (Sheet 2 of 2)

ONE-ENGINE -INOPERATIVE MAXIMUM CRUISE POWER
1700 RPM
ISA +37 °C

WEIGHT→			12,000 POUNDS					10,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	55	52	80	617	617	166	181	80	617	617	170	184
2000	51	48	78	586	586	163	182	79	587	587	166	186
4000	47	44	76	556	556	158	183	76	557	557	163	188
6000	43	40	74	528	528	154	184	74	529	529	159	189
8000	39	36	71	500	500	149	183	71	501	501	154	189
10,000	35	32	67	469	469	143	182	68	471	471	149	189
12,000	31	28	63	437	437	136	178	64	439	439	143	187
14,000	27	24	59	407	407	127	173	60	409	409	136	185
16,000	23	20	---	---	---	---	---	56	380	380	129	182
18,000	19	16	---	---	---	---	---	51	352	352	121	177
20,000	---	---	---	---	---	---	---	---	---	---	---	---
22,000	---	---	---	---	---	---	---	---	---	---	---	---
24,000	---	---	---	---	---	---	---	---	---	---	---	---
26,000	---	---	---	---	---	---	---	---	---	---	---	---
28,000	---	---	---	---	---	---	---	---	---	---	---	---

NOTES:
During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points =50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 15 knots.

IFAT based on 14,000 pounds.

Figure 7-90. One-Engine-Inoperative Maximum Cruise Power - 1700 RPM - ISA + 37°C (Sheet 1 of 2)

ONE-ENGINE -INOPERATIVE MAXIMUM CRUISE POWER
1700 RPM
ISA +37 °C

WEIGHT→			16,000 POUNDS					14,000 POUNDS				
PRESSURE ALTITUDE	IFAT	FAT	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENGINE	TOTAL FUEL FLOW	IAS	TAS
FEET	°C	°C	PERCENT	LBS/HR	LBS/HR	KTS	KTS	PERCENT	LBS/HR	LBS/HR	KTS	KTS
SL	55	52	79	615	615	154	167	80	616	616	161	175
2000	51	48	77	584	584	149	168	78	585	585	157	177
4000	47	44	75	554	554	143	166	76	555	555	153	177
6000	43	40	72	525	525	136	163	73	527	527	148	176
8000	39	36	68	494	494	125	155	70	498	498	141	174
10,000	35	32	---	---	---	---	---	66	466	466	133	169
12,000	31	28	---	---	---	---	---	61	433	433	121	159
14,000	27	24	---	---	---	---	---	---	---	---	---	---
16,000	23	20	---	---	---	---	---	---	---	---	---	---
18,000	19	16	---	---	---	---	---	---	---	---	---	---
20,000	---	---	---	---	---	---	---	---	---	---	---	---
22,000	---	---	---	---	---	---	---	---	---	---	---	---
24,000	---	---	---	---	---	---	---	---	---	---	---	---
26,000	---	---	---	---	---	---	---	---	---	---	---	---
28,000	---	---	---	---	---	---	---	---	---	---	---	---

NOTES:

During operation with ice vanes extended, torque will decrease approximately 14 percentage points (E.G., 64% - 14 percentage points = 50%). If desired, original power may be reset, provided TGT limit is not exceeded. If original power is reset, fuel flow will increase approximately 35 LBS/HR/ENG and true airspeed will be unchanged. If original power is not or cannot be reset, fuel flow will decrease approximately 8% and true airspeed will be reduced approximately 15 knots.

IFAT based on 14,000 pounds.

Figure 7-90. One-Engine-Inoperative Maximum Cruise Power - 1700 RPM - ISA + 37°C (Sheet 2 of 2)

TIME, FUEL, AND DISTANCE TO DESCEND

ASSOCIATED CONDITIONS:

POWER .... AS REQUIRED TO DESCEND AT 1500 FT/MIN
LANDING GEAR ...... UP
FLAPS.................. UP

EXAMPLE:

INITIAL ALTITUDE .... 25,000 FT
FINAL ALTITUDE .... 5998 FT

TIME TO DESCEND (16.7 − 4.1) .... 12.6 MIN
FUEL TO DESCEND (250 −87) .... 163 LBS
DISTANCE TO DESCEND (84 − 21) .... 63 NM

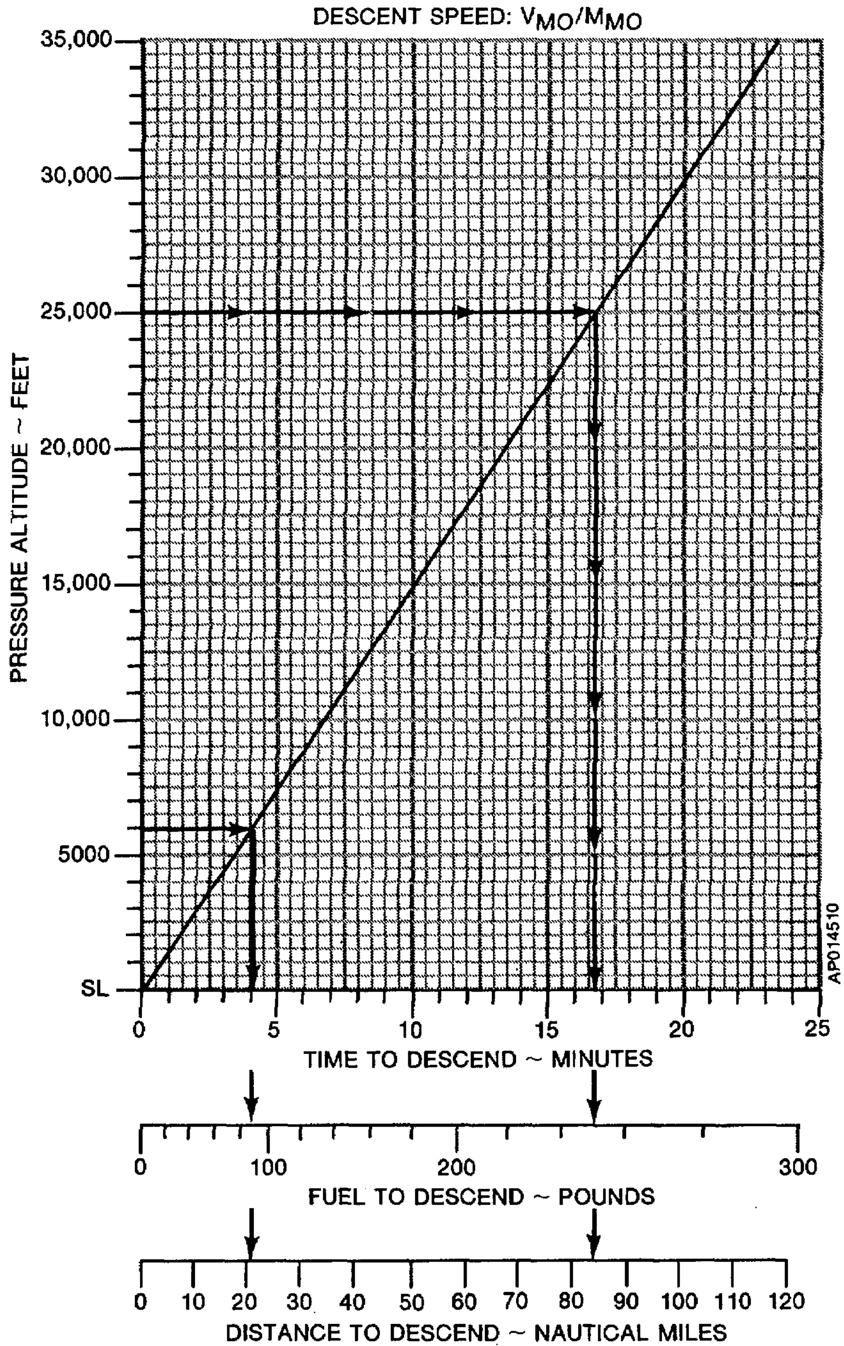


Figure 7-91. Time, Fuel, and Distance to Descend

CLIMB - BALKED LANDING
CLIMB SPEED 106 KNOTS (ALL WEIGHTS)

ASSOCIATED CONDITIONS

POWER	TAKEOFF
FLAPS	DOWN
LANDING GEAR	DOWN

EXAMPLE

FAT	20°C
PRESSURE ALTITUDE	6400 FT
WEIGHT	15,200 LBS
RATE OF CLIMB	1620 FT/MIN
CLIMB GRADIENT	12 6%

NOTES
1. DURING OPERATION WITH ICE VANES EXTENDED, ADD 16°C TO ACTUAL FAT BEFORE ENTERING GRAPH
2. ENTER GRAPH AT PRESSURE ALTITUDE FROM WHICH A GO-AROUND WOULD BE INITIATED

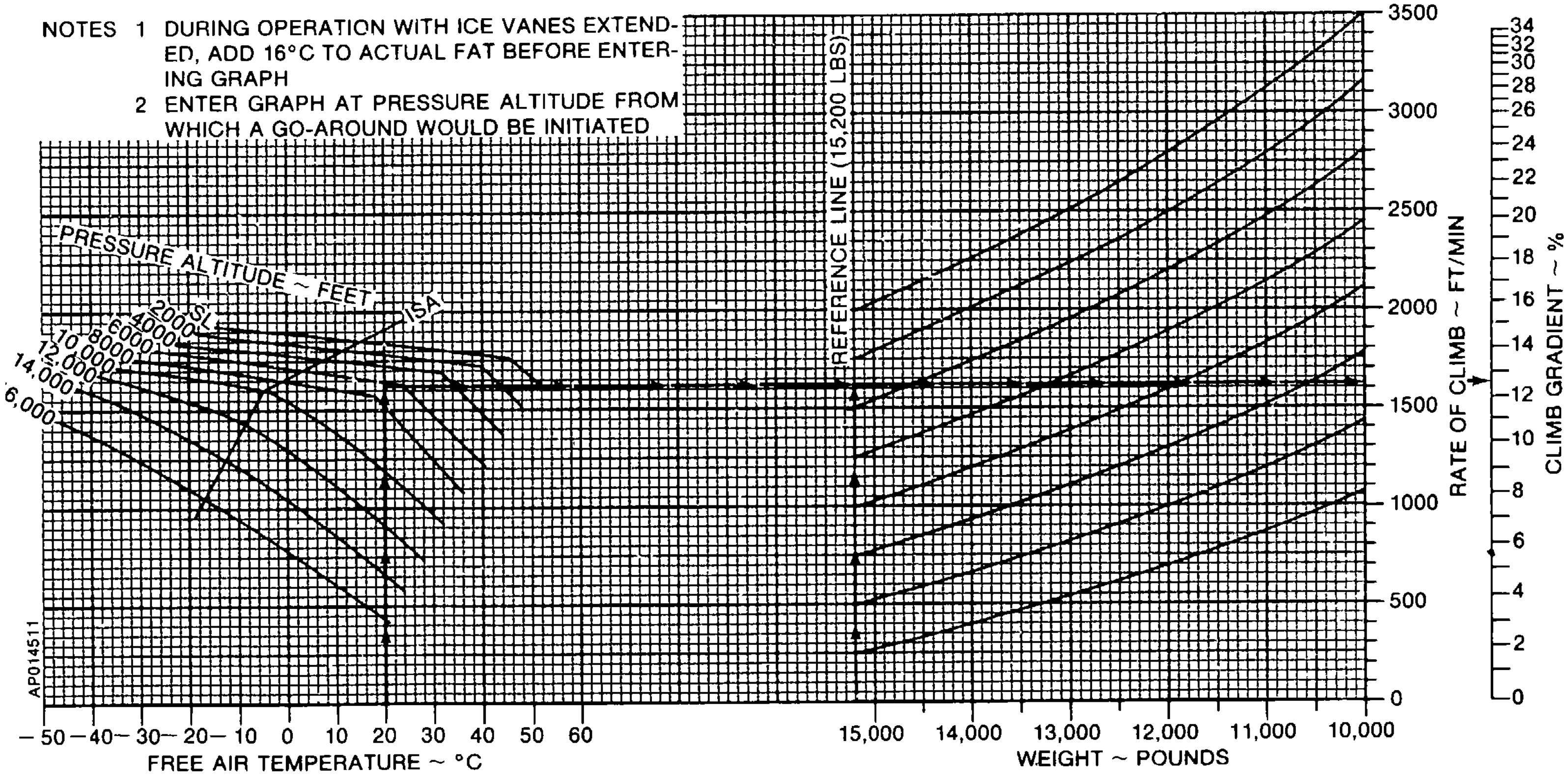


Figure 7-92. Climb - Balked Landing

NORMAL LANDING DISTANCE WITHOUT PROPELLER REVERSING - FLAPS DOWN

APPPROACH SPEED: 106 KNOTS (ALL WEIGHTS)

ASSOCIATED CONDITIONS:

POWER .... RETARDED TO MAINTAIN 500 FT/MIN ON FINAL APPROACH.
FLAPS .... DOWN
RUNWAY .... PAVED, LEVEL, DRY SURFACE
THROTTLES .... GROUND FINE AT TOUCHDOWN
BRAKING .... MAXIMUM WITHOUT SLIDING TIRES

NOTE: WEIGHT DOES NOT SIGNIFICANTLY EFFECT LANDING DISTANCE.

EXAMPLE:

FAT .... 20°C
PRESSURE ALTITUDE .... 5998 FT
HEADWIND COMPONENT .... 10 KTS

GROUND ROLL .... 1740 FT
TOTAL DISTANCE OVER 50-FT OBSTACLE .... 3350 FT

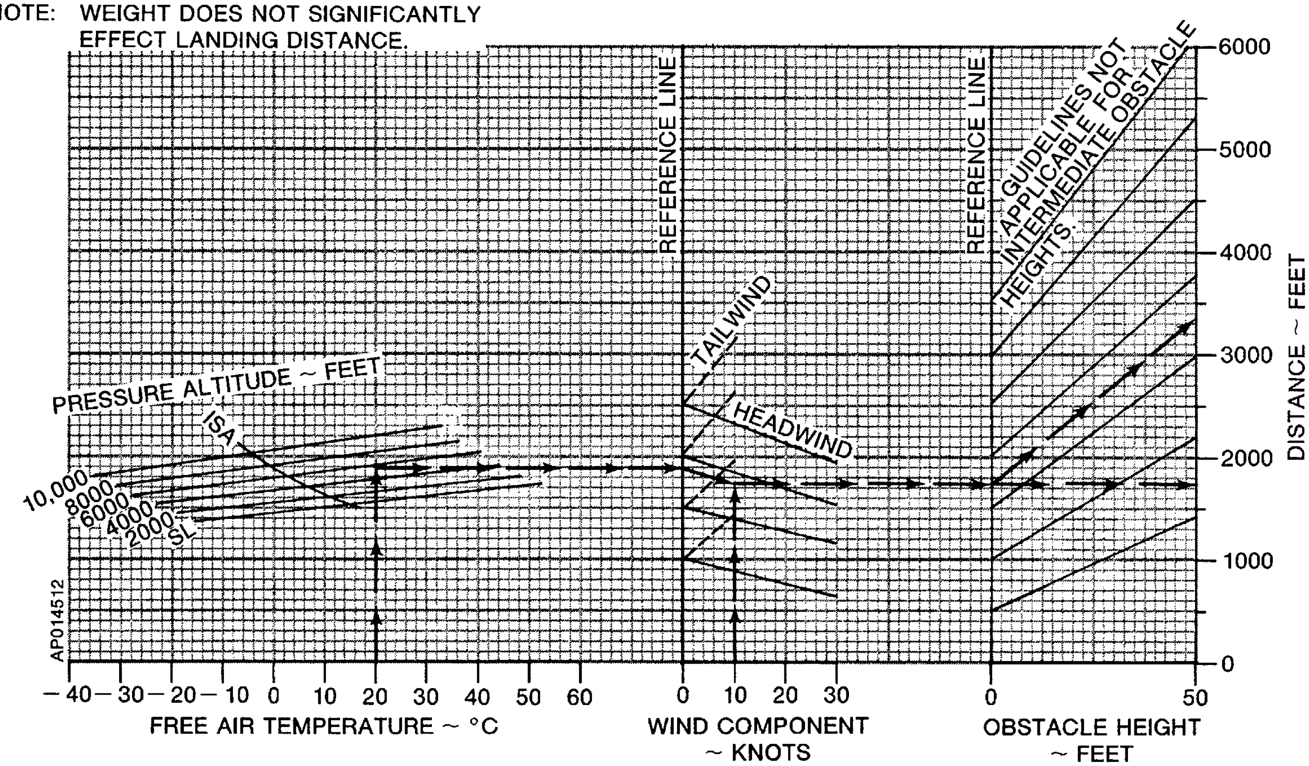


Figure 7-93. Normal Landing Distance Without Propeller Reversing - Flaps Down

LANDING DISTANCE WITHUT PROPELLER REVERSING - FLAPS UP

ASSOCIATED CONDITIONS:

POWER .... RETARDED TO MAINTAIN 500 FT/MIN ON FINAL APPROACH.
FLAPS .... UP
RUNWAY .... PAVED, LEVEL, DRY SURFACE
APPROACH SPEED.... KIAS AS TABULATED
THROTTLES .... GROUND FINE AT TOUCHDOWN
BRAKING .... MAXIMUM WITHOUT SLIDING TIRES

EXAMPLE:

FLAPS-DOWN LANDING DISTANCE OVER 50-FT OBSTACLE ...... 3350 FT
LANDING WEIGHT .... 15,200 LBS

FLAPS-UP LANDING DISTANCE OVER 50-FT OBSTACLE ...... 4710 FT
APPROACH SPEED....... 129 KTS

WEIGHT ~ POUNDS	APPROACH SPEED ~ KNOTS
15,200	129
14,000	124
13,000	120
12,000	116
11,000	111
10,000	106

NOTES:
1. LANDING WITH FLAPS FULL DOWN IS NORMAL PROCEDURE. USE THE GRAPH BELOW WHEN IT IS NECESSARY TO LAND WITH FLAPS UP.
2. TO DETERMINE FLAPS-UP LANDING DISTANCE, READ FROM THE "NORMAL LANDING DISTANCE WITHOUT PROPELLER REVERSING — FLAPS DOWN" GRAPH THE LANDING DISTANCE APPROPRIATE TO FAT, ALTITUDE, WIND, AND 50-FT OBSTACLE, THEN ENTER THE GRAPH BELOW WITH DERIVED VALUE AND READ THE FLAPS-UP LANDING DISTANCE.
3. FLAPS-UP LANDINGS WITH TAILWIND OR AT PRESSURE ALTITUDES HIGHER THAN 7500 FT MAY PRODUCE WHEEL SPEEDS THAT EXCEED THE WHEEL SPEED LIMIT, AND THEREFORE ARE PROHIBITED.

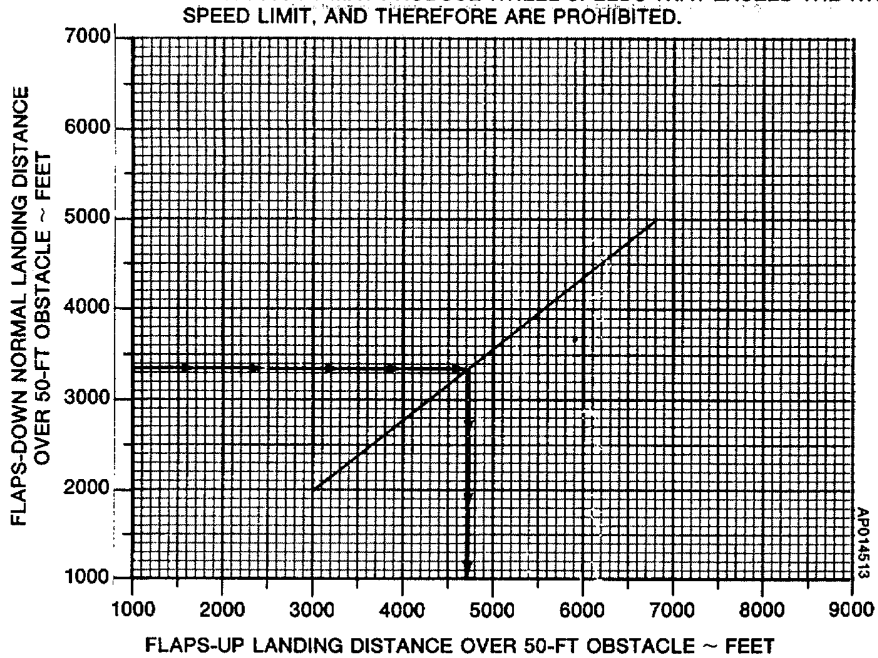


Figure 7-94. Landing Distance Without Propeller Reversing - Flaps Up

LANDING DISTANCE - ONE ENGINE INOPERATIVE - FLAPS DOWN

APPROACH SPEED: 106 KTS (ALL WEIGHTS

ASSOCIATED CONDITIONS:

POWER............................RETARDED TO MAINTAIN 500 FT/MIN ON FINAL APPROACH.
PROPELLER CONTROL:
INOPERATIVE ENGINE ......FEATHERED
FLAPS ....DOWN
RUNWAY ....PAVED, LEVEL, DRY SURFACE
THROTTLE:
OPERATIVE ENGINE ....GROUND FINE AT TOUCHDOWN
BRAKING..........................MAXIMUM WITHOUT SLIDING TIRES

EXAMPLE:

NORMAL LANDING DISTANCE
OVER 50-FT OBSTACLE ....3350 FT

LANDING DISTANCE —
ONE ENGINE INOPERATIVE —
OVER 50-FT OBSTACLE ....3610 FT

NOTE: TO DETERMINE THE ONE-ENGINE-INOPERATIVE LANDING DISTANCE, READ FROM THE "NORMAL LANDING DISTANCE WITHOUT PROPELLER REVERSING — FLAPS DOWN" GRAPH THE LANDING DISTANCE APPROPRIATE TO FAT, ALTITUDE, WIND AND 50-FT OBSTACLE. THEN ENTER THE GRAPH BELOW WITH THE DERIVED VALUE AND READ THE ONE-ENGINE-INOPERATIVE LANDING DISTANCE.

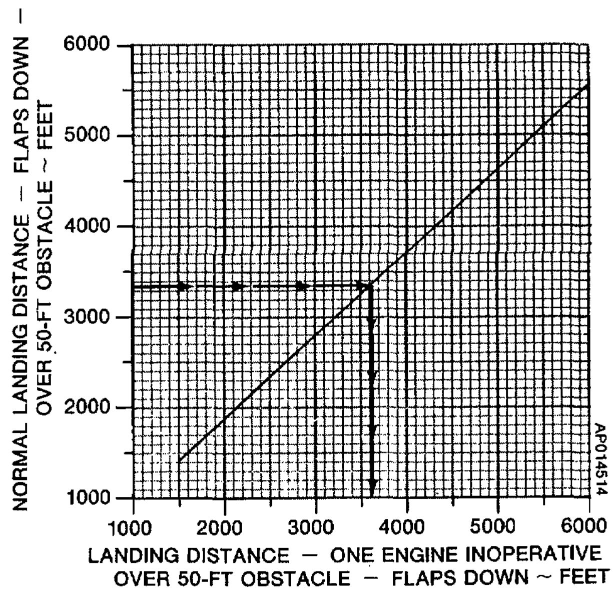


Figure 7-95. Landing Distance - One Engine Inoperative - Flaps Down

CHAPTER 8
NORMAL PROCEDURES

Section I. MISSION PLANNING

8-1. MISSION PLANNING.

Mission planning begins when the mission is assigned and extends to the preflight check of the aircraft. It includes, but is not limited to, checks of operating limits and restrictions; weight, balance, and loading; performance; publications; flight plan; and crew briefings. The pilot in command shall ensure compliance with the contents of this manual that are applicable to the mission and all aviation life support equipment required for the mission (e.g., helmets, gloves, survival vests, survival kits, etc.).

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 aircraft is a pilot and a copilot.

a. Pilot. The pilot in command is responsible for all aspects of mission planning, preflight, and operation of the aircraft. He will assign duties and functions to all other crew members as required. Prior to, or during the preflight check, the pilot will brief the crew on items pertinent to the mission; e.g., performance data, monitoring of instruments, communications, emergency procedures, taxi, and load operations.

b. Copilot. The copilot must be familiar with the pilot in command duties and will assist the pilot as directed.

8-4. 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, 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 direct voice communications with the crew. The following guide should be used in accomplishing required crew briefings. Items that do not pertain to a specific mission may be omitted.

1. Crew introduction.
2. Equipment.
   a. Personal, including ID tags.
   b. Professional (medical equipment, etc.).
   c. Survival.
3. Flight data.
   a. Route.
   b. Altitude.
   c. Time enroute.
   d. Weather.
4. Normal procedures.
   a. Entry and exit of aircraft.
   b. Seating.
   c. Seat belts.
   d. Movement in aircraft.
   e. Internal communications.
   f. Security of equipment
   g. Smoking.
   h. Oxygen.
   i. Refueling.
   j. Weapons.
   k. Protective masks.
   l. Parachutes.
   m. Hearing protection.
   n. Aviation Life Support Equipment (ALSE).
5. Emergency procedures.
   a. Emergency exits.
   b. Emergency equipment.
   c. Emergency landing/ditching procedures.

Section II. OPERATING PROCEDURES AND MANEUVERS

8-5. OPERATING PROCEDURES AND MANEUVERS. This section deals with normal procedures and includes all steps necessary for safe and efficient operation of the aircraft from the time a preflight begins until the flight is completed and the aircraft is parked and secured. Unique feel, characteristics, and reaction of the aircraft during various phases of operation, and the techniques and procedures used for taxiing, takeoff, climb, etc., are described, including precautions to be observed. Only the duties of the minimum crew necessary for the actual operation of the aircraft are included. For operation of avionics equipment, refer to the operating handbooks that accompany the aircraft loose tools.

8-6. SYMBOLS DEFINITION. Items which apply only to night or only to instrument flying shall have an N or I respectively, immediately preceding 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, at the command of the pilot, will be indicated by a circle (0) around the step number, i.e., (4). Circuit breakers In. The star symbol ★ indicates that an operational check is required. The asterisk symbol ✶ indicates that performance of a step is mandatory for all thru-flights. The asterisk applies only to checks performed prior to takeoff. Placarded items appear in upper case.

8-7. CHECKLIST. Normal procedures are given primarily in checklist form and are amplified as necessary in accompanying paragraph form when a detailed description of a procedure or maneuver is required. The condensed version of the amplified checklist is contained in the Operator's and Crewmember's Checklist, TM 55-1510-222-CL. To provide for easier cross referencing, the procedural steps are numbered to coincide with the corresponding numbered steps in this manual.

8-8. PREFLIGHT CHECK. The pilot's walk around and interior checks are outlined in the following procedures. The preflight check is not intended to be a detailed mechanical inspection. The steps that are essential for safe aircraft operation are included.

8-9. BEFORE EXTERIOR CHECK.

* 1. Publications Check DA Forms 2408-12, -13, -14, and -18, DD Form 365-4, locally required forms and publications, and availability of operator's manual (-10) and checklist (-CL).

★ 2. Oxygen system Check that oxygen quantity is sufficient for entire mission, that crew masks operate normally, and that the diluter selector is set at 100%. Refer to Chapter 5 for oxygen requirements.

a. Oxygen supply pressure gages Check

b. Supply control lever (green) ON.

c. Diluter control lever 100% OXYGEN

d. Emergency control lever (red) Set to TEST MASK position while holding mask directly away from face, then return to NORMAL.

e. Oxygen mask Put on and adjust.

f. Emergency pressure control lever Set to TEST MASK position and check mask for leaks, then return lever to NORMAL.

g. Flow indicator Check. During inhalation blinker appears, during exhalation blinker disappears. Repeat a minimum of 3 times.

h. Oxygen masks Remove and store.

* 3. Flight controls Unlock and checked.

* 4. Parking brake Set.

CAUTION

The elevator trim system shall not be forced past the limits which are shown on the elevator trim indicator scale.

5. Elevator trim Set to 0 (neutral).

CAUTION

Do not cycle landing gear handle on the ground.

* 6. GearDN.

* 7. Keylock switch ON.

NOTE

During ground operation, the ice vanes should be extended to preclude FOD to the engine.

* 8. Mission equipment As required.

★ 9. Fuel pumps/crossfeed operation Check as follows:

a. Fire pull handles Pull.

b. Standby pump switches ON.

c. Battery switch ON.

d. #1 and #2 FUEL PRESS warning annunciators Illuminated.

e. Fire pull handles In.

f. #1 and #2 FUEL PRESS warning annunciators Extinguished.

g. Standby fuel pump switches STANDBY PUMP.

h. #1 and #2 FUEL PRESS warning annunciators Illuminated.

i. Crossfeed Check. Check system operation by activating switch momentarily left then right, noting that #1 and #2 FUEL PRESS warning annunciators extinguish and that the FUEL CROSSFEED advisory light illuminates as switch is energized.

* 10. Ice vane control switches ON.

* 11. Battery switch ON.

12.. Lighting systems Check as required, to include position lights, recognition lights, landing/taxi light, wing ice lights, beacons, emergency lights, and interior lights, then OFF.

NOTE

The emergency lights override switch should be placed in the TEST position and the emergency lights (5) checked for illumination and intensity. A dim light indicates a weak battery pack. At the completion of the check, the switch must be cycled from the TEST position to the OFF/RESET position and then placed in AUTO.

13. Fuel gages Check fuel quantity and gage operation.

* 14. Stall and gear warning system Check as follows:

a. Stall warning test switch TEST. Check that warning horn sounds.

b. Landing gear warning test switch TEST. Check that warning horn sounds and that the LDG GEAR CONTR handle warning annunciation illuminates.

★ 15. Engine fire protection system Check as follows:

a. Engine fire protection test switches Hold switches to DET position, check that FIRE PULL handle warning annunciators, and MASTER WARNING annunciators illuminate.

b. Engine fire protection test switches Hold switches to EXT position, check that SQUIB OK and EXTGH DISCH annunciators, and MASTER CAUTION annunciators illuminate.

NOTE

If MASTER WARNING is canceled between tests, it may not re-illuminate.

16. INS Align as required.

17. Battery switch As required.

18. Toilet Check condition.

19. Emergency equipment Check that al required emergency equipment is available and that fire extinguishers and first-aid kits have current inspection date..

(0) 20. Parachutes Check.

8-10. FUEL SAMPLE.

NOTE

Fuel and oil quantity check may be performed prior to exterior check. During warm weather open fuel cap slowly to prevent being sprayed by fuel under thermal pressure.

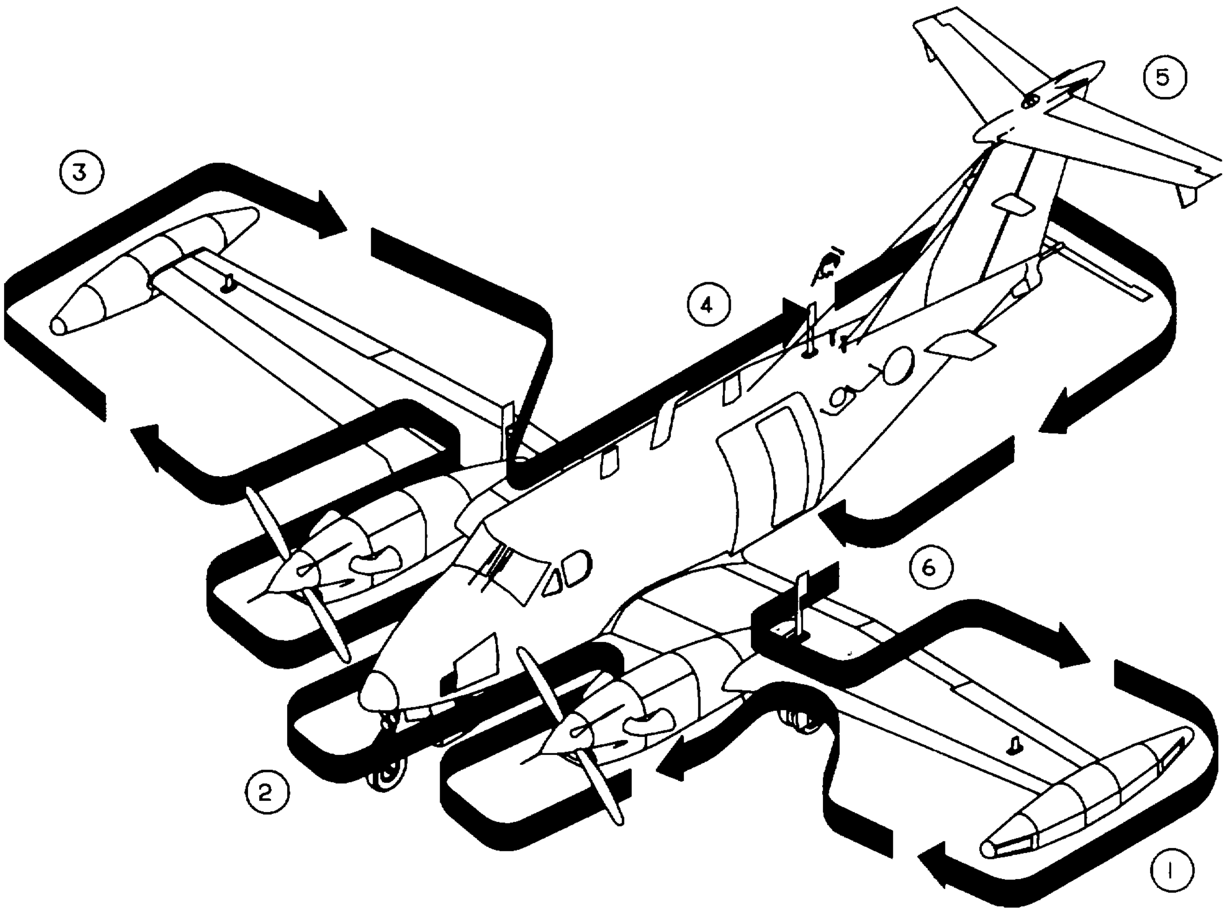
* 1. Fuel sample Check collective fuel sample from all drains for possible contamination. Thru-flight check is only required if aircraft has been refueled.

8-11. EXTERIOR CHECK.

a. Left Wing Area. Check as follows (fig.8-1):

* 1. General condition Check.

2. Flaps Check for full retraction (approximately 0.25 inch play) and skin damage, such as buckling, splitting, distortion or dents



AREA 1. Left wing landing gear, engine, nacelle and propeller
AREA 2. Nose section
AREA 3. Right wing landing gear, engine, nacelle and propeller
AREA 4. Fuselage, right side
AREA 5. Empennage
AREA 6. Fuselage, left side

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Figure 8-1. Exterior Inspection

3. Fuel sump drains Check for leaks.

4. Aileron and movable trim tab Check security and trim tab rig.

5. Static wicks Check security and condition.

6. Wing pod, navigation lights, deice boots and antennas Check condition.

7. Recognition light Check condition.

8. Outboard antenna set Check condition.

9. Outboard wing fuel vent Check free of obstruction.

*10. Main tank fuel and cap Check fuel level visually, condition of seal, and cap tight and properly installed.

11. Outboard deice boot Check for secure bonding, cracks, loose patches, stall trips, and condition.

12. Stall warning vane Check freedom of movement.

13. Monopoly antenna Check condition.

14. Tiedown Released.

15. Inboard dipole antenna set Check for security and cracks at mounting points. Check bonding secure, boots free of cuts and cracks.

16. Wing ice light Check condition.

17. AC GPU access door Secured.

18. Recessed and heated fuel vents. Check free of obstructions.

19. Inverter inlet and exhaust louvers Check free of obstructions.

b. Left Main Landing Gear. Check as follows:

* 1. Tires Check condition.

2. Brake assembly Check. Also, check brake deice assembly and bleed air hose for condition and security.

* 3. Shock strut Check for signs of leakage, minimum strut extension, (5.5 inches) and that left and right strut extension is approximately equal.

4. Torque links Check condition.

5. Safety switch Check condition, wire, and security.

* 6. Fire extinguisher pressure Check pressure within limits (Chapter 2).

7. Wheel, well, doors, and linkage Check for signs of leaks, broken wires, security, and condition.

* 8. Fuel sump drains (forward) Check for leaks.

c. Left Engine And Propeller. Check as follows:

CAUTION

A cold oil check is unreliable. Oil should be checked within 10 minutes after stopping engine. If more than 10 minutes have elapsed, motor engine for 40 seconds, then recheck. If more than 10 hours have elapsed, run engine for 2 minutes, then recheck. Add oil as required. Do not overfill.

* 1. Engine oil Check oil level, add as required, and oil cap secured.

* 2. Engine compartment, left side Check for fuel and oil leaks, security of oil cap, door locking pins, and condition. Lock compartment access door.

3. Left upper cowl locks Locked (check all latches).

4. Left exhaust stack Check for cracks and free of obstruction.

* 5. Propeller blades and spinner Check blade condition, security of spinner and free propeller rotation.

* 6. Engine air inlets and ice vane Check free of obstruction and ice vane extended.

7. Right upper cowl locks Locked (check all latches).

8. Right exhaust stack Check for cracks and free of obstructions.

* 9. Engine compartment, right side Check for fuel and oil leaks, ice vane linkage, door locking pins, and condition. Lock compartment access door.

d. Left Wing Center Section. Check as follows:

* 1. Auxiliary tank fuel and cap Check fuel level visually, condition of seal, and cap tight and properly installed.

2. Heat exchanger inlet and outlet Check for cracks and free of obstructions.

3. Deice boot Check.

*   4. Auxiliary tank fuel sump drain Check for leaks.

5. Hydraulic reservoir vent and pump seal drain - Check vent clear of obstructions, and that no excessive fluid is present.

6. Monopoly antenna Check condition.

e. Fuselage Underside. Check as follows:

*   1. General condition Check for skin damage.

2. Antennas Check security, and condition.

f. Nose Section. Check as follows:

1. Outside air temperature probe Check condition.

2. Avionics door, left side Check secure.

3. Air conditioner exhaust Check free of obstruction.

4. Forward data link radome Check condition.

5. Wheel well condition Check for signs of leaks, broken wires and condition.

6. Doors and linkage Check.

7. Nose gear turning stop Check condition.

*   8. Tire Check condition.

*   9. Shock strut Check for signs of leakage and 3.0 inches minimum extension.

10. Torque links Check condition.

11. Shimmy damper and linkage Check.

12. Landing and taxi lights Check for security and condition.

13. Pitot tubes Check free of obstruction.

14. Radome Check condition.

15. Windshields and wipers Check.

16. Air conditioner inlet Check free of obstructions.

17. Avionics door, right side Check secure.

g. Right Wing Center Section. Check as follows:

*   1. Auxiliary tank fuel and cap Check fuel level visually, condition of seal, and cap tight and properly installed.

2. Battery access panel Secure.

3. Battery exhaust louvers Check free of obstructions.

4. Heat exchanger outlet and inlet Check for cracks and free of obstruction.

5. Deice boot Check.

6. Battery compartment drain Check free of obstruction.

7. Battery ram air intake Check free of obstruction.

8. TAS probe Check condition and free of obstructions.

9. Auxiliary tank fuel sump drain Check for leaks.

10. Monopole antenna -. Check condition.

h. Right Engine And Propeller. Check as follows:

CAUTION

A cold oil check is unreliable. Oil should be checked within [0 minutes after stopping engine. If more than 10 minutes have elapsed, motor engine for 40 seconds, then recheck. If more than 10 hours have elapsed, run engine for 2 minutes, then recheck. Add oil as required. Do not overfill.

*   1. Engine oil Check oil level, add as required, and oil cap secure.

*   2. Engine compartment, left side Check for fuel and oil leaks, security of oil cap, door locking pins, and condition. Lock compartment access door.

3. Left upper cowl locks Locked (check all latches).

4. Left exhaust stack Check for cracks and free of obstruction.

*   5. Propeller blades and spinner Check blade condition, security of spinner, and free propeller rotation.

*   6. Engine air inlets and ice vane Check free of obstruction and ice vane extended.

7. Right cowl locks Locked (check all latches).

*   8. Engine compartment, right side Check for fuel and oil leaks, ice vane linkage, door locking pins, and condition. Lock compartment access door.

9. Right exhaust stack Check for cracks and free of obstruction.

i. Right Main Landing Gear. Check as follows:

* 1. Tires Check condition.

2. Brake assembly Check. Also check brake deice assembly and bleed air hose for condition and security.

* 3. Shock strut Check for signs of leakage and minimum strut extension (5.5 inches) and that left and right strut extension is approximately equal.

4. Torque links Check condition.

5. Safety switch Check condition, wire, and security.

★ 6. Fire extinguisher pressure Check pressure within limits (Chapter 2).

7. Wheel well, doors, and linkage Check for signs of leaks, broken wires, security, and condition.

* 8. Fuel sump drains (forward) Check for leaks.

j. Right Wing. Check as follows:

* 1. General condition Check.

2. Recessed and heated fuel vents Check free of obstructions.

3. Inverter inlet and exhaust louvers Check free of obstructions.

4. DC GPU access door Secured.

5. Inboard dipole antenna set Check for security and cracks at mounting points, bonding secure, free of cuts and cracks.

6. Wing ice light Check condition.

7. Outboard deice boot Check for secure bonding, cracks, loose patches, stall strips, and condition.

* 8. Tiedown Released.

9. Monopole antenna Check condition.

* 10. Main tank fuel and cap Check fuel level visually, condition of seal, and cap tight and properly installed.

11. Outboard wing fuel vent Check free of obstruction.

12. Outboard antenna set Check condition.

13. Recognition light Check condition.

14. Wing pod, navigation lights, deice boots and antennas Check condition.

15. Static wicks Check security and condition.

16. Aileron and trim tab Check security and condition.

* 17. Fuel sump drains Check for leaks.

18. Flaps Check for full retraction (approximately 0.25 inch play) and skin damage, such as buckling, splitting, distortion, or dents.

19. Chaff dispenser Check number of chaff cartridges in payload module and for security.

k. Fuselage Right Side. Check as follows:

* 1. General condition Check.

2. Emergency light Check condition.

3. Flare/chaff dispenser Check number of flares/ chaff cartridges in payload module and for security.

4. Beacon Check condition.

5. Fuselage underside antennas Check condition.

6. Towel bar antennas Check condition.

7. P-band antenna Check condition.

8. Tailcone access door Check secured.

9. Oxygen filler door Check secured.

10. Static ports Check clear of obstructions.

11. APR 44 antenna Check condition.

12. Emergency locator transmitter antenna -Check condition.

13. Stabilon Check condition.

l. Empennage. Check as follows:

* 1. General condition Check.

* 2 Vertical stabilizer, rudder, and trim tab - Check condition.

3. Static wicks Check installed.

4. Antennas Check security and condition.

5. Deice boots Check condition.

6. Horizontal stabilizer, tailets, elevator, and trim tab Check condition.

NOTE

Any difference between the indicated position on the trim tab position indicator and the actual position of the elevator trim tab signifies an unairworthy condition and must be corrected prior to flight.

WARNING

If the possibility of ice accumulation on the horizontal stabilizer or elevator exists, takeoff will not be attempted.

7. Elevator trim tab Verify O (neutral) position.

NOTE

The elevator trim tab O (neutral) position is determined by observing that the trailing edge of the elevator trim tab aligns with the trailing edge of the elevator, while the elevator is resting against the downstops.

8. Position and beacon lights Check condition.
9. Rotating boom dipole antenna Check condition and position.
10. Wide band data link antenna pod Check condition.

m. Fuselage Left Side. Check as follows:

* 1. General condition Check.
2. Stabilon Check condition.
3. Static ports Check clear of obstruction.
4. ELT ARMED.
5. APR-44 antenna Check condition.
6. P-band antenna Check condition.
7. Towel bar antennas Check condition.
8. Emergency light Check condition.
9. Cabin door Check door seal and condition.
10. Fuselage top side Check general condition and antennas.
* 11. Chocks and tiedowns Check removed.

8-12.* INTERIOR CHECK.

1. Cargo/loose equipment Check secured.

* 2. Cabin/cargo doors Test and lock:

a. Cabin door Check closed and latched by the following.

(1) Safety arm and diaphragm plunger - Check position (lift door step).

(2) Index marks on rotary cam locks (6) - Check aligned with indicator windows.

(3) Lower pin latch handle Check closed and latched. (Observe through cargo door lower latch handle access cover window.)

(4) Carrier rod Check indicator aligned with orange stripe on carrier rod. (Observe through window aft lower corner.)

(5) Battery switch OFF.

(6) Cargo door Check closed and latched.

(7) Cabin door Close but leave unlatched. Check CABIN DOOR annunciation light extinguished.

(8) Cabin door Open. Check CABIN DOOR annunciation light extinguished.

(9) Battery switch On. Check CABIN DOOR annunciation light illuminated.

(10) Cabin door Close and latch. Check CABIN DOOR annunciation light extinguished.

(11) Battery Switch - OFF.

3. Emergency exit Check secure and key removed.
4. Mission cooling ducts Check open and free of obstructions.
5. Flare/chaff dispenser preflight test -Completed.
6. KY-58 key Loaded as required.
7. Crew briefing As required.

8-13. BEFORE STARTING ENGINES.

* 1. Oxygen system Set as required.
2. Circuit breakers Check in.

* 3. Overhead panel Check and set.

a. Light dimming controls As required.
b. Cockpit light (3) As required.
c. Cabin air mode switch OFF.
d. Engine anti-ice ON.
e. Ice and rain switches Off.

f. Exterior light switches As required.

g. Inverter switches Off.

h. Avionics master power switch As required.

i. Environmental switches As required.

j. Autofeather switch OFF.

k. No. I ENGINE START switch OFF.

1. MASTER switch As required.

m. No. 2 ENGINE START switch OFF.

* 4. Fuel panel switches Check.

a. Standby pump switches Off.

b. Auxiliary transfer switches AUTO.

c. Crossfeed switch OFF.

5. Magnetic compass Check for fluid, heading, and current deviation card.

CAUTION

Movement of the power levers below the flight idle gate with the engines not operating may result in bending and damage to control linkage.

* 6. Pedestal controls Set.

a. Power levers IDLE.

b. Propeller levers HIGH RPM.

c. Condition levers FUEL CUTOFF.

d. Flaps UP.

* 7. Pedestal extension switches Set.

a. Avionics As required.

b. Rudder boost switch ON.

8. Gear alternate extension handle Stowed.

9. Free air temperature gage Check. Note current reading.

10. Pilot's instrument panel Check and set.

a. NAV and compass switches #1.

b. Microphone switch HEADSET.

c. Gyro switch SLAVE.

d. Flight instruments Check instrument for protective glass, warning flags, static readings, and heading correction card.

e. Propeller synchrophaser switch OFF.

f. Radar OFF.

g. APR-39 and APR-44 OFF.

h. Engine instruments Check instruments for protective glass, static readings, and slippage marks.

11. Copilot's instrument panel Check and set.

a. Copilot's flight instruments Check instruments for protective glass, heading flags, static readings, and slippage marks.

b. Copilot's NAV and compass switches #2.

c. Copilot's microphone switch HEADSET.

d. Copilot's gyro switch SLAVE.

12. Mission panel switches and circuit breakers -As required.

13. Subpanels Check and set.

a. Engine fire protection test switches OFF.

b. Cabin pressurization dump switch As required.

c. Pressurization controls Set as required.

d. Landing, taxi, and recognition lights OFF.

e. Landing gear switch Recheck DN.

f. Cabin lights switch As required.

g. Pilot's static air source NORMAL.

CAUTION

Do not use alternate static source during takeoff and landing except in an emergency. Pilot's instruments will show a variation in airspeed and altitude.

14. AC and DC GPU As required.

* 15. Battery switch ON.

16. DC power Check (22 VDC minimum for battery, 28 VDC maximum for GPU starts).

* 17. Annunciation panels Test as follows:

a. MASTER CAUTION, MASTER WARNING, #I FUEL PRESS, #2 FUEL PRESS, L BL AIR FAIL, R BL AIR FAIL, INST AC, #1 OIL PRESS, #2 OIL PRESS, #1 DC GEN, #1 INVERTER, #1 NO FUEL XFR, #2 NO FUEL XFR, #2 INVERTER, #2 DC GEN,#1 VANE EXT, #2 VANE EXT, GEAR DOWN Check illuminated.

b. Annunciation test switch Hold to TEST position. Check that the annunciation panels, fire pull handle annunciators, marker beacon annunciators, antenna azimuth indicator, master caution, and master warning annunciators are illuminated. Release switch and check that all annunciators except those in step (a) are extinguished.

NOTE

The Marker Beacon lights will illuminate only if the Avionics Master is turned ON/EXT PWR as applicable.

c. MASTER CAUTION and MASTER WARNING annunciators Press and release. Both annunciators should extinguish.

8-14.* FIRST ENGINE START (BATTERY START).

NOTE

The engines must not be started until after the INS is placed into the NAV mode or OFF, as required.

Starting procedures are identical for both engines except that second engine generator is kept off line after the second engine start. This allows performance of the current limiters check. When making a battery start, the right engine should be started first. A crewmember should monitor the outside observer throughout the engine start procedures.

1. Exterior lights switches As required.
2. Propeller area Clear.
3. #2 ignition and engine start switch START IGNITION. #2 IGN ON annunciation should illuminate and associated FUEL PRESS light should extinguish.

NOTE

False fuel flow indications may be observed with the starter engaged and the condition lever in cutoff.

CAUTION

If ignition does not occur within 10 seconds after moving condition lever to LOW IDLE, initiate Abort Start procedure. If for any reason a starting attempt is discontinued, the entire starting sequence must be repeated after allowing the engine to come to a complete stop (1 minute minimum).

4. Condition lever (after N. RPM passes 13% minimum) LOW IDLE.

CAUTION

Monitor TGT to avoid a hot start. If there is a rapid rise in TGT, be prepared to abort the start before limits are exceeded. During starting, the maximum allowable TGT is 1000° C for 5 seconds. If this limit is exceeded, use Abort Start procedure and discontinue start. Enter the peak temperature and duration on DA Form 2408-13.

5. TGT and N. Monitor (TGT 1000° C Maximum).
6. Oil pressure Check (60 PSI minimum).
7. #2 ignition and engine start switch OFF after TGT peaks.
8. Condition lever HIGH IDLE. Monitor TGT as the condition lever is advanced.
9. Generator switch RESET, then ON.

8-15.* SECOND ENGINE START (BATTERY START).

1. Propeller area Clear.
2. #1 ignition and engine start switch START IGNITION. #1 IGRN ON annunciation should illuminate and associated FUEL PRESS light should extinguish.
3. Condition lever (after N. RPM passes 13% minimum) LOW IDLE.
4. TGT and N, Monitor (TGT 1000° C maximum).
5. Oil pressure Check (60 PSI minimum).
6. # ignition and engine start switch OFF after TGT peaks.
7. Condition levers HIGH IDLE.
8. Power levers GROUND FINE.
9. Propeller levers Retard to feather detent.
10. BATTERY CHARGE annunciation Check on. Annunciation should extinguish within 5 minutes following a normal engine start on battery.
11. Inverter switches ON, check INVERTER annunciators off.
12. Second engine generator switch RESET, then ON.
13. Beacon light Reset. then on.

NOTE

To reset beacon light, turn off approximately 5 seconds, then DAY or NIGHT. When voltage drops below approximately 20 volts, the beacon light may become inoperative.

8-16. ABORT START PROCEDURE.

1. Condition lever FUEL CUTOFF.
2. Ignition and engine start switch STARTER ONLY
3. TGT Monitor for drop in temperature.
4. Ignition and engine start switch OFF.

8-17. ENGINE CLEARING PROCEDURE.

1. Condition lever FUEL CUTOFF.
2. Ignition and engine start switch OFF (1 minute minimum).
3. Ignition and engine start switch STARTER ONLY.
4. Ignition and engine start switch OFF.

8-18.*FIRST ENGINE START (GPU START).

When making a ground power unit (GPU) start, the left engine should be started first due to the GPU receptacle being adjacent to the right engine. Normally, only one engine is started utilizing the GPU, reverting to the Battery Start procedure for the second engine start. Crew member should monitor the outside observer throughout the engine start procedures.

1. INS As required.

NOTE

The engines must not be started until after the INS is placed into the NAV mode or OFF as required.

2. Exterior light switches As required.
3. Propeller area Clear.
4. #1 ignition and engine start switch START - IGNITION. #1 IGN ON annunciation should illuminate and associated FUEL PRESS annunciation should extinguish.

NOTE

False fuel flow indication may be observed with the starter engaged and the condition lever in cutoff.

CAUTION

If ignition does not occur within 10 seconds after moving condition lever to LOW IDLE, initiate Abort Start procedure. If for any reason a starting attempt is discontinued, the entire starting sequence must be repeated after allowing the engine to come to a complete stop (1 minute minimum).

5. Condition lever (after N., RPM passes 13% minimum) LOW IDLE.

CAUTION

Monitor TGT to avoid a hot start. If there is a rapid rise in TGT, be prepared to abort the start before limits are exceeded. During engine start, the maximum allowable TGT is 1000° C for 5 seconds. If this limit is exceeded, use Abort Start procedure and discontinue start. Enter the peak temperature and duration on DA Form 2408-13.

6. TGT and N. Monitor (TGT 1000° C maximum)
7. Oil pressure Check (60 PSI minimum).
8. #1 ignition and engine start switch OFF after TGT peaks.
9. Condition lever HIGH IDLE. Monitor TGT as the condition lever is advanced.
10. DC GPU disconnect As required.
11. Generator switch RESET then ON, for second engine battery start.

8-19.*SECOND ENGINE START (GPU START).

1. Propeller area Clear.
2. #2 ignition and engine start switch START IGNITION. #2 IGN ON annunciation should illuminate and associated FUEL PRESS annunciation should extinguish.
3. Condition lever (after N. RPM passes 13% minimum) LOW IDLE.
4. TGT and N. Monitor (TGT 1000° C maximum).
5. Oil pressure Check (60 PSI minimum).
6. #2 ignition and engine start switch OFF after TGT peaks.

7. Condition lever HIGH IDLE.

8. Propeller levers FEATHER (if required).

9. AC and DC GPU units Disconnect (check aircraft external power and mission external power annunciation extinguished).

10. Propeller levers Advance, then retard to feather detent.

11. Power levers GROUND FINE.

12. Inverter switches ON, check INVERTER annunciators extinguished.

13. Generator switches RESET, then ON.

NOTE

To reset beacon light, turn off approximately 5 seconds, then DAY or NIGHT. When voltage drops below approximately 20 volts, the beacon light may become inoperative.

14. Beacon light Reset.

CAUTION

Monitor oil temperature closely during ground operation with propellers in FEATHER due to lack of air flow over oil cooler.

8-20. BEFORE TAXIING.

*1. Brake deice Check and set as required. Ensure both bleed air valves are open.

*2. Cabin air mode and temperature switches Set as desired.

NOTE

For maximum cooling on the ground, turn the bleed air valve switches to PNEU ONLY position. Verify airflow is present from aft cockpit eyeball outlets to ensure sufficient cooling for mission equipment.

*3. AC/DC power Check for:
   a. AC frequency 394 406 Hz.
   b. AC voltage 104 124 VAC.
   c. DC voltage 28 28.5 VDC.

*4. 'Avionics master power switch ON.

WARNING

- **Do not operate the weather radar set while personnel or combustible materials are within 18 feet of the antenna reflector. When the weather radar set is operating, high-power radio frequency energy is emitted from the antenna reflector, which can have harmful effects on the human body and can ignite combustible materials.**
- **Do not operate radar in congested areas.**

CAUTION

Do not operate the weather radar system in a confined space where the nearest metal wall is 50 feet from the antenna reflector. Scanning such surfaces within 50 feet of the antenna reflector may damage receiver crystals.

NOTE

The radar system should be tested before each flight on which the system is to be used.

5. Weather radar Test and set as required.

6. Mission panel Set and checked as required.

*7. Automatic flight control system Check as follows:
   a. Altitude alert.

NOTE

Pause a few seconds between each step to allow time for the proper indications.

(1) Set alert controller more than 1000 feet above altitude indicated on pilot's altimeter. The pilot's altimeter alert annunciation should be extinguished.

(2) Decrease the alert controller to within 1000 feet of the pilot's altimeter setting. The alert annunciation should illuminate.

(3) Decrease the controller to less than 250 feet above the pilot's altimeter setting. The alert annunciation should extinguish.

(4) Increase the controller to 300 + 50 feet above the pilot's altimeter indication and check that the alert annunciation illuminates.

(5) Set the desired altitude.

b. Autopilot.

(1) Autopilot controller UP TRIM, DN TRIM annunciators Check not illuminated.

CAUTION

A steady illumination of UP TRIM or DN TRIM annunciation indicates that the automatic synchronization is not functioning and the autopilot should not be engaged.

(2) Turn knob Center.

(3) Elevator trim TM 55-1510-222-10 control switch On.

(4) Control wheel Hold to mid travel.

(5) AP button Press. AP ENGAGE and YD ENGAGE annunciators on autopilot controller will illuminate. Servo clutches will engage.

WARNING

If the STBY annunciation on the flight director mode selector does not illuminate within 10 seconds after the avionics master switch is turned on, the autopilot has failed self-test and is considered nonoperative and should not be used. The elevator trim system must not be forced beyond the limits which are indicated on the elevator trim tab indicator.

(6) Elevator trim follow-up Check.

(a) Control wheel Hold aft of mid travel. Trim wheel should run nose down after approximately 3 seconds. Trim down annunciation should illuminate after approximately 8 seconds, and AP TRIM annunciation should illuminate after approximately 13 seconds.

(b) Control wheel Hold forward of mid travel. Trim wheel should run nose up after approximately 3 seconds, trim up annunciation should illuminate after approximately 8 seconds, and AP TRIM annunciation should illuminate after approximately 13 seconds.

(7) Turn controller Check that control wheel follows in each applied direction, then center.

(8) Pitch wheel Check that trim responds to pitch wheel movement. (UP TRIM and DN TRIM annunciators may illuminate).

(9) Heading bug Center and engage HDG. Check that control follows a turn in each direction.

(10) Disengage AP by selecting GA. Check that AP disengages and FD commands 7° nose up, wings level attitude, and YD remains on.

c. Electric elevator trim Check.

(1) Elevator trim switch On.

(2) Pilot and copilot trim switches Check operation.

WARNING

Operation of the electric trim system should occur only by movement of pairs of switches. Any movement of the elevator trim wheel while depressing only one switch element indicates a trim system malfunction. The electric elevator trim control switch must then be turned OFF and flight conducted by operating the elevator trim wheel manually. Do not use autopilot.

(a) Pilot and copilot. Check individual element for no movement of trim, then check proper operation of both elements.

(b) Check pilot switches override copilot switches while trimming in opposite directions, and trim moves in direction commanded by pilot.

(3) Check pilot and copilot trim disconnects while activating trim.

(4) Elevator trim switch OFF then ON (ELEC TRIM OFF annunciation extinguishes).

8. Avionics Check and set as required.
9. Flaps Check.
10. Altimeters Set and check.

8-21.* TAXIING.

Taxi speed can be effectively controlled by the use of power application and the use of the variable pitch propellers in the ground fine range.

1. Brakes Check.
2. Flight instruments Check for normal operation.

8-22. ENGINE RUNUP.

1. Mission control panel Set.
2. Propeller feathering Check by pulling propeller levers aft past the detent to FEATHER. Check that each propeller feathers, then advance levers to the LOW RPM position.

* 3. Autofeather Check as follows:

a. Power levers Approximately 25% torque.

b. Autofeather switch Hold to TEST (both AUTOFEATHER annunciators illuminated).

c. Power levers Retard individually.

(1) At 14% to 20% torque Opposite annunciation extinguished.

(2) At 7% to 13% torque Both annunciators extinguished (propeller starts to feather).

NOTE

- **The power lever may have to be lifted and pulled towards the ground fine gate in order to attain the 7% to 13% torque.**
- **Autofeather annunciators will illuminate and extinguish with each fluctuation of torque as the propeller feathers.**

(3) Return power lever to approximately 25% torque.

d. Repeat above procedure with other engine.

e. Autofeather switch ARM.

* 4. Rudder boost Check as follows:

a. Propeller levers HIGH RPM

b. Rudder boost/yaw damper test switch Hold in YAW CONTROL TEST position.

c. Check RUDDER BOOST annunciation illuminated, and YD ENGAGE annunciation extinguished.

d. Yaw damper Engage. Ensure that the Yaw Damp system will not engage.

e. Rudder boost/yaw damper test switch RUDDER BOOST. Check RUDDER BOOST annunciation extinguished.

f. Yaw damper Engage. Observe YD ENGAGE annunciation illuminated.

g. Advance left power lever At approximately 60% torque differential, the YD ENGAGE annunciation should extinguish, and the left rudder pedal should start to move forward. Increasing engine power should result in increased rudder pedal travel. (Observe torque and TGT limits).

h. Slowly retard the left power lever Rudder pedal travel should decrease with decreasing power. At approximately 50% torque differential, the YD ENGAGE annunciation may flicker as the Rudder Boost system disengages.

i. Reengage the Yaw Damper, and repeat with the other engine.

* 5. Overspeed governor Check as follows:

a. Propeller test switch Hold to PROP GOVERNOR TEST position.

b. Left power lever Increase until propeller stabilizes at 1540 to 1580 RPM.

c. Release propeller test switch Observe that propeller RPM increases.

d. Repeat above steps with other engine.

* 6. Primary governors Check as follows:

a. Power levers Set at 1500 RPM.

b. Exercise propeller Move aft to detent, then return to high RPM.

7. Propeller levers Retard to detent.

8. Power levers Ground fine.

* 9. Engine anti-ice Check as follows:

a. Ice vane power select switch MAIN.

b. Ice vane control switches off, verify VANE EXTEND annunciators extinguish.

c. Ice vane power select switch STBY.

d. Ice vane control switches ON, verify VANE EXTEND annunciators illuminated.

e. Ice vane power select switch MAIN.

* 10. Anti-ice and deice systems Check as follows:

a. Beacon Off.

b. Left pitot heat switch ON Check for loadmeter rise, then off.

c. Right pitot heat switch ON Check for load meter rise, then off.

d. Stall warning heat switch ON Check for load-meter rise, them off.

e. Fuel vent heat switches ON Check for loadmeter rise, then off.

f. Windshield anti-ice switches NORMAL Check PILOT and COPILOT (individually) for loadmeter rise, then OFF.

g. Propeller deice MANUAL switch ON (momentarily), check for loadmeter rise.

h. Surface deice switch SINGLE CYCLE AUTO. Check for a drop in pneumatic pressure and wing deice boot inflation after 6 seconds for a second drop in pneumatic pressure. i. Surface deiceswitch MANUAL. Check that surface boots inflate, and remain inflated, then off.

j. Antenna deice switch SINGLE CYCLE AUTO. Check for a drop in pneumatic pressure and antenna deice boot inflation.

k. Antenna deice switch MANUAL. Check that boots inflate, and remain inflated, then off.

l. Radome Anti-ice switch ON, Check for proper indications OFF.

m. Beacon As required (DAY or NIGHT).

* 11. Pneumatic pressure Check as follows:

a. ENVIRO & PNEU bleed air LEFT switch Off.

b. Pneumatic pressure 12 20 PSI Check.

c. L BL AIR Off annunciators illuminated Check.

d. ENVIRO & PNEU bleed air RIGHT switch Off.

e. L & R BL AIR OFF and L & R BL AIR FAIL annunciators illuminated Check.

f. ENVIRO & PNEU bleed air LEFT switch ON.

g. L BL AIR OFF and L & R BL AIR FAIL annunciators extinguished, pneumatic pressure at 12 20 PSI Check.

h. ENVIRO & PNEU bleed air RIGHT switch ON.

i. R BL AIR OFF annunciation extinguished Check.

* 12. Pressurization system - Check and set as follows:

a. CABIN DOOR caution annunciation extinguished Check.

b. Vent windows closed Check.

c. ENVIRO & PNEU bleed air switches ON - Check.

d. Cabin altitude 500 feet lower than field pressure altitude Set.

e. Cabin pressure switch TEST (hold).

f. Cabin climb indicator descending indication Check, then release TEST switch.

g. ACFT ALT set to planned cruise altitude plus 500 feet Check (if this setting does not result in CABIN ALT indication of at least 500 feet over takeoff field pressure altitude, adjust as required).

h. Rate control set between 9 and 12 o'clock - Check.

13. Windshield anti-ice As required.

NOTE

If windshield anti-ice is needed prior to takeoff, use normal setting for a minimum of 15 minutes prior to selecting high temperature to provide adequate preheating and minimize effects of thermal shock.

8-23. *BEFORE TAKEOFF.

1. Bleed air valves As required.

2. Ice and rain switches As required. As a minimum, the PITOT, STALL WARN, and FUEL VENT switches shall be ON.

3. Fuel panel Check fuel quantity and switch positions.

4. Flight and engine instruments Check for normal indications.

5. Cabin controller - Set.

6. Annunciation panels Check (note indications).

7. Flaps - As required.

8. Trim Set.

9. Avionics Set.

10. Flights controls Check.

*11.Departure briefing Complete.

8-24. *LINE UP.

1. Engine antiice As required.

2. Propeller levers HIGH RPM.

3. Altitude alerter Check. Set as required.
4. Transponder - As required.
5. Engine auto ignition switches ARM.
6. Lights - As required.

NOTE

Landing lights may be used for takeoff to assist in avoiding bird strikes and to make the aircraft more visible while operating in congested areas.

8-25. TAKEOFF.

To aid in planning the takeoff and to obtain maximum aircraft performance, make full use of the information affecting takeoff shown in Chapter 7. The data shown is achieved by setting brakes, setting takeoff power and then releasing brakes. The normal takeoff may be modified by starting the takeoff roll prior to attaining takeoff power. This will result in a smoother takeoff, but will invalidate all subsequent field performance data.

a. Normal Takeoff. After the LINE UP check is complete, smoothly apply power to the setting determined from the appropriate "Minimum Static Takeoff Power at 1700 RPM" chart. Release brakes and maintain directional control with nose wheel steering and rudder, while maintaining wings level with ailerons. The pilot should retain a light hold on the power levers through the takeoff and be ready to initiate abort procedures if required. The copilot should ensure that the autofeather advisory lights are illuminated and monitor engine torque during the takeoff roll. As the aircraft accelerates, engine torque will increase, but should not exceed engine limits, either torque or TGT. As the copilot call "VI," the pilot will remove his hand from the power levers. The copilot will call "Rotate" at VI, and the pilot will commence a smooth, positive aircraft rotation to an indicated pitch attitude of 10°. When two positive climb indications are observed, the landing gear will be retracted.

b. Crosswind Takeoff. Position the aileron control into the wind at the start of the takeoff roll to maintain a wings level attitude. Under strong crosswind conditions, leading with upwind power at the beginning of the takeoff roll will assist in maintaining directional control. As the nose wheel comes off the ground, the rudder is used as necessary to prevent turning (crabbing) into the wind. Rotate in a positive manner to keep from side-skipping as weight is lifted from the shock struts. To prevent damage to the landing gear, in the event that the aircraft were to settle back onto the runway, remain in "slipping" flight until well clear of the ground, then crab into the wind to continue a straight flight path.

c. Minimum Run Takeoff. Follow the procedure as outlined for a normal takeoff, as described in Chapter 7.

d. Obstacle Clearance Climb. Follow procedure as outlined for a normal takeoff, as described in Chapter 7.

e. Soft Field Takeoff. Not applicable.

8-26. AFTER TAKEOFF'.

WARNING

Immediately after takeoff, the pilot flying the aircraft should avoid adjusting controls located on the aft portion of the extended pedestal to preclude inducing spatial disorientation. With both engines operating, the aircraft will rapidly accelerate through V2. Allow the aircraft to continue accelerating to the two engine climb speed, or the cruise climb schedule, as applicable. Retract the flaps when safely airborne. The procedural steps are as follows:

1. Gear-UP.
2. Flaps UP.
3. Landing lights OFF.
4. Climb power Set.
5. Propeller synchronization As required.
6. Yaw damper ON (required above 17,000 ft).
7. Autofeather As required.
8. Brake deice As required.
9. Windshield anti-ice As required.

NOTE

Turn windshield anli-ice on to normal when passing 10,000 feet AGL or prior to entering the freezing level (whichever comes first). Leave on until no longer required during descent for landing. High temperature may be selected as required after a minimum warm-up period of 15 minutes.

10. Cabin pressurization Check, adjust rate control knob so that cabin rate-of-climb equals one third of the aircraft rate-of-climb.
11. Wings and nacelles Check.
12. Flare/chaff dispenser safety pin (electronic module) Remove.
13. Chaff function selector switch As required.
14. APR-39 and APR44 As required.

8-27. CLIMB.

Cruise climb is performed at a speed which provides a good rate-of-climb and sufficient visibility over the nose. Propellers should be kept at 1700 RPM. Lower propeller RPMs will reduce the amount of cabin noise, but will degrade the aircraft climb performance. The following chart may be used as an airspeed schedule.

SL	to	10,000 FEET	160 KIAS
10,000	to	20,000 FEET	140 KIAS
20,000	to	25,000 FEET	130 KIAS
25,000	to	35,000 FEET	120 KIAS

NOTE

The maximum rate of climb performance is obtained by setting maximum continuous power and maintaining two-engine climb speed (Refer to Chapter 7).

8-28. CRUISE.

Refer to Chapter 7 for airspeed, power settings, and fuel flow information. The following procedures are to be used for Cruise configuration:

1. PowerSet.
2. Ice and rain switches As required.
3. Auxiliary fuel gages Monitor.
4. Altimeters Check.
5. Engine instrument indications Noted.
6. Recognition lights As required.

8-29. DESCENT.

a. Descent from cruising altitude should normally be made by letting down at cruise airspeed with reduced power. (Refer to Chapter 7 for performance data).

NOTE

Cabin altitude and rate-of-climb controller should be adjusted prior to starting descent.

b. If required to descent at a low airspeed (e.g., to conserve airspace min. turbulence), approach flaps and landing gear may be extended to increase the rate and angle of descent while maintaining the slower airspeed.

8-30. DESCENT-ARRIVAL.

Refer to Chapter 7 for performance data. Perform the following checks prior to the final descent for landing:

WARNING

M_{mo} may be easily exceeded when descending from high altitude. The pilot should frequently cross check the airspeed and Mach limit indicators to avoid exceeding Mmo. Exceeding Mmo could result in structural failure and loss of airframe integrity.

1. Cabin controller- -Set.
2. Ice & rain switches - -As required.
3. Windshield anti-ice - -As required.

NOTE

Set windshield anti-ice to normal or high as required well before descent into icing conditions or into warm moist air to aid in defogging. Turn off windshield anti-ice when descent is completed to lower altitudes and when heating is no longer required. This will preclude possible wind screen distortions.

4. Recognition lights ON.
5. Radio altimeter As required.
6. Altimeters Set to current altimeter setting.
7. Flare/chaff dispenser arm-safe switch SAFE.
8. Flare/chaff dispenser safety pin (electronic module) Insert.
9. Condition lever HIGH IDLE.
10. Arrival briefing Complete.

8-31. BEFORE LANDING.

1. Propeller synchronizer switch OFF.
2. Autofeather switch ARM.
3. Propeller levers HIGH RPM.
4. Flaps (below 197 KIAS) APPROACH.
5. Gear (below 178 KIAS) DN.
6. Landing lights As required.
7. Brake deice As required.

8-32. LANDING.

CAUTION

The maximum demonstrated cross wind component is 25 knots at 90°. Landing the aircraft in a crab will impose side loads on the landing gear and should be recorded on DA Form 2408-13.

a. Normal Landing. Refer to Chapter 7 for performance data. When landing is assured:

1. Autopilot and yaw damp Disengaged.
2. GEAR DOWN annunciators Check.
3. Flaps As required. After touchdown:
4. Power levers Lift and retard to GROUND FINE.
5. Brakes As required.

b. Cross wind Landing. Refer to Chapter 7 for recommended Vref speeds. Use the "crab-into-the-wind" method to correct for drift during final approach. The "crab" is changed to a slip (aileron into wind and top rudder) to correct for drift during flare and touchdown. After landing, position ailerons as required to correct for cross wind effect. For cross wind exceeding the published limits, a combination "slip and crab" method at touchdown should be used.

c. Soft Field Landing. Not applicable.

8-33. TOUCH-AND GO/STOP-AND GO LANDING.
When a touch and go landing is to be performed, the following procedures shall be used:

1. Propeller levers HIGH RPM.
2. Flaps As required.
3. Trim Set.
4. Power stabilized Check 25% minimum.
5. Takeoff power Set.

8-34. GO-AROUND.
When a go-around is commenced prior to the LANDING check, use power as required to climb to, or maintain, the desired altitude and airspeed. If the go-around is started after the LANDING check has been performed, apply maximum allowable power and simultaneously increase pitch attitude to stop the descent. Retract the landing gear after ensuring that the aircraft will not touch the ground. Retract the flamps to APPROACH, adjusting pitch attitude simultaneously to avoid an altitude loss. Accelerate to two engine rate-of-climb airspeed retracting flaps fully after attaining Vref speed used for the approach. Perform the following.

1. Power Maximum allowable.
2. Gear-UP.
3. Flaps UP.
4. Landing lights OFF.
5. Climb power Set.
6. Brake deice Off.

8-35. AFTER LANDING.
Complete the following procedures after the aircraft has cleared the runway:

1. Conditions levers HIGH IDLE.
2. Propeller levers Retard to feather detent.
3. Ice vane control switches ON.
4. Engine auto ignition switches Off.
5. Ice & rain switches -Off.
6. Flaps UP.
7. Radar/transponder As required.
8. Lights As required.
9. Mission control panel Set.

8-36. ENGINE SHUTDOWN.

NOTE

To prevent sustained loads on rudder shock links, the aircraft should be parked with the nose gear centered.

1. Brake deice Off.
2. Parking brake Set.
3. Landing/taxi light OFF.
4. Cabin air mode switch OFF.
5. Autofeather switch OFF.
6. Forward vent and afl. vent blower switches AUTO.
7. INS OFF.

8. Mission equipment OFF.
9. Inverter switches Off.
10. Battery condition Check.
11. TGT Check stabilized for I minute prior to shutdown.
12. Propeller levers FEATHER.

CAUTION

Monitor TGT during shutdown, if sustained combustion is observed, proceed immediately to Abort Start procedure.

13. Condition levers FUEL CUTOFF.

WARNING

Do not turn exterior lights off until propeller's rotation has stopped.

14. Exterior lights Off.
15. IR Flood lights Off.
16. Master panel lights Off.
17. Avionics master switch Off.
18. Master switch OFF.
19. Keylock switch OFF.
20. Oxygen system OFF.

8-37. BEFORE LEAVING AIRCRAFT.

NOTE

Brakes should be released after chocks are in place (ramp conditions permitting).

1. Wheels Chocked.
2. Parking brake As required.
3. Flight controls Locked.
4. Overhead flood lights OFF.
5. Standby fuel pump switches Off.
6. Transponder OFF.
7. Mode 4 Zeroize as required.
8. KY-58 Zeroize as required.
9. GPS Zeroize as required.
10. Windows As required.
11. Emergency exit lock As required.
12. Aft cabin lights OFF.
13. Door light OFF.
14. Walk-around inspection Complete.
15. Aircraft forms Complete.
16. Aircraft secured Check.

Section III. INSTRUMENT FLIGHT

8-38. GENERAL.

This aircraft is qualified for operation under instrument flight conditions. Handling characteristics, stability characteristics, and range are the same during instrument flight conditions as when under visual flight conditions.

8-39. INSTRUMENT FLIGHT PROCEDURES.

Refer to FM 1-240; DOD FLIP; AR 95-1; and procedures described in this manual or applicable foreign regulations.

8-40. INSTRUMENT TAKEOFF.

Complete the normal checks prescribed in the chapter. Follow takeoff procedures dictated by local conditions.

8-41. INSTRUMENT CLIMB.

Refer to Chapter 7 for information regarding fuel consumption, speed, and rate of climb.

8-42. INSTRUMENT CRUISE.

There are no unusual flight characteristics during cruise in instrument meteorological conditions.

8-43. INSTRUMENT DESCENT.

There are no unusual flight characteristics during descent in instrument meteorological conditions.

8-44.INSTRUMENT APPROACHES.

There are no unusual preparations or control techniques required for instrument approaches.

8-45. AUTOPILOT COUPLED APPROACHES.
There are no special preparations required for placing the aircraft under autopilot control. Refer to Chapter 3 for procedures to be followed for automatic approaches.

Section IV. FLIGHT CHARACTERISTICS

8-46. STALLS.

WARNING

- **Under certain flight conditions, prestall buffet may occur before the stall warning horn sounds.**
- **The RC-12K stall warning system may not provide adequate warning of impending stall. When operating under conditions where altitude loss is critical and stall recovery and aircraft control is difficult such as at night, IMC and autopilot operations, the pilot must closely monitor airspeed.**
-

A prestall warning in the form of light buffeting may be felt when approaching a stall. An aural warning is also provided by the warning horn. The warning horn may begin to sound approximately 5 12 KNOTS above power off stall speed, depending on aircraft configuration. If correct stall recovery technique is used, very little altitude will be lost during the stall recovery. For the purpose of this section, the term "power on" means that both engines and propellers of the aircraft are operating normally and are responsive to pilot control. The term "power off' means that both engines are operating at idle power. Landing gear position has no effect on stall speed. During practice, enter power off stalls from normal glides. Enter power on stalls by smoothly increasing pitch attitude to a climb attitude obviously impossible for the aircraft to maintain, and hold that attitude until the stall occurs.

a. Power On Stalls. The power on stall attitude is very steep and unless this high pitch attitude is maintained, the aircraft will generally settle or mush instead of stall. It is difficult to stall the aircraft inadvertently in any normal maneuver. A light buffet precedes the stall, and the first indication of approaching stall is generally a decrease in control effectiveness, accompanied by a tone from the stall warning horn. The stall itself is characterized by a rolling tendency if the aircraft is allowed to yaw. The proper use of rudder will minimize the tendency to roll. A slight pitching tendency will develop if the aircraft is held in the stall, resulting in the nose dropping slightly, then pitching up toward the horizon; this cycle is repeated until recovery is made. Control is regained very quickly with little altitude loss, providing the nose is not lowered excessively. Begin recovery with forward movement of the control wheel and a gradual return to level flight. The roll tendency caused by yaw is more pronounced in power on stalls, as is the pitching tendency; Power on stall characteristics are not greatly affected by wing flap position, except that stalling speed is reduced in proportion to the degree of wing flap extension.

b. Power Off Stalls. The rolling tendency is considerably less pronounced in power off stalls (in any configuration), and is more easily prevented or corrected by adequate rudder and aileron control, respectively. The nose will generally drop straight through with some tendency to pitch up again if recovery is not made immediately. The Stall Speed graph (fig. 8-2) shows the indicated power off stall speeds with aircraft in various configurations. Altitude loss during a full stall may be as high as 1320 feet.

c. Accelerated Stalls. The aircraft gives noticeable stall warning in the form of buffeting when the stall occurs. The stall warning and buffet can be demonstrated in turns by applying excessive back pressure on the control wheel.

8-47. SPINS.
Intentional spins are prohibited. If a spin is inadvertently entered use the following recovery procedure:

NOTE

Spin demonstrations have not been conducted. The recovery technique is based on the best available: information.

The first three actions should be performed as nearly simultaneously as possible.

1. Power levers IDLE.
2. Apply full rudder opposite the direction of spin rotation.

STALL SPEEDS — POWER IDLE

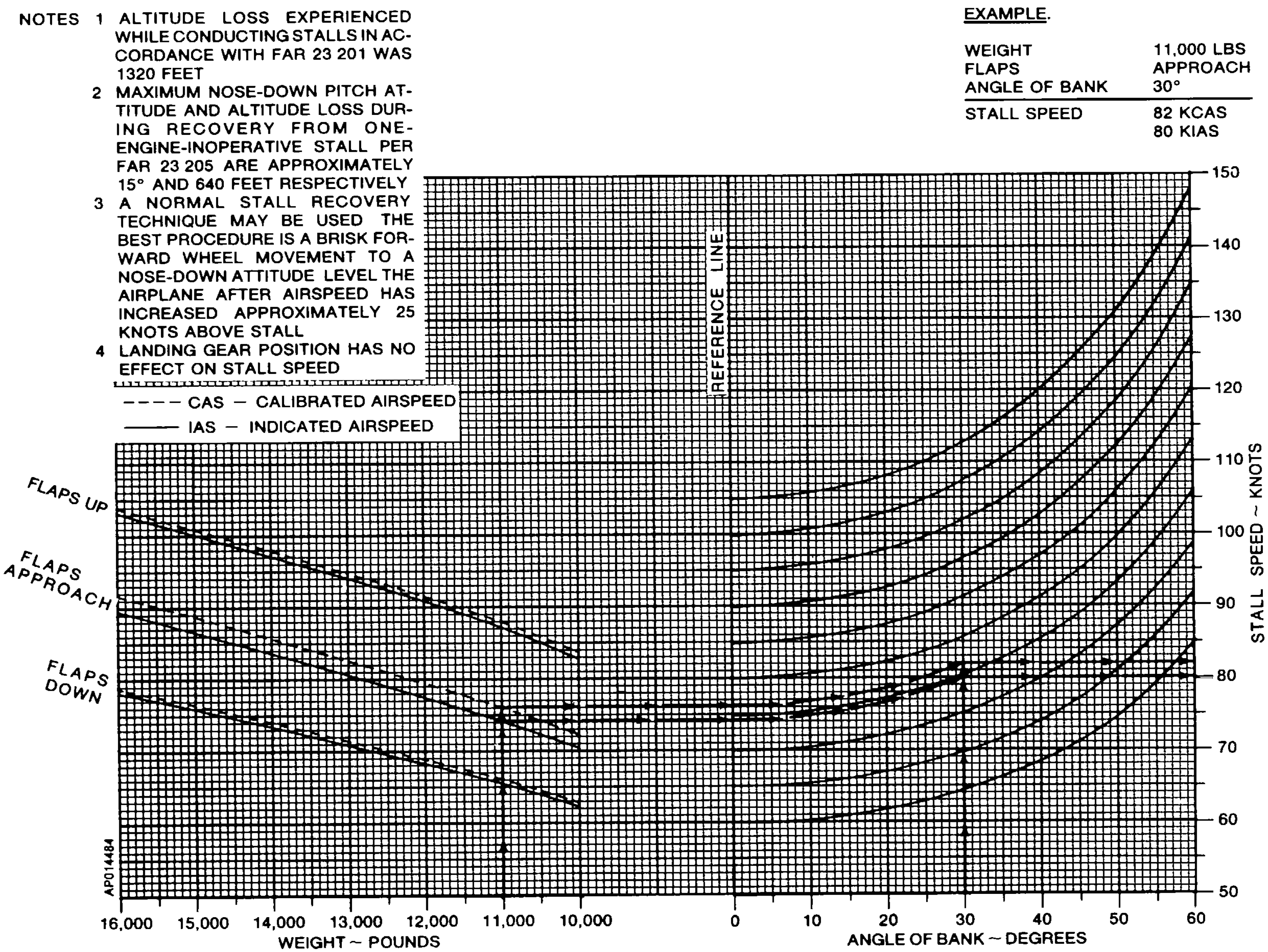

Figure 8-2. Stall Speeds -Power Idle

3. Simultaneously with rudder application, push the control wheel forward and neutralize ailerons.

4. When rotation stops, neutralize rudder.

CAUTION

Do not pull out of the resulting dive too abruptly as this could cause excessive wing loads and a possible secondary stall.

5. Pull out of dive by exerting a smooth, steady back pressure on the control wheel, avoiding an accelerated stall and excessive aircraft stresses.

8-48. MANEUVERING FLIGHT.

Maneuvering speed (V_a) is the maximum speed at which abrupt full control inputs can be applied without exceeding the design load on the aircraft as shown in Chapter 5. The data is based on 16,000 pounds and there are no additional restrictions below this weight. There are no unusual characteristics under accelerated flight.

8-49. FLIGHT CONTROLS.

The aircraft is stable under all normal flight conditions. Aileron, elevator, rudder and trim tab controls function effectively throughout all normal flight conditions. Elevator control forces are relatively light in the extreme aft CG (center of gravity) condition, progressing to moderately high with CG at the forward limit. Extending and retracting the landing gear causes only slight changes in control pressure. Control pressures, resulting from changes in power settings or the repositioning of the wing flaps are not excessive in the landing configuration at the most forward CG. The minimum speed at which the aircraft can be fully trimmed is 100 KIAS (gear and flaps down, propellers at high RPM). Control forces produced by changes in speed, power setting, wing flap position and landing gear position are light and can be overcome with one hand on the control wheel. Trim tabs permit the pilot to reduce these forces to zero. During single engine operation, the rudder boost system aids in relieving the relatively high rudder pressures resulting form the large variation in power.

8-50. LEVEL FLIGHT CHARACTERISTICS.

All flight characteristics are conventional through-out the level flight speed range.

Section V. ADVERSE ENVIRONMENTAL CONDITIONS

8-51. INTRODUCTION.

The purpose of this part is to inform the pilot of the special precautions and procedures to be followed during the various weather conditions that may be encountered in flight. This part is primarily narrative, only those checklists that cover specific procedures characteristic of weather operations are included. The checklist in Section II provides for adverse environmental operations.

8-52. COLD WEATHER OPERATIONS.

CAUTION

Operation of the surface deice system in ambient temperatures below -40 ° C can cause permanent damage to the deice boots.

Operational difficulties may be encountered during extremely cold weather, unless proper steps are taken prior to, or immediately after flight. All personnel should understand and be fully aware of the necessary procedures and precautions involved.

a. Preparation For Flight. Accumulations of snow, ice, or frost on aircraft surfaces will adversely affect takeoff distance, climb performance and stall speed to a dangerous degree. Such accumulations must be removed before flight. In addition to the normal exterior checks, following the removal of ice, snow, or frost, inspect wing and empennage surfaces to verify that these remain sufficiently cleared. Also, move all control surfaces to confirm full freedom of movement. Ensure that tires are not frozen to wheel chocks or to the ground. Use ground heaters, anti-ice solution, or brake deice, to free frozen tires. When heat is applied to release tires, the temperature should not exceed 71 C (160 ° F). Refer to Chapter 2 for anti-icing, deicing, and defrosting treatment.

b. Engine Starting. When starting engines on ramps covered with ice, propeller levers should be in the FEATHER position to prevent the tires from sliding.

c. Warm-Up and Ground Test. Warm-up procedures and ground test are the same as those outlines in Section II.

d Taxiing. Whenever possible, taxiing in deep snow, light weight dry snow or slush should be avoided, particularly in colder FAT conditions. If it is necessary to taxi through snow or slush, do not set the parking brake when stopped. If possible, do not park the aircraft in snow or slush deep enough to reach the brake assemblies. Chocks or sandbags should be used to prevent the aircraft from rolling while parked. Before attempting to taxi, activate the brake deice system, insuring that the bleed air valves are OPEN and that the condition levers are in HIGH IDLE. An outside observer should visually check wheel rotation to ensure brake assemblies have been deiced.

e. Before Takeoff.

1. If icing conditions are expected, activate all anti-ice systems before takeoff, allowing sufficient time for the equipment to become effective.

2. If the possibility of ice accumulation on the horizontal stabilizer or elevator exists, takeoff will not be attempted.

f Takeoff. Takeoff procedures for cold weather operations are the same as for normal takeoff. Taking off with temperature at or below freezing, with water, slush or snow on the runway, can cause ice to accumulate on the landing gear and can throw ice into the wheel well areas. Such takeoffs shall be made with brake deice on and with the ice vanes extended. Before flight into icing conditions, the pilot and copilot windshield anti-ice switches should be set at NORMAL position.

g. During Flight

1. After takeoff from a runway covered with snow or slush, it may be advisable to leave brake deice ON to dislodge ice accumulated from the spray of slush or water. Monitor BRAKE DEICE annunciator for automatic termination of system operation and then turn the switch OFF. During flight, trim tabs and controls should also be exercised periodically to prevent freezing. Ensure that anti-icing systems are activated before entering icing conditions. Do not activate the surface deice system until ice has accumulated at least 0.5 INCH. The propeller deice system operates effectively as an anti-ice system and it may be operated continuously in flight. If propeller imbalance due to ice does occur, it may be relieved by increasing RPM briefly, then returning to desired setting. Ice vanes must be extended when operating in visible moisture or when freedom from visible moisture cannot be assured, at + 5°C FAT or less. Ice vanes are designed as an anti-ice system, not a deice system. After the engine air inlet screens are blocked, lowering the ice vanes will not rectify the condition.

2. Stalling airspeeds should be expected to increase when ice has accumulated on the aircraft causing distortion of the wing airfoil. For the same reason, stall warning devices are not accurate and should not be relied upon. Keep a comfortable margin of airspeed above the normal stall airspeed. Maintain a minimum of 140 KNOTS during sustained icing conditions to prevent ice accumulation on unprotected surfaces of the wing. In the event of windshield icing, reduce airspeed to 226 KNOTS or below.

h. Descent. Use normal procedures in Section II. Brake icing should be considered if moisture was encountered during previous ground operations or in flight, in icing conditions with gear extended.

i. Landing. Landing on an icy runway should be attempted only when absolutely necessary and should not be attempted unless the wind is within 10° of runway heading. Application of brakes without skidding the tires on ice is very difficult, due to the sensitive brakes. In order not to impair pilot visibility, reverse thrust should be used with caution when landing on a runway covered with snow or standing water. Use procedures in Section II for normal landing.

j. Engine Shutdown. Use normal procedures in Section II.

k. Before Leaving the Aircraft. When the aircraft is parked outside on ice or in a fluctuating freeze-thaw temperature condition the following procedures should be followed in addition-to the normal procedures in Section II. After wheel chocks are in place, release the brakes to prevent freezing. Fill fuel tanks to minimize condensation, remove any accumulation of dirt and ice from the landing gear shock struts, and install protective covers to guard against possible collection of snow and ice.

8-53. DESERT OPERATION AND HOT WEATHER OPERATION.

Dust, sand, and high temperatures encountered during desert operation can sharply reduce the operational life of the aircraft and its equipment. The abrasive characteristics of dust and sand upon turbine blades and moving parts of the aircraft and the destructive effect of heat upon the aircraft instruments will necessitate many hours of maintenance if basic preventive measures are not followed. In flight, the hazards of dust and sand will be difficult to escape, since dust clouds over a desert may be found at altitudes up to 10,000 feet. During hot weather operations, the principle difficulties encountered are high turbine gas temperatures (TGT) during engine starting, over-heating of brakes, and longer takeoff and landing distances due to the higher density altitudes encountered. In areas where high humidity is encountered, electrical equipment (such as communication equipment and instruments) will be subject to malfunction by corrosion, fungi and moisture absorption by nonmetallic materials.

a. reparation For Flight. Check the position of the aircraft in relation to other aircraft. Propeller blown sand can damage nearby aircraft. Check that the landing gear shock struts are free of dust and sand. Check instrument panel and general interior for dust and sand accumulation. Open main entrance door and cockpit vent storm windows to ventilate the aircraft.

b. Engine Starting. Use normal procedures in Section II. Engine starting under conditions of high ambient temperatures may produce a higher than normal TGT during the start. The TGT should be closely monitored when the condition lever is moved to the LOW IDLE position. If overtemperature tendencies are encountered, the condition lever should be moved to IDLE CUTOFF position periodically during acceleration of gas generator RPM (NI). Be prepared to abort the start before temperature limitations are exceeded.

c. Warm-Up Ground Tests. Use normal procedures in Section II.

d. Taxiing. Use normal procedures in Section II. When practical, avoid taxiing over sandy terrain to minimize propeller damage and engine deterioration that results from impingement of sand and gravel. During hot weather operation, use minimum braking action to prevent brake overheating.

e. Takeoff. Use normal procedures in Section II. Avoid taking off in the wake of another aircraft if the runway surface is sandy or dusty.

f During Flight. Use normal procedures in Section II.

g. Descent. Use normal procedures in Section II.

h. Landing. Use normal procedures in Section II.

i. Engine Shutdown. Use normal procedures in Section II.

CAUTION

During hot weather, if fuel tanks are completely filled, fuel expansion may cause overflow, thereby creating a fire hazard.

j. Before Leaving Aircraft. Use normal procedures in Section II. Take extreme care to prevent sand or dust from entering the fuel and oil system during servicing. During hot weather, release the brakes immediately after installing wheel chocks to prevent brake disc warpage.

8-54 TURBULENCE AND THUNDERSTORM OPERATION.

CAUTION

Due to the comparatively light wing loading, control in severe turbulence and thunderstorms is critical. Since turbulence imposes heavy loads on the aircraft structure, make all necessary changes in aircraft attitude with the least amount of control pressures possible to avoid excessive loads on the aircraft structure.

Thunderstorms and areas of severe turbulence should be avoided. However, if such areas are to be penetrated, it will be necessary to counter rapid changes in attitude and accept major indicated altitude variations. Penetration should be at an altitude which provides adequate maneuvering margins as a loss or gain of several thousand feet of altitude may be expected. The recommended speed for penetration of severe turbulence is 150 KIAS. Constant pitch attitude and power settings are vital to proper flight technique. Establish recommended penetration speed and proper attitude prior to entering turbulent air to minimize most difficulties. False indications by the pressure instruments due to barometric pressure variations within the storm make them unreliable. Maintaining a pre-established attitude will result in a fairly constant airspeed. Turn cockpit and cabin lights on to minimize the blinding effects of lighting. Do not use autopilot altitude hold. Maintain constant power settings and pitch attitude regardless of airspeed or altitude indications. Concentrate on maintaining a level attitude by reference to the flight director/attitude indicator. Maintain original heading. Make no turns unless absolutely necessary.

8-55. ICE AND RAIN (TYPICAL).

WARNING

While in icing conditions, if there is an unexplained 30% increase of torque needed to maintain airspeed in level flight, a cumulative total of two or more inches of ice accumulation on the wing, an unexplained decrease of 15 knots IAS, or an unexplained deviation between pilot's and copilot's airspeed indicators, the icing environment should be exited as soon as practicable. Ice accumulation on the pitot tube assemblies could cause a complete loss of airspeed indication.

The following conditions indicate a possible accumulation of ice on the pitot tube assemblies and unprotected airplane surfaces. If any of these conditions are observed, the icing environment should be exited as soon as practicable.

(1) Total ice accumulation of two inches or more on the wing surfaces, Determination of ice thickness can be accomplished by summing the estimated ice thickness on the wing prior to each pneumatic boot deice cycle (e.g. four cycles of minimum recommended *%-inch accumulation.

(2) A 30 percent increase in torque per engine required to maintain a desired airspeed in level flight (not to exceed 85 percent torque) when operating at recommended holding/loiter speed.

(3) A decrease in indicated airspeed of 15 knots after entering the icing condition (not slower than 1.4 power off stall speed) if maintaining original power setting in level flight. This can be determined by comparing pre-icing condition entry speed to the indicated speed after a surface and antenna deice cycle is completed.

(4) Any variations from normal indicated airspeed between the pilot's and copilot's airspeed indicators.

a. Typical Ice. Icing occurs because of supercooled water vapor such as fog, clouds or rain. The most severe icing occurs on aircraft surfaces in visible moisture or precipitation with a true outside air temperature between -5°C and +1°C; however, under some circumstances, dangerous icing conditions may be encountered with temperatures below -10°C. The surface of the aircraft must be at a temperature of freezing or below before ice will stick to the aircraft. If severe icing conditions are encountered, ascend or descend to altitudes where these conditions do not prevail. If flight into icing conditions is unavoidable, proper use of aircraft anti-icing and deicing systems may minimize the problems encountered. Approximately 15 minutes prior to flight into temperature conditions which could produce frost or icing conditions, the pilot and co-pilot windshield anti-ice switches should be set at normal or high temperature position (after preheating) as necessary to eliminate windshield ice. Stalling airspeeds should be expected to increase when ice has accumulated on the aircraft causing distortion of the wing airfoil. For the same reason, stall warning devices are not accurate and should not be relied upon. Keep a comfortable margin of airspeed above the normal stall airspeed with ice on the aircraft. Maintain a minimum of 140 knots during sustained icing conditions to prevent ice accumulation on unprotected surfaces of the wing. In the event of windshield icing, reduce airspeed to 226 knots or below.

b. Rain. Rain presents no particular problems other than restricted visibility and occasional incorrect airspeed indications.

c. Taxiing. Extreme care must be exercised when taxiing on ice or slippery runways. Excessive use of either brakes or power may result in an uncontrollable skid.

d. Takeoff: Extreme care must be exercised during takeoff from ice or slippery runways. Excessive use of either brakes or power may result in an uncontrollable skid.

e. Climb. Keep aircraft attitude as flat as possible and climb with higher airspeed than usual, so that the lower surfaces of the aircraft will not be iced by flight at a high angle of attack.

f. Cruise Flight.

(1) Prevention of ice formation is far more effective and satisfactory than attempts to dislodge the ice after it has formed. If icing conditions are inadvertently encountered, turn on the anti-icing systems prior to the first sign of ice formation.

(2) Do not operate deicer boots continuously. Allow at least 0.5 inch of ice on the boots before activating the deicer boots to remove the ice. Continued flight in severe icing conditions should not be attempted. If ice forms on the wing area aft of the deicer boots, climb or descend to an altitude where conditions are less severe.

g. Landing. Extreme care must be exercised when landing on ice or slippery runways. Excessive use of either brakes or power may result in an uncontrollable skid. Ice accumulation on the aircraft will result in higher stalling airspeeds due to the change in aerodynamic characteristics and increased weight of the aircraft due to ice buildup. Approach and landing airspeeds must be increased accordingly.

NOTE

When operating on wet or icy runways, refer to stopping distance factors shown in Chapter 7.

8-55A. ICING (SEVERE).

a. The following weather conditions may be conducive to severe in-flight icing:

(1) Visible rain at temperatures below zero degrees Celsius ambient air temperature.

(2) Droplets that splash or splatter on impact at temperatures below zero degrees Celsius ambient air temperature.

b. The following procedures for exiting a severe icing environment are applicable to all flight phases from takeoff to landing.

(1) Monitor the ambient air temperature. While severe icing may form at temperatures as cold as -18 degrees Celsius, increased vigilance is warranted at temperatures around freezing with visible moisture present.

(2) Upon observing the visual cues specified in the limitations section of the airplane flight manual (Military Operations Manual) for the identification of severe icing conditions (reference paragraph 5-32B.), accomplish the following:

(a) Immediately request priority handling from air traffic control to facilitate a route or an altitude change to exit the severe icing conditions in order to avoid extended exposure to flight conditions more severe than those for which the airplane has been certificated.

(b) Avoid abrupt and excessive maneuvering that may exacerbate control difficulties.

(c) Do not engage the autopilot.

(d) If the autopilot is engaged, hold the control wheel firmly and disengage the autopilot.

(e) If an unusual roll response or uncommanded roll control movement is observed, reduce the angle-of-attack.

(f) Do not extend flaps during extended operation in icing conditions. Operations with flaps extended can result in a reduced angle-of-attack, with the possibility of ice forming on the upper surface further aft on the wing than normal, possibly aft of the protected area.

(g) If the flaps are extended, do not retract them until the airframe is clear of ice.

(h) Report these weather conditions to air traffic control.

Section VI. CREW DUTIES

★ 8-56. DEPARTURE BRIEFING.

The following is a guide that should be used as applicable in accomplishing the required crew briefing prior to takeoff. However, if the crew has operated together previously (thru-flight) and the pilot is certain that the copilot understands all items of the briefing, he may omit the briefing by stating “standard briefing,” when the briefing is called for during the BEFORE TAKEOFF CHECK.

1. ATC clearance - Review.

   a. Routing.

   b. Initial altitude.

2. Departure procedure - Review.

   a. SID.

   b. Noise abatement procedure.

   c. VFR departure route.

3. Copilot duties - Review.

   a. Adjust takeoff power.

   b. Monitor engine instruments.

   c. Ensure autofeather lights illuminated.

   d. Call V_1, ROTATE.

   e. Call out engine malfunctions.

   f. Tune/identify all nav/comm radios.

   g. Make all radio calls.

   h. Adjust transponder and radar as required.

   i. Complete flight log during flight. Note altitudes and headings. Note departure time.

4. PPC - Review.

   a. Takeoff power.

   b. V_1.

   c. V_r.

   d. V_2.

   e. V_{yse}.

   f. V_{enr}.

★ 8-57. ARRIVAL BRIEFING.

The following is a guide that should be used as applicable in accomplishing the required crew briefing prior to landing. However, if the crew has operated together previously (thru-flight) and the pilot is certain that the copilot understands all items of the briefing, he may omit the briefing by stating “standard briefing,” when the briefing is called for during the DESCENT-ARRIVAL CHECK.

1. Weather/altimeter setting.

2. Airfield/facilities - Review.

   a. Field elevation.

   b. Runway length.

   c. Runway condition.

3. Approach procedure - Review.

   a. Approach plan/profile.

   b. Altitude restrictions.

   c. Missed approach.

      (1) Point.

      (2) Time.

      (3) Intentions.

   d. Decision height or MDA.

   e. Lost communications.

4. Backup approach/frequencies.

5. Copilot duties - Review.

   a. Nav/comm set-up.

   b. Monitor altitude and airspeeds.

   c. Monitor approach.

   d. Call out visual/field in sight.

6. Landing performance data - Review.

   a. Approach speed.

   b. Runway required.

CHAPTER 9
EMERGENCY PROCEDURES

Section I. AIRCRAFT SYSTEMS

9-1. AIRCRAFT SYSTEMS.
This section describes the aircraft systems emergencies that may reasonably be expected to occur and presents the procedures to be followed. Emergency procedures are given in checklist form when applicable. A condensed version of these procedures is contained in the Operator's and Crewmember's Checklist, TM 55-1510-222-CL. Emergency operations of avionics equipment are covered when appropriate in Chapter 3, Avionics, and are repeated in this section only if safety of flight is affected.

9-2. IMMEDIATE ACTION EMERGENCY CHECKS.
Immediate action emergency items are underlined for your reference and shall be committed to memory.

NOTE

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

9-3. DEFINITION OF LANDING TERMS.
The term LAND AS SOON AS POSSIBLE is defined as executing a landing at the nearest suitable landing area without delay. The term LAND AS SOON AS PRACTICABLE is defined as executing a landing at the nearest suitable airfield.

9-4. EMERGENCY EXITS AND EQUIPMENT.
Emergency exits and equipment are shown in figure 9-1.

9-5. EMERGENCY ENTRANCE.
Entry may be made through the cabin emergency hatch. The hatch may be released by pulling on its flush-mounted, pull-out handle, placarded EMERGENCY EXIT PULL HANDLE TO RELEASE. The hatch is of the nonhinged, plug type, which removes completely from the frame when the latches are released. After the latches are released, the hatch may be pushed in.

9-6. ENGINE MALFUNCTION.
a. Flight Characteristics Under Partial Power Conditions. There are no unusual flight characteristics during single engine operation as long as airspeed is maintained at or above minimum control speed (V_{mca}). The capability of the aircraft to climb or maintain level flight depends on configuration, gross weight, altitude, and free air temperature. Performance and aircraft control will improve by feathering the propeller of the inoperative engine, retracting the landing gear and flaps, and establishing the single engine best rate-of-climb speed (V_{yse}).

b. *Engine Malfunction Prior To Or At V, (Abort).* If an engine should fail, or the crew determine that an abort is warranted prior to the aircraft achieving V,, utilize the following procedures:

1. Power levers GROUND FINE.
2. Braking As required.
3. Reverse thrust As required. If insufficient runway remains for stopping, perform the following.
4. Condition levers FUEL CUTOFF.
5. Fire pull handles Pull.
6. Master switch OFF.

With the operative engine in Ground Fine, heavy! braking on the side of that engine will be required to maintain directional control. Single engine reversing should be used only with extreme caution.

c. Engine Failure After V1. If engine failure occurs after V,, continue the takeoff. Directional control can readily be maintained with rudder. Do not retard the throttle of the inoperative engine, until the propeller has stopped rotating. To do so will deactivate the autofeather system, and the propeller may not feather. As the copilot calls "rotate", smoothly raise the nose of the aircraft to an indicated pitch attitude of 10°. After takeoff, verify two, positive climb indications, and raise the landing gear.

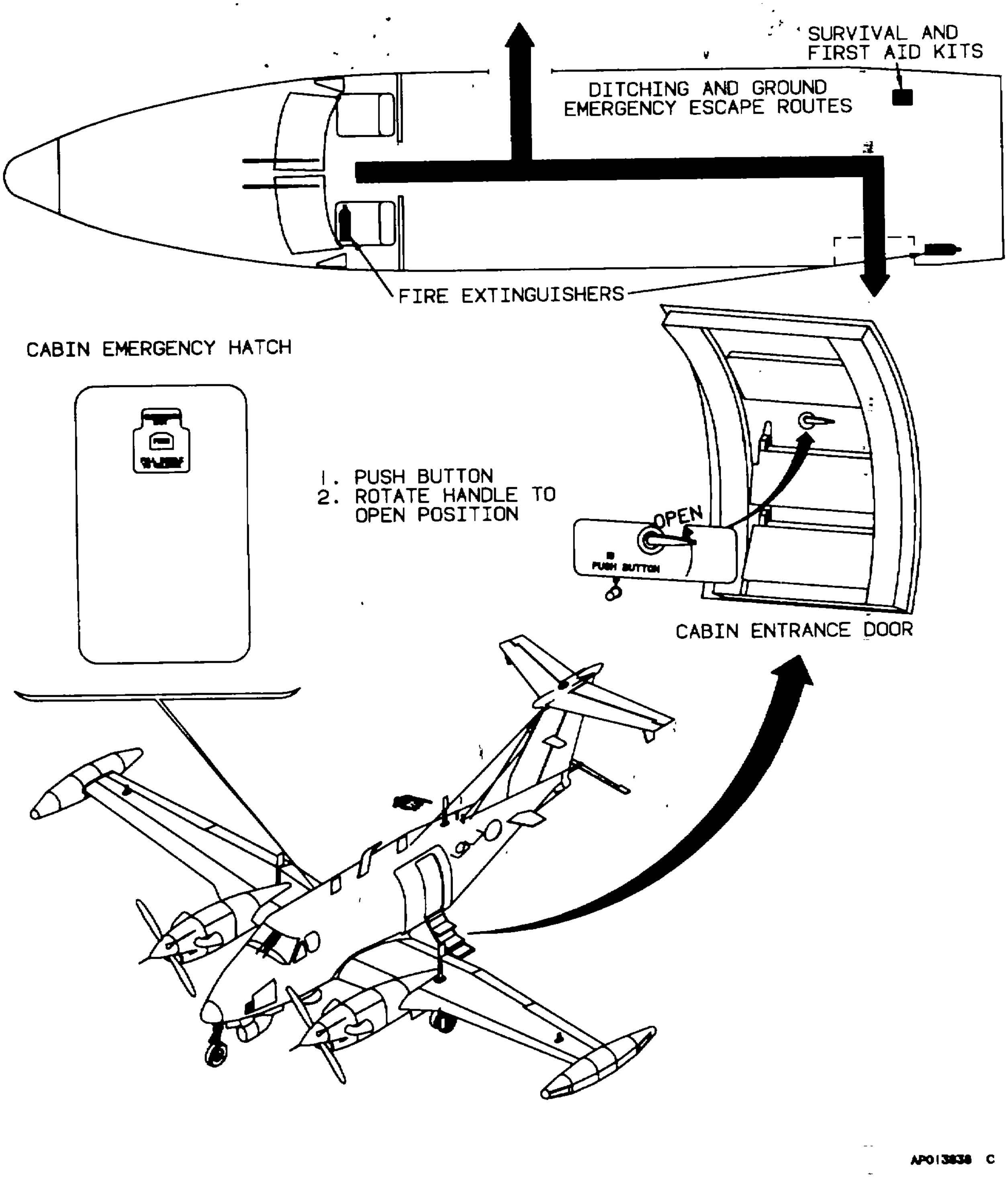

Figure 9-1. Emergency Exits and Equipment

Continue the climb at V2. Do not retract the flaps if they are set to 14° for takeoff. Level the aircraft at an altitude of 500 feet above the airport field elevation. Accelerate to V_{enr}, then raise the flaps, if extended. After flap retraction is complete, reduce power on the operating engine to maximum continuous and continue the climb at $V_{enr.}$

Field performance data, as obtained from Chapter 7 is predicated on no power adjustments from the point of brake release, to the power reduction at 500 feet. The Static Power Setting Chart in Chapter 7 permits a power setting that allows for normal torque increase during the takeoff roll and the ensueing climb. The static power is determined so that at some point during the climb to 500 feet, the torque or TGT will reach red line. (The TGT limit will only be reached on a minimum performance engine. A better than minimum engine will exhibit a positive TGT margin under these conditions.) Setting of a static power greater than that presented in Chapter 7 will result in an engine limit being exceeded prior to the aircraft reaching 500 feet, necessitating an unscheduled power adjustment. Setting of a static power less than that presented in Chapter 7 will result in insufficient power available and failure of the aircraft to attain scheduled performance.

1. Power Maximum allowable.
2. Gear UP (two positive climb indications).
3. Propeller Verify feathered.
4. Flaps UP after V_{enr} (121 KIAS).
5. Landing lights OFF.
6. Engine cleanup Perform.
7. Land as soon as practicable.

NOTE

Holding 5 degrees of bank towards the operating engine will assist in maintaining directional control and will improve aircraft performance.

d. Engine Malfunction During Flight. If an engine malfunctions during flight, perform the following:

1. Autopilot/Yaw Damp Disengage.
2. Power As required.
3. Dead engine Identify.
4. Power lever (dead engine) IDLE.
5. Propeller lever (dead engine) FEATHER.
6. Condition lever (dead engine) FUEL CUTOFF.
7. Gear As required.
8. Flaps As required.
9. Engine Cleanup Perform.
10. Power Set for Single Engine Cruise.
11. Land as soon as practicable.

e. *Engine Malfunction During Final Approach.* If an engine malfunctions during final approach (after LANDING CHECK) the propeller should not be manually feathered unless time and altitude permit or conditions require it. Continue approach using the following procedure:

1. Power As required.
2. Gear DN.

f. *Engine Malfunction (Second Engine).* If the second engine fails, do not feather the propeller if an engine restart is to be attempted. Engine restart without starter assist cannot be accomplished with a feathered propeller, and the propeller will not unfeather without the engine operating. 121 KIAS is recommended as the best all around glide speed (considering engine restart, distance covered, transition to landing configuration, etc.), although it does not necessarily result in the minimum rate of descent. Perform the following procedure if the second engine fails during cruise flight.

1. Airspeed 121 KIAS.
2. Power lever IDLE.
3. Propeller lever Do not FEATHER.
4. Conduct engine restart procedure.

9-7. ENGINE SHUTDOWN IN FLIGHT.

If it becomes necessary to shut an engine down during flight, perform the following:

1. Power lever IDLE.
2. Propeller lever FEATHER.
3. Condition lever FUEL CUTOFF.
4. Engine cleanup Perform.

9-8. ENGINE CLEANUP.

The cleanup procedure to be used after engine malfunction, shutdown, or an unsuccessful restart is as follows:

1. Condition lever FUEL CUTOFF.
2. Engine auto ignition switch Off.
3. Autofeather switch OFF.
4. Generator switch OFF.
5. Propeller synchronizer switch OFF.
6. Brake deice Off.

9-9. ENGINE RESTART DURING FLIGHT (USING STARTER).

Engine restarts should only be attempted below 25,000 feet. If a restart is attempted, perform the following:

CAUTION

- **The pilot should determine the reason for engine failure before attempting an airstart. Do not attempt an airstart if N, indicates zero.**
- **Do not attempt engine airstarts above 25,000 feet. During engine acceleration to idle speed, it may become necessary to move the condition lever into FUEL CUTOFF in order to avoid an overtemperature condition.**
-

1. Cabin air mode switch OFF; Blower AUTO.
2. Radar STANDBY or OFF.
3. Power lever IDLE.
4. Propeller lever LOW RPM.
5. Condition lever FUEL CUTOFF.
6. Fire pull handle Push in (to extinguish annunciator).

NOTE

- **If conditions permit, retard operative engine TGT to 700°C or less to reduce the possibility of exceeding TGT limit. Reduce electrical load to minimum consistent with flight conditions.**
- **False fuel flow indications may be observed with the starter engaged and the condition lever in cutoff.**
-

7. Ignition and start switch START IGNITION, check IGNITION annunciator Illuminated.
8. Condition lever LOW IDLE.
9. Ignition and start switch OFF after TGT peaks.
10. Condition lever HIGH IDLE.
11. Propeller lever As required.
12. Power lever As required.
13. Generator RESET, then ON.
14. Engine auto ignition As required.
15. Propeller synchronizer switch As required.
16. Electrical equipment As required.

9-10. ENGINE RESTART DURING FLIGHT (NO STARTER ASSIST).

CAUTION

- **The pilot should determine the reason for engine failure before attempting an airstart. Do not attempt an airstart if N, indicates zero.**
- **Do not attempt engine airstarts above 25,000 ft. As engine accelerates to idle speed, it may become necessary to move the condition lever into FUEL CUTTOFF in order to avoid an overtemperature condition.**

1. Power lever IDLE.
2. Propeller lever HIGH RPM.
3. Condition lever FUEL CUTOFF.
4. Fire pull handle Push (PUSH TO EXTINGUISH annunciator extinguished).
5. Engine anti-ice Off.
6. Generator (inoperative engine) OFF.
7. Airspeed As required (140 knots propeller windmilling, 190 knots propeller feathered).
8. Altitude Below 25,000 feet.
9. Engine N. Monitor (10% minimum, propeller feathered).

NOTE

N, may be increased by increasing air-speed.

10. Auto ignition ARM.

11. Condition lever LOW IDLE.
12. Power As required (after TGT peaks)
13. Generator RESET, then ON.
14. Propeller synchrophaser As required.
15. Electrical equipment As required.
16. Condition lever HIGH IDLE.

9-11. MAXIMUM GLIDE.
In the event of failure of both engines, maximum gliding distance is obtained by feathering both propellers to reduce propeller drag and by maintaining the appropriate airspeed with the gear and flaps up. Figure 9-2 gives the approximate gliding distances in relation to altitude. The procedures to follow in the event of failure of both engines is as follows:

1. Landing gear UP.
2. Wing flaps UP.

WARNING

Determine that procedures for restarting first and second failed engines are ineffective before feathering second engine propeller.

3. Propellers FEATHERED.
4. Airspeed As required (fig. 9-2).

9-12. SINGLE ENGINE DESCENT/ARRIVAL.
Perform the following procedure prior to the final descent for landing:

1. Cabin controller Set.
2. Ice & rain switches As required.
3. Exterior lights On.
4. Radio altimeter As required.
5. Altimeters Set to current altimeter setting.
6. Flare/chaff dispenser arm-safe switch SAFE.
7. Flare/chaff dispenser safety pin (electronic-module) Insert.
8. Arrival briefing Complete.

NOTE

When landing with one engine inoperative, maintain airspeed at a minimum of V_{yse} until landing is assured. A go-around after flaps are fully extended may not be possible.

9-13. SINGLE ENGINE BEFORE LANDING.

1. Propeller lever HIGH RPM.
2. Flaps APPROACH.
3. Gear DN.
4. Landing lights As required.
5. Yaw damp Off.
6. Brake deice Off.

9-14. SINGLE ENGINE LANDING CHECK.
Perform the following procedure during final approach to runway.

1. Autopilot/yaw damp Disengaged.
2. Gear down lights Check.
3. Propeller lever (operative engine) HIGH RPM.

NOTE

To ensure constant reversing characteristics, the propeller control must be in the HIGH RPM position.

9-15. SINGLE ENGINE GO-AROUND.

1. Power Maximum allowable.
2. Landing gear UP.
3. Flaps -UP.
4. Airspeed Vyse.
5. Landing lights OFF.

9-16. TWO ENGINES INOPERATIVE/OFF AIRFIELD LANDING.

NOTE

- **With propellers feathered, there is less drag and the aircraft will have a tendency to overshoot the planned touchdown point.**
- **When landing on rough terrain or unprepared surfaces, the landing gear will absorb landing energy during touchdown, if extended.**
-

Select landing gear up or down as best suits the

MAXIMUM GLIDE DISTANCE

STANDARD DAY (ISA)

ASSOCIATED CONDITIONS:

POWER .... BOTH ENGINES INOPERATIVE
PROPELLERS .... FEATHERED
LANDING GEAR ..... UP
FLAPS .... UP (0%)
AIRSPEED .... IAS AS TABULATED
WIND .... ZERO KNOTS

EXAMPLE:

HEIGHT ABOVE TERRAIN .... 12,000 FT
WEIGHT .... 13,500 LBS

MAXIMUM GLIDE DISTANCE ..... 23.3 NM
GLIDE SPEED .... 111 KTS

WEIGHT ~ POUNDS	BEST GLIDE SPEED ~ KNOTS
16,000	121
15,000	117
14,000	113
13,000	109
12,000	100

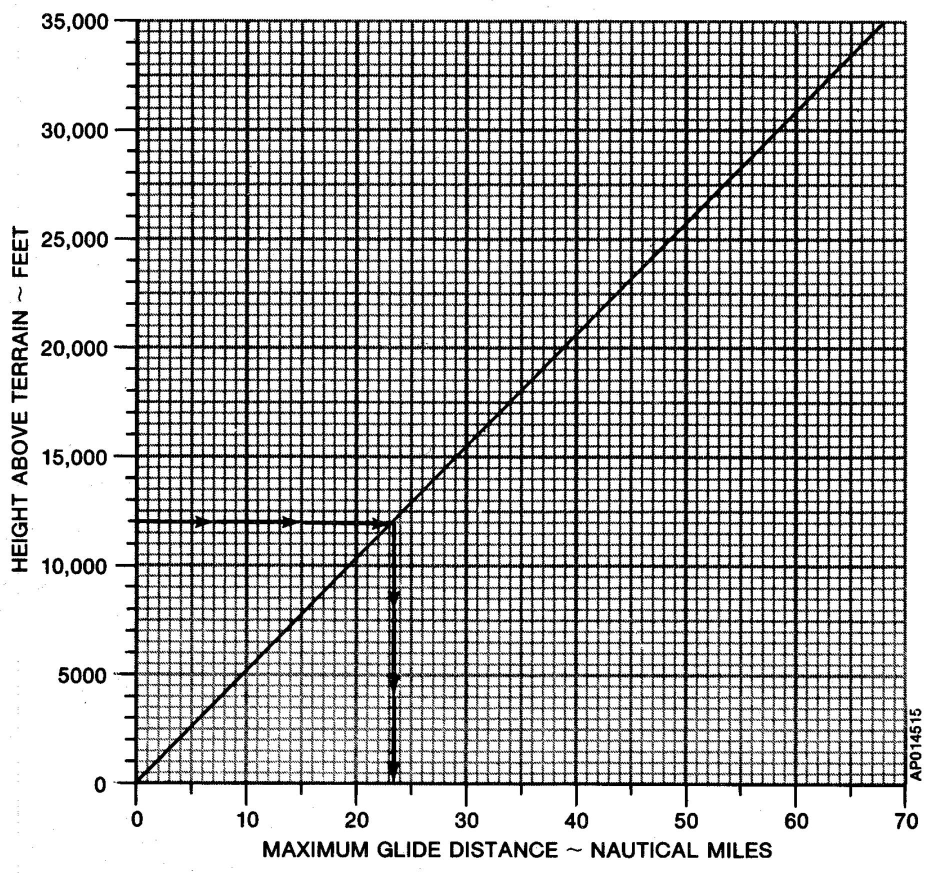

Figure 9-2. Maximum Glide Distance

conditions of the landing site. If gear-up, follow gear-up landing procedure. If gear-down, make a normal touchdown and use brakes as required.

9-17. LOW OIL PRESSURE.

In the event of a low oil pressure indication, perform procedures as applicable:

1. Oil pressure below 90 PSI and above 60 PSI: Torque As required (59% maximum).
2. Oil pressure below 60 PSI: Perform engine shutdown, or land as soon as practicable using minimum power to ensure safe arrival.

9-18. CHIP DETECTOR WARNING ANNUNCIATOR ILLUMINATED.

If the L CHIP DET or R CHIP DET warning annunciator illuminates, and safe single engine flight can be maintained.

1. Perform engine shutdown.
2. Land as soon as practicable.

9-19. DUCT OVERTEMPERATURE CAUTION ANNUNCIATOR ILLUMINATED.

Ensure the cabin floor outlets are open and unobstructed, then perform the following steps in sequence until the annunciator is extinguished. Allow approximately 30 seconds after each adjustment for the system temperature to stabilize. The overtemperature condition is considered corrected at any point during the procedure that the annunciator extinguishes.

1. Cabin air control In.
2. Cabin air mode switch AUTO.
3. Cabin temperature switch Decrease.
4. Vent blower switch HIGH.
5. Cabin air mode switch MAN COOL.
6. Manual temperature switch DECREASE (hold).
7. Left bleed air valve switch PNEU ONLY.
8. Light still illuminated after 30 seconds: Left bleed air valve switch ON.
9. Right bleed air valve switch PNEU ONLY. Light still illuminated after 30 seconds: Right bleed air valve switch ON.

NOTE

If the overtemperature annunciator has not extinguished after completing the above procedure, the warning system has malfunctioned.

9-20. ENGINE ANTI-ICE FAILURE.

Ice vane failure is indicated by VANE FAIL caution annunciator illumination. If the ice vanes fail to operate, perform the following:

1. Ice vane power select switch STBY.
2. Ice vane fail annunciator Check extinguished.

9-21. ENGINE BLEED AIR SYSTEM MALFUNCTION.

a. *Bleed Air Failure Annunciator Illuminated.* Steady illumination of the warning annunciator in flight indicates a possible ruptured bleed air line aft of the engine firewall. The annunciator will remain illuminated for the remainder of flight. Perform the following:

NOTE

BLEED AIR FAIL annunciators may momentarily illuminate during simultaneous surface deice and brake deice operation at low N. speed.

1. Brake deice switch Off.
2. TGT and torque Monitor (note readings).
3. Bleed air valve switch Off.

NOTE

Brake deice on the affected side will not be available with bleed air valve switch off.

4. Cabin pressurization Check.

b. Excessive Differential Pressure. If cabin differential pressure exceeds 6.5 PSI, perform the following:

1. Cabin altitude and rate-of-climb controller Select higher setting.

If condition persists:

2. Left bleed air valve switch PNEU ONLY (annunciator illuminated).

If condition still persists:

3. Right bleed air valve switch PNEU ONLY (annunciator illuminated).

If condition still persists:

4. Descend immediately. If unable to descend:
5. Oxygen masks On and 100%.
6. Cabin pressure switch DUMP.
7. Bleed air valve switches ON, if cabin heating is required.

9-22. LOSS OF PRESSURIZATION (ABOVE 10,000 FEET).

If cabin pressurization is lost when operating above 10,000 feet or the ALTITUDE warning annunciator illuminates, perform the following:

1. Crew oxygen masks On and 100%.
2. Descend as required.

9-23. CABIN DOOR CAUTION ANNUNCIATOR ILLUMINATED.

Remain clear of cabin door and perform the following:

1. Bleed air valve switches PNEU ONLY.
2. Descend below 14,000 feet as soon as practicable.
3. Oxygen As required.

9-24. PROPELLER FAILURE (OVER 1802 RPM).

If an overspeed condition occurs that cannot be controlled with the propeller lever, or by reducing power, perform the following:.

1. Power lever (affected engine) IDLE.
2. Propeller lever FEATHER.
3. Condition lever As required.
4. Engine cleanup As required.

9-25. FIRE.

a. *Engine Fire*. The following procedures shall be taken in the event of engine fire.

(1) Engine/Nacelle Fire During Start or Ground Operations. If engine/nacelle fire is identified during start or ground operation, perform the following:

1. Condition levers FUEL CUTOFF.
2. Propeller levers FEATHER.
3. Fire pull handle Pull.

CAUTION

If fire extinguisher has been used to extinguish an engine fire, do not attempt to restart, until maintenance personnel have inspected the aircraft and released it for flight.

4. Push to extinguish switch Push.
5. Master switch OFF.

(2) Engine Fire In Flight (fire pull handle light illuminated). If an engine fire is suspected in flight, perform the following:

1. Power lever IDLE.
2. If fire pull handle light is extinguished: Advance power.
3. If fire pull handle light is still illuminated: Engine fire in flight procedures (identified) Perform.

(3) Engine Fire In Flight (Identified). If an engine fire occurs in flight, perform the following:

CAUTION

Due to the possibilities of fire warning malfunctions, the fire should be visually identified before the engine is secured and the extinguisher actuated.

1. Power lever IDLE.
2. Propeller lever FEATHER.
3. Condition lever FUEL CUTOFF.
4. Fire pull handle Pull.
5. Fire extinguisher Actuate as required.
6. Engine cleanup Perform.

b. *Fuselage Fire*. If a fuselage fire occurs, perform the following:

1. Fight the fire.
2. Land as soon as possible if fire continues.

c. *Wing Fire*. There is; little that can be done to control a wing fire except to shut off fuel and electrical systems that may be contributing to the fire, or which could aggravate it. Diving and slipping the aircraft away from the burning wing may help. If a wing fire occurs, perform the following:

1. Perform engine shutdown on affected side.
2. Land as soon as possible.

d. *Electrical Fire*. Upon noting the existence or indications of an electrical fire, turn off all affected electrical circuits, if known. If electrical fire source is unknown, perform the following:

1. Crew oxygen - On and 100%.
2. Master switch - OFF (visual conditions only).
3. All nonessential electrical equipment - Off.

NOTE

With loss of DC electrical power, the air- craft will depressurize. All electrical instruments, with the exception of the propeller RPM, N. RPM, and TGT gages will be inoperative.

4. Battery switch - ON.
5. Generator switches (individually) - RESET, then ON.
6. Circuit breakers - Check for indication of defective circuit.

CAUTION

As each electrical switch is returned to ON, note loadmeter reading and check for evidence of fire.

7. Essential electrical equipment - On (individually until fire source is isolated).
8. Land as soon as practicable.

e. *Smoke and Fume Elimination.* To eliminate smoke and fumes from the aircraft, perform the following:

1. Crew oxygen - On and 100%.
2. Bleed air valve switches - PNEU ONLY.
3. FWD Vent blower switch - AUTO.
4. AFT vent blower switch - Off.
5. Cabin temperature mode selector switch - OFF.
6. If smoke and fumes are not eliminated:

Cabin pressure dump switch - CABIN PRESS DUMP.

NOTE

Opening storm window (after depressurizing) will facilitate smoke and fume removal.

7. Engine instruments - Monitor.

9-26. FUEL SYSTEM.

a. *Fuel Pressure Warning Annunciator Illuminated*. Illumination of the #1 or #2 FUEL PRESS warning annunciator usually indicates failure of the respective engine-driven boost pump. Perform the following:

1. Standby pump switch - ON.
2. Fuel pressure annunciator extinguished - Check.
3. Fuel pressure annunciator still illuminated - Record unboosted time.
4. Monitor system for further abnormal indications.

b. No Fuel Transfer Caution Annunciator Illuminated. Illumination of a #1 or #2 NO FUEL XFR annunciator with fuel remaining in the respective auxiliary fuel tank indicates a failure of that automatic fuel transfer system. Proceed as follows:

1. Auxiliary transfer switch (affected side) - OVRD.
2. Auxiliary fuel quantity - Monitor.
3. Auxiliary transfer switch (after respective auxiliary fuel has completely transferred) -AUTO.

c. *Nacelle Fuel Leak*. If nacelle fuel leaks are evident, perform the following:

1. Perform engine shutdown.
2. Fire pull handle - Pull.
3. Land as soon as practicable.

d. *Fuel Crossfeed.* For fuel crossfeed, perform the following:

1. Auxiliary transfer switches - AUTO.

NOTE

With the fire pull handle pulled, the fuel

in the auxiliary tank for that side will not be available (usable) for crossfeed.

2. Standby pumps - Off.

3. Crossfeed switch - As required.

4. Fuel crossfeed annunciator illuminated - Check.

NOTE

With the fire pull handle pulled, the FUEL PRESS annunciator will remain illuminated on the side supplying fuel.

5. Fuel pressure annunciator extinguished - Check.

6. Fuel quantity - Monitor.

e. NAC LOW Annunciator Illuminated. Illumination of the #1 or #2 NAC LOW caution annunciator indicates that the affected tank has approximately 30 minutes of usable fuel remaining at sea level, at normal cruise power consumption rate. Proceed as follows:

WARNING

Failure of the fuel tank venting systems will prevent the fuel in the wing tanks from gravity feeding into the nacelle tank. Fuel vent system failure may be indicated by illumination of the # 1 or #2 NAC LOW caution light with greater than 30 minutes of usable fuel indicated in the main tank fuel system. The total usable fuel remaining in the main fuel supply system with the low fuel caution light illuminated may be as little as 140 pounds, regardless of the total fuel quantity indicated. Continued flight may result in engine flameout due to fuel starvation.

1. Land as soon as practicable.

9-27. ELECTRICAL SYSTEM EMERGENCIES.

a. *DC GEN Annunciator Illuminated*. When a DC GEN annunciator illuminates, perform the following:

1. Generator switch - OFF, RESET, then ON.

2. Generator switch (no reset) - OFF.

3. Mission control switch - ORIDE.

4. Operating loadmeter - 100% maximum.

b. *Both DC Generator Lights Illuminated (reset failed).*

1. All nonessential equipment - Off.

2. Land as soon as practicable.

c. *Excessive Loadmeter Indication (over 100%).* If either loadmeter indicates over 100%, perform the following:

1. Battery switch - OFF (monitor loadmeter).

2. Loadmeter over 100% - Nonessential electrical equipment off.

3. Loadmeter under 100% - Battery switch ON.

d. *Inverter Annunciator Illuminated*. When either # or #2 INVERTER. annunciator illuminates, perform the following:

1. Affected inverter switch - Off.

e. *Instrument AC Annunciator Illuminated*. Illumination of the INST AC warning annunciator indicates that both 26 VAC transformer circuits are inoperative. The primary power indicating instruments, torque and fuel flow, will be inoperative. Under these conditions, power must be controlled by indications of the N. and TGT gages. Perform the following:

1. N. and TGT indications - Check.

2. Other engine instruments - Monitor.

f. *Circuit Breaker Tripped*. If a circuit breaker trips, perform the following:

1. Bus feeder breaker tripped - Do not reset.

NOTE

Circuit breakers should not be reset more than once until the cause of circuit malfunction has been determined and corrected.

2. Nonessential circuit - Do not reset.

3. Essential circuit - Reset once.

g. *Battery Charge Annunciator illuminated.* If the BATTERY CHARGE caution annunciator illuminates during normal cruise flight, perform the following:

1. Battery ammeter - Check, note indication, and monitor for increasing load. If load

continues to increase, turn battery switch OFF.

2. Battery switch OFF.

NOTE

The battery may be turned back ON only for gear and flap extension and approach to landing. Battery may be usable after a 15 20 minute cool down period.

3. Battery switch (landing gear/flap extension only) ON.

h. *Avionics Master Power Switch Failure*. If the Avionics Master Power Switch fails to operate in the ON position, perform the following:

4. AVIONICS MASTER CONTR circuit breaker-Pull.

NOTE

The avionics power relay is normally hot. Pulling the AVIONICS MASTER CONTR circuit breaker will remove power to the relay, thus allowing electrical power to the associated busses.

9-28. EMERGENCY DESCENT.

The following procedure assumes the structural integrity of the aircraft and smooth flight conditions. If structural integrity is in doubt, limit speed as much as possible, reduce rate of descent if necessary, and avoid high maneuvering loads. For emergency descent, perform the following:

1. Power levers IDLE.
2. Propeller levers HIGH RPM.
3. Flaps APPROACH.
4. Gear DN.
5. Airspeed 178 KIAS maximum.

NOTE

Windshield defogging may be required.

9-29. FLIGHT CONTROLS MALFUNCTION.

Use the following procedures, as applicable, for flight control malfunctions.

a. *Autopilot/Yaw Damp Emergency Disconnection*. The autopilot can be disengaged by any of the following methods:

1. Pressing the DISC TRIM AP YD disconnect switch (control wheels).
2. Pressing the AP ENGAGE pushbutton on the autopilot mode selector control panel.
3. Pressing the go-around switch (left power lever), (yaw damper will remain on).
4. Pulling the AP CONTR and AFCS DIRECT circuit breakers (overhead control panel).
5. Setting AVIONICS MASTER POWER switch (overhead control panel) to the off position.
6. Setting aircraft MASTER switch (overhead control panel) to the OFF position.

b. *Unscheduled Rudder Boost Activation*. Rudder boost operation without a large variation of power between engines indicates a failure of the system. Perform the following:

1. Control wheel disconnect switch Disconnect and hold (hold to first level).
2. Rudder boost control switch OFF.
3. Rudder boost circuit breaker Pull (Provided that rudder boost does not deactivate).
4. Control wheel disconnect Release.
5. Yaw damper Reengage.

c. *Unscheduled Electric Trim.* In the event of unscheduled electric elevator trim, perform the following:

1. Electric trim switch OFF.
2. Elevator trim circuit breaker Pull.

9-30. LANDING EMERGENCIES.

WARNING

Structural damage may exist after landing with brake, tire, or landing gear malfunctions. Under no circumstances shall an attempt be made to inspect the aircraft until jacks have been installed.

a. *Landing Gear Unsafe Indication*.

1. Landing gear control switch Check DN.
2. Landing gear control and gear indicator circuit breakers Check in.

3. Gear down lights illuminated - Check. IF INDICATOR REMAINS UNSAFE:

4. Landing gear emergency extension - Perform.

WARNING

If for any reason the green GEAR DOWN lights do not illuminate (e.g., in case of an electrical system failure), continue pumping until sufficient resistance is felt to ensure that the gear is down and locked. The landing gear cannot be manually retracted in flight.

b. *Landing Gear Emergency Extension*.

1. Airspeed - Below 178 KIAS.
2. LANDING GEAR CONTROL circuit breaker - Pull.
3. Landing gear control switch - DN.
4. Alternate extension lever - Unstow.
5. Alternate extension lever - Pump until the three green gear down annunciators illuminate.
6. Alternate extension lever - Stow (secure in clip).

c. *Gear-up Landing*.

1. Crew emergency briefing - Completed.
2. Loose equipment - Stowed.
3. Bleed air valves - PNEU ONLY.
4. Cabin pressure switch - DUMP.
5. Cabin emergency hatch - Remove and stow.
6. Seat belt and harnesses - Secured.
7. Alternate landing gear extension handle - Stowed.
8. LANDING GEAR CONTROL circuit breaker - In.
9. Gear - UP.
10. Nonessential electrical equipment - Off.
11. Flaps - As required (DOWN for landing).

NOTE

- **Fly a normal approach to touchdown. Avoid touching down in a nose-high attitude.**
- **Brakes may be used for reducing landing roll and for directional control.**

12. Power levers (runway assured) - IDLE.
13. Propeller levers - FEATHER.
14. Condition levers - FUEL CUTOFF.
15. Fire handles - Pull.
16. Master switch - OFF.

9-31. CRACKED WINDSHIELD.

a. Internal Crack. If an internal crack occurs, perform the following:

1. Descend - Below 20,000 feet
2. Cabin pressure - Reset pressure differential to 4 PSI or less within 10 minutes.

9-32. CRACKED CABIN WINDOW.

If crack(s) in a cabin window ply(s) occur, perform the following:

1. Crew oxygen masks - On and 100% (if above 10,000 feet).
2. Cabin pressure - Depressurize.
3. Land as soon as possible. If both plys of a cabin window have developed cracks the air- craft shall not be flown, once landed, without proper ferry flight authorization.

9-33. DITCHING.

Landing should be made with full flaps and landing gear retracted. Refer to Table 9-1 for pilot, copilot and ferry chair occupant actions. Refer to figure 9-3 for body positions during ditching. Figure 9-4 shows sea swell information. Refer to FM 20-151 for techniques to be used during ditching.

WARNING

Do not unstrap from the seat until all motion stops. The possibility of injury and disorientation requires that evacuation not be attempted until the aircraft comes to a complete stop.

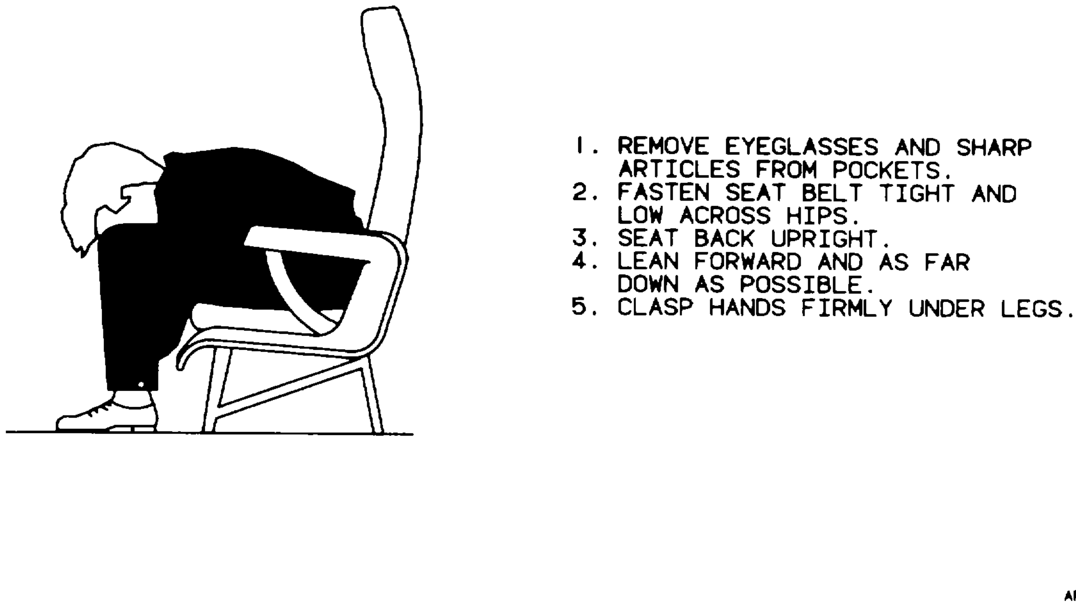

Figure 9-3. Ferry Chair Occupant Emergency Body Positions

1. Radio calls/transponder - As required.
2. Crew emergency briefing - As required.
3. Bleed air valves - PNEU ONLY.
4. Cabin pressure switch - DUMP.
5. Cabin emergency hatch - Remove and stow.
6. Seat belts and harnesses - Secured.
7. Gear - UP.
8. Flaps - DN.
9. Nonessential electrical equipment - Off.
10. Approach - Normal, power on.
11. Emergency lights - As required.

9-34. BAILOUT.

When the decision has been made to abandon the aircraft in flight, the pilot will give the warning signal. Exit from the aircraft will be through the main entrance door, and in the departure sequence using the exit routes as indicated in figure 9-1. Proceed as follows if bailout becomes necessary:

1. Notify crew to prepare to bail out.
2. Distress message - Transmit.
3. Voice security - ZEROIZE.
4. Transpond7 - 7700.
5. Mode 4 - ZEROIZE.
6. GPS - ZEROIZE.
7. Flaps - DN.
8. Airspeed - 110 KIAS.
9. Trim - As required.
10. Autopilot - Engage.
11. Cabin pressure switch - DUMP.
12. Parachute - Attach to harness.
13. Cabin door - Open.
14. Abandon the aircraft.

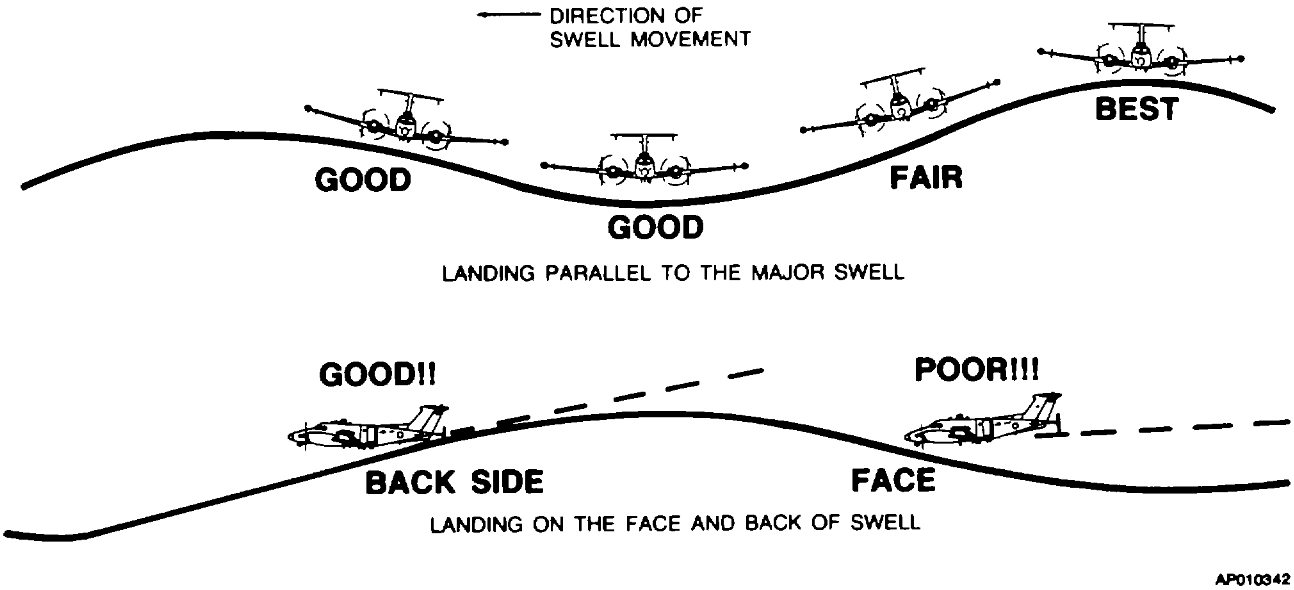

Figure 9-4. Wind Swell Ditch Heading Evaluation

Table 9-1. Ditching

PLANNED DITCHING	IMMEDIATE DITCHING
PILOT	PILOT
A. ALERT OCCUPANTS B. ORDER TO PREPARE SURVIVAL GEAR FOR AERIAL DROP C. TRANSMIT DISTRESS MESSAGE D. LIFE VEST - CHECK (DO NOT INFLATE) E. DISCHARGE MARKER DITCHING F. LAND AND DITCH AIRCRAFT G. ABANDON AIRCRAFT THROUGH CABIN EMERGENCY HATCH	A. WARN OCCUPANTS B. TRANSMIT DISTRESS MESSAGE C. LIFE VEST- CHECK (DO NOT INFLATE) D. APPROACH - NORMAL E. NOTIFY OCCUPANTS TO BRACE FOR F. LAND AND DITCH AIRCRAFT G. ABANDON AIRCRAFT AFTER COPILOT
COPILOT	COPILOT
A. REMOVE CABIN EMERGENCY HATCH B. LIFE VEST - CHECK (DO NOT INFLATE) C. ABANDON AIRCRAFT (TAKE LIFE RAFT AND FIRST AID KIT)	A. REMOVE CABIN EMERGENCY HATCH B. LIFE VEST - CHECK (DO NOT INFLATE) C. BANDON AIRCRAFT (TAKE LIFE RAFT AND FIRST AID KIT)
FERRY CHAIR OCCUPANT	FERRY CHAIR OCCUPANT
A. SEAT BELTS - FASTEN B. LIFE VEST - CHECK (DO NOT INFLATE) C. ON PILOT'S SIGNAL - BRACE FOR DITCHING D. ABANDON AIRCRAFT THROUGH CABIN DOOR (TAKE LIFE RAFT AND FIRST AID KIT KIT)	A. SEAT BELTS - FASTEN B. LIFE VEST - CHECK (DO NOT INFLATE) C. ON PILOT'S SIGNAL - BRACE FOR DITCHING D. ABANDON AIRCRAFT THROUGH CABIN DOOR (TAKE LIFE FIAFT AND FIRST AID

APPENDIX A
REFERENCES

Reference information for the subject material contained in this manual can be found in the following publications.

AR 95-1	Army Aviation - General Provisions and Flight Regulations
AR 95-16	Weight and Balance - Army Aircraft
AR 385-40	Accident Reporting and Records
AR 70-50	Design and Name of Military Aircraft
DA PAM 738-751	Functional User's Manual for the Army Maintenance Management System-Aviation - (TAMMS-A)
TM 55-1500-314-25	Handling, Storage, and Disposal of Army Aircraft Components Containing Radioactive Materials
TM 55-1500-342-23	Army Aviation Maintenance Manual - Weight and Balance
TB MED 501	Noise and Conservation of Hearing Radar Warning System, AN/APR-44(V)1
TM 55-410	Aircraft Maintenance, Servicing and Ground Handling Under Extreme Environmental Conditions
TM 55-1500-204-25/1	General Aircraft Maintenance Manual
TM 750-244-1-5	Procedures for the Destruction of Aircraft and Associated Equipment to Prevent Enemy Use
AR 380-40	Safeguarding COMSEC Information
AR 700-26	Aircraft Designation System
FAR Part 91	General Operating and Flight Rules
FM 1-5	Instrument Flying and Navigation for Army Aviators
FM 1-30	Meteorology for Army Aviators
TB AVN 23-13	Anti-icing, Deicing and Defrosting Procedures for Parked Aircraft
TB 55-9150-200-24	Engine and Transmission Oils, Fuels and additives for Army Aircraft
TM 9-1095-206-13&P	Operator's Aviation Unit Maintenance and Aviation Intermediate Maintenance Manual (Including Repair Parts and Special Tools List) to Dispenser, General Purpose Aircraft: M-130
(C) TM 11-5825-	Operator, Organizational, DS, GS, and Depot Maintenance Manual: RC-12K Air-252-15 craft Mission Equipment, (V)
TM 11-5841-291-12	Operator and Organizational Maintenance Manual, Radar Warning System, AN/APR-44(V) 1
TM 11-5841-283-20	Organizational Maintenance Manual for Detection Set, Radar Signal AN/APR-39(V) 1

TM 11-6140-203-14-2	Operator's Organizational, Direct Support, General Support and Depot Maintenance Manual Including Repair Parts and Special Tools List: Aircraft Nickel-Cadmium Batteries
TM 11-6940-214-12	Operator and Organization Maintenance Manual, Simulator, Radar Signal, SM-756/ APR-44(V)
TM 55-1510-200-PM	Phased Maintenance Checklist
TM 55-1510-219-23	Aviation Unit and Aviation Intermediate

APPENDIX B
ABBREVIATIONS AND TERMS

For the purpose of this manual, the following abbreviations and terms apply. See appropriate technical manuals for additional terms and abbreviations.

AIRSPEED TERMINOLOGY.

CAS	Calibrated airspeed is indicated airspeed corrected for position and instrument error.
FT/MIN	Feet per minute.
GS	Ground speed, though not an airspeed, is directly calculable from true airspeed if the true wind speed and direction are known.
IAS	Indicated airspeed is the speed as shown on the airspeed indicator and assumes no error.
KT	Knots.
Mmo	Maximum operating Mach number.
TAS	True airspeed is calibrated airspeed corrected for temperature, pressure, and compressibility effects.
V_1	Takeoff decision speed (V, = VR)
V_2	Takeoff safety speed is the speed at 50 feet AGL (35 feet AGL with one engine inoperative)
V_a	Maneuvering speed is the maximum speed at which application of full available aerodynamic control will not overstress the aircraft.
V_f	Design flap speed is the highest speed permissible at which wing flaps may be actuated.
V_{fc}	Maximum flap extended speed is the highest speed permissible with wing flaps in a prescribed extended position.
V_{ic}	Maximum landing gear extended speed is the maximum speed at which an aircraft can be safely flown with the landing gear extended.
V_{lo}.	Maximum landing gear operating speed is the maximum speed at which the landing gear can be safely extended or retracted.
V_{lof}	Lift off speed (takeoff airspeed).
V_{mca}	The minimum flight speed at which the aircraft is directional controllable as deter- mined in accordance with Federal Aviation Regulations. Aircraft Certification conditions include one engine becoming inoperative and windmilling; a 5° bank towards the operative engine; takeoff power on operative engine; landing gear up; flaps up; and most rearward CG. This speed has been demonstrated to provide satisfactory control above power off stall speed (which varies with weight, configuration, and flight attitude).
V_{mo}	Maximum operating limit speed.
V_{nc}	Never exceed speed.

V_r	Rotation speed.
V_s	Power off stalling speed or the minimum steady flight speed atwhich the aircraft is controllable.
V_{so}	Stalling speed or the minimum steady flight speed in the landing configuration.
V_{ssc}	The safe one-engine inoperative speed selected to provide a reasonable margin against the occurrence of an unintentional stall when making intentional engine cuts.
V_x	Best angle of climb speed.
V_{xsc}	best single-engine angle of climb speed.
V_y	Best rate of climb speed.
V_{ysc}	The best single engine rate of climb speed.
V_{ref}	The indicated airspeed the aircraft should be at when 50 feet above the runway in landing configuration.
V_{enr}	One-engine-inoperative enroute climb speed.

METEOROLOGICAL TERMINOLOGY.

Altimeter Setting	Barometric pressure corrected to sea level.
°C	Degrees Celsius.
°F	Degrees Fahrenheit.
FAT	Free air temperature is the free air static temperature, obtained either from ground meteorological sources or from inflight temperature indications adjusted for compressibility effects.
Indicated Pressure Altitude	The number actually read from an altimeter when, the barometric scale (Kollsman window) has been set to 29.92 inches of mercury (1013 millibars).
ISA	International Standard Atmosphere in which: a. The air is a dry perfect gas: b. The temperature at sea level is 59 degrees Fahrenheit, 15 degrees Celsius; c. The pressure at sea level is 29.92 inches Hg; d. The temperature gradient from seal level to the altitude at which the temperature is -69.7 degrees Fahrenheit is -0.003566 Fahrenheit per foot and zero above that altitude.
Pressure Altitude (press alt)	Indicated pressure altitude corrected for altimeter error.
SL	Sea level.
Wind	The wind velocities recorded as variables on the charts of this manual are to be understood as the headwind or tailwind components of the actual winds at 50 feet above runway surface (tower winds).

POWER TERMINOLOGY.

Beta Range	The region of the power lever control which is aft of the idle stop and forward of reversing range where blade pitch angle can be changed without a change of gas generator RPM.
Cruise Climb	Is the maximum power approved for normal climb. This power is torque or temperature (ITT) limited.
High Idle	Obtained by placing the condition lever in the HIGH IDLE position.
SHP	Shaft horsepower. That horsepower imparted to the propeller shaft.
Low Idle	Obtained by placing the condition lever in the LO IDLE position.
Maximum Cruise Power	Is the highest power rating for cruise and is not time limited.
Maximum Power	The maximum power available from an engine for use during an emergency operation.
Normal Rated Climb Power	The maximum power available from an engine for continuous normal climb operations.-
Normal Rated Power	The maximum power available from an engine for continuous operation in cruise (with lower ITT limit than normal rated climb power).
Reverse Thrust	Obtained by lifting the power levers and moving them aft of the beta range.
RPM	Revolutions Per Minute.
Takeoff Power	The maximum power available from an engine for takeoff, limited to periods of five minutes duration.

CONTROL AND INSTRUMENT TERMINOLOGY.

Condition Lever (Fuel Shut-off Lever)	The fuel shut-off lever actuates a valve in the fuel control unit which controls the flow of fuel at the fuel control outlet and regulates the idle range from LO to HIGH]
N_1 Tachometer (Gas Generator RPM)	The tachometer registers the RPM of the gas generator with 100% representing a gas generator speed of 37,500 RPM.
Power Lever (Gas Generator N_1 DRPM)	This lever serves to modulate engine power from full reverse thrust to take-off. The position for idle represents the lowest recommended level of power for flight operation.
Propeller Control Lever (N_2RPM)	This lever requests the control to maintain RPM at a selected value and, in the maximum decrease RPM position, feathers the propeller.
Propeller Governor	This Governor will maintain the selected propeller speed requested by the propeller control lever.
Torquemeter	The torquemeter system determines the shaft output torque. Torque values are obtained by tapping into two outlets on the reduction gear case and recording the differential pressure from the outlets.

GRAPH AND TABULAR TERMINOLOGY.

AGL	Above ground level.
Best Angle of Climb	The best angle-of-climb speed is the airspeed which delivers the greatest gain of altitude in the shortest possible horizontal distance with gear and flaps up.
Best Rate of Climb	The best rate-of-climb speed is the airspeed which delivers the greatest gain of altitude in the shortest possible time with gear and flaps up.
Clean Configuration	Gear and flaps up.
Climb Gradient	The ratio of the change in height during a portion of a climb, to the horizontal distance traversed in the same time interval.
Demonstrated Cross-	The maximum 90° crosswind component for which adequate control of the aircraftwind during takeoff and landing was actually demonstrated during certification tests.
Gradient	The ratio of the change in height to the horizontal distance, usually expressed in percent.
Maximum Zero Fuel Weight	Any weight above the value given must be loaded as fuel.
MEA	Minimum Enroute Altitude.
Obstacle Clearance Climb Speed	Obstacle clearance climb speed is a speed near V_x and V_y1.1 times power off stall speed, or 1.2 times minimum single-engine stall speed, whichever is higher.
Ramp Weight	The gross weight of the aircraft before engine start. Included is the takeoff weight plus a fuel allowance for start, taxi, run up and takeoff ground roll to lift-off.
Route Segment	A part of a route. Each end of that part is identified by a geographic location, or a point at which a finite radio fix can be established.
Service Ceiling	The altitude at which the minimum rate of climb of 100 feet per minute can be attained for existing aircraft weight.
Takeoff Weight	The weight of the aircraft at lift-off from the runway.
Turbine Gas Temperature (TGT)	Eight probes wired in parallel indicate the temperature between the compressor and power turbines.

WEIGHT AND BALANCE TERMINOLOGY.

Arm	The distance from the center of gravity of an object to a line about which moments are to be computed.
Approved Loading Envelope	Those combinations of aircraft weight and center of gravity which define the limits beyond which loading is not approved.
Basic Empty Weight	The aircraft weight with unusable fuel, full oil, and full operating fluids.
Center-of-Gravity	A point at which the weight of an object may be considered concentrated for weight and balance purposes.
CG Limits	CG limits are the extremes of movement which the CG can have without making the aircraft unsafe to fly. The CG of the loaded aircraft must be within these limits at takeoff, in the air, and on landing.

Datum	A vertical plane perpendicular to the aircraft longitudinal axis from which fore and aft (usually aft) measurements are made for weight and balance purposes.
Engine Oil	That portion of the engine oil which can be drained from the engine.
Empty Weight	The aircraft weight with fixed ballast, unusable fuel, engine oil, engine coolant, hydraulic fluid, and in other respects as required by applicable regulatory standards.
Landing Weight	The weight of the aircraft at landing touchdown.
Maximum Weight	The largest weight allowed by design, structural, performance or other limitations.
Moment	A measure of the rotational tendency of a weight, about a specified line, mathematically equal to the product of the weight and the arm.
Standard	Weights corresponding to the aircraft as offered with seating and interior, avionics, accessories, fixed ballast and other equipment specified by the manufacturer as composing a standard aircraft.
Station	The longitudinal distance from some point to the zero datum or zero fuselage station.
Takeoff Weight	The weight of the aircraft at lift-off.
Unusable Fuel	The fuel remaining after consumption of usable fuel.
Usable Fuel	That portion of the total fuel which is available for consumption as determined in accordance with applicable regulatory standards.
Useful Load	The difference between the aircraft ramp weight and basic empty weight.
Deg	Degrees
DN	Down
Ft	Foot or feet
FT LB	Foot-pounds
GAL	Gallons
HR	Hours
kHz	Kilohertz
LB	Pounds
Max	Maximum
MHz	Megahertz
MIN	Minimum
NAUT	Nautical
NM	Nautical miles
PSI	Pounds per square inch
R/C	Rate of climb
TEMP	Temperature

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Subject	Paragraph, Figure, Table Number

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Subject	Paragraph, Figure, Table Number

Subject	Paragraph, Figure, Table Number

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To: ls-lp@redstone.army.mil

Subject: DA Form 2028

1. ***From:*** Joe Smith
2. *Unit:* home
3. ***Address:*** 4300 Park
4. ***City:*** Hometown
5. ***St:*** MO
6. ***Zip:*** 77777
7. ***Date Sent:*** 19-OCT-93
8. ***Pub no:*** 55-2840-229-23
9. ***Pub Title:*** TM
10. ***Publication Date:*** 04-JUL-85
11. *Change Number:* 7
12. *Submitter Rank:* MSG
13. ***Submitter FName:*** Joe
14. *Submitter MName:* T
15. ***Submlfter LName:*** Smith
16. ***Submitter Phone:*** 123-123-1234
17. ***Problem:*** 1
18. *Page:* 2
19. *Paragraph:* 3
20. *Line:* 4
21, *NSN:* 5
22. *Reference:* 6
23. *Figure:* 7
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25. *Item:* 9
26. *Total:* 123
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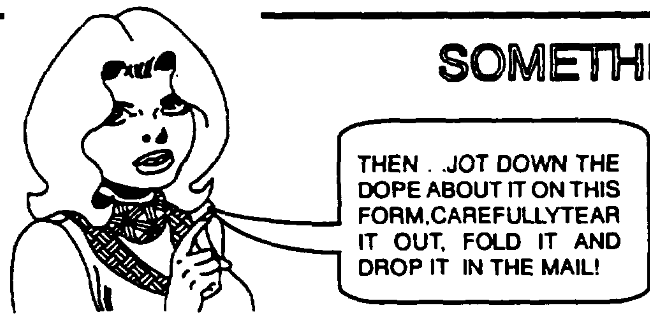

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PFC John DOE
CO A 3rd Engineer Bn
Ft. Leonardwood, MO 63108

DATE SENT 22 August 1992

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 1-1520-250-10	15 June 1992	Operator's manual MH60K Helicopter

BE EXACT PIN-POINT WHERE IT IS — **IN THIS SPACE, TELL WHAT IS WONG AND WHAT SHOULD BE DONE ABOUT IT:**

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO	
6	2-1 a			In line 6 of paragraph 2-1a the manual states the engine has 6 cylinders. The engine on my set only has 4 cylinders. Change the manual to show 4 cylinders.
81		4-3		Callout 16 on figure 4-3 is pointed at a bolt. In key to figure 4-3, item 16 is calle a shim. Please correct one or the other

EXAMPLE

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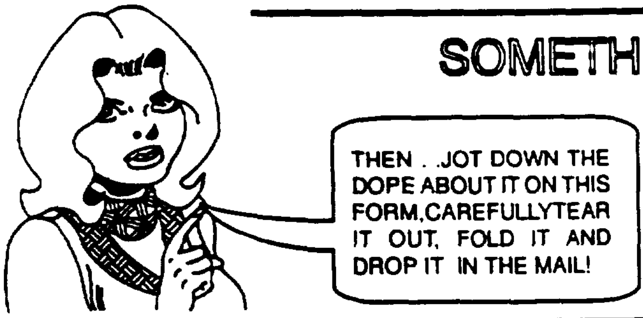

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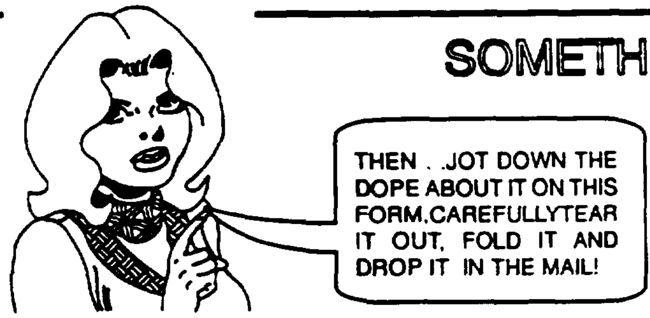

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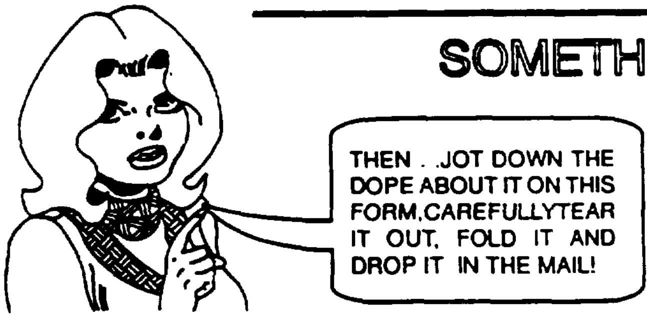

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 decagram = 10 grams = .35 ounce
1 hectogram = 10 decagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	Newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	Newton-meters	1.356	metric tons	short tons	1.102
pound-inches	Newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

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