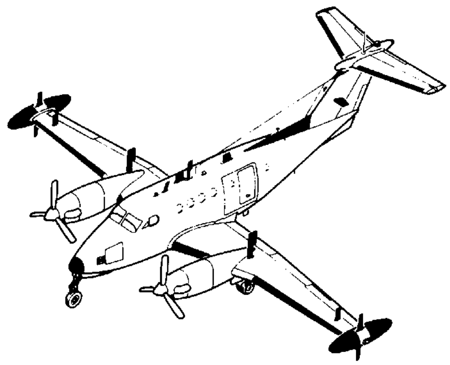
TECHNICAL MANUAL

OPERATOR'S MANUAL FOR ARMY RC-12G AIRCRAFT



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HEADQUARTERS, DEPARTMENT

OF THE ARMY
10 December 1985

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TM 55-1510-220-10
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CHANGE NO. 7

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OPERATOR' S MANUAL
FOR
ARMY RC-12G AIRCRAFT

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9-15 and 9-16	9-15 and 9-16
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Army RC-12G Aircraft

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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.

OPERATING PROCEDURES

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 possible hazard around AC inverters, ignition exciter units,; and strobe beacons.

USE OF FIRE EXTINGUISHERS IN CONFINED AREAS

Monobromotrifluoromethane (CF3Br) 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

A1 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.

Insure that landing gear control handle is in the DN position.

TECHNICAL MANUAL

NO.55-1520-220-10

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 10 December 1985

Operator's Manual

ARMY MODEL RC-12G

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.

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CHAPTER 1
INTRODUCTION

1-1. GENERAL.

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

1-2. WARNINGS, CAUTIONS, AND NOTES.

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

WARNING

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

CAUTION

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

NOTE

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

1-3. DESCRIPTION.

This manual contains the best operating instructions and procedures for the RC-12G 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, every titled paragraph, figure, and table contained in this manual. Chapter 7, Performance Data, has an additional index within the chapter.

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 750-244-1-5.

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 I and Balance TM 55-1500-342-23.

1-10. EXPLANATION OF CHANGE SYMBOLS.

Changes, except as noted below, to the text and tables, including new material on added pages, are indicated by a vertical line in the outer margin extending close to the entire area of the material affected; exception: pages with emergency markings, which consist of black diagonal lines around three edges, may have the vertical line or change symbol placed along the inner margins. Symbols show current changes only. A miniature pointing hand symbol is used to denote a change to an illustration. However, a vertical line in the outer margin, rather than miniature pointing hands, is utilized when there have been extensive changes made to 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.

1-1 1. AIRCRAFT DESIGNATION SYSTEM.

The designation system prescribed by AR 7050 is used in aircraft designations as follows:

EXAMPLE RC-12G

R - Modified mission symbol (Reconnaissance)

C - Basic mission and type symbol (cargo)

12 - Design number

G - 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.

All placard 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-12G is a pressurized, low wing, all metal aircraft, powered by two PT6A-41 turboprop engines (fig. 2-1 and 2-2), and has all weather capability. Distinguishable features of the aircraft are the slender, streamlined engine nacelles, mission antennas, wing tip pods, 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 on the left side of the fuselage.

2-3. DIMENSIONS.

Overall aircraft dimensions are shown in figure 2-3.

2-4. GROUND TURNING RADIUS.

Minimum ground turning radius of the aircraft is shown in figure 2-4.

2-5. MAXIMUM WEIGHTS.

Maximum take of gross weight is 15,000 pounds. Maximum landing weight is 15,000 pounds. Maximum ramp weight is 15,090 pounds. Maximum zero fuel weight is 11,500 pounds.

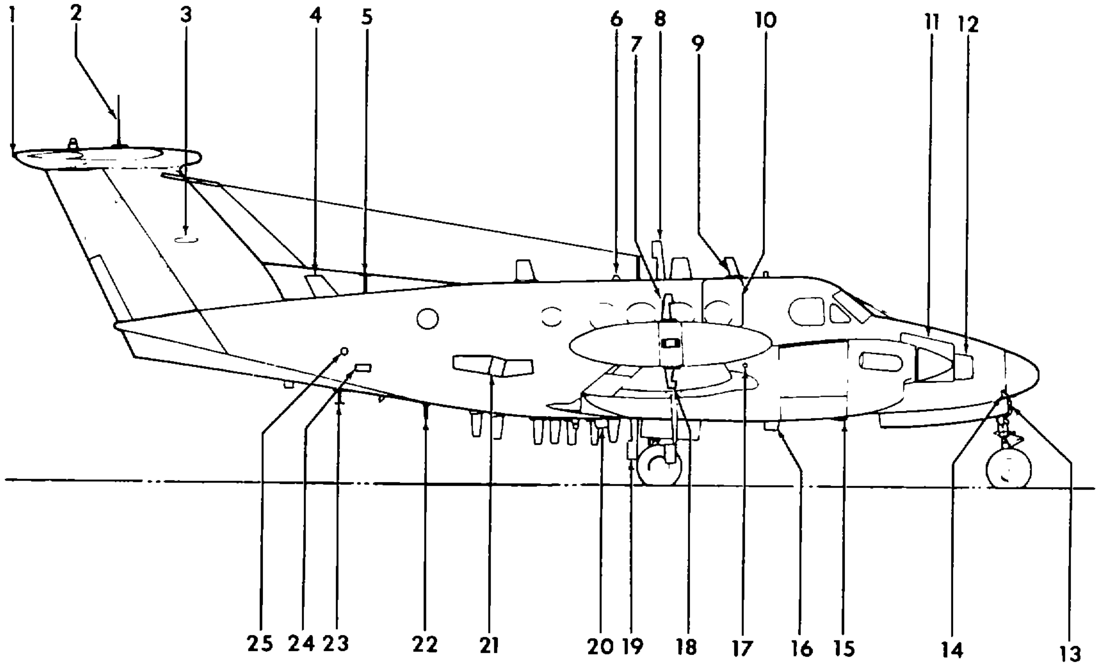
2-6. EXHAUST DANGER AREA.

Danger area to be avoided by personnel while aircraft engines are being operated on the ground are depicted in figure 2-5. Distance to be maintained with engines operating at idle are also shown. Temperature and velocity of exhaust gasses 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 landing gear is a retractable, tricycle type, electrically operated by a single DC motor. This motor drives the main landing gear actuators through a gear box and torque tube arrangement, and also drives a chain mechanism which controls the position of the nose gear. Positive down-locks are installed to hold the drag brace in the extended and locked position. The down-locks are actuated by overtravel of the linear jackscrews and are held in position by a spring-loaded overcenter mechanism. The jackscrew in each actuator holds all three gears in the UP position, when the gear is retracted. A friction clutch between the gearbox and the torque shafts protects the motor from electrical overload in the event of a mechanical malfunction. A 150-ampere current limiter, located on the DC distribution bus under the center floorboard, protects against electrical overload. 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 air and hydraulic fluid, are incorporated with the landing gear. Gear retraction or extension time is approximately six seconds.

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



1. NAVIGATION LIGHT
2. HF/VHF MONOPOLE ANTENNA
3. NAV (VOR/LOC) ANTENNA
4. ELT ANTENNA
5. APR-44 ANTENNA
6. TRANSPONDER ANTENNA
7. HF/VHF VERTICAL DIPOLE
8. HF INTERCEPT DIPOLE
9. VHF AIR-TO-AIR ANTENNA
10. EMERGENCY ENTRANCE/EXIT HATCH
11. NOSE AVIONICS COMPARTMENT ACCESS HATCH
12. AIR CONDITIONER CONDENSER AIR INLET
13. LANDING/TAXI LIGHTS
14. PITOT TUBE
15. MARKER BEACON ANTENNA
16. APR-39 ANTENNA
17. ICE LIGHT
18. HF/VHF VERTICAL DIPOLE
19. HF INTERCEPT DIPOLE
20. STROBE BEACON SHIELD
21. FLARE DISPENSER
22. VHF DF LOOP ANTENNA
23. APR-44 ANTENNA
24. OXYGEN SYSTEM SERVICING DOOR
25. ELT SWITCH ACCESS DOOR

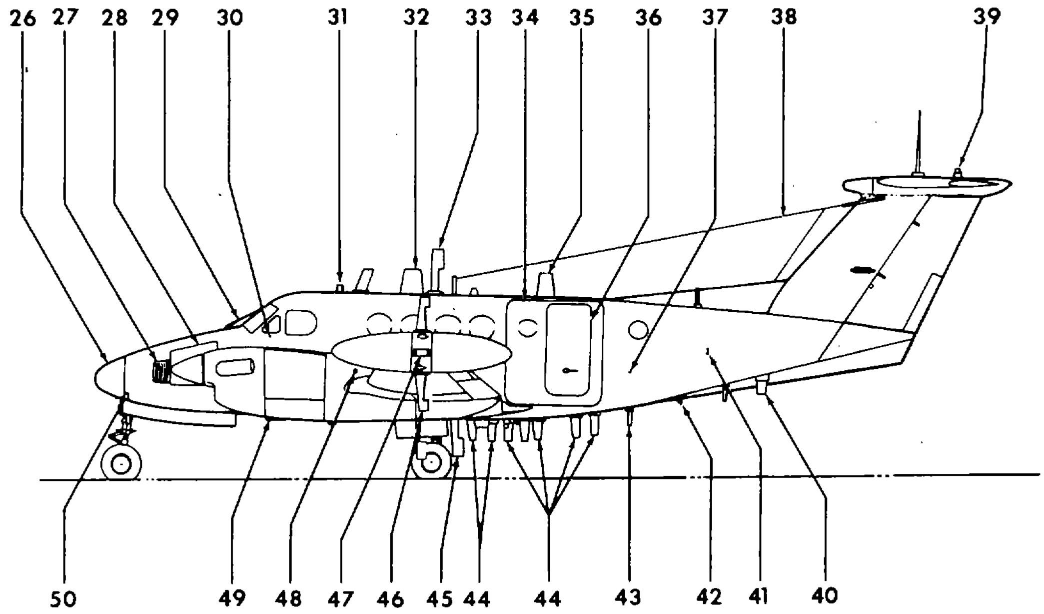
AP010212

Figure 2-1. General Exterior Arrangement (Sheet 1 of 6)

GEAR RELAY on the overhead circuit breaker panel (fig. 2-27).

b. Landing Gear Down Position-Indicator Lights. Landing gear down position is indicated by three green lights on the left subpanel, placarded GEAR DOWN. These lights may be checked by operating 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.2-27).

c. Landing Gear Position Warning Lights. Two red bulbs, wired in parallel and activated by microswitches independent of the GEAR DOWN position indicator annunciators, are positioned inside the clear plastic grip on the landing gear control switch. These annunciators illuminate whenever the landing gear switch is in either the UP or DN position and the gear is in transit. Both bulbs will also illuminate should either or both power levers be retarded below approximately 79 to 81% N_1 when the landing gear is not down and locked. To turn the switch annunciators OFF during single engine operation, the power lever for the inoperative engine must be advanced to a position which is higher than the setting of the warning horn microswitch. Extending the landing gear will also turn the annunciators off, provided the gear is down and locked. 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



26. RADOME
27. AIR CONDITIONER AIR OUTLET
28. NOSE AVIONICS COMPARTMENT ACCESS DOOR
29. WINDSHIELD WIPERS
30. FREE AIR TEMPERATURE GAGE PROBE
31. TACAN ANTENNA
32. VHF/AM/FM ANTENNA
33. HF DF INTERCEPT DIPOLE
34. CARGO DOOR
35. VHF/UHF ANTENNA
36. CABIN DOOR
37. EMERGENCY LIGHT
38. HF WIRE ANTENNA
39. STROBE BEACON
40. TRANSPONDER/VOW ANTENNA
41. STATIC PORTS
42. RELIEF TUBE DRAIN
43. VHF DF LOOP ANTENNA
44. UHF MONOPOLE BLADE ANTENNAS
45. HF INTERCEPT DIPOLE
46. HF VHF VERTICAL DIPOLE
47. APR-39 ANTENNA
48. ICE LIGHT
49. MARKER BEACON ANTENNA
50. PITOT TUBE

AP010209

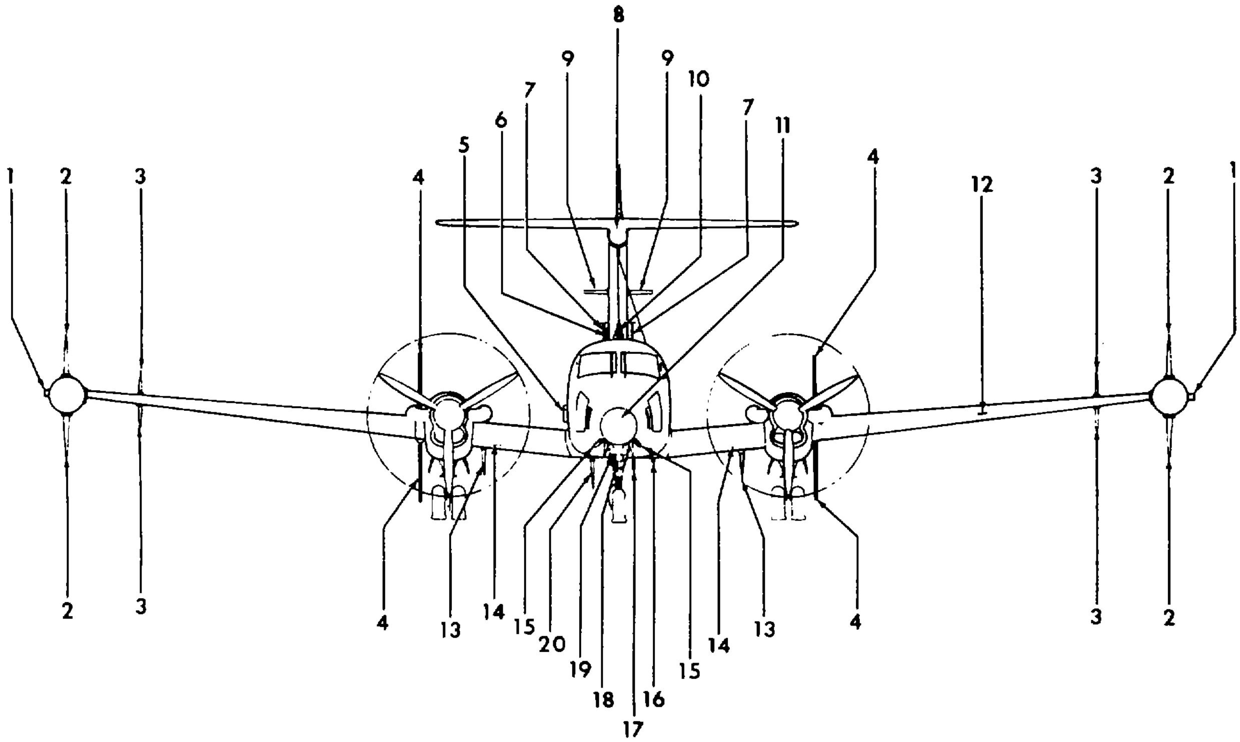
Figure 2-1. General Exterior Arrangement (Sheet 2 of 6)

circuit is protected by a 5-ampere circuit breaker, placarded LANDING GEAR IND, on the overhead circuit breaker panel (fig. 2-27.)

d. Landing Gear Warning Light Test Button. A test button, placarded HDL LT TEST, is located on the left subpanel. Failure of the landing gear switch to illuminate red, when this test button is pressed, indicates two defective bulbs or a circuit fault. The circuit is protected by a 5-ampere circuit breaker, placarded LANDING GEAR RELAY, on the overhead circuit breaker panel (fig. 2-27).

e. *Landing Gear Warning Horn* When either power lever is retarded below approximately 79 to 81% N_1 when the landing gear is not down and locked and if the flaps are extended beyond 40%, a warning horn, located in the overhead control panel will sound intermittently. To prevent the warning horn from sounding during long descents, a pressure differential "Q" switch is connected into the copilot's static line. The switch prevents the warning horn from sounding until airspeed drops below 140 KIAS. An altitude sensing switch is installed in series with the 140 KIAS "Q" switch which prevents the warning horn from sounding after climbing through 12,500 feet MSL. The horn will be engaged when the aircraft descends through 10, 500 feet MSL. The warning horn circuit is protected by a 5-ampere circuit breaker, placarded LANDING GEAR WARN, on the overhead circuit breaker panel (fig. 2-27).

f. Landing Gear Warning Horn Test Switch. The landing gear warning horn may be tested by the test switch on the right subpanel (fig. 2-



1. APR-39 ANTENNA
2. HF/VHF VERTICAL DIPOLE ANTENNA
3. UHF/VHF DIPOLE ANTENNA
4. VHF INTERCEPT DIPOLE
5. M-130 FLARE DISPENSER
6. ELT ANTENNA
7. APR-44 ANTENNA
8. HF/VHF HORIZONTAL LOOP ANTENNA
9. NAV (VOR/LOC) ANTENNA
10. TACAN ANTENNA
11. HF/VHF HORIZONTAL LOOP
12. STALL WARNING VANE
13. UHF DF MONOPOLE ANTENNA
14. BLEED AIR INLET HEAT EXCHANGER
15. PITOT TUBE
16. MARKER BEACON ANTENNA
17. TRANSPONDER ANTENNA
18. TAXI LIGHT
19. LANDING LIGHTS
20. UHF DF MONOPOLE ANTENNA

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Figure 2-1. General Exterior Arrangement (Sheet 3 of 6)

6). The switch, placarded STALL WARN TEST OFF LDG GEAR WARN TEST, will sound the landing gear warning horn and illuminate the landing gear position warning lights when moved to the momentary LDG GEAR WARN TEST position. The circuit is protected by a 5-ampere circuit breaker, placarded LANDING GEAR WARN, on the overhead circuit breaker panel (fig. 2-27).

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 activates the landing gear control circuits, cabin pressurization circuits and the flight hour meter when the strut is extended. This switch also activates a down-lock 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 DN LOCK REL located adjacent to the landing gear switch. If the override is used and / the landing gear control switch is raised, power will be supplied to the warning horn circuit and the horn will sound. The safety switch on the left main landing gear strut activates the left and

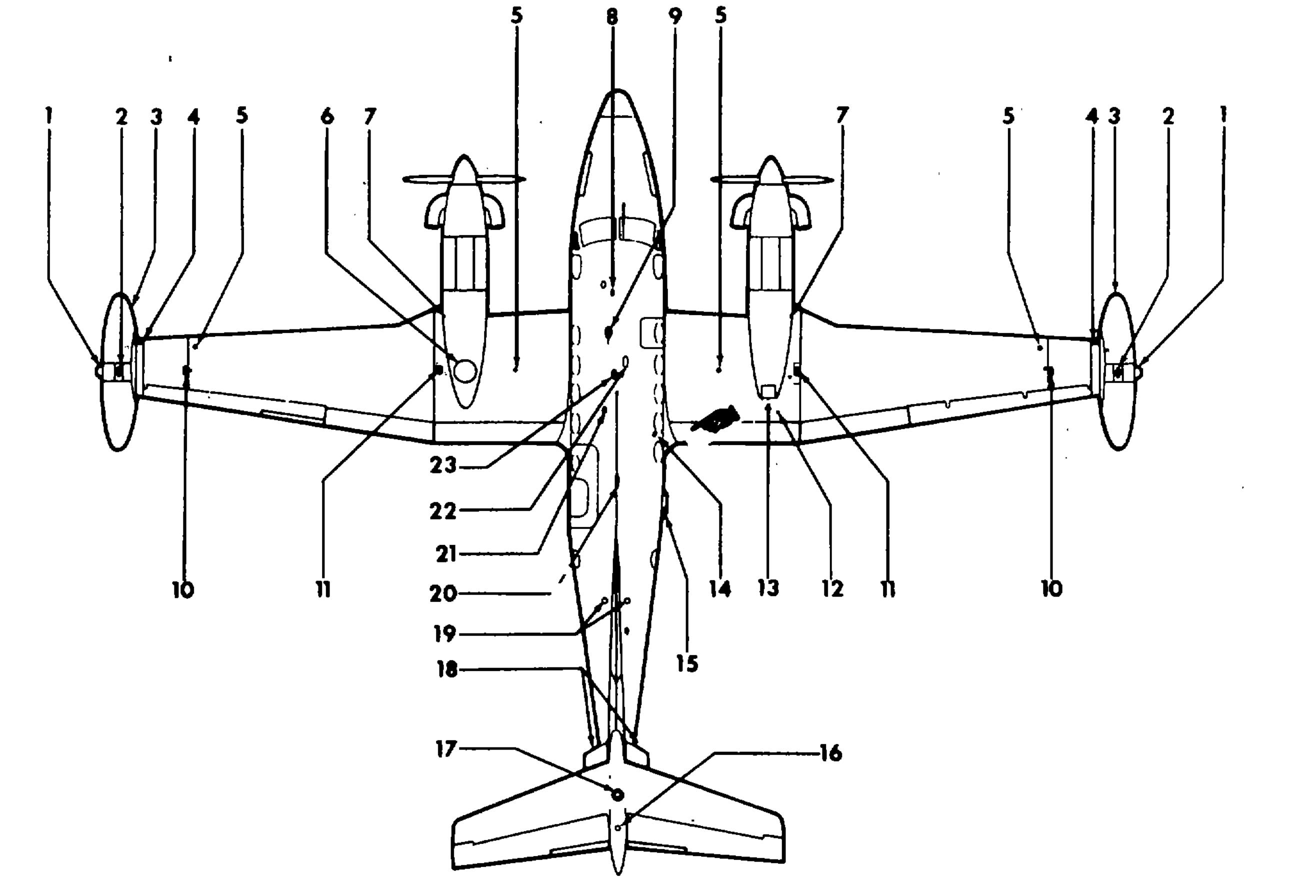


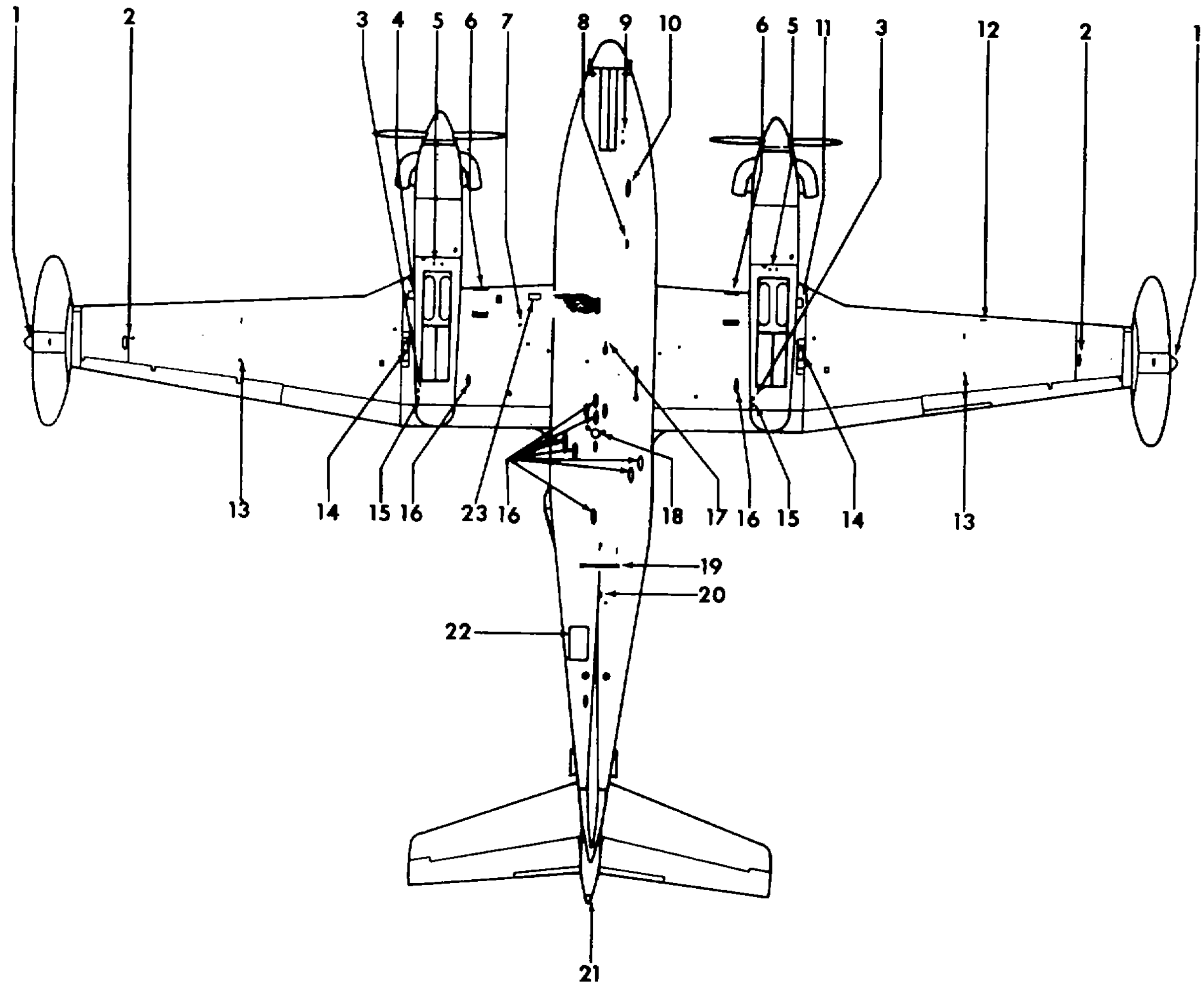
Figure 2-1. General Exterior Arrangement (Sheet 4 of 6)

right engine ambient air shut-off valves when the strut is extended.

h. Landing Gear Alternate Engage Handle. During manual landing gear extension, the landing gear motor must be disengaged from the landing gear drive mechanism. This is accomplished by a manually-operated clutch disengage lever (fig. 2-7 and 2-8) located adjacent to the landing gear alternate extension handle (fig. 27 and 2-8). To disengage the clutch, pull the alternate engage handle up and turn clockwise. To engage the clutch, turn the alternate engage handle counterclockwise and release.

CAUTION

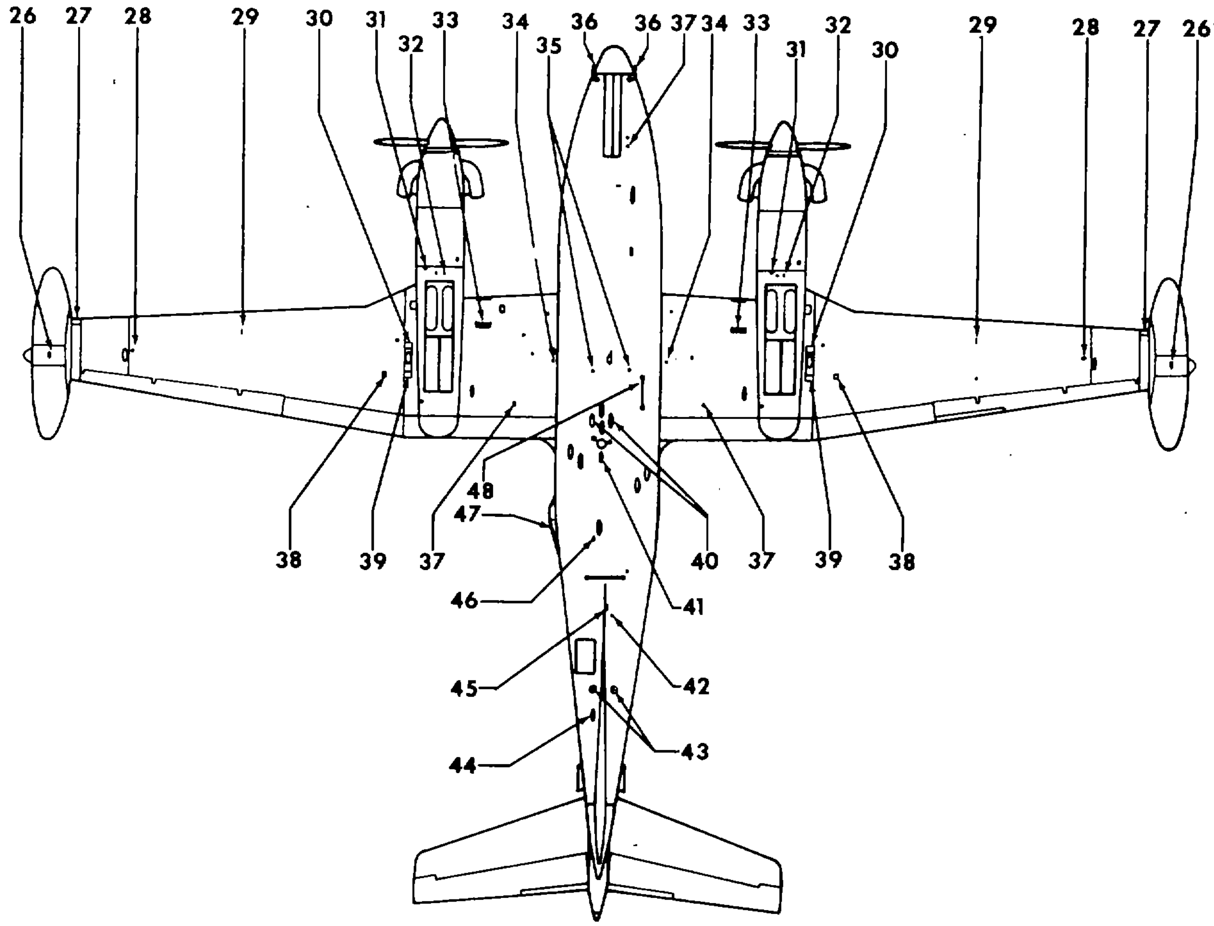
Continued pumping of handle after GEAR DOWN position indicator lights (3) are illuminated could damage the drive mechanism, and prevent subsequent gear retraction.



1. APR-39 ANTENNA
2. UHF/VHF COMM DIPOLE ANTENNA
3. GRAVITY LINE DRAIN
4. DC EXTERNAL POWER RECEPTACLE
5. STANDBY FUEL BOOST PUMP DRAIN
6. BLEED AIR HEAT EXCHANGER AIR INTAKE
7. BATTERY RAM AIR VENT
8. APR-39 BLADE ANTENNA
9. HYDRAULIC RESERVOIR DRAIN
10. MARKER BEACON ANTENNA
11. AC EXTERNAL POWER RECEPTACLE
12. STALL WARNING VANE
13. OUTBOARD WING FUEL SUMP DRAIN
14. VHF INTERCEPT DIPOLE ANTENNA
15. ENGINE OIL VENT
16. UHF DF MONOPOLE ANTENNA
17. ANTENNA DEICE SYSTEM BOOT
18. HOLD DOWN EJECTOR TUBE
19. STROBE BEACON
    VHF DF LOOP ANTENNA
20. OXYGEN REGULATOR VENT
21. TAIL NAVIGATION LIGHT
22. TAILCONE ACCESS DOOR
23. AIR DATA PROBE

Figure 2-1. General Exterior Arrangement (Sheet 5 of 6)

i. Landing Gear Alternate Extension Handle. Manual landing gear extension is provided through a manually powered system as a backup to the electrically operated system. Before manually extending the gear, make certain that the landing gear switch is in the down position with the LANDING GEAR RELAY circuit breaker pulled. Pulling up on the alternate engage handle, located on the floor, and turning it clockwise will lock it in that position. When the alternate engage handle is pulled, the motor is electrically disconnected from the system and the alternate drive system is locked to the gearbox and motor. When the alternate drive is locked in,



26. HF/VHF VERTICAL DIPOLE ANTENNA
27. RECOGNITION LIGHT
28. SIPHON FUEL VENT
29. TIEDOWN RING
30. THREE PHASE INVERTER COOLING AIR INTAKE
31. FIREWALL FUEL FILTER DRAIN
32. FUEL STRAINER DRAIN
33. BLEED AIR HEAT EXCHANGER AIR EXHAUST
34. EXTENDED RANGE FUEL SYSTEM FUEL LINE DRAIN
35. SURFACE DEICE SYSTEM EJECTOR EXHAUST
36. PITOT TUBE
37. JACK PAD
38. RAM SCOOP FUEL VENT
39. THREE PHASE INVERTER COOLING AIR OUTLET
40. STROBE BEACON SHIELD
41. INS TACAN ANTENNA
42. AFT COMPARTMENT DRAIN
43. APR-44 ANTENNAS
44. TRANSPONDER/VOW ANTENNA
45. RELIEF TUBE DRAIN
46. UHF/DF MONOPOLE ANTENNA
47. FLARE DISPENSER
48. HF DF LOOP ANTENNA

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Figure 2-1. General Exterior Arrangement (Sheet 6 of 6)

the chain is driven by a continuous action ratchet which is activated by pumping the landing gear alternate extension handle adjacent to the alternate engage handle.

(1) After a manual landing gear extension has been made, do not stow the handle, move any landing gear controls, or reset any switches or circuit breakers. The gear cannot be retracted manually.

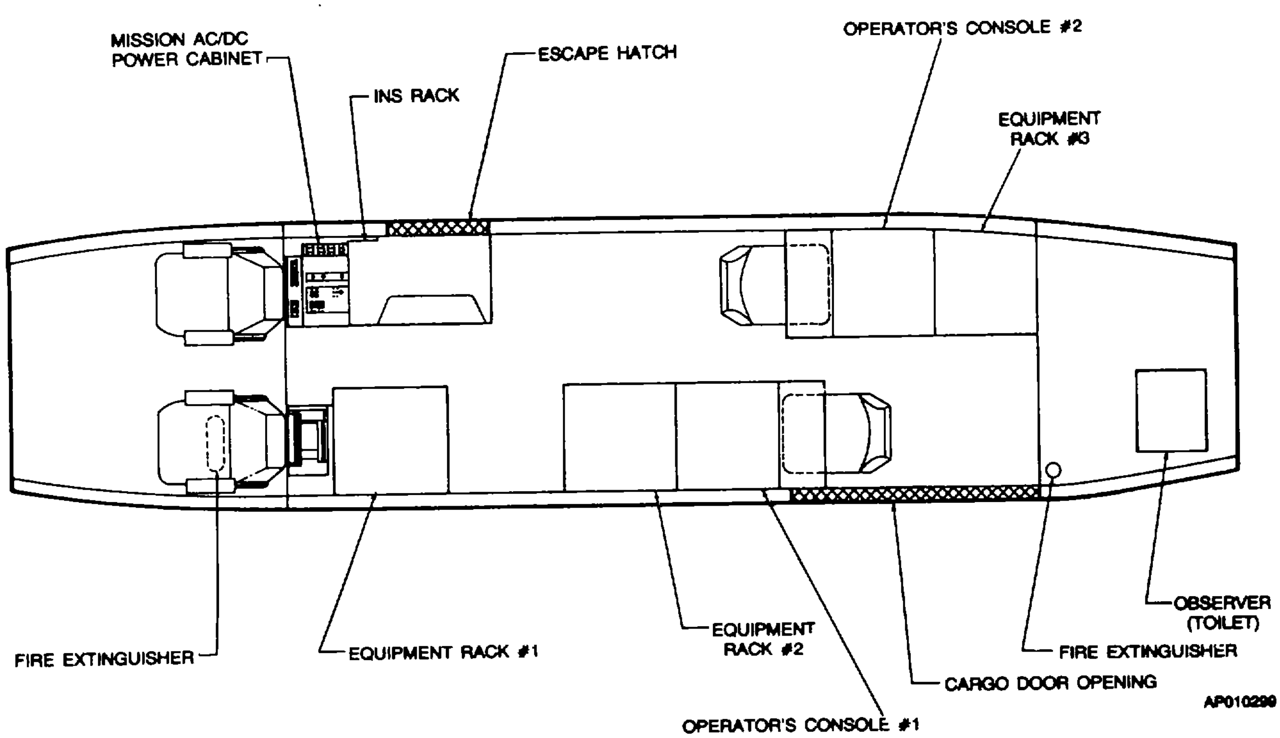


Figure 2-2. General Interior Arrangement (Sheet 1 of 2)

j. Tires. The aircraft is equipped with dual 22 x 6.75 x 10, 8 ply rated, tubeless, rim inflation tires on the main gear. The nose gear is equipped with a single 22 x 6.75 x 10, 8 ply rated, tubeless, rim inflated tire.

k. Steerable Nose Wheel. The aircraft can be 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 480 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.

I. Wheel Brake System. The main wheels are equipped with multiple-disc hydraulic brakes actuated by master cylinders attached to the rudder pedals at the pilot's and copilot's position. Braking is permitted from either set of rudder pedals. Brake fluid is supplied to the system from the reservoir in the nose compartment. The toe brake sections of the rudder pedals are connected to the master cylinders which actuate the system for the corresponding wheels. No emergency brake system is provided.

WARNING

Repeated and excessive application of brakes, without allowing sufficient time for cooling, between applications, will cause a loss of braking efficiency, possible failure of brake or wheel structure, possible blowout of tires, and in extreme cases may cause the wheel brake assembly to be destroyed 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 fully out sets the check valves in the system and any pressure being applied by the toe brakes is maintained. Parking brakes are released when the brake handle is pushed in. The parking brake may be set from either cockpit position.

CAUTION

Parking brakes shall not be set during flight.

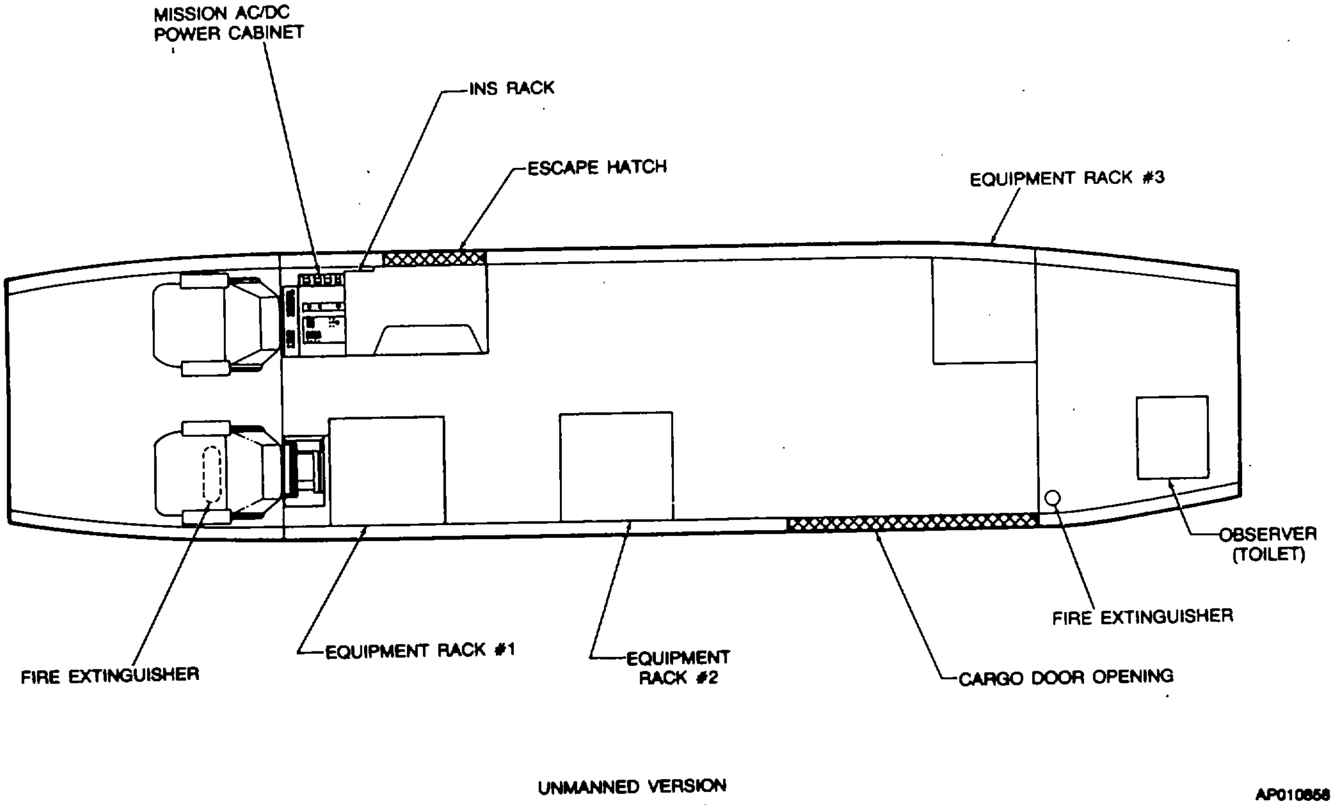


Figure 2-2. General Interior Arrangement (Sheet 2 of 2)

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 be caused if more than one person is on the cabin door at a time. The door is limited to a maximum of 300 pounds.

A swing-down door (fig. 2-9), hinged at the bottom, provides a stairway for normal and emergency entrance and exit. Two of the steps are movable and 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 support for the door in the open position, a handhold, 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 small round window just above the second step permits observation of the pressurization safety bellows. 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

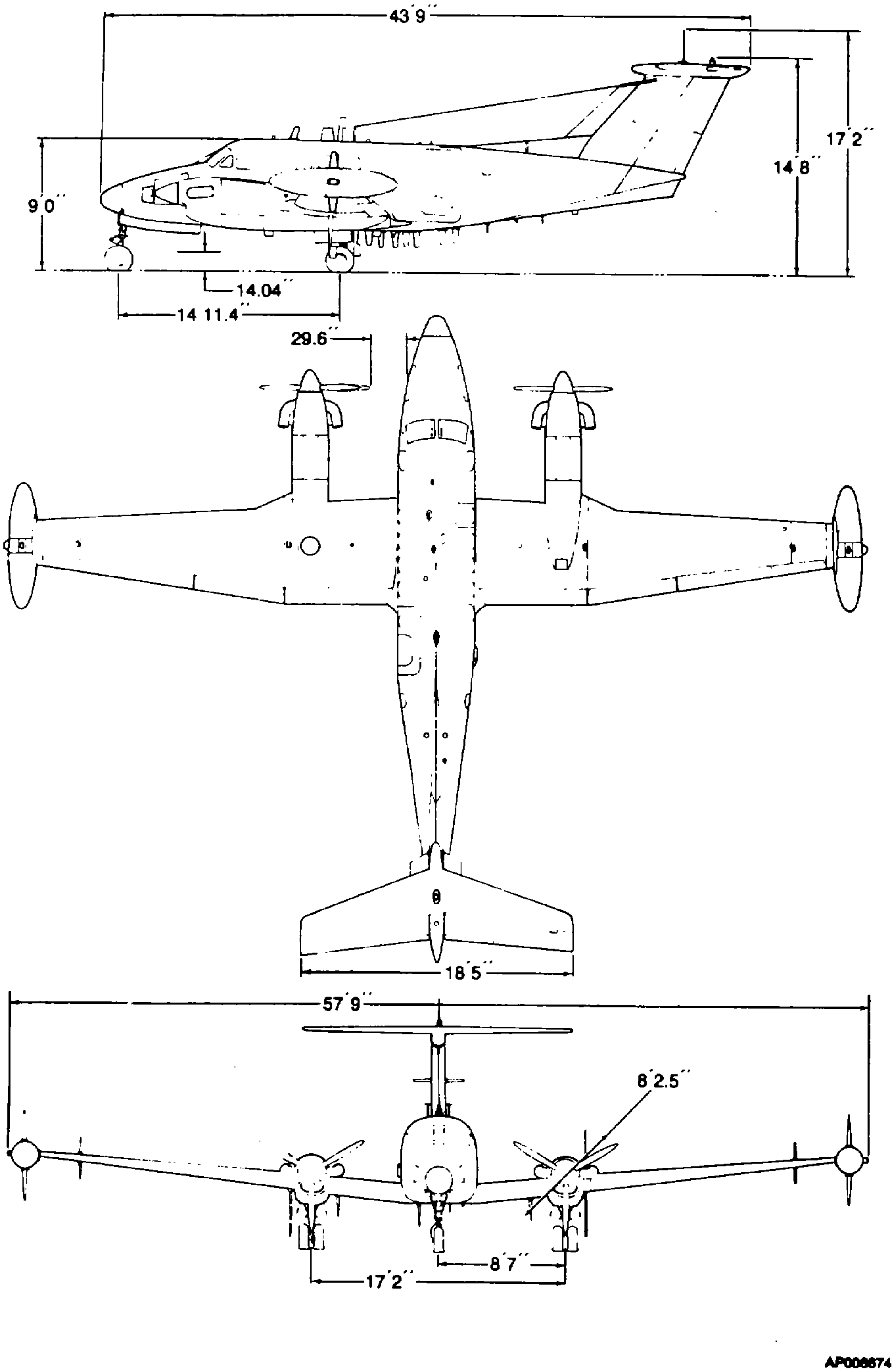
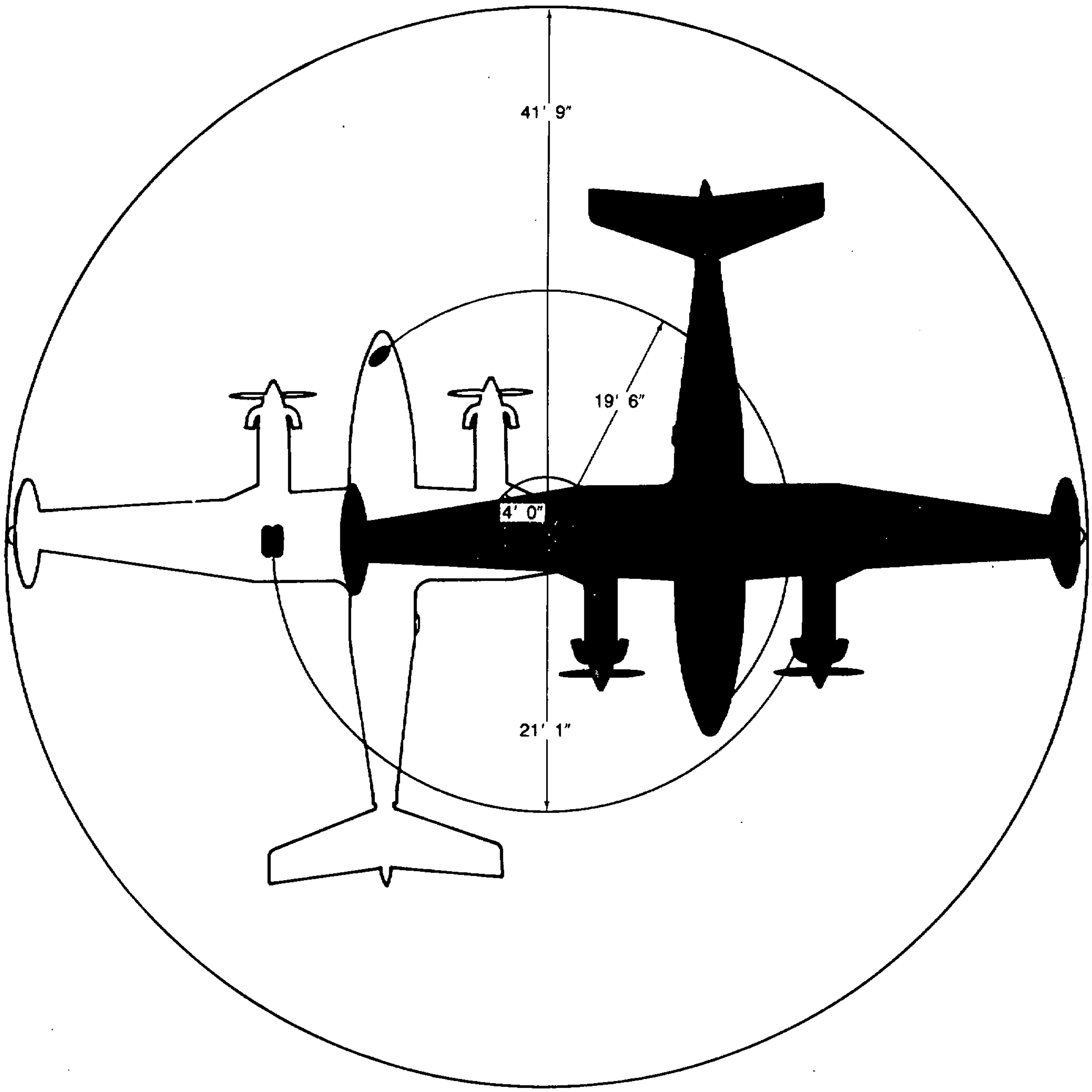


Figure 2-3. Principal Dimensions

GROUND TURNING CLEARANCE



RADIUS FOR INSIDE GEAR .... 4 FEET
RADIUS FOR NOSE WHEEL .... 19 FEET 6 INCHES
RADIUS FOR OUTSIDE GEAR .... 21 FEET 1 INCH
RADIUS FOR WING TIP .... 41 FEET 9 INCHES

TURNING RADII ARE PREDICTED ON THE USE OF PARTIAL BRAKING ACTION AND DIFFERENTIAL POWER

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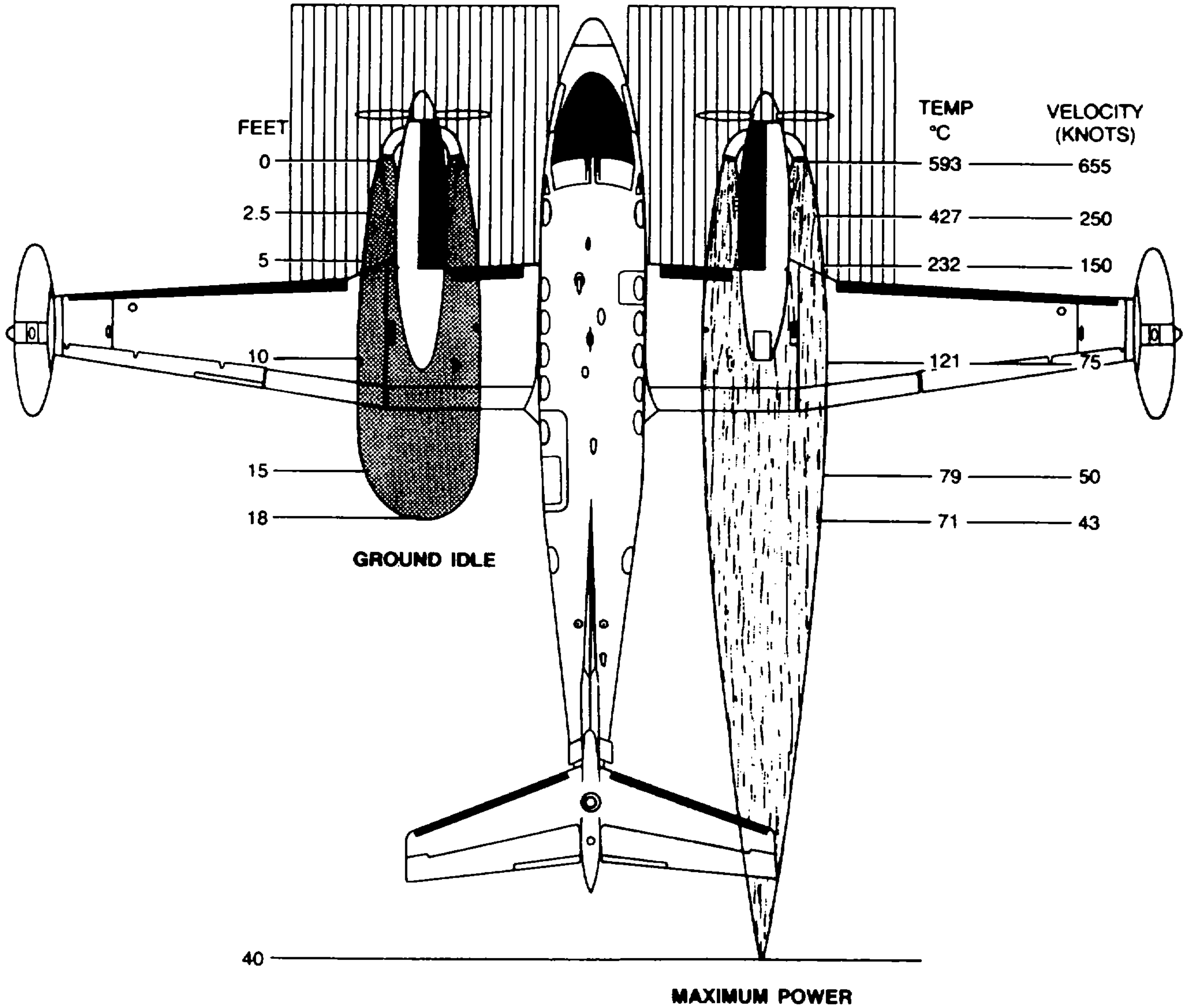
Figure 2-4. Ground Turning Radius



EXHAUST DANGER AREA (GROUND IDLE)

EXHAUST DANGER AREA (MAX POWER)

PROPELLER DANGER AREA

NOTE

- THE EXHAUST DANGER AREA DOES NOT INCLUDE PROPELLER WAKE WHICH INCREASES VELOCITY, AND SIGNIFICANTLY REDUCES TEMPERATURE.
- EXHAUST GAS TEMPERATURE AND VELOCITY AT GROUND IDLE IS VERY LOW, HOWEVER, THE IMMEDIATE AREA OF EXHAUST DISCHARGE SHOULD BE AVOIDED.

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Figure 2-5. Exhaust and Propeller Danger Areas

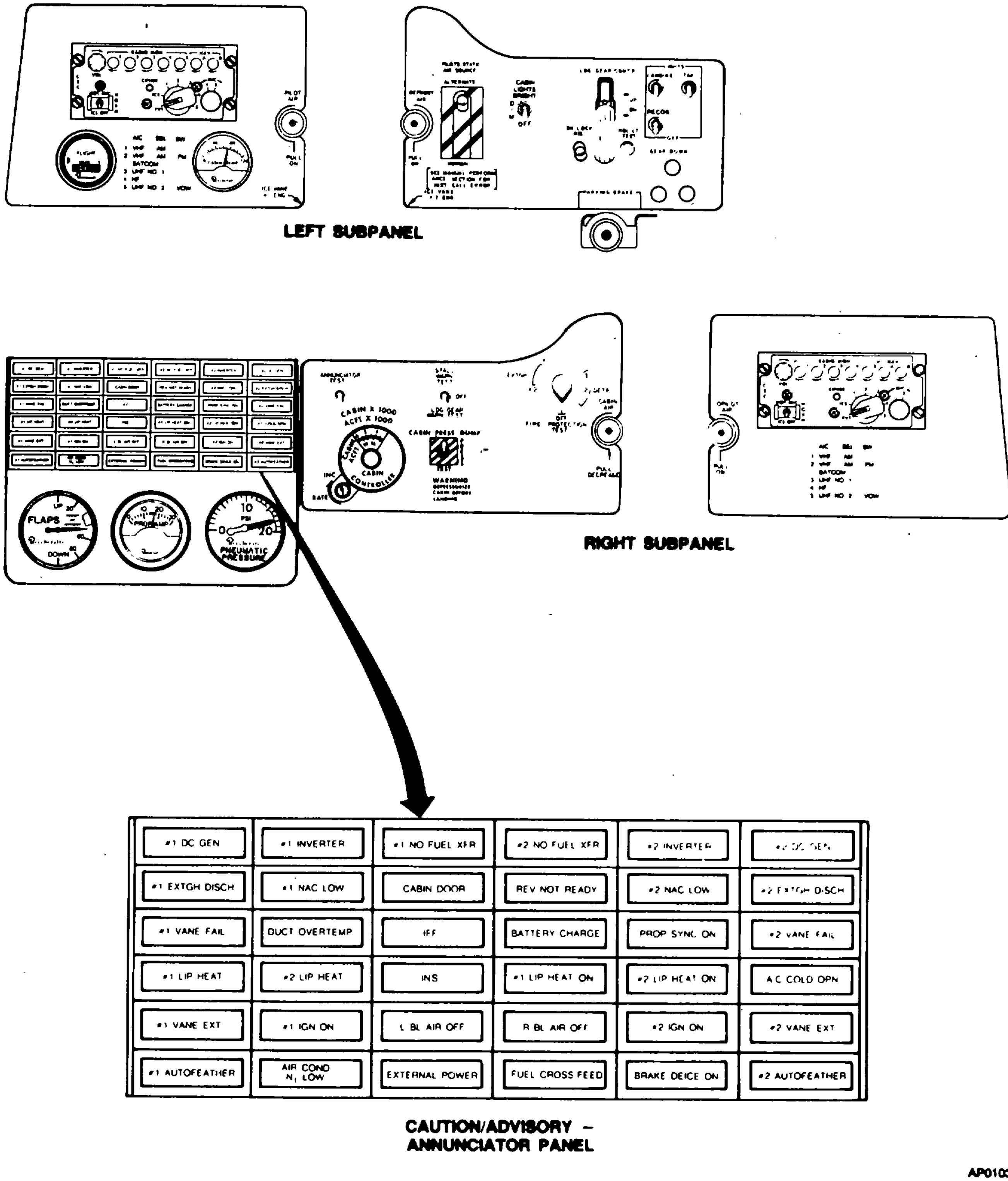
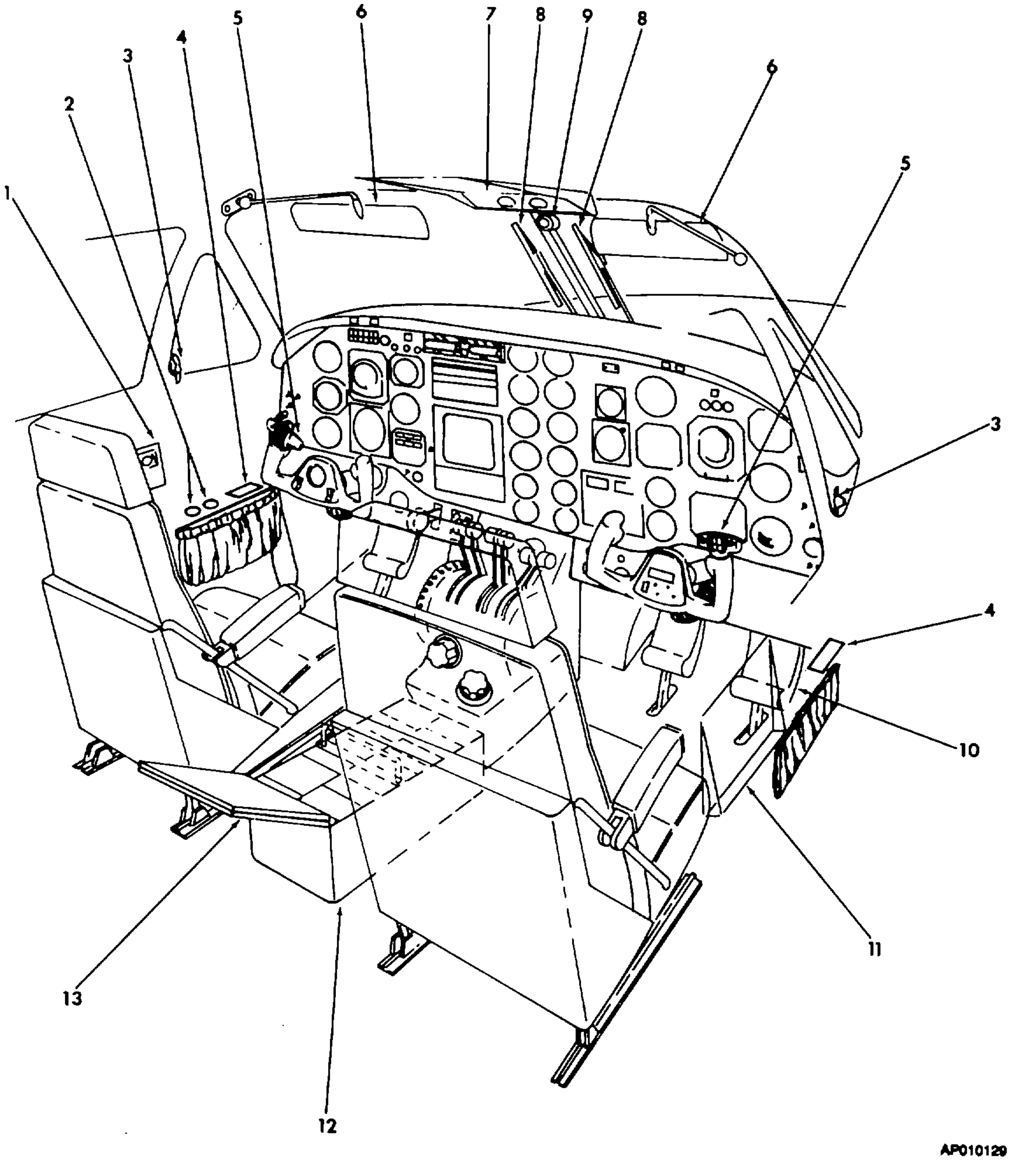
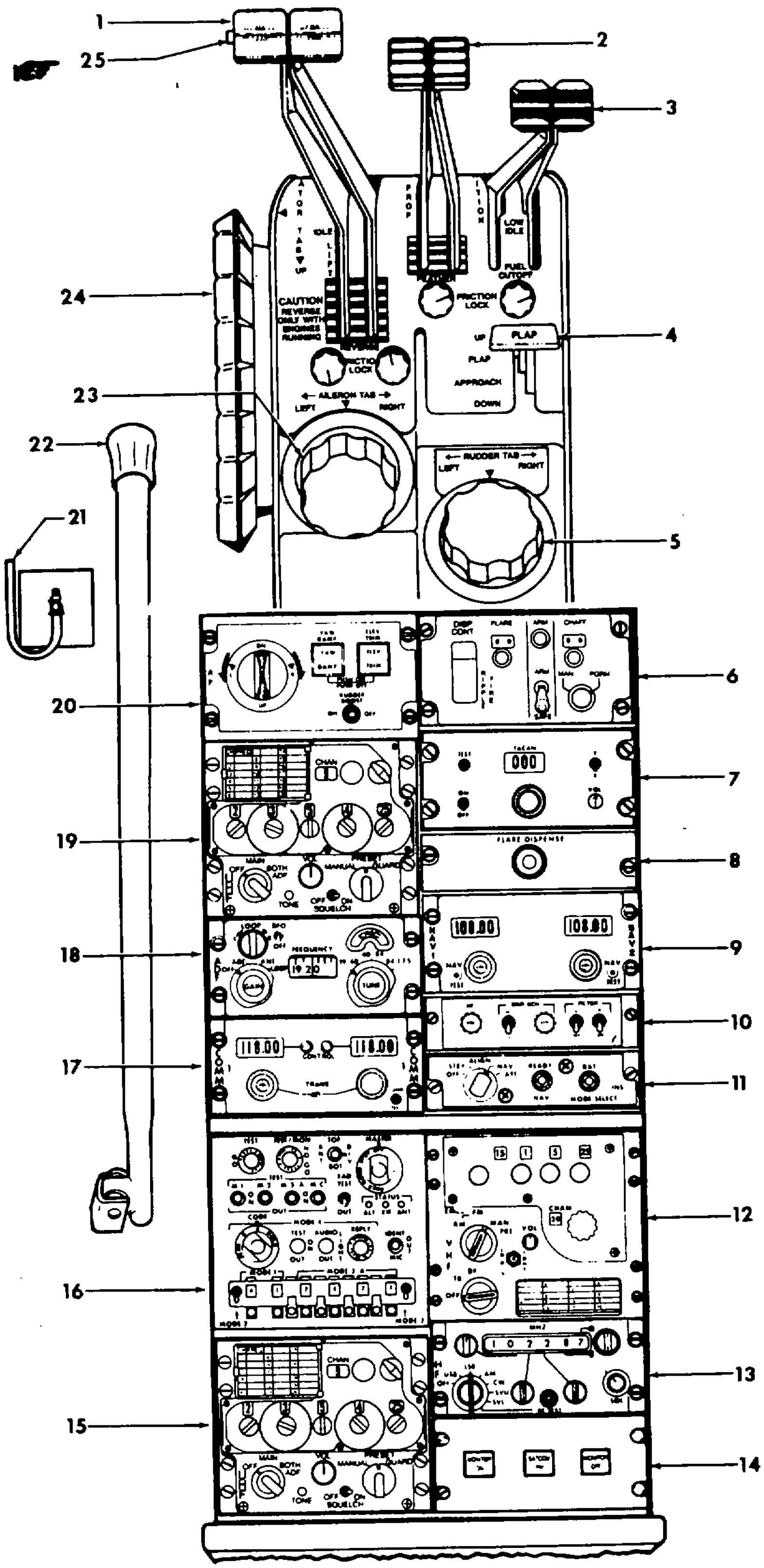


Figure 2-6. Subpanels



1. FREE AIR TEMPERATURE GAGE
2. OXYGEN SYSTEM PRESSURE GAGES
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

Figure 2-7. Cockpit



1. POWER LEVERS
2. PROPELLER LEVERS
3. CONDITION LEVERS
4. FLAP CONTROL
5. RUDDER TRIM TAB WHEEL
6. DISPENSER CONTROL PANEL
7. TACAN CONTROL PANEL
8. FLARE DISPENSE SWITCH
9. FOR CONTROL PANEL
10. MARKER BEACON AUDIO CONTROL PANEL
11. INS MODE SELECTOR UNIT
12. VHF AM-FM CONTROL PANEL
13. HF CONTROL PANEL
14. VHF/SATCOM AUDIO SELECTOR SWITCH PANEL
15. UHF CONTROL PANEL (VOR)
16. TRANSPONDER CONTROL PANEL
17. VHF-AM CONTROL PANEL
18. ADF CONTROL PANEL
19. UHF CONTROL PANEL
20. AUTOPILOT PITCH-TURN CONTROL/YAW DAMP/ELECTRIC ELEVATOR TRIM/RUDDER BOOST CONTROL PANEL
21. EMERGENCY LANDING GEAR ALTERNATE ENGAGE HANDLE
22. EMERGENCY LANDING GEAR EXTENSION RATCHET HANDLE
23. AILERON TRIM TAB WHEEL
24. ELEVATOR TRIM TAB WHEEL
25. GO-AROUND SWITCH

Figure 2-8. Control Pedestal

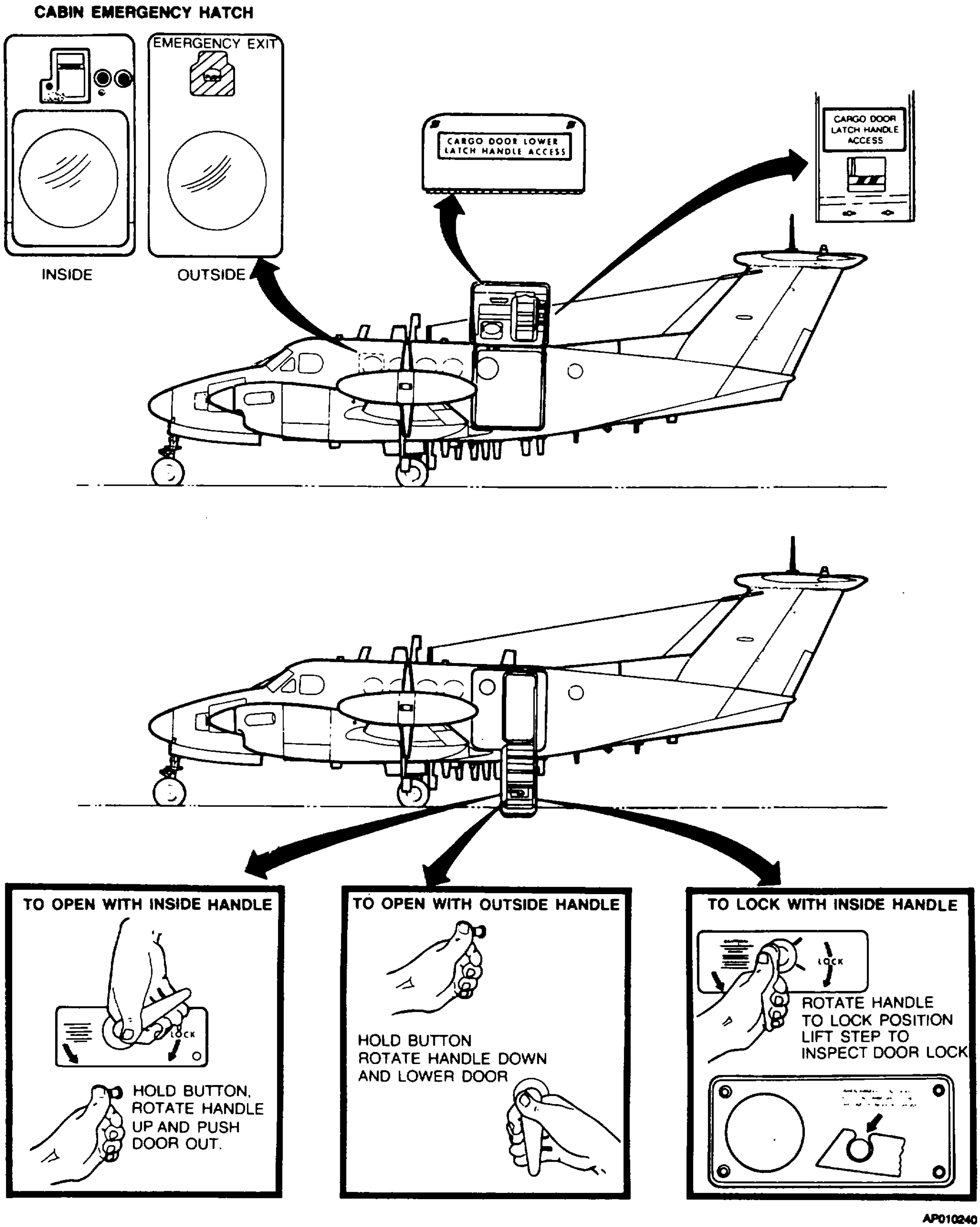


Figure 2-9. Cabin and Cargo Doors

inside door mechanism. A CABIN DOOR annunciator light 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. 2-9), hinged at the top, provides cabin access for loading cargo or bulky items. 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 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 remote indication of cabin/cargo door security. An annunciator light placarded CABIN DOOR will illuminate if the cabin or cargo door is open and the BATT switch in ON. If the battery switch is OFF, the annunciator will illuminate only if the cargo door is not securely closed and latched. The cargo door sensing circuit receives power from the hot battery bus. The cargo door opening is 52.0 inches wide by 52.0 inches high.

CAUTION

Insure 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 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 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 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 Emergency Hatch. The cabin emergency hatch, placarded EXIT PULL, is located on the right cabin sidewall just aft of the copilot's seat. The hatch may be released, 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 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 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.

d. Cabin Door Caution Light. As a safety precaution, two illuminated MASTER CAUTION lights, on the glare shield and a steadily illuminated CABIN DOOR yellow caution annunciator light on the caution/advisory panel indicate the cabin door is not closed and locked. This circuit is protected by 5-ampere circuit breakers placarded ANN PWR and ANN IND, located on the overhead circuit breaker panel (fig. 2-27).

2-10. WINDOWS.

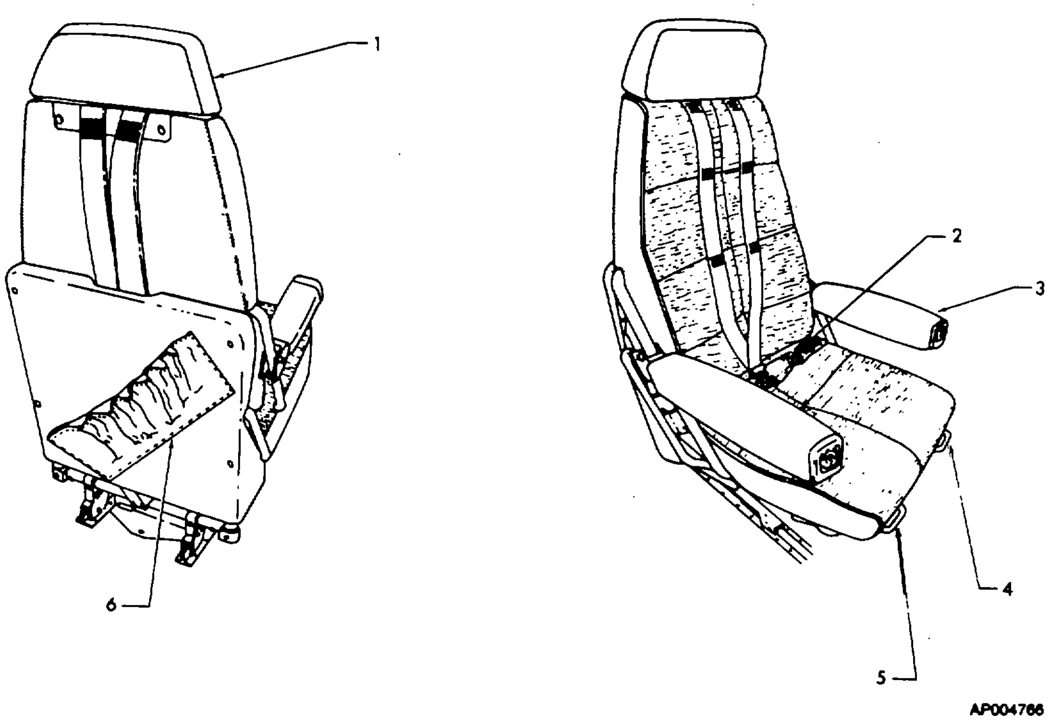
a. Cockpit Window. The pilot and copilot have side windows, a windshield and storm windows, which provide visibility from the cockpit. The storm windows may be opened on the ground or during unpressurized flight.

b. Cabin Window. The outer cabin windows are of two-ply construction, are the pressure type and are integral parts of the pressure vessel. All cabin windows are painted over except for the three windows located farthest aft on the right side, and the two farthest aft on the left side. The unpainted windows are provided with flaps which may be raised or lowered when it is desired to seal out light.

2-11. SEATS.

a. Pilot and Copilot Seats. The pilot and copilot seats (fig. 2-10) are separated from the cabin by movable curtains. 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 bottom 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 bottom 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.

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



1. ADJUSTABLE HEADREST
2. SEATBELT/SHOULDER HANRESS BUCKLE
3. MOVEABLE ARMREST
4. SEAT HEIGHT ADJUSTMENT (PILOT), FORE AND AFT ADJUSTMENT (COPILOT)
5. SEAT FORE AND AFT ADJUSTMENT (PILOT), HEIGHT ADJUSTMENT (COPILOT)
6. EXPANDABLE MAP POCKET

Figure 2-10. 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.

Four 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 on the left cabin sidewall, aft of the cabin door. They are of the monobromotrifluromethane (CF3Br) 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.

There are two different survival kits authorized for installation in the aircraft. Depending on the anticipated mission, either an overwater or overland kit may be installed.

2-16. SURVIVAL RADIOS.

Provisions are installed for installation of two AN/PRC-90 radio sets: one in the pocket behind the pilots seat, and one adjacent to the cabin entrance door. Each radio is equipped with a placard giving specific operating instructions.

Section III. ENGINES AND RELATED SYSTEMS

2-17. ENGINES.

The aircraft is powered by two .PT6A-41 turboprop engines (fig. 2-11).'The engine has a three stage axial, single stage centrifugal compressor, driven by a single stage reaction turbine. The power turbine, a two stage reaction turbine, counter-rotating with the compressor turbine, drives the output shaft. Both the compressor turbine and the power turbine are located in the approximate center of the engine with their shafts extending in opposite directions. 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 turbine then is routed through two exhaust ports near the front of the engine. A pneumatic fuel control system schedules fuel flow to maintain the 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, the oil pumps, the refrigerant compressor (right engine), the starter-generator, and the turbine tachometer transmitter. The reduction gearbox forward of the power turbine provides gearing for the propeller and drives the propeller tachometer transmitter, the propeller overspeed governor, and the propeller governor.

2-18. 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.

2-19. 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.

2-20. FOREIGN OBJECT DAMAGE CONTROL.

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

2-21. ENGINE ICE PROTECTION SYSTEMS.

a. Inertial Separator.

CAUTION

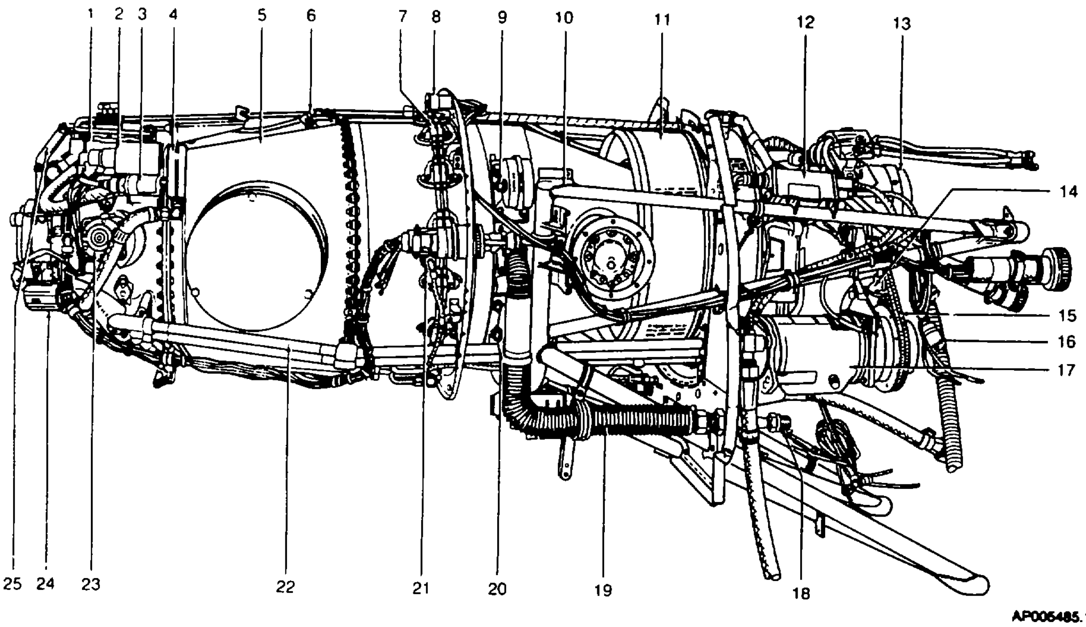
After the ice vanes have been manually extended, they may be mechanically actuated only. No electrical extension or retraction shall be attempted as damage to the actuator may result. Linkage in the nacelle area must be reset prior to operation of the electric system.

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 ICE VANE RETRACT EXTEND, located on the overhead control panel. A mechanical backup system is provided, and is actuated by pulling the T-handles just below the pilot's subpanel placarded ICE VANE No.1 ENG No.2 ENG. Decrease airspeed to 160 knots or less to reduce forces for manual extension. Normal airspeed may then be resumed.

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

(2) While in the icing flight mode, the extended position of the vane and bypass door is indicated by green annunciator lights, No.1 VANE EXT and No.2 VANE EXT.

(3) In the non-ice protection mode, the vane and bypass door are retracted out of the airstream by placing the ice vane switches in the RETRACT position. The green annunciator lights will extinguish. To assure adequate oil cooling, retraction should be accomplished at 15°C and



1. PRIMARY PROP GOVERNOR
2. TORQUE PRESSURE TRANSMITTER
3. TORQUE PRESSURE SWITCH
4. TORQUE PRESSURE MANIFOLD
5. EXHAUST DUCT
6. TGT TEMPERATURE PROBE
7. FUEL FLOW DIVIDER MANIFOLD
8. FIRE DETECTOR
9. ENGINE MOUNT BOLT
10. ENGINE MOUNT TRUSS ASSEMBLY
11. ENGINE AIR INTAKE SCREEN
12. IGNITION EXCITER
13. STARTER-GENERATOR
14. FUEL BOOST PUMP
15. AIR CONDITIONER COMPRESSOR DRIVE BELT (#2 ENGINE ONLY)
16. FIRE DETECTOR
17. AIR CONDITIONER COMPRESSOR (#2 ENGINE ONLY)
18. BLEED AIR ADAPTER
19. BLEED AIR LINE
20. ENGINE MOUNT
21. IGNITION EXCITER PLUG
22. OIL SCAVENGE TUBES
23. OVERSPEED GOVERNOR
24. PROP DEICE BRUSH BLOCK BRACKET
25. PROP REVERSE LINKAGE LEVER

Figure 2-11. PT6A-41 Engine (Sheet 1 of 2)

above. The vanes should be either extended or retracted; there are no intermediate positions.

(4) If for any reason the vane does not attain the selected position within 15 seconds, a yellow No.1 VANE FAIL or No.2 VANE FAIL light illuminates on the caution/advisory panel. In this event, the manual backup system should be used. When the vane is successfully positioned with the manual system, the yellow annunciator lights will extinguish. During manual system use, the electric motor switch position must match the manual handle position for a correct annunciator readout.

NOTE

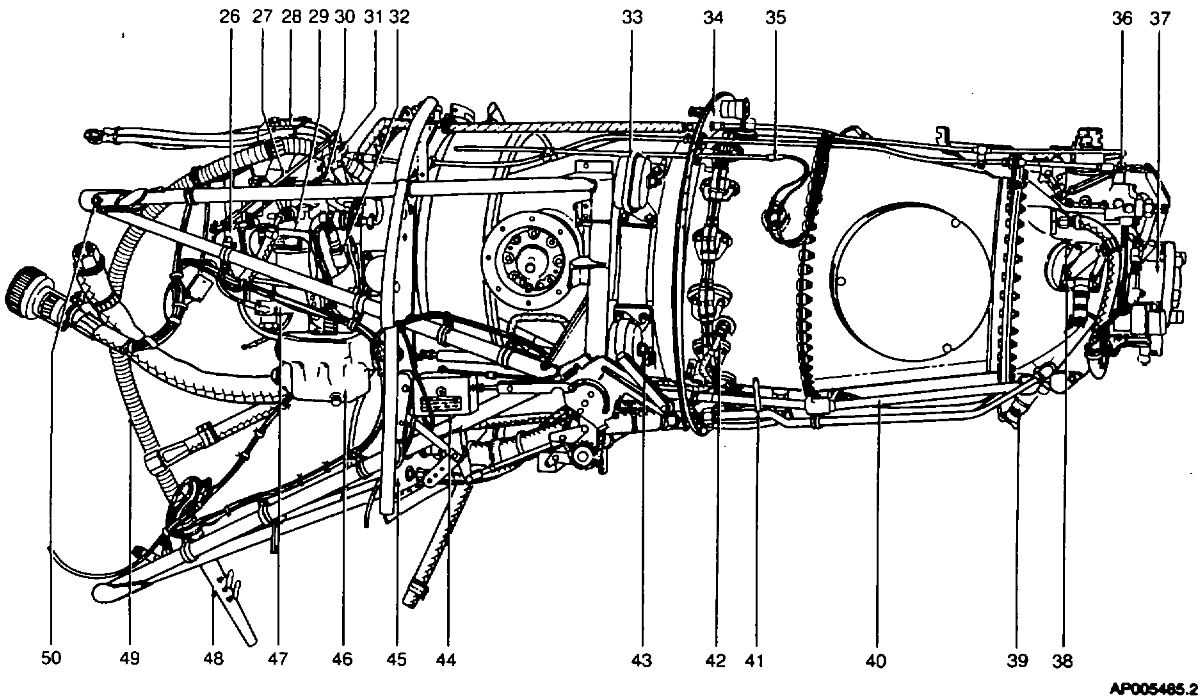
Ice vane extension is confirmed by a drop in torque, and a rise in TGT.

b. Engine Air Inlet Deice System.

(1) Description. Hot engine exhaust gas is utilized for heating the air inlet lips to prevent the formation of ice. Hot exhaust gas is picked up inside each engine exhaust stack and carried by plumbing to the inlet lip. The gas flows through the inside of the lip to the bottom where it is allowed to escape.

(2) Engine air inlet deice system switches. These switches are not used.

(3) Fuel heater. An oil-to-fuel heat exchanger, located on the engine accessory case,



26. FUEL CONTROL UNIT
27. FUEL CONTROL UNIT CONTROL ROD
28. STARTER GENERATOR LEADS
29. ENGINE DRIVEN FUEL PUMP
30. POWER CONTROL LEVER
31. PROP INTERCONNECT LINKAGE (AFT)
32. OIL PRESSURE TRANSDUCER
33. ENGINE MOUNT
34. FIRESHIELD
35. TRIM RESISTOR THERMOCOUPLE
36. PROP INTER CONNECT LINKAGE (FORE)
37. PROP SHAFT
38. TACH GENERATOR
39. CHIP DETECTOR
40. OIL PRESSURE TUBE
41. FIRE EXTINGUISHER LINE
42. IGNITION EXCITER PLUG
43. ENGINE MOUNT BOLT
44. ICE VANE ACTUATOR
45. ENGINE BAFFLE AND SEAL ASSY
46. FUEL/OIL HEATER
47. TACH-GENERATOR (AFT)
48. DRAIN MANIFOLD
49. OVERBOARD BREATHER TUBE
50. ENGINE TRUSS MOUNTING BOLT

Figure 2-11. P76A-41 Engine (Sheet 2 of 2)

operates continuously and automatically to heat the fuel sufficiently to prevent ice from collecting in the fuel control unit. Each fuel control unit is protected against ice. Fuel control heat is automatically turned on for all engine operations.

2-22. 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 and fourteen fuel nozzles.

b. Fuel Control Unit. One fuel control unit is mounted on the accessory case of each engine. This unit is a hydro-mechanical metering device which determines the proper fuel 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 compressor turbine (N1) speed. N1 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.

2-23. POWER LEVERS.

CAUTION

Moving the power levers into reverse range without the engines running may result in damage to the reverse linkage mechanism.

Two power levers are located on the control pedestal (fig. 2-8). These levers regulate power in the reverse, idle, and forward range, and operate so that forward movement increases engine power. Power control is accomplished through adjustment of the N1 speed governor in the fuel control unit. Power is increased when N1 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 reverse thrust. Placarding beside the lever travel slots reads POWER. Upper lever travel range is designated INCR (increase), supplemented by an arrow pointing forward. Lower travel range is marked IDLE, LIFT and REVERSE. A placard below the lever slots reads: CAUTION REVERSE ONLY WITH ENGINES RUNNING.

2-24. CONDITION LEVERS.

Two condition levers are located on the control pedestal (fig. 2-8). Each lever starts and stops the fuel supply, and controls the idle speed for its engine. The levers have three placarded positions: FUEL CUTOFF, LO IDLE, and HIGH IDLE. In the FUEL CUTOFF position, the condition lever controls the cutoff function of its engine-mounted fuel control unit. From LO 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 52 to 55% (at sea level) minimum N1 and HIGH IDLE position sets the rate to attain 70% minimum N1.The power lever for the corresponding engine can select N1 from the respective idle setting to maximum power. An increase in low idle N1 will be experienced at high field elevation.

2-25. FRICTION LOCK KNOBS.

Four friction lock knobs (fig. 2-8) are located on the control pedestal to adjust friction drag. One knob is below the propeller levers, one below the condition levers, and two under the power levers. When a knob is rotated clockwise, friction restraint is increased opposing movement of the affected lever as set by the pilot. Counterclockwise rotation of a knob will decrease friction drag thus permitting free and easy lever movement. Two FRICTION LOCK placards are located on the pedestal adjacent to the knobs.

2-26. ENGINE FIRE DETECTION SYSTEM.

a. Description. A flame surveillance system is installed on each engine to detect external engine fire and provide alarm to the pilot. Both nacelles are monitored, each having a control amplifier and three detectors. Electrical wiring connects all sensors and control amplifiers to DC power and to the cockpit visual alarm units. In each nacelle, one detector monitors the forward nacelle, a second monitors the upper accessory area, and a third the lower accessory area. Fire emits an infrared radiation that will be sensed by the detector which monitors the area of origin. Radiation exposure activates the relay circuit of a control amplifier which causes signal power to be sent to cockpit warning systems. An activated surveillance system will return to the standby state after the fire is out. The system includes a functional test switch and has circuit protection through the FIRE DETR circuit breaker. Warning of internal nacelle fire is provided as follows: the red MASTER WARNING lights on the glareshield illuminate accompanied by the illumination of a red warning light in the appropriate fire control T-handle placarded No.1 FIRE PULL or No.2 FIRE PULL (fig. 2-30). Fire detector circuits are protected by a single 5-ampere circuit breaker, placarded FIRE DETR, located on the overhead circuit breaker panel (fig. 2-27).

b. Fire Detection System Test Switch. One rotary switch placarded FIRE PROTECTION TEST on the copilot's subpanel is provided to test the engine fire detection system. Before checkout, battery power must be on and the FIRE DETR circuit breaker must be in. Switch position DETR 1, checks the area forward of the air intake of each nacelle, including circuits to the cockpit alarm and indication devices. Switch position DETR 2, checks the circuits for the upper accessory compartment of each nacelle. Switch position DETR 3, checks the circuits for the lower accessory compartment of each nacelle. Each numbered switch position will initiate the cockpit indications previously described.

c. Erroneous Fire Detection System Indications. During ground test of the engine fire detection system, an erroneous indication of system fault may be encountered if an engine cowling is not closed properly, or if the aircraft is headed toward a strong external light source. In this circumstance, change the aircraft heading to enable a valid system check.

2-27. ENGINE FIRE EXTINGUISHER SYSTEM.

a. Description. The fire extinguisher system utilizes an explosive squib, connected to a valve which, when opened, allows the distribution of the pressurized extinguishing agent through a plumbing network of spray nozzles strategically located in the fire zones of the engines.

b. Fire Pull Handles. The fire control T-handles, which are used to arm the extinguisher system are centrally located on the pilot's instrument panel (fig. 2-30), immediately below the glareshield. These controls receive power from the hot battery bus. The fire detection system will indicate an engine fire by illuminating the master fault warning annunciator on the pilot's and copilot's glareshield and the respective NO. 1 FIRE PULL or No. 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 fuel firewall shutoff valve for that particular engine. This will cause the red annunciator in the PUSH TO EXTINGUISH switch and the respective red No. 1 FUEL PRESS or No. 2 FUEL PRESS annunciator on the warning annunciator panel to illuminate. Pressing the lens of the PUSH TO EXTINGUISH switch (after lifting one side of its spring-loaded clear plastic guard) will fire the squib, expelling all the agent in the cylinder at one time. The respective yellow caution annunciator, No. 1 EXTGH DISCH or No. 2 EXTGH DISCH on the caution/advisory annunciator panel will illuminate and remain illuminated, until the squib is replaced.

c. Fire Extinguisher System Test Switch. A rotary test switch, placarded FIRE PROTECTION TEST, is located on the copilot's subpanel. The test functions, placarded EXTGH No.1 No.2, are arranged on the left side of the switch and provide a test of the pyrotechnic cartridge circuitry. During preflight, the pilot should rotate the test switch through the two positions and verify the illumination of the green SQUIB OK light on the PUSH TO EXTINGUISH switch and the corresponding yellow No.1 or No.2 EXTGH DISCH light on the caution/advisory annunciator panel.

d. Fire Extinguishing System Supply Cylinder Gages. A gage, calibrated in PSI, is mounted on each supply cylinder for determining the level of charge and should be checked during preflight (table 2-1).

2-28. OIL SUPPLY SYSTEM.

CAUTION

Maximum allowable oil consumption is one quart per 10 hours of engine operation.

a. The engine oil tank is integral with the airinlet 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 2.3 U.S. gallons. The total system capacity for each engine, which includes the oil tank, oil cooler, lines, etc., is 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 a heat exchanger unit (radiator) of fin-and-tube design. These exchanger units are the only airframe mounted part of the oil system and are attached to the nacelles below the engine air intake. Each heat exchanger incorporates a thermal bypass which assists in maintaining oil at the proper temperature range for engine operation.

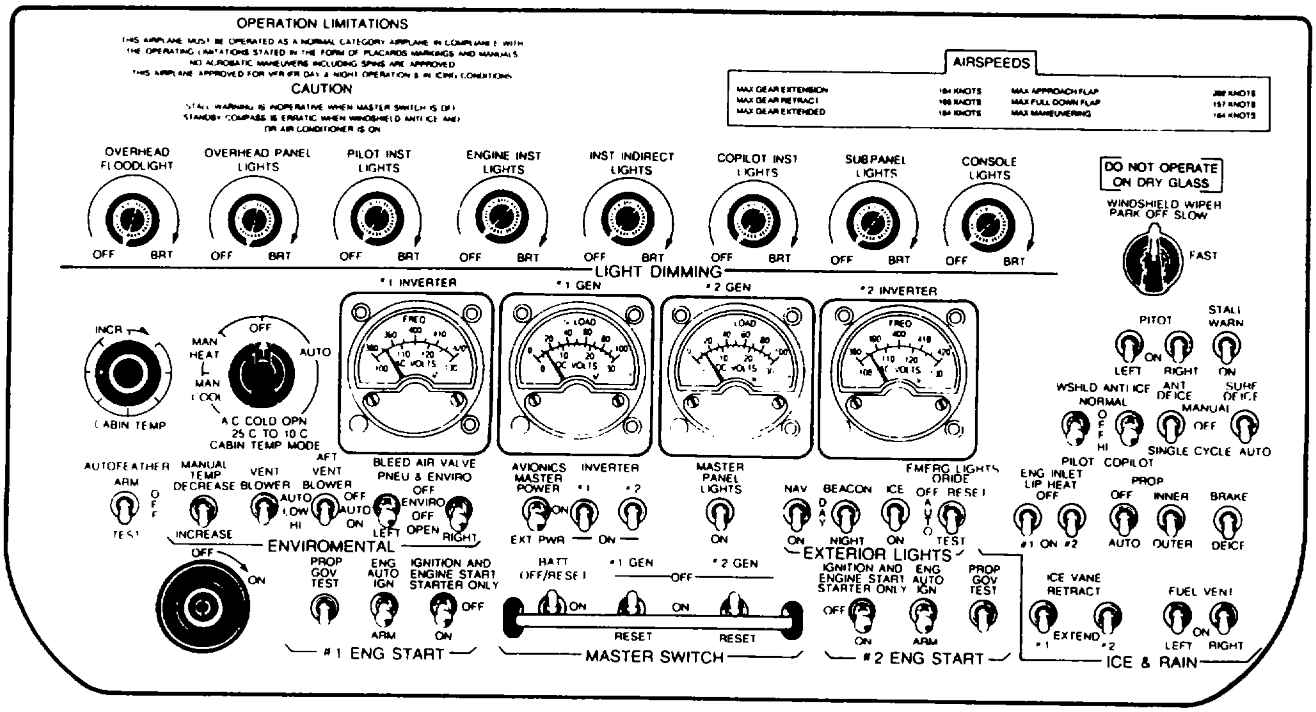


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Figure 2-12. Overhead Control Panel

2-29. ENGINE CHIP DETECTION SYSTEM.

A magnetic chip detector is installed in the bottom of each engine nose gearbox to warn the pilot of oil contamination and possible engine failure. The sensor is an electrically insulated gap immersed in the oil, functioning as a normally open switch. If a large metal chip or a mass of small particles bridge the detector gap, a circuit is completed, sending a signal to illuminate a red annunciator panel indicator light placarded No.1 CHIP DETR or No.2 CHIP DETR and the MASTER WARNING lights. Chip detector circuits are protected by two 5-ampere circuit breakers, placarded No.1 CHIP DETR and No.2 CHIP DETR on the overhead circuit breaker panel (fig. 2-27).

2-30. 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 ENG AUTO IGN switch. Placing an IGNITION AND ENGINE START switch to ON (forward) will cause the respective 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 Start Switches. Two three-position toggle switches, placarded IGNITION AND ENGINE START, are located on the overhead control panel (fig. 2-12). These switches will initiate starter motoring and ignition in the ON position, or will motor the engine in the STARTER ONLY position. The ON switch position completes the starter circuit for engine rotation, energizes the igniter plugs for fuel combustion, and activates the No.1 IGN ON or No.2 IGN ON light on the annunciator panel. In the center position the switch is OFF. Two 5ampere circuit breakers on the overhead circuit breaker panel, placarded IGNITOR CONTR No.1 and No.2, protect ignition circuits. Two 5-ampere circuit breakers on the overhead circuit breaker panel, placarded START CONTR No.1 and No.2, protect starter control circuits (fig. 2-27).

2-31. AUTOIGNITION SYSTEM.

If armed, the autoignition system automatically provides combustion re-ignition of either engine should accidental flameout occur. The system is not essential to normal engine opera tion, but is used to reduce the possibility of power loss due to icing or other conditions. Each engine has a separate autoignition control switch and a green indicator light placarded No.1 IGN ON or No.2 IGN ON, on the annunciator panel. Autoignition is accomplished-by energizing the two 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. Autoignition Switches. Two switches, located on the overhead control panel (fig. 2-12), placarded ENG AUTO IGN-ARM control the autoignition systems. The ARM position initiates a readiness mode for the autoignition system of the corresponding engine. The OFF position disarms the system. Each switch is protected by a corresponding START CONTR No.1 or No.2 5ampere circuit breaker on the overhead circuit breaker panel (fig. 2-27).

b. Autoignition Lights. If an armed autoignition system changes from a ready condition to an operating condition (energizing the igniter plugs in the engine) a corresponding green annunciator panel light will illuminate. The annunciator panel light is placarded No.1 IGN ON or No.2 IGN ON and indicates that the igniters are energized. The autoignition system is triggered from a ready condition to an operating condition when engine torque drops below approximately 20%. Therefore, when an autoignition 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 autoignition lights are protected by 5-ampere IGNITOR CONTR No.1 or No.2 circuit breakers, located on the overhead circuit breaker panel (fig. 2-27).

2-32. ENGINE STARTER-GENERATORS.

One starter-generator is mounted on each engine accessory drive section. Each is able to function either as a starter or as a generator. In the starter function, 24 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. An automatic starter cutoff control is installed in each starter-generator to provide automatic termination of the start cycle when engine speed reaches 44% NI. Engine speed is sensed by a magnetic sensor located in the starter-generator. For additional description of the starter-generator system, refer to Section IX.

2-33. ENGINE INSTRUMENTS.

The engine instruments are vertically mounted near the center of the instrument panel (fig. 230).

a. Turbine Gas Temperature Indicators. Two TGT gages on the instrument panel are calibrated in degrees Celsius (fig. 2-30). 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. Two torquemeters on the instrument panel indicate torque applied to the propeller shafts of the respective engines (fig. 2-30). Each gage shows torque in percent of maximum using 2 percent graduations and is actuated by an electrical signal from a pressure sensing system located in the respective propeller reduction gear case. Torquemeters are protected by individual. 0.5-ampere circuit breakers placarded TORQUE METER No.1 or No.2 on the overhead circuit breaker panel (fig. 2-27).

c. Turbine Tachometers. Two tachometers on the instrument panel register compressor turbine RPM (N1) for the respective engine (fig. 2-30). 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. Two gages on the instrument panel register oil pressure in PSI and oil temperature in °C (fig. 2-30). Oil pressure is taken from the delivery side of the main oil pressure pump. 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 transmitters installed on the respective engine. Both instruments are protected by 5-ampere circuit breakers, placarded OIL PRESS and OIL TEMP No.1 or No.2, on the overhead circuit breaker panel (fig. 2-27).

e. Fuel Flow Indicators. Two gages on the instrument panel (fig. 2-30) 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 0.5-ampere circuit breakers placarded FUEL FLOW No.1 or No.2, on the overhead circuit breaker panel (fig. 2-27).

Section IV. FUEL SYSTEMS

2-34. FUEL SUPPLY SYSTEM.

The engine fuel supply system (fig. 2-13) consists of two identical systems sharing a common fuel management panel (fig. 2-14) and fuel crossfeed plumbing (fig. 2-15). Each fuel system consists of five interconnected wing tanks, a nacelle tank, and an auxiliary inboard fuel tank. 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. Refer to Section IX for fuel grades and specifications. Fuel tank capacity is shown in table 2-2. Gravity feed fuel flow is shown in figure 2-16.

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 No.1 or No.2 FUEL PRESS warning annunciator lights and the simultaneous illumination of both MASTER WARNING lights. Refer to Chapter 9. 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 opposite 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 No.1 or No.2, located the overhead circuit breaker panel (fig. 2-27), and four 5-ampere circuit breakers (2 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 second time delay to avoid 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 10 second time delay provided to prevent cycling of the motive flow valve due to sloshing fuel. In the event of a failure of the motive flow valve or the associated control circuitry, the loss of motive flow pressure when there is still fuel remaining in the auxiliary fuel tank is sensed by a pressure switch and float switch, respectively, which illuminates a caution annunciator placarded No. 1 NO FUEL XFR or No. 2 NO FUEL XFR. During engine start, the pilot should note that the NO FUEL XFR annunciators extinguish 30 to 50 seconds after engine start. The NO FUEL XFR annunciators 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 on the fuel

Table 2-2. Fuel Quantity Data

	TANKS	NUMBER	GALLONS	**POUNDS
LEFT ENGINE	Wing Tanks Nacelle Tank Auxiliary Tank	5 1 1	135 57 79	877.5 370.5 513.5
RIGHT ENGINE	Wing Tanks Nacelle Tank Auxiliary Tank	5 1 1	135 57 79	877.5 370.5 513.5
	*TOTALS	14	542	3523.0

* Unusable fuel quantity and weight (4 gallons, 26 pounds not included in totals).

** Fuel weight is based on standard day conditions at 6.5 pounds per U.S. gallon.
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management panel to the OVERRIDE position. This will energize the transfer control motive flow valve. The transfer systems are protected by. 5ampere circuit breakers placarded AUXILIARY TRANSFER No. 1 or No. 2, located on the overhead circuit breaker panel (fig. 2-27).

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 system is measured by a capacitance type fuel gaging system. Two fuel gages, one for the left and one for the right fuel system, indicate the fuel quantity in pounds. Refer to Section IX for fuel capacities and weights. 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, yellow No. 1 NAC LOW or No. 2 NAC LOW annunciators on the caution/advisory annunciator panel illuminate when there is approximately 20 minutes of fuel per engine remaining (on standard day, lat sea level, maximum cruise power consumption rate). The fuel gaging system is protected by individual 5-ampere circuit breakers placarded QTY IND and QTY WARN No. I or No. 2 located on the overhead circuit breaker panel (fig. 2-27). A mechanical spiral float gage 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 tank cover, adjacent to the filler neck (fig. 2-17). A small sight window in the upper wing skin permits observation of the gage.

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

(1) Fuel gaging system control switch. A switch on the fuel management panel (fig. 2-14) 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 on the fuel management panel (fig. 2-14) control a submerged fuel pump located in the corresponding nacelle tank. During normal aircraft operation both switches are off so long as the engine-driven boost pumps function and during crossfeed operation. The loss of fuel

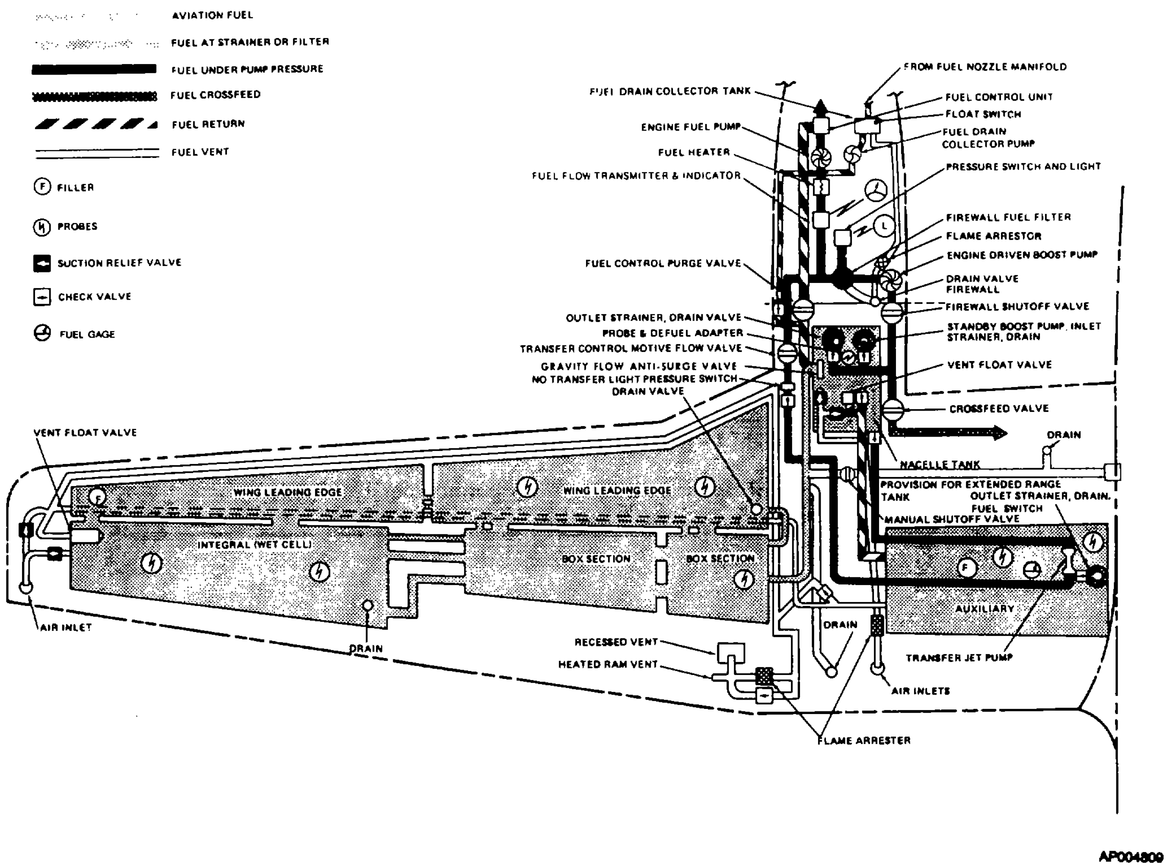


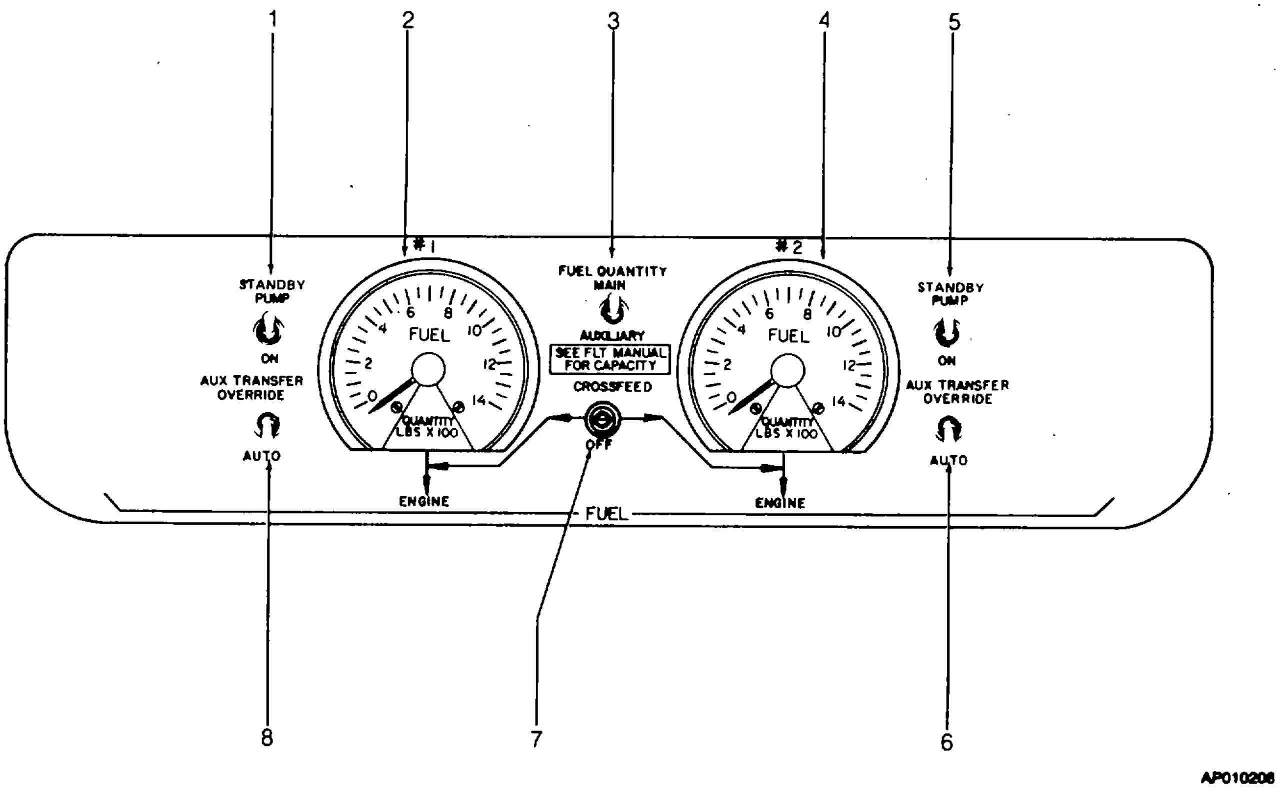
Figure 2-13. Fuel System Schematic

pressure, due to failure of an engine driven boost pump will illuminate the MASTER WARNING lights on the glareshield and will illuminate the No. 1 FUEL PRESS or No.2 FUEL PRESS on the warning annunciator panel. Turning ON the STANDBY PUMP will extinguish the FUEL PRESS lights. The MASTER WARNING lights must be manually cleared.

NOTE
Both standby pump switches shall

(3) Fuel transfer control switches. Two switches on the fuel management panel (fig. 214), placarded AUX TRANSFER OVERRIDE AUTO 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 two illuminated MASTER CAUTION lights on the glareshield and a steadily illuminated yellow No.1 NO FUEL XFR or No.2 NO FUEL XFR light on the caution annunciator panel.

(4) Fuel crossfeed switch. The fuel crossfeed valve is controlled by a 3-position switch (fig. 2-14), located on 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



1. STANDBY FUEL PUMP SWITCH (#1 ENGINE)
2. FUEL QUANTITY INDICATOR (#1 ENGINE)
3. FUEL QUANTITY SYSTEM CONTROL SWITCH
4. FUEL QUANTITY INDICATOR (#2 ENGINE)
5. STANDBY FUEL PUMP SWITCH (#2 ENGINE)
6. AUXILIARY FUEL TRANSFER PUMP OVERRIDE SWITCH (#2 ENGINE)
7. CROSSFEED VALVE SWITCH
8. AUXILIARY FUEL TRANSFER PUMP OVERRIDE SWITCH (#1 ENGINE)

Figure 2-14. Fuel Management Panel

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 CROSS-FEED light 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 on the overhead circuit breaker panel (fig. 2-27).

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 highpressure 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.

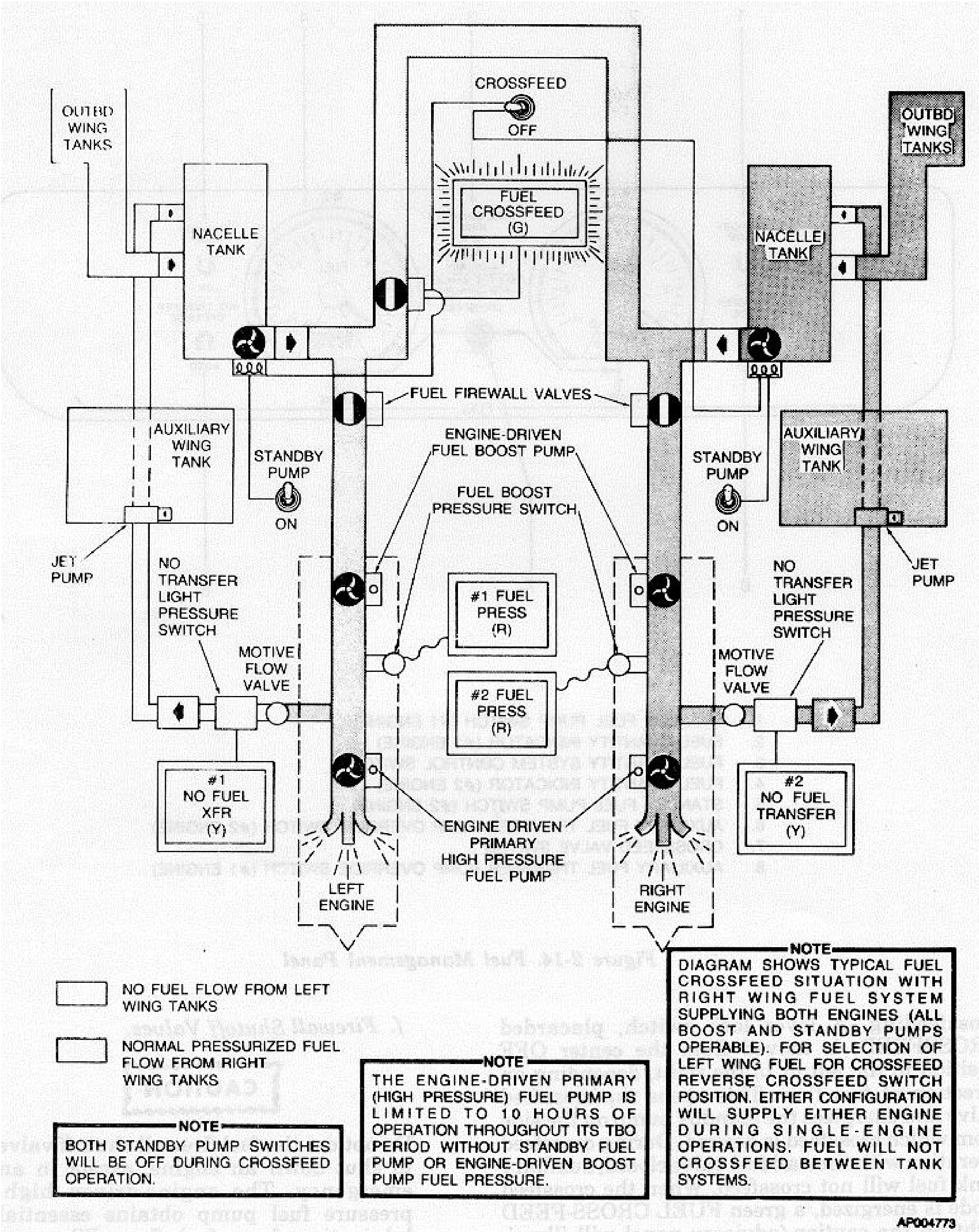


Figure 2-15. Crossfeed Fuel Flow

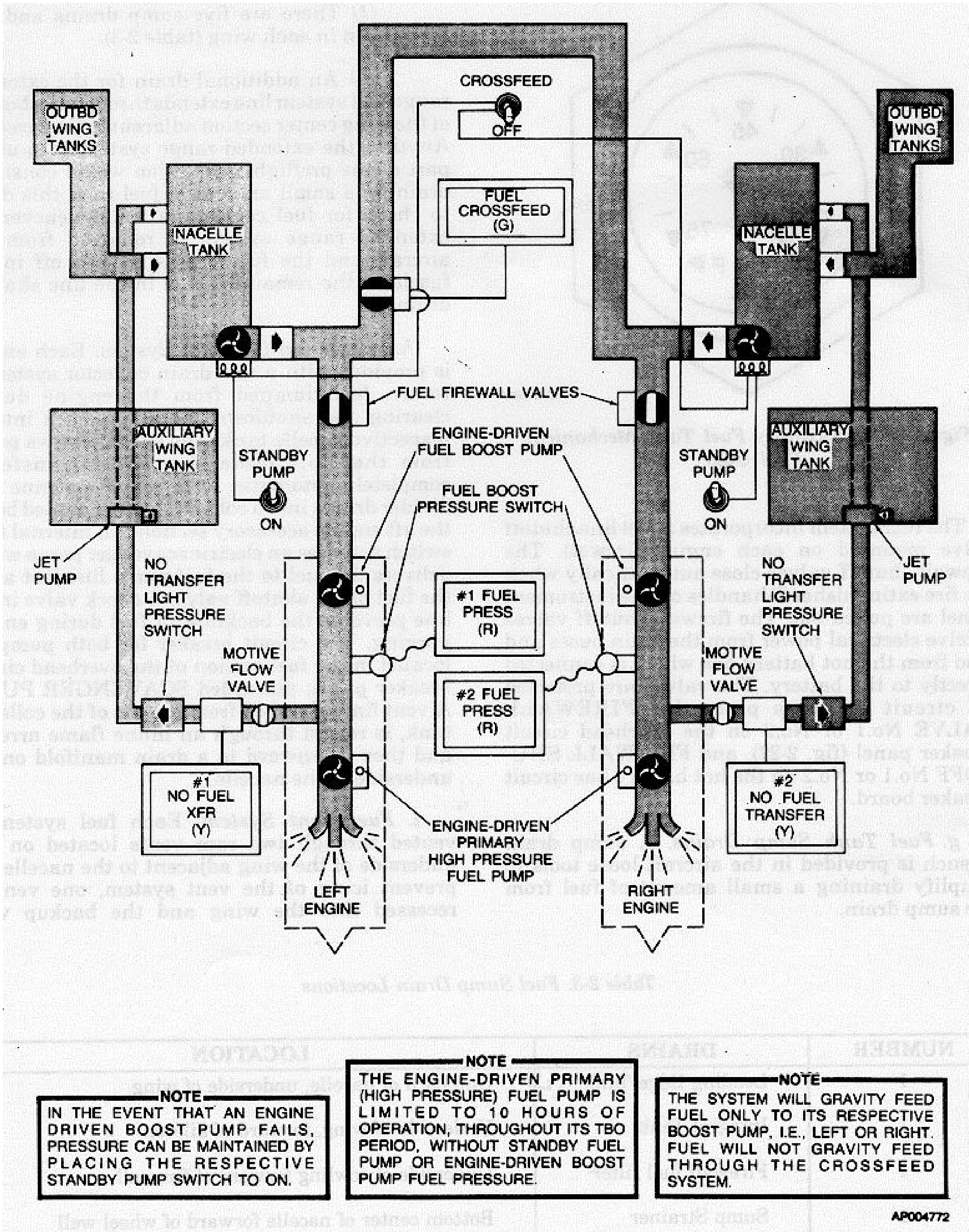


Figure 2-16. Gravity Feed Fuel Flow

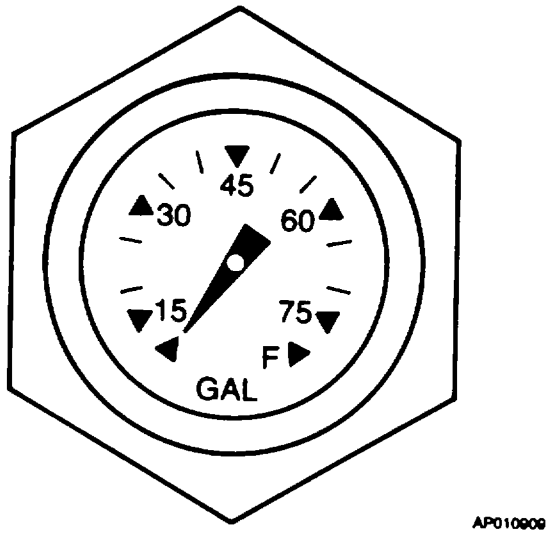


Figure 2-17. Auxiliary Fuel Tank Mechanical Fuel Gage

The fuel system incorporates a fuel line shutoff valve mounted on each engine firewall. The firewall shutoff valves close automatically 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 circuit breakers placarded FIREWALL VALVE No.1 or No.2 on the overhead circuit breaker panel (fig. 2-27), and FIREWALL SHUTOFF No.1 or No.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. Anytime 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 Drain Collector System. Each engine is provided with a fuel drain collector system to return fuel dumped from the engine during clearing and shutdown operations back into its respective nacelle tank. The system draws power from the No.4 feeder bus. Fuel transfer is completely automatic. Fuel from the engine flow divider drains into a collector tank mounted below the aft engine accessory section. An internal float switch actuates an electric scavenger pump which delivers the fuel to the fuel purge line just aft of the fuel purge shutoff valve. A check valve in the line prevents the backflow of fuel during engine purging. The circuit breaker for both pumps is located in the fuel section of the overhead circuit breaker panel; placarded SCAVENGER PUMP. A vent line, plumbed from the top of the collector tank, is routed through an inline flame arrestor and then downward to a drain manifold on the underside of the nacelle.

i. Fuel Vent System. Each fuel system is vented through two ram vents located on the underside of the wing adjacent to the nacelle. To prevent icing of the vent system, one vent is recessed into the wing and the backup vent

Table 2-3. Fuel Sump Drain Locations

NUMBER	DRAIN	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

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 K engine oil-to-fuel heat exchanger, located on each engine accessory case, operates continuously and automatically to heat the fuel delivered to the engine sufficiently to prevent the freezing of any water which it might contain. The temperature of the delivered fuel is thermostatically regulated to remain between 21°C and 32°C.

2-35. 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. 2-16). 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. A triple failure, which is highly unlikely, would result in the engine driven primary pump operating without inlet head pressure. Should this situation occur, the affected engine can continue to operate from its own fuel supply on its engine-driven primary high-pressure fuel pump.

2-36. FERRY FUEL SYSTEM.

Provisions are installed for connection to long range fuel cells.

Section V. FLIGHT CONTROLS

2-37. DESCRIPTION.

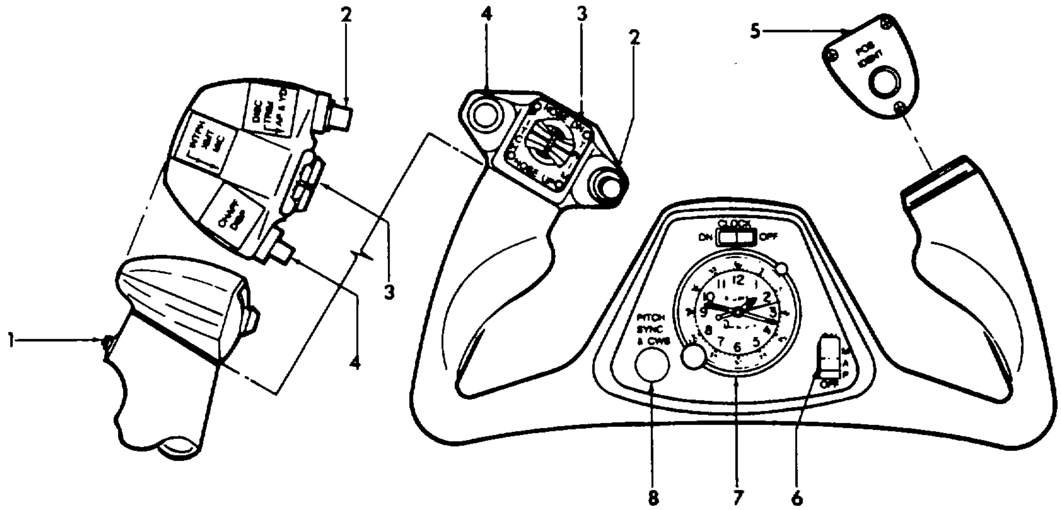
The aircraft's primary flight control systems consist of conventional rudder, elevator and aileron control surfaces. These surfaces are manually operated from the cockpit through mechanical linkage using a control wheel for the ailerons and elevators, and adjustable rudder/ brake pedals for the rudder. Both the pilot and copilot have flight controls. Trim control 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, and rudder. Chapter 3 describes the operation of the autopilot system.

2-38. CONTROL WHEELS

Elevator and aileron control surfaces are operated by manually actuating either the pilot's or copilot's control wheel. Switches are installed in the outboard grip of each wheel to operate the elevator trim tabs. A microphone switch, a chaff dispense switch, and an autopilot/yaw damp/ electric trim disconnect switch are also installed in the outboard grip of each wheel. A transponder ident switch is installed on top of the inboard grip of each control wheel. These control wheels (fig. 2-18) are installed on each side of the instrument subpanel. A manually wound 8-day clock is installed in the center of the pilot's control wheel, and a digital electric clock is installed in the center of the copilot's control wheel. A map light switch, and a pitch synchronization and control wheel steering switch are mounted adjacent to the clock in each control wheel.

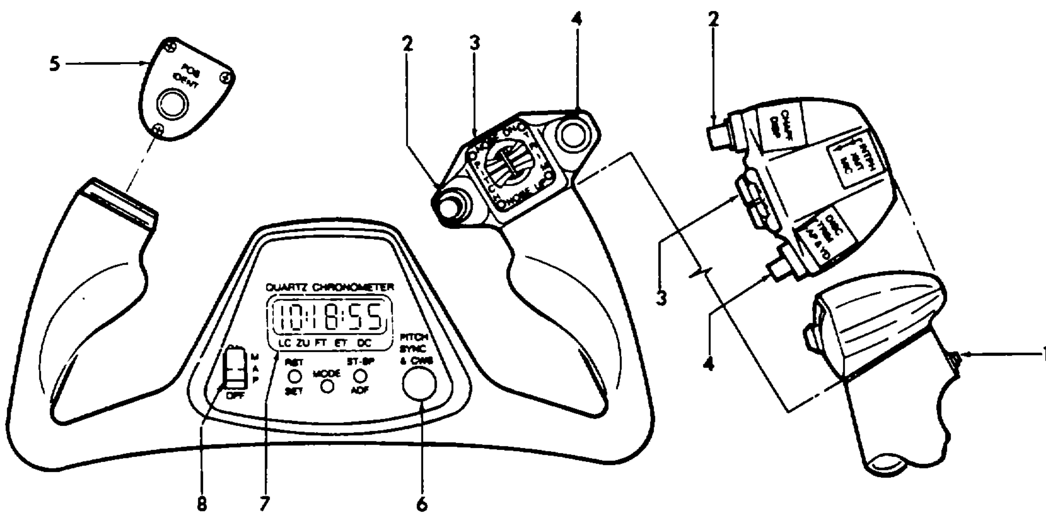
2-39. RUDDER SYSTEM.

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.



PILOT

1. MICROPHONE, INTERCOM, TRANSMIT SWITCH
2. TRIM, AUTOPILOT, YAW DAMP DISCONNECT SWITCH
3. PITCH-TRIM SWITCHES
4. CHAFF DISPENSE SWITCH
5. TRANSPONDER IDENT SWITCH
6. MAP LIGHT
7. EIGHT DAY CLOCK
8. PITCH SYNCHRONIZATION AND CONTROL WHEEL STEERING SWITCH



COPILOT

1. MICROPHONE, INTERCOM, TRANSMIT SWITCH
2. CHAFF DISPENSE SWITCH
3. PITCH-TRIM SWITCHES
4. TRIM, AUTOPILOT, YAW DAMP DISCONNECT SWITCH
5. TRANSPONDER IDENT SWITCH
6. PITCH SYNCHRONIZATION AND CONTROL WHEEL STEERING SWITCH
7. DIGITAL CLOCK
8. MAP LIGHT

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Figure 2-18. Control Wheels

b. Yaw Damp System. A yaw damp system is provided to aid the pilot in maintaining 'directional stability and increase ride comfort. The system may be used at any altitude and 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 adjacent to the ELEV TRIM switch on the pedestal extension.

c. Rudder Boost System. A rudder boost system is provided to aid the pilot in maintaining directional control resulting from an engine failure or a large variation of power between the engines. Incorporated in the rudder cable system are two pneumatic rudder boosting servos which actuate the cables to provide rudder pressure to help compensate for asymmetrical thrust.

(1) During operation, a differential pressure valve accepts bleed air pressure from each engine. When the pressure varies between the bleed air systems, the shuttle in the differential pressure valve moves toward the low pressure side. As the pressure difference reaches a preset tolerance, a switch closes on the low pressure side which activates the rudder boost system. This system is designed only to help compensate for asymmetrical thrust. Appropriate trimming is to be accomplished by the pilot.. Moving either or both of the bleed air valve switches on the overhead control panel to PNEU & ENVIRO OFF position will disengage the rudder boost system.

NOTE

Condition levers must be in LOW IDLE position to perform rudder boost check.

(2) The system is controlled by a switch located on the extended pedestal placarded RUDDER BOOST ON OFF (fig. 2-8), and is to be turned on before flight. A preflight check of the system can be performed during the run-up by retarding the power on one engine to idle and advancing power on the opposite engine until the power difference between the engines is great enough to activate the switch to turn on the rudder boost system. Movement of the appropriate rudder pedal (left engine idling, right rudder pedal moves forward) will be noted when the switch closes, indicating the system is functioning properly for low engine power on that side. Repeat the check with opposite power settings to check for movement of the opposite rudder pedal. The system is protected by a 5-ampere circuit breaker, placarded RUDDER BOOST, located on the overhead circuit breaker panel (fig. 2-27).

NOTE

With brake de-ice on, rudder boost may be inoperative.

2-40. FLIGHT CONTROLS LOCK.

CAUTION

Remove control locks before towing the aircraft or starting engines. Serious damage 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. 2-19) 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, thus locking the control wheel. 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.

2-41. TRIM TABS.

Trim tabs are provided for all flight control surfaces. These tabs are manually activated, and are mechanically controlled by a cable-drum and jack-screw 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.

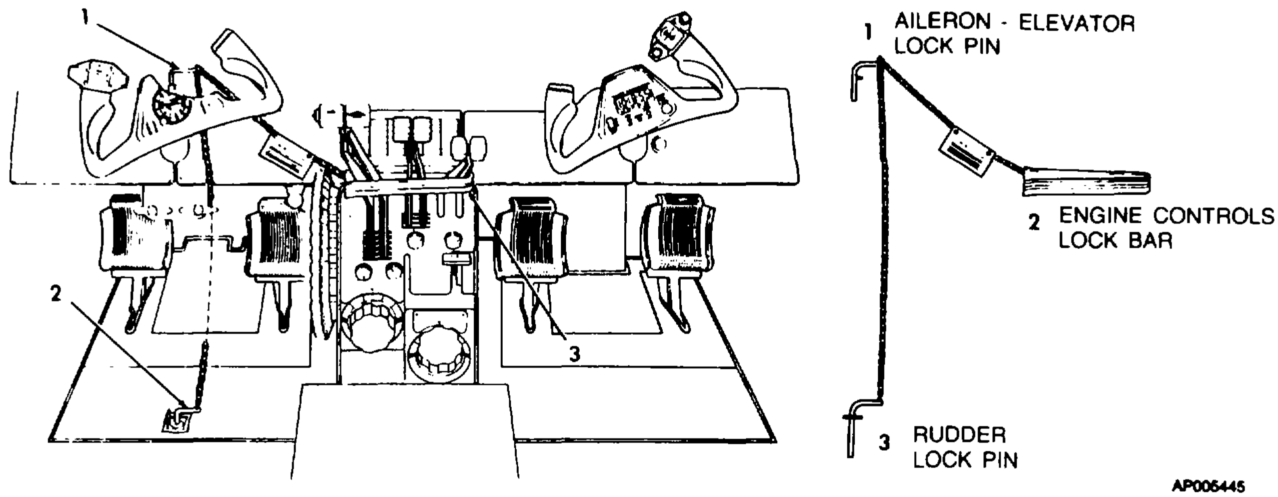

Figure 2-19. Control Locks

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. 2-8). The amount of elevator tab deflection, in degrees 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 PUSH ON PUSH OFF switch located on the pedestal, dual element thumb switches on the control wheels, a trim disconnect switch on each control wheel and a circuit breaker on the overhead circuit breaker panel. The PUSH ON PUSH OFF switch must be in the 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 cancelled by activation of the pilot's switch. Operating the pilot's and copilot's switches in opposing directions simultaneously results in no trim action. 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, pushbutton, 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 pressing the ON OFF switch on the pedestal to ON again.

c. Aileron Trim Tab Control. The aileron trim tab control, placarded AILERON TAB LEFT, RIGHT, is on the control pedestal and will adjust the left aileron trim tab only (fig. 2-8). The amount of aileron tab deflection, from a neutral setting, as indicted by a position arrow, is relative only and is not in degrees. Full travel of the tab control moves the trim tab 7-1/2 degrees up and down.

d. Rudder Trim Tab Control. The rudder trim tab control knob, placarded RUDDER TAB LEFT, RIGHT, is on the control pedestal, and controls adjustment of the rudder trim tab (fig. 2-8). The amount of rudder tab deflection, in degrees from a neutral setting, is indicated by a position arrow.

2-42. WING FLAPS.

The all-metal 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 movement is indicated in percent of travel by a flap position indicator on the forward control pedestal. Full flap extension and retraction time is approximately 11 seconds. The flap control switch is located on 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 on the overhead circuit breaker panel (fig. 2-27).

a. Wing Flap Control Switch. Flap operation is controlled by a three-position switch with a flapshaped handle on the control pedestal (fig. 2-8). The handle of this switch is placarded FLAP and switch positions are placarded: FLAP UP, APPROACH, and DOWN. The amount of downward extension of the flaps is established by position of the flap switch, and is as follows: UP 0%, APPROACH 40%, and DOWN 100%. Limit switches, mounted on the right inboard flap, control flap travel. The flap control switch, limit switch, and relay circuits are protected by a 5ampere circuit breaker, placarded FLAP CONTR located on the overhead circuit breaker panel (fig. 2-27). Flap positions between UP and APPROACH cannot be selected. For intermediate flap positions between APPROACH and DOWN, The APPROACH position acts as an off position. To return the flaps to any position between full DOWN and APPROACH, place the flap switch to UP and when desired flap position is obtained, return the switch to the APPROACH detent. 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 on the control pedestal (fig. 2-6). The approach and full down or extended flap position is 14 and 34 degrees, respectively. The flap position indicator is protected by a 5ampere circuit breaker, placarded FLAP CONTR, located on the overhead circuit breaker panel (fig. 2-27).

Section VI. PROPELLERS

2-43. DESCRIPTION.

A three-blade aluminum propeller is installed on each engine. The propeller is of the full feathering, constant speed, 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. Beta and reverse blade angles are controlled by the power levers in the beta and reverse range.

2-44. 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. An 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 ARM OFF TEST, the completion of the arming phase occurs when both power levers are advanced above 90% N1 at which time both indicator lights on the caution/ advisory annunciator panel indicate a fully armed system. The annunciator panel lights are green and are placarded No.1 AUTOFEATHER (left engine) and No.2 AUTOFEATHER (right engine). The system will remain inoperative as long as either power lever is retarded below 90% N1 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 and 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 16 21%, the autofeather system for the opposite engine will be disarmed. Disarming is confirmed when the No.1 AUTOFEATHER or No.2 AUTOFEATHER annunciator light of the opposite engine becomes extinguished. If torque drops further, to a reading between 9 and 14%, 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 No.1 AUTOFEATHER or No.2 AUTOFEATHER annunciator light of the feathered propeller to extinguish. At this time, both the No.1 AUTOFEATHER and No.2 AUTOFEATHER lights are extinguished, the propeller of the defective engine has feathered, and the propeller of the operative engine has been disarmed from the autofeathering capability. Only manual feathering control remains for the second propeller.

b. Propeller Autofeather Switch. Autofeathering is controlled by an AUTOFEATHER switch on the overhead control panel (fig. 2-12). The three-position switch is placarded ARM, OFF and TEST, and is spring loaded from TEST to OFF. The ARM position is used only during takeoff and landing. The TEST position of the switch, enables the pilot to check readiness of the autofeather systems, below 88% to 92% N1, and is for ground checkout purposes only.

c. Autofeather Lights. Two green lights on the caution/advisory annunciator panel, placarded AUTOFEATHER No.1 and AUTOFEATHER No.2. When illuminated, the lights indicate that the autofeather system is armed. Both lights will be extinguished if either propeller has been autofeathered 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 on the overhead circuit breaker panel (fig. 2-27).

2-45. 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 operates the propeller by means of this governor. If the constant speed governor should malfunction and request more than 2000 RPM, the overspeed governor cuts in at 2080 RPM and dumps oil from the propeller to keep the RPM from exceeding approximately 2080 RPM. A solenoid, actuated by the PROP GOV TEST switch located on the overhead control panel (fig. 2-12), is provided for resetting the overspeed governor to approximately 1830 to 1910 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 over speed condition, the power turbine governor, contained within the constant speed governor housing, acts as a fuel topping governor. When the propeller reaches 2120 RPM, the fuel topping governor will limit fuel flow to the gas generator, thereby keeping the propeller below 2120 RPM. During operation in the reverse range, the power turbine governor is reset to approximately 95% of the propeller RPM be< fore the propeller reaches a negative pitch angle. This insures 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 therefor, will always sense an underspeed condition and direct oil pressure to the propeller servo piston to permit propeller operation in beta and reverse ranges.

2-46. PROPELLER TEST SWITCHES.

Two two-position switches on the overhead control panel . 2-12), are provided for operational testing of the propeller systems. Placarding above the switches reads PROP GOV TEST. Each switch controls test circuits for the corresponding propeller. In the test position, the switches are used to test the function of the corresponding overspeed governor. Refer to Chapter 8, for test procedure. Propeller test circuits are protected by one 5-ampere circuit breaker placarded PROP GOV located on the overhead circuit breaker panel (fig. 2-27).

2-47. PROPELLER SYNCHROPHASER.

a. Operation. The propeller synchrophaser automatically matches the RPM of the right propeller (slave propeller) to that of the left propeller (master propeller) and maintains the blades of one propeller at a predetermined relative position with the blades of the other propeller. To prevent the right propeller from losing excessive RPM if the left propeller is feathered while the synchrophaser is on, the synchrophaser has a limited range of control from the manual governor setting. Normal governor operation is unchanged but the synchrophaser will continuously monitor propeller RPM and reset the governor as required. A magnetic pickup mounted in each propeller overspeed governor and adjacent to each propeller deice brush block transmits electric pulses to a transistorized control box installed forward of the pedestal. The right propeller RPM and phase will automatically be -adjusted to correspond to the left. To change RPM, adjust both propeller controls at the same time. This will keep the right governor setting within the limiting range of the left propeller. If the synchrophaser is on but is unable to adjust to the right propeller to match the left, the actuator has reached the end of its travel. To recenter, turn the switch off, synchronize the propellers manually, and turn the switch back on.

b. Control Box. The control box converts any pulse rate differences into correction commands, which are transmitted to a stepping type actuator motor mounted on the right engine cowl forward support ring. The motor then trims the right propeller governor through a flexible shaft and trimmer assembly to exactly match the left propeller. The trimmer, installed between the governor control arm and the control cable, screws in or out to adjust the governor while leaving the control lever setting constant. A toggle switch installed adjacent to the synchrophaser turns the system on. With the switch off, the actuator automatically runs to the center of its range of travel before stopping to assure normal function when used again. To operate the system, synchronize the propeller in the normal manner and turn the synchrophaser on. The system is designed for in-flight operations and is placarded to be off for take-off and landing. Therefore, with the system on and the landing gear extended, the master caution lights will illuminate and a yellow light on the caution/advisory annunciator panel, PROP SYNC ON, will illuminate.

c. Synchroscope. The propeller synchroscope, provides an indication of synchronization of the propellers. If the right propeller is operating at a higher RPM than the left, the face of the synchroscope, 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 propellers. The system is protected by a 5-ampere circuit breaker placarded PROP SYNC, located on the overhead circuit breaker panel (fig. 2-27).

2-48. PROPELLER LEVERS.

Two propeller levers on the control pedestal (fig. 2-8), placarded PROP, are used to regulate propeller speeds. Each lever controls a primary governor, which acts to regulate propeller speeds within the normal operation range. The full forward position of the levers is placarded TAKEOFF, LANDING AND REVERSE and also 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 2,000 depending upon power lever position. As a lever is moved aft, passing through the propeller governing range, but stopping at the feathering detent, propeller RPM will correspondingly decrease to the lowest limit. 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 into reverse range without the engine running. Damage to the reverse linkage mechanisms will occur.

CAUTION

Propeller reversing on unimproved surfaces should be accomplished carefully to prevent propeller erosion from reversed airflow and, in dusty conditions, to prevent obscuring the operator's vision.

CAUTION

To prevent an assymetrical thrust condition, propeller levers must be in HIGH RPM position prior to propeller reversing.

The propeller blade angle may be reversed to shorten landing roll. To reverse, propeller levers must be positioned at HIGH RPM (full forward), and the power levers are lifted up to pass over the IDLE detent, then pulled aft into REVERSE setting. One yellow caution light, placarded REV NOT READY, on the caution/advisory annunciator panel, alerts the pilot not to reverse the propellers. This light illuminates only when the landing gear handle is down, and if propeller levers are not at HIGH RPM (full forward). This circuit is protected by a 5-ampere circuit breaker, placarded LANDING GEAR RELAY, located on the overhead circuit breaker panel (fig. 2-27).

2-50. PROPELLER TACHOMETERS.

Two tachometers on the instrument panel register propeller speed in hundreds of RPM (fig. 2-30). 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 air, copilot air - IN.
2. Cabin air and defrost air controls - Out
3. Cabin temperature mode selector 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) may be controlled manually by manipulating the CABIN TEMP MODE control switch between the OFF and MAN HEAT positions. This control is located on the overhead control panel (fig. 2-12).

2-52. SURFACE DEICING SYSTEM.

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

CAUTION

Operation of the surface de-ice system in ambient temperatures below -40°C can cause permanent damage to the de-ice boots.

b. Operation.

(1) De-ice 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 three position switch on the overhead control panel placarded SURF DEICE MANUAL OFF SINGLE CYCLE AUTO, 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 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 deicer system. Check valves in the bleed air and vacuum lines prevent backflow through the system during single-engine operation. Regulated pressure is indicated on a gage, placarded PNEUMATIC PRESSURE, located on the copilots subpanel.

2-53. ANTENNA DEICING SYSTEM.

a. Description. The antenna de-ice system removes ice accumulation from the dipole antennas. Pressure regulated bleed air from the engines supplies pressure to inflate 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 a distributor valve.

b. Antenna De-ice System Switch. The antenna de-ice system is controlled by a switch placarded ANT DEICE, SINGLE OFF MANUAL located on the overhead control panel (fig. 2-12). The switch is spring loaded to return to the OFF position from the SINGLE or MANUAL position. When the switch is set to the single position, the system will -,run through one, timed 6 second 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. Operation.

(1) De-ice 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 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.

2-54. PROPELLER ELECTROTHERMAL ANTI-ICE SYSTEM.

a. Description. Electrothermal anti-ice boots are cemented to each propeller blade to prevent ice formation or to remove the ice from the propellers. Each thermal boot consists of one outboard and one inboard heating element, and receives electrical power from the de-ice timer. This timer sends current to all propeller de-ice boots and prevents the boots from overheating by limiting the time each element is energized. Four intervals of approximately 30 seconds each complete one cycle. Current consumption is monitored by a propeller ammeter on the copilot's subpanel. Two 20-ampere circuit breakers placarded PROP ANTI-ICE LEFT and RIGHT and 5-ampere propeller control circuit breaker placarded CONTR on the overhead circuit breaker panel (fig. 2-27), protect the propeller electrothermal de-ice system during manual operation. A 25 ampere circuit breaker placarded PROP AUTO, protects the system in automatic operation.

b. Automatic Operation. A control switch on the overhead control panel placarded PROP OFF AUTO is provided to activate the automatic system. A deice ammeter above the pedestal registers the amount of current (14 to 18 amperes) passing through the system being used. During AUTO operation, power to the timer will be cut off if the current rises above 25 amperes. Current flows from the timer to the brush assembly and then to the slip rings installed on the spinner backing plate. The slip rings carry the current to the deice boots on the propeller blades. Heat from the boots reduces the grip of the ice which is then thrown off by centrifugal force, aided by the air blast over the propeller surfaces. Power to the two heating elements on each blade, the inner and outer element, is cycled by the timer in the following sequence: right propeller outer element, right propeller inner element, left propeller outer element, left propeller inner element. Loss of one heating element circuit on one side does not mean that the entire system must be turned off. Proper operation can be checked by noting the correct level of current usage on the ammeter. An intermittent flicker of the needle approximately each 30 seconds indicates switching to the next group of heating elements by the timer.

c. Manual Operation. The manual propeller de-ice system is provided as a backup to the automatic system. A control switch located on the overhead control panel, placarded PROP INNER OUTER, controls the manual override relays. When the switch is in the OUTER position, the automatic timer is overridden and power is supplied to the outer heating elements of both propellers simultaneously. The switch is of the momentary type and must be held in position until the ice has been dislodged from the propeller surface. After deicing with the outer elements, the switch is to be held in the INNER position to perform the same function for the inner elements of both propellers. The loadmeters will indicate approximately a 5% increase of load per meter when manual propeller de-ice is operating. The propeller de-ice ammeter will not indicate any load in the manual mode of operation.

2-55. PITOT AND STALL WARNING HEAT SYSTEM.

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.

a. Pitot Heat. 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 on the overhead control panel (fig. 2-12). It is not advisable to operate the pitot heat system on the ground except for testing, or for short intervals of time to remove ice or snow from the mast. Circuit protection is provided by two 7 1/2 ampere circuit breakers, placarded PITOT HEAT, on the overhead circuit breaker panel (fig. 2-27). The INS true air speed probe (air data probe) heat control circuit is also protected by this circuit breaker. If either left or right pitot heat is on, INS true airspeed 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 on 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. 2-27).

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 a 5-ampere circuit breaker, placarded STALL WARN, on the overhead circuit breaker panel.

2-57. BRAKE DEICE SYSTEM.

a. Description. A 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 de-ice 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 de-ice system and the pneumatic systems operation.

b. Operation. A switch on the overhead control panel, placarded BRAKE DEICE, controls the solenoid valve by routing power through a control module box under the aisleway floorboards. When the switch is on, power from a 5-ampere circuit breaker on the overhead circuit breaker panel is applied to the control module. 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 DE-ICE ON annunciator light, and has a resetting circuit interlocked with the gear unlock switch. When the system is activated, the BRAKE DE-ICE ON light should be monitored and the control switch selected OFF after the light 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 10 minutes. If the automatic timer has terminated brake deicer 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 lights may momentarily illuminate during simultaneous operation of the surface de-ice and brake de-ice systems at low N1 speeds. If the lights immediately extinguish, they may be disregarded.

(2) During certain ambient conditions, use of the brake de-ice system may reduce available engine power, and during flight will result in a TGT rise of approximately 20° C. Appropriate performance charts should be consulted before brake de-ice system use. If specified power cannot be obtained without exceeding limits, the brake de-ice system must be selected off until after takeoff is completed. TGT limitations must also be observed when setting climb and cruise power. The brake de-ice system is not to be operated above 15°C ambient temperature. The system is not to be operated for longer than 10 minutes (one deicer cycle) with the landing gear retracted. If operation does not automatically terminate after approximately 10 minutes following gear retraction, the system must be manually selected off. During periods of simultaneous brake deice and surface de-ice operation, maintain 85% N1 or higher. If inadequate pneumatic pressure is developed for proper surface deicer 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 a 5-ampere circuit breaker, placarded BRAKE DEICE, on the overhead circuit breaker panel (fig. 2-27).

2-58. FUEL SYSTEM ANTI-ICING.

a. Description. An oil-to-fuel heat exchanger, located on 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. Two external fuel vents are provided on each wing. One is recessed to prevent ice formation; the other is electrically heated and is controlled by two toggle switches on the overhead control panel placarded FUEL VENT ON, LEFT and RIGHT (fig. 2-12). They are protected by two 5-ampere circuit breakers, placarded FUEL VENT HEAT, RIGHT or LEFT, located on the overhead circuit breaker panel (fig. 2-27). Each fuel control unit is protected against ice. The pneumatic governing for each fuel control unit is electrically heated, and protected by two 7 1/2-ampere circuit breakers located on the overhead circuit breaker panel placarded FUEL CONTR HEAT, LEFT or RIGHT (fig. 2-27). 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 (Chapter 8).

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. Two switches, placarded WSHLD ANTI-ICE NORMAL OFF HI PILOT, COPILOT, located on the overhead control panel (fig. 2-12) 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 50ampere circuit breaker which are 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. The 5-ampere circuit breakers are located on panels forward of the instrument panel.

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 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 the 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, ten seconds later, air flow through the right flow control unit. The bleed air switches, located on the overhead control panel (fig. 2-12) operate an integral electric solenoid which controls the bleed air to the firewall shutoff valves.

b. Pressure Differential. The pressure vessel is designed for a normal working pressure differential of 6.0 PSI, which will provide a cabin pressure altitude of 3870 feet at an aircraft altitude of 20,000 feet, and a nominal cabin altitude of 9840 feet at an aircraft altitude of 31,000 feet.

c. Cabin Altitude and Rate-of-Climb Controller. A control panel is installed on the copilot's side of the subpanel (fig. 2-6) for operation of the system. A knob, placarded INC RATE controls the rate of change of pressurization. A control, placarded CABIN CONTROLLER is used to set the desired cabin altitude. For proper cabin pressurization, the CABIN CONTROLLER should be set 500 feet above cruise altitude. For landing select 500 feet above field pressure altitude. The selected altitude is displayed on a mechanically coupled dial above the control, placarded CABIN ALT-FT. Mechanically coupled to the cabin altitude dial, placarded ACFTX1000. This dial indicates the maximum altitude the aircraft may be flown at to maintain the desired cabin altitude without exceeding the design pressure differential. A switch, placarded CABIN PRESS DUMP-PRESS-TEST, is provided to control pressurization. The switch is spring loaded to the PRESS position. In the DUMP position, the safety valve will be opened and the cabin will be depressurized to the aircraft altitude. In the PRESS position, cabin altitude is controlled by the CABIN CONTROLLER control. In the TEST position, the landing gear safety switch is bypassed to enable testing of the pressurization system on the ground. Operating instructions are contained in Chapter 8.

d. Cabin Rate-of-Climb Indicator. An indicator, placarded CABIN CLIMB, is installed on the copilot's side of the instrument panel (fig. 2-30). The cabin rate-of-climb controller is calibrated in thousands-of-feet per-minute change in cabin altitude.

e. Cabin Altitude Indicator. An indicator, placarded CABIN ALT, is installed in the instrument panel (fig. 2-30) above the cabin rate of-climb indicator. The longer needle indicates aircraft altitude in thousands-of-feet on the outside dial. The shorter needle indicates pressure differential in PSI on the inner dial. Maximum differential is 6.1 PSI.

f. Outflow Valve. A pneumatically operated outflow valve, located on the aft pressure bulkhead, maintains the selected cabin altitude and rate-of-climb commanded by the cabin rate-of climb and altitude controller on the copilot's instrument panel. 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 warning annunciator light, ALT WARN, to warn of operation requiring oxygen. This light is protected by a 5-ampere breaker, placarded PRESS CONTR.

g. Pressurization Safety Valve. Before takeoff, the safety valve is open with equal pressure between the cabin and the outside air. The safety valve closes upon liftoff if the CABIN PRESS CONTR switch on the instrument panel is in the PRESS mode. The safety valve adjacent to the outflow valve provides pressure relief in the event of failure of the outflow valve. This valve is also used as a dump valve and is opened by vacuum which is controlled by a solenoid valve operated by the cabin pressure dump switch adjacent to the controller. It is also wired through the right main 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 differential pressure of 6.1 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 forward of the firewall in each 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. The bleed air switches located on the overhead control panel (fig. 2-12) operates an integral electric solenoid which controls the bleed air to the firewall shutoff valves. A normally open solenoid operated by the landing gear safety switch controls the introduction of ambient air flow to the cabin on takeoff.

(1) The unit receives bleed air from the engine into an ejector which draws ambient air into the nozzle of the venturi. 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. 2-20) is provided primarily as an emergency system; however, the system may be used to provide supplemental (first aid) oxygen. Two 64 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, copilot, and mission operator positions (2) are equipped with pressure demand regulators. Also a first aid oxygen mask is provided in the toilet compartment. Oxygen system pressure is shown by two gages placarded OXYGEN SUPPLY PRESSURE, located aft of the pilot's oxygen regulator control panel. Two pressure reducers, 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 on 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 and table 2-5 shows oxygen duration capacities of the system. Figure 2-21 shows oxygen cylinder capacity percent of rated volume vs pressure and temperature for an 1800 PSI system.

(1) Regulator control panels.

WARNING

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

WARNING

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.

Each regulator control panel contains a blinkertype flow indicator, a 500 PSI pressure gage, a red emergency pressure control lever, a white diluter control lever, and a green supply control lever.

(a) Oxygen supply pressure gage. The 500 PSI oxygen pressure gages are provided on the oxygen control panels.

WARNING

Gage pressure of over 400 PSI indicates a malfunction of the pressure reducer.

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.

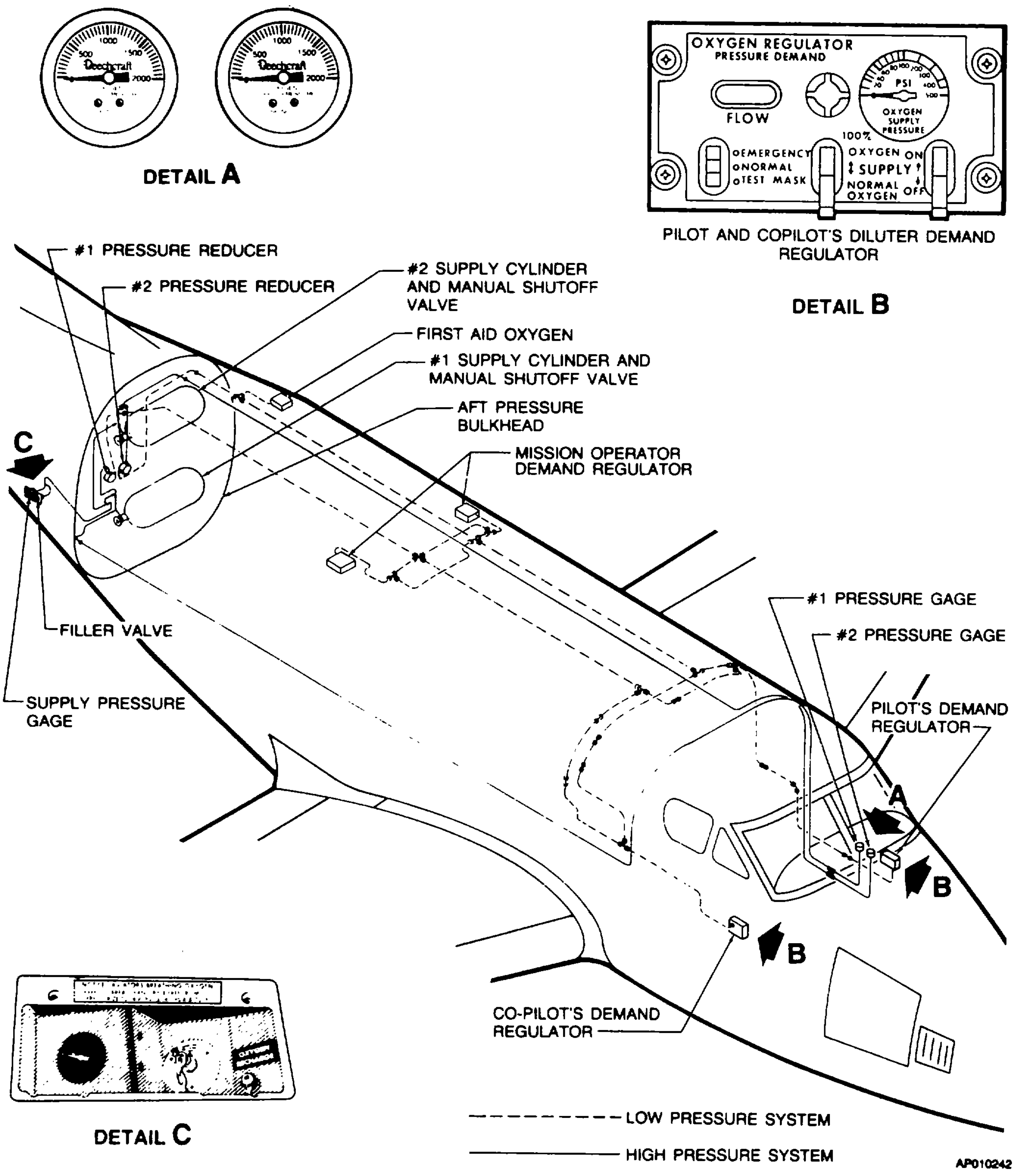

Figure 2-20. Oxygen System Schematic

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
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 of 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+3.6+3.9+4.2+4.5+4.8+5.1)÷11=5.4 LPM

This method is preferred over averaging the extremes as some flow characteristics vary in such a way as to yield an incorrect answer.

Table 2-5. Oxygen Duration

OXYGEN DURATION IN MINUTES 128 CUBIC FOOT SYSTEM								
	Cabin Pressure Altitude	Crew Mask Condition	Total Flow LPM-NTPD	Duration in Minutes at Percent of Rated Volume (1)				
				100% 3,074L	80% 2,459L	60% 1,844L	40% 1,230L	20% 615L
Two Man Crew	31,000	100%	8.4	366	293	220	146	73
	25,000	100%	11.8	261	208	156	104	52
	20,000	100%	15.2	202	162	121	81	40
	20,000	Normal	7.2	427	342	256	171	85
	15,000	100%	19.0	162	129	97	65	32
	15,000	Normal	10.2	301	241	181	121	60
	10,000	100%	23.8	129	103	77	52	26
	10,000	Normal	13.8	223	178	134	89	45
Two Man Crew Plus One Operator	31,000	100%	12.6	244	195	146	98	49
	25,000	100%	17.7	174	139	104	69	35
	20,000	100%	22.8	135	108	81	54	27
	20,000	Normal	10.8	285	228	171	114	57
	15,000	100%	28.5	108	86	65	43	22
	15,000	Normal	15.3	201	161	121	80	40
	10,000	100%	35.7	86	69	52	34	17
	10,000	Normal	20.7	149	119	89	59	30
Two Man Crew Plus Two Operators	31,000	100%	16.8	183	146	110	73	37
	25,000	100%	23.6	130	104	78	52	26
	20,000	100%	30.4	101	81	61	40	20
	20,000	Normal	14.4	213	171	128	85	43
	15,000	100%	38.0	81	65	49	32	16
	15,000	Normal	20.4	151	121	90	60	30
	10,000	100%	47.6	65	52	39	26	13
	10,000	Normal	27.6	111	89	67	45	22
Two Man Crew Plus Two Operators and One Observer	31,000	100%	24.2	127	102	76	51	25
	25,000	100%	31.0	99	79	59	40	20
	20,000	100%	37.8	81	65	49	33	16
	20,000	Normal	21.8	141	113	85	56	28
	15,000	100%	45.4	68	54	41	27	14
	15,000	Normal	27.8	111	88	66	44	22
	10,000	100%	55.0	56	45	34	22	11
	10,000	Normal	35.0	88	70	53	35	18

(1) 100% capacity of useable oxygen, 3,074 LNTPD. See figure 2-21 to determine percentage values with temperature and pressure known.

(2) When operating with a 100% cylinder capacity, read the duration in minutes directly from the table. However, if operating with less than a 100% cylinder capacity pressure (Ref. Table 2-4) perform the following computation: Total, crew (2) LPM usage at cabin pressure altitude; Total, passenger LPM usage at cabin pressure altitude; (Ref. Table 2-4); Total LPM usage of both crew and passengers. Multiply 3,074 liters times the percent of rated capacity at NTPD and divided by total crew and passenger LPM usage to obtain total (oxygen remaining) duration in minutes.

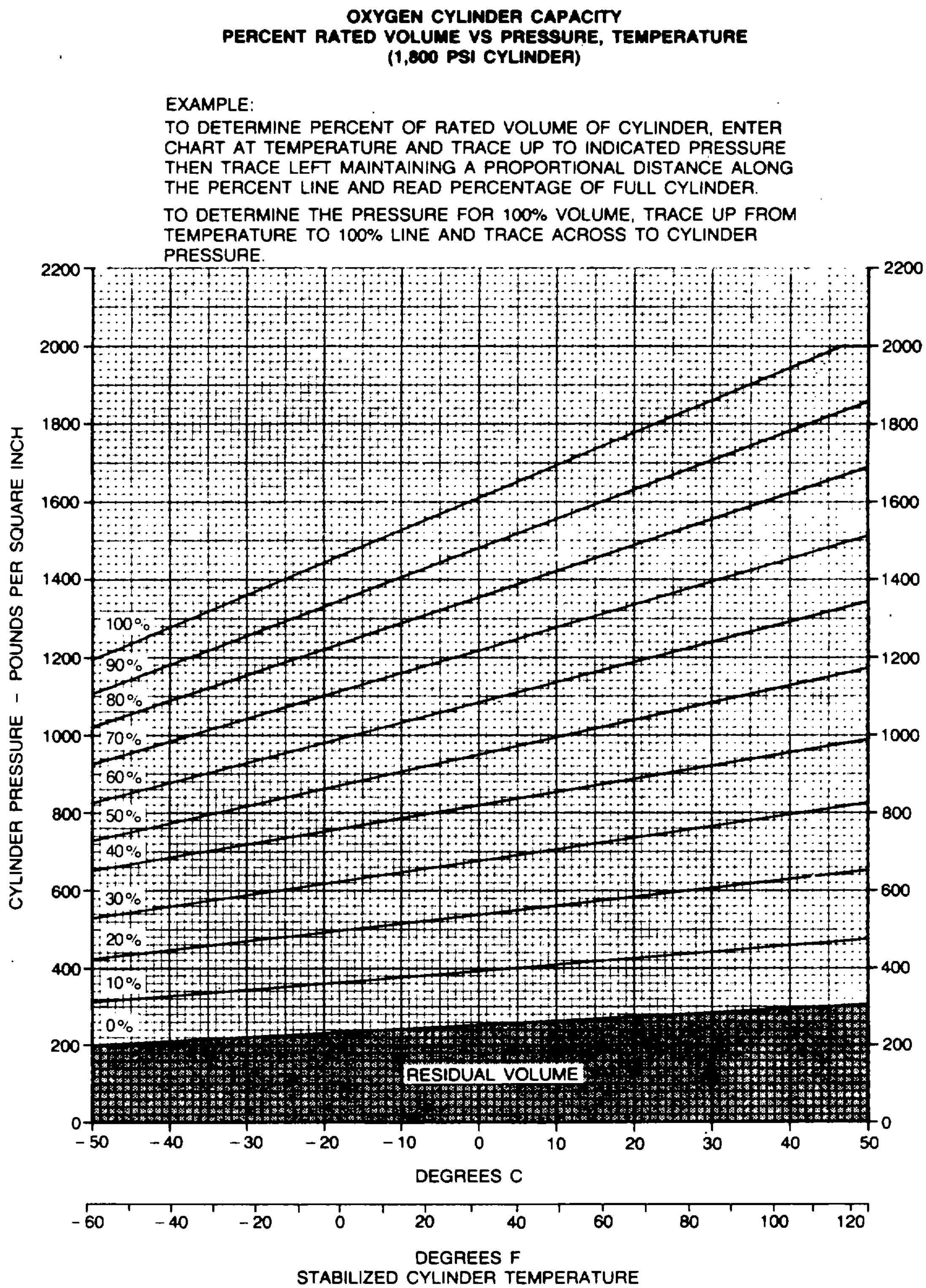

Figure 2-21. Oxygen System Cylinder Capacity

NOTE

Check to insure 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 rise again upon return to a lower or warmer altitude. 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 altitude which does not require the use of oxygen.

(b) Emergency pressure control lever. The emergency pressure control lever (red), is placarded EMERGENCY NORMAL TEST MASK, 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.

(*c*) *Diluter control lever.*

CAUTION

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

The diluter control lever (white), placarded 100% OXYGEN NORMAL OXYGEN, selects either normal or 100% oxygen, but acts to select only when the emergency pressure control lever is in the NORMAL position.

(d) Supply control lever. The supply control lever (green), placarded ON OFF, turns the oxygen supply on or off at the regulator control panel.

b. Oxygen masks. Oxygen masks for the pilot, copilot and mission operators are provided as personal equipment. 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 helmet 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.

c. Normal Operation. Oxygen pressure is maintained at all times to the regulator control panels if the cylinder shut-off valves are on 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 toilet compartment as a supplemental or emergency source of oxygen (100%). 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.

2-62. WINDSHIELD WIPERS.

a. Description. Two electrically operated windshield wipers, are provided for use at takeoff, cruise and landing speed. A rotary switch (fig. 2-12) placarded WINDSHIELD WIPER, located on 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 on 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 on the overhead circuit breaker panel (fig. 2-27).

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. To 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. MISSION OPERATOR SEATS.

The mission operators are each provided with a cushioned chair-type seat. The seats are individually located on floor-mounted seat tracks and may be positioned to face forward or aft. The seats are adjustable forward and aft by removing the seat track pins, repositioning the seat, then reinstalling the seat track pins. Each mission operator 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.

2-64. CIGARETTE LIGHTERS AND ASH TRAYS.

The pilot and copilot have individual cigarette lighters and ash trays mounted in escutcheons outboard of their seats. The cigarette lighters are protected by a 5-ampere circuit breaker, placarded CIGAR LIGHTER, on the overhead circuit breaker panel (fig. 2-27).

2-65. ELECTRIC TOILET.

a. Description. An electric toilet is installed in the aft cabin area. The circuit is protected by a 10-ampere circuit breaker located in the power distribution panel under the floor ahead of the main spar.

b. Operation. A switch, placarded PRESS TO FLUSH, is mounted on the seat assembly for operation of the toilet. Pressing the switch applies DC power to the motor which drives the pump. The pump applies flushing fluid through a nozzle in the upper rim and washes the inner surface of the bowl. Waste is carried to the waste tank mounted below the bowl. When desired, the removable waste tank may be removed from the toilet for servicing (Section XII).

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 cabin door on the left side of the fuselage.

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

2-68. HEATING SYSTEM.

a. Description. Warm air for heating the cockpit and mission avionics compartments 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 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 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 avionics compartment. The environmental system is shown in figure 2-22.

(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 fully pneumatic except for an integral electric solenoid firewall shutoff valve, controlled by the bleed air switches located on the overhead control panel (fig. 2-12) 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 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 on the overhead control panel (fig. 2-12).

(3) Bleed air valve switches. The bleed air flow control unit shutoff valve and pneumatic bleed air shutoff valves are controlled by two switches placarded BLEED AIR VALVE OPEN ENVIRO OFF PNEU & ENVIRO OFF, located on the overhead control panel (fig. 2-12). When set to the open position, both the environmental flow control unit shutoff valve and the pneumatic shutoff valve are open; when set to the ENVIRO OFF position, the environmental flow control unit shutoff valve is closed, and the pneumatic bleed air valve is open; in the PNEU & ENVIRO OFF position, both are closed. For maximum cooling on the ground, turn the bleed air valve switches to the ENVIRO OFF position.

(4) Cabin temperature mode selector switch. A switch placarded CABIN TEMP MODE MAN COOL MAN HEAT OFF AUTO A/ C COLD OPN -25°C to 10°C, located on 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 cabin temperature mode selector switch is set to the AUTO position, the heating and air conditioning systems are automatically controlled. When the temperature of the cabin 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. When the bypass valves are in the fully closed position, allowing no air to bypass the heat exchangers, the air conditoner 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 TEMP INCR, located on the overhead control panel (fig. 2-12), provides regulation of cabin temperature when the cabin temperature mode selector switch is set to the AUTO or the A/C 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 avionics compartment environment.

(6) Manual temperature control switch. A switch placarded MANUAL TEMP INCR DECR, located on the overhead control panel (fig.

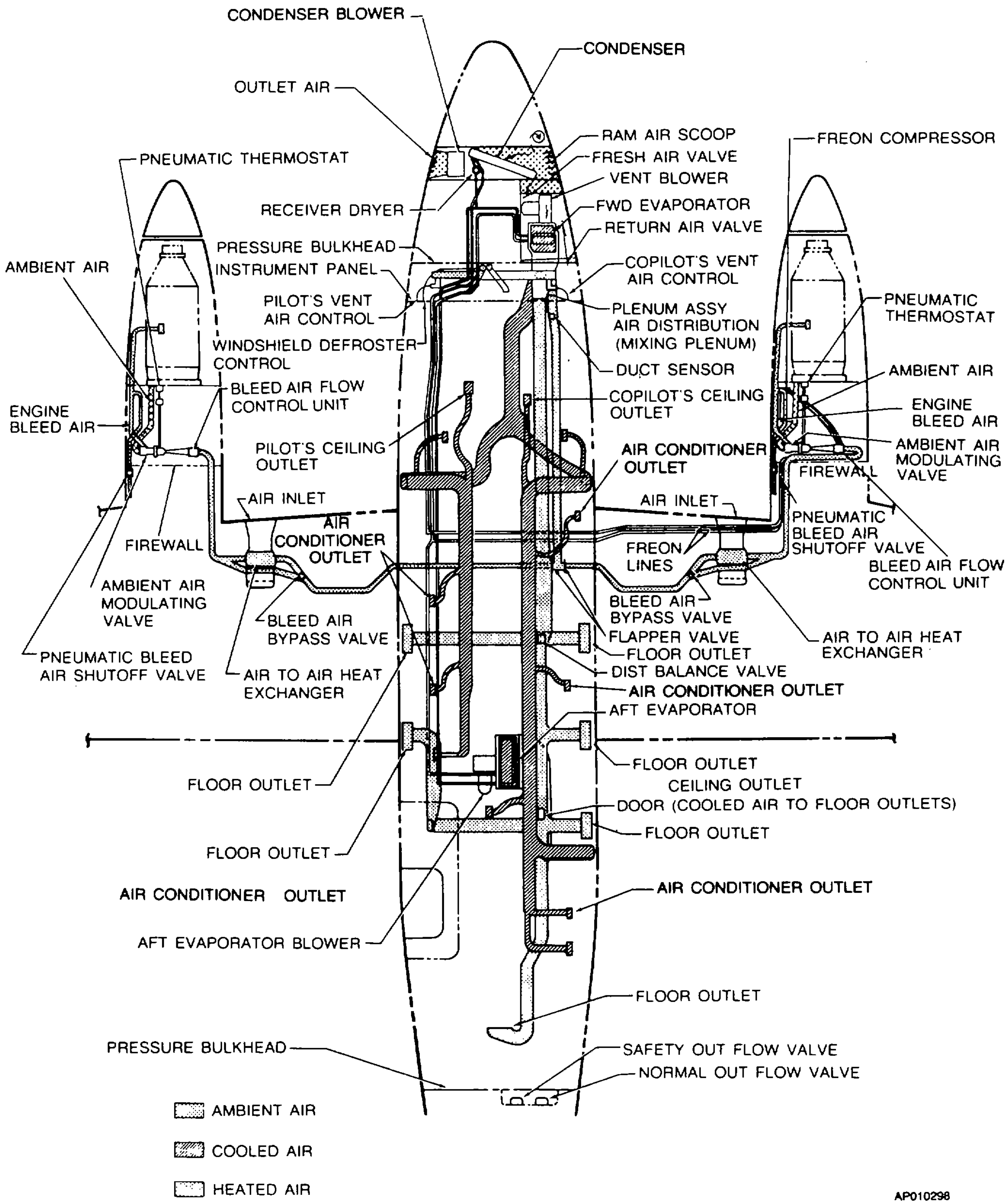

Figure 2-22. Environmental System

2-12), controls cockpit and mission avionics compartment temperature with the cabin temperature mode selector switch set to the MAN HEAT positions. The manual temperature control switch controls cockpit and mission avionics 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 I)ECR 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 a switch placarded VENT BI,OWER AUTO LO HI, located on the overhead control panel (fig. 2-12). 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 a switch placarded AFT VENT BLOWER OFF AUTO ON, located on the overhead control panel (fig. 2-12). The single speed blower operates automatically through the cabin temperature mode selector switch when the aft vent blower switch is placed in the AUTO position during ground operation and the air conditioner is operating. The blower runs continuously when the switch is placed in the ON position. 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, I,EFT and RIGHT.
2. Cabin temperature mode selector switch MAN HEA'I'.
3. Vent blower switches As required.
4. Manual temperature switch As required.
5. Cabin, cockpit and defrost air knobs As required.

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 No.2 engine accessory pad, refrigerant plumbing, N1 speed switch, high and low pressure protection switches, condenser coil, condenser-under-pressure switch, condenser blower, forward and aft evaporator, 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. A 7 1/2-ampere circuit breaker placarded AIR COND CONTR, located on the overhead control panel (fig. 2-12), protects the compressor clutch circuit.

(1) Forward evaporator. The forward evaporator and blower supplies 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 switch, located on the overhead control panel (fig. 2-12), to the HI position. The forward vent blower is protected by a circuit breaker located on the DC power distribution panel, located in the forward equipment bay.

(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 mode. The rear evaporator supplies the aft ceiling outlets, rear floor outlets, and toilet compartment. Rear evaporator blower is protected by a circuit breaker located on the DC power distribution panel in the lower equipment bay.

(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 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 on the ground as well as in flight. The current limiter for this blower is located on the DC distribution panel in the lower equipment bay. When the cabin temperature mode selector switch is set to the A/ C COLD OPN position, the condenser blower will be off, and will remain off until the condenser blower control high pressure switch senses a compressor discharge pressure equal to the pressure it is set to. The condenser blower will then remain in operation until the low pressure switch senses that the system pressure has dropped to the pressure it is set to.

(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.

NOTE

Starting the compressor in this optional mode at low ambient temperatures will decrease the operational life of the compressor by five hours each time the air conditioning system is started using this mode (A/C 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 A/C cold operation mode. there will be no degredation in the mean time between failures of the compressor.

(7) Air conditioner cold operation advisory annunciator light. A green advisory annunciator light placarded A/C COLD OPN, located on the caution/advisory annunciator panel (fig. 2-6), illuminates when the air conditioning system is operating in cold mode, or when ambient temperatures require switching to cold mode if air conditioning system operation is to be continued.

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 ENVIRO OFF 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. 2-12) 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, a vent blower control switch, an aft vent blower switch, a manual temperature switch for control of the heat exchanger valves, a cabin temperature level control, and the cabin temp mode selector switch for selecting automatic heating or cooling or manual heating or cooling. Four additional manual controls on the main instrument subpanels may be utilized for partial regulation of cockpit comfort when the cockpit partition door is closed and the cabin comfort level is satisfactory.

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 N1 speed is above 65%. When the bypass valve is opened to a position approximately 300 from full open, the refrigeration system will turn off.

(2) The CABIN 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 MANUAI, TEMP INCR DECR switch. To increase cabin temperature,

hold the switch at 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 COOI, position, the automatic temperature control system is bypassed. In the manual cooling mode, the refrigeration system is on, providing the right engine NI speed is above 65'SY, however, the bypass valves may be manually positioned for the desired temperature. Hold the MANUAL TEMP switch in the DECR position approximately one minute to fully close air-to-air heat exchanger bypass valves.

e. Bleed Air and Vent Control.

(1) Bleed air entering the cabin is controlled by bleed air valve switches placarded BLEED AIR VALVE OPEN ENVIRO OFF PNEU & ENVIRO OFF. When the switch is in the OPEN position, the environmental flow control unit and the pneumatic valve are open. When the switch is in the ENVIRO OFF position, the environmental flow control unit is closed and the pneumatic bleed air valve is open; in the PNEU & ENVIRO OFF position, both are closed. For maximum cooling on the ground, turn the bleed air valve switches to the ENVIRO OFF position.

(2) The forward vent blower is controlled by a switch placarded VENT BLOWER 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 selector switch is placed in the OFF position. In the OFF position, the blower will not operate.

(3) Aft vent blower switch. The aft vent blower is controlled by a switch placarded AFT VENT BLOWER OFF AUTO ON, located on the overhead control panel (fig. 2-12). The single speed blower operates automatically through the cabin temperature mode selector switch when the aft vent blower switch is placed in the AUTO position during ground operation and the air conditioner is operating. The blower runs continuously when the switch is placed in the ON position. 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. 2-23) is the basic power system energizing most aircraft circuits. Electrical power is used to start the engines, to power the landing gear and flap motors, and to operate the standby fuel pumps, ventilation blower, lights and electronic equipment. AC power is obtained from DC power through inverters. The single phase AC power system is shown in figure 2-24, and the three phase AC power system is shown in figure 2-25. 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 right nacelle (refer to Section XII for GPU requirements). The 3tarter-generators are controlled by generator control units. The output of each generator passes / through a cable to the respective generator bus (fig. 2-23). Other buses distribute power to aircraft DC loads, and derive 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, if no fault exists, aircraft DC power requirements continue to be supplied from one or the other generating source, but not from both. 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 mission inverters. AC power may be applied through an external power receptacle located on the left nacelle. The mission power system is shown in figure 2-26.

2-73. DC POWER SUPPLY.

One nickel-cadmium battery furnishes DC power when the engines are not operating. This

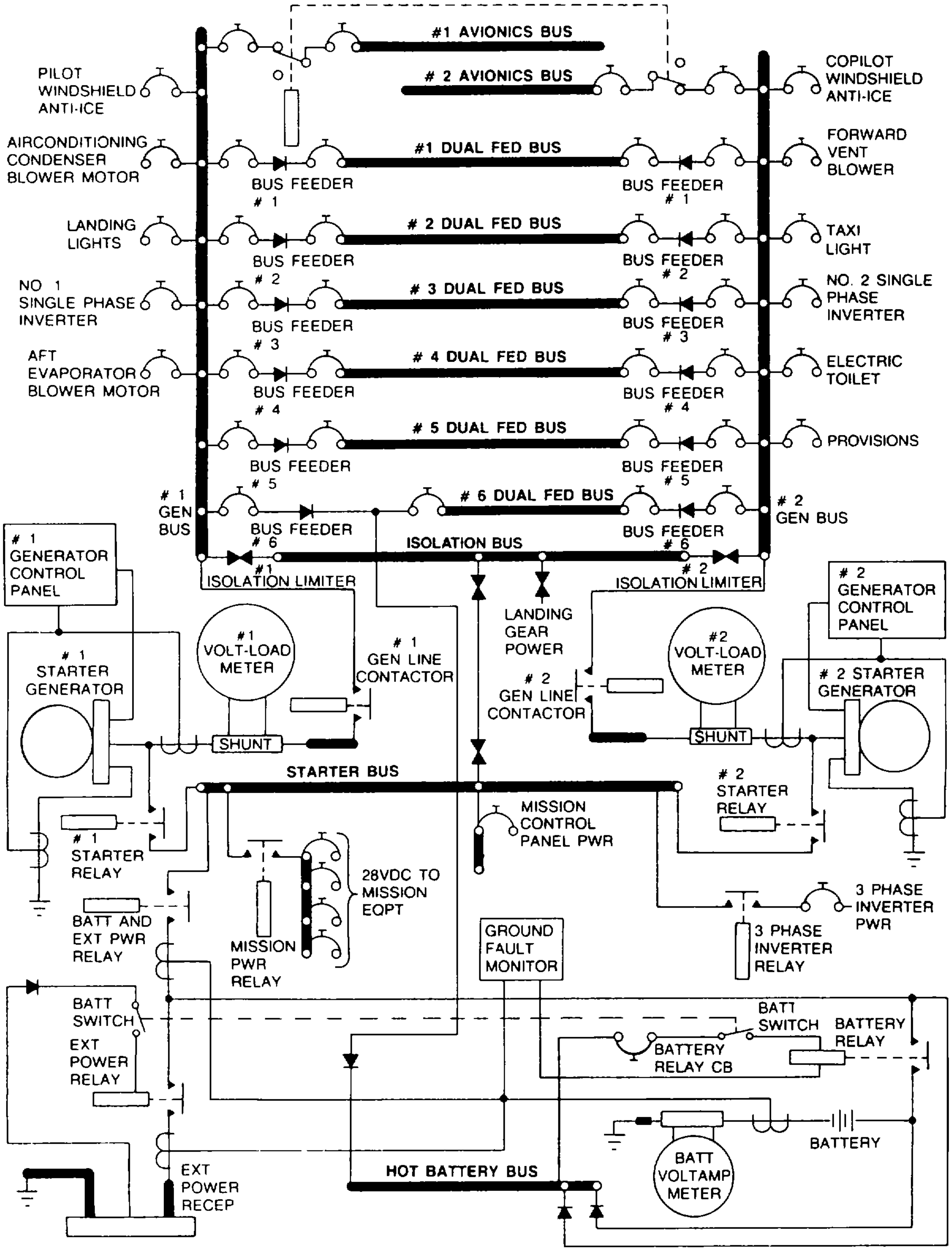

Figure 2-23. DC Electrical System (Sheet 1 of 3)

#1 AVIONICS BUS

HF RCVR	PILOT AUDIO	AFCS DIRECT
#1 VHF	TRANSPONDER	AP PWR
#1 VOR	UHF	VHF/AM/FM
#1 RMI	TACAN	
	INS CONTROL	

#2 AVIONICS BUS

#2 VOR	COPILOT AUDIO	SERVO DC
ADF	RADAR	RADIO RELAY
#2 RMI	RADAR-NAV	COPILOT ALT
		VOW

#1 DUAL FED BUS

ANN IND	STALL WARN	LEFT BLEED AIR WARN
#1 CHIP DETR	LANDING GEAR IND	#1 AUXILIARY TRANSFER
#1 QTY IND	#1 STANDBY PUMP	#1 ENG AIR SCOOP HEAT
#1 QTY WARN	#1 OIL PRESS	
#1 OIL TEMP		

#2 DUAL FED BUS

ANN PWR	FIRE DETR	RIGHT BLEED AIR WARN
#2 CHIP DETR	LANDING GEAR WARN	#2 AUXILIARY TRANSFER
#2 QTY IND	#2 STANDBY PUMP	#2 ENG AIR SCOOP HEAT
#2 QTY WARN	#2 OIL PRESS	ENG AIR SCOOP HEAT MONITOR
#2 OIL TEMP		
BATT CHARGE		

#3 DUAL FED BUS

WSHLD WIPER	LEFT PROP ANTI-ICE	PROP ANTI-ICE AUTO
SURF DEICE	LEFT FUEL VENT HEAT	LEFT FUEL CONTR HEAT
LEFT PITOT HEAT	#1 FIREWALL VALVE	#1 PRESS WARN
CROSSFEED	#1 ICE VANE CONTR	#1 IGNITOR CONTR
#1 START CONTR		
PROP SYNC		

#4 DUAL FED BUS

STALL WARN HEAT	RIGHT PROP ANTI-ICE	PROP ANTI-ICE CONTR
BRAKE DEICE	RIGHT FUEL VENT HEAT	RIGHT FUEL CONTR HEAT
RIGHT PITOT HEAT	#2 FIREWALL VALVE	#2 PRESS WARN
#2 START CONTR	#2 ICE VANE CONTR	#2 IGNITOR CONTR
AUTOFEATHER	PROP GOV	
HF POWER	SCAVENGER PUMP	

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Figure 2-23. DC Electrical System (Sheet 2 of 3)

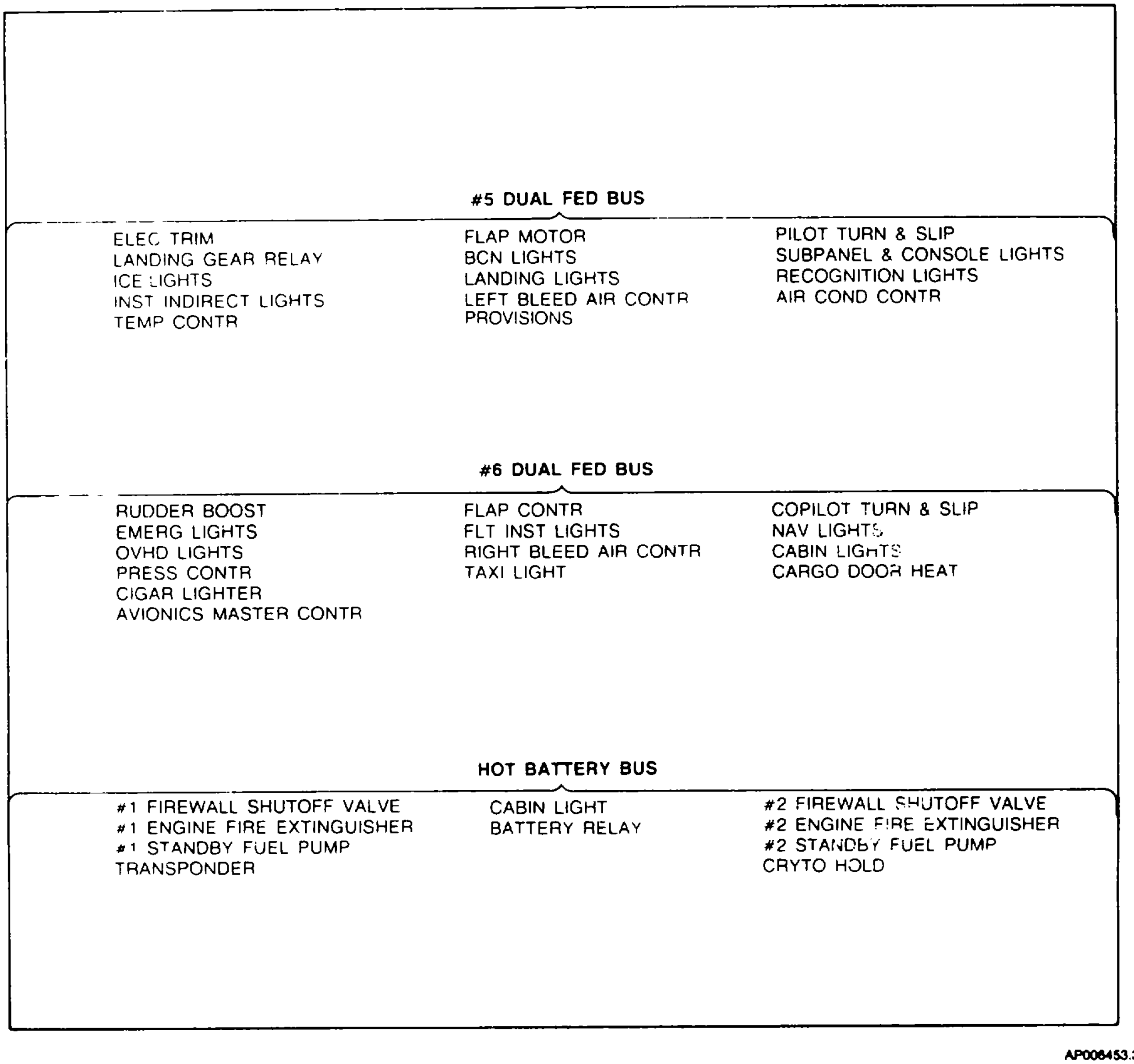

Figure 2-23. DC Electrical System (Sheet 3 of 3)

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 on the overhead control panel (fig. 2-12) and consist of a single battery switch (BATT), two generator switches (No.1 GEN and No.2 GEN), and two volt-loadmeters.

a. Battery Switch. A switch placarded BATT (fig. 2-1). is located on the overhead control panel under the MASTER SWITCH gang bar. The BATT switch controls DC power to the aircraft bus system through the battery relay, and must be ON to allow external power to enter the aircraft circuits. When the MASTER SWITCH is placed aft, the BATT 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 BATT switch is moved to OFF/RESET, then ON.

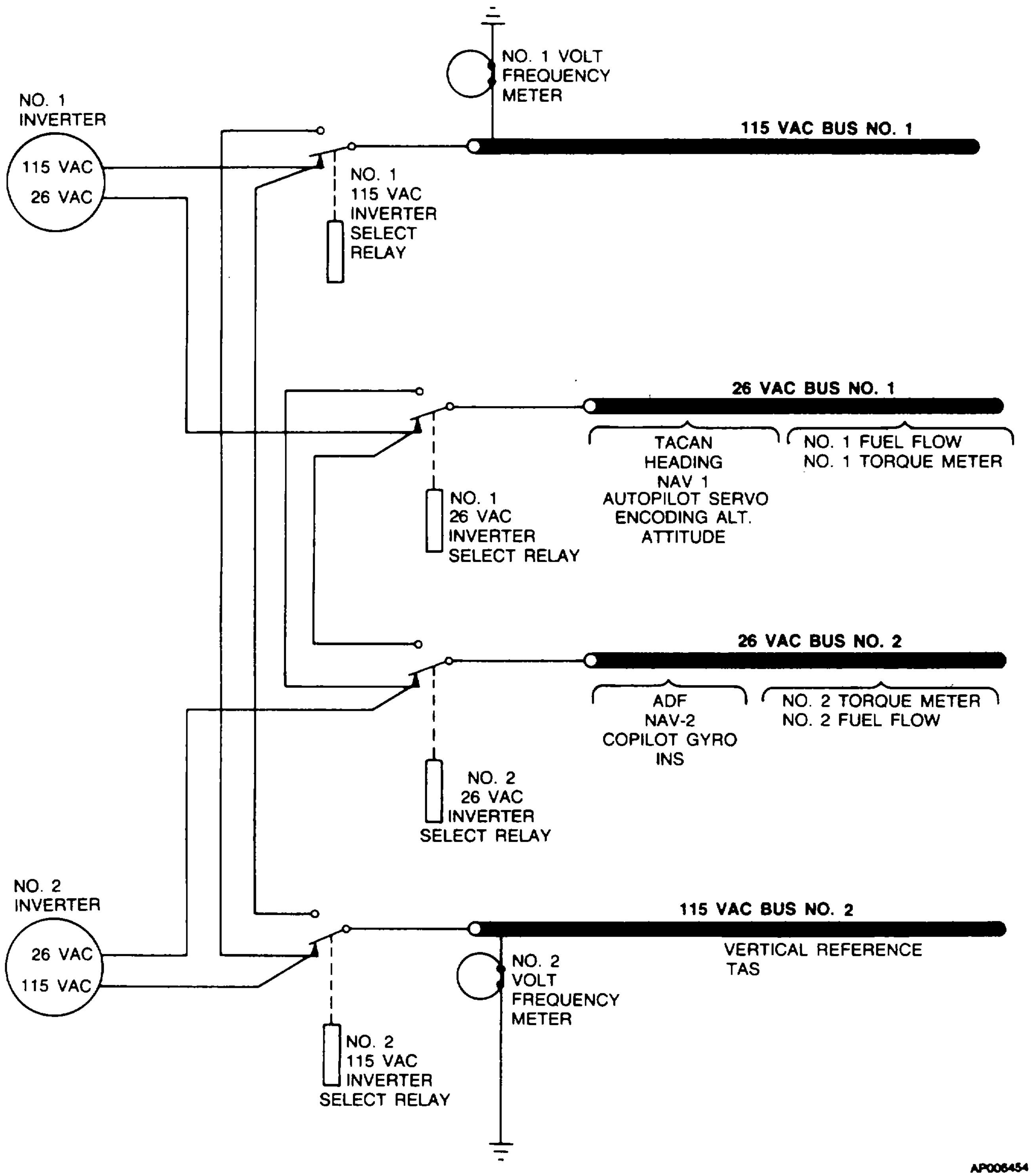

Figure 2-24. Single Phase AC Electrical System

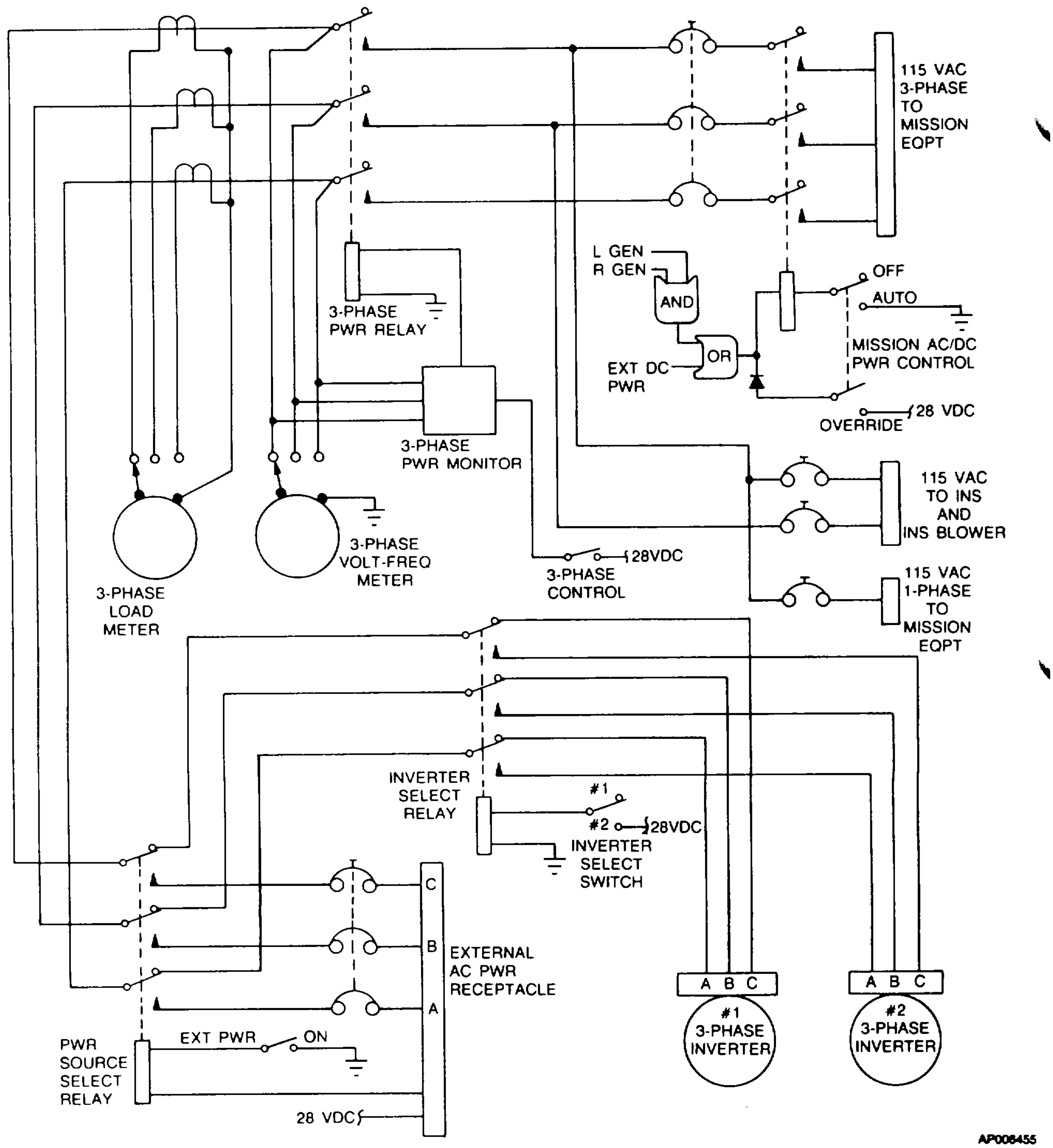

Figure 2-25. Three Phase AC Electrical System

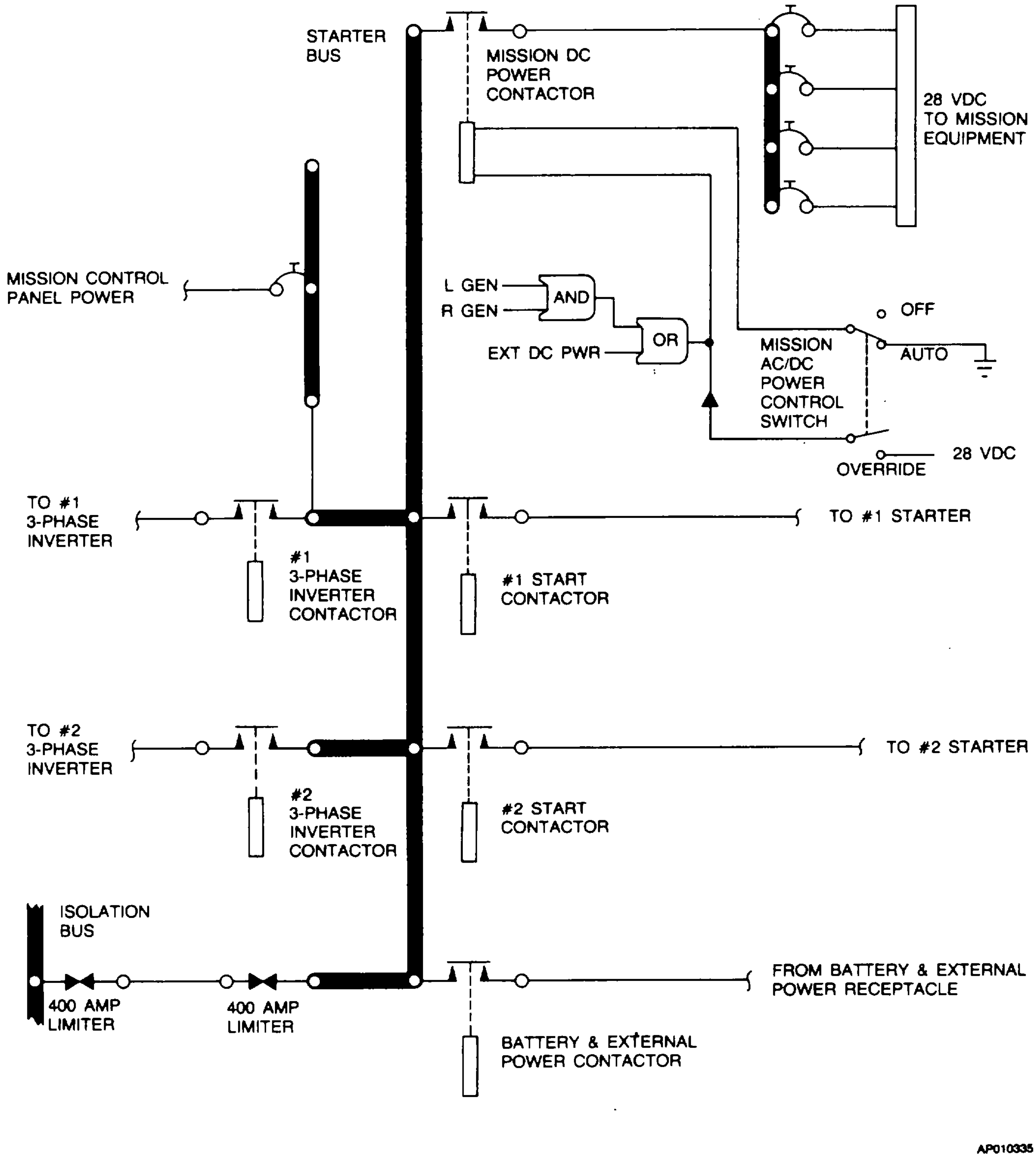

Figure 2-26. Mission Equipment DC Power System

b. Generator Switches. Two switches (fig. 212), placarded No.1 GEN and No.2 GEN are located on the overhead control panel under the MASTER SWITCH. 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 GEN switch in the OFF position, the affected unit cannot have its output restored to aircraft use until the GEN switch is moved to RESET, then ON.

c. Master Switch. All electrical current may be shut off using the MASTER SWITCH gangbar (fig. 2-12) 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 forces each switch to the OFF position.

d. Volt-Loadmeters. Two meters (fig. 2-12), on the overhead control panel display voltage readings and show the rate of current usage from left and right generating systems. Each meter is equipped with a spring-loaded pushbutton switch which when manually pressed will cause the meter to indicate main bus voltage. Each meter normally shows output the output amperage reading from the respective generator, unless the pushbutton switch is pressed to obtain the bus voltage reading. Current consumption is indicated as a percentage of total output amperage capacity for the generating system monitored.

e Battery Vol-Amp Meter. The mission control panel (fig. 4-1). located on the right fuselage sidewall adjacent to the copilot's seat, has a battery-amperage meter that displays battery voltage on the left side of the meter and (battery charge/discharge current) amperage on the right side of the meter.

NOTE

Battery voltage required for engine start is 24 VDC.

f. Battery 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 yellow BATTERY CHARGE annunciator light and the master fault caution light will illuminate. Following a battery engine start, the caution light will illuminate approximately six seconds after the generator switch is placed in the ON position. The light 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 light may also illuminate for short intervals after landing gear and/or flap operation. If the caution light should illuminate during normal steady-state cruise, it indicates that conditions exist that may cause a battery thermal runaway. If this occurs, the battery switch shall be turned OFF and may be turned back ON only for gear and flap extension and approach to landing. Battery may be used after a 15 to 20 minute cool down period.

g. Generator Out Warning Lights. Two caution/advisory annunciator panel lights inform the pilot when either generator is not delivering current to the aircraft DC bus system. These lights are placarded No.1 DC GEN and No.2 DC GEN. Two MASTER CAUTION lights and illumination of either fault light 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.

h. DC External Power Source. External DC power can be applied to the aircraft through an external power receptacle on the underside of the right wing leading edge 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 and applied directly to the battery bus after passing through the external power relay. 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 BATT switch is in the ON position. The GPU shall be adjusted to regulate at 28 volts maximum to prevent damage to the aircraft battery.

i. Security Keylock Switch. The aircraft has a security keylock switch (fig. 2-12) installed on the overhead control panel, placarded OFF ON.

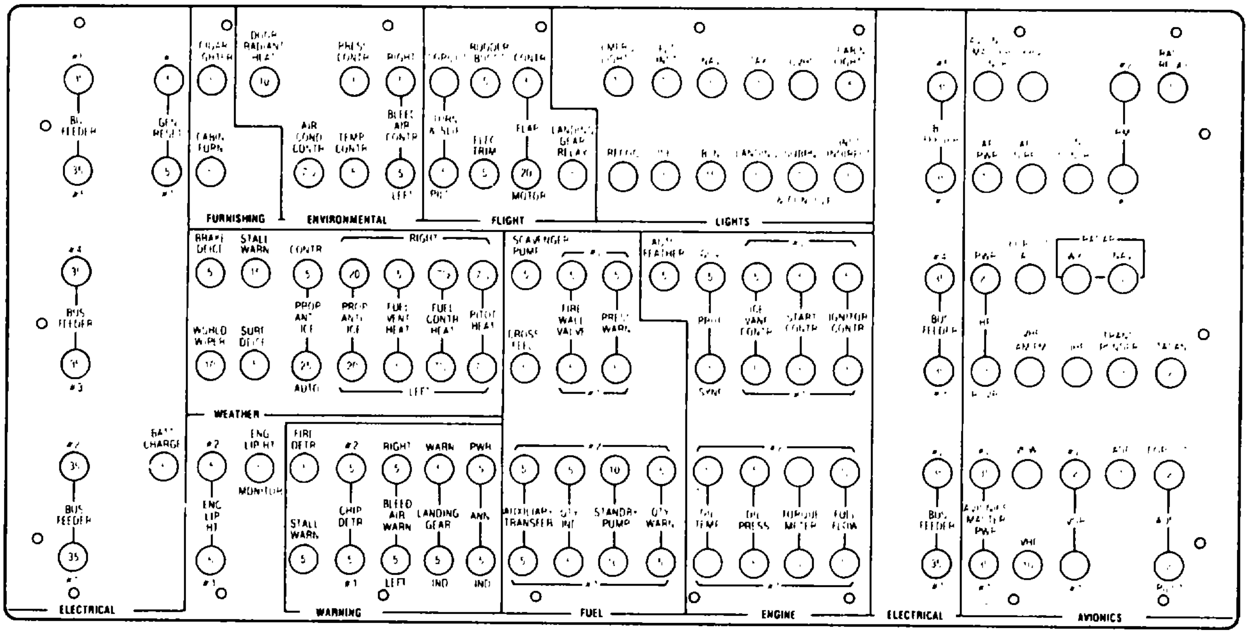

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Figure 2-27. Overhead Circuit Breaker Panel

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. 2-27) contains circuit breakers for most aircraft systems. The circuit breakers on the panel are grouped into areas which are placarded as to the general function they protect. A DC power distribution panel is mounted beneath the floor 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 No.1 and No.2 (fig. 2-24) 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 volt and 26 volt, 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 on the overhead control panel and on the caution/, advisory annunciator panel.

(1) AC Power WARNING/CAUTION Lights. Two MASTER CAUTION lights and the illumination of an annunciator caution light No.1 INVERTER or No.2 INVERTER indicates and inverter failure.

(2) Instrument AC Light. A red warning light, located on the warning annunciator panel, placarded INST AC, will illuminate if all instrument AC busses should fail.

(3) Inverter Control Switches. Two switches, placarded INVERTER No.1 and No.2 on the overhead control panel (fig. 2-12) give the pilot control of the single-phase AC inverters.

(4) Volt-Frequency Meters. Two voltfrequency meters (fig. 2-12) are mounted in the overhead control panel to provide monitoring capability for both 115 VAC buses. Normal display on the meter is shown in frequency (Hz). To read voltage, press the button located in the lower left corner of the meter. Normal output of the inverters will be indicated by 115 VAC and 400 Hz on the meters.

b. Three Phase A C Power Supply. Three phase AC electrical power for operation of the inertial navigation system and mission avionics is supplied by either of two DC powered 3000 voltampere solid state three phase inverters.

(*1*) *Three phase inverter control switch*. A three position switch placarded No.1 MSN OFF No.2 MSN INV, located on the mission control panel (fig. 4-1), controls three phase inverter operation.

(2) Three phase volt/frequency meter. A three phase volt/frequency meter, mounted on the mission control panel (fig. 4-1). monitors output of the selected three phase inverter. Frequency (Hz) is normally displayed on the meter. To read voltage, press the button located in the lower left corner of the meter. Each of the three phases is monitored individually by election on the mission AC volt frequency and load selector switch.

(3) Three phase loadmeter A three phase loadmeter mounted on the mission control panel (fig. 4-1). monitors inverter output level. Each of the three phases is monitored individually by selection of the mission A(' volt frequency and load selector switch.

(4) Three phase A C off annunciator light. An indicator light placarded 30 AC OFF, located on the misson annunciator panel (fig. 4-1), indicates that three phase AC power is not being supplied.

(5) Three phase AC external power. 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 on the underside of the left wing leading edge just outboard of the engine nacelle (fig. 2-1). The receptacle is installed inside the wing structure and is 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 Light. An annunciator light placarded EXT AC PWR ON, located on the mission annunciator panel (fig. 4-1), indicates that an AC GPU plug is mated to the AC external power receptacle.

(b) External AC power control switch. A switch placarded AC EXT POWER, located on the mission control panel (fig. 4-1), controls application of three phase AC power to the aircraft.

Section X. LIGHTING

2-75. EXTERIOR LIGHTING.

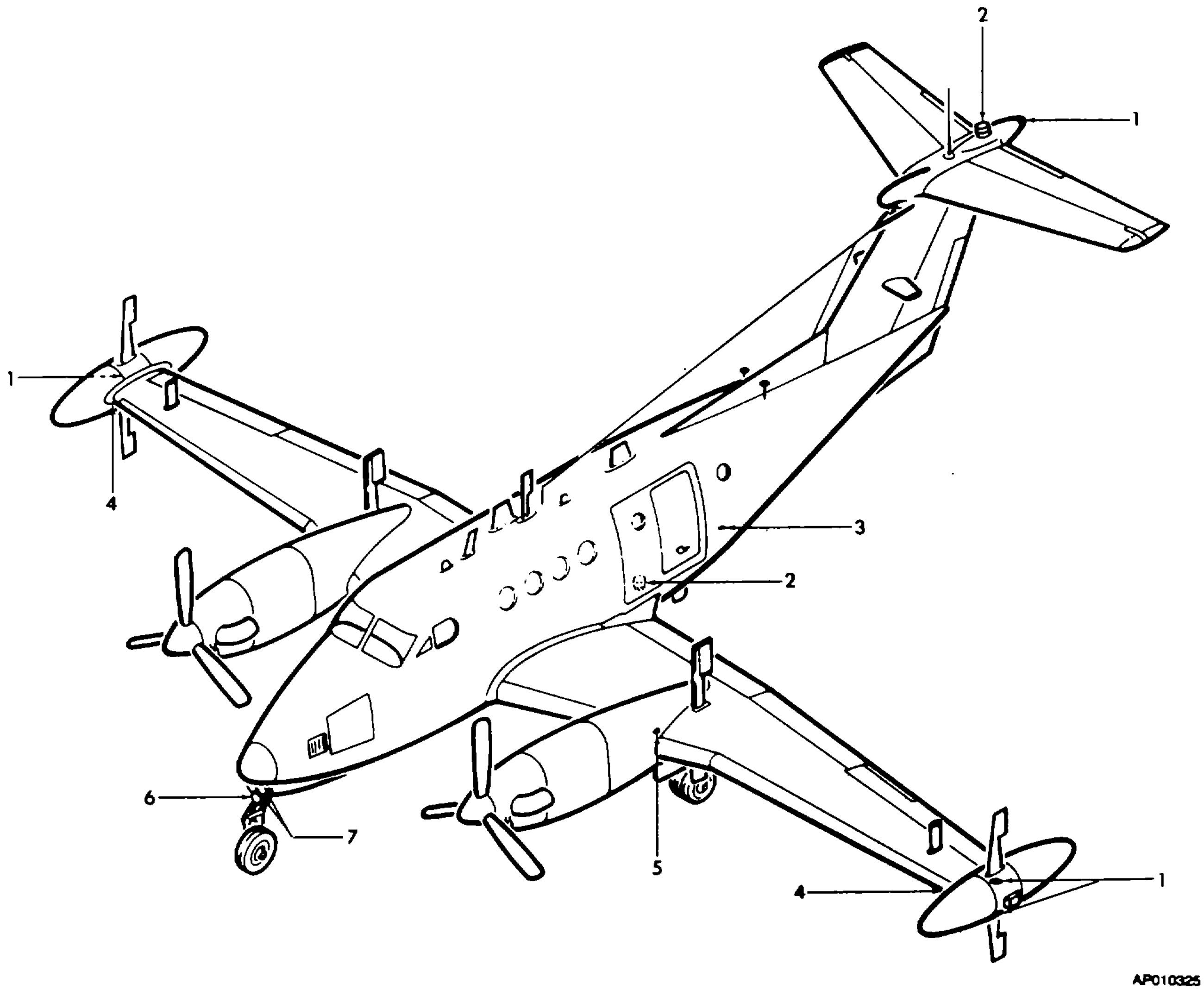
a. Description. Exterior lighting (fig. 2-28) consists of a navigation light on the top of the aft section of the vertical stabilizer, one navigation light on top and bottom of each wing tip pod, two strobe beacons, one on top of the vertical stabilizer and one on the underside of the fuselage center section, dual landing lights, one taxi light mounted on the nose gear assembly, a recognition light located in each wing tip, and two ice lights, one light flush mounted in each nacelle, positioned to illuminate along the leading edge of each outboard wing.

b. Navigation Lights. The navigation lights are protected by a 5-ampere circuit breaker placarded NAV on the overhead circuit breaker panel (fig. 2-27). Control of the lights is provided by a switch placarded NAV-ON on the overhead control panel (fig. 2-12).

c.. Strobe Beacons. The strobe beacons are dual intensity units. They are protected by a 15 ampere circuit breaker placarded BCN on the overhead circuit breaker panel (fig. 2-27). Control of the lights is provided by a switch placarded BEACON - DAY - NIGHT (fig. 2-12). Placing the switch in the DAY position will activate the high intensity white section of the strobe lights for greater visibility during daytime operation. Placing the switch in the NIGHT position activates the lower intensity red section of the strobe lights.

d. Landing/Taxi Lights. Dual landing lights and a single taxi light are mounted on the nose gear assembly. The lights are controlled by switches, placarded LANDING and TAXI, located in the LIGHTS section of the pilot's subpanel. The landing light circuit is protected by a 5-ampere circuit breaker placarded LANDING, located on the overhead circuit breaker panel (fig. 2-27). The taxi light circuit is protected by' a 5-ampere circuit breaker placarded TAXI, located on the overhead circuit breaker panel (fig. 2-27). Landing/Taxi lights are turned off when the landing gear is retracted. The landing lights and taxi light power circuits are protected by 35ampere and 15-ampere circuit breakers, respectively, located on the DC power distribution panel, beneath the cockpit floor.

e. Ice Lights. The ice lights circuit is protected by a 5-ampere circuit breaker placarded ICE on the overhead circuit breaker panel (fig. 2-27).



1. NAVIGATION LIGHT
2. STROBE BEACON
3. EMERGENCY LIGHT
4. RECOGNITION LIGHTS
5. ICE LIGHT
6. TAXI LIGHT
7. LANDING LIGHTS

Figure 2-28. Exterior Lighting

Control of the lights is provided by a switch placarded ICE ON the overhead control panel (fig. 2-12). Prolonged use during ground operation may generate enough heat to damage the lens.

f. Recognition Lights. A switch placarded RECOG ON, located in the pilot's subpanel LIGHTS section (fig. 2-6), controls the white recognition light in each wing tip. When requested, this steady, bright light is used for identification in the traffic pattern. The recognition lights circuit is protected by a 7 1/2 ampere RECOG circuit breaker located on the overhead circuit breaker panel (fig. 2-27).

2-76. INTERIOR LIGHTING.

Lighting systems are installed for use by the pilot, copilot, and mission operators in the cabin area. The lighting systems in the cockpit are provided with intensity controls on the overhead control panel. A switch placarded MASTER PANEL LIGHTS ON, on the overhead control panel (fig. 2-12), provides overall on-off control for all engine instrument lights, pilot and copilot instrument lights, overhead panel lights, console and subpanel lights and the free air temperature light.

a. Cockpit Lighting.

(1) Flight instrument lights. Each individual flight instrument contains internal lamps for illumination. The circuit is protected by a 7 l/2-ampere circuit breaker placarded FLT INST on the overhead circuit breaker panel (fig. 2-27). Control is provided ,by two rheostat switches placarded PILOT INST LIGHTS OFF BRT and COP'II,OT INST LIGHTS OFF BRT on the overhead control panel (fig. 2-12). Turning the control clockwise from OFF turns the lights on and increases their brilliance.

(2) Instrument indirect lights. Three lights are mounted in the glareshield overhang along the top edge of the instrument panel and provide overall instrument panel illumination. The circuit is protected by a 5-ampere circuit breaker placarded INST INDIRECT on the overhead circuit breaker panel (fig. 2-27). Control is provided by a rheostat switch placarded INST INDIRECT LIGHTS OFF BRT on the overhead control panel (fig. 2-12). Turning the control clockwise from OFF turns the lights on and increases their brilliance.

(3) Engine instrument lights. Each individual engine instrument contains internal lamps for illumination. The circuit is protected by a 7 1/2-ampere circuit breaker placarded FLT INST on the overhead circuit breaker panel (fig. 2-27). Control is provided by a rheostat switch placarded ENGINE INST LIGHTS OFF BRT on the overhead control panel (fig. 2-12). Turning the control clockwise from OFF turns the lights on and increases their brilliance.

(4) Flood light. A single overhead flood light is installed. It provides overall illumination of the entire cockpit area. The circuit is protected by a 5-ampere circuit breaker mounted beneath the battery and connected to the emergency battery bus. Control is provided by a rheostat switch placarded OVERHEAD FLOOD LIGHTOFF-BRT on the overhead control panel (fig. 212). Turning the control clockwise from OFF turns the light on and increases its brilliance.

(5) Overhead panel lights. Lamps on the overhead circuit breaker panel, control panel, and fuel management panel are protected by a 7 1/ 2-ampere circuit breaker placarded OVHD on the overhead circuit breaker panel (fig. 2-27). Control is provided by a rheostat switch placarded OVERHEAD PANEL LIGHTS OFF BRT on the overhead control panel (fig. 2-12). Turning the control clockwise from off turns the lights on and increases their brilliance.

(6) Subpanel and console lights. Lights on the pilot's and copilot's subpanels, console edge lighted panels and pedestal extension panels are protected by a 7 1/2-ampere circuit breaker placarded SUBPNL & CONSOLE on the overhead circuit breaker panel (fig. 2-27). Control is provided by two rheostat switches placarded SUBPANEL or CONSOLE LIGHTS OFF BRT on the overhead control panel (fig. 2-12). turning the control clockwise from OFF turns the lights on and increases their brilliance.

(7) Free air temperature light. Two post lights are mounted adjacent to the free air temperature gage on the left cockpit sidewall trim panel. The circuit is protected by a 7 1/2-ampere circuit breaker placarded FLT INST on the overhead circuit breaker panel (fig. 2-27). Control is provided by a pushbutton switch adjacent to the gage. No intensity control is provided.

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 mounted beneath the battery and 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) Dome light. A dome light is installed in the baggage area, in the overhead. The circuit is protected by a 5-ampere circuit breaker mounted beneath the battery and connected to the emergency battery bus. Control is provided by a switch mounted adjacent to the light.

(3) Cabin utility light. Each mission operator's position is provided with a utility light adjacent to each cabin light. Each utility light is individually controlled by a rheostat placarded OFF ON BRT on the back of the light. There is a momentary ON switch in the center of the rheostat. Each light is capable of producing a red or white spotlight by turning the selector on the front of the light. To remove the light from the stationary position, loosen the retaining screw directly below the light escutcheon and 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.

(4) Mission operator's position lights. Each mission operator's position is illuminated by an overhead flood. These lights are located adjacent to each other between the middle and aft cabin lights. They are positioned to illuminated each operator's position. A rheostat switch placarded OFF BRT, located adjacent to each light, is provided to turn the light on and off, and control its intensity. The mission operator's position lights are protected by a 5-ampere circuit breaker, placarded CABIN LIGHTS, located on the overhead circuit breaker panel (fig. 2-27).

(5) Cabin door latching mechanism light. A light 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 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 crew to read instruction placards and locate exits. An inertia switch, when subjected to a 2 G shock, will illuminate interior lights in the cockpit, forward and aft cabin areas, and 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 on the overhead control panel (fig. 212), is provided to turn the system off, if it is accidentally actuated. The switch is placarded EMERG LIGHTS ORIDE -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 momentary position. The lights should illuminate.

Moving the switch to the TEST OFF RESET position will turn the system off and reset it.

NOTE

If, while using the emergency lights. the battery is run down, it may become impossible to reset (turn off) the lights.

Section XI. FLIGHT INSTRUMENTS

2-78. PITOT AND STATIC SYSTEM.

a Description. The pitot and static system (fig. 2-20) supplies static pressure to two airspeed indicators, two altimeters, two vertical velocity indicators, and ram air to the airspeed indicators. 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. Refer to Chapter 7 for airspeed indicator and altimeter calibration information when using the alternate air source.

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-:30). The pilot's indicator provides yaw damping information to the autopilot. These indicators are gyroscopically operated. They use DC power and are protected by :,-ampere circuit breakers placarded TURN & SLIP PILOT OR COPILOT on the overhead circuit breaker panel (fig. 2-27).

2-80. AIRSPEED INDICATORS.

Airspeed indicators are installed separately on the pilot and copilot sides of the instrument panel (fig. 2-30). 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 (247 KIAS, 0.47 Mach) at the aircraft's present altitude.

2-81. PILOT'S ENCODING ALTIMETER.

The altimeter is located on the upper left side of the instrument panel (fig. 2-30). The altimeter> is a self-contained unit which consists of a precision pressure altimeter combined with an altitude encoder. The display indicates and the encoder transmits, simultaneously, pressure altitude information to the transponder. Altitude is displayed on the altimeter 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 50 foot increments. Below an altitude of 10,000 feet, a diagonal warning symbol will appear on the 10,000 foot counter. A barometic pressure setting knob is provided to insert the desired altimeter setting in inches Hg or millibars. A DC powered vibrator operates inside the altimeter whenever aircraft power is on. If I)C power to the altitude encoder is lost, a warning flag placarded COI)E OFF will appear in the upper center portion of the instrument face, indicating that the altitude encoder is inoperative and that the system is not reporting altitude to ground stations. Operating instructions are contained in Chapter 3.

2.82. COPILOT'S ALTIMETER.

The copilot's altimeter is located on the upper right side of the instrument panel (fig. 2-30). It is similar to the pilot's altimeter except it lacks altitude reporting capability.

2-83. VERTICAL VELOCITY INDICATORS.

Vertical velocity indicators are installed separately on the pilot and copilot sides of the instrument panel (fig. 2-30). 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.

The accelerometer, located on 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

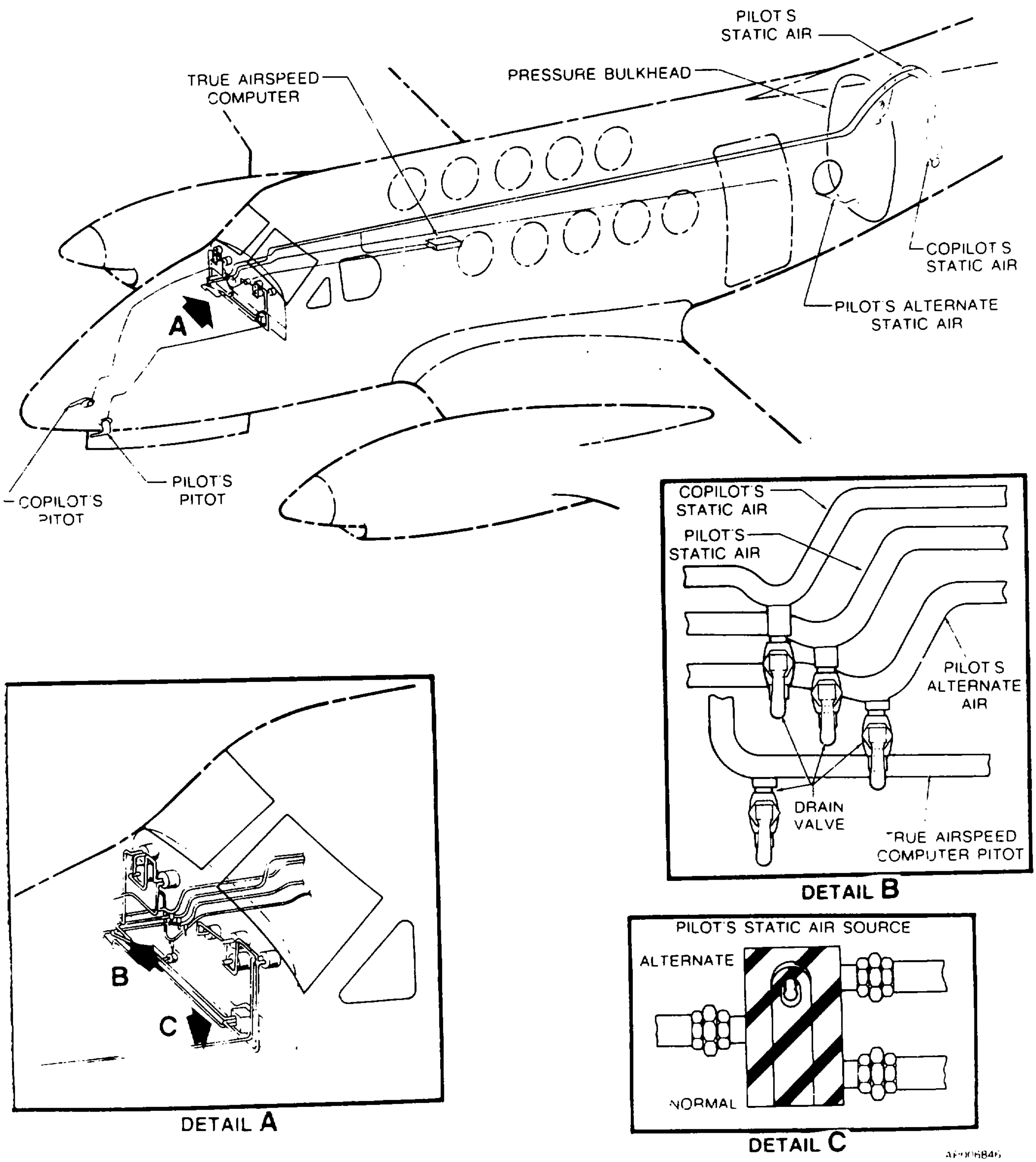
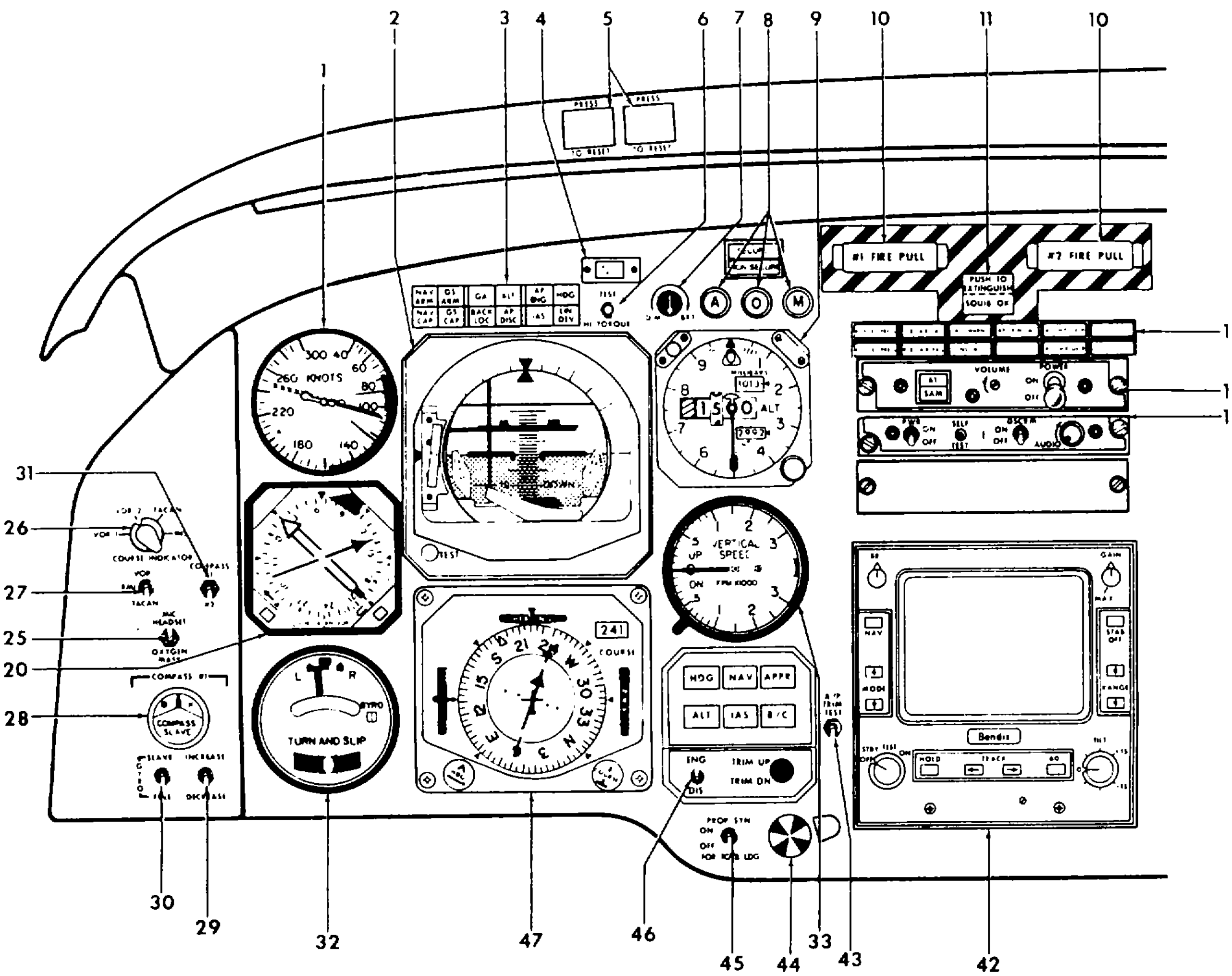


Figure 2-29. Pitot and Static System



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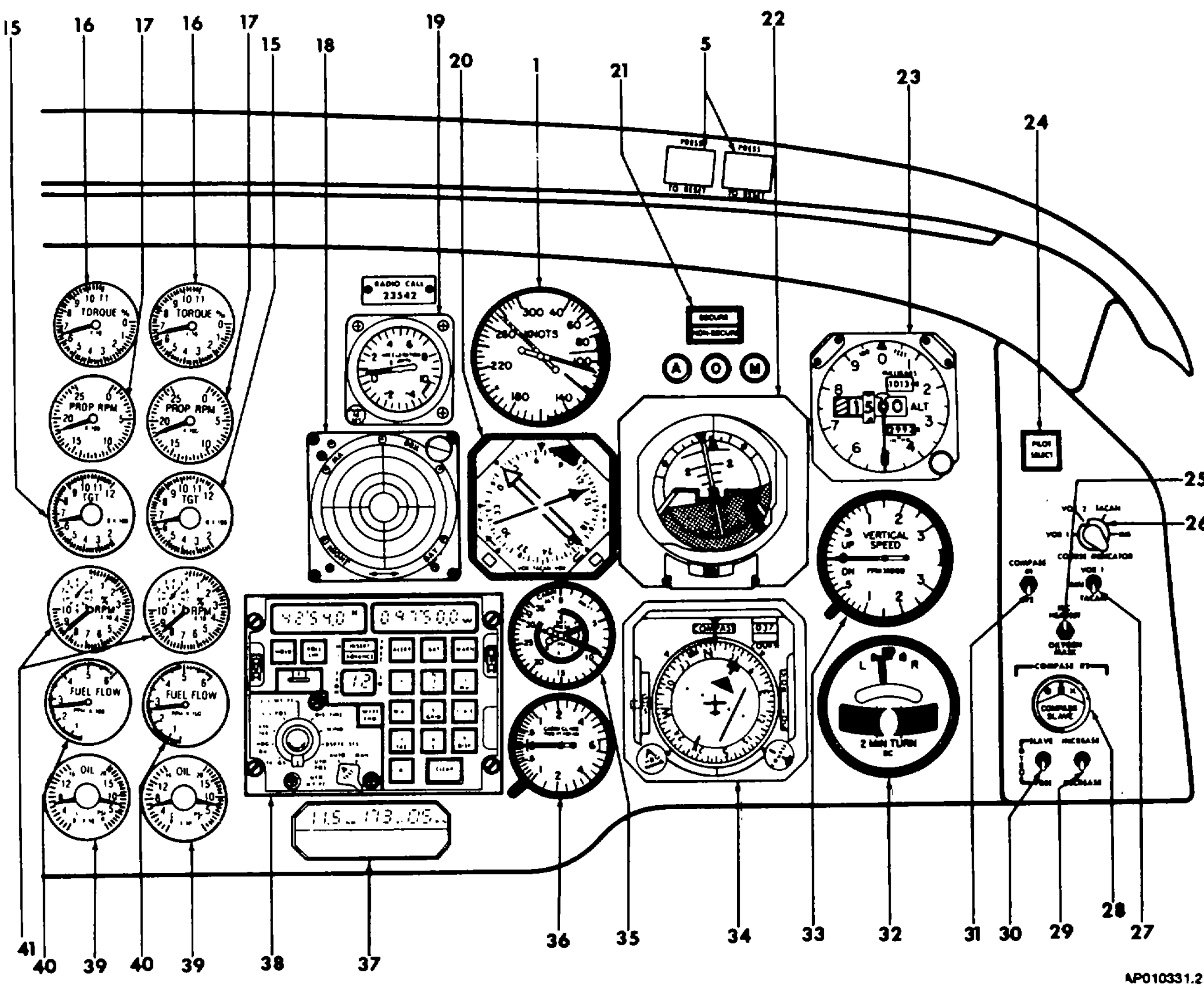
1. AIRSPEED INDICATORS
2. PILOT'S ATTITUDE DIRECTOR INDICATOR
3. AUTOPILOT/FLIGHT DIRECTOR ANNUNCIATOR PANEL
4. AILERON HIGH TORQUE ANNUNCIATOR
5. MASTER CAUTION/WARNING ANNUNCIATORS
6. AILERON HIGH TORQUE TEST SWITCH
7. AUTOPILOT/FLIGHT DIRECTOR ANNUNCIATOR DIMMER CONTROL
8. MARKER BEACON INDICATOR LAMPS
9. PILOT'S ENCODING ALTIMETER
0. FIRE PULL HANDLES
1. PUSH TO EXTINGUISH/SQUIB OK ANNUNCIATORS
2. WARNING ANNUNCIATOR PANEL
13. RADAR SIGNAL DETECTING SET CONTROL PANEL APR-44
14. RADAR RECEIVER CONTROL PANEL APR-39
15. TURBINE GAS TEMPERATURE INDICATORS
16. TORQUE INDICATORS
17. PROPELLER TACHOMETERS
18. RADAR SIGNAL DETECTING SET INDICATOR APR-39
19. ACCELEROMETER
20. RADIO MAGNETIC INDICATORS
21. COMMUNICATION SECURITY ANNUNCIATORS
22. COPILOT'S GYRO HORIZON INDICATOR
23. COPILOT'S ALTIMETER
24. PILOT SELECT ANNUNCIATOR

Figure 2-230. Instrument Panel (Sheet 1 of 2)



25. MICROPHONE HEADSET-OXYGEN MASK SELECTORS
26. COURSE INDICATOR SWITCHES
27. RMI SELECT SWITCHES
28. COMPASS SLAVE INDICATORS
29. COMPASS SLAVE INCREASE-DECREASE SWITCHES
30. GYRO SLAVE-FREE SWITCHES
31. COMPASS #1 - #2 SWITCHES
32. TURN AND SLIP INDICATORS
33. VERTICAL SPEED INDICATORS
34. COPILOT'S HORIZONTAL SITUATION INDICATOR
35. CABIN ALTIMETER/DIFFERENTIAL PRESSURE
36. CABIN RATE OF CLIMB INDICATOR
37. TACAN RANGE INDICATOR
38. INS CONTROL DISPLAY UNIT
39. OIL TEMPERATURE/PRESSURE INDICATORS
40. FUEL FLOW INDICATORS
41. TURBINE TACHOMETERS (N_1)
42. WEATHER RADAR INDICATOR
43. AUTOPILOT TRIM TEST SWITCH
44. PROPELLER SYNCHROSCOPE
45. PROPELLER SYNCH SWITCH
46. AUTOPILOT MODE SELECTOR
47. PILOT'S HORIZONTAL SITUATION INDICATOR

Figure 2-30. Instrument Panel (Sheet 2 of 2) to its maximum travel. The recording pointers remain 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 free air temperature in degrees Celsius.

2-86. STANDBY MAGNETIC COMPASS.

WARNING

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

The standby magnetic compass is located below the overhead fuel management panel and to the right of the windshield divider. It may be used in the event of failure of the compass system, or 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 is located on the magnetic compass.

2-87. MISCELLANEOUS INSTRUMENTS.

a. Annunciator Panels. Three annunciator panels are installed. One is a warning panel with red fault identification lights, and the others are caution/advisory panels with yellow and green identification lights. The warning panel is mounted near the center of the instrument panel below the glareshield (fig. 2-30) and one caution/ advisory panel is located on the center subpanel (fig. 2-6). The mission annunciator panel is located on the copilot's sidewall. Some normal flight operations involve indications from the mission control panel (fig. 4-1). Illumination of a red warning light signifies the existence of a hazardous condition requiring immediate corrective action. A yellow caution light signifies a condition other than hazardous requiring pilot attention. A green advisory light indicates a functional situation. Table 2-6, 2-7, and 2-8 provides a list of causes for illumination of the individual annunciator lights. In frontal view both panels present rows of small, opaque rectangular indicator lights. Word printing on each indicator identifies the monitored function, situation, or fault condition, but cannot be read until the light J is illuminated. The bulbs of all annunciator panel

Table 2-6. Warning Annunciator Panel Legend

WARNING ANNUNCIATOR		
NOMENCLATURE	**COLOR**	**CAUSE FOR ILLUMINATION**
No. 1 FUEL PRESS	Red	Fuel pressure failure on left side
No. 2 FUEL PRESS	Red	Fuel pressure failure on right side
L BL AIR FAIL	Red	Left bleed air warning line has melted or failed, indicating possible loss of No. 1 engine bleed air
R BL AIR FAIL	Red	Right bleed air warning line has melted or failed, indicating possible loss of No. 2 engine bleed air
ALT WARN	Red	Cabin altitude exceeds 12,500 feet
INST AC	Red	No AC power to engine instruments
AP TRIM FAIL	Red	Trim inoperative or running opposite direction commanded
No. 1 CHIP DETR	Red	Contamination of No. 1 engine oil detected
No. 2 CHIP DETR	Red	Contamination of No. 2 engine oil detected

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

CAUTION/ADVISORY ANNUNCIATOR		
NOMENCLATURE	**COLOR**	**CAUSE FOR ILLUMINATION**
No. 1 DC GEN	Yellow	No. 1 engine generator off the line
No. 1 INVERTER	Yellow	No. 1 inverter inoperative
REV NOT READY	Yellow	Propeller levers are not in the high RPM, low pitch position, with the landing gear extended
No. 2 INVERTER	Yellow	No. 2 inverter inoperative
No. 2 DC GEN	Yellow	No. 2 engine generator off line
No. 1 EXTGH DISCH	Yellow	No. 1 engine fire extinguisher discharged
No. 1 NAC LOW	Yellow	No. 1 engine has 20 minutes fuel remaining at sea level, normal cruise power consumption rate
CABIN DOOR	Yellow	Cabin/cargo door open or not secure
No. 2 NAC LOW	Yellow	No. 2 engine has 20 minutes fuel remaining at sea level, normal cruise power consumption rate.
No. 2 EXTGH DISCH	Yellow	No. 2 engine fire extinguisher discharged
No. 1 VANE FAIL	Yellow	No. 1 engine ice vane malfunction. Ice vane has not attained proper position
BATTERY CHARGE	Yellow	Excessive charge rate on battery
PROP SYNC ON	Yellow	Synchrophaser turned on with landing gear extended
No. 2 VANE FAIL	Yellow	No. 2 engine ice vane malfunction. Ice vane has not attained proper position
DUCT OVERTEMP	Yellow	Excessive bleed air temperature in environmental heat ducts
IFF	Yellow	Transponder fails to reply to a valid mode 4 interrogation
No. 1 NO FUEL XFR	Yellow	Auxiliary fuel tank on side of No. 1 engine not transferring fuel into nacelle tank
No. 2 NO FUEL XFR	Yellow	Auxiliary fuel tank on side of No. 2 engine not transferring fuel into nacelle tank
No. 1 LIP HEAT	Yellow	Failure of lip heat valve to conform to selected position or in transit
No. 2 LIP HEAT	Yellow	Failure of lip heat valve to conform to selected position or in transit
INS	Yellow	Inertial navigation system's cooling fan is off or an INS malfunction that illuminates the WARN annunciator on the CDU
No. 1 LIP HEAT ON	Green	No. 1 engine air scoop heat switch is on
No. 2 LIP HEAT ON	Green	No. 2 engine air scoop heat switch is on

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

NOMENCLATURE	CAUTION/ADVISORY ANNUNCIATOR COLOR	CAUSE FOR ILLUMINATION
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.
No. 1 DVANE EXT	Green	No. 1 ice vane extended
FUEL CROSS-FEED	Green	Crossfeed valve open
AIR COND N1 LOW	Green	No. 2 engine RPM too low for air conditioning load
No. 2 VANE EXT	Green	No. 2 ice vane extended
No. 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
EXTERNAL POWER	Green	External power connector plugged in
R BL AIR OFF	Green	Right environmental bleed air valve closed
No. 2 IGN ON	Green	No. 2 engine ignition/start switch on No. 2 engine autoignition switch armed and engine torque below 20 percent
No. 1 AUTOFEATHER	Green	No. 1 engine autofeather armed with power levers advanced above90% N_1
No. 2 AUTOFEATHER	Green	No. 2 engine autofeather armed with power levers advanced above90% N_1
BRAKE DEICE ON	Green	Brake deice system activated

lights are tested by activating the ANNUNCIATOR TEST switch, located on the right subpanel near the caution/advisory panel. The system is protected by two 5-ampere circuit breakers placarded ANN PWR and ANN IND on the overhead circuit breaker panel (fig. 2-27). The annunciator system lights are dimmed when the MASTER PANEL LIGHTS switch is ON and the pilot's flight instrument lights are illuminated. The lights are automatically reset to maximum brightness if:

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

(2) The INST INDIRECT LIGHTS switch is rotated clockwise.

(3) The MASTER PANEL LIGHTS switch is off.

(4) The MASTER PANEL LIGHTS switch is ON and the PILOT INST LIGHTS switch if OFF.

(5) Master warning annunciator (red). A MASTER WARNING annunciator is provided for both the pilot and the copilot and is located on each side of the glareshield (fig. 2-30). Any time a warning annunciator illuminates, the MASTER WARNING light will illuminate, and will stay illuminated until the MASTER WARNING annunciator is pressed to reset the circuit. If a new condition occurs, the annunciator will be reactivated, and the applicable annunciator panel annunciator will illuminate.

(6) Master caution annunciator (yellow). A MASTER CAUTION LIGHT is provided for both the pilot and copilot located adjacent to the MASTER WARNING annunciator. Whenever a

Table 2-8. Mission Control Panel Annunciator Legend

MISSION ANNUNCIATOR		
NOMENCLATURE	**COLOR**	**CAUSE FOR ILLUMINATION**
GROUND CALL	Yellow	Incoming call detected on mission voice order wire.
No. 1 OPR CALL	Yellow	Operator No. 1 calling on ICS.
No. 2 OPR CALL	Yellow	Operator No. 2 calling on ICS.
AIR LINK	Yellow	Quality of signal on air-to-air is deteriorating.
3 ØAC OFF	Yellow	Three phase AC power to INS is off.
BATT FEED FAULT	Yellow	Ground fault detected in battery external power line.
FILTER PRESS	Yellow	The pressure in one of the UHF diplexers is low, and needs to be recharged by maintenance personnel.
GROUND LINK	Yellow	Quality of signal on air/ground/air link is deteriorating.
SPCL EQPT OVRD	Yellow	Mission override switch in override position.
NO INS UPDATE	Yellow	INS is not updating with GPS or TACAN information.
MISSION AC ON	Green	Mission 3Ø 400 Hz AC is on.
INS UPDATE	Green	INS is updating with GPS or TACAN information.
MISSION DC ON	Green	Mission DC is on.
EXT AC PWR ON	Green	External AC power is on.
EXT DC PWR ON	Green	External DC power is on.
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caution annunciator illuminates, the MASTER CAUTION will illuminate, and will stay illuminated until the MASTER CAUTION annunciator is pressed to reset the circuit. If a new condition occurs, the light annunciator will be reactivated and the appropriate annunciator panel annunciators will illuminate.

b. Clocks. One manually-wound 8-day clock is mounted in the center of the pilot's control wheel and an electric digital clock is mounted in the center of the copilot's control wheel.

c. Copilot's Clock. The copilot's clock (fig. 2-18) is a five-function, six digit, clock-timer utilizing three button operation. Each of the five functions can be selected for viewing. This clock-timer has a liquid crystal display for readability in sunlight and an internal light for night use. The clock has an internal battery to maintain time when the aircraft power is off.

(1) Mode selection. The MODE button is pressed to select the desired operation. The mode annunciator is displayed above the mode identifiers. Pressing the MODE button will advance the annunciator to the desired operation.

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

(2) Clock timer mode.

(a) Setting Local Time. Press the MODE button to advance the annunciator to LC. To set hour, press RST button once, then press ADV button and hold until correct hour is displayed. To set minutes, press RST button once so that minutes and seconds are displayed. (Always set to the next

minute and count down from the selected time standard.) Then press SET button once to hold the time. When the time standard shows the exact time displayed, press the ST-SP button to activate time start.

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

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

(3) Trip or flight timer. Press the MODE button to advance the annunciator to FT. Press the ST SP button and verify that display shows zero. The timer will activate at takeoff and will stop at touchdown. The clock cannot be reset during flight to prevent accidental erasing of flight time.

(4) Elapsed time mode. Press the MODE button until the annunciator is in ET position. Press RST button to set time at zero. Then press the ST - SP button one time. To stop the counting, press the ST - SP button. Ending time will be displayed until RST button is pressed to clear the elapsed time. The clock may be used in other modes and elapsed time will remain until cleared by pressing RST button. If the timer is counting when the RST button is pressed it will continue to count from zero.

(4) Downcounter mode. Press the MODE button to advance the annunciator to DC position. Press SET button twice; hour display will show zero. Next press ADV button and hold until desired hour is displayed. To set minutes, again press SET button one time, then hold ADV button until desired minutes are displayed. To set seconds, press SET button one time so that zeros show in the seconds display. Press ADV button until desired number appears in the seconds display. Press SET button. Press ST SP button and display will start counting down. The counter will continue to count down if other modes are selected. When the counter reaches zero, the display will flash. Press the ST SP button and the display stops flashing.

NOTE

The alarm function self-terminates after one minute if not reset.

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. Table 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

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

WARNING

When aviation gasoline is used in a turbine engine, extreme caution should be used when around the combustion chamber and exhaust area to avoid cuts or abrasions. The exhaust deposits contain lead oxide which will cause lead poisoning.

CAUTION

Proper procedures for handling JP-4 and JP-5 fuel 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.

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 fuel 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 on 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, frost, water, and ice from the aircraft fuel filler cap area before removing the fuel filler cap (fig. 2-31). Remove only one aircraft tank filler cap at any one time, and replace each one immediately after the servicing operation is completed.

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

SYSTEM	SPECIFICATION	CAPACITY
Fuel	MIL-T-5624 (JP-4 and JP-5)	542 U.S. Gals.
Engine Oil	MIL-L-23699	14 U.S. Quarts per engine
Hydraulic Brake System	MIL-H-5606	1 U.S. Pint
Oxygen System	MIL-0-27210	128 Cubic Feet
Toilet Chemical	Monogram DG-19	3 Ounces

Table 2-10. Approved Fuels

SOURCE	PRIMARY OR STANDARD FUEL	ALTERNATE FUEL	
US MILITARY FUEL	JP-4 (MIL-T-5624)	JP-5 (MIL-T-5624)	
NATO Code No.	F-40 (Wide Cut Type)	F-44 (High Flash Type)	
COMMERCIAL FUEL	JET B	JET A JET A-1	
(ASTM-D-16551)	American JP-4	American Type A	NATO F-34
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.PA.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	Union JP-4	76 Turbine Fuel	
Foreign Fuel	NATO F40	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/UTL 9130-010	
Greece	JP-4 MIL-T-5624		
Italy	AA-M-C-1421	AMC-143	
Netherlands	JP-4 MIL-T-5624	D. Eng RD 2493	
Norway	JP-4 MIL-T-5624		
Portugal	JP-4 MIL-T-5624		
Turkey	JP-4 MIL-T-5624		
United Kingdom (Britain)	D. Eng RD 2454	D. Eng RD 2498	

NOTE:

Anti-icing and Biocidal Additive for Commercial Turbine Engine Fuel - The fuel system icing inhibitor shall conform to MIL-1-27686. The additive provides anti-icing protection and also functions as a biocide to kill microbial growths in aircraft fuel systems. Icing inhibitor conforming to MIL-I-27686 shall be added to commercial fuel, not containing an icing inhibitor, during refueling operations, regardless of ambient temperatures. Refueling operat ions shall be accomplished in accordance with accepted commercial procedures.

Table 2-11. Standard, Alternate and Emergency Fuels

ENGINE	ARMY STANDARD FUEL	ALTERNATE TYPE	EN1ERGENCY FUEL	
			TYPE	*MAN. HOURS
PT6A	MIL-T-5624 Grade JP-4	MIL-T-5624 Grade JP-5 Grade JP-8	MI-G-5572 Anv AV Gas	150
*Maximum operating hours with indicated fuel between engine overhauls (TBO).				

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

e. Avoid dragging the fueling hose where it can damage the soft. flexible surface of the deicer boots.

f. Observe NO SMOKING precautions.

g. Prior to removing filler cap insure that the hose is grounded to the aircraft.

h. Wash off spilled fuel immediately.

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

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

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

2-90. FILLING FUEL TANKS.

WARNING

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

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.

CAUTION

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. Fill main tank before filling respective auxiliary tanks unless less than a full fuel load is desired.

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.

To remove moisture and sediment from the fuel system, 12 fuel drains are installed (plus one for the ferry system, when installed).

2-92. FUEL TYPES.

Approved fuel types are as follows:

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

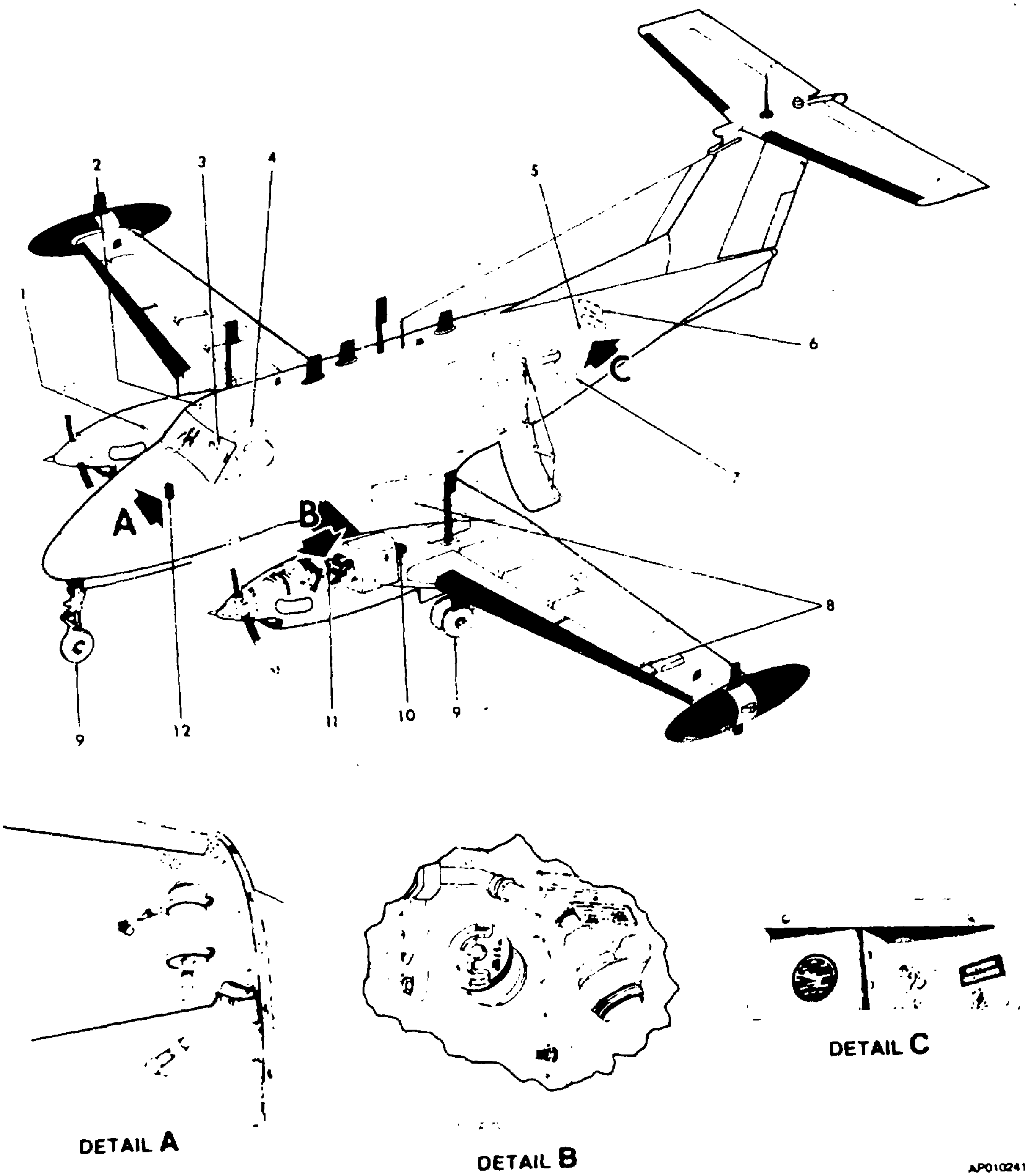
b. Alternate Fuels, Army Alternate fuels art JP-5 and JP-8.

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

2-93. USE OF FUELS.

Fuel is used as follows:

a. Fuel limitations. There is no special limitation on the use, of Army standard fuel, but certain



1 AIR CONDITIONING COMPRESSOR
2 EXTERNAL POWER RECEPTACLE
3 HAND FIRE EXTINGUISHER
4 BATTERY 24 VDC
5 OXYGEN SYSTEM FILLER PORT
6 OXYGEN CYLINDERS 2 (64 CU FT BOTTLES)
7 ELECTRIC TOILET
8 FUEL FILLER CAPS (TYPICAL LEFT AND RIGHT)
9 LANDING GEAR TIRES
10 ENGINE FIRE EXTINGUISHER
11 ENGINE OIL FILLER CAP (TYPICAL LEFT AND RIGHT)
12 WHEEL BRAKE FLUID RESERVOIR

Figure 2-31. Servicing Locations

limitations arc imposed when alternate or emergency fuels are used. For the purpose of recording. Fuel mixtures shall be identified as to the major component of the mixture. except when the mixture contains leaded gasoline. The use of any emergency fuels 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 starts at low ambient temperature may become difficult due to low vapor pressure.

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. Fuel 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 F40 (JP-4) or Commercial ASTM type B fuels. Whenever this condition occurs, the engine operating characteristics may change in that lower operating temperature, slower acceleration, lower engine speed, easier starting, and shorter range may be experienced. The reverse is true when changing from F-40 (JP-4) fuel to F-44 (JP-5) or Commercial ASTM Type A-1 fuels. 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 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 (starter only) for 15-20 seconds, then recheck. If over 10 hours have elapsed, start the engine and run for 2 minutes, then recheck. Add oil as required. Do not overfill.

2. Remove oil filler cap.
3. Insert a clean funnel, with a screen incorporated, into the filler neck.
4. 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).
5. Check oil filler cap for damaged performed packing, general condition and locking.

CAUTION

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

6. If oil level is over 2 quarts low, motor or run engine as required and as is necessary.
7. Install and secure oil filter cap.
8. Check for any oil leaks.

2-95. 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.

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 ELECTRIC TOILET.

The toilet should be serviced during routine ground maintenance of the aircraft following any usage. It is more efficient and convenient to remove, clean and recharge the toilet tank on a regular basis rather than to wait until the tank is filled to capacity. Instructions for servicing are provided on a decal applied to the front side of the removable tank. Instructions are as follows:

a. *Tank Removal.*

1. Open front access to the toilet, as applicable, to remove the toilet tank.
2. Depress the lock-ring of the flush hose quick-disconnect coupling located on the right side at the front of the tank top.
3. Drain any residue of flush fluid in the hose by partially disengaging the plug from the quick disconnect and manipulating the hose to assist drainage.
4. Remove the flush hose from the quick disconnect and place hose in the retaining clip located on the underside of the toilet mounting plate.
5. Install the cap attached to the quick disconnect to seal the coupling.
6. Close the knife valve at the bottom of the toilet bowl by pushing the actuator handle until the valve is fully closed.
7. Press the two fasteners on each side of the knife valve actuator to unlock the tank.
8. Remove the tank by pulling the recessed carrying handle on the tank top.

b. *Tank Cleaning.*

1. Dispose of tank contents by holding the tank upside-down over a sewer or toilet and pull the knife valve actuator handle, opening the valve and allowing the tank to drain.
2. Rinse the tank by filling one-half full with water. Close the knife valve and shake vigorously. Drain tank as in previous step.

NOTE

Commercial detergents and disinfectants can be included in the rinse water if desired. However, do not include these materials in the tank precharge.

3. Rinse and drain the tank several times to insure that the tank is thoroughly clean.
4. Wipe the exterior surfaces of the tank using a cloth moistened with clear water and disinfectant.

c. *Tank Precharge.*

CAUTION

During freezing temperatures, toilet shall be serviced with antifreeze solution to prevent damage.

Charge the tank with a mixture of water and chemical according to chemical manufacturer's specification.

d. *Tank Installation.*

1. Install the tank by inserting the slides located on each side of the knife valve into the slide plate assembly on the bottom of the toilet and slide tank into place.
2. Press the two fasteners to the first detent to secure the tank.
3. Remove the cap in the flush hose quick disconnect and connect the hose coupling to the quick disconnect. Lock the disconnect lock ring.
4. Pull the knife valve actuator to fully open the valve.
5. Lift the toilet seat and shroud assembly from the top of the toilet and wipe with

cloth moistened with clear water and disinfectant. Wipe the bowl and surrounding area.

6. Check flushing operation of the toilet and check for leaks.
7. Close access to the toilet.

2-98. ANTI-ICING, DEICING AND DEFROSTING PROTECTION.

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, insure that protective covers are fitted tightly. As a deicing measure, keep exposed aircraft wet with fluid for protection against frost.

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 more difficult to remove.

2-99. DELETE

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).			

2-100. APPLICATION OF EXTERNAL POWER.

CAUTION

Before connecting the power cables from the external power source to the aircraft, insure 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 the polarity of the external power source is the same as that of the aircraft before it is connected. Minimum GPU requirement is 400 amperes continuous and 1800 amperes for one tenth of a second.

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 (outboard side of' the right engine nacelle. An external A(, power receptacle is installed on the outboard side of' the left 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 2-20.

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.

(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. 2-20.
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. Insure 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-:32).

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 small top-off will create little heat. A complete recharge will create substantial heating. The final stabilized cylinder pressure should be adjusted for ambient temperature per figure 2-32.

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 2-33.

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 Practice. Aircraft equipped with turboprop engines require additional maintenance safety practices. The following list of safety practices should he 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, make sure the brakes are firmly set.

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

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

(6) Do not attempt towing or taxing of the aircraft with control surfaces until prepared to operate them.

(7) When high winds are present, do not unlock the control surface until prepared to 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.

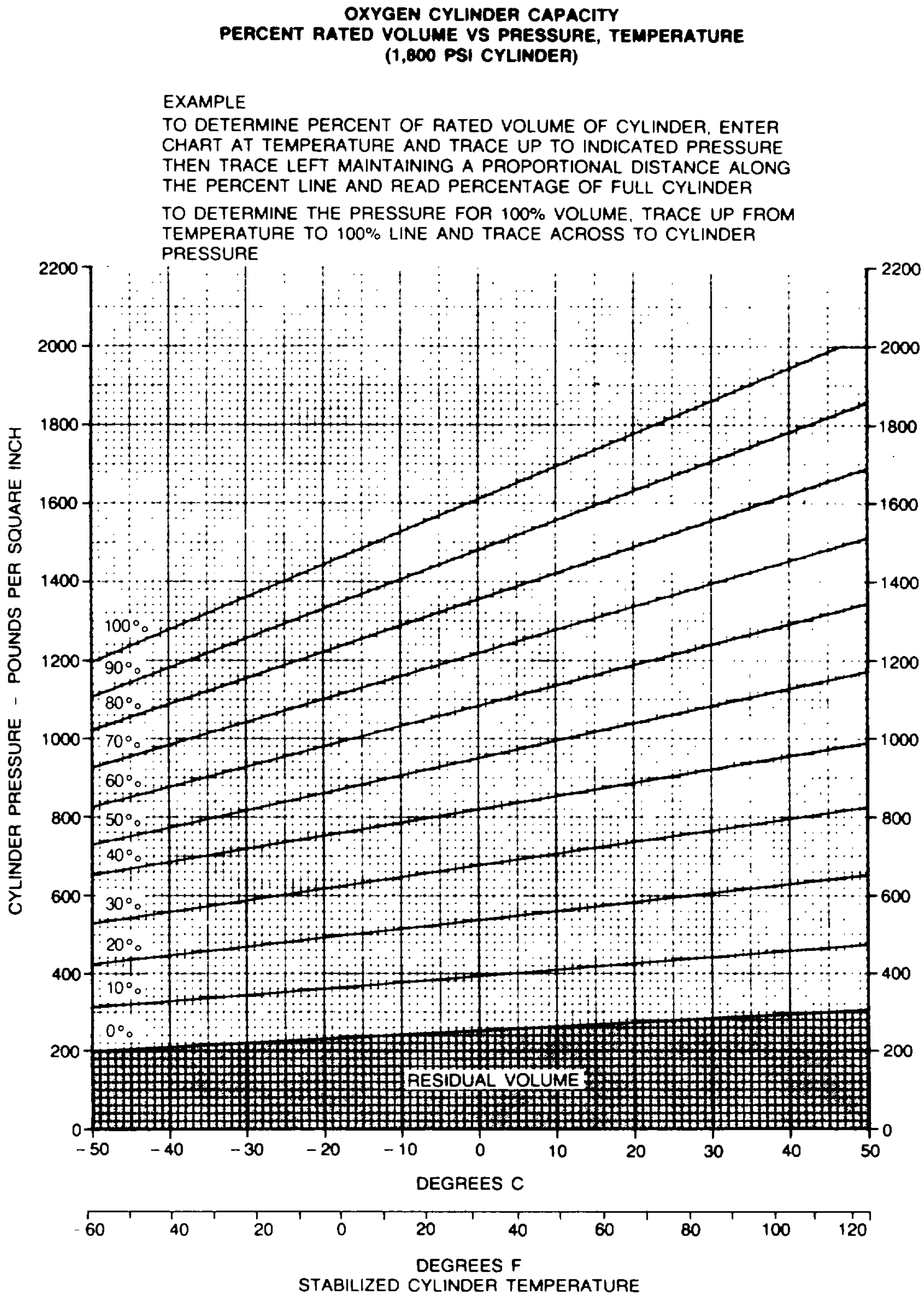


Figure 2-32. Oxygen System Servicing Pressure

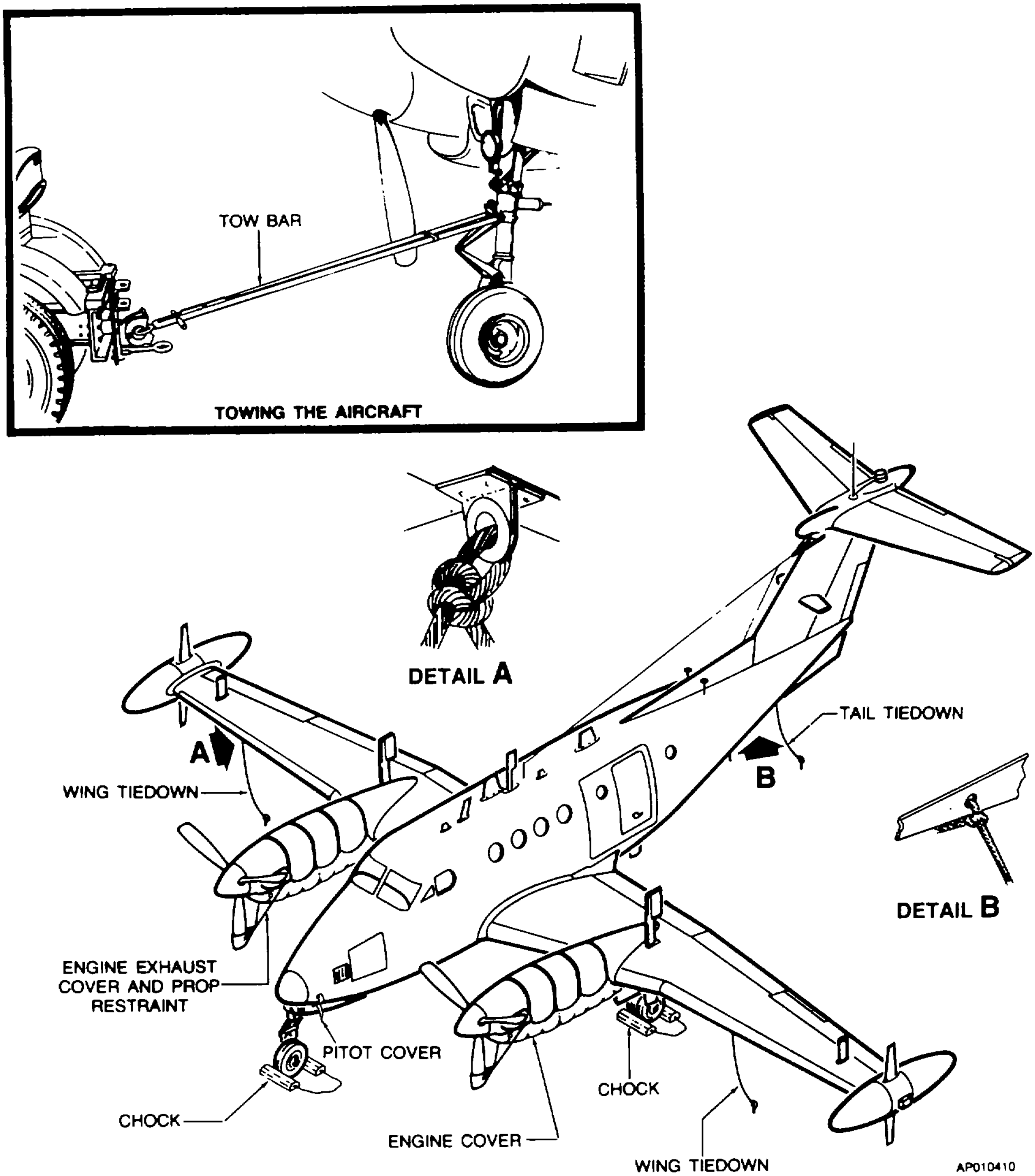


Figure 2-33. Parking, Covers, Ground Handling, and Towing Equipment

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. 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.

CAUTION

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. 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. The particular problems to be encountered under adverse weather conditions and the special methods designed to avoid damage to the aircraft are covered by the various phases of the ground handling procedures included in this section of general ground handling instructions. (Refer to TM 55-1500-204-25/1.)

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.

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. 2-19) holds the engine and propeller control levers in a secure position, and the elevator, rudder, and aileron in neutral position. Install the control locks as follows:

1. With engine and propeller control levers in secure position, slide lock onto control pedestal to prevent operation of levers.
2. Install elevator and aileron lockpin vertically through pilot's control column to lock control wheel.
3. Install rudder lock pin through flapper door forward of pilot's seat, making sure rudder is in neutral position.
4. Reverse steps1 through 3 above to remove control lock. Store control lock.

2-104. INSTALLATION OF PROTECTIVE COVERS.

The crew will insure that the aircraft protective covers are installed.

2-105. MOORING.

The aircraft is moored to insure 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. 2-34) 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 3/8 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 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 2-34. If aircraft must be secured use the following steps:

1. After aircraft is properly located, place nose wheel in centered position. Head 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 wing span distance from all other aircraft. Position nose mooring point approximately 3 to 5 feet down-wind 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. Accomplish aircraft tiedown by utilizing mooring points shown in figure 234. 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 2-34. When anchor kits are not available, use metal stakes or deadman type anchors, providing they can successfully sustain a minimum pull of 3000 pounds.

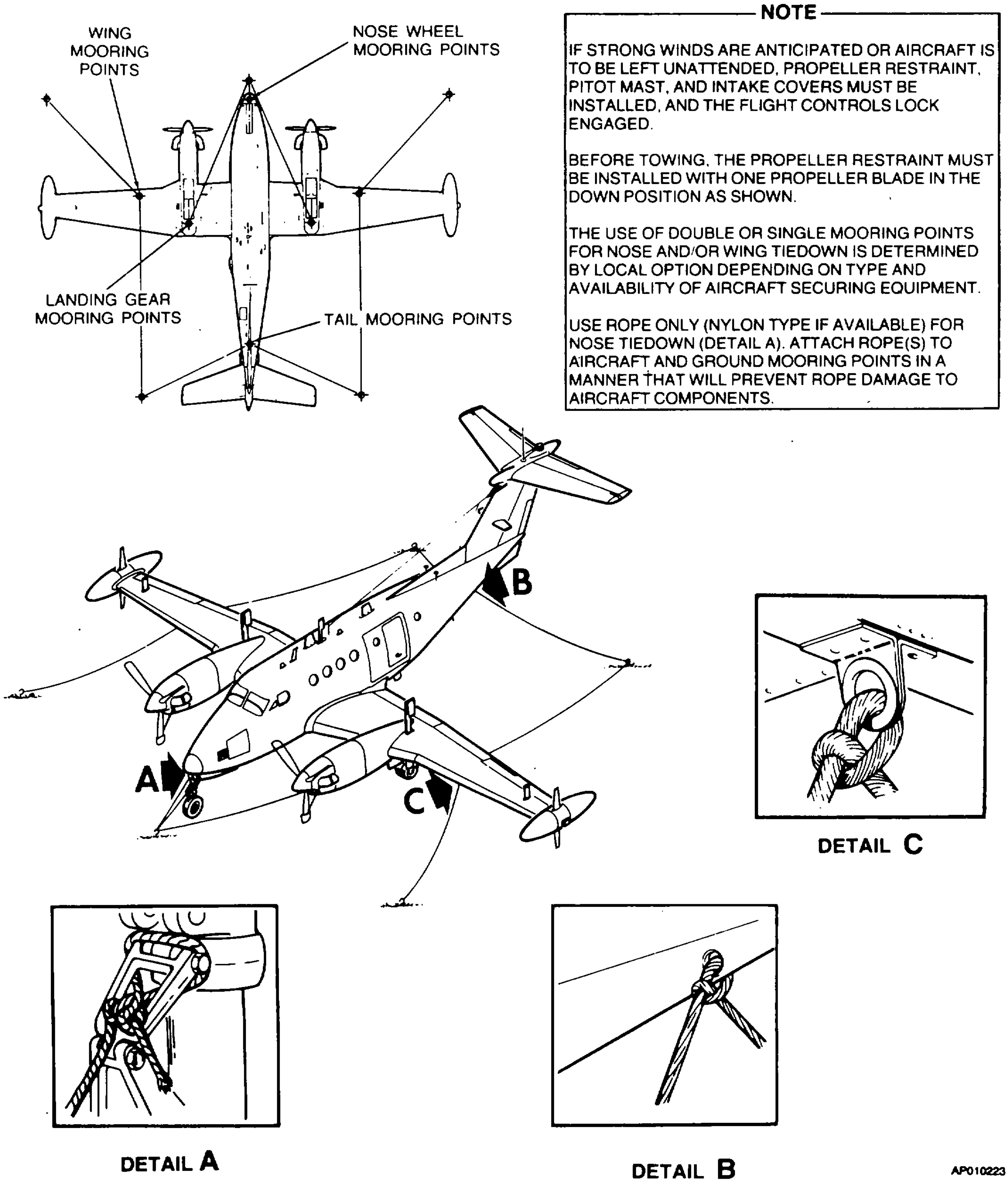


Figure 2-34. Mooring the Aircraft

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. 2-33).

9. Secure propellers to prevent windmilling (fig. 2-33).

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 RC12G aircraft. It provides a brief description of equipment covered, the technical characteristics and locations. It covers systems and 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, 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

Avionics equipment requires a 3-minute warm-up period. The weather radar has an automatic time delay of 60 to 70 seconds.

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 a 50-ampere circuit breaker to the avionics power relay which is controlled by the AVIONICS MASTER POWER switch on the overhead control panel (fig. 2-12). Individual system circuit breakers and the associated avionics busses are shown in fig. 223. 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 on the overhead circuit breaker panel (fig. 2-27). In the OFF (aft) position, the relay is energized and power is removed from avionics equipment. 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 single-phase AC power when operated by the INVERTER No.1 or No.2 switches (fig. 2-12). Either inverter is capable of powering all avionics equipment requiring AC power. AC power from the inverters is routed through fuses 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 either of two DC powered 3000 voltampere solid state three phase inverters. The three phase inverters are controlled by a three-position switch located on the mission control panel (fig. 4-1) placarded No. 1 MSN OFF No. 2 MSN.

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, HF, and SATCOM communication units.

3-5. MICROPHONES, SWITCHES AND JACKS.

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

NOTE

The audio system was designed for 5-OHM headsets.

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

b. Controls and Functions.

(1) Microphone control wheel switches (fig. 2-18). Keys selected facility.

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

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

(2) Floorboard microphone switches (fig. 2-7). Controls connection of selected microphone to audio system.

(a) Held depressed. Connects selected microphone to audio system.

(b) Released. Disconnects selected microphone from audio system.

c. Microphone jack selector switches. Two switches, placarded MIC HEADSET-OXYGEN MASK, are located on the extreme left and extreme right of the instrument panel (fig. 2-30). 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 head-set microphone to audio system.

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

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

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 and HF transceivers. The audio control panels are protected by respective 2-ampere AUDIO PILOT and AUDIO COPILOT circuit breakers located on the overhead circuit breaker panel (fig. 2-27).

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.

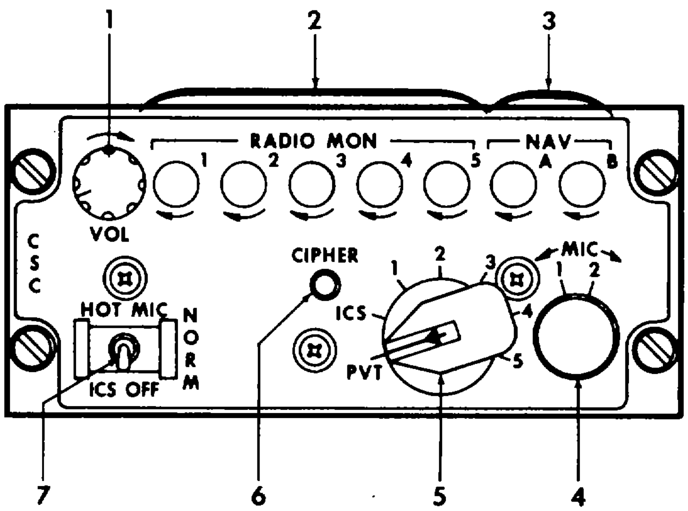
(2) Communication radio monitor controls. Each is combination rotary control and on-off push-pull switch, permitting both receiver selection and volume adjustment.

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

(b) No. 2. On connects user's headset to audio from VHF/AM/FM and SATCOM transceivers.

(c) No. 3. On connects user's headset to audio from No. 1 UHF transceiver in use.

(d) No. 4. On connects user's headset to audio from HF transceiver.



1. MASTER VOLUME CONTROL
2. RADIO AUDIO MONITOR CONTROLS
3. NAVIGATION RECEIVERS AUDIO MONITOR CONTROLS
4. MICROPHONE IMPEDANCE MATCHING SWITCH
5. TRANSMIT-INTERPHONE SELECTOR SWITCH
6. CIPHER INDICATOR LIGHT (NOT USED)
7. MICROPHONE SELECTOR SWITCH

Figure 3-1. Audio Control Panel (C-499) (Typical Pilot, Copilot)

(e) No. 5. On connects user's head-set to audio from No. 2 UHF and VOW transceivers.

(3) NAV radio monitor controls. Combination volume control and "ON-OFF" switches for NAV receivers.

(a) NAV-A. On connects user's head-set to audio from VOR-1, VOR-2 or marker beacon set in use.

(b) NAV-B. On connects user's head-set to audio from TACAN or ADF set in use.

c. Controls and Functions.

(1) Microphone Impedance Matching Switch. Two-position, thumb-actuated switch. Selects Interface circuit that best matches impedance of microphone in use.

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

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

(2) Microphone Selector Switch. Controls activation of microphones.

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

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

c. ICS OFF. Deactivates microphones.

d. Controls and Functions.

(1) Transmitter-interphone selector switch. Connects microphone and headset to selected radio transmitter or Interphone. Bypasses control of respective receiver audio switch.

(a) PVT. Activates pilot-to-copilot private Intercom.

(b) ICS. Activates interphone for pilot, copilot, and mission avionics operator communications. This switch position also enables a data link VOW key line by activating relays in the Data Link Transmit Control Switch Box located in the INS equipment rack aft of the copilot's seat. This provides secure voice key capabilities whenever the pilot or copilot key a microphone while the aircraft is operated in the unmanned (no mission avionics operators) configuration.

(c) No. 1. Permits audio reception from VHF-AM No. 1 transceiver. Routes key and microphone signals to VHF-AM No. 1 transceiver.

(d) No. 2. Permits audio reception from VHF/AM/FM and SATCOM transceivers. Routes key and microphone signals to VHF/AM/FM and SATCOM transceivers.

(e) No. 3. Permits audio reception from No. 1 UHF transceiver. Routes key and mic signals to No. 1 UHF transceiver.

(f) No. 4. Permits audio reception from HF transceiver. Routes key or microphone signals to transceiver.

(g) No. 5 Permits audio reception from No. 2 UHF or VOW. Routes key and microphone signals to transceiver.

e. Normal Operation.

(1) Turn-on procedure. Both audio control panels are activated when the Avionics Master switch is placed to the ON position.

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. Receiver audio switches (audio control panel) -As required.

2. Master volume control (audio control panel) -As required. (Adjust volume control of system being used.)

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.
4. Microphone select switch - As desired.

(3) Transmitter operating procedure.

1. Transmitter-interphone selector switch (audio control panel) - Set for transceiver desired.
2. Microphone jack selector switch (instrument panel, fig. 2-30) - As desired.
3. Use either one of the following microphone switches to key a selected transmitter;
   a. Control wheel microphone switch - Depress fully to the XMT position.
   b. Floorboard microphone switch - Depress.

(4) Intercommunication procedure.

1. Transmitter-interphone selector switch (audio control panel) - Select ICS or PVT as desired.
2. Microphone jack selector switch (instrument panel, fig. 2-30) - As desired.
3. Microphone select switch (audio control panel) - Select HOT MIC, NORM, or ICS OFF as desired.
   a. If HOT MIC is selected - Talk when ready.
   b. If NORM is selected - Depress control wheel microphone switch or floorboard microphone switch and speak into the microphone.
   c. If ICS OFF is selected - Intercom function is switched off.
4. Volume control (selected transceiver) - Set for comfort.

f. Emergency Operation. Not applicable.

g. Shutdown Procedure.

1. Avionics master power switch (overhead control panel, fig. 2-12) - OFF.
2. Leave controls and circuit breakers positioned for normal operation.

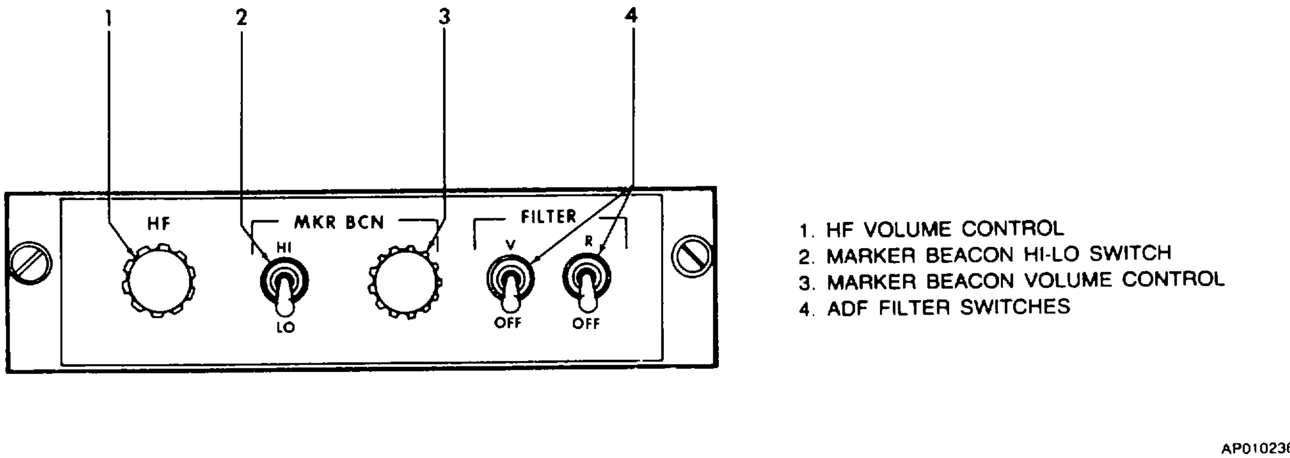


Figure 3-2. Marker Beacon Audio Control Panel

3-7. MARKER BEACON AUDIO CONTROL PANEL (FIG. 3-2).

a. Description. The marker beacon audio control panel, located on the pedestal extension (fig. 2-8) allows the pilot or copilot to selectively monitor audio signals from the high frequency (HF), marker beacon (MKR BCN), or ADF systems. It also has controls for the selection of ADF voice or range filters.

b. Controls and Functions.

(1) HF volume control. Adjusts volume of high-frequency radio signals received.

(2) MKR BCN HI-LO switch. Selects sensitivity of marker beacon receiver.

(3) MKR BCN volume control. Adjusts volume of marker beacon radio signals received.

(4) ADF Filter Switches. Controls selected ADF filter.

(a) FILTER V-OFF switch. Selects filter to block voice transmissions from ADF ground station.

(b) FILTER R-OFF switch. Selects filter to block range transmissions from ADF ground station.

3-8. FM/SATCOM AUDIO SELECTOR SWITCH PANEL.

The FM/SATCOM audio selector switch panel, located on the pedestal extension (fig. 2-8), provides a means of selection between SATCOM and the AN/ARC-186 (FM) radios when position No.2 on the audio control panel (fig. 3-1) has been selected. The FM/SATCOM audio selector panel has three pushbutton switch-indicators.

a. SATCOM/FM selector switch. The center switch, with illuminated placardeds which read SATCOM or FM, allows the alternate selection of SATCOM or FM audio. Depressing the center switch when the SATCOM placard is illuminated will cause the FM placard to illuminate and the SATCOM placard to extinguish. Depressing the center switch again will cause the illuminated placards to reverse. If the SATCOM system is not operational, the switch should remain in the FM mode.

b. Pilot's and Copilot's SATCOM/FM Monitor Switches. The pilot and copilot are each provided with a SATCOM/FM monitor control switch, located on the SATCOM/FM audio selector switch panel (fig. 2-8), on either side of the SATCOM/FM selector switch. The switches, with illuminated placards which read MONITOR ON or MONITOR OFF, allow the alternate selection of MONITOR ON or MONITOR OFF. Depressing the switches, when the MONITOR OFF placard is illuminated, will cause the MONITOR ON placard to illuminate, and the MONITOR OFF placard to extinguish. Depressing the switches again will cause the illuminated placards to reverse. When the center SATCOM/ FM selector switch has been set to SATCOM and the pilot's or copilot's SATCOM/FM monitor switch has been set to MONITOR ON, the pilot or copilot will receive audio from the FM receiver (the deselected receiver). When the SATCOM/FM selector switch has been set to FM, and the pilot's

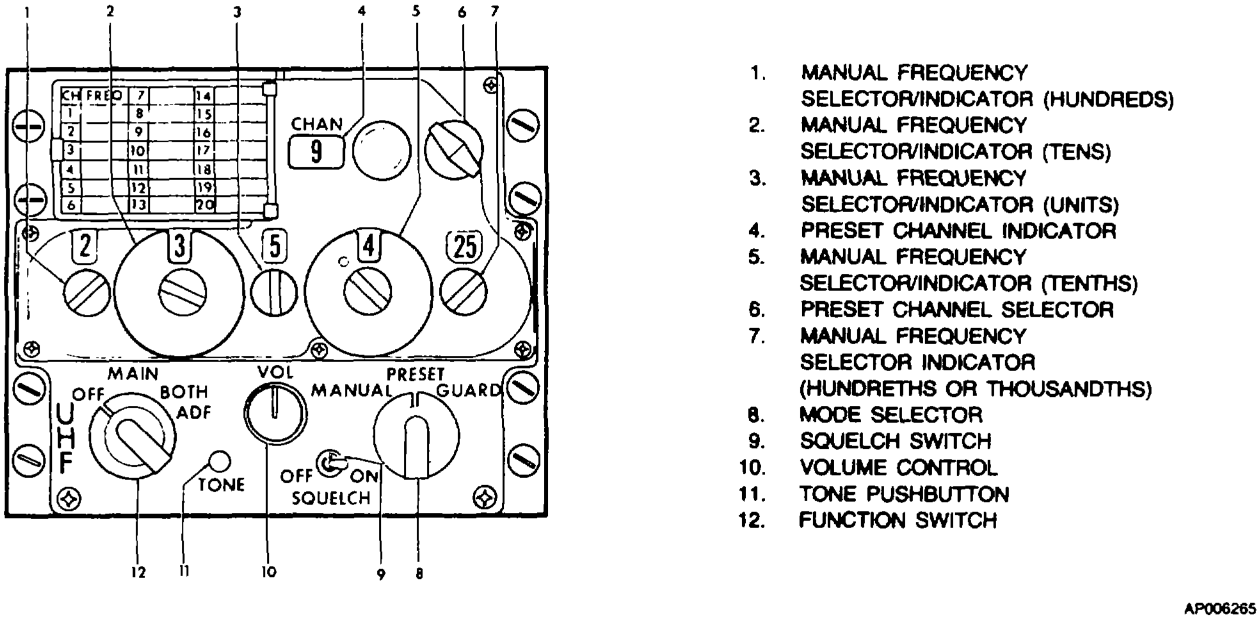


Figure 3-3. UHF Control Panel (AN/ARC-164)

or copilot's SATCOM/FM monitor switch has been set to MONITOR ON, the pilot or copilot will receive audio from the SATCOM receiver (the deselected receiver). Monitor volume is controlled by the master volume control, located on the appropriate pilot's or copilot's audio control panel (fig. 3-1).

3-9. UHFCOMMAND SET(AN/ARC-164).

a. Description. The UHF 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.

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.

Complete provisions only are installed for a TSEC/KY-58 voice security device to be located on the INS equipment rack behind the copilot. The UHF command set is protected by the 7 1/2 ampere UHF circuit breaker on the overhead circuit breaker panel (fig. 2-27). Figure 3-3 illustrates the UHF command set. The associated blade type antenna is shown in figure 2-1.

b. Controls and Functions.

(1) UHF control panel (fig. 3-3):

(2) Manual frequency selector (hundreds). Selects hundreds digit of frequency (either 2 or 3) in MHz.

(3) Manual frequency selector (tens). Selects tens digit of frequency (O through 9) in MHz.

(4) Manual frequencyselector (units). Selects units digit of frequency (O through 9) in MHz.

(5) Manual frequencyselector (tenths). Selects tenths digit of frequency (O through 9) in MHz.

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

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

(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. Activates ADF or homing system (if installed) and main receiver.

c. Normal Operation.

(1) Turn on procedure:

1. Insure that aircraft power is on.

NOTE

It is presumed that the avionics master power switch is on, and that normally used avionic circuit breakers remain depressed.

2. Avionics master power switch (overhead control panel, fig. 2-12) - ON.
3. Function switch (UHF control panel, fig. 3-3) - 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. UHF audio monitor switch (No.3, audio control panel) - ON, or transmitter-interphone selector switch (audio control panel) - No.3 position.
2. Volume control (UHF control panel) - Mid position.

(3) To use preset frequency (UHF control panel):

1. Mode selector switch - PRESET position.
2. Preset channel selector switch -Rotate to desired channel.

(4) To use non-preset frequency (UHF control panel):

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 (audio panel control panel, fig. 3-1) - No.3 position.
2. UHF control panel (fig. 3-3) - Set required frequency using either PRESET CHAN control or MANUAL frequency select controls.
3. Microphone jack selector switch (instrument panel, fig.2-30) - As desired.
4. Microphone switch - Depress to transmit.

(6) Shutdown procedure:

1. Function selector switch (UHF control panel, fig. 3-3) - OFF.

d. UHF Command Set Voice Security Operation (KY-58).

NOTE

Disregard operating procedures involving the voice security control-indicator if unit is not installed.

(1) Turn-on procedure:

1. Power switch (Voice Security panel, fig 3-6) - ON.
2. Function switch (UHF control panel) - BOTH.

2) Receiver operating procedure:

1. Mode selector switch (UHF control panel, fig. 3-3) - As required.
2. Transmitter-interphone selector switch (audio control panel, fig. 3-1) - No.3 position, or No.3 radio monitor control - On.
3. Set required frequency using preset channel control or manual frequency selector.
4. Volume control - Adjust.

NOTE

To adjust volume when radio signals are not being received, turn squelch switch OFF, adjust volume for comfortable noise level, then turn squelch disable switch ON.

5. Squelch switch - As required.

(3) Transmitter operating procedure (PLAIN):

1. Transmitter-interphone selector switch (audio control panel) - No.3 position.
2. Plain/cipher switch (voice security control panel) - PLAIN.
3. Microphone switch - Press.

(4) Transmitter operating procedure (CIPHER):

1. Transmitter-interphone selector switch (audio control panel) - No.3 position.
2. Plain/cipher switch (voice security control panel, fig. 3-6) - CIPHER. (CIPHER indicator will be illuminated as long as switch is in CIPHER position.)
3. RE-X/REG switch (voice security control panel)- REG.
4. 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.

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

(5) Shutdown procedure:

1. Function selector switch (UHF control panel)- OFF.
2. Power switch (Voice security control panel) - OFF.

e. UHF Command Set - Emergency Operation:

NOTE

Transmission on emergency frequencies (guard channels) is restricted to emergencies only. An emergency frequency of 121.500 MHz is also available on the VHF command radio set.

1. Transmitter-interphone selector switch (audio control panel) - No.3 position.
2. Mode selector switch (UHF control panel) - GUARD.
3. Microphone switch - Press.

3-10. VOICE ORDER WIRE (AN/ARC-164).

A radio set identical in type and performance to the UHF command set (fig. 3-3) is located behind the copilot's seat, to serve as voice order wire. The TM 55-1510-220-10 set provides the pilot and copilot with secure 2-way voice communications. Volume is controlled through the No. 5 position on the VHF-AM Control Panel (fig. 3-1). Complete provisions only are provided for a KY-58 voice security device. The voice order wire set is protected by a 7 1/2 ampere VOW circuit breaker on the overhead circuit breaker panel (fig. 2-27). The voice order wire shares an antenna mounted on the aircraft belly with the transponder set (fig. 2-1).

3-11. VHF-AM COMMUNICATIONS (VHF-20B).

a. Description. VHF-AM communications provide transmission and reception of amplitude modulated signals in the very high frequency range of 116.000 to 151.975 MHz for a range of approximately 50 miles, varying with altitude. A dual head control panel (fig. 3-4) is mounted on 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.1 transmitter selector switches located on 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 a 10-ampere VHF circuit breaker on the overhead circuit breaker panel (fig. 2-27). The associated antenna is shown in figure 2-1.

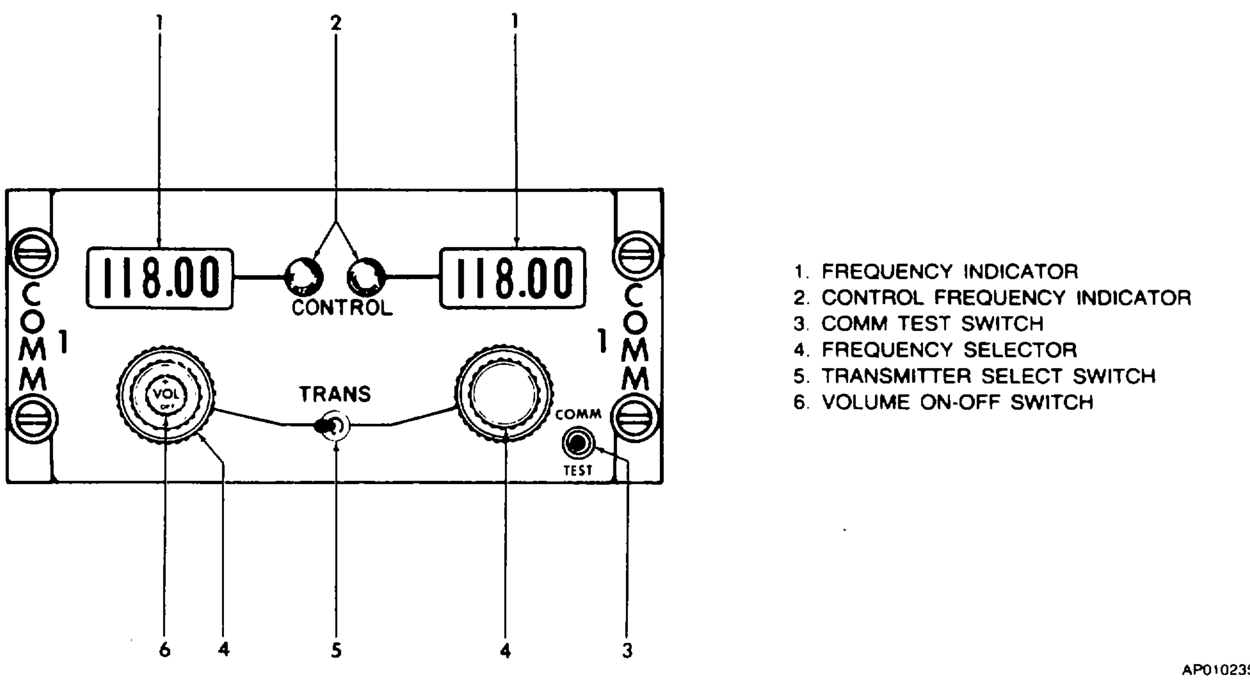


Figure 3-4. VHF-AM Control Panel (VHF-20B)

b. Controls/Indicators and Functions.

(1) Frequency indicator. Indicates set operating frequency.

(2) Control frequency indicators. Indicates frequency selected (left or right active).

(3) COMM TEST switch. Overrides automatic squelch circuit.

(4) Frequency selectors. Select desired set operating frequency.

(5) TRANS switch. Selects right or left frequency control selectors.

(6) VOL-OFF control. Adjusts volume of received audio, turns set ON or OFF.

c. VHF-AM Set - Normal Operation.

(1) Turn-on procedure: Volume control - Turn clockwise (ON).

(2) Receiver operating procedure:

1. Transmitter-interphone selector switch (audio control panel, fig. 3-1) - No.1 position, or radio monitor control No.1 - ON.
2. Frequency selector - Set desired frequency.
3. Volume control - As required.

(3) Transmitter operating procedure:

1. Transmitter-interphone selector switch (audio control panel, fig. 3-1) - No.1 position.
2. Microphone switch - Press.

(4) Shutdown procedure: Volume control - Turn counterclockwise (OFF).

d. VHF-AM 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 (audio control panel, fig. 3-1) - No.1 position.
2. Frequency selector (VHF control panel, fig. 3-4) - 121.500 MHz (emergency frequency).
3. Microphone switch - Press.

3-12. VHF AM-FM COMMAND SET (AN/ARC-186).

a. Description. The VHF AM-FM Command Set provides for normal and secure 2-way AM voice communication in the very high frequency range of 116.000 to 151.975 MHz and FM homing in the 30.000 to 87.975 MHz band. Twenty channels may be preset. Audio signals are applied through the No.2 position of the transmitter-interphone selector switches and through the No.2 receiver audio switches on the pilot's and copilot's audio control panels (fig. 3-1). Complete provisions only are installed for a TSEC/KY-58 voice security device. Circuits are protected by a 10-ampere VHF AM-FM circuit breaker on the overhead circuit breaker panel (fig. 2-27). Figure 3-5 illustrates the VHF AM-FM control panel. The associated antenna is shown in figure 2-1.

b. Controls/Indicators and Functions.

(1) 10 MHz selector. Selects receiver-transmitter frequency in increments of 10 MHz from 30 to 150 MHz. Clockwise rotation increases frequency.

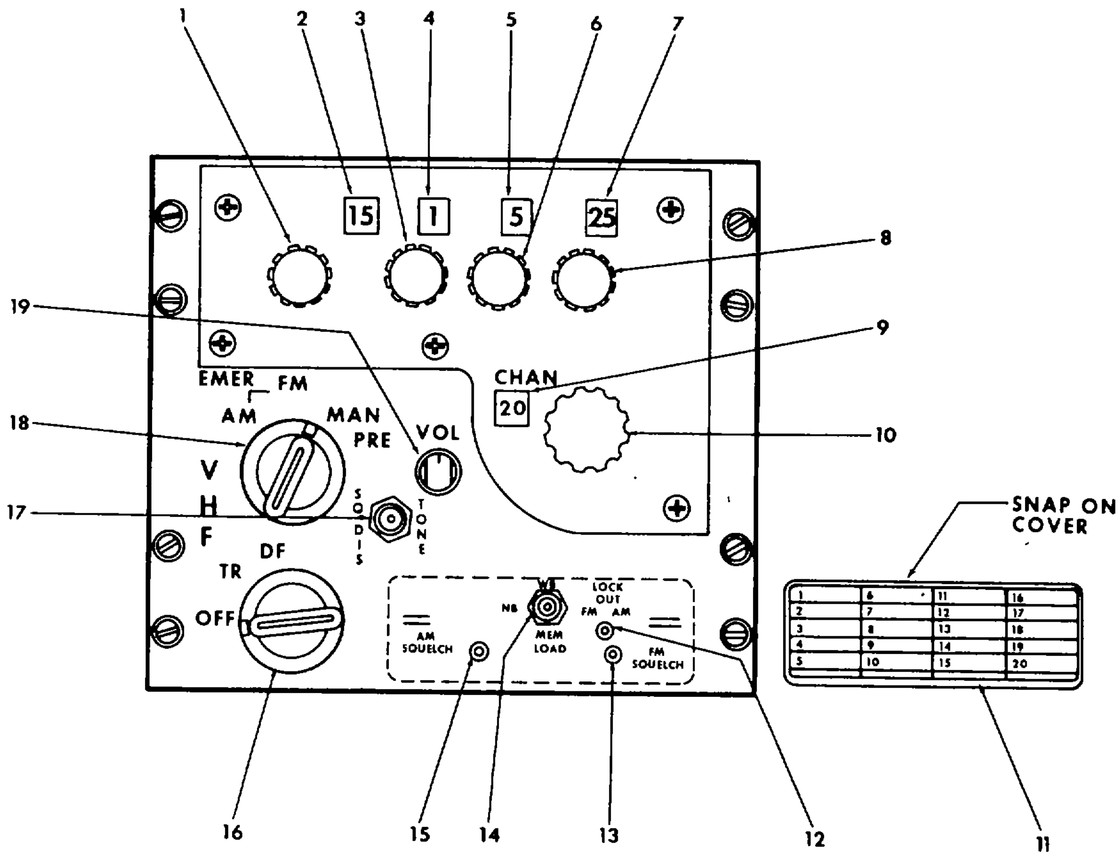
(2) 10 MHz indicator. Indicates manually selected receiver-transmitter frequency in 10 MHz increments from 30 to 150 MHz.

(3) 1.0 MHz selector. Selects receiver-transmitter frequency in 1.0 MHz increments. Clockwise rotation increases frequency.

(4) 1.0 MHz indicator. Indicates manually selected receiver-transmitter frequency in 1.0 MHz increments.

(5) 0.1 MHz selector. Selects receiver-transmitter frequency in 0.1 MHz increments. Clockwise rotation increases frequency.

(6) 0.1 MHz indicator. Indicates manually selected receiver-transmitter frequency in 0.1 MHz increments.



1. 10 MHZ SELECTOR
2. 10 MHZ INDICATOR
3. 1.0 MHZ SELECTOR
4. 1.0 MHZ INDICATOR
5. 0.1 MHZ INDICATOR
6. 0.1 MHZ SELECTOR
7. 0.025 MHZ INDICATOR
8. 0.025 MHZ SELECTOR
9. PRESET CHAN INDICATOR
10. PRESET CHAN SELECTOR
11. PRESET FREQUENCIES LIST
12. LOCKOUT FM/AM SWITCH
13. FM SQUELCH CONTROL
14. WB/NB MEM LOAD SWITCH
15. AM SQUELCH CONTROL
16. MODE SELECT SWITCH
17. SQ DIS/TONE SELECT SWITCH
18. FREQUENCY CONTROL EMERGENCY SELECT SWITCH
19. VOL CONTROL

AP006387

Figure 3-5. VHF AM-FM Control Panel (AN/ARC-186)

(7) 0.025 MHz selector. Selects receiver-transmitter frequency in 0.025 MHz increments. Clockwise rotation increases frequency.

(8) 0.025 MHz indicator. Indicates manually selected receiver-transmitter frequency in 0.025 MHz increments.

(9) Preset CHAN selector. Selects preset channel from 1 to 20. Clockwise rotation increases number selected.

(10) Preset CHAN indicator. Indicates selected preset channel.

(11) LOCKOUT FM-AM switch. Screwdriver adjustable three-position switch. Warning tone announces lockout when tuned to a frequency in the locked out band.

(a) Center. Selects AM or FM band.

(b) AM. Shuts off AM band.

(c) FM. Shuts off FM band.

(12) FM SQUELCH control. Screwdriver adjustable potentiometer. Squelch fully overdriven at full counterclockwise position. Clockwise rotation increases input signal required to open squelch.

(13) WB-NB-MEM LOAD switch. Three-position switch.

(a) NB. Limits selectivity to narrow-band intermediate frequency.

(b) WB. Limits selectivity to wide-band intermediate frequency of FM band.

(c) MEM LOAD. Momentary switch. If pressed, loads manually selected frequency in preset channel memory.

(14) AM SQUELCH control. Screwdriver adjustable potentiometer. Squelch fully overridden at full counterclockwise position. Clockwise rotation increases input signal required to open squelch.

(15) Mode selector switch. Three-position rotary switch.

(a) OFF. Shuts off receiver-transmitter.

(b) TR. Selects transmit/receive modes.

(c) DF. Not used.

(16) SQ-DIS-TONE select switch. Three-position switch.

(a) Center. Selects squelch function.

(b) SQ-DIS. Shuts off squelch function.

(c) TONE. Transmits tone of approximately 1000 Hz.

(17) Frequency control/emergency select switch. Three-position switch.

(a) PRE. Enables preset channel selection.

(b) MAN. Enables manual frequency selection.

*(c) EME*R*-AM-FM.* Selects a prestored guard channel.

(18) VOL control. Clockwise rotation increases volume.

c. Normal Operation.

(1) Turn-on procedure: Mode selector switch (VHF AM-FM control panel, fig. 3-5) - TR.

NOTE

SATCOM/FM audio selector switch must be set to FM .

(2) Receiver operating procedure:

1. Frequency control emergency selector switch (fig. 3-5) MAN or PRE, as desired.
2. Transmitter-interphone selector switch (audio control panel, fig. 3-1) No.2 position, or radio monitor control No.2ON.
3. Manual frequency/preset channel selectors Set desired frequency.
4. Volume control As required.

(3) Transmitter operating procedure:

1. Transmitter-interphone selector switch (audio control panel, fig. 3-1) No.2 position.
2. Microphone switch Press.

(4) Shutdown procedure:

1. Mode selector switch (fig. 3-5) OFF.

d. VHF AM-FM Emergency Operation:

(1) Emergency AM Mode:

1. Transmitter-interphone selector switch (audio control panel, fig. 3-1) No. 2 position.
2. Mode selector switch TR or DF, as desired.
3. Frequency control/emergency selector switch EMER AM.
4. Manual frequency/preset channel selector Automatically tuned to 121.5 MHz.
5. Microphone switch Press.

(2) Emergency FM mode

1. Transmitter-interphone selector switch (audio control panel, fig. 3-1 No. 2 position.
2. Mode selector switch TR or DF, as desired.
3. Frequency control/emergency selector switch EMER FM.
4. Manual frequency/preset channel selector switch Automatically tuned to 40.5 MHz.
5. Microphone switch Press
6. Shutdown mode select switch OFF.

3-13. VOICE SECURITY SYSTEM TSEC/KY-58 (PROVISIONS ONLY).

a. Description. The KY-58 provides secure voice communications for VHF COMM, VOW, and UHF COMM radio communications.

b. Purpose. These operating procedures provide the user of the TSEC/KY-58 with abbreviated operating instructions. They are a condensed version of the TSEC/KY-58 operating instructions contained in TM 11-5810-262-20.

c. Controls and Functions .

(1) MODE switch. Allows operator to select the type, of communication desired.

(a) P Plain, enables unciphered communications.

(b) C Cipher, enables ciphered communications.

(c) LD Load, enables codes to be loaded.

(d) RV Receive Variable, enables remote loading of codes.

(2) VOLUME control. Controls audio output volume.

(3) FILL connector. Accepts connector from common fill device (KYK-13), general purpose tape reader (KOI-18), or net control device (KYX15) to load variables into the KY-58.

(4) FILL switch. Allows the operator to select any of the six storage registers. This switch is also used to "Zeroize" registers 1-5 only, or all six (1-6) as desired.

(5) POWER switch. Controls system power.

(a) TD Time delay.

(b) ON Turns set on.

(c) OFF Turns set off.

(6) BAT INSTL screws. Removal of the screws allow access to the component battery. When installing a new battery, enter the date on the writing surface.

(7) AUDIO IN. Adjusts aircraft-to-ground audio volume level.

(8) Writing surface. Used to record addresses of the codes.

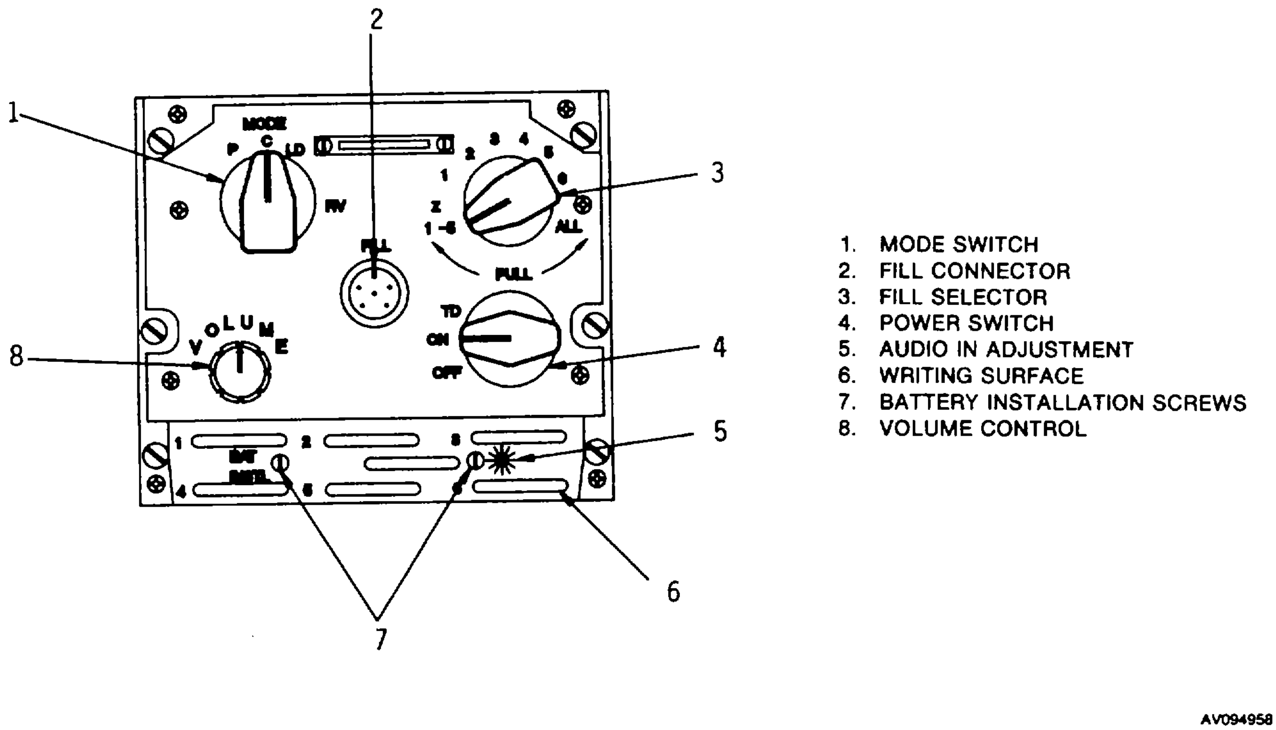


Figure 3-6. TSEC/KY-58 Voice Security System

d. Operating Instructions.

(1) Loading procedures.

NOTE

These procedures must be accomplished prior to takeoff.

(a) Set the TSEC/KY-58 power switch to ON.

(b) Set the TSEC/KY-58 address selector switch to the register to be filled.

(c) Set the TSEC/KY-58 MODE switch to LD.

(d) Identify the loaded variable on the TSEC/KY-58 writing surface.

(e) To load additional variables, set the TSEC/KY-58 address selector switch to the next storage register to be filled and repeat steps 1, 2, and 3.

(f) Set the TSEC/KY-58 MODE switch to C; leave the TSEC/KY58 address selector switch in any numbered register.

(2) Preparing the TSEC/KY-58 for secure voice operations.

NOTE

These procedures must be accomplished prior to takeoff and normally following the loading procedures outlined above.

(a) TSEC/KY-58 power switch is set to ON.

(b) TSEC/KY-58 MODE switch is set to C.

(c) TSEC/KY-58 address selector switch is set to any numbered storage register position.

(d) Turn the TSEC/KY-58 VOLUME switch fully clockwise.

(3) Receiver operating procedure:

(a) Transmitter-interphone selector switch (audio control panel, fig 3-1) No. 4 position.

(b) HF function selector switch (fig. 3-7) Set to USB, LSB or AM.

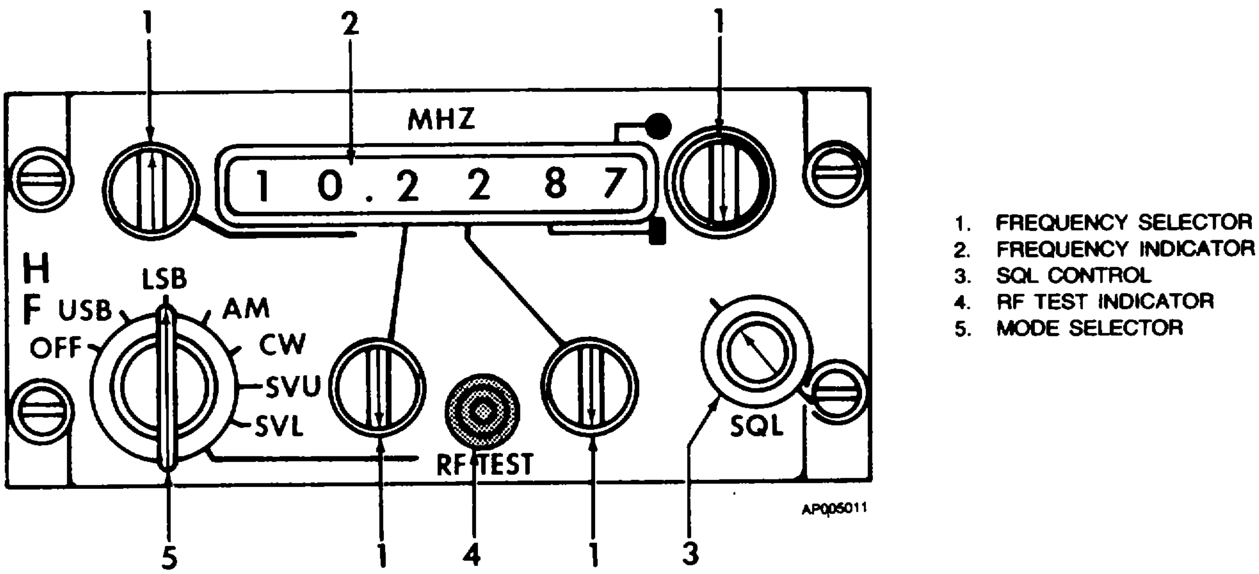


Figure 3-7. HF Control Panel (718 U-5)

(c) No. 4 radio monitor control (audio control panel, fig. 3-1) Set to mid position.

(d) Volume control (audio control panel) Adjust.

(e) Squelch control (HF control panel) As required.

(f) Frequency control (HF control panel) Set desired frequency.

(4) Transmitter operating procedure.

(a) Transmitter-interphone selector switch (audio control panel) No. 4 position.

(b) Function selector (HF panel) Set to USB, LSB, or AM.

(c) MIC HEADSET-OXYGEN MASK switch (instrument panel) As desired.

(d) SQL knob (HF panel) Adjust to just quiet noise when no signal is being received.

(e) MIC switch Depress to transmit.

3-14. HF COMMAND SET (718 U-5).

a. Description. The HF command set provides long-range voice communications within the frequency range of 2.000 to 29.999 MHz and employs either standard amplitude modulation (AM), lower side-board (LSB), or upper side-board (USB) modulation. The distance range of the set is approximately 2,500 miles and varies with atmospheric conditions. The unit is protected by a 3-ampere HF RCVR and the 25-ampere HF PWR circuit breaker on the overhead circuit breaker panel (fig. 2-27). The control panel is located on the pedestal extension.

b. Controls/Indicators and Functions.

(1) HF Control Panel (pedestal extension, (fig. 3-7).

(2) Frequency selector. Selects the desired operating frequency.

(3) Frequency indicator. Displays the selected frequency.

(4) SQL control. Adjusts squelch level.

(5) RF TEST indicator. Tests operational status of set. Unkeyed Tests the light. Keyed Indicates operational status of set.

(a) Burning steadily. Indicates a fault in the receiver exciter.

(b) Blinking. Indicates a fault in the power amplifier-coupler.

(c) Extinguished. Indicates normal operation.

(6) Mode selector. Turns set off and determines operating mode.

(a) OFF. Turns set off.

(b) USB. Selects Upper Side-board modulation.

(c) LSB. Selects Lower Side-board modulation.

(d) AM. Selects Amplitude Modulation.

(e) CW. Not used in this installation.

(f) SVU. Not used in this installation.

(g) SVL. Not used in this installation.

(7) RF TEST. Checks operational status of the system.

c. Normal Operation.

(1) Turn-on procedure:

1. Insure that aircraft DC power is on.

NOTE

It is presumed the avionics master power switch is on and that normally used avionic circuit breakers remain depressed.

NOTE

The aircraft can be configured for either HF on position 4, or VHF No. 2 and VOW, on position 5 of the audio control panel.

2. Avionics master power switch (overhead control panel, fig. 2-12) ON.

(2) Receiver operating procedure:

1. Transmitter-interphone selector switch (audio control panel, fig. 3-1) No.4 position.
2. HF function selector switch (fig. 37) Set to USB, LSB, or AM.
3. No.4 radio monitor control (audio control panel, fig. 3-1) Set to mid position.
4. Volume control (audio control panel) Adjust.
5. Squelch control (HF control panel) As required.
6. Frequency control (HF control panel) Set desired frequency.

(3) Transmitter operating procedure:

1. Transmitter-interphone selector switch (audio control panel) No.4 Position.
2. Function selector (HF panel) Set to USB, LSB, or AM.
3. MIC HEADSET-OXYGEN MASK switch (instrument panel) As desired.
4. SQL knob (HF panel) Adjust to just quiet noise when no signal is being received.
5. MIC switch Depress to transmit.

(4) Shutdown procedure:

1. Mode selector knob (HF panel) OFF.

d. HF Command Set Emergency Operation. Not applicable.

3-15. VOICE SECURITY SYSTEM (TSEC/KY75).

a. Description. The KY-75 voice security system is used in conjunction with the HF command set to provide secure (ciphered, two-way voice communications. The voice security control panel is located in the INS equipment rack, behind the copilot (fig. 3-8).

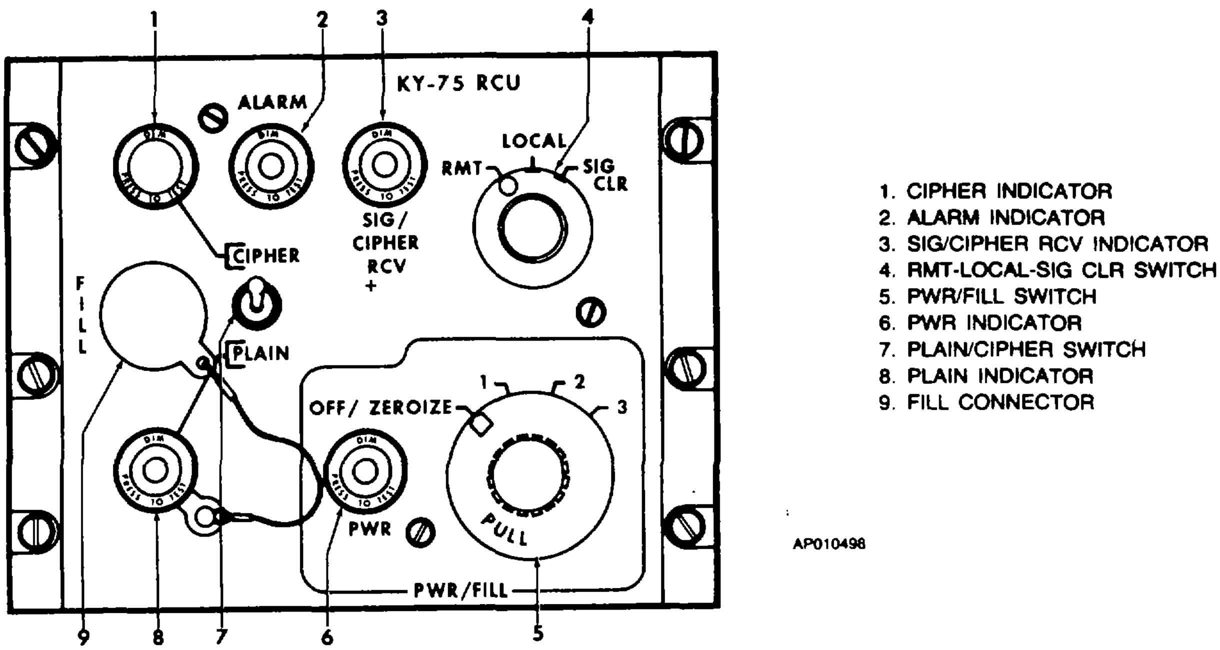


Figure 3-8. Voice Security Control Panel (TSEC/KY-75)

b. Controls/Indicators and Functions.

(1) RMT-LOCAL-SIG CLR switch. Selects operating mode.

(a) RMT. In this position the PLAIN/ CIPHER selection is controlled by input outside KY-75 control panel.

(b) LOCAL. In this position, transmit mode is controlled by PLAIN/ CIPHER switch.

(c) SIG CLR. In this position, if a fill device is connected to the FILL connector, the alarms will be set, and the selected fill register will be cleared. Upon release of the switch (it is spring loaded to the LOCAL position) the TSEC/ KY-75 will request a fill variable from the fill device. If a fill device is not connected, a steady tone signal will be transmitted to all other units within the net, indicating a desire to establish communications on that link.

(2) PLAIN/CIPHER switch. Selects plain or cipher mode.

(a) PLAIN. The TSEC/KY-75 system will receive cipher and plain signals and will transmit plain.

(b) CIPHER. Permits ciphered communication.

(3) P WR/FILL switch. Controls set power and fill positions.

(a) OFF/ZEROIZE. All power is removed from the TSEC/KY-75 system and all fill registers are zeroized. (To enter this position, the switch must be pulled out and rotated counterclockwise.)

(b) 1, 2, 3 fill positions. These positions are used to select the fill register of the TSEC/ KY-75 system to be used during transmission and reception of ciphered messages.

(4) ALARM indicator. This indicator illuminates when a fill error, randomizer, or battery failure occurs. The indicator includes a press-to-test feature.

(5) PLAIN indicator. This indicator illuminates when the PLAIN/CIPHER switch is set to the PLAIN position. The indicator includes a press-to-test feature.

(6) CIPHER indicator. This indicator illuminates when the PLAIN/CIPHER switch is set to the CIPHER position. The indicator includes a press-to-test feature.

(7) SIG/CIPHER RCV indicator. This indicator (blue) blinks continuously when the TSEC/KY-75 system is receiving ciphered text. The indicator includes a press-to-test feature.

(8) PWR indicator. This indicator (white) illuminates when power is applied to the TSEC/ KY-75 system and the PWR/FILL switch is set to one of the numbered fill positions.

(9) FILL connector. This connector, located on the front of the TSEC/KY-75 control panel allows connection to a fill device.

(10) Processor connector. This connector, located on the back of the TSEC/KY-75 control unit, allows connection of the control unit to the processor via a cable.

c. TSEC/KY-75 Operating Procedures.

(1) TSEC/KY-75 system turn-on procedure:

1. PWR/FILL switch (fig. 3-8) Set to any fill register number. Check that PWR indicator light is illuminated.
2. PLAIN/CIPHER switch CIPHER. Check that CIPHER indicator light is illuminated.
3. PWR/FILL switch Set to each fill register (1 thru 3). If the position has not already been filled a steady alarm tone will be heard.

(2) Filling TSEC/KY-75 using general purpose tape reader (KOI-18/TSEC).

1. FILL connector Connect to tape reader using fill cable (ON5124204).
2. PWR/FILL switch Set to register to be filled.
3. Insert the tape leader into the IN slot on tape reader. Line up tape feed holes with the white dots on tape reader.
4. RMT-LOCAL-SIG CLR switch Set to SIG CLR clear then release.
5. Pull tape through tape reader at a moderate rate. The steady alarm tone heard over the headset should stop, indicating a successful fill.
6. Repeat procedure for each register to be filled.

(3) Filling TSEC/KY-75 system using transfer-device KYK-13/TSEC.

1. Verify that the transfer device contains the variables in its registers that are indicated on its writing surface by:

   a. Transfer device mode switch OFF/CK.
   b. PWR/FILL switch Set to register to be verified.
   c. Transfer device initiate button Press and release. Transfer device indicator light will flash if the register contains a variable.
   d. Repeat procedure for each transfer device register to be verified.

NOTE

Insure that the rubber grommet is in the KYK-13/TSEC P1 connector and that the TSEC/KY-75 PLAIN/CIPHER switch is in the CIPHER position.

2. FILL connector Connect to transfer device (either directly or with a fill cable).
3. Transfer device FILL switch Set to register containing variable to be transferred.
4. Transfer device MODE switch ON.
5. RMT/LOCAL/SIG CLR switch (fig. 3-8) Set to SIG CLR and release. Parity indicator light on transfer device should flash, and the steady alarm tone in the headset should cease, indicating a successful transfer of the variable.
6. Repeat procedure for each TSEC/ KY-75 register to be filled.
7. Transfer device mode switch Set to OFF/CK and disconnect from TSEC/KY-75.

(4) TSEC/KY-75 secure voice operating procedure:

1. PLAIN/CIPHER switch (fig. 3-8) CIPHER. Check that CIPHER indicator light illuminates.

2. RMT/LOCAL/SIG CLR switch RMT.
3. PWR/FILL switch Set to desired fill register.
4. Microphone switch Press. Wait for the preamble to stop, then talk into the microphone.
5. Microphone switch Release. Wait for the postamble to stop.

NOTE

The SIG/CIPHER RCV indicator light (fig. 3-8) will flash during receipt of secure voice communications. After receiving a secure communications, wait until the postamble stops before initiating any transmission.

(5) TSEC/KY-75 clear voice operating procedure:

1. PLAIN/CIPHER switch PLAIN. Check that PLAIN indicator light illuminates.
2. RMT/LOCAL/SIG CLR switch RMT.
3. Microphone switch Press to talk, release when finished.

(6) Zeroizing TSEC/KY-75.

1. PWR/FILL switch (fig. 3-8) OFF/ ZEROIZE.

NOTE

All three fill registers of the TSEC/KY75 will be zeroized simultaneously.

2. The steady alarm tone should be heard if the PWR/FILL switch is set to any fill position.

NOTE

When aircraft power is not applied to the TSEC/KY-75 and the standby fill batteries have been removed or are too weak to maintain the memory circuits, all storage registers of the TSEC/KY-75 will be zeroized within approximately 45 seconds.

3-16. 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 right side of the aft fuselage (fig. 3-9). The transmitter unit is accessible through a service-panel located on the bottom of the aft fuselage.

b. Controls 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.

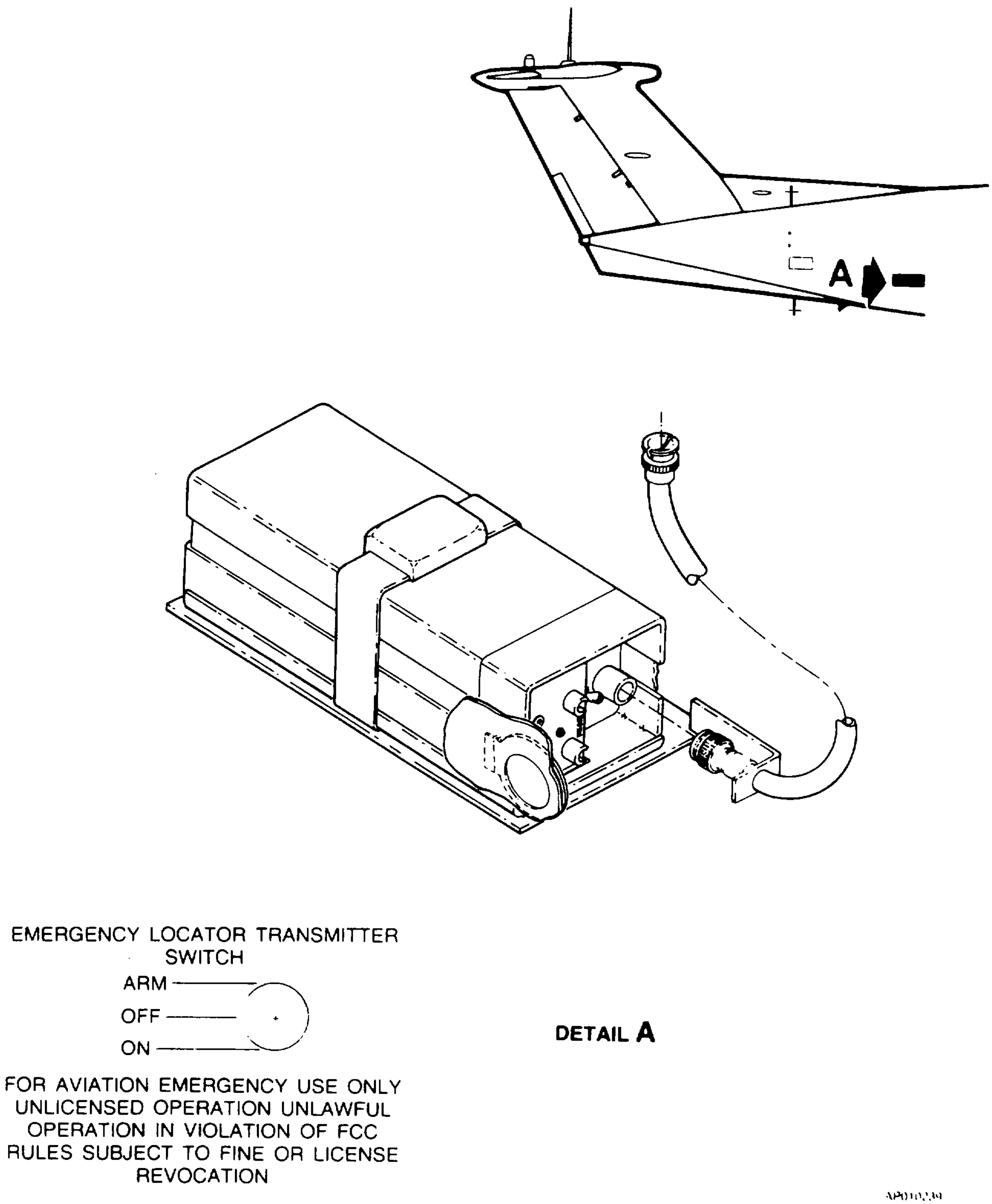


Figure 3-9. Emergency Locator Transmitter (Narco 03716-0300)

Section III. NAVIGATION

3-17. 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.

3-18. RADIO MAGNETIC INDICATORS (RMI).

a. Description. The pilot and copilot are each provided with identical radio magnetic indicators (RMI) (fig. 3-10), located on the instrument panel (fig. 2-30). Each unit serves as a navigational aid for the respective user and, by means of individual source select switches, will display aircraft magnetic heading and VOR, TACAN, INS or ADF bearing information. The pilot's RMI is protected by the 1ampere No. 1 RMI circuit breaker on the overhead circuit breaker panel (fig. 2-27) and the 1.5-ampere F13 fuse on the No. I junction box. The copilot's RMI is protected by the 1-ampere No. 2 RMI circuit breaker on the overhead circuit breaker panel and the 1.5-ampere F9 fuse on the No. 1 junction box.

b. Controls and Functions.

(1) Pilot's COMPASS No.1 No.2 switch. Selects desired source of magnetic heading information for display on pilot's HSI and copilot's RMI.

(a) No.1. Selects compass system No.1 for display control.

(b) No.2. Selects compass system No.2 for display control.

(2) Copilot's COMPASS No.l-No.2 switch. Selects desired source of magnetic heading information for display on copilot's HSI and pilot's RMI.

(a) No.1. Selects compass system No.1 for display.

(b) No.2. Selects compass system No.2 for display.

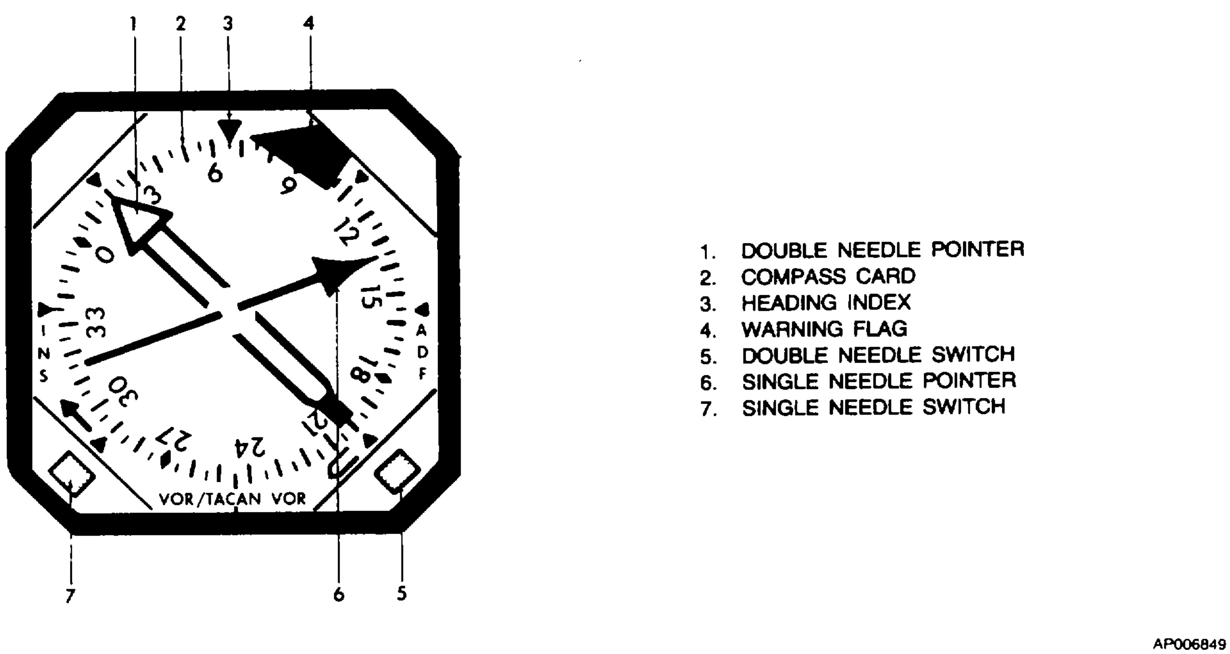


Figure 3-10. Radio Magnetic Indicator (RMI) (332C-10)

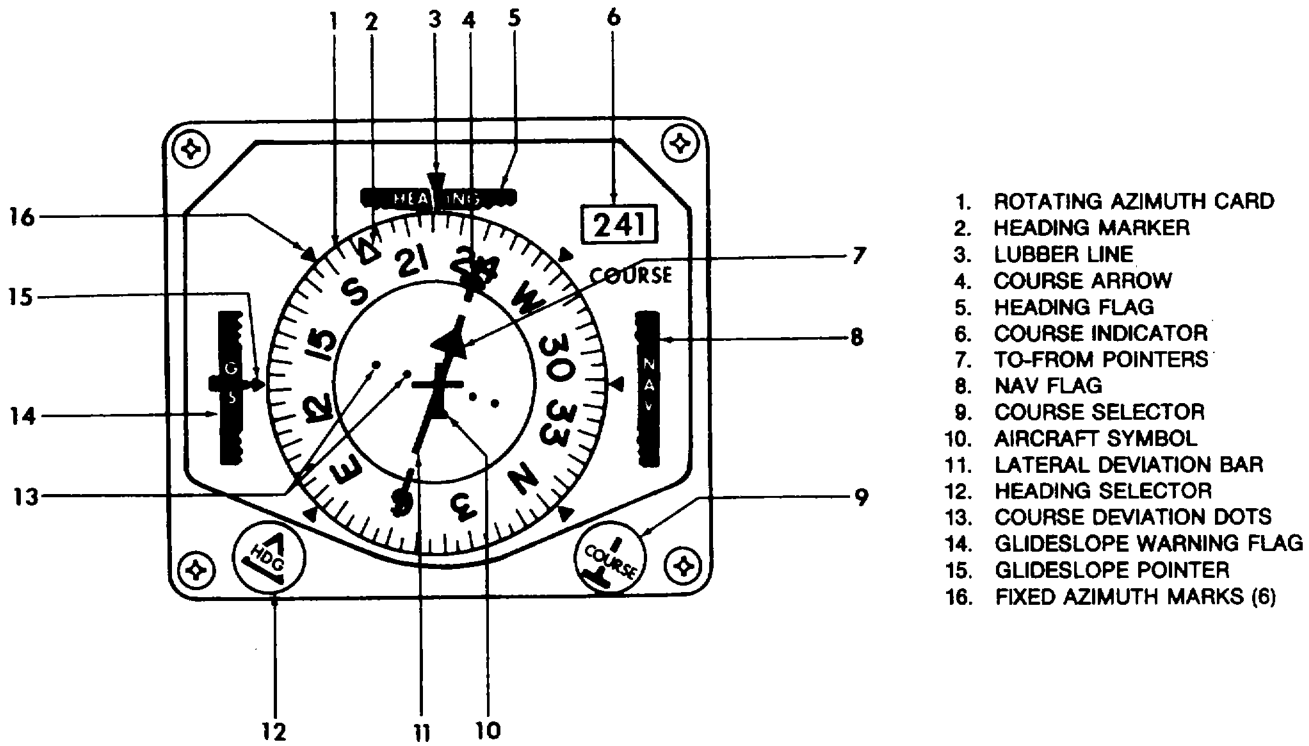


Figure 3-11. Pilot's Horizontal Situation Indicator (331A-8G)

(3) RMI select switch. Selects which of two signals will be displayed on respective RMI single-needle pointer, if single-needle switch is in the VOR-TACAN position.

(a) VOR 1. Selects VOR 1 bearing signals for display.

(b) TACAN. Selects TACAN bearing signal for display.

c. Indicators and Functions, RMI.

(1) Double needle pointer. Indicates bearing selected by double needle switch.

(2) Compass card. Indicates aircraft heading at top of dial.

(3) Heading index. Reference point for aircraft heading.

(4) Warning flag. Indicates loss of compass signal.

(5) Double needle switch. Selects desired signal to be displayed by double needle pointer.

(a) ADF. Selects ADF bearing information.

(b) VOR. Selects VOR 2 bearing information.

(6) Single needle pointer. Indicates bearing selected by single needle switch.

(7) Single needle switch. Selects desired signal to be displayed on single needle pointer .

(a) INS. Selects INS bearing to waypoint position.

(b) VOR-TACAN. Selects signal as determined by the RMI select switch on the instrument panel, either VOR No. I or TACAN.

3-19. HORIZONTAL SITUATION INDICATORS.

a. Description. The pilot and copilot have separate HSI instruments on respective instrument panel sections (fig. 3-11 and 3-12). Each HSI combines displays to provide a map-like presentation of the aircraft position. Each indicator displays aircraft

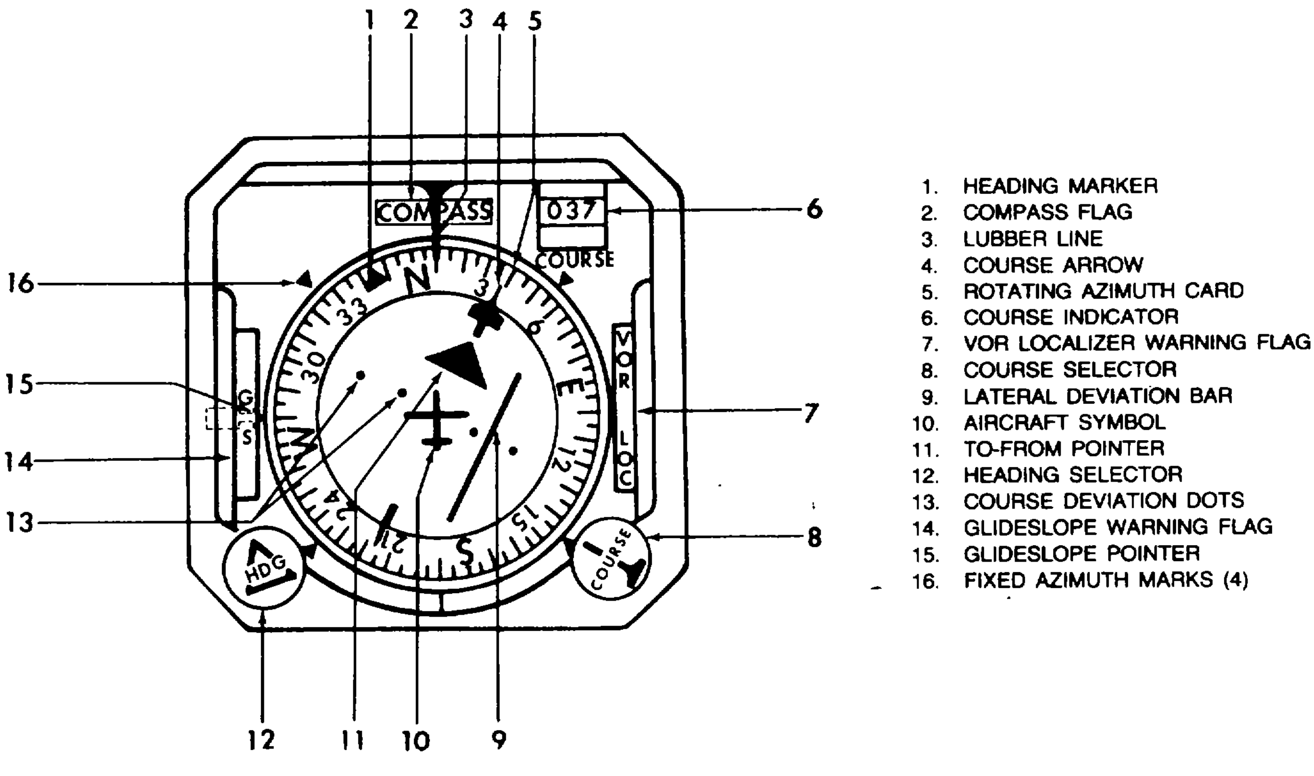


Figure 3-12. Copilot's Horizontal Situation Indicator (331A-8P)

heading, course deviation, and glideslope data. The pilot's HSI allows the desired course and autopilot input to be set manually. Each pilot's or copilot's HSI will display front course localizer sensing, when the front course is selected and back course is flown. Course deviation data is supplied to the HSI by the VOR I or VOR 2 systems, the TACAN, or the INS. Glideslope data is supplied by the VOR I or VOR 2 systems. The HSI displays warning flags when the VOR, TACAN, or glideslope signals are lost or become unreliable.

b. Controls/Indicators and Functions, Pilot's HSI.

(1) Rotating azimuth card. The rotating azimuth card displays slaved gyro-stabilized magnetic compass information and is graduated in five-degree increments.

(2) Heading marker. Indicates heading selected by HDG knob.

(3) Lubber line. This pointed fixed index mark aligns with the aircraft symbol to indicate aircraft magnetic heading on the compass card.

(4) Course arrow. Indicates VOR radial course selected by COURSE knob.

(5) HEADING flag. Indicates that the heading information displayed is invalid and should not be used.

(6) COURSE indicator. Provides a digital readout of the selected course.

(7) TO-FROM pointers. Two TO-FROM pointers are situated 180 degrees apart. The one which is visible points toward the station along the selected VOR or TACAN radial, or to the next INS waypoint.

(8) NAV flag. The NAV flag indicates that the information derived from the selected navigational beacon is invalid and should not be used.

(9) COURSE selector. The yellow course arrow 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 localizer course. Like the heading marker, the course arrow rotates with the azimuth card to provide a continuous readout of course error to the flight director computer.

(10) Aircraft symbol. A fixed aircraft symbol corresponds to the longitudinal axis of the aircraft and lubberline markings. The symbol shows aircraft position and heading with respect to a radio course and the azimuth card.

(11) Lateral deviation bar. This bar represents the centerline of the selected VOR, TACAN or localizer course. The aircraft symbol shows pictorially actual aircraft position in relation to this selected course.

(12) HDG selector. The heading marker (heading bug) is positioned on the rotating azimuth card and the heading knob sets pilot selected compass heading. The heading marker rotates with the azimuth card so the difference between the marker and the fore lubber line index is the amount of heading error applied to the flight director computer. In the heading mode, the FDI vertical command bar will display the required bank commands to bring the aircraft onto and maintain the selected heading.

(13) Course deviation dots. In VOR, TA* CAN or INS operation, each dot represents five degrees deviation from centerline. In ILS operation, each dot represents I degree deviation from centerline.

(14) GS flag. Indicates that the information displayed by the glideslope pointer is invalid and should not be used.

(15) Glideslope pointer. Indicates deviation from correct glideslope during ILS approach.

(16) Fixed azimuth marks. Fixed azimuth marks are fixed at 450 bearings throughout 360 degrees of compass card for quick reference.

(17) Pilot's course indicator selector switch (fig. 2-30). Selects desired source of data for display on pilot's HSI and input to autopilot flight computer.

(a) VOR 1. Selects data from VOR 1 system.

(b) VOR 2. Selects data from VOR 2 system.

(c) TACAN. Selects data from TACAN system.

(d) INS. Selects data from INS.

(18) Compass selector switch (fig. 2-30). Selects desired source of magnetic heading data for display on HSI compass card.

(a) No.1. Selects data from No.1 compass.

(b) No.2. Selects data from No.2 compass;

c. Controls/Indicators and Functions, Copilot's HSI.

NOTE

If both the pilot and copilot course indicator switches are in the same position, 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 as the pilot. Both the pilot and copilot can select INS at the same time with no annunciator illuminated

NOTE

When the pilot has selected INS, the copilot has the option to select either the VOR-I, VOR-2, TACAN or INS, to control the copilot's HSI.

*(1) Heading marke*r. Indicates heading selected by HDG knob.

(2) COMPASS flag. Indicates that the heading information displayed is invalid and should not be used.

(3) Lubber line. This pointed fixed index mark aligns with the aircraft symbol to indicate aircraft magnetic heading on the azimuth card.

(4) Course arrow. Indicates VOR or TA-I CAN course selected COURSE knob.

(5) Rotating azimuth card. The rotating azimuth card rotates throughout 360 degrees. The rotating azimuth card displays slaved gyro stabilized magnetic compass information. The azimuth ring is graduated in five-degree increments.

(6) COURSE indicator. Provides a digital readout of the selected course.

(7) VOR LOC flag. Flag indicates that information derived from the selected navigational I source (VOR, TACAN or INS) is invalid and should not be used.

(8) COURSE selector. The yellow course arrow is positioned on the azimuth card by the course knob to select a magnetic bearing that coincides with the desired VOR or TACAN radial or localizer course. Like the heading marker, the course arrow rotates with the azimuth card to provide a continuous readout of course error to the computer.

(9) Lateral deviation bar. This bar represents the centerline of the selected VOR, TACAN, INS or localizer course. The aircraft symbol shows, pictorially actual aircraft position in relation to this selected course.

(10) Aircraft symbol. A fixed aircraft symbol corresponds to the longitudinal axis of the aircraft and lubberline markings. The symbol shows aircraft position and heading with respect to a radial course and the rotating azimuth card.

(11) TO-FROM Pointers. Two TO-FROM pointers are situated 180 degrees apart. The one which is visible points toward the station along the selected VOR, or TACAN radial or INS waypoint.

(12) HDG Selector. The heading marker is positioned on the rotating azimuth by the heading knob and displays preselected compass heading. The heading marker rotates with the azimuth card so the difference between the marker and the fore lubber line index is the amount of heading error.

(13) Course deviation dots. In VOR, TACAN, or INS operation, each dot represents five degrees deviation from centerline. In ILS operation, each dot represents one degree deviation from centerline.

(14) GS flag. Indicates that the information displayed by the glideslope pointer is invalid and should not be used.

(15) Glideslope pointer. Indicates deviation from correct glideslope during ILS approach.

(16) Fixed azimuth marks. Fixed azimuth marks are fixed at 45° bearings throughout 360 degrees of compass card for quick reference.

(17) Copilot's course indicator selectors switch (fig. 2-30). Selects desired source of data ford display on copilot's HSI and input to autopilot.

(a) VOR 1. Selects data from VOR 1 system.

(b) VOR 2. Selects data from VOR 2 system.

(c) TACAN. Selects data from TACAN system.

(d) INS. Selects data from INS.

(18) Copilot's compass selector switch (fig. 2-30). Selects desired source of magnetic heading data for display on HSI compass card.

(a) No.1. Selects data from No.1 compass.

(b) No.2. Selects data from No.2 compass.

3-20. FLIGHT DIRECTOR INDICATOR.

a. Description. The flight director indicator (FDI) (fig. 3-13) is the pilot's basic attitude horizon indicator and the attitude direction instrument for the automatic flight control system.

b. Controls/Indicators and Functions.

(1) Vertical steering bar. Displays computed roll commands from flight director computer.

(2) Lateral steering bar. Displays computed pitch commands from the flight director comput

(3) Bank angle pointer. Indicates aircraft bank angle.

(4) Bank angle index. Reference indicating zero-degree bank.

(5) Bank angle scale. Allows measurement of aircraft bank angle from zero to 60 degrees.

(6) Horizon line. Affixed to sphere, remains parallel to the earth's horizon.

(7) CMPTR flag. Presence indicates a malfunction within the autopilot computer.

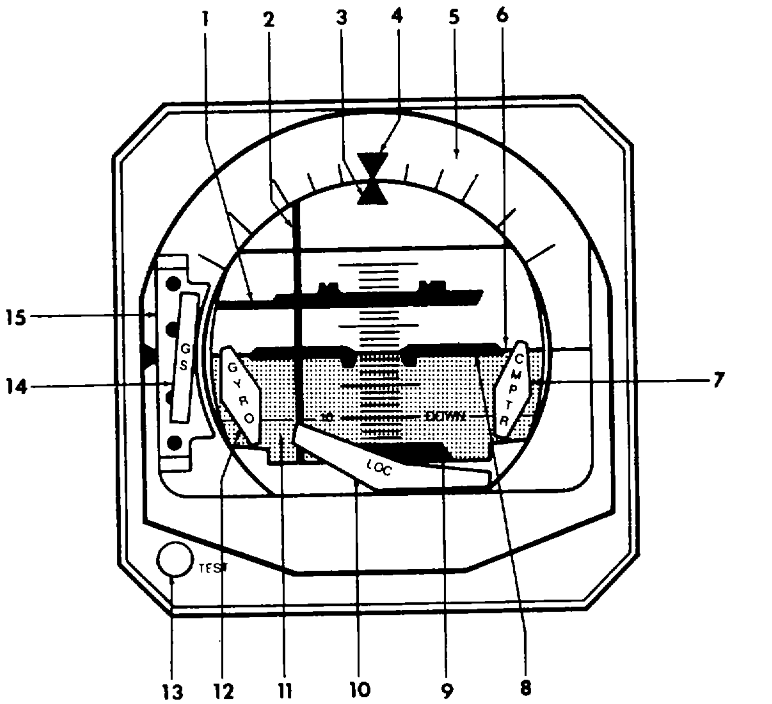


Figure 3-13. Flight Director Indicator (329B-9A)

NOTE

When flying coupled to the INS system, the CMPTR flag will be in view anytime the steering information is invalid or a malfunction exists in the autopilot computer.

(8) Miniature aircraft. Indicates attitude of aircraft with respect to the earth's horizon.

(9) Lateral deviation *indicator. Displays localizer deviation information from VOR No. 1 receiver or VOR No. 2 receiver* as selected by pilot's course indicator switch.

(10) Sphere. Remains oriented with the earth's axis at all times.

(11) GYRO warning flag. Presence indicates loss of power to, or low rotational speed of, vertical gyro.

(12) TEST pushbutton. When pressed, display indicates an additional 10° nose up, 200 right roll and the GYRO flag is visible.

(13) GS flag. Presence indicates glideslope information is not being presented on indicator.

(14) Glideslope deviation indicator. Displays glideslope deviation information from VOR No. I receiver.

(15) LOC warning flag. Presence indicates a that localizer information is not available or not reliable.

3-21. PILOT'S TURN AND SLIP INDICATOR.

a. Description. The pilot's turn and slip indicator (fig. 3-14) is used to provide automatic yaw damping information to the autopilot in addition to performing the functions of a turn and slip indicator. The pilot's turn and slip indicator is protected by a circuit breaker placarded TURN & SLIP, located on the overhead circuit breaker panel (fig. 2-30).

b. Controls/Indicators and Functions.

(1) Turn rate indicator. Deflects to indicate rate of turn

(2) Two-minute turn marks. Fixed markers indicate two-minute turn rate when covered by turn rate indicator.

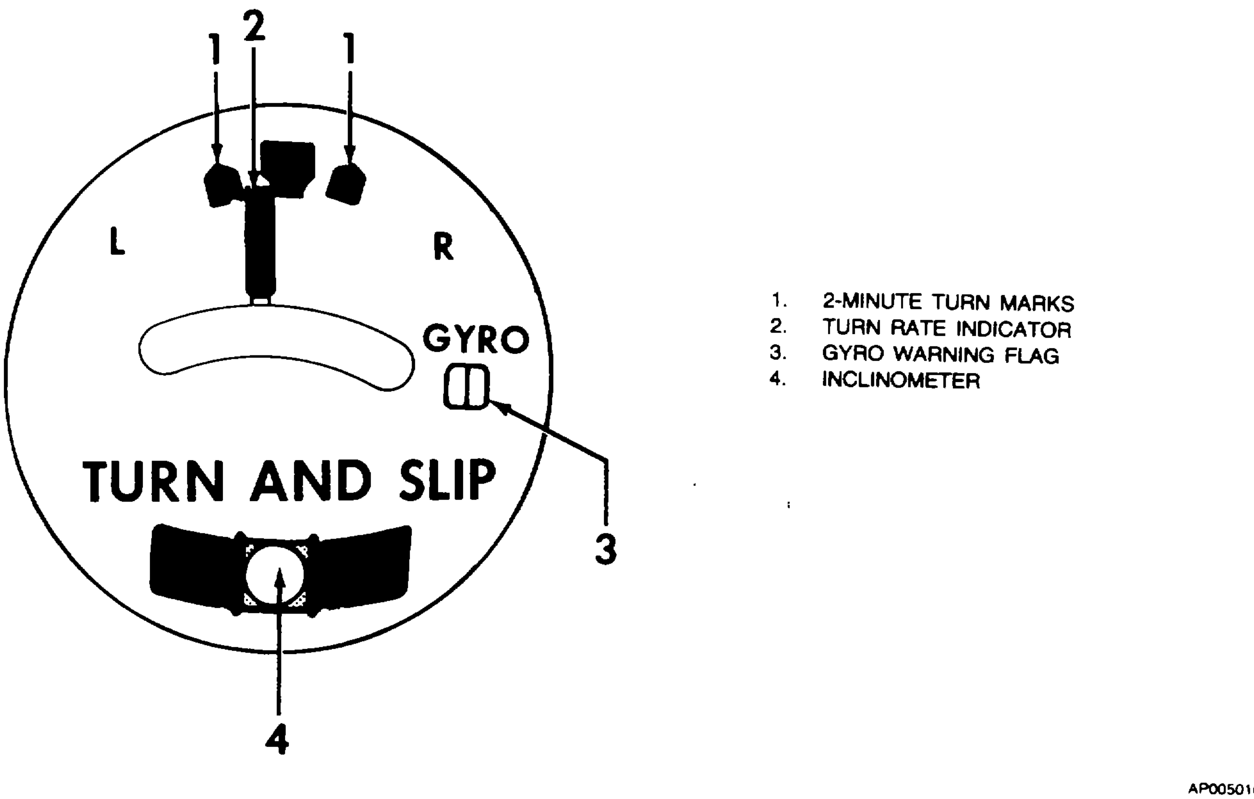


Figure 3-14. Pilot's Turn and Slip Indicator (329T-1)

(3) GYRO warning. Presence indicates loss of power to instrument.

(4) Inclinometer. Indicates lateral acceleration (side slip) of aircraft.

3-22. COPILOT'S GYRO HORIZON INDICATOR.

a. Description. The copilot's gyro horizon indicator (fig. 3-15) 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 index. Reference indicating zero-degree bank.

(2) Bank angle pointer. Indicates aircraft bank angle.

(3) Bank angle scale. Indicates aircraft bank angle from zero to 90 degrees with marks at 10, 20, 30, 45, 60, and 90 degrees.

(4) Horizon line. Affixed to sphere, remains parallel to the earth's horizon at all times.

(5) Miniature aircraft. Indicates attitude of aircraft with respect to the earth's horizon.

(6) G flag. Presence announces loss of power.

(7) Sphere. Indicates orientation with earth's axis at all times.

(8) Inclinometer. Assists the copilot in making coordinated turns.

3-23. 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.

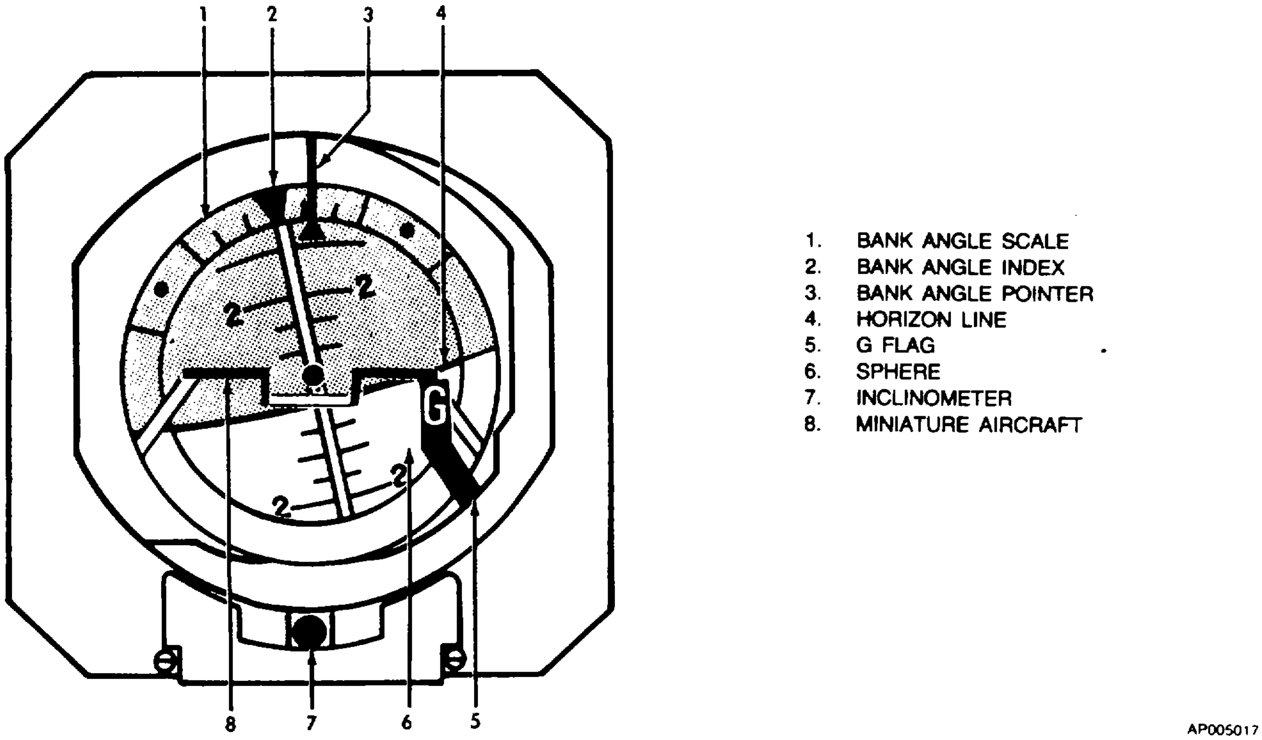


Figure 3-15. Copilot's Gyro Horizon Indicator (GH-14)

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.

There are no circuit breakers for the gyromagnetic compass systems. The circuits are protected by the 2-ampere F2 and F6 fuses on the No. 1 junction box.

b. Vertical Gyro A vertical gyro provides line-of-sight stabilization to the weather radar and roll and pitch information to the autopilot. No controls are required or provided for operation of the vertical gyro system. The circuit is protected by the 3-ampere F22 fuse in the No. 1 junction box.

c. Controls and Functions.

(1) Pilot's COMPASS No.l-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.l-No.2 switch. Selects desired source for magnetic heading information to display on copilot's HSI and pilot's RMI.

(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 gate connect to azimuth card.

(b) FREE. Selects free mode flux gate not connected to azimuth card.

(4) INCREASE-DECREASE switch. Provides manual fast synchronization of the system.

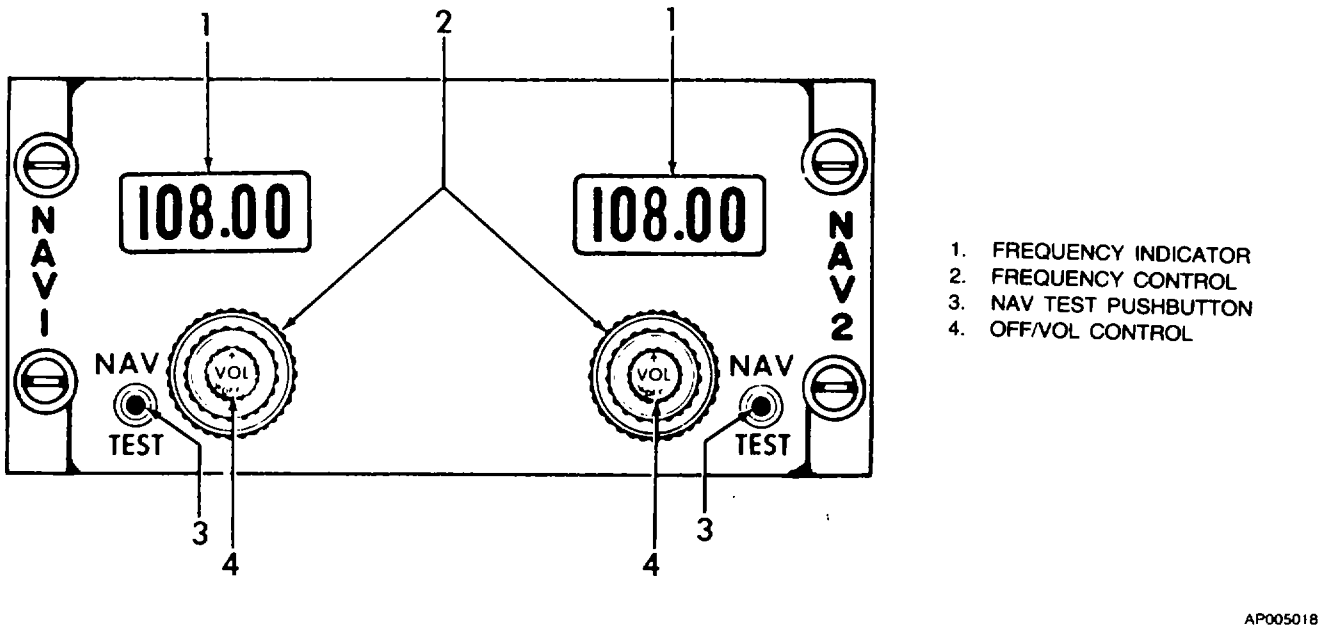


Figure 3-16. VOR Control Panel (VIR-30AGM, VIR-30AG)

(a) INCREASE. Causes gyro heading output to increase (move in counterclockwise direction).

(b) DECREASE. Causes gyro heading output to decrease (move in clockwise direction).

d. Normal Operation.

(1) Alignment procedure:

1. Gyro compass slave-free switch SLAVE.
2. Gyrocompass 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. Gyrocompass slave-free switch SLAVE.
2. RMI rotating heading dial (compass card) Read heading.

(3) To determine directional gyro heading:

1. Gyrocompass slave-free switch FREE.
2. Gyrocompass 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 the INVERTER No. I and INVERTER No. 2 switch is turned off. (If either inverter is on, both compass sets will be energized.)

3-24. VOR/LOC NAVIGATION SYSTEM.

a. Description. The aircraft is equipped with two VOR systems, controlled by a dual NAV I NAV 2 control panel, located on the pedestal (fig.

2-8). Either VOR can direct input signals to the flight director indicator. Controls are shown on figure 3-16. Each VOR receiver provides a VOR input to a respective RMI, HSI, and flight director computer. Each glideslope receiver sends GS flag and pointer deviation information to the HSI and flight director computer. VOR/LOC indicators may .be used for navigation during manual control of the aircraft, or the autopilot may be coupled to the VOR system, accepting VOR inputs to the autopilot computer. The pilot's unit (VOR 1) is a navigation radio system which receives and interprets VHF omnidirectional radio range (VOR) and localizer (LOC) signals, glideslope signals (GS), and marker beacon signals. It has a maximum range of 120 nautical miles line-of-sight. The system operates in a VOR/LOC frequency range of 108.00 to 117.95 megahertz in a glideslope frequency range of 329.15 to 335.00 megahertz, and at a marker beacon frequency of 75 megahertz. VOR 2 is similar to VOR I except VOR 2 cannot receive or interpret marker beacon signals. Each VOR system provides course deviation and glide path data, which can be switched either to the copilot's HSI or to the autopilot flight computer and * pilot's HSI. The audio outputs of VOR I and VOR 2 systems are supplied to the NAV control on the audio control panels. VOR I bearing data is supplied to the single-needle pointer on both radio magnetic indicators. VOR 2 bearing data is supplied to the double-needle pointer on both radio magnetic indicators. VOR I uses a marker beacon antenna located on the underside of the forward fuselage (fig. 2-1). VOR I and VOR 2 both use the same glideslope antenna, located inside the radome. Both VOR's are protected by separate 2-ampere circuit breakers, located respectively on the number 1 and number 2 avionics buses. The circuit breakers are placarded VOR No. I and VOR No. 2 are located on the overhead circuit breaker panel (fig. 2-27).

b. Controls/Indicators and Functions, NA V I1 Control Panel.

(1) Frequency indicator. Displays selected frequency of VOR 1 receiver.

(2) Frequency control Selects operating frequency of VOR 1 receiver.

(3) VOL-OFF control. Activates VOR 1 receiver. Permits monitoring VOR 1 audio and adjusts volume of signals received.

(4) NAV-TEST switch. Activates test of VOR I navigation system. If the system is functioning properly, the following indications are presented if tuned to VOR frequency.

(5) RMI. Single-needle indicates approximately 0'.

(6) HSI. Lateral deviation bar will center if arrow is set for 0', and NAV 1 is tuned to a localizer frequency.

c. Controls/Indicators and Functions, NA V2 Control Panel.

(1) VOL-OFF control. Activates VOR 2 receiver. Permits monitoring VOR 2 audio and adjusts volume of signals received.

(2) Frequency control. Selects operating frequency of VOR 2 receiver.

(3) Frequency indicator. Displays selected frequency of VOR 2 receiver.

(4) NAV-TEST switch. Activates test of VOR 2 navigation systems. If the system is functioning properly the following indications will be presented:

(5) RMI. Single-needle indicates approximately 0°.

(6) HSI. Lateral deviation bar approximately centers if course arrow is set to 0°, and NAV 1 is tuned to a localizer frequency.

d. Controls and functions.

(1) Pilot's COURSE INDICATOR switch. Selects receiver to control pilot's HSI

(a) VOR 1. VOR I controls pilot's HSI.

(b) VOR 2. VOR 2 controls pilot's HSI.

(c) TACAN. TACAN controls pilot's

(d) INS. INS controls pilot's HSI.

(2) Copilot's COURSE INDICATOR switch. Selects receiver to control copilot's HSI.

(a) VOR 1. VOR 1 controls copilot's HSI.

(b) VOR 2. VOR 2 controls copilot's HSI.

(c) TACAN. TACAN controls copilot's HSI.

(d) INS. INS controls copilot's HSI.

e. VOR Operation.

(1) Turn-on procedure:

1. Insure that aircraft DC and AC power is on.
2. Avionics master power switch (overhead control panel, fig. 2-12) ON.

3. Frequency controls (VOR control panel) Set for both receivers.
4. Volume controls (VOR control panel Turn clockwise to activate sets and adjust volume.
5. NAV A audio switches (audio control panel, fig. 3-1) ON. Confirm proper signal, then OFF.
6. RMI and HSI Confirm proper indications.

(a) Pilot/copilot course indicator switches (fig. 2-30). Pilot select VOR-1, copilot select VOR-2.

(b) To determine course to station on pilot's HSI: TO-FROM pointer reads TO (up) position.

(c) To determine bearing from station on pilot's HSI: TO-FROM pointer reads FROM position (down).

(d) To determine course to station on RMI: Select VOR, verify single needle points course to station.

(2) Localizer (LOC) operation:

1. VOR frequency knob (NAV panel) Select frequency.
2. Pilot's, copilot's COURSE INDICATOR switches (instrument panel) Select VOR source.
3. Check glideslope flags unmasked.

(3) VHF communications receiver operation:

1. VOR frequency control knob (VOR control panel, fig. 3-16) Select desired frequency.
2. Volume control knob (VOR control panel, fig. 3-16) Full on.
3. NAV A, audio switch ON. Adjust audio.

(4) Shutdown procedure:

1. Volume control (VOR control panel, fig. 3-16) OFF.

3-25. MARKER BEACON RECEIVER.

a. Description. The marker beacon receiver is located inside the No.1 VOR receiver. The marker beacon receiver obtains power through the VOR receivers. The marker beacon provides visual and aural indication of the aircraft's position over a 75 MHz marker beacon ground transmitter. Upon entering the range of marker beacon signals, blue, amber, or white annunciator lights will illuminate, and corresponding aural signals will indicate aircraft passage over the (0) outer, (M) middle, (A) inner or airway marker beacons. Range is vertical to 50,000 feet. On-off, volume, and sensitivity controls are located on the marker beacon audio control panel (fig. 3-2).

b. Controls/Indicators and Functions.

(1) Marker beacon sensitivity switch (marker beacon audio control panel, fig. 3-2) Controls sensitivity of marker beacon receiver.

(a) HI position enables high sensitivity operation of marker beacon receiver.

(b) LO position enables low sensitivity operation of marker beacon receiver.

(2) "0" indicator. Illuminates when aircraft passes over an outer marker beacon.

(3) "M" indicator. Illuminates when aircraft passes over a middle marker beacon.

(4) "A" indicator. Illuminates when aircraft passes over an inner or airway marker beacon.

c. Marker Beacon Operation.

1. Marker beacon volume control (marker beacon audio control panel, fig. 3-2) As required.
2. Marker beacon hi-lo switch (marker beacon audio control panel, fig. 3-2) As required.
3. Marker beacon indicator lights (instrument panel, fig. 2-30) Confirm beacon indication.

3-26. AUTOMATIC DIRECTION FINDER (DF203).

a. Description. The Automatic Direction Finder (ADF) (fig. 3-17), is a radio navigation system which provides a visual indication of aircraft bearing

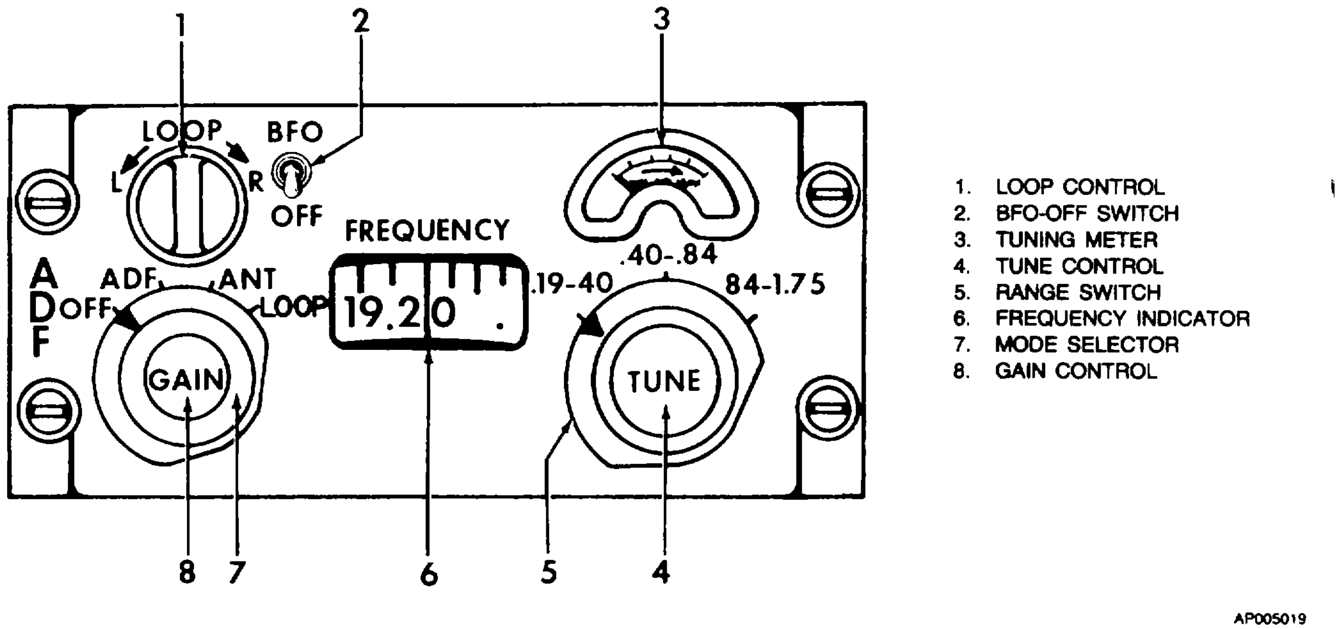


Figure 3-17. ADF Control Panel (DF-203)

relative to a selected ground radio station. It may also be used to home to a selected station, find aircraft position, or monitor conventional medium frequency AM radio transmissions. The system is designed to provide reliable reception of a 400-watt radio station at a range of 65 nautical miles throughout a 360degree turn of the aircraft. It operates in a frequency range of 190 to 1750 kilohertz. Bearing indications are displayed visually on the RMI's and aural signals are applied to the audio control panels. The ADF systems consists of a receiver, located on the forward side of the aft cabin bulkhead inside the pressure vessel; a control unit, located on the pedestal extension; a nondirectional sense antenna, installed in the aircraft dorsal fin; a directional loop antenna, located on the underside of the fuselage; and a quadrangle error corrector, installed on the loop antenna (to compensate for the deflection of arriving radio signals by the wings and fuselage of the aircraft). The system is protected by a 1-ampere ADF, a 5-ampere RADIO RELAY, and a 35-ampere AVIONICS BUS FEEDER No.2 circuit breaker located on the overhead circuit breaker panel (fig. 2-27).

NOTE

Keying the HF radio set while operating the ADF radio set will cause a momentarily unreliable ADF signal.

b. Controls and Functions (ADF Control Panel, fig. 3-17).

(1) L-LOOP-R control. Operative only when the function switch is in the LOOP or ADF position. Center position removes rotation signals from the loop antenna and the ADF pointer on the RMI's. L (left) or R (right) of center applies rotation signals to loop antenna and ADF pointer on RMI's for 360-degree rotation left or right. Center position holds antenna position.

(2) BFO-OFF. At BFO (on) setting, permits fine tuning with Beat Frequency Oscillator (BFO). Also provides audio tone when receiving unmodulated CW. OFF position turns BFO off.

(3) Tuning meter. Indicates relative strength of received signals.

(4) TUNE control. Selects operating frequency.

(5) Range switch. Selects operating frequency band.

(6) FREQUENCY indicator. Indicates selected frequency.

(7) Mode selector. Selects operating mode.

(a) OFF. Turns set off.

(b) ADF. Permits automatic direction finding or homing operation.

(c) ANT. Permits reception using sense antenna.

(d) LOOP. Permits audio-null homing and manual direction finding operations.

(8) GAIN control. Adjusts volume of received signal.

c. Controls and Functions (Marker Beacon Audio Control Panel, fig. 3-2).

(1) Receiver audio switch (audio control panel) NAV B position applies ADF audio to respective headset.

(2) FILTER V-OFF switch. Selects whether voice filter will be used with ADF audio.

(3) FILTER R-OFF switch. Selects whether range filter will be used with ADF audio.

NOTE

Range and voice filtering are canceled when both FILTER R and FILTER V are ON. Range and voice audio will be heard.

d. ADF Normal Operation.

NOTE

The only indication that the crewmember has for an unreliable ADF signal or loss of the ADF receiver is the loss of the ADF audio signal in the crewmembers headset.

(1) To operate the set as ADF.

1. Mode selector ADF.
2. BFO-OFF switch BFO.
3. Range switch Select frequency range.
4. Audio control panel (fig.. 3-1) NAV B switch On and adjusted.
5. Gain control As required.
6. TUNE control Rotate for maximum reading on tuning meter and zero BFO beat.
7. BFO-OFF switch OFF.
8. Double needle switch (RMI, fig. 3-10) ADF.
9. Double needle pointer (RMI, fig. 310) Read course to station.

(2) To operate set for sense antenna receiving only.

1. Mode selector (ADF control panel, fig. 16) ANT.
2. Range switch Select operating range.
3. Tune control Rotate for maximum I reading on tuning meter.
4. Gain control As required.

(a) To operate set for aural-null direction finding.

1. Mode selector (ADF control panel, fig. 3-17) ANT.
2. BFO-OFF switch BFO.
3. Range switch Select operating range.
4. Tune control Tune desired station.
5. Gain control Adjust for minimum audio output.
6. Double needle switches (RMI, fig. 10) As required.
7. BFO-OFF switch OFF.
8. Mode selector switch LOOP.
9. Loop switch L or R. Turn left or right until a null is reached (minimum sound in headsets).
10. Double needle on RMI (fig. 3-10) Read course to station.

NOTE

The true null and direction to the radio station may be indicated by either end of the single needle. This ambiguity must be solved to determine proper direction to the station.

(3) Shutdown procedure:

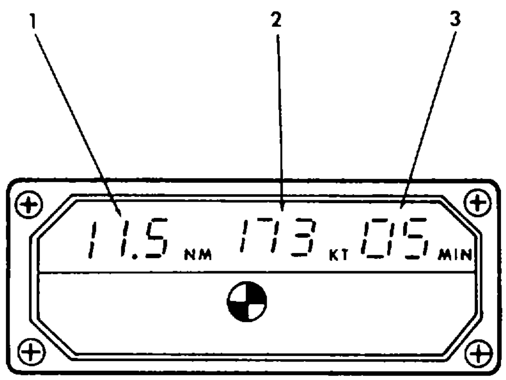


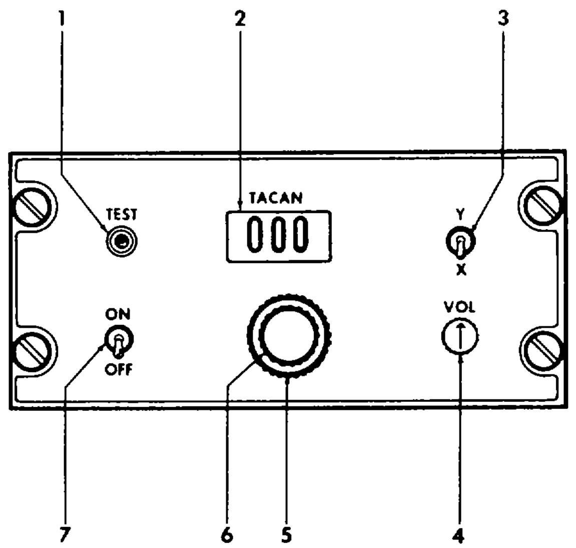
Figure 3-18. Tacan Distance Indicator

(a) Mode selector switch (ADF control panel, fig. 3-17) OFF.

3-27. TACAN SYSTEMS.

a. Description. Two tactical air navigation (TACAN) systems are provided. One is dedicated to the INS and is used only for position updating, and provides only DME information to the INS. The other is used in conjunction with other avionics systems, including the flight director system and the autopilot. For normal navigation, TACAN is a radio navigation system which provides aircraft distance and bearing information relative to a TACAN ground station. Both systems operate in the L band frequency range of 962 to 1213 MHz. Their range, though limited to line-of-sight, is designed to provide reliable reception of a TACAN ground station at a distance of 170 nautical miles at an aircraft altitude of 20,000 feet. The normal time required for the systems to lock on to a selected ground station signal is three seconds. The avionics TACAN is protected by a 2-ampere circuit breaker, placarded TACAN, located on the overhead circuit breaker panel (fig. 2-27). The INS TACAN is protected by a 2-ampere circuit breaker, on the INS J-box. I

b. TACAN System (Avionics). The TACAN system consists of a range unit (which includes the n system transmitter) and a bearing unit, both located in the right nose avionics compartment; a distance indicator (fig. 3-18), located on the instrument panel; a control unit (fig. 3-19), located in the pedestal extension; and an antenna, located on the top of the fuselage. The TACAN system (Avionics) operates in conjunction with TACAN and VORTAC ground stations to provide distance, groundspeed and time to-station data. It operates in the L band frequency range on one of 252 preselected frequencies, 126 X mode and 126 Y mode channels. Course deviation for TACAN stations is displayed on the HSI. Distance, time-to-station, and groundspeed are displayed on the TACAN digital display (fig. 3-18). 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 (Avionics) TA-CAN system may be operated by the flight director system or connected to and used with the autopilot



1. TEST PUSH SWITCH
2. CHANNEL INDICATOR
3. X-Y SWITCH
4. VOLUME CONTROL
5. TENS AND HUNDREDS CHANNEL SELECT KNOB
6. UNITS CHANNEL SELECT KNOB
7. ON-OFF SWITCH

Figure 3-19. Tacan Control Panel (AN-ARN-136)

system. When employed as the primary means of navigation, aircraft flight may be controlled manually or by the autopilot. Indications of aircraft heading and bearing to ground stations are displayed on the horizontal situation indicators. Magnetic bearing to a station is displayed by the RMI bearing pointer. TACAN distance, groundspeed and time-to-station are all displayed on the TACAN indicator located on the copilot's instrument panel (fig. 2-30). The TACAN control panel (fig. 3-19) enables selection of the TACAN frequency (channel) to be used, and provides for self-test of TACAN circuits. At the present time most TACAN and VORTAC stations are operated in the X mode. When Y mode stations become operational, air navigation charts will designate the Y mode stations.

c. INS TACAN System. The INS TACAN system is coupled directly to INS circuits. It is dedicated only to updating the INS, is activated when the INS is operational, and is controlled only by the INS. The INS TACAN consists of a range unit and a distance indicator, both located on the INS equipment rack and both identical to their counterparts in * the avionics TACAN and an antenna, located on the underside of the fuselage (fig. 2-1). No controls are required or provided for the INS TACAN system.

d. Controls/Indicators and Functions.

(1) TEST switch. Activates system self-test.

(2) Channel indicator. Displays selected TACAN channel.

(3) X-Y switch. Selects X or Y mode for TACAN channels.

(4) VOL control. Adjusts TACAN volume.

(5) Channel selectors. Dual knob for manual selection of operating channel.

(a) Outer knob. Selects tens and hundreds part of channel number.

(b) Inner knob. Selects units part of channel number.

(6) ON-OFF switch. Activates or deactivates system.

(7) NM indicator. Displays slant range distance in nautical miles from aircraft to selected TACAN ground station.

(8) KT indicator. Displays ground speed in knots.

(9) MIN indicator. Displays time to TACAN station in minutes.

e. Avionics TACAN Operation.

(1) Turn on procedure:

1. Power switch (fig. 3-18) ON.
2. Volume control As required.
3. Course indicator switches (fig. 230) TACAN.
4. RMI switches TACAN.
5. Self-test procedure: Course knob on pilot's HSI Set.

   (a) Pilot's HSI lateral deviation bar Centered, with course knob set to 180 ±2 degrees, and TO-FROM indicator indicating TO.
   (b) RMI bearing pointers (fig. 310) Point to 180 degrees.
   (c) HSI course knob Increase the selected course. The lateral deviation bar on a 180 ±2 degrees TO indication and the bearing pointers on each course indicator read 180 degrees. Using the course knob, increase the selected course, the lateral deviation bar will move left. Decrease the selected course, the deviation bar will center, then move to the right of center. Full scale deflection will be 10 ± 1°.

f. Normal Operating Procedure:

1. RMI single needle switch (fig. 3-10) VOR-TACAN.
2. RMI selector switch (instrument panel, fig. 2-30) TACAN.
3. Course indicator selector switch (instrument panel, fig. 2-30) TACAN.
4. TACAN X-Y switch As required.
5. TACAN channel selector knobs Select desired channel.
6. Wait 5 seconds for signal acquisition and lock-on.
7. If bearing lock-on is not obtained, perform an inflight self-test to insure correct operation of the system. Anytime a course indicator NAV or VOR LOC flag is in view, bearing, lateral deviation, and TO-FROM information may be inaccurate and should be disregarded.
8. Insure that audio station identification signal is correct for the ground station selected.
9. RMI single-needle pointer Read bearing to station.
10. HSI course control knob Set desired course.
11. HSI lateral deviation bar Read deviation from selected course. Course arrow will show wind correction angle when the lateral deviation bar is centered and the aircraft is tracking the selected course.
12. TACAN indicator Read distance to station.
13. To determine course TO or course FROM a TACAN station, rotate course knob (pilot's HSI) until lateral deviation bar is centered and the TO-FROM pointer reads TO or FROM.
14. To use TACAN during pilot-controlled flight, control aircraft by manual controls, responding to information displayed on the flight director, RMI, HSI, TACAN, and other instruments.
15. To use TACAN with the autopilot, engage autopilot and monitor autopilot performance on flight director, RMI, HSI and TACAN indicators. Verify adherence to preset heading and course, and confirm the execution of displayed steering commands.

NOTE

The TACAN ground speed reading will be accurate only when the aircraft is on a course directly to or from the TACAN station.

(1) Shutdown procedure: TACAN power switch (fig. 3-18) OFF.

3-28. AUTOMATIC FLIGHT CONTROL SYSTEM.

a. Description. The AP-106 is an integrated autopilot/flight director system that provides the following:

(1) Heading mode.

(2) Navigation mode.

1. Approach mode with automatic glideslope capture and track

(3) Altitude hold mode.

(4) Back course localizer mode.

(5) Go-around mode.

(6) Synchronized control wheel steering.

(7) Indicated airspeed hold mode.

(8) All-angle adaptive capture for VOR, LOC, and LOC B/C.

(9) Attitude display.

(10) Heading display.

(11) Mode selection indicators.

(12) Elevator trim indicator.

(13) System integrity warning flags.

(14) Automatic yaw damping.

(15) Turn and slip indicator.

The flight director and autopilot have a common computer system. When the autopilot is engaged, the flight control system controls the aircraft and the pilot monitors the flight path by observing the information displayed on the pilot's flight director indicator (FDI) and the pilot's horizontal situation indicator (HSI) (flight director system components).

Autopilot/flight director commands are selected at the autopilot mode selector panel (fig.320), located on the instrument panel (fig. 2-30). Manual roll rate and pitch commands are inserted at the autopilot pitch-turn panel (fig. 3-23).

Autopilot operational status is indicated by the autopilot/flight director annunciator (fig. 3-22) positioned above the pilot's flight director indicator on the instrument panel (fig. 2-30). Two autopilot switches are also provided on each control wheel (fig. 2-18). One switch is placarded PITCH SYNC & CWS (pitch synchronize and control wheel steering), and the other is placarded DISC-TRIM-AP-YD (disconnect trim/autopilot/ yaw damp).

The automatic flight control system is protected by a 10-ampere circuit breaker, placarded AP PWR, located on the overhead circuit breaker panel (fig. 2-27).

b. Controls/Indicators and Functions. The following controls and indicators are provided for operation of the system.

Autopilot mode selector control panel (fig. 320). The autopilot/flight director commands are selected by ,the autopilot mode selector control panel, located on the instrument panel (fig. 2-30). Selection is accomplished by pressing the face of the appropriate push-on/push-off annunciator switches. The lateral modes are HDG, NAV, APPR and B/C. When not in a lateral mode, the flight director command bars are biased out of view. The vertical modes are ALT hold, and IAS hold. If a vertical mode is not selected, the pitch hold mode is automatically operational. Selection of a mode causes the legend of that annunciator on the autopilot mode selector control panel to illuminate. The self-test switch on the autopilot mode selector control panel acts as a light test switch when depressed. For operation at night, overall illumination of the autopilot mode selector control panel and annunciator panel lights are adjusted by the PILOT INST LIGHTS light control, located on the overhead control panel (fig. 2-12).

(1) HDG switch. Engages heading mode. Commands aircraft to acquire the heading indicated by heading marker on pilot's HSI.

(2) NAV switch. Engages navigation mode. With VOR 1, VOR 2 or TACAN selected, commands aircraft to intercept and track VOR radial selected by course knob on pilot's HSI. With INS selected, commands aircraft to track steering signals from INS system. Intercept of approximately 45° and tracking will be computed by the INS system.

NOTE

APPR cannot be selected with INS selected.

(3) APPR switch. Engages approach mode. Commands aircraft to intercept and track ILS or localizer inbound course.

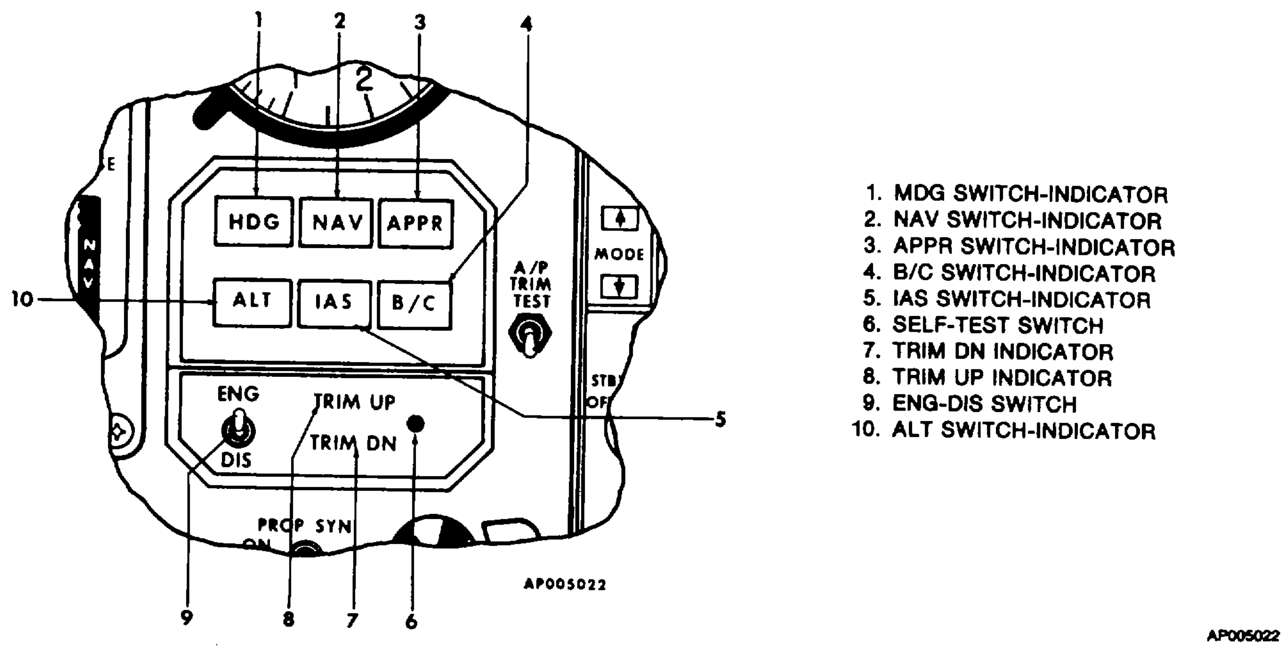


Figure 3-20. Autopilot Mode &elector Panel (614E-42A)

(4) ALT switch. Engages altitude hold mode. Commands aircraft to maintain its pressure altitude.

(5) IAS switch. Engages indicated airspeed hold mode. Commands aircraft to maintain its indicated airspeed.

(6) B/C switch. Engages backcourse mode. Commands aircraft to intercept localizer back course. Disables glideslope track.

(7) ENG-DIS switch. Controls coupling of the automatic pilot.

(a) ENG. Engages autopilot and illuminates AP ENG annunciator light on autopilot/ flight director annunciator panel (fig. 3-22).

(b) DIS. Disengages autopilot and illuminates AP DISC annunciator light on autopilot/flight director annunciator panel (fig. 3-22).

(8) TRIM UP indicator. Illuminates when autopilot is driving trim servo in up direction.

(9) TRIM DN indicator. Illuminates when autopilot is driving trim servo in down direction.

(10) Self-test switch. Tests display and selector indicator circuits when depressed.

(11) Autopilot trim test switch (fig. 3-20). Simulates trim system malfunctions and illuminates AP TRIM FAIL warning annunciator light (fig. 230)

(12) AIL HI TORQUE annunciator (fig. 321). Illumination is automatic from ground to 10,000 feet to show aileron servo is set to operate in high torque mode. Light extinguishes automatically above 10,000 feet to indicate aileron servo has terminated high torque mode operation.

(13) TEST switch (fig. 3-21). Normally off. Used only below 10,000 feet (TEST position) to confirm operability of aileron servo.

c. Autopilot/flight director annunciator panel (fig. 3-22).

(1) Description. The autopilot/flight director incorporates its own annunciator panel located just above the flight director display on the instrument panel (fig. 2-30). The modes and indications given on the annunciator panel are placarded on the face of the lenses and illuminate when the respective conditions are indicated. Dimming of the annunciator panel lights is provided by a control knob adjacent to the panel placarded DIM BRT.

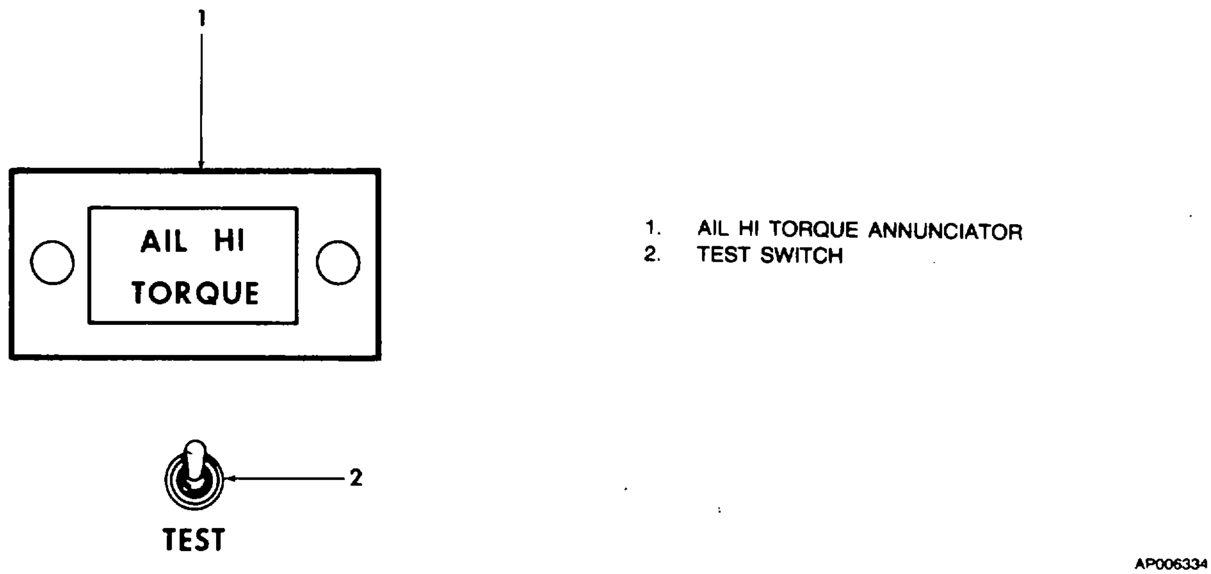


Figure 3-21. Aileron High Torque Test Switch and Annunciation

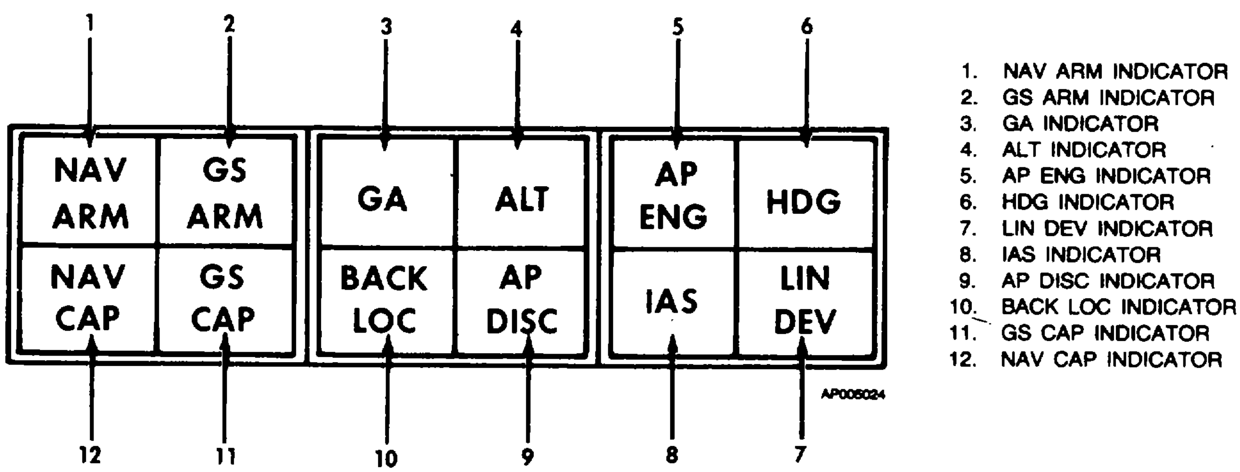


Figure 3-22. Autopilot/Flight Director Annunciator Panel

d. Controls/Indicators and Functions.

(a) NAV ARM annunciator. Illuminates when computer is armed to accept navigation signals.

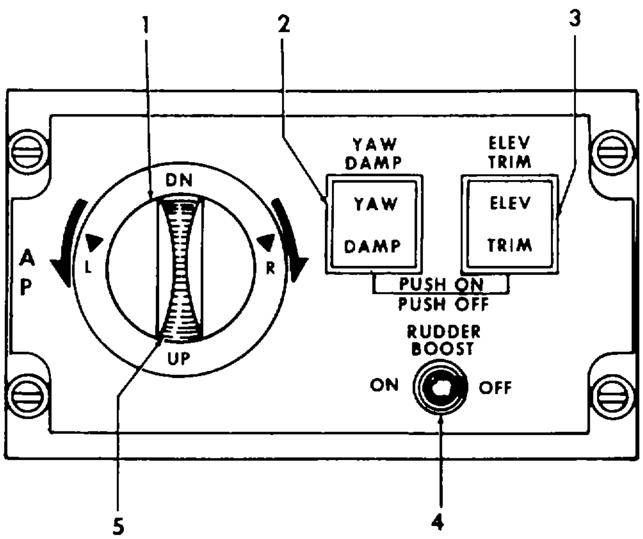
(b) NAV CAP annunciator. With VOR 1, VOR 2, or TACAN selected, illuminates when selected radial is captured. With INS selected, illuminates when INS is coupled to the flight director.

(c) GS ARM annunciator. Illuminates when approach mode is selected prior to glideslope capture. Extinguishes after glideslope capture.

(d) GS CAP annunciator. Illuminates when glidescope is captured.

(e) GA annunciator. Illuminates when go-around mode is selected.

(f) BACK LOC annunciator. Illuminates when back course mode is selected.



1. TURN CONTROL KNOB
2. YAW DAMP SWITCH/INDICATOR
3. ELEV TRIM SWITCH/INDICATOR
4. RUDDER BOOST TOGGLE SWITCH
5. PITCH CONTROL THUMBWHEEL

Figure 3-23. Autopilot Pitch-Turn Control Panel

(g) ALT annunciator. Illuminates when altitude hold mode is selected.

(h) AP DISC annunciator. Illuminates when autopilot is disconnected.

(i) AP ENG annunciator. Illuminates when autopilot is engaged.

(j) IAS annunciator. Illuminates when airspeed hold mode is selected.

(k) HDG annunciator. Illuminates when heading mode is selected.

(I) LIN DEV. Not Applicable

(1) Go-around switch (control pedestal, fig. 2-8). When pressed, autopilot disconnects, GA annunciator light illuminates, and flight director indicator commands wings level, 7° nose up attitude. Autopilot may be re-engaged to follow the go-around command.

e. Controls and Functions, Autopilot pitch-turn panel (fig. 3-23).

(1) Turn control knob. Supplies roll commands to autopilot. Spring loaded to center detent.

(2) Pitch control thumbwheel. Supplies pitch commands to autopilot. Spring loaded to center detent.

f. Controls and Functions. (fig. 2-17).

(1) DISC TRIM AP YD pushbutton. When pressed to the first detent, autopilot system and yaw damp are disconnected. When pressed to second detent, electric trim is disconnected.

(2) PITCH SYNC & CWS pushbutton. This button may be used instead of the pitch-turn control to establish the aircraft in a desired attitude. Depressing the button causes the autopilot servos to disengage from the control surfaces, enabling the pilot to manually fly the aircraft to the desired attitude until button is released.

g. Turn-on procedure: Power is applied to the system anytime the aircraft avionics bus is energized.

h. Autopilot Modes of Operation:

(1) Attitude mode. The autopilot is in the attitude mode when the ENG-DIS switch (autopilot mode selector control panel) is in the ENG position and no mode selector switches (HDG, NAV, etc.) have been selected (fig 3-20). The autopilot will fly the aircraft and accept pitch and roll rate commands from the autopilot pitch-turn panel (fig. 3-23).

(2) Guidance mode. When the autopilot is in the attitude mode and a mode selector switch (HDG, NAV, etc.) is pressed, the autopilot is

coupled to the flight director and accepts steering commands from the computer. Depending on which selector switch (autopilot mode selector control panel, fig. 3-20) is pressed, autopilot operation can be described by the following subguidance modes.

(a) Heading mode. When HDG mode is selected (autopilot mode selector control panel, fig. 3-20), with the autopilot engaged, the autopilot will fly the aircraft to, and then maintain, the heading under the heading marker on the pilot's HSI.

(b) Navigation mode. When NAV Mode is selected (fig. 3-20),. the system initially switches to the NAV ARM heading hold submode, as shown by the illumination of NAV ARM and HDG indicators (fig. 3-22). The autopilot will then command the aircraft to follow the heading under the pilot's HSI (when the heading marker set to produce the desired VOR, TACAN, INS or localizer intercept angle). The flight computer will compute a capture point based on deviation from the desired radio course, the rate at which the aircraft is approaching this course, and the course intercept angle. When course capture occurs, the HDG and NAV ARM annunciators (fig. 3-22) will extinguish and the NAV CAP annunciator will illuminate. The autopilot will then track 'the selected radio or INS course with automatic crosswind correction.

(c) Back-course mode. When B/C mode is selected on the autopilot mode selector control panel (fig. 3-20), localizer capture is the same as in a front-course approach in NAV or APPR mode. Glideslope is inhibited during a backcourse approach. The HSI must be set to the frontcourse heading so that front course sensing will be experienced.

(d) Approach mode. When APPR mode is selected (autopilot mode selector control panel, fig. :-20), localizer capture is the same as in the NAV mode but glideslope arm and capture functions are also provided. When the APPR mode is selected, the NAV ARM annunciator light will illuminate, indicating that the system is armed for localizer capture. As the aircraft approaches the localizer beam, the NAV CAP annunciator light will illuminate. Once the localizer is being tracked, the G(S ARM annunciator light will illuminate. Glideslope capture is dependent on localizer capture and must occur after localizer capture. The localizer is always captured from a selected heading, but the glideslope may be captured with the autopilot operating in any vertical mode (pitch hold, altitude hold, or indicated airspeed hold), and from above (not recommended), or below the glideslope. At the point of glideslope intercept, the GS CAP annunciator light will illuminate and all preselected vertical modes will be cleared. For localizer capture above the glideslope, NAV should be engaged until the aircraft has descended to the glideslope. After descending to the glideslope, APPR mode should be engaged for a coupled approach.

(3) *Go-around mode*. Pressing the GO AROUND button on the outboard side of the left power lever (fig. 2-8) selects the go-around mode. Go-around mode may be selected from any lateral mode (HDG, NAV, APPR, or B/C). When go-around mode is selected: (1) the autopilot is disengaged, (2) the GA annunciator light will illuminate, and (3) a command presentation for wings level and 7° nose up pitch attitude will appear on the pilot's flight director indicator.

NOTE

The heading marker may be preset to the go-around heading after the localizer is captured. After go-around airspeed and power settings are established, select the HI)G mode to clear the go-around mode. Pitch attitude will remain at that used for go-around until changed with the PITCH SYNC & CWS button or the selection of a vertical mode.

(4) Pitch hold mode. The pitch hold mode is selected by (1) selecting one of the vertical mode selector switches, or (2) actuating the pitch synchronize and control wheel steering switch (PITCH SYNC & CWS), located on each control wheel (fig. 2-17).

(5) Control wheel steering mode. Pressing one of the PITCH SYNC & CWS switches located on each control wheel (fig. 2-17) disconnects the autopilot servos from the control surfaces, and allows the pilot to fly the aircraft to a new pitch attitude, and synchronizes the horizontal command bar (pilot's F1)1) to aircraft attitude. The ALT or IAS mode will disengage (if selected) when the PITCH SYNC & CWS button is depressed. When the autopilot is coupled to the HDG, NAV, APPR, or B/C modes, releasing the PITCH SYNC & CWS switch will cause the autopilot to couple to the previously selected mode.

(6) Altitude hold mode. Pressing the ALT switch (autopilot mode selector control panel, fig. 3-20) when desired altitude has been reached (with autopilot engaged) will (1) cause the autopilot to fly the aircraft to maintain the pressure altitude at which the aircraft was flying when ALT switch was pressed, (2) illuminate the ALT annunciator light (autopilot/flight director annunciator panel, fig. 3-22).

(7) Indicated airspeed hold mode. Pressing the IAS switch (autopilot mode selector control panel, fig. 3-22) when desired airspeed has been reached (with autopilot engaged) will (1) cause the autopilot to fly the aircraft to maintain the indicated airspeed at which the aircraft was flying when IAS switch was pressed, (2) illuminate the IAS annunciator light (autopilot/flight director annunciator panel, fig. 3-22).

i. Autopilot Operation

(1) Engaging autopilot:

1. Autopilot engage switch (autopilot mode selector control panel, fig. 320) ENG.

NOTE

When the autopilot is engaged, the yaw damper is also automatically engaged.

The autopilot and flight director are coupled when both units are engaged. When coupled, the autopilot accepts guidance commands from the flight director. When the flight director is not engaged, the autopilot accepts pitch and roll commands from the pitch-turn control knobs as selected by the pilot.

The autopilot may be engaged in any reasonable attitude and in either the coupled or uncoupled mode. The autopilot will smoothly acquire the command attitude. When uncoupled, the autopilot will maintain the bank and pitch attitude at the time of engagement.

(2) Disengaging the autopilot. The autopilot may be disengaged by the following:

(a) Actuating compass INCREASE-DECREASE switch.

(b) Pressing TEST button on autopilot mode selector control panel.

(c) Pressing GO AROUND switch on left power lever.

(d) Pressing control wheel DISC switch to APYD position.

(e) The following functions will cause the autopilot to automatically disengage:

1. Vertical gyro failure.
2. Directional gyro failure.
3. Autopilot power or circuit failure.
4. Autopilot servo torque-limiting circuit failure.
5. Autopilot trim failure.

(3) Maneuvering.

(a) To change flight functions, press the desired mode button on the autopilot mode selector control panel (fig. 3-20). The button will illuminate along its edges and the autopilot annunciator lights on the instrument panel will illuminate, indicating the respective modes in operation.

(b) In any function except "after h glideslope capture", use the autopilot pitch control for climbing or descending. Movement of the pitch control establishes a pitch rate that is proportional to knob displacement. If any vertical mode button has been selected, it will automatically release when the pitch control knob is rotated.

(c) When HDG mode is selected, the autopilot will command the aircraft to execute it turn, then maintain the heading set by t111(heading marker.

(d) Use the autopilot turn control to command a roll rate when the autopilot is engaged. At the time control is returned to detent, the autopilot maintains the bank angle (up to approximately 30 degrees). Rotating the turn control when the autopilot is engaged and a lateral mode is selected (except APPR and GA modes) will cause the selected lateral modes to release.

(4) Control wheel synchronization. The PITCH SYNC & CWS button on the pilot's control wheel (fig. 2-17) can be used instead of the pitch/ turn control to establish the aircraft in a desired attitude. Depressing this button causes autopilot servos to disengage from the control surfaces. The pilot then flies the aircraft manually to a desired

attitude, releases the PITCH SYNC & CWS button to re-engage the servos, and the autopilot holds the established attitude.

The ALT and IAS mode will immediately disengage (if selected) when the PITCH SYNC & CWS button is coupled to the HDG, NAV or B/C modes. Upon release of the PITCH SYNC & CWS button, the autopilot will couple to the previously selected lateral mode.

NOTE

The APPR mode will not disengage when the PITCH SYNC & CWS button is depressed. When the button is released, the aircraft will return -to the localizer course and glideslope.

j. Before takeoff.

1. Heading marker (pilot's HSI) Set to runway heading.
2. Heading switch (autopilot mode selector control panel, fig. 3-20) Press. Do not engage autopilot.
3. Pitch steering bar Set for desired initial climb attitude using the pitch control thumbwheel.

k. Takeoff. Pressing the PITCH SYNC & CWS switch on the control wheel will provide pitch synchronization and the cross-pointers on the flight director indicator will command flight to the pitch attitude that existed when the PITCH SYNC & CWS switch was pressed.

l. Climbout.

1. Establish climb profile.
2. Autopilot engage switch (autopilot mode selector control panel, fig. 3-20) ENG (above 200 feet AGL).
3. Airspeed hold switch (autopilot mode selector control panel) Press (if desired).
4. Heading knob (pilot's HSI) Move heading marker as required for heading changes.

m. Cruise altitude.

1. Vertical speed Reduce to approximately 500 feet per minute (just before reaching cruise altitude).
2. Altitude hold switch (autopilot mode selector control panel, fig. 3-20) Press (upon reaching cruise altitude).

n. VOR Operation.

(1) To establish aircraft on a desired VOR radial, perform the following:

1. VOR receiver Tune appropriate frequency.

2. Course knob (pilot's HSI) Set desired radial to or from station (shown in COURSE window).

3. Heading knob (pilot's HSI) Set desired intercept angle under heading marker. (The intercept angle with respect to the radial may be any angle of 900 or less).

4. Navigation switch (autopilot mode selector control panel, fig. 3-20) Press. Observe illumination of NAV ARM annunciator light.

5. Navigation capture annunciator light (autopilot/flight director annunciator panel, fig. 3-22) Monitor. At point of capture, NAV CAP annunciator will illuminate.

NOTE

Except as described below, do not select a different VOR frequency, TACAN channel, or course, once a course and intercept have been programmed or capture achieved. To select a different course or VOR/TACAN frequency, return to the HDG mode, select the course or frequency, return to the NAV mode, then reset the desired course.

(2) To change course over a VOR station. To change course over a VOR station while operating in NAV mode, if course change is less than 300: Course knob (pilot's HSI) Set desired radial in COURSE window.

(3) Changing course over a VOR station. To change course over a VOR station while operating in NAV mode, if course change is greater than 30°:

1. Heading knob (autopilot mode selector control panel, fig. 3-20) Set desired intercept heading under heading marker.

2. Heading switch (autopilot mode selector control panel) Press. Observe HDG annunciator light illuminates (autopilot/flight director annunciator panel).
3. Course knob (pilot's HSI) Set new course in COURSE window.
4. Navigation switch (autopilot mode select control panel, fig. 3-20) Press. Observe that NAV ARM annunciator illuminates (autopilot/flight director annunciator panel).
5. Navigation capture annunciator light (autopilot/flight director annunciator panel) Monitor. Illumination means capture of new radial.

o. Automatic Approach, Front Course.

NOTE

The localizer and glideslope are captured automatically on the ILS front course approach. The localizer must be captured before glideslope capture can occur. The localizer is always captured from a selected heading, but the glideslope may be captured from any of the vertical modes and from above (not recommended) the glideslope.

1. VOR receiver Tune appropriate localizer frequency.
2. Course knob (pilot's HSI) Set inbound localizer course in COURSE window.
3. Heading knob (pilot's HSI) Set heading marker to desired intercept angle.
4. Heading selector switch (autopilot mode selector control panel, fig. 3-20) Press. Observe HDG illuminates on autopilot/ flight director annunciator panel.
5. Vertical mode (autopilot mode selector control panel, fig. 3-20) Select IAS or ALT.
6. Approach switch (autopilot mode selector control panel) Press. Observe that NAV ARM light illuminates on autopilot/flight director annunciator panel. If the localizer will be captured with the aircraft above the glideslope, then NAV mode should be used until the aircraft descends to the glideslope.
7. Navigation capture annunciator light (autopilot/flight director annunciator panel) Monitor. Illumination indicates capture of localizer course.
8. Glideslope arm annunciator light (autopilot/flight director annunciator panel) Monitor. Illumination indicates that autopilot is armed for glideslope capture.
9. Glideslope capture light (autopilot/ flight director annunciator panel) Monitor. Illumination confirms glideslope capture and that all vertical modes are cleared.

p. Go-Around. If visual contact with runway environment has not been made at decision height, go-around mode may be activated by pressing the GA button on the left power lever, and may be initiated from any lateral mode (HDG, NAV, APPR, B/C) with the following results:

(1) Illumination of GA annunciator light on autopilot/flight director annunciator panel.

(2) Autopilot disengagement.

(3) Pilot's FDI shows command presentation for wings level and 70 nose up climb attitude.

NOTE

The heading marker may be preset to go-around heading after the localizer is captured; After go-around airspeed and power settings are established, selection of the HDG mode will clear the go-around mode. Pitch attitude will remain at that used for go-around until changed with the PITCH SYNC & CWS button or by selection of a vertical mode.

q. Back Course Approach. As in front course approach, the localizer is captured automatically. The aircraft should be maneuvered into the approach area by setting the heading marker and functioning in the HDG mode.

1. VOR receiver (VOR control panel) Tune localizer frequency.
2. Course knob (pilot's HSI) Set front course localizer heading in COURSE window.
3. Heading knob (pilot's HSI) Set heading marker to desired intercept angle.

4. Heading switch (autopilot mode selector control panel, fig. 3-20) Press. Observe that HDG light illuminates on autopilot/flight director annunciator panel.

5. Back course switch (autopilot mode selector control panel) Press. Observe that NAV ARM lights illuminate (autopilot/flight director annunciator panel) indicating system is armed for back localizer capture. Any previously selected vertical mode will cancel.

6. NAV CAP light will illuminate when system has captured back localizer course.

7. Pitch control (autopilot/pitch turn panel) Use to establish and maintain desired rate of descent.

NOTE

The HDG mode should be used within one mile of the runway due to the large radio deviations encountered when flying over the localizer transmitter.

r. Yaw Damper Operation.

(1) The rudder channel of the autopilot may be selected separately for yaw damping by depressing the YAW DAMP switch on the pedestal. The switch face will illuminate when the yaw damper is engaged.

(2) To disengage the yaw damper, press the disconnect button on the pilot's or copilot's control wheel to the first detent or press the YAW DAMP switch on the pedestal.

(3) Refer to Emergency Procedures for other means of disconnecting the yaw damper.

s. Disconnecting Autopilot. The autopilot may be disconnected by any of the following actions:

(1) Pressing the DISC TRIM AP YD switch (control wheels, fig. 2-30) to the first detent.

(2) Placing the autopilot engage disengage switch (autopilot mode selector control panel, fig. 3-20) to the DIS position.

(3) Refer to Emergency Procedures for other means of disconnecting the autopilot.

NOTE

After assuming manual control, fly the aircraft using the same heading, course, and attitude displays used to monitor autopilot operation prior to assuming manual control.

3-29. 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 aircraft encoding altimeter, the true airspeed computer, 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 light 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. Altitude information is automatically inserted into the INS computer by an encoding altimeter whenever the INS is operational.

The Control Display Unit (CDU) (fig. 3-25) provides controls and indicators for entering data into the INS and displaying navigation and system status information.

The Mode Selector Unit (MSU) (fig. 3-24) controls system activation and selects operating modes.

The INS system is protected by the 10-ampere INS AC POWER and the 5-ampere INS HTR AC POWER circuit breakers on the mission AC/DC power cabinet, by the 5-ampere INS CONTROL circuit breaker on the overhead circuit breaker panel and by the 20-ampere circuit breaker on the front of the INS battery unit.

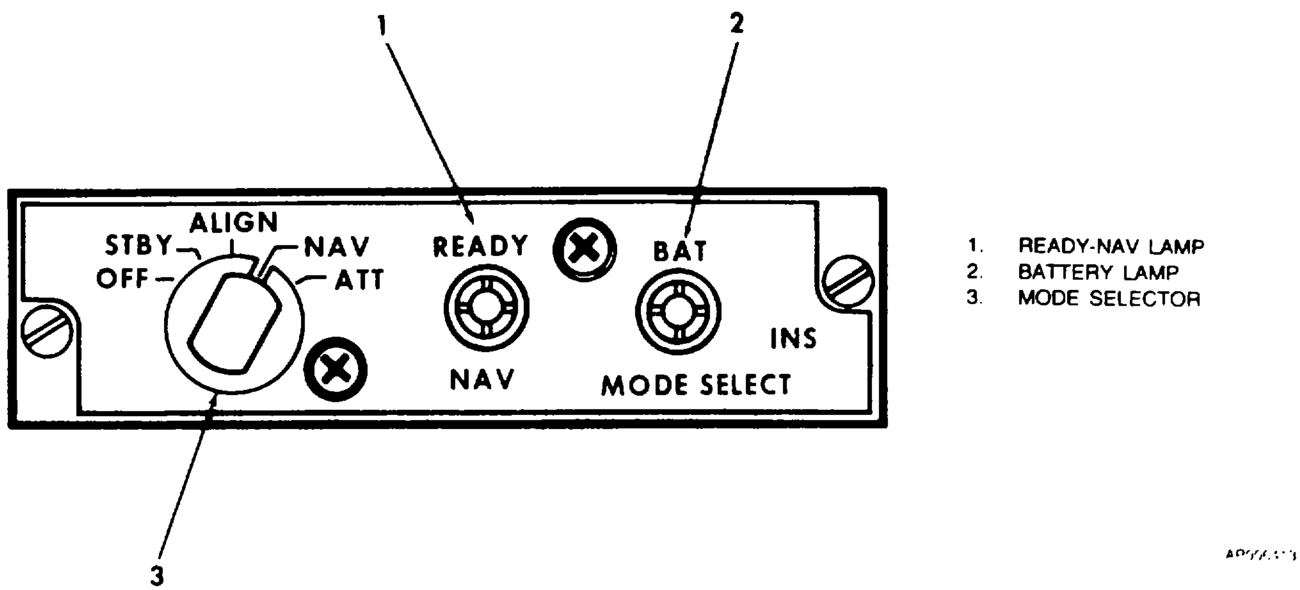


Figure 3-24. INS Mode Selector Unit (C-IV-E)

b. Controls/Indicators and Functions, INS mode selector unit (fig. 3-24).

(1) 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. 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 over temperature 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 lights operative. Once selected, INS alignment is lost.

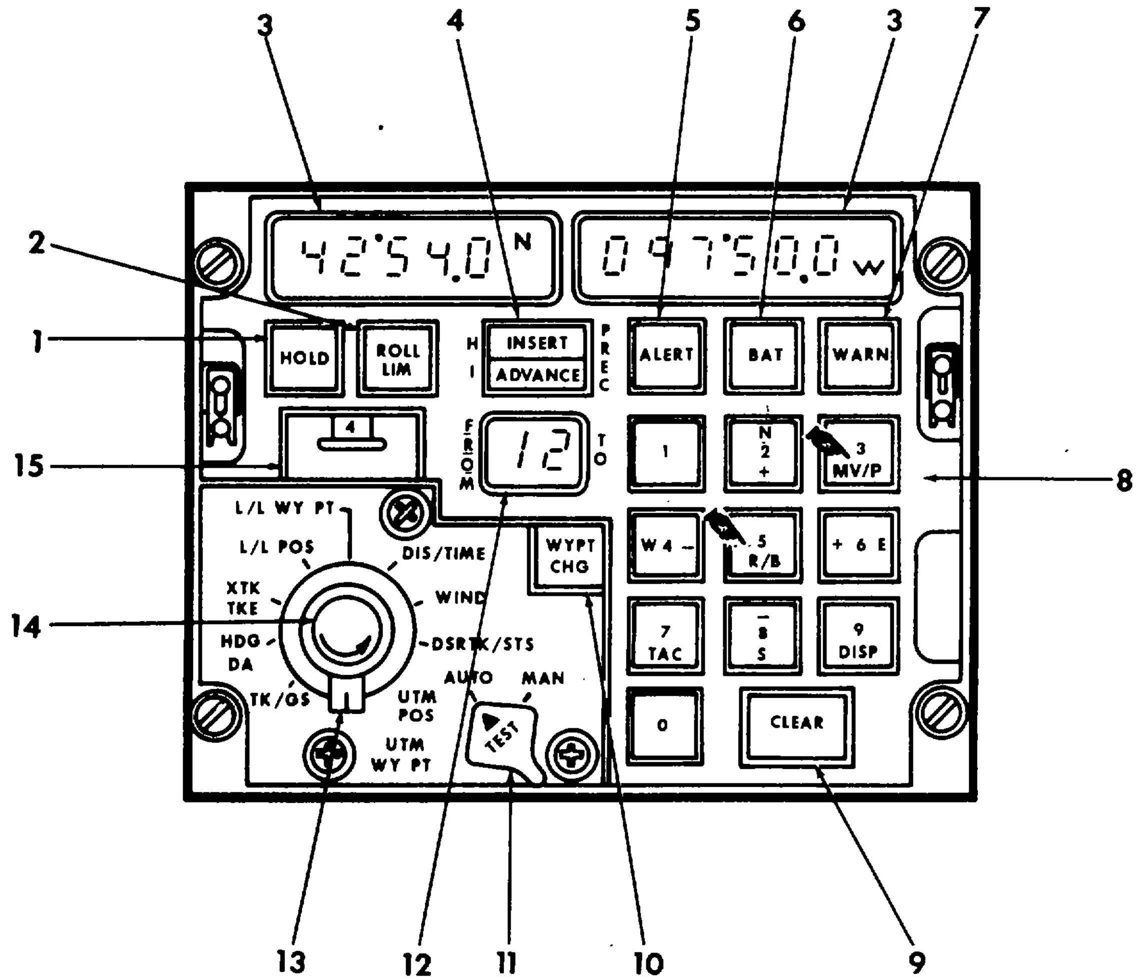
(2) BAT light. Illuminates to indicate INS shutdown due to low battery unit voltage.

(3) READY NAV light. Illuminates to indicate INS high accuracy alignment has been attained. If attained during ALIGN mode, light remains illuminated until NAV mode is selected. Light illuminates momentarily during alignment, if alignment is accomplished while in NAV mode.

c. Controls Indicators and Functions, INS control display unit (fig. 3-

(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. Lights when pressed first time; goes out 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 lights. Roll steering output is limited to 10 degrees. Press second time to exit mode, key light



1. HOLD KEY
2. ROLL LIM KEY
3. DATA DISPLAYS
4. INSERT/ADVANCE KEY
5. ALERT LAMP
6. BAT LAMP
7. WARN LAMP
8. KEYBOARD
9. CLEAR KEY
10. WYPT/CHG KEY
11. AUTO-MAN TEST SWITCH
12. TO/FROM DISPLAY
13. DATA SELECTOR
14. DIM KNOB
15. WAYPOINT/DME SELECTOR

AP006197

Figure 3-25. INS Control Display Unit (C-IV-E) extinguishes. Roll steering output returns to normal limit of 25 degrees.

(3) Data display, left and right: Composed of lights 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 any numerical key, alternates display of normal and high precision data.

(5) ALERT light. 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 waypoint, if AUTO-MAN switch is set to MAN. Light will extinguish if AUTO is selected or if a course change is inserted.

(6) WARN light. Lights red to alert pilot 1 .;S self-test circuits have detected a system fault. illumination may be caused by continuous or intermittent condition. Intermittent conditions light until reset by TEST switch. If continuous condition does not degrade attitude operation, light goes out when mode selector is set to ATT.

(7) 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 TA(.'AN station data. MV/P and DISP (on keys 3 and 9) are associated with loading and display of magnetic variation, magnetic heading, and the pattern steering mode. R/B and DISP (on keys 5 and 9) are associated with loading and display of UTM coefficients and waypoint move parameters.

(8) CLEAR key. When pressed, illuminates and erases data loaded into data displays or FROM-TO display. Used to cancel erroneous data. After clearing, data loading can be resumed.

(9) WYPT CHG key. When pressed, enables numbers in FROM-TO display to be changed. If L.JSERT/ADVANCE key is pressed, computer will use navigation leg defined by new number in all navigation computations. If INSERT/ AD)VANCE key is not pressed, computer will .continue using original numbers in all navigation computations; but distance/time information, based onnew leg, may be called up and read in data displays (in case of waypoints). When not in TACAN mix mode, TACAN station number is inserted to display DIS/TIME information.

(10) 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 waypoint in TO side of the FROM-TO display is reached.

(b) MAN. Selects manual leg switching mode. Pilot must make waypoint changes manually.

(c) TEST. When pressed, performs test of INS lights and displays, remote lights 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 and ALERT lights. 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 signal are also supplied to the autopilot when INS steering is selected. Rotating AUTO-MAN switch to

AUTO and pressing TEST during align furnishes a 15° left bank steering command. A 150 right bank steering command is furnished when the AUTO/ MAN switch is set to MAN.

(11) FROM-TO display. Display numbers defining waypoints of navigation leg being flown or, in the case of a flashing display, displays TACAN station being used.

Waypoint numbers automatically change each time a waypoint 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.

(12) 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.

(13) TK/GS. Displays aircraft track angle in left display and ground speed in right display.

(14) HDG/DA. Displays aircraft true heading in left display and drift angle in right display.

(15) XTK/TKE. Displays cross track distance in left display and track angle error in right display.

(16) 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.

(17) L/L WY PT. Displays or enters waypoint and TACAN station data, if used in conjunction with the waypoint/TACAN selector. This position will also cause display of inertial present position data when the HOLD key is illuminated.

(18) DIS/TIME. Displays distance from aircraft to TACAN station or any waypoint, or between any two waypoints in left display. Displays time to TACAN station or any waypoint, or between any two waypoints, in right display.

(19) 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 (115 to 400 KIAS).

(20) DSRTK/STS. Displays desired track angle to nearest degree in the left data display, and INS system status in right data display.

(21) UTMPOS. Displays or enters aircraft position in Universal Transverse Mercator (UTM) coordinates, with northing data in kilometers in left display and easting data in kilometers in right display. The extra precision display shows meters.

(22) UTM WY PT. Displays or enters waypoint and TACAN station data in UTM coordinates. Also enables loading and display of spheroid coefficients if GRID and DISP keys are pressed simultaneously.

(23) Dim knob. Controls intensity of CDU key lights and displays.

(24) 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 or universal transverse mercator (UTM) coordinates of aircraft during INS alignment. This information is necessary to program the INS computer during alignment procedure.

NOTE

When inserting data into INS computer, always start at the left and work to the right. The first digit inserted will appear in right position of applicable display. It will step to the left as each subsequent digit is entered. The degree sign, decimal point, and colon (if applicable) will appear automatically.

(1) Preflight procedure.

CAUTION

Insure 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.

(a) Applicable circuit breakers -Check depressed.
(b) Mode selector switch (fig. 3-24) ALIGN. Confirm the following:

1. TO-FROM display (fig. 325) indicates "1 2".
2. INSERT/ADVANCE push-button annunciator (CDU) illuminates.
3. BAT annunciator (fig. 3-24) illuminates for approximately 12 seconds then extinguishes when INS advances to alignment state "8".

NOTE

Avoid passenger or cargo loading, or any activity which may cause aircraft to change position or attitude during alignment. If aircraft is moved during alignment, it will be necessary to restart alignment by setting the mode selector to STBY, then back to ALIGN and reinserting present position data.

(c) Dim knob (CDU) Adjust for optimum brightness of CDU displays.
(d) 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 navigational errors. If aircraft is moved during alignment, restart alignment by setting mode selector switch to STBY, then back to ALIGN and reinserting present position.

NOTE

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.

1. AUTO-MAN TEST switch (CDU) Press and hold for test. Confirm the following on CDU:

Left and right data displays indicate "88"88.8 N/S and "88°88.8" E/W respectively.

TO-FROM display indicates "8.8".

The following pushbuttons and annunciators illuminate: ROLL LIM, HOLD, INSERT/ ADVANCE, WYPT CHG, ALERT, BAT (on CDU and MSU), WARN and READY NAV.

2. AUTO-MAN TEST switch (CDU) Release. Confirm the following: 3. Data displays indicate coordinates in computer memory.

4. Data selector (CDU) DSRTK/STS. Observe left-hand data display indicates the desired track in computer memory and right data display indicates status "194".

5. Monitor data display for system alignment state "9" to alignment state "8". Observe right data display will be "184".

6. 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 is off, ".03184" will appear in right data display and WARN annunciator is extinguished.

7. If there are malfunction codes, proceed to ABNORMAL PROCEDURES.

NOTE

To achieve best accuracy, engine start and heavy loading activity should be delayed until entry into NAV mode.

(2) Verify UTM grid coefficients (if UTM coordinates are to be used).

(a) Data selector (CDU) UTM WY PT.

(b) 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.

(c) Verify that values correspond to those required for spheroid being used.

NOTE

Values for various spheroids are listed in table 3-1.

(d) 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 the following steps:

NOTE

The INS geographic position, as read in L/L displays, will not be affected by any changes in these coefficients.

(e) Keys"2" or "8" Press to indicate following is the flatness coefficient. Observe INSERT/ ADVANCE pushbutton annunciator illuminates.

(f) Load earth flatness coefficient by pressing keyboard keys in sequence. Example: 2 9 4 9 8 = 29498. Observe numbers appear in left display as keys are pressed.

(g) INSER/ADVANCE pushbutton Press. Observe INSERT/ ADVANCE pushbutton annunciator extinguishes.

(h) Keys"4" or "6" Press, to indicate that the following load is relative earth radius. Observe INSERT/ADVANCE pushbutton annunciator illuminates.

(i) Load relative earth radius by pressing keyboard keys in sequence. Example: 8 2 0 6 m = 8206. Observe numbers appear in the right display as keys are pressed.

NOTE

Zone symbol is to be ignored.

(j) INSERT/ADVANCE pushbutton Press. Observe INSERT/ ADVANCE pushbutton annunciator extinguishes.

(k) Data selector (CDU) UTM POS. Observe coordinate will reflect values of new spheroid.

(3) 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 the HSI and the ALERT annunciators illuminate. 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.

Table 3-1. Various Values for UTM Grid Coefficients

SPHEROID	FLATNESS COEFFICIENT	RELATIVE RADIUS
International	29700	8388 m
Clark 1866	29498	8206 m
Clark 1880	29346	8249 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

NOTE

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.

NOTE

The quick test procedure may be performed any time after alignment state "8" is reached and prior to entry into NAV.

(a) Mode selector (MSU) ALIGN. Observe CDU displays are illuminated.

(b) 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 9gn.

(c) AUT-MAN switch (CDU) MAN.

(d) INS Couple to flight director and autopilot, as applicable.

(e) Data selector Set to any position except DSRTK/STS.

(f) CDU TEST switch Hold depressed. After performing the preceding step, observe:

1. All annunciators on MSU Check illuminated.
2. All annunciators on CDU All "8's" displayed.
3. HSI All angles 30°. Crosstrack deviation bar one dot right. All INS flags retracted.

4. Flight Director/Autopilot A 15' right steering command is issued.
5. Mission Control Panel TACAN UPDATE and DATA LINK UPDATE annunciators illuminated.

(g) CDU TEST switch Hold depressed and rotate AUTO-MAN switch to AUTO. Observe all indications are as in step (6) except at 15', left steering command is issued. On HSI, all angles are "0°" and cross-track deviation bar is one dot left.

(h) CDU TEST switch Release. If desired, decouple INS. Observe that operation returns to normal.

(4) 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.

NOTE

While parked aircraft is undergoing alignment, encoding altimeter will supply the field elevation (aircraft pressure altitude) into INS.

NOTE

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.

NOTE

If longitude and latitude coordinates are being used, skip step 4 (a) and proceed with step 4 (b).

(a) Insert UTM coordinates of aircraft present position:

1. Data selector UTM POS. Observe that prior to initial load, INSERT/ADVANCE pushbutton annunciator illuminates.
2. To load zone and easting values Press keys in sequence, starting with "E". Example: Zone 16,425 km East = E16 425. Observe that zone and easting in kilometers appear in right data display as keys are pressed.
3. INSERT/ADVANCE pushbutton Press. Observe pushbutton annunciator remains illuminated.
4. To load northing data Press keys in sequence, starting with "N" or "S" to indicate north or south hemisphere. Example: North = N 4749. Observe northing kilometers appear in left data display as keys are pressed.
5. INSERT/ADVANCE pushbutton Press. Observe that the pushbutton light remains illuminated.
6. INSERT/ADVANCE pushbutton Press. Observe extra precision display for present position northing and easting, to the nearest meter, appears in left and right data displays, respectively.
7. 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.
8. INSERT/ADVANCE pushbutton Press. Observe pushbutton annunciator remains illuminated.
9. To load extra precision northing data Press. Keys in sequence, starting with "N" or "S". Example: 901 m North = N. Observe that northing 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.

10. INSERT/ADVANCE pushbutton Press. Observe latitude and longitude data is displayed in UTM and INSERT/ADVANCE pushbutton light extinguishes.

NOTE

The computer will convert coordinates in the overlap area; however display values will reference appropriate zone.

NOTE

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.

NOTE

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.

(b) 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.

1. Data selector UIL POS. Observe that prior to initial load, the INSERT/ ADVANCE pushbutton annunciator is illuminated.
2. 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 the left data display as keys are pressed.
3. INSERT/ADVANCE pushbutton Press. Observe pushbutton annunciator remains illuminated.
4. 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.
5. INSERT/ADVANCE pushbutton Press. Observe pushbutton annunciator extinguishes.

NOTE

The computer retains all information from the previous NAV mode. Only present position has to be reloaded. Waypoint and TACAN does not need to be reloaded if it is correct.

(5) To program destinations or TACAN coordinates:

NOTE

If latitude and longitude coordinates are being used, skip step a and proceed with step b. Enter all of the data for a given destination or TACAN before starting to enter data for another.

(a) Insertion of UTM waypoint coordinates:

1. Data selector UTM WY PT. If this is the first insertion into the selected waypoint since turn-on, observe data displays indicate "0" (N) and approximately "31'166"(E). Otherwise, data displays will indicate last coordinates inserted into related waypoint.

2. Thumbwheel - Set to waypoint number to be loaded.

NOTE

UTM data may be loaded in any order and, until 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 = E16425. 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.

. 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 roundings 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.

NOTE

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.

NOTE

The extra precision values added to normal values. As an example, South 4,476. 995 m will display "4476(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 II for each waypoint to be loaded.

NOTE

A load cycle can be terminated prior to insertion of all four volumes by moving data selector or thumbwheel.

(b) *Insertion of geographic waypoint coordinates:*

1. Data selector UL WY PT. If this is the first insertion into the selected waypoint since turn-on, observe data displays indicate "0". Otherwise, data displays indicate last coordinates inserted into the selected waypoint.

2. Thumbwheel Set to waypoint number to be loaded.

3. 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.

4. INSERT/ADVANCE pushbutton Press. Observe pushbutton annunciator extinguishes.

5. 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.

6. INSERT/ADVANCE pushbutton Press. Observe pushbutton annunciator illuminates.

7. If desired to insert extra precision coordinate data Press INSERT/ADVANCE pushbutton. Observe that arc-seconds for loaded latitude and longitude, to the nearest tenth of a second, appear in left and right data displays, respectively.

8. To load related arc-second values for latitude Press keys in sequence, starting with "N". Example: 35.8' North = N 358.

9. INSERT/ADVANCE pushbutton Press. Observe pushbutton annunciator extinguishes.

10. To load related arc-second values for longitude Press keys in sequence, starting with "E". Example: 20.1" East = E 201.

11. INSERT/ADVANCE pushbutton Press. Observe pushbutton annunciator extinguishes.

12. Repeat steps 2 through 11 for each waypoint to be loaded.

NOTE

In above example, if INSERT/ ADVANCE pushbutton was pressed, the following normal display would appear: "42'54.4 (N)" and 87°54.3 (W). The extra precision values are added to normal values and normal data displays are not rounded off.

NOTE

The normal geographic coordinates must always be loaded prior to extra precision values.

NOTE

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.

NOTE

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 "TOFROM" display and data displays indicate coordinates of station selected by thumbwheel.
3. Thumbwheel Set to number of station to be loaded. Confirm:

a. Thumbwheel is in detent.

b. Station "O" 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 "TOFROM" display will be set to "0" when TACAN data is loaded.

c. 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.

d. INSERT/ADVANCE pushbutton Press. Observe that pushbutton light is illuminated.

e. To load northing Press keys in sequence, starting with "N" or TM 55-1510-220-10 "S" to indicate north or south hemisphere. Example: 4749 North = N 4749. Observe that northing kilometers appear in left data display as keys are pressed.

f. INSERT/ADVANCE pushbutton Press. Observe pushbutton annunciator remains illuminated.

g. 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.

h. To load extra precision easting value Press keys in sequence, starting with the "E". Example: 297 m East = E 297. Observe that easting meters appear in right data display as keys are pressed.

i. INSERT/ADVANCE pushbutton Press. Observe pushbutton remains illuminated.

j. 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.

k. 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.

NOTE

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.

NOTE

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.

l. INSERT/ADVANCE pushbutton Press. Observe right data display indicates last previously inserted altitude and left data display is blank.

m. To indicate the following load is altitude Press keys "4" or "6". Observe INSERT/ ADVANCE pushbutton annunciator illuminates.

n. 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.

o. INSERT/ADVANCE pushbutton Press. Observe pushbutton annunciator extinguishes.

p. INSERT/ADVANCE pushbutton Press. Observe that left data display increases last previously inserted channel number, and right display is blank.

q. To indicate following load is channel number Press keys "2" or "8". Observe INSERT/ ADVANCE pushbutton annunciator illuminates.

r. To load channel number Press keys in sequence. Example: 109 = 109. Observe number appears in left data display as keys are pressed.

s. 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.

NOTE

Channel number has an implied "X" suffix.

NOTE

Degree symbol (°) should be disregarded when reading altitude and data display.

t. INSERT/ADVANCE pushbutton Press. Observe station northing, zone, and easting reappear.

u. Repeat steps 3 through 20 for each TACAN station.

v. 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 "FROM TO" display will be set to "0" when TACAN data is loaded.

2. Keys "7" and "9" Observe that number of TACAN station used for navigation flashes on and off in "TOFROM" display. Data displays indicate coordinates of station selected via thumbwheel.

3. Thumbwheel Set to number of station being loaded. (Insure thumbwheel is in detent).

NOTE

Station "O" 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 = N 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 were 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.

NOTE

The normal geographic coordinates must always be loaded prior to extra precision values.

NOTE

The directions "N" or "S" and "E" or "W" are established during 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.

NOTE

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 light 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 range of 1 through 126 will be used for TACAN mixing.

NOTE

The channel number has an implied "X" suffix.

NOTE

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 LUL POS.

(7). Designating fl-to destinations on TACAN.

(a) Press waypoint change.
(b) Insert new TO-FROM waypoints.
(c) Press INSERT/ADVANCE.

NOTE

Navigation information is now available from INS for display on pilot's RMI and on pilot's and copilot's HSI's as determined by COURSE INDICATOR switches.

(8) After NA V READY annunciator illuminates, place mode selector to NA V.

NOTE

Do not pull up on mode selector when switching to NAV. Pulling causes overshooting into the ATT position which invalidates the alignment and alignment must be restarted.

(9) To fly selected course:

(a) Pilot's COURSE INDICATOR switch INS.
(b) Pilot's RMI select switch INS.
(c) Horizontal situation indicators (pilot's and/or copilot's HSI) Steer toward indicators.
(d) 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 waypoint, if AUTO-MAN switch is in MAN.

(10) Aided TACAN operation:

(a) Mode selector NAV.
(b) Data selector DSRTK/STS.
(c) Key "4" Press. Observe right data display is "000004" INSERT/ADVANCE pushbutton annunciator is illuminated.
(d) INSERT/ADVANCE pushbutton Press. Observe right data display is "1-XX4" and INSERT/ ADVANCE pushbutton annunciator 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 I and 126.

(e) Data selector UL WY PT or UTM WY PT.
(f) 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.
(g) To monitor station selection Observe TO-FROM data display. Observe only the number of stations eligible for mixing will be displayed. A "O" indicates that none of the 9 stations are eligible for selection.
(h) 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.

(i) To return INS display to normal Set data selector to any position except WYPT or DIS/TIME.
(j) To monitor program of mix Set data selector to DSRTK/STS. (Observe Accuracy Index (AI) will decrement to "0".)

NOTE

To insure 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 station updating, update should continue until aircraft has passed the station.
- For optimum dual TACAN station updating, use one "off-track" TACAN station and one "on-track" station.
- For optimum multi-TACAN station updating, the stations should be evenly distributed in azimuth around the aircraft.

(11) Switching from aided to unaided inertial operation.

(a) Data selector DSRTK/STS.
(b) Key "5" Press. Observe INSERT/ADVANCE pushbutton annunciator illuminates; 000005 appears in right data display.
(c) INSER/ADVANCE pushbutton Press. Observe INSERT/ ADVANCE 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.

(12) o 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 UL 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: Data selector HDG/DA. Observe aircraft heading appears in left data display to nearest tenth of a degree.

(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.

(I) Distance and time to next waypoint: 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 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 UL 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.

NOTE
These displays are not loadable prior to the NAV mode.

(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 or present inertial position to a tenth of an arc-second 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 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. Data selector UTM WY PT. Observe coordinates in UTM grid.
5. 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 the present inertial position northing and easting to nearest meter, appear in left and right data displays, respectively.
4. Data selector UL WY PT. Observe coordinates in latitude-longitude coordinates.
5. 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 TOFROM data display changes to desired waypoint number.

NOTE
Do not press INSERT/ADVANCE pushbutton. 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 ground-speed 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 TOFROM display.

(q) Distance and time between any two waypoints:

1. WYPT CHG pushbutton Press. Observe WYPT CHG and INSERT/ADVANCE pushbutton annunciator illuminates.
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 annunciators extinguish. Waypoints defining current navigation leg appear in TOFROM 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 15 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 TOFROM 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 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. LIL 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. LIL 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.

NOTE

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 2,474,206m = 2474S and 706.

(t) TACAN station data:

1. Data selector LIL WY PT or UTM WY PT.

2. Keys "7" and "9" Press simultaneously.

3. Waypoint thumbwheel Set to desired 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.

4. 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.

NOTE

UL 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".

5. 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.
6. INSERT/ADVANCE pushbutton Press. Observe TACAN station channel number, in whole numbers, will appear in left data display; data 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.

NOTE

Waypoint thumbwheel may be moved at any time and normal coordinates for new TACAN station will be displayed.

7. Data selector Momentarily to any position other than LUL WY PT, UTM WY PT or DIS/TIME. (Returns INS to normal operation).

(u) True heading.

1. Data selector HDG/DA. Observe true heading to nearest tenth degree appears in left data display.
2. Keys "3" and "9" Press simultaneously and hold. Observe magnetic variation 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.

(13) INS updating:

(a) Normal geographic present position check and update:

1. Data selector UL POS. Observe latitude and longitude of present position appear in left and right data displays, respectively.
2. HOLD pushbutton Press. Observe latitude and longitude in data displays freeze at values present when HOLD pushbutton is pressed. HOLD pushbutton illuminates.

NOTE

While HOLD pushbutton annunciator is illuminated, TACAN is inhibited.

3. Keys Press in sequence to load latitude of position reference, starting with "N" or "S" to indicate north or south. Example: 42 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' = 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 extinguish. Present position appears in data displays. Present position check and update is complete.
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 I 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 annunciator is extinguished, and any TACAN updating is discontinued.
4. Data selector ULL 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 = 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 358.
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 201.

NOTE

Extra precision values are added to normal values and normal displays are not rounded off.

NOTE

Normal latitude-longitude coordinates must always be loaded prior to extra precision values.

NOTE

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.

NOTE

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 as 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 freeze at values present when HOLD pushbutton was pressed.

NOTE

While HOLD pushbutton annunciator is illuminated, TACAN 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 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 extra precision display related to present position northing and easting, to nearest meter, appears in left and right data displays, respectively.

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.

NOTE

The extra precision values are always added to normal values.

NOTE

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 8 in procedure: "Normal 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 9 of procedure: "Normal 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 "I" 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 "O" (normal inertial mode) in last digit of right display. AI will be set to approximately three times the number of hours in NAV.

(14) 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 FROM and TO waypoints by pressing corresponding keys.
3. 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.

(15) After landing procedures:

CAUTION

If INS will be unattended for an extended period, it should be shut down.

CAUTION

Do not leave INS operating unless aircraft or ground power and cooling air are available to system.

NOTE

The INS may be 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.

CAUTION

Do not shut down the INS until the aircraft is parked. Do not tow or taxi the aircraft until the INS has been shut down for at least 2 minutes. This precaution is to prevent damage to the gyro's.

NOTE

Do not tow or taxi aircraft during INS alignment. Movement during alignment requires restarting alignment.

(16) 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).

(a) 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".

1. Data selector STBY, then to ALIGN.

2. Present position coordinates Insert, according to procedure: "Geographic Present Position Insertion" or "UTM Present Position Insertion."

(b) Realignment INS shutdown. Perform complete alignment procedures.

(c) Position update. Recommended if time is not available for realignment.

NOTE

Perform position update using parking coordinates in accordance with procedure: "Insertion of Geographic Waypoint Coordinates." If parking coordinates are not available, proceed as follows: operation in NAV, if INS accuracy appears acceptable.

Continue operation in NAV, if INS accuracy appears acceptable.

Perform position update using best estimate of parking coordinate.

(16) Downmoding to standby:

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:

(a) Mode selector STBY.

CAUTION

Do not leave INS operating unless aircraft or ground power and cooling air are available to system.

(17) Shutdown:

(a) 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.

(18) Abnormal procedures:

(a) General. INS contains self-testing features which provide one or more warning indications when a failure occurs. The WARN annunciator on 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.

(b) Automatic INS shutdown.

1. Overtemperature. An overtemp-erature 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 on 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.

2. 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 on MSU will illuminate and not extinguish until the mode selector is set to OFF. The battery unit should be replaced when this failure occurs.

3. 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 annunciator illuminated, and WARN annunciator 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 NAV unit computer failure.

   c. Improper displays Indicates NAV unit computer failure.

2. WARN annunciator extinguished. If CDU displays are blank, incorrect or frozen CDU failure is indicated.

NOTE

It is not possible to load displays from the keyboard. A temporary failure of a numerical key may prevent 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 on 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 position. Otherwise, a CDU failure is indicated.

4. CDU BAT indicator annunciator is illuminated.

CAUTION

Operation on battery is an indication that there may not be aircraft power to blower motor with resultant loss of cooling. The INS can operate only a limited time (normally 15 minutes) on battery power be

Table 3-2. 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 34 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.			

fore 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.

NOTE

During ground operation, it is recommended that operation on battery power not exceed 5 minutes.

5. To determine corrective action: (Monitor CD U displays while rotating the CDU selector switch.)

1. If displays are frozen (do not change while data selector is being rotated) problem is normally in the navigation unit.

2. If displays respond normally to the data selector, the problem is normally absence of 115V AC power to INS.

6. For corrective action: Check to assure proper settings of following switches and circuit breakers essential to INS operation:

1. Overhead circuit breaker panel (fig. 2-27) circuit breakers In.

   a. *AVIONICS MASTER CONTR

   b. *INS CONTROL

   c. *AVIONICS MASTER PWR No. 1

   d. *AVIONICS MASTER PWR No. 2

2. Overhead control panel (fig. 2-12): INVERTER No. I or INVERTER No. 2 switch ON (either).

3. Mission control panel (fig. 4-1):

   a. 3-phase AC BUS switch ON.

   b. INS POWER & AC CONT circuit breaker In.

(19) Mission AC/DC Power Cabinet (fig. 4-2).'

(a) 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 battery voltage drops below approximately 19 VDC. Flight crew should prepare for shutdown.

(20) Malfunction indications and procedures: Table 3-2 details the procedure for a Malfunction Code Check. Table 3-3 lists a number of malfunction indications which occur under given modes of operation. Follow procedure given. Table 3-4 details action codes and recommended action. Table 3-5 lists failed test symptoms by malfunction codes and lists codes for recommended actions.

(21) Reading computer memory through CDU (look routine):

(a) WYPT CHG key Press.

(b) Keys Enter "99". Note TOFROM displays "9".

(c) INSERT/ADVANCE pushbutton Press.

(d) Data selector LIL WY PT.

(e) CDU Enter "N" followed by octal address of desired (even numbered) memory location.

(f) Data selector L/L WY PT. Program prevents entry of an address higher than 13777.

(g) Insure waypoint thumbwheel is at (0ls.

(h) INSERT/ADVANCE pushbutton Press. Observe address will appear in both data displays.

(i) Data selector DST/TIME. Observe most significant half of desired data appears in left display and least significant half appears in right display.

Table 3-3. 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 by-passed by rotating mode selector to OFFE 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 cribed in Table 3-2	Navigation failure or interfacing em problem.

Table 3-4. Action Codes and Recommended Action

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 26VAC 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 3-5. Malfunction Codes (Sheet I of 2)

Malf Code	Failed Test	Modes of Operation	Recommended Action Code
10	Invalid platform heading	ALIGN	04
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
1i	Invalid pitch and roll	ALIGN, NAV	05
17	Invalid magnetic heading	ALIGN, NAV	05
18	Excessive saturation time	ALIGN	04
20*	Track angle error and drift angle No. 1	ALIGN, NAV	03
22*	Track angle error plus drift angle	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
31	Ground speed	NAV	02
32	Memory parity	STBY, ALIGN, NAV	02
33	Azimuth stabilization loop	ALIGN, NAV	01
34	Inner roll stabilization loop	ALIGN, NAV	01
35	Pitch stabilization loop	ALIGN, NAV	01

*Failed test does not illuminate WARN light on CDU.

Table 3-5. Malfunction Codes (Sheet 2 of 2)

Malf Code	Failed Test	Modes of Operation	Recommended Action Code
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 >45°	NAV	02
44	Azimuth gyro drift rate	ALIGN	02
45	Gyro scale factor or loaded altitude	ALGIN	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, NAV	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, NAV	02
* Failed test does not illuminate WARN light on DCU.			
			BT03618

j) To obtain next higher memory locations Advance waypoint thumbwheel. (For example: If address 400 was entered with thumbwheel at "0", address 402 will be available when thumbwheel is set to "1", "404" when thumbwheel is set to "2" etc.)

3-29A. GLOBAL POSITIONING SYSTEM (AN/ASN-149(V)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; GPS key, load, and zeroize panel; antenna electronics unit; and an antenna.

(1) Control/display unit (CDU). The control/display unit (fig. 3-25A), located on the electronics rack in the cabin, accomplishes all display and control functions necessary for the operation of the GPS receiver.

(2) GPS key, load, and zeroize panel. The GPS key, load, and zeroize panel (fig. 3-25B), located on the electronics rack in the cabin, contains GPS key, loading, and zeroizing controls.

b. GPS Controls, Indicators, and Functions.

(1) GPS control/display unit (fig 3-25A).

(a) Line selection keys. Four line selection keys, located to the left of the CDU display screen, are used t 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 selector 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 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:

NOTE

Pressing the WP key switches the CDU between the two modes.

1. Destination mode (active waypoint as destination)

2. Waypoint (WP) examine mode (any waypoint)

The 10 position data selector switch is used to select the type information to be displayed on the CDU as shown in Table 3-5A.

Table 3-5A. Data Selector Switch Positions

Position	Function
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.
DTA-VA	Desired track and vertical angle data is displayed.

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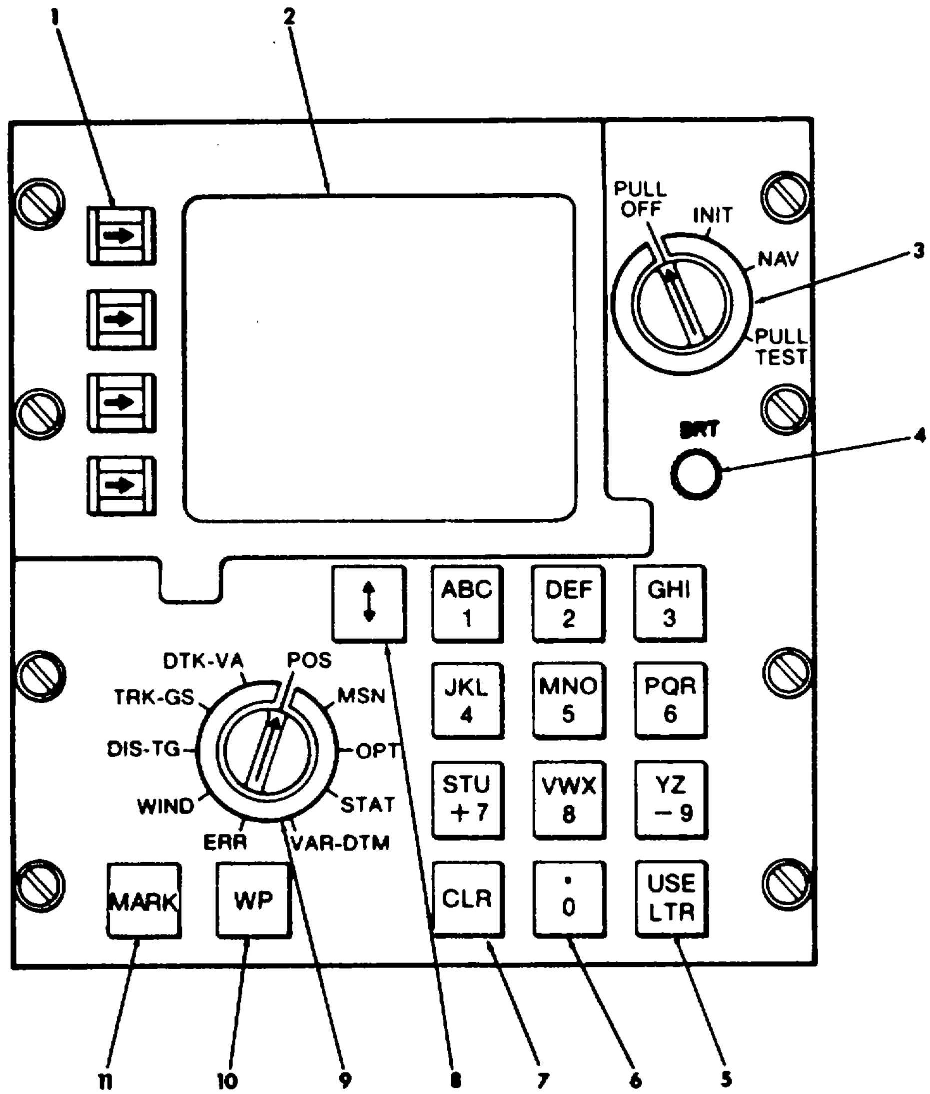

1. LINE SELECTION KEYS
2. DISPLAY
3. MODE SELECTOR SWITCH
4. DISPLAY BRIGHTNESS CONTROL
5. USE LETTER KEY
6. DATA ENTRY KEYS (0 THROUGH 9)
7. CLEAR KEY
8. SLEW KEY
9. DATA SELECTOR SWITCH
10. WAYPOINT KEY
11. MARK KEY

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Figure 3-25A. GPS Control/Display Unit (CDU) *(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 MARKand FREEZE functions.

(2) GPS key, load, and zeroize panel controls. indicators, and functions (fig. 3-25B).

(a) GPS zeroize switch. Actuating the guarded switch. placarded ZEROIZE GPS, will declassify the GPS receiver.

(b) GPS key connector. Connects GPS key.

(c) Load switch. This pushbutton switch initiates loading process.

(d) Load status indicator light. Illuminates to indicate load status.

(e) Dust cap. Covers GPS key connector when not in use.

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. If the INS is in NAV mode. the INS position from the INS and altitude from the pilot's encoding altimeter will be displayed on the CDI. This data will be used by the GPS for initial position and altitude.

(3) Navigation mode. Selection of the NAV (navigation) mode enables normal GPS functions (satellite tracking and navigation). including data transfer to and from the INS.

(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. GP.S 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 startup.

(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 brightness 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 TRKGS. Verify correct track and groundspeed are displayed. If not valid, enter correct values.

5. Slew key Press. Check, verify, or enter current time, year, and day of year on page 2.

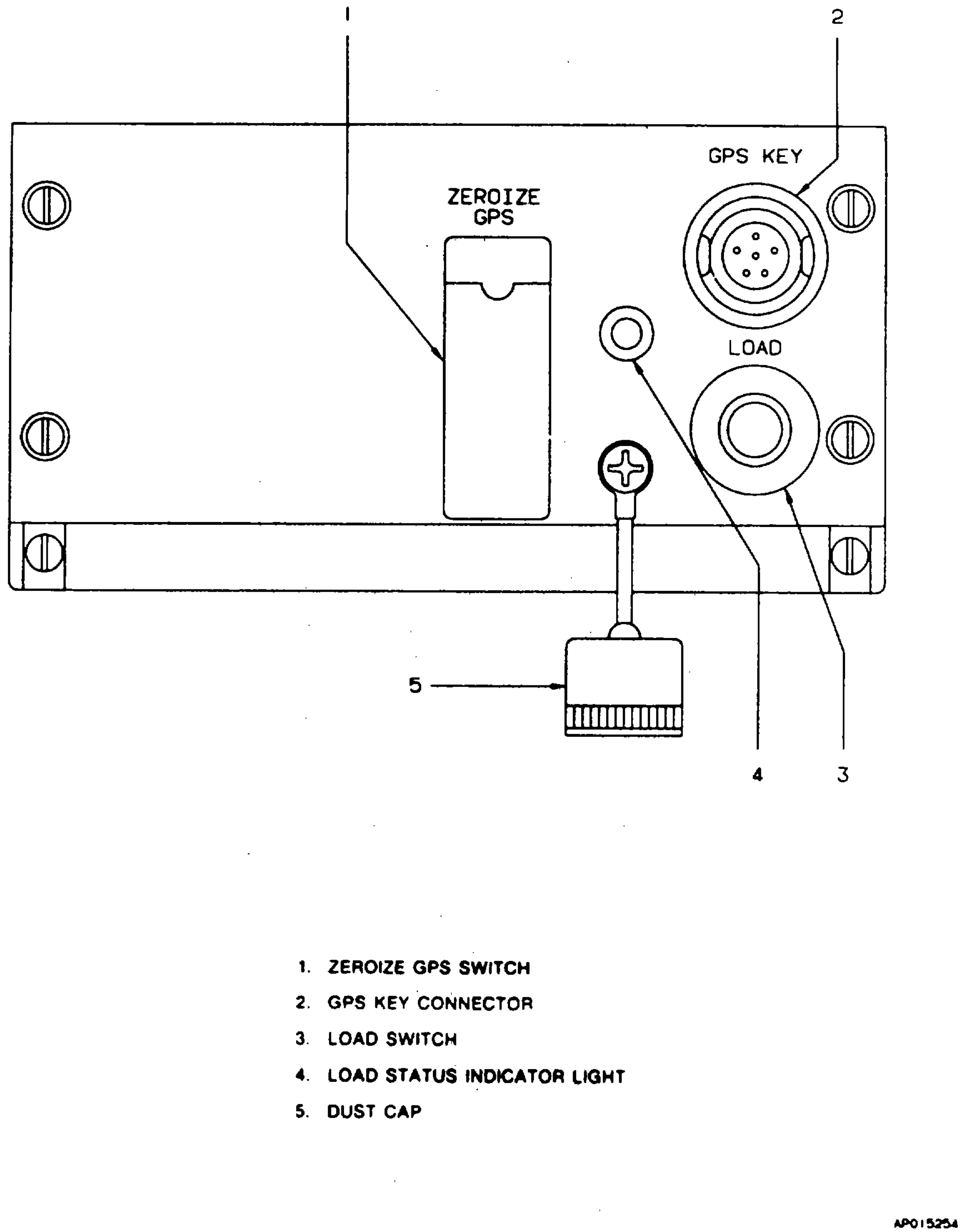


Figure 3-25B. GPS Key, Load, and Zeroize Panel

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 for INS updating when SAT 4 is displayed on STAT page 1 and FM (figure of merit) is PM3 or below.

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 I for 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 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 used to initialize time.

2. As the GPS is acquiring satellites, position, time, and velocity estimates can be checked to ensure that they are within startup 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 delector 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.

Section IV. TRANSPONDER AND RADAR

3-30. WEATHER RADAR SET (AN/APN-21 5).

a. Description. The weather radar set (fig.326), provides a visual presentation of the general sky area of approximately 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 5-ampere RADAR circuit breaker located on the overhead circuit breaker panel (fig. 2-27).

b. Controls/Indicators and Functions.

(1) GAIN control. Used to adjust radar receiver gain in the MAP mode only.

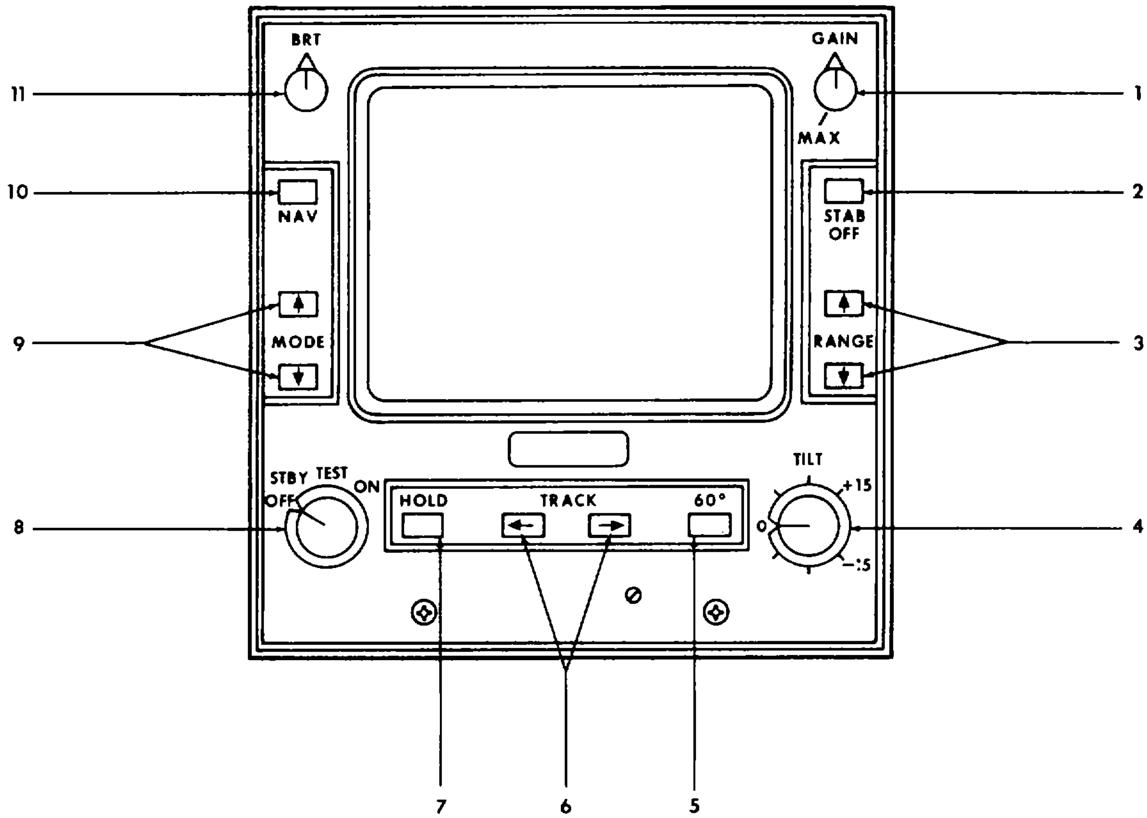
(2) STAB OFF switch. Push type on/off switch. Used to control antenna stabilization signals.

(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



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 CONTROL

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Figure 3-26. Weather Radar Control-Indicator (AN/APN-215) 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, 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.

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.
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.

3-31. 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. 327) located on the pedestal extension; a pair of remote switches, one on 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 the 35-ampere AVIOICS MASTER PWR No.1 circuit breakers on the overhead circuit breaker panel (fig. 2-27).

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.

(b) DIV. Selects diverse (both) antennas.

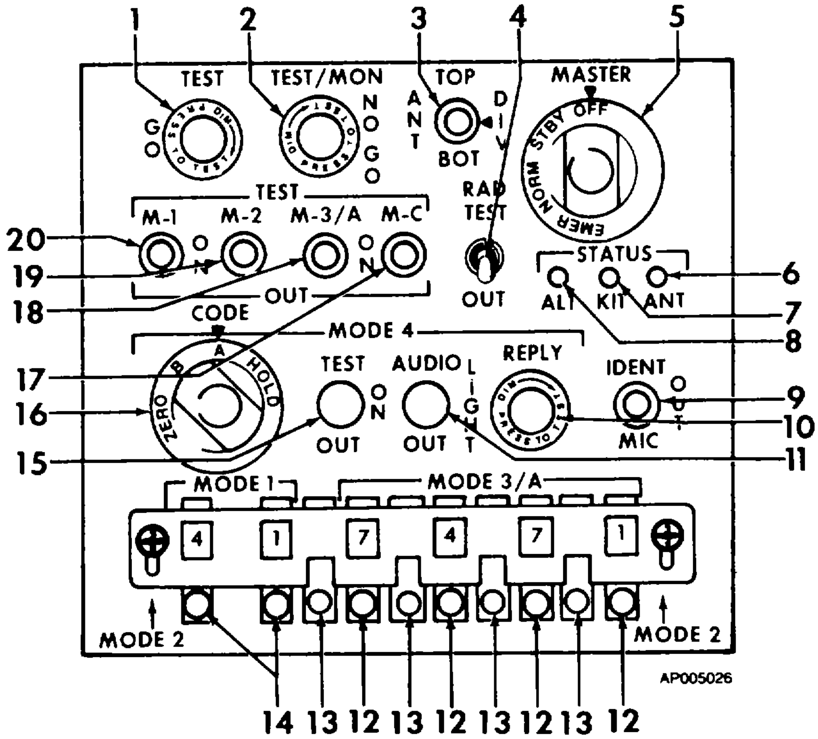
(c) BOT. Selects lower antenna.

(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.



1. TEST-GO INDICATOR
2. TEST/MON-NO GO INDICATOR
3. ANT SWITCH
4. RAD TEST-OUT SWITCH
5. MASTER CONTROL
6. STATUS ANT INDICATOR
7. STATUS KIT INDICATOR
8. STATUS ALT INDICATOR
9. IDENT-MIC SWITCH
10. MODE 4 REPLY INDICATOR
11. MODE 4 AUDIO-LIGHT-OUT SWITCH
12. MODE 3/A CODE SELECTORS
13. MODE 2 CODE SELECTORS
14. MODE 1 CODE SELECTORS
15. MODE 4 TEST-ON-OUT SWITCH
16. MODE 4 CODE CONTROL
17. M-L TEST SWITCH
18. M-3/A TEST SWITCH
19. M-2 TEST SWITCH
20. M-1 TEST SWITCH

Figure 3-27. Transponder Control Panel (AN/APX-100)

(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 MON 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 indicator 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 1 code selectors.* Select desired reply codes for mode 1 operation.

(14) *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.

(15) MODE 4 code control. Selects preset mode 4 code.

(16) M-C, M-3A, M-2, and M-1 switches. Select test or reply mode of respective codes.

(17) TEST. Activates self-test of selected code. Transponder can also reply

(18) ON. Activates normal operation.

(19) OUT. Deactivates operation of selected code.

(20) 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.

(21) POS IDENT pushbutton (control wheels, fig. 2-18). 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 indicator lights illuminate.
5. M-1 switch Return to ON.
6. Repeat steps 4 and 5 for the M-2, M3/A and M-C mode switches.
7. MASTER control NORM.
8. MODE 4 code control A. S(et a '-,d-. 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 light 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 MO)DE 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 indicator light 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.

NOTE

Set any of the M1, M2, M3/A, M-C, or MODE 4 switches to OUT to inhibit transmission of replies in undesired modes.

NOTE

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:

(a) To retain Mode 4 code in external computer during a temporary shutdown:

1. MODE 4 CODE switch Rotate to HOLD.

2. Wait 15 seconds.

3. MASTER control OFF.

4. To zeroize the Mode 4 code in the external computer turn MODE 4 CODE switch to ZERO.

5. MASTER control OFF. This will automatically zeroize the external computer unless codes have been retained (step 1. above).

d. Transponder Emergency Operation. Not applicable.

3-32. PILOT'S ENCODING ALTIMETER.

a. Description. The encoding altimeter (fig. 328), provides the pilot with an indication of present aircraft pressure altitude above sea level. It also supplies information to the transponder for Mode C (altitude reporting) operation and to the aided inertial navigation system. The circuit is protected by the 5-ampere PILOT'S ALT ENCD circuit breaker on the overhead circuit breaker panel and the 1-ampere F21 fuse in the No. 1 junction box.

b. Controls/Indicators and Functions.

(1) MILLIBARS window. Indicates local barometric pressure in millibars. Adjusted by use of set knob.

(2) IN HG window. Indicates local barometric pressure in inches of mercury. Adjusted by use of set knob.

(3) Drum indicator. Indicates aircraft altitude in ten-thousands, thousands, and hundreds of feet above sea level.

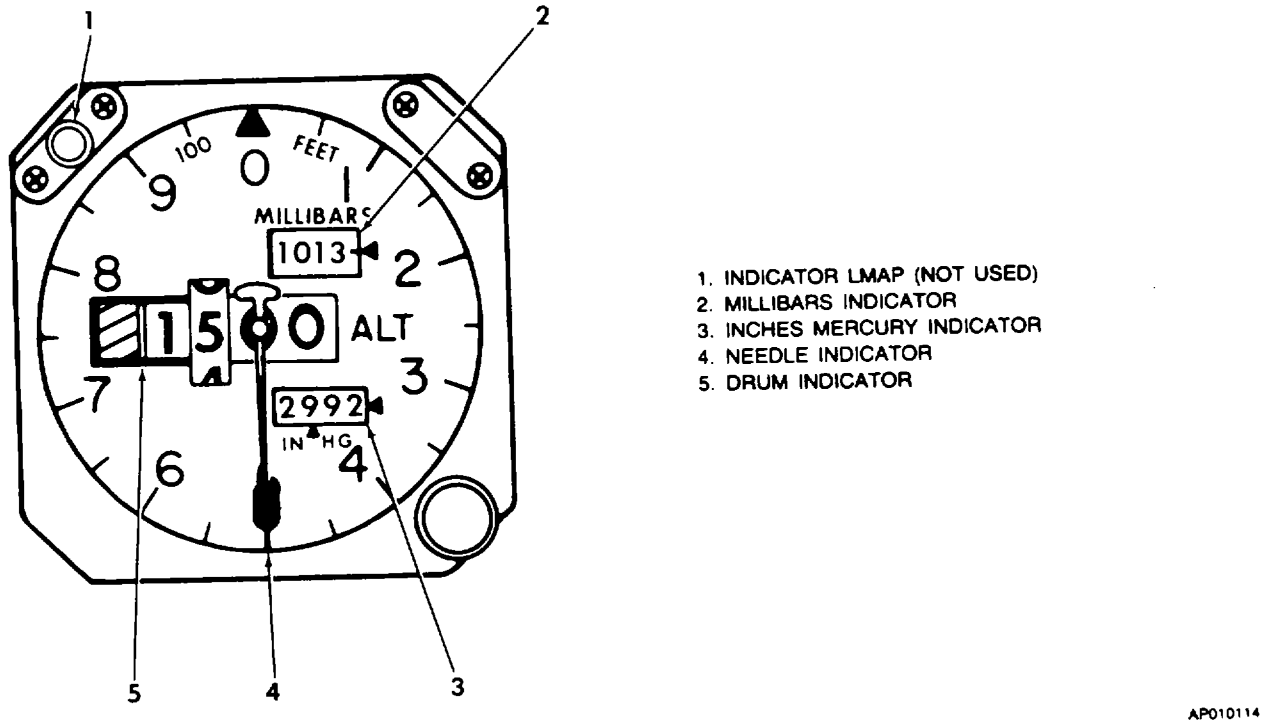


Figure 3-28. Pilot's Encoding Altimeter

(4) Needle indicator. Indicates aircraft altitude in hundreds of feet with subdivisions at fifty-foot intervals.

(5) CODE OFF flag (pilot only). Presence indicates loss of power to instrument.

(6) ALT indicator. Not used.

c. Encoding Altimeter Normal Operation.

(1) Turn-on procedure: Encoding altimeter will operate when transponder is operating with M-C switch set to center position.

(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.

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).

CHAPTER 4
MISSION EQUIPMENT

Section I. MISSION AVIONICS

4-1. MISSION AVIONICS OPERATING INSTRUCTIONS.

Operating instructions for mission avionics equipment are published in Chapter 3.

4-2. MISSION CONTROL PANEL.

The mission control panel, mounted on the copilot's sidewall, consists of three sections. The top section contains the mission caution/advisory annunciator panel. The center section contains the DC volt/ammeter and AC loadmeter. 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 j 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 a 5-ampere circuit breaker, placarded M130 POWER located on the mission control panel (fig. 4-1).

WARNING
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. The dispenser assembly breech plate has the electrical contact pins which fire the impulse cartridges. The unit also contains the sequencing mechanism.

(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 copilot's seat.

(a) Flare detector. The flare detector is provided to insure 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 red flag) prevents firing of

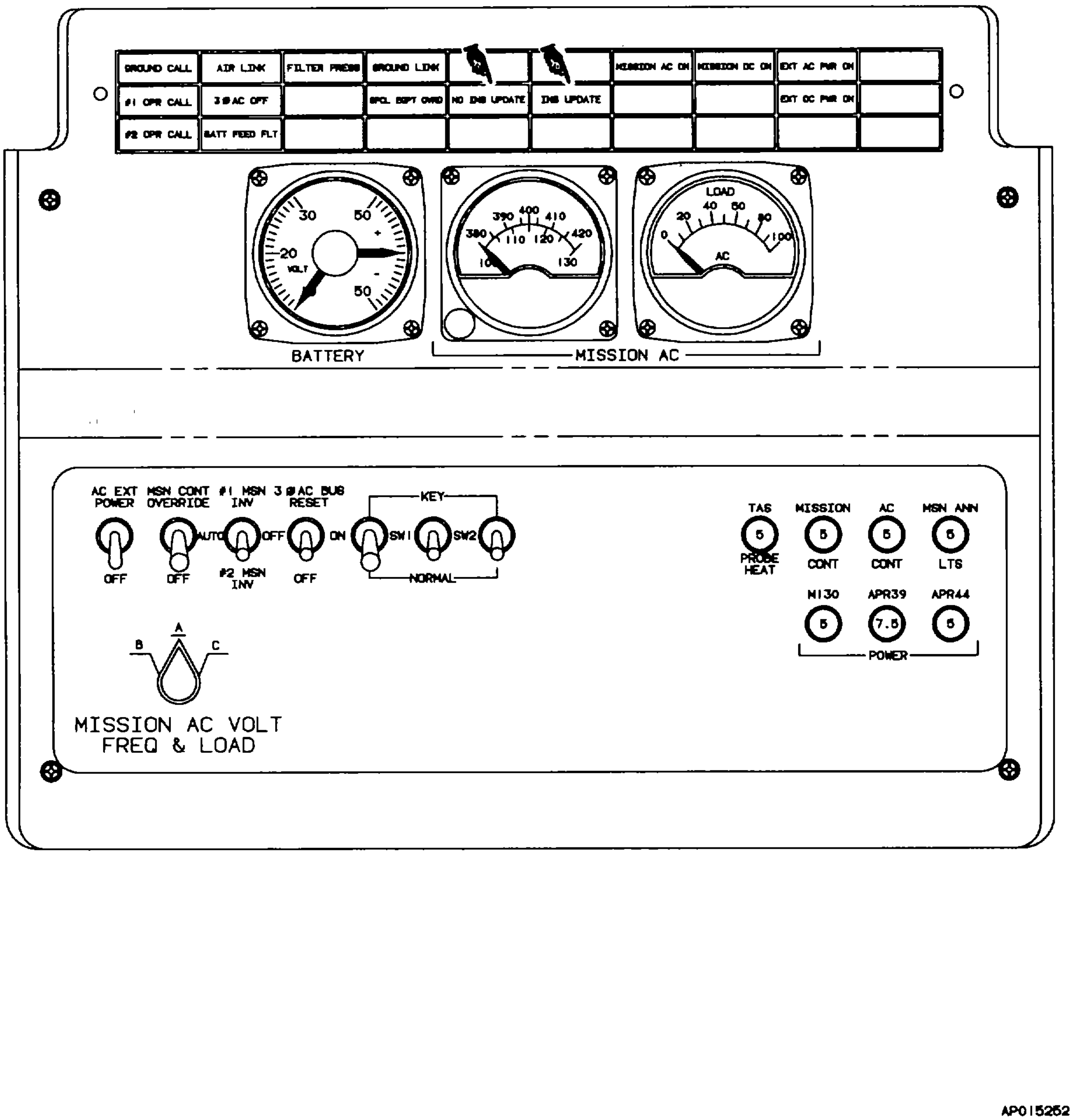


Figure 4-1. Mission Control Panel

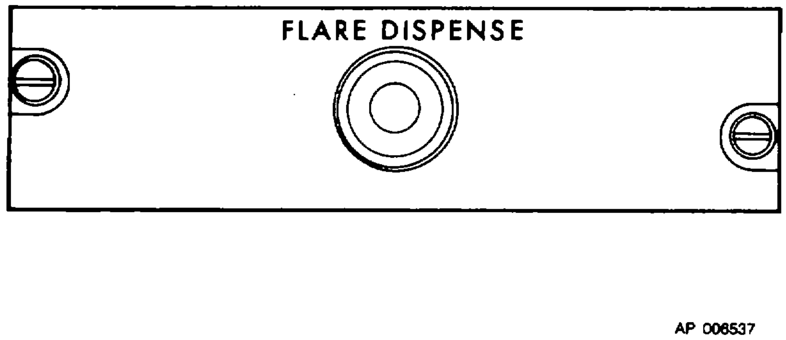
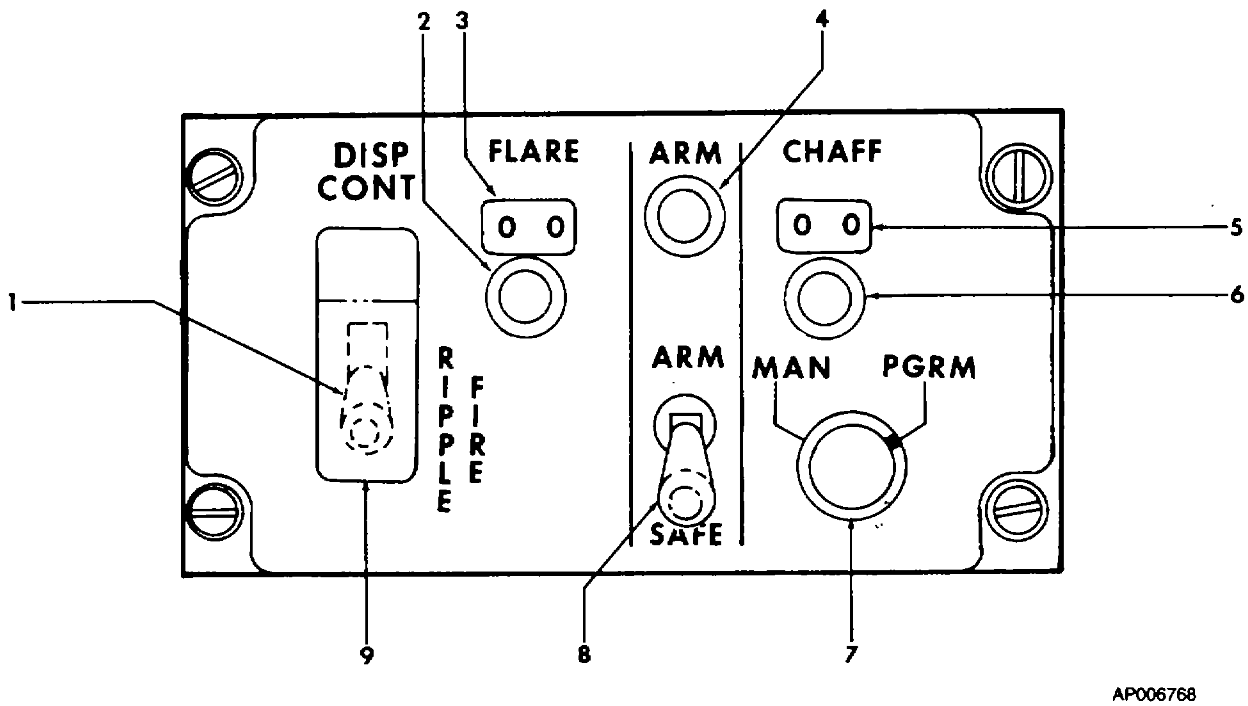


Figure 4-2. Flare Dispense Switch



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. MANUAL-PROGRAM SWITCH
8. ARM-SAFE SWITCH
9. RIPPLE FIRE SWITCH COVER

Figure 4-3. Flare and Chaff Dispenser Control Panel

chaff or 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. A single pushbutton switch placarded FLARE DISPENSE, located on the 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.

(5) Control wheel mounted chaff dispense switches. Two pushbutton switches placarded CHAFF DISP, one located on 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 red 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 dispenser control panel (fig. 4-2) is mounted in the control pedestal. Control functions are as follows:

(a) 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.

(b) ARM light. An amber press to test indicator light 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 indicator light.

(c) 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.

(d) FLARE counter. Indicates the number of flares remaining in the dispenser payload module.

(e) FLARE counter setting knob. Facilitates setting FLARE counter to the number of flares in the payload module before flight.

(f) CHAFF counter. Indicates the number of chaffs remaining in the payload module. CHAFF counter setting knob facilitates setting CHAFF counter to the number of chaffs in the payload module before flight.

(g) MAN-PGRMSELECTOR 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).

(8) Ammunition for dispenser. Ammunition for the system consists of countermeasure chaff M1, countermeasure flares M206, and impulse cartridges M796.

(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.

b. Normal Operation.

NOTE

If aircraft is to be flown with flare dispenser assembly removed, fairing should be removed from fuselage.

(1) General. At the present time surface to-air intermediate range guided missiles that are launched against the aircraft must be visually detected by the aircraft crew. Crew members must

insure 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.

(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.

WARNING

Aircraft must be in flight to dispense flares.

(a) Firing procedure.

1. *Flares.* Upon observing a missile launch the designated crewmember 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.

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 as established by training doctrine will be set into the programmer prior to take-off (refer to TM 91095-20613 & P for information 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 a dispenser switch.

(b) Firing responsibility. When the pilot or copilot observes a missile launch or radar warning indication, he fires flares or chaff and assumes command of the dispenser system, and fires succeeding flares as required. He will 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 and the second one shall be the one used to dispense chaff. Notify AVUM if any improper indications occur during the tests.

WARNING

Assure payload module is not connected to dispenser assembly at any time during the following test procedure.

1. On flare dispenser assembly, assure the CF selector switch is in F (flare) position.

2. Obtain M-91 test set and assure that TEST SEQUENCE switch is in START/HOME position.

3. Connect base plate of test set to breech of dispenser assembly. Secure both mounting studs uniformly hand

tight, using 5/32 inch hexagonal wrench provided in test set carrying case.

4. Obtain test set power cable from the M91 test set carrying case and connect cable between exterior

connection J1 (28V DC) on aircraft and aircraft power + 28V DC (J1) of test set.

5. Remove safety pin from EM and in the top skin of the right wing.

CAUTION

On DCP, assure that RIPPLE FIRE switch guard is in down position.

6. Provide aircraft power to DCP by setting M-130 POWER circuit breaker to ON position.

7. On DCP, press ARM lamp. Lamp will illuminate. Release ARM lamp. Lamp 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 lamp 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.

NOTE

On test set, TS PWR ON lamp (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 M91 test set:

a. Press to test the remaining three lamps on test set. Each lamp will illuminate.

NOTE

Replace any lamp that does not illuminate when pressed. If none of the indicating lamps illuminate, return test set to AVUM.

b. Rotate TEST SEQUENCE switch clockwise to the next position, TS RESET. No visual indication will occur.

c. Rotate TEST SEQUENCE switch clockwise to SV SELF TEST position. STRAY VOLTAGE lamp (red) will illuminate.

d. Rotate TEST SEQUENCE switch clockwise to next position, TS RESET. STRAY VOLTAGE lamp (red) will extinguish.

e. Rotate TEST SEQUENCE switch clockwise to next position, STRAY VOLT. STRAY VOLTAGE lamp (red) should not illuminate.

f. Rotate TEST SEQUENCE switch clockwise to next position, SYS NOT RESET. SYS NOT RESET lamp (amber) should not illuminate. If lamp illuminates, press and release MANUAL SYSTEM RESET switch and SYS NOT RESET lamp 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 DISP 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 lamp (green) on test set will illuminate.

14. Perform the following operations on the M91 test set:

a. Rotate TEST SEQUENCE switch counter-clockwise to SYS NOT RESET position. SYS NOT RESET lamp (amber) will illuminate. DISPENSER COMPLETE lamp (green) will remain illuminated.

b. Press and release MANUAL SYSTEM RESET switch. SYS NOT RESET lamp (amber) will extinguish.

NOTE

When the MANUAL SYSTEM RESET switch is pressed and released, and 28 volts I)C 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.

c. Rotate TEST SEQUENCE switch counterclockwise to STRAY VOLT position. STRAY VOLTAGE lamp (red) should not illuminate.

d. Rotate TEST SEQUENCE switch counter-clockwise to START/HOME position.

NOTE

When the TEST SEQUENCE switch is turned to the START/HOME position, the DISPENSER COMPLETE lamp will extinguish, the STRAY VOLTAGE lamp will illuminate and then will extinguish when passing through the TS RESET position.

15. On CHAFF dispenser assembly, assure 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 hand 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 has been 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.

NOTE

On test set, TS PWR ON lamp (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 M91 test set:

a. Press to test all four lamps on test set. Each lamp will illuminate.

NOTE

Replace any lamp that does not illuminate when pressed. If none of the indicating lamps 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 lamp (red) will illuminate.

d. Rotate TEST SEQUENCE switch clockwise to next position, TS RESET. STRAY VOLTAGE lamp (red) will extinguish.

e. Rotate TEST SEQUENCE switch clockwise to next position, STRAY VOLT. STRAY VOLTAGE lamp (red) should not illuminate.

f. Rotate TEST SEQUENCE switch clockwise to next position, SYS NOT RESET. SYS NOT RESET lamp (amber) should not illuminate. If lamp illuminates, press and release MANUAL SYSTEM RESET switch and SYS NOT RESET lamp 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 COMPL.

19. Press pilot CHAFF DISP switch once. Press copilot CHAFF DISP 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 DISP switches in aircraft. In DCP, the number shown on CHAFF counter should decrease in accordance with the program set on the EM.

22. Repeatedly press other CHAFF DISPENSE switch until CHAFF counter on DCP reads 00.

23. On test set, observe DISPENSE COMPLETE lamp (green) is illuminated and then perform the following operations:

a. Rotate TEST SEQUENCE switch counter-clockwise to SYS NOT RESET position. SYS NOT RESET lamp (amber) will illuminate.

b. Press and release MANUAL SYSTEM RESET switch. SYS NOT RESET lamp (amber) will 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.

c. Rotate TEST SEQUENCE switch counter-clockwise to STRAY VOLT position. STRAY VOLTAGE lamp (red) should not illuminate.

d. Rotate TEST SEQUENCE switch counter-clockwise to START/HOME position.

NOTE

When the TEST SEQUENCE switch is turned to the OFF position, the DISPENSER COMPLETE lamp will extinguish, the STRAY VOLTAGE lamp 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 M130 POWER 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 preformed packing in the flare cartridge. (There will be no preformed 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 to two retainer bolts into payload module.

WARNING

The system must have been tested to assure that there is no stray voltage and all aircraft power must be removed from the system prior to unloading the payload module.

7. On the dispenser control panel, assure ARM-SAFE switch is in SAFE position.

8. On the electronic module and right wing assure safety pins and flag assemblies are installed.

9. Slide payload module assembly into dispenser assembly and secure two stud bolts, hand tight, 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, assure 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 ordinance disposal personnel for disposition and disposal.

3. Remove module from dispenser assembly by unscrewing two stud bolts with a 5/32 inch hexagonal wrench and sliding out of dispenser assembly.

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

It is not unusual for the case of a chaff cartridge to crack when fired. It does not effect performance of the item and should not be reported as a malfunction.

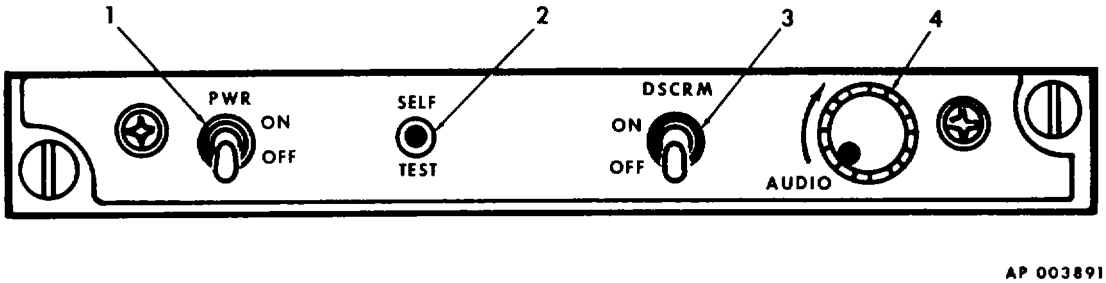
4-6. RADAR SIGNAL DETECTING SET (AN/APR39(V)1).

The radar signal detecting set (fig. 4-3) 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 APR 39, located on the mission control panel (fig. 4-1). The associated antennas are shown in figure 2-1. For operating instructions, refer to TM 115841-283-20. Self test pattern shall be as shown in figure 4-5.

a. Radar Signal Detecting Set Control Panel Functions (AN/APR-39(V)1).

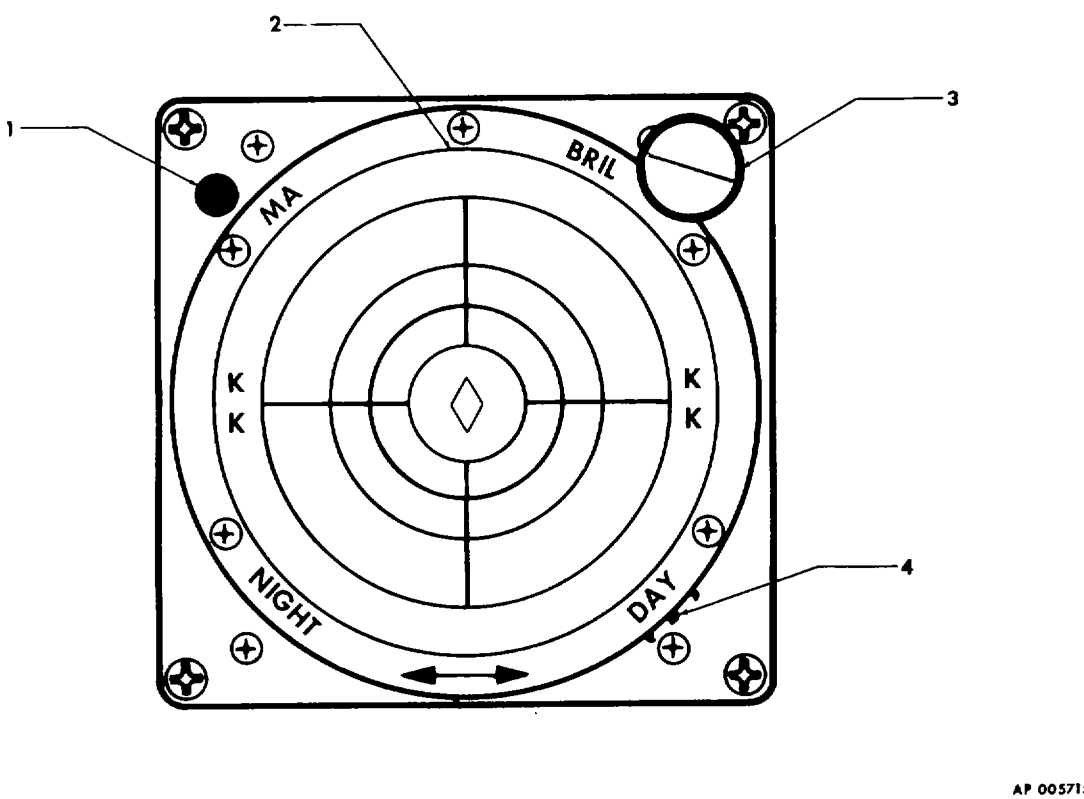
(1) *PWR switch.* Turns set on or off.

(2) *SELF TEST switch.* Initiates self test.



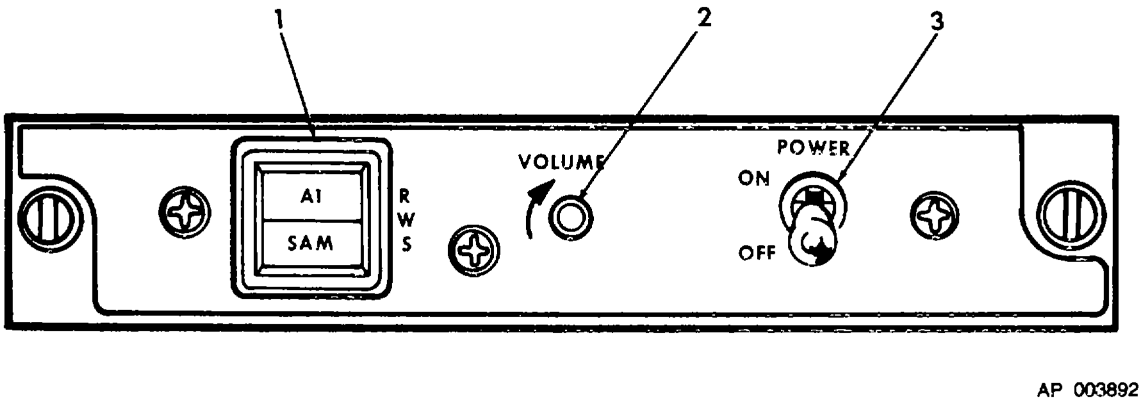
1. POWER SWITCH
2. SELF TEST SWITCH
3. DISCRIMINATE FUNCTION SWITCH
4. AUDIO LEVEL CONTROL

Figure 4-4. Radar Signal Detecting Set Control Panel (AN/APR-39(V)1)



1. MA INDICATOR
2. DISPLAY
3. BRIL CONTROL
4. DAY-NIGHT CONTROL

Figure 4-5. Radar Signal Detecting Set Indicator



1. RADAR WARNING INDICATOR
2. VOLUME CONTROL
3. POWER SWITCH

Figure 4-6. Radar Receiver Control Panel (AN/APR-44( ) (V3))

(3) DSCRM switch. Turns discriminate function on or off.

(4) AUDIO control. Adjusts audio level.

b. Radar Signal Detecting Set Indicator Functions (fig. 4-3).

(1) MA indicator. Illuminates to indicate the presence of an MA threat.

(2) BRIL control. Adjusts brilliance.

(3) DAY-NIGHT control. Rotate to adjust intensity of display.
7

4-7. RADAR WARNING RECEIVER (AN/APR-44( )(V)3).

The radar warning receiver (fig. 4-5) indicates the presence of certain types of search radar signals. The radar warning receiver is protected by the 5-ampere circuit breaker placarded APR44, 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 AI or SAM threat.

b. VOLUME control. Adjusts volume.

c. POWER switch. Turns set on or off.

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.

5-4. MINIMUM CREW REQUIREMENTS.

The minimum crew required for aircraft operation is two pilots. Additional crew members as required will be added at the discretion of the commander, in accordance with pertinent Department of the Army regulations.

Section II. SYSTEM LIMITS

5-5. INSTRUMENT MARKINGS.

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 denotes 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.

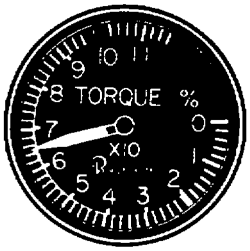
The maximum propeller overspeed limit is 2200 RPM. Propeller speeds above 2000 RPM indicate failure of the primary governor. Propeller speeds above 2080 RPM indicate failure of both primary and secondary governors. Torque is limited to 81% for sustained operation above 2000 RPM.

5-8. STARTER LIMITATIONS.

The starters in this aircraft are limited to an operating period of 30 seconds ON, then 5 minutes OFF, for two starter operations. After two starter operations the starter shall be operated for 30 seconds ON, then 30 minutes OFF.

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.

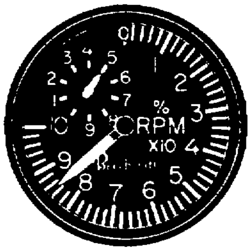


TORQUE

49% MAXIMUM BELOW 1600 RPM

20-100% NORMAL OPERATING RANGE

100% MAXIMUM
123% TRANSIENT (5 SECONDS)



TURBINE TACHOMETER (N1 SPEED)

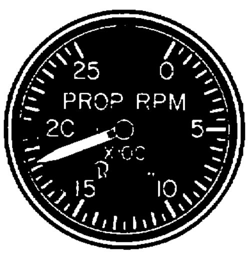
52% MINIMUM LOW IDLE
88% MAXIMUM REVERSE (ONE MINUTE)
101.5% MAXIMUM
100.1% MAXIMUM BELOW -48°C
102.6% TRANSIENT (10 SECONDS)

TURBINE GAS TEMPERATURE

400-750°C NORMAL OPERATING RANGE
660°C MAXIMUM LOW IDLE

750°C MAXIMUM CONTINUOUS
750°C MAXIMUM REVERSE (1 MINUTE)

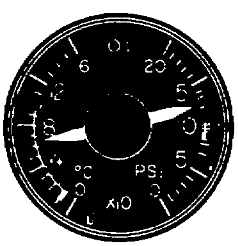
850°C MAXIMUM TRANSIENT
1000°C MAXIMUM STARTING (5 SECONDS)



PROPELLER TACHOMETER

1600-2000 RPM NORMAL OPERATING RANGE
1900 RPM MAXIMUM REVERSE (1 MINUTE)

2000 RPM MAXIMUM
2200 RPM TRANSIENT (5 SECONDS)



OIL TEMPERATURE AND PRESSURE

OIL TEMPERATURE SCALE

10-99°C NORMAL OPERATING RANGE
0-99°C CRUISE CLIMB AND RECOMMENDED SPEED
-40-99°C STARTING, LOW IDLE, HIGH IDLE

99°C MAXIMUM
104°C TRANSIENT (5 MINUTES)

OIL PRESSURE SCALE

60 PSI MINIMUM
60 TO 85 PSI, 49% TORQUE MAXIMUM

85-135 PSI NORMAL OPERATING ABOVE 21,000 FEET
85-105 PSI CAUTION RANGE BELOW 21,000 FEET

105-135 PSI NORMAL OPERATING BELOW 21,000 FEET

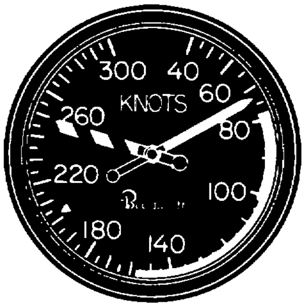
200 PSI MAXIMUM STARTING WITH COLD OIL

G R

NOTE: ± 10 PSI FLUCTUATIONS ARE ACCEPTABLE

AP010215

Figure 5-1. Instrument Markings (Sheet 1 of 3)



247 KIAS MAXIMUM (Vmo) (.47 MACH)

NOTE

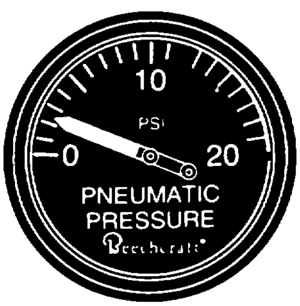
MAXIMUM ALLOWABLE AIRSPEED (RED STRIPED) POINTER IS SELF ADJUSTING WITH ALTITUDE

89 KIAS MINIMUM SINGLE-ENGINE CONTROL SPEED (Vmca)

130 KIAS ONE-ENGINE INOPERATIVE BEST RATE-OF-CLIMB (Vyse)

77-157 KIAS FULL FLAP OPERATIN RANGE

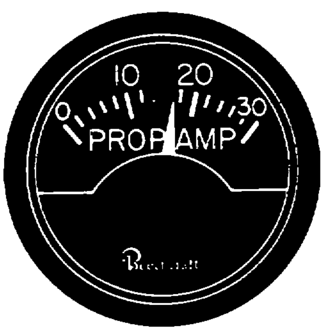
202 KIAS MAXIMUM APPROACH FLAP EXTENSION SPEED



PNEUMATIC PRESSURE

12-20 PSI NORMAL OPERATING RANGE

20 PSI MAXIMUM



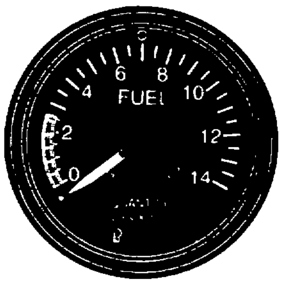
PROPELLER DEICER AMMETER

14-18 AMPERES NORMAL OPERATION

R
B
G

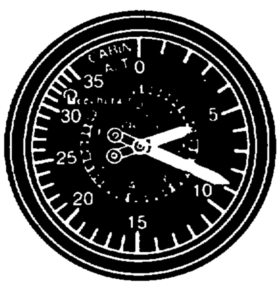
AP010217

Figure 5-1 Instrument Markings (Sheet 2 of 3)



FUEL QUANTITY

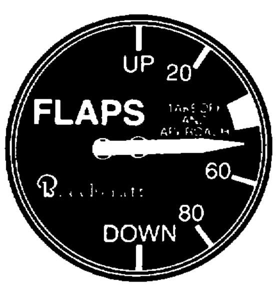
0-265 LBS NO TAKEOFF RANGE



CABIN ALTIMETER AND DIFFERENTIAL PRESSURE

0-6.1 PSI NORMAL RANGE

6.1 PSI MAXIMUM



FLAP POSITION INDICATOR

40% TAKEOFF AND APPROACH

R
G

AP004768.3

Figure 5-1 Instrument Markings (Sheet 3 of 3)

b. A pilot must be seated at the 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 247 knots/0.47 Mach.

d. During a coupled ILS approach do not operate the propellers in the 1750 to 1850 RPM range.

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.

a. Operating Limits. Operation with FUEL PRESS light on is limited to 10 hours. Log FUEL PRESS light on time on DA Form 2408-13. One standby boost pump may be inoperative for takeoff. (Crossfeed fuel will not be available from the side with the inoperative standby boost pump.) Operation on aviation gasoline is time limited to 150 hours between engine overhaul and altitude limited to 20,000 feet with one standby boost pump inoperative. Crossfeed capability is required for climb, when using aviation gasoline above 20,000 feet.

b. Fuel Management. Auxiliary tanks will not be filled for flight unless the main tanks are full. Maximum allowable fuel imbalance is 1000 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.

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 microbial growth in aircraft fuel systems.

5-11. BRAKE DEICE LIMITATIONS.

The following limitations apply to the brake deice system:

a. The brake deice system shall not be operated at ambient temperatures above 150 C.

b. 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.

c. Maintain 85% N1 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.

d. In order to maintain an adequate supply of systems pneumatic bleed air, the brake deice system shall be turned OFF during single engine operation.

5-12. PILOT HEAT LIMITATIONS.

Pilot 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.

The following limitations (table 5-1) observed in the operation of this aircraft equipped with two Pratt and Whitney of Canada, Ltd. PT6A-41 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 the operating limits marked on the face of each instrument.

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.

CAUTION

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 the limiting temperatures 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 operation the temperatures, speeds and time limits listed in the Engine Operating Speeds 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 and/or overspeed.

c. Continuous engine operation above 725°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 available, limited to periods of five minutes duration.

b. Maximum Continuous Power. 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 to 100% for flight and variable during ground operations. Observe the limits shown in table 5-2 during ground operation.

Table 5-1. Engine Operating Limitations

OPERATING CONDITION	SHP	TORQUE PERCENT (1)	MAXIMUM OBSERVED TGT °C	GAS GENERATOR RPM N1 (10) RPM %		PROP RPM N2 (11)	OIL PRESS PSI (2)	OIL TEMP °C
TAKEOFF (3)	850	100%	750	38,100	101.5	2000	105 to 135	10 to 99
MAX CONT	850	100% (4)	750	38,100	101.5	2000	105 to 135	10 to 99
MAX CLIMB MAX CRUISE	850	100% (4)	725	38,100	101.5	2000	105 to 135	0 to 99
HIGH IDLE	-	-	-	-	(5)	-	-	-40 to 99
LOW IDLE	-	-	660 (6)	19,500	52(min)	-	60(min)	-40 to 99
STARTING	-	-	1000 (7)	-	-	-	-	-40(min)
TRANSIENT	-	123% (7)	850	38,500 (8)	102.6 (8)	2200 (7)	-	0 to 104 (3)
MAX REVERSE (9)	-	-	750	-	88	1900	105 to 135	0 to 99

NOTES:

(1) Torque limit applies within range of 1600-2000 propeller RPM (N2). Below 1600 RPM, torque is limited to 49%.

(2) Normal takeoff and maximum continuous operation oil pressure at gas generator speeds above 72% with oil temperature between 60 and 71 °C is 105 to 135 PSIG up to 21,000 feet.
Above 21,000 feet, the minimum oil pressure is 85 PSIG. Plus or minus 10 PSIG fluctuations are acceptable. Oil pressure between 60 and 85 PSIG should be tolerated only for the completion of the flight at power setting not to exceed 49% torque. Oil pressures below 60 PSIG are unsafe and require that either the engine be shut down or a landing be made as soon as possible, using the minimum power required to sustain flight. During extremely cold starts, oil pressure may reach 200 PSI.

(3) These values are time limited to 5 minutes.

(4) Cruise torque values vary with altitude and temperature.

(5) At approximately 70% N1.

(6) High TGT at ground idle may be corrected by reducing accessory load and/or increasing N1 RPM.

(7) These values are time limited to 5 seconds.

(8) These values are time limited to 10 seconds.

(9) This operation is time limited to 1 minute.

(10) For every 56°C below - 48°C ambient temperature, reduce maximum allowable N1 by 1.6%.

(11) Torque is limited to 81% for sustained operation above 2000 propeller RPM.

Table 5-2. Generator Load Limits

GENERATOR LOAD	MINIMUM GAS GENERATOR RPM - N1	
	WITHOUT AIR CONDITIONING	*WITH AIR CONDITIONING
0 to 50%	53%	60%
50 to 80%	60%	659
80 to 100%	63%	70%

*Right engine only

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 sustain loss of engine power and successfully stop, continue the take off, or climb before or after gear retraction is not assured for all conditions. Thorough mission planning must be accomplished prior to take off by analysis of maximum take-off weight permitted by take-off distance, accelerate-stop, positive one-engine-inoperative climb at lift off, accelerate-go, take off climb gradient, and climb performance. These data will describe performance capabilities for critical mission decisions. Maximum takeoff gross weight is 15,000 pounds. Maximum landing weight is 15,000 pounds. Maximum ramp weight is 15,090 pounds. Maximum zero fuel weight is 11,500 pounds.

5-18A. CABIN DOOR WEIGHT LIMITATION.

Structural damage may be caused if more than one person is on the cabin door at a time. The door is weight limited to 300 pounds or less.

Section V. AIRSPEED LIMITS, MAXIMUM AND MINIMUM

5-19. AIRSPEED LIMITATIONS.

Airspeed indicator readings contained in procedures, text, and illustrations throughout this Operator's Manual are given as indicated airspeed (IAS). Airspeed indicator markings (fig. 5-1) and placarded airspeeds, located on the cockpit overhead control panel (fig. 2-12), are indicated airspeed (IAS). Airspeed Calibration Charts are provided in Chapter 7.

5-20. 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 247 KIAS/0.47 Mach.

5-21. LANDING GEAR EXTENSION SPEED.

The airspeed limit for extending the landing gear and for flight with the landing gear extended is 184 KIAS.

5-22. LANDING GEAR RETRACTION SPEED.

The airspeed limit for retracting the landing gear is 166 KIAS.

5-23. WING FLAP EXTENSION SPEEDS.

The airspeed limit for APPROACH extension (40%) of the wing flaps is 202 KIAS. The airspeed limit for full DOWN extension (100%) of the wing flaps is 157 KIAS. If wing flaps are extended above these speeds, the flaps or their operating mechanisms may be damaged.

FLIGHT ENVELOPE CHART

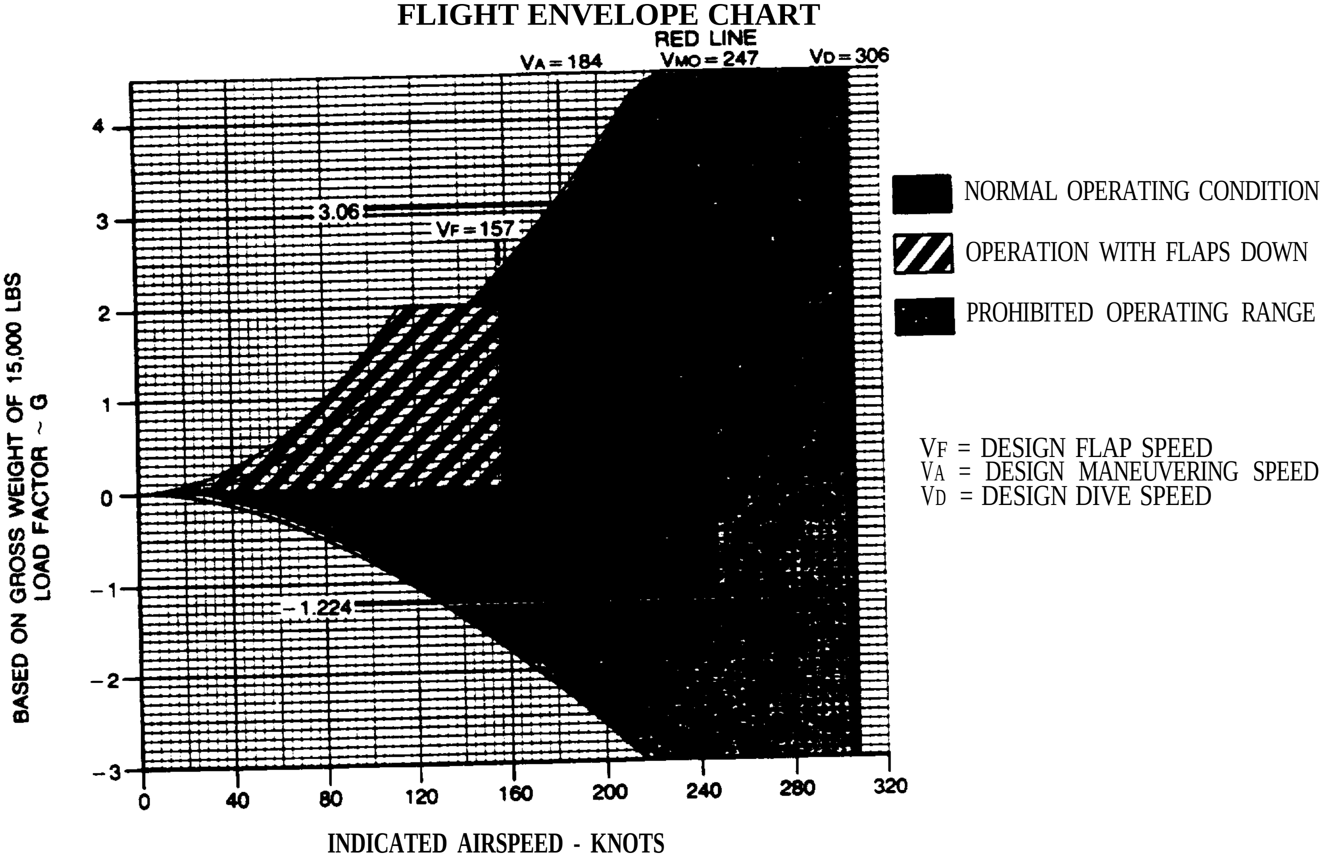


Figure 5-2. Flight Envelope

5-24. MINIMUM SINGLE-ENGINE CONTROL AIRSPEED (VMC).

The minimum single-engine control airspeed (V_{mc}) at sea level, standard conditions, is 89

5-25. MAXIMUM DESIGN MANEUVERING SPEED.

The maximum design maneuvering speed is 184 KIAS.

SECTION VI. MANUEVERING LIMITS

5-26. MANEUVERS.

a. The following maneuvers are prohibited:

(1) spins.

(2) Aerobatics of any kind.

(3) Abrupt maneuvers above 184 KIAS.

(4) Any maneuver which results in a positive load factor of 3.06G' s or a negative load factor of 1.224G' s with wing flaps up, or a positive load factor of 2.0G' s or any negative load factor with wing flaps down.

b. Recommended turbulent air penetration airspeed is 170 KIAS.

5-27. 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

5-28. ALTITUDE LIMITATIONS.

The maximum altitude that the aircraft may be operated at is 31,000 feet. When operating with inoperative yaw damp, the altitude limit is 17,000 feet.

5-29. TEMPERATURE LIMITS.

a. The aircraft shall not be operated when the ambient temperatures are warmer than ISA +37°C at SL to 25,000 feet, or ISA +31° C above 25,000 feet.

b. Engine ice vanes shall be retracted at +15° C and above.

c. Deice boots shall not be actuated below -40 °C.

5-30. FLIGHT UNDER IMC (INSTRUMENT METEOROLOGICAL CONDITIONS).

This aircraft is qualified for operation in instrument meteorological conditions.

5-30A. 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 an 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.

5-30B. 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 mired 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.

5-31. CROSSWIND LIMITATIONS.

The maximum crosswind component is 17 knots at 90°. The maximum angle of bank in a slip during landing is 8°. Landing the aircraft in a crab will impose side loads on the landing gear and should be recorded on the DA Form 2408-13-1. Refer to Chapter 8 for crosswind landing technique.

5-32. OXYGEN REQUIREMENTS.

For oxygen requirements applicable to the RC-12G aircraft, see AR 95-1.

5-33. CABIN PRESSURE LIMITS.

Maximum cabin differential pressure is 6.1 PSI.

5-34. CRACKED CABIN WINDOW / WIND-SHIELD.

If a crack occurs in both the inner and outer plys of a cabin window, the aircraft cannot he flown, except to be ferried to a maintenance facility for replacement of the window.

If a crack occurs in either layer of a cabin window, the aircraft can only he flown in an unpressurized flight.

NOTE

For further information on cracked cabin window procedures, see Service Instruction No. C-12-0117.

If there is a crack in only the outer ply of the windshield, unpressurized flight may be conducted provided that the following procedures and restrictions are observed:

1. Cracking must not significantly impair visibility of objects outside the aircraft.

2. Cracking must not interfere with the use of the windshield wipers.

3. The heating elements must be operative.

If there is a crack in the inner ply of the windshield, the windshield must be replaced prior to the next flight, to prevent injury to the pilots from possible glass splinters.

5-33. CABIN PRESSURE LIMITS.

Maximum cabin differential pressure is 6.1 PSI.

5-34. CRACKED CABIN WINDOW/WINDSHIELD.

If a crack occurs in both the inner and outer plys of a cabin window, the aircraft cannot be flown, except to be ferried to a maintenance facility for replacement of the window.

If a crack occurs in either layer of a cabin window, the aircraft can only be flown in unpressurized flight.

NOTE

For further information on cracked cabin window procedures, see Service Instruction No. C-12-0117.

If there is a crack in only the outer ply of the windshield, unpressurized flight may be conducted provided that the following procedures and restrictions are observed:

1. Cracking must not significantly impair visibility of objects outside the aircraft.

2. Cracking must not interfere with the use of the windshield wipers.

3. The heating elements must be operative.

If there is a crack in the inner ply of the windshield, the windshield must be replaced prior to the next flight, to prevent injury to the pilots from possible glass splinters.

WARNING

Pressurized flight is prohibited due to a cracked windshield. Conduct flight with the CABIN PRESS switch in the DUMP position and the BLEED AIR VALVE switches in the ENVIRO OFF or PNEU ONLY position.

NOTE

For further information on cracked windshield procedures, see the RC-12 Series Maintenance Manual.

Section VIII. OTHER LIMITATIONS

5-35. MAXIMUM DESIGN SINK RATE.

The maximum design sink rate below 13,500 lbs. gross weight is 600 feet per minute. The maximum design sink rate above 13,500 lbs. gross weight is 480 feet per minute.

5-36. INSTRUMENT LANDING SYSTEM LIMITS.

During ILS approach do not operate the propellers in the 1750 to 1850 RPM range.

5-37. INTENTIONAL ENGINE CUT SPEED.

Inflight engine cuts below the safe one-engine inoperative speed (Vsse, 107 KIAS) are prohibited.

5-38. LANDING ON UNPREPARED RUNWAY.

CAUTION

Except in an emergency, propellers should be moved out of reverse above 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.

5-39. MINIMUM OIL TEMPERATURE REQUIRED FOR FLIGHT.

Engine oil is used to heat the fuel upon entering the fuel control. Since no temperature measurement is available for the fuel at this point, it must be assumed to be the same as the FAT. The minimum oil temperature graph (fig. 5-3) is provided for use as a guide in preflight planning, based on known or forecast operating conditions, to allow the operator to become aware of operating temperatures where icing at the fuel control could occur. If the plot should indicate that oil temperatures versus FAT are such that ice formation could occur during take-off or in flight, anti-icing additive per MILI-27686 should be mixed with the fuel at refueling to insure safe operation. In the event that authorized fuels (Prist) are not available the limitation of this chart apply.

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%. Approved procedure for adding anti-icing concentrate is contained in Chapter 2, Section XII.

JP-4 fuel per MILT-5624 has anti-icing additive per MILI-27686 blended in the fuel at the refinery and no further treatment is necessary. Some fuel suppliers blend 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.

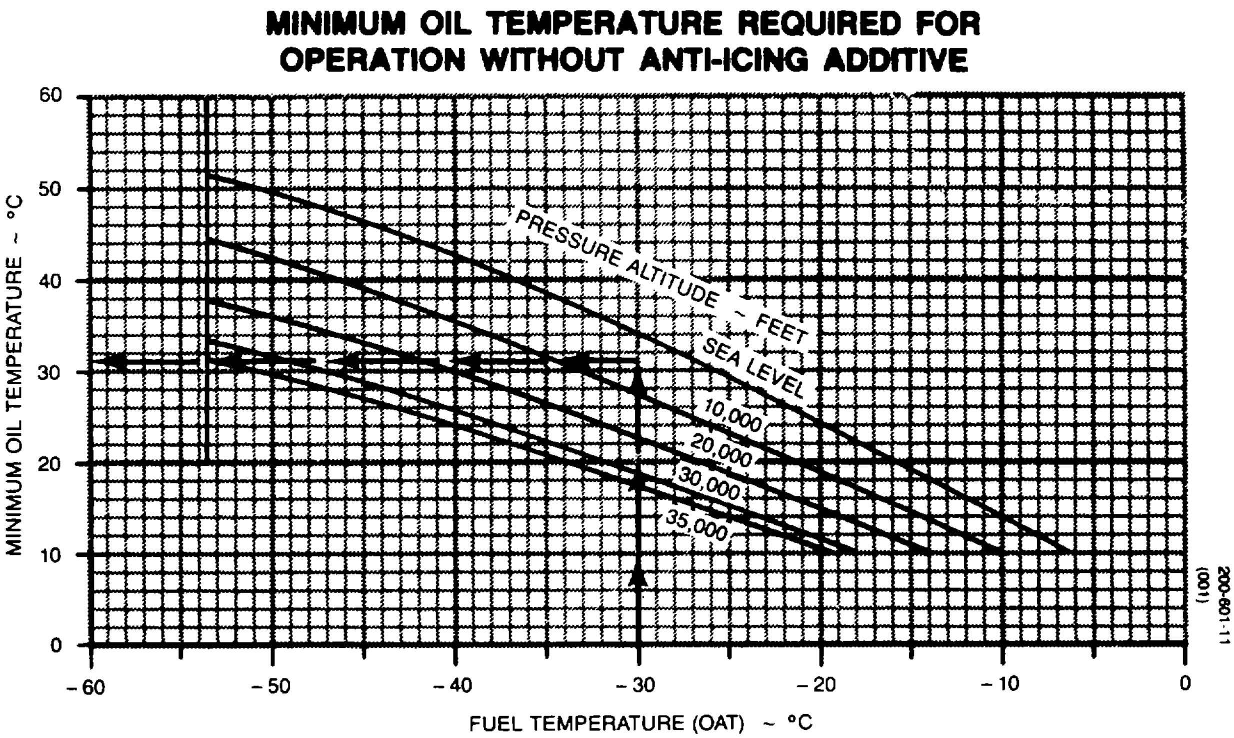


Figure 5-3. Minimum Oil Temperature

Section IX. REQUIRED EQUIPMENT FOR VARIOUS CONDITIONS OF FLIGHT

5-40. REQUIRED EQUIPMENT LISTING.

a. A Required Equipment for Various Conditions of Flight listing (fig. 54), 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, rudders, flaps, engines, landing gear, etc. Also the list does not include items which do not affect the airworthiness of the aircraft such as galley equipment, entertainment systems, passenger convenience items, etc. However, 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 or inoperative status of a piece of equipment on his aircraft will limit the conditions under which he may operate the aircraft.

(-) Indicates item may be inoperative for the specified flight condition.

(*) refers to remarks and/or exceptions column for explicit information or reference.

Numbered items contained in () are 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 REL may not deviate from requirements of the Operators Manual limitations section, emergency procedures or safety of flight messages.

SYSTEM and/or COMPONENT	Number of items installed	VFR Day	VFR Night	IFR Day	IFR Night	Icing Conditions	REMARKS and/or Exceptions
AIR CONDITIONING							
Bleed Air Fail Light	2	-	-	1	1	2	Provided bleed air is not used from side of failed light.
Pressurization Controller	1	1	1	1	1	1	
Safety Valve	1	1	1	1	1	1	
Outflow Valve	1	1	1	1	1	1	
Altitude Warning	1	1	1	1	1	1	May be inoperative provided airplane remains unpressurized.
Cabin Rate of Climb	1	1	1	1	1	1	
Differential Pressure/Cabin Altitude	1	1	1	1	1	1	
Pressurization Air Source	2	1	1	1	1	1	
Duct Overtemp Light	1	-	-	-	-	-	May be inoperative provided bleed air is not used.
COMMUNICATIONS							
Interphone System	1	-	-	-	-	-	
VHF Communications System	2	-	-	-	-	-	
Static Discharge Wicks	24	-	-	24	24	24	Minimum required - one wick at the outboard end of each control surface plus top of vertical stabilizer.
ELECTRICAL POWER							
Battery	1	1	1	1	1	1	
Battery Charge Light	1	1	1	1	1	1	
DC Generator	2	1	1	2	2	2	
DC Loadmeter	2	2	2	2	2	2	One may be inoperative provided corresponding generator caution light is monitored.
DC Generator Caution Light	2	2	2	2	2	2	One may be inoperative provided corresponding loadmeter is monitored.
Inverter	2	1	1	2	2	2	
Inverter Warning Light	1	-	-	1	1	1	May be inoperative provided both inverters are operative.
AC Frequency/Voltmeter	2	2	2	2	2	2	
EQUIPMENT FURNISHINGS							
Seat Belts	5	*	*	*	*	*	
Shoulder Harness; Pilot and Co-Pilot	2	*	*	*	*	*	*One per installed seat.

Figure 5-4. Required Equipment Listing (1 of 5)

SYSTEM and/or COMPONENT	Number of items installed	VFR Day	VFR Night	IFR Day	IFR Night	Icing Conditions	REMARKS and/or Exceptions
Emergency Locator Transmitter	1	-	-	-	-	-	
FIRE PROTECTION							
Fire Detector System	2	2	2	2	2	2	
Engine Fire Extinguisher	2	2	2	2	2	2	
Portable Fire Extinguisher	2	2	2	2	2	2	
FLIGHT CONTROLS							
Trim Tab Indicators - Rudder, Aileron, and Elevator	3	3	3	3	3	3	May be inoperative provided that the tabs are visually checked in the neutral position prior to each takeoff and checked for full range of operation.
Flap Position Indicator	1	1	1	1	1	1	May be inoperative provided that the flap travel is visually inspected prior to takeoff.
Flap System	1	-	-	-	-	-	
Rudder Boost	1	-	-	-	-	-	
Yaw Damp	1	1	1	1	1	1	May be inoperative for flight at and below 17,000 feet.
Stall Warning	1	1	1	1	1	1	
Autopilot	1	-	-	-	-	-	
FUEL EQUIPMENT							
Standby Fuel Boost Pump	2	1	1	1	1	1	Both required for operation on aviation gasoline above 20,000 feet.
Engine Driven Boost Pump	2	2	2	2	2	2	
Firewall Shutoff Valve	2	2	2	2	2	2	
Fuel Quantity Indicator	2	2	2	2	2	2	One may be inoperative provided other side is operational 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.
Crossfeed Valve	1	-	-	-	-	-	Required for (1) operation with aviation gasoline above 20,000 feet. (2) When operating with aviation kerosene when one standby boost pump is inoperative. If takeoff with inoperative crossfeed is planned, mission should be limited to that range attainable with single engine operation, one engine supplying fuel.

Figure 5-4. Required Equipment Listing (2 of 5)

SYSTEM and/or COMPONENT	Number of items installed	VFR Day	VFR Night	IFR Day	IFR Night	Icing Conditions	REMARKS and/or Exceptions
Crossfeed Light	1	1	1	1	1	1	May be inoperative provided proper operation of crossfeed system is checked prior to takeoff. Both fuel pressure lights must be operative.
Fuel Flow Indicator	2	2	2	2	2	2	One may be inoperative provided fuel quantity gages are operative.
Fuel Pressure Warning Light	2	2	2	2	2	2	One may be inoperative provided standby boost pump operation is ascertained using opposite light with crossfeed prior to engine start. Standby boost pump on side of failed light must be operated in flight to assure fuel pressure, should the engine driven boost pump fail.
Motive Flow Valve	2	-	-	-	-	-	Required if Aux Tanks contain fuel.
Jet Transfer Pump	2	-	-	-	-	-	Required if Aux Tanks contains fuel.
Fuel Quantity Gage Selector Switch	1	1	1	1	1	1	May be inoperative provided MAIN quantity indicators are operational.
ICE AND RAIN PROTECTION							
Airfoil Deice System (Wing and Horizontal Stabilizer)	1	-	-	-	-	1	
Antenna Deice System	1	-	-	-	-	1	
Engine Inertial Ice Vanes	2	2	2	2	2	2	
Ice Vane Lights	4	4	4	4	4	4	May be inoperative provided manual ice vane controls are operational and used.
Windshield Heat, Left and Right	2	-	-	-	-	1	Right side may be inoperative.
Windshield Wiper	2	-	-	-	-	-	
Auto Ignition System and Lights	2	2	2	2	2	2	
Pitot Heater	2	-	-	1	1	1	Right side may be inoperative.
Alternate Static Air Source	1	1	1	1	1	1	
Propeller Deice System (Auto)	1	-	-	-	-	1	
Propeller Deice System (Manual)	1	-	-	-	-	1	
Heated Fuel Vent	2	-	-	-	-	2	
Stall Warning Heater	1	-	-	-	-	1	
Brake Deicer System	1	-	-	-	-	-	
LANDING GEAR							
Landing Gear Motor	1	1	1	1	1	1	May be inoperative provided operations are continued only to a point where repairs can be accomplished.

Figure 5-4. Required Equipment Listing (3 of 5)

SYSTEM and/or COMPONENT	Number of items installed	VFR Day	VFR Night	IFR Day	IFR Night	Icing Conditions	REMARKS and/or Exceptions
Landing Gear Position Indicator Lights	3	3	3	3	3	3	One of three may be inoperative provided gear handle light is monitored.
Gear Handle Light	1	1	1	1	1	1	
Landing Gear Aural Warning	1	1	1	1	1	1	
LIGHTS							
Cockpit and Instrument Lights	*	-	*	-	*	-	*Lights must illuminate all instruments and controls.
Landing and Taxi Light	2	-	-	-	-	-	
Strobe Beacon	2	-	2	-	2	-	Per FAR 91.33
Position Lights	3	-	3	-	3	-	
Wing Ice Lights	2	-	-	-	-	*	*One required for night icing flight.
Master Fault Warning Light	2	-	-	-	-	-	
Master Fault Caution Lights	2	-	-	-	-	-	
Cabin Door Caution Light	1	*	*	*	*	*	*May be inoperative provided visual indicators are checked prior to each takeoff.
NAVIGATION INSTRUMENTS							
Altimeter	2	1	1	1	1	1	Right side may be inoperative.
Airspeed Indicator	2	1	1	1	1	1	Right side may be inoperative.
Vertical Speed Indicator	2	-	-	-	-	-	
Standby Magnetic Compass	1	1	1	1	1	1	
Horizon Indicator	2	-	-	2	2	2	Right side may be inoperative.
Outside Air Temperature	1	1	1	1	1	1	
Turn and Bank Indicator	2	-	-	1	1	1	Right side may be inoperative.
Directional Gyro	2	-	-	1	1	1	Right side may be inoperative.
Clock	2	-	-	1	1	1	
Transponder	1	-	-	1	1	-	
Distance Measuring Equipment	1	-	-	-	-	-	
Navigation Equipment	*	-	-	*	*	*	*Per AR-95-1

Figure 5-4. Required Equipment Listing (4 of 5)

SYSTEM and/or COMPONENT	Number of items installed	VFR Day	VFR Night	IFR Day	IFR Night	Icing Conditions	REMARKS and/or Exceptions
OXYGEN							
Oxygen system	1	1	1	1	1	1	
Oxygen Mask	*	-	-	-	-	-	*Refer to Oxygen Requirements in section VI.
PROPELLERS							
Propeller Overspeed Governor	2	2	2	2	2	2	
Propeller Governor Test Switch	2	2	2	2	2	2	
Autofeathering System	1	-	-	-	-	-	
Autofeathering Armed Light	2	-	-	-	-	-	
Reverse Not Ready Light	1	1	1	1	1	1	
Propeller Synchrophaser	1	-	-	-	-	-	
ENGINE INDICATING INSTRUMENTS							
Propeller Tachometer Indicator	2	1	1	1	1	1	
Propeller Synchroscope	1	-	-	-	-	-	
Gas Generator Tachometer Indicator	2	2	2	2	2	2	
TGT Indicator	2	2	2	2	2	2	
Torque Indicator	2	2	2	2	2	2	
ENGINE OIL INDICATORS							
Oil Pressure Indicator	2	2	2	2	2	2	
Oil Temperature Indicator	2	2	2	2	2	2	
Chip Detector Light	2	2	2	2	2	2	

Figure 5-4. Required Equipment Listing (5 of 5)

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 RC-12G 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.

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 principle 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:

a. Chart C - Basic Weight and Balance Record, DD Form 365-3.

b. 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.

NOTE

The maximum baggage compartment weight is 410 pounds. Do not exceed the 100 Lbs/Sq Ft floor loading limit.

6-7. DELETED.

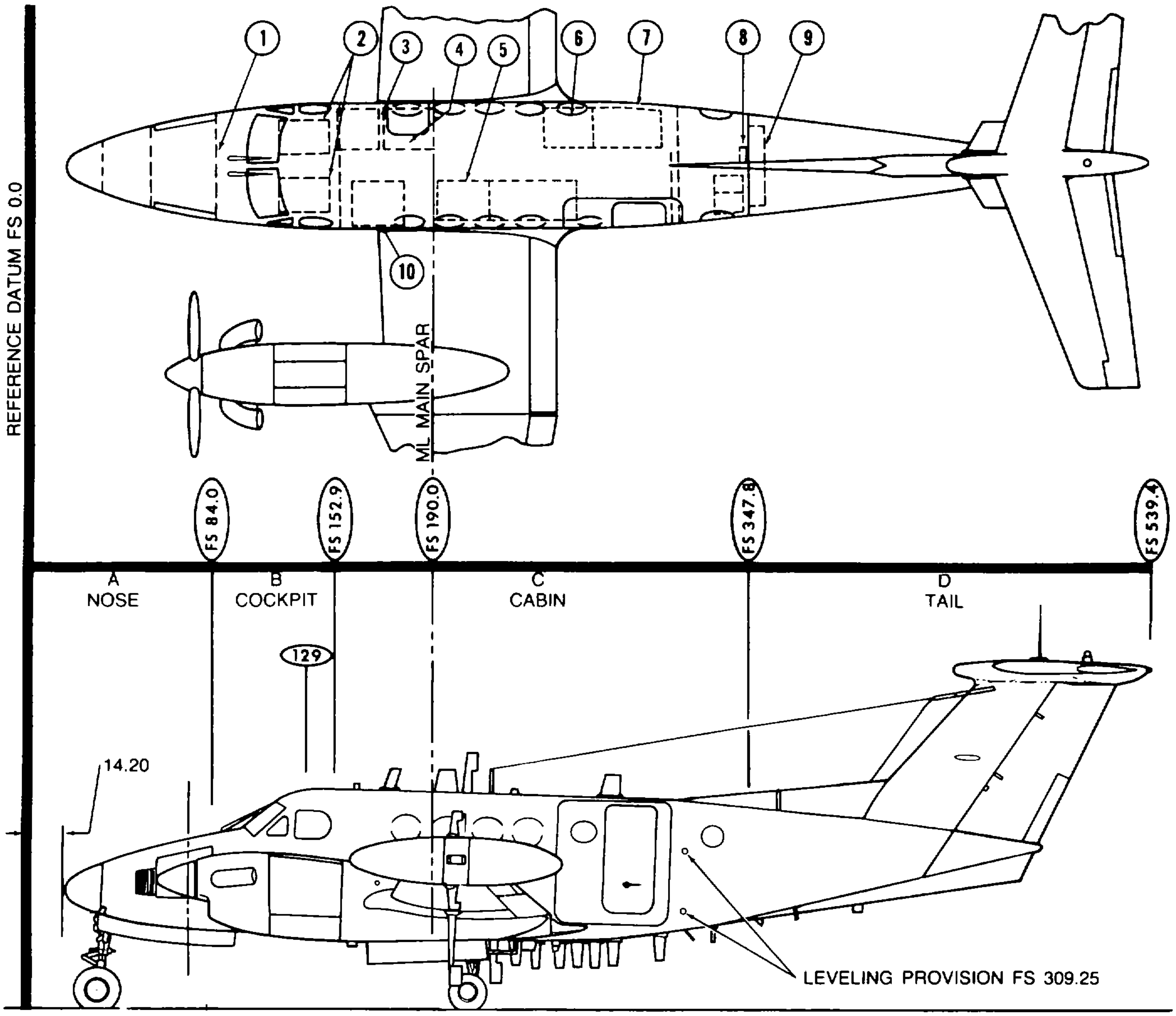
6-8. DELETED.

6-9. 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.

6-10. WEIGHT AND BALANCE CLEARANCE FORM F, DD FORM 365-4 (TACTICAL).

Refer to TM 55-1500-342-23 for Form F instructions. Refer to tables 6-1,6-1 A, 6-2, and 6-3 for moments.



1. AVIONICS COMPARTMENT: VHF-20B COMM, VIR-30 NAV NO. 1 & NO. 2, AN/ARN-136 TACAN, AN/APN-215 RADAR, TUNEABLE DIPLEXER, INS BATTERY, AND PC-17A INVERTER (2)
2. PILOT AND COPILOT SEATS
3. MISSION AC DC POWER CABINET
4. INS EQUIPMENT RACK
5. MISSION CONSOLE
6. MISSION CONSOLE
7. LAVATORY
8. DF-203 ADF RECEIVER & MOUNT
9. 671U-4A RECEIVER-EXCITER, 548S-3 POWER AMPLIFIER & OXYGEN BOTTLES.
10. EQUIPMENT RACK

AP010497

Figure 6-2. Basic Weight and Balance Record DD Form 365-3

DELETED

Figure 6-2. Basic Weight and Balance Record DD Form 365-3

DELETED

Figure 6-3. Weight and Balance Clearance, DD Form 365-4

Table 6-1. Occupant Useful Load, Weights and Moments

WEIGHT	CREW F.S. 129	OPERATOR SEAT F.S. 246	OPERATOR SEAT F.S. 264	LAVATORY F.S. 335
	MOMENT/1000			
80	103	197	211	268
90	116	221	238	302
100	129	246	264	335
110	142	271	290	369
120	155	295	317	402
130	168	320	343	436
140	181	344	370	469
150	194	369	396	503
160	206	394	422	536
170	219	418	449	570
180	232	443	475	603
190	245	467	502	637
200	258	492	528	670
210	271	517	554	704
220	284	541	591	737
230	297	566	607	771
240	310	590	634	804
250	323	615	660	838

Table 6-1A. Baggage Moment

WEIGHT	AFT CABIN
10	33
20	65
30	98
40	103
50	163
60	195
70	228
80	260
90	293
100	325
200	650
300	975
370	1203
400	1300
*410	1333
* Maximum Baggage Compartment Weight BT00999	

Table 6-2. Fuel Center-of-Gravity Moments

	6.4 LB/GAL		6.5 LB/GAL		6.6 LB/GAL		6.7 LB/GAL		6.8 LB/GAL	
GAL	WEIGHT	MOM. 100	WEIGHT	MOM. 100	WEIGHT	MOM. 100	WEIGHT	MOM. 100	WEIGHT	MOM. 100
10	64	99	65	100	66	102	67	103	68	105
20	128	197	130	200	132	203	134	206	136	209
30	192	305	195	310	198	314	201	319	204	324
40	256	423	260	430	264	436	268	443	272	450
50	320	542	325	550	330	559	335	567	340	575
60	384	662	390	672	396	683	402	693	408	703
70	448	782	455	794	462	807	469	819	476	831
80	512	904	520	918	528	932	536	926	544	960
90	576	1023	585	1039	594	1055	603	1071	612	1087
100	640	1142	650	1160	660	1178	670	1196	680	1214
110	704	1260	715	1280	726	1300	737	1319	748	1339
120	768	1379	780	1400	792	1422	804	1443	816	1465
130	832	1496	845	1519	858	1543	871	1566	884	1589
140	896	1615	910	1640	924	1665	938	1690	952	1715
150	960	1734	975	1761	990	1788	1005	1815	1020	1842
160	1024	1852	1040	1881	1056	1910	1072	1939	1088	1968
170	1088	1971	1105	2002	1122	2033	1139	2064	1156	2095
180	1152	2090	1170	2122	1188	2155	1206	2188	1224	2221
190	1216	2209	1235	2244	1254	2279	1273	2313	1292	2348
200	1280	2328	1300	2365	1320	2401	1340	2437	1360	2473
210	1344	2447	1365	2486	1386	2524	1407	2562	1428	2600
220	1408	2567	1430	2607	1452	2647	1474	2687	1496	2727
230	1472	2686	1495	2728	1518	2770	1541	2812	1564	2854
240	1536	2806	1560	2850	1584	2894	1608	2938	1632	2982
250	1600	2926	1625	2971	1650	3107	1675	3063	1700	3109
260	1664	3045	1690	3093	1716	3140	1742	3188	1768	3236
270	1728	3164	1755	3213	1782	3263	1809	3312	1836	3361
280	1792	3283	1820	3334	1848	3386	1876	3437	1904	3488
290	1856	3402	1885	3455	1914	3508	1943	3562	1972	3615
300	1920	3521	1950	3576	1980	3631	2010	3686	2040	3741
310	1984	3641	2015	3698	2046	3754	2077	3811	2108	3868
320	2048	3760	2080	3819	2112	3878	2144	3936	2176	3995
330	2112	3880	2145	3940	2178	4001	2211	4062	2244	4123
340	2176	3999	2210	4062	2344	4124	2278	4187	2312	4249
350	2240	4119	2275	4184	2310	4248	2345	4312	2380	4376
360	2304	4244	2340	4310	2376	4377	2412	4443	2448	4509
370	2368	4365	2405	4434	2442	4502	2479	4570	2516	4638
380	2432	4489	2470	4560	2508	4630	2546	4700	2584	4770
386	2470	4562	2509	4634	2548	4706	2586	4776	2625	4848
400	2560	4741	2600	4815	2640	4889	2680	4963	2720	5037
410	2624	4896	2665	4945	2706	5021	2747	5097	2788	5173
420	2688	4997	2730	5075	2772	5153	2814	5231	2856	5309
430	2752	5126	2795	5206	2838	5286	2881	5366	2924	5446
440	2816	5255	2860	5337	2904	5419	2948	5501	2992	5583
450	2880	5386	2925	5470	2970	5554	3015	5638	3060	5722
460	2944	5514	2990	5600	3036	5686	3082	5773	3128	5859
470	3008	5645	3055	5733	3102	5821	3149	5909	3196	5997
480	3072	5775	3120	5866	3168	5956	3216	6046	3264	6136
490	3136	5907	3185	5999	3234	6091	3283	6184	3332	6276
500	3200	6040	3250	6134	3300	6229	3350	6323	3400	6418
510	3264	6172	3315	6269	3366	6365	3417	6462	3468	6558
520	3328	6307	3380	6405	3432	6504	3484	6602	3536	6700
530	3392	6441	3445	6542	3498	6643	3551	6743	3604	6844
540	3456	6573	3510	6676	3564	6779	3618	6881	3672	6984
544	3482	6626	3536	6729	3590	6832	3645	6936	3699	7039

BT01000

Table 6-3. Center of Gravity Moment Table - Moment/100 (Continued)

GROSS WEIGHT POUNDS	FWD LIMIT MAC MOM/100	13.9 181.0	17.3 183.4	19.6 185.0	24.2 188.3	27.0 190.3	30.0 192.4	33.0 194.5	35.7 196.4
7200		13032	13205	13320	13558	13702	13853	14004	14141
7250		13123	13297	13413	13652	13797	13949	14101	14239
7300		13213	13388	13505	13746	13892	14045	14199	14337
7350		13304	13480	13598	13840	13987	14141	14296	14435
7400		13394	13572	13690	13934	14082	14238	14393	14534
7450		13485	13663	13783	14028	14177	14334	14490	14632
7500		13575	13755	13875	14123	14272	14430	14588	14730
7550		13666	13847	13968	14217	14368	14526	14685	14828
7600		13756	13938	14060	14311	14463	14622	14782	14926
7650		13847	14030	14153	14405	14558	14719	14879	15025
7700		13937	14122	14245	14499	14653	14815	14977	15123
7750		14028	14214	14338	14593	14748	14911	15074	15221
7800		14118	14305	14430	14678	14843	15007	15171	15319
7850		14209	14397	14523	14782	14939	15103	15268	15417
7900		14299	14489	14615	14876	15034	15200	15366	15516
7950		14390	14580	14708	14970	15129	15296	15463	15614
8000		14480	14672	14800	15064	15224	15392	15560	15712
8050		14571	14764	14893	15158	15319	15488	15657	15810
8100		14661	14855	14985	15252	15414	15584	15755	15908
8150		14752	14947	15078	15346	15509	15681	15852	16007
8200		14842	15039	15170	15441	15605	15777	15949	16105
8250		14933	15131	15263	15535	15700	15873	16046	16203
8300		15023	15222	15355	15629	15795	15969	16144	16301
8350		15114	15314	15448	15723	15890	16065	16241	16399
8400		15204	15406	15540	15817	15985	16162	16338	16498
8450		15295	15497	15633	15911	16080	16258	16435	16596
8500		15385	15589	15725	16006	16175	16354	16533	16694
8550		15476	15681	15818	16100	16271	16450	16630	16792
8600		15566	15772	15910	16194	16366	16546	16727	16890
8650		15657	15864	16003	16288	16461	16643	16824	16989
8700		15747	15956	16095	16382	16556	16739	16922	17087
8750		15838	16048	16188	16476	16651	16835	17019	17185
8800		15928	16139	16280	16570	16746	16931	17116	17283
8850		16019	16231	16373	16665	16842	17027	17213	17381
8900		16109	16323	16465	16759	16937	17124	17311	17480
8950		16200	16414	16558	16853	17032	17220	17408	17578
9000		16290	16506	16650	16947	17127	17316	17505	17676
9050		16381	16598	16743	17041	17222	17412	17602	17774
9100		16471	16689	16835	17135	17317	17508	17700	17872
9150		16562	16781	16928	17229	17412	17605	17797	17971
9200		16652	16873	17020	17324	17508	17701	17894	18069
9250		16743	16965	17113	17418	17603	17797	17991	18167
9300		16833	17056	17205	17512	17698	17893	18089	18265
9350		16924	17148	17298	17606	17793	17989	18186	18363
9400		17014	17240	17390	17700	17888	18086	18283	18462

Table 6-3. Center of Gravity Moment Table - Moment/100 (Continued)

GROSS WEIGHT POUNDS	FWD LIMIT MAC MOM/100	13.9 181.0	17.3 183.4	19.6 185.0	24.2 188.3	27.0 190.3	30.0 192.4	33.0 194.5	35.7 196.4
9450		17105	17331	17483	17794	17983	18182	18380	18560
9500		17195	17423	17575	17889	18078	18278	18478	18658
9550		17286	17515	17668	17983	18174	18374	18575	18756
9600		17376	17606	17760	18077	18269	18470	18672	18854
9650		17467	17698	17853	18171	18364	18567	18769	18953
9700		17557	17790	17945	18265	18459	18663	18867	19051
9750		17648	17882	18038	18359	18554	18759	18964	19149
9800		17738	17973	18130	18453	18649	18855	19061	19247
9850		17829	18065	18223	18548	18745	18951	19158	19345
9900		17919	18157	18315	18642	18840	19048	19256	19444
9950		18010	18248	18408	18736	18935	19144	19353	19542
10000		18100	18340	18500	18830	19030	19240	19450	19640
10050		18191	18432	18593	18924	19125	19336	19547	19738
10100		18281	18523	18685	19018	19220	19432	19645	19836
10150		18372	18615	18778	19112	19315	19529	19742	19935
10200		18462	18707	18870	19207	19411	19625	19839	20033
10250		18552	18799	18963	19301	19506	19721	19936	20131
10300		18643	18890	19055	19395	19601	19817	20034	20229
10350		18734	18982	19148	19489	19696	19913	20131	20327
10400		18824	19074	19240	19583	19791	20010	20228	20426
10450		18915	19165	19333	19677	19886	20106	20325	20524
10500		19005	19257	19425	19772	19981	20202	20423	20622
10550		19096	19349	19518	19866	20077	20298	20520	20720
10600		19186	19440	19610	19960	20172	20394	20617	20818
10650		19277	19532	19703	20054	20267	20491	20714	20917
10700		19367	19624	19795	20148	20362	20587	20812	21015
10750		19458	19716	19888	20242	20457	20683	20909	21113
10800		19548	19807	19980	20336	20552	20779	21006	21211
10850		19369	19899	20073	20431	20648	20875	21103	21309
10900		19729	19991	20165	20525	20743	20972	21201	21408
10950		19820	20082	20258	20619	20838	21068	21298	21506
11000		19910	20174	20350	20713	20933	21164	21395	21604
11050		20001	20266	20443	20807	21028	21260	21492	21702
11100		20091	20357	20535	20901	21123	21356	21590	21800
11150		20182	20449	20628	20995	21218	21453	21687	21899
11200		20272	20541	20720	21090	21314	21549	21784	21997
11250		20363	20633	20813	21184	21409	21645	21881	22095
11300	14.0	20461	20724	20905	21278	21504	21741	21979	22193
11350	14.2	20570	20816	20998	21372	21599	21837	22076	22291
11400	14.4	20679	20908	21090	21466	21694	21934	22173	22390
11450	14.7	20789	20999	21183	21560	21789	22030	22270	22488
*11500	14.9	20899	21091	21275	21655	21884	22126	22368	22586
11550	15.1	21008	21183	21368	21749	21980	22222	22465	22684
11600	15.4	21118	21274	21460	21843	22075	22318	22562	22782
11650	15.6	21229	21366	21553	21937	22170	22415	22659	22881

Table 6-3. Center of Gravity Moment Table - Moment/1OO (Continued)

GROSS WEIGHT POUNDS	FWD LIMIT MAC MOM/100	13.9 181.0	17.3 183.4	19.6 185.0	24.2 188.3	27.0 190.3	30.0 192.4	33.0 194.5	35.7 196.4
11700	15.8	21339	21458	21645	22031	22265	22511	22757	22979
11750	16.1	21449	21550	21738	22125	22360	22607	22854	23077
11800	16.3	21560	21641	21830	22219	22455	22703	22951	23175
11850	16.5	21671	21733	21923	22314	22551	22799	23048	23273
11900	16.8	21782	21825	22015	22408	22646	22896	23146	23372
11950		17.0	21916	22108	22502	22741	22992	23243	23470
12000		17.2	22008	22200	22596	22836	23088	23340	23568
12050		17.5	22119	22293	22690	22931	23184	23437	23666
12100		17.7	22231	22385	22784	23026	23280	23535	23764
12150		18.0	22343	22478	22878	23121	23377	23632	23863
12200		18.2	22455	22570	22973	23217	23473	23729	23961
12250		18.4	22567	22663	23067	23312	23569	23826	24059
12300		18.7	22679	22755	23161	23407	23665	23924	24157
12350		18.9	22792	22848	23255	23502	23761	24021	24255
12400		19.1	22904	22940	23349	23597	23858	24118	24354
12450		19.4	23017	23033	23443	23692	23954	24215	24452
12500			19.6	23125	23538	23787	24050	24313	24550
12550			19.8	23238	23632	23883	24146	24410	24648
12600			20.0	23352	23726	23978	24242	24507	24746
12650			20.3	23465	23820	24073	24339	24604	24845
12700			20.5	23579	23914	24168	24435	24702	24943
12750			20.7	23693	24008	24263	24531	24799	25041
12800			21.0	23807	24102	24358	24627	24896	25139
12850			21.2	23921	24197	24454	24723	24993	25237
12900			21.4	24035	24291	24549	24820	25091	25336
12950			21.7	24150	24385	24664	24916	25188	25434
13000			21.9	24265	24479	24739	25012	25285	25532
13050			22.1	24379	24573	24834	25108	25382	25630
13100			22.4	24494	24667	24929	25204	25480	25728
13150			22.6	24610	24761	25024	25301	25577	25827
13200			22.8	24725	24856	25120	25397	25674	25925
13250			23.1	24840	24950	25215	25493	25771	26023
13300			23.3	24956	25044	25310	25589	25869	26121
13350			23.5	25072	25138	25405	25685	25966	26219
13400			23.8	25188	25232	25500	25782	26063	26318
13450			24.0	25304	25326	25595	25878	26160	26416
13500					25421	25691	25974	26258	26514
13550					25515	25786	26070	26355	26612
13600					25609	25881	26166	26452	26710
13650					25703	25976	26263	26549	26809
13700					25797	26071	26359	26647	26907
13750					25891	26166	26455	26744	27005
13800					25985	26261	26551	26841	27103
13850					26080	26357	26647	26938	27201
13900					26174	26452	26744	27036	27300

Table 6-3. Center of Gravity Moment Table - Moment/1OO (Continued)

GROSS WEIGHT POUNDS	FWD LIMIT MAC MOM/100	13.9 181.0	17.3 183.4	19.6 185.0	24.2 188.3	27.0 190.3	30.0 192.4	33.0 194.5	35.7 196.4
13950					26268	26547	26840	27133	27398
14000					26362	26642	26936	27230	27496
14050					26456	26737	27032	27327	27594
14100					26550	26832	27128	27425	27692
14150					26644	26927	27225	27522	27791
14200					26739	27023	27321	27619	27889
14250					26833	27118	27417	27716	27987
14300					26927	27213	27513	27814	28085
14350					27021	27308	27609	27911	28183
14400					27115	27403	27706	28008	28282
14450					27209	27498	27802	28105	28380
14500					27304	27594	27898	28203	28478
14550					27398	27689	27994	28300	28576
14600					27492	27784	28090	28397	28674
14650					27586	27879	28187	28494	28773
14700					27680	27974	28283	28592	28871
14750					27774	28069	28379	28689	28969
14800					27868	28164	28475	28786	29067
14850					27963	28260	28571	28883	29165
14900					28057	28355	28668	28981	29264
14950					28151	28450	28764	29078	29362
15000					28245	28545	28860	29175	29460

* Maximum Zero Fuel Weight

BT01383

Table 6-4. Center of Gravity Limits (Landing Gear Down) Normal Category

WEIGHT CONDITION	FORWARD CG LIMIT	AFT CG LIMIT
12,500 LBS (MAX. TAKEOFF OR LANDING)	185.0	196.4
11,279 LBS OR LESS	181.0	196.4

BT01002

Table 6-5. Center of Gravity Limits (Landing Gear Down) Restricted Category

WEIGHT CONDITION	FORWARD CG LIMIT	AFT CG LIMIT
14,200 LBS (MAX. TAKEOFF)	188.3	196.4
13,500 LBS (MAX. LANDING)	188.3	196.4
11,279 LBS OR LESS	181.0	196.4

BT01003

FUEL DENSITY/WEIGHT VS TEMPERATURE

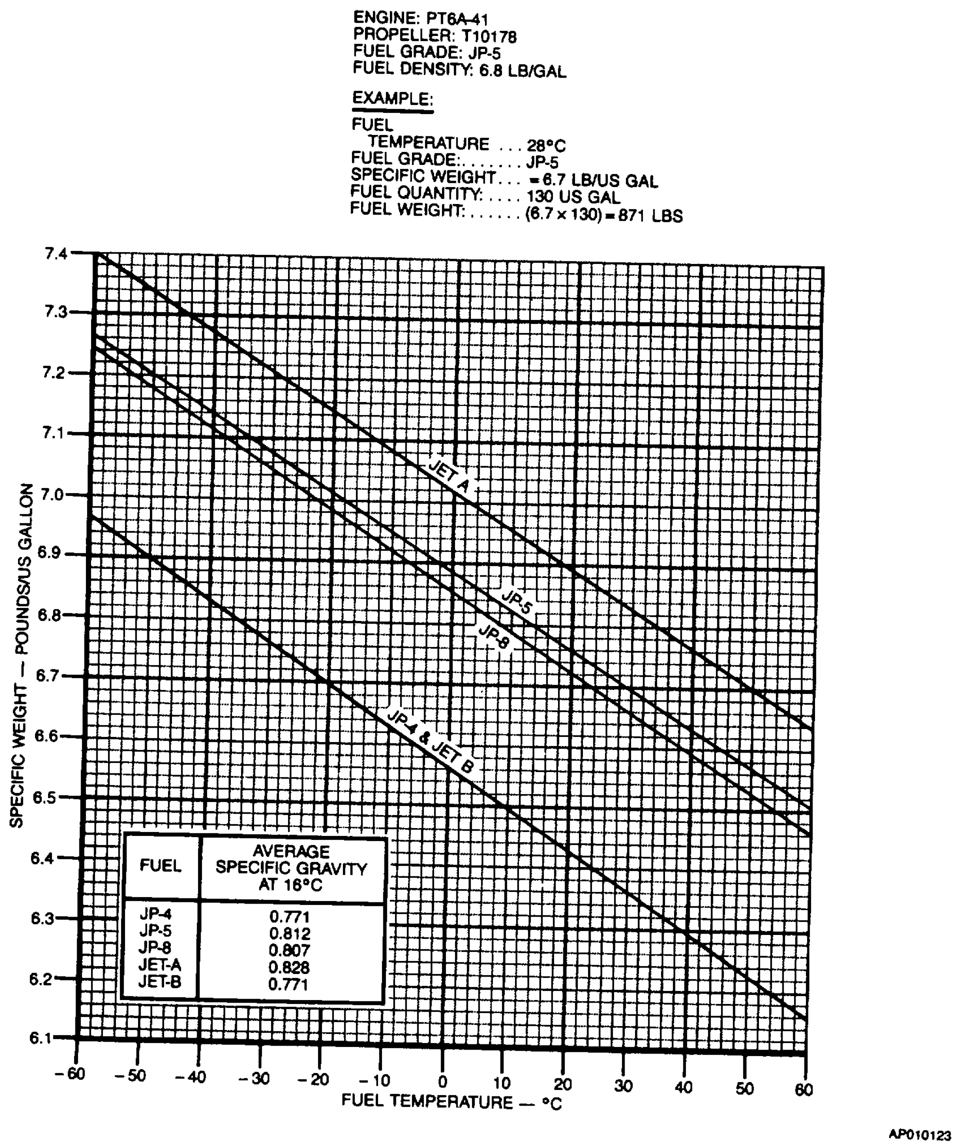


Figure 6-4. Density Variation of Aviation Fuel

Section III. FUEL/OIL

6-11. 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 passengers, baggage and fuel. Weight up to and including the remaining allowable capacity can be subtracted directly from the weight of passengers, baggage and fuel. As the fuel load is increased, the loading capacity is reduced.

6-12. FUEL AND OIL DATA.

a. *Fuel Moments Table*. This table (Table 6-2) shows fuel moment/100 given US gallons or pounds for JP-4 and JP-5.

b. *Oil Data*. Total oil weight is 62 pounds and is included in the basic weight of the aircraft. Servicing information is provided in Section XII of Chapter 2.

Section IV. CENTER OF GRAVITY

6-13. CENTER OF GRAVITY LIMITATIONS.

WARNING

The forward Center of Gravity limit may be exceeded 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 11,279 Lbs. or less is 181.0 ARM inches. At 14,200 Lbs. or less, the aft CG limit is 196.4 ARM inches. The Center of Gravity Limitations Tables (Tables 6-4 or 6-5) are designed to establish forward and aft CG limitations.

Section V. CARGO LOADING

6-14. 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.

6-15. LOADING PROCEDURE.

Loading of cargo is accomplished through the cabin door (21.5 in. X 50.0 in.) or the cargo door (52.0 in. X 52.0 in).

6-16. 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.

CHAPTER 7
PERFORMANCE

7-1. Introduction To Performance.

The graphs in this Section present performance information for takeoff, climb, cruise, and landing at various parameters of weight, altitude, and temperature.

The following example presents calculations for a proposed flight from Denver to Reno using the conditions listed below:

7-2. PERFORMANCE EXAMPLE.

The following example presents calculations for a proposed flight from Denver to Reno using the conditions listed below.

a. Conditions.

Free Air Temperature ....28°C (82°F)
Field Elevation .... 5333 feet[1]
Altimeter Setting .... 29.82 in. Hg
Wind ....3100 at 13 knots
Runway 35R Length ....12,000 feet[1]

Route segment of trip[2]:
DEN - J116 - EKR - J173 - SLC - J154
BAM - J32 - RNO
Cruise Altitude:
26,000 feet

Route segment date[2].

ROUTE SEGMENT	AVERAGE MAGNETIC COURSE	AVERAGE MAGNETIC VARIATION	DISTANCE NM
DEN-EKR	263°	13°E	143[4]
EKR-SLC	269°	14°E	192
SLC-BVL	248°	14°E	81
BVL-BAM	249°	16°E	145
BAM-RNO	226°	17°E	146[4]

BT01495

WIND AT FL 260 DIR/KNOTS	FAT AT FL 260 °C	FAT AT [3]16,000 Fr °C	ALTIMETER SETIING IN. HG
350°/40	-10	-6	29.82
350°/40	-10	-6	29.82
340°/35	-20	0	29.75
340°/35	-20	0	29.75
290°/45	-20	-4	29.60

BT01496

At Cannon International (RNO):
Free Air Temperature .... 32°C (90°F)
Field Elevation................................... 4412 feet[1]
Altimeter Setting .... 29.60 in. Hg
Wind .... 2900 at 13 knots
Runway 25 Length .... 6101 feet[1]

[1]Source: NOAA Standard Instrument Departures for Western United States, 9 Jun 1983.
[2]Source: NOAA Enroute High Altitude - U.S. Chart H-2, 9 Jun 1983.
[3]MEA on NOAA Enroute Low Altitude - U.S. Chart L-8, 9 Jun 1983.
[4]Includes distance between airport and VORTAC, per Source in Footnote

7-3. 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 DEN:

29.92 in. Hg - 29.82 in. Hg = 0.10

0.10 x 1000 feet = 100 feet

The pressure altitude at DEN is 100 feet above field elevation.

Pressure altitude at DEN = 5333 + 100 =5433 feet.

Pressure altitude at RNO:

29.92 in. Hg - 29.60 in. Hg = 0.32

0.32 x 1000 feet = 320 feet

The pressure altitude at RNO is 320 feet above field elevation.

Pressure altitude at RNO = 4412 + 320 = 4732 feet.

7-4. Performance Example.

Maximum takeoff weight (from LIMITATIONS Section) = 15,000 pounds

NOTE

For this example, the effect of paragraph 7-17 has not been shown.

7-5. Maximum Takeoff Weight Permitted By Enroute Climb Requirement.

Enter the graph at 5433 feet takeoff field pressure altitude to 280C takeoff FAT:

Maximum Allowable Takeoff

Weight.................................14,090 pounds

The maximum takeoff weight permitted by the Enroute Climb Requirement graph is the only operating limitation required to meet applicable FAR requirements. Information has been presented, however, to determine the takeoff weight, field requirements, and takeoff flight path assuming an engine failure occurs during the takeoff procedure. The following illustrates the use of these charts.

7-6. Takeoff Weight To Achieve Positive One-Engine-Inoperative Climb At Liftoff (Flaps 0%).

Enter the graph at 5433 feet to 28°C, to determine a the maximum weight at which the accelerate-go procedure should be attempted.

Maximum Accelerate-Go

Weight.................................12,100 pounds

7-7. Accelerate-Stop (Flaps 0%).

Enter the Accelerate-Stop graph at 280C, 5433 feet pressure altitude, 12,100 pounds, and 10 knots head wind component:

Accelerate-Stop Distance.................... 5100 feet

Takeoff Decision Speed......................101 knots

7-8. Take-Off Distance (Flaps 0%).

Enter the graph at 280C, 5433 feet pressure altitude, 12,100 pounds, and 10 knots head wind component:

Ground Roll.....................................3280 feet X

Total Distance Over 50-foot

Obstacle .... 5000 feet

Take-off Speed:

At Rotation...................................101 knots

At 50 Feet....................................118 knots

7-9. Takeoff Flight Path Example.

The following example assumes the aircraft is loaded so that takeoff weight is 10,000 pounds.

7-10. Accelerate-Go Distance Over 50-Foot Obstacle (Flaps 0%).

Enter the graph at 280C, 5433 feet pressure altitude, 10,000 pounds, and 10 knots head wind component:

Total Distance Over 50-foot

Obstacle .... 7800 feet

Speed at Rotation (V^R ....95 knots

Speed at 35 Feet Above Runway

(Climb Speed)...............................109 knots

7-11. Takeoff Climb Gradient - One Engine Inoperative (Flaps 0%).

Enter the graph at 280C, 5433 feet pressure altitude, and 10,000 pounds:

Climb Gradient..4.2%
Climb Speed ....109 knots

A 4.2 climb gradient is 42 feet of vertical height per 1000 feet of horizontal distance.

NOTE

The graphs for takeoff climb gradient assume a zero-wind condition. Climbing into a head wind will result in higher angles of climb, and hence better obstacle clearance capabilities.

Calculations of the horizontal distance to clear an obstacle 100 feet above the runway surface:

Distance from 50 feet to 100 feet = 50 feet
(100 - 50) (1000 + 42) = 1191 feet
Total Distance = 7800 + 1191 = 8991 feet

Results are illustrated below:

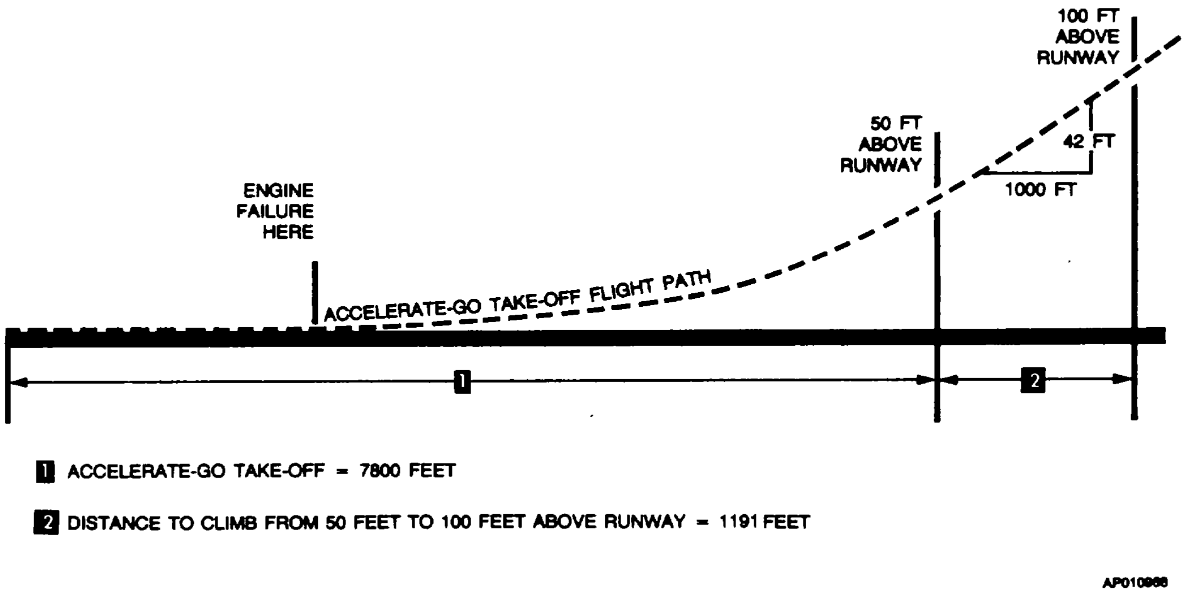


Figure 7-1. Takeoff Flight Path

7-12. FLIGHT PLANNING.

Calculations for flight time, block speed, and fuel requirements for a proposed flight are detailed below using the same conditions presented on page 17-1, and a takeoff weight of 12,000 pounds:

DEN

Pressure Altitude................................5433 feet
FAT...28°C
ISA Condition.................................. ISA + 23°C

DEN-SLC

Pressure Altitude............................. 26,000 feet
FAT..-10°C
ISA Condition.................................. ISA + 27°C

SLC-RNO

Pressure Altitude............................. 26,000 feet
FAT..-20°C
ISA Condition.................................. ISA + 17°C

RNO
Pressure Altitude................................ 4732 feet
FAT... 32°C
ISA Condition.................................. ISA + 27°C

Enter the TIME, FUEL, AND DISTANCE TO CLIMB Graph at 280C to 5433 feet, and to 12,000 pounds, and enter at -100C to 26,000 feet, and to 12,000 pounds, and read:

Time to Climb = 33.6 - 3.2 = 30.3 = 30 minutes
Fuel Used to Climb = 404 - 60 = 344 pounds
Distance Traveled = 94 - 8 = 86 nautical miles

Enter the TIME, FUEL, AND DISTANCE TO DESCEND Graph at 26,000 feet, and enter again at 4732 feet, and read:
Time to Descend = 17.5 - 13.1 = 14.4 = 14 minutes
Fuel Used to Descend = 160 - 38 = 122 pounds
Distance Traveled = 79 - 13 = 66 nautical miles

An estimated average cruise weight of 11,200 pounds was used for this example.

Enter the tables for MAXIMUM ENDURANCE POWER @ 1700 RPM for ISA + 10°C, ISA + 20°C, and ISA + 30°C, and read the cruise speeds for 26,000 feet at 12,000 pounds and 11,000 pounds:

CRUISE TRUE AIRSPEEDS AT FL 260		
11,000 POUNDS		
ISA + 10°C 208	ISA + 20°C 212	ISA + 30°C 210
12,000 POUNDS		
ISA + 10°C 208	ISA + 20°C 212	ISA + 30°C 196
Interpolate between these speeds for ISA + 270C and ISA + 17°C at 11,200 pounds:		

Cruise True Airspeed (ISA + 27°C)......209 knots
Cruise True Airspeed (ISA + 17°C)......211 knots

Enter the *MAXIMUM ENDURANCE POWER @ 1700 RPM Tables for ISA + 10°C, ISA + 20°C, and ISA + 30°C at 12,000 pounds and 11,000 pounds and interpolate the recommended torque settings for ISA + 27°C and ISA + 17°C, then add 2 percentage units.

ISA + 27°C......................52% torque per engine
ISA + 17°C......................51% torque per engine

Enter the *MAXIMUM ENDURANCE POWER @ 1700 RPM Tables for ISA + 10°C, ISA + 20°C, and 7-4 ISA + 30°C at 12,000 pounds and 11,000 pounds at 26,000 feet, and interpolate the fuel flows for ISA + 27°C and ISA + 17°C at 11,200 pounds, then add 10 pounds per hour per engine.

ISA + 27°C
Fuel Flow Per Engine........................ 238 Lbs/hr
Total Fuel Flow .... 476 Lbs/hr

ISA + 17°C
Fuel Flow Per Engine........................ 240 Lbs/hr
Total Fuel Flow .... 480 Lbs/hr

***NOTE**

For flight planning, enter these charts at the forcasted ISA condition; for enroute power settings and fuel flows, enter at the actual indicated FAT.

Time and fuel used were calculated at MAXIMUM ENDURANCE POWER @ 1700 RPM as follows:

$$\text{Time} = \frac{\text{Distance}}{\text{Ground Speed}}$$

$$\text{Fuel Used} = \frac{\text{Distance}}{\text{Ground Speed}} \times \text{Total Fuel Flow}$$

Results are as follows:

ROUTE	DISTANCE	ESTIMATED GROUND SPEED	TIME AT CRUISE ALTITUDE	FUEL USED FOR CRUISE
	NM	KNOTS	HRS: MIN	LBS
DEN-EKR	143-86=57*	194	0 : 17	140
EKR-SLC	192	190	1: 01	481
SLC-BVL	81	201	0: 24	194
BVL-BAM	145	199	0: 44	350
BAM-RNO	146-66=80*	178	0: 27	216

*Distance required to climb or descend has been subtracted from segment distance.

TIME - FUEL - DISTANCE

ITEM	TIME HRS: MINS	FUEL POUNDS	DISTANCE NM
Start, Runup, Taxi, and Takeoff acceleration	0: 00	90	0
Climb	0: 30	344	86
Cruise	2: 53	1381	555
Descent	0: 14	122	66
Total	3: 37	1937	707

Block Speed: 707 NM + 3 hours, 37 minutes = 195 knots

Reserve Fuel is calculated for 45 minutes at Maximum Range Power @ 1700 RPM. Use planned cruise altitude (26,000 feet), forecasted ISA condition (ISA + 17°C), and estimated weight at end of planned trip (10,153 pounds). (Since the lowest weight column in the tables is 11,000 pounds, assume weight at the end of the planned trip to be 11,000 pounds, and use that fuel flow value for this example.)

Enter the tables for MAXIMUM RANGE POWER @ 1700 RPM for ISA + 10°C and ISA + 20°C at 11,000 Lbs and 26,000 feet, and read the total fuel flows:

ISA + 10°C....................................... 454 Lbs/hr
ISA + 20°C....................................... 466 Lbs/hr

Then interpolate for the fuel flow at ISA + 17 °C as follows:

Change in Fuel Flow = 466 - 454 = 12 Lbs/hr

Change in Temperature = (ISA + 20°C) - (ISA + 10°C) = 10°C

Rate of Change in Fuel Flow = Change in Fuel Flow + Change in Temperature

Rate of Change in Fuel Flow = (12 Lbs/hr) + (10°C)

Rate of Change in Fuel Flow = 1.2 Lbs/hr increase per 1°C increase

Temperature increase from ISA + 100C to ISA + 17°C = 7°C

Total Change in Fuel Flow = 7 x 1.2 Lbs/hr = 8.4 Lbs/hr

Total Fuel Flow = (ISA + 100C Fuel Flow) + (Total Change in Fuel Flow)

Total Fuel Flow = (454) + (8.4) = 462.4 Lbs/hr

Reserve Fuel = 45 minutes x Total Fuel Flow

Reserve Fuel = (0.75) x (462.4 Lbs/hr) = 349.112 = 350 Lbs/hr.:

a. Total Fuel Requirement.
   1937 + 350 = 2287 pounds

7-14. Zero Fuel Weight Limitation.

For this example, the following conditions were assumed:

Ramp Weight..12,090 pounds
Weight of Usable Fuel Onboard................2287 pounds

Zero Fuel Weight = Ramp Weight - Weight of Usable Fuel Onboard

Zero Fuel Weight = (12,090) - (2287) = 9803 pounds

Maximum zero fuel weight limitation (from LIMITATIONS section) = 11,500 pounds.

Maximum Zero Fuel Weight Limitation has not been exceeded.

Anytime the Zero Fuel Weight exceeds the Maximum Zero Fuel Weight Limit, the excess must be off-loaded from PAYLOAD. If desired, additional FUEL ONLY may then be added until the ramp weight equals the Maximum Ramp Weight Limit of 15,090 Lbs.

7-15. Landing Information.

The estimated Landing Weight is determined by subtracting the fuel required for the trip from the Ramp Weight:

Ramp Weight.. 12,090 Lbs
Fuel Required for Total Trip .... 1937 pounds
Landing Weight (12,090-1937) .... 10,153 pounds

NOTE

Some graph examples use 10,300 pounds for the landing weight.

Enter the NORMAL LANDING DISTANCE WITHOUT PROPELLER REVERSING - FLAPS 100'/(Graph at 32°C, 4732 feet, 10,153 pounds, and 10 knots head wind component:
Ground Roll..1215 feet
Total Distance Over 50-foot
Obstacle ....2120 feet
Approach Speed .... 100 knots

Enter the CLIMB - BALKED LANDING Graph at 320C, 4732 feet, and 10,153 pounds:
Rate of Climb..1340 ft/min
Climb Gradient.. 10.7%

7-16. Comments Pertinent To The Use Of Performance Graphs.

a. In addition to presenting the answer for a particular set of conditions, the example on a graph also presents the order in which the various scales on the graph should be used. For instance, if the first item in the example is FAT, then enter the graph at the existing FAT.

b. The reference lines indicate where to begin following the guidelines. Always project to the reference line first, then follow the guidelines to the next known item by maintaining the same PROPORTIONAL DISTANCE between the guide line above and the guide line 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 and follow them to the next known item.

c. 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.

d. The full amount of usable fuel is available for all approved flight conditions.

e. Notes have been provided on various graphs and tables to approximate performance with ice vanes extended. The effect will vary, depending upon airspeed, temperature, altitude, and ambient conditions. 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 after the ice vanes have been extended.

7-17. PERFORMANCE AMENDMENTS FOR THE RC-12G AIRCRAFT.

The performance charts in this section are amended as follows:

a. Power Tables. Indicated airspeed IAS values shown are invalid on all power tables except Maximum Cruise Power @ 1700 RPM and One-Engine-Inoperative Maximum Cruise Power @ 1900 RPM.

b. Maximum Cruise Power @ 1900 RPM Tables. Decrease true airspeed by 11 KTAS.

c. Maximum Cruise Speeds @ 1900 RPM Graph. Decrease true airspeed by 11 KTAS.

d. Maximum Range Power @ 1700 RPM Tables. Decrease true airspeed by 9 KTAS and decrease torque setting by 1 percentage unit.

e. All Range Profile Graphs. Decrease range values by 5%.

f. Maximum Endurance Power @ 1700 RPM Tables. Increase fuel flow by 10 pounds per hour per engine, and increase torque setting by 0 percentage units.

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AIRSPEED CALIBRATION — NORMAL SYSTEM

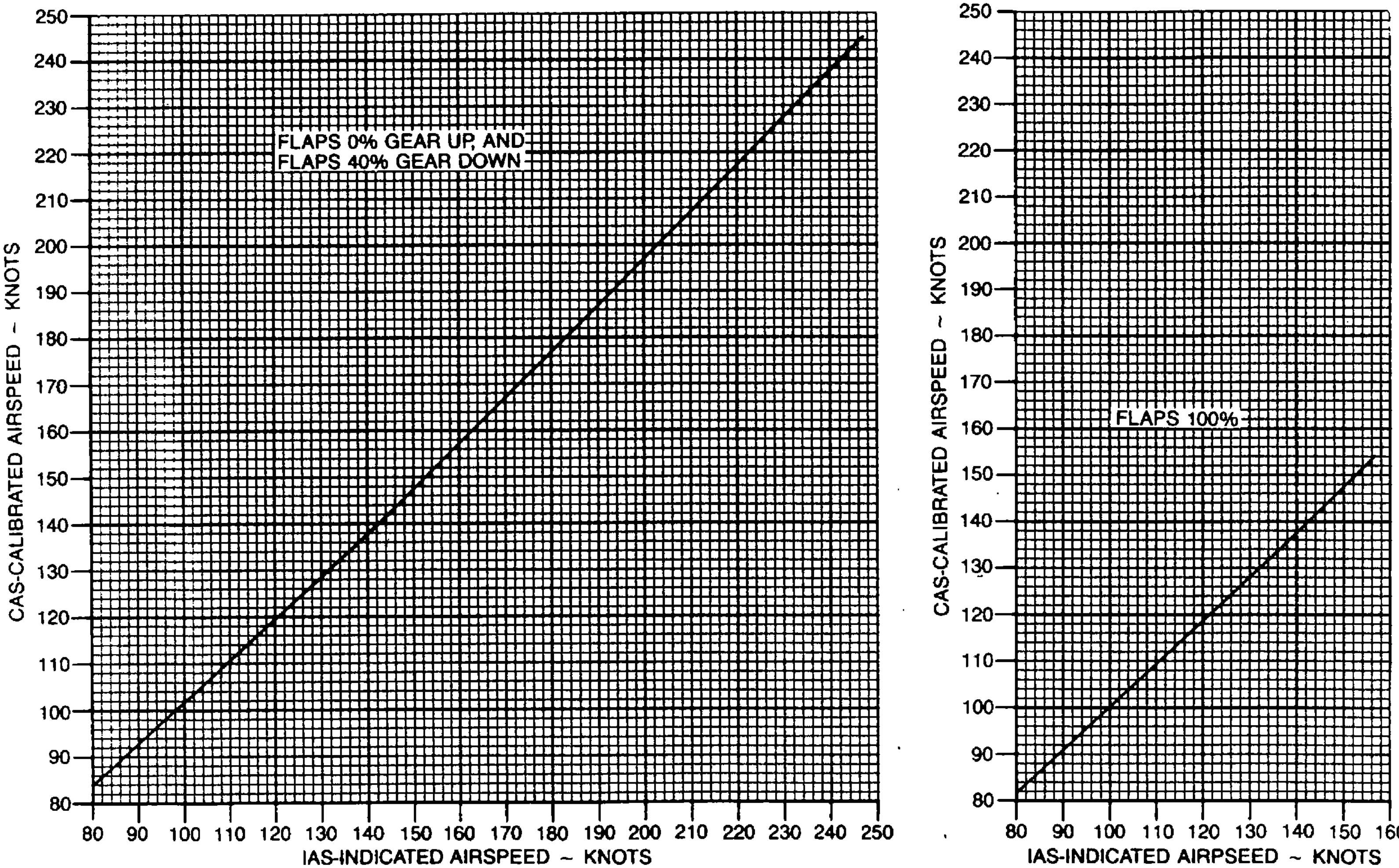

Figure 7-2. Airspeed Calibration - Normal System

ALTIMETER CORRECTION – NORMAL SYSTEM

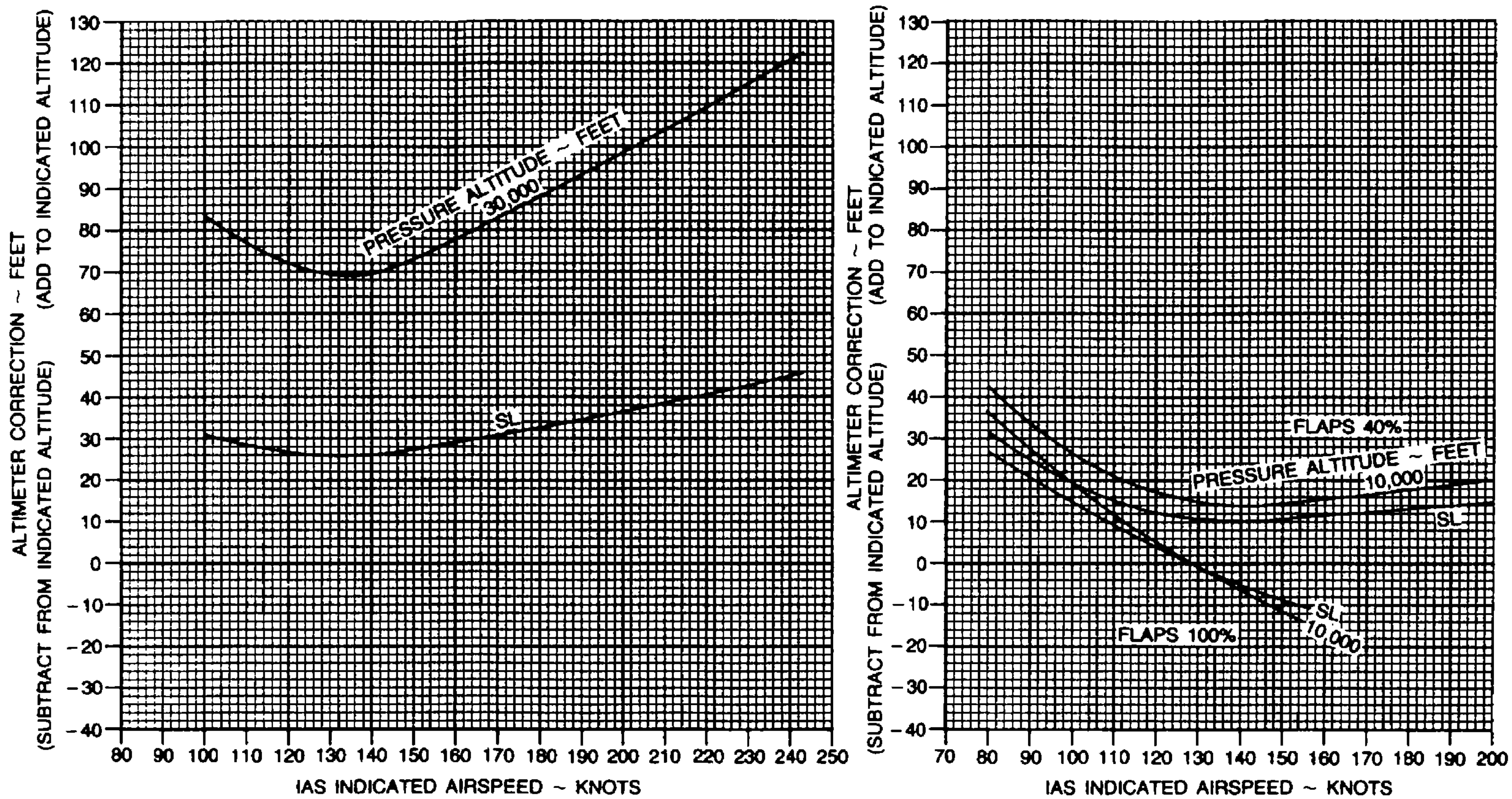

Figure 7-3. Altimeter Correction - Normal System

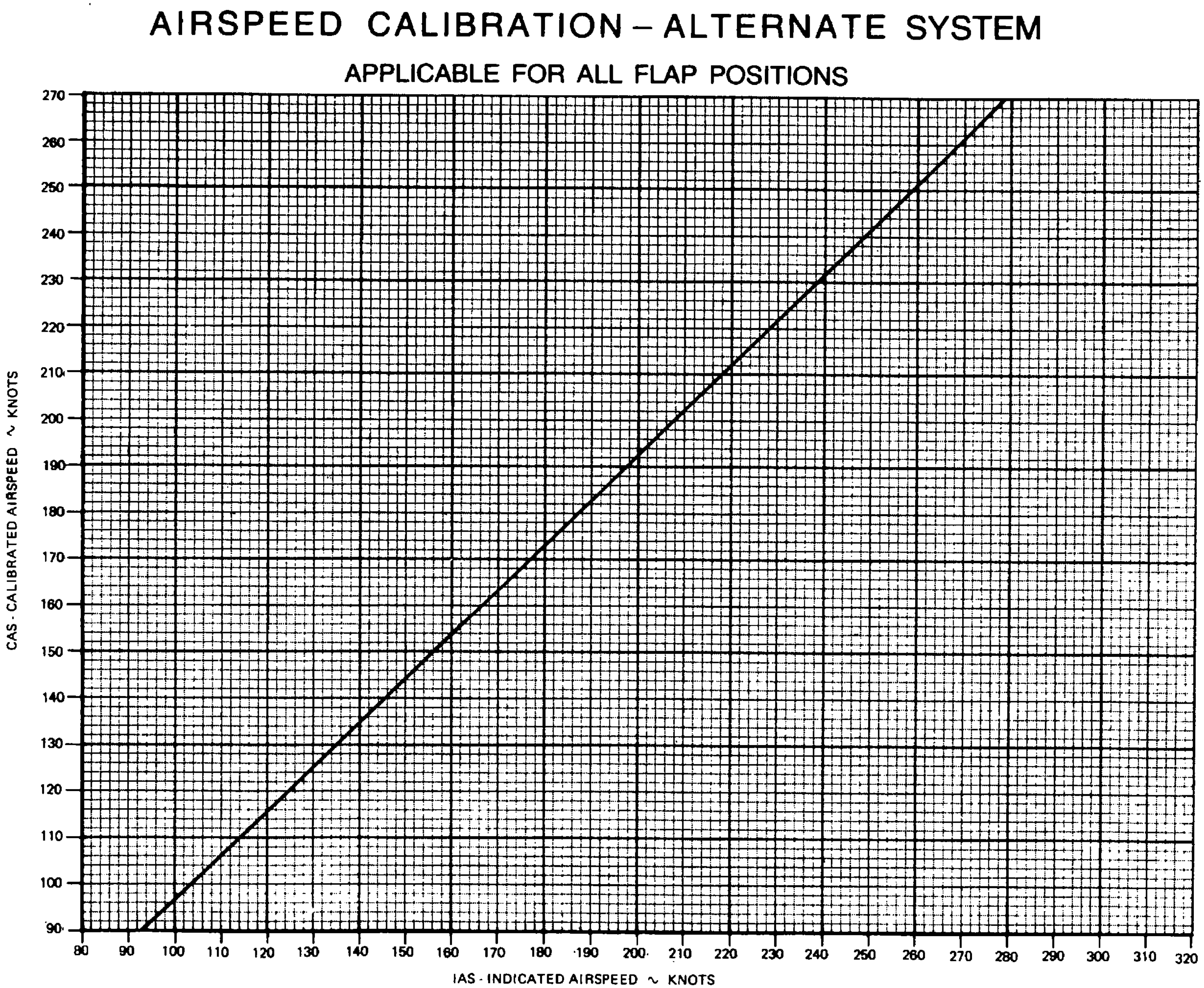

Figure 7-4. Airspeed Calibration - Alternate System

ALTIMETER CORRECTION – ALTERNATE SYSTEM

APPLICABLE FOR ALL FLAP POSITIONS

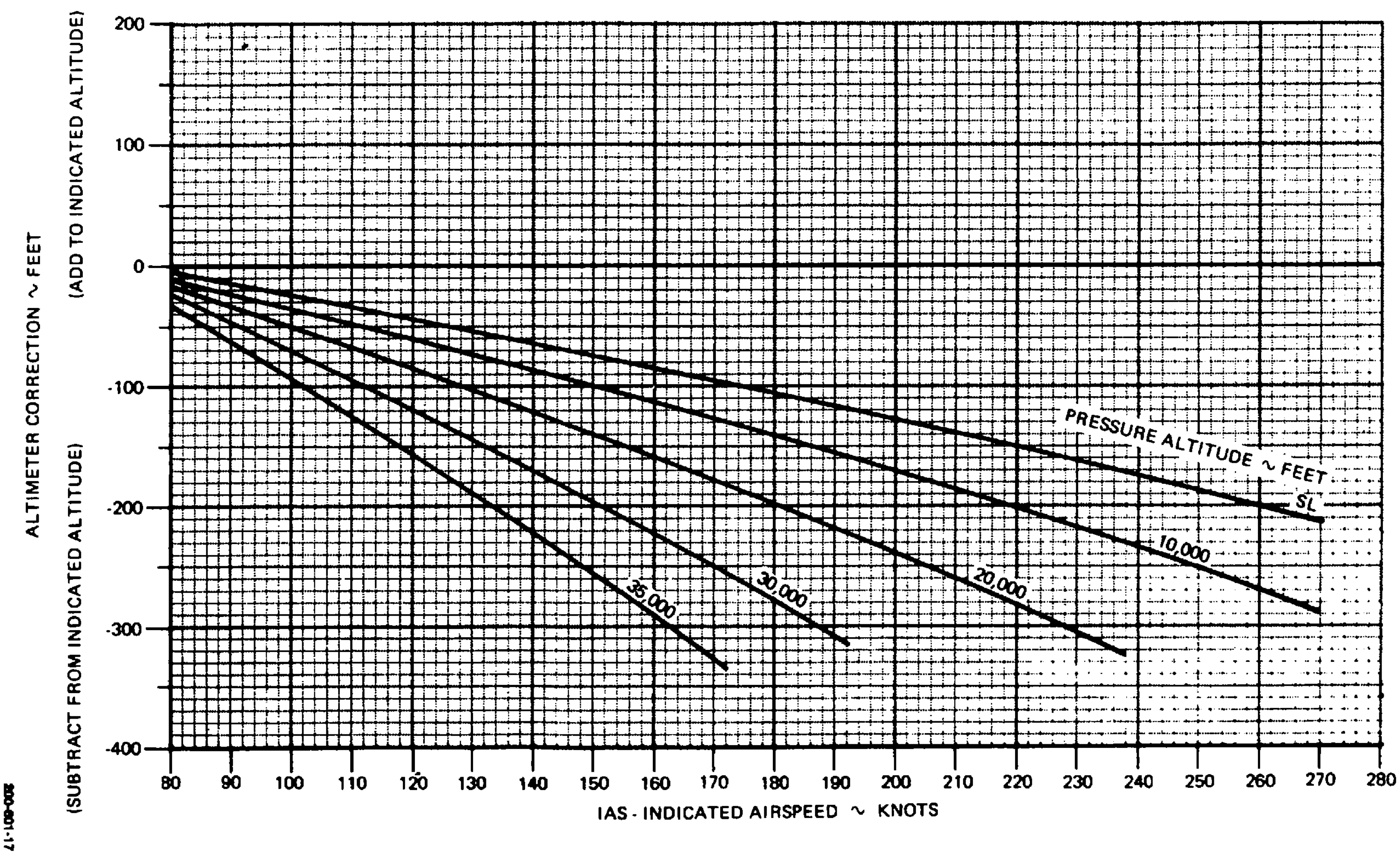

Figure 7-5. Altimeter Correction - Alternate System

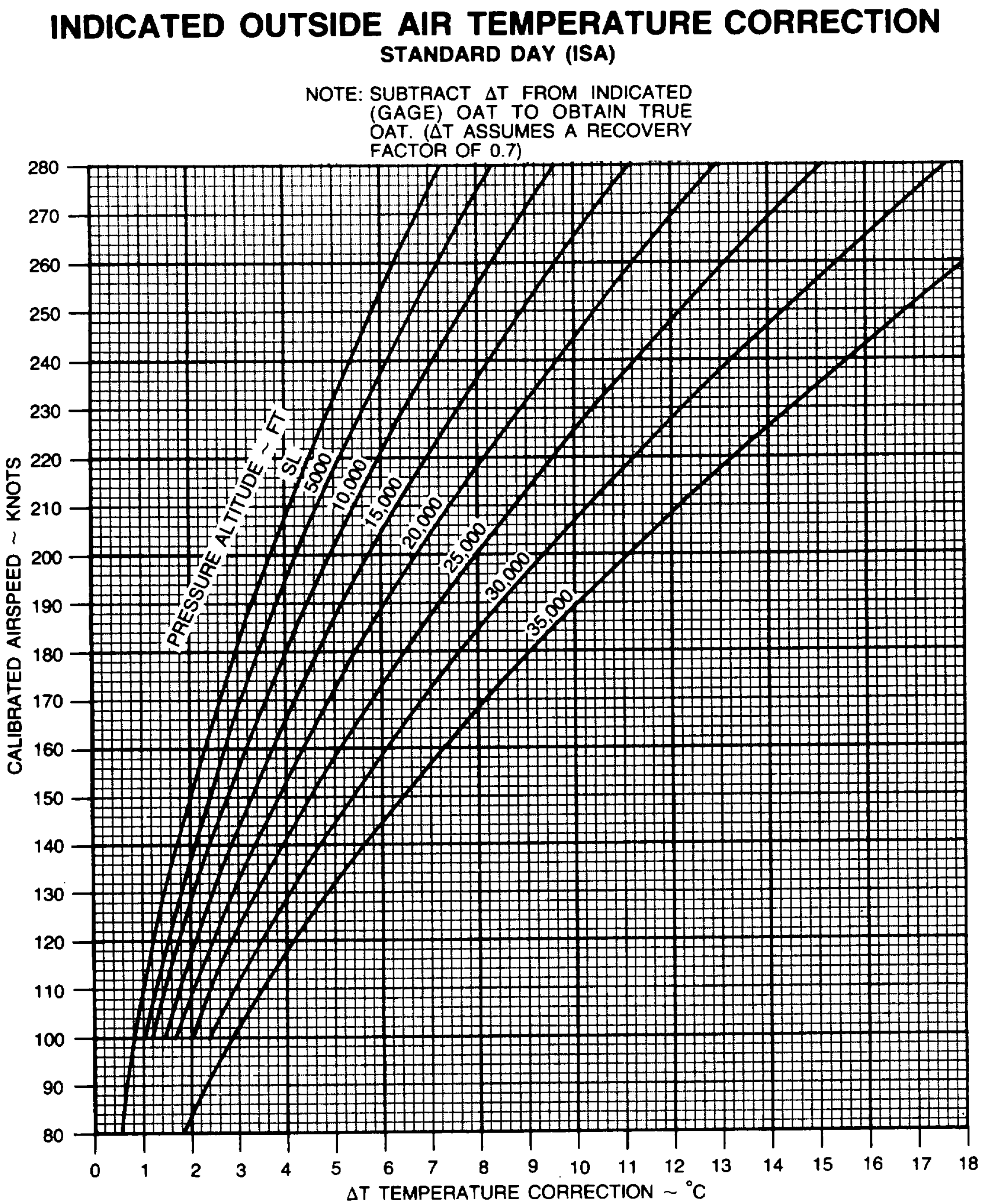

Figure 7-6. Free Air Temperature Correction

ISA CONVERSION

PRESSURE ALTITUDE vs OUTSIDE AIR TEMPERATURE

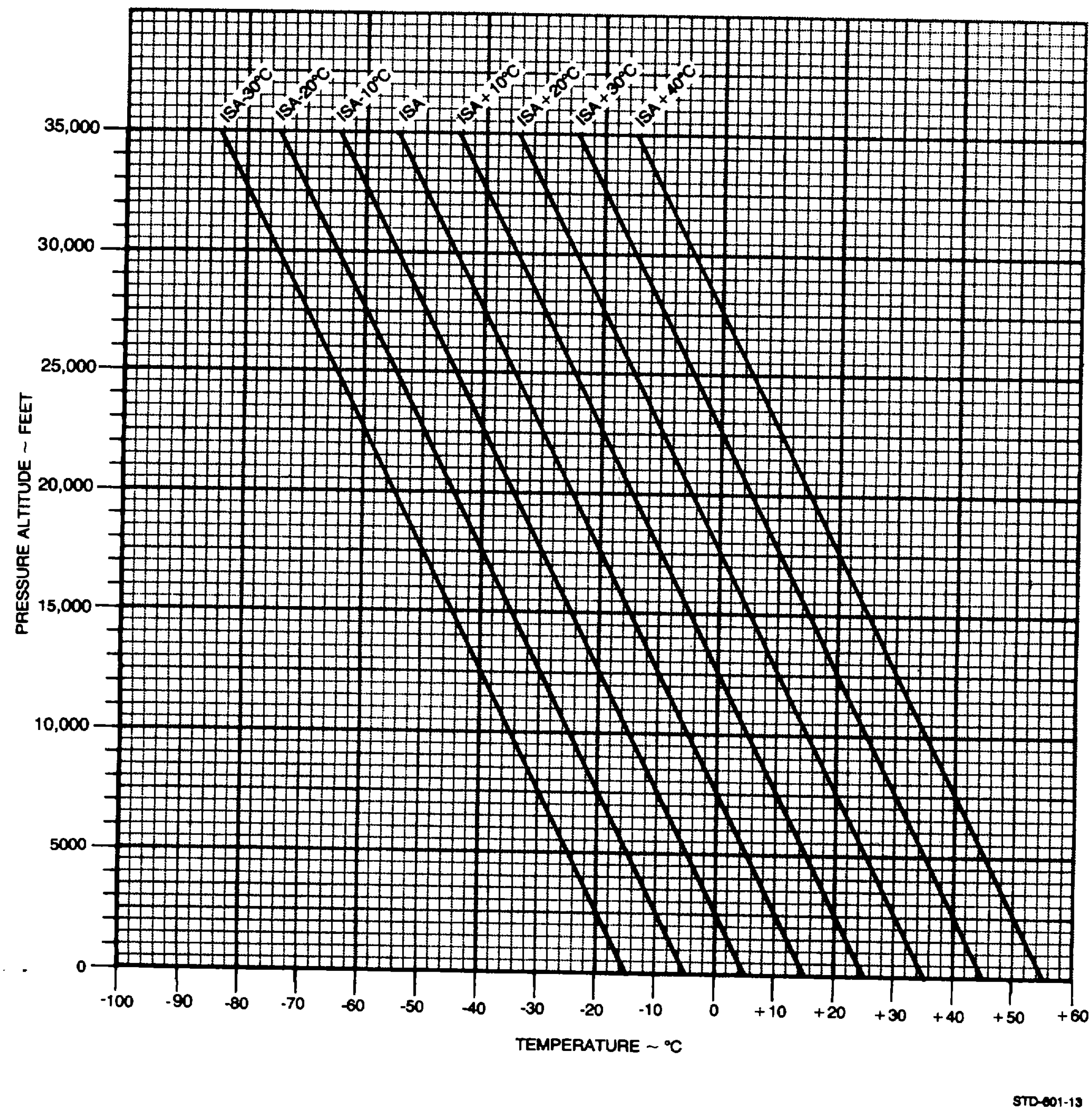

Figure 7-7. ISA Conversion

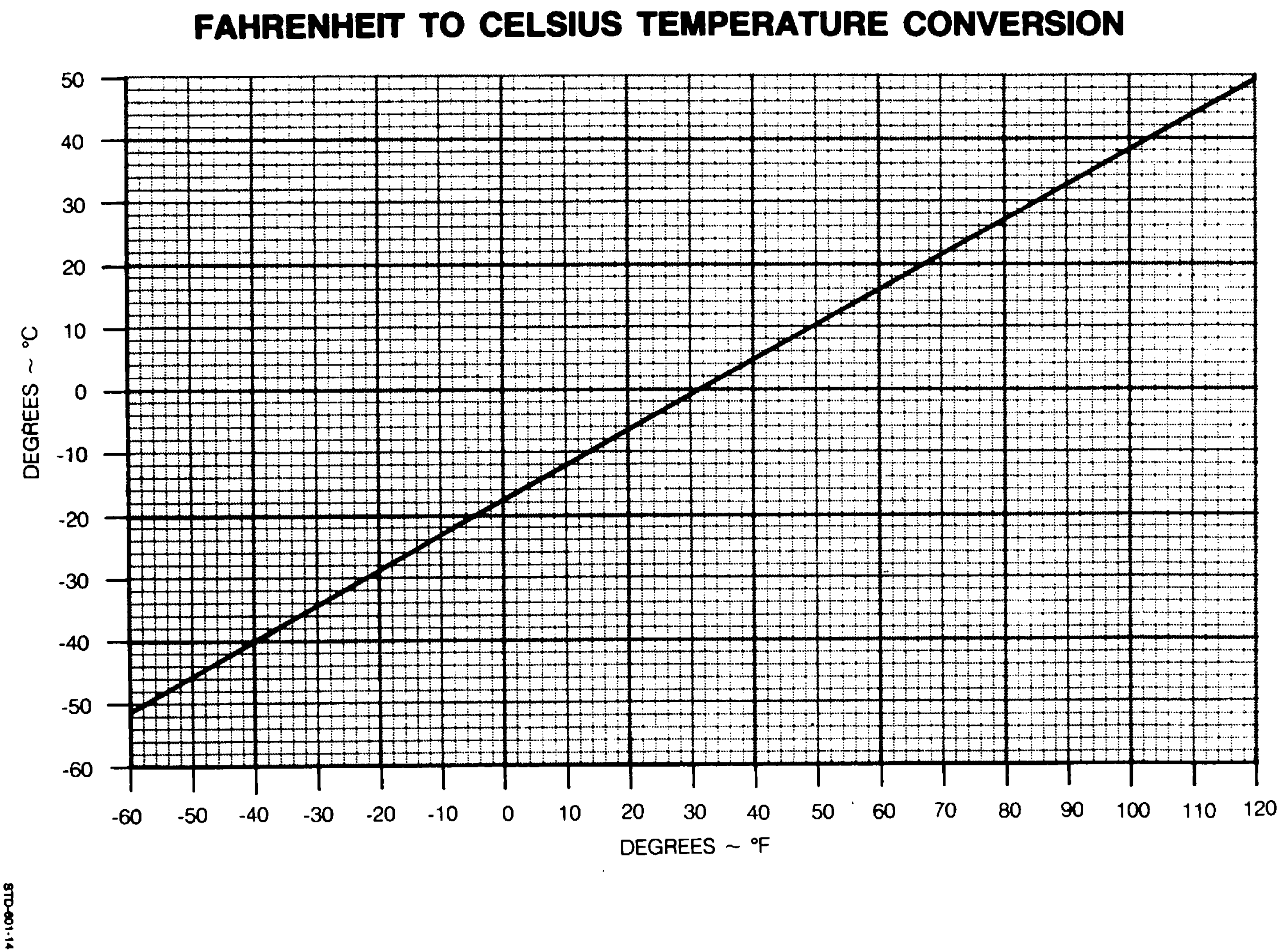

Figure 7-8. Fahrenheit to Celsuis Temperature Conversion

MINIMUM TAKEOFF POWER AT 2000 RPM
(65 knots)

NOTES:

1. TORQUE INCREASES APPROXIMATELY 1% FROM 0 TO 65 KNOTS.
2. THE PERCENT TORQUE INDICATED IN THIS FIGURE IS THE MINIMUM VALUE AT WHICH TAKEOFF PERFORMANCE PRESENTED IN THE SECTION CAN BE REALIZED. ANY EXCESS POWER WHICH MAY BE DEVELOPED WITHOUT EXCEEDING ENGINE LIMITATIONS MAY BE UTILIZED.
3. FOR OPERATION WITH ICE VANES EXTENDED, INCREASE FIELD PRESSURE ALTITUDE 1000 FEET BEFORE ENTERING GRAPH.

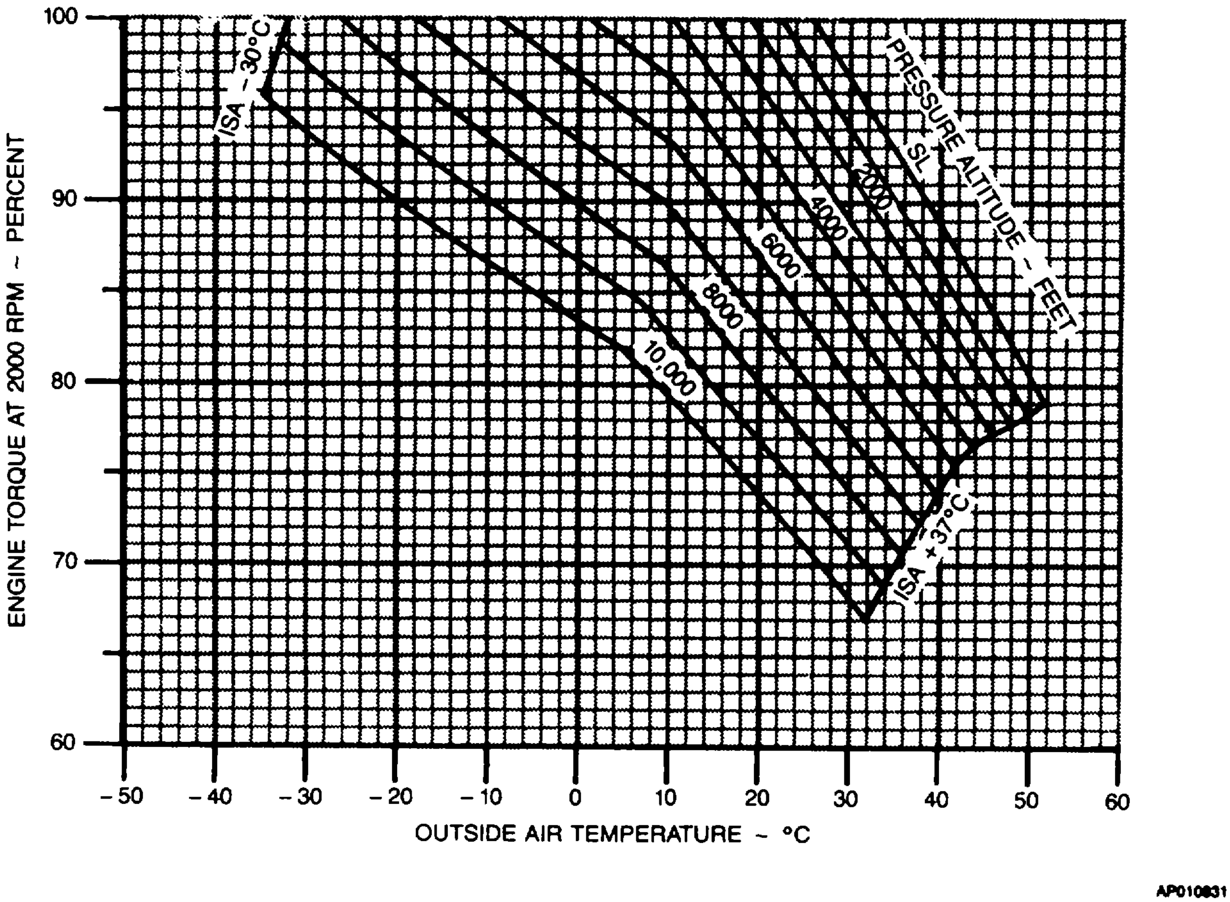

Figure 7-9. Minimum Take-off Power at 2000RPM

MAXIMUM TAKEOFF WEIGHT PERMITTED BY ENROUTE CLIMB REQUIREMENT

ASSOCIATED CONDITIONS:

POWER . . . . .MAXIMUM CONTINUOUS
INOPERATIVE PROPELLER . . .FEATHERED
LANDING GEAR. . . . . .UP
FLAPS .0%

EXAMPLE:

PRESSURE ALTITUDE . . . . 5433 FT
OAT . . . . 28°C

MAXIMUM
TAKEOFF WEIGHT . . . . . 14,090 LBS

NOTE: ONE-ENGINE-INOPERATIVE PERFORMANCE WEIGHT LIMIT IS FOR RATE-OF-CLIMB CAPABILITIES AT 5000 FT PRESSURE ALTITUDE. REFER TO THE CLIMB-ONE ENGINE INOPERATIVE GRAPH FOR ACTUAL CLIMB CAPABILITIES APPLICABLE TO THE PARTICULAR TEMPERATURE AND ALTITUDE BEING CONSIDERED.

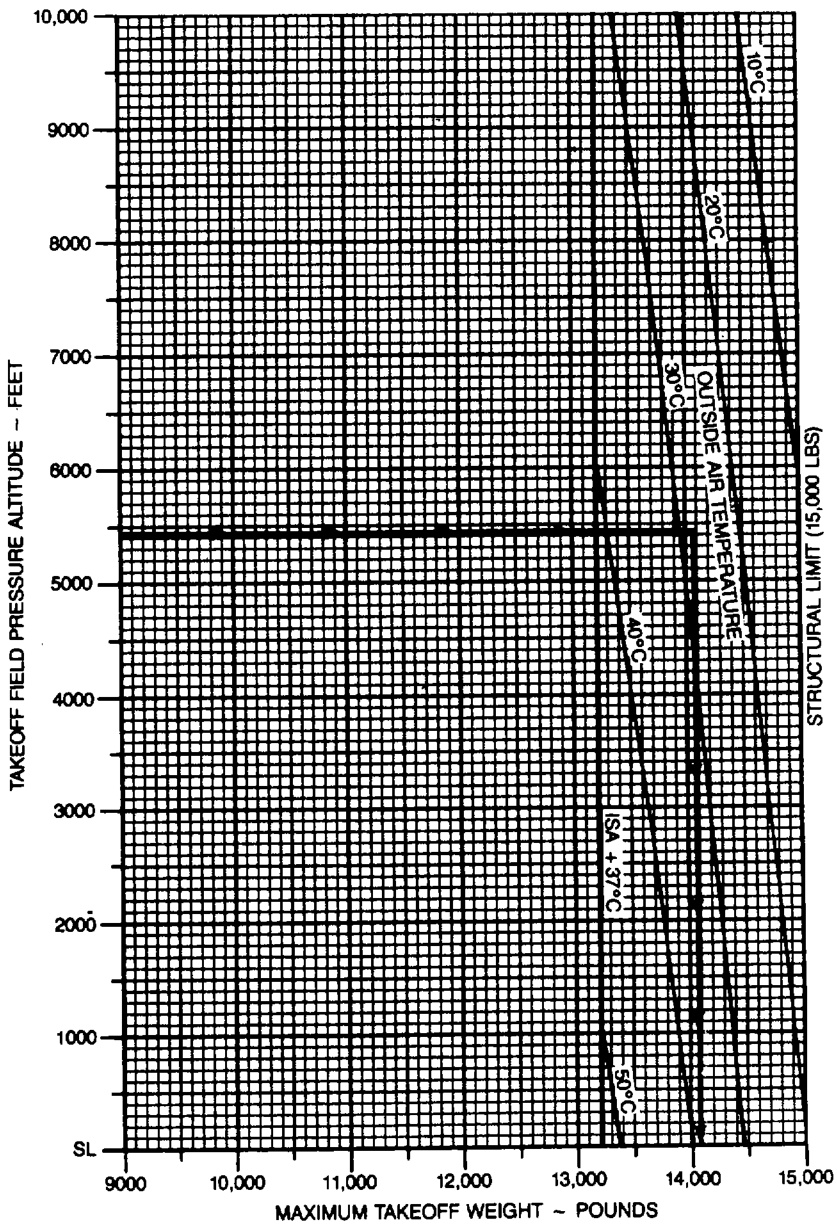

Figure 7-10. Maximum Take-off Weight Permitted by Enroute Climb Requirement

TAKEOFF WEIGHT - FLAPS 0%
TO ACHIEVE POSITIVE ONE-ENGINE-INOPERATIVE CLIMB AT LIFT-OFF

ASSOCIATED CONDITIONS:

POWER	TAKEOFF
FLAPS	0%
LANDING GEAR	DOWN
INOPERATIVE PROPELLER	FEATHERED

EXAMPLE:

PRESSURE ALTITUDE	5433 FT
OAT	28°C
TAKEOFF WEIGHT	12,100 LBS

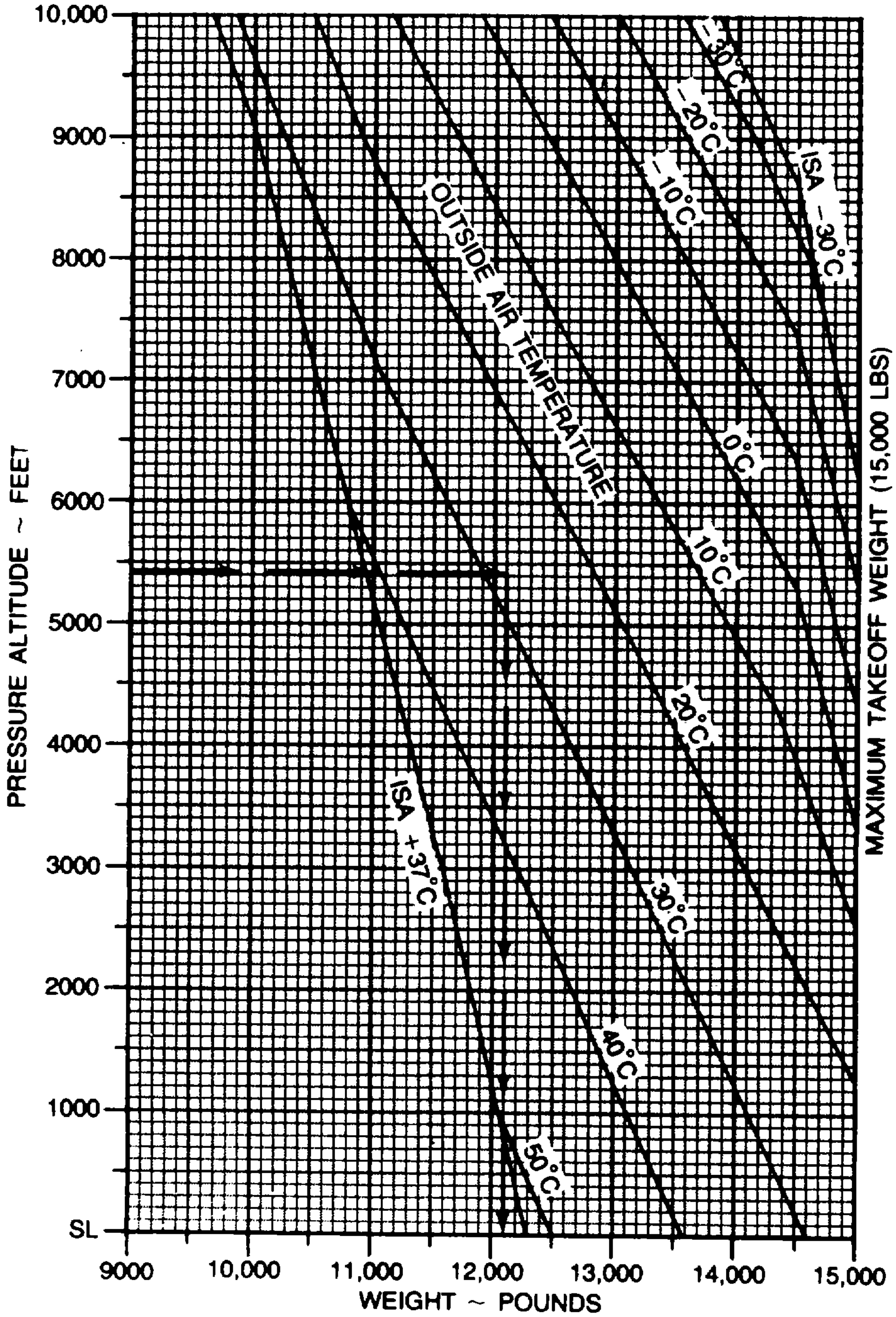

Figure 7-11. Take-off Weight - Flaps 0%, to Achieve Positive One-Engine Climb

TAKEOFF WEIGHT - FLAPS 40%
TO ACHIEVE POSITIVE ONE-ENGINE-INOPERATIVE CLIMB AT LIFT-OFF

ASSOCIATED CONDITIONS:

POWER .... TAKEOFF
FLAPS 40%
LANDING GEAR .... DOWN
INOPERATIVE PROPELLER .... FEATHERED

EXAMPLE:

PRESSURE ALTITUDE ... 5433 FT
OAT .... 28°C

TAKEOFF WEIGHT ..... 10,960 LBS

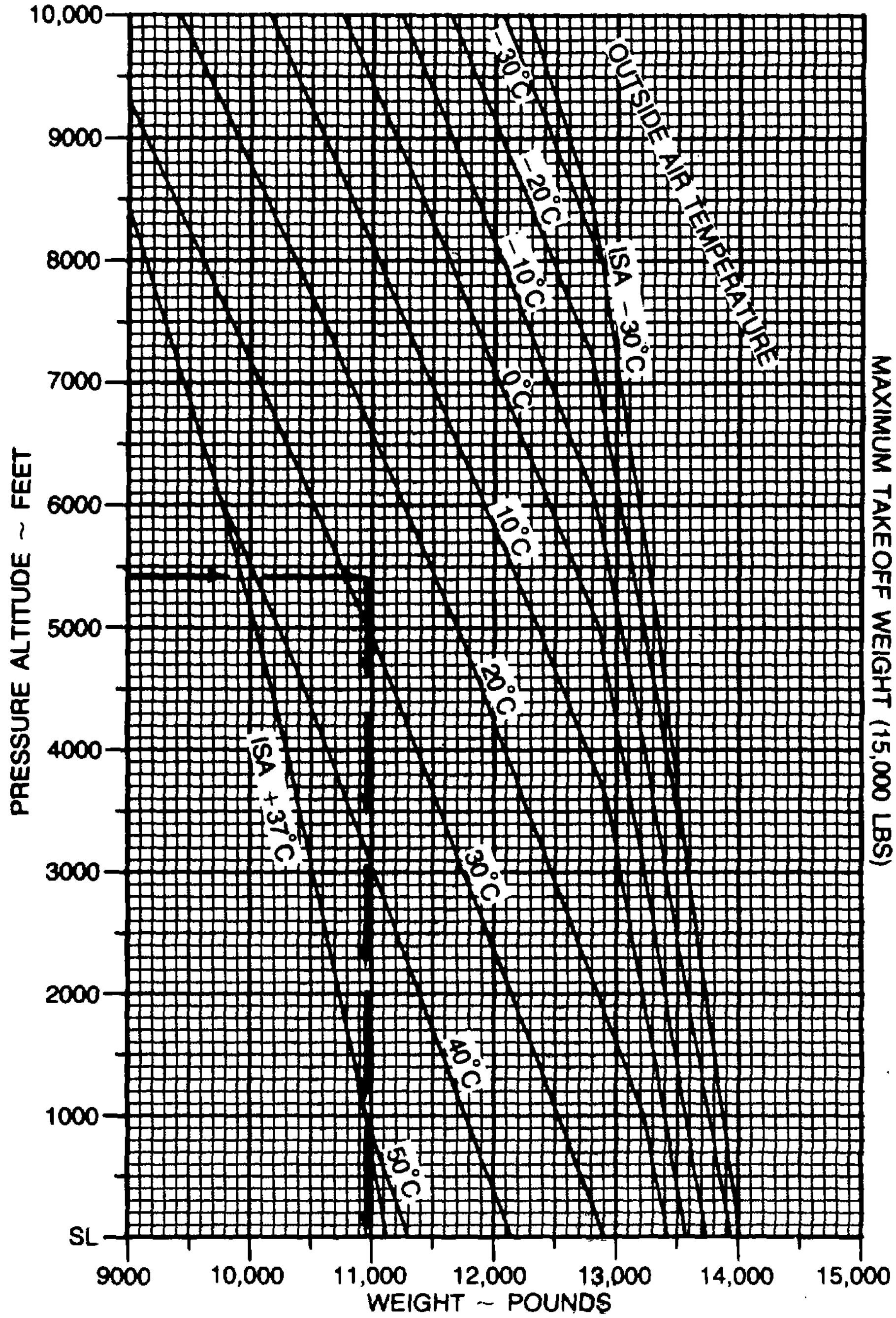

Figure 7-12. Takeoff Weight - Flaps 40%, to Achieve Positive One-Engine Climb

WIND COMPONENTS

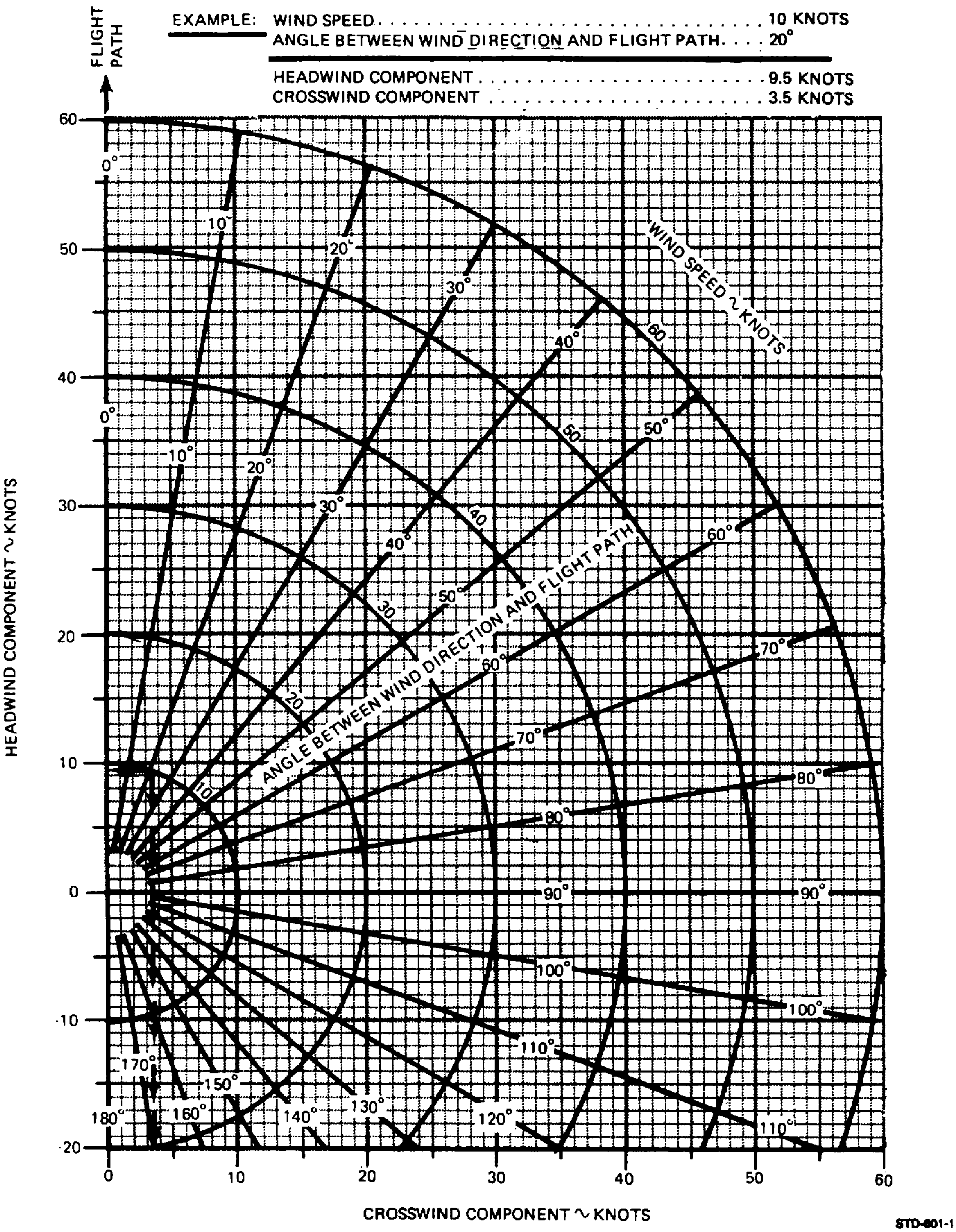

Figure 7-13. Wind Components

TAKEOFF DISTANCE — FLAPS 0%

ASSOCIATED CONDITIONS:

POWER. . . . . .TAKEOFF POWER SET BEFORE BRAKE RELEASE
FLAPS. 0%
LANDING GEAR . . .RETRACT AFTER LIFT-OFF
RUNWAY. . . . . .PAVED, LEVEL, DRY SURFACE

WEIGHT ~ POUNDS	TAKEOFF SPEED ~ KNOTS	
	ROTATION	50-FT
15,000	107	126
13,000	103	121
11,000	98	115
9000	92	103

EXAMPLE:

OAT . . . . .28°C
PRESSURE ALTITUDE . . . . .5433 FT
TAKEOFF WEIGHT . . . . .12,100 LBS
HEADWIND COMPONENT . . . . .10 KTS

GROUND ROLL . . . . .3280 FT
TOTAL DISTANCE OVER
50-FT OBSTACLE . . . . .5000 FT
TAKEOFF SPEED AT ROTATION . . .101 KTS
AT 50-FT .118 KTS

NOTES: 1. FOR OPERATION WITH ICE VANES EXTENDED, INCREASE TOTAL DISTANCE OVER 50-FOOT OBSTACLE BY 7%.
2. ADD 15% TO OR SUBTRACT 2% FROM TOTAL TAKEOFF DISTANCE FOR EACH 1% OF RUNWAY SLOPE (UP-ADD; DOWN-SUBTRACT).

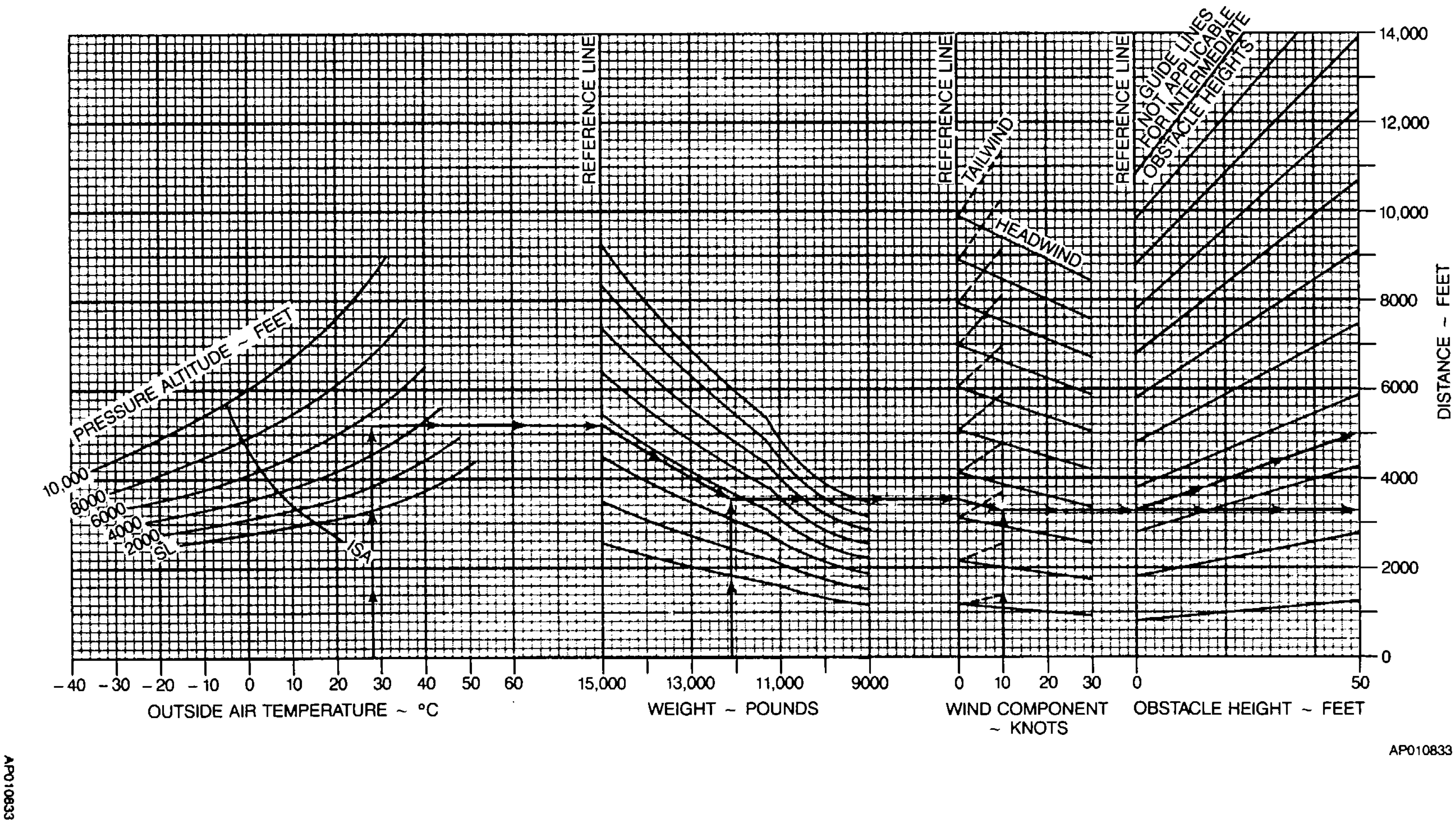

Figure 7-14. Takeoff Distance - Flaps 0%

ACCELERATE-STOP — FLAPS 0%

ASSOCIATED CONDITIONS:

POWER ....1. TAKEOFF POWER SET BEFORE BRAKE RELEASE
2. BOTH ENGINES IDLE AT V_R AND REVERSE OPERATING ENGINE

FLAPS 0%

AUTOFEATHER . . .ARMED

BRAKING ....MAXIMUM

RUNWAY ....PAVED, LEVEL, DRY SURFACE

WEIGHT ~ POUNDS	V_R ~ KNOTS
15,000	107
13,000	103
11,000	98
9000	92

EXAMPLE:

OAT ....28°C

PRESSURE ALTITUDE ......5433 FT

WEIGHT..................12,100 LBS

HEADWIND COMPONENT . . .10 KTS

FIELD LENGTH ....5100 FT

V_R ....101 KTS

NOTE: 1. FOR OPERATION WITH ICE VANES EXTENDED, INCREASE ACCELERATE-STOP FIELD LENGTH BY 3%.

2. ADD 8% TO ACCELERATE-STOP FIELD LENGTH FOR EACH 1% OF UPHILL RUNWAY SLOPE; DO NOT SUBTRACT ANYTHING FOR DOWNHILL SLOPE.

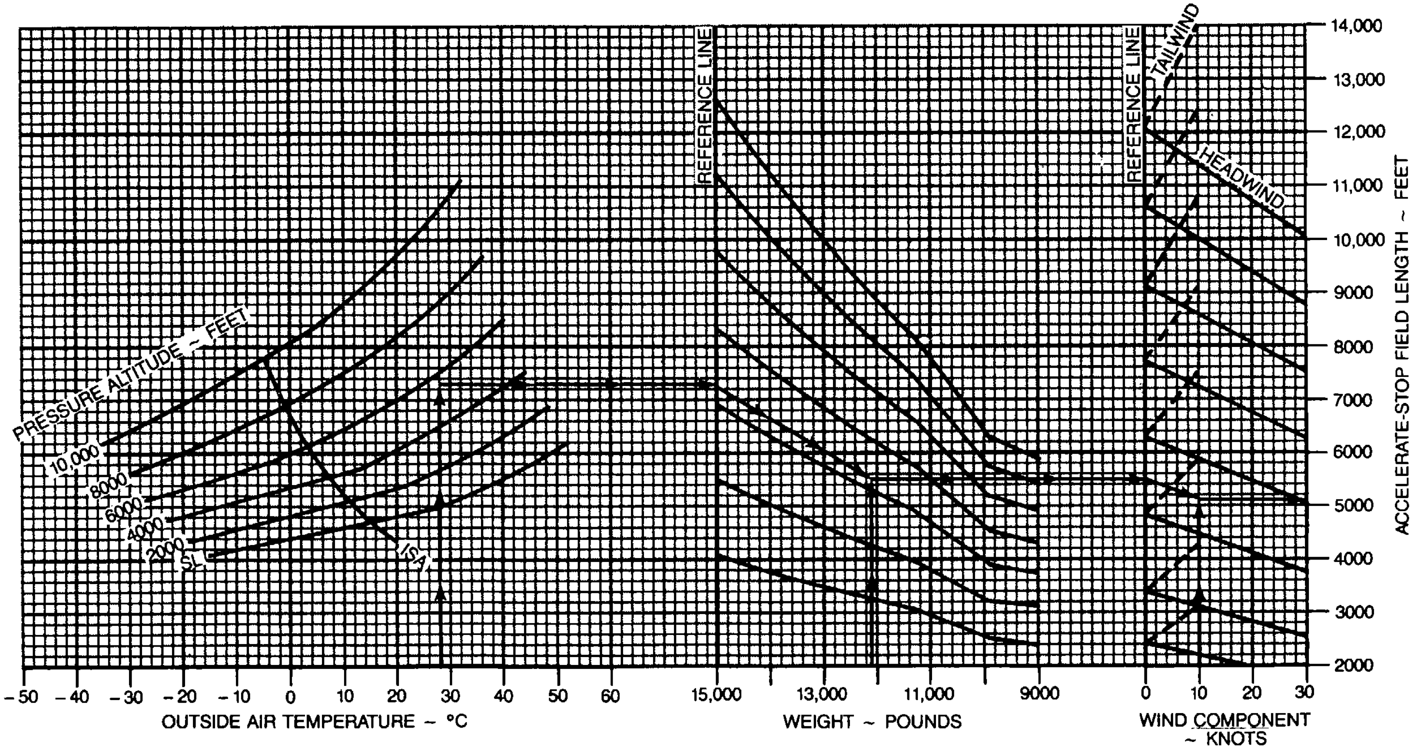

Figure 7-15. Accelerate Stop - Flaps 0%

STOPPING DISTANCE FACTORS

EXAMPLES:

1. LANDING DISTANCE (FLAPS 100%, NO REV)
   GROUND ROLL (DRY) .... 1215 FT
   TOTAL OVER 50-FT OBSTACLE .... 2120 FT
   RUNWAY CONDITION READING 8
   LANDING WEIGHT .... 10,153 LBS

   STOPPING FACTOR 1.96
   LANDING DISTANCE
   GROUND ROLL (1215 X 1.96)........ 2381 FT
   AIR DISTANCE (2120 − 1215)........... 905 FT
   TOTAL OVER 50-FT OBSTACLE .... 3286 FT

2. ACCELERATE-STOP DISTANCE (FLAPS 0%, NO REV)*
   ACCELERATE-STOP DISTANCE .... 5100 FT
   ACCELERATE BEFORE LIFT-OFF
   GROUND ROLL .... 3280 FT
   RUNWAY CONDITION READING 10
   TAKE-OFF WEIGHT .... 12,100 LBS

   STOPPING FACTOR 1.62
   STOPPING DISTANCE
   (5100 − 3280) X 1.62 .... 2948 FT
   ACCELERATE DISTANCE .... 3280 FT
   ACCELERATE-STOP DISTANCE .... 6228 FT

NOTES:
1. IF RCR READING IS NOT AVAILABLE, ASSUME ICY RUNWAY RCR = 5 AND WET RUNWAY RCR = 12.
*2. DO NOT USE "WITH REVERSING" CURVES TO DETERMINE ONE-ENGINE-INOPERATIVE STOPPING DISTANCE FACTORS.

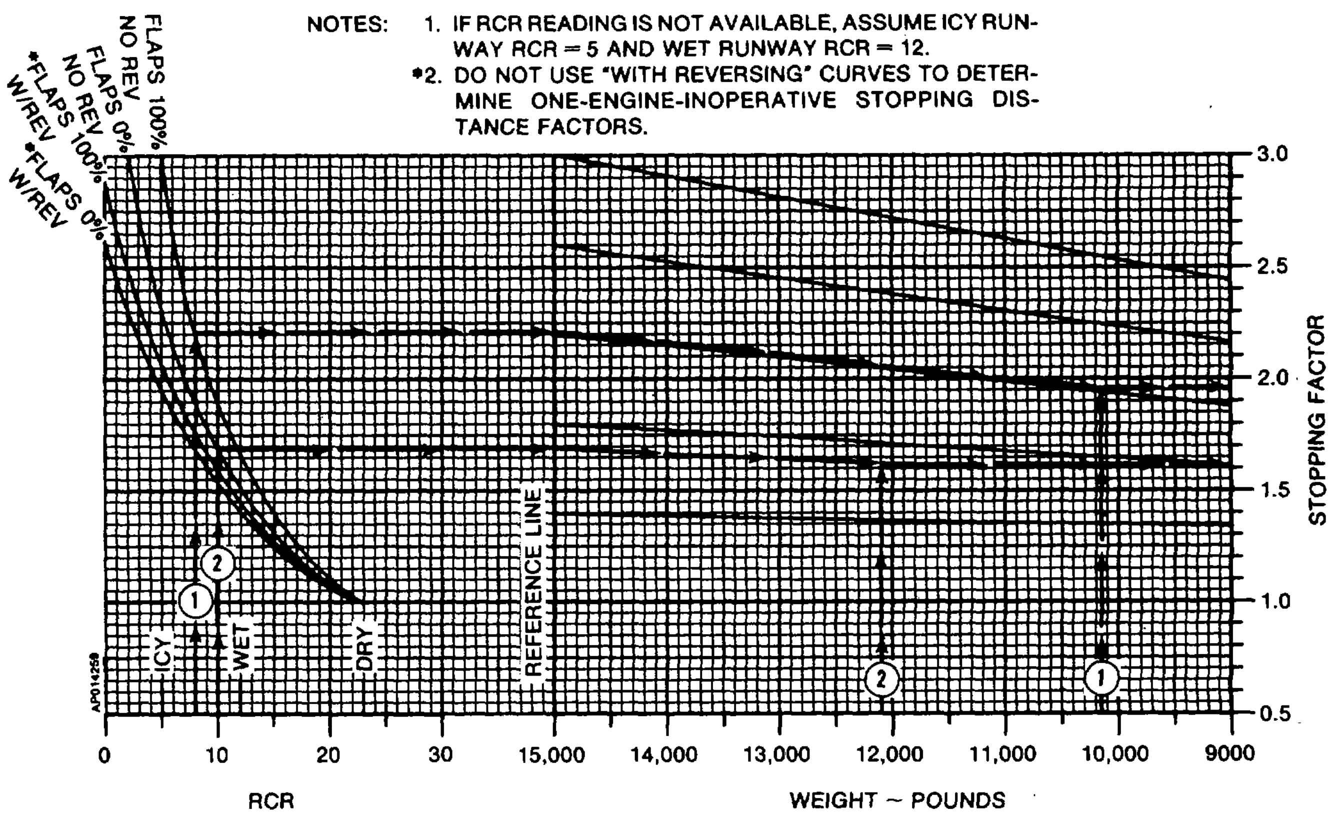

Figure 7-15A. Stopping Distance Factors

ACCELERATE-GO DISTANCE OVER 50-FT OBSTACLE — FLAPS 0%

ASSOCIATED CONDITIONS:

POWER. . . . . .TAKEOFF POWER SET BEFORE BRAKE RELEASE
FLAPS. 0%
AUTOFEATHER. . . .ARMED
LANDING GEAR . . .RETRACT AFTER LIFT-OFF
RUNWAY. . . . . .PAVED, LEVEL, DRY SURFACE

WEIGHT ~ POUNDS	SPEED ~ KNOTS	
	V_R	CLIMB SPEED
15,000	107	126
13,000	103	121
11,000	98	115
9000	92	103

EXAMPLE:

OAT . . . . .28°C
PRESSURE ALTITUDE . . . . . .5433 FT
TAKEOFF WEIGHT . . . . .10,000 LBS
HEADWIND COMPONENT . . .10 KTS

TAKEOFF DISTANCE OVER 50-FT OBSTACLE. . . . . .7800 FT
SPEEDS V_R . . . . .95 KTS
CLIMB SPEED. . . . . .109 KTS

NOTES: 1. DISTANCES ASSUME AN ENGINE FAILURE AT ROTATION AND PROPELLER IMMEDIATELY FEATHERED.
2. FOR OPERATION WITH ICE VANES EXTENDED, INCREASE TAKEOFF DISTANCE OVER 50-FOOT OBSTACLE BY 14%.
3. ADD 16% OR SUBTRACT 2% OF TAKEOFF FIELD LENGTH FOR EACH 1% OF RUNWAY SLOPE (UP- ADD; DOWN-SUBTRACT).

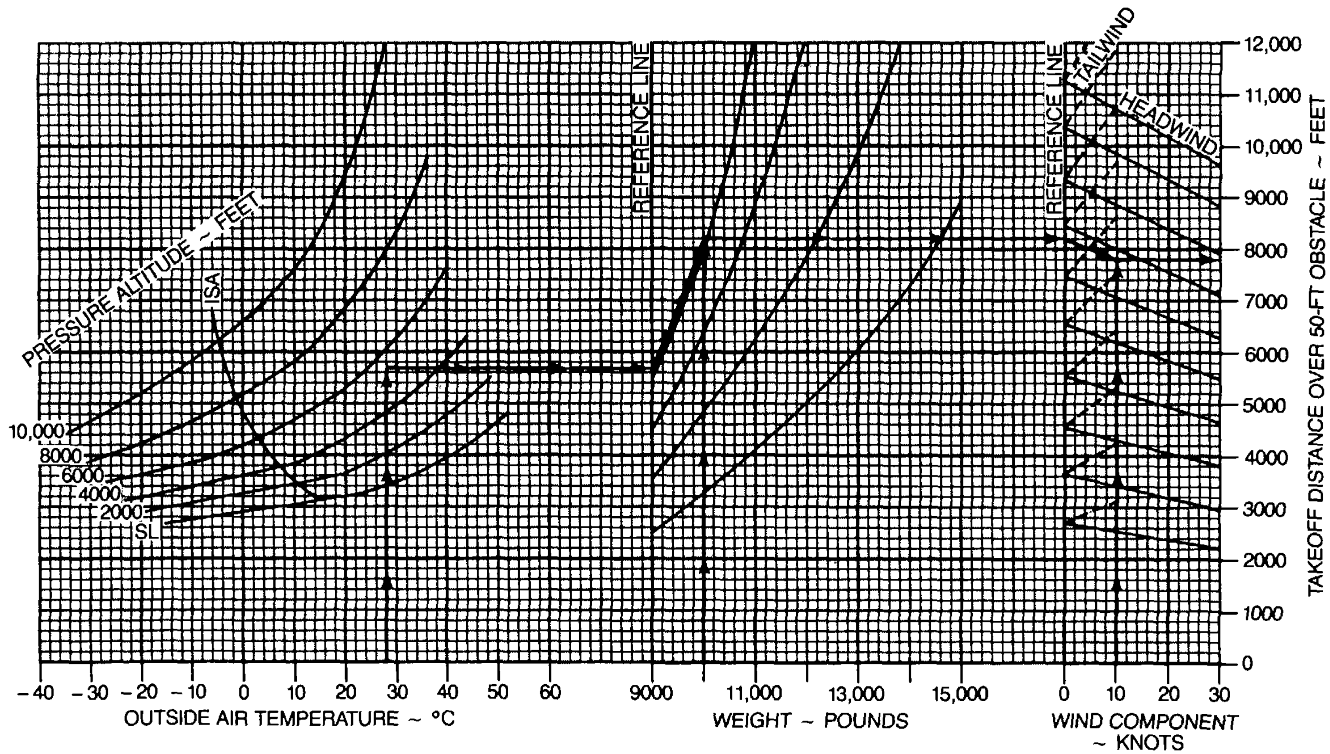

Figure 7-16. Accelerate - Go Distance Over 50-Ft Obstacle - Flaps 0%

TAKEOFF CLIMB GRADIENT — ONE ENGINE INOPERATIVE — FLAPS 0%

ASSOCIATED CONDITIONS:

POWER . . . . .TAKEOFF
FLAPS .0%
LANDING GEAR . . . . .UP
INOPERATIVE PROPELLER . . .FEATHERED

WEIGHT ~ POUNDS	CLIMB SPEED ~ KNOTS
15,000	126
13,000	121
11,000	115
9000	103

EXAMPLE:

OAT . . . . .28°C
PRESSURE ALTITUDE . . .5433 FT
WEIGHT. . . . . .10,000 LBS

CLIMB GRADIENT 4.2%
CLIMB SPEED. . . . . .109 KTS

NOTE: FOR OPERATION WITH ICE VANES EXTENDED, SUBTRACT 0.5 PERCENTAGE UNITS FROM CLIMB GRADIENT (EXAMPLE: 4.2% – 0.5% = 3.7%).

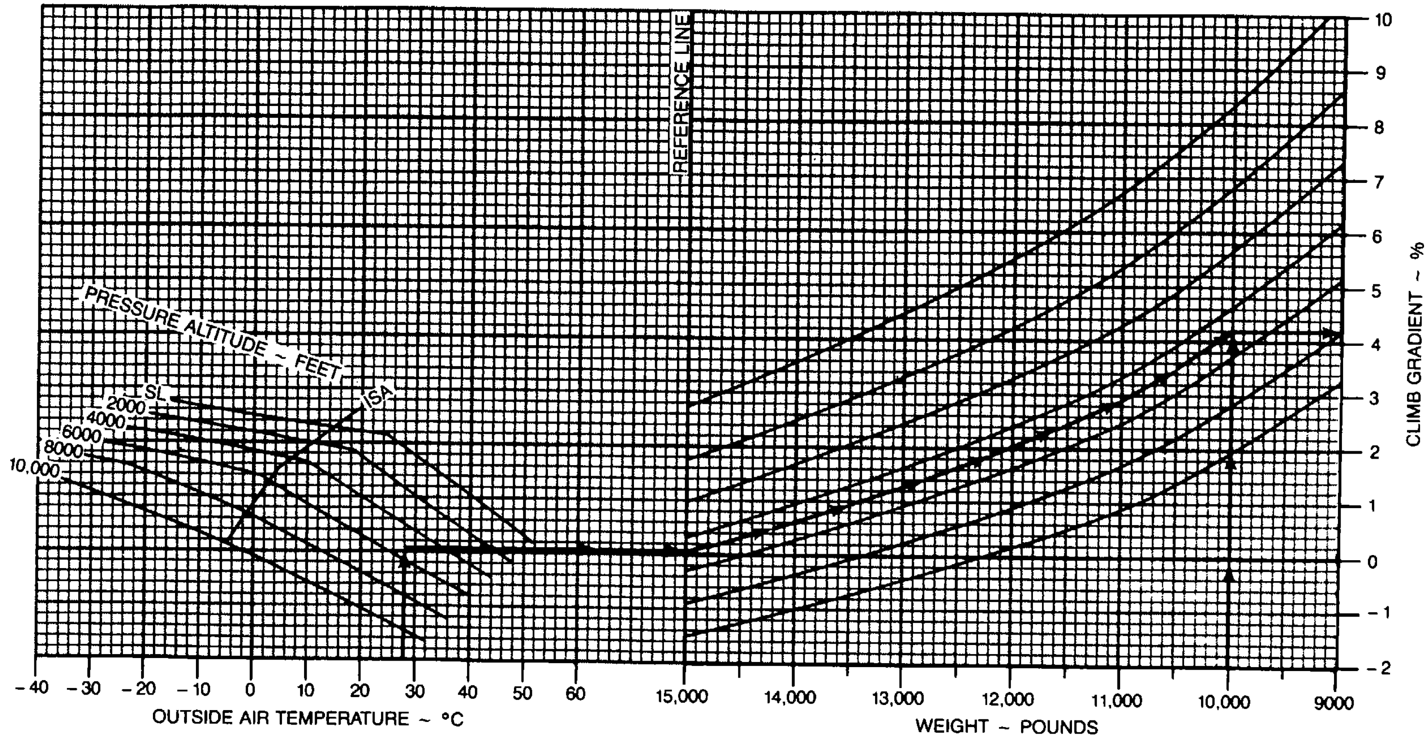

Figure 7-17. Takeoff Climb Gradient - One-Engine-Inoperative - Flaps 0%

TAKEOFF DISTANCE — FLAPS 40%

ASSOCIATED CONDITIONS:

POWER .... TAKEOFF POWER SET BEFORE BRAKE RELEASE
FLAPS 40%
LANDING GEAR... RETRACT AFTER LIFT-OFF
RUNWAY .... PAVED. LEVEL. DRY SURFACE

WEIGHT ~ POUNDS	TAKEOFF SPEED ~ KNOTS	
	ROTATION	50-FT
15,000	94	111
13,000	92	103
11,000	92	99
9000	92	99

EXAMPLE:

OAT .... 28°C
PRESSURE ALTITUDE........... 5433 FT
TAKEOFF WEIGHT.............. 10,960 LBS
HEADWIND COMPONENT .... 10 KTS

GROUND ROLL................ 2600 FT
TOTAL DISTANCE OVER 50-FT OBSTACLE .... 4020 FT
TAKEOFF SPEED AT ROTATION ... 92 KTS
AT 50-FT OBSTACLE .... 99 KTS

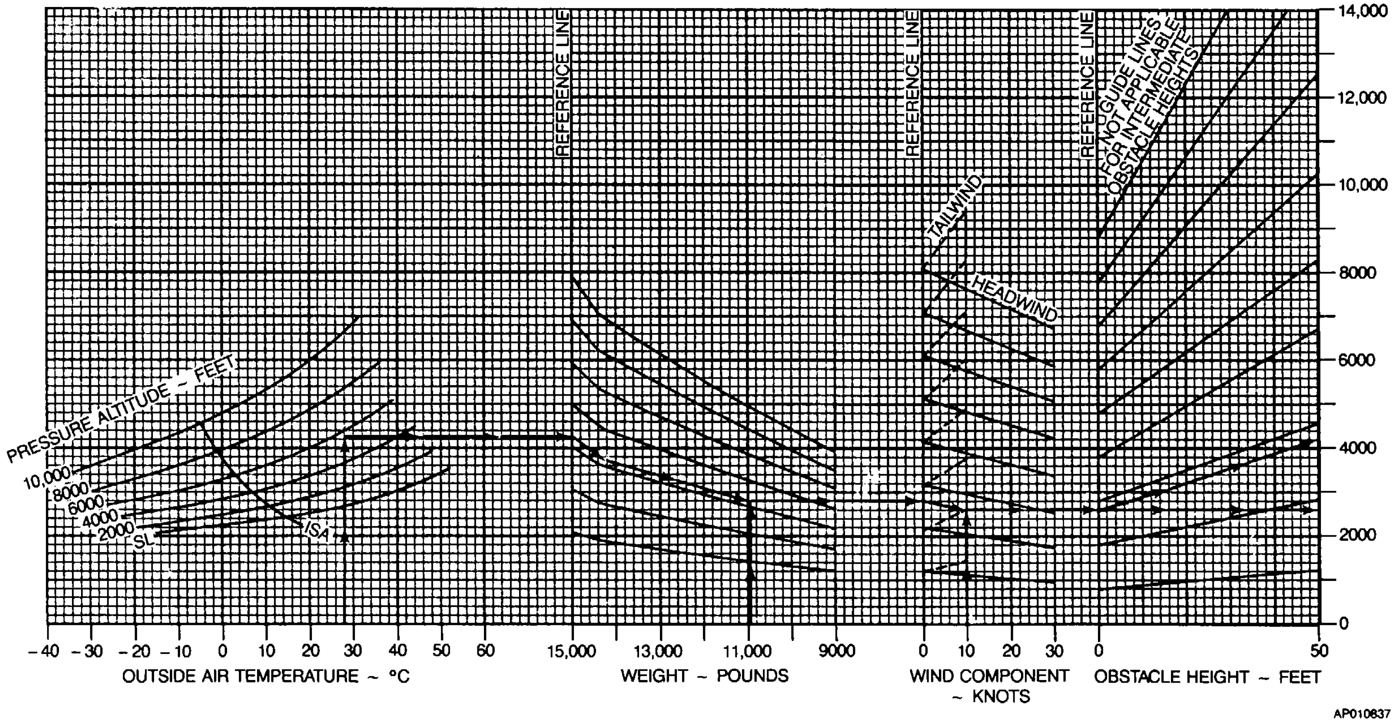

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Figure 7-18. Takeoff Distance - Flaps 40%

ACCELERATE-STOP — FLAPS 40%

ASSOCIATED CONDITIONS:

POWER . . . . 1. TAKEOFF POWER SET BEFORE BRAKE RELEASE
2. BOTH ENGINES IDLE AT V_R AND REVERSE OPERATING ENGINE
FLAPS 40%
AUTOFEATHER . . . ARMED
BRAKING . . . . MAXIMUM
RUNWAY . . . . PAVED, LEVEL, DRY SURFACE

WEIGHT ~ POUNDS	V_R ~ KNOTS
15,000	94
13,000	92
11,000	92
9000	92

EXAMPLE:

OAT . . . . 28°C
PRESSURE ALTITUDE . . . . 5433 FT
WEIGHT. . . . . 10,960 LBS
HEADWIND COMPONENT . . . . 10 KTS

FIELD LENGTH . . . . 4250 FT
V_R . . . . 92 KTS

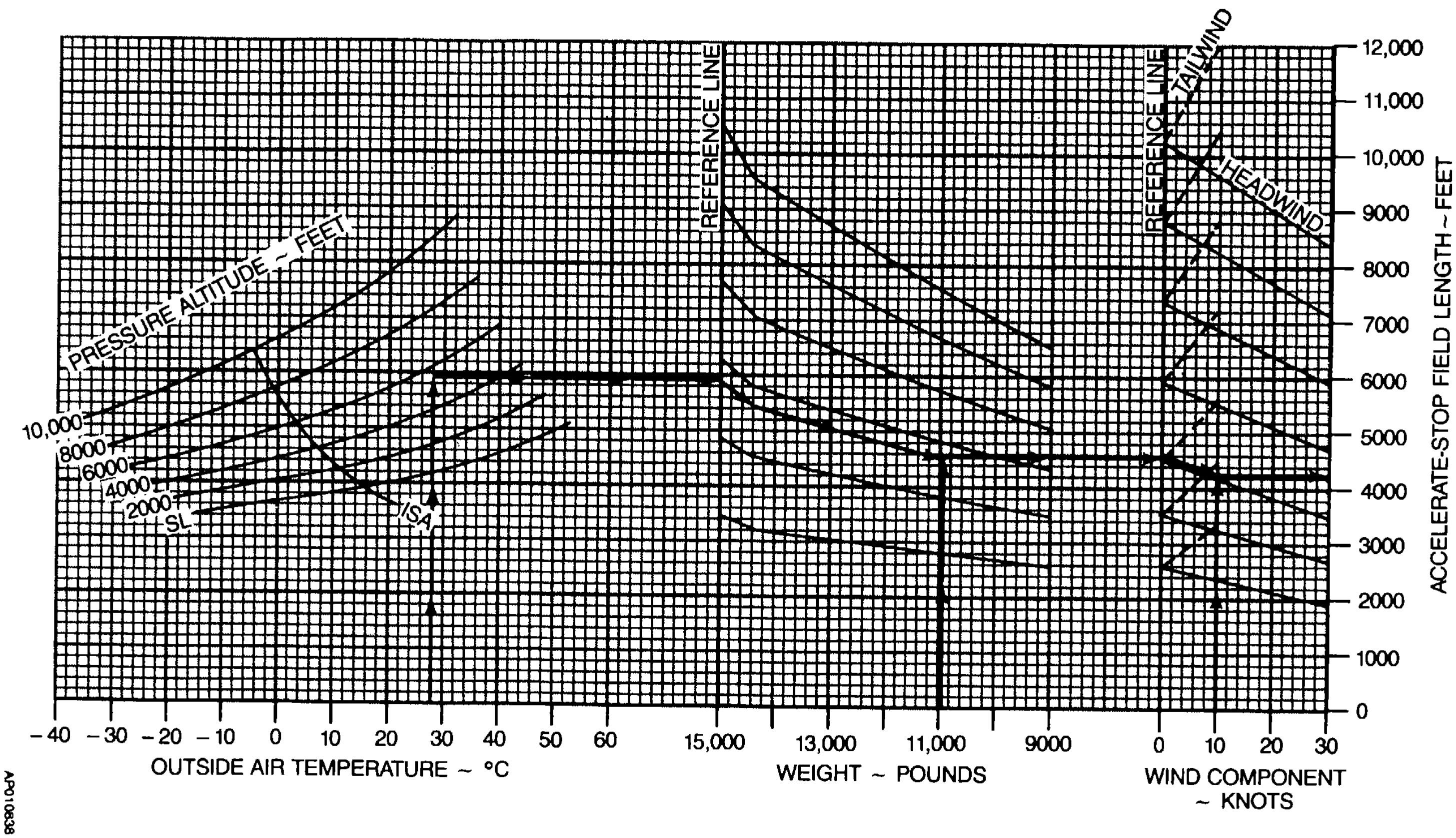

Figure 7-19. Accelerate-Stop - Flaps 40%

ACCELERATE-GO DISTANCE OVER 50-FOOT OBSTACLE — FLAPS 40%

ASSOCIATED CONDITIONS:

POWER..........TAKEOFF POWER
SET BEFORE BRAKE RELEASE
FLAPS...........40%
AUTOFEATHER....ARMED
LANDING GEAR...RETRACT AFTER LIFT-OFF
RUNWAY.........PAVED, LEVEL, DRY SURFACE

WEIGHT ~ POUNDS	SPEED ~ KNOTS	
	V_R	CLIMB SPEED
15,000	94	111
13,000	92	103
11,000	92	99
9000	92	99

EXAMPLE:

OAT .... 28°C
PRESSURE ALTITUDE ...... 5433 FT
TAKEOFF WEIGHT .... 10,000 LBS
HEADWIND COMPONENT... 10 KTS

TAKEOFF DISTANCE OVER
50-FT OBSTACLE......... 6750 FT
V_R...................... 92 KTS
CLIMB SPEED............. 99 KTS

NOTES: 1. DISTANCES ASSUME AN ENGINE FAILURE AT ROTATION AND PROPELLER IMMEDIATELY FEATHERED.
2. WEIGHTS IN SHADED AREA MAY NOT PROVIDE POSITIVE ONE-ENGINE-INOPERATIVE CLIMB. REFER TO "MAXIMUM TAKEOFF WEIGHT TO ACHIEVE POSITIVE ONE-ENGINE-INOPEATIVE CLIMB AT LIFT-OFF" GRAPH FOR MAXIMUM WEIGHT AT WHICH THE ACCELERATE-GO PROCEDURE SHOULD BE ATTEMPTED.

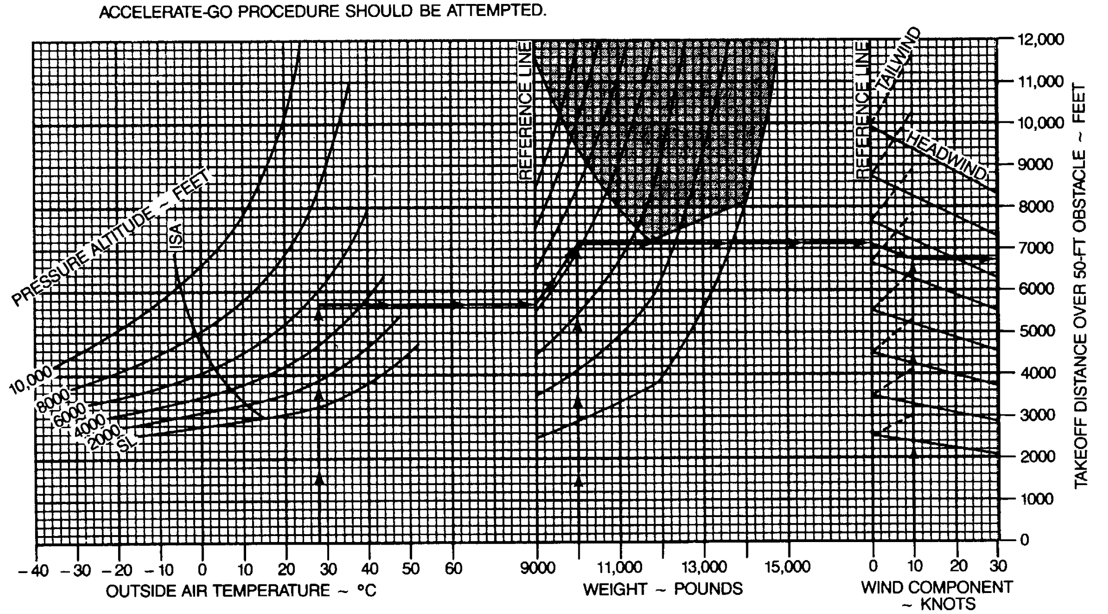

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Figure 7-20. Accelerate-Go Distance Over 50-Ft Obstacle - Flaps 40%

TAKEOFF CLIMB GRADIENT — ONE ENGINE INOPERATIVE — FLAPS 40%

ASSOCIATED CONDITIONS:
POWER .... TAKEOFF
FLAPS 40%
LANDING GEAR............ UP
INOPERATIVE PROPELLER... FEATHERED

WEIGHT ~POUNDS	CLIMB SPEED ~KNOTS
15,000	111
13,000	103
11,000	98
9000	98

EXAMPLE:
OAT .... 28°C
PRESSURE ALTITUDE... 5433 FT
WEIGHT.............. 10,000 LBS

CLIMB GRADIENT...... 3.2%
CLIMB SPEED.......... 98 KTS

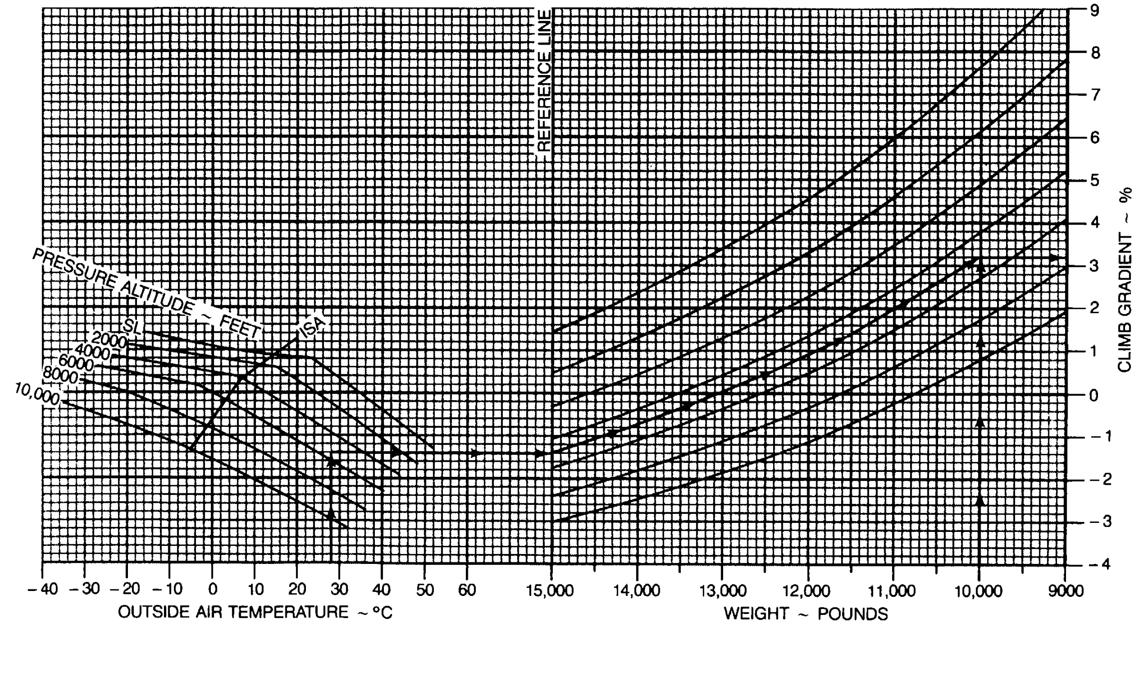


Figure 7-21. Takeoff Climb Gradient - One-Engine-Inoperative - Flaps 40%

CLIMB — TWO ENGINES — FLAPS 0%

ASSOCIATED CONDITIONS:

POWER .... MAXIMUM CONTINUOUS
FLAPS 0%
LANDING GEAR... UP

WEIGHT ~ POUNDS	CLIMB SPEED ~ KNOTS
15,000	135
13,000	130
11,000	123
9000	121

EXAMPLE:

OAT .... 0°C
PRESSURE ALTITUDE ... 16,000 FT
WEIGHT................ 10,500 LBS.

RATE-OF-CLIMB .... 1460 FT/MIN
CLIMB GRADIENT....... 8.5%
CLIMB SPEED........... 122 KTS

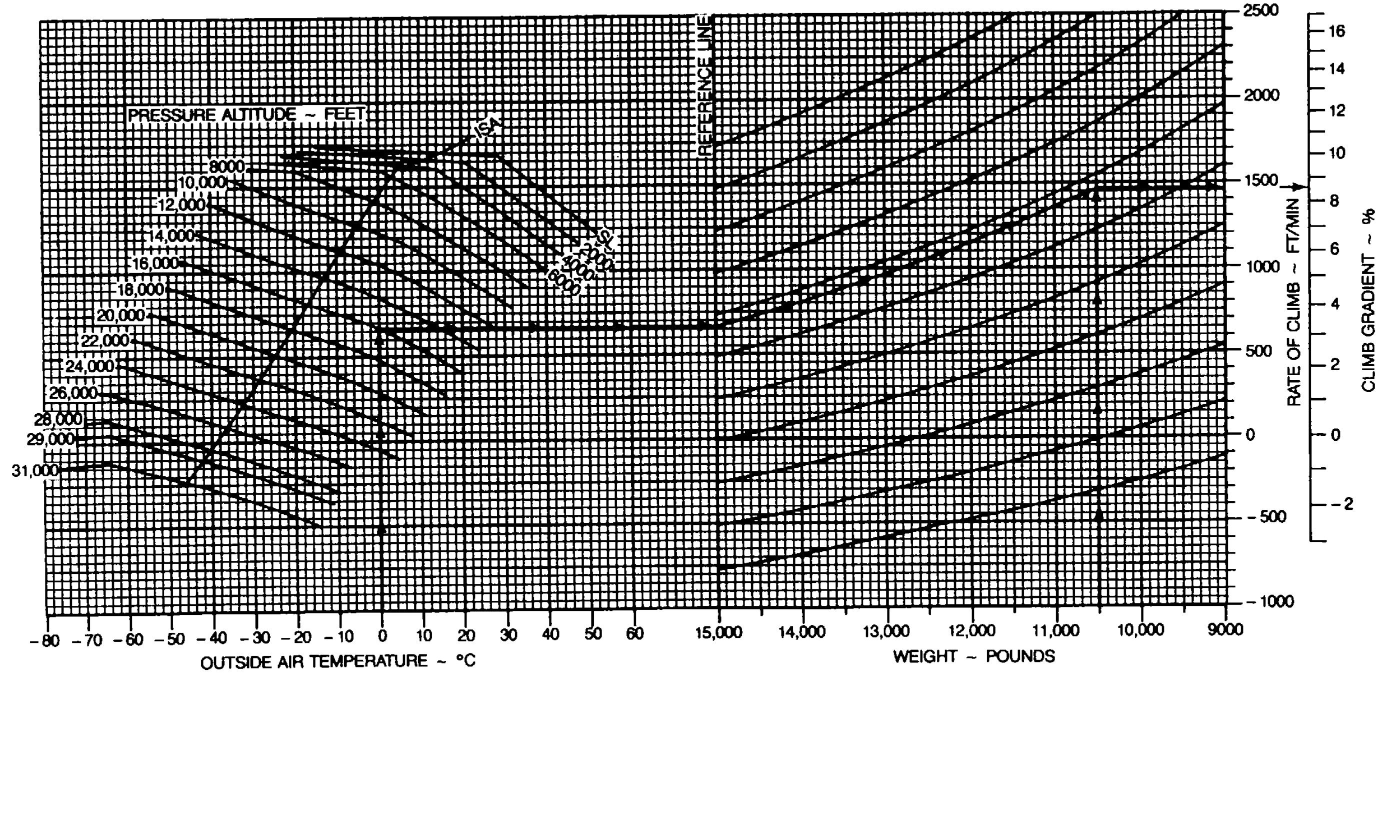


Figure 7-22. Climb Two-Engine - Flaps 0%

CLIMB — TWO ENGINES — FLAPS 40%

ASSOCIATED CONDITIONS:

POWER .... MAXIMUM CONTINUOUS
FLAPS 40%
LANDING GEAR... UP

WEIGHT ~ POUNDS	CLIMB SPEED ~ KNOTS
15,000	128
13,000	124
11,000	121
9000	121

EXAMPLE:

OAT .... 0°C
PRESSURE ALTITUDE... 16,000 FT
WEIGHT.............. 10,500 LBS

RATE-OF-CLIMB......... 1135 FT/MIN
CLIMB GRADIENT 6.7%
CLIMB SPEED .... 121 KTS

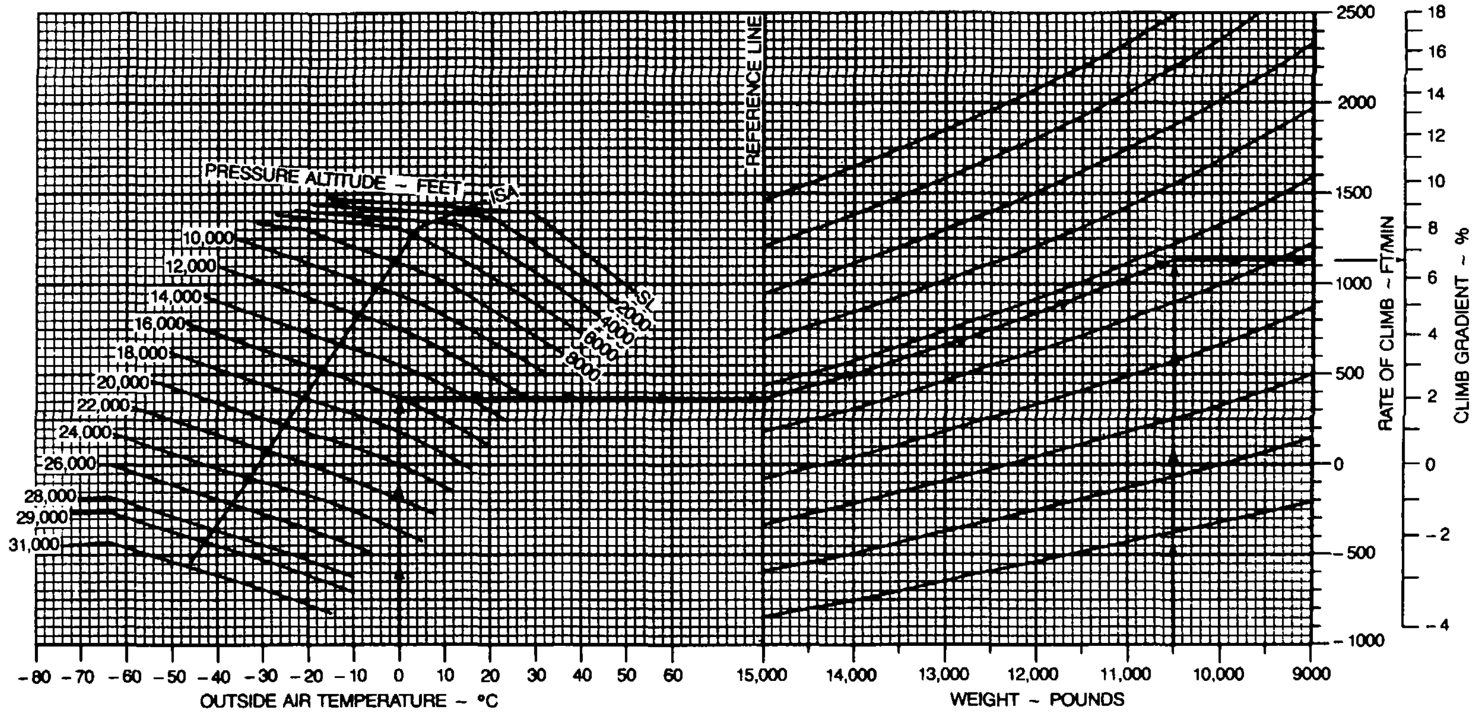


Figure 7-23. Climb Two-Engine - Flaps 40%

CLIMB — ONE ENGINE INOPERATIVE

ASSOCIATED CONDITIONS:

POWER.................. MAXIMUM CONTINUOUS
FLAPS.................. 0%
LANDING GEAR............ UP
INOPERATIVE PROPELLER... FEATHERED

WEIGHT ~ POUNDS	CLIMB SPEED ~ KNOTS
15,000	130
14,000	127
13,000	125
12,500	123
11,000	121
10,000	121
9000	121

EXAMPLE:

FAT.................. 0°C
PRESSURE ALTITUDE... 16,000 FT
WEIGHT.............. 10,500 LBS

RATE OF CLIMB........ 5 FT/MIN
CLIMB GRADIENT...... .02%
CLIMB SPEED......... 121 KTS

NOTE: DURING OPERATION WITH ICE VANES EXTENDED, RATE OF CLIMB WILL BE REDUCED APPROXIMATELY 60 FEET PER MINUTE.

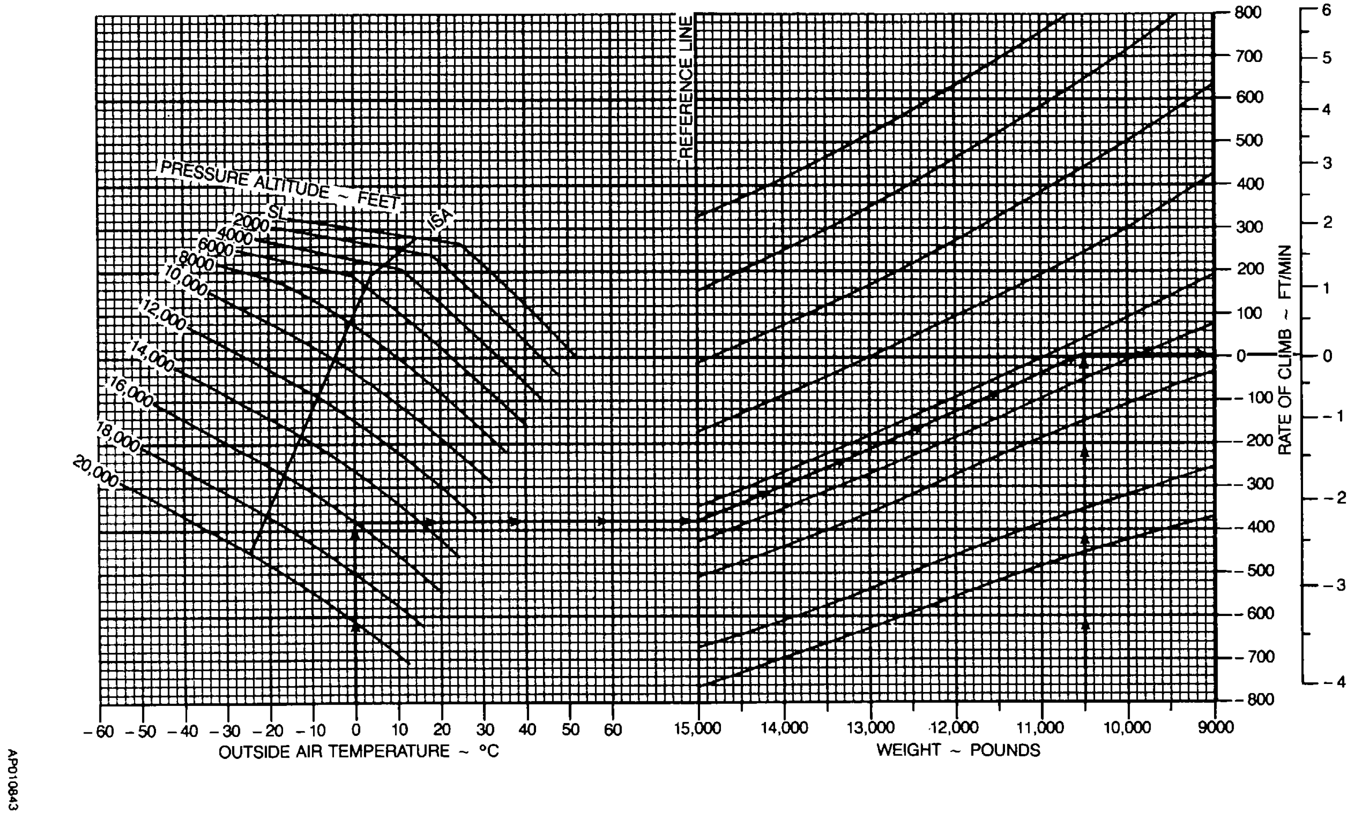


Figure 7-24. Climb One-Engine Inoperative

SERVICE CEILING — ONE ENGINE INOPERATIVE

ASSOCIATED CONDITIONS:

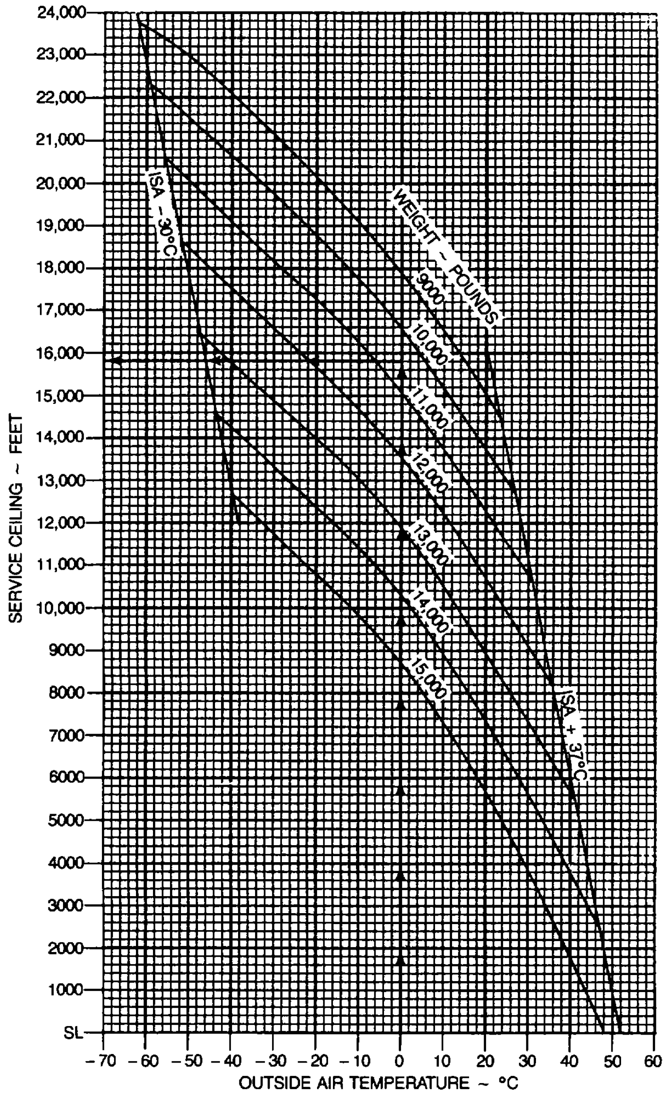
POWER.................. MAXIMUM CONTINUOUS
LANDING GEAR............ UP
INOPERATIVE PROPELLER... FEATHERED
FLAPS.................... UP (0%)

EXAMPLE:

OAT............... 0°C
WEIGHT........... 10,500 LBS

SERVICE CEILING ... 15,800 FT

NOTE: 1. SERVICE CEILING IS THE MAXIMUM ALTITUDE AT WHICH THE AIRPLANE IS CAPABLE OF CLIMBING 50 FT PER MINUTE WITH ONE PROPELLER FEATHERED.
2. REDUCE SERVICE CEILING BY 800 FEET.



AP010856

Figure 7-25. Service Ceiling One-Engine-Inoperative

TIME, FUEL, AND DISTANCE TO CRUISE CLIMB

ASSOCIATED CONDITIONS:

PROPELLER SPEED . . . 1900 RPM
POWER:
TGT. . . . . 750°C
OR TORQUE 100%

ALTITUDE ~ FT	CLIMB SPEED ~ KNOTS
SL TO 10,000	144
10,000 TO 20,000	134
20,000 TO 31,000	123

EXAMPLE:

OAT AT TAKEOFF. . . . . 28°C
OAT AT CRUISE. . . . . −10°C
AIRPORT PRESSURE ALTITUDE. . . 5433 FT
CRUISE ALTITUDE. . . . . 26,000 FT
INITIAL CLIMB WEIGHT. . . . . 12,000 LBS

TIME TO CLIMB. . . . . (33.5 − 3.2 = 30.3) 30 MIN
FUEL TO CLIMB. . . . . (404 − 60) 344 LBS
DISTANCE TO CLIMB. . . . . (94 − 8) 86 NM

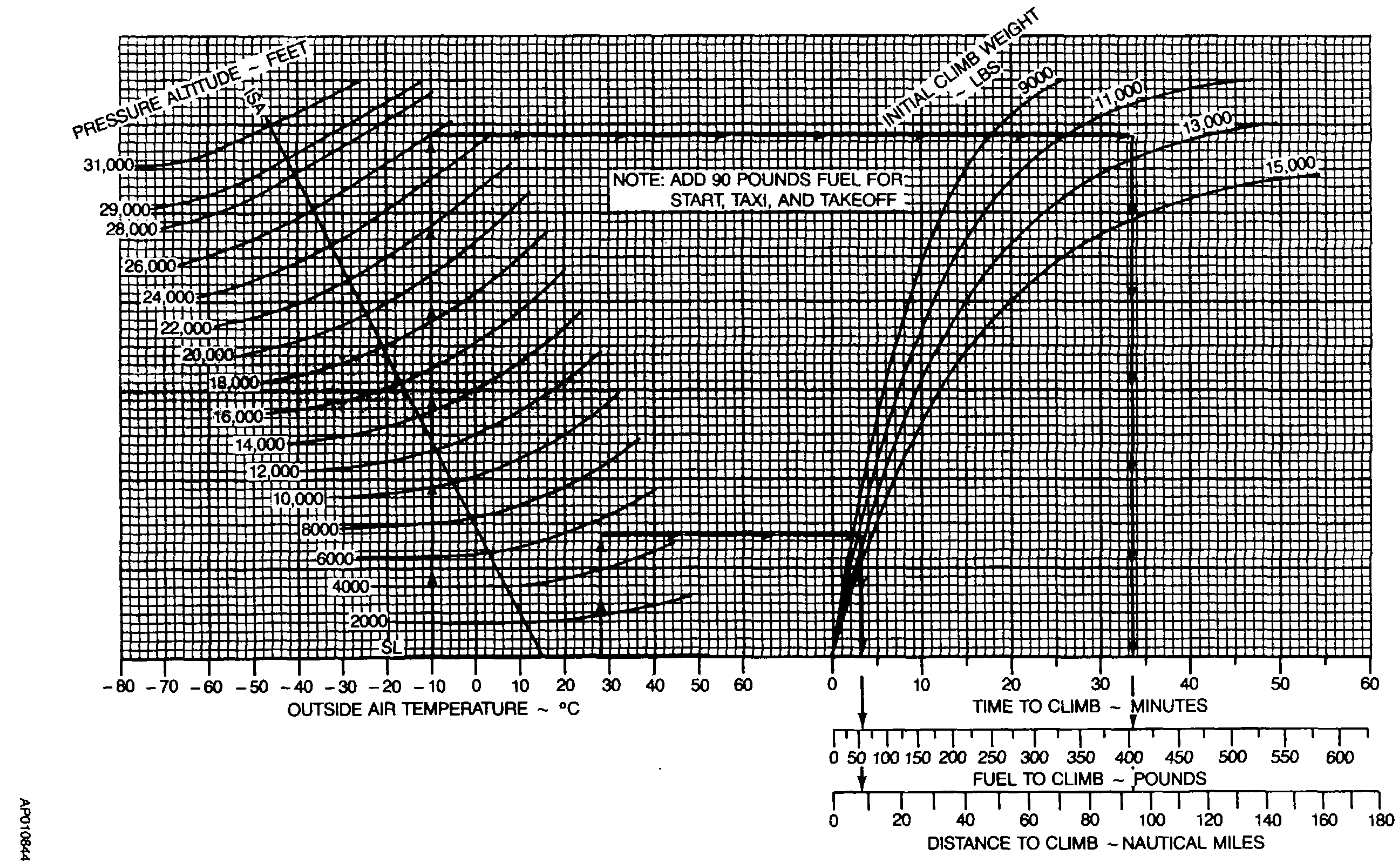


Figure 7-26. Time, Fuel, and Distance to Cruise Climb

MAXIMUM CRUISE POWER

1900 RPM

ISA – 30° C

WEIGHT →			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	−11	−15	100	518	1036	230	220	100	518	1036	231	220
2000	−14	−19	100	506	1012	228	223	100	506	1012	229	224
4000	−18	−23	100	494	988	225	227	100	494	988	226	228
6000	−22	−27	100	483	966	223	232	100	483	966	224	233
8000	−26	−31	100	473	946	221	236	100	473	946	222	237
10,000	−29	−35	100	464	928	218	240	100	463	926	220	242
12,000	−33	−39	100	457	914	216	245	100	457	914	217	246
14,000	−37	−43	100	452	904	214	249	100	452	904	215	251
16,000	−41	−47	97	437	874	209	251	98	437	874	210	253
18,000	−45	−51	91	407	814	200	249	91	407	814	202	251
20,000	−49	−55	84	378	756	192	246	84	379	758	194	249
22,000	−53	−59	78	353	706	183	243	78	354	708	186	246
24,000	−57	−63	72	328	656	174	238	72	329	658	177	242
26,000	−61	−67	65	301	602	163	231	66	303	606	167	236
28,000	−66	−71	58	270	540	149	219	58	273	546	154	227
29,000	−69	−72	53	253	506	137	206	54	257	514	146	218
31,000												

AP007261

Figure 7-27. Maximum Cruise Power @ 1900 RPM ISA -30°C (Sheet 1 of 2)

MAXIMUM CRUISE POWER

1900 RPM

ISA – 30° C

WEIGHT →			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	-11	-15	100	518	1036	232	221	100	518	1036	232	222
2000	-14	-19	100	505	1010	229	225	100	505	1010	230	226
4000	-18	-23	100	494	988	227	229	100	493	986	228	230
6000	-22	-27	100	483	966	225	234	100	483	966	226	235
8000	-26	-31	100	473	946	223	238	100	473	946	224	239
10,000	-29	-35	100	463	926	221	243	100	463	926	222	244
12,000	-33	-39	100	457	914	218	247	100	456	912	219	249
14,000	-37	-43	100	451	902	216	252	100	451	902	217	253
16,000	-41	-47	98	438	876	212	255	98	439	878	213	256
18,000	-45	-51	91	408	816	204	253	91	409	818	205	255
20,000	-49	-55	85	380	760	196	251	85	381	762	197	253
22,000	-53	-59	79	355	710	188	249	79	356	712	190	251
24,000	-57	-63	73	330	660	179	245	73	331	662	181	248
26,000	-61	-67	66	304	608	170	241	67	305	610	173	244
28,000	-66	-71	59	275	550	159	233	60	277	554	162	238
29,000	-69	-72	55	259	518	151	226	56	261	522	156	233
31,000	-74	-76	47	229	458	136	211	48	232	464	142	221

AP007262

Figure 7-27. Maximum Cruise Power @ 1900 RPM ISA -30°C (Sheet 2 of 2)

MAXIMUM CRUISE POWER

1900 RPM

ISA – 20° C

WEIGHT →			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	0	– 5	100	520	1040	228	222	100	520	1040	229	223
2000	– 4	– 9	100	508	1016	226	226	100	508	1016	227	227
4000	– 8	– 13	100	496	992	224	230	100	496	992	225	231
6000	– 12	– 17	100	484	968	221	235	100	484	968	222	236
8000	– 16	– 21	100	474	948	219	239	100	474	948	220	240
10,000	– 19	– 25	100	465	930	217	243	100	465	930	218	245
12,000	– 23	– 29	100	458	916	214	248	100	458	916	215	249
14,000	– 27	– 33	100	452	904	211	252	100	453	906	213	254
16,000	– 31	– 37	93	422	844	203	250	93	422	844	205	252
18,000	– 35	– 41	86	393	786	195	247	87	393	786	197	250
20,000	– 39	– 45	80	366	732	186	244	81	367	734	188	247
22,000	– 43	– 49	75	341	682	177	241	75	342	684	180	244
24,000	– 47	– 53	69	317	634	168	235	69	318	636	171	240
26,000	– 51	– 57	63	293	586	157	229	63	294	588	161	235
28,000	– 56	– 61	57	270	540	146	220	58	272	544	151	228
29,000	– 58	– 62	54	258	516	138	212	55	261	522	145	223
31,000												

AP007263

Figure 7-28. Maximum Cruise Power @ 1900 RPM ISA -20°C (Sheet 1 of 2)

MAXIMUM CRUISE POWER

1900 RPM

ISA – 20° C

WEIGHT →			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	0	− 5	100	520	1040	230	224	100	520	1040	231	225
2000	− 4	− 9	100	508	1016	228	228	100	507	1014	229	229
4000	− 8	− 13	100	495	990	226	232	100	495	990	227	233
6000	− 12	− 17	100	484	968	223	237	100	484	968	224	238
8000	− 16	− 21	100	474	948	221	241	100	474	948	222	242
10,000	− 19	− 25	100	465	930	219	246	100	465	930	220	247
12,000	− 23	− 29	100	458	916	216	250	100	458	916	217	252
14,000	− 27	− 33	100	453	906	214	255	100	452	904	215	256
16,000	− 31	− 37	93	423	846	206	254	94	424	848	208	256
18,000	− 35	− 41	87	394	788	198	252	87	395	790	200	254
20,000	− 39	− 45	81	368	736	190	250	81	368	736	192	252
22,000	− 43	− 49	75	343	686	182	247	76	344	688	184	250
24,000	− 47	− 53	69	319	638	174	244	70	320	640	176	247
26,000	− 51	− 57	64	295	590	165	240	64	296	592	168	244
28,000	− 56	− 61	59	274	548	156	234	59	275	550	159	239
29,000	− 58	− 62	56	263	526	150	230	56	264	528	154	237
31,000	− 63	− 66	50	238	476	137	219	51	240	480	143	228

AP007264

Figure 7-27. Maximum Cruise Power @ 1900 RPM ISA -20°C (Sheet 2 of 2)

MAXIMUM CRUISE POWER

1900 RPM

ISA – 10° C

WEIGHT →			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	10	5	100	521	1042	227	225	100	521	1042	228	226
2000	6	1	100	508	1016	224	229	100	507	1014	225	230
4000	2	– 3	100	496	992	222	233	100	496	992	223	234
6000	– 2	– 7	100	486	972	220	237	100	486	972	221	238
8000	– 5	– 11	100	476	952	217	242	100	476	952	218	243
10,000	– 9	– 15	100	466	932	215	246	100	466	932	216	247
12,000	– 13	– 19	100	459	918	212	251	100	459	918	213	252
14,000	– 17	– 23	94	432	864	205	249	95	433	866	206	252
16,000	– 21	– 27	88	404	808	197	247	88	405	810	199	250
18,000	– 25	– 31	82	377	754	188	245	82	378	756	191	248
20,000	– 29	– 35	76	352	704	180	242	77	353	706	182	245
22,000	– 33	– 39	71	329	658	171	237	71	330	660	174	242
24,000	– 38	– 43	65	305	610	161	232	66	306	612	165	237
26,000	– 42	– 47	60	282	564	150	224	60	284	568	155	231
28,000	– 46	– 51	55	261	522	138	213	55	263	526	145	224
29,000	– 49	– 52						53	252	504	138	218
31,000												

AP007266

Figure 7-29. Maximum Cruise Power @ 1900 RPM ISA -10°C (Sheet 1 of 2)

MAXIMUM CRUISE POWER

1900 RPM

ISA – 10° C

WEIGHT →			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	10	5	100	521	1042	228	226	100	521	1042	229	227
2000	6	1	100	507	1014	226	231	100	507	1014	227	232
4000	2	– 3	100	496	992	224	235	100	495	990	225	236
6000	– 2	– 7	100	485	970	222	240	100	485	970	223	240
8000	– 5	– 11	100	475	950	219	244	100	475	950	220	245
10,000	– 9	– 15	100	466	932	217	249	100	465	930	218	250
12,000	– 13	– 19	100	458	916	215	253	100	458	916	216	255
14,000	– 17	– 23	95	433	866	208	253	95	434	868	209	255
16,000	– 21	– 27	89	406	812	200	252	89	406	812	202	254
18,000	– 25	– 31	83	379	758	193	250	83	379	758	194	252
20,000	– 29	– 35	77	354	708	185	248	77	354	708	187	250
22,000	– 33	– 39	72	330	660	177	245	72	331	662	179	248
24,000	– 37	– 43	66	307	614	168	242	66	308	616	171	245
26,000	– 41	– 47	61	285	570	159	237	61	286	572	163	242
28,000	– 46	– 51	56	264	528	150	231	56	265	530	154	237
29,000	– 48	– 52	53	254	508	145	227	54	255	510	149	234
31,000	– 52	– 56	49	234	468	133	217	49	236	472	139	227

AP007266

Figure 7-29. Maximum Cruise Power @ 1900 RPM ISA -10°C (Sheet 2 of 2)

MAXIMUM CRUISE POWER

1900 RPM

ISA

WEIGHT →			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	20	15	100	524	1048	225	227	100	523	1046	226	228
2000	16	11	100	510	1020	223	231	100	510	1020	224	232
4000	12	7	100	497	994	220	236	100	497	994	221	237
6000	8	3	100	486	972	218	240	100	486	972	219	241
8000	5	− 1	100	476	952	216	244	100	476	952	217	246
10,000	1	− 5	99	465	930	212	248	99	465	930	214	250
12,000	− 3	− 9	94	438	876	205	248	94	438	876	207	249
14,000	− 7	− 13	88	410	820	198	246	89	411	822	200	248
16,000	− 11	− 17	83	384	768	190	244	83	384	768	192	246
18,000	− 15	− 21	77	358	716	181	240	77	359	718	184	244
20,000	− 19	− 25	71	333	666	172	237	72	334	668	175	241
22,000	− 24	− 29	66	311	622	163	232	66	312	624	167	237
24,000	− 28	− 33	61	289	578	153	225	61	290	580	159	231
26,000	− 32	− 37	55	267	534	141	215	56	269	538	147	224
28,000	− 37	− 41						51	248	496	135	214
29,000												
31,000												

AP007267

Figure 7-30. Maximum Cruise Power @ 1900 RPM ISA (Sheet 1 of 2)

MAXIMUM CRUISE POWER

1900 RPM

ISA

WEIGHT →			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	20	15	100	523	1046	227	229	100	523	1046	228	230
2000	16	11	100	510	1020	225	233	100	510	1020	226	234
4000	12	7	100	497	994	222	238	100	497	994	223	239
6000	9	3	100	486	972	220	242	100	485	970	221	243
8000	5	−1	100	476	952	218	247	100	476	952	219	248
10,000	1	−5	100	465	930	215	251	100	466	932	216	252
12,000	−3	−9	95	439	878	208	251	95	439	878	210	253
14,000	−7	−13	89	412	824	201	250	89	412	824	203	252
16,000	−11	−17	83	385	770	194	249	83	386	772	195	251
18,000	−15	−21	77	359	718	186	246	78	360	720	188	249
20,000	−19	−25	72	335	670	178	244	72	336	672	180	247
22,000	−23	−29	67	314	628	170	241	67	314	628	172	245
24,000	−27	−33	62	291	582	161	237	62	292	584	164	241
26,000	−32	−37	57	270	540	152	231	57	271	542	156	237
28,000	−36	−41	52	250	500	142	224	52	252	504	147	232
29,000	−38	−42	50	241	482	136	219	50	242	484	142	228
31,000												

AP007268

Figure 7-30. Maximum Cruise Power @ 1900 RPM ISA (Sheet 2 of 2)

MAXIMUM CRUISE POWER

1900 RPM

ISA + 10° C

WEIGHT →			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	30	25	100	526	1052	223	229	100	525	1050	225	230
2000	26	21	100	512	1024	221	234	100	512	1024	222	235
4000	22	17	100	499	998	219	238	100	498	996	220	239
6000	19	13	100	487	974	216	242	100	487	974	218	244
8000	15	9	96	464	928	211	243	97	464	928	212	245
10,000	11	5	92	440	880	205	244	93	440	880	207	246
12,000	7	1	88	415	830	198	243	88	415	830	200	245
14,000	3	−3	82	388	776	190	241	82	389	778	192	243
16,000	−1	−7	76	363	726	182	238	77	364	728	184	241
18,000	−6	−11	71	339	678	174	235	72	340	680	177	239
20,000	−10	−15	66	316	632	165	231	67	317	634	168	236
22,000	−14	−19	61	295	590	155	225	62	296	592	159	231
24,000	−18	−23	56	273	546	144	216	57	274	548	149	225
26,000	−23	−27						52	253	506	138	215
28,000												
29,000												
31,000												

AP007269

Figure 7-31. Maximum Cruise Power @ 1900 RPM ISA +10°C (Sheet 1 of 2)

MAXIMUM CRUISE POWER

1900 RPM

ISA + 10° C

WEIGHT →			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	30	25	100	525	1050	225	231	100	525	1050	226	232
2000	26	21	100	511	1022	223	236	100	511	1022	224	237
4000	22	17	100	498	996	221	240	100	498	996	222	241
6000	19	13	100	486	972	219	245	100	486	972	220	246
8000	15	9	97	465	930	214	246	97	465	930	215	248
10,000	11	5	93	441	882	208	247	93	441	882	209	249
12,000	7	1	88	416	832	201	247	88	416	832	203	249
14,000	3	− 3	82	389	778	194	246	83	390	780	195	248
16,000	− 1	− 7	77	364	728	186	244	77	365	730	188	246
18,000	− 5	− 11	72	341	682	179	242	72	342	684	181	245
20,000	− 9	− 15	67	318	636	171	240	68	319	638	174	243
22,000	− 13	− 19	62	297	594	163	236	63	298	596	166	240
24,000	− 18	− 23	57	276	552	154	231	58	277	554	157	236
26,000	− 22	− 27	52	255	510	144	224	53	257	514	149	231
28,000	− 26	− 31	48	236	472	133	215	49	238	476	139	225
29,000	− 29	− 32						46	229	458	134	220
31,000												

AP007270

Figure 7-31. Maximum Cruise Power @ 1900 RPM ISA +10°C (Sheet 2 of 2)

MAXIMUM CRUISE POWER

1900 RPM

ISA + 20° C

WEIGHT →			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	40	35	100	527	1054	222	231	100	527	1054	223	233
2000	36	31	97	505	1010	217	233	97	505	1010	219	235
4000	32	27	95	483	966	213	236	95	483	966	214	237
6000	28	23	92	461	922	208	237	92	461	922	209	239
8000	24	19	88	438	876	202	238	89	438	876	204	240
10,000	20	15	85	415	830	196	238	85	415	830	198	240
12,000	16	11	80	391	782	190	237	81	391	782	192	240
14,000	12	7	76	366	732	182	235	76	367	734	184	238
16,000	8	3	71	343	686	174	233	71	344	688	177	236
18,000	4	−1	66	320	640	166	229	67	321	642	169	233
20,000	0	−5	61	298	596	155	223	61	299	598	160	228
22,000	−4	−9	56	278	556	145	216	57	279	558	151	223
24,000	−9	−13						52	259	518	140	216
26,000												
28,000												
29,000												
31,000												

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Figure 7-32. Maximum Cruise Power @ 1900 RPM ISA +20°C (Sheet 1 of 2)

MAXIMUM CRUISE POWER

1900 RPM

ISA + 20° C

WEIGHT →			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	40	35	100	527	1054	224	234	100	527	1054	225	235
2000	36	31	97	505	1010	220	236	98	505	1010	221	237
4000	32	27	95	483	966	215	238	95	484	968	217	240
6000	28	23	92	461	922	211	240	92	461	922	212	242
8000	25	19	89	438	876	205	241	89	439	878	207	243
10,000	21	15	85	416	832	200	242	85	416	832	201	244
12,000	17	11	81	392	784	193	242	81	392	784	195	244
14,000	13	7	76	368	736	187	241	76	368	736	188	243
16,000	9	3	71	344	688	179	239	72	345	690	181	242
18,000	5	−1	67	322	644	172	237	67	323	646	174	241
20,000	0	−5	62	300	600	163	233	62	300	600	166	237
22,000	−4	−9	57	280	560	155	229	58	281	562	158	234
24,000	−8	−13	53	261	522	146	224	53	262	524	150	230
26,000	−12	−17	48	241	482	135	216	49	243	486	141	224
28,000												
29,000												
31,000												

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Figure 7-32. Maximum Cruise Power @ 1900 RPM ISA +20°C (Sheet 2 of 2)

MAXIMUM CRUISE POWER

1900 RPM

ISA + 30° C

WEIGHT →			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	50	45	89	497	994	211	224	90	497	994	213	226
2000	46	41	88	476	952	207	226	88	476	952	209	228
4000	42	37	86	456	912	203	229	86	457	914	205	231
6000	38	33	84	436	872	199	231	84	436	872	201	233
8000	34	29	81	413	826	193	231	81	414	828	195	234
10,000	30	25	77	391	782	188	232	78	392	784	190	234
12,000	26	21	73	368	736	181	230	74	368	736	183	233
14,000	22	17	69	345	690	173	228	69	345	690	176	231
16,000	18	13	64	322	644	165	224	65	323	646	168	229
18,000	14	9	60	301	602	156	220	61	302	604	160	225
20,000	10	5	56	280	560	146	213	56	282	564	151	221
22,000	5	1	51	260	520	133	202	52	262	524	141	213
24,000												
26,000												
28,000												
29,000												
31,000												

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Figure 7-33. Maximum Cruise Power @ 1900 RPM ISA +30°C (Sheet 1 of 2)

MAXIMUM CRUISE POWER

1900 RPM

ISA + 30° C

WEIGHT →			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	50	45	90	497	994	214	227	90	497	994	215	228
2000	46	41	88	477	954	210	229	88	477	954	211	231
4000	42	37	86	457	914	206	232	86	457	914	208	234
6000	38	33	84	436	872	202	234	84	437	874	203	236
8000	34	29	81	414	828	197	236	81	414	828	198	237
10,000	30	25	78	392	784	192	237	78	392	784	193	239
12,000	26	21	74	369	738	185	236	74	369	738	187	238
14,000	22	17	69	346	692	178	235	70	346	692	180	237
16,000	18	13	65	324	648	171	233	65	324	648	173	236
18,000	14	9	61	303	606	163	230	61	303	606	166	234
20,000	10	5	57	283	566	156	227	57	284	568	159	231
22,000	6	1	52	264	528	147	221	53	265	530	151	227
24,000	2	−3	48	244	488	136	213	49	245	490	142	222
26,000												
28,000												
29,000												
31,000												

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Figure 7-33. Maximum Cruise Power @ 1900 RPM ISA +30°C (Sheet 2 of 2)

MAXIMUM CRUISE POWER

1900 RPM

ISA + 37° C

WEIGHT →			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	56	52	83	477	954	204	219	83	477	954	206	221
2000	53	48	81	457	914	200	221	81	457	914	202	223
4000	49	44	80	438	876	197	224	80	438	876	198	226
6000	45	40	78	419	838	192	226	78	419	838	194	228
8000	41	36	75	398	796	187	226	76	398	796	189	229
10,000	31	32	73	376	752	181	227	73	377	754	184	230
12,000	33	28	69	353	706	174	225	69	354	708	177	229
14,000	29	24	64	330	660	166	222	65	331	662	170	226
16,000	25	20	60	308	616	158	218	61	309	618	162	223
18,000	21	16	56	287	574	148	212	56	288	576	153	219
20,000	16	12	52	267	534	137	203	52	269	538	144	213
22,000												
24,000												
26,000												
28,000												
29,000												
31,000												

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Figure 7-34. Maximum Cruise Power @ 1900 RPM ISA +37°C (Sheet 1 of 2)

MAXIMUM CRUISE POWER

1900 RPM

ISA + 37° C

WEIGHT →			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	57	52	83	477	954	207	222	83	477	954	208	223
2000	53	48	82	458	916	203	225	82	458	916	205	226
4000	49	44	80	439	878	200	227	80	439	878	201	229
6000	45	40	78	419	838	196	230	78	419	838	197	231
8000	41	36	76	398	796	191	231	76	398	796	192	233
10,000	37	32	73	377	754	186	232	73	378	756	188	234
12,000	33	28	69	354	708	179	231	69	355	710	181	234
14,000	29	24	65	332	664	172	230	65	332	664	175	233
16,000	25	20	61	310	620	165	227	61	311	622	168	231
18,000	21	16	57	289	578	157	224	57	290	580	160	229
20,000	17	12	53	270	540	149	220	53	271	542	153	226
22,000	13	8	49	252	504	140	214	49	253	506	145	222
24,000	8	5						45	235	470	135	215
26,000												
28,000												
29,000												
31,000												

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Figure 7-34. Maximum Cruise Power @ 1900 RPM ISA +37°C (Sheet 2 of 2)

MAXIMUM CRUISE POWER

1900 RPM

NOTE: ISA DEVIATION LINES REFLECT ACTUAL TEMPERATURES, FOR FLIGHT PLANNING. INDICATED TEMPERATURES SHOULD BE USED FOR IN-FLIGHT CRUISE POWER SETTINGS.

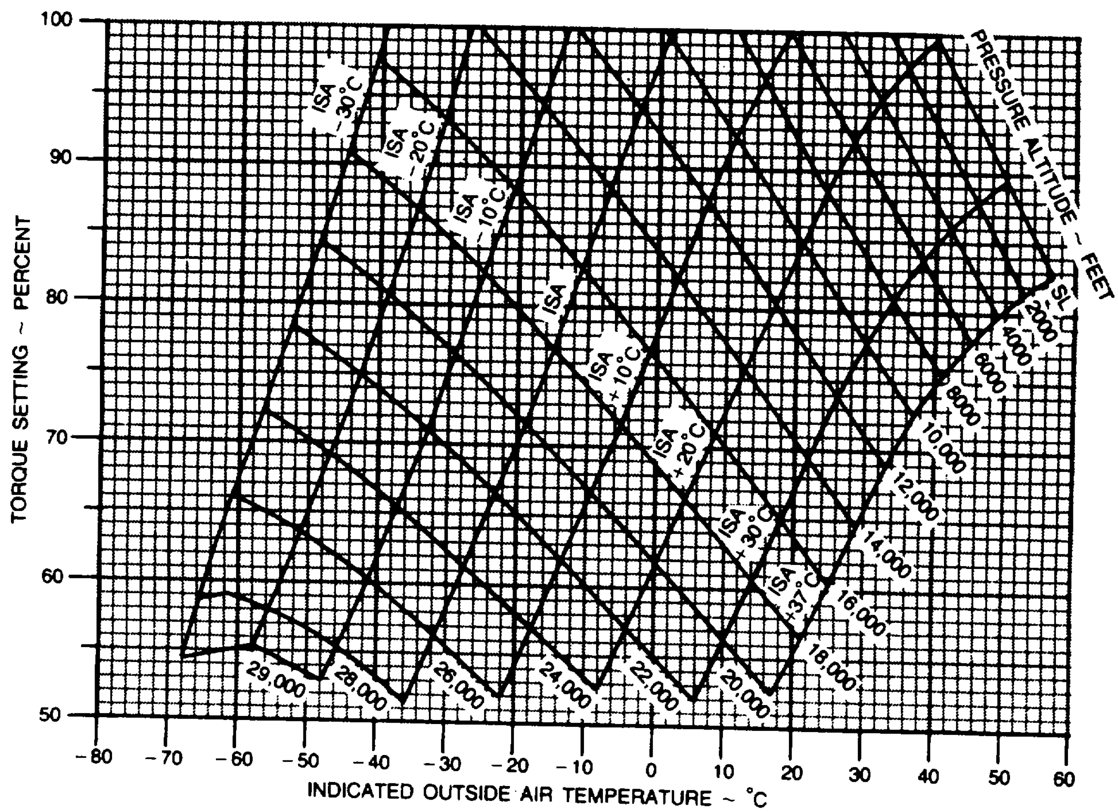

Figure 7-35. Maximum Cruise Power @ 1900 RPM

MAXIMUM CRUISE SPEEDS

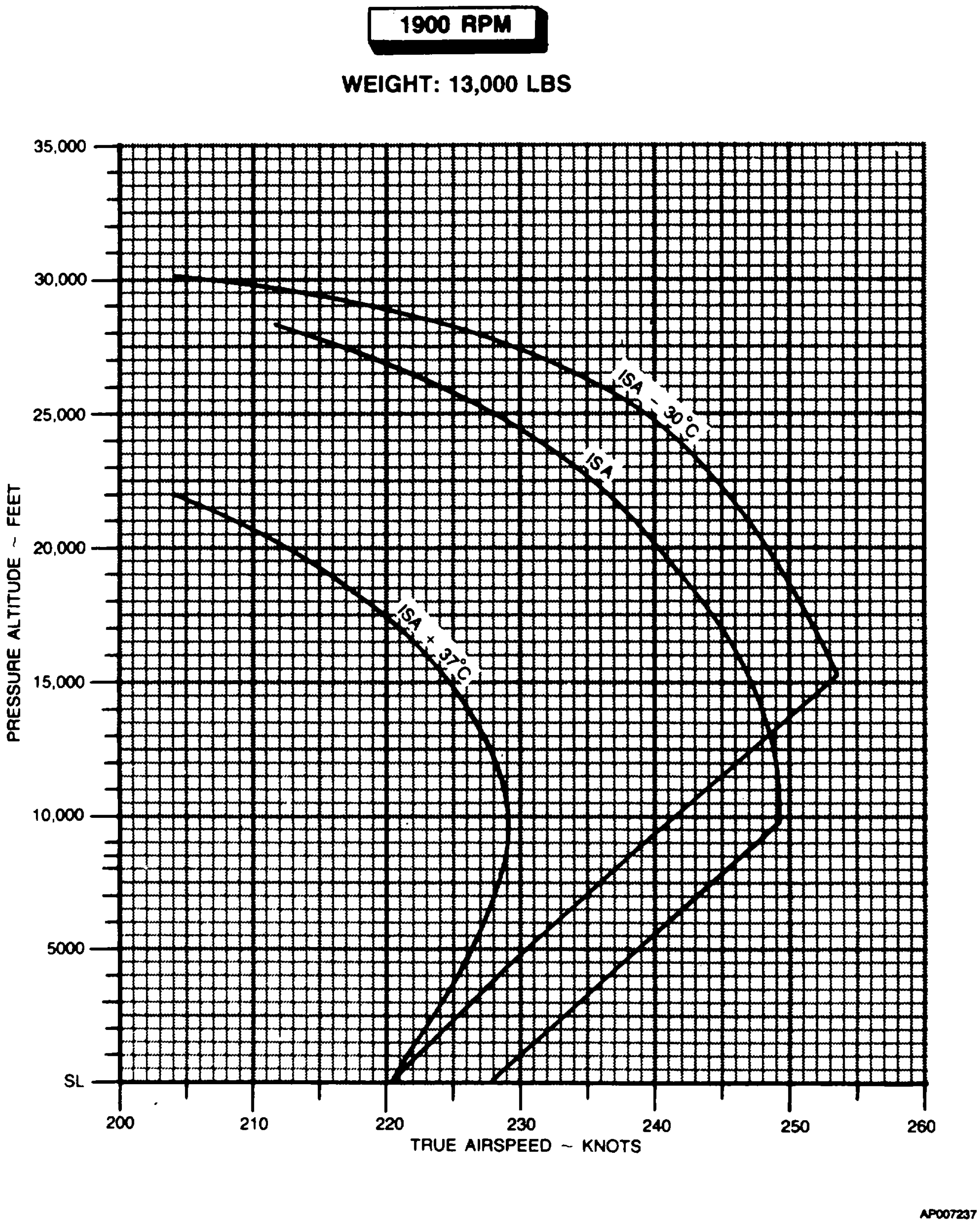

Figure 7-36. Maximum Cruise Speeds @ 1900 RPM

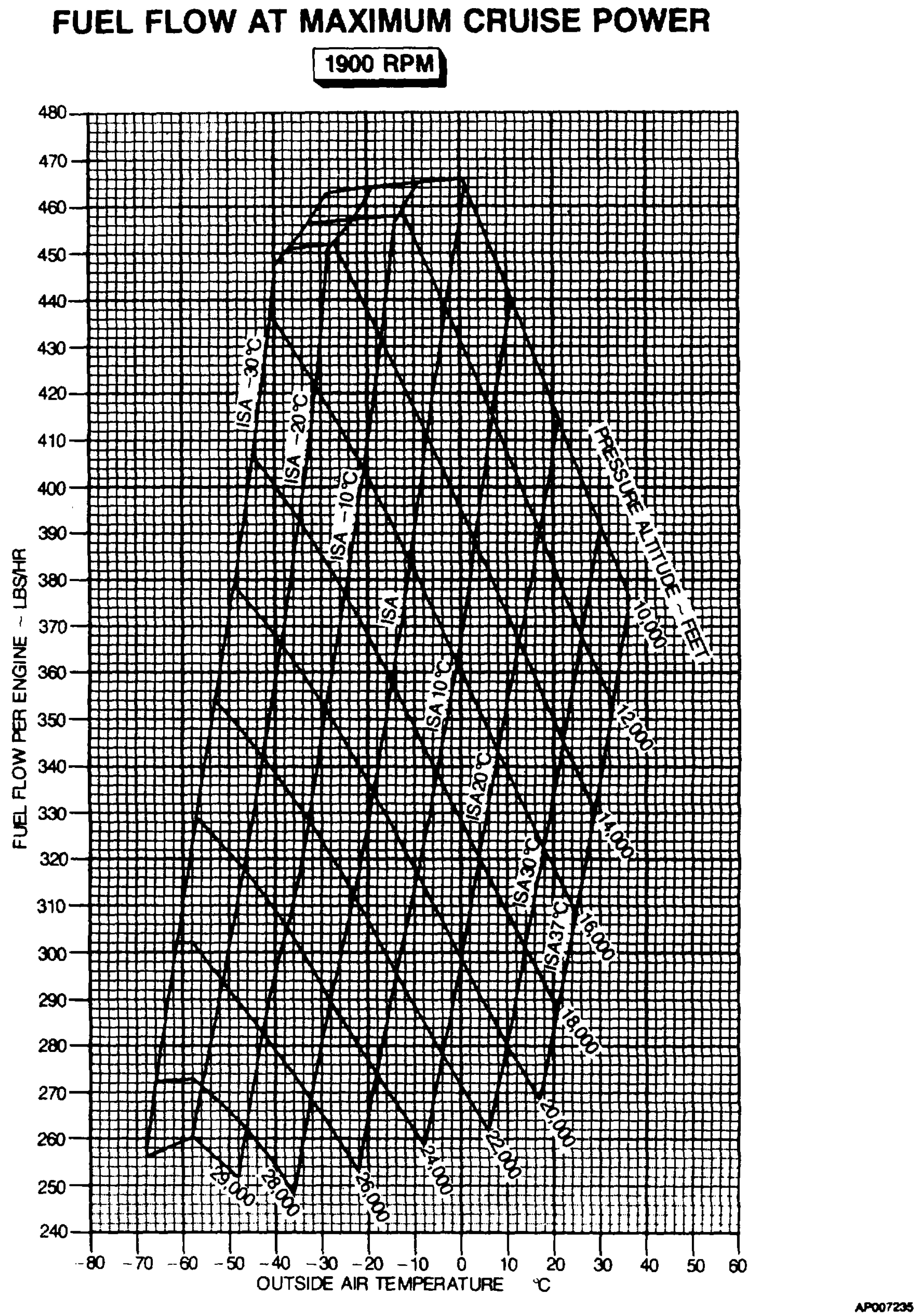

Figure 7-37. Fuel Flow at Maximum Cruise Power @ 1900 RPM

RANGE PROFILE — MAXIMUM CRUISE POWER

1900 RPM

STANDARD DAY (ISA)

ASSOCIATED CONDITIONS:

WEIGHT. . . . . *15,090 LBS BEFORE ENGINE START
FUEL . . . . AVIATION KEROSENE
FUEL DENSITY . . . 6.7 LBS/GAL
WIND . . . . ZERO

EXAMPLE:

PRESSURE ALTITUDE. . . 26,000 FT
FUEL . . . . 2140 LBS

RANGE. . . . . 638 NM

NOTES: 1. RANGE ALLOWS FOR TAXI AND RUNUP; INCLUDES CRUISE CLIMB AND DESCENT; AND ALLOWS FOR 45 MINUTES RESERVE FUEL AT LONG RANGE POWER.

*2. AT 15,090 LBS RAMP WEIGHT, THE MAXIMUM ZERO-FUEL WEIGHT LIMITATION OF 11,500 LBS WOULD BE EXCEEDED AT FUEL LOADINGS LESS THAN 3590 LBS.

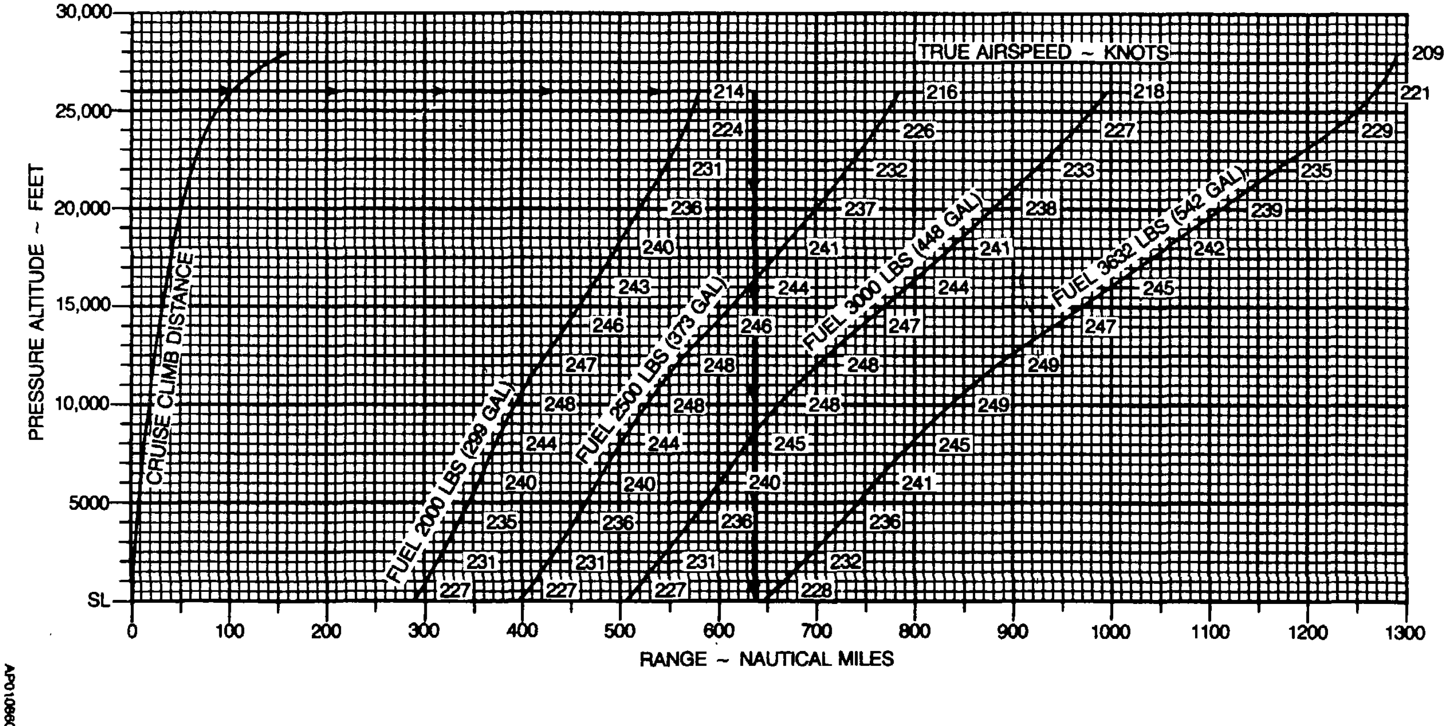

Figure 7-38. Range Profile - Maximum Cruise Power @ 1900 RPM

MAXIMUM CRUISE POWER

1700 RPM

ISA -30 °C

WEIGHT			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	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	%	LBS/HR	LBS/HR	KTS	KTS	%	LBS/HR	LBS/HR	KTS	KTS
SL	-11	-15	100	479	958	213	203	100	479	958	214	204
2000	-15	-19	100	466	932	211	206	100	466	932	212	207
4000	-19	-23	100	454	908	209	210	100	454	908	210	211
6000	-23	-27	100	443	886	207	214	100	443	886	208	215
8000	-26	-31	100	434	868	204	218	100	434	868	205	219
10,000	-30	-35	100	425	850	202	221	100	425	850	203	223
12,000	-34	-39	100	418	836	199	225	100	417	834	201	227
14,000	-38	-43	100	412	824	197	229	100	412	824	199	231
16,000	-42	-47	100	409	818	195	234	100	408	816	197	236
18,000	-45	-51	99	403	806	192	238	100	404	808	194	240
20,000	-50	-55	92	375	750	184	235	93	376	752	186	238
22,000	-54	-59	86	350	700	175	232	86	351	702	178	235
24,000	-58	-63	79	325	650	166	227	79	326	652	169	231
26,000	-62	-67	72	298	596	155	220	72	299	598	159	225
28,000	-67	-70	63	266	532	141	207	64	269	538	147	215
29,000	-69	-72	58	250	500	132	197	60	253	506	139	208
31,000	-73	-76	—	—	—	—	—	51	223	446	122	189

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Figure 7-38A. Maximum Cruise Power @ 1700 RPM ISA -30°C (Sheet 1 of 2)

MAXIMUM CRUISE POWER

1700 RPM

ISA -30 °C

WEIGHT			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	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	%	LBS/HR	LBS/HR	KTS	KTS	%	LBS/HR	LBS/HR	KTS	KTS
SL	-11	-15	100	479	958	215	205	100	478	956	216	206
2000	-15	-19	100	466	932	213	208	100	466	932	214	209
4000	-19	-23	100	453	906	211	212	100	453	906	212	213
6000	-23	-27	100	442	884	209	216	100	442	884	210	217
8000	-26	-31	100	433	866	207	220	100	433	866	208	221
10,000	-30	-35	100	424	848	204	224	100	424	848	205	225
12,000	-34	-39	100	417	834	202	228	100	417	834	203	229
14,000	-38	-43	100	412	824	200	233	100	412	824	201	234
16,000	-41	-47	100	408	816	198	237	100	408	816	199	239
18,000	-45	-51	100	404	808	196	242	100	404	808	197	244
20,000	-49	-55	93	377	754	188	240	93	377	754	190	242
22,000	-53	-59	86	352	704	180	238	87	353	706	182	240
24,000	-57	-63	80	327	654	172	235	80	328	656	174	238
26,000	-62	-67	73	301	602	163	229	73	302	604	165	233
28,000	-66	-70	65	271	542	151	221	65	273	546	155	226
29,000	-68	-72	61	256	512	145	215	61	258	516	149	222
31,000	-73	-76	52	225	450	130	201	53	228	456	136	210

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Figure 7-38A. Maximum Cruise Power @ 1700 RPM ISA -30°C (Sheet 2 of 2)

MAXIMUM CRUISE POWER

1700 RPM

ISA -20 °C

WEIGHT			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	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	%	LBS/HR	LBS/HR	KTS	KTS	%	LBS/HR	LBS/HR	KTS	KTS
SL	-1	-5	100	482	964	212	205	100	482	964	213	206
2000	-5	-9	100	469	938	210	209	100	469	938	211	210
4000	-9	-13	100	457	914	207	213	100	457	914	208	214
6000	-13	-17	100	446	892	205	216	100	446	892	206	218
8000	-16	-21	100	436	872	202	220	100	436	872	204	221
10,000	-20	-25	100	427	854	200	224	100	427	854	201	225
12,000	-24	-29	100	419	838	198	228	100	419	838	199	230
14,000	-28	-33	100	414	828	196	233	100	414	828	197	234
16,000	-32	-37	100	411	822	193	237	100	410	820	195	239
18,000	-35	-41	95	389	778	187	236	95	390	780	189	239
20,000	-40	-45	88	363	726	178	233	89	364	728	181	236
22,000	-44	-49	82	338	676	170	230	82	339	678	173	233
24,000	-48	-53	75	314	628	160	224	76	315	630	164	229
26,000	-52	-57	69	290	580	150	217	70	291	582	154	223
28,000	-56	-60	63	267	534	138	207	64	269	538	144	216
29,000	-59	-62	60	255	510	131	200	61	258	516	138	211
31,000	-63	-66	—	—	—	—	—	54	232	464	123	195

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Figure 7-38b. Maximum Cruise Power @ 1700 RPM ISA -20°C (Sheet 1 of 2)

MAXIMUM CRUISE POWER

1700 RPM

ISA -20 °C

WEIGHT			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	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	%	LBS/HR	LBS/HR	KTS	KTS	%	LBS/HR	LBS/HR	KTS	KTS
SL	-1	-5	100	482	964	214	207	100	481	962	215	208
2000	-5	-9	100	469	938	212	211	100	469	938	213	212
4000	-9	-13	100	456	912	209	215	100	456	912	210	216
6000	-12	-17	100	445	890	207	219	100	445	890	208	220
8000	-16	-21	100	436	872	205	223	100	436	872	206	224
10,000	-20	-25	100	426	852	202	227	100	426	852	204	228
12,000	-24	-29	100	419	838	200	231	100	418	836	201	232
14,000	-28	-33	100	414	828	198	236	100	414	828	200	237
16,000	-31	-37	100	410	820	196	241	100	410	820	198	242
18,000	-35	-41	96	391	782	190	241	96	391	782	192	243
20,000	-39	-45	89	364	728	183	239	89	365	730	185	241
22,000	-43	-49	83	340	680	175	236	83	341	682	177	239
24,000	-48	-53	76	316	632	167	233	77	317	634	169	236
26,000	-52	-57	70	293	586	158	228	71	294	588	161	233
28,000	-56	-60	64	271	542	149	223	65	272	544	152	228
29,000	-58	-62	61	260	520	144	219	62	262	524	148	225
31,000	-62	-66	55	235	470	131	208	55	238	476	137	217

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Figure 7-38B. Maximum Cruise Power @ 1700 RPM ISA -20°C (Sheet 2 of 2)

MAXIMUM CRUISE POWER

1700 RPM

ISA -10 °C

WEIGHT			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	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	%	LBS/HR	LBS/HR	KTS	KTS	%	LBS/HR	LBS/HR	KTS	KTS
SL	9	5	100	484	968	210	208	100	484	968	211	209
2000	5	1	100	471	942	208	211	100	470	940	209	212
4000	1	-3	100	459	918	205	215	100	458	916	207	216
6000	-2	-7	100	448	896	203	219	100	448	896	204	220
8000	-6	-11	100	438	876	201	222	100	438	876	202	224
10,000	-10	-15	100	429	858	198	227	100	429	858	200	228
12,000	-14	-19	100	422	844	196	231	100	422	844	198	233
14,000	-18	-23	100	416	832	194	235	100	416	832	195	237
16,000	-22	-27	97	401	802	189	237	97	401	802	191	239
18,000	-26	-31	90	374	748	181	234	90	375	750	183	237
20,000	-30	-35	84	349	698	172	230	84	350	700	175	234
22,000	-34	-39	78	326	652	164	226	78	327	654	167	231
24,000	-38	-43	72	302	604	154	220	72	304	608	158	226
26,000	-42	-47	66	280	560	143	212	66	281	562	148	220
28,000	-47	-50	60	258	516	130	201	61	260	520	138	212
29,000	-49	-52	57	248	496	122	192	58	250	500	132	206
31,000	-53	-56	—	—	—	—	—	52	230	460	116	190

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Figure 7-38C. Maximum Cruise Power @ 1700 RPM ISA -10°C (Sheet 1 of 2)

MAXIMUM CRUISE POWER

1700 RPM

ISA -10 °C

WEIGHT			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	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	%	LBS/HR	LBS/HR	KTS	KTS	%	LBS/HR	LBS/HR	KTS	KTS
SL	9	5	100	483	966	212	210	100	483	966	213	210
2000	5	1	100	470	940	210	213	100	470	940	211	214
4000	1	-3	100	458	916	208	217	100	458	916	209	218
6000	-2	-7	100	448	896	205	221	100	448	896	206	222
8000	-6	-11	100	438	876	203	225	100	438	876	204	226
10,000	-10	-15	100	428	856	201	230	100	428	856	202	231
12,000	-14	-19	100	421	842	199	234	100	421	842	200	235
14,000	-17	-23	100	416	832	197	239	100	416	832	198	240
16,000	-21	-27	97	402	804	192	241	98	403	806	194	243
18,000	-25	-31	91	376	752	185	239	91	376	752	187	241
20,000	-29	-35	84	351	702	177	237	85	351	702	179	240
22,000	-34	-39	79	328	656	170	234	79	329	658	172	237
24,000	-38	-43	73	305	610	161	230	73	306	612	164	234
26,000	-42	-47	67	283	566	152	226	67	284	568	156	230
28,000	-46	-50	61	262	524	143	220	62	263	526	147	226
29,000	-48	-52	59	252	504	138	216	59	253	506	143	223
31,000	-52	-56	53	232	464	127	205	54	234	468	133	216

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Figure 7-38C. Maximum Cruise Power @ 1700 RPM ISA -10°C (Sheet 2 of 2)

MAXIMUM CRUISE POWER

1700 RPM

ISA

WEIGHT			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	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	%	LBS/HR	LBS/HR	KTS	KTS	%	LBS/HR	LBS/HR	KTS	KTS
SL	19	15	100	486	972	209	210	100	486	972	210	211
2000	15	11	100	473	946	206	213	100	473	946	207	214
4000	11	7	100	460	920	204	217	100	460	920	205	219
6000	8	3	100	449	898	202	221	100	449	898	203	222
8000	4	-1	100	440	880	199	225	100	440	880	201	226
10,000	0	-5	100	431	862	197	229	100	431	862	198	231
12,000	-4	-9	100	424	848	195	233	100	423	846	196	235
14,000	-8	-13	97	408	816	190	235	97	408	816	192	237
16,000	-12	-17	91	381	762	182	233	91	382	764	184	235
18,000	-16	-21	84	355	710	174	229	85	356	712	176	233
20,000	-20	-25	78	331	662	165	225	79	332	664	168	229
22,000	-24	-29	72	308	616	156	220	73	310	620	160	226
24,000	-28	-33	67	286	572	146	213	67	288	576	150	220
26,000	-33	-37	61	264	528	133	202	61	266	532	140	212
28,000	-37	-40	55	244	488	117	185	56	246	492	128	202
29,000	-39	-52	—	—	—	—	—	53	236	472	121	194
31,000	—	—	—	—	—	—	—	—	—	—	—	—

BT00654 RC-12G

Figure 7-38D. Maximum Cruise Power @ 1700 RPM ISA (Sheet 1 of 2)

MAXIMUM CRUISE POWER

1700 RPM

ISA

WEIGHT			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	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	%	LBS/HR	LBS/HR	KTS	KTS	%	LBS/HR	LBS/HR	KTS	KTS
SL	19	15	100	486	972	211	212	100	486	972	212	213
2000	15	11	100	473	946	208	215	100	473	946	209	216
4000	12	7	100	460	920	206	220	100	460	920	207	221
6000	8	3	100	449	898	204	224	100	449	898	205	225
8000	4	-1	100	440	880	202	228	100	440	880	203	229
10,000	0	-5	100	431	862	199	232	100	431	862	201	233
12,000	-4	-9	100	423	846	197	237	100	423	846	199	238
14,000	-7	-13	98	409	818	193	239	98	409	818	195	241
16,000	-11	-17	91	382	764	186	238	92	383	766	188	240
18,000	-16	-21	85	356	712	178	236	85	357	717	180	238
20,000	-20	-25	79	333	666	171	233	79	333	666	173	236
22,000	-24	-29	73	311	622	163	230	74	312	624	165	233
24,000	-28	-33	68	289	578	154	225	68	290	580	157	230
26,000	-32	-37	62	268	536	145	220	63	269	538	149	225
28,000	-36	-40	57	248	496	135	212	58	250	500	140	220
29,000	-38	-42	54	238	476	130	208	55	240	480	136	217
31,000	-43	-46	49	220	440	116	194	50	222	444	125	208

BT00655 RC-12G

Figure 7-38D. Maximum Cruise Power @ 1700 RPM ISA (Sheet 2 of 2)

MAXIMUM CRUISE POWER

1700 RPM

ISA +10 °C

WEIGHT			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	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	%	LBS/HR	LBS/HR	KTS	KTS	%	LBS/HR	LBS/HR	KTS	KTS
SL	29	25	100	489	978	207	212	100	489	978	208	213
2000	25	21	100	476	952	205	216	100	476	952	206	217
4000	22	17	100	463	926	202	219	100	463	926	204	221
6000	18	13	100	452	904	200	223	100	451	902	201	225
8000	14	9	100	441	882	198	227	100	441	882	199	229
10,000	10	5	100	432	864	195	232	100	431	862	197	233
12,000	6	1	96	412	824	190	232	97	412	824	192	235
14,000	2	-3	90	385	770	182	230	90	386	772	184	233
16,000	-2	-7	84	360	720	174	227	84	361	722	177	230
18,000	-6	-11	79	337	674	166	224	79	338	676	169	228
20,000	-10	-15	73	314	628	158	220	73	315	630	161	225
22,000	-14	-19	67	292	584	148	214	68	294	588	152	220
24,000	-19	-23	62	270	540	136	204	62	272	544	142	213
26,000	-23	-27	56	249	498	122	190	57	251	502	131	203
28,000	-27	-30	—	—	—	—	—	52	232	464	117	189
29,000	—	—	—	—	—	—	—	—	—	—	—	—
31,000	—	—	—	—	—	—	—	—	—	—	—	—

BT00656 RC-12G

Figure 7-38E. Maximum Cruise Power @ 1700 RPM ISA +10°C (Sheet 1 of 2)

MAXIMUM CRUISE POWER

1700 RPM

ISA +10 °C

WEIGHT			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	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	%	LBS/HR	LBS/HR	KTS	KTS	%	LBS/HR	LBS/HR	KTS	KTS
SL	29	25	100	489	978	209	214	100	488	976	210	215
2000	25	21	100	476	952	207	218	100	475	950	208	219
4000	22	17	100	463	926	205	222	100	463	926	206	223
6000	18	13	100	451	902	202	226	100	451	902	203	227
8000	14	9	100	441	882	200	230	100	441	882	201	231
10,000	10	5	100	431	862	198	235	100	431	862	199	236
12,000	6	1	97	413	826	193	236	97	413	826	195	238
14,000	2	-3	91	387	774	186	235	91	387	774	188	237
16,000	-2	-7	85	362	724	179	233	85	362	724	181	235
18,000	-6	-11	79	338	676	172	231	80	339	678	174	234
20,000	-10	-15	74	316	632	164	229	74	317	634	167	232
22,000	-14	-19	68	295	590	156	225	69	296	592	159	229
24,000	-18	-23	63	273	546	147	220	63	274	548	151	225
26,000	-22	-27	58	253	506	137	213	58	254	508	142	220
28,000	-27	-30	52	234	468	126	203	53	236	472	133	213
29,000	-29	-32	50	225	450	120	197	51	226	452	128	209
31,000	-33	-36	—	—	—	—	—	46	209	418	115	197

BT00657 RC-12G

Figure 7-38E. Maximum Cruise Power @ 1700 RPM ISA +10°C (Sheet 2 of 2)

MAXIMUM CRUISE POWER

1700 RPM

ISA +20 °C

WEIGHT			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	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	%	LBS/HR	LBS/HR	KTS	KTS	%	LBS/HR	LBS/HR	KTS	KTS
SL	39	35	100	492	984	206	214	100	492	984	207	215
2000	35	31	100	479	958	203	218	100	479	958	205	219
4000	32	27	100	466	932	201	221	100	465	930	202	223
6000	28	23	100	453	906	198	225	100	453	906	200	227
8000	24	19	98	436	872	194	227	98	436	872	196	229
10,000	20	15	93	412	824	188	227	94	413	826	190	230
12,000	16	11	89	388	776	182	226	89	389	778	184	229
14,000	12	7	83	364	728	174	224	84	365	730	177	227
16,000	8	3	78	341	682	167	222	78	341	682	169	225
18,000	4	-1	73	318	636	158	218	73	319	638	162	222
20,000	0	-5	67	295	590	148	211	67	297	594	153	217
22,000	-5	-9	62	276	552	138	204	62	277	554	144	212
24,000	-9	-13	57	256	512	126	193	57	257	514	134	204
26,000	-13	-17	—	—	—	—	—	53	238	476	121	192
28,000	—	—	—	—	—	—	—	—	—	—	—	—
29,000	—	—	—	—	—	—	—	—	—	—	—	—
31,000	—	—	—	—	—	—	—	—	—	—	—	—

BT00658 RC-12G

Figure 7-38F. Maximum Cruise Power @ 1700 RPM ISA +20°C (Sheet 1 of 2)

MAXIMUM CRUISE POWER

1700 RPM

ISA +20 °C

WEIGHT			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	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	%	LBS/HR	LBS/HR	KTS	KTS	%	LBS/HR	LBS/HR	KTS	KTS
SL	39	35	100.0	492	984	208	216	100.0	492	984	209	217
2000	36	31	100.0	478	956	206	220	100.0	478	956	207	221
4000	32	27	100.0	465	930	203	224	100.0	465	930	204	225
6000	28	23	100.0	453	906	201	228	100.0	453	906	202	229
8000	24	19	98	436	872	197	231	98	437	874	198	232
10,000	20	15	94	413	826	192	231	94	414	828	193	233
12,000	16	11	89	389	778	186	231	89	390	780	187	233
14,000	12	7	84	365	730	179	230	84	366	732	181	232
16,000	8	3	79	342	684	172	228	79	343	686	174	231
18,000	4	-1	74	320	640	165	226	74	320	640	167	229
20,000	0	-5	68	298	596	156	222	68	298	596	159	226
22,000	-4	-9	63	278	556	148	218	63	279	558	152	223
24,000	-8	-13	58	259	518	139	213	59	260	520	144	219
26,000	-13	-17	53	239	478	129	204	54	241	482	135	213
28,000	-17	-20	48	221	442	116	192	49	222	444	125	205
29,000	—	—	—	—	—	—	—	47	214	428	119	199
31,000	-23	-26	—	—	—	—	—	42	197	394	103	182

BT00659 RC-12G

Figure 7-38F. Maximum Cruise Power @ 1700 RPM ISA +20°C (Sheet 2 of 2)

MAXIMUM CRUISE POWER

1700 RPM

ISA +30 °C

WEIGHT			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	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	%	LBS/HR	LBS/HR	KTS	KTS	%	LBS/HR	LBS/HR	KTS	KTS
SL	49	45	100	495	990	204	216	100	495	990	205	217
2000	45	41	98	475	950	200	218	98	475	950	201	219
4000	42	37	96	455	910	196	220	96	455	910	197	221
6000	38	33	93	435	870	191	221	93	435	870	193	223
8000	34	29	89	412	824	186	221	90	412	824	188	223
10,000	30	25	86	389	778	180	221	86	390	780	182	224
12,000	26	21	81	366	732	173	220	81	366	732	176	223
14,000	22	17	76	342	684	166	217	76	343	686	168	221
16,000	18	13	71	320	640	158	214	71	321	642	161	218
18,000	13	9	66	299	598	149	209	67	300	600	153	215
20,000	9	5	61	278	556	139	202	62	280	560	145	210
22,000	5	1	56	259	518	127	192	57	260	520	135	202
24,000	1	-3	—	—	—	—	—	52	241	482	122	191
26,000	—	—	—	—	—	—	—	—	—	—	—	—
28,000	—	—	—	—	—	—	—	—	—	—	—	—
29,000	—	—	—	—	—	—	—	—	—	—	—	—
31,000	—	—	—	—	—	—	—	—	—	—	—	—

BT00660 RC-12G

Figure 7-38G. Maximum Cruise Power @ 1700 RPM ISA +30°C (Sheet 1 of 2)

MAXIMUM CRUISE POWER

1700 RPM

ISA +30 °C

WEIGHT			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	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	%	LBS/HR	LBS/HR	KTS	KTS	%	LBS/HR	LBS/HR	KTS	KTS
SL	49	45	100	495	990	206	218	100	494	988	207	219
2000	46	41	98	475	950	203	220	98	475	950	204	222
4000	42	37	96	456	912	199	223	96	456	912	200	224
6000	38	33	93	435	870	194	225	94	435	870	196	226
8000	34	29	90	413	826	189	225	90	413	826	191	227
10,000	30	25	86	390	780	184	226	86	390	780	186	228
12,000	26	21	81	367	734	178	225	82	367	734	179	228
14,000	22	17	77	344	688	171	224	77	344	688	173	226
16,000	18	13	72	322	644	164	222	72	322	644	166	225
18,000	14	9	67	301	602	157	219	67	301	602	159	223
20,000	10	5	62	281	562	149	216	63	282	564	152	221
22,000	6	1	58	262	524	140	210	58	263	526	144	216
24,000	1	-3	53	242	484	130	202	53	244	488	135	211
26,000	-3	-7	48	224	448	118	191	49	226	452	126	203
28,000	-7	-10	—	—	—	—	—	45	210	420	115	193
29,000	—	—	—	—	—	—	—	—	—	—	—	—
31,000	—	—	—	—	—	—	—	—	—	—	—	—

BT00661 RC-12G

Figure 7-38G. Maximum Cruise Power @ 1700 RPM ISA +30°C (Sheet 2 of 2)

MAXIMUM CRUISE POWER

1700 RPM

ISA +37 °C

WEIGHT			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	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	%	LBS/HR	LBS/HR	KTS	KTS	%	LBS/HR	LBS/HR	KTS	KTS
SL	56	52	93	475	950	198	211	93	476	952	199	212
2000	52	48	90	456	912	194	213	91	456	912	195	215
4000	48	44	89	437	874	190	215	89	437	874	191	217
6000	44	40	97	417	834	185	216	87	418	836	187	218
8000	41	36	84	396	792	180	217	84	397	794	182	219
10,000	37	32	80	375	750	174	217	81	375	750	177	220
12,000	33	28	76	352	704	167	215	76	352	704	170	218
14,000	28	24	71	329	658	160	212	71	329	658	163	216
16,000	24	20	66	307	614	151	208	67	307	614	155	213
18,000	20	16	61	285	570	142	201	62	286	572	147	208
20,000	16	12	57	266	532	131	193	58	267	534	138	202
22,000	11	8	53	248	496	117	179	53	249	498	127	194
24,000	7	4	—	—	—	—	—	49	231	462	112	179
26,000	—	—	—	—	—	—	—	—	—	—	—	—
28,000	—	—	—	—	—	—	—	—	—	—	—	—
29,000	—	—	—	—	—	—	—	—	—	—	—	—
31,000	—	—	—	—	—	—	—	—	—	—	—	—

BT00662 RC-12G

Figure 7-38H. Maximum Cruise Power @ 1700 RPM ISA +37°C (Sheet 1 of 2)

MAXIMUM CRUISE POWER

1700 RPM

ISA +37 °C

WEIGHT			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	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	%	LBS/HR	LBS/HR	KTS	KTS	%	LBS/HR	LBS/HR	KTS	KTS
SL	56	52	93	476	952	200	214	93	476	952	201	215
2000	52	48	91	456	912	196	216	91	457	914	198	217
4000	49	44	90	438	876	193	218	90	438	876	194	220
6000	45	40	87	418	836	189	220	87	418	836	190	222
8000	41	36	84	397	794	184	221	84	397	794	185	223
10,000	37	32	81	376	752	179	222	81	376	752	180	224
12,000	33	28	76	353	706	172	221	77	353	706	174	224
14,000	29	24	72	330	660	165	219	72	330	660	168	222
16,000	25	20	67	308	616	158	217	67	309	618	161	220
18,000	21	16	63	287	574	151	214	63	288	576	154	218
20,000	16	12	58	268	536	143	209	59	269	538	146	215
22,000	12	8	54	250	500	134	203	54	251	502	139	211
24,000	8	4	49	232	464	123	195	50	233	466	130	204
26,000	4	0	45	215	430	108	180	46	216	432	120	196
28,000	0	-7	—	—	—	—	—	42	200	400	105	182
29,000	—	—	—	—	—	—	—	—	—	—	—	—
31,000	—	—	—	—	—	—	—	—	—	—	—	—

BT00663 RC-12G

Figure 7-38H. Maximum Cruise Power @ 1700 RPM ISA +37°C (Sheet 2 of 2)

MAXIMUM CRUISE POWER

1700 RPM

WEIGHT: 13,000 LBS

NOTES: 1. ISA DEVIATION LINES REFLECT ACTUAL TEMPERATURES FOR FLIGHT PLANNING. INDICATED TEMPERATURES SHOULD BE USED FOR IN-FLIGHT CRUISE POWER SETTING.
2. FOR OPERATION WITH ICE VANES EXTENDED, IF ORIGINAL POWER IS NOT OR CAN NOT BE RESET, TORQUE WILL DECREASE BY APPROXIMATELY 12% OF ORIGINAL SETTING.

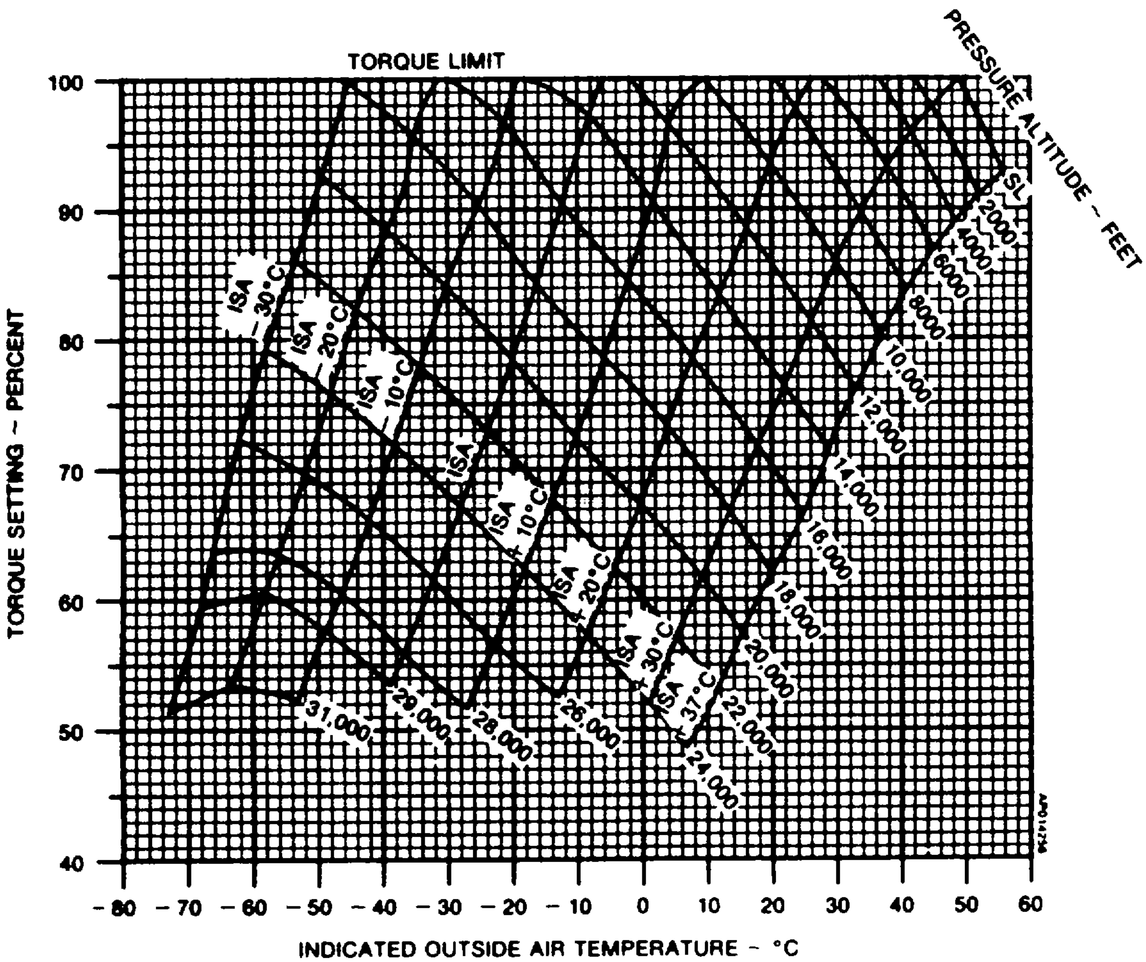

Figure 7-38I. Maximum Cruise Power

MAXIMUM RANGE POWER

1700 RPM

ISA – 30° C

WEIGHT →			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	-12	-15	76	407	814	198	189	73	398	796	195	187
2000	-16	-19	71	381	762	190	187	67	370	740	187	184
4000	-20	-23	67	357	714	183	185	63	345	690	180	182
6000	-24	-27	65	338	676	178	185	61	325	650	175	182
8000	-28	-31	63	322	644	174	186	59	308	616	170	183
10,000	-32	-35	62	308	616	170	188	58	293	586	166	184
12,000	-35	-39	62	298	596	167	191	57	283	566	163	186
14,000	-39	-43	62	289	578	164	193	57	274	548	160	189
16,000	-43	-47	61	280	560	161	195	57	266	532	158	191
18,000	-47	-51	61	272	544	157	197	56	259	518	155	194
20,000	-51	-55	60	264	528	153	197	56	253	506	152	197
22,000	-55	-59	59	258	516	148	198	55	246	492	148	198
24,000	-59	-63	60	259	518	147	203	54	239	478	143	197
26,000	-63	-67	61	261	522	145	207	55	240	480	141	201
28,000	-67	-71	57	244	488	133	197	57	243	486	140	206
29,000	-70	-72						55	233	466	133	200
31,000												

AP007280

Figure 7-39. Maximum Range Power @ 1700 RPM ISA -30°C (Sheet 1 of 2)

MAXIMUM RANGE POWER

1700 RPM

ISA − 30° C

WEIGHT →			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	−12	−15	69	388	776	193	185	66	380	760	191	182
2000	−16	−19	64	359	718	184	181	60	349	698	182	179
4000	−20	−23	59	333	666	177	179	55	321	642	174	176
6000	−24	−27	57	312	624	171	178	52	299	598	167	174
8000	−28	−31	55	295	590	166	179	50	282	564	163	175
10,000	−32	−35	53	279	558	162	180	48	266	532	158	175
12,000	−36	−39	52	269	538	159	182	48	255	510	155	177
14,000	−40	−43	52	259	518	156	184	47	244	488	152	179
16,000	−44	−47	52	250	500	153	186	47	236	472	149	181
18,000	−47	−51	51	244	488	151	189	46	228	456	147	184
20,000	−51	−55	52	238	476	149	192	46	222	444	144	187
22,000	−55	−59	52	234	468	147	196	47	219	438	142	190
24,000	−59	−63	51	229	458	143	197	47	215	430	140	194
26,000	−63	−67	50	221	442	137	196	47	211	422	138	197
28,000	−67	−71	50	221	442	135	200	46	206	412	133	197
29,000	−69	−72	51	226	452	135	203	47	208	416	133	200
31,000	−73	−76						49	213	426	133	207

AP007294

Figure 7-39. Maximum Range Power @ 1700 RPM ISA -30°C (Sheet 2 of 2)

MAXIMUM RANGE POWER

1700 RPM

ISA − 20° C

WEIGHT →			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	− 2	− 5	71	397	794	191	186	70	394	788	191	187
2000	− 6	− 9	70	381	762	187	188	69	376	752	188	188
4000	− 10	− 13	69	363	726	184	190	67	357	714	183	189
6000	− 14	− 17	67	347	694	180	191	64	337	674	178	189
8000	− 17	− 21	66	331	662	175	192	62	320	640	173	189
10,000	− 21	− 25	64	315	630	171	192	60	303	606	168	190
12,000	− 25	− 29	63	302	604	166	194	59	291	582	165	192
14,000	− 29	− 33	61	290	580	162	194	59	281	562	161	194
16,000	− 33	− 37	60	278	556	157	195	57	269	538	157	195
18,000	− 37	− 41	59	270	540	153	196	56	258	516	152	194
20,000	− 41	− 45	61	269	538	152	201	55	251	502	148	196
22,000	− 45	− 49	61	268	536	150	205	56	250	500	146	200
24,000	− 49	− 53	61	262	524	145	205	57	248	496	144	204
26,000	− 52	− 57	63	269	538	146	213	56	243	486	140	204
28,000	− 56	− 61	58	251	502	133	201	59	252	504	141	213
29,000	− 59	− 62						55	240	480	133	205
31,000												

AP007286

Figure 7-40. Maximum Range Power @ 1700 RPM ISA -20°C (Sheet 1 of 2)

MAXIMUM RANGE POWER

1700 RPM

ISA – 20° C

WEIGHT →			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	- 2	- 5	69	390	780	191	187	68	385	770	191	187
2000	- 6	- 9	67	370	740	187	188	64	362	724	186	186
4000	- 10	- 13	64	347	694	181	187	60	337	674	178	184
6000	- 14	- 17	60	325	650	175	186	56	314	628	172	183
8000	- 18	- 21	58	307	614	170	186	54	295	590	166	182
10,000	- 22	- 25	56	290	580	165	186	52	277	554	161	182
12,000	- 26	- 29	55	278	556	161	188	50	264	528	158	183
14,000	- 29	- 33	54	267	534	158	190	50	253	506	154	185
16,000	- 33	- 37	54	258	516	155	192	49	244	488	151	188
18,000	- 37	- 41	53	249	498	152	194	49	237	474	149	191
20,000	- 41	- 45	52	241	482	148	195	49	230	460	146	193
22,000	- 45	- 49	51	234	468	143	196	48	228	448	143	195
24,000	- 49	- 53	51	230	460	140	198	47	217	434	138	196
26,000	- 53	- 57	52	230	460	139	203	46	211	422	134	197
28,000	- 57	- 61	51	226	452	134	203	47	211	422	133	201
29,000	- 59	- 62	53	230	460	135	208	48	214	428	133	205
31,000	- 62	- 66						50	219	438	133	212

AP007296

Figure 7-40. Maximum Range Power @ 1700 RPM ISA -20°C (Sheet 2 of 2)

MAXIMUM RANGE POWER

1700 RPM

ISA – 10° C

WEIGHT →			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	8	5	71	396	792	188	187	67	387	774	186	185
2000	4	1	68	374	748	182	187	65	366	732	181	185
4000	0	- 3	66	356	712	178	187	64	350	700	178	187
6000	- 4	- 7	65	341	682	174	189	62	333	666	174	188
8000	- 7	- 11	64	327	654	171	191	61	319	638	170	190
10,000	- 11	- 15	63	313	626	167	193	60	304	608	166	191
12,000	- 15	- 19	62	302	604	164	195	58	390	780	162	192
14,000	- 19	- 23	62	294	588	161	198	57	279	558	158	193
16,000	- 23	- 27	62	287	574	159	201	57	270	540	154	195
18,000	- 27	- 31	62	280	560	155	203	57	264	528	152	198
20,000	- 31	- 35	61	272	544	151	203	57	259	518	149	202
22,000	- 35	- 39	62	272	544	149	207	57	254	508	146	204
24,000	- 38	- 43	64	273	546	147	213	57	251	502	142	206
26,000	- 42	- 47	58	251	502	133	199	59	254	508	142	211
28,000	- 47	- 51	60	259	518	133	206	56	243	486	133	206
29,000												
31,000												

AP007287

Figure 7-41. Maximum Range Power @ 1700 RPM ISA -10°C (Sheet 1 of 2)

MAXIMUM RANGE POWER

1700 RPM

ISA – 10° C

WEIGHT →			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	8	5	65	379	758	185	184	64	376	752	185	184
2000	4	1	64	362	724	182	186	62	358	716	182	186
4000	0	– 3	62	344	688	178	187	61	340	680	178	187
6000	– 4	– 7	61	328	656	174	189	59	322	644	173	188
8000	– 8	– 11	59	312	624	170	189	57	305	610	169	189
10,000	– 11	– 15	57	296	592	165	190	54	286	572	163	188
12,000	– 15	– 19	56	282	564	161	191	52	272	544	159	189
14,000	– 19	– 23	54	269	538	157	192	51	260	520	155	190
16,000	– 23	– 27	53	258	516	152	193	50	249	498	151	192
18,000	– 27	– 31	52	247	494	148	193	49	238	476	147	192
20,000	– 31	– 35	52	241	482	145	196	47	228	456	142	193
22,000	– 35	– 39	53	240	480	143	201	47	222	444	139	194
24,000	– 39	– 43	53	236	472	141	203	48	220	440	137	199
26,000	– 43	– 47	52	231	462	136	204	48	218	436	135	203
28,000	– 46	– 51	54	235	470	136	210	49	217	434	133	206
29,000	– 49	– 52	53	232	464	133	210	50	220	440	133	210
31,000												

AP007298

Figure 7-41. Maximum Range Power @ 1700 RPM ISA -10°C (Sheet 2 of 2)

MAXIMUM RANGE POWER

1700 RPM

ISA

WEIGHT →			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	18	15	74	410	820	191	193	71	402	804	190	192
2000	14	11	71	386	772	185	193	67	374	748	182	190
4000	10	7	68	364	728	179	192	64	351	702	176	189
6000	7	3	66	347	694	175	193	61	332	664	171	189
8000	3	− 1	65	334	668	171	195	60	318	636	167	191
10,000	− 1	− 5	65	321	642	168	198	60	306	612	165	193
12,000	− 5	− 9	64	311	622	165	200	60	296	592	162	196
14,000	− 9	− 13	64	300	600	161	202	60	288	576	160	199
16,000	− 13	− 17	62	287	574	156	201	59	278	556	156	201
18,000	− 17	− 21	61	279	558	152	202	57	267	534	151	201
20,000	− 21	− 25	63	280	560	152	209	57	259	518	146	202
22,000	− 24	− 29	64	280	560	149	213	58	260	520	146	208
24,000	− 28	− 33	65	279	558	147	216	59	260	520	144	212
26,000	− 33	− 37	59	258	516	133	203	55	243	486	133	203
28,000												
29,000												
31,000												

AP007299

Figure 7-42. Maximum Range Power @ 1700 RPM ISA (Sheet 1 of 2)

MAXIMUM RANGE POWER

1700 RPM

ISA

WEIGHT →			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	18	15	68	391	782	187	189	64	380	760	185	187
2000	14	11	63	363	726	179	187	59	352	704	177	184
4000	10	7	60	339	678	173	186	57	331	662	172	184
6000	6	3	58	322	644	169	187	56	315	630	168	186
8000	2	−1	56	306	612	165	187	54	298	596	164	186
10,000	−2	−5	55	292	584	161	189	52	283	566	160	188
12,000	−5	−9	54	280	560	158	191	51	270	540	156	189
14,000	−9	−13	55	272	544	155	194	50	258	516	152	190
16,000	−13	−17	55	264	528	153	198	49	249	498	149	192
18,000	−17	−21	54	257	514	150	200	49	242	484	147	196
20,000	−21	−25	53	249	498	146	202	49	235	470	144	198
22,000	−25	−29	52	241	482	141	202	49	230	460	141	201
24,000	−29	−33	54	240	480	140	207	48	222	444	136	201
26,000	−32	−37	54	240	480	138	211	49	220	440	134	205
28,000	−36	−41	54	238	476	134	213	50	222	444	133	211
29,000	−38	−42						51	225	450	133	214
31,000												

AP007300

Figure 7-42. Maximum Range Power @ 1700 RPM ISA (Sheet 2 of 2)

MAXIMUM RANGE POWER

1700 RPM

ISA + 10° C

WEIGHT →			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	28	25	72	406	812	187	192	70	400	800	187	192
2000	24	21	70	387	774	183	194	68	380	760	183	193
4000	21	17	69	368	736	178	195	66	361	722	178	194
6000	17	13	67	351	702	174	196	64	342	684	173	195
8000	13	9	66	336	672	170	197	62	326	652	169	196
10,000	9	5	65	321	642	166	199	61	311	622	165	197
12,000	5	1	63	308	616	162	200	60	298	596	161	199
14,000	1	−3	63	300	600	158	202	59	287	574	157	199
16,000	−3	−7	64	295	590	157	206	58	277	554	152	200
18,000	−7	−11	64	291	582	154	210	58	271	542	150	204
20,000	−10	−15	64	286	572	151	212	59	269	538	148	208
22,000	−14	−19	56	254	508	133	194	60	266	532	146	212
24,000	−18	−23	58	258	516	133	201	61	268	536	145	218
26,000	−23	−27						56	249	498	133	208
28,000												
29,000												
31,000												

AP007301

Figure 7-43. Maximum Range Power @ 1700 RPM ISA +10°C (Sheet 1 of 2)

MAXIMUM RANGE POWER

1700 RPM

ISA + 10° C

WEIGHT →			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	28	25	68	393	786	186	191	66	387	774	185	191
2000	24	21	66	374	748	182	193	63	365	730	180	191
4000	20	17	63	351	702	176	192	59	340	680	174	189
6000	17	13	60	331	662	171	192	56	318	636	167	188
8000	13	9	58	314	628	166	193	54	300	600	162	188
10,000	9	5	57	298	596	162	194	52	284	568	158	189
12,000	5	1	56	286	572	159	196	52	272	544	155	191
14,000	1	−3	56	277	554	156	199	51	264	528	153	194
16,000	−3	−7	55	266	532	151	199	51	255	510	150	197
18,000	−7	−11	53	255	510	147	200	50	246	492	146	199
20,000	−11	−15	53	249	498	143	202	49	235	470	141	199
22,000	−15	−19	54	249	498	143	208	48	229	458	138	201
24,000	−18	−23	55	246	492	140	211	49	228	456	136	206
26,000	−22	−27	53	236	472	133	208	50	227	454	134	210
28,000	−26	−31						51	228	456	133	215
29,000												
31,000												

AP007302

Figure 7-43. Maximum Range Power @ 1700 RPM ISA +10°C (Sheet 2 of 2)

MAXIMUM RANGE POWER

1700 RPM

ISA + 20° C

WEIGHT →			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	39	35	73	410	820	186	195	68	397	794	183	192
2000	35	31	70	388	776	181	195	66	376	752	178	192
4000	31	27	68	368	736	176	195	64	358	716	174	193
6000	27	23	66	351	702	171	196	62	340	680	170	194
8000	23	19	65	336	672	168	198	61	324	648	165	195
10,000	19	15	64	323	646	164	200	60	309	618	161	196
12,000	15	11	65	316	632	163	205	59	298	596	158	199
14,000	11	7	66	309	618	161	208	60	291	582	156	203
16,000	7	3	65	299	598	156	210	61	286	572	155	208
18,000	3	− 1	64	290	580	152	210	60	277	554	151	209
20,000	− 1	− 5	55	257	514	133	191	59	270	540	146	209
22,000	− 5	− 9	57	261	522	133	198	53	247	494	133	198
24,000	− 9	− 13						55	250	500	133	205
26,000												
28,000												
29,000												
31,000												

AP007303

Figure 7-44. Maximum Range Power @ 1700 RPM ISA +20°C (Sheet 1 of 2)

MAXIMUM RANGE POWER

1700 RPM

ISA + 20° C

WEIGHT →			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	38	35	65	388	776	181	190	63	381	762	181	189
2000	34	31	63	368	736	177	191	61	362	724	177	190
4000	31	27	62	350	700	173	192	60	343	686	173	192
6000	27	23	60	333	666	169	194	58	326	652	169	193
8000	23	19	58	316	632	165	195	56	308	616	164	194
10,000	19	15	57	300	600	160	195	54	290	580	159	194
12,000	15	11	55	286	572	156	196	53	277	554	155	195
14,000	11	7	55	275	550	152	198	51	265	530	151	196
16,000	7	3	55	267	534	150	201	50	254	508	147	197
18,000	3	−1	55	262	524	148	206	50	245	490	144	200
20,000	−1	−5	55	258	516	145	208	50	242	484	142	204
22,000	−5	−9	54	251	502	141	209	51	237	474	139	207
24,000	−8	−13	57	254	508	141	217	50	232	464	135	209
26,000	−12	−17						51	233	466	135	215
28,000												
29,000												
31,000												

AP007304

Figure 7-44. Maximum Range Power @ 1700 RPM ISA +20°C (Sheet 2 of 2)

MAXIMUM RANGE POWER

1700 RPM

ISA + 30° C

WEIGHT →			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	49	45	74	418	836	187	198	71	410	820	186	197
2000	45	41	72	397	794	182	199	69	386	772	180	197
4000	41	37	71	379	758	178	201	66	365	730	175	197
6000	37	33	69	363	726	174	203	64	348	696	171	199
8000	33	29	68	347	694	170	204	63	332	664	167	200
10,000	29	25	67	333	666	166	206	62	318	636	163	202
12,000	25	21	66	320	640	162	207	62	308	616	161	205
14,000	21	17	65	308	616	158	208	61	297	594	157	207
16,000	17	13	66	304	608	156	212	60	286	572	152	208
18,000	13	9	54	260	520	133	188	60	278	556	148	209
20,000	9	5	56	261	522	133	195	52	249	498	133	195
22,000	5	1						54	252	504	133	201
24,000												
26,000												
28,000												
29,000												
31,000												

AP007306

Figure 7-45. Maximum Range Power @ 1700 RPM ISA +30°C (Sheet 1 of 2)

MAXIMUM RANGE POWER

1700 RPM

ISA + 30° C

WEIGHT →			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	49	45	68	398	796	183	195	64	387	774	180	192
2000	45	41	64	374	748	177	194	60	361	722	174	191
4000	41	37	61	350	700	171	193	57	339	678	169	190
6000	37	33	60	333	666	167	194	56	323	646	165	192
8000	33	29	58	317	634	163	195	54	306	612	161	193
10,000	29	25	57	301	602	159	197	53	289	578	156	194
12,000	25	21	57	291	582	156	200	52	276	552	152	195
14,000	21	17	57	283	566	154	203	51	265	530	149	197
16,000	17	13	57	275	550	151	206	51	258	516	147	201
18,000	13	9	56	264	528	147	207	52	253	506	146	206
20,000	9	5	54	255	510	142	208	51	244	488	142	207
22,000	6	1	57	259	518	143	216	50	236	472	137	207
24,000	2	−3	53	242	484	133	209	49	231	462	133	209
26,000												
28,000												
29,000												
31,000												

AP007306

Figure 7-45. Maximum Range Power @ 1700 RPM ISA +30°C (Sheet 2 of 2)

MAXIMUM RANGE POWER

1700 RPM

ISA + 37° C

WEIGHT →			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	56	52	73	415	830	184	198	70	407	814	183	197
2000	52	48	71	396	792	180	199	68	388	776	179	198
4000	48	44	70	378	756	176	201	67	369	738	175	200
6000	44	40	68	362	724	172	202	65	352	704	171	201
8000	40	36	67	346	692	168	203	64	337	674	167	203
10,000	36	32	66	331	662	163	205	63	321	642	163	204
12,000	32	28	65	319	638	160	206	62	308	616	159	205
14,000	28	24	67	316	632	159	213	61	296	592	154	206
16,000	24	20	52	264	528	133	184	61	291	582	153	211
18,000	20	16	55	264	528	133	191	51	252	504	133	191
20,000	16	12	57	265	530	133	197	53	252	504	133	197
22,000												
24,000												
26,000												
28,000												
29,000												
31,000												

AP007307

Figure 7-46. Maximum Range Power @ 1700 RPM ISA +37°C (Sheet 1 of 2)

MAXIMUM RANGE POWER

1700 RPM

ISA + 37° C

WEIGHT →			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	56	52	68	399	798	182	196	64	390	780	180	194
2000	52	48	65	378	756	177	196	62	367	734	175	194
4000	48	44	63	358	716	173	198	59	345	690	170	194
6000	44	40	61	340	680	168	198	57	326	652	165	194
8000	40	36	60	324	648	164	200	55	309	618	161	195
10,000	36	32	59	309	618	161	201	54	293	586	157	196
12,000	32	28	58	296	592	157	203	53	282	564	154	199
14,000	28	24	57	285	570	153	205	53	272	544	151	202
16,000	24	20	56	274	548	149	206	52	263	526	148	205
18,000	20	16	56	266	532	146	208	51	252	504	144	205
20,000	16	12	49	241	482	133	197	50	243	486	139	206
22,000	13	8	52	243	486	133	204	52	242	484	138	212
24,000	8	5						50	233	466	133	211
26,000												
28,000												
29,000												
31,000												

AP007308

Figure 7-46. Maximum Range Power @ 1700 RPM ISA +37°C (Sheet 2 of 2)

MAXIMUM ENDURANCE POWER

1700 RPM

ISA – 30° C

WEIGHT →			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	−14	−15	37	299	598	133	128	35	293	586	133	128
2000	−17	−19	38	285	570	133	132	35	278	556	133	132
4000	−21	−23	38	272	544	133	135	36	264	528	133	135
6000	−25	−27	39	262	524	133	139	37	254	508	133	139
8000	−29	−31	40	254	508	133	143	38	246	492	133	143
10,000	−33	−35	41	247	494	133	148	39	238	476	133	148
12,000	−37	−39	43	241	482	133	152	40	233	466	133	152
14,000	−40	−43	44	237	474	133	157	41	229	458	133	157
16,000	−44	−47	46	234	468	133	162	43	225	450	133	162
18,000	−48	−51	47	232	464	133	167	44	222	444	133	167
20,000	−52	−55	49	231	462	133	172	46	221	442	133	172
22,000	−56	−59	50	231	462	133	178	47	221	442	133	178
24,000	−59	−63	52	233	466	133	184	49	221	442	133	184
26,000	−63	−67	54	237	474	133	190	51	225	450	133	190
28,000	−67	−71	57	244	488	133	197	53	230	460	133	197
29,000	−70	−72						54	233	466	133	200
31,000												

AP007277

Figure 7-47. Maximum Endurance Power @ 1700 RPM ISA -30°C (Sheet 1 of 2)

MAXIMUM ENDURANCE POWER

1700 RPM

ISA – 30° C

WEIGHT →			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	– 14	– 15	33	287	574	133	128	31	281	562	133	128
2000	– 17	– 19	33	272	544	133	132	31	266	532	133	132
4000	– 21	– 23	33	257	514	133	135	31	251	502	133	135
6000	– 25	– 27	34	247	494	133	139	32	240	480	133	139
8000	– 29	– 31	35	239	478	133	143	33	232	464	133	143
10,000	– 33	– 35	36	230	460	133	148	34	223	446	133	148
12,000	– 37	– 39	37	225	450	133	152	35	218	436	133	152
14,000	– 40	– 43	39	220	440	133	157	36	213	426	133	157
16,000	– 44	– 47	40	217	434	133	162	38	209	418	133	162
18,000	– 48	– 51	41	214	428	133	167	39	206	412	133	167
20,000	– 52	– 55	43	212	424	133	172	40	203	406	133	172
22,000	– 56	– 59	44	211	422	133	178	42	203	406	133	178
24,000	– 59	– 63	46	211	422	133	184	43	202	404	133	184
26,000	– 63	– 67	47	213	426	133	190	44	203	406	133	190
28,000	– 67	– 71	49	217	434	133	197	46	206	412	133	197
29,000	– 69	– 72	50	220	440	133	200	47	208	416	133	200
31,000	– 73	– 76						49	213	426	133	207

AP007278

Figure 7-47. Maximum Endurance power @ 1700 RPM ISA - 30°C (Sheet 2 of 2)

MAXIMUM ENDURANCE POWER

1700 RPM

ISA – 20° C

WEIGHT →			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	– 3	– 5	39	305	610	133	130	37	298	596	133	130
2000	– 7	– 9	39	291	582	133	134	37	285	570	133	134
4000	– 11	– 13	40	279	558	133	138	37	272	544	133	138
6000	– 15	– 17	41	269	538	133	142	38	262	524	133	142
8000	– 19	– 21	42	261	522	133	146	39	253	506	133	146
10,000	– 23	– 25	43	252	504	133	151	40	244	488	133	151
12,000	– 27	– 29	44	247	494	133	156	41	238	476	133	156
14,000	– 30	– 33	45	242	484	133	160	43	234	468	133	160
16,000	– 34	– 37	47	238	476	133	165	44	230	460	133	165
18,000	– 38	– 41	48	236	472	133	171	45	227	454	133	171
20,000	– 42	– 45	50	235	470	133	176	47	225	450	133	176
22,000	– 46	– 49	52	237	474	133	182	48	225	450	133	182
24,000	– 49	– 53	54	239	478	133	188	50	227	454	133	188
26,000	– 53	– 57	56	244	488	133	195	52	230	460	133	195
28,000	– 57	– 61	58	251	502	133	201	54	237	474	133	201
29,000	– 59	– 62						55	240	480	133	205
31,000												

AP007279

Figure 7-48. Maximum Endurance Power @ 1700 RPM ISA -20°C (Sheet 1 of 2)

MAXIMUM ENDURANCE POWER

1700 RPM

ISA − 20° C

WEIGHT →			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	− 3	− 5	35	293	586	133	130	33	287	574	133	130
2000	− 7	− 9	35	278	556	133	134	33	273	546	133	134
4000	− 11	− 13	35	265	530	133	138	33	259	518	133	138
6000	− 15	− 17	36	255	510	133	142	34	248	496	133	142
8000	− 19	− 21	37	245	490	133	146	35	239	478	133	146
10,000	− 23	− 25	38	237	474	133	151	35	230	460	133	151
12,000	− 27	− 29	39	230	460	133	156	36	223	446	133	156
14,000	− 30	− 33	40	225	450	133	160	38	218	436	133	160
16,000	− 34	− 37	41	221	442	133	165	39	214	428	133	165
18,000	− 38	− 41	42	218	436	133	171	40	210	420	133	171
20,000	− 42	− 45	44	216	432	133	176	41	208	416	133	176
22,000	− 46	− 49	45	215	430	133	182	43	207	414	133	182
24,000	− 49	− 53	47	216	432	133	188	44	206	412	133	188
26,000	− 53	− 57	49	218	436	133	195	46	208	416	133	195
28,000	− 57	− 61	51	223	466	133	201	47	211	422	133	201
29,000	− 59	− 62	52	226	452	133	205	48	214	428	133	205
31,000	− 62	− 66						50	219	438	133	212

AP007280

Figure 7-48. Maximum Endurance Power @ 1700 RPM ISA -20°C (Sheet 2 of 2)

MAXIMUM ENDURANCE POWER

1700 RPM

ISA – 10° C

WEIGHT →			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	7	5	39	308	616	133	133	37	302	604	133	133
2000	3	1	40	295	590	133	137	38	289	578	133	137
4000	– 1	– 3	41	283	566	133	141	38	276	552	133	141
6000	– 5	– 7	42	274	548	133	145	39	267	534	133	145
8000	– 9	– 11	43	266	532	133	149	40	258	516	133	149
10,000	– 13	– 15	44	257	514	133	154	41	249	498	133	154
12,000	– 16	– 19	45	251	502	133	159	42	243	486	133	159
14,000	– 20	– 23	46	246	492	133	164	43	238	476	133	164
16,000	– 24	– 27	47	243	486	133	169	45	234	468	133	169
18,000	– 28	– 31	49	241	482	133	174	46	231	462	133	174
20,000	– 32	– 35	51	240	480	133	180	48	230	460	133	180
22,000	– 35	– 39	53	242	484	133	186	49	231	462	133	186
24,000	– 39	– 43	55	246	492	133	193	51	233	466	133	193
26,000	– 43	– 47	58	251	502	133	199	54	237	474	133	199
28,000	– 47	– 51	60	259	518	133	206	56	243	486	133	206
29,000												
31,000												

AP007281

Figure 7-49. Maximum Endurance Power @ 1700 RPM ISA -10°C (Sheet 1 of 2)

MAXIMUM ENDURANCE POWER

1700 RPM

ISA – 10° C

WEIGHT →			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	7	5	35	296	592	133	133	34	291	582	133	133
2000	3	1	36	283	566	133	137	34	277	554	133	137
4000	– 1	– 3	36	270	540	133	141	34	264	528	133	141
6000	– 5	– 7	37	260	520	133	145	35	254	508	133	145
8000	– 9	– 11	38	251	502	133	149	36	245	490	133	149
10,000	– 13	– 15	39	242	484	133	154	37	235	470	133	154
12,000	– 16	– 19	40	235	470	133	159	37	228	456	133	159
14,000	– 20	– 23	41	230	460	133	164	39	223	446	133	164
16,000	– 24	– 27	42	226	452	133	169	40	218	436	133	169
18,000	– 28	– 31	43	222	444	133	174	41	214	428	133	174
20,000	– 32	– 35	45	220	440	133	180	42	211	422	133	180
22,000	– 35	– 39	46	220	440	133	186	43	211	422	133	186
24,000	– 39	– 43	48	221	442	133	193	45	212	424	133	193
26,000	– 43	– 47	50	224	448	133	199	47	213	426	133	199
28,000	– 47	– 51	52	229	458	133	206	49	217	434	133	206
29,000	– 49	– 52	53	232	464	133	210	50	220	440	133	210
31,000												

AP007282

Figure 7-49. Maximum Endurance Power @ 1700 RPM ISA -10°C (Sheet 2 of 2)

MAXIMUM ENDURANCE POWER

1700 RPM

ISA

WEIGHT →			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	17	15	39	309	618	133	135	37	303	606	133	135
2000	13	11	40	297	594	133	139	38	291	582	133	139
4000	9	7	41	286	572	133	143	39	279	558	133	143
6000	5	3	42	276	552	133	148	40	269	538	133	148
8000	1	− 1	43	268	536	133	152	41	261	522	133	152
10,000	− 3	− 5	44	260	520	133	157	42	253	506	133	157
12,000	− 6	− 9	46	255	510	133	162	43	246	492	133	162
14,000	− 10	− 13	47	251	502	133	167	44	241	482	133	167
16,000	− 14	− 17	49	248	496	133	172	46	238	476	133	172
18,000	− 18	− 21	50	245	490	133	178	47	235	470	133	178
20,000	− 21	− 25	52	245	490	133	184	49	234	468	133	184
22,000	− 25	− 29	54	248	496	133	190	51	236	472	133	190
24,000	− 29	− 33	57	252	504	133	197	53	239	478	133	197
26,000	− 33	− 37	59	258	516	133	203	55	243	486	133	203
28,000												
29,000												
31,000												

AP007283

Figure 7-50. Maximum Endurance Power @ 1700 RPM ISA (Sheet 1 of 2)

MAXIMUM ENDURANCE POWER

1700 RPM

ISA

WEIGHT →			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	17	15	35	298	596	133	135	33	292	584	133	135
2000	13	11	36	285	570	133	139	34	280	560	133	139
4000	9	7	37	273	546	133	143	35	267	534	133	143
6000	5	3	38	263	526	133	148	36	257	514	133	148
8000	1	−1	38	254	508	133	152	36	247	494	133	152
10,000	−3	−5	39	245	490	133	157	37	239	478	133	157
12,000	−6	−9	40	239	478	133	162	38	232	464	133	162
14,000	−10	−13	41	233	466	133	167	39	226	452	133	167
16,000	−14	−17	43	229	458	133	172	40	221	442	133	172
18,000	−18	−21	44	226	452	133	178	41	218	436	133	178
20,000	−21	−25	46	225	450	133	184	43	216	432	133	184
22,000	−25	−29	47	225	450	133	190	44	216	432	133	190
24,000	−29	−33	49	227	454	133	197	46	216	432	133	197
26,000	−33	−37	51	230	460	133	203	48	219	438	133	203
28,000	−36	−41	53	236	472	133	211	50	222	444	133	211
29,000	−38	−42						51	225	450	133	214
31,000												

AP007284

Figure 7-50. Maximum Endurance Power @ 1700 (Sheet 2 of 2)

MAXIMUM ENDURANCE POWER

1700 RPM

ISA + 10° C

WEIGHT →			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	27	25	39	310	620	133	137	37	303	606	133	137
2000	23	21	40	299	598	133	141	38	292	584	133	141
4000	19	17	41	288	576	133	146	39	281	562	133	146
6000	15	13	42	278	556	133	150	40	271	542	133	150
8000	11	9	44	271	542	133	155	41	262	524	133	155
10,000	8	5	45	263	526	133	160	42	254	508	133	160
12,000	4	1	47	258	516	133	165	44	249	498	133	165
14,000	0	− 3	48	255	510	133	170	45	245	490	133	170
16,000	− 4	− 7	50	252	504	133	176	46	242	484	133	176
18,000	− 8	− 11	51	251	502	133	181	48	240	480	133	181
20,000	− 11	− 15	53	252	504	133	188	50	240	480	133	188
22,000	− 15	− 19	56	254	508	133	194	52	242	484	133	194
24,000	− 19	− 23	58	258	516	133	201	54	245	490	133	201
26,000	− 23	− 27						56	249	498	133	208
28,000												
29,000												
31,000												

AP007266

Figure 7-51. Maximum Endurance Power @ 1700 RPM ISA +10°C (Sheet 1 of 2)

MAXIMUM ENDURANCE POWER

1700 RPM

ISA + 10° C

WEIGHT →			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	27	25	35	298	596	133	137	33	292	584	133	137
2000	23	21	36	286	572	133	141	34	281	562	133	141
4000	19	17	37	275	550	133	146	35	269	538	133	146
6000	15	13	38	265	530	133	150	36	259	518	133	150
8000	11	9	39	256	512	133	155	37	249	498	133	155
10,000	8	5	40	247	494	133	160	38	240	480	133	160
12,000	4	1	41	240	480	133	165	39	233	466	133	165
14,000	0	– 3	42	237	474	133	170	40	229	458	133	170
16,000	– 4	– 7	44	233	466	133	176	41	225	450	133	176
18,000	– 8	– 11	45	230	460	133	181	42	222	444	133	181
20,000	– 11	– 15	47	229	458	133	188	44	220	440	133	188
22,000	– 15	– 19	49	230	460	133	194	45	220	440	133	194
24,000	– 19	– 23	50	232	464	133	201	47	221	442	133	201
26,000	– 22	– 27	53	236	472	133	208	49	224	448	133	208
28,000	– 26	– 31						51	228	456	133	215
29,000												
31,000												

AP007286

Figure 7-51. Maximum Endurance Power @ 1700 RPM ISA +10°C (Sheet 2 of 2)

MAXIMUM ENDURANCE POWER

1700 RPM

ISA + 20° C

WEIGHT →			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	37	35	40	315	630	133	140	38	308	616	133	140
2000	33	31	41	303	606	133	144	39	296	592	133	144
4000	29	27	42	292	584	133	148	40	285	570	133	148
6000	25	23	43	283	566	133	153	41	275	550	133	153
8000	21	19	45	276	552	133	158	42	267	534	133	158
10,000	18	15	46	268	536	133	163	43	259	518	133	163
12,000	14	11	47	262	524	133	168	44	253	506	133	168
14,000	10	7	49	258	516	133	173	46	249	498	133	173
16,000	6	3	51	256	512	133	179	47	245	490	133	179
18,000	3	−1	53	254	508	133	185	49	244	488	133	185
20,000	−1	−5	55	257	514	133	191	51	245	490	133	191
22,000	−5	−9	57	261	522	133	198	53	247	494	133	198
24,000	−9	−13						55	250	500	133	205
26,000												
28,000												
29,000												
31,000												

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Figure 7-52. Maximum Endurance Power @ 1700 RPM ISA +20°C (Sheet 1 of 2)

MAXIMUM ENDURANCE POWER

1700 RPM

ISA + 20° C

WEIGHT →			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	37	35	36	301	602	133	140	34	295	590	133	140
2000	33	31	37	289	578	133	144	35	283	566	133	144
4000	29	27	37	278	556	133	148	35	271	542	133	148
6000	25	23	38	268	536	133	153	36	261	522	133	153
8000	21	19	39	259	518	133	158	37	252	504	133	158
10,000	18	15	41	251	502	133	163	38	244	488	133	163
12,000	14	11	42	245	490	133	168	39	237	474	133	168
14,000	10	7	43	240	480	133	173	41	232	464	133	173
16,000	6	3	44	236	472	133	179	42	228	456	133	179
18,000	3	-1	46	234	468	133	185	43	224	448	133	185
20,000	-1	-5	48	234	468	133	191	45	225	450	133	191
22,000	-5	-9	50	235	470	133	198	46	225	450	133	198
24,000	-9	-13	52	238	476	133	205	48	226	452	133	205
26,000	-12	-17						50	229	458	133	212
28,000												
29,000												
31,000												

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Figure 7-52. Maximum Endurance Power @ 1700 RPM ISA +20°C (Sheet 2 of 2)

MAXIMUM ENDURANCE POWER

1700 RPM

ISA + 30° C

WEIGHT →			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	47	45	41	318	636	133	142	39	312	624	133	142
2000	43	41	42	307	614	133	146	39	299	598	133	146
4000	39	37	43	296	592	133	151	40	288	576	133	151
6000	35	33	44	287	574	133	155	41	279	558	133	155
8000	32	29	45	279	558	133	160	43	271	542	133	160
10,000	28	25	47	272	544	133	165	44	263	526	133	165
12,000	24	21	48	267	534	133	171	45	257	514	133	171
14,000	20	17	50	263	526	133	176	47	253	506	133	176
16,000	16	13	52	261	522	133	182	48	250	500	133	182
18,000	13	9	54	260	520	133	188	50	248	496	133	188
20,000	9	5	56	261	522	133	195	52	249	498	133	195
22,000	5	1						54	252	504	133	201
24,000												
26,000												
28,000												
29,000												
31,000												

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Figure 7-53. Maximum Endurance Power @ 1700 RPM ISA +30°C (Sheet 1 of 2)

MAXIMUM ENDURANCE POWER

1700 RPM

ISA + 30° C

WEIGHT →			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	47	45	37	305	610	133	142	35	300	600	133	142
2000	43	41	37	293	586	133	146	35	286	572	133	146
4000	39	37	38	281	562	133	151	36	274	548	133	151
6000	35	33	39	271	542	133	155	37	265	530	133	155
8000	32	29	40	263	526	133	160	38	256	512	133	160
10,000	28	25	41	255	510	133	165	39	248	496	133	165
12,000	24	21	42	248	496	133	171	40	241	482	133	171
14,000	20	17	44	244	488	133	176	41	235	470	133	176
16,000	16	13	45	241	482	133	182	43	232	464	133	182
18,000	13	9	47	238	476	133	188	44	229	458	133	188
20,000	9	5	49	237	474	133	195	46	227	454	133	195
22,000	5	1	51	240	480	133	201	47	229	458	133	201
24,000	2	-3	53	242	484	133	209	49	231	462	133	209
26,000												
28,000												
29,000												
31,000												

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Figure 7-53. Maximum Endurance Power @ 1700 RPM ISA +30°C (Sheet 2 of 2)

MAXIMUM ENDURANCE POWER

1700 RPM

ISA + 37° C

WEIGHT →			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	54	52	41	319	638	133	143	39	312	624	133	143
2000	50	48	42	308	616	133	148	40	301	602	133	148
4000	46	44	43	298	596	133	152	41	290	580	133	152
6000	42	40	44	289	578	133	157	42	281	562	133	157
8000	39	36	46	282	564	133	162	43	273	546	133	162
10,000	35	32	47	275	550	133	167	44	266	532	133	167
12,000	31	28	49	270	540	133	173	46	260	520	133	173
14,000	27	24	50	266	532	133	178	47	256	512	133	178
16,000	23	20	52	264	528	133	184	49	253	506	133	184
18,000	20	16	55	264	528	133	191	51	252	504	133	191
20,000	16	12	57	265	530	133	197	53	252	504	133	197
22,000												
24,000												
26,000												
28,000												
29,000												
31,000												

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Figure 7-54. Maximum Endurance Power @ 1700 RPM ISA +37°C (Sheet 1 of 2)

MAXIMUM ENDURANCE POWER

1700 RPM

ISA + 37° C

WEIGHT →			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS	TORQUE PER ENGINE	FUEL FLOW PER ENG.	FUEL FLOW TOTAL	IAS	TAS
FEET	°C	°C	%	LB/HR	LB/HR	KTS	KTS	%	LB/HR	LB/HR	KTS	KTS
SL	54	52	37	306	612	133	143	35	301	602	133	143
2000	50	48	37	295	590	133	148	36	289	578	133	148
4000	46	44	38	283	566	133	152	36	277	554	133	152
6000	42	40	39	274	548	133	157	37	267	534	133	157
8000	39	36	40	265	530	133	162	38	258	516	133	162
10,000	35	32	42	257	514	133	167	39	250	500	133	167
12,000	31	28	43	251	502	133	173	40	243	486	133	173
14,000	27	24	44	247	494	133	178	42	238	476	133	178
16,000	23	20	46	243	486	133	184	43	235	470	133	184
18,000	20	16	47	241	482	133	191	45	232	464	133	191
20,000	16	12	49	241	482	133	197	46	231	462	133	197
22,000	12	8	52	243	486	133	204	48	232	464	133	204
24,000	8	5						50	233	466	133	211
26,000												
28,000												
29,000												
31,000												

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Figure 7-54. Maximum Endurance Power @ 1700 RPM ISA +37°C (Sheet 2 of 2)

RANGE PROFILE — LONG RANGE POWER

1700 RPM

STANDARD DAY (ISA)

ASSOCIATED CONDITIONS:

WEIGHT......... *15,090 LBS BEFORE ENGINE START
FUEL........... AVIATION KEROSENE
FUEL DENSITY... 6.7 LBS/GAL
WIND........... ZERO

EXAMPLE:

PRESSURE ALTITUDE... 26,000 FT
FUEL................ 2140 LBS
RANGE............... 630 NM

NOTES: 1. RANGE ALLOWS FOR TAXI AND RUNUP; INCLUDES CRUISE CLIMB AND DESCENT; AND ALLOWS FOR 45 MINUTES RESERVE FUEL AT LONG RANGE POWER.

*2. AT 15,090 LBS RAMP WEIGHT, THE MAXIMUM ZERO-FUEL WEIGHT LIMITATION OF 11,500 LBS WOULD BE EXCEEDED AT FUEL LOADINGS LESS THAN 3590 LBS.

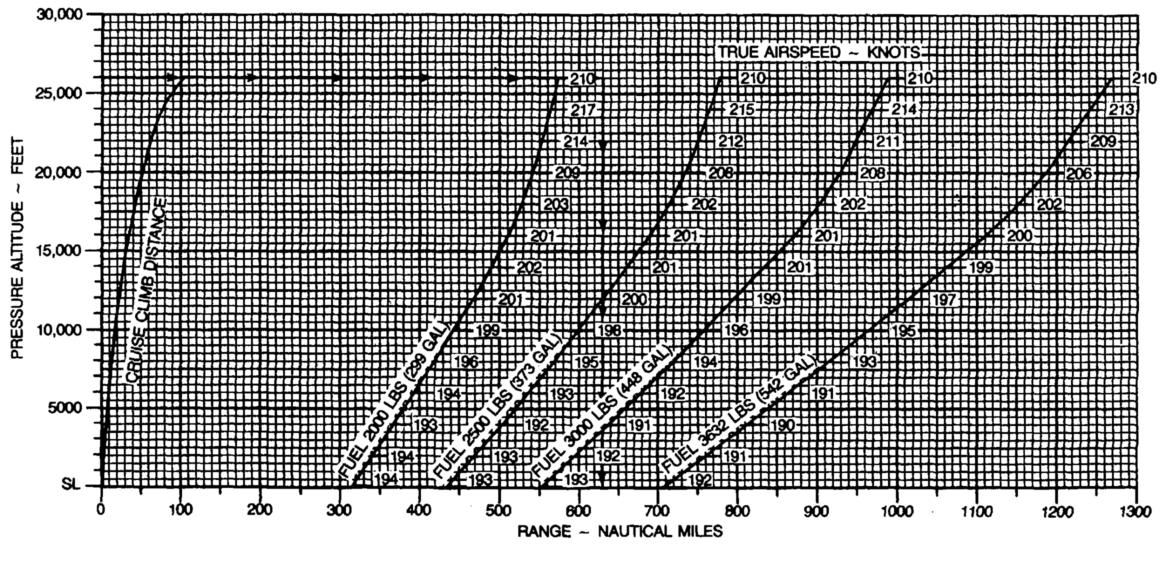

Figure 7-55. Range Profile - Long Range Power @ 1700 RPM

RANGE PROFILE — 542 GALLONS USABLE FUEL

STANDARD DAY (ISA)

ASSOCIATED CONDITIONS:

WEIGHT . . . . 15,090 LBS BEFORE ENGINE START
FUEL . . . . AVIATION KEROSENE
FUEL DENSITY . . . 6.7 LBS/GAL
WIND . . . . ZERO

EXAMPLE:

PRESSURE ALTITUDE . . . . 20,000 FT

RANGE AT
MAXIMUM CRUISE POWER . . . . 1115 NM
LONG RANGE POWER . . . . 1185 NM
MAXIMUM ENDURANCE POWER . . . 1196 NM

NOTE: RANGE ALLOWS FOR TAXI AND RUNUP; INCLUDES CRUISE CLIMB AND DESCENT; AND ALLOWS FOR 45 MINUTES RESERVE FUEL AT LONG RANGE POWER.

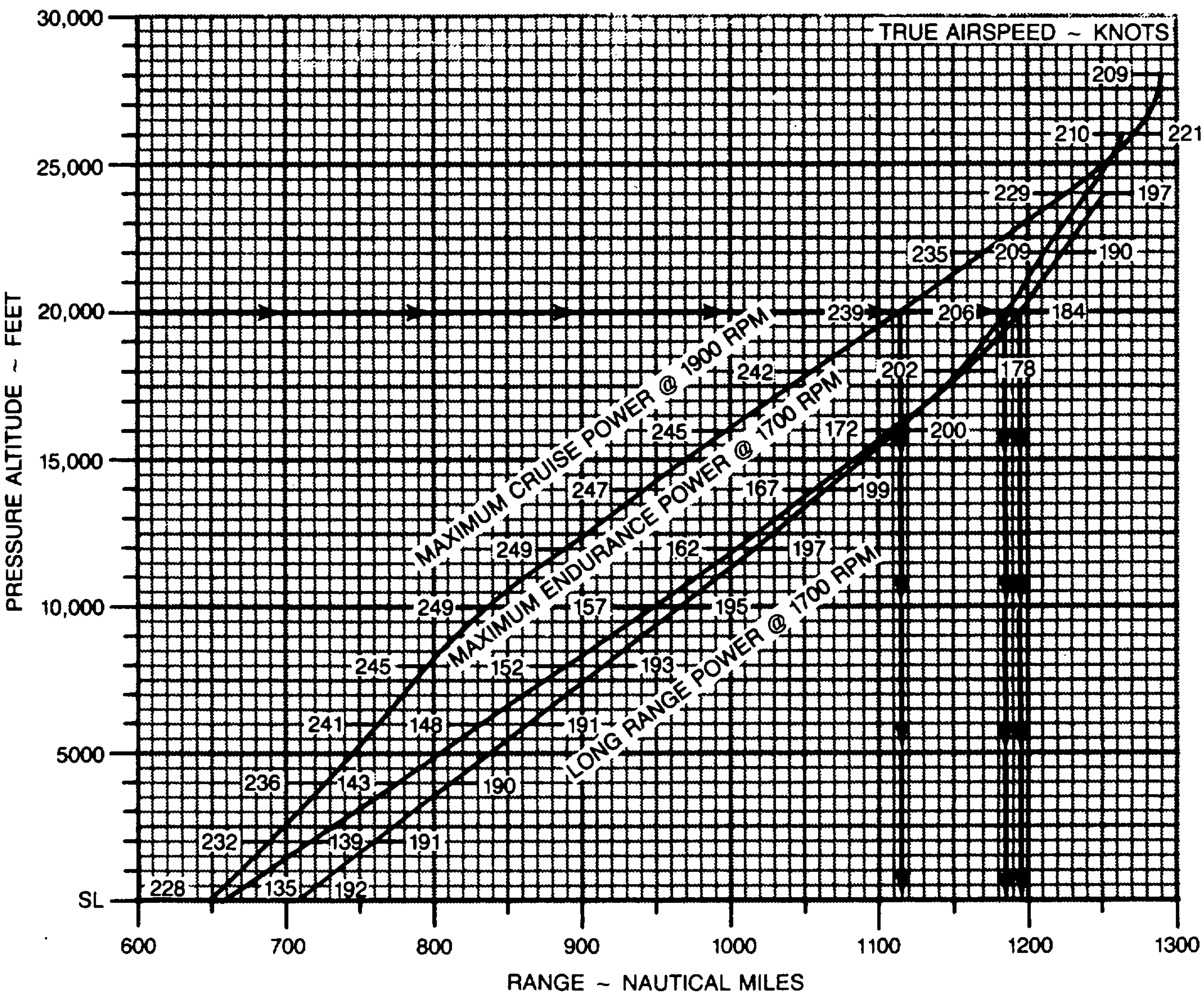

Figure 7-56. Range Profile - 542 Gallons Useable Fuel

ENDURANCE PROFILE — 542 GALLONS USABLE FUEL

STANDARD DAY (ISA)

ASSOCIATED CONDITIONS:

WEIGHT . . . . 15,090 LBS BEFORE ENGINE START
FUEL . . . . AVIATION KEROSENE
FUEL DENSITY . . . 6.7 LBS/GAL

EXAMPLE:

PRESSURE ALTITUDE . . . . 20,000 FT

ENDURANCE AT
MAXIMUM CRUISE POWER. . . . . 4.73 HR
LONG RANGE POWER. . . . . 5.75 HR
MAXIMUM ENDURANCE POWER . . . 6.42 HR

NOTE: ENDURANCE ALLOWS FOR TAXI AND RUNUP; INCLUDES CRUISE CLIMB AND DESCENT; AND ALLOWS FOR 45 MINUTES RESERVE FUEL AT LONG RANGE POWER.

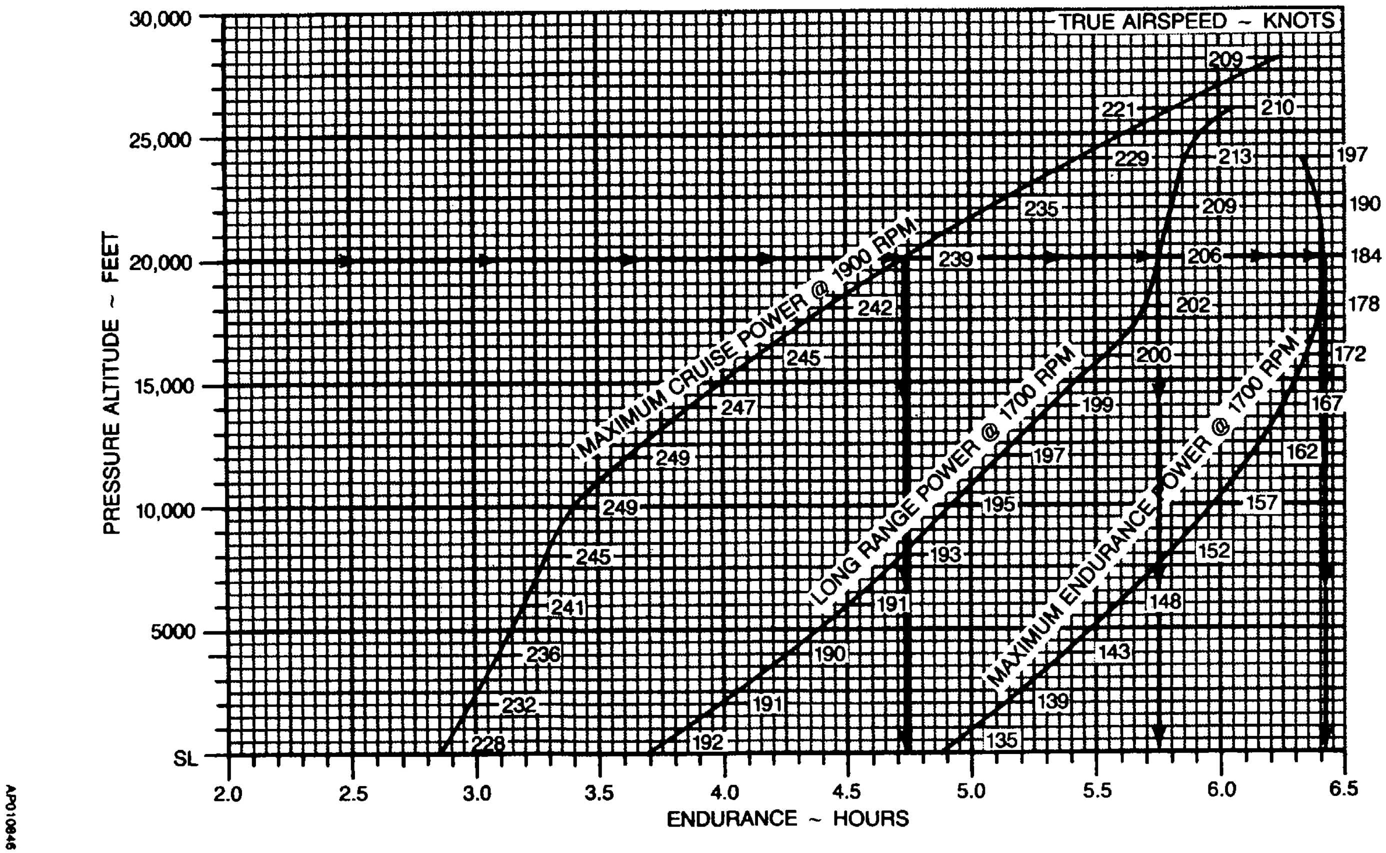

Figure 7-57. Endurance Profile - 542 Gallons Useable Fuel

ONE-ENGINE-INOPERATIVE

MAXIMUM CRUISE POWER

1900 RPM

ISA -30 °C

WEIGHT			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	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	%	LBS/HR	LBS/HR	KTS	KTS	%	LBS/HR	LBS/HR	KTS	KTS
0	-13	-15	100	529	529	163	156	100	529	529	166	158
2000	-17	-19	100	516	516	161	158	100	516	516	164	160
4000	-21	-23	100	504	504	158	160	100	503	503	161	163
6000	-24	-27	100	492	492	156	161	100	492	492	159	165
8000	-28	-31	100	482	482	153	163	100	482	482	156	167
10,000	-32	-35	100	473	473	150	165	100	473	473	154	169
12,000	-36	-39	100	467	467	147	166	100	466	466	151	171
14,000	-40	-43	95	441	441	138	161	95	442	442	144	168
16,000	-45	-47	88	410	410	124	150	88	412	412	134	162
18,000	-49	-51	—	—	—	—	—	82	382	382	121	152
20,000	—	—	—	—	—	—	—	—	—	—	—	—
22,000	—	—	—	—	—	—	—	—	—	—	—	—
24,000	—	—	—	—	—	—	—	—	—	—	—	—
26,000	—	—	—	—	—	—	—	—	—	—	—	—
28,000	—	—	—	—	—	—	—	—	—	—	—	—
29,000	—	—	—	—	—	—	—	—	—	—	—	—
31,000	—	—	—	—	—	—	—	—	—	—	—	—

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Figure 7-57A. One Engine-Inoperative Maximum Cruise Power 1900 RPM ISA -30°C (Sheet 1 of 2)

ONE-ENGINE-INOPERATIVE

MAXIMUM CRUISE POWER

1900 RPM

ISA -30 °C

WEIGHT			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	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	%	LBS/HR	LBS/HR	KTS	KTS	%	LBS/HR	LBS/HR	KTS	KTS
0	-13	-15	100	528	528	163	160	100	528	528	170	162
2000	-17	-19	100	516	516	166	165	100	515	515	168	165
4000	-20	-23	100	503	503	164	165	100	503	503	166	167
6000	-24	-27	100	492	492	162	168	100	491	492	164	170
8000	-28	-31	100	482	482	159	170	100	481	481	162	173
10,000	-32	-35	100	472	472	157	173	100	472	472	159	175
12,000	-36	-39	100	466	466	154	175	100	466	466	157	178
14,000	-40	-43	95	443	443	148	173	96	444	444	152	177
16,000	-44	-47	89	413	413	140	169	89	414	414	144	174
18,000	-48	-51	82	384	384	131	163	83	386	386	136	170
20,000	-52	-55	76	357	357	119	153	77	358	358	128	164
22,000	-56	-59	—	—	—	—	—	71	332	332	116	155
24,000	—	—	—	—	—	—	—	—	—	—	—	—
26,000	—	—	—	—	—	—	—	—	—	—	—	—
28,000	—	—	—	—	—	—	—	—	—	—	—	—
29,000	—	—	—	—	—	—	—	—	—	—	—	—
31,000	—	—	—	—	—	—	—	—	—	—	—	—

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Figure 7-57A. One Engine-Inoperative Maximum Cruise Power 1900 RPM ISA -30°C (Sheet 2 of 2)

ONE-ENGINE-INOPERATIVE

MAXIMUM CRUISE POWER

1900 RPM

ISA -20 °C

WEIGHT			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	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	%	LBS/HR	LBS/HR	KTS	KTS	%	LBS/HR	LBS/HR	KTS	KTS
0	-3	-5	100	531	531	162	157	100	531	531	164	160
2000	-7	-9	100	518	518	159	159	100	517	517	162	162
4000	-11	-13	100	505	505	156	161	100	505	505	160	164
6000	-14	-17	100	494	494	154	163	100	494	494	157	166
8000	-18	-21	100	484	484	151	164	100	484	484	154	168
10,000	-22	-25	100	474	474	148	166	100	474	474	152	171
12,000	-26	-29	97	458	458	141	164	98	458	458	147	170
14,000	-30	-33	90	426	426	130	156	91	427	427	138	165
16,000	-34	-37	—	—	—	—	—	84	398	398	127	157
18,000	—	—	—	—	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—	—	—
22,000	—	—	—	—	—	—	—	—	—	—	—	—
24,000	—	—	—	—	—	—	—	—	—	—	—	—
26,000	—	—	—	—	—	—	—	—	—	—	—	—
28,000	—	—	—	—	—	—	—	—	—	—	—	—
29,000	—	—	—	—	—	—	—	—	—	—	—	—
31,000	—	—	—	—	—	—	—	—	—	—	—	—

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Figure 7-57B. One-Engine-Inoperative Maximum Cruise Power 1900 RPM ISA -20°C (Sheet 1 of 2)

ONE-ENGINE-INOPERATIVE

MAXIMUM CRUISE POWER

1900 RPM

ISA -20 °C

WEIGHT			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	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	%	LBS/HR	LBS/HR	KTS	KTS	%	LBS/HR	LBS/HR	KTS	KTS
0	-3	-5	100	531	531	167	162	100	531	531	164	160
2000	-6	-9	100	517	517	165	164	100	517	517	162	162
4000	-10	-13	100	504	504	162	167	100	505	505	160	164
6000	-14	-17	100	493	493	160	169	100	494	494	157	166
8000	-18	-21	100	483	483	157	172	100	484	484	154	168
10,000	-22	-25	100	474	474	155	174	100	474	474	152	171
12,000	-26	-29	98	458	458	151	175	98	458	458	147	170
14,000	-30	-33	91	428	428	143	171	92	427	427	138	165
16,000	-34	-37	85	399	399	134	166	85	398	398	127	157
18,000	-38	-41	79	371	371	124	158	79	373	373	131	167
20,000	-42	-45	—	—	—	—	—	73	347	347	121	160
22,000	-47	-49	—	—	—	—	—	68	323	323	106	147
24,000	—	—	—	—	—	—	—	—	—	—	—	—
26,000	—	—	—	—	—	—	—	—	—	—	—	—
28,000	—	—	—	—	—	—	—	—	—	—	—	—
29,000	—	—	—	—	—	—	—	—	—	—	—	—
31,000	—	—	—	—	—	—	—	—	—	—	—	—

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Figure 7-57B. One Engine-Inoperative Maximum Cruise Power 1900 RPM ISA -20°C (Sheet 2 of 2)

ONE-ENGINE-INOPERATIVE

MAXIMUM CRUISE POWER

1900 RPM

ISA -10 °C

WEIGHT			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	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	%	LBS/HR	LBS/HR	KTS	KTS	%	LBS/HR	LBS/HR	KTS	KTS
0	7	5	100	533	533	160	158	100	532	532	163	161
2000	3	1	100	519	519	157	160	100	518	518	161	163
4000	-1	-3	100	506	506	155	162	100	506	506	158	165
6000	-4	-7	100	496	496	152	164	100	495	495	155	168
8000	-8	-11	100	485	485	149	165	100	485	485	153	170
10,000	-12	-15	99	470	470	144	165	99	471	471	149	171
12,000	-16	-19	92	439	439	134	158	93	440	440	140	166
14,000	-20	-23	—	—	—	—	—	86	411	411	131	160
16,000	—	—	—	—	—	—	—	—	—	—	—	—
18,000	—	—	—	—	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—	—	—
22,000	—	—	—	—	—	—	—	—	—	—	—	—
24,000	—	—	—	—	—	—	—	—	—	—	—	—
26,000	—	—	—	—	—	—	—	—	—	—	—	—
28,000	—	—	—	—	—	—	—	—	—	—	—	—
29,000	—	—	—	—	—	—	—	—	—	—	—	—
31,000	—	—	—	—	—	—	—	—	—	—	—	—

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Figure 7-57C. One Engine-Inoperative Maximum Cruise Power 1900 RPM ISA -10°C (Sheet 1 of 2)

ONE-ENGINE-INOPERATIVE

MAXIMUM CRUISE POWER

1900 RPM

ISA -10 °C

WEIGHT			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	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	%	LBS/HR	LBS/HR	KTS	KTS	%	LBS/HR	LBS/HR	KTS	KTS
0	7	5	100	532	532	165	163	100	532	532	167	166
2000	4	1	100	518	518	163	166	100	518	518	165	168
4000	0	-3	100	506	506	161	168	100	505	505	163	171
6000	-4	-7	100	495	495	158	171	100	495	495	161	173
8000	-8	-11	100	485	485	156	173	100	484	484	159	176
10,000	-12	-15	99	472	472	153	175	99	472	472	156	178
12,000	-16	-19	93	441	441	145	172	93	441	441	149	176
14,000	-20	-23	87	412	412	137	167	87	413	413	142	173
16,000	-24	-27	81	384	384	128	161	81	385	385	134	169
18,000	-29	-31	75	358	358	114	150	76	359	359	125	163
20,000	-32	-35	—	—	—	—	—	70	334	334	113	154
22,000	—	—	—	—	—	—	—	—	—	—	—	—
24,000	—	—	—	—	—	—	—	—	—	—	—	—
26,000	—	—	—	—	—	—	—	—	—	—	—	—
28,000	—	—	—	—	—	—	—	—	—	—	—	—
29,000	—	—	—	—	—	—	—	—	—	—	—	—
31,000	—	—	—	—	—	—	—	—	—	—	—	—

BT00669 - RC-12G

Figure 7-57C. One Engine-Inoperative Maximum Cruise Power 1900 RPM ISA -10°C (Sheet 2 of 2)

ONE-ENGINE-INOPERATIVE

MAXIMUM CRUISE POWER

1900 RPM

ISA

WEIGHT			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	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	%	LBS/HR	LBS/HR	KTS	KTS	%	LBS/HR	LBS/HR	KTS	KTS
0	17	15	100	535	535	158	159	100	534	534	161	162
2000	13	11	100	521	521	156	161	100	520	520	159	165
4000	10	7	100	507	507	153	163	100	507	507	156	167
6000	6	3	100	496	496	150	165	100	496	496	154	169
8000	2	-1	96	473	473	143	163	97	474	474	148	168
10,000	-3	-5	91	446	446	134	157	92	447	447	141	165
12,000	-7	-9	85	417	417	121	146	86	419	419	132	159
14,000	-11	-13	—	—	—	—	—	81	392	392	120	149
16,000	—	—	—	—	—	—	—	—	—	—	—	—
18,000	—	—	—	—	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—	—	—
22,000	—	—	—	—	—	—	—	—	—	—	—	—
24,000	—	—	—	—	—	—	—	—	—	—	—	—
26,000	—	—	—	—	—	—	—	—	—	—	—	—
28,000	—	—	—	—	—	—	—	—	—	—	—	—
29,000	—	—	—	—	—	—	—	—	—	—	—	—
31,000	—	—	—	—	—	—	—	—	—	—	—	—

BT00670 - RC-12G

Figure 7-57D. One Engine-Inoperative Maximum Cruise Power 1900 RPM ISA (Sheet 1 of 2)

ONE-ENGINE-INOPERATIVE

MAXIMUM CRUISE POWER

1900 RPM

ISA

WEIGHT			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	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	%	LBS/HR	LBS/HR	KTS	KTS	%	LBS/HR	LBS/HR	KTS	KTS
0	18	15	100	534	534	164	165	100	534	534	166	167
2000	14	11	100	520	520	162	167	100	520	520	164	170
4000	10	7	100	507	507	159	170	100	507	507	162	172
6000	6	3	100	495	495	157	172	100	495	495	159	175
8000	2	-1	97	475	475	152	172	97	475	475	155	176
10,000	-2	-5	92	447	447	146	170	92	448	448	149	174
12,000	-6	-9	87	420	420	138	167	87	421	421	143	172
14,000	-10	-13	81	393	393	130	161	82	394	394	135	169
16,000	-15	-17	76	367	367	118	153	76	368	368	127	163
18,000	—	—	—	—	—	—	—	71	342	342	116	155
20,000	—	—	—	—	—	—	—	—	—	—	—	—
22,000	—	—	—	—	—	—	—	—	—	—	—	—
24,000	—	—	—	—	—	—	—	—	—	—	—	—
26,000	—	—	—	—	—	—	—	—	—	—	—	—
28,000	—	—	—	—	—	—	—	—	—	—	—	—
29,000	—	—	—	—	—	—	—	—	—	—	—	—
31,000	—	—	—	—	—	—	—	—	—	—	—	—

BT00671 - RC-12G

Figure 7-57D. One Engine-Inoperative Maximum Cruise Power 1900 RPM ISA (Sheet 2 of 2)

ONE-ENGINE-INOPERATIVE

MAXIMUM CRUISE POWER

1900 RPM

ISA +10 °C

WEIGHT			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	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	%	LBS/HR	LBS/HR	KTS	KTS	%	LBS/HR	LBS/HR	KTS	KTS
0	27	25	100	537	537	157	161	100	537	537	160	164
2000	23	21	100	523	523	154	162	100	522	522	157	166
4000	19	17	97	499	499	149	161	97	500	500	153	166
6000	15	13	94	475	475	142	159	94	475	475	147	165
8000	11	9	89	449	449	134	155	90	450	450	140	162
10,000	7	5	85	423	423	122	146	85	424	424	133	158
12,000	—	—	—	—	—	—	—	80	397	397	121	149
14,000	—	—	—	—	—	—	—	—	—	—	—	—
16,000	—	—	—	—	—	—	—	—	—	—	—	—
18,000	—	—	—	—	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—	—	—
22,000	—	—	—	—	—	—	—	—	—	—	—	—
24,000	—	—	—	—	—	—	—	—	—	—	—	—
26,000	—	—	—	—	—	—	—	—	—	—	—	—
28,000	—	—	—	—	—	—	—	—	—	—	—	—
29,000	—	—	—	—	—	—	—	—	—	—	—	—
31,000	—	—	—	—	—	—	—	—	—	—	—	—

BT00672 - RC-12G

Figure 7-57E. One Engine-Inoperative Maximum Cruise Power 1900 RPM ISA +10°C (Sheet 1 of 2)

ONE-ENGINE-INOPERATIVE

MAXIMUM CRUISE POWER

1900 RPM

ISA +10 °C

WEIGHT			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	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	%	LBS/HR	LBS/HR	KTS	KTS	%	LBS/HR	LBS/HR	KTS	KTS
0	28	25	100	536	536	163	166	100	536	536	165	169
2000	24	21	100	522	522	160	169	100	522	522	163	171
4000	20	17	97	500	500	156	169	98	500	500	159	172
6000	16	13	94	476	476	151	169	94	476	476	154	172
8000	12	9	90	450	450	145	167	90	451	451	149	171
10,000	8	5	86	425	425	138	165	86	426	426	143	170
12,000	4	1	81	399	399	130	160	81	399	399	136	167
14,000	-1	-3	75	372	372	119	152	76	373	373	128	162
16,000	-4	-7	—	—	—	—	—	70	349	349	118	155
18,000	—	—	—	—	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—	—	—
22,000	—	—	—	—	—	—	—	—	—	—	—	—
24,000	—	—	—	—	—	—	—	—	—	—	—	—
26,000	—	—	—	—	—	—	—	—	—	—	—	—
28,000	—	—	—	—	—	—	—	—	—	—	—	—
29,000	—	—	—	—	—	—	—	—	—	—	—	—
31,000	—	—	—	—	—	—	—	—	—	—	—	—

BT00673 - RC-12G

Figure 7-57E. One Engine-Inoperative Maximum Cruise Power 1900 RPM ISA +10°C (Sheet 2 of 2)

ONE-ENGINE-INOPERATIVE

MAXIMUM CRUISE POWER

1900 RPM

ISA +20 °C

WEIGHT			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	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	%	LBS/HR	LBS/HR	KTS	KTS	%	LBS/HR	LBS/HR	KTS	KTS
0	37	35	93	517	517	149	156	94	517	517	153	160
2000	33	31	91	496	496	145	155	92	496	496	149	160
4000	29	27	89	474	474	139	154	89	475	475	144	160
6000	25	23	86	450	450	132	150	86	451	451	138	158
8000	21	19	82	425	425	120	141	82	426	426	131	154
10,000	17	15	—	—	—	—	—	78	401	401	121	147
12,000	—	—	—	—	—	—	—	—	—	—	—	—
14,000	—	—	—	—	—	—	—	—	—	—	—	—
16,000	—	—	—	—	—	—	—	—	—	—	—	—
18,000	—	—	—	—	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—	—	—
22,000	—	—	—	—	—	—	—	—	—	—	—	—
24,000	—	—	—	—	—	—	—	—	—	—	—	—
26,000	—	—	—	—	—	—	—	—	—	—	—	—
28,000	—	—	—	—	—	—	—	—	—	—	—	—
29,000	—	—	—	—	—	—	—	—	—	—	—	—
31,000	—	—	—	—	—	—	—	—	—	—	—	—

BT00674 - RC-12G

Figure 7-57F. One Engine-Inoperative Maximum Cruise Power 1900 RPM ISA +20 °C (Sheet 1 of 2)

ONE-ENGINE-INOPERATIVE

MAXIMUM CRUISE POWER

1900 RPM

ISA +20 °C

WEIGHT			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	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	%	LBS/HR	LBS/HR	KTS	KTS	%	LBS/HR	LBS/HR	KTS	KTS
0	37	35	94	518	518	157	163	94	518	518	159	166
2000	33	31	92	497	497	153	164	91	497	497	156	167
4000	30	27	90	475	475	148	164	90	475	475	152	167
6000	26	23	87	452	452	143	163	87	452	452	147	167
8000	22	19	83	427	427	137	161	83	427	427	141	166
10,000	17	15	79	402	402	130	157	79	403	403	135	164
12,000	13	11	74	377	377	120	151	75	378	378	128	160
14,000	9	7	—	—	—	—	—	70	354	354	119	154
16,000	5	3	—	—	—	—	—	65	330	330	105	142
18,000	—	—	—	—	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—	—	—
22,000	—	—	—	—	—	—	—	—	—	—	—	—
24,000	—	—	—	—	—	—	—	—	—	—	—	—
26,000	—	—	—	—	—	—	—	—	—	—	—	—
28,000	—	—	—	—	—	—	—	—	—	—	—	—
29,000	—	—	—	—	—	—	—	—	—	—	—	—
31,000	—	—	—	—	—	—	—	—	—	—	—	—

BT00675 - RC-12G

Figure 7-57F. One Engine-Inoperative Maximum Cruise Power 1900 RPM ISA +20 °C (Sheet 2 of 2)

ONE-ENGINE-INOPERATIVE

MAXIMUM CRUISE POWER

1900 RPM

ISA +30 °C

WEIGHT			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	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	%	LBS/HR	LBS/HR	KTS	KTS	%	LBS/HR	LBS/HR	KTS	KTS
0	47	45	84	487	487	138	146	84	488	488	143	152
2000	43	41	82	468	468	133	145	83	468	468	139	152
4000	39	37	81	448	448	126	142	81	449	449	134	151
6000	35	33	—	—	—	—	—	79	428	428	128	148
8000	31	29	—	—	—	—	—	75	404	404	117	140
10,000	—	—	—	—	—	—	—	—	—	—	—	—
12,000	—	—	—	—	—	—	—	—	—	—	—	—
14,000	—	—	—	—	—	—	—	—	—	—	—	—
16,000	—	—	—	—	—	—	—	—	—	—	—	—
18,000	—	—	—	—	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—	—	—
22,000	—	—	—	—	—	—	—	—	—	—	—	—
24,000	—	—	—	—	—	—	—	—	—	—	—	—
26,000	—	—	—	—	—	—	—	—	—	—	—	—
28,000	—	—	—	—	—	—	—	—	—	—	—	—
29,000	—	—	—	—	—	—	—	—	—	—	—	—
31,000	—	—	—	—	—	—	—	—	—	—	—	—

BT00676 -RC-12G

Figure 7-57G. One Engine-Inoperative Maximum Cruise Power 1900 RPM ISA +30 °C (Sheet 1 of 2)

ONE-ENGINE-INOPERATIVE

MAXIMUM CRUISE POWER

1900 RPM

ISA +30 °C

WEIGHT			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	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	%	LBS/HR	LBS/HR	KTS	KTS	%	LBS/HR	LBS/HR	KTS	KTS
0	47	45	84	488	488	147	156	85	489	489	151	159
2000	43	41	83	469	469	144	157	83	469	469	147	161
4000	39	37	81	449	449	140	157	82	450	450	144	162
3000	35	33	79	428	428	134	156	79	425	429	139	161
8000	31	29	75	405	405	128	153	76	405	405	133	159
10,000	27	25	72	381	381	119	147	72	382	382	127	157
12,000	23	21	—	—	—	—	—	68	357	357	118	151
14,000	19	17	—	—	—	—	—	64	333	333	104	140
16,000	—	—	—	—	—	—	—	—	—	—	—	—
18,000	—	—	—	—	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—	—	—
22,000	—	—	—	—	—	—	—	—	—	—	—	—
24,000	—	—	—	—	—	—	—	—	—	—	—	—
26,000	—	—	—	—	—	—	—	—	—	—	—	—
28,000	—	—	—	—	—	—	—	—	—	—	—	—
29,000	—	—	—	—	—	—	—	—	—	—	—	—
31,000	—	—	—	—	—	—	—	—	—	—	—	—

BT00677 - RC-12G

Figure 7-57G. One Engine-Inoperative Maximum Cruise Power 1900 RPM ISA +30 °C (Sheet 2 of 2)

ONE-ENGINE-INOPERATIVE

MAXIMUM CRUISE POWER

1900 RPM

ISA +37 °C

WEIGHT			14,000 POUNDS					13,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	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	%	LBS/HR	LBS/HR	KTS	KTS	%	LBS/HR	LBS/HR	KTS	KTS
0	54	52	77	467	467	128	137	78	468	468	135	145
2000	50	48	76	448	448	121	133	77	449	449	131	144
4000	46	44	—	—	—	—	—	75	431	431	126	143
6000	42	40	—	—	—	—	—	73	411	411	117	137
8000	—	—	—	—	—	—	—	—	—	—	—	—
10,000	—	—	—	—	—	—	—	—	—	—	—	—
12,000	—	—	—	—	—	—	—	—	—	—	—	—
14,000	—	—	—	—	—	—	—	—	—	—	—	—
16,000	—	—	—	—	—	—	—	—	—	—	—	—
18,000	—	—	—	—	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—	—	—
22,000	—	—	—	—	—	—	—	—	—	—	—	—
24,000	—	—	—	—	—	—	—	—	—	—	—	—
26,000	—	—	—	—	—	—	—	—	—	—	—	—
28,000	—	—	—	—	—	—	—	—	—	—	—	—
29,000	—	—	—	—	—	—	—	—	—	—	—	—
31,000	—	—	—	—	—	—	—	—	—	—	—	—

BT00678 - RC-12G

Figure 7-57H. One Engine-Inoperative Maximum Cruise Power 1900 RPM ISA +37 °C (Sheet 1 of 2)

ONE-ENGINE-INOPERATIVE

MAXIMUM CRUISE POWER

1900 RPM

ISA +37 °C

WEIGHT			12,000 POUNDS					11,000 POUNDS				
PRESSURE ALTITUDE	IOAT	OAT	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	%	LBS/HR	LBS/HR	KTS	KTS	%	LBS/HR	LBS/HR	KTS	KTS
0	54	52	78	468	468	141	151	78	469	469	145	155
2000	50	48	77	450	450	137	151	77	450	450	141	156
4000	46	44	76	432	432	133	151	76	432	432	138	157
6000	42	40	74	411	411	127	149	74	412	412	133	156
8000	38	36	70	389	389	119	144	71	390	390	127	154
10,000	34	32	—	—	—	—	—	68	368	368	120	150
12,000	30	28	—	—	—	—	—	64	343	343	108	141
14,000	—	—	—	—	—	—	—	—	—	—	—	—
16,000	—	—	—	—	—	—	—	—	—	—	—	—
18,000	—	—	—	—	—	—	—	—	—	—	—	—
20,000	—	—	—	—	—	—	—	—	—	—	—	—
22,000	—	—	—	—	—	—	—	—	—	—	—	—
24,000	—	—	—	—	—	—	—	—	—	—	—	—
26,000	—	—	—	—	—	—	—	—	—	—	—	—
28,000	—	—	—	—	—	—	—	—	—	—	—	—
30,000	—	—	—	—	—	—	—	—	—	—	—	—
32,000	—	—	—	—	—	—	—	—	—	—	—	—
34,000	—	—	—	—	—	—	—	—	—	—	—	—

BT00679 - RC-12G

Figure 7-57H. One Engine-Inoperative Maximum Cruise Power 1900 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
GEAR. . . . . UP
FLAPS 0%

EXAMPLE:

INITIAL ALTITUDE . . . . 26,000 FT
FINAL ALTITUDE . . . . 4732 FT

TIME TO DESCEND. . . . . (17.5 – 3.1) 14 MIN
FUEL TO DESCEND . . . . (160 – 38) 122 LBS
DISTANCE TO DESCEND . . . (79 – 13) 66 NM

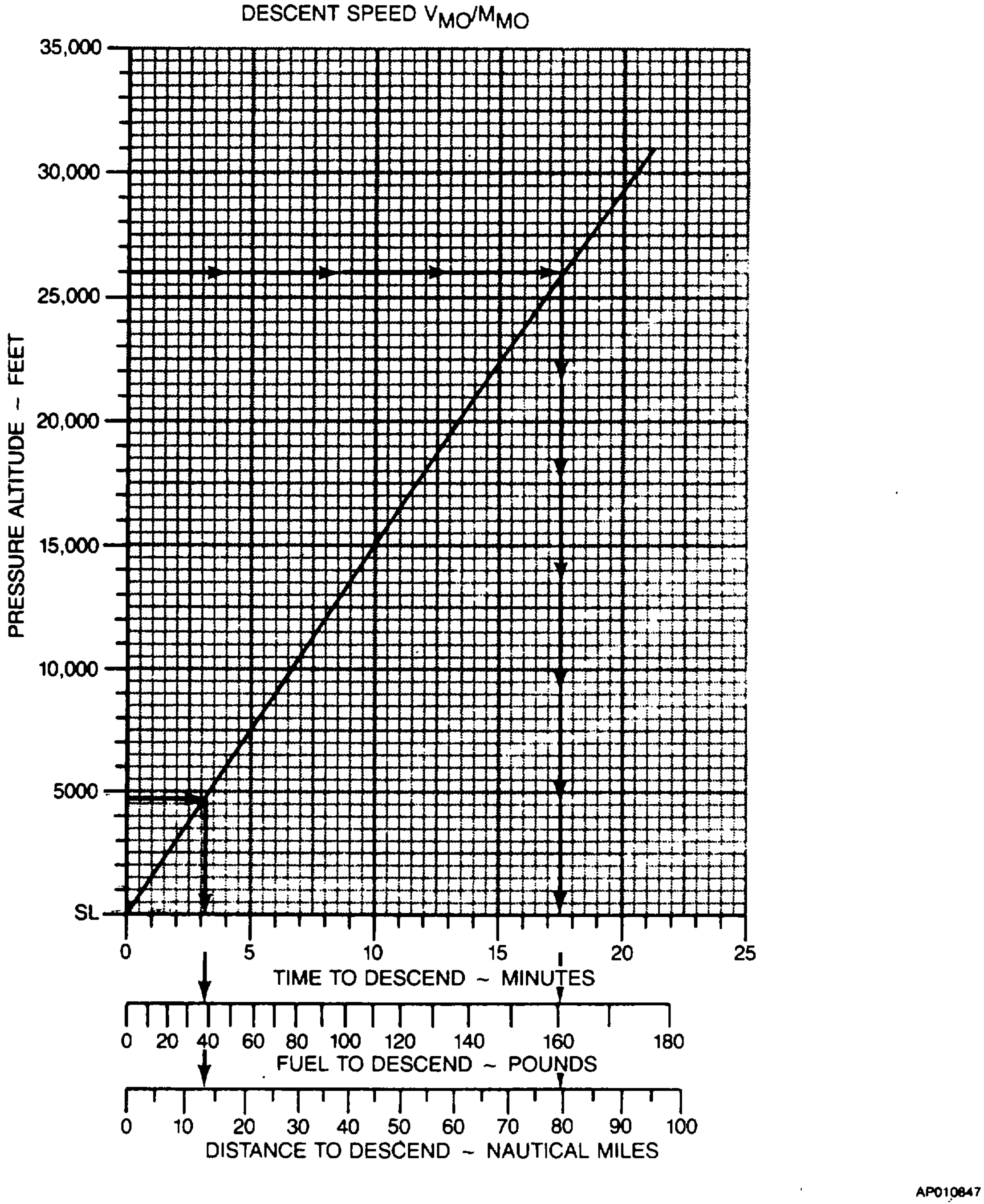

Figure 7-58. Time, Fuel, and distance to Descend

CLIMB — BALKED LANDING

CLIMB SPEED 102 KNOTS (ALL WEIGHTS)

ASSOCIATED CONDITIONS:

POWER........... TAKEOFF
FLAPS............ 100%
LANDING GEAR ... DOWN

EXAMPLE:

OAT .... 32°C
PRESSURE ALTITUDE... 4732 FT
WEIGHT............... 10,300 LBS

RATE-OF-CLIMB .... 1300 FT/MIN
CLIMB GRADIENT 10.3%

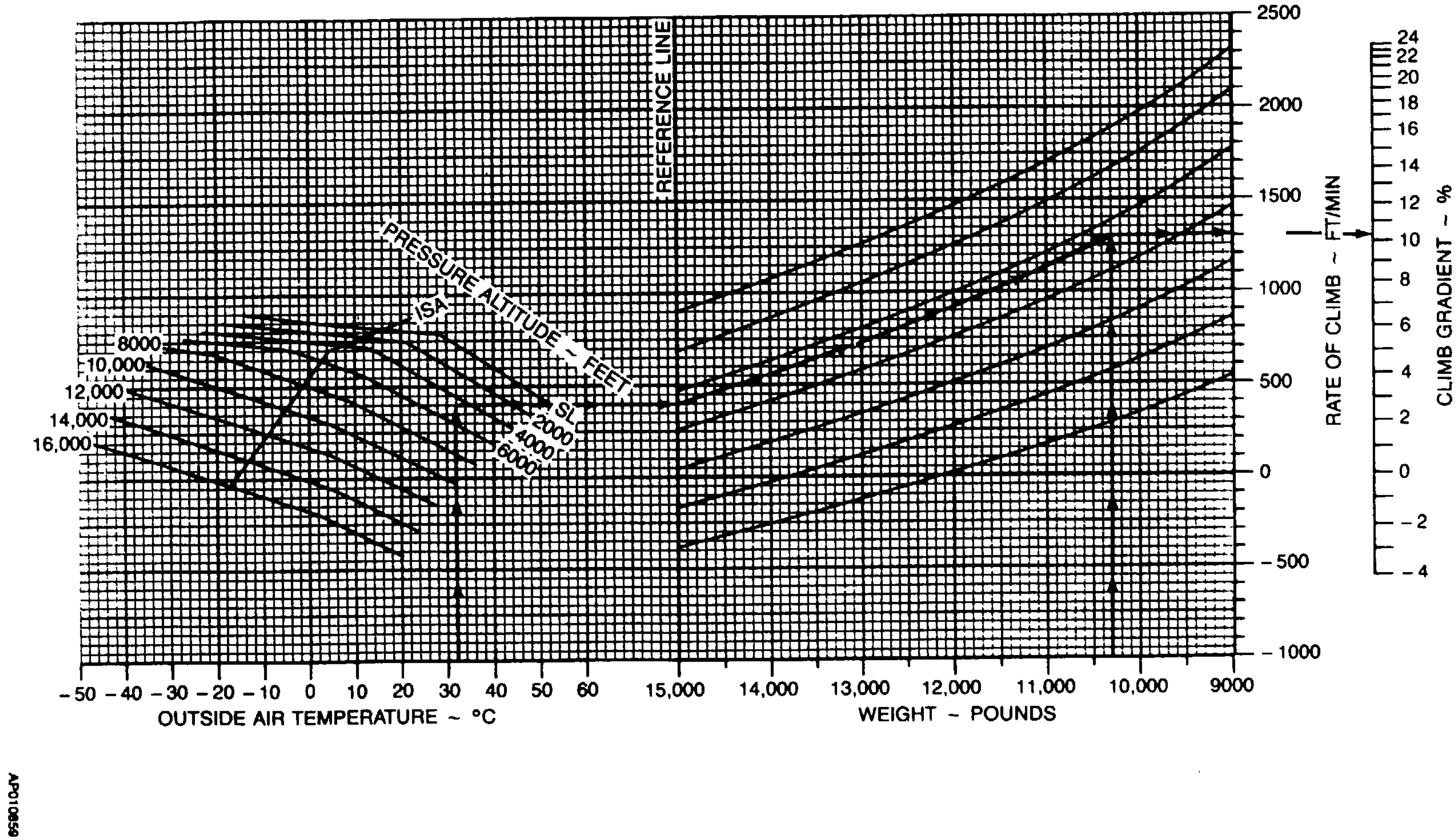

Figure 7-59. Climb-Balked Landing

NORMAL LANDING DISTANCE WITHOUT PROPELLER REVERSING — FLAPS 100%

ASSOCIATED CONDITIONS:

POWER ....RETARDED TO MAINTAIN APPROPRIATE DESCENT RATE ON FINAL APPROACH. ABOVE 13,500 LBS USE 480 FT/MIN; AT OR BELOW 13,500 LBS USE 600 FT/MIN.
FLAPS 100%
RUNWAY............PAVED, LEVEL, DRY SURFACE
APPROACH SPEED . . .IAS AS TABULATED
BRAKING ....MAXIMUM

WEIGHT ~ POUNDS	APPROACH SPEED ~ KNOTS
15,000	107
13,500	102
13,000	100
11,000	100
9000	100

EXAMPLE:

OAT ....32°C
PRESSURE ALTITUDE ....4732 FT
LANDING WEIGHT ....10,153 LBS
HEADWIND COMPONENT ....10 KTS

GROUND ROLL................1215 FT
TOTAL OVER 50-FT OBSTACLE . . .2120 FT
APPROACH SPEED ....100 KIAS

NOTE: USE DASH LINES ON OBSTACLE HEIGHT FOR 480 FT/MIN DESCENT.

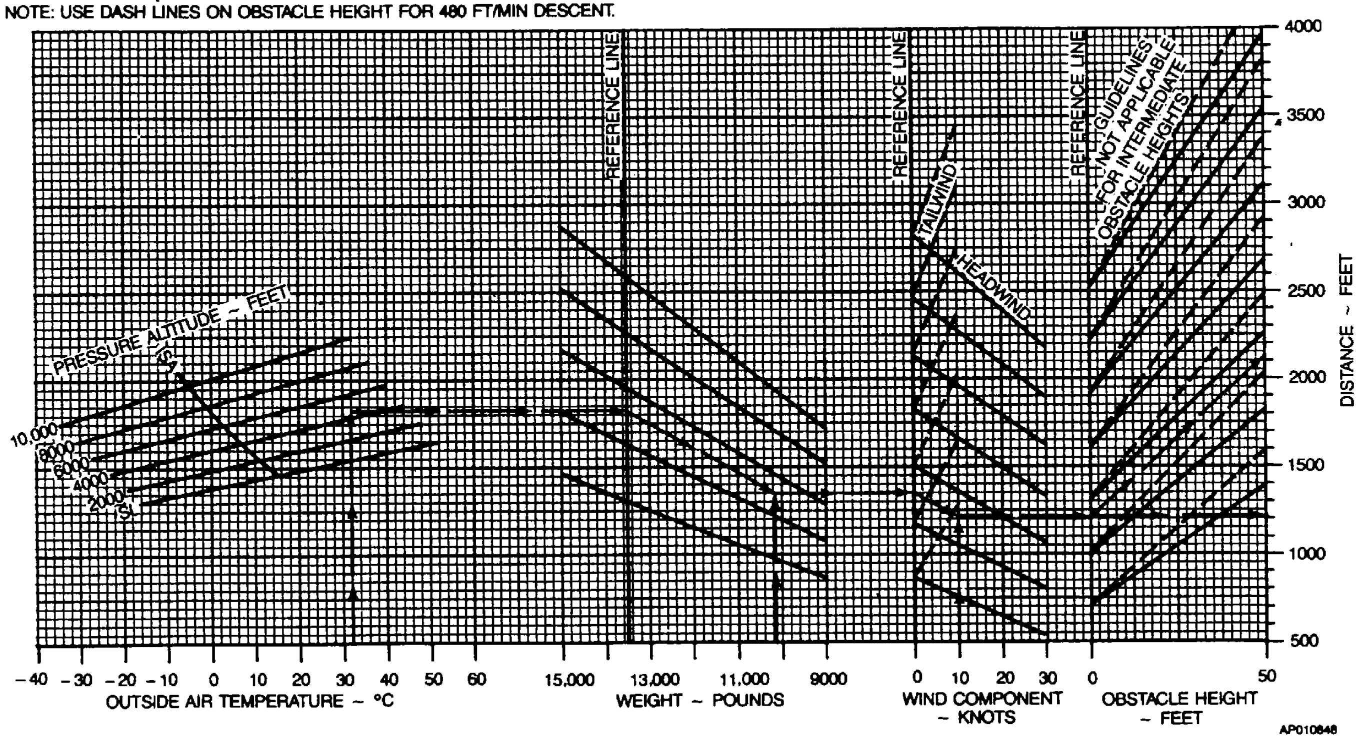

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Figure 7-60. Normal Landing Without Propeller Reversing - Flaps 100%

LANDING DISTANCE WITHOUT PROPELLER REVERSING — FLAPS 0%

ASSOCIATED CONDITIONS:

POWER . . . . .RETARDED TO MAINTAIN APPROPRIATE DESCENT RATE ON FINAL APPROACH. ABOVE 13,500 LBS USE 480 FT/MIN; AT OR BELOW 13,500 LBS USE 600 FT/MIN.
FLAPS 0%
RUNWAY . . . . .PAVED, LEVEL, DRY, SURFACE
APPROACH SPEED . . .IAS AS TABULATED
BRAKING. . . . . .MAXIMUM

WEIGHT ~ POUNDS	APPROACH SPEED ~ KTS
15,000	136
13,500	133
13,000	131
11,000	126
9000	113

EXAMPLE:

FLAPS-100% LANDING DISTANCE OVER 50-FT OBSTACLE . . . 1850 FT
LANDING WEIGHT. . . . 10,153 LBS

FLAPS-UP LANDING DISTANCE OVER 50-FT OBSTACLE . . . 2675 FT
APPROACH SPEED . . . 120 KIAS

NOTES: 1. LANDING WITH FLAPS FULL DOWN (100%) IS NORMAL PROCEDURE. USE THE GRAPH BELOW WHEN IT IS NECESSARY TO LAND WITH FLAPS UP (0%).

2. TO DETERMINE FLAPS-UP LANDING DISTANCE, READ FROM THE "NORMAL LANDING DISTANCE WITHOUT PROPELLER REVERSING-FLAPS 100%" GRAPH, THE LANDING DISTANCE APPROPRIATE TO OAT, ALTITUDE, WIND, AND 50 FOOT OBSTACLE, THEN ENTER THE GRAPH BELOW WITH THE DERIVED VALUE AND READ THE FLAPS-UP LANDING DISTANCE.

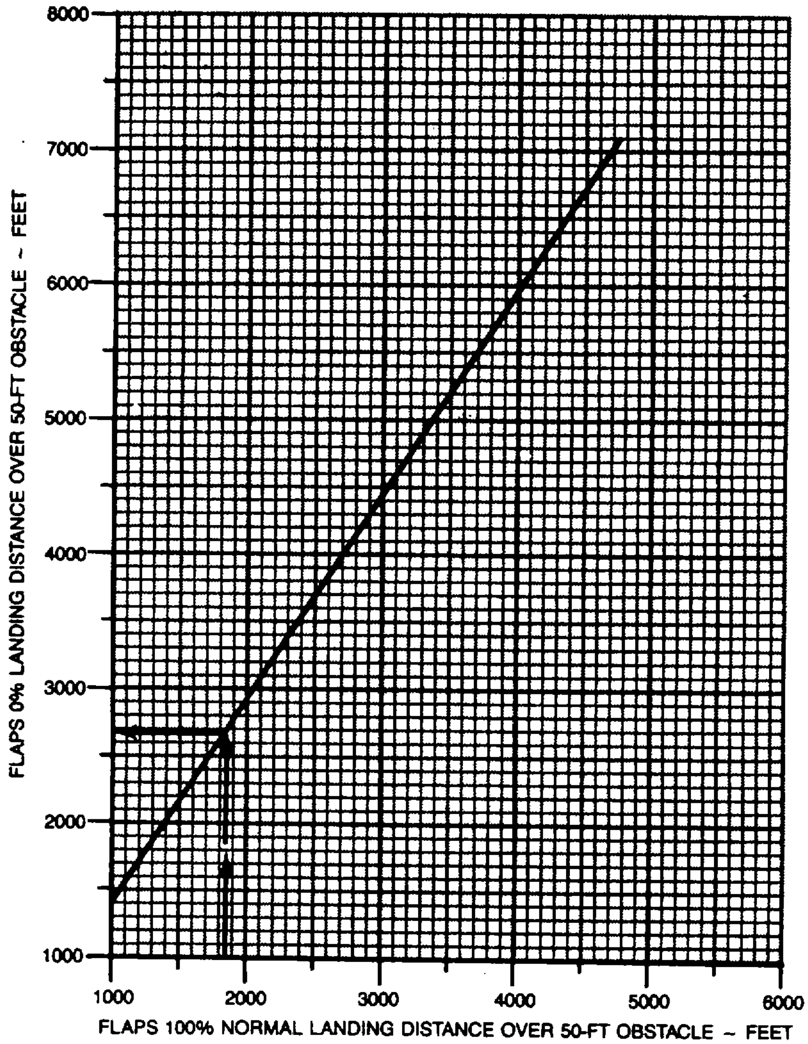

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Figure 7-61. Landing distance Without Propeller Reversing - Flaps 0%

LANDING DISTANCE WITH PROPELLER REVERSING – FLAPS 0%

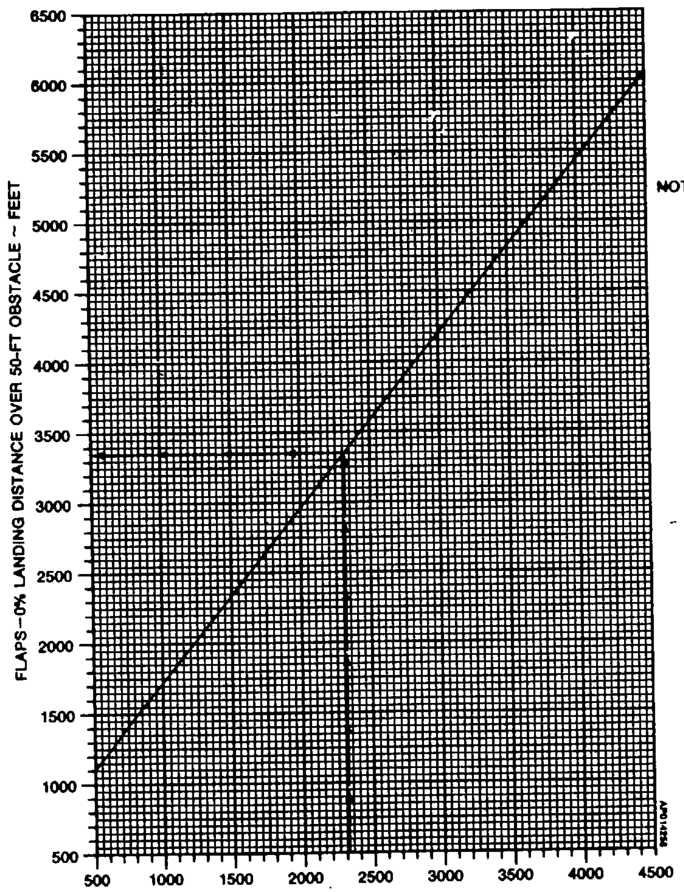
ASSOCIATED CONDITIONS:

POWER .... RETARD TO MAINTAIN APPROPRIATE DESCENT RATE ON FINAL APPROACH: ABOVE 13,500 LBS USE 480 FT/MIN; AT OR BELOW 13,500 LBS USE 600 FT/MIN.
FLAPS 0%
RUNWAY .... PAVED, LEVEL, DRY SURFACE
APPROACH SPEED ...... IAS AS TABULATED
BRAKING .... MAXIMUM

WEIGHT ~ POUNDS	APPROACH SPEED ~ KNOTS
15,000	134
13,500	131
11,000	125
9000	113

EXAMPLE:

FLAPS–100% LANDING DISTANCE (W/REV) OVER 50-FT OBSTACLE .... 2315 FT
LANDING WEIGHT .... 10,153 LBS
FLAPS–0% LANDING DISTANCE (W/REV) OVER 50-FT OBSTACLE .... 3350 FT
APPROACH SPEED .... 120 KTS



NOTES:
1. LANDING WITH FLAPS DOWN (100%) IS NORMAL PROCEDURE. USE THE GRAPH AT LEFT WHEN IT IS NECESSARY TO LAND WITH FLAPS UP (0%).
2. TO DETERMINE FLAPS-UP LANDING DISTANCE, READ FROM THE "LANDING DISTANCE WITH PROPELLER REVERSING – FLAPS 100%" GRAPH THE LANDING DISTANCE APPROPRIATE TO OAT, ALTITUDE, WIND, AND 50-FT OBSTACLE. THEN ENTER THE GRAPH AT LEFT WITH THE DERIVED VALUE AND READ THE FLAPS-UP LANDING DISTANCE.
3. INCREASE TOTAL GROUND ROLL DISTANCE 3% FOR EACH 1% RUNWAY DOWNSLOPE. DECREASE TOTAL GROUND ROLL 3% FOR EACH 1% RUNWAY UPSLOPE.

Figure 7-62. Landing Distance With Propeller Reversing Flaps 0%

LANDING DISTANCE WITH PROPELLER REVERSING – FLAPS 100%

ASSOCIATED CONDITIONS:

POWER .... RETARDED TO MAINTAIN APPROPRIATE DESCENT RATE ON FINAL APPROACH. ABOVE 13,500 LBS USE 480 FT/MIN: AT OR BELOW 13,500 LBS USE 600 FT/MIN.
FLAPS 100%
RUNWAY .... PAVED, LEVEL, DRY SURFACE
APPROACH SPEED .... IAS AS TABULATED
BRAKING .... MAXIMUM

WEIGHT ~ POUNDS	APPROACH SPEED ~ KNOTS
15,000	107
13,500	102
13,000	100
11,000	100
9000	100

EXAMPLE:

OAT .... 32°C
PRESSURE ALTITUDE .... 4732 FT
LANDING WEIGHT .... 10,153 LBS
HEADWIND COMPONENT .... 10 KTS
GROUND ROLL .... 925 FT
TOTAL OVER 50-FT OBSTACLE ..... 2315 FT
APPROACH SPEED .... 100 KIAS

NOTES: 1. USE DASH LINES ON OBSTACLE HEIGHT FOR 480 FT/MIN DESCENT.
2. INCREASE TOTAL GROUND ROLL DISTANCE 3% FOR EACH 1% RUNWAY DOWNSLOPE. DECREASE TOTAL GROUND ROLL DISTANCE 3% FOR EACH 1% RUNWAY UPSLOPE.

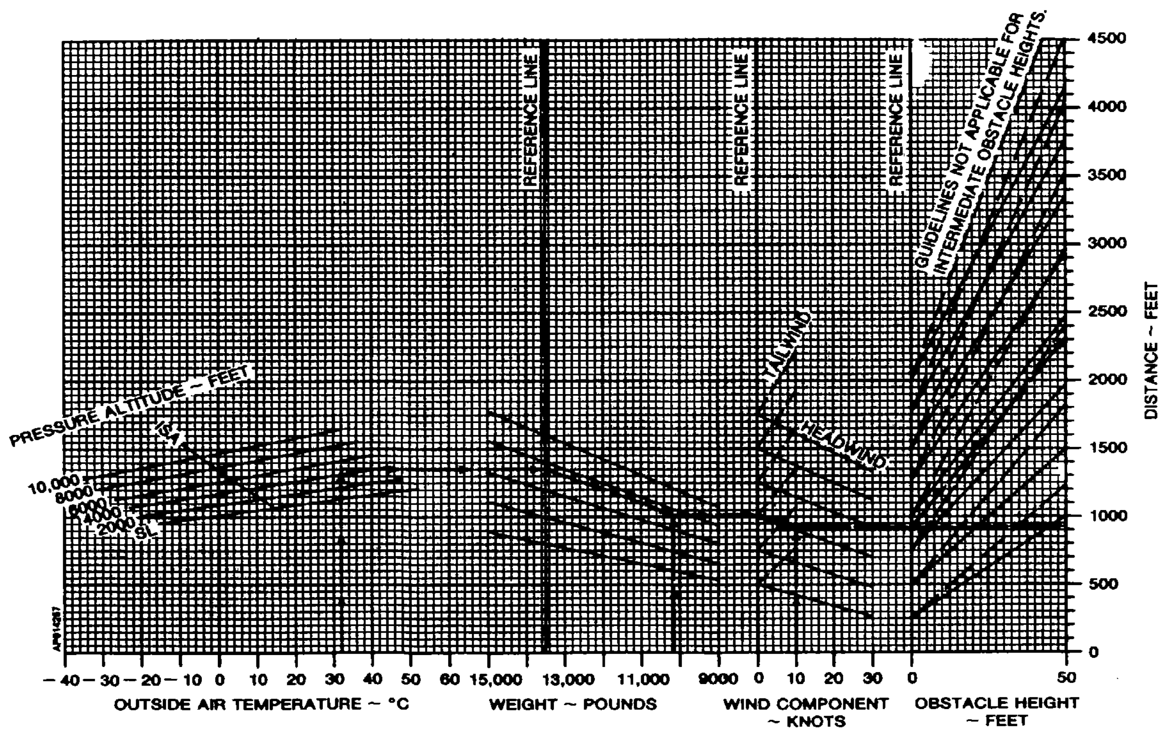


Figure 7-63. Landing Distance With Propeller Reversing Flaps 100%

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 and passenger briefings. The pilot in command shall insure compliance with the contents of this manual that are applicable to the mission.

8-2. OPERATING LIMITS AND RESTRICTIONS.

The minimum, maximum, normal, and cautionary operational ranges represent careful aerodynamic and structural calculations, substantiated by flight test data. These limitations must be adhered to during all phases of the mission. Refer to Chapter 5, OPERATING LIMITS AND RESTRICTIONS, for detailed information.

8-3. WEIGHT, BALANCE, AND LOADING.

The aircraft must be loaded and weight and balance verified per Chapter 6, WEIGHT, BALANCE, AND LOADING. This aircraft is in weight and balance Class 1B and requires a weight and balance clearance for each flight per AR 95-16. Weight and center of gravity conditions must be within the limits prescribed in Chapters 5 and 6.

8-4. PERFORMANCE.

Refer to Chapter 7, PERFORMANCE DATA, to determine the capability of the aircraft for the entire mission. Consideration must be given to changes in performance resulting from variation in loads, temperatures, and pressure altitudes. Record the data on the Performance Planning Card for use in completing the flight plan and for reference throughout the mission.

8-5. FLIGHT PLAN.

A flight plan must be completed and filed per AR 95-1, DOD FLIP, and local regulations.

8-6. CREW BRIEFINGS.

A crew briefing must be conducted for a thorough understanding of individual and team responsibilities. The briefing should include, but not be limited to, copilot, crew chief, and ground crew responsibilities and the coordination necessary to complete the mission most efficiently. A review of visual signals is desirable when ground guides do not have a direct voice communications link with the crew. Refer to Section VI for crew briefings.

Section II. OPERATING PROCEDURES AND MANEUVERS

8-7. 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 I precautions to be observed. Only the duties of the minimum crew are included.

8-8. ADDITIONAL DATA.

Additional crew duties are covered as necessary in Section VI, CREW DUTIES. Mission equipment checks are contained in Chapter 4, MISSION EQUIPMENT. Procedures specifically related to instrument flight that are different from normal procedures are covered in this section following normal procedures. Descriptions of functions, operations, and effects of controls are covered in Section III, FLIGHT CHARACTERISTICS, and are repeated in this section only when required for emphasis. Checks that must be made under adverse environmental conditions, such as desert and cold weather operations, supplement normal procedures checks in this section and are covered in Section V, ADVERSE ENVIRONMENTAL CONDITIONS.

8-9. 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. A condensed version of the amplified checklist, omitting all explanatory text, is contained in the Operator's and Crewmember's Checklist, TM 551510-220-CL. To provide for easier cross referencing, the procedural steps are numbered to coincide with the corresponding numbered steps in TM 551510-220-CL.

8-10. USE OF CHECKLIST.

Although a good working knowledge of all aircraft procedures is desirable, it is not mandatory that they be committed to memory. The pilot is responsible for the initiation and accomplishment of all required checks. Checklist items will be called out orally and the action verified using the pilot's checklist (-CL). The copilot will normally read the checklist and perform such duties as indicated, as well as those directed by the pilot. "As required" will not be used as a response; instead the actual position or setting of the unit or item, such as "ON" or "UP" or "APPROACH" will be stated. Upon completion of each checklist, the copilot will advise the pilot that the checklist called for has been completed.

8-1 1. CHECKS.

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 around the step number, i.e.,(4.)Circuit breakers In. The star symbol 4 indicates an operational check contained in the performance section of the condensed checklist. The asterisk symbol "*" indicates that performance of the step is mandatory for all thru-flights. The asterisk applies only to checks performed prior to takeoff. Placarded items appear in upper case.

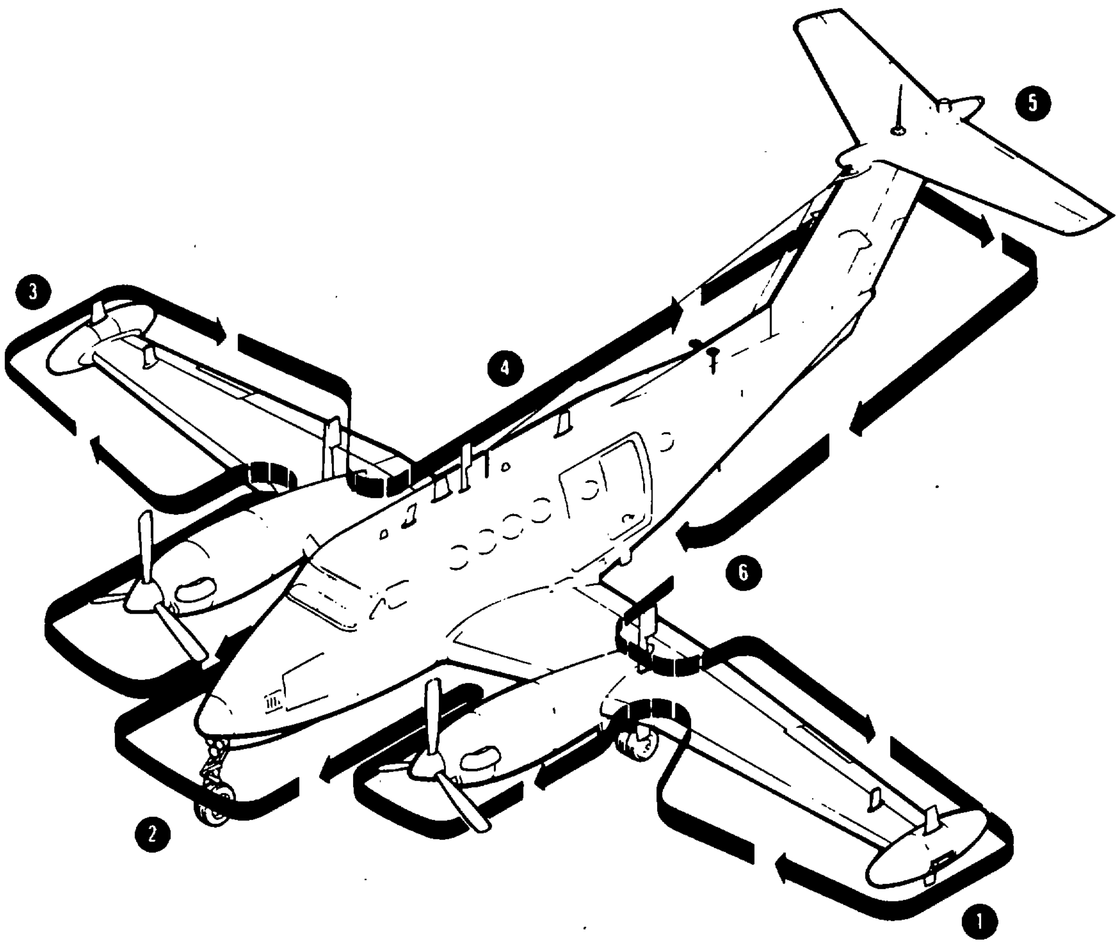
8-12. BEFORE EXTERIOR CHECK.

*1. Publications Check DA Forms 2408-12, -13, -14, and -18, DD Form 365F, 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 the entire mission.

CAUTION

If high or gusty winds are present, and the flight controls are unlocked, control surfaces may be damaged by buffeting



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. Flight controls Unlock and check.

*4. Parking brake Set.

CAUTION

The elevator trim system must not be forced past the limits which are indicated on the elevator trim tab position indicator.

5. Elevator trim Set to "O" (neutral).

CAUTION

Do not cycle landing gear handle on the ground.

*6. Gear - DN.

*7. Ice vane pull handles In.

*8. Keylock switch - ON.

*9. Battery switch - ON.

10. Ice vane switches - RETRACT.

11. Lighting systems Check as required, to include navigation 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.

★ 12. Pitot tubes (2), stall warning vane, heated fuel vents (2) Check.

a. Stall warning heat switch ON.

b. Pitot heat switches (2) ON. Check cover removed.

c. Fuel vent heat switches (2) ON.

d. Left wing heated fuel vent Check by feel for heat and condition.

e. Stall warning vane Check by feel for heat and condition.

f. Left pitot tube Check by feel for heat and free of obstructions.

g. Right pitot tube Check by feel for heat and free of obstructions.

h. Right wing heated fuel vent Check by feel for heat and condition.

i. Stall warning heat switch OFF.

j. Pitot heat switches (2) OFF.

k. Heated fuel vent switches (2) OFF.

13. Fuel gages Check fuel quantity and gage operation.

14. Battery switch As required.

15. Toilet Check condition and that knife valve is open approximately 0.25 inch.

16. Emergency equipment Check that all required emergency equipment is available and that fire extinguishers (2) and first-aid kits (4) have current inspection dates.

17. Mission equipment and circuit breakers Check and set.

18. Parachutes Check secure and for current inspection and repack dates.

8-13. FUEL SAMPLE.

NOTE

Fuel and oil quantity check may be performed prior to EXTERIOR CHECK to preclude carrying ladder and fuel sample container around during the inspection. During warm weather open fuel cap slowly to prevent being sprayed by fuel under pressure due to thermal expansion.

*1. Fuel sample Check collective fuel sample from all drains for possible contamination. Thru-flight check is only required if aircraft has been refueled.

8-14. LEFT WING, AREA 1.

1. Left wing area Check as follows (fig. 81):

*a. General condition Check for skin damage such as buckling, splitting, distortion, dents, or fuel leaks.

b. Flaps Check for full retraction (approximately 0.25 inch play) and skin damage such as buckling, splitting, distortion, or dents.

c. Fuel sump drains (3) Check for leaks.

d. Controls and moveable trim tab Check security and moveable trim tab position.

NOTE

All static wicks (24) must be installed for optimum radio performance.

e. Static wicks (4) Check security and condition.

f. Wing pod, navigation lights and antennas Check condition.

g. Recognition light Check condition.

h. Outboard antenna set Check condition.

i. Main tank fuel and cap Check fuel level visually, condition of seal, and cap tight and properly installed.

j. Outboard wing fuel vent Check free of obstructions.

k. Outboard deice boot Check for secure bonding, cracks, loose patches, stall strips, and general condition.

l. Stall warning vane Check free.

m. Tiedown Release.

n. Inboard dipole antenna set Check for security and cracks at mounting points. Check bonding secure, boots free of cuts and cracks.

o. Wing ice light Check condition.

p. AC GPU access door Secure.

q. Recessed and heated fuel vents Check free of obstructions.

r. Inverter inlet and exhaust louvers Check free of obstructions.

8-15. LEFT MAIN LANDING GEAR.

1. Left main landing gear Check as follows:

a. Tires Check for cuts, bruises, wear, proper inflation and wheel condition.

b. Brake assembly Check brake lines for damage or signs of leakage, brake linings for wear (0.25 inch maximum, between housing and lining carrier), brake device assembly and bleed air hose for condition and security.

c. Shock strut Check for signs of leakage, minimum strut extension (5.50 inches), and that left and right strut extension is approximately equal.

d. Torque knee Check condition.

e. Safety switch Check condition, wire, and security.

f. Fire extinguisher pressure Check pressure within limits.

g. Wheel well, doors, and linkage Check for signs of leaks, broken wires, security, and general condition.

h. Fuel sump drains (forward) Check for leaks.

8-16. LEFT ENGINE AND PROPELLER.

1. Left engine 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 30 seconds, then recheck. If more than 10 hours have elapsed, run engine for 2 minutes, then recheck. Add oil as required. Do not overfill.

*a. Engine oil Check oil level no more than 2 quarts low, cap secure, locking tab aft, and access door locked.

b. Engine compartment, left side Check for fuel and oil leaks, security of oil cap, door locking pin, and general condition.

NOTE

Secure front cowling latches first.

c. Left cowl locks Locked.

d. Left exhaust stack Check for cracks and free of obstructions.

*e. Propeller blades and spinner Check blade condition, boots, security of spinner and free propeller rotation.

*f. Engine air inlets and ice vane Check free of obstruction and ice vane retracted.

g. Bypass door Check condition.

h. Right cowl locks Locked.

i. Right exhaust stack Check for cracks and free of obstructions.

j. Engine compartment, right side Check for fuel and oil leaks, ice vane linkage, door locking pin, and general condition. Lock compartment access door.

8-17. CENTER SECTION, LEFT SIDE.

1. Center section Check as follows:

a. Heat exchanger inlet and outlet Check for cracks and free of obstruction.

b. Auxiliary tank fuel sump drain Check for leaks.

c. Inboard deice boot Check for secure bonding, cracks, loose patches, and general condition.

*d. Auxiliary tank fuel gage and cap Check fuel level visually, condition of seal, and cap tight and properly installed.

e. Monopole antenna Check condition.

8-18. FUSELAGE UNDERSIDE.

1. Fuselage underside Check as follows:

*a. General condition - Check for skin damage such as buckling, splitting, distortion, dents, or fuel leaks.

b. Antennas - Check security, and general condition.

8-19. NOSE SECTION, AREA 2.

1. Nose section Check as follows: a. Free air temperature probe Check condition.

b. Avionics door, left side Check secure.

c. Air conditioner exhaust Check free of obstructions.

d. Wheel well Check for signs of leaks, broken wires and general condition.

e. Doors and linkage Check condition, security, and alignment.

f. Nose gear turning stop Check condition.

*g. Tire Check for cuts, bruises, wear, appearance of proper inflation, and wheel condition.

*h. Shock strut Check for signs of leakage and 3.0 inches minimum extension.

i. Torque knee Check condition.

j. Shimmy damper and linkage Check for security and condition.

k. Landing and taxi lights Check for security and condition.

l. Pitot tubes Check covers removed, alignment, security, and free of obstructions.

m. Radome Check condition.

n. Windshields and wipers Check windshield for cracks and cleanliness and wipers for contact with glass surface.

o. Air conditioner inlet Check free of obstructions.

p. Avionics door, right side - Check secure.

8-20. CENTER SECTION, RIGHT SIDE.

1. Center section Check as follows:

   a. Inboard deice boot Check for secure bonding, cracks, loose patches, and general condition.

   b. Battery access panel Secure.

   c. Battery vents Check free of obstruction.

   *d. Auxiliary tank fuel gage and cap Check fuel level visually, condition of seal, and cap tight and properly installed (locking tab aft).

   e. Battery compartment drain Check free of obstruction.

   f. Battery ram air intake Check free of obstruction.

   g. INSTAS temperature probe Check condiion and free of obstructions.

   h. Auxiliary tank fuel sump drain Check for leaks.

   i. Heat exchanger inlet and outlet Check for cracks and free of obstructions.

   j. Monopole antenna Check condition.

8-21. RIGHT ENGINE AND PROPELLER.

1. Right 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 30 seconds, then recheck. If more than 10 hours have elapsed, run engine for 2 minutes, then recheck. Add oil as required. Do not overfill.

   *a. Engine oil Check oil level no more than 3 quarts low, locking tab aft, and access door locked.

   b. Engine compartment, left side Check for fuel and oil leaks, security of oil cap, door locking pins, and general condition.

   c. Left cowl locks Locked.

   d. Left exhaust stack Check for cracks and free of obstructions.

   *e. Propeller blades and spinner Check blade condition, boots, security of spinner, and free propeller rotation.

   *f. Engine air inlets and ice vane Check free of obstruction and ice vane retracted.

   g. Bypass door Check condition.

   h. Right cowl locks Locked.

   i. Right exhaust stack Check for cracks and free of obstructions.

   j. Engine compartment, right side Check for fuel and oil leaks, ice vane linkage, door locking pins, and general condition. Lock compartment access door.

8-22. RIGHT MAIN LANDING GEAR.

1. Right main landing gear Check as follows: a. Fuel sump drains (forward) Check for leaks.

   *b. Tires Check for cuts, bruises, wear, proper inflation and wheel condition.

   c. Brake assembly Check brake lines for damage or signs of leakage, brake linings for wear (0.25 inch maximum, between piston housing and lining carrier), brake deice assembly and bleed air hose for condition and security.

   *d. Shock strut Check for signs of leakage, minimum strut extension (5.50 inches), and that left and right strut extension is approximately equal.

   e. Torque knee Check condition.

   f. Safety switch Check condition, wire, and security.

★g. Fire extinguisher pressure Check pressure within limits.

h. Wheel well, doors, and linkage Check for signs of leaks, broken wires, security, and general condition.

8-23. RIGHT WING, AREA 3.

1. Right wing - Check as follows:

   a. Recessed and heated fuel vents Check free of obstructions.

   b. Inverter inlet and exhaust louvers Check free of obstructions.

   c. DC GPU access door Secure.

   d. Inboard dipole antenna set Check for security and cracks at mounting points, bonding secure, free of cuts and cracks.

   e. Wing ice light Check condition.

   f. Outboard deice boot Check for secure bonding, cracks, loose patches, stall strips, and general condition.

   *g. Tiedown Release.

   *h. Main tank fuel and cap Check fuel level visually, condition of seal, and cap tight and properly installed.

   i. Outboard wing fuel vent Check free of obstructions.

   j. Outboard antenna set Check condition.

   k. Recognition light Check condition.

   1. Wing pod, navigation lights and antennas Check condition.

   m. Static wicks (4) Check security and condition.

   n. Controls Check security and condition of ground adjustable tab.

   o. Fuel sump drains (3) Check for leaks.

   p. Flaps Check for full retraction (approximately 0.25 inch play) and skin damage, such as buckling, splitting, distortion, or dents.

   q. Chaff dispenser Check number of chaffs in payload module and for security.

   *r. General condition Check for skin damage such as buckling, splitting, distortion, dents, or fuel leaks.

8-24. FUSELAGE RIGHT SIDE. AREA 4.

1. Fuselage right side Check as follows:

   *a. General condition Check for skin damage such as buckling, splitting, distortion or dents.

   b. Emergency light Check condition.

   c. Flare/chaff dispenser Check number of flares in payload module and for security.

   d. Beacon Check condition.

   e. Tailcone access door Check secure.

   f. Oxygen filler door Check secure.

   g. Static ports Check clear of obstructions.

   h. Emergency locator transmitter ARMED.

   i. APR 44 antennas (2) Check.

   j. Emergency locator transmitter antenna Check condition.

8-25. EMPENNAGE, AREA 5.

1. Empennage Check as follows: a. Vertical stabilizer, rudder, and trim tab Check for skin damage, such as buckling, distortion, or dents, and trim tab rig.

   b. Static wicks (16) Check installed.

   c. Antennas Check security, and general condition.

   d. Deice boots Check for secure bonding, cracks, loose patches, and general condition.

e. Horizontal stabilizer, and elevator Check for skin damage, such as buckling, distortion and dents.

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 the next flight of the aircraft.

f. Elevator trim tab Verify "O" (neutral) position.

WARNING

If the possibility of ice accumulation on the horizontal stabilizer or elevator exists, takeoff will not be attempted.

g. Position and beacon lights Check condition.

8-26. FUSELAGE, LEFT SIDE. AREA 6.

1. Fuselage left side Check as follows:

*a. General condition Check for skin damage such as buckling, distortion, or dents.

b. Static ports Check clear of obstructions.

c. APR-44 antennas (2) Check.

d. Emergency light Check condition.

e. Cabin door Check door seal and general condition.

f. Fuselage top side Check general condition and antennas.

*g. Chocks and tiedowns Check removed.

8-27. * INTERIOR CHECK.

1. Cargo/loose equipment Check secure.

2. Cabin/cargo doors Test and lock:

a. Cabin door Check closed and latched by the following.

1. Safety arm and diaphram plunger Check position (lift door step).

2. Index marks on rotary cam locks (6) Check aligned with indicator windows.

b. Cargo door Check closed and latched by the following: 1. Upper handle Check closed and latched. (Observe through cargo door latch handle access cover window.) 2. Index marks on rotary cam locks (4) 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 annunciator light illuminated.

8. Cabin door Open. Check CABIN DOOR annunciator light extinguished.

9. Battery switch ON. Check CABIN DOOR annunciator light illuminated.

10. Cabin door Close and latch. Check CABIN DOOR annunciator 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. Crew briefing As required. Refer to Section VI.

8-28. BEFORE STARTING ENGINES.

★1. Oxygen system Check as required.

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 masks 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.

2. Circuit breakers Check in.

*3. Overhead control panel switches Set as follows:

a. Light dimming controls As required.

b. Cabin temperature mode selector switch OFF.

c. Ice & rain switches As required.

d. Exterior light switches As required.

e. Master panel lights switch As required.

f. Inverter switches OFF.

g. Avionics master power switch As required.

h. Environmental switches As required.

i. Autofeather switches OFF.

j. #1 engine start switches OFF.

k. Master switch OFF.

l. #2 engine start switches OFF.

*4. Fuel panel switches Check as follows:

a. Standby fuel pump switches OFF.

b. Auxiliary transfer override switches AUTO.

c. Crossfeed switch - OFF.

5. Magnetic compass Check for fluid, heading and current deviation card.

*6. Pedestal controls Set as follows:

CAUTION

Movement of power levers into reverse range while engines are shut down may result in bending and damage to control linkages.

a. Power levers IDLE.

b. Propeller levers HIGH RPM.

c. Condition levers FUEL CUTOFF.

d. Flaps - UP.

e. Friction locks Check and set.

*7. Pedestal extension switches Set as follows:

a. Flare/chaff dispenser control SAFE.

b. Avionics As required.

c. Rudder boost switch ON.

8. Gear alternate engage and ratchet handles Stowed.

9. Free air temperature gage Check, note current reading.

10. Instrument panel Check and set as follows:

a. Pilot's and copilot's course indicator switches As required.

b. Pilot's and copilot's RMI switches As required.

c. Pilot's and copilot's microphone switch As required.

d. Pilot's and copilot's compass switches As required.

e. Gyro switches SLAVE.

f. Flight instruments Check instruments for protective glass, warning flags (10 pilot, 5 copilot), static readings, and heading correction card.

g. Radar OFF.

h. APR-39 and APR-44 OFF.

i. Engine instruments Check for protective glass and static readings.

11. PROP SYNC switch OFF.

12. Mission panel switches and circuit breakers Set and OFF.

13. Pressurization controls Set.

14. Subpanels Check and set as follows: a. Fire protection test switch OFF.

b. Landing, taxi, and recognition lights OFF.

c. Landing gear control switch Recheck DN.

d. Cabin lights As Required.

15. Pilot's static air source NORMAL.

NOTE

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.

16. Pilot's and copilot's audio control panels As required.

17. Ice vane pull handles In.

★18. Fuel pumps/crossfeed operation Check as follow

. Fire pull handles Pull.

b. Standby fuel pump switches On.

c. Battery switch ON.

d. #1 fuel pressure and #2 fuel pressure warning lights Illuminated.

e. Fire pull handles In.

f. #1 fuel press and #2 fuel press warning annunciator lights Extinguished.

g. Standby fuel pump switches OFE h. #1 fuel pressure and #2 fuel pressure warning lights Illuminated.

i. Crossfeed Check. Check system operation by activating switch momentarily left then right, noting that #1 FUEL PRESS and #2 FUEL PRESS warning annunciator lights extinguish and that the FUEL CROSS-FEED advisory annunciator light illuminates as switch is energized.

19. AC and DC GPU As required.

20. External power advisory annunciator lights As required. (Aircraft EXTERNAL POWER and mission EXT AC PWR ON annunciator lights illuminated.)

21. DC power Check. (22 VDC minimum for battery, 28 maximum for GPU starts).

★22. Annunciator panels Test as required.

a. MASTER CAUTION, MA'STER WARNING, #1 FUEL PRESS, #2 FUEL PRESS, GEAR DN, L BL AIR FAIL, R BL AIR FAIL, INST AC, #1 DC GEN, #1 INVERTER, #1 NO FUEL XFR, #2 NO FUEL XFR, #2 INVERTER, #2 DC GEN, Check illuminated.

b. ANNUNCIATOR TEST switch Press and hold. Check that the annunciator panels, FIRE PULL handle lights, marker beacon lights, MASTER CAUTION and MASTER WARNING lights are illuminated. Release switch and check that all lights except those in step (a) are extinguished.

c. MASTER CAUTION and MASTER WARNING lights Press. Check that both lights extinguish.

★23. Stall and gear warning system Check as follows:

a. STALL WARN TEST switch TEST. Check that warning horn sounds.

b. LDG GEAR WARN TEST switch TEST. Check that warning horn sounds and that the LDG GEAR CONTR handle warning lights (2) illuminate.

★24. Fire Protection system Check as follows:

a. Fire Detector Test switch Rotate counterclockwise to check three DETR positions. FIRE PULL handles should illuminate in each position. Reset MASTER WARNING in each position.

b. Fire Detector Test switch Rotate counterclockwise to check two EXTGH positions. SQUIB OK light, associated #1 EXTGH DISCH and #2 EXTGH DISCH annunciator caution light and MASTER CAUTION LIGHT should illuminate in each position.

25. INS Align as required.

8-29. * 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. When making a battery start, the right engine should be started first. When making a ground power unit (GPU) start, the left engine should be started first due to the GPU receptable being located adjacent to the right engine. A crewmember should monitor the outside observer throughout the engines start.

1. Avionics master switch OFF.
2. Exterior light switches As required.
3. Propeller Clear.
4. Ignition and engine start switch ON. Propeller should begin to rotate and associated #1 IGN ON or #2 IGN ON annunciator light should illuminate. Associated #1 FUEL PRESS or #2 FUEL PRESS light should extinguish.

CAUTION

If ignition does not occur within 10 seconds after moving condition lever to LOW IDLE, initiate engine clearing 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 (5 minute minimum).

5. Condition lever (after N1 RPM stabilizes, 12% 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 five 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 N1 Monitor (TGT 1000°C maximum, N1 52% minimum).
7. Oil pressure Check (60 PSI minimum).
8. Ignition and engine start switch OFF, after 50% N1.
9. Condition -lever HI IDLE. Monitor TGT as the condition lever is advanced.
10. Generator switch RESET, then ON.

8-30. * SECOND ENGINE START (BATTERY START).

1. First engine generator load 50% or less.
2. Propeller Clear.
3. Ignition and engine start switch ON. Propeller should begin to rotate and associated #1 IGN ON or #2 IGN ON annunciator light should illuminate. Associated #1 FUEL PRESS or # 2 FUEL PRESS annunciator light should extinguish.

CAUTION

If ignition does not occur within 10 seconds after moving condition lever to LOW IDLE, initiate engine clearing 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 (5 minute minimum).

4. Condition lever (after N1 RPM passes 12%

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 five 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 N1 Monitor (TGT 1000°C maximum, N1 52% minimum).
6. Oil pressure Check (60 PSI minimum).
7. Ignition and engine start switch OFF after 50% N1.
8. Battery charge light Check (light should illuminate approximately 6 seconds after generator is brought on line. Light should extinguish within 5 minutes following a normal engine start on battery).
9. Inverter switches ON, check INVERTER annunciator lights extinguished.
10. Second engine generator RESET, then ON.
11. Condition levers As required.

8-31. ABORT START.

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.

8-32. ENGINE CLEARING.

1. Condition lever FUEL CUTOFF.
2. Ignition and engine start switch OFF (5 minute minimum).

CAUTION

Do not exceed starter limitation of 30 seconds ON and 5 minutes OFF for two starting attempts and engine clearing procedure. Allow 30 minutes off before additional starter operation.

3. Ignition and engine start switch STARTER ONLY (15 seconds minimum, 30 seconds maximum).
4. Ignition and engine start switch OFF.

8-33. * FIRST ENGINE START (GPU START).

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. Avionics master switch As required.
3. Exterior light switches · As required.
4. Propeller Clear.
5. Ignition and engine start switch ON. Propeller should begin to rotate and associated #1 IGN ON or #2 IGN ON should illuminate. Associated #1 FUEL PRESS or #2 FUEL PRESS warning annunciator light should extinguish.
6. Condition lever (after N1 RPM stabilizes, 12%, 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 five seconds. If this limit is exceeded, use ABORT START procedure and discontinue start. Enter the peak temperature and duration on DA Form 2408-13.

7. TGT and N1 Monitor (TGT 1000°C maximum, N1 52% minimum).
8. Oil pressure Check (60 PSI minimum).
9. Ignition and engine start switch OFF after 50% N1.
10. Condition lever HI IDLE. Monitor TGT as the condition lever is advanced.
11. DC GPU Disconnect as required.
12. Generator switch (GPU disconnected) RESET, then ON.

8-34. * SECOND ENGINE START (GPU START).

1. Propeller Clear.
2. Ignition and engine start switch ON. Propeller should begin to rotate and associated #1 IGN ON or #2 IGN ON annunciator light should illuminate. Associated #1 FUEL PRESS or #2 FUEL PRESS annunciator light should extinguish.

CAUTION

If ignition does not occur within 10 seconds after moving condition lever to LOW IDLE, initiate engine clearing 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 (5 minute minimum).

3. Condition lever (after N1 RPM passes 12% 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 10000 C for five seconds. If this limit is exceeded, use ABORT START procedure and discontinue start. Enter the peak temperature and duration on DA Form 2408-13.

4. TGT and N1 Monitor (TGT 10000C maximum, N1 52% minimum).
5. Oil pressure Check (60 PSI minimum).
6. Ignition and engine start switch OFF, after 50% N1 7. Propeller levers FEATHER.
8. GPU Disconnect. (Check aircraft external power and mission external power light extinguished.) 9. Propeller levers HIGH RPM.
10. Aircraft inverter switches ON, check #1 INVERTER and #2 INVERTER annunciator lights extinguished.
11. Generator switches RESET, then ON.
12. Condition levers As required.

8-35. BEFORE TAXIING.

*1. Brake deice As required. To activate the brake deice system proceed as follows: a. Bleed air valves OPEN.

   b. Condition levers HI IDLE.

   c. Brake deice switch DEICE. Check BRAKE DEICE ON advisory annunciator light illuminated.

*2. Cabin temperature and mode Set.

CAUTION

Verify airflow is present from aft cockpit eyeball outlets to insure sufficient cooling for mission equipment.

NOTE

For maximum cooling on the ground, turn the bleed air valve switches to ENVIRO OFF position.

*3. AC/DC power Check for:

a. AC frequency 394 to 406 Hz.

b. AC voltage 104 to 124 VAC.

c. DC load Check.

d. DC voltage 28.0 to 28.5 VDC.

WARNING

Do not operate radar in congested areas. Injury could result to personnel in close proximity to operating radar.

CAUTION

Do not operate the weather radar in an area where the nearest effective surface is 50 feet or less from the antenna reflector. Scanning such surfaces within 50 feet of the antenna reflector may damage receiver crystals.

*4. Avionics master switch ON.

5. Mission panel Set and checked as required.

★6. Electric elevator trim and autopilot/flight director operation Check as follows:

a. Pilot's and copilot's PITCH TRIM switches Press to NOSE UP and NOSE DN positions, singularly and in pairs. Check that trim wheel moves in proper direction and operates only when trim switches are pressed in pairs. Any deviation requires that electric elevator trim be turned off and flight conducted using manual trim.

b. DISC TRIM switch Press to second detent and verify that electric trim disconnects and ELEV TRIM annunciator light (in pedestal) extinguishes.

c. Flight director (FDI) and Radio Magnetic Indicator (RMI) warning flags Check masked.

NOTE

Since the pressure of airflow that normally opposes movement of control surfaces is absent during preflight check, it is possible to get a hard over control surface deflection if an autopilot command is allowed to remain active for any appreciable length of time. Move turn knob and pitch thumbwheel only enough to check operation, then return them to the center position.

d. Autopilot mode selector panel Select HDG mode.

e. Horizontal Situation Indicator (HSI) Set heading marker under lubber line.

f. Autopilot Engage. Check that controls are stiff and that AP ENG, HDG, and AIL HI TORQUE annunciator lights illuminate.

g. AIL HI TORQUE test switch Engage. Check that AIL HI TORQUE light extinguishes.

h. HSI heading marker Move 10° left and right and verify that flight director and control wheels respond in the appropriate direction.

i. Autopilot/yaw damp disengage switch (control wheels) Press to first detent and verify that autopilot disengages (AP DISC annunciator illuminates) and that flight controls are free.

j. Autopilot Engage.

k. Autopilot pitch-turn control (pedestal extension) Command 5° trim UP and verify that manual trim wheel moves nose up and AP trim light indicates UP trim.

l. Pitch trim switch (control wheels) Command nose down and verify that autopilot disengages and AP TRIM FAIL and MASTER WARNING annunciator lights illuminate.

NOTE

The AP TRIM FAIL annunciator will extinguish by pressing the AP/YD disconnect button on the control wheel to the second detent.

m. Repeat steps (i) thru (1) above using opposite commands.

n. Autopilot Engage.

o. HSI heading marker Move to command a bank on flight director indicator.

p. GO-AROUND switch Press and verify that GA annunciator light illuminates, autopilot disengages, and that flight director indicator commands a wingslevel 7° nose-up attitude.

q. TEST switch (pilot's flight director indicator) Press and verify that attitude display indicates an additional 10° pitch up and 20° right roll, and GYRO flag is visible.

★*7. Autopilot trim fail system Check as follows: a. Autopilot Engage. Command DN on AP pitch wheel and hold TRIM TEST switch when elevator trim wheel starts to rotate.

b. Verify that autopilot disengages and AP TRIM FAIL and MASTER WARNING lights illuminate within 10 seconds. Repeat steps (a) and (b) using opposite commands.

8. Avionics Check and set as required.
9. Flaps Check.
10. Altimeters Check and set.

8-36. * TAXIING.

CAUTION

Excessive use of brakes with the increased weight of this aircraft will increase the possibility of brake failure and/or brake fire. Judicious use of the brakes is recommended with coordinated use of beta range.

Taxi speed con be effectively controlled by the use of power application and the use of the variable pitch propellers in beta range. Normal turns may be made with the steerable nose wheel; however, a turn may be tightened by using full rudder and inside brake as necessary. Turns should not be started with brakes alone, nor should the aircraft be pivoted sharply on one main gear.

1. Brakes Check.
2. Flight instruments Check for normal operation.

8-37. ENGINE RUNUP.

1. Mission control panel Set.

★2. Propeller manual feathering Check as follows:

a. Condition lever LOW IDLE.

b. Left propeller lever FEATHER. Check that propeller feathers.

c. Left propeller lever HIGH RPM.

d. Repeat procedure for right propeller.

3. Autofeather Check as follows:

a. Condition levers LOW IDLE.

b. Autofeather switch Hold to TEST. (#1 AUTOFEATHER and #2 AUTOFEATHER advisory annunciator lights should remain extinguished.)

c. Power levers Advance to approximately 22% torque, then move autofeather switch to TEST. Both #1 AUTOFEATHER and #2 AUTOFEATHER advisory annunciator lights should illuminate.

d. Left power lever Retard.

a. At approximately16 to 21% torque, check #2 AUTOFEATHER advisory annunciator extinguished.

b. At approximately 9 to 14% torque, check #1 AUTOFEATHER advisory annunciator light extinguished. (Left propeller starts to feather.)

e. Left power lever Set approximately 22% torque.

f. Repeat steps b through d for right engine.

★4. Overspeed governors Check as follows:

a. Power levers Set approximately 1950 RPM (both engines).

b. #1 propeller governor test switch Hold to TEST position.

c. #1 propeller RPM 1830 to 1910 Check.

d. Repeat steps b and c for # 2 engine.

e. Power levers Set 1800 RPM.

★5. Primary governors Check as follows:

a. Power levers Set 1800 RPM.

b. Propeller levers Move aft to detent. Check that propeller RPM drops to 1600 to 1640 RPM.

c. Propeller levers HIGH RPM.

★6. Ice vanes Check as follows:

a. Ice vane switches EXTEND. Verify torque drop, TGT increase, and illumination of #1 ICE VANE EXTEND and #2 ICE VANE EXT annunciators.

b. Ice vane switches RETRACT. Verify return to original torque and TGT, and that #1 ICE VANE EXTEND and #2 ICE VANE EXT annunciators extinguish.

7. Condition levers HI IDLE.

8. Power levers IDLE.

★9. Anti-ice and deice systems Check as follows:

a. Windshield anti-ice switches NORMAL and HI. Check PILOT and COPILOT (individually) for loadmeter rise, then OFF.

b. Propeller switches INNER and OUTER (momentarily). Check for loadmeter rise.

c. Surface deice switch SINGLE CYCLE AUTO. Check for a drop in pneumatic pressure and wing deice boot inflation and after 6 seconds for a second drop in pneumatic pressure.

d. Surface deice switch MANUAL. Check that surface boots inflate, and remain inflated, then OFF.

e. Antenna deice switch SINGLE. Check for a drop in pneumatic pressure and antenna deice boot inflation.

f. Antenna deice switch MANUAL. Check that boots inflate, and remain inflated, then OFF.

g. Engine inlet lip heat switches ON. Check that #1 LIP HEAT ON and and #2 LIP HEAT ON advisory annunciator lights are illuminated, and the #1 LIP HEAT and #2 LIP HEAT caution annunciator lights are extinguished, then OFF.

h. Anti-ice and deice system switches OFF.

★10. Pneumatic pressure Check as follows:

a. Left bleed air valve switch PNEU & ENVIRO OFF.

b. Pneumatic pressure Check 12 to 20 PSI.

c. Right pneumatic and environmental switch PNEU & ENVIRO OFF. Check that L BL AIR FAIL and R BL AIR FAIL, and L BL AIR OFF and R BL AIR OFF annunciator lights are illuminated.

d. Pneumatic pressure Verify zero.

e. Left pneumatic and environmental switches OPEN. Check that L BL AIR FAIL and R BL AIR FAIL, and L BL AIR OFF and R BL AIR OFF annunciator lights are extinguished.

f. Pneumatic pressure Verify 12 to 20 PSI.

g. Right pneumatic and environmental switches OPEN.

11. Pressurization system Check as follows:

a. Cabin door caution light Check extinguished.

b. Storm windows Check closed.

c. Bleed air valve switches Check OPEN.

d. Cabin altitude Set 500 feet lower than airfield elevation.

e. Cabin pressure/dump switch TEST (hold).

f. Cabin rate-of-climb gage Check for descending indication and, when confirmed, release cabin pressure/dump switch from TEST.

g. Aircraft altitude Set to planned cruise altitude plus 500 feet. (If this setting does not result in a CABIN ALT indication of at least 500 feet over takeoff field pressure altitude, adjust as required.)

12. Condition levers As required.

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.

8-38. *BEFORE TAKEOFF.

(1). Auto feather switch ARM.

(2). Bleed air valves As required.

(3). Ice & rain switches As required.

(4). Fuel panel Check fuel quantity and switch positions.

(5). Flight and engine instruments Check for normal indications.

(6). Cabin altitude and rate-of-climb controller Set.

(7). Annunciator panels Check (note indications).

8. Propeller levers HIGH RPM.

9. Flaps As required.

10. Trim Set.

11. Avionics Set.

(12). Flight controls Check.

(13). Departure briefing Complete.

8-39. *LINE UP.

(1). Transponder As required.

(2). Engine autoignition switch ARM.

3. Power stabilized Check approximately 25% minimum.

(4) Condition levers LOW IDLE.

5. Lights As required.

6. Mission control panel Set.

8-40. 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. When runway lengths permit, the normal takeoff may be modified by starting the takeoff after power has been stabilized at approximately 25% torque, then applying power smoothly so as to attain full power no later than 65 KIAS. This will result in a smoother takeoff but will significantly increase takeoff distance.

a. Normal Takeoff. After LINE UP procedures have been completed, release brakes and smoothly apply power to within 5% of target. Power should be applied at a rate that will produce takeoff power by 40 KIAS. Maintain directional control with nosewheel steering, rudder, and differential power, while maintaining wings level with ailerons. The pilot should retain a light hold on the power levers throughout the takeoff and be ready to initiate ABORT procedures if required. The copilot should insure that the AUTOFEATHER advisory lights are illuminated (if applicable), adjust and maintain power at the exact takeoff power settings, and monitor all engine instruments. The pilot will rotate at the recommended rotation speed (Vr) and establish the climb attitude (9°to 16°) that will attain best rate-of-climb airspeed (Vy) during the initial climb. Rotation should be at a rate that will allow liftoff at liftoff airspeed (V1of).

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 nosewheel 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.

WARNING

Spectacular takeoff performance can be obtained by lifting off at speeds below those recommended in Chapter 7. However, control of the aircraft will be lost if an engine failure occurs immediately following liftoff until a safe speed can be attained. Except during soft field takeoff liftoff below recommended speeds will not be performed.

Minimum run takeoffs are performed with flaps extended to 40% although at some conditions, use of flaps during takeoff may result in the inability to attain positive single-engine climb if an engine fails immediately after liftoff.

To compensate for torque effect during the beginning of the takeoff roll, align the aircraft with the nose approximately 10° right of centerline. After LINE UP procedures have been completed, hold brakes firmly and apply TAKEOFF POWER, allowing for some increase in power as airspeed increases during the takeoff roll. Copilot action is the same as for normal takeoff. Release brakes and maintain directional control and nosewheel steering and rudder. Do not use brakes unless absolutely necessary. Hold the elevators in a neutral position, maintaining wings level with ailerons. Allow the aircraft to roll with its full weight on the wheels until the recommended rotation speed (V_r) is reached. At this speed rotate smoothly and firmly at a rate that will allow liftoff at liftoff air speed (V_{lof}). When flight is assured, retract the landing gear.

d. Obstacle Clearance Climb. Follow procedures as outlined for a minimum run takeoff, to the point of actual liftoff. When flight is assured, retract the landing gear and establish a wings level climb attitude, maintaining the computed obstacle clearance airspeed (V_x). Climb at this speed until clear of the obstacle. After the obstacle is cleared, lower the nose slowly and accelerate to best rate-of-climb airspeed (V_y). Retract flaps after attaining single engine best rate-of-climb airspeed (V_{yse}).

NOTE

The best angle-of-climb speed (V_x) is very close to single engine power-off stall speed. To provide for a margin of safety in the event of engine failure immediately after takeoff, the obstacle clearance airspeed value is used in lieu of true (V_x) for maximum angle takeoff climbs. Takeoff performance data shown in Chapter 7 is based on the use of obstacle clearance climb speed.

e. Soft Field Takeoff. If a takeoff must be made in conditions of mud, snow, tall grass, rough surface or other conditions of high surface friction, the following procedure should be used. Set flaps at TAKEOFF (40%), align the aircraft with the runway, and with the yoke held firmly aft, begin a slow steady acceleration, avoiding rapid or transient accelerations. Continue to hold full aft yoke so as to transfer the weight of the aircraft from the wheels to the wings as soon as possible. When the aircraft rotates, control pitch attitude (nose) so as to lift off from the soft surface at the slowest possible speed. When airborne, level off immediately in ground effect just above the surface, and accelerate to normal lift-off airspeed (V_{lof}) before rotating to climb attitude and retracting the landing gear. Consider the effects of snow or mud on gear retraction as applicable.

8-41. 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 due to Coriolis illusion.

After the aircraft is positively airborne and flight is assured, retract the landing gear. Adjust pitch attitude as required to maintain best rate-of-climb airspeed (V_y). Retract flaps after attaining best single-engine rate-of-climb airspeed (V_{yse}) The copilot should continue to maintain power at the computed setting and to monitor instruments. At single-engine maneuvering altitude, adjust pitch attitude to obtain cruise climb airspeed. As cruise climb airspeed, is attained, adjust power to the climb power setting. The copilot then activates the yaw damp and checks that the cabin is pressurizing. Both pilots check the wings and nacelles for fuel or oil leaks. The procedural steps after takeoff are as follows:

1. Gear- UP.
2. Flaps - UP.
3. Landing lights - OFF.
4. Climb power- Set.
5. PROP SYNC Switch - As required.

(6.) YAW DAMP switch - As required.

(7.) Autofeather switch - As required.

(8.) Brake de-ice - As required.

(9.) Windshield anti-ice - As required.

NOTE

Turn windshield anti-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 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.

8-42. CLIMB.

a. Cruise Climb. Cruise climb is performed at a speed which is the best combination of climb, fuel burn-off, and distance covered. Set propellers at 1900 RPM and torque as required. Adhere to the following airspeed schedule as closely as possible.

SL to 10,000 feet	144 KIAS
10,000 to 20,000 feet	134 KIAS
20,000 to 31,000 feet	123 KIAS

b. Climb Maximum Rate. Maximum rate of climb performance is obtained by setting propellers at 2,000 RPM, torque at 100% (or maximum climb TGT), and maintaining best rate-of-climb airspeed. Refer to Chapter 7 for best rate-of-climb airspeed for specific weights.

8-43. CRUISE.

Cruise power settings are entirely dependent upon the prevailing circumstances and the type of mission being flown. Refer to Chapter 7 for airspeed, power settings, and fuel flow information. The following procedures are applicable to all cruise requirements.

1. Power Set. Refer to the cruise power graphs contained in Chapter 7. To account for ram air temperature increase, it is essential that temperature be obtained at stabilized cruise airspeed.

NOTE

A new engine operated at the torque value presented in the cruise power charts will show a TGT margin below the maximum cruise limit. Maximum cruise power settings for temperature and altitude (derived from Chapter 7) if exceeded will adversely affect engine life. With ice vanes retracted, if cruise torque settings shown on cruise power charts cannot be obtained without exceeding TGT limits, the engine should be inspected.

2. Ice & rain switches As required. Insure that anti-ice equipment is activated before entering icing conditions.

NOTE

Ice vanes must be extended when operating in visible moisture at +5°C or less. Visible moisture is moisture in any form (clouds, ice crystals, snow, rain, sleet, hail, or any combination of these).

(3.) Auxiliary fuel gages - Monitor. Insure that fuel is being transferred from auxiliary tanks. (Chapter 2, Section IV.)

(4.) Altimeters - Check. Verify that altimeter setting complies with transition altitude requirement

(5) Engine instrument indications - Check all engine instruments for normal indications.
6. Recognition lights - As required.

8-44. DESCENT.

Descent from cruising altitude should normally be made by letting down at cruise airspeed with reduced power. Refer to Chapter 7 for power settings and rates of descent.

NOTE

Cabin altitude and rate-of-climb controller should be adjusted prior to starting descent.

a. DESCENT MAX RATE (CLEAN). To obtain the maximum rate of descent in clean configuration, perform the following:

(1.) Cabin pressurization Set Adjust CABIN CONTROLLER dial as required and adjust RATE control knob so that cabin rate of descent equals one-third aircraft rate of descent
2. Power levers IDLE.
3. Propeller levers HIGH RPM.
4. Flaps UP.
5. Gear UP.
6. Airspeed V_{mo}.
(7.) Ice & rain switches - As required.
8. Recognition lights - As required.

b. DESCENT - MAX RATE (LANDING CONFIGURATION). If required to descend at a low airspeed (e.g., to conserve airspace or in turbulence), approach flaps and landing gear may be extended to increase the rate and angle of descent while maintaining the slower airspeed. To perform the maximum rate of descent in landing configuration, perform the following:

(1.) Cabin pressurization Set. Adjust CABIN CONTROLLER dial as required and adjust RATE control knob so that cabin descent rate equals one-third aircraft descent rate.
2. Power levers - IDLE.
3. Propeller levers - HIGH RPM.
4. Flaps - APPROACH.
5. Gear - DN.
6. Airspeed - 184 KIAS maximum.
(7.) Ice & rain switches - As required.
8. Recognition lights - As required.

8-45. DESCENT-ARRIVAL.

Perform the following checks prior to the final descent for landing.

(1) Cabin pressurization - Set. Adjust CABIN CONTROLLER dial as required.
(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. Altimeters - Set to current altimeter setting.
(6.) Flare/chaff dispenser arm-safe switch - SAFE.
(7.) Flare/chaff dispenser safety pin (electronic module) - Insert
✶ 8. Crew briefing - Complete.

8-46. BEFORE LANDING.

1. Propeller synchronization switch - OFF.
(2) Autofeather switch - ARM.
3. Propeller levers - As required.

NOTE

During approach, propellers should be set to 1900 RPM to prevent glideslope interference (ILS approach), provide better power response during approach, and minimize attitude change when advancing propeller levers for landing.

4. Flaps (below 202 KIAS)- APPROACH.
5. Gear - DN.
6. Landing lights - As required.
(7.) Brake de-ice - As required.

8-47. OBSTACLE CLEARANCE APPROACH AND MINIMUM RUN LANDING.

When landing over obstacles that require a steeper than normal approach path, or when greater precision is required due to restricted runway lengths, the "Power Approach/Precision Landing" technique should be employed as follows: Prior to intercepting the descent path, complete the LANDING check and stabilize airspeed (V_{ref}) at 1.2 times power-off stall speed in landing configuration (V_{SO}). After intercepting the desired approach angle maintain a constant descent by controlling the descent with power and airspeed with elevator. Transition smoothly from approach to landing attitude. Touchdown should be made on the main gear with the nose slightly high, with power as required to control rate of descent for a smooth touchdown. Immediately after touchdown, allow the nosewheel to make ground contact and apply full reverse power and braking, as required. If possible, remove reverse thrust as the aircraft slows to 40 KIAS to minimize propeller blade erosion.

NOTE

Using 1.2 x (V_{SO}) for approach airspeed will provide increased performance and more responsive control; however, performance data are not available for approach at this slower airspeed.

8-48. LANDING.

CAUTION

Operation on unimproved, soft, or rough surfaces are not recommended for aircraft not equipped with a high flotation landing gear.

CAUTION

Except in an emergency, propellers should be moved out of reverse above 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 and/or dust on the surface. Flying gravel will damage propeller blades and dust may impair the pilot's forward visibility at low airplane speeds.

Performance data charts for landing computations assume that the runway is paved, level and dry. Additional runway must be allowed when these conditions are not met. Refer to Chapter 7 for landing data. Do not consider headwind during landing computations; however, if landing must be downwind, include the tailwind in landing distance computations. Plan the final approach to arrive at 50 feet over the landing area at approach speed (V_{ref}) plus 1/2 wind gust speed. Perform the following procedures as the aircraft nears the runway:

1. Autopilot and yaw damp - Disengaged.
2. Gear down lights - Check three green.
3. Propeller levers - HIGH RPM.

a. Normal Landing. As the aircraft nears the runway, flare slightly to break the rate of descent and reduce power smoothly to idle as the nose of the aircraft is rotated to landing attitude. Avoid the tendency to ride the ground effect cushion while waiting for the aircraft to slow down to a soft landing. As the aircraft touches down, gently lower the nosewheel to the runway and use reversing, brakes, or beta range, as required. If reversing is used, remove reverse power as the aircraft slows to 40 KIAS to minimize propeller blade erosion.

b. Crosswind Landing. Refer to Chapter 7 for recommended (V_{ref}) 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 crosswind effect. For crosswind exceeding the published limits, a combination "slip and crab" method at touchdown should be used.

c. Soft Field Landing. When landing on a soft or unprepared surface such as mud, tall grass, or snow, plan a normal power approach with flaps fully extended. Decelerate to the slowest possible airspeed just prior to touchdown, using power to control the final rate of descent to as slow as possible. Do not stall prior to touchdown as the nose attitude and rate of descent will become unacceptable. On touchdown apply full back (aft) elevator and then reduce power slowly. Do not use brakes unless absolutely necessary. Every precaution must be taken to prevent the nose wheel from digging into the surface.

d. Touch-and-Go Landings. The instructor should select a point on the runway where all pre-takeoff procedures will have been completed prior to the pilot's initial application of power. In selecting this point, prime consideration shall be given to the required accelerate-stop distance precomputed for the runway in use. The nosewheel should be on the runway and rolling straight before the touch-and-go procedures are initiated. After the pilot applies power to within 5 percent of target, the copilot's (instructor's) actions are the same as during a normal takeoff. If touch-and-go landings are approved for training purposes use the following procedure:

(1.) Propeller levers - HIGH RPM.
(2.) Flaps - As required.
(3.) Trim - Set.
4. Power stabilized - Check approximately 25% minimum.
5. Takeoff power - Set.

8-49. 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 insuring that the aircraft will not touch the ground. Retract the flaps to APPROACH, adjusting pitch attitude simultaneously to avoid an altitude loss. Accelerate to best rate-of-climb airspeed (V_y), retracting flaps fully after attaining the (V_{ref}) speed used for the approach. Perform the following:

1. Power - As required.
2. Gear- UP.
3. Flaps - UP.
4. Landing lights - OFF.
5. Climb power - Set.
(6.) Yaw damp - As required.
(7.) Brake de-ice - OFF.

8-50. AFTER LANDING.

Complete the following procedures after the aircraft has cleared the runway:

(1.) Condition levers - As required.
(2.) Engine autoignition switch - OFF.
(3.) Ice & rain switches - OFF.
(4.) Flaps- UP.
(5.) Transponder - As required.
6. Lights - As required.
(7.) Mission control panel - Set.

8-51. ENGINE SHUTDOWN.

CAUTION

To prevent sustained loads on rudder shock links, the aircraft should be parked with the nose gear centered.

1. Brake de-ice - OFF.
2. Parking brake - Set.
3. Landing/taxi lights - OFF.
4. Cabin temperature mode selector switch - OFF.
5. Autofeather switch - OFF.
6. Vent and aft vent blower switches - AUTO.
7. INS - OFF.
8. Mission equipment - OFF, as required.
9. Inverter switches - OFF.
10. Battery condition - Check as required.
11. TGT - Check. TGT must be 660°C or below for one minute prior to shutdown.

CAUTION

Monitor TGT during shutdown. If sustained combustion is observed, proceed immediately to ABORT START procedure.

12. Propeller levers - FEATHER.
13. Condition levers - FUEL CUTOFF.

WARNING

Do not turn exterior lights off until propeller's rotation has stopped.

14. Exterior lights - OFF.
15. Master panel lights switch - OFF.
16. Avionics master switch - Off.
17. Master switch - OFF.
18. Keylock switch - OFF.
19. Oxygen system - OFF.

8-52. BEFORE LEAVING AIRCRAFT.

1. Wheels - Chocked.
2. Parking brake -.As required.

NOTE

Brakes should be released after chocks are in place (ramp conditions permitting).

3. Flight controls - Locked.
4. Overhead flood lights - Off.
5. Standby fuel pump switches - OFF.
6. Transponder - OFF.
7. Mode 4 - As required.
8. Emergency exit lock - As required.
9. Aft cabin light - OFF.
10. Door light - OFF.

CAUTION

If strong winds are anticipated while the aircraft is unattended, the propellers shall be secured to prevent their windmilling with zero engine oil pressure.

11. Walk-around inspection Complete. Conduct a thorough walk-around inspection, checking for damage, fluid leaks, and levels. Check that covers, tiedowns, restraints, safety pins and chocks are installed as required.

NOTE

A cold oil check is unreliable. Oil should be checked within 10 minutes after stopping engine.

12. Aircraft forms Complete. In addition to established requirements for reporting any system defects, unusual and excessive operation such as hard landings, etc., the flight crew will also make entries on DA Form 2408-13 to indicate when limits in the Operator's Manual have been exceeded.
13. Aircraft Secured. Lock cabin door as required.

Section III. INSTRUMENT FLIGHT

8-53. GENERAL.

This aircraft is qualified for operation in instrument meteorological conditions. Flight handling, stability characteristics and range are approximately the same during instrument flight conditions as when under visual flight conditions.

8-54. INSTRUMENT FLIGHT PROCEDURES.

Refer to FM 1-5, FM 1-230; FLIP; AR 95-1; FC 1-218; or applicable foreign government regulations, and procedures described in this manual.

8-55. INSTRUMENT TAKEOFF.

Complete the BEFORE TAKEOFF check. Engage the heading (HDG) mode on the autopilot computer/control (do not engage autopilot). Set heading marker (HDG) to runway heading and align the aircraft with the runway centerline, insuring that nosewheel is straight before stopping aircraft. Hold brakes and complete the LINEUP check. Insure that the roll steering bar is centered. Power application and copilot duties are identical to those prescribed for a "visual" takeoff. After the brakes are released, initial directional control' should be accomplished predominantly with the aid of outside visual references. As the takeoff progresses, the crosscheck should transition from outside references to the flight director and airspeed indicator. The rate of transition is directly proportional to the rate at which the outside references deteriorate. Approaching rotation speed (V_r), the crosscheck should be totally committed to the instruments so that erroneous sensory inputs can be ignored. At rotation speed, establish takeoff attitude on the flight director. Maintain this pitch attitude and wings-level attitude until the aircraft becomes airborne. When both the vertical-velocity indicator and altimeter show positive climb indications, retract the landing gear. After the landing gear is retracted, adjust the pitch attitude as required to attain best rate-of-climb airspeed (V_y). Use PITCH-SYNC as required to reposition the flight director pitch steering bar. Retract flaps after attaining best single-engine rate-of-climb speed (V_{yse}), and readjust pitch as required. Control bank attitude to maintain the desired heading. Support flight director indications throughout the maneuver by crosschecking "raw data" information displayed on supporting instruments.

NOTE

Due to possible precession error, the pitch steering bar may lower slightly during acceleration, causing the pitch attitude to appear higher than actual pitch attitude. To avoid lowering the nose prematurely, crosscheck the vertical velocity indicator and altimeter to insure proper climb performance. The erection system will automatically remove the error after the acceleration ceases.

8-56. INSTRUMENT CLIMB.

Instrument climb procedures are the same as those for visual climb. Enroute instrument climbs are normally performed at cruise climb airspeeds.

8-57. INSTRUMENT CRUISE.

There are no unusual flight characteristics during cruise in instrument meteorological conditions.

8-58. INSTRUMENT DESCENT.

When a descent at slower than recommended speed is desired, slow the aircraft to the desired speed before initiating the descent. Normal descent to approach altitude can be made using cruise airspeed. Normally, descent will be made with the aircraft in a cruise configuration, maintaining desired speed as required.

8-59. INSTRUMENT APPROACHES.

There are no unusual preparations or control techniques required for instrument approaches. The approaches are normally flown at an airspeed of (V_{ref}) +20 until transitioning to visual flight.

8-60. AUTOPILOT 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.

NOTE

The ILS localizer and glideslope warning flags indicate insufficient signal strength to the receiver. Certain electrical mechanical malfunctions between the receiver and indicators may result in erroneous localizer/glideslope information without a warning flag. It is recommended that ILS information be crosschecked with other flight instruments prior to and during final approach. Utilization of NAV TEST prior to the final approach fix may detect certain malfunctions not indicated by the warning flags.

Section IV. FLIGHT CHARACTERISTICS

8-61. STALLS.

A prestall warning in the form of very light buffeting can be felt when a stall is approached. An aural warning is provided by a warning horn. The warning horn starts sounding approximately five to ten knots above stall speed with the aircraft in any 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" shall mean that both engines and propellers of the aircraft are operating normally and power is set at approximately 50%. The term "power-off" shall mean 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 decrease airspeed by approximately one knot per second until 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 most stalls, and the first indication of approaching stall is generally a decrease in control effectiveness, accompanied by a "chirping" 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 prevent the tendency to roll. A slight pitching tendency will develop if the aircraft is held in the stall, resulting in the nose dropping sharply, 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; however, both are easily controlled after the initial entry. 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. With wing flaps down, there is little or no rolling tendency and stalling speed is much slower than with wing flaps up. The Stall Speed Chart (fig. 8-2) shows the indicated power-off stall speeds with aircraft in various configurations. Altitude loss during a full stall will be approximately 800 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.

8-62. SPINS.

Intentional spins are prohibited. If a spin is inadvertently entered use the following recovery procedure:

STALL SPEEDS — POWER IDLE

NOTES:
1. INCREASE INDICATED AIRSPEED VALUES BY 4 KIAS.
2. ALTITUDE LOSS EXPERIENCED WHILE CONDUCTING STALLS IN ACCORDANCE WITH FAR 23.201 WAS 650 FEET.
3. MAXIMUM NOSE-DOWN PITCH ATTITUDE AND ALTITUDE LOSS DURING RECOVERY FROM ONE-ENGINE-INOPERATIVE STALLS PER FAR 23.205 ARE APPROXIMATELY 8° AND 250 FEET RESPECTIVELY.
4. A NORMAL STALL RECOVERY TECHNIQUE MAY BE USED. THE BEST PROCEDURE IS A BRISK FORWARD WHEEL MOVEMENT TO A NOSE-DOWN ATTITUDE. LEVEL THE AIRPLANE AFTER AIRSPEED HAS INCREASED APPROXIMATELY 25 KNOTS ABOVE STALL.
5. LANDING GEAR POSITION HAS NO EFFECT ON STALL SPEED.

EXAMPLE:

WEIGHT . . . . .14,000 LBS
FLAPS. 100%
ANGLE OF BANK . . .30°

STALL SPEEDS. . . . .85 KCAS
81 KIAS

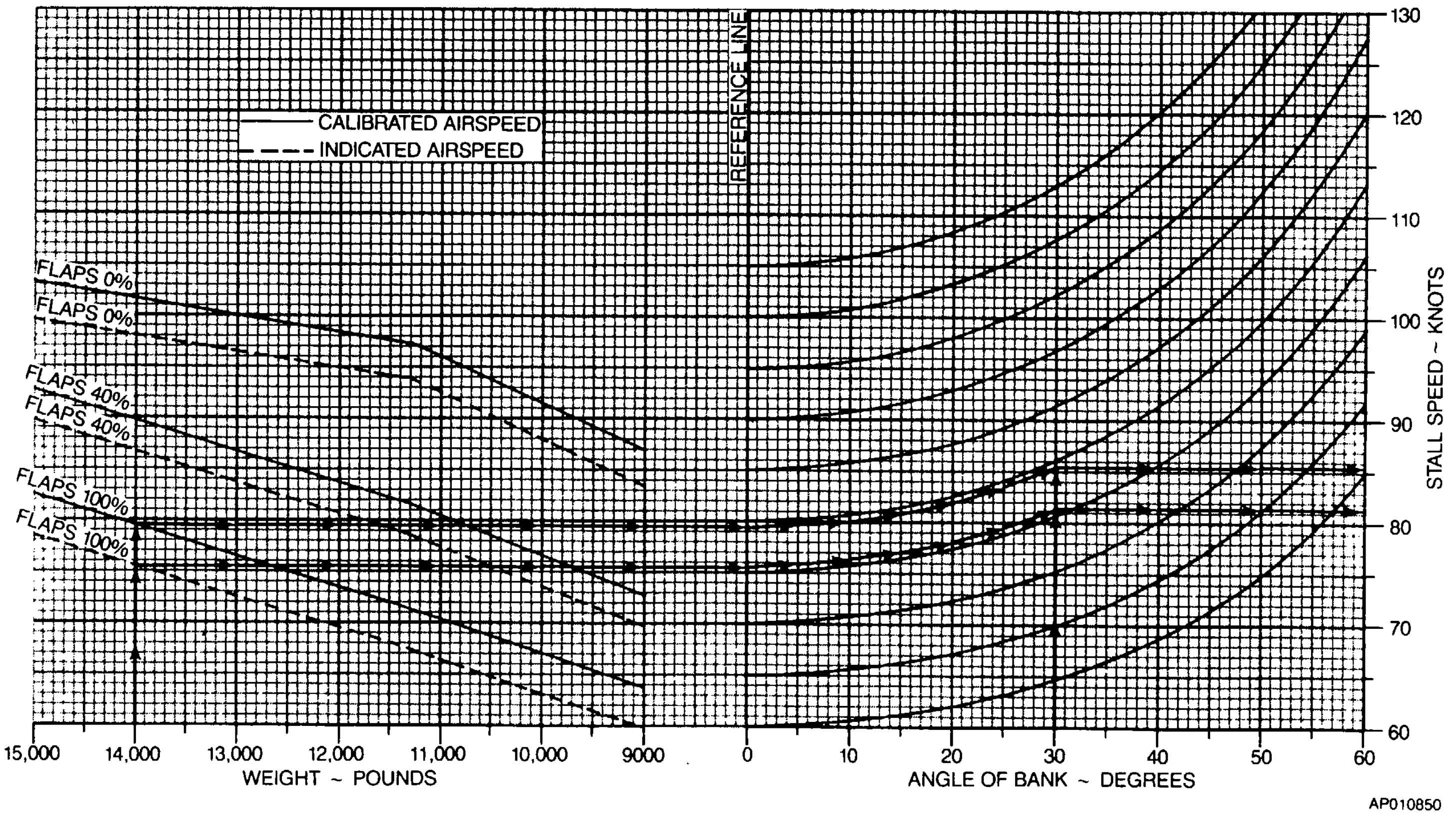

Figure 8-2. Stall Speed

NOTE

Spin demonstrations have not been conducted. The recovery technique is based on the best available information. The first three actions should be accomplished as nearly simultaneous as possible.

1. Power levers IDLE.
2. Apply full rudder opposite the direction of spin rotation.
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.

8-63. DIVING.

Maximum diving airspeed (red line) is 247 KIAS or 0.47 Mach. Flight characteristics are conventional throughout a dive maneuver; however, caution should be used if rough air is encountered after maximum allowable dive speed has been reached, since it is difficult to reduce speed in dive configuration. Dive recovery should be very gentle to avoid excessive aircraft stresses.

8-64. MANEUVERING FLIGHT.

Maneuvering speed (V_a, 184 KIAS), is the maximum speed that abrupt control movements can be applied without exceeding the design load factor of the aircraft. The data is based on 15,000 pounds.

8-65. 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 position. The minimum speed at which the aircraft can be fully trimmed is 92 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 from the large variation in power.

8-66. LEVEL FLIGHT CHARACTERISTICS.

All flight characteristics are conventional throughout the level flight speed range.

Section V. ADVERSE ENVIRONMENTAL CONDITIONS

8-67. 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.

8-68. COLD WEATHER OPERATIONS.

CAUTION

Operation of the surface de-ice system in ambient temperatures below -40°C can cause permanent damage to the de-ice 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 speeds 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. Assure that tires are not frozen to wheel chocks or to the ground. Use ground heaters, anti-ice solution, or brake de-ice, 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. To prevent exceeding torque limits when advancing CONDITION levers to HIGH IDLE during the starting procedure, place the power lever in BETA and the propeller lever in HIGH RPM before advancing the condition lever to HI IDLE.

c. Warm-Up and Ground Test. Warm-up procedures and ground test are the same as those outlined 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 de-ice system, insuring that the bleed air valves are OPEN and that the condition levers are in HI IDLE. An outside observer should visually check wheel rotation to insure brake assemblies have been deiced. The condition levers may be returned to LOW IDLE as soon as the brakes are free of ice.

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. If icing conditions are expected, activate all anti-ice systems before takeoff, allowing sufficient time for the equipment to become effective.

f. Takeoff. Takeoff procedures for cold weather operations are the same as for normal takeoff. Taking off with temperatures 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 de-ice on and with the ice vanes extended to preclude the possibility of ice build-up on engine air inlets. Monitor oil temperatures to insure operation within limits. Before flight into icing conditions, the pilot and copilot WSHLD ANTI-ICE switches should be set at NORMAL position.

g. During Flight.

(1) Brake de-ice. After takeoff from a runway covered with snow or slush, it may be advisable to leave brake de-ice ON to dislodge ice

accumulated from the spray of slush or water. Monitor BRAKE DE-ICE annunciator for automatic termination of system operation and then turn the switch OFF.

(2) Flight controls. During flight, trim tabs and controls should also be exercised periodically to prevent freezing.

(3) Anti-icing equipment. Insure that anti-icing systems are activated-before entering icing conditions. Do not activate the surface de-ice system until ice has accumulated one-half to one inch. The propeller de-ice 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.

NOTE

Do not operate deicer boots continuously. Continuous operation tends to balloon the ice over the boots. Allow at least 1/ 2 inch of ice to accumulate on the surface boots and 1/8 to 1/4 inch of ice to accumulate on the antenna boots, then activate the deicer boots to remove the ice. Repeat this procedure as required.

(4) Ice vanes. 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 de-ice system. After the engine air inlet screens are blocked, lowering the ice vanes will not rectify the condition. Ice vanes should be retracted at 15°C FAT and above to assure adequate engine oil cooling.

(5) Stall speeds. 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 inflight 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 degrees 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 the 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.

8-69. 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 qualities 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 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, overheating of brakes, and longer takeoff and landing rolls due to the higher density altitudes. 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. Preparation For Flight. Check the position of the aircraft in relation to other aircraft. Propeller sand blast can damage closely parked 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.

CAUTION

N_1 speeds of 70% or higher may be required to keep oil temperature within limits.

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 LO IDLE position. If overtemperature tendencies are encountered. the condition lever should be moved to the IDLE CUTOFF position periodically during acceleration of gas generator RPM (N_1). Be prepared to abort the start before temperature limitations are exceeded.

c. Warm-Up Ground Tests. Use normal procedures in Section II. To minimize the possibility of damage to the engines during dusty/sandy conditions, activate ICE VANES if the temperature is below 15° C.

d. Taxing. 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 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 tire 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.

8-70. 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 to avoid excessive loads on the aircraft' s structure.

Thunderstorms and areas of severe turbulence should be avoided. 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 of an altitude which provides adequate maneuvering margins as a loss or gain of several thousand feet of altitude may he expected. The recommended penetration speed in severe turbulence is 170 KIAS. Pitch attitude and constant 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.

8-71. 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 an 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 Icing. Typical 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. Taxing. 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 he 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 he iced by flight at a high angle of attack.

f. Cruise Flight.

(1) Prevention of Ice Formation. 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) Deicer Boots. Do not operate deicer boots continuously. Allow at least one-half 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 au 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.

8-71A. ICING (SEVERE).

a The following weather conditions may be conducive to severe in-flight icing:

(I) 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 5-30B.), 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.

(9 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

✯ 8-72. CREW BRIEFING.

The following guide should be used in accomplishing required passenger briefings. Items that do not pertain to a specific mission may be omitted.

a. *Crew introduction.*

b. *Equipment.*

1. Personal to include ID tags.
2. Professional (medical equipment, etc.).
3. Survival.

c. *Flight data.*

1. Route.
2. Altitude.
3. Time enroute.
4. Weather.

d. *Normal procedures.*

1. Entry and exit of aircraft.
2. Seating and seat position.
3. Seat belts.
4. Movement in aircraft.
5. Internal communications.
6. Security of equipment.
7. Smoking.
8. Oxygen.
9. Refueling.
10. Weapons and prohibited items.
11. Protective masks.
12. Toilet.

e. *Emergency procedures.*

1. Emergency exits.
2. Emergency equipment.
3. Emergency landing/ditching procedures.

✯ 8-73. 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 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.

a. *A TC clearance- Review.*

1. Routing.
2. Initial altitude.

b. *Departure procedure - Review.*

1. SID.
2. Noise abatement procedure.
3. VFR departure route.

c. *Copilot duties - Review.*

1. Adjust takeoff power.
2. Monitor engine instruments.
3. Power check at 65 knots.
4. Call out engine malfunctions.
5. Tune/ident all nav/com radios.
6. Make all radio calls.
7. Adjust transponder and radar as required.
8. Complete flight log during flight (note altitudes and headings).
9. Note departure time.

d. *PPC- Review.*

1. Takeoff power.

2. Altitude restrictions.
3. Missed approach.
   a. Point.
   b. Time.
   c. Intentions.
4. Decision height or MDA.
5. Lost communications.

d. Back up approach/frequencies.

e. Copilot duties - Review.

1. Nav/Com set-up.
2. Monitor altitude and airspeeds.
3. Monitor approach.
4. Call out visual/field in sight.

f. Landing performance data - Review.

1. Approach speed.
2. Runway required.
2. V_r
3. V_y (climb to 500' AGL).
4. V_{yse}

✯ 8-74. 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 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.

a. Weather/altimeter setting.

b. Airfield/facilities - Review.

1. Field elevation.
2. Runway length.
3. Runway condition.

c. Approach procedure- Review.

1. Approach plan/profile.

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 in the Operator's and Crewmember's Checklist, TM 55-1510-220-CL. Emergency operations of avionics equipment are covered when appropriate in Chapter 3, Avionics, and are repeated in this section only as 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. During an emergency, the checklist will be called for to verify the memory steps performed and to assist in completing any additional emergency procedures.

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. Reset MASTER CAUTION after each malfunction to allow systems to respond to subsequent malfunctions.

9-3. DEFINITION OF LANDING TERMS.

The term LANDING IMMEDIATELY is defined as executing a landing without delay. (The primary consideration is to assure the survival of occupants.) 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 to the nearest suitable airfield.

9-4. AFTER EMERGENCY ACTION.

After a malfunction has occurred, appropriate emergency actions have been taken, and the aircraft is on the ground, an entry shall be made in the remarks section of DA Form 2408-13 describing the malfunction.

9-5. EMERGENCY EXITS AND EQUIPMENT.

Emergency exits and equipment are shown in figure 9-1.

9-6. 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.

9-7. 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_{mc}) and above power-off stall speed. The capability of the aircraft to climb or maintain level flight depends on configuration, gross weight, altitude, and free air temperature. Performance and control will improve by feathering the propeller of the inoperative engine, retracting the landing gear and flaps, and establishing the appropriate single-engine best rate-of-climb speed (Vyse). Minimum control speed (V_{mc}) with flaps retracted is approximately 1 knot higher than with flaps at takeoff (40%) position.

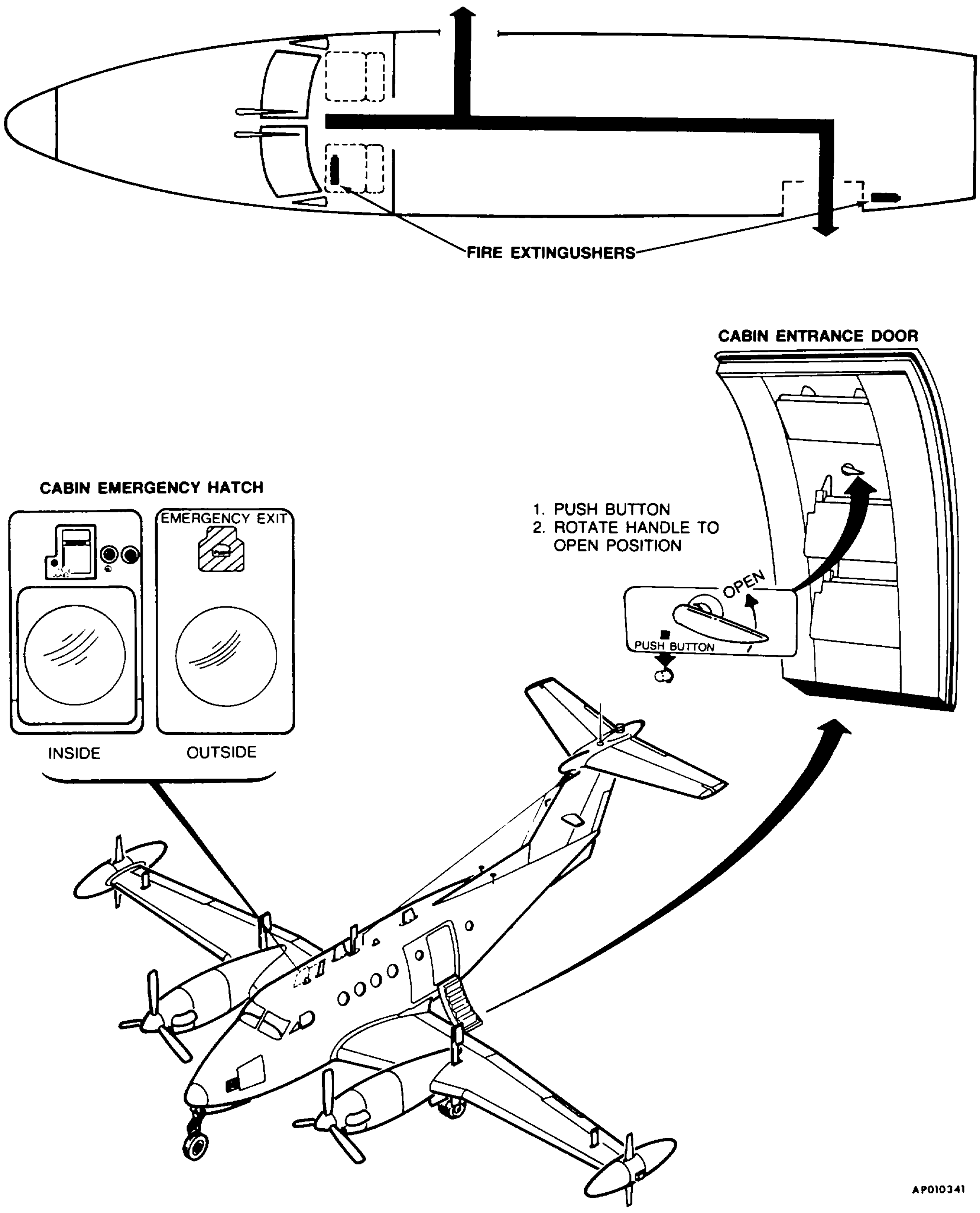

Figure 9-1. Emergency Exits and Equipment

b. Engine Malfunction During And After Takeoff. The action to be taken in the event of an engine malfunction during takeoff depends on whether or not liftoff speed (V_{lof}) has been attained. If an engine fails immediately after liftoff, many variables such as airspeed, runway remaining, aircraft weight, altitude at time of engine failure, and single-engine performance must be considered in deciding whether it is safer to land or continue flight.

c. Engine Malfunction Before Liftoff (Abort). If an engine fails and the aircraft has not accelerated to recommend liftoff speed (Vlof), retard power levers immediately to IDLE and stop the aircraft with brakes and reverse thrust. Perform the following:

1. Power levers - IDLE.
2. Braking - As required.

NOTE

If insufficient runway remains for stopping perform steps 3 thru (5.)

(3.) Condition levers - FUEL CUTOFF.

(4.) Fire pull handles - Pull.

(5.) Master switch - OFF.

d. Engine Malfunction After Liftoff. If an engine fails after becoming airborne, maintain single-engine best rate-of-climb speed (V_{yse}) or, if airspeed is below (V_{yse}), maintain whatever airspeed is attained between liftoff (V_{lof}) and (V_{yse}) until sufficient altitude is attained to trade altitude for airspeed and accelerate to (V_{yse}).

(1) Engine Malfunction after liftoff (abort), perform the following and land in a wingslevel attitude:

1. Power levers - Reduce.
2. Gear - DN.
3. Complete normal landing.

NOTE

If able to land on remaining runway, check gear down and use brakes and 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.

(2) Engine malfunction after liftoff (flight continued) perform the following:

1. Power - Maximum controllable.

NOTE

If airspeed is below V_{yse}, maintain whatever airspeed has been attained (between (V_{lof}) and V_{yse}) until sufficient altitude can be obtained to trade off altitude for airspeed to assist in acceleration to V_{yse}.

2. Gear - UP.
3. Flaps - UP.
4. Landing lights - OFF.
5. Brake deice - OFF.
6. Engine cleanup - Perform.

NOTE

Holding three to five degrees bank (one-half ball width) towards the operating engine will assist in maintaining directional control and improve aircraft performance.

e. Engine Malfunction During Flight. If an engine malfunctions during cruise flight, maintain control of the aircraft while maintaining heading or turn as required. Add power as required to keep airspeed from decaying excessively and to maintain altitude. Identify the failed engine by feel (if holding rudder pressure to keep the aircraft from yawing; the rudder being pressed indicates the good engine) and engine instruments, then confirm identification by retarding the power lever of the suspected failed engine. Refer to Chapter 7 for single-engine cruise information. If one engine malfunctions during flight, perform the following:

1. Autopilot/yaw damp - DISENGAGE.
2. Power - As required.
3. Dead engine - Identified.
4. Power lever (dead engine) - IDLE.

5. Propeller lever (dead engine) - FEATHER.
6. Propeller synchronization switch - OFF
7. Gear- As required.
8. Flaps- As required.
9. Power- Set for single engine cruise.

(10.) Engine cleanup - Perform.

NOTE

At V_{yse} speeds, holding three to five degrees bank (one-half ball width) towards the operating engine will assist in maintaining directional control and improve aircraft performance.

f. 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.

g. 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 can not be accomplished with a feathered propeller, and the propeller will not unfeather without the engine operating. 140 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 - 140 KIAS.
2. Power lever - IDLE.
3. Propeller lever - Do not FEATHER.
4. Conduct engine restart procedure.

h. 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.

i. Engine Cleanup. The cleanup procedure to be used after engine malfunction, shutdown, or an unsuccessful restart is as follows:

(1.) Autoignition switch - OFF.

(2.) Autofeather switch - OFF.

(3.) Generator switch - OFF.

4. Propeller synchronization switch - OFF.

j. Engine Restart During Flight Using Starter. Engine restarts may be attempted at all altitudes. If a restart is attempted, perform the following:

(1.) Cabin temperature mode selector switch - OFF.

(2.) Electrical load - Reduce to minimum.

3. Fire pull handle - In.
4. Power lever - IDLE.
5. Propeller lever - FEATHER.
6. Condition lever - FUEL CUTOFF.
7. TGT (operative engine) - 700° C or less.

(8.) Ignition and engine start switch - ON.

9. Condition lever- LOW IDLE.

NOTE

If a rise in TGT does not occur within 10 seconds after moving the condition lever to LOW IDLE, abort the start.

10. TGT - Monitor (1,000°C for 5 seconds maximum).
11. Oil pressure - Check.

(12.) Ignition and engine start switch - OFF at 50% N_1.

(13.) Generator switch - RESET, then ON.

(14.) Engine cleanup Perform if engine restart unsuccessful.

(15.) Cabin temperature mode selector switch - As required.

(16.) Electrical equipment - As required.

(17.) Autoignition switch - ARM.

18. Propellers - Synchronize.

19. Power - As required.

k. Engine Restart During Flight (Not Using Starter). A restart without starter assist may be accomplished provided airspeed is at or above 140 KIAS, altitude is below 20,000 feet, and the propeller is not feathered. If altitude permits, diving the aircraft will increase N_1 and assist in restart. N_1 required for airstart should be at or above 9%. If a start is attempted, perform following:

(1.) Cabin temperature mode selector switch - OFF.

(2.) Electrical load - Reduce to minimum.

(3.) Generator switch (affected engine) - OFF.

4. Fire pull handle - Check in.

5. Power lever - IDLE.

6. Propeller lever - HIGH RPM.

7. Condition lever - FUEL CUTOFF.

8. Airspeed - 140 KIAS minimum.

9. Altitude below 20,000 feet - Check.

(10.) Engine autoignition switch - ARM.

11. Condition lever - LOW IDLE.

NOTE

If N_1 is below 12%, starting temperatures tend to be higher than normal. To preclude overtemperature (1000°C or above) during engine acceleraton to idle speed, periodically move the condition lever into FUEL CUTOFF position as necessary.

NOTE

If a rise in TGT does not occur within 10 seconds after moving the condition lever to LOW IDLE, abort the start.

12. TGT - Monitor (1,000°C for 5 seconds maximum).

13. Oil pressure - Check.

(14.) Generator switch - RESET, then ON.

(15.) Engine Cleanup - Perform if engine restart unsuccessful.

(16.) Cabin temperature mode selector switch - As required.

(17.) Electrical equipment - As required.

(18.) Autoignition switch - ARM.

19. Propellers - Synchronized.

20. Power - As required.

l. Maximum Glide. In the event of failure of both engines, maximum gliding distance can be 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.

m. Landing With Two Engines Inoperative. Maintain best glide speed (figure 9-2). If sufficient altitude remains after reaching a suitable landing area, a circular pattern will provide best observation of surface conditions, wind velocity, and direction. When the condition of the terrain has been noted and the landing area selected, set up a rectangular pattern. Extending APPROACH flaps and landing gear early in the pattern will give an indication of glide performance sooner and will allow more time to make adjustments for the added drag. Fly the base leg as necessary to control point of touchdown. Plan to overshoot rather than undershoot, then use flaps as necessary to arrive at the selected landing point. Keep in mind that, with both propellers feathered the normal tendency is to overshoot due to less drag. In event a positive gear-down indication cannot be determined, prepare for a gear-up landing; also, unless the surface of the landing area is hard and smooth, the landing should be made with the landing gear up. If landing on rough terrain, land in a slightly tail-low attitude to keep nacelles from possibly digging in. If possible, land with flaps fully extended.

9-8. LOW OIL PRESSURE.

In the event of a low oil pressure indication, perform the procedures below as applicable:

MAXIMUM GLIDE DISTANCE
STANDARD DAY (ISA)

ASSOCIATED CONDITIONS:

POWER . . . . BOTH ENGINES INOPERATIVE
PROPELLERS . . . . . FEATHERED
LANDING GEAR . . . UP
FLAPS 0%
AIRSPEED . . . . IAS AS TABULATED
WIND . . . . ZERO

EXAMPLE:

HEIGHT ABOVE TERRAIN . . . . . 10,000 FT
WEIGHT . . . . 11,000 LBS

MAXIMUM GLIDE DISTANCE . . . 20 NM
GLIDE SPEED . . . . 107 KTS

WEIGHT ~ LBS	BEST GLIDE SPEED ~ KNOTS
14,200	122
13,000	116
12,000	112
11,000	107

NOTE: REDUCE MAXIMUM GLIDE DISTANCE VALUES BY 3%.

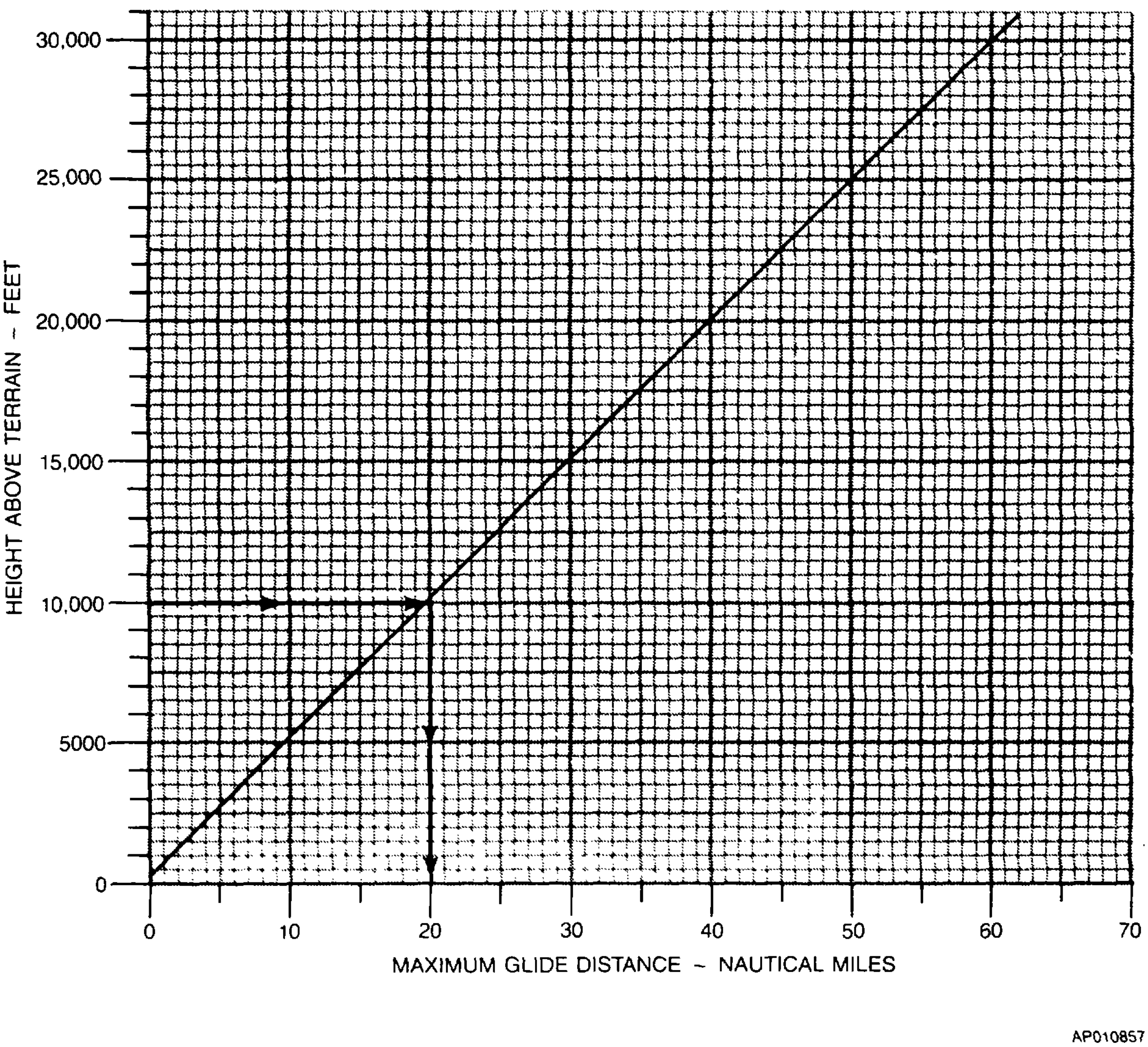

Figure 9-2. Maximum Glide Distance

1. Oil pressure below 105 PSI below 21,000 feet or 85 PSI 21,000 feet and above, torque 49% maximum.
2. Oil pressure below 60 PSI Perform engine shutdown, or land as soon as practicable using minimum power to insure safe arrival.

9-9. CHIP DETECTOR WARNING LIGHT ILLUMINATED.

If a L CHIP DETR or a R CHIP DETR warning light illuminates, and safe single-engine flight can be maintained; perform engine shutdown.

9-10. DUCT OVERTEMP CAUTION ANNUNCIATOR LIGHT ILLUMINATED.

If a DUCT OVERTEMP caution annunciator light is illuminated, insure that the cabin floor outlets are open and unobstructed, then perform the following steps in sequence until the light is extinguished. After completion of steps 1 thru 4, if light does not extinguish, 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 light extinguishes.

(1.) Cabin air control - In.

(2.) Cabin temperature mode selector switch - AUTO.

(3.) Cabin temperature control rheostat - Full decrease.

(4.) Vent blower switch - HI.

(5.) Cabin temperature mode selector switch - MAN COOL.

(6.) Manual temperature switch - DECREASE (hold).

(7.) Left bleed air valve switch - ENVIRO OFF.

(8.) If the light is still illuminated after 30 seconds: Left bleed air valve switch - OPEN.

(9.) Right bleed air valve switch - ENVIRO - OFF.

(10.) If the light is still illuminated after 30 seconds: Right bleed air valve switch - OPEN.

NOTE

If the overtemperature light has not extinguished after completing the above procedure, the warning system has malfunctioned.

9-11. ICE VANE FAILURE.

Ice vane failure is indicated by #1 VANE FAIL or #2 VANE FAIL caution annunciator light illumination. If an ice vane fails to operate electrically, perform the following:

CAUTION

After the ice vanes have been manually extended, they may be mechanically retracted. No electrical extension or retraction shall be attempted as damage to the electric actuator may result. Linkage in the nacelle area must be reset prior to operation of the electric system. Do not reset ice vane control circuit breaker.

CAUTION

Do not retract ice vanes electrically after manual extension.

1. Airspeed - 160 KIAS or below.

(2.) Ice vane control circuit breaker - Pull.

3. Ice vane - Operate manually.
4. Airspeed - Resume normal airspeed.

9-12. ENGINE BLEED AIR SYSTEM MALFUNCTION.

a. Bleed Air Failure Light Illuminated. Steady illumination of the warning light in flight indicates a possible ruptured bleed air line aft of the engine firewall. The light will remain illuminated for the remainder of flight. Perform the following:

NOTE

L BL AIR FAIL or R BL AIR FAIL lights may momentarily illuminate during simultaneous surface de-ice and brake de-ice operation at low N_1 speeds.

(1.) Brake de-ice - OFF.

(2.) TGT and torque - Monitor (note readings).

(3.) Bleed air valve switch - PNEU & ENVIRO OFF.

NOTE

Brake de-ice on the affected side, and rudder boost, will not be available with bleed air valve switch in PNEU & ENVIRO OFF.

(4.) Cabin pressurization - Check.

b. Excessive Differential Pressure. If cabin differential pressure exceeds 6.1 PSI, perform the following:

(1.) Cabin altitude and rate-of-climb controller - Select higher setting.

(2.) If condition persists: LEFT BLEED AIR VALVE switch - ENVIRO OFF (light illuminated).

(3.) If condition still persists: RIGHT BLEED AIR VALVE switch - ENVIRO OFF (light illuminated).

4. If condition still persists - Descend immediately.

(5.) If unable to descend: - CABIN PRESS DUMP switch - CABIN PRESS DUMP.

(6.) Bleed air valve switches - OPEN, if cabin heating is required.

9-13. LOSS OF PRESSURIZATION (ABOVE 10,000 FEET).

If cabin pressurization is lost when operating above 10,000 feet or the ALT WARN warning annunciator light illuminates, perform the following:

1. Crew oxygen masks 100% and on.

(2.) Passenger oxygen ON and check. The copilot should confirm that all passengers have oxygen masks on and are receiving supplemental oxygen if required.

9-14. CABIN DOOR CAUTION LIGHT ILLUMINATED.

Remain clear of cabin door and perform the following:

(1.) Bleed air valve switches - ENVIRO OFF.

2. Descend below 14,000 feet as soon as practicable.

3. Oxygen - As required.

9-15. SINGLE-ENGINE DESCENT/ARRIVAL.

NOTE

Approximately 85% N_1 is required to maintain pressurization schedule. Perform the following procedure prior to the final descent for landing.

(1.) Cabin controller - Set.

(2.) Ice and rain switches - As required.

3. Altimeters - Set.

4. Recognition lights - ON.

★ 5. Arrival briefing - Complete.

9-16. SINGLE-ENGINE BEFORE LANDING.

1. Propeller lever - As required.

NOTE

During approach, propeller should be set at 1900 RPM to prevent glideslope interference (ILS approach), provide better power response during approach, and to minimize attitude change when advancing propeller levers for landing.

2. Flaps - APPROACH.

3. Gear - DN.

4. Landing lights - As required.

(5.) Yaw damp - OFF.

(6.) Brake deice - OFF.

9-17. SINGLE-ENGINE LANDING CHECK.

Perform the following procedure during final approach to runway.

1. Autopilot/yaw damp - Disengaged.
2. Gear lights - Check (three green).
3. Propeller lever (operative engine) - HIGH RPM.

NOTE

To insure constant reversing characteristics, the propeller control must be in the HIGH RPM position.

9-18. SINGLE-ENGINE GO-AROUND.

The decision to go around must be made as early as possible. Elevator forces at the start of a go-around are very high and a considerable amount of rudder control will also be required at low airspeeds. Retrim as required. If rudder application is insufficient, or applied too slowly, directional control cannot be maintained. If control difficulties are experienced, reduce power on the operating engine immediately. Insure that the aircraft does not touch the ground before retracting the landing gear. Retract the flaps only as safe airspeed permits (TAKEOFF until (V_{ref}) then UP). Perform single-engine go-around as follows:

WARNING

Once flaps are fully extended, a single engine go-around may not be possible when close to the ground under conditions of high gross weights and/or high density altitude.

1. <u>Power - Maximum controllable.</u>
2. <u>Gear- UP.</u>
3. <u>Flaps - As required.</u>
4. Landing lights - OFF.
5. Power - As required.

(6.) Yaw damp - As required.

9-19. PROPELLER FAILURE (OVER 2080 RPM).

If an overspeed condition occurs that cannot be controlled with the propeller lever, or by reducing power, perform the following:

1. <u>Power lever (affected engine) - IDLE.</u>
2. <u>Propeller lever - FEATHER.</u>
3. Condition lever - As required.

(4.) Engine cleanup - As required.

9-20. FIRE.

The safety of aircraft occupants is the primary consideration when a fire occurs; therefore, it is imperative that every effort be made by the flight crew to put the fire out. On the ground it is essential that the engines be shut down, crew evacuated, and fire fighting begun immediately. If the aircraft is airborne when a fire occurs, the most important single action that can be taken by the pilot is to land safely as soon as possible.

a. Engine Fire. The following procedures shall be performed in case 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. <u>Propeller levers - FEATHER.</u>
2. <u>Condition levers - FUEL CUTOFF.</u>
3. <u>Fire pull handle - Pull.</u>

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. <u>Push to extinguish switch Push.</u>
5. <u>Master switch OFF.</u>

(2) Engine fire in flight (fire pull handle light illuminated). If an engine fire is suspected in flight, perform the following:

1. <u>Power lever - IDLE.</u>

2. If fire pull handle light out is extinguished: Advance power.

3. If fire pull handle light is still illuminated: Engine fire in flight procedures (identified) Perform.

NOTE

Flight into the sun at high aircraft pitch attitude may actuate the fire warning system. Lowering the nose and/or changing headings will confirm a warning system failure caused by sun rays.

(3) Engine fire in flight (identified). If an engine fire is confirmed in flight, perform the following: i CAUTION Due to the possibilities of fire warning system 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:

WARNING

The extinguisher agent (Bromochlorodifluoromethane) in the fire extinguisher can produce toxic effects if inhaled.

1. Fight the fire.
2. Land as soon as possible.

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 - 100%.

(2.) Master switch - OFF (visual conditions only).

3. All nonessential electrical equipment - OFF.

NOTE

With loss of DC electrical power, the aircraft will depressurize. All electrical instruments, with the exception of the propeller RPM, N_1 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 - 100% and ON.

(2.) Bleed air valve switches - ENVIRO OFF.

(3.) 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 oil pressure Monitor.

9-21. FUEL SYSTEM.

a. Fuel Pressure Warning Annunciator Light Illuminated. Illumination of the #1 FUEL PRESS or #2 FUEL PRESS warning light usually indicates failure of the respective engine-driven boost pump. Perform the following:

(1.) Standby pump switch ON.

(2.) Fuel pressure warning annunciator light Check extinguished.

(3.) If fuel pressure warning light is still illuminated: Record unboosted time.

b. No Fuel Transfer Caution Light Illuminated. Illumination of a #1 NO FUEL XFR or #2 NO FUEL XFR annunciator light with fuel remaining in the respective auxiliary fuel tank indicates a failure of that automatic fuel transfer system. Proceed as follows:

(1.) AUX TRANSFER switch (affected side) - OVERRIDE.

(2.) Auxiliary fuel quantity - Monitor.

(3.) AUX 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. Fuel crossfeed is normally used only during single-engine operation. The fuel from the dead engine side may be used to supply the live engine by routing the fuel through the crossfeed system. During extended flights, this method of fuel usage will provide a more balanced lateral load condition in the aircraft. For fuel crossfeed, use the following procedure:

(1.) AUX 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 advisory annunciator light - Check illuminated.

NOTE

With the FIRE PULL handle pulled, the respective #1 FUEL PRESS or #2 FUEL PRESS light will remain illuminated on the side supplying fuel.

(5.) Fuel pressure light extinguished Check.

(6.) Fuel quantity - Monitor.

WARNING

Failure of the fuel tank venting system 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 20 minutes of usable fuel indicated in the main tan 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 114 pounds, regardless of the total fuel quantity indicated. Continued flight may result in engine flameout due to fuel starvation.

e. Illumination of the #1 NACLOWor#2 NAC LOW caution annunciator light. Illumination of the #1 NAC LOW or #2 NAC LOW caution annunciator light indicates that the affected tank has 20 minutes remaining at sea level, normal cruise power consumption rate. Proceed as follows:

1. Twenty minutes fuel remaining Confirm.
2. Land as soon as possible.

9-22. ELECTRICAL SYSTEM EMERGENCIES.

a. DC Generator Caution Annunciator Light Illuminated. Illumination of a #1 DC GEN or #2 DC GEN caution annunciator light indicates failure of a generator or one of its associated circuits (generator control unit). If one generator system becomes inoperative, all nonessential electrical equipment should be used judiciously to avoid overloading the remaining generator. The use of accessories which create a very high drain should be avoided. If both generators are shut off due to either generator system failure or engine failure, all nonessential equipment should be turned off to preserve battery power for extending the landing gear and wing flaps. When a DC GEN light illuminates, perform the following:

(1.) Generator switch - OFF, RESET, then ON.

(2.) Generator switch (no reset) - OFF.

(3.) Mission control switch - OVERRIDE.

(4.) Operating loadmeter - 100%h maximum.

b. Both DC Generator Warning Annunciator Lights Illuminated.

(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%, - BATT switch ON.

d. Inverter Caution Annunciator Light Illuminated. Illumination of the #1 INVERTER or #2 INVERTER caution annunciator light indicates failure of the affected inverter. When either inverter fails, the total aircraft load is automatically switched. to the remaining inverter. When a #1 INVERTER or #2 INVERTER caution annunciator light illuminates, perform the following:

(1.) Affected #1 INVERTER or #2 INVERTER switch OFF.

e. INST AC Warning Annunciator Light Illuminated. Illumination of the INST AC warning light indicates that 26 VAC power is not available. All items connected to the 26 VAC bus will be inoperative (refer to AC wiring schematic diagram in chapter 2 for equipment effected). Under these conditions, power must be controlled by indications of the N1 and TGT gages. Perform the following:

1. N_1 and TGT indications - Check.
2. Other engine instruments - Monitor.

f. Circuit Breaker Tripped. If the circuit breaker is for a nonessential item, do not reset in flight. If the circuit breaker is for an essential item, the circuit breaker may be reset once. If a bus feeder circuit breaker (on the overhead circuit breaker panel) trips, a short is indicated. Do not reset in flight. If a circuit breaker trips, perform as follows:

(1.) BUS FEEDER breaker tripped - Do not reset.

(2.) Nonessential circuit - Do not reset.

(3.) Essential circuit - Reset once.

g. Battery Charge Caution Annunciator Light Illuminated. If the BATTERY CHARGE caution annunciator light illuminates during normal cruise flight, perform the following:

(1.) Loadmeter - Check; note indication.

(2.) Battery switch - OFF.

(3.) Loadmeter - Check. If loadmeter indicates less that 2.5%, change (one needle width), turn battery switch ON and monitor for increasing load. If load continues to increase, turn battery switch OFF.

NOTE

Circuit breakers should not be reset more than once until the cause of the circuit malfunction has been determined and corrected. Do not reset dual fed bus feeder circuit breakers.

(4) Battery switch (landing gear/flap extension only) ON.

9-23. EMERGENCY DESCENT.

Emergency descent is a maximum effort in which damage to the aircraft must be considered secondary to getting the aircraft down. 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:

NOTE

Windshield defogging may be required.

1. Power lever IDLE.
2. Propeller lever HIGH RPM.
3. Flaps APPROACH.
4. Gear - DN.
5. Airspeed 184 KIAS maximum.

9-24. 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. Should one or more of the three green landing gear indicator lights fail to indicate a safe condition, the following steps should be taken before proceeding to extend the gear manually.

1. Gear - DN.
2. Gear lights Check (three green).
(3) Landing gear relay and indicator circuit breaker Check In.

NOTE

If gear continues to indicate unsafe, attempt to verify position of the landing gear visually.

b. Landing Gear Emergency Extension.

CAUTION

Continued pumping of the handle after GEAR DOWN position indicator lights (3) are illuminated could damage the drive mechanism, and prevent subsequent gear retraction.

CAUTION

After an emergency landing gear extension has been made, do not stow the gear ratchet handle or move any landing gear controls or reset any switches or circuit breakers until the cause of the malfunction has been corrected.

1. Airspeed 130 KIAS.
(2) LANDING GEAR RELAY circuit breaker Out.
3. Gear - DN.
4. Landing gear alternate engage handle Lift and turn clockwise to the stop.
5. Alternate landing gear extension handle Pump.
6. Gear lights Check (three green).

c. Gear-up Landing (All Gear Up or Unlocked). Due to decreased drag with the gear up, the tendency will be to overshoot the approach. The center-of-gravity with the gear retracted is aft of the main wheels. This condition will allow the aircraft to be landed with the gear retracted and should result in a minimum amount of structural damage to the aircraft, providing the wings are kept level. It is recommended that the fuel load be reduced and the landing made with flaps fully extended on a hard surface runway. Landing on soft ground or dirt is not recommended as sod has a tendency to roll up into chunks, damaging the underside of the aircraft's structure. When fuel load has been reduced, prepare for a gear-up landing as follows:

(1) Crew emergency briefing Complete.
(2) Loose equipment Stowed.
(3) Bleed air valve switches ENVIRO OFF.
(4) Cabin pressure dump switch CABIN PRESS DUMP.
(5) Cabin emergency hatch Remove and stow.
6. Seat belts and harnesses Secured.
7. Landing gear alternate engage handle Disengaged.
8. Alternate landing gear extension handle Stowed.
(9) Gear relay circuit breaker In.
10. Gear - UP.
11. Nonessential electrical equipment OFF.
12. Flaps As required (DOWN for landing).

NOTE

Fly a normal approach to touchdown. After landing, accomplish the following:

13. Power levers (runway assured) - IDLE.
(14) Condition levers - FUEL CUTOFF.
(15) Fire pull handles - Pull.
(16) Master switch - OFF.

d. Landing With Nose Gear Unsafe. If the landing gear control switch handle warning light is illuminated and the nose GEAR DOWN indicator light shows an unsafe condition, the nose gear is probably not locked down, and the gear position should be checked visually by another aircraft, if possible. If all attempts to lock the nose gear fail, a landing should be made with the main gear down and locked. Hold the nose off the runway as long as possible and do not use brakes. Use the following procedures:

(1) Crew emergency briefing Complete.
(2) Loose equipment Stowed.
(3) Bleed air valve switches ENVIRO OFF.
(4) Cabin pressure dump switch CABIN PRESS DUMP.
(5) Cabin emergency hatch Remove and stow.
6. Seat belts and harnesses Secured.
(7) Nonessential electrical equipment OFF.

NOTE

Fly a normal approach to touchdown. After landing, accomplish the following:

8. Power levers (runway assured) - IDLE.
(9) Condition levers - FUEL CUTOFF.
(10) Fire pull handle - Pull.
(11) Master switch - OFF.

e. Landing With One Main Gear Unsafe. If one main landing gear fails to extend, retract the other gear and make a gear-up landing. If all efforts to retract the extended gear fail, land the aircraft on a hard runway surface, touching down on the same edge of the runway as the extended gear. Roll on the down and locked gear, holding the opposite wing up and the nose gear straight as long as possible. If the gear has extended, but is unsafe, apply brakes lightly on the unsafe side to assist in locking the gear. If the gear has not extended or does not lock, allow the wing to lower slowly to the runway. Use the following procedures:

(1) Crew emergency briefing Complete.
(2) Loose equipment Stowed.
(3) Bleed air valve switches ENVIRO OFF.
(4) Cabin pressure dump switch CABIN PRESS DUMP.
(5) Cabin emergency hatch Remove and stow.
6. Seat belts and harnesses Secured.
(7) Nonessential electrical equipment OFF.

8. Touchdown On safe main gear first.

NOTE

Fly a normal approach to touchdown. After landing, accomplish the following:

9. Power levers (runway assured) IDLE.
(10) Condition levers FUEL CUTOFF.
(11) Fire pull handle Pull.
(12) Master switch OFF.

f. Landing With Flat Tire(s). If aware that a main gear tire(s) is flat, a landing close to the edge of the runway opposite the flat tire will help avoid veering off the runway. If the nose wheel tire is flat, use minimum braking.

9-25. LANDING WITH INOPERATIVE WING FLAPS (UP).

The aircraft does not exhibit any unusual characteristics when landing with the wing flaps up. The approach angle will be shallow and the touchdown speed will be higher resulting in a longer landing roll.

9-26. CRACKED WINDSHIELD.

a. External Crack. If an external windshield crack is noted, no action is required in flight.

NOTE

Heating elements may be inoperative in areas of crack.

b. Internal Crack. If an internal crack occurs, perform the following:

1. Descend to below 25,000 feet.

(2) Cabin Pressure Reset pressure differential to 4 PSI or less within 10 minutes.

9-27. CRACKED CABIN WINDOW.

If a crack in a single ply of the external cabin window, unpressurized flight may be continued. Proceed as follows.

1. Oxygen As required.
2. Cabin pressurization Depressurize.
3. Descend As required.

NOTE

If both plys of the external cabin window have developed cracks, the aircraft shall not be flown, once landed, without proper ferry flight authorization.

9-28. DELETE

9-29. DITCHING.

If a decision to ditch is made, immediately alert all crewmembers to prepare for ditching. Plan the approach into the wind if the wind is high and the seas are heavy. If the swells are heavy but the wind is light, land parallel to the swells. Set up a minimum rate descent (power on or off, as the situation dictates, airspeed 110-120 KIAS). Do not try to flare as in a normal landing, as it is very difficult to judge altitude over water, particularly in a slick sea. Leveling off too high may cause a nose low "drop in," while having the tail too low on impact may result in the aircraft pitching forward and "digging in." Expect more than one impact shock and several skips before the final hard shock. There may be nothing but spray visible for several seconds while the aircraft is decelerating. To prevent cartwheeling, it is important that the wings be level when the aircraft hits the water. After the aircraft is at rest, supervise evacuation of passengers and exit the aircraft as quickly as possible. In a planned ditching, the life raft and first-aid kits should be secured close to the cabin emergency hatch for easy access when evacuating; however, do not remove the raft from its carrying case inside the aircraft. After exiting the aircraft, keep the raft away from any damaged surfaces which might tear or puncture the fabric. The length of time that the aircraft will float depends on the fuel level and the extent of aircraft damage caused by the ditching. Refer to figure 9-3 for body positions during ditching. Figure 9-4 shows wind swell information. Perform the following procedures:

Table 9-1. Ditching

PLANNED DITCHING	IMMEDIATE DITCHING
PILOT	**PILOT**
A. ALERT OCCUPANTS	A. WARN OCCUPANTS
B. ORDER TO PREPARE SURVIVAL GEAR FOR AERIAL DROP	B. TRANSMIT DISTRESS MESSAGE
C. TRANSMIT DISTRESS MESSAGE	C. LIFE VEST - CHECK (DO NOT INFLATE)
D. LIFE VEST - CHECK (DO NOT INFLATE)	D. APPROACH - NORMAL
E. DISCHARGE MARKER	E. NOTIFY OCCUPANTS TO BRACE FOR DITCHING
F. LAND AND DITCH AIRCRAFT	F. LAND AND DITCH AIRCRAFT
G. ABANDON AIRCRAFT	G. ABANDON AIRCRAFT AFTER COPILOT THROUGH CABIN EMERGENCY HATCH
COPILOT	**COPILOT**
A. REMOVE CABIN EMERGENCY HATCH	A. REMOVE CABIN EMERGENCY HATCH
B. LIFE VEST - CHECK (DO NOT INFLATE)	B. LIFE VEST - CHECK (DO NOT INFLATE)
C. ABANDON AIRCRAFT (TAKE LIFE RAFT AND FIRST AID KIT)	C. ABANDON AIRCRAFT (TAKE LIFE RAFT AND FIRST AID KIT)
PASSENGERS	**PASSENGERS**
A. SEAT BELTS - FASTEN	A. SEAT BELTS - FASTEN
B. LIFE VEST - CHECK (DO NOT INFLATE)	B. LIFE VEST - CHECK (DO NOT INFLATE)
C. ON PILOT'S SIGNAL - BRACE FOR DITCHING	C. ON PILOT'S SIGNAL - BRACE FOR DITCHING
D. ABANDON AIRCRAFT THROUGH CABIN DOOR (TAKE LIFE RAFT AND FIRST AID KIT)	D. ABANDON AIRCRAFT THROUGH CABIN DOOR (TAKE LIFE RAFT AND FIRST AID KIT)

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.

(1) Radio calls/transponder - As required.
(2) Crew emergency briefing - As required.
(3) Bleed air valve switches - ENVIRO OFF.

(4) Cabin pressure dump switch CABIN PRESS DUMP.
5. Cabin emergency hatch Remove and stow.
6. Seat belts and harnesses Secured.
7. Gear - UP.
8. Flaps DOWN.
(9) Nonessential electrical equipment OFF.
10. Approach Normal, power on.
(11) Emergency lights As required.

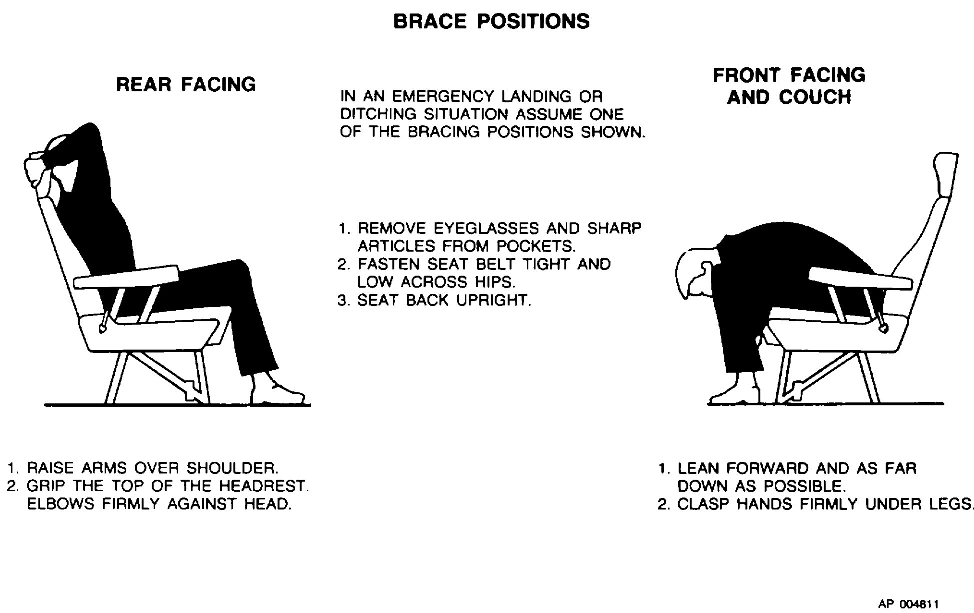

Figure 9-3. Emergency Body Positions

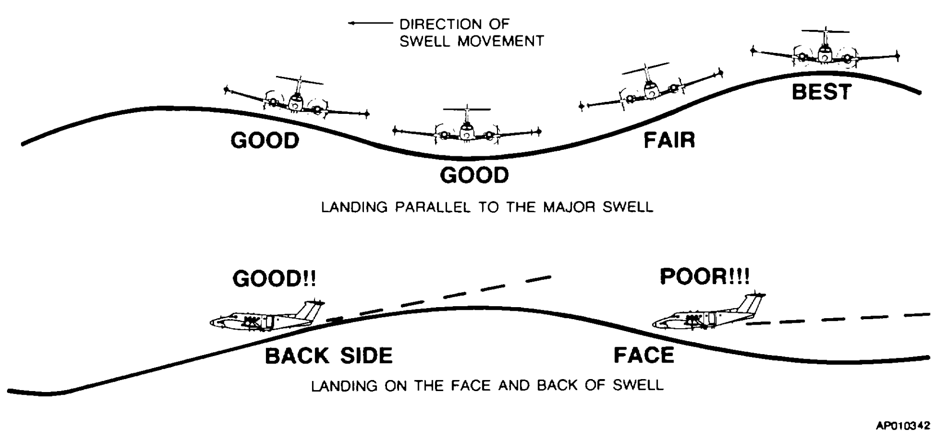

Figure 9-4. Wind Swell Ditch Heading Evaluation

9-30. 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) Moving the autopilot engage-disengage switch (autopilot mode selector control panel) to the DIS position.

(3) Pressing the go-around switch (left power lever), (yaw damper will remain on).

(4) Pulling the AP PWR and AFCS DIRECT circuit breakers (overhead control panel).

(5) Setting AVIONICS MASTER PWR 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) Rudder boost - OFF.

NOTE

The rudder boost system may not operate when the brake deice system is in use. Availability of the rudder boost system will be restored to normal when the BRAKE DEICE switch is turned off.

IF CONDITION PERSISTS:

(2) Bleed air valve switches - PNEU & ENVIRO OFF.
3. Rudder trim - Adjust.

c. Unscheduled Electric Elevator Trim. In the event of unscheduled electric elevator trim, perform the following:

1. Elevator trim switch - OFF.
2. Elevator trim circuit breaker - Out.

9-31. 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) Transponder- 7700.
5. Flaps - DOWN.
6. Airspeed- 100 KIAS.
7. Trim - As required.
8. Autopilot - Engage.
(9) Cabin pressure switch - DUMP.
10. Parachute - Attach to harness.
11. Cabin door- Open.
12. Abandon the aircraft.

APPENDIX A

REFERENCES

Reference information for the subject material contained in this manual can be found in the following publications:

AR 70-50	Designating and Naming Defense Equipment, Rockets, and Guided Missiles
AR 95-1	Army Aviation - General Provisions and Flight Regulations
AR 95-16	Weight and Balance - Army Aircraft
AR 380-40	Safeguarding COMSEC Information
AR 385-40	Accident Reporting and Records
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 55-9150-200-24	Engine and Transmission Oils, Fuels, and Additives for Army Aircraft
TB AVN 23-13	Anti-icing, Deicing and Defrosting Procedures for Parked Aircraft
TB MED 501	Noise and Conservation of Hearing
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
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 Organizational Maintenance Manual, Simulator, Radar Signal, SM-756/APR-44(V)
TM 38-750	Army Maintenance Management System
TM 55-405-9	Army Aviation Maintenance Manual: Weight and Balance
TM 55-410	Aircraft Maintenance, Servicing and Ground Handling Under Extreme Environmental Conditions
TM 55-1500-314-25	Handling, Storage, and Disposal of Army Aircraft Components Containing Radioactive Materials
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

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.

1. 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.
TAS	True airspeed is calibrated airspeed corrected for temperature, pressure, and compressibility effects.
Va	Maneuvering speed is the maximum speed at which application of full available aerodynamic control will not over stress the aircraft.
Vf	Design flap speed is the highest speed permissible at which wing flaps may be actuated.
Vfe	Maximum flap extended speed is the highest speed permissible with wing flaps in a prescribed extended position.
Vle	Maximum landing gear extended speed is the maximum speed at which an aircraft can be safely flown with the landing gear extended.
Vlo	Maximum landing gear operating speed is the maximum speed at which the landing gear can be safely extended or retracted.
Vlof	Lift off speed (takeoff airspeed).
Vmca	The minimum flight speed at which the aircraft is directionally controllable as determined in accordance with Federal Aviation Regulations. Aircraft Certification conditions include one engine becoming inoperative and windmilling; a 50 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).
Vmo	Maximum operating limit speed.
Vne	Never exceed speed.
Vr	Rotation speed.
Vs	Power off stalling speed or the minimum steady flight speed at which the aircraft is controllable.

VSO	Stalling speed or the minimum steady flight speed in the landing configuration.
Vsse	The safe one-engine inoperative speed selected to provide a reasonable margin against the occurrence of an unintentional stall when making intentional engine cuts.
Vx	Best angle of climb speed.
Vxse	Best single-engine angle of climb speed.
Vy	Best rate of climb speed.
Vyse	The best single engine rate of climb speed.

2. 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 sea 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	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).

3. 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 (TGT) limited.
High Idle	Obtained by placing the condition lever in the HIGH IDLE position.

HP	Horsepower.
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 operation.	The maximum power available from an engine for use during an emergency
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 TGT 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.

4. 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.
N1 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 N1 RPM)	This lever serves to modulate engine power from full reverse thrust to takeoff. The position for idle represents the lowest recommended level of power for flight operation.
Propeller Control Lever (N2 RPM)	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.
Turbine Gas Temperature (TGT)	Two gages on the instrument panel indicate the temperature between the compressor and power turbines.

5. GRAPH AND TABULAR TERMINOLOGY.

AGL	Above ground level.
Best Angle of	The best angle-of-climb speed is the airspeed which delivers the greatest gain Climb 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 regardless of mission antenna installation.
Demonstrated Crosswind	The maximum 90° crosswind component for which adequate control of the aircraft during takeoff and landing was actually demonstrated during certification tests.
Gradient in percent.	The ratio of the change in height to the horizontal distance, usually expressed
Landing Weight	The weight of the aircraft at landing touchdown.
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 Vx and Vy, 1.1 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 take-off ground roll to lift-off.
Route Segment	A part of a route. Each end of that part is identified by: a. A geographic location; or b. A point at which a definite radio fix can be established.
Service Ceiling	The altitude at which the maximum 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.

6. 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 fixed ballast, unusable fuel, engine oil, engine coolant, hydraulic fluid, and in other respects as required by applicable regulatory standards.
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.
Landing Weight	The weight of the aircraft at landing touchdown.
Maximum Weight	The largest weight allowed by design, structural, performance or other limitations.

Maximum Zero Fuel Weight	Any weight above the value must be loaded as fuel.
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 liftoff.
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.

7. MISCELLANEOUS ABBREVIATIONS.

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

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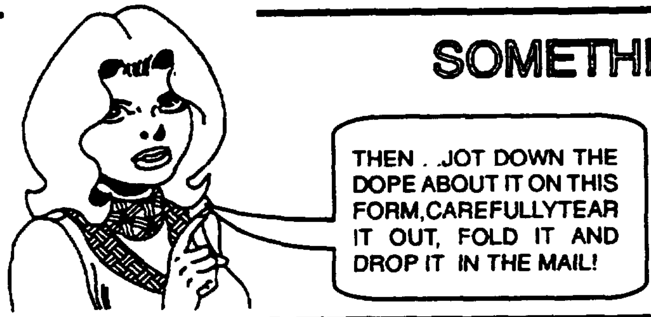

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Ft. Leonardwood, MO 63108

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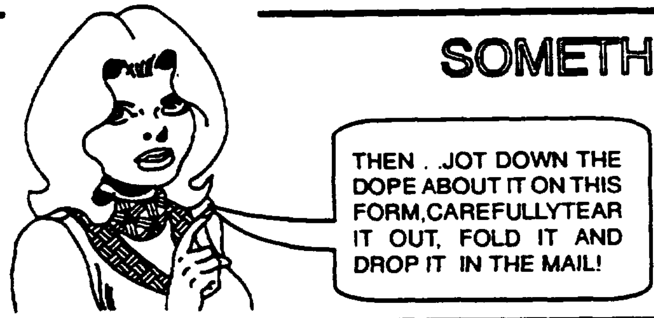

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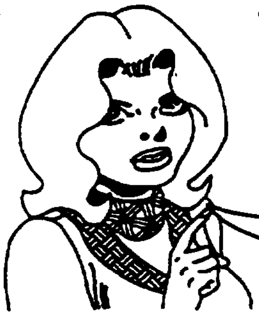

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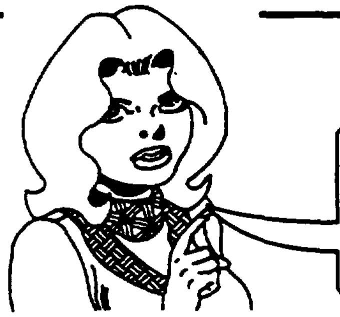

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The Metric System and Equivalents

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
acres
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

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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