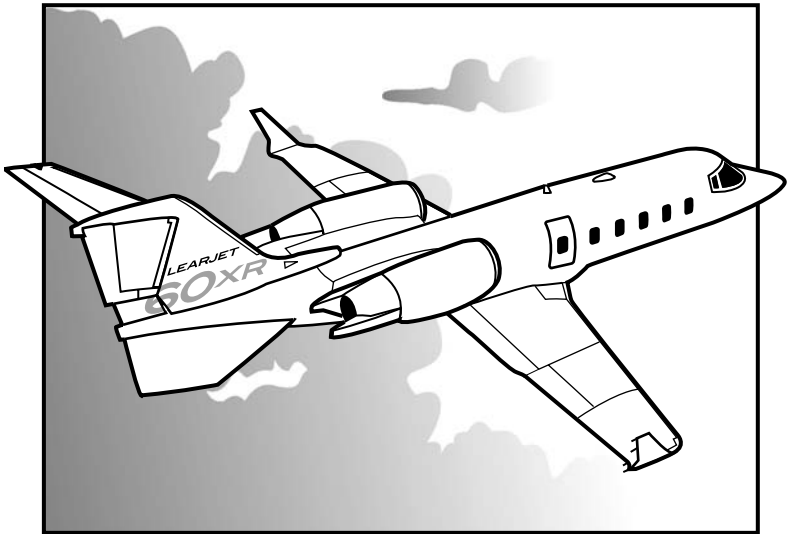


PILOT'S MANUAL

Learjet 60XR



This Pilot's Manual provides information supplemental to the Learjet 60XR FAA Approved Airplane Flight Manual. In the event any information herein conflicts with information in the FAA Approved Airplane Flight Manual, the FAA Approved Airplane Flight Manual shall take precedence.

Subject: Learjet 60XR Pilots Manual — Change 1

The following summary describes the changes that are incorporated with this change.

FRONT MATTER

Introduction Updated LOEP.

SECTION III — HYDRAULICS & LANDING GEAR

Emergency Air System Corrected — “Emergency Braking” was “Emergency Brakes”.

SECTION IV— ELECTRICAL & LIGHTING

Table of Contents Updated TOC — Removed deleted paragraph entries.

Battery Overheat Warning System
(Page 4-9) Removed text Ni-Cad battery not an option on the 60XR.

BAT 60 AND BAT 71 Lights
(Page 4-10) Removed text Ni-Cad battery not an option on the 60XR.

BAT TEMP Display
(Page 4-10) Removed text Ni-Cad battery not an option on the 60XR.

Electrical Page Display Removed Battery Temperature Indication not a feature with Lead Acid Battery.

Anti-Collision Beacon Strobe Lights Revised beacon strobe operation when modified by SB-60-33-7.

SECTION V— FLIGHT SYSTEMS & AVONICS

Table of Contents Updated TOC — Removed deleted paragraph entries.

Air Data Computers Added “ADC 2” when in EMER BUS operation.
Added bullet item “Cabin Pressurization”.

Remote Air Data Computer
(Page 5-28) Removed text not a feature on the 60xr. Compatible only when used with the B.F. Goodrich GH-3000 standby instrument.

SECTION VIII— FLIGHT CHARACTERISTICS & OPERATIONAL PLANNING

Table of Contents Updated TOC — “Temperature” was “Tempature”.

Climb Performance Two Engines Corrected — “23,500” was “25,500”.

LEGEND

- A ▶ ADD SHEET
 - ◀ D DESTROY SHEET
 - ALL OTHER SHEETS REVISED
-

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3-3 / 3-4
Electrical & Lighting
IV-1 / IV-2
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4-13 / 4-14
4-21 / 4-22
Flight Control Systems & Avionics
V-1 / V-2
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Flight Characteristics & Operational Planning
VIII-1 / VIII-2
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LIST OF EFFECTIVE PAGES

Use this List of Effective Pages to determine the current status of the Pilot's Manual. Pages affected by the current change are indicated by an asterisk (*) immediately preceding the page number.

Dates of issue for Original and Changed pages are:

Original O May 2007
Change 1 November 2009

Page	Change	Page	Change
Title.....	O	Anti-Ice & Environmental	
*A	1	VI-1 thru VI-3.....	O
i and ii	O	6-1 thru 6-46	O
General Description		Interior Equipment	
I-1	O	VII-1 and VII-2.....	O
1-1 thru 1-21	O	7-1 thru 7-35	O
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5-1 thru 5-24	O		
*5-25 and 5-26	1		
5-27	O		
*5-28	1		
5-29 thru 5-58.....	O		

INTRODUCTION

The information in this manual is intended to augment the information in the Learjet 60XR FAA Approved Airplane Flight Manual and in no manner supersedes any Flight Manual limitations, procedures, or performance data. In the event that any information in this manual should conflict with that in the FAA Approved Airplane Flight Manual, the FAA Approved Airplane Flight Manual shall take precedence.

THE MANUAL

Sections I through VII of this manual are intended to provide the operator of the Learjet 60XR with a basic description of the aircraft operating systems from the cockpit controls and indicators to the actuating mechanisms in the systems. No attempt has been made to establish a specific standard aircraft due to the numerous customer options. Therefore, the illustrations and descriptions within this manual are for a “typical” aircraft and may not match a specific aircraft. Specific serialization is shown only when more than one version of the same system is incorporated into production on a nonretrofit basis.

Section VIII of this manual contains tabular performance and fuel consumption data derived from the Flight Manual and flight testing. This data may be used by the operator for flight planning.

REVISING THE MANUAL

Periodically, Numbered Changes may be issued against this manual. Pages included in Numbered Changes supersede like numbered pages in the Pilot's Manual. Each page of a Numbered Change will contain a “Change” number located at the lower inside margin of the page. Portions of the text affected by the change are indicated by a vertical bar at the outer margin of the page. The vertical bars may not appear on pages that contain graphs or tables. Additionally, when a “changed” page occurs as the result of a rearrangement of material due to a change on a previous page, no vertical bar will appear.

REVISING THE MANUAL (CONT)

The List of Effective Pages provides the user with a guide to establish the current effective date of each page in the Pilot's Manual and may be used as an instruction sheet for incorporating the latest Numbered Change into the Pilot's Manual. Information included in the List of Effective Pages states the current "Change" number for each page and the dates of Original issue and Numbered Changes. An asterisk (*) next to a page number indicates the page was changed, added, or deleted by the current change.

ADDRESSES

Your comments and suggestions concerning this manual are solicited and should be forwarded to:

Learjet, Inc.
P.O. Box 7707
Wichita, Kansas 67277-7707

Attn: Technical Publications

SECTION I

GENERAL DESCRIPTION

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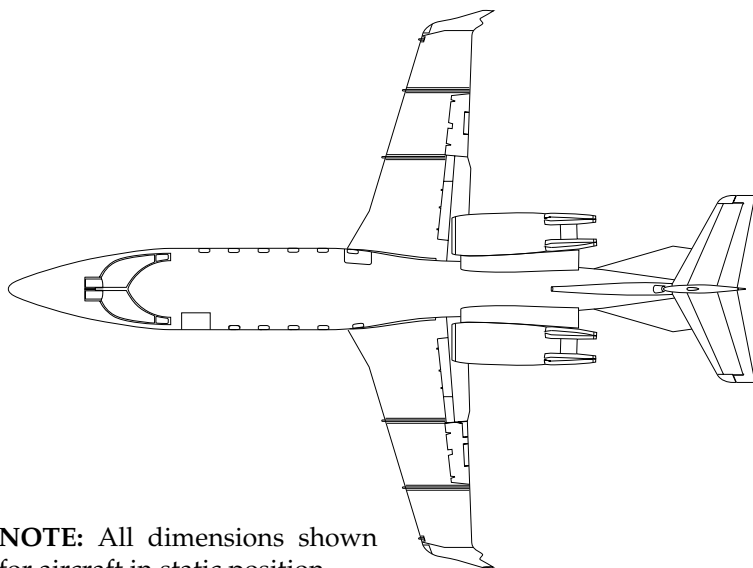
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SECTION I

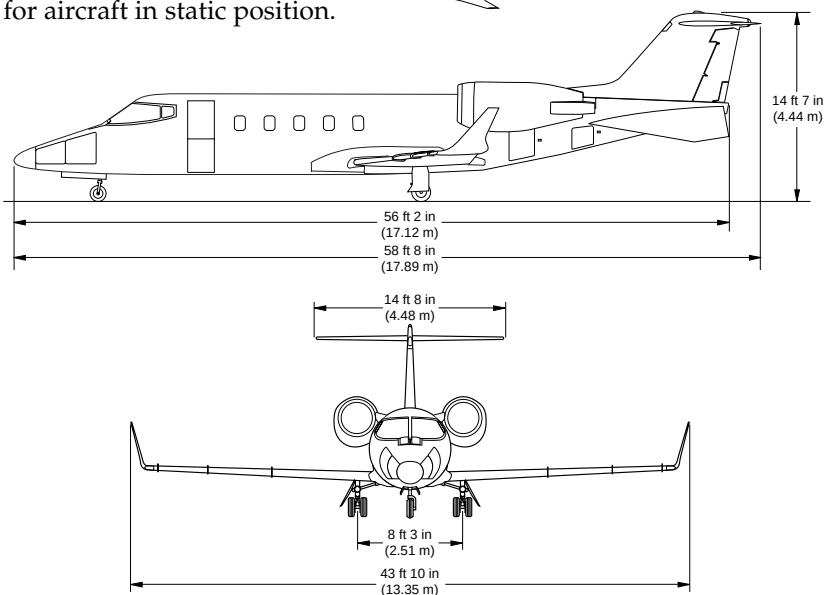
GENERAL DESCRIPTION

AIRCRAFT GENERAL DESCRIPTION

The Learjet 60XR aircraft, manufactured by Learjet, Inc., is an all metal, pressurized, low-wing, turbofan-powered monoplane. The high-aspect ratio, fully cantilevered, swept-back wings with winglets are of conventional riveted construction except for the upper section of the winglets, which is full-depth honeycomb core bonded to the outer skin. The fuselage is of "area rule" design and semi-monocoque construction. Two inverted "V" ventral fins (delta fins) are fitted to the aft section of the tailcone to provide the aircraft with favorable stall recovery characteristics and additional lateral/directional stability. Thrust is provided by two pod-mounted PW305A turbofan engines manufactured by Pratt and Whitney Canada, Inc. Independent fuel systems supply fuel to the engines with fuel storage available in wing and fuselage tanks. Engine-driven hydraulic pumps supply hydraulic power for braking, extending and retracting the landing gear, wing flaps, and spoilers. The landing gear system is a fully retractable tricycle-type gear with dual main-gear wheels, anti-skid braking, and nose-wheel steering. The flight controls are manually controlled through cables, bellcranks, pulleys, and push-pull tubes. Lateral and directional trim is accomplished by means of electrically-actuated trim tabs installed on the left aileron and on the rudder. Longitudinal trim is accomplished by changing the angle of incidence of the horizontal stabilizer with an electrically-operated linear actuator. Aircraft air conditioning systems provides heating, cooling, and pressurization for the crew, passenger, and cabin baggage compartments.

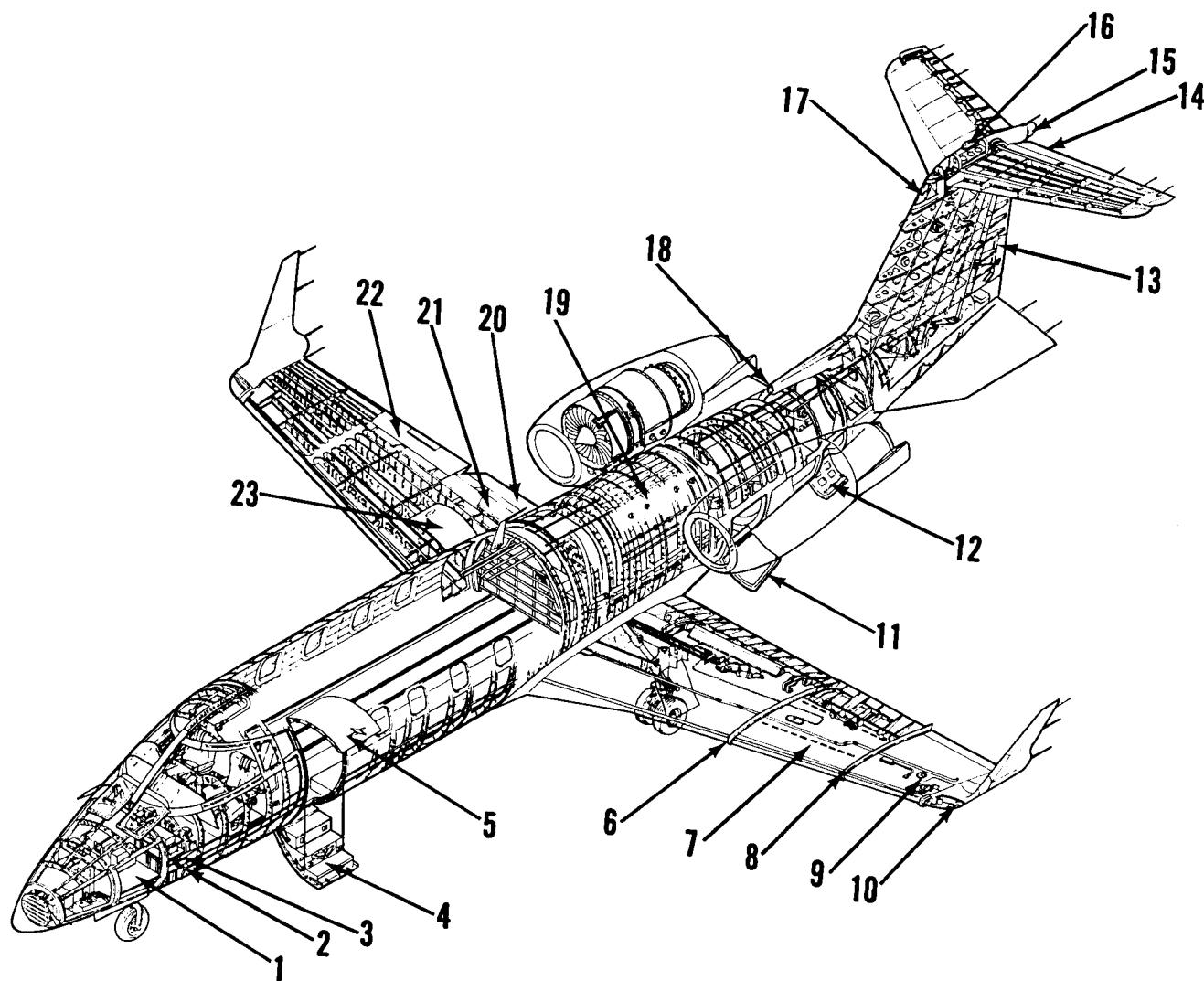


NOTE: All dimensions shown for aircraft in static position.



AIRPLANE THREE-VIEW
Figure 1-1

1. Fwd Avionics Compartment
2. Stall Warning Vane
3. Pitot-Static Tube
4. Lower Cabin Entry Door
5. Upper Cabin Entry Door
6. Inboard Wing Stall Fence
7. Boundary Layer Energizers
8. Outboard Wing Stall Fence
9. Wing Fuel Filler Cap
10. Wing Navigation Light
11. Aft Baggage Compartment Door
12. Tailcone Compartment Access Door
13. Rudder
14. Elevator
15. Tail Navigation Light
16. Tail Strobe/Beacon
17. Recognition Light
18. Ram Air Inlet
19. Fuselage Fuel Cell
20. Flap
21. Spoiler/Spoileron
22. Aileron
23. Emergency Exit/Baggage Door



GENERAL ARRANGEMENT - EXTERIOR
Figure 1-2

CABIN ENTRY DOOR

The cabin door consists of an upper portion that forms a canopy when open and a lower portion with integral steps. The upper portion has gas-charged struts (gas springs) installed to assist in door opening. A latch, when over centered, retains the door in the open position. A door release handle, located on the aft door frame, mechanically releases the latch to allow the upper door to close. The gas-charged struts soften door opening and closing movements. The lower portion of the door incorporates a torsion bar system to provide closing assistance. Cables attached to take-up reels are installed on the forward and aft lower door structure to aid in closing and prevent damage if the door is inadvertently allowed to drop open. A self-contained hydraulic damper is also attached to the lower door as an additional protection against dropping the door. Each door half has a locking handle which, when rotated, drives a series of locking pins into the fuselage structure and through interlocking arms secure the halves together. When the pins are engaged, the door becomes a rigid structural member. There is a secondary safety latch installation on the lower door separate from the door locking system. This installation will hold the lower door against the door frame seal, and align the locking pins with the pin holes. When the lower door is unlocked, the safety latch will keep the door from falling open. This latch may be operated from either inside or outside the aircraft. A key lock is provided on the upper door to secure the aircraft from the outside. Rotating the key lock will move a locking bar over the inside upper door handle, preventing it from rotating to the open position.

ENTRY DOOR LIGHT

A red ENTRY DOOR warning light is installed on the glareshield annunciator panel to provide the crew with visual indication of cabin door security. The light will illuminate and flash to indicate that one or more of the locking pins is not fully engaged or that the key lock is in the locked position. The light will illuminate steady when the entry door is full open and power is on the aircraft. If all pins are fully engaged, and the locking bar is recessed, the most probable cause for illumination is a switch malfunction or misalignment.

CABIN DOOR OPERATION

To open the cabin door from the outside:

1. Insert key in key lock and rotate. The key lock will retract the upper door handle locking bar.
2. Insert finger in the handle finger pull door and pull out handle halves. Rotate the handle halves clockwise to the stop.
3. Raise upper door to the full open position.
4. Reach inside and rotate lower door locking handle to OPEN position.
5. Release safety catch, located on forward side of middle step, from the inside, or outside using exterior button.
6. Gently lower door to the full down position.

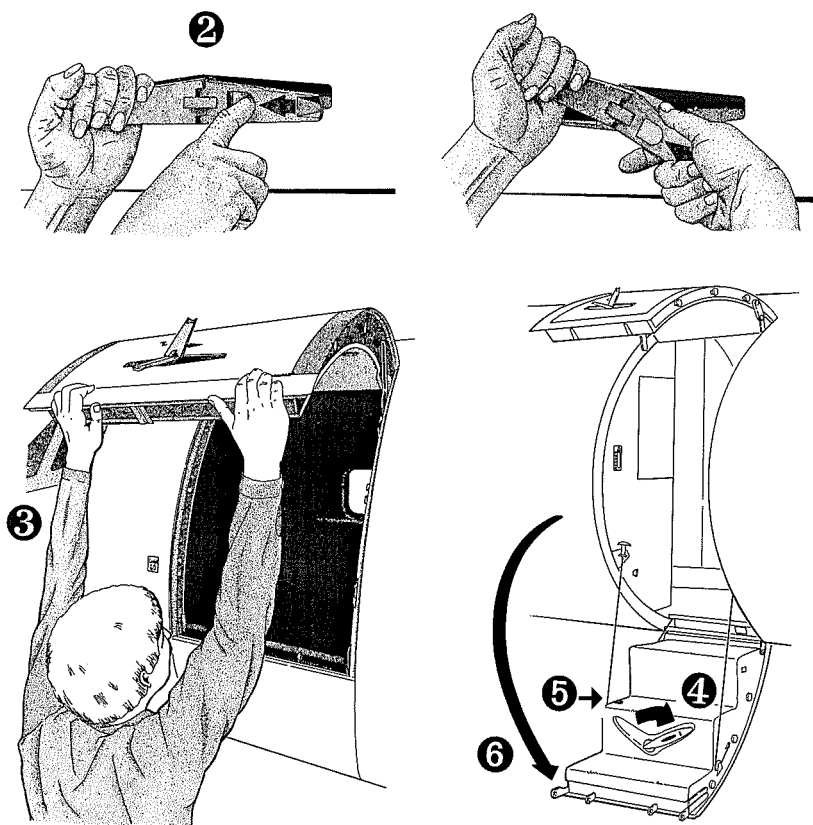
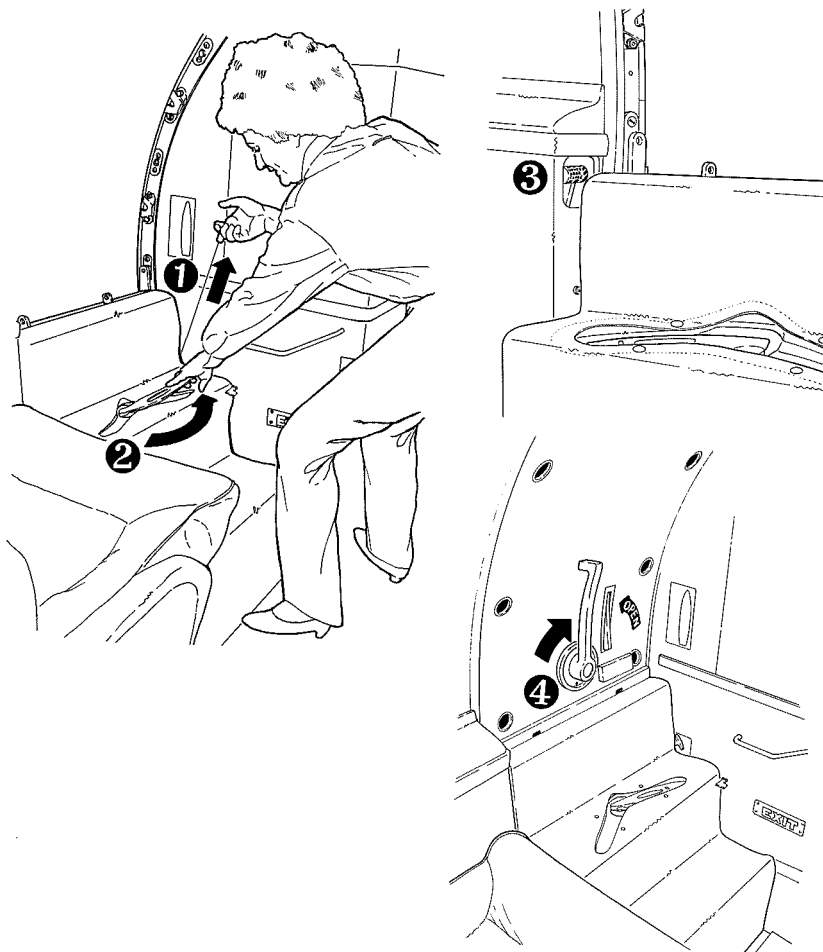
**OPENING CABIN DOOR (FROM OUTSIDE)**

Figure 1-3

CABIN DOOR OPERATION (CONT)

To close cabin door from inside:

1. Raise lower door, using forward cable knob, until safety latch fully engages.
2. Rotate lower door locking handle to the locked position.
3. Release upper door with door release handle on aft door frame.
4. With the upper door locking handle in OPEN position, pull door tightly against door seal and rotate locking handle to the locked position. (If preparing for flight, check ENTRY DOOR warning light extinguished.)



CLOSING CABIN DOOR (FROM INSIDE)

Figure 1-4

CABIN DOOR OPERATION (CONT)

To open cabin door from the inside:

1. Lift upper door locking handle to the OPEN position.
2. Push upper door outward and up to the full open position.
3. Rotate lower door locking handle to OPEN position.
4. Release safety latch, located on forward side of middle step.
5. Gently lower the lower door to full down position using the forward cable knob.

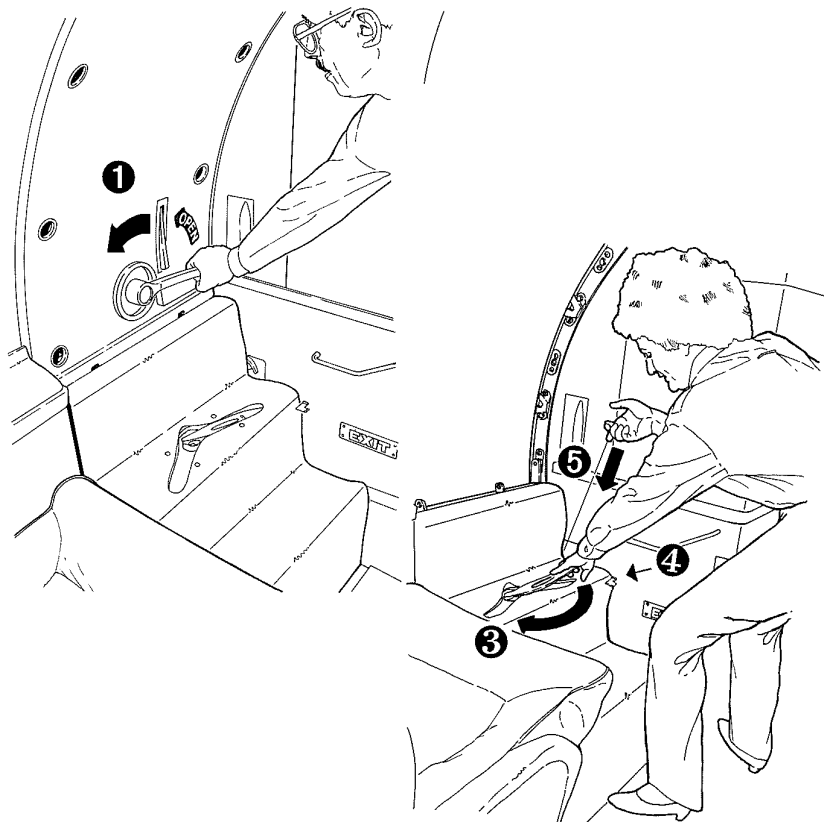
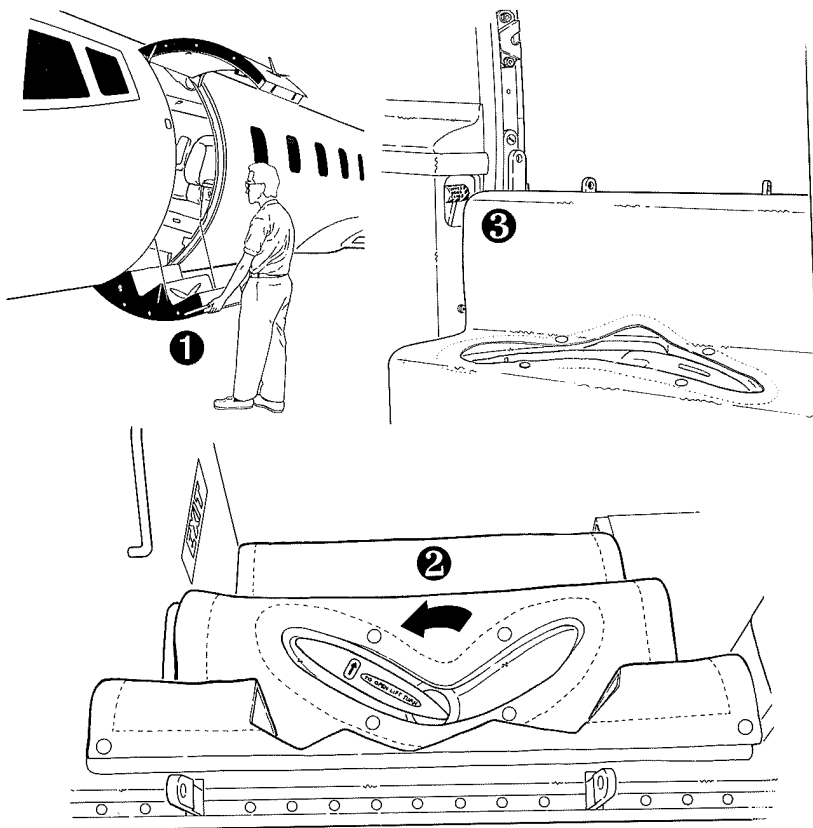
**OPENING CABIN DOOR (FROM INSIDE)**

Figure 1-5

CABIN DOOR OPERATION (CONT)

To close and lock cabin door from the outside:

1. Raise lower door until the safety latch fully engages.
2. Reach inside and rotate lower door locking handle to the locked position.
3. Release upper door with door release handle on aft door frame.
4. With upper door locking handle in the OPEN position, gently lower upper door and push tightly against door frame.
5. Rotate exterior handle halves counterclockwise to the stop and ensure each half recesses into door structure.
6. Insert key in key lock and rotate. This will extend the upper door locking bar over the locking handle.



CLOSING CABIN DOOR (FROM OUTSIDE)

Figure 1-6

EMERGENCY EXIT/BAGGAGE DOOR

The emergency exit/baggage door, located on the aft right side of the cabin, serves a dual function. It provides egress from the cabin during emergencies and access from the outside to the aft cabin baggage area. The door is attached to the airframe by hinges at the top and secured by locking pins at the side and lower edge. The door structure incorporates a window similar to those installed in the cabin. Gas-charged struts (gas springs) are installed to assist in door opening and closing and to hold the door open when fully extended. For security on the ground, the inner door latching handle has a red streamered locking pin installed through a hole in the handle to restrict movement. This pin must be removed before every flight.

AFT CAB DOOR LIGHT

To provide cockpit visual indication as to the flight status of the emergency exit/baggage door, a red AFT CAB DOOR warning light is installed on the glareshield annunciator panel. The light will illuminate and flash if the locking pins are not fully engaged, the handle mechanism is not in the latched position, or the red streamered locking pin has not been removed for flight. The light will illuminate steady when the handle is at the full open position. If all components are found to be properly positioned, a switch malfunction or misalignment is the probable cause for illumination.

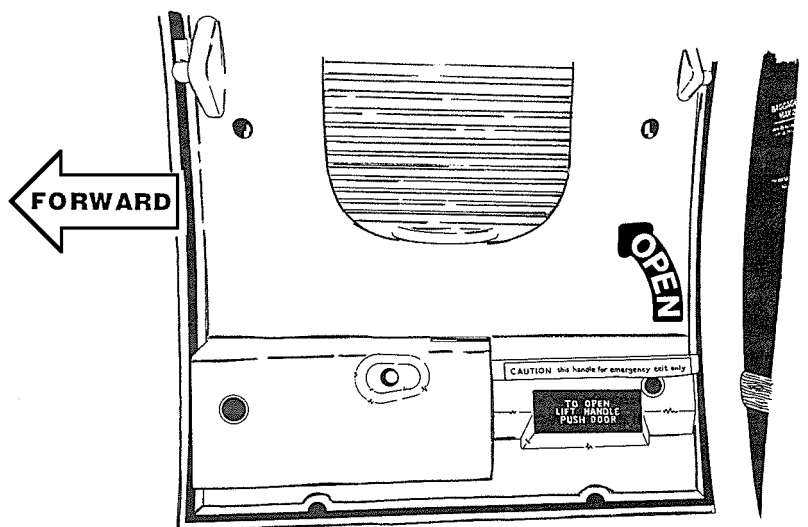
EMERGENCY EXIT/BAGGAGE DOOR OPERATION

To open emergency exit/baggage door from the inside:

1. Remove red streamered locking pin.
2. Rotate locking handle to the OPEN position.
3. Push door outward and up to the full open position.

To close the emergency exit/baggage door from the inside:

1. With the door locking handle in the OPEN position, gently lower the door.
2. Pull door tight against door seal and rotate the locking handle to the locked position.
3. If preparing for flight, no further action is required except to check AFT CAB DOOR warning light extinguished. If securing door on the ground, rotate pin cover knob and insert red streamered locking pin.



EMERGENCY EXIT/BAGGAGE DOOR OPERATION (FROM INSIDE)

Figure 1-7

EMERGENCY EXIT/BAGGAGE DOOR OPERATION (CONT'D)

To open emergency exit/baggage door from the outside:

1. Insert finger in the handle finger pull door and pull out handle halves. Rotate the handle halves clockwise to the stop.
2. Raise door upward to the full open position.

NOTE

Stand clear if there is a chance the cabin is still pressurized.

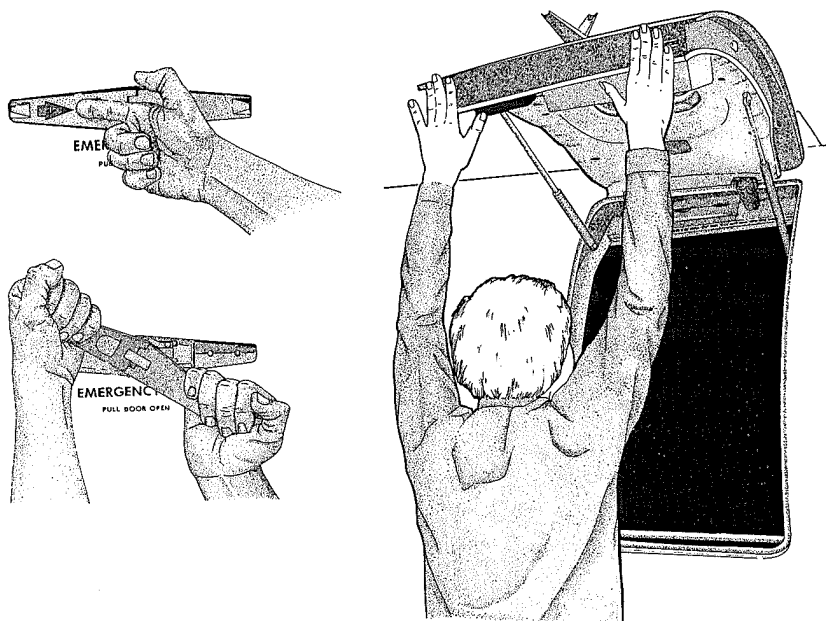
**EMERGENCY EXIT/BAGGAGE DOOR OPERATION
(FROM OUTSIDE)**

Figure 1-8

To close the emergency exit/baggage door from the outside:

1. With the door locking handle in the OPEN position, gently lower the door and push tightly against door frame.
2. Rotate exterior handle halves counterclockwise to the stop and ensure each half recesses into door structure.
3. If preparing for flight, no further action is required except to check AFT CAB DOOR warning light extinguished.

EXTERNAL DOORS

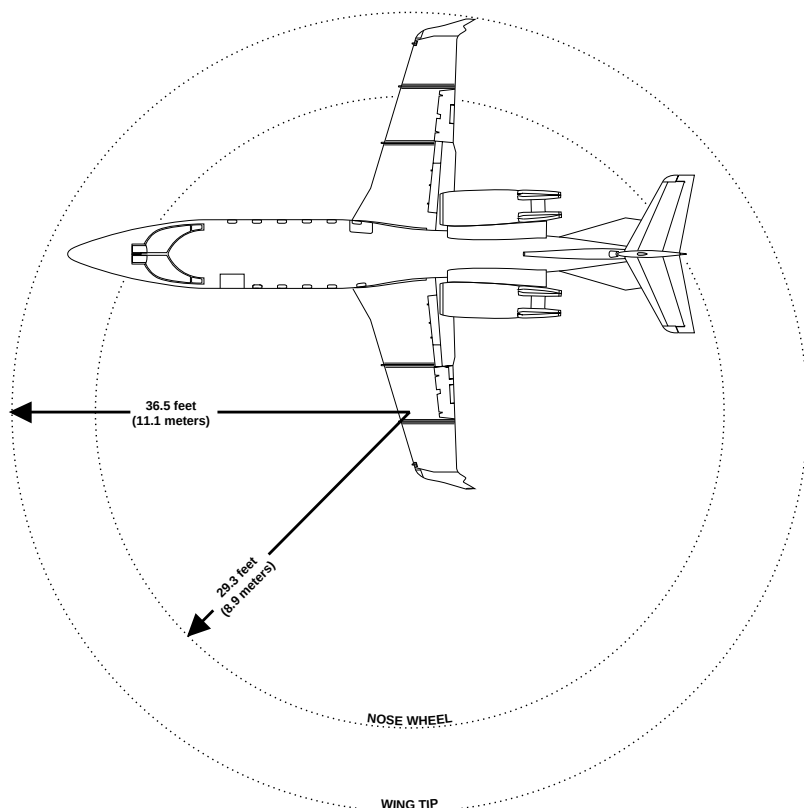
External doors are installed to provide for baggage loading and maintenance access. The nose area forward of the cockpit is accessible through four doors — two on the left side and two on the right side. The tailcone is accessible through the tailcone access door and aft baggage door, both located on the left side. Two doors provide access to the single-point pressure refueling system. These doors are located side by side on the right side of the fuselage beneath the right engine. Access to the external servicing provisions for the toilet is through a door on the underside of the fuselage below the toilet.

EXT DOORS LIGHT

Illumination of the red EXT DOORS warning light, located on the glareshield annunciator panel, indicates the tailcone access door and/or the aft baggage door is not properly closed and latched. The primary purpose of the light is to indicate a door open condition prior to takeoff. If the doors were properly latched prior to takeoff and the light illuminates in flight, the most probable cause is a switch failure.

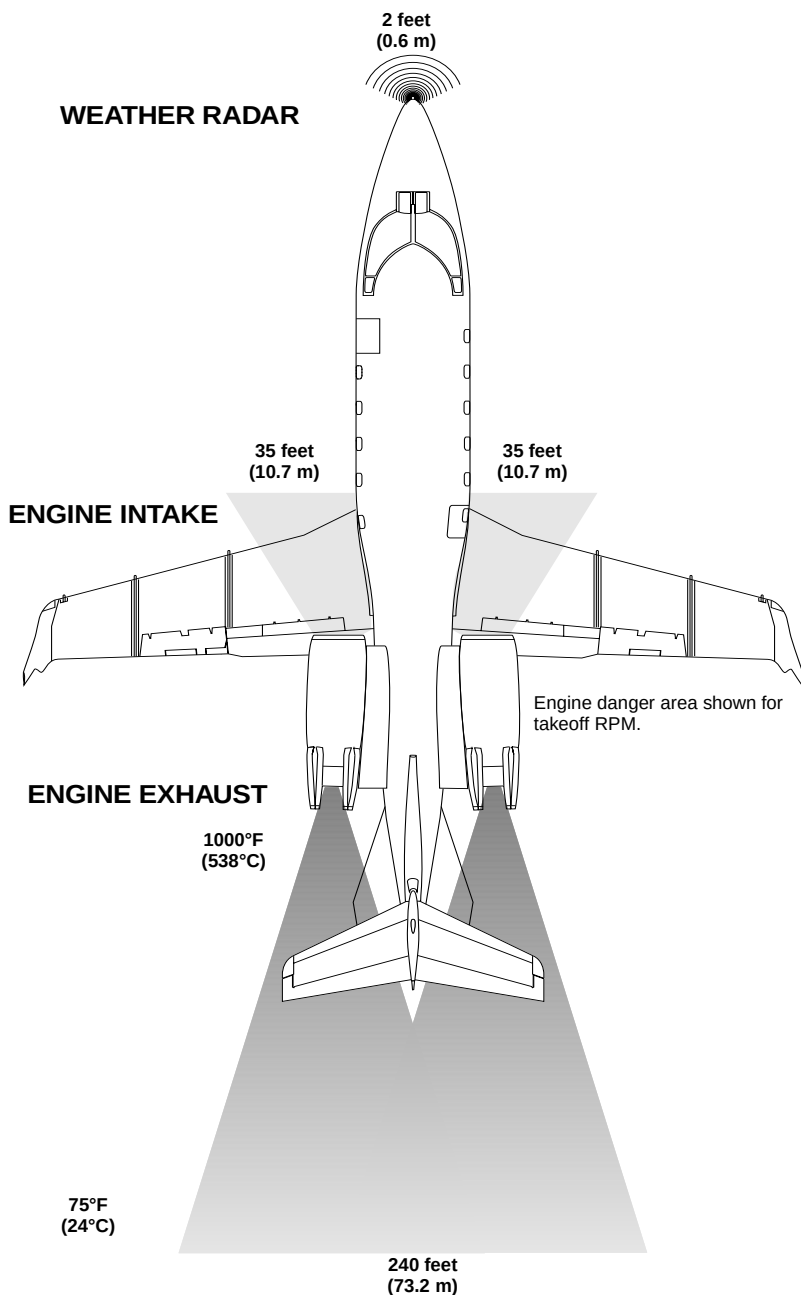
TAILCONE BAGGAGE COMPARTMENT

The tailcone baggage compartment is accessed through a door located under the left engine pylon. A slight pressure differential (0.25 psi) is maintained to prevent fluids from entering the compartment. The pressure is provided by ram air entering the dorsal inlet. An outflow valve, located on the top of the baggage compartment, controls the pressure.

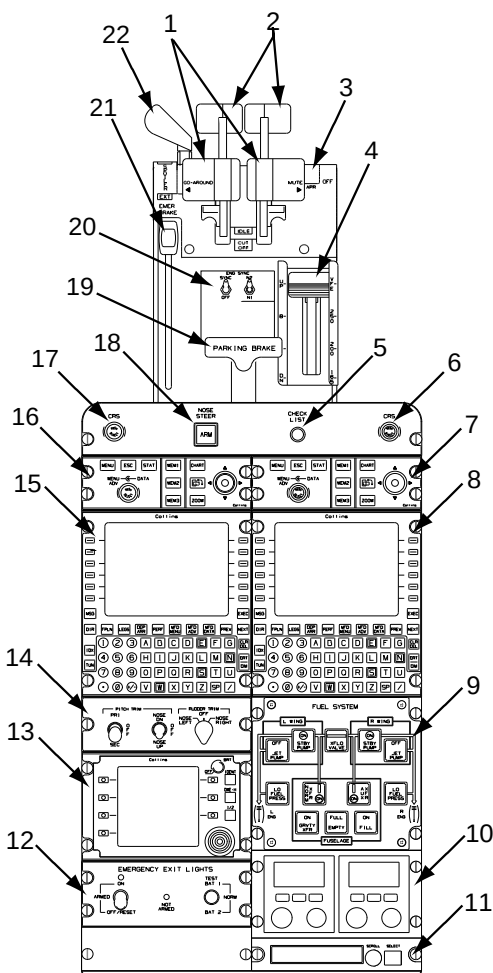


Turning radius expressed above is based upon 60° nose wheel travel (full-authority/low-speed steering). Limited authority steering provides 24° of nose wheel travel. Turning radius will increase accordingly.

TURNING RADIUS
Figure 1-9

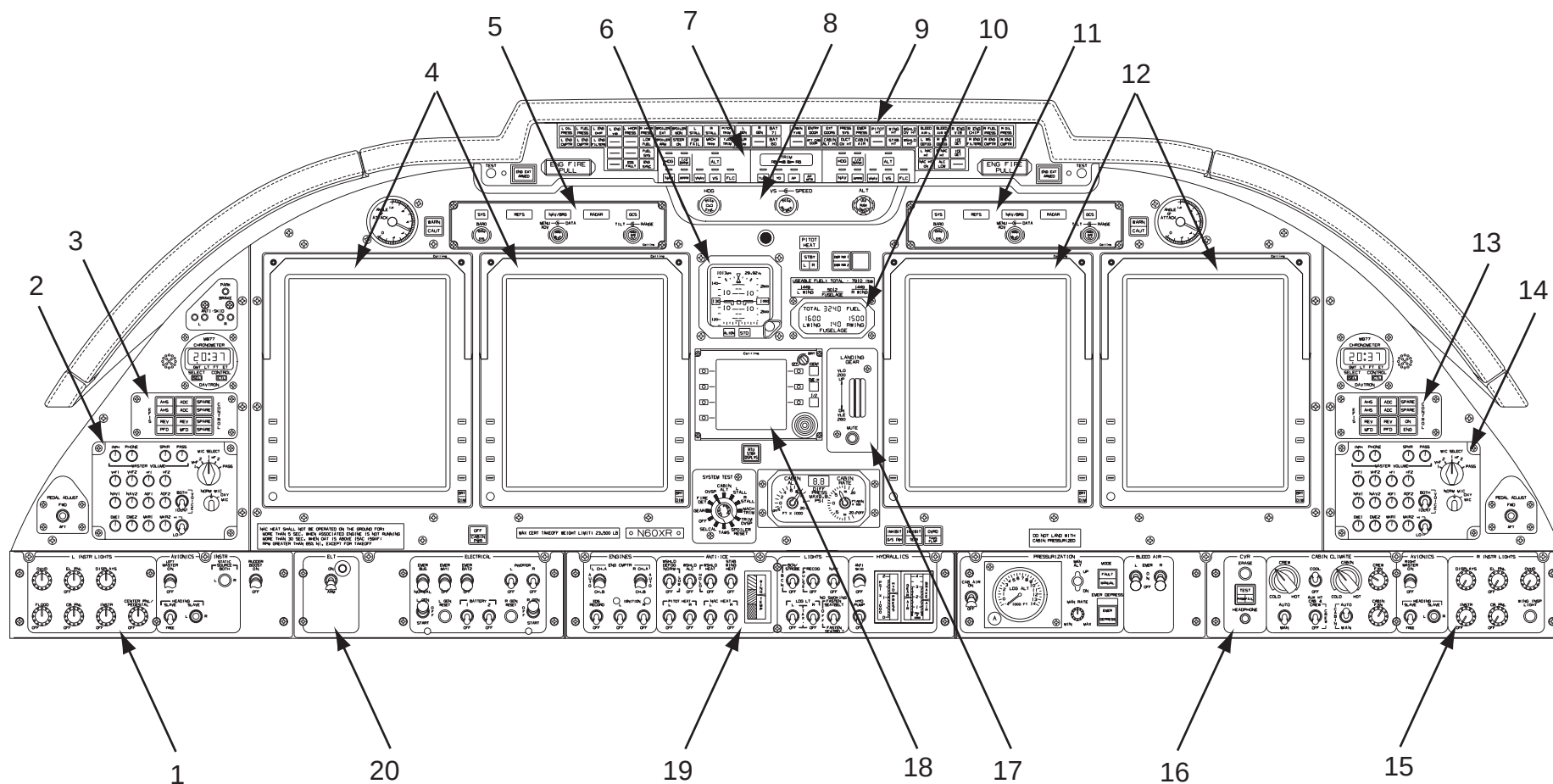


DANGER AREAS
Figure 1-10



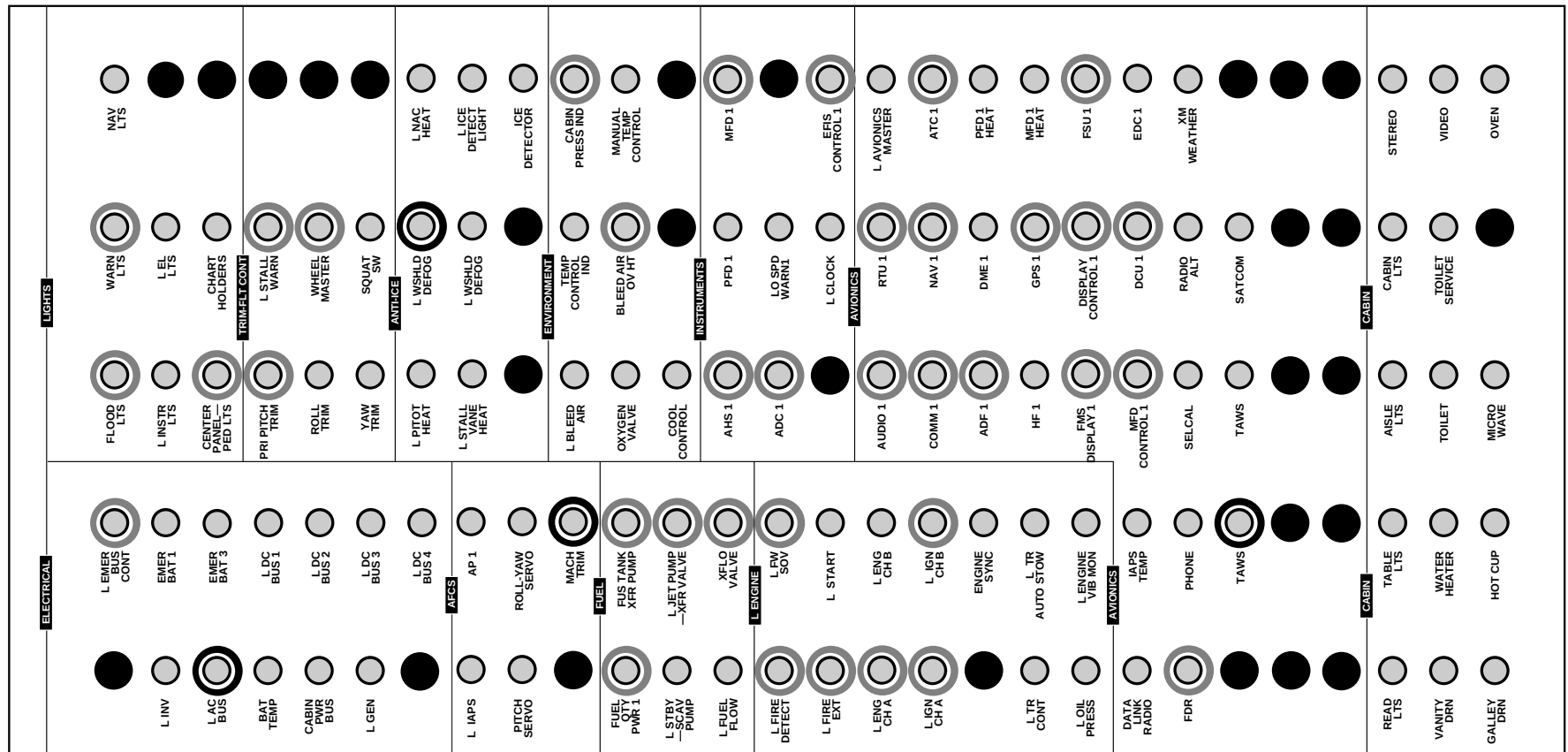
1. Thrust Levers
2. Thrust Reverser Levers
3. APR Switch (Recessed)
4. Flap Switch
5. Check List Switch
6. Copilot Course (CRS) Control
7. Copilot Cursor Control Panel (CCP)
8. Control Display Unit #2 (CDU)
9. Fuel Control Panel
10. Dual HF Comm Control Head
11. AIRSHOW Flight Deck Controller
12. Emergency Exit Lights Control Panel
13. Radio Tuning Unit #2 (RTU)
14. Trim Control Panel
15. Control Display Unit #1 (CDU)
16. Pilot Cursor Control Panel (CCP)
17. Pilot Course (CRS) Control
18. Nose Steer Switch
19. Parking Brake Handle
20. Engine Sync Switches
21. Emergency Brake Handle
22. Spoiler Lever

PEDESTAL (TYPICAL)
Figure 1-11

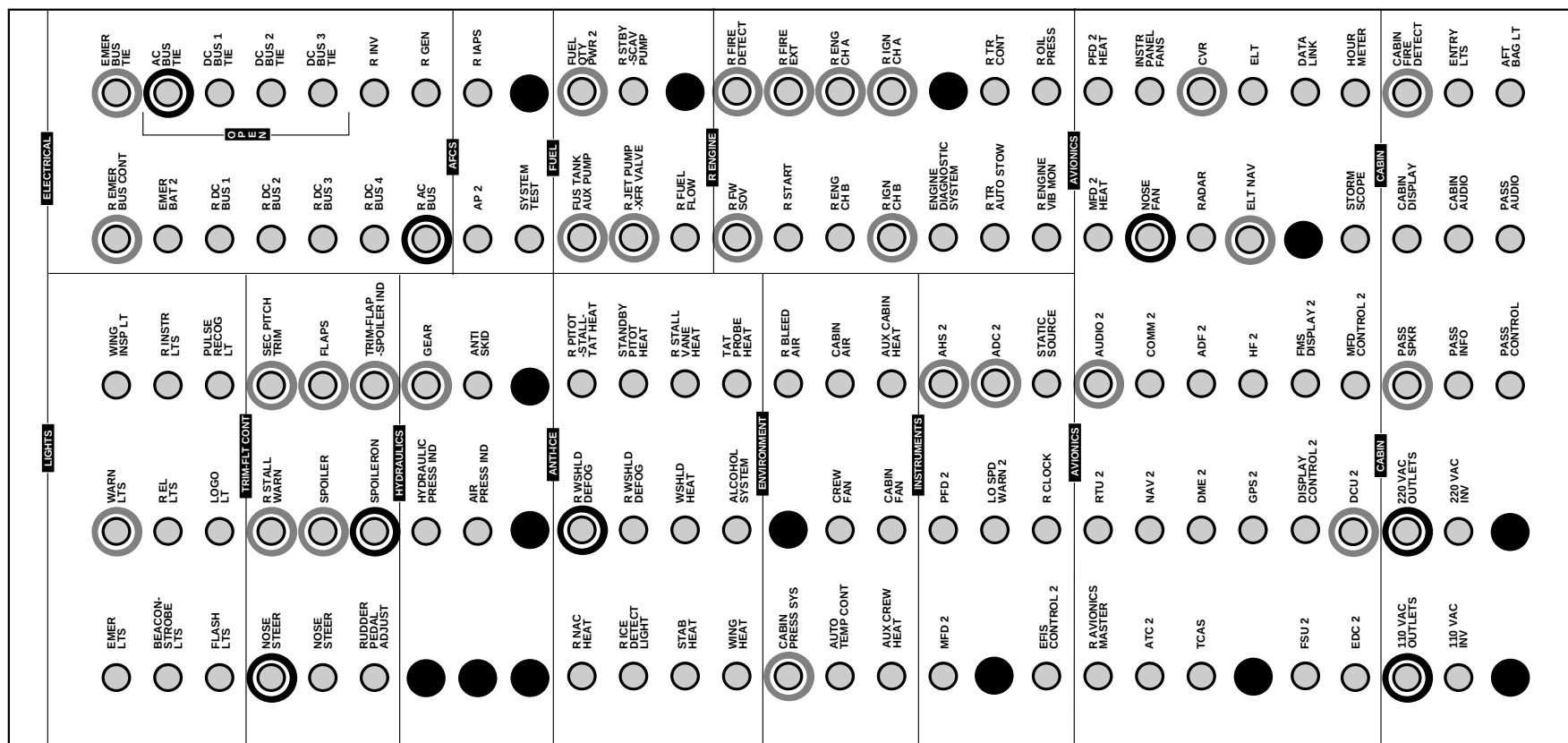


1. Pilot's Switch Panel
2. Pilot's Audio Control Panel
3. Pilot's EFIS Control Panel
4. Pilot's Flight Instruments (PFD & MFD)
5. Pilot's Display Control Panel (DCP)
6. Electronic Standby Instrument System (ESIS)
7. Flight Control Panel (FCP)
8. Heading Speed Altitude Panel (HSA)
9. Annunciator Panel
10. Fuel Quantity Indicator
11. Copilot's Display Control Panel (DCP)
12. Copilot's Flight Instruments (MFD & PFD)
13. Copilot's EFIS Control Panel
14. Copilot's Audio Control Panel
15. Copilot's Switch Panel
16. Cockpit Voice Recorder Control Panel
17. Landing Gear Control Panel
18. Radio Tuning Unit #1 (RTU)
19. Center Switch Panel
20. ELT Control Switch

INSTRUMENT PANEL (TYPICAL)
Figure 1-12



PILOT'S CIRCUIT BREAKER PANEL LAYOUT
Figure 1-13



- Denotes DC circuit breakers
- ⊙ Denotes AC circuit breakers
- ⊖ Denotes circuit breakers on the emergency bus
- Denotes unused circuit breaker positions

COPILOT'S CIRCUIT BREAKER PANEL LAYOUT
Figure 1-14

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SECTION II

ENGINES & FUEL

ENGINES

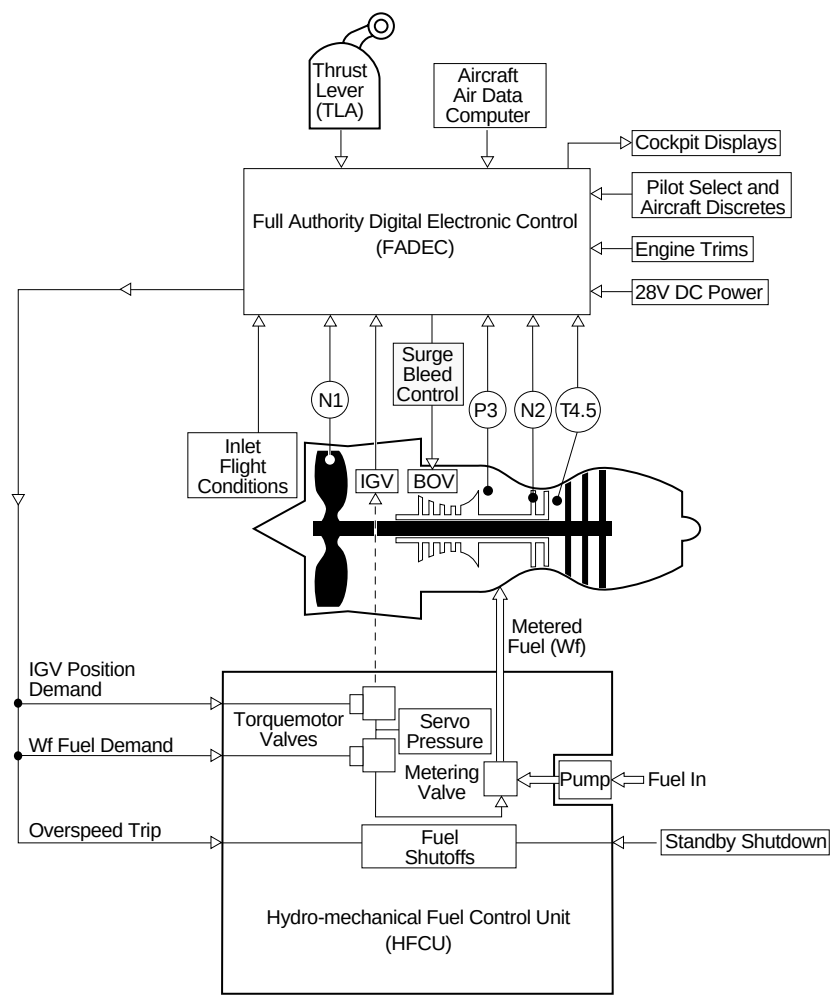
The Learjet 60XR is powered by two PW305A Pratt and Whitney two-spool, front-fan engines. Each engine is rated at 4600 pounds thrust at sea level.

A spinner and an axial-flow fan, located at the forward end of the engine, are driven by the low-pressure rotor. The low-pressure rotor consists of an axial-flow fan (low-pressure compressor) and a three-stage low-pressure axial turbine, mounted on a common shaft. The high-pressure rotor consists of a high-pressure compressor (four axial stages and a single centrifugal stage) and a two-stage high-pressure axial turbine, mounted on a common shaft. The rotor shafts are concentric, so that the low-pressure rotor shaft passes through the high-pressure rotor shaft. The high-pressure rotor drives the accessory gearbox through a driveshaft geared to the N2 rotor shaft.

An annular duct serves to bypass fan air for direct thrust and also diverts a portion of the fan air to the high-pressure compressor. The bypass ratio (bypass flow to core flow) is 4.55:1. Air from the low-pressure compressor flows through variable inlet guide vanes and first-stage variable stator vanes to the high-pressure compressor and is discharged into the annular combustor. Combustion products flow through the high- and low-pressure turbines and are discharged axially through the exhaust duct to provide additional thrust.

ENGINE FUEL AND CONTROL SYSTEM

The engine fuel and control system pressurizes fuel routed to the engine from the aircraft fuel system, meters fuel flow, and delivers atomized fuel to the combustion section of the engine. The system also supplies high-pressure motive-flow fuel to the aircraft fuel system for jet pump operation. The major components of the system are the thrust levers, the engine-driven fuel pump, the hydro-mechanical fuel control unit (HFCU), the full authority digital electronic control (FADEC), variable inlet guide vanes, variable stator vanes, and the surge bleed control.



ENGINE CONTROL LOGIC DIAGRAM
Figure 2-1

THRUST LEVERS

Two thrust levers (one for each engine) are located on the upper portion of the pedestal, and operate in a conventional manner with the full forward position being maximum thrust. Stops at the IDLE position prevent inadvertent reduction of the thrust levers to CUT-OFF. The IDLE stops can be released by lifting a finger lift on the outboard side of each thrust lever. Detents are provided for CUT-OFF, IDLE, maximum cruise (MCR), maximum continuous thrust (MCT), takeoff (TO), and automatic performance reserve (APR). Each thrust lever is mechanically linked to a rotary variable differential transformer (RVDT) position transducer. The RVDT provides dual electrical signals to the FADEC which correspond to the thrust lever angle (TLA). A switch, which actuates in the CUT-OFF position, provides a discrete signal to the FADEC to initiate the normal shutdown sequence.

ENGINE-DRIVEN FUEL PUMP

The engine-driven fuel pump provides high-pressure fuel to the engine fuel control system as well as motive-flow fuel for operation of the aircraft jet pumps. The pump consists of a low-pressure pump element, high-pressure pump element, relief valve, and motive flow provisions. The pump itself is housed in the hydro-mechanical fuel control unit. Fuel from the low-pressure element passes through a filter before it enters the high-pressure element. In the event the pressure differential across the fuel filter increases to a preset level, the impending bypass indicator will actuate and the white ENG FILTERS light will illuminate. If the pressure differential continues to increase, due to clogging, the filter bypass valve will open to allow fuel to bypass the filter.

HYDRO-MECHANICAL FUEL CONTROL UNIT (HFCU)

The HFCU mounts to the permanent magnet alternator on the aft side of the accessory gearbox. The HFCU's main function is to control fuel flow to the engine's fuel nozzles. Fuel flow is regulated in response to commands from the FADEC which computes the necessary settings for the existing conditions. The HFCU also provides servo pressure to the variable guide vane actuator, houses the engine-driven fuel pump, and provides fuel pressure regulation.

FULL AUTHORITY DIGITAL ELECTRONIC CONTROL (FADEC)

There are two FADECs installed, one on each engine. Each FADEC has two channels (A and B), each fully capable of controlling the engine. During normal operation (ENG CMPTR switch in AUTO), the most capable channel is automatically selected to control the engine. FADEC functions include:

- Thrust Management
- Overspeed Protection
- Bleed-Off Valve Control
- Automatic Performance Reserve
- Inlet Guide Vane & Inlet Stator Vane Control
- Igniter Operation
- Surge Protection
- Fault Detection
- N1 Bug Setting
- Engine Synchronization
- Starting & Shutdown Control
- Digital ITT

The crew is able to control the engine through the FADEC by changing the TLA input to change desired thrust level. The FADEC receives input from several engine sensors and the aircraft's air data computers and together with the TLA input it determines the appropriate signals to send to the HFCU, the inlet guide vane and stator vane actuator, and the bleed-off valve solenoid to achieve the desired engine operation. The aircraft's air data computers provide inlet static pressure (PAMB) and Mach number as primary signals to the FADEC. PAMB and Mach number are also measured by the FADEC transducer but used only as a backup to the air data computer signals. Sensors on the engine provide inlet total temperature (T_{T0}) signals to the FADEC. A T_{T0} signal is provided by the air data computer, but used only as a backup to the engine sensor signals. Electrical power is supplied by an engine-driven permanent-magnet alternator. Backup power and power for starting is provided through the ENG CH A and ENG CH B circuit breakers on the pilot's and copilot's circuit breaker panels. Backup power is available to channel A during EMER BUS mode.

ENG CMPTR SWITCHES

Two switches, one for each engine, on the center switch panel labeled ENG CMPTR CH. A/AUTO/CH. B enable the flight crew to select the FADEC channel (A or B) to be used to control the engine. Normally, the switches are left in the AUTO position which allows the FADEC to automatically select the most capable channel. During abnormal situations, the crew may use this switch to force the desired channel to take control of the engine.

ENG CMPTR LIGHTS

Two ENG CMPTR lights are provided for each engine and reside in the annunciator panel. One light is white and one is amber. Illumination of a white light indicates a minor malfunction in one or both channels of the associated FADEC. Illumination of an amber light indicates a major malfunction in one channel of the associated FADEC. Illumination of both the white and amber lights indicates a malfunction in both channels of the associated FADEC. Dispatch is **not** permitted with any white or amber light illuminated.

VARIABLE INLET GUIDE VANES AND VARIABLE STATOR VANES

The engine is equipped with variable inlet guide vanes to direct air into the first stage axial compressor and variable stator vanes to direct air into the second stage axial compressor. This feature permits peak compressor efficiency throughout various operating conditions. A variable guide vane actuator is used to simultaneously position the guide vanes and stator vanes. The FADEC computes the desired vane position and commands the HFCU to provide servo pressures (fuel) to the actuator which positions the vanes. A rotary variable differential transformer (RVDT) position transducer, mounted on the actuator, sends an electrical feedback signal to the FADEC.

SURGE BLEED CONTROL

Each engine has a surge bleed control system which allows surge free operation throughout various operating conditions and improves engine starting characteristics. The system consists of a solenoid control valve and three bleed-off valves (BOV). Two valves bleed compressor air from station 2.5 while the third valve bleeds air from station 2.8. BOV position is controlled by the FADEC via the solenoid control valve. Compressor discharge air (P3) is used to provide servo pressure to close the bleed-off valves. The solenoid control valve applies P3 pressure to the BOVs to close them and vents P3 pressure to open them. In the event a solenoid control valve fails, the bleed-off valves will go to the open position.

AUTOMATIC PERFORMANCE RESERVE (APR)

The APR system provides for an automatic change from the takeoff N1 rating to the APR rating for the operative engine in the event of loss of thrust from one engine during takeoff. The amount of thrust change will depend on ambient conditions. Since the engines installed on the Learjet 60XR are flat rated, the difference between takeoff and APR thrust will be very small under some ambient conditions. The system consists of an APR switch on the forward pedestal, APR ARM and APR ON indicators which display on the EIS Engine Page normally displayed on the pilot's MFD, and associated aircraft wiring. To detect loss of thrust, the FADEC continuously monitors the opposite engine's N1 and N2 signals. Loss of thrust is defined by the FADECs as meeting one or more of the following criteria:

- The N1 of one engine differs more than 15% from the N1 of the other engine.
- The N2 of one engine differs more than 7.5% from the N2 of the other engine.
- The N1 of one engine differs more than 4% from the N1 of the other engine and N1 is decreasing at a rate greater than 5% per second.
- The N2 of one engine differs more than 2% from the N2 of the other engine and N2 is decreasing at a rate greater than 2% per second.

APR SWITCH

APR system automatic operation is pilot controlled through the APR ARM-OFF switch located on the right side of the pedestal adjacent to the thrust levers. The switch is recessed to prevent inadvertent APR activation. The switch has two positions: OFF and ARM. For automatic operation the switch is set to ARM. When ARM is selected, the APR ARM indicator on the EIS will illuminate provided no faults exist which affect the APR function. When a loss of thrust is detected by one of the FADECs, an uptrim of the operative engine is commanded. The FADEC checks that the change to the appropriate APR N1 setting has been triggered and if it has, the APR ON indicator on the EIS will illuminate. Should automatic activation of APR fail to occur, APR thrust can be manually obtained by setting the thrust lever to the APR detent. In this case, the APR ON indicator on the EIS will not illuminate. Once invoked, the APR thrust schedule will remain active until the APR switch is set to OFF.

APR ARM INDICATOR

The green ARM indicator on the EIS will illuminate when the APR switch is in the ARM position provided no faults exist which affect the APR function.

APR ON INDICATOR

If APR is activated automatically by the FADEC, the amber APR ON indicator on the EIS will illuminate once APR thrust has been achieved. The APR ON indicator will not illuminate if APR thrust is obtained manually using the thrust lever detent.

ENGINE SYNCHRONIZER

The engine synchronizer system consists of two ENG SYNC switches, an amber or green SYNC indicator on the EIS Engine Page, and engine synchronizer circuits within the FADECs. During flight, the engine synchronizer, if selected, will maintain the two engines' N1 or N2 in sync with each other. The engine synchronizer must not be used during takeoff, landing, or single-engine operations. Engine synchronization is not available on the ground or whenever APR is armed. Electrical power for the engine synchronizer is 28 VDC supplied through the ENGINE SYNC circuit breaker on the pilot's circuit breaker panel.

Synchronization is accomplished by maintaining the speed of the slave engine in sync with the speed of the master engine. The master engine is determined and so designated during installation. The following criteria must be satisfied before the system will operate:

- The ENG SYNC switch is set to SYNC.
- The difference between the N1 speed of each engine is no more than 5%.
- Thrust levers are in the range from IDLE to MCT.
- Thrust reversers are stowed.
- APR is disarmed.

Deviating from any of these criteria will cancel engine synchronization. The system will raise flight idle of the master engine by a maximum of 1% N1 when activated.

ENG SYNC SWITCHES

Two ENG SYNC switches are installed on the pedestal immediately below the thrust levers. The ENG SYNC control switch is labeled SYNC-OFF and the ENG SYNC selector switch is labeled N1-N2. When moved to the SYNC position, the control switch will activate the engine synchronizer and remove N1 Indicator compensation; therefore, the N1 and N1 bug presentations will reflect actual N1 speed. When SYNC is selected, N1 or N2 synchronization is selected by moving the ENG SYNC selector switch to N1 or N2 as desired.

ENG SYNC INDICATORS

The green SYNC indicator on the EIS will illuminate when the SYNC-OFF switch is in the SYNC position.

The amber SYNC indicator on the EIS and the amber ENG SYNC light on the glareshield will illuminate when the nose gear is not up and the SYNC-OFF switch is in the SYNC position.

GROUND IDLE SYSTEM

The ground idle system provides reduced engine idle speeds for ground operations. When the thrust lever is in the IDLE detent and the squat switch is in the ground mode, idle speed is reduced from approximately 65% N₂ (flight idle) to approximately 52% N₂ (ground idle). In flight, the idle speed setting is selected to ensure adequate transient response to full takeoff power. The system incorporates a 10-second delay after touchdown before ground idle is activated.

ENGINE OIL SYSTEM

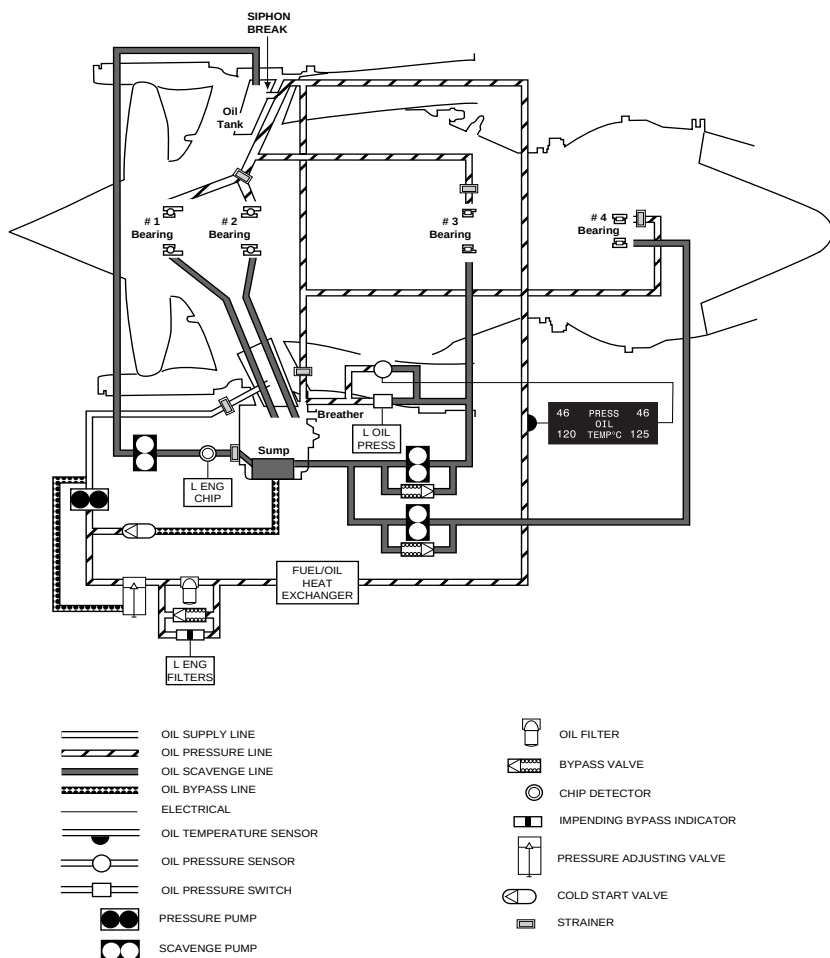
The engine oil system provides lubrication and cooling for the mainshaft bearings, all accessory drive gears and all accessory bearings. The system consists of a pressure system, a scavenge system, and a breather system.

PRESSURE SYSTEM

The oil tank is an integral part of the engine intermediate case. Oil is drawn from the tank by a gear-type pressure pump. Pump output is directed through a pressure adjusting valve which bleeds excess pressure back to the pump inlet. From there, oil passes through an oil filter and fuel/oil heat exchanger before being routed to the mainshaft bearings, accessory drive gears, and accessory bearings. A cold-start valve diverts oil from the pump outlet into the accessory gearbox sump if pressure exceeds 200 psi during cold weather operation.

The oil filter incorporates a bypass valve allowing oil to bypass the filter should it become clogged. An impending bypass indicator provides both a pop-up type visual indicator and an electrical signal to activate the ENG FILTERS light in the cockpit. To avoid false indications at engine start-up with cold oil, a thermal lockout inhibits the impending bypass indication if oil temperature is below 38° C (100° F).

An anti-siphon device is incorporated to prevent oil from being siphoned out of the oil tank following engine shutdown. The device contains a small hole drilled through to the expansion space at the top of the oil tank. This breaks the siphon action caused by the oil tank level being higher than the main bearing oil jets.



ENGINE OIL SYSTEM SCHEMATIC
Figure 2-2

SCAVENGE SYSTEM

The scavenge system incorporates three gear-type scavenge pumps installed in the accessory gearbox. Oil from the number 1 and 2 bearing compartments drains by gravity into the accessory gearbox sump. Oil from number 3 and 4 bearings is pumped by scavenge pumps into the accessory gearbox sump. Scavenge flow from all bearing compartments is aided by pressurizing airflow through the labyrinth air seals. Bypass valves are incorporated around the number 3 and 4 bearing scavenge pumps to prevent pressure build-up in the scavenge lines at higher bearing cavity pressure conditions. Oil collected in the accessory gearbox sump is pumped to the top of the oil tank by a separate scavenge pump.

BREATHER SYSTEM

Air from the bearing compartments, accessory gearbox, and oil tank is vented overboard through an impeller-type centrifugal air/oil separator installed in the accessory gearbox.

ENGINE IGNITION SYSTEM

Each engine ignition system consists of an IGNITION switch, a green annunciator, two ignition exciter units, two shielded cables, two igniter plugs, and associated aircraft wiring. The ignition exciter unit is a solid-state, high-voltage unit which provides a spark rate of 1 to 4 sparks per second at an output of 24,000 to 35,000 volts. The igniter plugs are mounted at four and five o'clock positions in the combustion chamber case. The plugs are operated by separate cables and spark when pulsed by the ignition exciter units. During the start cycle, the ignition system is automatically energized by the FADEC when the thrust levers are placed in the IDLE position and N₂ is above approximately 6%. The ignition system is automatically de-energized by the FADEC at approximately 40% N₂. At pressure altitudes below 20,000 feet and TLA at or above IDLE, the FADEC will sequence the ignition system on should N₂ speed fall below 40%. This feature provides for an immediate relight when the aircraft is below 20,000 feet. The ignition system may be operated continuously through the corresponding IGNITION switch. The ignition system light will be illuminated whenever the associated ignition system is operating either continuously (IGNITION On) or automatically (FADEC control). The ignition system is powered by 28 VDC from the L and R IGN CH A and IGN CH B circuit breakers on the pilot's and copilot's circuit breaker panels. The ignition system is operative during EMER BUS mode.

IGNITION SWITCHES

The IGNITION switches, located on the center switch panel, are used to obtain continuous engine ignition. The switch controlling the left engine ignition system is labeled L-OFF. The switch controlling the right engine ignition system is labeled R-OFF. When an IGNITION switch is placed in the On (L or R as applicable) position, 28 VDC from the corresponding L or R IGN CH A and IGN CH B circuit breakers is applied to the corresponding ignition exciter units.

IGNITION LIGHTS

Green lights above each IGNITION switch are installed to indicate ignition system operation. The corresponding light will be illuminated when the associated ignition system is operating either continuously (IGNITION On) or automatically (FADEC control).

ENGINE INDICATING SYSTEM (EIS)

The EIS Engine Page consists of full time displays, normally on the pilot's MFD, of N1, ITT, N2, Fuel Flow, Oil Pressure, and Oil Temperature. The EIS Engine Page can be displayed on any Adaptive Flight Display (AFD) by pressing the SYS button on the respective DCP or pressing a line select key (LSK). Unless in reversionary mode, EIS pages normally displayed on the MFDs when selected to a different EIS page will redisplay after 20 seconds.

The EIS Engine Page information is also available on the RTU STBY DISPLAY page.



EIS ENGINE PAGE

Figure 2-3

N1 INDICATORS

There is a N1 indicator for each engine. Each indicator utilizes both a digital display and an arc-sweep display with a pointer to indicate N1. The N1 pointer shares the same sweep display as the ITT indicator for each engine. The digital display shows the fan speed to the nearest tenth of a percent. Each indicator also has a trapezoid-shaped N1 bug driven by a signal from the associated FADEC. The N1 bug represents the speed the engine should achieve given the ambient conditions, thrust lever setting, flap setting, and squat switch position. N1 is an indication of engine speed plus compensation. The FADEC takes into consideration its inputs to calculate and transmit the proper N1 bug settings for the ambient conditions. While airborne with the flaps up, the N1 bugs will show the proper N1 for the selected throttle detent or, if the throttles are in between detents, the next higher setting. While on the ground, or in flight with flaps 3° or lower, the N1 bugs will show takeoff power. On the ground with the thrust reversers deployed, the N1 bugs will show the maximum reverse N1 for the current conditions. Each engine FADEC has an externally mounted trim plug which provides trim compensation to the N1 signal. This trim plug will ensure consistent N1 indications for a specific paired throttle position. When ENG SYNC is On, compensation is removed. Each engine is also equipped with two induction-type speed sensors at the aft end of the low-pressure rotor. A toothed wheel is attached to the low-pressure shaft rotating adjacent to the stationary speed sensors. As the toothed wheel turns, its teeth cause the frequency output of the speed sensors to change proportionally. The frequency of the output signal represents the speed of the rotating N1 group. One sensor provides output signals to the N1 indicator, and channel A of the FADEC while the other sensor provides output signals to channel B of the FADEC and the opposite engine's FADEC (used for APR and engine synchronizer).

ITT INDICATORS

There is an ITT indicator for each engine. Each indicator utilizes digital display and an arc-sweep display with a pointer to indicate ITT. The ITT pointer shares the same sweep display as the N1 indicator for each engine. The digital display shows the turbine temperature to the nearest degree. Interstage turbine temperature for each engine is sensed by Chromel-Alumel parallel wired thermocouples positioned between the high- and low-pressure turbine sections at engine station 4.5. The thermocouples provide an average T4.5 signal to the FADEC. The ITT indicator is driven by a signal from the FADEC.

N2 INDICATORS

There is a digital N2 display for each engine. The display shows the turbine speed to the nearest tenth of a percent. Each engine is equipped with two induction-type speed sensors installed on the right side of the accessory gearbox. The gearshaft teeth on the centrifugal impeller (within the accessory gearbox) rotate adjacent to the stationary speed sensors. As the gearshaft turns, its teeth cause the frequency output of the speed sensors to change proportionally. Since the accessory gearbox is driven by the N2 spool, the frequency of the output signal represents the speed of the rotating N2 group. One sensor provides output signals to the N2 indicator, and channel A of the FADEC while the other sensor provides output signals to channel B of the FADEC and the opposite engine's FADEC (used for APR and engine synchronizer).

FUEL FLOW (FF) INDICATION

There is a digital fuel flow (FF) display for each engine's fuel burn rate. The digital display indicates fuel flow to the nearest 10 pounds per hour. A fuel-flow transmitter (flowmeter) for each engine measures fuel flow by means of a rotary vane installed in the engine fuel supply line between the hydro-mechanical fuel control unit and the fuel dump valve. As fuel flows through the flowmeter, an amplitude-modulated constant-frequency sine wave signal is generated and applied to the fuel flow signal. The analog signal is converted to a digital signal of fuel burn rate (pounds per hour) for display. The Fuel Flow indicating system also provides a signal to the flight management system for each pound of fuel burned.

ENGINE OIL INDICATIONS (Pressure and Temperature)

There are two digital engine OIL displays for each engine — one for pressure and one for temperature. The pressure ranges from 0 to 220 psi. The temperature ranges from -50°C to 150°C. A resistance-type temperature sensor located in an oil pressure line on each engine provides the temperature information. A pressure transducer which senses the pressure differential between the oil scavenge line and the oil pressure line on each engine provides the pressure information.

OIL PRESSURE LIGHTS

Red L OIL PRESS and R OIL PRESS warning lights are installed in the glareshield annunciator panel. In the event that either engine's oil pressure drops below approximately 20 psi, a pressure switch connected to the oil pressure line and oil scavenge line of the affected engine will cause the applicable light to illuminate. Also, the applicable light will be illuminated whenever electrical power is on the aircraft and the corresponding engine is not operating.

ENGINE CHIP LIGHTS

Illumination of either amber L ENG CHIP or R ENG CHIP light indicates the presence of contaminants and debris in the corresponding engine's oil system. The lights are activated by a magnetic chip detector installed in the scavenge oil passage of each engine's accessory gear box.

ENG FILTERS LIGHT

Illumination of a white ENG FILTERS light on the glareshield annunciator panel indicates one or more of the following conditions:

- Impending bypass of the respective engine fuel filter
- Impending bypass of the respective engine oil filter
- Impending bypass of the respective airframe-mounted fuel filter

The airframe-mounted fuel filter circuit is wired through the squat switch and may cause the ENG FILTERS light to illuminate only if the aircraft is on the ground. The engine fuel filter circuit is not wired through the squat switch and may cause the ENG FILTERS light to illuminate either in flight or on the ground. A maintenance panel, installed in the tailcone, is utilized by maintenance personnel to determine the specific filter causing the ENG FILTERS light to illuminate and to reset the system after the corrective action has been taken.

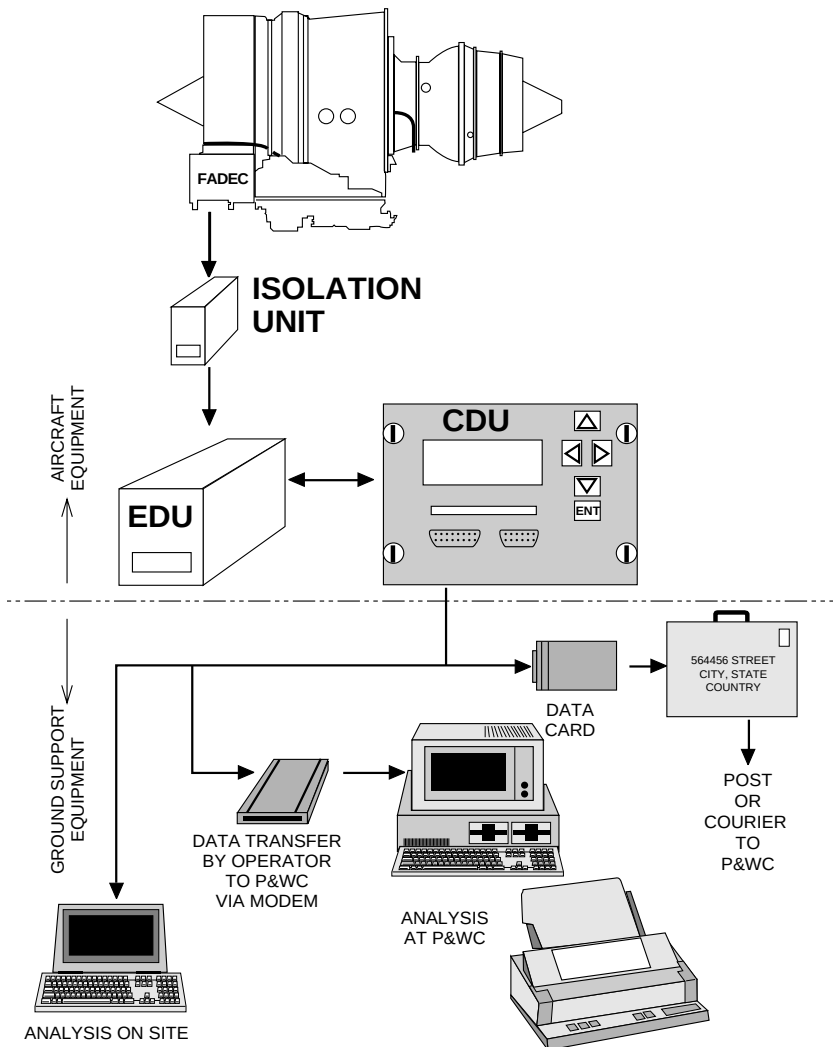
ENG VIB LIGHTS

Illumination of either amber L ENG VIB or R ENG VIB light indicates an abnormally high level of vibration in the associated engine. The lights are activated by a signal conditioning box located in the tailcone. A transducer installed on a mounting pad of each engine's intermediate case provides the trigger to initiate an engine vibration caution.

ENGINE DIAGNOSTIC SYSTEM (EDS)

An EDS is installed to provide engine fault recording and trend monitoring. The system periodically records engine parameters and allows the crew to request that conditions be recorded at anytime. Normal use of the system entails downloading data from the EDS and submitting to Pratt and Whitney Canada for analysis on a monthly basis. The data may be downloaded at any time to assist in diagnosing engine problems which may be encountered. The EDS is intended for maintenance functions only and not for in-flight monitoring or diagnosis by the flight crew.

The system consists of an Engine Diagnostic Unit (EDU), two isolation units (one for each engine), a Control Display Unit (CDU), a white EDS FAULT annunciator and an EDS RECORD switch on the center switch panel. The system is powered by 28 VDC through the ENGINE DIAGNOSTIC SYSTEM circuit breaker on the copilot's circuit breaker panel.



ENGINE DIAGNOSTIC SYSTEM
Figure 2-4

ENGINE DIAGNOSTIC UNIT (EDU)

The EDU contains the memory used to store the collected data for each engine. The unit's capacity allows approximately 200 hours of data storage. The unit is installed in the tailcone. On the back of the EDU is a green, an amber, and a red light. The green light illuminates to indicate the EDS is powered. The red light illuminates to indicate the EDS has failed the self test.

ISOLATION UNITS

The isolation units are installed in the tailcone and provide protection for the FADECs in case of a fault in the engine diagnostic system.

CONTROL DISPLAY UNIT (CDU)

The CDU contains the display, control keys and connections necessary to control the system and download data. The CDU incorporates provisions to interface the system with a personal computer and provisions to download data onto a solid state data card.

EDS FAULT ANNUNCIATOR

The white EDS FAULT annunciator is located in the glareshield annunciator panel. Illumination of the light indicates one of the following:

- The EDS is off.
- The EDU Built In Test Equipment (BITE) has detected a system failure.
- The EDU memory is 85% full.
- The system has detected an engine condition which is out of acceptable parameters.

EDS RECORD SWITCH

The EDS RECORD switch is located on the center switch panel. The purpose of the switch is to allow the flight crew to initiate data collection by the EDS. When the switch is actuated, the engine parameters existing four minutes prior to and one minute after switch actuation will be recorded in the EDU memory.

ENGINE FIRE DETECTION SYSTEM

Three heat-sensing elements connected in series are located in each engine nacelle to detect an engine fire. One element is located around the accessory gearbox; one is located around the engine tailcone; and another around the engine firewall. The fire detection system is controlled by two fire-detect control boxes located in the tailcone. In the event of an engine fire, the control box(es) will sense a resistance change in the sensing elements and flash the applicable ENG FIRE PULL light. The FIRE indicator on the EIS will illuminate inside the appropriate N1/ITT analog display. Electrical power for the system is 28 VDC supplied through the L and R FIRE DETECT circuit breakers on the pilot's and copilot's circuit breaker panels respectively. The fire detect system is operative during EMER BUS mode.

SYSTEM TEST SWITCH — FIRE DETECTION FUNCTION

The rotary-type SYSTEM TEST switch on the instrument panel is used to test the fire detection system. Rotating the switch to FIRE DET and depressing the switch TEST button will connect a resistance into both fire detect system circuits. This resistance, simulating an engine fire, will cause both ENG FIRE PULL lights to illuminate and flash. It also tests and lights the ENG EXT ARMED lights. This test function also tests the tailcone bleed air overheat system. Depressing the TEST button will cause both red BLEED AIR L and BLEED AIR R lights to illuminate and the FIRE indicator on the EIS to illuminate. These tests check the heat-sensing elements for continuity.

ENG FIRE PULL LIGHT

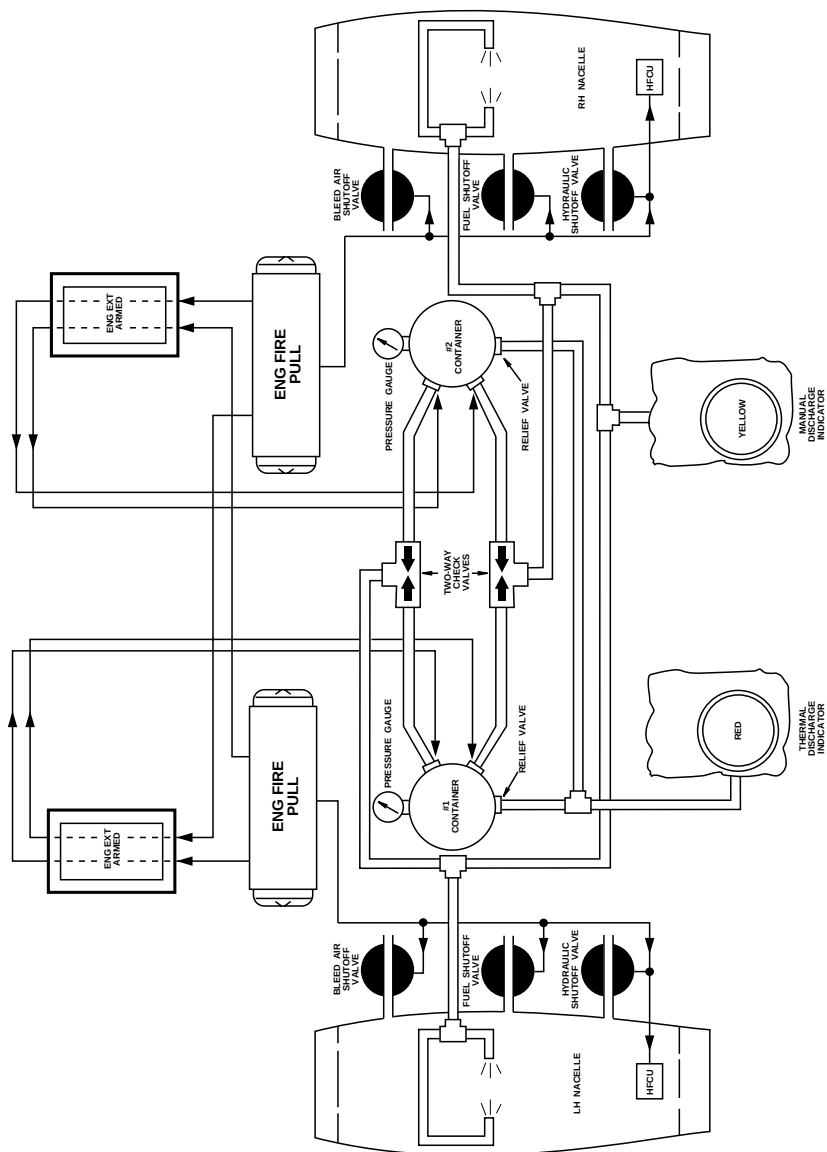
A red ENG FIRE PULL warning light is part of a T-handle installed on the glareshield to warn the crew of a fire in the associated engine nacelle. In the event of an engine fire, the associated ENG FIRE PULL light will illuminate and flash. Operation of the T-handle is explained under ENGINE FIRE EXTINGUISHING SYSTEM.

ENGINE FIRE EXTINGUISHING SYSTEM

The engine fire extinguishing system components include: two spherical extinguishing agent containers, an ENG FIRE PULL T-handle for each engine, two amber ENG EXT ARMED light/switches, a hydraulic shutoff valve for each engine, a fuel shutoff valve for each engine, a thermal discharge indicator, a manual discharge indicator, and associated wiring and plumbing. The system also utilizes the pneumatic system bleed-air shutoff valves. The system is plumbed to provide the contents of either or both extinguishing agent containers to either engine nacelle. Two-way check valves are installed to prevent extinguishing agent flow between containers. The extinguishing agent, Halon 1301 (bromotrifluoromethane [CF₃Br]), is stored under pressure in the extinguisher containers and a pressure gage on each container is visible from inside the tailcone. Halon 1301 is non-toxic at normal temperatures and is non-corrosive. As Halon 1301 is non-corrosive, no special cleaning of the engine or nacelle area is required in the event the system has been used. The system operates on 28 VDC supplied through the L and R FIRE EXT circuit breakers on the pilot's and copilot's circuit breaker panels respectively. The fire extinguishing system is operative during EMER BUS mode.

ENG FIRE PULL HANDLE AND ENG EXT ARMED LIGHTS

The engine fire extinguishing system is operated through the ENG FIRE PULL T-handles and the ENG EXT ARMED lights located on either end of the glareshield annunciator panel. The ENG EXT ARMED lights are combination light/switches. When the ENG FIRE PULL T-handle is pulled, the associated engine fuel, hydraulic, and bleed-air shutoff valves will close to isolate the affected engine. The associated thrust reverser isolation valve will also close, shutting off hydraulic fluid to the associated thrust reverser. A solenoid valve in the HFCU shuts off fuel to the engine causing immediate shutdown, and both ENG EXT ARMED lights will illuminate. Illumination of the ENG EXT ARMED lights indicates that the fire extinguishing system is armed. Depressing an illuminated ENG EXT ARMED light will discharge the contents of an extinguisher bottle into the affected engine nacelle. Depressing the second ENG EXT ARMED light will discharge the contents of the other extinguisher bottle into the affected nacelle.



FIRE EXTINGUISHING SYSTEM
Figure 2-5

FIRE EXTINGUISHER DISCHARGE INDICATORS

Two disk-type indicators are flush-mounted in the fuselage under the left engine pylon. If the contents of either or both containers have been discharged into the engine nacelles, the yellow disk will be ruptured. If the contents of either or both containers have been discharged overboard as the result of an overheat condition causing excessive pressure within the containers, the red disk will be ruptured. If both disks are intact, the system has not been discharged. The indicators are readily accessible for visual inspection and must be checked for condition prior to each flight.

THRUST REVERSER SYSTEM

Each engine is equipped with an independent, electrically controlled, hydraulically actuated, target-type thrust reverser. The thrust reverser system consists of a thrust reverser assembly installation on each engine, thrust reverser levers on the main thrust levers, a throttle balk solenoid, associated hydraulic plumbing and associated electrical wiring. Each thrust reverser assembly installation consists of an upper and lower target-type door, four-bar door linkage, an inboard and outboard door actuator, two secondary latches, four stow switches and one deploy switch. A hydraulic control unit (HCU) for each thrust reverser is installed in the tailcone. The HCU controls the hydraulic flow to the associated thrust reverser in response to electrical inputs. Hydraulic power for thrust reverser operation is supplied by a combination of engine driven hydraulic pump flow and a thrust reverser accumulator. Pressure from the auxiliary hydraulic pump is not available to the thrust reverser system. The thrust reverser accumulator is plumbed primarily to power thrust reverser operations but assists the main system accumulator for landing gear, flap and brake operation. Refer to Section III for more details on the thrust reverser hydraulic system. Electrical power for thrust reverser control and auto stow functions is 28 VDC supplied through the L and R TR CONT and the L and R TR AUTO STOW circuit breakers on the pilot's and copilot's circuit breaker panels. The WARN LTS circuit breakers supply electrical power for FADEC discrete signals and a redundant power source for the annunciator circuits.

The status of the thrust reversers is indicated on the EIS Engine Page in the lower portion of the N1/ITT analog display.

DEPLOY

In order to arm a thrust reverser, both squat switches must be in the ground mode (aircraft weight on wheels), and the applicable thrust lever must be in the IDLE detent. When the prerequisite conditions are met, a signal from the applicable thrust reverser relay box will open the applicable isolation valve (within the HCU) allowing hydraulic pressure to be available for thrust reverser deployment. The presence of hydraulic pressure will actuate a pressure switch and illuminate the green REV indicator on the EIS. Lifting the thrust reverser lever to the DEPLOY detent will signal the applicable HCU to apply hydraulic pressure to the secondary latch actuators and deploy port of the thrust reverser actuators (inboard and outboard). When the secondary latches are released, the secondary latch stow switches send a signal to illuminate the amber UNL indicator on the EIS. Once the thrust reverser doors move out of the stowed position, the primary latch stow switches send a discrete signal to the on-side FADEC to limit engine thrust to idle. When the doors reach the fully deployed position, the deploy switch sends a signal to illuminate the white DEP indicator on the EIS and a discrete signal is sent to the on-side FADEC to allow engine thrust to increase above idle. The N1 bug will reposition indicating the FADEC is utilizing the reverse thrust schedule. A throttle balk solenoid prevents either thrust reverser lever from moving significantly above reverse idle until both thrust reversers are fully deployed. Once the deploy switches on both thrust reversers are actuated, the solenoid is energized allowing the thrust reverser levers to move into the reverse thrust range.

STOW

To stow the thrust reverser, the thrust reverser lever is moved into the STOW position. The thrust reverser relay box will signal the applicable HCU to apply hydraulic pressure to the stow port of the thrust reverser actuators (inboard and outboard). Once the thrust reverser doors move out of the deployed position, the deploy switch sends a signal to illuminate the amber UNL indicator on the EIS and a discrete signal is sent to the on-side FADEC to limit engine thrust to idle. When the doors reach the stowed position, the primary latch stow switches send a discrete signal to the on-side FADEC to restore engine thrust. The upper and lower doors trip their respective spring-loaded secondary latches as they reach the stowed and locked position. At this point, the secondary latch stow switches send a signal to remove the amber UNL indicator from the EIS.

AUTO STOW

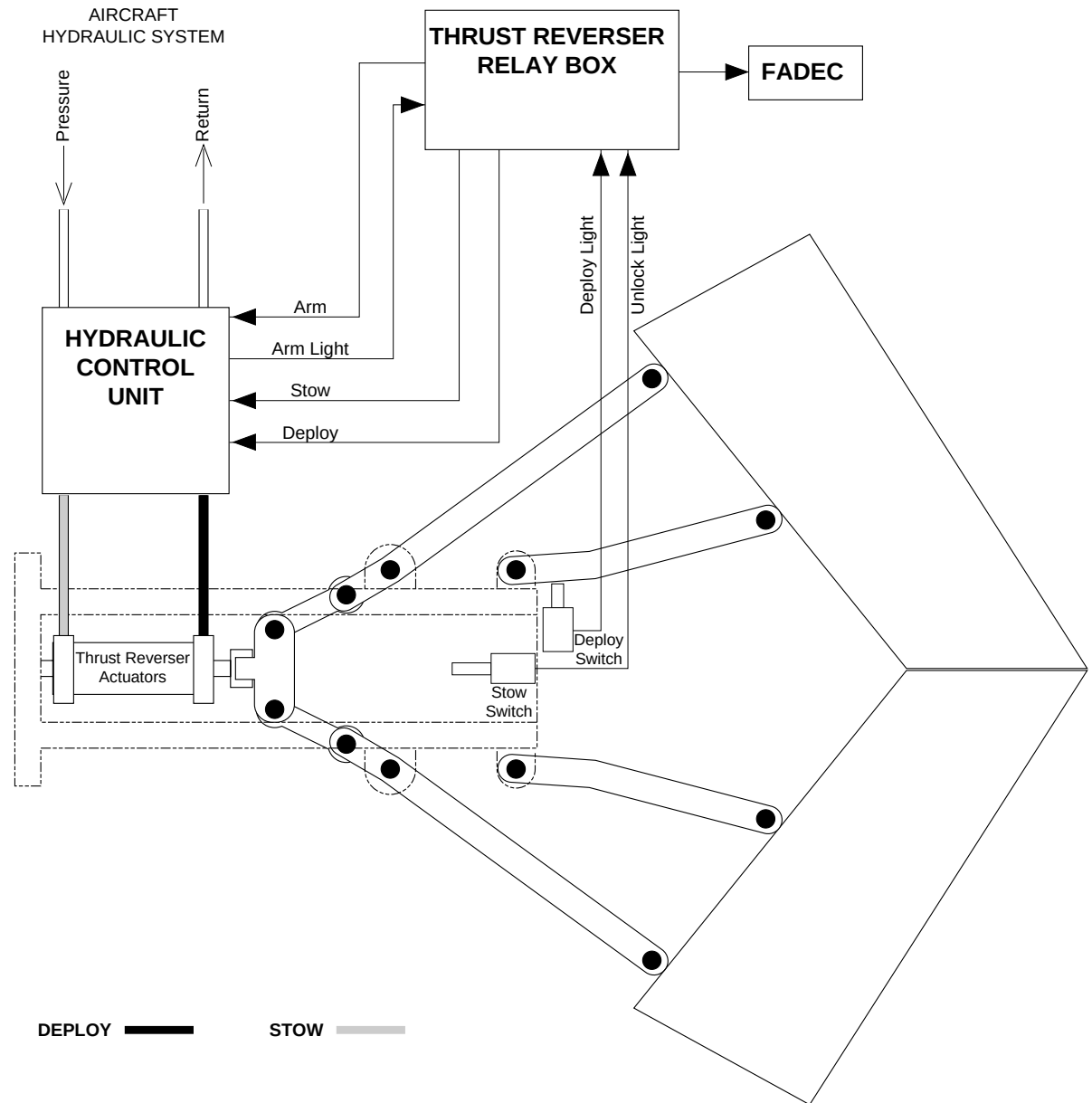
The thrust reverser doors are mechanically secured in the stowed position by a four-bar overcenter door linkage (primary latch). Should an uncommanded unlock condition be sensed by the primary latch stow switches, an auto stow sequence will be initiated and the UNL indicator on the EIS will illuminate (amber on the ground or red in flight). The thrust reverser relay box will command the HCU to open the isolation valve and apply hydraulic pressure to the stow port of the thrust reverser actuators (inboard and outboard). A primary latch unlock condition will result in a discrete signal being sent to the on-side FADEC to limit thrust to flight idle, regardless of throttle position, until the thrust reverser is returned to the stowed position. An unlock condition sensed by the secondary latch stow switches will illuminate the UNL indicator on the EIS (amber on the ground or red in flight) but will not initiate the auto stow sequence.

THRUST REVERSER ASSEMBLY

Each engine is equipped with a thrust reverser assembly attached to the engine outer fan duct. When stowed, the thrust reverser fairings with the nacelle and forms the engine afterbody. Each upper and lower door is attached to the support structure by a four-bar linkage. Two links are idler links and two are driver links. The driver links connect to the inboard and outboard actuators with an overcenter link. After stowing the doors, the actuators continue to drive the overcenter links to an overcenter position. This provides a mechanical latch to keep the doors stowed. This overcenter mechanism is referred to as the primary latch.

In addition to the primary latch, each thrust reverser door is held in the stowed position by a secondary latch. A latch plate on each door engages the spring-loaded secondary latch mechanism securing the door in the stowed and locked position. During the deployment sequence, each secondary latch is released by hydraulic pressure from the deploy line.

Each assembly is equipped with two primary latch stow switches, two secondary latch stow switches, and one deploy switch. The primary latch stow switches are used to detect the extreme aft (locked) position of the inboard and outboard actuators. The secondary latch stow switches are used to detect the engagement of the secondary latch with the thrust reverser doors. The deploy switch is actuated by one of the idler links and detects the fully deployed position. These switches provide signals to sequence the thrust reverser operation, control the thrust reverser annunciators, control the throttle balk solenoid and initiate the auto stow sequence.



THRUST REVERSER SYSTEM SCHEMATIC
Figure 2-6

THRUST REVERSER LEVER

A thrust reverser lever is mounted piggy-back fashion on each main thrust lever. The thrust reverser lever cannot be moved out of the STOW position unless the associated main thrust lever is at the IDLE stop. Similarly, the main thrust lever cannot be moved from the IDLE position when the associated thrust reverser lever is in the DEPLOY and reverse thrust range.

Moving the main thrust lever to IDLE actuates a switch in the throttle quadrant to signal the system to arm if the aircraft is on the ground.

Another switch in the throttle quadrant is actuated by the thrust reverser lever and signals the system to stow or deploy the associated thrust reverser.

When both thrust reversers are fully deployed, the thrust reverser levers are allowed to move beyond the DEPLOY detent into the reverse thrust range. Moving the thrust reverser lever above reverse idle allows the engine to spool up providing the desired amount of reverse thrust. The FADEC will schedule reverse thrust as a function of airspeed (provided by ADC 1 and 2), decreasing thrust as the airplane slows down. If airspeed data is not provided to the FADEC, the maximum reverse thrust available will be 65% N1.

THROTTLE BALK SOLENOID

A throttle balk solenoid is installed in the pedestal to mechanically prevent either thrust reverser lever from moving into the reverse range until both thrust reversers are fully deployed. When the solenoid is de-energized, a spring-loaded lockout mechanism allows the thrust reverser levers to move between the STOW and DEPLOY positions only. When energized, the solenoid will overcome the spring-loaded lockout mechanism allowing the thrust reverser levers to move beyond the DEPLOY position into the reverse thrust range

HYDRAULIC CONTROL UNIT (HCU)

The HCU functions as a shutoff valve to isolate the thrust reverser system from the aircraft's hydraulic system and also as a selector valve directing hydraulic fluid to stow and deploy the thrust reverser doors as commanded.

The HCU incorporates both a mechanical and an electrical isolation valve. The mechanical valve may be manually closed and secured with a locking pin thereby deactivating the thrust reversers. The electrical valve is closed until the conditions for arming are satisfied or the auto stow sequence is initiated. The electrical signals to operate the HCU come from the applicable thrust reverser relay box. When the left or right ENG FIRE PULL T-handle is pulled, the associated isolation valve will close, shutting off hydraulic fluid to the associated thrust reverser.

A pressure switch, in the HCU, senses hydraulic pressure availability to the selector valve. When pressure is present, the switch will illuminate the REV indicator on the EIS (green on the ground and amber in flight).

Each HCU incorporates a check valve in the hydraulic return port which allows free flow from the HCU to the aircraft's hydraulic return system but no flow in the reverse direction.

THRUST REVERSER RELAY BOX

Two thrust reverser relay boxes are installed in the tailcone. One box controls the left thrust reverser system and the other controls the right. Inputs to each relay box are provided from: left and right squat switches, arming switch (throttle quadrant), stow/deploy switch (throttle quadrant), stow switches (thrust reverser assembly), deploy switch (thrust reverser assembly), and pressure switch (HCU). From the input signals the relay box determines the appropriate output signals including: arm thrust reverser (open isolation valve in the HCU), deploy thrust reverser, stow thrust reverser, initiate auto stow, limit engine thrust to idle (discrete signal to FADEC), restore engine thrust to normal (discrete signal to FADEC), enable thrust reverser levers (throttle balk solenoid), annunciate thrust reverser conditions and indicate to the takeoff monitor whether the thrust reverser is locked or unlocked.

AIRCRAFT FUEL SYSTEM

The aircraft fuel system consists of two wing tanks, a fuselage fuel tank, a fuel supply system, a fuel quantity indicating system, a fuel transfer system and a fuel vent system. Fuel fillers are located outboard near each wing tip. A single-point pressure refuel (SPPR) system is also installed.

WING TANKS

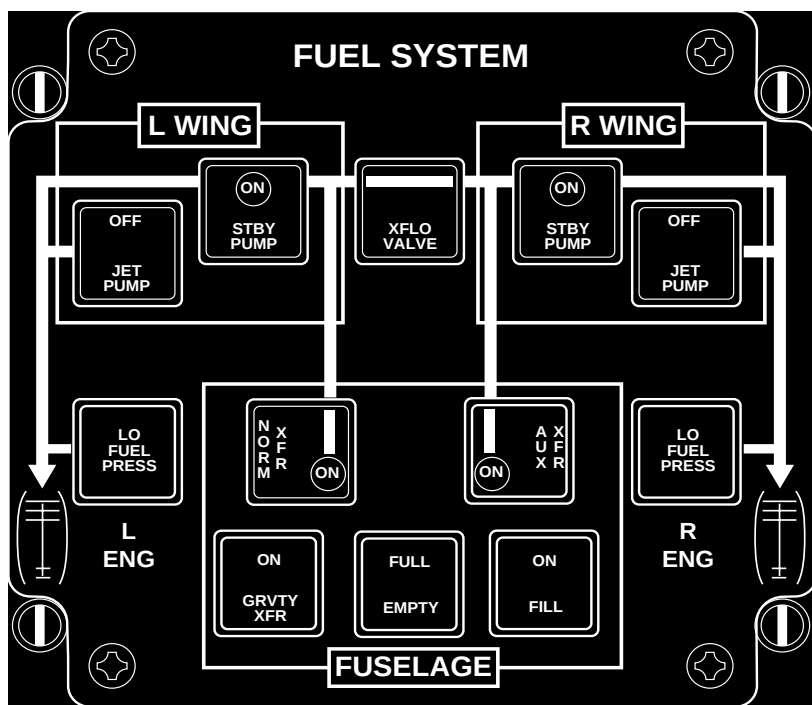
The wing is divided by a center bulkhead into two separate fuel-tight compartments which serve as fuel tanks. Each tank extends from the center bulkhead outboard to the wing tip rib, thus providing a separate fuel supply for each engine. A tank crossflow valve is installed to permit fuel transfer between wing tanks. Center bulkhead relief valves prevent wing tank overpressurization during fuel crossflow operations. Flapper-type check valves, located in the various wing ribs, allow free fuel flow inboard but restrict outboard fuel flow. A jet pump and an electric standby pump are mounted in each wing tank near the center bulkhead to supply fuel under pressure to the respective engine fuel system. An electric scavenge pump, located in the forward inboard section of each wing tank, is used to transfer fuel to the section containing the main fuel pumps and is operated by the low-fuel float switch. Three jet-type transfer pumps, located along the aft portion of each wing tank, transfer fuel to the section containing the main fuel pumps. A filler cap, located in the outer section of the wing tank, is used for fuel servicing.

FUSELAGE TANK

The fuselage tank, installed in the aft fuselage, consists of two interconnected bladder-type cells. The fuselage tank is provided with two transfer pumps, a float switch, a fuel quantity probe, and single-point pressure refuel provisions. The fuselage tank can be refueled by pumping wing fuel with the wing tank standby pumps through both transfer lines or by using the single-point pressure refuel system. Fuel can be transferred to the wing tanks by normal fuel transfer, auxiliary fuel transfer, rapid fuel transfer or gravity transfer. During the normal fuel transfer, the left fuselage tank transfer pump will pump fuel into both wing tanks. During the auxiliary fuel transfer, the right fuselage tank transfer pump will pump fuel into both wing tanks. During rapid fuel transfer, both the normal and auxiliary fuel transfer modes are energized. During gravity transfer, fuel will flow to both wing tanks through both transfer lines.

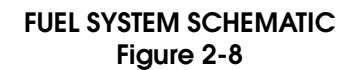
FUEL CONTROL PANEL SWITCHES AND ANNUNCIATORS

The fuel control panel incorporates all the necessary switches to maintain proper fuel management and to fuel the aircraft.

**FUEL CONTROL PANEL****Figure 2-7**

JET PUMP SWITCHES

The JET PUMP switches, on the fuel control panel, control the motive flow valves. The switches are an alternate action type. Selecting On, opens the corresponding motive flow valve and allows high-pressure fuel from the corresponding engine-driven fuel pump to flow to the corresponding jet pumps. Selecting OFF, closes the corresponding motive flow valve and renders the associated jet pumps inoperative. When OFF is selected, an OFF annunciation (on the switch) will illuminate and the Master CAUT lights will flash (Master CAUT will not illuminate during engine start). If a motive flow valve is neither open nor closed, the corresponding OFF annunciator will flash. The motive flow valves operate on 28 VDC supplied through the L and R JET PUMP-XFR VALVE circuit breakers on the pilot's and copilot's circuit breaker panels. Loss of power to the motive flow valve causes the valve to remain in its last position. Motive flow valves are operative during EMER BUS mode.



STBY PUMP SWITCHES

The STBY PUMP switches, on the fuel control panel, control the operation of the standby electric pumps. The switches are an alternate action type. The switches normally remain Off except in the event of a jet pump failure or during fuel crossflow. Regardless of switch position, the standby pumps are automatically de-energized during fuselage fuel transfer operations. The standby pumps are automatically energized when the fuselage tank FILL function is selected or the START-GEN switch is set to START. An ON annunciation (on the switch) will illuminate whenever power is applied to the corresponding standby pump. The green FUEL SYS light, on the glareshield annunciator panel, will also illuminate whenever a standby pump is on. The standby pumps operate on 28 VDC supplied through the L and R STBY-SCAV PUMP circuit breakers on the pilot's and copilot's circuit breaker panels.

XFLO VALVE SWITCH

The XFLO VALVE switch, on the fuel control panel, controls the crossflow valve. The switch is an alternate action type. Selecting Open, opens the crossflow valve allowing fuel to flow between the wing tanks. Whenever the crossflow valve is open, a horizontal bar (on the switch) will illuminate to annunciate the valve's open status. The green FUEL SYS light will also illuminate whenever the crossflow valve is fully opened. If the crossflow valve is neither open nor closed, the horizontal bar will flash. The crossflow valve is opened automatically when filling the fuselage tank from the wings and during fuselage fuel transfer operations. To balance wing fuel, the XFLO VALVE switch should be set to Open and the heavy side STBY PUMP switch set to ON. The standby pump on the light side should be OFF. The standby pump will continue to operate until the STBY PUMP switch is set to Off. The crossflow valve allows all usable wing fuel aboard the aircraft to be available to either engine. The switch should be set to Off except when correcting an out-of-balance condition. The crossflow valve operates on 28 VDC supplied through the XFLO VALVE circuit breaker on the pilot's circuit breaker panel. Loss of power to the crossflow valve causes the valve to remain in its last position. The crossflow valve is operative during EMER BUS mode.

NORM XFR SWITCH

The NORM XFR switch, on the fuel control panel, is used to operate the normal (left) fuel transfer system. The switch is an alternate action type. When NORM XFR is selected, the left transfer pump is energized, the left transfer valve will open, both standby pumps will be rendered inoperative, and the crossflow valve will open. Fuel will then be pumped from the fuselage tank to the wing tanks until the wing float switches actuate to de-energize the transfer pump and close the transfer valve (the crossflow valve will remain open). If the fuselage tank should empty before the wing float switches shut down the left transfer system, a pressure switch in the fuselage tank transfer line will illuminate the EMPTY light. The green FUEL SYS light will illuminate when NORM XFR is selected and flash whenever the EMPTY light illuminates. Setting the switch to Off will extinguish the EMPTY light (if illuminated), close the left transfer valve, de-energize the left transfer pump, enable the standby pumps, and close the crossflow valve. Whenever the left transfer valve is open, a vertical bar (on the switch) will illuminate to annunciate the valve's open status. If the transfer valve is neither open nor closed, the vertical bar will flash. An ON annunciation (on the switch) will illuminate whenever power is applied to the left transfer pump. The left fuel transfer valve operates on 28 VDC supplied through the L JET PUMP-XFR VALVE circuit breaker on the pilot's circuit breaker panel. Loss of power to the left transfer valve causes the valve to remain in its last position. The left transfer pump operates on 28 VDC supplied through the FUS TANK XFR PUMP circuit breaker on the pilot's circuit breaker panel. Both the valve and pump are operative during EMER BUS mode.

AUX XFR SWITCH

The AUX XFR switch, on the fuel control panel, operates the auxiliary (right) fuel transfer system which provides an alternate transfer system in the event the normal system fails or, when used in conjunction with the normal system, allows rapid transfer of fuselage fuel if desired. The switch is an alternate action type. When AUX XFR is selected, the right fuselage transfer pump is energized, the right transfer valve will open, both standby pumps will be rendered inoperative, and the crossflow valve will open. Fuel will then be pumped from the fuselage tank into the wing tanks. The switch should be set to Off when either the EMPTY light illuminates or the wing tanks become full. The green FUEL SYS light will illuminate when AUX XFR is selected and flash whenever the EMPTY light illuminates. Setting the switch to Off will close the right transfer valve, de-energize the right transfer pump, close the crossflow valve, enable the standby pumps, and extinguish the EMPTY light, if illuminated. Actuation of the wing float switches has no effect on the auxiliary (right) fuel transfer system. Therefore, if the switch is not set to OFF when the wing tanks are full, fuel will continue to circulate between the fuselage and wing tanks through the wing expansion and fuel transfer lines. When the fuselage tank is emptied, a pressure switch in the right transfer line will actuate to illuminate the EMPTY light. Whenever the right transfer valve is open, a vertical bar (on the switch) will illuminate to annunciate the valve's open status. If the transfer valve is neither open nor closed, the vertical bar will flash. An ON annunciation (on the switch) will illuminate whenever power is applied to the right transfer pump. The right fuel transfer valve operates on 28 VDC supplied through the R JET PUMP-XFR VALVE circuit breaker on the copilot's circuit breaker panel. Loss of power to the right transfer valve causes the valve to remain in its last position. The right transfer pump operates on 28 VDC supplied through the FUS TANK AUX PUMP circuit breaker on the copilot's circuit breaker panel. Both the valve and pump are operative during EMER BUS mode.

GRVTY XFR SWITCH

The GRVTY XFR switch, on the fuel control panel, can be used to transfer fuselage fuel without using the transfer pumps. The switch is an alternate action type. When GRVTY XFR is selected, both transfer valves will open, the crossflow valve will open, and both standby pumps will be rendered inoperative. Fuel will then gravity flow from the fuselage tank to the wing tanks until the wings are full or the wing and fuselage tank heads are equal. When using this method to transfer fuel, approximately 350 pounds (159 kilograms) of fuel will remain in the fuselage tank and the EMPTY light will be inoperative. To assure all possible fuel has been transferred, reference must be made to the fuel quantity indicator. The switch should be set to Off when all fuel possible has been transferred and during approach and landing. The green FUEL SYS light and an ON annunciation (on the switch) will illuminate whenever gravity transfer is selected. Gravity transfer is operative during EMER BUS mode.

FILL SWITCH

The FILL switch, on the fuel control panel, is used to operate the fuselage tank fill system. The switch is an alternate action type and must be held approximately 3 seconds to select the FILL function. When FILL is selected, both wing tank standby pumps are energized, both left and right transfer valves are opened via the fuselage tank float switch, and the crossflow valve will open. Fuel will then be pumped into the fuselage tank from the wing tanks until the switch is turned Off or the fuselage tank float switch actuates to close the transfer valves, shut down the standby pumps, and illuminate the FULL light. Placing the switch in the Off position will extinguish the FULL light and close the crossflow valve. The green FUEL SYS light and an ON annunciation (on the switch) will illuminate whenever fuselage tank fill is selected. If FILL is selected and the left wing float switch trips the LOW FUEL light or the squat switch goes to the air mode, the fuselage tank fill function will be automatically deselected. The FILL function may be subsequently reselected, if desired.

FUSELAGE TANK SWITCH PRIORITY

The FUSELAGE Tank switches are listed below in their order of priority (highest to lowest). If the FUSELAGE Tank switches are positioned to contradictory positions, the function with the highest priority will override conflicting functions.

1. NORM XFR and AUX XFR switches (both have same priority)
2. FILL switch
3. GRVITY XFR switch

FUSELAGE TANK FULL LIGHT

The FUSELAGE FULL light, on the fuel control panel, is installed to indicate a fuselage tank full condition during fuselage tank fill operations. The light is illuminated through actuation of the fuselage tank float switch. During normal fuselage tank fill operations, actuation of the float switch will illuminate the FULL light, close the transfer valves, and shut down the standby pumps. The FILL switch must be set to Off to extinguish the light.

FUSELAGE TANK EMPTY LIGHT

The FUSELAGE EMPTY light, on the fuel control panel, is installed to indicate a fuselage tank empty condition during fuel transfer. The light is operated by pressure switches in the left and right fuselage fuel transfer lines. As the fuselage tank empties during transfer operations, the pressure switches sense a loss of pressure in the transfer line and complete circuits to illuminate the EMPTY light. Either pressure switch can illuminate the light. Setting the NORM XFR and/or AUX XFR switch (as applicable) to Off will extinguish the light.

LO FUEL PRESS LIGHTS

The two LO FUEL PRESS lights, on the fuel control panel, repeat the L and R FUEL PRESS annunciators on the glareshield panel. See FUEL SYSTEM GLARESHIELD LIGHTS, this section.

FUEL GAGING SYSTEM

The fuel gaging system consist of a fuel quantity indicator installed in the cockpit, fuel quantity probes located in the various fuel tanks, and an optional total quantity indicator located near the single point pressure refueling controls. The fuel gaging system operates on 28 VDC supplied through the FUEL QTY PWR 1 and FUEL QTY PWR 2 circuit breakers on the pilot's and copilot's circuit breaker panels. The fuel gaging system is operative during EMER BUS mode.

FUEL QUANTITY INDICATOR

The fuel quantity indicator, on the instrument panel, indicates fuel quantity in pounds (or optionally kilograms) of fuel. The indicator has four digital readouts — one for the left wing tank, one for the right wing tank, one for the fuselage tank, and one which shows the total of the other three summed together. Inputs from the attitude heading reference system are used to correct the fuel quantity indication for aircraft pitch attitude. The indicator incorporates a feature to alert the crew of a fuel imbalance between the left and right wing tanks. Should a fuel imbalance of 500 pounds, (200 pounds if flaps are 8° or lower) or more occur, the fuel quantity reading representing the heavy wing and the IMB annunciator, on the fuel quantity indicator, will flash. The flashing annunciations may be cancelled by depressing and releasing the mute switch in the right thrust lever.

FUEL QUANTITY PROBES

Fuel quantity is sensed by four capacitance-type fuel quantity probes in each wing tank and a capacitance-type fuel quantity probe in the fuselage fuel tank. The left inboard fuel quantity probe incorporates a fuel temperature compensator which compensates for fuel density changes due to temperature.

TOTAL QUANTITY INDICATOR (SPPR)

The optional total quantity indicator, located with the single point pressure refueling controls, indicates total fuel quantity in pounds of fuel. The system may also be configured to indicate kilograms of fuel. The indicator has a digital readout which repeats the total indication shown on the cockpit indicator. Refueling personnel can use the indicator to determine the total fuel load without reference to the cockpit indicator.

FUEL SYSTEM GLARESHIELD LIGHTS

FUEL PRESS LIGHTS

The red L FUEL PRESS and R FUEL PRESS warning lights in the glareshield annunciator panel are installed to alert the pilot of a low fuel pressure condition. The FUEL PRESS lights are energized by a pressure switch installed in each engine fuel supply line between the aircraft fuel filter and the engine-driven fuel pump. When fuel supply pressure drops to 2.75 psi or below, the pressure switch closes to illuminate the respective light. At 3.75 psi, the switch will reopen. Should the light illuminate, the standby pumps should be used to supply engine fuel. The fuel control panel incorporates two LO FUEL PRESS lights which illuminate in conjunction with the associated glareshield warning light.

LOW FUEL LIGHT

The amber LOW FUEL caution light in the glareshield annunciator panel will illuminate when the fuel quantity in either wing tank decreases to approximately 410 pounds (186 kilograms) of fuel with the aircraft in a level attitude. The light is operated by a low wing fuel float switch installed in each wing tank. Either float switch may cause the light to illuminate.

FUEL SYS LIGHT

The green FUEL SYS light in the glareshield annunciator panel will illuminate whenever a fuel transfer function is selected on the fuel control panel.

The following conditions cause the light to illuminate:

- Crossflow valve is fully opened
- Either transfer valve (left or right) is open
- NORM, AUX, or GRVITY XFR is selected
- FILL is selected
- Either standby pump is on

The following conditions cause the light to flash:

- The fuselage EMPTY light is illuminated
- The fuselage FULL light is illuminated

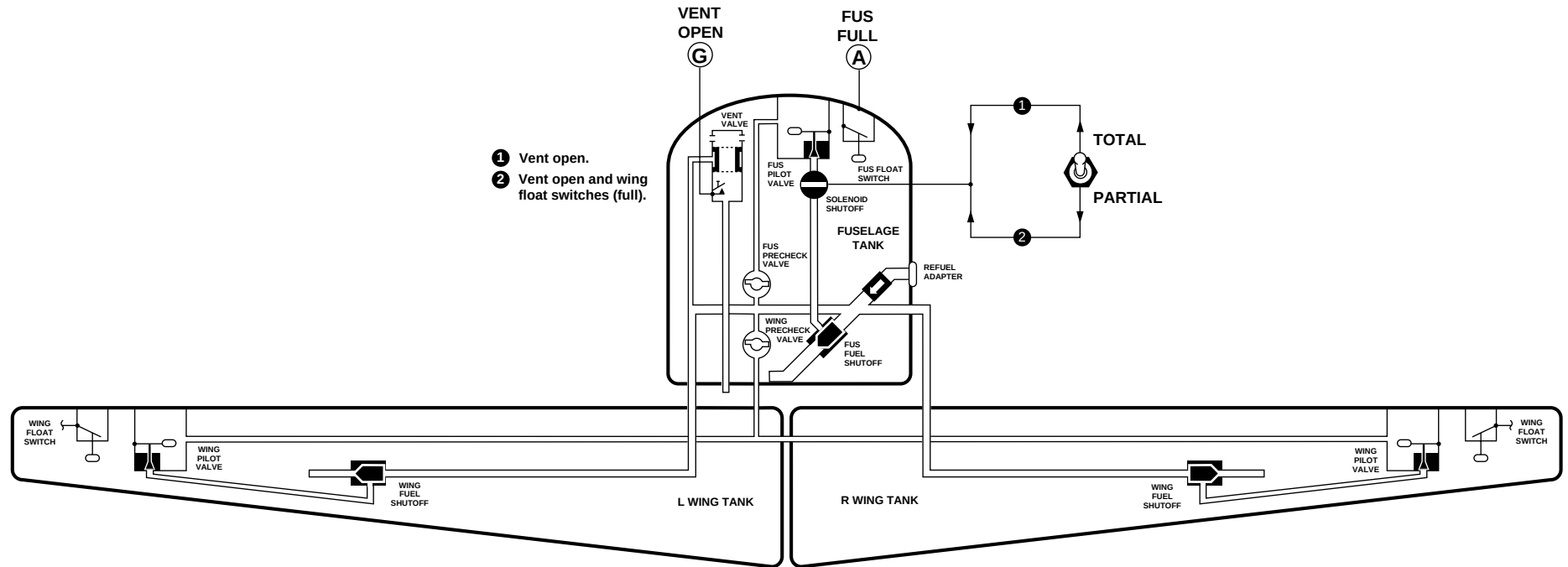
RAM AIR FUEL VENT SYSTEM

The fuel vent system provides ram air pressure to all interconnected components of the fuel system to ensure positive pressure during all flight conditions. Flush mounted underwing scoops (inboard) admit pressure to the fuselage vent system, and a separate set of underwing scoops (outboard) admit pressure for the wing vent systems. The fuselage vent line is connected to a sump that has a moisture drain valve. Each wing tank vent system has a sump with a moisture drain valve located next to the wing vent underwing scoops. Overpressurization due to thermal expansion in the wing tanks is relieved through the left and right expansion lines to the fuselage tank. Overpressurization of the fuselage tank, should the vent and expansion lines be clogged, is relieved overboard through a pair of pressure relief valves and a separate vent line.

SINGLE-POINT PRESSURE REFUEL (SPPR) SYSTEM

The single-point pressure refueling (SPPR) system allows the entire fuel system to be serviced through a fuel servicing adapter located on the right side of the aircraft below the engine pylon. An SPPR control panel is located immediately forward of the refuel adapter. The SPPR incorporates a precheck system which allows the operator to check the operation of the system vent and shutoff valves before commencing refuel operations. The major system components are the refuel adapter, the control panel, a vent valve, a shutoff valve and pilot valve for each tank (both wings and fuselage), solenoid valve for the fuselage tank, two precheck valves, and associated plumbing and wiring. The control panel is located on the right fuselage below the engine pylon. Electrical power to operate the system indicator lights and solenoid valve is 28 VDC supplied from the #2 battery through the BATT ON-OFF switch on the refuel control panel.

The vent valve is installed to prevent system overpressurization in the event of a shutoff valve failure. Operation of the valve is checked during the precheck sequence. The valve automatically opens whenever fuel pressure is applied to the system. When the valve reaches the full open position, a switch in the valve completes a circuit to illuminate the VENT OPEN light on the SPPR control panel.



SINGLE-POINT REFUEL SYSTEM SCHEMATIC
Figure 2-9

Each shutoff valve is controlled by the associated pilot valve located at the high point in each tank. When refueling pressure is applied to the system through the refuel adapter, pressurized fuel is applied to each shutoff valve. This pressure is applied to both sides of the valve poppet. If the pilot valve is open (associated tank not full), some of the pressure acting to hold the valve closed will be vented through the pilot valve and the pressure acting to unseat the poppet will drive the valve open against the spring tension. When the tank fills, the pilot valve will close, fuel pressure on both sides of the shutoff valve poppet will equalize, and spring tension will drive the valve closed.

The solenoid valve for the fuselage tank is located between the tank pilot valve and shutoff valve in the vent line. This valve is normally closed and must be energized open in order to open the shutoff valve for filling the tank. The valve is used to isolate the fuselage tank if filling that tank is not desired.

WING AND FUS PRECHECK VALVES

The WING and FUS PRECHECK valves are used to check operation of the system vent valve and individual shutoff valves before full refueling procedures are commenced. System precheck is accomplished with the Refuel Selector switch set to TOTAL in order to check all shutoff valves. When the WING and FUS PRECHECK valves are set to OPEN (grips vertical) and refuel pressure is applied to the refuel adapter, fuel will be admitted to the precheck lines and to the tank fill lines. The shutoff valves will open and fuel will flow into all tanks. The fuel in the precheck lines will empty into a float basin at each pilot valve. When the basin fills the pilot valve float will close the pilot valve, which causes the associated shutoff valve to close terminating fuel flow. The vent valve should open when fuel flow is initiated. Fuel flow should stop within 10 to 20 seconds.

SPPR BATT SWITCH

The BATT ON-OFF switch, on the refuel control panel, allows operation of the single-point pressure refuel system without the need to enter the cockpit in order to energize aircraft power. When the switch is set to ON, DC power from the aircraft's #2 battery is applied to the SPPR control circuits.

REFUEL SELECTOR SWITCH

The Refuel Selector switch, on the SPPR fuel control panel, is used to select the tank(s) to be filled during refueling. The switch has two positions: TOTAL and PARTIAL.

The TOTAL position of the Refuel Selector switch is used to fill the wing and fuselage tanks simultaneously. When TOTAL is selected and refueling pressure is applied (vent valve opens), circuits are completed to open the fuselage tank solenoid valve. When the solenoid valve opens the fuselage tank shutoff valve will open to admit fuel into the fuselage tank.

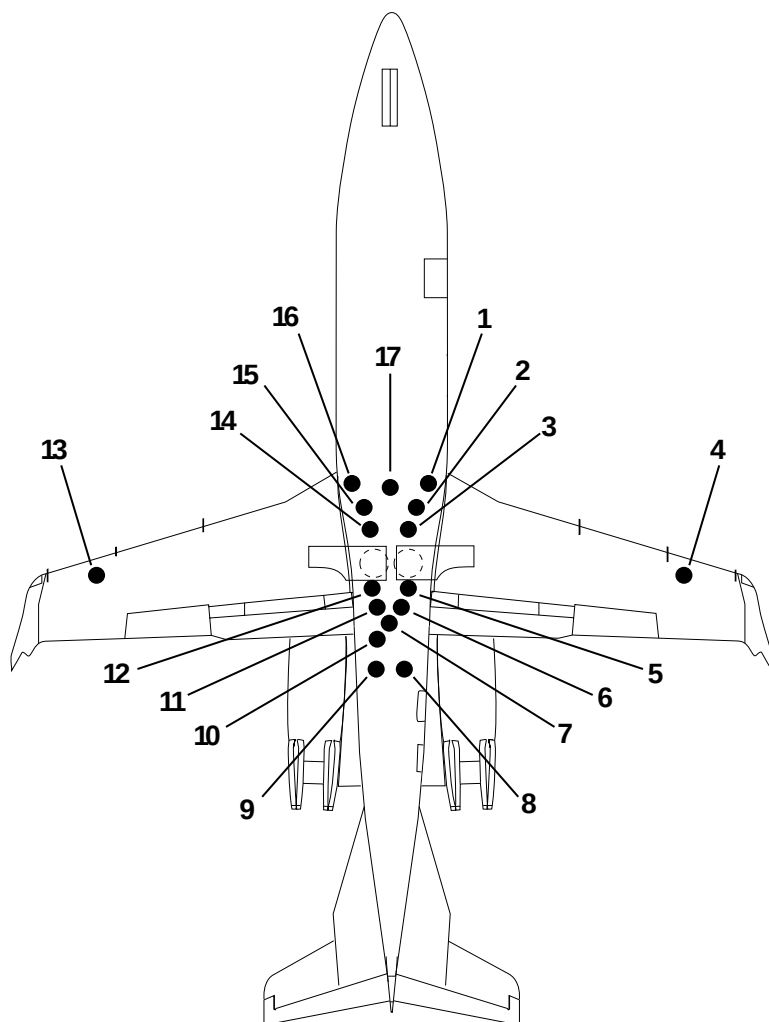
The PARTIAL position of the Refuel Selector switch is used to fill the wings first and then the fuselage. This is useful when full wings and less than full fuselage fuel is desired. When PARTIAL is selected and the vent valve opens, the fuselage tank solenoid valve will be controlled by the wing high-level float switches. When the wings are full, the wing high-level float switches complete the circuit to open the fuselage tank solenoid valve. When the solenoid valve opens, the fuselage tank shutoff valve will open and admit fuel to the fuselage tank.

FUS FULL LIGHT

The amber FUS FULL light, on the refuel control panel, will illuminate whenever the fuselage tank float switch actuates. The light illuminates to alert the operator that refuel operations should have automatically terminated. If fuel flow continues with the light illuminated, fueling operations should be immediately terminated.

VENT OPEN LIGHT

The green VENT OPEN light, on the refuel control panel, will illuminate whenever the fuselage tank vent valve opens. The light is operated by a microswitch in the valve. The circuit for the fuselage tank solenoid valve is wired through this switch to prevent filling the fuselage tank until the vent valve opens.



- | | |
|-----------------------------|-------------------------------|
| 1. Left Wing Scavenge Pump | 10. Fuselage Tank Sump |
| 2. Left Wing Sump | 11. Right Wing Transfer Line |
| 3. Left Engine Fuel | 12. Right Wing Expansion Line |
| 4. Left Wing Vent (sump) | 13. Right Wing Vent (sump) |
| 5. Left Wing Expansion Line | 14. Right Engine Fuel |
| 6. Left Wing Transfer Line | 15. Right Wing Sump |
| 7. Fuel Vent (fuselage) | 16. Right Wing Scavenge Pump |
| 8. Left Fuel Filter | 17. Fuel Crossover |
| 9. Right Fuel Filter | |

FUEL DRAINS
Figure 2-10

FUEL ANTI-ICING ADDITIVE

Anti-icing additive is not a requirement. However, for microbial protection, it is recommended that anti-icing additive be used at least once a week for aircraft in regular use and whenever a fueled aircraft will be out of service for a week or more. Refer to the Airplane Flight Manual for the recommended concentration and the proper method of blending anti-icing additive.

REFUELING

The aircraft may be refueled through filler caps on each wing tip or through the single-point pressure refuel adapter on the right fuselage below the engine pylon. Bonding jacks are located on the underside of each wing near the fuel filler and behind the SPPR control panel door. Refer to the Airplane Flight Manual for approved fuels and proper refueling procedures.

AUXILIARY POWER UNIT (APU)

The Auxiliary Power Unit (APU), located in the rear equipment bay, is a self-contained, single stage gas turbine unit that can be operated continuously up to an ambient temperature of 130° F (54° C). The APU provides electric power for ground operations of the aircraft electrical system, independent of the aircraft main engines. It is restricted to ground operations only. The starting, acceleration and operation of the engine is controlled by an integral system of automatic and coordinated pneumatic and electromechanical controls.

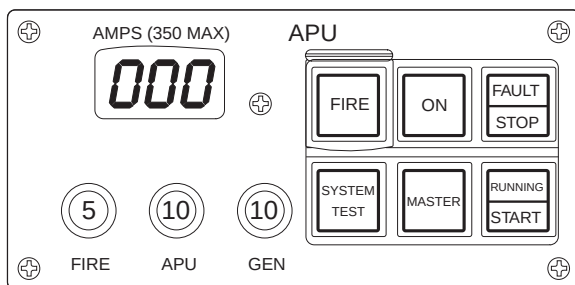
The APU engine is comprised of three major sections: the accessory section, compressor section and turbine section. Engine power for the auxiliary power unit is developed through compression of ambient air by a single entry, radial, outward-flow, centrifugal compressor. The compressed air, when mixed with fuel and ignited, drives a radial inward-flow turbine rotor.

The APU control panel (located above the copilot's circuit breaker panel) contains all the primary controls to operate the APU. There is also an APU Relay Panel and APU BITE (Built-In-Test-Equipment) box (primarily for maintenance use), located in the APU compartment, which displays the fault codes associated with the APU.

The engine is controlled and serviced by four systems: the engine fuel system, lubrication system, electrical system and indicating system. Fuel for the APU flows from the left wing fuel tank, through the APU boost pump, a shutoff valve and a fuel filter prior to reaching the APU. The APU uses approximately 40 pounds of fuel per hour. Running out of fuel in the left wing fuel tank will introduce air in the APU fuel lines which will cavitate the APU and prevent it from restarting immediately. The APU gearbox serves as an oil sump for the APU self-contained lubrication system. The APU Electronic Sequence Unit (ESU) is a fully automatic system that directs delivery of the correct amount of fuel regardless of ambient conditions and load requirements, as well as properly sequencing control of fuel and ignition during starting. The ESU also monitors engine parameters during operation and automatically shuts down the APU in the event a parameter is not within operational limits. A weight-on-wheels input prevents operation of the APU while airborne.

APU CONTROL PANEL

The APU control panel, located above the copilot's circuit breaker panel, houses the necessary controls for operation and monitoring. APU fire detection/extinguishing controls are also located on the APU control panel.



APU CONTROL PANEL
Figure 2-11

APU AMPS INDICATOR

The AMPS indicator is a digital display indicating the amperage output of the APU generator (shows zero during start). Display will flash when current is at or above 400 amps.

APU FIRE

This switch/indicator is used to show an APU system fire or overheat (800°F at a single point in the fire loop or 375°F within overall length of the fire loop) and activate the APU fire extinguishing system. Should there be a fire/overheat in the APU, as detected by the fire loop, the FIRE switch/indicator will indicate FIRE (red), the aircraft Master WARN light will illuminate, and the APU fire warning horn will sound. The fire detection/extinguishing system will automatically shut down the APU by closing the fuel shutoff valve, and activate the fire extinguisher within 20 seconds.

Depressing the FIRE switch/indicator will also shut down the APU and discharge the APU fire extinguishing bottle.

APU FAULT/STOP SWITCH

This switch/indicator is a momentary, two cell, lighted switch. The lower portion is labeled STOP (white) and during normal operation this switch is used to shut down the APU by sending an overspeed signal to the Electronic Sequence Unit of the APU. A normal shutdown will not cause the FAULT half of the switch to illuminate. The top portion of this switch is labeled FAULT (amber) and shows a malfunction in the APU system. The APU will automatically shut down if a fault is sensed. The FAULT indicator circuit is latched and is cleared by the FAULT RESET switch on the APU relay box, located near the APU.

APU RUNNING/START SWITCH

This switch/indicator is a momentary, two cell, lighted switch. Depressing this switch initiates the APU start sequence. The lower portion is labeled START (white) and is illuminated whenever the MASTER Switch is on to identify the switch. The top portion is labeled RUNNING (green) and is illuminated when the APU is running and supplying or ready to supply power to the aircraft.

APU MASTER SWITCH

The APU MASTER switch is used to power up the APU control circuits from the aircraft normal electrical system. The legend is daylight readable and illuminated white when the aircraft NAV light switch is on.

APU ON INDICATOR

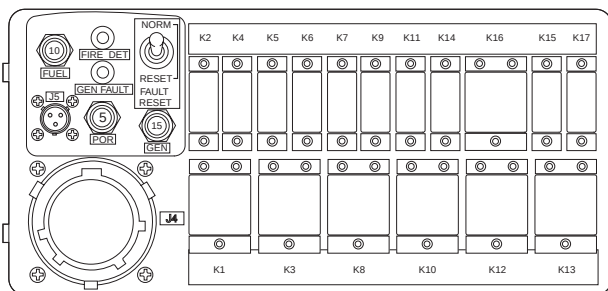
The APU ON (green) indicator illuminates when the MASTER switch is on.

APU SYSTEM TEST SWITCH

The APU SYSTEM TEST switch tests the integrity of the APU fire loop/extinguishing system. Depressing this switch will also test all annunciator lights on the APU control panel, sound the APU fire horn, close the APU fuel shutoff valve and illuminate the aircraft Master WARN/CAUT lights. Depressing this switch while the APU is running will close the APU fuel shutoff valve and shut down the APU.

APU RELAY PANEL

The APU relay panel is located in the rear equipment bay, next to the APU. The panel contains circuit breakers and relays which interface to the APU control panel and system components for starting and operating the APU. The relay panel also contains two magnetic latching BITE indicators to display generator faults or overheat faults.



APU RELAY PANEL
Figure 2-12

FIRE DET BITE INDICATOR

The white FIRE DET indicator shows a fire or overheat condition has been detected.

GEN FAULT BITE INDICATOR

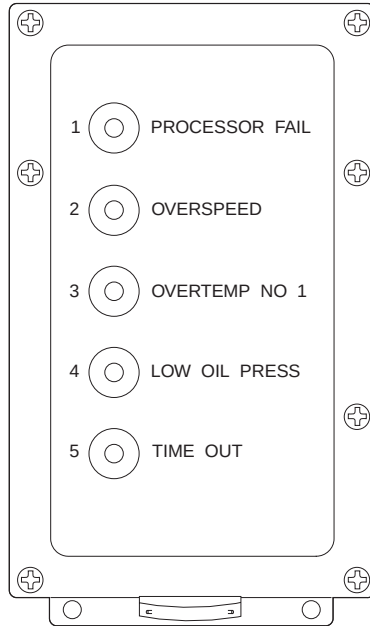
The white GEN FAULT indicator shows a generator fault has been detected by the ESU.

FAULT RESET SWITCH

This switch has two positions, NORM and RESET. The switch is spring loaded to remain in the NORM position for normal APU operations. Selecting the RESET position resets the FIRE DET and the GEN FAULT BITE indicators.

APU BITE ANNUNCIATOR BOX

The BITE annunciator box, located in the APU compartment, will display any fault codes (BITE indication) encountered. An indicator activated white shows a malfunction.

**APU BITE ANNUNCIATOR BOX****Figure 2-13****APU GENERATOR**

Refer to Section IV, ELECTRICAL & LIGHTING, for information on the APU generator.

APU OPERATING PROCEDURES

APU PRE-START CHECK

This check should be accomplished in addition to the Preflight Inspection in Section II of the FAA approved Airplane Flight Manual.

1. APU Oil Level — Check.
2. Check APU area for indications of oil or fuel leaks.
3. FUEL, GEN, & POR (Point of Regulation) Circuit Breakers (APU Relay Panel) — Set.
4. APU Inlet & Exhaust — Clear.
5. FIRE, APU, & GEN Circuit Breakers (APU Control Panel) — Set.
6. BATTERY 1 & BATTERY 2 Switches — On.
7. GPU (if desired) — Connect.
8. Verify 18 volts minimum are available for starting the APU.
9. Left Wing Fuel Quantity — Check.
10. APU MASTER Switch — Press. Verify ON, START, STOP and AMPS indicator all illuminate.
11. APU SYSTEM TEST Switch — Press. APU fire horn sounds, APU FIRE warning switch, all APU annunciator lights illuminate and the digital AMPS indicator displays all 8's.

APU START-UP

To start the APU:

1. BCN/STROBE Switch — BCN.
2. APU START Switch — Press (momentarily). An automatic start sequence is initiated and the following events will occur:
 - The APU engine start relay receives starting power from the aircraft batteries or external power.
 - At 5% RPM the APU fuel shutoff valve opens.
 - At 65% RPM the starter is de-energized.
 - At 98% RPM + 20 seconds the green RUNNING annunciator illuminates indicating the APU is ready to provide electrical power. If external ground power is not being used, the APU generator will automatically go on-line and the AMPS indicator will indicate the APU generator load.

APU SHUTDOWN

To shut down the APU:

1. APU STOP Switch — Press (momentarily). An automatic shut-down sequence is initiated. Verify that the green RUNNING light goes off.
2. APU MASTER Switch — Press. The APU ON annunciator will extinguish.
3. BCN/STROBE Switch — Off.
4. BATTERY Switches — Off.

APU SHUTDOWN FEATURES (Automatic)

During APU operation, the ESU monitors engine speed, temperature, oil pressure and electrical surge conditions. The ESU contains circuitry which will automatically send a signal to the APU Relay Panel which in turn will close the fuel shutoff valve and shut down the APU under the following conditions:

- Overspeed
- Underspeed
- Over temperature
- Low oil pressure
- Loss of EGT signal to the APU ESU
- Loss of RPM
- High oil temperature
- APU fire indication
- Low fire bottle pressure
- Generator malfunction

SECTION III

HYDRAULICS & LANDING GEAR

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SECTION III

HYDRAULICS & LANDING GEAR

HYDRAULIC SYSTEM

The aircraft hydraulic system supplies hydraulic pressure for operation of the aircraft landing gear, brake, flap, spoiler and thrust reverser systems. Hydraulic fluid is supplied from the hydraulic reservoir through shutoff valves to the engine-driven hydraulic pumps for distribution to the required systems upon demand. The engine-driven, variable-volume hydraulic pumps will normally maintain system pressure between 1400 and 1550 psi. A pressure relief valve installed between the high-pressure and return lines will open to relieve pressure in excess of 1750 psi. Reservoir pressure is maintained at approximately 20 psi by bleed air supplied through a pressure regulator. Reservoir pressure in excess of 20 psi is relieved overboard by a pressure relief valve and a vacuum relief valve prevents negative pressure in the reservoir. Two precharged (850 psi) hydraulic accumulators are installed to absorb pressure surges. Both accumulator indicators are located under the right engine behind a transparent sight panel. The right-hand accumulator is plumbed for the brakes, landing gear and flaps; the left-hand accumulator is plumbed primarily to power thrust reverser operations but assists the main system accumulator for landing gear, flap and brake operation. Two high-pressure filters and one return filter prevent hydraulic fluid contamination. The return filter incorporates a bypass valve which will open in the event it becomes clogged. Both the high-pressure and return filter incorporate an overpressure bypass button. An auxiliary hydraulic pump is installed to provide system pressure in the event of a malfunction or during engine-off ground operations.

The thrust reverser hydraulic system incorporates a mechanically controlled isolation valve that will shut off hydraulic fluid to the thrust reverser system if it senses that hydraulic pressure in the main hydraulic system has dropped below approximately 150 psi. This prevents thrust reverser activation in the unlikely event of engine-driven pump failure. A one-way check valve downstream of the thrust reverser system ensures that fluid does not back-up from the main system.

Two motor-driven firewall shutoff valves can stop hydraulic fluid flow to the engine-driven hydraulic pumps in the event of an emergency or engine fire. Each shutoff valve is operated by the corresponding ENG FIRE PULL T-handle on the glareshield. (Refer to ENGINE FIRE EXTINGUISHING). The valves operate on 28 VDC supplied through the L and R FW SOV circuit breaker on the pilot's and copilot's circuit breaker panels respectively. Loss of power causes the shutoff valves to remain in their last position. The firewall shutoff valves are operative during EMER BUS mode.

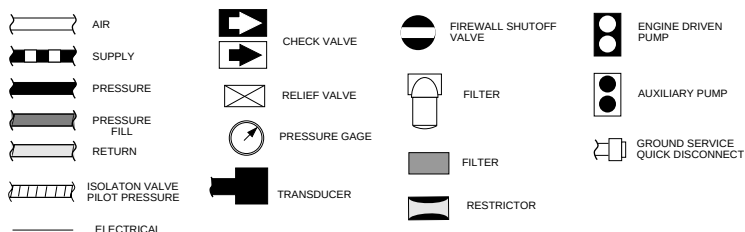
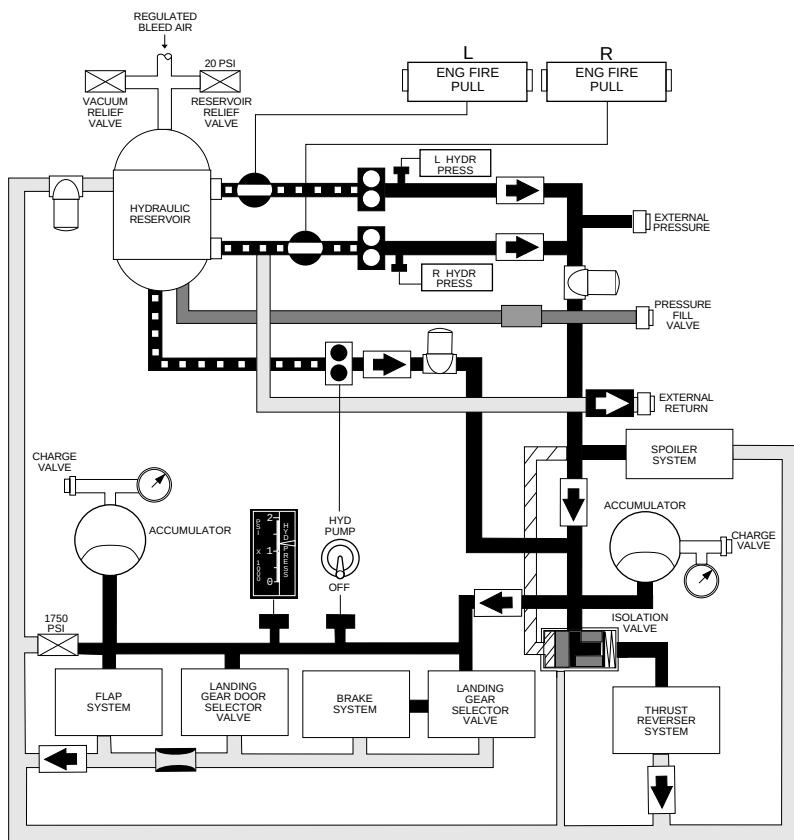
The system is serviced through a ground service access located below the right engine pylon. The service access includes quick-disconnect ports for pressure and return lines, an air valve for accumulator charging, and a direct-reading accumulator pressure gage.

HYD PUMP SWITCH

The auxiliary hydraulic pump is controlled by the HYD PUMP switch located on the center switch panel. When the switch is placed in the On (HYD PUMP) position, the auxiliary hydraulic pump is cycled by a pressure sensing switch plumbed into the high-pressure side of the system. The pressure switch will energize the auxiliary hydraulic pump if system pressure drops below approximately 1000 psi and then de-energize the pump when system pressure rises above approximately 1100 psi. The auxiliary hydraulic pump is plumbed to provide hydraulic pressure for the landing gear, wheel brake, and flap systems only and will not supply pressure for operation of the spoilers or thrust reversers. The auxiliary hydraulic pump operates on 28 VDC supplied through a current limiter and is available when EMER BUS is selected. Refer to Airplane Flight Manual for hydraulic pump limitations.

HYDR PRESS LIGHTS

Illumination of the amber L and R HYDR PRESS lights on the glareshield annunciator panel indicate low hydraulic system pressure from either the left or right engine-driven pump respectively. The lights are operated by the hydraulic pump pressure switches that sense hydraulic pressure provided by each engine-driven pump. The L or R HYDR PRESS light will illuminate when hydraulic system pressure drops below approximately 150 (± 50) psi in the engine-driven hydraulic pump line.



HYDRAULIC SYSTEM SCHEMATIC
Figure 3-1

HYD PRESS INDICATOR

The HYD PRESS indicator is a vertical-scale instrument and is located on the center switch panel adjacent to the auxiliary hydraulic pump and anti-skid switches. The indicator face consists of a vertical scale marked from 0 to 2000 psi in 500 psi increments and a pointer at the right margin of the instrument. The instrument is operated by a pressure transducer plumbed to the high-pressure side of the hydraulic system in the gear, flap and brake part of the circuit. The indicator operates on 28 VDC supplied through the HYDRAULIC PRESS IND circuit breaker on the copilot's circuit breaker panel. Refer to Airplane Flight Manual for instrument limit markings.

EMERGENCY AIR SYSTEM

Two emergency air bottles (3000 psi) are installed to provide alternate gear extension and emergency braking in the event of an electrical or hydraulic system failure. One bottle provides air pressure to operate the emergency gear extension blow down system and the other bottle provides air pressure to operate the emergency brakes and emergency gear extension free fall systems. One emergency air bottle is installed behind the left wing/fuselage fairing, and the other is installed behind the right wing/fuselage fairing. Refer to LANDING GEAR ALTERNATE EXTENSION and EMERGENCY BRAKING for system operation.

EMERGENCY AIR PRESSURE INDICATOR

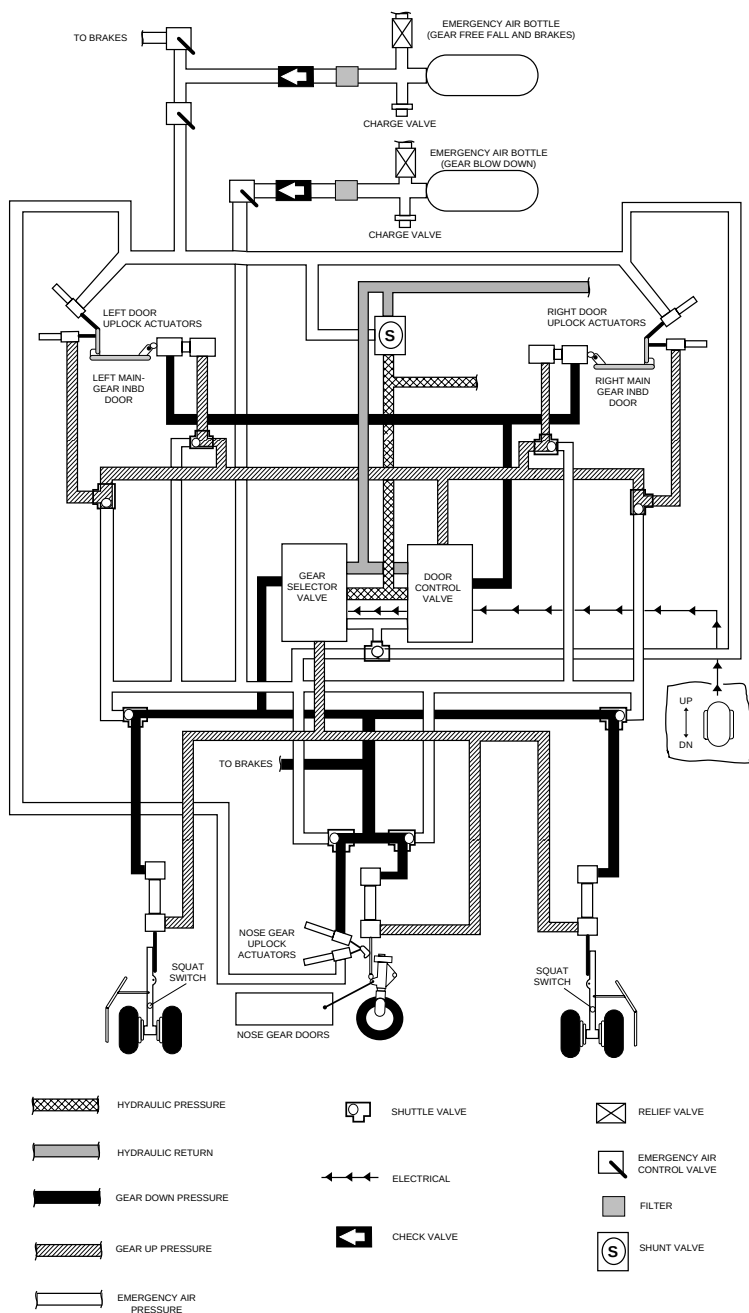
The emergency air pressure indicator is a vertical scale, dual-reading instrument and is located on the center switch panel adjacent to the hydraulic pressure indicator. The indicator face consists of a center scale reading from 0 to 4000 psi in 500 psi increments and two pointers on opposite margins of the scale. The left margin is labeled GEAR AIR and the right margin is labeled BRAKE AIR. The indicator pointers are operated by transducers plumbed to the corresponding emergency air bottles. The GEAR AIR pointer indicates the state of charge for the air bottle operating the alternate gear extension blow down system and the BRAKE AIR pointer indicates the state of charge for the air bottle operating the emergency braking and alternate gear extension free fall systems. The indicator operates on 28 VDC supplied through the AIR PRESS IND circuit breaker on the copilot's circuit breaker panel. Refer to Airplane Flight Manual for instrument limit markings.

LANDING GEAR SYSTEM

The landing gear is hydraulically retractable, tricycle gear with air-hydraulic shock strut-type nose and main gear. The main gear has dual wheels and brakes on each strut. Each main gear wheel is equipped with two fusible plugs which will melt and release tire pressure in the event wheel temperature reaches 390°F. The brake system incorporates four power-assisted disc-type brakes with an integral anti-skid system. The nose gear utilizes a chined tire to prevent splashing into the engine inlet. Nose wheel steering is electrically controlled by the rudder pedals. Hydraulic pressure for gear retraction and extension is transmitted by a system of tubing, hoses, and actuating cylinders, and is electrically controlled by limit switches and solenoid valves. Alternate extension can be accomplished pneumatically in case of hydraulic or electrical system failure. Two doors enclose each main gear after retraction. The inboard doors are hydraulically operated and the outboard doors are mechanically operated by linkage connected to the main gear struts. The nose gear doors operate mechanically with linkage attached to the nose gear shock strut.

LANDING GEAR SELECTOR SWITCH

The LANDING GEAR switch, located on the center instrument panel, is a lever-lock type switch and must be pulled aft before selecting the UP or DN position. The switch controls the position of the gear selector valve and the door selector valve through gear and door position switches. Electrical power for the control circuits is 28 VDC supplied through the GEAR circuit breaker on the copilot's circuit breaker panel. The landing gear control circuits are operative during EMER BUS mode.



LANDING GEAR EXTENSION/RETRACTION SCHEMATIC
Figure 3-2

Landing gear retraction cycle: When the LANDING GEAR switch is placed in the UP position and the squat switches are in the air mode, the following sequence of events will occur:

1. 28 VDC will be applied to the “open” solenoid of the door selector valve and hydraulic pressure will be applied to both inboard main gear door uplock actuators and door actuators.
2. When the inboard main gear doors open, door open switches will complete a circuit from the LANDING GEAR switch to the “up” solenoid of the gear selector valve. Hydraulic pressure will be applied to the main and nose gear actuators and the gear will retract.
3. When the main gear retract, gear up switches will complete a circuit from the LANDING GEAR switch to the “close” solenoid of the door selector valve. Hydraulic pressure will be applied to the inboard main gear doors actuators to raise the gear doors. Additionally, a gear down safety switch will complete a circuit to the “up” solenoid of the gear selector valve to maintain continuous hydraulic pressure in the gear actuators.
4. The gear doors are latched by uplatch actuator spring tension.

Landing gear extension cycle: When the LANDING GEAR switch is placed in the DN position the following sequence of events will occur:

1. 28 VDC will be applied to the “open” solenoid of the door selector valve and hydraulic pressure will be applied to both inboard main gear door uplock actuators and door actuators.
2. When the main gear doors open, door open switches will complete a circuit from the LANDING GEAR switch to the “down” solenoid of the gear selector valve. Hydraulic pressure will be applied to the main and nose gear actuators and the gear will extend.
3. When the main gear are full down, gear down switches will complete a circuit from the LANDING GEAR switch to the “close” solenoid of the door selector valve. Hydraulic pressure will be applied to the inboard main gear door actuators to raise the gear doors. Additionally, a gear down safety switch will complete a circuit to the “down” solenoid of the gear selector valve to maintain continuous hydraulic pressure in the gear actuators.
4. The gear doors are latched by uplatch actuator spring tension.

LANDING GEAR POSITION INDICATORS

The landing gear position display, located on the EIS Flight Page, consists of gear indications arranged in a triangular pattern. The indicators are green, red, amber, or white in color. The location of each indicator in the triangular arrangement corresponds to the location of the gear on the aircraft. A DN (green) indication signifies the corresponding gear is down and locked. An unsafe (red rectangle) signifies that the corresponding gear is not in the down and locked position. A door unsafe (white or amber rectangle) displayed along with the DN (green) indication, signifies that the corresponding main gear door is open. During the gear retraction sequence, the unsafe (white rectangle) indicators will display when the sequence is initiated, remain displayed throughout the retraction cycle, and then extinguish when the nose gear is up and locked and the main gear inboard doors close. During the gear extension sequence, the unsafe (white rectangle) indicators will display when the sequence is initiated, remain displayed throughout the extension cycle, and then extinguish when the nose gear is down and locked and the main gear inboard doors close. The indicators are operated by the same switches that control the landing gear extension and retraction cycles. Refer to Airplane Flight Manual for detailed information on the landing gear position indicators.

The indicators may be tested with the landing gear retracted by using the GEAR function of the system test switch. When the system test switch is pressed, the landing gear unsafe indicators on the EIS Flight Page will display, the mute light will illuminate on the landing gear switch panel and the landing gear warning horn will sound. If the landing gear is down, only the landing gear warning horn will sound.

LANDING GEAR WARNING SYSTEM

A landing gear warning system is installed to warn the operator of potentially unsafe flight conditions with the landing gear retracted. The system consists of the landing gear warning horn, a thrust lever position switch, and flap position switches. The warning system also uses the landing gear position switches and unsafe indicators. The ADCs (air data computers) provide the airspeed/altitude trip signal. Depending upon the flight condition encountered, one of two distinct warnings will be given as follows:

Warning horn sounds and three red gear unsafe indicators display —

This indicates that the landing gear is not down, airspeed is below approximately 170 KIAS, altitude is below approximately 16,300 feet, and at least one thrust lever is below the 60% N1 position. When the horn sounds under these conditions, the horn can be silenced by depressing the MUTE switch on the LANDING GEAR control panel or depressing the MUTE button in the right thrust lever handle. Whenever the warning horn has been muted, the amber MUTE light on the LANDING GEAR control panel will illuminate. The unsafe indicators will continue to display until either the landing gear is extended or one of the above conditions is corrected.

Warning horn only sounds — Normally, sounding of the warning horn without a corresponding unsafe indicator being displayed signifies that the landing gear is not down and the flaps are lowered beyond 25°. When the horn sounds because the flaps are lowered, the horn cannot be silenced by either mute switch. The horn will continue to sound until either the landing gear is extended or the flaps are retracted.

LANDING GEAR ALTERNATE EXTENSION

In the event of a main hydraulic system failure or an electrical system malfunction, the landing gear can be extended pneumatically. Pneumatic gear extension can be accomplished by using either the alternate gear blow down system or the alternate gear free fall system. However, to ensure adequate emergency air supply for emergency braking (hydraulic system failure) or to ensure hydraulic pressure can be regained (electrical malfunction), it is recommended that blow down be selected first. If an attempt to blow down the gear is unsuccessful, alternate gear free fall should be selected. Air pressure to operate the blow down system is supplied by the GEAR AIR emergency air bottle and is controlled by the EMERGENCY BLOW DOWN GEAR lever on the right side of the pedestal. Air pressure to operate the free fall system is supplied by the BRAKE AIR emergency air bottle and is controlled by the EMERGENCY FREE FALL GEAR lever on the right side of the pedestal forward of the blow down lever. Whenever alternate gear extension is to be selected, the LANDING GEAR selector switch should be placed in the DOWN position and the GEAR circuit breaker on the copilot's circuit breaker panel should be pulled. This will prevent inadvertent gear retraction in the event electrical power to the system is regained.

GEAR BLOW DOWN

When the EMERGENCY BLOW DOWN GEAR lever on the right side of the pedestal is pushed full down (until lever latches), air pressure from the GEAR AIR emergency air bottle is admitted to the blow down system through the lever actuated blow down valve. Since the air pressure is greater than the landing gear system hydraulic pressure, shuttle valves in the landing gear system will reposition to admit air pressure to the landing gear system inboard main gear door and door uplock actuators, the main gear actuators, the nose gear uplock and gear actuators, the gear control valve, and the door control valve. The gear and door selector valves are positioned to “down” to prevent inadvertent gear retraction. When the landing gear is down and locked, the three green DN indicators will display. The two main gear door unsafe indicators will remain displayed after gear extension due to the inboard main gear doors remaining open. When emergency gear blow down is selected, it is not required that the EMERGENCY BLOW DOWN GEAR lever be returned to the “up” position prior to landing. However, the lever must be returned to the “up” position prior to servicing either the GEAR AIR bottle or the hydraulic system. The EMERGENCY BLOW DOWN GEAR lever is returned to the “up” position by lifting the lever release (small metal tab available through a small hole immediately forward of the lever) and pulling the lever to the full up (latched) position.

GEAR FREE FALL

When the EMERGENCY FREE FALL GEAR lever on the right side of the pedestal is pushed full down (until lever latches), air pressure from the BRAKE AIR and free fall emergency air bottle is admitted to the free fall system through the lever actuated free fall valve. The air pressure is directly applied to an uplock actuator for each inboard main gear door, a nose gear uplock actuator, the door selector valve, the gear selector valve, and a hydraulic pressure shunt. The uplock actuators open the gear doors and release the nose gear uplock allowing the gear to free fall. The gear and door selector valves are positioned to “down” to prevent inadvertent gear retraction. The hydraulic pressure shunt diverts hydraulic system pressure to a hydraulic return line. Full gear extension should occur within 30 seconds with a complete loss of hydraulic pressure. When the landing gear is down and locked, the three green DN indicators will display. The two main gear door unsafe indicators will remain displayed after extension due to the inboard main gear doors remaining open. When emergency gear free fall is selected, the EMERGENCY FREE FALL GEAR lever must be returned to the “up” position in order to retain BRAKE AIR bottle pressure for emergency braking (hydraulic system failure) or in order to allow the hydraulic shunt to reposition, allowing the hydraulic system to regain pressure (electrical malfunction). The EMERGENCY FREE FALL GEAR lever is returned to the “up” position by lifting the lever release (small metal tab available through the small hole immediately forward of the lever) and pulling the lever to the full up (latched) position.

NOSE WHEEL STEERING SYSTEM

The digital nose wheel steering system is a steer by wire system that receives pilot commands through dual rudder pedal position and dual rudder pedal force sensors. The computer processes information from the rudder pedal position and force sensors and three anti-skid wheel speed generators and steering authority is modified as a function of aircraft ground speed. For low speed ground operations 60° of steering authority either side of neutral is available. At low speed and large rudder pedal deflection the nose wheel displacement will be large for high maneuverability. Once a rudder pedal has reached its stop, further nose wheel displacement is generated by additional force being applied to that rudder pedal. As ground speed increases, the maximum wheel deflection is reduced to zero. At 90 knots 28 VDC is removed and the system disengages. Above 90 knots the nose wheel is allowed to castor. Nose wheel steering engage circuits are controlled through the momentary-action pedestal-mounted NOSE STEER/ARM switch and the Control Wheel Master Switches (MSW). When the squat switches are in the ground mode, depressing and releasing the NOSE STEER/ARM switch will activate the computer when AC and DC power are available, the nose gear is down and locked, and no faults are detected by the system monitor. When the system is active the STEER ON annunciator on the glareshield and the ARM annunciator on the NOSE STEER/ARM switch will illuminate. At 90 knots, when the system disengages, the glareshield STEER ON annunciator will extinguish. When the nose gear is no longer in the down and locked position, the ARM annunciator on the NOSE STEER/ARM switch will extinguish, however; the computer is still powered and system monitor circuitry remains active. When the nose gear is down and locked for landing the ARM annunciator on the NOSE STEER/ARM switch will illuminate provided no faults have been detected. After touchdown, when ground speed decreases to 90 knots, the STEER ON light on the glareshield will illuminate and steering authority will increase as ground speed decreases.

If the system cannot be armed, limited authority steering (24° either side of neutral) is available by depressing and holding either MSW. It should be noted that in some instances, even though a fault has been detected, the system will continue to function normally until shutdown. After that, however; it will not be possible to operate the system with full steering authority until the fault has been corrected. If the system cannot be accessed by either MSW, sufficient control is still available by differential braking.

The nose wheel steering system is powered by 28 VDC supplied through the NOSE STEER circuit breaker and 115 VAC supplied through the NOSE STEER circuit breaker in the TRIM-FLT CONT group on the copilot's circuit breaker panel.

STEER ON LIGHT

The green STEER ON light on the glareshield annunciator panel illuminates to indicate the nose wheel steering system is capable of responding to rudder pedal inputs.

NOSE STEER/ARM SWITCH

Normally, the NOSE STEER switch is used to activate nose steering circuits for taxi operations. Momentarily depressing the NOSE STEER switch will activate the system and the ARM annunciator will illuminate. When nose steering has been activated, the system can be disengaged by depressing then releasing either the pilot's or copilot's Control Wheel Master Switch (MSW) or by depressing the NOSE STEER switch a second time. The disconnect tone will sound.

CONTROL WHEEL MASTER SWITCH — NOSE STEERING FUNCTION

Depressing and holding either Control Wheel Master Switch (MSW) will engage the nose wheel steering system. While the MSW is held, the nose steering system will operate normally and the STEER ON annunciator will be illuminated. When the MSW is released, the nose wheel steering system will disconnect. The STEER ON annunciator will extinguish. In the event that nose wheel steering will not arm, the MSW can be depressed and held for limited authority steering, under some fault conditions.

WHEEL BRAKE SYSTEM

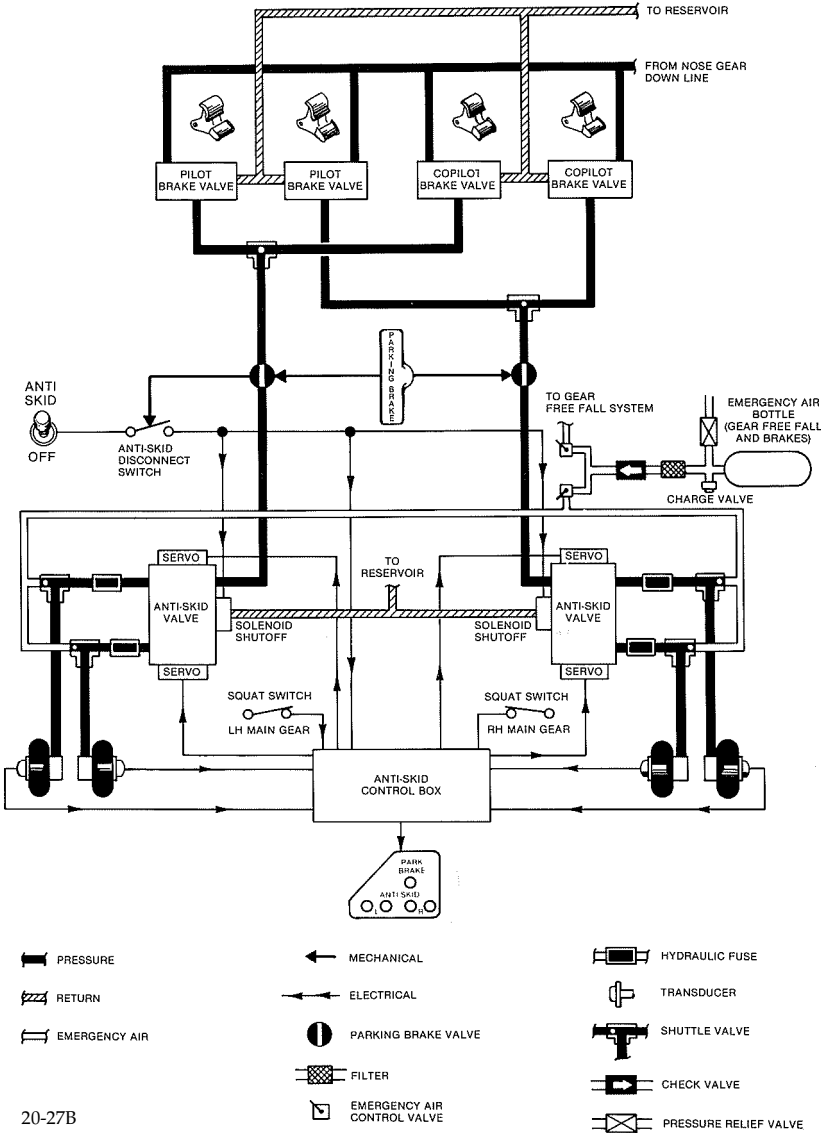
The primary brake system utilizes hydraulic system pressure for power boost. Hydraulic pressure from the nose gear down line is metered to the disc-type wheel brakes by the power brake valves. The valves are controlled by the rudder pedal toe brakes through mechanical linkage. Two shuttle valves in the pressure lines prevent fluid feedback between the pilot's and copilot's pedals. Four additional shuttle valves connect the pneumatic system to the brake system for emergency braking. Hydraulic fuses, located in the main gear wheel wells, will close to prevent pressure loss if fluid flow exceeds normal brake actuation rate. "Snubbing" of the main gear wheels is accomplished during retraction by means of hydraulic back pressure in the brake lines caused by a restrictor in the return line. An integral anti-skid system is installed to effect maximum braking efficiency. When parking, it is advisable to have the wheels chocked prior to releasing brakes.

PARKING BRAKE

The parking brake handle is labeled PARKING BRAKE and is located on the pedestal below the thrust levers. The handle is mechanically connected to the parking brake valve through which all pressure from the primary brake system must pass. The parking brake system is actuated by pressing and holding the toe brakes (hydraulic system pressurized) then pulling the parking brake handle which closes the parking brake valve, locking pressure against the wheel brakes. Pulling the parking brake handle also closes the solenoid shutoff valve on the anti-skid system to prevent leakage through the anti-skid valve. Returning the parking brake handle to the off position releases the brakes. The anti-skid system is inoperative when the parking brake is engaged.

PARK BRAKE LIGHT

An amber PARK BRAKE light, on the pilot's subpanel, immediately above the ANTI-SKID lights, is installed to alert the operator that the parking brake may be engaged. The light is operated by a switch attached to the parking brake valve and will be illuminated whenever power is on the aircraft and the PARKING BRAKE handle is not full in.



WHEEL BRAKE SYSTEM SCHEMATIC
Figure 3-3

EMERGENCY BRAKING

In the event of a main hydraulic system failure, the wheel brakes can be applied pneumatically. Emergency (pneumatic) braking is initiated and controlled through the red EMER BRAKE handle located on the pedestal to the left of the thrust levers. Emergency braking is initiated by pulling the handle out of the recess and pushing down. As the EMER BRAKE handle is pushed down, air pressure from the BRAKE AIR emergency air bottle is directed to the wheel brake shuttle valves through the lever actuated emergency brake valve. If the emergency air pressure is greater than the brake system pressure, the wheel brake shuttle valves will reposition to admit air pressure to apply the brakes. As the brake handle is released, excess air will be vented overboard and the brakes will release. Because the emergency air lines are plumbed into the hydraulic brake system between the anti-skid control valves and the wheel brakes, anti-skid protection is not available when using emergency brakes. Also, the parking brake will be inoperative when using emergency air pressure.

ANTI-SKID SYSTEM

An anti-skid system is integrated into the hydraulic brake system to provide maximum braking efficiency under all runway surface conditions without skidding the tires. The system consists of the ANTI-SKID control switch, anti-skid control box, two anti-skid control valves, monitoring lights, four wheel-speed transducers (one in each main wheel axle), and associated aircraft wiring. Each anti-skid control valve is a dual unit capable of individually modulating brake pressure for both associated brakes. As the transducers are driven by the main wheels, a frequency proportional to the wheel speed is induced and forwarded to the control box. The control box converts the wheel-speed frequency to an analog signal and compares the analog to a reference representing the normal deceleration limits. Should the wheel speed deviate from the normal deceleration limits, the control box will signal the affected wheel's control valve to reduce braking pressure on the affected wheel. Braking pressure is reduced by bypassing some of the hydraulic system pressure into a return line by means of a servo controlled valve in the control valve. As the wheel speed increases, normal braking pressure is restored. To ensure full manual control of the hydraulic braking system and to prevent pressure loss when the parking brake is set, a solenoid-operated shutoff valve at each control valve return port is de-energized closed when the ANTI-SKID switch is OFF or the parking brake is set. Electrical power for the anti-skid system control circuits is 28 VDC supplied through the ANTI-SKID circuit breaker in the hydraulics group on the copilot's circuit breaker panel.

ANTI-SKID LIGHTS

Four amber ANTI-SKID lights on the pilot's subpanel provide a continuous cockpit indication of the anti-skid system control circuits. The two lights labeled L represent control circuits for the left main gear brakes and the two lights labeled R represent control circuits for the right main gear brakes. The anti-skid control box continuously monitors the system circuits and will illuminate the applicable light(s) should any of the following conditions arise: loss of input power, open and short transducer circuits, open or short control valve circuits, and failure of control box circuits. Also, the lights will be illuminated any time the gear is down and locked, power is on the aircraft, and the ANTI-SKID switch is off.

ANTI-SKID SWITCH

The ANTI-SKID switch is located on the center switch panel and has two positions: On (ANTI-SKID) and OFF. When the switch is in the On (ANTI-SKID) position, 28 VDC is applied to the anti-skid system control circuits. Normally, the switch remains in the On (ANTI-SKID) position for all operations.

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ELECTRICAL & LIGHTING

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SECTION IV

ELECTRICAL & LIGHTING

DC POWER DISTRIBUTION

Primary electrical power for aircraft and avionics systems requiring DC power is supplied by two engine-driven, 30-volt, 400-ampere starter/generators. Secondary DC electrical power is supplied by two 24-volt Concorde Lead Acid batteries. An external power receptacle is installed for engine start and stationary ground operations.

A generator control unit (GCU) is installed for each starter/generator. The GCUs contain circuits to maintain generator output at approximately 28 VDC throughout varying engine speeds and loads. The GCUs also contain circuits to equalize generator load during parallel operation, provide overvoltage protection, and provide current limiting during ground operations and during generator-assisted cross starts.

During normal operation, the generators supply all aircraft DC power requirements. Regulated 28 VDC output from the generators is applied to the respective generator buses. The voltage on the generator buses is applied to the battery charging bus through 275-amp current limiters. Battery charge is maintained from the battery charging bus through the battery relays and battery buses. The DC BUS 2 and 3 buses in the circuit breaker panels are powered from the respective generator buses through 50-amp current limiters. The DC BUS 4 buses in the circuit breaker panels are powered from the battery charging bus through 40-amp current limiters. The battery bus in the pilot's circuit breaker panel is powered from the #1 battery through a 20-amp current limiter. The battery bus in the copilot's circuit breaker panel is powered from the #2 battery through a 10-amp current limiter. The DC BUS 1 buses in the circuit breaker panels are powered from the respective generator bus through an overload sensor and a control relay. A CABIN PWR BUS is installed in the pilot's circuit breaker panel. The CABIN PWR BUS is powered from the battery charging bus through a 100-amp current limiter, an overload sensor, and a control relay. The inverters are powered through overload sensors and control relays. Additionally, aircraft systems producing heavy loads; such as resistance heaters, freon compressor, large lamps, inverters, blowers, heavy-duty motors, and heavy-duty pumps, are supplied power through current limiters connected to either the battery charging bus or generator buses.

Overload sensors are installed between the DC BUS 1 buses and the associated generator bus. The overload sensors are installed to protect the DC BUS 1 feeder circuits from an overload. Basically, each overload sensor is a 70-amp circuit breaker mechanically connected to a switch. Should an overload condition occur, the circuit breaker will reposition the switch to de-energize a power relay, thereby disconnecting the DC BUS 1 bus. Additionally, the switch will apply a ground to trip the affected L or R DC BUS 1 circuit breaker. When the overload sensor circuit breaker cools, the switch will reset; however, the power relay will not re-energize due to the open L or R DC BUS 1 circuit breaker. When the malfunction has been corrected and the affected L or R DC BUS 1 circuit breaker reset, the power relay will re-energize and power to the DC BUS 1 bus will be restored. An overload sensor is installed between the CABIN PWR bus and the battery charging bus. The overload sensor is installed to protect the CABIN PWR BUS feeder circuit from an overload. Operation of the CABIN PWR BUS overload sensor is the same as that described for the DC BUS 1 overload sensors.

The generators will not come on-line if an operating ground power unit is connected to the aircraft.

A cross start relay box is installed which enables an operating generator to assist in providing power to start the opposite engine. If one generator is on-line and a start of the opposite engine is initiated, the cross start relay circuits will cause both left and right starter relays to close. In effect, this will bypass both battery charging bus 275-amp current limiters and the output of the operating generator will supplement the aircraft batteries in providing power for the starter.

An airstart relay box is installed which prevents the primary flight displays from blanking and ensures certain equipment, necessary for a successful start, has adequate voltage during airstarts. During an airstart, the #2 battery is isolated from the battery charging bus and its power is dedicated to the following loads:

- L & R STBY-SCAV PUMP
- L & R ENG CH A (FADEC)
- L & R ENG CH B (FADEC)
- L & R START
- MFD 1 & 2
- DCP 1 & 2
- L & R JET PUMP-XFR VALVE
- L & R IGN CH A
- L & R IGN CH B
- AHS 1 & 2
- PFD 1 & 2

When the aircraft is on the ground, operation of the airstart circuits is inhibited and both batteries will be available to power the starter.

An emergency bus system is installed to operate selected equipment from the aircraft batteries for the maximum duration in the event of a dual generator failure. When the emergency buses are selected, the battery charging bus is isolated from the batteries and the equipment connected to the emergency buses will be powered from the aircraft batteries.

BATTERY SWITCHES

The aircraft batteries are controlled through the BATTERY 1 and 2 switches on the pilot's switch panel. The #1 battery is wired directly to the battery bus in the pilot's circuit breaker panel and the #2 battery is wired directly to the battery bus in the copilot's circuit breaker panel. When either BATTERY switch is placed in the On position, the corresponding battery relay closes to connect the respective battery bus to the battery charging bus if the EMER BUS switch is in the NORMAL position. When the BATTERY switch is placed in the OFF position, the battery relay is de-energized and the respective battery bus is isolated from the battery charging bus. The battery relays will also be de-energized whenever the EMER BUS switch is in the EMER BUS position.

START/GEN SWITCHES

The starter/generators are controlled through the START/L GEN and START/R GEN switches on the pilot's switch panel. Additionally, the START position of each switch is used to control various functions required for the starting sequence. These functions are described below. Each switch has three positions: START, OFF, and GEN. Prior to initiating the starting sequence, the associated thrust lever should be placed in the IDLE detent.

START position: With the BATTERY switches On, DC power from the L and R START circuit breakers is applied to the left and right START/GEN switches. When a START/GEN switch is set to START, DC power from the corresponding START circuit breaker is applied to close the corresponding starter relay, activate the corresponding standby pump, cause the corresponding motive flow valve to close, shutdown the cooling, auxiliary heating, and stabilizer heat systems, and energize the FADEC start sequence relay (supplies a discrete start signal to the FADEC). When the starter relay closes, the starter will begin to spool the engine and the START light will illuminate. When N2 reaches approximately 6%, the FADEC automatically activates the ignition system and turns on fuel flow to the engine. When N2 reaches approximately 40%, the ignition will automatically terminate. When N2 reaches approximately 45%, a speed sensor in the starter/generator will cause

power to be removed from the starter relay (starter will be de-energized and the START light will extinguish) and from the FADEC start sequence relay (discrete start signal to FADEC will be removed and the corresponding motive flow valve will open). When the switch is moved out of the START position, the corresponding standby pump will shut down. If the associated thrust lever is not in the IDLE detent, ignition and fuel flow will not occur as stated above.

GEN position: During the engine start sequence, when engine RPM reaches idle speed, the START/GEN switch should be set to GEN. When GEN is selected, the corresponding generation circuits will be activated. The generator will not come on-line with a GPU connected. Additionally, the cooling and auxiliary heating systems, and stabilizer heat system cutout relays will be reset. The generation circuits activate and control the corresponding generator through the generator control unit.

START LIGHTS

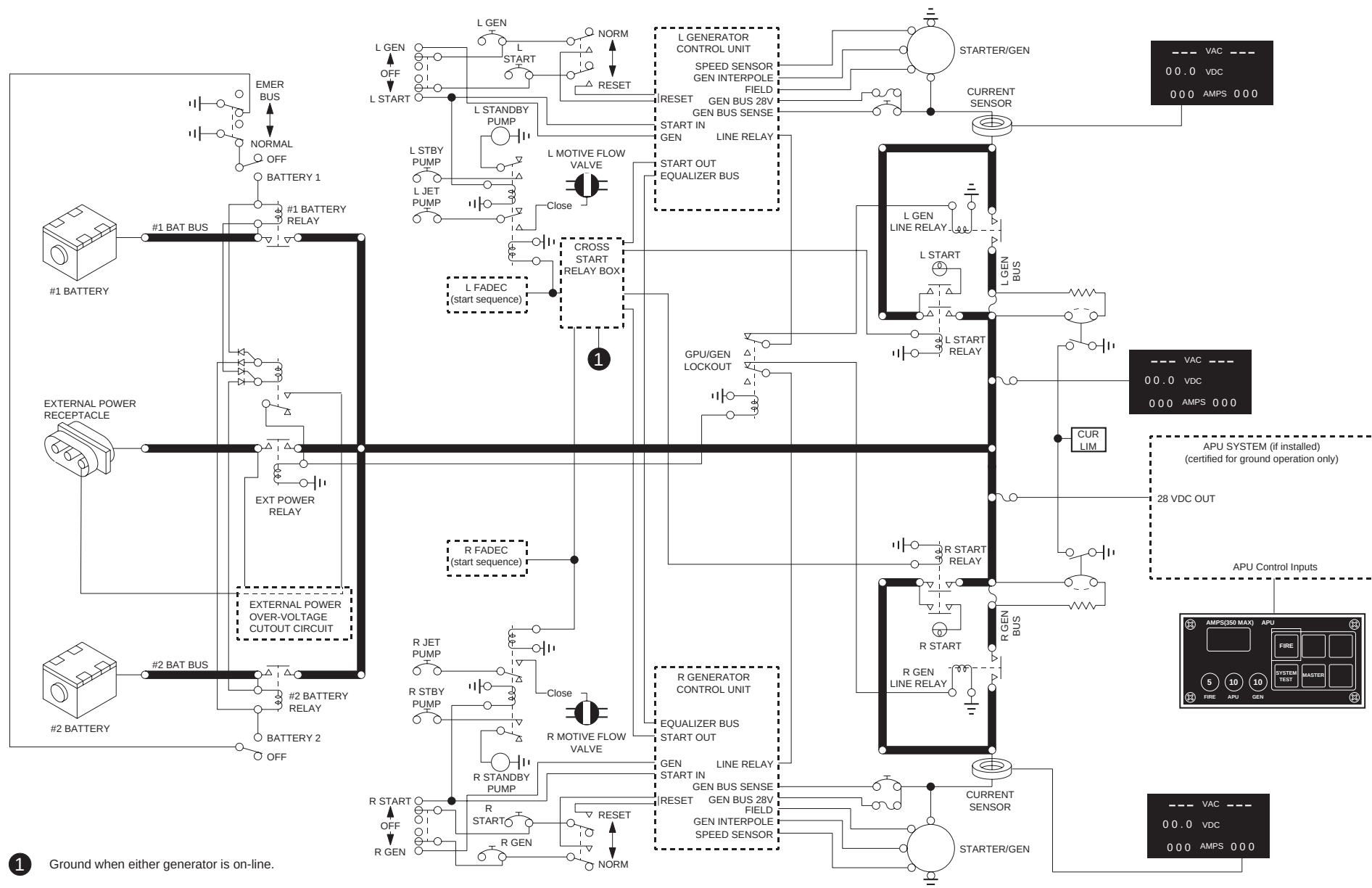
Amber lights adjacent to each START/GEN switch are installed to indicate starter operation. The corresponding light will be illuminated whenever the associated starter is energized.

GEN RESET SWITCHES

The GEN RESET buttons are located on the pilot's switch panel adjacent to the START/GEN switches. Should a generator fault occur, the corresponding generator control unit will de-energize the affected generator field circuit and open the generator relay isolating the generator from the respective generator bus. Momentarily depressing the applicable GEN RESET button will reset the generator by closing the affected generator field circuit and closing the generator relay. The GEN RESET buttons have no effect with the corresponding START/GEN switch OFF or the corresponding START and/or GEN circuit breaker open.

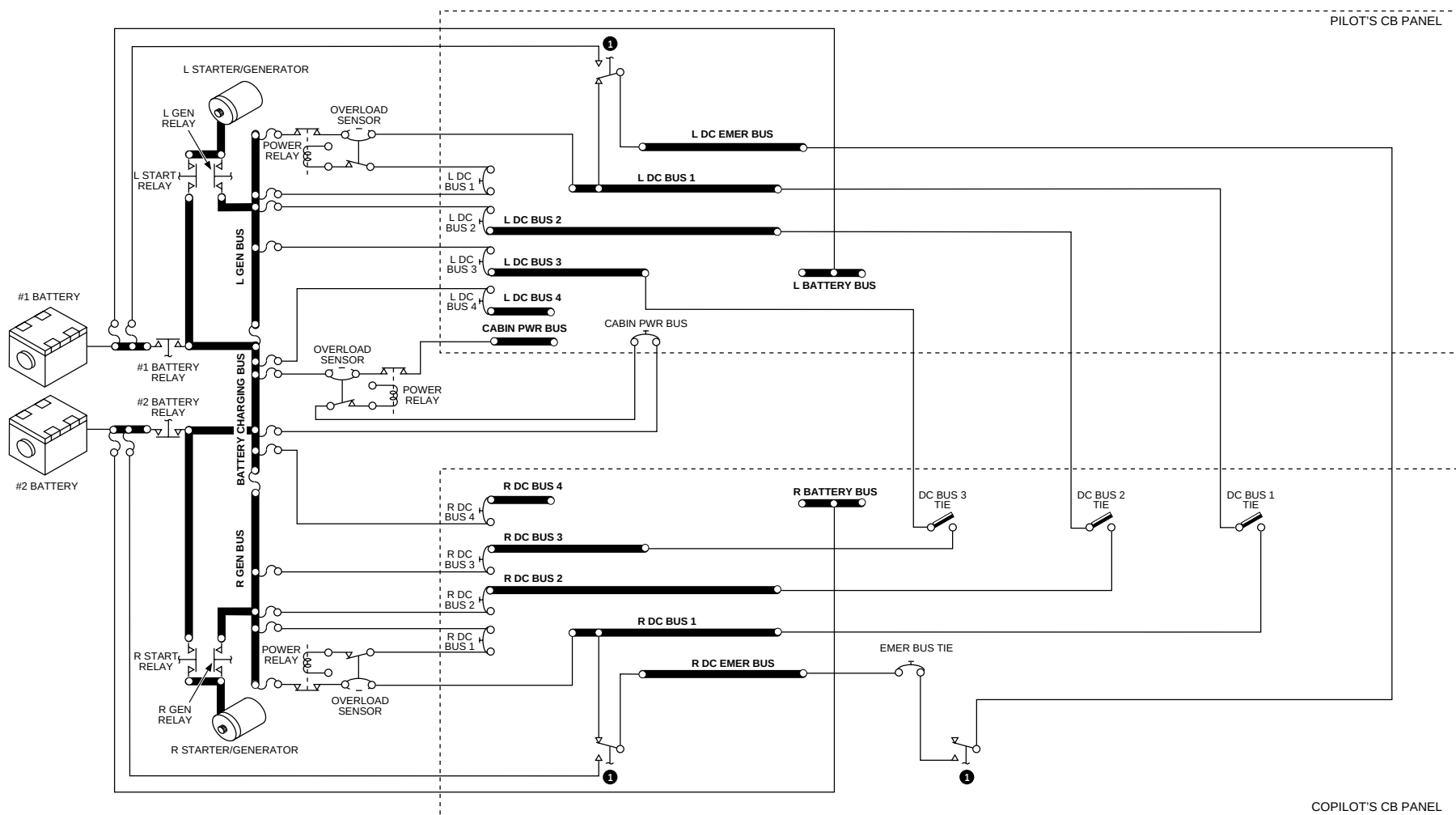
GEN LIGHTS

Amber L GEN and R GEN annunciator lights are installed in the glareshield annunciator panel. The lights are controlled by the corresponding generator control circuits and will illuminate whenever the corresponding generator has failed or is off line. The light will also illuminate whenever the corresponding START/GEN switch is in either START or OFF and at least one BATTERY switch is On.



NOTE: Airstart circuit not shown.

DC GENERATION AND START
Figure 4-1



① Controlled by EMER BUS Switch.
See figure 4-5 for schematic of EMER BUS system.

DC POWER DISTRIBUTION
Figure 4-2

CUR LIM LIGHT

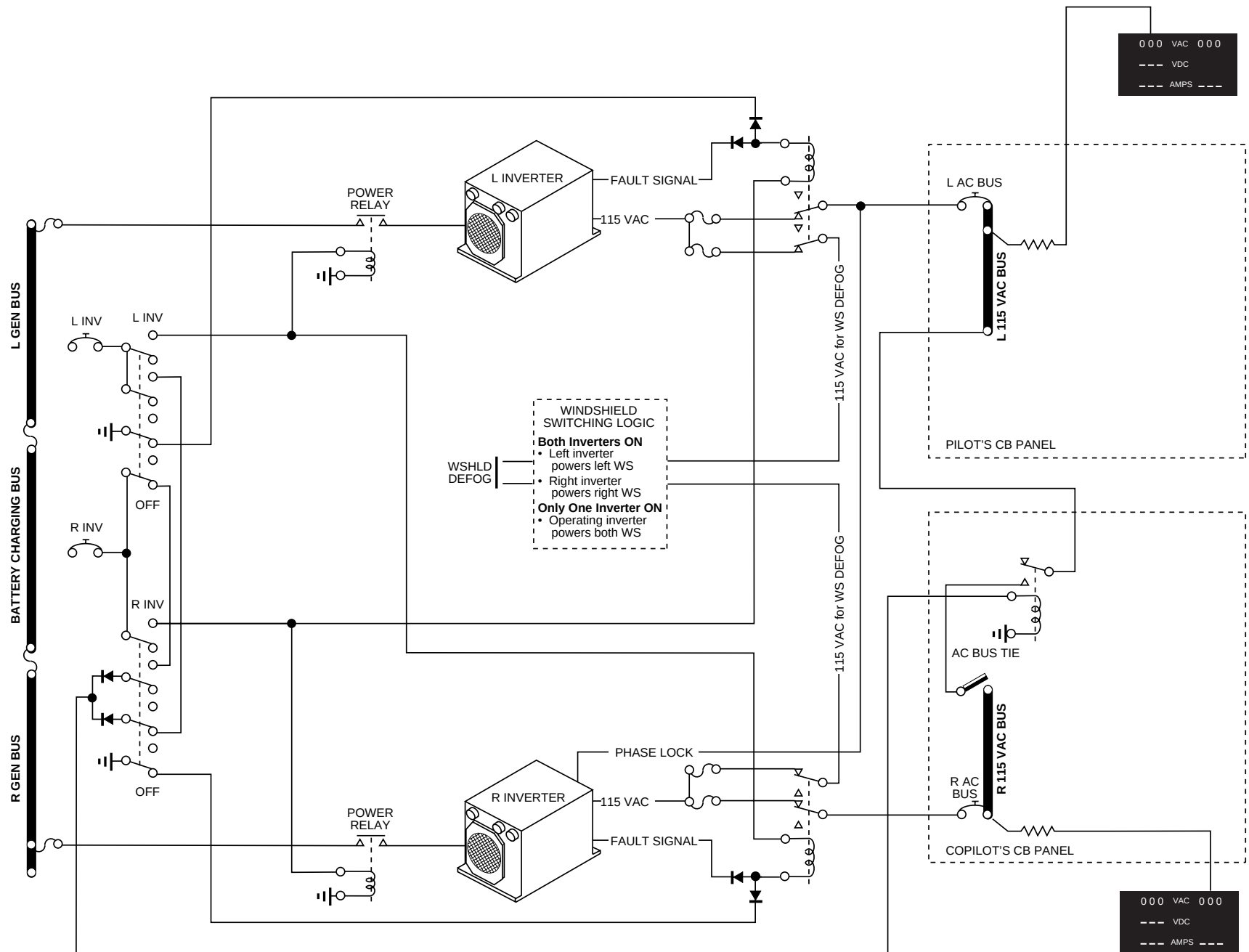
The amber CUR LIM annunciator light, on the glareshield annunciator panel, is installed to indicate the continuity of the 275-amp current limiters. The 275-amp current limiters connect the battery charging bus to the generator buses. Failure of both 275-amp current limiters will cause the equipment connected to the battery charging bus to be powered from the aircraft's batteries only. The light is illuminated by sensors wired across the current limiter terminals. A failure of either current limiter will cause the respective sensor to illuminate the CUR LIM light.

DC CIRCUIT BREAKERS

The aircraft DC electrical circuits are protected by push-to-reset, thermal-type circuit breakers. Most DC circuit breakers are located on the pilot's and copilot's circuit breaker panels. The L and R DC BUS 1, DC BUS 2, and DC BUS 3 buses may be interconnected through the DC BUS 1 TIE, DC BUS 2 TIE, and DC BUS 3 TIE circuit breaker/switches on the copilot's circuit breaker panel. Normally the L and R DC buses are not tied together. If it is desired to tie a L DC BUS and R DC BUS together, the appropriate DC BUS TIE circuit breaker/switch must be in the up (closed) position. The DC BUS 1 circuit breaker on each circuit breaker panel controls power to the associated DC BUS 1 bus through control relays. Circuit breakers are grouped together into system types (e.g. ELECTRICAL, LIGHTS, AVIONICS). Power to operate the emergency bus system is supplied from the batteries through the respective EMER BUS CONT circuit breaker (see figure 4-5). The circuit breakers for equipment powered during EMER BUS mode are denoted by red rings on the overlay.

EXTERNAL POWER RECEPTACLE

External power may be connected to the aircraft DC electrical distribution system through a standard receptacle located on the right fuselage below the pylon. To start an engine or operate aircraft systems using external power at least one BATTERY switch must be in the On position; however, the generators will not come on-line with an external power source connected. External power over-voltage protection circuits will open the external power relay and disconnect external power from the aircraft DC distribution system in the event the external power source exceeds approximately 32 volts. External power source amperage must be limited to a maximum of 1500 amps as specified on the placard above the external power receptacle.



AC POWER AND DISTRIBUTION
Figure 4-3

AC POWER DISTRIBUTION

Electrical power for aircraft and avionics systems requiring AC power is supplied through two 115-volt, 400-Hz, 1500VA, solid-state inverters. During normal operation, the left and right inverter output voltages are applied to the left and right AC buses respectively. The left and right AC buses may be interconnected through the AC BUS TIE circuit breaker/switch on the copilot's circuit breaker panel. Each AC bus is intended to be powered by only one inverter. Therefore, the AC BUS TIE switch should only be closed after removing power from one of the buses and setting the respective INVERTER switch to OFF. If both INVERTER switches are On, a relay in the copilot's circuit breaker panel will prevent the AC BUS TIE from functioning (electrically). An inverter relay box controls 28 VDC input to the inverters and provides isolation between the inverter output and AC bus should an inverter fault occur. A phase lock function within the right inverter keeps the output of each inverter in-phase. Input power to operate the left and right inverters is 28 VDC supplied through 100-amp current limiters connected to the left and right generator buses respectively.

INVERTER SWITCHES

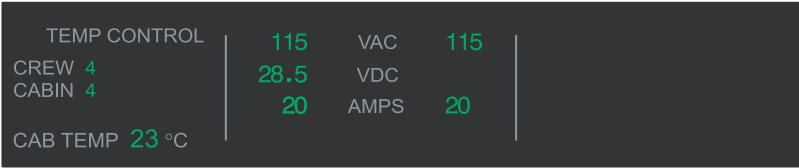
Operation of the left and right inverters is controlled through the two INVERTER switches on the pilot's switch panel. The switch controlling the left inverter is labeled L-OFF and the switch controlling the right inverter is labeled R-OFF. When either switch is moved to the On (L or R) position, the associated power relay is energized to supply input power to the associated inverter. When one switch is On and the other is OFF, a relay in the inverter relay box is energized isolating the inoperative inverter from its associated AC bus. The inverter control circuits operate on 28 VDC supplied through the L INV and R INV circuit breakers on the pilot's and copilot's circuit breaker panels respectively.

AC CIRCUIT BREAKERS

The aircraft AC electrical circuits are protected by push-to-reset magnetic-type circuit breakers. AC circuit breakers are denoted by a white ring on the panel overlay. The copilot's circuit breaker panel also contains the AC BUS TIE circuit breaker/switch which is used to tie the L AC BUS and R AC BUS together in the abnormal situation of single inverter operation. Circuit breakers are grouped together into system types (e.g. ELECTRICAL, AFCS, AVIONICS).

ELECTRICAL PAGE DISPLAY

The EIS Electrical Page is used to monitor left and right AC bus voltage, left and right DC generator load and the DC charging bus voltage. Digital displays are used for voltage and amperage readouts. Each parameter being monitored is divided into Normal, Caution and Warning ranges. Whenever any parameter goes from the normal range to the caution range, the digital readout will display in amber and flash for five seconds. If the parameter progresses into the warning range, the digital readout will display in red and flash for five seconds. The amber or red digital readout will remain until the affected parameter returns to the normal range. Caution and warning annunciations are inhibited during starter engagement. An amber boxed C located adjacent to the VAC display indicates that the inverter is out of phase.



EIS ELECTRICAL PAGE
Figure 4-4

Voltage and amperage parameters are shown in the following table:

	NORMAL	CAUTION	WARNING
AC Voltage	110 <= VAC <= 130	90 <= VAC <= 109 OR 131 <= VAC <= 134	VAC < 90 OR VAC > 134
DC Voltage	22.0 <= VDC <= 29.5	18.0 <= VDC < 22.0 OR 29.5 < VDC <= 31.5	VDC < 18.0 OR VDC > 31.5
DC Amperage			
On The Ground	DCA <= 325	330 <= DCA <= 400	DCA > 400
Up To 31,000 Feet	DCA <= 400	N/A	DCA > 400
From 31,001 Feet To 46,000 Feet	DCA <= 325	325 <= DCA <= 400	DCA > 400
From 46,001 Feet To 51,000 Feet Or Loss Of Air Data Information	DCA <= 300	300 <= DCA <= 400	DCA > 400
High Capacity Generator	DCA <= 400	N/A	DCA > 400

AUTOMATIC LOAD SHEDDING SYSTEM

An automatic electrical load-shedding system is installed to automatically reduce generator loading in the event of a single generator failure. The system is only active during flight (weight not on wheels). Should either L or R GEN light illuminate in flight, the following loads will automatically shut down to reduce the load on the operating generator:

- CABIN PWR BUS Loads
- Air Conditioning System
- Cockpit Floorboard Heater System
- Baggage Compartment Heater System

If the generator is brought back on-line, these loads will be regained.

EMERGENCY BUS SYSTEM

An emergency bus system is installed to provide 28 VDC to selected systems in the event of a dual generator system failure or to quickly de-energize and isolate all nonessential equipment in the event of electrical smoke or fire. The system uses the aircraft's batteries to supply DC power to the DC equipment on the emergency bus. All emergency bus circuit breakers are denoted by a red ring on the panel overlay. The EMER BUS TIE is located on the copilot's circuit breaker panel. The emergency bus system control circuits operate on 28 VDC supplied by the batteries through the EMER BUS CONT circuit breakers in the pilot's and copilot's circuit breaker panel.

CABIN POWER CONTROL SWITCH

The cabin power control switch system adds a CABIN PWR OFF switch inline with the CABIN PWR BUS circuit breaker. This allows the pilot to quickly and efficiently load shed all cabin power systems by selecting the CABIN PWR switch to the OFF position. When the cabin power switch is selected off it will disable all of the cabin entertainment equipment, ordinance signs and standard cabin lighting. Cabin Downwash Lighting will still be available and if not already on can be selected ON from the Master Control Switch Panel or the Cabin Control Switch Panel located in the LH FWD closet. Also, selecting CABIN PWR — OFF is one means of reducing generator loads when required by abnormal procedures in the FAA Approved Airplane Flight Manual. During single-generator operation, the aircraft load shed will automatically cause the CABIN PWR to go to the OFF mode.

EMER BUS SWITCH

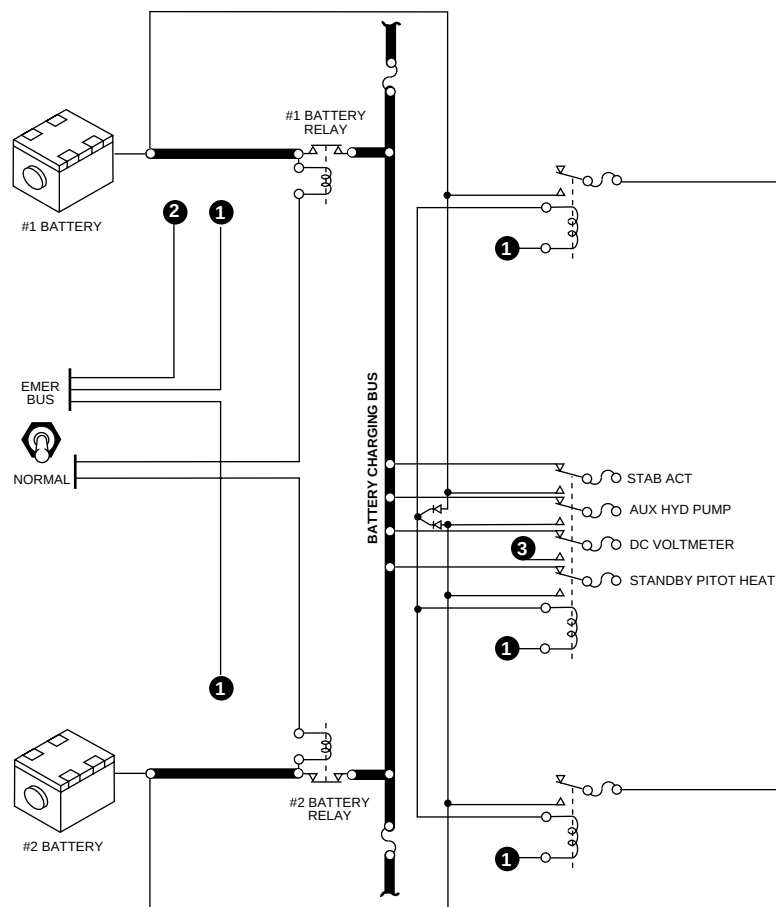
The EMER BUS switch on the pilot's switch panel is used to select the power source for the emergency buses. The switch has two positions—EMER BUS and NORMAL.

When the EMER BUS switch is in the NORMAL position, the emergency bus system relays will be de-energized and equipment on the emergency buses will be powered from the normal electrical system. DC equipment on the emergency buses will be powered through the associated DC BUS 1, 2, or 3. When the switch is in the EMER BUS position, the battery relays will be de-energized, the emergency bus system relays will be energized, and equipment on the emergency buses will be powered through the emergency bus system. When the battery relays are de-energized, the aircraft batteries are completely isolated from the battery charging bus and the normal DC power distribution system. When EMER BUS is selected, electrical power will be distributed as follows:

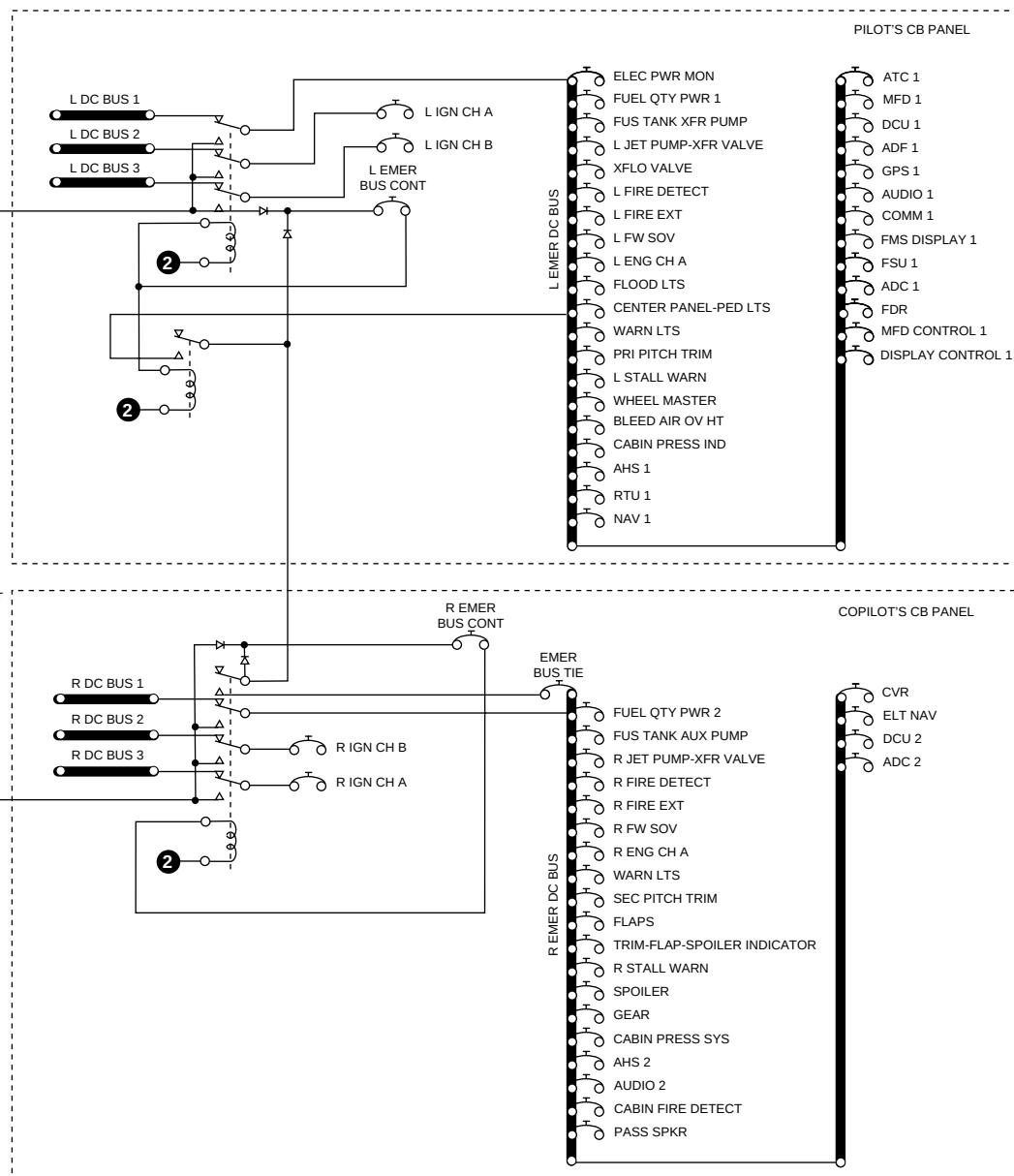
1. DC power for the primary pitch trim motor will be switched from the battery charging bus to the #1 aircraft battery.
2. DC power for the auxiliary hydraulic pump will be switched from the battery charging bus to the #2 aircraft battery.
3. DC power to heat the standby pitot-static probe will be switched from the battery charging bus to the #2 aircraft battery.
4. DC powered equipment on the emergency buses will be switched from the associated DC BUS 1 to the aircraft batteries.
5. The DC voltmeter will display the voltage of both batteries (EMER BUS TIE must be closed).



- The conditions just described assume that both BATTERY switches are in the On position.
- If only the BATTERY 1 switch is On, the auxiliary hydraulic pump will not be available, heat for the standby pitot-static probe will not be available, and the DC voltmeter will display the voltage of the #1 battery. All other conditions will be as described.
- If only the BATTERY 2 switch is On, Primary Pitch Trim will not be available and the DC voltmeter will display the voltage of the #2 battery. All other conditions will be as described.



- ❶ Ground to activate relays supplied through EMER BUS position of EMER BUS switch and "On" position of BATTERY switches.
- ❷ Ground to activate relays supplied through EMER BUS position of EMER BUS switch.
- ❸ With EMER BUS switch in EMER BUS position and:
 - a. Both BATTERY switches "On" — Voltmeter will display voltage of both batteries (EMER BUS TIE must be closed).
 - b. Only one BATTERY switch "On" — Voltmeter will display voltage of the battery whose respective BATTERY switch is "On".



EMERGENCY BUS SYSTEM
Figure 4-5

AVIONICS POWER SYSTEM

An avionics power system is installed to allow selected DC powered avionics systems to be powered up through the use of two master switches. The system consists of a LEFT MASTER and RIGHT MASTER switch, and a control relay in each circuit breaker panel. The control relays operate on 28 VDC supplied through the corresponding AVIONICS MASTER circuit breaker in the associated circuit breaker panel. The AVIONICS MASTER switches have no effect when EMER BUS is selected and the generators are off-line.

AVIONICS MASTER SWITCH

The LEFT MASTER switch is installed in the pilot's switch panel and the RIGHT MASTER switch is installed in the copilot's switch panel. These two switches allow the crew to turn groups of avionic equipment off and on with only two switches.

Refer to the Airplane Flight Manual for a listing of equipment controlled by the MASTER switches. The actual equipment affected may vary with customized wiring options.

AUXILIARY POWER UNIT (APU) GENERATOR

The APU generator provides 28 volts DC electrical power to the aircraft battery charging bus. The generator is controlled by a Generator Control Unit (GCU). The APU is only certified for ground use. After starting the APU using the APU control panel on the copilot's circuit breaker panel, the green APU RUNNING annunciator will illuminate indicating that the APU system is ready to supply power to the aircraft. Refer to Auxiliary Power Unit in Section II of this manual.

EMERGENCY POWER SYSTEM

The aircraft is equipped with either a dual or triple emergency power system to supply electrical power to selected equipment in the event of a normal electrical power system failure. Operating time of equipment powered by the emergency power supply is presented in the Airplane Flight Manual. Power for the emergency power system is supplied by two emergency power supply units located in the right, aft, nose avionics compartment. Each emergency power supply unit contains a 12-cell lead-acid battery to provide electrical power. The emergency power supply batteries are trickle charged from the aircraft normal electrical system through the EMER BAT circuit breakers on the pilot's and copilot's circuit breaker panels.

If the normal electrical system has failed, EMER BAT 1 power supply will provide electrical power for the Electronic Standby Indicating System (ESIS) and lighting for the compass RTU 1, and CDU; EMER BAT 2 will supply electrical power for NAV 1, RTU 1, Data Concentrator Units (DCU 1 & 2), Attitude Heading Reference System (AHS 1 & 2), and air data computers (ADC 1 & 2); if a third emergency backup battery is installed, EMER BAT 3 will supply emergency power to COMM 1, AUDIO 1, FMS Display 1, and GPS 1/ADF 1 (Either or). The system is controlled through the EMER BAT 1, EMER BAT 2, and EMER BAT 3 switches on the pilot's switch panel. Amber EMR PWR 1, EMR PWR 2 and EMR PWR 3 annunciators on the center instrument panel will illuminate whenever electrical power from the associated emergency power supply is being used.

EMER BAT SWITCH

The EMER BAT switches have two positions: On (EMER BAT 1, 2, 3) and OFF. With a switch in the On position, electrical power from the corresponding emergency power supply battery is available to supply emergency power should the normal electrical system fail. Normally, electrical power from the emergency power supply batteries is not used because 28 VDC from the normal electrical system is balanced against it. In the event of a failure of the normal electrical system, the balanced condition is removed and electrical power from the emergency power supplies is used.

EXTERIOR LIGHTING

LANDING/TAXI LIGHTS

A landing/taxi light is installed on each main landing gear. The lights are controlled by the LDG LT switches on the center switch panel. The LDG LT switches have three positions: On (L and R), TAXI, and OFF. The landing light control circuits are wired through the main gear down-and-locked switches; therefore, the landing lights are inoperative when the landing gear is not down and locked. When the LDG LT switches are placed in the On position, control circuits apply full 28 VDC to the landing lights and the lights will illuminate full bright. When the LDG LT switches are in the TAXI position, resistors shunt the lamp input power to 21 VDC and the lights are dimmed. In order to extend the service life of the lamps, it is recommended that the lights be used as sparingly as possible in the LDG LT mode. The lamps and control circuits are supplied electrical power through 20-amp current limiters.

Some aircraft are equipped with a pulsating landing light option which is used in conjunction with the pulsating recognition light. On these aircraft, a pulse controller unit controls the landing lights by delivering pulsating DC current at approximately 45 cycles per minute. The effect of this pulsating current is to cause the bulb's brightness to continually vary between approximately 40% and 100% of full bright. The pulsating feature is activated when the RECOG light switch is set to the PULSE position, the applicable LDG LT switch is OFF and the landing gear is down and locked. When the LDG LT switch is positioned to On or TAXI, the landing/taxi lights will illuminate steadily.

NAVIGATION LIGHTS

Navigation lights are installed in the forward portion of the wing tips and in the vertical stabilizer upper aft fairing (bullet). The lights are controlled through the NAV switch in the LIGHTS group on the center switch panel. When the NAV light switch is placed in the On (NAV) position, the navigation lights will illuminate. Additionally, setting the NAV light switch to On (NAV) activates two-stage dimming and certain cockpit lights are automatically dimmed. Refer to TWO-STAGE DIMMING, this section. Electrical power for the navigation lights is 28 VDC supplied through the NAV LTS circuit breaker on the pilot's circuit breaker panel.

TAIL LOGO LIGHTS (OPTIONAL)

Optional tail logo lights may be installed in the horizontal stabilizer on either side of the vertical stabilizer. These lights are used to illuminate both sides of the vertical stabilizer. The lights are controlled through the NAV switch in the LIGHTS group on the center switch panel.

Aircraft with NAV LOGO-NAV-OFF Switch: When the NAV light switch is placed in the NAV LOGO position, the tail logo lights and navigation lights will illuminate. To use the navigation lights without the tail logo lights, select the NAV position of the switch.

Electrical power for the tail logo lights is 28 VDC supplied through a 15-amp current limiter. Power for the control circuit is 28 VDC supplied through the LOGO LT circuit breaker on the copilot's circuit breaker panel.

ANTI-COLLISION (BEACON/STROBE) LIGHTS

Anti-collision lights are mounted on top of the vertical stabilizer and on the bottom of the fuselage. Each light incorporates two flashtubes — one with an aviation red filter and one with a clear filter. The lights are controlled through the BCN/STROBE light switch in the LIGHTS group on the center switch panel.

On aircraft not modified by SB-60-33-7 (Modification of Strobe Light Switch), when the switch is placed in the BCN/STROBE position, the red flashtube in each light will flash if the aircraft's weight is on the wheels or the clear flashtube will flash if the aircraft's weight is not on the wheels.

On aircraft modified by SB-60-33-7 (Modification of Strobe Light Switch), when the switch is placed in the STROBE position, the white flashtube in each light will flash whether or not the aircraft's weight is on the wheels.

When the switch is placed in the BCN/STROBE position, the red flashtube in each light will flash if the aircraft's weight is on the wheels or the clear flashtube will flash if the aircraft's weight is not on the wheels. When the switch is placed in the BCN position, the red flashtube in each light will flash whether or not the aircraft's weight is on the wheels. Therefore, when the clear strobe light is not desired in flight, the switch must be set to BCN or OFF. Each flashtube pulses at a rate of approximately 50 pulses per minute. The lights operate on 28 VDC supplied through the 7.5-amp BEACON-STROBE LTS circuit breaker on the copilot's circuit breaker panel.

RECOGNITION LIGHT

A recognition light is installed on the upper, leading edge of the vertical stabilizer. The light is controlled through the RECOG light switch in the LIGHTS group on the center switch panel. When the switch is placed in the on (RECOG) position, control circuits apply full 28 VDC from the battery charging bus to illuminate the light. For greatest lamp life, it is recommended that the recognition light be turned OFF at altitudes of 18,000 feet or above. The recognition light operates on 28 VDC supplied through a 20-amp current limiter.

Some aircraft are equipped with a pulsating recognition light option. On these aircraft, the RECOG light switch has a middle position labeled PULSE and a pulse controller unit. When the switch is placed in the PULSE position, 28 VDC from the PULSE RECOG LT circuit breaker is applied to the pulse controller unit which in turn lights the recognition light by delivering pulsating DC current at approximately 45 cycles per minute. The effect of this pulsating current is to cause the bulb's brightness to continually vary between approximately 40% and 100% of full bright. This feature results in enhanced aircraft recognition and improved bulb life. Also, the landing lights will pulse alternately with the recognition light if the landing gear is down and locked and the LDG LT switches are OFF. On aircraft with a pulsating recognition light, a PULSE RECOG LT circuit breaker on the copilot's circuit breaker panel supplies 28 VDC to the pulse controller unit.

WING INSPECTION LIGHT

For a description of the wing inspection light, refer to Section VI, ANTI-ICE AND ENVIRONMENTAL.

EXTERIOR CONVENIENCE LIGHTS

Exterior convenience lights consist of a light on the underside of each engine pylon. The lights will illuminate the area around the tailcone baggage compartment and the single-point pressure refueling access. The lights are controlled by the entry light switch located near the entry door and are inoperative when the aircraft is in flight.

COCKPIT LIGHTING

INSTRUMENT PANEL FLOODLIGHTS

Lights are installed in the glareshield assembly to provide flood illumination of the instrument panel. The lights are controlled and dimmed through the FLOOD rheostat switch on the pilot's switch panel. Electrical power is 28 VDC supplied through the FLOOD LTS circuit breaker on the pilot's circuit breaker panel. Instrument panel floodlights are operative during EMER BUS mode.

INSTRUMENT LIGHTS

Lighting is installed for the pilot's indicators, copilot's indicators, center instrument panel indicators, pedestal indicators, and magnetic compass. Electrical power is 28 VDC supplied through the L and R INSTR LTS circuit breakers and the CENTER PANEL-PED LTS circuit breaker on the pilot's and copilot's circuit breaker panels. The lights are controlled and dimmed by the INSTR and CENTER PNL/PEDESTAL rheostat switches on the pilot's switch panel and the INSTR rheostat switch on the copilot's switch panel.

Pilot's INSTR dimmer switch: The pilot's INSTR dimmer switch provides variable dimming for the following:

- Oxygen pressure indicator
- Pilot's clock
- Pilot's angle-of-attack indicator

Copilot's INSTR dimmer switch: The copilot's INSTR dimmer switch provides dimming for the following:

- Pressurization panel
- Copilot's clock
- Copilot's angle-of-attack indicator
- APU control panel

CENTER PNL/PEDESTAL dimmer switch: The CENTER PNL/PED-ESTAL dimmer switch on the pilot's switch panel provides dimming for the following:

- Autopilot panel
- ESIS
- Magnetic compass
- WING TEMP indicator
- Fuel control panel
- Trim switch panel
- RTU, CDU and CCP panels
- Fuel quantity indicator
- HYD PRESS indicator
- GEAR & BRAKE AIR indicator
- NOSE STEER switch
- HF control head
- AIRSHOW Flight Deck Controller
- Cabin pressure indicator

Two master instrument light switches may be installed. They consist of two INSTR LIGHTS MASTER switches and the associated aircraft wiring. One master switch is located in the L INSTR LIGHTS group on the pilot's switch panel and the other is located in the R INSTR LIGHTS group on the copilot's switch panel. The WING INSP LIGHT switch, normally located on the copilot's switch panel, may be relocated to a position on the instrument panel. The INSTR LIGHTS MASTER switches allow certain cockpit lighting to be turned on and off using one switch instead of multiple switches. The following lighting groups are controlled by the INSTR LIGHTS MASTER switches:

L INSTR LIGHTS

- EL PNL
- CB PNL
- INSTR
- CENTER PNL/PEDESTAL

R INSTR LIGHTS

- EL PNL
- INSTR
- CB PNL

The individual controls are used to select the brightness level of the affected instrument lights and the master switch is used to turn the lighting groups off and on as desired.

TWO-STAGE LIGHTING

Certain lights are automatically dimmed when the NAV light switch is set to NAV. When the NAV light switch is set to OFF, full 28 VDC is applied to the lights allowing them to illuminate at full brightness. When the NAV light switch is set to NAV, the voltage applied to the lights is reduced to approximately 14 VDC reducing their brightness. The lights dimmed by the two-stage dimmers are:

- Autopilot controller
- ANTI-SKID lights
- IGNITION lights
- Fuel control panel lights
- START lights
- PARK BRAKE light
- EFIS reversionary mode lights
- Pressurization FAULT/MANUAL light
- Pressurization EMER DEPRESS light
- CVR TEST & CVR ERASE switches
- NOSE STEER ARM annunciator

SWITCH PANEL LIGHTING

Electroluminescent panel lighting is provided for the pilot's and copilot's switch panels, the center switch panel, audio control panels, MIC/PHONE jack panels, the pressurization control panel, anti-skid panel, system test switch panel, landing gear control panel, rudder pedal adjust panels, Display Control Panels (DCP), Cursor Control Panels (CCP), and circuit breaker panels. The panels are supplied 115 VAC through the L and R EL LTS circuit breakers on the pilot's and copilot's circuit breaker panels. The lights are controlled and dimmed through the EL PNL and CB PNL rheostat switches on the pilot's and copilot's switch panels.

Pilot's EL PNL and CB PNL dimmer switches: The pilot's EL PNL dimmer switch controls the electroluminescent lighting of the pilot's inboard and outboard switch panels, the center switch panel, the pilot's audio control panel, the pilot's rudder pedal adjust panel, the anti-skid panel, the system test switch panel, the landing gear control panel, the pilot's DCP and CCP panels, throttle quadrant overlay, and the engine synchronizer switch panel. The pilot's CB PNL dimmer switch controls the electroluminescent lighting of the pilot's circuit breaker panel, and MIC/PHONE jack panel.

Copilot's EL PNL and CB PNL dimmer switches: The copilot's EL PNL dimmer switch controls the electroluminescent lighting of the copilot's switch panel, the pressurization control panel, the copilot's audio control panel, the copilot's DCP and CCP panels, and the copilot's rudder pedal adjust panel. The copilot's CB PNL dimmer switch controls the electroluminescent lighting of the copilot's circuit breaker panel, MIC/PHONE jack panel and the APU control panel.

ADAPTIVE FLIGHT DISPLAY (AFD) LIGHTING

The brightness of the AFD tubes is controlled by two DISPLAY dimmer controls — one on the pilot's switch panel and one on the copilot's switch panel. Each DISPLAY dimmer is used to adjust the brightness of the on-side outboard display, primary flight display (PFD) and the on-side inboard display, multi-function display (MFD). The CDU screen lighting is controlled by the BRT Knob.

MAP READING LIGHTS

Map reading lights are located on the left and right cockpit sidewalls above the circuit breaker panels. Each lamp is mounted on a flexible conduit and is controlled by a rheostat switch located on the base of the assembly. The lights operate on 28 VDC supplied through the L and R INSTR LTS circuit breakers on the pilot's and copilot's circuit breaker panels.

LIGHTED CHART HOLDERS

A Lighted chart holder is located on each control wheel. Lighting is controlled by a control knob located on each chart holder. When the control knob is rotated fully counterclockwise the light is off. Rotating the knob clockwise will cause the light to come on and brighten as the knob is rotated. Chart holder lighting is powered by 28 VDC through the CHART HLDRS circuit breaker on the copilot's circuit breaker panel.

DOMES LIGHTS

Dome lights are installed in the cockpit overhead panel. These lights are used to illuminate the entire cockpit area. The lights are controlled by two separate electrical circuits. A rocker switch next to each light has three positions ON-off-REMOTE. If a BATTERY switch is on, setting a Dome Light switch to ON will illuminate the associated dome light. Rotating the associated OVHD dimmer control (pilot's and copilot's switch panel) will vary the brightness of the dome light. The ON position of the Dome Light switch is powered by 28 VDC through the R INSTR LTS circuit breaker on the copilot's circuit breaker panel. When a Dome Light switch is placed in the REMOTE position, the associated dome light is controlled by the dome light function of the membrane switch panel, located near the entry door. The REMOTE position does not require a BATTERY switch to be on. The REMOTE position of the Dome Light switch is powered by 28 VDC supplied through the ENTRY LTS circuit breaker on the copilot's circuit breaker panel.

PASSENGER COMPARTMENT LIGHTING

The passenger compartment lighting consists of aisle lights, passenger reading lights, overhead lights, entry lights, NO SMOKING/FASTEN SEAT BELTS signs, lavatory lights, cabin baggage compartment lights, and the cove cabinet lights.

AISLE LIGHTS

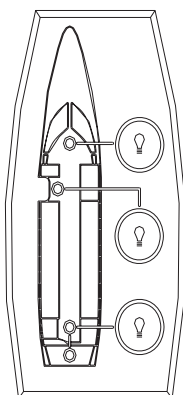
Aisle lights are installed on each side of the center aisle to provide foot path lighting. The lights are controlled by the aisle light function of the Cabin Touch Screen located on the upper inboard portion of the left forward closet and the Master Control unit. The lights operate on 28 VDC supplied through the AISLE LTS circuit breaker on the pilot's circuit breaker panel.

PASSENGER READING LIGHTS

Passenger reading lights are installed in the convenience panels above the seats on each side of the cabin. Some convenience panels consist of an eyeball-type air outlet and a reading light while others consist of a two-light assembly referred to as table lights. Each light includes an integral, directionally-adjustable lens. The lights are controlled through a CMS touch screen switch panel (READ LIGHTS and TABLE LIGHTS) in the armrest adjacent to each seat location. The lights operate on 28 VDC supplied through the READ LTS and TABLE LTS circuit breakers on the pilot's circuit breaker panel.

OVERHEAD LIGHTS

General cabin lighting is provided by lights recessed in the cabin convenience panel. The lights operate on 28 VDC supplied through the CABIN LTS circuit breaker on the pilot's circuit breaker panel. The lights are controlled through Cabin Touch Screen located on the upper inboard portion of the left forward closet and the Master Control unit. The switch panel provides on/off, bright and dim functions. In the event of cabin depressurization, the lights will automatically illuminate full bright if the cabin altitude reaches approximately 14,500 feet. Refer to OXYGEN SYSTEM for a description of emergency operation of the overhead lights.



Pressing the upper switch will toggle the ON/OFF state of the cockpit dome light if the dome light switch in the cockpit is in the remote position.

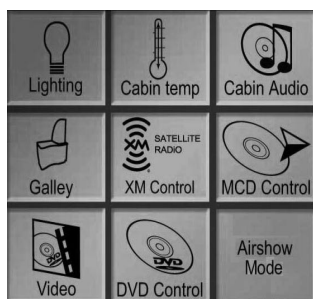
Pressing the middle switch will toggle the ON/OFF state of the entryway lights.

Pressing the lower switch will toggle the On/Off state of the baggage light, vanity light, and lavatory reading light.

Entry Door Switch Panel

(Located outboard on the aft side of the left forward cabinet)

Figure 4-6



Pressing the Lighting position on the Cabin Control Switch Panel will cause the Cabin Control Switch Panel to advance to the lighting control panel.

The lighting control panel toggles the following lights On/Off:

- Vanity/Bag
- Worksurface (Galley)
- DN Wash (Cabin Downwash)
- Club Accent
- Spot Light

Cabin Control Switch Panel

(Located on the inboard top side of the left forward cabinet)

Figure 4-7



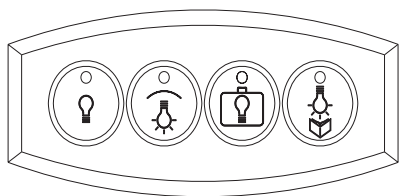
Pressing the Reading Light position on a Passenger Control Switch Panel will cause the Reading Light for that seat to toggle On/Off:

Pressing the Table Light position on a Passenger Control Switch Panel will cause the Table Light for that seat to toggle On/Off:

Passenger Control Switch Panel

(Located in the armrest adjacent to passenger seats)

Figure 4-8



The Lavatory Switch Panel toggles the following lights On/Off:

- Lavatory/Vanity
- Lavatory Downwash
- Baggage
- Reading

Lavatory Switch Panel
(Located in the lavatory wall)
Figure 4-9

ENTRY LIGHT

A cabin entry lights consist of a light in the top section of the door and a light on the bottom of the left forward cabinet. The lights are controlled by the entry light function of the entry door switch panel, located near the entry door. The light's circuits are wired to the right battery bus through the ENTRY LTS circuit breaker on the copilot's circuit breaker panel. Therefore, the light is operable regardless of BATTERY switch position. The aircraft has a timer function that turns the cabin entry lights off after approximately 60 minutes after the upper cabin door is closed.

LAVATORY LIGHTS

The lavatory is illuminated by lights recessed in the lavatory convenience panel, a reading light in the RH overhead convenience panel, a vanity light assembly installed over the vanity cabinet, and vanity mirror lights. The reading, downwash lights and vanity/lavatory light are controlled with a membrane switch panel located on the RH lavatory wall. The reading light operates on 28 VDC supplied through the READ LTS circuit breaker on the pilot's circuit breaker panel. The vanity/lavatory light operate on 28 VDC supplied through the ENTRY LTS circuit breaker on the pilot's circuit breaker panel. The downwash lights operates on 28 VDC supplied through the CABIN LTS circuit breaker on the pilot's circuit breaker panel.

BAGGAGE COMPARTMENT LIGHT

Overhead lights are installed in the cabin baggage compartment to provide illumination of the compartment. The lights are controlled by the entry light function of the membrane switch panel, located near the entry door or through a membrane-type baggage light switch located in the aft lavatory. The lights' circuits are wired to the right battery bus through the ENTRY LTS circuit breaker on the copilot's circuit breaker panel. Therefore, the light is operable regardless of BATTERY switch position. The aircraft has a timer function that turns the cabin entry lights off after approximately 60 minutes after the upper cabin door is closed.

NO SMOKING AND FASTEN SEAT BELT SIGNS

No smoking and fasten seat belt signs are installed in the cabin headliner immediately aft of the crew compartment and in the aft cabin. When illuminated, the sign displays symbolic representations for no smoking and fasten seat belts. Illumination of the sign is controlled through the NO SMOKING FASTEN SEAT BELT-OFF-FASTEN SEAT BELT switch on the center switch panel. When the switch is set to NO SMOKING FASTEN SEAT BELT, both symbols will illuminate and a chime will sound. When the switch is set to FASTEN SEAT BELT, only the fasten-seat-belt symbols will illuminate and the tone will sound. Additionally, a RETURN TO SEAT sign is installed in the lavatory. The RETURN TO SEAT sign will be illuminated whenever the fasten seat belt sign is illuminated. Electrical power to illuminate the signs is 28 VDC supplied through the PASS INFO circuit breaker on the copilot's circuit breaker panel. The chime is generated by the passenger speaker amplifier and broadcast through the passenger speakers. When the CABIN PWR switch is selected — OFF, the illuminated NO SMOKING/FASTEN SEAT BELT sign is disabled.

Some aircraft have a no smoking cabin. In these aircraft, the no smoking portion of the no smoking and fasten seat belt signs is illuminated anytime one of the BATTERY switches is on. A two-position FASTEN SEAT BELT-OFF switch replaces the three-position NO SMOKING FASTEN SEAT BELT-OFF-FASTEN SEAT BELT switch on the center switch panel.

CARGO AND SERVICING COMPARTMENT LIGHTING

TAILCONE BAGGAGE LIGHTS

Two lights are installed along the LH side of the tailcone baggage compartment to provide illumination of the compartment. A door-actuated switch and BAGGAGE LIGHTS - OFF toggle switch are installed. The toggle and door-activated switches are wired in series to the light assemblies; therefore, the baggage access door must be open and the toggle switch set to BAGGAGE LIGHTS to illuminate the lights. When the toggle switch is set to OFF, the lights will extinguish regardless of the door position. The lights will operate regardless of BATTERY switch position.

TAILCONE MAINTENANCE LIGHT

A tailcone maintenance light is installed in the tailcone equipment compartment to provide illumination of the compartment. The system consists of a light assembly, a MAINT LIGHTS - OFF toggle switch and a door-actuated switch. The toggle switch and door-actuated switch are wired in series to the light assembly; therefore, the tailcone access door must be open and the toggle switch set to the MAINT LIGHTS position to illuminate the light. When the toggle switch is set to OFF, the light will extinguish regardless of the access door position. When the access door is closed, the light will extinguish regardless of the toggle switch position. The maintenance light operates on 28 VDC supplied from the #1 battery through a current limiter.

ILLUMINATED EXIT SIGN SYSTEM

The Learjet 60XR aircraft comes standard with six illuminated exit signs, one located above the entry door, two in the LH FWD cabinet, one in the RH AFT partition, one in the lavatory toilet shroud and one above the emergency door. The illuminated exit signs system provides exit sign lighting in the event of a normal electrical system failure. The system also includes two emergency battery units, two egress light assemblies (located in the aircraft exit doors) an illuminated exit sign control panel in the cockpit and associated aircraft wiring. The batteries are charged through the EMER LTS circuit breaker on the copilot's circuit breaker panel. If armed, the system will automatically activate whenever R DC BUS 4 loses normal electrical power. Therefore, the system will automatically activate during EMER BUS mode.

EMERGENCY EXIT LIGHTS BATTERY UNITS

The battery units, used in the illuminated exit sign system, are rechargeable, 24-volt, and maintenance-free. Each battery unit incorporates a relay that when activated will connect the battery to the lights utilized for emergency illumination of the exit signs. The relay will remain latched in this position until a signal to reset is received. Therefore, once activated the illuminated exit sign system will remain activated even though control wiring may become severed. One battery is located in the forward part of the cabin while the other is located in the aft part of the cabin. Either battery is capable of powering the entire illuminated exit sign system by itself, thus allowing all illuminated exit signs to activate even with a vertical transverse separation of the cabin.

EGRESS LIGHT ASSEMBLIES

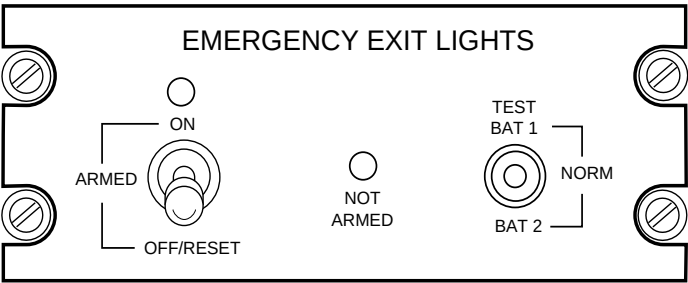
An egress light assembly is installed in the upper cabin door and the emergency escape/baggage door. When activated, these lights provide illumination of the emergency exits. Each light assembly includes a momentary push button switch. If the system is armed but not activated, pressing either push button switch will manually activate the system.

EMERGENCY EXIT LIGHTING (OPTIONAL)

The optional emergency exit lighting is supplemental to and works in conjunction with the illuminated exit sign system. The additional lighting provided by this option consists of the three cabin table lights, galley work surface light and the cabin aisle lights. These lights are utilized to provide cabin lighting for emergency egress.

EMERGENCY EXIT LIGHTS CONTROL PANEL

The EMERGENCY EXIT LIGHTS control panel, in the cockpit, provides control, testing, and indicating functions for the illuminated exit signs, egress lights and the optional emergency exit lighting. The panel includes: one control switch (ON-ARMED-OFF/RESET), one test switch (TEST BAT 1-NORM-TEST BAT 2), one white ON annunciator, and one amber NOT ARMED annunciator.



EMERGENCY EXIT LIGHTS CONTROL PANEL
Figure 4-10

CONTROL SWITCH

Functions of the control switch are shown in the following table:

SWITCH POSITION	SYSTEM RESPONSE
OFF/RESET	The relays in both battery units will reset to off and all emergency exit lighting will go out. Pressing one of the push button switches at either exit will activate the system while held. Upon release, the system will reset to off.
ARMED	Arms the system to automatically activate should normal electrical power be lost. Selecting ARMED prior to powering up the aircraft will cause the system to activate immediately. Pressing one of the push button switches at either exit will manually activate the system.
ON	To manually activate the system, hold switch momentarily to ON and release. The switch will spring back to the ARMED position and the system will remain activated.

TEST SWITCH

The test switch is a three-position switch spring loaded to the NORM position. The test switch is used to verify each battery unit is capable of powering all the emergency exit lighting by itself.

To test system:

1. Aircraft BATTERY Switches — On.
2. EMERGENCY EXIT LIGHTS Switch — ARMED.
3. TEST Switch — BAT 1 and hold. All six illuminated exit signs and both egress lights will illuminate. ON annunciator will also illuminate. If the optional emergency exit lighting is installed then the cabin table lights, galley work surface light and the cabin aisle lights will also illuminate.
4. TEST Switch — BAT 2 and hold. All six illuminated exit signs and both egress lights will illuminate. ON annunciator will also illuminate. If the optional emergency exit lighting is installed then the cabin table lights, galley work surface light and the cabin aisle lights will also illuminate.
5. TEST Switch — Release to NORM. Emergency exit lighting will reset to off and the ON annunciator will extinguish.

ANNUNCIATORS

Meaning of the ON and NOT ARMED lights is shown in the following table:

ANNUNCIATION	MEANS
ON	The system is activated either manually or automatically. Also annunciates during test.
NOT ARMED	The aircraft is powered up and the system is not yet armed. Also annunciates whenever the system has been automatically activated. Illumination of NOT ARMED will trip the Master CAUT lights.

MASTER CAUTION/WARNING AND ANNUNCIATOR PANEL LIGHTS

Master WARN/CAUT lights on the pilot's and copilot's instrument panels and annunciator panel cockpit warning lights give a visual indication of various systems operating conditions. The annunciator panel lights are white (advisory), green (normal), amber (caution) and red (warning).

The annunciator panel cockpit warning lights may be tested by pressing the test switch on either side of the panel. During the first 3 seconds of the lamp test, the two bulbs in each light will alternately illuminate. Thereafter, all the bulbs will illuminate until the test switch is released. Photoelectric cells, outboard of each ENG FIRE PULL switch, automatically dim the annunciator panel lights to a level corresponding to existing light in the cockpit or to a minimum preset level for a totally dark cockpit. Other cockpit annunciator lights are dimmed when the NAV lights are on.

If an annunciator light illuminates and the condition is corrected, the light will extinguish. If the condition recurs, the light will again illuminate.

Illumination of any red cockpit annunciator will cause both Master WARN lights to illuminate and flash. Depressing the Master WARN/CAUT light will extinguish the Master WARN light even though the annunciator light may be flashing (ENTRY DOOR, AFT CAB DOOR, L or R STALL, CABIN FIRE, or either ENG FIRE PULL).

Illumination of any amber cockpit annunciator, except starter engaged lights (during ground operations), will cause both Master CAUT lights to illuminate and flash unless the master caution feature has been inhibited. Depressing the Master WARN/CAUT light will extinguish the Master CAUT light even though the annunciator light may be illuminated. The annunciator light will remain on as long as the condition exists. When the aircraft is on the ground, the master caution feature may be inhibited by depressing and holding either Master WARN/CAUT light until the Master CAUT light illuminates steadily. Approximately 10 seconds after takeoff, the master caution feature will revert to the normal (uninhibited) mode.

Most white annunciators may be extinguished in flight by depressing either Master WARN/CAUT light. Depressing either warning lights Test switch will cause the annunciators to illuminate again. A white ENG CMPTR light accompanied by an amber ENG CMPTR light may not be extinguished. Any white annunciators which were extinguished in flight will again illuminate shortly after touchdown.

When an EIS page is not displayed and parameters on that page are out of tolerance, there will be an amber or red flag in the lower left of the currently displayed page indicating the page with the out of tolerance indication. This indication is in addition to the Master WARN/CAUT light.

SECTION V

FLIGHT SYSTEMS & AVIONICS

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SECTION V

FLIGHT SYSTEMS & AVIONICS

FLIGHT CONTROLS

The primary flight controls (ailerons, elevator, and rudder) are mechanically operated through the control columns, control wheels, and rudder pedals. The flaps and spoilers are hydraulically operated and electrically controlled. Aircraft trim systems (pitch, roll, and yaw) are electrically operated and controlled.

AILERON AND ELEVATOR

Movement of the control columns and control wheels is mechanically translated into elevator and aileron control surface movement through systems of cables, pulleys, and push-pull rods. In addition to aileron control, the control wheels incorporate switches that control normal trim, pitch-axis interrupt, autopilot and yaw damper disconnect, flight director clear, flight director sync, microphone keying, and nose wheel steering engage and disengage circuits. Control wheel switch functions are discussed under the applicable system.

RUDDER

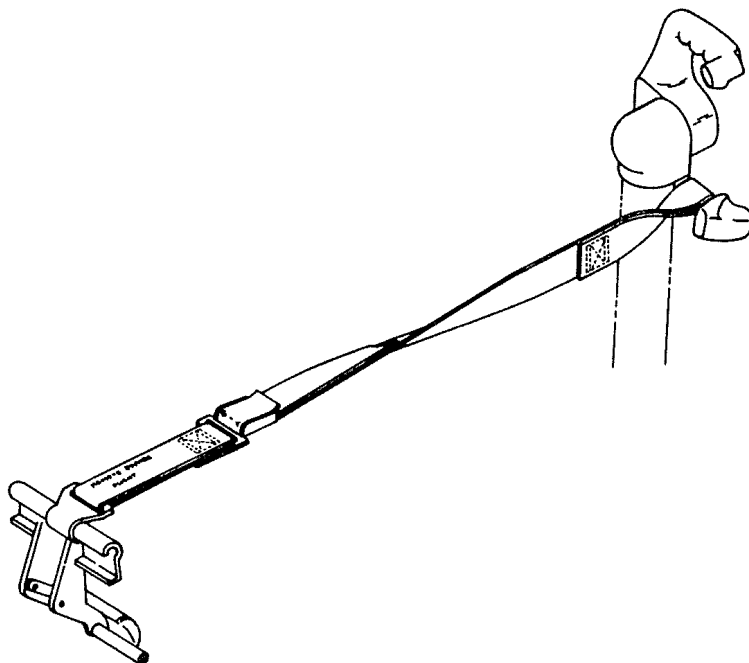
Rudder pedal movement is mechanically translated into rudder control surface movement through a system of cables, pulleys, and bellcranks. Nose wheel steering, when engaged, is electronically controlled by the pedals and braking may be accomplished by depressing the upper portion of the pedals.

PEDAL ADJUST SWITCHES

The pilot's and copilot's rudder pedals are individually adjustable through the PEDAL ADJUST switches on the pilot's and copilot's outboard switch panels. Each switch has three positions: FWD, OFF, and AFT. When either switch is held to the FWD or AFT position, an electrically controlled actuator will move the corresponding rudder pedals in the desired direction. The rudder pedal adjust system operates on 28 VDC supplied through the RUDDER PEDAL ADJUST circuit breaker on the copilot's circuit breaker panel.

CONTROLS GUST LOCK

A controls gust lock is provided to help prevent wind gust damage to the movable control surfaces. When installed, the lock provides security by holding full rudder, full aileron, and full down elevator.



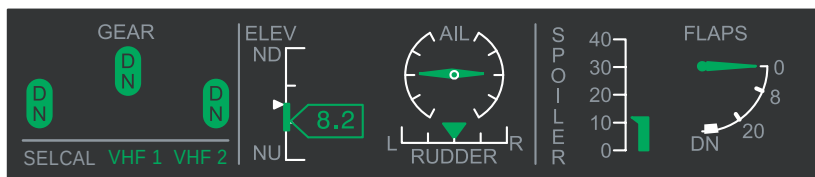
CONTROLS GUST LOCK
Figure 5-1

FLAPS

The hydraulically-actuated, electrically-controlled flap system provides flap settings of UP (0°), 8°, 20°, and DN (40°). The single-slotted flaps are attached to the rear wing spar with tracks, rollers, and hinges. The flap selector switch controls a solenoid-operated hydraulic control valve that meters hydraulic pressure to the flap actuators. The actuators mechanically rotate sectors attached to the flaps through adjustable push-pull tubes. Interconnecting cables and pulleys synchronize flap movement throughout the range of travel. A flap position switch is mechanically connected to each flap sector. These switches provide flap position information to the landing gear warning, stall warning, spoiler warning, trim-in-motion warning, spoileron, and autopilot systems. A flap limit switch is mechanically connected to each sector to automatically maintain flap position at the selected setting. Overtravel, when the flaps are fully extended, is mechanically prevented. The flap control system operates on 28 VDC supplied through the FLAPS circuit breaker on the copilot's circuit breaker panel. The flaps are operative during the EMER BUS mode.

FLAP SELECTOR SWITCH

The flap selector switch is located on the right side of the pedestal near the thrust levers. The switch has four positions: UP, 8, 20, and DN. The switch handle is shaped like an airfoil. When 8° or 20° flaps is selected, 28 VDC is directed to the applicable (up or down) solenoid of the flap control valve. The flap control valve will meter hydraulic pressure to the flap actuators and move the flaps in the desired direction. As the flaps approach within 1° of the selected setting, the applicable flap limit switch will remove power from the flap control valve solenoid and flap travel will stop. When UP is selected, 28 VDC is directed to the up solenoid of the flap control valve and the flaps will move in the up direction. When DN is selected, 28 VDC is directed to the down solenoid of the flap control valve and the flaps will move in the down direction. When the flaps reach full extension, the "down" pressure will remain to maintain the flaps full down.



FLIGHT CONTROL PAGE
Figure 5-2

FLAP POSITION INDICATOR

The FLAPS indicator, located on the EIS Flight Display Page, provides the crew with visual indication of flap position. The indicator face consists of a scale, which has markings for UP (0°), 8°, 20°, and DN (40°), and a pointer on the left of the scale. A potentiometer connected to the left flap sector transmits the flap position signal to the indicator. The indicator operates on 28 VDC supplied through the TRIM-FLAP-SPOILER INDICATOR circuit breaker on the copilot's circuit breaker panel. The flap position indicator is operative during the EMER BUS mode.

SPOILERS

The spoilers, located on the upper surface of the wings forward of the flaps, may be extended symmetrically for use as spoilers or asymmetrically for aileron augmentation when the flaps are extended. The spoilers are electrically controlled and hydraulically actuated either by a control switch (Normal Spoiler Mode), by the wing flap position switches (Spoileron), or automatically during ground operations when the thrust levers are pulled to idle (Autospoilers).

Autospoilers: The autospoiler mode is used to automatically extend the spoilers on landing or in the event of an aborted takeoff. When the SPOILER lever is set to ARM, the system will be armed (SPOILER ARM light will illuminate) to automatically extend both spoilers when one of the following conditions are met.

Flight Phase	Autospoilers will deploy when:
Aborted Takeoff	Aircraft accelerates to 40 knots or greater groundspeed and the thrust levers are brought to IDLE per the ABORTED TAKEOFF procedure. Spoilers will remain deployed unless a thrust lever is advanced above IDLE.
Landing	Either of the following occurs: - Both squat switches indicate an "on ground" condition and both thrust levers are in IDLE (one may be in CUTOFF) or - A wheel speed of 40 knots or greater is attained at touchdown and both thrust levers are in IDLE (one may be in CUTOFF). Spoilers will remain deployed unless a thrust lever is advanced above IDLE.

Once spoilers are deployed, the deploy signal will latch and cycling the squat switches will not stow the spoilers. Advancing one or both throttles will release the latch and stow the spoilers. Normal spoiler extension and retraction will override the autospoiler logic. Flap position has no effect on autospoiler operation and autospoilers are not operational when EXT or RET is selected. Autospoiler control circuits operate on 28 VDC supplied through the SPOILER circuit breaker on the copilot's circuit breaker panel. Autospoilers are operative during the EMER BUS mode.

Normal Spoiler Mode: During the spoiler mode, the spoilers are symmetrically extended and retracted through the SPOILER lever on the forward pedestal. In flight, the spoilers may be extended to any desired position by placing the SPOILER lever in any position between ARM and EXT. Detents for approximately 10° and 20° positions are provided between the ARM and EXT positions of the lever. On the ground, the spoilers will extend fully whenever any partial extension is selected. The SPOILER indicator, located on the EIS Flight Display Page, provides the crew with visual indication of spoiler position. The spoiler mode, when selected, will override the aileron augmentation (spoileron) mode, if aileron augmentation is engaged. When the spoiler lever is positioned for spoiler extension, a computer-amplifier will command a selector valve and two servo valves to the extend position. These valves will apply hydraulic pressure to the spoiler actuators and cause the spoilers to extend. As the spoilers unseat and extend through 1°, the SPOILER EXT light will illuminate and the computer will close a restrictor bypass to restrict hydraulic flow into the return line. The spoilers will fully extend in approximately 5 to 7 seconds. Full extension is approximately 45°. However, during flight, a pressure relief allows the spoilers to "blow down" to a lesser extension angle. When RET is selected, the computer-amplifier will command the servo valves closed and the selector valve to retract. The selector valve will then apply hydraulic pressure to the spoiler actuators and cause the spoilers to retract. When retracted, the spoilers are secured by an internal locking mechanism in the actuators. The spoilers will fully retract in approximately 4 seconds. A monitor circuit will automatically retract both spoilers and illuminate the SPOILER MON light should a malfunction occur. Spoiler mode control circuits operate on 28 VDC supplied through the SPOILER circuit breaker on the copilot's circuit breaker panel. The spoilers are operative during EMER BUS mode.

Spoileron Mode: During the spoileron (aileron augmentation) mode, the spoilers are independently raised and lowered in a one-to-one ratio with the upgoing aileron to improve lateral control with the flaps full down. Aileron augmentation is automatically engaged when the flaps are lowered beyond 25° and the SPOILER lever is in the RET or ARM position. During the spoileron mode, the computer-amplifier continuously monitors aileron position through follow-ups on the aileron sectors. As the ailerons move, the computer-amplifier actuates the spoiler selector and servo valves to control spoiler movement. As one aileron moves up, the servo valves are positioned so that the spoiler on the same wing moves up with the aileron while the opposite spoiler remains retracted. A limit switch for each spoiler limits spoiler extension to approximately 15°. A monitor circuit will automatically retract both spoilers and illuminate the SPOILER MON light should a malfunction occur. The spoileron mode operates on 115 VAC supplied through the SPOILERON circuit breaker on the copilot's circuit breaker panel.

SPOILER LEVER

Symmetric extension and retraction of the spoilers is controlled through the SPOILER lever located on the left side of the pedestal adjacent to the thrust levers. The lever has five positions: RET, ARM, two partial extension detents and EXT. When the switch is set to EXT, both spoilers will extend and the SPOILER EXT light will illuminate. When the lever is set to ARM, the autospoiler system will be armed for automatic spoiler extension and the SPOILER ARM light will illuminate. When the lever is set to RET, both spoilers will retract. The spoilers may be extended partially by placing the spoiler lever between ARM and EXT. When on the ground, the spoilers will extend fully when the spoiler lever is in any position between ARM and EXT.

SPOILER EXT LIGHT

The SPOILER EXT light, located on the glareshield annunciator panel, will illuminate steady whenever the flaps are UP and the spoilers are extended. The light will flash if the spoilers are extended and the flaps are beyond 3°. The light is operated by a 1°-up position switch for each spoiler. The light will illuminate if either 1°-up switch is actuated except during spoileron mode.

SPOILER ARM LIGHT

The SPOILER ARM light, on the glareshield annunciator panel, will illuminate whenever the autospoiler mode is armed and remains illuminated when autospoilers are extended. The light will not illuminate and the autospoiler system will not arm (SPOILER ARM light will not come on), or will disarm (SPOILER ARM light will go out), if the squat switches are in an asymmetric condition for more than approximately 2 minutes.

SPOILER MON LIGHT

The amber SPOILER MON light, located on the glareshield annunciator panel, will illuminate whenever monitor circuits in the computer-amplifier detect a malfunction during the spoileron mode or unequal spoiler extension during the spoiler mode. Should the monitor detect a malfunction during aileron augmentation, the monitor will automatically disengage the spoileron mode and the spoilers will immediately retract. If the monitor has disabled aileron augmentation or the SPOILERON circuit breaker is pulled, normal spoiler mode operation will not be available in flight; however, the spoilers will be available for ground operation. The autospoilers will also be operational but should not be armed if the SPOILERON circuit breaker is open. During the spoiler mode, the SPOILER MON light will illuminate and both spoilers will retract in the event of unequal spoiler extension where the difference is 6° or more. Additionally, the SPOILER MON light will also illuminate if either of the autospoiler dual logic circuits fail.

SYSTEM TEST SWITCH — SPOILER RESET FUNCTION

The rotary-type system test switch, located on the center instrument panel, is used to test the spoiler system.

During flight, the SPOILER RESET position is used to reset the spoiler/spoileron system in the event of a malfunction. Should the monitor disable spoiler/spoileron mode (SPOILER MON light illuminated) and the fault clears, the system may be enabled by momentarily placing the system test switch in the SPOILER RESET position. If the system is reset, the SPOILER MON light will extinguish. If the spoiler/spoileron system cannot be reset, the SPOILER MON light will remain illuminated and normal spoiler or spoilerons will not be available in flight.

During ground operations, the switch is used during the spoileron and autospoiler test sequence to verify system operation. Placing the system test switch in the SPOILER RESET position and depressing the PRESS TEST button in the center of the switch will simulate a malfunction.

TRIM SYSTEMS

MACH TRIM

The Mach trim system provides automatic pitch trim in response to Mach changes to increase longitudinal stability and counteract the center-of-lift movement at speeds above approximately 0.70 Mi if the autopilot is disengaged or inoperative. The system consists of a computer, a pitch trim followup, the MACH TRIM annunciator light, and associated aircraft wiring. The Mach trim computer receives Mach data from the air data computers. The Mach trim system utilizes the primary motor of the horizontal-stabilizer pitch-trim actuator to affect trim changes. The Mach trim computer operates on 115 VAC supplied through the MACH TRIM circuit breaker and 28 VDC supplied through the PRI PITCH TRIM circuit breaker on the pilot's circuit breaker panel. The Mach trim system is inoperative during EMER BUS mode.

During flight, with the autopilot disengaged or inoperative, the Mach trim system will automatically engage at approximately 0.70 Mi. As the aircraft Mach number changes, the change is sensed by the air data computers and transmitted to the Mach trim computer. If the aircraft is not retrimmed to compensate for the Mach change, the Mach trim computer will command the appropriate pitch trim change (nose up for increased Mach and nose down for decreased Mach) through the horizontal-stabilizer pitch-trim actuator. A followup on the horizontal stabilizer will transmit a horizontal stabilizer position signal to the Mach trim computer. Stabilizer trim motion will cease as the followup stabilizer position signal cancels the pitch trim signal from the Mach trim computer. Monitors are installed to disengage Mach trim in the event of a malfunction. If a monitor disengages Mach trim and Mach is above 0.77 Mi, the overspeed warning horn will sound. The Mach trim system is resynchronized whenever either pilot manually trims the aircraft and a synchronous standby mode is maintained if the autopilot is engaged. In flight, Mach trim monitor may also be reset through the SYSTEM TEST switch on the center instrument panel.

PITCH TRIM SELECTOR SWITCH — MACH TRIM FUNCTION

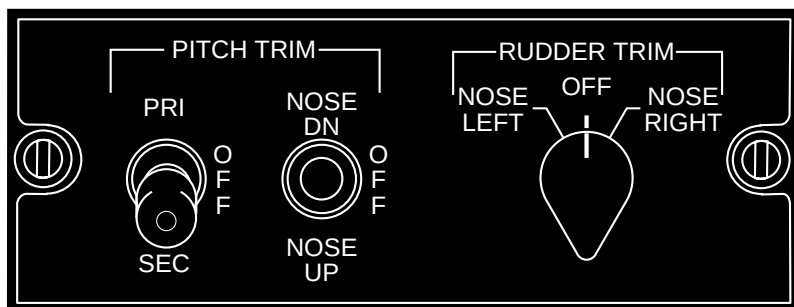
The Mach trim system utilizes the primary motor of the horizontal stabilizer pitch trim actuator to increase longitudinal stability. If the PITCH TRIM selector switch on the pedestal is in the PRI position, Mach trim will automatically engage at approximately 0.70 Mi if the autopilot is disengaged or inoperative. Mach trim will not engage or will disengage when the PITCH TRIM selector switch is moved to the OFF or SEC position. If the PITCH TRIM selector switch is in OFF or SEC, the Mach trim monitor will remain active and will illuminate the MACH TRIM light and cause the overspeed warning horn to sound at or above 0.77 Mi if the monitor detects a sufficient Mach/horizontal stabilizer position error.

MACH TRIM LIGHT

The amber MACH TRIM annunciator light, located on the glareshield annunciator panel, will illuminate whenever the Mach trim monitor or Mach monitor has disengaged the Mach trim system. Whenever the Mach trim system is disengaged and Mach is above 0.77 Mi, the overspeed warning horn will sound if the autopilot is inoperative or not engaged. The Mach trim monitor continuously monitors input signals and power to the Mach trim computer. In the event of loss of power to the Mach trim computer or primary pitch trim system, loss of input signals to the Mach trim computer, or a Mach/horizontal stabilizer position error, the Mach trim monitor will disengage Mach trim and illuminate the MACH TRIM light.

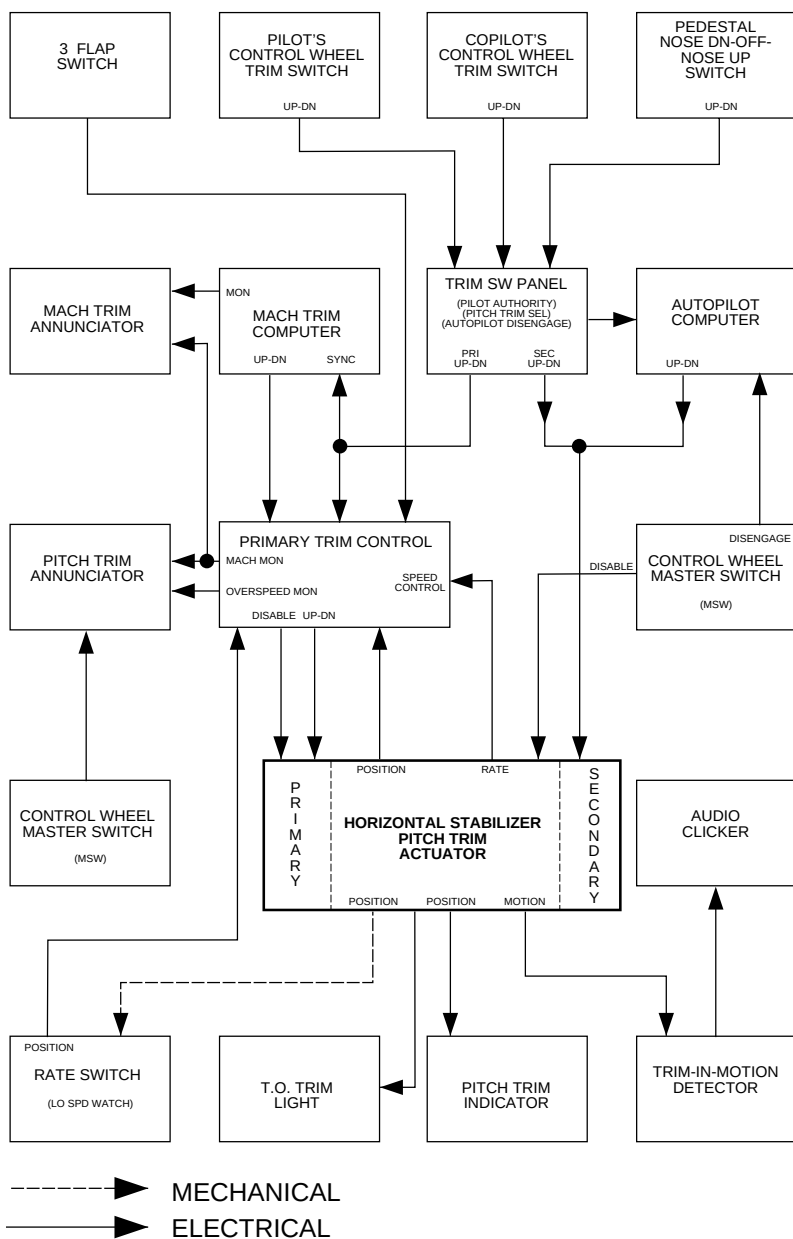
SYSTEM TEST SWITCH — MACH TRIM FUNCTION

The rotary-type SYSTEM TEST switch on the center instrument panel is used to test the Mach trim system and the Mach trim monitor while the aircraft is on the ground. In flight, the switch is used to resynchronize the system if the Mach trim monitor has disengaged the system. The test function is initiated by rotating the switch to MACH TRIM and then depressing the switch PRESS TEST button. When the aircraft is on the ground and the test sequence is initiated, the test switch inserts a signal that causes the horizontal stabilizer to trim in the nose-up direction. Since there is no corresponding airspeed change, the Mach trim monitor senses a Mach/horizontal stabilizer position error, disengages Mach trim, and illuminates the MACH TRIM light. In flight, depressing the PRESS TEST button will resynchronize the Mach trim system to the horizontal stabilizer position and Mach existing when the PRESS TEST button was depressed.

**TRIM CONTROL PANEL****Figure 5-3**

PITCH TRIM

Pitch trim is accomplished by repositioning the horizontal stabilizer to the desired trim setting through actuation of the horizontal stabilizer pitch trim actuator. The actuator is a dual-motor, screwjack-type actuator. The primary motor is operated by the aircraft primary pitch trim system and the Mach trim system. The secondary motor is operated by the aircraft secondary pitch trim system and the autopilot. A speed controller in the primary pitch trim system changes primary pitch trim rate as a function of horizontal stabilizer trim position. The speed controller allows high trim rates when the aircraft is trimmed for takeoff or approach and low trim rates when the aircraft is trimmed for cruise. A trim speed monitor is incorporated into the speed controller to alert the crew of a trim speed error. The primary and secondary pitch trim systems are electrically independent and mode selection is made through a selector switch. Primary pitch trim is pilot controlled through trim switches on each control wheel. Secondary pitch trim is pilot controlled through a switch on the pedestal. Emergency interrupt is provided for both systems through the Control Wheel Master switches (MSW). The ELEV trim indicator, located on the EIS Flight Display Page, provides the crew with visual indication of horizontal stabilizer position. Primary pitch trim control circuits operate on 28 VDC supplied through the PRI PITCH TRIM circuit breaker on the pilot's circuit breaker panel. Secondary pitch trim control circuits operate on 28 VDC supplied through the SEC PITCH TRIM circuit breaker on the copilot's circuit breaker panel. Both the primary and secondary pitch trim systems are operative during EMER BUS mode.



PITCH TRIM SYSTEM BLOCK DIAGRAM
Figure 5-4

PITCH TRIM SELECTOR SWITCH

The PITCH TRIM selector switch, located on the pedestal trim control panel, provides primary and secondary mode selection for the aircraft trim systems. The switch has three positions: PRI, OFF, and SEC. When the switch is set to PRI, a ground path is provided for the primary pitch trim system control circuits and trim changes are accomplished through the control wheel trim switches. When the switch is set to SEC, a ground path is provided for the secondary pitch trim system control circuits and trim changes are accomplished through the pedestal NOSE DN-OFF-NOSE UP switch. When the switch is set to the OFF position, both pitch trim electrical control circuits are isolated from the aircraft electrical system. The Mach trim system is inoperative with the PITCH TRIM selector switch in the OFF or SEC positions. The autopilot is inoperative with the PITCH TRIM selector switch in the OFF position.

CONTROL WHEEL TRIM SWITCHES — PITCH FUNCTION

Each control wheel trim switch is a dual-function (trim and trim arming) switch which controls primary pitch trim and roll trim. One switch is located on the outboard horn of each control wheel. Each switch has four positions: LWD, RWD, NOSE UP, and NOSE DN. The trim arming button on top of the switch must be depressed for trim motion to occur. With the PITCH TRIM selector switch in the PRI position, actuation of either switch to NOSE UP or NOSE DN will signal the primary motor in the horizontal stabilizer pitch trim actuator to move the stabilizer in the appropriate direction. Actuation of the pilot's switch will override actuation of the copilot's switch. Actuation of either switch to any of the four positions (LWD, RWD, NOSE UP, or NOSE DN) will disengage the autopilot. Actuation of either switch to NOSE UP or NOSE DN will re-synchronize the Mach trim computer.

NOSE DN-OFF-NOSE UP SWITCH

The NOSE DN-OFF-NOSE UP switch, located on the pedestal trim control panel, controls secondary pitch trim. The switch is spring loaded to the center (OFF) position. With the PITCH TRIM selector switch in the SEC position, actuation of the NOSE DN-OFF-NOSE UP switch to NOSE DN or NOSE UP will signal the secondary motor of the horizontal stabilizer pitch trim actuator to move the stabilizer in the appropriate direction. Actuation of secondary pitch trim will disengage the autopilot. The Mach trim system is inoperative when using secondary pitch trim. With the PITCH TRIM selector switch in the PRI or OFF position, this switch has no effect.

CONTROL WHEEL MASTER SWITCHES — PITCH TRIM FUNCTION

A Control Wheel Master Switch (MSW) is located beneath the control wheel trim switch on the outboard horn of each control wheel. In addition to the switches' other functions, either Control Wheel Master Switch (MSW), when depressed, will inhibit primary or secondary pitch trim. If the Control Wheel Master Switch is used to inhibit primary pitch trim, primary pitch trim cannot be reactivated until the Control Wheel Master Switch is released and the trim input is removed. Therefore, during the preflight check of the primary pitch trim system, it is necessary to release the control wheel trim switch as well as the Control Wheel Master Switch (MSW) to reset the system. Secondary pitch trim, however, will be inhibited only as long as the Control Wheel Master Switch (MSW) is held.

PITCH TRIM LIGHT

An amber PITCH TRIM annunciator light, located on the glareshield annunciator panel, is installed to alert the crew of primary pitch trim system malfunctions during flight. Additionally, the PITCH TRIM light will illuminate whenever either Control Wheel Master Switch (MSW) is depressed.

T. O. TRIM LIGHT

An amber T. O. TRIM annunciator light, located on the glareshield annunciator panel, is installed to alert the crew that the PITCH TRIM indicator pointer is not within the T. O. segment when the aircraft is on the ground. The light will be extinguished whenever the indicator pointer is set within the T. O. segment. The light is disabled during flight operations.

SYSTEM TEST SWITCH — TRIM OVERSPEED FUNCTION

The rotary-type SYSTEM TEST switch, located on the pilot's instrument panel, is used to test the trim speed monitor. Prior to beginning the trim speed monitor test, the pitch trim must be set on the high trim rate (N UP) side of the index on the PITCH TRIM indicator. The monitor test is initiated by rotating the SYSTEM TEST switch to TRIM OVSP, initiating primary pitch trim through either control wheel trim switch, and then depressing the switch PRESS TEST button. When the PRESS TEST button is depressed, a false low trim rate range horizontal stabilizer position signal is applied to the trim speed monitor. With the trim speed monitor in the low trim rate watch mode, running the primary pitch trim at the high trim rate will cause the trim speed monitor to illuminate the PITCH TRIM light.

PITCH TRIM INDICATOR

The ELEV indicator, located on the EIS Flight Display Page, provides the crew with visual indication of the horizontal stabilizer trim position. There is a pointer on the right side of the vertical scale with a digital readout of horizontal stabilizer trim position. The position pointer is green when on the ground and the pointer is within the T.O. segment. The position pointer is white when on the ground and the pointer is not within the T.O. segment. In air mode, the ELEV pointer is always green, regardless of position. The indicator range is from 1° to 12° of horizontal stabilizer travel. ND and NU markings indicate the direction of trim travel for airplane nose down and airplane nose up respectively. The T.O. (takeoff) segment from 5.7° to 8.75° is marked with a thick line. A triangle at the 6.5° position, separates the high and low trim rate ranges. At pitch trim settings on the NU side of the triangle, the trim speed controller will be in the high trim rate (low airspeed) mode. At pitch trim settings on the ND side of the triangle, the trim speed controller will be in the low trim rate (high airspeed) mode. The pitch trim indicator receives horizontal stabilizer position inputs from a potentiometer installed in the horizontal stabilizer pitch trim actuator. The system operates on 28 VDC supplied through the TRIM-FLAP-SPOILER INDICATOR circuit breaker on the copilot's circuit breaker panel.

TRIM-IN-MOTION AUDIO CLICKER

A trim-in-motion audio clicker system is installed to alert the crew of horizontal stabilizer movement. The system will annunciate continuous movement of the horizontal stabilizer by producing a series of audible clicks through the headsets and cockpit speakers. The system consists of a potentiometer in the horizontal stabilizer pitch trim actuator, a trim-in-motion detector box and associated aircraft wiring. As the horizontal stabilizer actuator drives the stabilizer, the output signal from the potentiometer is altered. The change in potentiometer signal is sensed by the detector box. After approximately 1/4 second of continuous stabilizer movement, the detector box will produce the speaker and headset clicks. The trim-in-motion audio clicker system is wired through the flap position switches and will not sound if the flaps are lowered beyond 3°. The trim-in-motion audible clicker may or may not sound during autopilot trim due to the duration of the trim inputs. Power for system operation is 28 VDC supplied from the WARN LTS circuit breakers on the pilot's and copilot's circuit breaker panels through the warning lights control box. These circuit breakers are powered during EMER BUS mode.

ROLL TRIM

Roll trim is accomplished by positioning the aileron trim tab on the in-board trailing edge of the left aileron through actuation of the roll trim actuator. The roll trim actuator is an electrically-operated, rotary-type actuator connected to the aileron trim tab by a push-pull rod. The system is controlled through the pilot's and copilot's control wheel trim switches. The AIL indicator, located on the EIS Flight Display Page, provides the crew with visual indication of the roll trim setting. The roll trim system operates on 28 VDC supplied through the ROLL TRIM circuit breaker on the pilot's circuit breaker panel.

CONTROL WHEEL TRIM SWITCHES — ROLL FUNCTION

Each control wheel trim switch is a dual-function (trim and trim arming) switch which controls roll trim and primary pitch trim. One switch is located on the outboard horn of each control wheel. Each switch has four positions: LWD, RWD, NOSE UP, and NOSE DN. The arming button on top of the switch must be depressed for trim motion to occur. Actuation of either control wheel trim switch to LWD or RWD will signal the aileron trim tab actuator to move the tab as required to lower the appropriate wing. Actuation of the pilot's switch will override actuation of the copilot's switch. Actuation of either switch to any of the four positions (LWD, RWD, NOSE-UP, or NOSE-DN) will disengage the autopilot if the trim arming button is depressed.

CONTROL WHEEL MASTER SWITCHES — ROLL TRIM

A Control Wheel Master Switch (MSW) is located beneath the control wheel trim switch on the outboard horn of each control wheel. In addition to the switches' other functions, either Control Wheel Master Switch (MSW), when depressed, will inhibit roll trim. The roll trim is inhibited only as long as the Control Wheel Master Switch (MSW) is held.

AILERON TRIM INDICATOR

Aileron trim information is provided by the AIL indication on the EIS Flight Display Page. Two semi-circular scales and pointers present the trim tab position in terms of left wing down and right wing down. The scale markings represent increments of trim tab travel. The aileron trim indicator receives inputs from a potentiometer in the roll trim actuator. The system operates on 28 VDC supplied through the TRIM-FLAP-SPOILER INDICATOR circuit breaker on the copilot's circuit breaker panel.

YAW TRIM

Yaw trim is accomplished by positioning the rudder trim tab on the lower trailing edge of the rudder through actuation of the yaw trim actuator. The yaw trim actuator is an electrically-operated, rotary-type actuator connected to the rudder trim tab by two push-pull rods. Yaw trim is pilot controlled through the RUDDER TRIM switch on the pedestal. The RUDDER indicator, located on the EIS Flight Display Page, provides the crew with visual indication of the yaw trim setting. The yaw trim system operates on 28 VDC supplied through the YAW TRIM circuit breaker on the pilot's circuit breaker panel.

RUDDER TRIM SWITCH

Yaw trim is pilot controlled through the RUDDER TRIM switch located on the pedestal trim control panel. The switch has three positions: NOSE LEFT, OFF, and NOSE RIGHT. The switch knob is split and both halves must be rotated simultaneously to initiate yaw trim motion. When the switch is released, both halves will return to the center OFF position. Actuation of the RUDDER TRIM switch to NOSE LEFT or NOSE RIGHT will signal the yaw trim actuator to move the rudder trim tab in the appropriate direction.

RUDDER TRIM INDICATOR

Rudder trim tab position indication is provided by the RUDDER indication on the EIS Flight Display Page. A horizontal scale and pointer indicates the direction (L or R) of yaw trim. The scale markings represent increments of rudder trim tab travel. The rudder trim indicator receives inputs from a potentiometer in the rudder trim actuator. The system operates on 28 VDC supplied through the TRIM-FLAP-SPOILER INDICATOR circuit breaker on the copilot's circuit breaker panel. The RUDDER TRIM indicator will be operative during the EMER BUS mode.

CONTROL WHEEL MASTER SWITCHES — YAW TRIM

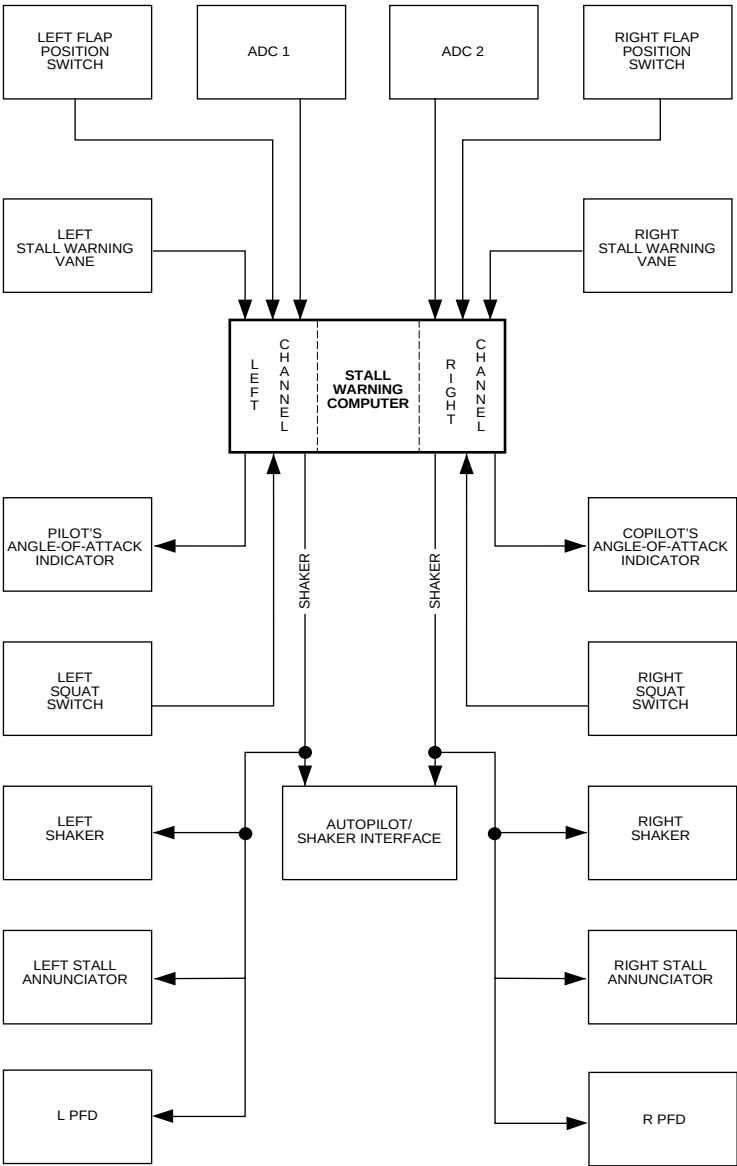
A Control Wheel Master Switch (MSW) is located beneath the control wheel trim switch on the outboard horn of each control wheel. In addition to the switches' other functions, either Control Wheel Master Switch (MSW), when depressed, will inhibit yaw trim. The yaw trim is inhibited only as long as the Control Wheel Master Switch (MSW) is held.

WARNING SYSTEMS

STALL WARNING SYSTEM

A stall warning system is installed to provide the crew with visual and tactile warning of an impending stall. The major components of the stall warning system consist of the following: left and right stall vanes on the forward fuselage, a two-channel computer-amplifier, flap position switches for each flap, two 18,100-foot altitude switches, a stick shaker for each crew position, an angle-of-attack indicator for each crew position, L and R STALL warning lights, and associated aircraft wiring. The flap position switches provide bias information to the computer-amplifier which will decrease stall warning speeds as the flaps go from 0° to 40°. Above approximately 18,100 feet pressure altitude, the altitude switches bias the system to increase stall warning speeds approximately 15 knots. The stick shakers are eccentric weights driven by an electric motor and actuation is evidenced by a high-frequency vibration of the control columns. The left and right systems are completely independent and utilize separate electronics, stall vanes, altitude switches, shaker motors, and flap switches. The stall warning system operates on 28 VDC supplied through the L and R STALL WARN circuit breakers on the pilot's and copilot's circuit breaker panels respectively. The stick shaker and STALL warning light circuits are wired through the squat switches; therefore, the stick shaker and STALL warning lights are deactivated when the squat switches are in the ground mode. The stick shaker and STALL warning lights will be deactivated for 3 to 5 seconds after lift-off. The angle-of-attack indicators remain active both on the ground and in flight, however the angle of attack displays are not available on the PFD while on the ground. The stall warning systems may be tested on the ground using the rotary-type systems test switch, located on the center instrument panel.

During flight, the stall warning vanes align with the local airstream and transducers produce a voltage proportional to airplane angle of attack. The transducer signals are transmitted to the appropriate computer-amplifier channel along with flap position information from the flap position switches and altitude information from the altitude switches. The angle-of-attack indicator pointers will enter the amber segment, the L and R STALL lights will illuminate and flash, and the stick shakers will actuate when the angle of attack increases to an angle corresponding to an airspeed at least 7% above the stall speed published in the Airplane Flight Manual.



STALL WARNING SYSTEM BLOCK DIAGRAM
Figure 5-5

ANGLE-OF-ATTACK INDICATORS

The angle-of-attack indicators, located on the pilot's and copilot's instrument panels, translate signals from the stall warning computer-amplifier into a visual indication of angle-of-attack. These indicators present normalized angle-of-attack information for all flap settings on a scale from 1.0 (max lift) to 0 (zero lift). The left stall warning system utilizes the pilot's angle-of-attack indicator and the right stall warning system utilizes the copilot's angle-of-attack indicator. Each indicator face is divided into three segments as follows: green -safe, amber -caution/shaker, and red -warning.

Low-Speed Awareness Cues

The PFD Airspeed displays receive information from the stall warning computer and display the following types of Low-Speed Awareness cues:

- Impending Stall Speed reference cue (ISS) which is represented by the top of the red bar on the airspeed cue and .82 AOA.
- Reference Approach Speed cue (RAS) which is represented by the 1.3Vs green line on the airspeed cue and .6 AOA.
- Airspeed Trend Vector on the airspeed cue.



Low-Speed awareness cues serve as an approximation of stall speed and do not replace the actual stall warning system.

STALL WARNING LIGHTS

The red L and R STALL warning lights, located in the glareshield annunciator panel, are installed to indicate impending stall or a system malfunction. During flight operations, the lights will illuminate and flash when the shaker is actuated. The lights are pulsed at the same frequency and duration as the shakers; therefore, the flash frequency will increase as the angle-of-attack increases from initial shaker actuation. At or just prior to the angle-of-attack pointer entering the red segment, the flash frequency is sufficient to cause the lights to appear steady.

SYSTEM TEST SWITCH — STALL WARNING FUNCTION

The rotary-type system test switch, located on the center instrument panel, is used to test the left and right stall warning systems. Each system is individually tested through the L STALL and R STALL positions of the system test switch. The test is initiated by rotating the system test switch to L or R STALL (as applicable) and then depressing the switch PRESS TEST button. When the test sequence is initiated, the corre-

sponding angle-of-attack indicator pointer will begin to sweep from the green segment toward the red segment. As the pointer passes the green-amber margin, the stick-shaker will actuate, Master WARN lights will illuminate, and the applicable STALL light will begin to flash. Shaker actuation is made evident by high frequency vibration of the control column.

OVERSPEED WARNING SYSTEM

The overspeed warning system provides an audible overspeed warning in the event aircraft speed exceeds a Mach or airspeed limit. The overspeed warning horn is activated by the air data computers when the position of the airspeed and the maximum allowable airspeed coincide. 28 VDC for system circuits is supplied through the WARN LTS circuit breakers on the pilot's and copilot's circuit breaker panels and will be powered during emergency bus operations. The overspeed warning horn will sound under any of the following conditions:

1. Airspeed exceeds VMO.
2. Mach exceeds MMO.

SYSTEM TEST SWITCH — OVERSPEED WARNING FUNCTION

The rotary-type system test switch, located on the center instrument panel, is used to test the overspeed warning system. The test sequence is initiated by rotating the system test switch to OVSP and then depressing the switch PRESS TEST button. The overspeed warning will sound three times, each separated by a brief pause. The third warning horn will continue until the TEST button is released.

TAKEOFF WARNING SYSTEM

The takeoff configuration monitor system consists of a monitor box, throttle quadrant switch and various system switches (provide the input signals to the monitor box). The system is active when the aircraft is on the ground (right squat switch in ground mode). A takeoff monitor aural warning will sound during ground operations when the right thrust lever is advanced to the MCR position or above and one or more of the following conditions exist:

1. Thrust reverser unlocked or deployed.
2. Flaps not set for takeoff.
3. Spoilers not retracted.
4. Pitch trim not in a safe position for takeoff.
5. Parking brake not released.

ENHANCED GROUND PROXIMITY WARNING SYSTEM WITH WINDSHEAR DETECTION (EGPWS/WS)

The Enhanced Ground Proximity Warning System with Windshear Detection (EGPWS/WS) provides the pilot with aural and visual warning of potentially dangerous flight paths relative to ground and windshear.

The system automatically and continuously monitors the airplane's flight path with respect to terrain when the aircraft is below 2450 feet radio altitude (altitude AGL). If the airplane's projected flight path would imminently result in terrain impact, the system issues appropriate visual and voice warnings. Warnings are issued for excessive sink rate, excessive terrain closure rate, descent after takeoff or missed approach, proximity to terrain with flaps and/or gear up, descent below glideslope, and descent below decision height (DH) or minimum descent altitude (MDA).

The system computes windshear and alerts the crew of windshear of sufficient magnitude to be hazardous to the aircraft. Windshear alerts are given for increasing headwind/decreasing tailwind and/or up-draft. Windshear warnings are given for decreasing headwind/increasing tailwind and/or down-draft.

The system consists of the EGPWS/WS computer, annunciators on the AFDs, INHIBIT/OVRD switches on the instrument panel for G/S INH, TERR, and TAES FLAP, and associated aircraft wiring. Voice warnings are made through the cockpit speakers and the headphones. Voice warnings generated by the EGPWS will have priority over voice warnings generated by the TCAS. The system receives inputs from the either air data computer, either AHRS, both stall warning vanes, radio altimeter, both nav receivers, nose gear down and locked switch, and the left flap 8°, 20° and 40° switch. The system operates on 28 VDC supplied through the EGPWS circuit breaker on the pilot's circuit breaker panel.

Refer to the Collins Pro Line 21 Avionics System with IFIS for the Learjet 60XR Operators Guide (Collins P/N 523-0807841, edition 1, dated April 24, 2006 or later applicable version) and the Learjet 60XR FAA Approved Airplane Flight Manual (FM-133) for additional information.

TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEM (TCAS)

The Traffic Alert and Collision Avoidance System (TCAS) provides the pilot with aural and visual indications of potentially dangerous flight paths relative to other aircraft in the vicinity. The system uses the transponder to interrogate other transponder-equipped aircraft and determine their bearing, range, and altitude. With this information, the TCAS processor can generate advisories to prevent or correct traffic conflicts.

The TCAS consists of a receiver/transmitter/processor, two directional antennas, and associated aircraft wiring. Power for system operation is 28 VDC supplied through the TCAS circuit breaker on the copilot's circuit breaker panel.

Advisories are issued to the crew via the aircraft audio system and integrated displays (PFDs and MFDs). Aural advisories generated by the ground proximity/windshear warning system (if installed) will have priority over aural advisories generated by the TCAS.

Refer to the Collins Pro Line 21 Avionics System with IFIS for the Learjet 60XR Operators Guide (Collins P/N 523-0807841, edition 1, dated April 24, 2006 or later applicable version) and the Learjet 60XR FAA Approved Airplane Flight Manual (FM-133) for additional information.

AIR DATA SYSTEMS

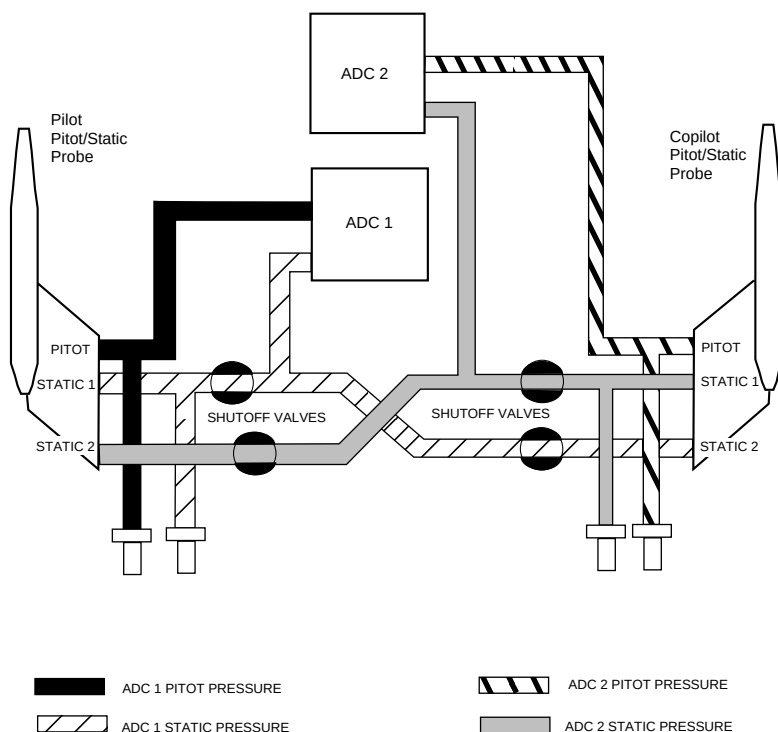
Air data for instruments and equipment requiring flight environment air data for display or operation is provided by two separate air data systems. The dual primary air data system consists of the primary pitot-static system, two air data computers, a total temperature probe and reversionary mode switch/annunciators. A separate standby pitot-static system is installed to provide flight environment air data for display on the standby instruments.

PRIMARY PITOT-STATIC SYSTEM

Pitot and static pressure for the air data computers and other using systems is obtained from the two primary pitot-static probes. One probe is located on each side of the nose compartment. Each probe contains a pitot (impact pressure) port and two static pressure ports. The probes also contain electrical heating elements controlled by the L and R PITOT HEAT switches. Four drain valves, located near the nose gear doors, are installed at the system low spots to drain moisture from the system. The pilot's pitot system is completely independent of the copilot's pitot system and utilizes the left pitot-static probe as the source of pitot pressure. The copilot's system utilizes the right pitot-static probe to obtain pitot pressure. The pilot's and copilot's systems each utilize a separate static source on each of the probes. A solenoid-operated shutoff valve is installed in each static source line to ensure accurate static pressure in the event one probe becomes clogged or unreliable. The shutoff valves are controlled through the STATIC SOURCE switch on the pilot's switch panel and operate on 28 VDC supplied through the STATIC SOURCE circuit breaker on the copilot's circuit breaker panel.

The pilot's pitot source supplies pitot pressure for ADC 1 air data computer. The copilot's pitot source supplies pitot pressure for ADC 2 air data computer.

Each pitot-static probe contains two static sources. One static source on each probe is interconnected with a static source on the opposite probe to supply static pressure to ADC 1. The other static source on each probe is interconnected with a static source on the opposite probe to supply static pressure to ADC 2. In the event a static source becomes clogged or unreliable, the affected pitot-static probe's static sources can be isolated, allowing all equipment to be operated from static sources on the opposite probe.



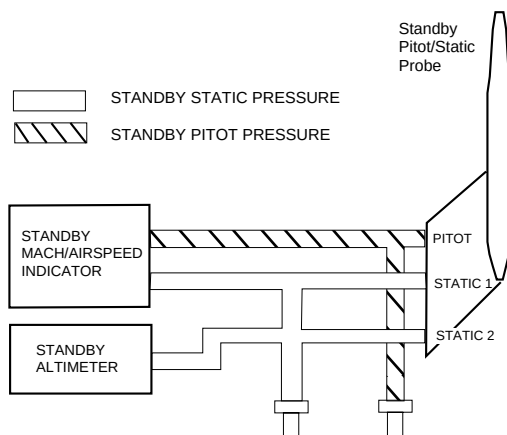
PRIMARY PITOT-STATIC SYSTEM SCHEMATIC
Figure 5-6

STATIC SOURCE SWITCH

The **STATIC SOURCE** switch controls solenoid-operated shutoff valves, in the static plumbing, to ensure accurate static pressure sensing in the event one of the pitot-static probes become inoperable or unreliable. The **STATIC SOURCE** switch, located on the pilot's switch panel, has three positions: L, BOTH, and R. When the switch is in the **BOTH** position all four shutoff valves are de-energized open and static pressure for the air data instruments and equipment is available from static ports in both pitot-static probes. Normally, the switch is in the **BOTH** position for all operations. When the switch is set to L or R, the shutoff valves for the opposite pitot-static probe are energized closed, and static pressure will be supplied by the selected pitot-static probe only.

STANDBY PITOT-STATIC SYSTEM

The standby pitot-static system is independent of the primary system and supplies pitot-static pressure to the standby Mach/airspeed indicator and the standby altimeter. The standby pitot-static probe is located on the right side of the nose compartment. This probe contains a pitot (impact pressure) port and two static pressure ports. The standby pitot-static probe contains an electrical heating element controlled by the R PITOT HEAT switch. Two drain valves, located near the nose gear doors, are installed at the system low spot to drain moisture from the system.



STANDBY PITOT-STATIC SYSTEM SCHEMATIC

Figure 5-7

AIR DATA COMPUTERS

Two digital air data computers receive pitot and static pressures from the primary pitot-static system and temperature data from the total temperature probe for computation of the flight environment. The computed results of the sensor inputs are converted to electrical signals and transmitted to the associated cockpit displays. Additional outputs from the air data computers are transmitted to the integrated avionics processor system (IAPS) for distribution to other systems that require air data for proper operation. The following table summarizes the various outputs under normal conditions. The air data computers operate on 28 VDC through the ADC circuit breakers on the pilot's and copilot's circuit breaker panels. ADC 1 and ADC 2 are operative during EMER BUS operations.

ADC 1	ADC 2
• Pilot's Instruments (EFIS) Airspeed/Mach Altitude/Vertical speed • Altitude Alert • L Stall Warning • Gear Warning • Overspeed profile • AHS (TAS) • L FCS • Mach Trim • ATC 1 (encoded altitude) • FMS 1 • FADEC • SAT • TAS • Cabin Pressurization	• Copilot's Instruments (EFIS) Airspeed/Mach Altitude/Vertical Speed • Altitude Alert • R Stall Warning • Gear Warning • Overspeed profile • AHS (TAS) • R FCS • Mach Trim • ATC 2(encoded altitude) • FMS 2 • FADEC • SAT • TAS • Cabin Pressurization

Refer to the Collins Pro Line 21 Avionics System with IFIS for the Learjet 60XR Operators Guide (Collins P/N 523-0807841, edition 1, dated April 24, 2006 or later applicable version) and the Learjet 60XR FAA Approved Airplane Flight Manual (FM-133) for additional operational information and a complete description of the air data system interfaces and instruments.

ADC/ADC TRANSFER SWITCH

The ADC/ADC transfer switches on the EFIS CONTROL panels are used to select the ADC source for display on the on-side display. On-side ADC is the normal selection indicated by a green annunciation of the switch. Reversionary (cross-side) selection is indicated by an amber annunciation on the switch. ADC reversion on either side will also cause the following annunciations: "ADC #" (# = system supplying air data [1 or 2]) on both PFDs.

ATTITUDE HEADING SYSTEM

Aircraft avionics displays and equipment requiring attitude or heading information are supplied that information from the dual, independent Collins Attitude Heading Systems (AHS 1 and AHS 2). Each system consists of an attitude heading computer with internal compensator, a magnetic flux sensor in the associated wing tip, two HEADING control switches, and associated aircraft wiring. The attitude heading computer is composed of inertial instruments, electronics, interface hardware, processing and memory circuits to provide attitude and heading information to other aircraft systems. One magnetic slaving unit is located in each wing tip and is used to sense the earth's magnetic field. The HEADING SLAVE-FREE switch allows the crew to select either Free or Slaved Magnetic Heading mode. The system has two operating modes, normal and basic. During normal operation, a true airspeed input is supplied by the air data system to improve accuracy. If the true airspeed input is lost, the system will continue to operate in the basic mode. AHS operation is automatic and both systems will initialize when battery power is applied to the aircraft. During the nominal 70 second alignment, the system determines its orientation with the local vertical and magnetic North and performs a series of self-test and calibration functions. The AHS 1 and 2 systems are powered by 28 VDC AHS 1 and AHS 2 circuit breakers on the pilot's and copilot's circuit breaker panels. Both AHS 1 and AHS 2 will be powered during EMER BUS operations. In the event of a power loss, approximately 11 minutes of back-up power (28 VDC) will be supplied to AHS 1 and AHS 2 by EMER BAT 2. This feature makes it unnecessary to reinitialize the system should a momentary power loss be experienced. Should one of the systems fail, the functions of the failed system may be assumed by the remaining system using the AHS/AHS reversionary mode.

Attitude/heading data is provided for the following using systems:

- EFIS Displays — attitude and heading displays
- Flight Management System — heading data
- Flight Control System — attitude, heading and acceleration data
- Fuel Quantity System — attitude, heading and acceleration data
- TCAS System — attitude, heading and acceleration data
- EGPWS System — attitude, heading and acceleration data
- Weather Radar — pitch and roll data for antenna stabilization
- Lightning Detection System (if installed) — pitch and roll data for heading stabilization

HEADING CONTROL SWITCHES

The HEADING control switches, located in the AVIONICS group on the pilot's and copilot's switch panels, are used to control the heading output of the associated AHS. The switches on the pilot's side control AHS 1 while the switches on the copilot's side control AHS 2. The SLAVE-FREE switch provides slaving mode selection for the associated AHS heading output. When the switch is set to SLAVE, the associated AHS heading output will be referenced to its magnetic slaving unit and the associated compass cards will reflect this "slaved" alignment. When the switch is set to FREE, the associated AHS heading output will not be referenced to its magnetic slaving unit. The SLAVE L-R switch provides for manual slewing of the associated compass cards. Small heading splits can usually be cleared by cycling the SLAVE-FREE switch to FREE and then back to SLAVE while the aircraft is in straight and level, unaccelerated flight.

AHS/AHS REVERSIONARY MODE

The AHS/AHS switches on the EFIS CONTROL panels are used to select the attitude heading system for the respective EFIS display and flight director. On-side AHS is the normal selection indicated by green annunciation on the switch. Reversionary (cross-side) selection is indicated by an amber annunciation on the switch. AHS reversion on either side will also cause the following annunciations: "ATT #" (# = system supplying attitude data [1 or 2]) on both PFDs and "MAG #" (# = system supplying heading data [1 or 2]) above each compass card.

MAGNETIC COMPASS

A direct-reading magnetic compass is installed on the windshield center post. The liquid filled compass contains a horizontal drum dial and a lubber line. The drum has a 360° scale graduated in 5° increments. Numerical markings appear at 30° intervals except that 0, 90, 180 and 270 are labeled N, E, S, and W respectively. N/S and E/W compensator screws are located under the cover plate. A compass steering correction card is located near the compass.

ELECTRONIC STANDBY INSTRUMENT SYSTEM (ESIS)

The ESIS is located on the center instrument panel. This indicator is a L3 Communications Avionics Systems solid state, graphic display standby indicator system. The system consists of a self-sensing single box unit and is powered by 28 VDC supplied by EMER BAT 1. This single LCD indicator provides the pilot and copilot with pitch and roll, slip/skid indications, altitude, airspeed, Mach number, dual baro-set, and VMO/MMO indications. Localizer and glideslope deviation is provided if NAV 1 is tuned to an ILS. It is designed to mimic the primary EFIS system.

For a more detailed description of this system, refer to the current L3 Communications Avionics Systems Electronic Standby Instrument System Pilot's Guide (P/N TP-560).



ELECTRONIC STANDBY INSTRUMENT SYSTEM
Figure 5-8

ELECTRONIC FLIGHT INSTRUMENT SYSTEM (EFIS)

The EFIS is a Collins 4-panel composite color display system. The system consists of a primary flight display (PFD) and a multifunction display (MFD) on each pilot's instrument pane, heading, speed, altitude panel (HSA), one course heading panel (CHP), two cursor control panels (CCP), two EFIS Control panels (ECP), and two Control Display Units (CDU).

Cooling for the PFDs and MFDs is provided by fans integral to each display unit and an avionics cooling fan. Failure of the avionics cooling fan is indicated by illumination of the white INSTR FAN annunciator on the glareshield annunciator panel. The system is powered by 28 VDC from the following circuit breakers: PFD 1 & 2, MFD 1 & 2, and EFIS CONTROL 1 & 2.

The EFIS is used to display airplane altitude, airspeed/Mach, vertical speed, air temperature, attitude data, navigational data, flight director commands, mode annunciators, weather, checklists, warnings, and diagnostic messages.

This description covers the system in a general manner and is intended for familiarization only. Refer to the Collins Pro Line 21 Avionics System with IFIS for the Learjet 60XR Operators Guide (Collins P/N 523-0807841, edition 1, dated April 24, 2006 or later applicable version), the Learjet 60XR FAA Approved Airplane Flight Manual (FM-133), and the Collins FMS 5000 Operators Guide for additional operational information and a complete description of the EFIS interfaces and instruments.

PRIMARY FLIGHT DISPLAY (PFD)

The PFD on each side displays attitude, primary air data and lateral navigation display elements. The PFDs provide the following information:

Pitch and Roll Attitude	Flight Director Commands
Mode Annunciations	Heading, Course & Bearing
Vertical Speed	Airspeed
Baro Corrected Altitude	Radio Altitude
Altitude Preselect	Reporting Altitude, MDA or DH Set
Temperature	VNAV Deviation
DME Data	Warning Annunciations & Flags
Marker Beacon	Glideslope and Localizer Deviation
TCAS RAS	

MULTIFUNCTION DISPLAY (MFD)

The MFD on each side brings together numerous displays to show a map-like presentation of the airplane's horizontal navigation situation. The MFDs provide the following information:

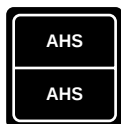
Heading	DME Data
Source Annunciations	Warning Annunciations & Flags
Course Deviation	VNAV Deviation
Selected Heading	Selected Course/Desired Track
Bearing Pointer	Weather Radar
Wind	

In addition, the MFD is capable of displaying the following information:

Checklists	Flight Plan Map
Maintenance Diagnostics	Nearby Nav Aids, Airports, etc.
Avionics Status	Performance and Progress
Sensor Status	TCAS TFC Display
Approach Charts	Graphical Weather
Airways	Geographical Data

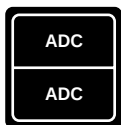
EFIS CONTROL PANEL

An EFIS control panel is installed on both the pilot's and copilot's instrument panel. Each panel controls its respective EFIS. Each switch is an alternate action switch. On-side selection is indicated by a green annunciation and cross-side or reversionary mode selection is indicated by an amber annunciation.



This switch selects the attitude heading system for the respective EFIS display, flight director and other systems requiring attitude or heading data. The switch is used to recover attitude and heading data if the on-side AHS fails.

Whenever cross-side AHS data is selected, the pitch, roll, and heading comparators will be disabled, and all equipment normally sourced by the on-side AHS will be sourced by the cross-side AHS.



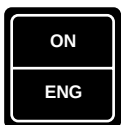
This switch selects the air data system for the respective EFIS display, flight director and other systems requiring air data. The switch is used to recover air data if the on-side ADC fails.



This reversionary mode selection switch is used to recover data on the MFD. When actuated in the REV mode, the adjacent PFD functions will be assumed by the MFD. This would be used if a PFD tube fails.



This reversionary mode selection switch is used to recover data on the PFD. When actuated in the REV mode, the adjacent MFD functions will be assumed by the PFD. This would be used if a MFD tube fails.



This switch is only located on the copilot's panel. The switch displays the engine indication display on the copilot's PFD.

DISPLAY CONTROL PANEL (DCP)

Two DCPs (one on the pilot's instrument panel and one on the copilot's instrument panel) provide PFD and MFD display control. The DCP is used to select control menus on the PFD and to adjust the display range on the PFD and MFD. The DCP provides dedicated controls for the Air Data System and Weather Radar System. For a detailed description of the DCP refer to the Collins Pro Line 21 Avionics System with IFIS for the Learjet 60XR Operators Guide (Collins P/N 523-0807841, edition 1, dated April 24, 2006 or later applicable version).

HEADING, SPEED, ALTITUDE PANEL (HSA)

The single HSA is located below the FCP on the glareshield and provides for heading selection, speed/vertical speed selection, as well as altitude pre-select inputs.

The HDG knob is used to change the selected heading indicated by the heading bug on both PFDs and MFDs simultaneously. Pressing the inset PUSH SYNC switch in the center of the HDG knob will synchronize the heading bug on all of the large displays to the current airplane heading as read under the lubber line on the pilot's PFD.

COURSE (CRS) CONTROL KNOBS

Two course (CRS) knobs are located on the pedestal forward of the cursor control panels. They are used to change the active selected course on the on-side PFD/MFD when VOR is the active NAV sensor. When FMS is the active NAV sensor and in the SEL CRS mode, these knobs change the course angle to the TO waypoint. Pressing the center PUSH DIRECT switch on either CRS knob will zero the course deviation and establish a course directly to the active NAV sensor.

CURSOR CONTROL PANEL (CCP)

Two Cursor Control Panels, located on the pedestal forward of the CDUs, operate MFD menus and select display formats. The Cursor Control Panel (CCP) is used to select and control the optional Integrated Flight Information System (IFIS) functions by MFD on-screen menus and to adjust the orientation of the optional FMS 3D Map. Dedicated controls are provided for chart selection, a joystick for panning and zooming charts, quick MFD format access keys, and MFD menu controls. Three quick access keys are used to store and then recall display format configurations for the MFD.

CONTROL DISPLAY UNIT (CDU)

Dual Collins CDUs are installed in the pedestal to control the PFDs, MFDs, and FMS. The CDUs also provide an additional method (other than the RTUs) for tuning NAV/COM radios and entering transponder codes. The CDU uses a combination of displayed menus, line-keys, full alphanumeric keypad, control knobs and dedicated control keys. In most cases, the CDUs can be operated simultaneously or independently. For instance, the pilot may change or edit the flight plan while the copilot manages NAV/COM frequencies. Neither CDU has priority over the other. If both CDUs tune the same radio, the most recent change is the one that will be used. The pilot should note that there are some functions that cannot be done simultaneously.

COMMUNICATIONS

VHF COMMUNICATIONS

Dual VHF communications transceivers are installed to provide AM voice communication capability. The VHF COMMs are capable of tuning 8.33Khz steps.

The transceivers are SELCAL compatible with analog audio interfaces. Tuning is accomplished via the Radio Tuning Units (RTU) or via the Control Display Units (CDU). The CDUs have similar radio management functions but differ on RTU failure procedures. (Refer to AFM for detailed malfunction information). The design of the system is such that all radio management functions are channeled through the RTUs, regardless of their origin. The center instrument panel RTU normally tunes COMM 1 and the pedestal RTU normally tunes COMM 2. If an RTU fails, the remaining RTU is capable of tuning both COMM 1 and COMM 2. Power for the system is 28 VDC supplied through the COMM 1 and COMM 2 circuit breakers on the pilot's and copilot's circuit breaker panels. COMM 1 is powered during EMER BUS operations.

The above information is presented in a general manner and is intended for familiarization only. For a detailed description and operation of the VHF communications system refer to the Collins Pro Line 21 Avionics System with IFIS for the Learjet 60XR Operators Guide (Collins P/N 523-0807841, edition 1, dated April 24, 2006 or later applicable version).

HF COMMUNICATIONS

An HF (high frequency) communication system is installed to provide long range communication capability. The system operates on any 0.1 kHz frequency between 2.0 and 29.9999 MHz. The system consists of a control/display unit (pedestal), a remote power amplifier and antenna coupler, remote receiver/transmitter, and antenna. System power is 28 VDC supplied through current limiters and controlled by a remote control circuit breaker. The remote control circuit breaker is controlled by the HF 1 circuit breaker on the pilot's circuit breaker panel. The HF receiver is SELCAL compatible.

The above information is presented in a general manner and is intended for familiarization only. For a detailed description and operation of the HF communications system refer to the appropriate HF operators manual.

SELCAL

The SELCAL system permits the selective calling of individual aircraft over normal radio communications circuits linking the ground station with the aircraft. The SELCAL system is integrated into the communication systems to relieve the flight crew from continuously monitoring communications frequencies during flights of extended duration. The system consists of a decoder unit and the SELCAL indication on the EIS Flight Page. The system is powered by 28 VDC through the SELCAL circuit breaker on the pilot's circuit breaker panel.

When a call is received, an indication in the SELCAL area of the flight display will show and an intermittent aural tone will sound. When the mic button is momentarily depressed, the aural tone will cease.

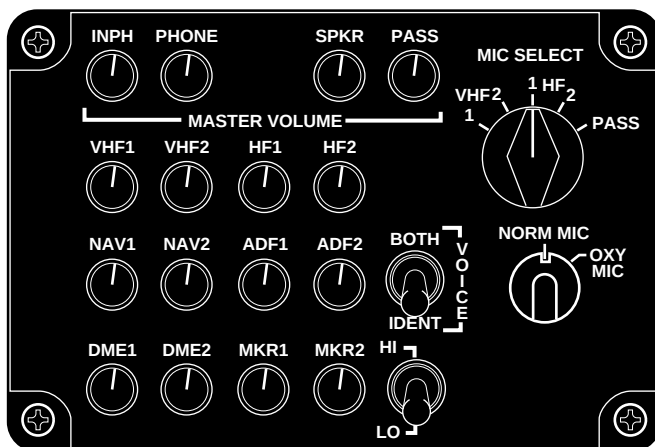
The SELCAL system can be tested by turning the system test switch to the SELCAL position and pushing the knob to start the test. The SELCAL alert tone will sound and each of the SELCAL enabled radios indicators (VHF 1, VHF 2, HF 1, HF 2) will be displayed.

AUDIO CONTROL SYSTEM

The audio control system is used to select the desired audio inputs for broadcast through the speakers or headphones. The audio control system is also used to select the desired transmitter to which microphone inputs will be directed. A separate audio control system is provided for pilot and copilot. Each system consists of an audio amplifier and audio control panel. The audio control system operates on 28 VDC supplied through the L and R Audio circuit breakers on the pilot's and copilot's circuit breaker panels respectively. The audio control systems will operate during EMER BUS mode.

AUDIO CONTROL PANEL

An audio control panel is installed at the outboard end of the pilot's and copilot's instrument panels. Each panel provides the controls necessary to direct audio signals and adjust volume levels. Each panel is used in conjunction with the on-side microphone, headphone and cockpit speaker.

**AUDIO CONTROL PANEL****Figure 5-9**

MIC SELECT SWITCH

The MIC SELECT Switch is a multi-position rotary-type switch labeled VHF 1, VHF 2, HF 1, and HF 2, and PASS. This switch provides the proper microphone audio inputs for the respective functions.

VHF 1, VHF 2, HF 1 and HF 2 Positions — When any of these positions are selected, microphone inputs are provided for the respective transceiver. Microphone must be keyed to transmit.

PASS Position — When this position is selected, the pilot or copilot, utilizing this function, may speak to the passengers through the passenger speaker. Microphone must be keyed to transmit. PASS should not be selected on both audio control panels simultaneously as degradation of the volume level may result.

NORM MIC/OXY MIC SWITCH

NORM MIC Position — When the switch is in this position, voice transmissions are accomplished with the headset microphone or handheld microphone.

OXY MIC Position — When the switch is in this position, voice transmissions are accomplished with the oxygen mask microphone. Both cockpit speakers, phone and interphone function (see VOLUME CONTROLS) will be active. The microphone must be keyed to transmit to the passengers or via a communications radio.

VOLUME CONTROLS

The volume controls consist of four MASTER VOLUME (INPH, PHONE, SPKR and PASS) controls. Each control is rotated to regulate the overall volume level to the applicable output device. The INPH and SPKR controls have a push-ON/push-OFF function. In the "ON" position, the control knob will protrude further than in the "OFF" position. Also, the controls will illuminate in the "ON" position.

INPH Volume — This control regulates the volume level of the crew interphone system. The interphone employs a voice-activated hot microphone.

SPKR Volume — This control regulates the volume level of the on-side cockpit speaker audio.

PHONE Volume — This control regulates the volume level of the on-side headphone audio.

PASS Volume — This control regulates the volume level of the passenger speaker audio.

RADIO MONITOR SWITCHES

Each control has a push-ON/push-OFF function and a volume control which is rotated to regulate the volume level of individual audio inputs. In the "ON" position, the control knob will protrude further than in the "OFF" position. Also, the control will illuminate in the "ON" position. Radio monitor switches on the audio control panel are labeled and perform the following functions:

VHF 1 and VHF 2 Switches — When in the "ON" position, provide audio from the VHF 1 and VHF 2 transceivers respectively.

HF 1 and HF 2 Switches — When in the "ON" position, provide audio from the HF 1 and HF 2 (if installed) transceiver respectively.

NAV 1 and NAV 2 Switches — When in the "ON" position, provide audio from the NAV 1 and NAV 2 receivers respectively.

ADF 1 and ADF 2 Switches — When in the "ON" position, provide audio from the ADF 1 and ADF 2 (if installed) receiver.

DME 1 and DME 2 Switches — When in the "ON" position, provide audio from the DME 1 and DME 2 receivers respectively.

MKR 1 and MKR 2 Switches — When in the "ON" position, provide audio from the MKR 1 and MKR 2 receivers respectively.

BOTH/VOICE/IDENT SWITCH

This switch controls the audio filtering for the NAV and ADF receivers.

BOTH Position — When the switch is in this position, both the station identifier and voice transmissions will be heard. The BOTH position is the normal position.

VOICE Position — When the switch is in this position, only the voice transmissions will be heard.

IDENT Position — When the switch is in this position, only the station identifier will be heard.

MARKER BEACON HI/LO SWITCH

The HI/LO switch on the pilot's audio control panel controls the #1 marker beacon receiver and the HI/LO switch on the copilot's audio control panel controls the #2 marker beacon receiver.

HI Position — When the switch is in this position, the marker beacon receiver sensitivity is increased.

LO Position — When the switch is in this position, the marker beacon receiver sensitivity is decreased.

AUDIO CONTROL — FLIGHT OPERATION

1. Applicable MASTER VOLUME Controls — Set to the "ON" position and rotate to a comfortable listening level.
2. Applicable Radio Monitor Switches — Set to the "ON" position and rotate to a comfortable listening level. The VHF 1 and VHF 2 volume controls do not affect sidetone levels. The HF 1 and HF 2 volume controls will affect the sidetone level since the audio and sidetone utilize a common line from the transceivers.
3. MIC SELECT Switch — Rotate to desired position.

CABIN BRIEFING SYSTEM

One of the optional systems (Airshow 410 or Airshow 4000 Cabin Video Information System) may be installed. Either system is designed to give passengers a recorded briefing for various phases of flight.

AIRSHOW CABIN VIDEO INFORMATION SYSTEM

An optional Airshow Cabin Video Information System may be installed. The system includes a serial mouse, video monitor and a flight deck controller. The Airshow system is selected for display from the cabin control switch panel located on the inboard upper side of the forward left-hand cabinet or from the master control switch panel, located in the cabin armrest.

The passenger briefing feature consists of three messages, (TAKEOFF, LANDING and TURBULENCE). To access these briefings, scroll through the menu and select Time To Destination (TTD), select SEL BRF from the sub-menu if using the optional flight deck controller, or by selecting SEL BRF from the INFO MENU if using the serial mouse. After selecting the desired briefing, the message will be heard through the overhead cabin speakers and in each passenger headphone. The briefing will override any other audio source except for paging. To cancel a briefing scroll to CANCEL or reselect the same briefing.

NAVIGATION

The navigation system includes the radios and controls used for VOR/ILS navigation, DME, ADF navigation, ATC transponder operation and radio altitude measurement. Tuning of all these functions except the radio altimeter is accomplished via the Radio Tuning Units (RTU) on the center instrument panel or via the Control Display Units (CDU) in the pedestal. The design of the system though is such that all navigation radio management functions are channeled through the RTUs regardless of their origin. The left RTU normally tunes NAV 1, ADF 1, ATC 1, etc. and the right RTU normally tunes the #2 radios. If an RTU fails, the remaining RTU is capable of tuning both #1 and #2 systems. Power for the RTUs is 28 VDC supplied through the RTU 1 and RTU 2 circuit breakers on the pilot's and copilot's circuit breaker panels. RTU 1 will be operative during EMER BUS operations. The radio altimeter will be discussed later.

Navigation information is presented in a general manner and is intended for familiarization only. For a detailed description and operation of the navigation system refer to the Collins Pro Line 21 Avionics System with IFIS for the Learjet 60XR Operators Guide (Collins P/N 523-0807841, edition 1, dated April 24, 2006 or later applicable version).

VHF NAVIGATION

Dual VHF navigation receivers and controls are installed to provide the crew with VOR bearing, VOR audio, localizer deviation, glideslope deviation, marker beacon passage identification and marker beacon audio. The receivers are capable of tuning the entire navigation and glideslope frequency range. The NAV 1 and NAV 2 circuit breakers on the pilot's and copilot's circuit breaker panels supply 28 VDC to power the VHF navigation receivers. NAV 1 will be powered during EMER BUS operations.

MARKER BEACON DISPLAY

Marker beacon passage, displayed on the PFD, is indicated by a cyan box with "OM" for outer marker, a yellow box with "MM" for middle marker, or white box with "IM" for inner marker. All marker beacon annunciations flash when they are displayed.

DISTANCE MEASURING EQUIPMENT (DME)

Dual DME transceivers are installed to provide distance, time-to-station, ground speed, and station ident information for use by other units in the avionics system. Each DME can track as many as three stations at the same time. Channel 1 of each DME is paired with a VOR frequency and tuned via the RTU or CDU for direct display by the crew. Channels 2 and 3 are used by the Flight Management System for multisensor navigation and are automatically tuned by the FMS. DME Hold can be activated on the RTU to "hold" the current DME frequency and allow the navigation receiver to be independently retuned. 28 VDC power for the DME receivers is supplied by the DME 1 and DME 2 circuit breakers on the pilot's and copilot's circuit breaker panels.

AUTOMATIC DIRECTION FINDING (ADF)

An ADF system is installed to provide aural reception of signals from a selected ground station and indicate relative bearing to that station. The system operates in the normal ADF frequency range and is tuned via the RTU or CDU for direct display by the crew. Functions such as BFO ON or OFF are controlled by the RTU. The ADF 1 circuit breaker is located on the pilot's circuit breaker panel to supply 28 VDC to the ADF receiver. ADF 1 will be operative during EMER BUS operations.

ATC TRANSPONDERS

Two ATC transponders are installed to provide identification (Mode-A), altitude (Mode-C), and select (Mode-S) reporting for the ATC radar beacon system. The traditional 4096 Mode-A codes are available and altitude reporting is selectable. The Mode-S data link feature is used for TCAS operation. The TDRs are equipped for Mode-S and Flight ID which includes Enhanced Surveillance. Code selection may be accomplished from the RTU or CDU. Other functions such as STBY mode, ID (ident) and turning off and on altitude reporting are controlled by the RTU. Power for the transponders is 28 VDC supplied by the ATC 1 and ATC 2 circuit breakers on the pilot's and copilot's circuit breaker panels. Identification and altitude reporting will be provided by ATC 1 during EMER BUS operations.

RADIO ALTIMETER

A radio altimeter is installed to give the pilot and copilot a direct radio height measurement from 0 to 2,500 feet AGL. The radio altitude is automatically displayed in green digits on both PFDs when the radio altitude is below 2,500 feet AGL. Changes in altitude are displayed by the radio altimeter in 50-foot increments when the altitude is above 1,000 and in 10-foot increments when the altitude is below 1,000 feet. No tuning is required and there are no operating controls that affect the radio altimeter. During a radio altimeter test, selected from the RTU, a fixed value of 50 feet will be displayed on both PFDs. The RADIO ALT circuit breaker on the pilot's circuit breaker panel supplies 28 VDC power to the radio altimeter.

FLIGHT CONTROL SYSTEM (FCS)

The FCS provides 3-axis autopilot/yaw damper, dual flight director, rudder boost and automatic pitch trim functions. The FCS contains two flight control computers and three primary servos and is controlled by a glareshield-mounted Flight Control Panel (FCP). Each side of the dual system (pilot and copilot) operates the same and both work together to drive the servos and the pitch trim system.

The following information is presented in a general manner and is intended for familiarization only. Refer to the Collins Pro Line 21 Avionics System with IFIS for the Learjet 60XR Operators Guide (Collins P/N 523-0807841, edition 1, dated April 24, 2006 or later and the FAA Approved Airplane Flight Manual for further information on the Flight Control System.

AUTOPILOT/FLIGHT DIRECTOR SYSTEM

The autopilot/flight director system provides automatic flight control and guidance for climb, cruise, descent and approach. The system provides dual channel flight guidance, and either channel can be coupled to the autopilot. Mode selection and annunciation for each flight guidance channel and engage controls for autopilot and yaw damper are provided through the glareshield-mounted FCP. Mode and system status annunciation is also provided on the appropriate cockpit displays.

The system provides dual-channel flight guidance in the pitch and roll axis. Dual-channel yaw axis outputs are used for yaw damping. Pitch and roll axis change, when commanded by the autopilot, is affected through autopilot elevator and aileron servos. The autopilot also provides pitch trim commands to the secondary trim system motor of the horizontal stabilizer pitch trim actuator. Autopilot pitch authority is

limited to 10° nose down and 20° nose up and roll authority is limited to 32° for lateral command, 27° bank for heading or course capture, and 15° for course tracking and roll rate is limited to 5° per second. Pilot inputs to the autopilot/flight director system are accomplished through the FCP, control wheel switches and the course heading panels. The pilot's flight guidance system operates on 28 VDC supplied through the AP 1 and the FD 1 circuit breakers on the pilot's circuit breaker panel. The copilot's flight guidance system operates on 28 VDC supplied through the AP 2 and the FD 2 circuit breakers on the copilot's circuit breaker panel. The autopilot system operates on 28 VDC supplied through the AP 1 and AP 2 circuit breakers.

The autopilot/flight guidance system is active whenever power is on the aircraft and both avionics master switches are on. The autopilot may be coupled to either the pilot's or copilot's flight guidance channel using the AP XFR and AP ENG switches on the FCP. When the autopilot is engaged, the associated or on-side PFD will display steering information from the on-side flight guidance channel. Whenever the autopilot is engaged, the on-side PFD command bars will display the steering command and the on-side instruments may be used to monitor autopilot performance. When the autopilot is not engaged, the PFD attitude display can be used to manually fly the airplane in response to steering commands from the on-side flight guidance channel (provided a vertical or lateral mode is selected).

FLIGHT CONTROL PANEL (FCP)

Autopilot/flight guidance mode selection and autopilot engagement functions are accomplished through the glareshield-mounted FCP. The controller contains three groupings of buttons. The center grouping provides the autopilot selection and engage buttons as well as autopilot status annunciators. The grouping on the left provides mode selection for the pilot's flight guidance channel and the grouping on the right provides mode selection for the copilot's flight guidance channel.

SELF-TEST

The system initiates a self-test sequence when the system is powered up (LEFT and RIGHT AVIONICS MASTER Switches ON). If the self-test sequence is not successfully completed, the autopilot will not engage and an "FD" flag will be displayed on the PFDs.

AUTOPILOT ENGAGE FUNCTIONS

AP XFR — The AP XFR is a momentary push-on/push-off button which is used to select the flight guidance channel to be coupled with the autopilot. A green triangle, on the FCP, will illuminate and point to the side which will couple to the autopilot, when engaged.

AP — The AP button is a momentary push-on/push-off button which is used to couple the autopilot to the selected flight guidance channel. If the autopilot passed the power-up self-test, the autopilot will engage and the green light will illuminate and a green ◀ AP or AP ▶ (as appropriate) annunciation will appear on the primary flight displays. An electrical interlock in the FCP automatically engages the yaw damper whenever the autopilot is engaged. Thereafter, the yaw damper may be independently disengaged.

YD — The YD button is a momentary push-on/push-off button which is used to engage the yaw damper. When engaged, the indicator above the YD button illuminates. The yaw damper can be disengaged by depressing the YD button a second time or by depressing the Control Wheel Master (MSW) switch.

TURB — The TURB button is a momentary push-on/push-off button which is used to select the autopilot turbulence mode. When TURB is selected, the autopilot will provide softer responses in the pitch and roll axis for flying through turbulence. TURB is not available during flight director only operation and is locked out in APPR mode.

AUTOPILOT/FLIGHT GUIDANCE MODE SELECTION

All mode selection buttons are the momentary push-on/push-off type. A light above the mode selector button will illuminate if all conditions for the mode are satisfied. Any selected mode can be cancelled by selecting an incompatible mode, depressing the mode selector button a second time, or depressing the FD CLEAR button. Mode selection and operation is identical for the left and right channels.

Attitude Hold — When the flight director is operating and no vertical mode is selected, pitch attitude hold will automatically be active. When the flight director is operating and no lateral mode is selected, roll attitude hold will automatically be active. Although active, the roll attitude hold cannot be entered without the autopilot first being engaged in the roll mode and then disconnected. These modes are used to maintain a reference pitch and bank angle. The reference angles may be established by manually flying the aircraft to the desired pitch and bank

angle and depressing the SYNC button (on the control wheel). When the SYNC button is released, the flight director will generate commands to maintain the existing pitch and roll attitude. If the bank angle is less than 5°, the flight director will command heading hold. The reference values may be changed using the vertical and lateral command function of the control wheel trim switches.

HDG (heading) — When HDG is selected, autopilot/flight director commands are generated to maneuver the airplane as necessary to fly a heading by position of the heading “bug” on the PFD.

1/2 BANK — When 1/2 BANK is selected, the flight director reduces its maximum roll attitude command to one-half of the normal limit. 1/2 BANK may be engaged in conjunction with any lateral mode except Approach. 1/2 BANK is automatically selected when the airplane's pressure altitude is at or above 41,500 feet. 1/2 BANK automatically clears when the airplane descends below this altitude.

NAV (navigation) — The NAV mode provides flight director commands to capture and track the navigational course set on the PFD.

APPR (approach) — The APPR mode provides flight director commands to capture and track the navigational course set on the PFD with approach accuracy. During ILS approaches, commands to capture and track the glideslope will be generated after the localizer has been captured.

ALT (altitude hold) — The ALT mode provides flight director commands to track the indicated altitude present at the time of mode engagement.

VS (vertical speed hold) — The VS mode provides flight director commands to maintain the vertical speed selected. In the absence of a pre-selected vertical speed, flight director commands will be generated to maintain the vertical speed present at the time of engagement.

VNAV (vertical navigation) — VNAV allows the pilot to program the FMS to provide vertical guidance in descent planning or to meet altitude crossing restrictions.

FLC (Flight Level Change) — FLC provides commands to acquire and track an IAS or Mach reference airspeed while taking into account the need to climb or descend to bring the aircraft to the active reference altitude (Preselect Altitude or Flight Plan Target Altitude).

Go-Around — The go-around (GA) mode is a flight director only mode and is selected by depressing the GO-AROUND button in the left thrust lever knob. When GA is selected, the autopilot will disengage, selected lateral and vertical modes will be cancelled, and a fixed 9° nose-up, heading hold steering command will be presented on the PFD.

FCP ANNUNCIATORS

The FCP incorporates annunciators to provide the status of the rudder boost and automatic pitch trim systems and an annunciator to indicate which flight director is selected.

TRIM (pitch trim) — The red TRIM annunciator will illuminate when an automatic pitch trim failure has been detected. The autopilot cannot be engaged while the red TRIM light is illuminated. If already engaged and the light illuminated, the autopilot will remain engaged until manually disengaged.

RB (rudder boost) — Two separate RB annunciators, one green and one amber, are installed. Illumination of the green RB annunciator indicates the rudder boost system is active. Illumination of the amber RB annunciator indicates a rudder boost system failure or that the RUDDER BOOST switch is off.

LEFT & RIGHT ARROWS (autopilot transfer arrows) — The left or right green arrow illuminates to indicate which flight director is selected. When the autopilot is engaged, the arrow points to the coupled flight director. If the autopilot is disengaged, a white arrow points to the selected flight director.



In ILS approach and go-around modes, both FGCs are used independently to provide steering commands to their on-side PFD and both left and right arrows will illuminate.

CONTROL WHEEL MASTER SWITCHES — AUTOPILOT FUNCTION

The Control Wheel Master Switches (MSW), located on the outboard horn of the pilot's and copilot's control wheels, may be used to disengage the autopilot. Depressing either the pilot's or copilot's MSW will disengage the autopilot. When the autopilot disengages, the green light above the AP button on the FCP will extinguish and the autopilot disengage tone will sound. For a pilot initiated autopilot disconnect, the AP annunciation flashes amber for 5 seconds, then self-clears. If a monitored disengagement occurs, the autopilot disconnect is a red AP and red transfer arrow for 5 seconds, then steady and will clear when the AP or MSW button is pressed, or the autopilot is re-engaged. When the autopilot is disengaged using the MSW, the flight director will remain active and will display steering information from the flight guidance computer, if a vertical or lateral mode is selected.

PITCH TRIM SELECTOR SWITCH — AUTOPILOT FUNCTION

When the autopilot is engaged, the autopilot maintains aircraft pitch trim through the secondary motor of the horizontal stabilizer pitch trim actuator if the PITCH TRIM selector switch on the pedestal is in the PRI or SEC position. The autopilot will not engage or will disengage if the PITCH TRIM selector switch is moved to the OFF position.

CONTROL WHEEL TRIM SWITCHES — AUTOPILOT/FLIGHT DIRECTOR FUNCTION

When either Control Wheel Trim switch (arming button depressed) is moved to any of the four positions (LWD, RWD, NOSE UP or NOSE DN), an aircraft trim input is made and the autopilot will disengage. If the arming button is not depressed, the on-side switch may be used to input lateral commands (LWD and RWD) and vertical commands (NOSE UP and NOSE DN) to the autopilot. Using this feature causes active modes (except GS) in the applicable axis to disengage and revert to the attitude hold mode. Armed modes are not effected. The control wheel trim switch has no effect on the flight director.

NOSE DN-OFF-NOSE UP SWITCH — AUTOPILOT FUNCTION

The NOSE DN-OFF-NOSE UP switch, located on the pedestal trim control panel, may be used to disengage the autopilot or to make trim adjustments with the autopilot pitch and roll axes inhibited. With the PITCH TRIM selector switch in the SEC position, actuation of secondary pitch trim through the NOSE DN-OFF-NOSE UP switch will disengage the autopilot, extinguish the green light above the AP button, and sound the autopilot disengage tone. When the autopilot is disengaged through the NOSE DN-OFF-NOSE UP switch, the flight director will remain active and will display steering information from the flight guidance computer.

SYNC SWITCHES

The SYNC switches in the control wheels are normally used with the on-side flight director to change a vertical mode (except GS, LVL CHG and ALTS) reference values without reselecting the mode. The only lateral mode in which SYNC switches are active is roll attitude hold (ROLL).

FD CLEAR SWITCHES

Depressing the FD CLEAR switch in either control wheel will remove the command bars and cancel any selected vertical or lateral mode from the on-side flight director. Depressing the FD CLEAR if the autopilot is coupled to the on-side flight director will remove the command bars and must be depressed to redisplay the command bars.

YAW DAMPER SYSTEM

The yaw damper augments aircraft stability by opposing uncommanded motion about the yaw axis and provides turn coordination. The yaw damper is provided by the yaw axis of the autopilot/flight guidance system. The yaw damper operates independent of the autopilot.

YAW DAMPER CONTROL

The yaw damper button and annunciator are located on the FCP. The yaw damper engages when the autopilot is engaged, or by depressing the YD button on the FCP. When the yaw damper is engaged, the green light above the YD button will be illuminated. If the yaw damper is already engaged, depressing the YD button will disengage the yaw damper.

CONTROL WHEEL MASTER SWITCHES - YAW DAMPER FUNCTION

The Control Wheel Master Switches (MSW), located on the outboard horn of the pilot's and copilot's control wheels, may be used to disengage the yaw damper. Depressing either the pilot's or copilot's Control Wheel Master Switch (MSW) will disengage the yaw damper. When the yaw damper is disengaged through pilot action, the yaw damper disengage tone will sound, and an amber YD annunciator on the EFIS will flash for 5 seconds, then extinguish. The green indicator light above the YD button on the FCP will also extinguish.

RUDDER BOOST SYSTEM

The rudder boost system is installed to provide reduced rudder pedal force, increased directional control effectiveness and improved takeoff performance. With the rudder boost on, minimum control speed-ground (VMCG), takeoff speeds and distances are all lower. Rudder boost is a function of the autopilot. In addition to the autopilot, the system consists of a yaw force interface box, force sensors, flap position switch, RUDDER BOOST Switch, and associated aircraft wiring. The yaw damper servo provides the "boost" to assist the pilot in moving the rudder in the desired direction. The rudder boost system is supplied 28 VDC through the FD 1 circuit breaker on the pilot's circuit breaker panel.

Normally the RUDDER BOOST Switch, on the pilot's switch panel, is left on at all times. With flaps lowered more than 3°, applying approximately 50 pounds of force to either rudder pedal will cause the yaw servo to automatically engage and apply force to the rudder in the same direction as the pilot. As pilot input force is increased, the servo force will also increase up to the maximum yaw servo force. When the rudder boost engages, the green RB annunciator, on the FCP, illuminates to indicate rudder boost is active. If the yaw damper is on when the rudder boost engages, the system will make a smooth transition from yaw damper to rudder boost. A failure of the system is indicated by illumination of the amber RB annunciator on the FCP. Self-test of the system is initiated during system power-up.

RUDDER BOOST SWITCH

Arming of the rudder boost system is controlled by the RUDDER BOOST Switch located on the pilot's switch panel. When the switch is set to ON, the system will be armed. Setting the switch to OFF will disarm the system and the amber RB annunciator, on the FCP, will illuminate.

FLIGHT MANAGEMENT SYSTEM (FMS)

The Learjet 60XR is equipped with a dual Collins FMS-5000 flight management system. The FMS is an integrated navigation management system that provides the pilot with centralized control for the airplane's navigation sensors, computer based flight planning, and fuel management. FMS capabilities include VFR/IFR RNAV operation, direct-to functions, VNAV, approach, and fuel management. The system also receives true airspeed and altitude information from the air data computer and fuel flow data from the fuel flow sensors.

The FMS provides worldwide point-to-point and great circle navigation. The FMS uses sensor data from GPS, VOR/DME nav aids, and air data systems, along with the active flight plan and its own database information. The sensor data is used by the FMS to determine the present position, direction, and speed.

GPS can be used as the primary means of navigation in oceanic and remote areas if a pre-departure verification of GPS navigation availability over the entire planned route is performed before each flight.

The FMS contains a subscription data base which has the appropriate nav aids and airports. The FMS scans for DME signals which, according to its data base present position, are expected to be received. The outputs of the two DMEs, three channels for each DME allowing up to six DMEs to be scanned. As navigation station signals are received, their identifiers are decoded for station verification. If at least three properly positioned DME signals are received, the airplane position can be determined. When less than three DMEs are available, then VOR radial and DME distance is used.

The fuel management function of the FMS allows the pilot to plan fuel requirements while on the ground. Pilot-supplied data and inputs from the airplane's fuel flow sensors give the FMS the necessary information to calculate and display significant real-time fuel management information throughout the flight.

For a detailed description and operation of the FMS, Refer to the Collins Pro Line 21 Avionics System with IFIS for the Learjet 60XR Operators Guide (Collins P/N 523-0807841, edition 1, dated April 24, 2006 or later applicable version).

WEATHER RADAR

A weather radar system is installed to give the pilot a pictorial representation of the safest possible flight path during adverse weather conditions. The single unit X-Band weather radar provides data from atmospheric moisture and ground features. The resulting radar "pictures" may be displayed on any of the AFDs. Terrain mapping is possible with the radar, and with practice, the pilot will be able to identify coastlines, large rivers and lakes, mountainous areas and cities. As the radar system becomes more familiar, it may be used to verify position, track, ground speed, altitude and attitude as well as for weather avoidance. The radar can be operated in a split mode or sync mode. In the split mode, both pilots have the option of placing the radar in different mode and range settings on alternate sweeps. This gives the appearance of two independent radars. In the sync mode, both sides show the same radar display. Some installations include the capability to detect precipitation related turbulence.

Control of the weather radar is accomplished from the pilot's and copilot's Display Control Panels (DCP) and the line select keys on the PFD/MFD. Primary stabilization for the radar is obtained from the left Attitude Heading System (AHS). If the left AHS fails, stabilization is automatically obtained from the right AHS.

For a detailed description and operation of the weather radar system refer to the Collins Pro Line 21 Avionics System with IFIS for the Learjet 60XR Operators Guide (Collins P/N 523-0807841, edition 1, dated April 24, 2006 or later applicable version).

MISCELLANEOUS

COCKPIT VOICE RECORDER (CVR)

A cockpit voice recording system is installed to record all cockpit voice, radio communication, aural annunciation, and aural navigation signals for the last 30 minutes of operation. System components consist of a TEST switch, an ERASE switch, a pass indicator, a fail indicator, a headphone jack, a microphone and a voice recorder unit.

The ERASE switch, TEST switch, pass indicator, fail indicator and HEADPHONE jack are installed on the copilots switch panel.

The area microphone, installed in the center of the instrument panel, picks up all cockpit audio. The microphone incorporates electronic background noise suppression.

The voice recorder unit converts audio input to digital format. The digital format audio is stored in a crash-survivable solid-state memory. The digital storage unit has a maximum recording interval of 30 minutes. After 30 minutes of continuous recording, the recorder automatically starts recording over the previously stored audio data.

The CVR TEST switch is pressed and held for at least 2 seconds to initiate the automatic self-test. During the self-test the PASS and FAIL annunciators will flash alternately for approximately 15 seconds. At the end of a successful self-test the PASS annunciator will illuminate steady for approximately 10 seconds. If the self-test fails, the FAIL annunciator will come on either steady or flashing. The pattern of flashes is an indication to maintenance personnel as to the nature of the failure.

Squat switch, parking brake and anti-skid ON interlock switching control the bulk erasure function.

Voice recorder system power is 28 VDC supplied through the CVR circuit breaker on the copilot's circuit breaker panel. The CVR will be operative during EMER BUS operations.

There is an optional 120 minute capacity CVR available. The only difference between the standard and optional CVR is the recording time.

FLIGHT DATA RECORDER (FDR) (Optional)

The flight data recorder will record pertinent flight profile data. A white FDR FAIL annunciator is installed in the warning lights annunciator panel to annunciate system malfunctions. The system is powered by 28 VDC through the FDR circuit breaker on the pilot's circuit breaker panel and is powered by the Emergency Bus.

The Flight Data Recorder is recording whenever power is applied to the aircraft. There are no controls or switches associated with the FDR and operation is completely automatic.

Upon power application to the aircraft, the system will perform a self-test. When the BATTERY switches are set to on, the FDR FAIL annunciator will illuminate briefly, then extinguish. The test will continue for another 60 seconds. The light should not come back on during the test.

CLOCKS

Each instrument panel is equipped with a multi-function chronometer to display GMT, local time (LT), flight time (FT), and elapsed time (ET). Power for the chronometers is 28 VDC supplied through the L and R CLOCK circuit breakers on the pilot's and copilot's circuit breaker panels.

The SEL button selects what is to be displayed and the CTL button controls what is being displayed. Pressing SEL sequentially selects GMT, LT, FT or ET for display. FT starts counting when the squat switches transition to the air mode and stops counting when they transition back to ground mode. The CTL button resets FT back to zero when held down for 3 seconds. ET is started and reset when the CTL button is pushed momentarily. Depressing the SEL and CTL buttons simultaneously enters the set mode and GMT or LT can be set. The CTL button is then pressed to increment the flashing digit to the desired value. Pressing the SEL button then enters that value and toggles to the next digit to be set.

HOURLMETER — AIRCRAFT

An hourmeter is installed to measure aircraft accumulated time. The hourmeter is located behind the carpeted access panel on the step behind the cockpit or in the copilot's circuit breaker panel. It is wired to the right squat switch and will measure accumulated time as soon as the aircraft lifts off. The hourmeter receives 28 VDC through the HOUR METER circuit breaker on the copilot's circuit breaker panel.

EMERGENCY LOCATOR TRANSMITTER

The Emergency Locator Transmitter (ELT) transmits distress signals assisting rescue personnel in locating a downed aircraft. The ELT consists of a transmitter, antenna, and remote switch.

TRANSMITTER AND ANTENNA

The transmitter and antenna are installed in the vertical stabilizer. Power for the transmitter is provided by an internal battery. The transmitter will automatically activate under emergency conditions or may be manually activated using the cockpit switch.

REMOTE SWITCH

A remote switch is installed in the cockpit to allow manual activation and resetting of the ELT transmitter without accessing the transmitter itself.

LIGHTNING DETECTION SYSTEM (LDS) (OPTIONAL)

The LDS, also called the L3 Communications Stormscope Series II Weather Mapping System, is a passive system; that is, it does not transmit energy. Instead, the LDS detects electrical discharges (lightning) through passive reception of their energy and displays them as a moving map on an adaptive flight display (AFD). Since the LDS does not plot water droplets like regular weather radar, it is not subject to attenuation. The LDS will automatically position thunderstorm information relative to aircraft heading. The LDS system includes an antenna, LDS processor, and associated aircraft wiring.

Operator control inputs include inputs from the line select keys on the AFDs, DCPs, reversionary switching, and other remote-mounted controls. Data collection and distribution is provided by the IAPS. The LDS processor calculates lightning azimuth and range, and generates lightning symbology, operating, and fault message for display on the AFDs. The LDS uses built-in test equipment to verify proper operation and to generate fault messages for display on the AFDs.

Displayed electromagnetic discharges associated with thunderstorm activity appear as lighting bolts on the display. The lighting bolts are color coded to identify different levels of intensity. The lighting bolts are removed from the screen after 2 minutes. When changing from one range display to another, no loss of data will occur since electrical discharge information is acquired and stored on all ranges simultaneously.



The LDS should never be used to attempt thunderstorm penetration. Thunderstorm avoidance must not be solely predicated upon the use of the LDS.

The LDS receives 28 VDC through the STORMSCOPE circuit breaker on the copilot's circuit breaker panel.

The preceding information on the LDS is meant as a familiarization only to the LDS. For a detailed description and operation of the LDS refer to the Collins Pro Line 21 Avionics System with IFIS for the Learjet 60XR Operators Guide (Collins P/N 523-0807841, edition 1, dated April 24, 2006 or later applicable version).

XM Satellite Weather (Optional)

The optional XM Satellite data link receiver is part of the optional Integrated Flight Information System (IFIS). The XM Satellite Receiver provides a constant stream of graphical and textual weather data from the XM Satellite Radio weather service to the FSU.

The Graphical Weather (GWX-3000) format provides the ability to show GWX images or reports on the MFD. The GWX images are provided by Baron Services by a satellite Information Service Provider (XM Satellite Weather Service). The GWX image can be a textual weather report/forecast or a graphical image. Weather reports include Significant Meteorological (SIGMET) and Airman Meteorological (AIRMET) advisories and Aviation Routine Weather Reports (METAR). Weather forecasts are Terminal Area Forecast (TAF). Observation images include NEXRAD and Echo Tops.

Universal Weather (Optional)

The GWX format provides the ability to show one GWX image at a time on the MFD. New GWX images are requested by the pilot with controls on the CDU. Refer to the Rockwell Collins Corporate Datalink System CMU-4000/RIU-40X0 Operator Guide, Collins Part Number 523-0790499, for detailed information on using the CDU to request and view GWX images.

The GWX images are uplinked with VHF datalink system from the Information Service Provider (Universal Weather). A list of saved and available GWX images shows on the MFD when requested by the pilot.

Using controls on the CCP, the pilot selects the desired GWX image to show on the MFD. The GWX image can be a forecast or an observation image. Forecast images include WINDS ALOFT, ICING, and TURBULENCE. Observation images include NEXRAD, TOPS/MOVEMENT, and Weather (WX) DEPICTION. Each datalinked GWX image is paired with a corresponding geopolitical background image. A title/time banner shows for each GWX image.

NAVIGATION SOURCE

The Navigation (NAV) or Map source legend shows along the left side of the MFD when the compass Arc, Rose, FMS Plan Map, PPOS map, or 3D Map is the active format on the MFD. The NAV source field is four lines of text that show along the left side of the MFD when the active NAV source and the Map source are the same FMS and the compass Arc or Rose is the active format on the MFD. The active NAV source is selected from the NAV SOURCE menu on the PFD. When the MFD Plan Map, PPOS Map, or 3D Map are selected for display on the PFD, the NAV source. The Map source is set to FMS1 or FMS2 with the MAP menu on the MFD.

3D MAP FORMAT (Optional)

The 3D Map is an optional, advanced FMS feature which provides lateral, vertical, and performance-predicted flight plan information in a single, three-dimensional (3D) format on the MFD. The map data is a combination of what would typically be presented as two separate map formats – a vertical profile and a plan map. The 3D Map has an adjustable viewing orientation which is used to customize the viewing angle. The 3D Map allows predicted flight path views that are referenced from the ground (such as a vertical profile view), referenced directly over a map center position (such as a Plan Map view), or referenced from an intermediate point in between.

E-CHARTS (Optional)

The E-Chart format provides the ability to show an electronic version of a conventional paper instrument chart on the MFD. The E-Charts are linked automatically by the FMS when a flight plan is entered and can also be selected manually by the pilot. The available charts are listed on the Chart Main Index. Controls for chart selection are on the CCP. When aircraft position data is available, a moving aircraft symbol shows on E-Charts that are geographic-referenced. A non-geographic-referenced chart has a magenta aircraft symbol with a circle and slash on the top right hand corner of the chart.

JEPPESEN CHART DISPLAY (Optional)

The selected Jeppesen E-Chart shows when selected by the pilot. Controls on the CCP are used to select a chart for display, pan around the chart, zoom in or out on the chart, and change the orientation of the chart. A moving aircraft symbol shows on the chart when the chart is geographically-referenced, as determined by the Jeppesen database and the aircraft position is within the geographically-referenced part of the chart.

NOTAMS (Optional)

The Chart NOTAMS menu shows the chart NOTAMS available for the selected airport. The page is broken into two fields, the NOTAM summary and NOTAM details. When more than one NOTAM is available for the selected airport, the selected NOTAM and total number of NOTAMS shows in the summary field. The selected NOTAM readout is also a data entry field that allows the user to select another NOTAM for viewing. The NOTAM type, effectivity, begin date, and end date show in the summary field. The NOTAM text as defined in the Jeppesen charts database shows in the details field.

SECTION VI

ANTI-ICE &

ENVIRONMENTAL

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SECTION VI

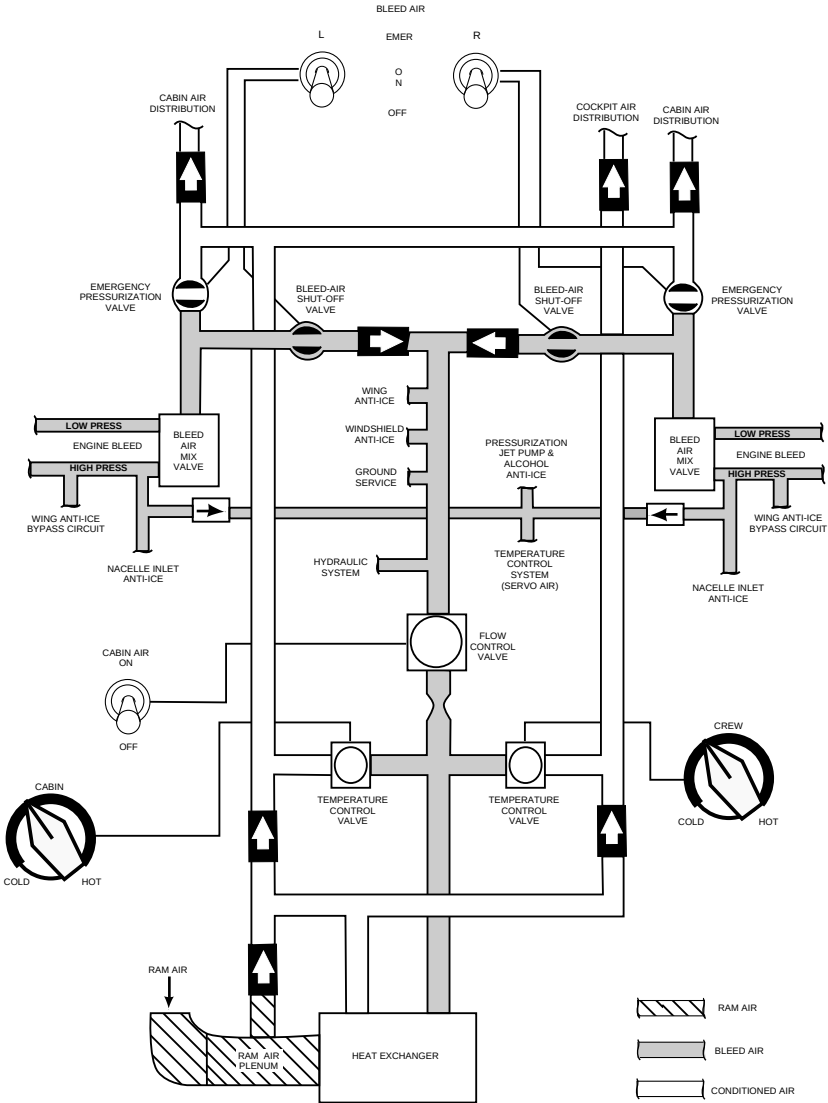
ANTI-ICE & ENVIRONMENTAL

BLEED AIR SUPPLY

Engine bleed air is used extensively for anti-icing and cabin environmental control. The source of this air is low- and high-pressure ports on each engine compressor. From the engine compressor, the bleed air is mixed and regulated in the mixing/regulating valve mounted on each engine. The bleed air is then ducted from the engines into the tailcone where it is available for several using systems. Shutoff valves and check valves are installed in the tailcone plumbing to control the bleed air from the left and right engines. In addition to the plumbing, the system includes BLEED AIR switches and an overheat warning system.

BLEED AIR SWITCHES

The L and R BLEED AIR switches, located in the BLEED AIR group on the copilot's switch panel, control the respective left and right bleed-air shutoff valves and left and right emergency pressurization valves. Each BLEED AIR switch has three positions: EMER, ON and OFF. When a BLEED AIR switch is in the ON position, the respective bleed-air shutoff valve will open and the emergency pressurization valve will be closed. When a BLEED AIR switch is set to OFF, the respective bleed-air shutoff valve will be energized to the closed position. When a BLEED AIR switch is set to EMER, the respective bleed-air shutoff valve will close and the emergency pressurization valve will be energized open and the high-stage bleed air will be shut off. The bleed-air shutoff valve will close automatically whenever emergency pressurization is activated or the ENG FIRE PULL T-handle is pulled on the respective side. The bleed-air shutoff valves control bleed-air flow to the cabin air distribution and temperature control systems, wing anti-ice system, and windshield anti-ice system. Bleed air for nacelle, engine anti-icing, and windshield alcohol tank pressurization is still available with the shutoff valves closed. The bleed-air shutoff valves and emergency pressurization valves operate on 28 VDC supplied through the L and R BLEED AIR circuit breakers on the pilot's and copilot's circuit breaker panels.



BLEED AIR SUPPLY SCHEMATIC
Figure 6-1

CABIN AIR LIGHT

A white CABIN AIR advisory light indicates that either the L BLEED AIR, R BLEED AIR or CAB AIR switches are in the off position.

BLEED AIR WARNING LIGHT

Engine pylon, bleed-air duct, and tailcone overheat indication is provided by the red BLEED AIR L and BLEED AIR R warning lights. Each light is operated by thermostatches installed in the pylon structure and in the bleed-air ducting. Activation of either thermostatch will illuminate the associated light. The thermostatch in the pylon structure will cause the associated light to illuminate if the pylon structure temperature reaches approximately 250°F. The thermostatch in the pylon bleed-air ducting will cause the associated light to illuminate if the duct temperature reaches approximately 600°F. In addition to the thermostatches, a tailcone sensing element is installed to detect elevated tailcone temperatures caused by a leak in the bleed-air ducting. If both the BLEED AIR L and BLEED AIR R warning lights illuminate simultaneously, the tailcone overheat sensor has tripped the lights. The lights operate on 28 VDC supplied through the WARN LTS circuit breakers on the pilot's and copilot's circuit breaker panels. The tailcone overheat detection system operates on 28 VDC supplied through the BLEED AIR OV HT circuit breaker on the pilot's circuit breaker panel. Warning lights and tailcone overheat detection is operative during EMER BUS mode

ANTI-ICE SYSTEMS

Aircraft anti-ice protection is provided through the use of electrically heated anti-ice systems, engine bleed-air heated anti-ice systems, and an alcohol anti-ice system. Electrically heated systems include the pitot-static probes, total air temperature probe, engine inlet air temperature/pressure sensors, stall warning vanes, and horizontal stabilizer leading edge. Electrically-heated windshields provide defogging for the windshield interior. Engine bleed air is utilized to provide anti-icing for the wing leading edge, windshield, nacelle inlets, low-pressure compressor inner stator, and engine fan spinners. The alcohol system is installed to provide backup anti-ice protection for the pilot's windshield in event of normal anti-icing system malfunction.

ROSEMOUNT ICE DETECTOR SYSTEM (OPTIONAL)

The optional Rosemount Ice Detector system is installed to detect an icing condition and notifies the pilots by illumination of the amber or white ICE DET lights, in the glareshield annunciator panel, and both Master CAUT lights. A self-test of the Rosemount Ice Detector system is conducted every time aircraft power is turned on, and the ICE DETECTOR circuit breaker is engaged. The ice detector system self-test will show a failed self-test if the amber ICE DET light and both Master CAUT lights are illuminated. The Rosemount Ice Detection System provides an additional means of ice detection and should not be used as the only source of ice detection. The Rosemount Ice Detector System receives 28 VDC through the ICE DETECTOR circuit breaker on the pilot's circuit breaker panel.

When the Rosemount Ice Detector probe detects an icing condition, and the STAB WING HEAT switch is Off, the amber ICE DET light located in the glareshield annunciator panel, and both Master CAUT lights will illuminate. Probe de-icing is done automatically by the Rosemount system itself. Selecting the STAB WING HEAT switch On will inhibit the amber ICE DET light and enable the white ICE DET light. The ICE DET white light is an advisory light which will illuminate only when icing is detected while the STAB WING HEAT switch is On. Illumination of the ICE DET amber light with the STAB WING HEAT switch On indicates a failure of the Rosemount Ice Detection system.

ICE DETECT LIGHTS

Two ice detect lights are installed on the forward glareshield to indicate ice or moisture formation on the windshield during night operations. These lights are illuminated whenever the BATTERY switches are On. When particles of ice or moisture form, light refraction results in the appearance of two red areas, approximately 1-1/2 inches (38 mm) in diameter, on the windshield. The light on the pilot's side is located in a position covered by the windshield anti-ice airstream. The copilot's light is positioned outside the airstream; therefore, the copilot's windshield must be monitored whenever windshield anti-ice system is in operation. The red areas indicate ice encounters when the SAT is below freezing and moisture encounters when the SAT is above freezing. The lights are supplied 28 VDC through the L and R ICE DETECT LIGHT circuit breakers on the pilot's and copilot's circuit breaker panels respectively.

WING INSPECTION LIGHT

The wing inspection light, located on the right forward fuselage, may be used to visually inspect the right wing leading edge for ice accumulation during night operations. The light is illuminated by depressing the WING INSP LIGHT momentary switch. The switch is located on the copilot's switch panel. The light illuminates a black dot on the outboard wing leading edge to enhance visual detection of ice accumulation. Power is supplied through the WING INSP LT circuit breaker on the copilot's circuit breaker panel.

ENGINE AND NACELLE INLET ANTI-ICE

The engine and nacelle inlet anti-ice system provides anti-ice protection for the engine fan spinners, low pressure compressor inner stator, nacelle inlets, and the engine inlet air temperature and pressure sensors. The fan spinners, low pressure compressor inner stator, and nacelle inlets are anti-iced by engine bleed air. The fan spinners are continually heated by bleed air flowing between their double-wall construction. The low pressure compressor inner stator and nacelle inlet are heated by bleed air when the associated NAC HEAT switch is on. The engine air temperature (TT0) and pressure (PT) sensors are anti-iced by integral electrical heating elements. Each engine anti-ice system is independently operated and consists of TT0/PT sensor heating elements, a nacelle inlet anti-ice control valve (controls flow to the nacelle inlet lip), an engine anti-ice control valve (controls flow to the low-pressure compressor inner stator), a pressure switch, a control switch, a NAC HT light, and associated aircraft wiring and bleed-air plumbing. Control circuits are powered by 28 VDC supplied through the L and R NAC HEAT circuit breakers on the pilot's and copilot's circuit breaker-panels respectively.

NAC HEAT SWITCHES

The left and right engine and nacelle inlet anti-ice systems are independently controlled through the NAC HEAT switches in the ANTI-ICE group on the center switch panel. Each NAC HEAT switch has two positions: On (L or R) and OFF. When a NAC HEAT switch is placed in the On (L or R) position, the associated TT0/PT sensor elements will be energized and the associated engine and nacelle inlet anti-ice control valves will open. Engine bleed air will flow through the open valves to the low pressure compressor inner stator and nacelle inlet lip. Since the control valves are energized closed, engine and nacelle inlet anti-ice protection will still be available in the event of an electrical system failure.

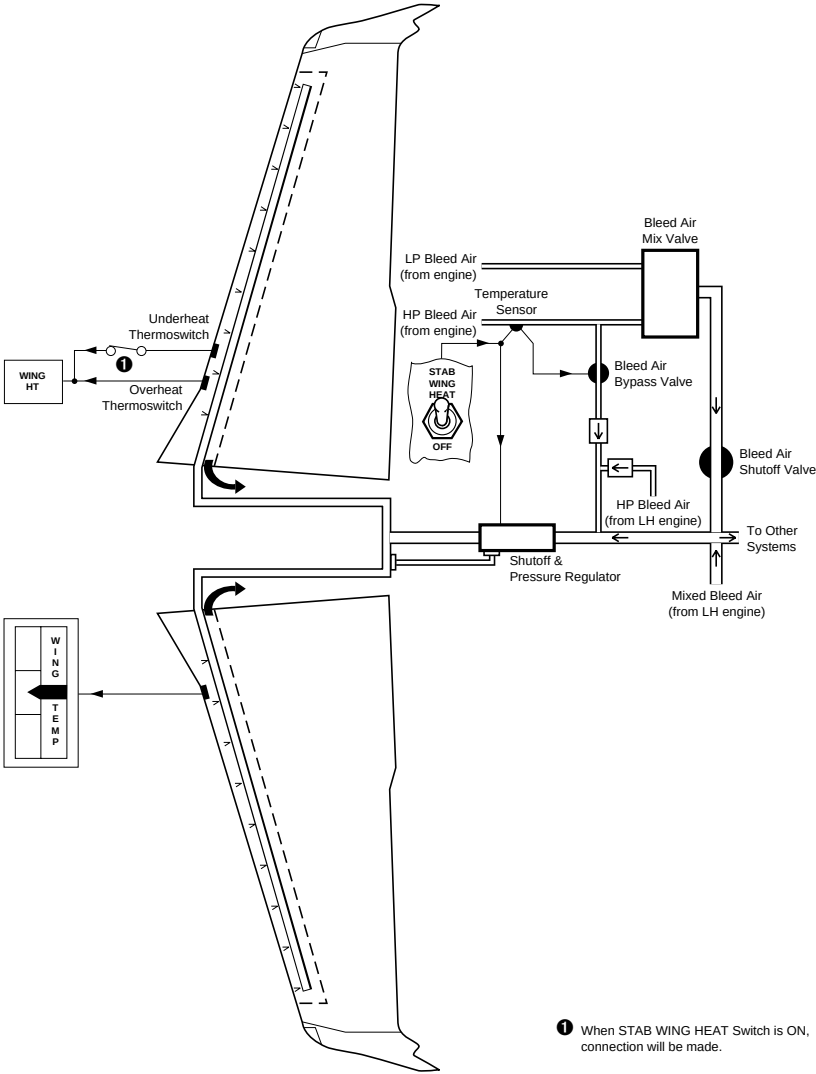
NAC HT LIGHTS

The amber L and R NAC HT lights on the glareshield annunciator panel provide the crew with visual indication of an engine or nacelle inlet anti-ice system malfunction. The lights are operated by a pressure switch in the associated nacelle inlet bleed air plumbing and a proximity switch built into the engine anti-ice control valve. Illumination of a NAC HT light when the associated NAC HEAT switch is in the On position, indicates that insufficient pressure is being applied to the nacelle inlet or the engine anti-ice control valve has failed to open. Illumination of a NAC HT light, when the associated NAC HEAT switch is in the OFF position, indicates that bleed-air pressure is being applied to the nacelle anti-ice system due to a malfunction of the nacelle anti-ice control valve.

The green NAC HT light on the glareshield annunciator panel provides the crew with visual indication that either nacelle heat switch is On.

WING ANTI-ICE

The wing anti-ice system utilizes engine bleed air directed through diffuser tubes in each wing leading edge. The heated air is distributed to the wing root and leading edge and then allowed to exit into the center wing/wheel well area. The system consists of wing diffuser tubes, a WING HT caution light, two thermostats (one underheat sensor and one overheat sensor), a wing temperature sensor, an anti-ice shut-off and pressure regulator valve, a bleed air bypass valve on each engine, a wing temperature indicator, a system switch, and associated aircraft wiring. Electrical power for system operation is 28 VDC supplied through the WING HEAT circuit breaker on the copilot's circuit breaker panel.



WING ANTI-ICE SYSTEM
Figure 6-2

STAB WING HEAT SWITCH — WING HEAT FUNCTION

The wing anti-ice system is controlled through the STAB WING HEAT switch located in the ANTI-ICE group on the center switch panel. The switch has two positions: On (STAB WING HEAT) and OFF. When the STAB WING HEAT switch is set On, the anti-ice shutoff and pressure regulator valve control solenoid will close allowing pressure to build within the valve reference chambers. The building pressure will open a butterfly valve in the bleed-air airstream and allow heated air to flow through the ducting into the wing diffuser tubes. The valve will maintain a regulated 15 (± 2.5) psi bleed airflow providing the butterfly remains open. In the event of an electrical system failure, the valve will shut off the bleed-air flow and wing anti-ice protection will not be available. Two sources of bleed air are used for wing anti-ice. In addition to the normal bleed-air supply (mixed low- and high-pressure), bypass circuits are activated which makes hotter bleed air from the engines' high pressure ports available for wing anti-icing. A temperature sensor will deactivate the bypass circuit if the respective high-pressure duct becomes too hot. When the STAB WING HEAT switch is set to OFF, the bypass circuits are deactivated. Additionally, the bypass circuit is deactivated if the respective BLEED AIR switch is not ON or the respective ENG FIRE PULL T-handle is pulled.

WING TEMP INDICATOR

The WING TEMP indicator, located on the center switch panel in the ANTI-ICE group, is installed to provide a visual indication of the wing leading edge temperature. The indicator receives input signals from the wing temperature sensor installed on the inner surface of the left wing leading edge. The indicator face is divided into three colored segments: blue, green, and red. If the indicator pointer is in the blue segment, wing leading edge temperature is cold enough for moisture to freeze on the surface. If the indicator pointer is in the green segment, wing leading edge temperature is warm enough that moisture will not freeze on the surface. If the indicator pointer is in the red segment, the wing leading edge is approaching an overheat condition and corrective action must be taken. The wing anti-ice system should be energized whenever flying through visible moisture and the WING TEMP indicator pointer is in the blue segment.

WING HT LIGHT

The amber WING HT light, on the glareshield annunciator panel, will illuminate to indicate the wing anti-ice system is not maintaining the temperature of the leading edge in the normal operating range. In the event that the wing leading edge heats to 215°F (102°C), the overheat thermoswitch located on the inner skin of the right wing leading edge will cause the light to illuminate. If the wing leading edge temperature cools to 55°F (13°C) and the STAB WING HEAT switch is on, the underheat thermoswitch located on inner skin of the right wing leading edge will cause the light to illuminate. The light will illuminate upon initial activation of the wing anti-ice system if the wing temperature is below the set point of the underheat thermoswitch. As the temperature of the wing leading edge rises, the light should extinguish.

HORIZONTAL STABILIZER ANTI-ICE

The horizontal stabilizer anti-ice system utilizes sequenced electrical heating elements along the horizontal stabilizer leading edge. The system consists of an electrically heated blanket bonded to each half of the horizontal stabilizer leading edge, three remote control circuit breakers (RCCB), a heat controller, a caution light, a system switch, and associated aircraft wiring. Control circuits operate on 28 VDC supplied through the STAB HEAT circuit breaker on the copilot's circuit breaker panel. Electrical power for the heating elements is 28 VDC supplied through three 50-amp current limiters.

STAB WING HEAT SWITCH — STABILIZER HEAT FUNCTION

The horizontal stabilizer anti-ice system is controlled through the STAB WING HEAT switch located in the ANTI-ICE group on the center switch panel. The switch has two positions: On (STAB WING HEAT) and OFF. When the aircraft is in flight and the STAB WING HEAT switch is On, 28 VDC is supplied through the three RCCBs to the heat controller. The heat controller distributes intermittent electrical power to the individual heating elements in a forward-to-aft sequence of 15 seconds duration each. Approximately 3 minutes are required to complete a full cycle. The center, or parting elements, are supplied with continuous electrical power. At least one engine generator must be operating to enable the heat controller circuits. The controller circuits are biased by starter engaged and weight-on-wheels signals; therefore, the system is inoperative when the squat switch is in the ground mode and during engine start.

STAB HT LIGHT

The amber STAB HT light, located on the glareshield annunciator panel will illuminate when any of the following conditions exist:

On the ground

- STAB HEAT circuit breaker is pulled.
- STAB WING HEAT switch is On.

In flight

- STAB HEAT circuit breaker is pulled.
- The STAB WING HEAT switch is On and any one heating element fails (remaining elements will continue to function normally).

During flight, illumination of the STAB HT light indicates system failure. During ground operation, the STAB HT light should illuminate whenever the STAB WING HEAT switch is On.

STABILIZER HEAT SELF TEST

A self test may be conducted with the aircraft on the ground and a generator on-line. Under these conditions, when the STAB WING HEAT switch is turned on the following events should happen:

1. The STAB HT light will illuminate.
2. The generator load will increase approximately 120 amps total for 2 to 3 seconds and then decrease to the "STAB HEAT off" value.
3. The STAB HT light will remain illuminated indicating the system is functioning normally.

The following events indicate a failure of the system:

1. STAB HT light does not illuminate when STAB WING HEAT switch is turned on. Turn STAB WING HEAT switch off.
2. Load does not decrease within 5 seconds. Turn STAB WING HEAT switch off.
3. STAB HT light flashes approximately 3 times per second. One or more heating elements are not within their operating tolerance (element failure). Turning STAB WING HEAT switch off will cancel the flashing.

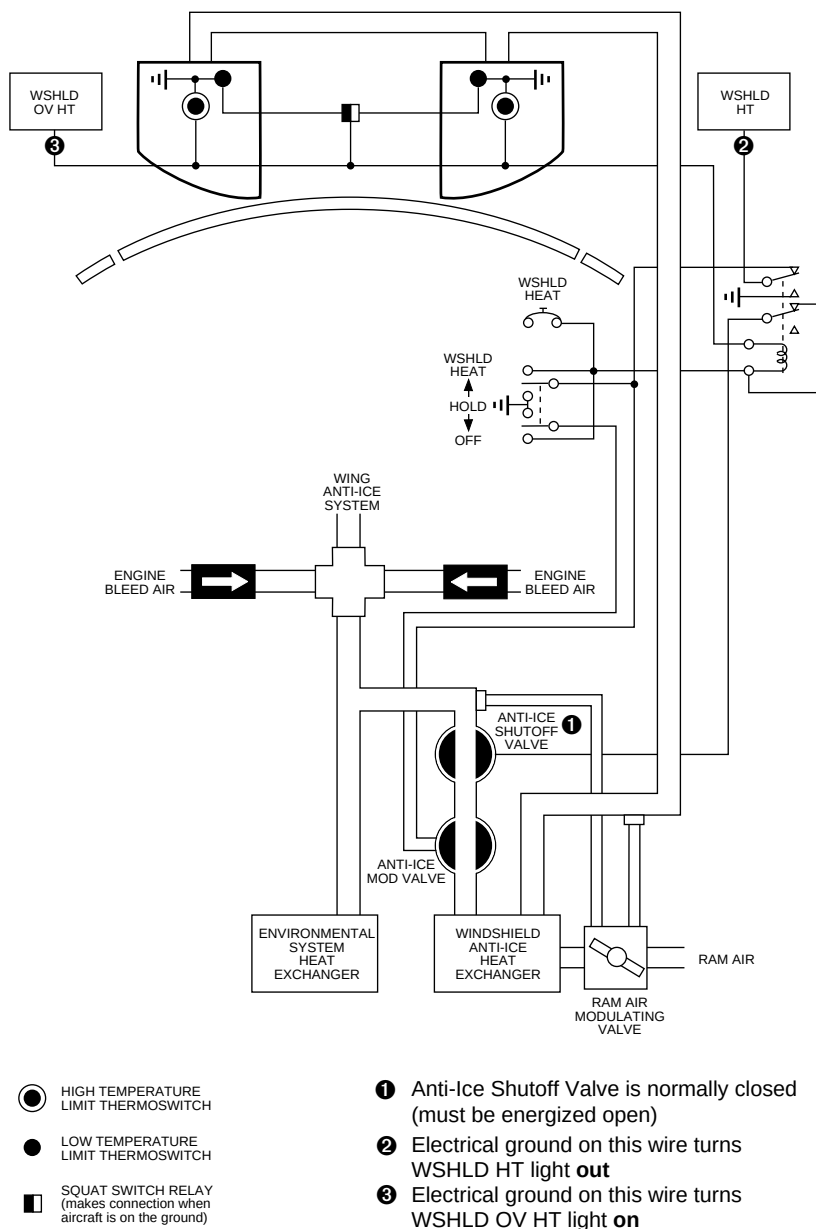
The STAB WING HEAT switch must be off for 3 minutes allowing the system to reset before another self test attempt can be made.

WINDSHIELD ANTI-ICE

Primary windshield anti-icing is accomplished by directing conditioned engine bleed air through ducting and control valves to external outlet nozzles forward of the windshield. The windshield anti-ice system consists of a shutoff valve, an anti-ice modulating valve, two low-limit overheat thermostats, two high-limit overheat thermostats, a green WSHLD HT light, an amber WSHLD OV HT caution light, a ram air modulating valve, an anti-ice duct temperature sensor, an anti-ice heat exchanger, two outlet nozzle assemblies, a system control switch, and associated aircraft wiring and bleed-air ducting. Electrical power to the control circuits is 28 VDC supplied through the WSHLD HEAT circuit breaker on the copilot's circuit breaker panel.

WSHLD HEAT SWITCH

The windshield anti-ice system is controlled through the WSHLD HEAT switch in the ANTI-ICE grouping on the center switch panel. The switch has three positions: WSHLD HEAT (On), HOLD, and OFF. When power is applied to the aircraft, or the BATTERY switches are set On, the windshield anti-ice shutoff valve is energized to the open position. When open, the shutoff valve allows engine bleed air to the anti-ice modulating valve downstream. When the WSHLD HEAT switch is placed in the On position, a circuit is completed to the anti-ice modulating valve and WSHLD HT indicator light. The anti-ice modulating valve will move toward full open until the valve is fully open or the WSHLD HEAT switch is set to HOLD. When the switch is in the HOLD position, the anti-ice modulating valve will remain in its last attained position, and allow bleed air to the anti-ice heat exchanger. When the WSHLD HEAT switch is set to OFF, the anti-ice modulating valve will move towards the closed position until the valve is fully closed or the WSHLD HEAT switch is set to HOLD. The anti-ice modulating valve will fully open or close in approximately 15 seconds. The anti-ice heat exchanger cools the bleed air with ram air regulated by a ram air modulating valve. This valve is controlled by the downstream anti-ice duct temperature sensor and regulates the anti-ice bleed air temperature by varying the amount of ram air allowed into the heat exchanger.



WINDSHIELD ANTI-ICE SYSTEM
Figure 6-3

WSHLD HT LIGHT

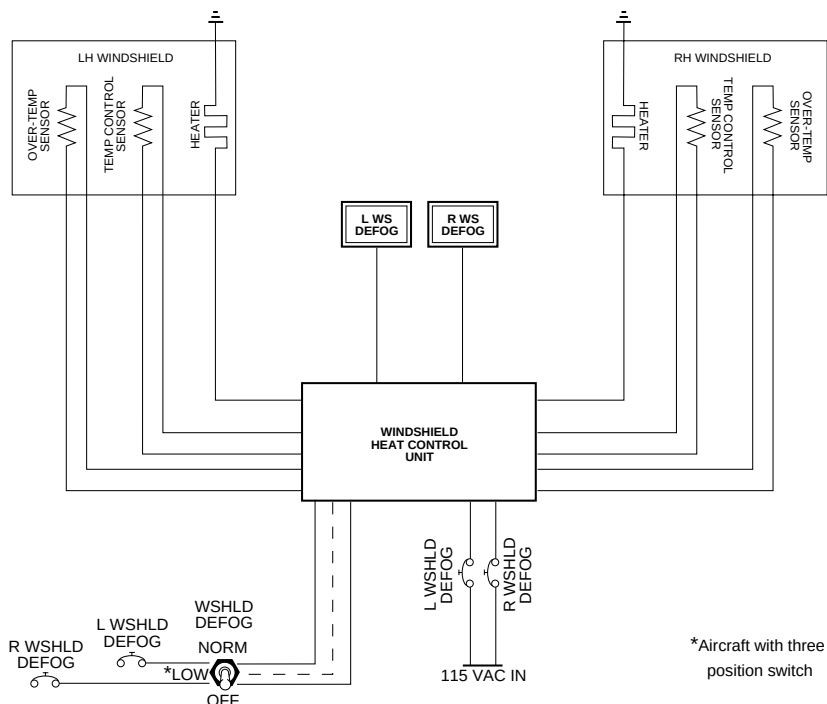
The green WSHLD HT light, located on the glareshield annunciator panel, provides the crew with a visual indication of windshield heat operation. The light is extinguished when the WSHLD HEAT switch is set to OFF. The light will illuminate when the WSHLD HEAT switch is moved out of the OFF position and remain illuminated until either the switch is set to OFF or an overheat thermoswitch trips shutting airflow off and extinguishing the green WSHLD HT light.

WSHLD OV HT LIGHT

Illumination of the amber WSHLD OV HT caution light, on the glareshield annunciator panel, indicates that the bleed air temperature in one or both of the windshield outlet nozzles has reached the respective low- or high-limit thermoswitch settings and the windshield anti-ice system has been shutdown by either the low- or high-limit thermoswitches. During ground operations, the light is controlled by the low-limit switches. In flight, the light is controlled by the high-limit switches. If the bleed air temperature in either outlet nozzle reaches 250°F (121°C) during ground operation, the low-limit overheat thermoswitches will close the anti-ice shutoff valve and illuminate the WSHLD OV HT caution light. If the outlet nozzle bleed air temperature in either nozzle reaches 347°F (175°C) in flight, the high-limit overheat thermoswitches will perform the same function. When the nozzle bleed air temperature drops to 240°F (115°C) during ground operations, or 311°F (155°C) in flight, the overheat thermoswitches will reset allowing the anti-ice shutoff valve to open and extinguish the WSHLD OV HT caution light. To avoid a false WSHLD OV HT indication upon landing, the low-limit overheat thermoswitch circuitry is disabled for 10 seconds after touchdown, after which normal functioning will resume.

WINDSHIELD DEFOG

Windshield internal defogging is accomplished using electrically heated windshield panels. The system is designed so that it may be activated before takeoff and remain on until shutdown. The system consists of two windshield panels with integral heaters, windshield heat control unit, system switch, L and R WS DEFOG annunciators, and associated aircraft wiring. The system utilizes the 115 VAC output from the inverter system to power the integral heaters. The control circuit receives 28 VDC through the L WSHLD DEFOG and R WSHLD DEFOG circuit breakers on the pilot's and copilot's circuit breaker panels. The 115 VAC input to the system is provided through the L and R WSHLD DEFOG circuit breakers on the pilot's and copilot's circuit breaker panels.



WINDSHIELD DEFOG SYSTEM

Figure 6-4

WSHLD DEFOG SWITCH

The windshield defog system is controlled through the WSHLD DEFOG switch in the ANTI-ICE group on the center switch panel.

The switch positions are OFF, LOW and NORM. With the WSHLD DEFOG switch set to LOW or NORM, the integral heaters will be supplied 115 volts AC power from the inverter system via the windshield heat control unit. When the switch is set to LOW, operating temperature range of the windshield is 90°-97°F (32°-36°C). When the WSHLD DEFOG switch is set to NORM, operating temperature range of the windshield is 105°-120°F (41°-49°C).



Normally, the left inverter will power the left windshield panel while the right inverter will power the right windshield panel. However, either inverter is capable of powering both windshield panels. Should one inverter switch be in the on position and the other in the off position, switching will occur allowing the operative inverter to power both windshield panels.

Normal system operation is indicated by illumination of the L and R WS DEFOG annunciators when the system is activated (windshield temperature below 85°F [29°C]). When the windshield is heated above 85°F (29°C), the annunciators will extinguish.

L AND R WS DEFOG ANNUNCIATORS

Illumination of a WS DEFOG annunciator, located on the glareshield annunciator panel, indicates an over-temperature condition, under-temperature condition or loss of AC or DC power. Temperature sensors are attached to each windshield panel which provide temperature data to the windshield heat control unit. Should the temperature of the windshield drop below 85°F (29°C), the applicable WS DEFOG annunciator will illuminate to alert the crew. Should the temperature of the windshield increase above 150°F (66°C), the applicable WS DEFOG annunciator will illuminate and the affected windshield will be deactivated. When the windshield cools to the normal operating range, the system will reactivate and the WS DEFOG annunciator will extinguish. Electrical faults detected by the system monitor will cause the affected WS DEFOG annunciator to illuminate.

WINDSHIELD ANTI-ICE — ALCOHOL SYSTEM

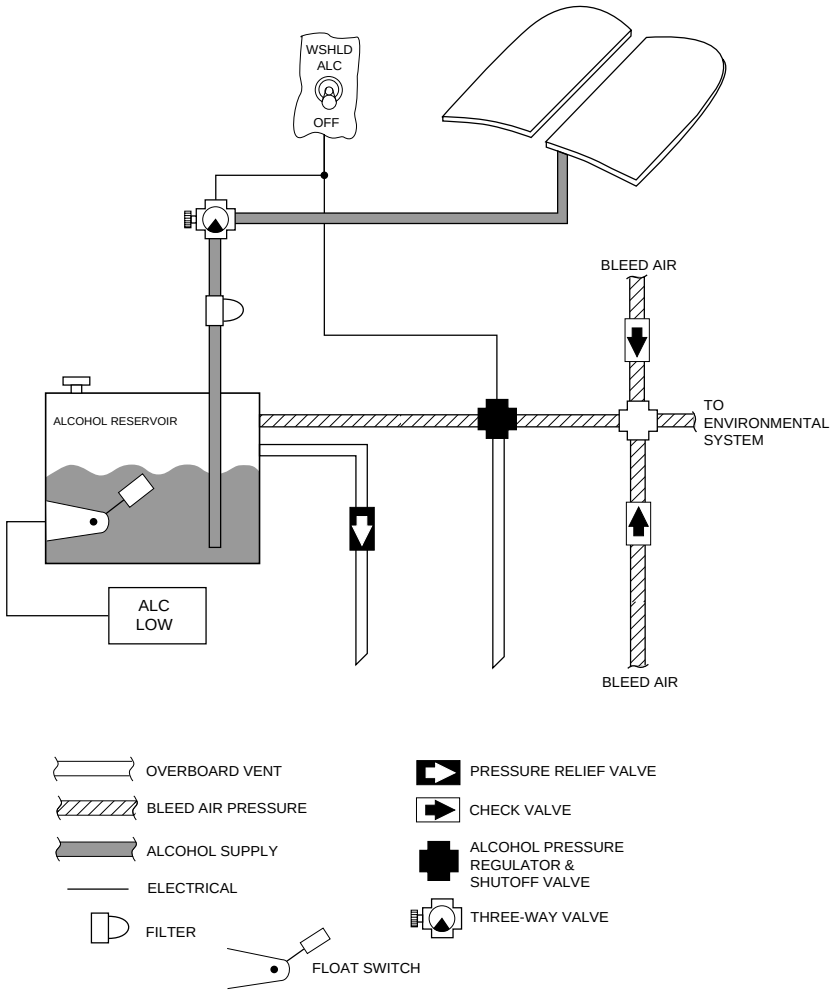
The alcohol anti-ice system is utilized for windshield anti-icing in the event of a windshield heating system malfunction. Alcohol anti-icing is accomplished by directing methyl alcohol over the pilot's windshield surface through an external outlet in the windshield heat outlet nozzle assembly. The system consists of a 2.35 gallon alcohol reservoir, a float switch, a filter, a relief valve, a three-way control valve, a bleed air shut-off and pressure regulator valve, a system switch, an amber ALC LOW caution light and associated aircraft wiring. The pressure relief valve is installed to prevent system overpressurization by venting system pressure greater than 2.6 psi above ambient, and bleed system pressure when the system is off. The system control circuits operate on 28 VDC supplied through the ALCOHOL SYSTEM circuit breaker on the copilot's circuit breaker panel.

WSHLD ALC SWITCH

The windshield alcohol anti-ice system is controlled by the WSHLD ALC switch in the ANTI-ICE group on the center switch panel. The switch has two positions: WSHLD ALC (On) and OFF. When the switch is set to WSHLD ALC, circuits are completed to open the shutoff and pressure regulator valve and position the three-way control valve for alcohol flow to the windshield. The alcohol reservoir, pressurized to approximately 2.4 psi above ambient through the shutoff and pressure regulator valve, supplies alcohol to the windshield outlet through a filter and the three-way control valve. When the switch is set to OFF, the shutoff and pressure regulator valve will close, the three-way valve will reposition to cut off flow and system pressure will bleed off through the pressure relief valve.

ALC LOW CAUTION LIGHT

Illumination of the amber ALC LOW light, located on the glareshield annunciator panel, indicates the alcohol supply in the reservoir is low. The reservoir float switch will illuminate the light through a relay when in the full down position. When the relay is energized, a holding circuit is also energized to prevent the light from flickering due to the bobbing motion of the float. The holding circuit is de-energized when the BATTERY switches are set to OFF and the alcohol reservoir is filled. A completely filled reservoir will supply the windshield alcohol anti-ice system with approximately 45 minutes of alcohol flow.



ALCOHOL ANTI-ICE SYSTEM
Figure 6-5

PITOT-STATIC AND STALL WARNING ANTI-ICE

Anti-ice protection for the pitot-static probes, total temperature probe, stall warning vanes, and the pressurization static port is accomplished by energizing integral electrical heating elements in each component. The independent pitot-static probe, total temperature probe, and stall warning vane anti-ice systems consist of control switches, probe heaters, vane heaters, and pitot heat monitors. Both left, right and standby systems utilize the same PITOT HT light. The pressurization static port heater is part of the right system. The pitot-static probe heating elements receive 28 VDC through their respective L PITOT HEAT, R PITOT-STALL-TAT HEAT, and STANDBY PITOT HEAT circuit breakers on the pilot's and copilot's circuit breaker panels. The total temperature probe heating element receives 28 VDC through the TAT PROBE HEAT circuit breaker on the copilot's circuit breaker panel. Total temperature probe heat is only enabled when the squat switch is in the air mode. The pressurization static port heating element receives 28 VDC through the R PITOT-STALL-TAT HEAT circuit breaker on the copilot's circuit breaker panel. The stall warning vane heating elements receive 28 VDC through the respective L and R STALL VANE HEAT circuit breakers on the pilot's and copilot's circuit breaker panels.

An optional Triple Pitot Heat Indication System may be installed. The system does not change the anti-ice protection for the pitot-static probes, stall warning vane, or total temperature probe. It does add specific warning annunciators in the event of failure of either left, right, or standby pitot-static heat system. The annunciators are installed on the center instrument panel, below the PITOT HEAT placard.

PITOT HEAT SWITCHES

The pitot-static heat systems are controlled through the PITOT HEAT switches in the ANTI-ICE group on the center switch panel. Each switch has two positions: On (L or R) and OFF. When the L and R PITOT HEAT switches are set to On (L and R), power is supplied to each pitot-static probe heater, each stall warning vane heater, the total temperature probe heater (aircraft in flight), and the pressurization static port heater. The standby pitot-static probe, pressurization static port, and the total temperature probe heat are activated through the R PITOT HEAT switch.

PITOT HT LIGHT

A pitot heat monitor system is installed to alert the pilot if insufficient current is being applied to any of the pitot-static probe heating elements (left, right and standby). Each monitor is basically a relay which maintains an open circuit for the PITOT HT light as long as sufficient current is being applied to the associated pitot-static probe heating element. In the event of a malfunction in or loss of power to the associated pitot-static probe heating element, the relay will release and complete the PITOT HT light circuit. Illumination of the amber PITOT HT light, in the glareshield annunciator panel, indicates a malfunction in either the left, right or standby pitot-static heat system, or that at least one PITOT HEAT switch is OFF.

L, R AND STBY PITOT HEAT LIGHTS

In the event of a malfunction in the pitot-static heat system, the applicable amber L, R, or STBY annunciator, and both Master CAUT lights will illuminate and flash. Additional pitot-static heat system failures will cause the applicable individual L, R, or STBY annunciator to illuminate and both Master CAUT lights to illuminate and flash. When the aircraft is powered from the EMER BUS, the L and R pitot heat annunciators will illuminate to notify pilots that only the standby pitot heat is operational.

OXYGEN SYSTEM

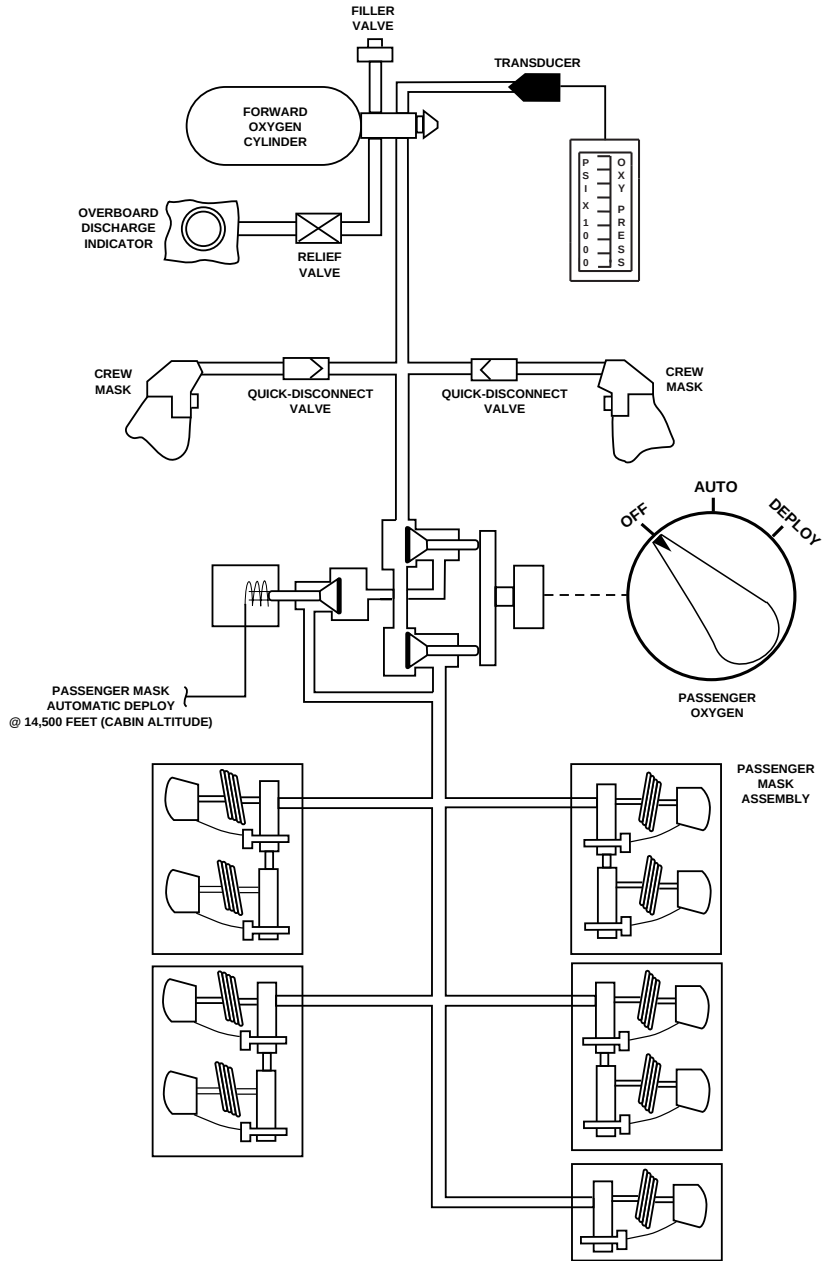
The aircraft oxygen system provides oxygen service for the crew and passengers. The system consists of the crew and passenger distribution systems, a high-pressure oxygen storage cylinder, a shutoff valve and pressure regulator assembly, an oxygen pressure transducer, an oxygen pressure indicator, an overboard discharge relief valve and indicator, a passenger oxygen control valve, lanyard actuated passenger mask oxygen valves, and crew and passenger oxygen masks. Electrical power to operate the passenger oxygen control valve and oxygen indicator is supplied through the OXYGEN VALVE circuit breaker on the pilot's circuit breaker panel. Oxygen is available to the crew at all times and can be made available to the passengers either automatically above 14,500 (± 250) feet cabin altitude, or manually at all altitudes through the use of the cockpit controls on the pilot's circuit breaker panel. The oxygen system is designed for use during emergency descent to a cabin altitude not requiring oxygen and is not to be used for extended periods of flight at cabin altitudes requiring oxygen or as a substitute for the normal pressurization system. Smoking is prohibited when oxygen is in use.

OXYGEN STORAGE AND PRESSURE REGULATION

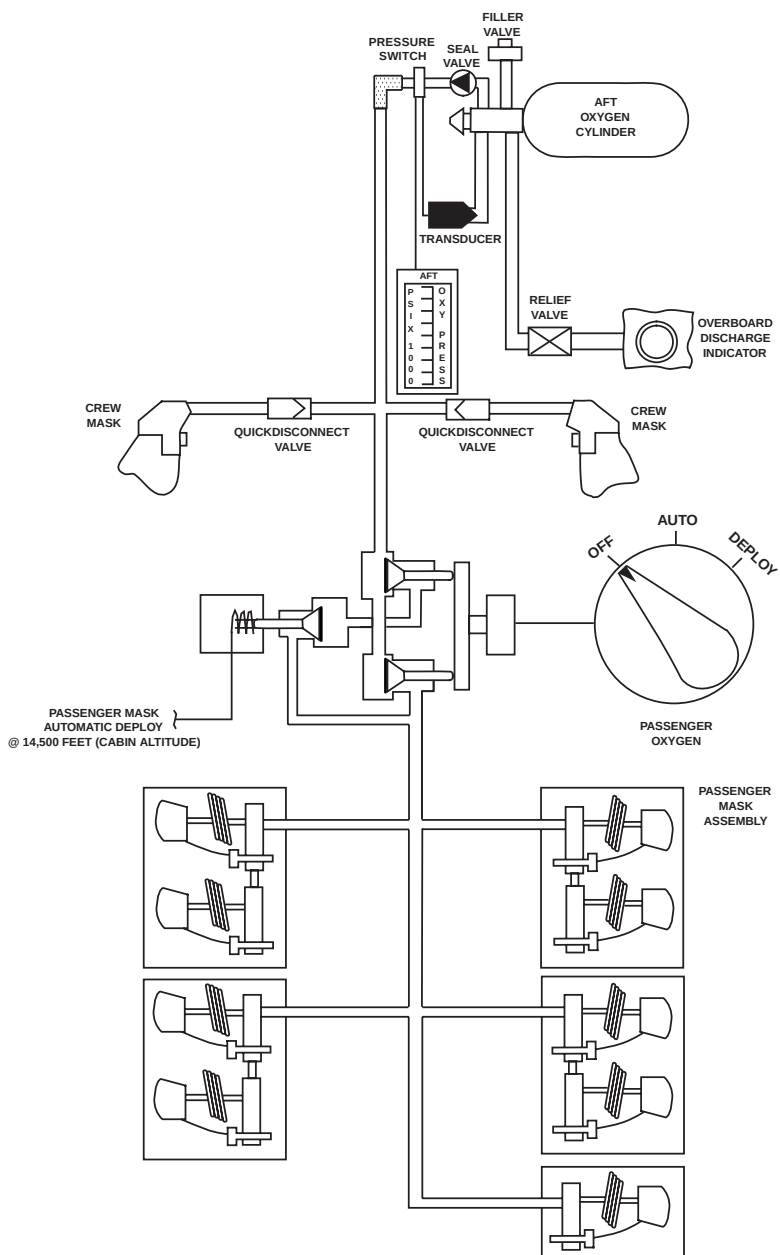
Several oxygen storage cylinder arrangements are used:

- Single cylinder in the nose compartment (40 or 77 cubic feet)
- Single cylinder in the vertical stabilizer (77 cubic feet)
- Dual cylinders — one in the nose compartment (40 or 77 cubic feet) and one in the vertical stabilizer (77 cubic feet)

The shutoff and pressure regulator assembly forms an integral part of the storage cylinder and provides for pressure regulation, pressure indication, and servicing. Oxygen pressure for the passenger and crew distribution systems is regulated to a pressure of 60 to 80 psi. The shutoff and pressure regulator assembly also incorporates a burst disc pressure relief valve to discharge the oxygen cylinder contents overboard in the event that cylinder pressure reaches 2700 to 3000 psi. Should the cylinder contents be discharged overboard, the green overboard discharge indicator will be ruptured or missing. Storage cylinders mounted in the nose compartment have the overboard discharge indicator located on the lower left side of the nose section. Storage cylinders mounted in the vertical stabilizer have the overboard discharge indicator located on the left side at the base of the vertical stabilizer.

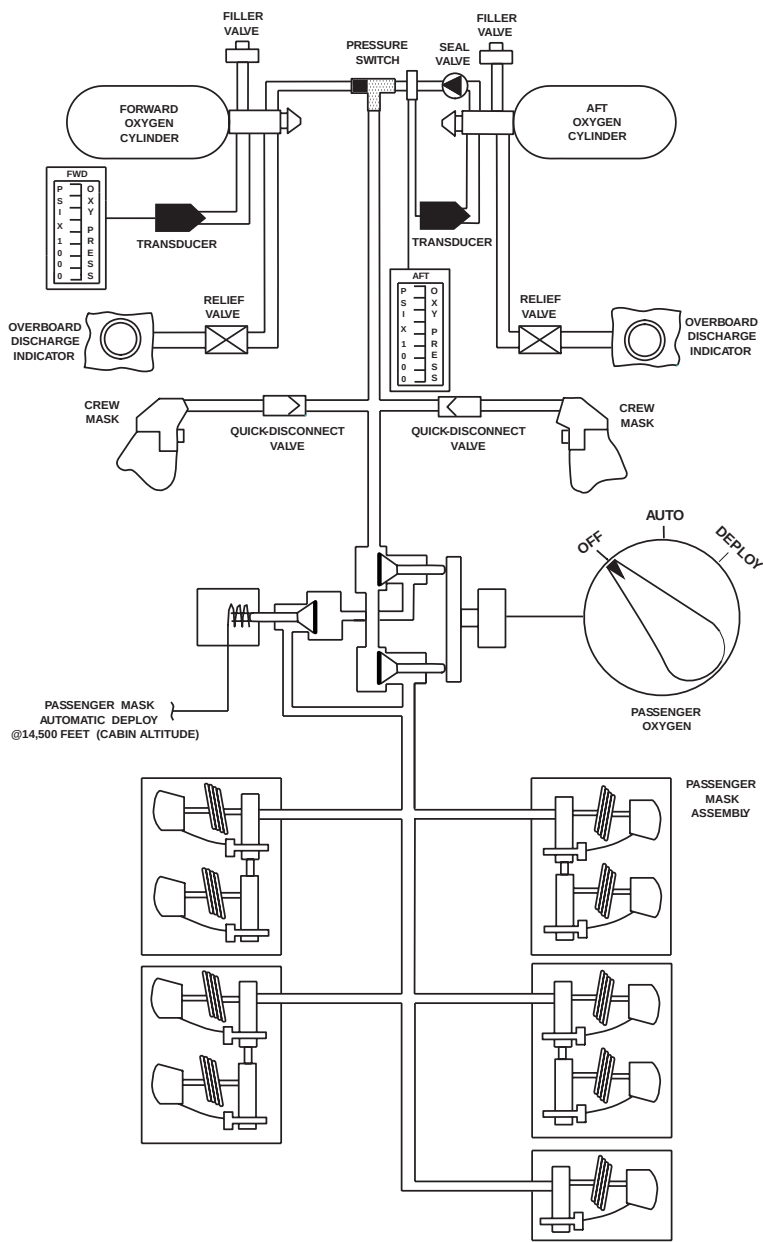


(with single forward cylinder)
OXYGEN SYSTEM SCHEMATIC
Figure 6-6



F6006000006601

(with single aft cylinder)
OXYGEN SYSTEM SCHEMATIC
Figure 6-6A



F60-060000-001-01

(with dual cylinders)
OXYGEN SYSTEM SCHEMATIC
Figure 6-6B

OXYGEN PRESSURE INDICATOR

The vertical-scale oxygen pressure indicator is located on the pilot's circuit breaker panel. The indicator face is marked from 0 to 2000 psi in 250 psi increments and is controlled by an electric transducer plumbed to the high-pressure side of the shutoff and pressure regulator assembly.

The oxygen supply system may be a single cylinder or dual cylinder system. The pressure indicator is located on the pilot's circuit breaker panel. In aircraft with dual systems, a second pressure indicator is added to the pilot's circuit breaker panel to allow determination of the oxygen pressure in each oxygen cylinder. The transducer for the aft oxygen system is wired through a pressure switch to the aft pressure indicator. The pressure switch senses loss of pressure in the aft oxygen tube. If the aft cylinder is pressurized but the supply tube is not (for example; due to blockage) the indicator will read zero. Since pressure will vary due to temperature the fore and aft cylinder may not indicate the same during flight.

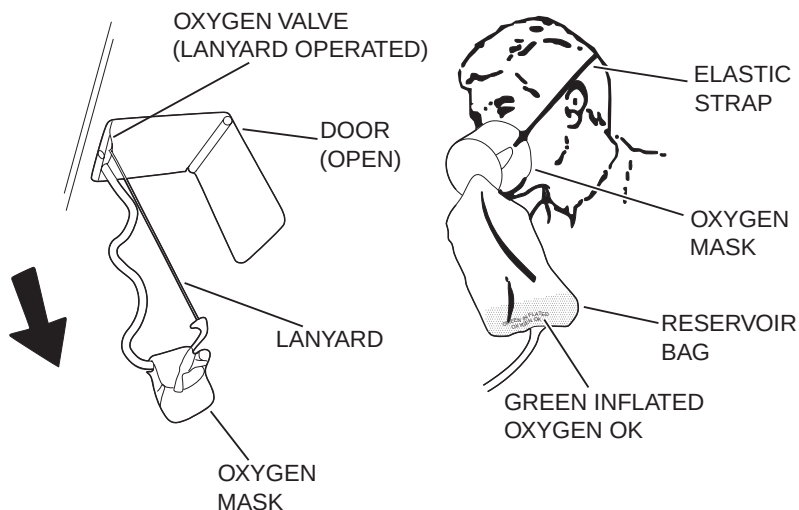
OXYGEN SYSTEM COCKPIT CONTROLS

The oxygen system cockpit controls consist of one control valve, labeled PASSENGER OXYGEN OFF-AUTO-DEPLOY, located on the pilot's circuit breaker panel. The control valve controls oxygen availability to the passenger oxygen distribution system and provides automatic or manual mode selection. Oxygen is available to the crew oxygen distribution system at all times when the oxygen cylinder shut-off valve is open. Control positions and system functions are as follows:

1. With the PASSENGER OXYGEN valve in the AUTO position, oxygen is available to the passenger distribution system and the passenger masks will deploy automatically in the event cabin altitude climbs to 14,500 feet. Should the cabin altitude reach 14,500 (± 250) feet, an electrical signal from the pressurization indicator will cause the solenoid valve (integral with the PASSENGER OXYGEN valve) to open, the passenger oxygen masks will deploy, and the cabin overhead lights will illuminate to provide maximum visibility for donning masks. Normally, the control should be in this position.
2. With the PASSENGER OXYGEN valve in the DEPLOY position, oxygen is available to the passenger distribution system and the passenger masks will deploy. Setting the PASSENGER OXYGEN valve to the DEPLOY position will manually open the PASSENGER OXYGEN valve and allow oxygen pressure to deploy the passenger masks. This position can be used to deploy the passenger masks at any cabin altitude and must be used if electrical power is unavailable.
3. With the PASSENGER OXYGEN valve in the OFF position, oxygen will not be available to the passenger distribution system regardless of cabin altitude. This position can be used when oxygen is required for the crew members only.

PASSENGER MASKS

The passenger oxygen masks are stowed in compartments in the convenience panels above the passenger seats. Whenever the compartment doors open automatically (PASSENGER OXYGEN-AUTO) or manually (PASSENGER OXYGEN-DEPLOY) the passenger oxygen masks will fall free and oxygen will be available for passenger use. Passengers should don masks and pull the mask lanyard to initiate oxygen flow. An orifice incorporated in the mask tubing connections will provide a constant flow rate of 4.5 liters per minute. A green area of the reservoir bag inflates when oxygen is flowing. Should the doors be inadvertently opened from the cockpit, pressure must be bled from the system by pulling one of the mask lanyards before the masks can be restowed. The compartment doors can be opened manually for mask cleaning and servicing per Maintenance Manual instructions.



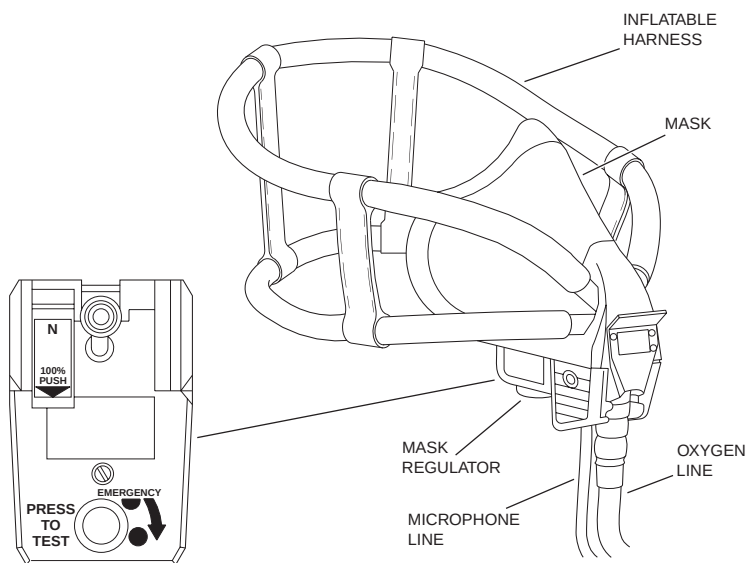
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PASSENGER MASK

Figure 6-7

CREW MASKS — Scott ATO

The flight crew oxygen masks are stowed in accessible stowage boxes just aft of the pilot's and copilot's circuit breaker panels or in storage cups just aft of the pilot and copilot on the bulkhead. The mask regulators provide for normal, 100% oxygen, and emergency operation (refer to the Airplane Flight Manual for detailed operational procedures). Each mask incorporates a microphone controlled by the NORM MIC/OXY MIC switch on the respective audio control panel. When the OXY MIC is in use, a voice-activated hot interphone exists for crew member communication. An optional oxygen pressure detector may be located in the oxygen line. If sufficient pressure is available in the line, the detector shows "green".

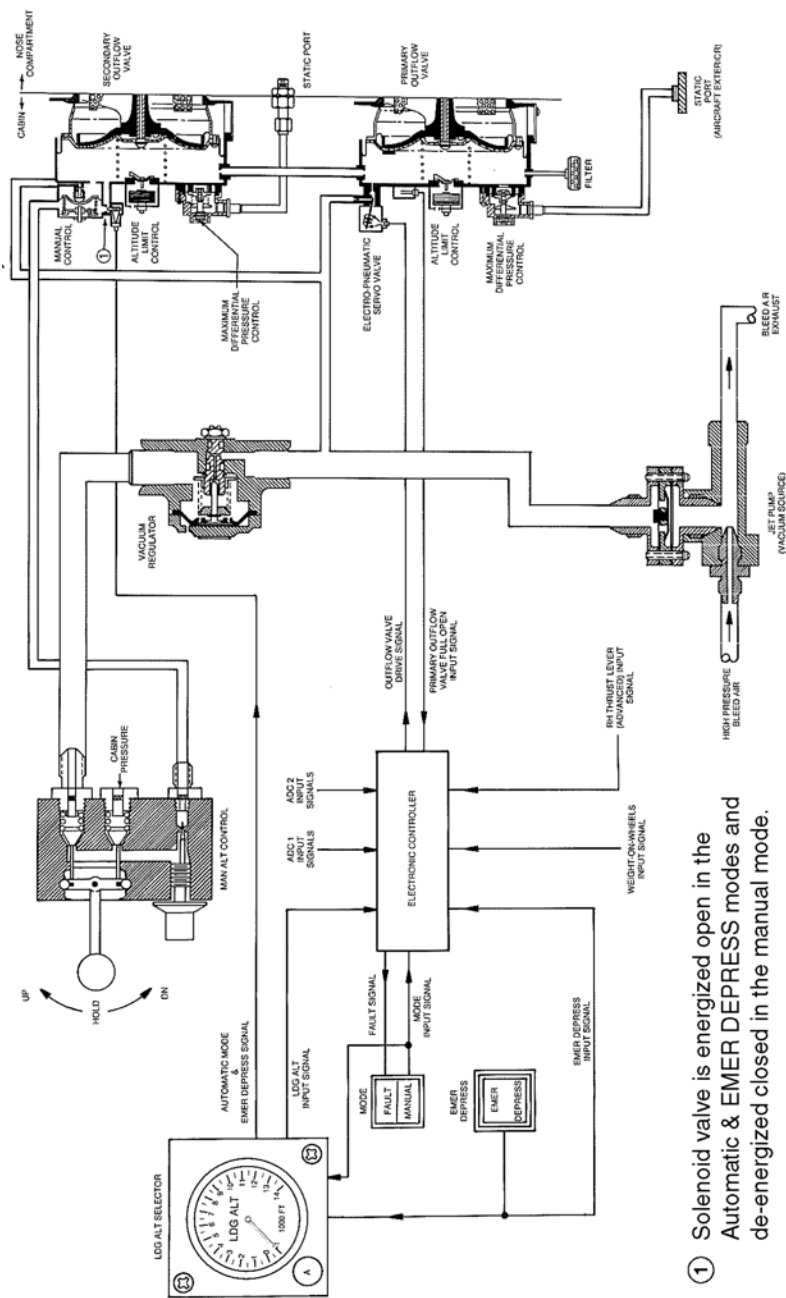


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CREW MASK — SCOTT ATO
Figure 6-8

PRESSURIZATION SYSTEM

Cabin pressurization is provided by conditioned air entering the cabin through the air distribution ducts and controlled by modulating the amount of air exhausted from the cabin. The pressurization system consists of a cabin primary outflow valve, a cabin secondary outflow valve, an electronic pressurization controller, a LDG ALT selector, a MAN ALT control valve with rate control, a MODE switch, an EMER DEPRESS switch, a pressurization vacuum jet pump, a vacuum regulator, a pressurization indicator, two emergency pressurization valves, two emergency pressurization aneroid switches, an amber PRESS SYS caution light, an amber EMER PRESS caution light, and an aural warning system. All system controls are located in the PRESSURIZATION group on the copilot's switch panel. The pressurization indicators are located directly above the system controls. Power for the control circuits is 28 VDC supplied through the CABIN PRESS SYS circuit breaker on the copilot's circuit breaker panel. Power for the pressurization indicator is 28 VDC supplied through the CABIN PRESS IND circuit breaker on the pilot's circuit breaker panel. Automatic and manual pressurization modes are available during EMER BUS mode. The pressurization indicator is operative during EMER BUS mode.



① Solenoid valve is energized open in the Automatic & EMER DEPRESS modes and de-energized closed in the manual mode.

PRESSURIZATION SYSTEM SCHEMATIC
Figure 6-10

NORMAL PRESSURIZATION

Normal pressurization is controlled by regulating control pressure to the cabin primary and secondary outflow valves. The control pressure may be regulated automatically by the electronic pressurization controller or manually by the MAN ALT control knob. A pressurization vacuum jet pump provides vacuum (servo pressure) to operate the outflow valves. MANUAL mode operation is completely independent of the aircraft electrical system. If the cabin-to-ambient differential pressure reaches 9.7 psid, the positive pressure relief metering section of the outflow valves will cause the outflow valves to open and maintain a 9.7 psi differential. The outflow valves incorporate a cabin altitude limiter which limits cabin altitude to approximately 13,700 (± 500) feet should the system fail to maintain the normal cabin altitude. Should the cabin altitude reach approximately 13,700 (± 500) feet, the altitude limiters will vent cabin pressure to the outflow valve control chambers causing the valves to close. Should a rapid descent cause a negative pressure in the cabin, both the primary and secondary outflow valves will open to vent ambient atmospheric pressure to the cabin.

When the system is in the automatic mode, the electronic controller maintains cabin pressure based on air data from the aircraft's air data computers, landing field elevation selected on the LDG ALT selector, position of the thrust levers, position of the landing gear squat switch, and the system's preprogrammed climb and descent schedules. The electronic controller features built-in test equipment which performs fault detection and annunciation routines during ground and flight operation. Should a fault be detected, the FAULT annunciator on the mode switch will illuminate and the system will automatically revert to manual mode. Depressing the mode switch will extinguish the FAULT annunciator and illuminate the MANUAL annunciator.

When the system is in the manual or fault modes, the crew maintains the desired cabin pressure using the MAN ALT and MAN RATE controls to position the outflow valves. Moving the MAN ALT control to UP or DN controls the outflow valves directly causing them to open or close as appropriate until the MAN ALT control is moved to the center position. The desired cabin altitude is then controlled by the crew by reference to the pressurization indicator. The rate at which the outflow valves will respond to MAN ALT control movement is controlled by rotating the MAN RATE knob from MIN to MAX as desired.

EMERGENCY PRESSURIZATION

In the event of normal cabin airflow malfunction, emergency pressurization is provided by routing low pressure engine bleed air directly into the cabin through the emergency pressurization valves. Emergency pressurization is accomplished automatically by opening the emergency pressurization valves in response to signals from the aneroid switches when the cabin altitude increases to 9500 (± 250) feet or manually by setting the BLEED AIR switches to EMER. When the aircraft is below 25,000 feet pressure altitude and the system is in automatic mode with a takeoff or landing field elevation greater than 8000 feet specified, the aneroid switches will not trigger the emergency pressurization unless the cabin altitude increases to 14,500 (± 250) feet. Emergency pressurization is provided by two independent circuits — left and right. If triggered automatically, the left and right circuits will activate approximately at the same time in response to the aneroid switch signals. If triggered manually, the left and right circuits may be activated separately.

When emergency pressurization is triggered the following events occur:

- Emergency pressurization valve opens
- The bleed-air mix valve goes to the low-pressure bleed port
- The bleed-air shutoff valve closes
- The wing anti-ice bypass circuit is deactivated
- The EMER PRESS annunciator illuminates

The result is that engine low-pressure bleed air is ducted directly into the cabin air overhead and floor diffusers. This bypasses all bleed-air plumbing in the tailcone area and will stabilize cabin altitude if the pressurization failure has occurred in that area. The emergency pressurization valves are energized to the open position and de-energized for normal bleed-air flow. Each valve is independent of the other and, whenever both valves are open, temperature control and bleed air for wing and windshield anti-ice will be unavailable. Operating power for emergency valve actuation is 28 VDC supplied through the L and R BLEED AIR circuit breakers on the pilot's and copilot's circuit breaker panels.

PRESSURIZATION CONTROLS AND INDICATORS

MODE SWITCH

The MODE switch is an alternate-action switch located on the copilot's switch panel. The switch is used to toggle the pressurization system between the automatic and manual modes. Upon initial power-up, the system will be in automatic mode if no faults were revealed in the self-test. If a fault is detected, the system will revert to manual and the FAULT annunciator (part of the MODE switch) will illuminate. To switch from automatic to manual mode and vice versa, the MODE switch is depressed and released. When manual mode is selected, the MANUAL annunciator (part of the MODE switch) will be illuminated.

MAN ALT CONTROL

The MAN ALT control is a 3-position valve located on the copilot's switch panel. The control is used to direct either regulated vacuum or cabin pressure to the outflow valves positioning them so that the desired cabin altitude results. Moving the control to the UP detent applies regulated vacuum to the outflow valves causing them to move toward the open position and increasing cabin altitude. Moving the control to the DN detent applies cabin pressure to the outflow valves causing them to move toward the close position and decreasing cabin altitude. When the control is in the center position, the outflow valves remain in their last attained position stabilizing the cabin altitude. Incorporated into the MAN ALT control valve is a MAN RATE control. The MAN RATE control is an adjustable needle valve which restricts the passage between the MAN ALT valve and the outflow valves. The rate at which the outflow valves react to the MAN ALT control is adjusted by varying this restriction.

EMER DEPRESS SWITCH

The EMER DEPRESS switch is an alternate-action switch located on the copilot's switch panel. A guard is installed over the switch to prevent inadvertent actuation. The switch is used to depressurize the cabin and increase cabin airflow for smoke and fume evacuation. The EMER DEPRESS function is available in both automatic and manual modes. When EMER DEPRESS is selected, the outflow valves receive a signal to move toward the full open position. The cabin altitude will ascend to the aircraft altitude or 13,700 (± 500) feet (cabin altitude limiter), whichever is less. When EMER DEPRESS mode is selected, the EMER DEPRESS annunciator (part of the EMER DEPRESS switch) will be illuminated. To de-select this mode, depress and release the EMER DEPRESS switch.

LDG ALT SELECTOR

The LDG ALT selector is located on the copilot's switch panel. The selector consists of a circular instrument graduated from -1000 to 14,000 feet in 500-foot increments and a setting knob used by the crew to select the landing field elevation. As the setting knob is moved, the needle on the instrument moves to show the selected landing altitude. The selected landing field elevation signal is supplied to the pressurization controller for use in determining the appropriate cabin climb and descent profile. The elevation of the destination airport is selected on the LDG ALT selector prior to takeoff and checked again prior to descent. The LDG ALT selector has no effect in manual mode.

HIGH ALTITUDE PRESSURIZATION MODE

When the aircraft is going to takeoff or land at a field elevation greater than 8000 feet, the system changes to high altitude pressurization mode. This increases the warning elevation to 14,500 (± 250) feet cabin altitude when the aircraft is below 25,000 feet pressure altitude.

PRESSURIZATION INDICATOR

The pressurization indicator consists of a circular CABIN ALT instrument graduated from -1000 to 20,000 feet, a circular CABIN RATE instrument graduated from 2000 feet per minute down to 2000 feet per minute up, and a digital readout to display differential pressure. All three components of the indicator require electrical power. If power to the indicator is lost, the CABIN ALT and CABIN RATE needles will go to the OFF position and the DIFF PRESS display will go blank.

The DIFF PRESS readout is capable of displaying differential pressure from 0.0 to 9.9 psid. If the differential pressure exceeds the maximum of 9.8 psid, the display will flash. If the differential pressure exceeds 0.5 psid negative, the DIFF PRESS readout will flash "0.5". The indicator provides outputs for the following:

- 8750 (± 250) feet cabin altitude — Illuminates PRESS SYS caution light if in the manual mode.
- Activates cabin altitude aural warning horn and red CABIN ALT HI light at:
 - 10,100 (± 250) feet cabin altitude whenever the aircraft is above 25,000 feet pressure altitude.
 - 10,100 (± 250) feet cabin altitude if the aircraft is below 25,000 feet pressure altitude and the system detects takeoff or landing at a field elevation less than 8000 feet.
 - 14,500 (± 250) feet cabin altitude if the aircraft is below 25,000 feet pressure altitude and the system detects takeoff or landing at a field elevation greater than 8000 feet.
- 14,500 (± 250) feet cabin altitude — Activates automatic deployment of passenger oxygen masks and turns on cabin overhead lighting.
- Differential pressure exceeds - 0.5 or + 9.8 psid — Illuminates PRESS SYS caution light.

PRESS SYS LIGHT

The amber PRESS SYS caution light, on the glareshield annunciator panel, illuminates to annunciate the following conditions:

- Differential pressure has exceeded the limit (- 0.5 to + 9.8 psid).
- *In automatic mode cabin altitude exceeds:*
 - 14,500 (± 250) feet if the aircraft is below 25,000 feet pressure altitude and the system detects takeoff or landing at a field elevation greater than 8000 feet.
 - 8600 (± 200) feet for all other conditions.
- *In manual mode cabin altitude exceeds 8750 (± 250) feet.*
- The pressurization system detects a fault.

EMER PRESS LIGHT

The amber EMER PRESS caution light, on the glareshield annunciator panel, illuminates to annunciate the following conditions:

- The emergency pressurization has activated on one or both sides.
- If emergency pressurization has not activated, an electrical fault exists which may prevent activation of emergency airflow.

BLEED AIR SWITCHES — EMER FUNCTION

The L and R BLEED AIR switches may be used to manually activate emergency pressurization. When a BLEED AIR switch is set to EMER, the respective bleed-air shutoff valve will close and emergency pressurization valve will be energized open and the high-stage bleed air will be shut off. To reset the emergency pressurization valve, reduce power on the respective engine and set the BLEED AIR switch to OFF.

CABIN ALTITUDE WARNING HORN and MUTE FUNCTION

A cabin altitude aural warning horn will sound to alert the crew to a problem with the cabin pressurization system. The horn is controlled by an output from the cabin pressurization indicator which activates the warning horn circuit (see pressurization indicator). The cabin altitude warning horn circuit is tested through the SYSTEM TEST switch on the instrument panel. The MUTE switch, on right thrust lever knob, may be used to interrupt the horn for approximately 60 seconds in the event the horn sounds.

CABIN ALT HI LIGHT

A red CABIN ALT HI light will illuminate in conjunction with the cabin altitude warning horn.

SYSTEM TEST SWITCH — CABIN ALT FUNCTION

The rotary-type SYSTEM TEST switch on the instrument panel is used to test the cabin altitude warning system. Rotating the switch to CABIN ALT and depressing the switch TEST button will provide a ground simulating the 10,100-foot trigger signal.

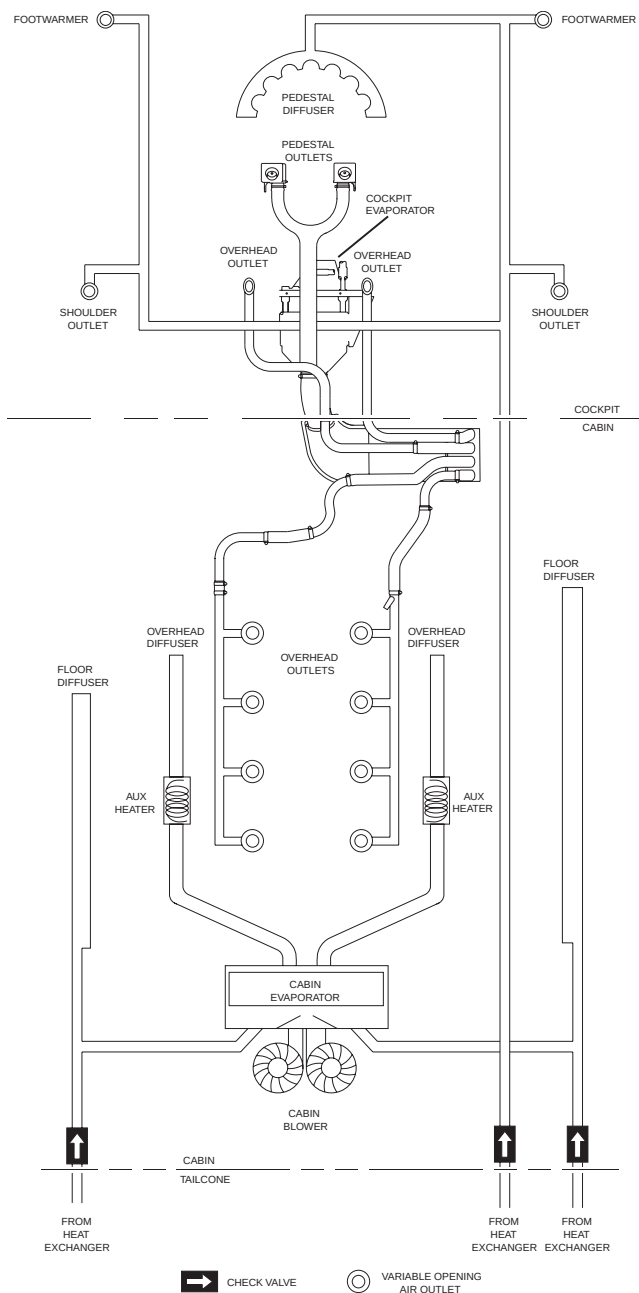
AIR CONDITIONING AND HEATING

Primary heating and cooling is accomplished by controlling the temperature of the bleed air entering the independently controlled cockpit and cabin air distribution systems. An R-134A vapor cycle cooling system is installed to provide additional cooling. An auxiliary (electrical) heating system is installed to provide additional heating for the cabin, if desired.

PRIMARY HEATING AND COOLING-BLEED AIR

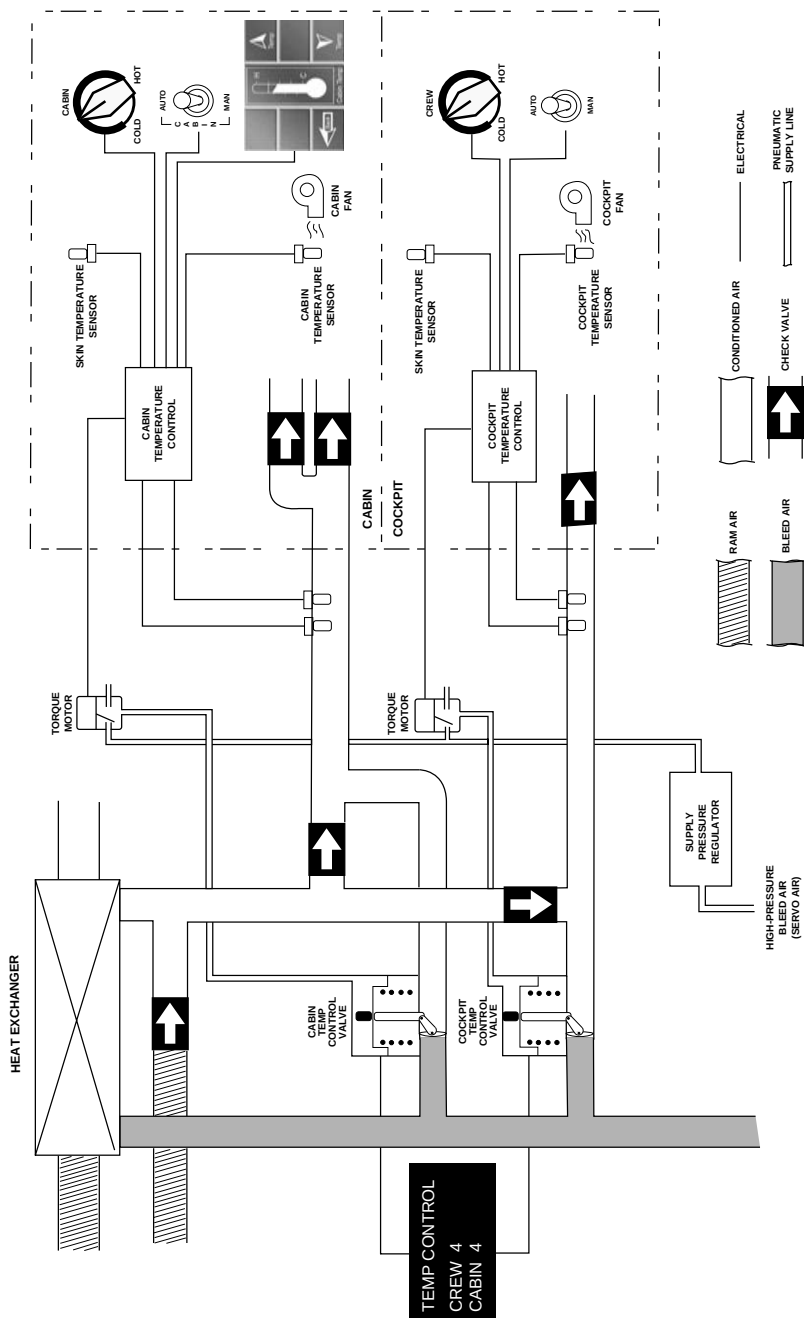
Cockpit and cabin temperature is regulated by controlling the temperature of the pressurization bleed air entering the cockpit and cabin air distribution systems. With the BLEED AIR switches ON and the CAB AIR switch ON, engine bleed air is admitted to the ram air heat exchanger through a flow control valve. The bleed air is cooled in the heat exchanger by ram air entering the dorsal inlet, passing through the exchanger, and then exiting overboard. The conditioned bleed air then passes out of the exchanger into the cockpit and cabin air distribution ducts. The temperature of the conditioned air is controlled by the temperature control valve on each distribution system duct. These valves bypass some of the bleed air around the heat exchanger and mix it directly with the conditioned air exiting the heat exchanger.

Temperature control valve position, thus, temperature regulation, is pneumatically controlled by the electrically operated temperature control system. Whenever either cabin or cockpit temperature AUTO-MAN switch is set to AUTO, the respective system temperature controller will automatically maintain the temperature set with the (CREW or CABIN) COLD-HOT selector. The cabin temperature AUTO-MAN switch also has a CABIN position which allows the temperature to be set using a temperature control panel in the cabin area. The controllers maintain the selected temperature by comparing input signals from various temperature sensors and then electrically controlling the torque motors that provide pneumatic pressure (servo air) to the temperature control valves. Duct temperature sensors are installed in each system to close the temperature control valves and light the DUCT OV HT caution light whenever excessively high duct temperatures are sensed. The cockpit and cabin air temperature sensors have small blowers that draw air past the sensing elements to assure rapid sensing of temperature changes.



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AIR DISTRIBUTION SCHEMATIC
Figure 6-11



TEMPERATURE CONTROL SCHEMATIC
Figure 6-12

Whenever MAN mode is selected with either system AUTO-MAN switch, temperature control valve position is controlled by rotating the CREW or CABIN COLD-HOT selector switch. The rheostat type switch will vary the input current to the affected torque motor to pneumatically position the temperature control valve. Duct overheat protection is provided in this mode also. Power for the temperature control circuits is 28 VDC supplied through the AUTO TEMP CONT circuit breaker on the copilot's circuit breaker panel (AUTO mode), and the MANUAL TEMP CONTROL circuit breaker on the pilot's circuit breaker panel (MAN mode).

CAB AIR SWITCH

The CAB AIR switch, on the copilot's switch panel, controls the flow control valve. With the BLEED AIR switches ON, setting the CAB AIR switch ON will de-energize the flow control valve controlling solenoid and allow system pressure to the valve's controlling chambers. Internal pressures will position the valve shutoff sleeve, controlling bleed-air flow to the heat exchanger. Setting the CAB AIR switch OFF will energize the valve control solenoid which will shutoff control pressure and allow the valve shutoff sleeve to block bleed-air flow.

CREW AUTO-MAN SWITCH

An AUTO-MAN mode switch is located below the CREW COLD-HOT selector on the copilot's switch panel. The switch provides automatic or manual mode operation for the cockpit temperature control system. When AUTO is selected, the cockpit temperature controller will automatically position the cockpit temperature control valve (through inputs to the torque motor) to maintain the temperature set on the CREW COLD-HOT selector. When MAN is selected, cockpit temperature control valve position is controlled directly from the CREW COLD-HOT selector.

CABIN AUTO-CABIN-MAN SWITCH

An AUTO-CABIN-MAN switch is located below the CABIN COLD-HOT selector on the copilot's switch panel. The switch provides automatic, automatic remote, and manual mode selection for the cabin temperature control system. When AUTO is selected, the cabin temperature control will automatically position the cabin temperature control valve (through inputs to the torque motor) to maintain the temperature set on the CABIN COLD-HOT selector above the AUTO-MAN switch. The CABIN mode operates identical to AUTO except that the temperature is set using a remote temperature selector in the cabin. When MAN is selected, cabin temperature control valve position is controlled directly from the CABIN COLD-HOT selector on the copilot's switch panel.

CREW AND CABIN COLD-HOT SELECTOR SWITCHES

A CREW COLD-HOT and a CABIN COLD-HOT selector switch are located on the copilot's switch panel and a remote temperature selector is located in the cabin. In system AUTO mode, these switches are used to select the desired system temperature to be maintained automatically by the temperature controllers. In MAN mode, these rheostat type switches directly vary the current input to the pneumatic torque motors which position the temperature control valves. Rotating the switches clockwise from COLD to HOT is equivalent to selecting temperatures ranging from 60°F (16°C) to 90°F (32°C). When CABIN is selected on the cabin AUTO-CABIN-MAN switch, a remote selector switch in the cabin can be used to select the desired cabin temperature.

TEMP CONTROL INDICATOR

A TEMP CONTROL indication, located on the EIS Electrical Page, provides the crew with a visual indication of the position of the crew and cabin temperature control valves. The indication ranges from 0 at full cold to 9 at full hot. Each TEMP CONTROL indication is controlled by an externally mounted potentiometer on each temperature control valve. The potentiometers are mechanically linked to the duct airflow control flappers. They operate on 28 VDC supplied through the TEMP CONTROL IND circuit breaker on the pilot's circuit breaker panel.

CAB TEMP INDICATOR

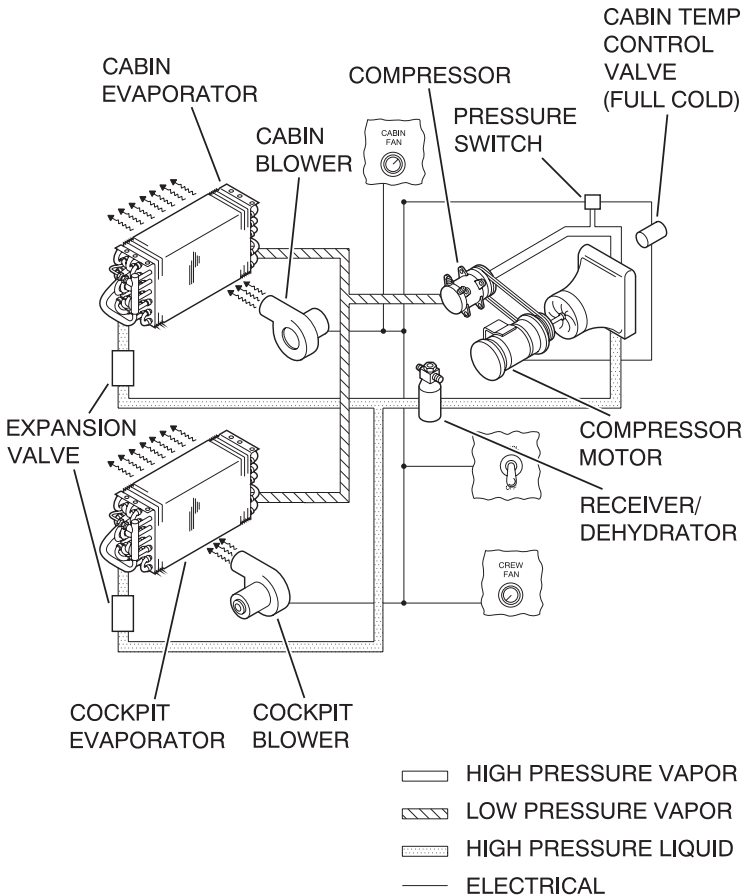
The CAB TEMP indication, located on the EIS Electrical Page, provides the crew with indication of cabin temperature in °C.

R-134A COOLING SYSTEM

The R-134A vapor cycle cooling system is installed for cockpit and cabin cooling during ground operations, inflight cooling, and cabin dehumidification. On the ground, power must be supplied by an engine generator, APU or ground power unit. In flight, the air conditioning system must be powered by both engine generators. When the COOL-OFF switch is set to COOL, power is supplied to the compressor motor and the system refrigerant is compressed and circulated under high pressure through a receiver/dehydrator (dryer) to the cockpit and cabin evaporators. A cockpit blower, located below the cockpit floor, and a cabin blower, located in the aft cabin overhead, circulate air through the system evaporators to provide cooling. Also, pressurization bleed air is used to provide airflow through the cabin evaporator.

The system is protected against overpressure conditions by two separate safety devices. The first is a binary high/low pressure switch located on the compressor discharge port. This switch will open at approximately 350 psig and will interrupt power to the compressor control circuit. This in turn will de-energize the compressor motor relay and remove power to the compressor motor. The system pressure will then drop. The switch will also interrupt power to the compressor control circuit under low pressure conditions. This low pressure switch may shut down the compressor if the average refrigerant temperature between the cabin and tailcone is 35°F (1.7°C) or less. The second overpressure safety device is a fuse plug located on the receiver /dehydrator bottle. This plug will vent the system refrigerant safely overboard in the event of a system pressure in excess of 425 psig. The compressor motor is automatically cut out during engine start, STAB WING HEAT operation, and inflight when only one generator is operating. When the aircraft is on external power, the compressor motor is powered by 28 VDC supplied through a 175-amp current limiter connected to the battery charging bus and a power contactor. When the generators are operating, the compressor motor is powered by 28 VDC supplied through two power contactors and two 175-amp current limiters connected to the generator buses. A fault isolator will remove power from the compressor motor should a fault occur which causes the compressor load to become unequally shared between the generators (except during single generator operation on the ground).

System control circuits, including the cabin blowers, are powered by 28 VDC supplied through the COOL CONTROL circuit breaker on the pilot's circuit breaker panel. The cabin blowers are powered by 28 VDC through a 50-amp current limiter. Speed control circuits for the cabin blowers are powered through the CABIN FAN circuit breaker on the copilot's circuit breaker panel. The cockpit blower (including speed control circuit) is powered by 28 VDC through the CREW FAN circuit breaker on the copilot's circuit breaker panel.



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REFRIGERANT COOLING SYSTEM
Figure 6-13

CABIN CLIMATE SWITCHES

COOL-OFF SWITCH

The COOL-OFF switch, located in the CABIN CLIMATE group on the copilot's switch panel, controls the freon cooling system. When set to COOL, the switch allows power to the freon compressor motor and cabin and cockpit blower circuits. If either the CREW or CABIN FAN switch is off when the switch is set to COOL, the respective blower, cockpit or cabin, will run at minimum speed. Blower speed may be increased by rotating the CREW or CABIN FAN switch, as applicable, in a clockwise direction until the desired speed is reached.

CABIN FAN SWITCH

Cabin blower speed is controlled during cooling and supplemental air circulation modes by the rheostat-type CABIN FAN switch located in the CABIN CLIMATE group on the copilot's switch panel. Rotating the switch clockwise out of the off detent position will turn on the cabin blowers and blower speed will increase with further clockwise movement. Power must be supplied by an engine generator, ground power unit or APU. During pressurized flight (CAB AIR switch ON), cabin cooling is accomplished by pressurization airflow through the cabin evaporator.

CREW FAN SWITCH

The rheostat-type CREW FAN switch is located in the CABIN CLIMATE group on the copilot's switch panel. The switch controls the cockpit blower which is available for all ground and inflight cooling or air circulation modes. When the cooling system is in operation, the blower will force air through the cockpit evaporator to provide cooling or circulate air when the air circulation mode is selected. Air circulated by the cockpit blower is exhausted through the cockpit and cabin overhead eyeball outlets when they are rotated to the open position.

HOURLMETER — COMPRESSOR

An hourmeter may be installed in the tailcone compartment to measure accumulated compressor usage time. The hourmeter is activated whenever the compressor motor is running. There is no separate circuit breaker installed with this installation.

AUXILIARY HEATING SYSTEM

An auxiliary heating system is installed to provide additional cabin and cockpit heating when desired. The COOL-OFF switch must be set to the OFF position in order to operate the cabin auxiliary heater. Power must be supplied by an engine generator, APU, or ground power unit. The AUX HT switch, on the copilot's switch panel, is used to control the system. The auxiliary heater control circuit is wired through the start cut-out relay; therefore, the system is inoperable during engine start.

CABIN AUXILIARY HEAT

The cabin auxiliary heat is provided by two heater assemblies located in the cabin left and right overhead diffusers. The system utilizes the cabin blower to provide air circulation. The heater assemblies incorporate several thermostatic controls to cycle the heaters at approximately 170° F. The thermostatic controls of each heater are connected in series to each other; therefore, cycling of each heater occurs simultaneously. The cabin blower will start when either heater warms to approximately 75° F. An overheat monitor is installed to monitor the temperature of both heaters. If either heater exceeds approximately 300° F or a switching failure occurs, both heaters will be disabled. Maintenance action is required when the overheat monitor disables the system. Each heater incorporates a thermofuse which will melt and disconnect electrical power to that heater should an overheat condition occur. The system control circuit operates on 28 VDC supplied through the AUX CABIN-CREW HEAT circuit breaker on the copilot's circuit breaker panel. The heater assemblies are supplied 28 VDC through two 50-amp current limiters. Operation of the cabin heaters is only available if the CAB AIR switch is OFF. During pressurized flight (CAB AIR switch ON), cabin heating is accomplished by pressurization airflow.

COCKPIT FLOORBOARD HEATERS

The cockpit floorboard heater system provides direct contact heat for crew foot warming. There are four heaters, one located beneath each rudder pedal. Each heater contains two heater blankets and a temperature limiting circuit which controls temperature between 100°F and 130°F independently of the other three heaters. When the temperature of a heater reaches 103°F, a relay will remove power to the two heater blankets causing them to cool. The cockpit floorboard heater is controlled through the use of the AUX HT switch. The system control circuit operates on 28 VDC supplied through the AUX CABIN-CREW HEAT circuit breaker on the copilot's circuit breaker panel.

AUX HT SWITCH

The auxiliary heating system is controlled through the use of the AUX HT switch located in the CABIN CLIMATE group on the copilot's switch panel. The switch has three positions: OFF, CREW and CAB & CREW. With the switch in the CAB & CREW position, the cabin heaters and blower will energize to provide cabin heat and the cockpit floorboard heaters (if applicable) will energize to provide cockpit heat. With the switch in the CREW position, only the cockpit floorboard heaters will be energized.

TAILCONE BAGGAGE COMPARTMENT HEATER SYSTEM

Tailcone baggage compartment heat is provided to keep the tailcone baggage compartment temperature between 35°F and 50°F. The BAGGAGE HEAT switch is located in the tailcone baggage compartment and is normally left in the ON position at all times. There is also a baggage heat switch located on the copilot's circuit breaker panel. The tailcone baggage heater elements are activated when either external power is connected, or at least one engine-driven generator is powering the electrical system, and the tailcone baggage heater switch is in the ON position. The tailcone baggage heaters are powered by 28 VDC through a 50-amp current limiter.

SECTION VII

INTERIOR EQUIPMENT

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SECTION VII

INTERIOR EQUIPMENT

COCKPIT DESCRIPTION

The instrument panel is readable by either crew member and the pedestal is accessible and readable by either crew member. Circuit breaker panels are located on the cockpit sidewalls. A magnetic compass is installed on the windshield center post. No switches (except dome light switches), instruments, or placards are located overhead. The pilot's and copilot's seats are adjustable forward, aft, and vertically. Life vest storage, in some installations, is provided behind each crew seat. On other installations, the life vests are installed in a pouch assembly added to the front of the crew seats. The pilot's and copilot's rudder pedals are adjustable forward and aft. A curtain, located behind the crew, may be closed for privacy or to darken the cockpit. A hand-held fire extinguisher is installed on the bulkhead behind each crew station at approximately shoulder height. A certificate holder is located just aft of the pilot's station. Air outlets are installed in each sidewall just aft of the armrest, in each kickplate adjacent to the outboard rudder pedals, on the front side of the center pedestal, and in the headliner above each crew station. An ashtray and drink holder is installed on each side just forward of the circuit breaker panels. Storage is provided as follows: pouches installed on the underside of the glareshield on each side, pouches attached to the lower part of each circuit breaker panel, Jeppesen-size manual holders located at the forward lower edge of each circuit breaker panel, checklist holders located on the side of the pedestal at each crew station, and storage compartments attached to each sidewall outboard of each crew seat. Oxygen masks will be stored in a stowage cup just aft of the pilot and copilot's seat or in an accessible compartment just aft of the pilot's and copilot's circuit breaker panel. A crew member PBE (protective breathing equipment) is stored in a box accessible to the crew (typically on the aft end of the pedestal). Map lights are installed in each sidewall above the circuit breaker panels and dome lights are installed in the headliner on each side. A work table is installed above the circuit breaker panels at each crew station. Each table hinges enabling it to be stowed against the sidewall when not in use. Sunvisors are installed in tracks at the upper edge of the windshield at each crew station and pull-out extensions are available at the outboard corners of the glareshield. An assist handle, installed overhead, provides a handhold for improved cockpit access.

COCKPIT SEATS

The cockpit seats (figure 7-1) are comprised of two basic structures; the upper structure containing the controls to adjust the headrest, recline, and lumbar support and the base structure containing the controls to adjust the thigh pad, seat height and seat horizontal position.

The seat belt system inertia reel is attached to the rear of the seat back. The seat belt reel lock is located on the outboard side of the seat, below and to the rear of the armrest. To lock the seat belt reels, push the reel lock handle down. For automatic reel control, move the reel handle up. The lap and crotch strap are mounted on the seat pan.

Seat height adjustment is accomplished by pressing a button on the height lock handle on the outboard side of the seat. When the button is pressed and handle pulled up, the seat will raise. When the button is pressed and the handle pushed down, the seat will lower. Release the button at the desired height to lock the seat into place.

Seat tracking is made with the track handle on the inboard side of the seat. Moving the handle aft will allow the seat to be moved forward and aft as desired. Release the track handle to lock the seat track into place.

The headrest may be adjusted for angle by moving the headrest to the right and rotating it to one of eight possible lock positions.

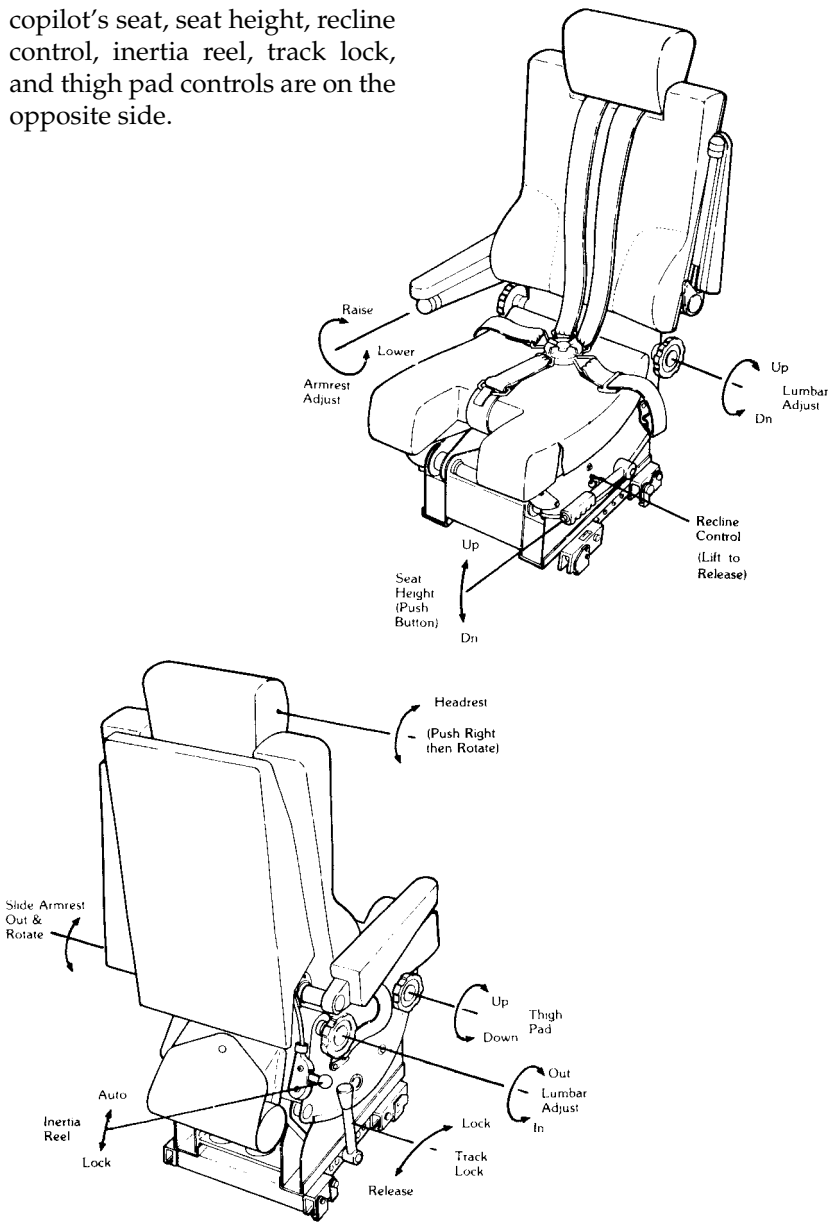
The back cushion/lumbar support adjustment is controlled by two handwheels, one on each side of the seat. The handwheel on the outboard side of the seat controls the up/down movement, the inboard handwheel controls the in/out movement. Full up/down movement of the back cushion is obtained within 3 1/2 turns of the handwheel and full in/out movement of the back cushion is obtained within 2 3/4 turns of the handwheel.

The armrests are padded and can be individually adjusted. Each armrest has an adjusting knob at the forward end of the arm. When either knob is turned counterclockwise, the armrest will lower. When either knob is turned clockwise, the armrest raises. The armrests can be folded back and pushed in towards the seat spine to facilitate entry and exit to the seat. Slide the armrest out and rotate down for use.

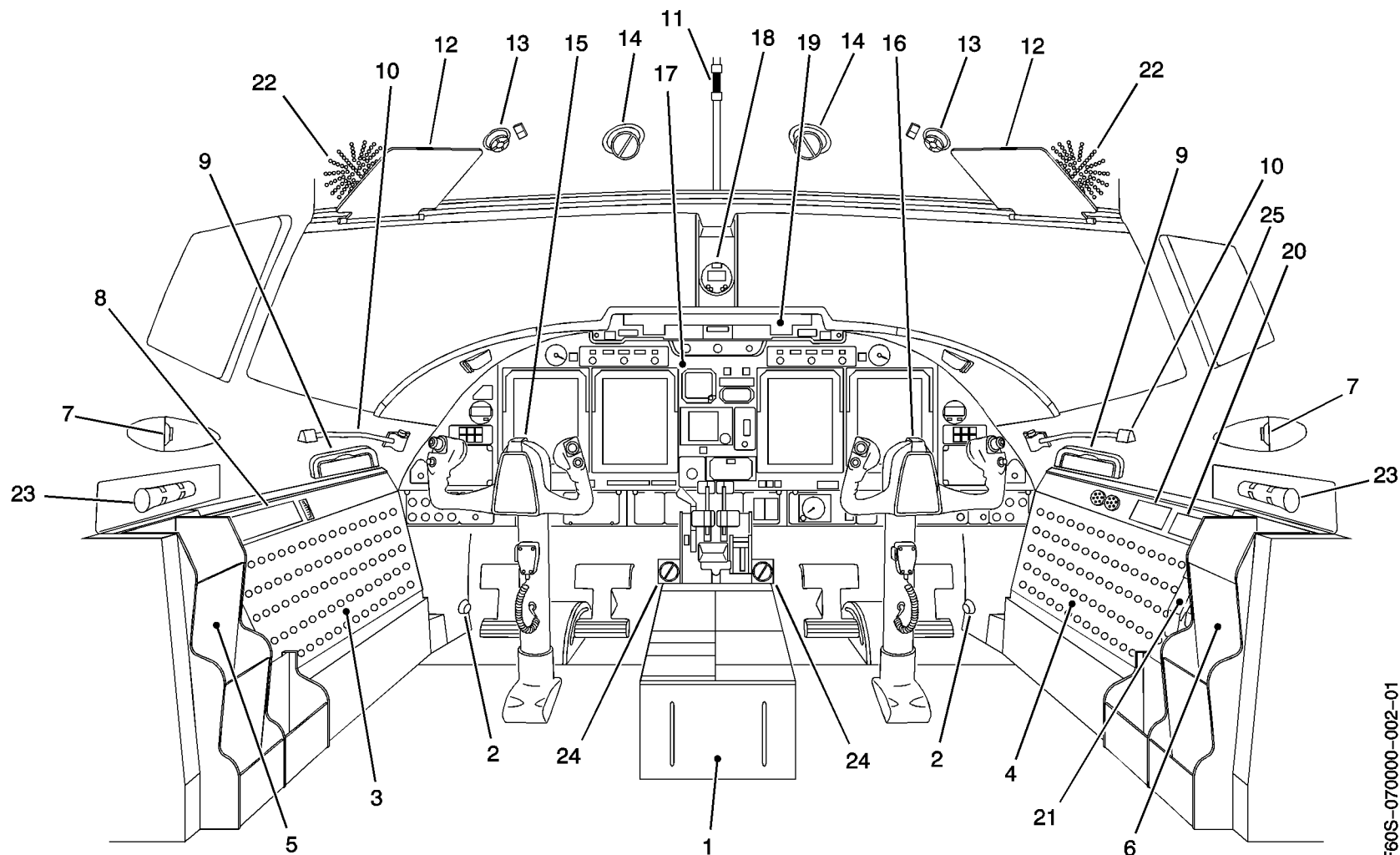
Thigh support pad adjustment is accomplished by turning the thigh pad adjusting handwheel located on the inboard, center section of the seat pan. Rotate the knob forward to raise the thigh pads, and rotate it backward to lower them. When the seat occupant uses the foot controls, thus putting pressure on the thigh pads, tension springs within the linkages are overridden allowing either thigh pad to be pushed downwards. When the thigh pad pressure is released the thigh pads return to their pre-set position.

The recline control lever is located on the outboard side of the seat below the lumbar support adjustment. Seats may be reclined to a maximum of 35°.

NOTE: Pilot's seat shown. On the copilot's seat, seat height, recline control, inertia reel, track lock, and thigh pad controls are on the opposite side.



COCKPIT SEAT (TYPICAL)
Figure 7-1



- | | |
|---|--------------------------------------|
| 1. Pedestal & Throttle Quadrant | 14. Overhead Air Outlet |
| 2. Ankle Air Outlet | 15. Pilot's Control Column & Wheel |
| 3. Pilot's Circuit Breaker Panel | 16. Copilot's Control Column & Wheel |
| 4. Copilot's Circuit Breaker Panel | 17. Instrument Panel |
| 5. Pilot's JEPP Storage Cabinet | 18. Magnetic Compass |
| 6. Copilot's JEPP Storage Cabinet | 19. Annunciator Panel |
| 7. Shoulder Air Outlet | 20. Copilot's Mic/Phone Jack Panel |
| 8. Oxygen Controls & Mic/Phone Jack Panel | 21. Cockpit Phone |
| 9. Foldout Work Table | 22. Cockpit Speakers |
| 10. Map Light | 23. Flashlight |
| 11. Assist Handle | 24. Pedestal Air Outlet |
| 12. Sunvisor | 25. APU Control Panel |
| 13. Dome Light | |

GENERAL ARRANGEMENT - COCKPIT
Figure 7-2

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CABIN DESCRIPTION

The aircraft cabin is divided into three areas: the passenger area, the lavatory, and the cabin baggage compartment. Access to the baggage compartment may be accomplished through the cabin or through the emergency exit/baggage door on the right side of the fuselage. The lavatory is located in the aft cabin immediately forward of the baggage compartment. Individual reading lights, air outlets, and passenger oxygen masks are located in the overhead convenience panels above the seats.

PASSENGER SEATS

Lap belts are included in each passenger seat (figure 7-3). Optional shoulder harnesses for three-point latching is available. Passenger seats do not have break-over backs.

A life vest is stowed in a pocket under each seat bottom. Access is through a panel on the front of the seat above the storage drawer.

Passenger seats can be swiveled 360° but normal aircraft installation is limited to 180°. Seats have lateral tracking on the seat base which allows them to be positioned as far outboard as possible for take-off and landing, thus maintaining maximum aisle clearance. Seat tracking or swivel is accomplished by lifting on the inboard release handle on the inboard armrest. Optional floortracking is accomplished by lifting on the release handle near the base of the seat.

Passenger seat backs may be reclined to a maximum of 30° with a mechanical button on the outboard armrest. The optional berthing position is available which allows the seat to go full flat.

Seats certified for aft facing take-offs and landing will be equipped with hidden "bread board" headrests which can be pulled up for use or stowed into the top of the seat.

Inboard armrests may be moved down by pulling up slightly on the armrest and allowing it to lower. Outboard armrests have an optional feature to be stowed as well. Armrest(s) may be raised and locked into place by pulling the armrest up until it clicks into place. Armrests may be either up or down for take-off and landing.



Do not sit on the armrests since this could cause damage to the internal latching device.

Storage drawers may be located below each seat and are accessed by pulling the knob on the drawer. These drawers are held shut by friction latches at the back of the drawer.

Passenger seats may be equipped with a recliner-style. When desired, the footrest can be pulled out for use.

Fire blocking of seat cushions is an optional feature to meet FAR Part 25 requirements.

Passenger seats may include an optional mechanical lumbar support adjustment knob on the outboard side of the seat back. Rotating the knob forward moves the lumbar support outward thus providing lower back support.



PASSENGER SEAT (TYPICAL)
Figure 7-3

EMERGENCY EQUIPMENT

CABIN BAGGAGE COMPARTMENT SMOKE DETECTION

A baggage area smoke detection system is installed to provide the crew with visual warning of a possible fire in the cabin baggage compartment. The system receives power from the 3-amp CABIN FIRE DETECT circuit breaker on the copilot's circuit breaker panel. If the smoke detector, located in the aft cabin baggage area, senses smoke in the aft cabin baggage or lavatory area, a signal is transmitted to an amplifier which will illuminate the red CABIN FIRE light on the glareshield annunciator panel. When the smoke clears, the light will extinguish. The cabin smoke detection system is operative during EMER BUS mode. Self test of the smoke detector is accomplished by pressing the annunciator light test switch. Illumination of the CABIN FIRE light indicates a successful self test.

SMOKE GOGGLES

Smoke goggles are provided for each crew member and are stowed in sidewall compartments just below the flashlight holder. The goggles must be donned should smoke or fumes be present in the aircraft. Refer to the AFM for the specific procedures.

HAND FIRE EXTINGUISHER

Halon 1211 fire extinguishers are installed for cockpit and cabin fire protection. The fire extinguishers, in some installations, are attached to the bulkheads just behind each crew station at approximately shoulder height. On other installations, the fire extinguishers may be attached just aft of the pedestal in the cockpit area. A fire extinguisher is also located next to the lavatory seat under the arm rest. The extinguishers incorporate a pressure gage which indicates the state of propellant charge. If properly charged, the indicator needle will be within the green segment. When an extinguisher has been manually discharged, the indicator will be in the red area. This provides the crew with visual indication that the bottle has been partially or totally discharged. The bottle takes approximately 10 seconds to fully discharge. The extinguishers are rechargeable.

PROTECTIVE BREATHING EQUIPMENT

Protective breathing equipment (PBE) is available for a crew member to use in fighting cabin fires. The PBE is designed to protect the user's eyes and respiratory system from the harmful atmosphere which may be generated by a cabin fire. The PBE is a hood with a visor which is placed over the head and seals around the neck. An oxygen-generating canister provides breathing oxygen for the user. The PBE is vacuum sealed in a bag and stored in a box accessible to the crew. The PBE is a throw-away unit that must be replaced whenever the vacuum seal has been broken. It is imperative that the vacuum seal be maintained since the oxygen-generating chemicals react with moisture.

Duration of oxygen production is nominally 15 minutes depending upon the work rate and size of the user. Useful life of a sealed PBE is 10 years from date of manufacture.

NORMAL OPERATION

Donning the PBE:

There are two available carriers for the PBE. A portable container stored in a cabinet behind the cockpit or a mounted container (normally mounted to the aft side of the pedestal).

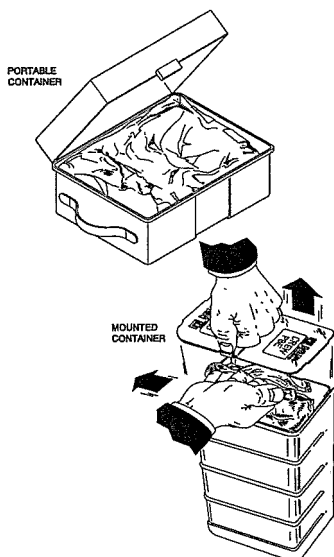
1. Removing mask from container.
 - a. To open the portable container, lift the single latch on the cover and lift. Remove sealed bag from the container.
 - b. On the mounted container, grasp the red access handle on the protective container firmly and pull forcible to disengage the cover. When the cover is removed from the container, immediately drop it. (The vacuum sealed bag does not need to be removed from the container to open.) The packaged unit may be removed from the stowage container prior to opening and carried to a remote location for use.
2. To remove the PBE from the vacuum sealed bag, locate the red I.D. tag and pull sharply to tear open the vacuum sealed bag. Reach into the opened vacuum-sealed bag and firmly grasp the PBE. Pull the PBE straight out of the bag. If necessary hold the bag with the opposite hand.
3. Place both hands inside the neckseal opening with palms facing each other and PBE visor facing downward with the oxygen-generating canister resting on the tip of the hands.
4. With the head bent forward, guide the PBE neckseal over the top of the head and down over the face using the hands to shield the face and glasses from the oronasal mask cone.

5. With both hands, grasp the adjustment straps at the lower corners of the visor and pull outward sharply to actuate the starter candle. Within 1-5 seconds, a rushing noise of oxygen entering the hood will be heard and inflation will be evident.

WARNING

Human hair is highly flammable. Hair that protrudes through the neckseal could ignite if brought into direct contact with flame.

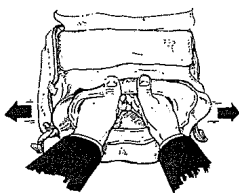
6. With the straps still in hand and head bent forward, pull backward to secure the oronasal mask cone high on the nose for a tight seal.
7. If wearing glasses, you may adjust their position to rest on tip of the oronasal mask cone by moving the sides of the frame through the hood fabric. Do not attempt to adjust through the neckseal as this will result in infiltration of the surrounding atmosphere into the interior of the hood.
8. When the neckseal is positioned at the neck and the oxygen-generating canister is resting on the nape of the neck, remove the hands, checking to see that clothing is not trapped in the seal and hair does not protrude between the seal and the neck. Pull the protective neck shield down to cover the collar and upper shoulder area.

**STEP 1**

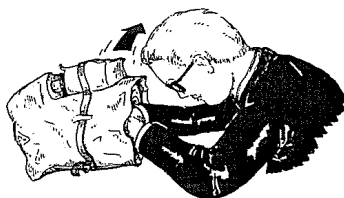
Grasp red access handle and pull forcibly to disengage the cover. Locate red I.D. tag and pull sharply to tear open the vacuum-sealed bag.

**STEP 2**

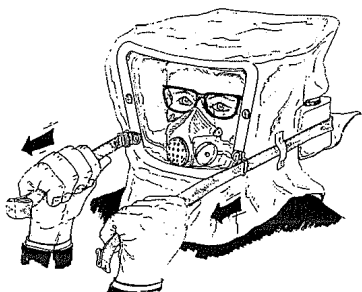
Pull PBE out of the vacuum-sealed bag and shake hood open.

**STEP 3**

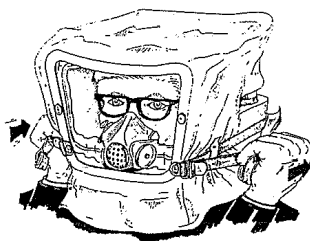
Place both hands inside the neckseal opening with palms facing each other and PBE visor facing downward with the canister resting on tip of hands.

**STEP 4**

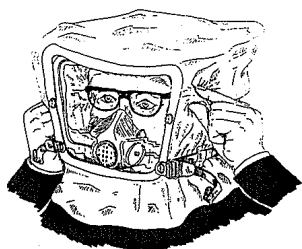
With the head bent forward, guide the PBE neckseal over the tip of the head and down over the face using the hands to shield the face and glasses from oronasal mask cone.

**STEP 5**

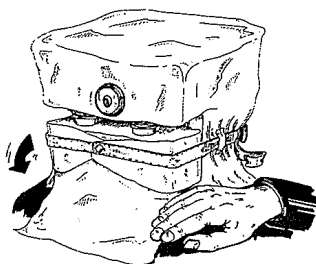
With both hands, grasp the adjustment straps at the lower corners of the visor and pull outward sharply to actuate the starter candle.

**STEP 6**

With the straps still in hand and head bent forward, pull backward to secure the oronasal mask cone high on the nose for a tight seal.

**STEP 7**

If wearing glasses, you may adjust their position to rest on top of the oronasal mask cone by moving the sides of the frame through the hood fabric. Do not attempt to adjust through the neckseal as this will result in infiltration of the surrounding atmosphere into the interior of the hood.

**STEP 8**

When the neckseal is positioned at the neck and the canister is resting on the nape of the neck, remove the hands, checking to see that clothing is not trapped in the seal and hair does not protrude between the seal and the neck. Pull the protective neck shield down to cover the collar and upper shoulder area.

Following actuation, the hood will inflate over a 15-20 second period. After this period, the starter candle will cease flowing and the only sound will be slight rustling of the fabric on each inhalation and exhalation. Dependent upon breathing rate, there will be a slight exhalation resistance as the exhaled breath is forced through the oxygen-generating canister. Inhalation resistance will be almost unrecognizable since inhalation is directly from the interior of the hood through a diaphragm type check valve located at the base of the oronasal mask. The visor should remain clear of fogging or misting. Heat is produced by both the chemical air regeneration process and transfer of body heat during the rebreathing cycle. Heat build-up within the hood is normal and is dependent upon the amount of work performed. There should be no irritating or strong unusual odors within the hood. Operational duration is variable dependent upon the amount of work performed by the user.

If the PBE is worn to exhaustion of the chemical regeneration system, this will be evidenced by a gradual reduction in the expended volume of the hood until the point that the hood is collapsed tightly around the head at the end of a full inhalation. Additionally, there will be a rapid buildup of heat and moisture in the hood as the canister loses its effectiveness. At this point, the wearer should immediately retire to a safe breathing area clear of flame and toxic fumes and remove the device.

Removing the PBE:

1. Go to a safe area away from immediate contact with fire or open flame and/or toxic fumes.
2. With both hands, reach for the two lower corners of the visor area and push forward on the metal tabs of the adjustment strap buckles to release the strap tension.
3. Place both hands under the neckseal in forward area and pull up, guiding the oronasal cone and neckseal over the face/glasses until the PBE is clear of the head.
4. Place the expended PBE in a safe place to cool away from fire or exposure to water.

Disposal:

The expended PBE still contains unreacted oxidizing material and strong alkali materials. At the completion of flight, it must be turned over to maintenance for authorized disposal.

ABNORMAL CONDITION OF OPERATION

CAUTION

This device produces oxygen which will vigorously accelerate combustion. Do not intentionally expose the device to direct flame contact, or remove in the immediate presence of fire or flame. Due to oxygen saturation of the hair, do not smoke or become exposed to fire or flame immediately after removing.

Users should be trained to recognize abnormal conditions which could signify malfunction or failure of the equipment to properly operate.

Failure of the starter candle:

If the starter candle fails to actuate when the adjustment strap is pulled, an additional sharp pull on the strap may be sufficient to dislodge the lanyard pin and actuate the device. If the device still fails to actuate, the hood will continue to function, although the initial purge capability is lost. Sticking the fingers into the neckseal to allow a large lung inhalation may be required to enable sufficient breathing volume until the chemical regeneration system begins producing a surplus of oxygen.

Inadequate oronasal mask seal:

Absence of a tight seal of the oronasal cone to the face may result in excess leakage of the exhaled breath into the hood, short circuiting the oxygen-generating canister. This condition may result in a build-up of CO₂ within the rebreathing volume in the hood. Excessive CO₂ is normally indicated by breathing distress such as rapid and labored breathing accompanied by a general feeling of insufficient ability to get one's breath, although there is no restriction to breathing. Presence of moisture or fogging on the visor and the sensation of air escaping from the mask, particularly around the nose and eyes are indications of a lack of proper fit. Adjustment of the mask straps and mask position to minimize leakage should rapidly alleviate the problem. If the perception of breathing distress persists, the user should quickly go to a safe area and remove the PBE and don alternate breathing equipment if required.

Loss of infiltration seal:

The smoke and toxic fumes generated by the combustion of most aircraft cabin interior materials has many strong irritants. The continued presence of strong irritation odors inside the hood resulting in eye and respiratory tract discomfort is a good indicator of the lack of an effective infiltration seal. Verify that the seal is in contact with the skin or the neck and does not have clothing or jewelry trapped in the seal, or hair protruding between the seal and the neck. If the condition persists, or there is evidence of a tear in the neckseal, the user should quickly go to a safe area and remove the PBE and don alternate breathing equipment if required.

FLOTATION EQUIPMENT

Pilot's and copilot's life vests are either stowed in a pocket on the pilot's and copilot's seat back or in a pouch assembly on the front of the pilot's and copilot's seats. Life vests in the passenger cabin are stowed in a compartment under each passenger/cabin seat. There is also a life vest stowed in the armrest next to the aft lavatory toilet seat. The life vests are inflated by pulling the red CO₂ release tabs.

MISCELLANEOUS EQUIPMENT

CREW COMPARTMENT

FLASHLIGHTS

Flashlights are located on the Jeppesen storage units next to the pilot's and copilot's seats. The rechargeable flashlights are waterproof, flame retardant, and floatable.

The rechargeable flashlights must be properly placed in the retention bracket to ensure their recharging. Ensure the "D" ring is properly secured into the flashlight end cap. Place the head end of the light against the retaining disc at the top end of the bracket with the switch toward the bracket and the small red LED light facing out. Once the head of the flashlight is positioned, snap the butt of the flashlight into the clips at the bottom of the bracket. When the flashlight is recharging, the LED light should be on. To remove the flashlight from the bracket, grasp and pull the lower end of the light out of the bracket clips. Do not install the flashlight into the recharging base while the flashlight is still turned on since recharging and lamp life would be significantly reduced.

The lamp inside the flashlight may need to be changed after approximately 20 hours of service. To change the lamp, unscrew the head of the light and remove the lens cap and reflector assembly. Remove the lamp from the reflector by unscrewing the threaded plastic retainer. Insert the new lamp and replace the retainer. Be sure to re-install the spacer/washers to retain its highly focused lighting ability. Do not touch the shiny surface of the reflector or the glass portions of the lamp. If the reflector surface requires cleaning, use only a soft, dry cloth.

The useful life per charge of the flashlight is approximately 45 minutes and requires about 16 hours to recharge after a full battery depletion. Leaving the flashlight on constant charge in extreme temperatures (below 30°F and above 100°F) could affect the useful life of the battery pack. The flashlights recharge only when an aircraft battery switch(es) is turned on. The power source for the recharging base, if installed, is 28 VDC from the FLASH LTS circuit breaker on the copilot's circuit breaker panel.

CREW WORK TABLE

A fold down work table, with hinged leaf, is located in the outboard panel adjacent to each pilot's seat. The table is folded out of its compartment by the available finger hold at the top edge of the panel compartment. Unfold its leaf for use. To stow the table fold the leaf up and push the table back into its compartment.

CHECKLIST HOLDER

A one-piece checklist holder is installed on the floor on each side of the forward pedestal. It can hold the checklist and prevent it from becoming displaced during flight.

SUNVISOR

Each pilot has a sunvisor located at the upper edge of the windshield. Each sunvisor is hinged so that it can be folded down and slid along its track as desired. Some aircraft may have pull-out extensions available at the outboard corners of the glareshield.

PASSENGER COMPARTMENT

CABINETS, DRAWERS & TABLES

Standard and optional cabinets, drawers and tables may be built into the passenger compartment. Due to the wide variety of options available, the following descriptions and figures show only the most common accessories. Power for the cabinet kicker lights and cabin aisle lights is 28 VDC from the AISLE LTS circuit breaker on the pilot's circuit breaker panel.

GALLEY CABINET

The galley cabinet (figure 7-5) has storage cabinets and drawers accessible through press-to-open buttons on the cabinet doors and drawers. There is a galley work light controlled by the galley work light switch located on the galley switch panel. Power for the galley work light is 28 VDC from the TABLE LTS circuit breaker on the pilot's circuit breaker panel. Internal galley lights are actuated by micro-switches in the cabinet doors. Power for the Internal galley lights is 28 VDC from the CABIN LTS circuit breaker on the pilot's circuit breaker panel.

Top galley cabinet contains one 1.5 gallon (5.71) or two .66 gallon (2.51) vented, stainless steel, removable liquid dispenser containers. This insulated container incorporates a heating element along the bottom and is automatically plugged into a power source when installed in the cabinet. An over-temperature sensor and a thermostat is built in, which will keep even small amounts of liquid warm without burning the container.

The lighted On/Off liquid warmer switch(es) are located on the galley switch panel. With at least one battery switch on, and a warmer switch pressed ON, the switch will illuminate and the warmer will keep already hot liquids between 150 and 170°F. Power to these warmers is 28 VDC from the HOT CUP circuit breaker on the pilot's circuit breaker panel. The liquid warmer container(s) can also be controlled from the Cabin Control Switch Panel. When aircraft power is cycled the hot liquid container(s) will turn off and the switch(es) will have to be selected to on when power is restored to the aircraft.

The container is removed by opening the top cabinet doors and pulling down the dispenser button panel located in the upper section of the cabinet. The dispenser button panel is held into place with ball-catches. Remove the dispenser by pulling it straight out from the cabinet. The containers can be drained through the screw on/off cap on the top of the unit, by pressing the spigot and allowing fluids to drain, or unscrewing the outside spigot ring and removing the spigot. The container is filled through the top cap. To reinstall the container, ensure the cap is screwed on tightly, and push the container completely into the cabinet, thus connecting the heating element to its power source. Flip the dispenser button panel over the spigot outlets before closing the top and middle cabinet doors.

The warmers are not able to heat cold liquids to very warm temperatures. Before installing the dispenser in the airplane, and to aid in sustaining hot liquids, it is recommended that very hot water be poured into the container. Install the lid and allow the container to pre-heat for approximately 15 minutes. Drain the hot water and add whatever hot beverage is desired. If desired, cold liquids may be available by not turning on the applicable warmer.

To serve liquids from the dispenser, position a cup under the desired liquid dispenser. Press the dispenser button which, in turn presses the spigot drain. A drip pan below the dispenser outlets will catch small amounts of overflow.

The top galley cabinet also contains door-mounted glass storage racks, two disposable cup holders mounted horizontally immediately above the liquid dispensers and a large general storage area below the hot liquid container(s).

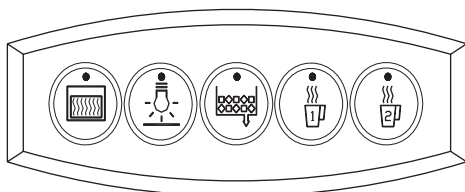
Slide-out drawers for storage and a divided ice drawer are located in the lower galley cabinet. Drainage for the ice drawer and the galley drip pan is provided through a drain valve on the underside of the cabinet. To open the drain press the drain position on the galley switch panel. The water will drain out through the forward cabinet drain mast. The drain mast is heated to prevent ice build up around the drain hole. The drain will only remain open while the switch is depressed. Power to the galley drain is 28 VDC from the GALLEY DRN circuit breaker on the pilot's circuit breaker panel.

The middle compartment is available for storage or an optional microwave oven. Power for the microwave oven is 28 VDC from a 50 amp current limiter located in the tailcone. The MICROWAVE circuit breaker on the pilot's circuit breaker panel controls a relay which will remove power from the microwave oven.

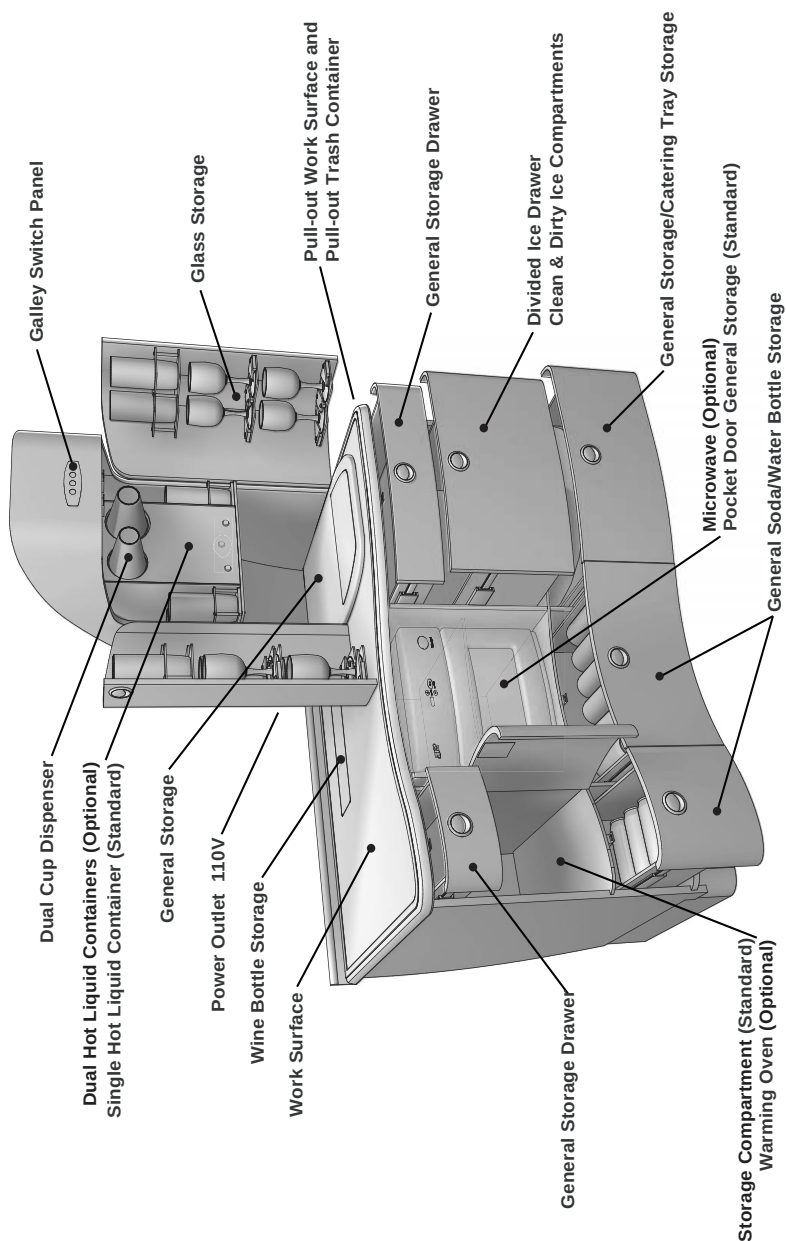
The left compartment is available for storage or an optional warming oven. A lighted On/Off warming oven switch is located on the galley switch panel. With the warming oven switch pressed on (illuminated) power is sent to the warming oven. Power for the warming oven is 28 VDC from the OVEN circuit breaker on the pilot's circuit breaker panel.

A wine storage unit in this cabinet is located at the center outboard edge of the worktop.

There is a pull-out trash container and a pull-out work surface on the forward side of the galley. No cigarettes, matches, or otherwise flammable materials, should be discarded in the trash container.



GALLEY SWITCH PANEL (TYPICAL)
Figure 7-4

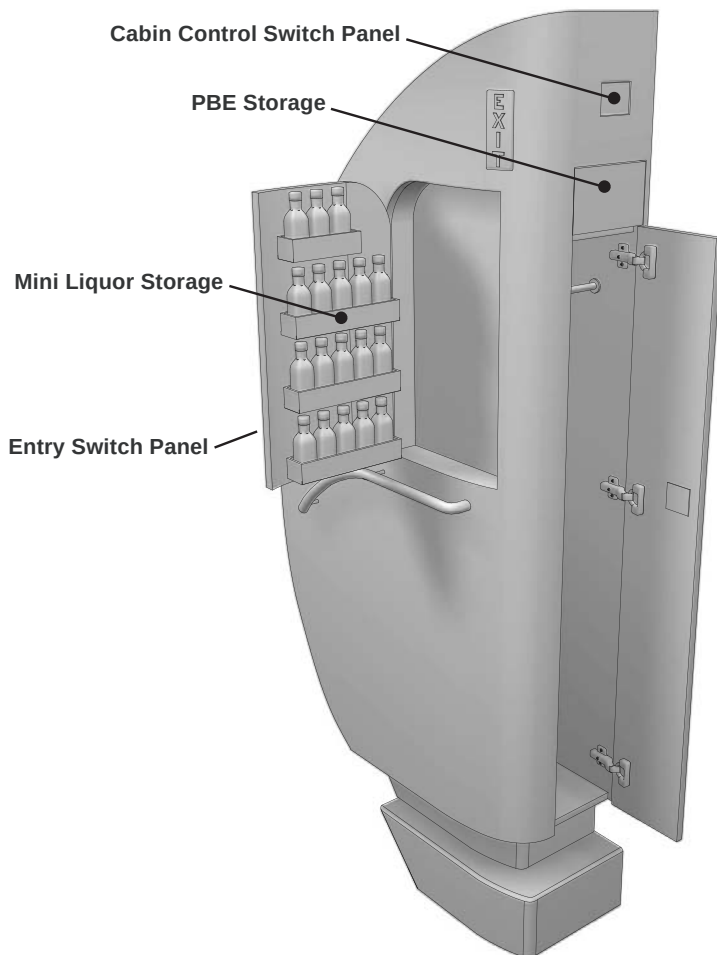


GALLEY CABINET (TYPICAL)

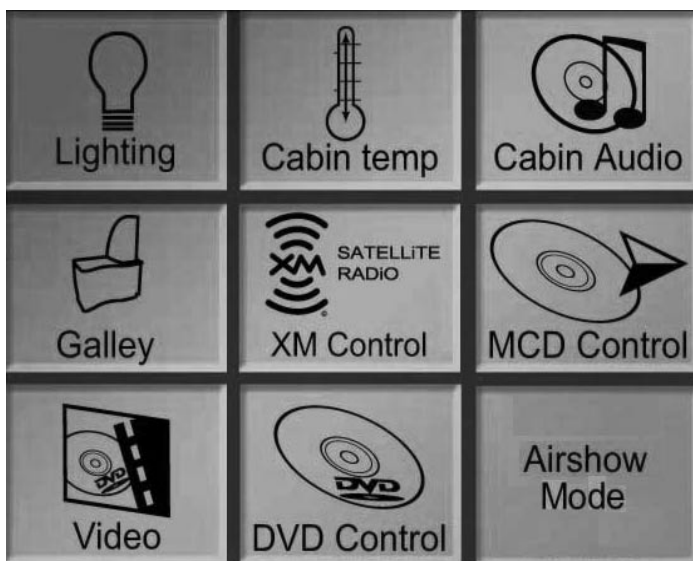
Figure 7-5

FORWARD LEFT-HAND CABINET

The forward left-hand cabinet (figure 7-6) has mini liquor storage, PBE storage and a closet with a coat rod accessible through press-to-open buttons on the cabinet doors. On the inboard upper side of the cabinet is the cabin control switch panel (figure 7-7) and on the aft side of the cabinet is the entry switch panel (figure 7-8).

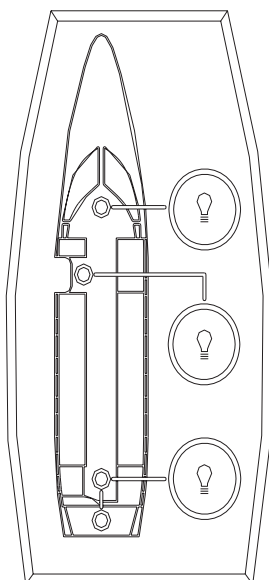


FORWARD LEFT-HAND CABINET
Figure 7-6



CABIN CONTROL SWITCH PANEL

Figure 7-7



ENTRY SWITCH PANEL

Figure 7-8

FORWARD RIGHT-HAND CABINET

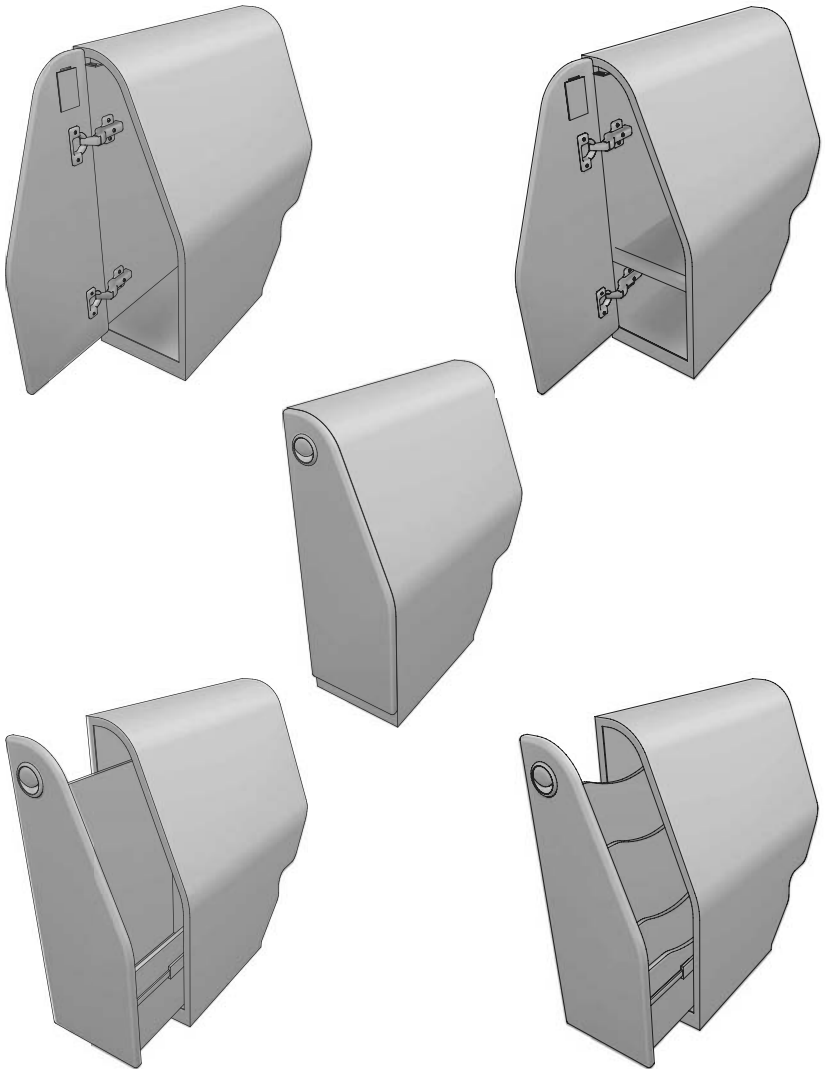
The forward right-hand cabinet (figure 7-9) has a closet accessible through press-to-open button on the cabinet door. On the aft side of the cabinet is the infrared eye which receives commands from the remote control and the optional 15.1 inch Liquid Crystal Display (LCD) video monitor.



FORWARD RIGHT-HAND CABINET
Figure 7-9

PYRAMID CABINETS

Optional pyramid cabinets (figure 7-10) may be located behind the individual cabin seats against the forward and/or aft bulkhead. Access is by pressing the button at the top, center section of the door/drawer panel. The cabinet door opens outward for miscellaneous storage.



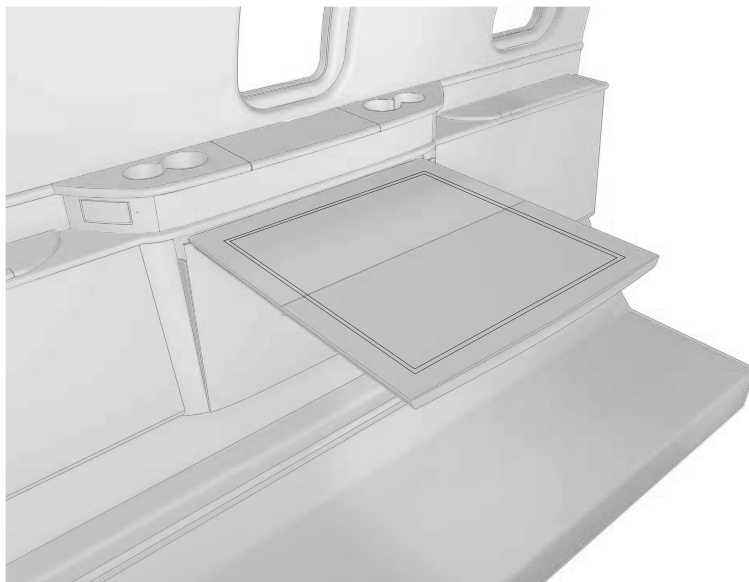
PYRAMID CABINETS (TYPICAL)
Figure 7-10

SIDEWALL STORAGE BOXES

Headphones, as well as other items, may be stored in the outboard sidewall storage boxes located along the cabin armrests.

EXECUTIVE TABLES

Pull-out executive tables (figure 7-11) are available in the sidewall between the aft and forward facing seat locations. The table is tilted away from the wall, pulled up and then the leaf unfolded for use.



EXECUTIVE TABLE INSTALLATION (TYPICAL)

Figure 7-11

PASSENGER ENTERTAINMENT SYSTEM**STEREO SYSTEM**

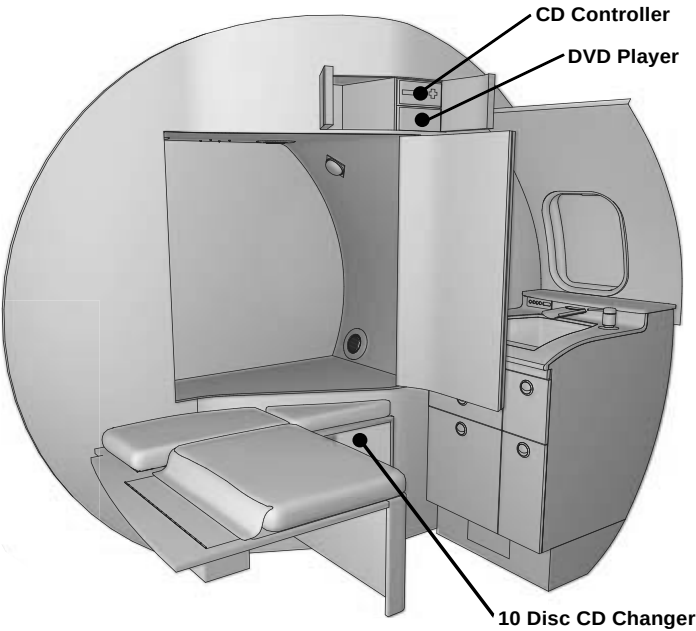
An audio signal is supplied to speakers on both sides of the cabin and to individual passenger switch panel headphone jack from a ten disc CD changer located in the vanity (figure 7-12). There is a master control switch panel, located in the cabin armrest (figure 7-13), which incorporates lighting, cabin speaker, audio select, video select (if installed) and remote cabin temperature controls. There are also passenger control switch panels, located in the cabin armrests adjacent to the passenger seats (figure 7-14), which incorporate lighting, headphone volume control, audio select controls, and a headphone jack.

Press the Cabin Audio position on the master control switch panel or the cabin control switch panel to change to the cabin audio control panel. The cabin audio control panel is used to select the desired audio source (e.g., CD, DVD), turn the cabin speakers on and off, and to control the volume, bass and treble settings for the speakers.

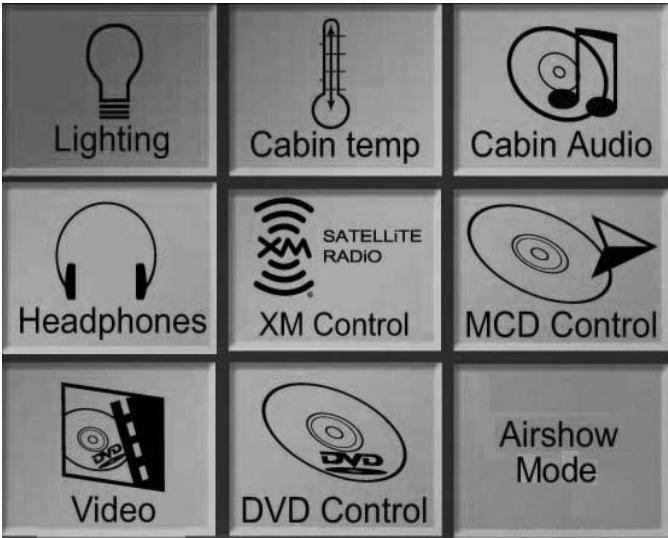
Each passenger location has a passenger control switch panel that may be used to select individual audio source, volume, bass and treble settings for use with headphones.

Power for the stereo system is 28 VDC from the STEREO circuit breaker on the pilot's circuit breaker panel. Power for the video system is 28 VDC from the VIDEO circuit breaker on the pilot's circuit breaker panel. Power to operate the audio distribution module and audio digital selectors is 28 VDC from the CABIN AUDIO circuit breaker on the copilot's circuit breaker panel. Power for the passenger speakers is 28 VDC from the PASS SPKR circuit breaker on the copilot's circuit breaker panel.

Keying the passenger address or passenger briefing system will automatically override any cabin stereo channel, including overhead speakers that have been turned off by the cabin control switch panel or the cabin master control switch panel. Passenger address and passenger briefings are transmitted over cabin speakers and headphone jacks.



CD and DVD PLAYERS
Figure 7-12



MASTER CONTROL SWITCH PANEL
Figure 7-13

**PASSENGER CONTROL SWITCH PANEL****Figure 7-14**

VIDEO SYSTEM

Optional 15.1 inch Liquid Crystal Display (LCD) video monitors may be installed in conjunction with a single or dual DVD player installed in the vanity (figure 7-12) and/or an Airshow system. The optional monitors are installed in either the forward right-hand cabinet facing aft and/or the aft right-hand partition facing forward. The video monitors and the DVD player receive 28 VDC from a VIDEO circuit breaker on the pilot's circuit breaker panel.

Press the Cabin Video position on the master control switch panel or the cabin control switch panel to change to the cabin video control panel. The cabin video control panel is used to select the desired video source (e.g., DVD1, DVD2, AIRSHOW) and turn the cabin LCD video monitors on and off.

Press the Cabin audio position on the master control switch panel or the cabin control switch panel to change to the cabin audio control panel. The cabin audio control panel is used to select the audio source corresponding to the selected video source.

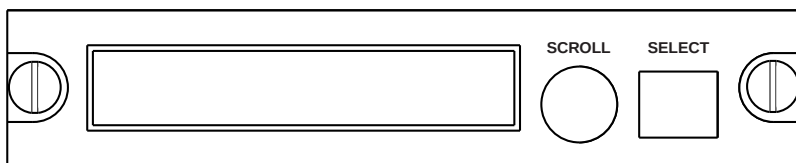
AIRSHOW SYSTEM

An optional Airshow system may be installed which allows passengers to be informed of flight status without interrupting the pilots, in addition to other pertinent inflight information. The unit interfaces with FMS-1 and can display customized modes of operation. The Airshow system receives 28 VDC from the PASS INFO circuit breaker on the copilot's circuit breaker panel. For additional information, reference the "Airshow Operator's Manual".

Pressing the Video position on the Cabin Control Switch Panel (located on the inboard top side of the left forward cabinet) or the Cabin Master Control Switch Panel (located in the cabin armrest) will cause that Switch Panel to change to the Video control panel. From this control panel the monitors are switched on and off and the video source for each monitor is selected.

Pressing the Airshow Mode position on the Cabin Control Switch Panel or the Master Control Switch Panel will cause that Switch Panel to change to the AIRSHOW control panel. The various modes of the Airshow display are accessed from the Airshow control panel.

The Airshow has an optional Flight Deck Controller (figure 7-15) which has an display with a push button SELECT switch and a SCROLL knob. The controller can be used to enter time to destination, Greenwich Mean Time, and the destination airport identifier. For a detailed description of the Airshow system refer to the current Airshow operators manual.



AIRSHOW FLIGHT DECK CONTROLLER
Figure 7-15

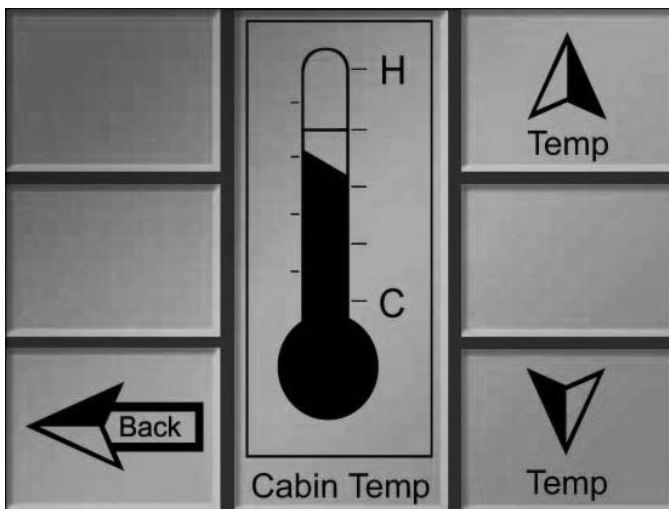
REMOTE CABIN TEMPERATURE CONTROL

A remote cabin temperature control (figure 7-16) is located on the Cabin Control Switch Panel (located on the inboard top side of the left forward cabinet) and on the Cabin Master Control Switch Panel (located in the cabin armrest).

When the AUTO-CABIN-MAN switch located below the CABIN HOT-COLD selector on the copilot's switch panel is set to CABIN, control for cabin temperature is given to the cabin control switch panel.

Pressing the Cabin temp position on the Cabin Control Switch Panel or the Master Control Switch Panel will cause that Switch Panel to change to the Cabin Temperature control panel.

The temperature control panel consists of a bar graph with "C" at one end and "H" at the other. The Temp ▲ (up) and Temp ▼ (down) position are used to raise and lower the setting.



CABIN TEMPERATURE CONTROL PANEL

Figure 7-16

IRIDIUM SATCOM SYSTEM (OPTIONAL)

The ICS-100 Iridium SATCOM is a single channel system and the ICS-200 Iridium SATCOM is a dual channel system. The SATCOM system consists of a transceiver, handsets, and low profile top mounted antenna. The SATCOM system provides features such as air to air, air to ground, ground to air, call transfer, extension to extension calling, and three party conferencing. The system uses the Iridium Low Earth Orbit (LEO) satellite constellation for global voice and data communications services including the polar regions. A customer selected service provider is identified on the Subscriber Identity Module (SIM) card installed in the transceiver. Power to the Iridium SATCOM system is through a SATCOM circuit breaker on the pilot's circuit breaker panel. Refer to the Iridium SATCOM user's manual for more detailed instructions on the use of the Iridium SATCOM system.

DATAPORT

A dataport may be installed in the cabin. The dataport is used in conjunction with the flight phone system to communicate to the internet for e-mails, etc.

AC OUTLETS

110 VAC 60 Hz outlets are located inside the storage box at each passenger seat location, for the three place divan there are two outlets located on either side of the center storage compartment in the armrest ledge, and for the two place divan there is one outlet located between the two storage compartments in the armrest ledge. They receive 110 VAC through an AC OUTLETS circuit breaker on the copilot's circuit breaker panel. An aneroid switch will disconnect power to the outlets if the cabin altitude should reach 9500 (± 250) feet. Power will be restored if normal cabin altitude is regained. The maximum load for each outlet is 220 Watts.

The optional 220 VAC 50 Hz outlets replace the 110 VAC 60 Hz outlets.

WINDOW SHADES

Window shades are installed in all passenger compartment windows. The shades can be lowered or raised to any level. The shades are translucent and will not totally block out light.

GASPER OUTLETS

Individual gasper, or air outlets, are available in the cockpit and in the cabin convenience panels. These outlets may be turned to approximately 40° around its center to direct air flow as desired. Rotate the conical port counterclockwise to open and clockwise to close.

CABIN BAGGAGE COMPARTMENT

The door to the aft cabin baggage compartment is located in the lavatory. It is a bi-fold door with a recessed, pull-type latch to open and close. When the door is closed and the latch pushed fully in, bolts in the door will engage into the top, bottom, and outboard side of the door jamb thus securing the door. The maximum weight for the cabin baggage compartment is placarded. The cabin baggage compartment door in the Vanity may be accessed through the emergency exit/baggage door.

LAVATORY/VANITY

The lavatory is equipped with a toilet and a vanity consisting of a sink, faucet, potable water tank, soap dispenser, tissue holder, trash container, AC outlet, swing out lighted mirror, and storage drawers.

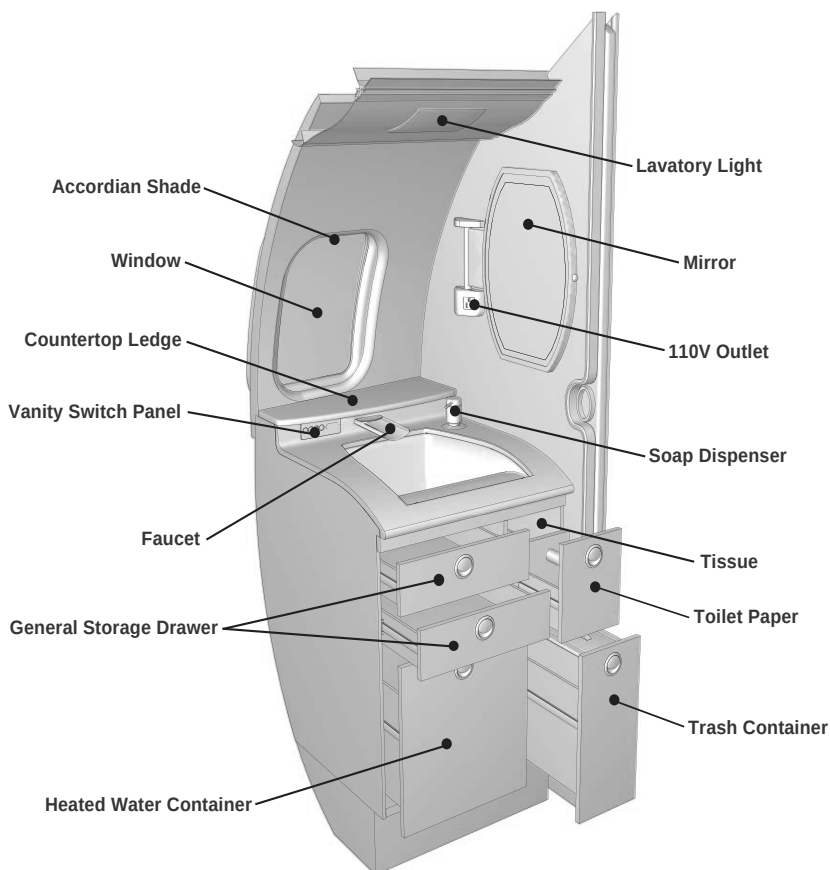
The lavatory is separated from the passenger cabin with a sliding door that is stowed and latched on the left-side of the bulkhead. The door is latched open with a recessed latch on the aft-side of the door to a catch in the aft-side of the bulkhead wall. A magnetic strip along the door edge allows the door to be closed but cannot be locked shut.

The potable water tank, pump, and heater are located under the sink. The tank itself is in the lavatory aft cabinet below the sink and holds approximately 1.7 gallons (6.4 liters). It is equipped with a quick disconnect shutoff for easy removal and installation. To remove the potable water tank, press the disconnect lever on the plumbing connection and pull it apart from the tubing. Pull the tank straight out from the cabinet. It is recommended that the potable water tank be removed from the aircraft during extended cold weather to prevent the water in the tank from freezing and damaging the tank. For more information on the servicing of the potable water tank, reference the GROUND HANDLING, SERVICING AND EMERGENCY INFORMATION manual.

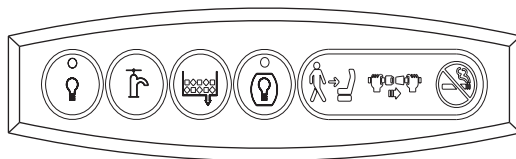
The heater is part of the potable water tank and disconnects electrically when the tank is removed from the cabinet. The potable water tank heater turns on when DC power is applied to the airplane. It increases water temperature to 100°F (38°C). The water heater receives 28 VDC from the WATER HEATER circuit breaker on the pilot's circuit breaker panel.

The switch for the water faucet is to the left of the faucet on the lavatory wall. When the switch is pressed a timer starts and the water pump is turned on. Only warm water from the potable water tank is available from the faucet. The water pump receives 28 VDC power through the VANITY DRAIN circuit breaker on the pilot's circuit breaker panel.

The sink is drained by pressing the DRAIN switch located on the vanity switch panel. A green LED on the switch will illuminate while the switch is pressed. The LED will extinguish when the switch is released. The drain switch receives 28 VDC from the VANITY DRAIN circuit breaker on the pilot's circuit breaker panel. The water is drained through a heated drain mast on the bottom of the aircraft. The heater is activated through a squat switch and prevents ice from forming on the drain mast.



VANITY
Figure 7-17



VANITY SWITCH PANEL

Figure 7-18

TOILET

A flushing toilet is installed in the lavatory. This unit features a two-compartment design isolating the flushing fluid from the waste. Raising the lid opens the sealed valve at the bottom of the bowl. Closing the lid automatically flushes the toilet. Length of the flush cycle is controlled automatically. Two electric pumps are used in this unit. The flushing pump circulates the flushing fluid during the flush cycle. The macerator/pump unloads the waste from the toilet during servicing only.

CAUTION

Use only biodegradable toilet paper such as that used in recreational vehicles. Do not use the toilet to dispose of other paper products, cigarettes, sanitary napkins, coffee grounds, etc. The macerator/pump will become clogged with these items making external servicing of the toilet impossible.

Servicing of the toilet is accomplished using servicing ports located on the aircraft exterior. The macerator/pump is used to pump the waste from the toilet while fresh flushing fluid is pumped into the toilet from the servicing equipment. Refer to Chapter 12 in the maintenance manual for servicing instructions.

Power to operate the flushing circuit is 28 VDC from the 5-amp TOILET circuit breaker on the pilot's circuit breaker panel. Power to operate the servicing circuit is 28 VDC from the 10-amp TOILET SERVICE circuit breaker on the pilot's circuit breaker panel. The TOILET SERVICE circuit breaker is powered from the left battery bus; therefore, servicing can be accomplished without turning the battery switches on.

SECTION VIII

FLIGHT CHARACTERISTICS & OPERATIONAL PLANNING

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SECTION VIII

FLIGHT CHARACTERISTICS & OPERATIONAL PLANNING

GENERAL FLIGHT CHARACTERISTICS

Taxi operations can be conducted using one or both engines. If nose-wheel steering is inoperative or when taxiing on a slick or icy surface, it is recommended that taxiing be conducted using both engines to preclude aggravating the problem with asymmetric thrust.

The digital nose-wheel steering system provides excellent taxi maneuverability. At low ground speeds, nose wheel travel is approximately 60° either side of neutral. The steering authority tapers off as ground speed increases and is reduced to zero at approximately 80 knots. At 90 knots, the system will automatically disengage. The rudder is effective for directional control above 45 KIAS.

The two pod-mounted PW305A engines, manufactured by Pratt and Whitney Canada, Inc., are rated at 4600 pounds thrust at sea level. The time required to accelerate these engines from idle RPM to maximum thrust RPM is approximately seven (7) seconds. The engine thrust and acceleration characteristics complement the Learjet 60XR airframe so that outstanding performance, flexibility, and safety margins are available in all flight regimes. Single-engine performance offers an example of these capabilities in that the sea-level single-engine rate of climb at 23,100 pounds is approximately 1,340 feet per minute and the single-engine service ceiling is approximately 31,000 feet at a cruise weight of 19,000 pounds.

Although the flight control systems are manual, stick forces are light to moderate throughout the flight envelope. Stability is good at all airspeeds and airplane configurations. Aircraft responsiveness and flight control authority are very good throughout the flight envelope. A yaw damper is employed to damp lateral oscillations caused by turbulent air; however, it is not required for dispatch. Trim changes due to use of the landing gear, flaps and power are slight; however, a trim change is required when spoilers are extended or retracted.

GENERAL FLIGHT CHARACTERISTICS (Cont)

The dual stall warning system provides an excellent indication of impending airplane stall. Additionally, the airplane exhibits an aerodynamic stall warning buffet in all configurations. The shaker actuates at least 7% above the stall speed published in the Airplane Flight Manual. The shaker system produces a high-frequency, low-amplitude vibration transmitted to the control columns. As the shakers actuate, the red low-speed awareness cue reaches the center of the airspeed display on the EFIS, the angle-of-attack indicator needle enters the yellow arc and the stall warning lights illuminate and flash. Recovery is easily accomplished by lowering the nose of the airplane while simultaneously advancing power as necessary to accelerate out of the stall regime. Good aircraft response, to elevator inputs, occurs throughout the aircraft operating envelope.

The spoiler system provides an effective means of increasing normal rates of descent and may be used as a drag device to achieve rapid airspeed deceleration. The spoilers are used just after touchdown to spoil the lift for more effective braking action and to increase drag for minimum landing roll. Aileron augmentation is accomplished by the spoiler system when the SPOILER switch is in the RET or ARM position and the flaps are lowered beyond 25°.

OPERATIONAL PLANNING

The charts and tables on the following pages contain performance data for climb, cruise, descent and holding. Takeoff and landing performance data is presented in tabular form in the FAA Approved Flight Manual. Fuel consumption information is presented based on flight test data and average engine characteristics. The following conditions are to be assumed when extracting data from this section:

WEIGHT

All weights presented in this section are to be understood as the gross weight of the airplane in pounds. For flight planning, the climb weight used is the gross weight of the airplane at the start of climb, the cruise weight used is the mid-weight between the start cruise weight and the end cruise weight and the descent weight used is assumed to be 16,000 pounds.

ALTITUDE

All altitudes presented in this section are to be understood as pressure altitude in feet.

TEMPERATURE

OAT — Outside Air Temperature. For presentation in this section, Temperature is to be understood as OAT unless otherwise specified.

SAT — Static Air Temperature obtained from inflight indications. SAT is equivalent to OAT.

RAT — Ram Air Temperature obtained from inflight measurement (includes compression rise).

FUEL FLOW

The fuel flows presented are for two engines except where single-engine performance is specified.

FLAPS

The wing flap position for various flight conditions is as follows:

Climb UP-0°
Enroute UP-0°
Holding UP-0°

OPERATIONAL PLANNING FORM

	WEIGHT	TIME	DISTANCE	FUEL
ZERO FUEL WEIGHT				
FUEL LOAD				
RAMP WEIGHT				
WARM UP & TAKEOFF				
Altitude=				
START CLIMB WEIGHT				
CLIMB				
END CLIMB WEIGHT				
Altitude=				
START CRUISE WEIGHT				
CRUISE				
END CRUISE WEIGHT				
Altitude=				
START CLIMB WEIGHT				
CLIMB				
END CLIMB WEIGHT				
Altitude=				
START CRUISE WEIGHT				
CRUISE				
END CRUISE WEIGHT				
Altitude=				
START CLIMB WEIGHT				
CLIMB				
END CLIMB WEIGHT				
Altitude=				
START CRUISE WEIGHT				
CRUISE				
END CRUISE WEIGHT				
Altitude=				
START CLIMB WEIGHT				
CLIMB				
END CLIMB WEIGHT				
Altitude=				
START CRUISE WEIGHT				
CRUISE				
END CRUISE WEIGHT				
Altitude=				
START DESCENT WEIGHT				
DESCENT				
END DESCENT WEIGHT				
Altitude=				
RESERVES				
ZERO FUEL WEIGHT				
Total				

TEMPERATURE CONVERSION

- To convert from Celsius to Fahrenheit, find, in bold face columns, the number representing the Celsius temperature to be converted. The equivalent Fahrenheit temperature is read in the adjacent column headed °F.
- To convert from Fahrenheit to Celsius, find, in bold face columns, the number representing the Fahrenheit temperature to be converted. The equivalent Celsius temperature is read in the adjacent column headed °C.

°F	◀▶	°C	°F	◀▶	°C	°F	◀▶	°C	°F	◀▶	°C	°F	◀▶	°C	°F	◀▶	°C
-148.0	-100	-73.3	-58.0	-50	-45.6	32.0	0	-17.8	122.0	50	10.0	212.0	100	37.8			
-146.2	-99	-72.8	-56.2	-49	-45.0	33.8	1	-17.2	123.8	51	10.6	213.8	101	38.3			
-144.4	-98	-72.2	-54.4	-48	-44.4	35.6	2	-16.7	125.6	52	11.1	215.6	102	38.9			
-142.6	-97	-71.7	-52.6	-47	-43.9	37.4	3	-16.1	127.4	53	11.7	217.4	103	39.4			
-140.8	-96	-71.1	-50.8	-46	-43.3	39.2	4	-15.6	129.2	54	12.2	219.2	104	40.0			
-139.0	-95	-70.6	-49.0	-45	-42.8	41.0	5	-15.0	131.0	55	12.8	221.0	105	40.6			
-137.2	-94	-70.0	-47.2	-44	-42.2	42.8	6	-14.4	132.8	56	13.3	222.8	106	41.1			
-135.4	-93	-69.4	-45.4	-43	-41.7	44.6	7	-13.9	134.6	57	13.9	224.6	107	41.7			
-133.6	-92	-68.9	-43.6	-42	-41.1	46.4	8	-13.3	136.4	58	14.4	226.4	108	42.2			
-131.8	-91	-68.3	-41.8	-41	-40.6	48.2	9	-12.8	138.2	59	15.0	228.2	109	42.8			
-130.0	-90	-67.8	-40.0	-40	-40.0	50.0	10	-12.2	140.0	60	15.6	230.0	110	43.3			
-128.2	-89	-67.2	-38.2	-39	-39.4	51.8	11	-11.7	141.8	61	16.1	231.8	111	43.9			
-126.4	-88	-66.7	-36.4	-38	-38.9	53.6	12	-11.1	143.6	62	16.7	233.6	112	44.4			
-124.6	-87	-66.1	-34.6	-37	-38.3	55.4	13	-10.6	145.4	63	17.2	235.4	113	45.0			
-122.8	-86	-65.6	-32.8	-36	-37.8	57.2	14	-10.0	147.2	64	17.8	237.2	114	45.6			
-121.0	-85	-65.0	-31.0	-35	-37.2	59.0	15	-9.4	149.0	65	18.3	239.0	115	46.1			
-119.2	-84	-64.4	-29.2	-34	-36.7	60.8	16	-8.9	150.8	66	18.9	240.8	116	46.7			
-117.4	-83	-63.9	-27.4	-33	-36.1	62.6	17	-8.3	152.6	67	19.4	242.6	117	47.2			
-115.6	-82	-63.3	-25.6	-32	-35.6	64.4	18	-7.8	154.4	68	20.0	244.4	118	47.8			
-113.8	-81	-62.8	-23.8	-31	-35.0	66.2	19	-7.2	156.2	69	20.6	246.2	119	48.3			
-112.0	-80	-62.2	-22.0	-30	-34.4	68.0	20	-6.7	158.0	70	21.1	248.0	120	48.9			
-110.2	-79	-61.7	-20.2	-29	-33.9	69.8	21	-6.1	159.8	71	21.7	249.8	121	49.4			
-108.4	-78	-61.1	-18.4	-28	-33.3	71.6	22	-5.6	161.6	72	22.2	251.6	122	50.0			
-106.6	-77	-60.6	-16.6	-27	-32.8	73.4	23	-5.0	163.4	73	22.8	253.4	123	50.6			
-104.8	-76	-60.0	-14.8	-26	-32.2	75.2	24	-4.4	165.2	74	23.3	255.2	124	51.1			
-103.0	-75	-59.4	-13.0	-25	-31.7	77.0	25	-3.9	167.0	75	23.9	257.0	125	51.7			
-101.2	-74	-58.9	-11.2	-24	-31.1	78.8	26	-3.3	168.8	76	24.4	258.8	126	52.2			
-99.4	-73	-58.3	-9.4	-23	-30.6	80.6	27	-2.8	170.6	77	25.0	260.6	127	52.8			
-97.6	-72	-57.8	-7.6	-22	-30.0	82.4	28	-2.2	172.4	78	25.6	262.4	128	53.3			
-95.8	-71	-57.2	-5.8	-21	-29.4	84.2	29	-1.7	174.2	79	26.1	264.2	129	53.9			
-94.0	-70	-56.7	-4.0	-20	-28.9	86.0	30	-1.1	176.0	80	26.7	266.0	130	54.4			
-92.2	-69	-56.1	-2.2	-19	-28.3	87.8	31	-0.6	177.8	81	27.2	267.8	131	55.0			
-90.4	-68	-55.6	-0.4	-18	-27.8	89.6	32	0.0	179.6	82	27.8	269.6	132	55.6			
-88.6	-67	-55.0	1.4	-17	-27.2	91.4	33	0.6	181.4	83	28.3	271.4	133	56.1			
-86.8	-66	-54.4	3.2	-16	-26.7	93.2	34	1.1	183.2	84	28.9	273.2	134	56.7			
-85.0	-65	-53.9	5.0	-15	-26.1	95.0	35	1.7	185.0	85	29.4	275.0	135	57.2			
-83.2	-64	-53.3	6.8	-14	-25.6	96.8	36	2.2	186.8	86	30.0	276.8	136	57.8			
-81.4	-63	-52.8	8.6	-13	-25.0	98.6	37	2.8	188.6	87	30.6	278.6	137	58.3			
-79.6	-62	-52.2	10.4	-12	-24.4	100.4	38	3.3	190.4	88	31.1	280.4	138	58.9			
-77.8	-61	-51.7	12.2	-11	-23.9	102.2	39	3.9	192.2	89	31.7	282.2	139	59.4			
-76.0	-60	-51.1	14.0	-10	-23.3	104.0	40	4.4	194.0	90	32.2	284.0	140	60.0			
-74.2	-59	-50.6	15.8	-9	-22.8	105.8	41	5.0	195.8	91	32.8	285.8	141	60.6			
-72.4	-58	-50.0	17.6	-8	-22.2	107.6	42	5.6	197.6	92	33.3	287.6	142	61.1			
-70.6	-57	-49.4	19.4	-7	-21.7	109.4	43	6.1	199.4	93	33.9	289.4	143	61.7			
-68.8	-56	-48.9	21.2	-6	-21.1	111.2	44	6.7	201.2	94	34.4	291.2	144	62.2			
-67.0	-55	-48.3	23.0	-5	-20.6	113.0	45	7.2	203.0	95	35.0	293.0	145	62.8			
-65.2	-54	-47.8	24.8	-4	-20.0	114.8	46	7.8	204.8	96	35.6	294.8	146	63.3			
-63.4	-53	-47.2	26.6	-3	-19.4	116.6	47	8.3	206.6	97	36.1	296.6	147	63.9			
-61.6	-52	-46.7	28.4	-2	-18.9	118.4	48	8.9	208.4	98	36.7	298.4	148	64.4			
-59.8	-51	-46.1	30.2	-1	-18.3	120.2	49	9.4	210.2	99	37.2	300.2	149	65.0			

Figure 8-2

LINEAR CONVERSIONS

- To convert from meters to feet, find, in the bold face columns, the number of meters to be converted. The equivalent number of feet is read in the adjacent column headed FEET.
- To convert from feet to meters, find, in the bold face columns, the number of feet to be converted. The equivalent number of meters is read in the adjacent column headed METERS.

METERS	◀ ▶	FEET	METERS	◀ ▶	FEET	METERS	◀ ▶	FEET
304.8	1000	3280.8	1341.1	4400	14435.5	2377.5	7800	25590.2
335.3	1100	3608.9	1371.6	4500	14763.6	2407.9	7900	25918.3
365.8	1200	3937.0	1402.1	4600	15091.7	2438.4	8000	26246.4
396.2	1300	4265.0	1432.6	4700	15419.8	2468.9	8100	26574.5
426.7	1400	4593.1	1463.1	4800	15747.8	2499.4	8200	26902.6
457.2	1500	4921.2	1493.5	4900	16075.9	2529.9	8300	27230.6
487.7	1600	5249.3	1524.0	5000	16404.0	2560.4	8400	27558.7
518.2	1700	5577.4	1554.5	5100	16732.1	2590.8	8500	27886.8
548.6	1800	5905.4	1585.0	5200	17060.2	2621.3	8600	28214.9
579.1	1900	6233.5	1615.5	5300	17388.2	2651.8	8700	28543.0
609.6	2000	6561.6	1645.9	5400	17716.3	2682.3	8800	28871.0
640.1	2100	6889.7	1676.4	5500	18044.4	2712.8	8900	29199.1
670.6	2200	7217.8	1706.9	5600	18372.5	2743.2	9000	29527.2
701.0	2300	7545.8	1737.4	5700	18700.6	2773.7	9100	29855.3
731.5	2400	7873.9	1767.9	5800	19028.6	2804.2	9200	30183.4
762.0	2500	8202.0	1798.3	5900	19356.7	2834.7	9300	30511.4
792.5	2600	8530.1	1828.8	6000	19684.8	2865.2	9400	30839.5
823.0	2700	8858.2	1859.3	6100	20012.9	2895.6	9500	31167.6
853.5	2800	9186.2	1889.8	6200	20341.0	2926.1	9600	31495.7
883.9	2900	9514.3	1920.3	6300	20669.0	2956.6	9700	31823.8
914.4	3000	9842.4	1950.7	6400	20997.1	2987.1	9800	32151.8
944.9	3100	10170.5	1981.2	6500	21325.2	3017.6	9900	32479.9
975.4	3200	10498.6	2011.7	6600	21653.3	3048.0	10000	32808.0
1005.9	3300	10826.6	2042.2	6700	21981.4	3352.8	11000	36088.8
1036.3	3400	11154.7	2072.7	6800	22309.4	3657.6	12000	39369.6
1066.8	3500	11482.8	2103.1	6900	22637.5	3962.4	13000	42650.4
1097.3	3600	11810.9	2133.6	7000	22965.6	4267.3	14000	45931.2
1127.8	3700	12139.0	2164.1	7100	23293.7	4572.1	15000	49212.0
1158.3	3800	12467.0	2194.6	7200	23621.8	4876.9	16000	52492.8
1188.7	3900	12795.1	2225.1	7300	23949.8	5181.7	17000	55773.6
1219.2	4000	13123.2	2255.5	7400	24277.9	5486.5	18000	59054.4
1249.7	4100	13451.3	2286.0	7500	24606.0	5791.3	19000	62335.2
1280.2	4200	13779.4	2316.5	7600	24934.1	6096.1	20000	65616.0
1310.7	4300	14107.4	2347.0	7700	25262.2	6400.9	21000	68896.8

Figure 8-3

VOLUME CONVERSIONS

- To convert from liters to gallons, find, in the bold face columns, the number of liters to be converted. The equivalent number of gallons is read in the adjacent column headed GALLONS.
- To convert from gallons to liters, find, in the bold face columns, the number of gallons to be converted. The equivalent number of liters is read in the adjacent column headed LITERS.

LITERS	◀ ▶	GALLONS	LITERS	◀ ▶	GALLONS	LITERS	◀ ▶	GALLONS
18.9	5	1.3	1476.2	390	103.0	2952.3	780	206.1
37.9	10	2.6	1514.0	400	105.7	2990.2	790	208.7
75.7	20	5.3	1551.9	410	108.3	3028.0	800	211.4
113.6	30	7.9	1589.7	420	111.0	3065.9	810	214.0
151.4	40	10.6	1627.6	430	113.6	3103.7	820	216.6
189.3	50	13.2	1665.4	440	116.2	3141.6	830	219.3
227.1	60	15.9	1703.3	450	118.9	3179.4	840	221.9
265.0	70	18.5	1741.1	460	121.5	3217.3	850	224.6
302.8	80	21.1	1779.0	470	124.2	3255.1	860	227.2
340.7	90	23.8	1816.8	480	126.8	3293.0	870	229.9
378.5	100	26.4	1854.7	490	129.5	3330.8	880	232.5
416.4	110	29.1	1892.5	500	132.1	3368.7	890	235.1
454.2	120	31.7	1930.4	510	134.7	3406.5	900	237.8
492.1	130	34.3	1968.2	520	137.4	3444.4	910	240.4
529.9	140	37.0	2006.1	530	140.0	3482.2	920	243.1
567.8	150	39.6	2043.9	540	142.7	3520.1	930	245.7
605.6	160	42.3	2081.8	550	145.3	3557.9	940	248.3
643.5	170	44.9	2119.6	560	148.0	3595.8	950	251.0
681.3	180	47.6	2157.5	570	150.6	3633.6	960	253.6
719.2	190	50.2	2195.3	580	153.2	3671.5	970	256.3
757.0	200	52.8	2233.2	590	155.9	3709.3	980	258.9
794.9	210	55.5	2271.0	600	158.5	3747.2	990	261.6
832.7	220	58.1	2308.9	610	161.2	3785.0	1000	264.2
870.6	230	60.8	2346.7	620	163.8	4163.5	1100	290.6
908.4	240	63.4	2384.6	630	166.4	4542.0	1200	317.0
946.3	250	66.1	2422.4	640	169.1	4920.5	1300	343.5
984.1	260	68.7	2460.3	650	171.7	5299.0	1400	369.9
1022.0	270	71.3	2498.1	660	174.4	5677.5	1500	396.3
1059.8	280	74.0	2536.0	670	177.0	6056.0	1600	422.7
1097.7	290	76.6	2573.8	680	179.7	6434.5	1700	449.1
1135.5	300	79.3	2611.7	690	182.3	6813.0	1800	475.6
1173.4	310	81.9	2649.5	700	184.9	7191.5	1900	502.0
1211.2	320	84.5	2687.4	710	187.6	7570.0	2000	528.4
1249.1	330	87.2	2725.2	720	190.2	7948.5	2100	554.8
1286.9	340	89.8	2763.1	730	192.9	8327.0	2200	581.2
1324.8	350	92.5	2800.9	740	195.5	8705.5	2300	607.7
1362.6	360	95.1	2838.8	750	198.2	9084.0	2400	634.1
1400.5	370	97.8	2876.6	760	200.8	9462.5	2500	660.5
1438.3	380	100.4	2914.5	770	203.4	9841.0	2600	686.9

Figure 8-4

WEIGHT CONVERSIONS

- To convert from kilograms to pounds, find, in the bold face columns, the number of kilograms to be converted. The equivalent number of pounds is read in the adjacent column headed POUNDS.
- To convert from pounds to kilograms, find, in the bold face columns, the number of pounds to be converted. The equivalent number of kilograms is read in the adjacent column headed KILOGRAMS.

KILOGRAMS	◀ ▶	POUNDS	KILOGRAMS	◀ ▶	POUNDS	KILOGRAMS	◀ ▶	POUNDS
4.5	10	22.0	208.7	460	1014.1	412.8	910	2006.2
9.1	20	44.1	213.2	470	1036.2	417.3	920	2028.2
13.6	30	66.1	217.7	480	1058.2	421.8	930	2050.3
18.1	40	88.2	222.3	490	1080.3	426.4	940	2072.3
22.7	50	110.2	226.8	500	1102.3	430.9	950	2094.4
27.2	60	132.3	231.3	510	1124.3	435.5	960	2116.4
31.8	70	154.3	235.9	520	1146.4	440.0	970	2138.5
36.3	80	176.4	240.4	530	1168.4	444.5	980	2160.5
40.8	90	198.4	244.9	540	1190.5	449.1	990	2182.6
45.4	100	220.5	249.5	550	1212.5	453.6	1000	2204.6
49.9	110	242.5	254.0	560	1234.6	499.0	1100	2425.1
54.4	120	264.6	258.6	570	1256.6	544.3	1200	2645.5
59.0	130	286.6	263.1	580	1278.7	589.7	1300	2866.0
63.5	140	308.6	267.6	590	1300.7	635.0	1400	3086.4
68.0	150	330.7	272.2	600	1322.8	680.4	1500	3306.9
72.6	160	352.7	276.7	610	1344.8	907.2	2000	4409.2
77.1	170	374.8	281.2	620	1366.9	1134.0	2500	5511.5
81.6	180	396.8	285.8	630	1388.9	1360.8	3000	6613.8
86.2	190	418.9	290.3	640	1410.9	1587.6	3500	7716.1
90.7	200	440.9	294.8	650	1433.0	1814.4	4000	8818.4
95.3	210	463.0	299.4	660	1455.0	2041.2	4500	9920.7
99.8	220	485.0	303.9	670	1477.1	2268.0	5000	11023.0
104.3	230	507.1	308.4	680	1499.1	2494.8	5500	12125.3
108.9	240	529.1	313.0	690	1521.2	2721.6	6000	13227.6
113.4	250	551.1	317.5	700	1543.2	2948.4	6500	14329.9
117.9	260	573.2	322.1	710	1565.3	3175.2	7000	15432.2
122.5	270	595.2	326.6	720	1587.3	3402.0	7500	16534.5
127.0	280	617.3	331.1	730	1609.4	3628.8	8000	17636.8
131.5	290	639.3	335.7	740	1631.4	3855.6	8500	18739.1
136.1	300	661.4	340.2	750	1653.4	4082.4	9000	19841.4
140.6	310	683.4	344.7	760	1675.5	4309.2	9500	20943.7
145.2	320	705.5	349.3	770	1697.5	4536.0	10000	22046.0
149.7	330	727.5	353.8	780	1719.6	4989.6	11000	24250.6
154.2	340	749.6	358.3	790	1741.6	5443.2	12000	26455.2
158.8	350	771.6	362.9	800	1763.7	5896.8	13000	28659.8
163.3	360	793.7	367.4	810	1785.7	6350.4	14000	30864.4
167.8	370	815.7	371.9	820	1807.8	6804.0	15000	33069.0
172.4	380	837.7	376.5	830	1829.8	7257.6	16000	35273.6
176.9	390	859.8	381.0	840	1851.9	7711.1	17000	37478.2
181.4	400	881.8	385.6	850	1873.9	8164.7	18000	39682.8
186.0	410	903.9	390.1	860	1896.0	8618.3	19000	41887.4
190.5	420	925.9	394.6	870	1918.0	9071.9	20000	44092.0
195.0	430	948.0	399.2	880	1940.0	9525.5	21000	46296.6
199.6	440	970.0	403.7	890	1962.1	9979.1	22000	48501.2
204.1	450	992.1	408.2	900	1984.1	10432.7	23000	50705.8

Figure 8-5

RELATION OF TEMPERATURE (°C) TO ISA

	-50°C	-40°C	-30°C	-20°C	-10°C	ISA	+10°C	+20°C	+30°C
51	-106.5	-96.5	-86.5	-76.5	-66.5	-56.5	-46.5	-36.5	-26.5
37	-106.5	-96.5	-86.5	-76.5	-66.5	-56.5	-46.5	-36.5	-26.5
35	-104.2	-94.2	-84.2	-74.2	-64.2	-54.2	-44.2	-34.2	-24.2
33	-100.3	-90.3	-80.3	-70.3	-60.3	-50.3	-40.3	-30.3	-20.3
31	-96.3	-86.3	-76.3	-66.3	-56.3	-46.3	-36.3	-26.3	-16.3
30	-94.4	-84.4	-74.4	-64.4	-54.4	-44.4	-34.4	-24.4	-14.4
29	-92.4	-82.4	-72.4	-62.4	-52.4	-42.4	-32.4	-22.4	-12.4
28	-90.4	-80.4	-70.4	-60.4	-50.4	-40.4	-30.4	-20.4	-10.4
27	-88.4	-78.4	-68.4	-58.4	-48.4	-38.4	-28.4	-18.4	-8.4
26	-86.5	-76.5	-66.5	-56.5	-46.5	-36.5	-26.5	-16.5	-6.5
25	-84.5	-74.5	-64.5	-54.5	-44.5	-34.5	-24.5	-14.5	-4.5
24	-82.5	-72.5	-62.5	-52.5	-42.5	-32.5	-22.5	-12.5	-2.5
23	-80.5	-70.5	-60.5	-50.5	-40.5	-30.5	-20.5	-10.5	-0.5
22	-78.6	-68.6	-58.6	-48.6	-38.6	-28.6	-18.6	-8.6	1.4
21	-76.6	-66.6	-56.6	-46.6	-36.6	-26.6	-16.6	-6.6	3.4
20	-74.6	-64.6	-54.6	-44.6	-34.6	-24.6	-14.6	-4.6	5.4
19	-72.6	-62.6	-52.6	-42.6	-32.6	-22.6	-12.6	-2.6	7.4
18	-70.6	-60.6	-50.6	-40.6	-30.6	-20.6	-10.6	-0.6	9.4
16	-66.7	-56.7	-46.7	-36.7	-26.7	-16.7	-6.7	3.3	13.3
14	-62.7	-52.7	-42.7	-32.7	-22.7	-12.7	-2.7	7.3	17.3
12	-58.8	-48.8	-38.8	-28.8	-18.8	-8.8	1.2	11.2	21.2
10	-54.8	-44.8	-34.8	-24.8	-14.8	-4.8	5.2	15.2	25.2
8	-50.8	-40.8	-30.8	-20.8	-10.8	-0.8	9.2	19.2	29.2
6	-46.9	-36.9	-26.9	-16.9	-6.9	3.1	13.1	23.1	33.1
4	-42.9	-32.9	-22.9	-12.9	-2.9	7.1	17.1	27.1	37.1
2	-39.0	-29.0	-19.0	-9.0	1.0	11.0	21.0	31.0	41.0
S.L.	-35.0	-25.0	-15.0	-5.0	5.0	15.0	25.0	35.0	45.0
	-50°C	-40°C	-30°C	-20°C	-10°C	ISA	+10°C	+20°C	+30°C

Figure 8-6

SPEED/TEMPERATURE CONVERSION

		MACH — TRUE											
		.60	.62	.64	.66	.68	.70	.72	.74	.76	.78	.80	.82
RAM AIR TEMPERATURE (RAT) °C	0 SAT	-18	-19	-20	-21	-23	-24	-25	-26	-28	-29	-30	-32
	KTAS	374	385	397	408	419	431	442	453	464	475	486	496
	-5 SAT	-23	-24	-25	-26	-27	-28	-30	-31	-32	-34	-35	-36
	KTAS	370	381	293	404	416	427	438	449	460	470	481	492
	-10 SAT	-27	-28	-30	-31	-32	-33	-34	-36	-37	-38	-39	-41
	KTAS	367	378	389	400	412	423	434	445	455	466	477	487
	-15 SAT	-32	-33	-34	-35	-36	-38	-39	-40	-41	-42	-44	-45
	KTAS	363	374	386	397	408	418	429	440	451	462	474	483
	-20 SAT	-37	-38	-39	-40	-41	-42	-43	-45	-46	-47	-48	-49
	KTAS	359	371	382	393	404	415	425	436	447	457	468	478
	-25 SAT	-41	-42	-43	-45	-46	-47	-48	-49	-50	-51	-53	-54
	KTAS	356	367	378	389	399	410	421	432	443	453	463	473
	-30 SAT	-46	-47	-48	-49	-50	-51	-52	-54	-55	-56	-57	-58
	KTAS	352	363	374	385	396	406	417	427	438	448	458	468
	-35 SAT	-51	-52	-53	-54	-55	-56	-57	-58	-59	-60	-62	-63
	KTAS	349	359	370	381	391	402	413	423	434	444	453	463
	-40 SAT	-55	-56	-57	-58	-59	-60	-62	-63	-64	-65	-66	-67
	KTAS	345	356	366	377	387	398	408	418	429	439	449	459
	-45 SAT	-60	-61	-62	-63	-64	-65	-66	-67	-68	-69	-70	-72
	KTAS	341	352	362	373	383	394	404	414	424	434	444	453
	-50 SAT	-65	-66	-67	-68	-69	-70	-71	-72	-73	-74	-75	-76
	KTAS	338	348	358	369	379	389	399	409	419	429	439	449
	-55 SAT	-69	-70	-71	-72	-73	-74	-75	-76	-77	-78	-79	-80
	KTAS	334	344	355	365	375	385	395	405	415	425	435	444
	-60 SAT	-74	-75	-76	-77	-78	-79	-80	-81	-82	-83	-84	-85
	KTAS	330	340	350	360	370	380	390	400	410	419	429	438
	-65 SAT	-79	-80	-80	-81	-82	-83	-84	-85	-86	-87	-88	-89
	KTAS	326	336	347	357	366	376	386	396	405	415	424	434
	-70 SAT	-83	-84	-85	-86	-87	-88	-89	-90	-91	-92	-93	-94
	KTAS	323	332	342	352	362	371	381	390	400	409	419	428
	-75 SAT	-88	-89	-90	-91	-91	-92	-93	-94	-95	-96	-97	-98
	KTAS	318	328	338	347	358	367	377	386	395	405	414	423
	-80 SAT	-93	-94	-94	-95	-96	-97	-98	-99	-100	-101	-102	-102
	KTAS	314	323	334	343	353	362	371	381	390	399	408	418
	-85 SAT	-97	-98	-99	-100	-101	-101	-102	-103	-104	-105	-106	-107
	KTAS	310	320	329	339	348	358	367	376	385	394	403	412

Figure 8-7

CLIMB PERFORMANCE

CLIMB POWER SETTING

Figure 8-8 presents the climb maximum continuous thrust settings. At the start of the climb, the thrust levers are moved to the Maximum Continuous Thrust (MCT) position. When airborne with the flaps up, the FADEC will determine the proper maximum continuous thrust N₁ and position the N₁ bug to that value. The N₁ needle should align with the N₁ bug.

CLIMB PERFORMANCE SCHEDULE

Figure 8-9 shows time, distance and fuel used to climb from sea level to altitude for standard and off-standard days at various weights. The climb weight used is the start-of-climb weight. Subtraction of performance values for two altitudes results in the time, distance and fuel required for climb between the two altitudes.

The climb speed schedule presented with each table is based upon an operational climb schedule to optimize fuel consumption and approximates the best rate-of-climb speeds. The climb speeds given are 250 KIAS up to 32,000 feet and 0.70 M₁ above 32,000 feet. Climb thrust is maximum continuous thrust (MCT).

**MAXIMUM CONTINUOUS THRUST FOR CLIMB (N₁)
ALL ENGINE**

ALTITUDE - 1000 FEET

STATIC AIR TEMPERATURE — °C		S.L.	5	10	15	20	25	30	35	40	45	50	51
	55	88.23 86.07											
	50	88.34 86.19											
	45	89.07 86.94	89.11 86.84										
	40	89.80 87.69	89.78 87.53										
	35	90.51 88.41	90.48 88.24	90.42 87.95									
	30	91.22 89.14	91.18 88.96	91.12 88.67									
	25	91.99 89.92	91.90 89.70	91.81 89.39	91.80 89.16								
	20	92.77 90.72	92.63 90.45	92.49 90.08	92.43 89.82								
	15	92.55 91.50	93.37 91.20	93.16 90.78	93.03 90.44	92.96 90.12							
	10	91.74 91.74	94.10 91.96	93.88 91.52	93.67 91.11	93.49 90.67							
	5	90.93 90.93	94.83 92.71	94.60 92.25	94.37 91.82	94.10 91.30	93.73 90.64						
	0	90.11 90.11	95.56 93.45	95.31 92.99	95.06 92.54	94.71 91.94	94.20 91.14						
	-5	89.28 89.28	94.95 94.20	96.02 93.72	95.75 93.26	95.38 92.64	94.69 91.65	94.34 91.02					
	-10	88.44 88.44	94.06 94.06	96.73 94.45	96.45 93.97	96.07 93.35	95.39 92.38	94.83 91.54					
	-15	87.60 87.60	93.16 93.16	97.44 95.19	97.14 94.69	96.76 94.07	96.09 93.11	95.48 92.22	95.08 91.54				
	-20	86.75 86.75	92.25 92.25	98.10 95.86	97.82 95.39	97.45 94.79	96.79 93.84	96.13 92.90	95.69 92.18				
	-25	85.88 85.88	91.34 91.34	97.31 96.50	98.40 96.00	98.06 95.43	97.48 94.56	96.78 93.59	96.30 92.83	95.79 91.99			
	-30	85.02 85.02	90.41 90.41	96.32 96.32	99.02 96.64	98.64 96.03	98.07 95.18	97.41 94.25	96.90 93.47	96.40 92.64	94.29 90.27	93.13 88.90	93.12 88.86
	-35	84.14 84.14	89.48 89.48	95.33 95.33	100.21 97.86	99.57 96.99	98.66 95.80	98.01 94.88	97.51 94.11	97.01 93.29	94.91 90.93	93.75 89.57	93.74 89.52
	-40	83.25 83.25	88.53 88.53	94.32 94.32	101.41 99.09	100.79 98.23	99.87 97.04	98.78 95.68	98.11 94.75	97.62 93.94	95.52 91.58	94.37 90.23	94.36 90.19
	-45	82.35 82.35	87.58 87.58	93.31 93.31	101.68 99.38	101.52 99.00	101.10 98.30	100.03 96.97	99.30 95.98	98.82 95.17	96.72 92.83	95.57 91.48	95.57 91.44
	-50	81.44 81.44	86.61 86.61	92.28 92.28	101.35 99.59	101.71 99.21	101.39 98.62	101.05 98.02	100.57 97.28	100.08 96.48	98.00 94.14	96.85 92.80	96.85 92.77
	-55	80.53 80.53	85.64 85.64	91.24 91.24	100.21 99.80	101.90 99.43	101.59 98.85	101.24 98.25	100.92 97.66	100.44 96.87	98.36 94.55	97.22 93.22	97.21 93.18
	-60	79.60 79.60	84.65 84.65	90.19 90.19	99.05 99.05	101.00 99.65	101.62 99.07	101.44 98.49	101.12 97.90	100.65 97.12	98.57 94.81	97.44 93.48	97.44 93.45
	-65						100.42 99.30	101.18 98.72	101.32 98.15	100.86 97.38	98.79 95.07	97.66 93.75	97.66 93.72
-70							99.96 98.95	100.36 98.39	100.36 97.63	99.00 95.33	97.88 94.02	97.88 93.98	

80-4096

XX.XX ANTI-ICE OFF

XX.XX FULL ANTI-ICE ON

SPEED SCHEDULE
250 KIAS up to 32,000 ft
.70 M_I above 32,000 ft

CLIMB PERFORMANCE TWO ENGINE

WEIGHT 14,000 LB	ISA -10°C			ISA			ISA +10°C			ISA +15°C			ISA +20°C		
	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb
51	14.4	89.4	418.7	20.4	130.5	509.6	19.9	128.9	516.3	18.4	118.6	502.3	24.2	159.8	592.7
49	11.2	68.0	371.2	13.6	85.0	416.5	14.5	91.7	440.7	14.5	91.5	445.0	17.2	110.8	495.1
47	9.4	56.7	343.0	11.2	68.8	379.2	12.2	75.7	403.7	12.4	77.2	410.8	14.4	91.3	451.3
45	8.3	49.0	321.4	9.7	58.8	353.3	10.7	65.6	377.2	11.0	67.6	385.0	12.7	79.2	420.5
43	7.4	43.2	303.3	8.6	51.6	332.4	9.6	58.3	355.6	10.0	60.5	363.2	11.4	70.3	395.4
41	6.7	38.6	287.2	7.8	46.0	314.4	8.8	52.4	336.5	9.1	54.6	343.5	10.4	63.2	373.1
39	6.1	34.7	272.4	7.1	41.5	297.9	7.5	43.6	303.0	7.8	45.3	308.0	8.8	52.1	333.3
37	5.6	31.4	258.4	6.5	37.6	282.6	6.3	35.2	266.6	7.0	40.0	285.5	7.9	45.7	308.0
35	5.2	28.7	245.5	6.0	34.4	268.5	5.6	30.9	246.2	6.3	35.0	263.1	7.1	39.8	282.8
33	4.8	26.1	232.8	5.6	31.4	254.5	5.1	27.2	227.0	5.6	30.7	242.1	6.3	34.7	259.5
31	4.3	23.3	217.4	5.1	27.9	237.3	4.6	24.0	208.7	5.1	26.9	222.2	5.6	30.3	237.5
29	3.9	20.6	201.7	4.6	24.7	219.9	4.1	21.0	191.0	4.5	23.5	202.9	5.0	26.4	216.3
27	3.5	18.2	186.7	4.2	21.8	203.3	3.6	18.3	173.6	4.0	20.4	184.1	4.4	22.9	196.0
25	3.2	16.1	172.4	3.7	19.3	187.4	3.2	15.9	156.6	3.5	17.7	165.8	3.9	19.7	176.3
23	2.9	14.2	158.3	3.4	17.0	171.9	2.8	13.6	139.8	3.1	15.2	147.9	3.4	16.9	157.1
21	2.6	12.5	144.5	3.0	14.9	156.6	2.4	11.6	123.3	2.9	12.9	130.3	2.9	14.3	138.2
19	2.3	10.9	130.9	2.7	13.0	141.6	2.1	9.7	106.8	2.3	10.7	112.9	2.5	11.9	119.5
17	2.0	9.5	117.4	2.3	11.2	126.7	1.7	7.9	90.4	1.9	8.8	95.5	2.1	9.7	101.0
15	1.8	8.1	103.9	2.0	9.5	111.8	1.4	6.2	74.1	1.5	6.9	78.2	1.6	7.7	82.6
13	1.5	6.9	90.4	1.7	8.0	97.1	1.0	4.7	57.8	1.1	5.2	60.9	1.3	5.7	64.2
11	1.3	5.7	76.9	1.4	6.5	82.3	0.7	3.3	41.4	0.8	3.6	43.6	0.9	4.0	45.9
9	1.0	4.6	63.4	1.2	5.2	67.5	0.4	1.9	25.0	0.5	2.1	26.2	0.5	2.3	27.5
7	0.8	3.5	49.7	0.9	3.9	52.8	0.1	0.6	8.4	0.2	0.7	8.8	0.2	0.7	9.2
5	0.6	2.5	35.9	0.6	2.7	38.0									
3	0.4	1.5	21.9	0.4	1.6	23.0									
1	0.1	0.5	7.4	0.1	0.5	7.8									

PRESSURE ALTITUDE — 1000 FEET

CLIMB SPEED: 250 KIAS up to 32,000 feet.
0.70 M1 above 32,000 feet.

Figure 8-9
(Sheet 1 of 12)

CLIMB PERFORMANCE
TWO ENGINE

WEIGHT 15,000 LB	ISA -10°C			ISA			ISA +10°C			ISA +15°C			ISA +20°C		
	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb
PRESSURE ALTITUDE — 1000 FEET															
51	20.0	125.5	518.6												
49	12.9	78.8	415.4	16.3	102.3	475.7									
47	10.5	63.4	377.1	12.6	77.8	419.5	16.9	107.2	496.7	23.5	153.3	598.5			
45	9.1	54.0	350.8	10.7	65.2	386.8	13.6	84.9	445.2	16.5	104.7	496.4	20.2	130.5	561.6
43	8.1	47.2	329.5	9.4	56.6	362.0	11.8	72.4	412.4	13.7	85.9	451.3	16.2	102.6	498.8
41	7.2	41.9	311.2	8.5	50.2	341.1	10.5	63.7	386.9	12.1	74.3	420.1	14.0	87.4	460.5
39	6.6	37.7	294.5	7.7	45.0	322.6	9.5	57.1	365.2	10.9	66.0	394.9	12.5	77.0	430.9
37	6.0	34.0	279.0	7.1	40.7	305.5	8.7	51.7	345.5	9.9	59.4	372.7	11.3	68.9	405.5
35	5.6	31.0	264.9	6.5	37.2	290.0	8.1	47.2	327.9	9.2	54.1	353.0	10.4	62.5	383.3
33	5.1	28.2	251.1	6.1	33.9	274.8	7.5	43.1	310.3	8.4	49.1	333.4	9.6	56.6	361.3
31	4.7	25.1	234.3	5.5	30.2	256.0	6.8	38.1	288.1	7.6	43.3	308.8	8.6	49.5	333.5
29	4.2	22.2	217.4	5.0	26.6	237.2	6.1	33.4	266.0	6.8	37.8	284.4	7.7	43.1	306.1
27	3.8	19.6	201.2	4.5	23.5	219.3	5.5	29.4	245.2	6.1	33.1	261.6	6.8	37.6	280.7
25	3.4	17.3	185.7	4.0	20.8	202.1	4.9	25.9	225.3	5.5	29.1	240.0	6.1	32.8	256.8
23	3.1	15.3	170.5	3.6	18.3	185.2	4.4	22.7	206.1	4.9	25.4	219.0	5.4	28.5	233.8
21	2.8	13.5	155.6	3.2	16.0	168.7	3.9	19.8	187.3	4.3	22.1	198.7	4.8	24.7	211.7
19	2.5	11.8	140.9	2.9	14.0	152.5	3.4	17.1	168.9	3.8	19.1	178.9	4.2	21.3	190.3
17	2.2	10.2	126.4	2.5	12.1	136.4	3.0	14.7	150.8	3.3	16.4	159.6	3.7	18.2	169.5
15	1.9	8.8	111.8	2.2	10.3	120.5	2.6	12.5	132.9	2.9	13.9	140.5	3.2	15.4	149.1
13	1.6	7.4	97.3	1.9	8.6	104.5	2.2	10.4	115.1	2.4	11.6	121.7	2.7	12.9	129.0
11	1.4	6.1	82.8	1.5	7.1	88.6	1.8	8.5	97.5	2.0	9.4	102.9	2.2	10.5	109.0
9	1.1	4.9	68.2	1.2	5.6	72.7	1.5	6.7	79.9	1.6	7.5	84.3	1.8	8.3	89.1
7	0.9	3.8	53.5	1.0	4.2	56.8	1.1	5.1	62.3	1.2	5.6	65.6	1.4	6.2	69.3
5	0.6	2.7	38.7	0.7	2.9	40.9	0.8	3.5	44.6	0.9	3.9	47.0	0.9	4.3	49.5
3	0.4	1.6	23.6	0.4	1.7	24.8	0.5	2.0	26.9	0.5	2.2	28.2	0.6	2.5	29.7
1	0.1	0.5	8.0	0.1	0.6	8.3	0.2	0.7	9.0	0.2	0.7	9.4	0.2	0.8	9.9

CLIMB SPEED: 250 KIAS up to 32,000 feet.
0.70 Mi above 32,000 feet.Figure 8-9
(Sheet 2 of 12)

CLIMB PERFORMANCE TWO ENGINE

WEIGHT 16,000 LB	ISA -10°C			ISA			ISA +10°C			ISA +15°C			ISA +20°C		
	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb
51	15.5	95.4	474.7	22.1	141.1	585.3									
49	11.8	71.5	415.6	14.4	89.3	467.0									
47	10.0	59.6	382.4	11.9	72.4	423.5	20.6	132.2	576.0	19.2	122.6	560.1	24.9	163.0	658.4
45	8.8	51.6	357.3	10.3	62.1	393.5	15.3	96.0	492.4	15.3	96.0	496.5	18.3	116.4	553.9
43	7.9	45.5	336.2	9.2	54.6	369.2	13.0	80.0	450.6	13.2	81.7	457.9	15.5	96.8	504.3
41	7.1	40.7	317.5	8.3	48.8	348.2	11.5	69.7	420.2	11.8	72.0	428.5	13.7	84.3	469.0
39	6.5	36.7	300.3	7.6	44.0	329.2	10.4	62.1	395.2	10.8	64.5	403.3	12.3	75.0	439.7
37	6.0	33.3	284.8	7.0	40.1	312.2	9.5	55.9	373.2	9.9	58.5	381.3	11.3	67.8	414.7
35	5.5	30.3	269.7	6.5	36.5	295.5	8.7	51.0	353.6	9.1	53.1	359.7	10.4	61.2	390.3
33	5.0	27.0	251.6	5.9	32.4	275.2	8.1	46.5	334.3	8.2	46.7	332.9	9.3	53.5	359.9
31	4.5	23.8	233.4	5.3	28.6	254.8	7.3	41.1	310.2	7.3	40.8	306.3	8.3	46.5	330.1
29	4.1	21.1	215.9	4.8	25.3	235.5	6.6	36.0	286.2	6.6	35.7	281.7	7.4	40.5	302.5
27	3.7	18.6	199.2	4.3	22.3	217.0	5.9	31.7	263.7	5.9	31.3	258.2	6.6	35.3	276.6
25	3.3	16.4	182.9	3.9	19.7	198.9	5.3	27.8	242.3	5.2	27.3	235.6	5.8	30.7	251.7
23	3.0	14.4	166.9	3.5	17.2	181.1	4.7	24.4	221.5	4.6	23.7	213.7	5.2	26.6	227.8
21	2.6	12.6	151.1	3.1	15.0	163.6	4.2	21.2	201.2	4.1	20.5	192.3	4.5	22.9	204.7
19	2.3	10.9	135.5	2.7	12.9	146.4	3.7	18.4	181.4	3.6	17.6	171.5	3.9	19.6	182.3
17	2.0	9.4	119.9	2.3	11.0	129.2	3.2	15.8	161.9	3.1	14.9	151.0	3.4	16.6	160.3
15	1.7	7.9	104.3	2.0	9.2	112.1	2.8	13.4	142.7	2.6	12.4	130.7	2.9	13.8	138.6
13	1.5	6.6	88.7	1.7	7.6	95.0	2.4	11.2	123.6	2.2	10.1	110.5	2.4	11.3	117.1
11	1.2	5.3	73.1	1.3	6.0	78.0	2.0	9.1	104.6	1.7	8.0	90.5	1.9	8.9	95.7
9	0.9	4.0	57.3	1.0	4.5	60.9	1.6	7.2	85.7	1.3	6.0	70.5	1.5	6.6	74.4
7	0.7	2.9	41.4	0.7	3.2	43.8	1.2	5.4	66.8	0.9	4.2	50.4	1.0	4.6	53.1
5	0.4	1.7	25.3	0.4	1.9	26.5	0.9	3.8	47.9	0.5	2.4	30.3	0.6	2.6	31.9
3	0.1	0.6	8.6	0.1	0.6	8.9	0.5	2.2	28.8	0.2	0.8	10.1	0.2	0.8	10.6
1	0.1	0.6	8.6	0.1	0.6	8.9	0.2	0.7	9.7	0.2	0.8	10.1	0.2	0.8	10.6

CLIMB SPEED: 250 KIAS up to 32,000 feet.
0.70 M₁ above 32,000 feet.

Figure 8-9
(Sheet 3 of 12)

CLIMB PERFORMANCE
TWO ENGINE

WEIGHT 17,000 LB	ISA -10°C			ISA			ISA +10°C			ISA +15°C			ISA +20°C		
	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb
51	21.7	135.6	593.8												
49	13.5	82.0	461.7	17.0	106.0	529.2									
47	11.1	66.1	417.3	13.2	81.0	464.9	17.5	110.3	549.5	23.6	152.4	653.7			
45	9.6	56.4	387.1	11.3	68.2	427.7	14.4	88.8	493.3	17.2	108.4	549.0	21.0	134.8	622.0
43	8.5	49.4	362.7	10.0	59.4	399.3	12.5	76.3	456.5	14.6	90.1	499.7	17.1	107.8	553.9
41	7.7	44.0	341.6	9.0	52.8	375.4	11.2	67.5	427.5	12.9	78.6	464.8	15.0	92.6	510.8
39	7.0	39.5	322.5	8.2	47.4	354.1	10.2	60.6	402.5	11.7	70.0	436.0	13.4	81.8	476.8
37	6.4	35.8	305.5	7.6	43.1	335.3	9.4	55.1	380.8	10.7	63.4	411.4	12.3	73.6	448.6
35	5.9	32.6	289.1	7.0	39.3	317.1	8.7	50.1	359.6	9.8	57.3	387.6	11.2	66.3	421.4
33	5.4	28.9	269.5	6.3	34.8	295.1	7.9	44.2	333.3	8.8	50.3	358.2	10.0	57.8	387.9
31	4.9	25.5	249.8	5.7	30.7	273.0	7.0	38.7	307.2	7.9	43.9	329.2	8.9	50.1	355.2
29	4.4	22.5	231.0	5.2	27.1	252.2	6.3	34.0	282.9	7.1	38.4	302.5	7.9	43.6	325.3
27	4.0	19.9	213.1	4.6	23.9	232.3	5.7	29.9	259.7	6.3	33.6	277.1	7.1	38.0	297.1
25	3.6	17.6	195.6	4.2	21.0	212.8	5.1	26.1	237.4	5.6	29.3	252.7	6.3	33.0	270.2
23	3.2	15.4	178.4	3.7	18.4	193.7	4.5	22.8	215.6	5.0	25.4	229.1	5.5	28.6	244.4
21	2.8	13.5	161.5	3.3	16.0	175.0	4.0	19.7	194.2	4.4	22.0	206.1	4.9	24.6	219.6
19	2.5	11.7	144.7	2.9	13.8	156.5	3.5	16.9	173.3	3.8	18.8	183.7	4.2	21.0	195.4
17	2.2	10.0	128.1	2.5	11.8	138.1	3.0	14.4	152.7	3.3	16.0	161.7	3.6	17.8	171.8
15	1.9	8.5	111.4	2.1	9.9	119.8	2.5	12.0	132.2	2.8	13.3	139.9	3.1	14.8	148.5
13	1.6	7.0	94.8	1.8	8.1	101.5	2.1	9.8	111.9	2.3	10.8	118.3	2.6	12.1	125.4
11	1.3	5.6	78.1	1.4	6.4	83.3	1.7	7.7	91.6	1.9	8.6	96.8	2.0	9.5	102.4
9	1.0	4.3	61.2	1.1	4.8	65.0	1.3	5.8	71.4	1.4	6.4	75.4	1.6	7.1	79.6
7	0.7	3.1	44.3	0.8	3.4	46.8	0.9	4.0	51.2	1.0	4.4	53.9	1.1	4.9	56.8
5	0.4	1.8	27.0	0.5	2.0	28.3	0.5	2.3	30.8	0.6	2.6	32.4	0.6	2.8	34.1
3	0.1	0.6	9.2	0.2	0.7	9.5	0.2	0.8	10.3	0.2	0.8	10.8	0.2	0.9	11.4
1															

PRESSURE ALTITUDE — 1000 FEET

CLIMB SPEED: 250 KIAS up to 32,000 feet.
0.70 Mi above 32,000 feet.Figure 8-9
(Sheet 4 of 12)

CLIMB PERFORMANCE TWO ENGINE

WEIGHT 18,000 LB	ISA -10°C			ISA			ISA +10°C			ISA +15°C			ISA +20°C		
	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb
51															
49															
47	16.0	97.8	523.5	22.3	141.0	639.8									
45	12.3	73.7	456.8	14.9	91.8	513.7									
43	10.5	61.8	419.4	12.4	75.2	465.4	20.7	131.9	627.0	19.6	124.5	612.9	25.1	162.6	715.9
41	9.2	53.6	391.0	10.9	64.7	431.7	16.0	99.3	542.0	16.1	99.9	546.7	19.2	121.2	611.6
39	8.3	47.5	367.1	9.7	57.1	404.3	13.7	83.8	496.2	14.1	86.0	504.6	16.4	102.0	557.4
37	7.5	42.5	345.8	8.8	51.1	380.4	12.2	73.4	462.3	12.6	76.1	471.3	14.6	89.3	517.4
35	6.9	38.4	327.1	8.1	46.4	359.7	11.1	65.6	433.9	11.6	68.6	443.7	13.3	80.0	485.2
33	6.4	34.9	309.2	7.5	42.1	339.8	10.2	59.5	409.8	10.6	61.9	417.3	12.1	71.8	454.9
31	5.8	30.9	288.0	6.8	37.3	315.8	9.4	54.0	386.4	9.5	54.2	384.9	10.8	62.4	417.8
29	5.2	27.3	266.8	6.1	32.9	292.0	8.4	47.5	357.7	8.5	47.2	353.4	9.6	54.0	381.9
27	4.7	24.1	246.6	5.5	29.0	269.6	7.6	41.5	329.3	7.6	41.2	324.3	8.5	46.9	349.3
25	4.2	21.2	227.3	5.0	25.6	248.1	6.8	36.4	302.9	6.8	36.0	296.9	7.6	40.8	318.8
23	3.8	18.7	208.6	4.4	22.5	227.2	6.1	32.0	278.0	6.0	31.4	270.6	6.7	35.4	289.7
21	3.4	16.4	190.2	4.0	19.7	206.8	5.4	28.0	253.9	5.3	27.2	245.1	5.9	30.6	261.8
19	3.0	14.4	172.1	3.5	17.1	186.8	4.8	24.4	230.4	4.7	23.5	220.4	5.2	26.4	235.1
17	2.7	12.5	154.3	3.1	14.8	167.0	4.2	21.1	207.6	4.1	20.1	196.4	4.5	22.5	209.2
15	2.3	10.7	136.5	2.7	12.6	147.3	3.7	18.1	185.1	3.5	17.1	172.8	3.9	19.0	183.8
13	2.0	9.0	118.7	2.3	10.5	127.7	3.2	15.3	163.0	3.0	14.2	149.5	3.3	15.8	158.7
11	1.7	7.5	101.0	1.9	8.6	108.2	2.7	12.8	141.1	2.5	11.6	126.4	2.7	12.9	134.0
9	1.4	6.0	83.1	1.5	6.8	88.8	2.2	10.4	119.4	2.0	9.1	103.4	2.2	10.1	109.5
7	1.1	4.6	65.2	1.2	5.2	69.3	1.8	8.2	97.8	1.5	6.9	80.4	1.7	7.6	85.0
5	0.8	3.3	47.1	0.8	3.6	49.9	1.4	6.2	76.2	1.1	4.7	57.5	1.2	5.2	60.7
3	0.5	2.0	28.7	0.5	2.1	30.2	1.0	4.3	54.5	0.6	2.7	34.6	0.7	3.0	36.4
1	0.2	0.7	9.8	0.2	0.7	10.2	0.6	2.5	32.9	0.2	0.9	11.5	0.2	1.0	12.1

PRESSURE ALTITUDE — 1000 FEET

CLIMB SPEED: 250 KIAS up to 32,000 feet.
0.70 MI above 32,000 feet.

Figure 8-9
(Sheet 5 of 12)

CLIMB PERFORMANCE
TWO ENGINE

WEIGHT 19,000 LB	ISA -10°C			ISA			ISA +10°C			ISA +15°C			ISA +20°C		
	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb
51															
49															
47															
45	21.4	132.5	639.1	17.3	107.0	576.4	28.1	181.3	778.3	23.2	148.3	699.4	21.7	138.2	681.2
43	13.9	83.5	503.6	13.7	83.3	507.7	18.0	112.5	599.7	17.9	111.5	600.5	18.1	113.0	609.9
41	11.5	67.9	454.8	11.8	70.6	466.7	15.1	92.3	540.4	15.4	94.3	548.5	16.0	97.7	562.0
39	10.0	58.3	421.3	11.8	70.6	466.7	15.1	92.3	540.4	15.4	94.3	548.5	16.0	97.7	562.0
37	8.9	51.2	394.1	10.5	61.8	435.1	13.3	79.9	500.0	13.7	82.7	509.6	14.4	87.0	525.0
35	8.1	45.6	370.3	9.5	55.1	408.3	11.9	71.0	467.6	12.5	74.3	478.4	13.1	77.8	490.9
33	7.4	41.2	349.7	8.7	49.8	385.3	11.0	64.2	440.6	11.4	66.9	448.9	11.7	67.4	449.7
31	6.8	37.3	330.2	8.0	45.2	363.6	10.1	58.1	414.8	10.2	58.3	413.3	10.3	58.1	410.2
29	6.2	33.0	307.3	7.3	39.9	337.5	9.1	51.0	383.3	9.1	50.7	378.8	9.1	50.4	374.6
27	5.5	29.1	284.3	6.5	35.1	311.7	8.1	44.5	352.4	8.1	44.2	347.2	8.1	43.7	341.5
25	5.0	25.7	262.7	5.9	30.9	287.6	7.2	39.0	323.9	7.2	38.6	317.6	7.2	37.9	310.1
23	4.5	22.6	242.0	5.3	27.3	264.5	6.5	34.2	297.0	6.4	33.6	289.2	6.3	32.8	280.1
21	4.0	19.9	222.0	4.7	24.0	242.2	5.8	29.9	271.1	5.7	29.1	261.8	5.6	28.2	251.3
19	3.6	17.5	202.4	4.2	21.0	220.3	5.1	26.0	245.9	5.0	25.1	235.4	4.8	24.1	223.4
17	3.2	15.3	183.1	3.7	18.2	198.9	4.5	22.5	221.4	4.4	21.5	209.6	4.2	20.3	196.2
15	2.8	13.2	164.0	3.3	15.7	177.7	3.9	19.3	197.4	3.8	18.2	184.3	3.5	16.9	169.4
13	2.5	11.4	145.1	2.8	13.4	156.8	3.4	16.3	173.7	3.2	15.2	159.4	2.9	13.7	143.0
11	2.1	9.6	126.2	2.4	11.2	135.9	2.9	13.6	150.3	2.6	12.4	134.7	2.3	10.8	116.7
9	1.8	7.9	107.3	2.0	9.2	115.1	2.4	11.1	127.1	2.1	9.7	110.1	1.8	8.1	90.7
7	1.4	6.4	88.4	1.6	7.3	94.4	1.9	8.8	104.1	1.6	7.3	85.7	1.2	5.6	64.7
5	1.1	4.9	69.3	1.2	5.5	73.7	1.5	6.6	81.1	1.1	5.1	61.2	0.7	3.2	38.8
3	0.8	3.5	50.1	0.9	3.8	53.0	1.0	4.6	58.0	0.7	2.9	36.8	0.2	1.0	12.9
1	0.5	2.1	30.5	0.5	2.3	32.1	0.6	2.7	34.9	0.2	0.9	12.3			
	0.2	0.7	10.4	0.2	0.7	10.8	0.2	0.9	11.7						

CLIMB SPEED: 250 KIAS up to 32,000 feet.
0.70 Mi above 32,000 feet.Figure 8-9
(Sheet 6 of 12)

CLIMB PERFORMANCE TWO ENGINE

WEIGHT 20,000 LB	ISA -10°C			ISA			ISA +10°C			ISA +15°C			ISA +20°C		
	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb
51															
49															
47															
45	16.0	97.3	564.3	21.5	134.5	675.6									
43	12.6	75.0	494.7	15.3	93.2	556.8	20.8	130.7	673.8	30.7	199.3	860.3			
41	10.8	63.3	454.0	12.9	77.2	505.1	16.6	102.2	590.1	20.1	125.8	664.0	25.3	161.7	771.2
39	9.6	55.3	422.8	11.4	67.0	468.2	14.4	87.3	541.3	16.9	103.8	597.4	20.1	126.0	670.3
37	8.6	49.0	396.1	10.2	59.3	437.8	12.9	76.9	503.8	14.9	90.1	551.4	17.5	107.3	611.4
35	7.9	44.1	373.4	9.4	53.5	412.4	11.8	69.2	473.4	13.5	80.5	515.7	15.7	94.8	568.5
33	7.3	39.9	352.1	8.6	48.4	388.5	10.8	62.5	444.9	12.3	72.2	482.8	14.2	84.4	529.8
31	6.6	35.3	327.2	7.8	42.7	360.1	9.7	54.7	410.3	11.0	62.8	443.4	12.6	72.8	483.8
29	5.9	31.0	302.5	7.0	37.5	332.3	8.7	47.7	376.6	9.8	54.3	405.6	11.1	62.5	440.3
27	5.3	27.3	279.3	6.3	33.0	306.3	7.7	41.7	345.8	8.7	47.3	371.3	9.8	54.1	401.4
25	4.8	24.1	257.2	5.6	29.0	281.6	6.9	36.5	316.8	7.7	41.3	339.3	8.7	46.9	365.5
23	4.3	21.2	235.8	5.0	25.5	257.6	6.2	31.9	289.0	6.9	35.9	308.7	7.7	40.6	331.5
21	3.8	18.6	214.9	4.5	22.3	234.3	5.5	27.7	262.0	6.1	31.1	279.3	6.8	35.0	299.1
19	3.4	16.2	194.4	4.0	19.4	211.4	4.8	24.0	235.7	5.3	26.8	250.9	5.9	30.1	268.2
17	3.0	14.1	174.1	3.5	16.7	188.9	4.2	20.5	210.1	4.6	22.9	223.3	5.2	25.7	238.3
15	2.6	12.1	154.0	3.0	14.2	166.5	3.6	17.4	184.8	4.0	19.4	196.3	4.4	21.7	209.2
13	2.2	10.2	133.9	2.6	11.9	144.3	3.1	14.5	159.9	3.4	16.1	169.7	3.8	18.0	180.6
11	1.9	8.4	113.8	2.1	9.7	122.2	2.5	11.8	135.2	2.8	13.1	143.3	3.1	14.6	152.3
9	1.5	6.8	93.7	1.7	7.7	100.2	2.0	9.3	110.6	2.3	10.4	117.2	2.5	11.5	124.3
7	1.2	5.2	73.5	1.3	5.8	78.2	1.6	7.0	86.1	1.7	7.8	91.1	1.9	8.6	96.5
5	0.9	3.7	53.1	0.9	4.1	56.3	1.1	4.9	61.7	1.2	5.4	65.1	1.3	5.9	68.8
3	0.5	2.2	32.4	0.6	2.4	34.1	0.6	2.8	37.1	0.7	3.1	39.1	0.8	3.4	41.2
1	0.2	0.7	11.0	0.2	0.8	11.5	0.2	0.9	12.4	0.2	1.0	13.0	0.3	1.1	13.7

PRESSURE ALTITUDE — 1000 FEET

CLIMB SPEED: 250 KIAS up to 32,000 feet.
0.70 Mi above 32,000 feet.

Figure 8-9
(Sheet 7 of 12)

CLIMB PERFORMANCE
TWO ENGINE

WEIGHT 21,000 LB	ISA -10°C			ISA			ISA +10°C			ISA +15°C			ISA +20°C		
	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb
51															
49															
47															
45	20.0	122.8	662.3												
43	14.0	83.8	541.1	17.3	106.4	617.5	25.7	164.0	793.3						
41	11.8	69.1	489.7	14.1	84.8	547.8	18.5	114.2	648.0	23.0	145.2	744.3	31.2	202.5	911.9
39	10.3	59.7	453.4	12.3	72.6	503.9	15.7	95.5	586.9	18.6	114.9	652.9	22.6	142.1	741.9
37	9.3	52.6	423.4	11.0	63.9	469.3	14.0	83.4	543.2	16.2	98.5	597.5	19.2	118.3	667.2
35	8.4	47.2	398.2	10.0	57.4	440.9	12.7	74.8	508.8	14.6	87.3	556.4	17.1	103.6	616.5
33	7.7	42.6	375.0	9.2	51.8	414.7	11.6	67.3	477.0	13.3	78.0	519.3	15.4	91.7	572.2
31	7.0	37.6	348.1	8.3	45.6	383.8	10.4	58.7	438.9	11.8	67.5	475.5	13.5	78.6	520.6
29	6.3	33.0	321.4	7.4	39.9	353.6	9.3	51.0	402.1	10.4	58.3	434.0	11.9	67.3	472.3
27	5.6	29.0	296.5	6.7	35.1	325.6	8.3	44.5	368.7	9.3	50.6	396.7	10.5	58.0	429.7
25	5.1	25.5	272.9	6.0	30.9	299.2	7.4	38.9	337.5	8.3	44.1	362.1	9.3	50.2	390.7
23	4.6	22.5	250.1	5.4	27.1	273.6	6.6	34.0	307.6	7.3	38.3	329.1	8.2	43.4	354.0
21	4.1	19.7	227.8	4.8	23.7	248.7	5.8	29.5	278.7	6.5	33.1	297.5	7.2	37.4	319.2
19	3.6	17.2	206.0	4.2	20.6	224.3	5.1	25.5	250.7	5.7	28.5	267.1	6.3	32.1	286.0
17	3.2	14.9	184.4	3.7	17.7	200.3	4.5	21.8	223.3	4.9	24.4	237.6	5.5	27.4	253.9
15	2.8	12.8	163.1	3.2	15.1	176.5	3.9	18.5	196.3	4.3	20.6	208.7	4.7	23.1	222.7
13	2.4	10.8	141.8	2.7	12.6	152.9	3.3	15.4	169.8	3.6	17.2	180.3	4.0	19.2	192.1
11	2.0	8.9	120.5	2.3	10.3	129.5	2.7	12.5	143.5	3.0	14.0	152.3	3.3	15.6	162.0
9	1.6	7.2	99.2	1.8	8.2	106.1	2.2	9.9	117.4	2.4	11.0	124.4	2.6	12.2	132.1
7	1.3	5.5	77.8	1.4	6.2	82.8	1.7	7.4	91.4	1.8	8.3	96.7	2.0	9.2	102.5
5	0.9	3.9	56.2	1.0	4.3	59.5	1.2	5.1	65.4	1.3	5.7	69.1	1.4	6.3	73.1
3	0.6	2.3	34.3	0.6	2.5	36.0	0.7	3.0	39.3	0.7	3.3	41.5	0.8	3.6	43.8
1	0.2	0.8	11.6	0.2	0.8	12.1	0.2	1.0	13.2	0.2	1.1	13.8	0.3	1.2	14.6

PRESSURE ALTITUDE — 1000 FEET

CLIMB SPEED: 250 KIAS up to 32,000 feet.
0.70 Mi above 32,000 feet.Figure 8-9
(Sheet 8 of 12)

CLIMB PERFORMANCE TWO ENGINE

WEIGHT 22,000 LB	ISA -10°C			ISA			ISA +10°C			ISA +15°C			ISA +20°C		
	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb
51															
49															
47															
45															
43	15.9	95.5	598.7	20.5	127.0	703.4									
41	12.9	75.6	529.4	15.6	93.8	596.6	20.9	129.9	719.1	27.7	176.8	863.3			
39	11.2	64.5	486.4	13.3	78.9	542.9	17.2	105.0	637.9	20.7	128.3	717.3	25.8	163.1	830.9
37	9.9	56.5	452.4	11.8	68.9	503.2	15.2	90.7	586.2	17.7	107.9	648.8	21.2	131.3	731.2
35	9.0	50.5	424.5	10.7	61.6	471.4	13.7	80.8	547.0	15.9	95.0	600.8	18.7	113.6	670.1
33	8.2	45.4	399.0	9.8	55.4	442.4	12.5	72.4	511.4	14.3	84.3	558.8	16.7	99.8	618.8
31	7.4	40.0	369.8	8.8	48.7	408.7	11.1	63.0	469.3	12.7	72.7	509.9	14.6	85.0	560.4
29	6.7	35.0	341.1	7.9	42.5	376.0	9.9	54.5	429.1	11.2	62.5	464.1	12.8	72.4	506.7
27	6.0	30.8	314.3	7.1	37.3	345.9	8.8	47.5	392.9	9.9	54.1	423.5	11.3	62.2	459.9
25	5.4	27.1	289.2	6.4	32.8	317.6	7.9	41.5	359.3	8.8	47.1	386.1	10.0	53.7	417.6
23	4.8	23.8	264.8	5.7	28.8	290.3	7.0	36.1	327.2	7.8	40.8	350.6	8.8	46.3	377.8
21	4.3	20.9	241.2	5.1	25.1	263.7	6.2	31.4	296.2	6.9	35.3	316.7	7.7	39.9	340.3
19	3.8	18.2	218.0	4.5	21.8	237.7	5.4	27.1	266.2	6.0	30.4	284.1	6.7	34.2	304.6
17	3.4	15.8	195.1	3.9	18.8	212.2	4.7	23.2	237.0	5.3	25.9	252.5	5.9	29.2	270.3
15	2.9	13.5	172.4	3.4	16.0	187.0	4.1	19.6	208.3	4.5	21.9	221.7	5.0	24.6	236.9
13	2.5	11.4	149.9	2.9	13.4	161.9	3.5	16.3	180.0	3.8	18.2	191.4	4.2	20.4	204.2
11	2.1	9.4	127.4	2.4	10.9	137.0	2.9	13.3	152.1	3.2	14.8	161.6	3.5	16.6	172.1
9	1.7	7.6	104.8	1.9	8.6	112.3	2.3	10.5	124.4	2.5	11.7	132.0	2.8	13.0	140.3
7	1.3	5.8	82.2	1.5	6.5	87.6	1.8	7.9	96.8	1.9	8.8	102.6	2.1	9.7	108.8
5	1.0	4.1	59.4	1.0	4.5	63.0	1.2	5.4	69.2	1.4	6.0	73.2	1.5	6.7	77.5
3	0.6	2.5	36.2	0.6	2.7	38.1	0.7	3.2	41.6	0.8	3.5	43.9	0.9	3.9	46.4
1	0.2	0.8	12.3	0.2	0.9	12.8	0.2	1.0	13.9	0.3	1.1	14.6	0.3	1.2	15.4

CLIMB SPEED: 250 KIAS up to 32,000 feet.
0.70 Mi above 32,000 feet.

Figure 8-9
(Sheet 9 of 12)

CLIMB PERFORMANCE
TWO ENGINE

WEIGHT 22,750 LB	ISA -10°C			ISA			ISA +10°C			ISA +15°C			ISA +20°C		
	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb
51															
49															
47															
45															
43	17.9	108.2	656.1	25.2	157.7	817.7									
41	13.8	81.4	562.9	16.8	102.0	639.1	23.4	146.3	788.9						
39	11.8	68.4	512.9	14.2	84.1	574.6	18.5	113.2	680.8	22.6	140.6	774.2	29.0	185.0	918.1
37	10.5	59.6	475.4	12.5	72.9	530.2	16.1	96.7	621.2	19.0	116.0	691.4	23.0	142.7	786.0
35	9.5	53.1	445.1	11.3	65.0	495.5	14.5	85.7	577.7	16.9	101.3	637.2	20.0	122.1	714.7
33	8.6	47.6	417.8	10.3	58.3	464.3	13.2	76.6	538.8	15.2	89.5	590.6	17.8	106.6	657.0
31	7.8	41.9	386.7	9.3	51.1	428.2	11.7	66.4	493.4	13.4	76.8	537.4	15.5	90.2	592.4
29	7.0	36.6	356.3	8.3	44.6	393.5	10.4	57.3	450.3	11.8	65.8	488.0	13.5	76.5	534.1
27	6.2	32.1	328.2	7.4	39.1	361.7	9.2	49.8	411.8	10.4	56.9	444.7	11.9	65.6	483.9
25	5.6	28.3	301.7	6.6	34.3	331.9	8.2	43.5	376.3	9.3	49.4	405.0	10.5	56.5	438.8
23	5.0	24.9	276.3	5.9	30.1	303.2	7.3	37.9	342.4	8.2	42.8	367.5	9.2	48.7	396.6
21	4.5	21.8	251.4	5.3	26.3	275.3	6.5	32.8	309.9	7.2	37.0	331.6	8.1	41.9	356.9
19	4.0	19.0	227.2	4.7	22.8	248.1	5.7	28.3	278.3	6.3	31.8	297.3	7.1	35.9	319.2
17	3.5	16.4	203.3	4.1	19.6	221.4	5.0	24.2	247.7	5.5	27.1	264.1	6.1	30.5	283.1
15	3.1	14.1	179.7	3.5	16.7	195.0	4.3	20.5	217.6	4.7	22.9	231.8	5.3	25.7	248.0
13	2.6	11.9	156.1	3.0	13.9	168.8	3.6	17.0	188.0	4.0	19.1	200.1	4.4	21.3	213.7
11	2.2	9.8	132.7	2.5	11.4	142.9	3.0	13.9	158.7	3.3	15.5	168.8	3.7	17.3	180.0
9	1.8	7.9	109.2	2.0	9.0	117.0	2.4	10.9	129.8	2.6	12.2	137.8	2.9	13.6	146.7
7	1.4	6.0	85.6	1.5	6.8	91.3	1.8	8.2	101.0	2.0	9.2	107.1	2.2	10.2	113.7
5	1.0	4.3	61.8	1.1	4.7	65.6	1.3	5.7	72.2	1.4	6.3	76.4	1.5	7.0	81.0
3	0.6	2.6	37.7	0.6	2.8	39.7	0.8	3.3	43.4	0.8	3.6	45.8	0.9	4.0	48.5
1	0.2	0.9	12.8	0.2	0.9	13.3	0.2	1.1	14.5	0.3	1.2	15.3	0.3	1.3	16.1

PRESSURE ALTITUDE — 1000 FEET

CLIMB SPEED: 250 KIAS up to 32,000 feet.
0.70 Mi above 32,000 feet.

Figure 8-9
(Sheet 10 of 12)

CLIMB PERFORMANCE TWO ENGINE

WEIGHT 23,000 LB	ISA -10°C			ISA			ISA +10°C			ISA +15°C			ISA +20°C		
	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb
51															
49															
47															
45															
43	18.8	113.8	680.2	27.6	173.0	872.0									
41	14.1	83.5	574.9	17.3	105.2	654.8	24.5	153.5	817.7						
39	12.0	69.8	522.2	14.5	86.0	585.8	19.0	116.2	696.3	23.3	145.3	795.4	30.0	191.5	947.5
37	10.6	60.7	483.3	12.7	74.3	539.5	16.5	98.8	633.5	19.5	118.9	706.6	23.6	147.0	806.0
35	9.6	54.0	452.2	11.5	66.1	503.8	14.8	87.5	588.4	17.2	103.5	649.9	20.5	125.1	730.6
33	8.8	48.4	424.2	10.5	59.3	471.8	13.4	78.0	548.4	15.5	91.4	601.7	18.2	109.0	670.4
31	7.9	42.5	392.5	9.4	51.9	434.9	11.9	67.5	501.7	13.6	78.3	546.9	15.8	92.0	603.6
29	7.1	37.2	361.5	8.4	45.3	399.5	10.6	58.3	457.6	12.0	67.0	496.3	13.7	77.9	543.6
27	6.3	32.6	332.9	7.5	39.7	367.1	9.4	50.6	418.3	10.6	57.9	451.9	12.1	66.7	492.2
25	5.7	28.7	306.0	6.7	34.8	336.7	8.4	44.2	382.1	9.4	50.2	411.5	10.6	57.5	446.0
23	5.1	25.2	280.1	6.0	30.5	307.6	7.4	38.4	347.6	8.3	43.5	373.2	9.4	49.5	403.0
21	4.6	22.1	254.9	5.4	26.6	279.2	6.6	33.3	314.5	7.3	37.6	336.8	8.2	42.5	362.5
19	4.0	19.2	230.3	4.7	23.1	251.6	5.8	28.7	282.5	6.4	32.3	301.8	7.2	36.5	324.2
17	3.6	16.7	206.1	4.1	19.9	224.5	5.0	24.6	251.3	5.6	27.5	268.1	6.2	31.0	287.4
15	3.1	14.3	182.1	3.6	16.9	197.7	4.3	20.8	220.8	4.8	23.3	235.3	5.3	26.1	251.8
13	2.7	12.0	158.3	3.0	14.1	171.2	3.7	17.3	190.7	4.1	19.3	203.0	4.5	21.7	216.9
11	2.2	9.9	134.5	2.5	11.5	144.8	3.0	14.1	161.0	3.4	15.7	171.3	3.7	17.6	182.7
9	1.8	8.0	110.7	2.0	9.1	118.6	2.4	11.1	131.6	2.7	12.4	139.8	3.0	13.8	148.9
7	1.4	6.1	86.7	1.6	6.9	92.5	1.9	8.3	102.4	2.0	9.3	108.6	2.3	10.3	115.4
5	1.0	4.3	62.7	1.1	4.8	66.5	1.3	5.8	73.2	1.4	6.4	77.5	1.6	7.1	82.2
3	0.6	2.6	38.2	0.7	2.8	40.2	0.8	3.3	44.0	0.8	3.7	46.5	0.9	4.1	49.2
1	0.2	0.9	13.0	0.2	0.9	13.5	0.3	1.1	14.7	0.3	1.2	15.5	0.3	1.3	16.3

PRESSURE ALTITUDE — 1000 FEET

CLIMB SPEED: 250 KIAS up to 32,000 feet.
0.70 Mi above 32,000 feet.

Figure 8-9
(Sheet 11 of 12)

CLIMB PERFORMANCE
TWO ENGINE

WEIGHT 23,500 LB	ISA -10°C			ISA			ISA +10°C			ISA +15°C			ISA +20°C		
	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb	Time Min.	Dist N.M.	Fuel Lb
51															
49															
47															
45															
43	21.2	129.4	743.8												
41	14.9	88.1	600.6	18.5	112.3	689.5	27.3	172.6	891.3						
39	12.5	72.7	541.4	15.1	89.9	609.2	20.0	122.7	729.3	24.9	156.0	842.5	33.9	218.4	1043.0
37	11.0	62.9	499.6	13.2	77.3	558.9	17.2	103.3	659.1	20.4	125.0	738.6	25.0	156.2	848.9
35	9.9	55.8	466.6	11.9	68.6	520.9	15.4	91.1	610.6	18.0	108.2	676.6	21.5	131.7	764.1
33	9.1	50.0	437.4	10.8	61.4	487.1	13.9	81.0	568.0	16.1	95.2	624.8	19.0	114.0	698.5
31	8.1	43.8	404.2	9.7	53.6	448.5	12.3	69.9	518.7	14.1	81.2	566.5	16.4	95.8	626.8
29	7.3	38.3	372.1	8.7	46.7	411.7	10.9	60.2	472.5	12.4	69.4	513.2	14.3	80.9	563.1
27	6.5	33.6	342.4	7.8	40.9	378.0	9.7	52.3	431.6	11.0	59.9	466.8	12.5	69.1	509.1
25	5.9	29.5	314.6	6.9	35.9	346.6	8.6	45.6	394.0	9.7	51.9	424.7	11.0	59.4	461.0
23	5.2	25.9	288.0	6.2	31.4	316.5	7.7	39.6	358.3	8.6	44.9	385.0	9.7	51.1	416.2
21	4.7	22.7	262.0	5.5	27.4	287.2	6.8	34.4	324.0	7.6	38.7	347.2	8.5	43.9	374.1
19	4.1	19.8	236.7	4.9	23.8	258.8	5.9	29.6	290.9	6.6	33.3	311.1	7.4	37.6	334.4
17	3.7	17.1	211.7	4.3	20.4	230.8	5.2	25.3	258.7	5.8	28.4	276.2	6.4	32.0	296.4
15	3.2	14.6	187.1	3.7	17.4	203.2	4.5	21.4	227.2	4.9	24.0	242.3	5.5	26.9	259.5
13	2.7	12.4	162.5	3.1	14.5	175.9	3.8	17.8	196.2	4.2	19.9	209.0	4.6	22.3	223.5
11	2.3	10.2	138.1	2.6	11.8	148.8	3.1	14.5	165.6	3.5	16.2	176.3	3.8	18.1	188.1
9	1.9	8.2	113.6	2.1	9.4	121.9	2.5	11.4	135.3	2.8	12.7	143.9	3.1	14.2	153.3
7	1.5	6.3	89.1	1.6	7.1	95.0	1.9	8.6	105.2	2.1	9.5	111.7	2.3	10.6	118.8
5	1.0	4.5	64.3	1.1	4.9	68.3	1.3	5.9	75.2	1.5	6.6	79.7	1.6	7.3	84.6
3	0.6	2.7	39.2	0.7	2.9	41.3	0.8	3.4	45.2	0.9	3.8	47.8	0.9	4.2	50.6
1	0.2	0.9	13.3	0.2	1.0	13.9	0.3	1.1	15.1	0.3	1.2	15.0	0.3	1.3	16.8

PRESSURE ALTITUDE — 1000 FEET

CLIMB SPEED: 250 KIAS up to 32,000 feet.
0.70 Mi above 32,000 feet.Figure 8-9
(Sheet 12 of 12)

CRUISE PERFORMANCE

The cruise performance on the following pages is based on flight test data and represents the average delivered aircraft.

NORMAL CRUISE

The Normal Cruise tables (Figure 8-10) provide fuel flows and true airspeed for constant 0.76 MI cruise at weights from 14,000 to 23,000 pounds. Engine power is adjusted to maintain constant Mach as weight decreases. Standard and off-standard day temperatures provide interpolation factors.

MAXIMUM SPECIFIC RANGE

Figure 8-11 presents a graphic description of the range capability at ISA as a function of weight and altitude. The data is based upon two engine, maximum-range cruise at ISA. In general, the cruise altitude selected should be near the maximum nautical miles per pound fuel for a given aircraft weight.

MAXIMUM-RANGE CRUISE - TWO ENGINES

The Maximum-Range Cruise - Two-Engine tables (Figure 8-12) provide fuel flow, indicated Mach or airspeed, and true airspeed for 100% maximum range cruise at weights from 14,000 to 23,000 pounds. Standard and off-standard day temperatures provide interpolation factors.

LONG-RANGE CRUISE - TWO ENGINES

The Long-Range Cruise - Two-Engine tables (Figure 8-13) provide fuel flow, indicated Mach or airspeed, and true airspeed for 99% maximum range cruise at weights from 14,000 to 23,000 pounds. Standard and off-standard day temperatures provide interpolation factors.

HIGH-SPEED CRUISE

The High Speed Cruise tables (Figure 8-14) provide fuel flows, indicated Mach or airspeed, and true airspeed for a MMO/VMO or VMAX cruise at weights from 14,000 to 23,000 pounds. Power for maximum speed cruise is for the limiting condition (MMO/VMO, or maximum cruise power). Standard and off-standard day temperatures provide interpolation factors.

MAXIMUM RANGE DESCENT - ONE ENGINE

Figure 8-15 shows the descent speed schedule for a maximum range descent to an altitude at or below the single-engine service ceiling for the aircraft gross weight.

LONG-RANGE CRUISE - ONE ENGINE

The Long-Range Cruise - One Engine tables (Figure 8-16) provide fuel flows, indicated Mach or airspeed and true airspeed for 99% maximum range cruise at weights from 14,000 to 23,000 pounds. Standard and off-standard day temperatures provide interpolation factors.

NORMAL CRUISE

WEIGHT — 14,000 LB Mach — .76 Mi		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 KTAS	425				
	Fuel - Lb/Hr	878				
	49 KTAS	425	435			
	Fuel - Lb/Hr	860	885			
	47 KTAS	425	435	445		
	Fuel - Lb/Hr	862	887	910		
	45 KTAS	425	435	445	450	454
	Fuel - Lb/Hr	881	907	931	942	954
	43 KTAS	425	435	445	450	455
	Fuel - Lb/Hr	912	937	961	974	986
	41 KTAS	425	435	445	450	455
	Fuel - Lb/Hr	953	978	1004	1018	1031
	39 KTAS	425	435	445	450	455
	Fuel - Lb/Hr	1005	1031	1058	1071	1086

WEIGHT — 14,500 LB Mach — .76 Mi		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 KTAS					
	Fuel - Lb/Hr					
	49 KTAS	425	435			
	Fuel - Lb/Hr	889	914			
	47 KTAS	425	435	445		
	Fuel - Lb/Hr	886	912	935		
	45 KTAS	425	435	445	450	
	Fuel - Lb/Hr	900	927	951	962	
	43 KTAS	425	435	445	450	455
	Fuel - Lb/Hr	927	954	979	991	1003
	41 KTAS	425	435	445	450	455
	Fuel - Lb/Hr	966	993	1018	1033	1046
	39 KTAS	425	435	445	450	455
	Fuel - Lb/Hr	1017	1044	1071	1085	1100

Figure 8-10
(Sheet 1 of 10)

NORMAL CRUISE

WEIGHT — 15,000 LB Mach — .76 Mi		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 KTAS Fuel - Lb/Hr					
	49 KTAS Fuel - Lb/Hr	425 920	435 946			
	47 KTAS Fuel - Lb/Hr	425 911	435 938			
	45 KTAS Fuel - Lb/Hr	425 921	435 947	445 972	450 985	
	43 KTAS Fuel - Lb/Hr	425 945	435 972	445 998	450 1010	454 1023
	41 KTAS Fuel - Lb/Hr	425 981	435 1009	445 1034	450 1049	455 1062
	39 KTAS Fuel - Lb/Hr	425 1030	435 1058	445 1085	450 1100	455 1114
	37 KTAS Fuel - Lb/Hr	425 1090	435 1119	445 1148	450 1162	455 1179
	35 KTAS Fuel - Lb/Hr	427 1169	437 1206	447 1233	452 1250	457 1268
	30 KTAS Fuel - Lb/Hr	437 1460	447 1491	456 1534	461 1554	466 1571
	25 KTAS Fuel - Lb/Hr	447 1833	456 1886	466 1933	470 1949	475 1972

WEIGHT — 15,500 LB Mach — .76 Mi		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 KTAS Fuel - Lb/Hr					
	49 KTAS Fuel - Lb/Hr	425 956				
	47 KTAS Fuel - Lb/Hr	425 939	435 965			
	45 KTAS Fuel - Lb/Hr	425 945	435 970	445 995		
	43 KTAS Fuel - Lb/Hr	425 962	435 991	445 1018	450 1029	454 1043
	41 KTAS Fuel - Lb/Hr	425 995	435 1024	445 1051	450 1065	455 1078
	39 KTAS Fuel - Lb/Hr	425 1043	435 1073	445 1099	450 1115	455 1129
	37 KTAS Fuel - Lb/Hr	425 1101	435 1132	445 1161	450 1176	455 1192
	35 KTAS Fuel - Lb/Hr	427 1179	437 1216	447 1243	452 1261	457 1279
	30 KTAS Fuel - Lb/Hr	437 1464	447 1495	456 1538	461 1558	466 1576
	25 KTAS Fuel - Lb/Hr	447 1834	456 1887	466 1934	470 1951	475 1973

Figure 8-10
(Sheet 2 of 10)

NORMAL CRUISE

WEIGHT — 16,000 LB Mach — .76 Mi		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 KTAS Fuel - Lb/Hr					
	49 KTAS Fuel - Lb/Hr	425 996				
	47 KTAS Fuel - Lb/Hr	425 967	435 994			
	45 KTAS Fuel - Lb/Hr	425 969	435 995	445 1020		
	43 KTAS Fuel - Lb/Hr	425 982	435 1011	445 1039	450 1050	454 1064
	41 KTAS Fuel - Lb/Hr	425 1011	435 1041	445 1069	450 1082	455 1095
	39 KTAS Fuel - Lb/Hr	425 1056	435 1087	445 1115	450 1130	455 1145
	37 KTAS Fuel - Lb/Hr	425 1114	435 1146	445 1174	450 1190	455 1206
	35 KTAS Fuel - Lb/Hr	427 1191	437 1227	447 1255	452 1273	457 1290
	30 KTAS Fuel - Lb/Hr	437 1468	447 1499	456 1543	461 1563	466 1580
	25 KTAS Fuel - Lb/Hr	447 1835	456 1889	466 1935	470 1952	475 1975

WEIGHT — 16,500 LB Mach — .76 Mi		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 KTAS Fuel - Lb/Hr					
	49 KTAS Fuel - Lb/Hr					
	47 KTAS Fuel - Lb/Hr	425 997	435 1026			
	45 KTAS Fuel - Lb/Hr	425 993	435 1021	445 1048		
	43 KTAS Fuel - Lb/Hr	425 1004	435 1031	445 1059	450 1071	454 1085
	41 KTAS Fuel - Lb/Hr	425 1027	435 1059	445 1088	450 1100	454 1114
	39 KTAS Fuel - Lb/Hr	425 1070	435 1103	445 1131	450 1146	455 1160
	37 KTAS Fuel - Lb/Hr	425 1126	435 1160	445 1188	450 1204	455 1221
	35 KTAS Fuel - Lb/Hr	427 1204	437 1239	447 1268	452 1286	457 1303
	30 KTAS Fuel - Lb/Hr	437 1472	447 1503	456 1548	461 1567	466 1585
	25 KTAS Fuel - Lb/Hr	447 1837	456 1891	466 1937	470 1954	475 1977

Figure 8-10
(Sheet 3 of 10)

NORMAL CRUISE

WEIGHT — 17,000 LB Mach — .76 Mi		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 KTAS Fuel - Lb/Hr					
	49 KTAS Fuel - Lb/Hr					
	47 KTAS Fuel - Lb/Hr	425 1033				
	45 KTAS Fuel - Lb/Hr	425 1020	435 1048			
	43 KTAS Fuel - Lb/Hr	425 1027	435 1052	445 1081	450 1094	
	41 KTAS Fuel - Lb/Hr	425 1046	435 1078	445 1108	450 1119	454 1134
	39 KTAS Fuel - Lb/Hr	425 1085	435 1118	445 1148	450 1162	455 1177
	37 KTAS Fuel - Lb/Hr	425 1139	435 1174	445 1203	450 1219	455 1236
	35 KTAS Fuel - Lb/Hr	427 1217	437 1252	447 1282	452 1299	457 1317
	30 KTAS Fuel - Lb/Hr	437 1479	447 1510	456 1555	461 1575	466 1592
	25 KTAS Fuel - Lb/Hr	447 1839	456 1893	466 1940	470 1956	475 1980

WEIGHT — 17,500 LB Mach — .76 Mi		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 KTAS Fuel - Lb/Hr					
	49 KTAS Fuel - Lb/Hr					
	47 KTAS Fuel - Lb/Hr	425 1071				
	45 KTAS Fuel - Lb/Hr	425 1047	435 1077			
	43 KTAS Fuel - Lb/Hr	425 1050	435 1076	445 1105	450 1119	
	41 KTAS Fuel - Lb/Hr	425 1068	435 1097	445 1129	450 1139	454 1155
	39 KTAS Fuel - Lb/Hr	425 1100	435 1134	445 1165	450 1179	455 1193
	37 KTAS Fuel - Lb/Hr	425 1153	435 1188	445 1218	450 1234	455 1251
	35 KTAS Fuel - Lb/Hr	427 1231	437 1265	447 1296	452 1313	457 1330
	30 KTAS Fuel - Lb/Hr	437 1488	447 1519	456 1565	461 1584	466 1601
	25 KTAS Fuel - Lb/Hr	447 1843	456 1897	466 1944	470 1960	475 1984

Figure 8-10
(Sheet 4 of 10)

NORMAL CRUISE

WEIGHT — 18,000 LB Mach — .76 Mi		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 KTAS Fuel - Lb/Hr					
	49 KTAS Fuel - Lb/Hr					
	47 KTAS Fuel - Lb/Hr	425 1114				
	45 KTAS Fuel - Lb/Hr	425 1076	435 1106			
	43 KTAS Fuel - Lb/Hr	425 1074	435 1102	445 1130		
	41 KTAS Fuel - Lb/Hr	425 1090	435 1117	445 1150	450 1161	454 1176
	39 KTAS Fuel - Lb/Hr	425 1120	435 1152	445 1184	450 1197	454 1212
	37 KTAS Fuel - Lb/Hr	425 1169	435 1203	445 1235	450 1250	455 1266
	35 KTAS Fuel - Lb/Hr	427 1245	437 1278	447 1311	452 1327	457 1345
	30 KTAS Fuel - Lb/Hr	437 1498	447 1528	456 1575	461 1594	466 1611
	25 KTAS Fuel - Lb/Hr	447 1846	456 1902	466 1948	470 1964	475 1988

WEIGHT — 18,500 LB Mach — .76 Mi		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 KTAS Fuel - Lb/Hr					
	49 KTAS Fuel - Lb/Hr					
	47 KTAS Fuel - Lb/Hr					
	45 KTAS Fuel - Lb/Hr	425 1111	435 1143			
	43 KTAS Fuel - Lb/Hr	425 1100	435 1129	445 1157		
	41 KTAS Fuel - Lb/Hr	425 1112	435 1137	445 1171	450 1183	454 1198
	39 KTAS Fuel - Lb/Hr	425 1140	435 1170	445 1204	450 1216	454 1231
	37 KTAS Fuel - Lb/Hr	425 1185	435 1218	445 1251	450 1266	455 1282
	35 KTAS Fuel - Lb/Hr	427 1260	437 1292	447 1326	452 1342	457 1359
	30 KTAS Fuel - Lb/Hr	437 1508	447 1538	456 1585	461 1605	466 1621
	25 KTAS Fuel - Lb/Hr	447 1850	456 1906	466 1952	470 1968	475 1992

Figure 8-10
(Sheet 5 of 10)

NORMAL CRUISE

WEIGHT — 19,000 LB Mach — .76 Mi		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 KTAS Fuel - Lb/Hr					
	49 KTAS Fuel - Lb/Hr					
	47 KTAS Fuel - Lb/Hr					
	45 KTAS Fuel - Lb/Hr	425 1148	435 1180			
	43 KTAS Fuel - Lb/Hr	425 1126	435 1157	445 1187		
	41 KTAS Fuel - Lb/Hr	425 1134	435 1161	445 1192	450 1206	
	39 KTAS Fuel - Lb/Hr	425 1160	435 1189	445 1224	450 1235	454 1252
	37 KTAS Fuel - Lb/Hr	425 1202	435 1234	445 1268	450 1282	455 1298
	35 KTAS Fuel - Lb/Hr	427 1275	437 1306	447 1341	452 1357	457 1374
	30 KTAS Fuel - Lb/Hr	437 1517	447 1549	456 1596	461 1615	466 1632
	25 KTAS Fuel - Lb/Hr	447 1854	456 1910	466 1956	470 1972	475 1997

WEIGHT — 19,500 LB Mach — .76 Mi		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 KTAS Fuel - Lb/Hr					
	49 KTAS Fuel - Lb/Hr					
	47 KTAS Fuel - Lb/Hr					
	45 KTAS Fuel - Lb/Hr	425 1187				
	43 KTAS Fuel - Lb/Hr	425 1153	435 1186			
	41 KTAS Fuel - Lb/Hr	425 1158	435 1186	445 1216	450 1232	
	39 KTAS Fuel - Lb/Hr	425 1181	435 1208	445 1244	450 1255	454 1273
	37 KTAS Fuel - Lb/Hr	425 1220	435 1250	445 1286	450 1299	454 1316
	35 KTAS Fuel - Lb/Hr	427 1290	437 1320	447 1357	452 1372	457 1389
	30 KTAS Fuel - Lb/Hr	437 1528	447 1560	456 1606	461 1626	466 1642
	25 KTAS Fuel - Lb/Hr	447 1858	456 1914	466 1960	470 1976	475 2001

Figure 8-10
(Sheet 6 of 10)

NORMAL CRUISE

WEIGHT — 20,000 LB Mach — .76 Mi		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 KTAS Fuel - Lb/Hr					
	49 KTAS Fuel - Lb/Hr					
	47 KTAS Fuel - Lb/Hr					
	45 KTAS Fuel - Lb/Hr	425 1235				
	43 KTAS Fuel - Lb/Hr	425 1184	435 1217			
	41 KTAS Fuel - Lb/Hr	425 1182	435 1211	445 1243	450 1259	
	39 KTAS Fuel - Lb/Hr	425 1203	435 1228	445 1265	450 1277	454 1294
	37 KTAS Fuel - Lb/Hr	425 1239	435 1268	445 1305	450 1318	454 1334
	35 KTAS Fuel - Lb/Hr	427 1306	437 1335	447 1373	452 1388	457 1405
	30 KTAS Fuel - Lb/Hr	437 1538	447 1571	456 1617	461 1637	466 1653
	25 KTAS Fuel - Lb/Hr	447 1862	456 1919	466 1965	470 1981	475 2006

WEIGHT — 20,500 LB Mach — .76 Mi		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 KTAS Fuel - Lb/Hr					
	49 KTAS Fuel - Lb/Hr					
	47 KTAS Fuel - Lb/Hr					
	45 KTAS Fuel - Lb/Hr					
	43 KTAS Fuel - Lb/Hr	425 1220	435 1253			
	41 KTAS Fuel - Lb/Hr	425 1207	435 1239	445 1271		
	39 KTAS Fuel - Lb/Hr	425 1224	435 1250	445 1286	450 1300	454 1316
	37 KTAS Fuel - Lb/Hr	425 1258	435 1286	445 1324	450 1337	454 1354
	35 KTAS Fuel - Lb/Hr	427 1322	437 1350	447 1389	452 1404	457 1420
	30 KTAS Fuel - Lb/Hr	437 1550	447 1584	456 1630	461 1649	466 1665
	25 KTAS Fuel - Lb/Hr	447 1866	456 1924	466 1969	471 1985	475 2011

Figure 8-10
(Sheet 7 of 10)

NORMAL CRUISE

WEIGHT — 21,000 LB Mach — .76 Mi		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 KTAS Fuel - Lb/Hr					
	49 KTAS Fuel - Lb/Hr					
	47 KTAS Fuel - Lb/Hr					
	45 KTAS Fuel - Lb/Hr					
	43 KTAS Fuel - Lb/Hr	425 1257	435 1292			
	41 KTAS Fuel - Lb/Hr	425 1233	435 1267	445 1299		
	39 KTAS Fuel - Lb/Hr	425 1246	435 1274	445 1308	450 1324	
	37 KTAS Fuel - Lb/Hr	425 1278	435 1304	445 1344	450 1356	454 1375
	35 KTAS Fuel - Lb/Hr	427 1338	437 1365	447 1406	452 1420	457 1437
	30 KTAS Fuel - Lb/Hr	437 1562	447 1597	457 1643	461 1663	466 1678
	25 KTAS Fuel - Lb/Hr	447 1871	456 1929	466 1975	471 1991	475 2017

WEIGHT — 21,500 LB Mach — .76 Mi		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 KTAS Fuel - Lb/Hr					
	49 KTAS Fuel - Lb/Hr					
	47 KTAS Fuel - Lb/Hr					
	45 KTAS Fuel - Lb/Hr					
	43 KTAS Fuel - Lb/Hr	425 1295	435 1332			
	41 KTAS Fuel - Lb/Hr	425 1260	435 1296	445 1329		
	39 KTAS Fuel - Lb/Hr	425 1269	435 1299	445 1331	450 1348	
	37 KTAS Fuel - Lb/Hr	425 1299	435 1323	445 1365	450 1376	454 1396
	35 KTAS Fuel - Lb/Hr	427 1356	437 1382	447 1424	452 1438	457 1455
	30 KTAS Fuel - Lb/Hr	437 1575	447 1611	457 1657	461 1676	466 1692
	25 KTAS Fuel - Lb/Hr	447 1881	456 1939	466 1984	471 2000	475 2027

Figure 8-10
(Sheet 8 of 10)

NORMAL CRUISE

WEIGHT — 22,000 LB Mach — .76 Mi		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 KTAS Fuel - Lb/Hr					
	49 KTAS Fuel - Lb/Hr					
	47 KTAS Fuel - Lb/Hr					
	45 KTAS Fuel - Lb/Hr					
	43 KTAS Fuel - Lb/Hr	425 1341				
	41 KTAS Fuel - Lb/Hr	425 1291	435 1327			
	39 KTAS Fuel - Lb/Hr	425 1292	435 1325	445 1358	450 1375	
	37 KTAS Fuel - Lb/Hr	425 1319	435 1346	445 1385	450 1398	454 1417
	35 KTAS Fuel - Lb/Hr	427 1374	437 1399	447 1443	452 1456	457 1475
	30 KTAS Fuel - Lb/Hr	437 1588	447 1625	457 1670	461 1690	466 1707
	25 KTAS Fuel - Lb/Hr	447 1891	456 1949	466 1994	471 2011	475 2037

WEIGHT — 22,500 LB Mach — .76 Mi		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 KTAS Fuel - Lb/Hr					
	49 KTAS Fuel - Lb/Hr					
	47 KTAS Fuel - Lb/Hr					
	45 KTAS Fuel - Lb/Hr					
	43 KTAS Fuel - Lb/Hr	425 1392				
	41 KTAS Fuel - Lb/Hr	425 1327	435 1363			
	39 KTAS Fuel - Lb/Hr	425 1317	435 1352	445 1386	450 1404	
	37 KTAS Fuel - Lb/Hr	425 1340	435 1369	445 1406	450 1422	454 1439
	35 KTAS Fuel - Lb/Hr	427 1393	437 1420	447 1462	452 1475	457 1495
	30 KTAS Fuel - Lb/Hr	437 1601	447 1640	457 1685	461 1704	466 1722
	25 KTAS Fuel - Lb/Hr	447 1901	456 1959	466 2004	471 2021	475 2047

Figure 8-10
(Sheet 9 of 10)

NORMAL CRUISE

WEIGHT — 23,000 LB Mach — .76 Mi		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 KTAS Fuel - Lb/Hr					
	49 KTAS Fuel - Lb/Hr					
	47 KTAS Fuel - Lb/Hr					
	45 KTAS Fuel - Lb/Hr					
	43 KTAS Fuel - Lb/Hr					
	41 KTAS Fuel - Lb/Hr	425 1364	435 1400			
	39 KTAS Fuel - Lb/Hr	425 1343	435 1380	445 1414		
	37 KTAS Fuel - Lb/Hr	425 1361	435 1393	445 1427	450 1445	455 1463
	35 KTAS Fuel - Lb/Hr	427 1412	437 1442	447 1481	452 1494	457 1515
	30 KTAS Fuel - Lb/Hr	437 1614	447 1655	457 1699	461 1718	466 1737
	25 KTAS Fuel - Lb/Hr	447 1911	456 1969	466 2013	471 2032	475 2058

Figure 8-10
(Sheet 10 of 10)

MAXIMUM SPECIFIC RANGE

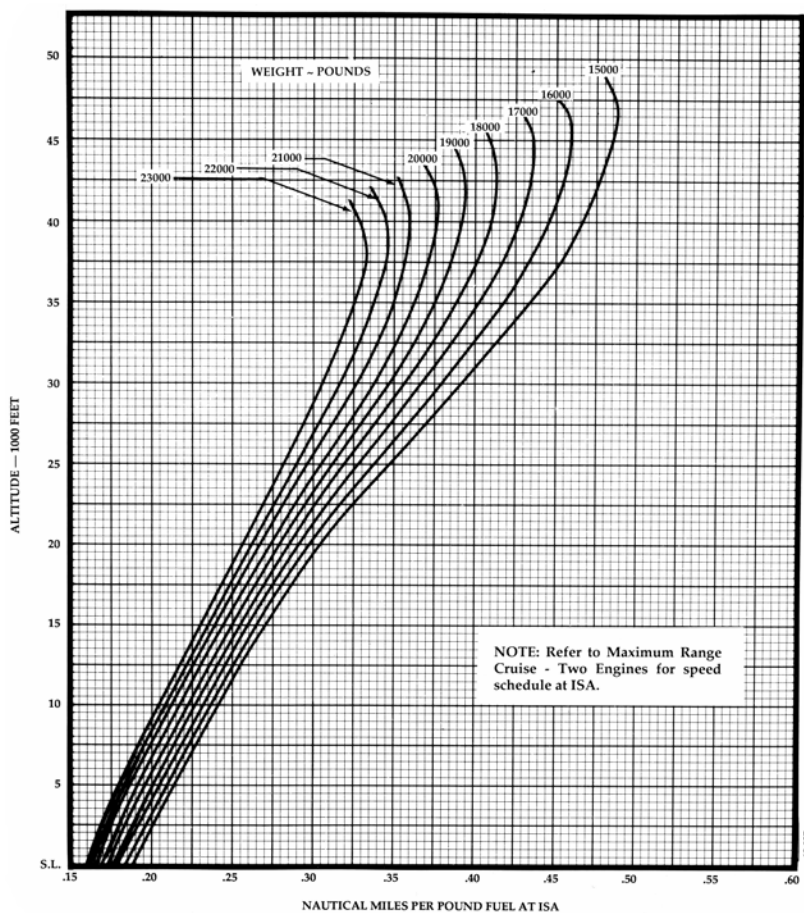


Figure 8-11

**MAXIMUM RANGE CRUISE
TWO ENGINE**

WEIGHT — 14,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind	.733				
	KTAS	409				
	Fuel - Lb/Hr	820				
	49 Mach Ind	.708	.711	.713		
	KTAS	395	406	417		
	Fuel - Lb/Hr	763	790	814		
	47 Mach Ind	.703	.704	.704	.704	.704
	KTAS	392	402	411	415	420
	Fuel - Lb/Hr	751	776	796	805	816
	45 Mach Ind	.687	.673	.675	.671	.682
	KTAS	383	384	394	396	407
	Fuel - Lb/Hr	743	750	772	779	800
	43 Mach Ind	.677	.654	.654	.654	.654
	KTAS	377	373	382	386	390
	Fuel - Lb/Hr	746	740	759	769	778
	41 Mach Ind	.666	.633	.641	.635	.634
	KTAS	371	361	374	374	378
	Fuel - Lb/Hr	750	730	758	760	770
	39 Mach Ind	.642	.607	.611	.616	.607
	KTAS	357	346	356	363	362
	Fuel - Lb/Hr	740	716	740	754	753
	37 Mach Ind	.606	.601	.604	.604	.598
	KTAS	337	342	352	356	356
	Fuel - Lb/Hr	713	729	753	761	762
	35 Mach Ind	.579	.573	.585	.585	.585
	KTAS	324	328	342	346	350
	Fuel - Lb/Hr	713	728	763	772	780
	30 Mach Ind	.506	.504	.510	.516	.521
	KTAS	289	295	305	311	317
	Fuel - Lb/Hr	705	724	755	774	790
	25 KIAS	191	191	191	191	191
	KTAS	273	279	284	287	290
	Fuel - Lb/Hr	753	776	801	810	818
	20 KIAS	190	191	195	196	195
	KTAS	250	256	267	271	272
	Fuel - Lb/Hr	791	821	856	865	866
	15 KIAS	200	204	199	197	195
	KTAS	243	253	251	251	251
	Fuel - Lb/Hr	888	921	909	906	906
	10 KIAS	207	203	198	195	192
	KTAS	233	232	231	229	228
	Fuel - Lb/Hr	960	948	941	938	938
	5 KIAS	204	198	194	192	191
	KTAS	213	211	210	210	211
	Fuel - Lb/Hr	972	965	972	979	990
	S.L. KIAS	202	199	196	195	194
	KTAS	196	197	198	198	199
	Fuel - Lb/Hr	1016	1028	1041	1052	1066

**Figure 8-12
(Sheet 1 of 19)**

MAXIMUM RANGE CRUISE TWO ENGINE

WEIGHT — 14,500 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind	.732				
	KTAS	409				
	Fuel - Lb/Hr	856				
	49 Mach Ind	.720	.720			
	KTAS	402	411			
	Fuel - Lb/Hr	808	830			
	47 Mach Ind	.704	.704	.704	.704	
	KTAS	392	402	411	415	
	Fuel - Lb/Hr	776	799	819	828	
	45 Mach Ind	.675	.687	.687	.688	.688
	KTAS	376	392	401	406	410
	Fuel - Lb/Hr	751	785	808	820	829
	43 Mach Ind	.662	.657	.658	.659	.658
	KTAS	369	375	384	389	393
	Fuel - Lb/Hr	747	763	783	795	804
	41 Mach Ind	.654	.642	.644	.643	.644
	KTAS	364	366	376	379	384
	Fuel - Lb/Hr	750	759	779	788	800
	39 Mach Ind	.631	.617	.621	.618	.617
	KTAS	351	352	362	364	368
	Fuel - Lb/Hr	740	745	770	774	783
	37 Mach Ind	.604	.604	.604	.604	.604
	KTAS	336	344	352	356	360
	Fuel - Lb/Hr	725	749	768	776	786
	35 Mach Ind	.593	.583	.596	.596	.581
	KTAS	332	334	349	352	347
	Fuel - Lb/Hr	744	756	792	800	789
	30 Mach Ind	.518	.514	.522	.527	.531
	KTAS	296	300	312	318	324
	Fuel - Lb/Hr	736	752	786	803	819
	25 KIAS	195	194	195	195	195
	KTAS	278	283	289	292	295
	Fuel - Lb/Hr	775	802	827	836	843
	20 KIAS	194	194	198	198	197
	KTAS	255	260	271	274	274
	Fuel - Lb/Hr	815	844	877	884	883
	15 KIAS	205	206	201	199	197
	KTAS	249	255	253	253	253
	Fuel - Lb/Hr	921	937	928	925	925
	10 KIAS	209	205	200	196	194
	KTAS	235	235	233	232	230
	Fuel - Lb/Hr	976	967	960	959	959
	5 KIAS	206	200	196	194	193
	KTAS	215	213	212	212	213
	Fuel - Lb/Hr	989	985	994	1003	1015
	S.L. KIAS	204	202	198	197	196
	KTAS	198	200	200	200	201
	Fuel - Lb/Hr	1037	1052	1065	1077	1091

Figure 8-12
(Sheet 2 of 19)

**MAXIMUM RANGE CRUISE
TWO ENGINE**

WEIGHT — 15,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr	.731 408 855	.723 413 868			
	47 Mach Ind KTAS Fuel - Lb/Hr	.706 394 803	.708 404 828	.704 411 844		
	45 Mach Ind KTAS Fuel - Lb/Hr	.695 388 795	.694 396 816	.694 405 837	.695 410 850	.695 415 859
	43 Mach Ind KTAS Fuel - Lb/Hr	.663 369 767	.668 381 795	.667 389 814	.669 395 828	.669 399 837
	41 Mach Ind KTAS Fuel - Lb/Hr	.648 361 761	.650 371 787	.651 380 807	.651 384 817	.654 390 832
	39 Mach Ind KTAS Fuel - Lb/Hr	.632 352 757	.626 357 774	.634 370 802	.626 369 803	.626 373 814
	37 Mach Ind KTAS Fuel - Lb/Hr	.604 336 740	.604 344 765	.604 352 784	.604 356 791	.604 360 803
	35 Mach Ind KTAS Fuel - Lb/Hr	.596 333 761	.594 340 784	.604 354 817	.604 358 825	.591 354 819
	30 Mach Ind KTAS Fuel - Lb/Hr	.529 303 766	.525 307 783	.533 319 818	.537 324 833	.540 329 846
	25 KIAS KTAS Fuel - Lb/Hr	197 281 797	198 288 829	198 294 853	198 297 862	198 300 869
	20 KIAS KTAS Fuel - Lb/Hr	197 259 841	197 265 868	200 274 897	200 276 903	198 277 902
	15 KIAS KTAS Fuel - Lb/Hr	208 252 941	208 258 956	205 258 956	201 256 944	199 256 945
	10 KIAS KTAS Fuel - Lb/Hr	210 237 993	207 237 987	201 235 980	198 234 980	196 233 984
	5 KIAS KTAS Fuel - Lb/Hr	207 217 1008	202 215 1005	198 214 1018	197 215 1028	195 215 1039
	S.L. KIAS KTAS Fuel - Lb/Hr	206 200 1060	204 202 1074	200 202 1088	199 202 1101	198 203 1115

**Figure 8-12
(Sheet 3 of 19)**

MAXIMUM RANGE CRUISE TWO ENGINE

WEIGHT — 15,500 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr	.733 409 891	.723 413 904			
	47 Mach Ind KTAS Fuel - Lb/Hr	.710 396 833	.710 405 858	.711 415 883		
	45 Mach Ind KTAS Fuel - Lb/Hr	.703 392 827	.703 402 851	.703 411 873	.703 415 882	.703 420 892
	43 Mach Ind KTAS Fuel - Lb/Hr	.673 375 800	.682 389 832	.683 399 855	.672 397 853	.682 407 876
	41 Mach Ind KTAS Fuel - Lb/Hr	.654 364 786	.654 373 810	.654 382 829	.654 386 841	.655 390 852
	39 Mach Ind KTAS Fuel - Lb/Hr	.633 353 776	.635 362 803	.635 370 821	.634 374 832	.636 379 845
	37 Mach Ind KTAS Fuel - Lb/Hr	.608 338 760	.610 348 789	.613 357 812	.607 358 813	.609 363 829
	35 Mach Ind KTAS Fuel - Lb/Hr	.601 336 783	.604 346 812	.604 354 832	.601 356 836	.601 360 849
	30 Mach Ind KTAS Fuel - Lb/Hr	.531 304 783	.536 314 814	.545 325 848	.547 330 862	.542 330 863
	25 KIAS KTAS Fuel - Lb/Hr	200 286 824	201 293 856	201 299 879	201 302 888	201 305 895
	20 KIAS KTAS Fuel - Lb/Hr	200 263 867	201 269 893	203 277 918	202 279 922	201 280 923
	15 KIAS KTAS Fuel - Lb/Hr	210 255 960	210 260 972	206 260 973	203 258 965	201 258 965
	10 KIAS KTAS Fuel - Lb/Hr	212 239 1011	209 239 1006	203 237 1000	200 236 1001	199 237 1014
	5 KIAS KTAS Fuel - Lb/Hr	210 219 1029	204 217 1026	200 217 1041	199 217 1053	199 219 1071
	S.L. KIAS KTAS Fuel - Lb/Hr	207 202 1079	206 204 1096	202 204 1113	201 205 1127	200 205 1142

Figure 8-12
(Sheet 4 of 19)

**MAXIMUM RANGE CRUISE
TWO ENGINE**

WEIGHT — 16,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr	.726 405 919				
	47 Mach Ind KTAS Fuel - Lb/Hr	.720 402 877	.720 412 903	.721 421 927		
	45 Mach Ind KTAS Fuel - Lb/Hr	.704 392 849	.704 402 874	.704 411 898	.703 415 905	.703 420 916
	43 Mach Ind KTAS Fuel - Lb/Hr	.689 384 839	.685 391 857	.688 401 882	.689 407 896	.689 411 906
	41 Mach Ind KTAS Fuel - Lb/Hr	.655 365 807	.659 376 835	.657 384 853	.657 387 865	.658 392 877
	39 Mach Ind KTAS Fuel - Lb/Hr	.641 357 804	.643 367 832	.643 375 849	.642 378 861	.645 384 876
	37 Mach Ind KTAS Fuel - Lb/Hr	.616 343 788	.619 353 818	.624 364 842	.616 363 843	.618 368 859
	35 Mach Ind KTAS Fuel - Lb/Hr	.604 338 802	.604 346 828	.604 354 847	.604 358 856	.604 361 870
	30 Mach Ind KTAS Fuel - Lb/Hr	.540 309 812	.547 320 844	.556 332 880	.557 336 891	.546 333 884
	25 KIAS KTAS Fuel - Lb/Hr	204 290 851	204 298 882	205 304 905	205 307 914	205 310 921
	20 KIAS KTAS Fuel - Lb/Hr	204 268 893	204 273 918	205 280 939	204 282 941	204 284 948
	15 KIAS KTAS Fuel - Lb/Hr	212 257 978	211 262 989	208 262 990	204 260 983	203 261 987
	10 KIAS KTAS Fuel - Lb/Hr	215 241 1032	210 241 1025	205 239 1020	202 239 1025	202 241 1043
	5 KIAS KTAS Fuel - Lb/Hr	211 221 1047	205 218 1047	202 219 1064	202 221 1083	202 222 1102
	S.L. KIAS KTAS Fuel - Lb/Hr	209 204 1101	208 206 1118	205 206 1137	204 207 1152	203 207 1168

**Figure 8-12
(Sheet 5 of 19)**

MAXIMUM RANGE CRUISE TWO ENGINE

WEIGHT — 16,500 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr	.732 409 967				
	47 Mach Ind KTAS Fuel - Lb/Hr	.723 404 914	.723 413 940			
	45 Mach Ind KTAS Fuel - Lb/Hr	.711 397 882	.710 406 907	.711 415 932	.704 415 931	
	43 Mach Ind KTAS Fuel - Lb/Hr	.695 387 866	.695 397 891	.692 404 909	.695 410 925	.695 415 935
	41 Mach Ind KTAS Fuel - Lb/Hr	.667 372 842	.671 383 870	.666 389 885	.666 393 897	.668 398 911
	39 Mach Ind KTAS Fuel - Lb/Hr	.649 361 832	.652 372 860	.649 379 877	.649 383 890	.654 390 907
	37 Mach Ind KTAS Fuel - Lb/Hr	.623 347 814	.627 358 847	.625 364 861	.624 368 873	.627 374 890
	35 Mach Ind KTAS Fuel - Lb/Hr	.604 338 817	.604 346 844	.605 354 862	.604 358 873	.604 361 887
	30 Mach Ind KTAS Fuel - Lb/Hr	.550 315 840	.557 326 874	.566 338 909	.556 336 903	.555 339 915
	25 KIAS KTAS Fuel - Lb/Hr	207 295 877	207 301 905	208 309 932	208 312 940	207 313 943
	20 KIAS KTAS Fuel - Lb/Hr	207 272 918	207 277 943	207 283 960	207 286 966	207 288 975
	15 KIAS KTAS Fuel - Lb/Hr	214 260 998	213 264 1007	209 264 1007	206 263 1002	206 265 1015
	10 KIAS KTAS Fuel - Lb/Hr	217 244 1050	212 243 1043	207 241 1040	205 242 1053	205 244 1074
	5 KIAS KTAS Fuel - Lb/Hr	213 223 1067	207 221 1068	205 222 1094	205 224 1114	205 226 1135
	S.L. KIAS KTAS Fuel - Lb/Hr	211 205 1121	209 207 1141	206 208 1161	206 209 1178	205 210 1195

Figure 8-12
(Sheet 6 of 19)

**MAXIMUM RANGE CRUISE
TWO ENGINE**

WEIGHT — 17,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr	.723 404 948	.723 413 975			
	45 Mach Ind KTAS Fuel - Lb/Hr	.708 395 904	.708 404 929	.711 415 959	.709 419 968	
	43 Mach Ind KTAS Fuel - Lb/Hr	.704 392 897	.704 402 924	.700 409 943	.704 415 958	.704 420 969
	41 Mach Ind KTAS Fuel - Lb/Hr	.682 380 880	.672 383 890	.674 394 917	.669 395 923	.681 406 951
	39 Mach Ind KTAS Fuel - Lb/Hr	.654 364 856	.654 373 881	.654 381 902	.654 386 915	.654 390 926
	37 Mach Ind KTAS Fuel - Lb/Hr	.630 351 841	.636 363 876	.631 368 888	.632 372 903	.635 379 920
	35 Mach Ind KTAS Fuel - Lb/Hr	.607 340 838	.611 350 871	.607 356 882	.607 359 895	.610 365 914
	30 Mach Ind KTAS Fuel - Lb/Hr	.559 320 869	.568 332 905	.574 343 936	.558 337 922	.564 344 945
	25 KIAS KTAS Fuel - Lb/Hr	207 295 891	209 303 925	211 313 959	211 316 967	207 314 959
	20 KIAS KTAS Fuel - Lb/Hr	210 276 944	210 282 969	210 287 985	210 290 991	210 293 1001
	15 KIAS KTAS Fuel - Lb/Hr	216 262 1017	215 266 1024	211 266 1025	209 267 1029	209 269 1043
	10 KIAS KTAS Fuel - Lb/Hr	219 246 1069	214 245 1063	209 244 1063	209 246 1082	209 248 1105
	5 KIAS KTAS Fuel - Lb/Hr	215 224 1086	209 222 1090	208 225 1124	208 227 1145	208 229 1167
	S.L. KIAS KTAS Fuel - Lb/Hr	213 207 1142	211 209 1163	208 210 1186	208 211 1204	208 213 1227

**Figure 8-12
(Sheet 7 of 19)**

MAXIMUM RANGE CRUISE TWO ENGINE

WEIGHT — 17,500 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr	.723 404 984	.723 414 1011			
	45 Mach Ind KTAS Fuel - Lb/Hr	.718 401 947	.718 410 974	.718 420 1000		
	43 Mach Ind KTAS Fuel - Lb/Hr	.704 392 919	.704 402 947	.703 411 972	.704 415 981	.703 420 993
	41 Mach Ind KTAS Fuel - Lb/Hr	.689 384 909	.685 391 930	.686 401 954	.687 405 969	.688 410 981
	39 Mach Ind KTAS Fuel - Lb/Hr	.654 364 875	.661 377 910	.654 382 922	.654 386 935	.654 390 947
	37 Mach Ind KTAS Fuel - Lb/Hr	.637 355 869	.644 367 905	.638 372 917	.639 377 932	.644 384 950
	35 Mach Ind KTAS Fuel - Lb/Hr	.614 344 865	.620 355 900	.614 360 910	.614 364 925	.618 370 943
	30 Mach Ind KTAS Fuel - Lb/Hr	.568 325 897	.578 338 935	.571 341 945	.567 342 952	.573 350 975
	25 KIAS KTAS Fuel - Lb/Hr	207 295 907	212 309 954	214 318 985	212 318 984	210 319 989
	20 KIAS KTAS Fuel - Lb/Hr	213 280 970	213 286 993	213 291 1010	213 294 1018	213 297 1028
	15 KIAS KTAS Fuel - Lb/Hr	218 265 1036	216 268 1043	212 268 1045	212 270 1056	212 273 1071
	10 KIAS KTAS Fuel - Lb/Hr	220 248 1087	216 247 1082	212 247 1092	212 249 1111	212 251 1135
	5 KIAS KTAS Fuel - Lb/Hr	217 226 1107	211 225 1115	211 229 1154	211 231 1176	211 233 1199
	S.L. KIAS KTAS Fuel - Lb/Hr	214 209 1164	213 211 1187	211 212 1213	211 214 1236	211 216 1260

Figure 8-12
(Sheet 8 of 19)

**MAXIMUM RANGE CRUISE
TWO ENGINE**

WEIGHT — 18,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr	.732 409 1034				
	45 Mach Ind KTAS Fuel - Lb/Hr	.723 403 985	.723 413 1013	.723 423 1041		
	43 Mach Ind KTAS Fuel - Lb/Hr	.709 396 948	.709 405 978	.707 413 1003	.704 415 1006	.704 420 1019
	41 Mach Ind KTAS Fuel - Lb/Hr	.694 387 934	.693 396 962	.692 404 983	.694 409 1000	.693 414 1010
	39 Mach Ind KTAS Fuel - Lb/Hr	.663 370 907	.664 379 932	.661 386 952	.664 392 969	.663 396 981
	37 Mach Ind KTAS Fuel - Lb/Hr	.644 359 896	.652 372 933	.645 376 945	.647 382 962	.651 388 981
	35 Mach Ind KTAS Fuel - Lb/Hr	.621 348 892	.628 360 929	.621 364 939	.622 368 955	.626 375 973
	30 Mach Ind KTAS Fuel - Lb/Hr	.577 330 926	.588 344 965	.573 343 964	.576 348 983	.582 355 1005
	25 KIAS KTAS Fuel - Lb/Hr	211 301 937	216 314 983	217 322 1012	213 320 1005	214 324 1019
	20 KIAS KTAS Fuel - Lb/Hr	216 284 996	216 290 1018	216 295 1035	216 298 1044	216 301 1058
	15 KIAS KTAS Fuel - Lb/Hr	220 267 1055	218 270 1060	215 272 1070	215 274 1084	215 277 1100
	10 KIAS KTAS Fuel - Lb/Hr	222 250 1106	217 249 1101	215 251 1119	215 253 1142	215 255 1167
	5 KIAS KTAS Fuel - Lb/Hr	218 228 1126	214 228 1143	214 232 1185	214 234 1208	214 236 1231
	S.L. KIAS KTAS Fuel - Lb/Hr	216 210 1186	215 213 1210	214 215 1244	214 217 1269	214 219 1294

**Figure 8-12
(Sheet 9 of 19)**

MAXIMUM RANGE CRUISE TWO ENGINE

WEIGHT — 18,500 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr	.722 403 1063				
	45 Mach Ind KTAS Fuel - Lb/Hr	.723 404 1019	.723 413 1047			
	43 Mach Ind KTAS Fuel - Lb/Hr	.704 393 968	.713 407 1008	.713 417 1037	.710 419 1042	
	41 Mach Ind KTAS Fuel - Lb/Hr	.701 391 964	.701 400 995	.693 405 1009	.704 415 1036	.701 418 1043
	39 Mach Ind KTAS Fuel - Lb/Hr	.673 375 940	.668 382 960	.669 390 984	.666 393 993	.673 401 1016
	37 Mach Ind KTAS Fuel - Lb/Hr	.651 363 924	.654 373 953	.651 380 973	.654 386 991	.653 389 1002
	35 Mach Ind KTAS Fuel - Lb/Hr	.627 351 919	.636 364 957	.627 368 967	.630 373 985	.633 379 1003
	30 Mach Ind KTAS Fuel - Lb/Hr	.585 335 954	.598 350 995	.581 348 994	.584 353 1013	.591 360 1035
	25 KIAS KTAS Fuel - Lb/Hr	215 306 968	219 318 1012	220 326 1035	217 325 1035	217 329 1049
	20 KIAS KTAS Fuel - Lb/Hr	219 288 1021	219 294 1044	219 300 1061	219 302 1071	219 305 1086
	15 KIAS KTAS Fuel - Lb/Hr	222 269 1075	219 272 1079	218 275 1097	218 278 1112	218 280 1126
	10 KIAS KTAS Fuel - Lb/Hr	225 253 1130	219 251 1122	218 254 1149	217 256 1171	217 258 1198
	5 KIAS KTAS Fuel - Lb/Hr	220 230 1147	217 231 1172	217 235 1217	217 237 1241	217 239 1264
	S.L. KIAS KTAS Fuel - Lb/Hr	218 212 1208	217 215 1234	217 218 1276	217 220 1301	217 222 1328

**Figure 8-12
(Sheet 10 of 19)**

**MAXIMUM RANGE CRUISE
TWO ENGINE**

WEIGHT — 19,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr					
	45 Mach Ind KTAS Fuel - Lb/Hr	.723 404 1053	.723 413 1083			
	43 Mach Ind KTAS Fuel - Lb/Hr	.713 398 1009	.713 408 1035	.713 417 1063	.713 421 1076	
	41 Mach Ind KTAS Fuel - Lb/Hr	.704 392 988	.704 402 1021	.703 411 1048	.704 415 1058	.703 420 1070
	39 Mach Ind KTAS Fuel - Lb/Hr	.685 382 975	.683 390 1002	.683 399 1025	.686 405 1045	.684 408 1054
	37 Mach Ind KTAS Fuel - Lb/Hr	.654 364 946	.654 373 971	.654 381 996	.654 386 1011	.654 390 1023
	35 Mach Ind KTAS Fuel - Lb/Hr	.634 355 946	.643 368 984	.634 372 996	.637 377 1015	.641 384 1033
	30 Mach Ind KTAS Fuel - Lb/Hr	.594 340 982	.604 354 1020	.589 352 1023	.592 358 1044	.599 366 1066
	25 KIAS KTAS Fuel - Lb/Hr	219 311 998	223 323 1041	219 324 1046	220 329 1064	220 333 1079
	20 KIAS KTAS Fuel - Lb/Hr	222 292 1047	222 298 1069	222 304 1087	222 306 1099	222 309 1114
	15 KIAS KTAS Fuel - Lb/Hr	224 272 1095	221 274 1098	221 279 1124	221 282 1140	221 284 1158
	10 KIAS KTAS Fuel - Lb/Hr	226 254 1147	221 253 1142	221 257 1177	221 260 1202	225 267 1251
	5 KIAS KTAS Fuel - Lb/Hr	222 232 1167	220 234 1201	220 238 1248	220 240 1273	220 242 1299
	S.L. KIAS Fuel - Lb/Hr	220 214 1230	220 217 1262	220 221 1308	220 223 1334	220 225 1362

**Figure 8-12
(Sheet 11 of 19)**

MAXIMUM RANGE CRUISE TWO ENGINE

WEIGHT — 19,500 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr					
	45 Mach Ind KTAS Fuel - Lb/Hr	.728 406 1097	.728 416 1128			
	43 Mach Ind KTAS Fuel - Lb/Hr	.722 403 1052	.722 413 1080	.722 422 1109		
	41 Mach Ind KTAS Fuel - Lb/Hr	.704 392 1009	.705 403 1046	.704 411 1073	.704 415 1081	.704 420 1095
	39 Mach Ind KTAS Fuel - Lb/Hr	.691 385 1003	.690 394 1033	.688 402 1054	.691 408 1074	.690 412 1085
	37 Mach Ind KTAS Fuel - Lb/Hr	.654 365 965	.654 373 992	.654 382 1017	.661 390 1041	.656 391 1046
	35 Mach Ind KTAS Fuel - Lb/Hr	.641 359 973	.640 367 998	.640 375 1025	.644 382 1045	.643 385 1054
	30 Mach Ind KTAS Fuel - Lb/Hr	.602 345 1011	.604 354 1034	.596 356 1052	.601 363 1074	.604 369 1090
	25 KIAS KTAS Fuel - Lb/Hr	222 316 1028	226 328 1070	222 329 1076	223 334 1094	224 338 1110
	20 KIAS KTAS Fuel - Lb/Hr	225 295 1073	225 302 1094	225 308 1113	225 310 1128	225 313 1143
	15 KIAS KTAS Fuel - Lb/Hr	226 274 1115	224 278 1124	224 283 1152	224 285 1169	224 288 1186
	10 KIAS KTAS Fuel - Lb/Hr	228 256 1164	224 256 1168	223 261 1206	223 263 1230	227 270 1275
	5 KIAS KTAS Fuel - Lb/Hr	223 233 1188	223 237 1230	223 241 1280	223 243 1306	239 263 1422
	S.L. KIAS KTAS Fuel - Lb/Hr	222 216 1259	222 220 1293	222 224 1341	222 226 1366	222 228 1394

Figure 8-12
(Sheet 12 of 19)

**MAXIMUM RANGE CRUISE
TWO ENGINE**

WEIGHT — 20,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr					
	45 Mach Ind KTAS Fuel - Lb/Hr	.732 409 1143				
	43 Mach Ind KTAS Fuel - Lb/Hr	.723 403 1085	.723 413 1114	.723 423 1144		
	41 Mach Ind KTAS Fuel - Lb/Hr	.703 392 1035	.712 407 1080	.710 414 1108	.704 415 1106	.706 421 1124
	39 Mach Ind KTAS Fuel - Lb/Hr	.695 387 1028	.695 397 1061	.680 397 1064	.695 410 1102	.695 415 1113
	37 Mach Ind KTAS Fuel - Lb/Hr	.662 369 996	.662 378 1025	.662 387 1050	.662 391 1063	.664 396 1080
	35 Mach Ind KTAS Fuel - Lb/Hr	.647 362 1001	.646 371 1027	.646 379 1053	.651 386 1075	.648 388 1082
	30 Mach Ind KTAS Fuel - Lb/Hr	.604 346 1029	.604 354 1048	.603 361 1081	.604 365 1096	.604 369 1105
	25 KIAS KTAS Fuel - Lb/Hr	226 321 1058	230 333 1098	225 334 1107	226 338 1124	227 343 1140
	20 KIAS KTAS Fuel - Lb/Hr	228 299 1098	228 306 1120	228 311 1141	228 314 1156	228 317 1172
	15 KIAS KTAS Fuel - Lb/Hr	228 277 1135	227 281 1150	227 286 1179	227 289 1198	227 292 1214
	10 KIAS KTAS Fuel - Lb/Hr	229 257 1182	226 259 1195	225 263 1233	224 264 1251	229 272 1299
	5 KIAS KTAS Fuel - Lb/Hr	226 236 1214	226 240 1260	226 244 1312	226 247 1338	241 266 1444
	S.L. KIAS KTAS Fuel - Lb/Hr	225 219 1289	225 223 1323	225 227 1372	225 229 1400	225 231 1429

**Figure 8-12
(Sheet 13 of 19)**

MAXIMUM RANGE CRUISE TWO ENGINE

WEIGHT — 20,500 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr					
	45 Mach Ind KTAS Fuel - Lb/Hr	.722 403 1173				
	43 Mach Ind KTAS Fuel - Lb/Hr	.723 403 1117	.723 413 1148	.723 423 1179		
	41 Mach Ind KTAS Fuel - Lb/Hr	.707 394 1068	.713 407 1105	.713 417 1139	.710 419 1145	.711 425 1160
	39 Mach Ind KTAS Fuel - Lb/Hr	.704 392 1060	.704 402 1096	.695 406 1111	.704 415 1137	.704 420 1149
	37 Mach Ind KTAS Fuel - Lb/Hr	.671 374 1028	.671 383 1059	.670 391 1083	.670 395 1097	.672 401 1114
	35 Mach Ind KTAS Fuel - Lb/Hr	.653 366 1028	.653 374 1056	.653 383 1083	.654 388 1098	.653 391 1111
	30 Mach Ind KTAS Fuel - Lb/Hr	.604 346 1044	.604 354 1065	.604 361 1099	.604 365 1112	.604 369 1121
	25 KIAS KTAS Fuel - Lb/Hr	230 326 1087	232 337 1124	229 338 1137	229 343 1153	230 347 1170
	20 KIAS KTAS Fuel - Lb/Hr	231 303 1124	231 309 1145	230 313 1163	230 316 1178	230 319 1193
	15 KIAS KTAS Fuel - Lb/Hr	230 279 1156	230 284 1175	230 290 1207	230 293 1226	230 295 1242
	10 KIAS KTAS Fuel - Lb/Hr	230 259 1200	229 263 1222	227 265 1257	229 270 1293	232 275 1324
	5 KIAS KTAS Fuel - Lb/Hr	229 239 1241	228 243 1290	228 247 1344	243 265 1450	244 268 1466
	S.L. KIAS KTAS Fuel - Lb/Hr	228 222 1317	228 226 1353	228 230 1405	228 232 1434	228 233 1464

**Figure 8-12
(Sheet 14 of 19)**

**MAXIMUM RANGE CRUISE
TWO ENGINE**

WEIGHT — 21,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr					
	45 Mach Ind KTAS Fuel - Lb/Hr					
	43 Mach Ind KTAS Fuel - Lb/Hr	.723 403 1152	.723 413 1184			
	41 Mach Ind KTAS Fuel - Lb/Hr	.715 399 1108	.715 408 1135	.715 418 1168	.715 422 1180	
	39 Mach Ind KTAS Fuel - Lb/Hr	.699 390 1077	.703 402 1118	.703 411 1150	.703 415 1159	.703 420 1172
	37 Mach Ind KTAS Fuel - Lb/Hr	.684 381 1068	.684 391 1101	.683 399 1124	.684 404 1142	.684 408 1156
	35 Mach Ind KTAS Fuel - Lb/Hr	.654 366 1046	.654 375 1077	.654 383 1103	.654 387 1116	.654 391 1132
	30 Mach Ind KTAS Fuel - Lb/Hr	.605 346 1061	.604 354 1082	.604 361 1116	.605 366 1130	.605 369 1139
	25 KIAS KTAS Fuel - Lb/Hr	233 331 1117	232 337 1138	232 343 1167	232 347 1183	233 352 1201
	20 KIAS KTAS Fuel - Lb/Hr	234 306 1151	234 313 1171	230 313 1177	230 316 1192	230 319 1208
	15 KIAS KTAS Fuel - Lb/Hr	233 282 1180	233 288 1202	233 293 1237	233 296 1255	233 299 1271
	10 KIAS KTAS Fuel - Lb/Hr	232 261 1220	232 266 1251	229 267 1282	232 273 1319	234 278 1348
	5 KIAS KTAS Fuel - Lb/Hr	231 242 1269	231 246 1321	231 250 1377	245 267 1469	245 270 1487
	S.L. KIAS KTAS Fuel - Lb/Hr	231 224 1347	231 228 1384	231 232 1439	231 234 1468	269 275 1746

**Figure 8-12
(Sheet 15 of 19)**

MAXIMUM RANGE CRUISE TWO ENGINE

WEIGHT — 21,500 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr					
	45 Mach Ind KTAS Fuel - Lb/Hr					
	43 Mach Ind KTAS Fuel - Lb/Hr	.728 407 1198	.728 416 1231			
	41 Mach Ind KTAS Fuel - Lb/Hr	.723 403 1151	.723 413 1181	.723 422 1212	.723 427 1228	
	39 Mach Ind KTAS Fuel - Lb/Hr	.703 392 1109	.704 402 1141	.704 411 1175	.704 415 1182	.704 420 1198
	37 Mach Ind KTAS Fuel - Lb/Hr	.690 384 1095	.690 394 1130	.678 396 1137	.690 407 1175	.689 411 1186
	35 Mach Ind KTAS Fuel - Lb/Hr	.655 367 1067	.655 376 1099	.655 384 1125	.655 388 1139	.655 392 1155
	30 Mach Ind KTAS Fuel - Lb/Hr	.612 351 1089	.604 354 1100	.610 365 1144	.612 370 1160	.612 374 1170
	25 KIAS KTAS Fuel - Lb/Hr	237 336 1147	230 334 1143	235 347 1197	235 352 1213	236 356 1231
	20 KIAS KTAS Fuel - Lb/Hr	237 310 1177	237 316 1198	231 315 1199	231 319 1215	232 323 1235
	15 KIAS KTAS Fuel - Lb/Hr	236 286 1206	236 291 1229	235 297 1265	235 300 1283	236 302 1299
	10 KIAS KTAS Fuel - Lb/Hr	235 264 1246	235 269 1279	235 274 1327	235 277 1347	236 281 1372
	5 KIAS KTAS Fuel - Lb/Hr	234 244 1295	234 249 1352	245 265 1467	245 268 1483	247 272 1508
	S.L. KIAS KTAS Fuel - Lb/Hr	233 227 1378	233 231 1416	233 235 1471	233 237 1501	254 260 1651

Figure 8-12
(Sheet 16 of 19)

**MAXIMUM RANGE CRUISE
TWO ENGINE**

WEIGHT — 22,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr					
	45 Mach Ind KTAS Fuel - Lb/Hr					
	43 Mach Ind KTAS Fuel - Lb/Hr	.732 409 1245	.732 419 1280			
	41 Mach Ind KTAS Fuel - Lb/Hr	.723 403 1183	.723 413 1214	.723 423 1246		
	39 Mach Ind KTAS Fuel - Lb/Hr	.703 392 1135	.710 405 1174	.708 414 1208	.703 415 1206	.704 420 1224
	37 Mach Ind KTAS Fuel - Lb/Hr	.685 382 1107	.695 397 1158	.679 396 1162	.695 410 1203	.695 414 1216
	35 Mach Ind KTAS Fuel - Lb/Hr	.663 371 1098	.662 380 1131	.662 388 1157	.662 393 1174	.662 397 1189
	30 Mach Ind KTAS Fuel - Lb/Hr	.619 355 1117	.609 357 1128	.616 369 1174	.619 374 1191	.610 373 1186
	25 KIAS KTAS Fuel - Lb/Hr	240 341 1177	233 338 1174	238 352 1226	238 356 1242	239 361 1261
	20 KIAS KTAS Fuel - Lb/Hr	239 314 1203	237 317 1212	234 320 1231	235 323 1248	235 327 1267
	15 KIAS KTAS Fuel - Lb/Hr	238 289 1231	238 295 1255	238 300 1293	238 303 1311	238 306 1327
	10 KIAS KTAS Fuel - Lb/Hr	238 267 1272	237 272 1307	238 277 1356	238 280 1374	239 284 1397
	5 KIAS KTAS Fuel - Lb/Hr	237 247 1324	237 252 1383	246 266 1483	247 270 1504	249 274 1526
	S.L. KIAS KTAS Fuel - Lb/Hr	236 230 1408	236 234 1446	236 238 1505	270 274 1758	256 262 1670

**Figure 8-12
(Sheet 17 of 19)**

MAXIMUM RANGE CRUISE TWO ENGINE

WEIGHT — 22,500 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr					
	45 Mach Ind KTAS Fuel - Lb/Hr					
	43 Mach Ind KTAS Fuel - Lb/Hr	.722 403 1268				
	41 Mach Ind KTAS Fuel - Lb/Hr	.723 404 1215	.723 413 1249	.723 423 1281		
	39 Mach Ind KTAS Fuel - Lb/Hr	.706 394 1165	.711 406 1199	.713 417 1242	.707 417 1240	.706 422 1255
	37 Mach Ind KTAS Fuel - Lb/Hr	.693 387 1145	.702 401 1191	.694 405 1212	.703 415 1238	.702 419 1251
	35 Mach Ind KTAS Fuel - Lb/Hr	.671 376 1130	.670 384 1165	.670 393 1191	.669 397 1209	.669 401 1223
	30 Mach Ind KTAS Fuel - Lb/Hr	.626 359 1146	.615 360 1158	.623 373 1205	.626 378 1222	.616 376 1216
	25 KIAS KTAS Fuel - Lb/Hr	244 345 1206	236 342 1204	241 356 1257	241 360 1273	242 365 1291
	20 KIAS KTAS Fuel - Lb/Hr	242 317 1229	237 317 1226	238 324 1263	238 328 1280	239 332 1299
	15 KIAS KTAS Fuel - Lb/Hr	241 292 1256	240 297 1278	241 304 1322	241 307 1340	241 309 1355
	10 KIAS KTAS Fuel - Lb/Hr	240 270 1299	238 273 1329	240 280 1383	240 283 1401	241 286 1421
	5 KIAS KTAS Fuel - Lb/Hr	239 250 1352	238 254 1409	248 268 1505	249 272 1525	250 275 1545
	S.L. KIAS KTAS Fuel - Lb/Hr	239 232 1439	239 236 1479	239 241 1539	257 261 1677	257 264 1691

Figure 8-12
(Sheet 18 of 19)

**MAXIMUM RANGE CRUISE
TWO ENGINE**

WEIGHT — 23,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr					
	45 Mach Ind KTAS Fuel - Lb/Hr					
	43 Mach Ind KTAS Fuel - Lb/Hr	.726 405 1323				
	41 Mach Ind KTAS Fuel - Lb/Hr	.723 404 1249	.723 413 1284	.723 423 1317		
	39 Mach Ind KTAS Fuel - Lb/Hr	.713 398 1204	.713 407 1231	.713 417 1267	.713 421 1280	.713 426 1295
	37 Mach Ind KTAS Fuel - Lb/Hr	.699 390 1179	.703 402 1215	.703 411 1252	.703 415 1262	.702 419 1273
	35 Mach Ind KTAS Fuel - Lb/Hr	.668 374 1147	.683 392 1208	.668 392 1209	.686 407 1261	.676 405 1255
	30 Mach Ind KTAS Fuel - Lb/Hr	.625 358 1161	.621 364 1187	.628 376 1234	.624 377 1237	.621 380 1247
	25 KIAS KTAS Fuel - Lb/Hr	247 349 1234	239 347 1235	244 360 1287	244 364 1302	245 370 1322
	20 KIAS KTAS Fuel - Lb/Hr	245 321 1256	240 321 1257	241 329 1294	241 332 1313	242 336 1331
	15 KIAS KTAS Fuel - Lb/Hr	244 296 1282	243 301 1308	244 307 1350	244 310 1368	244 313 1383
	10 KIAS KTAS Fuel - Lb/Hr	243 273 1325	240 275 1352	243 283 1410	243 286 1428	243 289 1445
	5 KIAS KTAS Fuel - Lb/Hr	242 253 1381	240 256 1435	250 270 1528	251 274 1546	252 277 1565
	S.L. KIAS KTAS Fuel - Lb/Hr	241 235 1469	241 239 1511	259 261 1683	259 263 1696	259 265 1710

**Figure 8-12
(Sheet 19 of 19)**

LONG RANGE CRUISE TWO ENGINE

WEIGHT — 14,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51	Mach Ind .746				
		KTAS 416				
		Fuel - Lb/Hr 843				
	49	Mach Ind .734	.735	.726		
		KTAS 409	420	424		
		Fuel - Lb/Hr 800	826	832		
	47	Mach Ind .721	.723	.724	.724	
		KTAS 402	413	423	428	
		Fuel - Lb/Hr 779	806	828	838	
	45	Mach Ind .712	.713	.714	.714	.714
		KTAS 397	407	417	421	426
		Fuel - Lb/Hr 779	803	826	836	846
	43	Mach Ind .700	.696	.695	.697	.698
		KTAS 390	397	406	411	416
		Fuel - Lb/Hr 779	796	815	828	839
	41	Mach Ind .684	.673	.677	.674	.676
		KTAS 381	384	395	397	403
		Fuel - Lb/Hr 777	785	809	815	829
	39	Mach Ind .661	.646	.657	.650	.646
		KTAS 368	368	383	383	385
		Fuel - Lb/Hr 769	769	804	803	808
	37	Mach Ind .629	.623	.630	.629	.623
		KTAS 350	355	367	370	371
		Fuel - Lb/Hr 747	764	793	800	801
	35	Mach Ind .610	.606	.612	.612	.607
		KTAS 341	347	358	362	363
		Fuel - Lb/Hr 758	777	807	816	817
	30	Mach Ind .541	.538	.544	.547	.550
		KTAS 309	314	325	330	335
		Fuel - Lb/Hr 762	780	813	828	843
	25	KTAS 205	202	206	208	208
		KTAS 291	294	305	311	315
		Fuel - Lb/Hr 812	826	868	886	896
	20	KTAS 205	211	214	213	211
		KTAS 269	282	292	294	294
		Fuel - Lb/Hr 858	911	944	948	946
	15	KTAS 221	221	218	214	212
		KTAS 268	273	274	272	271
		Fuel - Lb/Hr 990	1004	1002	993	990
	10	KTAS 224	220	214	211	208
		KTAS 251	251	250	248	247
		Fuel - Lb/Hr 1048	1036	1028	1025	1025
	5	KTAS 220	215	210	209	207
		KTAS 230	228	227	228	228
		Fuel - Lb/Hr 1059	1055	1063	1073	1084
	S.L.	KTAS 218	216	213	212	211
		KTAS 212	214	214	215	215
		Fuel - Lb/Hr 1109	1125	1141	1153	1166

Figure 8-13
(Sheet 1 of 19)

**LONG RANGE CRUISE
TWO ENGINE**

WEIGHT — 14,500 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind	.744				
	KTAS	416				
	Fuel - Lb/Hr	876				
	49 Mach Ind	.738	.739			
	KTAS	412	422			
	Fuel - Lb/Hr	837	861			
	47 Mach Ind	.728	.729	.729	.727	
	KTAS	406	416	426	430	
	Fuel - Lb/Hr	811	836	857	865	
	45 Mach Ind	.716	.715	.717	.718	.717
	KTAS	399	408	418	424	428
	Fuel - Lb/Hr	805	827	851	865	872
	43 Mach Ind	.699	.705	.703	.704	.704
	KTAS	390	402	410	415	420
	Fuel - Lb/Hr	796	826	845	858	868
	41 Mach Ind	.682	.683	.682	.682	.687
	KTAS	380	389	398	402	409
	Fuel - Lb/Hr	790	815	834	845	862
	39 Mach Ind	.662	.657	.664	.657	.658
	KTAS	368	374	387	387	392
	Fuel - Lb/Hr	784	802	831	831	843
	37 Mach Ind	.634	.630	.638	.633	.630
	KTAS	353	359	372	373	375
	Fuel - Lb/Hr	769	789	820	821	828
	35 Mach Ind	.614	.613	.619	.617	.612
	KTAS	343	351	362	365	366
	Fuel - Lb/Hr	778	803	831	837	839
	30 Mach Ind	.550	.549	.555	.558	.559
	KTAS	314	321	331	336	341
	Fuel - Lb/Hr	789	811	844	858	871
	25 KIAS	205	206	209	210	211
	KTAS	292	299	310	315	319
	Fuel - Lb/Hr	825	856	894	910	920
	20 KIAS	207	214	217	216	213
	KTAS	272	286	296	297	297
	Fuel - Lb/Hr	878	937	967	969	966
	15 KIAS	224	223	220	216	213
	KTAS	271	276	277	275	274
	Fuel - Lb/Hr	1012	1024	1024	1013	1010
	10 KIAS	227	222	216	213	210
	KTAS	254	254	252	250	249
	Fuel - Lb/Hr	1070	1057	1049	1048	1049
	5 KIAS	222	217	213	211	210
	KTAS	232	230	230	230	231
	Fuel - Lb/Hr	1080	1077	1088	1099	1111
	S.L. KIAS	220	219	215	214	213
	KTAS	214	216	217	217	218
	Fuel - Lb/Hr	1132	1150	1167	1180	1195

**Figure 8-13
(Sheet 2 of 19)**

LONG RANGE CRUISE TWO ENGINE

WEIGHT — 15,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr	.743 415 878	.743 425 902			
	47 Mach Ind KTAS Fuel - Lb/Hr	.733 409 843	.732 418 866	.730 426 884		
	45 Mach Ind KTAS Fuel - Lb/Hr	.721 402 834	.720 411 856	.720 420 878	.722 426 892	.720 430 899
	43 Mach Ind KTAS Fuel - Lb/Hr	.708 394 827	.711 406 855	.709 414 875	.709 418 886	.710 423 898
	41 Mach Ind KTAS Fuel - Lb/Hr	.688 383 815	.691 394 845	.689 402 862	.689 406 874	.693 413 891
	39 Mach Ind KTAS Fuel - Lb/Hr	.665 370 805	.667 380 833	.669 390 855	.666 392 862	.668 398 877
	37 Mach Ind KTAS Fuel - Lb/Hr	.639 355 790	.638 364 816	.648 378 849	.637 375 842	.638 380 856
	35 Mach Ind KTAS Fuel - Lb/Hr	.618 346 797	.620 355 827	.625 366 854	.619 366 854	.619 370 866
	30 Mach Ind KTAS Fuel - Lb/Hr	.557 318 814	.560 327 843	.566 338 876	.568 342 889	.564 344 893
	25 KIAS KTAS Fuel - Lb/Hr	208 296 847	209 304 883	212 314 919	213 319 934	213 322 943
	20 KIAS KTAS Fuel - Lb/Hr	211 276 905	217 290 962	219 299 989	218 300 989	215 299 985
	15 KIAS KTAS Fuel - Lb/Hr	226 274 1033	225 278 1043	221 279 1041	218 277 1032	215 276 1029
	10 KIAS KTAS Fuel - Lb/Hr	229 257 1090	224 257 1079	218 254 1070	215 253 1070	212 251 1073
	5 KIAS KTAS Fuel - Lb/Hr	225 234 1101	219 232 1099	215 232 1112	213 233 1125	212 233 1137
	S.L. KIAS KTAS Fuel - Lb/Hr	223 216 1157	221 219 1176	218 219 1193	217 220 1208	215 220 1223

Figure 8-13
(Sheet 3 of 19)

**LONG RANGE CRUISE
TWO ENGINE**

WEIGHT — 15,500 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind					
	KTAS					
	Fuel - Lb/Hr					
	49 Mach Ind	.746	.743			
	KTAS	416	425			
	Fuel - Lb/Hr	916	935			
	47 Mach Ind	.733	.733	.735		
	KTAS	409	419	430		
	Fuel - Lb/Hr	870	896	923		
	45 Mach Ind	.726	.725	.725	.725	.724
	KTAS	405	414	424	428	432
	Fuel - Lb/Hr	862	886	909	919	928
	43 Mach Ind	.715	.713	.715	.714	.715
	KTAS	399	407	418	422	427
	Fuel - Lb/Hr	858	879	905	916	928
	41 Mach Ind	.696	.699	.696	.696	.698
	KTAS	388	399	406	411	416
	Fuel - Lb/Hr	845	875	891	904	918
	39 Mach Ind	.673	.676	.674	.674	.678
	KTAS	375	386	393	397	404
	Fuel - Lb/Hr	833	864	879	892	911
	37 Mach Ind	.645	.649	.653	.646	.649
	KTAS	359	370	381	380	386
	Fuel - Lb/Hr	815	848	873	873	891
	35 Mach Ind	.624	.627	.632	.623	.625
	KTAS	349	359	370	369	374
	Fuel - Lb/Hr	820	852	878	876	892
	30 Mach Ind	.566	.570	.576	.576	.570
	KTAS	323	333	344	347	347
	Fuel - Lb/Hr	843	874	907	916	916
	25 KIAS	210	212	214	216	215
	KTAS	299	308	318	323	325
	Fuel - Lb/Hr	872	909	944	958	962
	20 KIAS	214	220	222	220	217
	KTAS	281	294	302	303	302
	Fuel - Lb/Hr	933	987	1012	1010	1006
	15 KIAS	229	228	223	219	217
	KTAS	277	281	281	279	278
	Fuel - Lb/Hr	1055	1063	1060	1051	1049
	10 KIAS	231	226	220	217	214
	KTAS	260	259	256	255	254
	Fuel - Lb/Hr	1112	1101	1092	1093	1097
	5 KIAS	227	221	217	216	214
	KTAS	237	234	235	235	236
	Fuel - Lb/Hr	1123	1122	1138	1152	1166
	S.L. KIAS	225	223	220	219	217
	KTAS	218	221	221	222	223
	Fuel - Lb/Hr	1180	1199	1219	1235	1250

**Figure 8-13
(Sheet 4 of 19)**

LONG RANGE CRUISE TWO ENGINE

WEIGHT — 16,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr	.746 416 954				
	47 Mach Ind KTAS Fuel - Lb/Hr	.737 411 907	.737 421 933			
	45 Mach Ind KTAS Fuel - Lb/Hr	.732 408 893	.730 417 917	.731 427 942	.729 430 948	
	43 Mach Ind KTAS Fuel - Lb/Hr	.719 401 884	.716 409 905	.717 419 929	.719 424 944	.718 428 954
	41 Mach Ind KTAS Fuel - Lb/Hr	.704 393 876	.707 403 905	.703 410 922	.703 415 934	.704 420 948
	39 Mach Ind KTAS Fuel - Lb/Hr	.681 379 862	.685 391 895	.681 397 909	.681 402 923	.688 410 944
	37 Mach Ind KTAS Fuel - Lb/Hr	.655 364 846	.660 376 881	.658 383 896	.656 387 907	.659 393 925
	35 Mach Ind KTAS Fuel - Lb/Hr	.630 352 844	.634 363 878	.636 372 899	.629 372 901	.632 378 919
	30 Mach Ind KTAS Fuel - Lb/Hr	.575 329 873	.581 340 906	.587 351 938	.580 350 937	.579 353 947
	25 KIAS KTAS Fuel - Lb/Hr	213 303 897	215 312 935	217 322 969	218 327 982	216 326 978
	20 KIAS KTAS Fuel - Lb/Hr	218 285 962	223 298 1013	224 306 1034	222 306 1032	219 305 1027
	15 KIAS KTAS Fuel - Lb/Hr	231 280 1077	229 283 1082	225 283 1079	221 281 1071	218 280 1070
	10 KIAS KTAS Fuel - Lb/Hr	234 262 1132	228 261 1119	222 259 1114	219 257 1117	216 257 1125
	5 KIAS KTAS Fuel - Lb/Hr	229 239 1147	223 237 1145	219 237 1164	218 238 1178	217 239 1195
	S.L. KIAS Fuel - Lb/Hr	227 220 1203	225 223 1224	222 223 1245	221 224 1262	220 225 1280

Figure 8-13
(Sheet 5 of 19)

**LONG RANGE CRUISE
TWO ENGINE**

WEIGHT — 16,500 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS					
	Fuel - Lb/Hr					
	49 Mach Ind KTAS	.743				
	Fuel - Lb/Hr	415				
	47 Mach Ind KTAS	.742	.742			
	Fuel - Lb/Hr	414	424			
	45 Mach Ind KTAS	.732	.734	.734	.730	
	Fuel - Lb/Hr	408	420	429	431	
	43 Mach Ind KTAS	.722	.721	.718	.722	.720
	Fuel - Lb/Hr	403	412	419	426	430
	41 Mach Ind KTAS	.710	.709	.709	.708	.710
	Fuel - Lb/Hr	396	405	414	418	423
	39 Mach Ind KTAS	.688	.694	.687	.689	.692
	Fuel - Lb/Hr	383	396	401	406	412
	37 Mach Ind KTAS	.662	.669	.663	.664	.668
	Fuel - Lb/Hr	891	926	938	953	970
	35 Mach Ind KTAS	.636	.642	.639	.636	.639
	Fuel - Lb/Hr	369	382	387	392	398
	30 Mach Ind KTAS	.585	.591	.593	.584	.589
	Fuel - Lb/Hr	874	913	923	939	958
	25 KIAS	216	218	220	220	217
	KTAS	307	316	326	329	328
	Fuel - Lb/Hr	869	905	921	929	947
	20 KIAS	221	226	226	224	221
	KTAS	290	302	309	309	307
	Fuel - Lb/Hr	903	937	962	959	979
	15 KIAS	234	231	226	222	220
	KTAS	283	285	285	283	282
	Fuel - Lb/Hr	1098	1101	1097	1091	1092
	10 KIAS	236	230	224	221	218
	KTAS	265	263	261	260	259
	Fuel - Lb/Hr	1153	1139	1136	1142	1151
	5 KIAS	231	224	221	220	219
	KTAS	241	239	239	240	241
	Fuel - Lb/Hr	1166	1168	1189	1206	1223
	S.L. KIAS	228	227	224	223	222
	KTAS	222	225	225	226	227
	Fuel - Lb/Hr	1225	1249	1271	1291	1307

**Figure 8-13
(Sheet 6 of 19)**

LONG RANGE CRUISE TWO ENGINE

WEIGHT — 17,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr	.745 416 988	.745 426 1016			
	45 Mach Ind KTAS Fuel - Lb/Hr	.733 409 945	.734 419 973	.735 430 1002		
	43 Mach Ind KTAS Fuel - Lb/Hr	.726 405 935	.725 414 963	.724 423 986	.725 428 998	.723 432 1007
	41 Mach Ind KTAS Fuel - Lb/Hr	.715 399 933	.711 406 953	.714 417 981	.713 421 994	.714 426 1007
	39 Mach Ind KTAS Fuel - Lb/Hr	.695 387 920	.700 399 953	.693 404 967	.695 410 983	.696 415 996
	37 Mach Ind KTAS Fuel - Lb/Hr	.669 373 903	.678 387 944	.670 391 952	.672 396 971	.678 404 991
	35 Mach Ind KTAS Fuel - Lb/Hr	.645 361 899	.652 373 938	.645 377 946	.646 382 962	.649 388 982
	30 Mach Ind KTAS Fuel - Lb/Hr	.594 340 933	.601 351 967	.596 356 982	.593 358 990	.597 364 1010
	25 KIAS KTAS Fuel - Lb/Hr	219 311 948	221 321 990	224 331 1024	221 331 1022	220 333 1027
	20 KIAS KTAS Fuel - Lb/Hr	225 294 1018	229 306 1064	229 312 1081	226 311 1075	223 310 1071
	15 KIAS KTAS Fuel - Lb/Hr	236 285 1119	233 288 1121	228 287 1116	224 285 1111	222 285 1115
	10 KIAS KTAS Fuel - Lb/Hr	238 267 1174	231 265 1160	225 263 1158	223 262 1167	221 262 1178
	5 KIAS KTAS Fuel - Lb/Hr	233 243 1188	226 241 1192	223 242 1217	223 243 1236	222 244 1254
	S.L. KIAS KTAS Fuel - Lb/Hr	230 224 1248	229 227 1274	226 227 1298	225 229 1318	224 229 1337

Figure 8-13
(Sheet 7 of 19)

**LONG RANGE CRUISE
TWO ENGINE**

WEIGHT — 17,500 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr	.746 416 1025	.741 424 1042			
	45 Mach Ind KTAS Fuel - Lb/Hr	.737 411 982	.737 421 1009	.737 431 1036		
	43 Mach Ind KTAS Fuel - Lb/Hr	.730 407 963	.730 417 993	.729 426 1019	.727 430 1025	.727 434 1038
	41 Mach Ind KTAS Fuel - Lb/Hr	.719 401 958	.716 409 983	.716 418 1006	.718 424 1024	.717 428 1034
	39 Mach Ind KTAS Fuel - Lb/Hr	.703 392 950	.702 401 976	.699 408 996	.701 413 1012	.702 419 1026
	37 Mach Ind KTAS Fuel - Lb/Hr	.676 377 932	.687 392 975	.677 395 982	.680 401 1002	.684 408 1021
	35 Mach Ind KTAS Fuel - Lb/Hr	.653 366 930	.661 378 969	.653 382 978	.655 388 996	.659 394 1015
	30 Mach Ind KTAS Fuel - Lb/Hr	.603 345 963	.609 356 995	.601 359 1004	.602 364 1022	.606 370 1041
	25 KIAS KTAS Fuel - Lb/Hr	222 316 978	225 327 1020	226 335 1050	223 334 1045	224 338 1058
	20 KIAS KTAS Fuel - Lb/Hr	228 299 1046	232 310 1088	231 315 1102	227 313 1094	225 313 1095
	15 KIAS KTAS Fuel - Lb/Hr	238 288 1140	235 290 1140	229 288 1136	226 287 1134	224 288 1141
	10 KIAS KTAS Fuel - Lb/Hr	240 269 1195	233 266 1179	227 265 1180	225 265 1193	223 265 1208
	5 KIAS KTAS Fuel - Lb/Hr	234 245 1209	228 243 1215	226 244 1245	225 245 1264	224 247 1285
	S.L. KIAS KTAS Fuel - Lb/Hr	232 226 1272	231 229 1299	228 230 1326	227 231 1347	227 232 1369

**Figure 8-13
(Sheet 8 of 19)**

LONG RANGE CRUISE TWO ENGINE

WEIGHT — 18,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr	.745 416 1063				
	45 Mach Ind KTAS Fuel - Lb/Hr	.740 413 1020	.740 423 1048			
	43 Mach Ind KTAS Fuel - Lb/Hr	.728 406 984	.735 420 1024	.734 429 1053	.732 432 1058	
	41 Mach Ind KTAS Fuel - Lb/Hr	.721 402 982	.720 411 1011	.717 419 1028	.721 426 1050	.720 430 1060
	39 Mach Ind KTAS Fuel - Lb/Hr	.708 395 978	.705 402 999	.706 412 1027	.705 416 1040	.708 422 1057
	37 Mach Ind KTAS Fuel - Lb/Hr	.683 380 960	.690 394 998	.683 398 1011	.688 406 1034	.688 410 1046
	35 Mach Ind KTAS Fuel - Lb/Hr	.661 370 959	.669 383 999	.660 387 1009	.664 393 1029	.667 399 1048
	30 Mach Ind KTAS Fuel - Lb/Hr	.610 349 990	.615 360 1020	.607 363 1031	.609 368 1050	.612 373 1068
	25 KIAS KTAS Fuel - Lb/Hr	226 321 1009	229 332 1051	228 337 1070	227 339 1075	227 343 1090
	20 KIAS KTAS Fuel - Lb/Hr	231 303 1072	234 313 1110	232 317 1120	229 315 1115	228 317 1126
	15 KIAS KTAS Fuel - Lb/Hr	240 291 1160	236 292 1159	231 291 1157	228 290 1157	228 293 1177
	10 KIAS KTAS Fuel - Lb/Hr	242 271 1214	234 268 1199	229 267 1203	227 267 1219	229 272 1254
	5 KIAS KTAS Fuel - Lb/Hr	236 247 1231	230 245 1240	228 247 1273	227 248 1295	227 250 1316
	S.L. KIAS Fuel - Lb/Hr	234 227 1295	233 231 1325	230 232 1355	230 233 1376	229 234 1399

Figure 8-13
(Sheet 9 of 19)

**LONG RANGE CRUISE
TWO ENGINE**

WEIGHT — 18,500 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr	.742 415 1100				
	45 Mach Ind KTAS Fuel - Lb/Hr	.744 415 1059	.744 425 1089			
	43 Mach Ind KTAS Fuel - Lb/Hr	.732 408 1016	.735 420 1050	.737 430 1082	.734 433 1088	
	41 Mach Ind KTAS Fuel - Lb/Hr	.724 404 1006	.724 413 1039	.721 421 1059	.724 428 1077	.722 431 1086
	39 Mach Ind KTAS Fuel - Lb/Hr	.713 398 1006	.711 406 1031	.711 415 1057	.710 419 1069	.712 425 1086
	37 Mach Ind KTAS Fuel - Lb/Hr	.689 384 988	.692 395 1018	.689 402 1040	.694 409 1063	.691 412 1071
	35 Mach Ind KTAS Fuel - Lb/Hr	.667 373 987	.673 386 1023	.667 391 1039	.671 398 1061	.673 403 1077
	30 Mach Ind KTAS Fuel - Lb/Hr	.617 353 1016	.620 363 1043	.613 366 1058	.615 371 1077	.618 377 1094
	25 KIAS KTAS Fuel - Lb/Hr	230 326 1041	232 337 1080	230 340 1092	230 344 1107	230 348 1121
	20 KIAS KTAS Fuel - Lb/Hr	234 306 1098	236 316 1133	233 318 1137	231 318 1137	231 321 1155
	15 KIAS KTAS Fuel - Lb/Hr	242 293 1182	238 294 1179	232 293 1178	230 293 1184	233 299 1215
	10 KIAS KTAS Fuel - Lb/Hr	243 273 1232	236 270 1220	231 269 1227	229 270 1245	240 285 1333
	5 KIAS KTAS Fuel - Lb/Hr	238 248 1252	232 247 1265	230 249 1302	230 251 1325	247 272 1451
	S.L. KIAS Fuel - Lb/Hr	236 229 1320	235 233 1350	233 234 1384	232 235 1406	231 237 1431

**Figure 8-13
(Sheet 10 of 19)**

LONG RANGE CRUISE TWO ENGINE

WEIGHT — 19,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr					
	45 Mach Ind KTAS Fuel - Lb/Hr	.745 416 1097	.745 426 1128			
	43 Mach Ind KTAS Fuel - Lb/Hr	.735 410 1050	.735 420 1077	.735 430 1107	.734 434 1119	.664 397 1043
	41 Mach Ind KTAS Fuel - Lb/Hr	.726 405 1030	.728 416 1067	.726 424 1093	.727 430 1105	.725 433 1114
	39 Mach Ind KTAS Fuel - Lb/Hr	.717 400 1031	.715 408 1060	.714 417 1084	.716 423 1103	.716 427 1114
	37 Mach Ind KTAS Fuel - Lb/Hr	.695 387 1016	.695 396 1042	.694 405 1068	.697 411 1088	.696 415 1100
	35 Mach Ind KTAS Fuel - Lb/Hr	.674 377 1016	.675 387 1043	.673 394 1068	.679 402 1093	.677 405 1102
	30 Mach Ind KTAS Fuel - Lb/Hr	.623 357 1042	.622 364 1060	.618 370 1085	.621 375 1105	.623 380 1119
	25 KIAS KTAS Fuel - Lb/Hr	233 331 1071	236 341 1110	233 344 1121	233 348 1138	234 353 1153
	20 KIAS KTAS Fuel - Lb/Hr	236 309 1123	238 319 1156	234 319 1154	233 321 1163	234 325 1181
	15 KIAS KTAS Fuel - Lb/Hr	244 296 1203	240 296 1200	234 295 1200	234 297 1216	236 303 1246
	10 KIAS KTAS Fuel - Lb/Hr	244 274 1250	237 272 1239	232 271 1251	233 274 1279	248 294 1392
	5 KIAS KTAS Fuel - Lb/Hr	240 250 1275	234 249 1292	233 252 1332	232 253 1356	258 283 1533
	S.L. KIAS KTAS Fuel - Lb/Hr	238 231 1343	237 235 1376	235 236 1413	234 238 1437	234 239 1464

Figure 8-13
(Sheet 11 of 19)

**LONG RANGE CRUISE
TWO ENGINE**

WEIGHT — 19,500 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr					
	45 Mach Ind KTAS Fuel - Lb/Hr	.745 416 1135	.746 426 1168			
	43 Mach Ind KTAS Fuel - Lb/Hr	.738 412 1086	.738 422 1114	.738 432 1145		
	41 Mach Ind KTAS Fuel - Lb/Hr	.724 404 1049	.733 419 1099	.731 427 1126	.729 431 1132	.729 435 1147
	39 Mach Ind KTAS Fuel - Lb/Hr	.719 401 1055	.718 410 1087	.714 417 1105	.719 424 1129	.718 428 1141
	37 Mach Ind KTAS Fuel - Lb/Hr	.703 392 1047	.702 400 1075	.700 409 1100	.701 413 1115	.703 419 1133
	35 Mach Ind KTAS Fuel - Lb/Hr	.681 381 1044	.679 389 1069	.680 398 1099	.686 406 1124	.680 407 1126
	30 Mach Ind KTAS Fuel - Lb/Hr	.629 360 1067	.624 365 1078	.624 373 1112	.626 378 1131	.628 383 1144
	25 KIAS KTAS Fuel - Lb/Hr	237 336 1102	239 346 1139	236 349 1153	236 353 1169	237 357 1186
	20 KIAS KTAS Fuel - Lb/Hr	239 313 1148	241 322 1179	235 321 1174	236 324 1190	236 328 1208
	15 KIAS KTAS Fuel - Lb/Hr	246 298 1226	242 298 1221	237 298 1227	238 302 1250	239 307 1277
	10 KIAS KTAS Fuel - Lb/Hr	246 276 1269	239 274 1260	234 273 1277	241 283 1341	250 297 1418
	5 KIAS KTAS Fuel - Lb/Hr	242 252 1297	237 252 1318	235 254 1363	253 276 1496	261 287 1565
	S.L. KIAS Fuel - Lb/Hr	239 233 1368	239 237 1403	237 239 1442	237 240 1469	236 242 1497

**Figure 8-13
(Sheet 12 of 19)**

LONG RANGE CRUISE TWO ENGINE

WEIGHT — 20,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr					
	45 Mach Ind KTAS Fuel - Lb/Hr	.744 416 1173				
	43 Mach Ind KTAS Fuel - Lb/Hr	.742 414 1126	.742 424 1155	.742 434 1186		
	41 Mach Ind KTAS Fuel - Lb/Hr	.729 407 1084	.735 420 1127	.735 430 1160	.732 432 1163	.733 438 1180
	39 Mach Ind KTAS Fuel - Lb/Hr	.721 402 1078	.721 412 1113	.717 419 1132	.721 426 1156	.720 430 1166
	37 Mach Ind KTAS Fuel - Lb/Hr	.708 395 1075	.707 404 1106	.706 412 1131	.705 416 1144	.707 422 1163
	35 Mach Ind KTAS Fuel - Lb/Hr	.687 385 1073	.685 393 1099	.686 402 1128	.688 408 1147	.686 411 1157
	30 Mach Ind KTAS Fuel - Lb/Hr	.635 363 1092	.625 366 1096	.629 376 1138	.632 382 1158	.633 387 1170
	25 KIAS KTAS Fuel - Lb/Hr	240 340 1132	240 348 1160	239 353 1184	240 358 1200	240 362 1217
	20 KIAS KTAS Fuel - Lb/Hr	242 316 1173	243 324 1202	238 324 1200	238 327 1217	239 331 1236
	15 KIAS KTAS Fuel - Lb/Hr	248 301 1247	244 301 1243	240 302 1255	241 306 1282	242 311 1307
	10 KIAS KTAS Fuel - Lb/Hr	247 277 1287	241 275 1282	236 276 1304	248 292 1400	253 300 1445
	5 KIAS KTAS Fuel - Lb/Hr	244 254 1321	239 254 1345	237 257 1393	262 286 1566	263 289 1588
	S.L. KIAS KTAS Fuel - Lb/Hr	242 235 1395	241 239 1431	239 241 1473	239 242 1499	261 267 1672

Figure 8-13
(Sheet 13 of 19)

**LONG RANGE CRUISE
TWO ENGINE**

WEIGHT — 20,500 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr					
	45 Mach Ind KTAS Fuel - Lb/Hr	.745 416 1223				
	43 Mach Ind KTAS Fuel - Lb/Hr	.744 416 1163	.744 425 1195			
	41 Mach Ind KTAS Fuel - Lb/Hr	.733 409 1119	.734 420 1150	.738 431 1192	.735 434 1198	
	39 Mach Ind KTAS Fuel - Lb/Hr	.720 401 1096	.724 414 1140	.722 422 1167	.724 427 1181	.722 431 1192
	37 Mach Ind KTAS Fuel - Lb/Hr	.713 398 1104	.712 406 1135	.709 414 1158	.711 420 1177	.712 424 1192
	35 Mach Ind KTAS Fuel - Lb/Hr	.693 388 1101	.690 396 1128	.691 405 1158	.690 409 1169	.690 414 1186
	30 Mach Ind KTAS Fuel - Lb/Hr	.641 367 1119	.630 369 1121	.635 379 1166	.638 385 1186	.637 389 1194
	25 KIAS KTAS Fuel - Lb/Hr	244 345 1163	242 350 1179	243 358 1216	243 362 1231	244 367 1248
	20 KIAS KTAS Fuel - Lb/Hr	245 320 1200	245 327 1224	240 328 1227	240 331 1244	241 335 1263
	15 KIAS KTAS Fuel - Lb/Hr	251 303 1269	246 303 1266	243 305 1286	244 310 1313	245 314 1337
	10 KIAS KTAS Fuel - Lb/Hr	249 279 1307	243 278 1306	243 284 1359	251 295 1427	255 303 1471
	5 KIAS KTAS Fuel - Lb/Hr	245 256 1344	241 256 1374	256 277 1519	264 288 1589	265 291 1609
	S.L. KIAS KTAS Fuel - Lb/Hr	243 237 1420	243 241 1459	242 243 1504	241 245 1531	272 279 1765

**Figure 8-13
(Sheet 14 of 19)**

LONG RANGE CRUISE TWO ENGINE

WEIGHT — 21,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr					
	45 Mach Ind KTAS Fuel - Lb/Hr					
	43 Mach Ind KTAS Fuel - Lb/Hr	.745 416 1200	.745 426 1234			
	41 Mach Ind KTAS Fuel - Lb/Hr	.735 410 1153	.735 420 1180	.737 431 1217	.735 434 1226	
	39 Mach Ind KTAS Fuel - Lb/Hr	.721 402 1123	.728 416 1169	.726 424 1200	.727 430 1211	.725 433 1221
	37 Mach Ind KTAS Fuel - Lb/Hr	.716 399 1129	.715 408 1162	.710 415 1180	.715 422 1207	.715 427 1220
	35 Mach Ind KTAS Fuel - Lb/Hr	.698 391 1129	.696 399 1158	.696 408 1187	.692 410 1193	.696 417 1217
	30 Mach Ind KTAS Fuel - Lb/Hr	.649 371 1149	.634 371 1146	.641 383 1195	.645 390 1216	.640 391 1217
	25 KIAS KTAS Fuel - Lb/Hr	247 350 1193	243 352 1200	246 363 1247	246 367 1262	247 371 1280
	20 KIAS KTAS Fuel - Lb/Hr	248 324 1228	246 329 1244	243 331 1257	243 335 1274	244 339 1294
	15 KIAS KTAS Fuel - Lb/Hr	253 306 1291	247 305 1287	246 309 1317	247 314 1343	248 318 1367
	10 KIAS KTAS Fuel - Lb/Hr	250 281 1327	244 280 1330	250 291 1410	254 298 1456	258 306 1497
	5 KIAS KTAS Fuel - Lb/Hr	247 258 1367	243 259 1403	265 287 1593	266 290 1612	267 293 1631
	S.L. KIAS KTAS Fuel - Lb/Hr	245 239 1447	245 243 1487	244 246 1536	263 267 1690	281 287 1841

Figure 8-13
(Sheet 15 of 19)

**LONG RANGE CRUISE
TWO ENGINE**

WEIGHT — 21,500 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr					
	45 Mach Ind KTAS Fuel - Lb/Hr					
	43 Mach Ind KTAS Fuel - Lb/Hr	.745 416 1239	.745 426 1273			
	41 Mach Ind KTAS Fuel - Lb/Hr	.738 412 1188	.738 422 1218	.738 432 1251		
	39 Mach Ind KTAS Fuel - Lb/Hr	.725 405 1155	.733 419 1200	.731 427 1233	.729 431 1238	.729 435 1253
	37 Mach Ind KTAS Fuel - Lb/Hr	.714 398 1146	.718 410 1188	.712 416 1206	.718 424 1234	.717 428 1246
	35 Mach Ind KTAS Fuel - Lb/Hr	.702 393 1155	.702 403 1190	.700 410 1214	.699 414 1228	.702 420 1249
	30 Mach Ind KTAS Fuel - Lb/Hr	.655 375 1177	.641 375 1178	.649 388 1230	.652 394 1249	.642 392 1240
	25 KIAS KTAS Fuel - Lb/Hr	250 354 1222	246 355 1229	249 367 1278	249 371 1294	250 376 1312
	20 KIAS KTAS Fuel - Lb/Hr	251 328 1256	247 330 1263	246 336 1289	247 339 1307	247 343 1327
	15 KIAS KTAS Fuel - Lb/Hr	255 308 1313	249 307 1309	249 313 1349	250 318 1374	251 322 1397
	10 KIAS KTAS Fuel - Lb/Hr	252 282 1346	246 282 1356	253 295 1444	257 302 1484	260 309 1524
	5 KIAS KTAS Fuel - Lb/Hr	249 260 1391	245 261 1431	267 289 1617	268 292 1635	269 295 1652
	S.L. KIAS Fuel - Lb/Hr	247 241 1475	248 245 1517	246 248 1568	275 279 1783	277 283 1814

**Figure 8-13
(Sheet 16 of 19)**

LONG RANGE CRUISE TWO ENGINE

WEIGHT — 22,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr					
	45 Mach Ind KTAS Fuel - Lb/Hr					
	43 Mach Ind KTAS Fuel - Lb/Hr	.745 416 1280	.745 426 1316			
	41 Mach Ind KTAS Fuel - Lb/Hr	.742 414 1228	.741 424 1258	.742 434 1293		
	39 Mach Ind KTAS Fuel - Lb/Hr	.729 407 1189	.734 419 1227	.735 429 1266	.730 431 1265	.732 437 1287
	37 Mach Ind KTAS Fuel - Lb/Hr	.715 398 1168	.720 411 1213	.717 419 1240	.720 425 1260	.719 429 1273
	35 Mach Ind KTAS Fuel - Lb/Hr	.702 393 1174	.707 406 1221	.702 411 1238	.706 418 1264	.707 423 1281
	30 Mach Ind KTAS Fuel - Lb/Hr	.658 377 1199	.648 379 1212	.657 393 1264	.656 397 1276	.648 396 1272
	25 KIAS KTAS Fuel - Lb/Hr	253 358 1248	249 360 1261	251 371 1306	252 375 1322	252 379 1338
	20 KIAS KTAS Fuel - Lb/Hr	254 332 1285	249 332 1284	250 340 1322	250 344 1340	251 348 1360
	15 KIAS KTAS Fuel - Lb/Hr	256 310 1334	251 310 1332	252 317 1380	253 321 1405	254 326 1427
	10 KIAS KTAS Fuel - Lb/Hr	253 284 1368	248 284 1382	256 298 1474	259 305 1512	263 312 1551
	5 KIAS KTAS Fuel - Lb/Hr	251 262 1415	248 263 1461	270 292 1642	270 295 1660	271 298 1676
	S.L. KIAS Fuel - Lb/Hr	249 243 1502	250 247 1547	264 266 1700	283 287 1859	279 285 1837

Figure 8-13
(Sheet 17 of 19)

**LONG RANGE CRUISE
TWO ENGINE**

WEIGHT — 22,500 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr					
	45 Mach Ind KTAS Fuel - Lb/Hr					
	43 Mach Ind KTAS Fuel - Lb/Hr	.744 416 1320				
	41 Mach Ind KTAS Fuel - Lb/Hr	.744 416 1264	.744 425 1299	.744 435 1332		
	39 Mach Ind KTAS Fuel - Lb/Hr	.734 409 1224	.732 418 1248	.738 431 1298	.734 434 1302	
	37 Mach Ind KTAS Fuel - Lb/Hr	.718 401 1199	.723 413 1239	.721 421 1272	.722 427 1287	.721 431 1299
	35 Mach Ind KTAS Fuel - Lb/Hr	.701 393 1193	.712 408 1250	.702 412 1261	.710 421 1296	.710 426 1311
	30 Mach Ind KTAS Fuel - Lb/Hr	.660 378 1220	.655 384 1246	.664 397 1297	.659 399 1301	.655 400 1306
	25 KIAS KTAS Fuel - Lb/Hr	254 360 1270	251 363 1290	253 374 1333	254 378 1348	253 381 1359
	20 KIAS KTAS Fuel - Lb/Hr	257 335 1313	252 336 1315	253 344 1354	253 348 1374	254 352 1392
	15 KIAS KTAS Fuel - Lb/Hr	258 312 1354	253 313 1361	255 320 1408	256 324 1433	256 328 1453
	10 KIAS KTAS Fuel - Lb/Hr	255 286 1391	252 289 1419	259 302 1504	262 308 1540	265 314 1577
	5 KIAS KTAS Fuel - Lb/Hr	252 264 1440	258 274 1538	272 294 1668	272 297 1683	273 300 1699
	S.L. KIAS Fuel - Lb/Hr	252 245 1532	252 249 1575	277 279 1803	281 285 1848	280 287 1859

**Figure 8-13
(Sheet 18 of 19)**

LONG RANGE CRUISE TWO ENGINE

WEIGHT — 23,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr					
	45 Mach Ind KTAS Fuel - Lb/Hr					
	43 Mach Ind KTAS Fuel - Lb/Hr	.744 416 1370				
	41 Mach Ind KTAS Fuel - Lb/Hr	.745 416 1300	.745 426 1338			
	39 Mach Ind KTAS Fuel - Lb/Hr	.735 410 1255	.734 419 1281	.738 431 1325	.735 434 1333	
	37 Mach Ind KTAS Fuel - Lb/Hr	.722 403 1231	.726 415 1267	.725 423 1304	.725 428 1315	.723 431 1325
	35 Mach Ind KTAS Fuel - Lb/Hr	.706 396 1225	.715 410 1277	.707 415 1294	.715 424 1327	.714 428 1340
	30 Mach Ind KTAS Fuel - Lb/Hr	.662 379 1241	.661 387 1276	.668 400 1325	.662 400 1325	.661 404 1339
	25 KIAS KTAS Fuel - Lb/Hr	255 360 1286	254 366 1318	256 377 1359	256 381 1375	254 382 1379
	20 KIAS KTAS Fuel - Lb/Hr	260 339 1341	255 340 1346	256 348 1387	256 352 1406	257 356 1425
	15 KIAS KTAS Fuel - Lb/Hr	259 314 1374	256 316 1387	257 323 1435	258 327 1459	259 331 1480
	10 KIAS KTAS Fuel - Lb/Hr	257 288 1414	256 294 1458	262 305 1533	264 311 1569	268 317 1604
	5 KIAS KTAS Fuel - Lb/Hr	254 265 1465	267 283 1607	274 297 1693	275 299 1708	274 302 1721
	S.L. KIAS KTAS Fuel - Lb/Hr	254 247 1562	254 252 1606	283 285 1858	283 287 1869	282 289 1881

Figure 8-13
(Sheet 19 of 19)

HIGH SPEED CRUISE

WEIGHT — 14,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind	.763				
	KTAS	427				
	Fuel - Lb/Hr	887				
	49 Mach Ind	.780	.768	.726		
	KTAS	437	440	424		
	Fuel - Lb/Hr	910	912	832		
	47 Mach Ind	.780	.780	.768	.745	.707
	KTAS	437	447	450	440	422
	Fuel - Lb/Hr	914	962	937	880	821
	45 Mach Ind	.780	.780	.780	.778	.764
	KTAS	437	447	457	461	457
	Fuel - Lb/Hr	933	980	1029	1012	967
	43 Mach Ind	.780	.780	.780	.780	.780
	KTAS	437	447	457	462	467
	Fuel - Lb/Hr	961	1013	1065	1088	1115
	41 Mach Ind	.790	.790	.790	.790	.790
	KTAS	443	454	464	469	474
	Fuel - Lb/Hr	1053	1107	1164	1190	1220
	39 Mach Ind	.800	.800	.800	.800	.800
	KTAS	449	460	470	475	481
	Fuel - Lb/Hr	1178	1233	1297	1326	1359
	37 Mach Ind	.810	.810	.810	.810	.810
	KTAS	456	466	477	482	487
	Fuel - Lb/Hr	1346	1410	1479	1513	1549
	35 Mach Ind	.810	.810	.810	.810	.810
	KTAS	458	469	479	485	490
	Fuel - Lb/Hr	1459	1531	1602	1638	1677
	30 Mach Ind	.810	.810	.810	.810	.805
	KTAS	469	479	490	495	497
	Fuel - Lb/Hr	1825	1912	2001	2047	1951
	25 KIAS	330	330	330	330	330
	KTAS	462	472	481	486	491
	Fuel - Lb/Hr	1997	2098	2183	2233	2280
	20 KIAS	340	340	340	340	340
	KTAS	440	449	458	462	467
	Fuel - Lb/Hr	2054	2156	2247	2287	2338
	15 KIAS	340	340	340	340	340
	KTAS	408	416	424	428	432
	Fuel - Lb/Hr	2057	2163	2257	2298	2340
	10 KIAS	340	340	340	340	340
	KTAS	380	387	394	398	401
	Fuel - Lb/Hr	2100	2189	2280	2324	2368
	5 KIAS	300	300	300	300	300
	KTAS	312	318	323	326	329
	Fuel - Lb/Hr	1729	1799	1861	1894	1930
	S.L. KIAS	300	300	300	300	300
	KTAS	291	296	301	304	306
	Fuel - Lb/Hr	1815	1886	1959	1992	2027

Figure 8-14
(Sheet 1 of 19)

HIGH SPEED CRUISE

WEIGHT — 14,500 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind	.744				
	KTAS	416				
	Fuel - Lb/Hr	876				
	49 Mach Ind	.780	.756			
	KTAS	437	432			
	Fuel - Lb/Hr	941	903			
	47 Mach Ind	.780	.780	.760	.730	
	KTAS	437	447	445	431	
	Fuel - Lb/Hr	939	988	936	871	
	45 Mach Ind	.780	.780	.780	.772	.755
	KTAS	437	447	457	458	451
	Fuel - Lb/Hr	955	1004	1052	1008	960
	43 Mach Ind	.780	.780	.780	.780	.780
	KTAS	437	447	457	462	467
	Fuel - Lb/Hr	981	1031	1084	1108	1135
	41 Mach Ind	.790	.790	.790	.790	.790
	KTAS	443	454	464	469	474
	Fuel - Lb/Hr	1071	1124	1183	1208	1239
	39 Mach Ind	.800	.800	.800	.800	.800
	KTAS	449	460	470	475	481
	Fuel - Lb/Hr	1194	1248	1314	1342	1376
	37 Mach Ind	.810	.810	.810	.810	.810
	KTAS	456	466	477	482	487
	Fuel - Lb/Hr	1363	1429	1497	1532	1568
	35 Mach Ind	.810	.810	.810	.810	.810
	KTAS	458	469	479	485	490
	Fuel - Lb/Hr	1470	1543	1613	1650	1689
	30 Mach Ind	.810	.810	.810	.810	.805
	KTAS	469	479	490	495	496
	Fuel - Lb/Hr	1831	1917	2007	2052	1950
	25 KIAS	330	330	330	330	330
	KTAS	462	472	481	486	491
	Fuel - Lb/Hr	1999	2100	2186	2236	2283
	20 KIAS	340	340	340	340	340
	KTAS	440	449	458	462	467
	Fuel - Lb/Hr	2055	2157	2248	2288	2339
	15 KIAS	340	340	340	340	340
	KTAS	408	416	424	428	432
	Fuel - Lb/Hr	2058	2164	2258	2299	2341
	10 KIAS	340	340	340	340	340
	KTAS	380	387	394	398	401
	Fuel - Lb/Hr	2102	2191	2282	2326	2371
	5 KIAS	300	300	300	300	300
	KTAS	312	318	324	326	329
	Fuel - Lb/Hr	1731	1802	1863	1896	1932
	S.L. KIAS	300	300	300	300	300
	KTAS	291	296	301	304	306
	Fuel - Lb/Hr	1818	1888	1961	1995	2029

Figure 8-14
(Sheet 2 of 19)

HIGH SPEED CRUISE

WEIGHT — 15,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr	.780 437 977	.737 421 890			
	47 Mach Ind KTAS Fuel - Lb/Hr	.780 437 965	.780 447 1017	.751 439 934	.704 416 854	
	45 Mach Ind KTAS Fuel - Lb/Hr	.780 437 977	.780 447 1028	.780 457 1079	.765 453 1004	.745 445 952
	43 Mach Ind KTAS Fuel - Lb/Hr	.780 437 1000	.780 447 1050	.780 457 1103	.780 462 1129	.779 466 1100
	41 Mach Ind KTAS Fuel - Lb/Hr	.790 443 1090	.790 453 1142	.790 464 1201	.790 469 1228	.790 474 1258
	39 Mach Ind KTAS Fuel - Lb/Hr	.800 449 1212	.800 460 1265	.800 470 1332	.800 475 1361	.800 481 1395
	37 Mach Ind KTAS Fuel - Lb/Hr	.810 456 1380	.810 466 1449	.810 477 1515	.810 482 1553	.810 487 1588
	35 Mach Ind KTAS Fuel - Lb/Hr	.810 458 1480	.810 469 1555	.810 479 1624	.810 485 1663	.810 490 1701
	30 Mach Ind KTAS Fuel - Lb/Hr	.810 469 1837	.810 479 1923	.810 490 2013	.810 495 2058	.804 496 1949
	25 KIAS KTAS Fuel - Lb/Hr	330 462 2002	330 472 2103	330 481 2189	330 486 2239	330 491 2286
	20 KIAS KTAS Fuel - Lb/Hr	340 440 2057	340 449 2159	340 458 2250	340 462 2290	340 467 2341
	15 KIAS KTAS Fuel - Lb/Hr	340 408 2060	340 416 2166	340 424 2260	340 428 2301	340 432 2343
	10 KIAS KTAS Fuel - Lb/Hr	340 380 2103	340 387 2193	340 394 2284	340 398 2328	340 401 2373
	5 KIAS KTAS Fuel - Lb/Hr	300 312 1734	300 318 1804	300 324 1866	300 326 1899	300 329 1935
	S.L. KIAS KTAS Fuel - Lb/Hr	300 291 1820	300 296 1891	300 301 1964	300 304 1997	300 306 2032

Figure 8-14
(Sheet 3 of 19)

HIGH SPEED CRUISE

WEIGHT — 15,500 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr	.774 433 1011				
	47 Mach Ind KTAS Fuel - Lb/Hr	.780 437 993	.778 446 1037	.739 432 932		
	45 Mach Ind KTAS Fuel - Lb/Hr	.780 437 1001	.780 447 1053	.778 456 1070	.757 448 999	.731 436 942
	43 Mach Ind KTAS Fuel - Lb/Hr	.780 437 1021	.780 447 1070	.780 457 1124	.780 462 1151	.774 463 1096
	41 Mach Ind KTAS Fuel - Lb/Hr	.790 443 1110	.790 453 1160	.790 464 1221	.790 469 1249	.790 474 1279
	39 Mach Ind KTAS Fuel - Lb/Hr	.800 449 1230	.800 460 1286	.800 470 1351	.800 475 1382	.800 481 1415
	37 Mach Ind KTAS Fuel - Lb/Hr	.810 456 1398	.810 466 1470	.810 477 1534	.810 482 1574	.808 486 1522
	35 Mach Ind KTAS Fuel - Lb/Hr	.810 458 1493	.810 469 1570	.810 479 1638	.810 485 1679	.810 490 1717
	30 Mach Ind KTAS Fuel - Lb/Hr	.810 469 1844	.810 479 1929	.810 490 2020	.810 495 2065	.803 495 1947
	25 KIAS KTAS Fuel - Lb/Hr	330 462 2004	330 472 2105	330 481 2192	330 486 2241	330 491 2289
	20 KIAS KTAS Fuel - Lb/Hr	340 440 2058	340 449 2160	340 458 2251	340 462 2292	340 467 2343
	15 KIAS KTAS Fuel - Lb/Hr	340 408 2061	340 416 2168	340 424 2262	340 428 2302	340 432 2345
	10 KIAS KTAS Fuel - Lb/Hr	340 380 2105	340 387 2195	340 394 2287	340 398 2330	340 401 2375
	5 KIAS KTAS Fuel - Lb/Hr	300 312 1736	300 318 1806	300 324 1868	300 326 1901	300 329 1937
	S.L. KIAS KTAS Fuel - Lb/Hr	300 291 1822	300 296 1893	300 301 1966	300 304 2000	300 306 2035

Figure 8-14
(Sheet 4 of 19)

HIGH SPEED CRUISE

WEIGHT — 16,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr	.761 426 1002				
	47 Mach Ind KTAS Fuel - Lb/Hr	.780 437 1024	.769 440 1028	.721 422 929		
	45 Mach Ind KTAS Fuel - Lb/Hr	.780 437 1026	.780 447 1079	.771 452 1068	.747 441 993	.712 425 928
	43 Mach Ind KTAS Fuel - Lb/Hr	.780 437 1043	.780 447 1094	.780 457 1148	.780 462 1176	.767 459 1091
	41 Mach Ind KTAS Fuel - Lb/Hr	.790 443 1131	.790 453 1183	.790 464 1242	.790 469 1272	.787 472 1228
	39 Mach Ind KTAS Fuel - Lb/Hr	.800 449 1250	.800 460 1308	.800 470 1370	.800 475 1404	.799 480 1368
	37 Mach Ind KTAS Fuel - Lb/Hr	.810 456 1417	.810 466 1491	.810 477 1557	.810 482 1595	.807 485 1519
	35 Mach Ind KTAS Fuel - Lb/Hr	.810 458 1509	.810 469 1589	.810 479 1656	.810 485 1698	.809 489 1654
	30 Mach Ind KTAS Fuel - Lb/Hr	.810 469 1854	.810 479 1938	.810 490 2030	.810 495 2075	.803 495 1946
	25 KIAS KTAS Fuel - Lb/Hr	330 462 2007	330 472 2108	330 481 2195	330 486 2244	330 491 2292
	20 KIAS KTAS Fuel - Lb/Hr	340 440 2060	340 449 2162	340 458 2253	340 462 2294	340 467 2345
	15 KIAS KTAS Fuel - Lb/Hr	340 408 2063	340 416 2169	340 424 2263	340 428 2304	340 432 2346
	10 KIAS KTAS Fuel - Lb/Hr	340 380 2107	340 387 2198	340 394 2289	340 398 2333	340 401 2377
	5 KIAS KTAS Fuel - Lb/Hr	300 312 1740	300 318 1810	300 324 1872	300 326 1905	300 329 1941
	S.L. KIAS KTAS Fuel - Lb/Hr	300 291 1825	300 296 1896	300 301 1970	300 304 2004	300 306 2038

Figure 8-14
(Sheet 5 of 19)

HIGH SPEED CRUISE

WEIGHT — 16,500 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr	.743 415 988				
	47 Mach Ind KTAS Fuel - Lb/Hr	.780 437 1060	.757 433 1017			
	45 Mach Ind KTAS Fuel - Lb/Hr	.780 437 1051	.780 447 1107	.765 448 1066	.734 433 985	
	43 Mach Ind KTAS Fuel - Lb/Hr	.780 437 1065	.780 447 1118	.780 457 1172	.777 461 1148	.760 455 1085
	41 Mach Ind KTAS Fuel - Lb/Hr	.790 443 1152	.790 453 1207	.790 464 1266	.790 469 1295	.783 469 1225
	39 Mach Ind KTAS Fuel - Lb/Hr	.800 449 1269	.800 460 1330	.800 470 1393	.800 475 1426	.797 478 1366
	37 Mach Ind KTAS Fuel - Lb/Hr	.810 456 1436	.810 466 1513	.810 477 1581	.810 482 1618	.804 484 1516
	35 Mach Ind KTAS Fuel - Lb/Hr	.810 458 1526	.810 469 1608	.810 479 1677	.810 485 1718	.807 488 1651
	30 Mach Ind KTAS Fuel - Lb/Hr	.810 469 1864	.810 479 1948	.810 490 2040	.810 495 2022	.802 494 1945
	25 KIAS KTAS Fuel - Lb/Hr	330 462 2010	330 472 2111	330 481 2198	330 486 2247	330 491 2295
	20 KIAS KTAS Fuel - Lb/Hr	340 440 2062	340 449 2164	340 458 2255	340 462 2296	340 467 2347
	15 KIAS KTAS Fuel - Lb/Hr	340 408 2064	340 416 2171	340 424 2265	340 428 2306	340 432 2348
	10 KIAS KTAS Fuel - Lb/Hr	340 380 2109	340 387 2200	340 394 2291	340 398 2335	340 401 2380
	5 KIAS KTAS Fuel - Lb/Hr	300 312 1744	300 318 1814	300 324 1877	300 326 1910	300 329 1946
	S.L. KIAS KTAS Fuel - Lb/Hr	300 291 1829	300 296 1901	300 301 1974	300 304 2008	300 306 2043

Figure 8-14
(Sheet 6 of 19)

HIGH SPEED CRUISE

WEIGHT — 17,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr	.780 437 1099	.739 423 1001			
	45 Mach Ind KTAS Fuel - Lb/Hr	.780 437 1079	.780 447 1136	.756 442 1064	.712 420 972	
	43 Mach Ind KTAS Fuel - Lb/Hr	.780 437 1088	.780 447 1143	.780 457 1198	.771 457 1144	.752 449 1079
	41 Mach Ind KTAS Fuel - Lb/Hr	.790 443 1174	.790 453 1232	.790 464 1291	.790 469 1323	.779 467 1221
	39 Mach Ind KTAS Fuel - Lb/Hr	.800 449 1290	.800 460 1354	.800 470 1417	.800 475 1449	.794 476 1363
	37 Mach Ind KTAS Fuel - Lb/Hr	.810 456 1458	.810 466 1538	.810 477 1608	.810 482 1646	.802 482 1512
	35 Mach Ind KTAS Fuel - Lb/Hr	.810 458 1543	.810 469 1628	.810 479 1699	.810 485 1739	.806 487 1648
	30 Mach Ind KTAS Fuel - Lb/Hr	.810 469 1874	.810 479 1958	.810 490 2050	.809 494 2020	.801 494 1943
	25 KIAS KTAS Fuel - Lb/Hr	330 462 2013	330 472 2114	330 481 2201	330 486 2251	330 491 2299
	20 KIAS KTAS Fuel - Lb/Hr	340 440 2064	340 449 2166	340 458 2257	340 462 2298	340 467 2349
	15 KIAS KTAS Fuel - Lb/Hr	340 408 2066	340 416 2173	340 424 2267	340 428 2308	340 432 2350
	10 KIAS KTAS Fuel - Lb/Hr	340 380 2111	340 387 2202	340 394 2294	340 398 2337	340 401 2382
	5 KIAS KTAS Fuel - Lb/Hr	300 312 1748	300 318 1819	300 324 1881	300 326 1914	300 329 1951
	S.L. KIAS KTAS Fuel - Lb/Hr	300 291 1833	300 296 1905	300 301 1979	300 304 2013	300 306 2048

Figure 8-14
(Sheet 7 of 19)

HIGH SPEED CRUISE

WEIGHT — 17,500 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr	.771 432 1126				
	45 Mach Ind KTAS Fuel - Lb/Hr	.780 437 1109	.779 447 1165	.746 436 1061		
	43 Mach Ind KTAS Fuel - Lb/Hr	.780 437 1111	.780 447 1169	.780 457 1226	.765 453 1139	.740 442 1070
	41 Mach Ind KTAS Fuel - Lb/Hr	.790 443 1196	.790 453 1256	.790 464 1317	.788 468 1293	.774 464 1218
	39 Mach Ind KTAS Fuel - Lb/Hr	.800 449 1312	.800 460 1379	.800 470 1444	.800 475 1479	.790 474 1360
	37 Mach Ind KTAS Fuel - Lb/Hr	.810 456 1481	.810 466 1565	.810 477 1638	.809 482 1611	.800 481 1509
	35 Mach Ind KTAS Fuel - Lb/Hr	.810 458 1561	.810 469 1649	.810 479 1721	.810 485 1761	.804 485 1645
	30 Mach Ind KTAS Fuel - Lb/Hr	.810 469 1885	.810 479 1968	.810 490 2061	.808 493 2018	.801 493 1942
	25 KIAS KTAS Fuel - Lb/Hr	330 462 2016	330 472 2117	330 481 2204	330 486 2254	330 491 2302
	20 KIAS KTAS Fuel - Lb/Hr	340 440 2066	340 449 2168	340 458 2258	340 462 2300	340 467 2351
	15 KIAS KTAS Fuel - Lb/Hr	340 408 2068	340 417 2175	340 424 2269	340 428 2310	340 432 2352
	10 KIAS KTAS Fuel - Lb/Hr	340 380 2113	340 387 2205	340 394 2296	340 398 2340	340 401 2384
	5 KIAS KTAS Fuel - Lb/Hr	300 312 1752	300 318 1823	300 324 1886	300 327 1919	300 329 1956
	S.L. KIAS KTAS Fuel - Lb/Hr	300 291 1838	300 296 1909	300 301 1983	300 304 2017	300 306 2053

Figure 8-14
(Sheet 8 of 19)

HIGH SPEED CRUISE

WEIGHT — 18,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr	.760 425 1116				
	45 Mach Ind KTAS Fuel - Lb/Hr	.780 437 1144	.771 442 1156	.732 428 1057		
	43 Mach Ind KTAS Fuel - Lb/Hr	.780 437 1136	.780 447 1196	.778 456 1220	.757 448 1134	.727 434 1060
	41 Mach Ind KTAS Fuel - Lb/Hr	.790 443 1219	.790 453 1282	.790 464 1344	.784 465 1289	.769 460 1213
	39 Mach Ind KTAS Fuel - Lb/Hr	.800 449 1336	.800 460 1406	.800 470 1473	.799 475 1445	.787 472 1357
	37 Mach Ind KTAS Fuel - Lb/Hr	.810 456 1509	.810 466 1593	.810 477 1668	.807 480 1609	.799 480 1507
	35 Mach Ind KTAS Fuel - Lb/Hr	.810 458 1581	.810 469 1670	.810 479 1744	.810 485 1785	.802 484 1642
	30 Mach Ind KTAS Fuel - Lb/Hr	.810 469 1896	.810 479 1979	.810 490 2072	.807 493 2017	.800 493 1941
	25 KIAS KTAS Fuel - Lb/Hr	330 462 2019	330 472 2120	330 481 2208	330 486 2257	330 491 2306
	20 KIAS KTAS Fuel - Lb/Hr	340 440 2068	340 449 2170	340 458 2260	340 462 2302	340 467 2353
	15 KIAS KTAS Fuel - Lb/Hr	340 408 2070	340 417 2177	340 425 2271	340 428 2312	340 432 2354
	10 KIAS KTAS Fuel - Lb/Hr	340 380 2116	340 387 2207	340 394 2298	340 398 2342	340 401 2387
	5 KIAS KTAS Fuel - Lb/Hr	300 312 1757	300 318 1828	300 324 1890	300 327 1924	300 329 1961
	S.L. KIAS KTAS Fuel - Lb/Hr	300 291 1842	300 296 1914	300 302 1988	300 304 2022	300 307 2058

Figure 8-14
(Sheet 9 of 19)

HIGH SPEED CRUISE

WEIGHT — 18,500 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr	.742 415 1100				
	45 Mach Ind KTAS Fuel - Lb/Hr	.780 437 1182	.760 435 1145			
	43 Mach Ind KTAS Fuel - Lb/Hr	.780 437 1163	.780 447 1224	.773 453 1217	.747 441 1127	.701 418 1042
	41 Mach Ind KTAS Fuel - Lb/Hr	.790 443 1243	.790 453 1308	.790 464 1371	.780 462 1286	.762 456 1208
	39 Mach Ind KTAS Fuel - Lb/Hr	.800 449 1360	.800 460 1434	.800 470 1502	.796 473 1443	.783 469 1354
	37 Mach Ind KTAS Fuel - Lb/Hr	.810 456 1538	.810 466 1622	.810 477 1698	.805 479 1606	.796 478 1504
	35 Mach Ind KTAS Fuel - Lb/Hr	.810 458 1605	.810 469 1693	.810 479 1770	.809 484 1741	.800 483 1639
	30 Mach Ind KTAS Fuel - Lb/Hr	.810 469 1908	.810 479 1990	.810 490 2084	.807 492 2015	.799 492 1940
	25 KIAS KTAS Fuel - Lb/Hr	330 462 2023	330 472 2124	330 481 2212	330 486 2262	330 491 2311
	20 KIAS KTAS Fuel - Lb/Hr	340 440 2070	340 449 2172	340 458 2262	340 462 2304	340 467 2355
	15 KIAS KTAS Fuel - Lb/Hr	340 408 2072	340 417 2179	340 425 2273	340 428 2314	340 432 2356
	10 KIAS KTAS Fuel - Lb/Hr	340 380 2118	340 387 2210	340 394 2301	340 398 2345	340 401 2389
	5 KIAS KTAS Fuel - Lb/Hr	300 312 1762	300 318 1833	300 324 1895	300 327 1929	300 329 1966
	S.L. KIAS KTAS Fuel - Lb/Hr	300 291 1846	300 296 1918	300 302 1993	300 304 2027	300 307 2063

Figure 8-14
(Sheet 10 of 19)

HIGH SPEED CRUISE

WEIGHT — 19,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr					
	45 Mach Ind KTAS Fuel - Lb/Hr	.780 437 1224	.745 426 1129			
	43 Mach Ind KTAS Fuel - Lb/Hr	.780 437 1191	.780 447 1253	.765 448 1213	.734 434 1119	
	41 Mach Ind KTAS Fuel - Lb/Hr	.790 443 1267	.790 453 1335	.790 464 1400	.775 459 1283	.755 451 1203
	39 Mach Ind KTAS Fuel - Lb/Hr	.800 449 1387	.800 460 1462	.800 470 1532	.793 471 1440	.780 467 1351
	37 Mach Ind KTAS Fuel - Lb/Hr	.810 456 1568	.810 466 1651	.810 477 1730	.803 478 1603	.793 476 1501
	35 Mach Ind KTAS Fuel - Lb/Hr	.810 458 1631	.810 469 1719	.810 479 1798	.807 483 1739	.799 482 1636
	30 Mach Ind KTAS Fuel - Lb/Hr	.810 469 1919	.810 479 2001	.810 490 2096	.806 492 2014	.798 492 1938
	25 KIAS KTAS Fuel - Lb/Hr	330 462 2027	330 472 2128	330 481 2217	330 486 2266	330 491 2315
	20 KIAS KTAS Fuel - Lb/Hr	340 440 2072	340 449 2174	340 458 2264	340 462 2307	340 467 2357
	15 KIAS KTAS Fuel - Lb/Hr	340 408 2074	340 417 2181	340 425 2275	340 428 2316	340 432 2358
	10 KIAS KTAS Fuel - Lb/Hr	340 380 2120	340 387 2212	340 394 2304	340 398 2347	340 401 2392
	5 KIAS KTAS Fuel - Lb/Hr	300 312 1766	300 318 1837	300 324 1900	300 327 1934	300 329 1971
	S.L. KIAS KTAS Fuel - Lb/Hr	300 291 1851	300 296 1923	300 302 1998	300 304 2032	300 307 2068

Figure 8-14
(Sheet 11 of 19)

HIGH SPEED CRUISE

WEIGHT — 19,500 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr					
	45 Mach Ind KTAS Fuel - Lb/Hr	.774 433 1277				
	43 Mach Ind KTAS Fuel - Lb/Hr	.780 437 1225	.780 447 1288	.758 443 1209	.705 416 1101	
	41 Mach Ind KTAS Fuel - Lb/Hr	.790 443 1294	.790 453 1362	.787 462 1375	.770 456 1279	.746 446 1195
	39 Mach Ind KTAS Fuel - Lb/Hr	.800 449 1416	.800 460 1491	.800 470 1564	.790 469 1437	.775 464 1347
	37 Mach Ind KTAS Fuel - Lb/Hr	.810 456 1599	.810 466 1682	.810 477 1718	.801 476 1600	.790 474 1498
	35 Mach Ind KTAS Fuel - Lb/Hr	.810 458 1659	.810 469 1746	.810 479 1827	.805 481 1736	.796 480 1633
	30 Mach Ind KTAS Fuel - Lb/Hr	.810 469 1934	.810 479 2015	.810 490 2111	.804 491 2011	.796 490 1935
	25 KIAS KTAS Fuel - Lb/Hr	330 462 2031	330 472 2132	330 481 2221	330 486 2271	330 491 2320
	20 KIAS KTAS Fuel - Lb/Hr	340 440 2074	340 449 2176	340 458 2267	340 462 2309	340 467 2360
	15 KIAS KTAS Fuel - Lb/Hr	340 408 2076	340 417 2183	340 425 2277	340 428 2318	340 432 2360
	10 KIAS KTAS Fuel - Lb/Hr	340 380 2122	340 387 2215	340 394 2306	340 398 2350	340 401 2395
	5 KIAS KTAS Fuel - Lb/Hr	300 312 1771	300 318 1842	300 324 1905	300 327 1939	300 329 1976
	S.L. KIAS KTAS Fuel - Lb/Hr	300 291 1856	300 297 1928	300 302 2003	300 304 2038	300 307 2074

Figure 8-14
(Sheet 12 of 19)

HIGH SPEED CRUISE

WEIGHT — 20,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr					
	45 Mach Ind KTAS Fuel - Lb/Hr	.765 428 1266				
	43 Mach Ind KTAS Fuel - Lb/Hr	.780 437 1260	.777 445 1307	.747 437 1203		
	41 Mach Ind KTAS Fuel - Lb/Hr	.790 443 1326	.790 453 1394	.783 459 1372	.763 452 1274	.735 439 1188
	39 Mach Ind KTAS Fuel - Lb/Hr	.800 449 1449	.800 460 1525	.799 469 1540	.786 466 1434	.770 461 1343
	37 Mach Ind KTAS Fuel - Lb/Hr	.810 455 1636	.810 466 1718	.807 475 1714	.799 475 1597	.787 472 1495
	35 Mach Ind KTAS Fuel - Lb/Hr	.810 458 1687	.810 469 1773	.810 479 1857	.803 480 1733	.794 479 1631
	30 Mach Ind KTAS Fuel - Lb/Hr	.810 469 1952	.810 479 2032	.810 490 2130	.803 490 2009	.795 489 1933
	25 KIAS KTAS Fuel - Lb/Hr	330 462 2035	330 472 2136	330 481 2226	330 486 2275	330 491 2325
	20 KIAS KTAS Fuel - Lb/Hr	340 440 2078	340 449 2180	340 458 2270	340 462 2313	340 467 2364
	15 KIAS KTAS Fuel - Lb/Hr	340 408 2080	340 417 2187	340 425 2281	340 429 2322	340 432 2364
	10 KIAS KTAS Fuel - Lb/Hr	340 380 2125	340 387 2218	340 394 2310	340 398 2353	340 401 2398
	5 KIAS KTAS Fuel - Lb/Hr	300 312 1776	300 318 1847	300 324 1911	300 327 1944	300 329 1982
	S.L. KIAS Fuel - Lb/Hr	300 291 1860	300 297 1933	300 302 2008	300 304 2043	300 307 2079

Figure 8-14
(Sheet 13 of 19)

HIGH SPEED CRUISE

WEIGHT — 20,500 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr					
	45 Mach Ind KTAS Fuel - Lb/Hr	.752 420 1251				
	43 Mach Ind KTAS Fuel - Lb/Hr	.780 437 1296	.769 441 1298	.733 428 1196		
	41 Mach Ind KTAS Fuel - Lb/Hr	.790 443 1358	.790 453 1427	.778 456 1369	.755 446 1268	.719 429 1175
	39 Mach Ind KTAS Fuel - Lb/Hr	.800 449 1484	.800 460 1559	.795 467 1537	.782 464 1431	.765 457 1339
	37 Mach Ind KTAS Fuel - Lb/Hr	.810 455 1673	.810 466 1757	.805 473 1709	.797 473 1595	.783 470 1492
	35 Mach Ind KTAS Fuel - Lb/Hr	.810 458 1715	.810 469 1801	.810 479 1847	.802 479 1730	.791 477 1628
	30 Mach Ind KTAS Fuel - Lb/Hr	.810 469 1971	.810 479 2051	.809 489 2096	.802 489 2006	.793 488 1930
	25 KIAS KTAS Fuel - Lb/Hr	330 462 2040	330 472 2141	330 481 2231	330 486 2280	330 491 2238
	20 KIAS KTAS Fuel - Lb/Hr	340 440 2081	340 449 2183	340 458 2274	340 462 2317	340 467 2368
	15 KIAS KTAS Fuel - Lb/Hr	340 408 2084	340 417 2191	340 425 2285	340 429 2326	340 432 2369
	10 KIAS KTAS Fuel - Lb/Hr	340 380 2129	340 387 2223	340 394 2314	340 398 2358	340 401 2403
	5 KIAS KTAS Fuel - Lb/Hr	300 312 1781	300 318 1853	300 324 1916	300 327 1950	300 330 1988
	S.L. KIAS KTAS Fuel - Lb/Hr	300 291 1865	300 297 1938	300 302 2013	300 304 2048	300 307 2085

Figure 8-14
(Sheet 14 of 19)

HIGH SPEED CRUISE

WEIGHT — 21,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr					
	45 Mach Ind KTAS Fuel - Lb/Hr					
	43 Mach Ind KTAS Fuel - Lb/Hr	.780 437 1338	.758 434 1285			
	41 Mach Ind KTAS Fuel - Lb/Hr	.790 443 1391	.790 453 1462	.772 452 1364	.746 441 1261	
	39 Mach Ind KTAS Fuel - Lb/Hr	.800 449 1520	.800 460 1596	.793 466 1535	.778 461 1428	.758 453 1333
	37 Mach Ind KTAS Fuel - Lb/Hr	.810 455 1711	.810 466 1798	.803 472 1706	.794 471 1592	.780 467 1489
	35 Mach Ind KTAS Fuel - Lb/Hr	.810 458 1744	.810 469 1830	.808 478 1843	.800 478 1728	.788 475 1625
	30 Mach Ind KTAS Fuel - Lb/Hr	.810 469 1990	.810 479 2072	.808 488 2093	.801 488 2004	.791 487 1927
	25 KIAS KTAS Fuel - Lb/Hr	330 462 2044	330 472 2145	330 481 2235	330 486 2285	330 491 2237
	20 KIAS KTAS Fuel - Lb/Hr	340 440 2084	340 449 2186	340 458 2277	340 462 2320	340 467 2371
	15 KIAS KTAS Fuel - Lb/Hr	340 408 2089	340 417 2196	340 425 2290	340 429 2330	340 432 2373
	10 KIAS KTAS Fuel - Lb/Hr	340 380 2134	340 387 2228	340 394 2319	340 398 2363	340 401 2408
	5 KIAS KTAS Fuel - Lb/Hr	300 313 1786	300 318 1858	300 324 1921	300 327 1955	300 330 1993
	S.L. KIAS KTAS Fuel - Lb/Hr	300 291 1870	300 297 1943	300 302 2018	300 304 2054	300 307 2091

Figure 8-14
(Sheet 15 of 19)

HIGH SPEED CRUISE

WEIGHT — 21,500 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr					
	45 Mach Ind KTAS Fuel - Lb/Hr					
	43 Mach Ind KTAS Fuel - Lb/Hr	.780 437 1397	.743 425 1267			
	41 Mach Ind KTAS Fuel - Lb/Hr	.790 443 1425	.787 451 1466	.765 448 1359	.733 433 1252	
	39 Mach Ind KTAS Fuel - Lb/Hr	.800 449 1556	.800 460 1634	.790 464 1532	.773 458 1424	.752 449 1328
	37 Mach Ind KTAS Fuel - Lb/Hr	.810 455 1751	.809 466 1827	.801 471 1703	.790 469 1588	.776 465 1486
	35 Mach Ind KTAS Fuel - Lb/Hr	.810 458 1776	.810 469 1863	.806 477 1839	.798 476 1725	.785 473 1622
	30 Mach Ind KTAS Fuel - Lb/Hr	.810 469 2009	.810 479 2093	.807 487 2091	.799 487 2001	.790 486 1925
	25 KIAS KTAS Fuel - Lb/Hr	330 462 2049	330 472 2150	330 481 2240	330 486 2290	329 490 2236
	20 KIAS KTAS Fuel - Lb/Hr	340 440 2088	340 449 2190	340 458 2281	340 463 2324	340 467 2375
	15 KIAS KTAS Fuel - Lb/Hr	340 408 2093	340 417 2200	340 425 2294	340 429 2335	340 432 2378
	10 KIAS KTAS Fuel - Lb/Hr	340 380 2138	340 387 2232	340 394 2324	340 398 2368	340 401 2413
	5 KIAS KTAS Fuel - Lb/Hr	300 313 1792	300 318 1863	300 324 1927	300 327 1961	300 330 1999
	S.L. KIAS KTAS Fuel - Lb/Hr	300 291 1875	300 297 1949	300 302 2024	300 304 2060	300 307 2097

Figure 8-14
(Sheet 16 of 19)

HIGH SPEED CRUISE

WEIGHT — 22,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr					
	45 Mach Ind KTAS Fuel - Lb/Hr					
	43 Mach Ind KTAS Fuel - Lb/Hr	.773 433 1439				
	41 Mach Ind KTAS Fuel - Lb/Hr	.790 443 1473	.781 448 1458	.758 443 1353	.700 413 1231	
	39 Mach Ind KTAS Fuel - Lb/Hr	.800 449 1593	.799 459 1640	.786 461 1528	.768 455 1419	.742 443 1320
	37 Mach Ind KTAS Fuel - Lb/Hr	.810 455 1792	.807 465 1823	.799 470 1700	.788 467 1586	.772 462 1482
	35 Mach Ind KTAS Fuel - Lb/Hr	.810 458 1812	.810 469 1901	.804 475 1835	.795 475 1722	.782 471 1618
	30 Mach Ind KTAS Fuel - Lb/Hr	.810 469 2029	.810 479 2115	.805 486 2087	.798 486 1999	.788 484 1922
	25 KIAS KTAS Fuel - Lb/Hr	330 462 2053	330 472 2154	330 481 2246	330 486 2295	329 490 2235
	20 KIAS KTAS Fuel - Lb/Hr	340 440 2092	340 449 2194	340 458 2284	340 463 2328	340 467 2379
	15 KIAS KTAS Fuel - Lb/Hr	340 409 2098	340 417 2205	340 425 2299	340 429 2340	340 432 2382
	10 KIAS KTAS Fuel - Lb/Hr	340 380 2142	340 387 2237	340 394 2329	340 398 2373	340 401 2418
	5 KIAS KTAS Fuel - Lb/Hr	300 313 1797	300 318 1869	300 324 1933	300 327 1967	300 330 2005
	S.L. KIAS KTAS Fuel - Lb/Hr	300 291 1881	300 297 1954	300 302 2030	300 304 2066	300 307 2103

Figure 8-14
(Sheet 17 of 19)

HIGH SPEED CRUISE

WEIGHT — 22,500 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr					
	45 Mach Ind KTAS Fuel - Lb/Hr					
	43 Mach Ind KTAS Fuel - Lb/Hr	.765 428 1427				
	41 Mach Ind KTAS Fuel - Lb/Hr	.790 443 1531	.775 444 1450	.747 437 1346		
	39 Mach Ind KTAS Fuel - Lb/Hr	.800 449 1649	.795 457 1635	.782 459 1524	.762 451 1414	.732 437 1312
	37 Mach Ind KTAS Fuel - Lb/Hr	.810 455 1854	.804 463 1818	.797 468 1697	.784 465 1582	.767 459 1477
	35 Mach Ind KTAS Fuel - Lb/Hr	.810 458 1848	.810 469 1940	.802 474 1832	.792 473 1718	.779 469 1615
	30 Mach Ind KTAS Fuel - Lb/Hr	.810 469 2050	.810 479 2137	.804 485 2084	.796 485 1996	.786 483 1918
	25 KIAS KTAS Fuel - Lb/Hr	330 462 2060	330 472 2161	330 481 2253	330 486 2303	329 489 2234
	20 KIAS KTAS Fuel - Lb/Hr	340 440 2095	340 449 2197	340 458 2288	340 463 2332	340 467 2383
	15 KIAS KTAS Fuel - Lb/Hr	340 409 2103	340 417 2210	340 425 2304	340 429 2344	340 432 2387
	10 KIAS KTAS Fuel - Lb/Hr	340 380 2147	340 387 2243	340 394 2334	340 398 2378	340 402 2423
	5 KIAS KTAS Fuel - Lb/Hr	300 313 1803	300 318 1874	300 324 1938	300 327 1973	300 330 2012
	S.L. KIAS KTAS Fuel - Lb/Hr	300 292 1886	300 297 1959	300 302 2035	300 304 2072	300 307 2109

Figure 8-14
(Sheet 18 of 19)

HIGH SPEED CRUISE

WEIGHT — 23,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	51 Mach Ind KTAS Fuel - Lb/Hr					
	49 Mach Ind KTAS Fuel - Lb/Hr					
	47 Mach Ind KTAS Fuel - Lb/Hr					
	45 Mach Ind KTAS Fuel - Lb/Hr					
	43 Mach Ind KTAS Fuel - Lb/Hr	.753 421 1410				
	41 Mach Ind KTAS Fuel - Lb/Hr	.790 443 1631	.766 439 1438	.732 428 1335		
	39 Mach Ind KTAS Fuel - Lb/Hr	.800 449 1710	.792 455 1630	.778 456 1521	.754 446 1407	.715 427 1299
	37 Mach Ind KTAS Fuel - Lb/Hr	.810 455 1924	.803 461 1815	.794 466 1694	.781 463 1579	.762 456 1472
	35 Mach Ind KTAS Fuel - Lb/Hr	.810 458 1886	.809 468 1970	.800 473 1829	.790 471 1716	.776 467 1611
	30 Mach Ind KTAS Fuel - Lb/Hr	.810 469 2070	.810 479 2160	.802 484 2082	.794 483 1993	.783 481 1914
	25 KIAS KTAS Fuel - Lb/Hr	330 462 2071	330 472 2172	330 481 2265	330 486 2315	328 488 2232
	20 KIAS KTAS Fuel - Lb/Hr	340 440 2099	340 449 2201	340 458 2292	340 463 2336	340 467 2388
	15 KIAS KTAS Fuel - Lb/Hr	340 409 2107	340 417 2214	340 425 2309	340 429 2349	340 433 2392
	10 KIAS KTAS Fuel - Lb/Hr	340 380 2151	340 387 2248	340 395 2340	340 398 2384	340 402 2429
	5 KIAS KTAS Fuel - Lb/Hr	300 313 1808	300 318 1880	300 324 1944	300 327 1979	300 330 2018
	S.L. KIAS KTAS Fuel - Lb/Hr	300 292 1891	300 297 1965	300 302 2041	300 304 2078	300 307 2115

Figure 8-14
(Sheet 19 of 19)

MAXIMUM RANGE DESCENT - ONE ENGINE

ALTITUDE ~ FT	DESCENT SPEED
51,000 to 49,000	0.70 MI
49,000 to 29,000	170 KIAS
29,000 to 21,000	0.45 MI
21,000 and below	200 KIAS

NOTE: This table represents the minimum sink-rate speed above the single-engine service ceiling and approximates the best rate-of-climb speed below the single-engine service ceiling.

Figure 8-15

LONG RANGE CRUISE ONE ENGINE

WEIGHT — 14,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	30	Mach Ind	.536	.533	.534	.538
		KTAS	306	312	319	324
		Fuel - Lb/Hr	695	722	761	782
	25	KIAS	198	198	196	198
		KTAS	282	289	292	297
		Fuel - Lb/Hr	693	728	753	776
	20	KIAS	199	199	200	199
		KTAS	261	267	273	274
		Fuel - Lb/Hr	703	739	773	783
	15	KIAS	200	202	202	202
		KTAS	243	250	254	258
		Fuel - Lb/Hr	724	760	794	814
	10	KIAS	200	202	205	208
		KTAS	225	231	239	244
		Fuel - Lb/Hr	742	787	838	867
	5	KIAS	203	209	214	216
		KTAS	212	222	232	235
		Fuel - Lb/Hr	794	859	919	939

WEIGHT — 15,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	30	Mach Ind	.558	.545	.559	.552
		KTAS	319	319	333	333
		Fuel - Lb/Hr	758	774	835	840
	25	KIAS	205	205	204	205
		KTAS	292	298	303	308
		Fuel - Lb/Hr	750	783	818	839
	20	KIAS	205	206	205	205
		KTAS	270	277	280	283
		Fuel - Lb/Hr	756	794	821	842
	15	KIAS	207	208	208	207
		KTAS	251	257	262	264
		Fuel - Lb/Hr	774	810	848	861
	10	KIAS	207	209	212	214
		KTAS	233	239	247	252
		Fuel - Lb/Hr	796	842	893	921
	5	KIAS	211	216	221	222
		KTAS	220	230	239	242
		Fuel - Lb/Hr	847	911	971	989

Figure 8-16
(Sheet 1 of 5)

LONG RANGE CRUISE ONE ENGINE

WEIGHT — 16,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	30	Mach Ind	.566	.567	.568	.570
		KTAS	324	332	339	344
		Fuel - Lb/Hr	801	849	886	910
	25	KIAS	212	208	211	211
		KTAS	301	303	313	317
		Fuel - Lb/Hr	806	827	881	899
	20	KIAS	212	212	212	212
		KTAS	278	284	289	292
		Fuel - Lb/Hr	809	845	881	901
	15	KIAS	213	213	212	212
		KTAS	258	264	268	270
		Fuel - Lb/Hr	824	859	892	912
	10	KIAS	214	216	218	217
		KTAS	241	247	255	255
		Fuel - Lb/Hr	850	898	945	956
	5	KIAS	218	223	228	224
		KTAS	227	237	246	245
		Fuel - Lb/Hr	900	964	1022	1020

WEIGHT — 17,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	30	Mach Ind	.584	.588	.584	.561
		KTAS	334	344	349	339
		Fuel - Lb/Hr	868	921	955	929
	25	KIAS	217	216	217	216
		KTAS	309	314	322	323
		Fuel - Lb/Hr	858	898	942	953
	20	KIAS	219	216	218	218
		KTAS	287	290	298	301
		Fuel - Lb/Hr	864	892	941	962
	15	KIAS	219	219	218	219
		KTAS	266	271	275	278
		Fuel - Lb/Hr	876	912	949	971
	10	KIAS	221	223	221	221
		KTAS	248	255	258	260
		Fuel - Lb/Hr	905	953	984	1000
	5	KIAS	224	229	229	225
		KTAS	234	244	248	245
		Fuel - Lb/Hr	953	1016	1052	1045

Figure 8-16
(Sheet 2 of 5)

LONG RANGE CRUISE ONE ENGINE

WEIGHT — 18,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	30	Mach Ind	.603	.600	.570	.505
		KTAS	345	351	341	305
		Fuel - Lb/Hr	938	980	965	907
	25	CIAS	220	224	222	223
		KTAS	312	325	329	333
		Fuel - Lb/Hr	900	968	998	1022
	20	CIAS	225	223	224	224
		KTAS	295	299	306	309
		Fuel - Lb/Hr	918	955	1001	1021
	15	CIAS	226	224	225	225
		KTAS	274	277	283	286
		Fuel - Lb/Hr	929	961	1008	1031
	10	CIAS	227	228	226	226
		KTAS	255	261	263	267
		Fuel - Lb/Hr	957	1002	1032	1057
	5	CIAS	231	236	230	227
		KTAS	241	251	249	248
		Fuel - Lb/Hr	1006	1069	1080	1082

WEIGHT — 19,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	30	Mach Ind	.610	.609		
		KTAS	349	356		
		Fuel - Lb/Hr	991	1036		
	25	CIAS	227	232	230	221
		KTAS	322	336	340	331
		Fuel - Lb/Hr	970	1038	1073	1046
	20	CIAS	227	230	230	229
		KTAS	298	308	314	315
		Fuel - Lb/Hr	957	1018	1059	1077
	15	CIAS	230	230	231	231
		KTAS	279	284	291	294
		Fuel - Lb/Hr	977	1019	1067	1090
	10	CIAS	233	231	231	232
		KTAS	261	264	270	273
		Fuel - Lb/Hr	1006	1042	1089	1112
	5	CIAS	237	238	234	233
		KTAS	248	253	253	255
		Fuel - Lb/Hr	1058	1105	1123	1141

Figure 8-16
(Sheet 3 of 5)

LONG RANGE CRUISE ONE ENGINE

WEIGHT — 20,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	30	Mach Ind	.613	.559		
		KTAS	351	327		
		Fuel - Lb/Hr	1043	1000		
	25	KIAS	234	234	228	207
		KTAS	332	340	338	311
		Fuel - Lb/Hr	1040	1084	1097	1031
	20	KIAS	233	236	234	235
		KTAS	305	315	320	324
		Fuel - Lb/Hr	1015	1077	1115	1142
	15	KIAS	234	236	236	236
		KTAS	283	291	298	300
		Fuel - Lb/Hr	1020	1077	1126	1146
	10	KIAS	238	236	237	237
		KTAS	267	271	276	279
		Fuel - Lb/Hr	1056	1097	1146	1171
	5	KIAS	244	240	240	239
		KTAS	254	255	259	261
		Fuel - Lb/Hr	1111	1135	1180	1202

WEIGHT — 21,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	30	Mach Ind	.569			
		KTAS	326			
		Fuel - Lb/Hr	1020			
	25	KIAS	241	240	216	
		KTAS	342	348	321	
		Fuel - Lb/Hr	1110	1151	1085	
	20	KIAS	240	241	240	237
		KTAS	314	323	328	326
		Fuel - Lb/Hr	1083	1136	1179	1184
	15	KIAS	240	241	242	240
		KTAS	291	298	304	306
		Fuel - Lb/Hr	1081	1134	1184	1201
	10	KIAS	241	242	243	243
		KTAS	271	277	283	286
		Fuel - Lb/Hr	1100	1154	1205	1231
	5	KIAS	247	244	245	245
		KTAS	258	260	266	268
		Fuel - Lb/Hr	1153	1184	1239	1261

Figure 8-16
(Sheet 4 of 5)

LONG RANGE CRUISE ONE ENGINE

WEIGHT — 22,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	30	Mach Ind KTAS Fuel - Lb/Hr				
	25	KIAS KTAS Fuel - Lb/Hr	247 349 1172	242 351 1199		
	20	KIAS KTAS Fuel - Lb/Hr	247 323 1152	245 327 1187	244 332 1232	229 316 1175
	15	KIAS KTAS Fuel - Lb/Hr	246 298 1141	247 305 1194	246 309 1236	246 313 1266
	10	KIAS KTAS Fuel - Lb/Hr	247 277 1156	248 284 1212	249 290 1266	248 292 1287
	5	KIAS KTAS Fuel - Lb/Hr	249 260 1185	249 265 1237	250 271 1291	250 273 1316
						250 275 1342

WEIGHT — 23,000 LB		TEMPERATURE — °C				
		ISA -10	ISA	ISA +10	ISA +15	ISA +20
ALTITUDE — 1000 FEET	30	Mach Ind KTAS Fuel - Lb/Hr				
	25	KIAS KTAS Fuel - Lb/Hr	251 355 1231	230 334 1180		
	20	KIAS KTAS Fuel - Lb/Hr	254 332 1219	251 335 1254	236 323 1224	210 291 1153
	15	KIAS KTAS Fuel - Lb/Hr	252 305 1201	252 311 1252	251 316 1300	252 320 1329
	10	KIAS KTAS Fuel - Lb/Hr	252 283 1212	253 290 1271	253 295 1321	253 301 1344
	5	KIAS KTAS Fuel - Lb/Hr	253 264 1232	254 270 1290	254 275 1344	254 278 1370
						254 280 1397

Figure 8-16
(Sheet 5 of 5)

DESCENT AND HOLDING PERFORMANCE

The descent and holding performance on the following pages is based on flight test data and represents the average delivered aircraft.

DESCENT PERFORMANCE SCHEDULE

Figures 8-17 and 8-18 show times, distance and fuel used, for normal and high speed descents respectively, from a given altitude to sea level. An average descent weight of 16,000 pounds is assumed in the tables. Subtraction of performance values for two altitudes results in the time, distance and fuel required for descent between the two altitudes. The descent speed schedule is presented with each table. The power setting for descent is IDLE thrust. Data are shown without the use of spoilers. Descent performance is improved if spoilers are deployed.

HOLDING OPERATIONS

Figure 8-19 shows fuel flows and holding speed for various weights and altitude conditions. The holding speeds presented are sufficient to ensure a comfortable margin above shaker operation or low-speed buffet while maneuvering in a holding pattern.

DESCENT PERFORMANCE SCHEDULE

NORMAL DESCENT

ALTITUDE 1000 Ft.	TIME Min.	DISTANCE N.M.	FUEL Lb.
51	17.6	114	167
49	16.6	106	157
47	15.4	97	144
45	14.1	88	131
43	12.9	80	118
41	11.9	72	107
39	11.0	66	98
37	10.2	60	90
35	9.6	55	83
33	9.1	52	78
31	8.6	48	74
29	8.3	46	70
27	7.9	43	67
25	7.5	40	63
23	7.1	37	59
21	6.6	34	55
19	6.2	31	51
17	5.8	28	48
15	5.3	25	44
13	4.9	23	41
11	4.4	20	37
9	3.7	16	31
7	2.9	13	25
5	2.1	9	19

DESCENT SPEED: 51,000 to 28,000 feet 0.76 MI
 28,000 to 10,000 feet 300 KIAS
 10,000 feet and below 250 KIAS

Figure 8-17

DESCENT PERFORMANCE SCHEDULE

HIGH SPEED DESCENT

ALTITUDE 1000 Ft.	TIME Min.	DISTANCE N.M.	FUEL Lb.
51	16.3	106	154
49	15.2	98	144
47	14.0	89	131
45	12.8	80	118
43	11.6	72	105
41	10.6	65	95
39	9.9	59	87
37	9.3	55	81
35	8.8	51	76
33	8.4	48	72
31	8.0	45	69
29	7.7	43	66
27	7.5	41	63
25	7.2	38	60
23	6.8	36	57
21	6.5	33	54
19	6.1	31	51
17	5.8	28	48
15	5.4	26	45
13	5.0	23	42
11	4.5	20	38
9	3.7	16	31
7	2.9	13	25
5	2.1	9	19

NOTE: The speed schedule portrayed below occurs when high-speed descent feature has been selected in the LVL CHG (Level Change) mode of the autopilot

DESCENT SPEED: 51,000 to 26,800 feet 0.76 MI
 43,000 to 37,000 feet 0.76 to 0.79 MI
 37,000 to 27,000 feet 0.79 MI
 27,000 to 14,500 feet 320 KIAS
 14,500 to 10,500 feet 330 to 250 KIAS
 10,500 feet and below 250 KIAS

HOLDING OPERATIONS

			WEIGHT — 1000 LB								
			15	16	17	18	19	20	21	22	23
ALTITUDE — 1000 FEET	41	Mach Ind	.650	.659	.672	.693	.704	.712	.715	.723	.741
		Fuel - Lb/Hr	787	835	891	962	1021	1080	1136	1214	1323
	39	Mach Ind	.626	.643	.654	.664	.683	.695	.703	.710	.713
		Fuel - Lb/Hr	774	832	881	932	1002	1061	1118	1174	1231
	37	Mach Ind	.604	.619	.636	.652	.654	.662	.684	.695	.703
		Fuel - Lb/Hr	765	819	876	933	972	1024	1100	1158	1214
	35	Mach Ind	.594	.604	.611	.628	.643	.646	.654	.662	.683
		Fuel - Lb/Hr	784	828	871	929	984	1027	1077	1131	1208
	33	Mach Ind	.566	.581	.594	.612	.627	.629	.634	.641	.658
		Fuel - Lb/Hr	787	837	885	943	999	1036	1082	1132	1201
	31	Mach Ind	.541	.559	.575	.594	.609	.612	.615	.621	.636
		Fuel - Lb/Hr	789	845	898	957	1011	1048	1087	1134	1199
	29	Mach Ind	.515	.537	.555	.575	.590	.595	.595	.600	.613
		Fuel - Lb/Hr	790	853	910	970	1023	1060	1092	1136	1196
	25	KIAS	170	175	180	185	190	195	200	205	210
		Fuel - Lb/Hr	740	787	835	882	930	978	1025	1073	1123
	20	KIAS	170	175	180	185	190	195	200	205	210
		Fuel - Lb/Hr	788	831	875	919	965	1010	1055	1101	1148
	15	KIAS	170	175	180	185	190	195	200	205	210
		Fuel - Lb/Hr	837	877	918	960	1001	1044	1087	1132	1178
	10	KIAS	170	175	180	185	190	195	200	205	210
		Fuel - Lb/Hr	875	915	956	999	1042	1087	1134	1181	1230
	5	KIAS	170	175	180	185	190	195	200	205	210
		Fuel - Lb/Hr	903	949	995	1043	1091	1143	1194	1247	1301

Figure 8-19