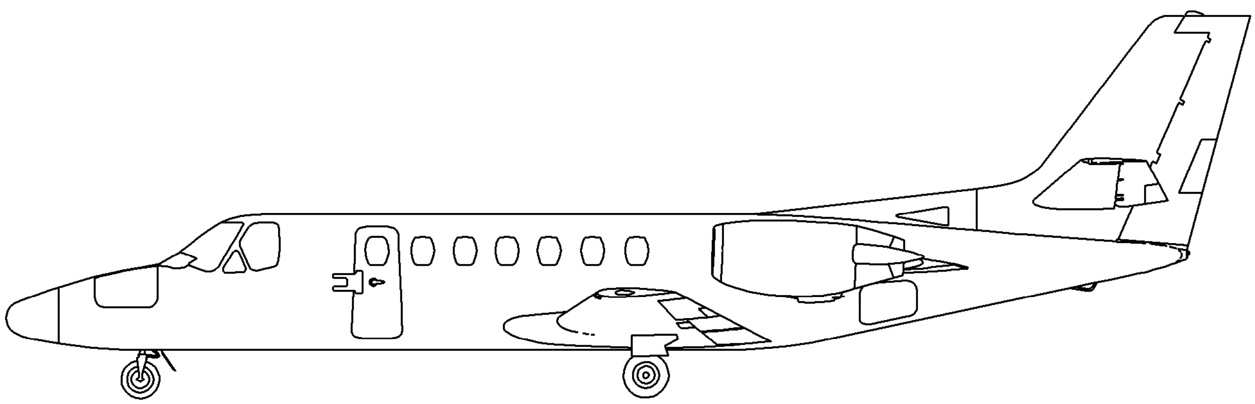
Cessna
A Textron Company

Operating Manual

Citation Encore

MODEL 560
560-0539 THRU -5000



Member of GAMA

28 SEPTEMBER 2000

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REVISION 1 3 NOVEMBER 2005

LOG OF EFFECTIVE PAGES

Use this page to determine the currency and applicability of your Operating Manual. Pages affected by the current revision are indicated by an asterisk (*) preceding the pages listed under the Page column. Determine which pages are applicable to your airplane by checking effectivity of each page, which is listed after each page entry where an airplane serialization is required. Only the pages applicable to your airplane should be retained in the Operating Manual. This manual pertains to Model 560 Encore airplanes, serial numbers 560-0539 thru -5000.

In addition to the serialization shown on the effectivity pages, pages that apply to certain airplanes have the applicable airplane configuration code on the bottom of the pages. Pages not serialized apply to all airplanes.

Refer to page Introduction-3 for an explanation of airplane configuration codes.

Following is a description of the Log of Effective Pages columns:

Revision Number - Indicates the revision number of the applicable manual.
Date - Indicates the date on which the manual (or revision to the manual) was issued.
Page - Describes the page (or pages) in question. Page numbers with a slash (/) indicates text or illustration on the first page and a blank backup on the second page.
Rev Level - Indicates the revision level of the page (or pages).

	REVISION NUMBER	DATE		REVISION NUMBER	DATE
Original	0	28 September 2000	Revision ...	1 ...	3 November 2005

	PAGE NUMBER	REV LEVEL
*	Title	1
*	Effectivity-1/Effectivity-2	1
*	Introduction-1/Introduction-2	
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*	6-1/6-2	1
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CONTENTS

INTRODUCTION

UNIT AND SERIAL NUMBER

On all Model 560 Citation Encore airplanes, the serial and unit number are stamped into the airplane identification nameplate. This manual uses serial numbers to describe airplane effectivities.

OPERATING MANUAL PART NUMBER

Each page in the Operating Manual contains the part number of the manual and the page status of each page; Refer to the following example:

Operating Manual
56 OMB - 00

Page Status (Original)
Manual (Operating Manual, Airplanes 560-0539 thru -5000)
Airplane Model (560)

AIRPLANE CONFIGURATION CODES

The following is a list of airplane configuration codes which appear at the bottom of the page of the Operating Manual, and which indicates page effectivity by serial number. Pages marked AA apply to all airplanes. This list contains only the configurations which have been incorporated into this Operating Manual.

Configuration Code	Effectivity by Serial Number
AA	Airplanes 560-0539 thru -5000.
AB	Airplanes 560-0539 thru -0625 not incorporating SB560-77-04.
AC	Airplanes 560-0539 thru -0625 incorporating SB560-77-04, and Airplanes 560-0626 thru -5000.
AD	Airplanes 560-0539 thru -0643 not incorporating SB560-34-103.
AE	Airplanes 560-0539 thru -0643 incorporating SB560-34-103, and Airplanes 560-0644 thru -5000.
AF	Airplanes 560-0539 thru -0651 not incorporating SB560-23-32.
AG	Airplanes 560-0539 thru -0651 incorporating SB560-23-32, and Airplanes 560-0652 thru -5000.

(Continued Next Page)

AIRPLANE CONFIGURATION CODES (Continued)

Configuration Code	Effectivity by Serial Number
AH	Airplanes 560-0626 thru -0644 not incorporating SB560-77-06.
AI	Airplanes 560-0645 thru -0677 not incorporating SB560-77-06.
AJ	Airplanes 560-0626 thru -0651 incorporating SB560-77-05, and Airplanes 560-0652 thru -5000.
AK	Airplanes 560-0626 thru -0651 not incorporating SB560-77-05.
AL	Airplanes 560-0539 thru -0648 not incorporating SB560-28-11.
AM	Airplanes 560-0539 thru -0648 incorporating SB560-28-11 and Airplanes 560-0649 thru -5000.
AN	Airplanes 560-0539 thru -0631.
AO	Airplanes 560-0632 thru -5000.
AR	Airplanes 560-0626 thru -0677 incorporating SB560-77-06 and Airplanes 560-0678 thru -5000.

COVERAGE

This manual is intended to provide an information source for familiarization, review and suggested technique to achieve maximum safety, passenger comfort and utility, and is based on experience gained in the typical transport category jet operating environment.

While the Operating Manual covers and expands upon the basic FAA Approved Airplane Flight Manual information, the FAA approved document shall take precedence should a difference be noted.

REVISIONS

As new information becomes available, the Operating Manual will be revised. Throughout this manual, revised material is identified by use of change bars or pointing hands.

TEXT CHANGES

In The Main Body

A change bar located in the left margin adjacent to the applicable text will extend the full length of new material on new pages. On presently existing pages, a change bar will extend the length of new or revised text. Deleted text will be indicated with a change bar near the beginning of its previous location.

In Footers

A change bar in the footer will indicate one of the following conditions:

- A configuration code change.
- Unedited text has slid on or off of the page.
- There is slippage of text as well as a change in text on the same page (in this case, a change bar would appear adjacent to the edited text and in the footer).

ILLUSTRATION CHANGES

A pointing hand or a change bar may be used to indicate changes to an existing illustration. If changes are minor, a change bar or pointing hand will appear adjacent to the changed portion of the illustration. If changes are extensive, a pointing hand or change bar will appear adjacent to the figure number. New figures will use only a pointing hand adjacent to the figure number.

SERVICE BULLETIN CONFIGURATION LIST

Number	Title	Airplane Serial Effectivity	Revision Incorporated	Incorporated In Airplane
SB560-23-32	Communications - RNZ-850 Navigation Radio Upgrade	560-0539 thru -0651		
SB560-34-103	Navigation - GH-3000 Field Replacement	560-0539 thru -0643		
SB560-77-04	AMLCD Modification	560-0539 thru -0625		
SB560-77-05	AMLCD Emergency Lighting Modification	560-0626 thru -0651		
SB560-28-11	Fuel - Encore Fuel Boost Pump Wire Routing Improvement	560-0539 thru -0648		
SB560-77-06	Engine Indicating - Active Matrix Liquid Crystal Display (AMLCD) Upgrade	560-0626 thru -0677		

DEFINITIONS AND ABBREVIATIONS

AC:	Alternating Current
Accelerate-Stop Distance:	The distance required to accelerate the aircraft and then abort the takeoff due to a failed engine, or other emergency, occurring just prior to V_1 with brake application commencing at V_1
ADF:	Automatic Direction Finding
ADI:	Attitude Director Indicator
AIA:	Anti-icing Additive
Altitude:	All altitudes used in this manual are pressure altitudes unless otherwise stated.
AM or AME:	Amplitude Modulation
Anti-Ice/Deice Systems:	The following systems comprise the anti-ice/deice systems: a. Windshield Bleed Air Anti-Ice. b. Wing Bleed Air Anti-Ice. c. Engine Bleed Air Anti-Ice. d. Pitot-Static System Anti-Ice (includes electrical anti-ice for AOA vane). e. Horizontal Stabilizer Pneumatic Deice. Performance, when referred to ANTI-ICE ON, is based on the wing and engine anti-ice systems being operated at the same time.
ARM:	The horizontal distance from the reference datum to the center-of-gravity (C.G.) of an item.
ATC:	Air Traffic Control
Basic Empty Weight:	Standard empty weight plus installed optional equipment.
°C:	Temperature in degrees Celsius.
CAT II:	Category II Operation. A straight-in ILS approach to the runway of an airport under a Category II ILS instrument approach procedure.
CB:	Circuit Breaker
CDI:	Course Deviation Indicator
Center-of-Gravity (C.G.):	The point at which an airplane would balance if suspended.
C.G. Arm:	The arm obtained by adding the airplane's individual moments and dividing the sum by the total weight.
C.G. Limits:	The extreme center-of-gravity locations within which the airplane must be operated at a given weight.
Climb Gradient:	The ratio of the change in height during a portion of a climb, to the horizontal distance traversed in the same time interval.
DC:	Direct Current

Demonstrated Crosswind:	The demonstrated crosswind velocity of 30 knots (measured at 30 feet above the runway surface) is the velocity of the crosswind component for which adequate control of the airplane during takeoff and landing was actually demonstrated during certification tests. This is not limiting. The demonstrated crosswind velocity for an airplane using thrust reversers is 30 knots.
DG:	Directional Gyro
DH:	Decision Height
DME:	Distance Measuring Equipment
Engine Cycle:	Any operational sequence involving engine start, power to 80 percent N_1 or above and engine shutdown.
Engine Out Accelerate-Go Distance	The horizontal distance from brake release to the point where the airplane attains a height of 35 feet above the runway surface on a takeoff during which an engine is recognized to have failed at V_1 and the takeoff is continued.
°F:	Temperature in degrees Fahrenheit
FAA:	Federal Aviation Administration
Flameout:	Unintentional loss of engine during operation.
FM:	Frequency Modulation
G:	Acceleration due to gravity. One G equals the pull of gravity with no acceleration.
Gross Climb Gradient:	The climb gradient that the airplane can actually achieve with ideal ambient conditions (smooth air).
HF:	High Frequency
Hot Start:	An engine start, or attempted start, which results in an interstage turbine temperature exceeding 550°C or which otherwise exceeds the engine starting temperature envelope limits.
Hr:	Hour
HSI:	Horizontal Situation Indicator
Hz:	Hertz
In. Hg:	Inches of Mercury
IOAT:	The indicated outside air temperature as read from the pilot’s panel. It is the same as RAT.
IFR:	Instrument Flight Rules

ISA:	International Standard Atmosphere in which: a. The air is a dry perfect gas; b. The temperature at sea level is 15°C (59°F); c. The pressure at sea level (standard datum plane) is 29.92 inches Hg. (1013.2 Mb); d. The temperature gradient from sea level to the altitude at which the temperature is -56.6°C will be -1.98°C per 1000 feet.
ITT:	Interstage Turbine Temperature. Engine operating temperature taken between the high and low pressure turbine sections.
Jack Point:	One of three points on the airplane designed to rest on a jack.
KCAS:	Indicated airspeed (knots) corrected for position error (instrument error is assumed to be zero).
kHz:	Kilohertz
KIAS:	Airspeed indicator reading (knots). Zero instrument error is assumed.
KTAS:	True airspeed expressed in knots
Landing Distance:	The distance from a point 50 feet above the runway surface to the point at which the airplane would come to a full stop on the runway.
Lb:	Pound
Lb/hr:	Pounds-per-hour
LH:	Left Hand
LSB:	Lower Side Band
M or Mach:	Mach Number. The ratio of true airspeed to the speed of sound.
MAC:	Mean Aerodynamic Chord. The chord of an imaginary airfoil which, throughout the flight range, will have the same force vectors as those of the wing.
Maximum Brake Energy Speed:	The maximum speed from which a stop can be accomplished within the energy capabilities of the brakes.
Maximum Continuous Power:	The power developed at 700°C ITT or 100.0 percent N_1 RPM, which is the maximum power setting without a time limit. Used in emergency conditions only.
Maximum Cruise Thrust Setting	Maximum power setting recommended for cruise thrust.
Maximum Landing Weight:	Maximum weight approved for landing touchdown.
Maximum Ramp Weight:	Maximum weight approved for ground maneuver. It includes engine start and taxi fuel.
Maximum Zero Fuel Weight:	Maximum weight exclusive of usable fuel.
Mb:	Millibars
Moment:	The product of the weight of an item multiplied by its arm. (Moment divided by a constant is used to simplify balance calculations by reducing the number of digits.)

MHz:	Megahertz
Multiengine Normal Climb Thrust Setting	Maximum power setting recommended for normal multiengine climb.
N_1:	Low pressure turbine speed. The fan is attached to the low pressure turbine.
N_2:	High pressure turbine speed.
Net Climb Gradient:	The gross climb gradient reduced by 0.8 percent during the takeoff phase and 1.1 percent during enroute. This conservatism is required by FAR Part 25 for terrain clearance determination to account for variables encountered in service.
OAT or TEMP:	Outside Air Temperature or Ambient Air Temperature. The free air static temperature, obtained either from ground meteorological sources or from inflight temperature indications adjusted for instrument error and compressibility effects.
Payload:	Weight of occupants, cargo and baggage.
Position Correction:	A correction applied to indicated airspeed or altitude to eliminate the effect of the location of the static pressure source on the instrument reading. No position corrections are required when using performance section charts in Section VII since all airspeeds and altitudes in this section are presented as "indicated" values except for stall speeds which are presented as "calibrated" values.
Power Lever:	Engine power control; synonymous with throttle in same terminology.
Pressure Altitude:	Altitude measured from standard sea level pressure (29.92 inches Hg) (standard datum plane) by a pressure or barometric altimeter. It is the indicated pressure altitude corrected for position and instrument error. In this manual, altimeter instrument errors are assumed to be zero.
PSI:	Pounds-per-Square Inch
PSIG:	Pounds-per-Square Inch Gage
RAT:	Ram Air Temperature. The indicated outside air temperature as read from the pilot's instrument panel.
REF:	Reference
Reference Datum:	An imaginary vertical plane from which all horizontal distances are measured for center-of-gravity purposes. In the Model 560, the zero reference datum line is 93.70 inches forward of the jig point (airplane nose jack pad location).
Reference Zero:	The point in the takeoff flight path at which the airplane is 35 feet above the takeoff surface and at the end of the takeoff distance required.
Residual Fuel:	The undrainable fuel remaining when the airplane is defueled in a specific attitude by the normal means and procedures specified for draining the tanks.

Residual Ice:	That ice which is not completely removed from the leading edge of the wing and horizontal stabilizer by the surface anti-ice/deice system during operation in icing conditions. Refer to Sections II and IV of the airplane flight manual for applicable procedures.
Reverse Thrust:	The thrust produced when the thrust reverser deflectors are deployed into the engine exhaust stream.
RH:	Right Hand
RMI:	Radio Magnetic Indicator
RNAV:	Area Navigation
RPM:	Revolutions-per-Minute.
R/T:	Receiver Transmitter
SAT:	Static Air Temperature. The temperature of the air undisturbed by the presence or motion of the airplane. SAT and OAT are similar terms.
SSB:	Single Side Band
Standard Empty Weight:	Weight of a standard airplane including unusable fuel, full oil and full operating fluids.
Station:	A location along the airplane fuselage given in terms of distance from the reference datum plane.
Takeoff Field Length:	The Takeoff Field Length given for each combination of gross weight, ambient temperature, altitude, wind and runway gradients is the greatest of the following: a. 115 percent of the two-engine horizontal takeoff distance from start to a height of 35 feet above runway surface. b. Accelerate-stop distance. c. The engine-out accelerate-go distance. No specific identification is made on the charts as to which of these distances governs a specific case. In all cases considered by the charts, the field length is governed by either b. or c., as the factored two-engine takeoff distance is always shorter.
Takeoff Power:	Power setting used for takeoff, limited to 5 minutes duration, not to exceed 720°C ITT or 100.0 percent N_1 RPM.
TAS:	True Airspeed. The airspeed relative to undisturbed air which is the CAS corrected for altitude, temperature and compressibility factor.
TAT:	Total Air Temperature. Air which has had its temperature increased due to adiabatic compression caused by the speed of the airplane. TAT and RAT are similar terms.
Temperature Compressibility Effects:	An error in the indication of temperature caused by airflow over the temperature probe. The error varies depending on altitude and airspeed.
Tower Wind:	Wind reported by the tower or from an FAA source, usually measured at a height of 30 feet above the runway, used for computation of takeoff and landing data.

True Airspeed (KTAS):	The airspeed (knots) of an airplane relative to undisturbed air.
UHF:	Ultra High Frequency
Unusable Fuel:	Fuel remaining after fuel runout tests have been completed in accordance with governmental regulations.
U.S.:	United States
Usable Fuel:	Fuel available for flight planning.
USB:	Upper Side Band
V_1:	Takeoff decision speed. The distance to continue the takeoff to 35 feet will not exceed the scheduled takeoff field length if recognition occurred at V_1 (accelerate-go). The distance to bring the airplane to a full stop (accelerate-stop) will not exceed the scheduled takeoff field length provided that the brakes are applied at V_1.
V_2:	Takeoff safety speed. This climb speed is the actual speed at 35 feet above the runway surface as demonstrated in flight during takeoff with one engine inoperative.
V_{35}:	This climb speed is the actual speed at 35 feet above the runway surface as demonstrated in flight during takeoff with both engines operating.
V_A:	The maneuvering speed is the maximum speed at which application of full available aerodynamic control will not overstress the airplane.
V_{APP}:	The landing approach airspeed (1.3 VS_1) with 15-degree flap position, landing gear UP.
V_{ENR}:	Single-engine enroute climb speed.
V_{FE}:	Maximum flap extended speed. The highest speed permissible with wing flaps in a prescribed extended position.
V_{LE}:	Maximum landing gear extended speed. The maximum speed at which an airplane can safely be flown with the landing gear extended.
V_{LO}:	Maximum landing gear operating speed. The maximum speed at which the landing gear can be safely extended or retracted. The Model 560 has different V_{L0} speeds for extension and retraction.
V_{MCA}:	Minimum airspeed in flight at which directional control can be maintained, when one engine is suddenly made inoperative. V_{MC_A} is a function of engine thrust which varies with altitude and temperature. The V_{MCA} presented in Section I was determined for maximum thrust. V_{MCA} = 86 KIAS.
V_{MCG}:	Minimum airspeed on the ground at which directional control can be maintained, when one engine is suddenly made inoperative, using only aerodynamic controls. V_{MCG} is a function of engine thrust which varies with altitude and temperature. The V_{MC_G} presented in Section I was determined for maximum thrust. 7° Flaps, V_{MCG} = 96 KIAS. 15° Flaps, V_{MCG} = 92 KIAS.
V_{MCL}:	Minimum airspeed in the air, in the landing configuration, at which directional control can be maintained, when one engine is suddenly made inoperative. V_{MCL} is a function of engine thrust which varies with altitude and temperature. The V_{MCL} is 88 KIAS at maximum takeoff thrust.

V_R:	The rotation speed is the speed at which rotation is initiated during takeoff to attain the V_2 climb speed at or before a height of 35 feet above runway surface has been reached.
V_{REF}:	The landing approach airspeed at the 50-foot point with flaps in landing position and landing gear extended (1.3 V_{SO}).
V_{SO}:	The stalling speed in the landing configuration.
V_{S1}:	The stalling speed obtained in a specified configuration.
V_Y:	Best Rate-of-Climb Speed. The airspeed which delivers the greatest gain of altitude in the shortest possible time.
V_{YSE}:	Best Single-Engine Rate-of-Climb Speed. The airspeed which delivers the greatest gain of altitude in the shortest possible time with one engine operating.
V_{MCL}:	Minimum airspeed in the air, in the landing configuration, at which directional control can be maintained, when one engine is suddenly made inoperative. V_{MCL} is a function of engine thrust which varies with altitude and temperature. The V_{MCL} is 92 KIAS at maximum takeoff thrust.
V_{MO}/M_{MO}:	Maximum Operating Limit Speed is the calibrated speed limit that may not be deliberately exceeded in normal flight operations. V is expressed in knots and M in Mach number.
V_X:	Best Angle-of-Climb Speed. The airspeed which delivers the greatest gain of altitude in the shortest possible horizontal distance.
VA:	Volt Amperes
VAC:	Volts Alternating Current
VG:	Vertical Gyro
VHF:	Very High Frequency
VLF:	Very Low Frequency
VNAV:	Vertical Navigation
VOR:	Very High Frequency Omnidirectional Radio Range
VOT:	Very High Frequency Omnidirectional Test
Visible Moisture:	Visible moisture includes, but is not limited to the following conditions: fog or clouds with visibility less than 1 mile, wet snow and rain.
Wind:	The wind velocities recorded as variables on the charts of this manual are to be understood to refer to the headwind or tailwind components of the actual winds at 30 feet above the runway surface (tower winds).
Windmill:	Engine turbine rotation from airstream inputs.
WPT:	Waypoint

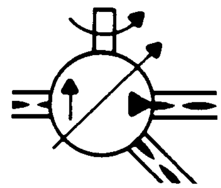
STANDARD SYSTEM SYMBOLS

Standard System Symbols have been developed and utilized in illustrated system diagrams throughout the Operating Manual. Included are symbols for components within the hydraulic/pneumatic systems, fuel system, bleed air, deice and vacuum systems and oxygen systems.

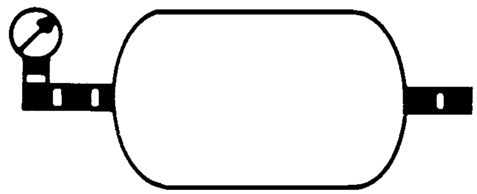
Symbols utilized in electrical schematics follow the Standard System Symbols.

HYDRAULIC/PNEUMATIC SYSTEM SYMBOLS

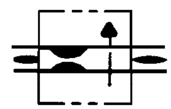
HYDRAULIC PUMP
ENGINE DRIVEN OR
ELECTRIC MOTOR
DRIVEN



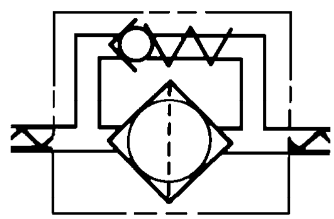
PNEUMATIC RESERVOIR
(BOTTLE) WITH
PRESSURE GAGE



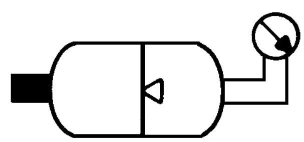
FLOW
REGULATOR



FILTER WITH
BYPASS

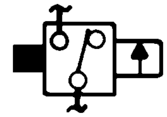


HYDROPNEUMATIC
ACCUMULATOR WITH
PRESSURE GAGE



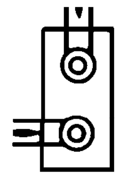
HYDRAULIC/PNEUMATIC SYSTEM SYMBOLS (Continued)

PRESSURE SWITCH

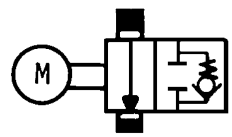


RESTRICTOR

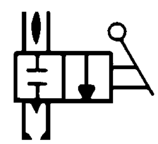
GROUND SERVICE, EXTERNAL
QUICK DISCONNECTS



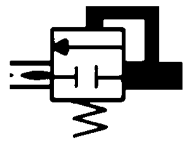
SHUTOFF VALVE WITH
PRESSURE RELIEF
TWO-POSITION - 2-WAY
(MOTOR ACTUATED)



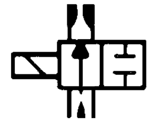
SHUTOFF VALVE WITH
TWO-POSITION - 2-WAY
(MANUALLY ACTUATED)



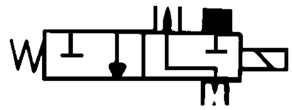
SHUTOFF VALVE
TWO-POSITION - 2-WAY
(PRESSURE OPERATED)



SHUTOFF VALVE
TWO-POSITION - 2-WAY
(SOLENOID OPERATED)



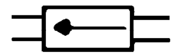
VALVE
TWO-POSITION - 3-WAY
(SOLENOID OPERATED)



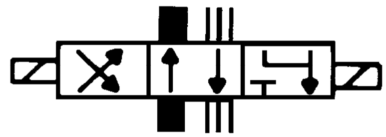
HYDRAULIC/PNEUMATIC SYSTEM SYMBOLS (Continued)

SHUTTLE VALVE

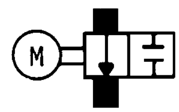
CHECK VALVE



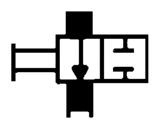
LANDING GEAR CONTROL
MODULE MANIFOLD VALVE
THREE-POSITION - 4-WAY
(SOLENOID OPERATED)



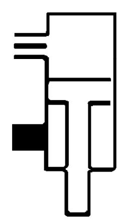
VALVE
TWO-POSITION - 2-WAY
(MOTOR (M) DRIVEN)



VALVE
TWO-POSITION - 2 - WAY
(MECHANICALLY ACTUATED)



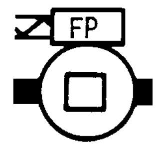
ACTUATOR



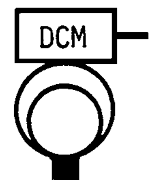
FUEL SYSTEM SYMBOLS

PUMP
(EJECTOR)

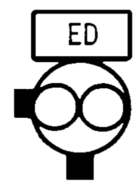
PUMP
(FUEL PRESSURE (FP) DRIVEN)



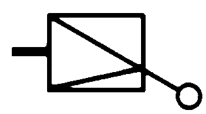
PUMP
(DC MOTOR (DCM) DRIVEN)



PUMP
(ENGINE DRIVEN (ED))

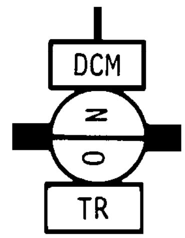


FLOAT SWITCH



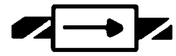
FILTER WITH
BYPASS RELIEF VALVE

SHUTOFF VALVE - NORMAL OPEN
(THERMAL RELIEF (TR) -
DC MOTOR (DCM) DRIVEN)



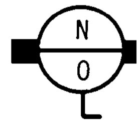
FUEL SYSTEM SYMBOLS (Continued)

CHECK VALVE

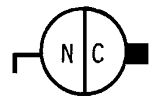


RELIEF VALVE

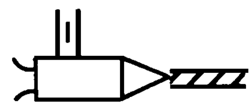
SHUTOFF VALVE - NORMAL OPEN
(MANUALLY OPERATED)



SHUTOFF VALVE - NORMAL CLOSED
(MANUALLY OPERATED)



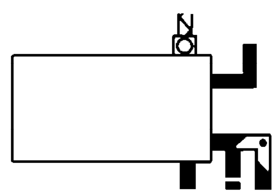
LEVEL CONTROL VALVE



QUICK COUPLER

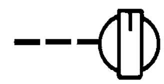
ORIFICE - FLOW
SENSE UNIT

STORAGE TANK

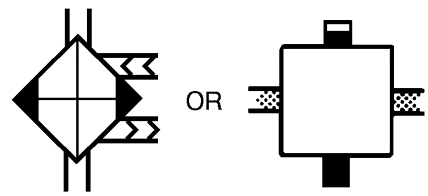


BLEED AIR/DEICE AND VACUUM SYSTEM SYMBOLS

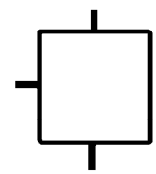
CONTROL



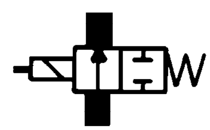
HEAT
EXCHANGER



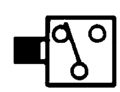
TEMPERATURE
CONTROL
UNIT



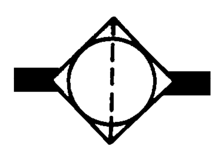
PRESSURE REGULATING
AND SHUTOFF VALVE
TWO-POSITION - 2-WAY
(SOLENOID OPERATED)



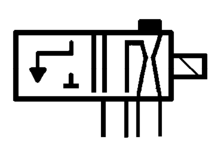
PRESSURE
SWITCH



FILTER

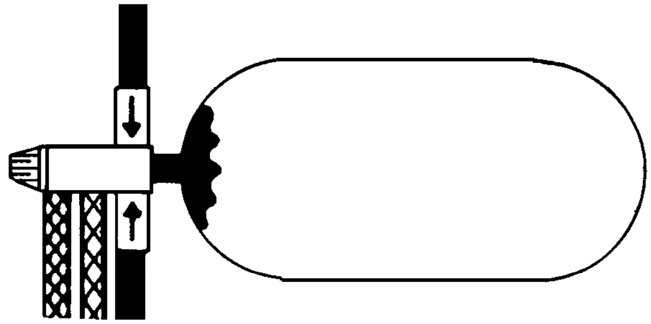


DEICE CONTROL
VALVE



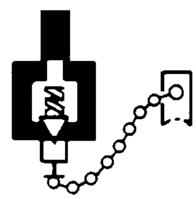
OXYGEN SYSTEM SYMBOLS

OXYGEN CYLINDER

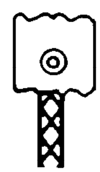


GAGE

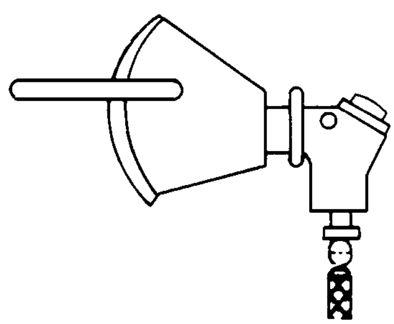
FILLER VALVE
AND PROTECTIVE CAP



OVERBOARD DISCHARGE
INDICATOR
(VENT PORT)



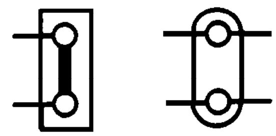
MASK (CREW)



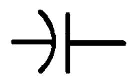
ELECTRICAL SYMBOLS

BATTERY

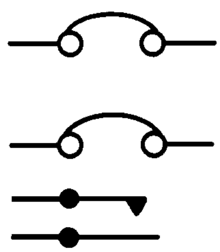
BUS



CAPACITOR



CIRCUIT BREAKER

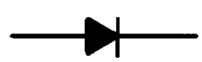


The switch contacts connect to an annunciator system to warn when a circuit breaker is open.

CURRENT TRANSFORMER

Current flowing in wire produces a voltage in coil.

DIODE

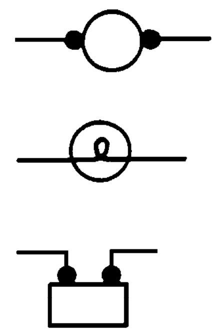


ELECTRICAL SYMBOLS (Continued)

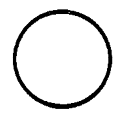
FUSE/LIMITER

GROUND

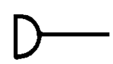
LAMP



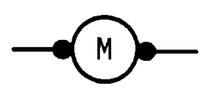
METER/INDICATOR



MICROPHONE



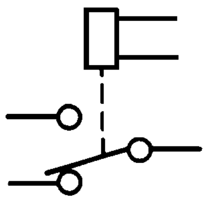
MOTOR

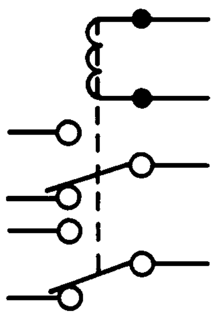


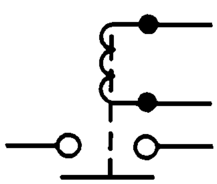
ELECTRICAL SYMBOLS (Continued)

RELAY

The symbol for the solenoid may be a box or a coil; the operation is identical.



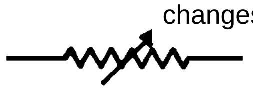




RESISTOR

REGULAR - resistance does not change.

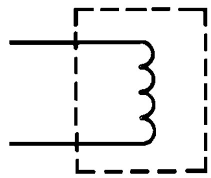
TEMPERATURE CONTROLLED - resistance changes with the temperature.



VARIABLE OR ADJUSTABLE - resistance changes with mechanical input.

ELECTRICAL SYMBOLS (Continued)

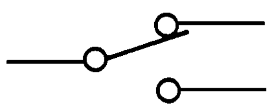
SOLENOID/SOLENOID VALVE



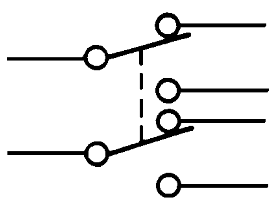
NO (normally open) or NC (normally closed) by a solenoid operated valve indicates the position of the valve with no power applied to the solenoid.

SWITCH

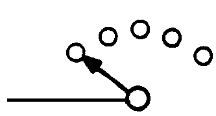
SINGLE POLE/SINGLE THROW (SPST)



SINGLE POLE/DOUBLE THROW (SPDT) may have OFF position in the center.



DOUBLE POLE/DOUBLE THROW (DPDT) may have OFF position in the center. Dashed line indicates all parts move simultaneously.



ROTARY OR MULTI POSITION

SECTION 1

DESCRIPTION AND SPECIFICATIONS

(Continued Next Page)

DESCRIPTION AND SPECIFICATIONS

GENERAL DESCRIPTION

The Cessna Citation Encore is certified in accordance with FAR Part 25 airworthiness standards and utilizes the fail-safe construction concept. It combines systems simplicity with ease of access to reduce maintenance requirements. Low takeoff and landing speeds permit operation at small and unimproved airports. Front fan type turbofan engines contribute to overall operating efficiency and performance.

FLIGHT CONTROLS

Ailerons provide lateral control of the airplane and are operated mechanically by control wheel movement. A trim tab control mechanically operates a trim tab attached to the trailing edge of the left aileron, which provides aerodynamic movement of the aileron

Rudder provides control of the airplane about the vertical axis and is controlled mechanically by the dual rudder pedals, located in the flight compartment. The trim tab on the rudder trailing edge is controlled mechanically by a rudder trim wheel located on the control pedestal

Elevators provide longitudinal control of the airplane and are operated mechanically by fore and aft movement of the control wheel. A trim tab is located on the trailing edge of each elevator. The trim tab is electrically operated and has manual override control

Flaps increase the lift of the wing when partially extended and increase drag to help reduce speed when fully extended. Flaps are actuated hydraulically and controlled mechanically through the preselect handle and indicator follow-up system

Speed brakes provide fast, precise speed control. Speed brakes are hydraulically actuated and manually controlled by a switch on the throttle pedestal. Safety override microswitches prevent extension above 85% N_2 throttle position. Speed brakes will automatically retract if the throttle levers are advanced beyond 85% N_2 .

ENGINES

Two Pratt & Whitney Canada Inc. PW535A turbofans installed on the rear fuselage produce 3400 pounds of thrust each. Ice protection and fire detection and extinguishing systems are incorporated. Fuel is carried in two integral wing tanks with each engine normally supplied from its respective side. The engines utilize a hydromechanical fuel control, and cross-feeding can be selected. Fueling is done through an overwing port in each tank, in addition to a single-point pressure refueling point. Target-type thrust reversers are individually operated by conventional “piggy back” controls mounted on the throttles.

FUSELAGE

Sequentially from front to rear are the avionics bay, nose baggage area, forward pressure bulkhead; flight deck, passenger and aft cabin compartments; rear pressure bulkhead and aft compartment (including tailcone/equipment and aft baggage compartments).

Approximately fifteen cubic feet of baggage space is available in the nose, except in airplanes which have certain avionics options. The flight deck is equipped with dual controls and has two seats, equipped with a five-point restraint system, that can be moved fore and aft, vertically, and tilted.

The passenger compartment provides seating and an air outlet, light and oxygen mask for each occupant. The seats may be moved laterally away from the sidewall, tracked fore or aft, and reclined, with the exception of the aft two seats which will not track fore and aft. The aft cabin compartment, which may be closed off with a privacy curtain, has another 26 cubic feet of storage space and a toilet. The aft compartment contains equipment and systems components and 25 cubic feet of additional baggage space.

ELECTRICAL SYSTEM

The main Direct Current (DC) buses are supplied from two starter/generators. Engine starting and secondary DC power is available from either the battery or an external source. Two static inverters provide power to the Alternating Current (AC) buses.

HYDRAULIC SYSTEM

Engine-driven pumps supply pressure for operation of the landing gear, flaps, speed brakes and thrust reversers through an open center system. The main gear is equipped with wheel brakes mechanically operated by a brake control (metering) valve. Pneumatic backup is available for landing gear extension and braking.

ENVIRONMENTAL CONTROL

Cabin pressurization utilizes bleed air from the engines which is routed through precoolers before being conditioned by an air cycle machine. Temperature is controllable over a wide range and the system provides sufficient pressure to maintain an 8000-foot cabin at a cruise altitude of 45,000 feet. The oxygen system automatically supplies oxygen to the cockpit quick-donning masks and to the cabin dropout type masks in the event of excessive cabin altitude. Additionally, air is conditioned by a vapor cycle machine.

AVIONICS

The standard, factory-installed avionics package includes weather radar, dual altitude reporting transponders, and a Primus 1000 integrated flight director system which incorporates the autopilot. Air traffic control and other communication is provided by two VHF transceivers. Navigation equipment includes a digitally tuned ADF, dual DME and VOR/localizer/glideslope/marker beacon receivers. A GNS-XL flight management system is installed on the center pedestal. The pilot’s and copilot’s positions are equipped with a dual electronic flight instrument system (EFIS), and a multifunction display is mounted on the center instrument panel. An emergency locator beacon, a cockpit voice recorder, and a Flitefone VI telephone system are also installed as standard equipment.

CABIN DOOR

The passenger/crew entry door is located on the left side of the fuselage at the forward side of the passenger compartment. The door is flush fitting and the inner surface is covered with upholstery panels that blend with the airplane interior decor. The door is constructed of frames, pin fittings and stiffeners covered by an outer skin and an inner upholstered panel. The door is attached to the fuselage structure by a single hinge. A window is located in the door.

An extruded rubber secondary door seal is installed around the outer edge of the door under the primary (inflatable) door seal. The primary (inflatable) door seal is a molded rubber continuous ring installed in a retainer on the door. A rain seal is installed on the cabin door frame next to the door hinge. Bleed air from the engine provides pressure for inflation of the seal. A bleed air fitting is attached to the fuselage in the hinge area and when the door is closed and latched. A fitting in the hinge mates with the fuselage fitting and pressurizes the inside of the hinge. Air is distributed from the hinge to the pressure seal.

The door can be opened from either inside or outside the airplane by handles attached to a common shaft. Both handles are retained in the stowed position by springs. When either handle is rotated out of the stowed position, lock pins are retracted into the door, allowing the door to swing outward to the open position. A hold-open latch on the doorframe retains the door in this position.

Five indicator windows (inspection holes) are installed in the passenger/crew door. The indicator windows are installed on the inside of the door to provide a visual means of viewing the position of the linkage. A window is located by each of the two top and bottom locking pins and one window is located by the inside door handle.

A door warning switch is installed in the fuselage door frame in a position so the forward lower locking pin actuates the switch.

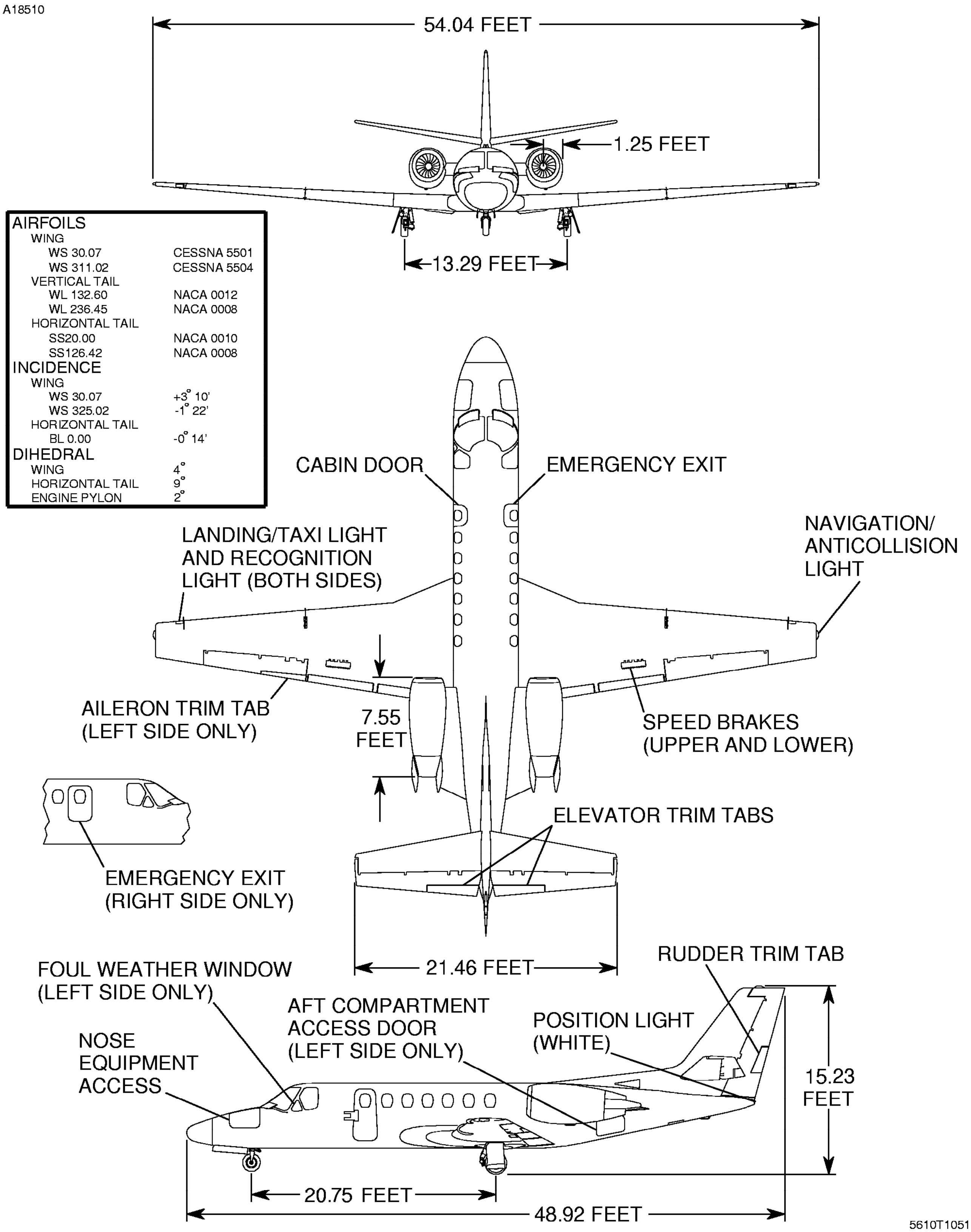
EMERGENCY EXIT DOOR

A removable emergency exit door is located on the right side of the fuselage toward the forward end of the passenger compartment. The forward right passenger compartment window is located in the door. The door is of the plug type and is installed or removed from inside the airplane. This exit is an alternate to the cabin door in the event of a crash landing and is the primary exit in a ditching situation.

The emergency exit door is locked in place by a latch pin at the top and two retainers at the bottom of the door. The latch pins are actuated by a latching mechanism and an inside and outside handle. The retainers at the bottom are fixed and inserted behind two stop blocks installed on the door frame. The outer handle housing of the emergency door incorporates a moisture drain. Also, the inside surface of the handle and housing is coated with teflon to prevent ice adhesion.

The emergency exit door is opened by rotating either handle to disengage the latch pin. Remove locking pin and plastic cover over inside handle when opening door from inside airplane. Allow top of door to extend inside the airplane until door clears the door frame. Raise door to clear stop blocks and remove door.

During emergency evacuation, the emergency exit door should be completely removed and thrown outside the airplane through its own open exit to keep the escape route clear inside the cabin.



AIRFOILS	
WING	
WS 30.07	CESSNA 5501
WS 311.02	CESSNA 5504
VERTICAL TAIL	
WL 132.60	NACA 0012
WL 236.45	NACA 0008
HORIZONTAL TAIL	
SS20.00	NACA 0010
SS126.42	NACA 0008
INCIDENCE	
WING	
WS 30.07	+3° 10'
WS 325.02	-1° 22'
HORIZONTAL TAIL	
BL 0.00	-0° 14'
DIHEDRAL	
WING	4°
HORIZONTAL TAIL	9°
ENGINE PYLON	2°

Figure 1-1. Three View Drawing

SPECIFICATIONS

DIMENSIONS

Length	48.92 Feet
Height	15.23 Feet
Wingspan	54.04 Feet
Horizontal Stabilizer Span	21.46 Feet
Wheelbase (Main to Nose Gear)	20.75 Feet
Stance (Distance Between Main Gear)	13.29 Feet
Cabin:	
Length (Pressure Vessel)	22.58 Feet
Height	4.70 Feet
Width	4.90 Feet

CAPACITIES

Oil Tank	2.15 Gallons Per Engine
Fuel (Maximum Usable at 6.75 lb/gal)	Approximately 2720 Pounds Per Tank (403 Gallons)
Oxygen (Full 64-cubic foot bottle charged to 1600-1800 PSI with usable regulated pressure of 70 PSI)	1600 Liters Usable
Hydraulic Fluid Reservoir	0.93 Gallon
Hydraulic Brake Fluid Reservoir	0.25 Gallon
Windshield Alcohol Reservoir	0.50 Gallon

ENGINES

Type	PW535A Turbofan
Manufacturer	Pratt & Whitney Canada Inc.
Maximum Dry Weight	699 Pounds
Thrust (Takeoff, Standard Day at Sea Level)	3400 Pounds
Bypass Ratio	2.55 to 1

AVIONICS (STANDARD PACKAGE)

Equipment	Quantity	Type Equipment
Communication (VHF)	1	Honeywell RCZ-833F
Navigation/ILS/Marker Beacon	1	Honeywell RNZ-850B
Standby Horizontal Situation Indicator (HSI)	1	Aeronetics HSI-315A
Distance Measuring Equipment (DME)	1	Honeywell Primus II DME-850
Transponder	1	Honeywell XS-852B
Weather Radar	1	Honeywell Primus P-660
Automatic Direction Finder	1	Honeywell AT-860
Digital Autopilot/Flight Director/Dual Electronic Instrument System (EFIS)	1	Honeywell Primus-1000
Radio Altimeter	1	Honeywell AA-300
Flight Management System with GPS	1	Global GNS-XL
Secondary Flight Display	1	Meggitt or Meggitt Mark II
Cockpit Voice recorder	1	Fairchild A200S
Directional Gyro	2	Honeywell C-14D
Vertical Gyro	2	Honeywell VG-14A
Emergency Locator Beacon	1	Artex 110-4
Audio Control Panel	1	Honeywell Primus II
Micro Air Data Computer (MADC)	2	Honeywell AZ-850
Radio Management Unit (RMU)	2	Honeywell RM-850
Rate Gyro	1	Honeywell RG-204
Angle of Attack	1	Safe Flight C-13106-1

OPERATING LIMITATIONS

WEIGHT

Maximum Design Ramp Weight . . . . 16,830 Pounds
Maximum Design Takeoff Weight . . . . 16,630 Pounds
Maximum Landing Weight . . . . 15,200 Pounds
Maximum Zero Fuel Weight (Standard) . . . . 12,600 Pounds

Maximum takeoff and landing weights may be additionally restricted due to altitude, temperature and field length.

CENTER-OF-GRAVITY

Forward Limit:
At 12,400 pounds - 18.00 percent MAC (296.14 inches aft of datum)
At 16,830 pounds - 21.89 percent MAC (299.29 inches aft of datum)
(Straight line variation between 18.00 and 21.89 percent MAC)
Aft Limit:
At 16,830 pounds or less - 28.0 percent MAC (304.23 inches aft of datum)

AIRSPEED

Maximum Operating Speeds:
M_{MO} (Above 28,907 Feet) . . . . 0.755 Mach (Indicated)
V_{MO} (Between 8000 Feet and 28,907 Feet) . . . . 292 KIAS
V_{MO} (Below 8000 Feet) . . . . 262 KIAS

The maximum operating limit speeds may not be deliberately exceeded in any phase of flight (climb, cruise, or descent) unless a higher speed is authorized for flight test or pilot training.

Maximum Maneuvering Speeds (V_A) . . . . Refer to Figure 1-3 and Section II of the basic FAA Approved Airplane Flight Manual

Full application of rudder and aileron controls as well as maneuvers that involve angles-of-attack near the stall should be confined to speeds below maximum maneuvering speed.

Maximum Flap Extended Speed (V_{FE}):
Partial Flaps 7° (T.O.) and 15° (T.O. & APPR. Position) . . . . 200 KIAS
Full Flaps 35° (LAND Position) . . . . 173 KIAS
Maximum Landing Gear Operating Speed, Extend - (V_{LO} Extending) . . . . 250 KIAS
Maximum Landing Gear Operating Speed, Retract - (V_{LO} Retracting) . . . . 200 KIAS
Maximum Landing Gear Extended Speed - (V_{LE}) . . . . 250 KIAS
Maximum Speed Brake Operation Speed - (V_{SB}) . . . . No Limit
Minimum Control Speeds (V_{MCA}, V_{MCL}, V_{MCG}) . . . . Refer to Section IV of the FAA Approved Airplane Flight Manual
Autopilot Operation . . . . 292 KIAS or 0.755 MACH
Minimum Speed Sustained Flight In Icing Conditions:
(Except Approach and Landing) . . . . 160 KIAS

TAKEOFF AND LANDING

Maximum Altitude Limit . . . . 10,000 Feet
Maximum Tailwind Components . . . . 10 Knots
Maximum Ambient Temperature . . . . ISA +34°C (Refer to Figure 1-3)
Minimum Ambient Temperature . . . . -40°C
Maximum Water/Slush on Runway . . . . 0.5 inches
Autopilot, yaw damper must be OFF for takeoff and landing.
Vertical navigation system must be off below 500 feet above ground level.
Takeoff and landings are limited to paved runway surfaces.
The nosewheel must be in firm contact with the ground prior to extending speed brakes and/or deploying thrust reversers.

EXAMPLE: Pressure Altitude - 25,000 FEET
Weight - 16,630 POUNDS
Maximum Maneuvering Speed - 236 KNOTS

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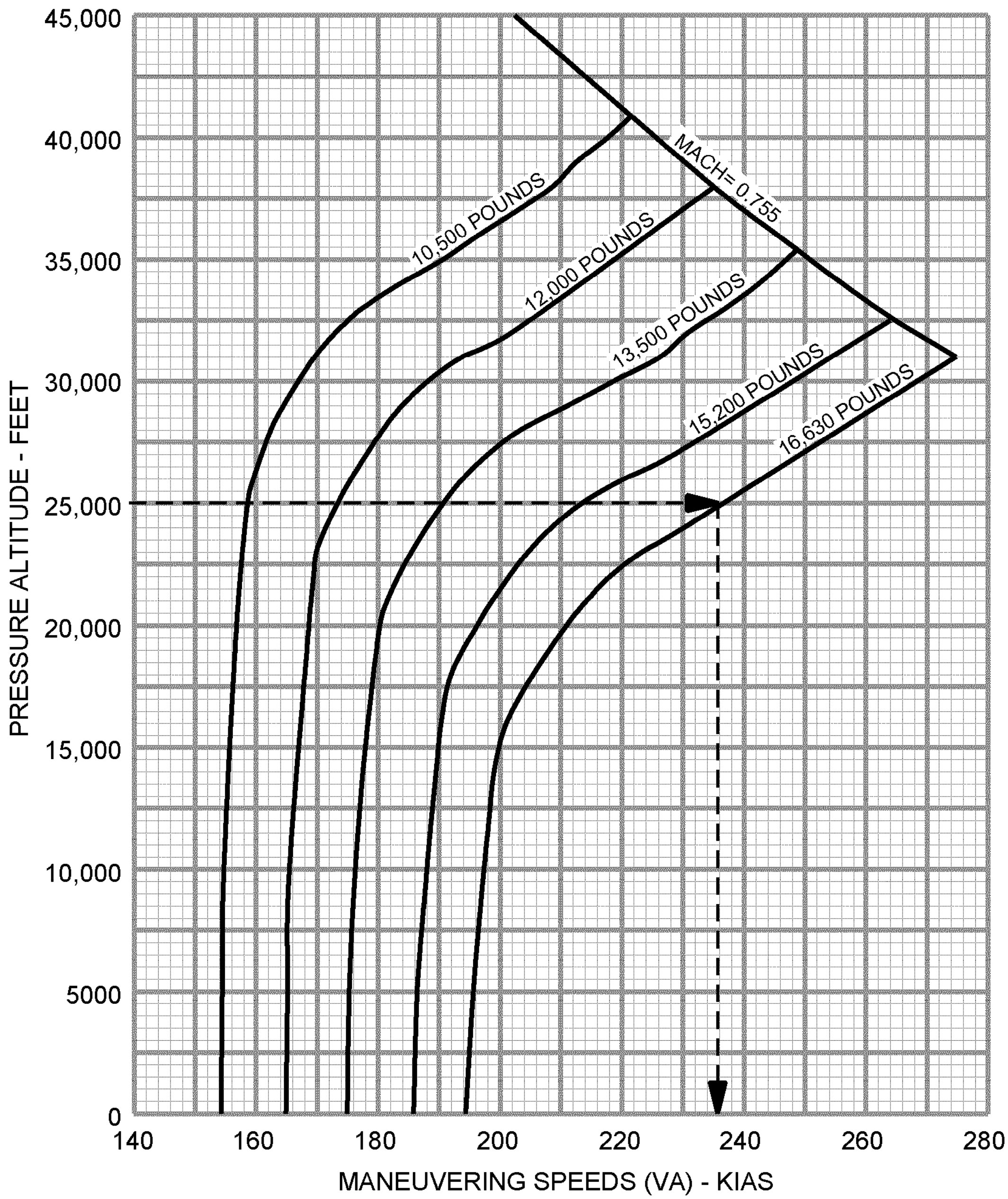

Figure 1-2. Maximum Maneuvering Speeds

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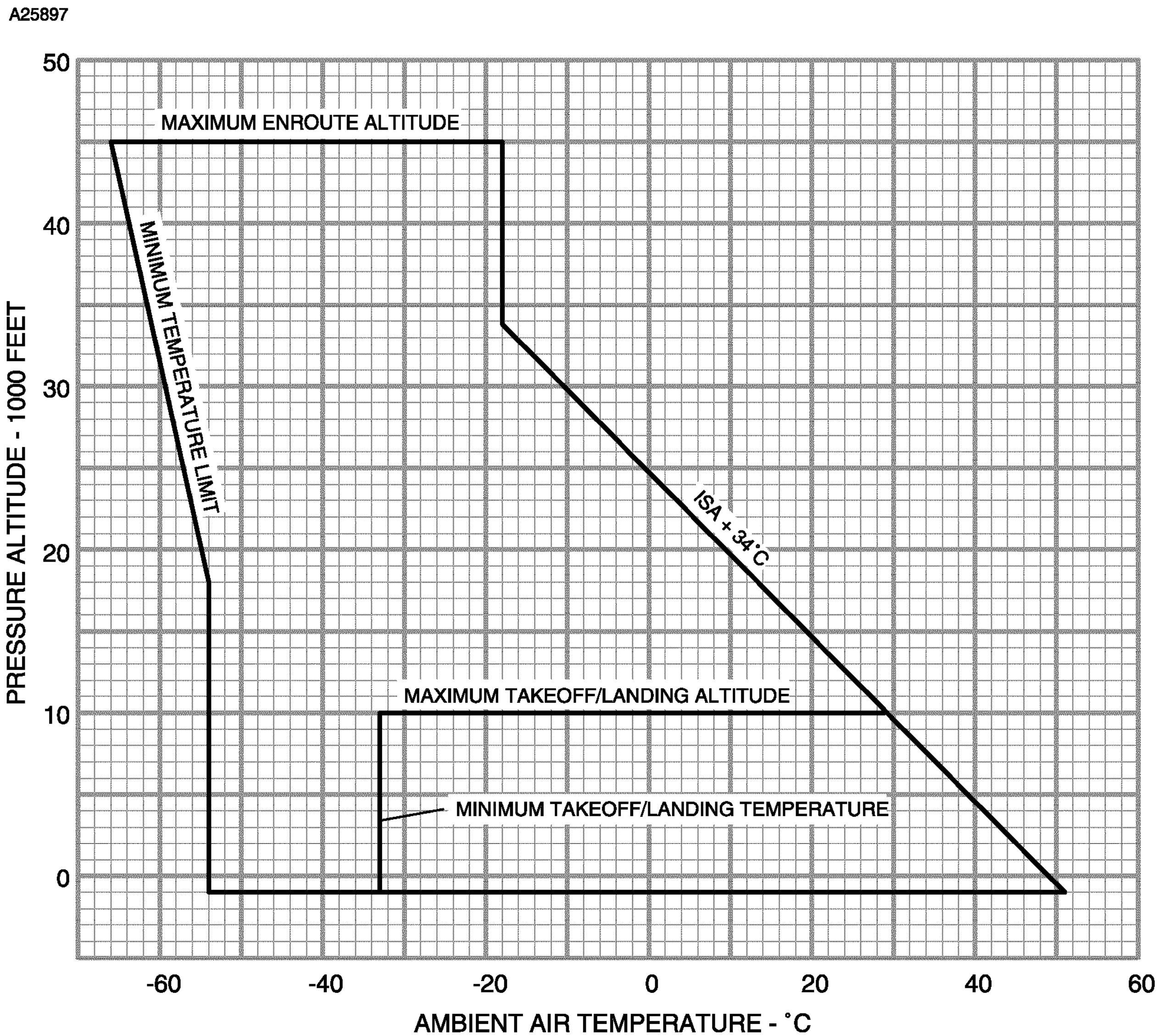

NOTE: Ambient Air Temperature Limit is indicated Ram Air Temperature (RAT) adjusted for Ram rise (refer to Figure 4-3 in Section IV of the FAA Approved Airplane Flight Manual.

Figure 1-3. Takeoff/Landing/Enroute Temperature Limitations

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APPROACH AND LANDING IN ICING CONDITIONS

When any residual ice is present or can be expected during approach and landing, V_{REF} and V_{APP} must be increased. V_{REF} and V_{APP}, the landing distance, and the maximum landing weight permitted by brake energy limits must be corrected per the appropriate tables in the Airplane Flight Manual Section IV, Performance - Approach and Landing.

OPERATING CONDITION		OPERATING LIMITS				
THRUST SETTING (Configuration Code)	**TIME LIMIT (MINUTES)**	**MAX OBSERVED ITT °C**	**N_2 %**	**N_1 %**	**OIL PRESSURE** (NOTE 1) **PSI**	**OIL TEMP °C**
TAKEOFF	5 (NOTE 2)	700	100	100 (NOTE 4)	45 TO 140	10 TO 132.2
MAXIMUM CONTINUOUS	CONTINUOUS	700	100	100 (NOTE 4)	45 TO 140	10 TO 132.2
GROUND IDLE	CONTINUOUS	--	49.1 MIN	--	25 TO 140	-40 TO 132.2
FLIGHT IDLE (NOTE 3)	CONTINUOUS	--	52.9 MIN	--	25 TO 140	-40 TO 132.2
STARTING	--	740**	--	--	--	-40 MIN
TRANSIENT	20 SECONDS	740**	102*	102*	0 MIN	--
TRANSIENT (AH,AI)	200 SECONDS (NOTE 1b)	--	--	--	20 TO 270	140.5 MAX
TRANSIENT (AB,AR)	400 SECONDS (NOTE 1b)	--	--	--	20 TO 270	140.5 MAX

* Refer to Figure 1-6.
** Refer to Figure 1-7.

NOTES

1. Oil Pressure
   a. Normal Oil pressure is 45 to 140 PSI at N_2 speeds above 60%. Oil pressure below 45 PSI is undesirable and should be tolerated only for the completion of the flight, preferably at reduced power setting.
   b. For starting, oil pressure may exceed 140 PSI (not to exceed 270 PSI) for up to 400 seconds. N_1 should not be increased above idle until oil pressure is below 140 PSI.
2. Takeoff ratings that are nominally limited to 5 minutes duration may be used for up to 10 minutes for One Engine Inoperative operations without adverse effects on engine airworthiness.
3. High idle corresponds to flight idle.
4. N_1% Fan RPM is limited to either 100% N_1 or the appropriate thrust setting chart in Section IV (Standard Charts) of the basic FAA Approved Airplane Flight Manual, whichever is less.

Figure 1-4 Engine Operating Limits

AREA **A** - NO ACTION REQUIRED.
AREA **B** - RECORD IN ENGINE LOG BOOK.
AREA **C** - REFER TO MAINTENANCE MANUAL.

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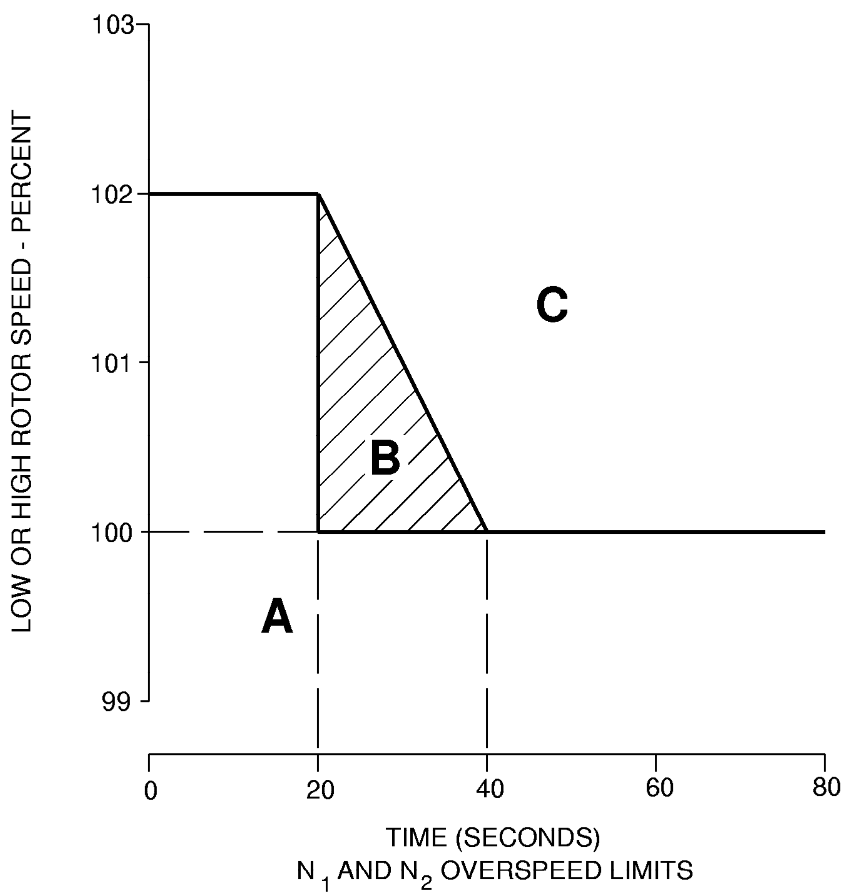

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Figure 1-5. Engine Overspeed Limits

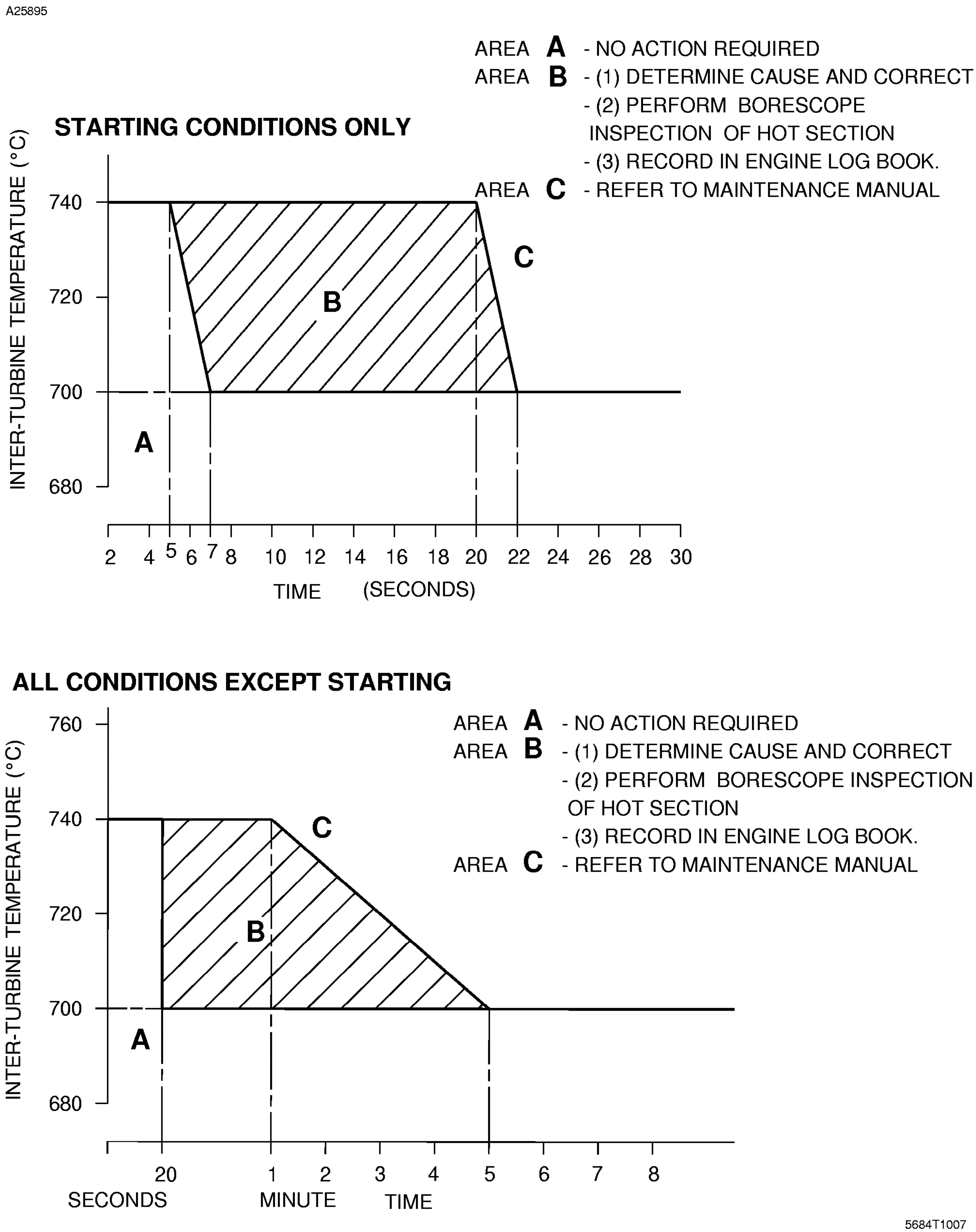

Figure 1-6. Interturbine Temperature Limits

BATTERY AND STARTER CYCLE LIMITATIONS

Starter Limitation with external power unit or generator assisted cross start as the starter power source.	Three engine starts per 30 minutes. Two cycles of operation with a 90-second rest period between cycles is permitted.
Battery Limitation.	Three engine starts per hour. Refer to Notes 2 and 3.

NOTES

1. If battery limitation is exceeded, a deep cycle including a capacity check must be accomplished to detect possible cell damage. Refer to Chapter 24 of the Maintenance Manual for procedures.
2. Three generator assisted cross starts are equal to one battery start.
3. If an external power unit is used for start, no battery cycle is counted.
4. Use of an external power source with voltage in excess of 28.0 Volts Direct Current (VDC) or current in excess of 1000 amperes may damage the starter. Minimum 800 amperes for start.

GROUND OPERATIONS

Continuous engine ground static operation up to and including five minutes at takeoff thrust is limited to ambient temperatures not to exceed 34°C above international standard atmosphere (ISA).

Limit ground operation of pitot/static heat to two minutes to preclude damage to the pitot tubes and angle-of-attack probe.

Electrical load is limited to 125 amps per generator during ground operations at ground idle and 225 amps at high idle. Transients up to 300 amps are permissible for up to 4 minutes.

If the airplane is cold soaked on the ground for an extended period of time at an ambient temperature colder than –40°C, the airplane and its components must be warmed to –40°C or above prior to start.

HYDRAULIC FLUID

Approved Fluids: Use Skydrol 500A, B, B-4, C or LD-4; or Hyjet, Hyjet W, III, IV, IVA, or IVA Plus only.

OIL

The following oils are approved for use:

MOBIL JET OIL II	EXXON TURBO OIL 2380	AEROSHELL TURBINE OIL 500
MOBIL JET OIL 254	CASTROL 5000	AEROSHELL TURBINE OIL 560
BP TURBO OIL 2380	ROYCO TURBINE OIL 500	ROYCO TURBINE OIL 560

In addition, oils listed for the engine in the latest revision to Pratt & Whitney Canada Inc. Engine Maintenance Manual are approved.

CAUTION

WHEN CHANGING FROM AN EXISTING LUBRICANT FORMULATION TO A “THIRD GENERATION” LUBRICANT FORMULATION (AEROSHELL TURBINE OIL 560 OR MOBIL JET 254), THE ENGINE MANUFACTURER STRONGLY RECOMMENDS THAT SUCH A CHANGE SHOULD ONLY BE MADE WHEN AN ENGINE IS NEW OR FRESHLY OVERHAULED. FOR ADDITIONAL INFORMATION ON USE OF THIRD GENERATION OILS, REFER TO THE ENGINE MANUFACTURER’S PERTINENT OIL SERVICE BULLETINS.

Should it be necessary to replenish oil consumption losses when oil of the same brand (as tank contents) is unavailable, then the following requirements apply:

For contingency purposes, oil replenishment using any other approved oil brand listed is acceptable provided:

1. The total quantity of added oil does not exceed two U.S. quarts in any 400-hour period.

2. If it is required to add more than two U.S. quarts of dissimilar oil brands, drain and flush complete oil system and refill with an approved oil in accordance with Engine Maintenance Manual instructions.

Should oils of non-approved brands or of different viscosities become intermixed, drain and flush complete oil system and refill with an approved oil in accordance with Engine Maintenance Manual instructions.

FUEL GRADE	FUEL SPECIFICATION	MINIMUM FUEL TEMPERATURE (TAKEOFF)	MAXIMUM FUEL TEMPERATURE (TAKEOFF)	MAXIMUM ALTITUDE
JET A	ASTM-D1655	-40°C	+55°C	45,000 FEET
JET A-1	ASTM-D1655	-40°C	+55°C	45,000 FEET
JET B	ASTM-D1655	-45°C	REFER TO FIGURE 1-8	REFER TO FIGURE 1-8
JP-4	MIL-DTL-5624	-52°C	REFER TO FIGURE 1-8	REFER TO FIGURE 1-8
JP-5	MIL-DTL-5624	-40°C	+55°C	45,000 FEET
JP-8	MIL-T-83133	-40°C	+55°C	45,000 FEET

NOTES

1. Maximum Asymmetrical Fuel Differential for normal operations is 200 pounds.
2. Flight characteristics requirements were not demonstrated with unbalanced fuel above 200 pounds. A lateral fuel imbalance of 600 pounds has been demonstrated for emergency return.

Figure 1-7. Fuel Limitations

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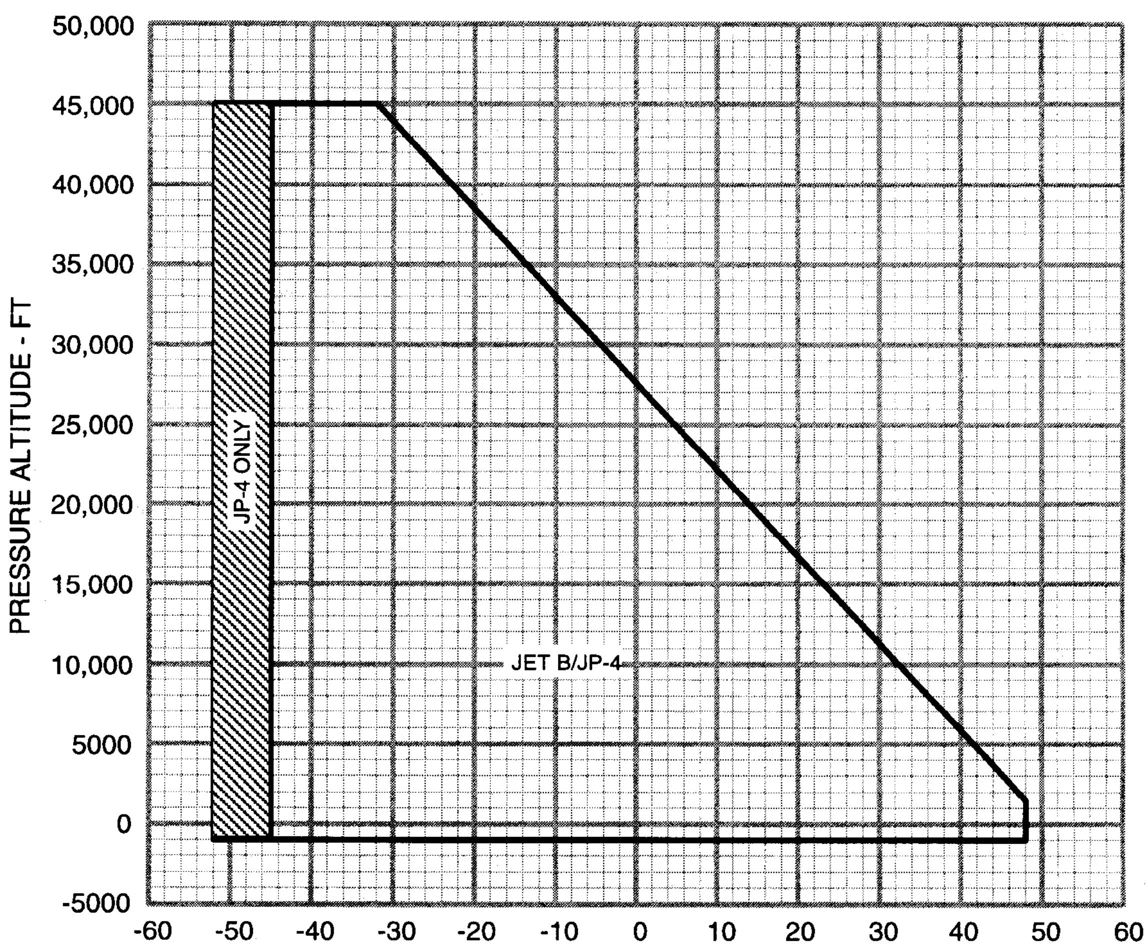

Figure 1-8. Jet B / JP-4 Fuel Operating Limitations

FUEL LIMITATIONS

Anti-icing must be added to all approved fuels not presently containing additive.

FUEL BOOST Pumps - ON; when low fuel lights illuminate or at 180 ± 20 pounds or less indicated fuel.

The following fuels are approved for use in accordance with Figure 1-8.

COMMERCIAL KEROSENE JET A, JET A-1, JET B, JP-4,JP-5, and JP-8.

SINGLE POINT REFUELING LIMITATION

Single point refueling operations must be accomplished per the procedures contained on the placard installed on the single point refueling access door. Refueling pressure range is 10 to 50 PSI, maximum defueling pressure is -10 PSI.

UNUSABLE FUEL

Fuel remaining in the fuel tanks when the fuel quantity indicator reads zero is not usable in flight.

ALCOHOL

Use TT-I-735 Isopropyl Alcohol for windshield anti-ice.

TIRE PRESSURE

Main Gear Tire Pressure:

1. Main gear tire pressure shall be kept at 152 PSIG, ±5 PSIG (1048 kPa ±34.5 kPa), **unloaded**, with an ambient temperature of 21.11° C (70°F).

2. Main gear tire pressure shall be kept at 158 PSIG, ±5 PSIG (1048 kPa ±34.5 kPa), l**oaded**, with an ambient temperature of 21.11° C (70°F).

(Nose Gear Tire Pressure:

1. Nose gear tire pressure shall be kept at 120 PSIG, ±5 PSIG (827 kPa, ±34.5 kPa), **unloaded**, with an ambient temperature of 21.11° C (70°F).

2. Nose gear tire pressure shall be kept at 125 PSIG, ±5 PSIG (862 kPa, ±34.5 kPa), **loaded**, with an ambient temperature of 21.11° C (70°F).

Adjust tire pressures for climate change. Climate changes will have an effect on tire pressure when flying from a hot climate to a cool climate and vice versa. When the temperature change is extreme, such as changes in excess of 10°C (50°F) for example, a tire inflated in a warm climate will drop in air pressure, when the airplane on which it is installed is flown to a cold climate. An airplane moved out of a heated hangar into the cold winter will do the same.

In either circumstance, tires should be overinflated to compensate for the subsequent cooling and loss of pressure caused by extreme temperature changes. As a general rule, an ambient temperature change of -15° C (5° F) produces a pressure change of about one percent.

AUTHORIZED OPERATIONS

This airplane is approved for day and night, VFR, IFR flight and flight into known icing conditions. This airplane is not approved for ditching under FAR 25.801.

NOTE

Icing conditions exist, when operating on the ground or in flight, when visible moisture is evident and the indicated OAT is between +10°C and -30°C.

LOAD FACTOR

In Flight:

Flaps - UP Position (0°)	–1.44 to +3.6G at 16,630 Pounds
Flaps - T.O., T.O. & APPR and LAND Position (7° to 35°)	0.0 to +2.0G at 16,630 Pounds

NOTE

These accelerations limit the angle-of-bank in turns and limit the severity of pull-up/push-over maneuvers.

Landing :

Flaps LAND Position (35°)	+3.46G at 15,200 Pounds

NOTE

This acceleration limits the airplane to a maximum landing sink rate of 600 feet-per-minute.

CABIN PRESSURIZATION LIMITATIONS

Normal Cabin Pressurization Limits	0.0 to 8.9 PSI +0.1 or -0.1 PSI Differential

Airplane must be depressurized for takeoff and landing.

PASSENGER COMPARTMENT

For all takeoff and landings, seats must be fully upright and outboard. The seat just aft of the emergency exit must be to the most aft position (toward rear of airplane) and passenger seat belts and shoulder harnesses must be fastened. The maximum number of passenger seats is 11.

ENROUTE OPERATIONAL LIMITS

Maximum Operating Altitude	45,000 Feet
Maximum Ambient Temperature	(Refer to Figure 1-3)
Minimum Ambient Temperature	(Refer to Figure 1-3)
Generator Load (Above High Idle)	300 Amperes in Flight
Generator Load (High Idle)	225 Amperes in Flight

MANEUVERS

No acrobatic maneuvers, including spins, are approved. No intentional stalls are permitted above 25,000 feet.

MINIMUM CREW

Minimum Flight Crew for all Operations: 1 Pilot and 1 Copilot.

The pilot in command must have a C-500 type rating and meet the requirements of FAR 61.58 for two pilot operation.

The copilot shall possess a multi-engine rating and meet the requirements of FAR 61.55.

Category II operation requires 1 pilot and 1 copilot, each meeting the requirement of FAR 61.3.

THRUST REVERSING

Reverse thrust power must be reduced to the idle reverse detent position at 60 KIAS on landing roll.

Maximum reverse thrust is limited to 71.4% N_1 for ambient temperatures at or above -18°C and 68.3% N_1 for ambient temperatures below -18°C.

Maximum allowable thrust reverser deployed time is 3 minutes in any 10-minute period.

Engine static ground operation is limited to idle power (if thrust reversers are deployed).

Use of thrust reversers is prohibited during touch and go landings.

The thrust reverser(s) must be verified to be operational by the TAXIING checks in Section IV, Normal Procedures, in this manual, or pinned in the stowed position.

Use of thrust reversers to back the airplane is prohibited.

AUTOPILOT

One pilot must remain in his seat with the seat belt fastened during all autopilot operations.

Autopilot operation is prohibited if a comparison monitor annunciator light illuminates in flight.

Minimum use height:	1000 Feet AGL -	Enroute
	300 Feet AGL -	Non-precision Approach
	180 Feet AGL -	Category I ILS Approach

BOUNDARY LAYER ENERGIZERS

All boundary layer energizers must be present for dispatch (16 per wing).

INSTRUMENT MARKINGS

Left and Right Oil Pressure Indicators	Red Line (Min):	20 PSI
	Yellow Band:	20 to 45 PSI
	Green Band:	45 to 140 PSI
	Red Line:	140 PSI
	Red Triangle (Max):	270 PSI
Left and Right Turbine RPM Indicators	Flashing Red Light:	>100% RPM
	Normal Operating:	45 to 100% RPM
Left and Right Oil Temperature Indicators	Red Line:	132.2°C
	Green Band:	10 to 132.2°C
	Red Triangle:	140.5°C
Airspeed Indicator (PFD and Standby Flight Display)	Red Bands:	262 KIAS
		292 KIAS
		0.755 Mach
Left and Right Inter Turbine Temperature Indicators	Red Triangle:	740°C
	Red Line:	700°C
	Green Band:	0 to 700°C
Left and Right Fan RPM Indicators	Red Line:	100.0%
(Refer to Section IV for thrust setting limits)	Green Band:	20 to 100.0%
Left and Right Ammeter Indicators	Red Line:	300 Amps
Cabin Differential Pressure Indicator	Red Line:	9.0 PSI
	Green Arc:	0.0 to 8.9 PSI
Oxygen Pressure Indicator	Red Line:	2000 PSI
	Yellow Arc:	0.0 to 400 PSI
	Green Arc:	1600 to 1800 PSI
Brake and Gear Pneumatic Pressure Indicator (In Nose Compartment)	Narrow Red Arc:	0-1600 PSI
	Wide Yellow Arc:	1600 to 1800 PSI
	Wide Green Arc:	1800 to 2050 PSI
	Wide Red Arc:	Above 2050 PSI
Brake Hydraulic Accumulator Pressure Indicator (In nose compartment)	Red Arc:	<675 PSI
	Grey Band:	675 PSI
	Yellow Arc:	> 675 to 1100 PSI
	Green Arc:	>1100 to 1500 PSI
	Red Arc:	>1500 PSI
Angle of Attack Indicator	White Band:	0.57 to 0.63
	Yellow Arc:	0.63 to 0.84
	Red Arc:	0.84 to 1.00
Battery Temperature Indicator	Yellow Arc:	145 to 160
	Red Arc:	160 to 180

HONEYWELL PRIMUS-1000 FLIGHT GUIDANCE SYSTEM

The Honeywell Primus 1000 Display and Flight Guidance System is a comprehensive flight management system that provides three axis airplane attitude stabilization and path control. Cathode Ray Tubes (CRTs) are utilized to display many functions traditionally referenced by analog instruments, such as attitude director indicators, horizontal situation indicators, glideslope indicators, and navigation bearing indicators.

Standard Electronic Flight Instrument System (EFIS) installation, is a three-tube system. It consists of a cathode ray tube (primary flight display), installed in left (pilot's) instrument panel, a second cathode ray tube (multifunction display), installed in center instrument panel and a third cathode ray tube (primary flight display), installed in right (copilot's) instrument panel. Two Display Guidance Computers (DGCs) are installed in the nose and act as symbol generators, flight directors, and autopilot computers.

In addition to displays and DGCs, source controllers, display controllers, and annunciator switches are installed to select information sources, position of displays, and display formats.

The Honeywell IC-600 display guidance computers are integrated computers which are the focal point of information flow within the system. Computers accept inputs from sensors, including DME, glideslope, directional gyros, flight management system, micro air data computer, radar, and long range navigation sources. Symbol generator portions of the display guidance computers convert input information into a video format for display on respective primary flight displays and multifunction display.

The Honeywell AZ-850 Micro Air Data Computer (MADC) accepts pitot and static pressure and outside temperature from a temperature probe. This information is used to produce static pressure and differential pressure signals which are utilized by the IC-600 Display Guidance Computer.

A Honeywell VG-14A Vertical Gyro provides three-wire synchro outputs that are electrical analogs of aircraft pitch and roll attitudes. Pitch gimbal freedom is +80 degrees to -80 degrees, and roll gimbal freedom is unlimited.

A Honeywell C-14D Directional Gyro provides three-wire synchro heading information. This component also includes a remotely mounted Auto/Man switch which controls slaved or unslaved modes of operation.

The Honeywell AG-222 Accelerometer is a self-contained, closed loop, force-balanced device, with DC signal output in proportion to normal airplane acceleration.

The Honeywell DC-550 Display Controller provides the pilot a method of control display formatting on the EFIS tubes, as well as data acquisition function for the remote instrument controller, and mode selector. This Information is then transmitted to the computer.

A Honeywell RI- 553 Remote Instrument Controller provides a method by which the pilot can manually select heading, course, and preselected altitude.

The Honeywell MS-560 Mode Selector provides push-button controls for Integrated Flight Guidance system and mode annunciation.

A Honeywell MC-800 Multifunction Display Controller provides a method for pilot selection of display modes and formats on the Multifunction Display (MFD), as well as interfacing with both IC-600 computers over a serial digital bus.

A DU-870 Display Unit is the electronic display used to provide Primary Flight Displays (PFDs) and Multifunction Display (MFD) in the Primus 1000 system. Tubes are driven by video and deflection signals compiled by the symbol generator function of the display guidance computers.

The Honeywell PC-400 Autopilot Controller provides a method of engaging autopilot and yaw damper, and manual control of autopilot through Turn knob and Pitch wheel.

Display guidance computers also drive aileron, elevator, rudder, and trim servos. Their description is covered in Chapter 22, Honeywell Autopilot Servo - Maintenance Practices.

STANDBY FLIGHT INSTRUMENTS

1. A satisfactory preflight test must be accomplished on the standby gyro system.
2. The standby flight display and standby HSI must be functioning prior to takeoff.

HIGH FREQUENCY (HF) / AUTOMATIC DIRECTION FINDER (ADF) SYSTEMS

The ADF bearing information may be erratic when keying the HF transmitter. Should this occur, disregard the ADF bearing during periods of transmission.

TRIM

Prior to the first flight of each day, the elevator trim check in Section IV, Operating Information, must be satisfactorily completed.

OXYGEN MASK

The pressure demand oxygen masks must be properly stowed in their containers to qualify as a quick-donning oxygen mask.

NOTE

Headsets, eyeglasses or hats worn by the crew should be removed prior to donning the oxygen masks.

SUPPLEMENTAL OXYGEN SYSTEM

Crew and passenger oxygen masks are not approved for use above 40,000 feet cabin altitude. Prolonged operation of passenger masks above 25,000 feet cabin altitudes is not recommended.

NOTE

Passenger masks are intended for use during an emergency descent to an altitude not requiring supplemental oxygen.

AIRPLANE BATTERY

If the BATT O'TEMP light illuminates during ground operation, do not take off until after the proper maintenance procedures have been accomplished.

ANGLE-OF-ATTACK / STICK SHAKER SYSTEM

The angle-of-attack and stall warning system must be operable and a satisfactory preflight must be performed in accordance with Section IV, Operating Information.

The angle-of-attack indicating system may be used as a reference system but does not replace the airspeed display in the PFD as a primary instrument.

The angle-of-attack system can be used as a reference for approach speed (1.3 V_{SI}) at all airplane weights and center-of-gravity locations at zero, takeoff, takeoff/approach and landing flap positions. 1.3 V_{SI} is indicated by approximately 0.6 on the Angle-Of-Attack Gage and by the top of the white tape on the pilot's and copilot's airspeed indicators.

If the stick shaker does not operate during the warning system test, or the angle-of-attack system is otherwise inoperative, it must be repaired before flight, except when the airplane is operated with an Approved Minimum Equipment List.

ENGINE FAN INSPECTION

To ensure accurate fan speed thrust indication, inspect the fan for damage prior to each flight.

NOTE

Refer to the exterior inspection in the Normal Procedures Section of this manual for engine duct and fan inspection.

GND IDLE SWITCH

The GND IDLE switch must be in the HIGH position when conducting touch and go landings and when operating on the ground with engine anti-ice bleed ON.

AUDIO CONTROL PANEL

Operation of the audio panel in the passenger speaker (PASS SPKR) mode is limited to required passenger briefings or emergencies.

NOTE

- The same side cockpit speaker is normally muted when PASS SPKR is selected. All incoming transmissions and auxiliary audio warnings (GPWS and TCAS, if installed) will be received through the opposite side speaker. If both audio control switches are selected to PASS SPKR, both cockpit speakers become muted. Avoid selecting both switches to PASS SPKR at the same time.

- With passenger speaker mode selected and microphone selector switch selected to oxygen mask, the same side cockpit speaker will not receive voice interphone communications from the oxygen mask microphone of the opposite side pilot.

- Headset audio is not affected when (PASS SPKR) mode is selected.

SECTION II

AIRPLANE AND SYSTEMS

CONTENTS

ENGINE

GENERAL

Jet engines produce thrust by accelerating air. It is the product of the mass of the air times the increase in velocity that determines thrust output. To generate a given amount of thrust, a small volume of air can be accelerated to a very high velocity, or a relatively large amount can be accelerated to a lower velocity.

In a turbojet engine, incoming air is compressed, mixed with fuel, combusted and exhausted at a high velocity. In a turbofan engine, only a portion of incoming air is combusted. The hot air then drives the fan which accelerates a large volume of air to a lower velocity. This air is bypassed around the engine and is not mixed with fuel or combusted. The relation of the total mass of bypassed air, to the amount of air going through the combustion section, is known as the bypass ratio. The bypass ratio of the Citation Encore engine is 2.55 to 1.

The PW535A, developed for the Citation Encore by Pratt and Whitney Canada Inc., is a turbofan engine rated at 3400 pounds static thrust. A concentric shaft system supports the fan and turbine rotors. The inner shaft connects the fan (N_1) and the axial boost stage of the low pressure compressor at the front of the engine to the two rear low pressure turbines. The outer shaft connects two axial compressors and the centrifugal compressor (N_2) and the forward high pressure turbine.

All intake air passes through the fan. Immediately aft of the fan the airflow is divided by a concentric duct. More than two-thirds of the total airflow is bypassed around the engine through the outer duct and is exhausted at the rear. Air entering the inner duct passes through guide vanes to the axial boost compressor stage, then through a second set of guide vanes and is compressed by the two axial and one centrifugal high pressure compressor. The high pressure air then passes through a diffuser assembly and moves aft to the combustion section.

The combustion chamber is of a reverse flow design to save space and reduce engine size. A portion of the air entering the chamber is mixed with fuel and ignited. The remainder enters the chamber liner downstream for cooling.

Fuel is introduced by 11 dual orifice nozzles supplied by a dual manifold. The mixture is ignited initially by two spark igniters which extend into the combustion chamber at the five and seven o'clock positions. After start, combustion becomes self-sustaining. The hot gases expand, reverse direction and pass through a set of turbine guide vanes to the high pressure turbine. The power generated by this turbine is transmitted by the outer shaft to turn the N_2 compressors.

Only a small part of the energy available in the hot, high pressure air is absorbed by the high pressure turbine. As the expanding gases move rearward, they pass through another set of guide vanes and enter the two-stage, low pressure turbine. A greater portion of the remaining energy is extracted there and transmitted by the inner shaft to the forward mounted fan and boost rotor. The hot gases then exhaust through the mixer nozzle and the bypass duct.

The turbofan is in effect two interrelated powerplants. One section is designed to produce energy in the form of high velocity, hot air. The other utilizes some of this air to provide the power to drive the fan. The fan of the PW535A, pumping a high volume of cool low velocity air, produces over one-half of the total thrust.

The Model 560 is equipped with a ground idle system which automatically allows the engines to decelerate to an idle speed of 49.1% N_2 eight seconds after the landing gear squat switches have sensed a landing. The slower idle speed allows better taxiing control at lighter weights and in very cold temperatures, when the normal flight idle speed of 52.9% N_2 (at sea level) would require more use of the brakes, resulting in reduced brake life. The ground idle function is controlled by a GRND IDLE switch on the tilt panel, which has NORM and HIGH positions. For normal conditions NORM is selected. HIGH position will disable the ground idle system, resulting in an idle speed of not less than 52.9% N_2. A GND IDLE annunciator is located on the annunciator panel. The annunciator will illuminate when the airplane is on the ground and the engine has assumed the slower idle speed, or will assume it when the throttle is reduced to idle. If the pilot desires to prevent the engine from assuming the slower idle speed, for reasons of faster engine acceleration time or higher electrical load, etc., the HIGH position is selected.

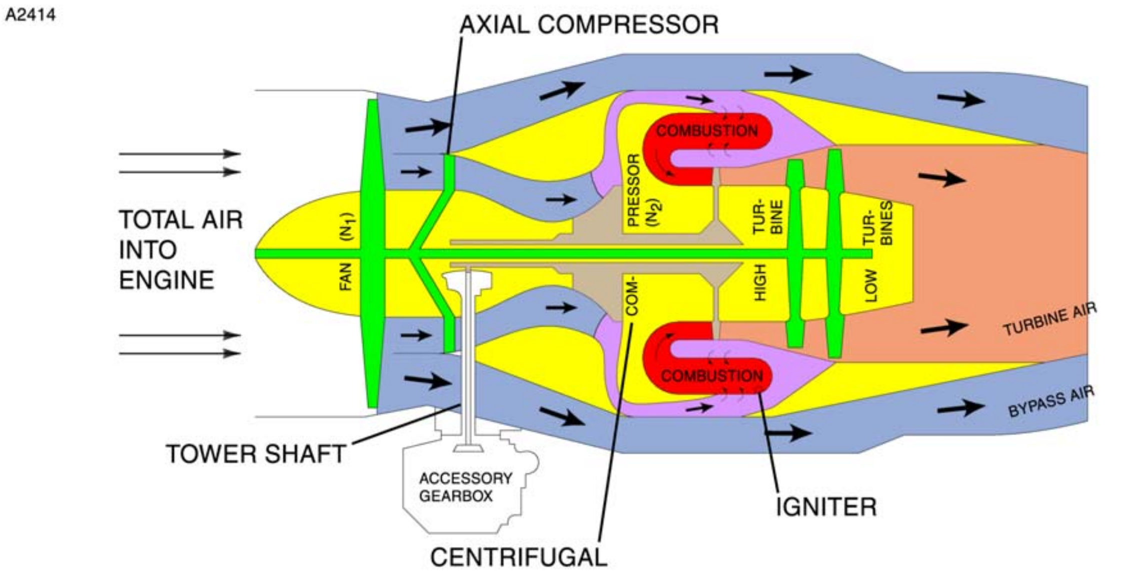

Figure 2-1 Engine Airflow and Cross Section

NOTES

- When practicing touch and go landings, the GND IDLE switch must be placed to HIGH for maximum engine acceleration capability.
- When operating on the ground with engine anti-ice bleed ON, the GND IDLE switch must be in the HIGH position.

ENGINE SYNCHRONIZER

The synchronizer utilizes a master engine (left) and a slave engine (right). The synchronizer automatically matches the speeds of the fans/turbines of the left and right engines. The speed of the slave engine (right) will follow changes in the speed of the master engine (left) over a predetermined limited RPM range. This limited range feature prevents the slave engine from losing more than a fixed amount of RPM in case the master engine is shutdown while the synchronizer is in the FAN or TURBINE position. Normal RPM settings and procedures are unchanged.

NOTE

For Airplanes -0539 and On, the engine synchronizer system is disabled at engine power settings below 60% N_2.

The synchronizing system consists of a synchronizer control box, a speed setting actuator, and adjustable rod end trimming assembly, a flexible rotary shaft assembly and an electrical cable assembly. The control box is mounted in the flight crew compartment control pedestal. It contains transistorized circuits, operates on 28 volts direct current (DC) power and draws less than one amp. The control box has a remote ON/OFF switch which will select fan or turbine synchronization. The speed setting actuator is a stepping motor which operates on command from the control box. The actuator is located in the right engine pylon. The rod end trimmer assembly and flexible rotary shaft assembly provide the mechanical linkage from the actuator to the engine fuel control to match slave engine with master engine RPM.

ENGINE SYNCHRONIZER (Continued)

Alternating current from the fan and turbine monopoles is routed into the control box. When any difference in frequency is detected, a signal is sent from the control box to the actuator, which trims the speed of the slave engine to match the master engine. Normal fuel control operation is not affected. The Synchronizer will continuously monitor engine speeds and resets the slave engine speed setting as required. The actuator has a range capability of approximately ±1.5% of N_1 RPM or ±1.0% N_2 RPM.

A turbine out-of-sync condition is generally more noticeable in the cockpit and a fan out-of-sync condition is usually more noticeable in the area of the rear seats.

IGNITION SYSTEM

Each engine incorporates dual exciter units and two igniters. The exciter units convert battery or generator input to high voltage Direct Current (DC), store it momentarily until a given energy level is reached, and allow it to discharge in spark form through the igniters. System wiring is such that malfunction of one igniter or exciter will not affect normal operation of the other.

Cockpit control consists of two-position RH and LH ignition switches. In NORM, function is automatic during start and with engine anti-ice selected. Moving the throttle to IDLE after depressing the start button activates ignition until it is terminated automatically at approximately 38% turbine RPM (N_2). Continuous ignition occurs any time the respective engine anti-ice or ignition switch is ON.

A small green light above each ITT tape indicator illuminates when both exciters are receiving electrical power. If one igniter should fail, ignition will still be available from the remaining igniter. If the ignition light does not illuminate when ignition is selected, or should be automatically provided, check the applicable ignition system circuit breaker on the left circuit breaker panel, or fuse in the aft power junction box.

ACCESSORY GEARBOX

The starter/generator, fuel pump, fuel control, hydraulic pump, and oil pump are driven by the accessory gearbox mounted below the engine. Power to drive the gearbox is transmitted from the N_2 section through the tower shaft and a series of bevel gears. Lubrication is provided by the engine oil system.

OIL SYSTEM

The system provides cooled, pressurized oil for lubrication and cooling of engine bearings and accessory drive gears and bearings. An integral oil tank on each engine has a capacity of 2.15 U.S. gallons, of which 0.15 gallons are unusable.

The engine oil system provides lubrication, cooling and cleaning of all engine bearings and gears. It has a pressure and scavenge system and a secondary air system. The pressure system is a flow regulated system designed to supply oil to satisfy the lubricating requirements throughout the engine operating range. Oil is supplied from the oil tank, which is integral with the intermediate case, to the pressure pump, having first flowed past a magnetic chip detector and is circulated through the engine oil filter and fuel/oil heat exchanger before being distributed throughout the engine. Calibrated oil nozzles deliver the necessary oil quantity to the various bearings, gear meshes and splines.

The scavenge system returns oil to the tank either directly, by means of a combination of blow down and dedicated pumps, or indirectly via the accessory gearbox dedicated pump. The secondary air system uses compressor air to pressurize the various bearing cavity seals. The breather system is part of the secondary air system. Air from the various bearing compartment seals is vented to the engine exhaust through an oil/air separator installed on the starter/generator gearshaft in the gearbox.

Cockpit indicators receive inputs from the pressure transmitter just upstream of the oil cooler and the temperature bulb immediately downstream of the cooler.

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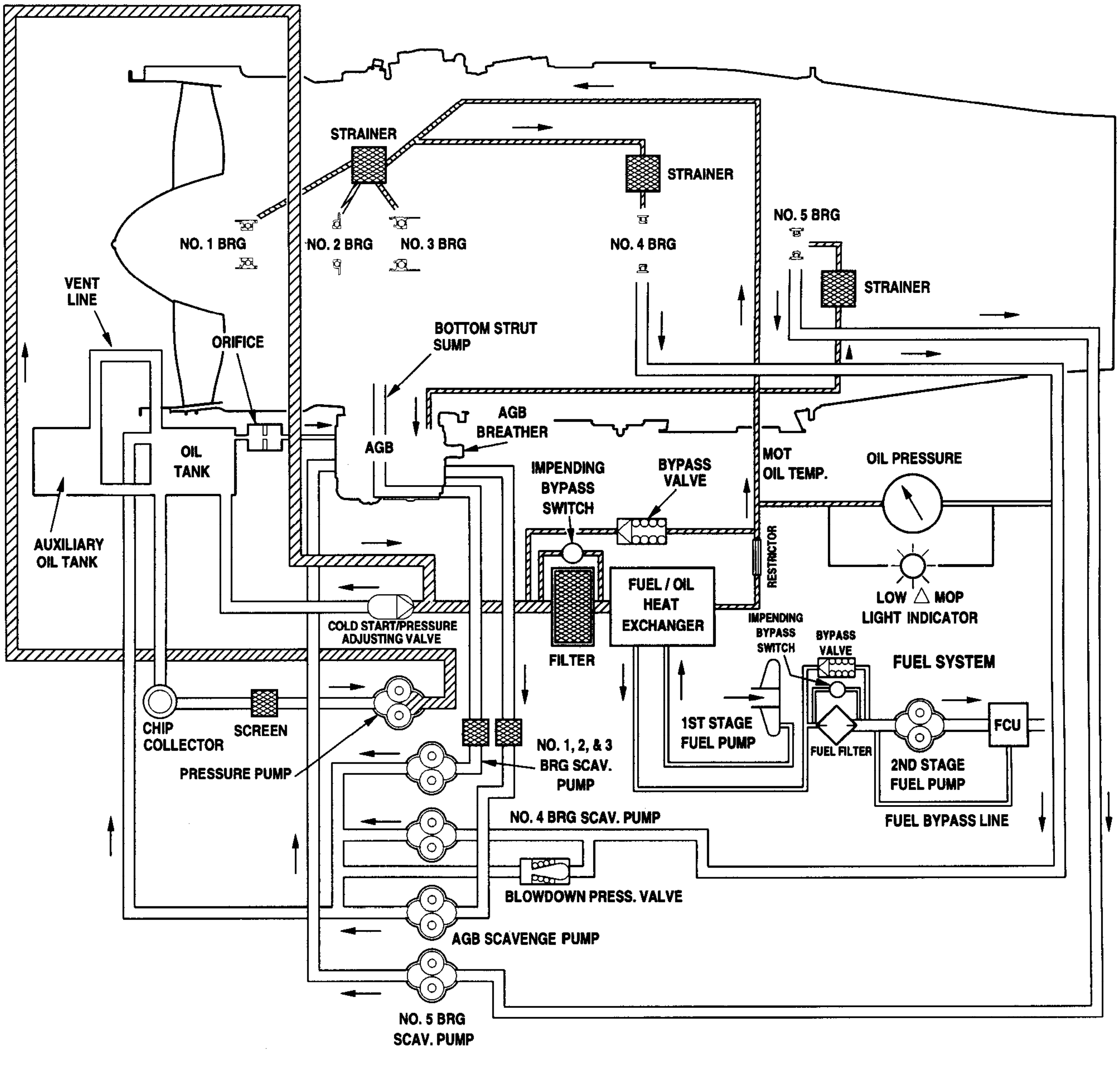

DEFINITIONS:

- AGB - ACCESSORY GEAR BOX
- MOP - MAIN OIL PRESSURE (DIFFERENTIAL)
- MOT - MAIN OIL TEMPERATURE
- BRG - BEARING

Figure 2-2 Engine Oil System Schematic

5685R1006

THRUST REVERSER SYSTEM

DESCRIPTION AND OPERATION

The thrust reversers are of the external target type employing two vertically oriented doors or buckets, which, when deployed, direct exhaust gases forward to provide a deceleration force for ground braking. When stowed, the reversers fair into external airplane contours to form the aft portion of the nacelle. The reversers are mounted to the engine fan nozzle through an aluminum support casting and four interconnecting links per door.

NORMAL OPERATION

The reverser system is designed for two-position operation: stowed during takeoff and flight and deployed during landing ground roll. The reversers are activated by pilot operation of the thrust reverser throttle levers and deployed by hydraulic pressure supplied by an engine-driven pump and directed to the drive actuators. The actuators are connected to a slider mechanism which is in turn connected to the reverser doors by a four-bar linkage system. The system, by design, incorporates an overcenter feature in the linkage which locks the reverser in the stowed position.

Hydraulic actuators are mounted to the support casting on each side of the reverser. The airplane hydraulic system provides pressure to these actuators which in turn operate the linkage system along a sliding track in the support casting to deploy and stow the reversers.

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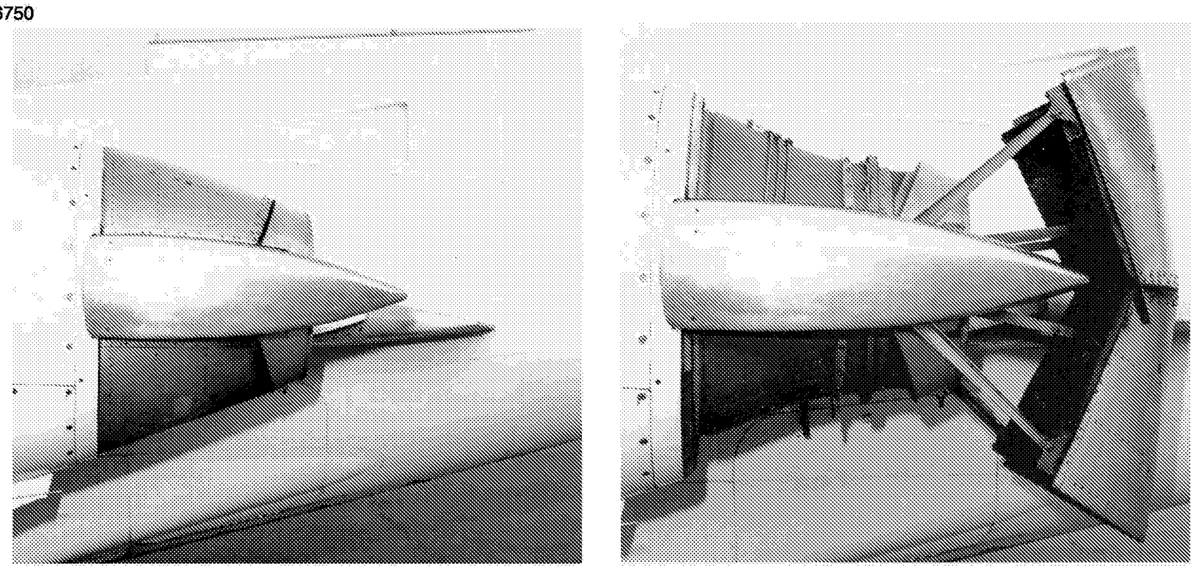

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6585P6026

Figure 2-3 Thrust Reverser in Stowed and Deployed Positions

Control of the individual thrust reverser is through the reverse thrust lever mounted on each of the engine throttles. The reversers can only be deployed when the primary throttle levers are in the idle thrust position and the airplane is on the ground as sensed by that side's respective main gear squat switches. The reverse thrust lever also controls engine thrust during reverse thrust operation.

In the event of an inadvertent thrust reverser deployment, an automatic throttle retarding device will bring the throttle to approximately idle thrust depending on the amount of throttle friction that has been applied. After this device has activated, the throttle lever can be advanced resulting in corresponding reverse thrust.

WARNING

DO NOT ATTEMPT TO OVERRIDE THE RETRACTION MECHANISM OR ADVANCE THE THROTTLE AFTER RETRACTION. THIS COULD RESULT IN A DANGEROUS ASYMMETRICAL THRUST CONDITION.

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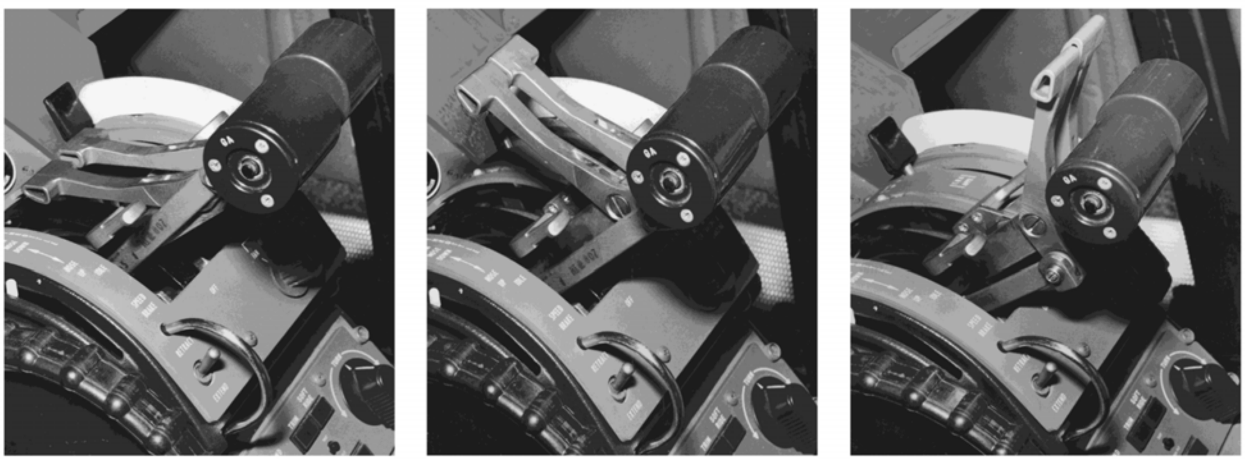

THRUST REVERSERS STOWED IDLE THRUST | THRUST REVERSES DEPLOYED IDLE THRUST | THRUST REVERSERS DEPLOYED MAX REVERSE THRUST

6585P6020
6585P6021
6585P6022

Figure 2-4. Throttles with Reverse Thrust Levers

WARNING

SHOULD AN INADVERTENT THRUST REVERSER DEPLOYMENT OCCUR, THE PILOT MUST ENSURE THAT THE THROTTLE LEVER IS IN THE IDLE POSITION.

Moving the reverse thrust lever from the STOWED to the IDLE REVERSE position actuates the deploy cycle. This electrically opens the isolation valve, moves the reverser control to deploy and pressurizes the airplane hydraulic system. The isolation valve allows the airplane hydraulic system to pressurize the thrust reverser system. The amber ARM light indicates hydraulic pressure to the reverser control valve as sensed by a pressure switch.

During thrust reverser deployment, the initial movement of the actuators activates the stow switches. Either switch will cause the amber UNLOCK light to illuminate. Further movement of the actuator unlocks the reverser through the overcenter linkage. The remaining travel of the actuators deploys the reverser doors.

At full deployment of the reverser, the deploy switch is activated which in turn illuminates the white DEPLOY light and unlocks the pedestal-mounted throttle lock-out cam. The purpose of the lock-out cam is to prevent increasing engine thrust, once reverser deployment has been selected, until the reversers have fully deployed.

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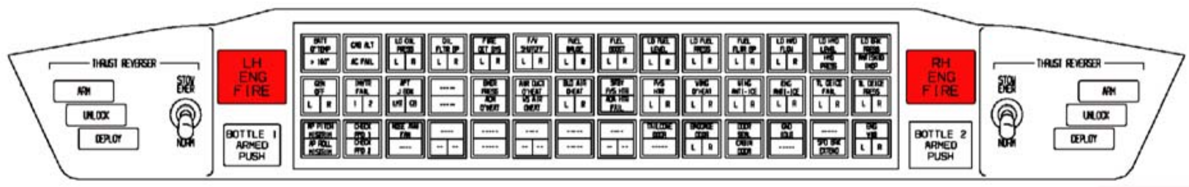

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Figure 2-5. Thrust Reverser Emergency Stow Switches and Indicator Lights

Three reverser indicator lights for each reverser are mounted on the cockpit glareshield for monitoring reverse functions: ARM, UNLOCK and DEPLOY.

NOTE

The DEPLOY light shall illuminate in less than 1.5 seconds after the hydraulic UNLOCK light illuminates. An erroneous sequencing or a delay in the illumination of the thrust reverser lights indicates a failure in the thrust reverser system. Either or both conditions requires a maintenance check.

WARNING

DO NOT ATTEMPT TO FLY THE AIRPLANE IF THE THRUST REVERSER PREFLIGHT CHECK IS UNSUCCESSFUL.

As previously mentioned, landing gear squat switch on the reverser side must be activated to complete the electrical circuit necessary to initiate deployment of the thrust reverser.

The thrust reverser lever(s) should not be placed in the idle reverse detent position in flight since a single failure of a squat switch could permit deployment of the thrust reverser(s). If the thrust reverser lever is placed in the idle reverse detent position while airborne, the airplane MASTER WARNING light will flash along with illumination of the ARM and HYD PRESS annunciator lights. A MASTER WARNING light, when thrust reversers are moved to deploy on the ground, means that a landing gear squat switch has activated. To ensure actuation of the squat switches and to eliminate any delay in the deployment of the thrust reversers, it is recommended that the speed brakes be extended immediately following touchdown.

After deployment, power may be increased by moving the thrust reverser throttle levers aft for maximum reverse thrust. For convenience, STOPS have been installed on the thrust reverser levers and are set to provide 71.4% (N_1) on a -18°C day at sea level. These stops will allow the pilot to keep his attention on the landing rollout instead of diverting his attention to the reverser power settings. Below a temperature of -18°C the pilot must limit reverse thrust to 68.3% fan speed (N_1) RPM. Maximum power available with the thrust levers at the stops varies with temperature. At warmer temperatures, the reverse thrust stops will, as set at the factory, result in lower than 71.4% N_1. The stops may be reset, but 71.4% N_1 may not be exceeded.

For increased aerodynamic drag on landing roll, it is suggested that the thrust reversers remain in the deployed idle reverse power position after maximum reverse thrust power has been terminated at 60 KIAS unless loose pavement, dirt or gravel is present on the runway. Idle reverse thrust is capable of causing ingestion of small grit at very low ground speed.

To stow the thrust reversers, move the reverse thrust lever through the idle reverse detent to the stow position. This actuates a switch in the pedestal which moves the thrust reverser control valve to the stow position. Hydraulic pressure is directed by the valve to the two actuators in the reverser which move the thrust reverser doors to the stowed position. Initial movement of the linkage toward the stowed position deactivates the deploy switch extinguishing the DEPLOY light. As each actuator moves to the fully stowed and locked position, they deactivate a thrust reverser unlocked switch. When both switches in a reverser have been deactivated, the UNLOCKED light is extinguished, the airplane hydraulic system is depressurized and the affected thrust reverser isolation valve closes. This extinguishes the ARM light as the pressure in the line downstream of the isolation valve drops.

The thrust reversers are not to be used during touch and go landings. A full stop landing must be made once reverse thrust has been selected. Less distance is required to stop, even on a slick runway, once the reversers have been deployed, than is required to restow the reversers and takeoff.

Landings with a crosswind component of 20 knots at 30 feet above runway were demonstrated. Adequate control of the airplane was maintained during and after thrust reverser deployment. Single-engine reversing has been demonstrated during normal landings and is easily controllable.

EMERGENCY STOW OPERATION

An emergency stow switch for each thrust reverser is located on the cockpit glare shield and will provide the same stow sequence (using the alternate 28 Volt thrust reverser power source) as the thrust reverser throttle levers, in the event of a failure of the pedestal-mounted deploy and stow switch, or of the respective 28 volt direct current (VDC) bus.

Each emergency stow switch receives its electrical power through the opposite thrust reverser circuit breaker. The emergency stow function can be checked on the ground by deploying the reversers normally and then actuating each emergency stow switch. The DEPLOY and UNLOCK lights shall extinguish. The ARM and HYD PRESS lights remain illuminated. Return the thrust reverser lever to stowed position, then turn each emergency stow switch off. All lights shall be extinguished.

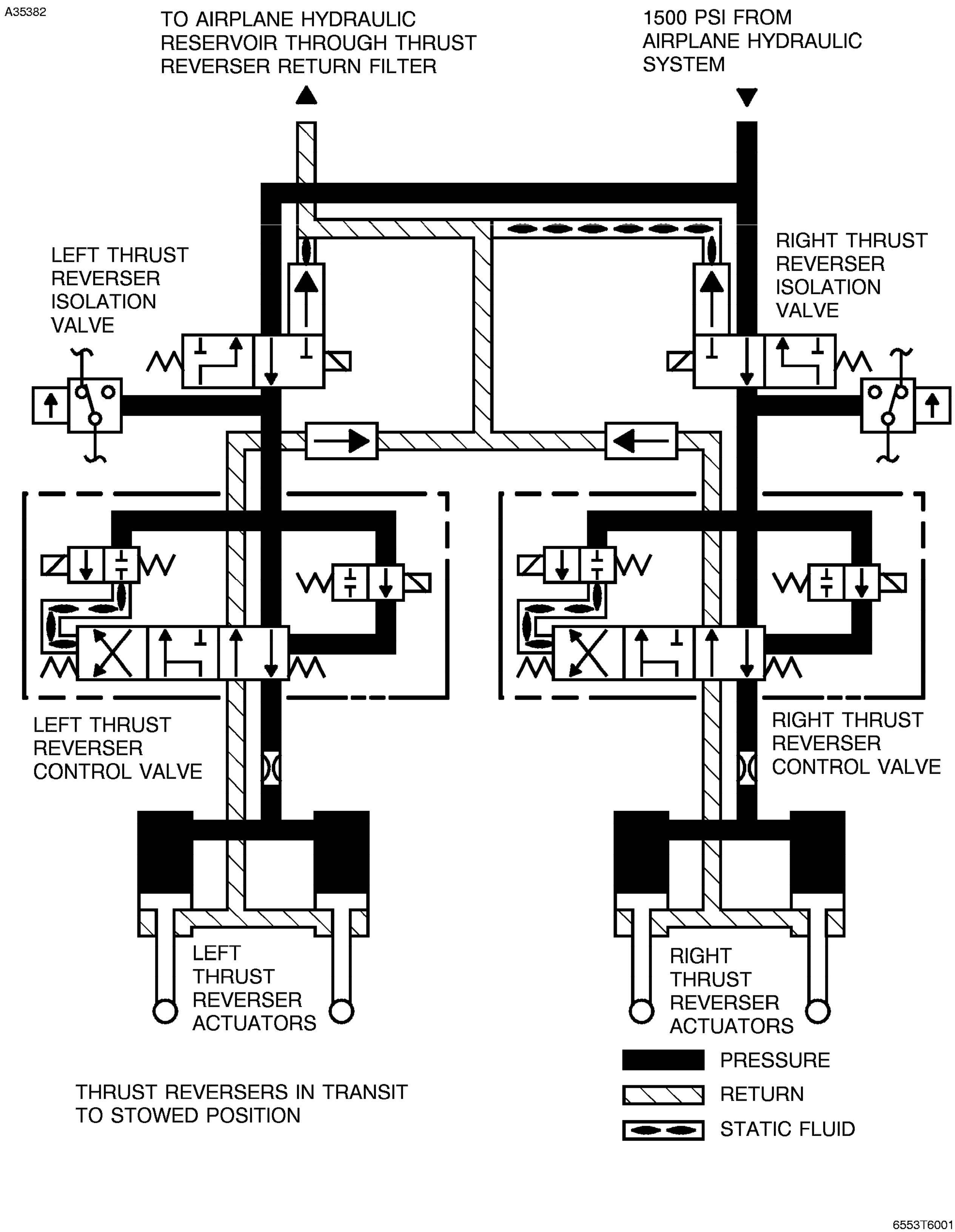

Figure 2-6. Thrust Reverser Hydraulic System Schematic (Sheet 1 of 3)

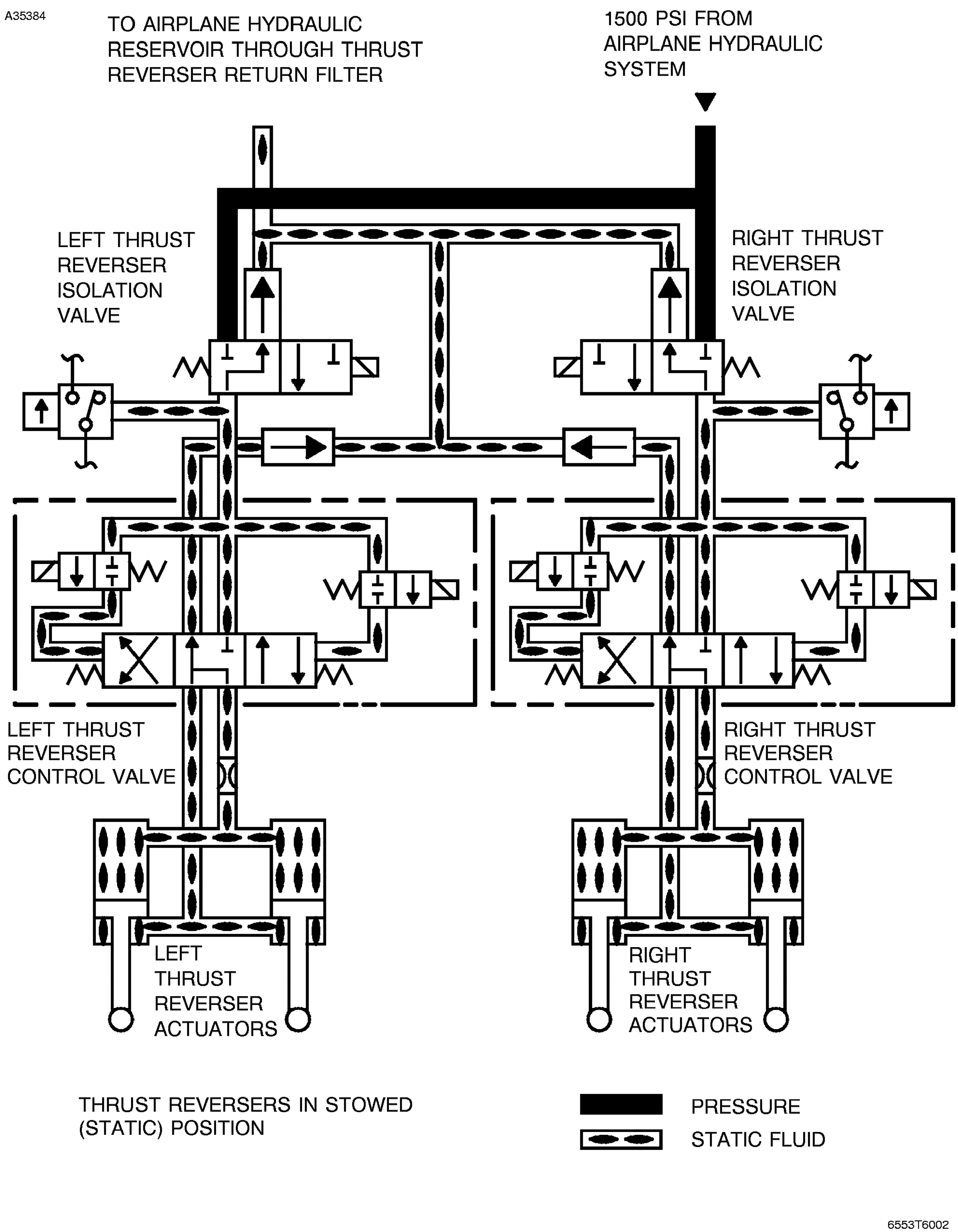

Figure 2-6. Thrust Reverser Hydraulic System Schematic (Sheet 2 of 3)

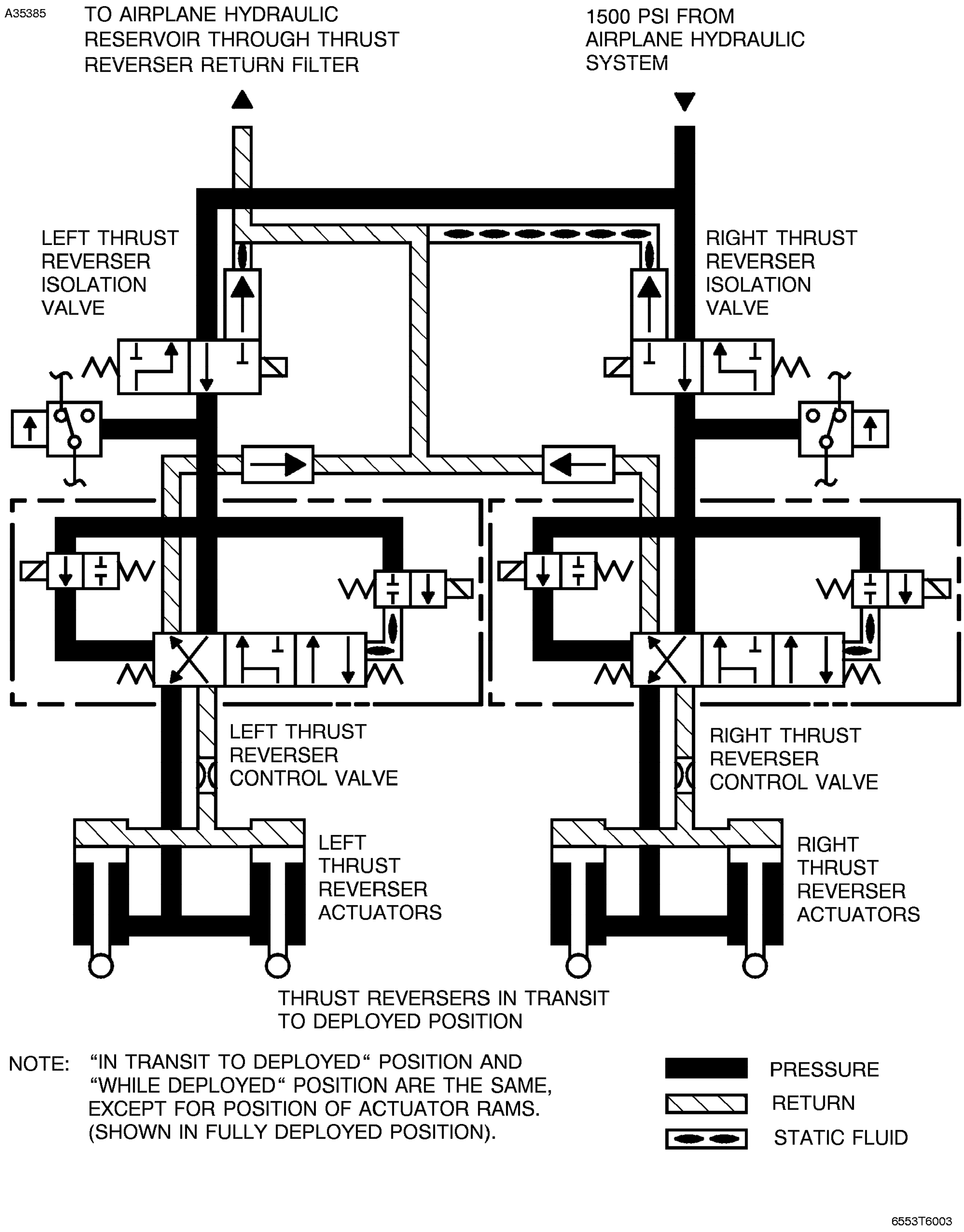

Figure 2-6. Thrust Reverser Hydraulic System Schematic (Sheet 3 of 3)

FIRE PROTECTION

Engine fire detection consists of a closed-loop sensing system and detector control unit which illuminates the respective red ENG FIRE warning light on the cockpit glare shield if a fire or overheat condition is present. The warning light, under a transparent, spring-loaded guard, also serves as a firewall shutoff switch.

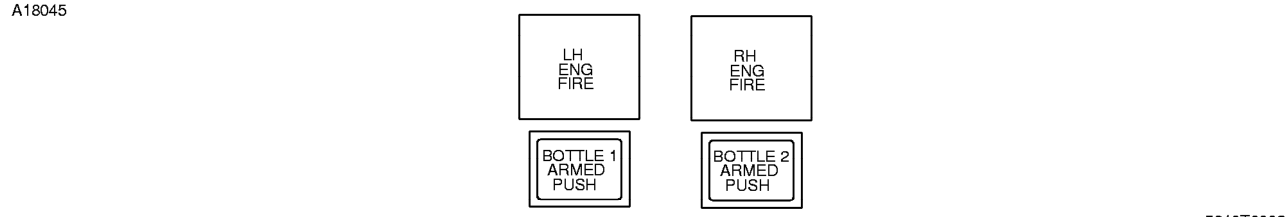

Figure 2-7 Fire Detection Indicating Light

Lifting the guard and depressing the warning light simultaneously closes the respective firewall fuel and hydraulic valves, de-energizes the starter/generator and arms the two freon extinguishing bottles. Firewall shutoff and extinguisher arming are indicated by illumination of the respective LO FUEL PRESS, LO HYD FLOW, F/W SHUTOFF and GEN OFF annunciator panel lights and both white BOTTLE ARMED lights.

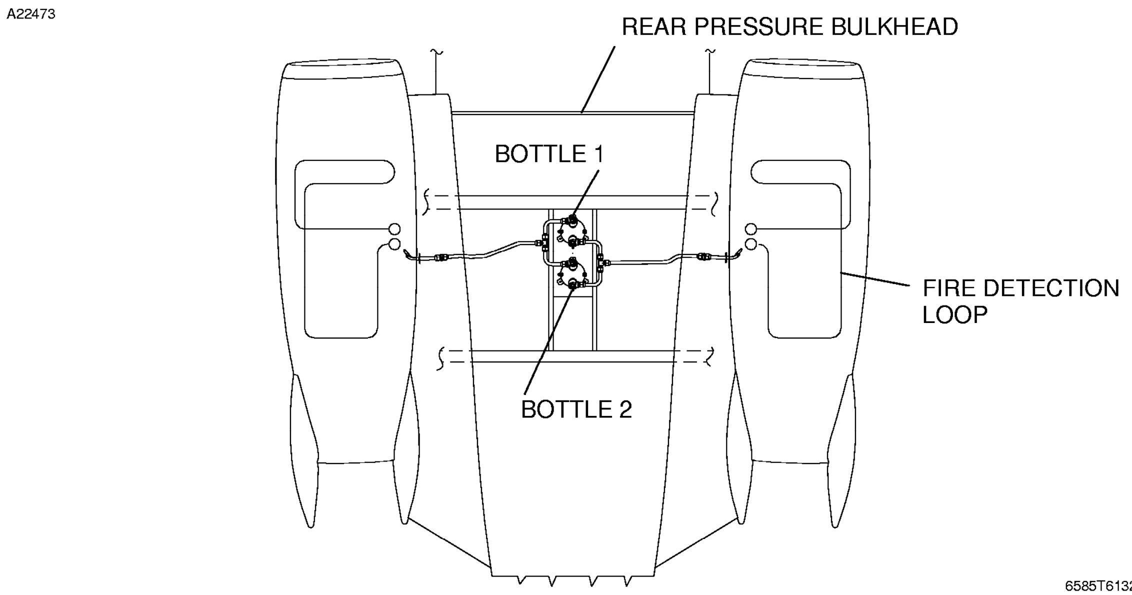

Figure 2-8 Engine Fire Extinguishing System

Once armed, either bottle may be discharged to the selected engine by pushing the BOTTLE ARMED light. The light will go out as the light is pushed. System plumbing is such that both bottles can be directed to the same engine if necessary.

Function of the lights and continuity of the sensor and detector control units is checked by placing the rotary TEST selector in the FIRE WARN position and observing illumination of both red lights. Depressing either fire light will then illuminate both BOTTLE ARMED lights. Since the BOTTLE ARMED lights will come on each time the system is tested or initially activated regardless of freon quantity, it is necessary to check proper bottle servicing on the sight gauges in the tailcone compartment during preflight inspection.

The fire detection system is equipped with an amber FIRE DET SYS annunciator light on the annunciator panel. If the fire detection system becomes inoperative due to lack of continuity (an open circuit) in the closed loop sensor, the annunciator will illuminate.

All test, detection and extinguishing features are electrically powered from the main Direct Current (DC) buses requiring either external power, the battery switch in BATT, or a generator on the line for operation.

FUEL

GENERAL

The Citation Encore fuel system is made up of two distinct, but essentially identical halves. Normal operation supplies fuel to the engine from its respective integral wing tank. Each half of the system holds approximately 403 U.S. gallons for a total airplane capacity of 806 gallons of usable fuel (approximately 5440 pounds). Crossfeed capability is incorporated, and when selected, enables both engines to receive fuel from a single tank. The single-point pressure refueling receptacle, is located on the right side of the fuselage, aft of the wing. It permits simultaneous servicing of both sides of the fuel system. Refer to the Maintenance Manual, Chapter 12 for fuel servicing procedures.

System operation is fully automatic throughout the normal flight profile. Fuel system control and monitoring is available through the boost pump switches, crossfeed switch, fuel quantity and flow indicators, and annunciator panel lights which warn of abnormal system operation. A low fuel level warning system functions independently of the normal fuel quantity indicating system.

FUEL CELL

Each tank encompasses the internal wing area forward of the rear spar except for the gear well, inboard to the wing root and outboard to the wing tip fairing. An electric boost pump, primary ejector pump, four transfer ejector pumps and seven fuel quantity probe assemblies are internally incorporated. A sump area in each saddle tank includes the electric boost pump, primary ejector pump and quick drains to preclude water and sediment buildup. The sump itself is designed to provide a minimum of five seconds fuel supply during negative gravity maneuvers not exceeding -0.5 G. Fueling is accomplished through an overwing port in each cell, or through the pressure refueling system.

A vent system ensures ambient pressure within the tank and fuel expansion overflow capability. A float-type valve restricts flow through the vent during inflight maneuvering. Design features of the vent prevent it from becoming blocked by inflight ice accumulation.

ELECTRIC BOOST PUMP

The electric boost pump provides fuel pressure for engine starting, crossfeeding and acts as a backup for the primary ejector pump. Operation is indicated by illumination of the L or R FUEL BOOST annunciator panel lights.

The pumps are controlled by a pair of three-position switches located on the left switch panel. The switches are marked OFF, NORM and ON. In the OFF position, the boost pump is deenergized. In NORM, function is automatic for start and crossfeed, and is activated by the pressure switch should output from the primary ejector pump be insufficient. The respective boost pump when in OFF or NORM is disabled any time the throttle is in cut-off, to preclude pump activation by low pressure sensing during shutdown. The ON position causes the selected pump to operate continuously regardless of throttle position.

To ensure uninterrupted fuel flow to the engines, the boost pump switches must be positioned ON when the low fuel lights illuminate or at 180 pounds or less indicated fuel.

EJECTOR PUMPS

Four ejector pumps in each fuel cell utilize existing fuel pressure in conjunction with a venturi to produce a high-volume flow. As high pressure fuel is forced through the ejector orifice, a low pressure area is created at the pump inlet drawing in a comparatively large volume of fuel and pushing it out at low pressure.

The primary ejector pump uses bypass fuel from the engine-driven pump as its motive flow source to pick up fuel from the sump area and deliver it to the engine. Three transfer ejector pumps in each tank operate similarly except that they use bypass fuel from the main supply line as a motive flow source. Their function is to ensure a constant supply of fuel to the sump by scavenging from the lowest point in the cell.

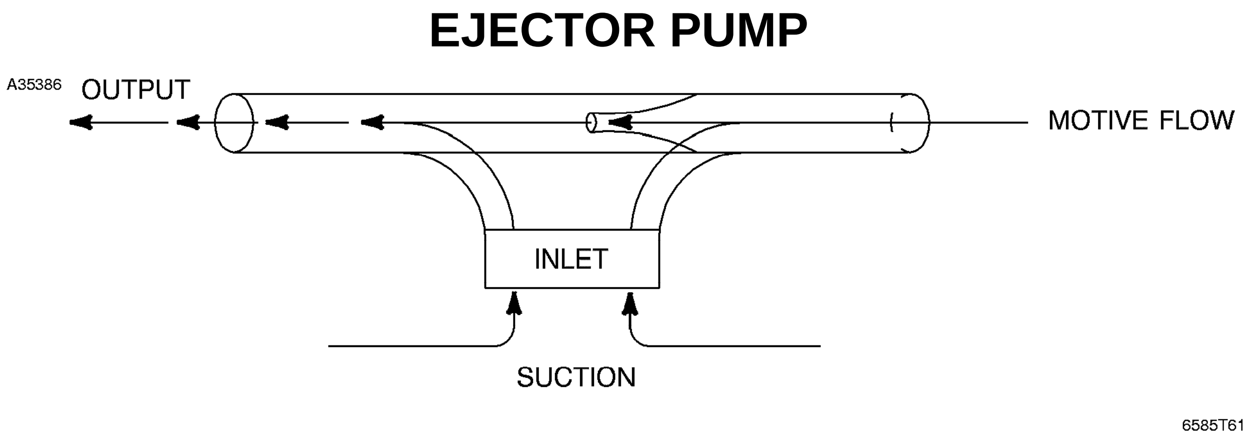

Figure 2-9

CROSSFEED

Crossfeed is controlled by a selector on the left switch panel labeled L TANK, OFF, R TANK. Crossfeed allows both engines to be supplied from one fuel cell.

Selecting either tank automatically turns on the electric boost pump in that cell, opens both crossfeed valves and three seconds later closes the motive flow shutoff valve on the side not selected. Returning the selector to OFF reverses the sequence. A green INTRANSIT light above the selector illuminates any time the crossfeed valves are not fully closed or open, or do not coincide with switch position.

NOTE

When selecting crossfeed, it is important to allow sufficient time for the cycle of events to be completed before returning the switch to OFF. Not allowing sufficient time can interfere with the normal operation of the time delay relays resulting in loss of control of the crossfeed system. If experienced, this condition can be corrected by placing the battery switch in EMER and turning both generators off. After several seconds, electrical power can be restored and crossfeed will function normally.

When crossfeed is selected, it is possible for a pressure spike to activate the fuel boost pump in the tank opposite the one selected. If this occurs, both fuel boost pumps would be operating, causing equal fuel pressures on both sides, preventing crossfeeding. When initiating system operation, monitor the FUEL BOOST ON annunciator panel lights and if both illuminate, cycle the fuel boost switch for the nonselected tank to OFF and back to NORM. This deactivates the boost pump in the tank not selected and allows normal crossfeed.

Operationally, it is seldom necessary to balance the fuel load by crossfeeding unless single-engine operations have been conducted or an uneven load was acquired during fueling. Maximum asymmetrical fuel differential between fuel tanks for normal operations is 200 pounds. In an emergency, the maximum asymmetrical fuel differential is 600 pounds.

ENGINE FUEL SYSTEM

The two-stage, engine-driven pump mounted on the accessory gearbox supplies high pressure flow to the fuel control unit. Fuel enters the pump at 20-30 PSI from the primary ejector pump. The engine-driven pump increases this pressure to 500-1250 PSI. Part of the pump output is bypassed through the motive flow valve to drive the primary ejector pump and the remainder is directed downstream to the fuel control. This positive pressure to the fuel control must be maintained by the engine-driven pump for the engine to continue to operate.

The fuel control unit is mounted on the engine-driven fuel pump and determines the proper fuel schedule for all phases of engine operation.

A flow divider downstream of the fuel control unit provides proper fuel distribution to the combustion chamber by dividing the flow from the fuel control between the primary and secondary fuel manifolds.

Each side of the fuel system incorporates quick drains.

FILTER

Each side of the fuel system incorporates quick drains and an engine mounted filter. In addition, inlet screens are installed on the fuel sump structure and all of the transfer ejector pump inlets. A pressure differential sensing switch and a bypass valve alert the pilot and allow flow to continue should the filter become obstructed. The switch closes and illuminates the FUEL FLTR BP annunciator panel light if the difference between filter inlet and outlet pressure reaches 22 PSI, ±2.0. The bypass valve opens at 28 PSI to bypass the obstructed filter. Illumination of the annunciator panel light indicates impending or actual bypass of fuel around the filter.

FLOW INDICATORS

Fuel flow rate is measured downstream of the fuel control and presented on a digital format gauge in pounds per hour per engine.

QUANTITY INDICATORS

Six capacitance-type probes and one temperature compensator in each cell supply information to the Fuel Quantity Signal Conditioner (FQSC). The FQSC converts these signals into voltage and transmits the signal to the vertical scale quantity indicator, which displays the fuel quantity in pounds.

LOW LEVEL WARNING

Low level warning functions independently of the normal quantity indicating system and provides a visual warning to the crew when a minimum amount of usable fuel remains in either tank. The system consists of a float switch in each fuel cell and L and R LO FUEL LEVEL annunciator panel lights. A minimum usable fuel quantity of 180 ± 20 pounds in either tank will illuminate the associated light. When operating with light fuel loads, it is possible for the lights to illuminate momentarily in turbulent flight conditions or while taxiing on rough surfaces. The system is calibrated to give an accurate indication in level unaccelerated flight.

FUEL SHUTOFF

Electrically operated firewall shutoff valves can be individually closed by depressing the LH or RH ENG FIRE button. Actuation of a shutoff valve will be indicated by illumination of the respective L or R F/W SHUTOFF annunciator panel light. Protection against severe overspeed or explosive structural failure of the engine is provided by an automatic fuel shutoff. It is actuated through a mechanical linkage should a 0.053 ± 0.002 inch rearward displacement of the turbine shaft take place. Fuel flow to the manifold is terminated, automatically shutting down the engine. A manual shutoff is located in each wing root for use by maintenance personnel.

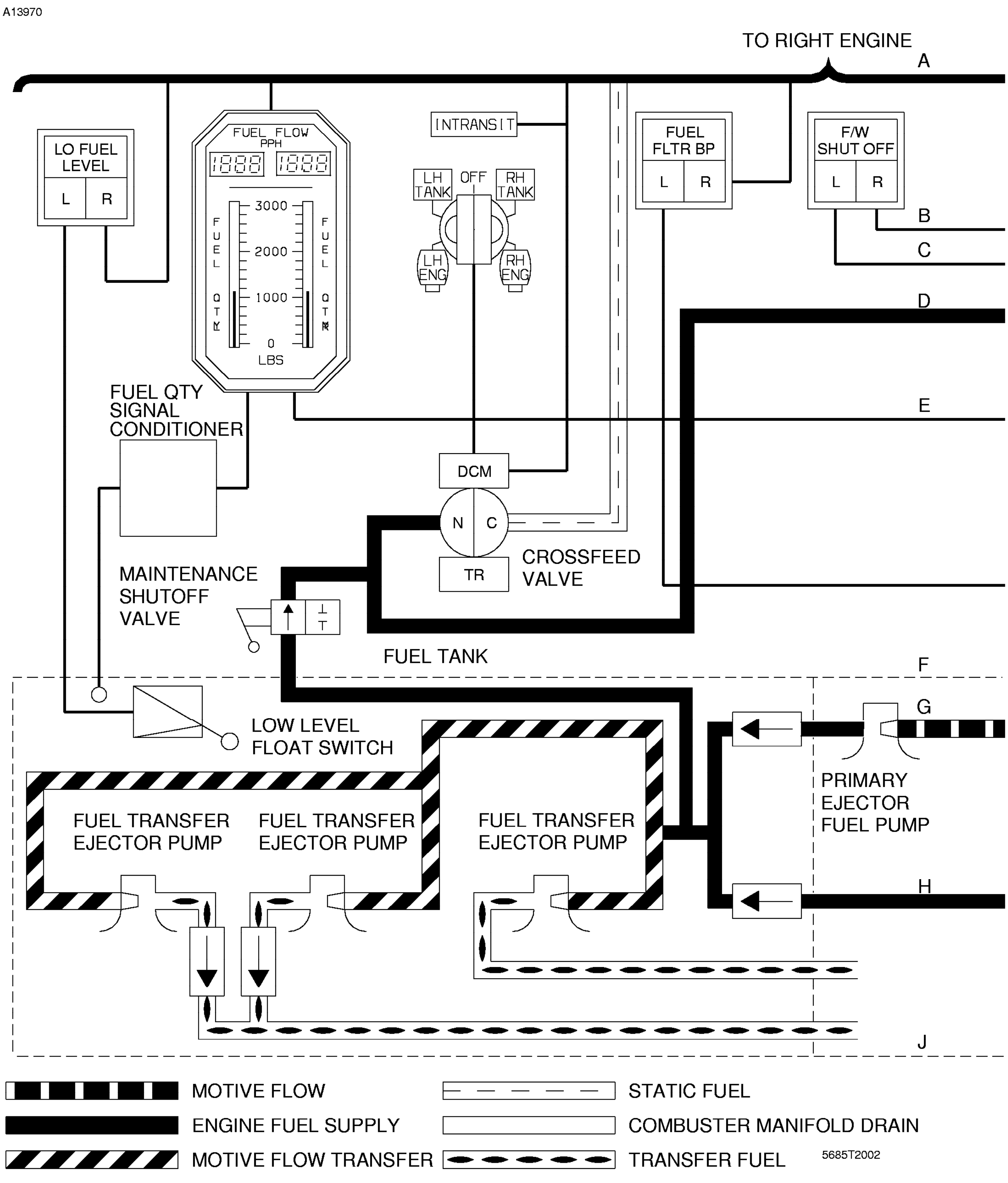

Figure 2-10 (Sheet 1 of 2) Fuel System Schematic

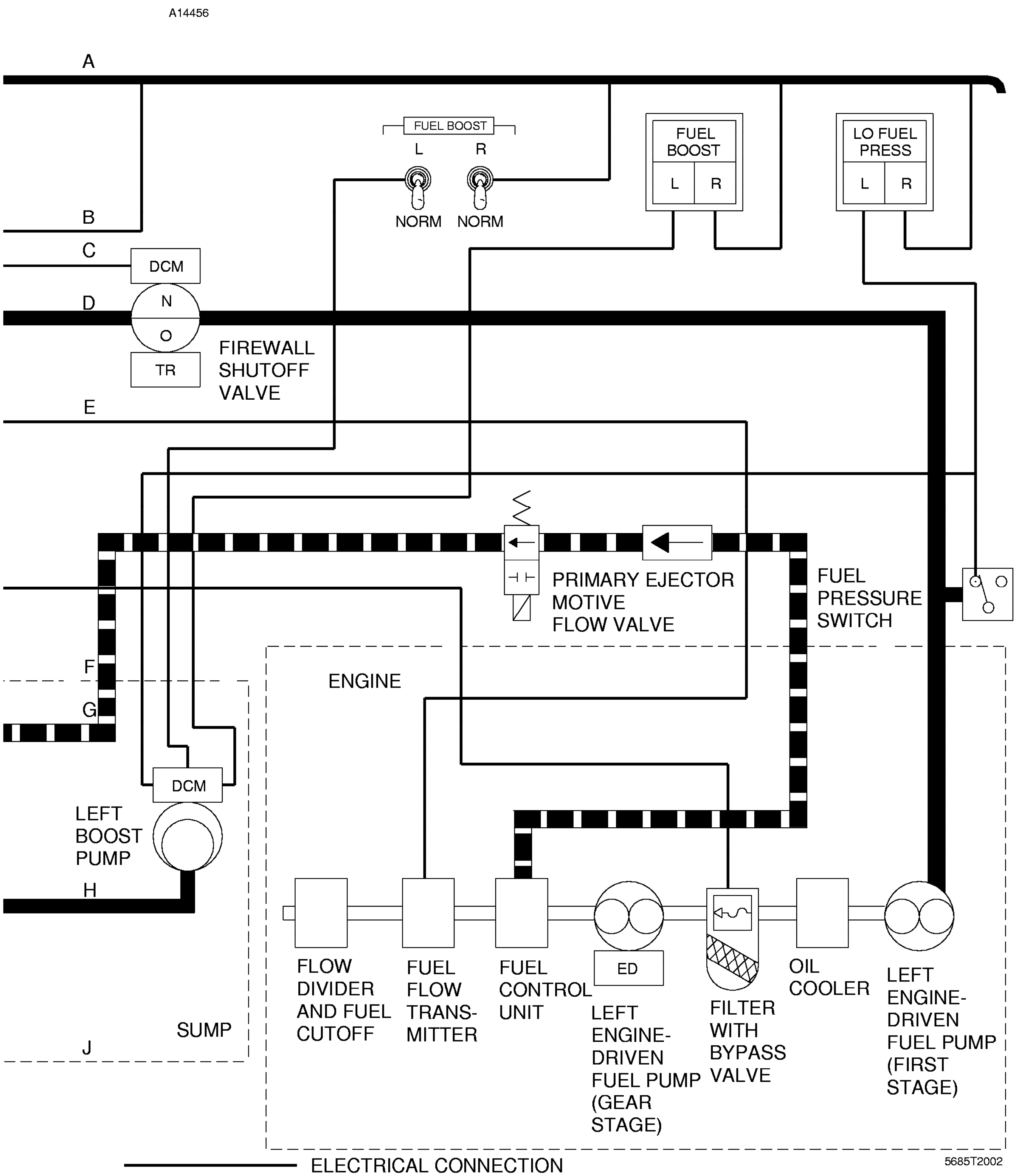

Figure 2-10 (Sheet 2 of 2) Fuel System Schematic

HYDRAULIC

GENERAL

The Main hydraulic system is an open-center type system. Two engine-driven pumps (one on each engine) supply a continuous flow of hydraulic fluid as long as engine(s) is operating. A reservoir stores fluid for the various hydraulically operated components. The reservoir is a boot-strap type and performs similar to a hydraulic accumulator by maintaining potential pressure on system. A solenoid operated bypass valve controls open center operation of the system. In a no-pressure-demand condition, the bypass valve is de-energized open, allowing fluid to free-flow from pressure to return. In a pressure demand condition, the bypass valve is energized closed and pressure is routed to a selected system/component. A relief valve limits hydraulic system pressure to 1500 PSI (10,342 kPa). A relief valve is installed in parallel with the bypass valve on a hydraulic sub-panel.

Other main system components include two pressure filters, one located in left engine pump pressure line and one in right pump pressure line. A third return filter is located in the return line to hydraulic reservoir. Two firewall hydraulic shutoff valves are motorized electrically closed or open. Either shutoff valve may be closed during an engine fire, stopping flow of fluid to the engine pump selected. Ground service connections are located at the tailcone lower exterior surface.

A flow switch check valve is incorporated in each pressure line from engine hydraulic pumps. Check valves prevent fluid flow from one engine pump to other. Flow switches provide an indication on the annunciator panel when low/no-flow occurs from respective engine pump.

RESERVOIR

The fluid for the system is contained in an accumulator-type reservoir located in the aft tailcone area. The quantity of fluid is shown by a plunger-type sight gage located on the aft side of the reservoir. The refill, low, full, and overfull indications correspond to 0.3, 0.8, 0.9, and 1.5 gallons, respectively. A microswitch attached to the accumulator plunger will activate an amber LO HYD LEVEL annunciator panel light any time the fluid level drops below the low position. Servicing requires equipment capable of delivering hydraulic fluid under pressure. Bleeding or relieving an overfill condition is accomplished by opening a relief valve located on the reservoir. Relieved excessive fluid is drained overboard through the underbelly vent mast. Any internal leakage is collected and drained through an overboard vent line into the underbelly vent mast.

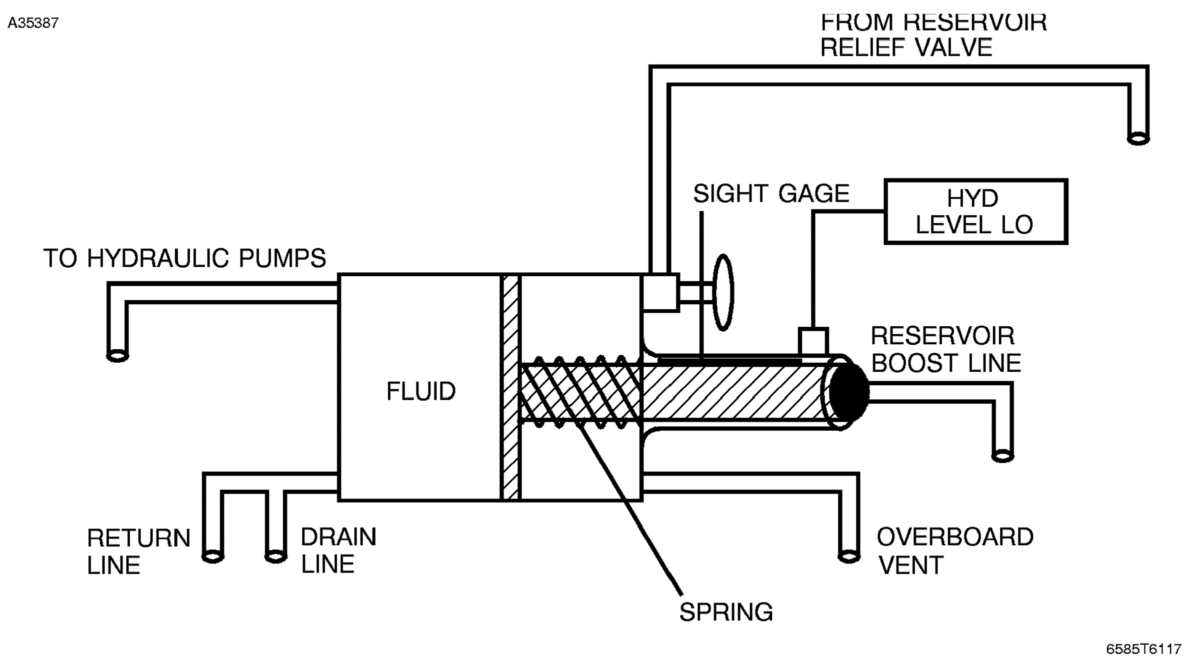

Figure 2-11 Hydraulic Reservoir

PUMPS

Hydraulic pressure is provided by two positive displacement engine-driven pumps, each mounted on the engine accessory case. Either pump is capable of supplying enough pressure to operate the gear, flaps, speedbrakes, two-position horizontal stabilizer and reversers. From each pump, hydraulic fluid is routed through filters and flow switch check valve assemblies to the bypass valve and relief valve. In the event that either pump output should drop to less than 0.45 ±0.10 gallons-per-minute, (GPM), the respective LO HYD FLOW annunciator panel light will illuminate. The light will extinguish when pump output reaches a minimum of 1.33 GPM.

HYDRAULIC SYSTEM INDICATING

The hydraulic indicating systems are comprised of three separate warning systems: A low-fluid quantity warning system to indicate when fluid in the reservoir is at minimum operating volume (HYD LOW LEVEL); a fluid flow warning system(s) to indicate low or no flow of fluid from either/both hydraulic pumps (HYD FLOW LOW LH) (HYD FLOW LOW RH); and a pressure indicating system to indicate hydraulic pressure buildup during actuation of a hydraulic system component (HYD PRESS ON).

Hydraulic Low Fluid Quantity Warning System - The hydraulic low-fluid quantity warning system incorporates a low-fluid warning switch mounted on the hydraulic reservoir visual indicator; a warning light HYD LOW LEVEL located on the annunciator panel and necessary wiring. The hydraulic reservoir fluid capacity is measured by volume of fluid. A visual indicator on the end of the reservoir is scaled at EMPTY (5 Cubic Inches), REFILL (38 Cubic Inches), FULL (125 Cubic Inches) and OVERFULL (150 + Cubic Inches). The low-fluid warning switch is mounted at approximately the REFILL mark with the switch actuator roller riding on the visual indicator rod. The rod moves according to the volume of fluid in the reservoir. The switch is electrically connected to the warning light HYD LOW LEVEL on the annunciator panel. The warning switch is a micro type switch, held to a bracket with two screws and nuts.

Hydraulic Fluid Flow Warning System - The fluid flow warning system incorporates two check valve-flow switches located on the forward side of the aft engine carry- thru beam; two warning lights, HYD FLOW LOW LH and HYD FLOW LOW RH, located on the annunciator panel and necessary wiring. The left and right fluid flow warning systems are independent of each other, but function identically. The check valve portion of each flow switch check valve prevents fluid flow from one engine pump to the other. The flow switch portion of each flow switch check valve is normally closed (no-flow), completing the electrical circuit to the warning light. At a predetermined fluid flow through the unit, the flow switch opens, extinguishing the warning light. Refer to Flow Switch Check Valve - Maintenance Practices.

Hydraulic Pressure Indicating System - The purpose of the hydraulic pressure indicating system is to inform the flight/maintenance crew that the hydraulic system is pressurized during landing gear actuation, flap actuation, speed brake actuation or thrust reverser operation. When the flap actuation, hydraulic system is in a no pressure condition (bypass valve open to return), the pressure indicating switch is open; the annunciator light HYD PRESS ON is extinguished. When the landing gear, flaps, speed brake or thrust reverser is actuated, the bypass valve also closes and pressure is built up to operate the selected system. As the pressure increases toward 1500 PSI (maximum system pressure), the pressure switch closes at 185 PSI maximum and completes the electrical circuit to illuminate the annunciator light HYD PRESS ON. After the selected hydraulic system completes actuation, the bypass valve opens, bypassing pressure to return. As the pressure decreases, the pressure switch opens at 155 PSI, +5 or - 5 PSI, minimum and extinguishes the annunciator light. Refer to Hydraulic Panel Assembly and Components - Maintenance Practices, for removal/installation of the pressure switch.

NORMAL OPERATION

When either the landing gear, flaps, speedbrakes, two-position horizontal stabilizer or thrust reversers are actuated, a bypass valve in the return line closes enabling the system to pressurize to 1500 PSI. At the same time, the respective control valve opens, allowing flow to go to the selected system. A relief valve which maintains system pressure at 1500 PSI is in parallel with the bypass valve. The relief valve cracks at 1350 PSI and is fully open at 1500 PSI. The HYD PRESS light illuminates on the annunciator panel any time the system is pressurized. Once the selected cycle is complete, the respective control valve closes, the bypass valve opens and the system reverts to the low pressure, open center state.

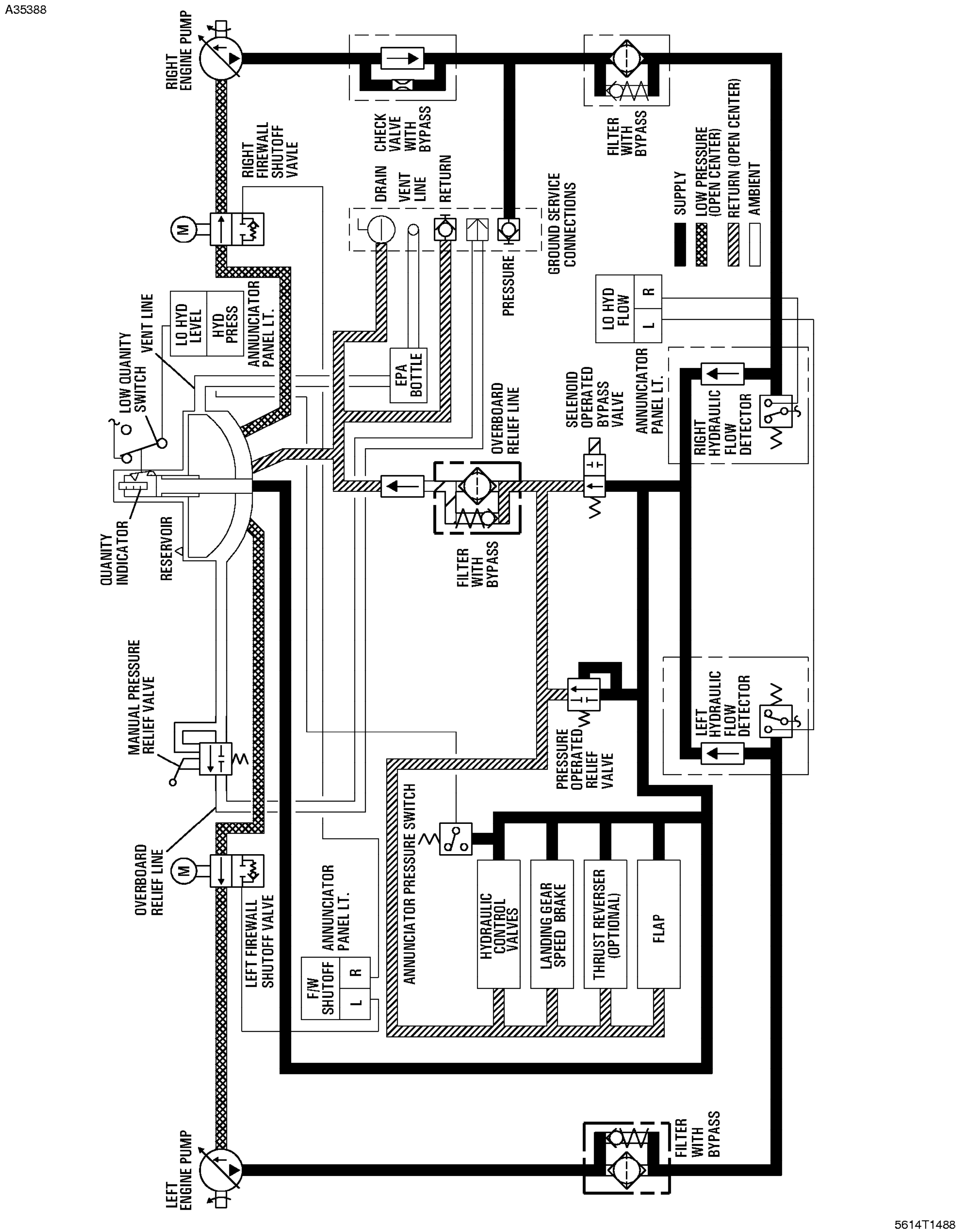

Figure 2-12. Hydraulic System Schematic

LANDING GEAR AND BRAKES

GENERAL

The landing gear is electrically controlled and hydraulically actuated. Each main landing gear assembly uses a single wheel assembly and an air over oil strut. The two main gear are articulated with a trailing link arrangement which improves the smoothness of landings. The nose gear has a straight oil over air strut and a chined tire for water and slush deflection. The main landing gear doors are mechanically connected to the main gear struts and extend and retract with the individual gear assemblies. The nose gear utilizes three doors. The rear door is mechanically connected to the nose gear strut and extends aft, or retracts forward with the nose gear assembly. The two forward double-action doors are mechanically linked to the nose gear. These doors close with the nose gear fully extended or retracted.

The gear actuators incorporate an internal lock to hold the gear in the extended position. They are held retracted by mechanical uplocks that are normally released hydraulically. The landing gear completes a retraction or extension cycle in less than 6 seconds. The gear can be extended at airspeeds up to 250 KIAS (V_{LO} extend). It can be retracted at speeds up to 200 KIAS (V_{LO} retract). With the landing gear extended, the maximum speed is 250 KIAS (V_{LE}).

CONTROL

The landing gear control panel contains the landing gear handle, an audible warning system, horn silence switch, three gear safe indicators and a red unlocked indicator. The landing gear handle has two positions: full down and full up. The gear handle must be pulled out to clear a detent before it can be repositioned. Operation of the gear and doors will not begin until the handle has been positioned in one of the two detents. A gear handle locking solenoid, activated by the left main gear squat switch, physically prevents inadvertent movement of the gear handle while on the ground.

EXTENSION AND RETRACTION

In a landing gear retraction cycle, the following takes place:

1. With weight off the left landing gear squat switch, power is applied to the solenoid lock, allowing the landing gear handle to be placed in the UP position.
2. Actuation of the gear handle to the UP position:
   a. Lights the GEAR UNLOCK warning light when any gear unlocks.
   b. Closes the bypass valve to the hydraulic return line, pressurizing the system as required.
   c. Positions the landing gear control valve to route hydraulic fluid to the retract side of the hydraulic cylinders.
3. The landing gear are mechanically latched and held in place by the uplock hooks.
4. Actuation of the three gear up microswitches:
   a. When all three indicate the gear is up and locked, they open the bypass valve in the hydraulic system returning it to open center operation and low pressure.
   b. Remove power from the landing gear control valve.
   c. Extinguish GEAR UNLOCK indicator light.

The sequence during a gear extension is identical with the following exceptions:

1. Solenoid lock on landing gear handle is not in use.
2. Movement of the gear handle to the DOWN position causes fluid to be routed by the control valve through the uplock actuators to retract the uplock hooks, releasing the landing gear, and then to the extend side of the hydraulic cylinders. The green LH, RH and NOSE gear indicating lights illuminate as each gear locks down. After all gear are down-and-locked, the gear down microswitches return the hydraulic system to open center operation and essentially trap fluid in the gear extend system.

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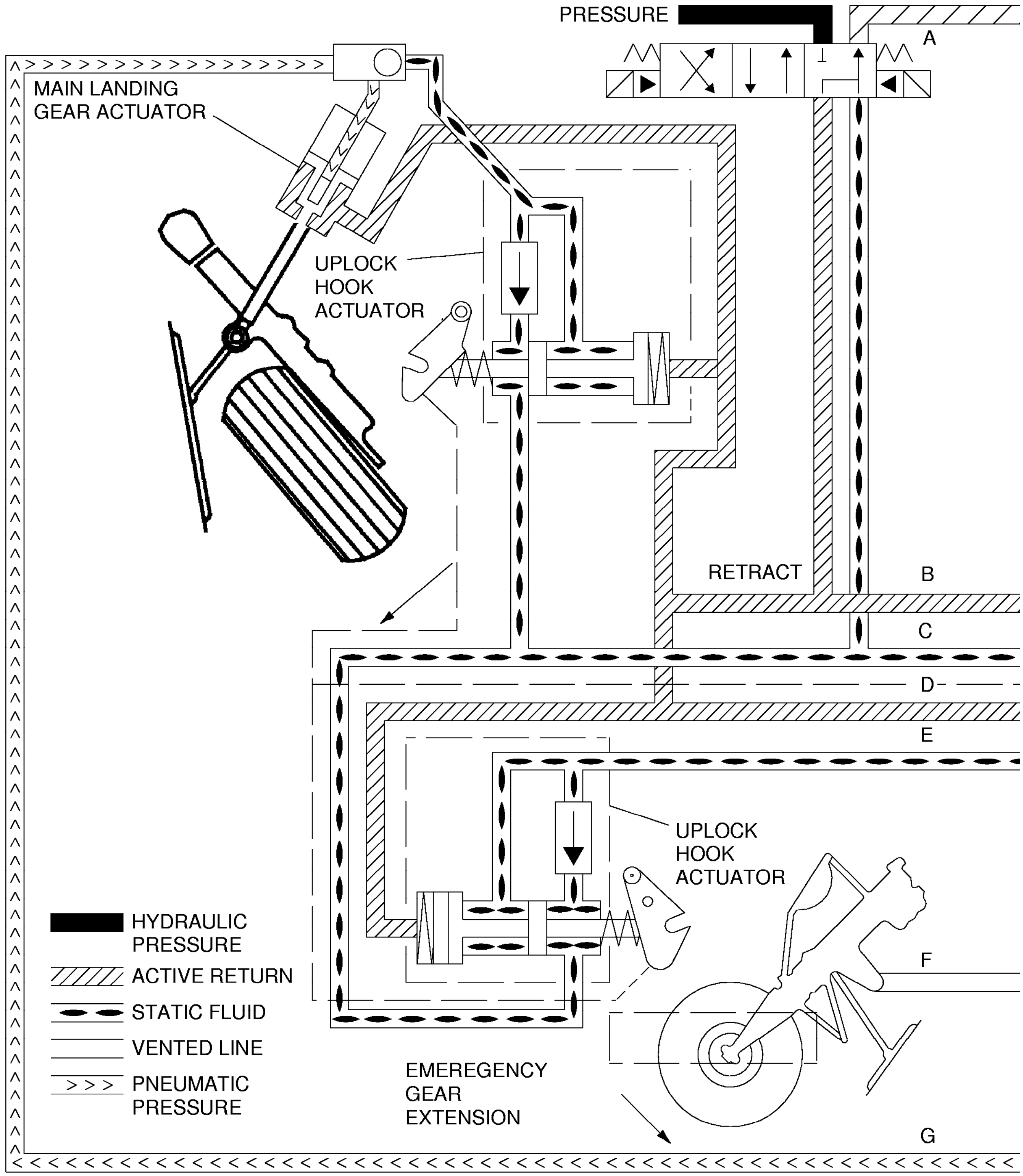

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Figure 2-13 (Sheet 1 of 2) Landing Gear Extension and Retraction Flow Diagram

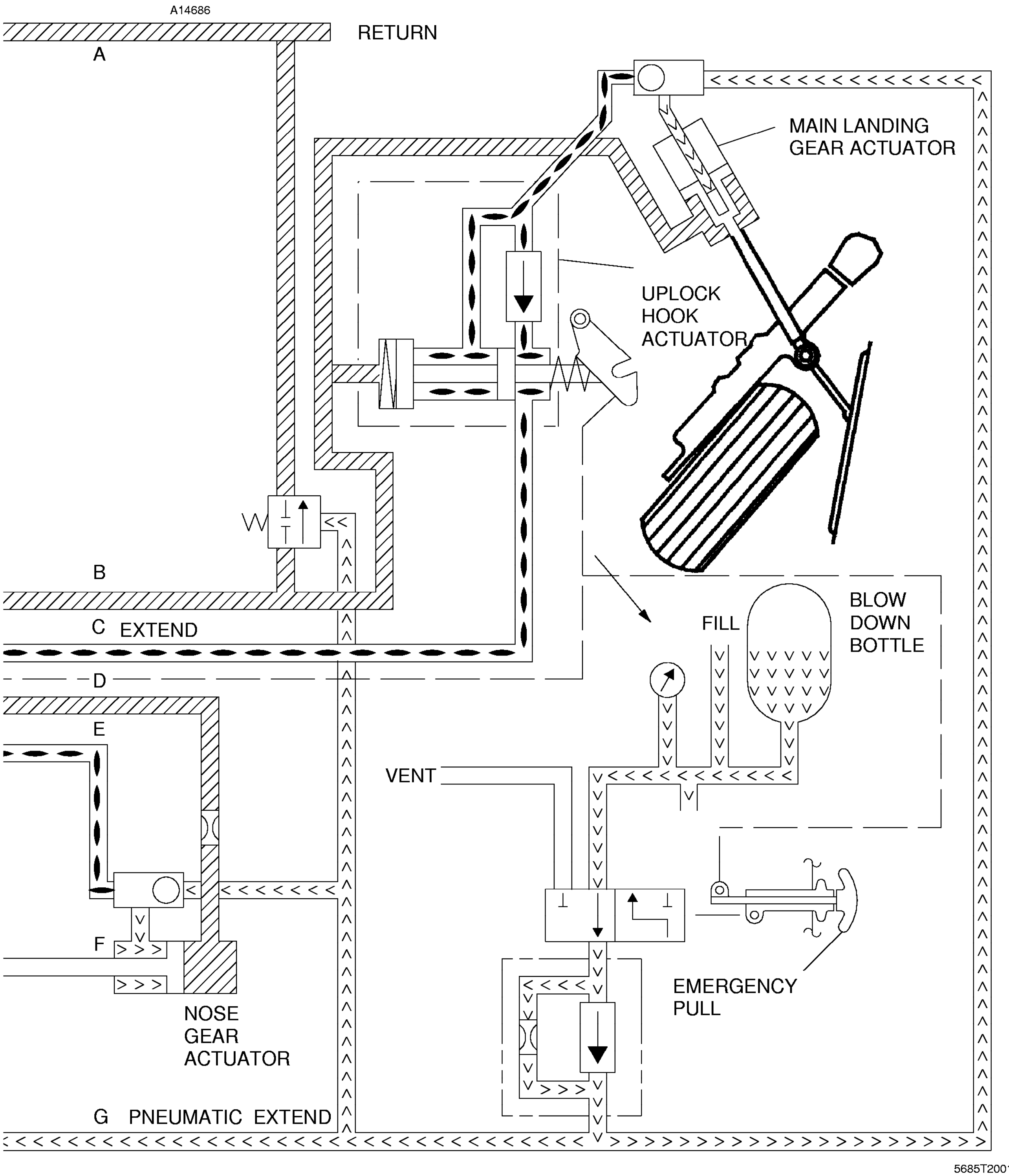

Figure 2-13 (Sheet 2 of 2) Landing Gear Extension and Retraction Flow Diagram

POSITION AND WARNING SYSTEM

The landing gear position and warning system provides visual and audible indication of landing gear position. Three green safe lights and a red GEAR UNLOCK light are located in a group adjacent to the gear control handle. Each green light corresponds to one gear, NOSE, LH or RH and indicates that it is in the down and locked position. The red light indicates an unsafe gear position (in transit or not locked). The landing gear warning system sounds an audible warning when the airspeed is below approximately 150 knots if either throttle is retarded below approximately 70% N_2 and the gear is not down and locked. The warning horn can be silenced for this condition by depressing the HORN SILENCE switch. The horn will reset if the throttle is advanced. If the flaps are extended beyond the T.O. & APPR. (15°) position and the gear is not down and locked, there will be an audible warning that cannot be silenced.

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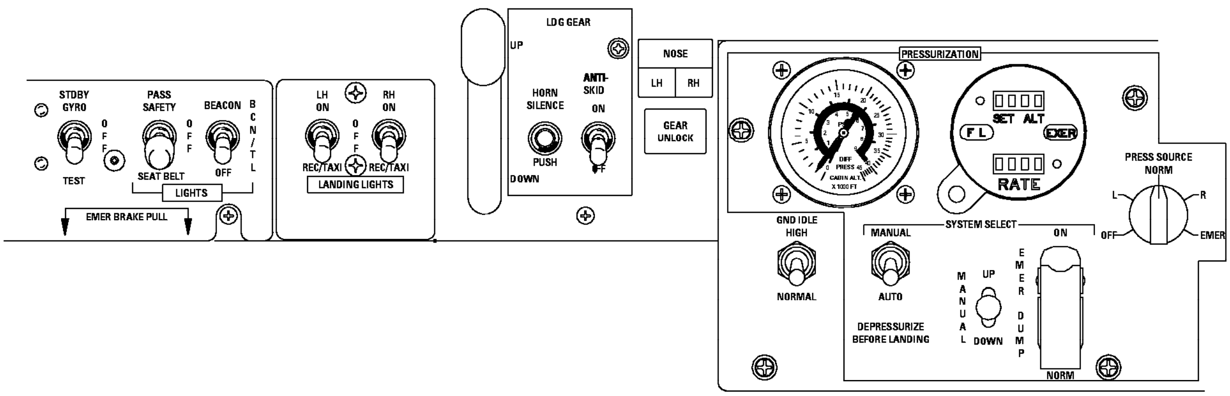

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Figure 2-14. Landing Gear Position Warning

EMERGENCY EXTENSION

In the event of normal system malfunction, a manually operated system is provided to release the landing gear for free-fall extension.

The manual system is actuated by the red AUX GEAR CONTROL T-handle located under the pilot's instrument panel. The handle is pulled and rotated clockwise to lock. This action mechanically disengages the landing gear uplocks, allowing the landing gear to free-fall to the down and locked position and also unlocks the red, collar-type, blow down knob. Lowering the landing gear by the free fall method is not advisable at speeds above 200 KIAS, as the gear may not fully extend above that speed. Approximately 180 KIAS with flaps up is the optimum speed/configuration for free fall extension. Yawing the airplane may be required to achieve green light indications and the pneumatic system should always be used to assure positive locking of all three gear actuators.

Pulling the red, collar-type knob on the T-handle shaft mechanically ports the emergency air bottle to the uplock actuators to retract the uplock hooks, and then to the extend side of all three landing gear actuators. The uplock hooks are unlocked and the gear is driven to the down and locked position. Normal indications will appear in the cockpit providing the gear handle is down. After actuation of the pneumatic system, the knob should be left in the extended position. After each use, the system must be serviced.

WHEEL BRAKES

Toe-actuated multiple disc brakes are installed on the main gear wheels. Braking can be accomplished by either of two independent systems: the power brake hydraulic system or the back-up pneumatic system. Normal braking can be applied from either cockpit seat. The emergency brake control handle is installed under the left instrument panel only.

DIGITAL ANTISKID/POWER BRAKE

The antiskid system provides power assisted braking with skid protection. It is designed to provide maximum braking efficiency on all runway surfaces. The system consists of two wheel speed transducers, brake metering/antiskid valve assembly, digital control box, reservoir, accumulator, an electrically driven hydraulic pump, filter, pressure and control switches and two indicator lights.

CAUTION

DO NOT PULL THE PWR BRKS CIRCUIT BREAKER TO PREVENT THE POWER BRAKE PUMP FROM CYCLING. WITH THE CIRCUIT BREAKER DISENGAGED, THE POWER BRAKE SYSTEM IS INOPERATIVE AND THE RUDDER PEDAL TOE BRAKES ARE DISABLED. BRAKING IS THEN AVAILABLE ONLY BY USE OF THE PNEUMATIC BRAKE SYSTEM.

System operation is conventional with power braking available at all speeds while antiskid protection is available at speeds above approximately 12 knots. The antiskid protection feature is designed to operate with maximum pilot brake applied pressure. The digital system is tuned to provide optimum performance with the trailing link gear and brake combination.

The wheel speed transducer is bolted in the main gear axle with the drive shaft connected through a drive cap to the main wheel. As the wheel turns, the transducer generates a 36 Hz signal for each wheel revolution that is sent to the control module as a variable frequency. The control module accepts the output of the left and right wheel speed transducers and converts these signals to a direct current (DC) voltage that is directly proportional to wheel speed. The voltage from the left and right wheels is averaged to provide a composite or reference voltage. Any significant variation between either wheel speed voltage and the reference voltage produces an error signal that activates the side of the antiskid valve assembly which controls the amount of braking being applied to that wheel. At touchdown, the generator voltage reaches maximum as soon as the wheel spins up. As long as no skid occurs, the transducer voltage follows wheel speed and the reference voltage follows the voltage of the transducer. When excessive deceleration of a wheel occurs, transducer voltage suddenly drops. An error signal is generated which energizes the appropriate servo valve segment of the antiskid valve for that wheel. The servo valve controls the movement of spools within the main body of the antiskid valve which modulate the braking effort being applied by the pilot as required to maintain transducer voltage and reference voltage within the skid limits, preventing the skid condition. When the airplane speed drops below approximately 12 knots, the antiskid function disengages.

To ensure proper braking on water, snow and ice-covered, hard-surface runways and all unimproved surfaces, it is necessary for the pilot to apply maximum effort to the brake pedals throughout the braking run. When the system anticipates a skid and releases the applied brake pressure, any attempt by the pilot to modulate braking can result in an interruption of the applied brake signal and may increase stopping distance significantly. Hydraulic power for the antiskid system is provided by an electrically driven hydraulic pump located in the left nose of the airplane. An accumulator is installed in the system to maintain system pressure when the pump is not running. The pump is controlled by a pressure switch that opens when the pressure approaches 1500 PSI and closes when the system pressure approaches 1000 PSI.

The power brake system is enabled by a switch which is operated by positioning the landing gear control. When the landing gear is down, the switch is positioned closed, providing a ground for the power brake hydraulic pump motor. The motor may then run in response to signals from the motor pressure switch. Upon landing, when the landing gear squat switch senses the airplane is on the ground it signals the antiskid electronic control box, which enables the antiskid system.

A switch on the instrument panel allows the pilot to select antiskid ON or OFF. When the switch is in the ON position, the antiskid function is operational. With the control switch in the OFF position, the ANTISKID INOP light on the annunciator panel will illuminate and the pilot will have power braking available without the antiskid function. If the power system should fail, braking will only be available through the back-up pneumatic system. The antiskid control module incorporates test circuitry which continually monitors the antiskid system. If a fault is detected, the ANTISKID INOP light will illuminate on the annunciator panel. Certain faults in the system are displayed on a “BITE” indicator (fault display unit), which is located under the removable panel at the aft of the left nose compartment. A white flag may appear in any of the five circular indicators located in a row on the fault display unit. The faults which may be displayed are: left transducer failure (LEFT XDCR), right transducer failure (RIGHT XDCR), left and right squat switch disagreement (SQUAT DISAGREE), control valve failure (VALVE), and control unit failure (CONTROL).

If hydraulic pressure in the power system drops below 750 PSI, the LO BRK PRESS light will illuminate.

The brake system receives electrical power through a 20-ampere circuit breaker on the left circuit breaker panel, which is labeled SKID CONTROL. The brake antiskid system and the power brake motor/pump receive power through this circuit breaker which, when disengaged, disables the power brake system. Braking is then available only by means of the pneumatic brake system.

PARKING BRAKE

The parking brake is a part of the normal brake system and employs controllable check valves that can prevent the return of fluid after the brakes have been set. Parking brakes are set by depressing the toe brakes and pulling out the black parking brake handle located under the lower left side of the instrument panel. The parking brake should not be set if the brakes are very hot. This increases brake cool-down time due to decreased airflow, and may result in sufficient heat transfer from the brakes to cause the parking brake thermal relief valves to open or to melt the thermal relief plugs in the wheel, causing deflation of the tire.

EMERGENCY BRAKING

In the event of normal hydraulic braking system failure, a pneumatic system is available. The pneumatic pressure required is contained in the emergency air bottle and is controlled by a lever with red knob located to the left of the AUX GEAR CONTROL T-handle. Pulling the lever aft will apply equal pressure to both main landing gear brake assemblies. Releasing the back pressure on the lever and allowing it to move forward will relieve the pressure. The air pressure to the brakes may be modulated to provide any braking rate desired, but differential braking and antiskid will not be available. The emergency air bottle, when fully charged, contains sufficient pressure for ten or more full brake applications. For the most efficient use of the system, apply sufficient air pressure to the brakes to obtain the desired deceleration rate. Maintain that pressure until airplane is stopped. When the handle is released, residual air pressure from the brakes is exhausted overboard.

NOTE

Normal braking should not be applied while using the pneumatic brakes. Depressing the pedals will reposition the shuttle valves in the brake lines to open, allowing high pressure air from the brake housing to enter the brake hydraulic reservoir, which might possibly rupture it.

Adequate emergency braking for most conditions will be available from a properly serviced air bottle, even if the landing gear have been extended pneumatically. After stopping and clearing the runway, it is probably best to shut down the engines and have the airplane towed to the ramp, as there is no warning in the cockpit when the air bottle is depleted.

PNEUMATIC

GENERAL

An air bottle which provides for emergency extension of the landing gear and/or emergency braking is located on the right side of the forward pressure bulkhead. The bottle is properly serviced at 1800-2050 PSI and can be checked on preflight by a gauge visible in the right forward baggage compartment. A relief valve on the bottle will rupture at 4000 PSI if the bottle becomes overpressurized.

The bottle has outlets to the vent line, the gear auxiliary extension line, and the brake air pressure line. In normal system configuration the landing gear auxiliary extension line is connected to the vent line through the position of the control valve.

When the AUX GEAR CONTROL T-handle shaft is pulled, a valve is repositioned to direct air from the bottle through the auxiliary extension lines to the uplock actuators to release the uplock hooks and then to the extend side of the landing gear actuators.

Emergency braking is controlled through a manually operated three-way pressure regulating valve. Air from the bottle is connected directly to the inlet port of the valve by the brake air pressure line. The outlet port is connected to the brakes and, when the emergency brake handle is in NORMAL position, is vented to an exhaust line. When the emergency brakes are applied, the vent is closed, the inlet port opens and high pressure air is applied to the brakes. Releasing the emergency brake handle opens the vent, relieving pressure. This allows modulation of the system to obtain the desired braking force. Each time the handle is cycled some air pressure is vented overboard, reducing the emergency bottle supply.

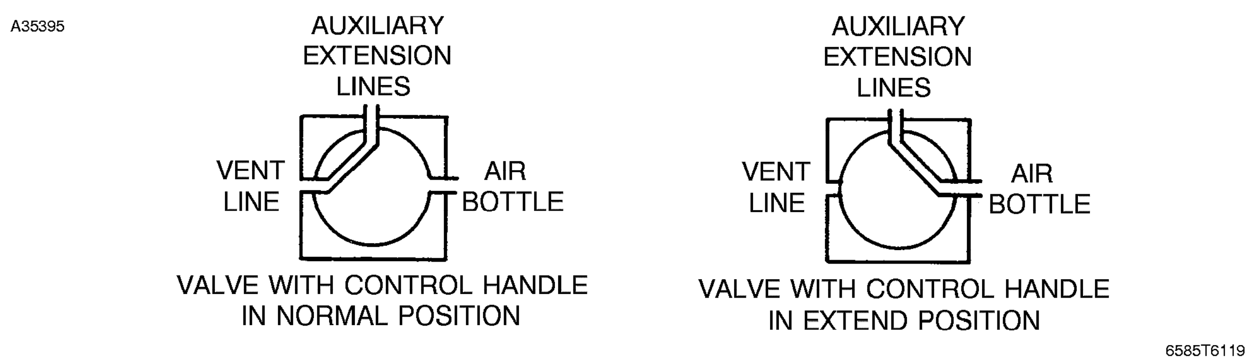


Figure 2-15. Emergency Air Bottle Control Valve

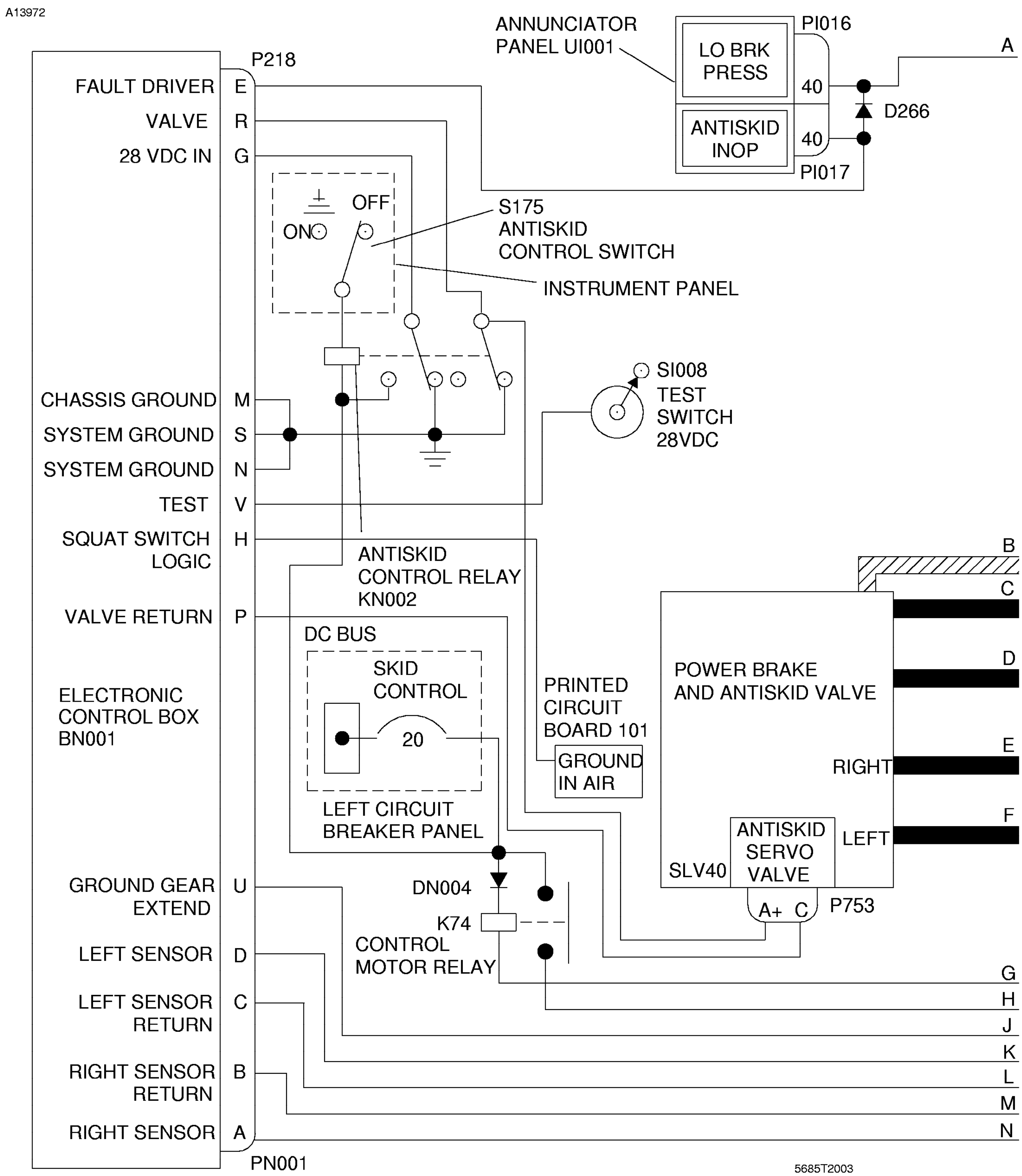
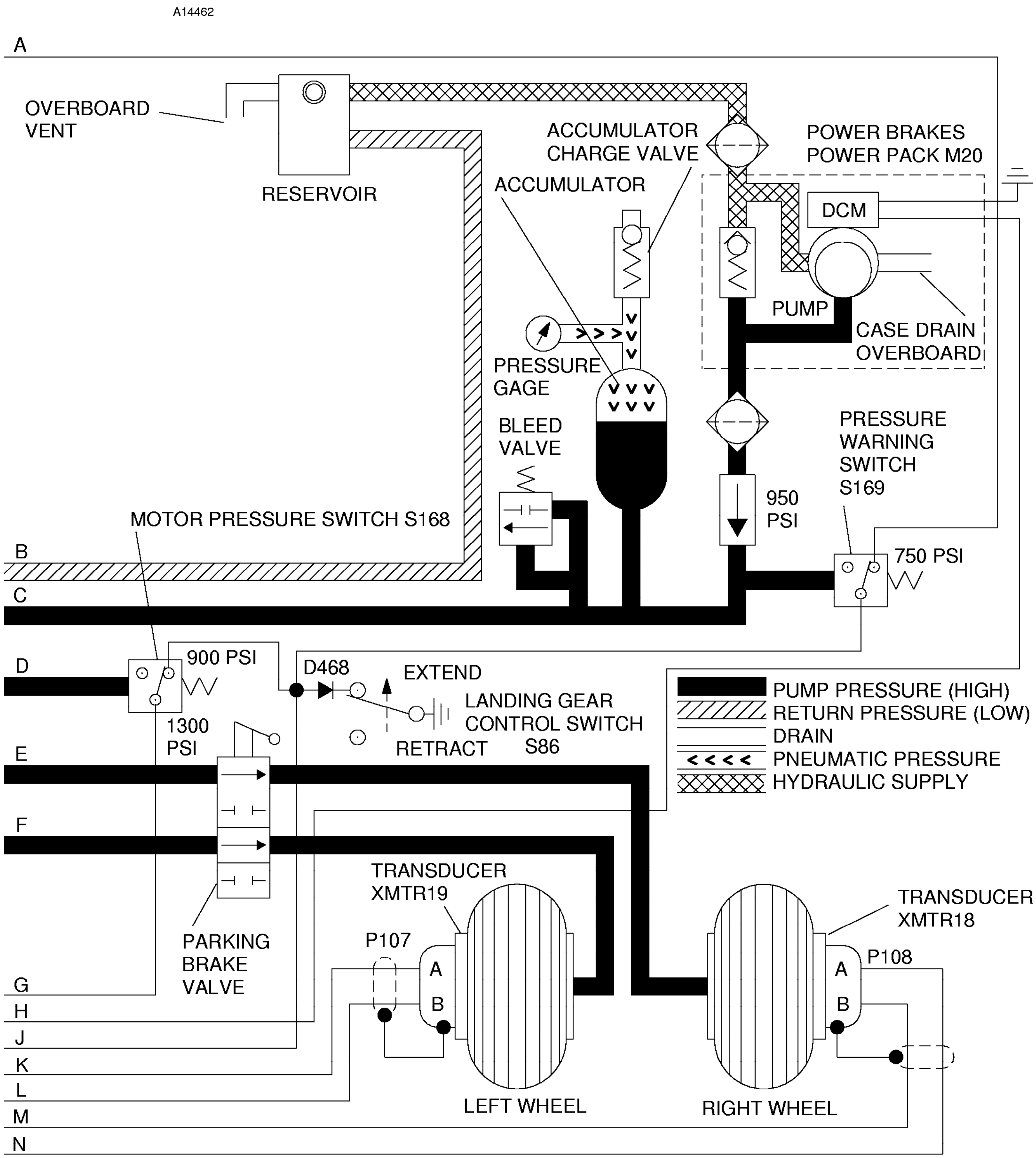


Figure 2-16 (Sheet 1 of 2) Wheel Brake Hydraulic System Schematic



NOTE: PRESSURE TO WHEELS ONLY PRESENT WHEN BRAKES ARE APPLIED

Figure 2-16 (Sheet 2 of 2) Wheel Brake Hydraulic System

FLIGHT CONTROLS

GENERAL

All aerodynamic controls, with the exception of the flaps and speed brakes, are mechanically actuated by cables. The ailerons, elevator and rudder have trimmed control surfaces and cockpit trim position indicators.

Flaps are hydraulically powered and can be operated to 15° at 200 KIAS or below and 35° (full travel) at 173 KIAS or below. Spoiler-type speed brakes are hydraulically actuated and electrically controlled and can be extended throughout the flight envelope.

AILERONS

The ailerons provide excellent lateral control throughout the entire operating envelope. Full range of travel is 19° , ±1° up and 15° , ±1° down. One trim tab, located on the left aileron, is mechanically controlled by a knob on the center pedestal. An indicator on the pedestal shows the amount of trim selected in relation to a neutral position.

ELEVATOR

Elevator control is mechanical through four cable assemblies. Full elevator travel is through a range of 18°, ±1° up, to 15°, ±1° down. Elevator trim tabs installed on each elevator can be positioned electrically or mechanically through cockpit trim tab controls. Full travel of the tabs is 4.5°, +0 or -0.5 up and 11°, +0.5 or -0° down. An elevator trim wheel on the pedestal provides manual trim control. An indicator on the pedestal shows the amount of trim selected in relation to the takeoff position and full travel.

A trim switch, located on the left side of the pilot's control wheel, controls an electric trim motor which in turn positions the elevator tabs. The copilot’s trim switch is located on the right side of the copilot's control wheel. The pilot's trim switch has priority and will interrupt and override the copilot's control. If the electric trim malfunctions, it can be overridden by the manual trim system, or momentarily disabled by pressing the AP/TRIM DISC switch on the pilot's or copilot's yoke.

Pulling the PITCH TRIM circuit breaker on the left circuit breaker panel will remove power from the electric trim motor. The elevator trim is mechanically interconnected with the flap system and will automatically provide trim compensation during UP or DOWN travel of the flaps between 15° and 25° of flap position. The flap trim compensation will also trim the airplane any time the electric trim is actuated while the flaps are in motion regardless of flap position. The flap-trim rate is faster than the electric trim rate and the two inputs are additive. Consequently, if the pilot is actuating the electric trim in the opposite direction to the flap compensation while the flaps are in motion, the net result will be a slow trim rate in the opposite direction to what the pilot has selected. The flap-trim can also be overridden by the manual trim or momentarily disabled by pressing the AP/TRIM DISC switch.

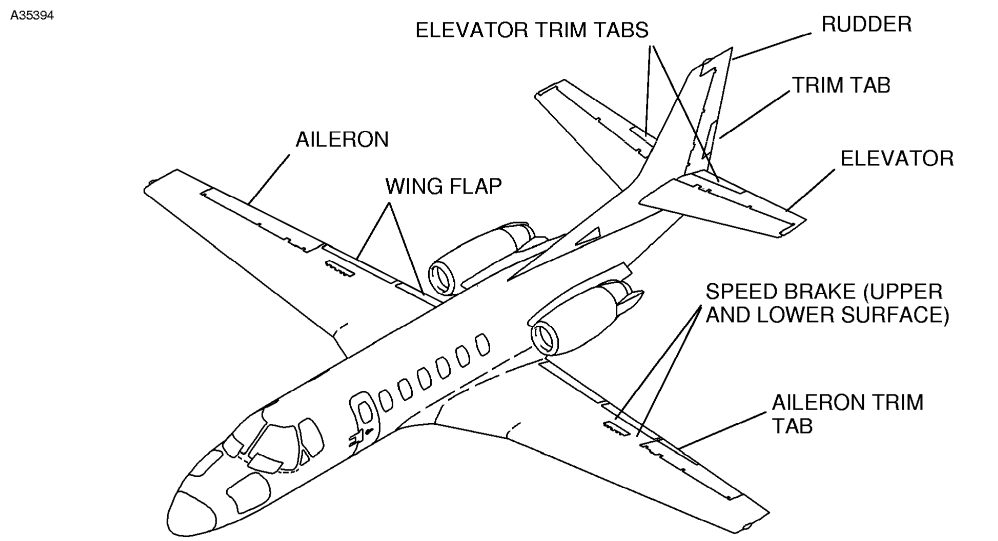


Figure 2-17. Flight Controls

RUDDER

Rudder control is effective at all flight speeds. Full rudder deflection is 22°, ±1° either side of center. The rudder trim is mechanically operated by the rudder trim wheel on the center pedestal. With the rudder in the trail position, the trim tab will deflect 10° , ±1° left and right. In addition to mechanical actuation, the rudder trim is servo-connected to assist in rudder movement. When the rudder moves to the left, the trim tab will servo to the right, assisting in pushing the rudder trailing edge to the left. When the rudder moves to the right, the trim tab will servo to the left, assisting in pushing the rudder trailing edge to the right. For each degree of angular displacement of the rudder, the trim tab will move approximately one-half degree in the opposite direction. A rudder-aileron interconnect operates in conjunction with the primary controls. When the pilot inputs left rudder command, the torsion bungee imposes a left roll torque to the aileron system. A left roll input likewise produces a left yaw response. Right inputs effect corresponding responses to the right.

NOSE GEAR STEERING

The nose gear is mechanically steered by the rudder pedals to 20° either side of center. Steering is accomplished through a mechanical linkage that allows the nose gear to center before entering the wheel well on retraction. Additional castering of the nose wheel can be achieved against a bungee in the steering linkage by application of differential power and braking. For ground handling and towing, maximum deflection of the nose wheel is 95° either side of center.

SPEED BRAKES

The speed brakes are installed on the upper and lower surfaces of each wing to permit rapid rates of descent without exceeding V_{MO}/M_{MO} and to spoil lift during landing roll. The speed brakes are electrically controlled and hydraulically actuated by a switch located on the throttle quadrant and may be selected to the fully extended or fully retracted positions. The angular travel for the upper speed brake panels is 58°, ±2°. The lower speed brake panels extend and retract through a interconnecting linkage with the upper panels.

When the speed brakes switch is positioned to EXTEND, electrical power is applied to close the bypass valve in the hydraulic system return line and open the speed brake control valve. This allows hydraulic fluid at 1500 PSI to flow to the extend side of the speed brake actuators. Once the speed brakes are extended, the speed brake control valve closes to create a hydraulic lock and hold the speed brakes extended. The bypass valve opens and the hydraulic system returns to an open center condition. Moving the speed brakes switch to RETRACT again pressurizes the system, and the speed brake control valve allows fluid to go to the retract side of the speed brake actuators.

When the speed brakes are fully retracted, the control valve closes, the hydraulic system bypass valve opens and open center operation resumes.

Microswitches in the tailcone prevent speed brakes extension at engine power settings above approximately 85% N_2. If the speed brakes are extended at lower power settings and either throttle is subsequently advanced above 85%, the speed brakes will retract and the switch will return to the RETRACT position.

In the event of an electrical failure a speed brake safety valve (in parallel to the control valve, moves to the open position and the speed brakes will trail. If a dual hydraulic pump failure or fluid loss should occur with the speed brakes extended, moving the switch to RETRACT will deenergize the speed brake control valve and the speed brakes will trail.

FLAPS

The trailing edge flaps are constructed of graphite composite laminates and consist of two segments on each wing. Electrically controlled and hydraulically actuated, the trailing edge flaps operate through a range of 0 to 35° of travel. A mechanical detent is installed at the T.O. (7°) and T.O. & APPR (15°-) positions of the flaps lever. The FULL or UP flaps positions are reached by pushing down on the flaps lever when passing through the T.O. and/or T.O. & APPR detents. Any intermediate position can be selected throughout the range of travel. An automatic trim has been incorporated into the flap system that mechanically drives the elevator trim tab to compensate for rapid pitch changes resulting from up or down travel of the flaps. The automatic trim interconnect operates only between 15 and 25 degrees of flaps travel. It should be checked before setting the flaps for takeoff, which is accomplished on the Before Takeoff Checklist before setting the trim for takeoff.

A gear warning horn will sound any time the flaps are selected past the T.O. & APPR position with the gear not down and locked. The horn cannot be silenced with the Horn Silence button in this condition.

CONTROL LOCK

The control lock is mechanically operated and, when engaged, locks the ailerons, elevators and rudder in the neutral position and the throttles in the OFF position. The control lock handle, located below the instrument panel on the left side, controls the system. When the handle is pulled straight aft to the detent, the flight controls and throttles are locked. To release the control lock system, rotate the T-handle 45° clockwise and push it in. With the control lock engaged, the maximum deflection of the nosewheel is restricted to 60° either side of center. Exceeding the degree of turn will cause excessive force to be placed on the control lock mechanism and rudder control cables. Towing the airplane with the control lock engaged should be avoided. The controls should be neutralized and both throttles moved to the cutoff position before engaging the lock.

STALL WARNING - STICK SHAKER

Stall warning is achieved by the use of a stick shaker mounted on the forward side of the pilot's control column. An electric motor with rotating weights induces a vibration feel to the control column. The pilot is alerted to impending stall by the vibration of the control column which occurs approximately 8% to 10% above the actual stall speed. Stick shaker activation will occur before stall buffet, except in the clean configuration where they are nearly the same and either could occur first. The stick shaker is energized by inputs from the angle-of-attack system. The test switch located on the pilot's switch panel provides a means of checking the shaker prior to flight.

ELECTRICAL

GENERAL

Electrical power is normally supplied by two 28.5-volt direct current (DC), 300-ampere, engine-driven starter/generators. A 24-volt, 40 or 44 ampere-hour, nickel-cadmium battery is located in the tailcone compartment to supply power for starting and emergency requirements. A receptacle below the left engine pylon is provided for connection of an external power unit.

ALTERNATING CURRENT (AC) POWER

Alternating current (AC) is provided by two 250 VA static inverters that convert 28 volt DC into 115 volts, 400 hertz AC and 26 volts, 400 hertz, single phase, single wave AC power. The AC system is a dual split bus system in which the number one 115 and 26 volt AC buses, and the number two 115 and 26 volt buses are powered by the number one and number two inverters respectively. If an inverter fails, the respective INVTR FAIL, AC FAIL, and MASTER CAUTION lights will alert the crew to then manually select the remaining inverter.

The AC power distribution system consists of a 2-position AVIONIC POWER switch, a 3-position INV 1/NORM/INV 2 switch, two 26 VAC/115 VAC, 400 Hz static inverters, four AC buses (two 26-volt and two 115-volt) and 2 annunciator panel lights (AC FAIL and INVERTER FAIL 1 and 2). Each inverter converts 28 volts DC into AC power, with a maximum output of 250 VA each.

Each inverter normally supplies AC power to its respective 115-volt and 26-volt buses; however, in the event of an inverter failure, the pilot must select the remaining inverter with the INV 1/NORM/INV 2 switch to connect the remaining good inverter to the 26-volt and 115-volt buses of the failed inverter. Inverter failure is annunciated by illumination of the INVERTER FAIL 1 or 2 light, the AC FAIL light and the MASTER CAUTION light. One inverter provides adequate power for the AC system; however, both inverters must be operational for takeoff.

The AC system powers avionics and navigation equipment. The number two 26-volt AC (VAC) bus provides reference voltage to the traffic collision avoidance system (TCAS). The number one 115 VAC bus powers the pilot's vertical gyro. The number one 26 VAC bus provides reference voltage to the standby horizontal situation indicator (HSI). The number two 115 VAC bus provides power for the copilot's vertical gyro. When the battery switch is placed in the EMER position, AC power for the standby HSI is provided by an internal static inverter in the pilot's directional gyro.

Power to the AC system is controlled by two switches labeled AVIONIC POWER on the left instrument panel. The right switch controls DC power to the system including DC power to the two 250 volt-ampere inverters. The left avionics switch (INV 1/NORM/INV 2) controls AC power from each (or both) inverter(s) to their respective 26 VAC and 115 VAC buses. The AC system is required to function normally prior to flight.

DIRECT CURRENT (DC) POWER

The direct current (DC) power generation system consists of two starter/generators, two generator control units, one battery, two DC ammeters, one aft power junction box (divided into left and right side electrical circuits), one DC voltmeter, and control switches. Normally, the left generator powers the left main DC bus and the right main DC bus receives power from the right generator. Both operate in parallel, but in the event either generator is offline, the crossover bus acts as a cross tie so that the remaining generator will power both main DC buses. The DC buses supply power for all DC functions except engine starting.

Each main DC bus, as well as the emergency DC bus, is controlled by its own power relay. The circuit breakers in Figure 2-19 are coded to indicate the equipment items powered by each main bus and by the emergency bus.

The DC power indicators consist of two ammeters, a voltmeter and two amber generator failure lights. The ammeters function as load meters indicating the load being carried by each generator.

The voltmeter is wired through the battery switch and will indicate the voltage of the hot battery bus any time the battery switch is in the BATT or EMER position. The voltmeter selector switch can be rotated to the L or R GEN positions to check generator voltage output. Since the voltmeter reads the highest voltage on the bus, an accurate check of one generator is obtained only with the opposite one off line.

Should either generator fail, the associated power relay will open, removing the generator from the system and illuminating the appropriate L or R GEN OFF annunciator panel light and the master caution. Should both generators fail, the master warning light will also illuminate. This is the only condition under which amber annunciator light illumination will trigger the master warning.

GENERATORS

A microprocessor controlled generator control unit provides starter regulation, overvoltage, feeder fault and ground fault protection for each generator. Three-position L and R generator switches are marked GEN, OFF and RESET. In the GEN position, generator control is automatic for regulation, protection and load bus connection. This is the normal switch position for battery starting and all flight modes. Placing the switch to OFF isolates the generator from its load bus. The momentary RESET position resets a generator that has been tripped as a result of an overvoltage, feeder fault or engine fire switch actuation.

Each starter/generator is capable of a 50% overload (450 amps) for five minutes. A single generator is capable of supporting the entire electrical system; however, should one generator go off line while in flight, the vapor cycle air conditioning system will automatically be shed from the remaining generator due to its high current draw.

JUNCTION BOX

The DC power junction box is located aft of the cabin centered at WL 127.00 and centerline of the airplane. The junction box is a single box divided into left and right sides by a dividing wall. A single cover closes the box. The J-box contains relays, current transformers, circuit breakers, fuse limiters, junction blocks, printed circuit boards, shunts and terminal boards. Three number 6-gauge wires (feeder cables) are routed independently of the main airplane wire bundles from each side of the power junction box to the respective circuit breaker panel. The feeder cables are protected at both ends in the junction box by individual 80-ampere fuse limiters and in the circuit breaker panel by 75-ampere circuit breakers. A wire protected by a 20-ampere circuit breaker in the aft junction box connects the emergency circuit to the right circuit breaker panel.

CIRCUIT BREAKERS

Push-to-reset, pull-off type circuit breakers, with the amperage rating marked on each breaker, are installed in panels located on both sides of the cockpit, under the side windows. Each panel incorporates various electrical system circuit breakers with the majority of the avionics circuit breakers located in the right circuit breaker panel. The AC BUS circuit breaker panel is located adjacent to the right circuit breaker panel. This circuit breaker panel controls the 26 VAC and 115 VAC split bus distribution of the Number 1 and 2 static inverters. Panel configurations may vary from airplane to airplane due to differences in installed equipment; therefore, the panels shown are typical installations.

BATTERY

The battery is a secondary source of direct current (DC) power available to supply the distribution system prior to start, or in the event of generator failure. The three-position control switch is labeled BATT, OFF and EMER. Placing the switch to the BATT position closes the battery and emergency relays and powers the battery bus, emergency bus and both main DC buses. This position also enables external power to supply the entire system. In the OFF position, battery or external power is isolated from all but the hot battery bus.

The hot battery bus is energized any time the battery is installed or external power is connected. It powers the emergency exit lights, tailcone light, nose baggage compartment light and an aft baggage compartment light. A battery disconnect relay between the battery and ground is located below the battery.

During each engine start using external power, the battery disconnect relay will automatically open interrupting battery power to the hot battery bus. The relay will close automatically at the end of the start cycle.

The EMER (emergency) position of the battery switch will provide approximately 30 minutes operation for selected instruments and systems. The following are powered from the emergency bus:

LH and RH N_1 Indicators	Standby HSI and Standby Flight Display
Standby Pitot and Static Heaters	Interior Entry Lights
Landing Gear Control and Indication	DME 1 (560-0552 only)
Flap Control	COMM 1
Standby Radio Control Head	NAV 1
Overhead Flood Lights	DG 1
Pilot’s and Copilot’s Audio Panels	RMU 1

Additionally, the standby gyro’s internal battery provides at least 30 minutes lighting for the dual fan (N_1) tachometer/Interturbine temperature (ITT) indicators, the secondary flight display, and the standby horizontal situation indicator (HSI).

In some cases, it may be prudent to turn OFF unneeded systems, such as lighting and pitot-static heat, in order to conserve the airplane’s battery. Communications may be continued normally using COMM 1. The speakers will remain operational and selection of EMER COMM is not necessary.

The battery temperature monitor gage provides a continuous indication of battery temperature from 0° to 180°F (-18° to +82°C).

Battery temperature should remain below 63°C (145°F). A battery temperature exceeding 63°C (145°F) is annunciated by a steady illumination of the BATT O'TEMP light on the annunciator panel. A battery temperature exceeding 71°C (160°F) is shown by a flashing annunciator light.

The battery must be serviced per the Maintenance Manual when the battery temperature exceeds 63°C (145°F).

EMERGENCY BATTERY

Placing the battery switch in the EMER position opens the battery relay. The emergency bus relay will remain closed. This disconnects the main direct current (DC) buses and the battery bus from the battery and connects the battery directly to the emergency bus. With both generators offline, all electrical equipment will be inoperative except COMM 1, NAV 1, the standby flight display, the standby horizontal situation indicator (HSI), directional gyro number one, the N_1 tachometers, the standby pitot-static system heaters, the voltmeter, the cockpit floodlights, the standby radio control head, RMU 1, landing gear control and indication, flap control, pilot's and copilot's audio panels, and the interior entry lights. Emergency lighting, in addition to the cockpit flood lights, which will be available are the instrument lights for the standby gyro, the N_1/ITT indicators, the standby HSI, and the standby flight display.

NOTE

The pilot should be aware that with both generators offline and the battery switch in the EMER position, some of the more important items such as annunciator lights, main pitot/static and angle-of-attack system heat, fire warning and fire bottle discharge will be inoperative.

Going to EMER with either or both generators online will have no affect except that the battery will not charge. As long as at least one generator is online, turning off the battery switch will not cause any equipment on the emergency bus to cease functioning.

EXTERNAL POWER

External direct current (DC) power can be connected to the airplane through a receptacle located on the left side of the fuselage. When external power is connected, the external power relay energizes and connects the power source to the hot battery bus provided the generators are off line. When either generator is on line, external power is disconnected from the battery bus. Positioning the battery switch to BATT energizes the battery and emergency relays allowing external power to be connected to the entire DC system. Ground power requirements dictate a 28-volt unit, with a maximum capability of 1000 amperes current. If an adjustable power unit is used, it should be adjusted to provide a maximum of 1000 amperes. A ground power unit with a soft start capability is preferable. The battery should be disconnected if the airplane is to be on a ground power unit for a prolonged period of time.

CAUTION

CURRENT IN EXCESS OF 1000 AMPERES MAY DAMAGE THE STARTERS.

Starts being made on external power may be accomplished with the generator switches in either the ON or OFF position; however, it is recommended that they be turned OFF during the start. If the generator switch is placed in the ON position the generator control unit will automatically initiate the generator mode after engine start. If the generator switch is placed in the OFF position, the generator mode will be initiated by manually placing the generator switch to the ON position. External power is automatically disconnected when either generator is supplying power to the bus. In order to start the second engine by auxiliary power unit, the generator supplying voltage to the bus must be disconnected by placing the generator switch to the OFF position.

An overvoltage protection system is provided during use of an auxiliary power unit. During an engine start utilizing an external power unit, a control module monitors the external power unit voltage and will deenergize the external power relay if voltage is above 32.5 volts. External power cannot be reapplied to the airplane until the voltage has been interrupted after the start termination for the current protection or until the voltage is reduced below 32.5 volts for the voltage protection.

For battery starts and under all normal flight conditions, the generators are left in the GEN position.

ENGINE STARTING

Depressing either engine start button closes the respective start relay and provides DC power to the engine starter. Power to close the solenoid start relays and energize ignition comes from the battery bus requiring the battery switch to be in the BATT position. Automatic ignition sequencing takes place with both engine ignition switches in the NORM position and throttles out of cutoff.

A white light in each starter button indicates power on the contacts of the respective start relay. The starter operation is terminated when the speed sensor in the generator control unit removes power from the start relay at approximately 38% N_2 RPM. The automatic start sequence can be terminated at any time by pushing the cockpit START DISG switch located between the start buttons which will open the start relay and halt the start sequence. During engine start, if the generators are online and the generator output exceeds battery voltage and/or is in parallel with the other generator (within 40 amperes), the starter/generator reverts to generator operation. The power relay closes and supplies power to the respective DC bus. Current will then flow from either main DC bus through the battery bus, battery relay and hot battery bus, providing battery charging.

The airplane is equipped with a cross start capability which utilizes the generator of an operating engine to assist starting the second. This is accomplished by both start relays closing when the second start is initiated routing power through the hot battery bus to the other engine. On all cross starts, the operating engine should be set to GND IDLE HIGH to ensure proper torque on the generator shaft. Cross generator start capability is disabled with weight off the left main gear squat switch in order to prevent cross starts in flight.

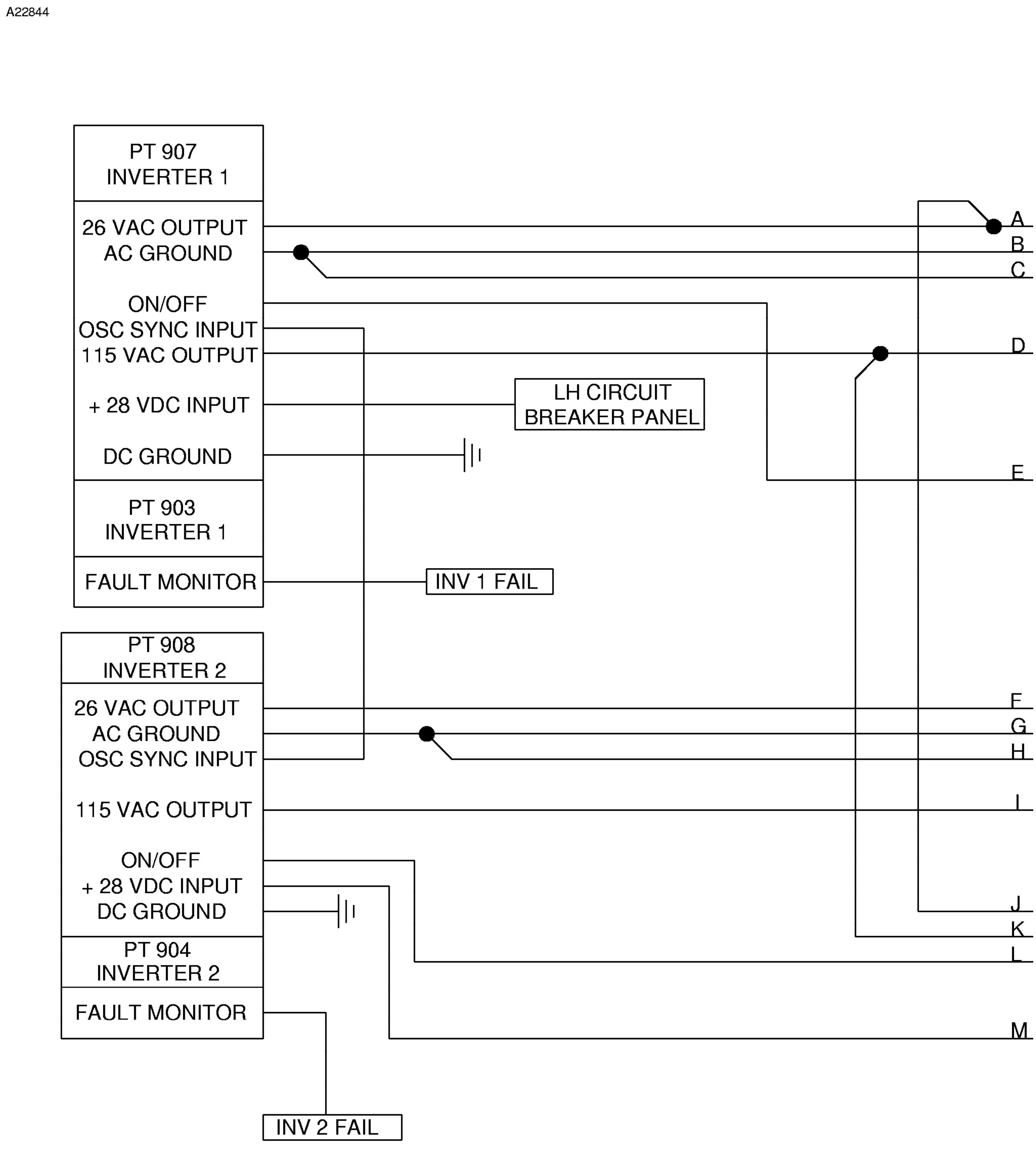


Figure 2-18. Alternating Current Electrical System Schematic (Sheet 1 of 2)

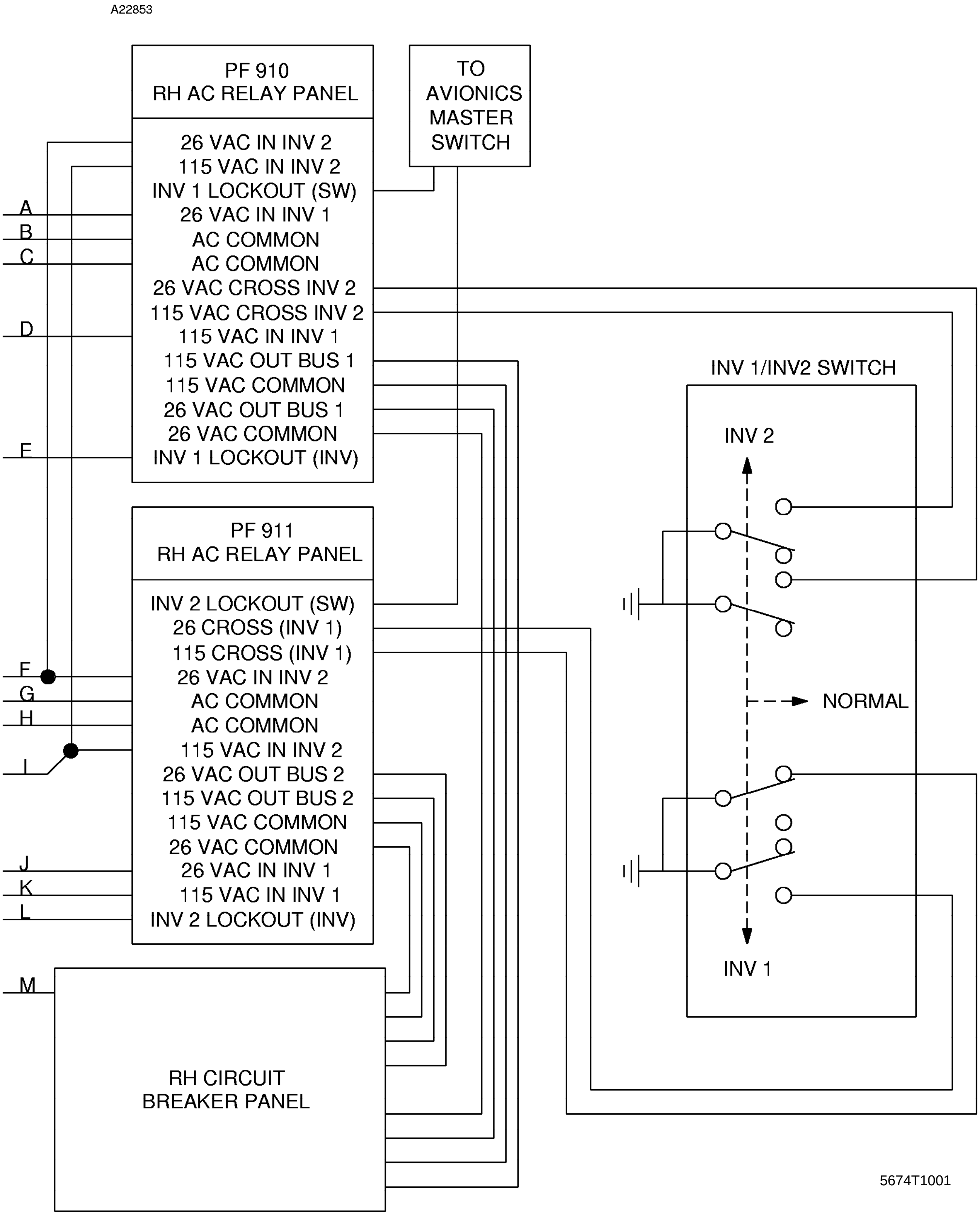


Figure 2-18. Alternating Current Electrical System Schematic (Sheet 2 of 2)

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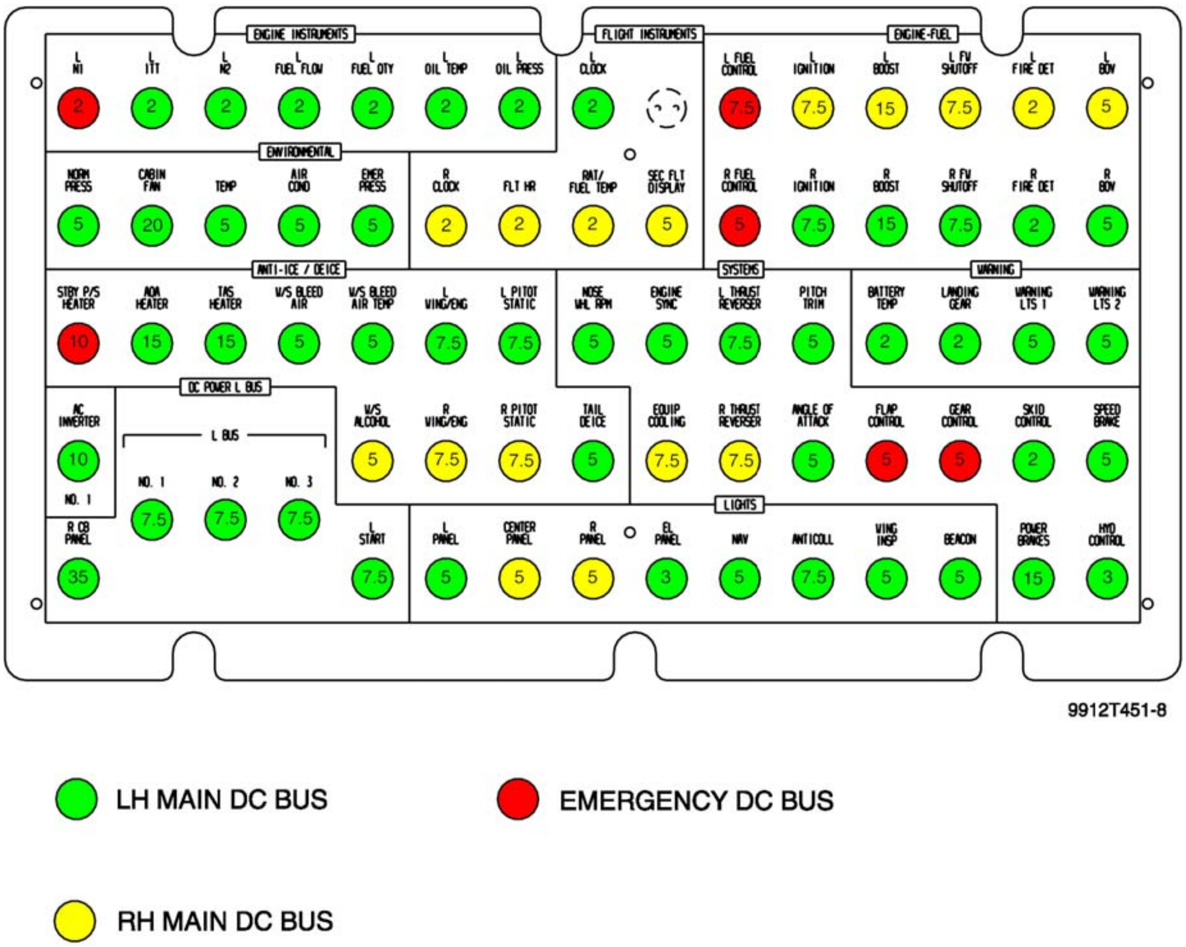


Figure 2-19. Left Circuit Breaker Panel (Sheet 1 of 2)

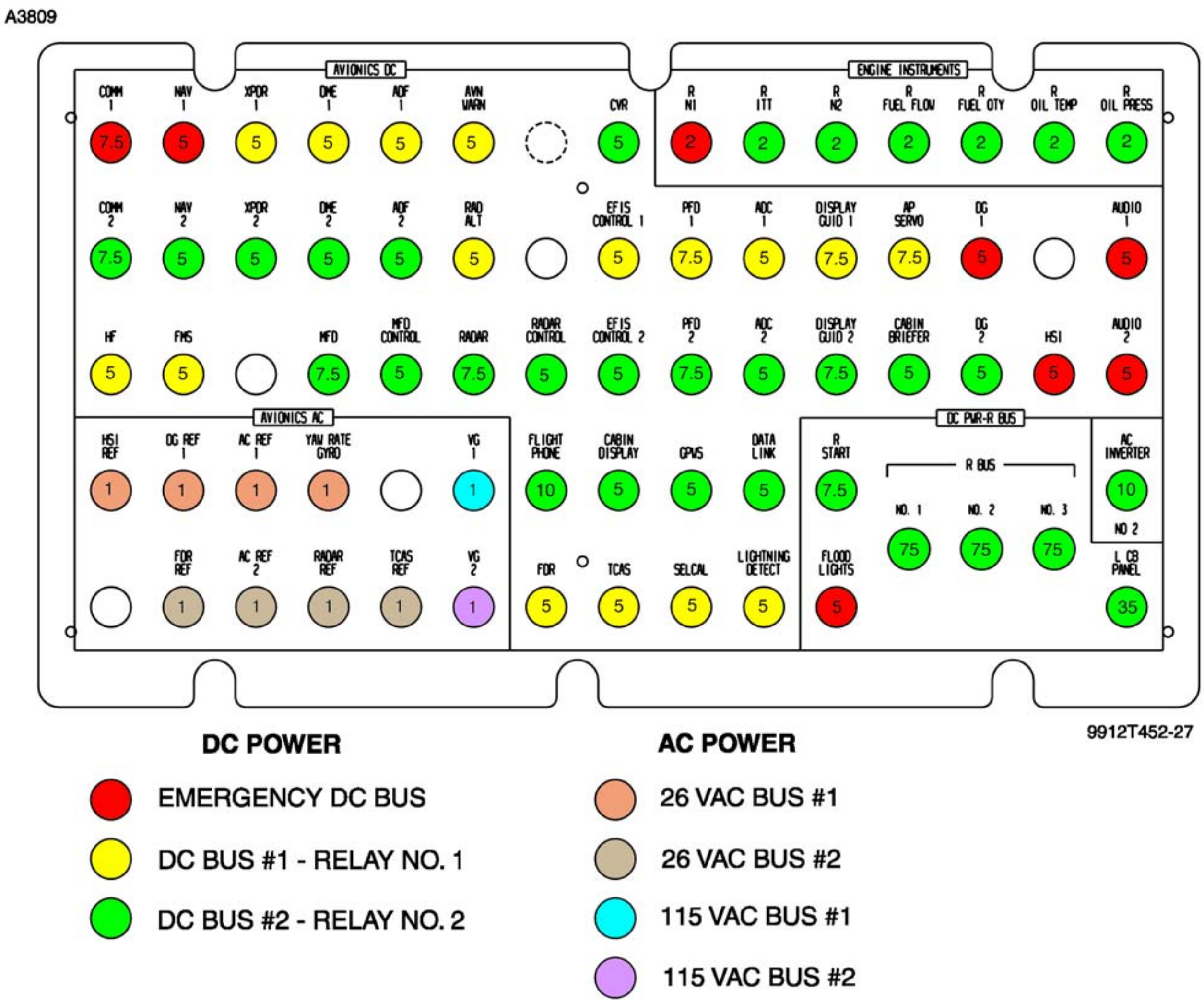


Figure 2-19. Right Circuit Breaker Panel (Sheet 2 of 2)

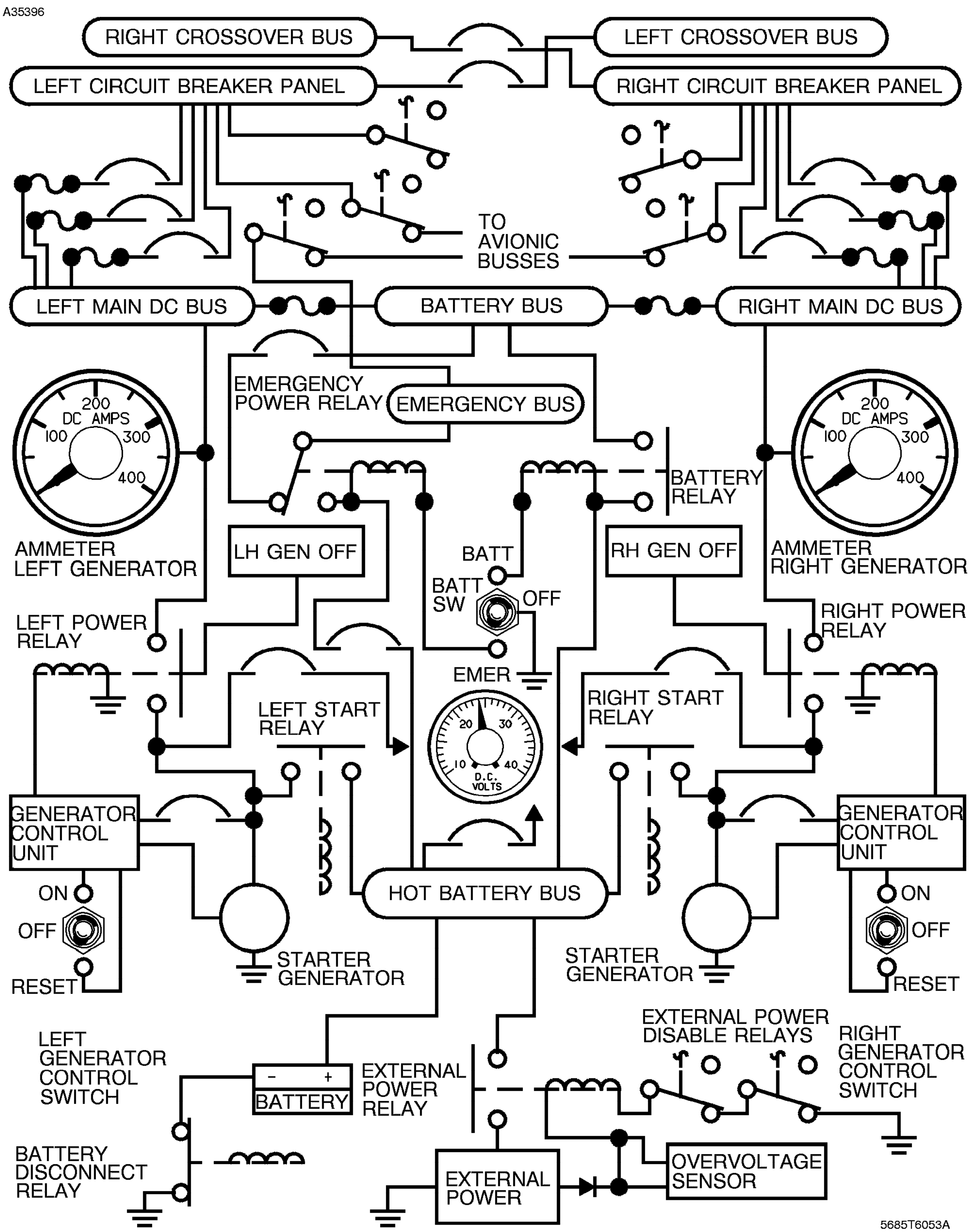


Figure 2-20. Direct Current Electrical System Schematic

ANTI-ICE/DEICE SYSTEMS

The anti-ice systems consist of bleed air heated engine inlets, wing leading edges, fan spinner and stators, and electrically heated pitot tubes, static ports and angle-of-attack probe. The horizontal stabilizer is deiced by pneumatic boots. Windshield anti-ice is provided by bleed air with alcohol backup.

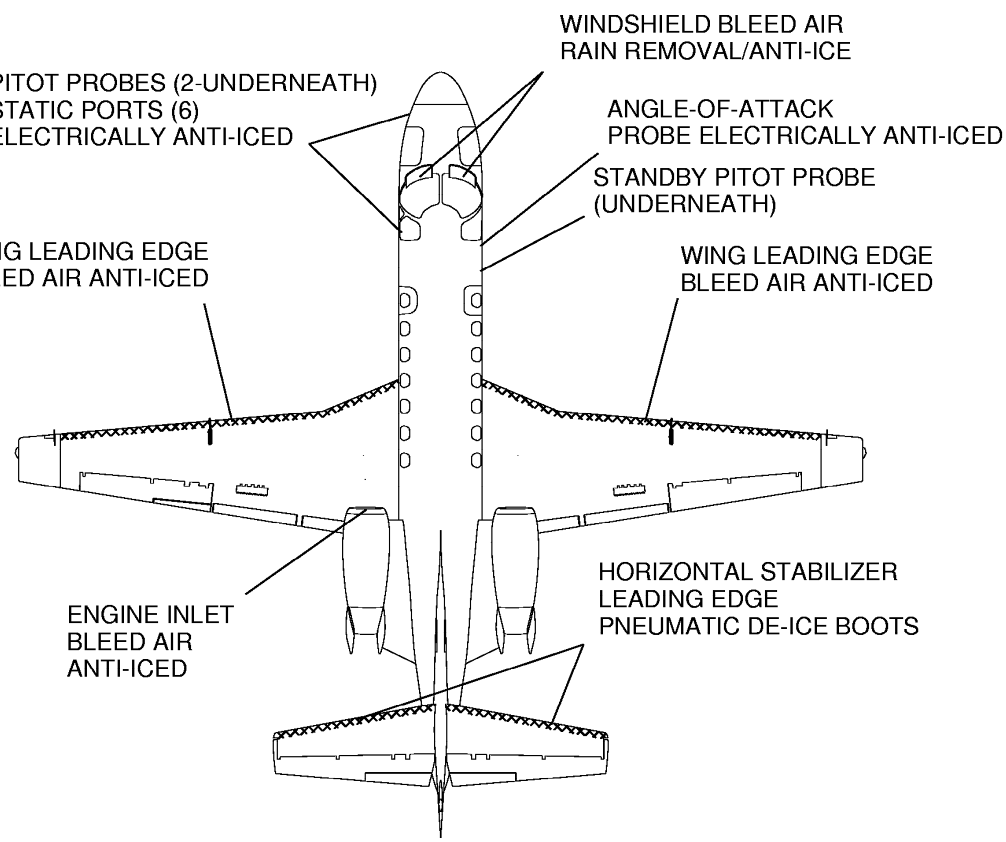


Figure 2-21 Airplane Anti-ice/Deice Systems 5610T1054

All anti-ice systems should be turned on when operating in visible moisture and the indicated RAT is +10°C (+50°F) or below.

CAUTION

- IF ANTI-ICE SYSTEMS ARE TO BE USED FOR TAKEOFF AND GROUND AMBIENT TEMPERATURE IS BETWEEN 0°C (+32°F) AND +10°C (+50°F), CLOSE THE R WINDSHIELD BLEED AIR MANUAL VALVE FOR TAKEOFF. THIS WILL ENSURE ADEQUATE BLEED AIR TEMPERATURE REGULATION TO THE PYLON PRE-COOLERS. AFTER THE THROTTLES HAVE BEEN REDUCED TO CLIMB POWER, THE R WINDSHIELD BLEED AIR MANUAL VALVE MAY BE OPENED AS DESIRED.
- ANY TIME ICE ACCUMULATION IS OBSERVED ON EITHER THE WINDSHIELD, WING FENCES, OR WING LIGHT SHIELDS (NEAR WING TIP), THE FLIGHT CREW MUST VISUALLY INSPECT BOTH WING LEADING EDGES AT A TIME INTERVAL OF NO LESS THAN 5 MINUTES.
- IF ICE ACCUMULATION IS DETECTED ON THE HEATED PORTION OF THE WING LEADING EDGE, THE ABNORMAL PROCEDURES FOR WING ANTI-ICE FAILURE MUST BE OBSERVED.

NOTE

- Icing conditions exist when the indicated RAT on the ground and for takeoff is +10°C (+50°F) or below; the indicated RAT inflight is +10°C (+50°F) or below; and visible moisture in any form is present (such as clouds, fog with visibility of one mile or less, rain, snow, sleet or ice crystals).
- Icing conditions also exist when the indicated RAT on the ground and for takeoff is +10°C (+50°F) or below when operating on ramps, taxiways or runways where snow, ice, standing water, or slush may be ingested by the engines or freeze on engine nacelles or engine sensor probes.

ENGINE AND WING ANTI-ICE SYSTEM

Bleed air flows continuously through the fan spinner whether the anti-ice system is activated or not. When the wing/engine anti-ice switches (one for each engine) are positioned to ENGINE ON, bleed air flows through the applicable engine inlet and engine stators. Adequate bleed air flow is available to maintain the proper engine inlet temperatures at flight idle thrust. The engine anti-ice annunciators may illuminate initially when the system is turned on if the inlets are cold. When the wing/engine anti-ice switches are positioned to WING/ENGINE ON, bleed air flows to the wing leading edges in addition to the engine inlet ring. If sufficient bleed air flow is not available to maintain the proper wing temperature, the wing anti-ice annunciator will illuminate. The light may be extinguished by increasing engine RPM. Operation of the system may be checked by observing engine ITT rise when the wing/engine anti-ice switches are turned on. If the check is made on the ground, it may require up to two minutes to extinguish the wing anti-ice light with N_1 set at approximately 70%. Maximum engine power setting values are reduced when using anti-ice, as shown in Section IV.

Loss of electrical power to the valve supplying flow to the inlets results in the anti-ice valves opening, thus assuring anti-ice capability. The WING XFLOW switch is designed to provide wing anti-ice protection to both wings in the event of an inoperative engine. The over-temperature and under-temperature sensors of both wings shall be active during WING XFLOW operations. During WING XFLOW operations, the anti-ice switch of the inoperative engine should be selected OFF to prevent illumination of the ENG ANTI-ICE annunciator.

The wing and engine anti-ice systems may be checked on preflight by selecting both systems ON with the engines at idle. A very small increase in ITT and very small drop in N_2 signifies that bleed flow has occurred. The WING ANTI-ICE L-R will illuminate initially to indicate an under temperature condition on the wing leading edges. The ENG ANTI-ICE L-R may not illuminate initially if the ambient temperature is above 15°C.

CAUTION

DURING SUSTAINED GROUND OPERATIONS IN FREEZING PRECIPITATION, IF THE ENGINES ARE OPERATED AT IDLE, ICE MAY FORM ON ENGINE PROBES AND INTERNAL COMPONENTS. THIS MAY CAUSE ENGINE VIBRATION. BY INCREASING THE ENGINE SPEED TO 60% N_2 OR HIGHER, THE ENGINE VIBRATION WILL BE ELIMINATED.

NOTE

During sustained ground operations in freezing precipitation, the engines should be operated for one minute out of every 4 minutes at 65% N_2 or above to preclude ice forming on engine probes or internal components.

TAIL DEICE

The horizontal tail is deiced by pneumatic boots controlled by the tail deice AUTO/OFF MANUAL switch. Selecting the switch to AUTO will activate a controller which will inflate the boots one side at a time and then repeat this cycle after 3 minutes, continuously, providing automatic deice of the stablizer. Selecting the momentary MANUAL position will inflate both boots as long as the pilot holds the switch in the MANUAL position. Vacuum is supplied to deflate the boots after each cycle and keep them deflated between cycles and when OFF.

NOTE

Allow the tail deice boot system to complete at least one complete cycle (approximately 18 seconds) before turning off.

Proper activation of the deice boots is annunciated by a white TL DEICE PRESS L or R advisory light on the annunciator panel which illuminates when proper inflation pressure is reached in each deice boot.

CAUTION

DO NOT OPERATE DEICE BOOTS UNDER ANY OF THE FOLLOWING CONDITIONS BECAUSE BOOT CRACKING MAY RESULT:

- AIRSPEEDS AT OR ABOVE 150 KIAS AND THE RAT IS LESS THAN OR EQUAL TO -35°C (-31°F).
- AIRSPEEDS BELOW 150 KIAS AND THE RAT IS LESS THAN OR EQUAL TO -40°C (-40°F).

Failure of the deice boots to activate properly is annunciated by an amber TL DEICE FAIL L or R advisory light on the annunciator panel which illuminates when tail deice pressure is not sequenced correctly to either deice boot.

If the switch is placed in MANUAL during a cycle of automatic operation, MANUAL will override the AUTO function and all the tubes will simultaneously inflate.

NOTE

Airflow perturbations during manual boot cycle or during AUTO boot cycle with significant ice on the stabilizer may cause a minor pitch bump.

If icing conditions are anticipated after takeoff, operation of the tail deice system should be functionally checked prior to takeoff. The pilot should also check the system for proper operation prior to entering areas in which icing may be encountered.

WINDSHIELD ANTI-ICE

The windshield bleed air system provides windshield anti-ice under all normal operating conditions. This system also provides external windshield defog and rain removal. The system supplies engine bleed air through an electrically actuated pressure regulating shutoff valve in the tailcone of the airplane and manually positioned valves which regulate air to each windshield. The manual valves are located at each bleed air nozzle and are left in the OFF position for all normal operation. A check should be made to ensure that the rain removal knob is pushed IN for windshield anti-icing. When windshield anti-icing is required, the WINDSHIELD BLEED AIR Knobs are turned ON and the W/S BLEED Switch is turned to LO if the indicated OAT is above -18°C or to HI if the indicated OAT is -18°C or below. Normal system operation is indicated by an increase in air noise as the bleed air discharges from the nozzles. A temperature sensor is located near the discharge nozzles and automatically controls the windshield bleed air temperature by modulating crossflow air through a heat exchanger in the tailcone.

An additional temperature sensor is located in the bleed air line, which automatically actuates the electrical shutoff valve and illuminates the WS AIR O'HEAT annunciator light should the bleed air temperature exceed the normal control value. This condition should not occur unless a sustained high power, low airspeed condition is maintained or a system malfunction occurs. If the WS AIR O'HEAT light illuminates, the WINDSHIELD BLEED AIR Knobs should be modulated to reduce the flow. If the light remains on for over 60 seconds, position the WINDSHIELD BLEED AIR Knobs to OFF. The WS AIR O'HEAT light will also illuminate if the electrical shutoff valve in the tailcone opens with the W/S BLEED Switch in the OFF position.

Self-test of the temperature monitor system is normally accomplished during the preflight warning systems check by turning the windshield bleed air switch to either the HI or LO position and selecting the W/S temperature position on the rotary test switch. Proper system function is verified by illumination of the W/S AIR O'HEAT annunciator light. Self-tests may also be accomplished in flight, if desired.

If the windshield bleed air anti-ice system fails, a backup alcohol anti-ice system is provided for the left windshield only. Sufficient alcohol is provided for ten minutes of operation; therefore, plans should be made to leave the icing environment without delay.

Verification of proper operation of the windshield bleed anti-ice system may be accomplished prior to flight with the engines running by turning the manual windshield bleed valves to MAX and selecting windshield bleed to LOW. Presence of bleed flow can be determined by the air noise audible in the cockpit.

PITOT-STATIC AND ANGLE-OF-ATTACK ANTI-ICE

Electric heating elements are provided in the pilot's, copilot's and standby pitot tubes; pilot's, copilot’s, and standby static ports, RAT probe, and the angle-of-attack probe. The pitot static anti-ice switch actuates all of these elements. Operation may be checked on preflight by turning the switch ON for approximately 30 seconds, then OFF; then feel each element during the external inspection. Failures of pitot and static heating elements and of the angle-of-attack probe element are annunciated by P/S HTR L or R, STBY P/S HTR and AOA HTR FAIL lights, respectively, in the annunciator panel.

CAUTION

LIMIT GROUND OPERATION OF PITOT STATIC HEAT TO TWO MINUTES ON WITH TWO MINUTES OFF BETWEEN CYCLES TO PRECLUDE SYSTEM DAMAGE.

ICE DETECTION AND WING INSPECTION LIGHTS

The ice detection and wing inspection lights are utilized at night or in conditions of poor visibility to visually detect the presence of any ice accumulating on the lower center portion of the windshield and wings. One ice detection light is located on each side of the windshield center post. These lights would typically be used first to visually detect the presence of any ice accumulating on the windshield. The ice detection lights come on when the battery switch is in the BATT position. If any ice is detected, the wing inspection lights located on the fuselage sides may then be used to determine to what extent ice is accumulating on the wings.

RAIN REMOVAL

This system utilizes the normal windshield bleed air anti-ice system for rain removal with augmenter doors to provide increased airflow over each windshield in heavy rain. These doors are manually operated by pulling the PULL RAIN handle located under the WINDSHIELD BLEED AIR knobs on the copilot's subpanel. For rain removal, the manual windshield bleed air controls on the copilot's subpanel should be turned to the MAX position, the PULL RAIN handle pulled out and the W/S BLEED switch positioned to LOW. Augmenter door opening will be difficult should the W/S BLEED switch be turned on first. It may also be difficult to open above 175 KIAS.

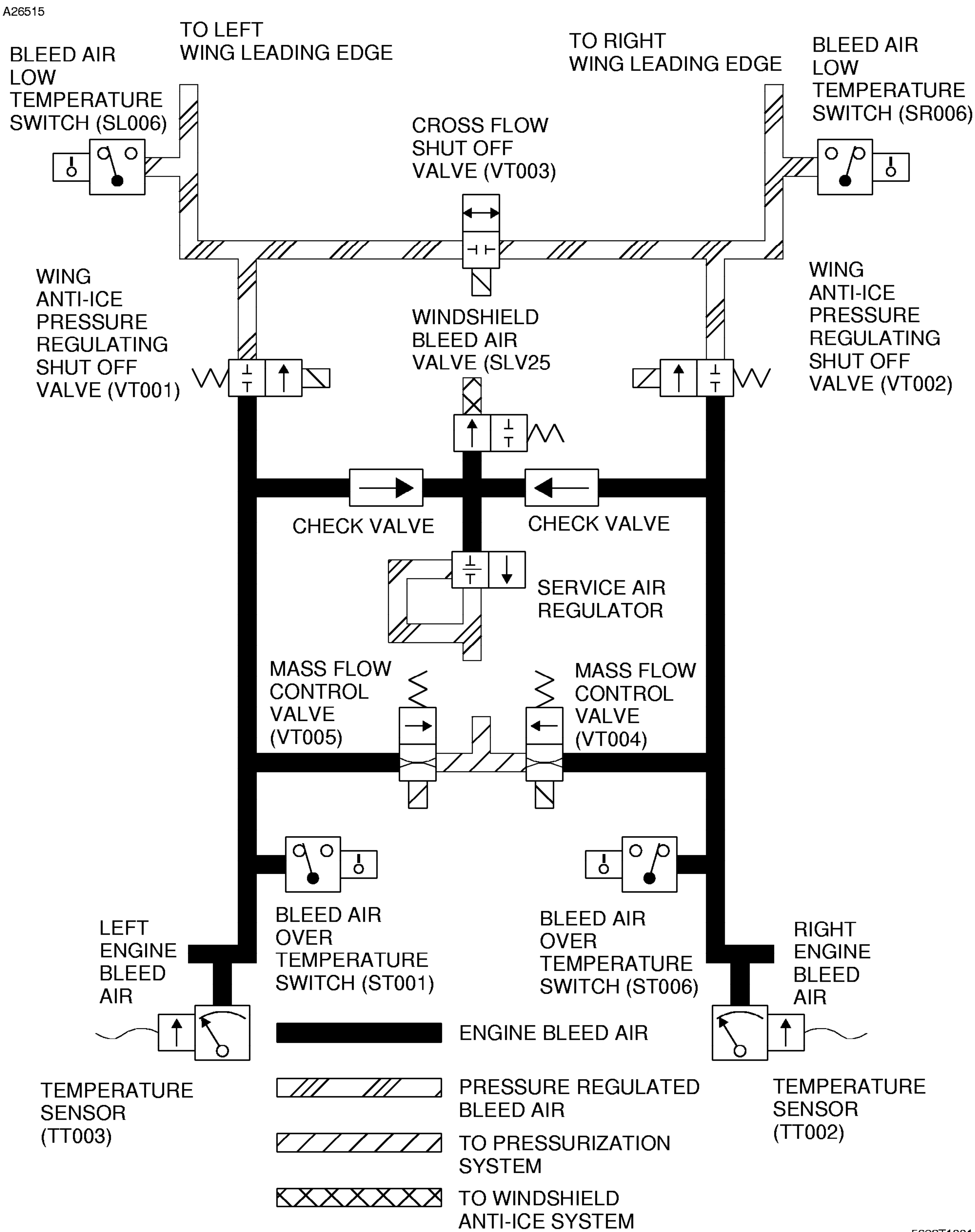
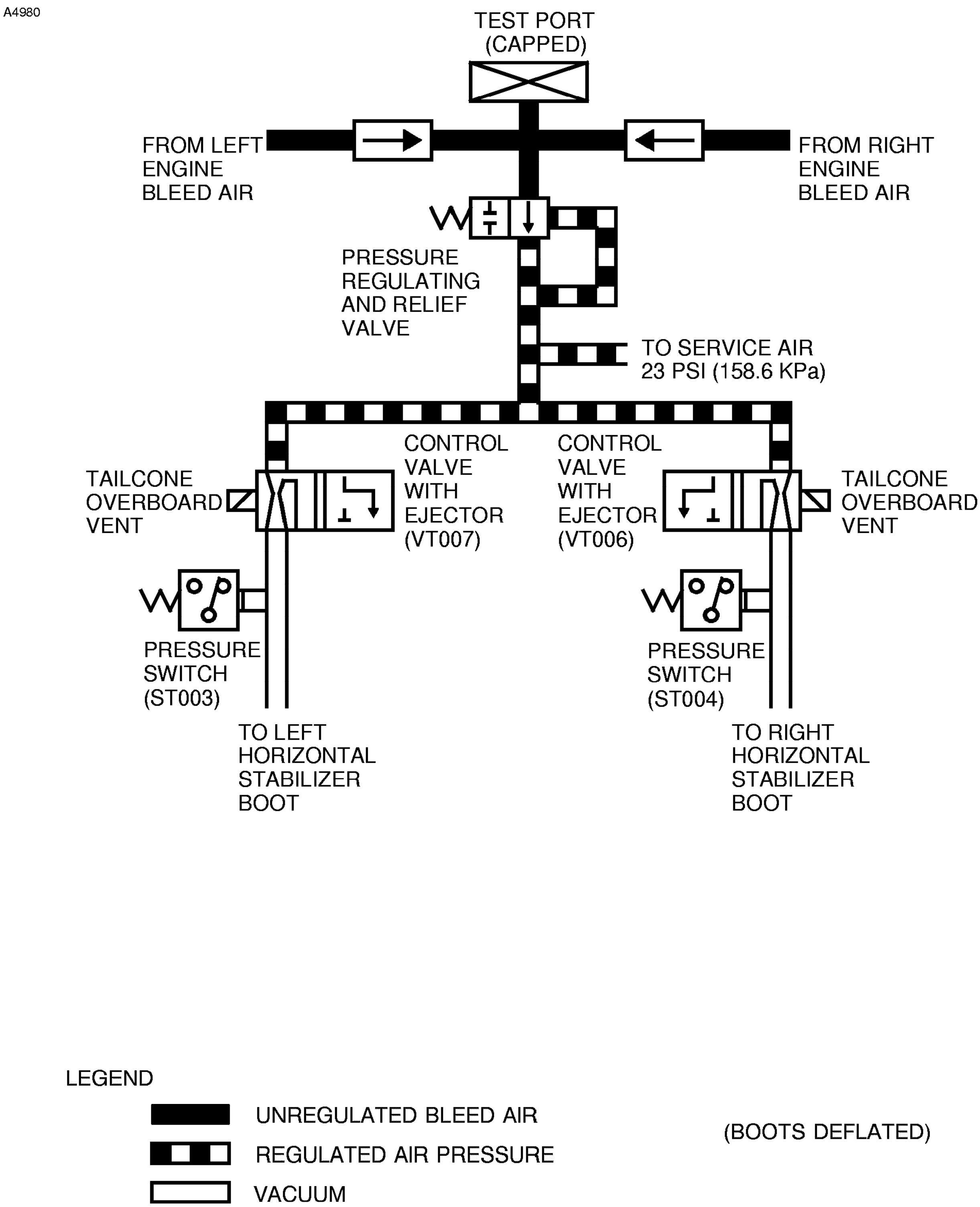


Figure 2-22. Wing Bleed Air Anti-ice System



AIRPLANES -0539 AND ON

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Figure 2-23. Tail Surface Deice System

ENVIRONMENTAL

The pressurization and air conditioning systems utilize engine bleed air to pressurize and air condition the cabin and defog the cabin and cockpit windows. During normal operation, most functions are automatic. The only manual adjustments required are for individual comfort, such as cabin rate-of-climb and temperature. Ram air for cabin ventilation is available when the pressurization system is not in use.

PRESSURIZATION

The cabin is pressurized by engine bleed air which has been conditioned (cooled) by the environmental control system. This inflow of conditioned air remains constant through a wide range of engine power settings. The level of pressurization (cabin altitude) and rate of cabin change is then controlled by the Cabin Pressure Control System, a microprocessor-controlled pneumatic/electrical system linked to outflow valves. Under most conditions, the controller will increase cabin altitude at a 600 feet/minute rate and decrease cabin altitude at a 500 feet/minute rate. When in the high altitude mode, these rates may increase to a climb rate of 2,500 feet/minute and a dive rate of 1,500 feet/minute. Ultimately, cabin pressurization is also controlled by limiters installed on the outflow valves. These limiters prevent the cabin altitude from exceeding 8.9 PSI, ±0.1 PSI, higher than ambient (Max Delta-P Limiters) and prevent cabin altitude from exceeding 14,500 feet (Max Altitude Limiters). Primary components of the system include the digital cabin pressure controller, the primary and secondary outflow valves, a MANUAL TOGGLE VALVE, an AUTO/MANUAL switch and an EMER DUMP switch.

AUTOMATIC OPERATION

The system has two methods of automatic operation. The primary (and default) method is the Auto Schedule Control Mode, which is used during all normal flight operations. This method of operation schedules the cabin altitude as a function of airplane altitude, cabin altitude, throttle position and whether the airplane is on the ground or in flight. In the auto schedule mode, the cabin will be depressurized by an altitude of 1500 feet above the set destination field elevation before landing.

A secondary method of automatic operation is called the Isobaric mode. This is a reversionary mode which can be used only if the Air Data Computer (ADC) altitude signal becomes invalid.

NOTE

> Neither Auto Schedule nor Isobaric modes are available in case of DC electrical power failure, since the controller does not receive power from the emergency bus. The manual control system functions without electrical power and is used to directly control the outflow valves in case of electrical failure or failure of the automatic controller.

AUTO SCHEDULE

In Auto Schedule, the controller maintains the lowest practical cabin altitude for the airplane throughout its flight envelope. This is done by electrical signals sent from the microprocessor to solenoids located on the primary outflow valve. These solenoid valves add or remove air in the outflow valve chambers, thus affecting the rate at which conditioned air is allowed to exit the pressure vessel. The controller has five sub-level modes of operation when in auto schedule: Ground Mode, Take-off (pre-pressurization) Mode, Flight Mode, Descent Mode and High Altitude Mode. When in auto schedule, the only crew action is to program in the Set Landing Altitude (SLA) prior to landing.

ISOBARIC MODE

The isobaric mode is a standby mode that can not be entered directly while in flight. The controller will switch from auto schedule to isobaric mode anytime the altitude signal (generated through the ADC) becomes disabled. Isobaric mode is indicated by a yellow warning indicator on the pressurization controller display face. If the air data sensor information resumes, the controller will automatically switch back to the auto schedule mode and the yellow warning indicator will extinguish.

If the controller switches to isobaric mode, the SLA on the controller display is replaced with the selected Flight Level, allowing the pilot to set the desired airplane cruising altitude. This altitude is selected by rotating the SET ALT knob to the desired flight level. The controller then uses the selected flight level to control the cabin pressure rate of change and the cabin pressure altitude to maintain near-maximum differential pressure.

During descent, the pilot can view the selected landing field altitude by pressing the FL button on the controller. The display will show cabin altitude, allowing the pilot to set the desired cabin altitude prior to landing. The controller then controls the cabin pressure rate of change to maintain the displayed cabin altitude.

In this position, electric power is removed from the controller (and subsequently the climb and dive solenoids associated with the primary outflow valve). All changes to the outflow valves are now commanded using differential pressure from cabin and ambient sources. Placing the MANUAL valve in the UP position will increase cabin altitude, and placing the valve in the DOWN position will decrease cabin altitude.

The amount of cabin altitude change and the cabin altitude rate of change is controlled by the amount of time the MANUAL valve is held in the UP or DOWN position. Because the manual valve uses cabin pressure to open and close the outflow valves, reaction time will increase at low cabin Delta-P. Safety features in the manual toggle valve will not allow rate selections beyond Delta-P limits.

EMERGENCY DUMP

The EMER DUMP ON switch is stowed in the de-activation position. The EMER DUMP ON switch may be used for rapid equalization of the cabin and ambient pressures up to approximately 13,000 feet. When activated, the primary outflow valve climb solenoid is electrically commanded to vent air out of the control chambers, causing the primary and secondary outflow valves to open and dump cabin pressure. The PRESS SOURCE selector must be OFF to obtain complete depressurization at altitudes above 13,000 feet. However, limiters in the solenoid will not allow cabin altitude to exceed 14,500 feet regardless of commands from the EMER DUMP ON switch.

BUILT IN TEST FUNCTIONS

The controller incorporates two sets of built-in diagnostics tests. The first test is an internal check of the controller and is performed continuously during operation. If an internal fault is detected, power is removed form the primary outflow valve climb and dive solenoids. The RATE and SET ALT displays will go blank, providing the pilot with immediate indication of the controller failure. The system is now in the manual mode of operation, with the outflow valves remaining in the last commanded position. If this failure occurs in flight, the cabin pressure altitude may then be controlled using the MANUAL toggle valve.

If the controller detects a loss of the air data computer signal, a yellow warning indicator will illuminate and the controller will automatically switch to the Isobaric Mode of operation. The controller will continue to operate in Isobaric Mode until the signal is restored. If the signal is restored in flight, the controller will switch back to the auto schedule mode of operation.

While on the ground, the integrity of the system may be checked by pressing and holding the EXER button for approximately 2 minutes. The controller will command the outflow valves to the closed position and pressurize the cabin to 200 feet below current field elevation. Upon release of the button, the controller will perform a display test and gradually re-open the outflow valves to their full open position, depressurizing the cabin.

NOTE

In flight, the EXER button provides only a lamp test.

EMERGENCY PRESSURIZATION

In the EMER position, the emergency pressurization valve opens allowing hot bleed air from the left engine to enter the cabin directly and the EMER PRESS annunciator light will illuminate. The air cycle machine is bypassed with emergency pressurization selected, cabin temperature will rise, and AUTOMATIC or MANUAL temperature control will be disabled. Cabin temperature can be controlled to some extent with the left throttle. Retarding the left throttle will lower bleed air temperature, but excessive reduction will allow the cabin altitude to climb.

Emergency pressurization will also automatically activate at 14,500 foot cabin altitude regardless of the bleed air control valve switch position, and will deactivate by 12,000 foot (descending).

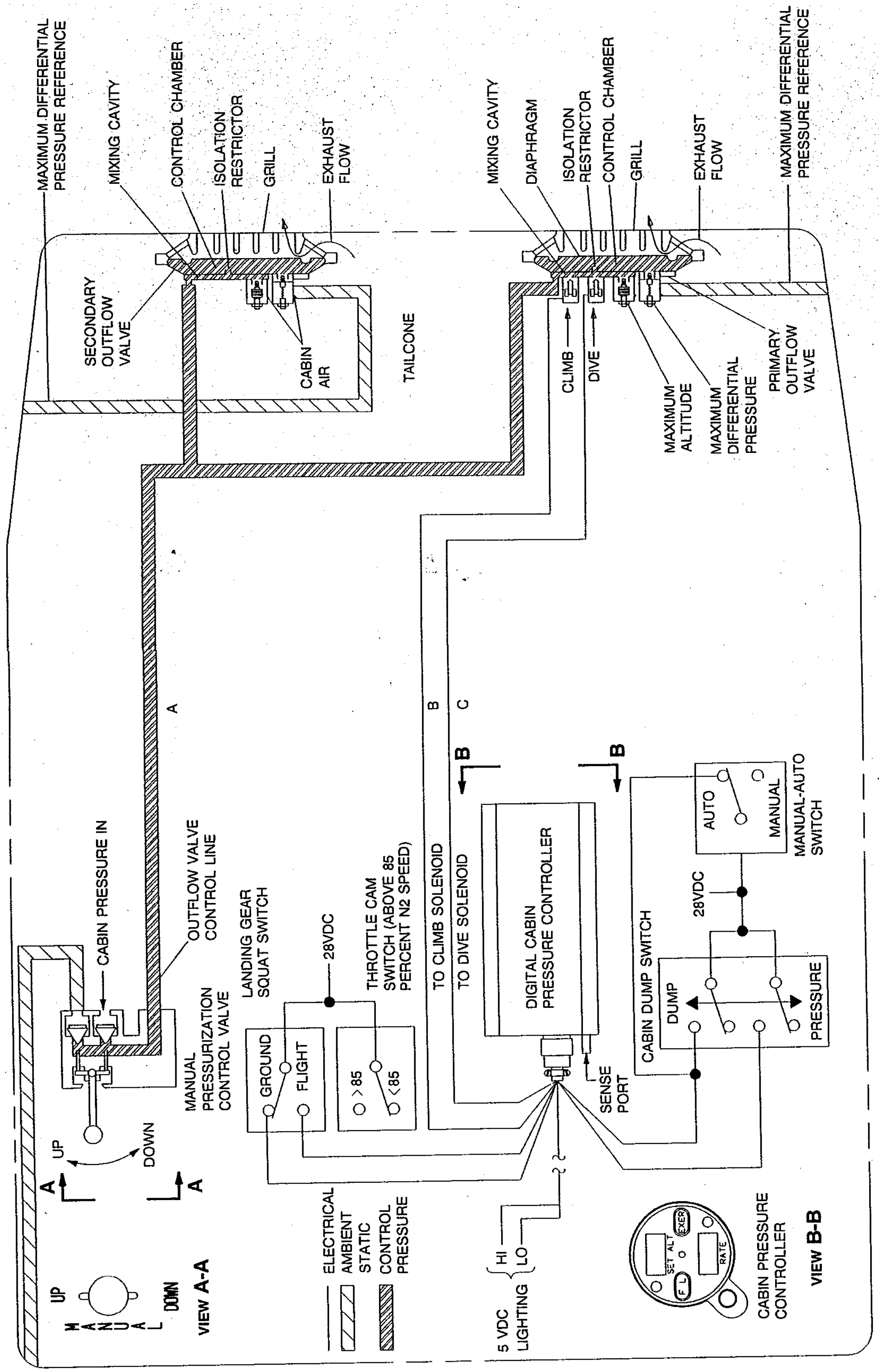

Figure 2-24. Pressurization Control System Schematic

AIR CONDITIONING

Air conditioning for the cabin is provided by routing engine bleed air through precoolers and in turn through the air cycle machine which conditions the air prior to distribution to the cabin. Cabin overhead and underfloor ducting is used to distribute the conditioned air. A standard R134A vapor cycle air conditioning system is also available for additional cooling up to 18,000 feet.

The air cycle machine located in the tailcone compartment, cools engine bleed air to approximately 2°C (35°F). Bleed air enters the air cycle machine through two bleed air shutoff and pressure regulating valves (LH, RH) and passes over a primary heat exchanger. The air is then compressed by a turbine-driven compressor and passed over a second heat exchanger. Finally, the air drives a turbine which extracts energy and cools the air further. Expansion provides the final cooling. The advantages of the compression cycle are twofold: (1) the compressor section provides a load for the turbine to work against and (2) compressing and heating the air increases the efficiency of the second heat exchanger. Fresh air enters the tailcone through the flush scoops in the dorsal fin. A small fan, driven by the air cycle machine, pulls the fresh air over both heat exchangers and the precooler and dumps it overboard through a vent in the tailcone.

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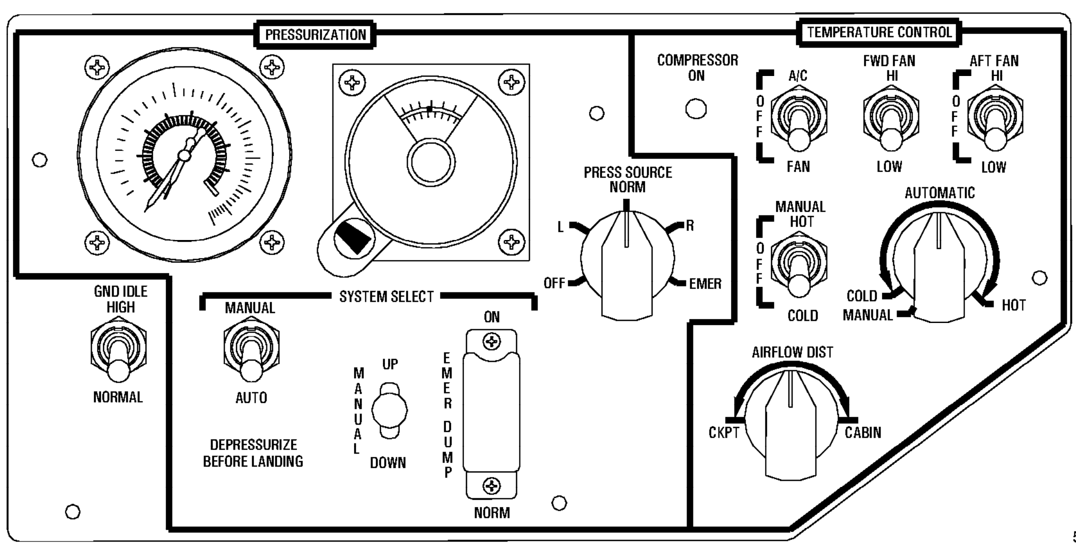

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Figure 2-25. Pressurization - Environmental Control Panel (Typical)

To warm the cabin to a desirable temperature, a bypass valve allows some hot engine bleed air to bypass the ACM and mix with the cold air exhausted from the air cycle machine. The bypass valve is controlled by the automatic or manual temperature control located on the pressurization environmental control panel. With the temperature control selector in the MANUAL position, the bypass valve can be controlled manually by the MANUAL HOT/MANUAL COLD switch. The switch has three positions, spring-loaded to the center (OFF) position. When the switch is deflected toward the MANUAL HOT position, the bypass valve is driven open, allowing more hot bleed air to bypass the ACM and mix with the cold air exhausted from the air cycle machine. When the switch is released, the bypass valve will remain at that position. When the switch is moved toward the MANUAL COLD position, the bypass valve is driven closed. The bypass valve, when manually controlled, will travel from full open to full closed in approximately ten seconds. When AUTOMATIC temperature control is selected, the cabin temperature will be automatically controlled, corresponding to the position of the automatic temperature selector. Response rate in automatic depends on temperature conditions. Two air duct temperature sensors are linked to the automatic temperature control selector to drive the bypass valve towards the desired position. Should the duct temperature become excessively hot, the amber AIR DUCT O'HEAT annunciator panel light will illuminate. This is an advisory light and corrective action, lowering the cabin temperature, should be accomplished to prevent system damage.

An air cycle machine overheat sensor is installed between the compressor and turbine section of the air cycle machine to prevent excessively hot air from causing damage to the air cycle machine due to overheating. If this sensor indicates that the compressor section is producing air that is too hot (approximately 435°F), it will close all shutoff valves in the bleed air ducts and open the emergency pressurization valve when airplane is in flight. This will secure the air cycle machine and pressurize the cabin by the emergency method. This condition will be indicated by the illumination of the EMERG PRESS ON annunciator light as well as the increased noise level associated with high velocity air entering the cabin. If the temperature drops below approximately 405°F within 12 seconds, the system will automatically return to normal operation. If the temperature is not reduced within 12 seconds, it will be necessary to rotate the pressurization source selector knob in the cockpit to EMER position and then reselect LH or RH to reset the system for normal operation.

During high altitude operation, particularly at low airspeed and high power settings while attempting to cool a warm cabin, it is possible for the cooling demand to exceed air cycle machine (ACM) capabilities. This would result in ACM overtemperature and shutdown and automatically trip the EMERGENCY pressurization on. To preclude this, an overtemperature protection circuit is incorporated which will bias the temperature controller when the ACM compressor discharge temperature reaches approximately 405°F. This bias causes the ACM temperature controller to respond as if a warmer cabin temperature had been selected; therefore, it switches from cooling to heating mode until the ACM overtemperature condition is corrected. Once the ACM compressor discharge temperature has cooled, the bias is automatically switched out and the ACM will return to cooling mode. This system will cycle the bias in and out until the ACM stabilizes (cabin temperature reaches selected value). The ACM overtemperature protection circuit operates only in the AUTOMATIC temperature controller mode. Therefore, operations above 31,000 feet altitude should be restricted to AUTOMATIC mode. It is possible, at high altitude, when using MANUAL mode, to select a cold enough temperature to cause ACM shutdown and to trip the emergency pressurization on.

A water separator is provided to dehumidify the conditioned air before entering the cabin. The conditioned air enters the water separator where it is filtered and the excess water is removed. The conditioned air is then ducted through a check valve into the cabin flow ducts for distribution. The condensate is injected into the air flowing over the heat exchangers to increase cooling.

The cabin air distribution system consists of an overhead air duct and outlets, and underfloor and armrest air ducts which supply conditioned air to the footwarmer manifolds, armrests, and the overhead outlets. A separate cockpit and defog air distribution system is ducted forward through the underfloor from a defog blower in the aft cabin.

When the air temperature selected is cold, a damper valve directs the air through the overhead, floor and armrest air ducts. As the temperature selected becomes warmer, the damper valve will close, recirculating underfloor airflow through the overhead air duct. When a hot temperature is selected (over 38°C (100°F), the damper valve will be closed, which directs all hot airflow through the floor and armrest air ducts.

A flow divider is provided to allow the crew to proportion, to a certain extent, the amount of air provided to the cockpit versus the cabin. The flow divider does not affect the overhead outlet system. A five-position selector is provided on the tilt panel for control of the flow divider.

Switches labeled OVHD FAN and DEFOG FAN are located on the copilot’s panel. Both have HI/OFF/LOW positions. If increased air circulation is desired, position the OVHD FAN switch to the HI or LOW position. This actuates the cabin fan, increasing airflow through the overhead ducts. The DEFOG FAN switch controls defog and ventilation airflow into the flight compartment.

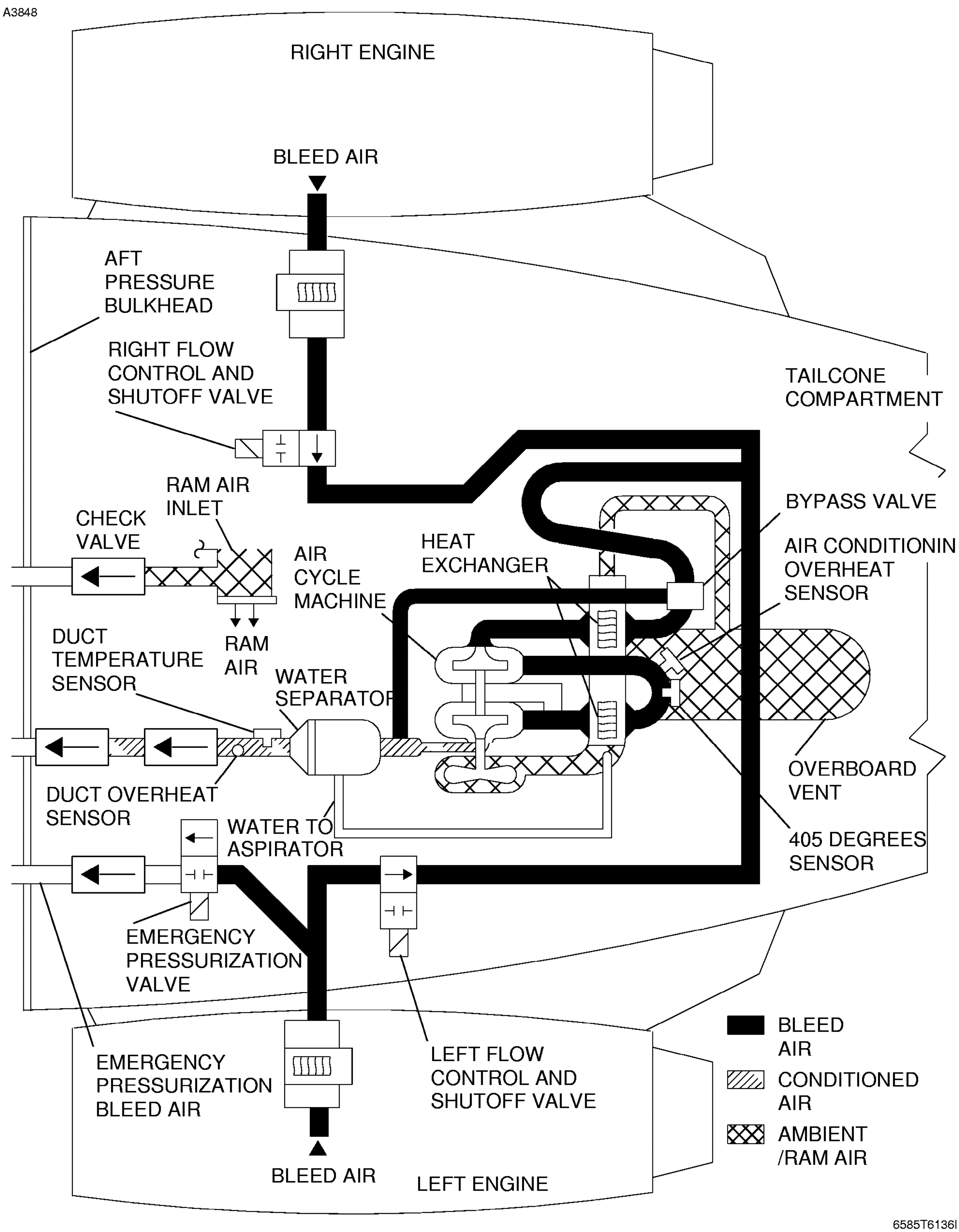

Figure 2-26. Bleed Air System Schematic

VAPOR CYCLE AIR CONDITIONING

A standard vapor cycle air conditioner using R134A refrigerant is available. It discharges conditioned air from floor mounted evaporator/blowers in the forward and aft ends of the dropped isle, to provide rapid cabin cooling. The air conditioner is controlled by a switch panel on the copilot’s instrument panel, and can be used on the ground or in flight up to 18,000 feet. The MODE, AC/FAN/OFF switch controls primary power to the system. The AC position turns on the compressor and the forward blower. The FWD FAN HI/LO switch controls the forward blower speed when the MODE switch is in AC or FAN. A COMP ON twist-dimmable light illuminates when the compressor is powered. The system may not be operated in the AC mode above 18,000 feet. A ground unit, or at least one generator, must be on line to run the compressor.

OXYGEN

GENERAL

The oxygen system provides supplementary oxygen for the cockpit sweep-on type masks and the passengers' continuous flow masks. It is not normally used since a cabin altitude of 8000 feet can be maintained at the maximum certified airplane altitude with normal pressurization system operation.

OXYGEN BOTTLE

In the unlikely event supplementary oxygen is required, a fully charged 64.0 cubic foot bottle, located in the left side of the tailcone compartment, beneath the floor, provides approximately one hour of oxygen for crew and six passengers. Duration for actual personnel aboard can be computed by assuming consumption at a rate of 4.3 liters per minute per occupant, and a usable full bottle output of 1812 liters. Normal pressure for the system is 1600 to 1800 PSI.

The bottle assembly contains a pressure reducing valve, shutoff valve and provisions for external servicing. A green disc is installed in the end of the bottle overpressure vent line which is flush mounted on the lower left side of the aft empennage. This disc, when ruptured, indicates bottle pressure has exceeded 2500 PSI and is empty. This overpressure system will actuate under only the most adverse circumstances; therefore, if the disc is ruptured, determine the cause of the overpressure before flight. The oxygen bottle pressure is displayed on the right instrument panel. A locking connector has been provided on the right and left flight deck consoles to supply the flight compartment occupants with 70 PSI oxygen for diluter demand mask use. The diluter demand masks have an integrally mounted microphone and oxygen regulator. Each oxygen regulator has a lever allowing manual selection of diluter demand (normal) or demand (100% oxygen) flows. The lever is normally placed in the 100% position so it is ready for emergency use at high altitudes. If oxygen is used below 20,000 feet, the lever can be repositioned to normal to conserve oxygen.

OXYGEN CONTROL PANEL

The left console contains the oxygen controls regulating flow to the passenger compartment. An oxygen control valve labeled CREW ONLY, NORMAL and MANUAL DROP allows the pilot to select oxygen flow to the flight deck only (CREW ONLY position), or flow to both the passenger compartment and flight deck (NORMAL position). The MANUAL DROP position will allow the passenger oxygen masks to be manually deployed in the event of an emergency and the masks fail to automatically deploy. A switch on both the pilot's and copilot's control panels, labeled MIC OXY MASK/MIC HEADSET, selects which microphone will be used. Refer to Figure 2-28 for the pilot’s side console.

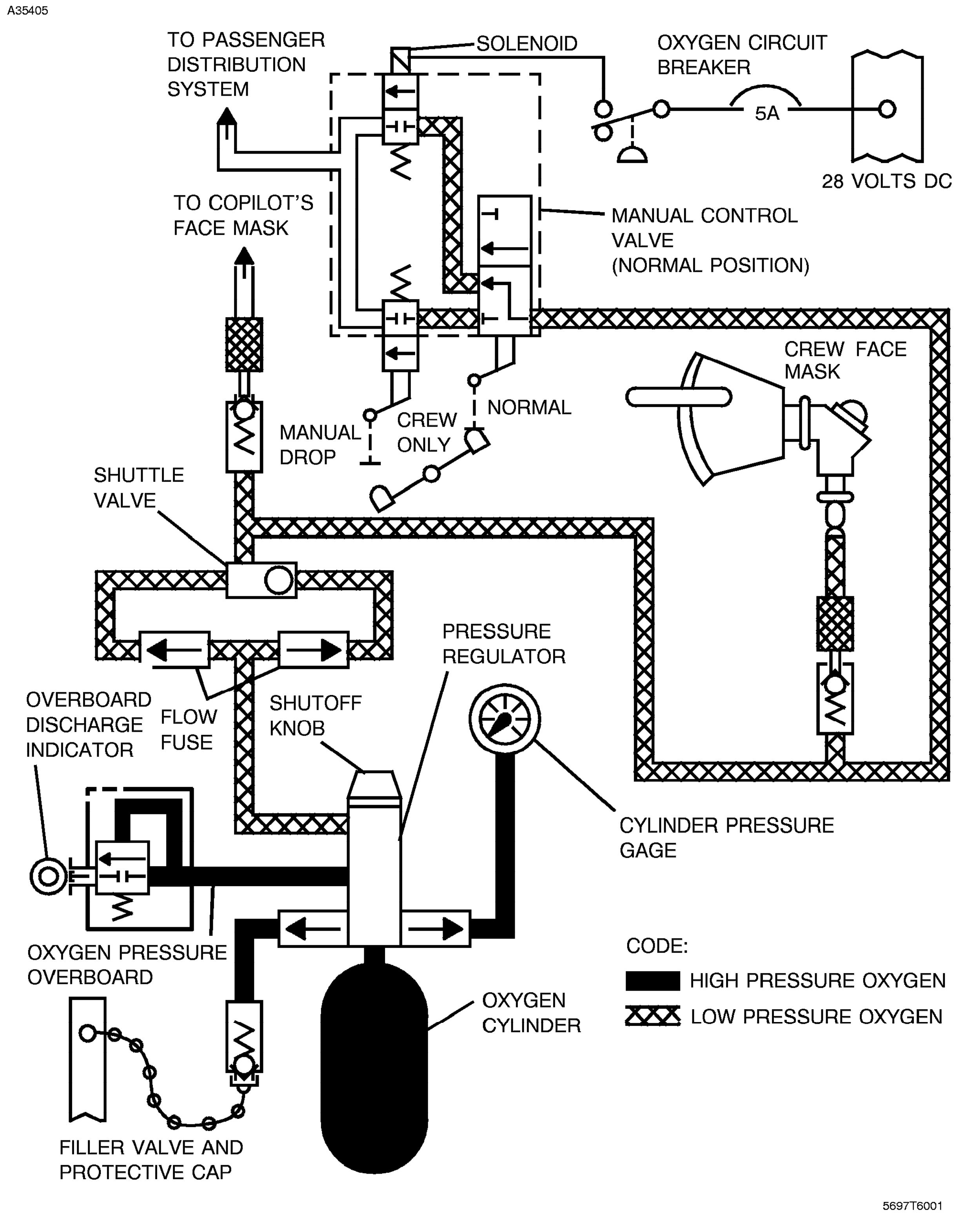

Figure 2-27 Oxygen System Schematic

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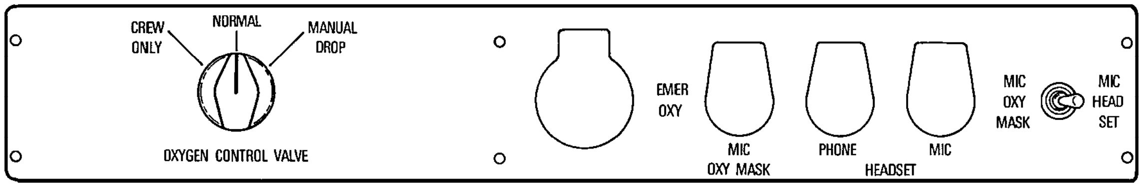

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Figure 2-28. Pilot's Side Console Oxygen Control and Outlets

WARNING

- **NO SMOKING WHEN OXYGEN IS BEING USED OR FOLLOWING USE OF PASSENGER OXYGEN UNTIL LANYARDS HAVE BEEN REINSTALLED.**
- **DUE TO HUMAN PHYSIOLOGICAL LIMITATIONS, THE PASSENGER OXYGEN SYSTEM IS NOT SATISFACTORY FOR CONTINUOUS OPERATION ABOVE 25,000 FEET CABIN ALTITUDE AND THE CREW OXYGEN SYSTEM IS NOT SATISFACTORY FOR CONTINUOUS OPERATION ABOVE 40,000 FEET CABIN ALTITUDE. INDIVIDUAL PHYSIOLOGICAL LIMITATIONS MAY VARY. IF CREW OR PASSENGERS EXPERIENCE HYPOXIC SYMPTOMS, DESCEND TO A LOWER CABIN ALTITUDE.**

Should cabin altitude exceed 14,500 feet, ±500 feet, an altitude sensing switch will electrically actuate the passenger solenoid valve, supplying 70 PSI oxygen pressure to the passenger manifold. This pressure is sufficient to operate the passenger mask actuators, deploy the doors and drop the continuous flow masks at each passenger seat. Oxygen will not flow from these masks until the lanyard on the respective mask has been pulled, removing the pintle pin. This conserves oxygen in the event all masks are not to be used. When the cabin altitude has reached approximately 8000 feet with electrical power available, the passenger solenoid valve will close, allowing passenger manifold oxygen pressure to bleed off. If electrical power is not available, the passenger manifold pressure can be shut off by closing the OXYGEN CONTROL VALVE by selecting CREW ONLY position. As the oxygen pressure dissipates, the door actuators will retract, allowing mask stowage to be accomplished. Reinstall all removed pintle pins before stowing masks.

The high altitude airport mode is automatically selected when a field elevation above 8,000 feet is set into the cabin pressurization controller. In this mode, the CAB ALT annunciator is inhibited below a cabin pressure altitude of approximately 14,500 feet.

WARNING

WHEN HOLDING OR OTHERWISE OPERATING AT ALTITUDES BELOW 25,000 FEET FOR PERIODS GREATER THAN 30 MINUTES WITH THE CABIN ALTITUDE WARNING SHIFTED FROM 10,000 FEET TO 14,500 FEET (SLA BETWEEN 8,000 FEET AND 14,500 FEET), AT LEAST ONE PILOT MUST USE SUPPLEMENTAL OXYGEN CONTINUOUSLY.

NOTE

If cabin altitude exceeds 14,500 feet ±500 feet, CAB ALT warning light will illuminate and passenger oxygen masks will deploy.

CREW OXYGEN MASKS

The EROS crew mask is a quick donning diluter-demand/pressure breathing mask with integral microphone and oxygen regulator. It is certified to a maximum cabin altitude of 40,000 feet.

A red rocker lever on the bottom of the mask labeled "N" and "100%" selects either NORMAL or 100% oxygen scheduling to the mask. In NORMAL mode the regulator increases the proportion of oxygen mixing with the cabin air as cabin altitude increases. Above approximately 27,000 feet cabin altitude NORMAL mode provides 100% oxygen. The "100%" position provides 100% oxygen at all cabin altitudes To provide the quickest recovery from hypoxia symptoms, the mask should be stowed with the 100% selected. To conserve oxygen, in the absence of smoke/fumes the mask should be switched to NORMAL when worn at any cabin altitude for an extended period of time.

Depressing a red tab on the front of the mask (left side, as viewed while wearing the mask) inflates the harness for donning. Releasing the tab causes the harness to conform to the user's head. To prevent damage to the harness it should not be inflated until the mask is completely out of the storage box.

The mask automatically supplies oxygen under pressure (pressure breathing) beginning at approximately 35,000 feet cabin altitude. Automatic pressure breathing is available in either NORMAL or 100% mode. Once pressure breathing begins, pressure supplied to the mask gradually increases as cabin altitude increases. Ability to speak via the mask microphone is not significantly impaired during pressure breathing.

A red knob on the bottom of the mask labeled EMERGENCY provides 100% oxygen flow and creates a positive oxygen pressure in the mask. Turning the knob approximately one quarter turn in the direction of the arrow selects EMERGENCY mode. Pressing the knob "in" momentarily may be used for mask preflight to ensure flow to the mask. Continuous EMERGENCY mode must be used in a smoke/fume environment to provide positive pressure to the mask and goggles. One the need for emergency pressure has been alleviated, EMERGENCY mode should be deselected as the oxygen consumption rate is high.

Smoke goggles (if provided with the EROS mask) are designed to fit over the mask and interface with a vent on the outside of the mask nose-bridge area. In a smoke/fumes environment, the mask should be donned first, then the goggles. A gray plastic slide on the mask nose bridge may then be pulled downward, opening the goggle vent. In the vent is fully open when a red band is visible above the slide. The upper harness tubes should be placed over the goggle frame's lower sides to provide maximum sealing. When smoke/fumes have been eliminated, the mask should be switched out of EMERGENCY mode and the nose bridge valve closed.

A two-position toggle switch is provided on the pilot's and copilot's side consoles. The switch is marked MIC OXY MASK and MIC HEAD SET. Depressing the microphone button on the appropriate control wheel allows a crewmember to transmit through the headset microphone or oxygen mask microphone, whichever is selected.

Oxygen pressure to the mask may be verified by setting the microphone switch to MIC OXY MASK, and keying the ICS MIC while selecting EMER position on the mask. Verify oxygen flow and listen for the sound of the flow through the headset or speaker to verify the oxygen mask microphone.

NOTE

Crew masks are assumed to be in the NORMAL setting below 25,000 feet cabin altitude and at 100% setting at or above 25,000 feet.

LIGHTING

INTERIOR LIGHTING

Interior lighting is provided for the flight compartment, cabin and tailcone area. Electroluminescent panels, instrument floodlights and white background lighting illuminate all cockpit instruments and switches. Two overhead floodlights, controlled by a single rheostat switch, are available for additional cockpit lighting. The overhead floodlights operate off the emergency bus in the event of a double generator failure. The following instrument panel lights can be operated from the standby gyro battery in case of electrical system failure: standby gyro indicator, dual fan tachometers, the standby altimeter/airspeed indicator and the standby horizontal situation indicator (HSI). All lights except the overhead and instrument floodlights are controlled by a PANEL LIGHT CONTROL master switch and then adjusted by rheostats. When the instrument panel lights are on, a dimmer is activated in the annunciator panel to provide for lower warning light intensity during night flying. The starter disengage switch is also illuminated when the panel lights are on. A floodlight in the glare shield comes on to illuminate the fan tachometers when a starter switch is pressed. It goes out when the starter/generator reverts to generator operation.

Two individually controlled map lights are located in the overhead panel above the pilot and copilot. Intensity controls are located at the forward end of each side console.

Cabin lighting includes overhead fluorescent lighting, individually controlled overhead reading lights, two aft baggage compartment lights and a refreshment center light. An illuminated switch on the forward door post turns on exit lights over the main and emergency doors and one aft baggage compartment light. These lights are powered by the hot battery bus and are available any time the battery is installed and serviceable.

A three-position passenger advisory switch in the cockpit is also tied to the hot battery bus. In the SEAT BELT position, only the FASTEN SEAT BELT sign is illuminated in the cabin. In the PASS SAFETY position, the NO SMOKING, FASTEN SEAT BELT sign and EMERGENCY EXIT lights are illuminated. When the switch is OFF, all advisory and emergency lighting is extinguished.

A third provision for emergency exit lighting is through a small battery located beneath the floorboard next to the cabin door, which will power the emergency exit lights any time a sensor is exposed to a force of 5 Gs or more.

TAILCONE LIGHTING

A detachable light located in the forward tailcone area provides interior lighting for tailcone inspection. Power is from the hot battery bus. The OFF/ON switch is mounted on the access doorframe and is wired through the door-closed microswitch. The same switch controls the tailcone light and the tailcone baggage compartment lights. Closing the tailcone compartment door will extinguish the light, regardless of OFF/ON switch position.

TAILCONE BAGGAGE COMPARTMENT LIGHTING

Two tailcone baggage compartment lights are located above the tailcone access door. The switch is located on the aft face of the forward door post. It is the same switch that controls the tailcone light discussed above. The tailcone baggage compartment lights are also controlled by the same door-closed microswitch as the tailcone light.

NOSE BAGGAGE COMPARTMENT LIGHTING

A light located centrally in the nose baggage compartment provides interior lighting for baggage loading or unloading. An illuminated OFF/ON switch, located adjacent to the light, is wired through a microswitch in each nose baggage access door release latch. With the switch in the ON position, opening either door will illuminate the light. Closing the baggage doors will extinguish the light, regardless of switch position.

The nose baggage light is powered by the hot battery bus and is available any time the battery is connected and serviceable.

EXTERIOR LIGHTING

Exterior lighting consists of wing and tail mounted navigation lights, anti-collision lights (strobe), wing inspection lights, landing lights, combination wing recognition/taxi lights, rotating beacon, and optional tail flood lights. All exterior lights are controlled by switches located on the instrument panel. The navigation lights are installed in the wing tips and in the tailcone cap. Wing inspection lights, located in the wing/fuselage fairing, illuminate the forward portion of each wing, enabling the pilot to detect ice buildup during night flight. The landing lights are located in the wing tips and are individually controlled. The recognition/taxi lights are individually controlled high intensity lights in the wingtips inboard of the landing lights. They provide traffic identification and safety lighting for easier recognition by pilots of other aircraft as well as air traffic controllers.

Additional landing/taxi lights are mounted on the main landing gear struts. With the landing gear extended, these lights illuminate along with the wingtip landing lights when their respective landing light switches are turned ON. They are also interfaced to the recognition/taxi lights such that they illuminate when the recognition/taxi lights switch is selected to REC/TAXI with the landing gear extended. When the landing gear are not extended, the strut-mounted landing/taxi lights are rendered inoperative.

The rotating beacon is located at the upper tip of the rudder. Anti-collision lights are mounted next to the navigation lights, one in each wing tip. These lights are of very high intensity and can be disturbing to other aircraft crew and ground personnel if they are used during ground operations. They should be turned on just prior to takeoff roll and secured shortly after landing. The tail flood lights, if installed, are mounted on top of the horizontal stabilizer and illuminate the vertical fin area for inflight recognition at night.

WARNING AND TEST

ANNUNCIATOR PANEL

The annunciator panel is designed to provide the pilot with an easily interpreted display of both normal and abnormal system conditions. Two flashing master warning lights (MASTER WARNING RESET) are used in conjunction with the panel to ensure rapid recognition of any red annunciator light. In addition, the master warning light will flash if both amber GEN OFF lights should illuminate.

The master warning lights can be reset by pressing either light. Resetting the master warning light rearms the system so that it will function should another failure occur.

The annunciator system is powered from the main direct current (DC) buses through the WARN LTS 1 and 2 circuit breakers on the left cockpit panel.

All system light bulbs can be tested by placing the rotary TEST selector on the left instrument panel to the ANNU position. This will illuminate all lights and cause the master warning lights to flash.

Burned out bulbs can be replaced by pushing in the light assemblies to the left and right of the failed bulb; then use a tool to remove the assembly with the burned out lamp.

If the MASTER WARNING light illuminates in a steady mode, it indicates that there has been a loss of power to the annunciator panel from either the left or right DC electrical bus.

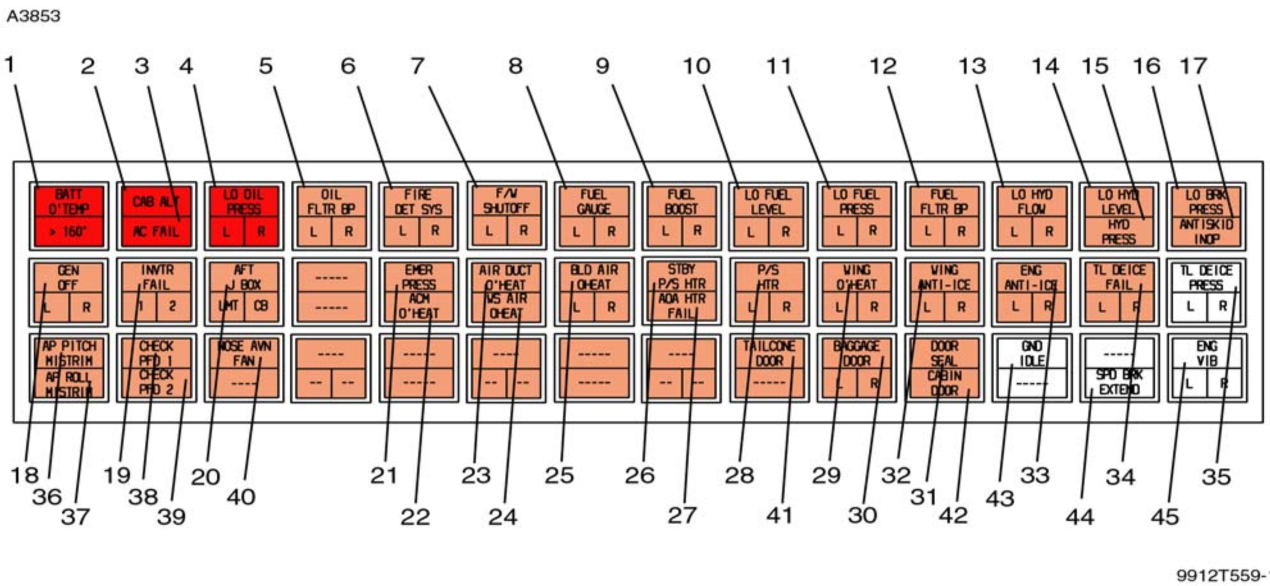

Figure 2-29. Annunciator Panel

1.	BATT O'TEMP	The red battery overtemperature light will illuminate with a steady light at temperatures over 145°F and will flash at temperatures over 160°F. Illumination of the light also triggers the master warning system and which will illuminate the master warning light.
	BATT O'TEMP >160°	The red battery overtemperature light and the >160° light will flash and the master warning will flash if battery temperature continues to climb over 160°. Pressing the master warning will cause the flashing annunciator to change to steady on and the master warning to extinguish.
2.	CAB ALT	The red cabin altitude light advises that the cabin pressure altitude is above 10,000 feet. Illumination of the light also triggers the master warning system, which will illuminate the master warning light. The CAB ALT light will remain illuminated until the MASTER WARN light is reset, even if the fault is momentary.
3.	AC FAIL	The red alternating current fail light advises that the AC power bus voltage is above 130 VAC or below 90 VAC. Illumination of light also triggers the master warning system, which will illuminate the master warning light. The AC FAIL light will remain illuminated until the MASTER WARN light is reset, even if the fault is momentary.
4.	LO OIL PRESS L R	The red oil pressure warning light advises that the oil pressure is below safe limits (45 PSI) in left or right engine. Illumination of light also triggers the master warning system which will illuminate the master warning light.
5.	OIL FLTR BP L R	The amber oil filter bypass light advises that bypass of the left and/or right oil filter is impending.
6.	FIRE DET SYS L R	The amber fire detection system light advises that the engine fire detection system has failed.

7.	F/W SHUTOFF L R	The amber firewall shutoff light advises that the left and/or right fuel and hydraulic shutoff valves are closed
8.	FUEL GAUGE L R	The amber fuel gauge light advises that the fuel gauging system has detected an error.
9.	FUEL BOOST L R	The amber fuel boost ON light advises that electrical power has been applied to the left and/or right boost pump.
10.	LO FUEL LEVEL L R	The amber fuel low light advises that the fuel quantity in the left and/or right tank is below approximately 185 pounds or less.
11.	LO FUEL PRESS L R	The amber fuel low pressure light advises that the fuel pressure is low in left and/or right systems.
12.	FUEL FLTR BP L R	The amber fuel filter bypass light advises that bypass of the left and/or right fuel filter is impending.
13.	LO HYD FLOW	The amber hydraulic flow low light advises that left and/or right hydraulic system flow is below approximately 0.35 to 0.55 gallons per minute.
14.	LO HYD LEVEL	The amber hydraulic low level light advises that the fluid in the hydraulic reservoir is low.
15.	HYD PRESS	The amber hydraulic pressure ON light advises that the hydraulic system is pressurized.
16.	LO BRK PRESS	The amber power brake low pressure light advises that the power brake hydraulic pressure is low.
17.	ANTISKID INOP	The amber antiskid inoperative light advises that the antiskid system is inoperative.
18.	GEN OFF L R	The amber generator OFF light advises that left and/or right generator is not connected to the airplane bus. Illumination of both left and right lights will trigger the master warning system which will illuminate the master warning light.
19.	INVTR FAIL 1 2	The amber inverter fail light advises that the number 1 or number 2 inverter output voltage is above 130 VAC or below 90 VAC. The failure of either inverter also triggers (AC FAIL). Resetting the master warning reset switch will extinguish the AC FAIL annunciation unless both inverter lights are illuminated.
20.	AFT J BOX LMT CB	The amber aft j-box LMT light flashes and the master caution illuminates to advise that the left and/or right crossfeed limiters have blown, disabling crossfeed of electrical power from left bus to right bus or visa versa. Pressing the master caution will cause the flashing annunciator to change to steady on and the master caution to extinguish. The amber aft j-box CB light flashes and the master caution illuminates to advise that the left and/or right start control PCB circuit breaker has opened, disabling the electrical start system. Pressing the master caution will cause the flashing annunciator to change to steady on and the master caution to extinguish.

21.	EMER PRESS	The amber emergency pressurization light flashes and the master caution illuminates to advise that emergency pressurization has been manually selected or automatically activated by an air cycle machine overheat. Pressing the master caution will cause the flashing annunciator to change to steady on and the master caution to extinguish.
22.	ACM O'HEAT	The amber ACM overheat light flashes and the master caution illuminates to advise of an overtemperature condition of air cycle machine (in excess of 420°F). This light will trip in conjunction with the EMER PRESS light. Pressing the master caution will cause the flashing annunciator to change to steady on and the master caution to extinguish.
23.	AIR DUCT O'HEAT	The amber air duct overheat light flashes and the master caution illuminates steady to advise that the temperature in either the cockpit or cabin warm air duct has exceeded 300°F. Pressing the master caution will cause the flashing annunciator to change to steady on and the master caution to extinguish.
24.	WS AIR O'HEAT	The amber overheat light flashes and the master caution illuminates steady to indicate an overtemperature condition in the left or right bleed air-heated windows. Pressing the master caution will cause the flashing annunciator to change to steady on and the master caution to extinguish.
25.	BLD AIR O'HEAT L R	The amber bleed air overheat light flashes and the master caution illuminates steady if left or right engine bleed air temperature is greater than 560°F as measured downstream of the pylon-mounted air-to-air heat exchanger. Pressing the master caution will cause the flashing annunciator to change to steady on and the master caution to extinguish.
26.	STBY P/S HTR	The amber standby pitot/static heater OFF light advises that the standby pitot/static heat has failed or the switch is OFF.
27.	AOA HTR FAIL	The amber angle-of-attack heater fail light advises that the heating element in the probe is inoperative.
28.	P/S HTR	On the ground, the amber pitot/static heater failure annunciator illuminates steady to indicate an inoperative heating element in the pitot-static system.
	L R	In the air, the amber light flashes and the master caution illuminates steady to advise of an inoperative heating element. Pressing the master caution will cause the flashing annunciator to change to steady on and the master caution to extinguish.
29.	WING O'HEAT L R	The amber wing overheat light flashes and the master caution illuminates steady if left or right forward wing spar temperature has exceeded 160°F. Pressing the master caution will cause the flashing annunciator to change to steady on and the master caution to extinguish.
30.	BAGGAGE DOOR L R	The amber light flashes and the master caution illuminates steady to indicate that either the left or right baggage door is not in the latched position. Pressing the master caution will cause the flashing annunciator to change to steady on and the master caution to extinguish.
31.	DOOR SEAL	The amber door seal light advises that the cabin door seal is not inflated.

32. WING ANTI-ICE L R — On the ground, with left and/or right anti-ice switches selected to the WING/ENGINE position, the amber wing anti-ice light will illuminate steady with no illumination of master caution to advise of low temperature (less than 300°F) in the respective wing. The light will extinguish after respective wings reach normal operating temperature.

After normal operating temperature has been reached, an under-temperature condition will cause the respective annunciator to flash and the mater caution light to illuminate. Pressing the master caution will cause the flashing annunciator to change to steady on and the master caution to extinguish.

In the air, with left and/or right anti-ice switches selected to the WING/ENGINE position, the amber wing anti-ice light will flash and the mater caution light will illuminate if normal operating temperatures are not reached within 4 minutes and 45 seconds. Pressing the master caution will cause the flashing annunciator to change to steady on and the master caution to extinguish.

Nuisance trips (less than 5 seconds between resumption of normal temperature and the detection of a new under-temperature condition) are inhibited by circuit logic.

33. ENG ANTI-ICE L R — On the ground, with left and/or right anti-ice switches selected to the WING/ENGINE position, the amber engine anti-ice light will illuminate steady with no illumination of master caution to advise of low temperature in the respective engine inlet. The light will extinguish after respective engines reach normal operating temperature.

After normal operating temperature has been reached, an under-temperature condition will cause the respective annunciator to flash and the mater caution light to illuminate. Pressing the master caution will cause the flashing annunciator to change to steady on and the master caution to extinguish.

In the air, with left and/or right anti-ice switches selected to the WING/ENGINE position, the amber engine anti-ice light will flash and the mater caution light will illuminate if normal operating temperatures are not reached within 4 minutes and 45 seconds. Pressing the master caution will cause the flashing annunciator to change to steady on and the master caution to extinguish.

Nuisance trips (less than 5 seconds between resumption of normal temperature and the detection of a new under-temperature condition) are inhibited by circuit logic.

If the respective left and/or right WING/ENGINE anti-ice switches are selected to the OFF position and the respective engine anti-ice fan stator valve is open, the annunciator will flash and illuminate the master caution. Pressing the master caution will cause the flashing annunciator to change to steady on and the master caution to extinguish.

34. TL DEICE FAIL L R — The amber light flashes and the master caution illuminates steady if, after the system is selected on, the respective tail deice valve has a loss of voltage and/or the respective tail deice system has a loss of pressure during the 2 minute on cycle time. Pressing the master caution will cause the flashing annunciator to change to steady on and the master caution to extinguish.

35. TL DEICE PRESS L R — The white light illuminates steady to indicate the tail deice system is operating (pressure greater than 12 PSI).

36. AP PITCH MISTRIM — The amber autopilot pitch mistrim light flashes and the master caution illuminates steady to advise that the autopilot is in an out-of-trim condition, and that a sustained input is being applied to the elevator servo. Pressing the master caution will cause the flashing annunciator to change to steady on and the master caution to extinguish.

37.	AP ROLL MISTRIM	The amber autopilot roll mistrim light flashes and the master caution illuminates steady to advise that the autopilot is in an out-of-trim condition, and that a sustained input is being applied to the aileron servo. Pressing the master caution will cause the flashing annunciator to change to steady on and the master caution to extinguish.
38.	CHECK PFD 1	The amber check PFD 1 light flashes and the master caution illuminates steady if the pilot's primary flight display (PFD) has a malfunction. Check the pilot's PFD against the standby instruments or the copilot's PFD. Pressing the master caution will cause the flashing annunciator to change to steady on and the master caution to extinguish.
39.	CHECK PFD 2	The amber check PFD 2 light flashes and the master caution illuminates steady if the copilot's primary flight display (PFD) has a malfunction. Check the copilot's PFD against the standby instruments or the pilot's PFD. Pressing the master caution will cause the flashing annunciator to change to steady on and the master caution to extinguish.
40.	NOSE AVN FAN	The amber nose avionics fan fail light advises that the nose avionics compartment cooling fan has failed.
41.	TAILCONE DOOR	The amber tailcone door annunciator advises that the tailcone door is unlatched.
42.	CABIN DOOR	The amber light flashes and the master caution illuminates steady to indicate failure or improper position of door switch(es), and/or possible disengagement of the cabin door pin. Pressing the master caution will cause the flashing annunciator to change to steady on and the master caution to extinguish.
43.	GND IDLE	On the ground, the white ground idle light indicates the EEC is in ground idle mode (46%N_2). In the air, the white annunciator flashes and the master caution illuminates when the EEC is in ground idle mode. Pressing the master caution will cause the flashing annunciator to change to steady on and the master caution to extinguish. Once the airplane has transitioned from flight to ground mode, the annunciator will illuminate steady 8 seconds after throttles are positioned to idle.
44.	SPD BRK EXTEND	The white speed brake extend light advises that the left and right speed brakes are fully extended.
45.	ENG VIB L R	The white engine vibration light advises that the left and/or right engine vibration has exceeded prescribed limits.

TEST SYSTEM

The test selector is located in the upper left corner of the pilot's switch panel and offers several positions of test. It will function only when the BATT switch is ON. A red light above the test selector switch illuminates whenever the test selector switch is in any position but OFF.

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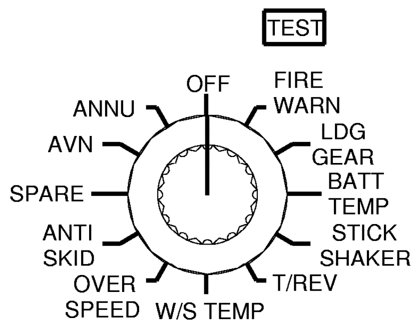

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Figure 2-30. Test Selector Switch

OFF	The red light will be off and the test system inoperative.
FIRE WARN	The engine fire lights on the upper center instrument panel will illuminate.
LDG GEAR	The three green safe lights and the red unlocked light on the landing gear control panel will illuminate and the warning horn will sound. Horn may be silenced by pressing horn silence button on landing gear control panel if flap position is less than 15 degrees.
BATT TEMP	The red BATT O'TEMP >160 annunciator will flash, the battery temperature gage will indicate 160°F and the MASTER WARNING lights will flash (cancelable).
STICK SHAKER	The stick shaker will operate on the left hand control column. The angle-of-attack meter needle will swing past the red band and the indexer will flash.
T/REV	The ARM, UNLOCK and DEPLOY thrust reverser lights (six) will illuminate and the MASTER WARNING lights will flash (cancelable).
W/S TEMP	The W/S AIR O'HEAT light will illuminate if LOW or HIGH is selected on the windshield bleed air switch.
OVERSPEED	Avionics switch must be on for the check of overspeed warning horn and related EFIS display information. The following indications will occur: The audible overspeed warning will sound and the PFD IAS will indicate approximate V_{MO} for the existing pressure altitude (red) PFD Mach will read .400 (red) Altitude will read 5000 feet PFD 1 & 2 vertical speed will read 2000 feet-per-minute.
ANTISKID	Initiates a self-test in the antiskid system. ANTISKID INOP will illuminate and remain illuminated five to seven seconds after the rotary TEST switch is selected to the ANTISKID position. ANTISKID INOP will then extinguish if the system checks operational. If the system does not check operational, the light will remain illuminated.
AVN	The avionics switch must be selected for this check. MASTER CAUTION and AP OFF and YD OFF annunciators will illuminate and the altitude alert tone will sound.
ANNU	The avionics switch must be selected for this check. All the annunciator panel lights and the master warning light will illuminate. Both red turbine overspeed lights will illuminate and the engine instrument digital display will flash 8's. AP OFF annunciators will illuminate and the altitude alert tone will sound

SECTION III

INSTRUMENTATION AND AVIONICS

CONTENTS

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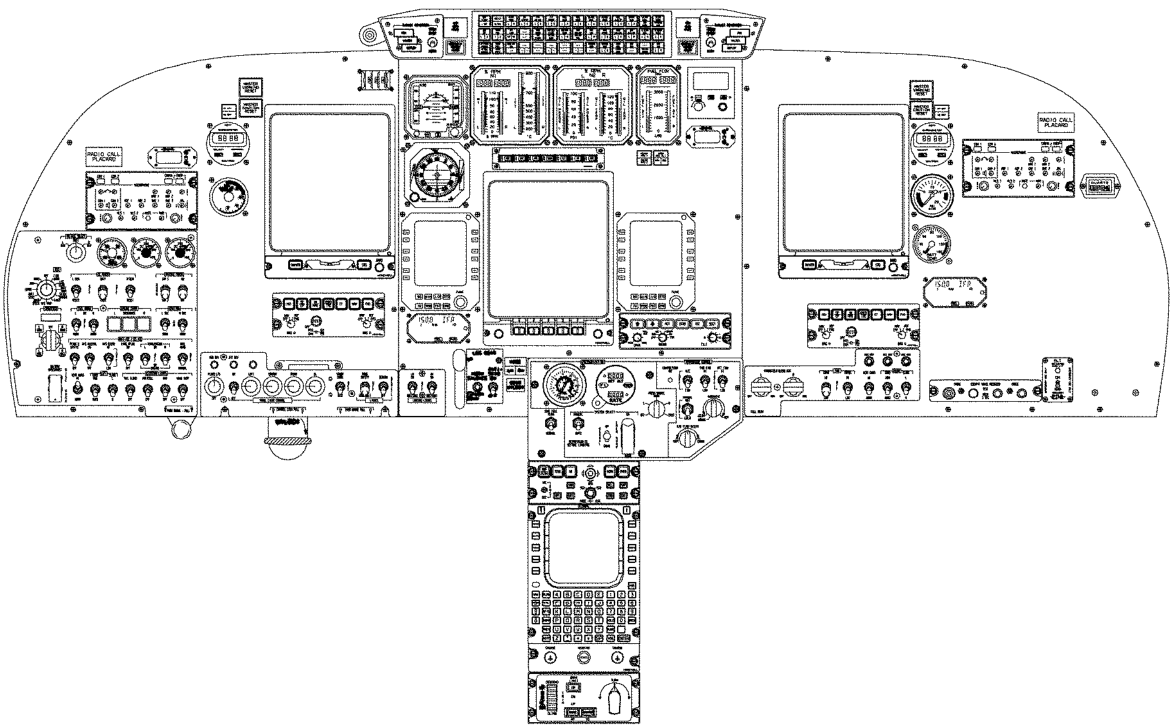

Figure 3-1 Instrument Panel (Typical)

INSTRUMENTATION

The Citation Encore is equipped with a Primus 1000 Integrated Avionics System which includes display, flight director guidance, autopilot, yaw damper and pitch trim functions. The system consists of the following components:

- IC-600 Integrated Avionics Computer (IAC) that includes:
  - Flight Guidance System (FGS)
  - Electronic Flight Instrument System (EFIS)
- AZ-850 Air Data System (ADS)
- Primus 880 Weather Radar
- Attitude and Heading Reference System

The IAC system is a fail-passive autopilot/flight director and display system that has full complement of horizontal and vertical flight guidance modes. These include all radio guidance modes, long range navigation system tracking modes, and air data vertical modes. Either pilot’s flight director (FD) can be coupled to control the airplane.

The IAC is the focal point of information flow in the system. It converts input data and information to the pilot-selected formats, and displays then on the attitude director indicator (ADI) and the horizontal situation indicator (HSI) within the confines of the primary flight display tube(s). The IAC also generates information that is displayed on the multifunction display (MFD), and it computes the flight director steering information for the autopilot function.

The two IACs are connected with high level data link control lines. This and other interconnects are used so that the flight guidance functions and symbol generator functions share, compare, and communicate blocks of information. When engaged and coupled to the flight director commands, the system’s autopilot controls the aircraft using the same commands that are displayed on the attitude director indicator. When the autopilot is engaged and uncoupled from the flight director commands, manual pitch and roll commands can be entered using the touch control steering (TCS) button or the autopilot PITCH wheel and TURN knob.

A standby flight display is installed, which displays the airplane attitude, altitude, and airspeed, as well as Mach number. All of this information is displayed in one DC powered cathode ray tube instrument, which is powered by its own battery. It receives its data from a small standby air data computer connected to the standby pitot-static system.

PITOT-STATIC SYSTEMS

The airplane is equipped with three separate and independent pitot-static systems. The two primary systems serve the pilot’s and copilot’s systems. The third (backup) system provides pitot and static air pressure to the backup airspeed indicator/altimeter on the center instrument panel and to the landing gear warning horn pressure switch, and provides a source of static pressure for the cabin pressure differential pressure gage.

Pitot pressure from the tube on the left side of nose of the airplane supplies pressure to the pilot's AZ-840 micro air data computer which, after converting the information into digital information, forwards the data through the system to the pilot’s primary flight display. The pitot tube on the right side of the nose of the airplane serves the same function in the copilot’s system. The pitot tube on the right side of the fuselage, below and forward of the emergency exit hatch, provides pitot pressure to the backup airspeed indicator/altimeter and the landing gear warning horn pressure switch.

Three static ports are located on each side of the airplane at approximately fuselage station 150. The lower port on the left side and the upper port on the right side provide the static source for the pilot's system. The upper port on the left side and the lower port on the right side provide the static source for the copilot's system. The center ports on each side provide static pressure for the backup pitot-static system. The two pitot tubes and four static ports of the primary pitot-static systems, as well as the two static ports and single pitot tube of the backup system, are electrically heated for ice protection.

ALTIMETER AND AIRSPEED INDICATIONS

Altitude and airspeed data to the primary flight displays (PFD) are provided by information generated by the AZ-850 micro air data computers which is transmitted in digital form through the IC-600 Display Guidance Computers to the pilots' primary flight displays. The altitude and airspeed are then presented in color on the display in the PFDs. The micro air data computers also generate the altitude information which is used by the mode C function of the transponders, and for the optional Traffic Collision Avoidance System(TCAS) if it is installed.

AIRSPEED INDICATION

The indicated airspeed display is to the left of the attitude display on the primary flight display. The display consists of a "rolling digit" window in the center of an airspeed vertical tape. The resolution of the rolling digits is one knot. The moving vertical tape moves behind the window and displays digital airspeed at 20 knot intervals, with the larger numbers at the top of the scale. The range of the airspeed scale is 40 to 400 knots with tick marks at 10-knot intervals. An airspeed trend vector, which displays an indication of the direction and rate of airspeed change, extends vertically from the apex of the current airspeed value display window. It extends upward for acceleration and downward for deceleration. The trend vector represents a prediction of what the airspeed will be in approximately 10 seconds if the current change in airspeed is maintained.

"Bugs" for six V-speeds are provided to allow pilot selection of key airspeeds by means of the multifunction display (MFD) bezel buttons. The bugs are labeled 1, (V_1) R (V_R), 2, (V_2)and E (V_{ENR}) (this airspeed is automatically displayed whenever V_1, V_R, or V_2 is selected for display; V_{ENR} is permanently selected to 160 knots) and RF (V_{REF}) and AP (V_{APP}). When the speeds are selected digital indications appear at the bottom of the PFD display as well as the bugs being placed into position. The bugs are positioned on the right outside edge of the airspeed tape. They consist of a horizontal T-shaped symbol with its respective label positioned to the right of the symbol. All the takeoff set bugs will be removed from the display when that airspeed has been attained and the airspeed exceeds 230 knots and the landing speed bugs are removed upon touchdown.

When the airspeed is below 40 knots, V_1, V_R, V_2, and V_E are displayed in the bottom portion of the airspeed tape in the form of a digital readout. The digital readout of the set value is displayed along with the bug symbol and are labeled in ascending order, starting with V_1. Upon power up, the digital readouts for the set bugs will be amber dashes. As the V speeds are set on the MFD menu, the digital readouts will follow the readout on the MFD and set accordingly. The digital readouts are removed from the display when the first V speed value comes into view on the airspeed tape.

Standby altitude and airspeed are available, in case of main electrical system failure, from the standby altimeter and the standby airspeed indicator, which are located in the standby flight display. These indicators receive their data from a standby micro air data computer (MADC). The standby MADC, powered by its own battery source, obtains its pneumatic data from the standby pitot-static system and converts it to digital electrical outputs for the indicators.

OVERSPEED INDICATIONS

Below 8000 feet altitude the limiting airspeed (V_{MO}) is 260 KIAS; between 8000 feet and 28,907 feet the limiting airspeed is 292 KIAS. When one of these limits is exceeded, the airspeed indication in the window to the left of the attitude display in the PFD will be changed to red and an amber annunciation, also to the left of the attitude sphere, will announce MAX AIRSPEED. A red thermometer type tape is also presented on the inside of the airspeed scale. The thermometer extends from V_{MO}/M_{MO} to larger airspeeds on the tape and appears in the indication as the airspeed reaches into the range near V_{MO}/M_{MO}. When the limiting airspeed is exceeded the overspeed warning horn will sound, and will continue to sound until the airspeed is reduced below the limit speed.

NOTE

- The aural warning system consists of two separate units which receive input from airplane anomalies of overspeed, autopilot off and altitude alert. The units will output aural signals to both the headphones and speakers.

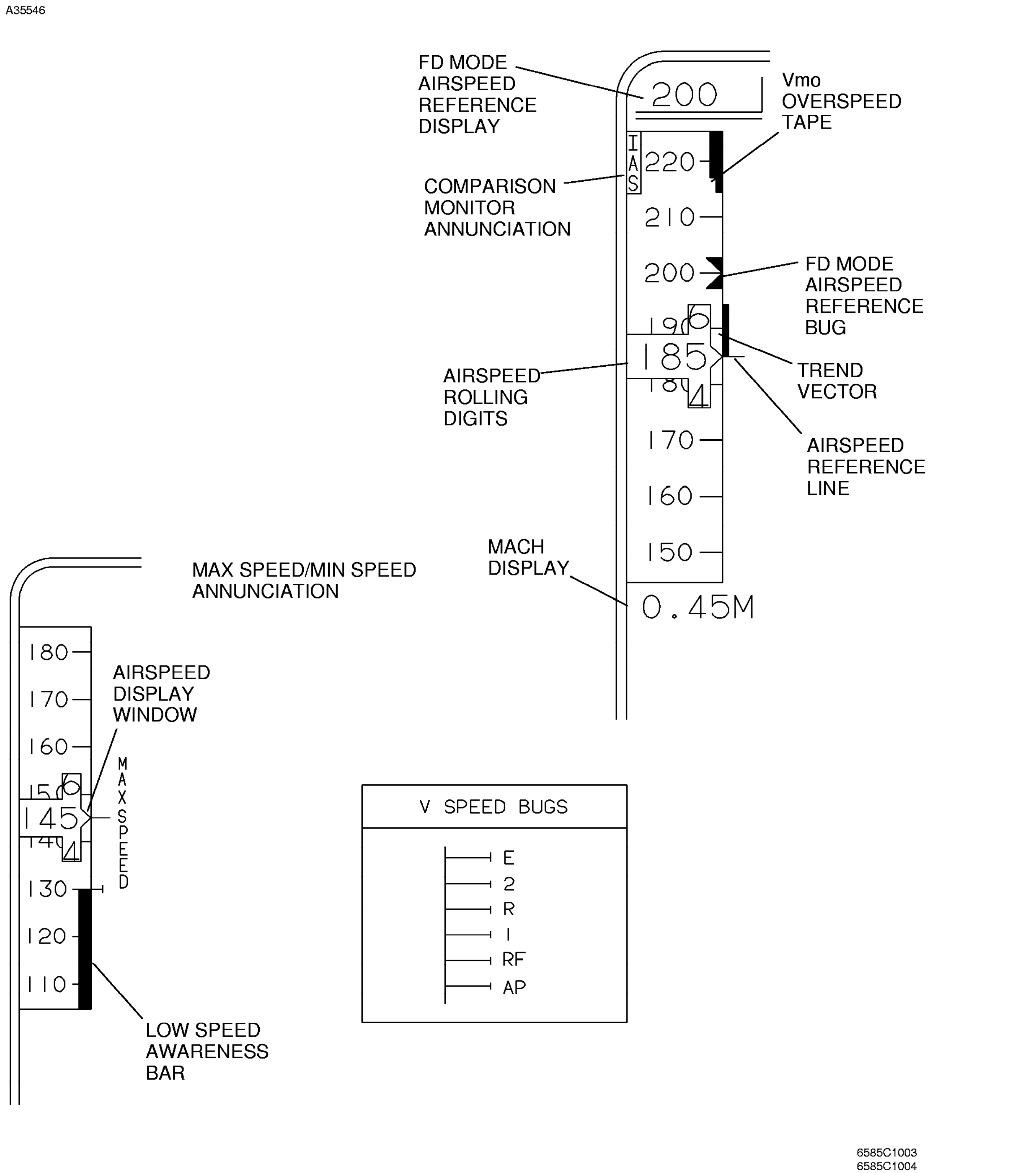

Figure 3-2 Typical Airspeed Display

LOW AIRSPEED AWARENESS

A red, amber, and white thermometer type display located on the inside of the airspeed scale gives indication of low airspeed. The white extends from 1.3 V_{S1} to 1.2 V_{S1}, the amber band extends from 1.2 V_{S1} to 1.1 V_{S1} (approximately stick shaker speed), and the red extends from stick shaker speed to the smaller airspeeds on the tape.

ALTITUDE INDICATION

The altitude display is located to the right of the attitude display on the primary flight display. The altitude is indicated by means of a vertical tape display which has a "rolling digit" window in the center of an altitude vertical tape. The resolution of the digits is 20 feet. The hundreds, thousands, and ten thousands digits are larger digit numerals than the others. The vertical tape moves behind the window and displays a tape 550 feet both above and below the present indicated altitude, with the larger numbers at the top of the scale. The range of the altitude window is from -1,000 to 60,000 feet with tick marks located at 500 foot increments. The scale is labeled in 500 foot intervals and single line chevrons are located at each 500 foot increment. Double line chevrons are located at each 1000 foot increment. The chevrons extend back to the approximate midpoint of the altitude tape and are connected with each other by a vertical line. The left side of the "rolling digit" window has the same angle as the chevrons.

The barometric pressure setting is controlled by a BARO knob at the bottom right of the primary flight display. A STD button, located next to the BARO knob, allows a change to a baro setting of 29.92 in. Hg. (or 1013 millibars) by simply pressing it. The baro correction setting display is located just below the altitude dial. When set to in. Hg. the BARO knob will change the altitude correction by 0.01 in. Hg. per click.

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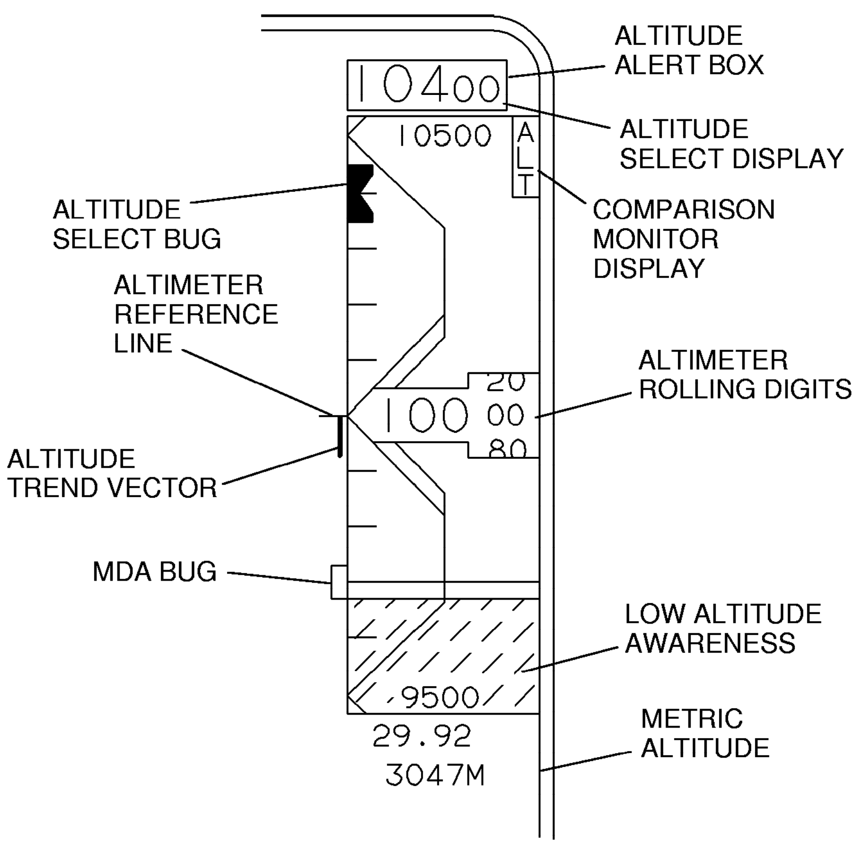

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Figure 3-3 Typical Altitude Display

An altitude trend vector is displayed on the left edge of the altitude tape and provides an indication of the rate of altitude change. The trend vector extends vertically from the apex of the current altitude display window. The vector extends up for positive vertical trends and down for negative values. The vector represents a prediction of what the altitude will be in six seconds if the current vertical speed is maintained.

Standby altitude indications are always available from the standby flight display which is discussed under Standby Flight Display System below in this section.

MACH NUMBER DISPLAY

A digital readout of indicated Mach number is displayed below the airspeed dial. The Mach number will come up on the display when Mach exceeds 0.390, and is removed when it is falls below 0.380 Mach. Resolution of the Mach display is 0.0001 Mach.

VERTICAL SPEED INDICATION

Vertical speed data is developed in the AZ-850 Micro Air Data Computers, which sense the rate-of-change of altitude from inputs of the static system. The computers convert the data into digital form and transmit it through the digital data bus system to the IC-600 Display Guidance Computers, which forward it to the DU-870 Primary Flight Displays where it is generated into a visual display.

The vertical speed display is a fixed scale meter movement type display; a pointer rotates about a point which is outside of the actual display. The scale is non-linear, which provides increased resolution around zero vertical speed. In the center of the scale a digital readout of the actual vertical speed is displayed. The digital display has a resolution of 50 feet per minute and can accommodate rates of climb or descent of 9900 feet per minute. On the display scale tick marks are located at the positive and negative values of 500, 1000, 1500, 2000, 2500, and 3000 feet per minute. The pointer will continue to move up to plus or minus 3200 feet per minute but will have a reduced sensitivity. The digital display and the digital readout box will be removed from the display for vertical speeds of plus or minus 500 feet per minute, leaving only the meter type display.

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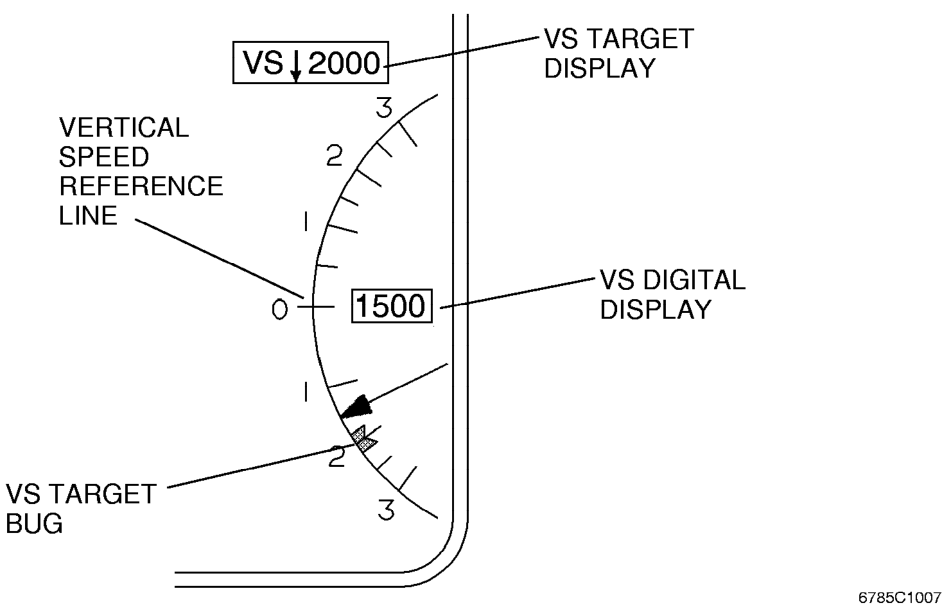

Figure 3-4 Vertical Speed Display

INCLINOMETERS

Conventional inclinometers (slip indicators) are fixed to the bezel of each primary flight display. In addition, the primary flight displays also show split sky pointers.

ENGINE INSTRUMENTS (For non-AMLCD equipped Aircraft)

Each engine is equipped with the following instruments located on the center instrument panel:

Fan RPM
Inter-Turbine Temperature (ITT)
Turbine RPM
Oil Temperature
Oil Pressure
Fuel Flow
Fuel Quantity

All engine instruments are of the vertical tape readout design except for the turbine RPM and fuel flow, which are digital readout only The gages are powered by 28 VDC through circuit breakers on both cockpit circuit breaker panels. The fan tachometer also has a digital RPM display as well as the vertical tape. The digital display is provided above the N_1 tape for a more accurate readout. The loss of DC power or instrument failure is indicated by OFF flags in each instrument, except the fan (N_1) and turbine (N_2) digital tachometers.

The fan RPM (% RPM N_1) and turbine RPM (% RPM N_2) are calibrated in percent from 0-115% (100% Fan RPM = 15,850; 100% Turbine RPM = 33,970). The fan (N_1) tachometers are powered from the emergency bus and are thus available in case of electrical system failure. They are powered by engine monopoles (magnetic speed sensors) mounted on the applicable engine shaft and require airplane electrical power for operation. The N_2 gage will illuminate the small red lights beside the digits and flash the display if a turbine overspeed occurs.

The ITT gage is calibrated in degrees centigrade from 150-800. The temperature displayed is a synthetic inter-turbine temperature which is computed by measuring the exhaust gas temperature and then adding to it three times the temperature rise across the fan.

The FUEL FLOW gage displays fuel flow in pounds per hour. Readings are accurate at stabilized power settings.

The FUEL QUANTITY gage is calibrated in pounds of fuel and accurately displays fuel remaining in the left and right tanks.

The OIL TEMPERATURE gage, in degrees centigrade and the OIL PRESSURE gage in PSI, show system limitations on the face of the instrument with red, yellow and green markings.

RAM AIR TEMPERATURE INDICATOR

A ram air temperature (RAT) indicator, located on the upper left side of the left instrument panel displays air temperature uncorrected for ram rise. Either Celsius or Fahrenheit readings may be selected by a switch on the face of the instrument.

FUEL TEMPERATURE INDICATOR

A fuel temperature indicator, located on the upper right side of the center instrument panel, displays the temperature, in degrees centigrade, of the fuel in either the left or right wing fuel tank. A switch on the face of the instrument allows selection between left and right fuel tank.

TRUE AIRSPEED PROBE

A true airspeed (TAS) probe is located below the windshield on the fuselage right side. The TAS probe temperature reading is fed directly into the Air Data Computers for computational purposes only and does not provide a viewable readout.

AMLCD INDICATING INSTRUMENT

Each engine is equipped with the following instruments displayed on the center instrument panel (See Figure 3-5):

Fan RPM (N_1)
Inter-Turbine Temperature (ITT)
Turbine RPM (N_2)
Oil Pressure
Oil Temperature
Fuel Flow

Also shown in addition to the engine instruments are:

Ram Air Temperature (RAT)
Fuel Temperature
Fuel Quantity

The engine instruments are displayed on a two screen active matrix liquid crystal display (AMLCD). On the left screen, $N_{1,}$ ITT, and Oil Pressure are shown with a vertical (tape) indicator format. Also shown are digital displays of N_1, ITT, and N_2. On the right screen, Oil Temperature and Fuel Quantity are shown with a vertical indicator format. Also shown are digital displays of Fuel Flow, RAT, Fuel Temperature, and Fuel Quantity.

A reversionary mode is available if a fault is detected. In the reversionary mode, one screen displays all of the parameters, while the opposite screen is blank. N_1 and ITT are shown with a digital and vertical indicator format, while all other parameters are shown in digital format only. The N_1 bugs and the IGN annunciators work the same as in the normal mode.

The reversionary mode is controlled by a rotary switch to the right of the engine instruments, labeled L-Auto-R. When this switch is in the AUTO position, the reversionary mode is automatically selected if a fault is detected. If the crew suspects a fault, the reversionary mode can be manually selected by placing the switch in the L or R position.

The left and right screens are powered through the LH ENG DISPLAY and RH ENG DISPLAY circuit breakers, on the respective left and right circuit breaker panels. The LH ENG DISPLAY circuit breaker is on the emergency bus, so when the battery switch is in the EMER position and the generators are offline, the left screen will change to the reversionary mode and the right screen would then be blank. Oil pressure and fuel quantity displays will be inoperative on the left screen, since they are powered through separate circuit breakers which are not on the emergency bus.

The fan RPM (N_1) and turbine RPM (N_2) are calibrated in percent from 0 - 115% (100% Fan RPM = 13034 RPM, 100% Turbine RPM = 32700 RPM). The fan and turbine RPM measurements come from monopoles (magnetic speed sensors) mounted on the applicable engine shaft. The vertical indicator and/or digits will turn red if 100% (redline) is exceeded. Two cyan N_1 bugs are displayed on both sides of the N_1 vertical indicators, and cyan digits above the vertical indicators show the N_1 bug setting. The bugs are set with a three position rotary switch to the left of the engine instruments labeled DEC - (off) - INC. At startup the N_1 bugs are set at 87.5%, and the cyan digits will flash until the switch is used to set the bugs to the correct N_1 target. Turn the switch to the DEC position to decrease the N_1 bug setting, and to the INC position to increase the N_1 bug setting.

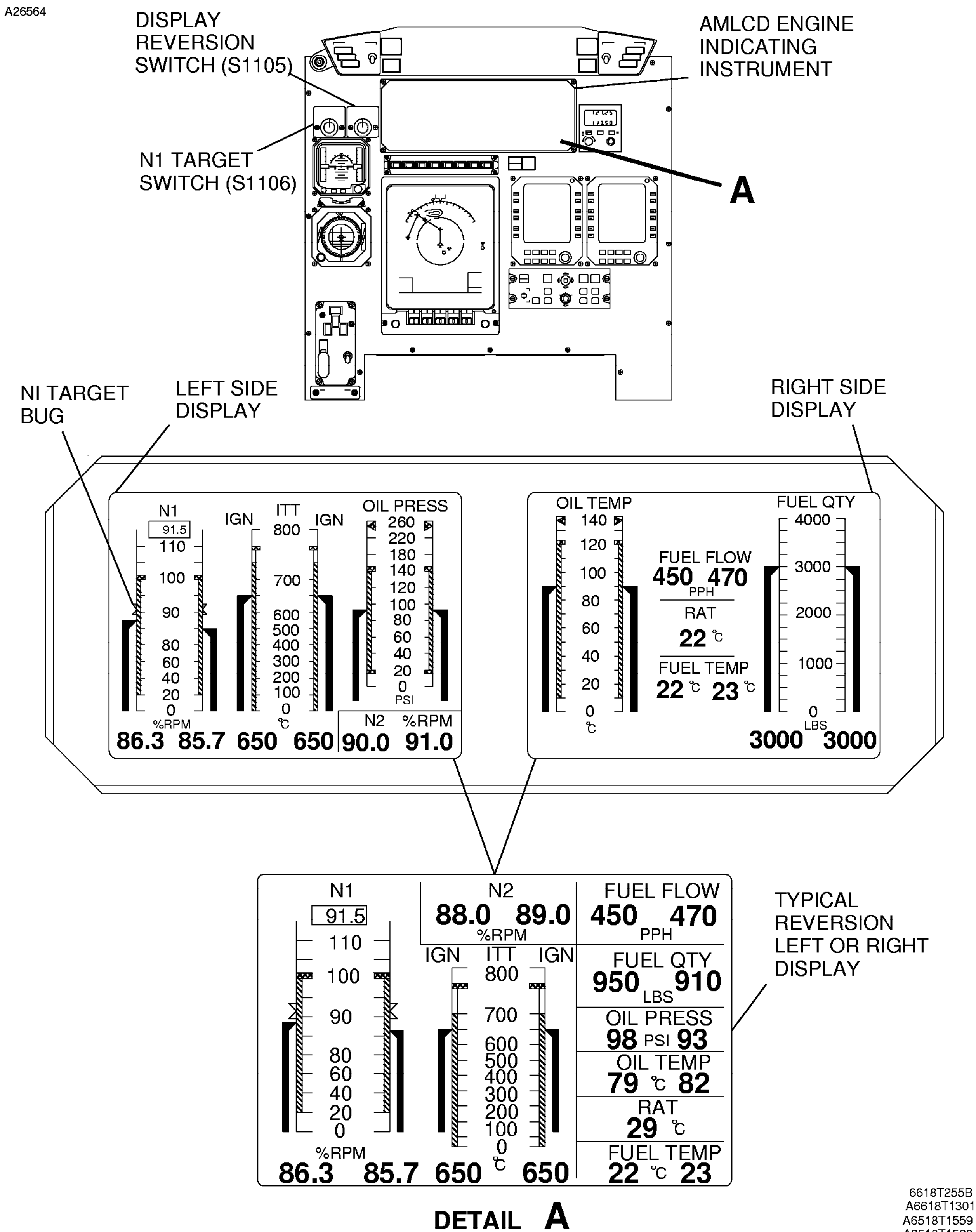

Figure 3-5 AMLCD Indicating Instrument

The ITT gage is calibrated from 0 - 750°C. The temperature displayed is a synthetic inter-turbine temperature which is computed by measuring the exhaust gas temperature and adding to it three times the temperature rise across the bypass duct. During normal engine operation, if the 741°C redline is exceeded, the ITT vertical indicator will turn red and red digits will be displayed. During an engine start sequence, green ITT digits will be displayed and the vertical indicator and digits will only turn red if the start temperature redline (740°C) is exceeded. When the ignition system is on, IGN is annunciated in green letters above the ITT vertical indicator.

The oil pressure gage is calibrated from 0 - 260 psi. The vertical indicator (or digits in the reversionary mode) turn red or yellow if a redline is exceeded or the yellow band is entered. When the 160 psi redline is exceeded, the red color change is suppressed for 400 seconds. Exceeding the 250 psi redline is indicated in red immediately. During engine start and shutdown, the yellow range changes of the indicators or digits are suppressed, the red triangle is still active.

The oil temperature gage is calibrated from 0 - 140°C. The vertical indicator (or digits in the reversionary mode) turn red if the 121°C redline is exceeded.

The fuel flow gage displays fuel flow in pounds per hour. Readings are accurate at stabilized power settings.

Ram air temperature (RAT) gage is calibrated from -70 - +70°C. It displays outside air temperature uncorrected for ram rise.

The fuel temperature gage is calibrated from -60 - +70°C.

The fuel quantity gage is calibrated in pounds of fuel and accurately displays the fuel remaining in the left and right tanks.

MAGNETIC COMPASS

A standard liquid filled magnetic compass is mounted above the glareshield.

FLIGHT HOUR METER

The quartz hour meter on a panel next to the right circuit breaker panel displays the total flight time on the airplane in hours and tenths. The landing gear squat switch activates the meter when the weight is off the gear. A small indicator on the face of the instrument rotates when the hour meter is in operation. It receives DC power from a circuit breaker (FLT HOUR) on the left circuit breaker panel.

STANDBY FLIGHT DISPLAY

A Meggitt Avionics Standby Flight Display (SFD) System indicator is located on the left side of the center instrument panel. This DC-powered cathode ray tube indicator combines standby attitude indicator, and altimeter, and airspeed indications into one composite instrument. A Mach indication is also included in the instrument. Pneumatics inputs, which are received from the standby pitot-static system, are fed into a standby micro air data computer (MADC) which is powered from the DC emergency bus. The standby MADC converts the data to digital information and forwards it to the indicator.

The SFD contains a gyro solid state inertial sensors for the measurement and presentation of aircraft pitch and bank attitudes. Application of 28-volt DC power to the display system initiates the attitude initialization process, which is identified by the display of the message “attitude initializing” in yellow on the SFD. The duration of the initialization process is normally less than 180 seconds.

The attitude display has an instantaneous display range of 360° of bank and 50° of pitch. A moving tape on the right side of the display includes a “rolling digit” depiction of altitude; the tape is marked in 100 foot increments with a numeric marking every 500 feet. The altitude display range is -2000 feet to 66,000 feet with a resolution of 20 feet. Baro data is set in the altitude display by a knob on the bottom right of the bezel; clockwise rotation increases the pressure setting and counterclockwise decreases it. The setting is displayed simultaneously in millibars at the top right of the display and in inches of mercury at the bottom right. On the left side of the display is a moving tape showing airspeed. The tape is marked in ten knot increments with a numeric marking every 20 knots and a “rolling digit” display in the center which becomes active at 40 knots. The airspeed display range is 40 to 500 knots with a resolution of one knot. The Mach number is displayed in the upper left corner of the display. The Mach display range is 0.350 to 0.999 Mach with a resolution of 0.001 Mach.

Failure flag indications for airspeed and altitude are red crosses covering the appropriate tape box, with all indications removed from within the box. The failure flags for the Mach indication and Baro Setting are a series of four red dashes in the appropriate display area. A light sensor is located on the bottom left side of the instrument case. It provides ambient light level data to the backlight control system to ensure optimum display brightness. The lighting level can still be controlled manually from the center instrument panel light rheostat control.

The navigation display is selected by the APR button on the bottom of the display bezel. Pressing the button results in display of ILS localizer and glideslope information from NAV 1 receiver. The ILS can be flown by reference to the ILS localizer and glideslope display on the SFD and/or standby horizontal situation indicator (HSI).

Power to the SFD is controlled by a switch marked STDBY GYRO (ON)/OFF/TEST located on the lower right of the pilot's instrument panel. The SFD has an emergency source of power from an emergency battery pack located in the nose avionics compartment of the airplane. This battery pack also provides emergency instrument lighting for the standby flight display system, the dual fan (N_1) tachometers/interturbine temperature (ITT) indicators and the standby horizontal situation indicator (HSI).

The battery pack is constantly charged by the airplane's electrical system, and should therefore be fully charged in the event of an electrical power failure. The STDBY GYRO switch must be ON for automatic transfer to battery power to occur. The SFD will operate for a minimum of 30 minutes on battery power. An amber POWER ON light next to the STDBY GYRO switch illuminates when the SFD is turned ON and the airplane's electrical system is not charging the emergency power supply batteries. When the SFD switch is held to the spring-loaded TEST position, a self-test of the battery and circuits is accomplished. The green GYRO TEST light, also next to the STDBY GYRO switch, will illuminate if the test is satisfactory and the battery is sufficiently charged.

When NAV 1 is tuned for ILS operation, pressing the APR button will select ILS localizer and glideslope display. Pressing the button a second time will provide back course display, and pressing it a third time will revert the display to non-ILS format. Maximum allowable airspeed (VMO) is displayed in analog form by a red warning strip on the airspeed tape. When VMO is reached, the numerals on the numeric airspeed display change from white to red. When the maximum allowable Mach number (MMO) is reached, the numeric Mach number display will also change from white to red.

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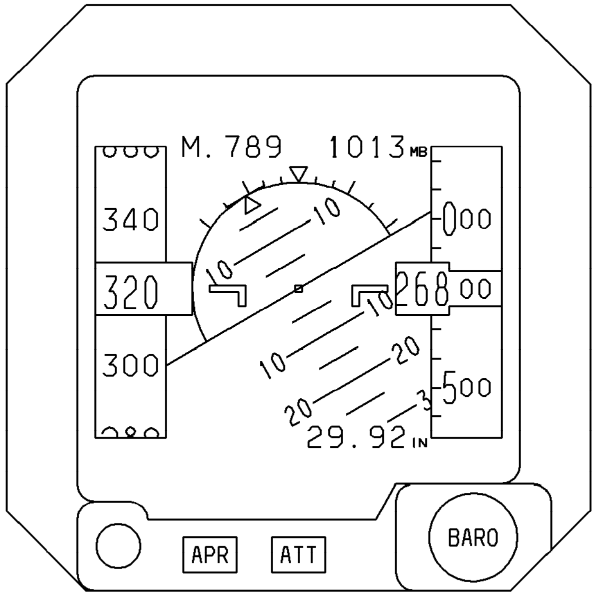

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Figure 3-6 Standby Flight Display

A built-in power up test system (PBIT) will automatically detect any failure of the display at power up or during continuous (CBIT) operation. If the pilot desires to test the system after it is powered up, pressing and holding the APR button while pressing the ATT button twice within two seconds will start an initiated built-in test (IBIT). The IBIT mode cannot be accessed at airspeeds greater than 40 knots. The APR button must be held in to cycle through all the IBIT displays.. If a failure is detected, the appropriate part of the display is replaced with a message indicating the failure. Where it is not possible to display an appropriate message (such as processor failure), the display backlight is switched off.

ANGLE-OF-ATTACK AND STALL WARNING SYSTEM

The angle-of-attack system is powered by 28 volts direct current (DC) from the left main DC bus through a circuit breaker on the left circuit breaker panel and incorporates an angle-of-airflow sensor, a signal summing unit, a vane heater monitor, an angle-of-attack indicator, an approach indexer and a stick shaker on the left control column. The vane type angle-of-airflow sensor, which is located on the forward right side of the fuselage, detects the angle of airflow and deflects accordingly. The wedge-shaped vane streamlines with the relative airflow and causes a transducer, at which it is mounted, to send signals to the signal summing unit (computer) located under the floor of the aft cabin baggage compartment. Signal inputs concerning flap position are also received by the signal summing unit. It then compensates for that variable and transmits the information to the angle-of-attack indicator and the optional indexer. Indications are accurate throughout the weight and CG range of the airplane.

The full range type indicator is calibrated from 0.1 to 1.0., and marked with red, yellow and white arcs. Lift information is displayed on the indicator with 0.1 representing near zero lift and 1.0 representing stall. Lift being produced is displayed as a percentage and, with flap position information, is valid for all airplane configurations and weights. At 1.0 where full stall occurs, 100 percent of the available lift coefficient is being achieved. At the bottom of the scale (0.1) near zero lift is being produced.

The area at the lower part of the scale (0.57 to 0.1) represents the normal operating range of the airplane, except for approach and landing. The narrow white arc (0.57 to 0.63) covers the approach and landing range and the middle of the white arc, 0.6, represents the optimum landing approach (V_{APP} or V_{REF}). The yellow range (0.63 to 0.85) represents a caution area where the airplane is approaching a critical angle-of-attack. The red arc (0.85 to 1.0) is a warning zone that represents the beginning of low speed buffet followed by full stall. If the angle-of-attack system loses power or becomes inoperative for other reasons, the needle will deflect to the top of the scale and stow at a 1.0 indication. A red X will also appear at the EADI slow/fast indication. The airplane may not be flown if the stick shaker is found to be inopertive on the preflight check, or if the angle-of-attack system is otherwise inoperative.

WARNING

IF THE ANGLE-OF-ATTACK VANE HEATER FAILS AND THE VANE BECOMES ICED, THE STICK SHAKER MAY NOT OPERATE OR MAY ACTIVATE AT NORMAL APPROACH SPEEDS

An optional approach indexer, mounted on the pilot's glareshield, provides a "heads up" display of deviation from the approach reference. The display is in the form of three red lighted symbols which are used to indicate the airplane angle-of-attack. High angle-of-attack is analogous to low airspeed; low angle-of-attack is analogous to high airspeed. Illumination of the symbols is progressive as the airplane angle-of-attack changes. When the airplane speed is on reference the center circle will be illuminated. As the speed decreases from reference (.6) the circle illumination will dim and the top chevron illumination will increase until the top chevron is fully illuminated and the circle is extinguished. As the angle-of-attack becomes high the top chevron will begin to flash.

When the airplane is accelerating from the on-speed reference the illumination of the circle will dim and illumination of the bottom chevron will increase until the circle is extinguished and only the bottom chevron is illuminated. The top chevron points down, indicating that the angle-of-attack must be decreased to eliminate the deviation. The bottom chevron points up to indicate that the angle-of-attack must be increased to eliminate the deviation. The indexer is active any time the nose gear is down and locked and the airplane is not on the ground. There is a twenty second delay after takeoff before the indexer will activate.

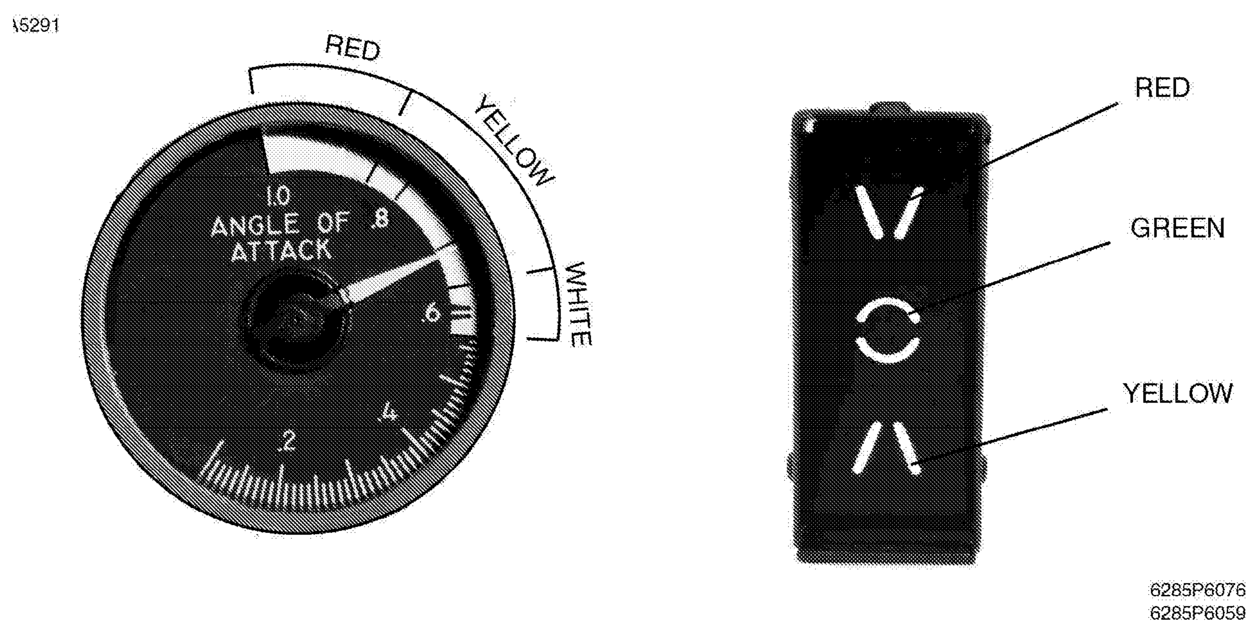

Figure 3-7. Angle-of-Attack Indicator And Indexer

DIGITAL CLOCK

One model M877 digital clock is mounted on the left side of the pilot's instrument panel and one on the right side of the copilot's panel. The clock can be made to display four time functions: local time, GMT, flight time and elapsed time. Two versions of the elapsed time function may be selected: count up or count down. The clock has two control buttons: SEL (select) and CTL (control). The SEL button is used to select the desired function, and the CTL button to start and reset the selected mode.

For normal operation, either local time or Greenwich Mean Time (GMT) may be selected. GMT is displayed only in 24-hour format, and local time is 12-hour format. Pressing the SEL button sequentially displays GMT, local time, flight time and elapsed time. The displayed mode is annunciated GMT, LT, FT and ET, as applicable, under the time display window. To set GMT or local time, select the desired function by pressing the SEL button. Simultaneously press both the SEL and the CTL buttons to enter the set mode. The tens of hours digit will start flashing and may be incremented by pressing the CTL button. The next digit is then selected by pressing the SEL button, and similarly set by means of the CTL button. When the last digit has been set, press the SEL button to exit the set mode. At that time the clock will start running and the lighted annunciator will resume flashing. When no airplane power is applied to the clock, the SEL and CTL buttons will not operate.

To use the clock as a stop watch to time approaches, etc., select ET with the SEL button and press the CTL button to start the timing. The clock will start counting elapsed time in minutes and seconds up to 59 minutes and 59 seconds. It will then switch to hours and minutes and continue up to 99 hours and 59 minutes. Pressing the CTL button will reset the elapsed time to zero. To use the clock for an elapsed time "count down" display, select ET for display and enter set mode by pressing both buttons simultaneously. A maximum count down time of 59 minutes and 59 seconds can be set. The time from which it is desired to count is entered in the same manner as setting GMT or local time. When the last digit is set, press the SEL button to exit the set mode. Pressing the CTL button will start the countdown. The display will flash when the time reaches zero. After reaching zero, the ET counter will count up. Pressing the CTL button again resets ET to zero.

A4546

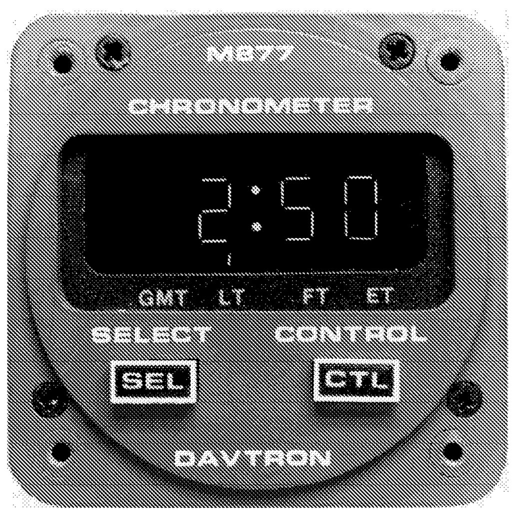

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Figure 3-8. Digital Clock

A flight time alarm mode is provided which will flash the clock display when the desired flight time is reached. To set the alarm function, select FT with the SEL button and enter the set mode by pressing both buttons simultaneously. Enter the desired alarm time in the identical manner that GMT or local time is set. When flight time equals the alarm time, the display will flash. If FT is not being displayed when the alarm time is reached, the clock will automatically select FT for display. Pressing either the SEL or CTL button will turn off the alarm and reset the alarm time to zero. Flight time is unchanged and continues counting.

The clock display may be tested when power is on the airplane by holding the SEL button down for three seconds. The display will show 88:88 and activate all four annunciators.

AVIONICS

The standard avionics package includes dual audio control panels, dual VHF COMM transceivers, dual NAVs, dual RMUs, dual DMEs, dual transponders, ADF, automatic flight guidance system, pilot's electronic flight instrument system (EFIS, which is part of the flight guidance system), a GNS-X_L flight management system with GPS capability, a standby horizontal situation indicator, a secondary flight display and weather radar. Included as part of the automatic flight guidance system is altitude preselect, altitude alerting, altitude reporting and vertical navigation. The system provides Category II equipment capability. An optional traffic collision avoidance system (TCAS) and a second ADF are available.

VHF COMM - HONEYWELL PRIMUS II REMOTE RADIO SYSTEM

The RCZ-833F integrated communications unit normally operates in the frequency range of 118 to 136 MHz with 25 kilohertz (KHz) and 8.33 KHz spacing. The unit can be strapped to extend the upper range to 152 MHz for operation in parts of the world where those frequencies are used. The RCZ-850 unit is the communications component of the SRZ-850 integrated radio system. The COM radios are controlled from the RM-850 radio management unit (RMU), two of which are mounted on the center instrument panel. COM 1, NAV 1, ADF 1, etc. are controlled by the left RMU and COM 2, NAV 2, and ADF 2 (if installed) are controlled by the right RMU. The unit being controlled is annunciated on the control display unit of the RMU. The four radio functions: COM, NAV, ATC (Transponder), and ADF which are controlled by the RMU are all displayed on page one (main frequency select page) of the RMU. Tuning control for the desired function/parameter is obtained by pressing the line select key next to that function/parameter. The COM radio has a memory capacity for up to 12 frequencies to be selected and stored for later use.

CONTROLS AND INDICATORS

Control of the COMM radios is normally through the controls and display located in the upper left corner of the radio management unit (RMU). Any selectable parameter is changed by pressing the corresponding line key next to the displayed parameter which brings an amber box (cursor) to surround that position, which allows it to be tuned by the single controller tuning knob on the bottom of the RMU.

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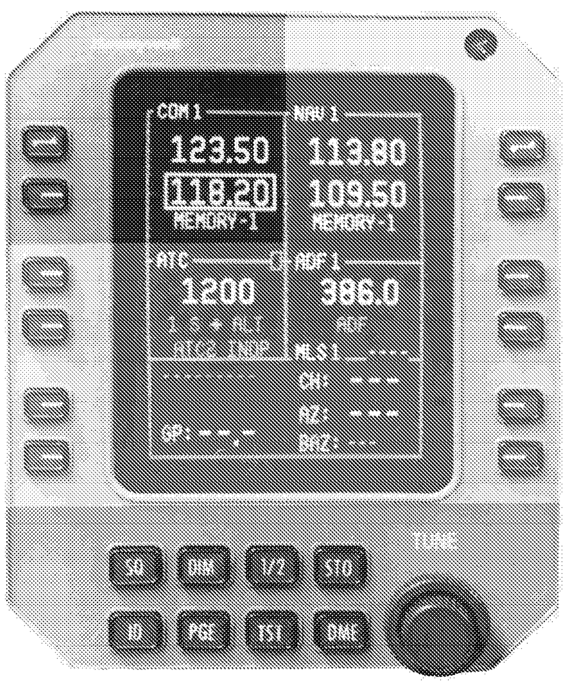

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Figure 3-9. PRIMUS II - COM Controls

CONTROLS AND INDICATORS

Tuning of the COM radios is accomplished by three methods. The first method, discussed below, also provides methods to store frequencies in the memory locations. This is considered the "normal" method. Storing of the frequencies while tuning is not required, however, and is discussed there only because it may be convenient to store the frequencies as they are used for possible later use. The second method is "direct tuning", and the third is remote tuning through the Auxiliary COM 1/NAV 2 control display unit control head which may be used when only battery power is available or desired, or in case of emergency. Operation of the Auxiliary COM 1/NAV 2 control display unit control head is discussed at the end of the COM section.

Normal, or preselect tuning of the COM radios is accomplished in the following manner: Press the line key next to the second COM frequency line displayed on the RMU. The amber box will move to that position if it is not already there; set the desired frequency by means of the concentric tuning knobs at the bottom of the RMU; press the upper left button on the RMU bezel (the one with vertical arrows), which will switch the pretuned frequency with the active frequency. When a frequency is preselected (set in the second line), it may result in the changing of a frequency which was identified by MEMORY, plus a number from 1 to 12, below the active frequency. The prior number has been stored in memory and the imposition of the second frequency over it is only temporary (which is identified TEMP) and will not result in the new frequency being stored in the memory unless the STO button is pressed before the frequency is transferred to the active location (top line). In this case, the word TEMP will be replaced by the word MEMORY plus the memory position number. The pilot may progress through all 12 of the memory locations by pressing the line key near the line identified by TEMP or MEMORY in the COM box (upper left hand corner), which will move the amber box to surround that line. Turning either the large or small tuning knob will then select each memory space sequentially, showing the frequency stored there in blue on the line above the MEMORY annunciator line. Vacant memory locations will not appear. When the last occupied memory location is selected, the frequency shown on the second line, which was a temporary frequency in memory, will again be shown to occupy that space, plus the word TEMP, indicating that it is not stored in MEMORY.

When progressing through the stored memory locations, the frequency in the memory location being displayed can be transferred into the active position (tuned) simply by pressing the upper button (the one with the vertical arrows).

If the pilot desires to view all of the stored frequencies at once, he may press the PGE (page) button at the bottom of the RMU and the active frequency, with a maximum of six stored frequencies, will be displayed along with the number of their memory location. Pressing the line key adjacent to the MORE annunciator will advance the page to show the remaining frequencies with their location numbers of 7 through 12. If it is desired to insert a frequency in any particular location on these pages, move the cursor to that location by pressing the line key next to the desired memory location and the tuning knob will control that selection. The memory locations must be filled sequentially, i.e., blanks cannot be left open. If memory location eleven is vacant, for instance, and an attempt is made to store a frequency in location twelve, the word “can’t” will appear in amber at the bottom of the page. It is not necessary to push STO to store the frequency. If deletion of a stored frequency is desired, press the line key adjacent to that memory location and press the line key adjacent to the DELETE annunciator. Higher memory locations will move down to fill the vacant space. If the pilot desires to place a frequency in a particular memory location, press the line key at that location to move the amber box there; press the line key at the INSERT location. The frequencies at the selected location and at higher location numbers will move up one location. The frequency in the selected location may then be modified and it will be stored.

If all the memory locations on the first memory page are not filled, the second memory page cannot be accessed. Direct tuning of the COM radio is accomplished by selecting the cursor (amber box) to the COM preset location (second frequency line) and pressing the line key at that position for a minimum of three seconds. The preset frequency will disappear and the cursor will move and enclose the active frequency. Direct tuning is then available. Preset tuning may be restored by pressing the same button again.

An additional feature provided by the SRZ-850 integrated system is stuck microphone protection. The COM transmitter has a two-minute timer which cuts off transmission after that time has elapsed if the MIC key has not been released. A short warning tone is sounded a few seconds before the automatic shutoff. When the microphone cutoff has been activated at the two-minute limit, a MIC STK warning in red will be annunciated in the upper left corner of the RMU.

A TX annunciation at the top of the COM frequency window will annunciate whenever the transmitter is active. When the second (first memory location) page of the display is selected, a "NARROW BANDWIDTH SELECT" annunciation will appear in the upper right corner of the display. Narrow bandwidth is the normal selection, however, a wider bandwidth may be selected for use in areas where slightly off-channel transmitters are used. Its selection will result in improved reception in such areas. The selection is made by pressing the double arrow selector next to the annunciation. Another press of the selector will return the selection to the original.

If any of the components of the radio system fail to respond to tuning or operating commands of the RMU, the frequency or operating command associated with that particular function will be dashed out. This alerts the crew to a failure or abnormal system operation.

"Cross-side" operation of the RMU is possible by pressing the 1/2 button on the bottom of the RMU. This allows the operator to tune the opposite side radio system from that RMU. The tuning will be followed on the other RMU and so indicated. The system banners will be indicated in magenta color to serve as a reminder of the cross tuning condition.

Each time the integrated radio system is powered up with the landing gear squat switches activated, a power on self-test (POST) will be activated. If any radio or bus fails any test parameter, an error message will be displayed on a test results page. If no errors are detected, the main tuning page will be displayed.

A pilot activated self-test (PAST) may be initiated by pressing the TST button on the RMU. A complete test will then be accomplished on the component represented by the window at which the yellow cursor is located. At the completion of the test, a legend will appear in the window for a short time to indicate successful completion. If the test is not successful, an error message will appear to indicate which circuit area has failed. By pressing the DIM button on the bottom of the RMU, the tuning button may be used to dim the display. Exit from the dim mode is accomplished by pressing the DIM button again. Variations in ambient light will be automatically sensed, within limits, and automatically adjusted to maintain a desired setting.

AUXILIARY COM 1/NAV 2 CONTROL DISPLAY UNIT (With Primus II Radios)

The auxiliary COM 1/NAV 2 control display unit is normally located on the center instrument panel next to the fuel flow/quantity instrument. It may be used in two modes: normal and emergency. The modes are selected by means of the mode switch on the CDU. The mode selections cycle as the switch is turned. In the emergency mode, EMRG is displayed vertically along the top right edge of the display. The CDU is powered from the NAV 2 DC circuit breaker and receives power any time the battery switch is in the BATT or EMER position.

In normal mode the CDU acts as an additional tuning source for the radio system. COM 1 and NAV 2 may be tuned by the CDU in this mode. The CDU verifies that the COM 1 RCZ-850 or the NAV 2 RNZ-850 (integrated COM and NAV units, respectively) are tuned to the correct frequency by checking the frequency echoed on the radio service bus (RSB). If the tuned frequency is incorrect, the frequency displayed on the CDU will be dashed out. If the appropriate RMU is illuminated, the frequency change will be seen to appear in the active display. In normal mode, the radios which are tunable by the CDU (COM 1 and NAV 2) may be also tuned from the applicable RMU. If tuned from the RMU, the frequency will also be tuned on the CDU.

In emergency mode, operation of the CDU is identical on the part of the operator. The internal tuning of the system differs in that it does not read and compare frequencies on the RSB; whatever frequencies are set in the CDU are transmitted to the appropriate NAV or COM unit and that frequency is tuned.

When tuning the CDU, COM frequencies are displayed on the top line and NAV frequencies on the bottom. An arrow cursor, which appears to the left of the displayed frequencies may be toggled between the NAV and COM frequencies by pressing the double arrow (transfer) switch. The line on which the arrow appears is then tunable by the tuning knobs on the CDU.

The SQ push button toggles the COM squelch open and closed. When the squelch is open, SQ is annunciated in the right center port of the display.

When the EMER button is selected on the audio panel, the NAV AUDIO push button toggles the NAV AUDIO off and on. When NAV AUDIO is on, it is summed in with the COM audio. NAV AUDIO will be annunciated at the center left of the display.

Any time the COM transmitter is being keyed, the TX annunciator in the center of the display will appear.

VHF COMM TRANSCEIVERS (Optional)

Dual VHF-22A transceivers are remotely located in the airplane tailcone. They are individually controlled by CTL-22 control heads located on the right side of the center instrument panel. Each radio is a 720-channel, very high frequency (VHF) unit with a frequency range from 118.000 to 135.975 megahertz (MHz) with 25 (KHz) and 8.33 KHz spacing.

During ground operation, radio transmissions can be blocked by surrounding terrain or structures. This may possibly be overcome by using the other COMM, because of airplane antenna location. The COMM 1 antenna is on the underside of the fuselage and the COMM 2 antenna is in the vertical stabilizer fin cap. Flying through dry precipitation, it is possible for static electricity buildup to cause the VHF COMMs to automatically squelch to a point where reception range is greatly reduced. Disabling the squelch by selecting SQ OFF will cause background static in the speaker or headset, but normal reception range will be restored. If the headset microphone fails to function properly, check the side console switch in MIC HEADSET.

CTL-22 CONTROL PANEL

The CTL-22 control panel located low on the center instrument panel, uses two digital readouts to display the controlling (active) frequency and a pilot selected preset frequency.

Tuning of the radio is by one set of dual concentric knobs which control either the active (ACT) frequency or the preselect frequency. The active frequency is the upper readout; the lower one is preselect. Pressing the ACT switch for approximately two seconds enables direct tuning of the active display and of the radio itself. In direct tuning operation, dashes are shown in the preselect display. Pressing the ACT switch again will toggle the control back to tune-preset mode and the frequency change knob will tune the preset frequency. Both displays will again be visible.

A total of eight frequencies is available: one active, one preset, and six stored in memory. The memory frequencies are not visible but may be selected for display by cycling the memory position (MEM) of the XFR/MEM switch. Each time the MEM switch is pressed, the memory loop is incremented one location and the frequency stored in that location is shown on the preselect display (it remains stored in the memory, however). Placing the XFR/MEM switch momentarily to the XFR position, causes the active and preset frequencies to exchange places and retunes the radio to the preset frequency.

Frequencies are stored in the memory by selecting the desired frequency in the preset frequency display and then pressing the stow (STO) switch twice. Pressing the STO switch once displays the location number of available memory.

A self-test system is installed which provides testing of selected COMM circuits and annunciates results in the lower display. The self-test program is activated by pressing the TEST button on the CTL-22 control. If no trouble is found, the active display will show dashes at the end of the self-test and the preset display will show 00. If any out-of-limit condition is found, the active display will show DIAG (diagnostic) and the preset display will show a two-digit fault code.

A comparator annunciator displays a flashing ACT to the left of the active frequency display when the selected control radio frequency is not identical to that of the radio receiver-transmitter unit.

An OFF/ON/SQ OFF function switch is concentric with a volume control. The ON position provides power to the system and SQ OFF position disables the automatic squelch circuits which compensate for varying noise levels during normal operation. The squelch threshold is non-adjustable; however, the squelch circuits can be disabled by selecting SQ OFF. Disabling the squelch may improve reception in some high noise conditions where the squelch may suppress a very weak signal.

HF COMMUNICATION

HF KHF-950 With KFS 594 CONTROL (Optional)

The KHF-950 with KFS-594 Control is a 150-watt transceiver system that provides 280,000 frequencies at 100 Hz increments with 19 channel preset capability in the HF band (2.0000 to 29.9999 MHz). It operates in AM and single sideband. Upper sideband (USB) is normally used for sideband operation, but lower sideband (LSB) is available where that mode may be used.

In TEL (A3J) mode, any of the ITU telephone channels (401 through 2241) may be selected.

CONTROLS AND INDICATORS

All controls and indicators are located on the radio set control, which is mounted on the associated instrument panel (center or right). The smaller left most knob controls power to the receiver/transmitter and controls the volume of the received audio. Clockwise rotation turns the unit on and increases the volume.

The larger left most knob controls the threshold of the received signal above which the audio is enabled (squelch). Turning the knob clockwise reduces the signal threshold (decreases the squelch).

The larger right most knob selects the emission modes; LSB, lower sideband; USB, upper sideband; AM, amplitude modulation; and TEL (A3J, or ITU mode). When LSB, USB, or AM is selected, the radio is set to the corresponding mode and a frequency is displayed in the control head, which may be directly selected on one of the 19 user programmable channels. When TEL (A3J) is selected, the radio is set to the corresponding mode and an ITU channel is displayed in the control head.

The smaller right-most knob, when pushed in, moves the cursor (represented by a flashing digit) from left to right. One push increments the cursor one digit to enable that digit to be selected as required. When the small knob is turned, it increments or decrements the digit selected by the cursor.

The STO button is used to perform three separate functions. (1) When in the channel mode (NOT in program mode - program mode is annunciated by the flashing dash adjacent to the channel number), pressing and holding the STO button causes the control to display the letters "TX" and the tuned transmit frequency while the receiver monitors the transmit frequency. This enables the pilot to listen for signals on the transmit frequency of duplex channels. (2) If STO is pushed while the microphone is keyed, a 1000 Hz tone is broadcast, which may be used to break the squelch of some stations. In the program mode, selected by incrementing the cursor until the dash appears in flashing mode, the selected frequency may be entered into the channel appearing under the CH designation on the display.

In order to program any one of the 19 user programmable channels, proceed as follows: (1) Select the channel to be programmed. (2) Step the cursor to the frequency digits, as described above, and set in the desired frequency. Changing the displayed frequency of a programmable channel will automatically place the control head in program mode, as indicated by the flashing dash adjacent to the channel number. (3) Press STO to transfer the frequency into the T/R unit receiver. The flashing "TX" will appear in the upper right of the display and the cursor will move to the 10/1 MHz digits. (4) Change the display to the desired transmit frequency (if different from the receive frequency). (5) Press STO again. When the transmit frequency is accepted, the letters "TX" and the cursor will disappear.

If the user desires to operate the radio in the directly tuned mode without a channel number annunciated or a flashing dash, he may tune the channel selector to zero and then tune a frequency. The zero will disappear and the annunciated frequency will be relocated. Other frequencies may be selected in like manner as long as a channel other than zero is not selected.

A photocell activated dimming circuit adjusts the brightness of the display to compensate for changes in the ambient light level.

MAGNASTAR C-2000 DIGITAL AIRBORNE TELEPHONE (OPTIONAL)

The MagnaStar C-2000 can be used to place and receive voice telephone calls, send data transmissions via modem, as well as to send and receive facsimile transmissions. A central processor on board each MagnaStar equipped airplane controls and coordinates for all voice calls, data and fax modem transmissions, and in-cabin intercom functions. The MagnaStar continually scans and monitors ground based radio cells for the clearest usable communications channel while in flight. The LCD on the handset indicate the clearest usable communications channel while in flight. The LCD on the handset indicates the availability of a channel. The system searches for the optimum channel when a call is initiated and connects the calling and receiving parties. The system allows for multiple handsets and two simultaneous calls may be placed (voice, fax, or data). Reliable and clear connections are ensured at all times through digital technology. Coverage is provided throughout North America above 17,000 feet (much of the United States is covered at lower altitudes) and additional coverage is available on the ground at many major domestic airports.

All operations are performed via the handset. The handset features adjustable volume and a telephone system numerical keypad. the two-button volume control is located on the side of the handset and should be used to adjust the volume to the users desired level. Two additional keys are also included: “+” and “END CALL”. The LCD on the handset displays information and “menu” style selections, reducing the need for separate instruction. A credit card reader is also provided in the handset, allowing optional billing to individual user accounts.

To initiate an Aircall, the ground part must dial 1-800-AIRFONE. When prompted, enter the Aircall number of the aircraft, a station handset, or of an individual traveler, then enter the callback telephone number of the ground party. To return a call to the displayed callback number, take the handset off-hook and press either “1” or “2”. Pressing “1” will charge the call to the aircraft account and automatically dial the number. Pressing “2” will allow you to charge the call to a credit card; after pressing “2” wait for the tone and then swipe the card or manually input the card number.

The C-2000 has many features not included in this manual. For more detailed information, refer to the MagnaStar C-2000 System Digital Airborne Telephone User’s Guide.

HONEYWELL PRIMUS II REMOTE RADIO SYSTEM - AUDIO CONTROL UNIT

Two Honeywell Primus II digital audio control units (AV-850A) are supplied with the Honeywell Primus II remote radio system. Digital transmission of audio from remote units to the audio panels differs from conventional audio systems in that it requires one twisted pair of wires rather than many twisted pairs to achieve the same performance.

The panels have three rows of combination audio ON/OFF switches and volume controls. The small round knobs serve as audio on/off switches when pressed. When the switch is latched in, the audio for the particular receiver it serves will be off. When pressed again, the switch will move outward turning the audio on. When the audio is on, the knob of the switch may be used as a volume control. Turning it clockwise will increase the volume; counter-clockwise will decrease it.

Two larger knobs on the lower part of the control panel serve as volume controls for the speaker and headset respectively, of the pilot and copilot. These knobs are in series with the smaller individual volume controls. This allows a volume selection to be made on the individual radio volume control, and then a final overall selection to be made by means of the speaker or headphone control, resulting in a more flexible individual control of all available audio signals.

A row of microphone selector buttons (push-push latching switches) is located across the top of the control panel. These buttons connect the pilot's or copilot's microphone to the selected transmitter. The receiver for the selected radio or interphone will also be selected regardless of the selection of the audio on/off switches. For night operation, a light above the microphone selector button is illuminated.

The emergency COM (EMER) microphone switch, located at the upper right corner of the audio panel, when depressed connects COM 1 transceiver directly to the aircraft microphone and headphone. All electronic circuitry is eliminated and all other audio panel modes are disabled in this mode. NAV 2 audio will also be directed into the headset controlled by the panel on which EMER is activated, if NAV AUDIO is selected on the CDU.

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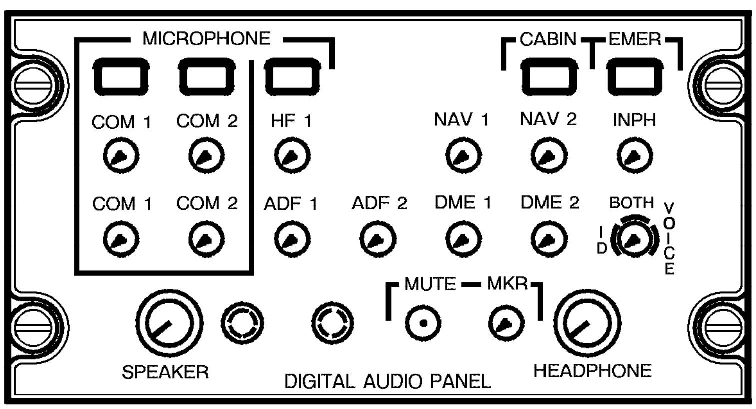

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Figure 3-10. PRIMUS II - Audio Control Panel (Typical)

An ID/VOICE selector is located on the right center of the audio panel. It is not a latching switch, but is active whenever NAV 1 or 2 and/or ADF 1 or 2 (if installed) is selected. If BOTH is selected, both ID and voice will be heard; if ID is selected, voice signals will be filtered out and coded identification signals will be heard. If VOICE is selected, coded signals will be filtered out and voice will be heard.

The DME 2 latching switch/volume control controls the volume of DME 2 identification signals in dual DME installations.

The marker mute and marker aural on/off/volume control are located on the bottom row of switches on the panel. The marker mute is used to temporarily silence the marker beacon audio. Momentarily pressing the MUTE button will mute the beacon signal as long as it remains above a minimum threshold level. When it drops below that level, a time-out sequence will begin, which will mute it for a fixed period of time. The MKR button may be pressed in to disable the aural signal. When the button is out (pressed again) the marker beacon volume can be controlled with the knob, however, maximum counter-clockwise rotation will not totally turn down the volume since a minimum signal is automatically retained in order not to miss the aural marker signal if it has been selected on.

AUDIO CONTROL PANEL (Optional)

Two audio control panels are installed to provide individual audio selection by each pilot. Three-position switches (SPKR-OFF-HDPH) enable all audio inputs to be selected to the speakers or headphones. A two-position IDENT/VOICE switch is used in conjunction with the NAV and ADF switches to monitor either voice or coded identifiers. Two concentric MASTER VOLUME knobs control the headset or speaker volume of all selected audio sources. A PASS SPKR VOLUME knob controls the output volume of the passenger compartment speaker.

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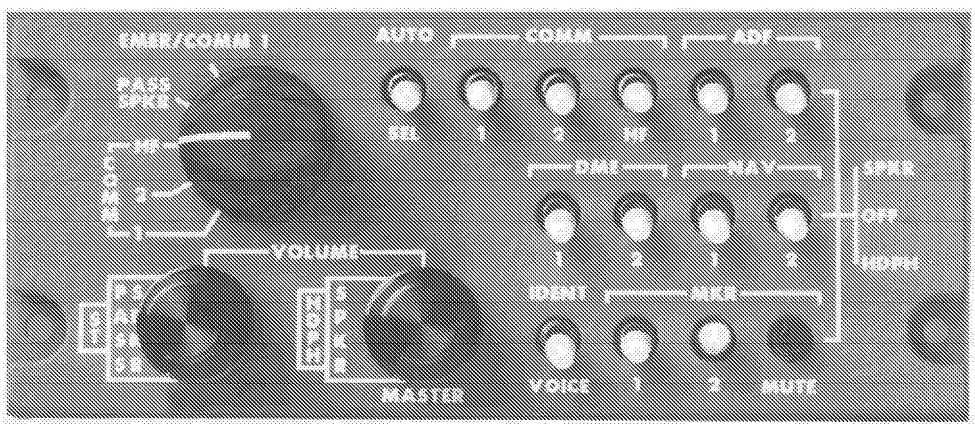

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Figure 3-11. Audio Control Panel (Typical)

A rotary microphone selector switch has four standard positions. COMM 1 or COMM 2 connects the microphone in use to the respective VHF transmitter. PASS SPKR allows for announcements to passengers through the cabin speakers. EMER/COMM 1 position may be used to operate COMM 1 radio directly, bypassing the audio amplifier, but requires the use of a headset, and volume control is available only at the radio. Transmitting remains normal from all microphone sources. An optional audio control panel has a fifth position to be used for the HF system, if installed.

NOTE

- When PASS SPKR is selected, the same side cockpit speaker is muted while the opposite speaker continues to provide normal audio reception. If both audio control switches are selected to PASS SPKR, both cockpit speakers will be muted. The use of PASS SPKR mode should be limited to required passenger briefings or emergencies.

NOTE

- With passenger speaker mode selected and microphone selector switch selected to oxygen mask, the same side cockpit speaker will not receive voice interphone communications from the oxygen mask microphone of the opposite side pilot.
- Headset audio is not affected when (PASS SPKR) mode is selected.

A side tone control knob, which is concentric to the passenger speaker volume control knob, is located on the lower left side of the audio control panel. The side tone control allows the pilot and copilot to select individual side tone volumes within certain limits. The side tone cannot be completely removed; some side tone will always remain. When the operator positions the control knob, side tone volume for all of the transmitters being operated from the respective audio control panel, and the interphone side tone, will be set.

A three-position AUTO SEL switch (SPKR-OFF-HDPH) automatically selects the proper speaker or headphone to match the position of the rotary microphone selector switch. All audio sources can be monitored at any time by use of the appropriate SPKR-OFF-HDPH switch regardless of the microphone selector switch or the AUTO SEL switch positions. A MKR MUTE button, when pressed, silences the marker beacon audio for approximately 30 seconds.

A two-position switch on the control wheel has MIC position for keying the transmitters and INPH for interphone communication when using the lip microphone or oxygen mask microphone. If a hand-held microphone is used, transmission is determined by the position of the microphone selector switch.

HONEYWELL PRIMUS II REMOTE RADIO SYSTEM - NAV

The RNZ-850 integrated navigation unit operates in the frequency range of 108.00 to 117.95 MHz. The RNZ-850 system encompasses the functions of VHF NAV, localizer and glideslope receiver, and marker beacon receiver, as well as the addition of functions of ADF and DME which, in conventional systems, are separate units. Operation of the ADF and DME modes will be covered in this section where operation of the standard ADF and DME installations is discussed. Operation of the marker beacon system is discussed under "Marker Beacon" below.

Glideslope paired frequencies are tuned with the published ILS frequencies as in standard VHF NAV practice. The RNZ-850 is the navigation component of the SRZ-850 integrated radio system. The two NAV integrated receivers are controlled and tuned in a similar manner to the RCZ-833F units discussed under PRIMUS II REMOTE RADIO SYSTEM - COM. A minor difference is the requirement for the PGE (page) button to be pressed twice in order to access the NAV page which shows the first six NAV memory locations. Otherwise, changing, storing and deleting frequencies is accomplished in the same manner.

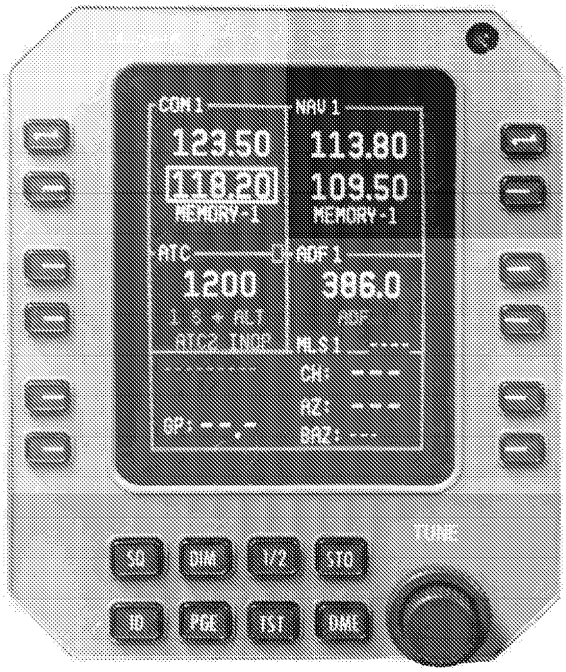
The NAV frequency window on the main tuning (first) page has an additional function called the "DME Split Tuning Mode". This function involves "DME hold" plus some additional features, and is discussed under Distance Measuring Equipment in the Pulse Equipment part of this section.

NAV 2 is also tunable by the Auxiliary COM 1/NAV 2 control display unit. Tuning of the CDU is discussed under Auxiliary COM 1/NAV 2 control display unit in this section.

Both NAV 1 and NAV 2 are selectable on the pilot's and/or copilot’s DC-550 display controller to be displayed on the respective PFD. If both PFDs are displaying the same NAV source, the annunciation will be in amber.

Operation of the NAV displays on the standby horizontal situation indicator (HSI) is discussed in this section.

A17453



5685P6019

Figure 3-12. PRIMUS II - NAV Controls

VHF NAV (Optional)

Dual VIR-432 navigation receivers provide VOR, localizer, glideslope and marker beacon capability. The receivers are remotely mounted in the airplane tailcone with the standard CTL-32 controls located on the lower right side of the center instrument panel. The VOR/localizer antennas are located high on either side of the vertical fin. The glide slope antennas are located in the nose section inside the radome.

Each system has 200 VOR/LOC operating channels and 40 glideslope channels and automatic DME channeling. Multiple outputs drive the Flight Director, standby HSI, and autopilot. All the basic functions have a built-in self-test.

CTL-32 CONTROL PANELS

The CTL-32 control panel uses two digital readouts to display the controlling (active) frequency and a pilot-selected preset frequency. Dual concentric frequency select knobs control the display which is cycled between active (ACT) and preset tuning modes by consecutive pressing of the ACT switch. Holding the ACT button for approximately 2 seconds enables the frequency select knobs to directly tune the VIR-32. Push the ACT button a second time to return the display to the normal two-display mode.

In direct (ACT) tuning, dashes show in the preset window. The OFF/ON/HLD function switch selects the mode of operation. On is the normal operating position. In HLD, the DME is held while NAV frequency is changed. In addition to the active and preset frequencies, four additional frequencies can be stored in memory to be called up with the MEM/XFR switch. Each time the MEM/XFR switch is pressed to MEM position, a frequency from memory is loaded in the display and the memory is advanced to the next location. Pressing the MEM/XFR switch to XFR exchanges the active and preset frequency displays.

A29359

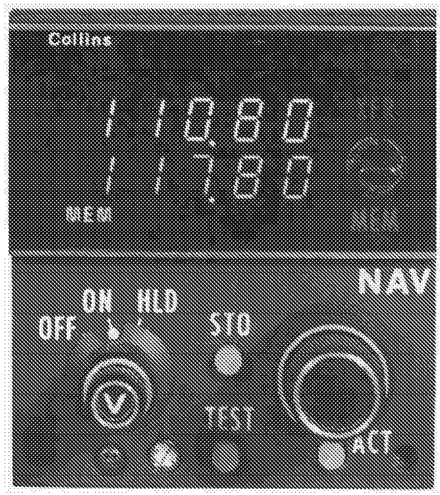


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Figure 3-13. CTL-32 Control Panel

ANNUNCIATORS

The NAV control contains MEM (memory), RMT (remote), and HLD (hold) annunciators. The MEM annunciator illuminates whenever a preset frequency is being displayed in the lower window. The RMT annunciator indicates that the VIR-32 is being remotely tuned by the NMS, FMS, etc. The remote tune frequency is displayed in the upper window, and this frequency is the frequency being returned by the VIR-32. The HLD annunciator indicates that the DME is held to the active frequency at the time of selection; the NAV frequency may be changed. The upper window displays the NAV frequency and the lower window displays the held DME frequency.

The pilot or copilot can display NAV 1 or NAV 2 on the primary flight display (PFD) by selecting either NAV by means of the NAV push button on his DC-550 display controller. The selection progression is NAV 1, NAV 2, NAV 1, etc., as the button is pressed. The NAV selected by means of the NAV button is displayed on the PFD in the horizontal situation indicator (HSI) portion of the display. It provides course guidance to the flight director if it is engaged.   NAV 1 may be selected on the " **O** " bearing needle and NAV 2 may be selected on the “ ◇ " bearing needle, by the applicable " **O** " or " ◇ " bearing selector knobs. Selections made by means of the bearing knobs cannot interface with the flight director or autopilot**.** The pilot’s IC-600 Display Guidance Computer (DGC) provides the autopilot control function as well as guidance for the pilot’s flight director (FD 1). The copilot’s DGC contains the copilot’s flight director (FD 2) guidance function but has no autopilot guidance component of its own, however, the copilot’s attitude, heading, and NAV course commands can be switched to the pilot’s IC-600 (see AP XFER/FD 1/AP XFER/FD 2 switch, below) if desired. Selections made on the copilot’s flight director will then be controlling the autopilot and flight director.

If the same NAV (VOR) selections are made on both DC-550s, the selection will be annunciated on the PFDs in amber.

A switch (AP XFER/FD 1/AP XFER/FD 2) is installed to enable selection of either flight director to control the autopilot. If FD 1 is selected, navigation guidance is being provided by the NAV selection made on the pilot's CD-550. If FD 2 is selected, the selection must be made on the copilot's CD-550.

A red X will appear in the center of the PFD if course information is unreliable or not present.

Glideslope frequencies are paired with localizer frequencies so that the correct glideslope channel is automatically selected when the localizer is tuned. Glideslope deviation will be displayed on the pilots’ PFDs when an ILS frequency is tuned and the airplane is within range of the ILS. If the localizer signal is unreliable or absent, a red X will appear in the center of the PFD. If glideslope information is absent or unreliable, a red X will appear at the glideslope indication on the pilot's PFD.

Outer, middle, and inner marker receivers are incorporated in the VIR-432 receivers. The visual marker beacon annunciators are located in the PFD display, on the center-right side. Refer to the Electronic Flight Instrument System (EFIS) discussion in this section. The copilot's system is a duplicate of the pilot's, except for the fact that there is no autopilot guidance capability internal to the copilot's IC-600 display Guidance Computer (DGC).

VIR-432 VHF NAV SELF-TEST

During self-test, the VIR-432 provides VOR, ILS, and marker beacon test outputs. The following steps provide the procedures required and the results to be expected when performing the self-test.

It is designed to give the pilot a simple and accurate method of checking VHF NAV system integrity. It is not a substitute for FAA required periodic accuracy checks.

NOTE

The NAV TEST should not be performed while the autopilot is coupled to the flight guidance system.

ILS TEST

1. Tune appropriate NAV receiver to any localizer frequency (any frequency between 108.1 and 111.9 that ends in an odd number). A signal on the frequency will not interfere with the test. The NAV to be tested must be selected on the DC-550 display controller.
2. Press the TEST button on the CTL-432.
3. The NAV and GS flags will come into view.
4. After approximately 3 seconds, the flags will go out of view, the EHSI or HSI lateral deviation bar will deflect right approximately 2/3 of full scale and the glideslope pointer will deflect down approximately 2/3 of full scale.
5. The VIR-32 will return to normal operation after approximately 15 seconds, even if the TEST button is held.
6. The marker beacon annunciators in the pilots PFDs will illuminate and blink with the NAV test. A 30-Hz tone will be heard over the marker audio if it is selected.

VOR Test

1. Tune appropriate NAV receiver to an operable VOR frequency. A specific frequency is not required. A signal on the frequency will not interfere with the self-test. Rotate the bearing pointer to approximately 0 degrees. The NAV to be tested must be selected on pilot's DC-550 display controller.
2. Press the TEST button on the CTL-432.
3. The NAV flag will come into view.
4. After approximately 2 seconds, the flag will go out of view, the HSI lateral deviation bar will approximately center, and a TO indication will appear.
5. The bearing pointer(s) selected to the VIR-432 being tested will indicate approximately a 0 degree magnetic bearing.
6. The VIR-432 will return to normal operation after approximately 15 seconds, even if the TEST button is held.
7. The DME will also test and blink, finishing with an indication of AOK and a display of 100 nautical miles on the indicator and on the PFD.
8. Test procedures using a VOT are standard. With the NAV receiver tuned to the published frequency of the test facility, the HSI will indicate 0° when centered with a FROM flag, and 180° centered with a TO flag.

STANDBY HORIZONTAL SITUATION INDICATOR (HSI)

The standby horizontal situation indicator is a three-inch instrument located on the left side of the center instrument panel. It provides navigational guidance in case of PFD/flight director failure.

The standby HSI displays compass heading, glideslope and localizer deviation and airplane position relative to VOR radials. The compass card is graduated in 5-degree increments and a lubber line is fixed at the fore and aft positions. Azimuth markings are fixed at 45, 135, 225, 270, and 315 degrees on the compass face. A fixed reference airplane is in the center of the HSI, aligned longitudinally with the lubber line markings.

A6762

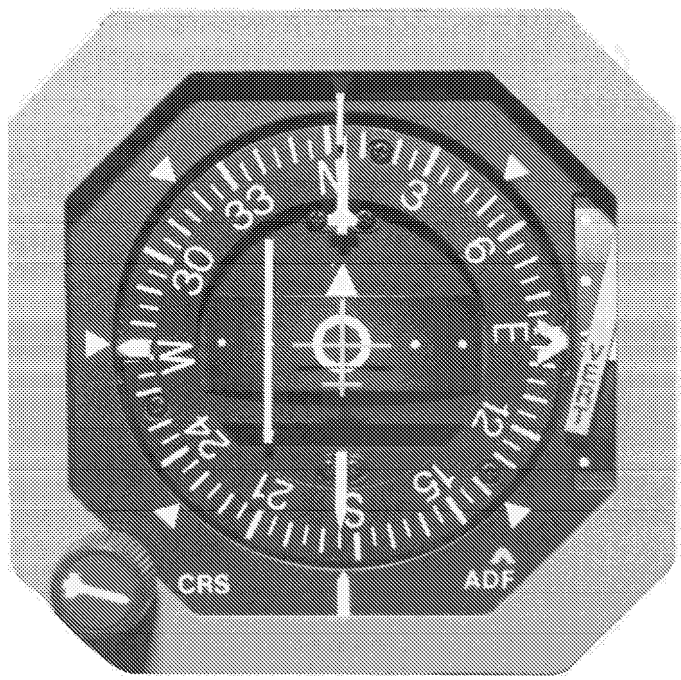

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Figure 3-14. Standby Horizontal Situation Indicator (HSI)

The course cursor is set by a knob on the instrument. Once set, the cursor rotates in its set position with the compass card. The course deviation bar, which forms the inner segment of the course cursor, rotates with the course cursor.

A blue ADF needle, which displays ADF 1 bearings, rotates around the outer portion of the dial.

A heading (HDG) flag will appear in the instrument when the compass system is OFF, the heading signal from the directional gyro (DG 1) becomes invalid, primary power to the indicator is lost, or the error between the displayed heading and the received signal becomes excessive.

The course deviation bar moves laterally in the HSI, in relation to the course cursor. Course deviation dots in the HSI act as a displacement reference for the course deviation bar. When tracking a VOR, the outer dot represents 10 degrees, while on an ILS localizer it represents 2-1/2 degrees. White TO-FROM flags point to or from a station along the VOR radial when operating on a VOR. A red warning flag comes into view when power is OFF, when NAV information is unreliable, or when signals from the NAV receiver are not valid. The standby HSI displays only NAV 1 information.

The glideslope deviation pointer is located to the right side of the display. When receiving glideslope information during an ILS approach, the green deviation pointer will be uncovered by the red VERT warning flag which will otherwise be in evidence. If an ILS frequency is not tuned and being received, or the ILS signal is unusable or unreliable, the deviation pointer will be covered by the red warning flag.

HONEYWELL PRIMUS II REMOTE RADIO SYSTEM - ADF

The automatic direction finder (ADF) function of the Primus II remote radio system is provided by the DF-850 ADF receiver module which is a component of the RNZ-850 integrated navigation unit. As discussed in the COM section above, the tuning of the complete system, which includes the ADF, is accomplished by means of the remote management unit (RMU), the RM-850.

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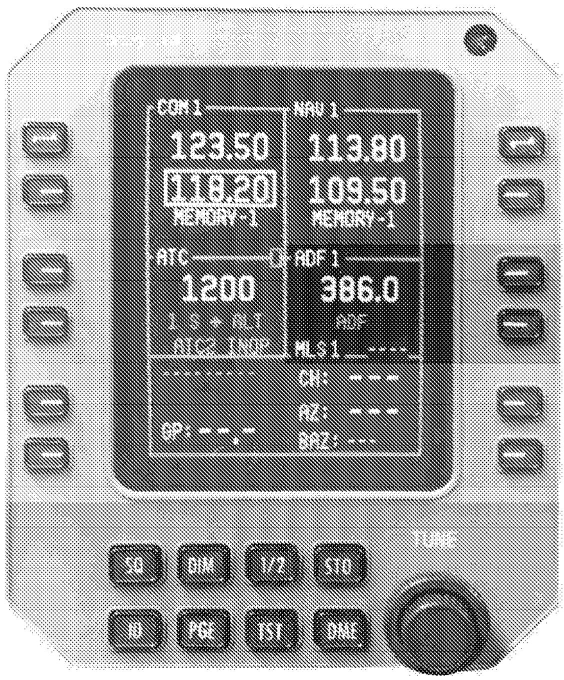

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Figure 3-15. PRIMUS II ADF Controls

The receiver has a frequency range of 100.00 to 1799.5 KHz in 0.5 KHz increments. A strap selectable option is available which allows tuning of marine emergency frequency of 2181 thru 2183 KHz. Four modes of operation are available on the DF-850 ADF: ANT (Antenna), ADF (Automatic Direction Finder), BFO (Beat Frequency Oscillator), and VOICE. In ANT mode, the ADF receives only and does not compute bearing information. In ADF mode, the system receives signals and computes relative bearing to station. In BFO mode, a beat frequency oscillator is added to the signal for reception of CW signals. In VOICE mode, the reception bandwidth is widened for improved voice audio on the frequency. The VOICE mode is not used for navigation. Bearing information is available only in ADF and BFO modes. If ANT is used for tuning, random ADF needle searching is prevented. The modes are selected by pressing the lower line key adjacent to the ADF window. Progression is: ANT; ADF; BFO; and VOICE. The mode changes each time the line key is pressed. When the tuning cursor (amber box) surrounds the lower ADF Line, the ANT, ADF, BFO, and VOICE progression may also be selected by turning the tuning knob.

When the line select key adjacent to the frequency window of the ADF is pressed, the cursor will move to the ADF frequency window and the ADF may be tuned by the tuning knobs. Tuning will increment in steps of 0.5 KHz with the small knob and 10 KHz with the large knob. If the knobs are turned faster, larger increments are selected for each turn enabling large changes to be made in much less time. The rate of increased tuning speed is proportional to the rate the knobs are turned. The ADF has a "scratch pad" memory which will store one frequency. This is accomplished by selecting the desired frequency and pressing the STO button for two seconds. To retrieve the frequency from memory, press the line select key adjacent to the ADF frequency window for two seconds.

The ADF bearing information may be selected on the "**O**" bearing needle of the pilot's electronic primary flight display (PFD). If dual ADFs are installed, the " ◇ " bearing pointer will display ADF 2, when selected. Selection is accomplished by means of the bearing knobs (**O** and ◇) on the respective DC-550.

AUTOMATIC DIRECTION FINDER - COLLINS ADF-462 (Optional)

The Collins ADF-462 is controlled by a CTL-62 electronic control head mounted on the right side of the center instrument panel. The automatic direction finder system operates in the frequency range of 190 to 1749.5 KHz. The CTL-62 control panel uses two digital readouts to display the controlling (active) frequency and a pilot-selected preset frequency. Dual concentric frequency select knobs control the display chosen by the ACT switch. When pressed, the ACT switch consecutively cycles the tuning modes between ACT (active) and preselect tuning. When preselect tuning is selected, both displays are illuminated and the bottom (preset) display is tuned. When ACT (active) tuning is selected, the active (top) display is directly tuned and dashes show in the preset display.

In addition to the active and preset frequencies, four additional frequencies can be stored in memory to be called up by use of the XFR/MEM switch. The XFR/MEM switch is spring-loaded to the center position. Pressing the switch to the MEM position loads a frequency in the preset display from memory and advances the memory location one space. Pressing the XFR/MEM switch to XFR exchanges the preset and active frequencies.

A29361

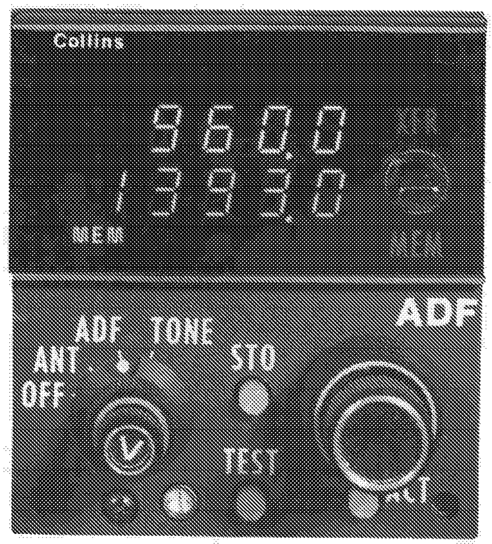

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Figure 3-16. CTL-62 Control Panel

The STO (store) switch, when pressed once, displays the location number of the available memory frequency. When pressed twice, the STO switch stores the preset frequency in the available memory.

A comparator annunciator (ACT) illuminates when the displayed radio control frequency and the actual radio frequency are not identical.

A rotary function selector switch has OFF, ANT, ADF and TONE positions. ANT position facilitates aural identification of the selected stations. ADF position provides bearing-to-station readings for the RMIs. TONE provides a tone for identification of keyed CW stations. Volume is controlled by a knob concentric with the function selector switch. The TEST button initiates a self-test; the ADF pointer on the PFD (and the standby HSI, NAV 1 only) will change 90 degrees and a row of annunciators at the bottom of the frequency display provides annunciation of pertinent systems. When ANT is selected or if the signal is lost, the ADF pointer on the RMI will park in the horizontal position. When ADF is not required for navigation, place the selector in ANT to eliminate excessive radio magnetic indicator (RMI) needle seeking.

A second ADF-462 may be installed, in which case the first system is duplicated with a second complete system, and operation of the second ADF is identical to the first. If a second ADF is installed, its bearing information may be displayed on the double barred needle (◇) on either PFD when that ADF is selected on the respective DC-550.

The ADF bearing information may be selected on the "**O**" bearing needle of the pilot's electronic primary flight display (PFD). If dual ADFs are installed, the " ◇ " bearing pointer will display ADF 2, when selected. Selection is accomplished by means of the bearing knobs (**O** and ◇) on the respective DC-550.

On the PFDs the single bar needle displays ADF 1 (when ADF is selected) and the double bar needle displays ADF 2 (when selected, if installed). In the standard single ADF installation, ADF information is not available to the "◇" needle.

C-14D COMPASS SYSTEM (PILOT'S)

The flight director and the flight director display on the pilot's DU-870 Primary Flight Display (PFD), the autopilot (except when AP XFER FD 2 is selected), and the standby horizontal situation indicator are driven by the pilot's C-14D slaved gyro system. The system consists of a directional gyro, a flux detector, a mode selector switch, a remote compensator, and a slaving indicator on the primary flight display (PFD). The directional gyro operates on 28 volts DC from the emergency bus, therefore power is available whenever the battery switch is placed in the BATT position or the EMER position. In the event of a DC power failure, placing the battery switch to the EMER position will regain the pilot's C-14D and provide gyro stabilized heading information through the standby HSI. The mode selector switch is located on the left switch panel and is labeled LH GYRO SLAVE. It has two positions; MAN and AUTO. In MAN position, the C-14D gyro operates in unslaved (gyro) mode. In the AUTO position, it operates in slaved (gyro stabilized magnetic) mode. When MAN is selected, the HSI compass card can be moved left or right at a rate of 30 degrees per minute by toggling the LH/RH switch, located to the right of the MAN/AUTO switch, to the RH or LH position. Manual operation gives accurate short term heading reference when magnetic information is unreliable.

Under normal operating conditions, the pilot's C-14D gyro slave switch should be left in the AUTO position. Fast slaving in the AUTO mode occurs at a minimum rate of 30 degrees per minute and will continue at that rate until the gyro is slaved to the magnetic compass heading. It will then continually maintain a slow slaving rate of 2.5 to 5.0 degrees per minute. If the gyro slave switch is in AUTO position at power-up, the system will slave itself. If the gyro has obtained operating speed in the MAN position, or is otherwise unslaved while operating, the LH/RH switch must be activated to start fast slaving action in the AUTO mode.

C-14D COMPASS SYSTEM (COPILOT'S)

The copilot's C-14D compass system is the same as the pilot's C-14D. The copilot's C-14D system drives the copilot's flight director and the flight director display on the copilot's PFD, and when AP XFER FD 2 is selected on the autopilot transfer switch, it provides heading guidance to the autopilot through the pilot's IC-600 Display Guidance Computer.

Two RH GYRO SLAVE switches, marked MAN/AUTO and LH/RH, are located low on the copilot's instrument panel. Operation of the switches is the same as described above in the pilot's C-14D system.

MARKER BEACON SYSTEM

The marker beacon, VOR, localizer and glideslope receivers are all combined into one navigation receiver. Each NAV receiver encompasses all of those functions. System operation is similar and equally automatic if either the standard or optional VHF radio systems are installed.

NAV 1 provides signals to the following:

1. Marker beacon data to the pilot's marker beacon annunciators on the center right side of his primary flight display (PFD).
2. VOR, localizer (ILS), and marker beacon signals to the audio control panels.

NAV 2 provides signals to the following:

1. Marker beacon data to the copilot's marker beacon annunciators on the center right side of his primary flight display (PFD).
2. VOR, localizer (ILS), and marker beacon signals to the audio control panels.

The marker beacon receivers are in operation whenever the NAV receivers are ON. They operate on a frequency of 75.00 MHz. The annunciators in the pilots' primary flight displays are part time displays. A white box. located in the center right of the display, identifies the location of the marker beacon annunciator when a localizer frequency is tuned. The marker beacons are annunciated by the appropriately colored letters: a blue 0 for outer marker, an amber M for middle marker, and a white I for inner marker. The letters appear in the white box when the marker beacon receiver is activated. A marker beacon tone is transmitted to the audio control panel and will be heard in the speaker/headset, if selected. A 400 Hz tone is heard at the outer marker, a 1300 Hz tone at the middle marker, and a 3000 Hz tone for the inner marker.

The audio muting system (MKR MUTE) provides the pilots with a method of temporarily cutting out the marker beacon audio. When pressed, the marker beacon signal is muted for approximately 30 seconds. The MKR MUTE switches (push buttons) are located on the audio control panels.

COCKPIT VOICE RECORDER

The Fairchild Solid State Cockpit Voice Recorder (CVR) system provides a continuous 30 minute recording of all voice communications originating in the cockpit and aft PA audio, via 4 individually recorded channels. Also provided is a separate 2 hour continuous recording which combines the 4 channels into a single data stream.

A sensitive cockpit microphone is located on the left side of the glareshield fire tray. The system is energized when the battery switch is in the BATT position. The control panel contains a TEST switch which must be pressed for a minimum of 5 seconds to check system operation. The steady illumination of the test lamp verifies that the recorder is operating properly. An erase button is provided which requires at least a 2 second depression to initiate the bulk erasure cycle. Bulk erasure can only be accomplished on the ground.

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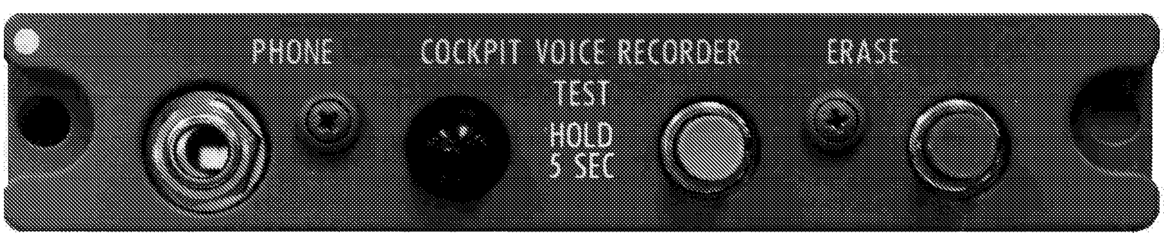

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Figure 3-17. Cockpit Voice Recorder Control Panel

DIGITAL FLIGHT DATA RECORDER (PARTS 91 AND 135)

On airplanes operated under FAR Part 91 or FAR Part 135, a digital flight data recorder, which continuously records at least 17 parameters of airplane systems operation, is required. A continuous recording of 8 hours also is required. The optional recorder installed in the Citation Encore records the information digitally by a solid state method. Recorder operation begins upon airplane power-up and continues until electrical power is shut off. Recorder operation requires no attention from crew members. An annunciator light (RECORDER PWR FAIL) on the instrument panel will illuminate if the flight data recorder malfunctions or if power to the system fails. The flight data recorder receives its power through a 28 VDC circuit breaker identified FDR on the right circuit breaker panel.

EMERGENCY LOCATOR BEACON

The emergency locator beacon (ELT) system is an emergency transmitter designed to assist in locating a downed airplane. The transmitter has a self-contained battery pack which must be changed every three years or after a cumulative total of one hour of operation. The system is activated automatically by an impact of 5.0 G,+2 or -0 G along the flight axis of the airplane. The ELT can also be activated manually by a remote EMER switch on the instrument panel. When activated, a modulated omni-directional signal is transmitted simultaneously on emergency frequencies 121.50 and 243.00 MHz. The modulated signal is a downward swept tone signal starting at approximately 1600 to 1300 Hz and sweeping down every two to four seconds continuously and automatically.

The transmitter itself has an integral ARM-ON-OFF switch which set to ARM upon final inspection and release after installation. ON position is used by maintenance/inspection personnel, as required, to test the system in compliance with FARs. Service center personnel may use the OFF position to disarm the ELT during phase inspections. In which case, the integral switch must be returned to ARM upon release for service.

A guarded EMER-NORM switch on the instrument panel provides manual activation of the system as well as a means of testing the operation. In NORM position, the system is armed for activation by the impact switch. In EMER position, the impact switch is bypassed and the emergency signal is transmitted. EMER position can be used to test the system; however, prior approval from control tower and flight service must be obtained. A RESET button is located next to the EMER-NORM switch on the instrument panel. Pressing the RESET button resets the ELT transmitter if it has been energized by the impact switch. The RESET button must be held depressed for a minimum of three seconds. A remote control, accessible from outside the airplane, is located on the left side of the dorsal fin under a plug button. The ELT can be turned ON, OFF, or RESET from that control. Two flush mounted antennas are located on either side of the dorsal fin just forward of the vertical fin.

FLIGHT GUIDANCE

PRIMUS 1000 INTEGRATED AVIONICS SYSTEM

The Primus 1000 Integrated Avionics system is an autopilot/flight director and electronic flight instrument system (EFIS) which are integrated into one complete automatic flight control system. The primary component of the system is the IC-600 Display Guidance computer (DGC) which contains the symbol generator, the flight director, and the autopilot computer. The entire system is comprised of the flight director, automatic pilot, pilot's and copilot's electronic attitude director indicators (EADIs) and electronic horizontal situation indicators (EHSIs) located in one single primary flight display (PFD) for each pilot, dual air data computers with associated outputs, autopilot controller, a vertical navigation (VNAV) mode including altitude alert and altitude preselect, touch control steering, dual rate gyros, and the autopilot servos. The air data system provides pressure altitude, indicated and true airspeed, altitude reporting, altitude preselect, IAS hold, vertical speed hold, and it provides overspeed warning. A multifunction display (MFD) provides a display for the weather radar returns and for flight management system (FMS) navigation data, as well as for the electronic checklist presentation, it also serves as a backup PFD.

The system may be flown manually or automatically.

MODE ANNUNCIATION

Flight director mode annunciations are integral to the primary flight displays. The vertical and lateral modes are annunciated along the top of the display. Armed vertical and lateral modes are annunciated in white and appear slightly to the left of the position of the captured vertical and lateral mode annunciations, which are presented in green. Lateral mode annunciations are located to the left of top center and vertical modes are annunciated to the right of top center. A white box appears around a capture or hold mode for five seconds after mode transition. Lateral and vertical mode annunciations and transitions are listed below:

VOR	A NAV mode (VOR) is armed or has been captured and is being tracked.
HDG	Heading select mode engaged
LOC	Localizer has been armed or captured.
VAPP	VOR approach selected or course capture has occurred.
GS	Glideslope armed or captured.
ASEL	Altitude preselect armed.
ALT	Altitude hold mode engaged.
BC	Back course armed or captured.
VS	Vertical speed hold has been selected and captured.
IAS or MACH*	Indicated airspeed (or Mach) hold has been selected and captured.
V-NAV	V-NAV mode is armed or captured.
LNAV	Long range NAV (FMS) mode has been selected.
GA	Go-around mode has been selected.

*IAS or MACH will be annunciated automatically, depending upon airplane altitude. Transition from IAS to Mach is automatic as the airplane climbs through 29,000 feet altitude, and Mach to airspeed occurs automatically as the airplane descends through 28,750.

LATERAL TRANSITIONS	VERTICAL TRANSITIONS
VOR arm to VOR cap	VNAV arm to VNAV cap
LOC arm to LOC cap	VNAV cap to ALT
BC arm to BC cap	ASEL arm to ASEL cap
VAPP arm to VAPP cap	ASEL cap to ALT
ASEL arm to ALT	GS arm to GS cap

MISCELLANEOUS ANNUNCIATIONS:

ATT1 (or ATT2)	Attitude Source (amber for "cross-selection").
DH	Illuminates when the airplane reaches the preset decision height. (Annunciated in amber in the upper left side of EADI display.) A white box is drawn around the indication for five seconds when DH is reached.
AP ENG	AUTOPILOT ENGAGED (green). A green arrow will point either left or right, indicating to which flight director (pilot's or copilot's) the flight director is coupled.
TCS ENG	Illuminates in amber to indicate touch control steering is engaged.
AP TEST	Illuminates in amber when the autopilot is in test mode. Annunciation is automatic immediately after power up.
TRN KNB	Illuminates in amber when the autopilot turn knob is out of center. The autopilot will not engage when the turn knob is out of center.

MISCELLANEOUS ANNUNCIATIONS :

AP FAIL	Illuminates in amber to indicate automatic flight control system (AFCS) failure.
MAG1 (MAG2) (DG1 (DG2)	Heading Source, in mid left-center of PFD. MAG annunciation if AUTO selected on gyro slave switch; DG if MAN selected. Annunciation is in amber. No annunciation if normal selections are made.
SG1 (SG2)	Amber, in upper left side of primary flight display (PFD) (annunciated only in case of reversion selection). Primary Flight Display DU-870 No. 1 (or No. 2) is providing symbol generator for both displays. Selection is made on the SG1/NORM/SG2 switch on the MFD controller. In SG1 position SG2 will be a duplicate of SG1; in SG2 position SG1 will be a duplicate of SG2.
ADC1 (ADC2)	Amber, in upper left side of PFD (annunciated only in case of reversion selection). ADC1 (ADC2) is the source of air data information for both displays, or a cross-selection of both systems (ADC2/ADC1) has been made. Selection is by the ADC button on the DC-550 PFD controller.
CAT2	Green CAT2 annunciation indicates that the excessive ILS deviation monitors are active on the PFD. Amber annunciation of CAT2 occurs when deviations of parameters required for Category 2 approaches are out of limits. For the monitors to become active APR mode must be selected, both NAV radios must be tuned to the same frequency, and both radio altimeters must be set to 100 feet.

FLIGHT DIRECTOR MODE SELECTOR

The flight director mode selector consists of eight push-on, push-off switches that select various flight director/autopilot modes of operation. The green mode activation light in the switch (button) will be illuminated if the corresponding mode is in the arm or capture state.

The status of the selected mode is displayed in white letters (annunciations) in the primary flight display (PFD) when armed, and in green when capture has occurred (or when selected on, for those modes where capture occurs immediately).

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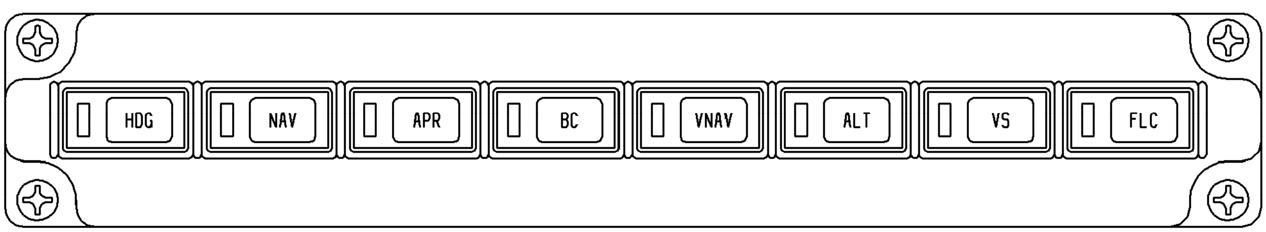

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Figure 3-18. MS-560 Mode Selector Panel

The flight director can be selected off by deselecting all of the modes on the MS-560 Flight Director Mode Selector. The command bars will bias out of view. If single-cue flight director operation is selected on the DC-550 Display Controller the flight director/autopilot will not engage if only a vertical mode is selected. If no modes are selected on the MS-560 mode selector the autopilot will engage in a basic heading hold/pitch hold mode which will be annunciated PIT and ROL in the primary flight display (PFD).

Operation of the various modes is explained under Primus 1000 System Operation in this section. The pilot and copilot may select either NAV 1 or NAV 2 for display on their respective primary flight display (PFD) by means of the NAV button on the DC-550 display controller. The respective NAV will be automatically selected upon power up; the sequence of selection will then be NAV2/NAV1/NAV2 etc. for the pilot and NAV1/NAV2/NAV1 etc. for the copilot. If both sides have been selected to the same source, the annunciation of VOR 1, etc., in the PFD will be in amber. The selection of NAV 1, NAV 2 or FMS is annunciated in the upper right corner of the EHSI as VOR 1, VOR 2 and FMS respectively.

The selection of NAV 1, NAV 2 or FMS on the DC-550 display controller push-buttons controls the source of navigation information to the flight director, as well as selects the source of navigation information displayed on the EFIS course deviation indicator of the PFD.

AUTOPILOT CONTROL PANEL

The autopilot control panel, mounted on the pedestal, provides the means of engaging the autopilot and yaw damper, as well as manually controlling the autopilot through the turn knob and pitch wheel.

The autopilot (AP) engage switch is used to engage the autopilot and yaw damper. The yaw damper (YD) switch is used to engage and disengage the yaw damper without the autopilot. Use of the yaw damper while manually controlling the airplane aids in airplane stability and passenger comfort. The push-on push-off AP and YD switches are illuminated green when engaged. Pressing the AP switch when the autopilot is engaged will disengage the autopilot but leave the yaw damper engaged. Pressing the YD switch when both YD and AP are engaged will turn off both the yaw damper and the autopilot. The yaw damper and autopilot may also be disengaged with the red AP TRIM DISC button on the pilot's and copilot's control wheels. Pressing the go around (GA) button on either throttle will disconnect the autopilot and force the flight director into go around mode; the yaw damper will remain engaged.

The pitch wheel allows manual pitch control of the airplane proportional to the rotation of the wheel and in the direction of wheel movement. Movement of the wheel also cancels any other previously selected vertical mode. The turn knob allows manual bank control of the airplane proportional to and in the direction of knob movement. Turns with a maximum bank angle of 27 degrees can be performed with the turn knob. The turn knob must be in the center detent position before the autopilot can be engaged. Rotation of the turn knob out of detent cancels any other previously selected lateral mode.

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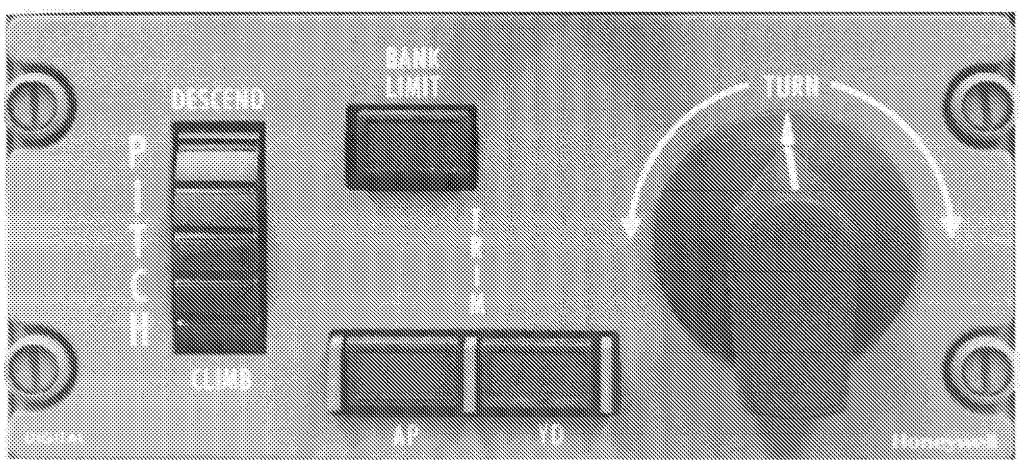

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Figure 3-19. Autopilot Control Panel

The elevator trim indicator shows an out of trim condition, in the direction indicated by illumination of UP or DN in the TRIM annunciator, when a sustained trim input is being applied to the elevator servo. The indicator should be OFF before engaging the autopilot. If the TRIM annunciator is illuminated and the autopilot must be disengaged, the pilot must be prepared for an out-of-trim condition in the annunciated direction. A separate additional AP PITCH MIS-TRIM/AP ROLL MIS-TRIM annunciator is located on the center instrument panel where it is more readily visible to the pilots. The AP PITCH MIS-TRIM annunciator is a repeat of the TRIM annunciator on the autopilot control panel. The AP ROLL MIS-TRIM annunciator indicates to the pilot that a sufficient level of roll mis-trim is present that the pilot must be prepared for an out-of-trim roll condition if the autopilot is disconnected. The bank limit (LOW) mode may be selected if it is desired to limit the maximum bank angle during autopilot operation. The mode is limited to use in conjunction with heading (HDG) mode only.

When the bank limit mode is engaged, the autopilot maximum bank angle is limited to 14 degrees. When the mode is engaged, LOW will annunciate in the pushbutton. Low bank mode will be automatically selected when climbing through 34,000 feet altitude, and will automatically cancel when descending through 33,750 feet. If heading mode is selected and then deselected while low bank is engaged low bank mode will be disengaged and the engage light will extinguish during the time heading mode is disengaged, but low bank mode will reengage and the LOW annunciator will re-illuminate when heading mode is reengaged.

The autopilot is normally disengaged in one of three ways: (1) depressing the AP/TRIM DISC switch on either yoke, (2) electrically trimming the elevator trim system, or (3) depressing the go-around button on either throttle. Actuation of the touch control steering button on the yoke will interrupt the pitch and roll servos until the switch is released; the yaw damper will remain engaged. If the autopilot is disengaged by any of the above three ways, a warning tone will sound for one second and the amber AUTOPILOT OFF light will illuminate for one second. Any other disconnect will cause the warning horn to sound for one second and the amber AUTOPILOT OFF light to stay illuminated. The amber light can be turned off by holding the AP/TRIM DISC switch for two seconds, or by pressing the electric trim switch or the go-around (GA) button on either throttle. The autopilot will also disengage if an overriding force (sustained torque) is applied to the vertical or horizontal axis for a minimum preset time. Disconnect will be annunciated by the one-second disconnect tone and illumination of the autopilot disconnect light, until the light is extinguished by one of the above methods.

ALTITUDE ALERT

An altitude alerting system provides a visual indication of when the airplane is within 1000 feet of a preselected altitude and normalizes when the airplane is within 250 feet of the preselected altitude. After capture, the system will reactivate if the airplane departs more than 250 feet from the selected altitude. As the airplane approaches within 1000 feet of the preselected altitude, which has been set into the lower right corner of the multifunction display (MFD), by the knob on the lower right side of the display bezel, the color of the altitude display will change to amber and the altitude warning horn will sound for one second. As the airplane approaches to within 250 feet of the selected altitude, the display will change back to blue. If the airplane again deviates from the selected altitude by more than 250 feet, the altitude display will change to amber and the altitude alert horn will sound for one second. The display will remain amber until the airplane returns to within 250 feet of the altitude, or until the altitude selection is reset.

The altitude alert function works in conjunction with altitude preselect (ASEL) mode, which is described below. The only difference in operation of altitude alert function alone is that the flight director and/or autopilot need not be engaged for altitude alert to function. The altitude alert annunciations are controlled by the pertinent flight director, which is selected by the autopilot couple switch (AP XFER FD1/AP XFER FD2), and are therefore based on the barometrically corrected altitude displayed on the same side of the cockpit. If the altitude set knob is moved or the glide slope capture mode is active, the annunciations of altitude alert will be cancelled.

PRIMUS 1000 SYSTEM OPERATION

The Primus 1000 system incorporates a wide variety of capabilities that produces one of the most precise, flexible and easy to use systems in airplanes today. The flight director and autopilot can be used independently or together. The airplane may be flown manually, using the guidance provided by the modes selected on the flight director, or when the autopilot is engaged and coupled to the flight director it will control the airplane using the commands generated by the flight director computer. Disengagement of the autopilot will have no effect on the FD modes in operation at the moment of disengagement, except when using the go-around button, in which case a wings level 10-degree nose up attitude will be commanded and all other FD modes will be reset. When the autopilot is engaged without any mode selected, manual pitch and roll commands may be made by means of the turn knob and pitch wheel on the autopilot controller. Touch control steering (TCS) can be used to maneuver the airplane or to modify the commands to the FD and AP. If the autopilot is not engaged, the TCS button can be used to synchronize the command bars to the airplane attitude. If HDG mode has been selected, BANK LIMIT mode may be engaged and the maximum bank angle will be limited to approximately 14 degrees.

Refer to the Primus-1000 Integrated Avionics System Pilot's Manual (Honeywell Publication Number A28-1146-134-00 Revision 0 dated April 2000 or later appropriate revision) for system description and operation of the installation of the Primus 1000 system.

The Primus 1000 system in the Citation V Encore operates through displays of the pilot's (or copilot's) electronic flight instrument system (EFIS). The systems of autopilot and EFIS are integrated, and unnecessary system redundancy has thereby been eliminated. The result is an overall simplification over previous systems, and greatly simplified interface requirements for the flight director function. If a particular EFIS unit is operational, the flight director will also be operational, and conversely if the EFIS has failed, the flight director will also be failed. The display is available as a single-cue or a double-cue (cross-pointer) presentation, the selection of which is made by means of the SC/CP button on the DC-550 Display Controller. The presentation upon power-up is single-cue. Glideslope and VNAV vertical path information are presented on the right side of the electronic attitude director indicator (EADI) section of the primary flight display (PFD). The pertinent command bar(s) of the flight director can be brought into view, when double cue display is selected, by selecting any mode. If single cue mode is selected, selection of only a vertical mode will not bring the command bars into view.

The autopilot may be switched to the pilot's flight director (FD 1) or the copilot's flight director (FD 2) by means of an illuminated selector switch (AP XFER FD 1/AP XFER FD 2) located on the center instrument panel. This switch determines only which flight director system provides guidance to the autopilot.

BASIC AUTOPILOT

The basic autopilot, without any inputs from the flight director system, can be used for pitch, roll and heading hold. The autopilot will hold the pitch attitude existing at the moment of AP engagement and the pitch attitude existing at the moment of disengagement of a vertical mode.

The autopilot can be engaged in any reasonable attitude; however, unless touch control steering (TCS) is used in conjunction with autopilot engagement, the autopilot will roll wings level if engaged while in a bank. If the bank is less than six degrees at engagement, the autopilot will hold the heading indicated when the autopilot is engaged. If the bank is over six degrees at engagement, it will hold the heading indicated when the airplane rolls through six degrees of bank on the way to wings level. If a lateral mode is disengaged, the autopilot will hold the heading existing at the moment of disengagement. If the turn controller is out of the center detent position, the autopilot will not engage.

VNAV MODE

The vertical navigation mode (VNAV) mode provides a means to define a climb or descent path to a vertical waypoint ahead of the airplane and to track the path to that waypoint. The waypoint is defined based on a distance reference (bias distance) “TO” or “FROM” a short range VORTAC station waypoint, or the next FMS waypoint if the FMS system is being used for navigation. Upon arrival at the waypoint/altitude the mode automatically changes to altitude select (ASEL) capture mode and then to altitude hold (ALT) mode when it levels at the selected altitude.

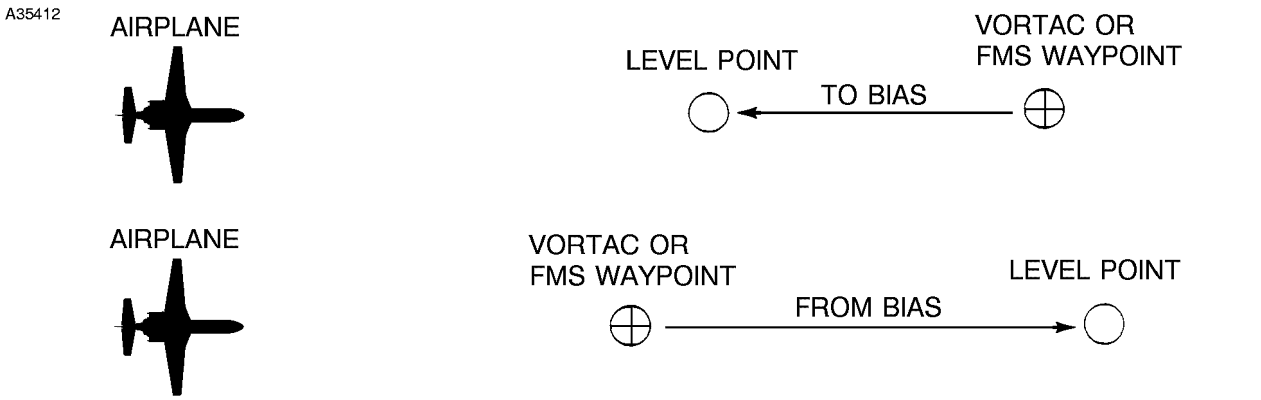

Figure 3-20. To - From Bias

VNAV DEFINITIONS AND OPERATION

Desired Altitude (ALT) - The altitude at which the airplane will level at the completion of the climb or descent.

Station Elevation (STA EL) - The elevation above sea level of the VORTAC station that the VOR and DME are receiving. Does not apply to FMS waypoints when used for VNAV.

TO/FROM Bias (TO/FR) - The distance set into the VNAV that moves the point for completion of the problem away from the VORTAC or FMS waypoint being used.

TO bias moves the point closer to the airplane than the VORTAC or FMS waypoint being used.

FROM bias moves the point farther from the airplane than the VORTAC or FMS waypoint being used.

During VNAV operation overspeed protection based on the V_{MO} speed limit, and underspeed protection based on a fixed 120 kts. will be provided. If either of these speeds is reached a special submode will engage and will override the VNAV mode until the speed situation is corrected. If a deviation of 1000 feet from the computed path occurs, VNAV mode will cancel. Single-point VNAV will remain armed if another vertical mode is selected for early descent prior to path capture. After level-off, a descent away from the altitude preselector will occur upon intercept of the programmed VNAV path. To prevent an undesired descent after level-off, manually disarm the VNAV mode.

VNAV operation will be cancelled if another vertical mode is selected, the air data information from the micro air data computer (MADC) becomes invalid, the DME signal is lost for five seconds, an overspeed or underspeed as described above occurs, the PFD NAV source is changed, glide slope capture or level off at the waypoint occurs, or in case of the detection of various system faults by the system monitors.

In order for VNAV mode to operate the airplane must be proceeding along a direct path towards or away from the short range NAV (VORTAC) (or to the next FMS NAV waypoint) which has been selected as a reference. If a VORTAC is being used, the VOR azimuth and DME must be locked onto the VORTAC station for VNAV computation. The desired altitude, station elevation (VORTAC only) to the nearest 100 feet, and the TO/FROM bias (if required) must be set into the VNAV system. If the FMS is being used for navigation, the next waypoint may be used, with or without TO or FROM bias, and station elevation (STA EL) data is not required. Attempts to insert VNAV problems behind the airplane or outside the parameters of the system will be ignored by the system.

PROGRAMMING

Programming is possible when a VOR station is tuned, lock-on of azimuth and DME occurs, and the waypoint desired is within selectable parameters, or when FMS navigation is in use and the next waypoint is used to define the VNAV problem. Arming of the VNAV to any waypoint consists of selection of the desired waypoint, and selection of waypoint data which will enable the flight director computer to compute a viable VNAV problem.

Using short range NAV, when a VORTAC station is tuned, identified, and lock-on is achieved, the VNAV selections can be made. If TO or FROM (FR) bias is required the second button from the left on the bezel of the multifunction display (MFD) is pressed, which will result in display of a box into which may be set the TO or FR bias by turning the left knob on the MFD. TO or FROM is selected before the distance selection is made by toggling the button, resulting in annunciation of TO or FR above the selection window. Station elevation (STA EL) of the VORTAC station in use is then set by pressing the second button from the right and setting the correct elevation, to the nearest 100 feet, into the window above it. Set the desired altitude in the preselect window. The VNAV problem is now established, and VNAV may be selected. If long range NAV is used the problem is similarly defined; FMS must be selected on the DC-550, which will result in long range data being displayed on the menu at the bottom of the MFD display, and therefore being selected by the respective knobs discussed above. If FMS is being used, station elevation (STA EL) is not required.

If a valid problem has been defined, the computed angle will be displayed on the MFD VNAV menu located at the bottom right of the MFD display. A VNAV problem is valid only if the vertical angle is less than +/- 6°. The flight director computer will continually compute the vertical angle based on aircraft position and update the display on the vertical path indicator on the PFD. If the pilot desires he can rotate the VNAV set knob and increase the vertical angle up to a maximum of 6°, which will create a vertical path intercept point some distance ahead of the aircraft. Once a valid VNAV problem has been defined, the pilot can select the VNAV mode on the MS-550 Mode Selector. VNAV mode will, however, not activate until it is selected, or selection is affirmed, by a pilot action.

If the pilot has selected an intercept point ahead of the airplane by increasing the vertical angle before selecting the VNAV mode, the flight director will remain in the previous mode until the appropriate time. Approximately one minute prior to the flare point the altitude alert horn will sound two short beeps. The vertical track alert (VTA) will flash on the PFD and the VNAV annunciator will flash on the MS-560 Mode Selector. A pilot action is required before the VNAV capture phase can commence. The pilot must press the flashing VNAV button on the mode selector before it stops flashing, to allow the mode to capture. Once the button is pressed, the annunciation in the mode selector will stop flashing and remain on, as with the VTA annunciator on the PFD. If the pilot wishes to cancel the mode he can press the VNAV button twice on the mode selector when it flashes, or he can do nothing and wait for the flashing to stop, at which time the mode will automatically disengage.

When the VNAV mode is engaged, the VNAV parameters are frozen. This includes STA EL, TO, FROM, and VANG; changing the ALT SEL value will also cause the mode to drop out. The pilot may still view any of these parameters but the set knob will have no affect. After the airplane has leveled off at the waypoint altitude and transitioned into altitude hold mode the VNAV parameters for the current problem are erased.

If the pilot deselects the VNAV mode by pressing the VNAV button, the flight director cancels the mode but the data for the current waypoint are retained. The angle from the present position to the waypoint will still be tracked but the parameters will no longer be frozen and can be modified as desired by the pilot. The VNAV mode can be reselected as long as the problem remains valid.

ALTITUDE ALERTING SYSTEM

The altitude alerting system is automatically engaged in conjunction with the altitude preselect mode (ASEL) and the vertical navigation (VNAV) mode. The desired altitude is set into the system for use of the VNAV or ASEL modes. In both cases the altitude is set into the lower right corner of the MFD with the right knob on the MFD bezel. The desired flight director mode which is to be used to reach the designated altitude is then selected on the flight director/autopilot mode control panel. Refer to Altitude Hold and Altitude Preselect, below. If the pilot does not desire to select a flight director mode, the airplane can be flown manually and the altitude alerting system will still provide the appropriate annunciations.

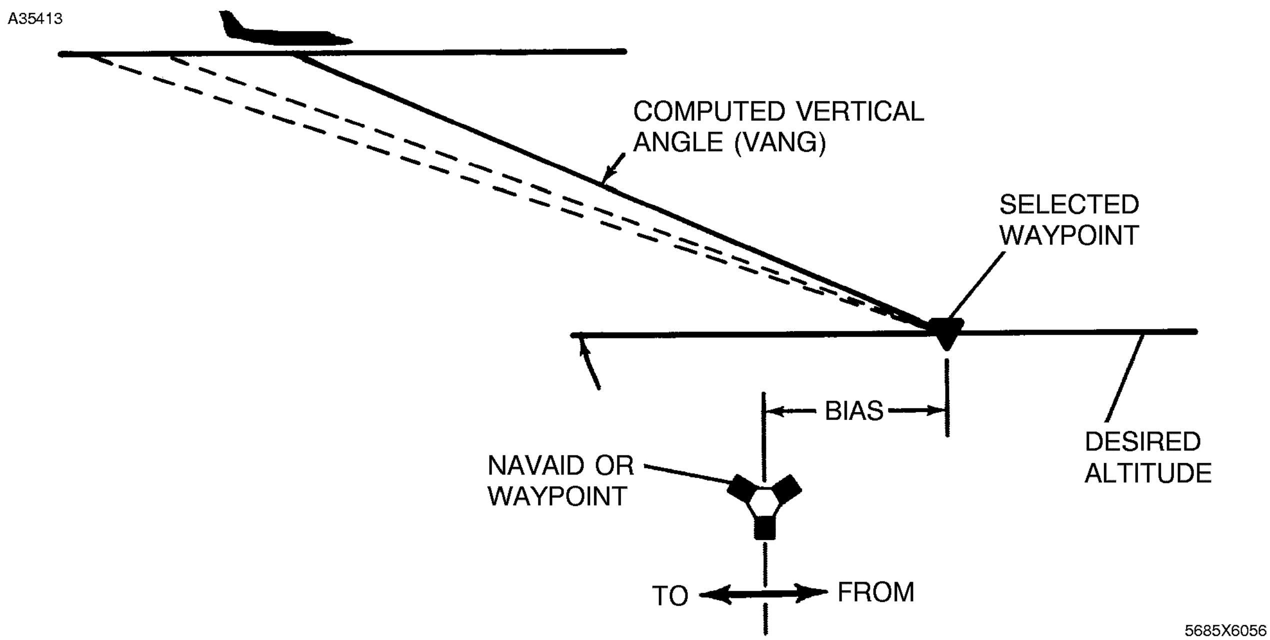

Figure 3-21. Vertical Angle Computation

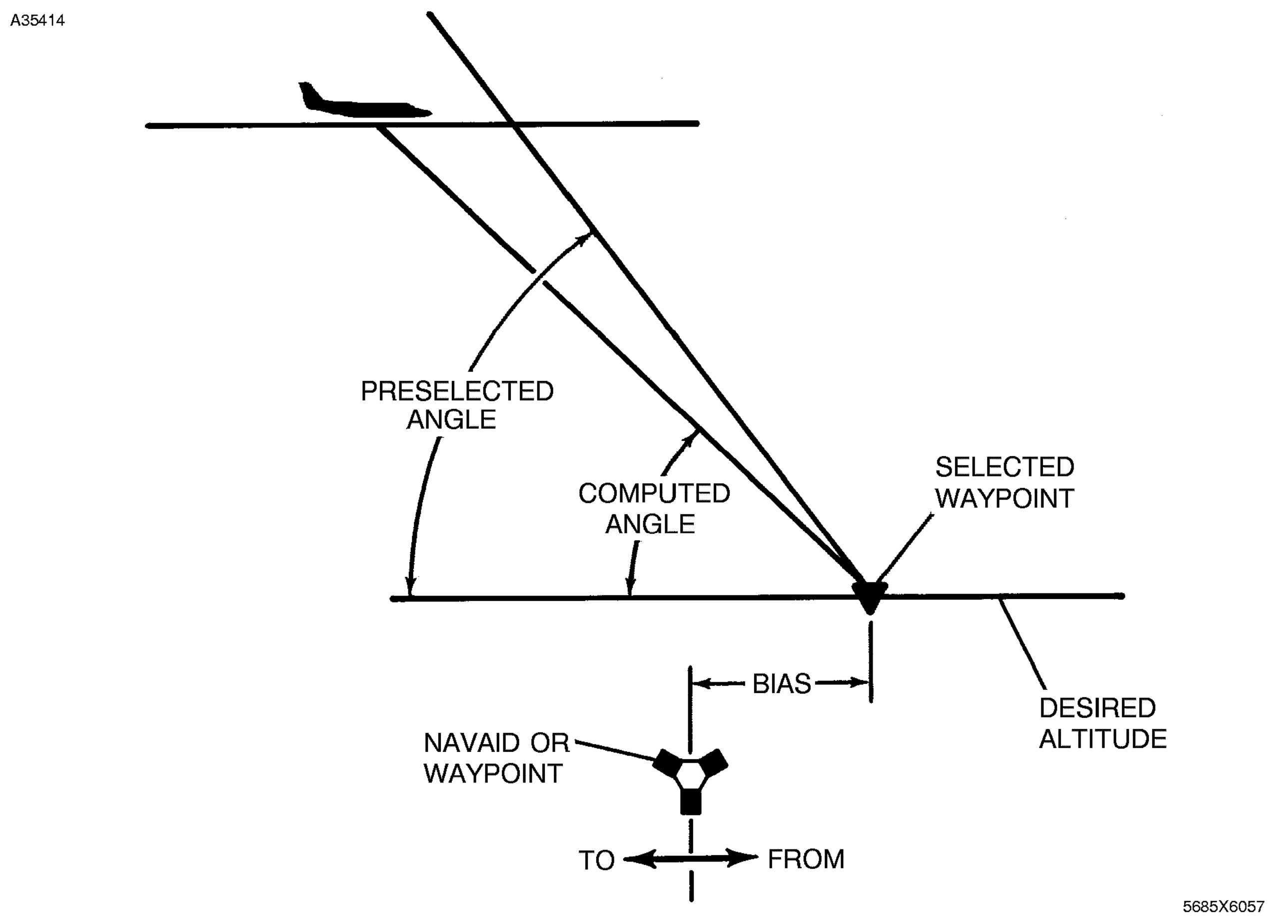

Figure 3-22. Intercepting Preset Angle

TOUCH CONTROL STEERING

Touch control steering (TCS) enables the airplane to be maneuvered manually during autopilot operation without cancellation of any selected flight director modes. To use touch control steering, press the TCS button, maneuver the airplane and release the TCS button. TCS is operable with all autopilot modes. During TCS operation the yaw damper will remain engaged.

If the autopilot is engaged in a bank and it is desired to hold the bank, press the TCS button, engage the autopilot and release the TCS button. The bank will be maintained if it is in excess of six degrees. The airplane may be rolled level with the turn knob. The memory function holding the autopilot in a bank will be canceled when the turn knob is moved out of detent.

In the case of speed (SPD) (IAS or MACH annunciated) mode, vertical speed (VS) mode or altitude hold (ALT) mode, the TCS button may be depressed and the airplane maneuvered to a new reference. When the TCS button is released, the flight director/autopilot will maintain the new reference.

HEADING MODE (HDG)

The heading mode (HDG - annunciated in green letters in the top right of the EADI) can be used with the flight director (FD) only, or in conjunction with the autopilot. When the heading (HDG) mode is selected on the MS-560 Mode Selector, the command bars will come into view and display a steering command that is controlled by the HDG cursor (bug) on the EHSI. The heading bug is set by means of the RI-553 Remote Instrument Controller located on the pilot’s pedestal. Pushing the HEADING knob PUSH SYNC function synchronizes the heading bug to the present heading (EHSI lubber line). The command bars will synchronize vertically to the pitch attitude at the time of HDG selection. Heading mode will be engaged automatically if another lateral mode is selected and the airplane is outside the capture parameters of that mode. In this case, HDG mode will remain ON until the airplane arrives at a point where capture can occur. The selected mode will then capture and be annunciated in the mode selector and in green letters at the top left side of the EHSI, and HDG will cancel. If the autopilot is also engaged, the autopilot will receive steering commands according to the selected mode(s). NAV and APR modes can be armed with the HDG mode ON. When intercepting a VOR radial or localizer course with the NAV or APR modes selected, the system will switch from ARM to CAP when within the capture limits and the armed mode will be captured.

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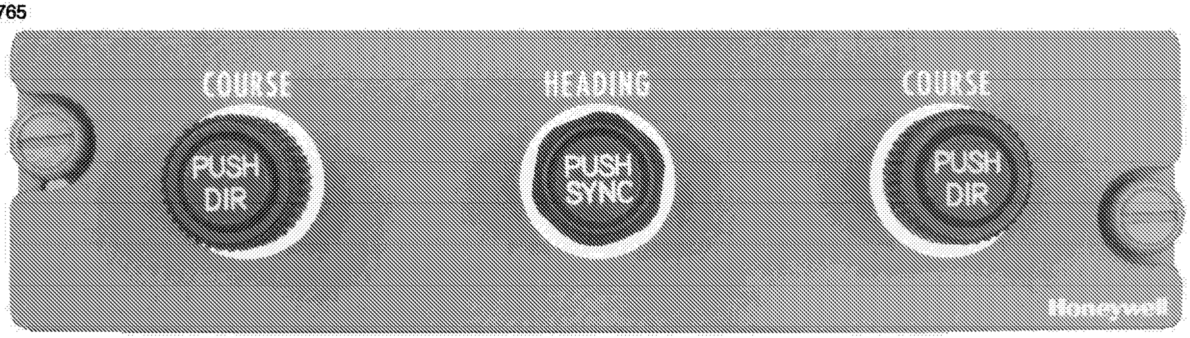

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Figure 3-23. RI-553 Remote Instrument Controller

NAV (VOR) AND NAV APR (VAPP) MODES

Two different modes of capture and tracking a VOR signal are used in the Primus 1000 system. One method is used for normal enroute navigation (VOR) and the other for a VOR approach (VAPP).

For enroute navigation, the desired VOR frequency is selected on a NAV receiver, the course bearing set on the EHSI, and NAV mode is selected on the MS-560 Flight Director Mode Selector. The small green light in the mode selector will illuminate, and if the airplane is outside the NAV capture limits, VOR will be annunciated in white at the top left of the EADI and HDG will be annunciated in green at the top right of the EADI. As the airplane is maneuvered within the capture limits, HDG will extinguish and VOR will illuminate in the green at the top left of the EADI. When the mode is transitioning to capture, a white box will be drawn around the mode for five seconds.

For a VOR approach (VAPP mode), the desired VOR frequency is selected on the NAV receiver, the course bearing set on the EHSI, and the APR mode is selected on the flight director mode selector. The green light will illuminate in the APR button and, if outside the capture limits, VAPP will illuminate in white on the top left side of the EADI. HDG will annunciate in green in the top right side of the EADI.. When the airplane maneuvers into capture range, HDG mode will cancel and VAPP will annunciate in green in the top left side of the EADI. A white box will be drawn around the capturing mode for five seconds.

In both NAV and APP modes, a station passage feature is provided that incorporates bank angle limits and a course hold (plus wind drift) mode. The station passage mode for enroute tracking (NAV mode) is of long enough duration to provide smooth transition of a VOR station at any altitude. The station passage mode for APP mode is of short duration to provide approach accuracy. This does not provide the degree of ride smoothing that is present in the enroute case.

Autopilot coupling during VOR approaches is limited to airports at elevations at or below 3,300 feet. Pilot flown approaches with flight director guidance may be conducted, however.

ILS APPROACH (LOC) OR (LOC GS)

With a localizer frequency selected in a NAV receiver, operation is similar to capturing and tracking a VOR radial. Selecting APR on the mode control panel with a localizer frequency tuned, arms both the LOC and GS modes and engages HDG, if not previously selected and the airplane is outside the capture parameters of the mode. It is imperative that the APR button be pressed when the airplane is within less than 90 degrees of the final approach course of the published ILS course; otherwise the system will assume that a back course is being selected, and will so annunciate. HDG will be displayed in green at the top right of the EADI and the green light in the APR button of the mode selector will illuminate; LOC and GS will be illuminated in white on the upper left and right, respectively, of the EADI. When inside the LOC capture limits, LOC will illuminate in green at the top left of the EADI and HDG will extinguish. At glideslope capture (approximately 1/2 dot), GS will illuminate in green on the EADI. During transition to both the LOC and GS capture modes a white box will be drawn around the respective mode annunciations. During ILS approaches, the FD gain is progressively adjusted during the approach using GS deviation, radio altitude, and middle marker passage for gain programming. If the radio altimeter is not operational, this function is performed as a function of glideslope capture and middle marker passage.

The capture limits for VOR and LOC captures are variable depending on DME distance, speed and intercept angle. Glideslope capture is locked out until localizer capture occurs. If the localizer mode becomes invalid for any reason, the glideslope mode will also be cancelled.

The glide slope indicator, located on the right side of the EADI presentation, is green unless there is a cross-side selection, in which case it will be yellow.

BACK COURSE LOCALIZER APPROACH (BC)

A back course localizer approach capability is provided using either flight director or autopilot or both.

With a localizer frequency set in the selected NAV, selecting APR on the mode selector arms the system for a back course localizer approach. The front course of the ILS must be set into the EHSI to give proper indications on the course deviation bar and for the flight director computer to compute correct back course corrections during the approach. If the back course is set on the EHSI the command bars and autopilot will be given incorrect steering commands. When APR is selected on the mode selector, the green light in the button will illuminate and BC will be annunciated in white on the left top side of the EHSI. HDG may illuminate in the top right side of the EADI if the airplane is outside of capture parameters for the mode and heading mode engages in order to effect capture. It is imperative that the APR button be pressed when the airplane is within less than 90 degrees of the final approach course of the published back course; otherwise the system will assume that a front course is being selected, and will so annunciate. When the back course is captured, BC will be illuminated in green on the top left side of the EADI and HDG will extinguish if heading mode was engaged to accomplish intercept. The system will not annunciate the back course mode until localizer capture occurs and the system confirms that the heading is in excess of 90 degrees from the selected (front) course.

ALTITUDE HOLD (ALT) AND ALTITUDE PRESELECT (ASEL)

Selecting altitude hold (ALT) provides steering commands to maintain the altitude at the moment of engagement. An altitude preselect (ASEL) mode is also incorporated which provides a preprogramming capability. To use altitude preselect, the desired altitude is set into the ALT window at the lower right corner of the multifunction display (MFD) by means of the knob on the bottom right of the MFD bezel. ASEL will illuminate in white in the top right side of the EADI to indicate that the altitude preselect mode is armed. The airplane may be maneuvered toward the desired altitude using any of several methods: the autopilot pitch wheel, touch control steering, FD pitch sync, speed hold or vertical speed hold. If the airplane is flown manually, the flight director will guide the pilot onto the selected altitude. As the airplane approaches the desired altitude, the altitude preselect will capture at an altitude corresponding to approximately 1/5 the rate-of-climb/descent; i.e., at 2000 feet/minute climb rate, the system will capture approximately 400 feet prior to the selected altitude.

At capture, the mode ASEL will illuminate in green on the EADI. The flight director will perform a smooth level-off at the selected altitude. At level-off altitude, ALT mode will be automatically selected and displayed in green on the EADI. Once altitude hold is captured, the touch control steering (TCS) button on the control wheel can be used to change or trim the selected altitude. TCS operates in conjunction with the flight director or the autopilot or both. Once ALT mode is engaged, resetting the BARO setting on the pilot's altimeter will cause the airplane to climb or descend to recapture the same indicated altitude. Moving the autopilot pitch wheel will cause ALT or ASEL CAP modes to be canceled if either is selected.

Selection of a vertical mode without a lateral mode will provide autopilot tracking of the mode but the FD command bars will not be in view.

FLIGHT LEVEL CHANGE HOLD AND VERTICAL SPEED HOLD

Flight Level Change (FLC) hold (IAS or MACH - mode selectable depends upon altitude) and vertical speed (VS) hold are selected by pressing the appropriate mode button (FLC or VS) on the MS-560 Flight Director Mode Control Selector. The flight director, autopilot, or both will hold the airspeed, (Mach if appropriate), or vertical speed indicated at the moment of engagement. The green light in the respective mode selector button will illuminate and VS or IAS (or Mach), as appropriate, will illuminate in green on the EADI. When initially selecting speed mode, the speed target will synchronize to the existing indicated airspeed for altitudes below 28,600 feet, and will synchronize to the existing Mach number for altitudes above 27,900 feet. The target will automatically switch from indicated airspeed to Mach number as the airplane climbs through 28,600 feet or greater than 0.62 Mach. It will automatically switch from Mach number to indicated airspeed as the airplane descends through 27,900 feet or if the Mach goes below 0.61. Upon initially selecting vertical speed hold mode, the vertical speed will synchronize to the existing vertical speed. Once the vertical speed mode is selected with the autopilot engaged, the pilot can select a different vertical speed with the pitch wheel on the autopilot controller. If the autopilot is engaged after VS mode is selected, the vertical speed must be resynchronized.

The autopilot pitch wheel may be used to change the reference speeds for both the speed mode and the vertical speed mode. The touch control steering (TCS) button may also be used to temporarily release the autopilot clutches and maneuver the airplane to a new reference. The airspeed, Mach, or vertical speed established when the (TCS) button is released will become the new reference.

A predetermined lower limit has been established, below which the FLC mode will not engage. At the opposite end of the speed spectrum, V_{MO} or M_{MO}, as appropriate, will not be exceeded. If an upper limiting speed is attained the system will maintain the limiting speed, thus speed hold mode can be used to fly V_{MO} or M_{MO} descents.

Selection of the flight level change mode will cancel all other vertical modes except altitude preselect arm (ASEL - green annunciation) and glide slope arm (GS - green annunciation).

GO-AROUND MODE

A go-around mode (GA) is available through buttons on the left and right throttles. Depressing one of the buttons will drop all other FD modes and disconnect the autopilot except, for the yaw damper. The FD command bars will command a wings level and a ten-degree nose up climb attitude. GA will illuminate in green on the EADI. After go-around has been selected, the selection of any lateral mode will cancel the wings level roll command but the pitch-up command will remain. The go-around mode is canceled by selecting another pitch mode, pressing the TCS button, or engaging the autopilot.

PITCH SYNCHRONIZATION

When flying the airplane manually and using the flight director, the command bars may be matched to the existing pitch attitude, or if a vertical mode has been selected, the mode reference may be changed by pressing the touch control steering (TCS) button. When the TCS button is released, the command bars will synchronize to the airplane attitude existing at the moment of release. If a vertical mode is selected (ALT, VS, SPD), the flight director/autopilot will hold the vertical reference existing at the time of release.

ELECTRONIC FLIGHT INSTRUMENT SYSTEM

The electronic flight instrument system (EFIS) is an integral part of the Primus 1000 Flight Guidance System. The EFIS system consists of three DU-870 electronic flight displays (the pilot's and copilot's are identical and interchangeable), and the center instrument panel mounted DU-870 Multifunction Display (MFD), a DC -550 Display Controller for each pilot, an MC-800 Multifunction Display Controller, an MS-560 Mode Selector for each pilot, and an RI-553 Remote Instrument Controller. An AZ-850 micro air data computer in each system also provides inputs which are used and displayed by the EFIS system; cross selection (ADC1/ADC2 on the display controller) of micro air data computers is possible, which provides system redundancy. The heart of each pilot's system is an IC-600 Display Guidance Computer. It contains the flight director computer; the pilot's IC-600 also contains the autopilot controller. The symbol generator receives and processes airplane sensor inputs and transmits the data to the electronic primary flight displays (PFDs) in its system. In case of malfunction of a symbol generator, which is located in the DU-870, reversion is possible through a selection (SG1/NORM/SG2) on the MC-800 Multifunction Display Controller.

Other parts of the system are discussed under different headings, since some of the sub-systems must be covered individually, and components of the EFIS system also comprise parts of those systems. The C-14D directional gyro and the VG-14A vertical gyro, for example, also are important parts of the integrated system, however, they are discussed under separate headings.

A conventional slip/skid indicator is attached to the PFD of each pilot. Both primary flight displays and the multifunction display can be dimmed manually by means of knobs on the respective controllers and the relative brightness will then be maintained photoelectrically.

Selections for navigation sources and bearing needle presentations are controlled by means of buttons and knobs on the display controller (DC). The selected sources are annunciated on the primary flight displays. Each pilot may choose FULL or ARC mode (ARC mode also displays weather radar) for compass display, single cue or cross pointer flight director display, a display of ground speed (GS) or time-to-go (TTG), and elapsed time (ET); he may select either micro air data computer (ADC 1 or 2) as a source of system air data information. NAV 1 or NAV 2, or FMS may be selected for navigation display and control of the flight director These functions are explained under Display Controller below. Additional knobs which select various navigation equipment for display (only) on the EFIS are also discussed below.

Operation of the EFIS is similar to a standard flight director system except for the presentation of additional information on the small format of two electronic display units. More information is available in a more compact arrangement and the format is variable as desired. Presentations that are not necessary or desired at any one time can be removed and replaced with more appropriate data for the existing flight conditions. The units of the system are discussed below.

The MC-800 multifunction display controller (MFD) is installed in the center pedestal. The MFD controller provides for the selection and control of the MFD formats, modes, and waypoint designator. The multifunction display controller is also discussed below in this section.

DISPLAY CONTROLLER

The display controllers, located on the left and right of the instrument panels, allows selection of the different formats and provides for selection of required navigation sources and bearing data.

The individual controls are:

SC/CP:	Selects flight director command mode. Alternate action toggling between single cue and cross pointer flight director display. Power up state is single cue.
GS/TTG Button:	Ground speed (GS) or time-to-go (TTG) is displayed in the lower right center of the EHSI. Pressing the GS/TTG button provides alternating selection of GS or TTG to next station or waypoint.
ET Button:	Controls elapsed timer that appears in the EHSI location dedicated to GSPD/TTG. Initial actuation enters the mode at the previous position. If elapsed time is being displayed, stops the display. Sequence of the ET button is: Reset - Elapsed Time - Stop - Repeat.
NAV Button:	Pressing the NAV button selects the VOR for display on the EHSI course deviation indicator (CDI). Pressing the button alternately selects NAV 1 and NAV 2 (annunciated VOR 1 and VOR 2 on the center right side of the EHSI; ILS 1 and ILS 2, if ILS frequency is tuned in NAV). The flight director interfaces with the NAV that is selected and displayed on the EHSI.
FMS	Selects flight management system (FMS) for display on the EHSI; the flight director will interface with the FMS. The EHSI course needle represents FMS course information on the bearing pointer.
BRG " **O** " Knob	This knob has four positions. The OFF position removes the bearing pointer from the display. In NAV position, VOR 1 bearing information is displayed. In ADF position, ADF 1 bearing is displayed. Selecting FMS displays FMS.
PFD DIM (Outer Concentric)	The DIM knob sets the overall brightness of the PFD. When a reference level is set, photoelectric sensors will maintain the relative brightness level in various lighting conditions. Full counterclockwise OFF position turns off the PFD, and will revert the display, through an EFIS backup mode, to the multifunction display. EFIS backup is provided by the MFD as an addition to the existing symbol generator (EFIS) reversionary modes. In case of failure of a primary flight display (PFD) cathode ray tube, selection of an EFIS backup mode can be accomplished by turning OFF the PFD DIM button on the affected PFD. The MFD will then take up the display selected on that controller. If both PFDs are OFF, the copilot's PFD will have priority on the MFD display.

Decision Height (Inner Concentric - “DH”)	Rotation of the "DH" knob adjusts the decision height display on the EADI. Rotating the knob fully counterclockwise removes decision height information from the display.
Test Function (TEST)	Pressing and holding the RA/TEST button causes the displays to enter the test mode. Flags, cautions, and all flight director and mode annunciations are tested and presented on the display. As the test button is held down an autopilot (left display only) and flight director system checks will be accomplished. Satisfactory or unsatisfactory test results will be annunciated on the display. The test will also result in a self-test of the radio altimeter system; 50 feet will be indicated in green at the bottom of the EADI display and the decision height (DH) horn will sound. The TEST button is wired through a squat switch and is completely active only when the airplane is on the ground. The Primus 1000 test is not active in flight, but a self-test of the radio altimeter system may be made in flight if the GS capture mode is not active. The EFIS system will also automatically self-test when it is powered up. If the test is not satisfactory it will be so annunciated.
BRG “ ◇ ” Knob	This knob has three positions. The OFF position removes the bearing pointer from the display. In NAV 2, NAV 2 bearing is displayed. In ADF 2 position (if installed), ADF 2 bearing is displayed.

HEADING REVERSION SWITCH (HDG REV)

The heading reversion switch is an auxiliary push button switch on the pilot's and copilot’s instrument panel which allows selection of the opposite side C-14D as an alternate (reversion) heading source for the pilot's or copilot’s flight director. MAG 2 (MAG 1) or DG 2 (DG 1) will be annunciated in amber in the center-left of the PFD. The annunciation of MAG or DG will be controlled by the position of the respective GYRO MAN/AUTO switch on the pilot’s or copilot’s instrument panel. If there is no reversion selection and both systems are selected to their own respective sources, there will be no annunciation. If there is a cross-selection on both sides, the annunciation will be in white. If the same C-14D is selected as a heading source on both sides, the heading source annunciation will be in amber, to apprise the pilots that both indicators are selected to the same heading source.

ATTITUDE REVERSION SWITCH (ATT REV)

The attitude reversion switch is an auxiliary push button switch on the pilot's and copilot’s instrument panel which allows selection of the opposite side VG-14A as an alternate (reversion) attitude source for the pilot's or copilot’s attitude indicator. ATT 2 or ATT 1 will be annunciated in amber in the upper-left of the PFD. If the same VG-14A is selected as an attitude source for the attitude indicators on both sides, the attitude source annunciation will be in amber; if both systems are selected to their respective sources there will be no annunciation. If there is a cross-selection on both sides the annunciation will be in white. In case of a reversion selection, the annunciation is in amber to apprise the pilots that both indicators are selected to the same heading source.

MULTIFUNCTION DISPLAY SYSTEM

The Multifunction Display (MFD), the central DU-870 cathode ray tube, serves as the weather radar indicator. It can be used to display the horizontal navigation situation, either short range (VORTAC) or long range (FMS), and to display electronic checklists. It also provides backup capability to the EFIS systems, with a major sub-function. If a symbol generator on one side fails the pilot can, through the SG1/NORM/SG2 control on the MFD controller, select the opposite side symbol generator to take over the failed side's display, and operation of the EFIS in that position will continue as before, with the selected symbol generator powering all three displays.

The multifunction display system expands on the navigation mapping capability of the EFIS, especially in conjunction with the flight management system (FMS). The MFD display may be used independently for navigation and mapping information without disturbing the EHSIs, which may be then used without additional displays which would result in more "clutter" on the EHSI. The weather radar display may be selected independently (by selecting off all of the navigation functions) or overlaid on the navigation display provided by the flight management system, in order to show the airplane route with respect to the displayed weather returns.

MULTIFUNCTION DISPLAY CONTROLLER

The EFIS multifunction display (MFD) controller, located at the front of the pilots' pedestal, allows mode selections, display control, and symbol generator reversion control of the pilot's and copilot's systems. In addition to its navigation, reversion, and checklist functions the MFD control also provides for control of the display of the optional Traffic Collision Avoidance System (TCAS).

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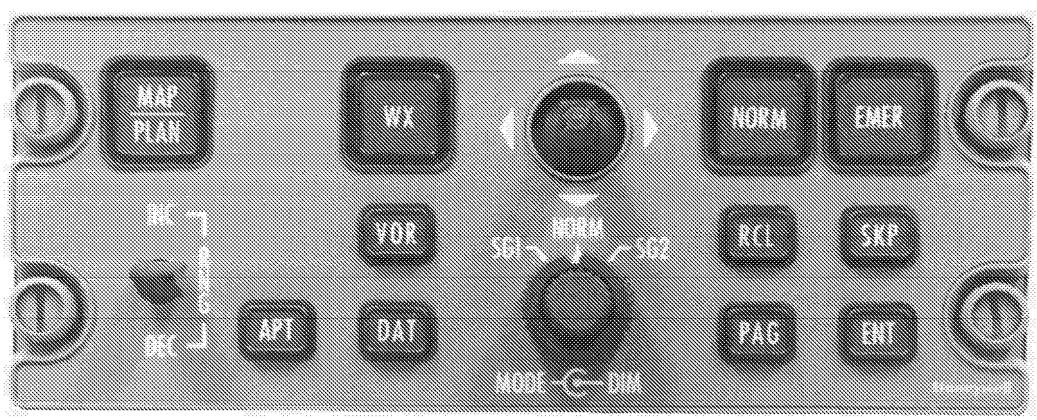

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Figure 3-24. Multifunction Display Controller (MC-800)(Typical)

MFD MODES OF OPERATION

The different modes of operation available to the multifunction display system are discussed below. The modes are: MAP/PLAN; WX; Checklist, with Normal and Emergency Procedures; and backup symbol generator modes for either of the primary flight displays (PFDs). The optional Traffic Collision Avoidance System (TCAS) also operates through displays presented on the multifunction display. If the TCAS system is installed, the MFD controller will have an additional (TCAS) button located to the right of the MAP/PLAN button.

MAP MODE

The MAP function is a partial arc airplane heading up display which is selected by the alternate action MAP/PLAN push button. The MFD display cycles from MAP to PLAN as the MAP/PLAN button is pressed. The MAP format allows totally independent use of the MFD display for navigation mapping and allows increasing the maximum range, beyond normal radar range, on the display which normally serves as the radar indicator. Power up mode is the MAP mode. To add weather to the display, press the WX button on the MFD controller.

The MAP format is always oriented to the airplane heading and the airplane symbol is located at the center of the display. When coupled to the FMS, the NAV route, with up to ten waypoints, can be displayed to the range limit. When weather returns are selected, range control defaults to the WC-650 Weather Radar Controller.

PLAN MODE

In PLAN mode the top of the display is oriented to North; a three-inch range ring is displayed and centered horizontally on the display area. An aircraft symbol is plotted at present position (if present position is on the display) and is oriented with respect to heading. The PLAN mode display encompasses 360°. Weather radar returns cannot be presented in the PLAN mode.

Traffic COLLISION AVOIDANCE SYSTEM (TCAS) (OPTIONAL)

The TCAS mode allows the TCAS window to be displayed when TCAS is installed in the airplane. TCAS resolution advisory will be displayed on the PFD (if TCAS II is installed) and traffic advisories will be displayed on the MFD.

WEATHER (WX) MODE

The WX mode allows the MFD display to be used as a weather radar indicator. In WX mode, weather data is presented on the MFD and is superimposed upon the normal navigation display. Weather radar can only be selected for display on the MFD if MAP mode is selected. If the MFD is in PLAN mode, selection of WX mode will force the display into MAP mode. Range selection is controlled by the weather radar control on the pilot's instrument panel. When the WX button is toggled, the progression of selection is: WX on - WX off. Annunciation of weather mode annunciations, warnings, and antenna tilt angle are provided at the lower middle left of the MFD display. Annunciations are color coded in magenta, green, and amber according to the importance of the display. Operation of the weather radar with the weather radar control is discussed in this section.

Checklist Mode

The NORM button on the MC-800 provides entry into the normal checklist display function. The normal checklists are arranged in the order of standard flight operations. Button actuations cause presentation of the normal checklist index page that contains the lowest order incomplete and unskipped checklist with the active selection at that checklist.

The RCL, SKP, PAG, and ENT buttons and the joystick on the MC-800 provide control of this function and are discussed under "Controls" below.

The EMER button on the MC-800 provides entry into the emergency checklist display function. Actuation of EMER results in the presentation of the first page of the emergency checklist index with the active selection at the first checklist. The RCL, SKP, PAG, and ENT buttons and the joystick provide control of this function and are described in "Controls" below. These controls perform as described for NORM with the exception of the action taken upon completion of the checklist. All checklist items are removed from the page and "EMERGENCY PROCEDURE COMPLETE" is written below the amber checklist title. This will be cleared when the index is selected. The SKP, PAG and ENT buttons will be inoperative.

EFIS BACKUP MODES

In case of a symbol generator failure, the side having the failure may be selected to the opposite side SG. If SG1 is selected it means that the pilot's symbol generator in his DU-870 is driving all three PFD displays. SG2 means the symbol generator in the copilot's DU-870 is driving all three PFD displays. In these cases the MFD will be normal and both PFD displays will have the same format. The multifunction display has no complete symbol generator function of its own and its symbol generator is therefore not selectable.

MFD CONTROLS

Dim	This knob controls overall MFD CRT dimming in addition to the automatic dimming feature accomplished by CRT mounted photodiodes. Counterclockwise dims display. The WX display is dimmed at the same time.
Joystick	The function of the joystick depends upon the type of MFD display:
MAP or PLAN:	Moves the designator in the directions shown.
TEXT:	a. Vertical actuations - act as a cursor control by changing the active line. This provides an additional means of skipping lines or returning to a previously skipped line.
	b. Horizontal actuations - control paging. Actuation to the right increases the page number, and actuation to the left decreases the page number.
MAP/PLAN	Pressing the MAP/PLAN button selects the MAP MFD display mode. Pressing it again selects North-up PLAN mode.
WX	Weather radar data may be displayed with the MAP mode. The toggling sequence of this button is: WX on WX off. If PLAN mode is selected, selection of MAP mode will be forced when WX mode is selected.
VOR	This button is used to display the four closest VORs, that are not on the active flight plan list, on the MFD MAP and PLAN displays. The first push of the button inserts the VORs with identifications. The second push removes the identification, and the third push removes the VORs from the display.
APT	The APT button is used to display the four closest airports, that are not on the active flight plan list, to the MFD MAP and PLAN displays. The first push of the APT button adds the airports with their identifiers. The next push of the button removes the airport identifiers. A third push of the button removes the airports from the MFD display.
DAT	This button is used to add long range NAV information to the MFD MAP and PLAN displays. The first push adds waypoint identifications and the second push removes them.
Range Controls (INC and DEC)	The MFD range controls are active only when WX is not selected for display. Selectable ranges are 5, 10, 25, 50, 100, 200, 300, 600 and 1200 NM. The switch position labeled INC increases the selected range, and the DEC decreases the selected range.
NORM	When this button is pressed, the MFD will display the index page containing the lowest numbered uncompleted or unskipped checklist with the active line at that checklist.
	While operating in this mode, as a checklist is completed, the system will automatically step to the next uncompleted procedure of the index.
EMER	Actuation results in the display of the first page of the emergency checklist index.
RCL	The function of this button depends upon the type of MFD display:
MAP or PLAN:	Recalls the designator to its home position.
TEXT:	Recalls the lowest numbered skipped line in a checklist by changing the active page and/or line.

MFD CONTROLS

SKP		The function of this button depends upon the type of MFD display:
	MAP or PLAN:	Skips the designator to the next waypoint. If the designator is not at the home position, the displacement line will be moved to the next waypoint.
	TEXT:	Actuation skips the active line in a checklist or index and advances the active selection to the subsequent line. If the line skipped is the last line, the active selection will revert to the lowest numbered skipped line.
PAG		Actuation advances the page count and places the active line selection at the first line of the page. Actuation with the last page displayed will result in display of the lowest numbered page containing a skipped line with the active line selection at the lowest numbered skipped line.
ENT		The function of this button depends upon the type of MFD display:
	MAP or PLAN:	With the designator moved from its home position, actuation of these buttons will enter the designator LAT/LON as a waypoint in place of the TO waypoint.
	TEXT:	Actuation checks off a line in a checklist or selects an index line item for display.

AUXILIARY EFIS ANNUNCIATORS

Indications in Upper Left of the Multifunction display

IC-1 HOT	Indicates Pilot IC-600 Display Guidance Computer Overtemperature Condition.
IC-2 HOT	Indicates Copilot IC-600 Display Guidance Computer Overtemperature Condition.
IC-1-2 HOT	Indicates Overtemperature Condition of Both IC-600 Display Guidance Computers.
IC-1 FAN	Indicates Failure of Pilot’s IC-600 Cooling Fan.
IC-2 FAN	Indicates Failure of Copilot’s IC-600 Cooling Fan.
IC-1-2 FAN	Indicates Failure of Both Pilot’s and Copilot’s IC-600 Cooling Fans.
CHK PFD1	IC-600 Display Guidance Computer Detects a Wrap-around Failure in PFD 1.
CHK PFD2	IC-600 Display Guidance Computer Detects a Wrap-around Failure in PFD 2.
CHK PFD1-2	IC-600 Display Guidance Computers Detect a Wrap-around Failure in Both PFDs.

ELECTRONIC ATTITUDE DIRECTOR INDICATOR (EADI)

Certain displays form a permanent part of the electronic attitude director indicator (EADI) portion of the Primary Flight Display (PFD). The displays are: the blue and brown sphere, the pitch and roll attitude reference marks, the airplane symbol, and the inclinometer which is fixed to the lower part of the PFD. Some annunciations which are presented in the EADI display are annunciations for other systems which are discussed under the headings of those systems, since they are not associated with EADI information. The flight director command bars will be in view on power up unless there is no lateral mode selected. The single-cue flight director presentation is the power-up mode.

Other displays are present when selected or during certain phases of a flight. When not in use, the displays are removed from view. The displays are:

Decision Height -	The decision height is a three-digit display identified DH (white) in the lower center-right side of the EADI presentation. The value of the decision height is identified in blue numbers. It is set by rotating the DH set knob on the display controller. Full counterclockwise rotation removes the display from view. A decision height annunciation (DH in amber inside a white box) appears in the upper left of the EADI display at radio altitudes less than or equal to the decision height setting and flashes for ten seconds. Decision height will not be annunciated until it is armed. Arming occurs when the “weight on wheels” switch senses “in air” and a radio altitude of 100 feet greater than the selected decision height for at least five seconds.
Flight Director Mode Annunciators -	Armed mode annunciations appear in white at the top left (lateral modes) and the top right (vertical modes) of the EADI presentation. Captured mode annunciations appear in green. When a mode is not selected, the annunciation is not present. As a mode transitions from armed to captured, a white box is drawn around the annunciation for five seconds.
Marker Beacon -	Marker beacon information appears below the glideslope indicator when ILS is tuned. A white box, in which the appropriate letter will flash when a marker beacon is passed, will be located in that position when a localizer frequency is tuned on the NAV control. Outer marker is identified with a blue "O", middle marker by an amber "M" and inner marker by a white "I".
Comparison Monitors -	Amber radio altitude comparison monitor warnings (RA), attitude comparison monitor warnings (ROL, PIT, ATT), and localizer and glideslope comparison monitor warning (LOC and GS) are located at the lower left side of the attitude display. Parameters for the illumination of comparator warnings are discussed under Comparison Monitor, below.
Flight Director Couple Arrow -	The green flight director couple arrow is positioned at the top, center of the PFD. The arrow is left pointing or right pointing to indicate which flight director the autopilot is coupled to. (This display is always present.)
Category Two Approach -	CAT2 (green), annunciated at the upper right of the EADI presentation, indicates that category two approach parameters have been met and the excessive deviation monitor has been enabled. A green category two approach window will be displayed around the center of the glide slope indicator. After a CAT2 condition has been established, if any one of several conditions should go invalid (except for autopilot engaged) the green CAT2 annunciator will be replaced by a flashing CAT2 legend, which will flash for ten seconds and then go steady. The CAT2 annunciation will be removed if the autopilot is disengaged or both DHs are set above 200 feet inclusive.

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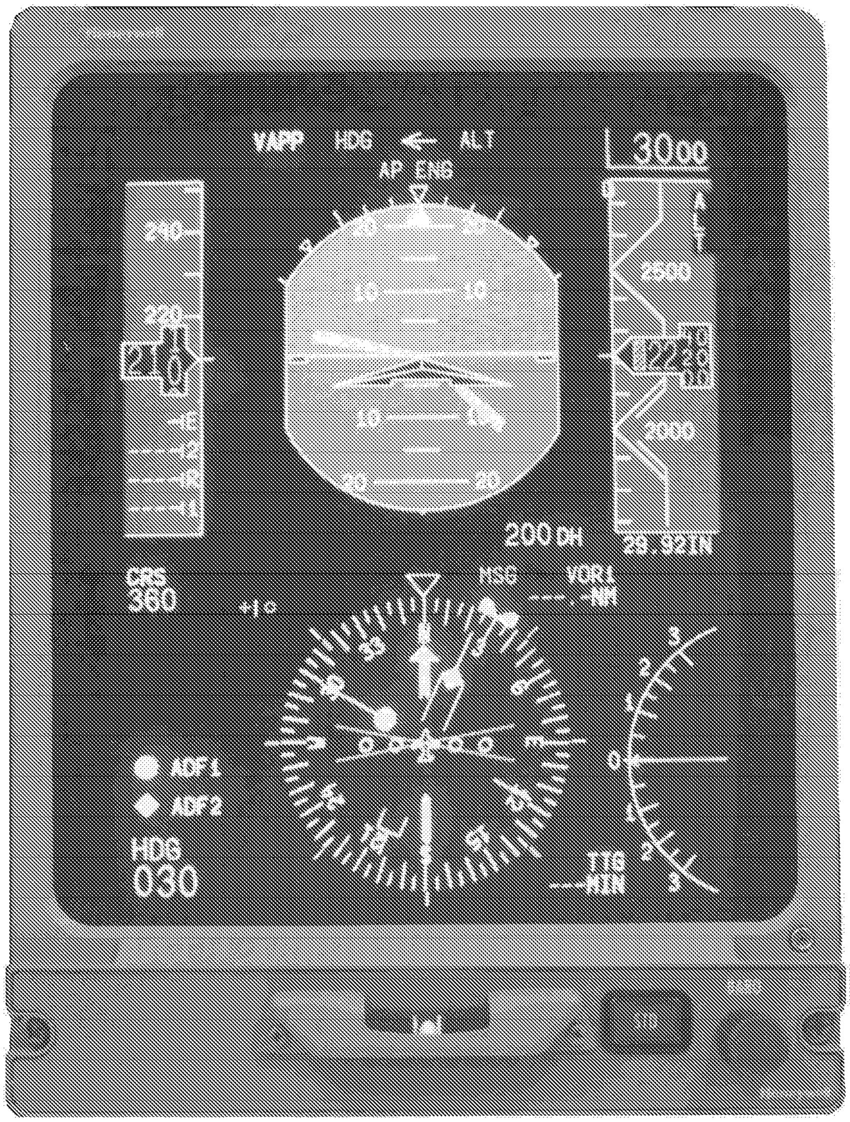

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Figure 3-25. Primary Flight Display

Low Altitude Awareness - A “Low altitude awareness” indication of a solid brown raster band will appear on the altitude tape as the radio altitude drops below 550 feet. When the airplane is on the ground the brown band will cover the lower half of the altitude tape. A yellow line will be drawn at the intersection of the brown and gray band of the altitude tape. There will be no written information displayed in the brown raster tape.

Glideslope/Vertical Path - When an ILS frequency is tuned, glideslope information will appear. Indication is conventional in appearance. Green color of the vertical scale pointer identifies the information as glide slope information. When tuned to other than an ILS frequency, the glideslope disappears. When FMS is selected, VNAV vertical path data will be displayed; pointer will be magenta and VTA (vertical Track Alert) will be displayed above the FMS annunciation at the upper right of the vertical path indicator.

NOTE

When the back course (BC) mode is selected on the flight director (the selected course is more than 90 degrees from the airplane heading) the glide slope indication will not be present.

Vertical Track Alert -	A vertical track alert message (VTA) will be displayed in amber above the glideslope/vertical path annunciation when VNAV function of FMS is selected for display. A white FMS will also be annunciated above the vertical deviation scale.
Vertical Navigation Display -	When VNAV mode is selected on the mode selector panel and NAV or FMS is selected on the display controller as a navigation source, the vertical navigation display comes into view. The magenta (FMS) or green (VORTAC) pointer indicates the center of the computed climb or descent angle.
Flight Director Command Cue -	The magenta flight director command cues can be selected in single cue or cross pointer format by pressing the SC/CP button on the mode selector panel. In the single cue format, if a lateral mode is not selected, the command bars will remain biased out of view. Power up default selection is single cue.
Source Annunciations -	Source annunciations (ADC1 and ADC2, ATT1 and ATT2, SG1 and SG2) will be displayed to indicate the sources of air data, attitude and symbol generator information, respectively. If the pilot and copilot are using their normal sources, there is no source annunciated. “Cross-selections” will be annunciated in white, and when both displays are selected to the same source the annunciation will be in amber, to remind the pilots of the single source selection. Annunciation is in the upper left section of the EADI display.
Radio Altitude	When at an altitude within operational range of the radio altimeter, the radio altitude display appears in green in the lower section of the EADI sphere.

EADI CAUTION OR FAILURE ANNUNCIATIONS

Flight Director Failure -	If the flight director fails, the flight director command bars disappear and an amber FD FAIL warning appears in the top left center of the display. All FD mode annunciators will be removed.
Internal Failures -	A large red X will cover the face of the primary flight display.
Radio Altimeter Failure -	If the radio altimeter fails, the radio altitude readout will be replaced by an amber RA. If the low altitude awareness indication is present, it will be removed.
Pointer/Scale Failures Glide Slope (Vertical Deviation), Altitude, Airspeed, and Vertical Speed -	Failure of pointers/scales is indicated by: Replacing the digital readouts with dashes, drawing a red X through the scale (IAS, ALT, GS only), and removing the pointer (GS and VS only).
Attitude Failure -	Attitude failure is annunciated by appearance of ATT FAIL in red in the middle of the attitude sphere. The sphere will change to solid blue, and the pitch scale and roll pointer will disappear.

ELECTRONIC HORIZONTAL SITUATION INDICATOR (EHSI)

The displays in the EHSI portion of the PFD are discussed below in three categories: FULL TIME which are always present, PART TIME which are sometimes present, and the arc mode.

FULL TIME DISPLAYS

Certain displays are always present on the EHSI or are always present when certain navigation equipment is in operation. The airplane symbol is always present and provides a quick visual cue of airplane position relative to a selected course or heading.

The other full time displays are discussed serially below. The angular presentations are all similar to those seen on a mechanical HSI.

Heading Dial and Digital Heading Readout -	Heading information is presented on standard type compass dial format and digital heading readout is shown above the heading dial when in the ARC mode.
Heading Select Bug and Heading Select Readout -	The heading bug is positioned around a compass dial with HDG knob on the remote instrument controller. The bug then retains its position in relation to the dial. A digital heading select readout is provided at the lower left of the display (cyan digits, white HDG label). The heading bug provides a heading error signal to the flight director.
Course Deviation Indicator -	Navigation or localizer course. Course deviation and airplane position relationships are depicted as on a mechanical HSI instrument. The course deviation indicator also operates in conjunction with the long range NAV system. Refer to Part Time Displays, below, for Desired Track information. The CDI is positioned by the course knob on the remote instrument controller. The course knob is not functional when FMS mode is selected. The CDI is magenta when FMS course information is presented, green when on-side NAV information is being presented, and yellow when off-side NAV information is being presented.
TO/FROM Annunciator -	Indicator points along selected course depicting whether the course will generally take the airplane to or from the selected station or waypoint. Indicator does not appear during localizer operation.
Distance Display -	Indicates nautical miles to selected station or waypoint. Distance display is in 0-399.9 NM for selection of short range navigation equipment and 0-3999 NM format for long range equipment. DME HOLD is indicated by an amber H next to the readout.
Navigation Source Annunciators -	NAV source annunciations are displayed in the upper right corner of the EHSI presentation. Long range sources are in magenta and short range sources are in green or yellow. A yellow indication means an “offside” selection or that both sources are the same. The label identification will always be white. A yellow annunciation of FMS indicates that both pilots are selected to the FMS.
Heading Source Annunciation -	Heading source is annunciated at the top left center of the EHSI presentation. A green annunciation indicates a normal selection and yellow indicates an “off-side” selection or that both selections are the same.
Heading SYNC Annunciator -	The heading SYNC annunciation is located to the left of the heading source annunciation in the upper left side of the EHSI presentation. The bar in the indicator represents commands to the compass to slew in the indicated direction. Plus indicates an increase in heading and zero indicates a reduction in heading. Slow oscillation indicates normal operation.

PART TIME DISPLAYS

Part time displays are present when selected on the display controller or the flight director mode selector panel. The mode and bearing pointers available depend upon optional equipment installed and may not be present in all installations. Some annunciations also concern other systems, which will be discussed under headings pertaining to those systems.

Bearing Pointer and Source Annunciation - The bearing pointers indicate relative bearing to the selected navaid and can be selected as desired on the display controller. Bearing pointers appear on the compass rose when they are selected by means of the knobs on the display controller, and the bearing pointer source annunciations are in the lower left of the EHSI display. If NAV source is invalid or LOC frequency is tuned, the NAV bearing pointer and the annunciation will disappear. The "**O**" bearing pointer is always NAV 1, ADF 1, or FMS. The "◇" bearing pointer is always NAV 2 or ADF 2 (if installed).

Elapsed Time Annunciation - Shows elapsed time in hours and minutes or minutes and seconds. Selection is made on display controller.

Time-to-Go and Ground Speed - Pressing the GS/TTG button on the display controller alternates time-to-go (to next waypoint or navaid) and ground speed displays.

Desired Track - When long range navigation is selected, the course pointer becomes a desired track pointer. The long range nav system will position the desired track pointer. A desired track (DTRK) digital display will appear in the upper left corner of the EHSI display. When FMS is selected, the course selection knob on the remote instrument controller is inactive.

NAV Source Annunciation - Appears in the upper right side on the EHSI presentation when a NAV (NAV), ILS (ILS), or FMS (FMS) source is selected as a navigation source. Distance to next waypoint or to selected VORTAC appears below the annunciation. Annunciated source will be displayed on the EHSI course deviation indicator (CDI).

Wind Display - The wind display (magenta direction and arrow) is located at the lower left-center of the display when FMS is selected for navigation.

Weather Radar Modes - Along the left top side of the EHSI display are the displays of the weather radar modes. These modes and displays are discussed under Weather Radar in this section.

ARC MODE (PARTIAL COMPASS FORMAT)

During operation in the arc (WX) mode, additional presentations are available which enhance navigation and safety of flight. Pressing the FULL/WX button on the display controller toggles the display between the full and partial compass display. Selecting Additional features presented in partial display are:

Range Rings - Display of the range rings aids in the use of radar returns when (WX) mode is selected. Center half-range ring represents the selected radar range. Range is controlled by the weather radar controller.

Weather - Weather radar returns are displayed on the EHSI when WX mode is selected on the display controller. WX mode forces the PFD into arc display if it was not already selected. Radar mode annunciations are presented on the upper left side of the EHSI presentation and on the lower left side of the multifunction display (MFD).

EHSI CAUTION OR FAILURE ANNUNCIATIONS

Amber caution annunciations will appear to indicate the following situations:

DME Hold - When the DME is selected to HOLD, an amber H will appear to the left of the DME readout on the EHSI.

FMS Alert Messages - Waypoint (WPT), dead reckoning (DR), or Degrade (DGR) messages appear in amber at the upper center-left of the EHSI presentation to indicate, respectively, that a waypoint is being passed, the FMS is in dead reckoning, or the FMS navigation has become degraded for any of various reasons. MSG annunciated in amber at the top center-right of the EHSI display indicates that the FMS has a message on the FMS CDU.

Digital Display Cautions - When DME, ground speed (GSPD), time-to-go (TTG), or elapsed time (ET), digital readouts fail, the digital display will be replaced by dashes.

Target Alerts - An amber TGT on the left of the EHSI indicates weather radar target alert. A green TGT annunciation indicates that target mode has been selected on the weather radar.

Digital Readouts - Failure of the course or heading select signals will cause these displays to be replaced by amber dashes. They are also dashed when the heading display is invalid.

Heading Source and Navigation Source - When both the pilot and copilot select the same heading source or NAV source, the source annunciators will be amber. If the NAV or heading sources are cross-switched, i.e., pilot to copilot and vice versa, the annunciation will also be in amber. Normal selections are not annunciated.

Heading Comparator Warning - HDG annunciated in amber at the top center-left of the EHSI display ind-cates that the comparator system has detected an excessive difference between the two heading indicators.

Red failure annunciations will appear in the following instances and locations:

Heading Failure - A heading failure will result in the following indications: heading and bearing annunciations and bearing pointers will disappear; HDG FAIL appears at top of heading dial. HDG, CRS SEL, and DTRK will dash.

Deviation Indicator Failures - A failure in the vertical deviation or glideslope system will result in removal of the applicable pointer and a red **X** being drawn through the scale.

Vertical Speed Display - A red **X** will be drawn through the scale.

DISPLAY REVERSION

In the event of failure of one of the display units, turning off the failed display DIM knob of the display controller will cause that display to be presented on the multifunction display (MFD). Control of the display will still be through the respective display controller.

EFIS EQUIPMENT FAILURE CHECKLIST

Failure of equipment feeding information to EFIS will be annunciated by flags or dashes. Failure effects of EFIS equipment are listed below.

FAILURE	ANNUNCIATION	FLIGHT DIRECTOR	PILOT ACTION
Symbol Generator Failure	Red **X** on PFD or display blank	All modes cancel	Select opposite symbol generator on MFD display controller to drive all displays.
Display Controller Failure	Display cannot be changed	N/A	Select opposite symbol generator on MFD display controller to drive all displays.
Display Failure	Display goes blank	None	Revert display to the MFD display. (Refer to NOTE below).
Heading Failure (DC)	Red HDG FAIL on EHSI, map, bearing pointers etc. removed	Command Bars out of view	Select opposite heading gyro by pressing appropriate HDG REV button.
Heading Failure (AC)	HDG flashes in amber on EHSI and heading searches	Command bars search	Select opposite heading gyro by pressing appropriate HDG REV button.
Attitude Failure	ATT FAIL annunciation; No pitch scale or roll pointer, sphere all blue	None	Select opposite vertical gyro by pressing appropriate ATT REV button.
Course Deviation Failure	Red **X** through scale and course deviation pointer removed	Command bars, CDI pointer and applicable bearing pointer off	Revert display to the MFD display. (Refer to NOTE).
Flight Director Failure	FD FAIL on PFD	FD Cues and Mode Annunciations Removed	Select opposite flight director on AP XFER FD1/AP XFER FD2 Switch and select opposite SG on MFD SG1/SG2 switch. Mode and display selections must be made on opposite Mode Selector and Display Controller respectively.

Figure 3-26. EFIS Equipment Failure Checklist

NOTE

Full counterclockwise OFF position of the DIM knob turns off the failed display and selects the respective display to the multifunction display (MFD) tube.

For detailed information concerning operation of the Primus 1000 system, consult the P-1000 Integrated Avionics System Pilot's Manual for the Citation Encore, Pub. No. A28-1146-134-00, dated April 2000, or later revision.

COMPARISON MONITOR

Selected pilot and copilot input data are compared in the symbol generator. If the difference between the data exceeds predetermined levels, the out-of-tolerance symbol will be displayed in amber. A list of the compared signals and the displayed cautionary symbols is given below. When the compared pitch and roll attitude or glideslope and localizer signals are out of tolerance, a combined level (ATT or ILS) will be displayed.

Compared Parameter	Annunciation	Triggering Difference
1. Pitch Attitude	"PIT"	5°
2. Roll Attitude	"ROL"	6°
3. Heading	"HDG" *	12°
4. Localizer	"LOC"**	Approximately dot
5. Glideslope "GS"**	Approximately dot	
6. Pitch and Roll Attitude	"ATT"	5° & 6° respectively
7. Localizer and Glideslope	"ILS"**	& dot respectively
8. Indicated Airspeed	"IAS"***	5 Knots
9. Altitude	"ALT"***	200 Feet

* If the compared heading sources are not the same (both MAG or TRU) the comparison monitor is disabled.

** These comparisons are only active during flight director, localizer, and glideslope capture with both NAV receivers tuned to a LOC frequency.

*** Airspeed and altitude displays will flash for ten seconds and then go steady.

PULSE EQUIPMENT

HONEYWELL PRIMUS II REMOTE RADIO SYSTEM - ATC

The ATC (transponder) function of the optional SRZ-850 Integrated Radio System is provided by the XS-850 transponder module, which is a sub-unit of the RCZ-850 Integrated Communication Unit. It functions as a 4096 code mode A transponder, as well as providing mode C (altitude) and mode S (collision avoidance) information. Altitude information is provided by the respective (1 or 2) AZ-840 Micro Air Data Computer in the pilot's or copilot's Primus 1000 system.

General tuning information concerning the SRZ-850 system is discussed under PRIMUS II REMOTE RADIO SYSTEM - COM in this section. Specifically, tuning of the transponder is accomplished by pressing the line key adjacent to the desired ATC function on the left side of the main tuning page which is displayed on the RMU. The ATC window has two lines. The top line represents the tunable transponder codes and the second line represents transponder modes. When the line key adjacent to the transponder code line is pressed, the amber box (cursor) will surround the code digits, which are then tunable by the tuning knobs. The large knob controls the left two digits and the small knob controls the right two digits.

A18504

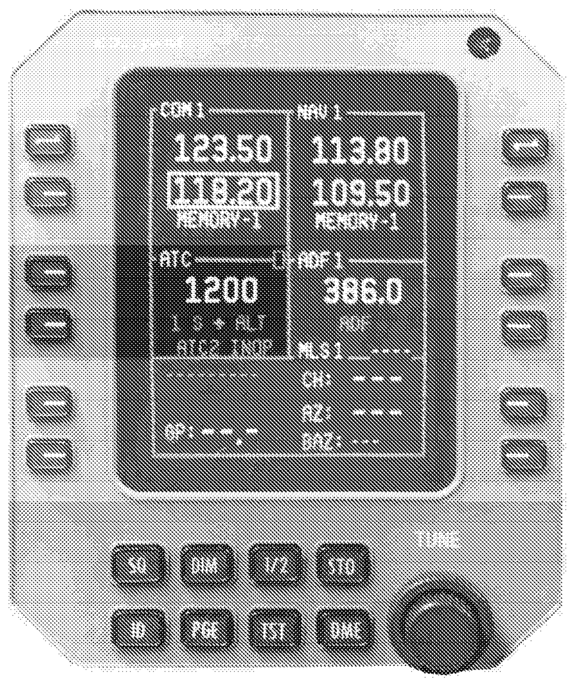

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Figure 3-27. PRIMUS II - ATC Controls

Pressing the mode select line button moves the cursor box to the mode select annunciator which connects the tuning knobs to that window. Either knob may then be used to select modes in the following sequence:

ON	System in Modes S and A, no altitude is reported.
ON + ALT	Replies on Modes A, C and S.
S ONLY	Mode S operation only.
S + ALT	Mode S with altitude reporting (Mode C).

Only one transponder is in operation at one time; the opposite one is held in STANDBY for instantaneous operation, if required. The system in operation is controlled by the mode select line key. Pressing the mode select line key (once the cursor is moved to that line) cycles the transponders as follows:

STANDBY - Both units in STANDBY.
SYSTEM No. 1 in operation.
STANDBY - Both units in STANDBY.
SYSTEM No. 2 in operation.
STANDBY - (sequence will repeat)

The system in operation is indicated by a "1" or "2" in front of the selected mode.

A transponder code may be stored in memory. To accomplish that, select the desired codes and press the STO button for two seconds. To retrieve the code from memory, press the line select button for two seconds.

The IDENT function of the transponder may be activated by pressing the ID button on the RMU or by pressing the ID button on the inboard side of either the pilot’s or copilot’s control wheel. Pressing any ID button will activate the ID mode for approximately 18 seconds. An amber ID annunciation will appear along the top edge of the transponder window during ID mode activation.

TRANSPONDER (Optional)

Two Collins TDR-94 transponders, each with 4096 Mode A code capability, are options installed in the nose avionics compartment. The transponders (1 and 2) have automatic altitude reporting (Mode C) capability which is provided electronically to the transponders by the respective side AZ-840 Micro Air Data Computer. The two transponders are controlled by a CTL-92 control on the right side of the center instrument panel. A switch on the control determines which transponder and altitude source is selected for operation.

CTL-92 CONTROL PANEL (Optional)

The CTL-92 uses a digital readout to display the pilot selected transponder code. Power and mode of operation are controlled by the power and mode switch which has OFF, STBY, ON and ALT positions. STBY applies power to the system for warmup and allows momentary power interruptions which may be desired without having to turn the system OFF. In ON, the transmitter is enabled for normal operation. ALT position causes transmission of uncorrected barometric altitude which is supplied by the respective AZ-840 micro air data computer. The 1/2 switch is used to select between number one or number two transponders.

Two concentric knobs are used to set the code. During normal operation, the upper window will display the selected code and the lower window will be blank. The lower window is active only during self-test. The TEST button initiates a system self-test. To test the system, select the desired transponder, turn the system ON and press the TEST button. The active code will be displayed in maximum intensity, and if the system is operating properly, ALT will be displayed and the altitude in thousands of feet (5.0 for 5000 feet) will be displayed in the upper window.

An IDENT button is located on the front of the transponder control and one or each control wheel. Any of the three will activate the IDENT circuit. The IDENT button will cause a distinctive return to appear on a ground controller's radar screen for 30 seconds after the IDENT button is pressed and released. It should not be depressed unless requested by a ground controller. The PRE button is used to select a preset code for storage. The button is pressed in and held while the selector knob is turned to select a code to be stored. Momentarily pressing the PRE button will recall the stored code.

When codes are being changed, an ACT annunciation will flash in the display. If ACT flashes, the code being transmitted is not identical to the one being displayed. An annunciation of TX will be displayed each time the transponder replies to an interrogation. If the transponder malfunctions, diagnostic message codes will be displayed in the upper window.

A29358

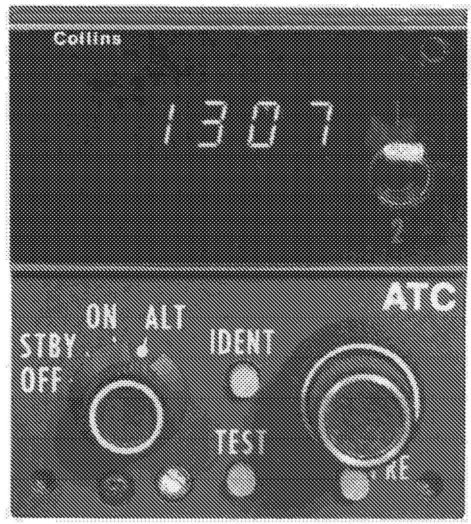

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Figure 3-28. CTL-92 Transponder Control Panel

DISTANCE MEASURING EQUIPMENT

HONEYWELL PRIMUS REMOTE RADIO SYSTEM - DME

The Primus II DME system ,the standard DME installation, is comprised of systems which are organized into compact modules. Each module, concerning the DME system, is comprised of an RNZ-850 integrated navigation unit, an NV-850 VHF NAV receiver and a DME-850 distance measuring module. The DME transmitter of the DME-850 works in the L frequency band, and the receiver frequency range is from 962 to 1213 MHz. DME tuning normally follows the VHF NAV receiver tuning which selects the DME frequencies paired to the VHF VORTAC published frequencies. The PRIMUS II, however, has a special "hold" function which also allows the tuning of military TACAN channels in order to receive the DME portion of the TACAN signals.

The DME has the capability to scan six channels, simultaneously tracking four selected DME channels for distance, ground speed and time to station, as well as tracking two stations for identification (IDENT) functions. Of the four channels of which it can track three functions (DIST, GS and TTG), two are dedicated to the flight management system (FMS).

Normally, one DME station will be tuned to an active VOR frequency, which is annunciated on the top line of the NAV tuning window of the radio management unit (RMU). Another (preset) VOR frequency may be selected in the preset frequency window. When a frequency is set in the preselect window, the system will already be tracking the preselected station so that there will be no delay when that frequency is transferred to active.

NAV tuning, which normally also selects the associated DME frequencies, is discussed under PRIMUS REMOTE RADIO SYSTEM - NAV in this section. Special tuning procedures applicable to DME, which are in addition to the NAV tuning, are discussed below.

Two DI-850 indicators are installed; one on the pilot's instrument panel and one on the copilot's instrument panel. DME information is presented on the DI-850 DME indicator and, when selected on the DC-550 display controller, on the pilot's and copilot's EHSIs. The channel (CH) button allows selection of NAV 1 or NAV 2 on either DI-850 indicator; each indicator can be selected to its own side or the opposite side. Selections on the CH button on the indicator will not affect the selection(s) made on the DC-550 Display Controller, which controls the display on the respective EFIS. A selection on one DI-850 indicator will not affect the selection on the opposite indicator.

A5328

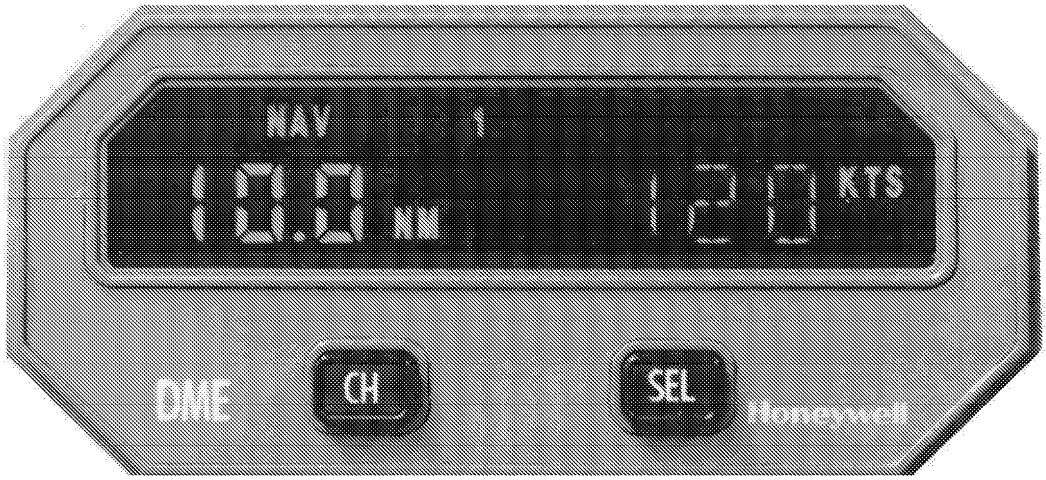

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Figure 3-29. Primus II DI-850 DME Indicator

NAV 1 or NAV 2 will be annunciated on the top line of the indicator to indicate which NAV is being displayed and computed. If the DME is being held, HLD is annunciated on the top line along with NAV 1 or NAV 2 to indicate which channel the DME is holding. When a station is being held, the regular functions are selectable on the DI-850 indicator and information will be computed from the station identified by “H” on the DME line of the RMU; however, after 15 seconds, the DI-850 annunciation will revert to identifier.

The select (SEL) button on the indicator is used to cycle the display on the right side of the readout through ground speed, time-to-station, and IDENT functions. If HOLD is selected on the DME, the function will return to IDENT in 15 seconds if any other function is selected.

The DME has a "split tuning" mode which operates somewhat like conventional HOLD functions, but provides other options. Pressing the DME button on the bottom of the RMU will divide the NAV window into two windows. The top window will remain the active VOR frequency. H will be annunciated on the bottom line, indicating that the DME frequency is holding with the active frequency which is displayed on the top line. The bottom line will be labeled DME and will have in it the active frequency displayed in VHF (VOR) format. The DME may then be tuned by pressing the line select key and changing it to a new channel. Pressing the DME button again will cause the DME (lower) window to change to a TACAN channel presentation. TACAN channels, along with their related W, X, Y, and Z channelization nomenclature will then be tunable with the tuning knobs. The DME function of all 126 TACAN channels may be tuned. No azimuth information is received in this mode. A third press of the DME button causes the NAV window to return to its normal active/preset presentation and the DME will resume tuning with the active frequency.

DME information is displayed on the pilot's and copilot's EHSIs by pressing the NAV button on the DC-550 Display Controller. Pressing the NAV button alternately selects NAV 1 and NAV 2 for display. If both NAV receivers are selected to the same NAV source, the NAV annunciations (VOR 1, VOR 2) on the EHSI will be in amber. The selected DME will always be the same as the NAV source (VOR). If no DME information is available, the DME readout will display amber dashes.

DME-442 WITH IND 42C INDICATORS (Optional)

The optional DME installation consists of two DME-442 receiver-transmitters and two IND-42C indicators. The IND-42C is an indicator only and does not control selection of DME data for any purpose other than selection of the data to be displayed on the indicator. Nav 1 is permanently connected to the pilot’s DME-442 indicator and NAV 2 is permanently connected to the copilot’s DME-442 indicator.

DME information is displayed on the pilot's and copilot's EHSIs by pressing the NAV button on the DC-550 EFIS display controller. Pressing the NAV button alternately selects NAV 1 and NAV 2 for display on the respective EFIS. If both NAV receivers are selected to the same NAV source, the NAV annunciation (VOR 1, VOR 2) will be in amber. The NAV source (VOR) displayed and annunciated on the EFIS display will always be the same as the DME selected by means of the NAV button on the DC-550 display controller. Selections made on the IND 442 indicator have no bearing on the EFIS display.

A6756

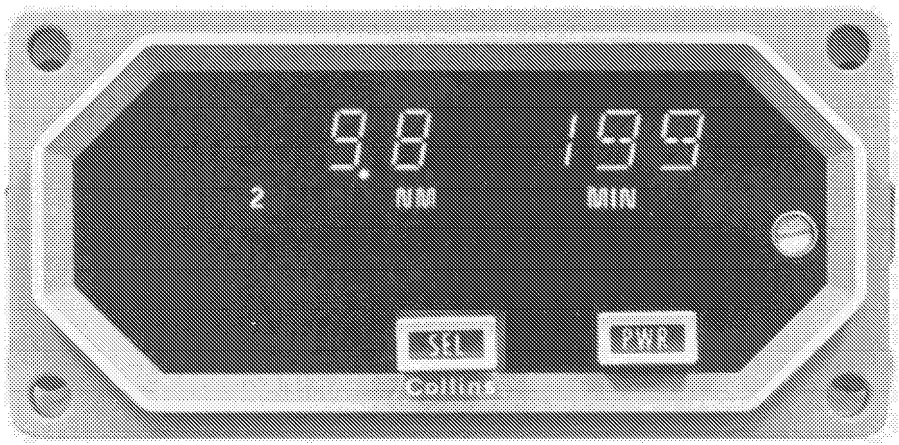

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Figure 3-30. IND-42C Indicator

The IND-42C power switch (PWR) controls power to the indicator and to the DME-442 receiver-transmitter. The mode selector switch (SEL) is a nonlatching pushbutton switch which selects the information to be displayed in the alphanumeric (right) digital display. When initially powered up, the alphanumeric display will show ID (DME station identifier). Pressing the SEL switch will sequentially select KT (knots), MIN (minutes-to-station), and ID. An NM (nautical miles) display is continually shown on the numeric (left) digital display. The annunciators 1, 2, NM, HLD (hold), KT, MIN, and ID will be present when the respective selection is made in order to identify the digital data presented and the source of the data.

Distance Measuring Equipment (DME) groundspeed or time to station readouts are only accurate when the airplane is proceeding directly to or from the selected station. Since it is slant range that is computed, groundspeed or time to station accuracy increases with distance from the station. The readouts can be considered reasonably close to actual speed when distance from the station in miles is equal to or greater than the airplane altitude in thousands of feet.

If the pilot desires to retune the CTL-32 NAV control to which the DME indicator is selected, but to retain the DME readout of the present station, HLD is selected on the respective NAV control before the set is retuned. The DME will hold on the previously tuned frequency and HLD will be annunciated on the IND-42C indicator. An amber "H" will also be annunciated to the left of the distance display on the EHSI presentation to indicate the DME frequency is being held.

The DME-442 system is self-tested by pressing the TEST button on a CTL-32 NAV receiver. Upon initiation of self-test, all display segments and annunciators on the IND-42C indicator will illuminate for a lamp test. If NM and ID were selected for display, the numeric display will show 100 NM. If KT was selected for display, the alphanumeric display will show 100 KT. If MIN was selected for display, 60 MIN will be displayed. At the completion of the test routine, AOK will appear in the alphanumeric display if no faults were detected. AOK will also be heard over the DME aural output. The IND-442 displays will then return to normal. If a fault is detected, the word DIAG and a self-test fault code will be displayed. A list of fault codes is found in the Component Maintenance Manual and a partial list in the Collins Pro Line II Pilot's Guide 523-0773070-001117, dated January 5, 1987, or later revision.

NOTE

The self-test routine takes approximately ten seconds to complete. For that reason, it should not be attempted during a critical phase of flight.

RADIO ALTIMETER

HONEYWELL AA300

The Honeywell AA300 radio altimeter displays the absolute altitude in a digital readout on each primary flight display (PFD). The radio altimeter system is a high resolution, short pulse system which provides continuous operation in a wide variety of conditions. It operates on a frequency of 4300 MHz.

The radio altimeter system interfaces with the data acquisition units (DAUs) and the optional ground proximity warning system. The DAUs provide information to the integrated avionics computers (IACs) which, in turn, provide the digital absolute altitude display In the PFDs, in the lower part of both attitude director (ADI) displays. The digital altitude readout is green until the airplane descends below a set decision height altitude, at which time the display becomes amber. The radio altimeter is in operation during the entire flight, however, there is no altitude indication above an absolute altitude of 2500 feet. If the radio altimeter is invalid, a red box with RA inside will appear instead of the digital read-out of altitude. The radio altimeter also has an effect on the altitude tape in the PFD. A solid brown raster band will appear on the altitude tape on the primary flight displays as the radio altitude drops below 550 feet. The brown band will cover the lower half of the altitude tape when the airplane is on the ground. A yellow line will be drawn at the intersection of the brown raster and the gray band of the latitude tape. There is no written information displayed in the brown band.

There is also a radio altimeter decision height indication, which is a digital display located in the PFDs in the lower right corner of the ADI display. The decision height is set to a predetermined altitude by rotating the MINIMUMS knob located in the lower left corner of the PFD bezel controller. The decision height is displayed in a window on the lower right side of the attitude director indicator display. When the airplane descends below the selected altitude, an amber DH, enclosed in a white box, will appear in the upper left side of the attitude director indicator display. The copilot's decision height is independent of the pilot's, even though only one radio altimeter is installed. The decision height warning horn will sound only when the airplane descends below the altitude selected in the decision height window on the pilot's attitude director indicator (ADI) display. The decision height (DH) display is located on each ADI. A different decision height can be set on each indicator, which will control the DH annunciator on that indicator only. The different radio altitude indicators operate independently of each other, even though they are driven by the same radio altimeter transceiver.

The radio altimeter can be functionally tested by selecting the Main 2/2 Menu on the applicable multifunction display, which will show LRU TEST as a selection option. Press LRU TEST and RAD ALT will appear as a submenu option; press RAD ALT and a box will appear around RAD ALT while it is being held down, and the radio altimeter will test. On airplanes equipped with the standard Honeywell AA300 system, the display will indicate 100 feet and the DH annunciator shall not be displayed. On airplanes having the Collins ALT-55 radio altimeter installation the display will indicate 50 feet. After the button is released the actual altitude will be shown. If a decision height is set below the radio altimeter test altitude, a chime will sound as the altitude comes back down through 100 feet (or 50 feet on Collins radio altimeter installations) when the button is released and the amber DH will be annunciated in a box in the upper left side of the altitude sphere. The radio altimeter test function is disabled after glideslope capture during an ILS or MLS approach in which the autopilot or flight director is being used. Taxiing over accumulations of ice and snow may cause radio altimeter fluctuations.

The system may be used in flight to monitor absolute altitude at any altitude within the range of the altimeter. The MINIMUMS control on the PFD can be set to alert the pilot automatically whenever the airplane reaches a preset altitude. The system may be used to display ground separation and climb conditions during night or instrument takeoffs, as well as to indicate ground clearance during approaches. The DH read-out may be extinguished by turning the MINIMUMS fully counterclockwise.

WEATHER RADAR

PRIMUS 660 COLORADAR

WARNING

ON THE PRIMUS 660 SERIES RADAR, THE AREA WITHIN 30 FEET OF AN OPERATING WEATHER RADAR SYSTEM CONSTITUTES A HAZARDOUS AREA. DO NOT OPERATE THE RADAR SYSTEM WITHIN 30 FEET OF PERSONNEL OR FLAMMABLE OR EXPLOSIVE MATERIAL OR DURING FUELING OPERATIONS. FOR GROUND OPERATION OF A RADAR SYSTEM, POSITION THE AIRPLANE FACING AWAY FROM BUILDINGS OR LARGE METAL STRUCTURES THAT ARE LIKELY TO REFLECT RADAR ENERGY BACK TO THE AIRPLANE.

The Primus 660 ColoRadar System is an X-band alphanumeric digital radar with display designed for weather location and analysis and for ground mapping. The radar system can also be operated in conjunction with Electronic Flight Instrument Systems (EFIS) and the Multifunction Display (MFD) to provide radar video to the EFIS EHSI display and the MFD. The MFD display serves as the primary indicator for the weather radar display, which is controlled by the WC-650 Remote Radar Controller. The system detects storms along the flight path and gives the pilot a visual indication, in color, of storm intensity. Storm intensity is displayed at five color video levels with black representing weak or no returns and green, yellow, red and magenta showing progressively stronger returns. In ground mapping mode, video levels of increasing reflectivity are displayed as black, cyan, yellow and magenta.

WARNING

THE SYSTEM PERFORMS ONLY THE FUNCTIONS OF WEATHER DETECTION AND GROUND MAPPING. IT SHOULD NOT BE USED OR RELIED UPON FOR PROXIMITY WARNING, ANTI-COLLISION OR TERRAIN AVOIDANCE.

The system consists of a receiver-transmitter antenna and an indicator with operating controls.

A6758

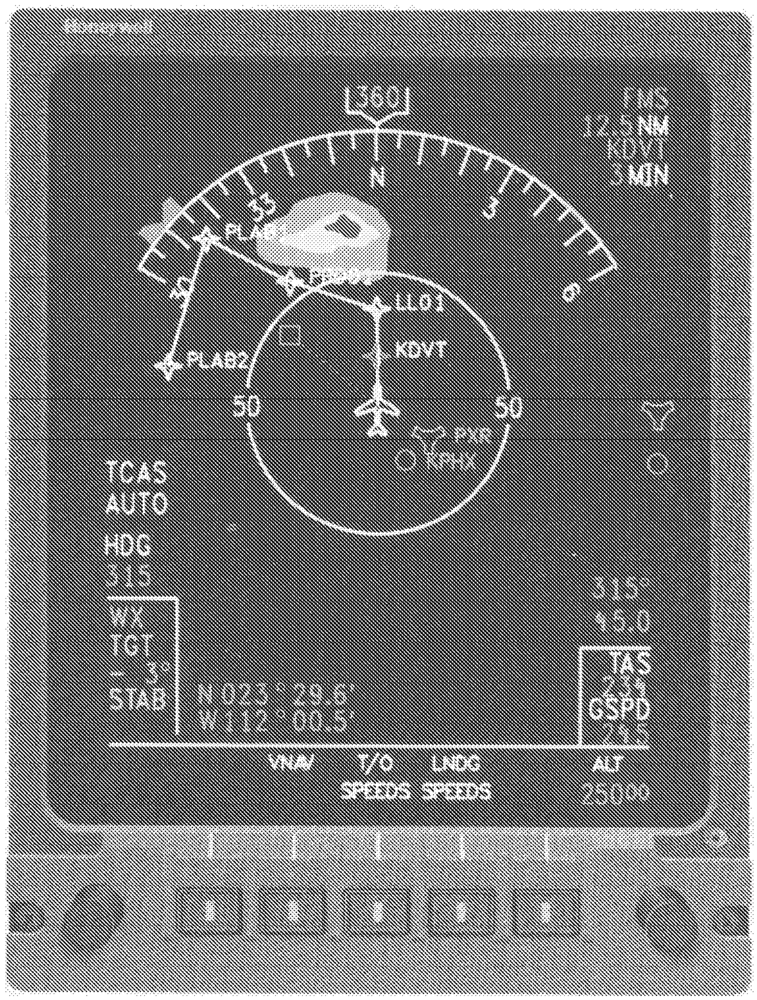

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Figure 3-31. Multifunction Display/Primus 660 ColoRadar Indicator

The remote radar controller (WC-660) is typically installed on the center instrument panel below the copilot's RMU. A multifunction display controller (MC-800) is installed at the forward end of the pilot's pedestal. Some functions of the multifunction display interface with the radar; these are also discussed under Electronic Flight Instrument System in this section.

A6767

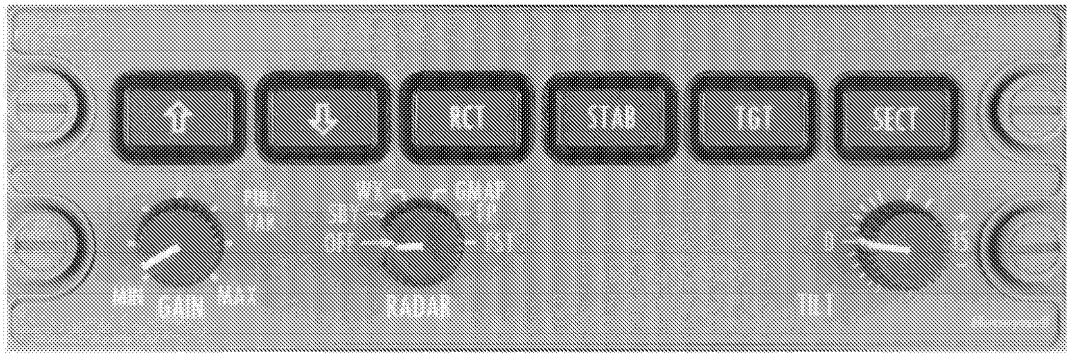

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Figure 3-32. Primus 660 ColoRadar Controller

CONTROLS

TILT — Rotary control used to select tilt angle of antenna beam with relation to earth plane. Tilt range is 15 degrees upward to 15 degrees downward.

SLV — An annunciator centered on the lower edge of the panel. This annunciator is used in a dual controller installation and lights whenever this controller is in the OFF mode and the opposite side controller is in any mode except OFF.

FULL/WX — On DC-550 EFIS display controller. Two-position rotary switch selects weather or map display on either primary flight display (PFD). WX selects arc mode as well as adds weather to the display.

WX — On MC-800 multifunction display controller. Selects radar weather mode for display on the multifunction display(MFD). If MFD is in PLAN mode, selecting MAP mode will force the display into the MAP mode for weather display.

MODE SWITCH Six-Position Rotary Switch

- OFF — Removes power from the system.
- SBY — Standby. System will warm up but antenna is stowed and transmitter is disabled.
- WX — Places system in the operational mode selected by FULL/WX switch on the DC-550 EFIS display controller.
- GMAP — Places system in ground mapping mode. Ground targets are enhanced. Do not use GMAP for weather detection, because weather type targets are not calibrated in GMAP mode.
- FP — Flight Plan. Provides extended range display of navigational data.
- TST — Activates the self-test mode and displays a test pattern. Transmitter is on and radiating.

GAIN — Rotary control used to adjust sensitivity of radar receiver. Receiver gain is fixed and calibrated in the PRESET position. Selection of REACT (RCT) overrides the gain control setting causing the receiver gain to be fixed and calibrated.

RANGE — A two-pushbutton range selection system permits range selection from 5 to 300 nautical miles full scale in the ON mode, or 5 to 1200 nautical miles in the Flight Plan mode. The UP arrow button selects increasing ranges while the DOWN arrow selects decreasing ranges. 100-nautical mile range is presented when system is initially turned on. The last range selected will be remembered when switching between ON and FP. WX range overrides the RNG/INC/DEC switch on the MC-800 multifunction display controller when WX mode is selected on that controller.

RCT	Alternate action pushbutton enables the Rain Echo Attenuation Compensation Technique (REACT) blue background field to indicate ranges at which the receiver calibration has been exceeded. The REACT OFF condition is annunciated above the button.
STAB	Alternate action pushbutton permits disabling the antenna stabilization causing the display to vary with airplane attitude. When disabled, the OFF condition is annunciated above the pushbutton.
TGT	Alternate action pushbutton enables the target alert function.
SECT	Alternate action pushbutton selects either full azimuth scan angle (120 degrees) or sector scan (60 degrees).

DISPLAY ANNUNCIATIONS

The different mode annunciations shown below in Figure 3-36 are annunciated in the mode field. The mode field is on the lower left side of the PFD display. Below the mode field is the antenna tilt angle display which is preceded by a blank for positive values and a "- " for negative values. Directly below the tilt display are the target mode annunciation or the variable gain indicator. When target mode is selected, a green TGT annunciation appears on this line. When the receiver/transmitter (R/T) detects an alert condition the TGT turns to amber as long as the alert condition persists. Variable gain indication is annunciated by an amber VAR in the same field as the target alert, however, target mode/alert has the higher priority. When full compass mode and WX are turned on, a magenta TX will be displayed in the mode field. Also, if WX is failed and in test mode, an amber FAIL will be displayed in the mode field, and a failure code in the tilt field. If more than one code is associated with the failure, the numbers toggle between different fault codes.

OPERATING MODE	FEATURE SELECTED	DISPLAY	
		MODE ANNUNCIATION	"TGT" AREA
WAIT	ANY SELECTION	WAIT (Green)	---
STANDBY	---	STBY (Green)	---
FORCED STANDBY	---	FSBY (Green)	---
TEST	---	TEST (Green) or FAIL (Amber)	---
WX	NONE VAR TGT RCT RCT/TGT	WX (Green) WX (Green) WX (Green) RCT (Green) RCT (Green)	--- VAR (Amber) TGT --- TGT
FLIGHT PLAN	NONE FPLN/TGT	FPLN (Green) FPLN (Green)	--- ---
GMAP	NONE VAR	GMAP (Green) GMAP (Green)	--- VAR (Amber)

Figure 3-33. PFD WX Radar Operating Mode Annunciations

TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEMS (TCAS) (OPTIONAL)

TCAS 1

The optional TCAS 1 system is an on board collision avoidance and traffic display system with computer processing to identify and display potential and predicted collision targets. The system is compatible with and independent of the air traffic control system. The TCAS 1 system, from transponder replies, determines the relative altitude, range and bearing of any aircraft equipped with a mode C or S transponder, and determines the threat posed by such traffic, by using standardized algorithms. Aircraft with only mode A transponders will not provide altitude information; however, TCAS 1 will issue traffic advisories. TCAS 1 cannot detect aircraft without operating transponders.

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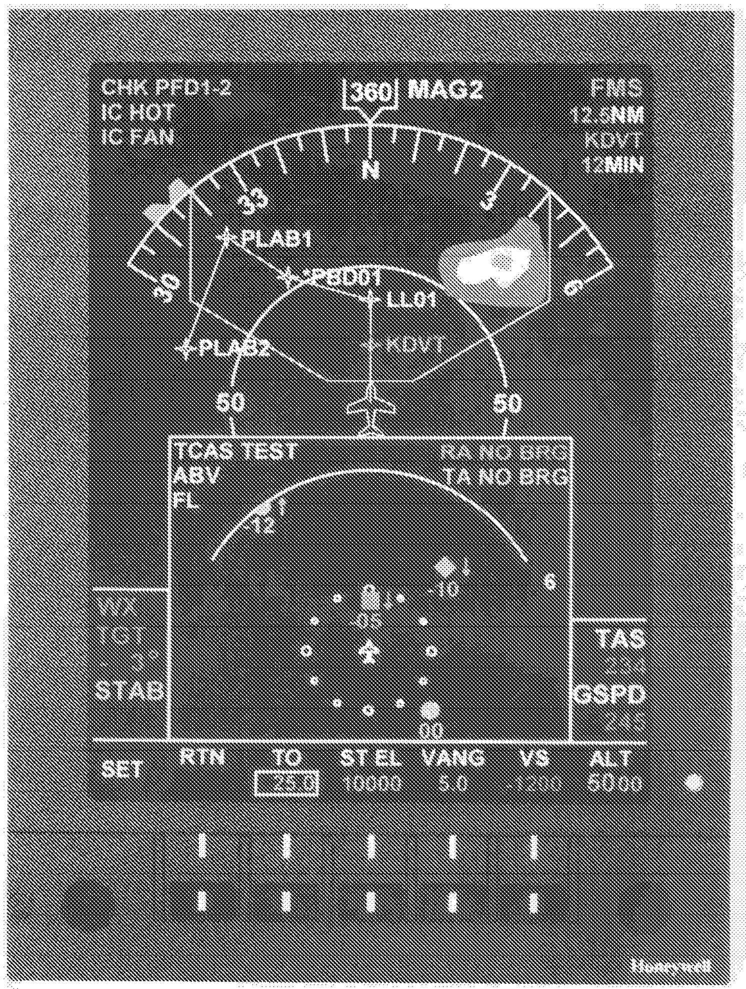

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Figure 3-34. Multifunction Display with TCAS Presentation

If the TCAS 1 system processor detects an aircraft which presents a potential collision hazard (intruder), it issues visual and aural (TRAFFIC, TRAFFIC) advisories to the crew. The visual advisory is presented by symbols on the lower part of the multifunction display (MFD), if the TCAS mode is selected on. The intruder's position is displayed on the PFD in its relative position, with trend arrows to show whether it is climbing or descending at a rate of more than 500 feet-per-minute. The symbols are color and shape coded to enable the crew to quickly identify the seriousness of the threat posed by each intruder.

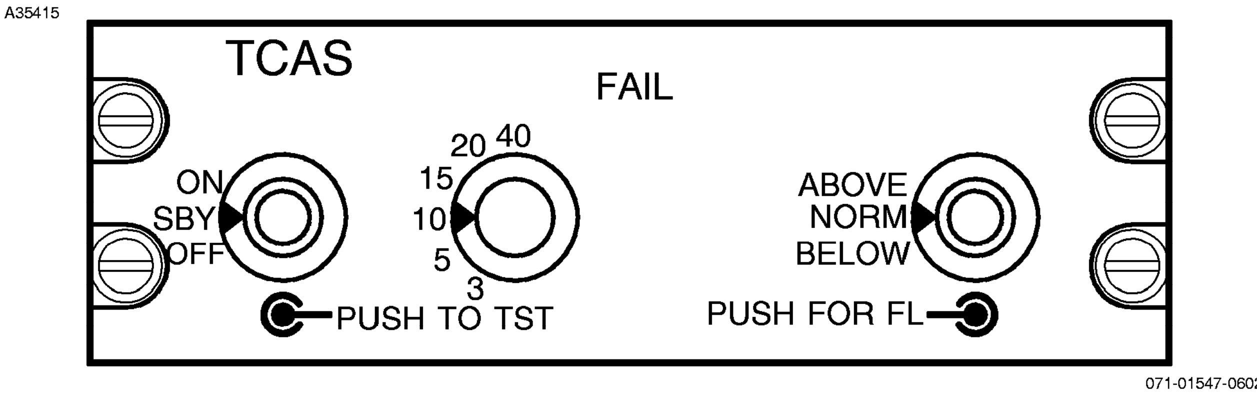

Figure 3-35. TCAS 1 Control Panel

TCAS 1 has two sensitivity levels; SL A and SL B. SL A is invoked when the airplane is below 2000 feet AGL, based on radio altimeter altitude. SL B is all other flight conditions. SL A is less sensitive, to preclude nuisance advisories in the area of airports and terminal areas, where the traffic density is highest, and airspeed is usually slower.

There are three modes of altitude display limits: ABOVE, NORMAL, and BELOW. ABOVE mode displays traffic that is between 8700 feet above and 2700 feet below your own airplane. ABOVE is typically used during the climb phase of flight. NORMAL mode displays traffic that is between 2700 feet above and 2700 feet below your own airplane, and is normally used for cruise flight. BELOW mode displays traffic that is between 2700 feet above and 8700 feet below your airplane. BELOW is normally used during the descent phase of flight.

If the TCAS system is unable to locate the azimuth of another aircraft, a NO BEARING message will appear on the screen when the system computes that the intruder is close enough to become a threat.

If the intruder aircraft is non-altitude reporting the TCAS will report only the range and bearing. It can issue a traffic advisory (TA) based upon distance and direction of flight. TCAS assumes that non-altitude reporting traffic is the same altitude as your own airplane.

CAUTION

THE CREW MUST NOT INITIATE EVASIVE MANEUVERS USING INFORMATION FROM THE TRAFFIC DISPLAY ONLY. THE TRAFFIC DISPLAY IS INTENDED TO ASSIST IN VISUALLY LOCATING TRAFFIC. THE TRAFFIC DISPLAY LACKS THE RESOLUTION NECESSARY FOR USE IN EVASIVE MANEUVERING.

It is possible to see an aircraft flying the same course and direction as your own airplane, yet TCAS may not consider it a threat. TCAS calculates the closure rate of the intruder, and derives the time to the closest point of approach (CPA). If there is no closure rate, no advisory will be issued, unless the intruder is very close (within approximately 0.2 mile). However, traffic at the same altitude very far ahead (about 10 miles) may be shown as a TA by TCAS because of a very rapid closure rate.

For specific operating procedures, consult the Bendix/King TCAS I Collision Avoidance System Pilot's Guide, 006-08746, Rev. 1 dated August 1993 or latest Revision.

TCAS II

TCAS II detects and tracks aircraft in the vicinity of your own airplane. It interrogates the transponders of other aircraft and analyzes the signals to determine range and bearing, and relative altitude if it is being reported. It then issues visual and aural advisories so the crew may perform appropriate vertical avoidance maneuvers. The following information is generated and considered by the TCAS II in making a decision as to whether an aircraft which returns a signal constitutes a threat or not: range between your airplane and the intruder, relative bearing of the intruder, altitude and vertical speed of the intruder(if it is reporting altitude), and the closing rate between your aircraft and the intruder.

The TA display identifies the relative threat of each aircraft which could present a traffic conflict (intruder), by using various symbols and colors. TCAS II also provides several appropriate synthesized voice announcements which are used to alert to traffic and to notify them of a recommended avoidance action. The TCAS II system is both compatible with current and planned ATC systems and operates independently of them. It has the capability to monitor two or more TCAS II equipped aircraft by means of their mode S transponders and to coordinate their maneuvers.

TCAS II has two types of cockpit display; the Resolution Advisory (RA) and Traffic Advisory (TA). The RA display is incorporated into the vertical speed indicator (VSI) display on the primary flight display (PFD). By illuminating red and green arcs around the display dial it presents the required rate or limitation of climb or descent to avoid a possible collision. The resolution advisory (RA) is based on the expectation that the crew will comply within 5 seconds. The system requires two and one half seconds to show an increase or a reversal to an RA. In order for the system to generate an RA the intruder must be reporting altitude; if an altitude is not bearing reported the advisory will be limited to a TA. The TA display shows the intruding airplane's relative position and altitude, with a trend arrow to indicate if it is climbing or descending at greater than 500 feet per minute. This display is provided at the bottom area of the MFD, which is reserved for TCAS presentation when TCAS is selected for display.

Normally a TA will precede an RA by 15 seconds, if an RA is going to ensue from the computation of closure rate, heading, rate-of-climb/descent etc., of the intruder. Depending upon altitude, the system will present a traffic alert display, accompanied by an aural “TRAFFIC, TRAFFIC”, when the time to the closest point of approach is between 20 and 48 seconds. The crew should attempt to gain visual contact with the intruder and be prepared to maneuver. The crew should take no evasive action based solely on the TCAS II traffic display.

TCAS II can track as many as 45 aircraft at one time and display up to 30 of them. It can coordinate a resolution advisory for as many as three intruders at one time. The advisories are always generated considering the least required amount of deviation from the flight while providing a safe vertical separation.

TCAS II does not replace ATC procedures and the existing “see and avoid” concept, however, if ATC communications are temporarily lost, TCAS II adds a significant backup capability for collision avoidance, and can also enhance safety of flight in crowded terminal areas, under both VFR and IFR conditions.

For specific operating procedures, consult the Bendix/King TCAS II Traffic Alert and Collision Avoidance System Pilot’s Guide, 006-18201-0000, dated April 1999 or latest Revision.

AREA NAVIGATION

GNS-XL FLIGHT MANAGEMENT SYSTEM

The GNS-XL Flight Management System is a comprehensive navigation management system which integrates multiple systems and sensors into an integrated whole, which is capable of precise navigation and aircraft performance computations. The system takes information from various navigation sources (DME, VOR, and GPS sensors), considers the strengths, weaknesses and signal strengths of each system and sensor in use, and computes a most likely position for the airplane. The GPS sensor has priority unless degraded sensor accuracy has been detected by the system. It accomplishes these computations with a minimum of attention by the flight crew, and advises them of components or systems requiring attention, as well as other irregularities such as loss of enough sensors to compute a valid position. In the latter situation, if sensor loss endures over a set length of time, the system will enter DR (dead reckoning) mode and so inform the pilot through a message on the control display unit (CDU).

The GNS-XL provides steering information to the pilot through the IC-600 Integrated Display Guidance Computer and Primary Flight Display (PFD). When connected to the autopilot, it provides roll steering commands. The NAV computer additionally computes fuel flow information, providing a current fuel status and airplane gross weight throughout the flight, if the fuel and gross weight are updated prior to takeoff.

The system also provides navigation data outputs which enable the active flight plan to be displayed on the multifunction display (MFD).

The following components comprise the GNS-XL system: a control display unit (CDU) which houses its own Global Positioning System (GPS) sensor, a configuration module unit, and an antenna.

The CDU is the heart of the system, possessing the computer, the VORTAC positioning unit (VPU), the navigation data bank (NDB), and the memory capability, as well as the GPS receiver. The NDB maintains 50,000 navigation points in its data base as well as up to 999 operator generated waypoints. Fifty six flight plans with up to fifty waypoints each may be stored. The NAV data base must be updated every twenty-eight days by means of a data transfer unit (DTU) or portable DTU. The connection for the DTU is located in the forward end of the center pedestal.

The FMS will supply waypoint (WPT) information to the IC-600 Display guidance Computer for use in micro air data computer vertical navigation (VNAV) computations, which are displayed on the multifunction display(MFD). An advisory vertical navigation capability is also provided through the GNS-X_L CDU. Vertical waypoints may be programmed and viewed on the CDU, and used as indicators for climb and descent points. The altitude changes may be programmed both with and without vertical path angles.

The CDU provides the pilot's interface with the system. It has a compact full alpha keyboard with a color cathode ray tube (CRT) to provide system readouts and to accept pilot inputs into the system.

LIMITATIONS

The single installation of the GNS-XL, with GPS sensor, is not approved as a sole means of navigation; therefore, when the GNS-XL is to be used as the primary means of navigation, or when coupled to the autopilot, flight director or primary flight display (PFD), the navigation equipment required by the FARs applicable to the specified type of operation being conducted must be installed and operating. Refer to the airplane flight manual for additional limitations and operating information.

OPERATOR’S MANUAL

For detailed operating information, consult the GNS-XL Operator’s Manual, Report Number 006-08845-0000, Revision 6, issued July 1988 or later revision.

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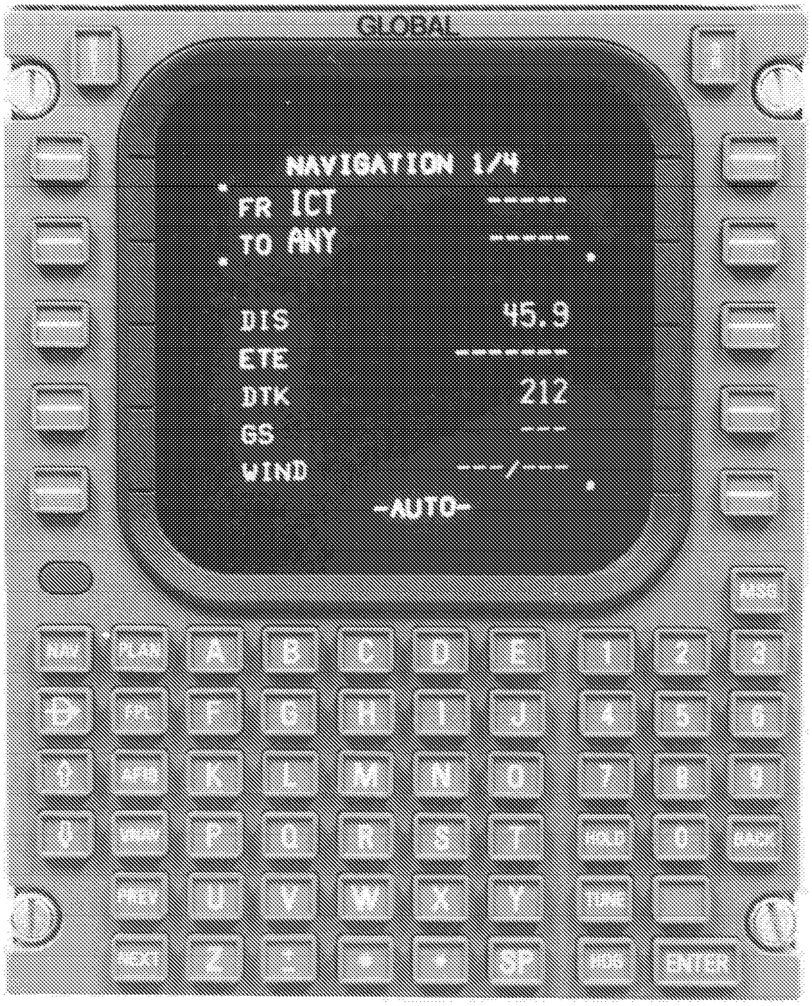

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Figure 3-36. GNS-XL Control Display Unit (CDU)

AIRBORNE FLIGHT INFORMATION SYSTEM (AFIS) (Optional)

The Global Airborne Flight Information System (AFIS) interfaces the flight planning and performance management functions of the standard GNS-XL Flight Management System with Global Data Center Computers, by means of the Aircraft Communications Addressing and Reporting System (ACARS). ACARS provides the computer data link between the airplane and the Global Data Center, by which transfer of digital data concerning flight plans, weather, and message traffic is possible.

The Model 560 Encore AFIS installation consists of a Data Management Unit (DMU), a configuration module, an optional data transfer unit (DTU), and an antenna. The Global Data Center and ACARS, with its VHF/ground telephone system interface, make up the ground portion of the system. The global data system provides the services of flight planning, aviation, weather, and a flight related message forwarding, thru its "mainframe" computers which accept and process digital data, and provide the requested information on a real time basis.

For detailed operating information, consult Section Seven of the Global Wulfsberg GNS-XLS Flight Management System Operator's Manual (Revision 2), Report Number 006-08845-0000, issued 2 January, 1996 or later revision. This section constitutes the Airborne Flight Information System and Satellite Data Communications System Supplement for the AFIS system.

OPERATING INFORMATION

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NORMAL PROCEDURES

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NORMAL PROCEDURES

PREFLIGHT INSPECTION

1. Battery - CONNECTED.
2. Engine Covers (2) - REMOVED.
3. Pitot Covers (3) - REMOVED.

NOTE

Refer to Normal Procedures, Cold Weather Operations, if the airplane has been exposed to ambient temperatures below -10°C (+14°F) for a prolonged period.

PRELIMINARY COCKPIT INSPECTION

1. Documents - CHECK ABOARD.
   a. To be displayed in airplane at all times:
      (1) Airworthiness and Registration Certificates.
      (2) Radio Station License(s) (if required).
   b. To be carried in the airplane at all times:
      (1) FAA Approved Airplane Flight Manual.
      (2) Honeywell Primus 1000 Pilot's Manual.
      (3) Applicable FMS Pilot's Manual (if required).
2. Flashlight - ABOARD.
3. Portable Fire Extinguisher - SERVICED and SECURE (under copilot's seat).
4. Microphones, Headsets, Oxygen Masks and Smoke Goggles - ABOARD and PROPERLY STOWED.
5. Oxygen Quantity - CHECK in Green arc.
6. CONTROL LOCK - UNLOCKED.
7. Gear Handle - DOWN.
8. Rudder, Aileron and Elevator Trim - POSITION Elevator trim tab indicator just below top of takeoff trim range and aileron and rudder trim tabs in neutral.
9. Flap Handle - AGREES with Flaps position.
10. Circuit Breakers - IN.
11. Generator Switches - L GEN and R GEN (OFF, if external power is to be used for start).
12. All other switches - OFF, NORM or AUTO.
13. Throttles - OFF.
14. Battery Switch - BATT (24 volts minimum).
15. Fuel Quantity and Balance - CHECK.

NOTE

Maximum lateral fuel imbalance is 200 pounds. If imbalance exceeds 200 pounds, correct prior to flight.

16. Battery Switch - EMER. Check N_1 Indicators, RMU 1, Standby HSI and Landing Gear Indicator receiving power.

NOTE

Standby Flight Display will be blank.

17. Battery Switch - BATT.

EXTERIOR INSPECTION

During inspection, make a general check for security, condition and cleanliness of the airplane and components. Check particularly for damage; fuel, oil and hydraulic fluid leakage; security of access panels; and removal of keys from locks.

NOTE

- Expedite all checks with electrical power on and ensure that the air conditioner switch is OFF, if external power is not used.
- Landing and nav lights may be omitted if night flight is not anticipated.

1. Hot Items/Lights - ON and CHECK.
   a. Left, Right and Standby Static Ports - CLEAR and WARM.
   b. Left, Right and Standby Pitot Tubes - CLEAR and HOT.
   c. Landing Lights - ALL ON (if not observed from cockpit).
   d. Recognition Lights - ALL ON (if not observed from cockpit).
   e. Angle-of-attack Vane - FREE and HOT.
   f. Beacon Light - ON and FLASHING (if not observed from cockpit).
   g. Right Wing Inspection, Navigation, and Anti-collision - ON (if not observed from cockpit).
   h. Tail Navigation Light - ON.
   i. Left Wing Inspection, Navigation, and Anti-collision Lights - ON (if not observed from cockpit).
   j. Hot Items/Lights and Battery Switches - OFF.
2. Left Nose - CHECK.
   a. Brake Fluid Reservoir Sight Gauges - FLUID VISIBLE.
   b. Power Brake Accumulator Charge - MINIMUM. Grey band (675 psi) with brake accumulator not charged. System Charged - IN GREEN ARC.

NOTE

If airplane has been cold soaked in ambient temperature below -10°C (+14°F), the accumulator charge may indicate below the grey band (675 psi), but the needle must be visibly above the lower stop.

   c. Nose Baggage Door - SECURE and LOCKED.
   d. Nose Gear, Doors, Wheel and Tire - CONDITION.
3. Right Nose and Fuselage Right Side - CHECK.
   a. Windshield Alcohol Reservoir Sight Gauge - FLUID VISIBLE.
   b. Brake and Gear Pneumatic Pressure Gauge - IN GREEN ARC.
   c. Nose Baggage Door - SECURE and LOCKED.
   d. Ram Air Temperature Probe - CLEAR.
   e. Overboard Vent Lines - CLEAR.
   f. Top and Bottom Antennas - CONDITION and SECURE.
   g. Dorsal Fin Air Inlet - CLEAR.
4. Right Wing - CHECK.
   a. Pylon Air Inlet - CLEAR.
   b. Engine Temperature Sensors (2) - CONDITION.
   c. Engine Fan Duct and Fan - CONDITION.
   d. Wing Inspection Light - CONDITION.

(Continued Next Page)

NORMAL PROCEDURES

PREFLIGHT INSPECTION

1. Battery - CONNECTED.
2. Engine Covers (2) - REMOVED.
3. Pitot Covers (3) - REMOVED.

NOTE

Refer to Normal Procedures, Cold Weather Operations, if the airplane has been exposed to ambient temperatures below -10°C (+14°F) for a prolonged period.

PRELIMINARY COCKPIT INSPECTION

1. Documents - CHECK ABOARD.
   a. To be displayed in airplane at all times:
      (1) Airworthiness and Registration Certificates.
      (2) Radio Station License(s) (if required).
   b. To be carried in the airplane at all times:
      (1) FAA Approved Airplane Flight Manual.
      (2) Honeywell Primus 1000 Pilot's Manual.
      (3) Applicable FMS Pilot's Manual (if required).
2. Flashlight - ABOARD.
3. Portable Fire Extinguisher - SERVICED and SECURE (under copilot's seat).
4. Microphones, Headsets, Oxygen Masks and Smoke Goggles - ABOARD and PROPERLY STOWED.
5. Oxygen Quantity - CHECK in Green arc.
6. CONTROL LOCK - UNLOCKED.
7. Gear Handle - DOWN.
8. Rudder, Aileron and Elevator Trim - POSITION Elevator trim tab indicator just below top of takeoff trim range and aileron and rudder trim tabs in neutral.
9. Flap Handle - AGREES with Flaps position.
10. Circuit Breakers - IN.
11. Generator Switches - L GEN and R GEN (OFF, if external power is to be used for start).
12. All other switches - OFF, NORM or AUTO.
13. Throttles - OFF.
14. Battery Switch - BATT (24 volts minimum).
15. Fuel Quantity and Balance - CHECK.

NOTE

Maximum lateral fuel imbalance is 200 pounds. If imbalance exceeds 200 pounds, correct prior to flight.

16. Battery Switch - EMER. Check Engine Display LH Reversionary Channel, RMU 1, Standby HSI and Landing Gear Indicator receiving power.

NOTE

Standby Flight Display will be blank.

17. Battery Switch - BATT.

EXTERIOR INSPECTION

During inspection, make a general check for security, condition and cleanliness of the airplane and components. Check particularly for damage; fuel, oil and hydraulic fluid leakage; security of access panels; and removal of keys from locks.

NOTE

- Expedite all checks with electrical power on and ensure that the air conditioner switch is OFF, if external power is not used.
- Landing and nav lights may be omitted if night flight is not anticipated.

1. Hot Items/Lights - ON and CHECK.
   a. Left, Right and Standby Static Ports - CLEAR and WARM.
   b. Left, Right and Standby Pitot Tubes - CLEAR and HOT.
   c. Landing Lights - ALL ON (if not observed from cockpit).
   d. Recognition Lights - ALL ON (if not observed from cockpit).
   e. Angle-of-attack Vane - FREE and HOT.
   f. Beacon Light - ON and FLASHING (if not observed from cockpit).
   g. Right Wing Inspection, Navigation, and Anti-collision - ON (if not observed from cockpit).
   h. Tail Navigation Light - ON.
   i. Left Wing Inspection, Navigation, and Anti-collision Lights - ON (if not observed from cockpit).
   j. Hot Items/Lights and Battery Switches - OFF.
2. Left Nose - CHECK.
   a. Brake Fluid Reservoir Sight Gauges - FLUID VISIBLE.
   b. Power Brake Accumulator Charge - MINIMUM. Grey band (675 psi) with brake accumulator not charged. System Charged - IN GREEN ARC.

NOTE

If airplane has been cold soaked in ambient temperature below -10°C (+14°F), the accumulator charge may indicate below the grey band (675 psi), but the needle must be visibly above the lower stop.

   c. Nose Baggage Door - SECURE and LOCKED.
   d. Nose Gear, Doors, Wheel and Tire - CONDITION.
3. Right Nose and Fuselage Right Side - CHECK.
   a. Windshield Alcohol Reservoir Sight Gauge - FLUID VISIBLE.
   b. Brake and Gear Pneumatic Pressure Gauge - IN GREEN ARC.
   c. Nose Baggage Door - SECURE and LOCKED.
   d. Ram Air Temperature Probe - CLEAR.
   e. Overboard Vent Lines - CLEAR.
   f. Top and Bottom Antennas - CONDITION and SECURE.
   g. Dorsal Fin Air Inlet - CLEAR.
4. Right Wing - CHECK.
   a. Pylon Air Inlet - CLEAR.
   b. Engine Temperature Sensors (2) - CONDITION.
   c. Engine Fan Duct and Fan - CONDITION.
   d. Wing Inspection Light - CONDITION.

(Continued Next Page)

EXTERIOR INSPECTION (Continued)

   e. Anti-Ice Bleed Air Cooling Air Inlet - CLEAR.
   f. Heated Leading Edge - CONDITION and VENTS CLEAR.
   g. Fuel Quick Drains (5) - DRAIN and CHECK for contamination.
   h. Main Gear Door, Wheel, Tire and Brake - CONDITION and SECURE.
   i. Boundary Layer Energizers (16) - CHECK (none may be missing).
   j. Fuel Filler Cap - SECURE.
   k. Fuel Tank Vent - CLEAR.
   l. Navigation, Anti-Collision, Landing and Recognition Lights - CONDITION.
   m. Static Wicks (7) - CHECK (one on tip may be missing).
   n. Aileron, Speed Brakes and Flaps - CONDITION and SECURE. (Flap position should match cockpit indication).
5. Right Nacelle - CHECK.
   a. Oil Level - CHECK.
   b. Chip Detector - TEST.
   c. Oil Filler Cap and Access Door - SECURE.
   d. Generator Cooling Air Exhaust - CLEAR.
   e. Engine Fluid Drain Mast - CLEAR.
   f. Engine Exhaust and Bypass Ducts - CONDITION and CLEAR.
   g. Thrust Reverser Buckets - CONDITION AND STOWED.
   h. Precooler Exhaust - CLEAR.
   i. Single Point Refueling Cap and Door - SECURE.
6. Right Empennage - CHECK.
   a. Air Conditioning Overboard Exhaust - CLEAR.
   b. Hydraulic Service Door - SECURE, drain mast clear.
   c. Right Horizontal Stabilizer Deice Boot - CONDITION and SECURE.
   d. Right Elevator and Trim Tab - CONDITION and SECURE (position matches cockpit indication, flush with elevator trailing edge).
   e. Rudder and Trim Tab - CONDITION and SECURE (correct servo tab action).
   f. Static Wicks (Rudder, Vertical Stabilizer and Both Elevators) (8) - CHECK (static wick on the stinger may be missing).
   g. Tail Skid - CONDITION and SECURE.
   h. Tail Mounted Beacon Light - CONDITION.
7. Left Empennage - CHECK.
   a. Left Elevator and Trim Tab - CONDITION and SECURE (position matches cockpit indication, flush with elevator trailing edge).
   b. Left Horizontal Stabilizer Deice Boot - CONDITION and SECURE.
   c. Oxygen Blowout Disk - GREEN.
   d. External Power Service Door - SECURE.
   e. Battery Cooling Intake and Vent Lines - CLEAR.
   f. Windshield Heat Exchanger Overboard Exhaust - CLEAR.
8. Aft Compartment - CHECK.
   a. Hydraulic Fluid Quantity - CHECK.
   b. Fire Bottle Pressure Gauges - CHECK (temperature/pressure relationship).
   c. ACM Oil Level - CHECK.
   d. Tailcone Access Door - CLOSED and LATCHED.
   e. Aft Compartment Baggage - SECURE.
   f. Aft Compartment Light - OFF.
   g. Aft Compartment Door - SECURE and LOCKED.

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EXTERIOR INSPECTION (Continued)

9. Left Nacelle - CHECK.
    a. Precooler Exhaust - CLEAR.
    b. Thrust Reverser Buckets - CONDITION AND STOWED.
    c. Engine Exhaust and Bypass Ducts - CONDITION and CLEAR.
    d. Engine Fluid Drain Mast - CLEAR.
    e. Generator Cooling Air Exhaust - CLEAR.
    f. Oil Level - CHECK.
    g. Chip Detector - TEST.
    h. Oil Filler Cap and Access Door - SECURE.
10. Left Wing - CHECK.
    a. Flap, Speed Brakes, Aileron and Trim Tab - CONDITION and SECURE.
    b. Static Wicks (7) - CHECK (one on tip may be missing).
    c. Navigation, Anti-Collision, Landing and Recognition Lights - CONDITION.
    d. Fuel Tank Vent - CLEAR.
    e. Fuel Filler Cap - SECURE.
    f. Main Gear Door, Wheel, Tire and Brake - CONDITION and SECURE.
    g. Boundary Layer Energizers (16) - CHECK (none may be missing).
    h. Fuel Quick Drains (6) - DRAIN and CHECK for contamination.
    i. Heated Leading Edge - CONDITION and VENTS CLEAR.
    j. Anti-Ice Bleed Air Cooling Air Inlet - CLEAR.
    k. Wing Inspection Light - CONDITION.
    l. Engine Fan Duct and Fan - CONDITION.
    m. Engine Temperature Sensors (2) - CONDITION.
    n. Pylon Air Inlet - CLEAR.
11. Cabin Entry - CHECK.
    a. Dorsal Fin Air Inlet - CLEAR.
    b. Secondary Cabin Door Seal - CHECK for RIPS, TEARS and FOLDING.

CABIN INSPECTION

1. Emergency Exit - SECURE; Handle Lock Pin - REMOVE.
2. Passenger Seats - UPRIGHT, OUTBOARD and POSITIONED AFT or FORWARD as required to clear exit doors.
3. Door Entry Lights - OFF.
4. Portable Fire Extinguishers - SERVICED and SECURE.

COCKPIT PREPARATION

1. Preflight Inspection - COMPLETE.
2. Oxygen - CHECK.
    a. OXYGEN CONTROL VALVE - NORMAL.
    b. Crew Oxygen Masks - CHECK and SET to 100%.
3. Circuit Breakers - CHECK IN.
4. Cockpit Switches - SET.
    a. Left Microphone - MIC HEAD SET.
    b. Generators - L GEN and R GEN (OFF if GPU start).
    c. Inverter - NORM.
    d. AVIONIC POWER Switch - OFF.
    e. FUEL BOOST Pumps - NORM.

(Continued Next Page)

COCKPIT PREPARATION (Continued)

f. IGNITION Switch - NORM.
g. Fuel CROSSFEED Switch - OFF.
h. Anti-Ice/Deice - OFF.
i. BATTERY DISCONNECT Switch - NORM (cover down).
j. Left VERT GYRO - NORM.
k. LEFT GYRO - AUTO.
l. Exterior Lights - OFF or AS REQUIRED.
m. PANEL LIGHTS - AS REQUIRED.
n. PANEL LIGHT CONTROLS - SET.
o. STBY GYRO - TEST, verify green light, then ON (Amber light on).
p. BEACON Light - AS DESIRED.
q. LANDING LIGHTS - OFF.
r. Gear Handle - DOWN.
s. ANTISKID Switch - ON.
t. GND IDLE Switch - NORM.
u. Pressurization SYSTEM SELECT - AUTO.
v. EMER DUMP - NORM.
w. PRESS SOURCE Select Knob - NORM.
x. A/C COMPRESSOR - OFF.
y. Temperature Select Knob - AS DESIRED.
z. Radar - OFF or STBY.
aa. WINDSHIELD BLEED AIR Knobs - OFF.
bb. OVHD FAN - OFF.
cc. DEFOG FAN - OFF.
dd. Right VERT GYRO - NORM.
ee. RIGHT GYRO - AUTO.
ff. Right Microphone - MIC HEAD SET.
gg. ENGINE SYNC Knob - OFF.

5. Battery Switch - BATT
6. Battery Voltage - CHECK (24 volts minimum).
7. External Power - CONNECTED (if applicable).
8. Tail Deice Switch - AUTO, CHECK TL DEICE FAIL L/R ILLUMINATED.
9. Tail Deice Switch - OFF.
10. AVIONIC POWER Switch - ON.
11. Engine Instruments - NO FLAGS.
12. Gear Position Indicator - 3 GREEN.

(Continued Next Page)

COCKPIT PREPARATION (Continued)

13. Warning Systems - TEST/OFF.

NOTE

The W/S TEMP annunciator may not test after cold soak at extremely cold temperatures. If this occurs, repeat the test after the cabin has warmed up. The test must be completed prior to each flight.

14. AVIONIC POWER Switch - OFF.
15. Windshield Ice Detection Lights - CHECK FOR ILLUMINATION.

DELAY BEFORE FLIGHT W/O GPU

1. STBY GYRO - OFF.
2. Battery Switch - OFF.

BEFORE STARTING ENGINES

1. Passenger Briefing - COMPLETED.
   a. Emergency exit location and operation.
   b. Use of emergency oxygen.
   c. Smoking.
   d. Seat adjustment - CHECK passenger seats are full upright, outboard and positioned aft or forward to clear all exit doors, seat belts and shoulder harnesses secure.
2. Battery Switch - BATT.
3. PARK BRAKE - SET.
4. Wheel Chocks - REMOVED.
5. Pilot's Cockpit Side Window - CLOSED/LATCHED.
6. Exterior Lights - AS REQUIRED.
   a. BEACON - ON.
   b. NAV Lights - ON (during night operations).
7. Annunciators - CHECKED.

STARTING ENGINES

NOTE

- Either engine may be started first.
- If the aircraft has been cold soaked at temperatures below -10°C (+14°F), the use of external power or warming the battery to -10°C (+14°F) or warmer is recommended. This temperature may be checked with the battery temperature gauge. Proper battery warmup may require extended application of heat to the battery. Refer to Normal Procedures, Cold Weather Operations.

1. Engine - START.
   a. ENGINE START Button - PUSH L or R; Button Light illuminates.
   b. At 8% N_2 - THROTTLE TO IDLE.
   c. Abort start if no ITT rise within 10 seconds.
   d. Abort start if ITT rapidly approaches 700°C.
   e. Abort start if no indication of N_1 rotation by 25% N_2.
   f. Engine instruments - CHECK NORMAL.

(Continued Next Page)

COCKPIT PREPARATION (Continued)

- f. IGNITION Switch - NORM.
- g. Fuel CROSSFEED Switch - OFF.
- h. Anti-Ice/Deice - OFF.
- i. BATTERY DISCONNECT Switch - NORM (cover down).
- j. Left VERT GYRO - NORM.
- k. LEFT GYRO - AUTO.
- l. Exterior Lights - OFF or AS REQUIRED.
- m. PANEL LIGHTS - AS REQUIRED.
- n. PANEL LIGHT CONTROLS - SET.
- o. STBY GYRO - TEST, verify green light, then ON (Amber light on).
- p. BEACON Light - AS DESIRED.
- q. LANDING LIGHTS - OFF.
- r. Gear Handle - DOWN.
- s. ANTISKID Switch - ON.
- t. GND IDLE Switch - NORM.
- u. Pressurization SYSTEM SELECT - AUTO.
- v. EMER DUMP - NORM.
- w. PRESS SOURCE Select Knob - NORM.
- x. A/C COMPRESSOR - OFF.
- y. Temperature Select Knob - AS DESIRED.
- z. Radar - OFF or STBY.
- aa. WINDSHIELD BLEED AIR Knobs - OFF.
- bb. OVHD FAN - OFF.
- cc. DEFOG FAN - OFF.
- dd. Right VERT GYRO - NORM.
- ee. RIGHT GYRO - AUTO.
- ff. Right Microphone - MIC HEAD SET.
- gg. ENGINE SYNC Knob - OFF.

5. Battery Switch - BATT
6. Battery Voltage - CHECK (24 volts minimum).
7. External Power - CONNECTED (if applicable).
8. Tail Deice Switch - AUTO, CHECK TL DEICE FAIL L/R ILLUMINATED.
9. Tail Deice Switch - OFF.
10. AVIONIC POWER Switch - ON.
11. Engine Instrument Warning Indicators - CHECK NORMAL (no dashes and/or FAIL messages).
12. Gear Position Indicator - 3 GREEN.

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COCKPIT PREPARATION (Continued)

13. Warning Systems - TEST/OFF.

NOTE

The W/S TEMP annunciator may not test after cold soak at extremely cold temperatures. If this occurs, repeat the test after the cabin has warmed up. The test must be completed prior to each flight.

14. AVIONIC POWER Switch - OFF.
15. Windshield Ice Detection Lights - CHECK FOR ILLUMINATION.

DELAY BEFORE FLIGHT W/O GPU

1. STBY GYRO Switch - OFF.
2. Battery Switch - OFF.

BEFORE STARTING ENGINES

1. Passenger Briefing - COMPLETED.
   a. Emergency exit location and operation.
   b. Use of emergency oxygen.
   c. Smoking.
   d. Seat adjustment - CHECK passenger seats are full upright, outboard and positioned aft or forward to clear all exit doors, seat belts and shoulder harnesses secure.
2. Battery Switch - BATT.
3. PARK BRAKE - SET.
4. Wheel Chocks - REMOVED.
5. Pilot's Cockpit Side Window - CLOSED/LATCHED.
6. Exterior Lights - AS REQUIRED.
   a. BEACON - ON.
   b. NAV Lights - ON (during night operations).
7. Annunciators - CHECKED.

STARTING ENGINES

NOTE

- Either engine may be started first.
- If the aircraft has been cold soaked at temperatures below -10°C (+14°F), the use of external power or warming the battery to -10°C (+14°F) or warmer is recommended. This temperature may be checked with the battery temperature gauge. Proper battery warmup may require extended application of heat to the battery. Refer to Normal Procedures, Cold Weather Operations.

1. Engine - START.
   a. ENGINE START Button - PUSH L or R; Button Light illuminates.
   b. At 8% N_2 - THROTTLE TO IDLE.
   c. Abort start if no ITT rise within 10 seconds.
   d. Abort start if ITT rapidly approaches 700°C.
   eAbort start if no indication of N_1 rotation by 25% N_2.
   f.Engine Instrument Warning Indicators - CHECK NORMAL (no dashes and/or FAIL messages).

(Continued Next Page)

STARTING ENGINES (Continued)

g. Fuel, Oil, Generator and Hydraulic Annunciators - EXTINGUISHED (respective engine).

2. GND IDLE Switch - HIGH.
3. Other Engine - START.
   a. Repeat procedures in item 1.

NOTE

The operating engine should be set to GND IDLE-HIGH for a cross generator start to provide additional amperage. Load on operating generator should be 200 AMPS or less prior to starting other engine.

4. GND IDLE Switch - NORM.
5. Engine Annunciators - EXTINGUISHED (except GND IDLE).
6. GPU - DISCONNECTED (if used).
7. Generator Switch - L GEN and R GEN/CHECK DC AMPS/VOLTS.
   a. Left generator - OFF, right generator - GEN, check left generator voltage, check right generator AMPS.
   b. Left generator - GEN, right generator - OFF, check left generator AMPS, check right generator voltage.
   c. Left generator - GEN, right generator - GEN, check left generator AMPS, check right generator AMPS, check system voltage.

NOTE

When operating in visible moisture and ambient air temperature is between +10°C and -30°C, turn pitot and static heat ON and engine LH and RH anti-ice systems ON. If temperature is above -18°C, turn W/S BLEED AIR switch to LOW. If temperature is -18°C or below, turn W/S BLEED AIR switch to HI. Check W/S BLEED AIR Knobs MAX. For sustained ground operation, the engines should be operated for one out of every four minutes at 65% N_2 or above.

CAUTION

LIMIT GROUND OPERATION OF PITOT STATIC HEAT TO TWO MINUTES ON WITH TWO MINUTES OFF BETWEEN CYCLES TO PRECLUDE SYSTEM DAMAGE.

8. Battery Temperature - CHECK.

BEFORE TAXI

1. AVIONIC POWER Switch - ON.

NOTE

The avionics will require warmup after cold soak. Over 20 minutes may be required at temperatures below -25°C (-13°F). Proper warmup is indicated by normal illumination of RMU/PFD/MFD displays with pilot control of brightness and by audio reception on all applicable avionics. In the absence of a suitable station, background static is an acceptable demonstration of reception. Refer to Normal Procedures, Cold Weather Operations.

(Continued Next Page)

BEFORE TAXI (Continued)

2. Flight Controls/Speed Brakes/Flaps - CHECKED/SET.

NOTE

Verify flaps trim interconnect operation is between 15 and 25 degrees.

3. Pitch Trim - CHECK/SET for Takeoff.
   a. LH - Push both trim switches down and verify elevator trim movement, and push AP TRIM DISC, verify no elevator trim movement. Release AP TRIM DISC.
   b. LH - Push both trim switches up, and verify elevator trim movement, and push AP TRIM DISC, verify no elevator trim movement. Release AP TRIM DISC.
   c. LH - Push left half of trim switch up and down, verify no elevator trim movement.
   d. LH - Push right half of trim switch up and down, verify no elevator trim movement.
   e. Verify manual trim wheel can move elevator trim.
   f. RH - Push both trim switches down, and verify elevator trim movement, and push AP TRIM DISC, verify no elevator trim movement. Release AP TRIM DISC.
   g. RH - Push both trim switches up, and verify elevator trim movement, and push AP TRIM DISC, verify no elevator trim movement. Release AP TRIM DISC.
   h. RH - Push left half of trim switch up and down, verify no elevator trim movement.
   i. RH - Push right half of trim switch up and down, verify no elevator trim movement.

4. Anti-Ice/Deice - CHECKED/SET AS REQUIRED.

NOTE

Proper tail deice system operation is indicated by the following:

AUTO - TL DEICE PRESS L advisory light, on 6 seconds.
TL DEICE PRESS L and R advisory lights, both off 6 seconds.
TL DEICE PRESS R advisory light, on 6 seconds.
TL DEICE PRESS L and R advisory lights, both off remainder of 3 minute cycle.

MANUAL - TL DEICE PRESS L and R advisory lights, both on when switch is in MANUAL.
TL DEICE PRESS L and R advisory lights, both off when switch is released.

5. TEMPERATURE CONTROL - AS REQUIRED (AUTO above FL310).
6. PRESSURIZATION Controller - SET Landing Field Elevation.
7. ATIS/Clearance/FMS - AS REQUIRED.
8. Avionics/Flight Instruments - SET.
   a. EFIS TEST switch - push, verify:
      (1) Pilot and copilot radio altimeters display 50 feet.
      (2) Red X displayed in barometric altimeters, airspeed, and CDI.
      (3) All digits replaced with dashes (except radio altimeter).
      (4) All error messages are displayed.
      (5) Test message is displayed in upper left corner of PFD.
      (6) Command cues (if selected) bias from view.

(Continued Next Page)

BEFORE TAXI (Continued)

- b. Radio Altimeter - SET.
- c. Altimeters - SET and CROSS CHECK.
- d. Heading - CROSS CHECK.
- e. Communication Frequencies - SET.
- f. Navigation Frequencies - SET.
- g. Course - SET.
- h. Autopilot (at pilot's discretion) - ENGAGE, PUSH left AP TRIM DISC switch, verify autopilot disconnects and chime sounds. Repeat using right AP TRIM DISC switch.

9. AC Inverter Switch - CHECK INV 1 and INV 2. VERIFY ATT flags on either PFD remain out of view and failed inverter is annunciated; then, Inverter Switch - NORM.
10. COCKPIT VOICE RECORDER TEST Button - PUSH and HOLD for 5 seconds, verify test light illuminates.
11. Annunciators - CHECKED.

NOTE

The antiskid system must be turned on and the self-test sequence completed (antiskid annunciator light out) while the airplane is stationary. If the airplane is taxiing when the antiskid system is actuated, the antiskid test sequence will not be completed successfully and the antiskid will not be operational during takeoff.

12. Avionics Cooling Fans - CHECK OPERATING.
13. Passenger Advisory Lights - PASS SAFETY.
14. Pilot and Copilot Foot Warmers - OPEN (Down).

TAXI

1. Brakes - CHECK.

CAUTION

IF, DURING TAXI, A NORMAL BRAKE PEDAL - NO BRAKING CONDITION IS ENCOUNTERED, OPERATE THE EMERGENCY BRAKE SYSTEM AS REQUIRED. CORRECT PRIOR TO FLIGHT.

2. Nosewheel Steering - CHECK.

NOTE

When taxiing in strong crosswinds, differential braking may be required to supplement nosewheel steering.

3. Thrust Reversers - CHECK.
   - a. Deploy Thrust Reversers, check sequencing and timing of lights.
   - b. Select STOW EMER, check sequencing and timing of lights.
   - c. Stow Thrust Reversers, check ARM lights remain illuminated.
   - d. Deselect STOW EMER, verify all Thrust Reverser lights extinguished.
4. Takeoff Speeds and Distance - SET.
   - a. Confirm V_1, V_R, V_2 and V_{ENR} displayed on PFD.
5. Takeoff N_1 - SET.
   - a. Obtain takeoff N_1 from Section IV, Performance, or abbreviated checklist.

BEFORE TAKEOFF

1. Flaps - SET.
2. Speed Brakes - RETRACTED.
3. Trims - (3) SET FOR TAKEOFF.
4. Anti-ice/Deice - AS REQUIRED. Check anti-ice and deice systems when icing conditions are anticipated.

CAUTION

- IF ANTI-ICE SYSTEMS ARE TO BE USED FOR TAKEOFF AND GROUND AMBIENT TEMPERATURE IS BETWEEN 0°C AND 10°C, CLOSE THE R WINDSHIELD BLEED AIR MANUAL VALVE FOR TAKEOFF. THIS WILL ENSURE ADEQUATE BLEED AIR TEMPERATURE REGULATION TO THE PYLON PRE-COOLERS. AFTER THE THROTTLES HAVE BEEN REDUCED TO CLIMB POWER, THE R WINDSHIELD BLEED AIR KNOB MAY BE OPENED AS DESIRED.

- DO NOT OPERATE DEICE BOOTS WHEN AMBIENT AIR TEMPERATURE IS BELOW -40°C (-40°F).

- LIMIT GROUND OPERATION OF PITOT STATIC HEAT TO TWO MINUTES ON WITH TWO MINUTES OFF BETWEEN CYCLES TO PRECLUDE SYSTEM DAMAGE.

5. Crew Briefing - COMPLETE.

---**CLEARED FOR TAKEOFF**--

6. IGNITION Switch - ON.
7. PITOT & STATIC Heat - ON.
8. Exterior Lights - AS REQUIRED.

NOTE

Do not operate the anti-collision lights in conditions of fog, clouds or haze as the reflection of the light beam can cause disorientation or vertigo.

9. Transponder/TCAS - TA/RA.
10. Radar - ON.
11. Engine Instruments - CHECK.
12. Annunciator Panel - CHECK.

NOTE

Generally, in non-icing conditions, all annunciators should be extinguished except GND IDLE.

TAKEOFF

1. Throttles - SET TAKEOFF N_1.
2. Engine Instruments - CHECK.
3. Brakes - RELEASE.
4. Throttles - Trim N_1 setting as required by 80 KIAS.

BEFORE TAXI (Continued)

b. Radio Altimeter - SET.
c. Altimeters - SET and CROSS CHECK.
d. Heading - CROSS CHECK.
e. Communication Frequencies - SET.
f. Navigation Frequencies - SET.
g. Course - SET.
h. Autopilot (at pilot's discretion) - ENGAGE, PUSH left AP TRIM DISC switch, verify autopilot disconnects and chime sounds. Repeat using right AP TRIM DISC switch.

9. AC Inverter Switch - CHECK INV 1 and INV 2. VERIFY ATT flags on either PFD remain out of view and failed inverter is annunciated; then, Inverter Switch - NORM.
10. COCKPIT VOICE RECORDER TEST Button - PUSH and HOLD for 5 seconds, verify test light illuminates.
11. Annunciators - CHECKED.

NOTE

The antiskid system must be turned on and the self-test sequence completed (antiskid annunciator light out) while the airplane is stationary. If the airplane is taxiing when the antiskid system is actuated, the antiskid test sequence will not be completed successfully and the antiskid will not be operational during takeoff.

12. Avionics Cooling Fans - CHECK OPERATING.
13. Passenger Advisory Lights - PASS SAFETY.
14. Pilot and Copilot Foot Warmers - OPEN (Down).

TAXI

1. Brakes - CHECK.

CAUTION

IF, DURING TAXI, A NORMAL BRAKE PEDAL - NO BRAKING CONDITION IS ENCOUNTERED, OPERATE THE EMERGENCY BRAKE SYSTEM AS REQUIRED. CORRECT PRIOR TO FLIGHT.

2. Nosewheel Steering - CHECK.

NOTE

When taxiing in strong crosswinds, differential braking may be required to supplement nosewheel steering.

3. Thrust Reversers - CHECK.
   a. Deploy Thrust Reversers, check sequencing and timing of lights.
   b. Select STOW EMER, check sequencing and timing of lights.
   c. Stow Thrust Reversers, check ARM lights remain illuminated.
   d. Deselect STOW EMER, verify all Thrust Reverser lights extinguished.
4. Takeoff Speeds and Distance - SET.
   a. Confirm V_1, V_R, V_2 and V_{ENR} displayed on PFD.
5. Takeoff N_1 - SET.
   a. Obtain takeoff N_1 from Section IV, Performance, or abbreviated checklist.

BEFORE TAKEOFF

1. Flaps - SET.
2. Speed Brakes - RETRACTED.
3. Trims - (3) SET FOR TAKEOFF.
4. Anti-ice/Deice - AS REQUIRED. Check anti-ice and deice systems when icing conditions are anticipated.

CAUTION

- IF ANTI-ICE SYSTEMS ARE TO BE USED FOR TAKEOFF AND GROUND AMBIENT TEMPERATURE IS BETWEEN 0°C AND 10°C, CLOSE THE R WINDSHIELD BLEED AIR MANUAL VALVE FOR TAKEOFF. THIS WILL ENSURE ADEQUATE BLEED AIR TEMPERATURE REGULATION TO THE PYLON PRE-COOLERS. AFTER THE THROTTLES HAVE BEEN REDUCED TO CLIMB POWER, THE R WINDSHIELD BLEED AIR KNOB MAY BE OPENED AS DESIRED.

- DO NOT OPERATE DEICE BOOTS WHEN AMBIENT AIR TEMPERATURE IS BELOW -40°C (-40°F).

- LIMIT GROUND OPERATION OF PITOT STATIC HEAT TO TWO MINUTES ON WITH TWO MINUTES OFF BETWEEN CYCLES TO PRECLUDE SYSTEM DAMAGE.

5. Crew Briefing - COMPLETE.

---**CLEARED FOR TAKEOFF**--

6. IGNITION Switch - ON.
7. PITOT & STATIC Heat - ON.
8. Exterior Lights - AS REQUIRED.

NOTE

Do not operate the anti-collision lights in conditions of fog, clouds or haze as the reflection of the light beam can cause disorientation or vertigo.

9. Transponder/TCAS - TA/RA.
10. Radar - ON.
11. Engine Instruments - CHECK.
12. Annunciator Panel - CHECK.

NOTE

Generally, in non-icing conditions, all annunciators should be extinguished except GND IDLE.

TAKEOFF

1. Throttles - SET TAKEOFF N_1.
2. Engine Instruments - CHECK NORMAL (no dashes and/or FAIL messages).
3. Brakes - RELEASE.
4. Throttles - Trim N_1 setting as required by 80 KIAS.

AFTER TAKEOFF - CLIMB

1. Landing Gear - UP.
2. Flaps - UP.
3. Throttles - SET CLIMB N_1.
4. ENGINE SYNC Knob - ON.
5. Yaw Damper - ENGAGE.
6. IGNITION Switch - NORMAL. (ON when flying in heavy rain).
7. Passenger Advisory Lights - AS REQUIRED.
8. Pressurization - CHECK.
9. Altimeters- SET and CROSS CHECK (transition altitude).
10. REC/TAXI Lights - OFF (transition altitude).
11. A/C COMPRESSOR - OFF or FAN (above 18,000 feet).
12. Anti-Ice/Deice - AS REQUIRED.

CRUISE

1. Throttles - SET CRUISE N_1.
2. Pressurization - CHECK.
3. Anti-Ice/Deice - AS REQUIRED.

CAUTION

DO NOT OPERATE DEICE BOOTS UNDER ANY OF THE FOLLOWING CONDITIONS BECAUSE BOOT CRACKING MAY RESULT:

AIRSPEEDS AT OR ABOVE 150 KIAS AND THE RAT IS LESS THAN OR EQUAL TO -35°C (-31°F).

AIRSPEEDS BELOW 150 KIAS AND THE RAT IS LESS THAN OR EQUAL TO -40°C (-40°F).

NOTE

- Ignition switches should be selected to ON when flying through heavy rain.
- Check deice systems for proper operation prior to entering areas in which icing might be encountered.
- The pilot’s and copilot’s footwarmers should be opened for a short period during cruise to purge the side windows of moist air.

4. Fuel CROSSFEED - AS REQUIRED (maximum imbalance 200 lbs.)

DESCENT

1. DEFOG Fan - HI or LOW (minimum of 15 minutes prior to descent).
2. Pilot and Copilot Foot Warmers - CLOSE (Up).
3. AIR FLOW DISTR - CKPT.
4. WINDSHIELD BLEED AIR Knobs - AS REQUIRED.
5. W/S BLEED Switch - AS REQUIRED.
6. Anti-ice/Deice - AS REQUIRED.

CAUTION

DO NOT OPERATE DEICE BOOTS UNDER ANY OF THE FOLLOWING CONDITIONS BECAUSE BOOT CRACKING MAY RESULT:

AIRSPEEDS AT OR ABOVE 150 KIAS AND THE RAT IS LESS THAN OR EQUAL TO -35°C (-31°F).

AIRSPEEDS BELOW 150 KIAS AND THE RAT IS LESS THAN OR EQUAL TO -40°C (-40°F).

NOTE

- Maintain sufficient thrust for wing anti-ice; advance throttles to extinguish wing anti-ice lights.
- Check deice system for proper operation prior to entering areas in which icing might be encountered.
- Adequate engine anti-ice is provided at all throttle settings, including idle.

7. IGNITION Switch - ON when flying in heavy rain.
8. Pressurization - CHECK/SET Landing Elevation.
9. A/C COMPRESSOR - AS DESIRED (below 18,000 feet).
10. REC/TAXI Lights - ON (below 18,000 feet).
11. Altimeter - SET (Transition Level).

APPROACH

1. Avionics/Flight Instruments - CHECK/SET.
2. Crew Briefing - COMPLETE.
   a. Landing Speeds and Distance - SET.
   b. Go-Around N_1 - SET.
3. Passenger Advisory Lights - PASS SAFETY.
4. Passengers - BRIEF.
   a. Verify passenger seats are full upright, outboard and positioned aft or forward to clear all exit doors, seat belts and shoulder harnesses secure.
5. Flaps - AS REQUIRED.
6. IGNITION Switch - ON.
7. Exterior Lights - AS REQUIRED.
8. Fuel CROSSFEED Switch - OFF.
9. ENGINE SYNC Knob - OFF.
10. Annunciators - CHECK.
11. GND IDLE Switch - NORM; or HIGH for touch-and-go landings.

NOTE

In moderate sideslips the angle-of-attack derived on speed indication for V_{REF} may be in error by a small amount and should be disregarded for the duration of the sideslip. This applies to LAA in the PFD, round dial AOA indicator and the AOA indexer mounted on the glareshield.

(Continued Next Page)

APPROACH (Continued)

12. Landing at airports above 11,500 feet:
    a. PRESS SOURCE Select Knob - OFF (below 15,000 feet).
    b. OXYGEN CONTROL VALVE - CREW ONLY.

WARNING

WHEN HOLDING OR OTHERWISE OPERATING AT ALTITUDES BELOW 25,000 FEET FOR PERIODS GREATER THAN 30 MINUTES WITH THE CABIN ALTITUDE WARNING SHIFTED FROM 10,000 FEET TO 14,500 FEET (SLA BETWEEN 8000 AND 14,500 FEET), REFER TO APPROPRIATE OPERATING REQUIREMENTS FOR USE OF SUPPLEMENTAL OXYGEN.

NOTE

- If the OXYGEN CONTROL VALVE remains selected to NORMAL and cabin altitude exceeds 14,500 feet ±500 feet, CAB ALT warning light will illuminate and passenger oxygen masks will deploy.
- Failure to select pressurization source to OFF will result in a sudden cabin depressurization at touchdown.

    c. OVHD Fan - HI.

BEFORE LANDING

1. Pressurization - ZERO DIFFERENTIAL PRIOR TO LANDING.
2. Landing Gear - DOWN.
3. ANTISKID Switch - CHECK ON.
4. Landing Lights - AS DESIRED.
5. Flaps - LAND (35°).
6. Airspeed - V_{REF}.
7. Autopilot and Yaw Damper - OFF (180 feet AGL and below).
8. Speed Brakes - RETRACT (50 feet AGL and below).

ALL ENGINES GO-AROUND

1. Throttles - SET TAKEOFF N_1.
2. Airplane Pitch Attitude - POSITIVE ROTATION TO +10 degrees (use flight director GA mode).
3. Flaps - T.O. & APPR (15°).
4. Climb Speed - V_{APP}.
5. Landing Gear - UP (positive rate-of-climb).
6. At airports above 11,500 feet:
    a. PRESS SOURCE Select Knob - NORM.
    b. OXYGEN CONTROL VALVE - NORMAL.

NOTE

If cabin altitude exceeds 14,500 ±500 feet, CAB ALT warning light will illuminate and passenger oxygen masks will deploy.

7. Flaps - UP, V_{APP} + 10 KIAS - above 400 feet AGL.
8. Throttles - SET CLIMB N_1.

LANDING

1. Throttles - IDLE.

NOTE

Eight seconds after touchdown, engines will spool down from flight idle to ground idle if the GND IDLE switch is in NORM.

2. Brakes - APPLY (after touchdown).

CAUTION

- IF, DURING LANDING, A NORMAL BRAKE PEDAL - NO BRAKING CONDITION IS ENCOUNTERED, OPERATE THE EMERGENCY BRAKE SYSTEM. CORRECT PRIOR TO NEXT FLIGHT.
- ANTISKID SYSTEM DOES NOT FUNCTION DURING EMERGENCY BRAKING. EXCESSIVE PRESSURE ON EMERGENCY BRAKE HANDLE CAN CAUSE BOTH WHEEL BRAKES TO LOCK, RESULTING IN BLOWOUT OF BOTH TIRES.

NOTE

To obtain maximum braking performance from the antiskid system, the pilot must apply continuous maximum effort (no modulation) to the brake pedals.

3. Control Wheel - APPLY FORWARD PRESSURE.

CAUTION

THE NOSEWHEEL MUST BE IN FIRM CONTACT WITH THE GROUND PRIOR TO EXTENDING SPEEDBRAKES AND/OR DEPLOYING THRUST REVERSERS.

4. Speed Brake - EXTEND (after nosewheel firm ground contact).
5. Thrust Reversers - DEPLOY (after nosewheel firm ground contact).

WARNING

DO NOT ATTEMPT TO RESTOW REVERSERS AND TAKE OFF ONCE REVERSERS HAVE STARTED TO DEPLOY.

NOTE

- To prevent any possible nose up pitch during thrust reverser deployment, maintain forward pressure on the control column after the nosewheel is on the ground.
- To avoid possible jamming of the throttle lockout cams, do not exceed approximately 15 pounds force on the thrust reverser levers until thrust reversers are fully deployed.

6. Thrust Reverser Indicator Lights - CHECK ILLUMINATION OF ARM, UNLOCK AND DEPLOY LIGHTS.
7. Reverse Thrust - AS REQUIRED. (Do not exceed 71.4% N_1 when OAT is at or above -18° C or 68.3% N_1 when OAT is below -18° C).
8. Thrust Reversers - REVERSER LEVERS TO IDLE REVERSE AT 60 KIAS.

AFTER LANDING

1. Thrust Reversers - STOW.

CAUTION

DO NOT ADVANCE THROTTLES UNTIL THE THRUST REVERSER UNLOCK LIGHTS ARE OUT.

2. Speed Brakes - RETRACT.
3. Flaps - UP.
4. IGNITION Switch - NORMAL.
5. Transponder/TCAS - STBY.
6. PITOT & STATIC Heat - OFF.
7. Anti-Ice/Deice - WING and TAIL OFF, ENGINE As Required.
8. Exterior Lights - AS REQUIRED.
   a. Anti-collision lights - OFF.
   b. REC/TAXI lights - AS REQUIRED.
9. Radar - STBY or OFF.

SHUTDOWN

1. Parking Brake - SET, or Wheels - CHOCK.

NOTE

Do not set parking brake, if brakes are hot, or the anticipated cold soak temperature is -10°C (+14°F) or below.

2. AVIONIC POWER Switch - OFF.
3. STBY GYRO - OFF.
4. Anti-Ice Systems - OFF.
5. Exterior Lights - OFF.
6. A/C COMPRESSOR - OFF.
7. Throttles - CUT OFF.
8. Defog Fan - OFF.
9. Passenger Advisory Lights - OFF.
10. Battery Switch - OFF.
11. CONTROL LOCK - PULL (as required).

NOTE

Do not set control lock if the anticipated cold soak temperature is -10°C (+14°F) or below.

12. Oxygen Masks - REMOVE from airplane if prolonged exposure to temperatures of 0°C (+32°F) or below is anticipated.

NOTE

Engine intake and exhaust covers should be installed to prevent long periods of windmilling.

DRY MOTORING

1. Throttle - OFF.
2. IGNITION Switch - OFF.
3. FUEL BOOST Pump - ON.
4. ENGINE START Button - PRESS momentarily. Motor engine for the desired duration. Observe starter and battery limitations.
5. ENGINE START DISENGAGE Button - PRESS.
6. FUEL BOOST Pump - OFF.

QUICK TURN

1. Warning Systems - TEST/OFF.
2. Return to BEFORE STARTING ENGINES checklist.

TURBULENT AIR PENETRATION

Flight through severe turbulence should be avoided if possible. The following is recommended for flight in severe turbulence.

1. IGNITION Switch - ON.
2. Airspeed approximately 180 KIAS. Do not chase airspeed.
3. Maintain a constant attitude without chasing the altitude. Avoid sudden large control movements.
4. Operation of the autopilot is recommended using basic pitch hold and lateral mode only.

SPECIAL PROCEDURES

SHORT FIELD OPERATION

For takeoff, taxi into position as close to the approach end as possible and apply takeoff thrust while holding the brakes. FAA Approved Airplane Flight Manual takeoff field length data assumes a static run-up and use of all available runway. When specified thrust is set, release the brakes. Rotate smoothly right at V_R as a delay will result in degradation of takeoff performance. Retract the gear when positively climbing and climb at V_2 (V_2 +10 KIAS Multi-engine) with T.O. (7 degree) or T.O. & APPR. (15°) flaps until clear of any obstacles.

Landing field length data in the FAA Approved Airplane Flight Manual assumes a steady 3 degree approach angle and a threshold crossing speed of V_{REF} at an altitude of 50 feet, with thrust reduced to idle at that point. In practice, it is suggested that for minimum field operations the threshold be crossed at a comfortable obstacle clearance altitude allowing some deceleration to take place approaching the runway. Touchdown should occur with maximum available runway remaining at minimum safe speed.

The energy to be dissipated during rollout is directly related to airplane weight and velocity at touchdown. Although weight is normally dictated by cabin loading and reserves required, flight planning into short fields should include avoiding carrying excessive weight in stored fuel. This consideration offers the side benefit of improved enroute performance. Velocity is something that can be controlled in nearly every case. Precise speed control is important in the short field environment. A one percent increase in speed will require approximately two percent more rollout distance. Excessive speed and late throttle reduction will also increase “float” prior to touchdown.

In general, short field landings are accomplished the same as normal landings except for heavier braking and closer attention to touchdown point and speed. A stabilized approach at V_{REF} provides the best possible starting point because any corrections necessary will be small. Establish a glide angle that will safely clear any obstacles and result in touchdown as comfortably close to the approach end as feasible.

Avoid a very flat approach as they generally result in excessive power being required in close and the vertical gust protection margin is reduced. At approximately 50 feet AGL, power reduction is normally begun to cross the threshold at a speed not in excess of V_{REF}. Check the throttles at idle and avoid an excessive flare that may cause the airplane to float. Deceleration will take place much more rapidly on the runway than it will airborne.

If thrust reversers are not used, extend the speed brakes while lowering the nose and commence braking with steady maximum pressure. Once braking has begun, back pressure on the yoke will create elevator drag without affecting weight on the gear providing the nose wheel is not lifted off the runway.

For landings utilizing thrust reversers, after touchdown on the mains, lower the nose, extend speed brakes, apply wheel brakes, and deploy the thrust reversers. Forward pressure on the yoke should be applied during reverser deployment. Check illumination of the ARM, UNLOCK and DEPLOY lights. Once the thrust reversers are deployed, apply maximum reverse thrust power. Once braking has begun and maximum reverse power is reached, back pressure on the yoke will provide additional weight on the main gear providing the nose is not raised. At 60 KIAS return the thrust reverser levers to the idle reverse detent position. Leave the thrust reversers deployed for aerodynamic drag and idle reverse thrust.

ADVERSE FIELD CONDITIONS

All flight manual field length data assumes a dry, hard surface runway except where otherwise noted. Precipitation-covered runway conditions will degrade braking effectiveness and will require significantly greater actual takeoff and landing field lengths.

Considerations for landing on a precipitation-covered runway are similar to those for short field operations where speed is minimized and maximum roll out distance is made available. Runway composition, condition and construction, the amount of precipitation and the depth of main landing gear tire tread remaining affect the magnitude of braking degradation, so it is impossible to apply a fixed factor to cover all conditions. Again, maximizing rollout runway available and touching down at minimum safe speed will provide the greatest possible margin.

Use of the thrust reversers on precipitation-covered runways is the same as that for a landing on a normal or dry runway. Cockpit visibility is not hampered by blowing rain, snow, or ice thrown forward by the thrust reversers except at low speed with idle reverse. Single-engine reversing during crosswind landings on precipitation-covered runways should be used with discretion.

Precipitation covered and icy runways present particular hazards which must be understood in order to achieve effective braking. Under normal braking conditions the antiskid system is very effective in preventing skids and in producing minimum stopping distances, with the pilot applying and maintaining steady maximum pressure. However, on a precipitation or ice covered runway, the phenomenon of dynamic hydroplaning may greatly reduce the antiskid effectiveness, because the wheels either do not spin up equally or do not spin up to the antiskid threshold speed. With 130 psi tires, hydroplaning may occur above approximately 80 knots ground speed. It is important to maintain properly inflated tires with good tread depth, and because ground speed is critical, to avoid tailwinds when operating in these conditions. When braking on precipitation covered runways ensure that the wheels are down and tracking prior to applying brakes. This will give the wheels time to spin up. Ensure that maximum weight is on the wheels, i.e., deploy speed brakes. If runway permits, utilize maximum aerodynamic braking and thrust reversers to slow the airplane prior to braking.

When braking is commenced, apply and maintain steady maximum pressure to the brake pedals. Longer or more frequent antiskid pressure dumps may be experianced due to the precipitation-covered surface, but this technique will produce the best overall stopping performance. Initial deceleration rate may appear tobe weak, but will improve noticeably as the airplane groundspeed reduces.

After landing on ice or slush, a complete check of the airplane, including overboard vents and control surfaces, should be conducted.

BIRD INGESTION PRECAUTIONS

Studies have indicated that bird strikes are most likely from the surface to approximately 4000 feet AGL. As a precaution against engine flameout due to bird ingestion, it is recommended that the engine igniters be ON when flying at or below 4000 feet AGL, or anytime the crew has reason to suspect that the potential for a bird strike exists.

PASSENGER COMFORT

When parked during daylight in hot weather, it is suggested that the cabin window shades be closed to reduce solar heat transfer. An optional exterior windshield cover performs the same function for the cockpit and is very effective. To circulate cool air in the interior, the right engine may be started and the PRESS SOURCE SELECT placed in GND. Turning the AUTO TEMP SELECT to MANUAL, and holding the MANUAL toggle switch to MANUAL COLD for approximately 10 seconds will drive the temperature mixing valve from full hot to full cold. Closing unused overhead outlets and placing the OVHD fan to HI will provide maximum airflow to occupied seats. Return temperature control to AUTOMATIC to avoid freezing the water separator and stopping airflow. Increased air circulation in the cockpit is available by turning on the DEFOG FAN and turning the AIR FLOW DISTR (bias) valve to CKPT (cockpit). Operating the right engine above idle RPM will increase airflow and air cycle machine efficiency.

The Freon air conditioner discharges conditioned air from floor mounted evaporator/blowers in the forward and aft ends of the dropped isle, to provide rapid cabin cooling. The air conditioner is controlled by a switch panel on the copilot’s instrument panel, and can be used on the ground or in flight up to 18,000 feet. The MODE, AC/BLO/OFF switch controls primary power to the system. The AC position turns on the compressor and the forward blower. The BLO position disables the compressor but leaves the forward blower on. The FWD BLOWER, HI/LO switch controls the forward blower speed when the MODE switch is in AC or BLO. If the forward blower is inoperative, the system should not be operated. The AFT BLOWER HI/OFF/LO switch controls the aft blower when the MODE switch is in AC or BLO. A COMP ON twist dimmable light illuminates when the compressor is powered. The system may not be operated in the AC mode above 18,000 feet. A ground unit, or at least one generator, must be on line to run the compressor.

An optional flood cooling system provides an air outlet grill on the upper aft pressure bulkhead to supply a high-volume flow of conditioned bleed air to flood the cabin, for faster and more efficient cooling. The system is controlled by an ON-OFF switch on the environmental control panel. When the switch is in the ON position, conditioned bleed air is diverted through a line in the tailcone to an axial flow blower on the top of the aft pressure bulkhead, then to the air outlet grill. The system can be used during ground operation and in flight below 10,000 feet.

Increasing or decreasing engine bleed air extraction can cause a slight momentary bump in cabin pressure. Always check power stabilized at idle when changing the PRESS SOURCE SELECT on the ground.

The abbreviated checklist is designed to enable the crew to perform all prestart functions in advance. This permits items such as the Warning Test to be complete before passenger boarding and accelerates the ramp departure without compromising safety or thoroughness.

Leaving the chocks, brake checks can be done lightly and smoothly. If heavy braking is required on landing roll, using up elevator to create drag also counters the nose down pitching moment so that deceleration feel in the cabin is less abrupt. Do not apply excessive back pressure, as weight may be lifted from the main wheels decreasing braking effectiveness and increasing the possibility of a blown tire.

The pressurization system procedures outlined in this chapter may at first appear complex, but thorough understanding of the controller and indicators coupled with minimal practical experience greatly simplifies operation. Optimum system performance in terms of passenger comfort is best achieved by slow, smooth selection of altitudes and rates and by reducing the variables when setting the controller by not making power changes simultaneously.

Although it is not mandatory, use of the yaw damper is recommended when hand flying the airplane. It reduces pilot rudder input required and the airplane rides better in rough air. The yaw damper must be off for takeoff and landing.

Power management has an impact on cabin comfort and changes should be made smoothly and symmetrically. An approximate estimate of synchronization can be made by observing the RPM gages and exact adjustments made audibly or with the engine synchronizer. Although the higher pitched turbine sound is generally more noticeable in the cockpit, the lower, fan out-of-synchronization sound is usually more pronounced in the area of the rear seats.

Good crew coordination and smooth operation of the controls and systems serves the best interests of safety, economy and passenger comfort.

TURBULENT AIR PENETRATION

Flight through severe turbulence should be avoided if possible. The following procedures are recommended for flight in severe turbulence.

1. IGNITION - ON.
2. Airspeed approximately 180 KIAS. Do not chase airspeed.
3. Maintain a constant attitude without chasing the altitude. Avoid sudden large control movements.
4. Operation of autopilot is recommended using basic pitch and lateral mode only.

WHEEL FUSIBLE PLUG CONSIDERATIONS

Brake application reduces the speed of an airplane by means of friction between the brake stack components. The friction generates heat, which increases the temperature of the brake and wheel assembly, resulting in an increased tire pressure. Each main wheel incorporates fuse plugs, which melt at a predetermined temperature, to prevent a possible tire explosion due to excessively high tire pressure. Flight crews must take precautions when conducting repetitive traffic circuits, including multiple landings and/or multiple rejected takeoffs, to prevent overheating the brakes, which could melt the fuse plugs and cause loss of all tire pressure and possible tire and wheel damage. During such operations, available runway permitting, minimize brake usage, and consider cooling the brakes in flight with the landing gear extended. Maximizing use of reverse thrust and extending speed brakes will assist in bringing the airplane to a stop.

THE SAFE FLIGHT ANGLE-OF-ATTACK/STALL WARNING SYSTEM

The Safe Flight Angle-of-Attack (AOA)/Stall Warning System incorporates a dual mode: Normal Mode and Ice Mode. On the ground, with engine anti-ice selected on, changing from Normal Mode to Ice Mode is delayed until after the airplane has been airborne for 150 seconds (+/-30s). In-flight switching between modes is immediate and indications change accordingly when engine anti-ice is selected ON or OFF.

NORMAL MODE

Stick shaker activation, angle of attack meter, angle of attack indexer (as installed) and low airspeed awareness are all referenced to standard airplane stall speeds.

ICE MODE

Activated when either or both engine anti-ice switches are ON. Stick shaker activation, angle of attack meter, angle of attack indexer (as installed) and low airspeed awareness are all referenced to the standard airplane stall speeds plus 5 knots. This is to account for residual airframe ice present during or after an icing encounter.

FLIGHT INTO ICING

Flight into known icing is the intentional flight into icing conditions that are known to exist by either visual observation or pilot weather report information. Icing conditions exist any time the indicated RAT is +10°C (+50°F) and below, and visible moisture in any form is present. This airplane, with properly operating anti-ice and deice equipment, is approved to operate in maximum intermittent and maximum continuous icing conditions as defined by 14 CFR 25, Appendix C. The equipment has not been designed to provide protection against freezing rain or severe conditions of mixed or clear ice. During all operations, the pilot is expected to exercise good judgement and be prepared to alter the flight plan, i.e. exit icing, if conditions exceed the capability of the aircraft and equipment.

Ice accumulations significantly alter the shape of airfoils and increase the weight of the aircraft. Flight with ice accumulated on the aircraft will increase stall speeds and alter the speeds for optimum performance. Flight at high angle-of-attack (low airspeed) can result in ice building on the underside of the wings and the horizontal tail aft of areas protected by boots or leading edge anti-ice systems. Minimum airspeed for sustained flight in icing conditions (except approach and landing) is 160 KIAS. Prolonged flight with the flaps and/or landing gear down is not recommended. Trace or light amounts of icing on the horizontal tail can significantly alter airfoil characteristics which will affect stability and control of the aircraft.

Freezing rain and clear ice will be deposited in layers over the entire surface of the airplane and can "runback" over the surface before freezing. Runback ice is normal under the right icing conditions. This can occur during prolonged exposure in moderate or heavy icing when the wing temperature (fuel temperature) is below freezing. This is typical of most bleed air heated wings and no adjustment to approach speed is required. Rime ice is an opaque, granular and rough deposit of ice that usually forms on the leading edges of wings, tail surfaces, pylons, engine inlets, antennas, etc.

ANTI-ICE ADDITIVES

PROCEDURE FOR ADDING ETHYLENE GLYCOL MONOMETHYL ETHER (EGME) FUEL ADDITIVE

Use the following procedure to blend anti-icing additive as the airplane is being refueled through the wing filler caps:

1. Attach MIL-I-27686 additive to refuel nozzle, making sure blender tube discharges in the refueling stream.
2. Start refueling while simultaneously fully depressing and slipping ring over trigger of blender.

WARNING

ANTI-ICING ADDITIVES CONTAINING ETHYLENE GLYCOL MONOMETHYL ETHER (EGME) ARE HARMFUL IF INHALED, SWALLOWED OR ABSORBED THROUGH THE SKIN, AND WILL CAUSE EYE IRRITATION. ALSO, IT IS COMBUSTIBLE. BEFORE USING THIS MATERIAL, REFER TO ALL SAFETY INFORMATION ON THE CONTAINER.

CAUTION

ASSURE THAT THE ADDITIVE IS DIRECTED INTO THE FLOWING FUEL STREAM AND THAT THE ADDITIVE FLOW IS STARTED AFTER THE FUEL FLOW STARTS AND IS STOPPED BEFORE FUEL FLOW STOPS. DO NOT ALLOW CONCENTRATED ADDITIVE TO CONTACT COATED INTERIOR OF FUEL TANK OR AIRPLANE PAINTED SURFACE. USE NOT LESS THAN 20 FLUID OUNCES OF ADDITIVE PER 156 GALLONS OF FUEL OR MORE THAN 20 FLUID OUNCES OF ADDITIVE PER 104 GALLONS OF FUEL.

PROCEDURE FOR ADDING DIETHYLENE GLYCOL MONOMETHYL ETHER (DIEGME) FUEL ADDITIVE

NOTE

Service experience has shown that DIEGME has provided acceptable protection from bacterial growth in fuel systems.

Use the following procedure to blend anti-icing additive as the airplane is being refueled through the wing filler caps:

1. Attach MIL-I-85470 additive to refuel nozzle, making sure blender tube discharges in the refueling stream.
2. Start refueling while simultaneously fully depressing and slipping ring over trigger of blender.

CAUTION

- DIETHYLENE GLYCOL MONOMETHYL ETHER (DIEGME) IS SLIGHTLY TOXIC IF SWALLOWED AND MAY CAUSE EYE REDNESS, SWELLING AND IRRITATION. IT IS ALSO COMBUSTIBLE. BEFORE USING THIS MATERIAL, REFER TO ALL SAFETY INFORMATION ON THE CONTAINER. ASSURE THE ADDITIVE IS DIRECTED INTO THE FLOWING FUEL STREAM WITH THE ADDITIVE FLOW STARTED AFTER THE FUEL FLOW STARTS AND STOPPED BEFORE FUEL FLOW STOPS. DO NOT ALLOW CONCENTRATED ADDITIVE TO CONTACT COATED INTERIOR OF FUEL TANK OR AIRPLANE PAINTED SURFACE.

- USE NOT LESS THAN 20 FLUID OUNCES OF ADDITIVE PER 156 GALLONS OF FUEL OR MORE THAN 20 FLUID OUNCES OF ADDITIVE PER 104 GALLONS OF FUEL.

PROCEDURE FOR CHECKING FUEL ADDITIVES

1. Prolonged storage of the airplane will result in a water buildup in the fuel which "leaches out" the additive. An indication of this is when an excessive amount of water accumulates in the fuel tank sumps. The concentration can be checked using an anti-icing additive concentration test kit available from Cessna Aircraft Company, Citation Marketing Division, Wichita, KS 67277. It is imperative that the instructions for the test kit be followed explicitly when checking the additive concentration. The concentrations by volume for EGME/DIEGME shall be 0.10 percent minimum and 0.15 percent maximum, either individually or mixed in a common tank. Fuel, when added to the tank, should have a minimum concentration of 0.10 percent by volume.

COLD WEATHER OPERATIONS

COLD SOAK

Operation of the airplane has been demonstrated after prolonged exposure to ground ambient temperature of -40°C (-40°F). This was the minimum temperature achieved in cold weather testing. The following operational procedures are recommended or required for operations where prolonged exposure to ground ambient temperatures below -10°C (+14°F) is anticipated or has occurred:

1. Preflight:

   a. Battery warmup to at least -10°C (+14°F) is required. Battery temperature may be checked with the battery temperature gage. Proper battery warmup may require extended application of heat to the battery.
   b. Brake accumulator charge may be below the grey band (675 psi). The needle must, however, indicate above the lower stop (peg). If this cannot be visibly verified by the flight crew, the airplane must be serviced prior to flight.
   c. After two hours (or longer) of exposure, cabin temperature must be held at or above 0°C (+32°F) for a minimum of 15 minutes prior to takeoff. This temperature ensures proper deployment and operation of the passenger oxygen masks. Cabin temperature can be determined using a handheld thermometer, or with the cockpit cabin temperature indicator, if installed. If using a handheld thermometer, the temperature should be taken in the middle of the cabin across from the cabin door. Heating the cabin may be accomplished with either of the following methods:

      (1) Engine Bleed Air - Increase engine thrust setting above idle ($\geq$ 65% N_2) to achieve higher cabin heat supply duct temperatures. Select the cockpit/cabin environmental TEMPERATURE CONTROL knob to MANUAL and the MANUAL toggle switch to full HOT, and the AIR FLOW DISTR to CABIN.

NOTE

Thrust settings above idle may require repositioning the airplane to a suitable ramp location, and depending on the severity of the cold soak, greater than one hour of engine operation. Be aware of fuel consumption.

      (2) Pre-Heat - Utilize a high output (BTU) external heater to directly heat the cabin. Care should be exercised as much as possible to heat the cabin uniformly.

COLD WEATHER OPERATIONS

2. Engine Start Preparation:

   a. Engine preheat should not be required for engine oil temperatures down to -20°C (-4°F). However, minor engine oil leaks may occur after start at extremely cold temperatures if the engines have not been preheated. Any leak should stop once the oil seals have warmed up. Any visible oil leak must stop prior to flight.

   For AMLCD equipped aircraft, include step b.

   b. Below an engine oil temperature of -20°C (-4°F) the oil temperature indicator will display a red FAIL message. Engine oil must be warmed to greater than or equal to -20°C (-4°F), and the red FAIL message extinguished prior to engine start.

3. After Engine Start:

   a. Avionics may require a 30-minute warm-up period after cold soak. All avionics must be operating properly before flight.

   b. WS TEMP annunciator may not test after cold soak at extremely cold temperatures. If this occurs, repeat the test after the cabin has warmed up. This test must be completed prior to flight.

4. Postflight:

   a. If prolonged exposure is anticipated:

      1) Do not set the parking brake or control lock.
      2) Remove the battery and store at a temperature above -10°C (+14°F).
      3) Parking the airplane within a heated shelter (hangar) is recommended.

   b. Remove crew oxygen masks if prolonged exposure to temperatures of 0°C (+32°F or less) are anticipated.

RAIN REMOVAL

The windshield bleed air system provides rain removal during flight and ground operations. This system also serves as the windshield anti-ice system when used as described in the windshield anti-ice paragraph of this section.

When rain removal is desired, the PULL RAIN knob should be pulled out first and then the W/S BLEED switch should be positioned to LOW. A check should be made to ensure the WINDSHIELD BLEED AIR Knobs are in the MAX position.

GROUND DEICE/ANTI-ICE OPERATIONS

During cold weather operations, flight crews are responsible for ensuring the aircraft is free of ice contaminants.

Ground icing may occur whenever there is high humidity with temperatures of +10°C (+50°F) or colder. Type I deice, and Type II or Type IV anti-ice fluids may be used sequentially to ensure compliance with FAA regulations (clean wing concept) requiring critical component airframe deicing and anti-icing.

NOTE

It is recommended that flight crews review the following publications for expanded deice and anti-ice procedures:

- Cessna Maintenance Manual Chapter 12.
- FAA Advisory Circular AC120-58 (large aircraft), dated September 30, 1992 or later.
- FAA Advisory Circular AC135-17 (small aircraft), dated December 14, 1994 or later.
- Cessna Citation Service Letter 560-30-08, dated May 29, 1998 or later.

DEICING/ANTI-ICING PROCEDURES (TYPE I, TYPE II, AND TYPE IV FLUIDS)

ONE STEP DEICING - Type I fluid is used to remove ice, slush and snow from the aircraft prior to departure, and to provide minimal anti-icing protection as provided in the Type 1 holdover timetable (refer to applicable service letter).

TWO STEP DEICE/ANTI-ICE - May be used to ensure the aircraft remains clean after deicing. Type II or Type IV fluid is used to provide longer term anti-icing protection as provided in the Type II or Type IV holdover timetable (refer to applicable service letter).

CAUTION

TYPE I AND TYPE II, AND TYPE IV FLUIDS ARE NOT COMPATIBLE AND MAY NOT BE MIXED. ADDITIONALLY, MOST MANUFACTURERS PROHIBIT MIXING OF BRANDS WITHIN A TYPE.

Line personnel should be supervised by the PIC or SIC to ensure proper application of deice or anti-ice fluids.

NOTE

The first area to be deiced/anti-iced should be easily visible from the cabin/cockpit and should be used to provide a conservative estimate for unseen areas of the aircraft before initiating takeoff roll.

Holdover timetables (refer to applicable service letter) are only estimates and vary depending on many factors to include temperature, precipitation type, wind and airplane skin temperature. Holdover times are based on mixture ratio. Times start when the last application has begun.

Guidelines for holdover times anticipated by SAE Type I or Type II, or Type IV, and ISO Type I, Type II, or Type IV fluid mixtures are a function of weather conditions and outside air temperature (OAT).

CAUTION

- AIRPLANE OPERATORS ARE SOLELY RESPONSIBLE FOR ENSURING HOLDOVER TIMETABLES CONTAIN CURRENT DATA.
- TABLES ARE FOR USE IN DEPARTURE PLANNING ONLY AND THEY SHOULD BE USED IN CONJUNCTION WITH PRETAKEOFF CONTAMINATION CHECK PROCEDURES.

NOTE

- Tables do not apply to other than SAE or ISO Type I, Type II, or Type IV FPD fluids.
- The responsibility for the application of this data remains with the user.
- The Freezing Point of Type I, Type II, and Type IV fluid mixture must be at least 10°C (18°F) below the current OAT.

SPRAYING TECHNIQUE TYPE I FLUID

Type I fluid should be sprayed on the aircraft (with engines off) in a manner which minimizes heat loss to the air. If possible, fluid should be sprayed in a solid cone pattern of large coarse droplets at a temperature of 160° to 180°F. The fluid should be sprayed as close as possible to the airplane surfaces, but not closer than 10 feet if a high pressure nozzle is used. Refer to Figure 4-2 and Figure 4-3 for essential areas to be deiced or anti-iced.

SPRAYING TECHNIQUE TYPE II FLUID

Application techniques for Type II fluid are the same as for Type I, except that since the airplane is already clean, the application should last only long enough to properly coat the aircraft surfaces.

Type II fluid should be applied cold to a clean airplane. It is, however, sometimes heated and sprayed as a deicing fluid. For this case, it should be considered a Type I fluid, as the heat may change the characteristics of the thickening agents in the fluid. Type II fluid applied in this manner will not be as effective as if it were applied cold.

SPRAYING TECHNIQUE TYPE IV FLUID

Application techniques for Type IV fluid are the same as for Type I, except that since the airplane is already clean, the application should last only long enough to properly coat the airplane surfaces.

Type IV fluid should be applied cold to a clean airplane. It is, however, sometimes heated and sprayed as a deicing fluid. For this case, it should be considered a Type I fluid, as the heat may change the characteristics of the thickening agents in the fluid. Type IV fluid, applied in this manner will not be as effective as if it were applied cold.

NOTE

- Holdover time starts when last application has begun.
- Some Type IV fluids could form a thick or high-strength gel during dry-out and when rehydrated form a slippery film.
- Some Type IV fluids exhibit poor aerodynamic elimination (flow-off) qualities at colder temperatures.
- Heated areas of the airplane (i.e.; heated leading edge) should be avoided due to the fact that fluid may dry into hard globular nodules.
- Type IV fluid should not be used undiluted below -24°C (-11°F).

PRETAKEOFF CONTAMINATION CHECK - GROUND ICING CONDITIONS

When ground icing conditions are present, a pretakeoff contamination check should be conducted by the PIC/SIC within 5 minutes of takeoff, preferable just prior to taxiing onto the active runway. Critical areas of the airplane such as empennage, wing, windshield and control surfaces should be checked to ensure they are free of ice, slush and snow or that the deice/anti-ice fluids are still protecting the airplane.

MINIMUM DIRECT SPRAY AREAS: ENGINE INLETS, ENGINE EXHAUST, RAM AIR INLETS, BRAKES, PITOT HEADS, STATIC PORTS, WINDSHIELD, CABIN WINDOWS, AND AOA VANES.

NOTE: SHADED AREAS INDICATE ESSENTIAL AREAS TO BE DEICED.

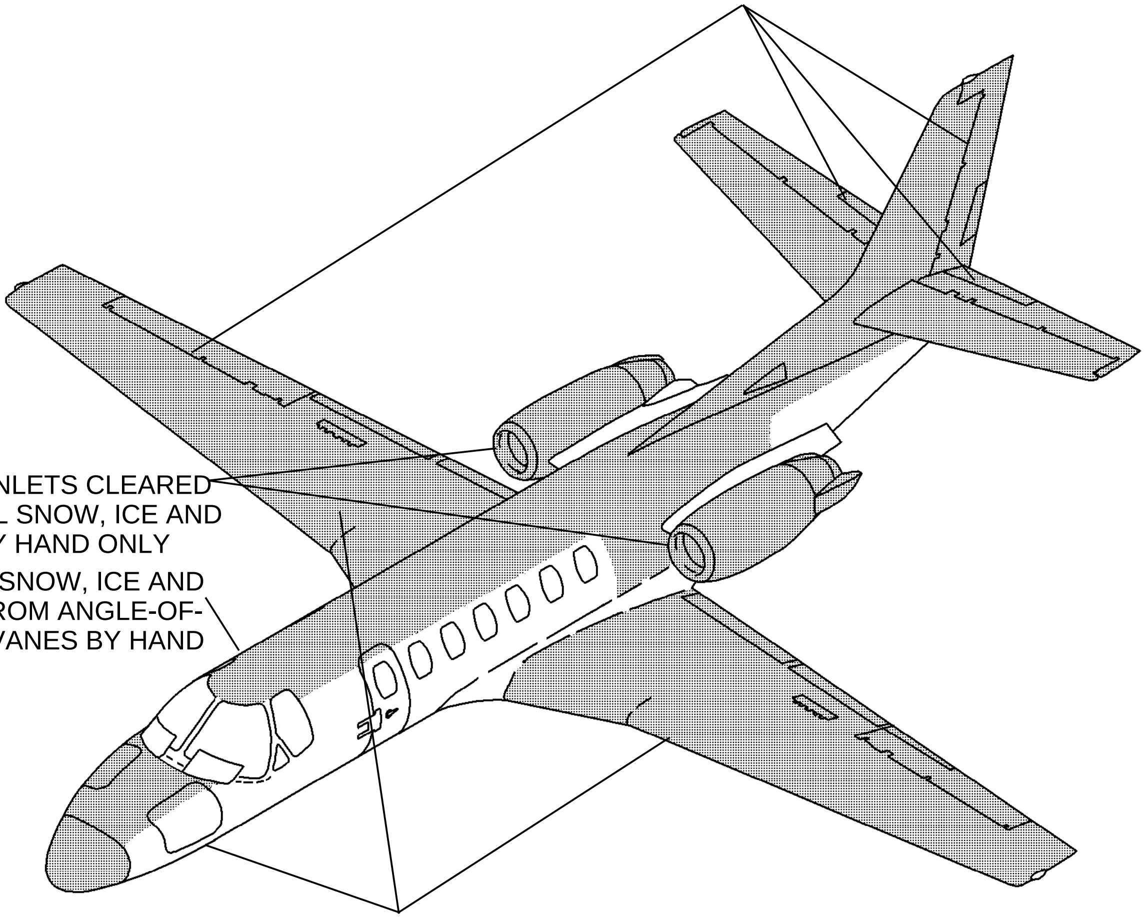

Figure 4-1 Airplane Deicing

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MINIMUM DIRECT SPRAY AREAS:	ENGINE INLETS, ENGINE EXHAUST, RAM AIR INLETS, BRAKES, PITOT HEADS, STATIC PORTS, WINDSHIELD, CABIN WINDOWS, AND AOA VANES.

NOTE: SHADED AREAS INDICATE ESSENTIAL AREAS TO BE ANTI-ICED.

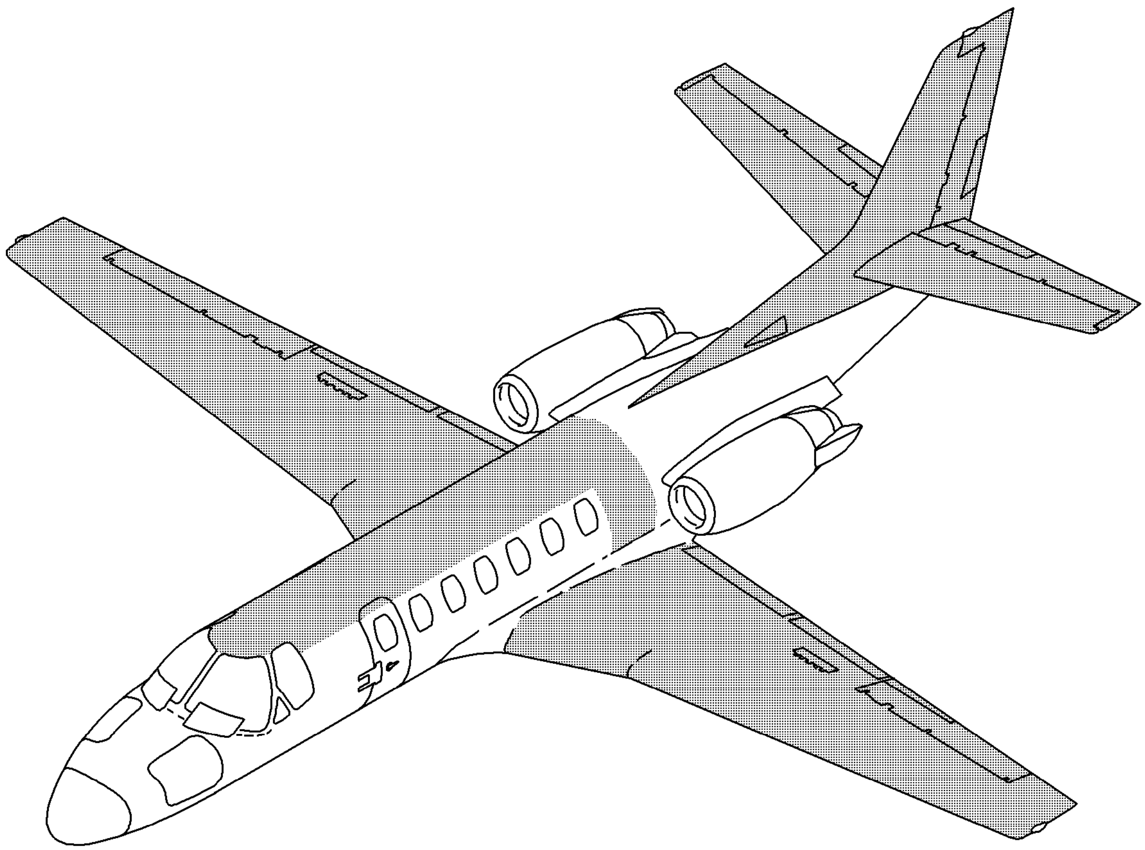

Figure 4-2 Airplane Deicing

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SERVICING

FUEL

A variety of fuels can be used in the airplane, but each must have anti-icing additive incorporated or added to the fuel during refueling. Commercial kerosene Jet A, Jet A-1, Jet B, JP-4, JP-5, and JP-8 are approved fuels and aviation gasoline in specified amounts is approved. Any grade of AVGAS is permitted for a maximum of 50 hours engine time between overhauls providing the pilot operates the airplane within the limits specified in Section II of the FAA Approved Airplane Flight Manual. For record keeping purposes, 1 hour of engine operation equals 70 gallons of gasoline. Refer to the FAA Approved Airplane Flight Manual for limitations and fuel control density settings for optimum engine acceleration.

Additives meeting the specifications of MIL-I-27686 or MIL-I-85470 (DIEGME) can be used with fuel that does not contain an anti-icing additive. Ethylene glycol monomethyl ether (EGME) and diethylene glycol monomethyl ether (DIEGME) are approved anti-icing additives which meet these specifications, respectively.

Refer to the Normal Procedures Section of the FAA Approved Airplane flight Manual for instructions concerning procedures, quantities, and equipment to be used in treating the airplane fuel with anti-icing additive.

WARNING

ANTI-ICING ADDITIVES CONTAINING ETHYLENE GLYCOL MONOMETHYL ETHER (EGME) ARE HARMFUL IF INHALED, SWALLOWED, OR ABSORBED THROUGH THE SKIN, AND WILL CAUSE EYE IRRITATION. ALSO, COMBUSTIBLE. BEFORE USING THESE MATERIALS, REFER TO ALL SAFETY INFORMATION ON THE CONTAINER.

CAUTION

- DIETHYLENE GLYCOL MONOMETHYL ETHER (DIEGME) IS SLIGHTLY TOXIC IF SWALLOWED AND MAY CAUSE EYE REDNESS, SWELLING AND IRRITATION. IT IS ALSO COMBUSTIBLE. BEFORE USING THIS MATERIAL, REFER TO ALL SAFETY INFORMATION ON THE CONTAINER. ASSURE THAT THE ADDITIVE, EGME OR DIEGME IS DIRECTED INTO THE FLOWING FUEL STREAM AND THAT THE ADDITIVE FLOW IS STARTED AFTER THE FUEL FLOW STARTS AND IS STOPPED BEFORE FUEL FLOW STOPS. DO NOT ALLOW CONCENTRATED ADDITIVE TO CONTACT COATED INTERIOR OF FUEL TANK OR AIRPLANE PAINTED SURFACE.

- USE NOT LESS THAN 20 FLUID OUNCES OF ADDITIVE PER 156 GALLONS OF FUEL OR MORE THAN 20 FLUID OUNCES OF ADDITIVE PER 104 GALLONS OF FUEL.

Insufficient additive concentration may result in fuel system icing. Excessive additive may cause fuel tank damage or erroneous fuel quantity indications.

When refueling, do not operate radios, radar or other electronic equipment and ensure the fuel truck is grounded and a ground is connected to the airplane. A fuel ground plug attachment point is located under each wing tip.

It is not necessary to maintain fuel balance during refueling; however, maximum asymmetric fuel differential for normal operations is 200 pounds. In an emergency, 600 pounds of fuel unbalance may be tolerated. Flight characteristics requirements were not demonstrated with unbalanced fuel above 200 pounds.

OIL

Each engine oil tank has an oil filler neck with a cap assembly. Oil is added to each engine directly through the filler neck and quantity is measured on the sight gage in U.S. quarts. An accurate check of oil quantity can only be made when the engine is hot, within approximately 10 minutes after engine shutdown.

CAUTION

PERSONS WHO HANDLE ENGINE OIL ARE ADVISED TO MINIMIZE SKIN CONTACT WITH USED OIL, AND PROMPTLY REMOVE ANY USED OIL FROM THEIR SKIN. A LABORATORY STUDY, WHILE NOT CONCLUSIVE, FOUND SUBSTANCES WHICH MAY CAUSE CANCER IN HUMANS. THOROUGHLY WASH USED OIL OFF SKIN AS SOON AS POSSIBLE WITH SOAP AND WATER. DO NOT USE KEROSENE, THINNERS OR SOLVENTS TO REMOVE USED ENGINE OIL. IF WATERLESS HAND CLEANER IS USED, ALWAYS APPLY SKIN CREAM AFTER USING.

BP TURBO OIL 2380, EXXON TURBO OIL 2380, CASTROL 5000, AEROSHELL TURBINE OIL 500, AEROSHELL TURBINE OIL 560, ROYCO TURBINE OIL 500, ROYCO TURBINE OIL 560, MOBIL JET OIL 254 and MOBIL JET OIL II are all approved oils. Normally different brands of oil should not be mixed; however, if oil replenishment is required and oil of the same brand as tank contents is not available, follow procedures set forth in Section I of this manual under OIL. The type of oil used in each airplane is noted in the engine logbook as well as on a placard inside the filler access door.

The latest revision of Pratt and Whitney Canada Inc. Service Bulletin 7001 may also be consulted for approved oils.

HYDRAULIC

Servicing the main hydraulic reservoir requires equipment capable of delivering hydraulic fluid under pressure and is normally performed by maintenance personnel. The reservoir should be serviced with one of the approved fluids, SKYDROL 500A, B, B-4, C or LD-4; or Hyjet, Hyjet W, III, IV, IVA, or IVA Plus.

The hydraulic brake reservoir can be serviced by removing the right baggage compartment aft liner to allow access to the reservoir. The filler plug can then be removed and the reservoir filled to within one-half inch of the opening. The brake reservoir should be serviced with one of the approved fluids, SKYDROL 500 B or equivalent.

OXYGEN

The oxygen filler valve is located just inside the access door in the tailcone compartment. Oxygen servicing should be done by maintenance personnel using breathing oxygen conforming to MIL-O-27210, Type I. Refer to the cockpit gage while servicing to prevent overfill.

Oxygen pressure will vary with ambient temperature. In very cold ambient temperatures the oxygen pressure indication may appear low, but may in actuality be appropriate for the temperature condition.

NOTE

Refer to Chapter 12 of the Airplane Maintenance Manual, Oxygen Service Requirements, Pressure Variations Chart.

ALCOHOL

An alcohol reservoir is located next to the brake reservoir behind the right baggage compartment aft liner. The liner must be removed for servicing. The filler plug on the reservoir should be removed and alcohol added to bring the fluid level up to the neck of the filler plug. Filling to above the sight gage provides a reserve supply of alcohol to perform preflight or operational checks without replenishing the reservoir.

FIRE BOTTLES

Underserviced fire bottles must be exchanged by authorized maintenance facilities.

GEAR AND BRAKE PNEUMATIC SYSTEM

The emergency gear and brake bottle should be serviced when the pressure gage reads below 1800 PSI. Maintenance personnel should perform the servicing with high pressure nitrogen and refill the bottle to 2050 PSI. Servicing is accomplished through a charging valve on the bottle which is located behind the right baggage compartment aft line reservoir.

TIRES

Main Gear Tire Pressure:

1. Main gear tire pressure shall be kept at 152 PSIG, +5 or -5 PSIG (1048 kPa +34.5 or -34.5 kPa), **unloaded**, with an ambient temperature of 21.11° C (70°F).

2. Main gear tire pressure shall be kept at 158 PSIG, +5 or -5 PSIG (1048 kPa +34.5 or -34.5 kPa), l**oaded**, with an ambient temperature of 21.11° C (70°F).

(Nose Gear Tire Pressure:

1. Nose gear tire pressure shall be kept at 120 PSIG, +5 or -5 PSIG (827 kPa, +34.5 or -34.5 kPa), **unloaded**, with an ambient temperature of 21.11° C (70°F).

2. Nose gear tire pressure shall be kept at 125 PSIG, +5 or -5 PSIG (862 kPa, +34.5 or -34.5 kPa), **loaded**, with an ambient temperature of 21.11° C (70°F).

Adjust tire pressures for climate change. Climate changes will have an effect on tire pressure when flying from a hot climate to a cool climate and vice versa. When the temperature change is extreme, such as changes in excess of 10°C, (50°F) for example, a tire inflated in a warm climate will drop in air pressure, when the airplane on which it is installed is flown to a cold climate. An airplane moved out of a heated hangar into the cold winter will do the same.

In either circumstance, tires should be overinflated to compensate for the subsequent cooling and loss of pressure caused by extreme temperature changes. As a general rule, an ambient temperature change of -15° C (5° F) produces a pressure change of about one percent.

TOILET

The flush toilet reservoir requires servicing when the liquid level becomes too low or when liquid appears to have incorrect chemical balance. To properly service the reservoir it must be removed from the toilet by disconnecting it and pulling it through the door in the front of the cabinet. Instructions for removing and servicing the reservoir are found in Chapter 12 of the Airplane Maintenance Manual. Servicing the reservoir requires the addition of the proper mixture of water and chemical (1.5 ounces of chemical per quart of water) to the reservoir. It will take approximately 2 quarts of liquid if the reservoir is empty. If outside temperatures are below freezing and the airplane is kept in an unheated hangar, add antifreeze to the reservoir.

AIRPLANE CLEANING AND CARE

PAINTED SURFACES

The exterior of a new airplane is painted with a polyurethane two-component topcoat which, unlike early coatings, does not require exposure to air for complete cure to occur. The care required by the finish will not change as the paint ages.

The finish should be cleaned only by washing with clean water and mild soap, followed by rinse water and drying with a soft cloth or chamois.

Minimize flying through rain, hail or sleet.

To help prevent development of corrosion, particularly filiform corrosion, the airplane should be spray-washed at least every two or three weeks (especially in warm, damp, and salty environments) and waxed with a good grade of water repellent wax to help keep water from accumulating in skin joints and around countersinks. A heavier coating of wax on the leading edge, on the vertical tail and on the engine nose cones helps to reduce abrasions encountered in these areas.

Polyurethane topcoats are designed with UV inhibitors to slow the degradation caused by exposure. The inhibitors concentrate near the surface of the coating during the initial stages of cure. Care must be taken during any buffing, polishing, or power waxing so that this surface layer is disturbed only to the smallest extent necessary. With special care, however, buffing, polishing or power waxing is acceptable. Wax products containing silicones should be avoided as they contribute to the buildup of P-static, especially if the surface is well buffed to produce a shine.

DEICE BOOTS

The deice boots on the horizontal stabilizer leading edges have a special electrically conductive coating to bleed off static charges which cause radio interference and may perforate the boots. Fueling and other servicing operations should be done carefully, to avoid damaging this conductive coating or tearing the boots.

To prolong the life of surface deice boots, they should be washed and serviced on a regular basis. Keep the boots clean and free from oil, grease and other solvents which cause rubber to swell and deteriorate. Outlined below are recommended cleaning and servicing procedures.

CAUTION

USE ONLY THE FOLLOWING INSTRUCTIONS WHEN CLEANING BOOTS. DISREGARD INSTRUCTIONS WHICH RECOMMEND PETROLEUM BASE LIQUIDS (METHYL-ETHYL-KETONE, NONLEADED GASOLINE, ETC.) WHICH CAN HARM THE BOOT MATERIAL.

Clean the boots with mild soap and water, then rinse thoroughly with clean water.

NOTE

Isopropyl alcohol can be used to remove grime which cannot be removed using soap. If isopropyl alcohol is used for cleaning, wash area with mild soap and water, then rinse thoroughly with clean water.

To possibly improve the service life of deice boots and to reduce the adhesion of ice, it is recommended that the deice boots be treated with AGE MASTER Number 1 and ICEX.

AGE MASTER Number 1, used to protect the rubber against deterioration from ozone, sunlight, weathering, oxidation and pollution, and ICEX, used to help retard ice adhesion and for keeping deice boots looking new longer, are both products of and recommended by B.F. Goodrich.

The application of both AGE MASTER Number 1 and ICEX should be in accordance with the manufacturer's recommended directions as outlined on the containers.

CAUTION

- PROTECT ADJACENT AREAS, CLOTHING, AND USE PLASTIC OR RUBBER GLOVES DURING APPLICATIONS, AS AGE MASTER NUMBER 1 STAINS AND ICEX CONTAINS SILICONE WHICH MAKES PAINT TOUCHUP ALMOST IMPOSSIBLE.

- ENSURE THAT THE MANUFACTURER'S WARNINGS AND CAUTIONS ARE ADHERED TO WHEN USING AGE MASTER NUMBER 1 AND ICEX.

If a high gloss finish is desired on the deice boots, ACROSEAL coating (available from Huber Inc., 114 North St. Francis Street, Wichita, KS 67202) may be used in lieu of AGE MASTER Number 1 and/or ICEX. Preparation for application of ACROSEAL is the same as required for AGE MASTER Number 1 and ICEX. Apply a thin layer of ACROSEAL on the clean and dry surface of the deice boot with a cloth swab. Let dry thoroughly and hand buff with a soft cloth.

Small tears and abrasions can be repaired temporarily without removing the boots and the conductive coating can be renewed.

ENGINES

The engine compartments should be cleaned using a suitable solvent. Most efficient cleaning is done using a spray-type cleaner. Before spray cleaning, ensure protection is afforded for other components which might be adversely affected by the solvent. Refer to the Airplane Maintenance Manual for proper lubrication of components after engine cleaning.

INTERIOR CARE

To remove dust and loose dirt from the upholstery, headliner and carpet, clean the interior regularly with a vacuum cleaner.

WINDOWS AND WINDSHIELDS

The acrylic windshields and windows should be kept clean and waxed at all times. To prevent scratches and crazing, wash them carefully with plenty of soap and water, using the palm of the hand to feel and dislodge dirt and mud. A soft cloth, chamois or sponge may be used, but only to carry water to the surface. Rinse thoroughly, then dry with a clean, moist chamois. Rubbing the surface of the plastic with a dry cloth builds up an electrostatic charge which attracts dust particles in the air. Wiping with a moist chamois will remove both the dust and this charge.

Remove oil and grease with a cloth moistened with kerosene. Never use gasoline, benzine, acetone, carbon tetrachloride, fire extinguisher fluid, lacquer thinner or glass cleaner. These materials will soften the acrylic and may cause it to craze.

After removing dirt and grease, if the surface is not badly scratched, it should be waxed with a good grade of commercial wax. The wax will fill in minor scratches and help prevent further scratching. Apply a thin, even coat of wax and bring it to a high polish by rubbing lightly with a clean, dry soft flannel cloth. Do not use a power buffer; the heat generated by the buffing pad may soften the acrylic. If the surface is badly scratched refer to the Airplane Maintenance Manual for approved repairs.

Do not use a canvas cover on the windshield unless freezing rain or sleet is anticipated. Canvas covers may scratch the acrylic surface.

OXYGEN MASKS

The crew masks are permanent-type masks which contain a microphone for radio transmissions. The passenger masks are oro-nasal type which forms around the mouth and nose area. All masks can be cleaned with alcohol. Do not allow solution to enter microphone or electrical connections. Apply talcum powder to external surfaces of passenger mask rubber face-piece.

ABNORMAL PROCEDURES

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ABNORMAL PROCEDURES

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ABNORMAL LANDING

MISCELLANEOUS

ABNORMAL PROCEDURES

ENGINE FAILURE/PRECAUTIONARY SHUTDOWN

1. AP TRIM DISC Button - PRESS and RELEASE.
2. Rudder and Aileron Trim - Trim toward operating engine as required.
3. Throttle (affected engine) - OFF.
4. Autopilot/Yaw Damper - ON as desired.
5. IGNITION Switch (affected engine) - NORM.
6. ENGINE SYNC Knob - OFF.
7. GEN Switch (affected engine) - OFF.
8. Electrical Load - REDUCE as required.
9. Fuel CROSSFEED Switch - AS REQUIRED (maximum imbalance 200 lbs.)
10. Affected ENGINE Anti-Ice - CHECK OFF.
11. WING XFLOW Switch - ON as required.
12. Refer to Abnormal Procedures, IN-FLIGHT RESTART - ONE ENGINE or Abnormal Procedures, SINGLE-ENGINE APPROACH and LANDING.

IN-FLIGHT RESTART - ONE ENGINE (Refer to Figure 3-3 for Airstart Envelope)

FOLLOWING SHUTDOWN - WITH STARTER ASSIST

1. Throttle - OFF.
2. GEN Switch - ON.
3. ENGINE FIRE Switch (affected engine) - CHECK OPEN. (F/W SHUTOFF Caution Light L or R extinguished).
4. IGNITION Switch - NORM.
5. ENGINE START L or R Button - PRESS momentarily.
6. Throttle - IDLE at 8% N_2 minimum.
7. Engine Instruments - MONITOR.
8. FUEL BOOST Pump - NORM.

IF START DOES NOT OCCUR

9. ENGINE START DISENGAGE Button - PRESS.
10. Accomplish Abnormal Procedures, ENGINE FAILURE/PRECAUTIONARY SHUTDOWN.

FOLLOWING SHUTDOWN - WINDMILLING WITH AIRSPEED ABOVE 200 KIAS AND N_2 ABOVE 8%. (Refer to Figure 3-3 for Airstart Envelope)

1. Throttle - OFF.
2. ENGINE FIRE Switch (affected engine) - CHECK OPEN. (F/W SHUTOFF Caution Light L or R extinguished).
3. IGNITION Switch - ON.
4. FUEL BOOST Pump - ON.
5. Throttle - IDLE.
6. Engine Instruments - MONITOR.
7. FUEL BOOST Pump and IGNITION Switch - NORM (after engine stabilizes).
8. GEN Switch - ON.

AIRSTART ENVELOPE

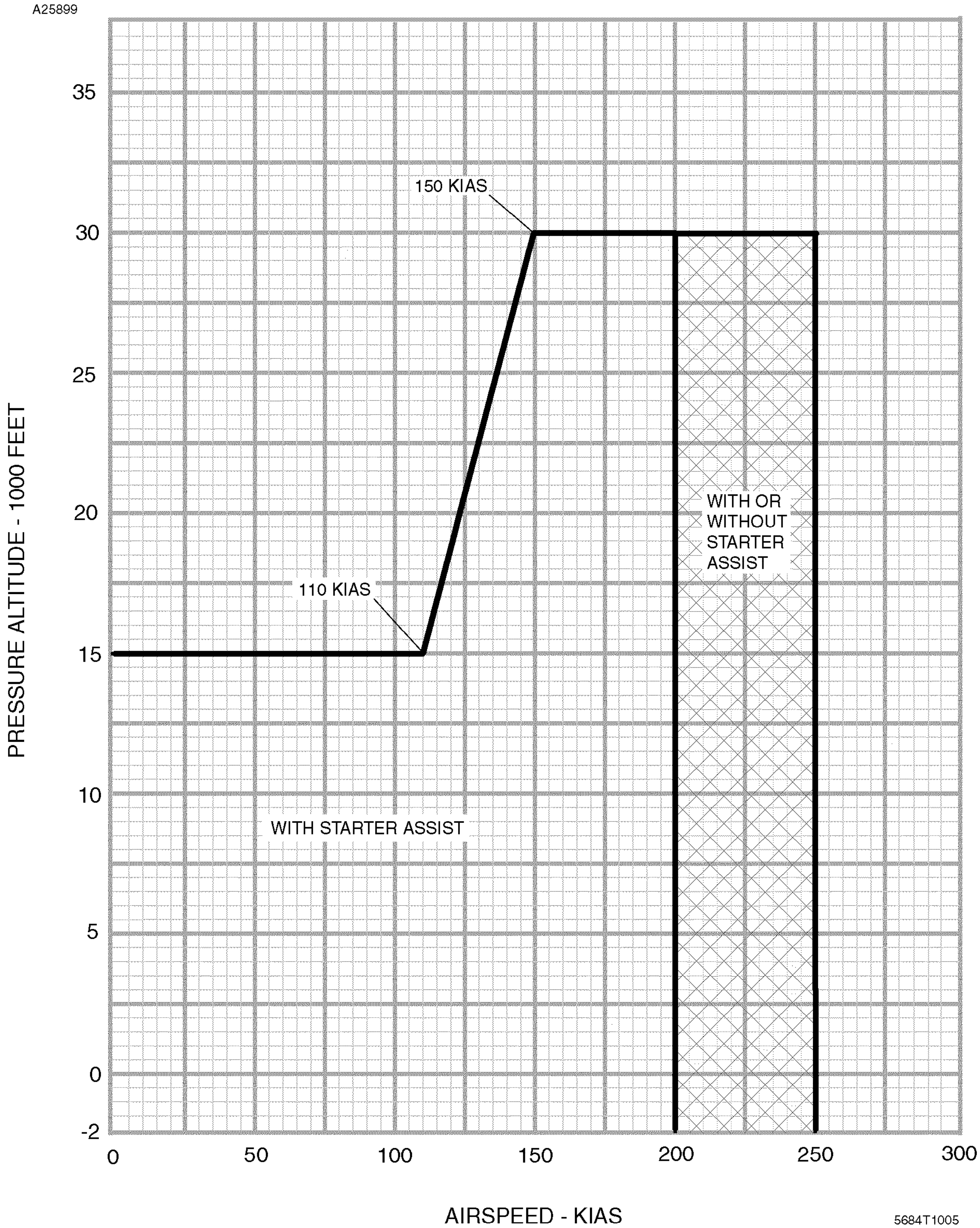

Figure 3-3

ABNORMAL PROCEDURES

ENGINE FAILURE/PRECAUTIONARY SHUTDOWN

1. AP TRIM DISC Button - PRESS and RELEASE.
2. Rudder and Aileron Trim - Trim toward operating engine as required.
3. Throttle (affected engine) - OFF.
4. Autopilot/Yaw Damper - ON as desired.
5. IGNITION Switch (affected engine) - NORM.
6. ENGINE SYNC Knob - OFF.
7. GEN Switch (affected engine) - OFF.
8. Electrical Load - REDUCE as required.
9. Fuel CROSSFEED Switch - AS REQUIRED (maximum imbalance 200 lbs.)
10. Affected ENGINE Anti-Ice - CHECK OFF.
11. WING XFLOW Switch - ON as required.
12. Refer to Abnormal Procedures, IN-FLIGHT RESTART - ONE ENGINE or Abnormal Procedures, SINGLE-ENGINE APPROACH and LANDING.

IN-FLIGHT RESTART - ONE ENGINE (Refer to Figure 3-3 for Airstart Envelope)

FOLLOWING SHUTDOWN - WITH STARTER ASSIST

1. Throttle - OFF.
2. GEN Switch - ON.
3. ENGINE FIRE Switch (affected engine) - CHECK OPEN. (F/W SHUTOFF Caution Light L or R extinguished).
4. IGNITION Switch - NORM.
5. ENGINE START L or R Button - PRESS momentarily.
6. Throttle - IDLE at 8% N_2 minimum.
7. Engine Instruments - MONITOR.
8. FUEL BOOST Pump - NORM.

IF START DOES NOT OCCUR

9. ENGINE START DISENGAGE Button - PRESS.
10. Accomplish Abnormal Procedures, ENGINE FAILURE/PRECAUTIONARY SHUTDOWN.

FOLLOWING SHUTDOWN - WINDMILLING WITH AIRSPEED ABOVE 200 KIAS AND N_2 ABOVE 8%. (Refer to Figure 3-3 for Airstart Envelope)

1. Throttle - OFF.
2. ENGINE FIRE Switch (affected engine) - CHECK OPEN. (F/W SHUTOFF Caution Light L or R extinguished).
3. IGNITION Switch - ON.
4. FUEL BOOST Pump - ON.
5. Throttle - IDLE.
6. Engine Instruments - MONITOR.
7. FUEL BOOST Pump and IGNITION Switch - NORM (after engine stabilizes).
8. GEN Switch - ON.

AIRSTART ENVELOPE

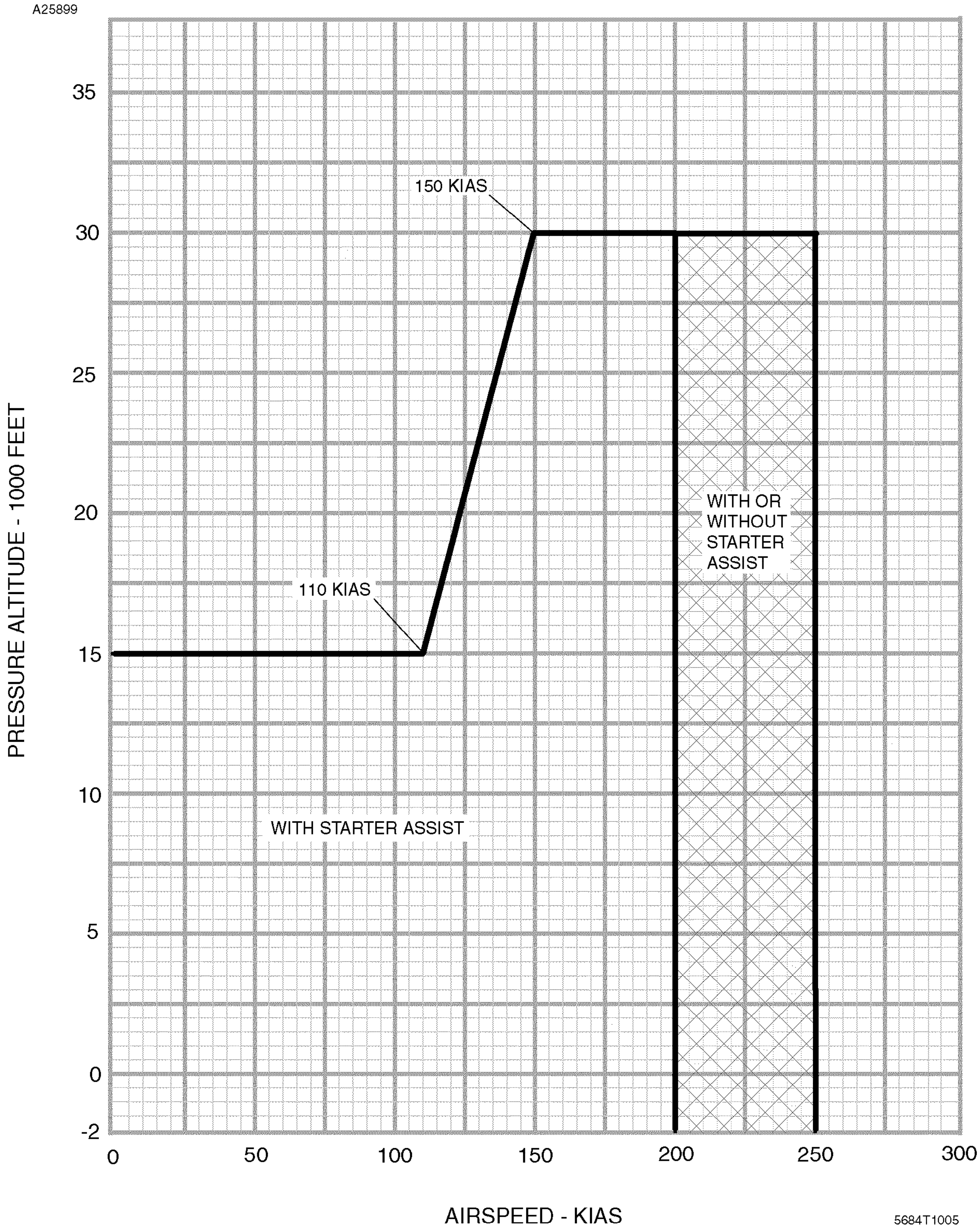

Figure 3-3

ENGINE START MALFUNCTION (ENGINE DOES NOT START ON GROUND)

1. Throttle - OFF.
2. ENGINE START DISENGAGE Button - PRESS 15 seconds after throttle OFF.

NOTE

Observe starter duty cycle limits.

ENGINE STARTER WILL NOT DISENGAGE (L OR R ENGINE START BUTTON LIGHT ON AFTER ENGINE START)

1. ENGINE START DISENGAGE Button - PRESS.

IF STARTER DOES NOT DISENGAGE AND ENGINE START BUTTON LIGHT REMAINS ILLUMINATED (START RELAY STUCK)

2. GEN Switches - OFF.
3. BATTERY DISCONNECT Switch (LH panel) - LIFT GUARD AND DISCONNECT.

NOTE

Verify ground power is disconnected prior to engine shutdown or the starter will continue to motor the engine.

4. Throttle(s) - OFF.
5. Disconnect the battery prior to turning the BATT Switch OFF.
6. BATT Switch - OFF.

HIGH SUSTAINED ITT DURING GROUND SHUTDOWN

1. Throttle - OFF.
2. ENGINE START Button - PRESS momentarily.
3. ENGINE START DISENGAGE Button - PRESS after 15 seconds.

OIL FILTER BYPASS (OIL FLTR BP L OR R CAUTION LIGHT ON)

1. Land as soon as practical - Monitor affected engine oil pressure and temperature. Consider possibility of partial or total loss of affected engine thrust.
2. Perform inspection/maintenance after landing.

HIGH OIL PRESSURE

ABOVE 270 PSI

1. Throttle (affected engine) - REDUCE THRUST.
2. Land as soon as practical.

LOW FUEL PRESSURE (LO FUEL PRESS L OR R CAUTION LIGHT ON)

1. FUEL BOOST Pump Switch- ON.
2. L or R BOOST and L or R FUEL CONTROL Circuit Breakers (LH panel) - CHECK IN.
3. Fuel Quantity - CHECK.
4. Fuel CROSSFEED Switch - AS REQUIRED.

LOW FUEL QUANTITY (LO FUEL LEVEL L OR R CAUTION LIGHT ON)

The illumination of this light serves notice to the pilot that a minimum of 180 ±20 pounds of fuel remains in the respective tank.

1. Land as soon as possible.

FUEL BOOST PUMP ON (FUEL BOOST L OR R CAUTION LIGHT ON)

Indicates that the respective fuel boost pump was either automatically or manually turned on.

1. FUEL BOOST Pump Switch (affected pump) - ON; then NORM. CHECK for FUEL BOOST L or R caution light to illuminate and extinguish.

If affected FUEL BOOST L or R caution light does not extinguish, refer to Abnormal Procedure, LOW FUEL PRESSURE.

FUEL FILTER BYPASS (FUEL FLTR BP L OR R CAUTION LIGHT ON)

1. Land as soon as practical.

WARNING

IT IS POSSIBLE THAT CONTAMINATED FUEL COULD HAVE BEEN INTRODUCED INTO ALL FUEL TANKS. MONITOR OPPOSITE ENGINE, RESTRICT CROSSFEED AND CONSIDER POSSIBLE PARTIAL OR TOTAL LOSS OF THRUST FROM BOTH ENGINES. INSPECT FILTERS AFTER LANDING.

2. Should both L and R caution lights illuminate, consider landing as soon as possible.

ENGINE START MALFUNCTION (ENGINE DOES NOT START ON GROUND)

1. Throttle - OFF.
2. ENGINE START DISENGAGE Button - PRESS 15 seconds after throttle OFF.

NOTE

Observe starter duty cycle limits.

ENGINE STARTER WILL NOT DISENGAGE (L OR R ENGINE START BUTTON LIGHT ON AFTER ENGINE START)

1. ENGINE START DISENGAGE Button - PRESS.

IF STARTER DOES NOT DISENGAGE AND ENGINE START BUTTON LIGHT REMAINS ILLUMINATED (START RELAY STUCK)

2. GEN Switches - OFF.
3. BATTERY DISCONNECT Switch (LH panel) - LIFT GUARD AND DISCONNECT.

NOTE

Verify ground power is disconnected prior to engine shutdown or the starter will continue to motor the engine.

4. Throttle(s) - OFF.
5. Disconnect the battery prior to turning the BATT Switch OFF.
6. BATT Switch - OFF.

HIGH SUSTAINED ITT DURING GROUND SHUTDOWN

1. Throttle - OFF.
2. ENGINE START Button - PRESS momentarily.
3. ENGINE START DISENGAGE Button - PRESS after 15 seconds.

OIL FILTER BYPASS (OIL FLTR BP L OR R CAUTION LIGHT ON)

1. Land as soon as practical - Monitor affected engine oil pressure and temperature. Consider possibility of partial or total loss of affected engine thrust.
2. Perform inspection/maintenance after landing.

HIGH OIL PRESSURE

ABOVE 270 PSI

1. Throttle (affected engine) - REDUCE THRUST.
2. Land as soon as practical.

LOW FUEL PRESSURE (LO FUEL PRESS L OR R CAUTION LIGHT ON)

1. FUEL BOOST Pump Switch- ON.
2. L or R BOOST and L or R FUEL CONTROL Circuit Breakers (LH panel) - CHECK IN.
3. Fuel Quantity - CHECK.
4. Fuel CROSSFEED Switch - AS REQUIRED.

LOW FUEL QUANTITY (LO FUEL LEVEL L OR R CAUTION LIGHT ON)

The illumination of this light serves notice to the pilot that a minimum of 180 ±20 pounds of fuel remains in the respective tank.

1. Land as soon as possible.

FUEL BOOST PUMP ON (FUEL BOOST L OR R CAUTION LIGHT ON)

Indicates that the respective fuel boost pump was either automatically or manually turned on.

1. FUEL BOOST Pump Switch (affected pump) - ON; then NORM. CHECK for FUEL BOOST L or R caution light to illuminate and extinguish.

If affected FUEL BOOST L or R caution light does not extinguish, refer to Abnormal Procedure, LOW FUEL PRESSURE.

FUEL FILTER BYPASS (FUEL FLTR BP L OR R CAUTION LIGHT ON)

1. Land as soon as practical.

WARNING

IT IS POSSIBLE THAT CONTAMINATED FUEL COULD HAVE BEEN INTRODUCED INTO ALL FUEL TANKS. MONITOR OPPOSITE ENGINE, RESTRICT CROSSFEED AND CONSIDER POSSIBLE PARTIAL OR TOTAL LOSS OF THRUST FROM BOTH ENGINES. INSPECT FILTERS AFTER LANDING.

2. Should both L and R caution lights illuminate, consider landing as soon as possible.

ENGINE DISPLAY FAILURE (BLANK DISPLAY CHANNEL)

1. Engine Display Reversion Switch - L or R. (Switch to operating side.)

NOTE

Depending on the failure, leaving the engine manual reversion mode switch in the AUTO position will achieve the same results as step 1 above.

ENGINE DISPLAY PARAMETER FAILURE

NOTE

- Fuel Quantity will display amber dashes "---" and an amber "FAIL" message with sensor failure or DC power interruption to the sensor.
- Oil Pressure will indicate zero or display an amber "FAIL" message with sensor failure or DC power interruption to the sensor.
- ITT, N_1, N_2, fuel flow, oil temperature, fuel temperature, and RAT may indicate zero, display amber dashes "---", and/or an amber "FAIL" message due to sensor failure. These sensors do not require excitation and do not have a DC circuit breaker.
- Fuel flow will display amber dashes "---" if the throttle is out of cutoff and there is no fuel flow.

1. Affected Engine Parameter (Fuel Quantity or Oil Pressure) Circuit Breaker - RESET.

IF AFFECTED PARAMETER CIRCUIT BREAKER WILL NOT RESET

2. Consider engine parameter unreliable.

NOTE

The following caution/warnings remain active with the engine display parameter failure:

- LO FUEL LEVEL L & R
- FUEL GUAGE L & R - Disabled when FUEL QTY circuit breaker is open, failed fuel quantity sensor(s) or signal conditioner.
- LO OIL PRESS L & R

FIREWALL SHUTOFF VALVE CLOSED (F/W SHUTOFF L OR R CAUTION LIGHT ON)

Indicates the fuel and hydraulic firewall shutoff valves have closed and the generator field relay has been activated by their respective ENGINE FIRE switch.

ENGINE FIRE DETECTION SYSTEM FAILURE (FIRE DET SYS L OR R CAUTION LIGHT ON)

Indicates failure of the affected engine fire detection system.

ON GROUND

1. Correct prior to flight.

IN FLIGHT

1. L or R FIRE DET Circuit Breaker (LH Panel) - CHECK IN.
2. Engine Instruments - MONITOR (for secondary indications of fire).
3. Land as soon as practical.

NOTE

The fire warning system is inoperative. The firewall shutoff and fire extinguisher bottles are still available if secondary indications of fire are present.

GROUND IDLE (GND IDLE ADVISORY LIGHT ON)

ON GROUND

Normal indication with the GND IDLE switch in the NORMAL position.

IN FLIGHT

Indicates that N_1 may be retarded to ground idle when the throttles are reduced to the idle stop. Engine acceleration time from idle to go-around thrust may be increased.

1. GND IDLE Switch - HIGH.
2. ENGINE SYNC Knob - OFF.

AFTER LANDING

1. GND IDLE Switch - NORM.

ENGINE VIBRATION (ENG VIB L OR R ADVISORY LIGHT ON)

Indicates engine vibration monitor has detected a higher than normal level of vibration.

1. Vibration - CONFIRM (audible and tactile indications).

(Continued Next Page)

ENGINE VIBRATION (ENG VIB L OR R ADVISORY LIGHT ON) (Continued)

IF VIBRATION EXISTS

ON GROUND

2. Correct prior to flight.

IN FLIGHT

2. Engine - MONITOR for other evidence of malfunction. Consider reducing RPM.
3. ENGINE SYNC Knob - OFF.
4. Throttle (affected engine) - REDUCE THRUST (as required).
5. Land as soon as practical.

IF VIBRATION INCREASES OR OTHER EVIDENCE OF ENGINE MALFUNCTION IS PRESENT

6. Consider the possibility of shutting down the engine. Refer to Abnormal Procedures ENGINE FAILURE/PRECAUTIONARY SHUTDOWN and SINGLE-ENGINE APPROACH AND LANDING.

CAUTION

IF SIGNIFICANT VIBRATION CONTINUES WITH THE ENGINE RUNNING, ENGINE FAILURE MAY RESULT.

FUEL GAUGING SYSTEM FAULT (FUEL GAUGE L OR R CAUTION LIGHT ON)

Indicates that a fault has been detected in the respective fuel gauging system. Monitor the respective fuel gauge for proper indication. Consider the possibility that the tank contains less fuel than the opposite tank. This fault may also be the result of improper fuel capacitance. Check fuel after landing.

1. BATT SWITCH - BATT (until B.I.T.E. control box indications are checked by appropriate personnel; record fuel quantity in each tank at time of fault.)

SINGLE GENERATOR FAILURE (GEN OFF L OR R CAUTION LIGHT ON)

1. Electrical Load - DECREASE if required.
2. A/C COMPRESSOR Switch - OFF or FAN.
3. Failed GEN Switch - RESET and GEN.

NOTE

The air conditioner compressor will not automatically load-shed on the ground.

IF UNABLE TO RESET

4. Failed GEN Switch - OFF.

FIREWALL SHUTOFF VALVE CLOSED (F/W SHUTOFF L OR R CAUTION LIGHT ON)

Indicates the fuel and hydraulic firewall shutoff valves have closed and the generator field relay has been activated by their respective ENGINE FIRE switch.

ENGINE FIRE DETECTION SYSTEM FAILURE (FIRE DET SYS L OR R CAUTION LIGHT ON)

Indicates failure of the affected engine fire detection system.

ON GROUND

1. Correct prior to flight.

IN FLIGHT

1. L or R FIRE DET Circuit Breaker (LH Panel) - CHECK IN.
2. Engine Instruments - MONITOR (for secondary indications of fire).
3. Land as soon as practical.

NOTE

The fire warning system is inoperative. The firewall shutoff and fire extinguisher bottles are still available if secondary indications of fire are present.

GROUND IDLE (GND IDLE ADVISORY LIGHT ON)

ON GROUND

Normal indication with the GND IDLE switch in the NORMAL position.

IN FLIGHT

Indicates that N_1 may be retarded to ground idle when the throttles are reduced to the idle stop. Engine acceleration time from idle to go-around thrust may be increased.

1. GND IDLE Switch - HIGH.
2. ENGINE SYNC Knob - OFF.

AFTER LANDING

1. GND IDLE Switch - NORM.

ENGINE VIBRATION (ENG VIB L OR R ADVISORY LIGHT ON)

Indicates engine vibration monitor has detected a higher than normal level of vibration.

1. Vibration - CONFIRM (audible and tactile indications).

(Continued Next Page)

ENGINE VIBRATION (ENG VIB L OR R ADVISORY LIGHT ON) (Continued)

IF VIBRATION EXISTS

ON GROUND

2. Correct prior to flight.

IN FLIGHT

2. Engine - MONITOR for other evidence of malfunction. Consider reducing RPM.
3. ENGINE SYNC Knob - OFF.
4. Throttle (affected engine) - REDUCE THRUST (as required).
5. Land as soon as practical.

IF VIBRATION INCREASES OR OTHER EVIDENCE OF ENGINE MALFUNCTION IS PRESENT

6. Consider the possibility of shutting down the engine. Refer to Abnormal Procedures ENGINE FAILURE/PRECAUTIONARY SHUTDOWN and SINGLE-ENGINE APPROACH AND LANDING.

CAUTION

IF SIGNIFICANT VIBRATION CONTINUES WITH THE ENGINE RUNNING, ENGINE FAILURE MAY RESULT.

FUEL GAUGING SYSTEM FAULT (FUEL GAUGE L OR R CAUTION LIGHT ON)

Indicates that a fault has been detected in the respective fuel gauging system. Monitor the respective fuel gauge for proper indication. Consider the possibility that the tank contains less fuel than the opposite tank. This fault may also be the result of improper fuel capacitance. Check fuel after landing.

1. BATT SWITCH - BATT (until B.I.T.E. control box indications are checked by appropriate personnel; record fuel quantity in each tank at time of fault.)

NOTE

Fuel Gauging System fault may cause the Engine Display Fuel Quantity Indicator to display amber dashes "---" and an amber "FAIL" message, or Fuel Quantity may not change.

SINGLE GENERATOR FAILURE (GEN OFF L OR R CAUTION LIGHT ON)

1. Electrical Load - DECREASE if required.
2. A/C COMPRESSOR Switch - OFF or FAN.
3. Failed GEN Switch - RESET and GEN.

NOTE

The air conditioner compressor will not automatically load-shed on the ground.

IF UNABLE TO RESET

4. Failed GEN Switch - OFF.

AFT J-BOX CURRENT LIMITER OR CIRCUIT BREAKER (AFT J BOX LMT OR CB CAUTION LIGHT ON)

Indicates either an open current limiter or circuit breaker in the aft junction box.

ON GROUND

1. Correct prior to flight.

IN FLIGHT

1. Electrical System - MONITOR (generator voltages may vary from 25 to 33 volts).

CAUTION

DO NOT TURN OFF THE GENERATORS BECAUSE PARTIAL ELECTRICAL SYSTEM FAILURE MAY OCCUR ON THE BUS ASSOCIATED WITH A GENERATOR WHICH IS TURNED OFF.

SINGLE INVERTER FAILURE (INVTR FAIL 1 OR 2 CAUTION LIGHT ON)

Indicates loss of AC power from affected inverter.

ON GROUND

1. Correct prior to flight.

IN FLIGHT

1. AC INVERTER NO. 1 (LH panel) and NO. 2 (RH panel) Circuit Breakers - CHECK IN.
2. INV 1/INV 2 Switch - SELECT Operating Inverter.

NOTE

Operation of all alternating current powered avionics equipment will be sustained by the opposite inverter. The flight director may disengage. It may be re-engaged to operate on the remaining inverter.

3. Continue or land at pilot's discretion.

IF REMAINING INVERTER FAILS

4. Refer to Emergency Procedures, AC POWER FAILURE AND DUAL INVERTER FAILURE.

ENGINE BLEED AIR OVERHEAT (BLD AIR O'HEAT L OR R CAUTION LIGHT ON)

1. PRESS SOURCE Select Knob - SELECT OPPOSITE SIDE.
2. Throttle (affected engine) - REDUCE when practical. Consider using WING XFLOW if in icing conditions.

IF LIGHT REMAINS ON

3. Land as soon as practical.

ENVIRONMENTAL SYSTEM AIR DUCT OVERHEAT (AIR DUCT O'HEAT CAUTION LIGHT ON)

1. TEMP Circuit Breaker (LH Panel) - CHECK IN.
2. Temperature Select Knob - MANUAL.
3. MANUAL HOT/COLD Switch - COLD; hold in this position until overheat light goes out (30 seconds maximum).

NOTE

Operation above 31,000 feet in MANUAL full cold mode may result in the cycle machine overtemp and shutdown. Refer to Abnormal Procedures, AUTOMATIC TEMPERATURE CONTROLLER INOPERATIVE.

IF LIGHT DOES NOT EXTINGUISH

4. PRESS SOURCE Select Knob - L or R; reduce power on selected engine, if necessary to control temperature.
5. ENGINE SYNC Knob - OFF.

IF LIGHT STILL DOES NOT EXTINGUISH

6. Land as soon as practical.

IF LIGHT EXTINGUISHES

4. MANUAL HOT/COLD Switch - RELEASE TO OFF (center position).
5. Temperature Select Knob - AUTOMATIC (select a cooler temperature).

NOTE

If the AIR DUCT O'HEAT light illuminates again, select MANUAL on the Temperature Select Knob and control temperature with the MANUAL HOT/COLD Switch.

AUTOMATIC TEMPERATURE CONTROLLER INOPERATIVE

1. Temperature Select Knob - MANUAL.
2. MANUAL HOT/COLD Switch - ENSURE NOT MANUAL FULL COLD. Select full manual cold, at least 12 seconds then actuate at least 3 seconds toward MANUAL HOT.

NOTE

Operation in manual mode, full cold, above 31,000 feet, particularly at low (climb) airspeed may result in air cycle machine overtemp and shutdown. In the event that this should occur, refer to Abnormal Procedures, EMERGENCY PRESSURIZATION ON.

EMERGENCY PRESSURIZATION ON (AUTOMATIC ACTUATION) (EMER PRESS CAUTION LIGHT ON) AND CABIN ALTITUDE (CAB ALT WARNING LIGHT NOT ON)

Indicates air cycle machine shutdown or failure.

1. NORM PRESS Circuit Breaker (LH panel) - CHECK IN.
2. Temperature Select Knob - ADJUST TO WARMER SETTING (may require manual mode).
3. PRESS SOURCE Select Knob - R, L or NORM.

(Continued Next Page)

EMERGENCY PRESSURIZATION ON (AUTOMATIC ACTUATION) (EMER PRESS CAUTION LIGHT ON) AND CABIN ALTITUDE (CAB ALT WARNING LIGHT NOT ON) (Continued)

IF EMER PRESS CAUTION LIGHT REMAINS ON

4. PRESS SOURCE Select Knob - EMER, then R, L or NORM.

IF EMER PRESS CAUTION LIGHT STILL REMAINS ON

5. PRESS SOURCE Select Knob - EMER.
6. Control cabin temperature with left throttle.
7. Overhead Wemacs - OPEN.
8. OVHD Fan Switch - HI.
9. ENGINE SYNC Knob - OFF.

NOTE

Emergency pressurization utilizes precooled bleed air (475°F) from the left engine.

CABIN PRESSURIZATION CONTROLLER FAILURE (RED LED ILLUMINATED)

NOTE

Detection of an internal controller fault will be indicated by both SET ALT and RATE displays blanking and the illumination of a red LED in the upper left corner of the controller face.

IF CABIN ALTITUDE IS NOT BEING MAINTAINED (CABIN ALTITUDE INCREASING/DECREASING)

1. Pressurization SYSTEM SELECT Switch - MANUAL.
2. Manual Toggle Switch - UP/DOWN to control cabin altitude.

CAUTION

CABIN MUST BE MANUALLY DE-PRESSURIZED PRIOR TO LANDING.

IF CABIN ALTITUDE IS BEING MAINTAINED (CABIN ALTIMETER STEADY)

1. Cabin Altitude - MONITOR.
2. Pressurization SYSTEM SELECT - Be prepared to select MANUAL prior to airplane altitude change.

CABIN PRESSURIZATION CONTROLLER FAILURE (AMBER LED ILLUMINATED)

NOTE

Detection of auxiliary control will be indicated by the SET ALT display showing the F_L icon and illumination of an amber LED in the upper left corner of the controller face.

Indicates probable loss of air data sensor (copilot's) input; therefore, the controller auto-schedule function will be inoperative.

1. Pressurization Controller Knob - SELECT CA or FL (cabin altitude or flight level).
2. Pressurization SET ALT Knob - SET DESIRED CA or FL.
3. Prior to Descent - SET ALT Knob - SET CA to destination airport elevation.

AIR CYCLE MACHINE OVERHEAT (ACM O'HEAT CAUTION LIGHT ON)

Indicates possible excess pressure in the bleed air supply to the ACM or overheating of the air cycle machine. The ACM will automatically turn off and the emergency pressurization will automatically come on.

ON GROUND

1. Correct prior to flight.

IN FLIGHT

1. Temperature Select Knob - ADJUST to warmer setting (may require manual mode).
2. PRESS SOURCE Select Knob - R, L or NORM.

IF ACM O'HEAT CAUTION LIGHT REMAINS ON

3. PRESS SOURCE Select Knob - EMER.
4. Control cabin temperature with left throttle.

NOTE

Emergency pressurization utilizes precooled bleed air (475°F) from the left engine.

ELECTRIC ELEVATOR RUNAWAY TRIM

1. AP TRIM DISC Button - PRESS and RELEASE.
2. Throttles - As required to control airspeed.
3. Manual Elevator Trim - AS REQUIRED.
4. PITCH TRIM Circuit Breaker (LH panel) - PULL.

NOTE

Do not attempt to use the autopilot if the electric trim is inoperative. The autopilot will not be able to trim out servo torque, and disengaging the autopilot could result in a significant pitch upset.

ELECTRIC TRIM INOPERATIVE

1. PITCH TRIM Circuit Breaker (LH panel) - CHECK IN.

IF STILL INOPERATIVE

2. Manual Elevator Trim - AS REQUIRED.

NOTE

Do not attempt to use the autopilot if the electric trim is inoperative. The autopilot will not be able to trim out servo torque, and disengaging the autopilot could result in a significant pitch upset.

JAMMED ELEVATOR TRIM

TRIM JAMMED AT CRUISE SETTING

1. AP TRIM DISC Button - PRESS and RELEASE.
2. Maintain trim speed as long as practical until speed reduction is required for approach.
3. Flaps - UP (0°). Do not extend flaps for approach or landing. Refer to Abnormal Procedures, FLAPS INOPERATIVE APPROACH and LANDING.

TRIM JAMMED AT TAKEOFF OR GO-AROUND SETTING

1. Throttles - REDUCE as required to maintain 120 KIAS or less.
2. Flaps - DO NOT MOVE.
3. Landing Gear - DOWN. Do not retract.
4. Airspeed - V_{REF} for full flaps, V_{APP} for 15° flaps, or V_{REF} + 12 KIAS for 7° flaps or V_{REF} + 15 KIAS for 0° flaps.
5. Flap Override Switch - GPWS FLAP OVRD ON (amber) if landing with flaps other than FULL.
6. Speed Brakes - RETRACT (50 feet AGL and below).
7. Yaw Damper Switch - OFF.
8. Land as soon as practical.

CAUTION

AVOID LANDINGS WITH TAILWINDS OR DOWNHILL RUNWAY GRADIENTS OR AT FIELD ELEVATIONS ABOVE 10,000 FEET MSL WITH FLAPS 15°, 5000 FEET MSL WITH FLAPS 7°, OR 3000 FEET MSL WITH FLAPS 0°.

NOTE

- Do not attempt to use the autopilot if the electric trim is inoperative. The autopilot will not be able to trim out servo torque, and disengaging the autopilot could result in a significant pitch upset.
- Multiply landing distance by 1.4 with flaps 15°, 1.5 for flaps 7°, and 1.6 for flaps 0°.

AUTOPILOT OUT OF TRIM (AP ROLL MISTRIM OR AP PITCH MISTRIM CAUTION LIGHT ON)

1. Control Wheel - Hold firmly with both hands.
2. AP TRIM DISC Button - PRESS and RELEASE (if elevator trim not in motion).

(Continued Next Page)

AUTOPILOT OUT OF TRIM (AP ROLL MISTRIM OR AP PITCH MISTRIM CAUTION LIGHT ON) (Continued)

NOTE

Be prepared for minor control wheel force required to maintain desired flight path

3. Elevator, Rudder or Aileron Trim - CHECK, ADJUST as required.
4. Thrust - CHECK balanced.
5. Fuel Quantity - CHECK balanced.
6. Autopilot Button - ENGAGE as desired.

LANDING WITH FAILED PRIMARY FLIGHT CONTROL CABLE

RUDDER

1. Utilize rudder trim.
2. Yaw Damper - OFF.
3. If possible, choose a runway with least possible crosswind.
4. After touchdown, lower the nose and extend speed brakes as soon as possible.

CAUTION

- AVOID THE USE OF ASYMMETRIC THRUST REVERSERS DURING LANDING ROLLOUT.
- NOSE WHEEL STEERING MAY NOT BE AVAILABLE, USE DIFFERENTIAL BRAKING.

AILERON

1. Yaw Damper - OFF.
2. Use rudder for directional control limiting bank angle to 15 degrees maximum. Do not use aileron trim except for gross adjustments.
3. If possible, choose a runway with least possible crosswind.
4. Land with flaps 15 degrees, V_{APP}.
5. Flap Override Switch - GPWS FLAP OVRD ON (amber).
6. After touchdown, lower the nose and extend speed brakes as soon as possible.
7. Thrust Reversers - AS DESIRED.

NOTE

Multiply landing distance by 1.4 for flaps 15°.

ELEVATOR

1. Use manual elevator trim wheel for primary pitch control. Do not use electric trim.
2. Make small pitch and power changes and set up landing configuration early.
3. After touchdown and nose wheel on ground, extend speed brakes and apply wheel brakes as soon as possible.
4. Land with flaps 15 degrees, V_{APP}.
5. Flap Override Switch - GPWS FLAP OVRD ON (amber).

WARNING

DO NOT DEPLOY THRUST REVERSERS DURING LANDING ROLLOUT WITH FAILED ELEVATOR CONTROL.

NOTE

Multiply landing distance by 1.4 for flaps 15°.

WING ANTI-ICE FAILURE (WING ANTI-ICE L OR R CAUTION LIGHT ON AND MASTER CAUTION)

1. Throttle (affected side) - INCREASE THRUST (as required above 70% N_2).

IF WING ANTI-ICE LIGHT REMAINS ON

2. WING XFLOW Switch - ON.
3. Throttle (opposite side) - INCREASE THRUST (as required above 70% N_2).

IF WING ANTI-ICE LIGHT STILL REMAINS ON

4. L/R WING/ENG Anti-ice Circuit Breaker (affected side) (LH panel) - PULL.

CAUTION

RESPECTIVE WING AND ENG ANTI-ICE ANNUNCIATORS WILL BE INOPERATIVE AND THE WING/ENGINE ANTI-ICE VALVES WILL OPEN. AFFECTED WING OVERHEAT PROTECTION WILL BE DISABLED.

5. Monitor wing leading edges. If any significant ice accumulates on the heated surface, the affected side must be considered inoperative.

NOTE

The outboard **32** inches of each wing is unheated and ice will accumulate with the wing anti-ice operating normally.

6. Reset respective WING/ENG Anti-ice circuit breaker after exiting icing conditions.

IF ICE ACCUMULATES ON THE FAILED SIDE WING LEADING EDGE

7. L and R WING/ENGINE Anti-ice Switches (**both sides**) - ENGINE.
8. L/R WING/ENG Anti-ice Circuit Breaker (affected side) (LH panel) - RESET.
9. IGNITION Switch - ON.
10. Autopilot - OFF.
11. Leave icing environment as soon as possible.

WARNING

IF WING ANTI-ICE HAS FAILED ON ONE SIDE, BOTH SIDES MUST BE SWITCHED TO ENGINE ANTI-ICE ONLY TO AVOID ASYMMETRIC WING ICE ACCUMULATION AND TO RETAIN AIRPLANE CONTROL.

NOTE

- Minor airframe buffet may be present during operation with ice on both wing leading edges.
- After an icing encounter with failed wing anti-ice, the crew should visually confirm the presence of ice on the wing leading edges. If no ice is present on either wing, the following BEFORE LANDING procedure is not applicable and normal landing procedures should be used.

(Continued Next Page)

WING ANTI-ICE FAILURE (WING ANTI-ICE L OR R CAUTION LIGHT ON AND MASTER CAUTION) (Continued)

BEFORE LANDING (with ice on wing leading edges)

WARNING

- **APPROXIMATELY 15 KNOTS INCREASE IN STALL SPEEDS CAN BE EXPECTED.**
- **DO NOT USE AUTOPILOT FOR APPROACH AND LANDING.**
- **USE FLAPS T.O. AND APPR (15°) FOR LANDING.**
- **USE V_{APP} + 15 KNOTS FOR APPROACH AND LANDING.**
- **DURING DESCENT TO WARMER TEMPERATURES (ABOVE FREEZING), ACCUMULATED ICE WILL SHED FROM THE INBOARD WING LEADING EDGE AND MAY BE INGESTED BY THE ENGINE(S). PARTIAL THRUST LOSS MAY RESULT.**

1. Avionics/Flight Instruments - CHECK/SET.
2. Crew Briefing - COMPLETE.
   a. Landing Speeds and Distance - SET.
   b. Go-Around N_1 - SET.
3. Passenger Advisory Lights - PASS SAFETY.
4. Passenger Briefing - CHECK passenger seats full upright, outboard and positioned aft or forward to clear all exit doors, seat belts and shoulder harnesses secure.
5. Flaps - T.O. & APPR (15°).
6. Flap Override Switch - GPWS FLAP OVRD ON (amber).
7. IGNITION Switch - ON.
8. Exterior Lights - AS REQUIRED.
9. Fuel CROSSFEED Switch - OFF.
10. ENGINE SYNC Knob - OFF.
11. Annunciators - CHECK.
12. GND IDLE Switch - NORM.
13. Pressurization - CHECK ZERO DIFFERENTIAL PRIOR TO LANDING.
14. Landing Gear - DOWN.
15. ANTI-SKID Switch - CHECK ON.
16. Landing Lights - AS DESIRED.
17. Airspeed - V_{APP} + 15 KIAS (minimum).
18. Speed Brakes - RETRACT (50 feet AGL and below)
19. Yaw Damper - OFF.

NOTE

Multiply landing distance by 1.7 for flaps 15° and V_{APP} + 15 KIAS.

ENGINE ANTI-ICE FAILURE (ENG ANTI-ICE L OR R CAUTION LIGHT ON AND MASTER CAUTION)

1. L/R WING/ENG Anti-ice Circuit Breaker (affected side) (LH panel) - PULL.

CAUTION

RESPECTIVE WING AND ENG ANTI-ICE ANNUNCIATORS WILL BE INOPERATIVE AND THE WING/ENGINE ANTI-ICE VALVES WILL OPEN.

2. Ignition (affected engine) - ON.
3. Monitor engine inlet - If any ice accumulates, leave icing environment as soon as possible.
4. After leaving icing environment, reset L/R WING/ENG Anti-ice Circuit Breaker and select anti-ice switches OFF.

WING BLEED AIR OVERHEAT (WING O'HEAT L OR R CAUTION LIGHT ON)

IF ANTI-ICE SWITCH IS WING/ENG ON

CONTINUOUS ILLUMINATION

1. AFFECTED WING - DECREASE THRUST (affected engine).
2. ENGINE SYNC Knob - OFF.

IF LIGHT DOES NOT EXTINGUISH

3. AFFECTED WING ANTI-ICE Switch - ENGINE ON.
4. WING XFLOW Switch - ON.
5. LEAVE ICING ENVIRONMENT AS SOON AS POSSIBLE.

TAIL DEICE FAILURE (TL DEICE FAIL L OR R CAUTION LIGHT ON)

1. Throttles - INCREASE THRUST (as required above 70% N_2).
2. TAIL DEICE Switch - OFF, then AUTO.

IF ANTI-ICE SWITCH IS OFF OR ENG ON

IF ON GROUND

1. Correct prior to flight - Indicates failed wing anti-ice valve or false indication.

IF IN FLIGHT

1. AFFECTED WING - DECREASE THRUST TO IDLE (affected engine).
2. ENGINE SYNC Knob - OFF.

IF LIGHT DOES NOT EXTINGUISH

3. Annunciation may be considered false.

IF LIGHT DOES EXTINGUISH (WING ANTI-ICE VALVE MAY HAVE FAILED OPEN)

3. LAND AS SOON AS PRACTICAL. Refer to ABNORMAL PROCEDURE, SINGLE ENGINE APPROACH AND LANDING.

IF TL DEICE FAIL LIGHT REMAINS ON

3. TAIL DEICE Switch - MANUAL (Repeat at 3 to 5 minute intervals).
4. Monitor Advisory Light(s) (TAIL DEICE PRESS L or R) for illumination.

NOTE

- Tail de-ice pressure is not monitored when using manual operation. Failure of the tail de-ice system in this mode must be detected by the absence of the TAIL DEICE PRESS advisory light(s) after switch activation.
- Airflow disturbance during manual boot cycle may cause a minor pitch bump.

IF ADVISORY LIGHT(S) FAILS TO ILLUMINATE

5. Leave icing environment as soon as possible.

BEFORE LANDING (with suspected ice contamination on tail leading edges)

WARNING

DO NOT SELECT FLAPS LAND (35°). DEGRADATION AND/OR LOSS OF PITCH CONTROL MAY RESULT.

1. Avionics/Flight Instruments - CHECK /SET.
2. Crew Briefing - COMPLETE.
   a. Landing Speeds and Distance - SET.
   b. Go-Around N_1 - SET.

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TAIL DEICE FAILURE (TL DEICE FAIL L OR R CAUTION LIGHT ON) (Continued)

3. Passenger Advisory Lights - PASS SAFETY.
4. Passenger Briefing - CHECK passenger seats full upright, outboard and positioned aft or forward to clear all exit doors, seat belts and shoulder harnesses secure.
5. Flaps - T.O. & APPR (15°).
6. Flap Override Switch - GPWS FLAP OVRD ON (amber).
7. IGNITION Switch - ON.
8. Exterior Lights - AS REQUIRED.
9. Fuel CROSSFEED Switch - OFF.
10. ENGINE SYNC Knob - OFF.
11. Annunciators - CHECK.
12. GND IDLE Switch - NORM.
13. Pressurization - CHECK ZERO DIFFERENTIAL PRIOR TO LANDING.
14. Landing Gear - DOWN.
15. ANTI-SKID Switch - CHECK ON.
16. Landing Lights - AS DESIRED.
17. Airspeed - V_{APP} .
18. Autopilot and Yaw Damper - OFF (400 feet AGL and below).
19. Speed Brakes - RETRACT (50 feet AGL and below).

NOTE

Multiply landing distance by 1.4 for flaps 15°.

TAIL DEICE TIMER FAILURE (TL DEICE PRESS L OR R ADVISORY LIGHT FAILS TO ILLUMINATE OR CONTINUES TO CYCLE OR TL DEICE PRESS REMAINS ILLUMINATED WITH SWITCH IN AUTO OR OFF)

IF TL DEICE ADVISORY LIGHT(S) FAILS TO ILLUMINATE

1. TAIL DEICE Switch - CHECK AUTO.
2. TAIL DEICE Circuit Breaker (LH panel) - CHECK IN.
3. TAIL DEICE Switch - MANUAL (Repeat at 3 to 5 minute intervals).
4. Monitor advisory lights (TL DEICE PRESS L or R) for illumination.

NOTE

Airflow disturbance during manual boot cycle may cause a minor pitch bump.

IF TL DEICE ADVISORY LIGHT(S) FAILS TO ILLUMINATE IN MANUAL OPERATION

5. Leave icing environment as soon as possible.

IF TL DEICE PRESS ADVISORY LIGHT REMAINS ILLUMINATED WITH SWITCH IN OFF OR AUTO POSITION

1. TAIL DEICE Circuit Breaker (LH panel) - PULL.
2. Reset circuit breaker as needed to actuate the system. (3-5 minute interval in icing conditions).
3. Leave icing environment as soon as practical.

BEFORE LANDING (with suspected ice contamination on tail leading edges)

WARNING

DO NOT SELECT FLAPS LAND (35°). DEGRADATION AND/OR LOSS OF PITCH CONTROL MAY RESULT.

(Continued Next Page)

TAIL DEICE TIMER FAILURE (TL DEICE PRESS L OR R ADVISORY LIGHT FAILS TO ILLUMINATE OR CONTINUES TO CYCLE OR TL DEICE PRESS REMAINS ILLUMINATED WITH SWITCH IN AUTO OR OFF)

(Continued)

1. Avionics/Flight Instruments - CHECK /SET.
2. Crew Briefing - COMPLETE.
   a. Landing Speeds and Distance - SET.
   b. Go-Around N_1 - SET.
3. Passenger Advisory Lights - PASS SAFETY.
4. Passenger Briefing - CHECK passenger seats full upright, outboard and positioned aft or forward to clear all exit doors, seat belts and shoulder harnesses secure.
5. Flaps - T.O. & APPR (15°).
6. Flap Override Switch - GPWS FLAP OVRD ON (amber).
7. IGNITION Switch - ON.
8. Exterior Lights - AS REQUIRED.
9. Fuel CROSSFEED Switch - OFF.
10. ENGINE SYNC Knob - OFF.
11. Annunciators - CHECK.
12. GND IDLE Switch - NORM.
13. Pressurization - CHECK ZERO DIFFERENTIAL PRIOR TO LANDING.
14. Landing Gear - DOWN.
15. ANTI-SKID Switch - CHECK ON.
16. Landing Lights - AS DESIRED.
17. Airspeed - V_{APP} .
18. Autopilot and Yaw Damper - OFF (400 feet AGL and below).
19. Speed Brakes - RETRACT (50 feet AGL and below).

NOTE

Multiply landing distance by 1.4 for flaps 15°.

WINDSHIELD AIR OVERHEAT (WS AIR O'HEAT CAUTION LIGHT ON)

IF W/S BLEED SWITCH LOW OR HI

WS AIR O'HEAT MOMENTARY ILLUMINATION (AIR FLOW CYCLES OFF AND ON)

1. If W/S BLEED Switch is HI - SELECT LOW.
2. WINDSHIELD BLEED AIR Knobs - REDUCE (OFF if windshield bleed air is not required).

IF AIR FLOW CYCLING CONTINUES

3. W/S BLEED Switch - OFF.
4. WINDSHIELD BLEED AIR Knobs - OFF.
5. W/S ALCOHOL Switch - AS REQUIRED.

NOTE

10 minutes alcohol available to pilot’s windshield only.

6. Leave icing environment as soon as possible.

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WINDSHIELD AIR OVERHEAT (WS AIR O'HEAT CAUTION LIGHT ON) (Continued)

WS AIR O'HEAT CONTINUOUS ILLUMINATION

1. W/S BLEED Switch - OFF.
2. WINDSHIELD BLEED AIR Knobs - OFF.
3. W/S ALCOHOL Switch - AS REQUIRED.

NOTE

10 minutes alcohol available to pilot’s windshield only.

4. Leave icing environment as soon as possible.

IF W/S BLEED SWITCH OFF

WS AIR O'HEAT MOMENTARY OR CONTINUOUS ILLUMINATION

Indicates probable solenoid valve failure or leak. Windshield air temperature is not regulated. Windshield heat damage is possible. Maintenance is required.

1. WINDSHIELD BLEED AIR Knobs - OFF.

WINDSHIELD BLEED AIR FAILURE

LOSS OF HOT AIR SUPPLY (VALVE WILL NOT OPEN OR POSSIBLE LINE FAILURE)

1. W/S BLEED Switch - OFF.
2. WINDSHIELD BLEED AIR Knobs - OFF.
3. W/S ALCOHOL Switch - AS REQUIRED.

NOTE

10 minutes alcohol available to pilot's windshield only.

4. Leave icing environment as soon as possible.

PITOT-STATIC HEATER FAILURE (P/S HTR L OR R, OR STBY P/S HTR CAUTION LIGHT ON)

1. PITOT & STATIC Heat Switch - CHECK ON.
2. L PITOT STATIC, R PITOT STATIC, and STBY P/S HEATER Circuit Breakers (LH panel) - CHECK IN.
3. Autopilot - SELECT side with operable pitot-static heat.
4. ADC Reversion Button - PUSH on failed side (if L or R PITOT STATIC failure).
5. XPDR ENC ALT - PRI or SEC - (select side with operable ADC).

NOTE

- The autopilot references the pilot's (L) or copilot's (R) pitot-static system; therefore, the altitude hold, vertical speed, vertical navigation and flight level change functions may be inoperative if the coupled side pitot-static system fails in icing conditions. Autopilot should be transferred to operative side.

- If standby pitot-static heat has failed, the flight may be continued at the pilot's discretion. Flight into icing conditions should be avoided.

ANGLE-OF-ATTACK PROBE HEATER FAILURE (AOA HTR FAIL CAUTION LIGHT ON)

Indicates that the angle of attack probe heating element has failed.

1. PITOT & STATIC Heat Switch - CHECK ON.
2. AOA HEATER Circuit Breaker (LH panel) - CHECK IN.
3. Leave icing environment as soon as practical.
4. If AOA Probe becomes iced, maintain the following minimum airspeeds:

FLAPS 0° = V_{APP} +10 KIAS
FLAPS 7° = V_{APP} +5 KIAS
FLAPS 15° = V_{APP}
FLAPS 35° = V_{REF}

NOTE

If the AOA probe heater fails and the AOA probe becomes iced, the stick shaker, angle of attack indexer, angle of attack gauge, and low airspeed awareness display on the PFDs may not function properly.

PFD ATTITUDE FAILURE - SINGLE (RED ATT FAIL ON PFD ADI)

1. ATT REV Button - PUSH (applicable display). Verify that amber ATT2 or ATT1 is displayed in both pilot's and copilot's PFD. Autopilot will remain inoperative.

PFD HEADING FAILURE - SINGLE (RED HDG FAIL ON PFD HSI)

1. HDG REV Button - PUSH (applicable display). Verify that amber MAG2 or MAG1 is displayed in pilot's and copilot's PFD.

NOTE

Standby HSI heading may become inoperative if pilot's heading source fails.

AIR DATA COMPUTER FAILURE - SINGLE (RED X ON PFD AIRSPEED/ALTITUDE TAPES)

1. ADC REV Button - PUSH (applicable display). Verify that amber, ADC2 or ADC1 is displayed in pilot's and copilot's PFD.
2. If copilot's ADC has failed, refer to Abnormal Procedures, CABIN PRESSURIZATION CONTROLLER FAILURE.

NOTE

If normal operation of the ADC is restored, all flight director modes and autopilot must be selected OFF and then back ON.

3. XPDR ENC ALT - PRI or SEC (SELECT side with operable ADC).

IC - PFD WRAP AROUND TEST FAIL (CHECK PFD I, CHECK PFD 2 CAUTION LIGHT ON)

Indicates IC to PFD communication wrap around test has failed.

1. AP TRIM DISC Button - PRESS and RELEASE.
2. Crosscheck pilot's and copilot's PFDs with standby flight instruments to determine correct source.

NOTE

If normal operations of the MADC is subsequently restored, all flight director modes and autopilot must be selected OFF and then back ON.

COMPARISON MONITOR ALERT (MESSAGE DISPLAYED ON PILOT'S OR COPILOT'S PFD)

Indicates one or more of the following parameters has exceeded its predetermined tolerance level:

PFD ANNUNCIATOR (AMBER)	PARAMETER	LOCATION ON PFD
PIT	Pitch Attitude	Below/left of ATT Sphere
ROL	Roll Attitude	Below/left of ATT Sphere
HDG	Heading	Below/left of ATT Sphere
LOC	Localizer	Below/left of ATT Sphere
ATT	Roll and Pitch Attitude	Below/left of ATT Sphere
GS	Glideslope	Below/left of ATT Sphere
ILS	Glideslope and Localizer	Below/left of ATT Sphere
IAS	Airspeed	Top of Airspeed Tape
ALT	Altitude	Top of Altitude Tape
RA*	Radio Altitude	Below/left of ATT Sphere

* Crosscheck aircraft altitude to determine the correct indicator to use. Autopilot does not have to be disconnected.

1. AP TRIM DISC Button- PRESS and RELEASE.

NOTE

The autopilot must remain OFF. Yaw Damper may be utilized.

2. Crosscheck pilot's and copilot's PFDs with standby flight instruments to determine correct source.
3. FD/AP PFD 1/2 - SELECT side with correct indication.
4. Consider ATT, HDG, or ADC reversion (reference Abnormal Procedures, PFD ATTITUDE FAILURE - SINGLE, PFD HEADING FAILURE - SINGLE OR AIR DATA COMPUTER FAILURE - SINGLE).

IF COMPARISON MONITORS EXTINGUISH

5. AUTOPILOT - AS DESIRED. If ATT REV selected, autopilot will remain inoperative.

SYMBOL GENERATOR FAILURE - SINGLE (RED "X" OR BLANK PFD)

1. MFD Mode Select Knob - SELECT opposite side symbol generator (either SG1 or SG2).
2. PFD display - VERIFY amber ADC1, ATT1, SG1 or ADC2, ATT2, SG2 (as appropriate) annunciated in both PFDs and autopilot transfer has occurred to the selected side.

LOSS OF TAS INPUT TO FLIGHT GUIDANCE SYSTEM

1. Failure Side - DETERMINE.

NOTE

- Failure of TAS input to the pilot's side will generate a 'TAS FAIL' message from FMS as well as blanking the displayed value of TAS on the MFD. Failure of TAS input to the co-pilot's side will not result in any message annunciation.

- Autopilot performance when coupled to the side with a failed TAS input will be significantly degraded in other than approach phases of flight.

- FMS derived wind vector and head/tail wind and crosswind displays will be unreliable.

2. MFD Mode Select Knob - SG1 or SG2. (Revert to cross side symbol generator with operable TAS input).
3. Autopilot - Coupled to side consistent with selected symbol generator.

PRIMARY FLIGHT OR MULTIFUNCTION DISPLAY FAILURE (PILOT'S OR COPILOT'S PFD OR MFD BLANK)

PFD BLANK ON GROUND

1. Correct prior to flight.

NOTE

A failed display unit in either the pilot's or co-pilot's PFD position may be interchanged with the MFD display unit to allow dispatch with two functioning PFDs. Access to the removal screw is gained by removing the lower bezels.

PFD BLANK IN FLIGHT

1. Dim Control Knob (applicable display) - OFF.

NOTE

Turning off the applicable DIM knob on the PFD display controller will cause the PFD information to be displayed on the MFD.

MFD BLANK IN FLIGHT

1. Flight - Continue at pilot's discretion.

NOTE

When the MFD Display Unit is inoperative, the following avionics equipment will not be available:

- Takeoff V Speed Display
- Landing V Speed Display
- TCAS Display (optional)
- Single Point V_{NAV}

DISPLAY GUIDANCE COMPUTER COOLING FAN FAILURE (IC-1 OR IC-2 FAN MESSAGE ON MFD)

ON GROUND

Indicates failure of the display guidance computer cooling fan.

1. Ground Operating Time - DO NOT EXCEED 10 MINUTES.

IF GROUND OPERATING TIME EXCEEDS 10 MINUTES

2. DISPLAY GUID 1, DISPLAY GUID 2, and/or MFD Circuit Breakers (RH panel) - PULL as appropriate.

CAUTION

ELECTRICAL POWER MUST BE REMOVED FROM EFIS SYSTEM TO PREVENT OVERHEATING DURING GROUND OPERATIONS.

3. DISPLAY GUID 1, DISPLAY GUID 2, and/or MFD Circuit Breakers (RH panel) - RESET prior to takeoff.

IF IC-1 OR IC-2 HOT MESSAGE ILLUMINATES

4. Refer to Abnormal Procedure, DISPLAY GUIDANCE COMPUTER OVERTEMPERATURE (IC-1 OR IC-2 HOT MESSAGE ON PFD), if required.

IN FLIGHT

Indicates failure of the display guidance computer cooling fan.

1. Continue flight (as desired).

IF IC-1 OR IC-2 HOT MESSAGE ILLUMINATES

2. Refer to Abnormal Procedure, DISPLAY GUIDANCE COMPUTER OVERTEMPERATURE (IC-1 OR IC-2 HOT MESSAGE ON PFD), if required.

DISPLAY GUIDANCE COMPUTER OVERTEMPERATURE (IC-1 OR IC-2 HOT MESSAGE ON PFD)

ON GROUND

1. Correct prior to flight.

IN FLIGHT

1. DISPLAY GUID 1 or DISPLAY GUID 2 Circuit Breaker (affected system) - PULL.
2. FD/AP Transfer Switch - Select operating side.
3. Land as soon as practical. Correct prior to next flight.

CAUTION

CONTINUED USE OF THE GUIDANCE COMPUTER WITHOUT THE FAN MAY LEAD TO COMPUTER DAMAGE.

NOTE

The output of the unaffected display guidance computer may be used to drive all three displays by placing the MFD Mode Select Knob located on the MFD display controller to SG1 or SG2 as appropriate.

NOSE AVIONIC FAN FAILURE (NOSE AVN FAN CAUTION LIGHT ON)

ON GROUND

1. Ground Operating Time - LIMIT TO 30 MINUTES.

IN FLIGHT

1. Flight may be continued in a normal manner.

AUTOPILOT FAIL/DISCONNECT (AP OFF ANNUNCIATOR ON AND AP FAIL MESSAGE ON PFD)

ON GROUND

1. DISPLAY GUID 1 Circuit Breaker - PULL and RESET.

IN FLIGHT

1. AP TRIM DISC Button - PRESS and RELEASE.
2. Yaw Damper Switch - As desired.

If the autopilot will not reset, continue flight in accordance with operating rules.

NOTE

Flight director will continue to function.

LANDING GEAR WILL NOT EXTEND

1. Landing Gear Handle - CHECK DOWN.
2. GEAR CONTROL Circuit Breaker (LH panel) - CHECK IN.
3. Airspeed - 160 to 180 KIAS recommended.
4. EMERGENCY GEAR RELEASE - PULL T-HANDLE AND ROTATE TO LOCK.

IF GEAR DOES NOT EXTEND INTO THE LOCKED POSITION

5. Yaw Damper Switch- OFF.
6. Airplane - YAW as required to force main gear into locked position.
7. Airspeed - INCREASE as required to assist main gear in achieving locked position (DO NOT EXCEED 200 KIAS).
8. EMERGENCY GEAR RELEASE - PULL KNOB TO BLOW DOWN (for positive lock).

NOTE

Pneumatic pressure should be used to assure positive locking of all three gear actuators.

9. EMERGENCY GEAR RELEASE - RESET KNOB AND T-HANDLE (after gear down and locked).

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LANDING GEAR WILL NOT EXTEND (Continued)

IF GEAR EXTENDS INTO THE LOCKED POSITION

5. EMERGENCY GEAR RELEASE - PULL KNOB TO BLOW DOWN (for positive lock).

NOTE

Pneumatic pressure should be used to assure positive locking of all three gear actuators.

6. EMERGENCY GEAR RELEASE - RESET KNOB AND T-HANDLE (after gear down and locked).

LOW HYDRAULIC FLOW (LO HYD FLOW L OR R CAUTION LIGHT ON)

Indicates inoperative left or right hydraulic pump.

IF BOTH LO HYD FLOW L AND R CAUTION LIGHTS ARE ON

1. Altitude - Maximum FL410.
2. Land as soon as practical. Refer to Abnormal Procedures, LANDING GEAR WILL NOT EXTEND, FLAPS INOPERATIVE APPROACH AND LANDING.

NOTE

The speed brakes, thrust reversers, and flaps may not operate. If the flap lever is moved, the flaps may tend to float in a trail position. The landing gear may not operate using normal procedures.

HYDRAULIC SYSTEM REMAINS PRESSURIZED (HYD PRESS CAUTION LIGHT REMAINS ON AFTER SYSTEM CYCLE IS COMPLETED)

1. HYD CONTROL Circuit Breaker (LH panel) - PULL.

IF SYSTEM REMAINS PRESSURIZED (Indicates bypass valve failed)

2. HYD CONTROL Circuit Breaker (LH panel) - RESET.
3. Airspeed - MAINTAIN 200 KIAS or below.
4. Altitude - FL310 or below.
5. Land as soon as practical.

IF SYSTEM DEPRESSURIZED

2. HYD CONTROL Circuit Breaker - RESET prior to approach.

LOW HYDRAULIC FLUID LEVEL (LO HYD LEVEL CAUTION LIGHT ON)

1. Altitude - Maximum FL410.
2. Flap Lever - Do not move from position at time of failure.
3. Land as soon as practical. Refer to Abnormal Procedures, LANDING GEAR WILL NOT EXTEND, and/or FLAPS INOPERATIVE APPROACH AND LANDING.

NOTE

The speed brakes, thrust reversers, and flaps may not operate. If the flaps are extended and the flap lever is moved, the flaps may tend to float in a trail position. The landing gear may not operate using normal procedures.

WHEEL BRAKE FAILURE

1. Brake Pedals - REMOVE FEET from BRAKE PEDALS.
2. EMER BRAKE Handle - PULL as required.

CAUTION

- ANTISKID SYSTEM DOES NOT FUNCTION DURING EMERGENCY BRAKING. EXCESSIVE PRESSURE ON EMER BRAKE HANDLE CAN CAUSE BOTH WHEEL BRAKES TO LOCK, RESULTING IN BLOWOUT OF BOTH TIRES.
- APPLYING PRESSURE TO BRAKE PEDALS WHILE SIMULTANEOUSLY PULLING ON EMER BRAKE HANDLE CAN ALLOW PNEUMATIC AIR PRESSURE ACCESS TO THE HYDRAULIC BRAKE RESERVOIR, POSSIBLY LEADING TO RUPTURE.

NOTE

- Use Nosewheel Steering for directional control.
- Multiply landing distance by 1.6 for a landing airspeed of V_{REF} (for normal power).
- Multiply landing distance by 2.3 for a landing airspeed of V_{REF} +5 KIAS (for emergency power).

POWER BRAKE SYSTEM FAILURE (LO BRK PRESS AND ANTISKID INOP CAUTION LIGHT ON)

1. SKID CONTROL Circuit Breaker (LH panel) - CHECK IN.

IF LIGHT REMAINS ILLUMINATED

2. Use the emergency brake system for landing.
3. Brake Pedals - REMOVE FEET from BRAKE PEDALS.
4. EMER BRAKE Handle - PULL as required.

CAUTION

- ANTISKID SYSTEM DOES NOT FUNCTION DURING EMERGENCY BRAKING. EXCESSIVE PRESSURE ON EMER BRAKE HANDLE CAN CAUSE BOTH WHEEL BRAKES TO LOCK, RESULTING IN BLOWOUT OF BOTH TIRES.
- APPLYING PRESSURE TO BRAKE PEDALS WHILE SIMULTANEOUSLY PULLING ON EMER BRAKE HANDLE CAN ALLOW PNEUMATIC AIR PRESSURE ACCESS TO THE HYDRAULIC BRAKE RESERVOIR, POSSIBLY LEADING TO RUPTURE.

NOTE

Multiply landing distance by 1.6.

ANTISKID SYSTEM FAILURE (ANTISKID INOP CAUTION LIGHT ON AND LO BRK PRESS CAUTION LIGHT EXTINGUISHED)

1. SKID CONTROL Circuit Breaker (LH panel) - CHECK IN.
2. ANTISKID Switch - OFF then ON.

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LANDING GEAR WILL NOT EXTEND (Continued)

IF GEAR EXTENDS INTO THE LOCKED POSITION

5. EMERGENCY GEAR RELEASE - PULL KNOB TO BLOW DOWN (for positive lock).

NOTE

Pneumatic pressure should be used to assure positive locking of all three gear actuators.

6. EMERGENCY GEAR RELEASE - RESET KNOB AND T-HANDLE (after gear down and locked).

LOW HYDRAULIC FLOW (LO HYD FLOW L OR R CAUTION LIGHT ON)

Indicates inoperative left or right hydraulic pump.

IF BOTH LO HYD FLOW L AND R CAUTION LIGHTS ARE ON

1. Altitude - Maximum FL410.
2. Land as soon as practical. Refer to Abnormal Procedures, LANDING GEAR WILL NOT EXTEND, FLAPS INOPERATIVE APPROACH AND LANDING.

NOTE

The speed brakes, thrust reversers, and flaps may not operate. If the flap lever is moved, the flaps may tend to float in a trail position. The landing gear may not operate using normal procedures.

HYDRAULIC SYSTEM REMAINS PRESSURIZED (HYD PRESS CAUTION LIGHT REMAINS ON AFTER SYSTEM CYCLE IS COMPLETED)

1. HYD CONTROL Circuit Breaker (LH panel) - PULL.

IF SYSTEM REMAINS PRESSURIZED (Indicates bypass valve failed)

2. HYD CONTROL Circuit Breaker (LH panel) - RESET.
3. Airspeed - MAINTAIN 200 KIAS or below.
4. Altitude - FL310 or below.
5. Land as soon as practical.

IF SYSTEM DEPRESSURIZED

2. HYD CONTROL Circuit Breaker - RESET prior to approach.

LOW HYDRAULIC FLUID LEVEL (LO HYD LEVEL CAUTION LIGHT ON)

1. Altitude - Maximum FL410.
2. Flap Lever - Do not move from position at time of failure.
3. Land as soon as practical. Refer to Abnormal Procedures, LANDING GEAR WILL NOT EXTEND, and/or FLAPS INOPERATIVE APPROACH AND LANDING.

NOTE

The speed brakes, thrust reversers, and flaps may not operate. If the flaps are extended and the flap lever is moved, the flaps may tend to float in a trail position. The landing gear may not operate using normal procedures.

WHEEL BRAKE FAILURE

1. Brake Pedals - REMOVE FEET from BRAKE PEDALS.
2. EMER BRAKE Handle - PULL as required.

CAUTION

- ANTISKID SYSTEM DOES NOT FUNCTION DURING EMERGENCY BRAKING. EXCESSIVE PRESSURE ON EMER BRAKE HANDLE CAN CAUSE BOTH WHEEL BRAKES TO LOCK, RESULTING IN BLOWOUT OF BOTH TIRES.
- APPLYING PRESSURE TO BRAKE PEDALS WHILE SIMULTANEOUSLY PULLING ON EMER BRAKE HANDLE CAN ALLOW PNEUMATIC AIR PRESSURE ACCESS TO THE HYDRAULIC BRAKE RESERVOIR, POSSIBLY LEADING TO RUPTURE.

NOTE

- Use Nosewheel Steering for directional control.
- Multiply landing distance by 1.6 for a landing airspeed of V_{REF}

POWER BRAKE SYSTEM FAILURE (LO BRK PRESS AND ANTISKID INOP CAUTION LIGHT ON)

1. SKID CONTROL Circuit Breaker (LH panel) - CHECK IN.

IF LIGHT REMAINS ILLUMINATED

2. Use the emergency brake system for landing.
3. Brake Pedals - REMOVE FEET from BRAKE PEDALS.
4. EMER BRAKE Handle - PULL as required.

CAUTION

- ANTISKID SYSTEM DOES NOT FUNCTION DURING EMERGENCY BRAKING. EXCESSIVE PRESSURE ON EMER BRAKE HANDLE CAN CAUSE BOTH WHEEL BRAKES TO LOCK, RESULTING IN BLOWOUT OF BOTH TIRES.
- APPLYING PRESSURE TO BRAKE PEDALS WHILE SIMULTANEOUSLY PULLING ON EMER BRAKE HANDLE CAN ALLOW PNEUMATIC AIR PRESSURE ACCESS TO THE HYDRAULIC BRAKE RESERVOIR, POSSIBLY LEADING TO RUPTURE.

NOTE

Multiply landing distance by 1.6.

ANTISKID SYSTEM FAILURE (ANTISKID INOP CAUTION LIGHT ON AND LO BRK PRESS CAUTION LIGHT EXTINGUISHED)

1. SKID CONTROL Circuit Breaker (LH panel) - CHECK IN.
2. ANTISKID Switch - OFF then ON.

2

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ANTISKID SYSTEM FAILURE (ANTISKID INOP CAUTION LIGHT ON AND LO BRK PRESS CAUTION LIGHT EXTINGUISHED) (Continued)

IF LIGHT REMAINS ILLUMINATED

3. ANTISKID Switch - OFF.

NOTE

Multiply landing distance by 1.6.

4. Thrust Reverser - Maximum Reverse Thrust.
5. Wheel Brakes - Lightly apply.

CAUTION

DIFFERENTIAL POWER BRAKING IS AVAILABLE. HOWEVER, SINCE THE ANTISKID IS INOPERATIVE, EXCESSIVE PRESSURE ON THE BRAKE PEDALS MAY CAUSE WHEEL BRAKES TO LOCK, RESULTING IN TIRE BLOWOUT.

6. Be prepared to use the emergency brake system.

CAUTION

APPLYING PRESSURE TO BRAKE PEDALS WHILE SIMULTANEOUSLY PULLING ON EMER BRAKE HANDLE CAN ALLOW PNEUMATIC AIR PRESSURE ACCESS TO THE HYDRAULIC BRAKE RESERVOIR, POSSIBLY LEADING TO RUPTURE.

NOTE

- If the antiskid hydraulic pump fails after the accumulator pressure exceeds 850 PSI, the LO BRK PRESS light may not illuminate until normal brakes are used.
- Use Nosewheel Steering for directional control.

SINGLE-ENGINE APPROACH AND LANDING

1. Avionics/Flight Instruments - CHECK/SET.
2. Crew Briefing - COMPLETE.
   a. Landing Speeds and Distance - SET.
   b. Go-Around N_1 - SET.
3. Passenger Advisory Lights - PASS SAFETY.
4. Passenger Briefing - CHECK passenger seats full upright, outboard and positioned aft or forward to clear all exit doors, seat belts and shoulder harnesses secure.
5. Flaps - T.O & APPR (15°).
6. IGNITION Switch (operating engine) - ON.
7. Exterior Lights - AS REQUIRED.
8. Fuel CROSSFEED Switch - OFF.
9. ENGINE SYNC Knob- OFF.
10. Annunciators - CHECK.
11. GND IDLE Switch - NORM.

(Continued Next Page)

SINGLE-ENGINE APPROACH AND LANDING (Continued)

12. Pressurization - CHECK ZERO DIFFERENTIAL PRIOR TO LANDING.
13. Landing Gear - DOWN.
14. ANTI-SKID Switch - CHECK ON.
15. Landing Lights - AS DESIRED.
16. Airspeed - $V_{APP.}$
17. Speed Brakes - RETRACT (50 feet AGL and below).
18. Flaps - LAND (35°).
19. Airspeed - V_{REF}.
20. Autopilot and Yaw Damper - OFF (400 feet AGL and below).
21. Refer to Abnormal Procedures, SINGLE ENGINE REVERSING and SINGLE ENGINE GO-AROUND.

SINGLE-ENGINE REVERSING

1. Throttle - IDLE.
2. Brakes - APPLY.
3. Speed Brakes - EXTEND.
4. Thrust Reverser - DEPLOY (after nose wheel on ground).
5. Thrust Reverser Indicator Lights - CHECK ILLUMINATION of ARM, UNLOCK and DEPLOY LIGHTS.
6. Thrust Reverser - REVERSE POWER ON UNAFFECTED ENGINE.
7. Thrust Reverser - REVERSER LEVER TO IDLE REVERSE AT 60 KIAS.

NOTE

Reverse thrust may need to be reduced during crosswind landings on wet or icy runways to prevent airplane from being forced to runway edge.

SINGLE-ENGINE GO-AROUND

1. Throttle (operating engine) - SET Takeoff N_1.
2. Airplane Pitch Attitude - 10° (Go-around mode on flight director for reference).
3. Flaps - T.O. & APPR (15°).
4. Climb Speed - V_{APP}.
5. Landing Gear - UP (when positive rate-of-climb is established).
6. If Anti-ice REQUIRED, R WINDSHIELD BLEED AIR Knob - OFF.

NOTE

The landing gear warning horn cannot be silenced if the landing gear is retracted prior to the flaps reaching the TAKEOFF and APPROACH position.

7. Flaps (when clear of obstacle) - RETRACT at 1500 feet and V_{APP} + 10 KIAS and accelerate to V_{ENR}.
8. Throttle (operating engine) - SET Maximum Continuous N_1.

FLAPS INOPERATIVE APPROACH AND LANDING (NOT IN LANDING POSITION)

1. Flap Override Switch - GPWS FLAP OVRD ON (amber).
2. Avionics/Flight Instruments - CHECK/SET.
3. Crew Briefing - COMPLETE.
   a. Landing Speeds and Distance - SET.
   b. Go-Around N_1 - SET.
4. Passenger Advisory Lights - PASS SAFETY.
5. Passenger Briefing - CHECK passenger seats full upright, outboard and positioned aft or forward to clear all exit doors, seat belts and shoulder harnesses secure.
6. FLAPS CONTROL Circuit Breaker (LH panel) - CHECK IN.
7. IGNITION Switch (operating engine) - ON.
8. Exterior Lights - AS REQUIRED.
9. Fuel CROSSFEED Switch - OFF.
10. ENGINE SYNC Knob- OFF.
11. Annunciators - CHECK.
12. GND IDLE Switch - NORM.
13. Pressurization - CHECK ZERO DIFFERENTIAL PRIOR TO LANDING.
14. Landing Gear - DOWN.
15. ANTI-SKID Switch - CHECK ON.
16. Landing Lights - AS DESIRED.
17. Airspeed - Flaps 15°, V_{REF} +7 KIAS.
    Flaps 7°, V_{REF} +12 KIAS.
    Flaps 0° or unknown, V_{REF} +15 KIAS.
18. Autopilot and Yaw Damper - OFF (400 feet AGL and below).
19. Speed Brakes - RETRACT (50 feet AGL and below).

CAUTION

AVOID LANDINGS WITH TAILWINDS OR DOWNHILL RUNWAY GRADIENTS OR AT FIELD ELEVATIONS ABOVE 10,000 FEET MSL WITH FLAPS 15°, 5000 FEET MSL WITH FLAPS 7°, OR 3000 FEET MSL WITH FLAPS 0° OR UNKNOWN.

NOTE

Multiply landing distance by 1.4 with flaps 15°, 1.5 with flaps 7°, or 1.6 with flaps 0° or unknown.

CABIN DOOR NOT LOCKED (CABIN DOOR CAUTION LIGHT ON)

Indicates failure or improper position of door switch(es) and/or possible disengagement of the lower forward cabin door pin.

ON GROUND

1. Correct prior to flight.

IN FLIGHT

1. Pressurization SYSTEM SELECT - MANUAL.
2. Cabin Altitude - SELECT to 9500 feet using manual toggle valve.
3. Airspeed - REDUCE to 200 KIAS.
4. Passenger Advisory Lights - PASS SAFETY.
5. Cabin Door - KEEP CLEAR.
6. Altitude - DESCEND to 41,000 feet or lower altitude. Do not descend below Minimum Safe Altitude.
7. Land as soon as practical.

CABIN DOOR PRESSURE SEAL FAILURE (DOOR SEAL CAUTION LIGHT ON)

ON GROUND

1. Correct prior to flight.

IN FLIGHT

1. Altitude - DESCEND to 41,000 feet or lower altitude. Do not descend below Minimum Safe Altitude.
2. OXYGEN MASKS - DON AND 100%.
3. Microphone Switches - MIC OXY MASK.
4. Passenger Advisory Lights - PASS SAFETY.
5. Monitor cabin pressure.
6. Land as soon as practical.

NOTE

- Secondary door seal will maintain cabin pressurization.
- Headsets or hats worn by the crew should be removed prior to donning the oxygen masks.

BAGGAGE OR TAILCONE DOOR NOT LOCKED (BAGGAGE DOOR L OR R OR TAILCONE DOOR CAUTION LIGHT ON)

Indicates unlocked baggage or tailcone door.

ON GROUND

1. Correct prior to flight.

IN FLIGHT

1. Airspeed - REDUCE to 200 KIAS.
2. Passenger Advisory Lights - PASS SAFETY.

ANGLE-OF-ATTACK SYSTEM FAILURE (AMBER AOA MESSAGE ON PFD)

1. Airspeed - Flaps 0 °= V_{APP} +10 KIAS
   Flaps 7° = V_{APP} +5 KIAS
   Flaps 15° = V_{APP}
   Flaps 35° = V_{REF}

NOTE

The following systems will be inoperative:

- Stall warning (stick shaker)
- Low airspeed awareness
- Angle of attack indexer
- Angle of attack gauge

USE OF SUPPLEMENTAL OXYGEN (UNPRESSURIZED)

1. Oxygen Masks - NORMAL below 25,000 feet cabin altitude.
   - 100% at or above 25,000 feet cabin altitude.
   - EMER for SMOKE OR FIRE.
   - Ensure crew and passengers are receiving oxygen.

NOTE

Headsets or hats worn by the crew should be removed prior to donning the oxygen masks.

2. Cabin Altitude - MAX 25,000 feet with passengers.
   - MAX 40,000 feet crew only.
3. Microphone Switches - MIC OXY MASK.
4. Oxygen - CHECK ENDURANCE (refer to Figure 3-4).
5. Range - COMPUTE, (based on oxygen endurance and revised fuel flow and ground speed).

MASTER WARNING LIGHT ON STEADY

1. MASTER WARNING RESET Button - PRESS to RESET.
2. WARN LTS 1 and 2 Circuit Breaker (LH panel) - CHECK IN.
3. Instruments (Fuel, Electrical, and Engine) - MONITOR.

MASTER CAUTION LIGHT ON STEADY, NO CAUTION LIGHTS ON

1. MASTER CAUTION RESET Button- PRESS to RESET.
2. WARN LTS 1 and 2 Circuit Breaker (LH panel) - CHECK IN.
3. Instruments (Fuel, Electrical, and Engine) - MONITOR.

MASTER WARNING LIGHT FLASHING, NO WARNING LIGHTS ON

1. MASTER WARNING RESET Button - PRESS to RESET.
2. WARN LTS 1 and 2 Circuit Breaker (LH panel) - CHECK IN.
3. Instruments (Fuel, Electrical, and Engine) - MONITOR.

SPEED BRAKES (SPD BRK EXTEND ADVISORY LIGHT ON)

Normal indication if speed brakes are extended.

IF SPEED BRAKES FAIL TO STOW

1. SPEED BRAKE Circuit Breaker (LH panel) - PULL.
2. Speed Brake Position - VERIFY visually that speed brakes blow back to near flush position.

INADVERTENT ICING ENCOUNTER

1. WING/ENGINE Anti-Ice L and R Switches - ON.
2. W/S BLEED Switch - LOW or HI.
3. TAIL DEICE Switch - AUTO.
4. Airspeed - Maintain 160 KIAS minimum (except for approach and landing).

EMERGENCY PROCEDURES

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EMERGENCY PROCEDURES

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EMERGENCY PROCEDURES

ENGINE FAILURE OR FIRE, OR MASTER WARNING DURING TAKEOFF

SPEED BELOW V_1 - TAKEOFF SHOULD BE ABORTED.

1. Brakes - AS REQUIRED.
2. Throttles - IDLE.
3. Speed Brakes - EXTEND.
4. Thrust Reverser - DEPLOY ON UNAFFECTED ENGINE.
5. Thrust Reverser Indicator Lights - CHECK ILLUMINATION of ARM, UNLOCK AND DEPLOY LIGHTS.
6. Thrust Reverser - REVERSE THRUST ON THE UNAFFECTED ENGINE.
7. Thrust Reverser - REVERSE LEVER TO IDLE REVERSE AT 60 KIAS.

NOTE

- To obtain maximum braking performance from the antiskid system, the pilot must apply continuous maximum effort (no modulation) to the brake pedals.

- The Takeoff Field Lengths assume that the pilot has maximum effort applied to the brakes at the scheduled V_1 speed during the aborted takeoff.

8. When airplane comes to a stop - Refer to Emergency Procedures, EMERGENCY EVACUATION (if appropriate).

SPEED ABOVE V_1 - TAKEOFF SHOULD NORMALLY BE CONTINUED.

1. Rotate - $V_{R.}$
2. Landing Gear - UP (after positive rate-of-climb).
3. Climb - V_2 until Level Off Altitude.
4. At or above 400 feet AGL, or Minimum Obstacle Clearance Altitude, accomplish Emergency Procedures, ENGINE FIRE (continue with step 5 after complete).
5. Flaps - RETRACT (at Level Off Altitude and V_2 + 10 KIAS, accelerate to V_{ENR}).
6. Throttle (operating engine) - SET Maximum Continuous N_1.

IF ENGINE FAILURE

4. At or above 400 feet AGL, or Minimum Obstacle Clearance Altitude, accomplish Abnormal Procedures, IN-FLIGHT RESTART - ONE ENGINE or Abnormal Procedures, ENGINE FAILURE/PRECAUTIONARY SHUTDOWN (continue with step 5 after complete).
5. Flaps - RETRACT (at Level Off Altitude and V_2 + 10 KIAS, accelerate to V_{ENR}).
6. Throttle (operating engine) - SET Maximum Continuous N_1.

ENGINE FIRE (LH OR RH ENGINE FIRE WARNING LIGHT ON)

1. Throttle (affected engine) - IDLE.

IF LIGHT REMAINS ON

2. ENGINE FIRE Switch (affected engine) - LIFT COVER and PUSH.
3. Either Illuminated BOTTLE ARMED Light - PUSH.
4. IGNITION Switch (affected engine) - NORM.
5. Throttle (affected engine) - OFF.
6. Electrical Load - REDUCE as required.
7. Affected ENGINE Anti-ice - CHECK OFF.
8. WING XFLOW Switch - ON as required.

IF FIRE WARNING LIGHT REMAINS ON AFTER 30 SECONDS

9. Remaining Illuminated BOTTLE ARMED Light - PUSH.
10. Land as soon as possible.
11. Refer to Abnormal Procedures, SINGLE-ENGINE APPROACH and LANDING.

IF LIGHT GOES OUT AND SECONDARY INDICATIONS ARE NOT PRESENT

2. Land as soon as practical.
3. Refer to Abnormal Procedures, SINGLE-ENGINE APPROACH and LANDING.

ENGINE FAILURE/FIRE DURING FINAL APPROACH

1. AP TRIM DISC Button - PRESS and RELEASE.
2. Thrust (operating engine) - INCREASE as required.
3. Airspeed - V_{APP}.
4. Flaps - T.O. & APPR (15°).
5. Rudder and Aileron Trim - TRIM toward operating engine as required.
6. Throttle (affected engine) - OFF.
7. Autopilot/Yaw Damper - ON as desired.
8. If engine fire, accomplish Emergency Procedures, ENGINE FIRE (LH OR RH ENGINE FIRE WARNING LIGHT ON). Return to step 9 when complete.
9. Passenger Advisory Lights - PASS SAFETY.
10. Passenger Briefing - CHECK passenger seats full upright, outboard and positioned aft or forward to clear all exit doors, seat belts and shoulder harnesses secure.
11. IGNITION Switch (operating engine) - ON.
12. Exterior Lights - AS REQUIRED.
13. Fuel CROSSFEED Switch - OFF.
14. ENGINE SYNC Knob - OFF.
15. Annunciators - CHECK.
16. GND IDLE Switch - NORM.
17. Pressurization - CHECK ZERO DIFFERENTIAL PRIOR TO LANDING.
18. Landing Gear - DOWN.
19. ANTI-SKID Switch - CHECK ON.
20. Landing Lights - AS DESIRED.
21. Flaps - LAND (35°).
22. Airspeed - V_{REF}.
23. Autopilot and Yaw Damper - OFF (400 feet AGL and below).
24. Speed Brakes - RETRACT (50 feet AGL and below).

EMERGENCY RESTART - TWO ENGINES

1. IGNITION Switches - BOTH ON.
2. FUEL BOOST Pumps - BOTH ON.
3. Throttles - IDLE.
4. If altitude allows - INCREASE AIRSPEED to 200 KIAS.
5. ENGINE FIRE Switches - CHECK OPEN (F/W SHUTOFF Caution Light L or R extinguished).
6. All Anti-Ice Switches - OFF.
7. If no start in ten seconds: Either ENGINE START Button - PRESS momentarily.

IF ENGINE DOES NOT START

8. ENGINE START DISENGAGE Button - PRESS momentarily.
9. ENGINE START Button - (Other engine) PRESS momentarily.

IF ENGINE DOES NOT START

10. ENGINE START DISENGAGE Button - PRESS momentarily.
11. Refer to Emergency Procedures, MAXIMUM GLIDE - EMERGENCY LANDING.

IF FIRST ENGINE STARTS

8. Thurst (operating engine) - INCREASE to arrest descent.
9. ENGINE START BUTTON (other engine) - PRESS momentarily.

IF ONLY ONE ENGINE RESTARTS

10. Refer to Abnormal Procedures, SINGLE ENGINE APPROACH AND LANDING.
11. Land as soon as practical.

IF BOTH ENGINES RESTART

10. Continue flight (as desired) or land as soon as practical.

MAXIMUM GLIDE - EMERGENCY LANDING

1. Airspeed - Per Chart Below.

AIRSPEED FOR MAXIMUM RANGE GLIDE (NO WIND)

WEIGHT (POUNDS)	11,000	12,000	13,000	14,000	15,000	16,000	16,630
KIAS	111	116	121	126	131	136	139

NOTE

The speed brakes and flaps may not operate. If flap lever is moved, the flaps may tend to float in a trail position. Landing gear extension, if required, must follow emergency gear release procedures.

2. Flaps - UP.
3. Flap Override Switch - GPWS FLAP OVRD ON (amber).
4. Speed Brakes - RETRACT.
5. ATC - ADVISE.
6. Transponder - EMERGENCY.

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AIRSTART ENVELOPE

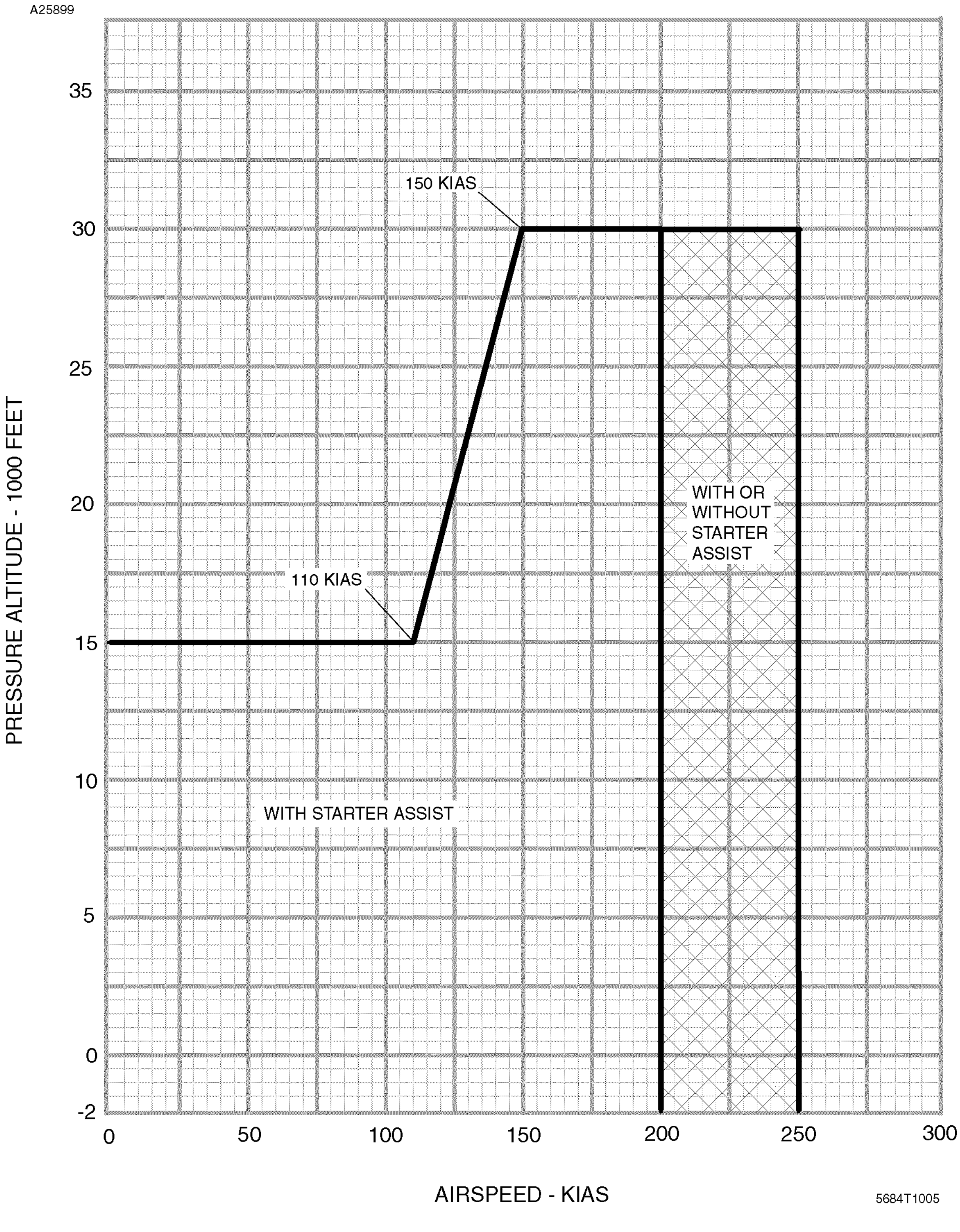

Figure 3-1

MAXIMUM GLIDE - EMERGENCY LANDING (Continued)

7. Passenger Advisory Lights - PASS SAFETY.
8. Passenger Briefing - CHECK passenger seats full upright, outboard and positioned aft or forward to clear all exit doors, seat belts and shoulder harnesses secure, and stow loose items securely.
9. Shoulder Harnesses - SECURE.
10. Landing Gear - AS DESIRED prior to touchdown.

LOW OIL PRESSURE (LO OIL PRESS L OR R WARNING LIGHT ON)

BETWEEN 20 AND 45 PSI

1. Throttle (affected engine) - REDUCE THRUST (if conditions permit).
2. Land as soon as practical.

BELOW 20 PSI

1. Throttle (affected engine) - OFF.
2. Accomplish Abnormal Procedures, ENGINE FAILURE/PRECAUTIONARY SHUTDOWN.

THRUST REVERSER INADVERTENT DEPLOYMENT DURING TAKEOFF

SPEED BELOW V_1 - TAKEOFF SHOULD BE ABORTED

1. Brakes - AS REQUIRED.
2. Throttles - IDLE.
3. Speed Brakes - EXTEND.
4. Thrust Reversers - BOTH DEPLOY.
5. Thrust Reverser Indicator Lights - CHECK ILLUMINATION of ARM, UNLOCK and DEPLOY LIGHTS.
6. Thrust Reversers - REVERSE THRUST ON BOTH ENGINES.

(Continued Next Page)

THRUST REVERSER INADVERTENT DEPLOYMENT DURING TAKEOFF (Continued)

SPEED ABOVE V_1 - TAKEOFF SHOULD NORMALLY BE CONTINUED.

1. Emergency STOW Switch (affected engine) - EMER.
2. Throttle (affected engine) - CHECK IDLE.
3. Rotate - V_R.
4. Landing Gear - UP (after positive rate-of-climb). Do not exceed 150 KIAS until thrust reverser stows.
5. Climb Airspeed - V_2.

IF THRUST REVERSER WILL NOT STOW

6. THRUST REVERSER Circuit Breaker (LH panel) - CHECK IN.
7. Throttle (affected engine) - OFF.
8. Airspeed - MAINTAIN 150 KIAS or below.
9. Land as soon as possible (affected thrust reverser will be inoperative).
10. Rudder and Aileron Trim - Trim toward operating engine as required.
11. GEN Switch (affected engine) - OFF.
12. Electrical Load - REDUCE as required.
13. Fuel CROSSFEED Switch - AS REQUIRED (maximum imbalance 200 lbs.)
14. ENGINE Anti-Ice (affected engine) - CHECK OFF.
15. WING XFLOW Switch - ON as required.

WARNING

DO NOT USE THE AUTOPILOT OR YAW DAMPER.

NOTE

If possible, choose a runway with least possible crosswind.

BEFORE LANDING (WITH THRUST REVERSER DEPLOYED)

1. Avionics and Flight Instruments - CHECK and SET.
2. Crew Briefing - COMPLETE.
   a. Landing Speeds and Distance - SET.
   b. Go-Around N_1 - SET.
3. Passenger Advisory Lights - PASS SAFETY.
4. Passenger Briefing - CHECK passenger seats full upright, outboard and positioned aft or forward to clear all exit doors, seat belts and shoulder harnesses secure.
5. Flaps - T.O. & APPR (15°).
6. Flap Override Switch - GPWS FLAP OVRD ON (amber).
7. IGNITION Switch (operating engine) - ON.
8. Exterior Lights - AS REQUIRED.
9. Fuel CROSSFEED Switch - OFF.
10. ENGINE SYNC Knob - OFF.
11. Annunciators - CHECK.
12. GND IDLE Switch - NORM.
13. Pressurization - CHECK ZERO DIFFERENTIAL PRIOR TO LANDING.
14. Landing Gear - DOWN.
15. ANTI-SKID Switch - CHECK ON.
16. Landing Lights - AS DESIRED.
17. Airspeed - V_{APP}.

(Continued Next Page)

MAXIMUM GLIDE - EMERGENCY LANDING (Continued)

7. Passenger Advisory Lights - PASS SAFETY.
8. Passenger Briefing - CHECK passenger seats full upright, outboard and positioned aft or forward to clear all exit doors, seat belts and shoulder harnesses secure, and stow loose items securely.
9. Shoulder Harnesses - SECURE.
10. Landing Gear - AS DESIRED prior to touchdown.

LOW OIL PRESSURE (LO OIL PRESS L OR R WARNING LIGHT ON)

BETWEEN 20 AND 45 PSI

1. Throttle (affected engine) - REDUCE THRUST (if conditions permit).
2. Land as soon as practical.

BELOW 20 PSI

1. Throttle (affected engine) - OFF.
2. Accomplish Abnormal Procedures, ENGINE FAILURE/PRECAUTIONARY SHUTDOWN.

ENGINE DISPLAY FAILURE (LOSS OF BOTH DISPLAYS)

1. LH ENG DISPLAY and RH ENG DISPLAY Circuit Breakers - CHECK.

NOTE

- Engine instruments are not available, use caution when applying power.
- Fuel quantity indication is unavailable. Be aware of fuel duration.

THRUST REVERSER INADVERTENT DEPLOYMENT DURING TAKEOFF

SPEED BELOW V_1 - TAKEOFF SHOULD BE ABORTED

1. Brakes - AS REQUIRED.
2. Throttles - IDLE.
3. Speed Brakes - EXTEND.
4. Thrust Reversers - BOTH DEPLOY.
5. Thrust Reverser Indicator Lights - CHECK ILLUMINATION of ARM, UNLOCK and DEPLOY LIGHTS.
6. Thrust Reversers - REVERSE THRUST ON BOTH ENGINES.

(Continued Next Page)

THRUST REVERSER INADVERTENT DEPLOYMENT DURING TAKEOFF (Continued)

SPEED ABOVE V_1 - TAKEOFF SHOULD NORMALLY BE CONTINUED.

1. Emergency STOW Switch (affected engine) - EMER.
2. Throttle (affected engine) - CHECK IDLE.
3. Rotate - V_R.
4. Landing Gear - UP (after positive rate-of-climb). Do not exceed 150 KIAS until thrust reverser stows.
5. Climb Airspeed - V_2.

IF THRUST REVERSER WILL NOT STOW

6. THRUST REVERSER Circuit Breaker (LH panel) - CHECK IN.
7. Throttle (affected engine) - OFF.
8. Airspeed - MAINTAIN 150 KIAS or below.
9. Land as soon as possible (affected thrust reverser will be inoperative).
10. Rudder and Aileron Trim - Trim toward operating engine as required.
11. GEN Switch (affected engine) - OFF.
12. Electrical Load - REDUCE as required.
13. Fuel CROSSFEED Switch - AS REQUIRED (maximum imbalance 200 lbs.)
14. ENGINE Anti-Ice (affected engine) - CHECK OFF.
15. WING XFLOW Switch - ON as required.

WARNING

DO NOT USE THE AUTOPILOT OR YAW DAMPER.

NOTE

If possible, choose a runway with least possible crosswind.

BEFORE LANDING (WITH THRUST REVERSER DEPLOYED)

1. Avionics and Flight Instruments - CHECK and SET.
2. Crew Briefing - COMPLETE.
   a. Landing Speeds and Distance - SET.
   b. Go-Around N_1 - SET.
3. Passenger Advisory Lights - PASS SAFETY.
4. Passenger Briefing - CHECK passenger seats full upright, outboard and positioned aft or forward to clear all exit doors, seat belts and shoulder harnesses secure.
5. Flaps - T.O. & APPR (15°).
6. Flap Override Switch - GPWS FLAP OVRD ON (amber).
7. IGNITION Switch (operating engine) - ON.
8. Exterior Lights - AS REQUIRED.
9. Fuel CROSSFEED Switch - OFF.
10. ENGINE SYNC Knob - OFF.
11. Annunciators - CHECK.
12. GND IDLE Switch - NORM.
13. Pressurization - CHECK ZERO DIFFERENTIAL PRIOR TO LANDING.
14. Landing Gear - DOWN.
15. ANTI-SKID Switch - CHECK ON.
16. Landing Lights - AS DESIRED.
17. Airspeed - V_{APP}.

(Continued Next Page)

THRUST REVERSER INADVERTENT DEPLOYMENT DURING TAKEOFF (Continued)

18. Speed Brakes - RETRACT (50 feet AGL and below).

WARNING

DO NOT INITIATE GO-AROUND BELOW 600 FEET AGL WITH A THRUST REVERSER DEPLOYED.

NOTE

Multiply landing distance by 1.4 for flaps 15°.

GO-AROUND (WITH THRUST REVERSER DEPLOYED)

1. Throttle (operating engine) - SET TAKEOFF N_1.
2. Airplane Pitch Attitude - +5°.
3. Climb Airspeed - V_{APP} +10 KIAS.
4. Flaps - 0° (when V_{APP} +10 KIAS).
5. Landing Gear - UP (when positive rate established).
6. Throttle (operating engine) - SET MAXIMUM CONTINUOUS N_1 (when clear of obstacles).

IF THRUST REVERSER STOWS

6. Thrust Reverser Indicator Lights - CHECK UNLOCK and DEPLOY LIGHT EXTINGUISHED.
   - ARM LIGHT ILLUMINATED.
7. Throttle (affected engine) - AS REQUIRED after the thrust reverser stows.
8. Flaps - RETRACT at V_2 +10 KIAS and accelerate.
9. Airspeed - MAINTAIN 200 KIAS or below (after T/R stows).
10. Altitude - FL310 or below.
11. Land as soon as practical (affected thrust reverser will be inoperative).

THRUST REVERSER INADVERTENT INFLIGHT DEPLOYMENT

1. Control Wheel/AP TRIM DISC Button - GRIP/PRESS and RELEASE.
2. Emergency STOW Switch (affected engine) - EMER.
3. Throttle (affected engine) - CHECK IDLE.
4. Airspeed - REDUCE TO 150 KIAS or below.

5. THRUST REVERSER Circuit Breaker (LH Panel) - CHECK IN.

IF THRUST REVERSER WILL NOT STOW

6. Throttle (affected engine) - OFF.
7. Airspeed - MAINTAIN 150 KIAS or below.
8. Land as soon as possible (affected thrust reverser will be inoperative).
9. Rudder and Aileron Trim - Trim toward operating engine as required.
10. GEN Switch (affected engine) - OFF.
11. Electrical Load - REDUCE as required.
12. Fuel CROSSFEED Switch - AS REQUIRED (maximum imbalance 200 lbs).
13. ENGINE Anti-Ice (affected engine) - CHECK OFF.
14. WING XFLOW Switch - ON as required.

WARNING

DO NOT USE THE AUTOPILOT OR YAW DAMPER.

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THRUST REVERSER INADVERTENT INFLIGHT DEPLOYMENT (Continued)

NOTE

If possible, the runway used for landing should have a minimum crosswind.

BEFORE LANDING (WITH THRUST REVERSER DEPLOYED)

1. Avionics and Flight Instruments - CHECK and SET.
2. Crew Briefing - COMPLETE.
   a. Landing Speeds and Distance - SET.
   b. Go-Around N_1 - SET.
3. Passenger Advisory Lights - PASS SAFETY.
4. Passenger Briefing - CHECK passenger seats full upright, outboard and positioned aft or forward to clear all exit doors, seat belts and shoulder harnesses secure.
5. Flaps - T.O. & APPR (15°).
6. Flap Override Switch - GPWS FLAP OVRD ON (amber).
7. IGNITION Switch (operating engine) - ON.
8. Exterior Lights - AS REQUIRED.
9. Fuel CROSSFEED Switch - OFF.
10. ENGINE SYNC Knob - OFF.
11. Annunciators - CHECK.
12. GND IDLE Switch - NORM.
13. Pressurization - CHECK ZERO DIFFERENTIAL PRIOR TO LANDING.
14. Landing Gear - DOWN.
15. ANTI-SKID Switch - CHECK ON.
16. Landing Lights - AS DESIRED.
17. Airspeed - V_{APP}.
18. Speed Brakes - RETRACT (50 feet AGL and below).

WARNING

DO NOT INITIATE GO-AROUND BELOW 600 FEET AGL WITH A THRUST REVERSER DEPLOYED.

NOTE

Multiply landing distance by 1.4 for flaps 15°.

GO-AROUND (WITH THRUST REVERSER DEPLOYED)

1. Throttle (operating engine) - SET TAKEOFF N_1.
2. Airplane Pitch Attitude - +5°.
3. Climb Airspeed - V_{APP} +10 KIAS.
4. Flaps - 0° (when V_{APP} +10 KIAS).
5. Landing Gear - UP (when positive rate established).
6. Throttle (operating engine) - SET MAXIMUM CONTINUOUS N_1 (when clear of obstacles).

IF THRUST REVERSER STOWS

6. Thrust Reverser Indicator Lights - CHECK UNLOCK and DEPLOY LIGHT EXTINGUISHED.
   - ARM LIGHT ILLUMINATED.
7. Throttle (affected engine) - AS REQUIRED after thrust reverser stows.
8. Airspeed - MAINTAIN 200 KIAS or below (after T/R stows).
9. Altitude - FL310 or below.
10. Land as soon as practical (affected thrust reverser will be inoperative).

THRUST REVERSER UNLOCK LIGHT ON IN FLIGHT

1. Emergency STOW Switch (affected engine) - EMER.
2. Thrust Reverser Levers - CHECK THRUST REVERSER LEVERS AT STOWED (FULL FORWARD) POSITION.

IF LIGHT WILL NOT EXTINGUISH

3. L/R THRUST REVERSER Circuit Breakers (LH panel) - CHECK IN.
4. Airspeed - MAINTAIN 200 KIAS or below.
5. Altitude - FL310 or below.
6. Land as soon as practical (affected thrust reverser will be inoperative).

THRUST REVERSER ARM LIGHT ON IN FLIGHT

1. Thrust Reverser Levers - CHECK THRUST REVERSER LEVERS AT STOWED (FULL FORWARD) POSITION.
2. Emergency STOW Switch (affected engine) - Verify NORM.

IF ARM LIGHT IS STILL ILLUMINATED

3. HYD PRESS caution light - CHECK.

IF HYD PRESS CAUTION LIGHT IS NOT ILLUMINATED

4. Land as soon as practical.

IF HYD PRESS CAUTION LIGHT IS ILLUMINATED (THRUST REVERSER ISOLATION VALVE IS OPEN)

4. Emergency STOW Switch (affected engine) - EMER.
5. Airspeed - MAINTAIN 200 KIAS or below.
6. Altitude - FL310 or below.
7. Land as soon as practical (affected thrust reverser will be inoperative).

OVERPRESSURIZATION

1. Pressurization SYSTEM SELECT - MANUAL. Control pressurization with the manual toggle switch.

IF STILL OVERPRESSURIZED

2. PRESS SOURCE Select Knob - L or R; control cabin pressure with throttle corresponding to the selected source.

IF UNABLE TO CONTROL

3. Oxygen Masks - DON and 100% OXYGEN.
4. Microphone Switches - MIC OXY MASK.

NOTE

Headsets or hats worn by the crew should be removed prior to donning the oxygen masks.

5. Oxygen Control Valve - MANUAL DROP.
6. Passenger Oxygen - ENSURE passengers are receiving oxygen.
7. Passenger Advisory Lights - PASS SAFETY.

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OVERPRESSURIZATION (Continued)

8. PRESS SOURCE Select Knob - OFF.
9. Descend to 15,000 feet MSL or Minimum Safe Altitude, whichever is higher.

IF STILL OVERPRESSURIZED

10. EMER DUMP Switch - ON.
11. Refer to Emergency Procedures, EMERGENCY DESCENT and Abnormal Procedures, USE OF SUPPLEMENTAL OXYGEN.

CABIN DECOMPRESSION (CAB ALT WARNING LIGHT ON)

1. Oxygen Masks - DON and 100% Oxygen.
2. Microphone Switches - MIC OXY MASK.
3. Emergency Descent - AS REQUIRED. Refer to Emergency Procedures, EMERGENCY DESCENT.
4. PRESS SOURCE Select Knob - NORM.
5. Passenger Oxygen - ENSURE passengers are receiving oxygen (MANUAL DROP as required).
6. Transponder - EMERGENCY.

NOTE

- Headsets or hats worn by the crew should be removed prior to donning the oxygen masks.
- The passenger oxygen masks will deploy automatically when cabin altitude exceeds 14,500 feet ±500 feet.
- If a high altitude airport (field elevation greater than 8,000 feet MSL) is selected on the cabin pressurization controller, the CAB ALT warning light will illuminate at 14,500 feet ±500 feet.

IF NOT ARRESTED BY 14,000 FEET CABIN ALTITUDE

7. PRESS SOURCE Select Knob - EMER (control cabin temperature with LH throttle).

NOTE

The emergency pressurization system will automatically activate when cabin altitude exceeds 14,500 feet ±500 feet and will automatically deactivate when cabin altitude descends below this altitude.

8. EMERGENCY Descent - INITIATE. Refer to Emergency Procedures, EMERGENCY DESCENT and Abnormal Procedures, USE OF SUPPLEMENTAL OXYGEN.
9. PRESS SOURCE Select Knob - NORM (if below 10,000 feet MSL).
10. Land as soon as practical.

IF ARRESTED BELOW 14,000 FEET CABIN ALTITUDE

7. Refer to Abnormal Procedures, USE OF SUPPLEMENTAL OXYGEN.
8. Land as soon as practical.

EMERGENCY DESCENT

1. AP TRIM DISC Button - PRESS and RELEASE.
2. Throttles - IDLE.
3. Speed Brakes - EXTEND.
4. Airplane Pitch Attitude - INITIALLY TARGET 20 DEGREES NOSE DOWN ATTITUDE.
5. Airspeed - M_{MO}/V_{MO} (use reduced speed if structural damage has occurred).
6. Transponder - EMERGENCY.
7. Passenger Advisory Lights - PASS SAFETY.
8. ATC - ADVISE and obtain local altimeter setting.
9. Altitude - 10,000 feet MSL or Minimum Safe Altitude, whichever is higher.

NOTE

If terrain or other circumstances prevent a direct descent to 10,000 feet MSL, the descent to 10,000 feet MSL should be completed within 25 minutes of the initiation of the emergency descent.

10. OXYGEN CONTROL VALVE - CREW ONLY (at 10,000 feet MSL and below)

IF DESCENT INTO ICING CONDITIONS IS REQUIRED

11. Anti-Ice/Deice - AS REQUIRED.
12. Throttles - AS REQUIRED, maintain sufficient thrust for wing anti-icing (WING ANTI-ICE lights extinguished).

ENVIRONMENTAL SYSTEM SMOKE OR ODOR

1. Oxygen Masks - DON and EMER.
2. Microphone Switches - MIC OXY MASK.

NOTE

Headsets or hats worn by the crew should be removed prior to donning the oxygen masks.

3. Smoke Goggles - DON (if required).
4. Cabin OVHD Fan - OFF.
5. DEFOG Fan - OFF.
6. PRESS SOURCE Select Knob - Isolate source by first selecting L.

NOTE

The PRESS SOURCE Select Knob must remain in each position long enough to allow adequate system purging to determine the source of smoke (approximately 1 minute).

IF SMOKE CONTINUES

7. PRESS SOURCE Select Knob - R (allow time for smoke to dissipate).

IF SMOKE STILL CONTINUES

8. PRESS SOURCE Select Knob - EMER (control cabin temperature with LH throttle).
9. Refer to Emergency Procedures, SMOKE REMOVAL.

(Continued Next Page)

SMOKE REMOVAL

NOTE

No action is normally required; however, if smoke is intense:

1. Oxygen Masks - DON and EMER.
2. Microphone Switches - MIC OXY MASK.

NOTE

Headsets or hats worn by the crew should be removed prior to donning the oxygen masks.

3. Smoke Goggles - DON (if required).
4. OXYGEN CONTROL Valve - MANUAL DROP.
5. Cockpit Divider - OPEN.
6. Passenger Oxygen - ENSURE passengers are receiving oxygen.
7. Passenger Advisory Light - PASS SAFETY.
8. EMER DUMP Switch - ON for normal power (utilize the manual toggle switch for emergency power situations).

NOTE

Cabin altitude will not exceed approximately 14,000 feet.

9. Refer to Abnormal Procedures, USE OF SUPPLEMENTAL OXYGEN.

IF SMOKE PERSISTS OR IT CANNOT BE VERIFIED THAT THERE IS NO FIRE

10. Land as soon as possible.

WARNING

WHETHER OR NOT SMOKE HAS DISSIPATED, IF IT CANNOT BE VISIBLY CONFIRMED THAT ANY FIRE HAS BEEN EXTINGUISHED FOLLOWING FIRE SUPPRESSION AND/OR SMOKE EVACUATION PROCEDURE, LAND IMMEDIATELY AT THE NEAREST SUITABLE AIRPORT.

ELECTRICAL FIRE OR SMOKE

1. Oxygen Masks - DON and EMER.
2. Microphone Switches - MIC OXY MASK.
3. Smoke Goggles - DON (if required).
4. PRESS SOURCE Select Knob - NORM.

NOTE

Headsets or hats worn by the crew should be removed prior to donning the oxygen masks.

(Continued Next Page)

ELECTRICAL FIRE OR SMOKE (Continued)

KNOWN SOURCE

5. Faulty Circuit(s) - PULL CIRCUIT BREAKER(s) to isolate.
6. Land as soon as practical.

UNKNOWN SOURCE

5. INTERIOR MASTER Switch - OFF.
6. Overhead FLOOD LTS - FULL BRIGHT.
7. BATT Switch - EMER.
8. L/R GEN Switches - OFF - With the battery switch in EMER and the generators OFF, a properly charged battery will supply power for approximately 30 minutes to the following equipment:

COMM 1	LH and RH N_1 Indicators	Overhead Flood Lights
NAV 1	Standby Pitot and Static Heaters	Pilot's and Copilot's Audio Panels
DG 1	Landing Gear Control & Indication	Standby HSI and Standby
RMU 1	Flap Control	Flight Display
	Standby Radio Control Head	Interior Entry Lights
		DME 1 (560-0552 only)

CAUTION

WHEN LANDING WITH EMERGENCY POWER (BATTERY SWITCH-EMER AND BOTH GENERATORS OFF), THE FOLLOWING ARE NOT AVAILABLE:

- THE ANTISKID/POWER BRAKE SYSTEM IS INOPERATIVE; ONLY THE EMERGENCY BRAKE SYSTEM IS AVAILABLE.
- THE WING AND ENGINE ANTI-ICE VALVES WILL BE OPEN. REFER TO ANTI-ICE ON THRUST CHARTS.
- THE RAM AIR TEMPERATURE GAUGE IS INOPERATIVE. SET GO-AROUND THRUST BASED ON REPORTED GROUND TEMPERATURE.
- ALL ENGINE INSTRUMENTS EXCEPT THE N_1 INDICATORS WILL BE INOPERATIVE.
- THE CABIN MUST BE DEPRESSURIZED WITH THE MANUAL TOGGLE SWITCH. THE EMERGENCY DUMP SWITCH IS INOPERATIVE.

NOTE

The standby flight display will continue to operate on its own emergency battery pack. This battery pack also provides 5-volt emergency instrument lighting for the standby flight display, standby HSI, N_1 indicator, and standby radio control head.

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ELECTRICAL FIRE OR SMOKE (Continued)

9. WINDSHIELD BLEED AIR Knobs - OFF UNLESS REQUIRED FOR ANTI-ICING.
10. Land as soon as practical (within 30 minutes).

IF SEVERITY OF SMOKE WARRANTS

11. Initiate Emergency Procedures, SMOKE REMOVAL and/or EMERGENCY DESCENT.
12. Land as soon as possible.

COCKPIT FIRE

13. Fire Extinguisher - UNSTOW and REMOVE SAFETY PIN (under copilot's seat).
14. Fire - LOCATE and EXTINGUISH.
15. Land as soon as possible.

CABIN FIRE

13. Fire Extinguisher - UNSTOW and REMOVE SAFETY PIN (aft cabin behind the aft, left seat).
14. Fire - LOCATE and EXTINGUISH.
15. Land as soon as possible.

WARNING

WHETHER OR NOT SMOKE HAS DISSIPATED, IF IT CANNOT BE VISIBLY CONFIRMED THAT ANY FIRE HAS BEEN EXTINGUISHED FOLLOWING FIRE SUPPRESSION AND/OR SMOKE EVACUATION, LAND IMMEDIATELY AT THE NEAREST SUITABLE AIRPORT.

NOTE

When flaps are at approach (15°) and the landing gear is down for the approach to landing, maintain V_{APP} +10 KIAS minimum.

WHEN LANDING ASSURED

16. Pressurization - ZERO DIFFERENTIAL PRIOR TO LANDING (use manual toggle switch to depressurize cabin).
17. Landing Gear - DOWN.
18. Flaps - LAND (35°).
19. Airspeed - V_{REF} +5 KIAS.
20. Landing - Use emergency brake system. Refer to Abnormal Procedures, WHEEL BRAKE FAILURE.

NOTE

For emergency braking, multiply landing distance by 2.3.

ELECTRICAL FIRE OR SMOKE (Continued)

KNOWN SOURCE

5. Faulty Circuit(s) - PULL CIRCUIT BREAKER(s) to isolate.
6. Land as soon as practical.

UNKNOWN SOURCE

5. INTERIOR MASTER Switch - OFF.
6. Overhead FLOOD LTS - FULL BRIGHT.
7. BATT Switch - EMER.
8. L/R GEN Switches - OFF - With the battery switch in EMER and the generators OFF, a properly charged battery will supply power for approximately 30 minutes to the following equipment:

COMM 1	LH and RH N_1 Indicators	Overhead Flood Lights
NAV 1	Standby Pitot and Static Heaters	Pilot's and Copilot's Audio Panels
DG 1	Landing Gear Control & Indication	Standby HSI and Standby
RMU 1	Flap Control	Flight Display
	Standby Radio Control Head	Interior Entry Lights
		DME 1 (560-0552 only)

CAUTION

WHEN LANDING WITH EMERGENCY POWER (BATTERY SWITCH-EMER AND BOTH GENERATORS OFF), THE FOLLOWING ARE NOT AVAILABLE:

- THE ANTISKID/POWER BRAKE SYSTEM IS INOPERATIVE; ONLY THE EMERGENCY BRAKE SYSTEM IS AVAILABLE.
- THE WING AND ENGINE ANTI-ICE VALVES WILL BE OPEN. REFER TO ANTI-ICE ON THRUST CHARTS.
- THE RAM AIR TEMPERATURE GAUGE IS INOPERATIVE. SET GO-AROUND THRUST BASED ON REPORTED GROUND TEMPERATURE.
- ALL ENGINE INSTRUMENTS EXCEPT THE N_1 INDICATORS WILL BE INOPERATIVE.
- THE CABIN MUST BE DEPRESSURIZED WITH THE MANUAL TOGGLE SWITCH. THE EMERGENCY DUMP SWITCH IS INOPERATIVE.

NOTE

The standby flight display will continue to operate on its own emergency battery pack. This battery pack also provides 5-volt emergency instrument lighting for the standby flight display, standby HSI, N_1 indicator, and standby radio control head.

(Continued Next Page)

ELECTRICAL FIRE OR SMOKE (Continued)

9. WINDSHIELD BLEED AIR Knobs - OFF UNLESS REQUIRED FOR ANTI-ICING.
10. Land as soon as practical (within 30 minutes).

IF SEVERITY OF SMOKE WARRANTS

11. Initiate Emergency Procedures, SMOKE REMOVAL and/or EMERGENCY DESCENT.
12. Land as soon as possible.

COCKPIT FIRE

13. Fire Extinguisher - UNSTOW and REMOVE SAFETY PIN (under copilot's seat).
14. Fire - LOCATE and EXTINGUISH.
15. Land as soon as possible.

CABIN FIRE

13. Fire Extinguisher - UNSTOW and REMOVE SAFETY PIN (aft cabin behind the aft, left seat).
14. Fire - LOCATE and EXTINGUISH.
15. Land as soon as possible.

WARNING

WHETHER OR NOT SMOKE HAS DISSIPATED, IF IT CANNOT BE VISIBLY CONFIRMED THAT ANY FIRE HAS BEEN EXTINGUISHED FOLLOWING FIRE SUPPRESSION AND/OR SMOKE EVACUATION, LAND IMMEDIATELY AT THE NEAREST SUITABLE AIRPORT.

WHEN LANDING ASSURED

16. Pressurization - ZERO DIFFERENTIAL PRIOR TO LANDING (use manual toggle switch to depressurize cabin).
17. Landing Gear - DOWN.
18. Flaps - LAND (35°).
19. Airspeed - V_{REF}.
20. Landing - Use emergency brake system. Refer to Abnormal Procedures, WHEEL BRAKE FAILURE.

NOTE

For emergency braking, multiply landing distance by 1.6.

ELECTRICAL FIRE OR SMOKE (Continued)

KNOWN SOURCE

5. Faulty Circuit(s) - PULL CIRCUIT BREAKER(s) to isolate.
6. Land as soon as practical.

UNKNOWN SOURCE

5. INTERIOR MASTER Switch - OFF.
6. Overhead FLOOD LTS - FULL BRIGHT.
7. BATT Switch - EMER.
8. L/R GEN Switches - OFF - With the battery switch in EMER and the generators OFF, a properly charged battery will supply power for approximately 30 minutes to the following equipment:

COMM 1	Engine Display LH Reversionary Channel	Overhead Flood Lights
NAV 1	Standby Pitot and Static Heaters	Pilot’s and Copilot’s Audio Panels
DG 1	Landing Gear Control & Indication	Standby HSI and Standby
RMU 1	Flap Control	Flight Display
	Standby Radio Control Head	Interior Entry Lights
		DME 1 (560-0552 only)

CAUTION

WHEN LANDING WITH EMERGENCY POWER (BATTERY SWITCH-EMER AND BOTH GENERATORS OFF), THE FOLLOWING ARE NOT AVAILABLE:

- THE ANTISKID/POWER BRAKE SYSTEM IS INOPERATIVE; ONLY THE EMERGENCY BRAKE SYSTEM IS AVAILABLE.
- THE WING AND ENGINE ANTI-ICE VALVES WILL BE OPEN. REFER TO ANTI-ICE ON THRUST CHARTS.
- OIL PRESSURE AND FUEL QUANTITY INDICATIONS ARE INOPERATIVE. BE AWARE OF FUEL DURATION.
- THE CABIN MUST BE DEPRESSURIZED WITH THE MANUAL TOGGLE SWITCH. THE EMERGENCY DUMP SWITCH IS INOPERATIVE.

NOTE

- The standby flight display will continue to operate on its own emergency battery pack. This battery pack also provides 5-volt emergency instrument lighting for the standby flight display, standby HSI, engine display (composite mode) and standby radio control head.
- With the battery switch in the EMER position and generators off, the engine display left reversionary channel will be operative in composite display mode. The fuel quantity indicator will display amber dashes "---", and the oil pressure indicator will display amber zeros "0" due to loss of DC power to the respective sensors. Display lighting intensity can be changed from a bright setting to a dim setting with the PANEL LIGHT CONTROL, OFF (DAY)/ON (NIGHT) toggle switch.

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ELECTRICAL FIRE OR SMOKE (Continued)

9. WINDSHIELD BLEED AIR Knobs - OFF.
10. Land as soon as practical (within 30 minutes).

IF SEVERITY OF SMOKE WARRANTS

11. Initiate Emergency Procedures, SMOKE REMOVAL and/or EMERGENCY DESCENT.
12. Land as soon as possible.

COCKPIT FIRE

13. Fire Extinguisher - UNSTOW and REMOVE SAFETY PIN (under copilot's seat).
14. Fire - LOCATE and EXTINGUISH.
15. Land as soon as possible.

CABIN FIRE

13. Fire Extinguisher - UNSTOW and REMOVE SAFETY PIN (aft cabin behind the aft, left seat).
14. Fire - LOCATE and EXTINGUISH.
15. Land as soon as possible.

WARNING

WHETHER OR NOT SMOKE HAS DISSIPATED, IF IT CANNOT BE VISIBLY CONFIRMED THAT ANY FIRE HAS BEEN EXTINGUISHED FOLLOWING FIRE SUPPRESSION AND/OR SMOKE EVACUATION, LAND IMMEDIATELY AT THE NEAREST SUITABLE AIRPORT.

NOTE

When flaps are at approach (15°) and the landing gear is down for the approach to landing, maintain V_{APP} +10 KIAS minimum.

WHEN LANDING ASSURED

16. Pressurization - ZERO DIFFERENTIAL PRIOR TO LANDING (use manual toggle switch to depressurize cabin).
17. Landing Gear - DOWN.
18. Flaps - LAND (35°).
19. Airspeed - V_{REF} +5 KIAS.
20. Landing - Use emergency brake system. Refer to Abnormal Procedures, WHEEL BRAKE FAILURE.

NOTE

For emergency braking, multiply landing distance by 2.3.

ELECTRICAL FIRE OR SMOKE (Continued)

KNOWN SOURCE

5. Faulty Circuit(s) - PULL CIRCUIT BREAKER(s) to isolate.
6. Land as soon as practical.

UNKNOWN SOURCE

5. INTERIOR MASTER Switch - OFF.
6. Overhead FLOOD LTS - FULL BRIGHT.
7. BATT Switch - EMER.
8. L/R GEN Switches - OFF - With the battery switch in EMER and the generators OFF, a properly charged battery will supply power for approximately 30 minutes to the following equipment:

COMM 1	Engine Display LH Reversionary Channel	Overhead Flood Lights
NAV 1	Standby Pitot and Static Heaters	Pilot's and Copilot's Audio Panels
DG 1	Landing Gear Control & Indication	Standby HSI and Standby
RMU 1	Flap Control	Flight Display
	Standby Radio Control Head	Interior Entry Lights
		DME 1 (560-0552 only)

CAUTION

WHEN LANDING WITH EMERGENCY POWER (BATTERY SWITCH-EMER AND BOTH GENERATORS OFF), THE FOLLOWING ARE NOT AVAILABLE:

- THE ANTISKID/POWER BRAKE SYSTEM IS INOPERATIVE; ONLY THE EMERGENCY BRAKE SYSTEM IS AVAILABLE.
- THE WING AND ENGINE ANTI-ICE VALVES WILL BE OPEN. REFER TO ANTI-ICE ON THRUST CHARTS.
- OIL PRESSURE AND FUEL QUANTITY INDICATIONS ARE INOPERATIVE. BE AWARE OF FUEL DURATION.
- THE CABIN MUST BE DEPRESSURIZED WITH THE MANUAL TOGGLE SWITCH. THE EMERGENCY DUMP SWITCH IS INOPERATIVE.

NOTE

- The standby flight display will continue to operate on its own emergency battery pack. This battery pack also provides 5-volt emergency instrument lighting for the standby flight display, standby HSI, engine display (composite mode) and standby radio control head.
- With the battery switch in the EMER position and generators off, the engine display left reversionary channel will be operative in composite display mode. The fuel quantity indicator will display amber dashes "---", and the oil pressure indicator will display amber zeros "0" due to loss of DC power to the respective sensors. Display lighting intensity can be changed from a bright setting to a dim setting with the PANEL LIGHT CONTROL, OFF (DAY)/ON (NIGHT) toggle switch.

(Continued Next Page)

ELECTRICAL FIRE OR SMOKE (Continued)

9. WINDSHIELD BLEED AIR Knobs - OFF.
10. Land as soon as practical (within 30 minutes).

IF SEVERITY OF SMOKE WARRANTS

11. Initiate Emergency Procedures, SMOKE REMOVAL and/or EMERGENCY DESCENT.
12. Land as soon as possible.

COCKPIT FIRE

13. Fire Extinguisher - UNSTOW and REMOVE SAFETY PIN (under copilot's seat).
14. Fire - LOCATE and EXTINGUISH.
15. Land as soon as possible.

CABIN FIRE

13. Fire Extinguisher - UNSTOW and REMOVE SAFETY PIN (aft cabin behind the aft, left seat).
14. Fire - LOCATE and EXTINGUISH.
15. Land as soon as possible.

WARNING

WHETHER OR NOT SMOKE HAS DISSIPATED, IF IT CANNOT BE VISIBLY CONFIRMED THAT ANY FIRE HAS BEEN EXTINGUISHED FOLLOWING FIRE SUPPRESSION AND/OR SMOKE EVACUATION, LAND IMMEDIATELY AT THE NEAREST SUITABLE AIRPORT.

WHEN LANDING ASSURED

16. Pressurization - ZERO DIFFERENTIAL PRIOR TO LANDING (use manual toggle switch to depressurize cabin).
17. Landing Gear - DOWN.
18. Flaps - LAND (35°).
19. Airspeed - V_{REF}.
20. Landing - Use emergency brake system. Refer to Abnormal Procedures, WHEEL BRAKE FAILURE.

NOTE

For emergency braking, multiply landing distance by 1.6.

ELECTRICAL FIRE OR SMOKE

KNOWN SOURCE

5. Faulty Circuit(s) - PULL CIRCUIT BREAKER(s) to isolate.
6. Land as soon as practical.

UNKNOWN SOURCE

5. INTERIOR MASTER Switch - OFF.
6. Overhead FLOOD LTS - FULL BRIGHT.
7. BATT Switch - EMER.
8. L/R GEN Switches - OFF - With the battery switch in EMER and the generators OFF, a properly charged battery will supply power for approximately 30 minutes to the following equipment:

COMM 1	Engine Display LH Reversionary Channel	Overhead Flood Lights
NAV 1	Standby Pitot and Static Heaters	Pilot's and Copilot's Audio Panels
DG 1	Landing Gear Control & Indication	Standby HSI and Standby
RMU 1	Flap Control	Flight Display
	Standby Radio Control Head	Interior Entry Lights
		DME 1 (560-0552 only)

CAUTION

WHEN LANDING WITH EMERGENCY POWER (BATTERY SWITCH-EMER AND BOTH GENERATORS OFF), THE FOLLOWING ARE NOT AVAILABLE:

- THE ANTISKID/POWER BRAKE SYSTEM IS INOPERATIVE; ONLY THE EMERGENCY BRAKE SYSTEM IS AVAILABLE.
- THE WING AND ENGINE ANTI-ICE VALVES WILL BE OPEN. REFER TO ANTI-ICE ON THRUST CHARTS.
- OIL PRESSURE AND FUEL QUANTITY INDICATIONS ARE INOPERATIVE. BE AWARE OF FUEL DURATION.
- THE CABIN MUST BE DEPRESSURIZED WITH THE MANUAL TOGGLE SWITCH. THE EMERGENCY DUMP SWITCH IS INOPERATIVE.

NOTE

- The standby flight display will continue to operate on its own emergency battery pack. This battery pack also provides 5-volt emergency instrument lighting for the standby flight display, standby HSI, engine display (composite mode) and standby radio control head.
- With the battery switch in the EMER position and generators off, the engine display left reversionary channel will be operative in composite display mode. Fuel Quantity will display amber dashes "--" and Oil Pressure will display amber zeros "0" due to no DC power to the respective sensors.

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ELECTRICAL FIRE OR SMOKE (Continued)

9. WINDSHIELD BLEED AIR Knobs - OFF.
10. Land as soon as practical (within 30 minutes).

IF SEVERITY OF SMOKE WARRANTS

11. Initiate Emergency Procedures, SMOKE REMOVAL and/or EMERGENCY DESCENT.
12. Land as soon as possible.

COCKPIT FIRE

13. Fire Extinguisher - UNSTOW and REMOVE SAFETY PIN (under copilot's seat).
14. Fire - LOCATE and EXTINGUISH.
15. Land as soon as possible.

CABIN FIRE

13. Fire Extinguisher - UNSTOW and REMOVE SAFETY PIN (aft cabin behind the aft, left seat).
14. Fire - LOCATE and EXTINGUISH.
15. Land as soon as possible.

WARNING

WHETHER OR NOT SMOKE HAS DISSIPATED, IF IT CANNOT BE VISIBLY CONFIRMED THAT ANY FIRE HAS BEEN EXTINGUISHED FOLLOWING FIRE SUPPRESSION AND/OR SMOKE EVACUATION, LAND IMMEDIATELY AT THE NEAREST SUITABLE AIRPORT.

NOTE

When flaps are at approach (15°) and the landing gear is down for the approach to landing, maintain V_{APP} +10 KIAS minimum.

WHEN LANDING ASSURED

16. Pressurization - ZERO DIFFERENTIAL PRIOR TO LANDING (use manual toggle switch to depressurize cabin).
17. Landing Gear - DOWN.
18. Flaps - LAND (35°).
19. Airspeed - V_{REF} +5 KIAS.
20. Landing - Use emergency brake system. Refer to Abnormal Procedures, WHEEL BRAKE FAILURE.

NOTE

For emergency braking, multiply landing distance by 2.3.

ELECTRICAL FIRE OR SMOKE (Continued)

KNOWN SOURCE

5. Faulty Circuit(s) - PULL CIRCUIT BREAKER(s) to isolate.
6. Land as soon as practical.

UNKNOWN SOURCE

5. INTERIOR MASTER Switch - OFF.
6. Overhead FLOOD LTS - FULL BRIGHT.
7. BATT Switch - EMER.
8. L/R GEN Switches - OFF - With the battery switch in EMER and the generators OFF, a properly charged battery will supply power for approximately 30 minutes to the following equipment:

COMM 1	Engine Display LH Reversionary Channel	Overhead Flood Lights
NAV 1	Standby Pitot and Static Heaters	Pilot's and Copilot's Audio Panels
DG 1	Landing Gear Control & Indication	Standby HSI and Standby
RMU 1	Flap Control	Flight Display
	Standby Radio Control Head	Interior Entry Lights
		DME 1 (560-0552 only)

CAUTION

WHEN LANDING WITH EMERGENCY POWER (BATTERY SWITCH-EMER AND BOTH GENERATORS OFF), THE FOLLOWING ARE NOT AVAILABLE:

- THE ANTISKID/POWER BRAKE SYSTEM IS INOPERATIVE; ONLY THE EMERGENCY BRAKE SYSTEM IS AVAILABLE.
- THE WING AND ENGINE ANTI-ICE VALVES WILL BE OPEN. REFER TO ANTI-ICE ON THRUST CHARTS.
- OIL PRESSURE AND FUEL QUANTITY INDICATIONS ARE INOPERATIVE. BE AWARE OF FUEL DURATION.
- THE CABIN MUST BE DEPRESSURIZED WITH THE MANUAL TOGGLE SWITCH. THE EMERGENCY DUMP SWITCH IS INOPERATIVE.

NOTE

- The standby flight display will continue to operate on its own emergency battery pack. This battery pack also provides 5-volt emergency instrument lighting for the standby flight display, standby HSI, engine display (composite mode) and standby radio control head.
- With the battery switch in the EMER position and generators off, the engine display left reversionary channel will be operative in composite display mode. Fuel Quantity will display amber dashes "--" and Oil Pressure will display amber zeros "0" due to no DC power to the respective sensors.

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ELECTRICAL FIRE OR SMOKE (Continued)

9. WINDSHIELD BLEED AIR Knobs - OFF.
10. Land as soon as practical (within 30 minutes).

IF SEVERITY OF SMOKE WARRANTS

11. Initiate Emergency Procedures, SMOKE REMOVAL and/or EMERGENCY DESCENT.
12. Land as soon as possible.

COCKPIT FIRE

13. Fire Extinguisher - UNSTOW and REMOVE SAFETY PIN (under copilot's seat).
14. Fire - LOCATE and EXTINGUISH.
15. Land as soon as possible.

CABIN FIRE

13. Fire Extinguisher - UNSTOW and REMOVE SAFETY PIN (aft cabin behind the aft, left seat).
14. Fire - LOCATE and EXTINGUISH.
15. Land as soon as possible.

WARNING

WHETHER OR NOT SMOKE HAS DISSIPATED, IF IT CANNOT BE VISIBLY CONFIRMED THAT ANY FIRE HAS BEEN EXTINGUISHED FOLLOWING FIRE SUPPRESSION AND/OR SMOKE EVACUATION, LAND IMMEDIATELY AT THE NEAREST SUITABLE AIRPORT.

WHEN LANDING ASSURED

16. Pressurization - ZERO DIFFERENTIAL PRIOR TO LANDING (use manual toggle switch to depressurize cabin).
17. Landing Gear - DOWN.
18. Flaps - LAND (35°).
19. Airspeed - V_{REF}.
20. Landing - Use emergency brake system. Refer to Abnormal Procedures, WHEEL BRAKE FAILURE.

NOTE

For emergency braking, multiply landing distance by 1.6.

BATTERY OVERTEMPERATURE (BATT O'TEMP WARNING LIGHT ON)

1. Amperage - NOTE.
2. BATT Switch - EMER.
3. Amperage - NOTE DECREASE.

NOTE

If current decreases and battery voltage is 1 volt less than generator voltage in 30 seconds to 2 minutes, monitor battery overheat annunciator for possible change.

IF NO VOLT/AMP DECREASE (Battery Relay Stuck)

4. BATT Switch - BATT.
5. BATTERY DISCONNECT Switch (LH panel) - LIFT GUARD AND DISC.
6. Amperage - NOTE DECREASE.

IF BATT O'TEMP WARNING LIGHT DOES NOT GO OUT OR >160° WARNING LIGHT ILLUMINATES

7. Land as soon as possible.

IF BATT O'TEMP WARNING LIGHT GOES OUT

7. BATTERY DISCONNECT Switch (LH panel) - NORM AND CLOSE GUARD.
8. Land as soon as practical.

IF VOLT/AMP DECREASE

4. BATT Switch - OFF (voltmeter will be inoperative).

IF BATT O'TEMP WARNING LIGHT GOES OUT

5. BATT Switch - BATT.
6. Continue flight (as desired).

CAUTION

- PROLONGED OPERATION WITH THE BATTERY DISCONNECT SWITCH DISCONNECTED AND THE BATT SWITCH ON WILL GRADUALLY DEPLETE THE BATTERY THROUGH THE BATTERY DISCONNECT RELAY. STARTER ASSISTED AIRSTARTS WILL NOT BE AVAILABLE.

- AFTER LANDING, REFER TO AIRPLANE MAINTENANCE MANUAL FOR PROPER MAINTENANCE PROCEDURES, AS DAMAGE TO THE BATTERY MAY HAVE OCCURRED.

LOSS OF BOTH GENERATORS (GEN OFF L AND R CAUTION LIGHTS ON AND MASTER WARNING)

1. L/R GEN Switches - RESET THEN GEN.

IF NEITHER GENERATOR COMES ON

2. Overhead FLOOD LTS - FULL BRIGHT.
3. BATT Switch - EMER. With the battery switch in EMER and the generators OFF, a properly charged battery will supply power for approximately 30 minutes to the following equipment:

COMM 1	LH and RH N_1 Indicators	Overhead Flood Lights
NAV 1	Standby Pitot and Static Heaters	Pilot's and Copilot's Audio Panels
DG 1	Landing Gear Control & Indication	Standby HSI and Standby
RMU 1	Flap Control	Flight Display
	Standby Radio Control Head	Interior Entry Lights
		DME 1 (560-0552 only)

CAUTION

WHEN LANDING WITH EMERGENCY POWER (BATTERY SWITCH-EMER AND BOTH GENERATORS OFF), THE FOLLOWING ARE NOT AVAILABLE:

- THE ANTISKID/POWER BRAKE SYSTEM IS INOPERATIVE; ONLY THE EMERGENCY BRAKE SYSTEM IS AVAILABLE.
- THE WING AND ENGINE ANTI-ICE VALVES WILL BE OPEN. REFER TO ANTI-ICE ON THRUST CHARTS.
- THE RAM AIR TEMPERATURE GAUGE IS INOPERATIVE. SET GO-AROUND THRUST BASED ON REPORTED GROUND TEMPERATURE.
- ALL ENGINE INSTRUMENTS EXCEPT THE N_1 INDICATORS WILL BE INOPERATIVE.
- THE CABIN MUST BE DEPRESSURIZED WITH THE MANUAL TOGGLE SWITCH. THE EMERGENCY DUMP SWITCH IS INOPERATIVE.

NOTE

The standby flight display will continue to operate on its own emergency battery pack. This battery pack also provides 5-volt emergency instrument lighting for the standby flight display, standby HSI, N_1 indicator and standby radio control head.

4. WINDSHIELD BLEED AIR Knobs - OFF UNLESS REQUIRED FOR ANTI-ICING.
5. Land as soon as practical (within 30 minutes).

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BATTERY OVERTEMPERATURE (BATT O'TEMP WARNING LIGHT ON)

1. Amperage - NOTE.
2. BATT Switch - EMER.
3. Amperage - NOTE DECREASE.

NOTE

If current decreases and battery voltage is 1 volt less than generator voltage in 30 seconds to 2 minutes, monitor battery overheat annunciator for possible change.

IF NO VOLT/AMP DECREASE (Battery Relay Stuck)

4. BATT Switch - BATT.
5. BATTERY DISCONNECT Switch (LH panel) - LIFT GUARD AND DISC.
6. Amperage - NOTE DECREASE.

IF BATT O'TEMP WARNING LIGHT DOES NOT GO OUT OR >160° WARNING LIGHT ILLUMINATES

7. Land as soon as possible.

IF BATT O'TEMP WARNING LIGHT GOES OUT

7. BATTERY DISCONNECT Switch (LH panel) - NORM AND CLOSE GUARD.
8. Land as soon as practical.

IF VOLT/AMP DECREASE

4. BATT Switch - OFF (voltmeter will be inoperative).

IF BATT O'TEMP WARNING LIGHT GOES OUT

5. BATT Switch - BATT.
6. Continue flight (as desired).

CAUTION

- PROLONGED OPERATION WITH THE BATTERY DISCONNECT SWITCH DISCONNECTED AND THE BATT SWITCH ON WILL GRADUALLY DEPLETE THE BATTERY THROUGH THE BATTERY DISCONNECT RELAY. STARTER ASSISTED AIRSTARTS WILL NOT BE AVAILABLE.
- AFTER LANDING, REFER TO AIRPLANE MAINTENANCE MANUAL FOR PROPER MAINTENANCE PROCEDURES, AS DAMAGE TO THE BATTERY MAY HAVE OCCURRED.

LOSS OF BOTH GENERATORS (GEN OFF L AND R CAUTION LIGHTS ON AND MASTER WARNING)

1. L/R GEN Switches - RESET THEN GEN.

IF NEITHER GENERATOR COMES ON

2. Overhead FLOOD LTS - FULL BRIGHT.
3. BATT Switch - EMER. With the battery switch in EMER and the generators OFF, a properly charged battery will supply power for approximately 30 minutes to the following equipment:

COMM 1	Engine Display LH Reversionary Channel	Overhead Flood Lights
NAV 1	Standby Pitot and Static Heaters	Pilot's and Copilot's Audio Panels
DG 1	Landing Gear Control & Indication	Standby HSI and Standby
RMU 1	Flap Control	Flight Display
	Standby Radio Control Head	Interior Entry Lights
		DME 1 (560-0552 only)

CAUTION

WHEN LANDING WITH EMERGENCY POWER (BATTERY SWITCH-EMER AND BOTH GENERATORS OFF), THE FOLLOWING ARE NOT AVAILABLE:

- THE ANTISKID/POWER BRAKE SYSTEM IS INOPERATIVE; ONLY THE EMERGENCY BRAKE SYSTEM IS AVAILABLE.
- THE WING AND ENGINE ANTI-ICE VALVES WILL BE OPEN. REFER TO ANTI-ICE ON THRUST CHARTS.
- OIL PRESSURE AND FUEL QUANTITY INDICATIONS ARE INOPERATIVE. BE AWARE OF FUEL DURATION.
- THE CABIN MUST BE DEPRESSURIZED WITH THE MANUAL TOGGLE SWITCH. THE EMERGENCY DUMP SWITCH IS INOPERATIVE.

NOTE

- The standby flight display will continue to operate on its own emergency battery pack. This battery pack also provides 5 volt emergency instrument lighting for the standby flight display, standby HSI, engine display (composite mode), and standby radio control head.
- With the battery switch in the EMER position and generators off, the engine display left reversionary channel will be operative in composite display mode. The fuel quantity indicator will display amber dashes "---", and the oil pressure indicator will display amber zeros "0" due to loss of DC power to the respective sensors. Display lighting intensity can be changed from a bright setting to a dim setting with the PANEL LIGHT CONTROL, OFF (DAY)/ON (NIGHT) toggle switch.

4. WINDSHIELD BLEED AIR Knobs - OFF UNLESS REQUIRED FOR ANTI-ICING.
5. Land as soon as practical (within 30 minutes).

(Continued Next Page)

BATTERY OVERTEMPERATURE (BATT O'TEMP WARNING LIGHT ON)

1. Amperage - NOTE.
2. BATT Switch - EMER.
3. Amperage - NOTE DECREASE.

NOTE

If current decreases and battery voltage is 1 volt less than generator voltage in 30 seconds to 2 minutes, monitor battery overheat annunciator for possible change.

IF NO VOLT/AMP DECREASE (Battery Relay Stuck)

4. BATT Switch - BATT.
5. BATTERY DISCONNECT Switch (LH panel) - LIFT GUARD AND DISC.
6. Amperage - NOTE DECREASE.

IF BATT O'TEMP WARNING LIGHT DOES NOT GO OUT OR >160° WARNING LIGHT ILLUMINATES

7. Land as soon as possible.

IF BATT O'TEMP WARNING LIGHT GOES OUT

7. BATTERY DISCONNECT Switch (LH panel) - NORM AND CLOSE GUARD.
8. Land as soon as practical.

IF VOLT/AMP DECREASE

4. BATT Switch - OFF (voltmeter will be inoperative).

IF BATT O'TEMP WARNING LIGHT GOES OUT

5. BATT Switch - BATT.
6. Continue flight (as desired).

CAUTION

- PROLONGED OPERATION WITH THE BATTERY DISCONNECT SWITCH DISCONNECTED AND THE BATT SWITCH ON WILL GRADUALLY DEPLETE THE BATTERY THROUGH THE BATTERY DISCONNECT RELAY. STARTER ASSISTED AIRSTARTS WILL NOT BE AVAILABLE.

- AFTER LANDING, REFER TO AIRPLANE MAINTENANCE MANUAL FOR PROPER MAINTENANCE PROCEDURES, AS DAMAGE TO THE BATTERY MAY HAVE OCCURRED.

LOSS OF BOTH GENERATORS (GEN OFF L AND R CAUTION LIGHTS ON AND MASTER WARNING)

1. L/R GEN Switches - RESET THEN GEN.

IF NEITHER GENERATOR COMES ON

2. Overhead FLOOD LTS - FULL BRIGHT.
3. BATT Switch - EMER. With the battery switch in EMER and the generators OFF, a properly charged battery will supply power for approximately 30 minutes to the following equipment:

COMM 1	Engine Display LH Reversionary Channel	Overhead Flood Lights
NAV 1	Standby Pitot and Static Heaters	Pilot's and Copilot's Audio Panels
DG 1	Landing Gear Control & Indication	Standby HSI and Standby Flight Display
RMU 1	Flap Control	Interior Entry Lights
	Standby Radio Control Head	DME 1 (560-0552 only)

CAUTION

WHEN LANDING WITH EMERGENCY POWER (BATTERY SWITCH-EMER AND BOTH GENERATORS OFF), THE FOLLOWING ARE NOT AVAILABLE:

- THE ANTISKID/POWER BRAKE SYSTEM IS INOPERATIVE; ONLY THE EMERGENCY BRAKE SYSTEM IS AVAILABLE.
- THE WING AND ENGINE ANTI-ICE VALVES WILL BE OPEN. REFER TO ANTI-ICE ON THRUST CHARTS.
- OIL PRESSURE AND FUEL QUANTITY INDICATIONS ARE INOPERATIVE. BE AWARE OF FUEL DURATION.
- THE CABIN MUST BE DEPRESSURIZED WITH THE MANUAL TOGGLE SWITCH. THE EMERGENCY DUMP SWITCH IS INOPERATIVE.

NOTE

- The standby flight display will continue to operate on its own emergency battery pack. This battery pack also provides 5 volt emergency instrument lighting for the standby flight display, standby HSI, engine display (composite mode), and standby radio control head.
- With the battery switch in the EMER position and generators OFF, the Engine Display LH Reversionary Channel will be operative in composite display mode. Fuel Quantity Indicator will display amber dashes "---", and Oil Pressure Indicator will display amber zeros "0" due to loss of DC power to the respective sensors.

4. WINDSHIELD BLEED AIR Knobs - OFF UNLESS REQUIRED FOR ANTI-ICING.
5. Land as soon as practical (within 30 minutes).

(Continued Next Page)

LOSS OF BOTH GENERATORS (GEN OFF L AND R CAUTION LIGHTS ON AND MASTER WARNING) (Continued)

NOTE

When flaps are at approach (15°) and the landing gear is down for the approach to landing, maintain V_{APP} +10 KIAS minimum.

WHEN LANDING ASSURED

6. Pressurization - ZERO DIFFERENTIAL PRIOR TO LANDING (use manual toggle switch to depressurize cabin).
7. Landing Gear - DOWN.
8. Flaps - LAND (35°).
9. Airspeed - V_{REF} +5 KIAS.
10. Landing - Use emergency brake system. Refer to Abnormal Procedures, WHEEL BRAKE FAILURE.

NOTE

For emergency braking, multiply landing distance by 2.3.

IF ONLY ONE GENERATOR COMES ON

2. Electrical Load - REDUCE as required.
3. Air Conditioner Compressor - OFF or FAN.

NOTE

The Interior Master Switch, located on the LH Oxygen Panel, will shed all non-essential passenger cabin electrical loads.

AC POWER FAILURE (AC FAIL AND MASTER WARNING LIGHTS ON) AND DUAL INVERTER FAILURE (MASTER CAUTION AND INVTR FAIL 1 AND 2 CAUTION LIGHTS ON)

1. BATT Switch - EMER.
2. Refer to standby flight display and standby HSI.

NOTE

Placing the battery switch to EMER will provide AC power from the static inverter in DG1 to power the standby HSI compass display. Both compass and NAV1 information will be displayed on the standby HSI. The PFD's and MFD will be inoperative with an AC power system failure.

3. INV 1/INV 2 Switch - NORM.
4. AC INVERTER NO. 1 (LH panel) and NO. 2 (RH panel) Circuit Breakers - CHECK and RESET.

IF BOTH INVERTERS WILL NOT RESET

5. AC INVERTER NO. 1 Circuit Breaker (LH panel) - PULL.
6. INVTR FAIL 2 Annunciator - CHECK (No annunciation indicates recovery of Inverter 2). Refer to IF INVERTER 1 OR 2 RECOVERS.

NOTE

If Inverter NO. 2 recovers, do not reset AC INVERTER NO. 1 breaker.

(Continued Next Page)

AC POWER FAILURE (AC FAIL AND MASTER WARNING LIGHTS ON) AND DUAL INVERTER FAILURE (MASTER CAUTION AND INVTR FAIL 1 AND 2 CAUTION LIGHTS ON) (Continued)

IF INVTR FAIL 2 ANNUNCIATOR REMAINS ILLUMINATED

7. AC INVERTER NO. 2 Circuit Breaker (RH panel) - PULL.
8. AC INVERTER NO. 1 Circuit Breaker (LH panel) - RESET.
9. INVTR FAIL 1 Annunciator - CHECK (No annunciation indicates recovery of Inverter 1). Refer to IF INVERTER 1 OR 2 RECOVERS.

NOTE

If Inverter NO. 1 recovers, do not reset AC INVERTER NO. 2 breaker.

IF BOTH INVERTERS REMAIN FAILED

10. Overhead FLOOD LTS - FULL BRIGHT.
11. Continue reference to standby instruments for remainder of flight.
12. Land as soon as practical (within 30 minutes).

IF INVERTER 1 OR 2 RECOVERS (INVTR FAIL 1 OR 2 ANNUNCIATOR EXTINGUISHED)

10. INV 1/INV 2 Switch - SELECT Operating Inverter.
11. BATT Switch - BATT.
12. Land as soon as practical.

NOTE

When flaps are at approach (15°) and the landing gear is down for the approach to landing, maintain V_{APP} +10 KIAS minimum.

WHEN LANDING ASSURED

13. Landing Gear - DOWN.
14. Flaps - LAND (35°).
15. Airspeed - V_{REF} +5 KIAS.

NOTE

Multiply landing distance by 1.5

IF BOTH INVERTERS RESET

5. BATT Switch - BATT.

AC POWER AND/OR DISTRIBUTION FAILURE (AC FAIL WARNING LIGHT ON AFTER MASTER WARNING RESET, INVTR FAIL 1 AND 2 CAUTION LIGHTS OUT)

1. AVIONICS AC Circuit Breakers (RH panel) - CHECK.

CAUTION

DO NOT RESET CIRCUIT BREAKER(S) IF DISENGAGED, FURTHER DAMAGE TO THE ELECTRICAL SYSTEM MAY RESULT.

2. Land as soon as practical.

LOSS OF BOTH GENERATORS (GEN OFF L AND R CAUTION LIGHTS ON AND MASTER WARNING) (Continued)

WHEN LANDING ASSURED

6. Pressurization - ZERO DIFFERENTIAL PRIOR TO LANDING (use manual toggle switch to depressurize cabin).
7. Landing Gear - DOWN.
8. Flaps - LAND (35°).
9. Airspeed - V_{REF}.
10. Landing - Use emergency brake system. Refer to Abnormal Procedures, WHEEL BRAKE FAILURE.

NOTE

For emergency braking, multiply landing distance by 1.6.

IF ONLY ONE GENERATOR COMES ON

2. Electrical Load - REDUCE as required.
3. Air Conditioner Compressor - OFF or FAN.

NOTE

The Interior Master Switch, located on the LH Oxygen Panel, will shed all non-essential passenger cabin electrical loads.

AC POWER FAILURE (AC FAIL AND MASTER WARNING LIGHTS ON) AND DUAL INVERTER FAILURE (MASTER CAUTION AND INVTR FAIL 1 AND 2 CAUTION LIGHTS ON)

1. BATT Switch - EMER.
2. Refer to standby flight display and standby HSI.

NOTE

Placing the battery switch to EMER will provide AC power from the static inverter in DG1 to power the standby HSI compass display. Both compass and NAV1 information will be displayed on the standby HSI. The PFD's and MFD will be inoperative with an AC power system failure.

3. INV 1/INV 2 Switch - NORM.
4. AC INVERTER NO. 1 (LH panel) and NO. 2 (RH panel) Circuit Breakers - CHECK and RESET.

IF BOTH INVERTERS WILL NOT RESET

5. AC INVERTER NO. 1 Circuit Breaker (LH panel) - PULL.
6. INVTR FAIL 2 Annunciator - CHECK (No annunciation indicates recovery of Inverter 2). Refer to IF INVERTER 1 OR 2 RECOVERS.

NOTE

If Inverter NO. 2 recovers, do not reset AC INVERTER NO. 1 breaker.

(Continued Next Page)

AC POWER FAILURE (AC FAIL AND MASTER WARNING LIGHTS ON) AND DUAL INVERTER FAILURE (MASTER CAUTION AND INVTR FAIL 1 AND 2 CAUTION LIGHTS ON) (Continued)

IF INVTR FAIL 2 ANNUNCIATOR REMAINS ILLUMINATED

7. AC INVERTER NO. 2 Circuit Breaker (RH panel) - PULL.
8. AC INVERTER NO. 1 Circuit Breaker (LH panel) - RESET.
9. INVTR FAIL 1 Annunciator - CHECK (No annunciation indicates recovery of Inverter 1).Refer to IF INVERTER 1 OR 2 RECOVERS.

NOTE

If Inverter NO. 1 recovers, do not reset AC INVERTER NO. 2 breaker.

IF BOTH INVERTERS REMAIN FAILED

10. Overhead FLOOD LTS - FULL BRIGHT.
11. Continue reference to standby instruments for remainder of flight.
12. Land as soon as practical (within 30 minutes).

IF INVERTER 1 OR 2 RECOVERS (INVTR FAIL 1 OR 2 ANNUNCIATOR EXTINGUISHED)

10. INV 1/INV 2 Switch - SELECT Operating Inverter.
11. BATT Switch - BATT.
12. Land as soon as practical.

WHEN LANDING ASSURED

13. Landing Gear - DOWN.
14. Flaps - LAND (35°).
15. Airspeed - V_{REF}.

IF BOTH INVERTERS RESET

5. BATT Switch - BATT.

AC POWER AND/OR DISTRIBUTION FAILURE (AC FAIL WARNING LIGHT ON AFTER MASTER WARNING RESET, INVTR FAIL 1 AND 2 CAUTION LIGHTS OUT)

1. AVIONICS AC Circuit Breakers (RH panel) - CHECK.

CAUTION

DO NOT RESET CIRCUIT BREAKER(S) IF DISENGAGED, FURTHER DAMAGE TO THE ELECTRICAL SYSTEM MAY RESULT.

2. Land as soon as practical.

PFD/MFD RED GUN FAILURE

The failure of a red gun in an electronic display indicator results in the following presentations:

PFD - Sky turns from dark blue to a dull dark blue.
Ground turns from brown to green hue
Compass rose turns from white to blue.

1. Use display with caution - MONITOR remaining displays for any red annunciators.

WARNING

FOLLOWING A FAILURE OF A RED GUN IN A DISPLAY UNIT, THE RED WARNING ANNUNCIATORS WILL NOT BE VISIBLE.

2. Land as soon as practical.

PFD ATTITUDE FAILURE - DUAL (RED ATT FAIL ON PFD ADI)

1. Airplane Attitude - CONTROL by reference to appropriate standby attitude source.
2. Land as soon as practical.

PFD HEADING FAILURE - DUAL (RED HDG FAIL ON PFD HSI)

1. Airplane Heading - CONTROL by reference to appropriate standby magnetic heading source.
2. Land as soon as practical.

AIR DATA COMPUTER FAILURE - DUAL (RED X ON PFD AIRSPEED/ALTITUDE TAPE)

1. Airplane Airspeed and Altitude - MONITOR by reference to standby flight display.
2. Land as soon as practical.
3. Refer to Abnormal Procedure, CABIN PRESSURIZATION CONTROLLER FAILURE.

DISPLAY GUIDANCE COMPUTER FAILURE - DUAL (RED “X” OR BLANK PFD’S/MFD)

1. Airplane - CONTROL by reference to standby flight display.
2. Land as soon as practical.

AUTOPILOT MALFUNCTION

1. AP TRIM DISC Switch - PRESS and RELEASE.

NOTE

- The autopilot monitors normally detect failures and automatically disengages the autopilot.
- Maximum altitude loss for autopilot malfunction:

Enroute	400 feet at 37,000 MSL
Climb	0 Feet at 17,000 MSL
ILS Approach	40 Feet. (Maximum deviation below glideslope during recovery from a failure at the critical fault point.) Refer to Figure 3-2 for Glideslope Deviation Profile.

AUTOPILOT GLIDESLOPE DEVIATION PROFILE

CONDITIONS:

Airspeed	- V_{REF}
Flaps	- Land
Gear	- Down
Delay	- One second from fault recognition. Pilot's hands on control wheel and throttles during the approach.

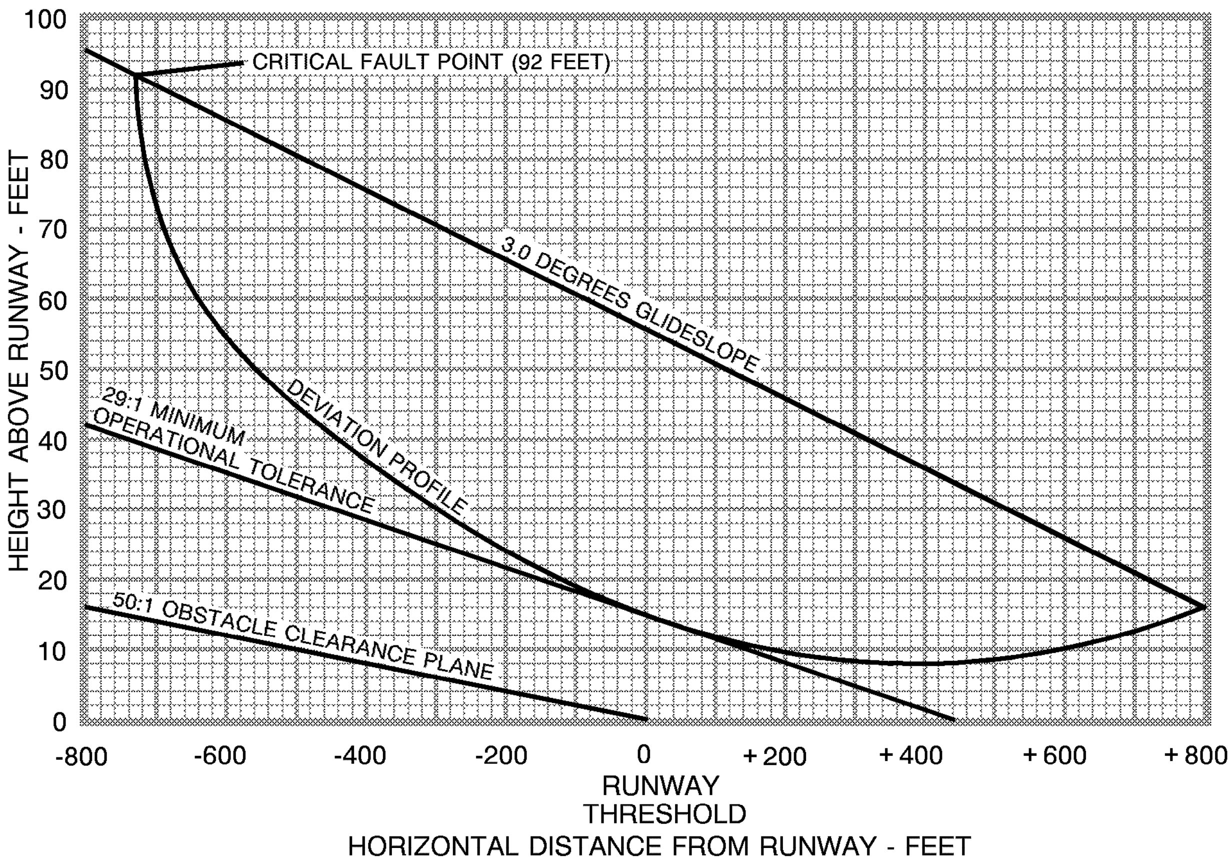


Figure 3-2

EMERGENCY EVACUATION

1. Parking Brake - SET.
2. Throttles - BOTH OFF.
3. LH/RH ENGINE FIRE Switches - BOTH PRESS.
4. LH/RH Fire Bottle Armed Switches - BOTH PRESS (if fire suspected).
5. Passenger Advisory Lights - PASS SAFETY.
6. BATT Switch - OFF.

7. Airplane and Immediate Area - CHECK for BEST ESCAPE ROUTE.

IF THRU CABIN DOOR

8. Cabin Door - OPEN.
9. Move away from airplane.

IF THRU EMERGENCY EXIT

8. Emergency Exit - REMOVE and THROW OUT of airplane.
9. Move away from airplane.

DITCHING

Ditching is not approved under 14 CFR 25.801 and was not conducted during certification testing of the airplane. Should ditching be required, the following procedures are recommended:

PRELIMINARY

1. PRESS SOURCE Select Knob - OFF (A/C Altitude $\leq$ 10,000 Feet MSL).
2. Radio - MAYDAY.
3. Transponder - Emergency (7700).
4. Emergency Locator Beacon - ON.
5. ATC - ADVISE.
6. Passenger Advisory Lights - PASS SAFETY.
7. Passengers - BRIEF.
   a. Verify passenger seats are full upright, outboard and positioned aft or forward to clear all exit doors, seat belts and shoulder harnesses secure, and stow loose items securely.
   b. Don life vests (do not inflate).
8. Ditching Heading - Parallel to Major Swell System.

APPROACH

1. Landing Gear - UP.
2. Speed Brakes - RETRACT.
3. Flaps - LAND (35°) (aural gear warning will not cancel).
4. Rate of Descent - 200 to 300 feet/minute (maintain V_{REF}).
5. Approach Speed - V_{REF}.

NOTE

Plan approach to parallel any uniform swell pattern and attempt to touch down along a wave crest or just behind it. If the surface wind is very strong or the water surface rough and irregular, ditch into the wind on the back side of a wave.

(Continued Next Page)

DITCHING (Continued)

WATER CONTACT

1. Aircraft Pitch Attitude - Slightly higher than Normal Landing Attitude.
2. Reduce airspeed and rate of descent to a minimum, but do not stall the airplane.
3. Throttles - OFF just prior to water contact and contact water on a crest of a swell, parallel to the major swell.

AFTER WATER CONTACT

Depending on sea conditions, multiple impacts can be expected. Seat belts should not be released until the airplane has come to a complete stop. Under reasonable ditching conditions, the aircraft should remain afloat an adequate time to launch and board life rafts in an orderly manner.

WARNING

THE MAIN CABIN DOOR SHOULD REMAIN CLOSED AND EVACUATION MADE THROUGH THE EMERGENCY EXIT.

SECTION VII

FLIGHT PLANNING AND PERFORMANCE

CONTENTS

WEIGHT AND BALANCE

The center-of-gravity (CG) of an airplane can be defined as the point on the longitudinal axis about which the airplane would balance. The force of weight always acts through the center-of-gravity. The forces of lift attempt to rotate the airplane about the center-of-gravity.

In flight, the forces of gravity and lift from the wing and horizontal stabilizer must balance about the center-of-gravity so that stability is achieved.

CENTER-OF-GRAVITY FORCES

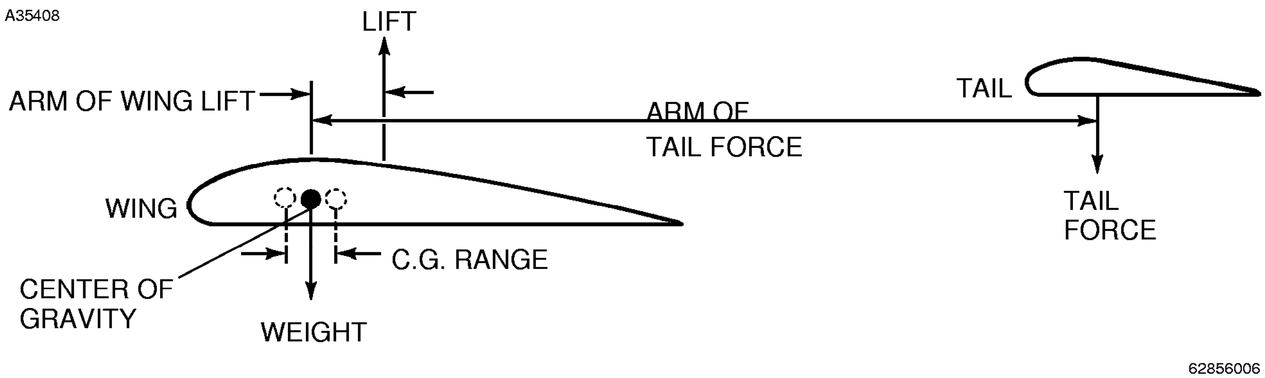


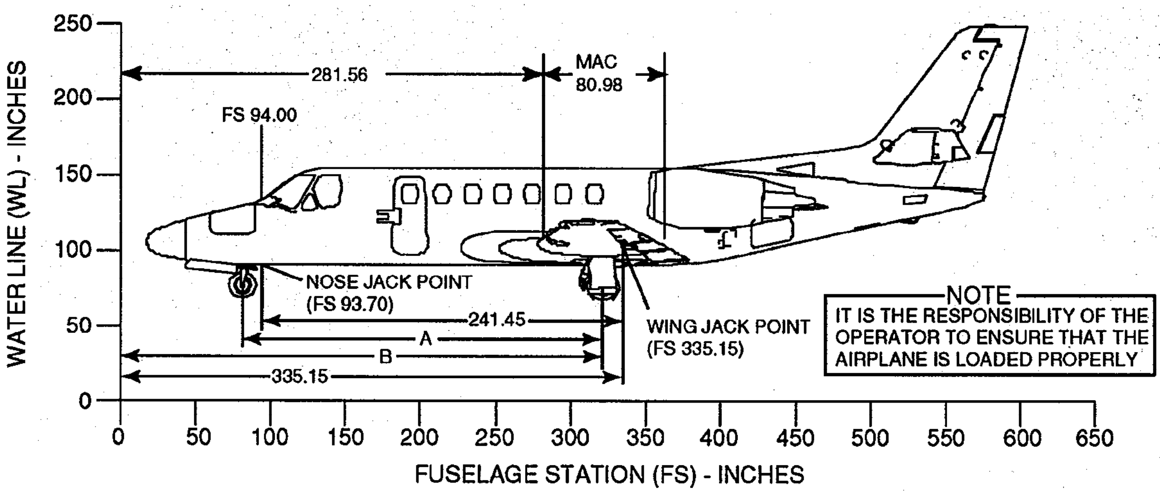
Figure 7-1. Center-Of-Gravity Forces

As the center-of-gravity changes forward or aft due to airplane loading, the lever or moment arm of the wing and tail lifting surfaces changes.

The horizontal stabilizer must be capable of providing an equalizing moment to that which is produced by the remainder of the airplane. Since the amount of lift produced by the horizontal stabilizer is limited, the range of movement of the center-of-gravity is restricted so that equilibrium can be maintained. Loading must be calculated as being within the allowable envelope to achieve proper stability and control.

The center-of-gravity of an empty airplane is found by accurate weighing to determine the balance point. This point is then defined by labeling it in inches aft of a fixed reference line located forward of the airplane nose. This line is called the Reference Datum Line. Selection of the Reference Datum Line is arbitrary, but it does provide a standard from which center-of-gravity movement along the longitudinal axis can be measured.

AIRPLANE WEIGHING INFORMATION



FORM NUMBER 2064, 27 March 2000

Figure 7-2. Airplane Weighing Information

At maximum gross weight, the center-of-gravity of a loaded airplane can move from 299.29 inches to 304.23 inches aft of Datum and remain within limits.

As the airplane is loaded, the center-of-gravity will shift. The amount of shift is dependent on not only the weight added, but the distance the weight is placed from the original center-of-gravity. Both of these factors can be considered by multiplying the weight added by the distance from the Reference Datum Line to produce the loading moment. This information is presented in table form in the Crew and Passenger, Cabinet, Baggage and Fuel Loading Moments tables.

The contribution each load station makes to center-of-gravity shift can be seen by comparing the respective center-of-gravity arm lengths given in the Weight and Moment Table. Any weight placed in the aft baggage bay will shift the center-of-gravity aft since it is aft of the typical standard empty weight center-of-gravity.

Adding fuel, passengers or baggage (in the nose compartment) will shift the center-of-gravity forward since all of them are loaded forward of the typical standard empty weight center-of-gravity. The magnitude of the shift for any given weight is proportional to the length of the moment arm.

SAMPLE LOADING PROBLEM

Standard Airplane

Basic Empty Weight - 10,176 pounds.*
Crew of 170 and 170 pounds in Seats 1 and 2.
One 170-pound Passenger in Seat 3.
One 170-pound Passenger in Seat 4.
One 170-pound Passenger in Seat 5.
One 170-pound Passenger in Seat 6.
One 170-pound Passenger in Seat 7.
One 170-pound Passenger in Seat 8.

100 pounds of baggage at station 74 in nose.
300 pounds of baggage at station 434 in tailcone baggage compartment.
5424 pounds of fuel.
2000-pound fuel burnoff during trip.
200-pound fuel burnoff during taxi.

*Includes all undrainable fluids and a full service of oil.

Determine the operational takeoff weight and center-of-gravity. Loading tables are found in this manual and in the Weight and Balance Data Sheets. The following step-by-step procedure illustrates a logical manner in which to approach the loading problem.

NOTE

During computation of the following sample problem, weights are rounded to nearest whole number (pound) for entry on the Weight and Balance Computation Form.

1. Use the Crew and Passenger Loading Table obtained from Weight and Balance Data Sheets to determine the moment for each load station. Enter the figures for each load station in the Weight and Balance Computation Form.
2. Use the Cabinet Loading Table obtained from Weight and Balance Data Sheet to determine the moment for any cabinet contents and enter the figures in the Weight and Balance Computation Form.
3. Use the Cargo Loading Table obtained from Weight and Balance Data Sheet to determine the moment for cargo loading in the nose, aft cabin and tailcone compartments. Enter the weight and moments for each load station in the Weight and Balance Computation Form.
4. Total the payload items and enter the totals on the Weight and Balance Computation Form (two places).
5. Enter the Airplane Basic Empty Weight and Moment from the Airplane Weighing Form on the Weight and Balance Computation Form.
6. Total the Basic Empty Weight and Payload and check the zero fuel weight.

NOTE

To check approved limits, locate the weight on the Center-of-Gravity Limits Envelope Graph (refer to Figure 7-5). Approved points are points located below the Zero Fuel Weight Line.

7. Determine the zero fuel weight center-of-gravity on the Weight and Balance Computation Form; divide moment by weight and multiply by 100.
8. Use the Fuel Loading Table (refer to Figure 7-4) to determine the moment for the amount of fuel being loaded for the flight. Enter the weight and moment of the fuel in the Weight and Balance Computation Form.
9. Total zero fuel weight and fuel loading to obtain ramp weight.

NOTE

To check approved limits, locate the weight on the Center-of-Gravity Limits Envelope Graph (refer to Figure 7-5). Approved points are points located below the Maximum Ramp Weight line.

10. Subtract the fuel and moment used for taxi. A standard 200-pound burnoff is assumed. The moment for the taxi fuel is determined by the difference in moments of the fuel loaded and the fuel remaining on board after taxi. Check takeoff weight and moment for approved limits.

NOTE

To check approved limits, divide moment by weight and multiply by 100 and obtain center-of-gravity. Locate the weight versus center-of-gravity point on the Center-of-Gravity Limits Envelope Graph (refer to Figure 7-5). Approved points are points located inside the shaded area.

11. Determine the estimated weight of the fuel to be used to arrive at the destination. The moment is determined by the difference in moments of the fuel remaining after taxi and the fuel remaining after reaching destination. Enter the weight of the fuel burned and the moment in the Weight and Balance Computation Form.

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WEIGHT AND BALANCE COMPUTATION FORM

PAYLOAD COMPUTATIONS

ITEM	ARM (INCHES)	WEIGHT (POUNDS)	MOMENT/ 100
OCCUPANTS			
SEAT 1	131.00	170	222.70
SEAT 2	131.00	170	222.70
SEAT 3	220.13	170	374.22
SEAT 4	222.13	170	377.62
SEAT 5	275.87	170	468.98
SEAT 6	275.87	170	468.98
SEAT 7	311.71	170	529.91
SEAT _			
SEAT _			
SEAT _			
TOILET	345.79		
BAGGAGE			
NOSE	74.00	100	74.00
TAILCONE	434.00	300	1320.00
TAILCONE STORAGE	462.00		
CABIN	348.00		
CABINET CONTENTS			
PAYLOAD		1590	4059.11

ITEM	WEIGHT (POUNDS)	MOMENT/ 100
1. BASIC EMPTY WEIGHT * Airplane CG= 310.25	10,176	31,571.04
2. PAYLOAD	1590	4059.11
3. ZERO FUEL WEIGHT (sub-total) (Do not exceed maximum zero fuel weight of 12,600 pounds (standard))	11,766	35,630.15
4. FUEL LOADING	5064	15,347.55
5. RAMP WEIGHT (sub-total) (Do not exceed maximum ramp weight of 16,830 pounds)	16,830	50,977.70
6. LESS FUEL FOR TAXIING	200	619.89
7. * *TAKEOFF WEIGHT (Do not exceed maximum takeoff weight of 16,630 pounds) * * Airplane CG= 302.81 * * *	* * * 16,630	50,357.81
8. LESS FUEL TO DESTINATION	2000	6165.84
9. * *LANDING WEIGHT (Do not exceed maximum landing weight of 15,200 pounds) * Airplane CG= 302.06 * * *	* * * 14,630	44,191.97

$$\text{* Airplane CG} = \frac{\text{MOMENT/100}}{\text{WEIGHT}} \times 100$$

* * Totals must be within approved weight and center-of-gravity limits. It is the responsibility of the operator to ensure that the airplane is loaded properly. The Basic Empty Weight CG is noted on the Airplane Weighing Form. If the airplane has been altered, refer to the Weight and Balance Record for information.

* * * Enter on the Center-of-Gravity Limits Envelope Graph to verify airplane is loaded within approved limits.

FORM NUMBER 2080-X1, 27 March 2000
REVISED 3 January 2001

Figure 7-3. Weight and Balance Form

FUEL LOADING WEIGHT AND MOMENT TABLE

WING TANK FUEL

WEIGHT (POUNDS)	MOMENT/100 ARM VARIES (INCH-POUNDS)
100	292.05
200	582.24
300	872.52
400	1165.28
500	1459.60
600	1755.42
700	2052.05
800	2349.84
900	2648.07
1000	2947.10
1100	3246.76
1200	3546.60
1300	3847.22
1400	4147.92
1500	4449.15
1600	4750.88
1700	5052.57
1800	5354.46
1900	5657.06
2000	5959.60
2100	6262.20
2200	6565.24
2300	6868.49
2400	7171.68
2500	7475.25
2600	7779.20
2700	8083.26
2800	8387.12
2900	8691.30
3000	8995.80

WING TANK FUEL (CONTINUED)

WEIGHT (POUNDS)	MOMENT/100 ARM VARIES (INCH-POUNDS)
3100	9300.31
3200	9604.80
3300	9909.90
3400	10214.96
3500	10520.65
3600	10827.36
3700	11134.04
3800	11441.42
3900	11749.53
4000	12058.00
4100	12366.42
4200	12675.18
4300	12984.28
4400	13293.28
4500	13602.60
4600	13911.78
4700	14221.26
4800	14530.56
4900	14840.14
5000	15149.50
5100	15459.12
5200	15769.00
5300	16078.61
5400	16388.46
5440	16512.58

FORM NUMBER 2062, 23 March 2000

Figure 7-4. Fuel Loading Weight and Moment Table

CENTER-OF-GRAVITY LIMITS ENVELOPE

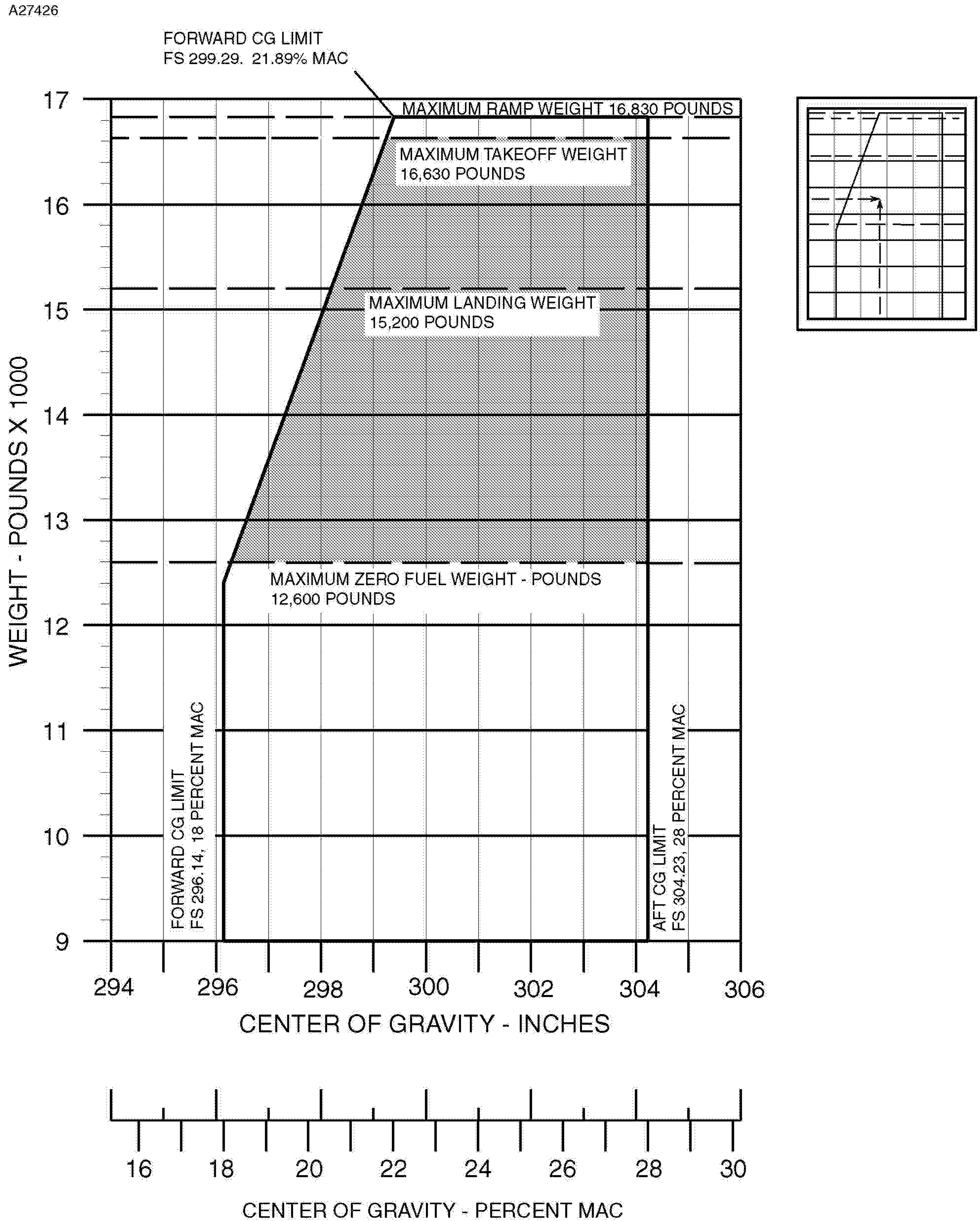
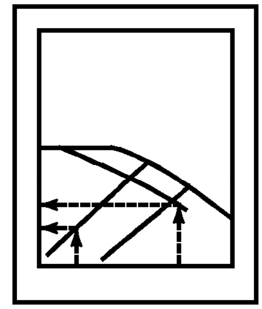


Figure 7-5. Center-of-Gravity Limits Envelope

MULTIENGINE NORMAL CLIMB
ANTI-ICE SYSTEMS - OFF



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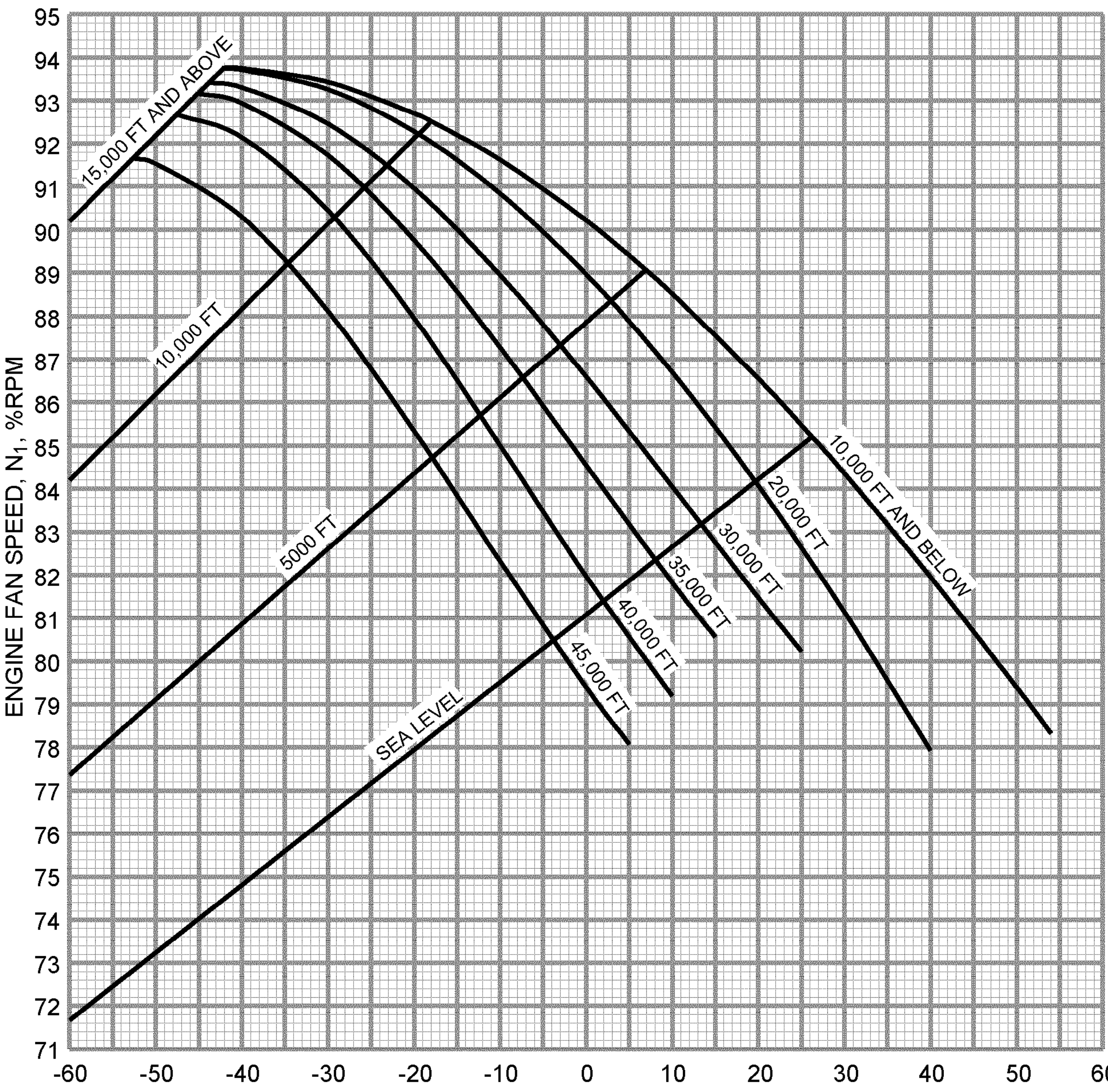
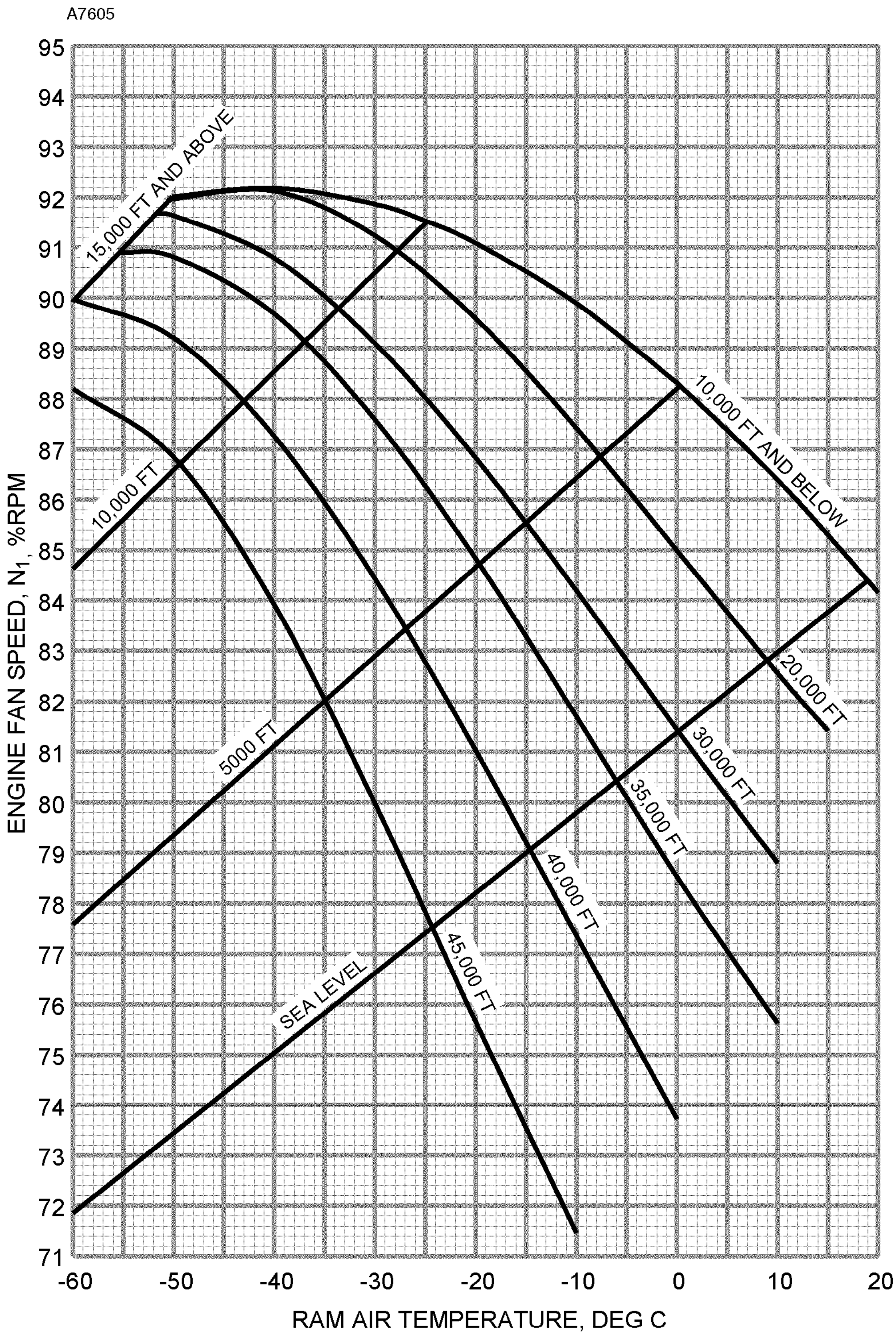


Figure 7-6. Multiengine Normal Climb

MULTIENGINE NORMAL CLIMB
ANTI-ICE SYSTEMS - ON



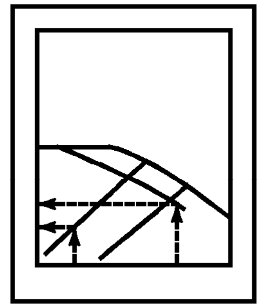
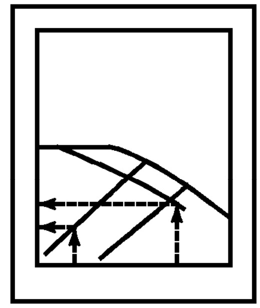


Figure 7-7. Multiengine Normal Climb

MAXIMUM CRUISE THRUST SETTING
ANTI-ICE SYSTEMS - OFF



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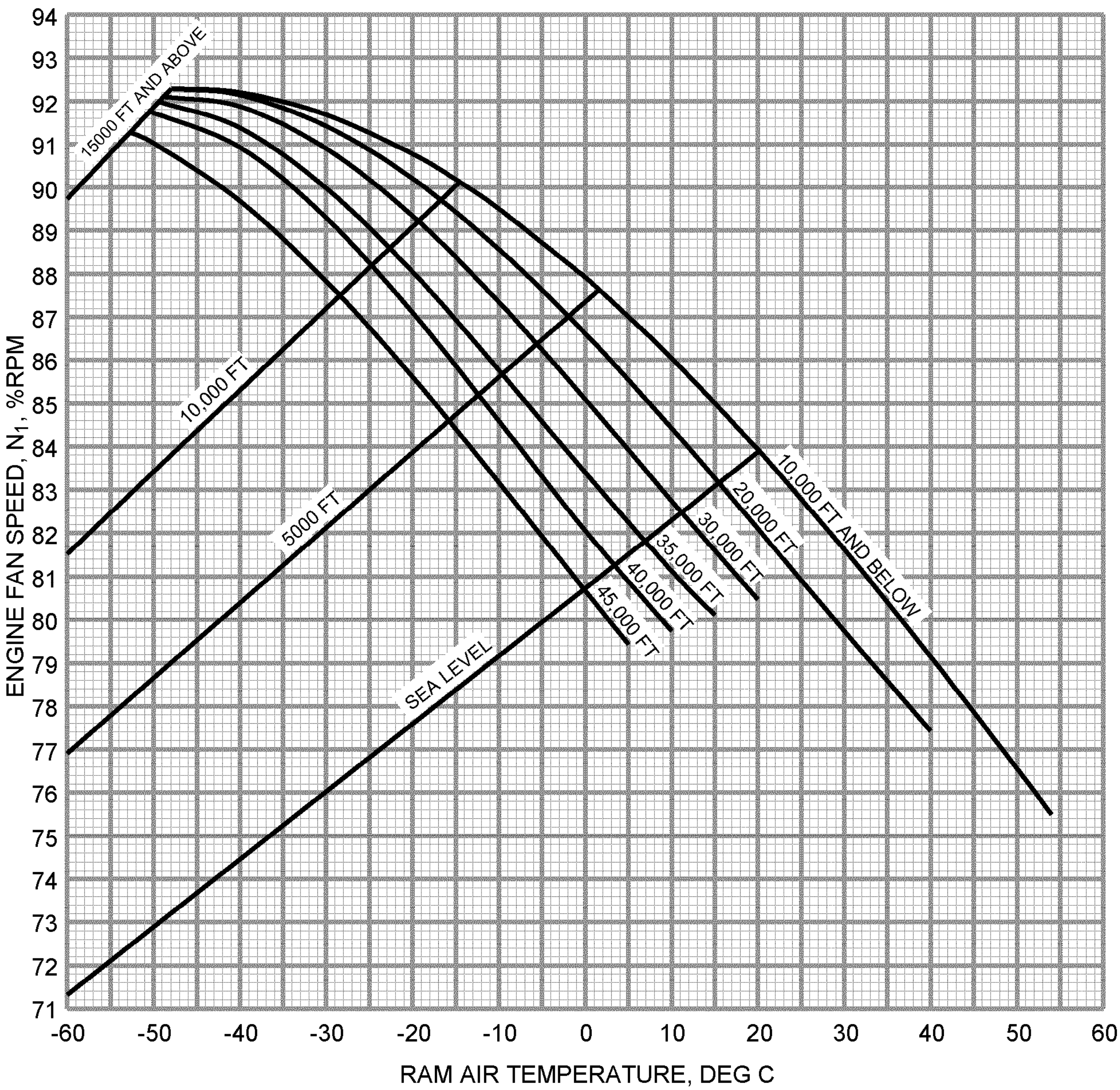
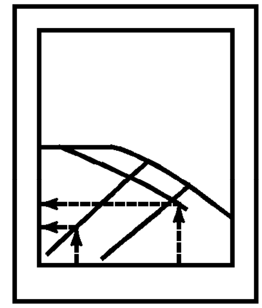


Figure 7-8. Maximum Cruise Thrust Setting

MAXIMUM CRUISE THRUST SETTING
ANTI-ICE SYSTEMS - ON



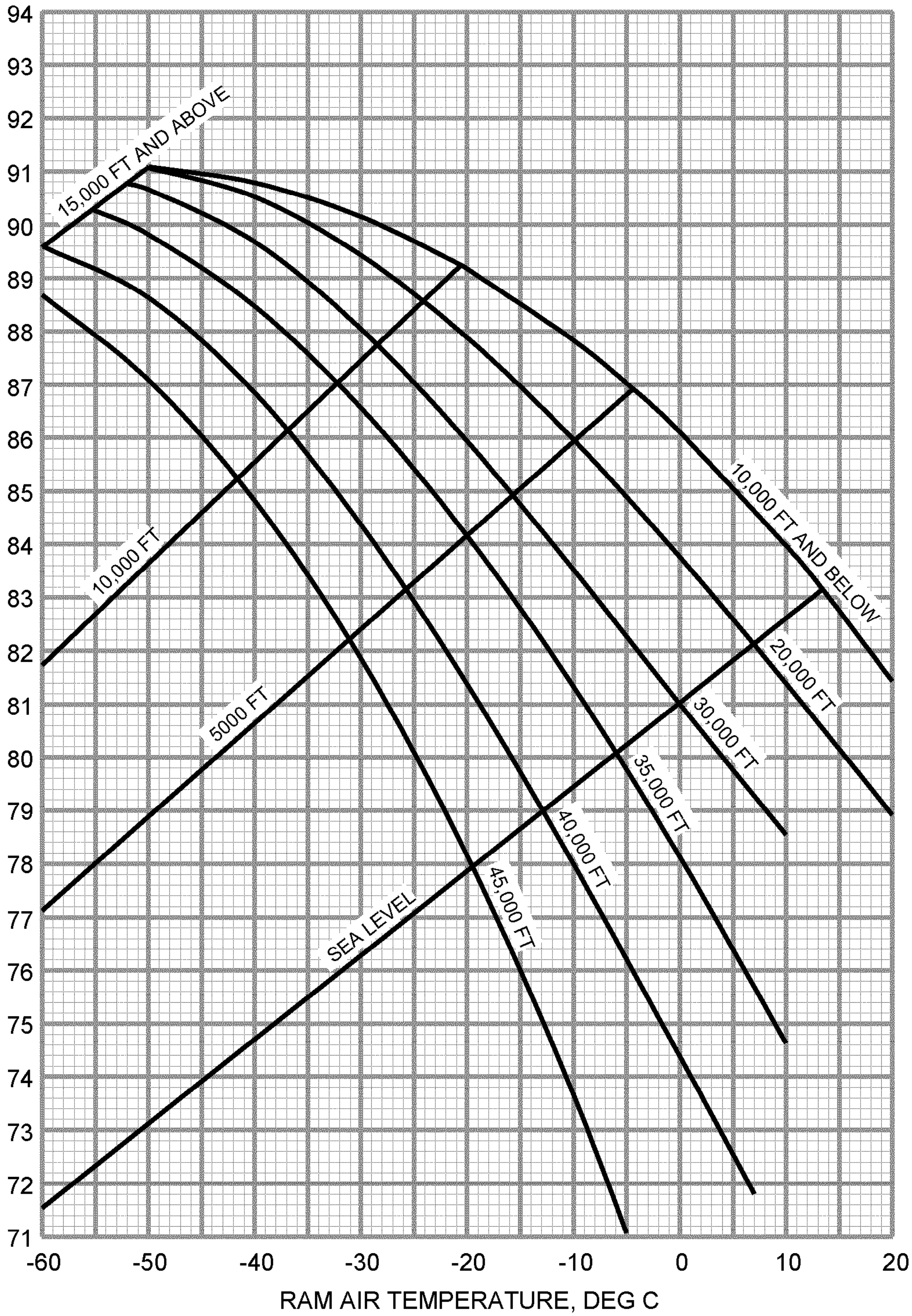


Figure 7-9. Maximum Cruise Thrust Setting

FLIGHT PLANNING

Thorough flight planning suggests establishing a preflight goal such as maximum range, minimum time enroute, or maximum fuel reserve within the parameters defined by the Airplane Flight Manual takeoff, climb and landing requirements. Tables for Maximum Cruise Thrust, .65 Mach, and Long Range Cruise are presented in this chapter to aid the crew in determining how best to achieve that goal. Maximum cruise thrust results in minimum time, long range cruise at optimum fuel consumption and .65 Mach represents a balance between the two.

Maximum range at a given altitude is dependent upon airframe efficiency and can be defined in still air as that point on the total drag curve where the relationship of velocity to total airplane drag is most favorable. The cruise angle-of-attack necessary to achieve that point is constant, but airspeed required is affected by airplane weight. The higher the weight, the higher the airspeed necessary to achieve optimum cruise angle-of-attack. This is in evidence when the long range cruise FLIGHT PLANNING tables are used and result in longer block times for the lighter weights. Enroute, as fuel burnoff occurs, thrust and airspeed required for best range will decrease as specific range increases due to improved performance at the lower operating weights. This should be considered when planning short stage lengths to avoid carrying excessive weight in stored fuel not operationally necessary.

Wind existing at cruise altitudes requires a more involved planning process to realize best range because it requires a true airspeed faster or slower than that at which optimum range angle-of-attack is achieved in still air. This minimizes the effects of a headwind, or takes maximum advantage of a tailwind. The airplane's broad altitude capability also brings into consideration engine efficiency. Since the fuel flow necessary for a given true airspeed decreases with an increase in altitude, a higher headwind component may be tolerated at the upper flight level with best results in terms of ground distance covered to fuel consumed. Conversely, large increases in headwind velocity with altitude may dictate a lower cruise level to obtain the best fuel to distance relationship.

To assist altitude selection taking into account upper winds, Cruise Tables in the Flight Planning and Performance Section present specific range as nautical miles per 100 pounds of fuel for different winds.

In comparative calculations, the highest number always represents best specific range. The Maximum Range mode will generally result in optimum specific range, but high headwinds may suggest an increased power setting to realize a shorter trip time without affecting total fuel burn appreciably. For example, at 37,000 feet and 15,000 pounds gross weight with a 100-knot headwind, Maximum Range and Maximum Cruise Thrust give 28.7 and 24.3 nautical miles/100 pounds, respectively. In that case, Maximum Range will produce only 4.4 nautical miles more distance per 100 pounds of fuel while the ground speed at Maximum Cruise Thrust would be approximately 90 knots faster. For the absolute best range or maximum fuel reserve goal however, cruising at the altitude/wind/thrust combination with the highest specific range number will produce optimum results.

Climb and descent at maximum speed available to achieve desired vertical rate can be used in conjunction with Maximum Cruise Thrust for the minimum time goal. Fuel economy, however, is better served by using the climb and descent schedules presented in the PERFORMANCE chapter of this section.

Once the cruise mode and altitude has been determined, enroute time and fuel required can be approximated from the appropriate FLIGHT PLANNING tables.

The following criteria are used:

1. 200 pounds of taxi fuel.
2. 247 Knot /.62 Mach climb schedule for all tables.
3. 60 percent of the cruise wind factor applied to climb; 40 percent to descent.
4. Descent to 10,000 feet from cruise altitude using normal descent profile.
5. Thirty nautical miles from destination at 10,000 feet and long range cruise airspeed.
6. Ten minutes approach fuel at 856 pounds per hour total fuel flow.
7. No reserve fuel.

FUEL RANGE TABLE USAGE

Entering the table at the planned stage length, read the fuel and time required per the conditions. If the fuel required is in excess of fuel available or if fuel reserves are inadequate, it may be advantageous to utilize one of the more economical cruise airspeed profiles and repeat the flight planning process. Specific data are presented in the PERFORMANCE chapter for separate computation of the climb, cruise and descent phases. If taxi time is known, 10 pounds per minute fuel flow can be used in lieu of the 200-pound figure.

After airplane loading and flight plan fuel requirements are determined, takeoff, climb and landing gross weights should be rechecked for compliance with Flight Manual criteria.

FLIGHT PLANNING
MAXIMUM CRUISE THRUST
CRUISE (79.8% N1)

STANDARD DAY **CRUISE ALTITUDE 19000 FEET**

		TAILWIND						ZERO		HEADWIND					
STAGE	T.O.	100 KT.		50 KT.		25 KT.		WIND		25 KT.		50 KT.		100 KT.	
LENGTH NM.	WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1093.	.66	1170.	.71	1216.	.74	1270.	.77	1332.	.81	1403.	.84	1586.	.92
	15000	1077.	.66	1154.	.71	1200.	.74	1253.	.77	1315.	.80	1386.	.84	1567.	.92
	12000	1049.	.65	1126.	.70	1172.	.73	1225.	.76	1286.	.79	1357.	.83	1537.	.91
300	16630	1432.	.87	1548.	.94	1618.	.99	1698.	1.03	1790.	1.09	1896.	1.14	2166.	1.28
	15000	1415.	.86	1531.	.94	1600.	.98	1679.	1.03	1771.	1.08	1876.	1.13	2144.	1.27
	12000	1386.	.86	1501.	.93	1570.	.97	1649.	1.02	1739.	1.07	1844.	1.13	2109.	1.26
400	16630	1771.	1.08	1927.	1.17	2019.	1.23	2125.	1.29	2247.	1.37	2388.	1.44	2746.	1.63
	15000	1753.	1.07	1908.	1.17	2000.	1.22	2105.	1.29	2227.	1.36	2366.	1.43	2721.	1.62
	12000	1723.	1.06	1877.	1.16	1968.	1.21	2072.	1.28	2192.	1.34	2330.	1.42	2680.	1.60
500	16630	2110.	1.28	2305.	1.41	2421.	1.48	2553.	1.56	2705.	1.65	2881.	1.75	3326.	1.99
	15000	2090.	1.27	2285.	1.40	2400.	1.47	2532.	1.55	2682.	1.63	2856.	1.73	3297.	1.97
	12000	2059.	1.27	2252.	1.39	2366.	1.45	2496.	1.54	2645.	1.62	2817.	1.72	3252.	1.95
600	16630	2448.	1.49	2683.	1.64	2822.	1.73	2981.	1.82	3163.	1.93	3373.	2.05	3906.	2.34
	15000	2428.	1.48	2662.	1.63	2800.	1.71	2958.	1.81	3138.	1.91	3346.	2.03	3874.	2.33
	12000	2396.	1.47	2627.	1.62	2764.	1.70	2920.	1.79	3099.	1.89	3304.	2.02	3824.	2.30
700	16630	2787.	1.70	3061.	1.87	3223.	1.97	3409.	2.08	3621.	2.21	3865.	2.35	4486.	2.69
	15000	2766.	1.69	3039.	1.86	3200.	1.96	3384.	2.07	3594.	2.19	3836.	2.33	4451.	2.68
	12000	2733.	1.68	3002.	1.84	3162.	1.94	3344.	2.05	3552.	2.17	3791.	2.31	4396.	2.65
800	16630	3126.	1.91	3439.	2.10	3625.	2.22	3836.	2.34	4079.	2.49	4358.	2.65	5066.	3.05
	15000	3104.	1.89	3416.	2.09	3600.	2.20	3810.	2.33	4050.	2.47	4327.	2.63	5027.	3.03
	12000	3069.	1.88	3377.	2.07	3560.	2.18	3767.	2.31	4005.	2.44	4278.	2.61	4967.	3.00
900	16630	3465.	2.11	3817.	2.33	4026.	2.46	4264.	2.60	4536.	2.77	4850.	2.95	5646.	3.40
	15000	3442.	2.10	3793.	2.32	4000.	2.44	4236.	2.59	4506.	2.75	4817.	2.92	5604.	3.39
	12000	3406.	2.09	3753.	2.30	3958.	2.42	4191.	2.57	4458.	2.72	4764.	2.91	5539.	3.35
1000	16630	3804.	2.32	4195.	2.56	4428.	2.71	4692.	2.86	4994.	3.05	5342.	3.25	6226.	3.76
	15000	3780.	2.30	4170.	2.55	4400.	2.69	4662.	2.85	4962.	3.02	5307.	3.22	6181.	3.74
	12000	3743.	2.30	4128.	2.53	4356.	2.66	4615.	2.83	4911.	2.99	5251.	3.21		
1100	16630	4143.	2.53	4574.	2.79	4829.	2.96	5120.	3.12	5452.	3.33	5835.	3.56		
	15000	4118.	2.51	4546.	2.78	4800.	2.93	5088.	3.11	5418.	3.30	5797.	3.52		
	12000	4079.	2.50	4503.	2.76	4754.	2.90	5039.	3.08	5364.	3.27				
1200	16630	4482.	2.74	4952.	3.02	5231.	3.20	5547.	3.39	5910.	3.61				
	15000	4456.	2.72	4923.	3.01	5200.	3.17	5514.	3.37	5874.	3.58				
	12000	4416.	2.71	4878.	2.99	5152.	3.15								
1300	16630	4820.	2.94	5330.	3.25	5632.	3.45								
	15000	4794.	2.92	5300.	3.24	5600.	3.42								
	12000	4753.	2.91	5253.	3.22										
1400	16630	5159.	3.15	5708.	3.49										
	15000	5131.	3.13	5677.	3.47										
	12000	5089.	3.12												
1500	16630	5498.	3.36												
	15000	5469.	3.33												
	12000	5426.	3.32												

Figure 7-10. Maximum Cruise Thrust (Sheet 1 of 14)

FLIGHT PLANNING
MAXIMUM CRUISE THRUST
CRUISE (81.3% N1)

STANDARD DAY **CRUISE ALTITUDE 21000 FEET**

STAGE LENGTH NM.	T.O. WEIGHT LBS.	TAILWIND 100 KT. FUEL LBS.	TAILWIND 100 KT. TIME HRS.	TAILWIND 50 KT. FUEL LBS.	TAILWIND 50 KT. TIME HRS.	TAILWIND 25 KT. FUEL LBS.	TAILWIND 25 KT. TIME HRS.	ZERO WIND FUEL LBS.	ZERO WIND TIME HRS.	HEADWIND 25 KT. FUEL LBS.	HEADWIND 25 KT. TIME HRS.	HEADWIND 50 KT. FUEL LBS.	HEADWIND 50 KT. TIME HRS.	HEADWIND 100 KT. FUEL LBS.	HEADWIND 100 KT. TIME HRS.
200	16630	1086.	.66	1160.	.71	1203.	.74	1254.	.77	1312.	.80	1379.	.83	1550.	.90
	15000	1069.	.66	1142.	.70	1185.	.73	1236.	.76	1294.	.79	1361.	.83	1530.	.90
	12000	1039.	.65	1112.	.70	1155.	.73	1206.	.75	1263.	.78	1330.	.82	1499.	.89
300	16630	1418.	.86	1529.	.93	1595.	.98	1670.	1.02	1757.	1.07	1857.	1.12	2109.	1.24
	15000	1400.	.86	1510.	.93	1576.	.97	1651.	1.01	1737.	1.06	1836.	1.12	2086.	1.24
	12000	1369.	.85	1479.	.92	1544.	.96	1619.	1.00	1704.	1.05	1803.	1.10	2050.	1.22
400	16630	1750.	1.07	1899.	1.16	1987.	1.21	2087.	1.27	2202.	1.34	2334.	1.41	2668.	1.58
	15000	1731.	1.06	1879.	1.15	1966.	1.21	2066.	1.27	2180.	1.33	2311.	1.41	2642.	1.57
	12000	1699.	1.05	1846.	1.14	1933.	1.20	2032.	1.25	2145.	1.32	2275.	1.39	2602.	1.56
500	16630	2082.	1.27	2268.	1.38	2378.	1.45	2504.	1.53	2647.	1.61	2811.	1.70	3227.	1.92
	15000	2062.	1.26	2247.	1.38	2356.	1.44	2481.	1.52	2623.	1.60	2786.	1.70	3198.	1.91
	12000	2029.	1.25	2213.	1.36	2321.	1.43	2445.	1.50	2586.	1.59	2747.	1.68	3154.	1.89
600	16630	2414.	1.47	2638.	1.61	2770.	1.69	2920.	1.78	3092.	1.88	3289.	2.00	3787.	2.26
	15000	2393.	1.46	2615.	1.60	2747.	1.68	2896.	1.77	3066.	1.87	3262.	1.99	3754.	2.25
	12000	2359.	1.45	2580.	1.59	2710.	1.67	2858.	1.75	3027.	1.86	3220.	1.96	3706.	2.22
700	16630	2746.	1.67	3007.	1.83	3162.	1.93	3337.	2.03	3537.	2.16	3766.	2.29	4346.	2.61
	15000	2725.	1.67	2984.	1.83	3137.	1.92	3311.	2.02	3509.	2.14	3737.	2.27	4310.	2.59
	12000	2689.	1.65	2947.	1.81	3099.	1.91	3271.	2.00	3467.	2.12	3692.	2.25	4258.	2.56
800	16630	3078.	1.88	3376.	2.06	3553.	2.17	3754.	2.29	3982.	2.43	4244.	2.58	4905.	2.95
	15000	3056.	1.87	3352.	2.05	3527.	2.15	3726.	2.28	3952.	2.40	4212.	2.56	4866.	2.93
	12000	3019.	1.85	3314.	2.03	3487.	2.14	3684.	2.25	3908.	2.39	4165.	2.54	4809.	2.89
900	16630	3410.	2.08	3746.	2.28	3945.	2.41	4170.	2.54	4427.	2.70	4721.	2.87	5464.	3.29
	15000	3387.	2.07	3720.	2.27	3917.	2.39	4141.	2.53	4395.	2.67	4687.	2.85	5421.	3.27
	12000	3349.	2.05	3681.	2.25	3876.	2.38	4097.	2.50	4349.	2.66	4637.	2.82	5361.	3.23
1000	16630	3742.	2.28	4115.	2.51	4337.	2.65	4587.	2.79	4872.	2.97	5198.	3.16	6023.	3.63
	15000	3718.	2.27	4089.	2.50	4308.	2.63	4557.	2.78	4839.	2.94	5163.	3.14	5977.	3.61
	12000	3679.	2.25	4048.	2.48	4265.	2.61	4510.	2.75	4790.	2.93	5110.	3.11		
1100	16630	4074.	2.48	4485.	2.73	4728.	2.89	5003.	3.05	5317.	3.24	5676.	3.45		
	15000	4049.	2.48	4457.	2.72	4698.	2.86	4972.	3.03	5282.	3.21	5638.	3.43		
	12000	4010.	2.45	4415.	2.70	4653.	2.85	4923.	3.00	5231.	3.19				
1200	16630	4406.	2.69	4854.	2.96	5120.	3.13	5420.	3.30	5762.	3.52				
	15000	4380.	2.68	4826.	2.95	5088.	3.10	5387.	3.29	5725.	3.48				
	12000	4340.	2.65	4782.	2.92	5042.	3.09	5336.	3.25						
1300	16630	4738.	2.89	5224.	3.18	5512.	3.37	5837.	3.56						
	15000	4712.	2.88	5194.	3.17	5479.	3.34	5802.	3.54						
	12000	4670.	2.85	5149.	3.14										
1400	16630	5070.	3.09	5593.	3.41										
	15000	5043.	3.08	5562.	3.40										
	12000	5000.	3.05	5516.	3.37										
1500	16630	5402.	3.30	5963.	3.63										
	15000	5374.	3.28	5931.	3.62										
	12000	5330.	3.26												
1600	16630	5734.	3.50												
	15000	5705.	3.49												
	12000	5660.	3.46												

Figure 7-10. Maximum Cruise Thrust (Sheet 2)

FLIGHT PLANNING
MAXIMUM CRUISE THRUST
CRUISE (83.1% N1)

STANDARD DAY **CRUISE ALTITUDE 23000 FEET**

		TAILWIND						ZERO WIND		HEADWIND					
STAGE	T.O.	100 KT.		50 KT.		25 KT.				25 KT.		50 KT.		100 KT.	
LENGTH NM.	WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1079.	.66	1149.	.70	1190.	.73	1238.	.76	1293.	.79	1356.	.82	1516.	.88
	15000	1060.	.65	1130.	.70	1171.	.73	1219.	.75	1274.	.78	1337.	.81	1496.	.88
	12000	1029.	.65	1098.	.69	1139.	.72	1187.	.75	1242.	.77	1305.	.81	1463.	.87
300	16630	1408.	.86	1513.	.92	1576.	.96	1647.	1.01	1729.	1.05	1823.	1.10	2060.	1.21
	15000	1388.	.85	1494.	.92	1556.	.96	1627.	1.00	1709.	1.04	1802.	1.09	2037.	1.20
	12000	1356.	.84	1461.	.91	1523.	.95	1594.	.99	1675.	1.03	1768.	1.08	2001.	1.19
400	16630	1736.	1.05	1878.	1.14	1962.	1.19	2057.	1.25	2166.	1.31	2291.	1.38	2604.	1.53
	15000	1716.	1.05	1857.	1.14	1941.	1.19	2036.	1.24	2144.	1.30	2268.	1.37	2579.	1.52
	12000	1683.	1.04	1823.	1.13	1906.	1.18	2000.	1.23	2108.	1.29	2231.	1.36	2538.	1.51
500	16630	2065.	1.25	2243.	1.36	2347.	1.43	2467.	1.50	2603.	1.57	2758.	1.66	3148.	1.86
	15000	2044.	1.24	2221.	1.35	2325.	1.42	2444.	1.49	2579.	1.57	2733.	1.65	3120.	1.85
	12000	2009.	1.23	2185.	1.34	2289.	1.40	2407.	1.48	2541.	1.55	2694.	1.64	3076.	1.83
600	16630	2393.	1.45	2607.	1.58	2733.	1.66	2877.	1.75	3039.	1.84	3225.	1.94	3692.	2.18
	15000	2372.	1.44	2585.	1.57	2710.	1.65	2853.	1.73	3014.	1.83	3199.	1.93	3661.	2.17
	12000	2336.	1.43	2548.	1.56	2672.	1.63	2813.	1.72	2973.	1.81	3156.	1.91	3613.	2.15
700	16630	2722.	1.65	2972.	1.80	3119.	1.89	3286.	1.99	3476.	2.10	3693.	2.22	4235.	2.51
	15000	2700.	1.64	2948.	1.79	3095.	1.88	3261.	1.97	3449.	2.09	3664.	2.21	4202.	2.50
	12000	2663.	1.62	2910.	1.78	3055.	1.86	3220.	1.96	3406.	2.06	3619.	2.19	4151.	2.48
800	16630	3050.	1.84	3336.	2.02	3505.	2.12	3696.	2.24	3912.	2.36	4160.	2.50	4779.	2.84
	15000	3028.	1.83	3312.	2.01	3479.	2.11	3669.	2.22	3884.	2.35	4130.	2.49	4744.	2.82
	12000	2990.	1.82	3272.	1.99	3438.	2.09	3626.	2.20	3839.	2.32	4082.	2.47	4688.	2.80
900	16630	3379.	2.04	3701.	2.23	3891.	2.35	4106.	2.49	4349.	2.62	4627.	2.78	5323.	3.16
	15000	3355.	2.03	3676.	2.22	3864.	2.34	4078.	2.46	4319.	2.61	4595.	2.76	5285.	3.14
	12000	3317.	2.01	3635.	2.21	3822.	2.32	4032.	2.45	4272.	2.58	4545.	2.75	5226.	3.12
1000	16630	3708.	2.24	4066.	2.45	4276.	2.58	4515.	2.73	4785.	2.88	5095.	3.06	5867.	3.49
	15000	3683.	2.23	4039.	2.44	4249.	2.57	4486.	2.71	4754.	2.87	5061.	3.04	5826.	3.47
	12000	3644.	2.21	3997.	2.43	4205.	2.55	4439.	2.69	4705.	2.84	5008.	3.02		
1100	16630	4036.	2.43	4430.	2.67	4662.	2.82	4925.	2.98	5222.	3.15	5562.	3.34		
	15000	4011.	2.42	4403.	2.66	4634.	2.80	4895.	2.95	5189.	3.13	5526.	3.32		
	12000	3971.	2.40	4360.	2.64	4588.	2.77	4845.	2.93	5138.	3.10				
1200	16630	4365.	2.63	4795.	2.89	5048.	3.05	5335.	3.23	5659.	3.41				
	15000	4339.	2.62	4767.	2.88	5018.	3.03	5303.	3.20	5624.	3.39				
	12000	4298.	2.60	4722.	2.86	4971.	3.00	5252.	3.18						
1300	16630	4693.	2.83	5160.	3.11	5434.	3.28	5745.	3.47						
	15000	4667.	2.82	5131.	3.09	5403.	3.26	5711.	3.44						
	12000	4624.	2.79	5084.	3.08	5354.	3.23								
1400	16630	5022.	3.03	5524.	3.33	5820.	3.51								
	15000	4995.	3.01	5494.	3.31	5788.	3.50								
	12000	4951.	2.99	5447.	3.30										
1500	16630	5350.	3.22	5889.	3.54										
	15000	5323.	3.21	5858.	3.53										
	12000	5278.	3.18												
1600	16630	5679.	3.42												
	15000	5650.	3.41												
	12000	5605.	3.38												

Figure 7-10. Maximum Cruise Thrust (Sheet 3)

FLIGHT PLANNING
MAXIMUM CRUISE THRUST
CRUISE (85.2% N1)

STANDARD DAY **CRUISE ALTITUDE 25000 FEET**

		TAILWIND						ZERO		HEADWIND					
STAGE	T.O.	100 KT.		50 KT.		25 KT.		WIND		25 KT.		50 KT.		100 KT.	
LENGTH NM.	WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1078.	.66	1145.	.70	1185.	.73	1231.	.75	1283.	.78	1343.	.81	1495.	.87
	15000	1059.	.66	1126.	.70	1165.	.72	1211.	.75	1264.	.78	1324.	.81	1475.	.86
	12000	1026.	.65	1092.	.69	1132.	.72	1178.	.74	1230.	.77	1290.	.80	1441.	.85
300	16630	1406.	.85	1508.	.92	1568.	.95	1637.	.99	1715.	1.03	1805.	1.08	2029.	1.18
	15000	1386.	.85	1488.	.91	1548.	.95	1616.	.99	1694.	1.03	1784.	1.07	2007.	1.17
	12000	1352.	.84	1454.	.90	1513.	.94	1582.	.98	1659.	1.02	1748.	1.06	1970.	1.16
400	16630	1734.	1.05	1871.	1.13	1952.	1.18	2044.	1.23	2148.	1.29	2267.	1.35	2563.	1.49
	15000	1714.	1.04	1850.	1.12	1930.	1.17	2022.	1.22	2125.	1.28	2244.	1.34	2539.	1.48
	12000	1679.	1.03	1815.	1.11	1895.	1.16	1985.	1.21	2089.	1.27	2206.	1.33	2498.	1.47
500	16630	2062.	1.24	2234.	1.34	2335.	1.40	2450.	1.47	2580.	1.54	2728.	1.62	3098.	1.80
	15000	2041.	1.23	2212.	1.33	2313.	1.40	2427.	1.46	2556.	1.53	2704.	1.61	3070.	1.79
	12000	2005.	1.22	2176.	1.32	2276.	1.38	2389.	1.45	2518.	1.52	2664.	1.60	3027.	1.78
600	16630	2390.	1.43	2597.	1.55	2719.	1.63	2857.	1.71	3012.	1.80	3190.	1.89	3632.	2.12
	15000	2369.	1.42	2575.	1.55	2695.	1.62	2832.	1.70	2987.	1.79	3164.	1.88	3602.	2.10
	12000	2332.	1.41	2537.	1.53	2657.	1.60	2793.	1.68	2947.	1.77	3122.	1.87	3556.	2.09
700	16630	2719.	1.62	2960.	1.77	3102.	1.85	3263.	1.94	3445.	2.05	3652.	2.16	4166.	2.43
	15000	2696.	1.62	2937.	1.76	3078.	1.84	3238.	1.93	3418.	2.04	3624.	2.15	4134.	2.41
	12000	2659.	1.60	2898.	1.75	3038.	1.82	3196.	1.92	3376.	2.02	3580.	2.13	4084.	2.39
800	16630	3047.	1.82	3324.	1.98	3486.	2.08	3670.	2.18	3877.	2.30	4113.	2.43	4700.	2.74
	15000	3023.	1.81	3299.	1.97	3461.	2.07	3643.	2.17	3849.	2.29	4084.	2.42	4666.	2.72
	12000	2985.	1.79	3259.	1.96	3419.	2.05	3600.	2.15	3805.	2.26	4037.	2.40	4613.	2.70
900	16630	3375.	2.01	3687.	2.19	3869.	2.30	4076.	2.42	4309.	2.56	4575.	2.70	5234.	3.05
	15000	3351.	2.00	3661.	2.18	3843.	2.29	4048.	2.41	4280.	2.54	4544.	2.69	5198.	3.03
	12000	3312.	1.98	3620.	2.17	3801.	2.27	4004.	2.39	4234.	2.51	4495.	2.67	5141.	3.01
1000	16630	3703.	2.20	4050.	2.40	4253.	2.53	4483.	2.66	4742.	2.81	5037.	2.97	5769.	3.37
	15000	3678.	2.19	4024.	2.39	4226.	2.52	4453.	2.64	4711.	2.80	5004.	2.96	5730.	3.35
	12000	3638.	2.17	3981.	2.38	4182.	2.49	4408.	2.63	4663.	2.76	4953.	2.94	5670.	3.32
1100	16630	4031.	2.39	4413.	2.62	4637.	2.75	4889.	2.89	5174.	3.06	5498.	3.24		
	15000	4006.	2.38	4386.	2.60	4608.	2.74	4859.	2.88	5142.	3.05	5464.	3.23		
	12000	3965.	2.36	4342.	2.59	4563.	2.71	4811.	2.86	5092.	3.01	5411.	3.20		
1200	16630	4359.	2.59	4776.	2.83	5020.	2.98	5296.	3.13	5606.	3.32				
	15000	4333.	2.57	4748.	2.82	4991.	2.96	5264.	3.12	5573.	3.30				
	12000	4292.	2.55	4704.	2.80	4944.	2.93	5215.	3.10						
1300	16630	4687.	2.78	5139.	3.04	5404.	3.20	5702.	3.37						
	15000	4661.	2.77	5110.	3.03	5374.	3.19	5669.	3.35						
	12000	4618.	2.74	5065.	3.01	5326.	3.15								
1400	16630	5015.	2.97	5502.	3.25	5787.	3.43								
	15000	4988.	2.96	5473.	3.24	5756.	3.41								
	12000	4945.	2.93	5426.	3.22										
1500	16630	5343.	3.16	5865.	3.47										
	15000	5316.	3.15	5835.	3.45										
	12000	5272.	3.12												
1600	16630	5671.	3.36												
	15000	5643.	3.34												
	12000	5598.	3.31												

Figure 7-10. Maximum Cruise Thrust (Sheet 4)

FLIGHT PLANNING
MAXIMUM CRUISE THRUST
CRUISE (87.9% N1)

STANDARD DAY **CRUISE ALTITUDE 27000 FEET**

		TAILWIND						ZERO WIND		HEADWIND					
STAGE LENGTH NM.	T.O. WEIGHT LBS.	100 KT. FUEL LBS.	100 KT. TIME HRS.	50 KT. FUEL LBS.	50 KT. TIME HRS.	25 KT. FUEL LBS.	25 KT. TIME HRS.	FUEL LBS.	TIME HRS.	25 KT. FUEL LBS.	25 KT. TIME HRS.	50 KT. FUEL LBS.	50 KT. TIME HRS.	100 KT. FUEL LBS.	100 KT. TIME HRS.
200	16630	1078.	.66	1143.	.70	1182.	.73	1226.	.75	1277.	.77	1336.	.80	1482.	.85
	15000	1058.	.66	1124.	.70	1162.	.72	1207.	.75	1258.	.77	1316.	.80	1462.	.85
	12000	1025.	.65	1090.	.69	1129.	.71	1174.	.74	1225.	.76	1283.	.79	1429.	.84
300	16630	1415.	.85	1515.	.91	1574.	.94	1641.	.98	1718.	1.02	1805.	1.06	2022.	1.16
	15000	1394.	.84	1495.	.90	1553.	.94	1621.	.98	1697.	1.01	1784.	1.06	2001.	1.15
	12000	1360.	.83	1460.	.89	1519.	.93	1586.	.97	1663.	1.00	1749.	1.05	1965.	1.14
400	16630	1751.	1.04	1887.	1.12	1966.	1.16	2056.	1.21	2158.	1.27	2274.	1.32	2562.	1.46
	15000	1730.	1.03	1866.	1.11	1945.	1.16	2035.	1.21	2136.	1.26	2252.	1.32	2539.	1.45
	12000	1696.	1.02	1830.	1.10	1909.	1.15	1999.	1.19	2100.	1.25	2216.	1.30	2501.	1.44
500	16630	2088.	1.23	2258.	1.32	2358.	1.38	2470.	1.45	2598.	1.51	2743.	1.58	3101.	1.76
	15000	2067.	1.22	2236.	1.32	2336.	1.37	2448.	1.44	2575.	1.50	2720.	1.57	3077.	1.75
	12000	2031.	1.21	2201.	1.30	2299.	1.36	2411.	1.42	2538.	1.49	2682.	1.56	3036.	1.73
600	16630	2425.	1.41	2630.	1.53	2750.	1.60	2885.	1.68	3038.	1.76	3212.	1.84	3641.	2.06
	15000	2403.	1.40	2607.	1.52	2727.	1.59	2862.	1.67	3015.	1.75	3188.	1.83	3615.	2.05
	12000	2367.	1.39	2571.	1.51	2690.	1.58	2824.	1.65	2976.	1.73	3148.	1.82	3572.	2.03
700	16630	2761.	1.60	3002.	1.74	3142.	1.82	3300.	1.91	3479.	2.00	3681.	2.10	4181.	2.36
	15000	2739.	1.59	2978.	1.73	3119.	1.81	3276.	1.90	3454.	1.99	3656.	2.09	4153.	2.35
	12000	2702.	1.58	2941.	1.71	3080.	1.80	3236.	1.88	3413.	1.98	3614.	2.08	4107.	2.33
800	16630	3098.	1.79	3373.	1.94	3534.	2.04	3715.	2.14	3919.	2.25	4150.	2.37	4721.	2.66
	15000	3075.	1.78	3349.	1.93	3510.	2.03	3690.	2.13	3893.	2.23	4123.	2.35	4692.	2.65
	12000	3038.	1.77	3311.	1.92	3470.	2.01	3649.	2.11	3851.	2.22	4080.	2.34	4643.	2.63
900	16630	3435.	1.98	3745.	2.15	3926.	2.25	4129.	2.37	4359.	2.49	4620.	2.63	5261.	2.96
	15000	3411.	1.97	3720.	2.14	3901.	2.24	4104.	2.36	4332.	2.48	4591.	2.61	5230.	2.95
	12000	3373.	1.95	3681.	2.12	3860.	2.23	4062.	2.33	4289.	2.46	4546.	2.59	5178.	2.92
1000	16630	3771.	2.16	4116.	2.35	4318.	2.47	4544.	2.60	4799.	2.74	5089.	2.89	5801.	3.26
	15000	3748.	2.15	4091.	2.34	4293.	2.46	4518.	2.59	4771.	2.72	5059.	2.87	5768.	3.25
	12000	3709.	2.14	4051.	2.33	4250.	2.44	4474.	2.56	4727.	2.70	5012.	2.85		
1100	16630	4108.	2.35	4488.	2.56	4710.	2.69	4959.	2.84	5240.	2.98	5558.	3.15		
	15000	4084.	2.34	4462.	2.55	4684.	2.68	4932.	2.82	5210.	2.97	5527.	3.13		
	12000	4045.	2.32	4421.	2.53	4641.	2.66	4887.	2.79	5164.	2.95				
1200	16630	4445.	2.54	4860.	2.77	5102.	2.91	5373.	3.07	5680.	3.23				
	15000	4420.	2.53	4833.	2.75	5075.	2.90	5346.	3.05	5650.	3.21				
	12000	4380.	2.51	4791.	2.74	5031.	2.88	5299.	3.02						
1300	16630	4782.	2.73	5231.	2.97	5494.	3.13	5788.	3.30						
	15000	4756.	2.71	5204.	2.96	5467.	3.11	5759.	3.28						
	12000	4716.	2.70	5161.	2.94										
1400	16630	5118.	2.91	5603.	3.18										
	15000	5092.	2.90	5575.	3.17										
	12000	5051.	2.88												
1500	16630	5455.	3.10												
	15000	5429.	3.09												
	12000	5387.	3.07												

Figure 7-10. Maximum Cruise Thrust (Sheet 5)

FLIGHT PLANNING
MAXIMUM CRUISE THRUST
CRUISE (89.2% N1)

STANDARD DAY — CRUISE ALTITUDE 29000 FEET

		TAILWIND						ZERO WIND		HEADWIND					
STAGE	T.O.	100 KT.		50 KT.		25 KT.				25 KT.		50 KT.		100 KT.	
LENGTH NM.	WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1066.	.67	1128.	.71	1165.	.73	1207.	.75	1256.	.77	1312.	.80	1451.	.85
	15000	1045.	.66	1107.	.70	1144.	.72	1187.	.75	1236.	.77	1292.	.80	1431.	.84
	12000	1010.	.65	1072.	.69	1110.	.71	1152.	.74	1201.	.76	1257.	.79	1397.	.83
300	16630	1396.	.85	1492.	.91	1549.	.94	1613.	.98	1687.	1.02	1770.	1.06	1978.	1.15
	15000	1375.	.85	1471.	.91	1528.	.94	1592.	.97	1665.	1.01	1749.	1.05	1956.	1.14
	12000	1339.	.84	1435.	.89	1492.	.93	1556.	.96	1629.	1.00	1713.	1.04	1919.	1.13
400	16630	1726.	1.04	1857.	1.12	1933.	1.16	2019.	1.21	2118.	1.26	2229.	1.32	2505.	1.44
	15000	1704.	1.03	1835.	1.11	1911.	1.16	1997.	1.20	2095.	1.25	2206.	1.31	2481.	1.43
	12000	1668.	1.02	1798.	1.10	1874.	1.14	1960.	1.19	2058.	1.24	2168.	1.30	2442.	1.42
500	16630	2057.	1.22	2221.	1.32	2317.	1.38	2425.	1.44	2548.	1.50	2688.	1.58	3032.	1.74
	15000	2034.	1.22	2198.	1.31	2294.	1.37	2402.	1.43	2525.	1.50	2664.	1.57	3006.	1.73
	12000	1997.	1.21	2160.	1.30	2256.	1.36	2364.	1.42	2486.	1.48	2624.	1.55	2965.	1.71
600	16630	2387.	1.41	2585.	1.53	2701.	1.59	2831.	1.67	2979.	1.74	3146.	1.84	3559.	2.04
	15000	2364.	1.41	2562.	1.52	2677.	1.59	2807.	1.66	2954.	1.74	3121.	1.82	3531.	2.02
	12000	2326.	1.39	2523.	1.50	2638.	1.57	2768.	1.64	2914.	1.72	3080.	1.81	3487.	2.00
700	16630	2717.	1.59	2949.	1.73	3085.	1.81	3237.	1.90	3410.	1.98	3605.	2.09	4086.	2.33
	15000	2694.	1.59	2925.	1.72	3060.	1.80	3212.	1.88	3384.	1.98	3578.	2.08	4057.	2.32
	12000	2655.	1.58	2886.	1.71	3020.	1.79	3171.	1.87	3342.	1.96	3535.	2.06	4010.	2.30
800	16630	3047.	1.78	3313.	1.94	3469.	2.02	3643.	2.12	3840.	2.23	4064.	2.35	4613.	2.63
	15000	3024.	1.78	3289.	1.93	3444.	2.02	3617.	2.11	3814.	2.22	4036.	2.34	4582.	2.61
	12000	2984.	1.76	3248.	1.91	3402.	2.00	3575.	2.09	3770.	2.21	3991.	2.32	4532.	2.59
900	16630	3378.	1.97	3678.	2.14	3853.	2.24	4049.	2.35	4271.	2.47	4522.	2.61	5139.	2.93
	15000	3353.	1.96	3652.	2.13	3827.	2.24	4022.	2.34	4243.	2.47	4493.	2.60	5107.	2.91
	12000	3313.	1.95	3611.	2.12	3784.	2.22	3979.	2.32	4198.	2.45	4447.	2.58	5055.	2.88
1000	16630	3708.	2.15	4042.	2.35	4237.	2.45	4455.	2.58	4702.	2.71	4981.	2.87	5666.	3.22
	15000	3683.	2.15	4016.	2.34	4210.	2.45	4428.	2.57	4673.	2.71	4951.	2.85	5632.	3.20
	12000	3642.	2.13	3974.	2.32	4167.	2.43	4383.	2.55	4627.	2.69	4902.	2.83	5578.	3.17
1100	16630	4038.	2.34	4406.	2.56	4621.	2.67	4861.	2.81	5132.	2.95	5439.	3.13	6193.	3.52
	15000	4013.	2.34	4380.	2.54	4593.	2.67	4833.	2.79	5103.	2.95	5408.	3.11	6157.	3.50
	12000	3971.	2.32	4336.	2.52	4549.	2.65	4787.	2.77	5055.	2.93	5358.	3.09		
1200	16630	4368.	2.52	4770.	2.76	5005.	2.89	5267.	3.04	5563.	3.19	5898.	3.39		
	15000	4343.	2.52	4743.	2.75	4976.	2.88	5238.	3.02	5532.	3.19	5865.	3.37		
	12000	4300.	2.50	4699.	2.73	4931.	2.86	5190.	3.00						
1300	16630	4699.	2.71	5134.	2.97	5388.	3.10	5673.	3.27						
	15000	4672.	2.71	5107.	2.95	5360.	3.10	5643.	3.25						
	12000	4629.	2.69	5062.	2.93	5313.	3.08								
1400	16630	5029.	2.89	5499.	3.17	5772.	3.32								
	15000	5002.	2.89	5470.	3.15	5743.	3.32								
	12000	4958.	2.87	5424.	3.13										
1500	16630	5359.	3.08	5863.	3.38										
	15000	5332.	3.08	5834.	3.36										
	12000	5287.	3.06												
1600	16630	5689.	3.26												
	15000	5662.	3.26												
	12000	5616.	3.24												

Figure 7-10. Maximum Cruise Thrust (Sheet 6)

FLIGHT PLANNING
MAXIMUM CRUISE THRUST
CRUISE (89.6% N1)

STANDARD DAY **CRUISE ALTITUDE 31000 FEET**

		TAILWIND						ZERO		HEADWIND					
STAGE	T.O.	100 KT.		50 KT.		25 KT.		WIND		25 KT.		50 KT.		100 KT.	
LENGTH NM.	WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1048.	.67	1106.	.71	1140.	.73	1180.	.76	1225.	.78	1277.	.80	1408.	.85
	15000	1025.	.67	1083.	.71	1118.	.73	1158.	.75	1203.	.77	1256.	.80	1387.	.84
	12000	987.	.66	1045.	.70	1080.	.72	1120.	.74	1166.	.76	1219.	.79	1350.	.83
300	16630	1358.	.86	1448.	.92	1501.	.95	1561.	.98	1630.	1.02	1709.	1.06	1904.	1.15
	15000	1335.	.85	1425.	.91	1478.	.94	1538.	.98	1607.	1.01	1686.	1.06	1881.	1.14
	12000	1296.	.84	1386.	.90	1439.	.93	1500.	.97	1569.	1.00	1647.	1.04	1842.	1.13
400	16630	1668.	1.05	1790.	1.12	1861.	1.17	1943.	1.21	2035.	1.27	2140.	1.32	2400.	1.45
	15000	1645.	1.04	1767.	1.12	1838.	1.16	1919.	1.21	2011.	1.26	2116.	1.31	2375.	1.44
	12000	1606.	1.03	1728.	1.10	1799.	1.15	1880.	1.20	1972.	1.24	2076.	1.30	2334.	1.42
500	16630	1978.	1.23	2132.	1.33	2222.	1.38	2324.	1.44	2440.	1.51	2571.	1.58	2896.	1.74
	15000	1954.	1.22	2108.	1.32	2198.	1.38	2300.	1.44	2416.	1.50	2546.	1.57	2870.	1.74
	12000	1915.	1.21	2069.	1.31	2158.	1.36	2260.	1.42	2375.	1.48	2505.	1.55	2826.	1.72
600	16630	2288.	1.42	2474.	1.53	2583.	1.60	2706.	1.67	2845.	1.75	3002.	1.84	3391.	2.04
	15000	2264.	1.41	2450.	1.53	2559.	1.59	2681.	1.67	2820.	1.74	2976.	1.83	3364.	2.03
	12000	2225.	1.40	2410.	1.51	2518.	1.58	2640.	1.65	2778.	1.73	2934.	1.81	3319.	2.01
700	16630	2598.	1.61	2816.	1.74	2944.	1.82	3087.	1.90	3250.	2.00	3434.	2.10	3887.	2.34
	15000	2574.	1.60	2792.	1.73	2919.	1.81	3062.	1.90	3224.	1.98	3406.	2.09	3858.	2.33
	12000	2534.	1.58	2751.	1.72	2878.	1.79	3020.	1.88	3181.	1.97	3363.	2.07	3811.	2.31
800	16630	2908.	1.79	3158.	1.94	3304.	2.04	3469.	2.13	3654.	2.24	3865.	2.36	4383.	2.64
	15000	2884.	1.78	3134.	1.94	3279.	2.02	3443.	2.12	3628.	2.23	3837.	2.34	4352.	2.63
	12000	2844.	1.76	3092.	1.92	3237.	2.00	3400.	2.11	3584.	2.21	3792.	2.32	4303.	2.60
900	16630	3218.	1.98	3501.	2.15	3665.	2.25	3850.	2.36	4059.	2.49	4296.	2.62	4879.	2.93
	15000	3194.	1.97	3475.	2.15	3639.	2.24	3824.	2.35	4032.	2.47	4267.	2.60	4847.	2.93
	12000	3153.	1.95	3433.	2.13	3597.	2.22	3780.	2.33	3987.	2.45	4221.	2.58	4795.	2.90
1000	16630	3529.	2.17	3843.	2.36	4026.	2.47	4232.	2.59	4464.	2.73	4727.	2.88	5375.	3.23
	15000	3503.	2.15	3817.	2.35	4000.	2.46	4205.	2.58	4436.	2.71	4697.	2.86	5341.	3.22
	12000	3463.	2.13	3775.	2.33	3956.	2.43	4160.	2.56	4390.	2.69	4650.	2.83	5287.	3.19
1100	16630	3839.	2.35	4185.	2.56	4387.	2.69	4613.	2.82	4869.	2.97	5159.	3.14	5871.	3.53
	15000	3813.	2.34	4159.	2.56	4360.	2.67	4586.	2.81	4840.	2.95	5127.	3.12	5835.	3.52
	12000	3772.	2.32	4116.	2.53	4316.	2.65	4540.	2.79	4793.	2.93	5079.	3.09		
1200	16630	4149.	2.54	4527.	2.77	4747.	2.91	4995.	3.05	5274.	3.22	5590.	3.40		
	15000	4123.	2.52	4501.	2.76	4720.	2.89	4966.	3.04	5244.	3.20	5557.	3.37		
	12000	4082.	2.50	4457.	2.74	4675.	2.86	4920.	3.01	5196.	3.17				
1300	16630	4459.	2.73	4869.	2.97	5108.	3.12	5376.	3.28	5679.	3.46				
	15000	4433.	2.71	4842.	2.97	5080.	3.10	5347.	3.27	5648.	3.44				
	12000	4391.	2.69	4798.	2.94	5035.	3.08	5300.	3.24						
1400	16630	4769.	2.91	5211.	3.18	5469.	3.34	5758.	3.50						
	15000	4743.	2.90	5184.	3.17	5441.	3.32	5728.	3.50						
	12000	4701.	2.87	5139.	3.15										
1500	16630	5079.	3.10	5553.	3.38										
	15000	5052.	3.08	5526.	3.38										
	12000	5011.	3.06												
1600	16630	5389.	3.29	5895.	3.59										
	15000	5362.	3.27	5868.	3.59										
	12000	5320.	3.24												
1700	16630	5699.	3.47												
	15000	5672.	3.45												
	12000	5630.	3.43												

Figure 7-10. Maximum Cruise Thrust (Sheet 7)

FLIGHT PLANNING
MAXIMUM CRUISE THRUST
CRUISE (89.9% N1)

STANDARD DAY **CRUISE ALTITUDE 33000 FEET**

		TAILWIND						ZERO		HEADWIND					
STAGE	T.O.	100 KT.		50 KT.		25 KT.		WIND		25 KT.		50 KT.		100 KT.	
LENGTH NM.	WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1034.	.68	1087.	.72	1119.	.74	1156.	.76	1199.	.78	1247.	.81	1370.	.85
	15000	1008.	.67	1062.	.71	1094.	.73	1132.	.75	1174.	.78	1223.	.80	1346.	.85
	12000	966.	.66	1021.	.70	1053.	.72	1090.	.74	1133.	.77	1183.	.79	1306.	.84
300	16630	1323.	.87	1407.	.92	1456.	.96	1513.	.99	1577.	1.03	1651.	1.07	1834.	1.15
	15000	1297.	.86	1381.	.92	1431.	.95	1487.	.98	1552.	1.02	1625.	1.06	1809.	1.15
	12000	1255.	.85	1339.	.91	1388.	.94	1445.	.97	1509.	1.01	1583.	1.05	1766.	1.13
400	16630	1612.	1.05	1726.	1.13	1793.	1.17	1869.	1.22	1956.	1.27	2054.	1.33	2298.	1.46
	15000	1586.	1.05	1700.	1.12	1767.	1.17	1843.	1.21	1929.	1.27	2028.	1.32	2271.	1.44
	12000	1543.	1.03	1657.	1.11	1723.	1.15	1799.	1.20	1885.	1.25	1983.	1.31	2226.	1.43
500	16630	1902.	1.24	2046.	1.34	2130.	1.39	2226.	1.46	2334.	1.52	2457.	1.59	2763.	1.76
	15000	1876.	1.23	2019.	1.33	2103.	1.39	2199.	1.44	2307.	1.51	2430.	1.58	2734.	1.74
	12000	1832.	1.22	1975.	1.32	2059.	1.37	2154.	1.43	2262.	1.49	2384.	1.56	2686.	1.72
600	16630	2191.	1.43	2365.	1.55	2467.	1.61	2582.	1.69	2713.	1.76	2861.	1.85	3227.	2.06
	15000	2165.	1.42	2338.	1.53	2440.	1.60	2554.	1.67	2684.	1.76	2832.	1.84	3196.	2.04
	12000	2120.	1.40	2293.	1.52	2394.	1.58	2508.	1.66	2638.	1.73	2784.	1.82	3145.	2.02
700	16630	2481.	1.62	2685.	1.75	2804.	1.83	2939.	1.92	3091.	2.01	3264.	2.11	3691.	2.36
	15000	2454.	1.61	2657.	1.74	2776.	1.82	2910.	1.90	3062.	2.00	3234.	2.10	3659.	2.34
	12000	2409.	1.59	2611.	1.73	2730.	1.80	2863.	1.89	3014.	1.98	3184.	2.08	3605.	2.31
800	16630	2770.	1.80	3004.	1.96	3141.	2.05	3296.	2.15	3469.	2.25	3667.	2.37	4156.	2.67
	15000	2743.	1.80	2976.	1.95	3112.	2.04	3266.	2.13	3440.	2.24	3636.	2.36	4121.	2.64
	12000	2697.	1.77	2929.	1.93	3065.	2.02	3217.	2.12	3390.	2.22	3585.	2.33	4065.	2.61
900	16630	3059.	1.99	3323.	2.17	3478.	2.27	3652.	2.38	3848.	2.50	4071.	2.63	4620.	2.97
	15000	3032.	1.98	3295.	2.15	3449.	2.26	3622.	2.36	3817.	2.49	4039.	2.62	4584.	2.94
	12000	2986.	1.96	3248.	2.14	3400.	2.23	3572.	2.34	3766.	2.46	3985.	2.59	4525.	2.90
1000	16630	3349.	2.18	3643.	2.38	3815.	2.48	4009.	2.61	4226.	2.74	4474.	2.89	5084.	3.27
	15000	3321.	2.17	3614.	2.36	3785.	2.47	3977.	2.59	4195.	2.73	4441.	2.88	5047.	3.24
	12000	3274.	2.15	3566.	2.34	3736.	2.45	3926.	2.57	4142.	2.70	4386.	2.85	4985.	3.20
1100	16630	3638.	2.36	3962.	2.59	4152.	2.70	4365.	2.85	4605.	2.99	4877.	3.16	5549.	3.57
	15000	3610.	2.36	3933.	2.57	4121.	2.69	4333.	2.82	4572.	2.98	4843.	3.14	5509.	3.54
	12000	3563.	2.33	3884.	2.55	4071.	2.66	4281.	2.80	4518.	2.94	4786.	3.11	5445.	3.49
1200	16630	3927.	2.55	4282.	2.79	4489.	2.92	4722.	3.08	4983.	3.24	5281.	3.42	6013.	3.87
	15000	3899.	2.54	4252.	2.77	4458.	2.91	4689.	3.05	4950.	3.22	5245.	3.40	5972.	3.84
	12000	3851.	2.52	4202.	2.75	4406.	2.88	4635.	3.03	4894.	3.19	5186.	3.36		
1300	16630	4217.	2.74	4601.	3.00	4826.	3.14	5078.	3.31	5362.	3.48	5684.	3.68		
	15000	4188.	2.73	4571.	2.98	4794.	3.13	5044.	3.28	5327.	3.47	5647.	3.66		
	12000	4140.	2.70	4520.	2.96	4742.	3.09	4990.	3.26	5270.	3.43				
1400	16630	4506.	2.93	4921.	3.21	5163.	3.36	5435.	3.54	5740.	3.73				
	15000	4477.	2.92	4890.	3.18	5130.	3.35	5400.	3.51	5705.	3.71				
	12000	4428.	2.89	4838.	3.16	5077.	3.31	5345.	3.49						
1500	16630	4795.	3.11	5240.	3.42	5500.	3.58	5792.	3.77						
	15000	4766.	3.10	5209.	3.39	5467.	3.56	5756.	3.74						
	12000	4717.	3.07	5156.	3.37										
1600	16630	5085.	3.30	5560.	3.62										
	15000	5055.	3.29	5528.	3.60										
	12000	5005.	3.26												
1700	16630	5374.	3.49	5879.	3.83										
	15000	5344.	3.48	5846.	3.80										
	12000	5294.	3.44												
1800	16630	5664.	3.68												
	15000	5633.	3.67												
	12000	5582.	3.63												

Figure 7-10. Maximum Cruise Thrust (Sheet 8)

FLIGHT PLANNING
MAXIMUM CRUISE THRUST
CRUISE (90.3% N1)

STANDARD DAY **CRUISE ALTITUDE 35000 FEET**

		TAILWIND						ZERO		HEADWIND					
STAGE	T.O.	100 KT.		50 KT.		25 KT.		WIND		25 KT.		50 KT.		100 KT.	
LENGTH NM.	WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1025.	.69	1075.	.72	1104.	.74	1139.	.76	1179.	.79	1224.	.81	1339.	.85
	15000	997.	.68	1047.	.72	1077.	.74	1112.	.76	1152.	.78	1198.	.80	1313.	.85
	12000	951.	.67	1002.	.70	1032.	.73	1067.	.75	1107.	.77	1153.	.79	1270.	.84
300	16630	1296.	.87	1374.	.93	1421.	.96	1474.	1.00	1534.	1.03	1603.	1.07	1776.	1.16
	15000	1268.	.87	1346.	.92	1393.	.95	1446.	.99	1506.	1.02	1575.	1.06	1748.	1.15
	12000	1221.	.85	1300.	.91	1346.	.94	1399.	.98	1460.	1.01	1529.	1.05	1702.	1.13
400	16630	1568.	1.06	1674.	1.14	1737.	1.18	1808.	1.23	1889.	1.28	1982.	1.34	2212.	1.46
	15000	1539.	1.05	1646.	1.13	1708.	1.17	1780.	1.22	1861.	1.27	1953.	1.33	2183.	1.45
	12000	1491.	1.04	1598.	1.12	1661.	1.16	1732.	1.21	1813.	1.26	1905.	1.31	2134.	1.43
500	16630	1839.	1.25	1974.	1.35	2053.	1.40	2143.	1.46	2245.	1.53	2361.	1.60	2649.	1.76
	15000	1810.	1.24	1945.	1.34	2024.	1.39	2113.	1.45	2215.	1.52	2331.	1.59	2617.	1.75
	12000	1762.	1.23	1896.	1.32	1975.	1.38	2065.	1.43	2166.	1.50	2281.	1.57	2566.	1.73
600	16630	2111.	1.44	2274.	1.56	2369.	1.62	2478.	1.70	2600.	1.77	2740.	1.86	3086.	2.07
	15000	2081.	1.43	2244.	1.54	2339.	1.61	2447.	1.68	2569.	1.76	2708.	1.85	3052.	2.05
	12000	2032.	1.41	2195.	1.53	2290.	1.59	2397.	1.66	2519.	1.74	2657.	1.83	2998.	2.03
700	16630	2382.	1.63	2573.	1.77	2686.	1.84	2813.	1.93	2956.	2.02	3119.	2.12	3522.	2.37
	15000	2352.	1.62	2543.	1.75	2655.	1.83	2781.	1.91	2924.	2.01	3086.	2.11	3487.	2.35
	12000	2303.	1.60	2493.	1.73	2604.	1.81	2730.	1.89	2872.	1.99	3032.	2.09	3430.	2.33
800	16630	2653.	1.81	2873.	1.97	3002.	2.06	3147.	2.16	3311.	2.27	3498.	2.39	3959.	2.67
	15000	2623.	1.80	2842.	1.96	2970.	2.05	3115.	2.14	3278.	2.25	3464.	2.37	3921.	2.65
	12000	2573.	1.79	2791.	1.94	2919.	2.03	3062.	2.12	3225.	2.23	3408.	2.35	3862.	2.63
900	16630	2925.	2.00	3173.	2.18	3318.	2.28	3482.	2.40	3667.	2.51	3877.	2.65	4395.	2.97
	15000	2894.	1.99	3141.	2.16	3286.	2.27	3449.	2.37	3632.	2.50	3841.	2.63	4356.	2.96
	12000	2843.	1.97	3089.	2.14	3233.	2.24	3395.	2.35	3578.	2.48	3784.	2.61	4294.	2.92
1000	16630	3196.	2.19	3473.	2.39	3634.	2.50	3817.	2.63	4022.	2.76	4256.	2.91	4832.	3.28
	15000	3165.	2.18	3440.	2.37	3601.	2.49	3783.	2.60	3987.	2.75	4219.	2.90	4791.	3.26
	12000	3114.	2.16	3388.	2.35	3548.	2.46	3728.	2.58	3931.	2.72	4160.	2.87	4726.	3.22
1100	16630	3468.	2.38	3772.	2.60	3951.	2.72	4152.	2.86	4378.	3.01	4635.	3.18	5269.	3.58
	15000	3436.	2.37	3739.	2.58	3917.	2.70	4117.	2.83	4341.	2.99	4596.	3.16	5225.	3.56
	12000	3384.	2.34	3686.	2.55	3863.	2.68	4060.	2.81	4284.	2.96	4536.	3.13	5158.	3.52
1200	16630	3739.	2.57	4072.	2.81	4267.	2.94	4486.	3.09	4733.	3.26	5013.	3.44	5705.	3.88
	15000	3707.	2.55	4039.	2.78	4232.	2.92	4451.	3.07	4696.	3.24	4974.	3.42	5660.	3.86
	12000	3655.	2.53	3984.	2.76	4177.	2.90	4393.	3.04	4636.	3.21	4911.	3.39	5590.	3.82
1300	16630	4010.	2.76	4372.	3.02	4583.	3.16	4821.	3.33	5088.	3.50	5392.	3.70	6142.	4.19
	15000	3978.	2.74	4338.	2.99	4548.	3.14	4784.	3.30	5050.	3.48	5352.	3.68	6095.	4.16
	12000	3925.	2.72	4282.	2.96	4492.	3.11	4725.	3.27	4989.	3.45	5287.	3.65		
1400	16630	4282.	2.94	4672.	3.23	4899.	3.38	5156.	3.56	5444.	3.75	5771.	3.97		
	15000	4249.	2.93	4637.	3.20	4863.	3.36	5118.	3.53	5404.	3.73	5729.	3.94		
	12000	4195.	2.90	4581.	3.17	4806.	3.33	5058.	3.49	5342.	3.69				
1500	16630	4553.	3.13	4971.	3.43	5216.	3.60	5491.	3.79	5799.	4.00				
	15000	4520.	3.12	4936.	3.40	5179.	3.58	5452.	3.76	5759.	3.98				
	12000	4466.	3.09	4879.	3.37	5121.	3.55								
1600	16630	4825.	3.32	5271.	3.64	5532.	3.82								
	15000	4791.	3.30	5235.	3.61	5494.	3.80								
	12000	4736.	3.28	5177.	3.58										
1700	16630	5096.	3.51	5571.	3.85										
	15000	5062.	3.49	5534.	3.82										
	12000	5007.	3.46												
1800	16630	5367.	3.70	5871.	4.06										
	15000	5333.	3.68	5833.	4.02										
	12000	5277.	3.65												
1900	16630	5639.	3.88												
	15000	5604.	3.87												
	12000	5547.	3.84												

Figure 7-10. Maximum Cruise Thrust (Sheet 9)

FLIGHT PLANNING
MAXIMUM CRUISE THRUST
CRUISE (90.3% N1)

STANDARD DAY **CRUISE ALTITUDE 37000 FEET**

STAGE LENGTH NM.	T.O. WEIGHT LBS.	TAILWIND						ZERO WIND		HEADWIND					
		100 KT.		50 KT.		25 KT.				25 KT.		50 KT.		100 KT.	
		FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1020.	.69	1066.	.73	1093.	.75	1125.	.77	1162.	.79	1204.	.81	1311.	.85
	15000	989.	.69	1035.	.72	1062.	.74	1095.	.76	1132.	.78	1175.	.81	1283.	.85
	12000	937.	.67	985.	.71	1012.	.73	1045.	.75	1083.	.77	1126.	.79	1235.	.84
300	16630	1271.	.88	1343.	.94	1386.	.97	1435.	1.00	1491.	1.04	1555.	1.08	1716.	1.16
	15000	1239.	.87	1312.	.93	1354.	.96	1404.	1.00	1460.	1.03	1524.	1.07	1685.	1.15
	12000	1187.	.86	1260.	.92	1303.	.95	1353.	.98	1409.	1.02	1474.	1.06	1635.	1.14
400	16630	1522.	1.07	1620.	1.15	1678.	1.19	1745.	1.24	1820.	1.29	1906.	1.34	2121.	1.47
	15000	1490.	1.06	1588.	1.14	1646.	1.18	1713.	1.23	1788.	1.28	1874.	1.33	2088.	1.45
	12000	1437.	1.05	1536.	1.12	1594.	1.17	1660.	1.21	1736.	1.26	1821.	1.32	2035.	1.43
500	16630	1773.	1.26	1898.	1.36	1971.	1.41	2055.	1.47	2149.	1.54	2257.	1.61	2526.	1.77
	15000	1740.	1.25	1865.	1.35	1938.	1.40	2021.	1.46	2116.	1.52	2224.	1.59	2491.	1.76
	12000	1687.	1.23	1812.	1.33	1885.	1.38	1968.	1.44	2062.	1.51	2169.	1.58	2435.	1.73
600	16630	2024.	1.45	2175.	1.57	2264.	1.63	2364.	1.71	2479.	1.78	2608.	1.87	2931.	2.08
	15000	1991.	1.44	2142.	1.55	2230.	1.62	2330.	1.69	2444.	1.77	2573.	1.86	2894.	2.06
	12000	1937.	1.42	2087.	1.53	2176.	1.60	2275.	1.67	2389.	1.75	2517.	1.84	2835.	2.03
700	16630	2275.	1.64	2452.	1.78	2556.	1.85	2674.	1.94	2808.	2.03	2959.	2.14	3336.	2.38
	15000	2241.	1.63	2418.	1.76	2522.	1.84	2639.	1.93	2772.	2.02	2923.	2.12	3297.	2.36
	12000	2187.	1.61	2363.	1.74	2466.	1.82	2583.	1.90	2715.	2.00	2865.	2.10	3235.	2.33
800	16630	2526.	1.83	2729.	1.99	2849.	2.07	2984.	2.17	3137.	2.28	3310.	2.40	3741.	2.69
	15000	2492.	1.82	2695.	1.97	2814.	2.06	2948.	2.16	3100.	2.26	3273.	2.38	3700.	2.67
	12000	2437.	1.79	2639.	1.95	2757.	2.04	2891.	2.13	3042.	2.24	3212.	2.36	3635.	2.63
900	16630	2776.	2.02	3007.	2.20	3142.	2.29	3294.	2.41	3466.	2.53	3661.	2.67	4146.	3.00
	15000	2742.	2.01	2972.	2.18	3106.	2.28	3257.	2.39	3428.	2.51	3622.	2.65	4102.	2.97
	12000	2686.	1.98	2914.	2.15	3048.	2.25	3198.	2.36	3368.	2.49	3560.	2.62	4035.	2.93
1000	16630	3027.	2.21	3284.	2.40	3435.	2.51	3604.	2.64	3795.	2.78	4012.	2.93	4551.	3.30
	15000	2993.	2.19	3248.	2.39	3398.	2.49	3566.	2.62	3756.	2.76	3972.	2.91	4505.	3.27
	12000	2936.	2.17	3190.	2.36	3339.	2.47	3506.	2.59	3695.	2.73	3908.	2.88	4435.	3.23
1100	16630	3278.	2.40	3561.	2.61	3727.	2.73	3914.	2.88	4125.	3.03	4363.	3.20	4956.	3.61
	15000	3243.	2.38	3525.	2.60	3689.	2.71	3875.	2.86	4084.	3.00	4322.	3.17	4908.	3.58
	12000	3186.	2.36	3466.	2.56	3630.	2.69	3813.	2.82	4021.	2.98	4255.	3.14	4835.	3.53
1200	16630	3529.	2.59	3839.	2.82	4020.	2.95	4224.	3.11	4454.	3.28	4714.	3.46	5361.	3.91
	15000	3494.	2.57	3801.	2.80	3981.	2.93	4184.	3.09	4412.	3.25	4671.	3.43	5311.	3.88
	12000	3436.	2.54	3742.	2.77	3921.	2.91	4121.	3.05	4347.	3.22	4603.	3.40	5235.	3.83
1300	16630	3780.	2.78	4116.	3.03	4313.	3.18	4533.	3.35	4783.	3.52	5065.	3.73	5766.	4.22
	15000	3744.	2.76	4078.	3.01	4273.	3.15	4492.	3.32	4740.	3.50	5021.	3.70	5714.	4.18
	12000	3686.	2.73	4017.	2.98	4211.	3.13	4429.	3.28	4674.	3.47	4951.	3.66	5635.	4.12
1400	16630	4031.	2.97	4393.	3.24	4605.	3.40	4843.	3.58	5112.	3.77	5416.	3.99	6171.	4.52
	15000	3995.	2.95	4355.	3.22	4565.	3.37	4801.	3.55	5068.	3.74	5371.	3.96	6117.	4.49
	12000	3936.	2.92	4293.	3.18	4502.	3.34	4736.	3.51	5000.	3.71	5299.	3.92		
1500	16630	4282.	3.16	4670.	3.45	4898.	3.62	5153.	3.81	5442.	4.02	5768.	4.26		
	15000	4245.	3.14	4631.	3.43	4857.	3.59	5110.	3.79	5396.	3.99	5720.	4.22		
	12000	4186.	3.10	4569.	3.39	4793.	3.56	5044.	3.74						
1600	16630	4533.	3.35	4948.	3.66	5191.	3.84	5463.	4.05						
	15000	4496.	3.33	4908.	3.64	5149.	3.81	5419.	4.02						
	12000	4435.	3.29	4844.	3.59	5084.	3.78								
1700	16630	4784.	3.54	5225.	3.87	5484.	4.06								
	15000	4746.	3.52	5185.	3.84	5441.	4.03								
	12000	4685.	3.48	5120.	3.80										
1800	16630	5035.	3.73	5502.	4.08										
	15000	4997.	3.70	5461.	4.05										
	12000	4935.	3.66	5396.	4.01										
1900	16630	5286.	3.92	5780.	4.29										
	15000	5247.	3.89	5738.	4.26										
	12000	5185.	3.85												
2000	16630	5537.	4.11												
	15000	5498.	4.08												
	12000	5435.	4.04												

Figure 7-10. Maximum Cruise Thrust (Sheet 10)

FLIGHT PLANNING
MAXIMUM CRUISE THRUST
CRUISE (90.2% N1)

STANDARD DAY **CRUISE ALTITUDE 39000 FEET**

		TAILWIND						ZERO		HEADWIND					
STAGE	T.O.	100 KT.		50 KT.		25 KT.		WIND		25 KT.		50 KT.		100 KT.	
LENGTH NM.	WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1020.	.70	1062.	.74	1087.	.76	1116.	.78	1150.	.80	1190.	.82	1289.	.86
	15000	985.	.69	1027.	.73	1052.	.75	1082.	.77	1117.	.79	1156.	.81	1256.	.85
	12000	927.	.68	971.	.71	996.	.73	1027.	.75	1062.	.77	1102.	.80	1203.	.84
400	16630	1479.	1.08	1570.	1.16	1623.	1.20	1684.	1.25	1754.	1.30	1834.	1.35	2033.	1.47
	15000	1443.	1.07	1533.	1.15	1587.	1.19	1648.	1.23	1717.	1.28	1797.	1.34	1995.	1.46
	12000	1384.	1.05	1475.	1.13	1528.	1.17	1589.	1.22	1659.	1.27	1738.	1.32	1936.	1.44
500	16630	1709.	1.27	1824.	1.37	1891.	1.42	1968.	1.48	2056.	1.55	2156.	1.62	2405.	1.78
	15000	1672.	1.26	1787.	1.36	1854.	1.41	1931.	1.47	2018.	1.53	2117.	1.60	2365.	1.76
	12000	1613.	1.24	1727.	1.34	1794.	1.39	1871.	1.45	1958.	1.51	2056.	1.58	2302.	1.74
600	16630	1939.	1.46	2078.	1.58	2160.	1.65	2252.	1.72	2358.	1.80	2478.	1.89	2777.	2.09
	15000	1901.	1.45	2040.	1.57	2121.	1.63	2213.	1.70	2318.	1.78	2438.	1.87	2734.	2.07
	12000	1841.	1.43	1979.	1.54	2060.	1.61	2152.	1.68	2256.	1.76	2375.	1.84	2668.	2.04
700	16630	2169.	1.66	2332.	1.79	2428.	1.87	2536.	1.96	2660.	2.05	2800.	2.15	3149.	2.40
	15000	2130.	1.64	2293.	1.78	2388.	1.85	2496.	1.93	2619.	2.03	2758.	2.14	3104.	2.37
	12000	2069.	1.62	2231.	1.75	2326.	1.83	2434.	1.91	2555.	2.00	2693.	2.11	3034.	2.34
800	16630	2398.	1.85	2586.	2.00	2696.	2.09	2820.	2.19	2961.	2.30	3122.	2.42	3521.	2.71
	15000	2359.	1.83	2546.	1.98	2655.	2.07	2779.	2.17	2919.	2.28	3079.	2.40	3473.	2.68
	12000	2298.	1.80	2483.	1.96	2592.	2.04	2715.	2.14	2853.	2.25	3011.	2.37	3400.	2.64
900	16630	2628.	2.04	2840.	2.21	2964.	2.32	3104.	2.43	3263.	2.55	3444.	2.69	3893.	3.02
	15000	2588.	2.02	2799.	2.19	2923.	2.29	3062.	2.40	3220.	2.53	3399.	2.67	3842.	2.98
	12000	2526.	1.99	2736.	2.17	2858.	2.26	2996.	2.37	3152.	2.50	3329.	2.63	3767.	2.94
1000	16630	2858.	2.23	3094.	2.42	3232.	2.54	3388.	2.66	3565.	2.80	3766.	2.95	4265.	3.33
	15000	2817.	2.20	3052.	2.40	3190.	2.51	3345.	2.63	3520.	2.78	3719.	2.93	4212.	3.29
	12000	2755.	2.18	2988.	2.37	3124.	2.48	3278.	2.60	3451.	2.74	3647.	2.89	4133.	3.24
1100	16630	3087.	2.42	3348.	2.63	3500.	2.76	3672.	2.90	3867.	3.05	4088.	3.22	4637.	3.64
	15000	3047.	2.39	3306.	2.61	3457.	2.73	3627.	2.87	3821.	3.03	4040.	3.20	4581.	3.59
	12000	2983.	2.36	3240.	2.58	3390.	2.70	3559.	2.83	3749.	2.99	3966.	3.15	4499.	3.54
1200	16630	3317.	2.61	3602.	2.84	3768.	2.99	3956.	3.13	4169.	3.30	4410.	3.49	5009.	3.95
	15000	3276.	2.58	3559.	2.82	3724.	2.95	3910.	3.10	4121.	3.27	4360.	3.46	4951.	3.90
	12000	3212.	2.55	3492.	2.79	3656.	2.92	3840.	3.06	4048.	3.23	4284.	3.42	4865.	3.84
1300	16630	3547.	2.80	3856.	3.05	4037.	3.21	4240.	3.37	4471.	3.55	4733.	3.76	5380.	4.26
	15000	3505.	2.77	3812.	3.03	3991.	3.17	4193.	3.33	4421.	3.52	4680.	3.73	5320.	4.20
	12000	3440.	2.74	3744.	3.00	3922.	3.14	4122.	3.29	4347.	3.48	4602.	3.68	5231.	4.14
1400	16630	3777.	2.99	4110.	3.26	4305.	3.43	4524.	3.61	4773.	3.80	5055.	4.02	5752.	4.57
	15000	3734.	2.96	4065.	3.24	4258.	3.40	4476.	3.57	4722.	3.77	5001.	3.99	5689.	4.51
	12000	3668.	2.93	3996.	3.20	4188.	3.35	4403.	3.52	4645.	3.72	4920.	3.94	5598.	4.44
1500	16630	4006.	3.18	4364.	3.48	4573.	3.65	4808.	3.84	5074.	4.05	5377.	4.29	6124.	4.88
	15000	3963.	3.15	4318.	3.45	4526.	3.62	4759.	3.80	5022.	4.02	5321.	4.26	6059.	4.81
	12000	3897.	3.11	4248.	3.41	4453.	3.57	4685.	3.75	4944.	3.97	5239.	4.20		
1600	16630	4236.	3.37	4618.	3.69	4841.	3.88	5092.	4.08	5376.	4.30	5699.	4.56		
	15000	4192.	3.34	4572.	3.66	4793.	3.84	5042.	4.03	5323.	4.27	5642.	4.52		
	12000	4125.	3.30	4500.	3.62	4719.	3.79	4966.	3.98	5242.	4.22				
1700	16630	4466.	3.56	4872.	3.90	5109.	4.10	5376.	4.31	5678.	4.55				
	15000	4421.	3.53	4825.	3.87	5060.	4.06	5324.	4.27	5623.	4.52				
	12000	4354.	3.49	4753.	3.83	4985.	4.01	5247.	4.22						
1800	16630	4696.	3.75	5126.	4.11	5377.	4.32	5660.	4.55						
	15000	4650.	3.72	5078.	4.08	5327.	4.28	5607.	4.50						
	12000	4582.	3.67	5005.	4.03	5251.	4.23								
1900	16630	4925.	3.94	5380.	4.32	5645.	4.55								
	15000	4879.	3.90	5331.	4.29	5594.	4.50								
	12000	4811.	3.86	5257.	4.24										
2000	16630	5155.	4.13	5634.	4.53										
	15000	5108.	4.09	5584.	4.50										
	12000	5039.	4.05												
2100	16630	5385.	4.32	5888.	4.74										
	15000	5338.	4.28	5837.	4.71										
	12000	5267.	4.24												
2200	16630	5614.	4.51												
	15000	5567.	4.47												
	12000	5496.	4.42												

Figure 7-10. Maximum Cruise Thrust (Sheet 11)

FLIGHT PLANNING
MAXIMUM CRUISE THRUST
CRUISE (89.9% N1)

STANDARD DAY **CRUISE ALTITUDE 41000 FEET**

		TAILWIND						ZERO		HEADWIND					
STAGE	T.O.	100 KT.		50 KT.		25 KT.		WIND		25 KT.		50 KT.		100 KT.	
LENGTH NM.	WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1028.	.71	1066.	.75	1089.	.77	1116.	.79	1148.	.80	1184.	.82	1276.	.86
	15000	986.	.70	1025.	.74	1049.	.76	1076.	.77	1108.	.79	1145.	.81	1238.	.85
	12000	922.	.69	962.	.72	986.	.74	1014.	.76	1047.	.78	1084.	.80	1179.	.84
400	16630	1448.	1.10	1531.	1.17	1580.	1.22	1636.	1.26	1701.	1.31	1775.	1.37	1960.	1.49
	15000	1405.	1.08	1488.	1.16	1537.	1.20	1594.	1.25	1658.	1.29	1732.	1.35	1916.	1.47
	12000	1339.	1.06	1423.	1.14	1472.	1.18	1528.	1.22	1592.	1.27	1665.	1.32	1848.	1.44
600	16630	1868.	1.48	1996.	1.60	2071.	1.66	2157.	1.74	2254.	1.82	2366.	1.91	2643.	2.11
	15000	1824.	1.46	1951.	1.58	2026.	1.64	2111.	1.72	2208.	1.79	2318.	1.88	2593.	2.08
	12000	1756.	1.44	1883.	1.55	1957.	1.62	2042.	1.69	2138.	1.76	2247.	1.85	2518.	2.05
800	16630	2288.	1.87	2461.	2.02	2562.	2.11	2677.	2.22	2808.	2.32	2956.	2.45	3327.	2.74
	15000	2243.	1.84	2414.	2.00	2515.	2.09	2629.	2.19	2758.	2.30	2905.	2.42	3271.	2.70
	12000	2173.	1.82	2343.	1.97	2443.	2.05	2556.	2.15	2683.	2.25	2828.	2.37	3188.	2.65
900	16630	2498.	2.06	2693.	2.24	2807.	2.34	2937.	2.45	3084.	2.58	3252.	2.72	3669.	3.05
	15000	2452.	2.04	2646.	2.21	2759.	2.31	2887.	2.42	3033.	2.55	3199.	2.68	3609.	3.01
	12000	2382.	2.00	2573.	2.18	2686.	2.27	2813.	2.38	2956.	2.50	3119.	2.63	3523.	2.96
1000	16630	2708.	2.25	2925.	2.45	3053.	2.56	3197.	2.69	3361.	2.83	3547.	2.99	4010.	3.36
	15000	2661.	2.23	2877.	2.42	3003.	2.53	3146.	2.66	3308.	2.80	3492.	2.95	3948.	3.32
	12000	2590.	2.19	2804.	2.38	2928.	2.49	3070.	2.61	3229.	2.74	3410.	2.90	3858.	3.26
1100	16630	2918.	2.44	3158.	2.66	3298.	2.79	3457.	2.93	3638.	3.09	3843.	3.26	4352.	3.68
	15000	2871.	2.42	3109.	2.63	3248.	2.75	3405.	2.90	3583.	3.05	3786.	3.22	4287.	3.63
	12000	2799.	2.38	3034.	2.59	3171.	2.71	3327.	2.84	3501.	2.99	3700.	3.16	4192.	3.56
1200	16630	3128.	2.64	3390.	2.87	3544.	3.01	3717.	3.17	3914.	3.34	4138.	3.53	4694.	3.99
	15000	3080.	2.61	3340.	2.84	3492.	2.97	3664.	3.13	3858.	3.30	4079.	3.49	4626.	3.93
	12000	3007.	2.57	3264.	2.80	3414.	2.93	3584.	3.08	3774.	3.24	3991.	3.42	4527.	3.87
1300	16630	3338.	2.83	3623.	3.09	3789.	3.23	3978.	3.41	4191.	3.59	4434.	3.80	5036.	4.30
	15000	3290.	2.80	3572.	3.05	3737.	3.20	3923.	3.37	4133.	3.55	4372.	3.75	4965.	4.24
	12000	3215.	2.76	3494.	3.01	3657.	3.15	3841.	3.31	4047.	3.48	4282.	3.68	4862.	4.17
1400	16630	3548.	3.02	3855.	3.30	4035.	3.46	4238.	3.65	4468.	3.85	4729.	4.07	5377.	4.62
	15000	3499.	2.99	3803.	3.26	3981.	3.42	4181.	3.60	4408.	3.80	4666.	4.02	5303.	4.55
	12000	3424.	2.95	3724.	3.22	3900.	3.37	4097.	3.54	4320.	3.73	4573.	3.94	5197.	4.47
1500	16630	3758.	3.21	4088.	3.51	4280.	3.68	4498.	3.88	4744.	4.10	5024.	4.34	5719.	4.93
	15000	3708.	3.18	4034.	3.47	4225.	3.64	4440.	3.84	4683.	4.05	4959.	4.29	5642.	4.86
	12000	3632.	3.14	3954.	3.42	4142.	3.59	4354.	3.77	4592.	3.97	4863.	4.21	5532.	4.77
1600	16630	3968.	3.41	4320.	3.72	4526.	3.91	4758.	4.12	5021.	4.35	5320.	4.61	6061.	5.24
	15000	3918.	3.37	4266.	3.68	4470.	3.86	4699.	4.07	4958.	4.30	5253.	4.56	5981.	5.17
	12000	3841.	3.32	4185.	3.63	4385.	3.81	4611.	4.00	4865.	4.22	5154.	4.47		
1700	16630	4178.	3.60	4552.	3.94	4771.	4.13	5018.	4.36	5298.	4.61	5615.	4.89		
	15000	4127.	3.56	4497.	3.89	4714.	4.08	4958.	4.31	5233.	4.55	5546.	4.82		
	12000	4049.	3.51	4415.	3.84	4628.	4.03	4868.	4.23	5138.	4.47				
1800	16630	4388.	3.79	4785.	4.15	5017.	4.35	5278.	4.60	5574.	4.86				
	15000	4336.	3.75	4729.	4.10	4958.	4.30	5216.	4.55	5508.	4.80				
	12000	4258.	3.70	4645.	4.05	4871.	4.24	5125.	4.46						
1900	16630	4599.	3.98	5017.	4.36	5262.	4.58	5538.	4.84						
	15000	4546.	3.94	4960.	4.31	5203.	4.53	5475.	4.78						
	12000	4466.	3.89	4875.	4.26	5114.	4.46								
2000	16630	4809.	4.17	5250.	4.58	5508.	4.80								
	15000	4755.	4.13	5192.	4.53	5447.	4.75								
	12000	4675.	4.08	5105.	4.46										
2100	16630	5019.	4.37	5482.	4.79										
	15000	4965.	4.32	5423.	4.74										
	12000	4883.	4.27	5335.	4.67										
2200	16630	5229.	4.56	5715.	5.00										
	15000	5174.	4.51	5655.	4.95										
	12000	5092.	4.45												
2300	16630	5439.	4.75	5947.	5.21										
	15000	5383.	4.70	5886.	5.16										
	12000	5300.	4.64												
2400	16630	5649.	4.94												
	15000	5593.	4.89												
	12000	5509.	4.83												

Figure 7-10. Maximum Cruise Thrust (Sheet 12)

FLIGHT PLANNING
MAXIMUM CRUISE THRUST
CRUISE (89.4% N1)

STANDARD DAY **CRUISE ALTITUDE 43000 FEET**

		TAILWIND						ZERO		HEADWIND					
STAGE	T.O.	100 KT.		50 KT.		25 KT.		WIND		25 KT.		50 KT.		100 KT.	
LENGTH NM.	WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1045.	.73	1080.	.76	1101.	.78	1126.	.80	1155.	.82	1188.	.84	1274.	.87
	15000	995.	.72	1031.	.75	1052.	.77	1078.	.78	1107.	.80	1142.	.82	1229.	.86
	12000	922.	.69	959.	.73	980.	.75	1007.	.76	1037.	.78	1072.	.80	1160.	.84
400	16630	1429.	1.12	1505.	1.20	1551.	1.24	1603.	1.28	1663.	1.33	1732.	1.39	1905.	1.51
	15000	1377.	1.10	1454.	1.17	1499.	1.21	1551.	1.26	1610.	1.31	1679.	1.36	1850.	1.48
	12000	1302.	1.07	1378.	1.14	1424.	1.19	1476.	1.23	1535.	1.28	1603.	1.33	1773.	1.45
600	16630	1813.	1.51	1931.	1.63	2001.	1.70	2081.	1.77	2171.	1.85	2275.	1.94	2536.	2.15
	15000	1759.	1.48	1876.	1.60	1945.	1.66	2024.	1.74	2114.	1.81	2216.	1.90	2471.	2.11
	12000	1682.	1.45	1798.	1.56	1867.	1.63	1945.	1.70	2033.	1.78	2134.	1.86	2385.	2.06
800	16630	2197.	1.90	2357.	2.06	2451.	2.15	2558.	2.25	2680.	2.36	2819.	2.49	3167.	2.79
	15000	2141.	1.87	2299.	2.02	2392.	2.11	2497.	2.21	2617.	2.32	2753.	2.44	3092.	2.73
	12000	2062.	1.83	2218.	1.98	2310.	2.07	2414.	2.17	2531.	2.27	2665.	2.39	2997.	2.67
1000	16630	2582.	2.29	2783.	2.49	2901.	2.61	3036.	2.74	3188.	2.88	3362.	3.04	3798.	3.43
	15000	2523.	2.25	2722.	2.44	2838.	2.56	2970.	2.69	3120.	2.82	3290.	2.98	3713.	3.36
	12000	2442.	2.21	2638.	2.40	2753.	2.51	2883.	2.63	3030.	2.77	3196.	2.92	3609.	3.28
1200	16630	2966.	2.68	3209.	2.93	3352.	3.06	3513.	3.22	3696.	3.39	3906.	3.59	4429.	4.07
	15000	2906.	2.63	3145.	2.87	3285.	3.01	3444.	3.16	3623.	3.33	3827.	3.52	4335.	3.98
	12000	2822.	2.58	3058.	2.81	3196.	2.95	3352.	3.10	3528.	3.26	3727.	3.45	4222.	3.89
1300	16630	3158.	2.88	3421.	3.14	3577.	3.29	3752.	3.46	3950.	3.65	4177.	3.87	4744.	4.39
	15000	3097.	2.82	3356.	3.08	3508.	3.23	3680.	3.40	3874.	3.58	4096.	3.79	4645.	4.29
	12000	3012.	2.77	3268.	3.02	3418.	3.17	3586.	3.33	3777.	3.51	3993.	3.72	4528.	4.20
1400	16630	3350.	3.07	3634.	3.36	3802.	3.52	3991.	3.70	4205.	3.91	4449.	4.15	5060.	4.71
	15000	3288.	3.01	3567.	3.29	3731.	3.46	3917.	3.64	4126.	3.84	4364.	4.06	4956.	4.61
	12000	3202.	2.96	3478.	3.23	3639.	3.39	3821.	3.57	4026.	3.76	4258.	3.98	4834.	4.50
1500	16630	3542.	3.27	3847.	3.57	4027.	3.75	4230.	3.95	4459.	4.17	4721.	4.42	5375.	5.03
	15000	3479.	3.21	3779.	3.50	3955.	3.68	4153.	3.87	4377.	4.09	4633.	4.33	5266.	4.92
	12000	3392.	3.15	3688.	3.44	3861.	3.61	4055.	3.80	4275.	4.01	4524.	4.24	5140.	4.81
1600	16630	3734.	3.46	4060.	3.79	4252.	3.98	4468.	4.19	4713.	4.42	4993.	4.70	5691.	5.35
	15000	3670.	3.40	3990.	3.72	4178.	3.91	4390.	4.11	4629.	4.34	4902.	4.60	5577.	5.23
	12000	3582.	3.34	3898.	3.65	4082.	3.83	4290.	4.04	4524.	4.26	4789.	4.51	5446.	5.11
1700	16630	3926.	3.66	4273.	4.01	4477.	4.21	4707.	4.43	4967.	4.68	5264.	4.97	6006.	5.67
	15000	3861.	3.59	4202.	3.93	4401.	4.13	4627.	4.35	4880.	4.59	5170.	4.87	5888.	5.54
	12000	3773.	3.53	4108.	3.86	4304.	4.05	4524.	4.27	4773.	4.50	5055.	4.77		
1800	16630	4118.	3.85	4486.	4.22	4702.	4.43	4946.	4.67	5221.	4.94	5536.	5.25		
	15000	4052.	3.78	4413.	4.14	4624.	4.36	4863.	4.59	5132.	4.85	5439.	5.14		
	12000	3963.	3.72	4317.	4.07	4526.	4.27	4759.	4.50	5022.	4.75				
1900	16630	4311.	4.05	4699.	4.44	4928.	4.66	5185.	4.91	5475.	5.20				
	15000	4243.	3.97	4624.	4.35	4848.	4.58	5100.	4.83	5384.	5.10				
	12000	4153.	3.91	4527.	4.28	4747.	4.49	4993.	4.74	5271.	5.00				
2000	16630	4503.	4.24	4912.	4.66	5153.	4.89	5423.	5.16	5730.	5.46				
	15000	4434.	4.16	4836.	4.56	5071.	4.81	5336.	5.06	5635.	5.35				
	12000	4343.	4.09	4737.	4.48	4969.	4.71	5228.	4.97						
2100	16630	4695.	4.44	5124.	4.87	5378.	5.12	5662.	5.40						
	15000	4625.	4.35	5047.	4.78	5294.	5.03	5573.	5.30						
	12000	4533.	4.28	4947.	4.69	5190.	4.93								
2200	16630	4887.	4.63	5337.	5.09	5603.	5.35								
	15000	4816.	4.55	5258.	4.99	5517.	5.26								
	12000	4723.	4.47	5157.	4.90										
2300	16630	5079.	4.83	5550.	5.30										
	15000	5007.	4.74	5470.	5.20										
	12000	4913.	4.66	5367.	5.11										
2400	16630	5271.	5.02	5763.	5.52										
	15000	5198.	4.93	5681.	5.41										
	12000	5103.	4.85												
2500	16630	5463.	5.22												
	15000	5389.	5.12												
	12000	5293.	5.04												

Figure 7-10. Maximum Cruise Thrust (Sheet 13)

FLIGHT PLANNING
MAXIMUM CRUISE THRUST
CRUISE (89.1% N1)

STANDARD DAY **CRUISE ALTITUDE 45000 FEET**

		TAILWIND						ZERO		HEADWIND					
STAGE	T.O.	100 KT.		50 KT.		25 KT.		WIND		25 KT.		50 KT.		100 KT.	
LENGTH NM.	WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1063.	.75	1092.	.77	1110.	.79	1131.	.81	1156.	.82	1185.	.84	1260.	.86
	15000	994.	.71	1025.	.74	1044.	.76	1066.	.78	1092.	.79	1123.	.81	1200.	.84
	12000	909.	.68	941.	.71	960.	.73	983.	.75	1010.	.76	1041.	.78	1121.	.81
400	16630	1415.	1.15	1484.	1.22	1524.	1.26	1571.	1.30	1626.	1.35	1688.	1.40	1846.	1.52
	15000	1343.	1.10	1412.	1.17	1452.	1.21	1500.	1.26	1553.	1.30	1615.	1.36	1771.	1.47
	12000	1255.	1.06	1323.	1.13	1364.	1.17	1411.	1.22	1464.	1.26	1526.	1.31	1680.	1.43
600	16630	1767.	1.54	1875.	1.66	1938.	1.73	2011.	1.80	2095.	1.88	2191.	1.97	2433.	2.19
	15000	1692.	1.49	1798.	1.60	1861.	1.67	1933.	1.74	2014.	1.82	2108.	1.90	2342.	2.11
	12000	1601.	1.44	1706.	1.55	1768.	1.62	1838.	1.69	1919.	1.76	2010.	1.84	2238.	2.04
800	16630	2120.	1.94	2266.	2.10	2353.	2.19	2451.	2.30	2564.	2.41	2694.	2.54	3019.	2.85
	15000	2041.	1.88	2185.	2.03	2270.	2.12	2366.	2.22	2476.	2.33	2601.	2.45	2914.	2.74
	12000	1947.	1.82	2089.	1.97	2172.	2.06	2266.	2.16	2373.	2.26	2495.	2.37	2797.	2.65
1000	16630	2472.	2.34	2658.	2.54	2767.	2.66	2892.	2.79	3034.	2.94	3196.	3.11	3605.	3.51
	15000	2390.	2.26	2572.	2.46	2678.	2.58	2799.	2.70	2937.	2.84	3094.	3.00	3485.	3.38
	12000	2294.	2.20	2471.	2.39	2575.	2.50	2693.	2.62	2827.	2.76	2979.	2.90	3356.	3.26
1200	16630	2825.	2.74	3049.	2.98	3181.	3.13	3332.	3.29	3503.	3.47	3699.	3.68	4192.	4.17
	15000	2739.	2.65	2958.	2.89	3087.	3.03	3232.	3.19	3398.	3.36	3586.	3.55	4056.	4.01
	12000	2640.	2.58	2854.	2.81	2979.	2.95	3121.	3.09	3281.	3.26	3464.	3.44	3915.	3.88
1400	16630	3177.	3.13	3440.	3.43	3596.	3.59	3772.	3.78	3972.	4.00	4202.	4.24	4778.	4.83
	15000	3088.	3.04	3345.	3.32	3495.	3.49	3665.	3.67	3859.	3.87	4079.	4.09	4627.	4.65
	12000	2986.	2.96	3237.	3.23	3383.	3.39	3548.	3.56	3736.	3.76	3948.	3.97	4474.	4.49
1600	16630	3529.	3.53	3832.	3.87	4010.	4.06	4212.	4.28	4442.	4.53	4705.	4.81	5364.	5.49
	15000	3437.	3.43	3731.	3.75	3904.	3.94	4099.	4.15	4320.	4.38	4572.	4.64	5199.	5.28
	12000	3332.	3.34	3619.	3.65	3787.	3.83	3976.	4.03	4190.	4.25	4433.	4.50	5033.	5.10
1700	16630	3706.	3.73	4027.	4.09	4217.	4.30	4432.	4.53	4676.	4.79	4956.	5.10	5658.	5.82
	15000	3612.	3.62	3925.	3.96	4108.	4.17	4315.	4.39	4550.	4.64	4818.	4.91	5484.	5.60
	12000	3506.	3.53	3810.	3.86	3989.	4.06	4190.	4.27	4417.	4.50	4675.	4.76	5312.	5.41
1800	16630	3882.	3.93	4223.	4.31	4424.	4.53	4652.	4.78	4911.	5.06	5207.	5.38	5951.	6.15
	15000	3786.	3.81	4118.	4.18	4312.	4.40	4532.	4.63	4781.	4.90	5065.	5.19	5770.	5.92
	12000	3679.	3.72	4002.	4.07	4191.	4.28	4403.	4.50	4644.	4.75	4917.	5.03	5591.	5.71
1900	16630	4058.	4.13	4419.	4.53	4631.	4.76	4872.	5.03	5146.	5.32	5459.	5.66		
	15000	3961.	4.01	4311.	4.39	4517.	4.62	4748.	4.87	5011.	5.15	5311.	5.46		
	12000	3852.	3.90	4193.	4.28	4393.	4.50	4617.	4.74	4871.	5.00	5159.	5.29		
2000	16630	4234.	4.33	4614.	4.75	4838.	5.00	5092.	5.27	5380.	5.59	5710.	5.95		
	15000	4135.	4.20	4504.	4.61	4721.	4.85	4965.	5.11	5242.	5.41	5557.	5.73		
	12000	4025.	4.09	4384.	4.48	4595.	4.72	4831.	4.97	5098.	5.25				
2100	16630	4410.	4.52	4810.	4.97	5046.	5.23	5312.	5.52	5615.	5.85				
	15000	4310.	4.39	4698.	4.82	4925.	5.08	5182.	5.36	5472.	5.67				
	12000	4198.	4.28	4576.	4.69	4797.	4.94	5045.	5.21						
2200	16630	4587.	4.72	5006.	5.19	5253.	5.46	5532.	5.77						
	15000	4484.	4.59	4891.	5.04	5130.	5.31	5398.	5.60						
	12000	4371.	4.47	4767.	4.90	4998.	5.16	5258.	5.44						
2300	16630	4763.	4.92	5201.	5.41	5460.	5.70								
	15000	4659.	4.78	5084.	5.25	5334.	5.53								
	12000	4544.	4.66	4958.	5.11	5200.	5.39								
2400	16630	4939.	5.12	5397.	5.64	5667.	5.93								
	15000	4833.	4.97	5278.	5.46	5538.	5.76								
	12000	4717.	4.85	5150.	5.32										
2500	16630	5115.	5.32	5593.	5.86										
	15000	5008.	5.17	5471.	5.68										
	12000	4891.	5.04	5341.	5.53										
2600	16630	5291.	5.52	5788.	6.08										
	15000	5182.	5.36	5664.	5.89										
	12000	5064.	5.23												
2700	16630	5468.	5.72												
	15000	5357.	5.56												
	12000	5237.	5.42												

Figure 7-10. Maximum Cruise Thrust (Sheet 14)

FLIGHT PLANNING
NORMAL CRUISE THRUST
CRUISE (.65 MACH)

STANDARD DAY — **CRUISE ALTITUDE 25000 FEET**

		TAILWIND						ZERO		HEADWIND					
STAGE	T.O.	100 KT.		50 KT.		25 KT.		WIND		25 KT.		50 KT.		100 KT.	
LENGTH NM.	WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1057.	.67	1120.	.71	1157.	.74	1201.	.77	1252.	.80	1310.	.83	1458.	.90
	15000	1031.	.67	1094.	.71	1131.	.74	1174.	.77	1225.	.79	1283.	.83	1430.	.89
	12000	988.	.66	1051.	.71	1088.	.73	1131.	.76	1181.	.79	1238.	.82	1385.	.89
300	16630	1349.	.87	1445.	.94	1502.	.98	1568.	1.02	1643.	1.07	1730.	1.12	1951.	1.24
	15000	1319.	.87	1414.	.94	1470.	.98	1536.	1.02	1611.	1.07	1697.	1.12	1916.	1.24
	12000	1270.	.86	1364.	.93	1420.	.97	1484.	1.02	1558.	1.06	1644.	1.12	1860.	1.23
400	16630	1640.	1.07	1770.	1.17	1846.	1.22	1934.	1.28	2035.	1.34	2150.	1.41	2443.	1.58
	15000	1606.	1.07	1734.	1.16	1810.	1.22	1897.	1.28	1997.	1.34	2111.	1.41	2402.	1.58
	12000	1551.	1.07	1677.	1.16	1752.	1.21	1838.	1.27	1936.	1.34	2049.	1.41	2335.	1.58
500	16630	1932.	1.28	2094.	1.39	2190.	1.46	2301.	1.54	2426.	1.61	2570.	1.71	2936.	1.92
	15000	1894.	1.27	2055.	1.39	2150.	1.46	2258.	1.53	2383.	1.61	2526.	1.70	2887.	1.92
	12000	1833.	1.27	1990.	1.38	2084.	1.45	2191.	1.52	2313.	1.61	2454.	1.70	2810.	1.92
600	16630	2224.	1.48	2419.	1.62	2535.	1.70	2667.	1.79	2817.	1.89	2991.	2.00	3428.	2.27
	15000	2182.	1.48	2375.	1.62	2489.	1.70	2620.	1.79	2769.	1.88	2940.	2.00	3373.	2.26
	12000	2114.	1.47	2304.	1.61	2416.	1.69	2544.	1.78	2691.	1.88	2859.	1.99	3284.	2.26
700	16630	2516.	1.68	2744.	1.85	2879.	1.94	3034.	2.05	3209.	2.16	3411.	2.29	3921.	2.61
	15000	2470.	1.68	2695.	1.84	2829.	1.93	2981.	2.04	3155.	2.16	3355.	2.29	3859.	2.61
	12000	2395.	1.67	2617.	1.83	2748.	1.93	2897.	2.03	3068.	2.15	3264.	2.29	3759.	2.61
800	16630	2808.	1.88	3069.	2.07	3224.	2.18	3400.	2.30	3600.	2.43	3831.	2.58	4413.	2.95
	15000	2757.	1.88	3016.	2.07	3169.	2.17	3342.	2.30	3541.	2.43	3769.	2.58	4344.	2.95
	12000	2677.	1.88	2930.	2.06	3080.	2.17	3251.	2.29	3446.	2.43	3669.	2.58	4234.	2.95
900	16630	3099.	2.09	3394.	2.30	3568.	2.42	3766.	2.56	3992.	2.71	4251.	2.88	4906.	3.30
	15000	3045.	2.08	3336.	2.30	3508.	2.41	3704.	2.55	3927.	2.70	4183.	2.87	4830.	3.29
	12000	2958.	2.08	3243.	2.28	3412.	2.41	3604.	2.54	3823.	2.70	4075.	2.87	4709.	3.29
1000	16630	3391.	2.29	3719.	2.53	3912.	2.66	4133.	2.81	4383.	2.98	4672.	3.17	5398.	3.64
	15000	3333.	2.29	3656.	2.52	3848.	2.65	4065.	2.81	4313.	2.97	4598.	3.16	5315.	3.64
	12000	3239.	2.28	3557.	2.51	3744.	2.65	3957.	2.80	4201.	2.97	4480.	3.16	5184.	3.64
1100	16630	3683.	2.49	4044.	2.75	4257.	2.90	4499.	3.07	4775.	3.25	5092.	3.46	5891.	3.98
	15000	3620.	2.49	3977.	2.75	4187.	2.89	4426.	3.07	4699.	3.25	5012.	3.46	5801.	3.98
	12000	3521.	2.49	3870.	2.74	4076.	2.89	4311.	3.05	4578.	3.25	4885.	3.46	5658.	3.98
1200	16630	3975.	2.70	4368.	2.98	4601.	3.14	4866.	3.32	5166.	3.52	5512.	3.75		
	15000	3908.	2.69	4297.	2.98	4527.	3.13	4788.	3.32	5085.	3.52	5426.	3.75		
	12000	3802.	2.69	4183.	2.96	4408.	3.13	4664.	3.31	4955.	3.52	5290.	3.75		
1300	16630	4266.	2.90	4693.	3.21	4946.	3.37	5232.	3.58	5558.	3.80				
	15000	4196.	2.89	4617.	3.20	4867.	3.37	5149.	3.58	5471.	3.79				
	12000	4083.	2.89	4496.	3.19	4740.	3.37	5017.	3.56	5333.	3.79				
1400	16630	4558.	3.10	5018.	3.43	5290.	3.61	5599.	3.84						
	15000	4484.	3.10	4938.	3.43	5206.	3.61	5510.	3.83						
	12000	4365.	3.09	4810.	3.41	5072.	3.61								
1500	16630	4850.	3.30	5343.	3.66	5634.	3.85								
	15000	4771.	3.30	5258.	3.66	5546.	3.85								
	12000	4646.	3.30	5123.	3.64										
1600	16630	5142.	3.51	5668.	3.89										
	15000	5059.	3.50	5578.	3.88										
	12000	4927.	3.50	5436.	3.86										
1700	16630	5434.	3.71	5993.	4.11										
	15000	5347.	3.70	5899.	4.11										
	12000	5209.	3.70												
1800	16630	5725.	3.91												
	15000	5635.	3.91												
	12000	5490.	3.91												

Figure 7-11. Normal Cruise Thrust (Sheet 1 of 10)

FLIGHT PLANNING
NORMAL CRUISE THRUST
CRUISE (.65 MACH)

STANDARD DAY — CRUISE ALTITUDE 27000 FEET

		TAILWIND						ZERO WIND		HEADWIND					
		100 KT.		50 KT.		25 KT.				25 KT.		50 KT.		100 KT.	
STAGE LENGTH NM.	T.O. WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1046.	.67	1104.	.72	1138.	.74	1179.	.77	1226.	.80	1280.	.83	1418.	.89
	15000	1017.	.67	1075.	.71	1109.	.74	1149.	.77	1196.	.80	1250.	.83	1387.	.89
	12000	969.	.66	1027.	.71	1061.	.73	1101.	.76	1147.	.79	1201.	.82	1338.	.89
300	16630	1317.	.88	1406.	.95	1459.	.98	1520.	1.03	1591.	1.07	1672.	1.12	1879.	1.24
	15000	1284.	.87	1372.	.94	1424.	.98	1485.	1.02	1555.	1.07	1635.	1.12	1840.	1.24
	12000	1229.	.87	1316.	.94	1368.	.98	1428.	1.02	1497.	1.07	1576.	1.12	1778.	1.24
400	16630	1589.	1.08	1709.	1.17	1780.	1.23	1862.	1.28	1956.	1.35	2064.	1.42	2339.	1.59
	15000	1550.	1.08	1669.	1.17	1740.	1.22	1821.	1.28	1914.	1.35	2021.	1.42	2292.	1.59
	12000	1489.	1.07	1606.	1.16	1675.	1.22	1755.	1.28	1847.	1.34	1952.	1.41	2219.	1.58
500	16630	1860.	1.28	2011.	1.40	2101.	1.47	2203.	1.54	2321.	1.62	2456.	1.72	2800.	1.93
	15000	1817.	1.28	1966.	1.40	2055.	1.46	2156.	1.54	2272.	1.62	2406.	1.71	2745.	1.93
	12000	1749.	1.28	1896.	1.39	1983.	1.46	2082.	1.53	2196.	1.61	2327.	1.71	2660.	1.93
600	16630	2132.	1.49	2314.	1.63	2422.	1.71	2545.	1.80	2686.	1.90	2849.	2.01	3260.	2.28
	15000	2084.	1.49	2264.	1.63	2370.	1.71	2492.	1.80	2631.	1.90	2791.	2.01	3197.	2.28
	12000	2009.	1.48	2185.	1.62	2290.	1.70	2409.	1.79	2546.	1.89	2703.	2.00	3101.	2.28
700	16630	2403.	1.69	2616.	1.86	2742.	1.95	2886.	2.05	3051.	2.17	3241.	2.31	3721.	2.62
	15000	2351.	1.69	2561.	1.85	2686.	1.95	2828.	2.06	2990.	2.17	3177.	2.30	3650.	2.63
	12000	2269.	1.69	2475.	1.85	2597.	1.94	2736.	2.05	2895.	2.16	3078.	2.30	3541.	2.62
800	16630	2675.	1.90	2919.	2.09	3063.	2.19	3228.	2.31	3416.	2.45	3633.	2.60	4181.	2.97
	15000	2618.	1.90	2858.	2.08	3001.	2.19	3163.	2.31	3349.	2.45	3562.	2.60	4102.	2.98
	12000	2529.	1.89	2765.	2.07	2904.	2.19	3063.	2.31	3245.	2.44	3454.	2.59	3982.	2.97
900	16630	2946.	2.10	3221.	2.32	3384.	2.43	3570.	2.57	3782.	2.73	4025.	2.90	4642.	3.31
	15000	2884.	2.10	3155.	2.31	3316.	2.43	3499.	2.57	3707.	2.72	3947.	2.89	4555.	3.32
	12000	2789.	2.09	3054.	2.30	3211.	2.43	3390.	2.56	3594.	2.71	3829.	2.89	4423.	3.32
1000	16630	3218.	2.31	3524.	2.54	3705.	2.68	3911.	2.82	4147.	3.00	4418.	3.19	5102.	3.66
	15000	3151.	2.31	3453.	2.54	3632.	2.67	3835.	2.83	4066.	3.00	4333.	3.19	5007.	3.67
	12000	3049.	2.30	3344.	2.53	3519.	2.67	3717.	2.82	3944.	2.99	4205.	3.18	4864.	3.66
1100	16630	3489.	2.51	3826.	2.77	4026.	2.92	4253.	3.08	4512.	3.28	4810.	3.49	5563.	4.01
	15000	3418.	2.51	3750.	2.77	3947.	2.91	4170.	3.09	4425.	3.27	4718.	3.49	5460.	4.02
	12000	3309.	2.50	3634.	2.76	3826.	2.91	4044.	3.08	4294.	3.26	4580.	3.48	5305.	4.01
1200	16630	3760.	2.71	4129.	3.00	4347.	3.16	4594.	3.34	4877.	3.55	5202.	3.79	6023.	4.35
	15000	3685.	2.72	4047.	2.99	4262.	3.15	4506.	3.34	4784.	3.55	5103.	3.78	5912.	4.37
	12000	3569.	2.71	3923.	2.99	4133.	3.16	4371.	3.34	4643.	3.54	4956.	3.77	5745.	4.36
1300	16630	4032.	2.92	4431.	3.23	4668.	3.40	4936.	3.59	5242.	3.83	5594.	4.08		
	15000	3952.	2.92	4344.	3.22	4578.	3.39	4842.	3.60	5142.	3.82	5489.	4.08		
	12000	3829.	2.91	4213.	3.21	4440.	3.40	4698.	3.59	4993.	3.81	5331.	4.07		
1400	16630	4303.	3.12	4734.	3.46	4988.	3.64	5277.	3.85	5607.	4.10				
	15000	4218.	3.13	4642.	3.45	4893.	3.64	5177.	3.86	5501.	4.10				
	12000	4089.	3.12	4503.	3.44	4747.	3.64	5025.	3.85	5342.	4.09				
1500	16630	4575.	3.33	5036.	3.69	5309.	3.88	5619.	4.11						
	15000	4485.	3.33	4939.	3.68	5208.	3.88	5513.	4.12						
	12000	4349.	3.32	4792.	3.67	5055.	3.88								
1600	16630	4846.	3.53	5339.	3.91	5630.	4.12								
	15000	4752.	3.54	5236.	3.91	5524.	4.12								
	12000	4609.	3.53	5082.	3.90										
1700	16630	5118.	3.73	5641.	4.14										
	15000	5019.	3.74	5533.	4.14										
	12000	4869.	3.73	5372.	4.12										
1800	16630	5389.	3.94	5944.	4.37										
	15000	5285.	3.95	5831.	4.36										
	12000	5129.	3.94												
1900	16630	5661.	4.14												
	15000	5552.	4.15												
	12000	5389.	4.14												

Figure 7-11. Normal Cruise Thrust (Sheet 2)

FLIGHT PLANNING
NORMAL CRUISE THRUST
CRUISE (.65 MACH)

STANDARD DAY **CRUISE ALTITUDE 29000 FEET**

		TAILWIND						ZERO		HEADWIND					
STAGE	T.O.	100 KT.		50 KT.		25 KT.		WIND		25 KT.		50 KT.		100 KT.	
LENGTH NM.	WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1038.	.68	1092.	.72	1124.	.74	1162.	.77	1206.	.80	1256.	.83	1385.	.89
	15000	1008.	.67	1061.	.72	1093.	.74	1131.	.77	1174.	.80	1224.	.83	1352.	.89
	12000	955.	.67	1008.	.71	1040.	.74	1077.	.76	1120.	.79	1170.	.82	1297.	.89
300	16630	1292.	.88	1375.	.95	1425.	.99	1482.	1.03	1548.	1.08	1624.	1.13	1818.	1.24
	15000	1256.	.88	1337.	.95	1386.	.98	1443.	1.03	1508.	1.07	1583.	1.12	1774.	1.24
	12000	1195.	.87	1276.	.94	1324.	.98	1380.	1.02	1444.	1.07	1518.	1.12	1707.	1.24
400	16630	1546.	1.09	1658.	1.18	1725.	1.23	1802.	1.29	1890.	1.35	1992.	1.42	2251.	1.59
	15000	1503.	1.08	1613.	1.18	1679.	1.23	1755.	1.29	1841.	1.35	1942.	1.42	2196.	1.59
	12000	1435.	1.08	1544.	1.17	1608.	1.22	1682.	1.28	1767.	1.35	1866.	1.42	2116.	1.59
500	16630	1800.	1.29	1942.	1.41	2026.	1.48	2122.	1.55	2233.	1.63	2360.	1.72	2684.	1.94
	15000	1751.	1.29	1890.	1.41	1972.	1.47	2067.	1.55	2175.	1.63	2300.	1.72	2618.	1.94
	12000	1676.	1.28	1812.	1.40	1892.	1.47	1985.	1.54	2091.	1.62	2214.	1.72	2525.	1.94
600	16630	2054.	1.50	2225.	1.64	2326.	1.72	2442.	1.81	2575.	1.91	2728.	2.02	3117.	2.29
	15000	1998.	1.50	2166.	1.63	2265.	1.71	2379.	1.81	2509.	1.91	2659.	2.02	3040.	2.29
	12000	1916.	1.49	2079.	1.63	2176.	1.71	2288.	1.80	2415.	1.90	2562.	2.02	2934.	2.29
700	16630	2308.	1.70	2508.	1.87	2627.	1.96	2762.	2.07	2918.	2.18	3096.	2.32	3550.	2.64
	15000	2246.	1.70	2442.	1.86	2558.	1.96	2690.	2.07	2843.	2.18	3018.	2.32	3462.	2.64
	12000	2156.	1.70	2347.	1.86	2461.	1.96	2590.	2.06	2739.	2.18	2910.	2.31	3343.	2.64
800	16630	2562.	1.91	2791.	2.09	2927.	2.21	3082.	2.33	3260.	2.46	3464.	2.61	3983.	3.00
	15000	2494.	1.91	2718.	2.09	2851.	2.20	3002.	2.33	3176.	2.46	3376.	2.62	3884.	2.99
	12000	2396.	1.90	2615.	2.09	2745.	2.20	2893.	2.32	3062.	2.46	3258.	2.61	3753.	2.99
900	16630	2816.	2.12	3074.	2.32	3228.	2.45	3402.	2.59	3602.	2.74	3832.	2.91	4416.	3.35
	15000	2741.	2.11	2994.	2.32	3144.	2.44	3314.	2.59	3510.	2.74	3735.	2.92	4305.	3.34
	12000	2636.	2.11	2883.	2.32	3029.	2.44	3195.	2.58	3386.	2.73	3606.	2.91	4162.	3.34
1000	16630	3070.	2.32	3358.	2.55	3528.	2.69	3722.	2.84	3945.	3.01	4200.	3.21	4849.	3.70
	15000	2989.	2.32	3270.	2.55	3437.	2.69	3626.	2.85	3844.	3.02	4094.	3.21	4727.	3.69
	12000	2876.	2.31	3151.	2.55	3313.	2.69	3498.	2.84	3710.	3.01	3954.	3.21	4571.	3.69
1100	16630	3324.	2.53	3641.	2.78	3829.	2.94	4042.	3.10	4287.	3.29	4569.	3.51	5281.	4.05
	15000	3236.	2.53	3546.	2.78	3730.	2.93	3938.	3.11	4177.	3.29	4453.	3.51	5149.	4.04
	12000	3116.	2.52	3418.	2.78	3597.	2.93	3801.	3.10	4034.	3.29	4302.	3.51	4980.	4.04
1200	16630	3578.	2.73	3924.	3.01	4129.	3.18	4363.	3.36	4629.	3.57	4937.	3.80	5714.	4.40
	15000	3484.	2.73	3822.	3.01	4022.	3.17	4250.	3.37	4511.	3.57	4811.	3.81	5571.	4.39
	12000	3356.	2.72	3686.	3.00	3881.	3.18	4103.	3.36	4357.	3.57	4650.	3.80	5389.	4.39
1300	16630	3832.	2.94	4207.	3.24	4430.	3.43	4683.	3.62	4972.	3.84	5305.	4.10	6147.	4.75
	15000	3731.	2.94	4098.	3.24	4315.	3.42	4562.	3.63	4845.	3.85	5170.	4.11	5993.	4.74
	12000	3596.	2.93	3954.	3.23	4166.	3.42	4406.	3.62	4681.	3.84	4998.	4.10	5799.	4.74
1400	16630	4086.	3.14	4491.	3.47	4730.	3.67	5003.	3.88	5314.	4.12	5673.	4.40		
	15000	3979.	3.14	4374.	3.47	4608.	3.66	4874.	3.89	5179.	4.13	5529.	4.41		
	12000	3837.	3.14	4222.	3.46	4450.	3.66	4709.	3.88	5005.	4.12	5346.	4.40		
1500	16630	4340.	3.35	4774.	3.70	5031.	3.91	5323.	4.14	5657.	4.40				
	15000	4226.	3.35	4650.	3.70	4901.	3.90	5186.	4.15	5512.	4.41				
	12000	4077.	3.34	4490.	3.69	4734.	3.91	5011.	4.14						
1600	16630	4594.	3.55	5057.	3.93	5331.	4.16	5643.	4.40						
	15000	4474.	3.56	4926.	3.93	5194.	4.15	5498.	4.41						
	12000	4317.	3.55	4758.	3.92	5018.	4.15								
1700	16630	4848.	3.76	5340.	4.16	5632.	4.40								
	15000	4722.	3.76	5202.	4.16	5487.	4.39								
	12000	4557.	3.75	5025.	4.15										
1800	16630	5102.	3.96	5623.	4.39										
	15000	4969.	3.97	5478.	4.39										
	12000	4797.	3.96	5293.	4.38										
1900	16630	5356.	4.17	5907.	4.61										
	15000	5217.	4.18	5755.	4.62										
	12000	5037.	4.16												
2000	16630	5610.	4.38												
	15000	5464.	4.38												
	12000	5277.	4.37												

Figure 7-11. Normal Cruise Thrust (Sheet 3)

FLIGHT PLANNING
NORMAL CRUISE THRUST
CRUISE (.65 MACH)

STANDARD DAY | CRUISE ALTITUDE 31000 FEET

		TAILWIND						ZERO WIND		HEADWIND					
STAGE	T.O.	100 KT.		50 KT.		25 KT.				25 KT.		50 KT.		100 KT.	
LENGTH NM.	WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1034.	.68	1084.	.72	1114.	.75	1149.	.77	1190.	.80	1237.	.83	1358.	.89
	15000	1002.	.68	1051.	.72	1081.	.74	1116.	.77	1156.	.80	1203.	.83	1324.	.89
	12000	945.	.67	993.	.71	1023.	.74	1057.	.76	1098.	.79	1144.	.82	1263.	.88
400	16630	1510.	1.09	1615.	1.18	1678.	1.24	1750.	1.30	1833.	1.36	1929.	1.43	2174.	1.60
	15000	1464.	1.09	1567.	1.18	1628.	1.23	1699.	1.29	1781.	1.36	1875.	1.43	2115.	1.60
	12000	1388.	1.08	1489.	1.18	1549.	1.23	1618.	1.29	1697.	1.35	1789.	1.42	2023.	1.59
500	16630	1748.	1.30	1881.	1.42	1960.	1.48	2050.	1.56	2155.	1.64	2275.	1.73	2581.	1.95
	15000	1695.	1.30	1825.	1.41	1902.	1.48	1991.	1.55	2093.	1.64	2210.	1.73	2510.	1.95
	12000	1610.	1.29	1737.	1.41	1812.	1.47	1898.	1.55	1997.	1.63	2112.	1.72	2403.	1.95
600	16630	1986.	1.51	2146.	1.65	2242.	1.73	2351.	1.82	2476.	1.92	2621.	2.03	2989.	2.31
	15000	1926.	1.50	2083.	1.64	2176.	1.73	2282.	1.82	2405.	1.92	2546.	2.03	2906.	2.31
	12000	1832.	1.50	1984.	1.64	2075.	1.72	2178.	1.81	2297.	1.91	2434.	2.03	2783.	2.30
700	16630	2224.	1.72	2412.	1.88	2524.	1.97	2652.	2.08	2798.	2.20	2967.	2.34	3397.	2.66
	15000	2157.	1.71	2340.	1.87	2449.	1.97	2574.	2.08	2717.	2.20	2882.	2.33	3302.	2.66
	12000	2054.	1.71	2232.	1.87	2337.	1.97	2458.	2.07	2597.	2.19	2757.	2.33	3163.	2.66
800	16630	2462.	1.92	2678.	2.11	2806.	2.22	2952.	2.35	3120.	2.48	3313.	2.64	3805.	3.02
	15000	2388.	1.92	2598.	2.11	2723.	2.22	2866.	2.34	3029.	2.48	3218.	2.63	3697.	3.02
	12000	2276.	1.91	2480.	2.10	2600.	2.21	2738.	2.33	2897.	2.47	3079.	2.63	3543.	3.01
900	16630	2700.	2.13	2944.	2.34	3088.	2.46	3253.	2.61	3442.	2.76	3659.	2.94	4213.	3.37
	15000	2619.	2.13	2856.	2.34	2997.	2.47	3157.	2.60	3342.	2.76	3553.	2.94	4093.	3.37
	12000	2498.	2.12	2727.	2.33	2863.	2.46	3019.	2.59	3197.	2.75	3402.	2.93	3923.	3.36
1000	16630	2938.	2.34	3209.	2.57	3370.	2.71	3553.	2.87	3763.	3.04	4006.	3.24	4621.	3.73
	15000	2849.	2.33	3114.	2.57	3270.	2.71	3449.	2.86	3654.	3.04	3889.	3.24	4489.	3.72
	12000	2720.	2.33	2975.	2.57	3126.	2.70	3299.	2.86	3497.	3.03	3725.	3.23	4303.	3.72
1100	16630	3176.	2.55	3475.	2.81	3652.	2.95	3854.	3.13	4085.	3.32	4352.	3.54	5028.	4.08
	15000	3080.	2.54	3371.	2.80	3544.	2.96	3741.	3.13	3966.	3.32	4225.	3.54	4884.	4.08
	12000	2942.	2.54	3223.	2.80	3389.	2.95	3579.	3.12	3797.	3.31	4047.	3.53	4683.	4.07
1200	16630	3414.	2.75	3741.	3.04	3934.	3.20	4154.	3.39	4407.	3.60	4698.	3.84	5436.	4.44
	15000	3311.	2.75	3629.	3.03	3818.	3.20	4032.	3.39	4278.	3.60	4560.	3.84	5280.	4.43
	12000	3164.	2.74	3470.	3.03	3652.	3.19	3859.	3.38	4096.	3.59	4370.	3.83	5063.	4.43
1300	16630	3652.	2.96	4006.	3.27	4216.	3.44	4455.	3.66	4729.	3.88	5044.	4.15	5844.	4.79
	15000	3542.	2.96	3887.	3.26	4091.	3.45	4324.	3.65	4590.	3.88	4896.	4.14	5676.	4.79
	12000	3386.	2.95	3718.	3.26	3915.	3.44	4139.	3.64	4396.	3.87	4692.	4.13	5443.	4.78
1400	16630	3891.	3.17	4272.	3.50	4498.	3.69	4756.	3.92	5050.	4.16	5390.	4.45	6252.	5.15
	15000	3773.	3.16	4145.	3.49	4365.	3.70	4615.	3.91	4902.	4.16	5232.	4.44	6071.	5.14
	12000	3608.	3.16	3966.	3.49	4178.	3.68	4420.	3.90	4696.	4.15	5015.	4.43		
1500	16630	4129.	3.38	4538.	3.73	4780.	3.93	5056.	4.18	5372.	4.44	5736.	4.75		
	15000	4004.	3.37	4403.	3.72	4639.	3.94	4907.	4.17	5214.	4.44	5568.	4.75		
	12000	3830.	3.37	4213.	3.72	4441.	3.93	4700.	4.16	4996.	4.43	5337.	4.73		
1600	16630	4367.	3.58	4803.	3.96	5062.	4.18	5357.	4.44	5694.	4.72				
	15000	4235.	3.58	4660.	3.96	4912.	4.19	5199.	4.44	5527.	4.72				
	12000	4052.	3.57	4461.	3.96	4704.	4.17	4980.	4.42	5296.	4.71				
1700	16630	4605.	3.79	5069.	4.19	5344.	4.43	5657.	4.71						
	15000	4466.	3.78	4918.	4.19	5186.	4.43	5490.	4.70						
	12000	4274.	3.78	4709.	4.19	4967.	4.42	5260.	4.68						
1800	16630	4843.	4.00	5335.	4.43	5626.	4.67								
	15000	4697.	3.99	5176.	4.42	5460.	4.68								
	12000	4496.	3.99	4956.	4.42	5230.	4.67								
1900	16630	5081.	4.21	5600.	4.66										
	15000	4928.	4.20	5434.	4.65										
	12000	4718.	4.20	5204.	4.65										
2000	16630	5319.	4.41	5866.	4.89										
	15000	5159.	4.41	5692.	4.88										
	12000	4939.	4.40	5452.	4.88										
2100	16630	5557.	4.62												
	15000	5390.	4.61												
	12000	5161.	4.61												

Figure 7-11. Normal Cruise Thrust (Sheet 4)

FLIGHT PLANNING
NORMAL CRUISE THRUST
CRUISE (.65 MACH)

STANDARD DAY **CRUISE ALTITUDE 33000 FEET**

		TAILWIND						ZERO		HEADWIND					
STAGE	T.O.	100 KT.		50 KT.		25 KT.		WIND		25 KT.		50 KT.		100 KT.	
LENGTH NM.	WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1032.	.68	1079.	.72	1106.	.75	1139.	.77	1177.	.80	1222.	.83	1335.	.88
	15000	999.	.68	1045.	.72	1073.	.74	1105.	.77	1143.	.79	1187.	.82	1300.	.88
	12000	939.	.67	984.	.71	1011.	.74	1044.	.76	1081.	.79	1124.	.82	1236.	.88
400	16630	1480.	1.10	1578.	1.19	1637.	1.24	1705.	1.30	1783.	1.36	1874.	1.43	2105.	1.60
	15000	1431.	1.10	1528.	1.19	1585.	1.24	1652.	1.30	1728.	1.36	1817.	1.43	2044.	1.60
	12000	1349.	1.09	1442.	1.18	1498.	1.23	1563.	1.29	1637.	1.36	1723.	1.43	1942.	1.60
600	16630	1927.	1.52	2078.	1.66	2167.	1.74	2271.	1.83	2389.	1.93	2526.	2.04	2875.	2.32
	15000	1863.	1.51	2010.	1.65	2098.	1.73	2198.	1.82	2314.	1.92	2447.	2.04	2788.	2.32
	12000	1759.	1.51	1901.	1.65	1985.	1.73	2081.	1.82	2193.	1.92	2321.	2.04	2648.	2.32
700	16630	2150.	1.73	2327.	1.89	2433.	1.98	2554.	2.09	2692.	2.21	2852.	2.35	3260.	2.68
	15000	2079.	1.72	2252.	1.89	2354.	1.98	2472.	2.09	2607.	2.21	2763.	2.34	3160.	2.68
	12000	1965.	1.72	2130.	1.88	2228.	1.98	2341.	2.08	2470.	2.20	2620.	2.34	3001.	2.68
800	16630	2374.	1.94	2577.	2.12	2698.	2.23	2837.	2.35	2995.	2.49	3178.	2.65	3645.	3.03
	15000	2296.	1.93	2493.	2.12	2611.	2.23	2745.	2.35	2899.	2.49	3078.	2.65	3532.	3.04
	12000	2170.	1.92	2359.	2.11	2472.	2.22	2600.	2.35	2748.	2.49	2919.	2.65	3354.	3.04
900	16630	2597.	2.15	2827.	2.36	2963.	2.48	3119.	2.62	3298.	2.77	3504.	2.95	4030.	3.39
	15000	2512.	2.14	2734.	2.35	2867.	2.48	3018.	2.62	3192.	2.77	3393.	2.95	3904.	3.39
	12000	2375.	2.13	2588.	2.35	2715.	2.47	2860.	2.61	3026.	2.77	3218.	2.95	3707.	3.40
1000	16630	2821.	2.35	3077.	2.59	3228.	2.73	3402.	2.88	3601.	3.06	3830.	3.26	4415.	3.75
	15000	2728.	2.35	2976.	2.59	3123.	2.72	3292.	2.88	3485.	3.05	3708.	3.26	4276.	3.75
	12000	2580.	2.34	2817.	2.58	2958.	2.72	3119.	2.87	3304.	3.05	3517.	3.25	4060.	3.75
1100	16630	3045.	2.56	3326.	2.82	3494.	2.97	3685.	3.15	3904.	3.34	4157.	3.56	4800.	4.11
	15000	2944.	2.56	3217.	2.82	3380.	2.97	3565.	3.14	3778.	3.34	4023.	3.56	4648.	4.11
	12000	2785.	2.55	3046.	2.81	3202.	2.97	3379.	3.14	3582.	3.33	3817.	3.56	4414.	4.11
1200	16630	3268.	2.77	3576.	3.06	3759.	3.22	3968.	3.41	4207.	3.62	4483.	3.87	5185.	4.47
	15000	3160.	2.77	3458.	3.05	3636.	3.22	3838.	3.41	4070.	3.62	4338.	3.87	5020.	4.47
	12000	2990.	2.76	3275.	3.05	3445.	3.21	3638.	3.40	3860.	3.62	4116.	3.86	4767.	4.47
1300	16630	3492.	2.98	3826.	3.29	4024.	3.47	4251.	3.67	4510.	3.90	4809.	4.17	5570.	4.83
	15000	3376.	2.98	3700.	3.29	3892.	3.47	4112.	3.67	4363.	3.90	4653.	4.17	5392.	4.83
	12000	3195.	2.97	3505.	3.28	3688.	3.46	3898.	3.67	4138.	3.90	4415.	4.17	5120.	4.83
1400	16630	3715.	3.19	4075.	3.52	4289.	3.72	4534.	3.94	4813.	4.19	5135.	4.47	5955.	5.19
	15000	3592.	3.19	3941.	3.52	4149.	3.71	4385.	3.93	4656.	4.18	4969.	4.47	5764.	5.19
	12000	3401.	3.18	3734.	3.51	3932.	3.71	4157.	3.93	4416.	4.18	4714.	4.47	5473.	5.19
1500	16630	3939.	3.40	4325.	3.76	4555.	3.97	4817.	4.20	5116.	4.47	5461.	4.78	6340.	5.55
	15000	3808.	3.39	4182.	3.75	4405.	3.96	4658.	4.20	4949.	4.47	5284.	4.78	6136.	5.55
	12000	3606.	3.39	3963.	3.75	4175.	3.96	4417.	4.19	4694.	4.46	5013.	4.78		
1600	16630	4162.	3.61	4575.	3.99	4820.	4.21	5100.	4.46	5418.	4.75	5787.	5.08		
	15000	4024.	3.60	4424.	3.99	4661.	4.21	4932.	4.46	5242.	4.75	5599.	5.08		
	12000	3811.	3.60	4192.	3.98	4418.	4.20	4676.	4.46	4972.	4.75	5312.	5.08		
1700	16630	4386.	3.82	4825.	4.23	5085.	4.46	5383.	4.73	5721.	5.03				
	15000	4240.	3.81	4665.	4.22	4918.	4.46	5205.	4.73	5534.	5.03				
	12000	4016.	3.80	4421.	4.21	4662.	4.45	4936.	4.72	5249.	5.03				
1800	16630	4610.	4.03	5074.	4.46	5350.	4.71	5665.	4.99						
	15000	4456.	4.02	4907.	4.45	5174.	4.70	5478.	4.99						
	12000	4221.	4.01	4650.	4.45	4905.	4.70	5195.	4.98						
1900	16630	4833.	4.24	5324.	4.69	5616.	4.96								
	15000	4672.	4.23	5148.	4.69	5430.	4.95								
	12000	4426.	4.22	4879.	4.68	5148.	4.95								
2000	16630	5057.	4.44	5574.	4.93										
	15000	4888.	4.44	5389.	4.92										
	12000	4631.	4.43	5108.	4.91										
2100	16630	5280.	4.65	5824.	5.16										
	15000	5104.	4.65	5631.	5.15										
	12000	4837.	4.64	5338.	5.15										
2200	16630	5504.	4.86												
	15000	5320.	4.86												
	12000	5042.	4.85												

Figure 7-11. Normal Cruise Thrust (Sheet 5)

FLIGHT PLANNING
NORMAL CRUISE THRUST
CRUISE (.65 MACH)

STANDARD DAY **CRUISE ALTITUDE 35000 FEET**

		TAILWIND						ZERO		HEADWIND					
STAGE	T.O.	100 KT.		50 KT.		25 KT.		WIND		25 KT.		50 KT.		100 KT.	
LENGTH NM.	WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1033.	.69	1076.	.72	1102.	.75	1133.	.77	1168.	.80	1210.	.82	1317.	.88
	15000	1000.	.68	1043.	.72	1068.	.74	1099.	.77	1134.	.79	1175.	.82	1281.	.88
	12000	938.	.67	980.	.72	1005.	.74	1035.	.76	1070.	.79	1111.	.82	1215.	.88
400	16630	1455.	1.11	1547.	1.20	1603.	1.25	1667.	1.30	1741.	1.37	1827.	1.44	2046.	1.61
	15000	1405.	1.10	1495.	1.19	1549.	1.24	1612.	1.30	1684.	1.36	1768.	1.44	1982.	1.61
	12000	1317.	1.10	1404.	1.19	1456.	1.24	1516.	1.30	1585.	1.36	1666.	1.43	1872.	1.61
600	16630	1876.	1.53	2018.	1.67	2103.	1.75	2201.	1.84	2313.	1.94	2443.	2.05	2775.	2.33
	15000	1810.	1.52	1948.	1.66	2031.	1.74	2126.	1.83	2235.	1.93	2361.	2.05	2684.	2.33
	12000	1697.	1.52	1828.	1.65	1907.	1.74	1997.	1.83	2101.	1.93	2221.	2.05	2529.	2.33
800	16630	2297.	1.95	2490.	2.14	2604.	2.25	2735.	2.37	2886.	2.51	3060.	2.67	3505.	3.06
	15000	2215.	1.94	2401.	2.13	2512.	2.24	2639.	2.37	2785.	2.51	2954.	2.67	3385.	3.06
	12000	2076.	1.94	2252.	2.12	2358.	2.24	2478.	2.36	2617.	2.51	2776.	2.66	3185.	3.06
900	16630	2508.	2.16	2725.	2.37	2854.	2.50	3002.	2.64	3172.	2.79	3368.	2.98	3870.	3.43
	15000	2418.	2.15	2628.	2.37	2753.	2.49	2896.	2.63	3060.	2.79	3250.	2.97	3735.	3.42
	12000	2266.	2.15	2465.	2.36	2583.	2.49	2719.	2.63	2874.	2.79	3054.	2.97	3514.	3.42
1000	16630	2719.	2.37	2961.	2.61	3104.	2.75	3269.	2.90	3458.	3.08	3677.	3.29	4234.	3.79
	15000	2620.	2.36	2854.	2.60	2993.	2.74	3153.	2.90	3335.	3.08	3547.	3.28	4086.	3.79
	12000	2456.	2.36	2677.	2.59	2809.	2.74	2959.	2.90	3132.	3.08	3332.	3.28	3842.	3.79
1100	16630	2929.	2.58	3196.	2.84	3355.	3.00	3537.	3.17	3744.	3.37	3985.	3.59	4599.	4.15
	15000	2823.	2.57	3081.	2.84	3234.	2.99	3410.	3.16	3610.	3.36	3843.	3.59	4437.	4.15
	12000	2645.	2.57	2889.	2.83	3034.	2.99	3200.	3.16	3390.	3.36	3609.	3.58	4171.	4.15
1200	16630	3140.	2.79	3432.	3.08	3605.	3.25	3804.	3.44	4031.	3.65	4293.	3.90	4964.	4.52
	15000	3025.	2.78	3307.	3.07	3474.	3.24	3666.	3.43	3886.	3.65	4139.	3.90	4787.	4.52
	12000	2835.	2.78	3101.	3.06	3260.	3.24	3440.	3.43	3648.	3.65	3887.	3.89	4499.	4.51
1300	16630	3351.	3.00	3667.	3.31	3855.	3.50	4071.	3.70	4317.	3.94	4602.	4.21	5328.	4.88
	15000	3228.	2.99	3533.	3.31	3715.	3.49	3923.	3.70	4161.	3.93	4436.	4.20	5138.	4.88
	12000	3025.	2.99	3313.	3.30	3485.	3.49	3681.	3.70	3905.	3.94	4164.	4.20	4827.	4.88
1400	16630	3562.	3.21	3903.	3.55	4106.	3.75	4338.	3.97	4603.	4.22	4910.	4.52	5693.	5.25
	15000	3431.	3.20	3760.	3.54	3956.	3.74	4180.	3.96	4436.	4.22	4732.	4.51	5489.	5.24
	12000	3215.	3.20	3525.	3.53	3710.	3.74	3921.	3.97	4163.	4.22	4442.	4.51	5156.	5.24
1500	16630	3772.	3.42	4138.	3.79	4356.	4.00	4605.	4.24	4889.	4.51	5218.	4.82	6058.	5.61
	15000	3633.	3.41	3986.	3.78	4196.	3.99	4437.	4.23	4711.	4.50	5029.	4.82	5839.	5.61
	12000	3404.	3.41	3737.	3.77	3936.	3.99	4162.	4.23	4421.	4.51	4720.	4.81	5484.	5.61
1600	16630	3983.	3.63	4374.	4.02	4606.	4.25	4872.	4.50	5175.	4.79	5527.	5.13		
	15000	3836.	3.62	4213.	4.01	4437.	4.24	4693.	4.50	4986.	4.79	5325.	5.13		
	12000	3594.	3.62	3949.	4.00	4161.	4.24	4402.	4.50	4679.	4.79	4997.	5.12		
1700	16630	4194.	3.84	4609.	4.26	4857.	4.50	5139.	4.77	5462.	5.08				
	15000	4038.	3.83	4439.	4.25	4678.	4.49	4950.	4.76	5261.	5.07				
	12000	3784.	3.83	4162.	4.24	4387.	4.49	4643.	4.77	4937.	5.08				
1800	16630	4404.	4.05	4845.	4.49	5107.	4.75	5406.	5.03	5748.	5.36				
	15000	4241.	4.05	4666.	4.48	4918.	4.74	5207.	5.03	5537.	5.36				
	12000	3974.	4.04	4374.	4.47	4612.	4.74	4883.	5.03	5194.	5.36				
1900	16630	4615.	4.26	5080.	4.73	5357.	5.00	5673.	5.30						
	15000	4443.	4.26	4892.	4.72	5159.	4.99	5464.	5.29						
	12000	4164.	4.25	4586.	4.71	4838.	4.99	5124.	5.30						
2000	16630	4826.	4.47	5316.	4.96	5607.	5.25								
	15000	4646.	4.47	5118.	4.95	5400.	5.24								
	12000	4353.	4.46	4798.	4.94	5063.	5.24								
2100	16630	5036.	4.69	5551.	5.20										
	15000	4848.	4.68	5345.	5.19										
	12000	4543.	4.68	5010.	5.18										
2200	16630	5247.	4.90	5787.	5.43										
	15000	5051.	4.89	5571.	5.42										
	12000	4733.	4.89	5222.	5.41										
2300	16630	5458.	5.11	6022.	5.67										
	15000	5253.	5.10	5798.	5.66										
	12000	4923.	5.10	5434.	5.65										

Figure 7-11 Normal Cruise Thrust (Sheet 6)

FLIGHT PLANNING
NORMAL CRUISE THRUST
CRUISE (.65 MACH)

STANDARD DAY **CRUISE ALTITUDE 37000 FEET**

		TAILWIND						ZERO		HEADWIND					
STAGE	T.O.	100 KT.		50 KT.		25 KT.		WIND		25 KT.		50 KT.		100 KT.	
LENGTH NM.	WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1039.	.69	1079.	.73	1103.	.75	1131.	.77	1165.	.79	1203.	.82	1303.	.87
	15000	1002.	.68	1041.	.72	1065.	.75	1094.	.77	1127.	.79	1165.	.82	1265.	.87
	12000	938.	.68	977.	.72	1001.	.74	1029.	.76	1062.	.79	1100.	.82	1198.	.87
400	16630	1436.	1.11	1522.	1.20	1574.	1.25	1634.	1.31	1704.	1.37	1784.	1.44	1991.	1.60
	15000	1383.	1.11	1468.	1.19	1519.	1.25	1578.	1.30	1646.	1.37	1725.	1.44	1927.	1.60
	12000	1292.	1.10	1373.	1.19	1421.	1.24	1478.	1.30	1543.	1.36	1618.	1.43	1812.	1.60
600	16630	1832.	1.53	1966.	1.67	2046.	1.75	2137.	1.84	2243.	1.94	2365.	2.06	2679.	2.33
	15000	1765.	1.53	1895.	1.67	1972.	1.75	2062.	1.84	2165.	1.94	2284.	2.06	2590.	2.33
	12000	1646.	1.52	1769.	1.66	1842.	1.74	1927.	1.84	2024.	1.94	2137.	2.05	2427.	2.34
800	16630	2228.	1.96	2409.	2.14	2517.	2.25	2640.	2.38	2782.	2.52	2947.	2.68	3367.	3.06
	15000	2146.	1.95	2321.	2.14	2426.	2.25	2546.	2.37	2684.	2.51	2843.	2.68	3252.	3.07
	12000	1999.	1.94	2164.	2.14	2263.	2.25	2376.	2.37	2506.	2.51	2656.	2.67	3041.	3.07
1000	16630	2625.	2.38	2852.	2.62	2988.	2.76	3143.	2.91	3322.	3.09	3528.	3.30	4056.	3.79
	15000	2527.	2.37	2748.	2.61	2879.	2.75	3030.	2.91	3203.	3.09	3403.	3.29	3914.	3.80
	12000	2353.	2.37	2560.	2.61	2684.	2.75	2825.	2.91	2987.	3.08	3174.	3.29	3655.	3.80
1100	16630	2823.	2.59	3074.	2.85	3224.	3.01	3395.	3.18	3591.	3.38	3818.	3.61	4400.	4.16
	15000	2718.	2.58	2961.	2.85	3106.	3.00	3272.	3.18	3462.	3.37	3682.	3.60	4245.	4.16
	12000	2530.	2.58	2758.	2.85	2894.	3.00	3049.	3.18	3228.	3.37	3434.	3.60	3962.	4.16
1200	16630	3021.	2.80	3295.	3.09	3459.	3.26	3646.	3.45	3861.	3.66	4109.	3.92	4744.	4.53
	15000	2909.	2.79	3175.	3.08	3333.	3.25	3514.	3.44	3722.	3.66	3962.	3.91	4577.	4.53
	12000	2707.	2.79	2956.	3.08	3104.	3.25	3274.	3.45	3468.	3.66	3693.	3.91	4269.	4.53
1300	16630	3219.	3.01	3517.	3.33	3695.	3.51	3898.	3.72	4131.	3.95	4399.	4.22	5088.	4.89
	15000	3100.	3.00	3388.	3.32	3560.	3.50	3756.	3.71	3981.	3.95	4242.	4.22	4908.	4.89
	12000	2884.	3.00	3153.	3.32	3315.	3.50	3498.	3.71	3709.	3.94	3952.	4.22	4577.	4.90
1400	16630	3417.	3.22	3739.	3.56	3931.	3.76	4149.	3.98	4400.	4.24	4690.	4.53	5432.	5.26
	15000	3290.	3.22	3601.	3.56	3786.	3.75	3998.	3.98	4241.	4.23	4521.	4.53	5239.	5.26
	12000	3061.	3.21	3351.	3.56	3525.	3.75	3723.	3.98	3950.	4.23	4212.	4.53	4884.	5.26
1500	16630	3615.	3.43	3960.	3.80	4166.	4.01	4401.	4.25	4670.	4.52	4980.	4.84	5776.	5.62
	15000	3481.	3.43	3815.	3.79	4013.	4.00	4240.	4.25	4500.	4.52	4801.	4.84	5570.	5.62
	12000	3238.	3.42	3549.	3.79	3735.	4.01	3947.	4.25	4191.	4.52	4471.	4.84	5191.	5.63
1600	16630	3814.	3.64	4182.	4.03	4402.	4.26	4652.	4.52	4940.	4.81	5271.	5.15	6120.	5.99
	15000	3672.	3.64	4028.	4.03	4240.	4.26	4482.	4.51	4760.	4.81	5081.	5.15	5901.	5.99
	12000	3414.	3.63	3747.	4.03	3946.	4.26	4172.	4.52	4431.	4.80	4731.	5.15	5498.	5.99
1700	16630	4012.	3.86	4404.	4.27	4638.	4.51	4904.	4.79	5209.	5.10	5561.	5.46		
	15000	3862.	3.85	4241.	4.26	4467.	4.51	4724.	4.78	5019.	5.10	5360.	5.46		
	12000	3591.	3.85	3945.	4.26	4156.	4.51	4396.	4.79	4672.	5.09	4990.	5.46		
1800	16630	4210.	4.07	4625.	4.51	4873.	4.76	5155.	5.05	5479.	5.39	5852.	5.77		
	15000	4053.	4.06	4454.	4.50	4693.	4.76	4966.	5.05	5279.	5.38	5640.	5.77		
	12000	3768.	4.06	4143.	4.50	4366.	4.76	4621.	5.05	4913.	5.38	5249.	5.77		
1900	16630	4408.	4.28	4847.	4.74	5109.	5.01	5407.	5.32	5748.	5.67				
	15000	4244.	4.27	4668.	4.74	4920.	5.01	5208.	5.32	5538.	5.67				
	12000	3945.	4.27	4340.	4.74	4577.	5.01	4845.	5.32	5153.	5.66				
2000	16630	4606.	4.49	5068.	4.98	5345.	5.26	5658.	5.59						
	15000	4435.	4.48	4881.	4.97	5147.	5.26	5450.	5.58						
	12000	4122.	4.48	4538.	4.97	4787.	5.26	5070.	5.59						
2100	16630	4804.	4.70	5290.	5.22	5580.	5.52								
	15000	4625.	4.69	5094.	5.21	5374.	5.51								
	12000	4299.	4.69	4736.	5.21	4997.	5.51								
2200	16630	5003.	4.91	5512.	5.45										
	15000	4816.	4.90	5308.	5.45										
	12000	4476.	4.90	4934.	5.45										
2300	16630	5201.	5.12	5733.	5.69										
	15000	5007.	5.11	5521.	5.68										
	12000	4653.	5.11	5132.	5.68										
2400	16630	5399.	5.33	5955.	5.93										
	15000	5198.	5.33	5734.	5.92										
	12000	4830.	5.33	5330.	5.92										
2500	16630	5597.	5.55												
	15000	5388.	5.54												
	12000	5006.	5.54												

Figure 7-11 Normal Cruise Thrust (Sheet 7)

FLIGHT PLANNING
NORMAL CRUISE THRUST
CRUISE (.65 MACH)

STANDARD DAY **CRUISE ALTITUDE 39000 FEET**

		TAILWIND						ZERO WIND		HEADWIND					
STAGE	T.O.	100 KT.		50 KT.		25 KT.				25 KT.		50 KT.		100 KT.	
LENGTH NM.	WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1048.	.69	1085.	.73	1107.	.75	1134.	.77	1165.	.79	1201.	.82	1294.	.86
	15000	1007.	.69	1044.	.72	1066.	.74	1093.	.77	1124.	.79	1160.	.81	1253.	.86
	12000	941.	.68	977.	.72	999.	.74	1025.	.76	1056.	.79	1092.	.81	1184.	.86
400	16630	1423.	1.12	1505.	1.20	1553.	1.25	1610.	1.31	1675.	1.37	1751.	1.44	1945.	1.59
	15000	1367.	1.11	1446.	1.20	1494.	1.25	1549.	1.30	1613.	1.36	1687.	1.43	1877.	1.60
	12000	1272.	1.10	1348.	1.19	1393.	1.24	1446.	1.30	1507.	1.36	1578.	1.43	1760.	1.60
600	16630	1798.	1.54	1924.	1.67	1999.	1.75	2085.	1.84	2185.	1.94	2300.	2.05	2596.	2.33
	15000	1727.	1.53	1849.	1.67	1922.	1.75	2006.	1.84	2102.	1.94	2215.	2.05	2502.	2.33
	12000	1603.	1.52	1718.	1.66	1787.	1.74	1867.	1.83	1958.	1.93	2064.	2.05	2335.	2.33
800	16630	2173.	1.96	2343.	2.15	2445.	2.25	2561.	2.38	2695.	2.51	2850.	2.67	3247.	3.06
	15000	2086.	1.96	2251.	2.14	2349.	2.25	2462.	2.38	2592.	2.51	2742.	2.67	3126.	3.06
	12000	1935.	1.95	2089.	2.13	2181.	2.24	2287.	2.37	2409.	2.51	2550.	2.67	2911.	3.06
1000	16630	2548.	2.38	2763.	2.62	2891.	2.76	3037.	2.91	3205.	3.09	3400.	3.29	3898.	3.79
	15000	2446.	2.38	2653.	2.61	2777.	2.76	2918.	2.91	3081.	3.08	3269.	3.29	3751.	3.79
	12000	2266.	2.37	2460.	2.61	2575.	2.75	2708.	2.90	2860.	3.08	3036.	3.29	3486.	3.79
1200	16630	2923.	2.80	3182.	3.09	3336.	3.26	3513.	3.45	3716.	3.66	3950.	3.91	4549.	4.52
	15000	2805.	2.80	3055.	3.08	3204.	3.26	3375.	3.45	3570.	3.66	3797.	3.91	4375.	4.52
	12000	2598.	2.79	2831.	3.08	2969.	3.25	3128.	3.44	3311.	3.66	3522.	3.90	4062.	4.52
1300	16630	3111.	3.01	3392.	3.33	3559.	3.51	3751.	3.72	3971.	3.95	4225.	4.22	4875.	4.89
	15000	2985.	3.01	3257.	3.32	3418.	3.51	3603.	3.72	3815.	3.94	4060.	4.22	4687.	4.89
	12000	2763.	3.01	3016.	3.31	3166.	3.50	3339.	3.71	3536.	3.95	3765.	4.21	4349.	4.89
1400	16630	3298.	3.23	3602.	3.56	3782.	3.76	3989.	3.98	4226.	4.24	4500.	4.53	5200.	5.25
	15000	3165.	3.22	3458.	3.56	3632.	3.76	3831.	3.99	4060.	4.23	4324.	4.53	4999.	5.25
	12000	2929.	3.22	3201.	3.55	3363.	3.75	3549.	3.98	3762.	4.23	4008.	4.52	4637.	5.26
1500	16630	3486.	3.44	3811.	3.80	4005.	4.01	4226.	4.25	4481.	4.52	4775.	4.84	5526.	5.62
	15000	3345.	3.44	3659.	3.79	3846.	4.01	4059.	4.25	4304.	4.52	4588.	4.84	5312.	5.62
	12000	3095.	3.43	3387.	3.79	3560.	4.00	3759.	4.24	3987.	4.52	4251.	4.83	4925.	5.62
1600	16630	3673.	3.65	4021.	4.04	4228.	4.26	4464.	4.52	4736.	4.81	5050.	5.15	5851.	5.99
	15000	3524.	3.65	3860.	4.03	4060.	4.26	4287.	4.52	4549.	4.80	4851.	5.15	5624.	5.98
	12000	3260.	3.64	3572.	4.02	3757.	4.25	3970.	4.51	4212.	4.81	4494.	5.14	5212.	5.99
1700	16630	3861.	3.86	4231.	4.27	4451.	4.51	4702.	4.79	4991.	5.10	5325.	5.46	6177.	6.35
	15000	3704.	3.86	4061.	4.26	4273.	4.52	4515.	4.79	4793.	5.09	5115.	5.46	5936.	6.35
	12000	3426.	3.85	3757.	4.26	3954.	4.50	4180.	4.78	4438.	5.10	4737.	5.45	5500.	6.35
1800	16630	4048.	4.07	4440.	4.51	4674.	4.76	4940.	5.05	5246.	5.39	5599.	5.77		
	15000	3884.	4.07	4262.	4.50	4487.	4.77	4744.	5.06	5038.	5.38	5379.	5.77		
	12000	3592.	4.06	3943.	4.50	4151.	4.75	4390.	5.05	4663.	5.38	4980.	5.76		
1900	16630	4236.	4.28	4650.	4.74	4897.	5.01	5178.	5.32	5501.	5.67	5874.	6.08		
	15000	4064.	4.28	4463.	4.73	4701.	5.02	4972.	5.33	5283.	5.67	5642.	6.08		
	12000	3757.	4.27	4128.	4.73	4348.	5.00	4601.	5.32	4889.	5.67	5223.	6.07		
2000	16630	4423.	4.49	4860.	4.98	5120.	5.26	5416.	5.59	5756.	5.96				
	15000	4243.	4.49	4665.	4.97	4915.	5.27	5200.	5.60	5527.	5.95				
	12000	3923.	4.49	4313.	4.97	4545.	5.26	4811.	5.58	5114.	5.96				
2100	16630	4611.	4.70	5070.	5.22	5343.	5.52	5654.	5.86						
	15000	4423.	4.70	4866.	5.21	5129.	5.52	5428.	5.86						
	12000	4089.	4.70	4499.	5.20	4742.	5.51	5021.	5.85						
2200	16630	4798.	4.91	5279.	5.45	5566.	5.77								
	15000	4603.	4.92	5067.	5.44	5342.	5.77								
	12000	4255.	4.91	4684.	5.44	4939.	5.76								
2300	16630	4986.	5.12	5489.	5.69										
	15000	4783.	5.13	5268.	5.68										
	12000	4420.	5.12	4869.	5.68										
2400	16630	5173.	5.34	5699.	5.93										
	15000	4963.	5.34	5469.	5.91										
	12000	4586.	5.33	5055.	5.91										
2500	16630	5360.	5.55	5908.	6.16										
	15000	5142.	5.55	5670.	6.15										
	12000	4752.	5.54	5240.	6.15										
2600	16630	5548.	5.76												
	15000	5322.	5.76												
	12000	4917.	5.75												

Figure 7-11 Normal Cruise Thrust (Sheet 8)

FLIGHT PLANNING
NORMAL CRUISE THRUST
CRUISE (.65 MACH)

STANDARD DAY **CRUISE ALTITUDE 41000 FEET**

		TAILWIND						ZERO		HEADWIND					
STAGE	T.O.	100 KT.		50 KT.		25 KT.		WIND		25 KT.		50 KT.		100 KT.	
LENGTH NM.	WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1062.	.70	1096.	.73	1117.	.75	1141.	.77	1170.	.79	1203.	.81	1289.	.85
	15000	1018.	.69	1052.	.73	1072.	.75	1097.	.77	1126.	.79	1160.	.81	1247.	.85
	12000	945.	.68	979.	.72	999.	.74	1024.	.76	1053.	.78	1087.	.81	1174.	.86
400	16630	1419.	1.12	1495.	1.20	1541.	1.25	1594.	1.31	1655.	1.36	1726.	1.43	1909.	1.59
	15000	1357.	1.11	1432.	1.20	1476.	1.25	1528.	1.30	1588.	1.36	1658.	1.43	1836.	1.59
	12000	1256.	1.10	1327.	1.19	1370.	1.24	1419.	1.30	1477.	1.36	1543.	1.43	1715.	1.59
600	16630	1776.	1.54	1894.	1.68	1965.	1.76	2046.	1.84	2140.	1.94	2249.	2.05	2528.	2.32
	15000	1697.	1.54	1812.	1.67	1880.	1.75	1959.	1.84	2050.	1.94	2156.	2.05	2426.	2.32
	12000	1568.	1.53	1676.	1.66	1740.	1.74	1815.	1.83	1901.	1.93	2000.	2.04	2256.	2.32
800	16630	2132.	1.97	2293.	2.15	2389.	2.26	2499.	2.38	2626.	2.51	2772.	2.67	3148.	3.05
	15000	2037.	1.96	2191.	2.14	2284.	2.25	2390.	2.38	2512.	2.51	2654.	2.67	3016.	3.05
	12000	1879.	1.95	2024.	2.14	2110.	2.25	2210.	2.37	2324.	2.51	2457.	2.66	2796.	3.05
1000	16630	2489.	2.39	2692.	2.62	2813.	2.76	2952.	2.92	3111.	3.09	3295.	3.29	3767.	3.78
	15000	2376.	2.38	2571.	2.62	2688.	2.76	2821.	2.91	2974.	3.08	3152.	3.29	3606.	3.79
	12000	2190.	2.37	2372.	2.61	2481.	2.75	2605.	2.90	2748.	3.08	2914.	3.28	3337.	3.79
1200	16630	2846.	2.81	3091.	3.09	3237.	3.26	3404.	3.45	3596.	3.66	3819.	3.91	4387.	4.51
	15000	2716.	2.80	2951.	3.09	3092.	3.26	3252.	3.45	3437.	3.66	3650.	3.91	4196.	4.52
	12000	2502.	2.79	2721.	3.08	2851.	3.25	3001.	3.44	3172.	3.65	3371.	3.90	3878.	4.52
1400	16630	3202.	3.23	3490.	3.56	3661.	3.77	3857.	3.99	4082.	4.23	4342.	4.53	5006.	5.25
	15000	3056.	3.23	3331.	3.56	3495.	3.76	3683.	3.99	3899.	4.23	4148.	4.53	4786.	5.25
	12000	2813.	3.22	3069.	3.56	3221.	3.76	3396.	3.97	3596.	4.23	3827.	4.52	4419.	5.25
1600	16630	3559.	3.66	3889.	4.03	4085.	4.27	4309.	4.53	4567.	4.81	4865.	5.15	5626.	5.98
	15000	3395.	3.65	3711.	4.04	3899.	4.26	4114.	4.52	4361.	4.80	4646.	5.15	5375.	5.98
	12000	3125.	3.64	3417.	4.03	3592.	4.26	3791.	4.51	4020.	4.80	4284.	5.14	4960.	5.98
1700	16630	3737.	3.87	4088.	4.27	4297.	4.52	4536.	4.79	4810.	5.09	5126.	5.45	5935.	6.34
	15000	3565.	3.86	3901.	4.27	4101.	4.52	4330.	4.79	4592.	5.09	4895.	5.46	5670.	6.35
	12000	3281.	3.85	3592.	4.27	3777.	4.51	3989.	4.78	4231.	5.09	4513.	5.45	5231.	6.35
1800	16630	3916.	4.08	4288.	4.51	4509.	4.77	4762.	5.06	5052.	5.38	5388.	5.76	6245.	6.71
	15000	3735.	4.07	4091.	4.51	4303.	4.77	4545.	5.06	4823.	5.38	5144.	5.76	5965.	6.72
	12000	3436.	4.06	3766.	4.50	3962.	4.76	4187.	5.04	4443.	5.38	4741.	5.75	5501.	6.72
1900	16630	4094.	4.29	4487.	4.74	4721.	5.02	4988.	5.33	5295.	5.67	5649.	6.07		
	15000	3905.	4.28	4281.	4.75	4505.	5.02	4761.	5.33	5054.	5.66	5393.	6.07		
	12000	3592.	4.27	3940.	4.74	4147.	5.01	4384.	5.31	4655.	5.67	4969.	6.06		
2000	16630	4272.	4.50	4687.	4.98	4934.	5.28	5215.	5.60	5538.	5.95				
	15000	4075.	4.49	4471.	4.98	4707.	5.27	4976.	5.60	5285.	5.95				
	12000	3748.	4.48	4114.	4.98	4332.	5.26	4582.	5.58	4867.	5.95				
2100	16630	4451.	4.71	4886.	5.21	5146.	5.53	5441.	5.87	5780.	6.24				
	15000	4244.	4.71	4661.	5.22	4909.	5.52	5192.	5.86	5516.	6.24				
	12000	3903.	4.69	4288.	5.21	4518.	5.51	4780.	5.85	5079.	6.24				
2200	16630	4629.	4.93	5086.	5.45	5358.	5.78	5667.	6.14						
	15000	4414.	4.92	4851.	5.46	5111.	5.77	5407.	6.13						
	12000	4059.	4.91	4463.	5.45	4703.	5.77	4977.	6.11						
2300	16630	4808.	5.14	5285.	5.69	5570.	6.03								
	15000	4584.	5.13	5041.	5.69	5313.	6.02								
	12000	4215.	5.12	4637.	5.69	4888.	6.02								
2400	16630	4986.	5.35	5485.	5.92	5782.	6.28								
	15000	4754.	5.34	5231.	5.93	5515.	6.28								
	12000	4371.	5.33	4811.	5.92	5073.	6.27								
2500	16630	5164.	5.56	5684.	6.16										
	15000	4924.	5.55	5421.	6.17										
	12000	4526.	5.54	4985.	6.16										
2600	16630	5343.	5.77	5884.	6.39										
	15000	5093.	5.76	5611.	6.40										
	12000	4682.	5.75	5159.	6.39										
2700	16630	5521.	5.98												
	15000	5263.	5.97												
	12000	4838.	5.96												

Figure 7-11 Normal Cruise Thrust (Sheet 9)

FLIGHT PLANNING
NORMAL CRUISE THRUST
CRUISE (.65 MACH)

STANDARD DAY **CRUISE ALTITUDE 43000 FEET**

		TAILWIND						ZERO		HEADWIND					
STAGE	T.O.	100 KT.		50 KT.		25 KT.		WIND		25 KT.		50 KT.		100 KT.	
LENGTH NM.	WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1086.	.71	1116.	.74	1135.	.75	1157.	.77	1183.	.79	1214.	.81	1293.	.84
	15000	1032.	.70	1063.	.73	1082.	.75	1105.	.77	1132.	.79	1163.	.81	1244.	.85
	12000	951.	.68	983.	.72	1002.	.74	1026.	.76	1053.	.78	1085.	.80	1166.	.85
400	16630	1427.	1.13	1498.	1.21	1541.	1.26	1590.	1.31	1648.	1.36	1715.	1.43	1886.	1.57
	15000	1355.	1.12	1424.	1.20	1466.	1.25	1515.	1.30	1571.	1.36	1637.	1.43	1805.	1.58
	12000	1245.	1.11	1312.	1.19	1352.	1.24	1399.	1.30	1453.	1.36	1516.	1.42	1677.	1.58
600	16630	1769.	1.55	1880.	1.68	1947.	1.76	2024.	1.84	2113.	1.94	2216.	2.04	2480.	2.31
	15000	1677.	1.54	1786.	1.67	1850.	1.75	1925.	1.84	2011.	1.93	2110.	2.05	2366.	2.31
	12000	1539.	1.53	1641.	1.66	1702.	1.74	1772.	1.83	1853.	1.93	1947.	2.04	2188.	2.31
800	16630	2110.	1.97	2262.	2.15	2353.	2.26	2458.	2.38	2578.	2.51	2717.	2.66	3073.	3.04
	15000	2000.	1.96	2147.	2.15	2234.	2.25	2335.	2.38	2450.	2.51	2584.	2.66	2927.	3.04
	12000	1833.	1.95	1970.	2.14	2051.	2.24	2145.	2.37	2253.	2.51	2378.	2.66	2699.	3.04
1000	16630	2452.	2.39	2644.	2.63	2759.	2.76	2891.	2.91	3042.	3.09	3218.	3.28	3667.	3.77
	15000	2323.	2.39	2508.	2.62	2618.	2.76	2745.	2.91	2890.	3.08	3058.	3.28	3488.	3.77
	12000	2127.	2.37	2298.	2.61	2401.	2.75	2518.	2.90	2653.	3.08	2809.	3.28	3210.	3.78
1200	16630	2793.	2.82	3026.	3.10	3166.	3.26	3325.	3.45	3507.	3.66	3719.	3.90	4260.	4.50
	15000	2646.	2.81	2869.	3.09	3002.	3.26	3154.	3.45	3329.	3.66	3531.	3.90	4049.	4.50
	12000	2421.	2.80	2627.	3.08	2750.	3.25	2891.	3.44	3053.	3.66	3240.	3.90	3721.	4.51
1400	16630	3135.	3.24	3408.	3.57	3572.	3.76	3758.	3.99	3972.	4.24	4220.	4.52	4854.	5.23
	15000	2969.	3.23	3230.	3.57	3386.	3.76	3564.	3.99	3768.	4.23	4005.	4.52	4610.	5.23
	12000	2715.	3.22	2956.	3.55	3100.	3.75	3264.	3.98	3454.	4.23	3672.	4.52	4231.	5.24
1600	16630	3476.	3.66	3790.	4.04	3978.	4.27	4192.	4.52	4437.	4.81	4721.	5.14	5447.	5.96
	15000	3292.	3.65	3591.	4.04	3770.	4.26	3974.	4.52	4208.	4.80	4478.	5.14	5170.	5.96
	12000	3009.	3.64	3285.	4.02	3450.	4.25	3638.	4.51	3854.	4.81	4103.	5.14	4742.	5.97
1800	16630	3818.	4.08	4172.	4.52	4384.	4.77	4625.	5.06	4901.	5.39	5222.	5.75	6041.	6.70
	15000	3615.	4.07	3953.	4.51	4154.	4.77	4384.	5.06	4647.	5.38	4952.	5.76	5731.	6.70
	12000	3303.	4.07	3614.	4.50	3799.	4.75	4011.	5.05	4254.	5.38	4534.	5.76	5253.	6.71
1900	16630	3988.	4.29	4363.	4.75	4587.	5.02	4842.	5.32	5134.	5.67	5472.	6.06		
	15000	3776.	4.29	4133.	4.75	4346.	5.02	4589.	5.33	4867.	5.66	5189.	6.07		
	12000	3450.	4.28	3778.	4.73	3974.	5.00	4197.	5.31	4454.	5.67	4750.	6.07		
2000	16630	4159.	4.50	4554.	4.99	4790.	5.27	5059.	5.59	5366.	5.96	5723.	6.37		
	15000	3938.	4.50	4314.	4.98	4538.	5.27	4794.	5.59	5086.	5.95	5426.	6.38		
	12000	3597.	4.49	3942.	4.97	4149.	5.26	4384.	5.58	4654.	5.96	4965.	6.38		
2100	16630	4330.	4.71	4745.	5.22	4994.	5.52	5276.	5.86	5599.	6.25				
	15000	4099.	4.71	4494.	5.22	4730.	5.52	4999.	5.86	5306.	6.24				
	12000	3744.	4.70	4107.	5.20	4324.	5.51	4570.	5.85	4854.	6.24				
2200	16630	4501.	4.93	4936.	5.46	5197.	5.77	5492.	6.13	5831.	6.54				
	15000	4261.	4.92	4675.	5.46	4922.	5.77	5204.	6.13	5526.	6.52				
	12000	3891.	4.91	4271.	5.44	4499.	5.76	4757.	6.12	5054.	6.53				
2300	16630	4671.	5.14	5127.	5.70	5400.	6.02	5709.	6.40	6063.	6.82				
	15000	4422.	5.13	4855.	5.69	5114.	6.02	5409.	6.40	5745.	6.81				
	12000	4038.	5.12	4436.	5.68	4673.	6.01	4944.	6.39	5254.	6.82				
2400	16630	4842.	5.35	5318.	5.93	5603.	6.27	5926.	6.66						
	15000	4583.	5.34	5036.	5.93	5305.	6.27	5614.	6.67						
	12000	4185.	5.33	4600.	5.91	4848.	6.26	5130.	6.65						
2500	16630	5013.	5.56	5509.	6.17	5806.	6.53								
	15000	4745.	5.55	5217.	6.17	5497.	6.53								
	12000	4332.	5.54	4764.	6.15	5023.	6.51								
2600	16630	5184.	5.77	5700.	6.41	6009.	6.78								
	15000	4906.	5.76	5397.	6.40	5689.	6.78								
	12000	4479.	5.76	4929.	6.38	5198.	6.76								
2700	16630	5354.	5.98	5891.	6.64										
	15000	5068.	5.97	5578.	6.64										
	12000	4626.	5.97	5093.	6.62										
2800	16630	5525.	6.19	6082.	6.88										
	15000	5229.	6.19	5758.	6.88										
	12000	4773.	6.18	5258.	6.86										

Figure 7-11 Normal Cruise Thrust (Sheet 10)

FLIGHT PLANNING
LONG RANGE CRUISE

STANDARD DAY | **CRUISE ALTITUDE 10000 FEET**

FAN SETTING FOR LONG RANGE CRUISE

	TAILWIND			ZERO	HEADWIND		
CRUISE	100 KT.	50 KT.	25 KT.	WIND	25 KT.	50 KT.	100 KT.
WEIGHT LBS.	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT
16630	61.5	62.9	63.9	64.8	66.9	69.3	73.8
16000	60.7	62.1	63.1	64.3	66.1	68.6	73.7
14000	58.0	59.5	60.6	62.4	63.9	66.5	72.9
12000	54.8	56.7	57.9	59.9	61.8	64.6	71.9
10000	51.1	53.5	54.8	56.9	59.8	62.9	70.6

		TAILWIND						ZERO WIND		HEADWIND					
STAGE	T.O.	100 KT.		50 KT.		25 KT.				25 KT.		50 KT.		100 KT.	
LENGTH NM.	WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1023.	.80	1135.	.88	1207.	.93	1292.	.97	1395.	1.01	1516.	1.04	1826.	1.05
	15000	993.	.81	1104.	.91	1176.	.95	1262.	.99	1365.	1.04	1488.	1.07	1804.	1.07
	12000	938.	.85	1047.	.95	1119.	1.00	1207.	1.05	1312.	1.09	1439.	1.12	1765.	1.11
400	16630	1609.	1.44	1840.	1.61	1986.	1.70	2161.	1.78	2370.	1.87	2618.	1.92	3247.	1.93
	15000	1551.	1.48	1779.	1.66	1926.	1.75	2104.	1.83	2313.	1.92	2563.	1.99	3206.	1.97
	12000	1445.	1.56	1670.	1.77	1819.	1.86	1998.	1.96	2212.	2.04	2472.	2.08	3133.	2.07
600	16630	2196.	2.08	2545.	2.33	2766.	2.46	3031.	2.59	3345.	2.72	3720.	2.81	4669.	2.80
	15000	2109.	2.14	2454.	2.42	2677.	2.55	2946.	2.67	3262.	2.80	3638.	2.91	4607.	2.87
	12000	1952.	2.27	2293.	2.59	2518.	2.73	2788.	2.87	3113.	3.00	3505.	3.05	4501.	3.02
800	16630	2782.	2.72	3250.	3.05	3546.	3.23	3900.	3.40	4320.	3.58	4821.	3.69	6090.	3.68
	15000	2668.	2.80	3129.	3.18	3428.	3.35	3787.	3.51	4210.	3.68	4713.	3.82	6008.	3.77
	12000	2459.	2.99	2916.	3.41	3217.	3.59	3579.	3.79	4013.	3.95	4538.	4.02	5870.	3.98
1000	16630	3368.	3.36	3954.	3.77	4325.	4.00	4769.	4.22	5295.	4.44	5923.	4.57		
	15000	3226.	3.47	3804.	3.94	4179.	4.15	4629.	4.35	5158.	4.56	5788.	4.74		
	12000	2966.	3.70	3539.	4.22	3916.	4.45	4370.	4.70	4914.	4.91	5571.	4.99		
1200	16630	3954.	4.01	4659.	4.50	5105.	4.77	5638.	5.03	6270.	5.29				
	15000	3784.	4.13	4479.	4.70	4929.	4.95	5471.	5.19	6107.	5.45				
	12000	3473.	4.41	4162.	5.04	4616.	5.31	5161.	5.61	5814.	5.86				
1400	16630	4541.	4.65	5364.	5.22	5885.	5.53								
	15000	4342.	4.80	5154.	5.46	5680.	5.75								
	12000	3980.	5.13	4784.	5.86	5315.	6.18								
1600	16630	5127.	5.29	6068.	5.94										
	15000	4900.	5.46	5829.	6.22										
	12000	4488.	5.84	5407.	6.68										
1800	16630	5713.	5.93												
	15000	5459.	6.12												
	12000	4995.	6.55												

Figure 7-12 Long Range Cruise (Sheet 1 of 16)

FLIGHT PLANNING
LONG RANGE CRUISE

STANDARD DAY

CRUISE ALTITUDE 15000 FEET

FAN SETTING FOR LONG RANGE CRUISE

	TAILWIND			ZERO	HEADWIND		
CRUISE	100 KT.	50 KT.	25 KT.	WIND	25 KT.	50 KT.	100 KT.
WEIGHT LBS.	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT
16630	64.2	65.4	66.5	67.9	70.0	71.3	76.1
16000	63.4	64.7	65.7	67.1	69.0	70.6	75.6
14000	60.5	62.2	63.1	64.4	66.1	68.4	74.1
12000	57.2	59.1	60.2	61.7	63.5	66.1	72.6
10000	53.6	55.5	56.9	59.0	61.1	63.6	71.0

		TAILWIND						ZERO		HEADWIND					
STAGE	T.O.	100 KT.		50 KT.		25 KT.		WIND		25 KT.		50 KT.		100 KT.	
LENGTH NM.	WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1012.	.77	1104.	.84	1162.	.88	1231.	.92	1313.	.95	1410.	.98	1657.	1.00
	15000	981.	.78	1072.	.86	1130.	.90	1199.	.94	1282.	.98	1380.	1.01	1631.	1.02
	12000	924.	.81	1014.	.89	1072.	.94	1142.	.99	1226.	1.02	1326.	1.06	1587.	1.06
400	16630	1547.	1.37	1739.	1.53	1860.	1.61	2006.	1.68	2178.	1.75	2379.	1.80	2886.	1.83
	15000	1488.	1.41	1680.	1.56	1801.	1.65	1946.	1.74	2118.	1.82	2323.	1.86	2840.	1.88
	12000	1380.	1.49	1570.	1.67	1692.	1.76	1839.	1.86	2016.	1.92	2224.	2.00	2763.	1.97
600	16630	2081.	1.98	2374.	2.22	2559.	2.34	2780.	2.45	3042.	2.54	3347.	2.63	4114.	2.67
	15000	1996.	2.04	2289.	2.27	2473.	2.41	2693.	2.54	2954.	2.66	3266.	2.72	4049.	2.73
	12000	1837.	2.18	2125.	2.45	2313.	2.59	2536.	2.73	2806.	2.81	3122.	2.94	3938.	2.89
800	16630	2615.	2.58	3009.	2.90	3258.	3.07	3555.	3.22	3906.	3.34	4315.	3.45	5343.	3.50
	15000	2503.	2.67	2897.	2.98	3145.	3.16	3440.	3.34	3790.	3.49	4210.	3.58	5258.	3.59
	12000	2293.	2.86	2681.	3.23	2933.	3.42	3233.	3.60	3595.	3.71	4020.	3.87	5114.	3.80
1000	16630	3149.	3.19	3644.	3.59	3957.	3.80	4330.	3.98	4770.	4.14	5284.	4.27	6572.	4.33
	15000	3011.	3.30	3505.	3.69	3817.	3.92	4186.	4.14	4626.	4.33	5153.	4.44	6467.	4.44
	12000	2750.	3.54	3237.	4.01	3553.	4.24	3931.	4.47	4385.	4.60	4918.	4.81	6289.	4.72
1200	16630	3683.	3.80	4279.	4.28	4655.	4.53	5104.	4.75	5634.	4.93	6252.	5.10		
	15000	3518.	3.94	4113.	4.40	4488.	4.67	4933.	4.94	5462.	5.17	6096.	5.30		
	12000	3206.	4.23	3793.	4.79	4174.	5.07	4628.	5.35	5175.	5.50	5815.	5.75		
1400	16630	4217.	4.40	4914.	4.97	5354.	5.26	5879.	5.52						
	15000	4025.	4.57	4722.	5.11	5160.	5.42	5680.	5.74						
	12000	3663.	4.91	4349.	5.57	4794.	5.89	5325.	6.22						
1600	16630	4752.	5.01	5549.	5.66	6053.	6.00								
	15000	4533.	5.20	5330.	5.81	5832.	6.18								
	12000	4119.	5.59	4905.	6.35	5415.	6.72								
1800	16630	5286.	5.62	6184.	6.35										
	15000	5040.	5.83	5938.	6.52										
	12000	4576.	6.28	5461.	7.13										
2000	16630	5820.	6.22												
	15000	5547.	6.46												
	12000	5032.	6.96												

Figure 7-12 Long Range Cruise (Sheet 2)

FLIGHT PLANNING
LONG RANGE CRUISE

STANDARD DAY

CRUISE ALTITUDE 19000 FEET

FAN SETTING FOR LONG RANGE CRUISE

	TAILWIND			ZERO	HEADWIND		
CRUISE	100 KT.	50 KT.	25 KT.	WIND	25 KT.	50 KT.	100 KT.
WEIGHT LBS.	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT
16630	67.0	68.0	69.1	70.3	71.6	73.4	76.9
16000	66.1	67.3	68.3	69.4	70.8	72.7	76.4
14000	63.1	64.5	65.4	66.6	68.3	70.4	75.0
12000	59.6	61.1	62.3	63.7	65.5	68.1	73.6
10000	55.6	57.3	58.9	60.9	62.6	65.6	72.1

		TAILWIND						ZERO		HEADWIND					
STAGE	T.O.	100 KT.		50 KT.		25 KT.		WIND		25 KT.		50 KT.		100 KT.	
LENGTH NM.	WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1010.	.74	1087.	.80	1136.	.84	1194.	.87	1262.	.90	1343.	.93	1547.	.98
	15000	978.	.75	1055.	.82	1103.	.86	1161.	.89	1230.	.93	1312.	.95	1520.	.98
	12000	920.	.77	995.	.85	1044.	.90	1102.	.94	1173.	.97	1256.	1.00	1472.	1.01
400	16630	1506.	1.32	1674.	1.46	1778.	1.53	1902.	1.60	2046.	1.66	2216.	1.70	2639.	1.78
	15000	1449.	1.35	1614.	1.50	1718.	1.58	1842.	1.65	1988.	1.72	2160.	1.77	2592.	1.80
	12000	1340.	1.43	1504.	1.60	1608.	1.69	1734.	1.76	1884.	1.83	2060.	1.89	2511.	1.88
600	16630	2003.	1.90	2260.	2.11	2421.	2.21	2609.	2.32	2830.	2.41	3089.	2.48	3731.	2.58
	15000	1919.	1.96	2173.	2.18	2333.	2.30	2523.	2.40	2746.	2.51	3009.	2.58	3665.	2.62
	12000	1761.	2.09	2012.	2.35	2173.	2.48	2366.	2.59	2595.	2.69	2864.	2.78	3550.	2.75
800	16630	2500.	2.49	2847.	2.76	3063.	2.90	3317.	3.05	3615.	3.16	3963.	3.25	4822.	3.38
	15000	2390.	2.56	2732.	2.86	2949.	3.01	3204.	3.16	3504.	3.30	3857.	3.39	4738.	3.43
	12000	2181.	2.75	2520.	3.10	2737.	3.28	2998.	3.41	3306.	3.55	3668.	3.66	4590.	3.62
1000	16630	2996.	3.07	3433.	3.42	3706.	3.59	4024.	3.77	4399.	3.92	4836.	4.02	5914.	4.19
	15000	2861.	3.16	3291.	3.55	3564.	3.73	3885.	3.91	4262.	4.09	4706.	4.21	5810.	4.25
	12000	2602.	3.41	3028.	3.85	3302.	4.07	3630.	4.24	4017.	4.41	4473.	4.55	5629.	4.50
1200	16630	3493.	3.65	4019.	4.07	4348.	4.28	4732.	4.50	5183.	4.67	5709.	4.79		
	15000	3331.	3.77	3850.	4.23	4179.	4.45	4566.	4.67	5020.	4.89	5554.	5.02		
	12000	3022.	4.07	3536.	4.60	3866.	4.87	4262.	5.07	4728.	5.28	5277.	5.44		
1400	16630	3990.	4.23	4606.	4.72	4991.	4.97	5440.	5.22	5967.	5.42				
	15000	3802.	4.37	4409.	4.91	4794.	5.17	5246.	5.43	5778.	5.68				
	12000	3443.	4.73	4044.	5.35	4431.	5.66	4894.	5.89	5438.	6.14				
1600	16630	4486.	4.82	5192.	5.37	5633.	5.65								
	15000	4272.	4.97	4968.	5.59	5409.	5.89								
	12000	3863.	5.39	4552.	6.10	4996.	6.46								
1800	16630	4983.	5.40	5778.	6.03										
	15000	4743.	5.58	5527.	6.27										
	12000	4283.	6.05	5060.	6.85										
2000	16630	5480.	5.98	6365.	6.68										
	15000	5214.	6.18	6086.	6.95										
	12000	4704.	6.71	5568.	7.60										

Figure 7-12 Long Range Cruise (Sheet 3)

FLIGHT PLANNING

LONG RANGE CRUISE

STANDARD DAY **CRUISE ALTITUDE 21000 FEET**

FAN SETTING FOR LONG RANGE CRUISE

	TAILWIND			ZERO	HEADWIND		
CRUISE	100 KT.	50 KT.	25 KT.	WIND	25 KT.	50 KT.	100 KT.
WEIGHT LBS.	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT
16630	68.4	69.4	70.5	71.5	72.6	74.2	76.5
16000	67.6	68.6	69.7	70.7	71.9	73.5	76.3
14000	64.6	65.8	66.8	67.9	69.5	71.2	75.3
12000	61.0	62.5	63.5	65.0	66.7	68.7	74.2
10000	56.8	58.7	60.0	62.0	63.6	66.0	72.9

		TAILWIND						ZERO		HEADWIND					
STAGE	T.O.	100 KT.		50 KT.		25 KT.		WIND		25 KT.		50 KT.		100 KT.	
LENGTH NM.	WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1010.	.73	1082.	.79	1126.	.82	1179.	.85	1241.	.88	1314.	.91	1501.	.97
	15000	978.	.74	1049.	.80	1093.	.84	1146.	.87	1209.	.90	1283.	.93	1472.	.97
	12000	919.	.76	988.	.83	1032.	.87	1086.	.91	1150.	.95	1226.	.98	1422.	1.00
400	16630	1487.	1.30	1643.	1.42	1739.	1.49	1852.	1.56	1985.	1.61	2140.	1.67	2528.	1.77
	15000	1429.	1.33	1583.	1.47	1679.	1.54	1793.	1.61	1927.	1.68	2084.	1.72	2480.	1.79
	12000	1321.	1.41	1472.	1.57	1568.	1.64	1684.	1.72	1821.	1.80	1983.	1.85	2396.	1.86
600	16630	1964.	1.87	2204.	2.06	2352.	2.16	2526.	2.26	2730.	2.34	2966.	2.42	3556.	2.57
	15000	1880.	1.92	2117.	2.13	2265.	2.24	2440.	2.35	2645.	2.45	2886.	2.51	3487.	2.60
	12000	1723.	2.05	1956.	2.30	2105.	2.41	2283.	2.53	2492.	2.64	2741.	2.72	3370.	2.71
800	16630	2441.	2.44	2765.	2.70	2965.	2.84	3200.	2.97	3475.	3.07	3792.	3.17	4583.	3.38
	15000	2331.	2.51	2651.	2.80	2851.	2.94	3087.	3.09	3363.	3.22	3688.	3.30	4495.	3.41
	12000	2124.	2.70	2440.	3.03	2641.	3.18	2881.	3.34	3163.	3.49	3498.	3.59	4343.	3.57
1000	16630	2918.	3.01	3326.	3.33	3578.	3.51	3874.	3.67	4219.	3.80	4618.	3.92	5611.	4.18
	15000	2782.	3.11	3185.	3.46	3437.	3.65	3734.	3.82	4081.	4.00	4490.	4.09	5502.	4.23
	12000	2526.	3.35	2923.	3.76	3177.	3.95	3480.	4.14	3834.	4.34	4256.	4.46	5317.	4.43
1200	16630	3395.	3.57	3887.	3.97	4192.	4.18	4548.	4.38	4964.	4.53	5444.	4.68		
	15000	3233.	3.70	3719.	4.12	4023.	4.35	4381.	4.56	4800.	4.77	5292.	4.88		
	12000	2928.	4.00	3407.	4.50	3714.	4.72	4078.	4.95	4505.	5.19	5014.	5.33		
1400	16630	3872.	4.14	4448.	4.61	4805.	4.85	5222.	5.08	5709.	5.26				
	15000	3684.	4.29	4253.	4.79	4609.	5.05	5028.	5.30	5518.	5.54				
	12000	3330.	4.65	3891.	5.23	4250.	5.49	4677.	5.76	5176.	6.04				
1600	16630	4349.	4.71	5009.	5.24	5418.	5.52	5896.	5.78						
	15000	4135.	4.89	4787.	5.45	5195.	5.75	5675.	6.04						
	12000	3731.	5.29	4375.	5.96	4786.	6.26	5276.	6.57						
1800	16630	4826.	5.28	5570.	5.88	6031.	6.19								
	15000	4586.	5.48	5321.	6.12	5781.	6.45								
	12000	4133.	5.94	4859.	6.70	5322.	7.03								
2000	16630	5303.	5.85	6131.	6.52										
	15000	5037.	6.07	5855.	6.78										
	12000	4535.	6.59	5343.	7.43										
2200	16630	5780.	6.42												
	15000	5488.	6.66												
	12000	4937.	7.24												

Figure 7-12 Long Range Cruise (Sheet 4)

FLIGHT PLANNING
LONG RANGE CRUISE

STANDARD DAY **CRUISE ALTITUDE 23000 FEET**

FAN SETTING FOR LONG RANGE CRUISE

	TAILWIND			ZERO	HEADWIND		
CRUISE	100 KT.	50 KT.	25 KT.	WIND	25 KT.	50 KT.	100 KT.
WEIGHT LBS.	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT
16630	69.8	70.9	71.7	73.0	73.9	75.0	76.5
16000	68.9	70.1	70.9	72.2	73.1	74.5	76.3
14000	65.9	67.2	68.1	69.2	70.5	72.4	75.5
12000	62.4	63.9	64.9	66.0	67.7	69.8	74.3
10000	58.5	60.3	61.3	62.6	64.9	66.8	72.8

		TAILWIND						ZERO		HEADWIND					
STAGE	T.O.	100 KT.		50 KT.		25 KT.		WIND		25 KT.		50 KT.		100 KT.	
LENGTH NM.	WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1009.	.71	1074.	.77	1114.	.80	1162.	.84	1218.	.87	1285.	.89	1454.	.96
	15000	977.	.72	1041.	.78	1081.	.82	1129.	.85	1186.	.88	1252.	.91	1424.	.96
	12000	917.	.74	980.	.81	1019.	.85	1068.	.89	1125.	.92	1194.	.95	1372.	.98
400	16630	1466.	1.27	1609.	1.39	1698.	1.46	1802.	1.52	1923.	1.58	2065.	1.63	2420.	1.76
	15000	1408.	1.30	1549.	1.43	1638.	1.50	1742.	1.57	1865.	1.63	2009.	1.68	2369.	1.78
	12000	1299.	1.37	1438.	1.52	1526.	1.60	1631.	1.69	1757.	1.75	1905.	1.81	2282.	1.83
600	16630	1923.	1.83	2145.	2.01	2282.	2.11	2442.	2.20	2629.	2.29	2844.	2.37	3385.	2.57
	15000	1839.	1.88	2058.	2.08	2194.	2.19	2355.	2.29	2544.	2.38	2765.	2.45	3314.	2.60
	12000	1682.	2.00	1897.	2.23	2033.	2.36	2194.	2.49	2388.	2.59	2616.	2.66	3192.	2.68
800	16630	2380.	2.39	2680.	2.63	2866.	2.76	3082.	2.88	3334.	3.00	3624.	3.11	4351.	3.37
	15000	2270.	2.46	2566.	2.73	2751.	2.88	2969.	3.01	3224.	3.12	3521.	3.22	4258.	3.41
	12000	2065.	2.64	2356.	2.94	2539.	3.11	2758.	3.29	3019.	3.42	3327.	3.52	4102.	3.53
1000	16630	2837.	2.94	3216.	3.25	3450.	3.41	3723.	3.56	4039.	3.71	4404.	3.85	5317.	4.17
	15000	2701.	3.04	3075.	3.38	3308.	3.56	3582.	3.74	3903.	3.87	4277.	3.98	5203.	4.23
	12000	2448.	3.27	2815.	3.64	3046.	3.87	3321.	4.09	3650.	4.25	4038.	4.38	5011.	4.38
1200	16630	3294.	3.50	3751.	3.88	4035.	4.06	4363.	4.25	4744.	4.42	5184.	4.58	6282.	4.97
	15000	3132.	3.63	3584.	4.03	3865.	4.25	4195.	4.46	4582.	4.62	5033.	4.75	6148.	5.05
	12000	2830.	3.90	3274.	4.35	3553.	4.62	3884.	4.89	4282.	5.08	4748.	5.24	5921.	5.23
1400	16630	3751.	4.06	4286.	4.50	4619.	4.72	5003.	4.93	5449.	5.13	5964.	5.32		
	15000	3563.	4.21	4092.	4.68	4422.	4.94	4808.	5.18	5262.	5.37	5790.	5.52		
	12000	3213.	4.53	3733.	5.06	4059.	5.38	4448.	5.68	4913.	5.91	5459.	6.09		
1600	16630	4208.	4.61	4822.	5.12	5203.	5.37	5643.	5.61						
	15000	3994.	4.79	4601.	5.33	4979.	5.63	5422.	5.90						
	12000	3596.	5.16	4191.	5.77	4566.	6.13	5011.	6.48						
1800	16630	4665.	5.17	5357.	5.74	5787.	6.02								
	15000	4425.	5.37	5109.	5.98	5535.	6.31								
	12000	3978.	5.79	4650.	6.48	5073.	6.89								
2000	16630	5122.	5.73	5893.	6.36										
	15000	4856.	5.95	5618.	6.63										
	12000	4361.	6.42	5109.	7.18										
2200	16630	5579.	6.29	6428.	6.98										
	15000	5287.	6.53	6126.	7.28										
	12000	4744.	7.05	5568.	7.89										

Figure 7-12 Long Range Cruise (Sheet 5)

FLIGHT PLANNING
LONG RANGE CRUISE

STANDARD DAY **CRUISE ALTITUDE 25000 FEET**

FAN SETTING FOR LONG RANGE CRUISE

	TAILWIND			ZERO	HEADWIND		
CRUISE	100 KT.	50 KT.	25 KT.	WIND	25 KT.	50 KT.	100 KT.
WEIGHT LBS.	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT
16630	71.1	72.3	73.1	73.9	75.1	76.4	76.7
16000	70.3	71.5	72.3	73.1	74.3	75.7	76.5
14000	67.5	68.7	69.6	70.4	71.6	73.3	75.6
12000	64.1	65.4	66.3	67.3	68.9	70.7	74.5
10000	60.1	61.4	62.4	63.9	65.9	67.7	73.0

		TAILWIND						ZERO		HEADWIND					
STAGE	T.O.	100 KT.		50 KT.		25 KT.		WIND		25 KT.		50 KT.		100 KT.	
LENGTH NM.	WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1014.	.70	1073.	.76	1110.	.79	1154.	.82	1205.	.85	1266.	.88	1421.	.96
	15000	981.	.71	1040.	.77	1076.	.80	1120.	.83	1172.	.86	1233.	.89	1390.	.96
	12000	921.	.73	978.	.79	1014.	.83	1058.	.86	1110.	.90	1173.	.93	1334.	.97
400	16630	1452.	1.25	1585.	1.36	1666.	1.43	1762.	1.48	1873.	1.54	2003.	1.60	2329.	1.76
	15000	1394.	1.28	1525.	1.40	1606.	1.47	1702.	1.53	1814.	1.59	1946.	1.65	2277.	1.77
	12000	1284.	1.35	1412.	1.49	1493.	1.57	1590.	1.65	1705.	1.71	1840.	1.77	2185.	1.81
600	16630	1890.	1.79	2096.	1.97	2222.	2.06	2370.	2.15	2541.	2.24	2740.	2.33	3238.	2.57
	15000	1806.	1.85	2010.	2.04	2136.	2.14	2284.	2.23	2457.	2.32	2658.	2.40	3165.	2.58
	12000	1648.	1.97	1846.	2.20	1972.	2.32	2122.	2.43	2299.	2.53	2508.	2.61	3035.	2.66
800	16630	2328.	2.34	2608.	2.57	2779.	2.70	2979.	2.81	3210.	2.94	3477.	3.05	4146.	3.37
	15000	2219.	2.42	2494.	2.67	2665.	2.81	2866.	2.93	3100.	3.05	3371.	3.15	4052.	3.39
	12000	2012.	2.59	2280.	2.90	2451.	3.06	2654.	3.21	2894.	3.34	3176.	3.45	3886.	3.50
1000	16630	2767.	2.88	3120.	3.17	3335.	3.33	3587.	3.48	3878.	3.63	4215.	3.77	5054.	4.18
	15000	2632.	2.98	2979.	3.31	3195.	3.48	3448.	3.63	3743.	3.78	4084.	3.90	4939.	4.21
	12000	2376.	3.21	2714.	3.60	2930.	3.81	3186.	3.99	3488.	4.15	3844.	4.28	4736.	4.34
1200	16630	3205.	3.43	3631.	3.77	3891.	3.97	4195.	4.14	4546.	4.33	4952.	4.49	5962.	4.99
	15000	3044.	3.55	3464.	3.95	3725.	4.15	4030.	4.33	4385.	4.50	4797.	4.66	5827.	5.02
	12000	2740.	3.82	3148.	4.30	3408.	4.55	3718.	4.77	4083.	4.97	4512.	5.12	5587.	5.19
1400	16630	3643.	3.97	4143.	4.38	4448.	4.60	4804.	4.80	5214.	5.02	5689.	5.21		
	15000	3457.	4.12	3949.	4.58	4255.	4.82	4612.	5.03	5028.	5.23	5510.	5.41		
	12000	3104.	4.44	3582.	5.01	3887.	5.29	4250.	5.55	4678.	5.78	5180.	5.96		
1600	16630	4081.	4.51	4654.	4.98	5004.	5.24	5412.	5.47	5882.	5.72				
	15000	3869.	4.69	4434.	5.22	4785.	5.49	5194.	5.73	5671.	5.96				
	12000	3467.	5.06	4016.	5.71	4366.	6.04	4781.	6.33	5272.	6.60				
1800	16630	4519.	5.06	5166.	5.58	5560.	5.87	6020.	6.13						
	15000	4282.	5.26	4919.	5.85	5314.	6.16	5776.	6.43						
	12000	3831.	5.68	4451.	6.41	4845.	6.78	5313.	7.11						
2000	16630	4957.	5.60	5677.	6.18										
	15000	4695.	5.83	5404.	6.49										
	12000	4195.	6.30	4885.	7.11										
2200	16630	5395.	6.15	6189.	6.79										
	15000	5107.	6.39	5889.	7.12										
	12000	4559.	6.92	5319.	7.82										
2400	16630	5833.	6.69												
	15000	5520.	6.96												
	12000	4923.	7.54												

Figure 7-12 Long Range Cruise (Sheet 6)

FLIGHT PLANNING
LONG RANGE CRUISE

STANDARD DAY **CRUISE ALTITUDE 27000 FEET**

FAN SETTING FOR LONG RANGE CRUISE

	TAILWIND			ZERO	HEADWIND		
CRUISE	100 KT.	50 KT.	25 KT.	WIND	25 KT.	50 KT.	100 KT.
WEIGHT LBS.	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT
16630	72.6	73.8	74.7	74.7	75.1	75.9	77.4
16000	71.8	73.0	73.9	74.0	74.7	75.6	77.0
14000	69.0	70.1	71.0	71.7	72.8	74.0	75.6
12000	65.5	66.7	67.7	68.7	70.1	71.7	74.3
10000	61.5	62.8	64.0	65.2	66.7	68.7	73.1

		TAILWIND						ZERO		HEADWIND					
STAGE	T.O.	100 KT.		50 KT.		25 KT.		WIND		25 KT.		50 KT.		100 KT.	
LENGTH NM.	WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1019.	.69	1072.	.75	1105.	.78	1145.	.81	1192.	.84	1247.	.88	1392.	.95
	15000	985.	.70	1038.	.75	1071.	.78	1111.	.81	1158.	.84	1213.	.88	1356.	.95
	12000	924.	.71	976.	.77	1008.	.81	1048.	.84	1095.	.87	1152.	.90	1298.	.96
400	16630	1439.	1.22	1561.	1.33	1636.	1.39	1724.	1.46	1826.	1.52	1945.	1.58	2246.	1.77
	15000	1380.	1.25	1501.	1.37	1576.	1.43	1664.	1.49	1766.	1.55	1886.	1.61	2189.	1.77
	12000	1271.	1.32	1388.	1.46	1463.	1.53	1551.	1.60	1656.	1.67	1780.	1.72	2094.	1.80
600	16630	1860.	1.76	2050.	1.92	2166.	2.01	2302.	2.10	2460.	2.20	2643.	2.28	3101.	2.59
	15000	1776.	1.81	1964.	1.99	2080.	2.08	2217.	2.17	2375.	2.26	2559.	2.35	3023.	2.58
	12000	1617.	1.93	1801.	2.14	1917.	2.25	2054.	2.36	2217.	2.46	2408.	2.54	2889.	2.64
800	16630	2280.	2.29	2539.	2.51	2697.	2.63	2881.	2.75	3094.	2.87	3340.	2.98	3955.	3.40
	15000	2171.	2.36	2427.	2.60	2585.	2.73	2770.	2.85	2984.	2.97	3232.	3.08	3856.	3.40
	12000	1964.	2.54	2214.	2.83	2372.	2.98	2558.	3.12	2777.	3.26	3036.	3.35	3684.	3.48
1000	16630	2701.	2.82	3028.	3.09	3227.	3.25	3459.	3.40	3727.	3.55	4038.	3.68	4809.	4.22
	15000	2566.	2.92	2890.	3.22	3090.	3.38	3323.	3.53	3592.	3.68	3905.	3.82	4689.	4.21
	12000	2311.	3.15	2627.	3.51	2826.	3.70	3061.	3.88	3338.	4.05	3664.	4.17	4479.	4.32
1200	16630	3121.	3.35	3517.	3.68	3758.	3.87	4038.	4.04	4361.	4.22	4736.	4.38	5664.	5.04
	15000	2961.	3.47	3353.	3.84	3594.	4.03	3876.	4.21	4201.	4.39	4578.	4.55	5522.	5.03
	12000	2658.	3.76	3040.	4.20	3281.	4.42	3564.	4.64	3899.	4.84	4293.	4.99	5274.	5.16
1400	16630	3542.	3.88	4006.	4.27	4288.	4.48	4616.	4.69	4995.	4.90	5433.	5.08	6518.	5.86
	15000	3357.	4.03	3816.	4.46	4099.	4.68	4429.	4.89	4810.	5.10	5251.	5.29	6355.	5.84
	12000	3005.	4.37	3453.	4.88	3735.	5.15	4067.	5.41	4459.	5.64	4921.	5.80	6070.	6.00
1600	16630	3962.	4.41	4494.	4.86	4819.	5.10	5195.	5.34	5629.	5.58	6131.	5.78		
	15000	3752.	4.58	4279.	5.07	4604.	5.33	4982.	5.57	5418.	5.81	5924.	6.02		
	12000	3352.	4.98	3866.	5.57	4190.	5.87	4571.	6.17	5020.	6.43	5549.	6.62		
1800	16630	4382.	4.94	4983.	5.44	5349.	5.72	5773.	5.98						
	15000	4147.	5.14	4742.	5.69	5108.	5.97	5535.	6.25						
	12000	3698.	5.59	4279.	6.25	4644.	6.59	5074.	6.93						
2000	16630	4803.	5.47	5472.	6.03	5879.	6.34								
	15000	4543.	5.70	5205.	6.31	5613.	6.62								
	12000	4045.	6.20	4691.	6.94	5098.	7.32								
2200	16630	5223.	6.00	5961.	6.62										
	15000	4938.	6.25	5667.	6.92										
	12000	4392.	6.81	5104.	7.63										
2400	16630	5644.	6.53												
	15000	5333.	6.81												
	12000	4739.	7.42												

Figure 7-12 Long Range Cruise (Sheet 7)

FLIGHT PLANNING
LONG RANGE CRUISE

STANDARD DAY **CRUISE ALTITUDE 29000 FEET**

FAN SETTING FOR LONG RANGE CRUISE

	TAILWIND			ZERO	HEADWIND		
CRUISE	100 KT.	50 KT.	25 KT.	WIND	25 KT.	50 KT.	100 KT.
WEIGHT LBS.	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT
16630	74.3	74.7	75.1	75.6	76.0	76.6	78.6
16000	73.4	74.1	74.5	75.0	75.6	76.3	78.0
14000	70.3	71.6	72.2	72.9	73.8	74.8	76.1
12000	66.9	68.4	69.1	70.0	71.2	72.6	74.5
10000	63.3	64.5	65.4	66.4	67.8	69.7	73.2

		TAILWIND						ZERO		HEADWIND					
STAGE	T.O.	100 KT.		50 KT.		25 KT.		WIND		25 KT.		50 KT.		100 KT.	
LENGTH NM.	WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1024.	.69	1073.	.74	1103.	.77	1140.	.80	1183.	.83	1234.	.86	1368.	.93
	15000	989.	.69	1037.	.74	1068.	.77	1104.	.80	1147.	.83	1197.	.87	1331.	.94
	12000	927.	.69	975.	.75	1004.	.78	1040.	.81	1083.	.85	1134.	.88	1267.	.95
400	16630	1428.	1.20	1541.	1.31	1610.	1.37	1691.	1.43	1785.	1.49	1895.	1.57	2175.	1.76
	15000	1368.	1.23	1480.	1.34	1549.	1.40	1629.	1.46	1723.	1.52	1833.	1.58	2114.	1.76
	12000	1259.	1.29	1368.	1.42	1436.	1.49	1517.	1.56	1613.	1.62	1726.	1.67	2011.	1.79
600	16630	1832.	1.72	2008.	1.89	2116.	1.97	2242.	2.06	2387.	2.14	2556.	2.27	2982.	2.59
	15000	1748.	1.77	1922.	1.94	2030.	2.03	2155.	2.12	2300.	2.21	2470.	2.30	2896.	2.59
	12000	1591.	1.88	1761.	2.09	1867.	2.19	1993.	2.30	2142.	2.40	2317.	2.47	2755.	2.63
800	16630	2236.	2.24	2476.	2.46	2622.	2.57	2792.	2.69	2989.	2.80	3217.	2.97	3789.	3.42
	15000	2128.	2.31	2365.	2.54	2510.	2.66	2680.	2.79	2877.	2.91	3106.	3.02	3679.	3.41
	12000	1923.	2.48	2154.	2.75	2299.	2.90	2470.	3.05	2671.	3.17	2908.	3.26	3499.	3.47
1000	16630	2640.	2.76	2943.	3.03	3129.	3.17	3343.	3.32	3591.	3.45	3877.	3.67	4596.	4.25
	15000	2507.	2.85	2807.	3.14	2991.	3.29	3205.	3.45	3454.	3.60	3742.	3.73	4462.	4.24
	12000	2254.	3.07	2547.	3.42	2730.	3.61	2946.	3.79	3201.	3.94	3500.	4.06	4243.	4.31
1200	16630	3044.	3.27	3411.	3.61	3635.	3.77	3894.	3.95	4194.	4.11	4538.	4.37	5403.	5.09
	15000	2887.	3.39	3250.	3.74	3472.	3.92	3731.	4.11	4030.	4.29	4379.	4.45	5245.	5.07
	12000	2586.	3.67	2940.	4.09	3162.	4.31	3423.	4.53	3730.	4.72	4091.	4.85	4987.	5.15
1400	16630	3448.	3.79	3878.	4.18	4141.	4.38	4445.	4.58	4796.	4.76	5199.	5.07	6210.	5.92
	15000	3266.	3.93	3692.	4.34	3953.	4.55	4256.	4.77	4607.	4.98	5015.	5.16	6028.	5.89
	12000	2918.	4.26	3333.	4.75	3593.	5.02	3899.	5.28	4260.	5.49	4682.	5.65	5731.	6.00
1600	16630	3852.	4.31	4346.	4.75	4648.	4.98	4996.	5.21	5398.	5.42	5860.	5.77		
	15000	3646.	4.47	4135.	4.94	4434.	5.18	4782.	5.44	5184.	5.67	5651.	5.88		
	12000	3250.	4.85	3726.	5.42	4025.	5.73	4376.	6.02	4789.	6.27	5274.	6.44		
1800	16630	4256.	4.83	4814.	5.33	5154.	5.58	5547.	5.84	6000.	6.07				
	15000	4025.	5.01	4577.	5.54	4915.	5.81	5307.	6.10	5760.	6.36				
	12000	3582.	5.45	4119.	6.09	4456.	6.43	4852.	6.76	5319.	7.04				
2000	16630	4660.	5.34	5281.	5.90	5660.	6.18								
	15000	4405.	5.55	5020.	6.14	5396.	6.45								
	12000	3913.	6.04	4512.	6.76	4888.	7.14								
2200	16630	5064.	5.86	5749.	6.48										
	15000	4784.	6.09	5462.	6.74										
	12000	4245.	6.64	4905.	7.42										
2400	16630	5468.	6.38	6216.	7.05										
	15000	5164.	6.63	5905.	7.34										
	12000	4577.	7.23	5298.	8.09										

Figure 7-12 Long Range Cruise (Sheet 8)

FLIGHT PLANNING
LONG RANGE CRUISE

STANDARD DAY | **CRUISE ALTITUDE 31000 FEET**

FAN SETTING FOR LONG RANGE CRUISE

	TAILWIND			ZERO	HEADWIND		
CRUISE	100 KT.	50 KT.	25 KT.	WIND	25 KT.	50 KT.	100 KT.
WEIGHT LBS.	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT
16630	75.8	75.9	76.3	76.5	76.8	77.2	79.0
16000	74.9	75.3	75.7	75.9	76.3	76.9	78.4
14000	71.8	72.8	73.2	73.8	74.4	75.5	76.5
12000	68.4	69.7	70.1	71.0	72.1	73.5	74.8
10000	64.7	65.8	66.5	67.6	69.4	70.8	73.4

		TAILWIND						ZERO		HEADWIND					
STAGE	T.O.	100 KT.		50 KT.		25 KT.		WIND		25 KT.		50 KT.		100 KT.	
LENGTH NM.	WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1029.	.68	1074.	.73	1102.	.76	1136.	.79	1176.	.82	1222.	.85	1347.	.92
	15000	994.	.68	1038.	.73	1065.	.76	1099.	.80	1138.	.83	1186.	.86	1309.	.93
	12000	931.	.68	974.	.73	1001.	.76	1034.	.80	1073.	.83	1119.	.86	1241.	.94
400	16630	1418.	1.18	1523.	1.29	1587.	1.35	1661.	1.42	1749.	1.49	1853.	1.56	2120.	1.74
	15000	1358.	1.20	1461.	1.31	1525.	1.38	1599.	1.44	1686.	1.50	1788.	1.57	2047.	1.77
	12000	1249.	1.26	1349.	1.38	1412.	1.45	1486.	1.52	1574.	1.57	1677.	1.63	1939.	1.78
600	16630	1807.	1.69	1971.	1.85	2071.	1.95	2187.	2.06	2323.	2.17	2483.	2.27	2893.	2.55
	15000	1723.	1.73	1885.	1.90	1984.	1.99	2099.	2.08	2234.	2.17	2390.	2.28	2785.	2.61
	12000	1567.	1.84	1724.	2.03	1823.	2.14	1939.	2.23	2075.	2.32	2235.	2.40	2636.	2.61
800	16630	2196.	2.19	2419.	2.41	2555.	2.55	2712.	2.70	2896.	2.84	3113.	2.98	3666.	3.37
	15000	2088.	2.26	2308.	2.48	2443.	2.60	2599.	2.72	2782.	2.83	2992.	2.99	3523.	3.45
	12000	1885.	2.42	2099.	2.69	2233.	2.83	2391.	2.95	2577.	3.07	2792.	3.17	3334.	3.45
1000	16630	2585.	2.70	2868.	2.97	3039.	3.14	3238.	3.34	3470.	3.52	3743.	3.68	4438.	4.19
	15000	2452.	2.78	2731.	3.06	2902.	3.21	3099.	3.36	3330.	3.50	3594.	3.70	4261.	4.29
	12000	2203.	3.00	2475.	3.34	2644.	3.51	2844.	3.67	3078.	3.82	3350.	3.94	4031.	4.29
1200	16630	2974.	3.20	3316.	3.53	3523.	3.74	3764.	3.97	4044.	4.19	4373.	4.39	5211.	5.01
	15000	2817.	3.31	3154.	3.65	3361.	3.82	3600.	4.00	3877.	4.17	4196.	4.41	4999.	5.13
	12000	2521.	3.58	2850.	3.99	3055.	4.20	3296.	4.39	3579.	4.56	3908.	4.72	4729.	5.13
1400	16630	3363.	3.70	3764.	4.09	4007.	4.34	4289.	4.61	4617.	4.87	5003.	5.10	5984.	5.83
	15000	3182.	3.83	3578.	4.23	3821.	4.44	4100.	4.65	4425.	4.84	4797.	5.13	5737.	5.97
	12000	2839.	4.16	3225.	4.64	3466.	4.89	3749.	5.11	4081.	5.31	4465.	5.49	5426.	5.97
1600	16630	3752.	4.21	4213.	4.65	4491.	4.93	4815.	5.25	5191.	5.55	5633.	5.80		
	15000	3546.	4.36	4001.	4.81	4280.	5.05	4600.	5.29	4973.	5.51	5399.	5.84		
	12000	3157.	4.74	3600.	5.29	3876.	5.57	4201.	5.83	4582.	6.06	5023.	6.26		
1800	16630	4141.	4.71	4661.	5.21	4975.	5.53	5340.	5.89	5765.	6.22				
	15000	3911.	4.89	4424.	5.39	4739.	5.66	5100.	5.93	5521.	6.17				
	12000	3475.	5.32	3975.	5.94	4287.	6.26	4654.	6.55	5083.	6.80				
2000	16630	4530.	5.22	5109.	5.77	5460.	6.13	5866.	6.52						
	15000	4276.	5.41	4847.	5.98	5198.	6.27	5600.	6.57						
	12000	3794.	5.90	4350.	6.59	4698.	6.95	5106.	7.27						
2200	16630	4919.	5.72	5558.	6.33	5944.	6.72								
	15000	4640.	5.94	5271.	6.56	5657.	6.89								
	12000	4112.	6.48	4725.	7.24	5109.	7.64								
2400	16630	5308.	6.22	6006.	6.89										
	15000	5005.	6.46	5694.	7.14										
	12000	4430.	7.06	5100.	7.89										
2600	16630	5697.	6.73												
	15000	5370.	6.99												
	12000	4748.	7.64												

Figure 7-12 Long Range Cruise (Sheet 9)

FLIGHT PLANNING
LONG RANGE CRUISE

STANDARD DAY **CRUISE ALTITUDE 33000 FEET**

FAN SETTING FOR LONG RANGE CRUISE

	TAILWIND			ZERO	HEADWIND		
CRUISE	100 KT.	50 KT.	25 KT.	WIND	25 KT.	50 KT.	100 KT.
WEIGHT LBS.	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT
16630	76.8	77.1	77.5	77.5	77.6	78.3	80.3
16000	76.0	76.5	76.8	77.0	77.2	77.7	79.5
14000	73.2	74.1	74.4	74.8	75.5	75.8	77.1
12000	69.8	70.9	71.4	72.1	73.2	73.7	75.0
10000	65.9	67.0	67.9	68.9	70.2	71.4	73.2

		TAILWIND						ZERO		HEADWIND					
STAGE	T.O.	100 KT.		50 KT.		25 KT.		WIND		25 KT.		50 KT.		100 KT.	
LENGTH NM.	WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1035.	.68	1076.	.72	1102.	.75	1133.	.78	1170.	.81	1214.	.84	1329.	.90
	15000	999.	.67	1040.	.73	1065.	.75	1096.	.78	1133.	.81	1176.	.85	1291.	.91
	12000	935.	.67	974.	.72	999.	.75	1029.	.78	1065.	.81	1107.	.85	1220.	.93
400	16630	1410.	1.17	1508.	1.27	1567.	1.34	1637.	1.40	1719.	1.47	1816.	1.55	2068.	1.71
	15000	1350.	1.19	1446.	1.29	1504.	1.35	1573.	1.43	1654.	1.49	1748.	1.56	1996.	1.74
	12000	1240.	1.23	1333.	1.35	1391.	1.41	1459.	1.47	1540.	1.53	1634.	1.60	1874.	1.78
600	16630	1785.	1.67	1939.	1.83	2033.	1.92	2141.	2.02	2268.	2.13	2418.	2.25	2807.	2.52
	15000	1701.	1.70	1851.	1.86	1943.	1.96	2050.	2.08	2174.	2.18	2320.	2.28	2702.	2.56
	12000	1546.	1.80	1692.	1.98	1783.	2.07	1889.	2.17	2014.	2.26	2160.	2.35	2527.	2.62
800	16630	2161.	2.16	2370.	2.38	2498.	2.50	2646.	2.64	2817.	2.80	3020.	2.96	3546.	3.33
	15000	2052.	2.21	2257.	2.42	2382.	2.56	2527.	2.72	2695.	2.86	2893.	3.00	3407.	3.39
	12000	1851.	2.37	2051.	2.61	2175.	2.74	2320.	2.86	2489.	2.98	2686.	3.10	3181.	3.46
1000	16630	2536.	2.66	2802.	2.93	2963.	3.09	3150.	3.26	3366.	3.46	3622.	3.66	4285.	4.14
	15000	2402.	2.72	2662.	2.99	2821.	3.16	3004.	3.37	3216.	3.54	3465.	3.72	4112.	4.22
	12000	2157.	2.93	2410.	3.24	2567.	3.40	2750.	3.55	2964.	3.71	3212.	3.85	3834.	4.31
1200	16630	2912.	3.15	3233.	3.48	3429.	3.67	3654.	3.88	3915.	4.12	4224.	4.37	5023.	4.95
	15000	2753.	3.24	3068.	3.55	3260.	3.76	3481.	4.02	3736.	4.23	4037.	4.44	4817.	5.04
	12000	2462.	3.50	2769.	3.87	2959.	4.06	3180.	4.24	3438.	4.43	3739.	4.59	4488.	5.15
1400	16630	3287.	3.65	3664.	4.03	3894.	4.26	4159.	4.50	4464.	4.79	4826.	5.08	5762.	5.76
	15000	3104.	3.75	3474.	4.12	3699.	4.36	3957.	4.67	4257.	4.91	4609.	5.15	5522.	5.87
	12000	2768.	4.07	3128.	4.50	3350.	4.73	3611.	4.94	3913.	5.16	4265.	5.34	5142.	6.00
1600	16630	3662.	4.14	4096.	4.58	4360.	4.84	4663.	5.13	5013.	5.45	5428.	5.78	6501.	6.57
	15000	3455.	4.26	3879.	4.69	4138.	4.96	4434.	5.32	4778.	5.60	5181.	5.87	6227.	6.70
	12000	3073.	4.63	3486.	5.13	3742.	5.39	4041.	5.63	4388.	5.88	4791.	6.09	5795.	6.84
1800	16630	4038.	4.64	4527.	5.13	4825.	5.43	5167.	5.75	5562.	6.11	6029.	6.49		
	15000	3806.	4.77	4285.	5.25	4577.	5.57	4911.	5.97	5299.	6.28	5753.	6.59		
	12000	3379.	5.20	3845.	5.76	4134.	6.05	4471.	6.32	4862.	6.60	5318.	6.84		
2000	16630	4413.	5.13	4958.	5.68	5290.	6.01	5671.	6.37						
	15000	4157.	5.29	4691.	5.82	5016.	6.17	5388.	6.61						
	12000	3684.	5.77	4204.	6.39	4526.	6.71	4902.	7.02						
2200	16630	4789.	5.63	5389.	6.23	5756.	6.59								
	15000	4508.	5.80	5096.	6.38	5455.	6.77								
	12000	3990.	6.33	4563.	7.02	4918.	7.38								
2400	16630	5164.	6.12	5821.	6.78										
	15000	4859.	6.31	5502.	6.95										
	12000	4295.	6.90	4922.	7.65										
2600	16630	5539.	6.62												
	15000	5209.	6.82												
	12000	4601.	7.46												

Figure 7-12 Long Range Cruise (Sheet 10)

FLIGHT PLANNING
LONG RANGE CRUISE

STANDARD DAY **CRUISE ALTITUDE 35000 FEET**

FAN SETTING FOR LONG RANGE CRUISE

	TAILWIND			ZERO	HEADWIND		
CRUISE	100 KT.	50 KT.	25 KT.	WIND	25 KT.	50 KT.	100 KT.
WEIGHT LBS.	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT
16630	77.7	78.3	78.3	78.7	79.1	79.4	81.0
16000	77.1	77.6	77.7	78.0	78.3	78.7	80.2
14000	74.6	75.2	75.4	75.5	75.9	76.5	77.8
12000	71.3	72.1	72.5	72.8	73.5	74.3	75.5
10000	67.3	68.5	69.1	69.9	70.9	72.2	73.4

		TAILWIND						ZERO		HEADWIND					
STAGE	T.O.	100 KT.		50 KT.		25 KT.		WIND		25 KT.		50 KT.		100 KT.	
LENGTH NM.	WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1042.	.68	1081.	.72	1105.	.75	1134.	.77	1169.	.80	1209.	.83	1316.	.88
	15000	1006.	.67	1044.	.72	1067.	.74	1095.	.77	1130.	.80	1170.	.83	1277.	.89
	12000	940.	.66	976.	.71	999.	.74	1027.	.78	1060.	.81	1100.	.84	1207.	.91
400	16630	1405.	1.16	1496.	1.26	1552.	1.32	1617.	1.39	1694.	1.45	1784.	1.53	2020.	1.69
	15000	1344.	1.17	1433.	1.28	1488.	1.34	1552.	1.40	1627.	1.48	1716.	1.55	1949.	1.72
	12000	1234.	1.21	1319.	1.32	1373.	1.38	1435.	1.45	1510.	1.52	1597.	1.58	1820.	1.77
600	16630	1767.	1.64	1911.	1.80	1999.	1.90	2100.	2.00	2219.	2.11	2360.	2.23	2724.	2.50
	15000	1682.	1.67	1823.	1.83	1908.	1.93	2008.	2.04	2125.	2.15	2263.	2.26	2621.	2.55
	12000	1527.	1.76	1663.	1.93	1746.	2.02	1844.	2.12	1959.	2.22	2093.	2.31	2434.	2.62
800	16630	2130.	2.13	2326.	2.35	2446.	2.47	2583.	2.61	2745.	2.76	2936.	2.93	3428.	3.31
	15000	2020.	2.18	2212.	2.39	2329.	2.52	2464.	2.67	2623.	2.82	2810.	2.97	3294.	3.38
	12000	1821.	2.31	2006.	2.54	2120.	2.66	2253.	2.79	2409.	2.92	2590.	3.04	3047.	3.48
1000	16630	2493.	2.61	2741.	2.89	2892.	3.05	3067.	3.23	3270.	3.42	3511.	3.63	4133.	4.12
	15000	2358.	2.68	2602.	2.95	2750.	3.12	2921.	3.30	3120.	3.50	3357.	3.69	3966.	4.20
	12000	2114.	2.86	2349.	3.15	2494.	3.31	2662.	3.46	2858.	3.62	3087.	3.77	3660.	4.34
1200	16630	2856.	3.09	3157.	3.43	3339.	3.62	3550.	3.84	3795.	4.07	4087.	4.33	4837.	4.92
	15000	2697.	3.18	2992.	3.51	3171.	3.71	3377.	3.93	3618.	4.17	3903.	4.40	4638.	5.03
	12000	2408.	3.40	2692.	3.76	2868.	3.95	3071.	4.14	3308.	4.32	3583.	4.50	4274.	5.19
1400	16630	3219.	3.57	3572.	3.97	3786.	4.20	4033.	4.45	4321.	4.73	4663.	5.03	5541.	5.73
	15000	3035.	3.68	3381.	4.07	3592.	4.30	3834.	4.57	4116.	4.85	4450.	5.12	5311.	5.86
	12000	2702.	3.95	3035.	4.37	3241.	4.59	3480.	4.81	3758.	5.02	4080.	5.23	4887.	6.05
1600	16630	3581.	4.06	3987.	4.51	4233.	4.77	4516.	5.07	4846.	5.38	5238.	5.73	6245.	6.54
	15000	3373.	4.18	3771.	4.63	4012.	4.90	4290.	5.20	4614.	5.52	4997.	5.83	5983.	6.69
	12000	2995.	4.50	3379.	4.98	3615.	5.23	3889.	5.48	4207.	5.72	4576.	5.96	5501.	6.91
1800	16630	3944.	4.54	4402.	5.05	4680.	5.35	4999.	5.68	5371.	6.04	5814.	6.43		
	15000	3711.	4.68	4160.	5.19	4433.	5.49	4746.	5.83	5111.	6.20	5544.	6.54		
	12000	3289.	5.05	3722.	5.59	3989.	5.87	4298.	6.15	4657.	6.42	5073.	6.69		
2000	16630	4307.	5.02	4817.	5.59	5127.	5.92	5482.	6.30	5897.	6.69				
	15000	4050.	5.19	4550.	5.74	4854.	6.08	5203.	6.46	5609.	6.87				
	12000	3583.	5.60	4065.	6.19	4362.	6.51	4707.	6.82	5106.	7.12				
2200	16630	4670.	5.50	5232.	6.13	5574.	6.50	5965.	6.91						
	15000	4388.	5.69	4940.	6.30	5275.	6.68	5659.	7.10						
	12000	3876.	6.15	4408.	6.80	4736.	7.15	5116.	7.49						
2400	16630	5033.	5.99	5648.	6.67										
	15000	4726.	6.19	5329.	6.86										
	12000	4170.	6.70	4751.	7.41										
2600	16630	5395.	6.47	6063.	7.22										
	15000	5064.	6.69	5719.	7.42										
	12000	4464.	7.25	5095.	8.02										
2800	16630	5758.	6.95												
	15000	5402.	7.19												
	12000	4757.	7.80												

Figure 7-12 Long Range Cruise (Sheet 11)

FLIGHT PLANNING
LONG RANGE CRUISE

STANDARD DAY **CRUISE ALTITUDE 37000 FEET**

FAN SETTING FOR LONG RANGE CRUISE

	TAILWIND			ZERO	HEADWIND		
CRUISE	100 KT.	50 KT.	25 KT.	WIND	25 KT.	50 KT.	100 KT.
WEIGHT LBS.	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT
16630	79.6	79.6	80.0	80.4	81.0	81.5	83.1
16000	78.8	78.9	79.2	79.6	80.0	80.5	82.2
14000	76.0	76.6	76.7	76.9	77.2	77.7	79.3
12000	72.9	73.6	73.9	74.2	74.6	75.2	76.5
10000	69.3	70.1	70.7	71.4	72.3	72.9	73.8

		TAILWIND						ZERO		HEADWIND					
STAGE	T.O.	100 KT.		50 KT.		25 KT.		WIND		25 KT.		50 KT.		100 KT.	
LENGTH NM.	WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1052.	.68	1089.	.72	1111.	.74	1138.	.76	1170.	.79	1207.	.81	1305.	.86
	15000	1012.	.67	1048.	.72	1070.	.74	1097.	.77	1129.	.79	1166.	.82	1265.	.87
	12000	946.	.66	980.	.71	1001.	.74	1027.	.77	1058.	.81	1095.	.83	1195.	.89
400	16630	1403.	1.15	1488.	1.25	1541.	1.31	1602.	1.37	1674.	1.43	1759.	1.51	1979.	1.65
	15000	1340.	1.16	1423.	1.26	1474.	1.32	1535.	1.38	1605.	1.45	1688.	1.53	1906.	1.69
	12000	1229.	1.19	1309.	1.29	1358.	1.35	1417.	1.42	1485.	1.48	1565.	1.56	1773.	1.75
600	16630	1753.	1.63	1888.	1.79	1971.	1.87	2067.	1.97	2179.	2.08	2311.	2.20	2653.	2.44
	15000	1667.	1.65	1799.	1.81	1879.	1.90	1973.	2.00	2082.	2.11	2211.	2.23	2546.	2.50
	12000	1513.	1.72	1639.	1.88	1716.	1.97	1807.	2.06	1912.	2.15	2035.	2.28	2351.	2.62
800	16630	2104.	2.10	2288.	2.32	2401.	2.44	2532.	2.58	2684.	2.72	2862.	2.89	3327.	3.23
	15000	1995.	2.14	2174.	2.35	2283.	2.48	2411.	2.62	2558.	2.77	2734.	2.94	3187.	3.32
	12000	1797.	2.25	1968.	2.47	2074.	2.58	2197.	2.71	2339.	2.83	2505.	3.01	2928.	3.48
1000	16630	2455.	2.58	2688.	2.85	2831.	3.01	2997.	3.19	3189.	3.37	3414.	3.58	4001.	4.02
	15000	2322.	2.62	2550.	2.90	2688.	3.06	2849.	3.24	3035.	3.43	3256.	3.65	3827.	4.14
	12000	2080.	2.78	2298.	3.05	2432.	3.20	2586.	3.35	2767.	3.50	2975.	3.73	3506.	4.34
1200	16630	2806.	3.05	3088.	3.39	3260.	3.58	3461.	3.79	3694.	4.02	3966.	4.27	4675.	4.81
	15000	2649.	3.11	2926.	3.44	3092.	3.64	3287.	3.85	3512.	4.10	3779.	4.35	4468.	4.95
	12000	2364.	3.31	2628.	3.64	2790.	3.81	2976.	4.00	3194.	4.18	3445.	4.45	4084.	5.21
1400	16630	3157.	3.53	3488.	3.92	3690.	4.14	3926.	4.40	4199.	4.66	4517.	4.96	5349.	5.60
	15000	2977.	3.60	3301.	3.99	3497.	4.22	3724.	4.47	3988.	4.76	4302.	5.06	5108.	5.77
	12000	2648.	3.84	2957.	4.22	3147.	4.43	3366.	4.64	3621.	4.85	3915.	5.18	4662.	6.07
1600	16630	3507.	4.01	3887.	4.46	4120.	4.71	4391.	5.00	4704.	5.31	5069.	5.65	6023.	6.39
	15000	3304.	4.09	3677.	4.54	3902.	4.80	4162.	5.09	4465.	5.42	4824.	5.77	5749.	6.58
	12000	2931.	4.37	3287.	4.81	3505.	5.04	3756.	5.29	4049.	5.52	4385.	5.90	5240.	6.93
1800	16630	3858.	4.48	4287.	4.99	4550.	5.28	4855.	5.61	5208.	5.95	5621.	6.34		
	15000	3632.	4.58	4052.	5.08	4306.	5.38	4600.	5.70	4942.	6.08	5347.	6.47		
	12000	3215.	4.90	3616.	5.40	3863.	5.66	4146.	5.93	4476.	6.20	4855.	6.62		
2000	16630	4209.	4.95	4687.	5.52	4980.	5.84	5320.	6.21	5713.	6.60				
	15000	3959.	5.07	4428.	5.63	4711.	5.96	5038.	6.32	5418.	6.74				
	12000	3499.	5.43	3946.	5.98	4221.	6.27	4536.	6.58	4903.	6.87				
2200	16630	4560.	5.43	5087.	6.06	5410.	6.41	5785.	6.82						
	15000	4286.	5.55	4804.	6.17	5115.	6.54	5476.	6.94						
	12000	3782.	5.96	4275.	6.57	4578.	6.89	4926.	7.22						
2400	16630	4910.	5.91	5487.	6.59	5840.	6.98								
	15000	4614.	6.04	5179.	6.72	5520.	7.12								
	12000	4066.	6.49	4605.	7.15	4936.	7.50								
2600	16630	5261.	6.38	5887.	7.13										
	15000	4941.	6.53	5555.	7.26										
	12000	4350.	7.02	4935.	7.74										
2800	16630	5612.	6.86	6287.	7.66										
	15000	5268.	7.02	5930.	7.81										
	12000	4633.	7.55	5264.	8.33										

Figure 7-12 Long Range Cruise (Sheet 12)

FLIGHT PLANNING
LONG RANGE CRUISE

STANDARD DAY **CRUISE ALTITUDE 39000 FEET**

FAN SETTING FOR LONG RANGE CRUISE

	TAILWIND			ZERO	HEADWIND		
CRUISE	100 KT.	50 KT.	25 KT.	WIND	25 KT.	50 KT.	100 KT.
WEIGHT LBS.	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT
16000	80.9	81.4	81.7	82.0	82.6	83.1	84.5
14000	78.0	78.3	78.6	79.0	79.3	79.7	81.3
12000	74.7	75.1	75.5	75.8	76.2	76.8	78.2
10000	71.1	71.8	72.3	72.5	73.2	74.4	75.3

		TAILWIND						ZERO		HEADWIND					
STAGE	T.O.	100 KT.		50 KT.		25 KT.		WIND		25 KT.		50 KT.		100 KT.	
LENGTH NM.	WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1065.	.68	1098.	.71	1118.	.73	1143.	.76	1173.	.78	1207.	.80	1297.	.84
	15000	1021.	.67	1055.	.71	1076.	.73	1101.	.76	1130.	.78	1165.	.81	1256.	.85
	12000	952.	.66	984.	.70	1004.	.72	1028.	.75	1057.	.78	1091.	.82	1183.	.87
400	16630	1405.	1.15	1486.	1.24	1535.	1.29	1592.	1.35	1660.	1.41	1738.	1.47	1942.	1.60
	15000	1339.	1.15	1417.	1.25	1465.	1.30	1521.	1.36	1587.	1.43	1665.	1.50	1867.	1.64
	12000	1226.	1.17	1300.	1.27	1345.	1.33	1400.	1.40	1463.	1.47	1538.	1.54	1734.	1.71
600	16630	1745.	1.62	1873.	1.76	1951.	1.85	2042.	1.94	2147.	2.04	2270.	2.15	2588.	2.36
	15000	1656.	1.63	1779.	1.78	1854.	1.87	1942.	1.97	2044.	2.08	2165.	2.19	2477.	2.44
	12000	1500.	1.68	1617.	1.84	1687.	1.94	1771.	2.05	1869.	2.15	1985.	2.26	2284.	2.55
800	16630	2085.	2.08	2261.	2.29	2367.	2.41	2491.	2.53	2634.	2.67	2802.	2.82	3233.	3.12
	15000	1973.	2.10	2141.	2.32	2243.	2.44	2362.	2.58	2501.	2.72	2664.	2.88	3088.	3.23
	12000	1774.	2.19	1933.	2.41	2029.	2.55	2143.	2.70	2275.	2.83	2431.	2.98	2834.	3.39
1000	16630	2426.	2.55	2649.	2.81	2783.	2.96	2940.	3.12	3121.	3.30	3333.	3.49	3878.	3.88
	15000	2290.	2.58	2503.	2.85	2632.	3.01	2783.	3.18	2958.	3.37	3164.	3.57	3698.	4.03
	12000	2047.	2.70	2249.	2.97	2371.	3.16	2515.	3.34	2681.	3.51	2878.	3.69	3385.	4.23
1200	16630	2766.	3.02	3036.	3.34	3200.	3.52	3389.	3.71	3608.	3.93	3865.	4.16	4524.	4.64
	15000	2607.	3.06	2865.	3.39	3021.	3.58	3203.	3.79	3415.	4.02	3664.	4.26	4309.	4.82
	12000	2321.	3.21	2565.	3.54	2712.	3.77	2887.	3.99	3087.	4.19	3325.	4.41	3935.	5.07
1400	16630	3106.	3.49	3424.	3.86	3616.	4.08	3838.	4.30	4095.	4.56	4397.	4.84	5169.	5.39
	15000	2924.	3.54	3227.	3.92	3410.	4.15	3624.	4.39	3872.	4.67	4164.	4.96	4919.	5.62
	12000	2595.	3.72	2882.	4.11	3054.	4.38	3259.	4.64	3493.	4.87	3772.	5.13	4485.	5.92
1600	16630	3446.	3.96	3812.	4.38	4032.	4.64	4287.	4.89	4582.	5.20	4928.	5.51	5815.	6.15
	15000	3242.	4.01	3589.	4.46	3799.	4.72	4045.	5.00	4330.	5.32	4664.	5.65	5530.	6.41
	12000	2869.	4.23	3198.	4.68	3396.	4.99	3630.	5.29	3899.	5.55	4218.	5.85	5036.	6.76
1800	16630	3787.	4.43	4199.	4.91	4448.	5.20	4737.	5.49	5069.	5.83	5460.	6.18	6460.	6.91
	15000	3559.	4.49	3951.	4.99	4188.	5.29	4465.	5.61	4787.	5.97	5163.	6.34	6140.	7.20
	12000	3143.	4.74	3514.	5.25	3738.	5.59	4002.	5.94	4304.	6.23	4665.	6.57	5586.	7.60
2000	16630	4127.	4.90	4587.	5.43	4865.	5.75	5186.	6.08	5556.	6.46	5991.	6.85		
	15000	3876.	4.97	4313.	5.52	4577.	5.86	4886.	6.21	5244.	6.61	5663.	7.03		
	12000	3416.	5.25	3831.	5.82	4079.	6.20	4374.	6.58	4710.	6.92	5112.	7.29		
2200	16630	4467.	5.37	4975.	5.96	5281.	6.31	5635.	6.67						
	15000	4193.	5.44	4675.	6.06	4966.	6.43	5306.	6.82						
	12000	3690.	5.76	4147.	6.38	4421.	6.81	4746.	7.23						
2400	16630	4807.	5.84	5362.	6.48	5697.	6.87								
	15000	4510.	5.92	5037.	6.59	5355.	7.00								
	12000	3964.	6.27	4463.	6.95	4763.	7.42								
2600	16630	5148.	6.31	5750.	7.01										
	15000	4827.	6.40	5399.	7.13										
	12000	4238.	6.78	4780.	7.52										
2800	16630	5488.	6.78	6138.	7.53										
	15000	5144.	6.87	5761.	7.66										
	12000	4511.	7.29	5096.	8.09										

Figure 7-12 Long Range Cruise (Sheet 13)

FLIGHT PLANNING
LONG RANGE CRUISE

STANDARD DAY **CRUISE ALTITUDE 41000 FEET**

FAN SETTING FOR LONG RANGE CRUISE

	TAILWIND			ZERO	HEADWIND		
CRUISE	100 KT.	50 KT.	25 KT.	WIND	25 KT.	50 KT.	100 KT.
WEIGHT LBS.	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT
16000	83.5	83.9	84.2	84.6	85.2	85.8	86.9
14000	80.1	80.5	80.7	81.0	81.5	82.0	83.4
12000	76.6	77.0	77.3	77.6	78.1	78.5	80.0
10000	73.0	73.5	73.8	74.5	74.7	75.3	76.7

		TAILWIND						ZERO		HEADWIND					
STAGE	T.O.	100 KT.		50 KT.		25 KT.		WIND		25 KT.		50 KT.		100 KT.	
LENGTH NM.	WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1080.	.67	1110.	.71	1128.	.73	1151.	.75	1178.	.77	1209.	.79	1291.	.83
	15000	1035.	.67	1066.	.71	1085.	.72	1108.	.75	1135.	.77	1167.	.79	1250.	.83
	12000	960.	.66	989.	.70	1008.	.72	1031.	.75	1058.	.77	1090.	.80	1175.	.85
400	16630	1413.	1.14	1488.	1.22	1534.	1.27	1588.	1.32	1651.	1.38	1724.	1.44	1912.	1.56
	15000	1342.	1.14	1415.	1.23	1460.	1.28	1513.	1.34	1575.	1.40	1647.	1.47	1834.	1.60
	12000	1224.	1.15	1293.	1.25	1335.	1.31	1386.	1.38	1445.	1.44	1515.	1.51	1698.	1.68
600	16630	1745.	1.60	1866.	1.74	1940.	1.81	2025.	1.90	2124.	1.99	2239.	2.09	2533.	2.29
	15000	1648.	1.61	1765.	1.76	1836.	1.84	1918.	1.94	2014.	2.04	2126.	2.15	2418.	2.37
	12000	1488.	1.65	1596.	1.81	1663.	1.91	1741.	2.00	1832.	2.11	1940.	2.23	2220.	2.50
800	16630	2078.	2.06	2245.	2.25	2345.	2.36	2462.	2.47	2597.	2.60	2754.	2.74	3154.	3.01
	15000	1955.	2.08	2114.	2.29	2211.	2.40	2323.	2.53	2453.	2.67	2606.	2.82	3001.	3.13
	12000	1751.	2.15	1900.	2.37	1990.	2.50	2096.	2.63	2219.	2.78	2365.	2.94	2743.	3.33
1000	16630	2411.	2.52	2623.	2.76	2751.	2.90	2899.	3.05	3070.	3.21	3269.	3.39	3775.	3.74
	15000	2261.	2.56	2464.	2.81	2587.	2.96	2729.	3.13	2893.	3.31	3086.	3.50	3585.	3.90
	12000	2015.	2.65	2203.	2.92	2317.	3.09	2451.	3.26	2606.	3.46	2790.	3.65	3266.	4.15
1200	16630	2744.	2.98	3001.	3.28	3156.	3.45	3336.	3.62	3543.	3.82	3784.	4.03	4395.	4.46
	15000	2568.	3.03	2813.	3.34	2962.	3.52	3134.	3.72	3332.	3.94	3565.	4.18	4168.	4.67
	12000	2279.	3.14	2507.	3.48	2645.	3.68	2806.	3.89	2993.	4.13	3215.	4.37	3789.	4.98
1400	16630	3076.	3.45	3380.	3.79	3562.	3.99	3773.	4.20	4016.	4.43	4300.	4.68	5016.	5.19
	15000	2874.	3.50	3162.	3.87	3338.	4.08	3539.	4.32	3772.	4.57	4045.	4.86	4752.	5.43
	12000	2543.	3.64	2810.	4.03	2972.	4.27	3161.	4.52	3380.	4.80	3640.	5.08	4311.	5.80
1600	16630	3409.	3.91	3758.	4.30	3967.	4.53	4211.	4.77	4490.	5.04	4815.	5.33	5637.	5.91
	15000	3181.	3.97	3512.	4.39	3713.	4.64	3944.	4.91	4211.	5.21	4525.	5.54	5336.	6.20
	12000	2806.	4.14	3114.	4.59	3299.	4.87	3516.	5.15	3768.	5.47	4065.	5.79	4834.	6.63
1800	16630	3742.	4.37	4136.	4.82	4373.	5.08	4648.	5.35	4963.	5.65	5330.	5.98	6258.	6.64
	15000	3487.	4.44	3861.	4.92	4089.	5.20	4350.	5.50	4651.	5.84	5004.	6.21	5919.	6.97
	12000	3070.	4.64	3417.	5.15	3627.	5.46	3872.	5.78	4155.	6.14	4490.	6.50	5357.	7.45
2000	16630	4074.	4.83	4515.	5.33	4779.	5.62	5085.	5.92	5436.	6.27	5845.	6.63		
	15000	3794.	4.91	4210.	5.45	4464.	5.76	4755.	6.10	5090.	6.48	5484.	6.89		
	12000	3334.	5.14	3720.	5.70	3954.	6.05	4227.	6.40	4542.	6.81	4915.	7.22		
2200	16630	4407.	5.30	4893.	5.85	5184.	6.16	5522.	6.50	5909.	6.88				
	15000	4100.	5.38	4560.	5.97	4840.	6.32	5160.	6.69	5530.	7.11				
	12000	3598.	5.63	4024.	6.26	4281.	6.64	4582.	7.03	4929.	7.48				
2400	16630	4740.	5.76	5271.	6.36	5590.	6.71	5959.	7.08						
	15000	4407.	5.86	4909.	6.50	5216.	6.88	5565.	7.29						
	12000	3861.	6.13	4327.	6.81	4609.	7.23	4937.	7.66						
2600	16630	5073.	6.22	5649.	6.87	5995.	7.25								
	15000	4713.	6.33	5258.	7.03	5591.	7.44								
	12000	4125.	6.63	4631.	7.37	4936.	7.83								
2800	16630	5405.	6.68	6028.	7.39										
	15000	5020.	6.80	5608.	7.55										
	12000	4389.	7.13	4934.	7.92										
3000	16630	5738.	7.14												
	15000	5326.	7.27												
	12000	4652.	7.62												

Figure 7-12 Long Range Cruise (Sheet 14)

FLIGHT PLANNING
LONG RANGE CRUISE

STANDARD DAY | **CRUISE ALTITUDE 43000 FEET**

FAN SETTING FOR LONG RANGE CRUISE

CRUISE WEIGHT LBS.	TAILWIND 100 KT. N1 PCT	TAILWIND 50 KT. N1 PCT	TAILWIND 25 KT. N1 PCT	ZERO WIND N1 PCT	HEADWIND 25 KT. N1 PCT	HEADWIND 50 KT. N1 PCT	HEADWIND 100 KT. N1 PCT
16000	86.2	86.8	87.1	87.8	88.0	88.2	89.5
14000	82.4	82.9	83.1	83.5	84.0	84.4	85.8
12000	78.6	79.1	79.3	79.6	80.2	80.7	82.1
10000	74.9	75.4	75.7	75.9	76.4	76.9	78.4

STAGE LENGTH NM.	T.O. WEIGHT LBS.	TAILWIND 100 KT. FUEL LBS.	TAILWIND 100 KT. TIME HRS.	TAILWIND 50 KT. FUEL LBS.	TAILWIND 50 KT. TIME HRS.	TAILWIND 25 KT. FUEL LBS.	TAILWIND 25 KT. TIME HRS.	ZERO WIND FUEL LBS.	ZERO WIND TIME HRS.	HEADWIND 25 KT. FUEL LBS.	HEADWIND 25 KT. TIME HRS.	HEADWIND 50 KT. FUEL LBS.	HEADWIND 50 KT. TIME HRS.	HEADWIND 100 KT. FUEL LBS.	HEADWIND 100 KT. TIME HRS.
200	16630	1098.	.68	1125.	.71	1141.	.73	1162.	.76	1186.	.78	1215.	.80	1292.	.84
	15000	1051.	.67	1079.	.70	1096.	.72	1117.	.74	1141.	.75	1170.	.78	1247.	.82
	12000	970.	.66	998.	.70	1015.	.72	1037.	.74	1062.	.76	1092.	.79	1171.	.83
400	16630	1425.	1.13	1496.	1.21	1539.	1.26	1589.	1.31	1648.	1.36	1716.	1.42	1891.	1.53
	15000	1350.	1.13	1419.	1.22	1461.	1.27	1510.	1.32	1568.	1.37	1635.	1.43	1808.	1.55
	12000	1224.	1.14	1289.	1.24	1329.	1.30	1376.	1.36	1431.	1.42	1497.	1.49	1667.	1.64
600	16630	1753.	1.58	1868.	1.71	1937.	1.79	2017.	1.87	2109.	1.95	2217.	2.04	2489.	2.23
	15000	1649.	1.60	1759.	1.73	1826.	1.82	1904.	1.90	1994.	1.99	2099.	2.09	2369.	2.28
	12000	1478.	1.63	1581.	1.78	1643.	1.87	1715.	1.97	1801.	2.08	1901.	2.19	2163.	2.45
800	16630	2081.	2.03	2240.	2.21	2335.	2.31	2445.	2.42	2571.	2.53	2718.	2.66	3088.	2.92
	15000	1948.	2.06	2099.	2.25	2191.	2.36	2297.	2.48	2420.	2.61	2564.	2.74	2931.	3.01
	12000	1733.	2.12	1872.	2.33	1956.	2.45	2055.	2.59	2170.	2.74	2306.	2.89	2659.	3.25
1000	16630	2409.	2.48	2612.	2.71	2733.	2.84	2873.	2.97	3033.	3.12	3219.	3.27	3686.	3.61
	15000	2247.	2.52	2439.	2.77	2555.	2.91	2691.	3.06	2847.	3.22	3028.	3.40	3492.	3.74
	12000	1987.	2.60	2163.	2.87	2270.	3.03	2394.	3.20	2540.	3.39	2711.	3.59	3155.	4.06
1200	16630	2736.	2.93	2984.	3.21	3131.	3.36	3301.	3.53	3495.	3.70	3720.	3.89	4284.	4.30
	15000	2546.	2.99	2780.	3.29	2920.	3.46	3084.	3.64	3273.	3.84	3492.	4.05	4054.	4.47
	12000	2241.	3.09	2454.	3.42	2584.	3.61	2733.	3.82	2909.	4.05	3115.	4.30	3651.	4.87
1400	16630	3064.	3.38	3355.	3.71	3529.	3.89	3728.	4.08	3957.	4.29	4221.	4.51	4883.	4.99
	15000	2845.	3.45	3120.	3.80	3285.	4.01	3477.	4.22	3699.	4.46	3957.	4.71	4615.	5.20
	12000	2495.	3.58	2746.	3.96	2898.	4.18	3073.	4.43	3278.	4.71	3520.	5.00	4147.	5.68
1600	16630	3392.	3.83	3727.	4.21	3927.	4.41	4156.	4.64	4418.	4.87	4722.	5.13	5481.	5.68
	15000	3144.	3.91	3460.	4.32	3650.	4.56	3871.	4.80	4126.	5.08	4421.	5.36	5176.	5.93
	12000	2749.	4.06	3037.	4.51	3211.	4.76	3412.	5.05	3648.	5.37	3925.	5.70	4643.	6.49
1800	16630	3720.	4.29	4099.	4.71	4325.	4.94	4584.	5.19	4880.	5.46	5223.	5.75	6079.	6.37
	15000	3443.	4.38	3800.	4.84	4015.	5.11	4264.	5.38	4552.	5.70	4886.	6.01	5738.	6.66
	12000	3004.	4.55	3328.	5.05	3525.	5.34	3751.	5.67	4017.	6.03	4330.	6.40	5139.	7.30
2000	16630	4048.	4.74	4471.	5.21	4723.	5.47	5012.	5.74	5342.	6.04	5724.	6.37		
	15000	3742.	4.84	4140.	5.36	4380.	5.66	4658.	5.96	4978.	6.31	5350.	6.67		
	12000	3258.	5.04	3620.	5.60	3839.	5.92	4091.	6.28	4386.	6.68	4734.	7.10		
2200	16630	4375.	5.19	4843.	5.71	5122.	5.99	5439.	6.30	5804.	6.63				
	15000	4042.	5.31	4480.	5.87	4745.	6.21	5051.	6.54	5405.	6.93				
	12000	3512.	5.52	3911.	6.14	4152.	6.49	4430.	6.90	4756.	7.34				
2400	16630	4703.	5.64	5215.	6.21	5520.	6.52	5867.	6.85						
	15000	4341.	5.77	4820.	6.39	5109.	6.75	5445.	7.12						
	12000	3766.	6.01	4202.	6.68	4466.	7.07	4769.	7.51						
2600	16630	5031.	6.09	5586.	6.71	5918.	7.04								
	15000	4640.	6.23	5161.	6.91	5474.	7.30								
	12000	4021.	6.49	4494.	7.23	4780.	7.65								
2800	16630	5359.	6.54	5958.	7.20										
	15000	4939.	6.70	5501.	7.43										
	12000	4275.	6.98	4785.	7.77										
3000	16630	5686.	6.99	6330.	7.70										
	15000	5238.	7.16	5841.	7.94										
	12000	4529.	7.47	5076.	8.32										

Figure 7-12 Long Range Cruise (Sheet 15)

FLIGHT PLANNING
LONG RANGE CRUISE

STANDARD DAY **CRUISE ALTITUDE 45000 FEET**

FAN SETTING FOR LONG RANGE CRUISE

	TAILWIND			ZERO	HEADWIND		
CRUISE	100 KT.	50 KT.	25 KT.	WIND	25 KT.	50 KT.	100 KT.
WEIGHT LBS.	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT	N1 PCT
16000	89.5	90.2	90.6	90.9	91.0	91.0	91.0
14000	85.2	85.5	85.8	86.2	86.5	86.9	88.0
12000	80.9	81.2	81.4	81.8	82.2	82.9	84.9
10000	76.8	77.1	77.4	77.7	78.1	78.8	80.4

		TAILWIND						ZERO		HEADWIND					
STAGE	T.O.	100 KT.		50 KT.		25 KT.		WIND		25 KT.		50 KT.		100 KT.	
LENGTH NM.	WEIGHT LBS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.	FUEL LBS.	TIME HRS.
200	16630	1284.	.66	1301.	.67	1309.	.70	1320.	.75	1335.	.79	1342.	.85	1394.	.94
	15000	1254.	.54	1263.	.56	1272.	.57	1281.	.59	1292.	.62	1306.	.64	1354.	.74
	12000	1179.	.55	1196.	.57	1204.	.57	1216.	.59	1230.	.59	1248.	.61	1294.	.57
400	16630	1594.	1.10	1651.	1.16	1684.	1.21	1723.	1.28	1769.	1.35	1813.	1.44	1954.	1.61
	15000	1533.	1.00	1581.	1.08	1613.	1.12	1649.	1.16	1690.	1.22	1739.	1.28	1874.	1.44
	12000	1412.	1.03	1462.	1.11	1491.	1.15	1526.	1.20	1568.	1.25	1618.	1.31	1747.	1.37
600	16630	1904.	1.54	2002.	1.65	2059.	1.72	2125.	1.81	2202.	1.91	2285.	2.03	2513.	2.28
	15000	1813.	1.46	1899.	1.59	1953.	1.66	2016.	1.73	2088.	1.82	2172.	1.91	2395.	2.14
	12000	1645.	1.51	1728.	1.65	1778.	1.72	1837.	1.81	1906.	1.90	1988.	2.01	2201.	2.18
800	16630	2214.	1.98	2352.	2.14	2434.	2.24	2528.	2.35	2636.	2.47	2756.	2.62	3073.	2.95
	15000	2092.	1.93	2217.	2.10	2294.	2.20	2383.	2.30	2486.	2.43	2605.	2.55	2915.	2.85
	12000	1878.	1.99	1995.	2.19	2064.	2.30	2147.	2.42	2243.	2.56	2358.	2.71	2655.	2.99
1000	16630	2524.	2.42	2703.	2.63	2809.	2.75	2931.	2.88	3070.	3.03	3228.	3.20	3633.	3.62
	15000	2371.	2.39	2535.	2.62	2635.	2.74	2751.	2.87	2884.	3.03	3039.	3.19	3436.	3.55
	12000	2111.	2.47	2261.	2.73	2351.	2.87	2457.	3.04	2581.	3.21	2727.	3.41	3109.	3.80
1200	16630	2834.	2.86	3053.	3.11	3184.	3.26	3334.	3.41	3504.	3.59	3699.	3.79	4193.	4.29
	15000	2650.	2.85	2853.	3.13	2976.	3.29	3118.	3.45	3281.	3.63	3472.	3.82	3957.	4.26
	12000	2344.	2.95	2527.	3.27	2638.	3.45	2767.	3.65	2919.	3.87	3097.	4.11	3563.	4.61
1400	16630	3144.	3.30	3403.	3.60	3559.	3.77	3736.	3.95	3938.	4.15	4171.	4.38	4753.	4.96
	15000	2929.	3.31	3171.	3.64	3317.	3.83	3485.	4.02	3679.	4.24	3905.	4.46	4477.	4.96
	12000	2577.	3.44	2793.	3.81	2924.	4.03	3078.	4.26	3257.	4.52	3467.	4.81	4016.	5.42
1600	16630	3454.	3.74	3754.	4.09	3934.	4.28	4139.	4.48	4372.	4.71	4642.	4.97	5313.	5.63
	15000	3209.	3.77	3489.	4.15	3657.	4.37	3853.	4.59	4077.	4.84	4338.	5.09	4998.	5.66
	12000	2810.	3.92	3059.	4.35	3211.	4.60	3388.	4.87	3594.	5.18	3837.	5.51	4470.	6.23
1800	16630	3764.	4.18	4104.	4.58	4309.	4.80	4542.	5.02	4806.	5.27	5113.	5.56	5873.	6.30
	15000	3488.	4.23	3807.	4.67	3998.	4.91	4220.	5.16	4475.	5.44	4771.	5.73	5519.	6.37
	12000	3043.	4.40	3326.	4.89	3498.	5.18	3698.	5.49	3932.	5.83	4207.	6.21	4924.	7.04
2000	16630	4074.	4.62	4455.	5.07	4684.	5.31	4945.	5.55	5239.	5.83	5585.	6.15		
	15000	3767.	4.70	4125.	5.18	4339.	5.46	4588.	5.73	4873.	6.04	5204.	6.37		
	12000	3276.	4.88	3592.	5.43	3784.	5.75	4008.	6.10	4270.	6.49	4576.	6.91		
2200	16630	4384.	5.06	4805.	5.56	5059.	5.82	5347.	6.08	5673.	6.39				
	15000	4046.	5.16	4443.	5.69	4680.	6.00	4955.	6.31	5270.	6.65				
	12000	3509.	5.36	3858.	5.97	4071.	6.33	4319.	6.71	4608.	7.14				
2400	16630	4694.	5.50	5155.	6.04	5434.	6.33	5750.	6.62						
	15000	4326.	5.62	4761.	6.20	5021.	6.54	5322.	6.88						
	12000	3742.	5.84	4124.	6.51	4357.	6.90	4629.	7.32						
2600	16630	5004.	5.94	5506.	6.53	5809.	6.85								
	15000	4605.	6.08	5078.	6.72	5361.	7.08								
	12000	3975.	6.32	4391.	7.05	4644.	7.48								
2800	16630	5314.	6.38	5856.	7.02										
	15000	4884.	6.54	5396.	7.23										
	12000	4208.	6.80	4657.	7.59										
3000	16630	5624.	6.82	6207.	7.51										
	15000	5163.	7.00	5714.	7.74										
	12000	4441.	7.28	4923.	8.13										

Figure 7-12 Long Range Cruise (Sheet 16)

CLIMB

Multiengine climb performance is presented in tabulated form on the following pages. The climb presented is based on 247 KIAS/0.62 INDICATED MACH.

This performance is based on maximum continuous thrust setting on both engines (refer to the Multiengine Normal Climb thrust setting chart, Figure 7-6), gear and flaps up, speedbrakes retracted and anti-ice systems OFF. The performance is also presented for anti-ice systems ON.

The time, distance, fuel and rate-of-climb used to any given altitude is based on the climb starting at sea level. If the climb is initiated at some other altitude, it is necessary to go into the data twice, once at the initial altitude and once at the final altitude. The difference in time, distance and fuel between these two altitudes provides the proper values for the climb. The data allows for fuel burnoff in the climb; therefore, the weight presented is at the start of the climb.

The climb data for the conditions requiring a step climb are based on climbing direct to the highest obtainable altitude as shown in the step climb weight table, cruising at the altitude until the desired weight is achieved, and then climbing to the desired altitude or the next step altitude per the step climb weight table.

CRUISE CLIMB

247 KIAS/0.62 INDICATED MACH

TIME, DISTANCE, FUEL, AND RATE OF CLIMB — **ANTI-ICE SYSTEMS OFF**

T.O. WEIGHT	16630	16000	15000	14000	12000	16630	16000	15000	14000	12000	16630	16000	15000	14000	12000	16630	16000	15000	14000	12000
PRESSURE ALTITUDE	5000 FEET ISA = 5°C = 41°F					10000 FEET ISA = - 5°C = 23°F					15000 FEET ISA = -15°C = 6°F					17000 FEET ISA = -19°C = - 2°F				
MIN	2	2	2	2	2	4	4	4	4	3	7	6	6	5	5	8	7	7	6	5
ISA NM	7	7	6	6	5	17	16	15	14	11	29	28	25	23	19	35	33	30	28	23
+20°C LB	79	75	70	64	54	160	152	141	129	108	246	234	215	197	164	282	267	246	226	188
R/C	2652	2787	3020	3284	3932	2428	2555	2776	3025	3636	1970	2081	2273	2489	3017	1809	1914	2096	2300	2797
MIN	2	2	2	2	1	3	3	3	3	2	5	5	5	4	4	6	6	5	5	4
ISA NM	5	5	5	4	4	12	12	11	10	8	21	20	18	17	14	25	24	22	20	17
+10°C LB	67	64	59	55	46	134	128	119	109	92	203	194	179	165	138	231	220	203	187	157
R/C	3495	3663	3956	4287	5104	3274	3436	3716	4034	4815	2794	2938	3189	3471	4165	2609	2747	2986	3255	3915
MIN	2	2	1	1	1	3	3	3	2	2	4	4	4	3	3	5	4	4	4	3
ISA NM	4	4	4	3	3	10	9	8	8	6	16	15	14	13	11	19	18	17	15	13
LB	60	57	53	49	42	118	113	105	97	82	177	169	157	145	122	200	191	177	164	138
R/C	4475	4682	5044	5455	6469	4184	4382	4727	5118	6082	3699	3879	4194	4550	5427	3487	3660	3962	4302	5140
MIN	1	1	1	1	1	2	2	2	2	2	4	3	3	3	3	4	4	4	3	3
ISA NM	4	3	3	3	2	8	8	7	6	5	13	12	11	11	9	15	15	14	12	10
-10°C LB	53	50	47	43	37	106	102	95	88	74	158	151	140	130	110	179	171	159	147	124
R/C	5175	5411	5823	6290	7445	5234	5474	5893	6368	7544	4445	4656	5024	5441	6470	4103	4301	4647	5038	6001
PRESSURE ALTITUDE	19000 FEET ISA = -23°C = - 9°F					21000 FEET ISA = -27°C = -16°F					23000 FEET ISA = -31°C = -23°F					25000 FEET ISA = -35°C = -30°F				
MIN	9	8	8	7	6	10	10	9	8	7	12	11	10	9	8	13	13	12	11	9
ISA NM	41	39	36	33	27	49	46	42	39	32	57	54	50	45	37	68	64	58	53	43
+20°C LB	319	303	278	255	212	358	340	312	285	237	401	380	348	318	263	447	423	387	353	291
R/C	1658	1758	1930	2124	2594	1494	1588	1750	1932	2373	1312	1399	1550	1719	2128	1128	1209	1348	1504	1879
MIN	7	6	6	5	5	7	7	7	6	5	8	8	7	7	6	9	9	8	8	6
ISA NM	29	28	26	24	20	34	33	30	27	23	40	38	35	32	26	46	44	40	37	30
+10°C LB	260	247	228	210	176	289	276	254	234	196	320	305	281	258	216	353	336	309	284	237
R/C	2428	2559	2787	3043	3670	2250	2375	2592	2836	3432	2044	2162	2366	2595	3154	1834	1944	2135	2349	2870
MIN	5	5	5	4	4	6	6	5	5	4	7	6	6	5	5	7	7	7	6	5
ISA NM	22	21	19	18	15	26	24	22	21	17	30	28	26	24	20	34	33	30	28	23
LB	224	214	198	183	154	248	237	219	203	170	274	261	242	223	187	301	287	265	244	205
R/C	3274	3439	3727	4053	4852	3004	3160	3431	3737	4486	2685	2830	3080	3362	4053	2392	2526	2758	3018	3655
MIN	5	4	4	4	3	5	5	5	4	4	6	5	5	5	4	6	6	6	5	4
ISA NM	18	17	16	15	12	21	20	19	17	14	24	23	21	20	16	28	27	25	23	19
-10°C LB	201	192	178	165	139	223	213	197	182	154	245	234	217	201	169	269	257	238	220	185
R/C	3805	3993	4319	4689	5597	3528	3705	4014	4364	5221	3245	3412	3703	4032	4838	2924	3080	3351	3656	4403
PRESSURE ALTITUDE	27000 FEET ISA = -38°C = -37°F					29000 FEET ISA = -42°C = -44°F					31000 FEET ISA = -46°C = -52°F					33000 FEET ISA = -50°C = -59°F				
MIN	15	14	13	12	10	17	16	15	13	11	19	18	16	15	12	20	19	17	16	13
ISA NM	80	75	69	62	51	91	86	78	70	57	102	96	86	78	63	113	106	95	86	69
+20°C LB	498	471	429	391	321	543	512	466	423	347	583	549	498	452	369	623	585	530	480	391
R/C	976	1052	1184	1331	1683	1201	1300	1469	1658	2110	1177	1279	1454	1648	2112	1102	1206	1383	1579	2048
MIN	11	10	9	9	7	12	11	10	9	8	13	12	11	10	9	14	13	12	11	9
ISA NM	53	50	46	42	35	60	57	52	47	39	66	63	57	52	43	74	70	63	58	47
+10°C LB	388	368	339	311	259	417	396	364	334	277	445	422	388	355	294	475	450	412	377	311
R/C	1670	1776	1958	2162	2658	2003	2136	2364	2619	3237	1795	1923	2145	2391	2986	1592	1718	1934	2173	2749
MIN	8	8	7	7	6	9	9	8	7	6	10	10	9	8	7	11	10	10	9	7
ISA NM	40	38	35	32	26	45	43	39	36	30	50	48	44	40	33	56	53	48	44	36
LB	329	313	289	267	223	354	337	311	286	239	378	359	331	304	254	403	383	352	323	269
R/C	2164	2290	2510	2756	3354	2482	2634	2899	3195	3914	2275	2424	2682	2970	3666	2024	2169	2418	2695	3364
MIN	7	7	6	6	5	8	7	7	6	5	8	8	7	7	6	9	9	8	8	6
ISA NM	33	31	29	26	22	37	35	32	29	24	41	39	36	33	27	46	43	40	36	30
-10°C LB	294	280	259	239	201	316	301	279	257	215	337	321	297	273	229	359	342	315	290	243
R/C	2672	2819	3076	3365	4070	2984	3158	3459	3798	4622	2698	2866	3156	3480	4267	2380	2540	2817	3126	3872

CRUISE CLIMB

247 KIAS/0.62 INDICATED MACH

TIME, DISTANCE, FUEL, AND RATE OF CLIMB — **ANTI-ICE SYSTEMS OFF**

T.O. WEIGHT	16630	16000	15000	14000	12000	16630	16000	15000	14000	12000	16630	16000	15000	14000	12000	16630	16000	15000	14000	12000
PRESSURE ALTITUDE	35000 FEET ISA = -54°C = -66°F					37000 FEET ISA = -57°C = -70°F					39000 FEET ISA = -57°C = -70°F					41000 FEET ISA = -57°C = -70°F				
ISA +20°C MIN	22	21	19	17	14	25	23	21	19	15	28	26	23	21	16	37	32	27	24	18
NM	125	117	105	94	75	139	130	116	103	82	162	149	131	116	91	215	187	157	135	103
LB	664	622	562	508	412	709	663	597	538	434	773	718	641	573	459	907	815	707	623	490
R/C	1019	1124	1304	1503	1976	774	874	1044	1231	1674	437	528	683	852	1249	130	216	361	519	884
ISA +10°C MIN	15	14	13	12	10	17	16	15	13	11	19	18	16	15	12	23	21	19	17	13
NM	82	77	70	64	52	92	86	78	70	57	105	98	88	79	63	126	116	102	90	71
LB	506	478	437	399	329	540	509	464	422	347	582	547	496	449	367	641	597	535	482	389
R/C	1417	1541	1753	1989	2552	1130	1247	1448	1669	2194	783	891	1076	1278	1756	479	583	759	951	1400
ISA MIN	12	11	10	10	8	13	13	12	11	9	15	14	13	12	10	17	16	14	13	11
NM	62	59	54	49	40	70	66	60	54	44	79	75	67	61	49	93	86	77	69	55
LB	429	407	374	342	284	457	433	397	363	300	491	464	423	386	318	533	501	454	412	337
R/C	1783	1924	2165	2434	3078	1448	1580	1806	2057	2654	1081	1204	1413	1644	2190	769	887	1088	1308	1825
ISA -10°C MIN	10	10	9	8	7	11	11	10	9	8	13	12	11	10	8	15	14	13	11	9
NM	51	48	44	40	33	58	55	50	45	37	66	62	56	51	42	77	72	65	58	47
LB	383	364	335	308	257	409	388	356	327	271	439	415	380	347	287	476	448	408	371	305
R/C	1985	2136	2395	2683	3376	1588	1728	1968	2234	2868	1228	1359	1582	1829	2414	935	1063	1280	1518	2078

PRESSURE ALTITUDE	43000 FEET ISA = -57°C = -70°F					45000 FEET ISA = -57°C = -70°F				
ISA +20°C MIN	*171	*129	* 63	31	22	*315	*273	*207	*137	28
NM	1052	797	381	177	122	1966	1710	1295	855	163
LB	2848	2219	1217	716	533	4756	4126	3126	2123	613
R/C	100	100	100	187	523	101	101	101	100	195
ISA +10°C MIN	30	26	22	19	15	*112	* 70	30	24	17
NM	168	147	124	107	82	684	424	168	134	96
LB	749	677	591	523	416	1951	1318	694	585	448
R/C	189	289	457	641	1066	100	100	174	351	757
ISA MIN	21	19	17	15	12	28	24	20	17	13
NM	114	104	91	80	63	155	133	111	95	72
LB	591	549	492	442	357	698	625	543	480	381
R/C	473	587	781	993	1487	188	299	488	694	1169
ISA -10°C MIN	17	16	14	13	10	22	19	17	15	12
NM	93	85	75	67	53	117	105	90	78	60
LB	522	487	439	397	323	589	541	479	428	343
R/C	662	787	1000	1232	1775	378	500	708	935	1461

* INDICATES STEP CLIMB REQUIRED
NOTE: STEP CLIMB DATA INCLUDES TIME, DISTANCE AND FUEL USED IN CRUISE PORTION, BASED ON MAXIMUM CRUISE THRUST.

CRUISE CLIMB SPEED - KIAS

PRESSURE ALTITUDE-FEET									
0	5000	10000	15000	20000	25000	30000	35000	40000	45000
247	247	247	247	247	247	231	206	183	163

WIND EFFECT ON CLIMB DISTANCE - NM
(SUBTRACT FOR HEADWIND, ADD FOR TAILWIND)

CLIMB TIME (MIN)	WIND 25KTS	50KTS	100KTS
5	2	4	8
10	4	8	16
15	6	12	25
20	8	16	33
25	10	20	41
30	12	25	50

NOTE: FOR CLIMB CONDITIONS REQUIRING A STEP CLIMB, THE FOLLOWING TABLE GIVES THE WEIGHT AT THE END OF STEP CRUISE AT THE STEP ALTITUDE, REQUIRED TO CONTINUE CLIMB.

STEP CLIMB ALT IN FEET	TEMPERATURE ISA -10°C	ISA + 0°C	ISA +10°C	ISA +20°C
41000	----	----	----	13916
43000	----	----	14826	11995

CRUISE CLIMB

247 KIAS/0.62 INDICATED MACH

TIME,DISTANCE,FUEL, AND RATE OF CLIMB — ANTI-ICE SYSTEMS ON

T.O. WEIGHT	16630	16000	15000	14000	12000	16630	16000	15000	14000	12000	16630	16000	15000	14000	12000	16630	16000	15000	14000	12000
PRESSURE ALTITUDE	5000 FEET ISA = 5°C = 41°F					10000 FEET ISA = - 5°C = 23°F					15000 FEET ISA = -15°C = 6°F					17000 FEET ISA = -19°C = - 2°F				
ISA +10°C MIN	2	2	2	2	2	4	4	4	3	3	6	6	6	5	4	7	7	6	6	5
NM	7	6	6	5	4	15	15	13	12	10	27	25	23	21	18	32	30	28	26	21
LB	78	75	69	64	53	157	150	138	127	106	241	230	212	194	162	277	263	243	223	185
R/C	2829	2971	3218	3497	4183	2666	2803	3042	3311	3972	2067	2183	2383	2608	3158	1846	1953	2139	2347	2855
ISA MIN	2	2	2	2	1	3	3	3	3	2	5	5	4	4	3	5	5	5	5	4
NM	5	5	4	4	3	11	11	10	9	7	19	18	17	15	13	23	22	20	18	15
LB	66	63	58	54	45	131	125	116	107	90	198	189	175	162	136	226	216	199	184	154
R/C	3781	3961	4275	4630	5506	3588	3762	4066	4409	5255	2925	3075	3336	3631	4354	2687	2829	3075	3352	4031
ISA -10°C MIN	2	2	1	1	1	3	3	2	2	2	4	4	3	3	3	4	4	4	4	3
NM	4	4	3	3	2	9	8	8	7	6	15	14	13	12	10	17	16	15	14	12
LB	57	55	51	47	40	114	109	101	94	79	172	164	152	141	119	195	186	173	160	134
R/C	4847	5070	5459	5900	6990	4596	4810	5185	5610	6659	3876	4064	4393	4765	5680	3624	3803	4116	4469	5338
PRESSURE ALTITUDE	19000 FEET ISA = -23°C = - 9°F					21000 FEET ISA = -27°C = -16°F					23000 FEET ISA = -31°C = -23°F					25000 FEET ISA = -35°C = -30°F				
ISA +10°C MIN	8	8	7	7	6	10	9	9	8	7	11	11	10	9	8	13	12	11	10	9
NM	39	37	33	31	25	46	44	40	36	30	55	52	47	43	35	66	62	56	51	42
LB	316	300	275	253	210	357	338	311	284	236	402	381	349	319	264	453	428	391	357	294
R/C	1637	1737	1910	2103	2573	1436	1529	1689	1868	2302	1237	1323	1470	1635	2033	1044	1122	1258	1409	1772
ISA MIN	6	6	6	5	4	7	7	6	6	5	8	8	7	7	6	9	9	8	7	6
NM	27	26	24	22	18	32	30	28	25	21	37	35	32	30	25	43	41	38	35	29
LB	255	243	225	207	173	285	271	251	231	193	316	301	278	255	213	350	333	307	282	235
R/C	2477	2611	2843	3105	3746	2275	2402	2623	2870	3475	2043	2161	2367	2598	3160	1818	1929	2120	2335	2857
ISA -10°C MIN	5	5	4	4	4	6	5	5	5	4	6	6	6	5	4	7	7	6	6	5
NM	20	19	18	16	14	24	23	21	19	16	28	26	24	22	19	32	31	28	26	22
LB	218	209	193	179	150	243	232	215	198	167	269	256	237	219	184	296	282	261	240	202
R/C	3351	3520	3816	4149	4967	3009	3166	3439	3747	4502	2687	2832	3085	3369	4064	2386	2521	2754	3017	3657
PRESSURE ALTITUDE	27000 FEET ISA = -38°C = -37°F					29000 FEET ISA = -42°C = -44°F					31000 FEET ISA = -46°C = -52°F					33000 FEET ISA = -50°C = -59°F				
ISA +10°C MIN	15	14	13	12	10	17	16	15	13	11	19	18	16	15	12	21	20	18	16	13
NM	79	74	67	61	49	91	86	77	70	56	102	96	86	78	62	114	106	95	85	68
LB	509	480	438	398	326	559	526	478	433	354	602	566	513	464	378	645	605	547	494	401
R/C	885	959	1086	1228	1566	1091	1187	1350	1532	1966	1116	1217	1389	1580	2037	1057	1160	1336	1531	1995
ISA MIN	10	10	9	8	7	11	11	10	9	8	12	12	11	10	8	14	13	12	11	9
NM	50	48	44	40	33	57	54	49	45	37	64	60	55	50	41	71	67	61	55	45
LB	385	366	337	309	257	416	395	363	333	276	445	422	387	354	294	475	450	412	376	311
R/C	1643	1749	1931	2136	2631	1958	2090	2317	2571	3184	1802	1932	2156	2406	3007	1593	1720	1938	2181	2762
ISA -10°C MIN	8	8	7	7	6	9	8	8	7	6	10	9	9	8	7	11	10	9	9	7
NM	38	36	33	30	25	43	41	37	34	28	48	45	42	38	31	53	50	46	42	35
LB	325	309	286	263	220	351	334	308	283	237	375	356	328	302	252	400	380	349	321	267
R/C	2146	2273	2493	2740	3340	2437	2589	2852	3147	3862	2310	2462	2725	3018	3728	2048	2195	2448	2730	3410
PRESSURE ALTITUDE	35000 FEET ISA = -54°C = -66°F					37000 FEET ISA = -57°C = -70°F					39000 FEET ISA = -57°C = -70°F					41000 FEET ISA = -57°C = -70°F				
ISA +10°C MIN	23	21	19	17	14	25	24	21	19	15	30	28	24	21	17	----	----	32	26	20
NM	126	117	105	94	75	141	131	116	103	82	171	155	135	118	92	----	----	184	149	108
LB	688	644	580	523	423	740	690	619	555	447	825	760	672	598	476	----	----	799	677	518
R/C	980	1085	1264	1462	1932	672	769	934	1116	1544	281	367	513	672	1044	----	----	108	250	576
ISA MIN	15	14	13	12	10	17	16	14	13	11	19	18	16	14	12	23	21	19	17	13
NM	79	74	67	61	50	89	83	75	68	55	103	96	86	77	62	128	116	102	89	70
LB	507	479	438	399	329	543	512	466	424	348	590	553	501	453	369	663	613	547	490	394
R/C	1407	1532	1747	1985	2552	1068	1184	1383	1602	2122	688	794	975	1173	1639	368	469	640	827	1261
ISA -10°C MIN	12	11	10	9	8	13	12	11	10	9	15	14	13	11	9	17	16	14	13	11
NM	59	56	51	47	38	67	63	57	52	42	77	72	65	59	47	92	85	75	67	54
LB	426	404	371	340	282	456	431	395	361	299	491	464	423	385	317	538	504	456	413	337
R/C	1783	1925	2170	2441	3092	1407	1539	1766	2016	2613	1013	1135	1343	1572	2113	685	802	1001	1218	1727

CRUISE CLIMB SPEED - KIAS

PRESSURE ALTITUDE-FEET									
0	5000	10000	15000	20000	25000	30000	35000	40000	41000
247	247	247	247	247	247	231	206	183	179

WIND EFFECT ON CLIMB DISTANCE - NM
(SUBTRACT FOR HEADWIND, ADD FOR TAILWIND)

CLIMB TIME (MIN)	WIND 25KTS	50KTS	100KTS
5	2	4	8
10	4	8	16
15	6	12	25
20	8	16	33
25	10	20	41
30	12	25	50

CRUISE

Specific performance data are presented on the following pages for various combinations of fan speeds, weights, temperature, altitudes and winds to enable the calculation of the cruise portion of a range profile.

The various fan speeds presented provide the specific ranges between maximum cruise thrust (maximum TAS) and the approximate maximum range thrust. It should be noted that reducing thrust to maintain a constant indicated airspeed as the airplane weight decreases during cruise results in a significant increase in range. The best range, however, results from decreasing thrust to fly a constantly decreasing airspeed as airplane weight decreases per the values shown in the tabulated data.

When the anti-ice systems are ON, increase the fuel flows and decrease the specific ranges that are presented for each altitude by 10 percent. The cruise speeds will remain the same for a given fan RPM (N_1). The maximum allowable fan speeds with anti-ice systems ON are presented on each chart for each altitude. Only fan speeds equal to or lower than these values can be used.

The one engine specific range data is presented for use in the event of an enroute engine failure.

CRUISE
5000 FEET

ANTI-ICE SYSTEMS OFF **TWO ENGINES**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL: 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
16500.	ISA+20°C	35	(1) 69.0	1579	262	.43	289	12.0	15.1	16.7	18.3	19.9	21.5	24.6
	25°C	35	67.8	1520	254	.420	281	11.9	15.2	16.8	18.5	20.1	21.8	25.1
		34	66.9	1471	248	.410	274	11.8	15.2	16.9	18.6	20.3	22.0	25.4
		34	66.0	1424	242	.400	267	11.7	15.3	17.0	18.8	20.5	22.3	25.8
		34	(2) 65.2	1387	237	.39	262	11.7	15.3	17.1	18.9	20.7	22.5	26.1
	ISA+10°C	25	(1) 67.8	1550	262	.43	284	11.9	15.1	16.7	18.3	19.9	21.5	24.8
	15°C	25	66.7	1492	254	.420	276	11.8	15.1	16.8	18.5	20.2	21.9	25.2
		24	65.8	1445	248	.410	269	11.7	15.2	16.9	18.6	20.4	22.1	25.6
		24	64.9	1399	242	.400	263	11.6	15.2	17.0	18.8	20.6	22.4	25.9
		23	(2) 64.4	1372	238	.39	259	11.6	15.2	17.0	18.9	20.7	22.5	26.1
	ISA+ 0°C	15	(1) 66.7	1522	262	.43	279	11.8	15.0	16.7	18.3	20.0	21.6	24.9
	5°C	14	65.6	1465	254	.420	271	11.7	15.1	16.8	18.5	20.2	21.9	25.3
		14	64.7	1419	248	.410	265	11.6	15.1	16.9	18.6	20.4	22.2	25.7
		13	63.8	1376	242	.400	258	11.5	15.1	16.9	18.8	20.6	22.4	26.0
		13	(2) 63.4	1357	239	.40	255	11.4	15.1	17.0	18.8	20.7	22.5	26.2
	ISA-10°C	4	(1) 65.5	1495	262	.43	274	11.6	15.0	16.7	18.3	20.0	21.7	25.0
	-5°C	4	64.4	1441	254	.420	266	11.5	15.0	16.8	18.5	20.2	22.0	25.4
		3	63.6	1396	248	.410	260	11.5	15.0	16.8	18.6	20.4	22.2	25.8
		3	62.7	1354	242	.400	253	11.3	15.0	16.9	18.7	20.6	22.4	26.1
		3	(2) 62.5	1345	240	.40	252	11.3	15.0	16.9	18.7	20.6	22.5	26.2
16000.	ISA+20°C	35	(1) 68.8	1572	262	.43	289	12.0	15.2	16.8	18.4	20.0	21.6	24.7
	25°C	35	67.7	1512	254	.420	281	12.0	15.3	16.9	18.6	20.2	21.9	25.2
		34	66.7	1463	248	.410	274	11.9	15.3	17.0	18.7	20.4	22.1	25.6
		34	65.8	1416	242	.400	267	11.8	15.3	17.1	18.9	20.6	22.4	25.9
		33	(2) 64.8	1367	235	.39	260	11.7	15.4	17.2	19.0	20.9	22.7	26.3
	ISA+10°C	25	(1) 67.7	1543	262	.43	284	11.9	15.2	16.8	18.4	20.0	21.6	24.9
	15°C	25	66.6	1485	254	.420	276	11.9	15.2	16.9	18.6	20.3	22.0	25.3
		24	65.7	1437	248	.410	269	11.8	15.3	17.0	18.7	20.5	22.2	25.7
		24	64.7	1391	242	.400	263	11.7	15.3	17.1	18.9	20.7	22.5	26.1
		23	(2) 63.9	1350	236	.39	257	11.6	15.3	17.1	19.0	20.9	22.7	26.4
	ISA+ 0°C	15	(1) 66.5	1515	262	.43	279	11.8	15.1	16.8	18.4	20.1	21.7	25.0
	5°C	14	65.5	1458	254	.420	271	11.7	15.2	16.9	18.6	20.3	22.0	25.5
		14	64.5	1412	248	.410	265	11.7	15.2	17.0	18.7	20.5	22.3	25.8
		13	63.6	1368	242	.400	258	11.6	15.2	17.0	18.9	20.7	22.5	26.2
		13	(2) 62.9	1336	237	.39	253	11.5	15.2	17.1	19.0	20.8	22.7	26.4
	ISA-10°C	4	(1) 65.4	1488	262	.43	274	11.7	15.0	16.7	18.4	20.1	21.8	25.1
	-5°C	4	64.3	1434	254	.420	266	11.6	15.1	16.8	18.6	20.3	22.1	25.5
		3	63.4	1389	248	.410	260	11.5	15.1	16.9	18.7	20.5	22.3	25.9
		3	62.5	1346	242	.400	253	11.4	15.1	17.0	18.8	20.7	22.5	26.3
		3	(2) 62.1	1326	239	.40	250	11.3	15.1	17.0	18.9	20.8	22.7	26.4
15500.	ISA+20°C	35	(1) 68.7	1565	262	.43	289	12.1	15.3	16.9	18.5	20.1	21.6	24.8
	25°C	35	67.5	1505	254	.420	281	12.0	15.3	17.0	18.7	20.3	22.0	25.3
		34	66.6	1456	248	.410	274	12.0	15.4	17.1	18.8	20.5	22.3	25.7
		34	65.6	1408	242	.400	267	11.9	15.4	17.2	19.0	20.8	22.5	26.1
		33	(2) 64.4	1346	233	.39	258	11.7	15.5	17.3	19.2	21.0	22.9	26.6
	ISA+10°C	25	(1) 67.6	1537	262	.43	284	12.0	15.2	16.8	18.5	20.1	21.7	25.0
	15°C	25	66.4	1478	254	.420	276	11.9	15.3	17.0	18.7	20.4	22.1	25.4
		24	65.5	1430	248	.410	269	11.8	15.3	17.1	18.8	20.6	22.3	25.8
		24	64.6	1383	242	.400	263	11.8	15.4	17.2	19.0	20.8	22.6	26.2
		23	(2) 63.4	1329	234	.39	254	11.6	15.4	17.3	19.1	21.0	22.9	26.7
	ISA+ 0°C	15	(1) 66.4	1509	262	.43	279	11.9	15.2	16.8	18.5	20.1	21.8	25.1
	5°C	14	65.3	1451	254	.420	271	11.8	15.2	17.0	18.7	20.4	22.1	25.6
		14	64.4	1405	248	.410	265	11.7	15.3	17.1	18.8	20.6	22.4	25.9
		13	63.5	1361	242	.400	258	11.6	15.3	17.1	19.0	20.8	22.6	26.3
		13	(2) 62.5	1316	235	.39	251	11.5	15.3	17.2	19.1	21.0	22.9	26.7
	ISA-10°C	4	(1) 65.2	1482	262	.43	274	11.7	15.1	16.8	18.5	20.2	21.9	25.2
	-5°C	4	64.2	1428	254	.420	266	11.7	15.2	16.9	18.7	20.4	22.2	25.7
		3	63.2	1383	248	.410	260	11.6	15.2	17.0	18.8	20.6	22.4	26.0
		3	62.3	1339	242	.400	253	11.5	15.2	17.1	18.9	20.8	22.7	26.4
		3	(2) 61.7	1308	237	.39	249	11.4	15.2	17.1	19.0	20.9	22.8	26.7
15000.	ISA+20°C	35	(1) 68.6	1558	262	.43	289	12.1	15.3	16.9	18.5	20.1	21.7	24.9
	25°C	35	67.4	1498	254	.420	281	12.1	15.4	17.1	18.7	20.4	22.1	25.4
		34	66.4	1449	248	.410	274	12.0	15.5	17.2	18.9	20.6	22.4	25.8
		34	64.5	1354	236	.390	260	11.9	15.5	17.4	19.2	21.1	22.9	26.6
		33	(2) 63.9	1327	232	.38	256	11.8	15.5	17.4	19.3	21.2	23.1	26.8
	ISA+10°C	25	(1) 67.4	1530	262	.43	284	12.0	15.3	16.9	18.6	20.2	21.8	25.1
	15°C	25	66.3	1472	254	.420	276	12.0	15.4	17.1	18.8	20.5	22.2	25.6
		24	65.3	1423	248	.410	269	11.9	15.4	17.2	18.9	20.7	22.4	26.0
		23	63.5	1332	236	.390	256	11.7	15.5	17.3	19.2	21.1	23.0	26.7
		23	(2) 63.0	1311	232	.39	253	11.6	15.5	17.4	19.3	21.2	23.1	26.9
	ISA+ 0°C	15	(1) 66.3	1502	262	.43	279	11.9	15.2	16.9	18.6	20.2	21.9	25.2
	5°C	14	65.2	1445	254	.420	271	11.9	15.3	17.0	18.8	20.5	22.2	25.7
		14	64.2	1399	248	.410	265	11.8	15.3	17.1	18.9	20.7	22.5	26.1
		13	63.3	1354	242	.400	258	11.7	15.4	17.2	19.1	20.9	22.8	26.4
		13	(2) 62.1	1298	234	.39	250	11.5	15.4	17.3	19.2	21.2	23.1	26.9
	ISA-10°C	4	(1) 65.1	1476	262	.43	274	11.8	15.2	16.9	18.6	20.2	21.9	25.3
	-5°C	4	64.0	1421	254	.420	266	11.7	15.2	17.0	18.7	20.5	22.3	25.8
		3	63.1	1376	248	.410	260	11.6	15.3	17.1	18.9	20.7	22.5	26.2
		3	62.2	1332	242	.400	253	11.5	15.3	17.1	19.0	20.9	22.8	26.5
		3	(2) 61.2	1285	235	.39	246	11.4	15.3	17.2	19.2	21.1	23.0	26.9

CRUISE
5000 FEET

ANTI-ICE SYSTEMS OFF **TWO ENGINES**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
14000.	ISA+20°C	35	(1) 68.3	1546	262	.43	289	12.2	15.4	17.1	18.7	20.3	21.9	25.1
	25°C	35	67.1	1485	254	.420	281	12.2	15.5	17.2	18.9	20.6	22.3	25.6
		34	65.2	1386	242	.400	267	12.1	15.7	17.5	19.3	21.1	22.9	26.5
		34	64.2	1339	236	.390	260	12.0	15.7	17.6	19.4	21.3	23.2	26.9
		33	(2) 62.8	1277	226	.38	251	11.8	15.7	17.7	19.6	21.6	23.5	27.5
	ISA+10°C	25	(1) 67.2	1518	262	.43	284	12.1	15.4	17.1	18.7	20.3	22.0	25.3
	15°C	25	66.0	1459	254	.420	276	12.1	15.5	17.2	18.9	20.6	22.4	25.8
		24	64.1	1362	242	.400	263	11.9	15.6	17.5	19.3	21.1	23.0	26.6
		23	63.1	1318	236	.390	256	11.8	15.6	17.5	19.4	21.3	23.2	27.0
		23	(2) 62.0	1267	228	.38	248	11.7	15.6	17.6	19.6	21.5	23.5	27.5
	ISA+ 0°C	15	(1) 66.0	1491	262	.43	279	12.0	15.4	17.0	18.7	20.4	22.1	25.4
	5°C	14	64.9	1433	254	.420	271	12.0	15.4	17.2	18.9	20.7	22.4	25.9
		13	63.0	1340	242	.400	258	11.8	15.5	17.4	19.3	21.1	23.0	26.7
		13	62.0	1297	236	.390	252	11.7	15.5	17.5	19.4	21.3	23.3	27.1
		13	(2) 61.1	1256	229	.38	245	11.6	15.5	17.5	19.5	21.5	23.5	27.5
	ISA-10°C	4	(1) 64.9	1465	262	.43	274	11.9	15.3	17.0	18.7	20.4	22.1	25.5
	-5°C	4	63.8	1409	254	.420	266	11.8	15.3	17.1	18.9	20.7	22.4	26.0
		3	61.9	1319	242	.400	253	11.6	15.4	17.3	19.2	21.1	23.0	26.8
		3	61.0	1277	236	.390	247	11.5	15.4	17.4	19.3	21.3	23.3	27.2
		2	(2) 60.2	1244	230	.38	242	11.4	15.4	17.4	19.4	21.4	23.5	27.5
13000.	ISA+20°C	35	(1) 68.1	1534	262	.43	289	12.3	15.6	17.2	18.8	20.5	22.1	25.3
	25°C	34	65.9	1422	248	.410	274	12.2	15.8	17.5	19.3	21.0	22.8	26.3
		34	64.9	1372	242	.400	267	12.2	15.8	17.7	19.5	21.3	23.1	26.8
		33	62.9	1282	229	.380	254	12.0	15.9	17.8	19.8	21.7	23.7	27.6
		33	(2) 61.5	1231	222	.37	245	11.8	15.9	17.9	19.9	22.0	24.0	28.1
	ISA+10°C	25	(1) 67.0	1507	262	.43	284	12.2	15.5	17.2	18.8	20.5	22.2	25.5
	15°C	24	64.8	1397	248	.410	269	12.1	15.7	17.5	19.3	21.1	22.9	26.4
		24	63.8	1350	242	.400	263	12.1	15.8	17.6	19.5	21.3	23.2	26.9
		23	61.8	1262	229	.380	249	11.8	15.8	17.8	19.8	21.7	23.7	27.7
		22	(2) 60.7	1218	223	.37	242	11.7	15.8	17.8	19.9	21.9	24.0	28.1
	ISA+ 0°C	15	(1) 65.8	1479	262	.43	279	12.1	15.5	17.2	18.9	20.5	22.2	25.6
	5°C	14	63.7	1374	248	.410	265	12.0	15.6	17.4	19.3	21.1	22.9	26.5
		13	62.7	1328	242	.400	258	11.9	15.7	17.6	19.4	21.3	23.2	27.0
		13	60.8	1242	229	.380	245	11.7	15.7	17.7	19.7	21.7	23.7	27.8
		12	(2) 59.7	1203	223	.37	239	11.5	15.7	17.8	19.8	21.9	24.0	28.1
	ISA-10°C	4	(1) 64.7	1454	262	.43	274	12.0	15.4	17.1	18.8	20.6	22.3	25.7
	-5°C	3	62.6	1352	248	.410	260	11.8	15.5	17.4	19.2	21.1	22.9	26.6
		3	61.6	1307	242	.400	253	11.7	15.6	17.5	19.4	21.3	23.2	27.0
		2	59.7	1224	229	.380	241	11.5	15.6	17.6	19.7	21.7	23.7	27.8
		2	(2) 58.7	1187	223	.37	235	11.3	15.5	17.6	19.8	21.9	24.0	28.2
12000.	ISA+20°C	35	(1) 67.8	1524	262	.43	289	12.4	15.7	17.3	19.0	20.6	22.2	25.5
	25°C	34	65.6	1410	248	.410	274	12.3	15.9	17.7	19.4	21.2	23.0	26.5
		34	63.6	1313	236	.390	260	12.2	16.0	17.9	19.8	21.7	23.6	27.4
		33	61.4	1227	223	.370	247	12.0	16.0	18.1	20.1	22.2	24.2	28.3
		32	(2) 60.1	1181	216	.36	239	11.8	16.0	18.1	20.3	22.4	24.5	28.7
	ISA+10°C	25	(1) 66.7	1496	262	.43	284	12.3	15.6	17.3	19.0	20.6	22.3	25.7
	15°C	24	64.6	1385	248	.410	269	12.2	15.8	17.6	19.4	21.3	23.1	26.7
		23	62.5	1293	236	.390	256	12.1	15.9	17.9	19.8	21.7	23.7	27.5
		22	60.4	1208	223	.370	243	11.8	16.0	18.0	20.1	22.2	24.2	28.4
		22	(2) 59.2	1167	217	.36	236	11.6	15.9	18.1	20.2	22.3	24.5	28.8
	ISA+ 0°C	15	(1) 65.6	1469	262	.43	279	12.2	15.6	17.3	19.0	20.7	22.4	25.8
	5°C	14	63.4	1363	248	.410	265	12.1	15.8	17.6	19.4	21.3	23.1	26.8
		13	61.5	1272	236	.390	252	11.9	15.8	17.8	19.8	21.7	23.7	27.6
		12	59.4	1190	223	.370	238	11.6	15.8	17.9	20.0	22.1	24.2	28.4
		12	(2) 58.3	1151	217	.36	232	11.5	15.8	18.0	20.1	22.3	24.5	28.8
	ISA-10°C	4	(1) 64.5	1445	262	.43	274	12.0	15.5	17.2	19.0	20.7	22.4	25.9
	-5°C	3	62.3	1341	248	.410	260	11.9	15.6	17.5	19.4	21.2	23.1	26.8
		3	60.4	1253	236	.390	247	11.7	15.7	17.7	19.7	21.7	23.7	27.7
		2	59.4	1212	229	.380	241	11.6	15.7	17.8	19.8	21.9	24.0	28.1
		2	(2) 57.3	1137	217	.36	228	11.3	15.7	17.9	20.1	22.3	24.5	28.9

(1) MAXIMUM CRUISE THRUST

(2) THRUST FOR MAXIMUM RANGE (APPROXIMATE)

ANTI-ICE SYSTEMS ON		
MAX. FAN %RPM		
15°C	5°C	-5°C
67.7	66.6	65.4
INCREASE FUEL FLOWS AND DECREASE SPECIFIC RANGES BY 10%		

Figure 7-14 Cruise (Sheet 2)

CRUISE
10,000 FEET

ANTI-ICE SYSTEMS OFF **TWO ENGINES**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
								NAUTICAL MILES/100 LBS. FUEL						
16500.	ISA+20°C 15°C	30	(1) 76.6	1768	292	.53	346	13.9	16.8	18.2	19.6	21.0	22.4	25.2
		28	73.8	1582	272	.490	323	14.1	17.2	18.8	20.4	22.0	23.5	26.7
		27	71.5	1441	255	.460	303	14.1	17.5	19.3	21.0	22.7	24.5	27.9
		26	69.8	1354	243	.440	289	14.0	17.7	19.5	21.4	23.2	25.1	28.8
		24	(2) 67.1	1230	225	.41	268	13.7	17.8	19.8	21.8	23.9	25.9	30.0
	ISA+10°C 5°C	20	(1) 75.3	1734	292	.53	340	13.8	16.7	18.2	19.6	21.1	22.5	25.4
		18	72.5	1552	272	.490	317	14.0	17.2	18.8	20.4	22.0	23.6	26.9
		16	70.2	1414	255	.460	297	14.0	17.5	19.3	21.0	22.8	24.6	28.1
		15	68.6	1329	243	.440	284	13.9	17.6	19.5	21.4	23.3	25.2	28.9
		14	(2) 66.0	1210	225	.41	264	13.6	17.7	19.8	21.8	23.9	26.0	30.1
	ISA+ 0°C -5°C	9	(1) 74.0	1700	292	.53	334	13.8	16.7	18.2	19.6	21.1	22.6	25.5
		7	71.3	1522	272	.490	311	13.9	17.2	18.8	20.4	22.1	23.7	27.0
		6	69.8	1431	260	.470	298	13.9	17.4	19.1	20.9	22.6	24.3	27.8
		5	67.4	1304	243	.440	279	13.7	17.6	19.5	21.4	23.3	25.2	29.1
		4	(2) 64.9	1191	226	.41	260	13.4	17.6	19.7	21.8	23.9	26.0	30.2
	ISA-10°C -15°C	-1	(1) 72.7	1667	292	.53	328	13.7	16.7	18.2	19.7	21.2	22.7	25.7
		-3	70.0	1494	272	.490	305	13.7	17.1	18.8	20.4	22.1	23.8	27.1
		-4	68.5	1404	260	.470	293	13.7	17.3	19.1	20.9	22.6	24.4	28.0
		-6	66.2	1280	243	.440	274	13.6	17.5	19.4	21.4	23.3	25.3	29.2
		-7	(2) 63.8	1172	226	.41	256	13.3	17.5	19.7	21.8	23.9	26.1	30.3
16000.	ISA+20°C 15°C	30	(1) 76.5	1762	292	.53	346	14.0	16.8	18.2	19.6	21.1	22.5	25.3
		28	73.7	1576	272	.490	323	14.1	17.3	18.9	20.5	22.1	23.6	26.8
		27	71.3	1434	255	.460	303	14.1	17.6	19.4	21.1	22.9	24.6	28.1
		25	68.7	1305	237	.430	283	14.0	17.8	19.8	21.7	23.6	25.5	29.3
		24	(2) 66.5	1206	223	.40	266	13.7	17.9	20.0	22.0	24.1	26.2	30.3
	ISA+10°C 5°C	20	(1) 75.2	1728	292	.53	340	13.9	16.8	18.2	19.7	21.1	22.6	25.5
		18	72.4	1546	272	.490	317	14.0	17.3	18.9	20.5	22.1	23.7	27.0
		16	70.1	1407	255	.460	297	14.0	17.6	19.4	21.1	22.9	24.7	28.2
		15	67.6	1280	237	.430	278	13.9	17.8	19.7	21.7	23.7	25.6	29.5
		14	(2) 65.4	1184	223	.40	261	13.6	17.8	19.9	22.1	24.2	26.3	30.5
	ISA+ 0°C -5°C	9	(1) 73.9	1694	292	.53	334	13.8	16.8	18.2	19.7	21.2	22.7	25.6
		7	71.2	1516	272	.490	311	13.9	17.2	18.9	20.5	22.2	23.8	27.1
		6	68.9	1381	255	.460	292	13.9	17.5	19.3	21.2	23.0	24.8	28.4
		4	66.4	1257	237	.430	273	13.7	17.7	19.7	21.7	23.7	25.7	29.7
		3	(2) 64.3	1165	223	.41	257	13.5	17.8	19.9	22.1	24.2	26.3	30.6
	ISA-10°C -15°C	-1	(1) 72.6	1661	292	.53	328	13.7	16.7	18.2	19.7	21.2	22.7	25.7
		-3	69.9	1487	272	.490	305	13.8	17.2	18.8	20.5	22.2	23.9	27.3
		-5	67.6	1355	255	.460	287	13.8	17.5	19.3	21.1	23.0	24.8	28.5
		-6	65.2	1234	237	.430	268	13.6	17.6	19.7	21.7	23.7	25.7	29.8
		-7	(2) 63.2	1147	224	.41	253	13.3	17.7	19.8	22.0	24.2	26.4	30.7
15500.	ISA+20°C 15°C	30	(1) 76.4	1756	292	.53	346	14.0	16.9	18.3	19.7	21.1	22.6	25.4
		28	73.6	1569	272	.490	323	14.2	17.4	19.0	20.6	22.2	23.7	26.9
		27	71.2	1427	255	.460	303	14.2	17.7	19.5	21.2	23.0	24.7	28.2
		25	68.5	1296	237	.430	283	14.1	18.0	19.9	21.8	23.7	25.7	29.5
		24	(2) 65.9	1180	220	.40	263	13.8	18.0	20.1	22.3	24.4	26.5	30.7
	ISA+10°C 5°C	20	(1) 75.1	1722	292	.53	340	13.9	16.8	18.3	19.7	21.2	22.7	25.6
		18	72.3	1539	272	.490	317	14.1	17.3	19.0	20.6	22.2	23.8	27.1
		16	70.0	1400	255	.460	297	14.1	17.7	19.5	21.2	23.0	24.8	28.4
		15	67.4	1272	237	.430	278	14.0	17.9	19.9	21.8	23.8	25.8	29.7
		13	(2) 64.9	1162	221	.40	259	13.7	18.0	20.1	22.3	24.4	26.6	30.9
	ISA+ 0°C -5°C	9	(1) 73.8	1689	292	.53	334	13.9	16.8	18.3	19.8	21.3	22.7	25.7
		7	71.0	1510	272	.490	311	14.0	17.3	19.0	20.6	22.3	23.9	27.2
		6	68.7	1374	255	.460	292	14.0	17.6	19.4	21.3	23.1	24.9	28.5
		4	66.2	1249	237	.430	273	13.8	17.8	19.8	21.8	23.8	25.8	29.8
		3	(2) 63.8	1146	222	.40	255	13.5	17.9	20.1	22.3	24.4	26.6	31.0
	ISA-10°C -15°C	-1	(1) 72.5	1656	292	.53	328	13.7	16.8	18.3	19.8	21.3	22.8	25.8
		-3	69.8	1481	272	.490	305	13.9	17.2	18.9	20.6	22.3	24.0	27.4
		-5	67.5	1348	255	.460	287	13.8	17.5	19.4	21.3	23.1	25.0	28.7
		-6	65.0	1226	237	.430	268	13.7	17.8	19.8	21.8	23.9	25.9	30.0
		-7	(2) 62.8	1128	222	.40	251	13.4	17.8	20.0	22.2	24.4	26.7	31.1
15000.	ISA+20°C 15°C	30	(1) 76.3	1750	292	.53	346	14.1	16.9	18.3	19.8	21.2	22.6	25.5
		28	73.4	1563	272	.490	323	14.2	17.4	19.0	20.6	22.2	23.8	27.0
		27	71.1	1419	255	.460	303	14.3	17.8	19.6	21.3	23.1	24.8	28.4
		25	68.4	1289	237	.430	283	14.2	18.1	20.0	21.9	23.9	25.8	29.7
		24	(2) 65.4	1158	218	.40	260	13.8	18.2	20.3	22.5	24.6	26.8	31.1
	ISA+10°C 5°C	20	(1) 75.0	1717	292	.53	340	14.0	16.9	18.4	19.8	21.3	22.7	25.6
		18	72.2	1533	272	.490	317	14.1	17.4	19.0	20.7	22.3	23.9	27.2
		16	69.8	1393	255	.460	297	14.2	17.8	19.6	21.4	23.1	24.9	28.5
		15	67.2	1265	237	.430	278	14.1	18.0	20.0	22.0	23.9	25.9	29.9
		13	(2) 64.3	1139	218	.40	256	13.7	18.1	20.3	22.5	24.7	26.9	31.3
	ISA+ 0°C -5°C	9	(1) 73.7	1683	292	.53	334	13.9	16.9	18.4	19.8	21.3	22.8	25.8
		7	70.9	1504	272	.490	311	14.0	17.4	19.0	20.7	22.4	24.0	27.3
		6	68.6	1367	255	.460	292	14.0	17.7	19.5	21.4	23.2	25.0	28.7
		4	66.0	1241	237	.430	273	13.9	17.9	20.0	22.0	24.0	26.0	30.0
		3	(2) 63.3	1123	219	.40	252	13.6	18.0	20.2	22.5	24.7	26.9	31.4
	ISA-10°C -15°C	-1	(1) 72.4	1651	292	.53	328	13.8	16.8	18.3	19.9	21.4	22.9	25.9
		-3	69.7	1475	272	.490	305	13.9	17.3	19.0	20.7	22.4	24.1	27.5
		-5	67.4	1341	255	.460	287	13.9	17.6	19.5	21.4	23.2	25.1	28.8
		-6	64.8	1219	237	.430	268	13.8	17.9	19.9	22.0	24.0	26.1	30.2
		-7	(2) 62.2	1105	220	.40	248	13.4	17.9	20.2	22.4	24.7	27.0	31.5

Figure 7-14 Cruise (Sheet 3)

CRUISE
10,000 FEET

ANTI-ICE SYSTEMS OFF **TWO ENGINES**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL: 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
14000.	ISA+20°C 15°C	30	(1) 76.1	1740	292	.53	346	14.1	17.0	18.5	19.9	21.3	22.8	25.6
		28	73.2	1551	272	.490	323	14.4	17.6	19.2	20.8	22.4	24.0	27.2
		26	69.9	1360	249	.450	296	14.4	18.1	19.9	21.8	23.6	25.4	29.1
		25	67.1	1232	232	.420	276	14.3	18.4	20.4	22.4	24.4	26.5	30.5
		23	(2) 64.2	1112	214	.39	255	13.9	18.4	20.7	22.9	25.2	27.4	31.9
	ISA+10°C 5°C	20	(1) 74.9	1706	292	.53	340	14.1	17.0	18.5	19.9	21.4	22.9	25.8
		18	72.0	1521	272	.490	317	14.3	17.5	19.2	20.8	22.5	24.1	27.4
		16	69.6	1380	255	.460	297	14.3	17.9	19.7	21.6	23.4	25.2	28.8
		14	65.9	1210	232	.420	271	14.2	18.3	20.4	22.4	24.5	26.6	30.7
		13	(2) 63.2	1096	214	.39	251	13.8	18.4	20.7	22.9	25.2	27.5	32.1
	ISA+ 0°C -5°C	9	(1) 73.5	1673	292	.53	334	14.0	17.0	18.5	20.0	21.5	22.9	25.9
		7	70.7	1492	272	.490	311	14.2	17.5	19.2	20.9	22.5	24.2	27.6
		6	68.4	1354	255	.460	292	14.2	17.9	19.7	21.6	23.4	25.3	29.0
		4	64.8	1188	232	.420	266	14.0	18.2	20.3	22.4	24.5	26.6	30.9
		3	(2) 62.2	1079	215	.39	247	13.7	18.3	20.6	22.9	25.2	27.6	32.2
	ISA-10°C -15°C	-1	(1) 72.2	1641	292	.53	328	13.9	16.9	18.4	20.0	21.5	23.0	26.1
		-3	69.5	1464	272	.490	305	14.0	17.4	19.1	20.9	22.6	24.3	27.7
		-5	67.1	1329	255	.460	287	14.0	17.8	19.7	21.6	23.4	25.3	29.1
		-6	63.6	1166	232	.420	261	13.8	18.1	20.3	22.4	24.6	26.7	31.0
		-7	(2) 61.2	1064	215	.39	243	13.5	18.2	20.5	22.9	25.2	27.6	32.3
13000.	ISA+20°C 15°C	30	(1) 76.0	1730	292	.53	346	14.2	17.1	18.6	20.0	21.5	22.9	25.8
		28	73.0	1540	272	.490	323	14.5	17.7	19.3	20.9	22.6	24.2	27.4
		26	69.6	1347	249	.450	296	14.6	18.3	20.1	22.0	23.8	25.7	29.4
		24	65.8	1177	226	.410	269	14.4	18.6	20.8	22.9	25.0	27.1	31.4
		23	(2) 63.1	1068	209	.38	250	14.0	18.7	21.1	23.4	25.7	28.1	32.8
	ISA+10°C 5°C	20	(1) 74.7	1696	292	.53	340	14.2	17.1	18.6	20.0	21.5	23.0	25.9
		18	71.8	1510	272	.490	317	14.4	17.7	19.3	21.0	22.6	24.3	27.6
		16	68.4	1322	249	.450	291	14.4	18.2	20.1	22.0	23.9	25.8	29.6
		14	64.7	1156	226	.410	265	14.3	18.6	20.7	22.9	25.1	27.2	31.6
		13	(2) 62.1	1051	210	.38	246	13.9	18.6	21.0	23.4	25.8	28.2	32.9
	ISA+ 0°C -5°C	9	(1) 73.4	1664	292	.53	334	14.1	17.1	18.6	20.1	21.6	23.1	26.1
		7	70.5	1482	272	.490	311	14.3	17.6	19.3	21.0	22.7	24.4	27.7
		5	67.2	1298	249	.450	286	14.3	18.2	20.1	22.0	23.9	25.9	29.7
		4	64.4	1174	232	.420	266	14.2	18.4	20.6	22.7	24.8	27.0	31.2
		2	(2) 61.0	1035	210	.38	242	13.7	18.5	21.0	23.4	25.8	28.2	33.0
	ISA-10°C -15°C	-1	(1) 72.1	1631	292	.53	328	14.0	17.0	18.6	20.1	21.6	23.1	26.2
		-3	69.3	1454	272	.490	305	14.1	17.6	19.3	21.0	22.7	24.4	27.9
		-5	66.0	1274	249	.450	280	14.1	18.1	20.0	22.0	24.0	25.9	29.8
		-6	63.3	1152	232	.420	261	14.0	18.3	20.5	22.7	24.8	27.0	31.4
		-8	(2) 60.0	1019	210	.38	238	13.5	18.4	20.9	23.3	25.8	28.2	33.2
12000.	ISA+20°C 15°C	30	(1) 75.8	1721	292	.53	346	14.3	17.2	18.7	20.1	21.6	23.0	25.9
		28	72.0	1479	266	.480	316	14.6	18.0	19.7	21.4	23.1	24.7	28.1
		26	69.3	1335	249	.450	296	14.7	18.4	20.3	22.2	24.0	25.9	29.7
		24	65.4	1163	226	.410	269	14.6	18.9	21.0	23.2	25.3	27.5	31.8
		23	(2) 61.7	1017	203	.37	243	14.1	19.0	21.4	23.9	26.4	28.8	33.7
	ISA+10°C 5°C	20	(1) 74.5	1687	292	.53	340	14.2	17.2	18.7	20.2	21.6	23.1	26.1
		17	70.8	1451	266	.480	310	14.5	17.9	19.7	21.4	23.1	24.8	28.3
		16	68.1	1311	249	.450	291	14.6	18.4	20.3	22.2	24.1	26.0	29.8
		14	64.3	1142	226	.410	265	14.4	18.8	21.0	23.2	25.4	27.6	31.9
		12	(2) 60.7	1001	204	.37	239	13.9	18.9	21.4	23.9	26.4	28.9	33.9
	ISA+ 0°C -5°C	9	(1) 73.2	1655	292	.53	334	14.1	17.2	18.7	20.2	21.7	23.2	26.2
		7	70.4	1472	272	.490	311	14.3	17.7	19.4	21.1	22.8	24.5	27.9
		5	66.9	1286	249	.450	286	14.4	18.3	20.3	22.2	24.1	26.1	30.0
		4	63.2	1121	226	.410	260	14.3	18.7	21.0	23.2	25.4	27.6	32.1
		2	(2) 59.8	990	205	.37	236	13.8	18.8	21.3	23.9	26.4	28.9	34.0
	ISA-10°C -15°C	-1	(1) 71.9	1623	292	.53	328	14.0	17.1	18.6	20.2	21.7	23.3	26.4
		-3	69.1	1444	272	.490	305	14.2	17.7	19.4	21.1	22.9	24.6	28.1
		-5	65.7	1263	249	.450	280	14.3	18.2	20.2	22.2	24.2	26.2	30.1
		-7	62.0	1101	226	.410	255	14.1	18.6	20.9	23.2	25.4	27.7	32.2
		-8	(2) 58.7	974	205	.37	232	13.5	18.7	21.2	23.8	26.4	28.9	34.1

(1) MAXIMUM CRUISE THRUST

(2) THRUST FOR MAXIMUM RANGE (APPROXIMATE)

ANTI-ICE SYSTEMS ON		
MAX. FAN %RPM		
5°C	-5°C	-15°C
75.6	74.3	73.0
INCREASE FUEL FLOWS AND DECREASE SPECIFIC RANGES BY 10%		

Figure 7-14 Cruise (Sheet 4)

CRUISE
15,000 FEET

ANTI-ICE SYSTEMS OFF **TWO ENGINES**

WT. LBS.	TEMP	RAT DEG. C		FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
16500.	ISA+20°C	23	(1)	79.7	1726	292	.58	373	15.8	18.7	20.2	21.6	23.1	24.5	27.4
	5°C	20		76.8	1546	273	.540	349	16.1	19.4	21.0	22.6	24.2	25.8	29.1
		19		74.6	1418	257	.510	330	16.2	19.7	21.5	23.3	25.0	26.8	30.3
		17		72.4	1302	242	.480	310	16.2	20.0	21.9	23.8	25.8	27.7	31.5
		16	(2)	70.0	1184	224	.45	288	15.9	20.1	22.2	24.3	26.5	28.6	32.8
	ISA+10°C	12	(1)	78.3	1690	292	.58	366	15.7	18.7	20.2	21.7	23.1	24.6	27.6
	-5°C	10		75.5	1515	273	.540	343	16.0	19.3	21.0	22.6	24.3	25.9	29.2
		8		73.3	1390	257	.510	324	16.1	19.7	21.5	23.3	25.1	26.9	30.5
		7		71.2	1277	242	.480	305	16.0	20.0	21.9	23.9	25.8	27.8	31.7
		5	(2)	68.8	1164	224	.45	284	15.8	20.1	22.2	24.4	26.5	28.7	32.9
	ISA+ 0°C	1	(1)	76.9	1656	292	.58	359	15.7	18.7	20.2	21.7	23.2	24.7	27.7
	-15°C	-1		74.2	1485	273	.540	337	15.9	19.3	21.0	22.7	24.3	26.0	29.4
		-2		72.0	1363	257	.510	318	16.0	19.6	21.5	23.3	25.2	27.0	30.7
		-4		69.9	1253	242	.480	299	15.9	19.9	21.9	23.9	25.9	27.9	31.9
		-5	(2)	67.6	1143	224	.45	278	15.6	20.0	22.2	24.4	26.5	28.7	33.1
	ISA-10°C	-9	(1)	75.5	1622	292	.58	352	15.6	18.6	20.2	21.7	23.3	24.8	27.9
	-25°C	-11		72.8	1456	273	.540	330	15.8	19.2	21.0	22.7	24.4	26.1	29.5
		-13		70.7	1337	257	.510	312	15.8	19.6	21.4	23.3	25.2	27.1	30.8
		-14		68.6	1229	242	.480	293	15.7	19.8	21.8	23.9	25.9	27.9	32.0
		-15	(2)	66.4	1126	225	.45	274	15.4	19.9	22.1	24.3	26.5	28.8	33.2
16000.	ISA+20°C	23	(1)	79.6	1719	292	.58	373	15.9	18.8	20.2	21.7	23.1	24.6	27.5
	5°C	20		76.7	1539	273	.540	349	16.2	19.4	21.1	22.7	24.3	25.9	29.2
		19		74.5	1411	257	.510	330	16.3	19.8	21.6	23.4	25.2	26.9	30.5
		17		71.5	1258	236	.470	304	16.2	20.2	22.2	24.2	26.2	28.1	32.1
		15	(2)	69.5	1159	221	.44	285	16.0	20.3	22.4	24.6	26.8	28.9	33.2
	ISA+10°C	12	(1)	78.2	1684	292	.58	366	15.8	18.8	20.3	21.7	23.2	24.7	27.7
	-5°C	10		75.4	1509	273	.540	343	16.1	19.4	21.1	22.7	24.4	26.1	29.4
		8		73.2	1383	257	.510	324	16.2	19.8	21.6	23.4	25.2	27.0	30.7
		6		70.3	1233	236	.470	298	16.1	20.1	22.2	24.2	26.2	28.3	32.3
		5	(2)	68.3	1139	222	.44	280	15.8	20.2	22.4	24.6	26.8	29.0	33.4
	ISA+ 0°C	1	(1)	76.8	1650	292	.58	359	15.7	18.7	20.3	21.8	23.3	24.8	27.8
	-15°C	-1		74.0	1479	273	.540	337	16.0	19.4	21.1	22.8	24.5	26.1	29.5
		-2		71.9	1356	257	.510	318	16.1	19.8	21.6	23.4	25.3	27.1	30.8
		-4		69.0	1210	236	.470	293	15.9	20.1	22.1	24.2	26.3	28.3	32.5
		-5	(2)	67.1	1120	222	.44	276	15.7	20.1	22.4	24.6	26.8	29.1	33.5
	ISA-10°C	-9	(1)	75.4	1616	292	.58	352	15.6	18.7	20.2	21.8	23.3	24.9	28.0
	-25°C	-11		72.6	1449	273	.540	330	15.9	19.3	21.0	22.8	24.5	26.2	29.7
		-13		70.5	1330	257	.510	312	15.9	19.7	21.6	23.4	25.3	27.2	31.0
		-14		67.7	1187	236	.470	287	15.8	20.0	22.1	24.2	26.3	28.4	32.6
		-16	(2)	65.9	1102	223	.44	271	15.5	20.0	22.3	24.6	26.8	29.1	33.6
15500.	ISA+20°C	23	(1)	79.5	1713	292	.58	373	15.9	18.9	20.3	21.8	23.2	24.7	27.6
	5°C	20		76.6	1533	273	.540	349	16.3	19.5	21.2	22.8	24.4	26.1	29.3
		18		73.6	1363	252	.500	323	16.4	20.1	21.9	23.7	25.6	27.4	31.1
		17		71.3	1249	236	.470	304	16.3	20.3	22.3	24.3	26.3	28.3	32.3
		15	(2)	68.8	1132	218	.44	282	16.0	20.5	22.7	24.9	27.1	29.3	33.7
	ISA+10°C	12	(1)	78.1	1678	292	.58	366	15.9	18.8	20.3	21.8	23.3	24.8	27.8
	-5°C	10		75.3	1502	273	.540	343	16.2	19.5	21.2	22.8	24.5	26.2	29.5
		8		72.3	1337	252	.500	318	16.3	20.0	21.9	23.8	25.6	27.5	31.2
		6		70.1	1225	236	.470	298	16.2	20.3	22.3	24.4	26.4	28.4	32.5
		5	(2)	67.6	1113	219	.44	277	15.9	20.4	22.6	24.9	27.1	29.4	33.9
	ISA+ 0°C	1	(1)	76.7	1644	292	.58	359	15.8	18.8	20.3	21.9	23.4	24.9	27.9
	-15°C	-1		73.9	1472	273	.540	337	16.1	19.5	21.2	22.9	24.6	26.3	29.7
		-3		71.0	1311	252	.500	312	16.1	20.0	21.9	23.8	25.7	27.6	31.4
		-4		68.8	1202	236	.470	293	16.0	20.2	22.3	24.4	26.4	28.5	32.7
		-6	(2)	66.5	1094	219	.44	272	15.7	20.3	22.6	24.9	27.2	29.4	34.0
	ISA-10°C	-9	(1)	75.3	1610	292	.58	352	15.7	18.8	20.3	21.9	23.4	25.0	28.1
	-25°C	-11		72.5	1443	273	.540	330	15.9	19.4	21.1	22.9	24.6	26.3	29.8
		-13		69.6	1286	252	.500	306	16.0	19.9	21.8	23.8	25.7	27.7	31.5
		-14		67.5	1179	236	.470	287	15.9	20.1	22.2	24.3	26.5	28.6	32.8
		-16	(2)	65.3	1078	220	.44	268	15.6	20.2	22.5	24.8	27.1	29.5	34.1
15000.	ISA+20°C	23	(1)	79.3	1707	292	.58	373	16.0	18.9	20.4	21.8	23.3	24.8	27.7
	5°C	20		76.5	1526	273	.540	349	16.3	19.6	21.3	22.9	24.5	26.2	29.4
		18		73.4	1356	252	.500	323	16.5	20.2	22.0	23.9	25.7	27.5	31.2
		16		70.4	1205	231	.460	297	16.4	20.5	22.6	24.7	26.8	28.8	33.0
		15	(2)	68.0	1104	215	.43	278	16.1	20.6	22.9	25.2	27.4	29.7	34.2
	ISA+10°C	12	(1)	78.0	1672	292	.58	366	15.9	18.9	20.4	21.9	23.4	24.9	27.9
	-5°C	10		75.1	1496	273	.540	343	16.2	19.6	21.3	22.9	24.6	26.3	29.6
		8		72.1	1330	252	.500	318	16.4	20.1	22.0	23.9	25.8	27.6	31.4
		6		69.2	1182	231	.460	292	16.2	20.5	22.6	24.7	26.8	28.9	33.2
		5	(2)	66.9	1087	216	.43	274	16.0	20.6	22.9	25.2	27.5	29.8	34.4
	ISA+ 0°C	1	(1)	76.6	1638	292	.58	359	15.8	18.9	20.4	21.9	23.5	25.0	28.0
	-15°C	-1		73.8	1466	273	.540	337	16.1	19.5	21.3	23.0	24.7	26.4	29.8
		-3		70.8	1304	252	.500	312	16.2	20.1	22.0	23.9	25.8	27.7	31.6
		-4		68.6	1194	236	.470	293	16.1	20.3	22.4	24.5	26.6	28.7	32.9
		-6	(2)	65.8	1069	216	.43	269	15.8	20.5	22.8	25.1	27.5	29.8	34.5
	ISA-10°C	-9	(1)	75.2	1605	292	.58	352	15.7	18.8	20.4	21.9	23.5	25.1	28.2
	-25°C	-11		72.4	1437	273	.540	330	16.0	19.5	21.2	23.0	24.7	26.4	29.9
		-13		69.5	1279	252	.500	306	16.1	20.0	21.9	23.9	25.8	27.8	31.7
		-14		67.3	1172	236	.470	287	16.0	20.2	22.4	24.5	26.6	28.8	33.0
		-16	(2)	64.6	1052	217	.43	264	15.6	20.4	22.7	25.1	27.5	29.9	34.6

Figure 7-14 Cruise (Sheet 5)

CRUISE
15,000 FEET

ANTI-ICE SYSTEMS OFF | **TWO ENGINES**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
14000.	ISA+20°C	23	(1) 79.1	1696	292	.58	373	16.1	19.0	20.5	22.0	23.5	24.9	27.9
	5°C	20	75.5	1469	268	.530	343	16.5	19.9	21.6	23.3	25.0	26.7	30.1
		18	72.3	1302	247	.490	317	16.7	20.5	22.4	24.3	26.3	28.2	32.0
		16	69.3	1154	226	.450	291	16.6	20.9	23.1	25.2	27.4	29.6	33.9
		14	(2) 66.5	1048	209	.42	270	16.2	21.0	23.4	25.7	28.1	30.5	35.3
	ISA+10°C	12	(1) 77.8	1661	292	.58	366	16.0	19.0	20.5	22.0	23.5	25.1	28.1
	-5°C	9	74.1	1440	268	.530	337	16.4	19.9	21.6	23.4	25.1	26.8	30.3
		8	71.8	1316	252	.500	318	16.5	20.3	22.2	24.1	26.0	27.9	31.7
		6	68.8	1167	231	.460	292	16.5	20.7	22.9	25.0	27.2	29.3	33.6
		4	(2) 65.4	1033	210	.42	266	16.1	20.9	23.3	25.7	28.2	30.6	35.4
	ISA+ 0°C	1	(1) 76.4	1627	292	.58	359	15.9	19.0	20.5	22.1	23.6	25.2	28.2
	-15°C	-1	72.8	1412	268	.530	330	16.3	19.9	21.6	23.4	25.2	26.9	30.5
		-3	70.5	1291	252	.500	312	16.4	20.3	22.2	24.1	26.1	28.0	31.9
		-5	67.6	1145	231	.460	287	16.3	20.7	22.9	25.0	27.2	29.4	33.8
		-6	(2) 64.3	1016	210	.42	261	15.9	20.8	23.3	25.7	28.2	30.6	35.6
	ISA-10°C	-9	(1) 75.0	1595	292	.58	352	15.8	19.0	20.5	22.1	23.7	25.2	28.4
	-25°C	-12	71.4	1384	268	.530	324	16.2	19.8	21.6	23.4	25.2	27.0	30.6
		-13	69.2	1266	252	.500	306	16.2	20.2	22.2	24.1	26.1	28.1	32.0
		-15	66.3	1123	231	.460	281	16.1	20.6	22.8	25.0	27.2	29.5	33.9
		-17	(2) 63.1	999	210	.42	256	15.7	20.7	23.2	25.7	28.2	30.7	35.7
13000.	ISA+20°C	23	(1) 79.0	1685	292	.58	373	16.2	19.2	20.6	22.1	23.6	25.1	28.1
	5°C	20	75.2	1458	268	.530	343	16.7	20.1	21.8	23.5	25.2	27.0	30.4
		18	72.1	1289	247	.490	317	16.8	20.7	22.7	24.6	26.5	28.5	32.4
		16	68.8	1138	226	.450	291	16.8	21.2	23.4	25.6	27.8	30.0	34.4
		14	(2) 65.0	997	203	.41	263	16.3	21.3	23.8	26.3	28.9	31.4	36.4
	ISA+10°C	12	(1) 77.6	1651	292	.58	366	16.1	19.2	20.7	22.2	23.7	25.2	28.2
	-5°C	9	73.9	1429	268	.530	337	16.6	20.1	21.8	23.6	25.3	27.1	30.6
		7	70.8	1264	247	.490	311	16.7	20.7	22.6	24.6	26.6	28.6	32.5
		5	67.6	1117	226	.450	286	16.6	21.1	23.3	25.6	27.8	30.1	34.5
		4	(2) 63.9	980	204	.41	258	16.1	21.2	23.8	26.3	28.9	31.4	36.5
	ISA+ 0°C	1	(1) 76.2	1617	292	.58	359	16.0	19.1	20.7	22.2	23.8	25.3	28.4
	-15°C	-1	72.6	1401	268	.530	330	16.4	20.0	21.8	23.6	25.4	27.2	30.7
		-3	69.5	1240	247	.490	305	16.6	20.6	22.6	24.6	26.6	28.7	32.7
		-5	66.4	1096	226	.450	280	16.4	21.0	23.3	25.6	27.9	30.1	34.7
		-7	(2) 62.9	965	204	.41	254	16.0	21.1	23.7	26.3	28.9	31.5	36.7
	ISA-10°C	-9	(1) 74.8	1585	292	.58	352	15.9	19.1	20.7	22.2	23.8	25.4	28.5
	-25°C	-12	71.2	1374	268	.530	324	16.3	19.9	21.8	23.6	25.4	27.2	30.9
		-14	68.2	1216	247	.490	299	16.4	20.5	22.6	24.6	26.7	28.7	32.8
		-15	65.2	1076	226	.450	275	16.3	20.9	23.2	25.5	27.9	30.2	34.8
		-17	(2) 61.7	950	205	.41	250	15.7	21.0	23.6	26.3	28.9	31.5	36.8
12000.	ISA+20°C	23	(1) 78.8	1675	292	.58	373	16.3	19.3	20.8	22.3	23.8	25.2	28.2
	5°C	20	75.0	1447	268	.530	343	16.8	20.2	22.0	23.7	25.4	27.2	30.6
		18	71.8	1277	247	.490	317	17.0	20.9	22.9	24.8	26.8	28.7	32.7
		15	67.5	1088	221	.440	284	16.9	21.5	23.8	26.1	28.4	30.7	35.3
		14	(2) 63.8	957	200	.40	258	16.5	21.7	24.3	26.9	29.6	32.2	37.4
	ISA+10°C	12	(1) 77.4	1641	292	.58	366	16.2	19.3	20.8	22.3	23.8	25.4	28.4
	-5°C	9	73.7	1418	268	.530	337	16.7	20.2	22.0	23.7	25.5	27.3	30.8
		7	70.5	1252	247	.490	311	16.9	20.9	22.9	24.9	26.9	28.9	32.8
		5	66.3	1068	221	.440	279	16.8	21.5	23.8	26.1	28.5	30.8	35.5
		3	(2) 62.8	941	200	.40	254	16.3	21.6	24.3	26.9	29.6	32.2	37.5
	ISA+ 0°C	1	(1) 76.0	1608	292	.58	359	16.1	19.2	20.8	22.3	23.9	25.5	28.6
	-15°C	-1	72.4	1391	268	.530	330	16.6	20.2	22.0	23.8	25.6	27.4	30.9
		-3	69.2	1228	247	.490	305	16.7	20.8	22.8	24.9	26.9	28.9	33.0
		-5	65.1	1049	221	.440	274	16.6	21.4	23.7	26.1	28.5	30.9	35.7
		-7	(2) 61.6	925	200	.40	249	16.1	21.5	24.2	26.9	29.6	32.3	37.7
	ISA-10°C	-9	(1) 74.6	1576	292	.58	352	16.0	19.2	20.8	22.4	23.9	25.5	28.7
	-25°C	-12	71.0	1364	268	.530	324	16.4	20.1	21.9	23.8	25.6	27.4	31.1
		-14	67.9	1205	247	.490	299	16.6	20.7	22.8	24.9	26.9	29.0	33.1
		-16	63.9	1029	221	.440	269	16.4	21.2	23.7	26.1	28.5	31.0	35.8
		-17	(2) 60.5	910	200	.40	244	15.9	21.3	24.1	26.8	29.6	32.3	37.8

(1) MAXIMUM CRUISE THRUST

(2) THRUST FOR MAXIMUM RANGE (APPROXIMATE)

ANTI-ICE SYSTEMS ON		
MAX. FAN %RPM		
-5°C	-15°C	-25°C
78.6	77.2	75.8
INCREASE FUEL FLOWS AND DECREASE SPECIFIC RANGES BY 10%		

Figure 7-14 Cruise (Sheet 6)

CRUISE
17,000 FEET

ANTI-ICE SYSTEMS OFF **TWO ENGINES**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
16500.	ISA+20°C	20	(1) 81.4	1731	292	.60	384	16.4	19.3	20.8	22.2	23.7	25.1	28.0
	1°C	17	78.0	1525	273	.560	360	17.0	20.3	22.0	23.6	25.2	26.9	30.2
		16	75.9	1402	257	.530	340	17.1	20.7	22.5	24.3	26.1	27.8	31.4
		14	73.0	1256	237	.490	315	17.1	21.1	23.1	25.1	27.0	29.0	33.0
		12	(2) 71.1	1168	223	.46	297	16.9	21.2	23.3	25.4	27.6	29.7	34.0
	ISA+10°C	9	(1) 80.0	1694	292	.60	377	16.4	19.3	20.8	22.3	23.7	25.2	28.2
	-9°C	7	76.7	1493	273	.560	353	16.9	20.3	22.0	23.6	25.3	27.0	30.3
		5	74.5	1374	257	.530	334	17.0	20.7	22.5	24.3	26.1	28.0	31.6
		3	71.7	1232	237	.490	309	17.0	21.0	23.1	25.1	27.1	29.1	33.2
		2	(2) 69.9	1148	224	.46	292	16.7	21.1	23.3	25.5	27.6	29.8	34.2
	ISA+ 0°C	-2	(1) 78.5	1659	292	.60	370	16.3	19.3	20.8	22.3	23.8	25.3	28.3
	-19°C	-4	75.3	1463	273	.560	346	16.8	20.3	22.0	23.7	25.4	27.1	30.5
		-5	73.2	1347	257	.530	328	16.9	20.6	22.5	24.3	26.2	28.1	31.8
		-7	71.1	1241	242	.500	309	16.9	20.9	22.9	24.9	26.9	29.0	33.0
		-8	(2) 68.7	1128	224	.46	287	16.6	21.0	23.2	25.4	27.7	29.9	34.3
	ISA-10°C	-12	(1) 77.0	1624	292	.60	363	16.2	19.3	20.8	22.3	23.9	25.4	28.5
	-29°C	-14	73.8	1434	273	.560	339	16.7	20.2	21.9	23.7	25.4	27.2	30.6
		-16	71.8	1320	257	.530	321	16.8	20.5	22.4	24.3	26.2	28.1	31.9
		-17	69.7	1217	242	.500	303	16.7	20.8	22.9	24.9	27.0	29.0	33.1
		-19	(2) 67.5	1110	225	.47	282	16.4	20.9	23.2	25.4	27.7	29.9	34.4
16000.	ISA+20°C	20	(1) 81.2	1723	292	.60	384	16.5	19.4	20.9	22.3	23.8	25.2	28.1
	1°C	17	77.9	1518	273	.560	360	17.1	20.4	22.1	23.7	25.3	27.0	30.3
		15	75.0	1356	252	.520	334	17.3	20.9	22.8	24.6	26.5	28.3	32.0
		14	72.8	1248	237	.490	315	17.2	21.2	23.2	25.2	27.2	29.2	33.2
		12	(2) 70.4	1138	220	.46	293	16.9	21.3	23.5	25.7	27.9	30.1	34.5
	ISA+10°C	9	(1) 79.8	1687	292	.60	377	16.4	19.4	20.9	22.4	23.8	25.3	28.3
	-9°C	7	76.5	1487	273	.560	353	17.0	20.4	22.1	23.7	25.4	27.1	30.5
		5	74.4	1367	257	.530	334	17.1	20.8	22.6	24.5	26.3	28.1	31.8
		3	71.5	1223	237	.490	309	17.1	21.2	23.2	25.3	27.3	29.3	33.4
		2	(2) 69.3	1119	221	.46	288	16.8	21.3	23.5	25.7	28.0	30.2	34.7
	ISA+ 0°C	-2	(1) 78.4	1652	292	.60	370	16.4	19.4	20.9	22.4	23.9	25.4	28.5
	-19°C	-4	75.1	1457	273	.560	346	16.9	20.3	22.1	23.8	25.5	27.2	30.6
		-5	73.0	1340	257	.530	328	17.0	20.7	22.6	24.5	26.3	28.2	31.9
		-7	70.2	1200	237	.490	303	16.9	21.1	23.2	25.3	27.3	29.4	33.6
		-9	(2) 68.1	1102	221	.46	283	16.6	21.2	23.4	25.7	28.0	30.3	34.8
	ISA-10°C	-12	(1) 76.9	1618	292	.60	363	16.2	19.3	20.9	22.4	24.0	25.5	28.6
	-29°C	-14	73.7	1427	273	.560	339	16.8	20.3	22.0	23.8	25.5	27.3	30.8
		-16	71.6	1313	257	.530	321	16.9	20.7	22.6	24.5	26.4	28.3	32.1
		-18	68.9	1176	237	.490	297	16.7	21.0	23.1	25.2	27.4	29.5	33.7
		-19	(2) 66.8	1083	222	.46	278	16.5	21.1	23.4	25.7	28.0	30.3	34.9
15500.	ISA+20°C	20	(1) 81.1	1716	292	.60	384	16.6	19.5	20.9	22.4	23.9	25.3	28.2
	1°C	17	77.8	1511	273	.560	360	17.2	20.5	22.2	23.8	25.5	27.1	30.4
		15	74.8	1348	252	.520	334	17.4	21.1	22.9	24.8	26.6	28.5	32.2
		13	71.9	1205	232	.480	308	17.3	21.4	23.5	25.6	27.6	29.7	33.9
		12	(2) 69.8	1111	217	.45	289	17.0	21.5	23.8	26.0	28.3	30.5	35.0
	ISA+10°C	9	(1) 79.7	1681	292	.60	377	16.5	19.5	21.0	22.5	23.9	25.4	28.4
	-9°C	7	76.4	1480	273	.560	353	17.1	20.5	22.2	23.9	25.5	27.2	30.6
		5	73.5	1322	252	.520	328	17.2	21.0	22.9	24.8	26.7	28.6	32.4
		3	71.3	1215	237	.490	309	17.2	21.3	23.4	25.4	27.5	29.5	33.7
		1	(2) 68.7	1094	218	.45	285	16.9	21.4	23.7	26.0	28.3	30.6	35.2
	ISA+ 0°C	-2	(1) 78.3	1645	292	.60	370	16.4	19.5	21.0	22.5	24.0	25.5	28.6
	-19°C	-4	75.0	1450	273	.560	346	17.0	20.4	22.2	23.9	25.6	27.3	30.8
		-6	72.2	1296	252	.520	322	17.1	21.0	22.9	24.8	26.8	28.7	32.5
		-7	70.0	1192	237	.490	303	17.0	21.2	23.3	25.4	27.5	29.6	33.8
		-9	(2) 67.4	1075	218	.45	280	16.7	21.4	23.7	26.0	28.3	30.7	35.3
	ISA-10°C	-12	(1) 76.8	1611	292	.60	363	16.3	19.4	21.0	22.5	24.1	25.6	28.7
	-29°C	-14	73.6	1421	273	.560	339	16.8	20.4	22.1	23.9	25.6	27.4	30.9
		-16	70.8	1270	252	.520	315	16.9	20.9	22.8	24.8	26.8	28.8	32.7
		-18	68.7	1169	237	.490	297	16.9	21.1	23.3	25.4	27.6	29.7	34.0
		-19	(2) 66.2	1058	219	.45	275	16.5	21.2	23.6	26.0	28.3	30.7	35.4
15000.	ISA+20°C	20	(1) 81.0	1710	292	.60	384	16.6	19.6	21.0	22.5	23.9	25.4	28.3
	1°C	17	77.6	1504	273	.560	360	17.3	20.6	22.2	23.9	25.6	27.2	30.6
		15	74.7	1341	252	.520	334	17.5	21.2	23.0	24.9	26.8	28.6	32.4
		13	71.7	1197	232	.480	308	17.4	21.6	23.7	25.8	27.8	29.9	34.1
		11	(2) 69.2	1085	214	.44	285	17.1	21.7	24.0	26.3	28.6	30.9	35.5
	ISA+10°C	9	(1) 79.6	1674	292	.60	377	16.6	19.6	21.0	22.5	24.0	25.5	28.5
	-9°C	7	76.3	1474	273	.560	353	17.2	20.6	22.3	24.0	25.7	27.3	30.7
		5	73.3	1314	252	.520	328	17.3	21.1	23.0	24.9	26.8	28.7	32.6
		3	70.4	1174	232	.480	303	17.3	21.5	23.6	25.8	27.9	30.0	34.3
		1	(2) 68.0	1066	215	.45	281	16.9	21.6	24.0	26.3	28.7	31.0	35.7
	ISA+ 0°C	-2	(1) 78.1	1639	292	.60	370	16.5	19.5	21.1	22.6	24.1	25.6	28.7
	-19°C	-4	74.9	1444	273	.560	346	17.1	20.5	22.3	24.0	25.7	27.4	30.9
		-6	72.0	1289	252	.520	322	17.2	21.1	23.0	25.0	26.9	28.8	32.7
		-8	69.1	1151	232	.480	297	17.1	21.4	23.6	25.8	28.0	30.1	34.5
		-9	(2) 66.8	1049	215	.45	276	16.8	21.5	23.9	26.3	28.7	31.1	35.8
	ISA-10°C	-12	(1) 76.7	1605	292	.60	363	16.4	19.5	21.0	22.6	24.2	25.7	28.8
	-29°C	-14	73.5	1415	273	.560	339	16.9	20.5	22.2	24.0	25.8	27.5	31.1
		-16	70.6	1264	252	.520	315	17.0	21.0	23.0	24.9	26.9	28.9	32.9
		-18	67.8	1129	232	.480	291	16.9	21.3	23.5	25.8	28.0	30.2	34.6
		-20	(2) 65.6	1033	216	.45	271	16.6	21.4	23.8	26.3	28.7	31.1	35.9

Figure 7-14 Cruise (Sheet 7)

CRUISE
17,000 FEET

ANTI-ICE SYSTEMS OFF **TWO ENGINES**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
								NAUTICAL MILES/100 LBS. FUEL						
14000.	ISA+20°C	20	(1) 80.8	1697	292	.60	384	16.8	19.7	21.2	22.7	24.1	25.6	28.6
	1°C	17	76.6	1449	268	.550	353	17.5	20.9	22.7	24.4	26.1	27.8	31.3
		15	73.6	1289	247	.510	328	17.7	21.5	23.5	25.4	27.4	29.3	33.2
		13	70.6	1147	227	.470	302	17.6	21.9	24.1	26.3	28.5	30.7	35.0
		11	(2) 67.7	1032	209	.43	278	17.2	22.1	24.5	26.9	29.4	31.8	36.6
	ISA+10°C	9	(1) 79.4	1661	292	.60	377	16.7	19.7	21.2	22.7	24.2	25.7	28.7
	-9°C	6	75.3	1420	268	.550	347	17.4	20.9	22.7	24.4	26.2	27.9	31.5
		4	72.3	1264	247	.510	322	17.5	21.5	23.5	25.4	27.4	29.4	33.4
		2	69.3	1125	227	.470	296	17.4	21.9	24.1	26.3	28.5	30.8	35.2
		1	(2) 66.6	1015	209	.43	273	17.1	22.0	24.5	26.9	29.4	31.9	36.8
	ISA+ 0°C	-2	(1) 77.9	1627	292	.60	370	16.6	19.7	21.2	22.8	24.3	25.8	28.9
	-19°C	-4	73.9	1391	268	.550	340	17.3	20.9	22.6	24.4	26.2	28.0	31.6
		-6	71.0	1239	247	.510	315	17.4	21.4	23.4	25.5	27.5	29.5	33.5
		-8	68.0	1104	227	.470	291	17.3	21.8	24.1	26.3	28.6	30.8	35.4
		-10	(2) 65.5	999	210	.44	269	16.9	21.9	24.4	26.9	29.4	31.9	36.9
	ISA-10°C	-12	(1) 76.4	1593	292	.60	363	16.5	19.6	21.2	22.8	24.3	25.9	29.0
	-29°C	-14	73.2	1404	273	.560	339	17.1	20.6	22.4	24.2	26.0	27.7	31.3
		-17	69.6	1215	247	.510	309	17.2	21.3	23.4	25.4	27.5	29.6	33.7
		-19	66.7	1083	227	.470	285	17.1	21.7	24.0	26.3	28.6	30.9	35.5
		-20	(2) 64.3	984	210	.44	264	16.7	21.8	24.3	26.9	29.4	31.9	37.0
13000.	ISA+20°C	20	(1) 80.5	1685	292	.60	384	16.9	19.9	21.3	22.8	24.3	25.8	28.8
	1°C	17	76.4	1437	268	.550	353	17.6	21.1	22.8	24.6	26.3	28.1	31.5
		15	73.3	1276	247	.510	328	17.8	21.8	23.7	25.7	27.6	29.6	33.5
		12	69.4	1099	222	.460	295	17.8	22.3	24.6	26.9	29.2	31.4	36.0
		10	(2) 66.2	980	203	.42	270	17.4	22.5	25.0	27.6	30.1	32.7	37.8
	ISA+10°C	9	(1) 79.1	1650	292	.60	377	16.8	19.8	21.4	22.9	24.4	25.9	28.9
	-9°C	6	75.0	1408	268	.550	347	17.5	21.1	22.8	24.6	26.4	28.2	31.7
		4	72.0	1251	247	.510	322	17.7	21.7	23.7	25.7	27.7	29.7	33.7
		2	68.2	1078	222	.460	290	17.6	22.3	24.6	26.9	29.2	31.5	36.2
		0	(2) 65.1	965	203	.42	266	17.2	22.4	25.0	27.6	30.2	32.8	37.9
	ISA+ 0°C	-2	(1) 77.7	1615	292	.60	370	16.7	19.8	21.4	22.9	24.5	26.0	29.1
	-19°C	-4	73.7	1380	268	.550	340	17.4	21.0	22.8	24.6	26.5	28.3	31.9
		-6	70.7	1226	247	.510	315	17.6	21.6	23.7	25.7	27.8	29.8	33.9
		-9	66.9	1058	222	.460	284	17.4	22.2	24.5	26.9	29.3	31.6	36.3
		-10	(2) 64.0	951	204	.42	262	17.0	22.3	24.9	27.5	30.2	32.8	38.1
	ISA-10°C	-12	(1) 76.2	1582	292	.60	363	16.6	19.8	21.4	22.9	24.5	26.1	29.3
	-29°C	-15	72.3	1353	268	.550	333	17.3	20.9	22.8	24.6	26.5	28.3	32.0
		-17	69.3	1203	247	.510	309	17.4	21.5	23.6	25.7	27.8	29.9	34.0
		-19	66.4	1069	227	.470	285	17.3	22.0	24.3	26.7	29.0	31.3	36.0
		-20	(2) 62.8	934	204	.42	257	16.8	22.1	24.8	27.5	30.2	32.8	38.2
12000.	ISA+20°C	20	(1) 80.3	1673	292	.60	384	17.0	20.0	21.5	23.0	24.5	26.0	28.9
	1°C	17	76.1	1426	268	.550	353	17.8	21.3	23.0	24.8	26.5	28.3	31.8
		14	72.2	1225	242	.500	321	18.0	22.1	24.2	26.2	28.2	30.3	34.4
		12	68.2	1050	217	.450	289	18.0	22.7	25.1	27.5	29.9	32.3	37.0
		10	(2) 64.6	930	197	.41	263	17.5	22.9	25.6	28.3	31.0	33.6	39.0
	ISA+10°C	9	(1) 78.9	1639	292	.60	377	16.9	20.0	21.5	23.0	24.5	26.1	29.1
	-9°C	6	74.8	1398	268	.550	347	17.7	21.2	23.0	24.8	26.6	28.4	32.0
		4	70.9	1202	242	.500	315	17.9	22.1	24.2	26.2	28.3	30.4	34.6
		1	66.9	1031	217	.450	284	17.8	22.7	25.1	27.5	29.9	32.4	37.2
		0	(2) 63.5	915	197	.41	258	17.3	22.8	25.5	28.3	31.0	33.7	39.2
	ISA+ 0°C	-2	(1) 77.5	1605	292	.60	370	16.8	19.9	21.5	23.1	24.6	26.2	29.3
	-19°C	-4	73.4	1370	268	.550	340	17.5	21.2	23.0	24.8	26.7	28.5	32.1
		-7	69.6	1179	242	.500	309	17.8	22.0	24.1	26.2	28.4	30.5	34.7
		-9	66.6	1043	222	.460	284	17.7	22.5	24.9	27.3	29.6	32.0	36.8
		-11	(2) 62.5	901	198	.41	254	17.1	22.7	25.4	28.2	31.0	33.8	39.3
	ISA-10°C	-12	(1) 76.0	1572	292	.60	363	16.7	19.9	21.5	23.1	24.7	26.3	29.4
	-29°C	-15	72.1	1343	268	.550	333	17.4	21.1	23.0	24.8	26.7	28.6	32.3
		-17	68.3	1156	242	.500	303	17.6	21.9	24.1	26.2	28.4	30.5	34.9
		-19	65.3	1024	222	.460	279	17.5	22.3	24.8	27.2	29.7	32.1	37.0
		-21	(2) 61.3	887	198	.41	250	16.9	22.5	25.3	28.1	31.0	33.8	39.4

(1) MAXIMUM CRUISE THRUST

(2) THRUST FOR MAXIMUM RANGE (APPROXIMATE)

ANTI-ICE SYSTEMS ON		
MAX. FAN %RPM		
-9°C	-19°C	-29°C
80.2	78.7	77.3
INCREASE FUEL FLOWS AND DECREASE SPECIFIC RANGES BY 10%		

Figure 7-14 Cruise (Sheet 8)

CRUISE
19,000 FEET

ANTI-ICE SYSTEMS OFF **TWO ENGINES**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL: 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
16500.	ISA+20°C	17	(1) 83.1	1732	291	.62	395	17.0	19.9	21.3	22.8	24.2	25.7	28.6
	-3°C	14	79.4	1509	272	.580	370	17.9	21.2	22.8	24.5	26.2	27.8	31.1
		13	77.1	1382	257	.550	351	18.1	21.8	23.6	25.4	27.2	29.0	32.6
		10	74.3	1243	237	.510	325	18.1	22.2	24.2	26.2	28.2	30.2	34.2
		9	(2) 72.4	1156	224	.48	307	17.9	22.3	24.4	26.6	28.7	30.9	35.2
	ISA+10°C	6	(1) 81.8	1710	292	.62	389	16.9	19.8	21.3	22.7	24.2	25.7	28.6
	-13°C	4	78.0	1478	272	.580	363	17.8	21.2	22.9	24.6	26.2	27.9	31.3
		2	75.7	1354	257	.550	344	18.0	21.7	23.6	25.4	27.3	29.1	32.8
		0	73.7	1250	242	.520	325	18.0	22.0	24.0	26.0	28.0	30.0	34.0
		-1	(2) 71.2	1138	225	.48	303	17.8	22.2	24.4	26.6	28.8	31.0	35.4
	ISA+ 0°C	-5	(1) 80.3	1673	292	.62	381	16.8	19.8	21.3	22.8	24.3	25.8	28.8
	-23°C	-7	76.6	1447	272	.580	356	17.7	21.1	22.9	24.6	26.3	28.0	31.5
		-9	74.3	1327	257	.550	337	17.9	21.7	23.6	25.4	27.3	29.2	33.0
		-10	72.3	1225	242	.520	319	17.9	22.0	24.0	26.0	28.1	30.1	34.2
		-12	(2) 70.0	1118	225	.48	297	17.6	22.1	24.3	26.6	28.8	31.1	35.5
	ISA-10°C	-15	(1) 78.8	1636	292	.62	374	16.7	19.8	21.3	22.8	24.4	25.9	28.9
	-33°C	-18	75.1	1418	272	.580	349	17.5	21.1	22.8	24.6	26.4	28.1	31.6
		-19	72.9	1300	257	.550	331	17.7	21.6	23.5	25.4	27.4	29.3	33.1
		-21	70.9	1201	242	.520	313	17.7	21.9	23.9	26.0	28.1	30.2	34.4
		-22	(2) 68.6	1097	225	.48	291	17.4	22.0	24.3	26.6	28.8	31.1	35.7
16000.	ISA+20°C	17	(1) 83.0	1730	292	.62	395	17.1	20.0	21.4	22.8	24.3	25.7	28.6
	-3°C	14	79.2	1502	272	.580	370	18.0	21.3	23.0	24.6	26.3	28.0	31.3
		12	76.2	1338	252	.540	344	18.3	22.0	23.9	25.7	27.6	29.5	33.2
		10	74.1	1234	237	.510	325	18.3	22.3	24.3	26.4	28.4	30.4	34.5
		9	(2) 71.7	1125	220	.47	303	18.0	22.5	24.7	26.9	29.1	31.3	35.8
	ISA+10°C	6	(1) 81.7	1703	292	.62	389	17.0	19.9	21.4	22.8	24.3	25.8	28.7
	-13°C	4	77.8	1471	272	.580	363	17.9	21.3	23.0	24.7	26.4	28.1	31.5
		2	75.6	1347	257	.550	344	18.1	21.8	23.7	25.6	27.4	29.3	33.0
		0	72.8	1209	237	.510	319	18.1	22.3	24.3	26.4	28.5	30.5	34.7
		-2	(2) 70.5	1109	221	.48	298	17.9	22.4	24.6	26.9	29.1	31.4	35.9
	ISA+ 0°C	-5	(1) 80.2	1666	292	.62	381	16.9	19.9	21.4	22.9	24.4	25.9	28.9
	-23°C	-7	76.4	1440	272	.580	356	17.8	21.2	23.0	24.7	26.4	28.2	31.7
		-9	74.2	1319	257	.550	337	18.0	21.8	23.7	25.6	27.5	29.4	33.2
		-10	71.4	1186	237	.510	313	18.0	22.2	24.3	26.4	28.5	30.6	34.8
		-12	(2) 69.3	1090	222	.48	293	17.7	22.3	24.6	26.9	29.2	31.5	36.1
	ISA-10°C	-15	(1) 78.6	1630	292	.62	374	16.8	19.9	21.4	22.9	24.5	26.0	29.1
	-33°C	-18	74.9	1411	272	.580	349	17.6	21.2	22.9	24.7	26.5	28.3	31.8
		-19	72.7	1293	257	.550	331	17.8	21.7	23.6	25.6	27.5	29.4	33.3
		-21	70.1	1162	237	.510	307	17.8	22.1	24.2	26.4	28.5	30.7	35.0
		-22	(2) 68.0	1073	222	.48	288	17.5	22.2	24.5	26.8	29.2	31.5	36.2
15500.	ISA+20°C	17	(1) 83.1	1733	292	.62	396	17.1	20.0	21.4	22.9	24.3	25.7	28.6
	-3°C	14	79.1	1495	272	.580	370	18.1	21.4	23.1	24.7	26.4	28.1	31.4
		12	76.0	1330	252	.540	344	18.4	22.1	24.0	25.9	27.8	29.7	33.4
		10	73.2	1193	233	.500	319	18.3	22.5	24.6	26.7	28.8	30.9	35.1
		8	(2) 71.0	1098	217	.47	299	18.1	22.6	24.9	27.2	29.5	31.8	36.3
	ISA+10°C	6	(1) 81.6	1696	292	.62	389	17.0	20.0	21.5	22.9	24.4	25.9	28.8
	-13°C	4	77.7	1463	272	.580	363	18.0	21.4	23.1	24.8	26.5	28.2	31.6
		2	74.7	1303	252	.540	338	18.3	22.1	24.0	25.9	27.9	29.8	33.6
		0	72.6	1201	237	.510	319	18.2	22.4	24.5	26.6	28.7	30.7	34.9
		-2	(2) 69.8	1080	218	.47	294	17.9	22.6	24.9	27.2	29.5	31.8	36.5
	ISA+ 0°C	-5	(1) 80.1	1659	292	.62	381	17.0	20.0	21.5	23.0	24.5	26.0	29.0
	-23°C	-7	76.3	1433	272	.580	356	17.8	21.3	23.1	24.8	26.6	28.3	31.8
		-9	73.3	1277	252	.540	331	18.1	22.0	24.0	25.9	27.9	29.9	33.8
		-10	71.2	1178	237	.510	313	18.1	22.3	24.5	26.6	28.7	30.8	35.1
		-12	(2) 68.6	1063	218	.47	289	17.8	22.5	24.8	27.2	29.5	31.9	36.6
	ISA-10°C	-15	(1) 78.5	1623	292	.62	374	16.9	19.9	21.5	23.0	24.6	26.1	29.2
	-33°C	-18	74.8	1404	272	.580	349	17.7	21.3	23.1	24.8	26.6	28.4	32.0
		-20	71.9	1252	252	.540	325	18.0	21.9	23.9	25.9	27.9	29.9	33.9
		-21	69.9	1155	237	.510	307	17.9	22.2	24.4	26.6	28.7	30.9	35.2
		-23	(2) 67.3	1044	219	.47	284	17.6	22.4	24.8	27.2	29.5	31.9	36.7
15000.	ISA+20°C	17	(1) 82.9	1727	292	.62	396	17.2	20.1	21.5	23.0	24.4	25.9	28.7
	-3°C	14	78.9	1488	272	.580	370	18.1	21.5	23.2	24.9	26.5	28.2	31.6
		12	75.9	1323	252	.540	344	18.5	22.3	24.1	26.0	27.9	29.8	33.6
		10	73.0	1185	233	.500	319	18.5	22.7	24.8	26.9	29.0	31.1	35.4
		8	(2) 70.3	1068	214	.46	294	18.2	22.8	25.2	27.5	29.9	32.2	36.9
	ISA+10°C	6	(1) 81.5	1689	292	.62	389	17.1	20.1	21.5	23.0	24.5	26.0	28.9
	-13°C	4	77.6	1457	272	.580	363	18.0	21.5	23.2	24.9	26.6	28.3	31.8
		2	74.5	1296	252	.540	338	18.4	22.2	24.1	26.1	28.0	29.9	33.8
		0	71.7	1161	233	.500	313	18.3	22.6	24.8	26.9	29.1	31.2	35.6
		-2	(2) 69.1	1051	214	.46	289	18.0	22.8	25.1	27.5	29.9	32.3	37.0
	ISA+ 0°C	-5	(1) 80.0	1652	292	.62	381	17.0	20.1	21.6	23.1	24.6	26.1	29.1
	-23°C	-7	76.1	1427	272	.580	356	17.9	21.4	23.2	24.9	26.7	28.4	32.0
		-9	73.1	1270	252	.540	331	18.2	22.2	24.1	26.1	28.1	30.0	34.0
		-11	70.4	1139	233	.500	307	18.2	22.6	24.7	26.9	29.1	31.3	35.7
		-13	(2) 67.9	1034	215	.46	284	17.8	22.7	25.1	27.5	29.9	32.3	37.2
	ISA-10°C	-15	(1) 78.4	1617	292	.62	374	16.9	20.0	21.6	23.1	24.7	26.2	29.3
	-33°C	-18	74.7	1398	272	.580	349	17.8	21.4	23.2	24.9	26.7	28.5	32.1
		-20	71.7	1245	252	.540	325	18.0	22.1	24.1	26.1	28.1	30.1	34.1
		-21	69.0	1117	233	.500	301	18.0	22.4	24.7	26.9	29.2	31.4	35.9
		-23	(2) 66.7	1017	216	.47	279	17.6	22.5	25.0	27.5	29.9	32.4	37.3

Figure 7-14 Cruise (Sheet 9)

CRUISE
19,000 FEET

ANTI-ICE SYSTEMS OFF **TWO ENGINES**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL: 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
14000.	ISA+20°C	17	(1) 82.7	1713	292	.62	396	17.3	20.2	21.7	23.1	24.6	26.0	29.0
	-3°C	14	78.7	1474	272	.580	370	18.3	21.7	23.4	25.1	26.8	28.5	31.9
		12	74.8	1272	247	.530	338	18.7	22.6	24.6	26.6	28.5	30.5	34.4
		9	71.9	1137	228	.490	312	18.7	23.1	25.3	27.5	29.7	31.9	36.3
		8	(2) 69.0	1016	208	.45	286	18.3	23.3	25.7	28.2	30.6	33.1	38.0
	ISA+10°C	6	(1) 81.3	1676	292	.62	389	17.2	20.2	21.7	23.2	24.7	26.2	29.2
	-13°C	4	77.3	1444	272	.580	363	18.2	21.7	23.4	25.1	26.9	28.6	32.1
		1	73.5	1246	247	.530	332	18.6	22.6	24.6	26.6	28.6	30.6	34.6
		-1	70.6	1115	228	.490	307	18.5	23.0	25.3	27.5	29.8	32.0	36.5
		-3	(2) 67.8	999	209	.45	282	18.2	23.2	25.7	28.2	30.7	33.2	38.2
	ISA+ 0°C	-5	(1) 79.8	1640	292	.62	381	17.2	20.2	21.7	23.3	24.8	26.3	29.4
	-23°C	-7	75.9	1414	272	.580	356	18.1	21.6	23.4	25.2	26.9	28.7	32.2
		-10	72.1	1222	247	.530	325	18.4	22.5	24.6	26.6	28.7	30.7	34.8
		-11	69.3	1093	228	.490	301	18.4	22.9	25.2	27.5	29.8	32.1	36.7
		-13	(2) 66.6	984	209	.45	277	18.0	23.1	25.6	28.1	30.7	33.2	38.3
	ISA-10°C	-15	(1) 78.2	1605	292	.62	374	17.1	20.2	21.7	23.3	24.8	26.4	29.5
	-33°C	-18	74.4	1385	272	.580	349	17.9	21.6	23.4	25.2	27.0	28.8	32.4
		-20	70.7	1198	247	.530	319	18.3	22.4	24.5	26.6	28.7	30.8	35.0
		-22	67.9	1072	228	.490	295	18.2	22.8	25.2	27.5	29.8	32.2	36.8
		-23	(2) 65.4	967	210	.45	272	17.8	22.9	25.5	28.1	30.7	33.3	38.4
13000.	ISA+20°C	17	(1) 82.5	1701	292	.62	396	17.4	20.4	21.8	23.3	24.8	26.2	29.2
	-3°C	14	77.6	1416	267	.570	363	18.6	22.1	23.9	25.7	27.4	29.2	32.7
		12	74.5	1258	247	.530	338	18.9	22.9	24.9	26.9	28.8	30.8	34.8
		9	70.7	1090	223	.480	306	18.9	23.5	25.8	28.1	30.4	32.7	37.3
		7	(2) 67.6	968	203	.44	279	18.5	23.7	26.3	28.9	31.4	34.0	39.2
	ISA+10°C	6	(1) 81.0	1665	292	.62	389	17.4	20.4	21.9	23.4	24.9	26.4	29.4
	-13°C	3	76.2	1387	267	.570	357	18.5	22.1	23.9	25.7	27.5	29.3	32.9
		1	73.2	1233	247	.530	332	18.8	22.8	24.9	26.9	28.9	30.9	35.0
		-1	69.4	1069	223	.480	300	18.7	23.4	25.8	28.1	30.4	32.8	37.5
		-3	(2) 66.4	951	203	.44	275	18.3	23.6	26.2	28.9	31.5	34.1	39.4
	ISA+ 0°C	-5	(1) 79.5	1629	292	.62	381	17.3	20.3	21.9	23.4	25.0	26.5	29.6
	-23°C	-7	74.8	1359	267	.570	350	18.4	22.1	23.9	25.7	27.6	29.4	33.1
		-10	71.8	1209	247	.530	325	18.6	22.8	24.8	26.9	29.0	31.0	35.2
		-12	68.1	1048	223	.480	294	18.6	23.3	25.7	28.1	30.5	32.9	37.6
		-14	(2) 65.2	935	204	.44	270	18.1	23.5	26.2	28.8	31.5	34.2	39.5
	ISA-10°C	-15	(1) 78.0	1594	292	.62	374	17.2	20.3	21.9	23.4	25.0	26.6	29.7
	-33°C	-18	73.3	1332	267	.570	343	18.2	22.0	23.9	25.7	27.6	29.5	33.2
		-20	70.4	1185	247	.530	319	18.5	22.7	24.8	26.9	29.0	31.1	35.3
		-22	66.8	1028	223	.480	289	18.3	23.2	25.6	28.1	30.5	32.9	37.8
		-24	(2) 64.0	919	204	.44	264	17.9	23.3	26.1	28.8	31.5	34.2	39.7
12000.	ISA+20°C	17	(1) 82.3	1690	292	.62	396	17.5	20.5	22.0	23.5	24.9	26.4	29.4
	-3°C	14	77.3	1405	267	.570	363	18.8	22.3	24.1	25.9	27.7	29.4	33.0
		11	73.4	1210	242	.520	332	19.1	23.3	25.3	27.4	29.5	31.5	35.7
		8	69.6	1043	218	.470	300	19.1	23.9	26.3	28.7	31.1	33.5	38.3
		6	(2) 65.9	916	197	.43	271	18.7	24.1	26.9	29.6	32.3	35.0	40.5
	ISA+10°C	6	(1) 80.8	1654	292	.62	389	17.5	20.5	22.0	23.5	25.0	26.5	29.6
	-13°C	3	76.0	1376	267	.570	357	18.6	22.3	24.1	25.9	27.7	29.6	33.2
		0	72.1	1186	242	.520	325	19.0	23.2	25.3	27.4	29.6	31.7	35.9
		-2	68.3	1024	218	.470	294	19.0	23.8	26.3	28.7	31.2	33.6	38.5
		-4	(2) 64.8	901	197	.43	266	18.5	24.0	26.8	29.6	32.4	35.1	40.7
	ISA+ 0°C	-5	(1) 79.3	1618	292	.62	381	17.4	20.5	22.0	23.6	25.1	26.7	29.8
	-23°C	-7	74.5	1348	267	.570	350	18.5	22.2	24.1	25.9	27.8	29.6	33.4
		-10	70.8	1163	242	.520	319	18.8	23.1	25.3	27.4	29.6	31.7	36.0
		-12	67.0	1004	218	.470	288	18.7	23.7	26.2	28.7	31.2	33.7	38.7
		-14	(2) 63.6	885	197	.43	262	18.2	23.9	26.7	29.5	32.4	35.2	40.8
	ISA-10°C	-15	(1) 77.8	1584	292	.62	374	17.3	20.4	22.0	23.6	25.2	26.8	29.9
	-33°C	-18	73.1	1321	267	.570	343	18.4	22.2	24.0	25.9	27.8	29.7	33.5
		-21	69.4	1140	242	.520	313	18.7	23.0	25.2	27.4	29.6	31.8	36.2
		-23	65.7	985	218	.470	283	18.5	23.6	26.1	28.7	31.2	33.7	38.8
		-24	(2) 62.4	871	198	.43	257	18.0	23.7	26.6	29.5	32.4	35.2	41.0

(1) MAXIMUM CRUISE THRUST

(2) THRUST FOR MAXIMUM RANGE (APPROXIMATE)

ANTI-ICE SYSTEMS ON		
MAX. FAN %RPM		
-13°C	-23°C	-33°C
81.9	80.4	78.9
INCREASE FUEL FLOWS AND DECREASE SPECIFIC RANGES BY 10%		

Figure 7-14 Cruise (Sheet 10)

CRUISE
21,000 FEET

ANTI-ICE SYSTEMS OFF **TWO ENGINES**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
								NAUTICAL MILES/100 LBS. FUEL						
16500.	ISA+20°C -7°C	13	(1) 83.6	1662	284	.63	398	17.9	20.9	22.4	23.9	25.4	26.9	30.0
		11	80.2	1454	266	.590	373	18.8	22.2	24.0	25.7	27.4	29.1	32.6
		9	77.7	1324	251	.560	354	19.2	23.0	24.9	26.8	28.7	30.6	34.3
		7	75.7	1225	237	.530	335	19.2	23.3	25.4	27.4	29.4	31.5	35.6
		6	(2) 73.7	1134	223	.50	316	19.1	23.5	25.7	27.9	30.1	32.3	36.7
	ISA+10°C -17°C	3	(1) 83.4	1720	292	.65	401	17.5	20.4	21.9	23.3	24.8	26.2	29.1
		1	80.6	1525	275	.610	379	18.3	21.5	23.2	24.8	26.5	28.1	31.4
		-1	77.1	1335	256	.570	354	19.0	22.8	24.6	26.5	28.4	30.3	34.0
		-3	74.4	1200	237	.530	329	19.1	23.3	25.3	27.4	29.5	31.6	35.8
		-5	(2) 72.5	1114	223	.50	311	18.9	23.4	25.7	27.9	30.1	32.4	36.9
	ISA+ 0°C -27°C	-7	(1) 81.9	1682	292	.65	393	17.4	20.4	21.9	23.4	24.9	26.3	29.3
		-10	79.1	1492	275	.610	371	18.2	21.5	23.2	24.9	26.6	28.2	31.6
		-12	75.6	1307	256	.570	347	18.9	22.7	24.6	26.5	28.5	30.4	34.2
		-14	72.9	1176	237	.530	323	18.9	23.2	25.3	27.4	29.6	31.7	35.9
		-15	(2) 71.1	1094	224	.50	305	18.7	23.3	25.6	27.9	30.2	32.5	37.0
	ISA-10°C -37°C	-18	(1) 80.3	1644	292	.65	385	17.3	20.4	21.9	23.4	24.9	26.5	29.5
		-20	77.5	1460	275	.610	364	18.1	21.5	23.2	24.9	26.6	28.3	31.8
		-22	74.2	1280	256	.570	340	18.7	22.6	24.6	26.5	28.5	30.5	34.4
		-24	72.1	1182	242	.540	322	18.8	23.0	25.1	27.2	29.4	31.5	35.7
		-25	(2) 69.8	1075	224	.50	299	18.5	23.2	25.5	27.9	30.2	32.5	37.2
16000.	ISA+20°C -7°C	13	(1) 83.6	1660	285	.63	399	18.0	21.0	22.5	24.0	25.5	27.0	30.0
		11	80.0	1445	266	.590	373	18.9	22.4	24.1	25.8	27.6	29.3	32.8
		9	77.5	1315	251	.560	354	19.3	23.1	25.0	26.9	28.8	30.7	34.5
		7	75.5	1216	237	.530	335	19.4	23.5	25.5	27.6	29.6	31.7	35.8
		5	(2) 73.1	1108	220	.49	312	19.2	23.7	25.9	28.2	30.4	32.7	37.2
	ISA+10°C -17°C	3	(1) 83.3	1713	292	.65	401	17.6	20.5	22.0	23.4	24.9	26.3	29.3
		1	80.4	1517	275	.610	379	18.4	21.7	23.3	25.0	26.6	28.3	31.6
		-1	76.9	1327	256	.570	354	19.1	22.9	24.8	26.7	28.6	30.4	34.2
		-3	74.1	1191	237	.530	329	19.2	23.4	25.5	27.6	29.7	31.8	36.0
		-5	(2) 71.8	1089	221	.49	307	19.0	23.6	25.9	28.2	30.5	32.8	37.4
	ISA+ 0°C -27°C	-7	(1) 81.8	1675	292	.65	393	17.5	20.5	22.0	23.5	25.0	26.5	29.4
		-10	78.9	1484	275	.610	371	18.3	21.6	23.3	25.0	26.7	28.4	31.8
		-12	75.4	1299	256	.570	347	19.0	22.9	24.8	26.7	28.6	30.6	34.4
		-14	72.7	1167	237	.530	323	19.1	23.4	25.5	27.6	29.8	31.9	36.2
		-15	(2) 70.5	1070	221	.50	302	18.8	23.5	25.9	28.2	30.5	32.9	37.5
	ISA-10°C -37°C	-18	(1) 80.2	1638	292	.65	385	17.4	20.5	22.0	23.5	25.0	26.6	29.6
		-20	77.4	1452	275	.610	364	18.2	21.6	23.3	25.0	26.8	28.5	31.9
		-22	74.0	1273	256	.570	340	18.8	22.8	24.7	26.7	28.7	30.6	34.6
		-24	71.3	1144	237	.530	316	18.9	23.3	25.4	27.6	29.8	32.0	36.4
		-26	(2) 69.2	1050	221	.50	296	18.6	23.4	25.8	28.2	30.5	32.9	37.7
15500.	ISA+20°C -7°C	13	(1) 83.5	1657	285	.63	399	18.0	21.1	22.6	24.1	25.6	27.1	30.1
		11	79.8	1437	266	.590	373	19.0	22.5	24.2	26.0	27.7	29.5	32.9
		9	77.3	1307	251	.560	354	19.5	23.3	25.2	27.1	29.0	30.9	34.8
		7	74.6	1176	233	.520	329	19.5	23.7	25.9	28.0	30.1	32.2	36.5
		5	(2) 72.4	1082	217	.49	309	19.3	23.9	26.2	28.5	30.8	33.1	37.8
	ISA+10°C -17°C	3	(1) 83.2	1706	292	.65	401	17.6	20.6	22.0	23.5	25.0	26.4	29.4
		1	79.3	1456	270	.600	372	18.7	22.2	23.9	25.6	27.3	29.0	32.5
		-2	75.9	1280	251	.560	348	19.3	23.3	25.2	27.2	29.1	31.1	35.0
		-3	73.9	1183	237	.530	329	19.4	23.6	25.7	27.8	29.9	32.1	36.3
		-5	(2) 71.2	1063	218	.49	303	19.1	23.8	26.2	28.5	30.9	33.2	37.9
	ISA+ 0°C -27°C	-7	(1) 81.6	1668	292	.65	393	17.6	20.6	22.1	23.6	25.1	26.6	29.6
		-10	77.8	1425	270	.600	365	18.6	22.1	23.9	25.6	27.4	29.1	32.6
		-12	74.5	1254	251	.560	341	19.2	23.2	25.2	27.2	29.2	31.2	35.2
		-14	72.5	1159	237	.530	323	19.2	23.5	25.7	27.8	30.0	32.2	36.5
		-16	(2) 69.9	1045	218	.49	298	18.9	23.7	26.1	28.5	30.9	33.3	38.1
	ISA-10°C -37°C	-18	(1) 80.0	1631	292	.65	385	17.5	20.5	22.1	23.6	25.1	26.7	29.7
		-21	76.3	1395	270	.600	358	18.5	22.1	23.8	25.6	27.4	29.2	32.8
		-22	73.8	1265	256	.570	340	19.0	22.9	24.9	26.9	28.8	30.8	34.8
		-24	71.1	1136	237	.530	316	19.0	23.4	25.6	27.8	30.0	32.2	36.6
		-26	(2) 68.5	1025	218	.49	292	18.7	23.6	26.0	28.5	30.9	33.4	38.2
15000.	ISA+20°C -7°C	13	(1) 83.6	1662	286	.63	400	18.1	21.1	22.6	24.1	25.6	27.1	30.1
		11	79.6	1428	266	.590	373	19.1	22.6	24.4	26.1	27.9	29.6	33.1
		8	76.5	1265	247	.550	348	19.6	23.6	25.5	27.5	29.5	31.5	35.4
		7	74.4	1167	233	.520	329	19.6	23.9	26.1	28.2	30.3	32.5	36.8
		5	(2) 71.7	1053	214	.48	304	19.4	24.1	26.5	28.9	31.2	33.6	38.4
	ISA+10°C -17°C	3	(1) 83.1	1699	292	.65	401	17.7	20.7	22.1	23.6	25.1	26.5	29.5
		1	79.1	1448	270	.600	372	18.8	22.3	24.0	25.7	27.5	29.2	32.6
		-2	75.8	1273	251	.560	348	19.5	23.4	25.4	27.3	29.3	31.2	35.2
		-4	73.0	1144	233	.520	323	19.5	23.9	26.0	28.2	30.4	32.6	37.0
		-6	(2) 70.5	1036	215	.48	299	19.2	24.0	26.5	28.9	31.3	33.7	38.5
	ISA+ 0°C -27°C	-7	(1) 81.5	1661	292	.65	393	17.6	20.7	22.2	23.7	25.2	26.7	29.7
		-10	77.7	1417	270	.600	365	18.7	22.2	24.0	25.8	27.5	29.3	32.8
		-12	74.3	1247	251	.560	341	19.3	23.3	25.3	27.3	29.3	31.3	35.4
		-14	71.7	1121	233	.520	317	19.3	23.8	26.0	28.2	30.5	32.7	37.2
		-16	(2) 69.2	1019	215	.48	294	19.0	23.9	26.4	28.8	31.3	33.8	38.7
	ISA-10°C -37°C	-18	(1) 79.9	1625	292	.65	385	17.5	20.6	22.2	23.7	25.2	26.8	29.9
		-21	76.1	1387	270	.600	358	18.6	22.2	24.0	25.8	27.6	29.4	33.0
		-23	72.9	1222	251	.560	334	19.1	23.2	25.3	27.3	29.4	31.4	35.5
		-25	70.3	1099	233	.520	310	19.1	23.7	25.9	28.2	30.5	32.8	37.3
		-26	(2) 67.9	1001	216	.48	288	18.8	23.8	26.3	28.8	31.3	33.8	38.8

Figure 7-14 Cruise (Sheet 11)

CRUISE
21,000 FEET

ANTI-ICE SYSTEMS OFF **TWO ENGINES**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL: 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
14000.	ISA+20°C	13	(1) 83.5	1659	287	.64	402	18.2	21.2	22.7	24.2	25.7	27.2	30.2
	-7°C	11	79.3	1413	266	.590	373	19.3	22.9	24.7	26.4	28.2	30.0	33.5
		8	76.1	1250	247	.550	348	19.8	23.8	25.8	27.8	29.8	31.8	35.8
		6	72.5	1091	223	.500	316	19.9	24.4	26.7	29.0	31.3	33.6	38.2
		4	(2) 70.1	994	207	.47	294	19.5	24.6	27.1	29.6	32.1	34.6	39.6
	ISA+10°C	3	(1) 82.9	1687	292	.65	401	17.8	20.8	22.3	23.8	25.3	26.7	29.7
	-17°C	1	78.8	1433	270	.600	372	19.0	22.5	24.2	26.0	27.7	29.5	33.0
		-2	74.7	1225	247	.550	342	19.7	23.8	25.8	27.9	29.9	32.0	36.1
		-4	71.9	1098	228	.510	317	19.7	24.3	26.6	28.8	31.1	33.4	37.9
		-6	(2) 68.9	978	208	.47	289	19.4	24.5	27.0	29.6	32.1	34.7	39.8
	ISA+ 0°C	-7	(1) 81.3	1649	292	.65	393	17.8	20.8	22.3	23.8	25.4	26.9	29.9
	-27°C	-10	77.4	1403	270	.600	365	18.9	22.5	24.2	26.0	27.8	29.6	33.2
		-13	73.3	1200	247	.550	335	19.6	23.7	25.8	27.9	30.0	32.1	36.2
		-15	70.6	1077	228	.510	310	19.6	24.2	26.5	28.8	31.2	33.5	38.1
		-17	(2) 67.7	963	208	.47	285	19.2	24.4	27.0	29.6	32.2	34.8	39.9
	ISA-10°C	-18	(1) 79.7	1613	292	.65	385	17.7	20.8	22.3	23.9	25.4	27.0	30.1
	-37°C	-21	75.8	1374	270	.600	358	18.8	22.4	24.2	26.0	27.9	29.7	33.3
		-23	71.9	1176	247	.550	328	19.4	23.6	25.8	27.9	30.0	32.1	36.4
		-25	69.2	1055	228	.510	304	19.3	24.1	26.4	28.8	31.2	33.6	38.3
		-27	(2) 66.5	947	209	.47	280	19.0	24.2	26.9	29.5	32.1	34.8	40.1
13000.	ISA+20°C	14	(1) 83.4	1659	288	.64	403	18.3	21.3	22.8	24.3	25.8	27.3	30.3
	-7°C	11	79.0	1399	266	.590	373	19.5	23.1	24.9	26.7	28.5	30.3	33.8
		8	75.0	1202	242	.540	342	20.1	24.3	26.4	28.4	30.5	32.6	36.8
		6	72.1	1075	223	.500	316	20.1	24.8	27.1	29.5	31.8	34.1	38.8
		4	(2) 68.8	944	201	.45	286	19.7	25.0	27.7	30.3	33.0	35.6	40.9
	ISA+10°C	3	(1) 82.7	1675	292	.65	401	18.0	21.0	22.5	23.9	25.4	26.9	29.9
	-17°C	0	77.6	1369	266	.590	366	19.4	23.1	24.9	26.7	28.6	30.4	34.0
		-2	74.4	1211	247	.550	342	19.9	24.1	26.1	28.2	30.3	32.3	36.5
		-5	70.8	1053	223	.500	310	20.0	24.7	27.1	29.5	31.8	34.2	39.0
		-7	(2) 67.5	928	202	.45	281	19.6	24.9	27.6	30.3	33.0	35.7	41.1
	ISA+ 0°C	-7	(1) 81.1	1638	292	.65	393	17.9	21.0	22.5	24.0	25.5	27.1	30.1
	-27°C	-10	77.1	1390	270	.600	365	19.1	22.7	24.5	26.3	28.1	29.9	33.5
		-13	73.0	1187	247	.550	335	19.8	24.0	26.1	28.2	30.3	32.4	36.6
		-15	69.5	1033	223	.500	304	19.8	24.6	27.0	29.5	31.9	34.3	39.1
		-17	(2) 66.3	912	202	.45	276	19.3	24.8	27.6	30.3	33.0	35.8	41.3
	ISA-10°C	-18	(1) 79.5	1602	292	.65	385	17.8	20.9	22.5	24.0	25.6	27.2	30.3
	-37°C	-21	75.6	1361	270	.600	358	18.9	22.6	24.4	26.3	28.1	29.9	33.6
		-23	71.6	1163	247	.550	328	19.6	23.9	26.0	28.2	30.3	32.5	36.8
		-26	68.1	1013	223	.500	298	19.6	24.5	27.0	29.4	31.9	34.4	39.3
		-27	(2) 65.1	897	202	.46	271	19.1	24.7	27.5	30.2	33.0	35.8	41.4
12000.	ISA+20°C	14	(1) 83.4	1662	289	.64	405	18.3	21.3	22.8	24.3	25.8	27.3	30.4
	-7°C	11	78.7	1386	266	.590	373	19.7	23.3	25.1	26.9	28.7	30.6	34.2
		8	74.7	1189	242	.540	342	20.3	24.5	26.7	28.8	30.9	33.0	37.2
		5	70.9	1030	219	.490	310	20.4	25.3	27.7	30.1	32.5	35.0	39.8
		3	(2) 67.2	894	196	.44	278	20.0	25.5	28.3	31.1	33.9	36.7	42.3
	ISA+10°C	3	(1) 82.5	1664	292	.65	401	18.1	21.1	22.6	24.1	25.6	27.1	30.1
	-17°C	0	77.3	1357	266	.590	366	19.6	23.3	25.2	27.0	28.8	30.7	34.4
		-3	73.4	1165	242	.540	335	20.2	24.5	26.6	28.8	30.9	33.1	37.4
		-5	69.7	1010	219	.490	304	20.2	25.2	27.6	30.1	32.6	35.1	40.0
		-7	(2) 66.1	879	196	.44	274	19.7	25.4	28.3	31.1	34.0	36.8	42.5
	ISA+ 0°C	-7	(1) 80.9	1627	292	.65	393	18.0	21.1	22.6	24.2	25.7	27.2	30.3
	-27°C	-11	75.8	1329	266	.590	359	19.5	23.3	25.1	27.0	28.9	30.8	34.6
		-13	72.0	1142	242	.540	329	20.0	24.4	26.6	28.8	31.0	33.2	37.6
		-16	68.3	991	219	.490	298	20.0	25.1	27.6	30.1	32.6	35.2	40.2
		-18	(2) 64.9	864	196	.44	269	19.5	25.3	28.2	31.1	34.0	36.9	42.7
	ISA-10°C	-18	(1) 79.4	1591	292	.65	385	17.9	21.1	22.6	24.2	25.8	27.3	30.5
	-37°C	-21	74.4	1301	266	.590	352	19.3	23.2	25.1	27.0	28.9	30.9	34.7
		-24	70.6	1119	242	.540	322	19.8	24.3	26.5	28.8	31.0	33.2	37.7
		-26	67.0	971	219	.490	292	19.8	24.9	27.5	30.1	32.7	35.2	40.4
		-28	(2) 63.7	850	197	.44	264	19.3	25.1	28.1	31.0	34.0	36.9	42.8

(1) MAXIMUM CRUISE THRUST

(2) THRUST FOR MAXIMUM RANGE (APPROXIMATE)

ANTI-ICE SYSTEMS ON		
MAX. FAN %RPM		
-17°C	-27°C	-37°C
82.8	82.0	80.4
INCREASE FUEL FLOWS AND DECREASE SPECIFIC RANGES BY 10%		

Figure 7-14 Cruise (Sheet 12)

CRUISE
23,000 FEET

ANTI-ICE SYSTEMS OFF **TWO ENGINES**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
16500.	ISA+20°C	9	(1) 84.1	1587	277	.64	400	18.9	22.1	23.6	25.2	26.8	28.4	31.5
	-11°C	7	81.1	1403	259	.600	377	19.7	23.3	25.1	26.9	28.6	30.4	34.0
		5	78.5	1271	246	.570	358	20.3	24.2	26.2	28.2	30.1	32.1	36.0
		4	76.5	1175	232	.540	339	20.4	24.6	26.8	28.9	31.0	33.1	37.4
		2	(2) 75.0	1105	221	.52	324	20.2	24.7	27.0	29.3	31.5	33.8	38.3
	ISA+10°C	1	(1) 85.3	1746	292	.67	414	18.0	20.8	22.3	23.7	25.1	26.6	29.4
	-21°C	-2	82.0	1515	273	.630	388	19.0	22.3	23.9	25.6	27.2	28.9	32.2
		-4	78.8	1327	255	.590	363	19.9	23.6	25.5	27.4	29.3	31.2	34.9
		-6	75.7	1179	237	.550	339	20.3	24.5	26.6	28.7	30.9	33.0	37.2
		-8	(2) 73.7	1085	221	.52	318	20.1	24.7	27.0	29.3	31.6	33.9	38.5
	ISA+ 0°C	-10	(1) 83.7	1705	292	.67	405	17.9	20.8	22.3	23.8	25.2	26.7	29.6
	-31°C	-13	80.4	1481	273	.630	380	18.9	22.3	24.0	25.7	27.3	29.0	32.4
		-15	77.3	1298	255	.590	356	19.7	23.6	25.5	27.4	29.4	31.3	35.1
		-17	74.3	1155	237	.550	332	20.1	24.4	26.6	28.8	30.9	33.1	37.4
		-18	(2) 72.3	1066	222	.52	312	19.9	24.6	26.9	29.3	31.6	34.0	38.7
	ISA-10°C	-21	(1) 82.0	1666	292	.67	397	17.8	20.8	22.3	23.8	25.3	26.8	29.8
	-41°C	-23	78.8	1449	273	.630	372	18.8	22.2	24.0	25.7	27.4	29.1	32.6
		-25	75.8	1271	255	.590	349	19.6	23.5	25.5	27.4	29.4	31.4	35.3
		-27	72.8	1131	237	.550	325	19.9	24.3	26.5	28.8	31.0	33.2	37.6
		-29	(2) 70.9	1046	222	.52	306	19.7	24.5	26.9	29.3	31.7	34.0	38.8
16000.	ISA+20°C	9	(1) 84.1	1588	277	.64	401	19.0	22.1	23.7	25.3	26.9	28.4	31.6
	-11°C	7	80.9	1393	259	.600	377	19.9	23.5	25.3	27.0	28.8	30.6	34.2
		5	78.3	1262	246	.570	358	20.5	24.4	26.4	28.4	30.4	32.3	36.3
		4	76.3	1165	232	.540	339	20.5	24.8	27.0	29.1	31.3	33.4	37.7
		2	(2) 74.4	1081	218	.51	320	20.4	25.0	27.3	29.6	31.9	34.2	38.9
	ISA+10°C	1	(1) 85.2	1738	292	.67	414	18.0	20.9	22.4	23.8	25.2	26.7	29.5
	-21°C	-2	81.8	1506	273	.630	388	19.1	22.4	24.1	25.8	27.4	29.1	32.4
		-4	78.6	1317	255	.590	363	20.0	23.8	25.7	27.6	29.5	31.4	35.2
		-6	75.5	1170	237	.550	339	20.4	24.7	26.8	29.0	31.1	33.2	37.5
		-8	(2) 73.1	1062	219	.51	315	20.2	24.9	27.3	29.6	32.0	34.3	39.1
	ISA+ 0°C	-10	(1) 83.6	1698	292	.67	405	18.0	20.9	22.4	23.9	25.3	26.8	29.8
	-31°C	-13	80.3	1473	273	.630	380	19.0	22.4	24.1	25.8	27.5	29.2	32.6
		-15	77.1	1289	255	.590	356	19.9	23.7	25.7	27.6	29.6	31.5	35.4
		-17	74.1	1146	237	.550	332	20.3	24.6	26.8	29.0	31.2	33.3	37.7
		-19	(2) 71.7	1043	219	.51	309	20.0	24.8	27.2	29.6	32.0	34.4	39.2
	ISA-10°C	-21	(1) 81.9	1659	292	.67	397	17.9	20.9	22.4	23.9	25.4	26.9	30.0
	-41°C	-23	78.7	1440	273	.630	372	18.9	22.4	24.1	25.8	27.6	29.3	32.8
		-25	75.5	1262	255	.590	349	19.7	23.7	25.7	27.6	29.6	31.6	35.6
		-27	72.6	1123	237	.550	325	20.1	24.5	26.7	29.0	31.2	33.4	37.9
		-29	(2) 70.4	1024	220	.51	303	19.8	24.7	27.2	29.6	32.0	34.5	39.4
15500.	ISA+20°C	9	(1) 84.0	1586	278	.64	402	19.1	22.2	23.8	25.4	26.9	28.5	31.7
	-11°C	7	80.7	1383	259	.600	377	20.0	23.6	25.4	27.2	29.0	30.9	34.5
		5	78.1	1253	246	.570	358	20.6	24.6	26.6	28.6	30.6	32.6	36.6
		4	76.1	1156	232	.540	339	20.7	25.0	27.2	29.3	31.5	33.7	38.0
		2	(2) 73.7	1055	216	.50	316	20.5	25.2	27.6	30.0	32.3	34.7	39.5
	ISA+10°C	1	(1) 85.1	1731	292	.67	414	18.1	21.0	22.5	23.9	25.3	26.8	29.7
	-21°C	-2	81.7	1498	273	.630	388	19.2	22.6	24.2	25.9	27.6	29.2	32.6
		-4	78.3	1308	255	.590	363	20.1	24.0	25.9	27.8	29.7	31.6	35.4
		-7	74.7	1132	232	.540	333	20.6	25.0	27.2	29.4	31.6	33.8	38.2
		-9	(2) 72.4	1037	216	.50	311	20.4	25.2	27.6	30.0	32.4	34.8	39.6
	ISA+ 0°C	-10	(1) 83.5	1691	292	.67	405	18.1	21.0	22.5	24.0	25.4	26.9	29.9
	-31°C	-13	80.1	1464	273	.630	380	19.1	22.5	24.2	26.0	27.7	29.4	32.8
		-15	76.9	1280	255	.590	356	20.0	23.9	25.9	27.8	29.8	31.7	35.6
		-17	73.2	1109	232	.540	326	20.4	24.9	27.1	29.4	31.7	33.9	38.4
		-19	(2) 71.1	1018	217	.51	305	20.2	25.1	27.5	30.0	32.4	34.9	39.8
	ISA-10°C	-21	(1) 81.8	1652	292	.67	397	18.0	21.0	22.5	24.0	25.5	27.0	30.1
	-41°C	-23	78.5	1432	273	.630	372	19.0	22.5	24.2	26.0	27.7	29.5	33.0
		-25	75.3	1254	255	.590	349	19.8	23.8	25.8	27.8	29.8	31.8	35.8
		-28	71.8	1087	232	.540	319	20.2	24.8	27.1	29.4	31.7	34.0	38.6
		-29	(2) 69.7	1000	217	.51	299	19.9	24.9	27.4	29.9	32.4	34.9	39.9
15000.	ISA+20°C	10	(1) 84.0	1590	279	.64	404	19.1	22.2	23.8	25.4	27.0	28.5	31.7
	-11°C	7	80.5	1374	259	.600	377	20.1	23.8	25.6	27.4	29.2	31.1	34.7
		5	77.9	1245	246	.570	358	20.7	24.7	26.8	28.8	30.8	32.8	36.8
		3	75.2	1118	228	.530	333	20.8	25.3	27.5	29.8	32.0	34.3	38.7
		2	(2) 73.1	1029	213	.50	312	20.6	25.5	27.9	30.4	32.8	35.2	40.1
	ISA+10°C	1	(1) 85.0	1723	292	.67	414	18.2	21.1	22.5	24.0	25.4	26.9	29.8
	-21°C	-2	80.7	1440	268	.620	382	19.6	23.0	24.8	26.5	28.2	30.0	33.5
		-5	77.3	1256	250	.580	357	20.5	24.5	26.5	28.4	30.4	32.4	36.4
		-7	74.4	1124	232	.540	333	20.7	25.2	27.4	29.6	31.8	34.1	38.5
		-9	(2) 71.8	1011	213	.50	307	20.5	25.4	27.9	30.4	32.8	35.3	40.3
	ISA+ 0°C	-10	(1) 83.3	1684	292	.67	405	18.1	21.1	22.6	24.1	25.6	27.0	30.0
	-31°C	-13	80.0	1456	273	.630	380	19.2	22.7	24.4	26.1	27.8	29.5	33.0
		-15	75.8	1230	250	.580	350	20.3	24.4	26.4	28.5	30.5	32.5	36.6
		-17	73.0	1101	232	.540	326	20.5	25.1	27.4	29.6	31.9	34.2	38.7
		-19	(2) 70.5	994	214	.50	301	20.3	25.3	27.8	30.3	32.9	35.4	40.4
	ISA-10°C	-21	(1) 81.7	1645	292	.67	397	18.0	21.1	22.6	24.1	25.6	27.2	30.2
	-41°C	-23	78.4	1425	273	.630	372	19.1	22.6	24.4	26.1	27.9	29.6	33.1
		-26	74.3	1204	250	.580	343	20.2	24.3	26.4	28.5	30.5	32.6	36.8
		-28	71.6	1079	232	.540	319	20.3	25.0	27.3	29.6	31.9	34.2	38.9
		-30	(2) 69.1	976	214	.50	296	20.1	25.2	27.7	30.3	32.9	35.4	40.6

Figure 7-14 Cruise (Sheet 13)

CRUISE
23,000 FEET

ANTI-ICE SYSTEMS OFF **TWO ENGINES**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
14000.	ISA+20°C	10	(1) 83.9	1585	280	.65	405	19.2	22.4	24.0	25.5	27.1	28.7	31.8
	-11°C	7	80.1	1357	259	.600	377	20.4	24.1	25.9	27.8	29.6	31.4	35.1
		5	76.7	1193	241	.560	352	21.1	25.3	27.4	29.5	31.6	33.7	37.9
		3	74.0	1072	223	.520	327	21.1	25.8	28.1	30.5	32.8	35.1	39.8
		1	(2) 71.6	975	207	.48	303	20.9	26.0	28.6	31.1	33.7	36.3	41.4
	ISA+10°C	1	(1) 84.7	1710	292	.67	414	18.3	21.3	22.7	24.2	25.6	27.1	30.0
	-21°C	-2	80.4	1425	268	.620	382	19.8	23.3	25.0	26.8	28.5	30.3	33.8
		-5	76.9	1241	250	.580	357	20.7	24.8	26.8	28.8	30.8	32.8	36.9
		-7	73.3	1078	228	.530	327	21.0	25.6	28.0	30.3	32.6	34.9	39.6
		-10	(2) 70.4	959	207	.48	299	20.7	25.9	28.5	31.1	33.7	36.3	41.6
	ISA+ 0°C	-10	(1) 83.1	1671	292	.67	405	18.3	21.3	22.8	24.3	25.8	27.3	30.2
	-31°C	-13	78.9	1393	268	.620	374	19.7	23.3	25.1	26.8	28.6	30.4	34.0
		-15	75.4	1215	250	.580	350	20.6	24.7	26.8	28.8	30.9	32.9	37.1
		-18	71.9	1057	228	.530	320	20.8	25.6	27.9	30.3	32.7	35.0	39.7
		-20	(2) 69.1	943	208	.49	293	20.5	25.8	28.4	31.1	33.8	36.4	41.7
	ISA-10°C	-21	(1) 81.5	1633	292	.67	397	18.2	21.2	22.8	24.3	25.8	27.4	30.4
	-41°C	-24	77.3	1363	268	.620	366	19.5	23.2	25.0	26.9	28.7	30.5	34.2
		-26	73.9	1190	250	.580	343	20.4	24.6	26.7	28.8	30.9	33.0	37.2
		-28	70.5	1036	228	.530	313	20.6	25.4	27.8	30.3	32.7	35.1	39.9
		-30	(2) 67.8	926	208	.49	288	20.3	25.7	28.4	31.1	33.8	36.5	41.8
13000.	ISA+20°C	10	(1) 83.9	1586	281	.65	406	19.3	22.5	24.0	25.6	27.2	28.8	31.9
	-11°C	7	79.8	1342	259	.600	377	20.6	24.3	26.2	28.1	29.9	31.8	35.5
		4	75.7	1146	237	.550	346	21.4	25.8	28.0	30.1	32.3	34.5	38.9
		2	72.9	1027	219	.510	320	21.5	26.3	28.8	31.2	33.6	36.1	40.9
		0	(2) 70.0	919	200	.47	294	21.1	26.5	29.3	32.0	34.7	37.4	42.9
	ISA+10°C	1	(1) 84.5	1697	292	.67	414	18.5	21.4	22.9	24.4	25.8	27.3	30.3
	-21°C	-2	80.2	1411	268	.620	382	20.0	23.5	25.3	27.1	28.8	30.6	34.1
		-5	75.7	1189	246	.570	351	21.1	25.3	27.4	29.5	31.6	33.7	37.9
		-8	72.2	1034	223	.520	320	21.3	26.1	28.6	31.0	33.4	35.8	40.6
		-10	(2) 68.8	905	200	.47	289	20.9	26.4	29.2	32.0	34.7	37.5	43.0
	ISA+ 0°C	-10	(1) 82.9	1658	292	.67	405	18.4	21.4	22.9	24.4	25.9	27.5	30.5
	-31°C	-13	78.7	1380	268	.620	374	19.9	23.5	25.3	27.1	28.9	30.7	34.4
		-16	74.3	1165	246	.570	344	21.0	25.3	27.4	29.6	31.7	33.8	38.1
		-18	70.8	1014	223	.520	314	21.1	26.0	28.5	31.0	33.4	35.9	40.8
		-21	(2) 67.5	889	201	.47	284	20.7	26.3	29.1	31.9	34.7	37.6	43.2
	ISA-10°C	-21	(1) 81.3	1621	292	.67	397	18.3	21.4	22.9	24.5	26.0	27.6	30.7
	-41°C	-24	77.1	1350	268	.620	366	19.7	23.4	25.3	27.1	29.0	30.8	34.5
		-26	72.8	1141	246	.570	337	20.8	25.2	27.3	29.5	31.7	33.9	38.3
		-29	69.4	994	223	.520	307	20.9	25.9	28.4	30.9	33.5	36.0	41.0
		-31	(2) 66.3	875	201	.47	279	20.4	26.1	29.0	31.9	34.7	37.6	43.3
12000.	ISA+20°C	10	(1) 83.9	1588	282	.65	408	19.4	22.5	24.1	25.7	27.3	28.8	32.0
	-11°C	7	79.4	1328	259	.600	377	20.8	24.6	26.5	28.4	30.3	32.1	35.9
		4	75.3	1132	237	.550	346	21.7	26.1	28.3	30.5	32.7	34.9	39.4
		2	71.7	984	214	.500	314	21.8	26.8	29.4	31.9	34.5	37.0	42.1
		-1	(2) 68.5	866	193	.45	285	21.3	27.1	30.0	32.9	35.8	38.6	44.4
	ISA+10°C	1	(1) 84.3	1686	292	.67	414	18.6	21.6	23.0	24.5	26.0	27.5	30.5
	-21°C	-3	79.0	1348	264	.610	376	20.4	24.2	26.0	27.9	29.7	31.6	35.3
		-6	74.6	1141	241	.560	345	21.5	25.9	28.1	30.3	32.4	34.6	39.0
		-8	71.1	992	219	.510	314	21.6	26.6	29.2	31.7	34.2	36.7	41.8
		-11	(2) 67.2	851	194	.45	280	21.1	27.0	29.9	32.8	35.8	38.7	44.6
	ISA+ 0°C	-10	(1) 82.7	1647	292	.67	405	18.5	21.6	23.1	24.6	26.1	27.6	30.7
	-31°C	-14	77.5	1319	264	.610	368	20.3	24.1	26.0	27.9	29.8	31.7	35.5
		-16	73.2	1117	241	.560	338	21.3	25.8	28.0	30.3	32.5	34.7	39.2
		-19	69.7	972	219	.510	308	21.4	26.5	29.1	31.7	34.2	36.8	42.0
		-21	(2) 66.0	837	194	.45	275	20.9	26.8	29.8	32.8	35.8	38.8	44.8
	ISA-10°C	-21	(1) 81.1	1610	292	.67	397	18.4	21.5	23.1	24.6	26.2	27.8	30.9
	-41°C	-24	75.9	1291	264	.610	360	20.2	24.0	26.0	27.9	29.9	31.8	35.7
		-27	71.8	1095	241	.560	331	21.1	25.7	28.0	30.2	32.5	34.8	39.4
		-29	68.3	953	219	.510	302	21.1	26.4	29.0	31.6	34.3	36.9	42.1
		-32	(2) 64.7	823	195	.46	270	20.6	26.7	29.7	32.7	35.8	38.8	44.9

(1) MAXIMUM CRUISE THRUST

(2) THRUST FOR MAXIMUM RANGE (APPROXIMATE)

ANTI-ICE SYSTEMS ON		
MAX. FAN %RPM		
-21°C	-31°C	-41°C
83.2	83.7	82.0
INCREASE FUEL FLOWS AND DECREASE SPECIFIC RANGES BY 10%		

Figure 7-14 Cruise (Sheet 14)

CRUISE
25,000 FEET

ANTI-ICE SYSTEMS OFF **TWO ENGINES**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
16500.	ISA+20°C	6	(1) 84.6	1520	269	.65	403	19.9	23.2	24.8	26.5	28.1	29.8	33.1
	-15°C	3	82.0	1355	253	.610	380	20.7	24.4	26.2	28.1	29.9	31.7	35.4
		2	80.4	1268	244	.590	368	21.1	25.1	27.0	29.0	31.0	32.9	36.9
		1	77.9	1154	231	.560	349	21.6	25.9	28.1	30.2	32.4	34.6	38.9
		-1	(2) 76.4	1083	219	.53	332	21.4	26.1	28.4	30.7	33.0	35.3	39.9
	ISA+10°C	-3	(1) 86.5	1711	287	.69	420	18.7	21.6	23.1	24.5	26.0	27.5	30.4
	-25°C	-5	83.3	1503	271	.650	397	19.8	23.1	24.7	26.4	28.1	29.7	33.1
		-7	80.4	1325	253	.610	373	20.6	24.4	26.2	28.1	30.0	31.9	35.7
		-9	77.2	1163	235	.570	348	21.4	25.7	27.8	30.0	32.1	34.3	38.6
		-11	(2) 75.0	1063	220	.53	327	21.3	26.0	28.4	30.7	33.1	35.4	40.1
	ISA+ 0°C	-13	(1) 85.9	1746	292	.70	418	18.2	21.1	22.5	23.9	25.4	26.8	29.7
	-35°C	-16	81.7	1468	271	.650	389	19.7	23.1	24.8	26.5	28.2	29.9	33.3
		-18	78.9	1295	253	.610	365	20.5	24.3	26.3	28.2	30.1	32.1	35.9
		-20	75.7	1138	235	.570	341	21.2	25.6	27.8	30.0	32.2	34.4	38.8
		-22	(2) 73.6	1045	221	.54	321	21.1	25.9	28.3	30.7	33.1	35.5	40.3
	ISA-10°C	-24	(1) 84.1	1704	292	.70	409	18.1	21.1	22.5	24.0	25.5	26.9	29.9
	-45°C	-27	80.1	1435	271	.650	381	19.6	23.0	24.8	26.5	28.3	30.0	33.5
		-29	77.3	1267	253	.610	357	20.3	24.3	26.2	28.2	30.2	32.2	36.1
		-31	74.2	1115	235	.570	334	21.0	25.5	27.7	30.0	32.2	34.5	38.9
		-32	(2) 72.2	1025	221	.54	314	20.9	25.8	28.2	30.7	33.1	35.6	40.4
16000.	ISA+20°C	6	(1) 84.6	1520	270	.65	404	20.0	23.3	24.9	26.6	28.2	29.9	33.2
	-15°C	3	81.7	1344	253	.610	380	20.8	24.6	26.4	28.3	30.1	32.0	35.7
		2	79.3	1216	240	.580	362	21.5	25.6	27.7	29.7	31.8	33.8	37.9
		0	77.1	1117	227	.550	343	21.7	26.2	28.5	30.7	32.9	35.2	39.6
		-1	(2) 75.7	1055	216	.53	328	21.6	26.3	28.7	31.1	33.5	35.8	40.6
	ISA+10°C	-3	(1) 86.4	1711	288	.69	421	18.7	21.6	23.1	24.6	26.0	27.5	30.4
	-25°C	-6	82.4	1445	266	.640	391	20.1	23.6	25.3	27.0	28.8	30.5	34.0
		-8	79.5	1271	248	.600	367	21.0	24.9	26.9	28.8	30.8	32.8	36.7
		-10	76.2	1120	231	.560	342	21.6	26.1	28.3	30.6	32.8	35.0	39.5
		-12	(2) 74.4	1037	217	.53	322	21.5	26.3	28.7	31.1	33.5	35.9	40.7
	ISA+ 0°C	-13	(1) 85.7	1737	292	.70	418	18.3	21.2	22.6	24.1	25.5	26.9	29.8
	-35°C	-16	81.5	1458	271	.650	389	19.8	23.2	25.0	26.7	28.4	30.1	33.5
		-18	78.7	1285	253	.610	365	20.6	24.5	26.5	28.4	30.4	32.3	36.2
		-20	75.5	1129	235	.570	341	21.4	25.8	28.0	30.2	32.5	34.7	39.1
		-22	(2) 73.0	1018	218	.53	317	21.3	26.2	28.6	31.1	33.5	36.0	40.9
	ISA-10°C	-24	(1) 84.0	1696	292	.70	409	18.2	21.2	22.6	24.1	25.6	27.1	30.0
	-45°C	-27	79.9	1425	271	.650	381	19.7	23.2	25.0	26.7	28.5	30.2	33.7
		-29	77.1	1257	253	.610	357	20.5	24.5	26.4	28.4	30.4	32.4	36.4
		-31	74.0	1105	235	.570	334	21.2	25.7	28.0	30.2	32.5	34.8	39.3
		-33	(2) 71.5	999	218	.53	310	21.0	26.1	28.6	31.1	33.6	36.1	41.1
15500.	ISA+20°C	6	(1) 84.6	1518	271	.65	405	20.1	23.4	25.0	26.7	28.3	30.0	33.3
	-15°C	3	81.5	1334	253	.610	380	21.0	24.8	26.6	28.5	30.4	32.2	36.0
		2	79.0	1206	240	.580	362	21.7	25.8	27.9	30.0	32.1	34.1	38.3
		0	76.8	1107	227	.550	343	21.9	26.5	28.7	31.0	33.2	35.5	40.0
		-2	(2) 75.0	1029	214	.52	324	21.8	26.6	29.1	31.5	33.9	36.3	41.2
	ISA+10°C	-3	(1) 86.4	1711	289	.69	421	18.8	21.7	23.2	24.6	26.1	27.5	30.5
	-25°C	-6	82.2	1435	266	.640	391	20.3	23.8	25.5	27.2	29.0	30.7	34.2
		-8	79.3	1261	248	.600	367	21.1	25.1	27.1	29.1	31.1	33.0	37.0
		-10	76.0	1111	231	.560	342	21.8	26.3	28.6	30.8	33.1	35.3	39.8
		-12	(2) 73.7	1010	214	.52	318	21.6	26.6	29.0	31.5	34.0	36.5	41.4
	ISA+ 0°C	-13	(1) 85.6	1729	292	.70	418	18.4	21.3	22.7	24.2	25.6	27.1	29.9
	-35°C	-16	81.4	1448	271	.650	389	19.9	23.4	25.1	26.9	28.6	30.3	33.8
		-18	78.5	1275	253	.610	365	20.8	24.7	26.7	28.6	30.6	32.6	36.5
		-21	74.5	1088	231	.560	335	21.6	26.2	28.5	30.8	33.1	35.4	40.0
		-22	(2) 72.3	993	215	.52	313	21.4	26.4	29.0	31.5	34.0	36.5	41.6
	ISA-10°C	-24	(1) 83.9	1688	292	.70	409	18.3	21.3	22.7	24.2	25.7	27.2	30.1
	-45°C	-27	79.7	1415	271	.650	381	19.8	23.4	25.1	26.9	28.7	30.4	34.0
		-29	76.9	1247	253	.610	357	20.6	24.6	26.6	28.6	30.7	32.7	36.7
		-31	73.0	1065	231	.560	328	21.4	26.1	28.5	30.8	33.2	35.5	40.2
		-33	(2) 70.9	974	215	.52	306	21.2	26.3	28.9	31.5	34.0	36.6	41.7
15000.	ISA+20°C	6	(1) 84.5	1518	272	.65	406	20.2	23.5	25.1	26.8	28.4	30.1	33.3
	-15°C	3	81.3	1324	253	.610	380	21.2	24.9	26.8	28.7	30.6	32.5	36.3
		2	78.7	1196	240	.580	362	21.9	26.1	28.1	30.2	32.3	34.4	38.6
		0	76.6	1098	227	.550	343	22.1	26.7	29.0	31.2	33.5	35.8	40.3
		-2	(2) 74.3	1004	211	.51	320	21.9	26.9	29.4	31.9	34.4	36.9	41.9
	ISA+10°C	-2	(1) 86.4	1709	289	.69	422	18.8	21.7	23.2	24.7	26.1	27.6	30.5
	-25°C	-6	82.0	1426	266	.640	391	20.4	23.9	25.7	27.4	29.2	30.9	34.4
		-8	79.0	1251	248	.600	367	21.3	25.3	27.3	29.3	31.3	33.3	37.3
		-10	75.8	1102	231	.560	342	22.0	26.5	28.8	31.1	33.3	35.6	40.1
		-12	(2) 73.0	986	211	.51	315	21.8	26.8	29.4	31.9	34.4	37.0	42.0
	ISA+ 0°C	-13	(1) 85.5	1722	292	.70	418	18.5	21.4	22.8	24.3	25.7	27.2	30.1
	-35°C	-16	81.2	1439	271	.650	389	20.1	23.5	25.3	27.0	28.8	30.5	34.0
		-19	77.5	1224	248	.600	359	21.2	25.3	27.3	29.3	31.4	33.4	37.5
		-21	74.3	1079	231	.560	335	21.8	26.4	28.8	31.1	33.4	35.7	40.3
		-23	(2) 71.7	969	212	.52	309	21.6	26.7	29.3	31.9	34.5	37.0	42.2
	ISA-10°C	-24	(1) 83.7	1681	292	.70	409	18.4	21.4	22.8	24.3	25.8	27.3	30.3
	-45°C	-27	79.5	1406	271	.650	381	20.0	23.5	25.3	27.1	28.8	30.6	34.2
		-29	75.9	1198	248	.600	352	21.0	25.2	27.3	29.4	31.4	33.5	37.7
		-31	72.8	1057	231	.560	328	21.6	26.3	28.7	31.1	33.4	35.8	40.5
		-33	(2) 70.3	951	212	.52	303	21.3	26.6	29.2	31.8	34.5	37.1	42.4

Figure 7-14 Cruise (Sheet 15)

CRUISE
25,000 FEET

ANTI-ICE SYSTEMS OFF **TWO ENGINES**

WT. LBS.	TEMP	RAT DEG. C		FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL: 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
14000.	ISA+20°C	6	(1)	84.5	1518	273	.66	408	20.3	23.6	25.2	26.9	28.5	30.2	33.5
	-15°C	3		81.0	1306	253	.610	380	21.5	25.3	27.2	29.1	31.0	32.9	36.8
		2		78.3	1177	240	.580	362	22.2	26.5	28.6	30.7	32.8	35.0	39.2
		0		75.5	1053	222	.540	337	22.5	27.2	29.6	32.0	34.4	36.7	41.5
		-2	(2)	73.0	954	206	.50	312	22.3	27.5	30.1	32.7	35.4	38.0	43.2
	ISA+10°C	-2	(1)	86.3	1709	290	.69	423	18.9	21.8	23.3	24.8	26.2	27.7	30.6
	-25°C	-6		81.7	1409	266	.640	391	20.6	24.2	26.0	27.7	29.5	31.3	34.8
		-8		77.7	1192	244	.590	361	21.9	26.1	28.2	30.3	32.4	34.4	38.6
		-11		74.7	1058	227	.550	336	22.3	27.1	29.4	31.8	34.2	36.5	41.2
		-13	(2)	71.7	938	206	.50	307	22.1	27.4	30.1	32.7	35.4	38.1	43.4
	ISA+ 0°C	-13	(1)	85.2	1707	292	.70	418	18.6	21.5	23.0	24.5	25.9	27.4	30.3
	-35°C	-16		80.9	1424	271	.650	389	20.3	23.8	25.6	27.3	29.1	30.8	34.3
		-19		77.0	1206	248	.600	359	21.5	25.6	27.7	29.8	31.9	33.9	38.1
		-21		73.2	1036	227	.550	329	22.1	27.0	29.4	31.8	34.2	36.6	41.4
		-23	(2)	70.3	921	206	.50	301	21.9	27.3	30.0	32.7	35.4	38.1	43.6
	ISA-10°C	-24	(1)	83.5	1667	292	.70	409	18.5	21.5	23.0	24.5	26.0	27.5	30.5
	-45°C	-27		79.3	1392	271	.650	381	20.2	23.8	25.5	27.3	29.1	30.9	34.5
		-29		75.5	1180	248	.600	352	21.3	25.5	27.7	29.8	31.9	34.0	38.3
		-32		71.7	1015	227	.550	322	21.9	26.8	29.3	31.8	34.2	36.7	41.6
		-34	(2)	69.0	904	207	.50	295	21.6	27.1	29.9	32.7	35.4	38.2	43.7
13000.	ISA+20°C	6	(1)	84.5	1520	274	.66	410	20.4	23.7	25.3	27.0	28.6	30.3	33.5
	-15°C	3		80.6	1289	253	.610	380	21.7	25.6	27.6	29.5	31.4	33.4	37.3
		1		77.1	1126	235	.570	355	22.7	27.1	29.3	31.6	33.8	36.0	40.4
		-1		74.3	1009	218	.530	330	22.8	27.8	30.3	32.8	35.2	37.7	42.7
		-3	(2)	71.4	900	199	.49	303	22.5	28.1	30.9	33.7	36.4	39.2	44.8
	ISA+10°C	-2	(1)	86.3	1713	291	.70	425	19.0	21.9	23.3	24.8	26.2	27.7	30.6
	-25°C	-6		81.4	1395	266	.640	391	20.8	24.4	26.2	28.0	29.8	31.6	35.2
		-8		77.3	1175	244	.590	361	22.2	26.4	28.6	30.7	32.8	34.9	39.2
		-11		73.6	1015	222	.540	330	22.7	27.6	30.1	32.5	35.0	37.5	42.4
		-14	(2)	70.2	886	200	.49	298	22.3	28.0	30.8	33.6	36.5	39.3	44.9
	ISA+ 0°C	-13	(1)	85.0	1694	292	.70	418	18.8	21.7	23.2	24.7	26.1	27.6	30.6
	-35°C	-16		79.9	1364	266	.640	383	20.7	24.4	26.2	28.1	29.9	31.7	35.4
		-19		75.8	1150	244	.590	353	22.0	26.4	28.5	30.7	32.9	35.1	39.4
		-22		72.1	994	222	.540	323	22.5	27.5	30.0	32.5	35.1	37.6	42.6
		-24	(2)	68.9	870	200	.49	292	22.1	27.9	30.7	33.6	36.5	39.3	45.1
	ISA-10°C	-24	(1)	83.3	1654	292	.70	409	18.7	21.7	23.2	24.7	26.2	27.8	30.8
	-45°C	-27		78.2	1334	266	.640	375	20.6	24.4	26.2	28.1	30.0	31.8	35.6
		-30		74.2	1126	244	.590	346	21.8	26.3	28.5	30.7	32.9	35.1	39.6
		-32		70.7	974	222	.540	317	22.2	27.4	29.9	32.5	35.1	37.6	42.8
		-34	(2)	67.5	855	201	.49	287	21.8	27.7	30.6	33.5	36.5	39.4	45.2
12000.	ISA+20°C	6	(1)	84.4	1516	275	.66	411	20.5	23.8	25.4	27.1	28.7	30.4	33.7
	-15°C	3		80.2	1273	253	.610	380	22.0	25.9	27.9	29.9	31.8	33.8	37.7
		1		75.9	1078	231	.560	349	23.1	27.8	30.1	32.4	34.7	37.0	41.7
		-2		72.5	940	209	.510	318	23.2	28.5	31.2	33.8	36.5	39.1	44.5
		-4	(2)	69.7	844	192	.47	292	22.8	28.7	31.7	34.6	37.6	40.6	46.5
	ISA+10°C	-2	(1)	86.3	1710	292	.70	425	19.0	22.0	23.4	24.9	26.3	27.8	30.7
	-25°C	-6		81.2	1382	266	.640	391	21.0	24.7	26.5	28.3	30.1	31.9	35.5
		-9		76.0	1122	240	.580	354	22.7	27.1	29.4	31.6	33.8	36.1	40.5
		-12		71.8	946	214	.520	318	23.0	28.3	30.9	33.6	36.2	38.9	44.2
		-14	(2)	68.5	831	193	.47	288	22.6	28.6	31.6	34.6	37.6	40.6	46.7
	ISA+ 0°C	-13	(1)	84.8	1681	292	.70	418	18.9	21.9	23.4	24.9	26.3	27.8	30.8
	-35°C	-16		79.6	1351	266	.640	383	20.9	24.6	26.5	28.3	30.2	32.0	35.7
		-20		74.5	1098	240	.580	347	22.5	27.1	29.3	31.6	33.9	36.2	40.7
		-22		71.0	953	218	.530	317	22.8	28.1	30.7	33.3	35.9	38.6	43.8
		-25	(2)	67.2	816	193	.47	282	22.3	28.4	31.5	34.6	37.6	40.7	46.8
	ISA-10°C	-24	(1)	83.1	1642	292	.70	409	18.8	21.9	23.4	24.9	26.4	28.0	31.0
	-45°C	-27		78.0	1321	266	.640	375	20.8	24.6	26.5	28.4	30.3	32.1	35.9
		-30		73.0	1076	240	.580	340	22.3	26.9	29.3	31.6	33.9	36.2	40.9
		-33		69.6	934	218	.530	311	22.6	27.9	30.6	33.3	35.9	38.6	44.0
		-35	(2)	65.9	802	193	.47	277	22.0	28.3	31.4	34.5	37.6	40.7	47.0

(1) MAXIMUM CRUISE THRUST

(2) THRUST FOR MAXIMUM RANGE (APPROXIMATE)

ANTI-ICE SYSTEMS ON		
MAX. FAN %RPM		
-25°C	-35°C	-45°C
83.5	85.4	84.0
INCREASE FUEL FLOWS AND DECREASE SPECIFIC RANGES BY 10%		

Figure 7-14 Cruise (Sheet 16)

CRUISE
27,000 FEET

ANTI-ICE SYSTEMS OFF **TWO ENGINES**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
								NAUTICAL MILES/100 LBS. FUEL						
16500.	ISA+20°C	2	(1) 85.2	1452	260	.65	404	20.9	24.4	26.1	27.8	29.5	31.2	34.7
	-18°C	0	82.8	1310	246	.620	383	21.6	25.5	27.4	29.3	31.2	33.1	36.9
		-2	80.6	1191	234	.590	365	22.2	26.4	28.5	30.6	32.7	34.8	39.0
		-4	78.5	1094	221	.560	346	22.5	27.1	29.4	31.7	34.0	36.2	40.8
		-5	(2) 77.0	1029	211	.53	331	22.4	27.3	29.7	32.1	34.5	37.0	41.8
	ISA+10°C	-7	(1) 87.0	1631	278	.69	420	19.7	22.7	24.3	25.8	27.3	28.9	31.9
	-28°C	-9	83.3	1403	259	.650	394	20.9	24.5	26.3	28.1	29.8	31.6	35.2
		-12	80.5	1242	242	.610	370	21.7	25.7	27.8	29.8	31.8	33.8	37.8
		-14	77.6	1097	225	.570	346	22.4	26.9	29.2	31.5	33.8	36.1	40.6
		-15	(2) 75.6	1009	211	.53	324	22.2	27.2	29.7	32.1	34.6	37.1	42.1
	ISA+ 0°C	-15	(1) 88.5	1836	292	.73	431	18.0	20.8	22.1	23.5	24.8	26.2	28.9
	-38°C	-19	83.2	1461	268	.670	397	20.4	23.8	25.5	27.2	28.9	30.6	34.0
		-21	80.3	1289	251	.630	374	21.3	25.1	27.1	29.0	31.0	32.9	36.8
		-24	76.8	1103	230	.580	344	22.1	26.7	28.9	31.2	33.5	35.7	40.3
		-26	(2) 74.1	988	211	.54	318	22.0	27.1	29.6	32.2	34.7	37.2	42.3
	ISA-10°C	-26	(1) 86.7	1791	292	.73	422	18.0	20.8	22.1	23.5	24.9	26.3	29.1
	-48°C	-30	81.5	1426	268	.670	389	20.2	23.7	25.5	27.2	29.0	30.8	34.3
		-32	78.6	1260	251	.630	366	21.1	25.1	27.1	29.0	31.0	33.0	37.0
		-34	75.2	1080	230	.580	337	21.9	26.6	28.9	31.2	33.5	35.8	40.5
		-36	(2) 72.6	969	211	.54	311	21.8	27.0	29.5	32.1	34.7	37.3	42.4
16000.	ISA+20°C	2	(1) 85.2	1452	262	.66	405	21.0	24.5	26.2	27.9	29.6	31.3	34.8
	-18°C	0	82.5	1298	246	.620	383	21.8	25.7	27.6	29.5	31.5	33.4	37.2
		-1	81.1	1218	238	.600	371	22.3	26.4	28.4	30.5	32.5	34.6	38.7
		-3	78.8	1108	225	.570	353	22.8	27.3	29.6	31.8	34.1	36.3	40.8
		-5	(2) 76.9	1030	214	.54	335	22.8	27.7	30.1	32.5	35.0	37.4	42.3
	ISA+10°C	-6	(1) 87.0	1631	279	.70	422	19.7	22.8	24.3	25.8	27.4	28.9	32.0
	-28°C	-9	83.1	1391	259	.650	394	21.1	24.7	26.5	28.3	30.1	31.9	35.5
		-11	81.0	1268	246	.620	376	21.7	25.7	27.7	29.6	31.6	33.6	37.5
		-13	78.0	1116	230	.580	352	22.5	27.0	29.3	31.5	33.7	36.0	40.5
		-15	(2) 75.5	1009	214	.54	329	22.7	27.6	30.1	32.6	35.1	37.5	42.5
	ISA+ 0°C	-15	(1) 88.4	1827	292	.73	431	18.1	20.9	22.2	23.6	25.0	26.3	29.1
	-38°C	-18	83.8	1499	272	.680	403	20.2	23.6	25.2	26.9	28.6	30.2	33.6
		-21	80.0	1277	251	.630	374	21.4	25.4	27.3	29.3	31.2	33.2	37.1
		-23	77.2	1127	234	.590	350	22.2	26.7	28.9	31.1	33.3	35.5	40.0
		-26	(2) 74.1	990	214	.54	323	22.5	27.5	30.1	32.6	35.1	37.6	42.7
	ISA-10°C	-26	(1) 86.6	1782	292	.73	422	18.0	20.9	22.3	23.7	25.1	26.5	29.3
	-48°C	-29	82.0	1464	272	.680	394	20.1	23.5	25.2	26.9	28.7	30.4	33.8
		-32	78.4	1248	251	.630	366	21.3	25.3	27.3	29.3	31.3	33.3	37.3
		-34	75.6	1102	234	.590	343	22.0	26.6	28.8	31.1	33.4	35.6	40.2
		-36	(2) 72.6	971	214	.54	316	22.2	27.4	30.0	32.5	35.1	37.7	42.8
15500.	ISA+20°C	2	(1) 85.1	1450	262	.66	406	21.1	24.6	26.3	28.0	29.8	31.5	34.9
	-18°C	0	82.3	1286	246	.620	383	22.0	25.9	27.9	29.8	31.7	33.7	37.6
		-2	80.0	1167	234	.590	365	22.7	27.0	29.1	31.3	33.4	35.6	39.8
		-3	78.4	1094	225	.570	353	23.1	27.7	30.0	32.2	34.5	36.8	41.4
		-5	(2) 76.4	1009	212	.54	333	23.1	28.0	30.5	33.0	35.5	37.9	42.9
	ISA+10°C	-6	(1) 87.0	1634	280	.70	423	19.8	22.8	24.3	25.9	27.4	28.9	32.0
	-28°C	-9	82.9	1380	259	.650	394	21.3	24.9	26.7	28.5	30.3	32.2	35.8
		-11	80.7	1257	246	.620	376	21.9	25.9	27.9	29.9	31.9	33.9	37.8
		-13	77.7	1105	230	.580	352	22.8	27.3	29.6	31.8	34.1	36.4	40.9
		-15	(2) 75.0	991	213	.54	327	22.9	28.0	30.5	33.0	35.5	38.1	43.1
	ISA+ 0°C	-15	(1) 88.3	1818	292	.73	431	18.2	21.0	22.3	23.7	25.1	26.4	29.2
	-38°C	-18	83.6	1489	272	.680	403	20.4	23.7	25.4	27.1	28.8	30.4	33.8
		-21	79.8	1266	251	.630	374	21.6	25.6	27.6	29.5	31.5	33.5	37.4
		-24	76.2	1081	230	.580	344	22.6	27.2	29.6	31.9	34.2	36.5	41.1
		-26	(2) 73.6	974	214	.54	321	22.7	27.9	30.4	33.0	35.6	38.1	43.3
	ISA-10°C	-26	(1) 86.4	1774	292	.73	422	18.1	21.0	22.4	23.8	25.2	26.6	29.4
	-48°C	-29	81.9	1454	272	.680	394	20.3	23.7	25.4	27.1	28.8	30.6	34.0
		-32	78.2	1238	251	.630	366	21.5	25.5	27.5	29.6	31.6	33.6	37.6
		-34	75.4	1091	234	.590	343	22.2	26.8	29.1	31.4	33.7	36.0	40.6
		-36	(2) 72.1	955	214	.54	315	22.5	27.7	30.4	33.0	35.6	38.2	43.4
15000.	ISA+20°C	2	(1) 85.1	1451	264	.66	408	21.2	24.7	26.4	28.1	29.8	31.6	35.0
	-18°C	0	82.1	1276	246	.620	383	22.2	26.1	28.1	30.0	32.0	34.0	37.9
		-2	79.7	1156	234	.590	365	22.9	27.2	29.4	31.6	33.7	35.9	40.2
		-4	77.3	1052	221	.560	346	23.4	28.2	30.6	32.9	35.3	37.7	42.4
		-5	(2) 75.7	984	210	.53	329	23.3	28.4	30.9	33.4	36.0	38.5	43.6
	ISA+10°C	-6	(1) 87.0	1635	281	.70	424	19.8	22.9	24.4	25.9	27.4	29.0	32.0
	-28°C	-9	82.6	1369	259	.650	394	21.5	25.1	26.9	28.8	30.6	32.4	36.1
		-12	79.8	1207	242	.610	370	22.4	26.5	28.6	30.6	32.7	34.8	38.9
		-14	76.6	1060	225	.570	346	23.2	27.9	30.3	32.6	35.0	37.3	42.1
		-16	(2) 74.3	965	210	.53	323	23.1	28.3	30.9	33.5	36.1	38.7	43.8
	ISA+ 0°C	-15	(1) 88.1	1810	292	.73	431	18.3	21.0	22.4	23.8	25.2	26.6	29.3
	-38°C	-19	82.6	1430	268	.670	397	20.8	24.3	26.0	27.8	29.5	31.3	34.8
		-21	79.6	1256	251	.630	374	21.8	25.8	27.8	29.8	31.8	33.7	37.7
		-24	75.9	1070	230	.580	344	22.8	27.5	29.8	32.2	34.5	36.9	41.5
		-26	(2) 72.9	948	211	.53	317	22.9	28.2	30.8	33.5	36.1	38.7	44.0
	ISA-10°C	-26	(1) 86.3	1766	292	.73	422	18.2	21.0	22.5	23.9	25.3	26.7	29.5
	-48°C	-30	80.9	1396	268	.670	389	20.7	24.3	26.0	27.8	29.6	31.4	35.0
		-32	78.0	1228	251	.630	366	21.6	25.7	27.7	29.8	31.8	33.9	37.9
		-34	74.3	1047	230	.580	337	22.6	27.4	29.8	32.2	34.6	36.9	41.7
		-37	(2) 71.5	930	211	.53	311	22.7	28.0	30.7	33.4	36.1	38.8	44.2

Figure 7-14 Cruise (Sheet 17)

CRUISE
27,000 FEET

ANTI-ICE SYSTEMS OFF **TWO ENGINES**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
14000.	ISA+20°C	2	(1) 85.0	1452	265	.66	411	21.4	24.8	26.6	28.3	30.0	31.7	35.2
	-18°C	0	81.6	1255	246	.620	383	22.6	26.6	28.6	30.6	32.5	34.5	38.5
		-2	79.2	1135	234	.590	365	23.3	27.8	30.0	32.2	34.4	36.6	41.0
		-4	76.2	1008	217	.550	340	23.8	28.8	31.3	33.8	36.3	38.7	43.7
		-6	(2) 74.3	931	204	.52	320	23.6	29.0	31.7	34.4	37.1	39.8	45.1
	ISA+10°C	-6	(1) 86.9	1635	282	.70	425	19.9	22.9	24.5	26.0	27.5	29.1	32.1
	-28°C	-9	82.2	1348	259	.650	394	21.8	25.5	27.3	29.2	31.1	32.9	36.6
		-12	79.3	1186	242	.610	370	22.7	26.9	29.1	31.2	33.3	35.4	39.6
		-14	75.4	1011	221	.560	340	23.7	28.6	31.1	33.6	36.1	38.5	43.5
		-16	(2) 72.9	915	204	.52	315	23.5	28.9	31.7	34.4	37.1	39.9	45.3
	ISA+ 0°C	-15	(1) 87.9	1795	292	.73	431	18.4	21.2	22.6	24.0	25.4	26.8	29.6
	-38°C	-19	82.2	1412	268	.670	397	21.1	24.6	26.4	28.1	29.9	31.7	35.2
		-22	78.5	1199	246	.620	368	22.4	26.5	28.6	30.7	32.8	34.9	39.0
		-24	74.6	1018	225	.570	338	23.4	28.3	30.8	33.2	35.7	38.1	43.1
		-27	(2) 71.5	898	205	.52	309	23.2	28.8	31.6	34.4	37.2	39.9	45.5
	ISA-10°C	-26	(1) 86.1	1751	292	.73	422	18.4	21.2	22.7	24.1	25.5	26.9	29.8
	-48°C	-30	80.5	1379	268	.670	389	20.9	24.6	26.4	28.2	30.0	31.8	35.4
		-32	76.9	1172	246	.620	360	22.2	26.4	28.6	30.7	32.8	35.0	39.2
		-35	73.0	997	225	.570	331	23.2	28.2	30.7	33.2	35.7	38.2	43.2
		-37	(2) 70.1	881	205	.52	302	23.0	28.7	31.5	34.3	37.2	40.0	45.7
13000.	ISA+20°C	3	(1) 85.0	1451	267	.67	412	21.5	25.0	26.7	28.4	30.1	31.9	35.3
	-18°C	0	81.2	1236	246	.620	383	22.9	27.0	29.0	31.0	33.0	35.1	39.1
		-3	77.8	1078	230	.580	359	24.0	28.6	31.0	33.3	35.6	37.9	42.6
		-5	75.0	965	213	.540	334	24.3	29.5	32.0	34.6	37.2	39.8	45.0
		-6	(2) 72.8	881	198	.50	312	24.0	29.7	32.5	35.4	38.2	41.1	46.7
	ISA+10°C	-6	(1) 86.8	1632	282	.70	426	20.0	23.1	24.6	26.1	27.6	29.2	32.2
	-28°C	-9	81.9	1332	259	.650	394	22.0	25.8	27.7	29.6	31.4	33.3	37.1
		-12	78.1	1129	238	.600	364	23.4	27.8	30.0	32.2	34.4	36.7	41.1
		-15	74.2	969	217	.550	334	24.1	29.3	31.9	34.4	37.0	39.6	44.8
		-17	(2) 71.5	866	199	.51	306	23.8	29.6	32.5	35.4	38.3	41.2	46.9
	ISA+ 0°C	-15	(1) 87.7	1780	292	.73	431	18.6	21.4	22.8	24.2	25.6	27.0	29.8
	-38°C	-19	81.9	1397	268	.670	397	21.3	24.9	26.6	28.4	30.2	32.0	35.6
		-22	77.4	1142	242	.610	362	22.9	27.3	29.5	31.7	33.9	36.1	40.4
		-25	73.4	973	221	.560	333	23.9	29.0	31.6	34.2	36.7	39.3	44.5
		-27	(2) 70.1	850	199	.51	300	23.6	29.5	32.4	35.4	38.3	41.2	47.1
	ISA-10°C	-26	(1) 85.9	1737	292	.73	422	18.5	21.4	22.8	24.3	25.7	27.2	30.0
	-48°C	-30	80.2	1365	268	.670	389	21.2	24.8	26.6	28.5	30.3	32.1	35.8
		-33	75.8	1118	242	.610	354	22.8	27.2	29.5	31.7	33.9	36.2	40.6
		-35	71.9	953	221	.560	325	23.7	28.9	31.5	34.1	36.8	39.4	44.6
		-38	(2) 68.7	834	199	.51	294	23.3	29.3	32.3	35.3	38.3	41.3	47.3
12000.	ISA+20°C	3	(1) 84.9	1453	268	.67	414	21.6	25.1	26.8	28.5	30.2	31.9	35.4
	-18°C	0	80.8	1219	246	.620	383	23.2	27.3	29.4	31.4	33.5	35.5	39.6
		-3	77.3	1061	230	.580	359	24.4	29.1	31.4	33.8	36.2	38.5	43.2
		-5	73.9	923	209	.530	328	24.7	30.1	32.8	35.5	38.2	41.0	46.4
		-7	(2) 71.1	827	191	.49	302	24.4	30.4	33.4	36.5	39.5	42.5	48.5
	ISA+10°C	-6	(1) 86.8	1632	283	.71	427	20.1	23.1	24.7	26.2	27.7	29.3	32.3
	-28°C	-9	81.6	1318	259	.650	394	22.3	26.1	28.0	29.9	31.8	33.7	37.5
		-13	76.7	1074	234	.590	358	24.0	28.6	31.0	33.3	35.6	38.0	42.6
		-15	73.1	928	213	.540	327	24.5	29.9	32.6	35.3	38.0	40.7	46.1
		-18	(2) 69.9	813	192	.49	296	24.1	30.3	33.4	36.4	39.5	42.6	48.7
	ISA+ 0°C	-15	(1) 87.5	1767	292	.73	431	18.7	21.6	23.0	24.4	25.8	27.2	30.0
	-38°C	-19	80.8	1334	263	.660	391	21.8	25.6	27.5	29.3	31.2	33.1	36.8
		-23	76.1	1088	238	.600	356	23.6	28.1	30.4	32.7	35.0	37.3	41.9
		-25	72.3	933	217	.550	327	24.3	29.7	32.3	35.0	37.7	40.4	45.7
		-28	(2) 68.5	799	192	.49	291	23.9	30.1	33.3	36.4	39.5	42.7	48.9
	ISA-10°C	-26	(1) 85.7	1724	292	.73	422	18.7	21.6	23.0	24.5	25.9	27.4	30.3
	-48°C	-30	79.1	1304	263	.660	383	21.7	25.5	27.5	29.4	31.3	33.2	37.0
		-33	75.4	1102	242	.610	354	23.1	27.6	29.9	32.2	34.4	36.7	41.2
		-36	70.8	914	217	.550	320	24.0	29.5	32.2	35.0	37.7	40.4	45.9
		-38	(2) 67.2	786	193	.49	285	23.6	30.0	33.1	36.3	39.5	42.7	49.1

(1) MAXIMUM CRUISE THRUST

(2) THRUST FOR MAXIMUM RANGE (APPROXIMATE)

ANTI-ICE SYSTEMS ON		
MAX. FAN %RPM		
-28°C	-38°C	-48°C
83.8	85.7	86.6
INCREASE FUEL FLOWS AND DECREASE SPECIFIC RANGES BY 10%		

Figure 7-14 Cruise (Sheet 18)

CRUISE
29,000 FEET

ANTI-ICE SYSTEMS OFF | **TWO ENGINES**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
								NAUTICAL MILES/100 LBS. FUEL						
16500.	ISA+20°C -22°C	-2	(1) 85.7	1382	252	.66	404	22.0	25.6	27.4	29.2	31.0	32.8	36.5
		-4	83.7	1268	240	.630	386	22.6	26.5	28.5	30.5	32.4	34.4	38.4
		-6	81.6	1157	228	.600	368	23.2	27.5	29.6	31.8	34.0	36.1	40.4
		-7	79.6	1060	216	.570	350	23.6	28.3	30.6	33.0	35.4	37.7	42.4
		-8	(2) 78.4	1007	207	.55	337	23.5	28.5	31.0	33.5	35.9	38.4	43.4
	ISA+10°C -32°C	-10	(1) 87.5	1562	270	.70	422	20.6	23.8	25.4	27.0	28.6	30.2	33.4
		-13	84.1	1353	252	.660	396	21.9	25.6	27.4	29.3	31.1	33.0	36.7
		-15	81.4	1204	236	.620	373	22.7	26.8	28.9	31.0	33.0	35.1	39.3
		-17	79.3	1095	224	.590	355	23.3	27.8	30.1	32.4	34.7	37.0	41.5
		-19	(2) 76.9	988	208	.55	331	23.4	28.4	31.0	33.5	36.0	38.6	43.6
	ISA+ 0°C -42°C	-19	(1) 89.2	1773	284	.74	432	18.7	21.6	23.0	24.4	25.8	27.2	30.0
		-22	84.8	1454	264	.690	405	21.0	24.4	26.2	27.9	29.6	31.3	34.8
		-25	81.1	1245	244	.640	376	22.2	26.2	28.2	30.2	32.3	34.3	38.3
		-27	77.7	1070	224	.590	347	23.1	27.8	30.1	32.4	34.8	37.1	41.8
		-29	(2) 75.5	970	209	.55	325	23.2	28.4	30.9	33.5	36.1	38.7	43.8
	ISA-10°C -52°C	-29	(1) 90.9	1908	291	.75	433	17.5	20.1	21.4	22.7	24.0	25.3	27.9
		-32	83.8	1472	268	.700	402	20.5	23.9	25.6	27.3	29.0	30.7	34.1
		-35	80.1	1252	248	.650	374	21.9	25.9	27.9	29.9	31.9	33.9	37.8
		-38	76.8	1081	228	.600	345	22.7	27.3	29.7	32.0	34.3	36.6	41.2
		-40	(2) 73.9	950	209	.55	318	23.0	28.2	30.9	33.5	36.1	38.8	44.0
16000.	ISA+20°C -22°C	-2	(1) 85.7	1383	253	.66	406	22.1	25.7	27.5	29.3	31.2	33.0	36.6
		-4	83.4	1255	240	.630	386	22.8	26.8	28.8	30.8	32.8	34.8	38.8
		-6	81.3	1147	228	.600	368	23.4	27.7	29.9	32.1	34.3	36.5	40.8
		-7	79.2	1047	216	.570	350	23.9	28.6	31.0	33.4	35.8	38.2	43.0
		-9	(2) 77.7	982	205	.54	334	23.8	28.9	31.4	34.0	36.5	39.1	44.2
	ISA+10°C -32°C	-10	(1) 87.5	1562	270	.70	423	20.7	23.9	25.5	27.1	28.7	30.3	33.5
		-13	83.9	1341	252	.660	396	22.1	25.8	27.7	29.6	31.4	33.3	37.0
		-15	81.1	1190	236	.620	373	22.9	27.1	29.2	31.3	33.4	35.5	39.7
		-17	78.3	1051	220	.580	349	23.7	28.4	30.8	33.2	35.6	37.9	42.7
		-19	(2) 76.2	963	206	.54	327	23.6	28.8	31.4	34.0	36.6	39.2	44.4
	ISA+ 0°C -42°C	-19	(1) 89.2	1774	284	.74	433	18.8	21.6	23.0	24.4	25.8	27.2	30.0
		-23	83.7	1395	260	.680	400	21.5	25.1	26.9	28.7	30.4	32.2	35.8
		-25	80.8	1232	244	.640	376	22.4	26.5	28.5	30.5	32.6	34.6	38.7
		-27	77.4	1059	224	.590	347	23.4	28.1	30.4	32.8	35.2	37.5	42.2
		-30	(2) 74.7	943	206	.54	321	23.4	28.7	31.4	34.0	36.7	39.3	44.6
	ISA-10°C -52°C	-29	(1) 90.8	1903	291	.76	433	17.5	20.1	21.5	22.8	24.1	25.4	28.0
		-32	83.6	1461	268	.700	402	20.7	24.1	25.8	27.5	29.2	30.9	34.4
		-35	79.8	1241	248	.650	374	22.1	26.1	28.1	30.1	32.2	34.2	38.2
		-38	75.8	1036	224	.590	340	23.1	28.0	30.4	32.8	35.2	37.6	42.5
		-40	(2) 73.2	925	206	.55	314	23.2	28.6	31.3	34.0	36.7	39.4	44.8
15500.	ISA+20°C -22°C	-2	(1) 85.7	1385	254	.67	408	22.2	25.8	27.6	29.4	31.2	33.1	36.7
		-4	83.1	1241	240	.630	386	23.1	27.1	29.1	31.1	33.1	35.2	39.2
		-6	81.0	1133	228	.600	368	23.7	28.1	30.3	32.5	34.7	36.9	41.3
		-7	78.9	1034	216	.570	350	24.2	29.0	31.4	33.8	36.3	38.7	43.5
		-9	(2) 77.0	956	203	.54	330	24.1	29.3	31.9	34.5	37.1	39.7	45.0
	ISA+10°C -32°C	-10	(1) 87.5	1559	271	.71	424	20.8	24.0	25.6	27.2	28.8	30.4	33.6
		-13	83.6	1329	252	.660	396	22.3	26.1	27.9	29.8	31.7	33.6	37.3
		-15	80.8	1177	236	.620	373	23.2	27.4	29.5	31.7	33.8	35.9	40.2
		-17	78.0	1039	220	.580	349	23.9	28.8	31.2	33.6	36.0	38.4	43.2
		-19	(2) 75.5	937	203	.54	324	23.9	29.2	31.9	34.6	37.2	39.9	45.2
	ISA+ 0°C -42°C	-19	(1) 89.2	1774	285	.74	434	18.8	21.6	23.0	24.4	25.8	27.3	30.1
		-23	83.5	1384	260	.680	400	21.7	25.3	27.1	28.9	30.7	32.5	36.1
		-25	79.9	1184	240	.630	371	22.9	27.1	29.2	31.3	33.4	35.5	39.7
		-27	77.1	1048	224	.590	347	23.6	28.4	30.8	33.2	35.5	37.9	42.7
		-30	(2) 74.0	918	203	.54	317	23.7	29.1	31.8	34.5	37.3	40.0	45.4
	ISA-10°C -52°C	-29	(1) 90.8	1904	292	.76	434	17.5	20.2	21.5	22.8	24.1	25.4	28.0
		-32	83.4	1451	268	.700	402	20.8	24.3	26.0	27.7	29.4	31.2	34.6
		-36	78.8	1192	244	.640	368	22.5	26.7	28.8	30.9	33.0	35.1	39.3
		-38	75.5	1025	224	.590	340	23.4	28.3	30.7	33.2	35.6	38.0	42.9
		-40	(2) 72.5	900	204	.54	311	23.4	29.0	31.7	34.5	37.3	40.1	45.6
15000.	ISA+20°C -22°C	-2	(1) 85.6	1386	255	.67	410	22.3	25.9	27.7	29.5	31.3	33.1	36.8
		-4	82.8	1229	240	.630	386	23.3	27.4	29.4	31.5	33.5	35.5	39.6
		-6	80.7	1120	228	.600	368	23.9	28.4	30.6	32.9	35.1	37.3	41.8
		-8	77.9	995	212	.560	344	24.5	29.5	32.0	34.5	37.0	39.6	44.6
		-9	(2) 76.4	936	201	.53	328	24.3	29.7	32.4	35.0	37.7	40.4	45.7
	ISA+10°C -32°C	-10	(1) 87.5	1560	272	.71	425	20.8	24.0	25.6	27.2	28.8	30.4	33.6
		-13	83.4	1318	252	.660	396	22.5	26.3	28.2	30.1	32.0	33.9	37.7
		-15	80.5	1164	236	.620	373	23.4	27.7	29.9	32.0	34.2	36.3	40.6
		-18	77.0	998	216	.570	343	24.3	29.3	31.8	34.3	36.8	39.4	44.4
		-20	(2) 74.9	917	202	.53	321	24.1	29.6	32.3	35.1	37.8	40.5	46.0
	ISA+ 0°C -42°C	-19	(1) 89.2	1775	285	.74	434	18.8	21.6	23.1	24.5	25.9	27.3	30.1
		-23	83.2	1373	260	.680	400	21.8	25.5	27.3	29.1	30.9	32.8	36.4
		-25	79.6	1172	240	.630	371	23.1	27.4	29.5	31.6	33.8	35.9	40.2
		-28	76.1	1004	220	.580	341	24.1	29.0	31.5	34.0	36.5	39.0	44.0
		-30	(2) 73.5	899	202	.53	315	23.9	29.5	32.3	35.0	37.8	40.6	46.2
	ISA-10°C -52°C	-29	(1) 90.6	1895	292	.76	434	17.6	20.3	21.6	22.9	24.2	25.5	28.2
		-32	83.3	1440	268	.700	402	21.0	24.5	26.2	27.9	29.7	31.4	34.9
		-36	78.6	1181	244	.640	368	22.7	26.9	29.1	31.2	33.3	35.4	39.7
		-38	75.2	1013	224	.590	340	23.7	28.6	31.1	33.5	36.0	38.5	43.4
		-41	(2) 71.9	879	202	.53	308	23.6	29.3	32.2	35.0	37.9	40.7	46.4

Figure 7-14 Cruise (Sheet 19)

CRUISE
29,000 FEET

ANTI-ICE SYSTEMS OFF **TWO ENGINES**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
14000.	ISA+20°C	-1	(1) 85.5	1384	257	.67	412	22.6	26.2	28.0	29.8	31.6	33.4	37.0
	-22°C	-4	82.3	1205	240	.630	386	23.8	27.9	30.0	32.1	34.1	36.2	40.4
		-6	80.1	1096	228	.600	368	24.5	29.0	31.3	33.6	35.9	38.2	42.7
		-7	77.7	994	216	.570	350	25.1	30.2	32.7	35.2	37.7	40.2	45.3
		-9	(2) 75.6	913	202	.54	329	25.1	30.6	33.3	36.1	38.8	41.5	47.0
	ISA+10°C	-10	(1) 87.5	1564	273	.71	427	20.9	24.1	25.7	27.3	28.9	30.5	33.7
	-32°C	-13	82.9	1296	252	.660	396	22.9	26.7	28.7	30.6	32.5	34.5	38.3
		-15	80.0	1142	236	.620	373	23.9	28.3	30.4	32.6	34.8	37.0	41.4
		-17	77.0	1003	220	.580	349	24.8	29.8	32.3	34.8	37.3	39.7	44.7
		-19	(2) 74.3	897	203	.54	324	24.9	30.5	33.3	36.1	38.9	41.7	47.2
	ISA+ 0°C	-19	(1) 89.2	1777	286	.74	435	18.9	21.7	23.1	24.5	25.9	27.3	30.1
	-42°C	-22	83.7	1402	264	.690	405	21.8	25.4	27.1	28.9	30.7	32.5	36.1
		-25	79.8	1186	244	.640	376	23.3	27.5	29.6	31.7	33.8	36.0	40.2
		-27	76.3	1013	224	.590	347	24.4	29.3	31.8	34.3	36.7	39.2	44.1
		-30	(2) 72.8	881	204	.54	318	24.7	30.4	33.2	36.1	38.9	41.7	47.4
	ISA-10°C	-29	(1) 90.3	1877	292	.76	434	17.8	20.5	21.8	23.1	24.5	25.8	28.4
	-52°C	-32	82.9	1422	268	.700	402	21.3	24.8	26.5	28.3	30.0	31.8	35.3
		-36	78.1	1159	244	.640	368	23.1	27.4	29.6	31.8	33.9	36.1	40.4
		-38	74.7	991	224	.590	340	24.2	29.2	31.7	34.3	36.8	39.3	44.4
		-40	(2) 71.3	863	204	.54	311	24.4	30.2	33.1	36.0	38.9	41.8	47.6
13000.	ISA+20°C	-1	(1) 85.5	1387	259	.68	415	22.7	26.3	28.1	29.9	31.7	33.5	37.1
	-22°C	-4	81.8	1185	240	.630	386	24.2	28.4	30.5	32.6	34.7	36.8	41.0
		-6	79.6	1074	228	.600	368	25.0	29.6	31.9	34.3	36.6	38.9	43.6
		-8	76.4	946	212	.560	344	25.8	31.1	33.7	36.4	39.0	41.6	46.9
		-10	(2) 74.1	861	196	.52	320	25.6	31.4	34.3	37.2	40.1	43.0	48.8
	ISA+10°C	-10	(1) 87.4	1561	274	.71	428	21.0	24.2	25.8	27.4	29.0	30.6	33.8
	-32°C	-13	82.4	1275	252	.660	396	23.3	27.2	29.1	31.1	33.1	35.0	38.9
		-16	78.8	1085	232	.610	367	24.6	29.2	31.5	33.8	36.1	38.4	43.0
		-18	75.6	952	216	.570	343	25.5	30.7	33.4	36.0	38.6	41.2	46.5
		-20	(2) 72.7	845	197	.52	314	25.3	31.3	34.2	37.2	40.1	43.1	49.0
	ISA+ 0°C	-19	(1) 89.2	1777	287	.74	436	18.9	21.7	23.1	24.6	26.0	27.4	30.2
	-42°C	-23	82.5	1336	260	.680	400	22.4	26.2	28.1	29.9	31.8	33.7	37.4
		-25	78.6	1131	240	.630	371	23.9	28.3	30.6	32.8	35.0	37.2	41.6
		-28	74.9	962	220	.580	341	25.1	30.3	32.9	35.5	38.1	40.7	45.9
		-31	(2) 71.3	830	197	.52	308	25.1	31.1	34.1	37.1	40.2	43.2	49.2
	ISA-10°C	-29	(1) 90.0	1861	292	.76	434	18.0	20.6	22.0	23.3	24.7	26.0	28.7
	-52°C	-33	81.6	1353	264	.690	397	21.9	25.6	27.5	29.3	31.2	33.0	36.7
		-36	77.6	1140	244	.640	368	23.5	27.9	30.1	32.3	34.5	36.7	41.1
		-39	73.3	941	220	.580	334	24.9	30.2	32.8	35.5	38.1	40.8	46.1
		-41	(2) 69.9	814	198	.52	302	24.8	30.9	34.0	37.1	40.2	43.2	49.4
12000.	ISA+20°C	-1	(1) 85.5	1387	260	.68	417	22.8	26.4	28.2	30.0	31.9	33.7	37.3
	-22°C	-4	81.4	1167	240	.630	386	24.5	28.8	31.0	33.1	35.3	37.4	41.7
		-6	78.2	1019	224	.590	362	25.7	30.6	33.1	35.5	38.0	40.4	45.3
		-8	75.2	904	208	.550	338	26.3	31.8	34.6	37.3	40.1	42.9	48.4
		-10	(2) 72.5	810	190	.51	311	26.0	32.2	35.2	38.3	41.4	44.5	50.7
	ISA+10°C	-10	(1) 87.4	1560	275	.72	429	21.1	24.3	25.9	27.5	29.1	30.7	33.9
	-32°C	-13	82.1	1258	252	.660	396	23.6	27.5	29.5	31.5	33.5	35.5	39.4
		-16	78.3	1067	232	.610	367	25.0	29.7	32.0	34.4	36.7	39.1	43.7
		-18	74.4	908	212	.560	337	26.1	31.6	34.3	37.1	39.8	42.6	48.1
		-21	(2) 71.2	796	191	.51	305	25.8	32.0	35.2	38.3	41.5	44.6	50.9
	ISA+ 0°C	-19	(1) 89.2	1781	287	.75	438	18.9	21.8	23.2	24.6	26.0	27.4	30.2
	-42°C	-23	82.1	1321	260	.680	400	22.7	26.5	28.4	30.2	32.1	34.0	37.8
		-26	77.5	1078	236	.620	365	24.6	29.2	31.5	33.8	36.2	38.5	43.1
		-29	72.9	889	212	.560	330	25.8	31.5	34.3	37.1	39.9	42.7	48.3
		-31	(2) 69.8	781	191	.51	299	25.5	31.9	35.1	38.3	41.5	44.7	51.1
	ISA-10°C	-29	(1) 89.7	1845	292	.76	434	18.1	20.8	22.2	23.5	24.9	26.2	28.9
	-52°C	-33	81.3	1339	264	.690	397	22.2	25.9	27.8	29.6	31.5	33.4	37.1
		-36	76.6	1090	240	.630	363	24.1	28.7	31.0	33.3	35.6	37.9	42.4
		-39	72.0	896	216	.570	328	25.5	31.1	33.8	36.6	39.4	42.2	47.8
		-42	(2) 68.4	767	192	.51	293	25.2	31.7	35.0	38.2	41.5	44.7	51.3

(1) MAXIMUM CRUISE THRUST

(2) THRUST FOR MAXIMUM RANGE (APPROXIMATE)

ANTI-ICE SYSTEMS ON		
MAX. FAN %RPM		
-32°C	-42°C	-52°C
84.2	86.0	87.7
INCREASE FUEL FLOWS AND DECREASE SPECIFIC RANGES BY 10%		

Figure 7-14 Cruise (Sheet 20)

CRUISE
31,000 FEET

ANTI-ICE SYSTEMS OFF — **TWO ENGINES**

WT. LBS.	TEMP	RAT DEG. C		FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
16500.	ISA+20°C	-6	(1)	86.2	1309	242	.66	403	23.1	27.0	28.9	30.8	32.7	34.6	38.4
	-26°C	-8		83.9	1191	229	.630	383	23.8	28.0	30.1	32.2	34.3	36.4	40.6
		-9		82.5	1121	222	.610	371	24.2	28.7	30.9	33.1	35.3	37.6	42.0
		-10		81.1	1056	214	.590	359	24.5	29.3	31.6	34.0	36.4	38.7	43.5
		-12	(2)	79.6	988	204	.56	344	24.7	29.7	32.3	34.8	37.3	39.9	44.9
	ISA+10°C	-14	(1)	88.0	1494	261	.71	422	21.6	24.9	26.6	28.3	29.9	31.6	35.0
	-36°C	-17		85.0	1305	245	.670	399	22.9	26.7	28.7	30.6	32.5	34.4	38.2
		-19		82.3	1163	229	.630	375	23.7	28.0	30.1	32.3	34.4	36.6	40.9
		-21		80.2	1061	218	.600	358	24.3	29.0	31.4	33.7	36.1	38.4	43.1
		-22	(2)	78.1	966	204	.56	337	24.5	29.7	32.3	34.9	37.5	40.1	45.2
	ISA+ 0°C	-23	(1)	89.7	1656	272	.74	430	19.9	23.0	24.5	26.0	27.5	29.0	32.0
	-46°C	-26		84.7	1357	253	.690	402	22.3	25.9	27.8	29.6	31.5	33.3	37.0
		-29		81.9	1202	237	.650	379	23.2	27.4	29.5	31.5	33.6	35.7	39.9
		-31		79.2	1069	222	.610	356	23.9	28.6	31.0	33.3	35.6	38.0	42.6
		-33	(2)	76.5	946	205	.57	330	24.3	29.6	32.3	34.9	37.5	40.2	45.5
	ISA-10°C	-33	(1)	90.7	1771	279	.76	430	18.6	21.5	22.9	24.3	25.7	27.1	29.9
	-56°C	-37		83.6	1370	257	.700	399	21.8	25.4	27.3	29.1	30.9	32.7	36.4
		-39		80.8	1207	241	.660	376	22.9	27.0	29.1	31.2	33.2	35.3	39.5
		-41		77.5	1045	222	.610	348	23.7	28.5	30.9	33.3	35.7	38.1	42.9
		-43	(2)	74.9	925	205	.57	323	24.1	29.5	32.2	34.9	37.6	40.3	45.7
16000.	ISA+20°C	-6	(1)	86.1	1310	244	.67	405	23.3	27.1	29.0	30.9	32.8	34.7	38.6
	-26°C	-8		84.3	1214	233	.640	389	23.8	28.0	30.0	32.1	34.1	36.2	40.3
		-9		82.2	1110	222	.610	371	24.4	28.9	31.2	33.5	35.7	38.0	42.5
		-11		80.2	1016	210	.580	353	24.9	29.9	32.3	34.8	37.2	39.7	44.6
		-12	(2)	79.1	965	203	.56	341	25.0	30.2	32.8	35.4	37.9	40.5	45.7
	ISA+10°C	-14	(1)	87.9	1490	261	.71	423	21.7	25.0	26.7	28.4	30.1	31.7	35.1
	-36°C	-17		84.7	1292	245	.670	399	23.1	27.0	28.9	30.9	32.8	34.7	38.6
		-19		82.0	1152	229	.630	375	23.9	28.2	30.4	32.6	34.8	36.9	41.3
		-21		79.9	1050	218	.600	358	24.5	29.3	31.7	34.1	36.5	38.8	43.6
		-22	(2)	77.6	946	203	.56	335	24.8	30.1	32.8	35.4	38.0	40.7	46.0
	ISA+ 0°C	-23	(1)	89.7	1659	273	.74	431	20.0	23.0	24.5	26.0	27.5	29.0	32.0
	-46°C	-26		84.5	1345	253	.690	402	22.5	26.2	28.0	29.9	31.7	33.6	37.3
		-29		81.6	1189	237	.650	379	23.5	27.7	29.8	31.9	34.0	36.1	40.3
		-31		78.2	1026	218	.600	350	24.4	29.3	31.7	34.1	36.6	39.0	43.9
		-33	(2)	76.0	926	203	.56	328	24.6	30.0	32.7	35.4	38.1	40.8	46.2
	ISA-10°C	-33	(1)	90.6	1762	279	.76	430	18.7	21.6	23.0	24.4	25.8	27.2	30.1
	-56°C	-37		83.4	1359	257	.700	399	22.0	25.7	27.5	29.3	31.2	33.0	36.7
		-39		79.9	1161	237	.650	371	23.3	27.6	29.8	31.9	34.1	36.2	40.5
		-41		77.3	1035	222	.610	348	24.0	28.8	31.2	33.6	36.1	38.5	43.3
		-44	(2)	74.4	907	203	.56	321	24.4	29.9	32.7	35.4	38.2	40.9	46.4
15500.	ISA+20°C	-6	(1)	86.1	1310	245	.67	407	23.4	27.3	29.2	31.1	33.0	34.9	38.7
	-26°C	-8		84.0	1200	233	.640	389	24.1	28.3	30.4	32.4	34.5	36.6	40.8
		-9		81.9	1099	222	.610	371	24.7	29.2	31.5	33.8	36.1	38.3	42.9
		-11		79.8	1003	210	.580	353	25.2	30.2	32.7	35.2	37.7	40.2	45.2
		-12	(2)	78.4	940	200	.55	338	25.3	30.6	33.3	35.9	38.6	41.2	46.6
	ISA+10°C	-14	(1)	87.9	1493	262	.71	424	21.7	25.1	26.8	28.4	30.1	31.8	35.1
	-36°C	-17		84.4	1280	245	.670	399	23.4	27.3	29.2	31.2	33.1	35.1	39.0
		-19		81.7	1139	229	.630	375	24.2	28.6	30.8	33.0	35.2	37.4	41.8
		-21		78.9	1007	214	.590	352	25.0	30.0	32.4	34.9	37.4	39.9	44.8
		-23	(2)	77.0	923	201	.56	332	25.1	30.5	33.3	36.0	38.7	41.4	46.8
	ISA+ 0°C	-23	(1)	89.7	1661	273	.74	432	20.0	23.0	24.5	26.0	27.5	29.0	32.0
	-46°C	-26		84.3	1332	253	.690	402	22.7	26.4	28.3	30.2	32.0	33.9	37.7
		-29		81.3	1177	237	.650	379	23.7	28.0	30.1	32.2	34.3	36.4	40.7
		-31		78.0	1015	218	.600	350	24.6	29.6	32.0	34.5	37.0	39.4	44.3
		-33	(2)	75.5	906	202	.56	326	24.9	30.4	33.2	36.0	38.7	41.5	47.0
	ISA-10°C	-33	(1)	90.5	1753	279	.76	430	18.8	21.7	23.1	24.5	26.0	27.4	30.2
	-56°C	-37		83.2	1348	257	.700	399	22.2	25.9	27.7	29.6	31.4	33.3	37.0
		-39		79.6	1149	237	.650	371	23.5	27.9	30.1	32.2	34.4	36.6	40.9
		-42		76.3	992	218	.600	342	24.4	29.5	32.0	34.5	37.0	39.5	44.6
		-44	(2)	73.9	888	202	.56	319	24.7	30.3	33.1	35.9	38.7	41.6	47.2
15000.	ISA+20°C	-6	(1)	86.0	1312	246	.67	409	23.6	27.4	29.3	31.2	33.1	35.0	38.8
	-26°C	-8		83.7	1187	233	.640	389	24.4	28.6	30.7	32.8	34.9	37.0	41.2
		-9		81.7	1088	222	.610	371	24.9	29.5	31.8	34.1	36.4	38.7	43.3
		-11		79.5	990	210	.580	353	25.6	30.6	33.2	35.7	38.2	40.7	45.8
		-13	(2)	77.7	916	198	.55	334	25.6	31.0	33.8	36.5	39.2	42.0	47.4
	ISA+10°C	-14	(1)	87.9	1491	263	.71	425	21.8	25.2	26.8	28.5	30.2	31.9	35.2
	-36°C	-17		84.1	1268	245	.670	399	23.6	27.5	29.5	31.5	33.4	35.4	39.4
		-19		81.4	1125	229	.630	375	24.5	28.9	31.1	33.4	35.6	37.8	42.3
		-21		78.6	996	214	.590	352	25.3	30.3	32.8	35.3	37.8	40.4	45.4
		-23	(2)	76.2	897	199	.55	328	25.4	31.0	33.8	36.6	39.3	42.1	47.7
	ISA+ 0°C	-23	(1)	89.6	1659	274	.74	432	20.0	23.0	24.5	26.0	27.6	29.1	32.1
	-46°C	-26		84.0	1321	253	.690	402	22.9	26.6	28.5	30.4	32.3	34.2	38.0
		-29		80.4	1131	233	.640	373	24.2	28.6	30.8	33.0	35.2	37.4	41.8
		-31		77.7	1005	218	.600	350	24.9	29.9	32.4	34.8	37.3	39.8	44.8
		-34	(2)	74.7	880	199	.55	322	25.2	30.9	33.7	36.5	39.4	42.2	47.9
	ISA-10°C	-33	(1)	90.3	1744	279	.76	430	18.9	21.8	23.2	24.7	26.1	27.5	30.4
	-56°C	-37		83.0	1337	257	.700	399	22.3	26.1	27.9	29.8	31.7	33.6	37.3
		-39		79.3	1138	237	.650	371	23.8	28.2	30.4	32.6	34.8	37.0	41.4
		-42		76.0	982	218	.600	342	24.7	29.8	32.3	34.8	37.4	39.9	45.0
		-44	(2)	73.2	863	200	.55	315	24.9	30.7	33.6	36.5	39.4	42.3	48.1

Figure 7-14 Cruise (Sheet 21)

CRUISE
31,000 FEET

ANTI-ICE SYSTEMS OFF **TWO ENGINES**

WT. LBS.	TEMP	RAT DEG. C		FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
14000.	ISA+20°C	-5	(1)	85.9	1312	248	.68	412	23.8	27.6	29.5	31.4	33.3	35.2	39.1
	-26°C	-8		83.0	1161	233	.640	389	24.9	29.2	31.4	33.5	35.7	37.8	42.1
		-10		80.3	1028	218	.600	365	25.8	30.7	33.1	35.5	38.0	40.4	45.3
		-11		78.1	938	206	.570	347	26.3	31.7	34.3	37.0	39.7	42.3	47.7
		-13	(2)	76.2	865	194	.54	327	26.2	32.0	34.9	37.7	40.6	43.5	49.3
	ISA+10°C	-14	(1)	87.8	1493	264	.72	427	21.9	25.3	26.9	28.6	30.3	32.0	35.3
	-36°C	-17		83.6	1245	245	.670	399	24.0	28.0	30.0	32.0	34.1	36.1	40.1
		-19		80.0	1067	226	.620	370	25.3	29.9	32.3	34.6	37.0	39.3	44.0
		-22		77.3	943	210	.580	346	26.1	31.4	34.0	36.7	39.4	42.0	47.3
		-24	(2)	74.7	848	194	.54	320	26.0	31.9	34.8	37.8	40.7	43.7	49.6
	ISA+ 0°C	-23	(1)	89.6	1661	275	.75	433	20.1	23.1	24.6	26.1	27.6	29.1	32.1
	-46°C	-26		83.5	1300	253	.690	402	23.2	27.1	29.0	30.9	32.8	34.8	38.6
		-29		79.7	1107	233	.640	373	24.7	29.2	31.5	33.7	36.0	38.2	42.8
		-32		76.4	951	214	.590	344	25.7	31.0	33.6	36.2	38.8	41.5	46.7
		-34	(2)	73.3	832	194	.54	314	25.7	31.7	34.7	37.8	40.8	43.8	49.8
	ISA-10°C	-33	(1)	90.0	1725	279	.76	430	19.1	22.0	23.5	24.9	26.4	27.8	30.7
	-56°C	-37		82.6	1316	257	.700	399	22.7	26.5	28.4	30.3	32.2	34.1	37.9
		-40		78.0	1081	233	.640	365	24.5	29.1	31.4	33.7	36.1	38.4	43.0
		-42		74.7	930	214	.590	337	25.5	30.8	33.5	36.2	38.9	41.6	47.0
		-45	(2)	71.7	814	194	.54	307	25.4	31.6	34.6	37.7	40.8	43.8	50.0
13000.	ISA+20°C	-5	(1)	85.9	1313	250	.68	416	24.0	27.8	29.7	31.6	33.5	35.5	39.3
	-26°C	-8		82.4	1137	233	.640	389	25.5	29.9	32.1	34.2	36.4	38.6	43.0
		-9		80.3	1036	222	.610	371	26.2	31.0	33.4	35.8	38.2	40.7	45.5
		-11		77.2	910	206	.570	347	27.1	32.6	35.4	38.1	40.9	43.6	49.1
		-13	(2)	75.4	844	195	.54	329	27.1	33.0	36.0	39.0	41.9	44.9	50.8
	ISA+10°C	-14	(1)	87.8	1491	265	.72	429	22.0	25.4	27.1	28.7	30.4	32.1	35.4
	-36°C	-17		83.1	1224	245	.670	399	24.4	28.5	30.6	32.6	34.7	36.7	40.8
		-19		80.1	1076	229	.630	375	25.6	30.2	32.6	34.9	37.2	39.5	44.2
		-22		76.5	919	210	.580	346	26.8	32.2	34.9	37.6	40.4	43.1	48.5
		-23	(2)	74.1	830	196	.54	323	26.9	33.0	36.0	39.0	42.0	45.0	51.0
	ISA+ 0°C	-23	(1)	89.6	1664	276	.75	435	20.1	23.1	24.6	26.1	27.6	29.1	32.1
	-46°C	-26		83.1	1279	253	.690	402	23.6	27.5	29.5	31.4	33.4	35.3	39.2
		-29		79.2	1084	233	.640	373	25.2	29.8	32.1	34.4	36.7	39.0	43.7
		-32		75.7	928	214	.590	344	26.3	31.7	34.4	37.1	39.8	42.5	47.9
		-34	(2)	72.6	814	196	.54	317	26.7	32.8	35.9	39.0	42.0	45.1	51.2
	ISA-10°C	-33	(1)	89.6	1707	279	.76	430	19.3	22.3	23.7	25.2	26.7	28.1	31.0
	-56°C	-37		82.2	1296	257	.700	399	23.0	26.9	28.8	30.7	32.7	34.6	38.5
		-39		78.2	1093	237	.650	371	24.7	29.3	31.6	33.9	36.2	38.5	43.0
		-42		74.1	907	214	.590	337	26.1	31.6	34.3	37.1	39.9	42.6	48.1
		-44	(2)	71.1	799	197	.54	311	26.4	32.6	35.8	38.9	42.0	45.1	51.4
12000.	ISA+20°C	-5	(1)	85.9	1317	252	.69	418	24.2	28.0	29.9	31.8	33.7	35.6	39.4
	-26°C	-8		81.9	1115	233	.640	389	25.9	30.4	32.7	34.9	37.1	39.4	43.9
		-10		79.0	981	218	.600	365	27.0	32.1	34.7	37.2	39.8	42.3	47.4
		-12		75.9	864	203	.560	341	27.9	33.7	36.6	39.5	42.4	45.2	51.0
		-14	(2)	73.8	794	189	.52	320	27.7	34.0	37.1	40.3	43.4	46.5	52.8
	ISA+10°C	-13	(1)	87.8	1494	266	.72	430	22.1	25.5	27.1	28.8	30.5	32.1	35.5
	-36°C	-17		82.6	1203	245	.670	399	24.8	29.0	31.1	33.2	35.2	37.3	41.5
		-19		78.9	1024	226	.620	370	26.3	31.2	33.7	36.1	38.5	41.0	45.9
		-22		75.1	870	206	.570	340	27.6	33.3	36.2	39.1	41.9	44.8	50.6
		-24	(2)	72.5	779	190	.53	314	27.4	33.8	37.0	40.3	43.5	46.7	53.1
	ISA+ 0°C	-23	(1)	89.6	1667	276	.75	436	20.2	23.2	24.7	26.2	27.7	29.2	32.2
	-46°C	-26		82.7	1262	253	.690	402	23.9	27.9	29.9	31.8	33.8	35.8	39.8
		-30		78.0	1032	229	.630	367	25.9	30.8	33.2	35.6	38.0	40.4	45.3
		-32		74.3	878	210	.580	339	27.2	32.8	35.7	38.5	41.4	44.2	49.9
		-35	(2)	71.0	765	190	.53	308	27.1	33.7	36.9	40.2	43.5	46.7	53.3
	ISA-10°C	-33	(1)	89.3	1691	279	.76	430	19.5	22.5	24.0	25.4	26.9	28.4	31.3
	-56°C	-37		80.9	1232	253	.690	393	23.8	27.8	29.9	31.9	33.9	36.0	40.0
		-40		77.0	1040	233	.640	365	25.5	30.3	32.7	35.1	37.5	39.9	44.7
		-43		72.7	860	210	.580	331	26.9	32.7	35.6	38.5	41.4	44.3	50.1
		-45	(2)	69.5	750	190	.53	301	26.8	33.5	36.8	40.1	43.5	46.8	53.5

(1) MAXIMUM CRUISE THRUST

(2) THRUST FOR MAXIMUM RANGE (APPROXIMATE)

ANTI-ICE SYSTEMS ON		
MAX. FAN %RPM		
-36°C	-46°C	-56°C
84.5	86.3	87.9
INCREASE FUEL FLOWS AND DECREASE SPECIFIC RANGES BY 10%		

Figure 7-14 Cruise (Sheet 22)

CRUISE
33,000 FEET

ANTI-ICE SYSTEMS OFF **TWO ENGINES**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
16500.	ISA+20°C	-10	(1) 86.5	1232	232	.66	401	24.4	28.5	30.5	32.5	34.5	36.6	40.6
	-30°C	-12	84.8	1149	223	.640	386	24.9	29.3	31.4	33.6	35.8	38.0	42.3
		-13	83.4	1085	216	.620	374	25.3	29.9	32.2	34.5	36.8	39.1	43.7
		-15	81.5	998	204	.590	356	25.7	30.7	33.2	35.7	38.2	40.7	45.7
		-15	(2) 80.6	960	199	.57	347	25.7	31.0	33.6	36.2	38.8	41.4	46.6
	ISA+10°C	-18	(1) 88.2	1406	250	.71	420	22.8	26.3	28.1	29.9	31.7	33.5	37.0
	-40°C	-21	85.2	1223	234	.670	396	24.2	28.3	30.3	32.4	34.4	36.4	40.5
		-23	83.1	1121	223	.640	378	24.8	29.3	31.5	33.7	36.0	38.2	42.7
		-24	81.1	1029	212	.610	361	25.3	30.2	32.6	35.0	37.5	39.9	44.8
		-26	(2) 79.0	937	199	.57	340	25.6	30.9	33.6	36.3	38.9	41.6	46.9
	ISA+ 0°C	-28	(1) 89.9	1538	261	.74	427	21.3	24.5	26.1	27.7	29.4	31.0	34.2
	-50°C	-31	84.6	1268	242	.690	398	23.5	27.5	29.4	31.4	33.4	35.4	39.3
		-33	82.1	1125	227	.650	376	24.5	29.0	31.2	33.4	35.6	37.8	42.3
		-35	79.4	1005	212	.610	353	25.2	30.1	32.6	35.1	37.6	40.1	45.1
		-37	(2) 77.4	917	199	.58	333	25.4	30.8	33.6	36.3	39.0	41.7	47.2
	ISA-10°C	-38	(1) 90.4	1631	267	.76	426	20.0	23.1	24.6	26.1	27.7	29.2	32.3
	-60°C	-40	84.3	1323	249	.710	400	22.7	26.5	28.4	30.3	32.2	34.0	37.8
		-43	80.9	1130	230	.660	373	24.1	28.6	30.8	33.0	35.2	37.4	41.8
		-45	78.3	1010	216	.620	350	24.8	29.8	32.2	34.7	37.2	39.7	44.6
		-47	(2) 75.7	897	199	.58	325	25.1	30.7	33.5	36.3	39.1	41.9	47.4
16000.	ISA+20°C	-10	(1) 86.5	1235	233	.67	403	24.5	28.6	30.6	32.6	34.7	36.7	40.7
	-30°C	-12	84.5	1137	223	.640	386	25.2	29.6	31.8	34.0	36.2	38.4	42.8
		-13	83.1	1073	216	.620	374	25.6	30.2	32.5	34.9	37.2	39.5	44.2
		-15	81.1	985	204	.590	356	26.0	31.1	33.6	36.2	38.7	41.3	46.3
		-16	(2) 80.1	941	198	.57	346	26.1	31.4	34.1	36.7	39.4	42.1	47.4
	ISA+10°C	-18	(1) 88.2	1411	251	.72	422	22.8	26.4	28.2	29.9	31.7	33.5	37.0
	-40°C	-20	85.6	1247	238	.680	401	24.2	28.2	30.2	32.2	34.2	36.2	40.2
		-23	82.8	1109	223	.640	378	25.1	29.6	31.8	34.1	36.3	38.6	43.1
		-24	80.8	1017	212	.610	361	25.6	30.5	33.0	35.5	37.9	40.4	45.3
		-26	(2) 78.5	920	198	.57	339	26.0	31.4	34.1	36.8	39.6	42.3	47.7
	ISA+ 0°C	-28	(1) 89.9	1540	261	.74	428	21.3	24.5	26.2	27.8	29.4	31.0	34.3
	-50°C	-31	84.4	1256	242	.690	398	23.8	27.8	29.7	31.7	33.7	35.7	39.7
		-33	81.8	1114	227	.650	376	24.7	29.2	31.5	33.7	36.0	38.2	42.7
		-35	79.1	993	212	.610	353	25.5	30.5	33.0	35.5	38.0	40.6	45.6
		-37	(2) 76.9	899	198	.57	332	25.7	31.3	34.1	36.9	39.6	42.4	48.0
	ISA-10°C	-38	(1) 90.2	1621	267	.76	426	20.1	23.2	24.7	26.3	27.8	29.4	32.5
	-60°C	-40	84.1	1312	249	.710	400	22.9	26.7	28.6	30.5	32.4	34.3	38.2
		-43	80.7	1120	230	.660	373	24.4	28.8	31.1	33.3	35.5	37.8	42.2
		-45	78.0	999	216	.620	350	25.1	30.1	32.6	35.1	37.6	40.1	45.1
		-47	(2) 75.2	880	198	.57	324	25.5	31.2	34.0	36.8	39.7	42.5	48.2
15500.	ISA+20°C	-10	(1) 86.4	1232	235	.67	405	24.7	28.8	30.8	32.9	34.9	36.9	41.0
	-30°C	-12	84.2	1126	223	.640	386	25.4	29.9	32.1	34.3	36.5	38.8	43.2
		-13	82.8	1061	216	.620	374	25.8	30.6	32.9	35.3	37.6	40.0	44.7
		-15	80.8	972	204	.590	356	26.4	31.5	34.1	36.7	39.2	41.8	46.9
		-16	(2) 79.5	920	197	.57	344	26.5	31.9	34.6	37.3	40.1	42.8	48.2
	ISA+10°C	-18	(1) 88.2	1410	252	.72	423	22.9	26.5	28.3	30.0	31.8	33.6	37.1
	-40°C	-20	85.3	1233	238	.680	401	24.4	28.5	30.5	32.6	34.6	36.6	40.7
		-23	82.5	1098	223	.640	378	25.3	29.9	32.2	34.4	36.7	39.0	43.5
		-25	79.8	976	208	.600	355	26.1	31.2	33.8	36.4	38.9	41.5	46.6
		-26	(2) 78.0	900	197	.57	337	26.3	31.9	34.6	37.4	40.2	43.0	48.5
	ISA+ 0°C	-28	(1) 89.9	1541	262	.74	428	21.3	24.6	26.2	27.8	29.4	31.1	34.3
	-50°C	-31	84.2	1243	242	.690	398	24.0	28.0	30.0	32.1	34.1	36.1	40.1
		-33	81.5	1104	227	.650	376	25.0	29.5	31.8	34.0	36.3	38.6	43.1
		-35	78.8	982	212	.610	353	25.7	30.8	33.4	35.9	38.5	41.0	46.1
		-37	(2) 76.4	881	197	.57	330	26.1	31.8	34.6	37.4	40.3	43.1	48.8
	ISA-10°C	-38	(1) 90.1	1612	267	.76	426	20.2	23.3	24.9	26.4	28.0	29.5	32.6
	-60°C	-41	83.0	1254	245	.700	395	23.5	27.5	29.5	31.5	33.5	35.5	39.5
		-43	80.4	1107	230	.660	373	24.6	29.1	31.4	33.7	35.9	38.2	42.7
		-46	77.1	959	212	.610	345	25.5	30.7	33.3	35.9	38.5	41.2	46.4
		-47	(2) 74.7	862	197	.57	322	25.8	31.6	34.5	37.4	40.3	43.2	49.0
15000.	ISA+20°C	-10	(1) 86.3	1234	236	.68	407	24.9	28.9	31.0	33.0	35.0	37.1	41.1
	-30°C	-12	83.9	1115	223	.640	386	25.7	30.2	32.4	34.6	36.9	39.1	43.6
		-13	82.5	1050	216	.620	374	26.1	30.9	33.3	35.6	38.0	40.4	45.2
		-15	80.4	960	204	.590	356	26.7	31.9	34.5	37.1	39.7	42.3	47.5
		-16	(2) 78.9	899	195	.56	341	26.8	32.4	35.2	38.0	40.8	43.5	49.1
	ISA+10°C	-18	(1) 88.2	1412	253	.72	425	23.0	26.5	28.3	30.1	31.9	33.6	37.2
	-40°C	-20	85.0	1221	238	.680	401	24.7	28.8	30.8	32.9	34.9	37.0	41.1
		-23	82.2	1088	223	.640	378	25.6	30.2	32.5	34.8	37.1	39.4	44.0
		-25	79.4	964	208	.600	355	26.4	31.6	34.2	36.8	39.4	42.0	47.2
		-26	(2) 77.4	879	196	.57	335	26.7	32.4	35.2	38.0	40.9	43.7	49.4
	ISA+ 0°C	-28	(1) 90.0	1544	262	.74	429	21.3	24.6	26.2	27.8	29.4	31.0	34.3
	-50°C	-31	84.0	1231	242	.690	398	24.2	28.3	30.3	32.4	34.4	36.4	40.5
		-33	81.2	1091	227	.650	376	25.3	29.9	32.1	34.4	36.7	39.0	43.6
		-35	78.5	971	212	.610	353	26.0	31.2	33.8	36.3	38.9	41.5	46.6
		-37	(2) 75.8	860	196	.57	327	26.4	32.3	35.2	38.1	41.0	43.9	49.7
	ISA-10°C	-38	(1) 89.9	1603	267	.76	426	20.3	23.5	25.0	26.6	28.1	29.7	32.8
	-60°C	-41	82.8	1242	245	.700	395	23.7	27.8	29.8	31.8	33.8	35.8	39.8
		-43	80.0	1095	230	.660	373	24.9	29.5	31.8	34.0	36.3	38.6	43.2
		-46	76.8	949	212	.610	345	25.8	31.1	33.7	36.3	39.0	41.6	46.9
		-48	(2) 74.2	842	196	.57	320	26.2	32.1	35.1	38.0	41.0	44.0	49.9

Figure 7-14 Cruise (Sheet 23)

CRUISE
33,000 FEET

ANTI-ICE SYSTEMS OFF **TWO ENGINES**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
14000.	ISA+20°C -30°C	-9	(1) 86.3	1236	239	.68	411	25.2	29.2	31.3	33.3	35.3	37.3	41.4
		-11	83.9	1120	227	.650	392	26.1	30.6	32.8	35.0	37.3	39.5	44.0
		-14	81.2	996	212	.610	368	26.9	31.9	34.4	37.0	39.5	42.0	47.0
		-15	79.1	909	201	.580	350	27.5	33.0	35.8	38.5	41.3	44.0	49.5
		-17	(2) 77.6	851	191	.55	334	27.5	33.4	36.4	39.3	42.2	45.2	51.1
	ISA+10°C -40°C	-18	(1) 88.1	1408	254	.72	426	23.2	26.7	28.5	30.3	32.1	33.8	37.4
		-20	84.4	1197	238	.680	401	25.2	29.4	31.4	33.5	35.6	37.7	41.9
		-23	81.5	1061	223	.640	378	26.2	30.9	33.3	35.6	38.0	40.3	45.1
		-25	78.1	913	204	.590	349	27.3	32.7	35.5	38.2	40.9	43.7	49.2
		-27	(2) 76.1	834	192	.56	328	27.4	33.4	36.4	39.3	42.3	45.3	51.3
	ISA+ 0°C -50°C	-27	(1) 89.9	1544	263	.75	431	21.4	24.7	26.3	27.9	29.5	31.1	34.4
		-31	83.5	1207	242	.690	398	24.7	28.9	30.9	33.0	35.1	37.2	41.3
		-33	80.5	1066	227	.650	376	25.9	30.5	32.9	35.2	37.6	39.9	44.6
		-35	77.2	920	208	.600	347	26.8	32.3	35.0	37.7	40.4	43.1	48.6
		-38	(2) 74.6	819	192	.56	322	27.1	33.2	36.3	39.3	42.4	45.4	51.5
	ISA-10°C -60°C	-38	(1) 89.6	1585	267	.76	426	20.6	23.7	25.3	26.9	28.5	30.0	33.2
		-41	82.4	1220	245	.700	395	24.2	28.3	30.3	32.4	34.4	36.5	40.6
		-44	78.8	1041	227	.650	367	25.7	30.5	32.9	35.3	37.7	40.1	44.9
		-46	75.5	900	208	.600	339	26.6	32.1	34.9	37.7	40.5	43.3	48.8
		-48	(2) 73.1	803	193	.56	315	26.8	33.1	36.2	39.3	42.4	45.5	51.8
13000.	ISA+20°C -30°C	-9	(1) 86.2	1239	241	.69	415	25.4	29.5	31.5	33.5	35.5	37.5	41.6
		-11	83.2	1094	227	.650	392	26.7	31.3	33.5	35.8	38.1	40.4	45.0
		-14	80.5	971	212	.610	368	27.6	32.8	35.4	37.9	40.5	43.1	48.2
		-16	77.7	860	197	.570	344	28.4	34.2	37.1	40.0	43.0	45.9	51.7
		-17	(2) 76.0	801	186	.54	326	28.3	34.5	37.6	40.7	43.9	47.0	53.2
	ISA+10°C -40°C	-18	(1) 88.0	1409	255	.73	428	23.3	26.8	28.6	30.4	32.2	33.9	37.5
		-20	83.8	1174	238	.680	401	25.7	29.9	32.1	34.2	36.3	38.5	42.7
		-23	80.2	1006	219	.630	372	27.1	32.1	34.5	37.0	39.5	42.0	47.0
		-26	76.8	863	201	.580	343	28.1	33.9	36.8	39.7	42.6	45.5	51.3
		-28	(2) 74.5	785	187	.54	320	28.0	34.4	37.6	40.8	44.0	47.1	53.5
	ISA+ 0°C -50°C	-27	(1) 89.9	1548	264	.75	432	21.5	24.7	26.3	27.9	29.5	31.1	34.4
		-31	82.9	1185	242	.690	398	25.2	29.4	31.5	33.6	35.7	37.8	42.1
		-33	79.2	1012	223	.640	370	26.7	31.6	34.1	36.6	39.0	41.5	46.5
		-36	75.8	870	204	.590	341	27.7	33.5	36.4	39.2	42.1	45.0	50.7
		-38	(2) 73.0	769	187	.54	313	27.7	34.2	37.5	40.7	44.0	47.2	53.7
	ISA-10°C -60°C	-38	(1) 89.2	1567	267	.76	426	20.8	24.0	25.6	27.2	28.8	30.4	33.6
		-41	82.0	1200	245	.700	395	24.6	28.8	30.8	32.9	35.0	37.1	41.3
		-44	77.5	988	223	.640	362	26.5	31.5	34.1	36.6	39.1	41.6	46.7
		-47	74.2	851	204	.590	334	27.5	33.3	36.3	39.2	42.1	45.1	51.0
		-49	(2) 71.4	753	187	.54	306	27.4	34.1	37.4	40.7	44.0	47.3	54.0
12000.	ISA+20°C -30°C	-9	(1) 86.1	1238	243	.69	418	25.7	29.7	31.7	33.7	35.8	37.8	41.8
		-11	82.6	1070	227	.650	392	27.3	32.0	34.3	36.6	39.0	41.3	46.0
		-13	80.5	976	216	.620	374	28.1	33.2	35.8	38.4	40.9	43.5	48.6
		-15	77.5	859	201	.580	350	29.1	35.0	37.9	40.8	43.7	46.6	52.4
		-17	(2) 75.2	780	188	.54	329	29.4	35.8	39.0	42.2	45.4	48.6	55.0
	ISA+10°C -40°C	-17	(1) 88.1	1412	256	.73	430	23.4	26.9	28.7	30.4	32.2	34.0	37.5
		-20	83.3	1152	238	.680	401	26.2	30.5	32.7	34.8	37.0	39.2	43.5
		-23	79.5	982	219	.630	372	27.7	32.8	35.4	37.9	40.5	43.0	48.1
		-25	76.7	867	204	.590	349	28.7	34.5	37.4	40.3	43.1	46.0	51.8
		-27	(2) 73.8	766	189	.55	323	29.1	35.7	38.9	42.2	45.5	48.7	55.3
	ISA+ 0°C -50°C	-27	(1) 89.9	1548	265	.75	433	21.5	24.8	26.4	28.0	29.6	31.2	34.4
		-30	83.3	1209	245	.700	404	25.2	29.3	31.4	33.4	35.5	37.6	41.7
		-33	79.3	1020	227	.650	376	27.0	31.9	34.4	36.8	39.3	41.7	46.6
		-36	75.2	847	204	.590	341	28.5	34.4	37.3	40.3	43.2	46.2	52.1
		-38	(2) 72.3	751	189	.55	317	28.8	35.5	38.8	42.2	45.5	48.8	55.5
	ISA-10°C -60°C	-38	(1) 88.9	1549	267	.76	426	21.1	24.3	25.9	27.5	29.1	30.7	34.0
		-41	81.5	1179	245	.700	395	25.0	29.2	31.4	33.5	35.6	37.7	42.0
		-44	77.5	997	227	.650	367	26.8	31.8	34.3	36.8	39.3	41.9	46.9
		-46	74.2	855	208	.600	339	28.0	33.8	36.7	39.7	42.6	45.5	51.3
		-48	(2) 70.7	737	189	.55	310	28.5	35.3	38.7	42.1	45.5	48.9	55.7

(1) MAXIMUM CRUISE THRUST

(2) THRUST FOR MAXIMUM RANGE (APPROXIMATE)

ANTI-ICE SYSTEMS ON		
MAX. FAN %RPM		
-40°C	-50°C	-60°C
84.8	86.6	88.3
INCREASE FUEL FLOWS AND DECREASE SPECIFIC RANGES BY 10%		

Figure 7-14 Cruise (Sheet 24)

CRUISE
35,000 FEET

ANTI-ICE SYSTEMS OFF **TWO ENGINES**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
16500.	ISA+20°C	-15	(1) 86.8	1166	223	.67	399	25.7	30.0	32.1	34.3	36.4	38.6	42.8
	-34°C	-16	85.1	1080	213	.640	383	26.2	30.8	33.2	35.5	37.8	40.1	44.7
		-17	83.9	1024	206	.620	371	26.5	31.4	33.8	36.3	38.7	41.1	46.0
		-18	82.6	971	199	.600	359	26.7	31.8	34.4	37.0	39.6	42.1	47.3
		-19	(2) 81.8	938	194	.59	351	26.7	32.1	34.7	37.4	40.0	42.7	48.0
	ISA+10°C	-23	(1) 88.6	1332	241	.72	420	24.0	27.7	29.6	31.5	33.4	35.2	39.0
	-44°C	-25	85.8	1178	227	.680	398	25.3	29.5	31.7	33.8	35.9	38.0	42.3
		-26	84.0	1081	216	.650	381	26.0	30.6	32.9	35.2	37.5	39.8	44.5
		-28	82.2	998	206	.620	363	26.4	31.4	33.9	36.4	38.9	41.4	46.4
		-30	(2) 80.2	916	194	.59	344	26.6	32.0	34.8	37.5	40.2	42.9	48.4
	ISA+ 0°C	-32	(1) 90.4	1441	250	.74	424	22.5	26.0	27.7	29.5	31.2	32.9	36.4
	-54°C	-34	85.4	1225	234	.700	401	24.5	28.6	30.7	32.7	34.7	36.8	40.9
		-37	82.9	1084	220	.660	378	25.6	30.3	32.6	34.9	37.2	39.5	44.1
		-39	80.4	974	206	.620	355	26.2	31.3	33.9	36.5	39.0	41.6	46.7
		-40	(2) 78.5	896	194	.59	336	26.4	32.0	34.7	37.5	40.3	43.1	48.7
	ISA-10°C	-42	(1) 90.4	1508	255	.76	422	21.4	24.7	26.3	28.0	29.7	31.3	34.6
	-64°C	-45	84.3	1234	238	.710	397	24.0	28.1	30.1	32.1	34.2	36.2	40.2
		-47	81.5	1087	224	.670	375	25.3	29.9	32.2	34.5	36.8	39.1	43.7
		-49	79.2	976	209	.630	353	25.9	31.0	33.6	36.1	38.7	41.3	46.4
		-51	(2) 76.8	876	194	.59	329	26.1	31.8	34.7	37.5	40.4	43.2	48.9
16000.	ISA+20°C	-14	(1) 86.8	1165	224	.67	401	25.9	30.2	32.3	34.5	36.6	38.8	43.1
	-34°C	-16	84.8	1067	213	.640	383	26.5	31.2	33.6	35.9	38.3	40.6	45.3
		-17	83.5	1010	206	.620	371	26.8	31.8	34.3	36.7	39.2	41.7	46.6
		-18	82.2	957	199	.600	359	27.1	32.3	34.9	37.6	40.2	42.8	48.0
		-19	(2) 81.2	915	192	.58	348	27.2	32.6	35.3	38.1	40.8	43.5	49.0
	ISA+10°C	-22	(1) 88.5	1331	241	.72	421	24.1	27.9	29.7	31.6	33.5	35.4	39.1
	-44°C	-25	85.6	1167	227	.680	398	25.5	29.8	32.0	34.1	36.3	38.4	42.7
		-26	83.7	1069	216	.650	381	26.3	30.9	33.3	35.6	38.0	40.3	45.0
		-28	81.2	959	202	.610	358	26.9	32.1	34.7	37.3	39.9	42.5	47.7
		-30	(2) 79.6	895	193	.58	341	27.0	32.6	35.4	38.2	41.0	43.8	49.4
	ISA+ 0°C	-32	(1) 90.3	1439	250	.74	425	22.6	26.1	27.8	29.5	31.3	33.0	36.5
	-54°C	-34	85.2	1213	234	.700	401	24.8	28.9	31.0	33.0	35.1	37.1	41.3
		-37	82.6	1072	220	.660	378	25.9	30.6	32.9	35.3	37.6	39.9	44.6
		-39	80.1	961	206	.620	355	26.6	31.8	34.4	37.0	39.6	42.2	47.4
		-40	(2) 77.9	875	193	.58	334	26.8	32.5	35.4	38.2	41.1	43.9	49.6
	ISA-10°C	-42	(1) 90.0	1495	255	.76	422	21.5	24.9	26.6	28.2	29.9	31.6	34.9
	-64°C	-45	84.0	1222	238	.710	397	24.3	28.4	30.4	32.5	34.5	36.6	40.6
		-47	81.3	1076	224	.670	375	25.5	30.2	32.5	34.8	37.1	39.5	44.1
		-49	78.3	939	206	.620	347	26.3	31.6	34.3	37.0	39.6	42.3	47.6
		-51	(2) 76.2	855	193	.58	327	26.5	32.4	35.3	38.2	41.1	44.0	49.9
15500.	ISA+20°C	-14	(1) 86.8	1165	225	.67	403	26.0	30.3	32.5	34.6	36.8	38.9	43.2
	-34°C	-16	85.1	1084	216	.650	389	26.7	31.3	33.6	35.9	38.2	40.5	45.1
		-17	83.1	997	206	.620	371	27.2	32.2	34.7	37.2	39.7	42.2	47.3
		-18	81.8	943	199	.600	359	27.5	32.8	35.4	38.1	40.7	43.4	48.7
		-19	(2) 80.5	892	191	.58	346	27.6	33.2	36.0	38.8	41.6	44.4	50.0
	ISA+10°C	-22	(1) 88.5	1332	242	.72	422	24.2	28.0	29.8	31.7	33.6	35.5	39.2
	-44°C	-25	85.3	1156	227	.680	398	25.8	30.1	32.3	34.4	36.6	38.8	43.1
		-26	83.4	1057	216	.650	381	26.6	31.3	33.7	36.0	38.4	40.7	45.5
		-28	80.8	946	202	.610	358	27.2	32.5	35.1	37.8	40.4	43.1	48.4
		-30	(2) 79.0	873	191	.58	339	27.4	33.2	36.0	38.9	41.7	44.6	50.3
	ISA+ 0°C	-32	(1) 90.3	1439	251	.75	426	22.6	26.1	27.9	29.6	31.3	33.1	36.5
	-54°C	-34	84.9	1200	234	.700	401	25.0	29.2	31.3	33.4	35.5	37.5	41.7
		-37	82.3	1060	220	.660	378	26.2	30.9	33.3	35.6	38.0	40.4	45.1
		-39	79.7	949	206	.620	355	26.9	32.2	34.8	37.4	40.1	42.7	48.0
		-41	(2) 77.3	854	192	.58	332	27.2	33.0	36.0	38.9	41.8	44.8	50.6
	ISA-10°C	-42	(1) 89.7	1484	255	.76	422	21.7	25.1	26.8	28.4	30.1	31.8	35.2
	-64°C	-45	83.7	1210	238	.710	397	24.5	28.7	30.7	32.8	34.9	36.9	41.1
		-47	80.5	1035	220	.660	369	26.0	30.9	33.3	35.7	38.1	40.5	45.3
		-49	77.9	927	206	.620	347	26.7	32.0	34.7	37.4	40.1	42.8	48.2
		-51	(2) 75.6	836	192	.58	325	26.9	32.9	35.9	38.9	41.9	44.9	50.8
15000.	ISA+20°C	-14	(1) 86.7	1162	226	.68	405	26.2	30.6	32.7	34.9	37.0	39.2	43.5
	-34°C	-16	84.8	1072	216	.650	389	26.9	31.6	33.9	36.3	38.6	40.9	45.6
		-17	82.7	985	206	.620	371	27.5	32.6	35.2	37.7	40.2	42.8	47.8
		-18	81.4	930	199	.600	359	27.9	33.3	35.9	38.6	41.3	44.0	49.4
		-20	(2) 79.9	872	190	.58	344	28.0	33.8	36.6	39.5	42.4	45.2	51.0
	ISA+10°C	-22	(1) 88.5	1334	243	.72	424	24.3	28.0	29.9	31.8	33.6	35.5	39.3
	-44°C	-25	85.1	1143	227	.680	398	26.1	30.5	32.6	34.8	37.0	39.2	43.6
		-26	83.0	1046	216	.650	381	26.8	31.6	34.0	36.4	38.8	41.2	46.0
		-28	80.4	934	202	.610	358	27.6	32.9	35.6	38.3	41.0	43.6	49.0
		-30	(2) 78.3	852	190	.58	337	27.9	33.7	36.7	39.6	42.5	45.5	51.3
	ISA+ 0°C	-32	(1) 90.2	1440	251	.75	427	22.7	26.2	27.9	29.6	31.4	33.1	36.6
	-54°C	-34	84.6	1188	234	.700	401	25.3	29.5	31.6	33.7	35.8	37.9	42.1
		-37	82.0	1050	220	.660	378	26.5	31.2	33.6	36.0	38.4	40.8	45.5
		-39	78.7	912	202	.610	350	27.4	32.9	35.6	38.4	41.1	43.8	49.3
		-41	(2) 76.7	834	190	.58	330	27.6	33.6	36.6	39.6	42.6	45.6	51.6
	ISA-10°C	-42	(1) 89.5	1474	255	.76	422	21.9	25.2	26.9	28.6	30.3	32.0	35.4
	-64°C	-45	83.5	1198	238	.710	397	24.8	28.9	31.0	33.1	35.2	37.3	41.5
		-47	80.2	1024	220	.660	369	26.3	31.2	33.6	36.0	38.5	40.9	45.8
		-49	77.6	916	206	.620	347	27.0	32.4	35.2	37.9	40.6	43.4	48.8
		-51	(2) 75.0	815	190	.58	323	27.3	33.4	36.5	39.6	42.7	45.7	51.9

Figure 7-14 Cruise (Sheet 25)

CRUISE
35,000 FEET

ANTI-ICE SYSTEMS OFF — **TWO ENGINES**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL: 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
14000.	ISA+20°C	-14	(1) 86.6	1165	229	.69	410	26.6	30.9	33.0	35.2	37.3	39.5	43.8
	-34°C	-16	84.1	1049	216	.650	389	27.5	32.3	34.7	37.1	39.4	41.8	46.6
		-17	82.0	961	206	.620	371	28.2	33.4	36.0	38.6	41.2	43.8	49.0
		-19	80.0	880	195	.590	353	28.8	34.5	37.3	40.1	43.0	45.8	51.5
		-20	(2) 78.8	833	188	.57	341	28.9	34.9	37.9	40.9	43.9	46.9	52.9
	ISA+10°C	-22	(1) 88.4	1332	245	.73	426	24.5	28.2	30.1	32.0	33.8	35.7	39.5
	-44°C	-25	84.5	1116	227	.680	398	26.7	31.2	33.4	35.7	37.9	40.1	44.6
		-27	81.7	994	213	.640	375	27.7	32.7	35.2	37.7	40.2	42.7	47.8
		-28	79.7	910	202	.610	358	28.3	33.8	36.5	39.3	42.0	44.8	50.3
		-31	(2) 77.2	815	188	.57	334	28.7	34.8	37.9	41.0	44.0	47.1	53.2
	ISA+ 0°C	-32	(1) 90.3	1444	252	.75	429	22.8	26.2	28.0	29.7	31.4	33.1	36.6
	-54°C	-34	84.0	1163	234	.700	401	25.8	30.1	32.3	34.4	36.6	38.7	43.0
		-37	81.3	1026	220	.660	378	27.1	32.0	34.4	36.8	39.3	41.7	46.6
		-39	78.0	889	202	.610	350	28.1	33.7	36.5	39.3	42.1	45.0	50.6
		-41	(2) 75.6	798	188	.57	327	28.4	34.7	37.8	41.0	44.1	47.2	53.5
	ISA-10°C	-42	(1) 89.2	1455	255	.76	422	22.1	25.6	27.3	29.0	30.7	32.4	35.9
	-64°C	-45	82.1	1134	234	.700	391	25.7	30.1	32.3	34.5	36.7	38.9	43.3
		-47	79.5	1002	220	.660	369	26.9	31.9	34.4	36.9	39.4	41.8	46.8
		-50	76.3	869	202	.610	342	27.8	33.6	36.4	39.3	42.2	45.1	50.8
		-52	(2) 73.9	780	188	.57	319	28.1	34.5	37.7	40.9	44.2	47.4	53.8
13000.	ISA+20°C	-13	(1) 86.5	1163	231	.69	413	26.9	31.2	33.4	35.5	37.7	39.8	44.1
	-34°C	-16	83.4	1023	216	.650	389	28.3	33.1	35.6	38.0	40.5	42.9	47.8
		-17	81.4	939	206	.620	371	28.9	34.2	36.9	39.5	42.2	44.8	50.2
		-19	79.2	856	195	.590	353	29.6	35.4	38.4	41.3	44.2	47.1	53.0
		-20	(2) 77.4	788	184	.56	334	29.7	36.1	39.3	42.4	45.6	48.8	55.1
	ISA+10°C	-22	(1) 88.3	1332	246	.73	428	24.6	28.3	30.2	32.1	34.0	35.9	39.6
	-44°C	-25	83.8	1092	227	.680	398	27.3	31.9	34.2	36.5	38.7	41.0	45.6
		-27	81.0	970	213	.640	375	28.3	33.5	36.1	38.7	41.2	43.8	49.0
		-29	78.3	861	199	.600	352	29.2	35.0	37.9	40.8	43.7	46.7	52.5
		-31	(2) 75.9	773	185	.56	328	29.5	36.0	39.2	42.5	45.7	49.0	55.4
	ISA+ 0°C	-31	(1) 90.3	1447	253	.75	430	22.8	26.3	28.0	29.7	31.5	33.2	36.6
	-54°C	-34	83.6	1140	234	.700	401	26.4	30.8	32.9	35.1	37.3	39.5	43.9
		-37	80.0	974	216	.650	372	28.0	33.1	35.7	38.2	40.8	43.4	48.5
		-39	77.4	868	202	.610	350	28.8	34.5	37.4	40.3	43.2	46.0	51.8
		-42	(2) 74.4	757	185	.56	322	29.3	35.9	39.2	42.5	45.8	49.1	55.7
	ISA-10°C	-42	(1) 88.9	1438	255	.76	422	22.4	25.9	27.6	29.4	31.1	32.8	36.3
	-64°C	-45	81.7	1112	234	.700	391	26.2	30.7	32.9	35.2	37.4	39.7	44.2
		-48	78.2	951	216	.650	364	27.7	33.0	35.6	38.3	40.9	43.5	48.8
		-50	75.6	848	202	.610	342	28.5	34.4	37.3	40.3	43.2	46.2	52.0
		-52	(2) 72.7	742	185	.56	315	28.9	35.7	39.0	42.4	45.8	49.1	55.9
12000.	ISA+20°C	-13	(1) 86.4	1165	233	.70	417	27.2	31.5	33.6	35.8	37.9	40.1	44.4
	-34°C	-16	82.6	998	216	.650	389	29.0	34.0	36.5	39.0	41.5	44.0	49.0
		-17	80.6	913	206	.620	371	29.7	35.2	37.9	40.7	43.4	46.1	51.6
		-19	77.8	807	192	.580	347	30.6	36.8	39.9	43.0	46.1	49.2	55.4
		-21	(2) 75.7	739	179	.54	326	30.6	37.3	40.7	44.1	47.5	50.9	57.6
	ISA+10°C	-21	(1) 88.3	1334	247	.73	429	24.7	28.4	30.3	32.2	34.1	35.9	39.7
	-44°C	-25	83.2	1069	227	.680	398	27.9	32.6	34.9	37.2	39.6	41.9	46.6
		-27	80.3	945	213	.640	375	29.1	34.4	37.0	39.7	42.3	45.0	50.3
		-30	76.9	813	195	.590	346	30.3	36.4	39.5	42.6	45.6	48.7	54.9
		-32	(2) 74.2	724	180	.55	320	30.3	37.2	40.7	44.1	47.6	51.0	57.9
	ISA+ 0°C	-31	(1) 90.2	1447	254	.75	431	22.9	26.4	28.1	29.8	31.5	33.3	36.7
	-54°C	-34	83.1	1118	234	.700	401	26.9	31.3	33.6	35.8	38.1	40.3	44.8
		-37	79.3	950	216	.650	372	28.7	33.9	36.6	39.2	41.8	44.4	49.7
		-40	75.3	794	195	.590	338	30.0	36.3	39.4	42.6	45.7	48.9	55.2
		-42	(2) 72.7	709	180	.55	313	30.0	37.0	40.6	44.1	47.6	51.1	58.2
	ISA-10°C	-42	(1) 88.5	1420	255	.76	422	22.7	26.2	28.0	29.7	31.5	33.3	36.8
	-64°C	-45	81.3	1091	234	.700	391	26.7	31.3	33.6	35.9	38.2	40.5	45.0
		-48	77.5	928	216	.650	364	28.4	33.8	36.5	39.2	41.9	44.6	50.0
		-51	73.6	776	195	.590	330	29.7	36.1	39.3	42.6	45.8	49.0	55.4
		-53	(2) 71.1	695	180	.55	306	29.6	36.8	40.4	44.0	47.6	51.2	58.4

(1) MAXIMUM CRUISE THRUST

(2) THRUST FOR MAXIMUM RANGE (APPROXIMATE)

ANTI-ICE SYSTEMS ON		
MAX. FAN %RPM		
-44°C	-54°C	-64°C
85.2	87.1	88.9
INCREASE FUEL FLOWS AND DECREASE SPECIFIC RANGES BY 10%		

Figure 7-14 Cruise (Sheet 26)

CRUISE
37,000 FEET

ANTI-ICE SYSTEMS OFF **TWO ENGINES**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
								NAUTICAL MILES/100 LBS. FUEL						
16500.	ISA+20°C	-17	(1) 87.0	1083	211	.66	394	27.2	31.8	34.1	36.4	38.7	41.0	45.6
	-37°C	-18	85.9	1025	203	.640	381	27.4	32.3	34.8	37.2	39.6	42.1	47.0
		-19	85.4	1000	200	.630	375	27.6	32.6	35.1	37.6	40.1	42.6	47.6
		-20	84.3	954	193	.610	364	27.6	32.9	35.5	38.1	40.8	43.4	48.6
		-21	(2) 83.9	937	190	.60	359	27.7	33.0	35.7	38.3	41.0	43.7	49.0
	ISA+10°C	-25	(1) 88.8	1230	228	.71	415	25.6	29.7	31.7	33.8	35.8	37.8	41.9
	-47°C	-27	86.3	1108	217	.680	396	26.7	31.2	33.5	35.7	38.0	40.3	44.8
		-29	84.6	1024	206	.650	379	27.2	32.1	34.6	37.0	39.5	41.9	46.8
		-30	83.7	974	200	.630	367	27.5	32.6	35.2	37.7	40.3	42.9	48.0
		-31	(2) 82.2	914	191	.60	352	27.5	33.0	35.7	38.5	41.2	43.9	49.4
	ISA+ 0°C	-34	(1) 90.4	1332	238	.74	421	24.1	27.9	29.8	31.6	33.5	35.4	39.1
	-57°C	-37	85.8	1149	224	.700	399	26.0	30.3	32.5	34.7	36.9	39.0	43.4
		-38	83.8	1050	213	.670	382	26.8	31.6	34.0	36.3	38.7	41.1	45.9
		-40	81.9	950	200	.630	359	27.3	32.6	35.2	37.8	40.5	43.1	48.3
		-42	(2) 80.5	894	191	.60	344	27.3	32.9	35.7	38.5	41.3	44.1	49.7
	ISA-10°C	-45	(1) 90.9	1409	243	.76	420	22.7	26.3	28.0	29.8	31.6	33.4	36.9
	-67°C	-47	84.7	1154	227	.710	395	25.5	29.9	32.0	34.2	36.4	38.5	42.9
		-49	82.6	1052	217	.680	378	26.5	31.2	33.6	36.0	38.3	40.7	45.5
		-51	80.5	950	203	.640	356	27.0	32.3	34.9	37.5	40.2	42.8	48.1
		-52	(2) 78.7	874	191	.60	337	27.1	32.8	35.7	38.5	41.4	44.3	50.0
16000.	ISA+20°C	-17	(1) 86.9	1083	212	.67	397	27.4	32.0	34.3	36.7	39.0	41.3	45.9
	-37°C	-18	85.6	1010	203	.640	381	27.9	32.8	35.3	37.8	40.2	42.7	47.7
		-19	85.0	985	200	.630	375	28.0	33.0	35.6	38.1	40.6	43.2	48.3
		-20	83.8	938	193	.610	364	28.1	33.4	36.1	38.8	41.4	44.1	49.4
		-21	(2) 83.0	907	188	.60	355	28.1	33.6	36.4	39.2	41.9	44.7	50.2
	ISA+10°C	-25	(1) 88.8	1233	229	.72	417	25.8	29.8	31.8	33.9	35.9	37.9	42.0
	-47°C	-27	86.0	1096	217	.680	396	27.0	31.6	33.9	36.2	38.4	40.7	45.3
		-29	84.3	1010	206	.650	379	27.6	32.6	35.0	37.5	40.0	42.5	47.4
		-30	82.6	937	196	.620	362	27.9	33.3	35.9	38.6	41.3	43.9	49.3
		-31	(2) 81.4	886	189	.60	348	28.0	33.6	36.5	39.3	42.1	44.9	50.6
	ISA+ 0°C	-34	(1) 90.4	1332	238	.74	422	24.2	28.0	29.8	31.7	33.6	35.5	39.2
	-57°C	-37	85.5	1137	224	.700	399	26.3	30.7	32.9	35.1	37.3	39.5	43.9
		-38	83.5	1038	213	.670	382	27.1	32.0	34.4	36.8	39.2	41.6	46.4
		-40	81.5	936	200	.630	359	27.7	33.0	35.7	38.4	41.0	43.7	49.1
		-42	(2) 79.7	867	189	.60	341	27.8	33.6	36.5	39.3	42.2	45.1	50.9
	ISA-10°C	-45	(1) 90.6	1395	243	.76	420	22.9	26.5	28.3	30.1	31.9	33.7	37.3
	-67°C	-47	84.4	1144	227	.710	395	25.8	30.1	32.3	34.5	36.7	38.9	43.3
		-49	81.6	1012	213	.670	373	27.0	31.9	34.4	36.8	39.3	41.8	46.7
		-51	79.6	913	200	.630	351	27.5	32.9	35.7	38.4	41.1	43.9	49.4
		-53	(2) 77.9	847	189	.60	333	27.5	33.4	36.4	39.3	42.3	45.2	51.1
15500.	ISA+20°C	-17	(1) 86.9	1082	213	.67	399	27.7	32.3	34.6	36.9	39.2	41.5	46.1
	-37°C	-18	85.8	1023	206	.650	387	28.1	33.0	35.4	37.9	40.3	42.7	47.6
		-19	84.5	971	200	.630	375	28.4	33.5	36.1	38.7	41.2	43.8	49.0
		-20	83.3	923	193	.610	364	28.6	34.0	36.7	39.4	42.1	44.8	50.2
		-21	(2) 82.2	882	187	.59	352	28.6	34.3	37.1	40.0	42.8	45.6	51.3
	ISA+10°C	-25	(1) 88.6	1231	230	.72	419	25.9	30.0	32.0	34.0	36.1	38.1	42.1
	-47°C	-27	85.7	1083	217	.680	396	27.3	31.9	34.3	36.6	38.9	41.2	45.8
		-29	84.0	997	206	.650	379	28.0	33.0	35.5	38.0	40.5	43.0	48.0
		-30	82.2	923	196	.620	362	28.4	33.8	36.5	39.2	41.9	44.6	50.0
		-32	(2) 80.6	861	187	.59	345	28.5	34.3	37.2	40.1	43.0	45.9	51.7
	ISA+ 0°C	-34	(1) 90.4	1333	239	.74	423	24.3	28.0	29.9	31.8	33.6	35.5	39.3
	-57°C	-37	85.3	1125	224	.700	399	26.5	31.0	33.2	35.4	37.6	39.9	44.3
		-39	82.7	998	210	.660	376	27.7	32.7	35.2	37.7	40.2	42.7	47.7
		-40	81.0	923	200	.630	359	28.1	33.5	36.2	38.9	41.6	44.3	49.8
		-42	(2) 78.9	842	187	.59	338	28.3	34.2	37.2	40.1	43.1	46.1	52.0
	ISA-10°C	-45	(1) 90.2	1382	243	.76	420	23.2	26.8	28.6	30.4	32.2	34.0	37.6
	-67°C	-47	84.1	1133	227	.710	395	26.0	30.4	32.6	34.8	37.0	39.2	43.6
		-49	81.3	1000	213	.670	373	27.3	32.3	34.8	37.3	39.8	42.3	47.3
		-51	79.2	901	200	.630	351	27.8	33.4	36.2	39.0	41.7	44.5	50.1
		-53	(2) 77.2	824	187	.59	331	28.0	34.1	37.1	40.1	43.2	46.2	52.3
15000.	ISA+20°C	-16	(1) 86.8	1083	215	.67	402	27.9	32.5	34.8	37.1	39.4	41.7	46.3
	-37°C	-18	85.4	1010	206	.650	387	28.4	33.4	35.9	38.3	40.8	43.3	48.2
		-19	84.1	957	200	.630	375	28.8	34.0	36.6	39.2	41.8	44.4	49.7
		-20	82.8	908	193	.610	364	29.0	34.5	37.3	40.0	42.8	45.5	51.0
		-21	(2) 81.5	857	185	.59	350	29.1	35.0	37.9	40.8	43.7	46.6	52.5
	ISA+10°C	-25	(1) 88.6	1232	231	.72	421	26.0	30.1	32.1	34.1	36.1	38.2	42.2
	-47°C	-27	85.4	1072	217	.680	396	27.6	32.3	34.6	37.0	39.3	41.6	46.3
		-29	83.6	984	206	.650	379	28.3	33.4	36.0	38.5	41.0	43.6	48.7
		-30	81.8	909	196	.620	362	28.8	34.3	37.0	39.8	42.5	45.3	50.8
		-32	(2) 79.8	837	185	.59	343	29.0	34.9	37.9	40.9	43.9	46.9	52.8
	ISA+ 0°C	-34	(1) 90.4	1336	240	.75	425	24.3	28.0	29.9	31.8	33.7	35.5	39.3
	-57°C	-37	85.0	1114	224	.700	399	26.8	31.3	33.5	35.8	38.0	40.3	44.8
		-39	82.4	986	210	.660	376	28.0	33.1	35.6	38.1	40.7	43.2	48.3
		-41	80.0	887	196	.620	354	28.6	34.2	37.0	39.9	42.7	45.5	51.1
		-43	(2) 78.2	819	186	.59	335	28.7	34.8	37.9	40.9	44.0	47.1	53.2
	ISA-10°C	-45	(1) 89.9	1369	243	.76	420	23.4	27.0	28.9	30.7	32.5	34.3	38.0
	-67°C	-47	83.8	1122	227	.710	395	26.3	30.7	33.0	35.2	37.4	39.6	44.1
		-49	81.1	989	213	.670	373	27.6	32.6	35.2	37.7	40.2	42.8	47.8
		-51	78.8	888	200	.630	351	28.2	33.9	36.7	39.5	42.3	45.1	50.7
		-53	(2) 76.4	801	186	.59	328	28.4	34.7	37.8	40.9	44.1	47.2	53.4

Figure 7-14 Cruise (Sheet 27)

CRUISE
37,000 FEET

ANTI-ICE SYSTEMS OFF **TWO ENGINES**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
14000.	ISA+20°C	-16	(1) 86.7	1081	217	.68	405	28.3	32.9	35.2	37.5	39.8	42.1	46.8
	-37°C	-18	84.6	985	206	.650	387	29.2	34.2	36.8	39.3	41.8	44.4	49.5
		-19	83.3	932	200	.630	375	29.6	34.9	37.6	40.3	43.0	45.6	51.0
		-21	81.3	857	190	.600	358	30.1	35.9	38.8	41.7	44.6	47.5	53.4
		-22	(2) 80.1	813	183	.58	345	30.1	36.3	39.4	42.4	45.5	48.6	54.7
	ISA+10°C	-24	(1) 88.6	1234	233	.73	423	26.2	30.3	32.3	34.3	36.3	38.4	42.4
	-47°C	-26	85.5	1083	220	.690	402	27.9	32.5	34.8	37.1	39.4	41.7	46.4
		-29	82.9	960	206	.650	379	29.0	34.3	36.9	39.5	42.1	44.7	49.9
		-31	80.3	860	193	.610	356	29.8	35.6	38.5	41.4	44.3	47.2	53.0
		-32	(2) 78.5	795	183	.58	338	30.0	36.2	39.4	42.5	45.7	48.8	55.1
	ISA+ 0°C	-34	(1) 90.3	1335	241	.75	426	24.4	28.2	30.1	31.9	33.8	35.7	39.4
	-57°C	-37	84.4	1089	224	.700	399	27.4	32.0	34.3	36.6	38.9	41.2	45.8
		-39	81.8	963	210	.660	376	28.7	33.9	36.5	39.1	41.7	44.2	49.4
		-41	79.2	863	196	.620	354	29.4	35.2	38.1	41.0	43.9	46.8	52.6
		-43	(2) 76.8	778	183	.58	331	29.7	36.1	39.3	42.6	45.8	49.0	55.4
	ISA-10°C	-45	(1) 89.1	1345	243	.76	420	23.8	27.5	29.4	31.2	33.1	34.9	38.6
	-67°C	-47	83.2	1098	227	.710	395	26.8	31.4	33.7	36.0	38.2	40.5	45.1
		-50	80.0	939	210	.660	367	28.5	33.8	36.4	39.1	41.8	44.4	49.7
		-52	77.4	842	196	.620	345	29.1	35.1	38.0	41.0	44.0	46.9	52.9
		-54	(2) 75.1	761	183	.58	324	29.4	36.0	39.2	42.5	45.8	49.1	55.7
13000.	ISA+20°C	-16	(1) 86.6	1081	220	.69	410	28.7	33.3	35.6	37.9	40.3	42.6	47.2
	-37°C	-17	84.6	990	210	.660	393	29.6	34.6	37.2	39.7	42.2	44.7	49.8
		-19	82.5	908	200	.630	375	30.3	35.8	38.6	41.3	44.1	46.8	52.3
		-21	80.4	832	190	.600	358	31.0	37.0	40.0	43.0	46.0	49.0	55.0
		-22	(2) 78.8	773	180	.57	341	31.2	37.6	40.9	44.1	47.3	50.6	57.0
	ISA+10°C	-24	(1) 88.5	1237	235	.73	426	26.4	30.4	32.4	34.4	36.5	38.5	42.5
	-47°C	-26	84.9	1056	220	.690	402	28.6	33.3	35.7	38.0	40.4	42.8	47.5
		-29	82.2	938	206	.650	379	29.7	35.1	37.7	40.4	43.1	45.7	51.1
		-31	79.5	836	193	.610	356	30.6	36.6	39.6	42.6	45.6	48.5	54.5
		-33	(2) 77.2	757	181	.57	334	31.0	37.6	40.9	44.2	47.5	50.8	57.4
	ISA+ 0°C	-34	(1) 90.3	1336	242	.75	428	24.5	28.3	30.2	32.0	33.9	35.8	39.5
	-57°C	-37	83.8	1064	224	.700	399	28.1	32.8	35.1	37.4	39.8	42.1	46.8
		-39	81.1	941	210	.660	376	29.3	34.6	37.3	40.0	42.6	45.3	50.6
		-41	77.8	816	193	.610	348	30.4	36.5	39.6	42.6	45.7	48.7	54.9
		-43	(2) 75.6	741	181	.57	327	30.7	37.4	40.8	44.2	47.6	50.9	57.7
	ISA-10°C	-45	(1) 88.8	1326	243	.76	420	24.1	27.9	29.8	31.7	33.5	35.4	39.2
	-67°C	-47	82.7	1075	227	.710	395	27.4	32.1	34.4	36.7	39.0	41.4	46.0
		-50	79.3	918	210	.660	367	29.1	34.6	37.3	40.0	42.7	45.4	50.9
		-52	76.7	820	196	.620	345	29.9	36.0	39.0	42.1	45.1	48.2	54.3
		-54	(2) 73.9	724	181	.57	320	30.3	37.3	40.7	44.2	47.6	51.1	58.0
12000.	ISA+20°C	-15	(1) 86.5	1080	222	.70	414	29.1	33.7	36.0	38.3	40.7	43.0	47.6
	-37°C	-17	83.8	964	210	.660	393	30.4	35.6	38.2	40.8	43.4	46.0	51.2
		-20	81.1	860	196	.620	370	31.3	37.1	40.0	43.0	45.9	48.8	54.6
		-21	79.0	786	186	.590	352	32.0	38.4	41.6	44.8	48.0	51.1	57.5
		-23	(2) 77.3	729	177	.56	334	32.2	39.0	42.5	45.9	49.3	52.8	59.6
	ISA+10°C	-24	(1) 88.5	1239	236	.74	428	26.5	30.5	32.5	34.5	36.6	38.6	42.6
	-47°C	-26	84.3	1031	220	.690	402	29.3	34.1	36.6	39.0	41.4	43.8	48.7
		-29	80.8	888	203	.640	373	30.7	36.4	39.2	42.0	44.8	47.6	53.3
		-31	78.0	789	190	.600	350	31.7	38.0	41.2	44.3	47.5	50.7	57.0
		-33	(2) 75.8	715	177	.56	328	31.9	38.9	42.4	45.9	49.4	52.9	59.9
	ISA+ 0°C	-34	(1) 90.3	1337	243	.76	430	24.7	28.4	30.3	32.1	34.0	35.9	39.6
	-57°C	-37	83.2	1041	224	.700	399	28.7	33.5	35.9	38.3	40.7	43.1	47.9
		-39	79.7	891	206	.650	370	30.4	36.0	38.8	41.6	44.4	47.2	52.8
		-41	77.0	795	193	.610	348	31.2	37.5	40.6	43.8	46.9	50.0	56.3
		-44	(2) 74.2	700	177	.56	322	31.6	38.8	42.3	45.9	49.5	53.0	60.2
	ISA-10°C	-45	(1) 88.4	1309	243	.76	420	24.4	28.3	30.2	32.1	34.0	35.9	39.7
	-67°C	-48	81.3	1015	224	.700	389	28.5	33.4	35.9	38.4	40.8	43.3	48.2
		-50	78.5	895	210	.660	367	29.9	35.5	38.3	41.1	43.9	46.7	52.2
		-52	75.3	777	193	.610	340	30.9	37.3	40.5	43.7	47.0	50.2	56.6
		-54	(2) 72.6	686	178	.56	315	31.3	38.6	42.2	45.8	49.5	53.1	60.4

(1) MAXIMUM CRUISE THRUST

(2) THRUST FOR MAXIMUM RANGE (APPROXIMATE)

ANTI-ICE SYSTEMS ON		
MAX. FAN %RPM		
-47°C	-57°C	-67°C
85.0	86.9	88.7
INCREASE FUEL FLOWS AND DECREASE SPECIFIC RANGES BY 10%		

Figure 7-14 Cruise (Sheet 28)

CRUISE
39,000 FEET

ANTI-ICE SYSTEMS OFF **TWO ENGINES**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
16500.	ISA+20°C	-19	(1) 86.9	978	193	.64	379	28.5	33.7	36.2	38.8	41.3	43.9	49.0
	-37°C	-20	86.3	945	187	.620	370	28.5	33.8	36.5	39.1	41.7	44.4	49.7
		-19	(2) 86.4	950	188	.62	371	28.5	33.8	36.4	39.1	41.7	44.3	49.6
	ISA+10°C	-26	(1) 88.6	1110	213	.70	406	27.6	32.1	34.4	36.6	38.9	41.1	45.6
	-47°C	-27	87.3	1054	207	.680	396	28.1	32.9	35.2	37.6	40.0	42.3	47.1
		-28	86.3	1005	200	.660	385	28.3	33.3	35.8	38.3	40.8	43.3	48.2
		-29	85.3	960	194	.640	373	28.5	33.7	36.3	38.9	41.5	44.1	49.3
		-30	(2) 84.7	929	189	.62	364	28.5	33.8	36.5	39.2	41.9	44.6	50.0
	ISA+ 0°C	-35	(1) 90.3	1206	223	.73	415	26.1	30.3	32.4	34.4	36.5	38.6	42.7
	-57°C	-37	87.2	1089	213	.700	399	27.4	32.0	34.3	36.6	38.9	41.2	45.8
		-38	84.9	1001	203	.670	382	28.1	33.1	35.6	38.1	40.6	43.1	48.1
		-39	84.0	956	197	.650	370	28.3	33.5	36.1	38.8	41.4	44.0	49.2
		-41	(2) 82.9	907	189	.63	357	28.3	33.8	36.6	39.3	42.1	44.9	50.4
	ISA-10°C	-45	(1) 91.5	1307	230	.75	418	24.3	28.1	30.0	31.9	33.9	35.8	39.6
	-67°C	-47	87.4	1133	220	.720	400	26.5	30.9	33.1	35.3	37.5	39.7	44.1
		-49	83.5	999	207	.680	378	27.9	32.9	35.4	37.9	40.4	42.9	47.9
		-50	82.1	931	197	.650	362	28.1	33.5	36.2	38.8	41.5	44.2	49.6
		-51	(2) 81.1	887	190	.63	349	28.1	33.8	36.6	39.4	42.2	45.0	50.7
16000.	ISA+20°C	-18	(1) 86.9	980	195	.64	384	29.0	34.1	36.6	39.2	41.7	44.3	49.4
	-37°C	-19	86.2	948	191	.630	375	29.1	34.3	37.0	39.6	42.3	44.9	50.2
		-20	85.8	927	187	.620	370	29.1	34.5	37.2	39.8	42.5	45.2	50.6
		-20	(2) 85.7	918	186	.62	367	29.1	34.5	37.2	39.9	42.7	45.4	50.8
	ISA+10°C	-26	(1) 88.6	1112	214	.70	409	27.8	32.3	34.5	36.8	39.0	41.3	45.8
	-47°C	-27	86.9	1040	207	.680	396	28.5	33.3	35.7	38.1	40.5	42.9	47.7
		-28	85.9	989	200	.660	385	28.8	33.8	36.4	38.9	41.4	43.9	49.0
		-30	84.5	923	191	.630	367	29.0	34.4	37.1	39.8	42.5	45.2	50.6
		-30	(2) 83.9	895	186	.62	359	29.0	34.5	37.3	40.1	42.9	45.7	51.3
	ISA+ 0°C	-35	(1) 90.3	1211	225	.73	418	26.2	30.4	32.4	34.5	36.6	38.6	42.8
	-57°C	-37	86.5	1074	213	.700	399	27.8	32.5	34.8	37.1	39.4	41.8	46.4
		-38	84.5	987	203	.670	382	28.5	33.6	36.1	38.7	41.2	43.7	48.8
		-40	83.1	920	194	.640	365	28.8	34.2	37.0	39.7	42.4	45.1	50.5
		-41	(2) 82.1	874	186	.62	352	28.8	34.5	37.4	40.2	43.1	46.0	51.7
	ISA-10°C	-45	(1) 91.5	1312	232	.76	419	24.4	28.2	30.1	32.0	33.9	35.8	39.6
	-67°C	-47	87.0	1119	220	.720	400	26.8	31.3	33.5	35.7	38.0	40.2	44.7
		-49	83.2	986	207	.680	378	28.2	33.3	35.8	38.4	40.9	43.4	48.5
		-50	81.7	917	197	.650	362	28.5	34.0	36.7	39.5	42.2	44.9	50.4
		-52	(2) 80.3	854	187	.62	344	28.6	34.4	37.4	40.3	43.2	46.1	52.0
15500.	ISA+20°C	-18	(1) 86.7	978	197	.65	387	29.4	34.5	37.1	39.6	42.2	44.7	49.9
	-37°C	-18	86.3	954	194	.640	381	29.5	34.7	37.3	40.0	42.6	45.2	50.5
		-19	85.8	932	191	.630	375	29.6	34.9	37.6	40.3	43.0	45.7	51.0
		-20	85.4	910	187	.620	370	29.6	35.1	37.9	40.6	43.4	46.1	51.6
		-20	(2) 84.8	889	184	.61	363	29.6	35.2	38.0	40.9	43.7	46.5	52.1
	ISA+10°C	-25	(1) 88.6	1115	216	.71	412	27.9	32.4	34.7	36.9	39.2	41.4	45.9
	-47°C	-27	86.6	1027	207	.680	396	28.8	33.7	36.1	38.6	41.0	43.5	48.3
		-29	85.0	951	197	.650	379	29.3	34.6	37.2	39.8	42.5	45.1	50.3
		-30	84.1	907	191	.630	367	29.5	35.0	37.7	40.5	43.2	46.0	51.5
		-31	(2) 83.1	867	184	.61	356	29.5	35.3	38.1	41.0	43.9	46.8	52.6
	ISA+ 0°C	-35	(1) 90.2	1207	225	.74	419	26.4	30.6	32.6	34.7	36.8	38.8	43.0
	-57°C	-37	86.1	1062	213	.700	399	28.1	32.8	35.2	37.5	39.9	42.2	46.9
		-38	84.2	974	203	.670	382	28.9	34.1	36.6	39.2	41.8	44.3	49.5
		-40	82.7	905	194	.640	365	29.3	34.8	37.5	40.3	43.1	45.8	51.4
		-41	(2) 81.4	847	184	.61	349	29.3	35.2	38.2	41.1	44.1	47.0	52.9
	ISA-10°C	-45	(1) 91.2	1299	232	.76	420	24.6	28.5	30.4	32.3	34.2	36.2	40.0
	-67°C	-47	85.3	1068	217	.710	395	27.6	32.3	34.6	36.9	39.3	41.6	46.3
		-49	82.8	974	207	.680	378	28.6	33.7	36.3	38.8	41.4	44.0	49.1
		-51	80.8	882	194	.640	356	29.1	34.7	37.6	40.4	43.2	46.1	51.7
		-52	(2) 79.6	828	185	.61	341	29.1	35.1	38.1	41.2	44.2	47.2	53.2
15000.	ISA+20°C	-18	(1) 86.7	979	199	.66	391	29.7	34.8	37.4	40.0	42.5	45.1	50.2
	-37°C	-18	85.9	939	194	.640	381	30.0	35.3	38.0	40.6	43.3	45.9	51.3
		-19	85.4	916	191	.630	375	30.1	35.5	38.3	41.0	43.7	46.5	51.9
		-20	84.3	874	184	.610	364	30.2	35.9	38.7	41.6	44.5	47.3	53.1
		-20	(2) 83.9	860	182	.60	360	30.2	36.0	38.9	41.8	44.7	47.6	53.4
	ISA+10°C	-25	(1) 88.5	1115	217	.71	413	28.1	32.6	34.9	37.1	39.3	41.6	46.1
	-47°C	-27	86.2	1014	207	.680	396	29.2	34.1	36.6	39.1	41.5	44.0	48.9
		-29	84.6	937	197	.650	379	29.8	35.1	37.8	40.4	43.1	45.8	51.1
		-30	83.6	892	191	.630	367	30.0	35.6	38.4	41.2	44.0	46.8	52.4
		-31	(2) 82.2	840	182	.60	352	30.1	36.0	39.0	42.0	44.9	47.9	53.9
	ISA+ 0°C	-35	(1) 90.2	1210	226	.74	421	26.5	30.6	32.7	34.8	36.8	38.9	43.0
	-57°C	-37	85.8	1051	213	.700	399	28.4	33.2	35.6	37.9	40.3	42.7	47.5
		-38	83.8	961	203	.670	382	29.3	34.5	37.1	39.7	42.3	44.9	50.1
		-40	81.9	869	191	.630	359	29.8	35.6	38.4	41.3	44.2	47.1	52.8
		-42	(2) 80.5	820	182	.60	345	29.9	36.0	39.0	42.1	45.1	48.2	54.3
	ISA-10°C	-45	(1) 90.8	1286	232	.76	420	24.9	28.8	30.7	32.7	34.6	36.6	40.4
	-67°C	-47	84.6	1055	217	.710	395	27.9	32.7	35.0	37.4	39.8	42.2	46.9
		-49	82.5	962	207	.680	378	28.9	34.1	36.7	39.3	41.9	44.5	49.7
		-51	80.5	869	194	.640	356	29.5	35.3	38.1	41.0	43.9	46.8	52.5
		-52	(2) 78.7	802	183	.61	337	29.6	35.8	39.0	42.1	45.2	48.3	54.6

Figure 7-14 Cruise (Sheet 29)

CRUISE
39,000 FEET

ANTI-ICE SYSTEMS OFF **TWO ENGINES**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
14000.	ISA+20°C	-17	(1) 86.6	977	202	.67	397	30.4	35.5	38.0	40.6	43.2	45.7	50.8
	-37°C	-18	85.0	910	194	.640	381	30.9	36.4	39.1	41.9	44.6	47.4	52.9
		-19	84.4	887	191	.630	375	31.0	36.7	39.5	42.3	45.1	48.0	53.6
		-20	83.2	843	184	.610	364	31.3	37.2	40.2	43.1	46.1	49.1	55.0
		-21	(2) 82.1	806	178	.59	352	31.3	37.5	40.6	43.7	46.8	49.9	56.2
	ISA+10°C	-25	(1) 88.3	1116	219	.72	417	28.4	32.9	35.2	37.4	39.6	41.9	46.4
	-47°C	-27	85.6	989	207	.680	396	29.9	35.0	37.5	40.0	42.6	45.1	50.1
		-29	83.9	910	197	.650	379	30.6	36.1	38.9	41.6	44.4	47.1	52.6
		-30	82.1	843	187	.620	362	31.0	37.0	39.9	42.9	45.9	48.8	54.8
		-32	(2) 80.4	787	178	.59	345	31.2	37.5	40.7	43.9	47.1	50.2	56.6
	ISA+ 0°C	-34	(1) 90.2	1210	228	.74	423	26.7	30.8	32.9	34.9	37.0	39.1	43.2
	-57°C	-37	85.2	1027	213	.700	399	29.1	33.9	36.4	38.8	41.2	43.7	48.5
		-39	82.6	911	200	.660	376	30.3	35.8	38.5	41.3	44.0	46.8	52.2
		-40	80.9	843	191	.630	359	30.8	36.7	39.7	42.6	45.6	48.6	54.5
		-42	(2) 78.8	769	179	.59	338	31.0	37.5	40.7	44.0	47.2	50.5	57.0
	ISA-10°C	-45	(1) 90.0	1259	232	.76	420	25.4	29.4	31.4	33.4	35.4	37.3	41.3
	-67°C	-47	84.0	1034	217	.710	395	28.5	33.3	35.8	38.2	40.6	43.0	47.8
		-49	81.3	913	203	.670	373	29.9	35.4	38.1	40.9	43.6	46.3	51.8
		-51	79.1	822	191	.630	351	30.5	36.6	39.6	42.7	45.7	48.8	54.8
		-53	(2) 77.0	752	179	.59	331	30.7	37.3	40.6	44.0	47.3	50.6	57.3
13000.	ISA+20°C	-16	(1) 86.4	976	205	.67	402	30.9	36.0	38.6	41.2	43.7	46.3	51.4
	-37°C	-18	84.8	909	197	.650	387	31.6	37.1	39.8	42.6	45.3	48.1	53.6
		-20	82.8	838	187	.620	370	32.2	38.1	41.1	44.1	47.1	50.1	56.0
		-21	81.5	794	181	.600	358	32.5	38.8	41.9	45.1	48.2	51.4	57.7
		-22	(2) 80.5	760	175	.58	347	32.5	39.1	42.4	45.7	49.0	52.3	58.8
	ISA+10°C	-25	(1) 88.3	1118	221	.72	421	28.7	33.2	35.4	37.7	39.9	42.1	46.6
	-47°C	-27	85.0	967	207	.680	396	30.6	35.8	38.4	41.0	43.6	46.2	51.3
		-29	83.1	886	197	.650	379	31.5	37.1	40.0	42.8	45.6	48.4	54.1
		-31	80.5	795	184	.610	356	32.2	38.5	41.6	44.8	47.9	51.1	57.4
		-32	(2) 78.9	743	176	.58	340	32.3	39.1	42.4	45.8	49.2	52.5	59.3
	ISA+ 0°C	-34	(1) 90.1	1212	229	.75	425	26.8	31.0	33.0	35.1	37.1	39.2	43.3
	-57°C	-37	84.5	1003	213	.700	399	29.8	34.7	37.2	39.7	42.2	44.7	49.7
		-39	82.0	887	200	.660	376	31.1	36.8	39.6	42.4	45.2	48.0	53.7
		-41	79.4	796	187	.620	354	31.8	38.1	41.3	44.4	47.5	50.7	56.9
		-43	(2) 77.3	726	176	.58	333	32.1	39.0	42.4	45.9	49.3	52.7	59.6
	ISA-10°C	-45	(1) 89.2	1234	232	.76	420	25.9	30.0	32.0	34.0	36.0	38.1	42.1
	-67°C	-47	83.4	1010	217	.710	395	29.2	34.1	36.6	39.1	41.6	44.0	49.0
		-49	80.7	890	203	.670	373	30.6	36.2	39.1	41.9	44.7	47.5	53.1
		-52	77.6	777	187	.620	345	31.6	38.0	41.2	44.4	47.6	50.9	57.3
		-53	(2) 75.5	710	176	.58	326	31.8	38.8	42.3	45.8	49.4	52.9	59.9
12000.	ISA+20°C	-16	(1) 86.3	976	208	.68	407	31.4	36.5	39.1	41.7	44.2	46.8	51.9
	-37°C	-18	84.0	886	197	.650	387	32.4	38.1	40.9	43.7	46.5	49.4	55.0
		-19	82.6	837	191	.630	375	32.9	38.9	41.9	44.9	47.9	50.9	56.8
		-21	80.5	768	181	.600	358	33.6	40.1	43.3	46.6	49.8	53.1	59.6
		-22	(2) 79.0	719	173	.57	343	33.7	40.7	44.2	47.6	51.1	54.6	61.5
	ISA+10°C	-24	(1) 88.3	1122	223	.73	424	28.9	33.4	35.6	37.8	40.1	42.3	46.7
	-47°C	-26	85.0	972	210	.690	402	31.1	36.2	38.8	41.4	43.9	46.5	51.7
		-29	82.3	863	197	.650	379	32.3	38.1	41.0	43.9	46.8	49.7	55.5
		-31	79.6	771	184	.610	356	33.2	39.7	42.9	46.2	49.4	52.7	59.2
		-33	(2) 77.4	702	173	.57	335	33.5	40.6	44.2	47.8	51.3	54.9	62.0
	ISA+ 0°C	-34	(1) 90.1	1214	230	.75	427	26.9	31.1	33.1	35.2	37.2	39.3	43.4
	-57°C	-37	83.9	978	213	.700	399	30.5	35.6	38.2	40.7	43.3	45.9	51.0
		-39	81.2	866	200	.660	376	31.9	37.7	40.5	43.4	46.3	49.2	55.0
		-41	78.5	774	187	.620	354	32.8	39.2	42.5	45.7	48.9	52.2	58.6
		-43	(2) 75.8	687	173	.58	328	33.2	40.5	44.1	47.8	51.4	55.1	62.3
	ISA-10°C	-45	(1) 88.8	1215	232	.76	420	26.3	30.5	32.5	34.6	36.6	38.7	42.8
	-67°C	-47	82.8	987	217	.710	395	29.9	34.9	37.5	40.0	42.5	45.1	50.1
		-50	79.4	845	200	.660	367	31.6	37.6	40.5	43.5	46.4	49.4	55.3
		-52	76.8	755	187	.620	345	32.5	39.1	42.4	45.7	49.0	52.3	59.0
		-54	(2) 74.1	672	173	.58	321	32.9	40.3	44.0	47.8	51.5	55.2	62.6

(1) MAXIMUM CRUISE THRUST

(2) THRUST FOR MAXIMUM RANGE (APPROXIMATE)

ANTI-ICE SYSTEMS ON		
MAX. FAN %RPM		
-47°C	-57°C	-67°C
84.4	86.3	88.2
INCREASE FUEL FLOWS AND DECREASE SPECIFIC RANGES BY 10%		

Figure 7-14 Cruise (Sheet 30)

CRUISE
41,000 FEET

ANTI-ICE SYSTEMS OFF **TWO ENGINES**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL: 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
16500.	ISA+10°C	-28	(1) 88.5	996	194	.67	391	29.2	34.2	36.8	39.3	41.8	44.3	49.3
	-47°C	-28	87.8	973	191	.660	385	29.3	34.4	37.0	39.5	42.1	44.7	49.8
		-29	87.4	954	188	.650	379	29.2	34.5	37.1	39.7	42.4	45.0	50.2
		-29	(2) 87.3	952	188	.65	379	29.2	34.5	37.1	39.7	42.4	45.0	50.2
	ISA+ 0°C	-36	(1) 90.1	1089	207	.71	405	28.0	32.6	34.9	37.2	39.5	41.8	46.4
	-57°C	-37	88.2	1017	200	.690	393	28.8	33.7	36.2	38.6	41.1	43.6	48.5
		-38	87.5	992	197	.680	387	29.0	34.0	36.5	39.1	41.6	44.1	49.1
		-39	86.0	946	191	.660	376	29.2	34.5	37.1	39.7	42.4	45.0	50.3
		-39	(2) 85.5	927	188	.65	370	29.2	34.5	37.2	39.9	42.6	45.3	50.7
	ISA-10°C	-46	(1) 91.3	1182	216	.74	410	26.3	30.5	32.6	34.7	36.8	38.9	43.2
	-67°C	-47	88.0	1056	207	.710	395	27.9	32.7	35.0	37.4	39.8	42.1	46.9
		-48	86.3	990	200	.690	384	28.7	33.7	36.3	38.8	41.3	43.8	48.9
		-49	84.8	942	194	.670	373	29.0	34.3	36.9	39.6	42.3	44.9	50.2
		-50	(2) 83.7	906	188	.65	363	29.0	34.5	37.3	40.0	42.8	45.6	51.1
16000.	ISA+10°C	-27	(1) 88.4	1003	198	.68	398	29.7	34.7	37.2	39.6	42.1	44.6	49.6
	-47°C	-28	87.7	976	194	.670	390	29.8	34.9	37.4	40.0	42.6	45.1	50.3
		-28	87.2	954	191	.660	385	29.8	35.1	37.7	40.3	43.0	45.6	50.8
		-29	86.8	933	188	.650	379	29.9	35.2	37.9	40.6	43.3	46.0	51.3
		-29	(2) 86.4	918	185	.64	374	29.9	35.3	38.0	40.7	43.5	46.2	51.6
	ISA+ 0°C	-36	(1) 90.0	1089	209	.72	408	28.3	32.9	35.2	37.5	39.8	42.0	46.6
	-57°C	-37	87.3	995	200	.690	393	29.4	34.5	37.0	39.5	42.0	44.5	49.5
		-38	86.4	970	197	.680	387	29.6	34.8	37.4	39.9	42.5	45.1	50.3
		-39	85.4	928	191	.660	376	29.7	35.1	37.8	40.5	43.2	45.9	51.3
		-40	(2) 84.7	896	186	.64	367	29.8	35.3	38.1	40.9	43.7	46.5	52.1
	ISA-10°C	-45	(1) 91.2	1186	217	.74	413	26.4	30.7	32.8	34.9	37.0	39.1	43.3
	-67°C	-47	87.5	1036	207	.710	395	28.5	33.3	35.7	38.1	40.5	42.9	47.8
		-48	85.5	969	200	.690	384	29.3	34.4	37.0	39.6	42.2	44.8	49.9
		-49	83.9	924	194	.670	373	29.5	35.0	37.7	40.4	43.1	45.8	51.2
		-51	(2) 82.8	875	186	.64	359	29.6	35.3	38.2	41.0	43.9	46.7	52.5
15500.	ISA+10°C	-26	(1) 88.3	1005	200	.69	402	30.0	35.0	37.5	40.0	42.5	45.0	49.9
	-47°C	-28	87.2	958	194	.670	390	30.3	35.5	38.1	40.7	43.4	46.0	51.2
		-28	86.7	937	191	.660	385	30.4	35.7	38.4	41.1	43.7	46.4	51.8
		-29	85.8	896	185	.640	373	30.5	36.1	38.8	41.6	44.4	47.2	52.8
		-30	(2) 85.5	885	183	.63	370	30.5	36.1	38.9	41.8	44.6	47.4	53.0
	ISA+ 0°C	-35	(1) 90.0	1092	211	.72	412	28.5	33.1	35.4	37.7	40.0	42.3	46.8
	-57°C	-37	87.8	1012	203	.700	399	29.5	34.4	36.9	39.4	41.9	44.3	49.3
		-38	85.3	932	194	.670	382	30.2	35.6	38.3	40.9	43.6	46.3	51.7
		-39	84.4	891	188	.650	370	30.4	36.0	38.8	41.6	44.4	47.2	52.8
		-40	(2) 83.8	864	183	.64	362	30.3	36.1	39.0	41.9	44.8	47.7	53.5
	ISA-10°C	-45	(1) 91.2	1189	219	.75	416	26.5	30.7	32.8	35.0	37.1	39.2	43.4
	-67°C	-47	86.9	1018	207	.710	395	28.9	33.8	36.3	38.8	41.2	43.7	48.6
		-48	84.5	952	200	.690	384	29.8	35.1	37.7	40.3	43.0	45.6	50.8
		-50	83.0	887	191	.660	367	30.1	35.8	38.6	41.4	44.2	47.0	52.7
		-51	(2) 81.9	843	184	.64	354	30.2	36.1	39.0	42.0	45.0	47.9	53.9
15000.	ISA+10°C	-26	(1) 88.3	1007	202	.70	405	30.3	35.2	37.7	40.2	42.7	45.2	50.1
	-47°C	-28	86.7	942	194	.670	390	30.8	36.2	38.8	41.5	44.1	46.8	52.1
		-28	86.2	920	191	.660	385	30.9	36.4	39.1	41.8	44.5	47.2	52.7
		-29	85.3	879	185	.640	373	31.1	36.8	39.6	42.4	45.3	48.1	53.8
		-30	(2) 84.7	853	180	.63	365	31.1	36.9	39.8	42.8	45.7	48.6	54.5
	ISA+ 0°C	-35	(1) 89.9	1093	212	.73	414	28.7	33.3	35.6	37.9	40.2	42.5	47.0
	-57°C	-37	87.0	996	203	.700	399	30.0	35.0	37.5	40.0	42.5	45.0	50.1
		-38	84.9	916	194	.670	382	30.8	36.2	38.9	41.7	44.4	47.1	52.6
		-39	83.9	875	188	.650	370	30.9	36.6	39.5	42.3	45.2	48.0	53.7
		-41	(2) 82.9	832	181	.63	357	30.9	36.9	39.9	42.9	45.9	48.9	55.0
	ISA-10°C	-45	(1) 91.3	1194	220	.75	418	26.6	30.8	32.9	35.0	37.1	39.2	43.4
	-67°C	-47	87.3	1035	210	.720	400	29.0	33.8	36.2	38.7	41.1	43.5	48.3
		-48	84.1	940	200	.690	384	30.2	35.5	38.2	40.8	43.5	46.2	51.5
		-50	82.5	872	191	.660	367	30.7	36.4	39.3	42.1	45.0	47.9	53.6
		-51	(2) 81.1	813	181	.63	350	30.7	36.9	39.9	43.0	46.1	49.2	55.3

Figure 7-14 Cruise (Sheet 31)

CRUISE
41,000 FEET

ANTI-ICE SYSTEMS OFF **TWO ENGINES**

WT. LBS.	TEMP	RAT DEG. C		FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
14000.	ISA+20°C	-18	(1)	86.4	881	186	.64	384	32.2	37.9	40.7	43.6	46.4	49.3	54.9
	-37°C	-19		85.7	851	182	.630	375	32.4	38.2	41.2	44.1	47.0	50.0	55.8
		-20		85.2	831	179	.620	370	32.4	38.4	41.4	44.4	47.4	50.5	56.5
		-20		84.7	813	176	.610	364	32.4	38.6	41.6	44.7	47.8	50.8	57.0
		-20	(2)	84.6	811	175	.61	363	32.4	38.6	41.7	44.7	47.8	50.9	57.1
	ISA+10°C	-26	(1)	88.1	1008	204	.70	410	30.7	35.7	38.2	40.6	43.1	45.6	50.6
	-47°C	-27		86.5	938	197	.680	396	31.6	36.9	39.6	42.2	44.9	47.6	52.9
		-29		84.9	869	188	.650	379	32.1	37.9	40.7	43.6	46.5	49.4	55.1
		-30		84.0	829	182	.630	367	32.3	38.3	41.3	44.3	47.4	50.4	56.4
		-31	(2)	82.9	791	175	.61	356	32.3	38.6	41.8	44.9	48.1	51.3	57.6
	ISA+ 0°C	-35	(1)	89.9	1099	215	.74	419	29.0	33.6	35.8	38.1	40.4	42.7	47.2
	-57°C	-37		86.0	970	203	.700	399	30.8	35.9	38.5	41.1	43.7	46.2	51.4
		-38		84.0	889	194	.670	382	31.7	37.3	40.1	42.9	45.8	48.6	54.2
		-40		82.6	826	185	.640	365	32.1	38.1	41.1	44.2	47.2	50.2	56.3
		-41	(2)	81.2	773	176	.61	348	32.1	38.6	41.8	45.1	48.3	51.5	58.0
	ISA-10°C	-45	(1)	90.8	1182	221	.76	420	27.1	31.3	33.4	35.5	37.6	39.7	44.0
	-67°C	-47		85.0	974	207	.710	395	30.3	35.4	38.0	40.5	43.1	45.7	50.8
		-49		82.7	889	197	.680	378	31.3	36.9	39.8	42.6	45.4	48.2	53.8
		-51		80.7	805	185	.640	356	31.8	38.0	41.1	44.3	47.4	50.5	56.7
		-52	(2)	79.4	755	176	.61	341	31.9	38.5	41.8	45.1	48.4	51.8	58.4
13000.	ISA+20°C	-18	(1)	86.2	879	190	.66	391	33.1	38.8	41.6	44.5	47.3	50.2	55.9
	-37°C	-18		85.3	842	185	.640	381	33.4	39.3	42.3	45.3	48.3	51.2	57.2
		-20		84.0	801	179	.620	370	33.7	39.9	43.0	46.1	49.3	52.4	58.6
		-20		83.4	781	176	.610	364	33.7	40.1	43.3	46.5	49.7	52.9	59.3
		-21	(2)	82.6	754	171	.59	355	33.8	40.4	43.7	47.0	50.4	53.7	60.3
	ISA+10°C	-25	(1)	88.0	1009	207	.71	414	31.1	36.1	38.6	41.0	43.5	46.0	51.0
	-47°C	-27		85.7	913	197	.680	396	32.4	37.9	40.7	43.4	46.1	48.9	54.4
		-29		84.1	841	188	.650	379	33.1	39.1	42.1	45.0	48.0	51.0	56.9
		-30		82.3	780	179	.620	362	33.5	40.0	43.2	46.4	49.6	52.8	59.2
		-32	(2)	80.9	735	171	.60	347	33.6	40.4	43.8	47.2	50.6	54.0	60.8
	ISA+ 0°C	-34	(1)	89.8	1098	216	.74	421	29.3	33.8	36.1	38.4	40.7	42.9	47.5
	-57°C	-37		85.3	946	203	.700	399	31.6	36.8	39.5	42.1	44.8	47.4	52.7
		-39		82.8	841	191	.660	376	32.8	38.8	41.7	44.7	47.7	50.7	56.6
		-40		81.2	779	182	.630	359	33.3	39.7	42.9	46.1	49.3	52.5	58.9
		-42	(2)	79.3	719	172	.60	340	33.4	40.4	43.9	47.3	50.8	54.3	61.3
	ISA-10°C	-45	(1)	90.0	1155	221	.76	420	27.7	32.0	34.2	36.4	38.5	40.7	45.0
	-67°C	-47		84.1	952	207	.710	395	31.0	36.2	38.8	41.5	44.1	46.7	52.0
		-49		81.4	842	194	.670	373	32.4	38.4	41.3	44.3	47.3	50.2	56.2
		-51		79.3	760	182	.630	351	33.0	39.6	42.9	46.2	49.5	52.8	59.4
		-53	(2)	77.5	703	172	.60	333	33.1	40.2	43.8	47.4	50.9	54.5	61.6
12000.	ISA+20°C	-17	(1)	86.0	877	193	.67	397	33.8	39.5	42.4	45.2	48.1	50.9	56.6
	-37°C	-18		84.3	816	185	.640	381	34.5	40.6	43.7	46.8	49.8	52.9	59.0
		-20		82.9	773	179	.620	370	34.9	41.3	44.6	47.8	51.0	54.3	60.7
		-21		81.6	733	173	.600	358	35.2	42.0	45.4	48.8	52.2	55.6	62.5
		-21	(2)	80.8	706	168	.58	348	35.2	42.3	45.8	49.3	52.9	56.4	63.5
	ISA+10°C	-25	(1)	87.9	1011	209	.72	419	31.5	36.5	38.9	41.4	43.9	46.3	51.3
	-47°C	-27		85.1	889	197	.680	396	33.3	38.9	41.7	44.5	47.4	50.2	55.8
		-29		83.2	816	188	.650	379	34.2	40.3	43.4	46.4	49.5	52.6	58.7
		-30		81.3	753	179	.620	362	34.7	41.4	44.7	48.0	51.3	54.7	61.3
		-32	(2)	79.2	690	168	.59	342	35.0	42.3	45.9	49.5	53.1	56.8	64.0
	ISA+ 0°C	-34	(1)	89.8	1101	218	.75	424	29.4	34.0	36.3	38.5	40.8	43.1	47.6
	-57°C	-37		84.6	923	203	.700	399	32.3	37.8	40.5	43.2	45.9	48.6	54.0
		-39		82.1	817	191	.660	376	33.8	39.9	43.0	46.1	49.1	52.2	58.3
		-41		79.5	734	179	.620	354	34.5	41.3	44.7	48.2	51.6	55.0	61.8
		-43	(2)	77.6	675	168	.59	335	34.8	42.2	45.9	49.6	53.3	57.0	64.4
	ISA-10°C	-45	(1)	89.1	1131	221	.76	420	28.3	32.7	34.9	37.1	39.4	41.6	46.0
	-67°C	-47		83.4	928	207	.710	395	31.8	37.1	39.8	42.5	45.2	47.9	53.3
		-49		80.8	819	194	.670	373	33.3	39.4	42.5	45.5	48.6	51.6	57.7
		-51		78.4	735	182	.630	351	34.1	40.9	44.3	47.7	51.1	54.5	61.3
		-53	(2)	75.8	659	169	.59	327	34.4	42.0	45.8	49.6	53.4	57.2	64.8

(1) MAXIMUM CRUISE THRUST

(2) THRUST FOR MAXIMUM RANGE (APPROXIMATE)

ANTI-ICE SYSTEMS ON		
MAX. FAN %RPM		
-47°C	-57°C	-67°C
83.9	85.7	87.7
INCREASE FUEL FLOWS AND DECREASE SPECIFIC RANGES BY 10%		

Figure 7-14 Cruise (Sheet 32)

CRUISE
43,000 FEET

ANTI-ICE SYSTEMS OFF **TWO ENGINES**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
16200.	ISA+ 0°C	-38	(1) 89.8	983	190	.69	391	29.6	34.7	37.3	39.8	42.4	44.9	50.0
	-57°C	-38	89.1	952	186	.674	384	29.8	35.1	37.7	40.3	43.0	45.6	50.8
		-39	88.6	931	183	.664	378	29.9	35.3	37.9	40.6	43.3	46.0	51.4
		-39	88.1	913	180	.654	373	29.9	35.3	38.1	40.8	43.6	46.3	51.8
		-39	(2) 88.1	912	180	.65	372	29.9	35.3	38.1	40.8	43.6	46.3	51.8
	ISA-10°C	-47	(1) 91.0	1068	200	.72	399	28.1	32.7	35.1	37.4	39.8	42.1	46.8
	-67°C	-47	89.3	1011	196	.705	392	28.9	33.8	36.3	38.8	41.3	43.7	48.7
		-49	87.7	950	189	.685	381	29.6	34.8	37.5	40.1	42.7	45.4	50.6
		-49	87.2	926	186	.674	375	29.7	35.1	37.8	40.5	43.2	45.9	51.3
		-50	(2) 86.2	888	180	.65	364	29.7	35.4	38.2	41.0	43.8	46.6	52.2
16000.	ISA+ 0°C	-37	(1) 89.7	981	191	.69	393	29.9	35.0	37.5	40.1	42.6	45.2	50.3
	-57°C	-38	89.1	955	188	.680	387	30.1	35.3	37.9	40.5	43.2	45.8	51.0
		-38	88.5	933	185	.670	382	30.2	35.6	38.2	40.9	43.6	46.3	51.6
		-39	88.0	914	182	.660	376	30.2	35.7	38.4	41.2	43.9	46.6	52.1
		-39	(2) 87.5	897	179	.65	371	30.2	35.8	38.5	41.3	44.1	46.9	52.5
	ISA-10°C	-47	(1) 91.0	1069	201	.72	401	28.2	32.8	35.2	37.5	39.9	42.2	46.9
	-67°C	-48	88.4	981	194	.700	389	29.5	34.6	37.1	39.7	42.2	44.8	49.9
		-49	87.2	929	188	.680	378	30.0	35.3	38.0	40.7	43.4	46.1	51.5
		-50	86.1	889	182	.660	367	30.1	35.7	38.5	41.3	44.1	46.9	52.6
		-50	(2) 85.6	872	179	.65	362	30.0	35.8	38.6	41.5	44.4	47.2	53.0
15500.	ISA+ 0°C	-37	(1) 89.7	985	194	.70	399	30.3	35.4	38.0	40.5	43.0	45.6	50.6
	-57°C	-37	88.9	955	191	.690	393	30.7	35.9	38.5	41.1	43.8	46.4	51.6
		-38	87.5	909	185	.670	382	31.0	36.5	39.2	42.0	44.8	47.5	53.0
		-39	86.9	889	182	.660	376	31.1	36.7	39.5	42.3	45.1	47.9	53.6
		-39	(2) 86.7	882	181	.66	374	31.1	36.7	39.6	42.4	45.2	48.1	53.7
	ISA-10°C	-46	(1) 90.9	1075	203	.73	406	28.5	33.1	35.5	37.8	40.1	42.4	47.1
	-67°C	-47	88.4	989	197	.710	395	29.8	34.9	37.4	39.9	42.4	45.0	50.0
		-48	87.0	929	191	.690	384	30.5	35.9	38.6	41.3	44.0	46.7	52.1
		-49	85.7	884	185	.670	373	30.9	36.5	39.3	42.2	45.0	47.8	53.5
		-50	(2) 84.8	859	181	.66	366	30.9	36.7	39.6	42.6	45.5	48.4	54.2
15000.	ISA+10°C	-28	(1) 88.0	902	184	.67	388	31.9	37.5	40.2	43.0	45.8	48.5	54.1
	-47°C	-29	87.3	874	179	.650	379	31.9	37.6	40.5	43.3	46.2	49.1	54.8
		-29	(2) 87.3	875	179	.65	379	31.9	37.6	40.5	43.3	46.2	49.1	54.8
	ISA+ 0°C	-36	(1) 89.6	988	197	.71	404	30.7	35.8	38.3	40.8	43.4	45.9	51.0
	-57°C	-37	87.9	930	191	.690	393	31.5	36.9	39.5	42.2	44.9	47.6	53.0
		-38	87.2	907	188	.680	387	31.7	37.2	39.9	42.7	45.4	48.2	53.7
		-39	85.8	867	182	.660	376	31.8	37.6	40.5	43.4	46.3	49.1	54.9
		-39	(2) 85.4	852	180	.65	371	31.8	37.7	40.6	43.6	46.5	49.4	55.3
	ISA-10°C	-46	(1) 90.9	1081	206	.74	411	28.7	33.4	35.7	38.0	40.3	42.6	47.2
	-67°C	-47	87.8	964	197	.710	395	30.6	35.7	38.3	40.9	43.5	46.1	51.3
		-48	86.0	905	191	.690	384	31.4	36.9	39.6	42.4	45.2	47.9	53.5
		-49	84.5	861	185	.670	373	31.7	37.5	40.4	43.3	46.2	49.1	54.9
		-50	(2) 83.6	831	180	.65	363	31.7	37.7	40.7	43.7	46.7	49.7	55.7
14000.	ISA+10°C	-27	(1) 87.7	907	190	.68	399	33.0	38.5	41.3	44.0	46.8	49.5	55.0
	-47°C	-28	87.0	875	185	.670	390	33.2	38.9	41.8	44.6	47.5	50.3	56.0
		-28	86.5	855	182	.660	385	33.3	39.1	42.0	45.0	47.9	50.8	56.7
		-29	85.6	818	176	.640	373	33.4	39.5	42.5	45.6	48.7	51.7	57.8
		-30	(2) 85.4	808	175	.63	370	33.4	39.5	42.6	45.7	48.8	51.9	58.1
	ISA+ 0°C	-36	(1) 89.4	990	201	.72	411	31.4	36.4	38.9	41.5	44.0	46.5	51.6
	-57°C	-37	87.3	923	194	.700	399	32.4	37.8	40.5	43.2	45.9	48.6	54.0
		-38	85.1	851	185	.670	382	33.1	39.0	41.9	44.9	47.8	50.7	56.6
		-39	84.2	813	179	.650	370	33.3	39.4	42.5	45.5	48.6	51.7	57.8
		-40	(2) 83.6	788	175	.63	362	33.2	39.6	42.8	45.9	49.1	52.3	58.6
	ISA-10°C	-45	(1) 90.8	1086	209	.75	416	29.1	33.7	36.0	38.3	40.6	42.9	47.5
	-67°C	-47	87.4	958	200	.720	400	31.3	36.5	39.2	41.8	44.4	47.0	52.2
		-48	84.3	869	191	.690	384	32.7	38.4	41.3	44.2	47.0	49.9	55.7
		-50	82.8	810	182	.660	367	33.0	39.2	42.3	45.4	48.5	51.5	57.7
		-51	(2) 81.8	769	175	.64	354	33.0	39.5	42.8	46.0	49.3	52.5	59.0

Figure 7-14 Cruise (Sheet 33)

CRUISE
43,000 FEET

ANTI-ICE SYSTEMS OFF **TWO ENGINES**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
13000.	ISA+20°C	-19	(1) 85.9	789	173	.63	375	34.9	41.2	44.4	47.5	50.7	53.9	60.2
	-37°C	-20	85.5	772	170	.620	370	34.9	41.4	44.6	47.8	51.1	54.3	60.8
		-20	(2) 85.2	762	169	.61	366	34.9	41.5	44.7	48.0	51.3	54.6	61.1
	ISA+10°C	-26	(1) 87.6	908	193	.70	405	33.6	39.1	41.9	44.6	47.4	50.1	55.7
	-47°C	-28	86.0	844	185	.670	390	34.4	40.3	43.3	46.2	49.2	52.2	58.1
		-29	85.0	805	179	.650	379	34.7	40.9	44.0	47.1	50.2	53.3	59.5
		-30	84.2	768	173	.630	367	34.8	41.3	44.6	47.8	51.1	54.3	60.8
		-31	(2) 83.5	743	169	.61	359	34.8	41.5	44.9	48.3	51.6	55.0	61.7
	ISA+ 0°C	-35	(1) 89.4	995	203	.73	416	31.8	36.8	39.3	41.8	44.3	46.9	51.9
	-57°C	-37	86.1	895	194	.700	399	33.4	39.0	41.8	44.5	47.3	50.1	55.7
		-38	84.2	822	185	.670	382	34.3	40.4	43.4	46.5	49.5	52.6	58.6
		-40	82.8	765	176	.640	365	34.6	41.1	44.4	47.7	50.9	54.2	60.7
		-41	(2) 81.8	724	169	.62	351	34.6	41.5	45.0	48.4	51.9	55.3	62.2
	ISA-10°C	-45	(1) 90.6	1086	211	.76	420	29.5	34.1	36.4	38.7	41.0	43.3	47.9
	-67°C	-47	86.3	929	200	.720	400	32.3	37.7	40.4	43.1	45.8	48.5	53.8
		-49	82.8	820	188	.680	378	33.9	40.0	43.1	46.1	49.2	52.2	58.3
		-50	81.3	763	179	.650	362	34.3	40.9	44.2	47.5	50.7	54.0	60.6
		-52	(2) 79.9	707	169	.62	343	34.4	41.5	45.0	48.5	52.1	55.6	62.7
12000.	ISA+20°C	-18	(1) 85.7	788	178	.65	385	36.1	42.4	45.6	48.8	51.9	55.1	61.5
	-37°C	-19	84.8	759	173	.630	375	36.3	42.9	46.2	49.5	52.8	56.1	62.7
		-20	84.2	740	170	.620	370	36.4	43.2	46.5	49.9	53.3	56.7	63.4
		-20	83.6	723	168	.610	364	36.5	43.4	46.8	50.3	53.8	57.2	64.1
		-21	(2) 83.0	702	164	.60	356	36.5	43.6	47.2	50.7	54.3	57.9	65.0
	ISA+10°C	-26	(1) 87.5	907	195	.70	410	34.2	39.7	42.4	45.2	47.9	50.7	56.2
	-47°C	-28	85.2	818	185	.670	390	35.5	41.6	44.7	47.7	50.8	53.8	60.0
		-29	84.2	776	179	.650	379	35.9	42.4	45.6	48.8	52.0	55.2	61.7
		-30	82.5	721	170	.620	362	36.3	43.2	46.7	50.2	53.7	57.1	64.1
		-31	(2) 81.3	685	164	.60	349	36.4	43.7	47.3	51.0	54.6	58.3	65.6
	ISA+ 0°C	-35	(1) 89.3	998	206	.74	420	32.1	37.1	39.6	42.1	44.6	47.1	52.1
	-57°C	-37	85.3	870	194	.700	399	34.3	40.0	42.9	45.8	48.7	51.5	57.3
		-39	82.9	775	182	.660	376	35.6	42.1	45.3	48.5	51.7	55.0	61.4
		-40	81.3	719	173	.630	359	36.0	43.0	46.5	50.0	53.4	56.9	63.9
		-42	(2) 79.6	669	164	.60	342	36.2	43.6	47.4	51.1	54.9	58.6	66.1
	ISA-10°C	-45	(1) 89.6	1057	211	.76	420	30.3	35.0	37.4	39.7	42.1	44.5	49.2
	-67°C	-47	84.1	875	197	.710	395	33.7	39.4	42.3	45.1	48.0	50.8	56.6
		-49	81.5	775	185	.670	373	35.2	41.6	44.9	48.1	51.3	54.6	61.0
		-51	80.0	718	176	.640	356	35.7	42.7	46.2	49.6	53.1	56.6	63.6
		-53	(2) 77.9	654	165	.60	335	35.9	43.5	47.3	51.2	55.0	58.8	66.5

(1) MAXIMUM CRUISE THRUST

(2) THRUST FOR MAXIMUM
RANGE (APPROXIMATE)

Figure 7-14 Cruise (Sheet 34)

CRUISE
45,000 FEET

ANTI-ICE SYSTEMS OFF **TWO ENGINES**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL: 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
15000.	ISA+ 0°C	-38	(1) 89.4	882	178	.67	384	32.3	37.9	40.8	43.6	46.4	49.3	55.0
	-57°C	-39	88.7	855	174	.660	376	32.3	38.2	41.1	44.0	46.9	49.9	55.7
		-39	(2) 88.6	852	173	.66	375	32.3	38.2	41.1	44.0	47.0	49.9	55.8
	ISA-10°C	-47	(1) 90.6	968	189	.71	397	30.7	35.8	38.4	41.0	43.6	46.2	51.3
	-67°C	-48	89.0	918	185	.700	389	31.5	37.0	39.7	42.4	45.1	47.9	53.3
		-49	87.7	867	179	.680	378	32.1	37.9	40.7	43.6	46.5	49.4	55.1
		-49	87.2	848	177	.670	373	32.2	38.1	41.0	44.0	46.9	49.9	55.8
		-50	(2) 86.7	830	174	.66	367	32.2	38.2	41.2	44.2	47.2	50.2	56.3
14000.	ISA+ 0°C	-37	(1) 89.1	887	185	.70	398	33.6	39.2	42.0	44.9	47.7	50.5	56.1
	-57°C	-38	87.7	842	179	.680	387	34.1	40.0	43.0	46.0	49.0	51.9	57.9
		-38	87.1	823	177	.670	382	34.2	40.3	43.4	46.4	49.4	52.5	58.5
		-39	86.3	804	174	.660	376	34.3	40.5	43.6	46.8	49.9	53.0	59.2
		-39	(2) 86.3	804	174	.66	376	34.3	40.5	43.7	46.8	49.9	53.0	59.2
	ISA-10°C	-46	(1) 90.5	978	195	.73	407	31.4	36.5	39.1	41.6	44.2	46.8	51.9
	-67°C	-47	88.0	894	188	.710	395	33.0	38.6	41.4	44.2	47.0	49.8	55.4
		-48	86.5	841	182	.690	384	33.7	39.7	42.7	45.6	48.6	51.6	57.5
		-49	85.2	800	177	.670	373	34.1	40.3	43.5	46.6	49.7	52.8	59.1
		-50	(2) 84.5	782	174	.66	367	34.2	40.6	43.8	46.9	50.1	53.3	59.7
13000.	ISA+10°C	-27	(1) 87.3	810	177	.67	391	36.0	42.2	45.2	48.3	51.4	54.5	60.7
	-47°C	-28	86.8	789	174	.660	385	36.1	42.4	45.6	48.8	51.9	55.1	61.4
		-29	86.3	771	171	.650	379	36.2	42.6	45.9	49.1	52.4	55.6	62.1
		-29	85.9	756	168	.640	373	36.1	42.7	46.0	49.3	52.6	56.0	62.6
		-29	(2) 85.9	756	168	.64	373	36.1	42.7	46.0	49.3	52.7	56.0	62.6
	ISA+ 0°C	-36	(1) 89.0	893	190	.72	407	34.4	40.0	42.8	45.6	48.4	51.2	56.8
	-57°C	-37	86.4	821	182	.690	393	35.7	41.8	44.8	47.9	50.9	54.0	60.1
		-38	85.4	784	177	.670	382	35.9	42.3	45.5	48.7	51.8	55.0	61.4
		-39	84.9	767	174	.660	376	36.0	42.5	45.8	49.0	52.3	55.6	62.1
		-40	(2) 84.1	738	169	.64	366	36.0	42.8	46.2	49.6	53.0	56.4	63.1
	ISA-10°C	-45	(1) 90.4	986	199	.75	415	32.0	37.0	39.6	42.1	44.6	47.2	52.3
	-67°C	-47	87.5	881	191	.720	400	34.1	39.7	42.6	45.4	48.2	51.1	56.8
		-48	84.4	798	182	.690	384	35.6	41.8	45.0	48.1	51.2	54.4	60.6
		-50	83.0	746	174	.660	367	35.8	42.5	45.9	49.2	52.6	55.9	62.6
		-51	(2) 82.3	719	169	.64	358	35.8	42.8	46.3	49.7	53.2	56.7	63.6
12000.	ISA+10°C	-27	(1) 87.1	811	181	.69	400	37.0	43.2	46.3	49.4	52.4	55.5	61.7
	-47°C	-28	86.1	775	177	.670	390	37.5	43.9	47.2	50.4	53.6	56.9	63.3
		-29	85.2	739	171	.650	379	37.7	44.5	47.9	51.3	54.6	58.0	64.8
		-30	84.3	707	165	.630	367	37.8	44.9	48.5	52.0	55.5	59.1	66.1
		-30	(2) 83.9	689	162	.62	361	37.8	45.1	48.7	52.3	55.9	59.6	66.8
	ISA+ 0°C	-35	(1) 88.8	895	193	.73	414	35.0	40.6	43.4	46.2	49.0	51.8	57.4
	-57°C	-37	85.4	795	182	.690	393	36.9	43.1	46.3	49.4	52.6	55.7	62.0
		-38	84.3	753	177	.670	382	37.4	44.0	47.3	50.7	54.0	57.3	63.9
		-40	82.9	703	168	.640	365	37.7	44.8	48.3	51.9	55.5	59.0	66.1
		-41	(2) 82.1	672	162	.62	353	37.7	45.1	48.8	52.5	56.2	60.0	67.4
	ISA-10°C	-45	(1) 90.4	991	201	.76	420	32.3	37.3	39.9	42.4	44.9	47.4	52.5
	-67°C	-47	86.2	850	191	.720	400	35.3	41.2	44.2	47.1	50.0	53.0	58.9
		-49	82.9	751	179	.680	378	37.0	43.7	47.0	50.3	53.7	57.0	63.6
		-50	81.5	700	171	.650	362	37.4	44.6	48.1	51.7	55.3	58.8	66.0
		-52	(2) 80.3	657	163	.62	346	37.4	45.0	48.8	52.6	56.5	60.3	67.9

(1) MAXIMUM CRUISE THRUST

(2) THRUST FOR MAXIMUM RANGE (APPROXIMATE)

Figure 7-14 Cruise (Sheet 35)

CRUISE
5000 FEET

ANTI-ICE SYSTEMS OFF **ONE ENGINE**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
16500.	ISA+20°C	33	(1) 80.9	1154	226	.37	250	13.0	17.3	19.5	21.6	23.8	26.0	30.3
	25°C	32	79.4	1095	217	.360	240	12.8	17.4	19.6	21.9	24.2	26.5	31.1
		32	(2) 78.6	1066	212	.35	235	12.7	17.4	19.7	22.0	24.4	26.7	31.4
	ISA+10°C	24	(1) 83.1	1268	245	.40	266	13.1	17.0	19.0	21.0	22.9	24.9	28.8
	15°C	23	80.3	1156	229	.380	249	12.9	17.3	19.4	21.6	23.7	25.9	30.2
		22	(2) 77.4	1047	213	.35	231	12.5	17.3	19.7	22.1	24.5	26.9	31.6
	ISA+ 0°C	15	(1) 84.5	1382	262	.43	279	13.0	16.6	18.4	20.2	22.0	23.8	27.4
	5°C	13	80.0	1176	236	.390	252	12.9	17.1	19.3	21.4	23.5	25.6	29.9
		12	(2) 76.1	1028	213	.35	228	12.4	17.3	19.7	22.1	24.6	27.0	31.9
	ISA-10°C	4	(1) 83.0	1353	262	.43	274	12.9	16.6	18.4	20.2	22.1	23.9	27.6
	-5°C	3	78.6	1152	236	.390	247	12.8	17.1	19.3	21.4	23.6	25.8	30.1
		1	(2) 74.9	1011	213	.35	224	12.3	17.2	19.7	22.2	24.6	27.1	32.1
16000.	ISA+20°C	33	(1) 80.9	1153	227	.38	251	13.1	17.4	19.6	21.8	23.9	26.1	30.4
	25°C	32	79.1	1085	217	.360	240	12.9	17.5	19.8	22.1	24.4	26.7	31.4
		32	(2) 77.9	1041	210	.35	232	12.7	17.5	19.9	22.3	24.7	27.1	31.9
	ISA+10°C	24	(1) 83.0	1266	245	.41	267	13.2	17.1	19.1	21.0	23.0	25.0	28.9
	15°C	22	78.9	1104	223	.370	243	12.9	17.5	19.7	22.0	24.2	26.5	31.0
		22	(2) 76.7	1022	210	.35	229	12.6	17.5	19.9	22.4	24.8	27.3	32.2
	ISA+ 0°C	15	(1) 84.4	1374	262	.43	279	13.0	16.7	18.5	20.3	22.1	23.9	27.6
	5°C	13	79.8	1168	236	.390	252	13.0	17.3	19.4	21.5	23.7	25.8	30.1
		11	(2) 75.4	1004	210	.35	225	12.5	17.4	19.9	22.4	24.9	27.4	32.4
	ISA-10°C	4	(1) 82.9	1346	262	.43	274	12.9	16.6	18.5	20.4	22.2	24.1	27.8
	-5°C	3	78.4	1144	236	.390	247	12.9	17.2	19.4	21.6	23.8	26.0	30.3
		1	(2) 74.1	985	211	.35	221	12.3	17.4	19.9	22.4	25.0	27.5	32.6
15000.	ISA+20°C	33	(1) 80.9	1153	229	.38	254	13.3	17.7	19.8	22.0	24.2	26.4	30.7
	25°C	32	78.5	1065	217	.360	240	13.1	17.8	20.2	22.5	24.9	27.2	31.9
		31	(2) 76.3	988	204	.34	227	12.8	17.9	20.4	22.9	25.5	28.0	33.0
	ISA+10°C	24	(1) 83.1	1270	248	.41	269	13.3	17.2	19.2	21.2	23.2	25.1	29.1
	15°C	22	78.4	1086	223	.370	243	13.1	17.7	20.0	22.3	24.6	27.0	31.6
		21	(2) 75.2	971	205	.34	223	12.7	17.8	20.4	23.0	25.5	28.1	33.3
	ISA+ 0°C	15	(1) 84.1	1361	262	.43	279	13.2	16.8	18.7	20.5	22.3	24.2	27.8
	5°C	13	78.2	1107	229	.380	245	13.1	17.6	19.9	22.1	24.4	26.7	31.2
		11	(2) 73.9	954	205	.34	219	12.5	17.8	20.4	23.0	25.6	28.2	33.5
	ISA-10°C	4	(1) 82.6	1332	262	.43	274	13.1	16.8	18.7	20.6	22.4	24.3	28.1
	-5°C	2	76.8	1085	229	.380	241	13.0	17.6	19.9	22.2	24.5	26.8	31.4
		1	(2) 72.6	936	205	.34	216	12.4	17.7	20.4	23.0	25.7	28.4	33.7
14000.	ISA+20°C	33	(1) 80.8	1152	232	.38	256	13.5	17.9	20.1	22.2	24.4	26.6	30.9
	25°C	32	76.8	1006	211	.350	233	13.2	18.2	20.7	23.2	25.7	28.1	33.1
		31	(2) 74.8	936	199	.33	221	12.9	18.2	20.9	23.6	26.2	28.9	34.2
	ISA+10°C	24	(1) 83.0	1268	249	.41	271	13.5	17.4	19.4	21.3	23.3	25.3	29.2
	15°C	22	77.9	1069	223	.370	243	13.3	18.0	20.4	22.7	25.0	27.4	32.0
		21	(2) 73.6	920	199	.33	217	12.7	18.2	20.9	23.6	26.3	29.0	34.5
	ISA+ 0°C	15	(1) 83.8	1348	262	.43	279	13.3	17.0	18.8	20.7	22.5	24.4	28.1
	5°C	13	77.8	1091	229	.380	245	13.3	17.9	20.2	22.5	24.7	27.0	31.6
		11	(2) 72.4	904	200	.33	214	12.6	18.1	20.9	23.6	26.4	29.2	34.7
	ISA-10°C	4	(1) 82.4	1320	262	.43	274	13.2	17.0	18.9	20.8	22.6	24.5	28.3
	-5°C	2	76.4	1069	229	.380	241	13.1	17.8	20.2	22.5	24.8	27.2	31.8
		1	(2) 71.2	889	200	.33	210	12.4	18.0	20.8	23.6	26.5	29.3	34.9
13000.	ISA+20°C	33	(1) 80.8	1151	233	.39	258	13.7	18.1	20.2	22.4	24.6	26.8	31.1
	25°C	32	76.3	989	211	.350	233	13.5	18.5	21.1	23.6	26.1	28.6	33.7
		31	(2) 73.1	882	193	.32	214	12.9	18.6	21.4	24.2	27.1	29.9	35.6
	ISA+10°C	24	(1) 83.0	1269	251	.41	272	13.6	17.5	19.5	21.5	23.4	25.4	29.4
	15°C	22	76.2	1011	217	.360	236	13.5	18.4	20.9	23.3	25.8	28.3	33.2
		21	(2) 71.9	867	193	.32	210	12.7	18.5	21.4	24.3	27.1	30.0	35.8
	ISA+ 0°C	15	(1) 83.6	1336	262	.43	279	13.4	17.1	19.0	20.9	22.8	24.6	28.4
	5°C	12	76.1	1033	223	.370	238	13.4	18.2	20.7	23.1	25.5	27.9	32.8
		10	(2) 70.7	851	193	.32	207	12.6	18.4	21.4	24.3	27.2	30.2	36.0
	ISA-10°C	4	(1) 82.1	1308	262	.43	274	13.3	17.1	19.0	20.9	22.8	24.8	28.6
	-5°C	2	74.8	1013	223	.370	234	13.2	18.2	20.7	23.1	25.6	28.1	33.0
		0	(2) 69.6	839	194	.32	204	12.4	18.3	21.3	24.3	27.3	30.3	36.2
12000.	ISA+20°C	33	(1) 80.8	1152	235	.39	260	13.9	18.2	20.4	22.6	24.7	26.9	31.3
	25°C	32	75.8	973	211	.350	233	13.7	18.8	21.4	24.0	26.5	29.1	34.3
		30	(2) 71.4	831	187	.31	207	12.9	18.9	21.9	24.9	28.0	31.0	37.0
	ISA+10°C	24	(1) 82.9	1267	252	.42	274	13.7	17.7	19.6	21.6	23.6	25.5	29.5
	15°C	22	75.8	996	217	.360	236	13.7	18.7	21.2	23.7	26.2	28.7	33.7
		20	(2) 70.3	817	187	.31	204	12.7	18.9	21.9	25.0	28.0	31.1	37.2
	ISA+ 0°C	15	(1) 83.3	1325	262	.43	279	13.5	17.3	19.2	21.1	22.9	24.8	28.6
	5°C	12	75.7	1019	223	.370	238	13.6	18.5	20.9	23.4	25.9	28.3	33.2
		10	(2) 69.1	803	187	.31	201	12.5	18.8	21.9	25.0	28.1	31.2	37.5
	ISA-10°C	4	(1) 81.9	1297	262	.43	274	13.4	17.3	19.2	21.1	23.0	25.0	28.8
	-5°C	2	74.4	999	223	.370	234	13.4	18.4	20.9	23.4	25.9	28.4	33.4
		0	(2) 68.2	796	189	.32	199	12.4	18.7	21.8	25.0	28.1	31.3	37.5

(1) MAXIMUM CRUISE THRUST

(2) THRUST FOR MAXIMUM RANGE (APPROXIMATE)

Figure 7-15 Cruise (Sheet 1 of 10)

CRUISE
10,000 FEET

ANTI-ICE SYSTEMS OFF **ONE ENGINE**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
16500.	ISA+20°C	23	(1) 83.2	1051	214	.39	256	14.8	19.6	22.0	24.3	26.7	29.1	33.9
	15°C	23	82.2	1018	209	.380	249	14.7	19.6	22.1	24.5	27.0	29.4	34.3
		23	(2) 82.1	1014	208	.38	249	14.7	19.6	22.1	24.5	27.0	29.5	34.4
	ISA+10°C	15	(1) 85.1	1168	235	.43	275	15.0	19.3	21.4	23.5	25.7	27.8	32.1
	5°C	13	82.7	1067	220	.400	258	14.8	19.5	21.9	24.2	26.5	28.9	33.6
		13	(2) 80.8	996	209	.38	245	14.6	19.6	22.1	24.6	27.1	29.6	34.6
	ISA+ 0°C	6	(1) 86.9	1303	255	.46	293	14.8	18.6	20.5	22.5	24.4	26.3	30.1
	-5°C	4	83.1	1121	232	.420	266	14.8	19.3	21.5	23.8	26.0	28.2	32.7
		2	(2) 79.5	977	209	.38	241	14.4	19.5	22.1	24.7	27.2	29.8	34.9
	ISA-10°C	-3	(1) 88.4	1445	274	.49	308	14.4	17.8	19.6	21.3	23.0	24.8	28.2
	-15°C	-6	82.5	1137	237	.430	268	14.7	19.1	21.3	23.5	25.7	27.9	32.3
		-8	(2) 78.1	959	210	.38	237	14.3	19.5	22.1	24.7	27.3	29.9	35.1
16000.	ISA+20°C	23	(1) 83.1	1050	216	.39	258	15.0	19.8	22.2	24.5	26.9	29.3	34.1
	15°C	23	81.9	1007	209	.380	249	14.8	19.8	22.3	24.8	27.3	29.7	34.7
		23	(2) 81.3	986	205	.37	245	14.7	19.8	22.4	24.9	27.4	30.0	35.0
	ISA+10°C	15	(1) 85.1	1168	236	.43	276	15.1	19.4	21.5	23.7	25.8	27.9	32.2
	5°C	13	82.5	1057	220	.400	258	15.0	19.7	22.1	24.4	26.8	29.2	33.9
		12	(2) 80.0	968	206	.37	242	14.6	19.8	22.4	25.0	27.5	30.1	35.3
	ISA+ 0°C	6	(1) 86.8	1300	256	.46	293	14.9	18.7	20.6	22.6	24.5	26.4	30.3
	-5°C	4	82.9	1112	232	.420	266	15.0	19.5	21.7	24.0	26.2	28.5	33.0
		2	(2) 78.6	950	206	.38	238	14.5	19.7	22.4	25.0	27.6	30.3	35.5
	ISA-10°C	-3	(1) 88.4	1448	275	.50	309	14.4	17.9	19.6	21.3	23.1	24.8	28.2
	-15°C	-6	82.3	1128	237	.430	268	14.9	19.3	21.5	23.7	25.9	28.2	32.6
		-8	(2) 77.3	933	207	.38	234	14.3	19.7	22.4	25.0	27.7	30.4	35.8
15000.	ISA+20°C	24	(1) 83.1	1052	219	.40	262	15.4	20.1	22.5	24.9	27.2	29.6	34.4
	15°C	23	81.2	985	209	.380	249	15.2	20.2	22.8	25.3	27.9	30.4	35.5
		22	(2) 79.6	932	200	.36	239	14.9	20.3	23.0	25.6	28.3	31.0	36.4
	ISA+10°C	15	(1) 85.0	1167	238	.43	279	15.3	19.6	21.7	23.9	26.0	28.2	32.4
	5°C	13	81.9	1038	220	.400	258	15.2	20.1	22.5	24.9	27.3	29.7	34.5
		12	(2) 78.3	915	200	.37	235	14.8	20.2	23.0	25.7	28.4	31.2	36.6
	ISA+ 0°C	6	(1) 86.8	1300	257	.47	295	15.0	18.9	20.8	22.7	24.6	26.6	30.4
	-5°C	4	81.5	1054	226	.410	260	15.2	19.9	22.3	24.7	27.0	29.4	34.1
		2	(2) 76.9	897	200	.37	231	14.6	20.2	23.0	25.8	28.5	31.3	36.9
	ISA-10°C	-3	(1) 88.4	1445	276	.50	310	14.5	18.0	19.7	21.5	23.2	24.9	28.4
	-15°C	-6	81.9	1112	237	.430	268	15.1	19.6	21.8	24.1	26.3	28.6	33.1
		-8	(2) 75.7	883	201	.37	227	14.4	20.1	22.9	25.8	28.6	31.4	37.1
14000.	ISA+20°C	24	(1) 83.1	1053	222	.40	265	15.6	20.4	22.8	25.1	27.5	29.9	34.6
	15°C	23	80.5	965	209	.380	249	15.5	20.7	23.3	25.8	28.4	31.0	36.2
		22	(2) 77.9	879	194	.35	232	15.1	20.7	23.6	26.4	29.3	32.1	37.8
	ISA+10°C	15	(1) 85.0	1168	240	.44	281	15.5	19.8	21.9	24.1	26.2	28.4	32.6
	5°C	13	80.3	982	215	.390	252	15.4	20.5	23.1	25.6	28.2	30.7	35.8
		12	(2) 76.6	863	195	.35	229	14.9	20.7	23.6	26.5	29.4	32.3	38.1
	ISA+ 0°C	6	(1) 86.8	1303	259	.47	297	15.1	19.0	20.9	22.8	24.7	26.7	30.5
	-5°C	4	81.0	1038	226	.410	260	15.4	20.2	22.6	25.1	27.5	29.9	34.7
		1	(2) 75.3	847	195	.36	225	14.7	20.6	23.6	26.5	29.5	32.4	38.3
	ISA-10°C	-3	(1) 88.4	1446	278	.50	312	14.6	18.1	19.8	21.6	23.3	25.0	28.5
	-15°C	-6	81.5	1097	237	.430	268	15.3	19.8	22.1	24.4	26.7	29.0	33.5
		-9	(2) 74.0	833	195	.36	221	14.5	20.6	23.6	26.6	29.6	32.6	38.6
13000.	ISA+20°C	24	(1) 83.1	1053	224	.41	267	15.9	20.6	23.0	25.4	27.8	30.1	34.9
	15°C	22	78.8	911	203	.370	243	15.7	21.2	23.9	26.7	29.4	32.2	37.6
		22	(2) 76.1	828	189	.34	226	15.2	21.2	24.3	27.3	30.3	33.3	39.4
	ISA+10°C	15	(1) 84.9	1168	242	.44	283	15.7	20.0	22.1	24.3	26.4	28.5	32.8
	5°C	13	79.7	965	215	.390	252	15.7	20.9	23.5	26.1	28.7	31.3	36.4
		11	(2) 74.9	812	189	.35	222	15.0	21.2	24.3	27.3	30.4	33.5	39.6
	ISA+ 0°C	6	(1) 86.8	1301	261	.47	299	15.3	19.1	21.0	23.0	24.9	26.8	30.6
	-5°C	4	80.6	1022	226	.410	260	15.6	20.5	23.0	25.4	27.9	30.3	35.2
		1	(2) 73.6	798	189	.35	218	14.8	21.1	24.2	27.4	30.5	33.6	39.9
	ISA-10°C	-3	(1) 88.4	1447	279	.50	313	14.7	18.2	19.9	21.6	23.4	25.1	28.5
	-15°C	-6	80.1	1041	232	.420	261	15.5	20.3	22.7	25.1	27.5	29.9	34.7
		-9	(2) 72.3	784	190	.35	215	14.6	21.0	24.2	27.4	30.6	33.8	40.1
12000.	ISA+20°C	24	(1) 83.0	1052	226	.41	270	16.1	20.9	23.3	25.6	28.0	30.4	35.1
	15°C	22	78.2	893	203	.370	243	16.0	21.6	24.4	27.2	30.0	32.8	38.4
		21	(2) 74.3	776	183	.33	219	15.3	21.7	25.0	28.2	31.4	34.6	41.1
	ISA+10°C	15	(1) 84.9	1168	244	.44	285	15.8	20.1	22.3	24.4	26.5	28.7	33.0
	5°C	13	78.0	911	209	.380	245	15.9	21.4	24.2	26.9	29.6	32.4	37.9
		11	(2) 73.0	761	183	.33	215	15.1	21.7	25.0	28.2	31.5	34.8	41.4
	ISA+ 0°C	6	(1) 86.8	1304	262	.47	301	15.4	19.2	21.1	23.0	25.0	26.9	30.7
	-5°C	3	79.0	968	220	.400	254	15.9	21.0	23.6	26.2	28.8	31.4	36.5
		1	(2) 71.8	748	183	.34	212	14.9	21.6	24.9	28.3	31.6	35.0	41.6
	ISA-10°C	-3	(1) 88.3	1446	280	.50	314	14.8	18.3	20.0	21.7	23.5	25.2	28.6
	-15°C	-6	79.8	1028	232	.420	261	15.7	20.6	23.0	25.4	27.9	30.3	35.2
		-9	(2) 70.6	735	184	.34	208	14.7	21.5	24.9	28.3	31.7	35.1	41.9

(1) MAXIMUM CRUISE THRUST

(2) THRUST FOR MAXIMUM RANGE (APPROXIMATE)

Figure 7-15 Cruise (Sheet 2)

CRUISE
15,000 FEET

ANTI-ICE SYSTEMS OFF **ONE ENGINE**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
16500.	ISA+10°C	5	(1) 86.3	1048	219	.44	278	17.0	21.7	24.1	26.5	28.9	31.3	36.0
	-5°C	4	84.9	991	210	.420	266	16.8	21.8	24.4	26.9	29.4	31.9	37.0
		4	(2) 84.4	972	207	.41	262	16.7	21.8	24.4	27.0	29.6	32.1	37.3
	ISA+ 0°C	-4	(1) 88.0	1163	239	.48	296	16.9	21.2	23.3	25.5	27.6	29.8	34.1
	-15°C	-5	85.0	1033	221	.440	274	16.8	21.7	24.1	26.5	29.0	31.4	36.2
		-6	(2) 82.9	953	207	.41	258	16.6	21.8	24.4	27.1	29.7	32.3	37.6
	ISA-10°C	-12	(1) 89.4	1311	259	.51	314	16.3	20.1	22.1	24.0	25.9	27.8	31.6
	-25°C	-15	85.0	1079	231	.460	281	16.8	21.4	23.7	26.0	28.4	30.7	35.3
		-17	(2) 81.4	936	208	.42	254	16.4	21.8	24.4	27.1	29.8	32.5	37.8
16000.	ISA+10°C	5	(1) 86.3	1047	221	.44	280	17.1	21.9	24.3	26.7	29.1	31.5	36.2
	-5°C	4	84.6	980	210	.420	266	17.0	22.1	24.6	27.2	29.7	32.3	37.4
		4	(2) 83.6	946	204	.41	259	16.8	22.1	24.8	27.4	30.0	32.7	38.0
	ISA+ 0°C	-4	(1) 87.9	1162	240	.48	297	17.0	21.3	23.4	25.6	27.7	29.9	34.2
	-15°C	-5	84.7	1022	221	.440	274	17.0	21.9	24.4	26.8	29.2	31.7	36.6
		-7	(2) 82.2	928	205	.41	255	16.7	22.1	24.8	27.5	30.2	32.9	38.3
	ISA-10°C	-12	(1) 89.4	1313	260	.52	315	16.4	20.2	22.1	24.0	25.9	27.8	31.6
	-25°C	-15	84.8	1070	231	.460	281	16.9	21.6	23.9	26.3	28.6	30.9	35.6
		-17	(2) 80.7	910	205	.41	250	16.5	22.0	24.8	27.5	30.3	33.0	38.5
15500.	ISA+20°C	14	(1) 84.4	943	202	.40	261	17.1	22.4	25.1	27.7	30.4	33.0	38.3
		14	(2) 84.2	937	201	.40	260	17.1	22.4	25.1	27.7	30.4	33.1	38.4
	ISA+10°C	5	(1) 86.2	1047	222	.44	281	17.3	22.1	24.5	26.9	29.3	31.6	36.4
	-5°C	4	84.2	969	210	.420	266	17.2	22.3	24.9	27.5	30.1	32.6	37.8
		3	(2) 82.8	919	202	.40	256	17.0	22.4	25.1	27.8	30.5	33.3	38.7
	ISA+ 0°C	-4	(1) 88.0	1164	241	.48	299	17.1	21.4	23.5	25.7	27.8	30.0	34.3
	-15°C	-5	84.4	1013	221	.440	274	17.2	22.1	24.6	27.1	29.5	32.0	36.9
		-7	(2) 81.4	902	202	.40	252	16.8	22.4	25.1	27.9	30.7	33.4	39.0
	ISA-10°C	-12	(1) 89.4	1314	261	.52	317	16.5	20.3	22.2	24.1	26.0	27.9	31.7
	-25°C	-15	84.5	1061	231	.460	281	17.1	21.8	24.1	26.5	28.9	31.2	35.9
		-17	(2) 80.0	885	203	.41	247	16.6	22.3	25.1	27.9	30.8	33.6	39.2
15000.	ISA+20°C	14	(1) 84.4	943	204	.41	264	17.4	22.7	25.3	28.0	30.6	33.3	38.6
	5°C	14	83.7	918	200	.400	258	17.2	22.7	25.4	28.1	30.9	33.6	39.0
		13	(2) 83.5	911	199	.40	257	17.2	22.7	25.4	28.2	30.9	33.7	39.2
	ISA+10°C	5	(1) 86.2	1048	224	.45	283	17.5	22.3	24.6	27.0	29.4	31.8	36.6
	-5°C	4	83.9	959	210	.420	266	17.4	22.6	25.2	27.8	30.4	33.0	38.2
		3	(2) 82.1	893	199	.40	252	17.1	22.7	25.5	28.3	31.1	33.9	39.5
	ISA+ 0°C	-4	(1) 88.0	1166	243	.48	301	17.2	21.5	23.6	25.8	27.9	30.1	34.4
	-15°C	-5	84.1	1003	221	.440	274	17.3	22.3	24.8	27.3	29.8	32.3	37.3
		-7	(2) 80.6	875	199	.40	248	16.9	22.6	25.5	28.3	31.2	34.1	39.8
	ISA-10°C	-12	(1) 89.3	1311	262	.52	317	16.6	20.4	22.3	24.2	26.1	28.0	31.8
	-25°C	-15	84.3	1052	231	.460	281	17.2	22.0	24.3	26.7	29.1	31.5	36.2
		-17	(2) 79.2	859	200	.40	244	16.7	22.6	25.5	28.4	31.3	34.2	40.0
14000.	ISA+20°C	14	(1) 84.3	943	208	.41	268	17.8	23.1	25.8	28.4	31.1	33.7	39.0
	5°C	14	83.0	896	200	.400	258	17.7	23.2	26.0	28.8	31.6	34.4	40.0
		13	(2) 81.7	855	193	.39	249	17.4	23.3	26.2	29.1	32.0	35.0	40.8
	ISA+10°C	5	(1) 86.2	1049	226	.45	286	17.8	22.5	24.9	27.3	29.7	32.1	36.9
	-5°C	4	83.3	939	210	.420	266	17.7	23.1	25.7	28.4	31.0	33.7	39.0
		3	(2) 80.4	840	193	.39	245	17.3	23.2	26.2	29.2	32.2	35.1	41.1
	ISA+ 0°C	-3	(1) 87.9	1166	245	.49	303	17.4	21.7	23.8	26.0	28.1	30.3	34.6
	-15°C	-6	82.7	951	215	.430	268	17.6	22.9	25.5	28.2	30.8	33.4	38.7
		-8	(2) 79.0	825	194	.39	241	17.1	23.2	26.2	29.2	32.3	35.3	41.4
	ISA-10°C	-12	(1) 89.3	1313	264	.52	319	16.7	20.5	22.4	24.3	26.2	28.1	31.9
	-25°C	-15	82.9	998	226	.450	275	17.5	22.5	25.0	27.5	30.0	32.5	37.5
		-18	(2) 77.6	810	194	.39	237	16.9	23.1	26.2	29.3	32.4	35.4	41.6
13000.	ISA+20°C	14	(1) 84.3	943	211	.42	272	18.2	23.5	26.2	28.8	31.5	34.1	39.4
	5°C	13	81.2	845	195	.390	252	17.9	23.9	26.8	29.8	32.7	35.7	41.6
		13	(2) 79.6	801	187	.37	241	17.6	23.9	27.0	30.1	33.3	36.4	42.6
	ISA+10°C	6	(1) 86.1	1048	229	.46	289	18.0	22.8	25.2	27.6	30.0	32.4	37.1
	-5°C	4	81.8	888	205	.410	260	18.0	23.6	26.5	29.3	32.1	34.9	40.5
		2	(2) 78.3	786	187	.37	237	17.5	23.8	27.0	30.2	33.4	36.6	42.9
	ISA+ 0°C	-3	(1) 87.8	1164	246	.49	305	17.6	21.9	24.0	26.2	28.3	30.5	34.8
	-15°C	-6	82.2	934	215	.430	268	18.0	23.3	26.0	28.7	31.3	34.0	39.4
		-8	(2) 77.0	771	187	.38	233	17.3	23.8	27.0	30.2	33.5	36.7	43.2
	ISA-10°C	-12	(1) 89.4	1316	266	.53	321	16.8	20.6	22.5	24.4	26.3	28.2	32.0
	-25°C	-15	82.5	983	226	.450	275	17.8	22.9	25.4	28.0	30.5	33.1	38.1
		-18	(2) 75.6	759	188	.38	230	17.1	23.7	27.0	30.3	33.6	36.8	43.4
12000.	ISA+20°C	15	(1) 84.2	943	213	.43	275	18.6	23.9	26.5	29.2	31.8	34.5	39.8
	5°C	13	80.5	826	195	.390	252	18.4	24.4	27.4	30.5	33.5	36.5	42.6
		12	(2) 77.6	749	181	.36	234	17.9	24.5	27.9	31.2	34.5	37.9	44.6
	ISA+10°C	6	(1) 86.1	1047	231	.46	291	18.3	23.0	25.4	27.8	30.2	32.6	37.4
	-5°C	4	81.2	870	205	.410	260	18.4	24.1	27.0	29.9	32.7	35.6	41.4
		2	(2) 76.3	735	181	.36	230	17.7	24.5	27.9	31.3	34.7	38.1	44.9
	ISA+ 0°C	-3	(1) 87.8	1166	248	.49	307	17.7	22.0	24.2	26.3	28.5	30.6	34.9
	-15°C	-6	81.7	918	215	.430	268	18.3	23.7	26.4	29.2	31.9	34.6	40.1
		-8	(2) 75.0	723	182	.36	226	17.5	24.4	27.8	31.3	34.8	38.2	45.1
	ISA-10°C	-12	(1) 89.3	1315	267	.53	323	16.9	20.7	22.6	24.5	26.4	28.3	32.1
	-25°C	-16	81.1	932	221	.440	269	18.1	23.5	26.1	28.8	31.5	34.2	39.5
		-19	(2) 73.7	710	182	.37	222	17.2	24.3	27.8	31.3	34.8	38.4	45.4

(1) MAXIMUM CRUISE THRUST

(2) THRUST FOR MAXIMUM RANGE (APPROXIMATE)

Figure 7-15 Cruise (Sheet 3)

CRUISE
17,000 FEET

ANTI-ICE SYSTEMS OFF **ONE ENGINE**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
16500.	ISA+10°C	1	(1) 86.8	1000	212	.44	278	17.8	22.8	25.3	27.8	30.3	32.8	37.8
	-9°C	0	86.0	968	207	.430	271	17.6	22.8	25.4	28.0	30.5	33.1	38.3
		0	(2) 85.9	966	207	.43	270	17.6	22.8	25.4	28.0	30.6	33.2	38.3
	ISA+ 0°C	-8	(1) 88.5	1123	234	.48	299	17.7	22.2	24.4	26.6	28.8	31.1	35.5
	-19°C	-9	85.9	1007	217	.450	278	17.7	22.7	25.2	27.6	30.1	32.6	37.6
		-10	(2) 84.4	946	207	.43	266	17.5	22.8	25.4	28.1	30.7	33.4	38.6
	ISA-10°C	-16	(1) 89.9	1252	253	.52	316	17.2	21.2	23.2	25.2	27.2	29.2	33.2
	-29°C	-19	85.9	1050	227	.470	285	17.6	22.4	24.8	27.1	29.5	31.9	36.7
		-20	(2) 82.8	928	208	.43	261	17.4	22.7	25.4	28.1	30.8	33.5	38.9
16000.	ISA+10°C	1	(1) 86.8	1002	215	.45	280	18.0	23.0	25.5	28.0	30.5	33.0	37.9
	-9°C	0	85.6	957	207	.430	271	17.9	23.1	25.7	28.3	30.9	33.5	38.8
		0	(2) 85.1	940	204	.42	267	17.8	23.1	25.8	28.4	31.1	33.7	39.1
	ISA+ 0°C	-8	(1) 88.4	1119	235	.48	300	17.9	22.3	24.6	26.8	29.0	31.3	35.7
	-19°C	-9	85.6	996	217	.450	278	17.9	22.9	25.4	27.9	30.4	33.0	38.0
		-10	(2) 83.6	918	204	.42	262	17.6	23.1	25.8	28.5	31.2	34.0	39.4
	ISA-10°C	-16	(1) 89.8	1252	254	.52	317	17.3	21.3	23.3	25.3	27.3	29.3	33.3
	-29°C	-19	85.6	1039	227	.470	285	17.8	22.6	25.0	27.4	29.8	32.2	37.0
		-20	(2) 82.0	899	204	.42	257	17.5	23.0	25.8	28.6	31.4	34.1	39.7
15500.	ISA+10°C	1	(1) 86.7	1001	216	.45	282	18.2	23.2	25.7	28.2	30.7	33.2	38.2
	-9°C	0	85.3	945	207	.430	271	18.1	23.4	26.0	28.6	31.3	33.9	39.2
		0	(2) 84.3	911	201	.42	263	17.9	23.4	26.1	28.9	31.6	34.4	39.9
	ISA+ 0°C	-7	(1) 88.4	1121	236	.49	302	18.0	22.4	24.7	26.9	29.1	31.4	35.8
	-19°C	-9	85.3	985	217	.450	278	18.1	23.2	25.7	28.2	30.8	33.3	38.4
		-10	(2) 82.8	892	201	.42	258	17.8	23.4	26.2	29.0	31.8	34.6	40.2
	ISA-10°C	-16	(1) 89.8	1253	255	.53	318	17.4	21.4	23.4	25.4	27.4	29.4	33.4
	-29°C	-19	85.4	1029	227	.470	285	18.0	22.8	25.2	27.7	30.1	32.5	37.4
		-21	(2) 81.3	876	202	.42	254	17.6	23.3	26.2	29.0	31.9	34.7	40.4
15000.	ISA+10°C	1	(1) 86.7	1001	218	.45	284	18.4	23.4	25.9	28.4	30.9	33.4	38.4
	-9°C	0	84.9	935	207	.430	271	18.3	23.6	26.3	29.0	31.7	34.3	39.7
		0	(2) 83.5	884	198	.41	260	18.0	23.7	26.5	29.4	32.2	35.0	40.7
	ISA+ 0°C	-7	(1) 88.3	1119	237	.49	303	18.1	22.6	24.8	27.1	29.3	31.5	36.0
	-19°C	-9	85.0	975	217	.450	278	18.3	23.4	26.0	28.5	31.1	33.7	38.8
		-11	(2) 82.0	866	199	.41	255	17.9	23.7	26.6	29.4	32.3	35.2	41.0
	ISA-10°C	-16	(1) 89.8	1254	256	.53	319	17.5	21.5	23.5	25.5	27.5	29.5	33.5
	-29°C	-19	85.1	1020	227	.470	285	18.1	23.0	25.5	27.9	30.4	32.8	37.7
		-21	(2) 80.5	850	199	.41	251	17.7	23.6	26.5	29.5	32.4	35.4	41.3
14000.	ISA+20°C	10	(1) 84.8	901	202	.42	269	18.7	24.3	27.1	29.8	32.6	35.4	40.9
	1°C	10	84.0	875	197	.410	263	18.6	24.3	27.2	30.1	32.9	35.8	41.5
		10	(2) 83.2	849	192	.40	257	18.5	24.4	27.3	30.3	33.2	36.1	42.0
	ISA+10°C	2	(1) 86.6	1001	220	.46	288	18.8	23.8	26.3	28.7	31.2	33.7	38.7
	-9°C	0	84.3	914	207	.430	271	18.7	24.2	26.9	29.6	32.4	35.1	40.6
		-1	(2) 81.8	832	193	.40	252	18.3	24.3	27.3	30.3	33.4	36.4	42.4
	ISA+ 0°C	-7	(1) 88.3	1120	239	.49	306	18.4	22.8	25.1	27.3	29.5	31.8	36.2
	-19°C	-9	84.5	956	217	.450	278	18.6	23.9	26.5	29.1	31.7	34.3	39.6
		-11	(2) 80.4	816	193	.40	248	18.2	24.3	27.4	30.4	33.5	36.5	42.7
	ISA-10°C	-16	(1) 89.8	1257	258	.53	322	17.6	21.6	23.6	25.6	27.6	29.6	33.6
	-29°C	-19	83.7	967	222	.460	279	18.5	23.6	26.2	28.8	31.4	34.0	39.1
		-21	(2) 78.9	800	194	.40	244	18.0	24.2	27.3	30.5	33.6	36.7	42.9
13000.	ISA+20°C	11	(1) 84.8	903	205	.43	274	19.2	24.8	27.5	30.3	33.1	35.8	41.4
	1°C	9	82.4	825	192	.400	256	18.9	25.0	28.0	31.1	34.1	37.1	43.2
		9	(2) 81.4	795	186	.39	249	18.7	25.0	28.2	31.3	34.5	37.6	43.9
	ISA+10°C	2	(1) 86.6	1002	223	.46	291	19.1	24.1	26.6	29.0	31.5	34.0	39.0
	-9°C	0	82.7	864	202	.420	264	19.0	24.8	27.7	30.6	33.5	36.4	42.2
		-1	(2) 80.0	780	187	.39	245	18.6	25.0	28.2	31.4	34.6	37.8	44.2
	ISA+ 0°C	-7	(1) 88.3	1120	241	.50	308	18.6	23.0	25.3	27.5	29.7	32.0	36.4
	-19°C	-10	83.0	906	212	.440	272	19.0	24.5	27.3	30.0	32.8	35.5	41.0
		-11	(2) 78.7	766	187	.39	241	18.4	24.9	28.2	31.5	34.7	38.0	44.5
	ISA-10°C	-16	(1) 89.7	1255	259	.53	323	17.8	21.8	23.8	25.8	27.8	29.7	33.7
	-29°C	-19	83.2	951	222	.460	279	18.8	24.1	26.7	29.3	31.9	34.6	39.8
		-22	(2) 77.2	752	188	.39	237	18.2	24.8	28.2	31.5	34.8	38.1	44.8
12000.	ISA+20°C	11	(1) 84.7	903	208	.43	277	19.6	25.2	27.9	30.7	33.5	36.2	41.8
	1°C	9	81.7	805	192	.400	256	19.4	25.6	28.7	31.8	35.0	38.1	44.3
		8	(2) 79.1	740	180	.38	240	19.0	25.7	29.1	32.5	35.9	39.2	46.0
	ISA+10°C	2	(1) 86.6	1003	225	.47	294	19.3	24.3	26.8	29.3	31.8	34.3	39.3
	-9°C	0	82.1	846	202	.420	264	19.4	25.4	28.3	31.3	34.2	37.2	43.1
		-2	(2) 77.8	726	180	.38	236	18.8	25.7	29.1	32.6	36.0	39.4	46.3
	ISA+ 0°C	-7	(1) 88.3	1123	243	.50	311	18.7	23.2	25.4	27.6	29.9	32.1	36.5
	-19°C	-10	82.5	889	212	.440	272	19.3	24.9	27.8	30.6	33.4	36.2	41.8
		-12	(2) 76.5	714	181	.38	233	18.6	25.6	29.1	32.6	36.1	39.6	46.6
	ISA-10°C	-16	(1) 89.8	1259	261	.54	326	17.9	21.9	23.9	25.9	27.8	29.8	33.8
	-29°C	-19	81.8	902	217	.450	273	19.1	24.7	27.5	30.2	33.0	35.8	41.3
		-22	(2) 75.1	701	181	.38	228	18.3	25.5	29.0	32.6	36.2	39.7	46.9

(1) MAXIMUM CRUISE THRUST

(2) THRUST FOR MAXIMUM RANGE (APPROXIMATE)

Figure 7-15 Cruise (Sheet 4)

CRUISE
19,000 FEET

ANTI-ICE SYSTEMS OFF **ONE ENGINE**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
16500.	ISA+ 0°C	-12	(1) 89.0	1073	227	.49	300	18.6	23.3	25.6	27.9	30.3	32.6	37.2
	-23°C	-13	86.9	982	213	.460	282	18.6	23.6	26.2	28.7	31.3	33.8	38.9
		-13	(2) 85.8	934	205	.44	272	18.4	23.8	26.4	29.1	31.8	34.5	39.8
	ISA-10°C	-20	(1) 90.4	1170	243	.52	313	18.2	22.5	24.6	26.8	28.9	31.1	35.3
	-33°C	-22	86.6	1021	223	.480	289	18.5	23.4	25.8	28.3	30.7	33.2	38.1
		-24	(2) 84.1	914	205	.44	267	18.2	23.7	26.5	29.2	31.9	34.7	40.1
16000.	ISA+10°C	-3	(1) 87.3	956	207	.45	280	18.8	24.1	26.7	29.3	31.9	34.5	39.7
	-13°C	-3	86.7	934	204	.440	275	18.7	24.1	26.8	29.4	32.1	34.8	40.1
		-3	(2) 86.6	930	203	.44	274	18.7	24.1	26.8	29.5	32.2	34.9	40.2
	ISA+ 0°C	-11	(1) 88.9	1073	228	.49	301	18.8	23.4	25.8	28.1	30.4	32.8	37.4
	-23°C	-13	86.7	970	213	.460	282	18.8	23.9	26.5	29.1	31.7	34.2	39.4
		-14	(2) 85.0	910	203	.44	269	18.6	24.1	26.8	29.6	32.3	35.1	40.6
	ISA-10°C	-20	(1) 90.3	1169	244	.52	315	18.4	22.6	24.8	26.9	29.1	31.2	35.5
	-33°C	-22	86.3	1010	223	.480	289	18.7	23.6	26.1	28.6	31.0	33.5	38.5
		-24	(2) 83.4	891	203	.44	264	18.4	24.0	26.8	29.7	32.5	35.3	40.9
15500.	ISA+10°C	-3	(1) 87.3	956	209	.45	282	19.1	24.3	26.9	29.6	32.2	34.8	40.0
	-13°C	-3	86.4	922	204	.440	275	19.0	24.4	27.1	29.8	32.5	35.2	40.7
		-4	(2) 85.8	904	200	.43	271	18.9	24.4	27.2	30.0	32.7	35.5	41.0
	ISA+ 0°C	-11	(1) 88.9	1073	230	.49	303	18.9	23.6	25.9	28.3	30.6	32.9	37.6
	-23°C	-13	86.3	959	213	.460	282	19.0	24.2	26.8	29.4	32.0	34.6	39.9
		-14	(2) 84.3	885	201	.43	266	18.8	24.4	27.2	30.1	32.9	35.7	41.4
	ISA-10°C	-20	(1) 90.3	1170	245	.53	316	18.5	22.8	24.9	27.0	29.2	31.3	35.6
	-33°C	-22	86.0	1000	223	.480	289	18.9	23.9	26.4	28.9	31.4	33.9	38.9
		-24	(2) 82.7	868	201	.44	261	18.6	24.4	27.2	30.1	33.0	35.9	41.6
15000.	ISA+10°C	-3	(1) 87.3	957	211	.46	285	19.3	24.6	27.2	29.8	32.4	35.0	40.2
	-13°C	-3	86.0	911	204	.440	275	19.2	24.7	27.5	30.2	33.0	35.7	41.2
		-4	(2) 84.9	874	197	.43	267	19.1	24.8	27.6	30.5	33.4	36.2	41.9
	ISA+ 0°C	-11	(1) 88.8	1072	231	.50	305	19.1	23.8	26.1	28.4	30.8	33.1	37.8
	-23°C	-13	86.0	948	213	.460	282	19.2	24.5	27.1	29.8	32.4	35.0	40.3
		-14	(2) 83.4	857	198	.43	262	18.9	24.7	27.7	30.6	33.5	36.4	42.3
	ISA-10°C	-20	(1) 90.3	1173	247	.53	318	18.6	22.8	25.0	27.1	29.2	31.4	35.6
	-33°C	-22	85.8	990	223	.480	289	19.1	24.1	26.6	29.2	31.7	34.2	39.3
		-24	(2) 81.9	841	198	.43	258	18.7	24.7	27.7	30.6	33.6	36.6	42.5
14000.	ISA+20°C	6	(1) 85.4	861	195	.42	269	19.7	25.5	28.4	31.3	34.2	37.1	42.9
		6	(2) 84.7	840	192	.41	264	19.5	25.5	28.5	31.4	34.4	37.4	43.3
	ISA+10°C	-2	(1) 87.2	957	214	.46	289	19.8	25.0	27.6	30.2	32.8	35.4	40.7
	-13°C	-3	85.3	889	204	.440	275	19.7	25.3	28.1	30.9	33.8	36.6	42.2
		-4	(2) 83.3	823	192	.42	260	19.4	25.5	28.5	31.5	34.6	37.6	43.7
	ISA+ 0°C	-11	(1) 88.8	1074	234	.50	308	19.4	24.0	26.4	28.7	31.0	33.3	38.0
	-23°C	-13	85.4	928	213	.460	282	19.6	25.0	27.7	30.4	33.1	35.8	41.2
		-15	(2) 81.8	807	192	.42	255	19.2	25.4	28.5	31.6	34.7	37.8	44.0
	ISA-10°C	-20	(1) 90.2	1174	249	.53	321	18.8	23.0	25.2	27.3	29.4	31.6	35.8
	-33°C	-23	84.6	938	218	.470	283	19.5	24.8	27.5	30.1	32.8	35.5	40.8
		-25	(2) 80.3	792	193	.42	251	19.0	25.3	28.5	31.7	34.8	38.0	44.3
13000.	ISA+20°C	7	(1) 85.3	862	199	.43	274	20.2	26.0	28.9	31.8	34.7	37.7	43.5
	-3°C	6	83.5	805	189	.410	261	20.0	26.2	29.3	32.4	35.5	38.6	44.8
		6	(2) 82.9	789	186	.40	257	19.9	26.2	29.4	32.6	35.7	38.9	45.2
	ISA+10°C	-2	(1) 87.2	959	217	.47	293	20.1	25.4	28.0	30.6	33.2	35.8	41.0
	-13°C	-4	83.7	840	199	.430	269	20.1	26.0	29.0	32.0	35.0	37.9	43.9
		-5	(2) 81.5	772	186	.40	252	19.7	26.2	29.4	32.7	35.9	39.1	45.6
	ISA+ 0°C	-11	(1) 88.8	1077	236	.51	311	19.6	24.3	26.6	28.9	31.2	33.5	38.2
	-23°C	-13	83.9	878	208	.450	276	20.0	25.7	28.6	31.4	34.3	37.1	42.8
		-15	(2) 80.0	758	187	.40	248	19.5	26.1	29.4	32.7	36.0	39.3	45.9
	ISA-10°C	-20	(1) 90.2	1178	251	.54	323	19.0	23.2	25.3	27.4	29.6	31.7	35.9
	-33°C	-23	84.0	920	218	.470	283	19.8	25.3	28.0	30.7	33.4	36.1	41.6
		-25	(2) 78.5	742	187	.41	243	19.3	26.0	29.4	32.8	36.1	39.5	46.2
12000.	ISA+20°C	7	(1) 85.2	861	202	.44	278	20.7	26.5	29.4	32.3	35.3	38.2	44.0
	-3°C	6	82.7	784	189	.410	261	20.5	26.9	30.1	33.3	36.5	39.7	46.0
		5	(2) 80.9	734	180	.39	248	20.2	27.0	30.4	33.8	37.2	40.6	47.4
	ISA+10°C	-2	(1) 87.1	959	220	.47	296	20.5	25.7	28.3	30.9	33.5	36.1	41.3
	-13°C	-4	83.1	821	199	.430	269	20.6	26.6	29.7	32.7	35.8	38.8	44.9
		-5	(2) 79.6	721	180	.39	244	20.0	26.9	30.4	33.9	37.3	40.8	47.7
	ISA+ 0°C	-10	(1) 88.7	1075	238	.51	313	19.8	24.5	26.8	29.1	31.5	33.8	38.4
	-23°C	-13	83.3	861	208	.450	276	20.4	26.2	29.1	32.0	35.0	37.9	43.7
		-15	(2) 78.2	709	181	.39	240	19.8	26.9	30.4	33.9	37.4	41.0	48.0
	ISA-10°C	-20	(1) 90.2	1179	253	.54	325	19.1	23.4	25.5	27.6	29.7	31.8	36.1
	-33°C	-23	82.6	872	213	.460	276	20.2	26.0	28.8	31.7	34.6	37.4	43.2
		-26	(2) 76.8	696	182	.39	236	19.6	26.8	30.3	33.9	37.5	41.1	48.3

(1) MAXIMUM CRUISE THRUST

(2) THRUST FOR MAXIMUM RANGE (APPROXIMATE)

Figure 7-15 Cruise (Sheet 5)

CRUISE
21,000 FEET

ANTI-ICE SYSTEMS OFF | **ONE ENGINE**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
16500.	ISA+ 0°C	-15	(1) 89.4	1024	220	.49	300	19.5	24.4	26.8	29.3	31.7	34.1	39.0
	-27°C	-16	87.8	958	209	.470	286	19.4	24.6	27.3	29.9	32.5	35.1	40.3
		-17	(2) 87.0	924	204	.46	278	19.3	24.7	27.4	30.1	32.8	35.5	40.9
	ISA-10°C	-25	(1) 90.8	1094	232	.52	310	19.2	23.8	26.0	28.3	30.6	32.9	37.5
	-37°C	-26	87.5	993	219	.490	292	19.4	24.4	26.9	29.4	31.9	34.5	39.5
		-27	(2) 85.3	905	204	.46	273	19.1	24.7	27.4	30.2	33.0	35.7	41.3
16000.	ISA+ 0°C	-15	(1) 89.3	1021	221	.50	301	19.7	24.6	27.1	29.5	32.0	34.4	39.3
	-27°C	-16	87.5	945	209	.470	286	19.7	25.0	27.6	30.3	32.9	35.5	40.8
		-17	(2) 86.3	898	201	.45	275	19.5	25.1	27.9	30.6	33.4	36.2	41.8
	ISA-10°C	-25	(1) 90.7	1094	234	.52	312	19.4	23.9	26.2	28.5	30.8	33.1	37.6
	-37°C	-26	87.2	981	219	.490	292	19.6	24.7	27.2	29.8	32.3	34.9	40.0
		-28	(2) 84.7	879	201	.45	270	19.3	25.0	27.9	30.7	33.6	36.4	42.1
15500.	ISA+10°C	-7	(1) 87.8	912	202	.45	282	19.9	25.4	28.2	30.9	33.6	36.4	41.9
		-7	(2) 87.3	893	199	.45	277	19.9	25.5	28.3	31.1	33.9	36.7	42.3
	ISA+ 0°C	-15	(1) 89.4	1025	223	.50	304	19.9	24.8	27.2	29.7	32.1	34.6	39.4
	-27°C	-16	87.1	934	209	.470	286	19.9	25.3	28.0	30.6	33.3	36.0	41.3
		-17	(2) 85.7	874	199	.45	272	19.7	25.5	28.3	31.2	34.0	36.9	42.6
	ISA-10°C	-24	(1) 90.7	1097	235	.53	314	19.5	24.1	26.3	28.6	30.9	33.2	37.7
	-37°C	-26	86.1	940	214	.480	286	19.8	25.1	27.8	30.4	33.1	35.8	41.1
		-28	(2) 84.0	855	199	.45	267	19.5	25.4	28.3	31.2	34.2	37.1	42.9
15000.	ISA+10°C	-7	(1) 87.8	912	204	.46	285	20.2	25.7	28.5	31.2	33.9	36.7	42.2
	-17°C	-7	87.1	888	200	.450	279	20.2	25.8	28.6	31.4	34.2	37.1	42.7
		-7	(2) 86.5	868	196	.44	274	20.1	25.8	28.7	31.6	34.5	37.4	43.1
	ISA+ 0°C	-15	(1) 89.3	1023	224	.50	306	20.1	25.0	27.4	29.9	32.3	34.8	39.7
	-27°C	-16	86.8	923	209	.470	286	20.2	25.6	28.3	31.0	33.7	36.4	41.8
		-18	(2) 84.9	849	197	.44	269	19.9	25.8	28.8	31.7	34.7	37.6	43.5
	ISA-10°C	-24	(1) 90.7	1097	237	.53	316	19.6	24.2	26.5	28.8	31.0	33.3	37.9
	-37°C	-26	85.8	930	214	.480	286	20.0	25.4	28.1	30.8	33.5	36.2	41.5
		-28	(2) 83.3	831	197	.44	264	19.8	25.8	28.8	31.8	34.8	37.8	43.8
14000.	ISA+10°C	-6	(1) 87.7	912	208	.47	290	20.8	26.3	29.0	31.8	34.5	37.2	42.7
	-17°C	-7	86.3	865	200	.450	279	20.7	26.5	29.4	32.3	35.2	38.1	43.8
		-8	(2) 84.7	813	191	.43	266	20.5	26.6	29.7	32.8	35.8	38.9	45.1
	ISA+ 0°C	-15	(1) 89.3	1025	227	.51	310	20.4	25.3	27.8	30.2	32.6	35.1	40.0
	-27°C	-16	86.3	901	209	.470	286	20.6	26.2	29.0	31.7	34.5	37.3	42.8
		-18	(2) 83.2	797	191	.43	262	20.3	26.6	29.7	32.9	36.0	39.1	45.4
	ISA-10°C	-24	(1) 90.7	1100	240	.53	319	19.9	24.4	26.7	29.0	31.3	33.5	38.1
	-37°C	-26	85.2	909	214	.480	286	20.5	26.0	28.7	31.5	34.2	37.0	42.5
		-28	(2) 81.6	782	192	.43	257	20.1	26.5	29.7	32.9	36.1	39.3	45.7
13000.	ISA+20°C	3	(1) 85.8	822	193	.43	275	21.3	27.4	30.4	33.4	36.5	39.5	45.6
	-7°C	2	84.6	785	186	.420	265	21.1	27.4	30.6	33.8	37.0	40.2	46.5
		2	(2) 84.4	778	185	.42	263	21.0	27.5	30.7	33.9	37.1	40.3	46.7
	ISA+10°C	-6	(1) 87.7	915	211	.47	294	21.2	26.7	29.4	32.2	34.9	37.6	43.1
	-17°C	-7	84.7	817	195	.440	273	21.2	27.3	30.4	33.4	36.5	39.5	45.7
		-8	(2) 82.9	762	185	.42	259	20.9	27.4	30.7	34.0	37.3	40.6	47.1
	ISA+ 0°C	-14	(1) 89.3	1027	230	.51	313	20.7	25.6	28.0	30.5	32.9	35.3	40.2
	-27°C	-17	84.8	852	205	.460	280	21.1	27.0	29.9	32.9	35.8	38.7	44.6
		-19	(2) 81.4	747	186	.42	254	20.7	27.4	30.7	34.1	37.4	40.8	47.5
	ISA-10°C	-24	(1) 90.6	1102	242	.54	322	20.1	24.7	26.9	29.2	31.5	33.7	38.3
	-37°C	-26	84.7	891	214	.480	286	20.9	26.5	29.3	32.1	34.9	37.7	43.4
		-29	(2) 79.9	733	186	.42	250	20.5	27.3	30.7	34.1	37.5	40.9	47.8
12000.	ISA+20°C	3	(1) 85.8	822	197	.44	280	21.9	28.0	31.0	34.0	37.1	40.1	46.2
	-7°C	2	83.8	763	186	.420	265	21.7	28.2	31.5	34.8	38.1	41.3	47.9
		2	(2) 82.5	727	179	.40	256	21.4	28.3	31.7	35.2	38.6	42.1	48.9
	ISA+10°C	-6	(1) 87.7	916	214	.48	298	21.6	27.1	29.8	32.6	35.3	38.0	43.5
	-17°C	-7	84.0	797	195	.440	273	21.7	28.0	31.1	34.3	37.4	40.5	46.8
		-9	(2) 81.0	712	180	.41	251	21.2	28.3	31.8	35.3	38.8	42.3	49.3
	ISA+ 0°C	-14	(1) 89.2	1025	232	.52	315	21.0	25.9	28.3	30.8	33.2	35.6	40.5
	-27°C	-17	84.1	833	205	.460	280	21.6	27.6	30.6	33.6	36.6	39.6	45.6
		-19	(2) 79.6	698	180	.41	247	21.0	28.2	31.8	35.4	38.9	42.5	49.7
	ISA-10°C	-24	(1) 90.6	1106	244	.54	325	20.3	24.8	27.1	29.3	31.6	33.9	38.4
	-37°C	-27	83.4	843	209	.470	280	21.4	27.3	30.3	33.2	36.2	39.2	45.1
		-29	(2) 78.1	685	180	.41	242	20.8	28.1	31.7	35.4	39.0	42.7	50.0

(1) MAXIMUM CRUISE THRUST

(2) THRUST FOR MAXIMUM
RANGE (APPROXIMATE)

Figure 7-15 Cruise (Sheet 6)

CRUISE
23,000 FEET

ANTI-ICE SYSTEMS OFF **ONE ENGINE**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL: 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
16500.	ISA+ 0°C	-20	(1) 89.8	964	210	.49	296	20.4	25.5	28.1	30.7	33.3	35.9	41.1
	-31°C	-20	88.9	937	205	.480	290	20.3	25.6	28.3	30.9	33.6	36.3	41.6
		-20	(2) 88.4	917	202	.47	285	20.2	25.6	28.4	31.1	33.8	36.6	42.0
	ISA-10°C	-29	(1) 91.1	1034	223	.52	307	20.1	24.9	27.3	29.7	32.2	34.6	39.4
	-41°C	-30	88.0	940	210	.490	290	20.2	25.5	28.2	30.8	33.5	36.2	41.5
		-31	(2) 86.6	896	202	.47	279	20.0	25.6	28.4	31.2	34.0	36.8	42.4
16000.	ISA+ 0°C	-19	(1) 89.9	969	213	.50	300	20.7	25.8	28.4	31.0	33.6	36.1	41.3
	-31°C	-20	88.5	923	205	.480	290	20.6	26.0	28.7	31.4	34.1	36.8	42.2
		-21	(2) 87.7	892	200	.47	282	20.4	26.1	28.9	31.7	34.5	37.3	42.9
	ISA-10°C	-29	(1) 91.1	1036	225	.52	310	20.3	25.1	27.5	29.9	32.3	34.7	39.6
	-41°C	-30	87.4	927	210	.490	290	20.5	25.8	28.5	31.2	33.9	36.6	42.0
		-31	(2) 86.0	871	200	.47	277	20.3	26.0	28.9	31.7	34.6	37.5	43.2
15500.	ISA+ 0°C	-19	(1) 89.8	970	215	.50	303	20.9	26.1	28.6	31.2	33.8	36.4	41.5
	-31°C	-20	88.1	911	205	.480	290	20.8	26.3	29.1	31.8	34.6	37.3	42.8
		-21	(2) 86.9	867	198	.46	279	20.7	26.5	29.3	32.2	35.1	38.0	43.8
	ISA-10°C	-28	(1) 91.1	1035	226	.53	312	20.5	25.3	27.7	30.1	32.5	35.0	39.8
	-41°C	-30	87.0	916	210	.490	290	20.7	26.2	28.9	31.6	34.4	37.1	42.5
		-31	(2) 85.2	847	198	.46	274	20.5	26.4	29.4	32.3	35.3	38.2	44.1
15000.	ISA+10°C	-10	(1) 88.3	876	198	.46	285	21.2	26.9	29.7	32.6	35.4	38.3	44.0
		-11	(2) 87.8	857	194	.46	280	21.1	26.9	29.8	32.7	35.6	38.6	44.4
	ISA+ 0°C	-19	(1) 89.7	973	217	.51	306	21.1	26.3	28.9	31.4	34.0	36.6	41.7
	-31°C	-20	87.8	898	205	.480	290	21.1	26.7	29.5	32.3	35.0	37.8	43.4
		-21	(2) 86.1	838	195	.46	275	20.9	26.9	29.9	32.8	35.8	38.8	44.8
	ISA-10°C	-28	(1) 91.1	1040	228	.53	315	20.6	25.4	27.9	30.3	32.7	35.1	39.9
	-41°C	-30	86.7	904	210	.490	290	21.0	26.5	29.3	32.0	34.8	37.6	43.1
		-32	(2) 84.4	820	195	.46	270	20.7	26.8	29.9	32.9	36.0	39.0	45.1
14000.	ISA+10°C	-10	(1) 88.2	877	202	.47	291	21.8	27.5	30.4	33.2	36.1	38.9	44.6
	-21°C	-11	87.4	843	196	.460	283	21.7	27.7	30.6	33.6	36.6	39.5	45.4
		-11	(2) 86.3	807	190	.45	274	21.6	27.8	30.9	34.0	37.1	40.2	46.4
	ISA+ 0°C	-19	(1) 89.8	977	220	.51	311	21.6	26.7	29.2	31.8	34.3	36.9	42.0
	-31°C	-20	87.0	875	205	.480	290	21.7	27.4	30.2	33.1	36.0	38.8	44.5
		-22	(2) 84.7	789	190	.45	269	21.4	27.8	30.9	34.1	37.3	40.4	46.8
	ISA-10°C	-28	(1) 91.1	1041	231	.54	318	21.0	25.8	28.2	30.6	33.0	35.4	40.2
	-41°C	-30	86.0	882	210	.490	290	21.5	27.2	30.0	32.8	35.7	38.5	44.2
		-32	(2) 83.0	772	190	.45	264	21.2	27.7	30.9	34.2	37.4	40.6	47.1
13000.	ISA+20°C	-1	(1) 86.4	783	186	.44	274	22.3	28.7	31.9	35.1	38.2	41.4	47.8
		-1	(2) 85.9	769	183	.43	271	22.2	28.7	31.9	35.2	38.4	41.7	48.2
	ISA+10°C	-10	(1) 88.1	877	205	.48	296	22.4	28.1	30.9	33.8	36.6	39.5	45.2
	-21°C	-11	85.8	795	192	.450	277	22.3	28.6	31.7	34.9	38.0	41.2	47.4
		-12	(2) 84.4	752	184	.43	266	22.0	28.7	32.0	35.3	38.7	42.0	48.6
	ISA+ 0°C	-18	(1) 89.7	979	223	.52	314	21.9	27.0	29.6	32.1	34.7	37.2	42.3
	-31°C	-21	85.7	827	201	.470	284	22.2	28.3	31.3	34.3	37.3	40.3	46.4
		-22	(2) 82.8	737	184	.43	261	21.9	28.6	32.0	35.4	38.8	42.2	49.0
	ISA-10°C	-28	(1) 91.0	1043	234	.54	322	21.2	26.0	28.4	30.8	33.2	35.6	40.4
	-41°C	-30	85.4	862	210	.490	290	22.0	27.8	30.7	33.6	36.5	39.4	45.2
		-32	(2) 81.2	723	185	.43	256	21.6	28.6	32.0	35.5	38.9	42.4	49.3
12000.	ISA+20°C	-1	(1) 86.3	783	190	.45	280	23.0	29.4	32.6	35.8	39.0	42.2	48.6
	-11°C	-2	84.9	743	183	.430	270	22.9	29.6	33.0	36.3	39.7	43.1	49.8
		-2	(2) 83.9	716	178	.42	262	22.7	29.6	33.1	36.6	40.1	43.6	50.6
	ISA+10°C	-9	(1) 88.0	877	208	.49	300	22.8	28.5	31.4	34.2	37.1	39.9	45.6
	-21°C	-11	85.0	773	192	.450	277	22.9	29.4	32.6	35.8	39.1	42.3	48.8
		-12	(2) 82.4	701	178	.42	258	22.5	29.6	33.2	36.7	40.3	43.9	51.0
	ISA+ 0°C	-18	(1) 89.6	978	225	.53	317	22.2	27.3	29.9	32.4	35.0	37.6	42.7
	-31°C	-21	85.1	807	201	.470	284	22.8	29.0	32.1	35.2	38.3	41.4	47.6
		-23	(2) 80.9	687	179	.42	253	22.3	29.6	33.2	36.8	40.5	44.1	51.4
	ISA-10°C	-28	(1) 91.0	1043	236	.55	324	21.5	26.3	28.7	31.1	33.5	35.9	40.7
	-41°C	-31	84.1	816	205	.480	284	22.5	28.7	31.7	34.8	37.9	40.9	47.1
		-33	(2) 79.4	675	179	.42	249	22.0	29.4	33.2	36.9	40.6	44.3	51.7

(1) MAXIMUM CRUISE THRUST

(2) THRUST FOR MAXIMUM RANGE (APPROXIMATE)

Figure 7-15 Cruise (Sheet 7)

CRUISE
25,000 FEET

ANTI-ICE SYSTEMS OFF **ONE ENGINE**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
16000.	ISA+ 0°C	-24	(1) 90.4	901	200	.49	293	21.4	26.9	29.7	32.5	35.2	38.0	43.6
		-24	(2) 89.7	885	198	.48	289	21.3	27.0	29.8	32.6	35.5	38.3	43.9
	ISA-10°C	-33	(1) 91.4	983	216	.53	308	21.2	26.2	28.8	31.3	33.9	36.4	41.5
	-45°C	-34	89.6	910	205	.500	293	21.2	26.7	29.5	32.2	35.0	37.7	43.2
		-35	(2) 87.9	863	197	.48	282	21.1	26.9	29.8	32.7	35.6	38.5	44.3
15500.	ISA+ 0°C	-24	(1) 90.3	902	203	.49	296	21.8	27.3	30.1	32.8	35.6	38.4	43.9
	-35°C	-24	88.6	864	197	.480	287	21.7	27.5	30.4	33.3	36.1	39.0	44.8
		-24	(2) 88.5	861	196	.48	287	21.7	27.5	30.4	33.3	36.2	39.1	44.9
	ISA-10°C	-33	(1) 91.4	985	218	.53	311	21.4	26.5	29.0	31.6	34.1	36.6	41.7
	-45°C	-34	89.1	895	205	.500	293	21.6	27.1	29.9	32.7	35.5	38.3	43.9
		-35	(2) 86.6	840	196	.48	280	21.5	27.4	30.4	33.4	36.3	39.3	45.3
15000.	ISA+ 0°C	-23	(1) 90.3	905	206	.50	300	22.1	27.6	30.4	33.1	35.9	38.7	44.2
	-35°C	-24	88.1	852	197	.480	287	22.0	27.9	30.8	33.7	36.7	39.6	45.5
		-25	(2) 87.6	832	193	.47	282	21.9	27.9	30.9	33.9	36.9	39.9	45.9
	ISA-10°C	-32	(1) 91.4	989	220	.54	314	21.6	26.7	29.2	31.7	34.3	36.8	41.8
	-45°C	-34	88.4	882	205	.500	293	21.9	27.6	30.4	33.2	36.1	38.9	44.6
		-35	(2) 85.8	813	193	.47	277	21.7	27.9	30.9	34.0	37.1	40.2	46.3
14000.	ISA+10°C	-14	(1) 88.7	837	195	.48	291	22.8	28.8	31.8	34.8	37.8	40.7	46.7
	-25°C	-15	87.6	800	188	.460	281	22.6	28.9	32.0	35.2	38.3	41.4	47.7
		-15	(2) 87.6	799	188	.46	281	22.6	28.9	32.0	35.2	38.3	41.4	47.7
	ISA+ 0°C	-23	(1) 90.2	908	210	.51	306	22.7	28.2	30.9	33.7	36.4	39.2	44.7
	-35°C	-24	87.3	826	197	.480	287	22.7	28.7	31.8	34.8	37.8	40.8	46.9
		-25	(2) 85.9	782	188	.46	276	22.5	28.9	32.1	35.3	38.5	41.7	48.1
	ISA-10°C	-32	(1) 91.4	988	223	.54	318	22.0	27.1	29.6	32.2	34.7	37.2	42.3
	-45°C	-34	86.9	856	205	.500	293	22.6	28.4	31.3	34.2	37.2	40.1	45.9
		-35	(2) 84.2	765	189	.46	270	22.3	28.8	32.1	35.4	38.6	41.9	48.4
13000.	ISA+20°C	-5	(1) 87.0	745	179	.44	273	23.2	29.9	33.3	36.7	40.0	43.4	50.1
	ISA+10°C	-14	(1) 88.7	839	199	.49	297	23.5	29.5	32.4	35.4	38.4	41.4	47.3
	-25°C	-15	86.8	775	188	.460	281	23.4	29.8	33.1	36.3	39.5	42.7	49.2
		-15	(2) 86.0	747	183	.45	274	23.2	29.9	33.3	36.6	40.0	43.3	50.0
	ISA+ 0°C	-23	(1) 90.1	911	213	.52	311	23.1	28.6	31.4	34.1	36.9	39.6	45.1
	-35°C	-24	86.5	803	197	.480	287	23.3	29.6	32.7	35.8	38.9	42.0	48.2
		-26	(2) 84.4	730	183	.45	268	23.1	29.9	33.3	36.7	40.2	43.6	50.4
	ISA-10°C	-32	(1) 91.3	989	226	.55	322	22.4	27.5	30.0	32.5	35.0	37.6	42.6
	-45°C	-34	86.2	835	205	.500	293	23.1	29.1	32.1	35.1	38.1	41.1	47.1
		-36	(2) 82.7	714	183	.45	263	22.8	29.8	33.3	36.8	40.3	43.8	50.8
12000.	ISA+20°C	-5	(1) 86.9	746	184	.45	281	24.2	30.9	34.2	37.6	40.9	44.3	51.0
	-15°C	-5	86.1	724	180	.440	274	24.1	31.0	34.4	37.9	41.3	44.8	51.7
		-6	(2) 85.5	707	176	.43	269	23.9	31.0	34.5	38.1	41.6	45.1	52.2
	ISA+10°C	-13	(1) 88.6	840	203	.49	302	24.1	30.0	33.0	36.0	39.0	41.9	47.9
	-25°C	-15	86.0	751	188	.460	281	24.1	30.8	34.1	37.4	40.8	44.1	50.7
		-16	(2) 83.9	692	177	.43	264	23.8	31.0	34.6	38.2	41.8	45.4	52.7
	ISA+ 0°C	-22	(1) 90.1	914	216	.53	315	23.5	29.0	31.7	34.5	37.2	39.9	45.4
	-35°C	-24	85.7	782	197	.480	287	24.0	30.4	33.6	36.7	39.9	43.1	49.5
		-26	(2) 82.4	679	177	.43	260	23.6	30.9	34.6	38.3	42.0	45.7	53.0
	ISA-10°C	-31	(1) 91.3	991	229	.55	325	22.7	27.7	30.3	32.8	35.3	37.8	42.9
	-45°C	-34	84.8	789	201	.490	287	23.7	30.1	33.2	36.4	39.6	42.7	49.1
		-36	(2) 80.8	665	178	.44	255	23.3	30.8	34.6	38.4	42.1	45.9	53.4

(1) MAXIMUM CRUISE THRUST

(2) THRUST FOR MAXIMUM RANGE (APPROXIMATE)

Figure 7-15 Cruise (Sheet 8)

CRUISE
27,000 FEET

ANTI-ICE SYSTEMS OFF **ONE ENGINE**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
15500.	ISA+ 0°C	-28	(1) 90.8	846	192	.49	290	22.4	28.3	31.3	34.2	37.2	40.1	46.1
		-28	(2) 90.5	837	190	.48	287	22.4	28.3	31.3	34.3	37.3	40.3	46.3
	ISA-10°C	-37	(1) 91.7	917	206	.52	304	22.3	27.7	30.4	33.2	35.9	38.6	44.1
	-48°C	-38	89.7	854	197	.500	291	22.3	28.2	31.1	34.0	36.9	39.9	45.7
		-39	(2) 88.7	818	190	.48	281	22.2	28.3	31.3	34.4	37.4	40.5	46.6
15000.	ISA+ 0°C	-28	(1) 90.8	849	195	.50	295	22.9	28.8	31.7	34.7	37.6	40.6	46.4
		-28	(2) 89.8	823	190	.48	288	22.8	28.9	31.9	35.0	38.0	41.0	47.1
	ISA-10°C	-37	(1) 91.7	920	209	.53	308	22.6	28.0	30.7	33.4	36.2	38.9	44.3
	-48°C	-38	89.2	839	197	.500	291	22.7	28.7	31.6	34.6	37.6	40.6	46.5
		-39	(2) 87.9	801	190	.48	281	22.6	28.8	32.0	35.1	38.2	41.3	47.6
14000.	ISA+10°C	-18	(1) 89.3	798	187	.48	290	23.7	30.0	33.1	36.3	39.4	42.5	48.8
		-18	(2) 89.0	791	186	.47	287	23.7	30.0	33.2	36.3	39.5	42.6	49.0
	ISA+ 0°C	-27	(1) 90.7	853	200	.51	302	23.7	29.6	32.5	35.4	38.3	41.3	47.1
	-38°C	-28	88.7	806	192	.490	291	23.7	29.9	33.0	36.1	39.2	42.3	48.5
		-29	(2) 87.3	773	186	.47	282	23.5	30.0	33.2	36.5	39.7	42.9	49.4
	ISA-10°C	-36	(1) 91.7	925	213	.54	314	23.1	28.5	31.2	33.9	36.6	39.3	44.8
	-48°C	-38	89.0	837	201	.510	296	23.5	29.5	32.4	35.4	38.4	41.4	47.4
		-39	(2) 85.6	757	187	.48	277	23.3	29.9	33.2	36.5	39.9	43.2	49.8
13000.	ISA+10°C	-18	(1) 89.2	800	192	.49	297	24.6	30.9	34.0	37.1	40.2	43.4	49.6
	-28°C	-18	87.8	755	184	.470	285	24.5	31.1	34.4	37.7	41.0	44.4	51.0
		-19	(2) 87.3	740	181	.46	280	24.4	31.2	34.5	37.9	41.3	44.7	51.4
	ISA+ 0°C	-27	(1) 90.7	857	204	.52	308	24.3	30.2	33.1	36.0	38.9	41.8	47.7
	-38°C	-28	87.4	781	192	.490	291	24.4	30.8	34.0	37.2	40.4	43.6	50.0
		-29	(2) 85.6	723	182	.46	275	24.2	31.1	34.6	38.0	41.5	45.0	51.9
	ISA-10°C	-36	(1) 91.6	927	217	.55	319	23.6	29.0	31.7	34.4	37.1	39.8	45.2
	-48°C	-38	86.5	784	197	.500	291	24.3	30.7	33.9	37.0	40.2	43.4	49.8
		-39	(2) 83.9	707	182	.46	270	24.0	31.0	34.6	38.1	41.7	45.2	52.3
12000.	ISA+20°C	-9	(1) 87.5	712	177	.45	280	25.3	32.3	35.8	39.3	42.9	46.4	53.4
		-9	(2) 87.2	702	175	.45	277	25.2	32.4	35.9	39.5	43.0	46.6	53.7
	ISA+10°C	-17	(1) 89.1	802	196	.50	303	25.3	31.6	34.7	37.8	40.9	44.0	50.3
	-28°C	-18	86.9	731	184	.470	285	25.3	32.1	35.6	39.0	42.4	45.8	52.7
		-19	(2) 85.5	686	176	.45	272	25.1	32.3	36.0	39.6	43.3	46.9	54.2
	ISA+ 0°C	-26	(1) 90.6	858	208	.53	313	24.9	30.7	33.6	36.5	39.4	42.3	48.2
	-38°C	-28	86.6	758	192	.490	291	25.2	31.8	35.1	38.4	41.7	45.0	51.6
		-30	(2) 83.9	671	176	.45	267	24.8	32.3	36.0	39.8	43.5	47.2	54.7
	ISA-10°C	-36	(1) 91.6	930	220	.56	323	24.0	29.4	32.1	34.7	37.4	40.1	45.5
	-48°C	-38	85.5	764	197	.500	291	24.9	31.5	34.8	38.0	41.3	44.6	51.1
		-40	(2) 82.1	656	176	.45	261	24.6	32.2	36.0	39.8	43.6	47.4	55.1

(1) MAXIMUM CRUISE THRUST

(2) THRUST FOR MAXIMUM RANGE (APPROXIMATE)

Figure 7-15 Cruise (Sheet 9)

CRUISE
29,000 FEET

ANTI-ICE SYSTEMS OFF — **ONE ENGINE**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
14000.	ISA+ 0°C	-31	(1) 91.1	807	191	.51	299	24.6	30.8	33.9	37.0	40.1	43.2	49.4
	-42°C	-32	90.0	769	184	.490	289	24.5	31.0	34.3	37.5	40.7	44.0	50.5
		-32	(2) 89.6	759	182	.48	285	24.4	31.0	34.3	37.6	40.9	44.2	50.8
	ISA-10°C	-41	(1) 91.9	863	202	.54	308	24.1	29.9	32.8	35.7	38.6	41.5	47.3
	-52°C	-42	89.4	794	192	.510	294	24.4	30.7	33.8	37.0	40.1	43.3	49.6
		-43	(2) 87.7	739	182	.48	279	24.2	31.0	34.3	37.7	41.1	44.5	51.2
13000.	ISA+10°C	-22	(1) 89.7	750	183	.49	292	25.7	32.3	35.7	39.0	42.3	45.7	52.3
		-22	(2) 89.0	738	181	.48	289	25.6	32.4	35.8	39.2	42.5	45.9	52.7
	ISA+ 0°C	-31	(1) 91.1	808	196	.52	306	25.5	31.7	34.7	37.8	40.9	44.0	50.2
	-42°C	-32	89.4	762	188	.500	294	25.5	32.1	35.4	38.6	41.9	45.2	51.8
		-32	(2) 87.4	723	181	.48	284	25.5	32.4	35.8	39.3	42.8	46.2	53.1
	ISA-10°C	-40	(1) 91.9	868	207	.55	315	24.8	30.5	33.4	36.3	39.2	42.0	47.8
	-52°C	-42	88.5	767	192	.510	294	25.3	31.8	35.1	38.3	41.6	44.8	51.4
		-43	(2) 85.6	705	181	.48	278	25.2	32.3	35.8	39.4	42.9	46.5	53.6
12000.	ISA+10°C	-21	(1) 89.6	755	188	.50	301	26.6	33.3	36.6	39.9	43.2	46.5	53.1
	-32°C	-22	87.9	712	180	.480	289	26.5	33.5	37.1	40.6	44.1	47.6	54.6
		-23	(2) 86.8	680	174	.46	279	26.3	33.7	37.4	41.0	44.7	48.4	55.7
	ISA+ 0°C	-30	(1) 91.0	809	200	.53	312	26.2	32.3	35.4	38.5	41.6	44.7	50.9
	-42°C	-32	86.8	714	184	.490	289	26.4	33.4	36.9	40.4	43.9	47.4	54.4
		-33	(2) 85.2	666	175	.47	274	26.1	33.6	37.4	41.2	44.9	48.7	56.2
	ISA-10°C	-40	(1) 91.8	870	210	.56	320	25.3	31.0	33.9	36.8	39.7	42.5	48.3
	-52°C	-42	87.3	741	192	.510	294	26.1	32.9	36.3	39.6	43.0	46.4	53.1
		-44	(2) 83.4	650	175	.47	268	25.9	33.5	37.4	41.2	45.1	48.9	56.6

CRUISE
31,000 FEET

ANTI-ICE SYSTEMS OFF — **ONE ENGINE**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
13000.	ISA+ 0°C	-35	(1) 91.4	758	186	.52	301	26.5	33.1	36.4	39.7	43.0	46.3	52.9
	-46°C	-36	90.2	725	180	.500	292	26.5	33.4	36.8	40.3	43.7	47.2	54.1
		-36	(2) 89.6	707	176	.49	286	26.4	33.4	37.0	40.5	44.1	47.6	54.7
	ISA-10°C	-45	(1) 92.0	808	196	.54	309	25.9	32.1	35.2	38.3	41.4	44.5	50.7
	-56°C	-46	88.9	727	184	.510	291	26.3	33.1	36.6	40.0	43.5	46.9	53.8
		-47	(2) 87.7	689	176	.49	280	26.1	33.3	37.0	40.6	44.2	47.9	55.1
12000.	ISA+10°C	-26	(1) 90.0	701	177	.49	294	27.7	34.9	38.4	42.0	45.6	49.2	56.3
		-26	(2) 88.9	680	174	.48	288	27.7	35.0	38.7	42.4	46.1	49.7	57.1
	ISA+ 0°C	-35	(1) 91.3	762	191	.53	309	27.5	34.0	37.3	40.6	43.9	47.1	53.7
	-46°C	-36	88.9	696	180	.500	292	27.6	34.7	38.3	41.9	45.5	49.1	56.3
		-37	(2) 87.1	662	173	.48	282	27.4	35.0	38.8	42.5	46.3	50.1	57.6
	ISA-10°C	-44	(1) 92.0	813	200	.55	316	26.6	32.8	35.8	38.9	42.0	45.1	51.2
	-56°C	-45	88.6	721	187	.520	297	27.3	34.2	37.7	41.2	44.6	48.1	55.0
		-47	(2) 85.3	647	173	.48	276	27.2	34.9	38.8	42.6	46.5	50.4	58.1

CRUISE
33,000 FEET

ANTI-ICE SYSTEMS OFF — **ONE ENGINE**

WT. LBS.	TEMP	RAT DEG. C	FAN PERCENT RPM	FUEL FLOW LBS/HR	KIAS	IND. MACH	KTAS	NAUTICAL MILES/100 LBS. FUEL 100 KT. HEADWIND	50 KT. HEADWIND	25 KT. HEADWIND	ZERO WIND	25 KT. TAILWIND	50 KT. TAILWIND	100 KT. TAILWIND
13000.	ISA+ 0°C	-40	(1) 91.6	699	172	.50	290	27.1	34.3	37.8	41.4	45.0	48.6	55.7
		-40	(2) 91.4	695	171	.50	288	27.1	34.3	37.9	41.5	45.1	48.7	55.9
	ISA-10°C	-49	(1) 92.0	744	182	.53	299	26.8	33.5	36.9	40.2	43.6	47.0	53.7
	-60°C	-50	90.4	701	175	.510	288	26.9	34.0	37.6	41.1	44.7	48.3	55.4
		-51	(2) 89.5	677	171	.50	281	26.8	34.2	37.9	41.5	45.2	48.9	56.3
12000.	ISA+ 0°C	-39	(1) 91.5	705	180	.52	302	28.6	35.7	39.2	42.8	46.3	49.9	56.9
	-50°C	-40	90.3	680	175	.510	295	28.7	36.0	39.7	43.4	47.1	50.7	58.1
		-40	(2) 89.3	654	170	.50	287	28.6	36.2	40.0	43.9	47.7	51.5	59.1
	ISA-10°C	-48	(1) 92.0	751	189	.55	310	27.9	34.6	37.9	41.3	44.6	47.9	54.6
	-60°C	-50	89.5	686	179	.520	294	28.3	35.6	39.2	42.9	46.5	50.2	57.5
		-51	(2) 87.4	638	170	.50	280	28.3	36.1	40.0	43.9	47.8	51.8	59.6

(1) MAXIMUM CRUISE THRUST

(2) THRUST FOR MAXIMUM RANGE (APPROXIMATE)

Figure 7-15 Cruise (Sheet 10)

DESCENT

Performance for two types of descent is presented on the following pages. Time, distance and fuel information are provided for a normal descent of 2000 feet per minute, and a high speed descent of 3000 feet per minute.

This performance is based on controlling the fan speed to obtain the fuel flows, airspeed and rates of descent presented with gear and flaps up, speed brakes retracted and anti-ice systems OFF or ON.

The time, distance and fuel used from a given altitude is based on descending to sea level. If the descent is to another altitude, the difference in time, distance and fuel used between the initial and the final altitude must be determined.

Begin descent at M_{MO} -10 KIAS, and maintain desired rate of descent when obtained.

The data is based on a gross weight of 11,000 pounds and standard day temperature. However, weight and temperature effects are minimal and the data can be used for all conditions.

NORMAL DESCENT

ANTI-ICE SYSTEMS OFF

SPEED BRAKES RETRACTED **GEAR AND FLAPS UP**

2000 FEET PER MINUTE RATE OF DESCENT

PRESSURE ALTITUDE FEET	KIAS	TIME MIN	FUEL USED LBS	DISTANCE - NAUTICAL MILES 100 KT HEADWIND	50 KT HEADWIND	25 KT HEADWIND	ZERO WIND	25 KT TAILWIND	50 KT TAILWIND	100 KT TAILWIND
45,000	191.	22.5	251.	99.	118.	127.	137.	146.	155.	174.
43,000	201.	21.5	243.	94.	112.	121.	130.	139.	148.	166.
41,000	211.	20.5	236.	89.	106.	115.	123.	132.	140.	157.
39,000	222.	19.5	227.	84.	100.	108.	116.	124.	132.	149.
37,000	233.	18.5	219.	78.	94.	102.	109.	117.	125.	140.
35,000	245.	17.5	210.	73.	88.	95.	102.	110.	117.	131.
33,000	257.	16.5	201.	68.	82.	89.	95.	102.	109.	123.
31,000	269.	15.5	190.	63.	75.	82.	88.	95.	101.	114.
29,000	282.	14.5	179.	57.	69.	75.	81.	87.	93.	105.
27,000	282.	13.5	167.	52.	63.	69.	74.	80.	85.	97.
25,000	282.	12.5	155.	47.	57.	62.	67.	73.	78.	88.
23,000	282.	11.5	143.	42.	51.	56.	61.	66.	70.	80.
21,000	282.	10.5	131.	37.	46.	50.	54.	59.	63.	72.
19,000	282.	9.5	118.	32.	40.	44.	48.	52.	56.	64.
17,000	282.	8.5	105.	28.	35.	39.	42.	46.	49.	56.
15,000	282.	7.5	92.	24.	30.	33.	36.	39.	42.	49.
10,000	282.	5.0	59.	14.	18.	20.	22.	24.	27.	31.
5,000	251.	2.5	31.	7.	9.	10.	11.	12.	13.	15.
0	251.	.0	0.	0.	0.	0.	0.	0.	0.	0.

WHEN THE ANTI-ICE SYSTEMS ARE ON, INCREASE THE FUEL USED BY 11%.
TIME AND DISTANCE REMAIN THE SAME.

Figure 7-16 Normal Descent

HIGH SPEED DESCENT

ANTI-ICE SYSTEMS OFF

SPEED BRAKES RETRACTED **GEAR AND FLAPS UP**

3000 FEET PER MINUTE RATE OF DESCENT

PRESSURE ALTITUDE FEET	KIAS	TIME MIN	FUEL USED LBS	DISTANCE - NAUTICAL MILES						
				100 KT HEADWIND	50 KT HEADWIND	25 KT HEADWIND	ZERO WIND	25 KT TAILWIND	50 KT TAILWIND	100 KT TAILWIND
45,000	191.	15.5	126.	66.	79.	86.	92.	98.	105.	118.
43,000	201.	14.8	122.	63.	75.	81.	88.	94.	100.	112.
41,000	211.	14.2	118.	59.	71.	77.	83.	89.	95.	106.
39,000	222.	13.5	114.	56.	67.	73.	78.	84.	90.	101.
37,000	233.	12.8	109.	52.	63.	68.	74.	79.	84.	95.
35,000	245.	12.2	105.	49.	59.	64.	69.	74.	79.	89.
33,000	257.	11.5	100.	45.	55.	60.	65.	69.	74.	84.
31,000	269.	10.8	95.	42.	51.	55.	60.	64.	69.	78.
29,000	282.	10.2	89.	38.	47.	51.	55.	59.	64.	72.
27,000	282.	9.5	83.	35.	43.	46.	50.	54.	58.	66.
25,000	282.	8.8	77.	31.	39.	42.	46.	50.	53.	61.
23,000	282.	8.2	70.	28.	35.	38.	41.	45.	48.	55.
21,000	282.	7.5	64.	25.	31.	34.	37.	40.	43.	50.
19,000	282.	6.8	57.	22.	27.	30.	33.	36.	39.	44.
17,000	282.	6.2	50.	19.	24.	27.	29.	32.	34.	39.
15,000	282.	5.5	44.	16.	21.	23.	25.	27.	30.	34.
10,000	282.	3.8	27.	10.	13.	14.	16.	18.	19.	22.
5,000	233.	2.0	16.	5.	6.	7.	8.	9.	10.	11.
0	231.	.0	0.	0.	0.	0.	0.	0.	0.	0.

WHEN THE ANTI-ICE SYSTEMS ARE ON, INCREASE THE FUEL USED BY 18%.
TIME AND DISTANCE REMAIN THE SAME.

Figure 7-17 High Speed Descent

HOLDING

Holding fuel in total pounds per hour is presented for various weights at several altitudes.

These data are based on a nominal holding speed with gear and flaps up and speed brakes retracted.

HOLDING FUEL

ANTI-ICE SYSTEMS OFF

SPEED BRAKES RETRACTED **GEAR AND FLAPS UP**

WEIGHT LBS	KIAS	TOTAL POUNDS PER HOUR							
		PRESSURE ALTITUDE - FEET							
		SEA LEVEL	1500	5000	10,000	15,000	20,000	25,000	30,000
15,000	180.	1116.	1084.	1015.	926.	891.	863.	825.	797.
14,000	175.	1075.	1043.	973.	884.	848.	820.	782.	753.
13,000	170.	1036.	1003.	933.	841.	807.	778.	739.	710.
12,000	165.	998.	965.	893.	801.	767.	737.	697.	668.
11,000	160.	961.	928.	856.	761.	726.	697.	657.	628.

WHEN THE ANTI-ICE SYSTEMS ARE ON, INCREASE THE FUEL USED BY 10%.

Figure 7-18 Holding Fuel

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