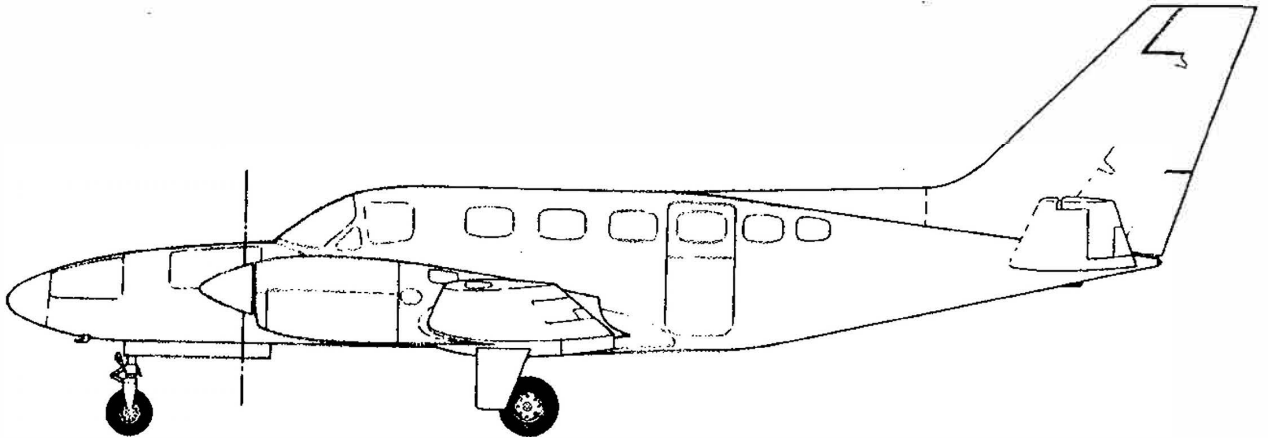


PILOT'S OPERATING HANDBOOK and FAA APPROVED AIRPLANE FLIGHT MANUAL



CESSNA AIRCRAFT COMPANY

MODEL 441

Serial Number 441-0005

Registration Number _____

THIS DOCUMENT MUST BE CARRIED
IN THE AIRPLANE AT ALL TIMES

THIS HANDBOOK INCLUDES THE MATERIAL REQUIRED
TO BE FURNISHED TO THE PILOT BY FAR PART 23 AND
CONSTITUTES THE FAA APPROVED AIRPLANE FLIGHT MANUAL

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THE CESSNA AIRCRAFT COMPANY

CESSNA AIRCRAFT COMPANY
Wallace Division
Wichita, Kansas

1 AUGUST 1977

ASSIGNMENT RECORD PAGE

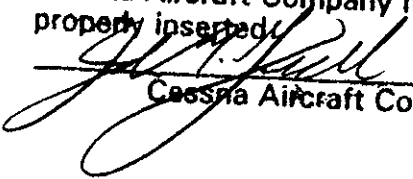
THIS MANUAL WAS PROVIDED FOR THE AIRPLANE
IDENTIFIED ON THE TITLE PAGE ON _____.

SUBSEQUENT REVISIONS SUPPLIED BY CESSNA
AIRCRAFT COMPANY MUST BE PROPERLY INSERTED.

CESSNA AIRCRAFT COMPANY, WALLACE DIVISION

This manual is issued to replace one originally provided for the airplane identified on the cover page on 3-21-78.
All revisions, if any, have been incorporated as of _____.

9-22-04
Subsequent revisions supplied by
Cessna Aircraft Company must be
properly inserted.


Cessna Aircraft Company

NOTICE

THE INFORMATION IN THIS PUBLICATION IS BASED ON DATA AVAILABLE AT THE TIME OF PUBLICATION AND IS KEPT CURRENT TO CESSNA SERVICE STATIONS THROUGH THE ISSUANCE OF SERVICE NEWSLETTERS, SERVICE BULLETINS, SUPPLIER SERVICE NOTICES, PUBLICATION CHANGES, REVISIONS, REISSUES, AND TEMPORARY REVISIONS.

USERS ARE URGED TO KEEP ABREAST OF THE LATEST CHANGES THROUGH SERVICE STATIONS OR THROUGH THE CESSNA PRODUCT SUPPORT SUBSCRIPTIONS SERVICE. CESSNA SERVICE STATIONS HAVE BEEN SUPPLIED WITH A GROUP OF SUPPLIER PUBLICATIONS WHICH PROVIDE DISASSEMBLY, OVERHAUL, AND PARTS BREAKDOWNS FOR SOME OF THE VARIOUS SUPPLIER EQUIPMENT ITEMS. SUPPLIER PUBLICATIONS ARE KEPT CURRENT BY SUPPLIER ISSUED REVISIONS AND SERVICE INFORMATION THAT ARE SENT TO CESSNA AIRCRAFT COMPANY. CESSNA IN TURN MAY REISSUE THEM, WHEN APPROPRIATE, TO AFFECTED CESSNA SERVICE STATIONS.

LIST OF TEMPORARY REVISIONS

for

D1561-15-13PH

MODEL 441 CONQUEST II

(SERIALS 441-0001 THRU 441-0172)

**PILOT'S OPERATING HANDBOOK
and**

**FAA APPROVED AIRPLANE
FLIGHT MANUAL**

Pilot's Operating Handbook
Model 441
Airplanes 441-0001 thru 441-0172
Conquest II

The following List of Temporary Revisions must be inserted into this Pilot's Operating Handbook until the information is incorporated at the next revision to this manual.

Insert this page opposite the first page of the Log of Effective Pages in the front of the Pilot's Operating Handbook.

TEMPORARY REVISION NUMBER	PAGE NUMBER	ISSUE DATE
D1561-15TR1	5-27	30 July 2003
D1561-15TR2	5-51	30 July 2003

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COVERAGE

The Pilot's Operating Handbook and FAA Approved Airplane Flight Manual in the airplane at the time of delivery from Cessna Aircraft Company contains information applicable to the Model 441 airplane designated by the serial number and registration number shown on the Title Page of this handbook. This handbook is applicable to airplane serial numbers 441-0001 thru 441-0172.

REVISIONS

Changes and/or additions to this handbook will be covered by revisions published by Cessna Aircraft Company. These revisions are distributed to owners of U.S. Registered airplanes according to FAA records at the time of revision issuance, and to Internationally Registered airplanes according to Cessna Owner Advisory records at the time of issuance.

Revisions should be examined immediately upon receipt and incorporated in this handbook.

NOTE

It is the responsibility of the owner to maintain this handbook in a current status when it is being used for operational purposes.

Owners should contact a Cessna Propjet Service Station whenever the revision status of their handbook is in question.

A revision bar will extend the full length of new or revised text and/or illustrations added on new or presently existing pages. This bar will be located adjacent to the applicable revised area on the outer margin of the page.

All revised pages will carry the revision number and date on the applicable page.

The following Log of Effective Pages provides the dates of issue for original and revised pages, and a listing of all pages in this handbook. Pages affected by the current revision are indicated by an asterisk (*) preceding the pages listed.

LOG OF EFFECTIVE PAGES

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Original	0	1 Aug 1977	Revision	8	3 Dec 1979
Revision	1	15 Nov 1977	Revision	9	2 Feb 1981
Revision	2	24 Feb 1978	Revision	10	1 Jul 1981
Revision	3	1 May 1978	Revision	11	2 Jan 1985
Revision	4	15 Sep 1978	Revision	12	3 Jun 1985
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Revision	6	1 May 1979	Revision	14	9 Jan 1998
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NOTE

Refer to Section 9, Table of
Contents, for Supplements
applicable to optional systems.

**PILOT'S OPERATING
HANDBOOK AND FAA
APPROVED AIRPLANE
FLIGHT MANUAL**

**PART NUMBER
D1561-15-13PH**

CONGRATULATIONS

Welcome to the ranks of Cessna owners/operators! Your Cessna has been designed and constructed to give you the most in performance, economy, and comfort. It is our desire that you will find flying it, a pleasant and profitable experience.

This Pilot's Operating Handbook and FAA Approved Airplane Flight Manual has been prepared as a guide to help you get the most pleasure and utility from your airplane. It contains information about your Cessna equipment, operating procedures and performance, and suggestions for its servicing and care. Please study it carefully and refer to it often.

Our interest in your flying pleasure has not ceased with your purchase of a Cessna. The Worldwide Cessna Organization and Cessna Propjet Service Stations stand ready to serve you. You will find the following services are offered by most Cessna Propjet Service Stations:

- **THE CESSNA WARRANTY**, which provides coverage for parts and labor, is available at Cessna Propjet Service Stations worldwide. Specific benefits and provisions of warranty, plus other important benefits for you, are contained in the Customer Care Program Handbook or The Service Information and Propjet CESCO Manual supplied with your airplane. Warranty service is available to you at authorized Cessna Propjet Service Stations throughout the world upon presentation of your Customer Care Card which establishes your eligibility under the warranty.
- **FACTORY-TRAINED PERSONNEL** to provide you with courteous, expert service.
- **FACTORY-APPROVED SERVICE EQUIPMENT** to provide you efficient and accurate workmanship.
- **A STOCK OF GENUINE CESSNA SERVICE PARTS** on hand when you need them.
- **THE LATEST AUTHORITATIVE INFORMATION FOR SERVICING CESSNA AIRPLANES.** Cessna Propjet Service Stations have all the Maintenance Manuals and Illustrated Parts Catalogs, and are kept current by Service Information Letters, Conquest Service Bulletins and Service Newsletters published by Cessna Aircraft Company.
- We urge all Cessna owners/operators to use the Cessna Organization to the fullest.

A current Cessna Sales and Service Directory accompanies your new airplane. The Directory is revised frequently, and a current copy can be obtained from a Cessna Service Station. Make the Directory one of your cross-country flight planning aids.

PERFORMANCE AND SPECIFICATIONS

WEIGHT:

Maximum Ramp Weight	9925 Pounds
Maximum Takeoff Weight	9850 Pounds
Maximum Landing Weight	9360 Pounds
Maximum Zero Fuel Weight	8500 Pounds

* SPEED At 8350 Pounds

Maximum Cruise at 16,000 Feet	295 KTAS
Maximum Cruise at 24,000 Feet	293 KTAS

* RANGE: For 475 Gallons Usable At 6.7 Pounds per Gallon (3183 Lbs)

Maximum Range Power At 17,000 Feet	1199 Nautical Miles 4.23 Hours 290 KTAS
At 25,000 Feet	1571 Nautical Miles 5.52 Hours 292 KTAS
At 33,000 Feet	2063 Nautical Miles 7.40 Hours 287 KTAS
At 35,000 Feet (Airplanes Incorporating SK441-36)	2193 Nautical Miles 7.98 Hours 283 KTAS
Maximum Range Power At 17,000 Feet	1471 Nautical Miles 6.35 Hours 234 KTAS
At 25,000 Feet	1816 Nautical Miles 7.46 Hours 246 KTAS
At 33,000 Feet	2212 Nautical Miles 8.75 Hours 257 KTAS
At 35,000 Feet (Airplanes Incorporating SK441-36)	2291 Nautical Miles 8.99 Hours 259 KTAS

RATE OF CLIMB AT SEA LEVEL

All Engines	2435 Feet Per Minute
One Engine Inoperative	715 Feet Per Minute

SERVICE CEILING

All Engines (Airplanes Not Incorporating SK441-36)	33,000 Feet
All Engines (Airplanes Incorporating SK441-36)	35,000 Feet
One Engine Inoperative	21,380 Feet

TAKEOFF PERFORMANCE: (Wing Flaps In T.O. Position And 9850 Pounds Weight)

Ground Roll	1785 Feet
Total Distance Over 50-Foot Obstacle	2465 Feet

LANDING PERFORMANCE: (Wing Flaps In LAND Position And 9360 Pounds Weight)

Ground Roll	1095 Feet
Total Distance Over 50-Foot Obstacle	1875 Feet

STANDARD EMPTY WEIGHT: (Approximate)

441-0001 thru 441-0070	5616 Pounds
441-0071 thru 441-0115	5651 Pounds
441-0116 thru 441-0172	5687 Pounds

BAGGAGE ALLOWANCE:

1500 Pounds

WING LOADING

38.80 Pounds Per Square Foot

POWER LOADING

7.88 Pounds Per Horsepower

FUEL CAPACITY: (Total)

481.5 Gallons (475 Gallons Usable)

OIL CAPACITY (Per Engine)

7.5 Quarts

ENGINES:

TPE331-8-401S, TPE331-8-402S, TPE331-8-403S, or TPE331-8-404S

Garrett/AiResearch Turbine Engine Company Fixed Shaft Turbine Engines, Flat Rated To

635.5 Shaft Horsepower At 2000 Propeller RPM

PROPELLERS:

Hartzell or McCauley	9910348-1, 9910348-2, or 9910478-1

Constant Speed, Full Feathering, Reversible, Three-Bladed, 7.50 Feet Diameter

* Range data include allowances for start, taxi, takeoff, climb, descent and 45 minutes reserve at the particular cruise power and altitude. Speeds shown are at mid-cruise weight.

The above performance figures are based on the indicated weights, standard atmospheric conditions, level hard-surface dry runways and no wind. They are calculated values derived from flight tests conducted by Cessna Aircraft Company under carefully documented conditions and will vary with individual airplanes and numerous factors affecting performance.

SECTION 1 GENERAL

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INTRODUCTION

This handbook consists of 9 sections and an alphabetical index as shown on the Contents page. It includes the material required to be furnished to the pilot by FAR Part 23. It also contains supplemental data supplied by Cessna Aircraft Company. Specific information can be rapidly found by referring to the Table of Contents page for the appropriate section or by using the Alphabetical Index.

NOTE

This handbook includes the material required to be furnished to the pilot by the Federal Aviation Regulations and additional information provided by Cessna Aircraft Company and constitutes the FAA Approved Airplane Flight Manual.

This handbook is not intended to be a guide for basic flight instruction or a training manual and should not be used as one. It is not a substitute for adequate and competent flight instruction, knowledge of current airworthiness directives, applicable federal air regulations or advisory circulars.

Assuring the airworthiness of the airplane is the responsibility of the airplane owner/operator. Determining if the airplane is safe for flight is the responsibility of the pilot in command. The pilot is also responsible for staying within operating limitations as outlined by instrument markings, placards and this Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

Section 1 of this handbook presents basic airplane data and general information which will be of value to the pilot.

THREE-VIEW DRAWING

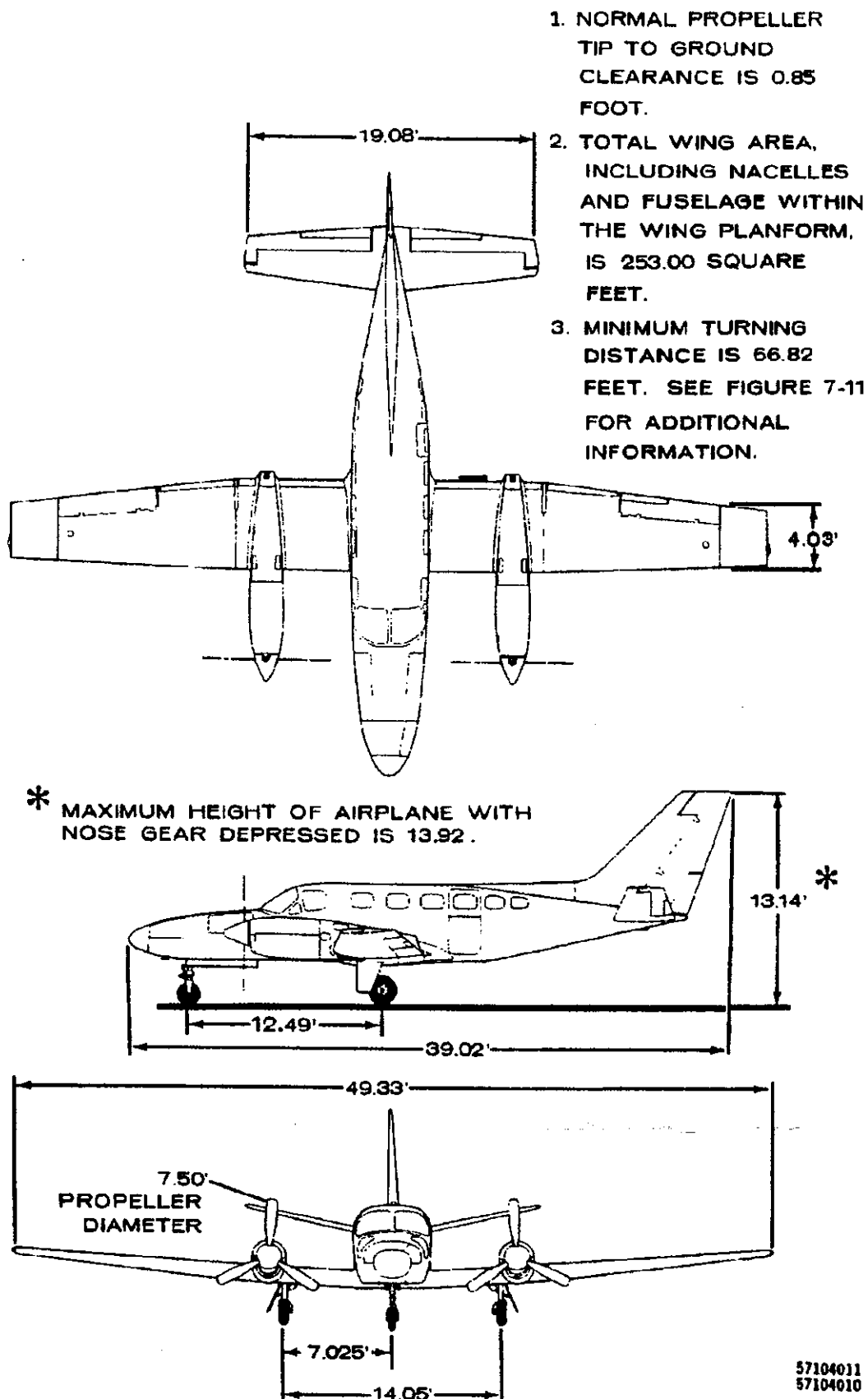


Figure 1-1

ENGINES

Number of Engines: 2

Manufacturer: Garrett/AiResearch Turbine Engine Company

Engine Model Number: TPE331-8-401S, TPE331-8-402S, TPE331-8-403S or TPE331-8-404S

Engine Type: Garrett/AiResearch Turbine Engine Company TPE331 turboprop single fixed-shaft engine. Each engine incorporates a two-stage centrifugal compressor, a three-stage axial-flow turbine, and an annular combustion chamber.

Horsepower: Flat rated at 635.5 shaft horsepower. At 100% RPM, the main shaft turns 41,730 RPM while the propeller turns 2000 RPM.

PROPELLERS

Number of Propellers: 2

Manufacturer: Hartzell Propeller, Inc. or McCauley Accessory Division

Cessna Part Number: 9910348-1, 9910348-2 or 9910478-1

Number of Blades: 3

Propeller Diameter: 7.50'

Propeller Type: Constant speed, full feathering, reversible and hydraulically actuated.

Blade Angle: (At 30-Inch Station)

Hartzell Propeller, Inc. (9910348-1 or 9910348-2)	McCauley Propeller (9910478-1)
a. Feathered $87.4^{\circ} + .1^{\circ}, -.2^{\circ}$	a. Feathered $85.3^{\circ} \pm .2^{\circ}$
b. Flight Idle $10^{\circ} \pm .2^{\circ}$	b. Flight Idle $8.5^{\circ} \pm .2^{\circ}$
c. Start Locks $2.0^{\circ} \pm .1^{\circ}$	c. Start Locks $2.0^{\circ} \pm .2^{\circ}$
d. Full Reverse $-8.0^{\circ} \pm .2^{\circ}$	d. Full Reverse $-8.0^{\circ} \pm .2^{\circ}$

FUEL

APPROVED FUEL GRADES

Aviation turbine fuel ASTM D-1655, Jet A, Jet A-1, or Jet B; MIL-L-5616, JP-1; MIL-T-5624, JP-4, JP-5; MIL-T-83133, JP-8 are approved fuels. Aviation Gasoline (all grades) is approved for limited emergency use only. A record of total aviation gasoline used must be recorded in the Airplane Engine Maintenance Record. Refer to Section 2, Fuel Limitations for fuel specifications and limitations. Refer to Section 8, Servicing for additional fuel servicing information.

NATO equivalents of the above fuels may be used.

APPROVED FUEL ADDITIVES

One of the following additives is required for anti-icing protection:

Ethylene Glycol Monomethyl Ether (MIL-I-27686).
Diethylene Glycol Monomethyl Ether (MIL-I-85470).

CAUTION

JP-4 and JP-5 fuel per Mil-T-5624 and JP-8 fuel per Mil-T-83133a contain the correct premixed quantity of an approved type of anti-icing fuel additive and no additional anti-ice compounds should be added.

If additional antistatic protection is desired, the following additives are approved for use:

Shell ASA3
Dupont Stadis 450

If additional biocidal protection is desired, the following additive is permitted for use in certain conditions.

Sohio Biobor JF

Refer to Section 2, Fuel Limitations and Section 8, Servicing for allowable concentrations of the above additives and additional information.

FUEL CAPACITY

Total Fuel Capacity (U.S. Gallons)	Usable Fuel (U.S. Gallons)
481.5	475.0

Figure 1-2

OIL

When adding oil, service the engines with the type and brand which is currently being used in the engines. Refer to the engine log books. Do not mix brands and/or types of oils.

Type I oils in compliance with MIL-L-7808G and Type II oils in compliance with MIL-L-23699 are approved for use. Refer to Section 8 for additional information.

Total Tank

Capacity: 7.5 quarts per engine

Drain and

Refill Quantity: 7.5 quarts per engine including oil filter.

Oil Quantity

Fill to capacity. Do not operate engine when indicated

Operating Range: oil level is below the ADD mark.

NOTE

If oil dipstick indicates oil is abnormally low and operation of the propeller unfeathering switch has occurred, it is possible the engine oil has been transferred to the engine gear case. If this is suspected, motor the applicable engine for 5 to 10 seconds and recheck the oil level.

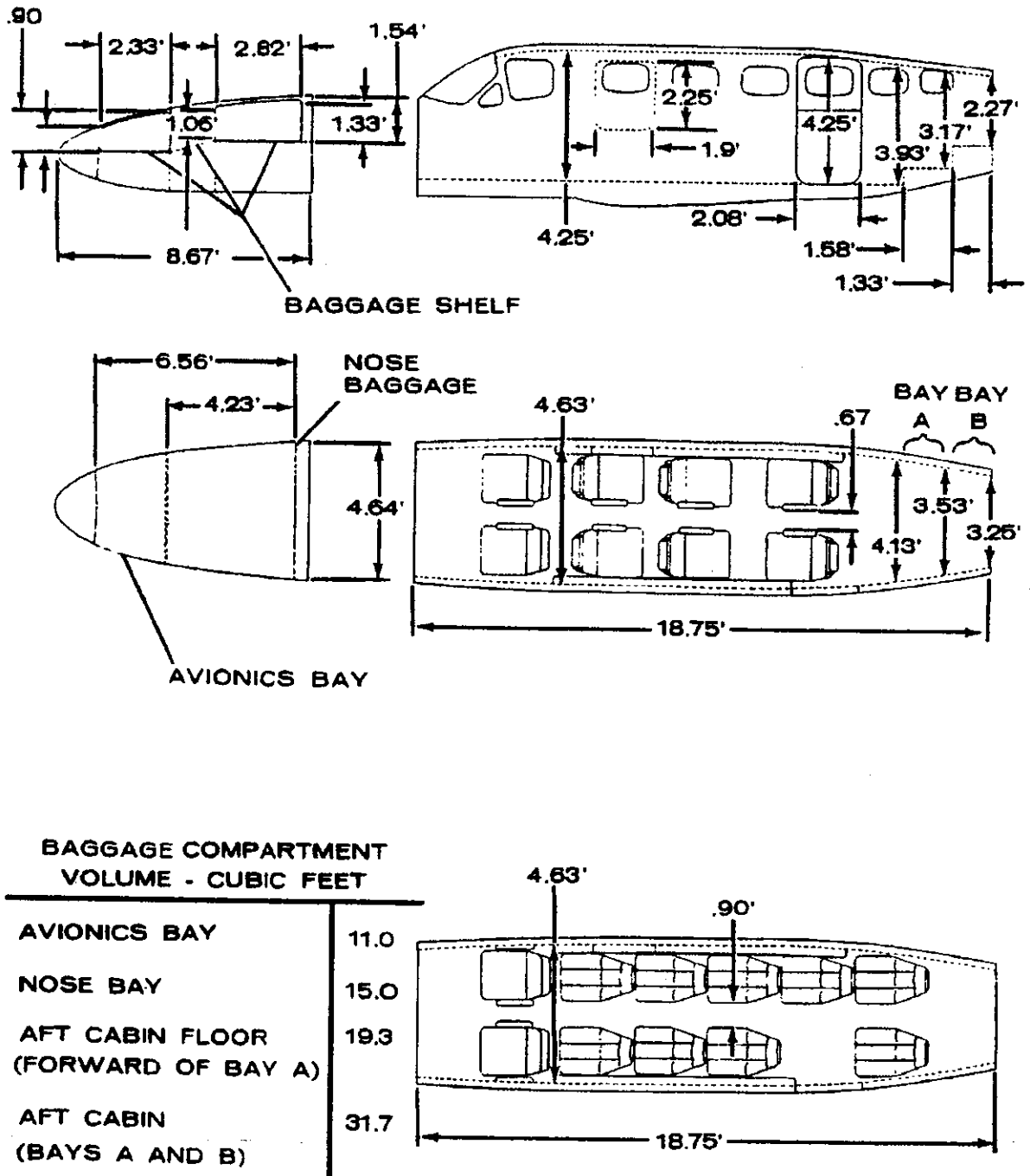
MAXIMUM CERTIFICATED WEIGHTS

Maximum Ramp Weight:	9925 pounds
Maximum Takeoff Weight:	9850 pounds
Maximum Landing Weight:	9360 pounds
Maximum Zero Fuel Weight:	8500 pounds
Maximum Weights in Baggage Compartments	a. Avionics Bay: 250 pounds less installed optional equipment. Refer to the loading placard in the airplane avionics baggage bay. b. Nose Bay: 350 pounds less installed optional equipment. Refer to the loading placard in the airplane nose baggage bay. c. Aft Cabin (On Floor Forward Of Bay A). Refer to Figure 1-3: 400 pounds (200 Pounds Per Side). Maximum floor loading is 200 pounds per square foot. d. Aft Cabin (Bay A). Refer to Figure 1-3: 400 pounds (200 Pounds Per Side). Maximum floor loading is 75 pounds per square foot. e. Aft Cabin (Bay B). Refer to Figure 1-3: 100 pounds (50 Pounds Per Side). Maximum floor loading is 75 pounds per square foot.

STANDARD AIRPLANE WEIGHTS

Standard Empty Weight	5616 pounds (441-0001 thru 441-0070) 5651 pounds (441-0071 thru 441-0115) 5687 pounds (441-0116 thru 441-0172)
Maximum Useful Load (Based On Maximum Ramp Weight)	4309 pounds (441-0001 thru 441-0070) 4274 pounds (441-0071 thru 441-0115) 4238 pounds (441-0116 thru 441-0172)

CABIN, BAGGAGE AND ENTRY DIMENSIONS



57103006
57103006
57103005

Figure 1-3

SPECIFIC LOADINGS

Wing Loading: 38.80 pounds per square foot

Power Loading: 7.88 pounds per shaft horsepower

SYMBOLS, ABBREVIATIONS AND TERMINOLOGY

GENERAL AIRSPEED TERMINOLOGY AND SYMBOLS

CAS	Calibrated airspeed means indicated speed of an airplane corrected for position and instrument error. Calibrated airspeed is equal to true airspeed in standard atmosphere at sea level.
G	Acceleration due to gravity.
GS	Ground speed is the speed of the airplane relative to the ground.
IAS	Indicated airspeed is the speed of an airplane as shown on the airspeed indicator when corrected for instrument error. IAS values published in this handbook assume zero instrument error.
KCAS	Calibrated airspeed expressed in knots.
KIAS	Indicated airspeed expressed in knots.
KTAS	True airspeed expressed in knots.
M	Mach number is the ratio of true airspeed to the speed of sound.
NM	Nautical miles.
TAS	True airspeed is the airspeed of an airplane relative to undisturbed air which is the CAS corrected for altitude, temperature and compressibility.
V _A	Maneuvering speed is the maximum speed at which application of full available aerodynamic control will not overstress the airplane.
V _{FE}	Maximum flap extended speed is the highest speed permissible with wing flaps in a prescribed extended position.
V _{LE}	Maximum landing gear extended speed is the maximum speed at which an airplane can be safely flown with the landing gear extended.
V _{LO}	Maximum landing gear operating speed is the maximum speed at which the landing gear can be safely extended or retracted.

V_{MCA}

Air minimum control speed is the minimum flight speed at which the airplane is directionally and laterally controllable as determined in accordance with Federal Aviation Regulations. Airplane certification conditions include one engine becoming inoperative; not more than a 5-degree bank toward the operative engine; takeoff power on operative engine; landing gear up; flaps in takeoff position; and most critical center-of-gravity.

V_{MO}/M_{MO}

Maximum operating limit speed is the speed limit that may not be deliberately exceeded in normal flight operations. V is expressed in knots and M in Mach Number.

V_S

Stalling speed or the minimum steady flight speed at which the airplane is controllable.

V_{SO}

Stalling speed is the minimum steady flight speed at which the airplane is controllable in the landing configuration.

V_{SSE}

Intentional one engine inoperative speed is a minimum speed selected by the manufacturer for intentionally rendering one engine inoperative in flight for pilot training.

V_X

Best angle-of-climb speed is the airspeed which delivers the greatest gain of altitude in the shortest possible horizontal distance.

V_Y

Best rate-of-climb speed is the airspeed which delivers the greatest gain in altitude in the shortest possible time.

METEOROLOGICAL TERMINOLOGY

°C

Temperature expressed in degrees Celsius.

°F

Temperature expressed in degrees Fahrenheit.

Indicated
Pressure
Altitude

The number actually read from an altimeter when the barometric subscale has been set to 29.92 inches of mercury (1013.2 millibars).

IOAT

Indicated outside air temperature is the temperature indicated on the pilot's outside air temperature indicator. The indication is not adjusted for instrument error or temperature compressibility effects.

ISA

International standard atmosphere in which:

- (1) The air is a dry perfect gas;
- (2) The temperature at sea level is 15° Celsius;
- (3) The pressure at sea level is 29.92 inches Hg. (1013.2 mb);
- (4) The temperature gradient from sea level to the altitude at which the temperature is -56.6°C is -1.98°C per 1000 feet.

OAT	Outside air temperature is the free air static temperature, obtained either from inflight temperature indications or ground meteorological sources adjusted for instrument error and compressibility effects.
Pressure Altitude	Altitude measured from standard sea-level pressure (29.92 inches Hg.) by a pressure or barometric altimeter. It is the indicated pressure altitude corrected for position and instrument error. In this handbook, altimeter instrument errors are assumed to be zero.
Station Pressure	Actual atmospheric pressure at field elevation.
Temperature Compressibility Effects	An error in the indication of temperature caused by air-flow over the temperature probe. The error varies, depending on altitude and airspeed.
Wind	The wind velocities recorded as variables on the charts of this handbook are to be understood as the headwind or tailwind components of the reported winds.

POWER TERMINOLOGY

Critical Altitude	The maximum altitude at which in standard temperature it is possible to maintain a specified power.
Cruise Climb Power	The power recommended to operate the airplane in a cruise climb profile.
EGT	Exhaust gas temperature.
Engine Cycle	A cycle is any operational sequence involving engine start, airplane takeoff and landing and engine shutdown.
Flameout	Unintentional loss of combustion chamber flame during operation.
Flat Rated	Constant horsepower over a specific altitude range.
Hot Start	An engine start, or attempted start, which results in EGT exceeding 770°C. It is caused by an excessive fuel-to-air ratio.
Maximum Continuous Power	The power developed at 100% RPM when at torque limit or EGT limit.
Maximum Cruise Power	The power developed at 96% RPM when at torque limit or EGT limit.
Negative Torque	The turning force applied to the engine by the propeller. This occurs when an engine loses power in flight and the propeller turns due to wind resistance.

Negative Torque Sensing (NTS) System	A system designed to automatically reduce drag against an inoperative engine by moving the propeller blades toward feather.
RPM	Revolutions Per Minute, normally expressed as a percentage of maximum engine speed.
Reverse Thrust	The thrust produced when the propeller blades are rotated past flat pitch into reverse.
SHP	Shaft horsepower means the power delivered at the propeller shaft.
Single Red Line EGT	A presentation to the pilot of a calculated exhaust gas temperature, corrected for altitude, engine inlet air temperature and Mach Number, to allow use of a single temperature limit.
Torque	A measurement that is proportional to the power output of the engine.
Windmill	Propeller rotation from airstream inputs.

ENGINE CONTROLS AND INSTRUMENTS

Beta Mode	Engine operational mode in which propeller blade pitch is hydraulically controlled from the cockpit power lever during ground operations only.
Condition Lever	The cockpit lever provides speed and condition selection to the fuel control computer and mechanically provides emergency fuel shutoff and propeller feathering.
EGT Gage	Exhaust gas temperature instrument displaying air temperature aft of the third stage axial flow turbine.
Fuel Control Torque Motor	A part located within the fuel control unit that receives inputs from the fuel computer to control the engine fuel flow.
Manual Mode Operation	Occurs when the fuel schedule is mechanically set by the pilot. It is the back up mode of operation for normal mode.
Monopole	A magnetic pickup that transmits electrical pulses (or counts) used by the computer to monitor engine RPM.
Normal Mode Operation	Is the electronic mode of operation where fuel scheduling is electronically controlled.
Overspeed Governor	Flyweight operated fuel metering device, housed in the fuel control unit. It prevents engine overspeed in the event of a malfunction of the propeller governor.
Power Lever	Cockpit lever used to change propeller pitch during Beta operation and select engine fuel flow during propeller governing.

Propeller Governor	Regulates the RPM of the engine/propeller by increasing or decreasing the propeller pitch through a pitch change mechanism in the propeller hub.
Propeller Governor Torque Motor	A device located within the propeller governor that receives inputs from the fuel computer to control engine RPM.
Start Locks	Mechanical latching device on each propeller blade used to maintain the propeller at minimum pitch position during engine starting.
Tachometer	Indicates the speed of the engine in % of maximum.
Torque Meter	The instrument that indicates the torque output of the engine gear box.
Δ P/P Transducer	A transducer that generates a signal in proportion to flight Mach number. Transducer inputs include total (pitot) and static (engine P5) pressures.
T2 Sensor	A temperature sensor that measures the engine inlet air temperature.

AIRPLANE PERFORMANCE AND FLIGHT PLANNING TERMINOLOGY

Accelerate-Go Distance	The distance required to accelerate an airplane to a specified speed and, assuming failure of an engine at the instant that speed is attained, continue takeoff on the remaining engine to a height of 50 feet.
Accelerate-Stop Distance	The distance required to accelerate an airplane to a specified speed and, assuming failure of an engine at the instant that speed is attained, to bring the airplane to a stop.
Aerobatic Maneuver	An intentional maneuver involving an abrupt change of an airplane's attitude, an abnormal attitude, or abnormal acceleration, not necessary for normal flight.
Balked Landing	A balked landing is an aborted landing (i.e., all engines go-around in the landing configuration).
Balked Landing Transition Speed	The minimum speed at which a transition to a balked landing climb should be attempted from 50-foot obstacle height.
Climb Gradient	The demonstrated ratio of the change in height during a portion of a climb to the horizontal distance traversed in the same time interval.
Demonstrated Crosswind Velocity	The demonstrated crosswind velocity is the velocity of the crosswind component for which adequate control of the airplane during takeoff and landing was actually demonstrated during certification tests. The value shown is not considered to be limiting. This value is not an aerodynamic limit for the airplane.

Maneuvering Fuel	Maneuvering fuel is the usable fuel as shown in Section 2 for all airplane configurations, provided the maximum side slip duration is not exceeded.
Maximum Effective Braking	The maximum amount of braking pressure that can be applied to the toe brakes without locking the wheels.
MEA	Minimum enroute IFR altitude.
Route Segment	A part of a route. Each end of that part is identified by: (1) a geographical location; or (2) a point at which a definite radio fix can be established.

WEIGHT AND BALANCE TERMINOLOGY

Arm	The horizontal distance from the reference datum to the center-of-gravity (C.G.) of an item.
Basic Empty Weight	Standard empty weight plus installed optional equipment.
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.
Center-of-Gravity (C.G.)	The point at which an airplane would balance if suspended. Its distance from the reference datum is found by dividing the total moment by the total weight of the airplane.
Jack Point	One of the three points on the airplane designed to rest on a jack.
MAC	The mean aerodynamic chord of a wing is the chord of an imaginary airfoil which throughout the flight range will have the same force vectors as those of the wing.
Maximum Landing Weight	Maximum weight approved for the landing touchdown.
Maximum Ramp Weight	Maximum weight approved for ground maneuver. It includes weight of start, taxi and run-up fuel.
Maximum Takeoff Weight	Maximum weight approved for the start of the takeoff run.
Maximum Zero Fuel Weight	Maximum weight exclusive of usable fuel.
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.)
Payload	Weight of occupants, cargo and baggage.

Reference Datum	An imaginary vertical plane from which all horizontal distances are measured for balance purposes.
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.
Standard Empty Weight	Weight of a standard airplane including unusable fuel, full operating fluids and full oil.
Station	A location along the airplane fuselage given in terms of distance from the reference datum.
Tare	Tare is the weight of the chocks, blocks, stands, etc. used when weighing an airplane, and is included in the scale readings. Tare is deducted from the scale reading to obtain the actual (net) airplane weight.
Unusable Fuel	Fuel remaining after fuel runout tests have been completed in accordance with governmental regulations.
Usable Fuel	Fuel available for flight planning.
Useful Load	Difference between ramp weight and the basic empty weight.

SECTION 2 LIMITATIONS

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INTRODUCTION

Section 2 of this handbook presents the operating limitations, the significance of such limitations, instrument markings, color coding and basic placards necessary for the safe operation of the airplane, its powerplants, standard systems and standard equipment. The limitations included in this section and Section 9 have been approved by the Federal Aviation Administration. Observance of these operating limitations is required by law.

Operation in countries other than the United States may require observance of other limitations, procedures or performance data in applicable supplements.

NOTE

Refer to Section 9 of this handbook for amended operating limitations, operating procedures, performance data and other necessary information for airplanes equipped with specific options.

AIRSPEED LIMITATIONS

SPEED	CIAS	KCAS	REMARKS
Maximum Maneuvering Speed 9850 Pounds at Sea Level V_A (Knots)	167	167	Do not make abrupt control movements above this speed. Refer to Figure 2-2.
Maximum Flap Extended Speed V_{FE} (Knots) T.O. and APPR Positions LAND Position	200 180	199 179	Do not exceed this speed with the given flap setting.
Maximum Gear Operating Speed V_{LO} (Knots)	180	179	Do not extend or retract landing gear above this speed.
Maximum Gear Extended Speed V_{LE} (Knots)	180	179	Do not exceed this speed with landing gear extended.
Air Minimum Control Speed (Wing Flaps In T.O. Position) - V_{MCA} (Knots) NOTE Buffet can be encountered as high as 99 KIAS with the airplane at maximum takeoff weight and the wing flaps in the UP position.	91	92	This is the minimum flight speed at which the airplane is controllable with one engine inoperative and with a 5° bank towards the operative engine.
One Engine Inoperative Best Rate-of-Climb Speed (Wing Flaps In UP Position) - V_Y (Knots)	120	120	This speed delivers the greatest gain in altitude in the shortest possible time with one engine inoperative.
Maximum Operating Speed V_{MO} (Knots) M_{MO} (Mach)	245 .55 Mach	243	Do not exceed this speed or mach number in any operation.

Figure 2-1

MAXIMUM MANEUVERING SPEEDS

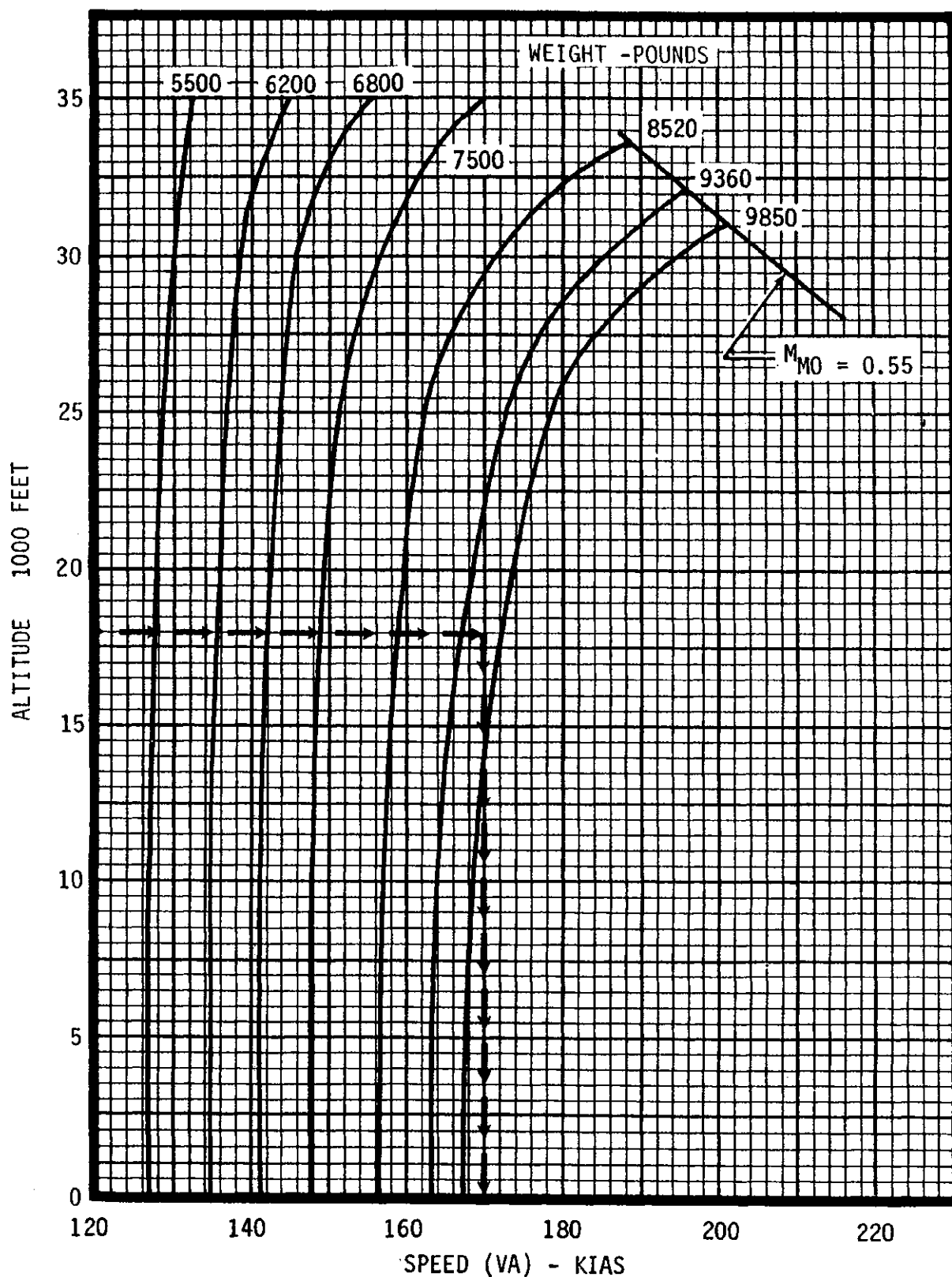
**OPERATION ABOVE 33,000 FEET RESTRICTED
TO AIRPLANES INCORPORATING SK441-36****CONDITIONS:**
1. Landing Gear - Up.
2. Wing Flaps - Up.**EXAMPLE:**
Altitude 18,000 Feet
Weight 9700 Pound
Maximum Maneuvering
Speed 170 KIAS

Figure 2-2

Airspeed Indicator Markings: See Figure 2-3

AIRSPEED INDICATOR TABLE

MARKING	KIAS VALUE OR RANGE	SIGNIFICANCE
Red Radial	91	Air minimum control speed with wing flaps in T.O. position.
White Arc Wide Narrow	74 to 180 74 to 89 89 to 180	Operating speed range with wing flaps in LAND position. Lower limit is maximum weight stalling speed in landing configuration. Upper limit is maximum speed permissible with wing flaps in LAND position. The transition point from wide to narrow arc is the stall speed with wing flaps in UP position.
Blue Radial	120	One engine inoperative best rate-of-climb speed with wing flaps in UP position.
Red and White Barber Pole	245 KIAS/.55 Mach	Maximum operating speed.

Figure 2-3

ENGINE LIMITATIONS

Number of Engines: 2

Engine Manufacturer: Garrett Turbine Engine Company

Engine Model Number: TPE331-8-401S, TPE331-8-402S, TPE331-8-403S or
TPE331-8-404S

Engine Operating Limits: See Figure 2-4

Exhaust Gas Temperature Limits For Manual Mode Operation: See Figure 2-5

Starting Cycle Limitations:

- a. External Power
Or Battery Start: 30 seconds on 60 seconds off,
30 seconds on 60 seconds off,
30 seconds on 30 minutes off. Repeat the above
cycle as required.

Engine Inoperative Fuel Crossfeed Operation:

- a. Inoperative engine fuel boost pump switch shall be positioned to MAIN during all engine-inoperative crossfeed operations.

ENGINE OPERATING LIMITS

- When engine speed is below 80% RPM, the EGT system reads compensated EGT.
- When operating in manual mode above 80% RPM, the EGT system continues to read compensated EGT.
- When operating in normal mode above 80% RPM, the EGT system reads a calculated single red line EGT.
- Refer to the applicable engine maintenance manual, if any of the limitations indicated below are exceeded.

CONDITION	TIME	TORQUE	MAXIMUM EGT	ENGINE RPM	OIL PRESSURE	OIL TEMPERATURE
Takeoff and Climb	Continuous	1669 Ft Lbs (6) at 100% RPM	450°C (3)	100% (4) Maximum (10)	70 to 120 PSI (2)	55 to 110°C
Flight Idle	Continuous	--	--	--	70 to 120 PSI (2)	55 to 110°C
Ground Idle And Taxi	Continuous	--	770°C (5)	--	40 to 120 PSI	-40 to 127°C
Maximum Reverse (Landing) (1)	Continuous	--	450°C	93% Minimum	70 to 120 PSI	55 to 110°C
Maximum Reverse (Static)	Continuous	--	450°C	94.5% Minimum	70 to 120 PSI	55 to 110°C
Starting (7)	--	--	770°C (8)	(9)	--	-40 to 110°C
Windmilling (During NTS Operation)	1 Minute	--	--	100 to 28.0%		
	0 Seconds	--	--	28 to 18.0% (9)		
	5 Minutes	--	--	18 to 10.0%		
	30 Minutes	--	--	10 to 5.0%		
Overspeed Governor Check	Continuous	--	--	5 to 0%	70 to 120 PSI	-40 to 127°C
	5 Seconds	--	--	105.5 to 106.0% (11) 101.5 to 105.5%		
	30 Seconds	--	--	--		

- (1) Do not use full reverse above 90 KIAS. Position power lever to ground idle until airplane has slowed to 90 KIAS.
- (2) Above 23,000 feet altitude, minimum allowable operating oil pressure is 50 PSI.
- (3) Refer to OAT gage and Figure 2-5 in this section for temperature limits when operating in manual mode.
- (4) 101% maximum continuous.
- (5) EGT limit while taxiing with condition levers in START & TAXI position. Temperature is limited to 1 second duration.
- (6) Maximum cruise torque is 1738 Ft Lbs at 96% RPM.
- (7) Maximum altitude for airstarts is 20,000 feet.
- (8) Temperature is limited to 1 second duration.
- (9) Avoid operation between 18 and 28 percent RPM, except for the transients occurring during start and shutdown.
- (10) Continuous operation at 100.5% RPM on airplanes -0001 thru -0172 except airplanes incorporating SK441-79 and 100.0% RPM on airplanes -0001 thru -0172 incorporating SK441-79 is authorized with the propeller synchrophaser ON (if installed) and the condition levers positioned to TAKEOFF, CLIMB AND LANDING.
- (11) 5 seconds, at 105.5% to 106.0% must be included in 30 seconds above 101.5%.

Figure 2-4

MAXIMUM EGT LIMITS FOR MANUAL MODE OPERATION

100% RPM

OPERATION ABOVE 33,000 FEET RESTRICTED
TO AIRPLANES INCORPORATING SK441-36

CONDITIONS:

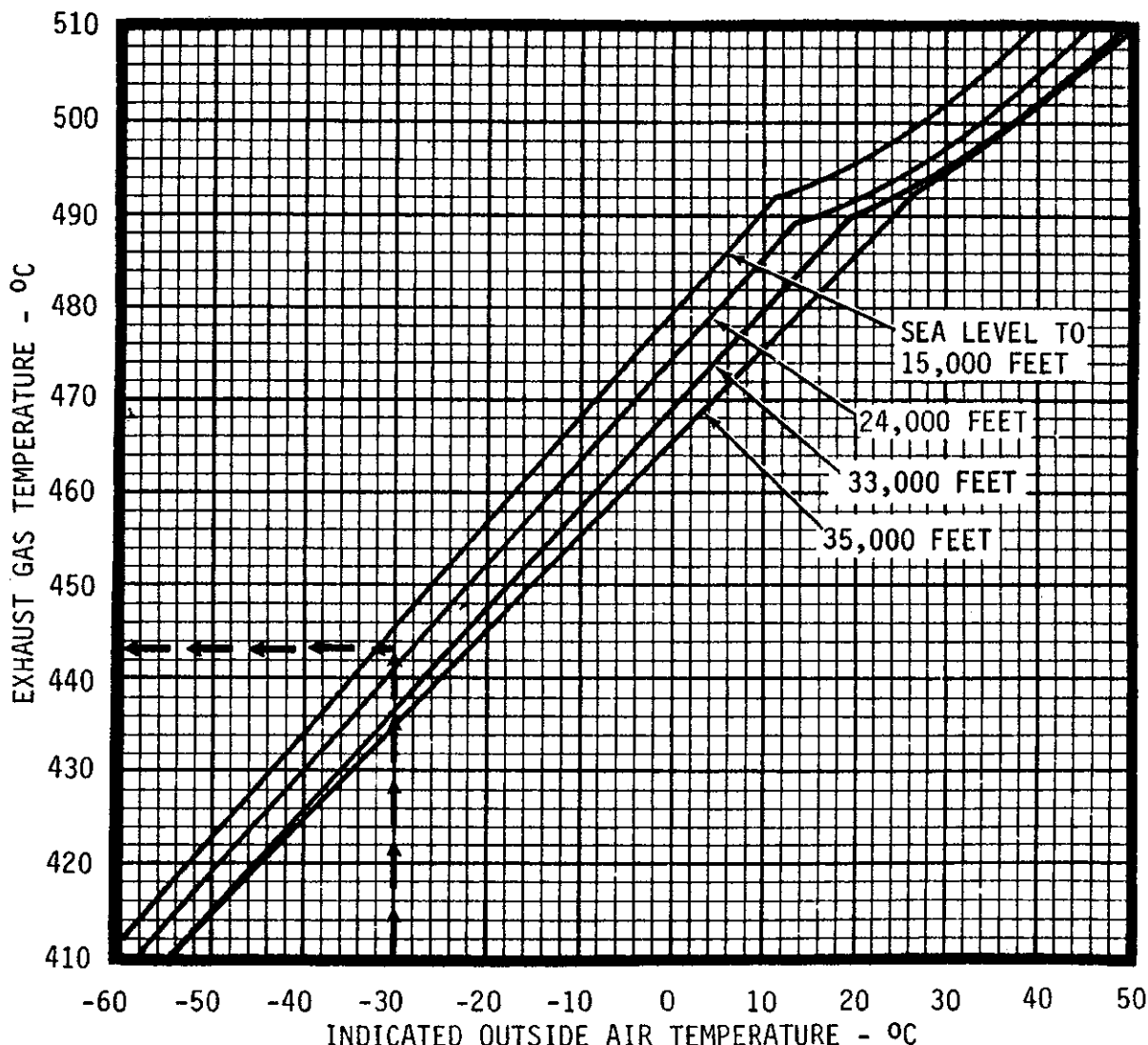
1. Engine(s) must be operating in manual mode.
2. Add tabular EGT correction to graphical value.
3. Below 10,000 Feet it is possible that the EGT value cannot be obtained if the maximum fuel flow is obtained first.

EXAMPLE:

OAT	-30°C
Altitude	18,000 Feet
KIAS	200
EGT	443°C
EGT With Correction	445°C

NOTE: Add EGT correction to value obtained from graph.

SPEED - KIAS	120	140	160	180	200	220 AND ABOVE
EGT CORRECTION °C	9	8	6	4	2	0



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Figure 2-5

FAA Approved
1 August 1977

Propellers:

- a. Number of Propellers: 2
- b. Manufacturer: Hartzell Propeller, Inc. or McCauley Accessory Division
- c. Cessna Part Number: 9910348-1, 9910348-2 or 9910478-1
- d. Number of Blades: 3
- e. Diameter: 7.50'
- f. Maximum Operating Speed: 2000 RPM
- g. Blade Angle: (At 30-Inch Station)
 - (1) Hartzell Propeller (9910348-1 or 9910348-2)
 - (a) Feathered $87.4^{\circ} + .1^{\circ}, -.2^{\circ}$
 - (b) Flight Idle $10^{\circ} \pm .2^{\circ}$
 - (c) Start Locks $2.0^{\circ} \pm .1^{\circ}$
 - (d) Full Reverse $-8.0^{\circ} \pm .2^{\circ}$
 - (2) McCauley Propeller (9910478-1)
 - (a) Feathered $85.3^{\circ} \pm .2^{\circ}$
 - (b) Flight Idle $8.5^{\circ} \pm .2^{\circ}$
 - (c) Start Locks $2.0^{\circ} \pm .2^{\circ}$
 - (d) Full Reverse $-8.0^{\circ} \pm .2^{\circ}$
- h. Flight operations with power levers retarded below FLIGHT IDLE are prohibited. Such positioning may lead to loss of airplane control or may result in an engine overspeed condition and consequent loss of engine power.

Preflight Checks:

- a. The Following Checks Shall Be Performed Before The First Flight Of The Day, Prior To Any Flight Where Intentional Airstarts Are Planned, If There Is An Indication Of Engine Malfunction, After Engine Control System Maintenance And Adjustment Has Been Made.
 - (1) High Power Monitor Check (Not applicable when engine or engines are operating in manual mode.)
 - (2) NTS Check
 - (3) Overspeed Governor Check
 - (4) Manual Mode Fuel Control Check (Not applicable when engine or engines are operating in manual mode.)
- b. The following shall be performed whenever fuel type is changed:
 - (1) Operate fuel boost pumps for 3 minutes prior to engine start.
 - (2) Operate engines at 100% RPM for 3 minutes.
 - (3) Overspeed governor checked to within 103.5 to 105.5% RPM on airplanes -0173 thru -0339 except airplanes incorporating SK441-79; 104.5 to 105.5% RPM on airplanes -0340 and On and airplanes -0173 thru -0339 incorporating SK441-79.

Engine Instrument Markings:

- a. Torque Indicators:
 - (1) 1669.0 Ft.-Lbs. Maximum Takeoff And Climb Torque At 100% RPM (Yellow Radial)
 - (2) 0 to 1669.0 Ft.-Lbs. (Green Arc)
 - (3) 1738.0 Ft.-Lbs. Maximum Cruise Torque At 96% RPM (Red Radial)
- b. Exhaust Gas Temperature Indicators:
 - (1) For All Normal Mode Operations Above 80% RPM (Calculated EGT)
 - (a) Outer Scale
 - 1) 450°C (Red Line)
 - 2) 100 to 450°C (Green Arc)
 - (b) Inner Scale (Start And Taxi)
 - 1) 770°C (Red Triangle)

- (2) For All Manual Mode Operations And All Normal Mode Operations Below 80% RPM (Compensated EGT)
 - (a) Inner Scale (Start And Taxi)
 - 1) 100 to 700°C (Green Arc - See Figure 2-5 For Maximum Value)
 - 2) 700 to 770°C (Yellow Arc)
 - 3) 770°C (Red Triangle)
- c. Engine RPM Indicators:
 - (1) 101% RPM (Red Line)
 - (2) 96 to 100% RPM (Green Arc)
- d. Oil Pressure Indicators:
 - (1) 40 and 120 PSI (Red Radial)
 - (2) 40 to 70 PSI (Yellow Arc)
 - (3) 70 to 120 PSI (Green Arc)
- e. Oil Temperature Indicators:
 - (1) -40 and 127°C (Red Radial)
 - (2) +55 to 110°C (Green Arc)
 - (3) -40 to 55°C and 110 to 127°C (Yellow Arc). Operation in either yellow arc is approved for ground operation only.

MISCELLANEOUS INSTRUMENT MARKINGS

Instrument Air:

- a. Red Line: 2.25 PSI
- b. Green Arc: 2.25 to 2.75 PSI

Oxygen Pressure:

- a. Yellow Arc: 0 to 300 PSI
- b. Green Arc: 1550 to 1850 PSI
- c. Red Line: 2000 PSI
- d. The Cubic Foot Capacity of the Bottle Installed Will Be Indicated On The Face Of The Gage.

Propeller Deice Ammeter:

- a. Individual Indicators Will Be Marked LEFT or RIGHT
- b. White Arc Operating Range Will Be Marked With The High End Of The Scale Marked With HI.
- c. A Normal Operating Green Arc Will Be Provided In the Center of the White Arc Operating Range

OIL LIMITATIONS

Refer to Section 8 for list of approved oils and specifications.

When adding oil, service the engines with the type and brand which is currently being used in the engines. Do not mix types or brands of oils.

Check oil level before each flight and fill to capacity. Do not operate below the ADD mark on the dipstick.

Type I oils in compliance with MIL-L-7808G and Type II oils in compliance with MIL-L-23699 are approved for use.

WEIGHT LIMITS

Maximum Ramp Weight: 9925 Pounds

Maximum Takeoff Weight: 9850 Pounds

Maximum Landing Weight: 9360 Pounds

Maximum Zero Fuel Weight: 8500 Pounds

Maximum Weights In Baggage Compartments:

- a. Avionics Baggage (Fuselage Station 32)
(1) 250 pounds less installed optional equipment.
- b. Nose Baggage (Fuselage Station 71)
(1) 350 pounds less installed optional equipment.
- c. Aft Cabin Floor (Fuselage Station 281)
(1) 400 pounds (200 pounds per side). Do not exceed 200 pounds per square foot floor loading.
- d. Aft Cabin Lower Shelf (Bay A - Fuselage Station 301)
(1) 400 pounds (200 pounds per side). Do not exceed 75 pounds per square foot floor loading.
- e. Aft Cabin Upper Shelf (Bay B - Fuselage Station 317)
(1) 100 pounds (50 pounds per side). Do not exceed 75 pounds per square foot floor loading.

FLIGHT CENTER OF GRAVITY LIMITS (LANDING GEAR EXTENDED):

- a. Aft Limit: 178.07 inches aft of reference datum (28.5% MAC) at 9850 pounds or less
- b. Forward Limit: 173.35 inches aft of reference datum (21.04% MAC) at 9850 pounds to 167.63 inches aft of reference datum (12.0% MAC) at 6800 pounds with straight line variation between these two points. At 6800 pounds or less, the limit is 167.63 inches aft of reference datum (12.0% MAC).
- c. Refer to Weight and Balance Data in Section 6 for loading schedule. The reference datum is 100 inches forward of the aft face of the fuselage bulkhead forward of the rudder pedals. The mean aerodynamic chord (MAC) is 63.25 inches in length. The leading edge of the MAC is 160.04 inches aft of the reference datum.

MANEUVER LIMITS

This is a normal category airplane. Aerobatic maneuvers, including spins, are prohibited.

FLIGHT LOAD FACTOR LIMITS

■ IN FLIGHT:

- a. Wing Flaps - UP -1.44 to +3.6G at 9850 pounds
- b. Wing Flaps - T.O. thru LAND positions 0.0 to +2.0G at 9850 pounds

■ LANDING:

- a. Wing Flaps - T.O. thru LAND positions 0.0 to +2.0G at 9360 pounds

FLIGHT CREW LIMITS

Minimum Flight Crew Is One Pilot

OPERATION LIMITS

The standard airplane is approved for day and night VFR operations, day and night IFR operations and flight into icing conditions as defined by the FAA. For additional information, refer to the following paragraphs.

ICE PROTECTION EQUIPMENT (Flight In Icing Conditions)

NOTE

This airplane is approved for flight into icing conditions, as defined by the FAA, if the following equipment is installed and operational.

- 1. Heated stall warning vane or optional angle-of-attack lift sensor vane.
- 2. Heated pitot/static sources (2).
- 3. Wing and empennage deice boot system.
- 4. Windshield anti-ice system.
- 5. Propeller deice system (2).
- 6. Engine inlet anti-ice system (2).
- 7. Left wing deice light.
- 8. Outside air temperature indicator.

FUEL LIMITATIONS

■ MINIMUM FUEL QUANTITY:

- a. Minimum approved fuel quantity for takeoff is 208 pounds (31 gallons) in each main tank.

MANEUVERING FUEL:

- a. Due to possible fuel starvation, maximum side slip duration time is one minute when the L and/or R X-FER WARNING annunciator is illuminated. The airplane is considered in a side slip any time the turn and bank "ball" is more than one-half ball out of the center (coordinated flight) position.

TOTAL FUEL CAPACITY: 481.5 U.S. Gallons**USABLE FUEL:** 475.0 U.S. Gallons**UNUSABLE FUEL:** 3.25 U.S. Gallons per side**FUEL SPECIFICATIONS AND APPROVED FUEL ADDITIVES:**

FUEL GRADE (2)	FUEL SPECIFICATIONS	MINIMUM FUEL TEMPERATURE FOR TAKEOFF - °C (1)	SPECIFIC WEIGHT (POUNDS PER U.S. GALLON AT 60°F)	COLOR
JET A	ASTM-D1655	-35°C	6.7	COLORLESS
JET A-1	ASTM-D1655	-40°C	6.7	COLORLESS
JET B	ASTM-D1655	-45°C	6.7	COLORLESS
JP-4	MIL-T-5624	-45°C	6.5	COLORLESS
JP-5	MIL-T-5624	-40°C	6.8	COLORLESS
JP-8	MIL-T-83133A	-40°C	6.7	COLORLESS
* AVIATION GASOLINE (3)	MIL-G-5572 ASTM-D910	-54°C	6.0	80/87 - RED, 100LL - BLUE

* Aviation gasoline (80/87 and 100LL) is approved for emergency use only on airplanes 441-0001 thru 441-0106 and 441-0109 incorporating SK441-28 and airplanes 441-0107, 441-0108, and 441-0110 thru 441-0172 and is limited according to the grade(s) used. A record of total aviation gasoline used must be recorded in the Airplane Engines Maintenance Records.

CAUTION

- Aviation gasoline is restricted to emergency use only and may result in significant reductions in performance. Refer to Section 5 for possible performance effects with aviation gasoline usage.
- The electronic fuel computer(s) must be on and operational for takeoff when aviation gasoline is used.
- Refer to Section 8, and to the Airplane and Engine Maintenance Manuals, for servicing information and additional procedures to be followed whenever a change in fuel type is made.

(1) Minimum starting temperature is that given or the minimum allowable oil temperature -40°C (-40°F) whichever is warmer.

(2) NATO equivalents of the above fuels may be used.

(3) Aviation gasoline is approved for emergency use only in the following proportions:

- (a) Aviation gasoline MIL-G-5572D, Grade 80/87, not in excess of 1000 gallons per 100 hours of operation, may be used for emergency fuel operation.
- (b) Aviation gasoline ASTM-D-910, Grade 100LL, not in excess of 250 gallons (U.S.) per 100 hours of operation, may be used for emergency fuel operations.
- (c) Total aviation gasoline usage must be limited to 7000 gallons during any 3000 hour period. If combinations of the above aviation gasolines are used, the following formula is required for establishing proportions of combinations during any 3000 hour period:

$$\frac{\text{Amount of 100LL, Gallons}}{7000 \text{ Gallons}} + \frac{\text{Amount of 80/87, Gallons}}{30,000 \text{ Gallons}} = 1.0$$

Fuel Anti-Icing Additives:

Fuel used must contain fuel anti-icing additive, Ethylene Glycol Monomethyl Ether (EGME) in compliance with MIL-I-27686, or Diethylene Glycol Monomethyl Ether (DIEGME) in accordance with MIL-I-85470.

CAUTION

JP-4 and JP-5 fuels per MIL-T-5624 and JP-8 fuel per MIL-T-83133A contain the correct premixed quantity of an approved type of anti-icing fuel additive and no additional anti-ice compounds should be added.

WARNING

- Proper mixing of EGME or DIEGME compound with the fuel is extremely important. A concentration in excess of that recommended (0.15 percent by volume maximum) will result in detrimental effects to the fuel tanks, such as deterioration of protective primer and sealants and damage to o-rings and seals in the fuel system and engine. Use only blending equipment that is recommended by the manufacturer to obtain proper proportioning.
- Refer to Section 8 for proper handling and servicing of fuels and allowable concentrations of fuel additives, and for additional approved fuel additives.

MAXIMUM OPERATING ALTITUDE LIMIT

Maximum Operating Altitude:

a.	Airplanes Not Incorporating SK441-36:	33,000 Feet
b.	Airplanes Incorporating SK441-36:	35,000 Feet

CABIN PRESSURIZATION LIMIT

Maximum: 6.3 PSI

Normal: 0 to 6.3 PSI

Cabin Shall Be Depressurized During:

- a. Takeoff
- b. Landing
- c. All ground operations

OPERATING TEMPERATURE LIMITS

Cold Day

- a. -54°C from Sea Level to 25,300 feet, then MIL-STD-210A cold day to 33,000 feet at -65°C (Airplanes Not Incorporating SK441-36) or 35,000 feet at -65°C (Airplanes Incorporating SK441-36).

Hot Day

- a. ISA +39.4°C for ground operations to 5000 feet.
- b. ISA +36.7°C for all ground operations from 5000 feet to 14,000 feet.
- c. ISA +36.7°C for all flight operations from sea level to 33,000 feet (Airplanes Not Incorporating SK441-36) or 35,000 feet (Airplanes Incorporating SK441-36)
- d. Refer to ISA Conversion Chart in Section 5 for exact temperatures.

MAXIMUM PASSENGER SEATING LIMITS

The two forward seats are pilot seats.

A maximum of nine passenger seats may be installed aft of the pilot seats. See weight and balance section for seat locations.

AVIONICS SYSTEMS LIMITATIONS

Autopilot:

- a. Autopilot and yaw damper must be off for takeoff and landing.
- b. Approach VOR radial at an angle of 135° or less prior to engaging the navigation mode.
- c. Approach localizer at an angle of 90° or less prior to engaging the navigation mode.
- d. Disengage autopilot if malfunction occurs.
- e. Maximum speed for autopilot operation is 245 KIAS/.55 Mach, VMO/MMO.
- f. Do not use autopilot under 200 feet AGL.

Altitude Encoding Altimeter:

- a. A standby barometric altimeter is required when the encoding altimeter is installed.

Radar:

- a. Do not operate the radar system within 15 feet of ground personnel or containers holding flammable or explosive material.
- b. Do not operate the radar system during fueling operations.
- c. When preflighting the radar system, ensure that the airplane is facing away from buildings or large metal structures that are likely to reflect significant amounts of radar energy back into the system.

Electric Elevator Trim:

- a. Disengage electric elevator trim if malfunction occurs.

SYSTEMS AND EQUIPMENT LIMITS

WINDSHIELD ANTI-ICE SYSTEM

- a. Do not operate windshield anti-ice system in excess of 10 seconds with outside air temperature above 4°C.

ENGINE AIR INLET ANTI-ICING SYSTEM

- a. Do not operate engine air inlet anti-icing system in excess of 10 seconds with outside air temperature above 4°C.

IGNITION UNIT DUTY CYCLES/TIME LIMITS

The ignition unit duty cycles and time limits vary according to the Garrett part number of the ignition unit. Each engine ignition unit part number must be determined to establish its duty cycle and time limits.

NOTE

If the ignition unit part number is different for each engine, the ignition unit duty cycle and time limits may be different.

After determining and recording ignition units part numbers, the duty cycles and time limits can be determined by referring to the following chart:

- a. For Part Number 868962-2, 10-378400-2 or 10-378400-3 and 868962-3 or 10-378400-5 Ignition Units, if the engine anti-ice shield holes have not been plugged per Garrett Service Bulletin TPE/TSE331-75-0004, dated January 14, 1985:

DUTY CYCLES/TIME LIMITS

1 Minute ON - 1 Minute OFF

2 Minutes ON - 2 Minutes OFF
Additional 2 Minutes ON - 23 Minutes OFF

5 Minutes ON - 55 Minutes OFF

- b. For Part Number 868962-3 or 10-378400-5 only, if Garrett SB75-0004 (holes plugged) has been complied with.

DUTY CYCLES/TIME LIMITS

1. Outside Air Temperature (OAT) Above +50°F (+10°C)

1 Hour ON - 1 Hour OFF

2. Outside Air Temperature (OAT) Below +50°F (+10°C)

Continuous ON - No Time Limit

REQUIRED PLACARDS

Aft Of Left Side Panel Above Pilot's Armrest:

a. OPERATIONAL LIMITS

THE MARKINGS AND PLACARDS INSTALLED IN THIS AIRPLANE CONTAIN OPERATING LIMITATIONS WHICH MUST BE COMPLIED WITH WHEN OPERATING THIS AIRPLANE IN THE NORMAL CATEGORY. OTHER OPERATING LIMITATIONS WHICH MUST BE COMPLIED WITH WHEN OPERATING THIS AIRPLANE IN THE NORMAL CATEGORY ARE CONTAINED IN THE "PILOT'S OPERATING HANDBOOK AND FAA APPROVED AIRPLANE FLIGHT MANUAL."

NO ACROBATIC MANEUVERS, INCLUDING SPINS, APPROVED

MAXIMUM DESIGN MANEUVERING SPEED 167 KIAS

MAXIMUM LANDING GEAR OPERATING SPEED 180 KIAS

THIS AIRPLANE IS APPROVED FOR VFR, IFR, DAY AND NIGHT OPERATIONS AND FLIGHT INTO ICING CONDITIONS
LANDING WITH CABIN PRESSURIZED PROHIBITED

On Instrument Panel:

a. Around Landing Gear Selector Switch:

HORN GEAR UP
DISABLE DOWN

b. Adjacent to landing gear selector:

GEAR UP DOWN HORN DISABLE

EMER GEAR CONTROL

1. GEAR SELECT - DOWN
 - *2. GEAR HYD C/B - PULL
 - **2. LDG GEAR C/B - PULL
 3. "T"-HANDLE - PULL
- 

c. On Landing Gear Indicator Lights:

"GEAR UNLOCKED" (Red Light)

"NOSE - LH - RH" (Green Light)

d. Adjacent to Wing Flap Position Switch:

"0° - 200 KTS - APPR" (Blue Segment)

"APPR - 180 KTS - 45° (White Segment)

e.***Above the engine torque indicators (removable, two-sided placard posted for engine adjustment) when engines are adjusted to use jet fuel:

ENGINES ADJUSTED FOR JET FUEL (black lettering on gray background)

When engines are adjusted to use aviation gasoline:

ENGINES ADJUSTED FOR AVGAS (black lettering on yellow background)

*Airplanes 441-0001 thru 441-0063.

**Airplanes 441-0064 thru 441-0172 and spares 441-0001 thru 441-0172.

***Airplanes -0001 thru -0106 and -0109 incorporating SK441-28 and airplanes -0107, -0108 and -0110 thru -0172 not incorporating SK441-83.

FAA Approved

1 August 1977

Revision 13 - 2 November 1987

SECTION 2
LIMITATIONS

Cessna
MODEL 441

On Engine Control Pedestal:

- a. Near Elevator Trim Control:
NOSE DN T.O. NOSE UP (Range Mark on Elevator Trim For Takeoff is .5°
Nose Up to 1.5° Nose Down)
- b. Near Aileron Trim Tab Control:
L ROLL R
- c. Near Rudder Trim Tab Control:
L NOSE R (Takeoff Reference Mark Located at 0° Tab)
- d. Adjacent to propeller synchrophaser switch:
ON PROP SYNC OFF PHASE LOCK PHASE ADJ
MUST BE OFF FOR TAKEOFF, LANDING, APPROACH TO STALL AND ONE ENGINE
OPERATION

On Copilot's Side Panel:

- a. Adjacent to static source drain:
 STATIC SOURCE DRAIN
DO NOT OPEN WHILE PRESSURIZED

On Avionics Bay Baggage Door (If Optional Avionics Bay Baggage Door Is Installed):

MAXIMUM BAGGAGE XX.X
MAX. CAPACITY 250 LBS LESS
XX.X OPTIONAL EQUIP.

On Avionics Bay Forward Partition (If Optional Avionics Bay Baggage Door Is Not Installed):

MAXIMUM BAGGAGE XX.X
MAX. CAPACITY 250 LBS LESS
XX.X OPTIONAL EQUIP.

On Aft Cabin Floor (Fuselage Station 281):

FLOOR LOADING LIMITATIONS 400 POUNDS MAX. ON THE FLOOR (200 LBS/SIDE, 200 LBS/SQ. FT) FOR AIRPLANE LOADING SEE WEIGHT & BALANCE DATA IN PILOT'S OPERATING HANDBOOK

On Aft Cabin Lower Shelf (Bay A - Fuselage Station 301):

FLOOR LOADING LIMITATIONS 400 POUNDS MAX. THIS SHELF (200 LBS/SIDE, 75 LBS/SQ. FT) FOR AIRPLANE LOADING SEE WEIGHT & BALANCE DATA IN PILOT'S OPERATING HANDBOOK

On Aft Cabin Upper Shelf (Bay B - Fuselage Station 317):

FLOOR LOADING LIMITATIONS 100 POUNDS MAX THIS SHELF (50 LBS/SIDE, 75 LBS/SQ FT) FOR AIRPLANE LOADING SEE WEIGHT & BALANCE DATA IN PILOT'S OPERATING HANDBOOK

Adjacent To Each Aft Facing Seat:

- a. On side wall:
AFT FACING SEAT BACK MUST BE ERECT FOR TAKEOFF & LANDING

On Emergency Exit Window:

- a. On emergency exit window trim (if optional external emergency exit window handle is not installed):

EMERGENCY EXIT

1. TURN HANDLE OPEN 
2. PULL DOOR INBD & DOWN

AFT FACING SEAT MUST BE

 FULL FWD WITH BACK ERECT
FOR TAKEOFF & LANDING

- b. On emergency exit window trim (if optional external emergency exit window handle is installed):

EMERGENCY EXIT

1. TURN HANDLE OPEN 
2. PULL DOOR INBD & DOWN

AFT FACING SEAT MUST BE

 FULL FWD WITH BACK ERECT
FOR TAKEOFF & LANDING

Near Upper Cabin Door Latch Mechanism (Airplanes 441-0001 thru 441-0034 and 441-0036 thru 441-0069):

- a. External and to the right of the handle: OPEN



- b. Internal near handle:

CLOSED

OPEN CLOSED

Near Upper Cabin Door Latch Mechanism (Airplanes 441-0035 and 441-0070 and On):

- a. External between button and handle: DOOR OPERATION
TO OPEN:
PUSH BUTTON &
ROTATE
HANDLE 

TO CLOSE:
ROTATE
HANDLE 

- b. Internal near handle:

CHECK DOOR LOCK INDICATOR OPEN CLOSE STOW

■ On Interior Side of Each Oil Filler Door:

ENGINE OIL - CAPACITY 7.5 U.S. QUARTS
TYPE: SEE PILOT'S OPERATING HANDBOOK FOR APPROVED OILS

■ Adjacent To Each Wing Fuel Filler:

JET-A FUEL 237.5 U.S. GAL. USABLE ANTI-ICE ADDITIVE REQD SEE
PILOT'S OPERATING HANDBOOK FOR OTHER APPROVED FUELS,
QUANTITY AND TYPE OF ADDITIVE AND FUELING PROCEDURE

■ On Lower Tailcone Surface Auxiliary Power Receptacle Door:

EXTERNAL POWER 28 VOLTS D.C. NOMINAL 800 AMP STARTING
CAPACITY MIN. DO NOT EXCEED 1700 AMPS

■ On the Nose Baggage Compartment Doors:

MAXIMUM BAGGAGE XXX.X
MAX. CAPACITY 350 LBS LESS
XX.X OPTIONAL EQUIP.

SECTION 3 EMERGENCY PROCEDURES

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INTRODUCTION

Section 3 of this handbook describes the recommended procedures for emergency and abnormal situations. The first part of this section, between the emergency and abnormal tab dividers, provides emergency procedural action required in an abbreviated checklist form, followed by amplification of the abbreviated checklist. The second part of this section, after the abnormal tab divider, provides amplified abnormal procedures.

NOTE

Refer to Section 9 of this handbook for amended operating limitations, operating procedures, performance data and other necessary information for airplanes equipped with specific options.

EMERGENCY PROCEDURES ABBREVIATED CHECKLIST

Procedures in the Checklist portion of this section outlined in black
☐ are immediate-action items and should be committed to memory.

AIRSPEEDS FOR SAFE OPERATION

Conditions:	
1. Takeoff Weight 9850 Pounds	3. Standard Day, Sea Level
2. Landing Weight 9360 Pounds	4. Wing Flaps in T.O. Position Unless Otherwise Noted
(1) Air Minimum Control Speed (V_{MCA})	91 KIAS
(2) Intentional One Engine Inoperative Speed	98 KIAS
(3) One Engine Inoperative Best Obstacle Clearance Speed	110 KIAS
(4) One Engine Inoperative Best Rate-of-Climb Speed (Wing Flaps UP)	120 KIAS

Figure 3-1

ENGINE FAILURE

ENGINE SECURING PROCEDURE

1. Condition Lever - EMER SHUTOFF.
2. Firewall Shutoff - PUSH to close.
3. Inoperative Engine.
 - a. Fuel Boost Pump - CHECK MAIN if fire hazard does not exist.
- OFF if fire hazard does exist.
 - b. Generator - OFF.
 - c. Propeller Synchrophaser - OFF (If Installed).

ENGINE FAILURE BEFORE ROTATION (Speed Below 98 KIAS)

1. Power Levers - GRND IDLE.
2. Brakes and Nosewheel Steering - AS REQUIRED.
3. Inoperative Engine Firewall Shutoff - PUSH to close.

ENGINE FAILURE AFTER ROTATION (Speed Above 98 KIAS)

Decision To Continue Takeoff (GO)

1. Aileron and Rudder - AS REQUIRED to maintain straight-ahead flight.
Maintain 3° to 4° bank with 2/3 to 3/4 ball slip into operative engine.
2. Power Levers - TAKEOFF POWER.
3. Landing Gear - UP.
4. Climb to Clear Obstacles - 110 KIAS.
5. Inoperative Engine - DETERMINE.
 - a. Condition Lever - EMER SHUTOFF.
 - b. Firewall Shutoff - PUSH to close.

6. Airspeed - ACCELERATE to 115 KIAS.
7. Wing Flaps - UP.
8. Climb - 120 KIAS (One Engine Inoperative Best Rate-of-Climb Speed With Wing Flaps UP).
9. Trim Tabs - ADJUST.
10. Inoperative Engine.
 - a. Fuel Boost Pump - CHECK MAIN if fire hazard does not exist.
- OFF if fire hazard does exist.
 - b. Generator - OFF.
 - c. Propeller Synchrophaser - OFF (If Installed).
11. As Soon As Practical - LAND. Refer to Engine Inoperative Landing Procedure.

DECISION TO ABORT TAKEOFF (NO GO)

1. Landing Gear - CHECK DOWN. Gear down lights on.
2. Power Levers - RETARD to FLIGHT IDLE.
3. Power Levers - GRND IDLE after touchdown.
4. Brakes and Nosewheel Steering - AS REQUIRED.
5. Inoperative Engine Firewall Shutoff - PUSH to close.

ENGINE FAILURE IN FLIGHT (Speed Below V_{MCA})

1. Power Lever - RETARD as required to stop turn.
2. Aileron and Rudder - AS REQUIRED toward operative engine to maintain straight-ahead flight.
3. Pitch Attitude - LOWER NOSE to accelerate above 91 KIAS.
4. Accomplish procedures for Engine Failure During Flight (Speed Above V_{MCA}).

ENGINE FAILURE IN FLIGHT (Speed Above V_{MCA})

1. Engine Power - ADJUST as required.
2. Inoperative Engine - DETERMINE. Idle engine same side as idle foot; also, torque and EGT will be low.
 - a. Condition Lever - EMER SHUT-OFF.
 - b. Firewall Shutoff - PUSH to close.
3. Landing Gear - UP.
4. Wing Flaps - UP above 115 KIAS.

Before Securing Inoperative Engine:

5. Determine probable cause of engine stoppage.
6. Inoperative Engine - SECURE or ATTEMPT AIRSTART.

If Engine Is To Be Secured:

7. Inoperative Engine
 - a. Fuel Boost Pump - CHECK MAIN if fire hazard does not exist.
- OFF if fire hazard does exist.
 - b. Generator - OFF.
 - c. Propeller Synchrophaser - OFF (If Installed).
8. Operative Engine - ADJUST.
9. Trim Tabs - ADJUST to maintain bank toward operative engine.
10. Electrical Load - DECREASE if required to prevent battery discharge.
11. Fuel Crossfeed Selector - AS REQUIRED to maintain fuel balance. Do not crossfeed if fire hazard exists.
12. As Soon As Practical - LAND. Refer to Engine Inoperative Landing Procedure.

BOTH ENGINES FAIL IN FLIGHT

If Insufficient Altitude Exists to Permit Airstarts:

1. Wing Flaps - APPR within gliding distance of selected landing site with propellers windmilling.
 2. Condition Levers - EMER SHUT-OFF when flaps at APPR.
 3. Firewall Shutoff Buttons - PUSH to close.
 4. Fuel Boost Pumps - OFF.
5. Refer to LANDING WITHOUT POWER procedure.

If Sufficient Altitude Exists to Attempt Airstarts:

6. Use Of Supplemental Oxygen - AS REQUIRED.
 7. Wing Flaps and Landing Gear - CHECK UP or SELECT UP while propellers are windmilling.
 8. Airspeed - 110 KIAS. See GLIDE procedure.
9. Airstarts - ATTEMPT. Refer to Airstart procedure.

If Airstarts Fail:

10. Condition Levers - EMER SHUT-OFF.
11. Firewall Shutoff Buttons - PUSH to close.
12. Engine Stop Buttons - PUSH momentarily.
13. Fuel Boost Pumps - OFF.
14. Refer to LANDING WITHOUT POWER procedure.

OIL PRESSURE BELOW 40 PSI (OIL PRESS Light Illuminated)

1. Oil Pressure Indication - CROSSCHECK annunciator light with pressure gage.
2. If Pressure Gage And Annunciator Disagree:
 - a. Oil Pressure and Annunciator Circuit Breakers - CHECK in.
 - b. Engine Instruments - CHECK.
 - (1) If indications are normal, assume an indicator malfunction and proceed to destination while closely monitoring all engine instrumentation.
 - (2) If indications are not normal (i.e.: erratic torque and/or high oil temperature), secure engine as shown in the following step 3.
3. If Pressure Gage And Annunciator Agree:
 - a. Affected Engine - SECURE.
 - (1) Condition Lever - EMER SHUT-OFF.
 - (2) Firewall Shutoff - PUSH to close.
 - (3) Fuel Boost Pump - CHECK MAIN if fire hazard does not exist.
- OFF if fire hazard does exist.
 - (4) Generator - OFF.
 - (5) Propeller Synchrophaser - OFF (If Installed).
 - b. Operative Engine - ADJUST.
 - c. Trim Tabs - ADJUST to maintain bank toward operative engine.
 - d. Electrical Load - DECREASE if required to prevent battery discharge.
 - e. Fuel Crossfeed Selector - AS REQUIRED to maintain fuel balance.
Do not crossfeed if fire hazard exists.
 - f. As Soon As Practical - LAND.

**SUDDEN OR INTERMITTENT PARTIAL ENGINE POWER LOSS IN
CRUISE FLIGHT (Engine in Normal Mode-Speed Above V_{MCA})**

1. Engine With Reduced Power - DETERMINE. Idle engine same side as idle foot. Torque, EGT and fuel flow may be low or split relative to the good engine.
2. Condition Levers - TAKEOFF, CLIMB AND LANDING.
3. Power Levers - REDUCE POWER below torque or temperature limits on good engine.
4. Fuel Computer Switches - OFF. Verify illumination of FUEL COMP OFF annunciator lights and engine speeds stabilizing at 100% RPM.
5. Power Lever Of Suspect Engine - ADJUST to match engine torque, EGT or fuel flow.

If Able To Obtain Manual Mode Power:

6. Refer to Manual Mode Operating Procedures For Continued Operation.

If Unable To Obtain Manual Mode Power:

7. Engine With Reduced Power - SECURE.
 - a. Condition Lever - EMER SHUT-OFF.
 - b. Firewall Shutoff - PUSH to close.
 - c. Fuel Boost Pump - CHECK MAIN if fire hazard does not exist.
- OFF if fire hazard exists.
 - d. Generator - OFF.
 - e. Propeller Synchrophaser - OFF (If Installed).
8. Operative Engine.
 - a. Fuel Computer Switch - ON.
(1) FUEL COMP OFF Annunciator - OFF.
 - b. Operative Engine - ADJUST.
9. Trim Tabs - ADJUST to maintain bank toward operative engine.
10. Electrical Load - DECREASE if required to prevent battery discharge.
11. Fuel Crossfeed Selector - AS REQUIRED to maintain fuel balance. Do not crossfeed if fire hazard exists.
12. As Soon As Practical - LAND.

AIRSTART (Normal or Manual Mode)**BEFORE AIRSTART**

1. Engine Stop Button - PUSH momentarily.
2. Altitude - BELOW 20,000 FEET if sufficient altitude exists.
3. Airspeed - 100 to 200 KIAS.
4. Firewall Shutoff - PUSH to open.
5. Condition Lever - START AND TAXI.
6. Power Lever - AIRSTART.
7. Generator - OFF.
8. Fuel Boost Pump - CHECK MAIN.
9. Propeller Synchrophaser - OFF (If Installed).

NORMAL MODE AIRSTART

1. Fuel Computer Switch - CYCLE OFF then back to ON if fuel computer tripped to manual mode.
 - a. FUEL COMP OFF Annunciator - OFF.
2. EGT - BELOW 200°C if sufficient time exists.
3. Engine Start Button - PUSH momentarily. Observe propeller rotation.
 - a. Fuel and Ignition - CHECK fuel flow increase and ignition light on at 10% RPM.
 - b. EGT Rise - CHECK after reaching 10% to 20% RPM. (If EGT rise does not occur by 25% RPM, reject start by positioning condition lever to EMER SHUT-OFF then pushing the engine stop button.)
 - c. Condition Lever - TAKEOFF, CLIMB AND LANDING (at 60% RPM).
 - d. Engine Instruments - CHECK.
 - (1) Oil Pressure - CHECK rising within 10 seconds after engine lightoff.
 - (2) RPM Stabilization - CHECK 100% RPM.
4. Generator - RESET then ON.
5. Fuel Boost Pump - CYCLE to OFF then to MAIN.
 - a. FUEL PRESS LOW and AUX BOOST ON Annunciator Lights - OFF.

MANUAL MODE AIRSTART

1. Fuel Computer Switch - OFF.
2. EGT - BELOW 200°C if sufficient time exists.
3. Engine Start Button - PUSH momentarily. Observe propeller rotation.
4. Manual Start Switch - 10% POSITION momentarily (at 10 to 15% RPM).
5. Engine Start Button - PUSH immediately and hold for fuel enrichment at light-off.
 - a. Fuel and Ignition - CHECK fuel flow increase and ignition light on.
 - b. EGT Rise - CHECK after reaching 10% to 20% RPM. (If EGT rise does not occur by 25% RPM, reject start by positioning condition lever to EMER SHUT-OFF then pushing the engine stop button.)
6. Engine Start Button - PUSH as required for fuel enrichment to assist engine acceleration to 100% RPM. Modulate within EGT and RPM limits.
7. Manual Start Switch - 60% POSITION momentarily (at 60 to 70% RPM).
 - a. Engine Instruments - CHECK.
 - (1) Oil Pressure - CHECK rising within 10 seconds after engine lightoff.
 - (2) RPM Stabilization - CHECK 100% RPM.
8. Generator - RESET then ON.
9. Fuel Boost Pump - CYCLE to OFF then to MAIN.
 - a. FUEL PRESS LOW and AUX BOOST ON Annunciator Lights - OFF.
10. Condition Lever - TAKEOFF, CLIMB AND LANDING.

IF AIRSTART ATTEMPTS FAIL

1. Inoperative Engine.
 - a. Condition Lever - EMER SHUTOFF.
 - b. Firewall Shutoff - PUSH to close.
 - c. Engine Stop Button - PUSH momentarily.
 - d. Fuel Boost Pump - CHECK MAIN if fire hazard does not exist.
- OFF if fire hazard does exist.
 - e. Generator - OFF.
 - f. Propeller Synchrophaser - OFF (If Installed).
2. Operative Engine - ADJUST.
3. Trim Tabs - ADJUST to maintain bank toward operative engine.
4. Electrical Load - DECREASE if required to prevent battery discharge.
5. Fuel Crossfeed Selector - AS REQUIRED to maintain fuel balance. Do not crossfeed if fire hazard exists.
6. As Soon As Practical - LAND. Refer to Engine Inoperative Landing Procedure.

SMOKE AND FIRE

ENGINE FIRE DURING GROUND OPERATIONS (Engine Start, Taxi and Takeoff With Sufficient Distance Remaining to Stop)

1. Power Levers - RETARD as required to retain control.
2. Engine Stop Buttons - PUSH momentarily if during engine start.
3. Condition Levers - EMER SHUTOFF.
4. Firewall Shutoff Buttons - PUSH to close.
5. Brakes - AS REQUIRED.
6. Applicable Fire Extinguisher Armed Button - PUSH.
7. Battery Switch(es) - OFF.

8. Generators - OFF.
9. Evacuate airplane as soon as practical.

CABIN FIRE DURING GROUND OPERATIONS (Engine Start, Taxi and Takeoff With Sufficient Distance Remaining to Stop)

1. Power Levers - Retard as required to retain control.
2. Engine Stop Buttons - PUSH momentarily if during engine start.
3. Condition Levers - EMER SHUTOFF.
4. Firewall Shutoff Buttons - PUSH to close.
5. Brakes - AS REQUIRED.
6. Battery Switch(es) - OFF.

7. Generators - OFF.
8. Portable Fire Extinguisher - FIGHT FIRE.
9. Evacuate airplane as soon as practical.

INFLIGHT WING OR ENGINE FIRE (Illuminated Firewall Shutoff Button)

1. Condition Lever - EMER SHUTOFF.
 2. Illuminated Firewall Shutoff Button - PUSH to close.
 3. Fuel Crossfeed Selector - OFF.
 4. Affected Engine Fuel Boost Pump - OFF.
5. Applicable Fire Extinguisher Armed Button - PUSH (Optional System).
 6. Appropriate Engine - SECURE.
 7. Propeller Synchrophaser - OFF (If Installed).
 8. Pressurization Source Selector - SELECT operating engine.
 9. Land and evacuate airplane as soon as practical.

INFLIGHT CABIN ELECTRICAL FIRE OR SMOKE

1. Use of Supplemental Oxygen - AS REQUIRED.
2. If Source of Fire or Smoke is Known:
 - a. Source - ISOLATE.
 - b. Fire - EXTINGUISH.
 - c. Smoke Removal Procedure - INITIATE.
- d. As Soon As Practical - LAND.
3. If Source of Fire or Smoke is Unknown:
 - a. Generator and Battery Switch(es) - OFF unless flight conditions dictate otherwise.
 - b. All Electrical Systems Switches - OFF.
 - c. Fire - EXTINGUISH.
 - d. Smoke Removal Procedure - INITIATE.
 - e. Generator and Battery Switch(es) - On.
 - f. Electrical Systems - REINSTATE required systems only, one at a time with a pause between switch actuations to determine source.
 - g. As Soon As Practical - LAND.
4. If fire or Smoke Cannot Be Isolated or Extinguished:
 - a. Emergency Descent - INITIATE.
 - b. Generator and Battery Switch(es) - OFF.
 - c. As Soon As Practical - LAND.

SMOKE REMOVAL

1. Source of Smoke - IDENTIFY and ELIMINATE. Refer to procedures concerning airplane fires and pressurization air contamination.
2. Cabin Divider Door - OPEN (Optional Equipment).
3. Use Of Supplemental Oxygen - AS REQUIRED.
4. If Source of Smoke Cannot Be Eliminated:
 - a. EMERGENCY DESCENT as required.
 - b. Cabin Pressurization Toggle Valve - DEPRESS when oxygen requirements are satisfied.
 - c. Pressurization Source Selector - OFF.
 - d. Cabin Vent Control - PULL open.
5. As Soon As Practical - LAND.

EMERGENCY DESCENT

1. Power Levers - FLIGHT IDLE.
2. Condition Levers - TAKEOFF, CLIMB AND LANDING.
3. Wing Flaps - APPR below 200 KIAS.
4. Wing Flaps - LAND at 180 KIAS.
5. Landing Gear - DOWN at 180 KIAS.
6. Airspeed - 180 KIAS.

GLIDE**MAXIMUM GLIDE
CONFIGURATION****Conditions:**

1. Landing Gear - UP.
2. Wing Flaps - UP.
3. Propellers - FEATHERED.
4. Airspeed - AS SCHEDULED.

BEST GLIDE SPEED	
Weight - Pounds	KIAS
9850	121
9000	115
8000	109
7000	102
6000	94

LANDING EMERGENCY**PRECAUTIONARY OR FORCED LANDING (With Power)**

1. Landing Site - CHECK. Overfly site at 120 KIAS and APPR wing flaps.
2. Landing Gear - DOWN or UP (At Pilot's Discretion).
3. Pressurization Source Selector - OFF.
4. Cabin Pressurization Toggle Valve - DEPRESS (Guard Raised).
5. All Nonessential Switches - OFF.
6. Landing - INITIATE in nose-high attitude.
 - a. Firewall Shutoff Buttons - PUSH to close.
 - b. Battery Switch(es) - OFF.

LANDING WITH FLAT MAIN GEAR TIRE

If a blowout occurs during takeoff and the takeoff is continued, proceed as follows:

1. Landing Gear - Leave DOWN.
2. Fuel Crossfeed Selector - AS REQUIRED to burn off fuel from the tank over the defective gear. Do not exceed 300 pounds asymmetric fuel loading.
3. Fuel Crossfeed Selector - OFF.
4. If a crosswind landing is required, select a runway with a crosswind from the side opposite the defective tire.
5. Wing Flaps - LAND.
6. In approach, align airplane with edge of runway opposite the defective tire, allowing room for a mild turn in the landing roll.
7. Land slightly wing-low on the side of inflated tire and lower nosewheel to ground immediately for positive steering.
8. Use full aileron in landing roll to lighten load on defective tire.
9. Apply brakes and reverse thrust as required to minimize landing roll and maintain directional control.
10. Stop airplane to avoid further damage, unless active runway must be cleared for other traffic.

LANDING WITH FLAT NOSE GEAR TIRE

If a blowout occurs on the nose gear tire during takeoff and the takeoff is continued, proceed as follows:

1. Landing Gear - Leave DOWN.
2. Move disposable load to baggage area and passengers to available rear seat space.
3. Approach at 104 KIAS with APPR wing flaps.
4. Land in a nose-high attitude with power.
5. Maintain back pressure on control wheel to hold nosewheel off the ground in landing roll.
6. Use minimum braking in landing roll.
7. Power Levers - GRND IDLE during landing roll.
8. As landing roll speed diminishes, hold control wheel fully aft until airplane is stopped.
9. Avoid further damage by holding additional taxi to a minimum.

LANDING WITH DEFECTIVE MAIN GEAR

1. Fuel Crossfeed Selector - AS REQUIRED to burn off fuel from the tank over the defective gear. Proceed to destination to reduce fuel load. Do not exceed 300 pounds asymmetric fuel loading.
2. Fuel Crossfeed Selector - OFF.
3. Select a wide, hard surface runway, or if necessary, a wide sod runway. If a crosswind landing is necessary, select a runway with crosswind from the side opposite the defective landing gear.
4. Landing Gear - DOWN.
5. Wing Flaps - LAND.
6. In approach, align airplane with edge of runway opposite the defective landing gear, allowing room for a ground-loop in landing roll.
7. Land slightly wing-low toward the operative landing gear and lower the nosewheel immediately for positive steering.
8. Start moderate ground-loop into defective landing gear until airplane stops.
9. Engine Stop Buttons - PUSH momentarily.
10. Use full aileron in landing roll to lighten the load on the defective landing gear.
11. Apply brakes only on the operative landing gear to maintain desired rate of turn and minimize the landing roll.
12. Firewall Shutoff Buttons - PUSH.
13. Battery Switch(es) - OFF.
14. Evacuate the airplane as soon as it stops.

LANDING WITH DEFECTIVE NOSE GEAR

1. Move disposable load to baggage area and passengers to available rear seat space.
2. Landing Gear - DOWN.
3. Approach at 104 KIAS with APPR wing flaps.
4. Land in a slightly nose-high attitude.
5. Firewall Shutoff Buttons - PUSH.
6. Hold nose off throughout ground roll. Lower gently as speed dissipates.
7. Battery Switch(es) - OFF.

LANDING WITHOUT POWER

Wing Flaps Up With Propellers Feathered:

1. When Reaching Landing Site Is Assured.
 - a. Condition Levers - TAKEOFF, CLIMB AND LANDING.
 - b. Unfeathering Pump Switch - ACTUATE to initiate left and right propeller rotation to 8-10% RPM.
 - c. Wing Flaps - APPR. Wing flaps should reach the APPR position in less than 20 seconds.
 - d. Condition Levers - EMER SHUT-OFF when flaps at APPR.

Wing Flaps At APPR:

2. Condition Levers - EMER SHUT-OFF.
3. Firewall Shutoff Buttons - PUSH to close.
4. Boost Pumps - OFF.
5. Landing Gear - DOWN or UP at pilot's discretion.
 - a. If Landing Gear Down Selected:
 - (1) Landing Gear Switch - DOWN.
 - (2) LDG GEAR System Circuit Breaker - PULL.
 - (3) Emergency Gear Extension T-Handle - PULL within gliding distance of field.
6. Approach - 104 KIAS.
7. Battery Switch(es) - OFF.
8. Landing - INITIATE in nose-high attitude.

ENGINE INOPERATIVE LANDING

1. Fuel Balance - CHECK maximum of 300 pounds differential.
2. Fuel Crossfeed Selector - OFF.
3. Condition Lever - TAKEOFF, CLIMB AND LANDING.
4. Wing Flaps - T.O.
5. Approach at 120 KIAS with excessive altitude.
6. Landing Gear - DOWN within gliding distance of field.
7. Wing Flaps - LAND when landing is assured.
8. Decrease speed below 100 KIAS only if landing is assured.
9. Air Minimum Control Speed - 91 KIAS.
10. Power Levers - RETARD to FLIGHT IDLE.
11. Power Levers - GRND IDLE after touchdown.
12. Brakes, Reverse Thrust and Nosewheel Steering - AS REQUIRED.

ENGINE INOPERATIVE GO-AROUND (Speed Above 100 KIAS)

- | |
|---|
| <ol style="list-style-type: none">1. Power Lever - ADVANCE to takeoff power while maintaining straight-ahead flight. Maintain 3 to 4° bank with 2/3 to 3/4 ball slip into operative engine.2. Wing Flaps - T.O.3. Positive Rate-of-Climb - ESTABLISH at 110 KIAS.4. Landing Gear - UP. |
|---|

5. Airspeed - 115 KIAS.
6. Wing Flaps - UP.
7. Climb at 120 KIAS.
8. Trim Tabs - ADJUST.

DITCHING

1. Landing Gear - UP.
2. Plan approach into wind if winds are high and seas are heavy. With heavy swells and light wind, land parallel to swells, being careful not to allow wing tips to hit first.
3. Wing Flaps - LAND.
4. Carry sufficient power to maintain approximately 300 feet per minute rate-of-descent.
5. Airspeed - 91 KIAS minimum. Reduce airplane weight by fuel burn-off as much as practical.
6. Maintain a continuous descent until touchdown to avoid flaring and touching down tail-first, pitching forward sharply, and decelerating rapidly. Strive for initial contact at fuselage area below rear cabin section (point of maximum longitudinal curvature of fuselage).

SYSTEMS EMERGENCIES

ENGINE

Left or Right Engine Start Light (L or R ENG START) Remains On After Start

1. Engine(s) - OPERATE above 95% RPM momentarily to charge the EPA purge system.
2. Battery Switches - ON if not already on.
3. Auxiliary Power Unit - OFF, then DISENGAGE if connected to prevent motoring the affected engine start motor during engine shutdown.
4. Engine(s) - SHUTDOWN.
5. Battery and Generator Switches - OFF WITHOUT DELAY to prevent motoring the affected engine start motor during engine shutdown.

Beta Light Illumination At Low Power And Approach Airspeed (L or R BETA Light Illuminated)

1. Affected Engine Power Lever - ADVANCE slightly to extinguish the beta light and continue flight if desired.

If Beta Light Remains Illuminated:

2. Affected Engine Condition Lever - EMER SHUT-OFF before landing. Refer to Engine Inoperative Landing Emergency procedures.

FUEL

Main and Auxiliary Boost Pump Failure

If fuel boost pump switches are positioned to MAIN and L or R AUX BOOST ON light illuminated with respective L or R FUEL PRESS LOW light illuminated, proceed as follows:

1. Maintain coordinated flight at all times.
2. Do not allow pitch attitude to exceed $\pm 10^\circ$ as indicated on the flight director indicator.
3. Adjust engine power as much as practical to maintain lateral fuel balance. Use caution during fuel crossfeed operations. Feeding from the inoperative side may result in an engine failure. Crossfeeding from the inoperative side may result in a dual engine failure.
 - a. During level coordinated flight only, begin crossfeed operation (from the operative side) before fuel level on the inoperative side reaches 150 pounds.
 - b. During attitudes other than level, begin crossfeed operation (from the operative side) before fuel level on the inoperative side reaches 300 pounds.
4. Land as soon as practical as lateral imbalance will be affected at the rate of 400 to 500 pounds per hour during crossfeed operation.

ELECTRICAL

Battery Overheat (BATT O'HEAT Light or Lights Illuminated)

If Light or Lights Illuminate Continuously:

1. Battery 1 or Battery 2 - IDENTIFY (Airplanes Incorporating SK441-37).
2. Battery Switch(es) - OFF.

3. Left Ammeter - CHECK while holding BATT/L GEN switch in BATT position.
 - a. If ammeter shows zero indication:
 - (1) Unaffected Battery Switch - ON if only one battery is overheated (Airplanes incorporating SK441-37).
 - (2) Monitor overheat lights.
 - b. If ammeter shows up scale indication:
 - (1) Generators - OFF.
 - (2) All Electrical System Switches - OFF.
 - (3) After 5 Minutes:
 - (a) Either Generator - ON.
 - (b) Left Ammeter - CHECK while holding BATT/L GEN switch in BATT position.
 - 1) If ammeter shows up scale indication:
 - a) Generator - OFF.
 - 2) If ammeter shows zero indication:
 - a) Generators (and Unaffected Battery for Airplanes incorporating SK441-37) - ON.
 - b) Reinstate electrical systems as required.
 - c) Monitor overheat lights.
 4. As Soon As Practical - LAND.

If Light or Lights Begin Flashing:

1. Both Battery Switch(es) - OFF or CHECK OFF.
2. Generators - OFF.
3. All Electrical Systems Switches - OFF.
4. After 5 Minutes:
 - a. Either Generator - ON.
 - b. Left Ammeter - CHECK while holding BATT/L GEN switch in BATT position.
 - (1) If ammeter shows up scale indication:
 - (a) Generator - OFF.
 - (2) If ammeter shows zero indication:
 - (a) Generators (and Unaffected Battery for Airplanes incorporating SK441-37) - ON.
 - (b) Reinstate electrical systems as required.
 - (c) Monitor overheat lights.
5. As Soon As Practical - LAND.

FLIGHT CONTROLS

Electric Elevator Trim Runaway

1. Control Wheel - OVERPOWER as required.
 2. Control Wheel AP/TRIM Switch - DISCONNECT immediately.
3. Manual Elevator Trim - AS REQUIRED.
 4. Do not attempt to use the electric elevator trim system until ground maintenance has been completed.

Autopilot Emergencies

1. Autopilot Malfunction

- a. Elevator or Aileron Control - OVERPOWER as required.
- b. Control Wheel AP/TRIM Switch - DISCONNECT immediately.

2. Engine Failure

- a. Control Wheel AP/TRIM Switch - DISCONNECT.
- b. Operative Engine - ADJUST as required.
- c. Inoperative Engine - SECURE.
- d. Trim Tabs - ADJUST.
- e. Autopilot - REENGAGE if desired.

ENVIRONMENTAL

Wing Overheat (L or R WING O'HEAT Light Illuminated)

1. Verify bleed airflow is automatically terminated. EGT indication on the affected side should decrease approximately 10 to 15°C.
2. If any doubt exists regarding bleed air termination:
 - a. Pressurization Source Selector - SELECT the affected engine momentarily. A rise in cabin altitude indicates the bleed air flow has been shut off.
3. If WING O'HEAT light does not go out in two minutes or it is verified that bleed airflow has not terminated:
 - a. Affected Engine - SECURE.
 - (1) Condition Lever - EMER SHUT-OFF.
 - (2) Firewall Shutoff - PUSH to close.
 - (3) Fuel Boost Pump - CHECK MAIN if fire does not exist.
- OFF if fire hazard does exist.
 - (4) Generator - OFF.
 - (5) Propeller Synchrophaser - OFF.
 - b. Operative Engine - ADJUST.
 - c. Trim Tabs - ADJUST to maintain bank toward operative engine.
 - d. Electrical Load - DECREASE if required to prevent battery discharge.
 - e. Fuel Crossfeed Selector - AS REQUIRED to maintain fuel balance.
Do not crossfeed if fire hazard exists.
 - f. As Soon As Practical - LAND.

Emergency Pressurization (EMER PRESS ON Light Illuminated)

1. If above 10,000 feet:
 - a. Use of Supplemental Oxygen - AS REQUIRED.
 - b. Emergency Descent - AS REQUIRED.
2. Pressurization Source Selector - OFF when oxygen requirements are satisfied or when cabin temperature becomes excessive.
3. For ventilation while unpressurized:
 - a. Cabin Vent Control - PULL OPEN.
 - b. Cabin Pressurization Toggle Valve - DEPRESS.

Cabin Distribution Duct Overheat (AIR DUCT O'HEAT Light Illuminated)

1. CABIN TEMP Circuit Breaker - RESET.
2. Auto Temp Selector - MAN.
3. Manual Temperature Control - COOL and hold for 15 seconds.
4. If Light Goes Out:
 - a. Manual Temperature Control - AS REQUIRED.
5. If Light Does Not Go Out:
 - a. Pressurization Source Selector - EMER.
 - b. Initiate Emergency Pressurization procedure.

Cabin Overpressure (Over 6.3 PSI and Increasing)

1. Cabin Altitude Control - SET to higher cabin altitude.
2. Cabin Rate Control - INCREASE.

If still overpressure:

3. Pressurization Source Selector - LH or RH.

If unable to control:

4. Pressurization Source Selector - OFF.

5. Use of Supplemental Oxygen - AS REQUIRED.

If above 10,000 feet without supplemental oxygen:

6. DESCEND as soon as practical.
7. Pressurization Source Selector - LH or RH as required to limit maximum cabin altitude during descent.
8. For ventilation while unpressurized:
 - a. Cabin Vent Control - PULL OPEN.
 - b. Cabin Pressurization Toggle Valve - DEPRESS.

Cabin Altitude Above 10,000 Feet (CABIN ALT Light Illuminated On Airplanes Not Incorporating SK441-36)

Cabin Altitude Above 11,500 Feet (CABIN ALT Light Illuminated On Airplanes Incorporating SK441-36)

1. Use Of Supplemental Oxygen - INITIATE.
2. Emergency Descent - AS REQUIRED.
3. Pressurization Air Controls - CHECK.
 - a. Cabin Altitude Control - SET to maintain cabin altitude below 11,500 feet.
 - b. Cabin Pressurization Toggle Valve - PRESS (Guard Down).
 - c. Cabin Vent Control - PUSH in.
 - d. Pressurization Source Selector:
 - (1) CHECK BOTH, LH, RH or EMER if supplemental oxygen not available.

NOTE

If EMER position is required to maintain or lower cabin altitude, temperature control is no longer available and cabin temperature will climb uncontrollably.

4. If EMER Position is Required on the Pressurization Source Selector:
 - a. Emergency Descent - AS REQUIRED.
 - b. Pressurization Source Selector - OFF when oxygen requirements are satisfied or when cabin temperature becomes excessive.
5. For Ventilation while unpressurized:
 - a. Cabin Vent Control - PULL OPEN.
 - b. Cabin Pressurization Toggle Valve - DEPRESS.

Pressurization Air Contamination

1. Source of Contamination - IDENTIFY.
 - a. Pressurization Source Selector - LH, then RH, then EMER, then OFF.

If The Pressurization Source Selector is Positioned to OFF Above 10,000 Feet:

2. Use Of Supplemental Oxygen - INITIATE.
3. Emergency Descent - AS REQUIRED.
4. For Ventilation while unpressurized:
 - a. Cabin Vent Control - PULL OPEN.
 - b. Cabin Pressurization Toggle Valve - DEPRESS.
5. As Soon As Practical - LAND.

If The Pressurization Source Selector is Positioned to EMER Above 10,000 Feet:

6. Use of Supplemental Oxygen - INITIATE.
7. Emergency Descent - AS REQUIRED.
8. Pressurization Source Selector - OFF when oxygen requirements are satisfied or when cabin temperature becomes excessive.
9. For ventilation while unpressurized:
 - a. Cabin Vent Control - PULL OPEN.
 - b. Cabin Pressurization Toggle Valve - DEPRESS.
10. As Soon As Practical - LAND.

OXYGEN

Use Of Supplemental Oxygen

1. Oxygen Mask - DON.
 2. Mask Regulator - CHECK 100% OXY.
 3. Side Console Microphone Selector - OXY MASK.
 4. Passenger Advisory Lights - ON.
 5. Passenger Oxygen Masks Switch - DEPLOY as required.
6. Reconnect passenger mask pintle pins in oxygen flow valves after use.
Reposition pilot's microphone selector to HEADSET position.

ICE PROTECTION

Inadvertent Icing Encounter

1. Ignition Override Switches - ON. Observe ignition duty cycle limits.
2. Engine Inlet Anti-Ice Switches - ON one at a time.
3. Pitot/Static Heat Switches - ON.
4. Stall Vane Anti-Ice Switches - ON.
5. Windshield Anti-Ice Switch - ON.
6. Propeller Deice Switches - ON.
7. Surface Deice Boots Switch - AS REQUIRED.

Windshield Air Overheat (W/S AIR O'HEAT Light Illuminated)

1. Verify windshield bleed air flow is terminated. Air flow noise associated with bleed air windshield operation should terminate, indicating bleed air flow was automatically terminated. When windshield temperature has decreased to a safe level, W/S AIR O'HEAT light will go out and the bleed air flow will turn back on.
2. If the system cycles on and off twice after initial turn on, indicating a failure of the air temperature controller and heat exchanger subsystem:
 - a. Windshield Anti-Ice Switch - OFF.
 - b. Leave icing conditions as soon as practical.
3. If windshield airflow does not automatically terminate or remains on when the anti-ice switch is selected to off, indicating a failure in the overheat protection subsystems:
 - a. Windshield Anti-Ice Switch - ON to allow the temperature control valve and heat exchanger to control bleed air temperature as much as possible.
 - b. Pressurization Source Selector - select EMER to draw hot bleed air through the cabin and away from the windshield.
 - c. Cabin Altitude Control - set to 10,000 feet to open the outflow valves as much as possible and maximize flow of hot air out of the cabin.
 - d. Cabin Rate Control - INCREASE.
 - e. Land as soon as practical.

Engine Inlet Anti-Ice Failure (ENGINE ANTI-ICE Light Out)

1. Ignition Override Switch - ON.
2. Leave icing conditions as soon as practical.

Surface Deice Failure

If the SURFACE DEICE annunciator remains on longer than 30 seconds after deice boot actuation:

1. Surface Deice Switch - RESET then ON.
2. If normal operation does not occur, leave icing conditions as soon as practical.

Pitot/Static System Failure

1. Pitot/Static Heat Switches - CHECK ON.
2. Pilot's and Copilot's Instruments - DETERMINE which instruments are functioning normally.
3. Complete flight on the operative instruments.
4. Affected Engine - ADJUST fuel flow and torque to match the values shown on the normally functioning engine.

Propeller Deice Failure

If uneven deicing of the propeller is indicated by excessive vibration:

1. Condition Lever - TAKEOFF, CLIMB and LANDING then return to CRUISE.
2. Propeller Ammeter - CHECK for proper operation by periodic fluctuations within the green arc.
3. If ammeter reading is below the green arc, indicating the propeller blades may not be deicing uniformly:
 - a. Propeller Deice Switch - OFF.
4. Leave icing conditions as soon as practical.

EMERGENCY EXITS

Emergency Exit Window Removal

1. Cabin Pressurization Switch - DEPRESSURIZE.
2. Cabin Differential Pressure - CHECK ZERO DIFFERENTIAL.
3. Emergency Release Handle Plastic Cover - PULL OFF.
4. Release Handle - ROTATE AS REQUIRED.
5. Emergency Exit Window - PULL IN and DOWN.

CABIN DOOR NOT SECURED (DOOR NOT LOCKED Light Illuminated)

1. If Loud Crack Or Other Evidence Of Actual Door Failure:
 - a. Cabin Pressurization Toggle Valve - DEPRESS.
 - b. Use of Supplemental Oxygen - AS REQUIRED.
 - c. Pressurization Source Selector - OFF.
 - d. Emergency Descent - AS REQUIRED.
- e. For ventilation while unpressurized:
 - (1) Pressurization source selector - BOTH.
- f. As Soon As Practical - LAND.
2. If Light is Not Accompanied by Other Evidence of Actual Door Failure:
 - a. If above 10,000 feet:
 - (1) Use of Supplemental Oxygen - INITIATE.
 - (2) Descend as soon as practical.
 - b. Cabin Pressurization Toggle Valve - DEPRESS when oxygen requirements are satisfied.
 - c. As Soon As Practical - LAND.

IMPENDING SKIN PANEL OR WINDOW FAILURE

1. Cabin Pressurization Toggle Valve - DEPRESS.
2. Use of Supplemental Oxygen - AS REQUIRED.
3. Pressurization Source Selector - OFF.
4. Emergency Descent - AS REQUIRED.

5. For ventilation while unpressurized:
 - a. Pressurization Source Selector - BOTH.
6. As Soon As Practical - LAND.

LOCATOR BEACON RESCUE PROCEDURES

Before Landing

1. VHF COM - SET 121.5 MHz and transmit May Day calls for assistance if time permits.

After Landing

1. Plug Button - REMOVE (Located On Side of Tail Cone).
2. Locator Beacon Switch - ON.

After Rescue

1. Locator Beacon Switch - OFF.

TRANSPONDER PROCEDURES FOR EMERGENCY SITUATIONS

Emergency Signal Transmission

1. ALT and ON Pushbutton Switches - PUSH IN.
2. Reply-Code Selector Switches - SELECT Code 7700.

Loss Of Communications Signal Transmission

1. ALT and ON Pushbutton Switches - PUSH IN.
2. Reply-Code Selector Switches - SELECT Code 7600.

Hijacked Signal Transmission

1. ALT and ON Pushbutton Switches - PUSH IN.
2. Reply-Code Selector Switches - SELECT Code 7500.

TOTAL LOSS OF COMMUNICATIONS

In the event that the audio control panel malfunctions such that communications operations cannot be performed on COM 1, COM 2 or COM 3, proceed as follows:

1. Function Selector Switch - EMER COM.
2. Employ the headsets if not already in use.
3. Set the desired frequency on the designated emergency COM (1 or 2) and proceed with communications on that Com only.
4. Select the NAV, MKR, ADF or DME audio to be monitored by setting the appropriate receiver selector switches to HDST. A reduction in normal amplitude will be experienced while operating in the emergency mode.

SPINS

Intentional spins are not permitted in this airplane. Should a spin occur however, the following recovery procedures should be employed:

1. Power Levers - FLIGHT IDLE IMMEDIATELY.
2. Ailerons - NEUTRALIZE.
3. Rudder - HOLD FULL RUDDER opposite the direction of rotation.
4. Control Wheel - FORWARD BRISKLY, 1/2 turn of spin after applying full rudder.
5. Inboard Engine - INCREASE POWER to slow rotation. (If Necessary).

After rotation has stopped:

6. Rudder - NEUTRALIZE.
7. Inboard Engine (If used) - DECREASE POWER to equalize engines.
8. Control Wheel - PULL to recover from resultant dive. Apply smooth steady control pressure.

AMPLIFIED EMERGENCY PROCEDURES

NOTE

- A complete knowledge of the procedures set forth in this section will enable the pilot to cope with various emergencies that can be encountered; however, this does not diminish the fact that the primary responsibility of the pilot is to maintain control at all times. Good judgment and precise action are essential and can only be developed through frequent practice of emergency and simulated single-engine procedures. The pilot must have a thorough knowledge of all emergency procedures so that in the event of an emergency, reaction will be precise and done with confidence. This is required so the pilot can cope with the demands of an emergency situation.
- Procedures outlined in black are immediate action items and should be committed to memory.

AIRSPEEDS FOR SAFE OPERATION

The most critical time for an engine failure condition in a multiengine airplane is during a two or three second period late in the takeoff run while the airplane is accelerating to a safe engine failure speed. A detailed knowledge of recommended engine inoperative airspeeds is essential for safe operation of the airplane.

The airspeed indicator is marked with a red radial at the air minimum control speed (wing flaps in T.O. position) and a blue radial at the one engine inoperative best rate-of-climb speed (wing flaps in UP position) to facilitate instant recognition. The following paragraphs present a detailed discussion of the problems associated with engine failures during takeoff. A summary of the engine inoperative speeds is presented in the abbreviated checklist for maximum takeoff weight.

AIR MINIMUM CONTROL SPEED (91 KIAS)

The airplane must reach the air minimum control speed (V_{MC_A}) before full control deflections are able to counteract the roll and yaw tendencies associated with one engine inoperative and full power operation on the other engine. V_{MC_A} with wing flaps in T.O. position is indicated by a red radial on the airspeed indicator. V_{MC_A} with wing flaps in the UP position and the airplane in an enroute climb configuration will be buffet limited and occur at a higher speed.

INTENTIONAL ONE ENGINE INOPERATIVE SPEED (98 KIAS)

Although the airplane is controllable at the air minimum control speed, the airplane performance is less than optimum. A more suitable speed with wing flaps positioned to T.O. is 98 KIAS. This speed is identical to the normal rotation speed, thus the pilot can direct more of this attention to determining and securing the inoperative engine than to achieving a speed not normally associated with takeoff. This speed also provides additional safety for controllability and allows easier maintenance of altitude during the period of gear retraction and securing the inoperative engine.

ONE ENGINE INOPERATIVE BEST OBSTACLE CLEARANCE SPEED (110 KIAS)

The one engine inoperative best obstacle clearance speed (110 KIAS) with wing flaps in T.O. position and the landing gear retracted, should be achieved to obtain the performance shown in Section 5. This speed is identical to the all engines obstacle clearance speed, thus allowing the pilot to direct more of his attention to the present emergency rather than achieving a speed not normally associated with takeoff.

ONE ENGINE INOPERATIVE BEST RATE-OF-CLIMB SPEED (120 KIAS)

The one engine inoperative best rate-of-climb speed with wing flaps and landing gear retracted is 120 KIAS (blue radial on the airspeed indicator). This speed becomes important for long range obstacle clearance or when it is difficult to maintain altitude.

The one engine inoperative best rate-of-climb speed at various altitudes is shown in Section 5. Best single-engine climb is attained with the wings banked approximately 3° to 4° and with a 2/3 to 3/4 ball slip into the operative engine when the airplane is at low airspeed and heavy weight. As airspeed increases and/or airplane weight is significantly reduced, the 2/3 to 3/4 ball slip becomes less important.

ENGINE FAILURE

ENGINE SECURING PROCEDURE

1. Condition Lever - EMER SHUT-OFF.
2. Firewall Shutoff - PUSH to close.
3. Inoperative Engine.
 - a. Fuel Boost Pump - CHECK MAIN if fire hazard does not exist.
- OFF if fire hazard exists.
 - b. Generator - OFF.
 - c. Propeller Synchrophaser - OFF (If Installed).

CAUTION

An airstart may not be possible after a prolonged shutdown during which the engine oil temperature has been allowed to decrease below 4°C.

ENGINE FAILURE BEFORE ROTATION (Speed Below 98 KIAS)

1. Power Levers - GRND IDLE.
2. Brakes and Nosewheel Steering - AS REQUIRED.
3. Inoperative Engine Firewall Shutoff - PUSH to close.

CAUTION

If necessary, cautiously apply reversing as required on the operating engine to maintain directional control. The reverse thrust is counteracted by opposite brake and rudder. If runway braking action is less than normal due to loose gravel, sod surface, snow, ice or rain, careful modulation of power will be required to maintain directional control.

NOTE

The distance required for the airplane to be accelerated from a standing start to the recommended safe one engine inoperative rotation speed on the ground, and to decelerate to a stop with heavy braking, is presented in the Accelerate Stop Distance Chart in Section 5 for various combinations of conditions.

ENGINE FAILURE AFTER ROTATION (Speed Above 98 KIAS)**Decision To Continue Takeoff (GO)**

1. Aileron and Rudder - AS REQUIRED to maintain straight-ahead flight. Maintain approximately 3° to 4° bank with a 2/3 to 3/4 ball slip (indicated on the turn and bank indicator) into the operative engine.

NOTE

Normally, the bank angle required will be 5° or less; however, if strong crosswinds and other such conditions exist, increase the bank angle as required to maintain straight-ahead flight.

2. Power Levers - TAKEOFF POWER.
3. Landing Gear - UP.
4. Climb to Clear Obstacles - 110 KIAS.

5. Inoperative Engine - DETERMINE.
 - a. Condition Lever - EMER SHUT-OFF.

WARNING

Do not retard either condition lever until the inoperative engine is positively identified. Indicators of the inoperative engine are: low torque, low EGT and "idle engine same side as idle foot."

- b. Firewall Shutoff - PUSH to close.
6. Airspeed - ACCELERATE to 115 KIAS.
7. Wing Flaps - UP.
8. Climb - 120 KIAS (One Engine Inoperative Best Rate-of-Climb Speed With Wing Flaps UP).
9. Trim Tabs - ADJUST.
10. Inoperative Engine.
 - a. Fuel Boost Pump - CHECK MAIN if fire hazard does not exist.
- OFF if fire hazard does exist.
 - b. Generator - OFF.
 - c. Propeller Synchrophaser - OFF (If Installed).
11. As Soon As Practical - LAND. Refer to Engine Inoperative Landing Procedure.

Decision To Abort Takeoff (NO GO)

1. Landing Gear - CHECK DOWN. Gear down lights on.
2. Power Levers - RETARD to FLIGHT IDLE.

WARNING

Do not retard power levers below FLIGHT IDLE while airborne.

3. Power Levers - GRND IDLE after touchdown.
4. Brakes and Nosewheel Steering - AS REQUIRED.
5. Inoperative Engine Firewall Shutoff - PUSH to close.

CAUTION

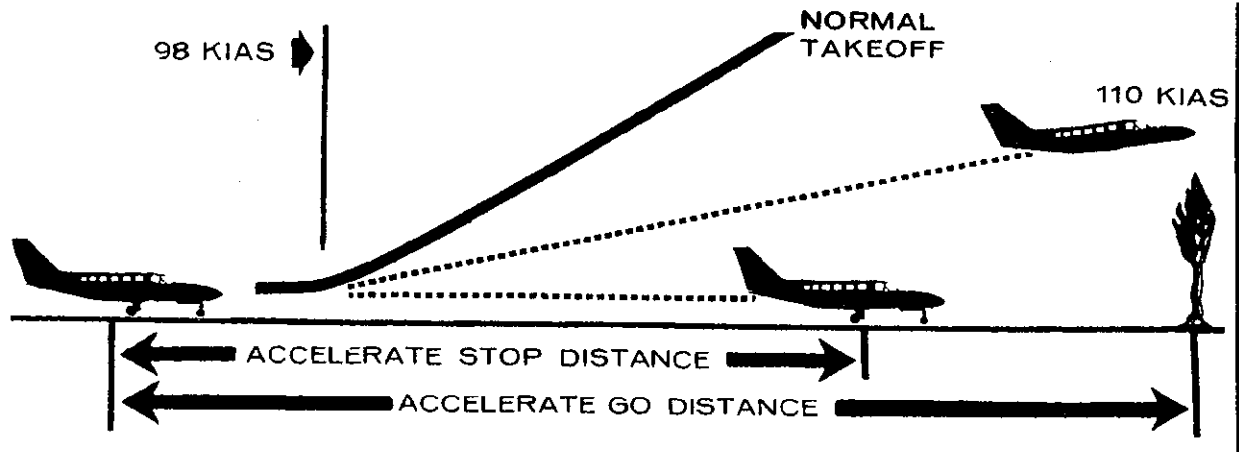
If necessary, cautiously apply reversing as required on the operating engine to maintain directional control. The reverse thrust is counteracted by opposite brake and rudder. If runway braking action is less than normal due to loose gravel, sod surface, snow, ice or rain, careful modulation of power will be required to maintain directional control.

Should an engine fail on takeoff after reaching 98 KIAS, the pilot must continue or abort the takeoff. The accelerate-stop and accelerate-go data in Section 5 should be used to assist the pilot in making this decision. For a given runway, a reduction in fuel loading or payload may be appropriate. The possibility of an engine failure during this critical period should be reviewed as a routine matter before every takeoff. In this manner, the appropriate action can be taken immediately with confidence.

To make an intelligent decision in this type of emergency, the pilot must consider the field length, field elevation, air temperature, headwind, takeoff weight and obstruction height. The limitations of one-engine climb performance shown in Section 5 should be reviewed before takeoff. Accelerate stop and accelerate go distances are predicated on an engine failure at rotation. If the airplane has already left the runway when an emergency occurs, it is normally considered prudent to continue the takeoff unless the nature of the emergency indicates that continued flight may become impossible.

If a decision to land the airplane is made, the pilot should realize that: (1) the airplane may be as much as 7 Knots below a safe T.O. flap setting approach speed, and (2) the total distance to complete the maneuver will greatly exceed the published accelerate stop distance.

GO NO GO DECISION ENGINE FAILURE DURING TAKEOFF



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Figure 3-2

At sea level pressure altitude and 20°C, with zero wind, both engines operating in normal mode and 9850 pounds weight, the distance to accelerate to 98 KIAS and stop is 3750 feet, while the total unobstructed distance required to takeoff and climb over a 50-foot obstacle after an engine failure at 98 KIAS is 4120 feet. This total distance over an obstacle can be reduced slightly under more favorable conditions of weight, headwind, or obstruction height. Higher field elevations combined with hot temperatures will cause the engine failure takeoff distances to lengthen until conditions are reached where a successful takeoff is improbable.

During a one engine inoperative takeoff over an obstacle, headwind presents an appreciable advantage. A decrease of approximately 7% in ground distance required to clear a 50-foot obstacle can be gained for each 10 knots of headwind. Excessive speed above one engine inoperative best rate-of-climb speed at engine failure is not nearly as advantageous as one might expect since deceleration is rapid and ground distance is used up quickly at higher speeds while the airplane is being cleaned up for climb. However, the extra speed is important for controllability.

The following facts should be used as a guide at the time of engine failure during takeoff: (1) altitude is more valuable to safety after takeoff than is airspeed in excess of the one engine inoperative best rate-of-climb speed since excess airspeed is lost much more rapidly than is altitude; (2) climb or continued level flight at moderate altitude is improbable with the landing gear and wing flaps extended and the propeller windmilling; (3) the decrease in performance upon engine failure, is not quite as severe as in other airplanes due to the airplane's high power to weight ratio; additionally, the negative torque sensing (NTS) system will

automatically increase the propeller blade angle on the inoperative engine, thereby decreasing the drag normally associated with a windmilling propeller; (4) in no case should the airspeed be allowed to fall below the one engine inoperative best rate-of-climb speed, even though altitude is lost, since this speed will always provide a better chance of climb, or a smaller altitude loss, than any lesser speed.

WARNING

The propeller on the inoperative engine must be feathered, landing gear and wing flaps retracted per the engine failure procedures in order to obtain the performance shown in Section 5.

One engine inoperative procedures should be practiced to better prepare the pilot for actual engine inoperative emergencies. Before starting the engines, the pilot should practice positioning the condition lever to EMER SHUT-OFF. It will be noted there are two lifting motions required to move the condition lever full aft to a full shutoff feather position. The pilot should also be familiar with the location of all controls necessary to complete an immediate shutdown and securing procedure.

When in flight at a safe altitude and airspeed, perform the Training Shutdown During Cruise Flight procedure. This procedure is intended to familiarize the pilot with the inflight shutdown and the resultant changes in trim and general handling characteristics. When the pilot is competent and comfortable performing the training shutdown procedure, he may transition to the simulated engine failure procedure.

Initially, the Simulated Engine Failure In Takeoff Configuration procedure should be accomplished at 98 KIAS or greater, with wing flaps in the T.O. position and at a safe altitude. As recovery ability is gained with practice, the starting speed may be lowered in small increments until the feel of the airplane is well known in the emergency conditions.

ENGINE FAILURE IN FLIGHT (Speed Below V_{MC_A})

1. Power Lever - RETARD as required to stop turn.
2. Aileron and Rudder - AS REQUIRED toward operative engine to maintain straight-ahead flight.

WARNING

Normally, the bank angle required will be 5° or less; however, increase the bank angle as required to maintain straight-ahead flight.

3. Pitch Attitude - LOWER NOSE to accelerate above 91 KIAS.
4. Accomplish procedures for Engine Failure in Flight (Speed Above V_{MC_A}).

ENGINE FAILURE IN FLIGHT (Speed Above V_{MCA})

1. Engine Power - ADJUST as required.
2. Inoperative Engine - DETERMINE. Idle engine same side as idle foot; also, torque and EGT will be low.
 - a. Condition Lever - EMER SHUT-OFF.
 - b. Firewall Shutoff - PUSH to close.
3. Landing Gear - UP.
4. Wing Flaps - UP above 115 KIAS.

Before Securing Inoperative Engine:

5. Determine probable cause of engine stoppage.
6. Inoperative Engine - SECURE or ATTEMPT AIRSTART.

CAUTION

- Do not attempt a restart if engine stoppage was due to a malfunction which could create a hazardous situation if a restart was attempted.
- An airstart may not be possible after a prolonged shutdown during which the engine oil temperature has been allowed to decrease below 4°C.

If Engine Is To Be Secured:

7. Inoperative Engine:
 - a. Fuel Boost Pump - CHECK MAIN if fire hazard does not exist.
- OFF if fire hazard does exist.
 - b. Generator - OFF.
 - c. Propeller Synchrophaser - OFF (If Installed).
8. Operative Engine - ADJUST.
9. Trim Tabs - ADJUST to maintain bank toward operative engine.
10. Electrical Load - DECREASE if required to prevent battery discharge.
11. Fuel Crossfeed Selector - AS REQUIRED to maintain fuel balance. Do not crossfeed if fire hazard exists.

NOTE

Schedule fuel use such that an adequate amount of fuel is available in the operative engine main tank for landing. Crossfeed as required to maintain lateral balance within 300 pounds per side.

12. As Soon As Practical - LAND. Refer to Engine Inoperative Landing Procedure.

BOTH ENGINES FAIL IN FLIGHT

NOTE

- By design, each engine is totally independent of each other with the exception of drawing fuel from the same tank during crossfeeding. Fuel starvation would therefore be suspect.
- Depending upon the circumstances and the amount of available altitude at the time of occurrence, the pilot may choose to configure the airplane for maximum glide and attempt airtstarts, or he may prepare for an immediate landing.
- Pressure gyro instruments will be inoperative. Cabin altitude will increase uncontrollably to ambient altitude. Electrical power available will be limited to the amount of energy contained in the batteries. Wing flaps and hydraulic gear operation will be limited by the reduced hydraulic power available from windmilling propellers.

If Insufficient Altitude Exists to Permit Airtstarts:

1. Wing Flaps - APPR within gliding distance of selected landing site with propellers windmilling.
2. Condition Levers - EMER SHUT-OFF when flaps at APPR.
3. Firewall Shutoff Buttons - PUSH to close.
4. Fuel Boost Pumps - OFF.
5. Refer to LANDING WITHOUT POWER procedure.

If Sufficient Altitude Exists to Attempt Airtstarts:

6. Use Of Supplemental Oxygen - AS REQUIRED.
7. Wing Flaps and Landing Gear - CHECK UP or SELECT UP while propellers are windmilling.
8. Airspeed - 110 KIAS. See GLIDE procedure.
9. Airtstarts - ATTEMPT. Refer to Airstart procedures.

If Airtstarts Fail:

10. Condition Levers - EMER SHUT-OFF.
11. Firewall Shutoff Buttons - PUSH to close.
12. Engine Stop Buttons - PUSH momentarily to close the electric fuel shutoffs.
13. Fuel Boost Pumps - OFF.
14. Refer to LANDING WITHOUT POWER procedure.

NOTE

If time permits, advise ATC and squawk 7700. Passenger advisory lights should be on and loose items in the cabin should be secured. Review the Emergency Exit Window Removal procedure and consider the exit window removal prior to landing if a passenger is available to do so. Fasten seat belts and shoulder harnesses.

OIL PRESSURE BELOW 40 PSI (OIL PRESS Light Illuminated)

1. Oil Pressure Indication - CROSSCHECK annunciator light with pressure gage.
2. If Pressure Gage And Annunciator Disagree:
 - a. Oil Pressure and Annunciator Circuit Breakers - CHECK in.
 - b. Engine Instruments - CHECK.
 - (1) If indications are normal, assume an indicator malfunction and proceed to destination while closely monitoring all engine instrumentation.
 - (2) If indications are not normal (i.e.: erratic torque and/or high oil temperature), secure engine as shown in the following step 3.
3. If Pressure Gage And Annunciator Agree:
 - a. Affected Engine - SECURE.
 - (1) Condition Lever - EMER SHUT-OFF.
 - (2) Firewall Shutoff - PUSH to close.
 - (3) Fuel Boost Pump - CHECK MAIN if fire hazard does not exist.
- OFF if fire hazard does exist.
 - (4) Generator - OFF.
 - (5) Propeller Synchrophaser - OFF (If Installed).
 - b. Operative Engine - ADJUST.
 - c. Trim Tabs - ADJUST to maintain bank toward operative engine.
 - d. Electrical Load - DECREASE if required to prevent battery discharge.
 - e. Fuel Crossfeed Selector - AS REQUIRED to maintain fuel balance.
Do not crossfeed if fire hazard exists.

NOTE

Schedule fuel use such that an adequate amount of fuel is available in the operative engine main tank for landing. Crossfeed as required to maintain lateral balance within 300 pounds per side.

- f. As Soon As Practical - LAND.

**SUDDEN OR INTERMITTENT PARTIAL ENGINE POWER LOSS DURING
CRUISE FLIGHT (ENGINE IN NORMAL MODE-SPEED ABOVE V_{MCA})**

NOTE

Sudden or intermittent partial engine power losses during flight with the engines operating in normal mode may be related to the electronic fuel control. Operation in the manual mode may restore engine power and allow continued use of the affected engine. The decision to evaluate manual mode operation is at the pilot's discretion and should be subject to the characteristics of the power loss and the flight conditions at that time. In certain circumstances, it may be advisable to secure the affected engine for the duration of the flight or until such time as a manual mode airstart can safely be attempted.

1. Engine With Reduced Power - DETERMINE. Idle engine same side as idle foot. Torque, EGT and fuel flow may be low or split relative to the good engine.
2. Condition Levers - TAKEOFF, CLIMB AND LANDING.
3. Power Levers - REDUCE POWER below torque or temperature limits on good engine.
4. Fuel Computer Switches - OFF. Verify illumination of FUEL COMP OFF annunciator lights and engine speeds stabilizing at 100% RPM.
5. Power Lever of Suspect Engine - ADJUST to match engine torque, EGT or fuel flow.

NOTE

When matching the affected engine operating parameters to those of the good engine, an attempt should be made to reach close agreement between two out of the three parameters of torque, EGT and fuel flow. The pilot should determine at this time the condition of this engine or power indications.

If Able To Obtain Manual Mode Power:

6. Refer to Manual Mode Operating procedures for continued operation.

If Unable To Obtain Manual Mode Power:

7. Engine With Reduced Power - SECURE.
 - a. Condition Lever - EMER SHUT-OFF.
 - b. Firewall Shutoff - PUSH to close.
 - c. Fuel Boost Pump - CHECK MAIN if fire hazard does not exist.
- OFF if fire hazard exists.
 - d. Generator - OFF.
 - e. Propeller Synchrophaser - OFF (If Installed).

8. Operative Engine.
 - a. Fuel Computer Switch - ON.
 - (1) FUEL COMP OFF Annunciator - OFF.
 - b. Operative Engine - ADJUST.
9. Trim Tabs - ADJUST to maintain bank toward operative engine.
10. Electrical Load - DECREASE if required to prevent battery discharge.
11. Fuel Crossfeed Selector - AS REQUIRED to maintain fuel balance. Do not crossfeed if fire hazard exists.

NOTE

Schedule fuel use such that an adequate amount of fuel is available in the operative engine main tank for landing. Crossfeed as required to maintain lateral balance within 300 pounds per side.

12. As Soon As Practical - LAND.

AIRSTART (Normal or Manual Mode)**NOTE**

- Performing an Inflight Engine Clearing Procedure, as outlined in Section 4, prior to any airstart attempt, will maximize the potential for a successful airstart.
- An airstart may not be possible after a prolonged shutdown during which the engine oil temperature has been allowed to decrease below 4°C.

BEFORE AIRSTART

1. Engine Stop Button - PUSH momentarily to cancel and reset start logic and close the electric fuel shutoff.
2. Altitude - BELOW 20,000 FEET if sufficient altitude exists.
3. Airspeed - 100 to 200 KIAS.
4. Firewall Shutoff - PUSH to open.
5. Condition Lever - START AND TAXI.
6. Power Lever - AIRSTART.
7. Generator - OFF.
8. Fuel Boost Pump - CHECK MAIN.
9. Propeller Synchrophaser - OFF (If Installed).

NORMAL MODE AIRSTART**NOTE**

If the inoperative engine power lever was retarded below the AIRSTART position, the fuel computer will have tripped to manual mode.

1. Fuel Computer Switch - CYCLE OFF then back to ON if fuel computer tripped to manual mode.
 - a. FUEL COMP OFF Annunciator - OFF.
2. EGT - BELOW 200°C if sufficient time exists.

3. Engine Start Button - PUSH momentarily. Observe propeller rotation.
 - a. Fuel and Ignition - CHECK fuel flow increase and ignition light on at 10% RPM.
 - b. EGT Rise - CHECK after reaching 10% to 20% RPM. (If EGT rise does not occur by 25% RPM, reject start by positioning condition lever to EMER SHUT-OFF then pushing the engine stop button.)

CAUTION

Exceeding the 770°C EGT limitation will result in engine damage, thus limiting available power and reducing expected engine life. Take appropriate maintenance action should the engine limits be exceeded.

- c. Condition Lever - TAKEOFF, CLIMB AND LANDING (at 60% RPM).

NOTE

- Abrupt movement of the condition lever should be avoided. Premature advancement of the condition lever prior to reaching 60% RPM may result in reverting to manual mode (refer to manual mode airstart).
- Excess delay in advancement of condition lever may result in spurious EGT indications. Advancing the condition lever at this time will stabilize the EGT reading.

- d. Engine Instruments - CHECK.
 - (1) Oil Pressure - CHECK rising within 10 seconds after engine lightoff.
 - (2) RPM Stabilization - CHECK 100% RPM.
4. Generator - RESET then ON.
5. Fuel Boost Pump - CYCLE to OFF then to MAIN.
 - a. FUEL PRESS LOW and AUX BOOST ON Annunciator Lights - OFF.

MANUAL MODE AIRSTART

1. Fuel Computer Switch - OFF.
2. EGT - BELOW 200°C if sufficient time exists.
3. Engine Start Button - PUSH momentarily. Observe propeller rotation.
4. Manual Start Switch - 10% POSITION momentarily (at 10 to 15% RPM).
5. Engine Start Button - PUSH immediately and hold for fuel enrichment at light-off.
 - a. Fuel and Ignition - CHECK fuel flow increase and ignition light on.
 - b. EGT Rise - CHECK after reaching 10% to 20% RPM. (If EGT rise does not occur by 25% RPM, reject start by positioning condition lever to EMER SHUT-OFF then pushing the engine stop button.)

6. Engine Start Button - PUSH as required for fuel enrichment to assist engine acceleration to 100% RPM. Modulate within EGT and RPM limits.

CAUTION

Exceeding the 770°C EGT limitation will result in engine damage, thus limiting available power and reducing expected engine life. Take appropriate maintenance action should the engine limits be exceeded.

7. Manual Start Switch -60% POSITION momentarily (at 60 to 70% RPM).
 - a. Engine Instruments - CHECK.
 - (1) Oil Pressure - CHECK rising within 10 seconds after engine lightoff.
 - (2) RPM Stabilization - CHECK 100% RPM.
8. Generator - RESET then ON.
9. Fuel Boost Pump - CYCLE to OFF then to MAIN.
 - a. FUEL PRESS LOW and AUX BOOST ON Annunciator Lights - OFF.
10. Condition Lever - TAKEOFF, CLIMB AND LANDING.

IF AIRSTART ATTEMPTS FAIL

1. Inoperative Engine.
 - a. Condition Lever - EMER SHUT-OFF.
 - b. Firewall Shutoff - PUSH to close.
 - c. Engine Stop Button - PUSH momentarily.
 - d. Fuel Boost Pump - CHECK MAIN if fire hazard does not exist.
- OFF if fire hazard does exist.
 - e. Generator - OFF.
 - f. Propeller Synchrophaser - OFF.
2. Operative Engine - ADJUST.
3. Trim Tabs - ADJUST to maintain bank toward operative engine.
4. Electrical Load - DECREASE if required to prevent battery discharge.
5. Fuel Crossfeed Selector - AS REQUIRED to maintain fuel balance. Do not crossfeed if fire hazard exists.

NOTE

Schedule fuel use such that an adequate amount of fuel is available in the operative engine main tank for landing. Crossfeed as required to maintain lateral balance within 300 pounds differential.

6. As Soon As Practical - LAND. Refer to Engine Inoperative Landing Procedures.

SMOKE AND FIRE

ENGINE FIRE DURING GROUND OPERATIONS (Engine Start, Taxi and Takeoff With Sufficient Distance Remaining to Stop)

1. Power Levers - RETARD as required to retain control.
2. Engine Stop Buttons - PUSH momentarily if during engine start.
3. Condition Levers - EMER SHUT-OFF.
4. Firewall Shutoff Buttons - PUSH to close.
5. Brakes - AS REQUIRED.
6. Applicable Fire Extinguisher Armed Button - PUSH.
7. Battery Switches - OFF.

8. Generators - OFF.
9. Evacuate airplane as soon as practical.

CABIN FIRE DURING GROUND OPERATIONS (Engine Start, Taxi and Takeoff With Sufficient Distance Remaining to Stop)

1. Power Levers - RETARD as required to retain control.
2. Engine Stop Buttons - PUSH momentarily if during engine start.
3. Condition Levers - EMER SHUT-OFF.
4. Firewall Shutoff Buttons - PUSH to close.
5. Brakes - AS REQUIRED.
6. Battery Switches - OFF.

7. Generators - OFF.
8. Portable Fire Extinguisher - FIGHT FIRE.
9. Evacuate airplane as soon as practical.

INFLIGHT WING OR ENGINE FIRE (Illuminated Firewall Shutoff Button)

1. Condition Lever - EMER SHUT-OFF.
2. Illuminated Firewall Shutoff Button - PUSH to close.
3. Fuel Crossfeed Selector - OFF.
4. Affected Engine Fuel Boost Pump - OFF.

5. Applicable Fire Extinguisher Armed Button - PUSH (Optional System).
6. Appropriate Engine - SECURE.
7. Propeller Synchrophaser - OFF.
8. Pressurization Source Selector - SELECT operating engine.

NOTE

Initiate appropriate action to keep cabin pressure above ambient pressure in area of fire. This action will prevent smoke from entering the cabin.

9. Land and evacuate airplane as soon as practical.

INFLIGHT CABIN ELECTRICAL FIRE OR SMOKE

1. Use of Supplemental Oxygen - AS REQUIRED.
2. If Source of Fire or Smoke is Known:
 - a. Source - ISOLATE.
 - b. Fire - EXTINGUISH.
 - c. Smoke Removal Procedure - INITIATE.
- d. As Soon As Practical - LAND.
3. If Source of Fire or Smoke is Unknown:
 - a. Generator and Battery Switch(es) - OFF unless flight conditions dictate otherwise.
 - b. All Electrical Systems Switches - OFF.
 - c. Fire - EXTINGUISH.
 - d. Smoke Removal Procedure - INITIATE.
 - e. Generator and Battery Switch(es) - On.
 - f. Electrical Systems - REINSTATE required systems only, one at a time with a pause between switch actuations to determine source.
 - g. As Soon As Practical - LAND.
4. If fire or Smoke Cannot Be Isolated or Extinguished:
 - a. Emergency Descent - INITIATE.
 - b. Generator and Battery Switch(es) - OFF.

NOTE

Without electrical power, engines will switch to manual mode. All electric gyros, engine instruments, fuel boost pumps, annunciator lights and all avionics will be inoperative.

- c. As Soon As Practical - LAND.

SMOKE REMOVAL

1. Source of Smoke - IDENTIFY and ELIMINATE. Refer to procedures concerning airplane fires and pressurization air contamination.
2. Cabin Divider Door - OPEN (Optional Equipment).

NOTE

Normal airflow through the cabin will remove the contaminated air via the pressurization outflow valves.

3. Use of Supplemental Oxygen - AS REQUIRED.
4. If Source of Smoke Cannot be Eliminated:
 - a. EMERGENCY DESCENT as required.
 - b. Cabin Pressurization Toggle Valve - DEPRESS when oxygen requirements are satisfied.
 - c. Pressurization Source Selector - OFF.
 - d. Cabin Vent Control - PULL open.
5. As Soon As Practical - LAND.

SUPPLEMENTARY INFORMATION CONCERNING AIRPLANE FIRES

With the use of modern installation techniques and material, the probability of an airplane fire occurring in your airplane is extremely remote. However, in the event a fire is encountered, the following information will be helpful in dealing with the emergency as quickly and safely as possible.

The preflight checklist is provided to aid the pilot in detecting conditions which could contribute to an airplane fire. As a fire requires both fuel and an ignition source, close preflight inspection should be given to the engine nacelles, wing leading edges and wing lower surfaces. Leaks in the fuel system or oil system can lead to a ground or airborne fire.

NOTE

Flight should not be attempted with known fuel, oil or exhaust leaks. The presence of fuel, unusual oil or exhaust stains may be an indication of system leaks and should be carefully investigated prior to flight.

If an airplane fire is discovered on the ground or during takeoff, but prior to committed flight, the airplane is to be landed and/or stopped and the passengers and crew evacuated as soon as practical.

Fires originating in flight must be controlled as quickly as possible in an attempt to prevent major structural damage. Fire or smoke should be controlled by identifying and shutting down the faulty system. An appropriate course of action is: 1) identify the source of fire or smoke; 2) isolate the source; then 3) extinguish the fire. Until this process is complete, assume the worst and initiate action for an immediate landing. Above all, maintain control of the airplane! Inflight fires are unusual emergencies; therefore, it is understandable that a pilot could become distracted by the fire to the point that control could be lost. The pilot must be able to complete a deductive analysis to determine the source of the fire. Complete familiarity with the airplane, its systems and these procedures will prove invaluable should a fire occur.

Basically, two types of inflight fires exist: 1) wing or engine fires and 2) cabin fires and smoke. Each type has its peculiarities regarding isolation and smoke control.

Wing or engine fires are usually caused by a failure which allowed fuel to contact a hot surface or excessively hot temperatures to reach the fuel. Immediate actuation of the appropriate firewall shutoff will terminate bleed air and fuel flow at the firewall.

The objective of smoke control is to keep it out of the cabin rather than smoke removal. Keeping the cabin pressurized will prevent smoke from being drawn into the cabin, unless the smoke is being generated in the bleed air system. The pilot should lower the landing gear as late in the landing approach as possible. A no-flap landing should also be attempted if practical. Actuation of these devices create local pressure changes which could allow smoke to enter the cabin. Turn off the bleed air flow from the engine and/or wing which is on fire to prevent the possibility of smoke entering the cabin via the air cycle machine.

Cabin fires can be expected to be electrical in nature. If smoke is severe, use oxygen masks and begin a descent for landing. If the source of fire is unknown immediately, shut down all electrical equipment until smoke and fire are suppressed. One at a time, reinstate the electrical systems, allowing a pause between each system to determine which system is at fault. If smoke only is apparent, the source can be the bleed air sources or the air cycle machine. If selecting RH or LH on the pressurization source selector removes the smoke, the source is then identified as being the left or right engine bleed air. If smoke is not terminated with the pressurization source selector positioned to LH or RH, but smoke is suppressed with the selector in OFF, then the source of smoke is probably the air cycle machine or cabin air ducts. A review of the annunciator panel can provide assistance in the search.

2. Fuel Crossfeed Selector - AS REQUIRED to, burn off fuel from the tank over the defective gear.

NOTE

Fuel should be used from this tank first, to lighten the load on the wing, prior to attempting a landing if inflight time permits. However, an adequate supply of fuel should be left in this tank so that it may be used during landing. Maintain lateral balance within 300 pounds differential.

3. Fuel Crossfeed Selector - OFF.
4. If a crosswind landing is required select a runway with a crosswind from the side opposite the defective tire.
5. Wing Flaps - LAND.
6. In approach, align airplane with edge of runway opposite the defective tire, allowing room for a mild turn in the landing roll.
7. Land slightly wing-low on the side of inflated tire and lower nosewheel to ground immediately for positive steering.
8. Use full aileron in landing roll to lighten load on defective tire.
9. Apply brakes and reverse thrust as required to minimize landing roll and maintain directional control
10. Stop airplane to avoid further damage unless active runway must be cleared for other traffic.

LANDING WITH FLAT NOSE GEAR TIRE

If a blowout occurred on the nose gear tire during takeoff and the takeoff is continued, proceed as follows.

1. Landing Gear - Leave DOWN.

NOTE

Do not attempt to retract the landing gear if a nose gear tire blowout occurs. The nose gear tire may be distorted enough to bind the nosewheel strut within the wheel well and prevent later extension.

2. Move disposable load to baggage area and passengers to available rear seat space.
3. Approach at 104 KIAS with APPR wing flaps.
4. Land in a nose-high attitude with power.
5. Maintain back pressure on control wheel to hold nosewheel off the ground in landing roll
6. Use minimum braking in landing roll.
7. Power Levers - GRND IDLE during landing roll.
8. As landing roll speed diminishes, hold control wheel fully aft until airplane is stopped.
9. Avoid further damage by holding additional taxi to a minimum.

LANDING WITH DEFECTIVE MAIN GEAR

1. Fuel Crossfeed Selector - AS REQUIRED to burn off fuel from the tank over the defective gear.

NOTE

Fuel should be used from this tank first, to lighten the load on the wing, prior to attempting a landing if in-flight time permits. However, an adequate supply of fuel should be left in this tank so that it may be used during landing. Maintain lateral balance within 300 pounds differential.

2. Fuel Crossfeed Selector - OFF.
3. Select a wide, hard surface runway, or if necessary, a wide sod runway. Select a runway with crosswind from the side opposite the defective landing gear, if a crosswind landing is necessary.
4. Landing Gear - DOWN.
5. Wing Flaps - LAND.
6. In approach, align airplane with edge of runway opposite the defective landing gear, allowing room for a ground-loop in landing roll.
7. Land slightly wing-low toward the operative landing gear and lower the nosewheel immediately for positive steering.
8. Start moderate ground-loop into defective landing gear until airplane stops.
9. Engine Stop Buttons - PUSH momentarily.
10. Use full aileron in landing roll to lighten the load on the defective landing gear.
11. Apply brakes only on the operative landing gear to maintain desired rate of turn and minimize the landing roll.
12. Firewall Shutoff Buttons - PUSH.
13. Battery Switch(es) - OFF.
14. Evacuate the airplane as soon as it stops.

LANDING WITH DEFECTIVE NOSE GEAR

1. Move disposable load to baggage area and passengers to available rear seat space.
2. Landing Gear - DOWN.
3. Approach at 104 KIAS with APPR wing flaps.
4. Land in a slightly nose-high attitude.
5. Firewall Shutoff Buttons - PUSH.
6. Hold nose off throughout ground roll. Lower gently as speed dissipates.
7. Battery Switch(es) - OFF.

LANDING WITHOUT POWER

Wing Flaps Up With Propellers Feathered:

1. When Reaching Landing Site Is Assured.
 - a. Condition Levers - TAKEOFF, CLIMB AND LANDING.
 - b. Unfeathering Pump Switch - ACTUATE to initiate left and right propeller rotation to 8-10% RPM.
 - c. Wing Flaps - APPR. Wing flaps should reach the APPR position in less than 20 seconds.
 - d. Condition Levers - EMER SHUT-OFF when flaps at APPR.

Wing Flaps At APPR:

2. Condition Levers - EMER SHUT-OFF.
3. Firewall Shutoff Buttons - PUSH to close.
4. Boost Pumps - OFF.
5. Landing Gear - DOWN or UP at pilot's discretion.
 - (a) If Landing Gear Down Selected:
 - (1) Landing Gear Switch - DOWN.
 - (2) LDG GEAR System Circuit Breaker - PULL.
 - (3) Emergency Gear Extension T-Handle - PULL within gliding distance of field.
6. Approach - 104 KIAS.
7. Battery Switches - OFF.
8. Landing - INITIATE in nose-high attitude.

ENGINE INOPERATIVE LANDING

1. Fuel Balance - CHECK maximum of 300 pounds differential.
2. Fuel Crossfeed Selector - OFF.
3. Condition Lever - TAKEOFF, CLIMB AND LANDING.
4. Wing Flaps - T.O.
5. Approach at 120 KIAS with excessive altitude.
6. Landing Gear - DOWN within gliding distance of field.
7. Wing Flaps - LAND when landing is assured.
8. Decrease speed below 100 KIAS only if landing is assured.
9. Air Minimum Control Speed - 91 KIAS.
10. Power Levers - RETARD to FLIGHT IDLE.

WARNING

Do not retard power lever below FLIGHT IDLE while airborne.

11. Power Levers - GRND IDLE after touchdown.
12. Brakes, Reverse Thrust and Nosewheel Steering - AS REQUIRED.

CAUTION

If necessary, apply single-engine reversing cautiously as required to maintain directional control. The reverse thrust is counteracted by opposite brake and rudder. If runway braking action is less than normal due to loose gravel, sod surface, snow, ice or rain, careful modulation of power will be required to maintain directional control.

ENGINE INOPERATIVE GO-AROUND (Speed Above 100 KIAS)

WARNING

Level flight may not be possible for extreme combinations of weight, temperature and altitude.

1. Power Lever - ADVANCE to takeoff power while maintaining straight ahead flight. Maintain approximately 3 to 4° bank with a 2/3 to 3/4 ball slip (indicated on the turn and bank indicator) into the operative engine.
2. Wing Flaps - T.O.
3. Positive Rate-of-Climb - ESTABLISH at 110 KIAS.
4. Landing Gear - UP.
5. Airspeed - 115 KIAS.
6. Wing Flaps - UP.
7. Climb at 120 KIAS.
8. Trim Tabs - ADJUST.

DITCHING

1. Landing Gear - UP.
2. Plan approach into wind if winds are high and seas are heavy. With heavy swells and light wind, land parallel to swells, being careful not to allow wing tips to hit first.
3. Wing Flaps - LAND.
4. Carry sufficient power to maintain approximately 300 feet per minute rate-of-descent.
5. Airspeed - 91 KIAS minimum. Reduce airplane weight by fuel burn-off as much as practical.
6. Maintain a continuous descent until touchdown to avoid flaring and touching down tail-first, pitching forward sharply, and decelerating rapidly. Strive for initial contact at fuselage area below rear cabin section (point of maximum longitudinal curvature of fuselage).

NOTE

The airplane has not been flight tested in actual ditchings, thus the above recommended procedure is based entirely on the best judgment of Cessna Aircraft Company.

SYSTEMS EMERGENCIES

ENGINE

Left or Right Engine Start Light (L or R ENG. START) Remains On After Start

1. Engine(s) - OPERATE above 95% RPM momentarily to charge the EPA purge system.
2. Battery Switch(es) - ON if not already on.
3. Auxiliary Power Unit - OFF, then DISENGAGE if connected to prevent motoring the affected engine start motor during engine shutdown.
4. Engine(s) - SHUTDOWN.
5. Battery and Generator Switches - OFF WITHOUT DELAY to prevent motoring the affected engine start motor during engine shutdown.

CAUTION

The L or R ENG START light illuminates any time the start relay or cross start relay is closed. These relays provide current to the appropriate starter motor. Failure of the start relay to open will preclude a normal engine shutdown and will result in a starter/generator failure if the engine is shutdown in flight.

BETA Light Illumination At Low Power And Approach Airspeed (L or R BETA Light Illuminated)

NOTE

- Early illumination of beta lights at flight idle power settings and approach airspeeds while operating in manual mode can be experienced due to reduced fuel flow scheduling. Beta Light illumination will be accompanied by higher than normal drag and can be corrected by advancement of the power levers. In manual mode, the power levers should not be fully retarded to FLIGHT IDLE before touchdown.
- In normal mode operation, continued illumination of a L or R BETA light is abnormal and may be an indication of a failure in the propeller pitch control unit. It is possible the pilot will be unable to reduce thrust on the affected engine during the flare and after touchdown. The affected propeller should be feathered before landing.

1. Affected Engine Power Lever - ADVANCE slightly to extinguish the beta light and continue flight if desired.

If Beta Light Remains Illuminated:

2. Affected Engine Condition Lever - EMER SHUTOFF before landing. Refer to Engine Inoperative Landing Emergency procedures.

FUEL

Main and Auxiliary Boost Pump Failure

If fuel boost pump switches are positioned to MAIN and L or R AUX BOOST ON light illuminated with respective L or R FUEL PRESS LOW light illuminated, proceed as follows:

1. Maintain coordinated flight at all times.
2. Do not allow pitch attitude to exceed $\pm 10^\circ$ as indicated on the flight director indicator.
3. Adjust engine power as much as practical to maintain lateral fuel balance. Use caution during fuel crossfeed operations. Feeding from the inoperative side may result in an engine failure. Crossfeeding from the inoperative side may result in a dual engine failure.
 - a. During level coordinated flight only, begin crossfeed operation (from the operative side) before fuel level on the inoperative side reaches 150 pounds.
 - b. During attitudes other than level, begin crossfeed operation (from the operative side) before fuel level on the inoperative side reaches 300 pounds.
4. Land as soon as practical as lateral imbalance will be affected at the rate of 400 to 500 pounds per hour during crossfeed operation.

ELECTRICAL

Battery Overheat (BATT O'HEAT Light Or Lights Illuminated)

If Light or Lights Illuminate Continuously:

1. Battery 1 or Battery 2 - IDENTIFY (Airplanes Incorporating SK441-37).
 2. Battery Switch(es) - OFF.
3. Left Ammeter - CHECK while holding BATT/L GEN switch in BATT position.
 - a. If ammeter shows zero indication:
 - (1) Unaffected Battery Switch - ON if only one battery is overheated. (Airplanes incorporating SK441-37).
 - (2) Monitor overheat lights.
 - b. If ammeter shows up scale indication:
 - (1) Generators - OFF.

NOTE

Without electrical power, engines will switch to manual mode. All electric gyros, engine instruments, fuel boost pumps, annunciator lights and all avionics will be inoperative.

- (2) All Electrical System Switches - OFF.

- (3) After 5 minutes:
 - (a) Either Generator - ON.
 - (b) Left Ammeter - CHECK while holding BATT/L GEN switch in BATT position.
 - 1 If ammeter shows up scale indication:
 - a Generator - OFF.
 - 2 If ammeter shows zero indication:
 - a Generators (and Unaffected Battery for airplanes incorporating SK441-37) - ON.
 - b Reinstate electrical systems as required.
 - c Monitor overheat lights.

4. As Soon As Practical - LAND.

If Light or Lights Begin Flashing:

1. Battery Switch(es) - CHECK OFF.
2. Generators - OFF.

NOTE

Without electrical power, engines will switch to manual mode. All electric gyros, engine instruments, fuel boost pumps, annunciator lights and all avionics will be inoperative.

3. All Electrical Systems Switches - OFF.
4. After 5 Minutes:
 - a. Either Generator - ON.
 - b. Left Ammeter - CHECK while holding BATT/L GEN switch in BATT position.
 - (1) If ammeter shows up scale indication:
 - (a) Generator - OFF.
 - (2) If ammeter shows zero indication:
 - (a) Generators (and Unaffected Battery for airplanes incorporating SK441-37) - ON.
 - (b) Reinstate electrical systems as required.
 - (c) Monitor overheat lights.
5. As Soon As Practical - LAND.

FLIGHT CONTROLS

Electric Elevator Trim Runaway

1. Control Wheel - OVERPOWER as required.
 2. Control Wheel AP/TRIM Switch - DISCONNECT immediately.
3. Manual Elevator Trim - AS REQUIRED.
 4. Do not attempt to use the electric elevator trim system until ground maintenance has been completed.

Autopilot Emergencies

1. Autopilot Malfunction

- a. Elevator or Aileron Control - OVERPOWER as required.
- b. Control Wheel AP/TRIM Switch - DISCONNECT immediately.

NOTE

Sustained elevator overpower will result in the autopilot trimming against the overpower force.

2. Engine Failure

- a. Control Wheel AP/TRIM Switch - DISCONNECT.
- b. Operative Engine - ADJUST as required.
- c. Inoperative Engine - SECURE.
- d. Trim Tabs - ADJUST.
- e. Autopilot - REENGAGE if desired.

NOTE

Power, speed and/or configuration changes, such as on the approach to landing, will require manual trim adjustments to ensure continued proper autopilot operation.

3. Possible altitude loss if autopilot malfunctions (includes altitude loss prior to pilot recognition):
 - a. Cruise Configuration - 700 feet.
 - b. Approach Configuration - 190 feet.
4. Airplane control wheel forces required to overpower the autopilot (prior to autopilot elevator trimming against the overpower force) will not exceed:
 - a. Elevator - 40 pounds.
 - b. Aileron - 20 pounds.
 - c. Yaw Damper - 70 pounds.
5. Airplane control wheel forces, in excess of normal control forces, required to overpower a slip clutch in the event of a jammed servo actuator will not exceed:
 - a. Elevator - 50 pounds.
 - b. Aileron - 25 pounds.
 - c. Yaw Damper - 120 pounds.

ENVIRONMENTAL

Wing Overheat (L or R WING O'HEAT Light Illuminated)

NOTE

Bleed air flow from the affected wing will automatically be terminated when WING O'HEAT light illuminates. Bleed air flow will not resume upon clearance of the light. A latching voltage remains applied to the firewall shutoff.

1. Verify bleed air flow is automatically terminated. EGT indication on the affected side should decrease approximately 10 to 15°C.
2. If Any Doubt Exists Regarding Bleed Air Termination:
 - a. Pressurization Source Selector - SELECT the affected engine momentarily. A rise in cabin altitude indicates the bleed air flow has been shut off.
3. If WING O'HEAT Light Does Not Go Out In Two Minutes Or It Is Verified That Bleed Airflow Has Not Terminated:
 - a. Affected Engine - SECURE.
 - (1) Condition Lever - EMER SHUT-OFF.
 - (2) Firewall Shutoff - PUSH to close.
 - (3) Fuel Boost Pump - CHECK MAIN if fire does not exist.
- OFF if fire hazard does exist.
 - (4) Generator - OFF.
 - (5) Propeller Synchrophaser - OFF.
 - b. Operative Engine - ADJUST.
 - c. Trim Tabs - ADJUST to maintain bank toward operative engine.
 - d. Electrical Load - DECREASE if required to prevent battery discharge.
 - e. Fuel Crossfeed Selector - AS REQUIRED to maintain fuel balance.
Do not crossfeed if fire hazard exists.

NOTE

Schedule fuel use such that an adequate amount of fuel is available in the operative engine main tank for landing. Crossfeed as required to maintain lateral balance within 300 pounds differential.

- f. As Soon As Practical - LAND.

Emergency Pressurization (EMER PRESS ON Light Illuminated)**NOTE**

- Emergency pressurization bleed air will automatically be selected during an air cycle machine overheat condition. An EMER PRESS ON light will illuminate only due to an air cycle machine overheat condition.
- When operating on emergency pressurization, temperature control is no longer available and cabin temperature will climb uncontrollably.

1. If above 10,000 feet:
 - a. Use of Supplemental Oxygen - AS REQUIRED.
 - b. Emergency Descent - AS REQUIRED.
2. Pressurization Source Selector - OFF when oxygen requirements are satisfied or when cabin temperature becomes excessive.
3. For Ventilation while unpressurized:
 - a. Cabin Vent Control - PULL OPEN.
 - b. Cabin Pressurization Toggle Valve - DEPRESS.

Cabin Distribution Duct Overheat (AIR DUCT O'HEAT Light Illuminated)

1. CABIN TEMP Circuit Breaker - RESET.
2. Auto Temp Selector - MAN.
3. Manual Temperature Control - COOL and hold for 15 seconds.
4. If Light Goes Out:
 - a. Manual Temperature Control - AS REQUIRED.
5. If Light Does Not Go Out:
 - a. Pressurization Source Selector - EMER.
 - b. Initiate Emergency Pressurization procedure.

Cabin Overpressure (Over 6.3 PSI and Increasing)

1. Cabin Altitude Control - SET to higher cabin altitude.
 2. Cabin Rate Control - INCREASE.
- if Still Overpressure:
3. Pressurization Source Selector - LH or RH.

If Unable to Control:

4. Pressurization Source Selector - OFF.
 5. Use of Supplemental Oxygen - AS REQUIRED.
- If Above 10,000 Feet Without Supplemental Oxygen:
6. DESCEND as soon as practical.
 7. Pressurization Source Selector - LH or RH as required to limit maximum cabin altitude during descent.
 8. For Ventilation while unpressurized:
 - a. Cabin Vent Control - PULL OPEN.
 - b. Cabin Pressurization Toggle Valve - DEPRESS.

Cabin Altitude Above 10,000 Feet (CABIN ALT Light Illuminated On Airplanes Not Incorporating SK441-36)

Cabin Altitude Above 11,500 Feet (CABIN ALT Light Illuminated On Airplanes Incorporating SK441-36)

1. Use Of Supplemental Oxygen - INITIATE.
2. Emergency Descent - AS REQUIRED.
3. Pressurization Air Controls - CHECK.
 - a. Cabin Altitude Control - SET to maintain cabin altitude below 11,500 feet.
 - b. Cabin Pressurization Toggle Valve - PRESS (Guard Down).
 - c. Cabin Vent Control - PUSH in.
 - d. Pressurization Source Selector:
 - (1) CHECK BOTH, LH, RH or EMER if supplemental oxygen not available.

NOTE

If EMER position is required to maintain or lower cabin altitude, temperature control is no longer available and cabin temperature will climb uncontrollably.

4. If EMER Position is Required on the Pressurization Source Selector:
 - a. Emergency Descent - AS REQUIRED.
 - b. Pressurization Source Selector - OFF when oxygen requirements are satisfied or when cabin temperature becomes excessive.
5. For Ventilation while unpressurized:
 - a. Cabin Vent Control - PULL OPEN.
 - b. Cabin Pressurization Toggle Valve - DEPRESS.

Pressurization Air Contamination

1. Source of Contamination - IDENTIFY.
 - a. Pressurization Source Selector - LH, then RH, then EMER, then OFF.

NOTE

Pressurization air contamination can be from left or right engines or air cycle machine. When selecting the above positions, hold each position long enough to determine if smoke is decreasing. When a position is found which eliminates the generation of smoke, continue operation in that position.

If The Pressurization Source Selector is Positioned to OFF Above 10,000 Feet:

2. Use Of Supplemental Oxygen - INITIATE.
3. Emergency Descent - AS REQUIRED.
4. For Ventilation while unpressurized:
 - a. Cabin Vent Control - PULL OPEN.
 - b. Cabin Pressurization Toggle Valve - DEPRESS.
5. As Soon As Practical - LAND.

If The Pressurization Source Selector is Positioned to EMER Above 10,000 Feet:

NOTE

If EMER position is required to eliminate smoke generation, the air cycle machine is at fault. No temperature control is available in the EMER position; therefore, cabin temperature will climb uncontrollably.

6. Use of Supplemental Oxygen - INITIATE.
7. Emergency Descent - AS REQUIRED.
8. Pressurization Source Selector - OFF when oxygen requirements are satisfied or when cabin temperature becomes excessive.
9. For ventilation while unpressurized:
 - a. Cabin Vent Control - PULL OPEN.
 - b. Cabin Pressurization Toggle Valve - DEPRESS.
10. As Soon As Practical - LAND.

OXYGEN

Use Of Supplemental Oxygen

1. Oxygen Mask - DON.
2. Mask Regulator - CHECK 100% OXY.
3. Side Console Microphone Selector - OXY MASK.

NOTE

- Refer to Section 7 for oxygen duration for crew and passengers.
- For airplanes incorporating SK441-36 or the Quick-Don Oxygen Mask Option, refer to the Quick-Don oxygen Mask System Supplement in Section 9 of this handbook for oxygen duration chart and the description and operation of pilot's and copilot's oxygen masks.

4. Passenger Advisory Lights - ON.
5. Passenger Oxygen Masks Switch - DEPLOY as required.

NOTE

- All passenger masks will deploy automatically if the cabin altitude climbs above 14,500 feet.
- All passenger masks use a breathing cup with flow bag attached. Oxygen flow is indicated by an in-line flow indicator in the plastic supply tube or by inflation of the green bag within the flow bag.

6. Reconnect passenger mask pintle pins in oxygen flow valves after use. ■
Reposition pilot's microphone selector to HEADSET position.

ICE PROTECTION

Inadvertent Icing Encounter

1. Ignition Override Switches - ON. Observe ignition duty cycle limits.

NOTE

Turn one ignitor OFF at a time to satisfy duty cycle limits.

2. Engine Inlet Anti-Ice Switches - ON one at a time.

NOTE

If the possibility of ice exists in the engine inlets before the inlet heat switches are actuated, position the Ignition Override switches to ON before actuating inlet heat switches. Actuate the switches one at a time to ensure normal engine operation continues. Actuation of the Ignition Override switches will provide continuous ignition to prevent a flameout if ice should be ingested by the engine.

3. Pitot/Static Heat Switches - ON.
4. Stall Vane Anti-Ice Switches - ON.
5. Windshield Anti-Ice Switch - ON.
6. Propeller Deice Switches - ON.
7. Surface Deice Boots Switch - AS REQUIRED.

Windshield Air Overheat (W/S AIR O'HEAT Light Illuminated)

1. Verify windshield bleed air flow is terminated. Air flow noise associated with bleed air windshield operation should terminate, indicating bleed air flow was automatically terminated. When windshield temperature has decreased to a safe level, W/S AIR O'HEAT light will go out and the bleed air flow will turn back on.
2. If the system cycles on and off twice after initial turn on, indicating a failure of the air temperature controller and heat exchanger subsystem:
 - a. Windshield Anti-Ice Switch - OFF.
 - b. Leave icing conditions as soon as practical.
3. If windshield airflow does not automatically terminate or remains on when the anti-ice switch is selected to off, indicating a failure in the overheat protection subsystems:
 - a. Windshield Anti-Ice Switch - ON to allow the temperature control valve and heat exchanger to control bleed air temperature as much as possible.
 - b. Pressurization Source Selector - select EMER to draw hot bleed air through the cabin and away from the windshield.
 - c. Cabin Altitude Control - set to 10,000 feet to open the outflow valves as much as possible and maximize flow of hot air out of the cabin.
 - d. Cabin Rate Control - INCREASE.
 - e. Land as soon as practical.

Engine Inlet Anti-Ice Failure (ENGINE ANTI-ICE Light Out)

NOTE

The green ENGINE ANTI-ICE light will be on when the system is operating properly.

1. Ignition Override Switch - ON.
2. Leave icing conditions as soon as practical.

Surface Deice Failure

If the SURFACE DEICE annunciator remains on longer than 30 seconds after deice boot actuation:

1. Surface Deice Switch - RESET then ON.
2. If normal operation does not occur, leave icing conditions as soon as practical.

Pitot/Static System Failure

1. Pitot/Static Heat Switches - CHECK ON.
2. Pilot's and Copilot's Instruments - DETERMINE which instruments are functioning normally.

NOTE

Initiate climb or descent with fixed power and watch for appropriate indication on rate-of-climb, airspeed and altimeter. Above 15,000 feet, an EGT split will assist in determining the inoperative system.

3. Complete flight on the operative instruments.

NOTE

Copilot's pitot/static system is totally separate from the pilot's system.

4. Affected Engine - ADJUST fuel flow and torque to match the values shown on the normally functioning engine.

NOTE

The left engine EGT references the left pitot system and the right engine EGT references the right pitot system. Loss of either pitot system will cause Δ P/P compensation to be lost from the EGT system indication.

Propeller Deice Failure

If uneven deicing of the propeller is indicated by excessive vibration:

1. Condition Lever - TAKEOFF, CLIMB and LANDING then return to CRUISE.
2. Propeller Ammeter - CHECK for proper operation by periodic fluctuations within the green arc.
3. If ammeter reading is below the green arc, indicating the propeller blades may not be deicing uniformly:
 - a. Propeller Deice Switch - OFF.
4. Leave icing conditions as soon as practical.

EMERGENCY EXITS

Emergency Exit Window Removal

1. Cabin Pressurization Switch - DEPRESSURIZE.
2. Cabin Differential Pressure - CHECK ZERO DIFFERENTIAL.
3. Emergency Release Handle Plastic Cover - PULL OFF.
4. Release Handle - ROTATE AS REQUIRED.
5. Emergency Exit Window - PULL IN and DOWN.

CABIN DOOR NOT SECURED (DOOR NOT LOCKED Light Illuminated)

1. If Loud Crack Or Other Evidence Of Actual Door Failure:
 - a. Cabin Pressurization Toggle Valve - DEPRESS.
 - b. Use of Supplemental Oxygen - AS REQUIRED.
 - c. Pressurization Source Selector - OFF.
 - d. Emergency Descent - AS REQUIRED.

- e. For ventilation while unpressurized:
 - (1) Pressurization Source Selector - BOTH.
- f. As Soon As Practical - LAND.

WARNING

Do not attempt to check the security of the cabin door. Remain as far from the door as possible with seat belts securely fastened until landing is completed.

2. If Light is Not Accompanied by Other Evidence of Actual Door Failure:
 - a. If above 10,000 feet:
 - (1) Use of Supplemental Oxygen - INITIATE.
 - (2) Descend as soon as practical.
 - b. Cabin Pressurization Toggle Valve - DEPRESS when oxygen requirements are satisfied.
 - c. As Soon As Practical - LAND.

WARNING

Do not attempt to check the security of the cabin door. Remain as far from the door as possible with seat belts securely fastened until landing is completed.

IMPENDING SKIN PANEL OR WINDOW FAILURE

1. Cabin Pressurization Toggle Valve - DEPRESS.
2. Use of Supplemental Oxygen - AS REQUIRED.
3. Pressurization Source Selector - OFF.
4. Emergency Descent - AS REQUIRED.

5. For ventilation while unpressurized:
 - a. Pressurization Source Selector - BOTH.
6. As Soon As Practical - LAND.

NOSE BAGGAGE DOOR OPEN ON TAKEOFF

If a baggage door is left unlatched, it may open as the nose is raised on takeoff. The door will not hit a propeller nor will there be any unusual handling characteristics. If sufficient runway remains for a safe abort, the airplane should be stopped. If the decision is made to continue the takeoff, maintain airspeed below 120 KIAS and return for landing as soon as practical. Avoid lowering the nose abruptly which could throw loose objects out of the compartment.

LOCATOR BEACON RESCUE PROCEDURES**Before Landing**

1. VHF COM - SET 121.5 MHz and transmit May Day calls for assistance if time permits.

After Landing

1. Plug Button - REMOVE (Located On RH Side of Tail Cone, Aft of the Access Panel).
2. Locator Beacon Switch - ON.

After Rescue

1. Locator Beacon Switch - OFF.

TRANSPONDER PROCEDURES FOR EMERGENCY SITUATIONS**Emergency Signal Transmission**

1. ALT and ON Pushbutton Switches - PUSH IN.
2. Reply-Code Selector Switches - SELECT Code 7700.

Loss Of Communications Signal Transmission

1. ALT and ON Pushbutton Switches - PUSH IN.
2. Reply-Code Selector Switches - SELECT Code 7600.

Hijacked Signal Transmission

1. ALT and ON Pushbutton Switches - PUSH IN.
2. Reply-Code Selector Switches - SELECT Code 7500.

TOTAL LOSS OF COMMUNICATIONS

In the event that the audio control panel malfunctions such that Com operations cannot be performed on COM 1, COM 2 or COM 3, proceed as follows:

1. Function Selector Switch - EMER COM.

NOTE

Speaker operations will be inoperable in all modes since the EMER COM position turns off all power to the switch panel.

2. Employ the headsets if not already in use.
3. Set the desired frequency on the designated emergency COM (1 or 2) and proceed with communications on that Com only.
4. Select the NAV, MKR, ADF or DME audio to be monitored by setting the appropriate receiver selector switches to HDST. A reduction in normal amplitude will be experienced while operating in the emergency mode.

SPINS

Intentional spins are not permitted in this airplane. Should a spin occur however, the following recovery procedures should be employed:

1. Power Levers - FLIGHT IDLE IMMEDIATELY.
2. Ailerons - NEUTRALIZE.
3. Rudder - HOLD FULL RUDDER opposite the direction of rotation.
4. Control Wheel - FORWARD BRISKLY, 1/2 turn of spin after applying full rudder.
5. Inboard Engine - INCREASE POWER to slow rotation. (If necessary).

After rotation has stopped:

6. Rudder - NEUTRALIZE.
7. Inboard Engine (If used) - DECREASE POWER to equalize engines.
8. Control Wheel - PULL to recover from resultant dive. Apply smooth steady control pressure.

NOTE

The airplane has not been flight tested in spins; thus, the above recommended procedure is based entirely on the best judgment of Cessna Aircraft Company.

SECTION 3

ABNORMAL PROCEDURES

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* Airplanes not incorporating Cessna Service Bulletin CQB01-1R2.

INTRODUCTION

The procedures in this part of the handbook describe the recommended procedures for abnormal situations. An abnormal procedure is one requiring the use of special systems and/or the alternate use of regular systems which, if followed, will maintain an acceptable level of airworthiness.

ENGINE

START SEQUENCE WILL NOT BEGIN

1. Switches and Circuit Breakers - RECHECK.
2. Voltmeter - CHECK.
3. Engine Stop Button - PUSH momentarily.
4. L or R Engine Start Button - PUSH.

NOTE

If start sequence does not begin on either engine, the start sequence is probably locked in the airstart mode. This probably is caused by a failure of the left landing gear safety switch.

ENGINE CRANKS BUT FUEL FLOW AND IGNITION DO NOT OCCUR

1. (Normal Mode Only) Manual Start Switch - 10% POSITION momentarily (Guard Raised And Switch Up) at 10 to 15% RPM.

NOTE

- If the above action allows the engine to start normally, the 10% switch has probably failed.
- Do not exceed starter duty cycle.
- Perform all future ground starts on this engine in manual mode.

START SEQUENCE COMPLETE BUT IGNITION AND GEN OFF LIGHTS REMAIN ILLUMINATED

1. Affected Generator - RESET then ON.
2. Ignition Override Switches - CHECK OFF.
3. If Lights Still Illuminated:
 - a. (Normal Mode Only) Manual Start Switch - 60% POSITION momentarily (at 60 to 70% RPM).

NEGATIVE TORQUE SENSING IN FLIGHT

1. Power Lever(s) - ADVANCE slightly.

NOTE

NTS operation, as evidenced by a cycling sound of the engine(s), can occur at high airspeed with power levers at FLIGHT IDLE; this is particularly true when operating in manual mode. NTS operation occurs when the propeller is driving the engine, rather than the engine driving the propeller. During normal mode operation, NTS can indicate the fuel flow is insufficient for existing conditions.

MONOPOLE FAILURE (LEFT or RIGHT FAIL Light Illuminated) *

NOTE

Illumination of the monopole monitor failure light indicates one of the two speed sensors have failed. Normal operation will continue. Subsequent flights should be conducted in manual mode.

- * Airplanes not incorporating Cessna Service Bulletin CQB01-1R2.

**TORQUE, EGT OR RPM OSCILLATIONS IN NORMAL MODE
(EGT/TORQUE Limiting in AUTO)**

Affected Engine:

1. Synchrophaser - OFF (If Installed).
2. Power Lever - REDUCE POWER below torque or temperature limit.
3. EGT/TORQUE Limiting Switch - OFF (If Installed).

If Oscillations Persist:

4. Condition Lever - TAKEOFF, CLIMB AND LANDING.
5. Power Lever - REDUCE POWER below torque or temperature limit.
6. Fuel Computer Switch - OFF. Verify illumination of FUEL COMP OFF annunciator light and engine speed stabilizing at 100% RPM.

7. Refer to Manual Mode Operating Procedures in this section for continued operation.

If Oscillations Persist:

8. Engine Securing Procedure - COMPLETE. Refer to Emergency Procedure in Section 3.

PROPELLER**PROPELLER SYNCHROPHASER FAILURE**

1. Propeller Synchrophaser - OFF (If Installed).

FUEL**MAIN FUEL BOOST PUMP FAILURE (L or R AUX BOOST ON Light Illuminated)****NOTE**

The L or R AUX BOOST ON annunciator light illumination is normal with the Fuel Boost switch positioned to AUX and/or during crossfeed operations. During crossfeed, the tank providing the fuel will have its AUX BOOST ON annunciator illuminated.

1. Fuel System Circuit Breakers - CHECK and reset as required.
2. Affected Fuel Boost Switch - OFF then MAIN.

NOTE

- Leave the fuel boost switch in the MAIN position to allow proper crossfeed operation.
- If a main boost pump should fail, the auxiliary boost pump will automatically start, providing sufficient fuel flow for all operations. During the automatic transition, momentary (2 to 3 seconds) illumination of the L or R FUEL PRESS LOW annunciator light is normal.
- If the auxiliary boost pump should fail also, as indicated by continuous illumination of the L or R FUEL PRESS LOW annunciator light, refer to Main And Auxiliary Boost Pump Failure procedure in the Emergency Procedures.

FUEL TRANSFER PUMP FAILURE (L or R X-FER PUMP FAIL Light Illuminated)

1. Avoid Attitudes Which Will Cause Light Illumination.

NOTE

- The L or R X-FER PUMP FAIL light will illuminate when the forward and/or aft transfer pump fails. If the light illuminates in a nose-high attitude, the aft transfer pump has failed. If the light illuminates in the nose-low attitude, the forward transfer pump has failed. Light illumination is normal when the fuel quantity is less than 80 pounds and when on the ground before actuating the boost pump with fuel quantity less than 580 pounds.
- If L or R X-FER PUMP FAIL light illuminates continuously with fuel quantity greater than 80 pounds, the result will be the same as if the main and auxiliary fuel boost pumps have failed. Refer to Main And Auxiliary Boost Pump Failure procedure in the Emergency Procedures.

2. If Crossfeeding, Fuel Crossfeed Selector - OFF until light extinguishes.

FUEL PRESSURE LOW (L or R FUEL PRESS LOW Light Illuminated)

If L or R FUEL PRESS LOW Light is Illuminated and Respective L or R AUX BOOST ON Light is Not Illuminated, Proceed as Follows:

1. Fuel Boost Pump - AUX.

NOTE

The L or R FUEL PRESS LOW light will illuminate momentarily while transitioning from one fuel boost pump to the other or when the auxiliary and main boost pumps are not operating.

2. If light does not go out and L or R X-FER PUMP FAIL light is also illuminated, refer to Main And Auxiliary Boost Pump Failure in the emergency procedures.

ELECTRICAL

GENERATOR FAILURE (L or R GEN OFF Light Illuminated)

1. Electrical Load - DECREASE as required to prevent discharge of the batteries.
2. DC POWER Circuit Breakers - CHECK and reset as required.
3. Affected Generator - RESET then ON.
4. If Normal Generator Operation Does Not Occur:
 - a. Affected Generator - OFF.

HYDRAULICS**LOW HYDRAULIC FLOW (L or R HYD FLOW LOW Light Illuminated)**

1. As Soon As Practical - LAND.

NOTE

The HYD FLOW LOW annunciator light will illuminate when hydraulic fluid quantity is low or to indicate a hydraulic system component failure. Be prepared for a wing flaps up landing and the possible requirement for actuating the emergency landing gear extension system.

HYDRAULIC SYSTEM PRESSURIZED (HYD PRESS ON Light Illuminated)**NOTE**

The HYD PRESS ON annunciator light is illuminated when the landing gear or wing flaps are in an operational cycle. If the light remains illuminated after the landing gear and/or wing flaps have reached their selected positions, proceed with the following steps.

1. Airspeed - 140 KIAS or less.
2. LDG GEAR and FLAP CONTROL System Circuit Breakers - CYCLE to determine which system is causing the malfunction.
3. Landing Gear and/or Wing Flap Switch - RAPIDLY RECYCLE.

CAUTION

If the HYD PRESS ON annunciator light cannot be extinguished, land as soon as practical to prevent damage to the hydraulic system and/or components.

4. If Light Fails To Go Out And Wing Flaps Are Causing The Malfunction:
 - a. Wing Flaps Switch - MOVE slightly away from selected position.
 - b. If Light Remains Illuminated:
 - (1) Wing Flaps Switch - SELECT desired position.
 - (2) FLAP CONTROL System Circuit Breaker - PULL after wing flaps reach desired position.
5. If Light Fails To Go Out And Landing Gear Is Causing The Malfunction:
 - a. Landing Gear Switch - RAPIDLY RECYCLE.
 - b. If Light Remains Illuminated:
 - (1) Landing Gear Switch - SELECT desired position.
 - (2) LDG GEAR System Circuit Breaker - PULL after landing gear reaches desired position.
6. Before Landing - REINSTATE applicable circuit breaker.

NOTE

Normal landing gear or wing flap operation will not be available until the applicable circuit breaker is reinstated.

WING FLAPS

LANDING WITHOUT WING FLAPS (0° Extension)

Use Normal Procedures for Before Landing, Balked Landing and After Landing except as follows:

1. Approach Speed - 114 KIAS (See Figures 5-29 thru 5-31).
2. Balked Landing Transition Speed - 114 KIAS.
3. Landing distance from over the obstacle will be approximately 75% greater than normal.

LANDING GEAR

LANDING GEAR WILL NOT EXTEND NORMALLY

1. Airspeed - 140 KIAS or less.

NOTE

Airspeeds as high as 180 KIAS may be used; however, as low an airspeed as practical is recommended as a lower airspeed will decrease the airloads on the nose gear during extension, thereby insuring gear extension.

2. Landing Gear Switch - DOWN.
3. LDG GEAR System Circuit Breaker - PULL.
4. Emergency Gear Extension T-Handle - PULL.
5. Gear Down Lights - ON; Unlocked Light - OFF.
6. If Main Gear Does Not Lock Down - YAW AIRPLANE. Airloads will lock main gear down if uplocks have released.
7. Gear Warning Horn - CHECK.
8. As Soon As Practical - LAND.

CAUTION

The landing gear cannot be retracted in flight, once the emergency gear extension T-handle has been pulled. Ground servicing is required.

LANDING GEAR DOWN AND LOCKED LIGHT ILLUMINATED WITH GEAR HANDLE UP AND HYDRAULIC PRESSURE LIGHT OUT

1. Perform "LANDING GEAR WILL NOT EXTEND NORMALLY" procedures.

NOTE

Failure of any one of the three down lock switches in the down position may result in that gear not locking down during a gear down cycle if the other two gears lock down first. The down and locked light for the affected gear may remain on continually regardless of actual gear position.

ICE PROTECTION

Engine Inlet Anti-Ice Valve Fails To Close (L or R ENGINE ANTI-ICE Light On With Switch Off)

1. Engine Inlet Anti-Ice Switch - CYCLE. Attempt to close the valve.
2. If the valve closes (ENGINE ANTI-ICE Light Extinguishes):
 - a. Continue normal operations.
 - b. Service the valve as soon as practical.
3. If the valve remains open (ENGINE ANTI-ICE Light Remains On):
 - a. Outside Air Temperature Below 4°C:
 - (1) Continue normal flight operations.
 - b. Outside Air Temperature Above 4°C:
 - (1) Discontinue the flight as soon as practical.
 - (2) Secure the respective engine immediately upon landing and clearing the runway.
 - c. Service the valve prior to the next flight.

ENVIRONMENTAL**AUTOMATIC CABIN TEMPERATURE CONTROL FAILURE**

1. Auto Temp Selector - MAN.

NOTE

Before initiating manual operation, check the temperature sensor air inlet on the aft cabin baggage step for possible obstruction of airflow. Items such as luggage and coats must be kept clear of the inlet in order for the system to function properly.

2. Manual Temp Control - HEAT or COOL for 15 seconds. This action will drive the air cycle machine bypass valve toward full hot or full cold.

NOTE

Wait a few minutes to evaluate the cabin temperature change before again actuating the manual temperature switch. Approximately 21 seconds of switch actuation will drive the bypass valve from full open to full closed.

AVIONICS BUS FAILURE

1. Applicable Avionics Bus Switch Breaker - RESET after cooling 3 minutes.
 - a. If Switch Breaker Trips Again - DO NOT RESET.
2. With L AVIONICS BUS Switch Breaker Off, The Following Avionics Will Be Inoperative:

a. RMI 1	f. G/S 1	k. RADIO ALTIMETER
b. RNAV 1	g. NAV 1	l. ALTITUDE ALERT
c. ADF 1	h. COM 1	m. MARKER BEACON
d. DME 1	i. AUDIO 1*	n. COM 3
e. XPDR 1	j. RADIO TELEPHONE	
3. With R AVIONICS BUS Switch Breaker Off, The Following Avionics Will Be Inoperative:

a. RMI 2	g. NAV 2	m. RADAR R/T
b. RNAV 2	h. COM 2	n. RADAR STAB
c. ADF 2	i. AUDIO 2	o. FDI 2
d. DME 2	j. A/P COMPUTER	
e. XPDR 2	k. A/P ACTUATORS	
f. G/S 2	l. YAW DAMPER	

*Powered by Right AVIONICS BUS Switch Breaker on single audio control panel installations on Airplanes 441-0071 thru 441-0172.

400 ENCODING ALTIMETER FAILURE (Warning Flag In View)

1. ENC ALT Circuit Breaker - RESET.
2. If warning flag remains in view, use the standby barometric altimeter.

CREW TRAINING ONE ENGINE INOPERATIVE PROCEDURES**TRAINING SHUTDOWN DURING CRUISE FLIGHT**

1. Power Lever - RETARD to AIRSTART position.

NOTE

- The AIRSTART position does provide some forward thrust. This position is recommended as it allows the best EGT stabilization before shutdown and it is the lowest position which will prevent the fuel computer from tripping to manual mode during an airstart.
- If the power lever is retarded below the AIRSTART position and the fuel computer trips to manual mode, normal mode may be regained by advancing the power lever slightly and cycling the fuel computer switch to OFF then back to ON.

2. Inoperative Engine - DETERMINE. Idle engine same side as idle foot; also, torque and EGT will be low.
3. Aileron and Rudder - AS REQUIRED toward operative engine to maintain straight-ahead flight.
4. After EGT Has Stabilized (Approximately 30 Seconds After Setting Power Lever To AIRSTART Position):
 - a. Engine Stop Button - PUSH and hold for 5 seconds. Observe engine negative torque sensing.
 - b. Condition Lever - EMER SHUT-OFF above 30% RPM.
 - c. Firewall Shutoff - PUSH to close.
5. Operative Engine - ADJUST as required.
6. Landing Gear - UP.
7. Wing Flaps - UP above 115 KIAS.
8. Inoperative Engine.
 - a. Fuel Boost Pump - CHECK MAIN if fire hazard does not exist.
- OFF if fire hazard does exist.
 - b. Generator - OFF.
 - c. Propeller Synchrophaser - OFF (If Installed).
9. Operative Engine - ADJUST.
10. Trim Tabs - ADJUST to maintain bank toward operative engine.
11. Electrical Load - DECREASE if required to prevent battery discharge.
12. Fuel Crossfeed Selector - AS REQUIRED to maintain fuel balance. Do not crossfeed if fire hazard exists.

NOTE

Crossfeed as required to maintain lateral balance within 300 pounds per side.

13. Inoperative Engine:
 - a. Ignition Override Switch - CHECK OFF.
 - b. Condition Lever - START AND TAXI after propeller has feathered.

CAUTION

- Use of the Unfeathering Pump Switch prior to pushing the engine stop button will result in unwanted fuel in the engine and a possible engine start-up. Ensure that fuel has been shut off by pushing the stop button prior to activating the Unfeathering Pump Switch.
- Do not allow engine to continuously NTS between 18% and 28% RPM.

- c. Unfeathering Pump Switch - PUSH as required to maintain 10% to 15% RPM.
- d. Condition Lever - EMER SHUT-OFF when EGT is 200°C or less if immediate restart is planned. For prolonged shutdown, continue rotation until 150°C EGT is reached.

CAUTION

An airstart may not be possible after a prolonged shutdown during which the engine oil temperature has been allowed to decrease below 4°C.

SIMULATED ENGINE FAILURE (Fuel Interruption) IN TAKEOFF CONFIGURATION

1. Power Levers - SET for desired symmetrical power.
2. Wing Flaps - T.O.
3. Landing Gear - DOWN.
4. Trim - AS REQUIRED ($V_{SSE} = 98$ KIAS).

NOTE

Practice demonstrations of V_{MC_A} should be conducted in accordance with Section 4, Normal Procedures. Trim setting should be set to TAKEOFF positions prior to the simulated engine failure to provide representative control forces during the maneuver.

5. Instructor Pilot - INITIATE simulated engine failure after EGT has stabilized.
 - a. Engine Stop Button - PUSH momentarily.
6. Aileron and Rudder - AS REQUIRED toward operative engine to maintain straight-ahead flight. Maintain 3° to 4° bank with 2/3 to 3/4 ball slip into operative engine.
7. Power Levers - TAKEOFF POWER.
8. Landing Gear - UP.
9. Climb to Clear Obstacle - 110 KIAS.
10. Inoperative Engine - DETERMINE. Idle engine same side as idle foot; also, torque and EGT will be low.
 - a. Condition Lever - EMER SHUT-OFF.
 - b. Firewall Shutoff - PUSH to close.
11. Airspeed - ACCELERATE to 115 KIAS.
12. Wing Flaps - UP.
13. Climb - 120 KIAS (One Engine Inoperative Best Rate-of-Climb Speed With Wing Flaps UP).
14. Trim Tabs - ADJUST to maintain bank toward operative engine.
15. Inoperative Engine.
 - a. Fuel Boost Pump - CHECK MAIN if fire hazard does not exist.
- OFF if fire hazard does exist.
 - b. Generator (Inoperative Engine) - OFF.
 - c. Propeller Synchrophaser - OFF (If Installed).
16. Electrical Load - DECREASE if required to prevent battery discharge.
17. Fuel Crossfeed Selector - AS REQUIRED to maintain fuel balance. Do not crossfeed if fire hazard exists.

NOTE

Crossfeed as required to maintain lateral balance within 300 pounds per side.

18. Inoperative Engine:

- a. Ignition Override Switch - CHECK OFF.
- b. Condition Lever - TAKEOFF, CLIMB AND LANDING after propeller has feathered.

CAUTION

- Use of the Unfeathering Pump Switch prior to pushing the engine stop button will result in unwanted fuel in the engine and a possible engine start-up. Ensure that fuel has been shut off by pushing the stop button prior to activating the Unfeathering Pump Switch.
- Do not allow engine to continuously NTS between 18% and 28% RPM.

- c. Unfeathering Pump Switch - PUSH as required to maintain 10% to 15% RPM.
- d. Condition Lever - EMER SHUT-OFF when EGT is 200°C or less if immediate restart is planned. For prolonged shutdown, continue rotation until 150°C is reached.

CAUTION

An airstart may not be possible after a prolonged shutdown during which the engine oil temperature has been allowed to decrease below 4°C.

TRAINING AIRSTART

CAUTION

An airstart may not be possible after a prolonged shutdown during which the engine oil temperature has been allowed to decrease below 4°C.

Before Airstart:

1. Engine Stop Button - PUSH momentarily to cancel and reset start logic and close the electric fuel shutoff.
2. Altitude - BELOW 20,000 feet.
3. Airspeed - 100 to 200 KIAS.
4. Firewall Shutoff - PUSH to open.
5. Condition Lever - START AND TAXI.
6. Power Lever - AIRSTART.
7. Generator - OFF.
8. Fuel Boost Pump - CHECK MAIN.
9. Propeller Synchrophaser - OFF (If Installed).

10. Unfeathering Pump Switch - PUSH and hold until RPM has stabilized at 10% to 15% RPM.

CAUTION

Do not allow engine to continuously NTS between 18% and 28% RPM. If RPM enters this speed range, reduce airspeed, position the condition lever to EMER SHUTOFF and restart the Training Airstart procedure.

11. EGT - CHECK below 200°C.

Normal Mode Airstart:

1. Fuel Computer Switch - CYCLE OFF then back to ON if fuel computer tripped to manual mode.
 - a. FUEL COMP OFF Annunciator - OFF.
2. EGT - Below 200°C if sufficient time exists.
3. Engine Start Button - PUSH momentarily. Observe propeller rotation.
 - a. Fuel and Ignition - CHECK fuel flow increase and ignition light on at 10% RPM.
 - b. EGT Rise - CHECK after reaching 10 to 20% RPM. (If EGT rise does not occur by 25% RPM, reject start by positioning condition lever to EMER SHUT-OFF then pushing the engine stop button. Perform an inflight engine clearing procedure, refer to Section 4, before attempting a second start with following manual mode procedures).

CAUTION

If RPM stops increasing prior to 40% RPM, or if EGT is approaching 770°C and rising rapidly, immediately reject start by positioning condition lever to EMER SHUT-OFF, then pushing the engine stop button. Perform an engine clearing procedure before attempting a second start.

- c. Condition Lever - TAKEOFF, CLIMB AND LANDING (at 60% RPM).

NOTE

- Abrupt movement of the condition lever should be avoided. Premature advancement of the condition lever prior to reaching 60% RPM may result in reverting to manual mode (refer to manual mode airstart).
- Excess delay in advancement of condition lever may result in spurious EGT indications. Advancing the condition lever at this time will stabilize the EGT reading.

- d. Engine Instruments - CHECK.
 - (1) Oil Pressure - CHECK rising within 10 seconds after engine light off. (if no rise is indicated, shut down engine by positioning condition lever to EMER SHUT-OFF).
 - (2) RPM Stabilization - check 100% RPM.
- 4. Generator - RESET then ON.
- 5. Fuel Boost Pump - CYCLE to OFF then to MAIN.

Manual Mode Airstart:

- 1. Fuel Computer Switch - OFF.
- 2. EGT - Below 200°C if sufficient time exists.
- 3. Engine Start Button - PUSH momentarily. Observe propeller rotation.
- 4. Manual Start Switch - 10% POSITION momentarily (at 10 to 15% RPM).
- 5. Engine Start Button - PUSH immediately and hold for fuel enrichment at light off.
 - a. Fuel and Ignition - CHECK fuel flow increase and ignition light on.
 - b. EGT Rise - CHECK within 10 seconds after reaching 10% RPM or at 20% RPM. (If EGT rise does not occur, reject start by positioning condition lever to EMER SHUT-OFF then pushing the engine stop button. Perform an inflight engine clearing procedure, refer to Section 4, before attempting a second start).
- 6. Engine Start Button - PUSH as required for fuel enrichment to assist engine acceleration to 100% RPM. Modulate within EGT and RPM limits.

CAUTION

If RPM stops increasing prior to 40% RPM, or if EGT is approaching 770°C and rising rapidly, immediately reject start by positioning condition lever to EMER SHUT-OFF then pushing the engine stop button. Perform an engine clearing procedure before attempting a second start.

- 7. Manual Start Switch - 60% POSITION momentarily (at 60 to 70% RPM).
 - a. Engine Instruments - CHECK.
 - (1) Oil Pressure - CHECK rising within 10 seconds after engine light off. (If no rise is indicated, shut down engine by positioning condition lever to EMER SHUT-OFF.)
 - (2) RPM Stabilization - CHECK 100% RPM.
- 8. Generator - RESET then ON.
- 9. Fuel Boost Pump - CYCLE to OFF then to MAIN.
 - a. FUEL PRESS LOW and AUX BOOST ON Annunciator Lights - OFF.
- 10. Condition Lever - TAKEOFF, CLIMB AND LANDING.

MANUAL MODE OPERATING PROCEDURES

DETERMINING ENGINE POWER FOR MANUAL MODE OPERATION

When operating in manual mode, the condition lever does not control engine RPM. Engine RPM is controlled by the propeller governor to maintain $100 \pm .5\%$ RPM. Engine power levels are indicated by EGT and torque. Three methods are available to determine appropriate EGT values: 1) OAT gage reference; 2) reference to Section 2 Maximum EGT Limits chart; and 3) matching power against the normal mode engine.

OAT Gage Reference

During EGT limited operations, adjust the power lever of the manual mode engine to the EGT value indicated on the EGT scale of the OAT gage. This value is conservative, thus full power is not available. When both engines are in manual mode, this method will prove most satisfactory for cruise climb, cruise and descent. The pilot must continually monitor OAT and manually adjust the power levers as required to maintain the proper EGT values.

Maximum EGT Limit Chart

The maximum EGT limit chart, see Figure 2-5, provides maximum allowable EGT when both engines are operating in manual mode at 100% RPM. The pilot must monitor OAT and airspeed and manually adjust the power levers as required to maintain the proper EGT or torque values. All manual mode performance data shown in Section 5 is based on torque limit, fuel flow available or EGT limit as shown in Figure 2-5.

Matching Power Against Normal Mode Engine

This method provides maximum power available, at all altitudes and temperatures, with minimum pilot effort. To use this method, only one engine can be operating in manual mode. Set the condition levers of the normal mode engine to TAKEOFF, CLIMB AND LANDING. Adjust the power lever of the manual mode engine such that its fuel flow or torque matches the fuel flow or torque of the normal mode engine. Match the engine parameter which will provide the lowest power from the manual mode engine. At high altitudes, in certain conditions, it may not be possible to match torque or fuel flow due to the lower fuel flow scheduling provided by the manual mode fuel control.

NOTE

The following procedures are applicable when both engines are operating in manual mode. If only one engine is operating in manual mode, refer to the Normal Procedures checklist for the engine operating in normal mode unless the following procedures specify otherwise.

BEFORE STARTING ENGINES

1. Preflight Inspection - COMPLETE.
2. If a quick turnaround after a flight (10 to 45 minutes):
 - a. Propellers - ROTATE by hand, 10 minutes before engine start. Move propeller so spinner rotates only 1-3/8 inches, while checking for abnormal engine noises and freedom of rotation. If abnormal noises occur, refer to System Check Procedures in Section 4.

CAUTION

Rotate the propellers in the normal direction only (counterclockwise as viewed when standing in front of propeller). Rotating the propeller backwards will shorten the starter-generator brush service life and can have adverse affects on engine mounted accessories which are sensitive to reverse rotation.

3. Cabin Door - LATCHED and SECURE.
 - a. Safety Pin - INSTALLED (airplanes 441-0001 thru -0034 and -0036 thru -0069)
4. Emergency Exit Window Locking Pin - CHECK REMOVED (Optional System).
5. Control Locks - REMOVE.
6. Seats, Seat Belts and Shoulder Harnesses - ADJUST and SECURE.
7. Parking Brake - SET.
8. All Switches and Circuit Breakers - SET.
 - a. Left and Right Side Panel Circuit Breakers - CHECK IN.
 - b. Ignition Override Switches - OFF.
 - c. Generators - OFF.
 - d. Fuel Boost Pump Switches - OFF.
 - e. Deice/Anti-Ice Switches - OFF.
 - f. Avionics Bus Switches - OFF.
 - g. Gyro Inverter Switch - OFF.
 - h. All Guarded Switches - GUARDS DOWN.
9. Battery Switch(es) - ON.
10. Interior and Exterior Lights - AS REQUIRED.
 - a. Master Lighting Switch - AS REQUIRED.
 - b. Panel Lights - AS REQUIRED.
 - c. External Lights - CHECK OFF.
11. Passenger Advisory Lights - ON.
12. Landing Gear Switch - DOWN; Check Green Lights - ON.
13. Avionics Bus Switches - ON.

14. Annunciator Panel and Warning Lights - PRESS-TO-TEST.

NOTE

- Airplanes 441-0001 thru 441-0115:

The press-to-test function will also test the landing gear warning horn, avionic light displays in both Coms, both Navs, ADF, autopilot mode selector, autopilot mode repeater annunciators, all marker beacon lights, altitude alert annunciator, the GA and DH lights in the pilot's ADI, the RN and BC lights in the pilot's OBI repeater and the optional copilot's RNAV light adjacent to the HSI.

- Airplanes 441-0116 thru 441-0172:

The press-to-test function will also test the landing gear warning horn, light displays in the autopilot mode selector, autopilot mode repeater annunciators, all marker beacon lights, altitude alert annunciator, the GA and DH lights in the pilot's ADI, the RN and BC lights in the pilot's OBI repeater and the optional copilot's R-NAV light adjacent to the HSI.

- a. Firewall Shutoff Buttons - CYCLE one at a time. Check illumination of F/W SHUTOFF and optional BOT ARMED annunciator lights.
15. Avionics Bus Switches - OFF.
16. Oxygen Quantity, Pilots' Masks and Hoses - CHECK.
17. Pilot and Copilot Oxygen Masks - DON with mask regulator in 100% OXY position. Insure no restrictions to breathing are present and that adequate oxygen pressure exists. COCK mask and STOW on cockpit side panel hooks.
18. Pressurization Source Selector - OFF.
19. Power Levers - FLIGHT IDLE.
20. Condition Levers - START AND TAXI.
21. Fuel Crossfeed Selector - OFF.
22. Cabin Vent Control - PUSH IN.
23. Cabin Pressurization Switch - PRESS (Guard Down).
24. Trim Tabs - CHECKED and SET.
25. Cabin Fan - OFF.
26. External Lights - AS REQUIRED.

NOTE

Operation of the anticollision lights is not recommended for any ground operations, particularly at night. These high intensity lights are of considerable annoyance to ground personnel and other pilots.

STARTING ENGINES

Battery Start (Left Engine First)

1. Voltmeter - CHECK 24 volts minimum. If less than 24 volts is indicated, refer to Starting Engines With Auxiliary Power procedure.

CAUTION

Do not attempt a ground engine start unless the start locks are engaged (propeller in flat pitch). If a start is attempted with the start locks disengaged, a hot start will result.

2. Propeller - CLEAR and on start locks.
 - a. If propeller start locks are not engaged:
 - (1) Power Lever - REVERSE.
 - (2) Unfeathering Pump Switch - ACTUATE and hold until propeller is on the start locks.
 - (3) Power Lever - FLIGHT IDLE.
3. Fuel Computer Switches - OFF. Check FUEL COMP OFF lights on.
4. Fuel Boost Pumps - AUX. Check AUX BOOST ON annunciator light on.
5. NTS Check - COMPLETE before the first flight of the day.
 - a. Unfeathering Pump Switch - ACTUATE until NTS CHECK annunciator light illuminates; hold switch while engine start button is pushed and CHECK NTS annunciator light goes out; continue to hold switch until approximately 30% engine RPM and observe NTS annunciator illuminates, then release switch.

NOTE

Do not attempt to start engine until EGT is less than 200°C.

6. Engine Start Button - PUSH momentarily. Observe propeller rotation. (If propeller rotation does not start immediately, reject start by pushing engine stop button.)
7. Manual Start Switch - 10% POSITION momentarily at 10 to 15% RPM.
8. Engine Start Button - PUSH immediately and hold for fuel enrichment at light-off.
 - a. Fuel and Ignition - CHECK fuel flow increase and ignition light on.
 - b. EGT Rise - CHECK within 10 seconds after reaching 10% RPM or at 20% RPM. (If EGT rise does not occur, reject start by pushing engine stop button.)

CAUTION

Perform a Ground Operations Engine Clearing Procedure before attempting a second start. Refer to System Check Procedures in Section 4. Observe starting cycle limitations.

9. Engine Start Button - PUSH as required for fuel enrichment to assist engine acceleration to 85% RPM. Modulate within EGT and RPM limits.

CAUTION

- If RPM stops increasing prior to 40% RPM, or if EGT is approaching 770°C and rising rapidly, immediately push the engine stop button. Exceeding 770°C can seriously damage the engine.
- Perform a Ground Operations Engine Clearing Procedure before attempting a second start. Refer to System Check Procedures in Section 4. Observe starting cycle limitations.

10. Manual Start Switch - 60% POSITION momentarily (at 60 to 70% RPM).
 - a. Engine Instruments - CHECK.
 - (1) Oil Pressure - CHECK rising within 10 seconds after engine light off. If no rise indicated, shut down engine and determine cause.
 - (2) Engine Idle Speed - CHECK 75% to 95% and not affected by condition lever setting.
11. Generator - ON; Voltmeter - CHECK 28 volts.
12. Pressurization Source Selector - LEFT.
13. Wing Flaps - UP.
14. Repeat steps 2 through 11 for the right engine after ammeter decreases below 200 amperes.
15. Pressurization Source Selector - BOTH. The GND position is disabled during manual mode operations.

STARTING ENGINES WITH AUXILIARY POWER

NOTE

When an auxiliary power unit is used, ensure the unit is negatively grounded and regulated to 28 volts DC with a capability of providing a minimum of 800 amperes during the starting cycle. Maximum allowable auxiliary power output is 1700 amperes.

1. Battery Switch(es) - OFF.
2. Auxiliary Power Unit - ENGAGE, then ON.
3. Left Engine - START using appropriate Battery Starting Engines procedure.
4. Right Engine - START using appropriate Battery Starting Engines procedure.
5. Battery Switch(es) - ON.
6. Auxiliary Power Unit - OFF, then DISENGAGE.
7. Generators - ON.

BEFORE TAXIING

1. Passenger Briefing - COMPLETE.
2. Emergency Pressurization Check - COMPLETE, if applicable.
3. Windshield Anti-Ice Check - COMPLETE, if applicable.
4. Overspeed Governors - CHECK 103.5 to 105.5%. Check before the first flight of the day if airstarts are planned, if any maintenance in the engine control system has been performed, if there is any indication of malfunction, or whenever fuel type is changed. Refer to System Check Procedures in Section 4 for appropriate procedures.

- 5. Propeller Start Locks - DISENGAGE. Move power levers slowly toward reverse. If the Beta annunciator light(s) goes out, stop power lever movement until light(s) comes on again. Continue movement until a positive indication of reverse thrust is observed (rise in torque and EGT).
 - a. Power Levers - GRND IDLE.
- 6. Gyro Inverter - ON.
- 7. Avionics - AS REQUIRED. Refer to applicable avionics system procedures in Section 4 or Section 9.
 - a. Avionics Bus Switches - ON.
- 8. Parking Brake - RELEASE. Pushing in the parking brake knob releases trapped fluid in the brake system allowing the brakes to release.

TAXIING

1. Power Levers - AS REQUIRED for taxiing.

CAUTION

When operating in manual mode, no underspeed governing is available. If reverse thrust is required, monitor RPM continuously to prevent engine speed from falling below 55% RPM. If RPM drops below 55% at any time, immediately return the power lever(s) to GRND IDLE.

NOTE

- If both engines are operating in manual mode, taxi power can be improved by removing bleed air and gear driven accessory loads from the engines. Under some conditions (advancing power levers too rapidly), the engine(s) will not accelerate properly. Acceleration can be improved by pushing the engine start button(s) as required to provide additional fuel enrichment.
- During all operations in manual mode, compensated EGT is presented on the EGT indicators. The inner green arc on the EGT indicator displays the normal operating range for ground operations.

2. Brakes - CHECK.
3. Flight Instruments - CHECK.

BEFORE TAKEOFF

1. Brakes - SET.
2. Power Levers - GRND IDLE.
3. Fuel Low Pressure Lights - CHECK OFF.
4. Fuel Boost Pumps - OFF momentarily. Check AUX BOOST ON annunciator lights off and FUEL PRESS LOW annunciator lights on.
 - a. Fuel Boost Pumps - MAIN. Check AUX BOOST ON and FUEL PRESS LOW annunciator lights off.

NOTE

If engine(s) continues to operate on the auxiliary fuel pump(s), as evidenced by illumination of the AUX BOOST ON annunciator light(s), momentarily position the fuel boost pump(s) to OFF then back to MAIN.

5. Ice Protection Equipment - CHECK or CHECK AS REQUIRED. Refer to System Check Procedures in Section 4.
 - a. Windshield Anti-ice - CHECK. Avoid prolonged ground operation.
 - b. Engine Inlet Anti-Ice - CHECK.

CAUTION

Operate windshield and engine inlet heat for check purposes only (maximum of 10 seconds) if outside air temperature is above 4°C (40°F).

- c. Propeller Deice - CHECK AS REQUIRED
 - d. Surface Deice - CHECK AS REQUIRED.

NOTE

Windshield and engine inlet anti-ice systems should be activated to purge any possible entrapped water from the windshield nozzle and ensure satisfactory systems operation prior to each flight. Propeller deice, surface deice, windshield anti-ice and engine inlet anti-ice systems should be checked if icing conditions are anticipated.

6. Annunciator Panel - CLEAR except for L and R Beta and L and R FUEL COMP OFF lights.
7. Flight Control CHECK, free and correct.
8. Instrument Air Pressure CHECK.
9. Flight Instruments and Avionics - SET. Refer to applicable avionics systems procedures in Section 4 or Section 9 for additional information.
 - a. Electric Elevator Trim Disengage Check - COMPLETE. Refer to applicable System Check Procedures in Section 4 for additional information.
 - b. Autopilot Preflight Check - COMPLETE. Refer to applicable System Check Procedures in Section 4 for additional information.
10. Engine Instrument - CHECK.
11. Fuel Quantity and Balance - CHECK. Do not exceed 300 pounds asymmetric fuel loading.
12. Fuel Crossfeed Selector - CYCLE, then OFF. When selector is in the left and right positions, check annunciator panel for proper light illumination.
13. Trim Tabs - SET elevator, aileron and rudder tabs in the takeoff range.
14. Pressurization Source Selector - BOTH.

15. Cabin Pressurization and Temperature Controls - SET.
 - a. Pressurization Toggle Valve - PRESS (Guard Down).
 - b. Altitude Control - SET to destination field pressure altitude plus 200 feet (outer scale) or cruise altitude plus 500 feet (inner scale) whichever gives the highest cabin altitude.
 - c. Rate Control - SET to reach selected cabin altitude at approximately the same time the airplane reaches cruise altitude.
 - d. Auto Temp Selector - SET for automatic temperature control.
 - e. Cabin Fan - AS REQUIRED.
16. Wing Flaps - SET T.O. Position.
17. Cabin Door and Windows - CLOSE.
18. Seat Belts and Shoulder Harness - SECURE.
19. Brakes - RELEASE.

TAKEOFF (Ground Roll To 50-Foot Obstacle)

NOTE

- When operating one engine in normal mode and the other engine in manual mode, the power response will be slower on the manual mode engine. The engine in manual mode will operate at 100% RPM regardless of condition lever setting. It is recommended that both engines be operated in manual mode for takeoff.
- The power levers may be mismatched between the two manually controlled engines. The degree of mismatch depends upon the basic calibration of the hydro-mechanical controls and the effects of atmospheric conditions. While in position for takeoff, set the brakes and slowly advance the power levers for takeoff power. Press the engine start buttons as required to obtain fuel enrichment to aid engine acceleration to 100% RPM. Do not initiate the takeoff roll until propeller governing is established and the BETA annunciator lights are out.

1. Anti-Collision Lights - ON.
2. Ice Protection Equipment - AS REQUIRED.
 - a. Pitot Static Heat - ON.
3. Power Levers - GRND IDLE.
4. Condition Levers - TAKEOFF, CLIMB AND LANDING.
5. Power Levers - ADVANCE for takeoff power. Press the engine start buttons as required to obtain fuel enrichment to aid engine acceleration to 100% RPM. Do not exceed 1669 ft-lbs. torque or manual mode EGT limits whichever occurs first. Check engine speeds at 100% RPM.

CAUTION

Torque and temperature limiting (optional some airplanes) is inoperative on engines operating in manual mode. Torque and EGT must be manually controlled to prevent engine damage.

NOTE

When operating in manual mode, the EGT limit is conservatively indicated by the outside air temperature indicator pointer. The maximum allowable EGT, see Figure 2-5, must be used to obtain the performance specified in Section 5.

6. Engine Instruments - CHECK.
7. Rotate - 98 KIAS.
8. Airspeed - 110 KIAS until obstacles are cleared.

AFTER TAKEOFF

1. Brakes - APPLY momentarily.
2. Landing Gear - RETRACT. Check gear unlocked and HYD PRESS ON lights off.
3. Airspeed - 115 KIAS.
4. Wing Flaps - UP.
5. Recommended Climb Speed - 140 KIAS.

CLIMB

1. Power Levers - SET.

NOTE

- When operating in manual mode, EGT is conservatively indicated by the outside air temperature indicator pointer. The maximum allowable EGT, see Figure 2-5, must be used to obtain the performance specified in Section 5.
- When operating in manual mode, only one RPM (100%) is available. Condition levers do not control RPM when operating in manual mode.
- Optional torque and temperature limiting and propeller synchrophaser systems are inoperative when engines are operating in manual mode.

2. Airspeed - 140 KIAS.
3. Trim Tabs - ADJUST.
4. Yaw Damper - AS DESIRED.
5. Cabin Altitude/Differential Pressure and Rate-of-Climb Indicators - CHECK for desired pressurization.
6. Oxygen Masks - POSITION around neck above 25,000 feet (Airplanes Incorporating SK441-36).
7. Ice Protection Equipment - AS REQUIRED.

CRUISE

1. Power Levers - AS REQUIRED. Do not exceed 1669 ft-lbs torque or manual mode EGT limit as shown in Figure 2-5, whichever occurs first. Do not exceed 245 KIAS.

NOTE

When operating in manual mode, only one engine RPM (100%) is available. Condition levers do not control RPM when operating in the manual mode.

2. Trim Tabs - ADJUST.
3. If an enroute climb is desired:
 - a. Airspeed - 160 KIAS.
 - b. Trim Tabs - ADJUST.
 - c. Cabin Rate Control - ARROW UP.
 - d. Cabin Altitude Control - SET SLOWLY as cruising altitude changes. Reset cabin altitude control to destination field pressure altitude plus 200 feet (outer scale), or cruise altitude plus 500 feet (inner scale) whichever gives the highest cabin altitude.
4. If Icing Conditions Are Encountered (Below 4°C), Refer to Section 4 for Additional Information.

DESCENT

1. Foot Warmer Valves - DEF.
 - a. Cabin Fan Switch - OFF if necessary to defog windshields during the descent.
 - b. Cabin Flood Air Control - AS REQUIRED to assist defogging of windshield.
2. Pressurization - SET.
 - a. Cabin Altitude - SET SLOWLY. During the initial portion of the descent, set the cabin altitude control to field pressure altitude plus 200 feet (outer scale).
 - b. Cabin Rate Control - SET to reach selected cabin altitude (zero cabin pressure) at approximately the same time the airplane reaches field pressure altitude plus 200 feet.
3. Ice Protection Equipment - AS REQUIRED. Refer to Section 4 for additional information.
4. Power Levers - AS REQUIRED for desired rate-of-descent.
5. Fuel Crossfeed Selectors - OFF.
6. Altimeter - SET.
7. Passenger Advisory Lights - ON.
8. Seat Belts and Shoulder Harness - SECURE.

BEFORE LANDING

1. Ice Protection Equipment - AS REQUIRED. Insure anti-icing systems are OFF when outside air temperature is above 4°C.
2. Fuel Quantity and Balance - CHECK. Maintain lateral balance within 300 pounds differential.
3. Fuel Crossfeed Selector - OFF.
4. Wing Flaps - T.O. or APPR below 200 KIAS. With wing flaps extended beyond APPR, landing gear warning horn will sound until gear is extended.
5. Propeller Synchrophaser - OFF (If Installed).

NOTE

If landing will be attempted with one engine in manual mode, switch the second engine into manual mode.

6. Landing Gear - DOWN below 180 KIAS. Check down lights ON; Unlocked light - OFF.
7. Landing and Taxi Lights - AS REQUIRED.
8. Condition Levers - TAKEOFF, CLIMB AND LANDING.
9. FUEL COMP OFF Annunciator Lights - ILLUMINATED.
10. Cabin Differential Pressure - CHECK ZERO DIFFERENTIAL.
11. Ignition Override Switches - AS REQUIRED.

NOTE

The Ignition Override switches may be positioned to ON to prevent the possibility of a flameout if the runway is covered with slush or deep standing water.

12. Autopilot/Yaw Damper - OFF.
13. Wing Flaps - LAND below 180 KIAS.
14. Approach Speed - 99 KIAS at 9360 pounds. Refer to Section 5 for speeds at reduced weights.

NOTE

Prestall buffet and stall speeds increase slightly when deice boots are actuated. Maintain extra speed before actuating the boots and to compensate for the ice on the unprotected surfaces.

- a. Power Levers - RETARD for desired rate-of-descent.

WARNING

During manual mode operations, do not fully retard the power levers to FLIGHT IDLE before touchdown. The manual mode flight idle fuel schedule can result in a higher than normal propeller drag and descent rate. The descent rate is increased with the use of engine inlet heat and/or windshield anti-ice.

NOTE

- When operating in manual mode, engine NTS operation can occur if the power levers are retarded fully to the FLIGHT IDLE position.
- During the landing with both engines in manual mode, perform a normal approach, controlling the descent and matching engine thrust with power lever adjustments.

15. Power Levers - FLIGHT IDLE at touchdown.
16. Power Levers - GRND IDLE after touchdown. Lift flight idle stops to achieve GRND IDLE position.
17. Beta Lights - CHECK ON.

CAUTION

During the landing with both engines in manual mode, do not retard the power levers below GRND IDLE. Rapid movement of the power levers below GRND IDLE at high ground speeds can cause the engines to decelerate to below 55% RPM.

BALKED LANDING

1. Power Levers - ADVANCE for takeoff power.

CAUTION

Torque and temperature limiting is inoperative on engines operating in manual mode. Torque and EGT must be manually controlled to prevent engine damage.

NOTE

When operating in manual mode, EGT is conservatively indicated by the outside air temperature indicator pointer. The maximum allowable EGT, see Figure 2-5, must be used to obtain the performance specified in Section 5.

2. Balked Landing Transition Speed - 99 KIAS.
3. Wing Flaps - T.O.
4. Landing Gear - RETRACT during IFR go-around or simulated IFR go-around after establishing a positive rate-of-climb.

NOTE

- Experience indicates that retracting the landing gear during an operational VFR go-around, when an immediate landing is contemplated, has been conducive to gear up landings.
- Always follow the Before Landing Checklist.

5. Trim airplane for climb.
6. Wing Flaps - UP as soon as all obstacles are cleared and airspeed is above 115 KIAS.

AFTER LANDING

1. Wing Flaps - UP.
2. Ice Protection Equipment - OFF.
3. Power Levers - GRND IDLE. Operate at this power setting at least 3 minutes prior to shutdown.

NOTE

Engine RPM will drop to the manual mode idle value as the power levers are retarded. Rapid movement of the power levers below flight idle at high ground speeds can cause the engines to decelerate to below 55% RPM.

4. Anti-Collision Lights - AS REQUIRED.

SHUTDOWN

NOTE

Allow engines to operate a minimum of three minutes with the power levers in GRND IDLE position before shutdown to insure proper EGT stabilization. Taxi time may be included in the three-minute period.

1. Wing Flaps - T.O.
2. Fuel Boost Pumps - OFF.
3. Avionics Bus and Gyro Inverter Switches - OFF.
4. Engine Stop Buttons - PUSH and hold for 5 seconds.
 - a. Condition Levers - GUARD until certain that engine stop buttons are terminating engine operation.

CAUTION

When the engine stop buttons are pushed, a slight rise in RPM and EGT followed by an immediate drop in fuel flow should occur. If the immediate drop does not occur, immediately position the condition lever to EMER SHUT-OFF to prevent the possibility of an engine compartment fire.

5. Power Levers - REVERSE and hold until engine RPM decreases below 30% RPM to insure start locks engage.
6. Power Levers - GRND IDLE after propellers stop.

NOTE

If the indicated fuel quantity is less than 580 pounds on either or both sides, the operational status of the L and/or R X-FER PUMP FAIL annunciator can be checked. The applicable X-FER PUMP FAIL light should illuminate within one to two minutes after turning off the fuel boost pumps.

7. All Other Switches - OFF.
8. Parking Brake - SET if brakes are cool.
9. Pilot and Copilot Oxygen Masks - UNCOCK and STOW (Airplanes incorporating SK441-36).
10. Control Locks - INSTALL.
11. Emergency Exit Window Locking Pin - INSTALL (Optional System).

SECTION 4

NORMAL PROCEDURES

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INTRODUCTION

Section 4 of this handbook describes the recommended procedures for normal operations. The first part of this section provides normal procedural action required in an abbreviated checklist form. Amplification of the abbreviated checklist is presented in the second part of this section.

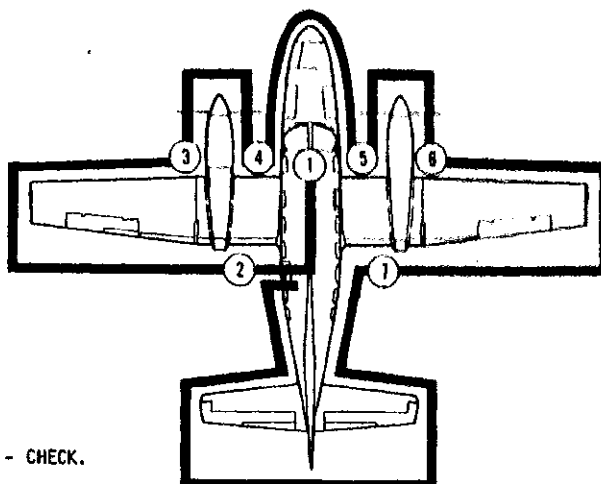
NOTE

- Refer to Section 9 of this handbook for amended operating limitations, operating procedures, performance data and other necessary information for airplanes equipped with specific options.
- Refer to Section 3, Abnormal Procedures, of this handbook for amended operating procedures when the engines are operating in manual mode.

PREFLIGHT INSPECTION

NOTE

- Visually check inspection plates and general airplane condition during walk-around inspection. If night flight is planned, check operation of all lights and make sure a flashlight is available.
- Ensure airplane has been serviced with the proper grade and type of fuel.
- Refer to Section 8 for quantities, materials and specifications of frequently used service items.



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- ①
 - a. Control Lock - REMOVE and stow.
 - b. Parking Brake - SET.
 - c. All Switches - OFF.
 - d. All Circuit Breakers - IN.
 - e. Spare Fuses - Ensure availability.
 - f. Oxygen Quantity, Pilot's Masks and Hoses - CHECK.
 - g. Landing Gear Switch - DOWN.
 - h. Trim Tab Controls (3) - SET for takeoff.
 - i. Fuel Crossfeed Selector - OFF.
 - j. Check fuel placard for proper engine adjustment for type fuel used (if installed).
 - k. *Cabin Fire Extinguisher - CHECK security and pressure.
 - l. Windshield and Windows - CHECK for cracks and general condition.
 - m. Battery Switches - ON.
 - n. Fuel Gages - CHECK quantity and operation.
 - o. *Fuel Totalizer - SET.
 - p. Pitot/Static and Stall Vane Heat Switches (3) - ON 20 seconds then OFF. Ensure pitot tube covers are removed before actuating switches.
 - q. Anti-Collision Lights - CHECK operation; then OFF.
 - r. *Recognition Lights - CHECK operation; then OFF.
 - s. Navigation and Wing Deice Lights - CHECK operation; then OFF.
 - t. Taxi Light - CHECK operation; then OFF.
 - u. Landing Light - CHECK operation; then OFF.
 - v. Battery Switch - OFF.
 - w. *Emergency Exit Window Locking Pin - REMOVE and STOW.
- ②
 - a. Wing Flap - CHECK security and attachment.
 - b. Exhaust Cover - REMOVE, if installed.
 - c. Engine Exhaust Area and Upper and Lower Tail Pipe Louvers - CLEAR.
 - d. Control Surface Lock - REMOVE, if installed.
 - e. Aileron and Trim Tab - CHECK condition, drains clear, security and aileron freedom of movement.
 - f. Trailing Edge Static Discharge Wicks - CHECK condition and attachment.
 - g. Navigation Light and Lens - CHECK condition.
 - h. Landing Light Filament - CHECK condition.
 - i. Stall Warning Vane - CHECK freedom of movement, audible warning and warn.
 - j. Fuel Tank Fuel Quantity - CHECK; Cap - SECURE.
 - k. Fuel Tank Vent and Overboard Drain Line - CLEAR.
 - l. Bottom Outboard Wing - CHECK for fuel leaks or stains.
 - m. Outboard Wing Deice Boot - CHECK condition and security.
- ③
 - a. Wing Tie Down - REMOVE.
 - b. Engine Cowling - SECURE.
 - c. Engine Intake Air Inlet Cover - REMOVE.
 - d. Engine Intake Air Inlet - CLEAR; Intake Temperature Sensor - CONDITION.
 - e. Engine Compressor Blades - CHECK for damage.
 - f. Propeller - ROTATE in normal direction by hand, checking for abnormal engine noises and freedom of rotation.
 - g. Propeller Blades - CHECK for nicks, gouges and security and propeller blades are on the start locks (flat pitch).
 - h. Propeller Hub and Spinner - CHECK for condition, cracks and grease or oil leakage.
 - i. Propeller Anti-Ice Boots - CHECK for condition and security.
 - j. Oil Level - CHECK above the ADD mark.
 - k. Oil Filter Bypass Valve - CHECK indicator button to be flush in non-actuated condition.
 - l. Oil Cooler Air Inlet - CLEAR.
 - m. Generator Air Inlet - CLEAR.
 - n. Engine Drains - CLEAR.
 - o. Fuel Tank Sumps and Crossfeed Line (3) - DRAIN. CHECK for water and contamination.
 - p. Inboard Deice Boot and Stall Strip - CHECK condition and security.
 - q. Main Gear, Strut, Door, Tire and Wheel Well - CHECK.
 - r. *Engine Fire Extinguisher Bottle Pressure - CHECK pressure. See Figure 4-3.
 - s. Lower Fuselage, Nose and Center Section - CHECK for fuel, oil and hydraulic fluid leaks or stains and antenna security.
 - t. Hydraulic Fluid Relief Overboard Line - CLEAR.
 - u. Wing Root Leading Edge Vent and Scupper Drains - CLEAR.
- ④
 - a. Hydraulic Fluid Reservoir Level - CHECK sight gage for dark color.
 - b. Battery Inlet and Overboard Vent Lines - CLEAR.

Figure 4-1 (Sheet 1 of 2)

PREFLIGHT INSPECTION

- c. Emergency Landing Gear
Blow Down Bottle Pressure - CHECK in the green arc. On airplanes -0071 and On, check that red ring is not showing on the blow-down valve control rod.
 - d. Baggage - SECURE.
 - e. Windshield Air Outlet - CLEAR.
 - f. Nose and Avionics Baggage Doors - SECURE and LOCKED (with key).
 - g. Nose Gear, Strut, Stop Block, Door, Tire and Wheel Well - CHECK.
 - h. Windshield Bleed Air Heat Exchanger Inlet - CLEAR and cover REMOVED.
 - i. Taxi Light Filament - CHECK condition.
 - j. Tie Down - REMOVE.
 - k. Pitot Tubes - CLEAR and WARM.
 - l. Air Cycle Machine Inlet and Temperature Sensor - CHECK clear and condition.
 - m. Instrument Air Overboard Line - CLEAR.
 - n. Windshield Bleed Air Heat Exchanger Exit Door - CLOSED.
 - o. Air Cycle Machine and Windshield Air Outlets - CLEAR.
 - p. Nose Baggage Door - SECURE and LOCKED (with key).
 - q. Avionics Cover - SECURE.
- ⑤
- a. Inboard Deice Boot and Stall Strip - CHECK condition and security.
 - b. Wing Root Leading Edge Vent and Scupper Drains - CLEAR.
 - c. Overboard Drain Lines (2) - CLEAR.
 - d. Lower Fuselage, Nose and Center Section - CHECK for fuel, oil and hydraulic fluid leaks or stains and antenna security.
 - e. *Engine Fire Extinguisher Bottle Pressure - CHECK pressure. See Figure 4-3.
 - f. Main Gear, Strut, Door, Tire and Wheel Well - CHECK.
 - g. Fuel Tank Sumps and Crossfeed Line (3) - DRAIN. CHECK for water and contamination.
 - h. Oil Cooler Air Inlet - CLEAR.
 - i. Generator Air Inlet - CLEAR.
 - j. Engine Drains - CLEAR.
 - k. Engine Intake Air Inlet Cover - REMOVE.
 - l. Engine Intake Air Inlet - CLEAR; Intake Temperature Sensor - CONDITION.
 - m. Engine Compressor Blades - CHECK for damage.
 - n. Propeller - ROTATE in normal direction by hand, checking for abnormal engine noises and freedom of rotation.
 - o. Propeller Blades - CHECK for nicks, gouges and security and propeller blades are on the start locks (flat pitch).
 - p. Propeller Hub and Spinner - CHECK for condition, cracks and grease or oil leakage.
 - q. Propeller Anti-Ice Boots - CHECK for condition and security.
 - r. Oil Level - CHECK above the ADD mark.
 - s. Oil Filter Bypass Valve - CHECK indicator button to be flush in non-actuated condition.
 - t. Wing Tie Down - REMOVE.
- ⑥
- a. Outboard Wing Deice Boot - CHECK condition and security.
 - b. Bottom Outboard Wing - CHECK for fuel leaks or stains.
 - c. Fuel Tank Vent and Overboard Drain Line - CLEAR.
 - d. Fuel Tank Fuel Quantity - CHECK; Cap - SECURE.
 - e. Landing Light Filament - CHECK condition.
 - f. Navigation Light and Lens - CHECK condition.
 - g. Trailing Edge Static Discharge Wicks - CHECK condition and attachment.
 - h. Control Surface Lock - REMOVE, if installed.
 - i. Aileron - CHECK condition, drains clear, security and freedom of movement.
 - j. Exhaust Cover - REMOVE, if installed.
 - k. Engine Exhaust Area and Upper and Lower Tail Pipe Louvers - CLEAR.
 - l. Wing Flap - CHECK security and attachment.
- ⑦
- a. Static Ports (3) - CLEAR. Do not blow into static ports.
 - b. Tailcone Access Door - SECURE.
 - c. Tailcone Overboard Vent - CLEAR.
 - d. Antennas - CHECK condition and security.
 - e. Oxygen Overboard Vent Blowout Disc - CHECK green color.
 - f. Tailcone Drain Holes and *Air Conditioning Exhaust - CHECK clear of obstructions.
 - g. *Air Conditioning Dorsal Fin Intake - CLEAR of obstructions.
 - h. Vertical Stabilizer Antenna - CHECK condition and security.
 - i. Vertical Stabilizer Deice Boot - CHECK condition and security.
 - j. Horizontal Stabilizer Deice Boot - CHECK condition and security.
 - k. Control Surface Locks - REMOVE, if installed.
 - l. *Rudder Gust Lock - RELEASED.
 - m. Trailing Edge Static Discharge Wicks - CHECK condition and attachment.
 - n. Elevators and Trim Tabs - CHECK condition, drains clear, freedom of movement, excessive looseness and trim tab position. Check that tab push-pull rods are secured to trim tabs.
 - o. Rudder and Trim Tab - CHECK condition, rudder freedom of movement and trim tab position. Move rudder right; trim tab should move left.
 - p. Trailing Edge Static Discharge Wicks - CHECK condition and attachment.
 - q. Navigation Light (If Installed) - CHECK operation.
 - r. Tie Down - REMOVE.
 - s. Horizontal Stabilizer Deice Boot - CHECK condition and security.
 - t. Vertical Stabilizer Deice Boot - CHECK condition and security.
 - u. Vertical Stabilizer Antenna - CHECK condition and security.
 - v. Static Ports (3) - CLEAR. Do not blow into static ports.
 - w. Cabin Door and Seal - CHECK condition and security.

*Denotes items to be checked if the applicable optional equipment is installed on your airplane.

Figure 4-1 (Sheet 2 of 2)

**NORMAL PROCEDURES
ABBREVIATED CHECKLIST****NOTE**

This Abbreviated Normal Procedures Checklist is included as a supplement to the Amplified Normal Procedures Checklist. Use of the Abbreviated Normal Procedures Checklist should not be used until the flight crew has become familiar with the airplane and systems. All amplified normal procedure items must be accomplished regardless of which checklist is used.

AIRSPEEDS FOR SAFE OPERATION**Conditions:**

1. Takeoff Weight 9850 Pounds.
2. Landing Weight 9360 Pounds.
3. Sea Level, Standard Day.

(1) Air Minimum Control Speed with Wing Flaps in T.O. Position	91 KIAS
(2) Rotation Speed with Wing Flaps in T.O. Position	98 KIAS
(3) Obstacle Clearance with Wing Flaps in T.O. Position	110 KIAS
(4) All Engines Best Rate-of-Climb Speed with Wing Flaps in T.O. Position	130 KIAS
(5) All Engines Best Rate-of-Climb Speed with Wing Flaps in UP Position	140 KIAS
(6) Maximum Operating Speed	245 KIAS (.55 Mach)
(7) Maneuvering Speed	167 KIAS
(8) All Engines Landing Approach Speed with Wing Flaps in LAND Position	99 KIAS
(9) Speed For Transition to Balked Landing Conditions	99 KIAS
(10) Maximum Demonstrated Crosswind Velocity	20 KNOTS

Figure 4-2

BEFORE STARTING ENGINES

1. Preflight - COMPLETE.
2. Cabin Door - LATCHED and SECURE.
 - a. Safety Pin - INSTALLED (Airplanes 441-0001 thru -0034, and -0036 thru -0069).
3. Control Locks - REMOVE.
4. Seat, Seat Belts and Shoulder Harness - ADJUST and SECURE.
5. Parking Brake - SET.
6. All Switches and Circuit Breakers - SET.
7. Battery Switch(es) - ON.
8. Passenger Advisory Lights - ON.
9. Landing Gear Switch - CHECK DOWN; Check Green Lights - ON.
10. Annunciator Panel and Warning Lights - PRESS-TO-TEST.
11. Oxygen Quantity - CHECK.
12. Pilot and Copilot Oxygen Masks and Hoses - CHECK (COCK and STOW on airplanes incorporating SK441-36).
13. Pressurization Source Selector - OFF.
14. High Power Monitor Check - COMPLETE.
 - a. Monopole Monitor Lights - CHECK OFF (Airplanes not incorporating Cessna Service Bulletin CQB01-1R2).
15. Power Levers - FLIGHT IDLE.
16. Condition Levers - START AND TAXI.
17. All Guarded Switches - CHECK GUARDS DOWN. Check FUEL COMP OFF Lights - OFF.

STARTING ENGINES (Normal Mode)

BATTERY START (Left Engine First)

1. Voltmeter - CHECK 24 volts minimum.
2. Propeller - CLEAR and on start locks.
3. Fuel Boost Pump - AUX. Check annunciator light.
4. NTS Check - INITIATE.
5. Engine - START.
6. Engine Instruments - CHECK.
7. Generator - ON; Voltmeter - CHECK 28 volts.
8. Pressurization Source Selector - LEFT.
9. Wing Flaps - UP.
10. Repeat steps 2 through 7 for right engine after ammeter decreases below 200 amps.
11. Pressurization Source Selector - BOTH or GND.

BEFORE TAXIING

1. Passenger Briefing - COMPLETE.
2. Emergency Pressurization Check - COMPLETE if applicable.
3. Windshield Anti-ice Check - COMPLETE if applicable.
4. Manual Mode Overspeed Governor Checks - COMPLETE.
5. Start Locks - DISENGAGE.
6. Ground Idle Speed - CHECK 65%.
7. Gyro Inverter - ON.
8. Avionics - AS REQUIRED.

TAXIING

1. Brakes - CHECK.
2. Flight Instruments - CHECK.

BEFORE TAKEOFF

1. Parking Brakes - SET.
2. Fuel Low Pressure Lights - CHECK OFF.
3. Fuel Boost Pumps - OFF (Check Fuel Low Pressure Lights ON); then, MAIN (Check Fuel Low Pressure Lights OFF).
4. EGT/Torque Limiting - CHECK AUTO (if installed).
5. Ice Protection Equipment - CHECK.
6. Annunciator Panel - CLEAR except Beta Lights.
 - a. Monopole Monitor Lights - CHECK OFF (Airplanes not incorporating Cessna Service Bulletin CQB01-1R2).
7. Flight Controls - CHECK.
8. Instrument Air Pressure - CHECK.
9. Flight Instruments and Avionics - CHECK and SET.
 - a. Electric Elevator Trim Disengage Check - COMPLETE.
 - b. Autopilot Preflight Check - COMPLETE.
10. Engine Instruments - CHECK.
11. Fuel Quantity and Balance - CHECK.
12. Crossfeed - CYCLE, then OFF.
13. Trim Tabs - SET.
14. Propeller Synchrophaser - OFF (if installed).
15. Pressurization Source Selector - BOTH.
16. Pressurization and Temperature Controls - SET.
17. Wing Flaps - SET T.O. POSITION.
18. Seat Belts and Shoulder Harnesses - SECURE.
19. Parking Brake - RELEASE.

TAKEOFF (To 50-Foot Obstacle)

1. Anti-Collision Lights - ON.
2. Ice Protection Equipment - AS REQUIRED.
 - a. Pitot Static Heat - ON.
3. Power - SET FOR TAKEOFF.
4. Engine Instruments - CHECK.
5. Rotate - 98 KIAS.
6. Airspeed 110 KIAS until obstacles cleared.

AFTER TAKEOFF

1. Landing Gear - RETRACT.
2. Airspeed - 115 KIAS.
3. Wing Flaps - UP.

CLIMB

1. Power - SET.
2. Propeller Synchrophaser - AS DESIRED (If Installed).
3. Yaw Damper - AS DESIRED.
4. Pressurization - CHECK.
5. Oxygen Masks - POSITION around neck above 25,000 Feet (Airplanes Incorporating SK441-36).

CRUISE

1. Power - SET.

DESCENT

1. Foot Warmer Valves - DEF.
2. Pressurization - SET.
3. Fuel Crossfeed Selector - OFF.
4. Altimeter - SET.
5. Passenger Advisory Lights - ON.
6. Seat Belts and Shoulder Harnesses - SECURE.

BEFORE LANDING

1. Fuel Quantity and Balance - CHECK.
2. Fuel Crossfeed Selector - OFF.
3. Wing Flaps - T.O. or APPR below 200 KIAS.
4. Propeller Synchrophaser - OFF (If Installed).
5. Landing Gear - DOWN below 180 KIAS.
6. Landing and Taxi Lights - AS REQUIRED below 180 KIAS.
7. Condition Levers - TAKEOFF, CLIMB AND LANDING.
8. Cabin Differential Pressure - CHECK ZERO DIFFERENTIAL.
9. Autopilot/Yaw Damper - OFF.
10. Wing Flaps - LAND below 180 KIAS.
11. Approach Speed - 99 KIAS at 9360 pounds. Refer to Normal Landing Distance Chart in Section 5 for speeds at reduced weights.
12. Power Levers - GROUND IDLE after touchdown.
13. Beta Lights - CHECK ON prior to reverse.

BALKED LANDING

1. Power Levers - ADVANCE for takeoff power.
2. Balked Landing Transition Speed - 99 KIAS.
3. Wing Flaps - T.O.
4. Landing Gear - RETRACT after establishing a positive rate of climb.
5. Wing Flaps - UP as soon as all obstacles are cleared and airspeed is above 115 KIAS.

AFTER LANDING

1. Wing Flaps - UP.
2. Ice Protection Equipment - OFF.

SHUTDOWN

1. Wing Flaps - SET T.O. POSITION.
2. Fuel Boost Pumps - OFF.
3. Avionics Bus and Gyro Switches - OFF.
4. Engine - SHUTDOWN.
5. Switches - OFF.
6. Parking Brake - SET if brakes are cool.
7. Pilot and Copilot Oxygen Masks - UNCOCK and STOW (Airplanes incorporating SK441-36.)
8. Control Locks - INSTALL.

AMPLIFIED NORMAL PROCEDURES

PREFLIGHT INSPECTION

The Preflight Inspection, described in Figure 4-1, is recommended for the first flight of the day. Inspection procedures for subsequent flights are normally limited to brief checks of the fuel and oil quantity, security of fuel and oil filler caps and a check of the propellers for freedom of rotation. A procedure is described under Systems Check Procedures in this section for engine restarts within 45 minutes after shutdown. If the airplane has been in extended storage, has had recent major maintenance or has been operated from marginal airports, a more extensive exterior inspection is recommended.

After major maintenance has been performed, a thorough preflight inspection, in accordance with Figure 4-1, should be completed. Pay particular attention to the security of access panels and doors and free and correct movement of control surfaces. If oil dipstick indicates oil is abnormally low and propeller maintenance has been performed, it is possible the engine oil has been transferred to the engine gear case. If this is suspected, motor the applicable engine for 5 to 10 seconds and recheck the oil level. If the airplane has been waxed or polished, check the external static pressure source holes for obstructions.

The optional fire extinguisher bottles, located in each wheel well, should be checked for the properly serviced indication. The indicated pressure will change with change in ambient temperature. Figure 4-3 should be used as a guide in determining the correct pressure.

If the airplane has been exposed to much ground handling in a crowded hangar, it should be checked for dents and scratches on wings, fuselage and tail surfaces, as well as damage to navigation, anti-collision and landing lights, deice boots and avionics antennas.

Outside storage for long periods may result in water and obstructions in airspeed system lines, condensation in fuel tanks, and dust and dirt in the engine air inlet and exhaust areas. Outside storage in windy or gusty areas, or adjacent to taxiing airplanes, calls for special attention to control surface stops, hinges and brackets to detect presence of wind damage. The recommended use of the control locks will remove this problem.

Prolonged storage of the airplane will result in a water buildup in the fuel which "leeches out" the fuel additive. An indication of this is when an excessive amount of water accumulates in the fuel tank sumps. Refer to Section 8 for EGME fuel additive servicing.

If the airplane has been operated from muddy fields or in snow or slush, check the main gear and nose gear wheel wells for obstructions and cleanliness. Operation from a gravel or cinder field will require extra attention to propeller tips, propeller deice boots, flaps and horizontal stabilizer leading edges and surface deice boots where abrasion can be encountered. Stone damage to the propeller can seriously reduce the fatigue life of the blades.

Frequently check all components of the landing gear retracting mechanisms, shock struts, tires and brakes. This is especially important on airplanes operating from rough fields and/or high altitudes. Improperly serviced shock struts could cause excessive landing and taxi loads on the airplane structure. Landing gear shock struts should be checked before each flight to ensure they are not collapsed. This can readily be determined by a visual inspection of the shock strut lower piston assembly. If the unpainted surface of the lower piston assembly is not visible, the shock strut is fully collapsed and must be serviced before the airplane is operated. A completely collapsed (zero extension) shock strut could cause a malfunction in the landing gear retraction system.

To prevent loss of fuel in flight, make sure the fuel tank filler caps are tightly sealed. The fuel tank vents on the lower surface of the tanks should also be inspected for obstructions, ice or water, especially after operation in cold, wet weather.

The interior inspection will vary according to the planned flight and the optional equipment installed. Prior to high-altitude flights, it is important to check the condition and quantity of oxygen face masks and hose assemblies. The oxygen supply system should be functionally checked to insure that it is in working order. The oxygen pressure gage should indicate 300 to 1800 PSI (11.0 cubic-foot system) or 300 to 1850 PSI (114.9 cubic-foot system) depending upon the anticipated requirements.

Satisfactory operation of the pitot tubes, static sources and stall warning transmitter heating elements is determined by observing a discharge on the ammeter when the pitot/static and stall vane switches are turned ON. Actuating the switches for 20 seconds, immediately prior to the exterior inspection, will warm the heating elements sufficiently so they will feel warm to the touch during the inspection. If operation of the static source heaters is questionable, run the back of a finger from the fuselage skin across the static port and then onto the fuselage skin. If operation is still questionable, the effectiveness of these heating elements can be verified by cautiously feeling the heat of these devices while the pitot/-static heat switches are on.

If the emergency landing gear extension T-handle was noticed to be partly extended during the cockpit preflight inspection, the emergency landing gear extension blow down valve assembly should be reset at the blowdown bottle in the left nose compartment in accordance with the airplane maintenance manual. On airplanes -0071 thru -0172, the position of the blowdown valve assembly can be checked. If the red band is visible, the blowdown bottle must be serviced in accordance with the airplane maintenance manual before flight. If the red band is not showing, push the

cable towards the valve assembly, then check the bottle pressure gage for normal pressure.

Flights at night and in cold weather involve a careful check of other specific areas which will be discussed later in this section.

BEFORE STARTING ENGINES

1. Preflight Inspection - COMPLETE (See Figure 4-1).
2. If a quick turn around after a flight (15 to 45 minutes), refer to "Engine Restart Within 15 to 45 Minutes After Shutdown" under System Check Procedures in this Section.
3. Cabin Door - LATCHED and SECURE.
 - a. Safety Pin - INSTALLED (Airplanes 441-0001 thru -0034 and -0036 thru -0069).
4. Emergency Exit Window Locking Pin - CHECK REMOVED (Optional System).
5. Control Locks - REMOVE.
6. Seat, Seat Belts and Shoulder Harness - ADJUST and SECURE.
7. Parking Brake - SET.
8. All Switches and Circuit Breakers - SET.
 - a. Left and Right Side Panel Circuit Breakers - CHECK IN.
 - b. Ignition Override Switches - OFF.
 - c. Generators - OFF.
 - d. Fuel Boost Pump Switches - OFF.
 - e. Torque/EGT Limiting Switches - AUTO (If Installed).
 - f. Deice/Anti-Ice Switches - OFF.
 - g. Avionics Bus Switches - OFF.
 - h. Gyro Inverter Switch - OFF.
 - i. All Guarded Switches - GUARDS DOWN.
9. Battery Switch(es) - ON.
10. Interior and Exterior Lights - AS REQUIRED.
 - a. Master Lighting Switch - AS REQUIRED.
 - b. Panel Lights - AS REQUIRED.
 - c. External Lights - CHECK OFF.
11. Passenger Advisory Lights - ON
12. Landing Gear Switch - DOWN; Check Green Lights - ON.
13. Avionics Bus Switches - ON.

14. Annunciator Panel and Warning Lights - PRESS-TO-TEST.

NOTE

- Airplanes 441-0001 thru 441-0115:

The press-to-test function will also test the landing gear warning horn, avionics light displays in both Coms, both Navs, ADF, autopilot mode repeater annunciators, all marker beacon lights, altitude alert annunciator, the GA and DH lights in the pilot's ADI, the RN and BC lights in the pilot's OBI repeater and the optional copilot's R-NAV light adjacent to the HSI. The gyro inverter and avionics switches must be ON to check the light displays in the autopilot mode selector.

- Airplanes 441-0116 thru 441-0172:

The press-to-test function will also test the landing gear warning horn, light displays in the autopilot mode repeater annunciators, all marker beacon lights, altitude alert annunciator, the GA and DH lights in the pilot's ADI, the RN and BC lights in the pilot's OBI repeater and the optional copilot's R-NAV light adjacent to the HSI. The gyro inverter and avionics switches must be ON to check the light displays in the autopilot mode selector.

- a. Firewall Shutoff Buttons - CYCLE one at a time. Check illumination of F/W SHUTOFF and optional BOT ARMED annunciator lights.
15. Avionics Bus Switches - OFF.
16. Oxygen Quantity,
Pilot and Copilot Masks and Hoses - CHECK (COCK and STOW on airplanes incorporating SK441-36).
17. Pressurization Source Selector - OFF.
18. Electronic Fuel Control High-Power Monitor Check - Complete before first flight of the day or after any maintenance involving the engine control system. Refer to System Check Procedures in this section for appropriate procedure.
 - a. Monopole Monitor Lights - CHECK OFF (Airplanes not incorporating Cessna Service Bulletin CQB01-1R2).
19. Power Levers - FLIGHT IDLE.
20. Condition Levers - START AND TAXI.
21. All Guarded Switches - CHECK GUARDS DOWN. Check FUEL COMP OFF Lights - OFF.

Airplanes not incorporating Cessna Service Bulletin CQB01-1R2:

CAUTION

If MONOPOLE monitor light(s) is illuminated, complete all further operations in manual mode.

NOTE

If FUEL COMP OFF light(s) is illuminated, position the applicable FUEL COMPUTER switch to OFF, then back to ON.

22. Fuel Crossfeed Selector - OFF.
23. Cabin Vent Control - PUSH IN.
24. Cabin Pressurization Switch - PRESS (Guard Down).
25. Trim Tabs - CHECKED and SET.
26. Cabin Fan - OFF.
27. External Lights - AS REQUIRED.

NOTE

Operation of the anti-collision lights is not recommended for any ground operations, particularly at night. These high intensity lights are of considerable annoyance to ground personnel and other pilots.

STARTING ENGINES

BATTERY START (Left Engine First)

1. Voltmeter - CHECK 24 volts minimum. If less than 24 volts is indicated, refer to Starting Engines With Auxiliary Power procedure.
2. Propeller - CLEAR and on start locks.
 - a. If propeller start locks are not engaged:
 - (1) Power Lever - REVERSE.
 - (2) Unfeathering Pump Switch - ACTUATE and hold until propeller is on the start locks.
 - (3) Power Lever - FLIGHT IDLE.
3. Fuel Boost Pumps - AUX. Check AUX BOOST ON annunciator lights on.
4. NTS Check - COMPLETE before the first flight of the day.
 - a. Unfeathering Pump Switch - ACTUATE until NTS CHECK annunciator light illuminates; continue to hold switch until engine start button is pushed and NTS CHECK annunciator light goes out.

NOTE

Do not attempt to start engine until EGT is less than 200°C.

5. Engine Start Button - PUSH momentarily. Observe propeller rotation and NTS CHECK annunciator light out. If propeller rotation does not start immediately, reject start by pushing engine stop button.
6. Fuel and Ignition - CHECK fuel flow increase and ignition light on at approximately 10% RPM.
7. EGT Rise - CHECK within 10 seconds after reaching 10% RPM or at 20% RPM. If EGT rise does not occur, reject start by pushing engine stop button.

CAUTION

- If RPM stops increasing prior to 40% RPM, or if EGT is approaching 770°C and rising rapidly, immediately reject start by positioning condition lever to EMER SHUT-OFF then pushing the engine stop button. Perform an engine clearing procedure before attempting a second start.
- Perform a Ground Operations Engine Clearing Procedure before attempting a second start. Refer to System Check Procedures in this section. Observe starting cycle limitations.

8. Engine Instruments - CHECK. Engine speed approximately 70% RPM.
 - a. Oil Pressure - CHECK rising within 10 seconds after engine lightoff. If no rise indicated, shut down engine and determine cause.
9. Generator - ON; Voltmeter - CHECK 28 volts.
10. Pressurization Source Selector - LEFT.
11. Wing Flaps - UP.
12. Repeat steps 2 through 9 for right engine after ammeter decreases below 200 amperes.
13. Pressurization Source Selector - BOTH or GND. Use of the GND position provides increased conditioned airflow.

STARTING ENGINES WITH AUXILIARY POWER

NOTE

When an auxiliary power unit is used, ensure the unit is negatively grounded and regulated to 28 volts DC with a capability of providing a minimum of 800 amperes during the starting cycle. Maximum allowable auxiliary power output is 1700 amperes.

1. Battery Switch(es) - ON.
2. Auxiliary Power Unit - ENGAGE, then ON.
3. Left Engine - START using appropriate Battery Starting Engines procedure.
4. Right Engine - START using appropriate Battery Starting Engines procedure.
5. Auxiliary Power Unit - OFF, then DISENGAGE.
6. Generators - ON.

Engine starts may be made with airplane battery power or with an auxiliary power unit (APU). However, it is recommended that an APU be used for all starts, particularly when the ambient air temperature is less than -12°C . The use of an APU at the colder temperatures is particularly important if the engines are serviced with Type II oil. Refer to Cold Weather Operation in this section when ambient temperature is below -12°C .

Before engine starting with the airplane batteries, check the voltmeter for a minimum of 24 volts. After starting the left engine, allow the generator charge rate to decrease below 200 amperes before starting the right engine.

It is recommended to start the left engine first, particularly during cold weather. Two starting cables are provided for the left engine, thus more electrical power will be available to the left engine starter than to the right engine starter.

Before initiating the start, set the power levers to FLIGHT IDLE. This starting position will provide normal starts while preventing the propellers from jumping their start locks.

As with all turbine engines, the operator must monitor EGT during each engine start to guard against a "hot" start. The operator must be ready to immediately stop the start if EGT exceeds 770°C or is rapidly approaching this limit. Usually "hot" starts are not a problem if the normal starting procedures are followed. A "hot" start is caused by excessive fuel flow at normal RPM or normal fuel low with insufficient RPM. The latter is usually the problem which is caused by attempting a start with low battery voltage or starting an engine which has excessive drag. The excessive drag can be a result of not using engine preheat when recommended, not having the start locks engaged during the start, or initiating a start on a low-time engine (within 15 to 45 minutes of the previous shutdown) without checking the propeller for freedom of movement. If the EGT maintains 770 to 776°C for 1 second but less than 3 seconds, perform a takeoff power check to determine satisfactory engine operation. If EGT maintains 770 to 776°C for more than 3 seconds, abort the flight and take appropriate maintenance action.

BEFORE TAXIING

1. Passenger Briefing - COMPLETE.
2. Emergency Pressurization Check - COMPLETE before the first flight of the day. Move Pressurization Source selector to EMER. Observe rush of air in the aft cabin indicating that the system is operating correctly. Reset the Pressurization source as required for flight. Observe that the rush of air ceases and the system returns to normal operation.
3. Windshield Anti-ice Check - COMPLETE before the first flight of the day. Select the windshield switch to ON. Observe no air is flowing to the windshield. Move both power levers out of flight idle to a higher power setting. Observe that air begins flowing to the windshield. Return the power levers to flight idle. Observe that airflow to the windshield ceases. Select the windshield Switch to OFF.

CAUTION

Do not operate windshield anti-ice on the ground for more than 10 seconds. If the airflow does not cease when the power levers are returned to idle, shut the engines down and correct the problem.

4. Manual Mode Overspeed Governor Checks - COMPLETE. Check 103.5 to 105.5, except on airplanes incorporating SK441-79, and 104.5 to 105.5 on airplanes incorporating SK441-79, before the first flight of the day, if airtasks are planned, any maintenance in the engine control system has been performed, there is any indication of malfunction, or whenever fuel type is changed. Refer to Manual Mode Overspeed Governor Check under System Check Procedures in this section. Individual Overspeed Governor and Manual Mode Fuel Control check procedures are available, if preferred.

5. Propeller Start Locks - DISENGAGE. Move power levers slowly toward reverse. If the Beta annunciator light(s) goes out, stop power lever movement until light(s) comes on again. Continue movement until a positive indication of reverse thrust is observed (rise in torque, fuel flow and EGT).
 - a. Power Levers - GRND IDLE.
6. Ground Idle Speed - CHECK 65%.
7. Gyro Inverter - ON.
8. Avionics - AS REQUIRED. Refer to applicable avionics system procedures in this section or Section 9.
 - a. Avionics Bus Switches - ON.
9. Parking Brake - RELEASE. Pushing in the parking brake knob releases the trapped brake fluid allowing the brakes to be released.

The airplane may be loaded to the maximum ramp weight of 9925 pounds if 75 pounds of fuel or more are anticipated to be used before initiating the takeoff roll.

TAXIING

1. Power Levers - AS REQUIRED for taxiing.

NOTE

During ground operations in normal mode with engine speed below 80% RPM, compensated EGT is presented on the EGT indicators. When operating in these conditions, the inner green arc on the EGT indicator displays the normal operating range.

2. Brakes - CHECK.
3. Flight Instruments - CHECK.
4. Condition Levers - SET for 65 to 75% RPM. 75% RPM will provide the best ground heating and cooling.

NOTE

With the pressurization source selector positioned to GND, the increased bleed air flow will automatically be reduced to normal flow when engine speed exceeds 80% RPM. The BLEED AIR GROUND annunciator will remain illuminated as long as the source selector is in the GND position.

A steerable nosewheel, interconnected with the rudder system, provides positive directional control up to approximately 5.5° left or right, and free turning to approximately 55° for sharp turns during taxiing. Normal steering may be aided through use of differential power and differential braking on the main wheels. These aids are listed in the preferred order of use. Do not use excessive brake on the inboard side to effect a turning radius as decreased tire life will result.

NOTE

If the airplane is parked with the nosewheel castered in either direction, initial taxiing should be done with caution. To straighten the nosewheel, use full opposite rudder and differential power instead of differential braking. After a few feet of forward travel, the nosewheel will steer normally.

When taxiing near buildings or other stationary objects, observe the minimum turning distance limits as stated in Figure 7-11. No abnormal precautions are required when taxiing in conditions of high winds.

At some time early in the taxi run, the brakes should be checked for any unusual reaction, such as uneven braking. The flight director indicator should be checked for normal erection. The horizontal situation indicator should be checked for normal slaving and cross-checked with the standby magnetic compass. Normal slaving is indicated by oscillations of the gyro slaving indicator about the null point (45° fixed reference line on the HSI).

Taxi speed can be reduced using normal braking or by retarding the power levers toward reverse as required. As the power levers are retarded from FLIGHT IDLE, the propeller blade angles reduce, allowing less thrust to be generated. If more rapid deceleration is desired, further retarding of the power levers will position the propellers in negative pitch, resulting in negative thrust being generated. The amount and direction of thrust generated is proportional to the power lever position. Minimize the use of reverse thrust on unprepared surfaces.

BEFORE TAKEOFF

1. Parking Brakes - SET.
2. Power Levers - GRND IDLE.
3. Fuel Low Pressure Lights - CHECK OFF.
4. Fuel Boost Pumps - OFF momentarily. Check AUX BOOST ON annunciator lights off and FUEL PRESS LOW annunciator lights on.
 - a. Fuel Boost Pumps - MAIN. Check AUX BOOST ON and FUEL PRESS LOW annunciator lights off.

NOTE

If engine(s) continues to operate on the auxiliary fuel pump(s), as evidenced by illumination of the AUX BOOST ON annunciator light(s), momentarily position the fuel boost pump(s) to OFF then back to MAIN.

5. EGT/Torque Limiting Switches - AUTO.
6. Ice Protection Equipment - CHECK or CHECK AS REQUIRED. Refer to System Check Procedures in Section 4.
 - a. Windshield Anti-ice - CHECK. Avoid prolonged ground operation.
 - b. Engine Inlet Anti-ice - CHECK.

CAUTION

Operate windshield and engine inlet heat for check purposes only (maximum of 10 seconds) if outside air temperature is above 4°C.

- c. Propeller Deice - CHECK AS REQUIRED.
- d. Surface Deice - CHECK AS REQUIRED.

NOTE

Windshield and engine inlet anti-ice systems should be activated to purge any possible entrapped water from the windshield nozzle and ensure satisfactory systems operation prior to each flight. Propeller deice and surface deice systems should be checked if icing conditions are anticipated.

7. Annunciator Panel - CLEAR except for L and R Beta lights.

Airplanes not incorporating Cessna Service Bulletin CQB01-1R2:

- a. Monopole Monitor Lights - OFF.

CAUTION

If monopole monitor light(s) was on before the engine start, all operations for that engine(s) shall be conducted in manual mode. Refer to Abnormal Procedures for manual mode operating procedures.

8. Flight Controls - CHECK, free and correct.
9. Instrument Air Pressure - CHECK.
10. Flight Instruments and Avionics - SET. Refer to applicable avionics systems procedures in this section or Section 9.
a. Electric Elevator Trim Disengage Check - COMPLETE. Refer to System Check Procedures in this section for additional information.
b. Autopilot Preflight Check - COMPLETE. Refer to System Check Procedures in this section for additional information.
11. Engine Instruments - CHECK.
12. Fuel Quantity and Balance - CHECK. Do not exceed 300 pounds asymmetric fuel loading.
13. Fuel Crossfeed Selector - CYCLE, then OFF. When selector is in the left and right positions, check annunciator panel for proper light illumination.
14. Trim Tabs - SET elevator, aileron and rudder tabs in the takeoff range.
15. Propeller Synchrophaser - OFF.
16. Pressurization Source Selector - BOTH.
17. Cabin Pressurization and Temperature Controls - SET.
a. Pressurization Toggle Valve - PRESS (Guard Down).
b. Altitude Control - SET to destination field pressure altitude plus 200 feet (outer scale) or cruise altitude plus 500 feet (inner scale) whichever gives the highest cabin altitude.
c. Rate Control - SET to reach selected cabin altitude at approximately the same time the airplane reaches cruise altitude.
d. Auto Temp Selector - SET for automatic temperature control.
e. Cabin Fan - AS REQUIRED.

18. Wing Flaps - SET T.O. Position.
19. Cabin Door and Windows - CLOSE.
20. Seat Belts and Shoulder Harness - SECURE.
21. Parking Brake - RELEASE.

Ensure the Before Takeoff Checklist is followed to prevent missing an important item.

The electric elevator trim disengage check and autopilot preflight check should be performed before each flight. If the disconnect check does not perform correctly, the system should be checked before inflight use of the autopilot. Do not press the autopilot PREFLIGHT TEST button in flight. Inflight actuation of the test button with the autopilot engaged will disengage the autopilot.

The flight and engine instruments should be checked for normal indications with no warning flags visible. All avionics should be set and checked for correct frequencies or operational modes. The altimeters should be set to reported field pressure, then cross-checked with each other and against field elevation.

A mental review of all engine inoperative speeds, procedures and field length requirements should be made before takeoff. Also, review the normal speeds and power limits (torque, EGT and fuel flow). In addition, review the manual mode EGT limits so that a possible overtemperature condition can be averted in the unlikely event of a fuel computer failure during takeoff or climb.

NOTE

Ensure weight does not exceed 9850 pounds before takeoff.

TAKEOFF (To 50-Foot Obstacle)

1. Anti-Collision Lights - ON.
2. Ice Protection Equipment - AS REQUIRED.
 - a. Pitot Static Heat - ON.

NOTE

- All flight operations in visible moisture with outside air temperature below 4°C shall be completed with engine inlet heat switches on and ignition override switches on.
- Observe ignition duty cycle limits.
- While in position for takeoff, set the brakes and slowly advance the power levers for takeoff power. Do not initiate the takeoff roll until propeller governing is established and the BETA annunciator lights are out.

3. Power Levers - GRND IDLE.
4. Condition Levers - TAKEOFF, CLIMB AND LANDING. Check engine speeds at 96% RPM.

5. Power Levers - ADVANCE for takeoff power. Do not exceed 1669 ft-lbs. torque or 450°C EGT, whichever occurs first. Check engine speeds at 100% RPM.

CAUTION

Advancing the power levers in excess of one lever width beyond the initial point of torque limiting may exceed the torque limiting system capability. When operating in normal mode with torque and temperature limiting switch (optional some airplanes) in AUTO position, advance the power levers slightly ahead of the point where takeoff power is attained. When operating in any other configuration, advance the power levers only sufficiently to attain the appropriate torque or EGT limit. When operating in normal mode, the red line EGT marking is applicable.

6. Engine Instruments - CHECK.
7. Rotate - 98 KIAS.
8. Airspeed - 110 KIAS until obstacles are cleared.

Before initiating the takeoff roll, a go, no-go decision should have been made in the event an engine failure should occur. Review the anticipated performance presented in the Accelerate-Stop Distance, Accelerate-Go Distance and Engine Inoperative Takeoff Climb Gradient charts in Section 5. In addition, review the applicable procedures and speeds associated with single-engine operation so that the transition (in the event of an engine failure) will be smooth, positive and safe. If the anticipated performance exceeds the runway length available or obstacle clearance requirements cannot be achieved, it is recommended to takeoff on a more favorable runway, off-load the airplane until the anticipated performance is consistent with existing conditions or delay the takeoff until more favorable atmospheric conditions exist.

Full power operation is recommended on takeoff since it is important that a speed well above air minimum control or buffet speed be obtained as rapidly as possible. It is desirable to accelerate the airplane to the intentional one engine inoperative speed (98 KIAS) before rotation for additional safety in case of an engine failure.

Takeoffs are normally accomplished with wing flaps positioned to T.O. as this flap position provides the shortest possible distance, with all engines operating, to clear a 50-foot obstacle.

For crosswind takeoffs, slightly reduced power may be carried on the downwind engine until the rudder becomes effective. The airplane is accelerated to a slightly higher than normal lift-off speed, and then is pulled off abruptly to prevent possible settling back to the runway while drifting. When clear of the ground, a coordinated turn is made into the wind to correct for drift.

After rotation at 98 KIAS, allow the airspeed to increase to 110 KIAS. Maintain 110 KIAS until the obstacles have been cleared.

AFTER TAKEOFF

1. Brakes - APPLY momentarily.
2. Landing Gear - RETRACT. Check gear unlocked and HYD PRESS ON lights off.
3. Airspeed - 115 KIAS.
4. Wing Flaps - UP.
5. Recommended Climb Speed - 140 KIAS.

After clearing the initial obstacle, it is good practice to climb rapidly to an altitude at which the airplane is capable of circling the field on one engine.

To establish climb configuration, retract the landing gear, allow airspeed to increase to 115 KIAS, retract the wing flaps and then increase airspeed to 140 KIAS. Maintain takeoff power.

Before retracting the landing gear, apply the brakes momentarily to stop the rotation of the main wheels. Centrifugal force caused by the rapidly rotating wheels expands the diameter of the tires, and if ice or mud has accumulated in the wheel wells, the rotating wheels may rub as they enter.

On long runways, the landing gear should be retracted at the point over the runway where a wheels-down forced landing on that runway would become impractical. However, on short runways, it may be preferable to retract the landing gear after the airplane is safely airborne.

CLIMB

1. Power Levers - SET.

CAUTION

Advancing the power levers in excess of one lever width beyond the initial point of torque limiting may exceed the torque limiting system capability. When operating in normal mode with torque and temperature limiting (optional some airplanes) switch in AUTO position, advance the power levers slightly ahead of the point where takeoff power is attained. When operating in any other configuration, advance the power levers only sufficiently to attain the appropriate torque on EGT limit. When operating in normal mode, the red line EGT marking is applicable.

2. Condition Levers - AS DESIRED.
3. Propeller Synchrophaser - AS DESIRED (if installed).
 - a. Condition Levers - SET to maintain RPM below red line.
 - b. Phasing Knob - ADJUST for desired phasing.
4. Airspeed - 140 KIAS to 16,000 feet, decreasing to 130 KIAS at 24,000 feet and on airplanes not incorporating SK441-36 120 KIAS at 33,000 feet; on airplanes incorporating SK441-36 118 KIAS at 35,000 feet.
5. Trim Tabs - ADJUST.
6. Yaw Damper - AS DESIRED.
7. Cabin Altitude/Differential Pressure and Cabin Rate-of-Climb Indicators - CHECK for desired pressurization.
8. Oxygen Masks - POSITION around neck above 25,000 feet (airplanes incorporating SK441-36).
9. Ice Protection Equipment - AS REQUIRED.

NOTE

- If the possibility of ice exists in the engine inlets, position the ignition override switches to ON before actuating the inlet heat switches. Actuate the switches one at a time to ensure normal engine operation continues. Actuation of the ignition override switches will provide continuous ignition to prevent flameout if ice should be ingested by the engine.
- All flight operations in visible moisture with outside air temperature below 4°C shall be completed with engine inlet heat switches and ignition override switches on.
- During flight in icing conditions, ice will accumulate on the unprotected surfaces of the airplane which can cause an increase in the prestall buffet speed. Positioning the wing flaps to T.O., APPR or LAND will immediately decrease buffet onset speeds.

Normally, maximum continuous power is maintained during the climb to cruise altitude. Adjust the power levers as required to prevent exceeding 1669 ft-lbs torque or the maximum allowable EGT of 450°C, whichever occurs first. This power setting provides the best performance and range. At lower altitudes and outside air temperatures (below approximately 10,000 feet and ISA +20°C), the engines will reach the torque limit before reaching the EGT limit. As the climb progresses, the EGT will increase until an altitude is reached where the EGT will dictate power lever positioning. When operating near the EGT limit, advance power levers slowly to allow current EGT to be indicated. The rate of power (and temperature) increase of the engine is greater than the response rate of the EGT system; therefore, a rapid power lever advance could allow an overtemperature condition to exist momentarily in the engine before the overtemperature would be indicated.

The propellers must be closely synchronized manually before engaging the synchrophaser. If the propellers are not closely synchronized, a power lever split can result after synchrophaser engagement. Upon positioning the synchrophaser switch to ON, engine speed on both engines will increase slowly approximately 1% RPM then slowly decrease to approximately 100.5% RPM. During this period of synchrophaser engagement, engine torque can vary ± 60 foot-pounds. Proper synchrophaser operation will begin approximately 20 seconds after switch engagement and will be indicated by continuous illumination of the PHASE LOCK light. After light illumination, the PHASE knob may be adjusted as required to achieve the desired noise characteristics.

CRUISE

1. Power Levers - RETARD to achieve a 10 to 15°C EGT decrease.
2. Condition Levers - RETARD slowly to 96% RPM.

3. Power Levers - SET to 1738 ft-lbs torque or 450°C EGT, whichever occurs first. Do not exceed 245 KIAS.

NOTE

If the fuel computer self-monitor causes a shift to manual mode operation from normal mode, one attempt to reset to normal mode may be performed. Set the condition lever to TAKEOFF, CLIMB AND LANDING and cycle the fuel computer switch to OFF then back to ON. The FUEL COMP OFF light should go out. If the reset attempt is unsuccessful, the flight may be completed in manual mode. Refer to Abnormal Procedures for manual mode operating procedures.

4. Propeller Synchrophaser - ON (If Installed).
a. Phasing Knob - ADJUST for desired phasing.
5. Trim Tabs - ADJUST.
6. If an enroute climb is desired:
a. Airspeed - 160 KIAS.
b. Trim Tabs - ADJUST.
c. Cabin Rate Control - ARROW UP.
d. Cabin Altitude Control - SET SLOWLY as cruising altitude changes. Reset cabin altitude control to destination field pressure altitude plus 200 feet (outer scale), or cruise altitude plus 500 feet (inner scale) whichever gives the highest cabin altitude.
7. Ice Protection Equipment - AS REQUIRED.

NOTE

- If the possibility of ice exists in the engine inlets, position the ignition override switches to ON before actuating the inlet heat switches. Actuate the switches one at a time to ensure normal engine operation continues. Actuation of the ignition override switches will provide continuous ignition to prevent flameout if ice should be ingested by the engine.
- All flight operations in visible moisture with outside air temperature below 4°C shall be completed with engine inlet heat switches and ignition override switches on.
- During flight in icing conditions, ice will accumulate on the unprotected surfaces of the airplane which can cause an increase in the prestall buffet speed. Positioning the wing flaps to T.O., APPR or LAND will immediately decrease buffet onset speeds.

During cruise flight, retard the condition levers to 96% RPM and set the power levers for cruise power as indicated in Section 5. Reducing EGT below 450°C will reduce fuel consumption and increase range if the airspeed remains above the maximum range cruise performance airspeed. Engine overhaul and periodic inspection costs also may be reduced by operating at reduced EGT. As the RPM is decreased from 100 to 96%, the maximum allowable torque will linearly increase from 1669 to 1738 foot-pounds. The synchrophaser may remain engaged during the RPM decrease from 100 to 96% RPM.

If the propeller synchrophaser is to be initially engaged or reengaged during cruise flight, the propellers must be closely manually synchronized before synchrophaser engagement. If the propellers are not closely synchronized, a power lever split can result after synchrophaser engagement. Proper synchrophaser operation will begin approximately 0 or 20 seconds after switch engagement (depending on which engine control system is installed) and will be indicated by continuous illumination of the PHASE LOCK light. After light illumination, the PHASE knob may be adjusted as required to achieve the desired noise characteristics. The synchrophaser will operate normally during all power decreases and small power increases. If large power increases are anticipated (flight idle to cruise power), the synchrophaser should be positioned to OFF then reengaged after the power increase.

The cabin rate-of-climb control should be positioned with the arrow straight up to provide the proper cabin rate-of-climb as small altitude changes occur.

If cruise altitude increases, adjust the cabin altitude control to prevent the cabin pressure from going to maximum pressure differential. When this occurs, the pressurization system can no longer control the cabin rate-of-climb, therefore any small airplane altitude changes will be reflected in cabin altitude changes. Generally, setting the airplane altitude control (inner scale) about 500 feet above the airplane cruise altitude will allow the pressurization system to maintain a stable cabin altitude. Adjust the cabin rate control as the climb progresses such that the selected cabin altitude is reached at approximately the same time the airplane reaches the new cruising altitude. This will permit a high airplane rate-of-climb to be used and still provide a comfortable environment for the passengers.

Normal operations may be conducted without the use of supplemental oxygen for extended periods up to a cabin altitude of approximately 10,000 feet. A CABIN ALTITUDE annunciator light illuminates when the cabin altitude exceeds 10,000 feet, (airplanes not incorporating SK441-36) or 11,500 feet (airplanes incorporating SK441-36).

If oxygen use is desired, remove the masks from the stowage compartments in the pilot and copilot armrests (airplanes not incorporating SK441-36 or the Quick-Don Oxygen Mask option). Pulling on the lanyard attached to the oxygen hose will remove the pintle pin from the oxygen flow valve, allowing oxygen to flow to the mask. After discontinuing oxygen use, reinstall the pintle pin in the flow valve to terminate oxygen flow. Passenger oxygen masks are of a similar design and operation, only they are stowed in overhead compartments adjacent to each passenger seat. Deployment of the passenger masks occurs automatically during cabin depressurization. In addition, the masks can be manually deployed by positioning the PASS OXY MASKS switch to DEPLOY. If individual passenger oxygen masks are desired without releasing all the oxygen doors, the individual doors can be opened

mechanically. Refer to Section 7 for systems description and Oxygen Duration Chart for crew and passengers.

WARNING

Permit no smoking when using oxygen. Oil, grease, soap, lipstick, lip balm, and other fatty materials constitute a serious fire hazard when in contact with oxygen. Be sure hands and clothing are oil-free before handling oxygen equipment.

If a shift to manual mode is required on one engine, the opposite engine condition lever may be positioned to TAKEOFF, CLIMB AND LANDING. The power lever of the manual mode operating engine can now be adjusted so its torque and fuel flow agree with the engine operating in normal mode. This will eliminate the need for the pilot to determine the appropriate parameters; however, he will still have to adjust the manual mode engine. Refer to Manual Mode Operating Procedures in Section 3.

If icing conditions are encountered, insure the anti-icing systems (windshields, pitot/static, stall vane, and engine inlets) are ON and operating before entering the icing conditions. These systems are designed to prevent ice formation, rather than removing it after it has formed. It is particularly important to begin engine inlet anti-icing early. If ice should form in the engine inlet, anti-icing could release the ice which would be ingested by the engine. The propeller deice system should also be turned on before entering icing conditions. Accumulation of some airframe ice is unavoidable; this will increase airplane weight and drag and decrease airspeed and general airplane performance. It is always wise to avoid icing conditions, if practical.

DESCENT

1. Foot Warmer Valves - DEF.
 - a. Cabin Fan Switch - OFF if necessary to defog windshields during the descent.
 - b. Cabin Flood Air Control - AS REQUIRED to assist defogging of windshield.
2. Pressurization - SET.
 - a. Cabin Altitude - SET SLOWLY. During the initial portion of the descent, set the cabin altitude control to field pressure altitude plus 200 feet (outer scale).
 - b. Cabin Rate Control - SET to reach selected cabin altitude (zero cabin pressure) at approximately the same time the airplane reaches field pressure altitude plus 200 feet.

3. Ice Protection Equipment - AS REQUIRED.

NOTE

- If the possibility of ice exists in the engine inlets, position the ignition override switches to ON before actuating the inlet heat switches. Actuate the switches one at a time to ensure normal engine operation continues. Actuation of the ignition override switches will provide continuous ignition to prevent flameout if ice should be ingested by the engine.
- All flight operations in visible moisture with outside air temperature below 4°C shall be completed with engine inlet heat switches and ignition override switches on.
- During flight in icing conditions, ice will accumulate on the unprotected surfaces of the airplane which can cause an increase in the prestall buffet speed. Positioning the wing flaps to T.O., APPR or LAND will immediately decrease buffet onset speeds.

4. Power Levers - AS REQUIRED for desired rate-of-descent.
5. Fuel Crossfeed Selector - OFF.
6. Altimeter - SET.
7. Passenger Advisory Lights - On.
8. Propeller Synchrophaser - AS REQUIRED.
9. Seat Belts and Shoulder Harness - SECURE.

Before initiating the descent, position the pilot's and copilot's foot warmer valves to DEF. and position the cabin fan switch to OFF. This action will provide maximum windshield and cockpit side window defroster airflow to reduce fogging. This is particularly important when a rapid descent into an area of high humidity is anticipated after cold soaking at altitude. Use the cabin flood air control as required to assist in defogging the cockpit windows.

The cabin altitude control should be set to give a cabin altitude equal to field pressure altitude plus 200 feet. The cabin altitude control should be set as early as practical in the descent in order to allow the lowest cabin rate-of-descent.

As the descent continues, the cabin rate-of-climb control is adjusted to reach the selected cabin altitude (zero cabin pressure differential) at the same time the airplane reaches field pressure altitude plus 200 feet. This procedure permits high rates of airplane descent while maintaining a comfortable environment for passengers.

NOTE

To obtain the approximate field pressure altitude, add 100 feet to the field elevation for each .1 inch Hg. the altimeter is below 29.92 inches Hg. or subtract 100 feet from the field elevation for each .1 inch Hg. the altimeter is above 29.92 inches Hg.

~~During descents with progressive power reductions, the optional synchrophaser may remain engaged. For large power changes, the synchrophaser should be positioned to OFF.~~

Upon completion of any large power changes, the synchrophaser may be reengaged for the remainder of the descent. Manually synchronize the propellers, then select the ON position of the synchrophaser.

To prevent confusion in interpreting which 10,000-foot segment of altitude is being displayed on the altimeter, a striped warning segment is exposed on the face of the copilot's altimeter at all altitudes below 10,000 feet.

BEFORE LANDING

1. Ice Protection Equipment - AS REQUIRED. Ensure anti-icing systems are OFF when outside air temperature is above 4°C (40°F).
2. Fuel Quantity and Balance - CHECK. Maintain lateral balance within 300 pounds differential.
3. Fuel Crossfeed Selector - OFF.
4. Wing Flaps - T.O. or APPR below 200 KIAS. With wing flaps extended beyond APPR, landing gear warning horn will sound until gear is extended.
5. Propeller Synchrophaser - OFF (If Installed).

WARNING

The propeller synchrophaser (if installed) must be OFF before retarding the power levers to FLIGHT IDLE or asymmetrical power and excessive airplane descent rates can occur.

6. Landing Gear - DOWN below 180 KIAS. Check down lights ON; Unlocked light - OFF.
7. Landing and Taxi Lights - AS REQUIRED below 180 KIAS.
8. Condition Levers - TAKEOFF, CLIMB AND LANDING.
9. FUEL COMP OFF Annunciator Lights - OFF.

NOTE

If landing will be attempted with one engine in manual mode, switch the second engine into manual mode. Refer to Abnormal Procedures for manual mode operating procedures.

10. Cabin Differential Pressure - CHECK ZERO DIFFERENTIAL.
11. Ignition Override Switches - AS REQUIRED.

NOTE

The ignition override switches may be positioned to ON to prevent the possibility of a flameout if the runway is covered with slush or deep standing water.

12. Autopilot/Yaw Damper - OFF.
13. Wing Flaps - LAND below 180 KIAS.
14. Approach Speed - 99 KIAS at 9360 pounds. Refer to Section 5 for speeds at reduced weights.

NOTE

- Prestall buffet and stall speeds increase slightly when deice boots are actuated. Maintain extra speed to compensate for boot operation and ice on the unprotected surfaces.
- Maintaining extra airspeed on approach will increase the landing distance.

- a. Power Levers - RETARD for desired rate-of-descent.
15. Power Levers - FLIGHT IDLE at touchdown.

WARNING

Do not abruptly retard the power levers to FLIGHT IDLE before touchdown with windshield and engine inlet anti-ice systems ON. The large bleed air flows will result in a significant increase in propeller drag which will yield an unusually high deceleration rate.

16. Power Levers - GRND IDLE after touchdown. Lift flight idle stops to achieve GRND IDLE position.
17. Beta Lights - CHECK ON.
18. Power Levers - REVERSE as required.

CAUTION

- Do not use full reverse above 90 KIAS.
- Advance power levers to GRND IDLE if engine speed falls below 93% RPM.
- Propellers should be moved out of full reverse pitch above 40 KIAS to minimize propeller blade erosion. Care must be exercised when reversing on runways with loose sand, gravel or dust on the surface to prevent propeller damage and deterioration of pilot's forward visibility.

If fuel has been consumed at uneven rates between the two fuel tanks because of prolonged one engine inoperative flight, it is desirable to balance the fuel load by operating both engines from the fullest tank. Fuel balancing will occur fairly rapidly when crossfeeding as both engines will receive fuel from the fullest tank plus fuel will be transferred to the lightest tank at 400 to 500 pounds per hour. If there is sufficient fuel in both tanks, even though they may have unequal quantities, it is important to position the crossfeed selector to OFF for the landing.

NOTE

Make sure weight does not exceed 9360 pounds before attempting landing.

Landing gear extension before landing is easily detected by a slight change in airplane trim and a slight "bump" as the gear locks down. Illumination of the gear-down indicator lights (green) is further proof that the gear is down and locked. The gear unlocked indicator light (red) will illuminate when the gear uplocks are released and will remain illuminated while the gear is in transit. The unlocked light will extinguish when the gear has locked down. If it is reasonably certain that the gear is down and one of the gear-down indicator lights is still not illuminated, the malfunction could be caused by a burned out light bulb. This can be checked by pushing the annunciator panel press-to-test button. If the bulb is burned out, it can be replaced with the bulb from any post light, or the landing gear unlocked indicator light.

A simple last-minute recheck on final approach should confirm that all applicable switches are on, the gear-down indicator lights (green) are illuminated, the gear unlocked indicator light (red) is extinguished, the optional propeller synchrophaser is OFF and the condition levers are set to TAKEOFF, CLIMB AND LANDING.

If one engine is operating in manual mode, switch the second engine to manual mode before landing. This will equalize engine thrust for landing. When operating in manual mode, the low flight idle fuel flows associated with manual mode operation can cause a significant increase in propeller drag. Slight advancing of the power levers should return the engines to normal operation. Do not abruptly retard the power levers to FLIGHT IDLE before touchdown. Refer to Abnormal Procedures in Section 3.

CAUTION

Reverse power will not be available during landing roll when operating in manual mode. Do not retard the power levers below GRND IDLE during the landing roll.

Landings are conventional in every respect. A power approach is used down to 50 feet above ground level using power as required to stabilize the approach speed and attitude with wing flaps fully extended, landing gear extended and airspeed of 99 KIAS. A decision must be made at the 50-foot point to complete the landing or initiate a balked landing climb using the

appropriate procedure. The landing is completed by further retarding the power levers while passing the 50-foot point and initiating a flare into the landing attitude.

Normally, the power levers are continuously retarded to FLIGHT IDLE throughout the landing flare while allowing the airplane to touchdown, main wheels first, slightly above stall speed. The nose is then gently lowered to the runway, power levers are positioned to GRND IDLE and brakes applied as required. At low altitudes, an abrupt power reduction at five feet altitude could result in a hard landing if the airplane is near stall speed. When landing at airports at high field elevations, abrupt power reduction will not present a problem as the normally high propeller drag associated with flight idle power is greatly decreased due to the decrease in air density. Short field landings on rough or soft runways are done in a similar manner except that the nosewheel is lowered to the runway at a lower speed to prevent excessive nose gear loads.

Maximum braking effectiveness is obtained by applying full even pressure to the toe brakes without locking the wheels and applying full back pressure to the control column. This procedure is recommended only for emergency stops as excessive brake pad and tire wear will occur. Maximum brake wear occurs at high speed. This brake wear can be reduced using aerodynamic braking supplemented with the use of wheel brakes. Maximum aerodynamic braking occurs with the wing flaps fully extended and control wheel held aft to keep the nose off the runway as long as possible.

When operating in normal mode and a short ground run is the major consideration, check left and right BETA annunciator lights on and retard the power levers to reverse as required. Do not exceed the maximum reverse power limits shown in Section 2. Discontinue reverse power when airspeed decreases to 40 KIAS or if engine speed falls below 93% RPM. Maximum effective braking is initiated immediately while continuing to hold the control wheel full aft.

When operating in manual mode and a short ground run is the major consideration, check left and right BETA annunciator lights ON and retard the power levers to GRND IDLE. Maximum effective braking is initiated immediately while continuing to hold the control wheel full aft. Refer to Normal Landing Distance in Section 5 for anticipated ground roll and total distance requirements.

Crosswind landings are performed by using either the wing-low, crab or combination method. Differential thrust may be used to assist in the wing-low approach during landings in strong crosswinds. Use the minimum flap setting required for the particular field length. The nosewheel is lowered to the runway immediately after touchdown. A straight course is maintained with the steerable nosewheel and occasional braking or differential thrust if necessary.

BALKED LANDING

1. Power Levers - ADVANCE for takeoff power.

NOTE

When operating in normal mode with engine torque and temperature limiting (optional some airplanes), advance the power levers slightly ahead of the point where takeoff power is attained. When operating in any other configuration, advance the power levers only sufficiently to attain takeoff power. When operating in normal mode, the red line EGT marking is applicable.

2. Balked Landing Transition Speed - 99 KIAS.
3. Wing Flaps - T.O.

NOTE

- Experience indicates that retracting the landing gear during an operational VFR go-around, when an immediate landing is contemplated, has been conducive to gear up landings.
- Always follow the Before Landing Checklist.

4. Landing Gear - RETRACT during IFR go-around or simulated IFR go-around after establishing a positive rate of climb.
5. Trim airplane for climb.
6. Wing Flaps - UP as soon as all obstacles are cleared and airspeed is above 115 KIAS.

AFTER LANDING

1. Wing Flaps - UP.
2. Ice Protection Equipment - OFF.

NOTE

Windshield anti-ice should be turned off as soon as practical in order to prevent possible system cycling due to windshield overheating during taxiing.

3. Power Levers - GRND IDLE. Operate at this power setting at least 3 minutes prior to shutdown.
4. Condition Levers - START AND TAXI.
5. Anti-Collision Lights - AS REQUIRED.
6. Pressurization Source Selector - BOTH or GND. The GND position will provide increased cabin air flow for ground ventilation.

After leaving the active runway, the wing flaps should be retracted and condition levers positioned to START AND TAXI. Be sure the wing flaps switch is identified before retracting the wing flaps. The wing flaps are positioned to T.O. before the engines are shut down to allow a thorough

preflight inspection of the flaps system before the next flight. Before retarding the condition levers to START AND TAXI, ensure the power levers are retarded to GRND IDLE. If the power levers are forward of GRND IDLE, the fuel control computers may switch to manual mode which will allow the engine speed to increase to manual mode ground idle RPM. Cycling of the FUEL COMPUTER switches would then be required to regain normal mode operation and the corresponding lower ground idle engine speeds.

SHUTDOWN

NOTE

- Allow engines to operate a minimum of three minutes with the power levers in GRND IDLE position before shutdown to ensure proper EGT stabilization. Taxi time may be included in the three-minute period if taxiing at GRND IDLE.
- If taxiing above GRND IDLE, allow at least one minute cooling period at GRND IDLE before shutdown.

1. Wing Flaps - SET to T.O. Position.
2. Fuel Boost Pumps - OFF.
3. Avionics Bus and Gyro Inverter Switches - OFF.
4. Engine Stop Buttons - PUSH and hold for 5 seconds to ensure maximum fuel system purging when shutting down engines.
 - a. Condition Levers - GUARD until certain that engine stop buttons are terminating engine operation.

CAUTION

When the engine stop buttons are pushed, a slight rise in RPM and EGT followed by an immediate drop in fuel flow should occur. If the immediate drop does not occur, immediately position the condition lever to EMER SHUT-OFF to prevent the possibility of an engine compartment fire.

5. Power Levers - REVERSE and hold until engine RPM decreases below 30% RPM to insure start locks engage.
6. Power Levers - GRND IDLE after propellers stop.

NOTE

If the indicated fuel quantity is less than 580 pounds on either or both sides, the operational status of the L and/or R X-FER PUMP FAIL annunciator can be checked. The applicable X-FER PUMP FAIL light should illuminate within one to two minutes after turning off the fuel boost pumps.

7. All Other Switches - OFF.
8. Parking Brake - SET if brakes are cool.
9. Pilot and Copilot Oxygen Masks - UNCOCK and STOW (airplanes incorporating SK441-36).

10. Control Locks - INSTALL.
11. Emergency Exit Window Locking Pin - INSTALL (Optional External Handle System).

A fuel purge system is installed to remove fuel from the engines during shutdown. Upon shutdown, compressed air stored in the purge canister, blows out all fuel remaining in the engine downstream of the fuel control unit. This purged fuel is burned by the engine during the shutdown. The purge cycle is actuated by pressing and holding the engine stop button for five seconds. The compressed air is pressurized bleed air supplied by the engine. To charge the purge canister, the engine must have operated at 95% RPM or more since the previous shutdown.

If dusty conditions exist or if the last flight of the day has been completed, install engine inlet and exhaust covers to protect the engines from debris. The covers may be installed after the engines have cooled down (EGT indicators showing "off scale" temperatures).

Hand rotation of the engine/propeller (in normal direction of rotation) within 15 minutes after shutdown will help expel residual heat in the engine and will enhance not only the fuel nozzle life, but will also reduce air seal drag on the internal parts of the engine, should a restart be accomplished within 45 minutes.

SYSTEM CHECK PROCEDURES

ENGINE RESTART WITHIN 15 TO 45 MINUTES AFTER SHUTDOWN

On the ground, if engine restarts are anticipated within 15 to 45 minutes after shutdown:

1. Airplane - PARK into the wind if possible.
2. Engines - SHUTDOWN.
3. Propellers - HAND-ROTATE rapidly several revolutions in the normal direction of rotation as soon as practical following engine shutdown.

CAUTION

Rotate the propellers in the normal direction only (counterclockwise as viewed when standing in front of propeller). Rotating the propeller backwards will shorten the starter-generator brush service life and can have an adverse affect on engine mounted accessories which are sensitive to reverse rotation.

NOTE

If the period of shutdown is less than 15 minutes, Step 3 may be omitted.

Prior to Engine Starting:

4. Propellers - HAND-ROTATE and check for abnormal resistance or noise.
 - a. If abnormal resistance or noise is encountered, wait an additional 10 minutes and recheck.
5. Engines - START.

CAUTION

Ensure that fuel and ignition are shut off prior to activating the Starter Motor switch by pushing the stop button. Use of the starter motor switch prior to pushing the engine stop button will result in unwanted fuel in the engine and a possible engine startup.

NOTE

If indicated ITT is in excess of 200°C EGT, the engine may be motored without fuel and ignition until either 200°C EGT or 15 percent rpm is attained, at which time the engine start button may be pushed to initiate the start sequence. Observe starter limitations.

If a restart is attempted on a warm engine with winds blowing up the engine eductor pipe, the probability of a hot start is greatly increased. During a period of 15 to 45 minutes after shutdown, low-time engines may not rotate freely. This is due to differences in the cooling rates of various internal components which create temporary tightness at the labyrinth seals. Depending upon the degree of thermal distortion at the time of the subsequent engine start, the resulting seal drag may slow normal engine acceleration enough to cause a hung start characteristically within the main shaft resonant range of 18 to 28 percent RPM.

If during the ground start the engine should fail to accelerate, regardless of indicated EGT, terminate the start immediately. After the engine has come to a complete stop, hand rotate the propeller in the normal direction of rotation rechecking for abnormal resistance or noise. The uneven engine cooling contributing to a hung start is commonly resolved during an aborted start; therefore, a second attempt should be successful.

Should two consecutive starts be unsuccessful due to hung starts, troubleshoot the engine to determine the cause prior to attempting another start.

ELECTRONIC FUEL CONTROL HIGH-POWER MONITOR CHECK

When operating in normal mode, this check is to be performed before engine starting on the first flight of the day or after performance of any maintenance, periodic inspection or adjustment involving the engine control system.

1. Power Levers - GRND IDLE.
2. Condition Levers - TAKEOFF, CLIMB AND LANDING.

3. Power Levers - FLIGHT IDLE.

NOTE

The FUEL COMP OFF lights should illuminate, indicating the high-power monitor is operating properly. If the light(s) does not illuminate, a problem in the airplane power lever rigging and/or the fuel control computer monitoring circuit is indicated. All flights should be conducted in manual mode until the problem is corrected. Refer to Manual Mode Operations in Section 3.

4. Condition Levers - START AND TAXI.

5. Fuel Computer Switches - CYCLE from ON to OFF to ON. Check that FUEL COMP OFF lights extinguish when the fuel computer switches are positioned to ON.

NEGATIVE TORQUE SENSING SYSTEM CHECK

The negative torque sensing check is to be accomplished before the first flight of the day during the "Starting Engines" procedures.

1. Before Starting Engines Check - COMPLETE.
2. Voltmeter - CHECK 24 volts minimum.
3. Propeller - CLEAR and on start locks.
4. Fuel Boost Pumps - AUX.
5. Unfeathering Pump Switch - ACUTATE and HOLD. NTS CHECK annunciator light will illuminate.
6. Engine Start Button - PUSH momentarily. Observe propeller rotation and NTS CHECK annunciator light goes out. At approximately 30% engine RPM NTS CHECK annunciator light will illuminate.
7. Unfeathering Pump Switch - RELEASE.
8. Refer to Starting Engines Procedure.

GROUND OPERATIONS ENGINE CLEARING PROCEDURE

Natural draining of fuel and fuel vapors from the engine will occur by allowing the engine to remain static for a minimum of three minutes.

1. Battery Switch(es) - ON.
2. Engine Stop Button - PUSH momentarily to close electric fuel shutoff.
3. Ignition Override Switch - CHECK OFF.
4. Propeller - CLEAR and on start locks.

CAUTION

Ensure that fuel and ignition are shut off prior to activating the Starter Motor Switch by pushing the stop button. Use of the starter motor switch prior to pushing the engine stop button will result in unwanted fuel in the engine and a possible engine startup.

5. Starter Motor Switch - LIFT cover guard and hold switch in desired position until engine reaches 15% RPM.

6. Battery Switch(es) - OFF.

NOTE

Do not attempt a restart until EGT is less than 200°C. Do not exceed starter duty cycle presented in Section 2.

INFLIGHT ENGINE CLEARING PROCEDURE

NOTE

The STARTER MOTOR switch is deactivated in flight. Engine rotation is accomplished through use of the unfeathering pump switch.

Natural draining of fuel and fuel vapors from the engine will occur by allowing the engine to remain static for a minimum of 30 seconds.

1. Engine Stop Button - PUSH momentarily to close electric fuel shutoff.
2. Ignition Override Switch - CHECK OFF.
3. Condition Lever - TAKEOFF, CLIMB AND LANDING.

CAUTION

- Use of the Unfeathering Pump Switch prior to pushing the engine stop button will result in unwanted fuel in the engine and a possible engine start up. Ensure that fuel and ignition are shut off prior to activating the Unfeathering Pump Switch.
- Do not allow engine to continuously NTS between 18% and 28% RPM.

4. Unfeathering Pump Switch - ACTUATE and hold until 10% to 15% RPM is achieved.
5. Condition Lever - EMER SHUTOFF.

NOTE

Do not attempt a restart until EGT is less than 200°C.

OVERSPEED GOVERNOR CHECK

This check should be made before the first flight of the day and whenever air starts will be attempted intentionally. The check should also be accomplished if there is an indication of malfunction, if any maintenance has been performed on the engine control system or whenever fuel type is

changed. Before performing the check, set the parking brake, ensure the propeller start locks are engaged and the area ahead of the airplane is clear. Refer to Section 8 for additional procedures and to Chapter 12 of the Maintenance Manual if an overspeed governor adjustment is required, whenever a change in fuel type is made.

1. Condition Levers - TAKEOFF, CLIMB AND LANDING.
2. Power Levers - ADVANCE until further motion causes no increase in fuel flows or RPMs. Engine speeds should be 103.5 to 105.5% RPM except on airplanes incorporating SK441-79. Engine speeds should be 104.5 to 105.5% RPM on airplanes incorporating SK441-79.

CAUTION

- Ensure that the propellers have not "jumped" their start locks.
- Do not allow engine speeds to exceed 106.0% RPM.
- If overspeed limits are exceeded beyond the following times, refer to the applicable engine maintenance manual.
 - a. Time in excess of 30 seconds to stabilize at 103.5% to 105.5% RPM.
 - b. Time in excess of 5 seconds at 105.5% to 106.0% RPM.
 - c. Anytime in excess of 106.0% RPM.

3. Power Levers - GRND IDLE.
4. Condition Levers - START & TAXI.

MANUAL MODE FUEL CONTROL CHECK

1. Condition Levers - ADVANCE to attain approximately 75% RPM.
2. Fuel Computer Switches - OFF. Verify illumination of FUEL COMP OFF annunciator lights and engine speeds initially decrease then increase and stabilize at 85% $\pm$ 10% RPM.

NOTE

If engine speeds decrease below 55% RPM, return the fuel computer switches to ON. Increase RPM to 85% using the condition levers and repeat the manual mode check.

3. Power Levers - ADVANCE slightly. Verify engine speed increases with power lever movement. Retard power levers to GRND IDLE.
4. Condition Levers - START AND TAXI.
5. Fuel Computer Switches - ON (Guards Down). Verify engine speeds decrease and FUEL COMP OFF annunciator lights go out.

MANUAL MODE OVERSPEED GOVERNOR CHECK

This check is intended for daily use and is a combination of the Overspeed Governor Check and the Manual Mode Fuel Control Check. Before performing the check, set the parking brake, ensure the propeller start locks are engaged and the area ahead of the airplane is clear.

1. Condition Levers - ADVANCE to attain approximately 75% RPM.
2. Fuel Computer Switches - OFF. Verify illumination of FUEL COMP OFF annunciator lights and engine speeds initially decrease then increase and stabilize at 85% $\pm$ 10% RPM.
3. Power Levers - ADVANCE slightly. Verify engine speed increases with power lever movement.
 - ADVANCE until further motion causes no increase in fuel flows or RPMs. Engine speeds should be 103.5 to 105.5% RPM except on airplanes incorporating SK441-79. Engine speeds should be 104.5 to 105.5 RPM on airplanes incorporating SK441-79.

CAUTION

- Ensure that the propellers have not "jumped" their start locks.
- Do not allow engine speeds to exceed 106.0% RPM.
- If overspeed limits are exceeded beyond the following times, refer to the applicable engine maintenance manual.
 - a. Time in excess of 30 seconds to stabilize at 103.5% to 105.5% RPM.
 - b. Time in excess of 5 seconds at 105.5% to 106.0% RPM.
 - c. Anytime in excess of 106.0% RPM.

4. Power Levers - GRND IDLE.
5. Condition Levers - START AND TAXI.
6. Fuel Computer Switches - ON (Guards Down) Verify engine speeds decrease and FUEL COMP OFF annunciator lights go out.

START LOCK ENGAGEMENT PROCEDURE**CAUTION**

Do not attempt a ground engine start unless the start locks are engaged. If a start is attempted with the start locks disengaged, a hot start will result.

1. Power Lever - REVERSE.
2. Unfeathering Pump Switch - ACTUATE and hold until propeller is on the start locks.
3. Power Lever - FLIGHT IDLE.

ELECTRIC ELEVATOR TRIM DISENGAGE CHECK

1. Electric Elevator Trim Switch - UP.
 - a. AP/TRIM Disengage Switch - DISCONNECT. Observe that manual trim wheel and indicator stop moving.
2. Electric Elevator Trim Switch - DN.
 - a. AP/TRIM Disengage Switch - DISCONNECT. Observe that manual trim wheel and indicator stop moving.
3. Elevator Trim - SET to takeoff range.

AUTOPILOT PREFLIGHT CHECK

1. Autopilot/Yaw Damper Switch - AP/YD (Check Pitch And Roll Command).
2. Autopilot Preflight Test Button - PUSH and hold.
 - a. Autopilot/Yaw Damper Switch - OBSERVE disengage; if no disengage, autopilot is inoperative for flight.
 - b. A/P OFF Light - ILLUMINATED.
 - c. Autopilot Disengage Horn - OBSERVE 1 to 2 second aural tone.
3. Airplane Control Wheel
AP/TRIM Disengage Switch - DISCONNECT to turn off A/P OFF light.

ICE PROTECTION EQUIPMENT CHECK

This check should be completed before takeoff if flight in icing conditions is anticipated.

1. Condition Levers - START AND TAXI.
2. Power Levers - FORWARD of FLIGHT IDLE.
3. Windshield Anti-Ice Switch - ON to check system operation and to purge any water which may be present in the windshield bleed air nozzles. Operation can be verified by an audible increase in airflow noise due to windshield bleed air flow.
 - a. W/S AIR O'HEAT Annunciator - CHECK off.

- b. EGT Indicators - CHECK for increase, indicating engine bleed air extraction.
- c. Windshield Anti-Ice Switch - OFF until starting takeoff roll.

NOTE

Windshield anti-ice system will not allow continuous ground operation due to inadequate flow across the windshield heat exchanger. Continuous ground operation can result in automatic termination of windshield bleed air flow due to windshield overheat.

- 4. Power Levers - AS REQUIRED.
- 5. Stall Vane Anti-Ice - CHECKED during preflight inspection.
- 6. Surface Deice Switch - ON momentarily. Visually check boot operation. Each switch actuation will result in a complete inflation and deflation cycle of the empennage boots and then the wing boots lasting approximately 90 seconds.
 - a. SURFACE DEICE Annunciator - CHECK on. Light should illuminate approximately 6 seconds while the empennage boots are pressurized, go off momentarily and then back on again for approximately 6 seconds while the wing boots are pressurized.

CAUTION

Surface deice boot activation below -40°C can result in permanent damage to the deice boots. Actuate only as necessary to remove ice below -40°C .

- 7. Engine Inlet Anti-Ice Switches - ON. Operation can be verified by observing EGT increase due to bleed airflow to engine inlet. Check L and R ENGINE ANTI-ICE annunciator lights on.

CAUTION

- Operate engine inlet heat for check purposes only (maximum of 10 seconds) if outside air temperature is above 4°C .
- If the possibility of ice exists in the engine inlets before the inlet heat switches are actuated, position the Ignition Override switches to ON before actuating the inlet heat switches. Actuate the switches one at a time to insure normal engine operation continues. Actuation of the Ignition Override switches will provide continuous ignition to prevent a flameout if ice should be ingested by the engine.

8. Propeller Deice Switches - ON. Proper operation is indicated by periodic fluctuations, within the green arc, on the propeller deice ammeter.
9. Pitot/Static Heat - CHECKED during preflight inspection.

ENGINE FIRE EXTINGUISHER BOTTLE PRESSURE CHECK

Due to the low volume and high pressure contained in the optional fire extinguisher bottles, the pressures will vary considerably with ambient temperature. Consequently, a properly serviced bottle will indicate different pressures with different ambient temperatures. The following chart will provide assistance in determining the recommended pressure for various ambient temperatures.

AMBIENT TEMPERATURE - °C (°F)	-34 (-30)	-18 (0)	-1 (30)	16 (60)	32 (90)	49 (120)
PROPERLY SERVICED GAGE READING	250	350	450	550	650	800

Figure 4-3

STALL

The stall characteristics of the airplane are conventional. Aural warning is provided by the stall warning horn 5 to 10 KIAS above the stall in all configurations. The wing flaps UP stall is also preceded by a moderate aerodynamic buffet approximately 10 KIAS above the stall which increases in intensity as the stall is approached. The wing flaps LAND stall is preceded by light buffet just prior to the stall. The power-on stall occurs at a very steep pitch angle with or without flaps. All power-off stalls must be conducted with condition levers positioned to TAKEOFF, CLIMB AND LANDING and optional synchrophaser positioned to OFF. It is difficult to inadvertently stall the airplane during normal maneuvering. Due to the large speed range between wing flaps UP and wing flaps LAND stall speeds, the immediate retraction of wing flaps from LAND to UP should be avoided. Follow all recommended procedures for wing flap retraction.

MANEUVERING FLIGHT

No aerobatic maneuvers, including spins, are approved in this airplane; however, the airplane is conventional in all respects through the maneuvering range encountered in normal flight.

PROCEDURES FOR PRACTICE DEMONSTRATION OF V_{MC_A}

One engine inoperative procedures should be practiced in anticipation of an emergency. This practice should be conducted at a safe altitude (5000 feet AGL), with full power operation on both engines, and should be started

at a safe speed of at least 98 KIAS. As recovery ability is gained with practice, the starting speed may be lowered in small increments until the feel of the airplane in emergency conditions is well known. It should be noted that as the speed is reduced, directional control becomes more difficult. Emphasis should be placed on stopping the initial large yaw angles by the IMMEDIATE application of rudder supplemented by banking slightly away from the yaw. Practice should be continued until: (1) an instinctive corrective reaction is developed and the corrective procedure is automatic and, (2) airspeed, altitude, and heading can be maintained easily while the airplane is being prepared for a climb. Crew Training One Engine Inoperative Procedures are provided in the Abnormal Procedures of this handbook.

V_{SSE} is used in training and is not a limitation. It is recommended, however, that except for training, demonstrations and landings, this airplane should not be flown at a speed slower than V_{SSE} .

Under no circumstances should a V_{MC_A} demonstration be attempted at a speed slower than the red radial on the airspeed indicator.

NIGHT FLYING

Before starting the engines for a night flight, position the master panel lighting switch to NIGHT and adjust the rheostats to provide enough illumination to check all switches, controls, etc.

Navigation lights are then checked by observing reflections from the pavement or ground. The operation of the anti-collision lights should be checked by observing the reflections on the ground. After starting the engines, the retractable landing lights may be extended and checked momentarily. Returning the landing light switches to OFF turns the lights off, but leaves them extended ready for instant use.

Before taxi, the interior lighting intensity is normally decreased to the minimum at which all the controls and switches are visible. The taxi light should be turned on prior to taxiing at night.

COLD WEATHER OPERATION

When the airplane is cold soaked at ambient temperatures below -12°C , the propellers should be rotated 30 blades by hand. This rotation will break the congealed oil on the gears and bearings and scavenge oil out of the engine nose case to decrease starting loads. If it is necessary to place a feathered propeller on the start locks, preheating is recommended at oil temperatures below -12°C with Type II oil and -20°C with Type I oil.

Due to the higher viscosity of Type II oils, starting difficulties or slow cranking of the engines can be encountered at ambient temperatures below approximately -12°C . This problem will be more evident after the airplane has cold soaked for several hours. Preheat is recommended.

Whenever possible, external preheat should be utilized in cold weather. The use of preheat substantially reduces the severity of conditions imposed on both engines and electrical systems. Preheat will thaw the oil trapped in the oil coolers and oil filters, which will probably be congealed prior to starting in very cold weather. Preheat can be applied through the engine inlet or tailpipe.

An auxiliary power unit should be used when ambient temperature is less than -12°C to compensate for the reduced battery efficiency and the higher starter load requirements.

If preheat and APU are not used when recommended, the probability of a "hot start" is increased.

If the engines accelerate smoothly and the oil pressure remains normal and steady, the airplane is ready for takeoff.

WARNING

The wings and tail surfaces must be clear of ice, snow and frost prior to takeoff as flight characteristics will be adversely affected.

During operation in cold wet weather, the possibility of brake freezing exists; therefore, special precautions should be taken. When severe icing or excessive moisture with freezing weather conditions exist, parked airplane should have brakes in "off condition" (not set). If ice is found on the brakes during preflight inspection, heat the brakes with a ground heater until the ice melts and all traces of moisture are removed. If a ground heater is not available, spray or pour isopropyl alcohol (MIL-F-5566) on the brakes to remove the ice.

CAUTION

If brakes are deiced using alcohol, ensure alcohol has evaporated from the ramp prior to starting engines as a fire could result.

If neither heat or alcohol is available, frozen brakes can sometimes be freed by actuating the brakes several times using maximum brake pressure.

When airplane is stopped on the taxiway or runway and brake freeze-up occurs, actuate the brake several times using maximum pressure. To reduce possibility of brake freeze-up during taxi operations in severe weather conditions, two taxi slowdowns (from 35 to 15 MPH) using firm brake pressure may be made permitting brakes to reach a warm condition evaporating any moisture buildup within the brake.

After takeoff from slush-covered runways or taxiways, leave landing gear down for a short period, allowing wheels to spin. This will allow centrifugal force to throw off any accumulated slush which should preclude frozen brakes on landing. Ensure wheels are stopped before retracting the landing gear to prevent buildup of ice or slush in the wheel wells.

During cruise, electrical equipment should be managed to assure adequate generator charging throughout the flight, since cold weather adversely affects battery capacity.

Prior to landing, and with gear down, maximum brake pressure should be applied several times to alleviate any brake freeze-up caused by icing in the brake assembly during flying conditions.

NOISE ABATEMENT

Increased emphasis on improving the quality of our environment requires renewed effort on the part of all pilots to minimize the effect of airplane noise on the public.

We, as pilots, can demonstrate our concern for environmental improvement by application of the following suggested procedures, and thereby tend to build public support for aviation:

1. Pilots operating airplanes under VFR over outdoor assemblies of persons, recreational and park areas, and other noise-sensitive areas should make every effort to fly not less than 2000 feet above the surface, weather permitting, even though flight at a lower level may be consistent with the provisions of government regulations.
2. During departure from or approach to an airport, climb after take-off and descent for landing should be made so as to avoid prolonged flight at low altitude near noise-sensitive areas. Avoidance of noise-sensitive areas, if practical, is preferable to overflight at relatively low altitudes.

NOTE

The preceding recommended procedures do not apply where they would conflict with Air Traffic Control clearances or instructions, or where, in the pilot's judgment, an altitude of less than 2000 feet is necessary to adequately exercise his duty to see and avoid other airplanes.

The flyover noise level, established in compliance with FAR 36, is 74.0 dB(A).

No determination has been made by the Federal Aviation Administration that the noise level of this airplane is, or should be acceptable or unacceptable, for operation at, into, or out of any airport.

OXYGEN USE AND THE PRESSURIZED AIRPLANE

Although this airplane exceeds the safety requirements for operation of pressurized airplanes at high altitude, it is felt that some words of caution are desirable in order to avoid unnecessary hazards. Normal operations may be conducted without supplemental oxygen for extended periods up to a cabin altitude of approximately 10,000 feet. Although the cabin altitude will not exceed 10,168 feet for operation up to the maximum altitude of 33,000 feet, (airplanes not incorporating SK441-36) or 11,200 feet for operation up to maximum altitude of 35,000 feet (airplanes incorporating SK441-36), it should be pointed out that the expected time that a person will remain conscious in the event the cabin must be totally depressurized at this altitude is less than one minute if supplementary oxygen is not used.

An altitude warning light is provided which indicates when the cabin altitude is higher than 10,900 feet (airplanes not incorporating SK441-36) or 11,500 feet (airplanes incorporating SK441-36). This indicator is controlled by a barometric switch which senses cabin altitudes and is operational when the battery switch is ON.

It is recommended that oxygen be used by all occupants when the cabin altitude warning light illuminates.

WARNING

Permit no smoking when using oxygen. Oil, grease, soap, lipstick, lip balm, and other fatty materials constitute a serious fire hazard when in contact with oxygen. Be sure hands and clothing are oil-free before handling oxygen equipment.

1. Pilots operating airplanes under VFR over outdoor assemblies of persons, recreational and park areas, and other noise-sensitive areas should make every effort to fly not less than 2000 feet above the surface, weather permitting, even though flight at a lower level may be consistent with the provisions of government regulations.
2. During departure from or approach to an airport, climb after take-off and descent for landing should be made so as to avoid prolonged flight at low altitude near noise-sensitive areas. Avoidance of noise-sensitive areas, if practical, is preferable to overflight at relatively low altitudes.

NOTE

The preceding recommended procedures do not apply where they would conflict with Air Traffic Control clearances or instructions, or where, in the pilot's judgment, an altitude of less than 2000 feet is necessary to adequately exercise his duty to see and avoid other airplanes.

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It is recommended that oxygen be used by all occupants when the cabin altitude warning light illuminates.

WARNING

Permit no smoking when using oxygen. Oil, grease, soap, lipstick, lip balm, and other fatty materials constitute a serious fire hazard when in contact with oxygen. Be sure hands and clothing are oil-free before handling oxygen equipment.

AVIONICS SYSTEMS NORMAL PROCEDURES**1000 AUDIO CONTROL PANEL**

1. VOL Control - Initial setting is approximately at the 3 o'clock position.

NOTE

Set the individual volume controls of each receiver only after setting the master volume level control on the audio control panel.

2. INTERCOM ON/OFF

Selector Switch - AS REQUIRED. When the switch is set to the ON position it provides communication between pilot and copilot without having to actuate any microphone button. During transmissions where the pilot or copilot wheel microphone buttons are pressed, the interphone function is muted.

NOTE

- The interphone level is adjustable only through the control panel VOL control and should be adjusted from the initial 3 o'clock setting to the desired level before the individual receiver controls are set to their final desired level.
- The speaker interphone function should only be used with oxygen mask microphones because the normal lip microphones will cause a feedback squeak in the cockpit.
- Intercommunication between pilot and copilot should not be attempted using the hand-held microphone, since keying the microphone will key the transmitter for whatever Com the function selector switch is set.

3. SPKR/OFF/HDST Receiver Selector Switches - SELECT any of the receiver audio signals individually or in combination for simultaneous monitoring.

NOTE

Set the individual receiver volume controls at their final desired level only after establishing the interphone level with the control panel VOL control. In the event that interphone is not being utilized, set the individual receiver volume controls with the control panel VOL control at the approximate 3 o'clock position.

4. Function Selector Switch - AS REQUIRED. Select COM 1, 2, 3, or CABIN. The transmitter sidetone audio will be heard in the headset or speaker for the appropriately selected transmitter. In dual installations, the sidetone will only be heard by pilot and copilot when both audio control panels are set to the same transmitter selection.
5. AUTO SPKR/HDST Selector Switch - AS REQUIRED. Selects the appropriate receiver audio or transmitter sidetone for reception on the headset or speaker. On dual installations, the pilot's control panel activates only the pilot's headset or speaker and the copilot's control panel activates only the copilot's headset or speaker.
6. Marker Beacon HIGH/LOW/MUTE Switch - AS REQUIRED. LOW position is used during an ILS approach. MUTE position is momentary and mutes the marker beacon audio for approximately 30 seconds.

NOTE

- The marker beacon and DME audio level is adjustable only through the control panel VOL control, therefore, it is important to keep the control panel VOL control within its' normal operating range of approximately 3 o'clock $\pm$ any individual comfort adjustment to take care of ambient noise level or variations in headset types (muff, single receiver, etc.)
- Do not operate the control panel VOL control at an extremely low setting while turning up the individual receiver volume controls to extremely high settings. This could result in distortion of NAV, COM and ADF audio as well as low levels of MKR and DME audio.

7. Cabin Communication - Cockpit communication with the cabin is accomplished by setting the function selector switch to CABIN position and actuating the cockpit microphone. When the cabin wishes to communicate with the cockpit, actuation of the cabin-mounted microphone key lights the CABIN CALL indicator on the audio control panel to signal the cockpit. When the function selector switch is set to CABIN, communication is established between the cockpit and cabin.

1000 AUTOMATIC DIRECTION FINDER

1. Audio Control Panel - AS^{*}REQUIRED.
2. OFF/VOL Control - CLOCKWISE as required.
3. Functional Check - COMPLETE.
 - a. TEST Pushbutton - PUSH until RMI double-bar pointer slews off indicated bearing. Pointer should return to original bearing after TEST pushbutton is released. Input and active frequencies should display 1888.
4. Normal Mode Operation:
 - a. DIR/NRM Selector - NRM.
 - b. Frequency Selectors - AS REQUIRED.
 - c. XFER Pushbutton - PRESS. Input frequency is transferred to active frequency readout. Previous active frequency is stored in memory. A second frequency may be programmed in the same manner as the first frequency. A third frequency may be stored in the frequency selector and input frequency readout.
 - d. RECALL Pushbutton - PRESS. Frequency in memory is transferred to active frequency readout and previous active frequency is stored in memory.
5. Direct Mode Operation:
 - a. DIR/NRM Selector - DIR. Input frequency readout is blank and active frequency readout displays frequency selected by frequency selectors.

NOTE

- XFER and RECALL functions are disabled when operating in direct mode.
- Switching to the direct mode does not affect the memory frequency. The memory frequency may be recalled by switching back to the normal mode and pressing RECALL.

- b. Frequency Selectors - AS REQUIRED.
6. Navigation:
 - a. Function Switch - REC.
 - b. Operating Frequency - LOAD as previously described and identify station.

NOTE

If station is transmitting keyed CW signals (Morse Code), set the function switch to BFO to identify the station.

- c. Function Switch - ADF.

1000 COMMUNICATION SYSTEM

1. VOL Control - CLOCKWISE.
2. Functional Check - COMPLETE.
 - a. Display Reliability Test
 - (1) Manually select 188.88 and check for proper readout.

3. Audio Control Panel - AS REQUIRED. COMM 2 provides best communication during all ground operations.
4. 25/50 Fractional MHz Switch - AS REQUIRED.
5. Frequency Selectors - AS REQUIRED.

NOTE

When tuned to a weak NAV signal, keying the COMM transmitter may cause momentary interference within the NAV receiver causing a NAV flag to appear. Should circumstances warrant, ATC should be requested to assign another COMM frequency.

6. Squelch Threshold - ADJUST as required.
7. XFER Pushbutton - PRESS. Input frequency is transferred to active frequency readout. Previous active frequency is stored in memory. A second frequency may be programmed in the same manner as the first frequency. A third frequency may be stored in the frequency selector and input frequency readout.
8. RECALL Pushbutton - PRESS. Frequency in memory is transferred to active frequency readout and previous active frequency is stored in memory.

800 DISTANCE MEASURING EQUIPMENT

1. TEST/ON-OFF Switch - SET to ON.
2. DME Mode Selector Switch - SET to NAV 1 or NAV 2.
3. NAV 1 and NAV 2 Receivers - SET.
4. Audio Control Panel - AS REQUIRED.
5. GS/TTS Switch - AS REQUIRED.
6. TEST/ON-OFF Switch - TEST:
 - a. Distance-to-Station display readout is 188.8.
 - b. Knots/Minutes display readout is 888.
7. TEST/ON-OFF Switch - RELEASE; display readouts return to normal.

400 ENCODING ALTIMETER

1. Encoding Altimeter - SET and crosscheck with standby barometric altimeter.
 - a. Power-Off Warning Flag - RETRACTED.

1000A INTEGRATED FLIGHT CONTROL SYSTEM

NOTE

The following additional features are incorporated when either a P/N 46210-8001 or P/N 46210-8004 replacement autopilot/flight director computer is installed:

Rotation of the pitch command wheel disengages the GS ENG mode.

The NAV ENG and GS ENG lights on the mode selection and the NAV and GS lights on the mode repeater annunciator will blink whenever NAV (VOR or LOC) mode and/or GS modes are engaged and a respective flag condition exists for more than 3 seconds.

Before Takeoff**AUTOPILOT AUTOMATIC DISCONNECT CHECK (WITH GYROS ERECTED)**

1. Autopilot Turn Command Knob - CENTER DETENT.
2. Autopilot/Yaw Damper Switch - AP/YD. Observe annunciation on mode selector for AP and FD engage, and that the turn and bank yaw damper flag is retracted.
3. FD Mode Selector Button - ACTUATE. Observe FD disengage.
4. PREFLIGHT TEST Button - PUSH and HOLD.
5. Verify the following:
 - a. Autopilot/Yaw Damper Switch - OBSERVE return to OFF position.
 - b. AP OFF Light - OBSERVE illumination.
 - c. Autopilot Disengage Horn - OBSERVE 1 to 2-second decreasing aural tone.
6. Airplane Control Wheel
Autopilot/Electric Trim Disengage Switch - PUSH to turn off the AP OFF light.
7. Autopilot/Yaw Damper Switch - AP/YD - OBSERVE annunciation.
8. Left Power Lever GA Switch - PRESS.
9. Verify the following:
 - a. Autopilot/Yaw Damper Switch - OBSERVE return to OFF position.
 - b. AP OFF Light - OBSERVE illumination.
 - c. Autopilot Disengage Horn - OBSERVE 1 to 2-second decreasing aural tone.
 - d. FD GA Light - OBSERVE illumination.
 - e. Flight Director Command Bars - CHECK for pitch up command.
10. Flight Director Mode Selector Button - ACTUATE. Observe FD disengage.
11. Left Power Lever GA Switch - PRESS.
12. Verify that flight director engages in GA mode.
13. Flight Director Mode Selector Button - ACTUATE. Observe FD disengage.

Basic Autopilot Operation (Flight Director On Or Off)**BEFORE ENGAGEMENT**

1. Airplane Elevator, Aileron and Rudder Trim - ADJUST.

ENGAGEMENT

1. Autopilot Turn Command Knob - CENTER DETENT.
2. Pitch Synchronization Button
(With Flight Director Engaged) - MOMENTARILY PRESS to synchronize the flight director pitch command bar to the airplane attitude.
3. Autopilot/Yaw Damper Switch - AP/YD. OBSERVE AP annunciation.

NOTE

Airplane rudder trim will have to be adjusted as required for ball centered flight. Airplane aileron trim will have to be readjusted as indicated by the roll trim indicator on the autopilot control head to compensate for large airspeed or configuration changes. Trim toward the roll trim indicator deflection.

TURN COMMANDS

1. Autopilot Turn Command Knob - ROTATE as desired.

PITCH COMMANDS

1. Autopilot Pitch Command Wheel - ROTATE as desired. (Or)
2. Pitch Synchronization Button - PRESS and HOLD. Manually place airplane at desired attitude, then release button.

DISENGAGEMENT

1. Autopilot/Electric Trim Disengage Switch - DISENGAGE. (Or)
2. Autopilot/Yaw Damper Switch - OFF. (Or)
3. Left Power Lever Go-Around Switch - PRESS. Refer to Go-Around Operation. (Or)
4. Pilot's Electric Elevator Trim Switch - ACTUATE.

NOTE

- If the autopilot is either disengaged with the autopilot/yaw damper switch or is automatically disengaged due to a system malfunction, the AP OFF light will continuously illuminate and a 1 to 2-second aural tone with decreasing amplitude will occur. The AP OFF light may be extinguished by cycling the pilot's or copilot's control wheel autopilot disengage switch.
- Normal autopilot disengagement should be conducted with the airplane control wheel autopilot/electric trim disengage switch. The AP OFF light will not illuminate but the 1 to 2-second aural tone will occur.
- Autopilot disengagement with the left power lever go-around (GA) switch or the AP/TRIM disengage switch will illuminate the AP OFF light and will give a 1 to 2-second aural tone. Refer to Go-Around Operation.

Basic Flight Director Operation (Autopilot Off)

ENGAGEMENT

1. Autopilot Turn Command Knob - CENTER DETENT.
2. Flight Director Mode Selector Button - ACTUATE. Observe annunciation and flight director command bars.

BASIC PITCH COMMANDS

1. Manually fly the airplane to the desired pitch attitude.
2. Pitch Synchronization Button - PRESS to synchronize the pitch command bar to the flight attitude.

NOTE

In a flight director mode, the flight director pitch command bar will automatically synchronize to the pitch attitude at the time of engagement. If a new pitch attitude is manually flown, the airplane control wheel pitch synchronization button should be pressed to synchronize the flight director command bar to that attitude.

DISENGAGEMENT (FLIGHT DIRECTOR)

1. Flight Director Mode Selector Button - ACTUATE.

NOTE

Altitude hold, heading select, and navigation coupling procedures that follow are identical for flight director and/or autopilot modes. In a flight director mode, with autopilot OFF, the pilot must manually satisfy the flight director pitch and roll command bars.

Altitude Hold Coupling (Flight Director And/Or Autopilot Modes)

ENGAGEMENT

NOTE

When approaching desired altitude, decrease vertical speed to 2000 feet per minute or less and decrease airplane pitch attitude to within 5° of level to attain smooth altitude captures.

1. With Basic IFCS:
 - a. Altitude Hold Mode Selector Button - PRESS at desired altitude. Observe annunciation.

NOTE

After engagement, and the airplane has accelerated to level cruise flight at high altitude, the autopilot air data static system may indicate a slightly different pressure than the pilot's and copilot's static system. As a consequence, the altitude hold mode may maintain the airplane at an altitude slightly above or below the desired altitude. If the altitude difference is objectionable, disengage the altitude hold mode and reengage while in level cruise flight.

2. With Optional Altitude Alert/Preselect System:
 - a. Desired Altitude - SELECT.
 - b. Altitude Alert/Preselect Arm Button - PUSH. Observe that amber ARMD light illuminates.

CAUTION

Do not operate the autopilot in altitude hold mode when flying in moderate to severe turbulence, mountain lee wave activity and/or moderate to severe icing conditions.

NOTE

The altitude alert/preselect ARMD mode is inoperative when the autopilot is in the altitude hold or glide slope mode.

- c. Autopilot Pitch Command Wheel - UP or DOWN as required to intercept selected altitude.
- d. When selected altitude is captured, OBSERVE:
 - (1) Altitude alert/preselect amber ARMD light goes OFF.
 - (2) Altitude alert/preselect green CPLD light illuminates.
 - (3) IFCS mode selector ALT light illuminates green.

NOTE

Once armed, the altitude alert/preselect can be disarmed by reselecting a different altitude on the altitude preselect presentation, by selecting the altitude hold mode on the mode selector or by glide slope capture.

DISENGAGEMENT (ALTITUDE HOLD COUPLING)

1. Altitude Hold Mode Selector Button - ACTUATE. (Or)
2. Pitch Synchronization Button - PRESS. (Or)
3. Autopilot Pitch Command Wheel - ROTATE.

NOTE

Altitude hold mode will automatically disengage in the coupled ILS mode when the glide slope is engaged.

Heading Select Function (Flight Director And/Or Autopilot Modes)

ENGAGEMENT

1. Autopilot Turn Command Knob - CENTER DETENT.
2. HSI Heading Selector Knob - ROTATE bug to desired magnetic heading.
3. Heading Mode Selector Button - ACTUATE. Observe annunciation.
4. HSI Heading Selector Knob - ADJUST for any subsequent desired heading changes.

NOTE

When an optional copilot's horizontal situation indicator is installed, the pilot's heading bug controls the heading when NAV 1 receiver is selected by the mode selector NAV 1/NAV 2 switch and the copilot's heading bug controls heading when NAV 2 receiver is selected. When a copilot's directional gyro is installed, the pilot's heading bug controls the heading when NAV 1 or NAV 2 receivers are selected.

DISENGAGEMENT (HEADING SELECT FUNCTION)

1. Heading Mode Selector Button - ACTUATE. (Or)
2. Autopilot Turn Command Knob - ROTATE. (Or)
3. Navigation Mode - AUTO ENGAGE.

VOR Coupling (Flight Director And/Or Autopilot Mode)

ENGAGEMENT

1. NAV 1 - NAV 2 Mode Selector Button - SELECT NAV 1 or NAV 2.
Observe proper annunciation
(including VOR annunciator on
Mode Selector).
2. Course Selector Knob - ADJUST to desired VOR course.
3. Wing Flaps - T.O. if VOR approach is desired.

NOTE

Wing Flaps must be positioned to T.O. or lower to obtain the VOR approach mode.

4. Airspeed - 120 to 160 KIAS for VOR approach.
5. Autopilot Turn Command Knob - CENTER DETENT.
6. Navigation Mode Selection.
 - a. Variable Angle Intercept.
 - (1) HSI Heading Selector Knob - ROTATE bug to within 135° of desired VOR course.
 - (2) Heading Mode Selector Button - PRESS. Observe HDG annunciation.
 - (3) Navigation Mode Selector Button - PRESS. Observe annunciation of NAV ARM on mode selector. Airplane will continue flying selected heading until the course deviation indicator moves off of the peg in the VOR approach mode or below 1/2 scale in the VOR enroute mode. HDG and ARM annunciators on the mode selector will then go out and NAV will light to indicate engagement.

NOTE

At NAV engage, if the selected intercept angle in HDG mode is less than 45 degrees, the airplane will initially turn toward beam center, then turn in the direction of the track. If the angle is more than 45 degrees, the airplane will initially turn in the direction of the track.

- b. Fixed Angle Intercept.
 - (1) Heading Mode - Disengage (if engaged).
 - (2) Maneuver the airplane to within 135° of the desired VOR course.
 - (3) Navigation Mode Selector Button - ACTUATE. Observe annunciation of NAV engage on mode selector. Airplane will turn to intercept the VOR beam at 45° intercept angle.
7. Condition Levers - TAKEOFF, CLIMB AND LANDING prior to final fix inbound.
8. Landing Gear - DOWN at final fix if all engines operating.
9. Wing Flaps - APPR.
10. Airspeed - 110 to 140 KIAS.

NOTE

Verify autopilot roll trim indicator is neutral after final configuration is complete. Retrim as required.

11. Landing Gear - DOWN within gliding distance of field if engine inoperative landing.
12. Control Wheel AP/TRIM Disengage Switch - DISCONNECT at minimum descent altitude.
13. Wing Flaps - LAND when landing is assured.

DISENGAGEMENT (VOR COUPLING)

1. Navigation Mode Selector Button - ACTUATE. (Or)
2. Autopilot Turn Command Knob - ROTATE. (Or)
3. Heading Mode Selector Button - ACTUATE.

NOTE

Complete autopilot disengagement should normally be conducted on a VOR approach at the appropriate minimums with the airplane control wheel autopilot disengage switch.

ILS/Localizer Coupling (Flight Director And/Or Autopilot Mode)

ENGAGEMENT

1. NAV 1-NAV 2 Mode Selector Button - SELECT NAV 1 or NAV 2. Observe proper annunciation on mode selector. Observe LOC annunciation on mode selector.
2. Course Selector Knob - ADJUST to localizer front course bearing for both front and back course approaches.
3. Back Course Mode Selector Button - ACTUATE as applicable. Observe BC annunciation on mode selector.
4. Wing Flaps - T.O.
5. Airspeed - 120 to 160 KIAS.
6. Autopilot Turn Command Knob - CENTER DETENT.

7. Altitude Mode Selector Button - ACTUATE as appropriate if desired. Observe annunciation.
8. Navigation Mode Selection
 - a. Variable Angle Intercept.
 - (1) HSI Heading Selector Knob - ROTATE bug for radar vectors and/or 30° to 90° localizer intercept angle. Intercept localizer before the outer marker.
 - (2) Heading Mode Selector Button - ACTUATE. Observe annunciation.
 - (3) Navigation Mode Selector Button - ACTUATE. Observe annunciation of NAV ARM on mode selector. Airplane will continue flying selected heading until the course deviation indicator moves off the peg. HDG and NAV ARM annunciators on mode selector will then go off and NAV annunciator will light, indicating NAV engage.

NOTE

At NAV engage, if the selected intercept angle in HDG mode is less than 30 degrees, the airplane will initially turn toward beam center, then turn in the direction of the track. If the angle is more than 30 degrees, the airplane will initially turn in the direction of the track.

- b. Fixed Angle Intercept.
 - (1) Heading Mode - DISENGAGE if engaged.
 - (2) Maneuver airplane to within 90° of runway heading.
 - (3) Navigation Mode Selector Button - ACTUATE. Observe annunciation of NAV engage on mode selector. Airplane will turn to intercept the localizer beam at a 30° intercept angle.
 9. Glide Slope Mode Selector Button - ACTUATE. Observe annunciation of GS ARM on mode selector. Maneuver airplane to intercept the glide slope. GS will engage when the glide slope deviation indicator passes through the center dot. ALT annunciation will then go off and GS will annunciate engagement.

NOTE

- Glide slope will only engage if NAV-LOC is engaged and glide slope is armed.
- Glide slope may be captured from above or below.
- Glide slope may be selected and will function in back course.
- With flight director engaged in NAV (LOC) or glide slope modes, the NAV or GS flags, when in view for more than 3 seconds, will cause the flight director command bars to be retracted from view until the warning flag is subsequently retracted. The command bars will then automatically return in view.
- If the autopilot is engaged in NAV (LOC) or glide slope modes, the autopilot will remain engaged even though the flight director command bars have been pulled from view due to a NAV or GS flag. If only a GS flag is in view, the autopilot may continue to be used by disengaging the glide slope mode on the mode selector returning pitch control to the pitch command wheel and the pitch synchronization button. ILS/localizer coupling should be disengaged upon receiving a NAV flag.

10. Condition Levers - TAKEOFF, CLIMB AND LANDING prior to the outer marker.
11. Landing Gear - DOWN at the outer marker if all engines operative.
12. Wing Flaps - APPR.
13. Airspeed - Maintain 110 to 140 KIAS.

NOTE

Verify autopilot roll trim indicator is neutral after final configuration is complete. Retrim as required.

14. Landing Gear - DOWN within gliding distance of field, if engine inoperative landing.
15. Control Wheel AP/TRIM Disengage Switch - DISCONNECT.
16. Wing Flaps - LAND when landing is assured.

DISENGAGEMENT (ILS/LOCALIZER COUPLING)

1. Navigation Mode Selector Button - ACTUATE. (Or)
2. Autopilot Turn Command Knob - ROTATE. (Or)
3. Heading Mode Selector Button - ACTUATE. (Or)

NOTE

- Complete autopilot disengagement should normally be conducted at the appropriate minimums with the airplane control wheel disengage switch.
- If an engine failure should occur, disengage the autopilot, retrim then reengage autopilot as required.

4. Left Power Lever Go-Around Switch - PRESS.

GO-AROUND OPERATION (FLIGHT DIRECTOR AND/OR AUTOPILOT MODE)

Left Power Lever Go-Around Switch - PRESS. Observe GA and FD annunciation on mode selector if not already engaged.

NOTE

The go-around mode gives a wings-level pitch up command of approximately 6° nose up on the flight director indicator. Actuation of go-around mode disengages the autopilot, if engaged.

DISENGAGEMENT (GO-AROUND)

1. Left Power Lever Go-Around Switch - PRESS. (Or)
2. Heading Mode Selector Button - ACTUATE. (Or)
3. Autopilot/Yaw Damper Switch - AP/YD.

NOTE

The airplane should be manually retrimmed to the flight director attitude before reengaging the autopilot to avoid an abrupt pitch change as the autopilot tries to satisfy the existing pitch command.

1000 NAVIGATION SYSTEM

1. VOL Control - CLOCKWISE.
2. Functional Check - COMPLETE.
 - a. Display Reliability Test.
 - (1) ID/VOX/TEST Switch - PRESS.
 - (a) Active Frequency Readout - READOUT is 188.88.
 - (b) Input Frequency Readout - READOUT is 188.88.
 - (c) Coupled Lamp - LIGHTED.

NOTE

This test does not fulfill the requirements of FAR 91.25.

- b. VOR Self-Test - COMPLETE.
 - (1) Navigation Receiver - SET to usable VOR signal.
 - (2) Course Indicator - SET to 0°.
 - (3) ID/VOX/TEST Switch - TEST and hold.
 - (a) Course deviation indicator should center with a FROM indication.
 - (b) Set course indicator 10° either side of 0°. Observe full scale deflection of course deviation indicator in the same direction as the 10° displacement.
 - (4) ID/VOX/TEST Switch - RELEASE.
- 3. Audio Control Panel - AS REQUIRED.
- 4. Frequency Selectors - AS REQUIRED.
- 5. XFER Pushbutton - PRESS. Input frequency is transferred to active frequency readout. Previous active frequency is stored in memory. A second frequency may be programmed in the same manner as the first frequency. A third frequency may be stored in the frequency selector and input frequency readout.
- 6. RECALL Pushbutton - PRESS. Frequency in memory is transferred to active frequency readout and previous active frequency is stored in memory.
- 7. Navigation Receiver Operation:
 - a. Audio Control Panel - AS REQUIRED.
 - b. Active Frequency - AS REQUIRED.
 - c. ID/VOX/TEST Switch - ID to identify station then VOX to filter identifier signal.
 - d. Navigation Indicator Warning Flags - RETRACTED as appropriate.

NOTE

When tuned to a weak NAV signal, keying the COMM transmitter may cause momentary interference within the NAV receiver causing a NAV flag to appear. Should circumstances warrant, ATC should be requested to assign another COMM frequency.

- e. Marker Beacon Switches - AS REQUIRED. Select HIGH position for airway flying or LOW position for ILS approaches. The MUTE position is a momentary switch which mutes the marker beacon audio for approximately 30 seconds.

1000 RADIO MAGNETIC INDICATOR

NOTE

Operation of the IN-1004A RMI/Converter is dependent upon input information from the stabilized heading source (pilot's HSI or optional copilot's slaved gyro) the associated VHF navigation and ADF sets, and the RNAV system. Refer to the appropriate supplements for the normal operation of this equipment.

1. RMI - CHECK airplane magnetic heading on heading index.
2. RMI and HSI or Copilot's Slaved Gyro - CROSS CHECK.
3. ADF Operation:
 - a. ADF Receiver - SET.
 - b. Audio Control Panel - AS REQUIRED.
 - c. RMI Selector - ADF 1 or ADF 2. Station bearing is indicated on RMI double bar pointer.
 - d. ADF Test Button - PUSH and hold until pointer slews off the indicated bearing. Release test button and pointer should return to original bearing.
4. VHF Operation:
 - a. Area Navigation and/or VHF Receivers - SET.
 - b. Audio Control Panel - AS REQUIRED.
 - c. RMI Selector Switch - NAV 1 or NAV 2. Station bearing indicated on RMI single bar pointer.
 - d. RMI Selector - RN. Check RN annunciator illuminated. Waypoint bearing indicated on RMI single bar pointer.
 - e. RMI Slew Button - PUSH and hold until pointer slews off the indicated station or waypoint bearing. Release test button and pointer should return to original bearing.

800 TRANSPONDER

1. SBY Pushbutton Switch - PUSH IN for all ground operations.
2. Reply-Code Selector Switches - AS REQUIRED.
3. Encoding Altimeter - SET. Check warning flag retracted.
4. ALT Pushbutton Switch - PUSH IN.
5. Functional Check - COMPLETE.
 - a. TEST Pushbutton Switch - PUSH IN. Reply lamp lights with full brilliance.
6. Ident Switch - PRESS momentarily when requested by ATC to "squawk IDENT."

RDR-160 WEATHER RADAR

PREFLIGHT TEST

1. Function Switch - TEST. Allow 2 minutes warmup.
2. Wx Gain Switch - Wx.
3. Hold/Scan Switch - SCAN.
4. Tilt Switch - +4°.
5. Brt Switch - AS REQUIRED. Insure there are two distinct shades of brightness in test pattern.
6. Self-Test - CHECK. Four equally spaced range marks should appear. Strobe line should smoothly sweep full 90°.
 - a. Hold/Scan Switch - HOLD. Strobe line should disappear and test pattern should "freeze" on indicator.
 - b. Wx Gain Switch - Wx A. Black contour band should cycle on and off approximately 4 times per antenna scan.
 - c. Hold/Scan Switch - SCAN.
 - d. Function Switch - 10. Transmitter on. Test pattern replaced by any local targets.
 - e. Tilt Switch - VARY between 0° and 15°. Close in ground clutter appears at lower tilt settings and any local moisture laden weather appears at higher tilt settings.

NORMAL OPERATION

1. Function Switch - STBY. Allow 2 minutes warmup.
2. Wx Gain Switch - GAIN. Adjust manual gain as required.
- Wx. For contour mode of operation.
3. Function Switch - AS REQUIRED.
4. Brt Switch - AS REQUIRED.
5. Wx A Switch - AS REQUIRED.
6. Hold/Scan Switch - AS REQUIRED.
7. Tilt Switch - AS REQUIRED.

400 MARKER BEACON

1. HIGH/LOW/MUTE Switch - SELECT HIGH position for airway flying or LOW position for ILS approaches. MUTE position is used to temporarily cut off marker beacon audio.
2. SPKR/OFF/HDST Switch - SELECT speaker or headset audio.
3. MKR BCN TEST Switch - ACTUATE to check that marker beacon indicator lights are operative.

NOTE

Marker beacon volume is controlled through the audio control panel volume control.

ICE PROTECTION EQUIPMENT NORMAL PROCEDURES

If icing conditions are encountered, ensure the anti-icing systems (windshields, pitot/static, stall vane and engine inlets) are ON and operating before entering the icing conditions. These systems are designed to prevent ice formation, rather than removing it after it has formed. It is particularly important to begin engine inlet anti-icing early. If ice should form in the engine inlet, anti-icing could release the ice which would be ingested by the engine. Propeller deice should also be turned on before entering icing conditions. Accumulation of some airframe ice is unavoidable; this will increase airplane weight and drag and decrease airspeed and general airplane performance. It is always wise to avoid icing conditions, if practical.

1. If Icing Conditions Are Encountered (Below 4°C):

NOTE

During flight in icing conditions, ice will accumulate on the unprotected surfaces of the airplane which will cause an increase in the prestall buffet speed. Positioning the wing flaps to T.O., APPR or LAND will immediately decrease buffet onset speeds.

- a. Ignition Override Switches - ON. Observe ignition duty cycle limits.

NOTE

- Regardless of whether icing conditions presently exist, position the ignition override switches to ON anytime ice is observed to be shedding from one or both of the propellers or propeller spinners.
- Turn one ignitor OFF at a time to satisfy duty cycle limits.

- b. Engine Inlet Anti-Ice Switches - ON. Operation can be verified by observing engine torque decrease or EGT increase due to bleed airflow to engine inlet. Check L and R ENGINE ANTI-ICE annunciator lights on.

NOTE

If the possibility of ice exists in the engine inlets, position the Ignition Override switches to ON before actuating the inlet heat switches. Actuate the switches one at a time to insure normal engine operation continues. Actuation of the Ignition Override switches will provide continuous ignition to prevent flameout if ice should be ingested by the engine.

- c. Pitot/Static Heat Switches - ON.
d. Stall Vane Anti-Ice Switch - ON.
e. Windshield Anti-Ice Switch - ON. Operation can be verified by an audible increase in airflow noise due to windshield bleed airflow. Check W/S AIR O'HEAT annunciator light off.
f. Propeller Deice Switches - ON. Check propeller ammeter within the green arc. Periodic fluctuations indicate boot segment cycling.

NOTE

Energizing the propeller deice prior to entering icing conditions will prevent ice build-up which will be thrown off and can chip the fuselage paint.

- g. Surface Deice Boots Switch - ON when ice accumulates between 1/4 to 1/2 inch. Repeat as necessary. Do not actuate prematurely. Monitor the SURFACE DEICE annunciator to assure proper system operation.

NOTE

Prestall buffet and stall speeds can increase when deice boots are actuated

SECTION 5
PERFORMANCE
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INTRODUCTION

Section 5 of this handbook contains all the performance information required to operate the airplane safely and to help you plan your flights in detail with reasonable accuracy. Safe and precise operation of the airplane requires the pilot to be thoroughly familiar with and understand the data and calculations of this section.

The data on these graphical and tabular charts have been compiled from actual flight tests, with the airplane and engines in good condition, using average pilot techniques. Note that the cruise performance data make no allowance for wind and/or navigational errors. Allowances for start, taxi, takeoff, climb, descent and 45 minutes reserve are provided in the range profile chart.

All performance, range, and endurance charts are based on the use of jet fuel with a nominal fuel density of 6.7 pounds per gallon.

USAGE OF AVIATION GASOLINE (For Emergency Use Only)

Aviation gasoline (80/87 and 100LL) is approved for emergency use only. If engine torque or EGT limits are achieved, the performance presented in this section will apply. However, emergency use of aviation gasoline can, on occasion, result in power reductions of as much as 6% and reductions in climb performance of as much as 170 feet-per-minute from existing all engines operating operations and 85 feet-per-minute from existing one engine inoperative operations. If the electronic fuel computer(s) trip to manual mode in flight, the power reduction may be as much as 12% of existing manual mode power.

The minimum engine torque for takeoff (refer to figure 5-9) is required in order to achieve the takeoff performance in this section.

INTRODUCTION TO TABULATED PERFORMANCE

The performance tables are presented in increments of temperature, altitude and any other variables involved. Performance for a given set of conditions can be approximated as follows:

- (1) Takeoff, Accelerate Stop, Accelerate Go, Landing - Enter tables at the next higher increment of weight, altitude and temperature.
- (2) Cruise - Enter tables at next lower increment of temperature and altitude.

To obtain exact performance values from the tables, it is necessary to interpolate between the increment values. The following is an example of approximation and interpolation, using an excerpt from the Normal Takeoff Distance Chart with wing flaps positioned to T.O.

EXAMPLE

Given:

Weight 9700 Pounds
Temperature (16°C)
Pressure Altitude 2400 Feet
Headwind 19 Knots

Find:

Takeoff Speed _____ KIAS
Ground Roll _____ Feet
Total Distance
to Clear 50-
Foot Obstacle _____ Feet

Weight Pounds	Takeoff To 50-Ft Obstacle Speed - KIAS	Pressure Altitude Feet	10°C		20°C	
			Ground Roll - Feet	Total Distance to Clear 50-Ft - Feet	Ground Roll - Feet	Total Distance to Clear 50-Ft - Feet
9850	110	2000	1960	2710	2090	2880
		3000	2090	2890	2230	3070
8800	105	2000	1740	2100	1850	2230
		3000	1850	2240	1970	2380

Approximation Method

Extract from the chart the next increment of weight, altitude and temperature which is more conservative than the actual conditions (i.e.: 9850

pounds, 3000 feet and 20°C).

Takeoff and Climb Speed	110 KIAS
Ground Roll	2230 Feet
Total Distance to Clear 50-Foot Obstacle	3070 Feet

Interpolation Method

If the approximation method yields a value larger than can be tolerated, a more exact value should be determined using the interpolation method.

The example weight (9700 pounds) is 8800 pounds plus 900/1050 or .86 times the difference between 9850 pounds and 8800 pounds [i.e.: 8800-pound value + .86 (9850-pound value - 8800-pound value)]

The example pressure altitude (2400 feet) is 2000 feet plus 400/1000 or .4 times the difference between 2000 feet and 3000 feet [i.e.: 2000-foot value + .4 (3000-foot value - 2000-foot value)].

The example temperature of 16°C is 10°C plus 6/10 or .6 times the difference between 10°C and 20°C [i.e.: 10°C value + .6 (20°C value - 10°C value)].

Interpolating Values for Normal Takeoff Distance:

Ground Roll (7 interpolations required)

Altitude interpolation at 10°C and 9850 pounds	= 2000-foot value + [4 (3000-foot value - 2000-foot value)]
	= 1960 feet + [.4 (2090 feet - 1960 feet)]
	= 1960 feet + [52 feet]
	= <u>2012 feet</u>

Altitude interpolation at 20°C and 9850 pounds	= 2000-foot value + [.4 (3000-foot value - 2000-foot value)]
	= 2090 feet + [.4 (2230 feet - 2090 feet)]
	= 2090 feet + [56 feet]
	= <u>2146 feet</u>

Altitude interpolation at 10°C and 8800 pounds	= 2000-foot value + [.4 (3000-foot value - 2000-foot value)]
	= 1740 feet + [.4 (1850 feet - 1740 feet)]
	= 1740 feet + [44 feet]
	= <u>1784 feet</u>

Altitude interpolation at 20°C and 8800 pounds	= 2000-foot value + [.4 (3000-foot value - 2000-foot value)]
	= 1850 feet + [.4 (1970 feet - 1850 feet)]
	= 1850 feet + [48 feet]
	= <u>1898 feet</u>

SECTION 5
PERFORMANCE

Cessna
MODEL

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The Normal Takeoff Distance chart, with altitude interpolation, looks as follows:

Weight Pounds	Takeoff To 50-Ft Obstacle Speed - KIAS	Pressure Altitude Feet	10°C		20°C	
			Ground Roll - Feet	Total Distance to Clear 50-Ft - Feet	Ground Roll - Feet	Total Distance to Clear 50-Ft - Feet
9850	110	2400	2012	----	2146	----
8800	105	2400	1784	----	1898	----

Weight interpolation
at 10°C and 2400 feet

$$\begin{aligned}
 &= 8800\text{-pound value} + [.86 (9850\text{-pound value} - 8800\text{-pound value})] \\
 &= 1784 \text{ feet} + [.86 (2012 \text{ feet} - 1784 \text{ feet})] \\
 &= 1784 \text{ feet} + [196 \text{ feet}] \\
 &= \underline{1980 \text{ feet}}
 \end{aligned}$$

Weight interpolation
at 20°C and 2400 feet

$$\begin{aligned}
 &= 8800\text{-pound value} + [.86 (9850\text{-pound value} - 8800\text{-pound value})] \\
 &= 1898 \text{ feet} + [.86 (2146 \text{ feet} - 1898 \text{ feet})] \\
 &= 1898 \text{ feet} + [213 \text{ feet}] \\
 &= \underline{2111 \text{ feet}}
 \end{aligned}$$

Takeoff to 50-Ft Obstacle
Speed

$$\begin{aligned}
 &= 8800\text{-pound value} + [.86 (9850\text{-pound value} - 8800\text{-pound value})] \\
 &= 105 \text{ KIAS} + [.86 (110 \text{ KIAS} - 105 \text{ KIAS})] \\
 &= 105 \text{ KIAS} + [4 \text{ KIAS}] \\
 &= \underline{109 \text{ KIAS}}
 \end{aligned}$$

The Normal Takeoff Distance chart, with altitude and weight interpolation, looks as follows:

Weight Pounds	Takeoff To 50-Ft Obstacle Speed - KIAS	Pressure Altitude Feet	10°C		20°C	
			Ground Roll - Feet	Total Distance to Clear 50-Ft - Feet	Ground Roll - Feet	Total Distance to Clear 50-Ft - Feet
9700	109	2400	1980	----	2111	----

$$\begin{aligned}
 \text{Temperature interpolation at 2400 feet and 9700 pounds} &= 10^{\circ}\text{C value} + [.6 (20^{\circ}\text{C value} - 10^{\circ}\text{C value})] \\
 &= 1980 \text{ feet} + [.6 (2111 \text{ feet} - 1980 \text{ feet})] \\
 &= 1980 \text{ feet} + [79 \text{ feet}] \\
 &= \underline{2059 \text{ feet}}
 \end{aligned}$$

The Normal Takeoff Distance chart, with altitude, weight and temperature, looks as follows:

Weight Pounds	Takeoff To 50-Ft Obstacle Speed - KIAS	Pressure Altitude Feet	16°C	
			Ground Roll - Feet	Total Distance to Clear 50-Ft - Feet
9700	109	2400	2059	----

Ground Roll with 19-knot headwind

$$\begin{aligned}
 &= 2059 \text{ feet} - [2059 \text{ feet} \left(\frac{19 \text{ knots headwind}}{10 \text{ knots headwind}} \right) (6\%)] \\
 &\approx 2059 \text{ feet} - 234 \text{ feet} \\
 &= \underline{1825 \text{ feet}}
 \end{aligned}$$

Total Distance to Clear 50-Foot Obstacle (7 interpolations required)

The interpolations required are identical to the ground roll interpolations, except "total distance to clear 50-foot obstacle" values are substituted for the "ground roll" values.

The interpolated value for the total distance to clear 50-foot obstacle is 2795 feet (no wind) and 2476 feet (19-knot headwind).

SAMPLE FLIGHT

The following is an example of a typical flight using the performance data contained in Figures 5-8 through 5-34. The approximation method is used in tabular performance except where noted.

AIRPLANE CONFIGURATION

Airplane Weight at Takeoff 9700 Pounds
Usable Fuel Load 2302 Pounds

TAKEOFF AIRPORT CONDITIONS

Field Length 7200 Feet (Runway 23)
Temperature 16°C
Field Pressure Altitude 2400 Feet
Wind 270° at 25 Knots
Obstacles None

CRUISE CONDITIONS

Distance	600 Nautical Miles
Cruise Altitude	18,000 Feet
Temperature	-30.6°C (ISA -10°C)
Wind	15-Knot Tailwind
Power	Maximum Recommended Cruise Power

LANDING AIRPORT CONDITIONS

Field Length	3500 Feet (Runway 19)
Temperature	7°C
Field Pressure Altitude	1700 Feet
Wind	210° at 17 Knots
Landing Weight	To be Calculated
Obstacles	50-Foot Trees

SAMPLE CALCULATIONS

Wind Component Chart (Figure 5-8)

- (1) The angle between the runway and the prevailing wind is 40°.
- (2) Enter Figure 5-8 on the 40° wind line and proceed out to the intersection with the 25-knot arc.
- (3) Read horizontally left from this intersection; the headwind component is 19 knots.

Normal Takeoff Distance (Figure 5-10)

- (1) Enter Figure 5-10 at 9850 pounds weight; the takeoff to 50-foot obstacle speed is 110 KIAS.
- (2) Proceed horizontally right from 3000-foot pressure altitude to the vertical columns for 20°C. The takeoff ground run is 2230 feet and the total distance required to clear a 50-foot obstacle is 3070 feet without wind correction. With a 19-knot headwind component, the corrected takeoff ground run is 1976 feet and the corrected total distance required is 2720 feet.

$$\frac{19 \text{ Knots Headwind}}{10 \text{ Knots Headwind}} (6\%) = 11.4\%$$

$$\begin{aligned} \text{Corrected Takeoff} &= 2230 \text{ feet} - [11.4\% (2230 \text{ feet})] \\ \text{Ground Run} &= 2230 \text{ feet} - [254 \text{ feet}] \\ &= \underline{1976 \text{ feet}} \end{aligned}$$

$$\begin{aligned} \text{Corrected Total} &= 3070 \text{ feet} - [11.4\% (3070 \text{ feet})] \\ \text{Distance Required} &= 3070 \text{ feet} - [350 \text{ feet}] \\ &= \underline{2720 \text{ feet}} \end{aligned}$$

Accelerate Stop Distance (Figure 5-11)

- (1) Enter Figure 5-11 at 9850 pounds weight; engine failure speed is 98 KIAS.

- (2) Proceed horizontally right from 3000-foot pressure altitude to the vertical columns for 20°C. The distance required to accelerate to 98 KIAS and stop is 4350 feet without wind correction. With a 19-knot headwind component, the accelerate stop distance can be reduced by:

$$\frac{19 \text{ Knots Headwind}}{4 \text{ Knots Headwind}} (2) = 9.5\%$$

$$\begin{aligned} \text{Corrected Accelerate} &= 4350 \text{ feet} - [9.5\% (4350 \text{ feet})] \\ \text{Stop Distance} &= 4350 \text{ feet} - [413 \text{ feet}] \\ &= \underline{3937 \text{ feet}} \end{aligned}$$

Accelerate Go Distance (Figure 5-12)

- (1) Enter Figure 5-12 at 9850 pounds weight; engine failure speed is 98 KIAS.
- (2) Proceed horizontally right from 3000-foot pressure altitude to the vertical columns for 20°C. The distance required to clear a 50-foot obstacle, after losing an engine at 98 KIAS, is 5300 feet without wind correction. With a 19-knot headwind component, the distance can be reduced by:

$$\frac{19 \text{ Knots Headwind}}{10 \text{ Knots Headwind}} (7\%) = 13.3\%$$

$$\begin{aligned} \text{Corrected Accelerate} &= 5300 \text{ feet} - [13.3\% (5300 \text{ feet})] \\ \text{Go Distance} &= 5300 \text{ feet} - [705 \text{ feet}] \\ &= \underline{4595 \text{ feet}} \end{aligned}$$

NOTE

- A more exact value of the accelerate-go distance can be obtained using the interpolation method if the distance required value from the approximation method is too large.
- The interpolation method gives an accelerate go distance of 4610 feet without wind or 3997 feet with 19 knots of headwind.

Rate-of-Climb - All Engines Operating (Figure 5-15) (Wing Flaps In T.O. Position)

- (1) Enter Figure 5-15 at 16°C.
- (2) Proceed vertically up to the 2400-foot pressure altitude line.
- (3) Proceed horizontally right to the reference line. Follow the slope of the adjacent rate-of-climb lines until intersecting the vertical 9700-pound line.
- (4) Proceed horizontally right to obtain rate-of-climb. (2240 Feet per minute)
- (5) Enter the climb speed data to determine the climb speed corrected for 2400 feet. (130 KIAS)

Rate-Of-Climb — Cruise Climb (Figure 5-16)

- (1) Enter Figure 5-16 at 16°C.
- (2) Proceed vertically up to the 2400-foot pressure altitude line.
- (3) Proceed horizontally right to the reference line. Follow the slope of the adjacent rate-of-climb lines until intersecting the vertical 9700-pound line.
- (4) Proceed horizontally right to obtain rate-of-climb. (2235 Feet per minute)
- (5) Climb speed is 160 KIAS for all conditions.

Rate-Of-Climb — One Engine Inoperative (Figure 5-17)

- (1) Enter Figure 5-17 at 16°C.
- (2) Proceed vertically up to the 2400-foot pressure altitude line.
- (3) Proceed horizontally right to the reference line. Follow the slope of the adjacent rate-of-climb lines until intersecting the vertical 9700-pound line.
- (4) Proceed horizontally right to obtain rate-of-climb. (690 Feet per minute)
- (5) The climb speed for all conditions is 120 KIAS.

Time, Fuel And Distance To Climb — Maximum Climb (Figure 5-20)

Time, fuel and distance to climb are determined by finding the difference between the airport and the cruise conditions; thus, two calculations are required, one for the airport condition and the second for the cruise condition.

Airport Condition:

- (1) Enter Figure 5-20 at 16°C.
- (2) Proceed vertically up to 2400-foot pressure altitude line.
- (3) Proceed horizontally right to the 9700-pound line.
- (4) Proceed vertically down to obtain time to climb (1.0 minutes), fuel to climb (14 pounds) and distance to climb (2 nautical miles).

Cruise Condition:

- (5) Enter Figure 5-20 at -30.6°C.
- (6) Proceed vertically up to 18,000-foot pressure altitude line.
- (7) Proceed horizontally right to the 9700-pound line.
- (8) Proceed vertically down to obtain time to climb (7.9 minutes), fuel to climb (97 pounds) and distance to climb (21 nautical miles).

Final Calculations:

Time to Climb = Cruise time to climb - Airport time to climb
= 7.9 minutes - 1.0 minutes
= 6.9 minutes

$$\begin{aligned}\text{Fuel to Climb} &= \text{Cruise fuel to climb} - \text{Airport fuel to climb} \\ &= 97 \text{ pounds} - 14 \text{ Pounds} \\ &= \underline{83 \text{ pounds}} \text{ (add 75 pounds for start, taxi and takeoff) (158 pounds total)} \\ \text{Distance to Climb} &= \text{Cruise distance to climb} - \text{Airport distance to climb} \\ &= 21 \text{ nautical miles} - 2 \text{ nautical miles} \\ &= 19 \text{ nautical miles} \\ &\text{Adjusted for wind (use 60\% of the wind at altitude for climb wind),} \\ &= 19 \text{ nautical miles} \pm \text{wind contribution} \\ &= 19 + \left[\frac{6.9 \text{ minutes}}{60 \text{ minutes}} (.6 \times 15 \text{ knots}) \right] \\ &= 19 \text{ nautical miles} + 1.1 \text{ nautical miles} \\ &= \underline{20.0 \text{ nautical miles}}\end{aligned}$$

Time, Fuel And Distance To Descend-Normal Descent (Figure 5-27)

Time, fuel and distance to descend are determined by finding the difference between the cruise and the landing airport conditions; thus two calculations are required, one for the cruise condition and the second for the landing airport condition.

Cruise Condition:

- (1) Enter Figure 5-27 at the cruise altitude of 18,000 feet.
- (2) Proceed horizontally right to the guideline.
- (3) Proceed vertically down to obtain time to descend (12.0 minutes), fuel to descend (84 pounds) and distance to descend (45.0 nautical miles).

Landing Airport Condition:

- (4) Enter Figure 5-27 at the airport altitude of 1700 feet.
- (5) Proceed horizontally right to the guideline.
- (6) Proceed vertically down to obtain time to descend (1.1 minutes), fuel to descend (9 pounds) and distance to descend (4.0 nautical miles).

Final Calculations:

$$\begin{aligned}\text{Time to Descend} &= \text{Cruise time to descend} - \text{Airport time to descend} \\ &= 12.0 \text{ minutes} - 1.1 \text{ minutes} \\ &= \underline{10.9 \text{ minutes}}\end{aligned}$$

*Fuel to Descend = Cruise fuel to descend - Airport fuel to descend

= 84 pounds - 9 pounds

= 75 pounds

Distance to Descend = Cruise distance to descend - Airport distance to descend.

= 45.0 nautical miles - 4.0 nautical miles

= 41.0 nautical miles

Adjusted for wind (use 40% of the wind at altitude for descent wind),

= 41.0 ± wind contribution

= 41.0 + $\left[\frac{10.9 \text{ minutes}}{60 \text{ minutes}} (.4 \times 15 \text{ knots}) \right]$

= 41.0 nautical miles + 1.1 nautical miles

= 39.9 nautical miles

Maximum Recommended Cruise Power (Figure 5-22)

The approximation method for extracting data from the cruise tables is to select the next lower temperature and altitude values, which are generally conservative with respect to fuel economy.

- (1) Enter the ISA -10°C data for Maximum Recommended Cruise Power (96% RPM) at an altitude of 18,000 Feet.
- (2) Use the higher weight of 9850 pounds. The airspeed is 293 KTAS and the total fuel flow is 654 pounds per hour.
- (3) Correcting for a weight of 9700 pounds, the airspeed increases to:

$$\begin{aligned} &\text{Airspeed at the Higher Weight} + \left[\frac{(\text{Higher Weight} - \text{Flight Weight})}{1500 \text{ pounds}} \right] \left[\text{KTAS at Lower Weight} - \text{KTAS at Higher Weight} \right] = \\ &293 \text{ KTAS} + \left[\frac{9850 \text{ pounds} - 9700 \text{ pounds}}{1500 \text{ pounds}} \right] [296 \text{ KTAS} - 293 \text{ KTAS}] = \\ &293 \text{ KTAS} + 0.3 \text{ KTAS} = \underline{293.3 \text{ KTAS}} \end{aligned}$$

The interpolation method may be used for interpolating altitude and temperature to obtain performance data closer to the actual conditions.

In the above calculations, for convenience, the weight was assumed to be equal to the takeoff weight of 9700 pounds. More realistic data can be determined if the average cruise weight is used. This average cruise weight is determined as follows:

$$\text{Cruise Fuel} = \frac{\text{Total distance}}{\text{True airspeed}} - \frac{\text{climb distance}}{\pm \text{wind correction}} - \frac{\text{descent distance}}{\text{True airspeed}} \times [\text{Total fuel flow per hour}]$$

$$= \frac{600 \text{ Nautical Miles} - 20.0 \text{ Nautical Miles} - 39.9 \text{ Nautical Miles}}{293.3 \text{ KTAS} + 15 \text{ Knot Tailwind}} \times [654 \text{ pounds per hour}]$$

$$= \frac{540.1 \text{ Nautical miles}}{308.3 \text{ Knots}} \times 654 \text{ pounds per hour}$$

$$= 1.75 \text{ hours} \times 654 \text{ pounds per hour}$$

$$= \underline{1145 \text{ pounds}}$$

$$\text{Average Cruise Weight} = \text{Takeoff weight} - \text{start, taxi and climb fuel} - \frac{\text{Cruise fuel}}{2}$$

$$= 9700 \text{ pounds} - 158 \text{ pounds} - \frac{1145 \text{ pounds}}{2}$$

$$= \underline{8970 \text{ pounds}}$$

$$\text{Average Cruise Speed} = \text{True airspeed from Figure 5-22} + \text{weight correction}$$

$$= 293 \text{ KTAS} + \frac{9850 \text{ pounds} - 8970 \text{ pounds}}{1500 \text{ pounds}} (296 - 293 \text{ KTAS})$$

$$= 293 \text{ KTAS} + 1.8 \text{ KTAS}$$

$$= \underline{294.8 \text{ KTAS}}$$

$$\text{Average Ground Speed} = 294.8 \text{ KTAS} + \text{tailwind}$$

$$= 294.8 \text{ KTAS} + 15 \text{ knots}$$

$$= \underline{309.8 \text{ knots}}$$

$$\text{Distance During Cruise} = \text{Total distance} - \text{Climb distance} - \text{Descent distance}$$

$$= 600 - 20.0 - 39.9$$

$$= \underline{540.1 \text{ Nautical Miles}}$$

$$\text{Time During Cruise} = \frac{\text{Cruise distance}}{\text{ground speed}}$$

$$= \frac{540.1}{309.8}$$

$$= \underline{1.74 \text{ hours}}$$

Normal Landing Distance Without Propeller Reversing (Figure 5-28)

Landing Weight = Takeoff weight - start, taxi and climb fuel - cruise fuel - descent fuel

= 9700 pounds - 158 pounds - 1145 pounds - 75 pounds

= 8322 pounds

Wind = 210° at 17 knots. Determine headwind component from Figure 5-8. (16 knots headwind)

Enter Figure 5-29 at 8800 pounds; the approach speed is 96 KIAS. Proceed horizontally right from 2000-foot pressure altitude to the vertical column for 10°C. The landing distance ground roll is 1100 feet and the total distance required to clear a 50-foot obstacle is 1880 feet without wind correction. With a 16-knot headwind component, the corrected ground roll distance is 1030 feet and the corrected total distance required is 1760 feet.

$$\frac{16 \text{ Knots Headwind}}{5 \text{ Knots Headwind}} (2\%) = 6.4\%$$

Corrected Landing Ground Roll = 1100 feet - [6.4% (1100)]

= 1100 feet - 70 feet

= 1030 feet

Corrected Total Distance Required = 1880 - [6.4% (1880)]

= 1880 feet - 120 feet

= 1760 feet

Rate-Of-Climb — Balked Landing Climb (Figure 5-18)

- (1) Enter Figure 5-18 at 7°C.
- (2) Proceed vertically up to the 1700-foot pressure altitude line.
- (3) Proceed horizontally right to the weight reference line. Follow the guidelines up and to the right until intersecting the vertical 8322-pound weight line.
- (4) Proceed horizontally right to determine the rate-of-climb. (2060 Feet per minute)

Total Fuel Required (Without Holding Fuel) = Start, taxi and climb fuel + cruise fuel + descent fuel

= 158 pounds + 1145 pounds + 75 pounds

= 1378 pounds

Holding Fuel And Time (Figure 5-26)

The holding fuel required for 45 minutes at 18,000 feet is as follows:

- (1) Enter Figure 5-26 at 0.75 hours.
- (2) Proceed horizontally right to the altitude guideline of 18,000 feet.
- (3) Proceed vertically downward to obtain the holding fuel required (310 pounds).

Total Fuel Required (With 45 Minutes Holding Fuel)	= Total fuel required without holding fuel + holding fuel required for 45 minutes.
	= 1378 pounds + 310 pounds
	= <u>1688 pounds</u>

To determine holding time, the fuel available for holding must be determined.

Fuel Available for Holding	= Initial fuel - start, taxi and climb fuel - cruise fuel - descent fuel
	= 2302 pounds - 158 pounds + 1145 pounds - 75 pounds
	= <u>924 pounds</u>

- (1) Enter Figure 5-26 at 924 pounds of fuel available.
- (2) Proceed vertically up to the intersection with the guideline for 18,000 feet.
- (3) Proceed horizontally left to obtain holding time available. (2.27 hours)

AIRSPEED CALIBRATION
PILOT'S AND COPILOT'S SYSTEMS**NOTE:**

1. Indicated airspeed assumes zero instrument error.

EXAMPLE:

Indicated Airspeed	120 Knots
Landing Gear	Down
Flaps	Approach
Calibrated Airspeed	118 Knots

Flight Calibration

GEAR UP FLAPS UP		GEAR DOWN FLAPS T.O.		GEAR DOWN FLAPS APPR.		GEAR DOWN FLAPS LAND	
CIAS	KCAS	CIAS	KCAS	CIAS	KCAS	CIAS	KCAS
--	--	70	73	70	73	70	73
--	--	80	82	80	82	80	81
90	91	90	91	90	91	90	90
100	101	100	101	100	100	100	99
110	111	110	110	110	109	110	107
120	121	120	120	120	118	120	117
140	140	140	139	140	137	140	136
160	160	160	159	160	157	160	156
180	179	180	178	180	176	180	175
200	199	200	198	200	195	--	--
220	219	--	--	--	--	--	--
245	243	--	--	--	--	--	--

Ground Calibration

FLAPS UP AND T.O.	
CIAS	KCAS
50	54
60	64
70	74
80	84
90	94
100	104
110	114

Figure 5-1

ALTIMETER CORRECTION

PILOT'S AND COPILOT'S SYSTEMS

OPERATION ABOVE 33,000 FEET RESTRICTED
TO AIRPLANES INCORPORATING SK441-36

NOTE:

1. Add correction to indicated altimeter reading.

EXAMPLE:

Flaps	Up
Indicated Airspeed	200 Knots
Desired Altitude	18,000 Feet
Correction to be added	-29 Feet
Indicated Altitude to Fly	18,029 Feet

Altitude	Sea Level				15,000 Feet				35,000 Feet			
Gear	Up	Down			Up	Down			Up	Down		
Flaps	UP	T.O.	APPR	LAND	UP	T.O.	APPR	LAND	UP	T.O.	APPR	LAND
KIAS	Feet	Feet	Feet	Feet	Feet	Feet	Feet	Feet	Feet	Feet	Feet	Feet
70	----	16	22	16	----	25	36	26	----	50	72	52
80	----	14	16	9	----	23	25	14	----	46	51	28
90	7	8	4	-4	12	13	6	-6	23	26	13	-13
99*	6	5	-1	-14	10	8	-1	-22	20	17	-3	-46
100	5	4	-6	-15	9	7	-10	-24	17	14	-20	-49
110	5	-2	-13	-27	8	-3	-20	-42	16	-6	-41	-86
120	3	-8	-19	-40	5	-12	-31	-63	10	-24	-63	-129
140	0	-14	-35	-57	0	-22	-56	-91	0	-45	-114	-184
160	-4	-25	-51	-68	-7	-39	-81	-109	-14	-80	-164	-221
180	-12	-33	-71	-79	-18	-52	-113	-126	-37	-106	-229	-256
200	-18	-48	-96	----	-29	-76	-153	----	----	----	----	----
220	-21	----	----	----	-33	----	----	----	----	----	----	----
240	-36	----	----	----	-58	----	----	----	----	----	----	----
245	-39	----	----	----	-63	----	----	----	----	----	----	----

*Recommended Minimum All Engines Approach Speed At 9360 Pounds With Wing Flaps In LAND position.

ALTITUDE CORRECTION PROCEDURE

$$\left[\begin{array}{c} \text{INDICATED ALTITUDE} \\ \text{TO FLY} \end{array} \right] = \left[\begin{array}{c} \text{DESIRED ALTITUDE} \\ \text{(MSL)} \end{array} \right] - \left[\begin{array}{c} \text{ALTIMETER} \\ \text{CORRECTION} \end{array} \right]$$

Figure 5-2

TEMPERATURE RISE DUE TO RAM RECOVERY

RECOVERY FACTOR (K) = .77

NOTE:

1. Subtract temperature rise from indicated outside air temperature to obtain true outside air temperature.

EXAMPLE:

KIAS 180
Altitude 18,000 Ft.
Ram Rise 6°

OPERATION ABOVE 33,000 FEET RESTRICTED
TO AIRPLANES INCORPORATING SK441-36

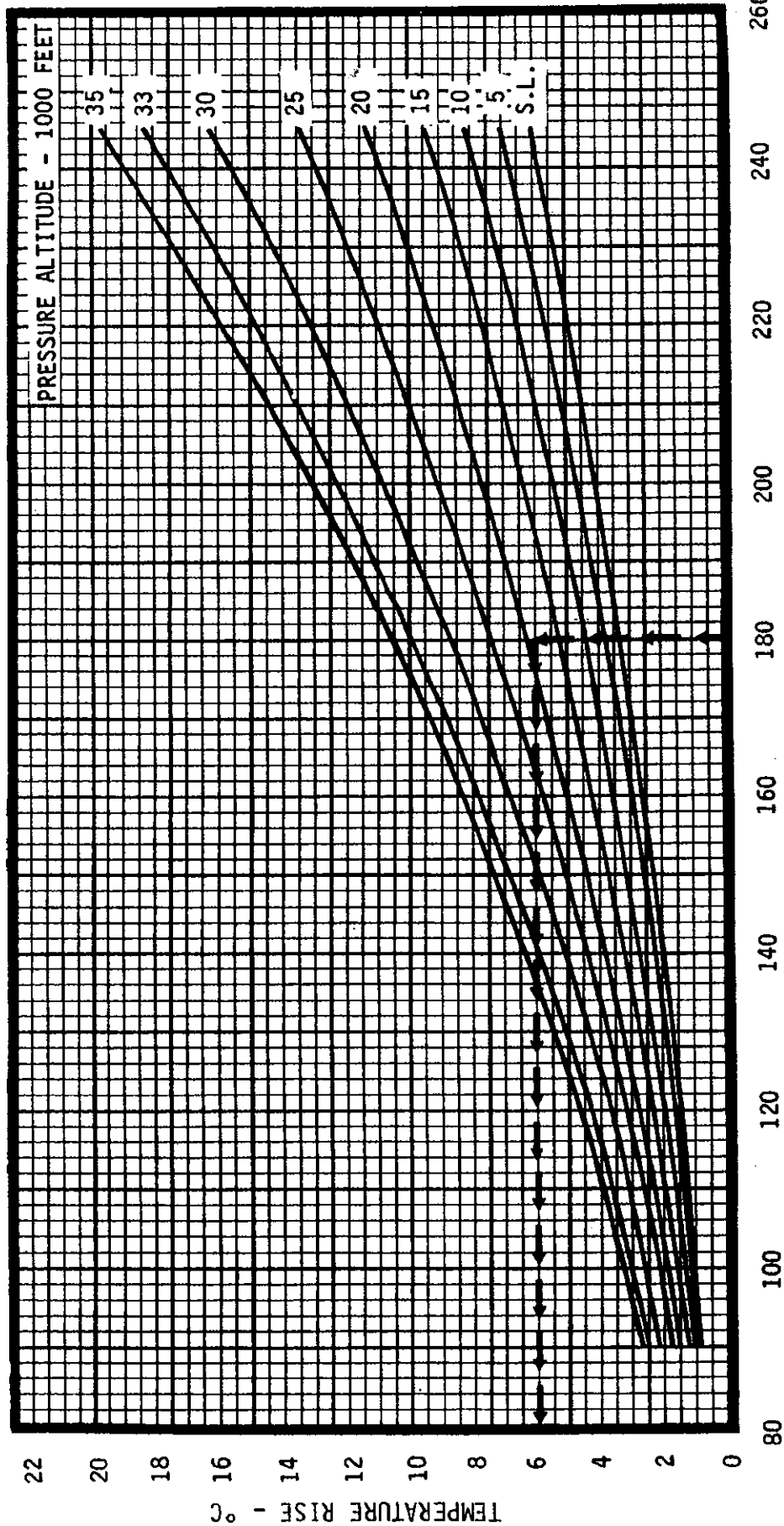


Figure 5-3

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TEMPERATURE CONVERSION FROM FAHRENHEIT TO CELSIUS

EXAMPLE:

$$\frac{\text{OAT-Fahrenheit } 60^{\circ}\text{F}}{\text{OAT-Celsius } 16^{\circ}\text{C}}$$

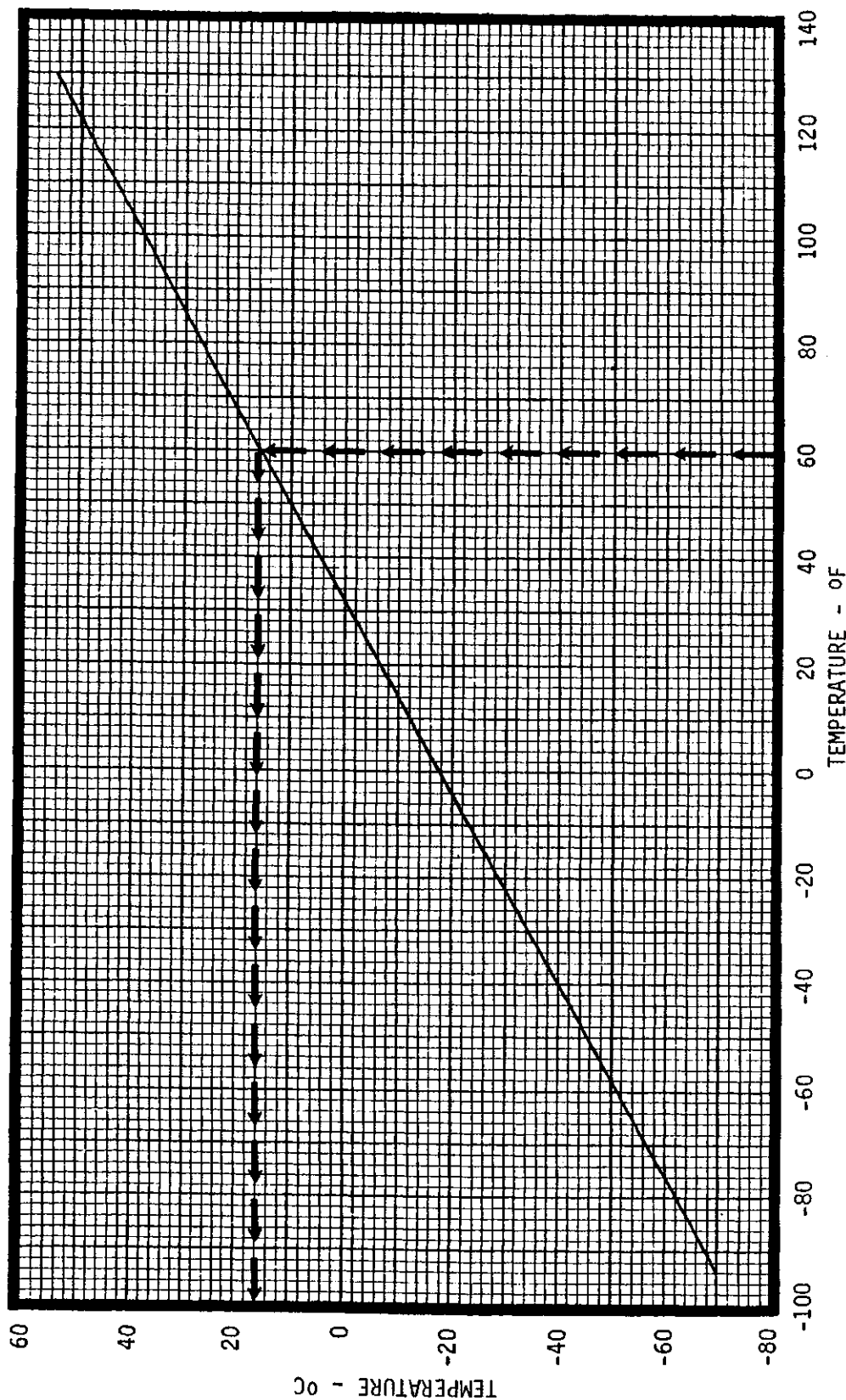


Figure 5-4

ISA CONVERSION AND OPERATING TEMPERATURE LIMITS

OPERATION ABOVE 33,000 FEET RESTRICTED
TO AIRPLANES INCORPORATING SK441-36

NOTE:

1. Do not operate in shaded area of chart.

EXAMPLE:

OAT 16°C
Pressure Altitude 2400 Feet
Temperature is within Limits

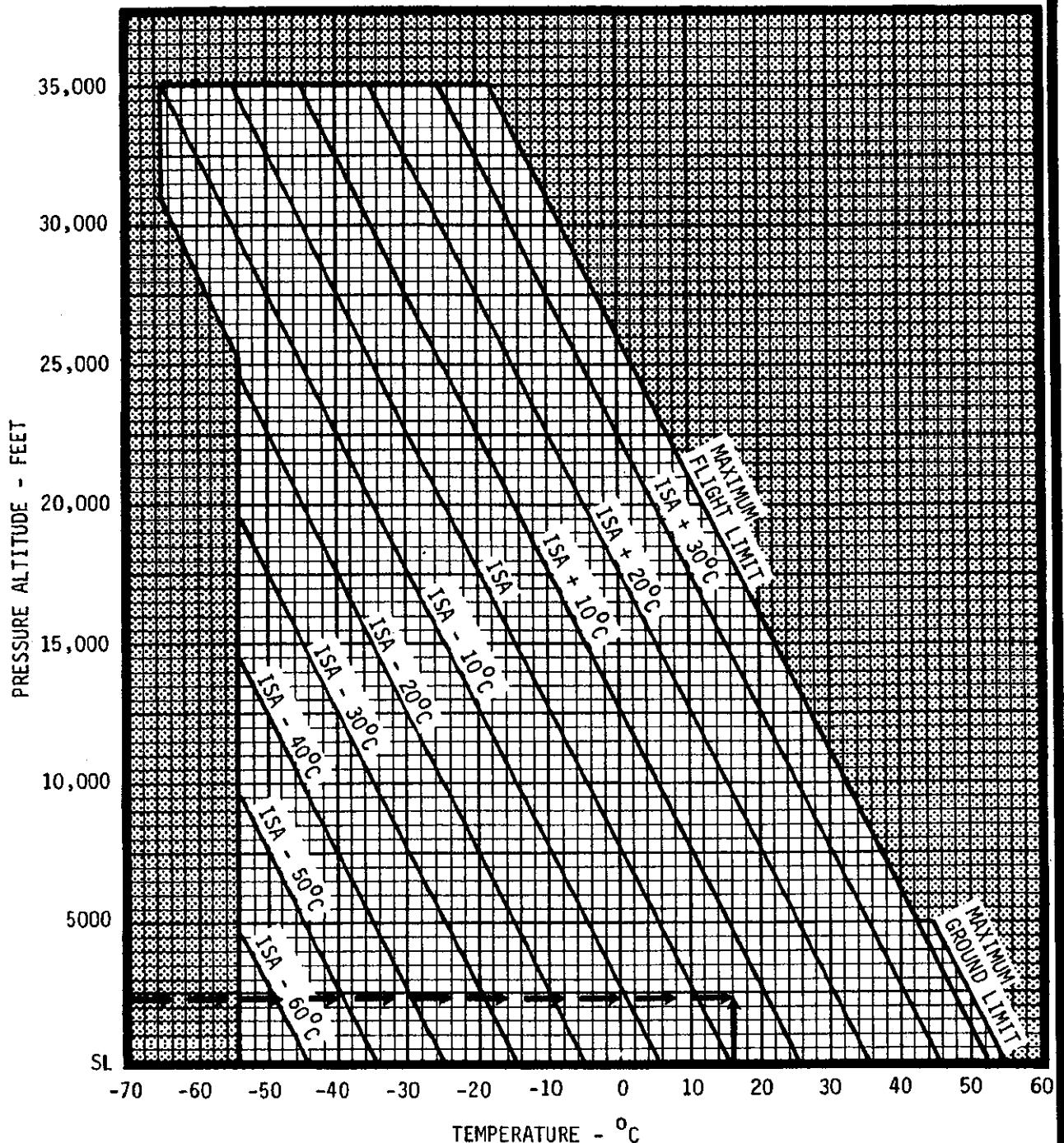


Figure 5-5

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PRESSURE CONVERSION INCHES OF MERCURY TO MILLIBARS

EXAMPLE:

Pressure - Inches of Mercury	29.92
Pressure - Millibars	1013

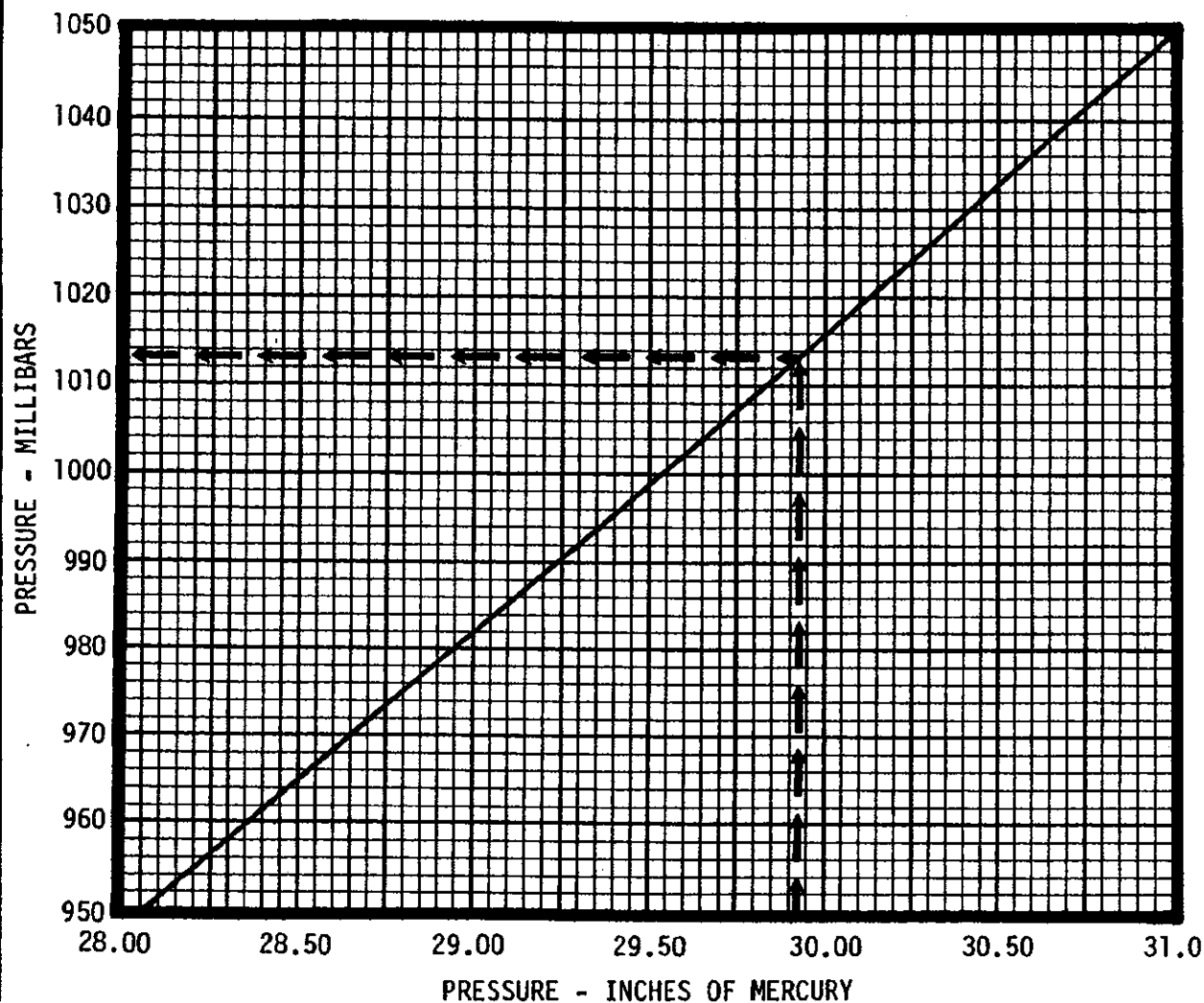


Figure 5-6

STALL SPEEDS

CONDITIONS:

1. Power Levers - Flight Idle.
2. Forward Center of Gravity.

EXAMPLE:

Weight 9700 Pounds
 Flaps T.O.
 Landing Gear Down
 Angle-of-Bank 0°
 Stall Speed 81.7 KIAS
 83.7 KCAS

NOTE:

1. Maximum altitude lost during a conventional stall is approximately 400 feet.
2. Maximum nose down pitch attitude and altitude loss during recovery from an engine inoperative stall is approximately 18° below the horizon and 480 feet respectively.

WEIGHT Pounds	Configuration		ANGLE OF BANK							
			0°		20°		40°		60°	
	Flaps	Gear	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
9850	UP	UP	89	90	92	93	102	103	128	128
	T.O.	DN	82	84	86	87	95	96	120	119
	APPR.	DN	77	79	80	82	89	90	114	112
	LAND.	DN	74	76	78	79	87	87	111	108
9360	UP	UP	87	88	90	91	100	101	125	125
	T.O.	DN	81	83	84	86	94	95	118	117
	APPR.	DN	77	79	79	81	90	90	113	111
	LAND.	DN	73	75	75	77	85	85	109	106
8300	UP	UP	84	85	86	87	96	97	120	120
	T.O.	DN	77	79	80	82	90	91	112	112
	APPR.	DN	72	75	74	77	85	86	107	106
	LAND.	DN	68	71	70	73	80	81	102	100
6800	UP	UP	79	80	81	82	90	91	112	112
	T.O.	DN	72	74	74	76	82	84	104	104
	APPR.	DN	65	69	67	71	75	78	97	97
	LAND.	DN	61	65	63	67	72	74	91	91

Figure 5-7

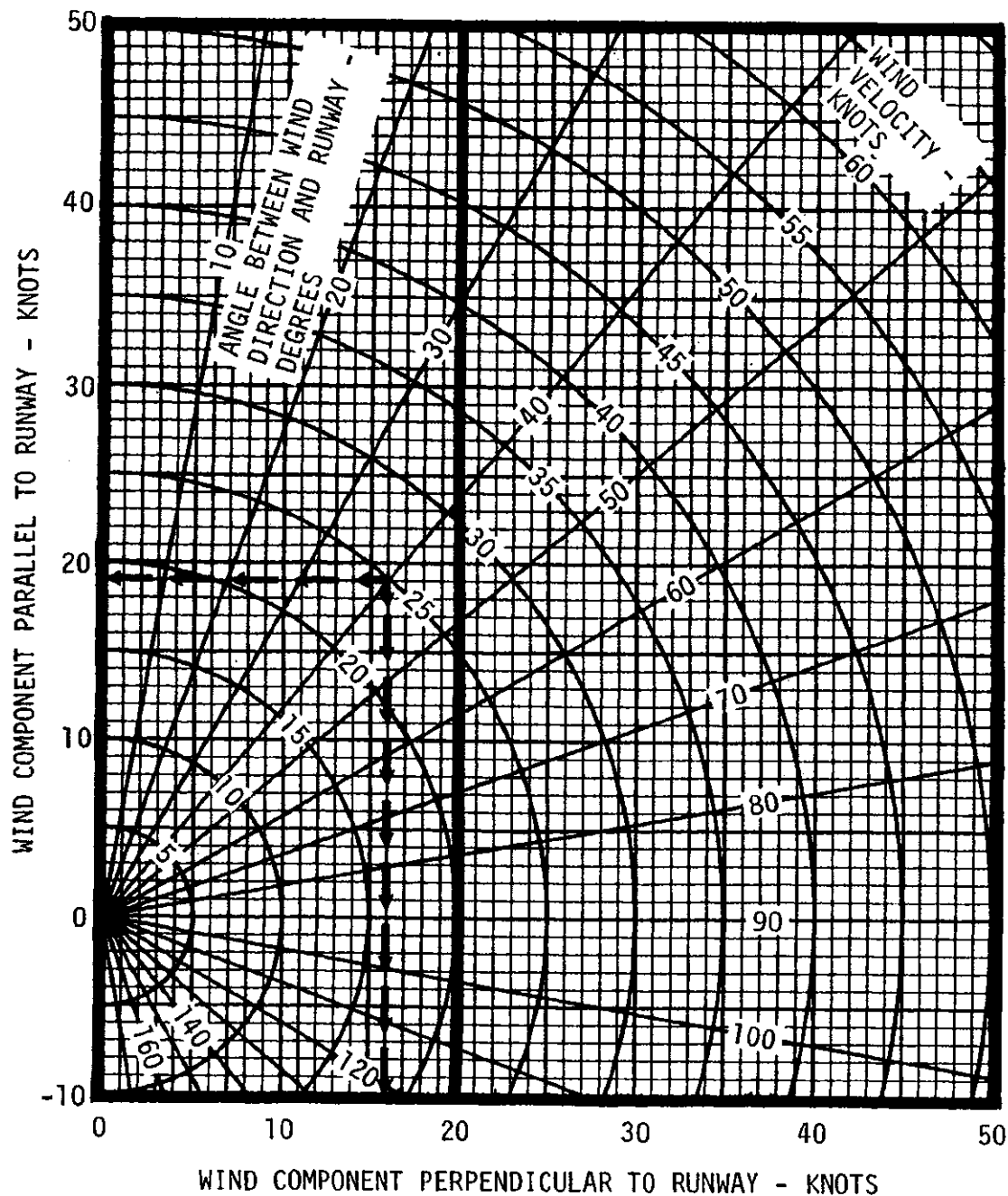
WIND COMPONENT

EXAMPLE:

Angle Between Wind and Direction of Runway	40°
Wind Velocity	25 Knots
Wind Component Parallel to Runway	19 Knots
Wind Component Perpendicular to Runway	16 Knots

NOTE

Maximum Demonstrated Crosswind Velocity is 20 Knots
(not a limitation).



55847021

Figure 5-8

MINIMUM ENGINE TORQUE FOR TAKEOFF (100% RPM)

CONDITIONS:

1. Power Levers - Takeoff Power.
2. Condition Levers - Takeoff, Climb and Landing.
3. Airspeed - 65 KIAS.
4. Normal Mode Operation Only.

NOTE:

1. Torque increases approximately 20 foot-pounds from 0 to 65 KIAS.
2. The torque indicated below is the minimum value for which takeoff performance in this section can be obtained.
3. Do not exceed 450°C EGT or 1669 foot-pounds torque, whichever occurs first.

EXAMPLE:

OAT 16°C
Pressure Altitude 2400 Feet
Engine Torque at 100% RPM 1669 Foot-Pounds

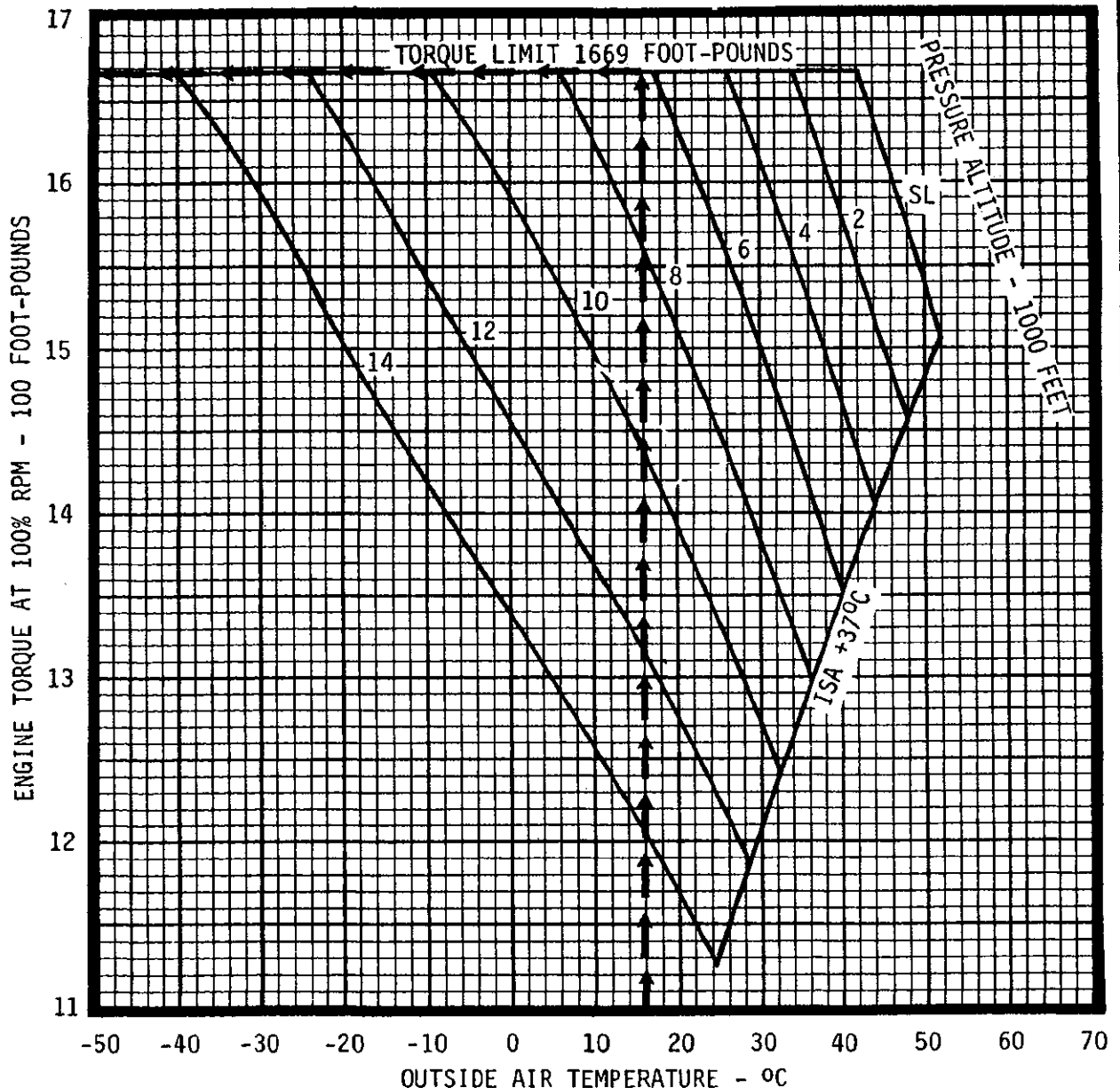


Figure 5-9

5734703F

NORMAL TAKEOFF DISTANCE

CONDITIONS:

1. Power Levers - Takeoff Power Before Brake Release.
2. Condition Levers - Takeoff, Climb and Landing.
3. Wind Flaps - T.O.
4. Level, Hard Surface, Dry Runway.
5. Rotate - 98 KIAS.

NOTE:

1. If full power is applied without brakes set, distances apply from point where full power is applied.
2. Decrease distance 6% for each 10 knots headwind.
3. Increase distance 3% for each 2 knots tailwind.
4. With windshield and engine inlet anti-ice systems on, at altitudes below 5000 feet, increase total takeoff distance and ground roll by 1%. At altitudes above 5000 feet, increase total takeoff distance by 18% and ground roll by 9%.
5. With optional dual anti-ice windshield and engine inlet anti-ice systems on, at altitudes below 5000 feet, increase total takeoff distance by 2% and ground roll by 1%. At altitudes above 5000 feet, increase total takeoff distance by 24% and ground roll by 13%.

EXAMPLE:
Weight 9700 Pounds
OAT 16°C
Pressure Altitude 2400 Feet
Headwind Component 19 Knots
Ground Run (Approximation Method) 2230 Feet
Total Distance Required (Approximation Method) 3070 Feet
(2720 Feet With Wind Correction)

WEIGHT - POUNDS	TAKEOFF TO 50-FOOT OBSTACLE SPEED - KIAS	PRESSURE ALTITUDE - FEET	-20°C			-10°C			0°C			10°C			20°C			30°C			40°C			50°C		
			GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE
9850	110	Sea Level	1440	2000	1530	2120	1630	2250	1730	2390	1840	2540	1960	2700	2080	2870	2250	2980	2440	3110	2870	3200	2290	3500	2490	3800
		1000	1520	2120	1630	2250	1730	2390	1840	2540	1960	2700	2080	2870	2250	2980	2440	3110	2870	3200	2290	3500	2490	3800	2600	4000
		2000	1620	2240	1730	2390	1840	2540	1960	2700	2080	2870	2250	2980	2440	3110	2870	3200	2290	3500	2490	3800	2600	4000	2710	4100
		3000	1720	2360	1840	2540	1960	2700	2080	2870	2250	2980	2440	3110	2870	3200	2290	3500	2490	3800	2600	4000	2710	4100	2820	4200
		4000	1830	2530	1960	2700	2080	2870	2250	2980	2440	3110	2870	3200	2290	3500	2490	3800	2600	4000	2710	4100	2820	4200	2930	4300
		5000	1960	2700	2090	2880	2240	3080	2390	3230	2560	3390	2670	3510	2800	3640	2930	3770	3080	3920	3200	4040	2930	4170	3040	4280
		6000	2090	2880	2240	3080	2390	3230	2560	3390	2670	3510	2800	3640	2930	3770	3080	3920	3200	4040	2930	4170	3040	4280	3150	4400
		7000	2230	3080	2400	3300	2570	3530	2750	3800	2980	4120	3270	4320	3450	4500	3580	4630	3720	4770	3850	4900	3980	5030	4110	5160
		8000	2390	3290	2570	3540	2750	3800	2980	4120	3270	4320	3450	4500	3580	4630	3720	4770	3850	4900	3980	5030	4110	5160	4230	5280
		9000	2570	3530	2750	3800	2980	4120	3270	4320	3450	4500	3580	4630	3720	4770	3850	4900	3980	5030	4110	5160	4230	5280	4340	5390
		10,000	2750	3790	2970	4090	3250	4510	3600	5110	4030	5390	4450	5810	4570	6030	4690	6140	4810	5860	4930	6080	5050	6100	5170	6220
		11,000	2970	4090	3240	4500	3570	5030	3970	5730	4450	5810	4680	6270	4860	6310	4980	6460	5000	6410	5120	6170	5240	6290	5360	6410
		12,000	3220	4430	3570	4990	3950	5640	4390	6440	4940	7610	5490	8720	5490	8720	5490	8720	5490	8720	5490	8720	5490	8720	5490	8720
		13,000	3520	4860	3930	5540	4370	6310	4860	7270	5490	8720	5490	8720	5490	8720	5490	8720	5490	8720	5490	8720	5490	8720	5490	8720
		14,000	3890	5430	4350	6200	4840	7100	5400	8270	6120	10,120	6120	10,120	6120	10,120	6120	10,120	6120	10,120	6120	10,120	6120	10,120	6120	10,120
8800	105	Sea Level	1270	1570	1360	1660	1440	1760	1530	1870	1630	1980	1740	2100	1840	2230	1990	2380	2160	2560	2330	2720	2500	2890	2670	3060
		1000	1350	1660	1440	1760	1530	1870	1630	1980	1740	2100	1840	2230	1990	2380	2160	2560	2330	2720	2500	2890	2670	3060	2780	3170
		2000	1440	1750	1530	1860	1630	1980	1740	2100	1850	2240	1970	2380	2110	2530	2280	2710	2490	2900	2680	3090	2870	3280	3060	3470
		3000	1530	1860	1630	1980	1740	2100	1850	2240	1970	2380	2110	2530	2280	2710	2490	2900	2680	3090	2870	3280	3060	3470	3200	3610
		4000	1630	1970	1740	2100	1860	2240	1980	2380	2120	2540	2260	2710	2490	2900	2680	3090	2870	3280	3060	3470	3200	3610	3310	3720
		5000	1730	2100	1850	2240	1980	2380	2120	2540	2260	2710	2490	2900	2680	3090	2870	3280	3060	3470	3200	3610	3310	3720	3420	3830
		6000	1850	2230	1980	2380	2120	2540	2260	2710	2490	2900	2680	3090	2870	3280	3060	3470	3200	3610	3310	3720	3420	3830	3530	3940
		7000	1980	2380	2120	2540	2260	2710	2490	2900	2680	3090	2870	3280	3060	3470	3200	3610	3310	3720	3420	3830	3530	3940	3640	4050
		8000	2120	2540	2260	2710	2490	2900	2680	3090	2870	3280	3060	3470	3200	3610	3310	3720	3420	3830	3530	3940	3640	4050	3750	4160
		9000	2270	2720	2440	2910	2640	3140	2890	3450	3220	3890	3650	4330	4030	4710	4470	5150	4910	5590	5350	6030	5790	6470	6170	6850
		10,000	2440	2910	2630	3130	2870	3420	3160	3710	3450	4000	3740	4290	4030	4580	4320	4870	4610	5160	4900	5450	5190	5740	5480	6030
		11,000	2630	3120	2870	3420	3160	3710	3450	4000	3740	4290	4030	4580	4320	4870	4610	5160	4900	5450	5190	5740	5480	6030	5780	6330
		12,000	2840	3380	3150	3770	3490	4200	3870	4710	4350	5410	5050	6010	5690	6650	6330	7290	6970	7930	7610	8570	8250	9210	8890	9440
		13,000	3110	3700	3470	4160	3850	4560	4250	5260	4830	6090	5680	6890	6480	7690	7280	8490	8080	9090	8680	9690	9280	10290	9880	10430
		14,000	3440	4090	3830	4610	4260	5190	4750	5890	5380	6590	6180	7390	6980	8190	7780	8990	8580	9590	9180	10190	9780	10790	10380	10930

Figure 5-10 (Sheet 1 of 2)

NORMAL TAKEOFF DISTANCE

CONDITIONS:

1. Power Levers - Takeoff Power Before Brake Release.
2. Condition Levers - Takeoff, Climb and Landing.
3. Wind Flaps - T.O.
4. Level, Hard Surface, Dry Runway.
5. Rotate - 98 KIAS.

NOTE:

1. If full power is applied without brakes set, distances apply from point where full power is applied.
2. Decrease distance 6% for each 10 knots headwind.
3. Increase distance 3% for each 2 knots tailwind.
4. With windshield and engine inlet anti-ice systems on, at altitudes below 5000 feet, increase total takeoff distance and ground roll by 1%. At altitudes above 5000 feet, increase total takeoff distance by 18% and ground roll by 9%.
5. With optional dual anti-ice windshield and engine inlet anti-ice systems on, at altitudes below 5000 feet, increase total takeoff distance by 2% and ground roll by 1%. At altitudes above 5000 feet, increase total takeoff distance by 24% and ground roll by 13%.

WEIGHT - POUNDS	TAKEOFF TO 50-FOOT OBSTACLE SPEED - KIAS	PRESSURE ALTITUDE - FEET	-20°C		-10°C		0°C		10°C		20°C		30°C		40°C		50°C	
			GROUND ROLL - 50-FOOT OBSTACLE FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE FEET	GROUND ROLL - 50-FOOT OBSTACLE FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE FEET	GROUND ROLL - 50-FOOT OBSTACLE FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE FEET	GROUND ROLL - 50-FOOT OBSTACLE FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE FEET	GROUND ROLL - 50-FOOT OBSTACLE FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE FEET	GROUND ROLL - 50-FOOT OBSTACLE FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE FEET	GROUND ROLL - 50-FOOT OBSTACLE FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE FEET	GROUND ROLL - 50-FOOT OBSTACLE FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE FEET
7800	104	Sea Level	1120	1340	1190	1420	1270	1510	1350	1600	1430	1690	1520	1790	1620	1900	1780	2090
		1000	1190	1420	1270	1500	1350	1600	1440	1690	1530	1790	1620	1900	1750	1940	2270	
		2000	1260	1500	1350	1590	1440	1690	1530	1790	1630	1900	1730	2020	1900	2210	-----	-----
		3000	1340	1590	1430	1690	1530	1790	1630	1910	1740	2020	1850	2150	2060	2410	-----	-----
		4000	1430	1680	1530	1790	1630	1910	1740	2030	1850	2150	2000	2330	2260	2640	-----	-----
		5000	1520	1790	1630	1910	1740	2030	1860	2160	1990	2300	2180	2530	2480	2900	-----	-----
		6000	1630	1900	1740	2030	1860	2160	1990	2300	2150	2490	2390	2770	2700	3180	-----	-----
		7000	1740	2030	1860	2160	2000	2310	2140	2470	2350	2720	2630	3060	-----	-----	-----	-----
		8000	1860	2160	2000	2310	2140	2470	2310	2660	2570	2980	2900	3390	-----	-----	-----	-----
		9000	1990	2310	2140	2470	2320	2670	2530	2920	2830	3280	3190	3760	-----	-----	-----	-----
		10,000	2140	2470	2310	2650	2520	2900	2790	3230	3110	3630	3520	4180	-----	-----	-----	-----
		11,000	2300	2650	2520	2890	2770	3190	3070	3560	3440	4030	3880	4640	-----	-----	-----	-----
		12,000	2500	2860	2760	3180	3060	3530	3390	3950	3800	4500	-----	-----	-----	-----	-----	-----
		13,000	2730	3130	3040	3510	3370	3920	3750	4390	4220	5040	-----	-----	-----	-----	-----	-----
		14,000	3010	3460	3360	3880	3730	4340	4150	4890	4690	5660	-----	-----	-----	-----	-----	-----
6800	104	Sea Level	970	1160	1030	1230	1100	1310	1170	1380	1240	1460	1320	1550	1400	1640	1540	1910
		1000	1030	1230	1100	1300	1170	1380	1240	1460	1320	1550	1410	1650	1500	1750	1670	1960
		2000	1090	1300	1170	1380	1240	1460	1320	1550	1410	1650	1500	1750	1600	1860	-----	-----
		3000	1160	1380	1240	1460	1320	1550	1410	1650	1500	1750	1600	1860	1730	2010	-----	-----
		4000	1240	1460	1320	1550	1410	1650	1500	1750	1600	1860	1730	2010	1950	2280	-----	-----
		5000	1320	1550	1410	1650	1510	1760	1610	1870	1720	1990	1890	2190	2140	2510	-----	-----
		6000	1410	1650	1510	1760	1610	1870	1720	1990	1860	2150	2060	2400	2330	2740	-----	-----
		7000	1500	1750	1610	1870	1720	2000	1850	2130	2030	2350	2270	2640	-----	-----	-----	-----
		8000	1610	1870	1730	2000	1850	2140	2000	2300	2220	2580	2500	2930	-----	-----	-----	-----
		9000	1720	2000	1850	2140	2000	2310	2190	2520	2440	2830	2750	3240	-----	-----	-----	-----
		10,000	1850	2140	1990	2290	2180	2510	2410	2790	2680	3140	3030	3600	-----	-----	-----	-----
		11,000	1990	2290	2170	2500	2390	2760	2650	3080	2960	3480	3340	4000	-----	-----	-----	-----
		12,000	2150	2470	2380	2750	2630	3050	2920	3410	3270	3880	-----	-----	-----	-----	-----	-----
		13,000	2360	2700	2620	3030	2910	3380	3220	3790	3630	4340	-----	-----	-----	-----	-----	-----
		14,000	2600	2990	2890	3340	3210	3740	3570	4220	4030	4870	-----	-----	-----	-----	-----	-----

Figure 5-10 (Sheet 2 of 2)

ACCELERATE STOP DISTANCE

CONDITIONS:

1. Maximum Takeoff Power Before Brake Release.
2. Wing Flaps - T.O.
3. Level, Hard Surface, Dry Runway.
4. Engine Failure - 98 KIAS.
5. Ground Idle Power and Maximum Effective Braking After Engine Failure.

NOTE:

1. If full power is applied without brakes set, distances apply from point where full power is applied.
2. Decrease all distances 2% for each 4 knots headwind.
3. Increase distances 5% for each 2 knots tailwind.
4. --- line indicates deceleration rates are unpredictable due to possible brake fading.
5. Distances in shaded areas are applicable only with headwind components of 10 knots or greater. At lower headwind components, deceleration rates are unpredictable due to possible brake fading. The distance correction factor of note (2) can be applied for all headwind components.

EXAMPLE:

Weight 9700 Pounds
OAT 16°C
Pressure Altitude 2400 Feet
Headwind Component 19 Knots
Distance to Accelerate Stop 4350 Feet
(Approximation Method)
(3937 Feet With Wind Correction)

PRESSURE ALTITUDE - FEET	ENGINE WEIGHT - POUNDS	ENGINE FAILURE SPEED - KIAS	TOTAL DISTANCE - FEET								WEIGHT - POUNDS	ENGINE FAILURE SPEED - KIAS	TOTAL DISTANCE - FEET							
			-20°C	-10°C	0°C	+10°C	+20°C	+30°C	+40°C	+50°C			-20°C	-10°C	0°C	+10°C	+20°C	+30°C	+40°C	+50°C
			3100	3260	3420	3580	3750	3930	4120	4390			2750	2890	3020	3160	3310	3460	3620	3850
Sea Level	9850	98	3250	3410	3580	3760	3940	4130	4360	4660	7800	98	2880	3020	3160	3310	3470	3630	3820	4070
1000			3400	3580	3760	3940	4140	4340	4570	4910			3010	3160	3310	3470	3640	3810	4040	
2000			3570	3750	3940	4140	4350	4570	4810	5150			3150	3310	3470	3640	3820	4000	4290	
3000			3740	3940	4150	4360	4580	4810	5050	5390			3300	3470	3650	3820	4010	4240	4560	
4000			3930	4140	4360	4590	4830	5070	5310	5650			3460	3640	3830	4020	4220	4500	4860	
5000			4140	4360	4590	4830	5070	5310	5550	5890			3640	3830	4030	4230	4470	4780	5180	
6000			4360	4590	4830	5070	5310	5550	5790	6130			3820	4030	4240	4460	4750	5110		
7000			4590	4830	5070	5310	5550	5790	6030	6370			4020	4240	4470	4720	5070	5470		
8000			4830	5070	5310	5550	5790	6030	6270	6610			4240	4470	4730	5030	5410	5860		
9000			5070	5310	5550	5790	6030	6270	6510	6850			4470	4720	5030	5380	5790	6290		
10,000			5310	5550	5790	6030	6270	6510	6750	7090			4720	5030	5370	5780	6220	6750		
11,000			5550	5790	6030	6270	6510	6750	6990	7330			5010	5370	5750	6180	6680	7250		
12,000			5790	6030	6270	6510	6750	6990	7230	7570			5240	5640	6040	6490	6990	7590		
13,000			6030	6270	6510	6750	6990	7230	7470	7810			5470	5910	6340	6800	7300	7890		
14,000			6270	6510	6750	6990	7230	7470	7710	8050			5720	6170	6600	7070	7570	8170		
Sea Level	8800	98	2930	3070	3220	3370	3530	3690	3860	4120	6800	98	2580	2700	2820	2950	3090	3230	3370	3580
1000			3060	3210	3370	3530	3700	3870	4080	4360			2690	2820	2950	3090	3230	3380	3560	3780
2000			3200	3360	3530	3700	3880	4070	4320	4590			2810	2950	3090	3240	3390	3540	3760	
3000			3360	3530	3700	3890	4080	4280	4590	4890			2940	3090	3240	3390	3550	3720	3980	
4000			3520	3700	3890	4080	4290	4530	4820	5120			3080	3240	3400	3560	3730	3930	4230	
5000			3690	3890	4090	4300	4520	4820	5120	5420			3230	3390	3570	3740	3920	4170	4500	
6000			3880	4090	4300	4530	4790	5140	5440	5740			3390	3560	3750	3930	4150	4430	4780	
7000			4080	4310	4530	4780	5100	5400	5700	6000			3560	3750	3940	4140	4410	4730		
8000			4300	4540	4780	5060	5340	5620	5900	6180			3740	3940	4150	4380	4690	5050		
9000			4530	4790	5060	5340	5620	5900	6180	6460			3940	4150	4380	4660	5000	5400		
10,000			4780	5060	5340	5620	5900	6180	6460	6740			4150	4380	4660	4980	5340	5780		
11,000			5060	5340	5620	5900	6180	6460	6740	7020			4380	4650	4960	5320	5720	6190		
12,000			5310	5590	5870	6150	6430	6710	6990	7270			4640	4960	5310	5690	6130			
13,000			5590	5870	6150	6430	6710	6990	7270	7550			4940	5300	5690	6100	6580			
14,000			5870	6150	6430	6710	6990	7270	7550	7830			5280	5680	6100	6580				

Figure 5-11

Publication Affected: Model 441 (1 thru 172) Pilot's Operating Handbook (thru Revision 15, dated 17 December 2001).

Airplane Serial Numbers: Airplanes 441-0001 thru 441-0172.

Description of Change: Section 5 Performance.

Filing Instructions: Insert this temporary revision into the Model 441 (1 thru 172) POH adjacent to page 5-27.

Removal Instructions: This temporary revision must be removed and discarded when revision 16 has been collated into the FAA Approved Airplane Flight Manual.

In Section 5, Performance, insert the temporary revision pages adjacent to page 5-27. Replace the information on the existing "ACCELERATE GO DISTANCE" chart (Figure 5-12) with that shown on the opposite page.

APPROVED BY

FAA APPROVED UNDER FAR 21 SUBPART J
The Cessna Aircraft Co
Delegation Option Authorization DOA-230428-CE

Handwritten Signature Executive Engineer

Handwritten Signature

DATE OF APPROVAL 30 JULY 2003

ACCELERATE GO DISTANCE

CONDITIONS:

- Maximum Takeoff Power Before Brake Release
- Wing Flap - T O
- Level, Hard Surface, Dry Runway
- Engine Failure - 98 KIAS
- Rotate - 98 KIAS
- Propeller Feathered and Landing Gear Retracted During Climb
- Windshield and Engine Inlet Anti-Ice - Off

NOTE:

- If full power is applied without brakes set, distances apply from point where full power is applied
- Decrease all distances 7% for each 10 knots headwind
- Increase distances 5% for each 2 knots tailwind
- Engine inoperative climb gradient chart should be checked to insure the climb over the obstacle is not too shallow for safe operation

EXAMPLE:

Weight 9700 Pounds
OAT 15°C
Pressure Altitude 2400 Feet
Headwind Component 19 Knots
Distance to Accelerate go (Approximation Method) 5300 Feet
(4595 Feet With Wind Correction)

PRESSURE ALTITUDE - FEET	ENGINE FAILURE SPEED - KIAS	WEIGHT - POUNDS	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE - FEET										TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE - FEET									
			-20°C	-10°C	0°C	+10°C	+20°C	+30°C	+40°C	+50°C												
			9850	98																		
Sea Level			3070	3290	3540	3810	4120	4460	4850	5900			1710	1820	1930	2050	2180	2320	2480	2650	2830	3190
1000			3280	3530	3810	4110	4460	4850	5290	6350			1810	1920	2050	2180	2320	2480	2660	2840	3200	
2000			3510	3790	4100	4450	4850	5290	5790				1920	2040	2180	2320	2480	2660	2850	3030		
3000			3770	4090	4450	4850	5300	5860	6440				2030	2170	2320	2480	2660	2860	3050	3240		
4000			4070	4430	4840	5300	5820	6400	7000				2160	2320	2480	2660	2860	3070	3270	3470		
5000			4410	4830	5300	5830	6450	7040	7650				2310	2480	2660	2860	3080	3300	3510	3720		
6000			4810	5280	5820	6450	7040	7650	8280				2470	2660	2860	3080	3320	3540	3760	3980		
7000			5260	5820	6450	7040	7650	8280	8920				2650	2860	3090	3340	3590	3820	4050	4280		
8000			5790	6440	7210	8020	8820	9620	10420				2850	3090	3340	3600	3860	4100	4340	4580		
9000			6420	7200	8030	8830	9630	10430	11230				3080	3340	3600	3870	4140	4400	4660	4920		
10,000			7170	8130	9060	10,060	11,060	12,060					3340	3650	4160	4670	5180	5690	6200	6710		
11,000			8090	9920	13,660								3640	4130	4910	5530	6150	6770	7390	8010		
12,000			9230	12,790									4020	4840	6190	6970	7790	8610	9430	10,250		
13,000			11,200										4600	5880	8580							
14,000													5490	7600								
Sea Level		8800	2080	2210	2350	2500	2670	2860	3060	3550			1490	1580	1670	1780	1890	2010	2150	2300	2470	
1000			2200	2340	2500	2670	2860	3060	3280	4020			1570	1670	1770	1890	2010	2150	2300	2460		
2000			2330	2490	2670	2850	3060	3290	3570				1660	1760	1860	1980	2100	2240	2400	2560		
3000			2480	2660	2850	3060	3290	3570	3900				1760	1860	1960	2080	2200	2340	2500	2660		
4000			2650	2850	3060	3290	3550	3970	4300				1880	2010	2150	2310	2480	2660	2840	3020		
5000			2830	3050	3290	3560	3860	4220	4570				2000	2150	2310	2480	2670	2860	3050	3240		
6000			3040	3290	3560	3860	4210	4570	4920				2140	2300	2480	2670	2860	3050	3240	3430		
7000			3280	3560	3860	4200	4570	4920	5270				2300	2480	2670	2860	3050	3240	3430	3620		
8000			3550	3860	4210	4570	4920	5270	5620				2470	2670	2860	3050	3240	3430	3620	3810		
9000			3850	4200	4570	4920	5270	5620	5970				2670	2860	3050	3240	3430	3620	3810	4000		
10,000			4190	4510	4880	5200	5500	5800	6100				2890	3080	3270	3460	3650	3840	4030	4220		
11,000			4600	4910	5280	5600	5900	6200	6500				3150	3340	3530	3720	3910	4100	4290	4480		
12,000			5130	5340	5640	5900	6160	6420	6680				3480	3670	3860	4050	4240	4430	4620	4810		
13,000			5940	6160	6450	6710	6970	7230	7490				3980	4170	4360	4550	4740	4930	5120	5310		
14,000			7270	7490	7780	8020	8260	8500	8740				4750	4940	5130	5320	5510	5700	5890	6080		

Figure 5-12

ACCELERATE GO DISTANCE

CONDITIONS:

1. Maximum Takeoff Power Before Brake Release.
2. Wing Flaps - T.O.
3. Level, Hard Surface, Dry Runway.
4. Engine Failure - 98 KIAS.
5. Rotate - 98 KIAS.
6. Propeller Feathered and Landing Gear Retracted During Climb.
7. Windsheild and Engine Inlet Anti-Ice - Off.

NOTE:

1. If full power is applied without brakes set, distances apply from point where full power is applied.
2. Decrease all distances 7% for each 10 knots headwind.
3. Increase distances 5% for each 2 knots tailwind.
4. Engine inoperative climb gradient chart should be checked to insure the climb over the obstacle is not too shallow for safe operation.

EXAMPLE:
Weight 9700 Pounds
OAT 16°C
Pressure Altitude 2400 Feet
Headwind Component 19 Knots
Distance to Accelerate Go 5300 Feet
(Approximation Method)
(4595 Feet With Wind Correction)

Off.

PRESSURE ALTITUDE - FEET	ENGINE WEIGHT - POUNDS	ENGINE FAILURE SPEED - KIAS	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE - FEET							ENGINE WEIGHT - POUNDS	ENGINE FAILURE SPEED - KIAS	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE - FEET								
			-20°C	-10°C	0°C	+10°C	+20°C	+30°C	+40°C			+50°C	-20°C	-10°C	0°C	+10°C	+20°C	+30°C	+40°C	+50°C
Sea Level	9850	98	3070	3290	3540	3810	4120	4460	4850	5900	7800	98	1710	1820	1930	2050	2180	2320	2480	2850
1000			3280	3530	3810	4110	4460	4850	5490	6970			1810	1920	2050	2180	2320	2480	2720	3190
2000			3510	3790	4100	4450	4850	5290	6350				1920	2040	2180	2320	2480	2660	3020	
3000			3770	4090	4450	4850	5300	5860	7590				2030	2170	2320	2480	2660	2860	3400	
4000			4070	4430	4840	5300	5820	6740	9700				2160	2320	2480	2660	2860	3170	3940	
5000			4410	4830	5300	5830	6450	8040	13,650				2310	2480	2660	2860	3080	3560	4710	
6000			4810	5280	5820	6450	7480	10,220					2470	2660	2860	3080	3420	4110	5770	
7000			5260	5820	6450	7200	9170	14,770					2650	2860	3090	3340	3890	4960		
8000			5790	6440	7210	8320	12,050						2850	3090	3340	3690	4530	6420		
9000			6420	7200	8330	10,580							3080	3340	3690	4260	5520	9840		
10,000			7170	8130	10,060								3340	3650	4160	5140	7380			
11,000			8090	9920	13,660								3640	4130	4910	6530	12,960			
12,000			9230	12,790									4020	4840	6190	9670				
13,000			11,200										4600	5880	8580					
14,000													5490	7600						
Sea Level	8800	98	2080	2210	2350	2500	2670	2860	3060	3550	6800	98	1490	1580	1670	1780	1890	2010	2150	2470
1000			2200	2340	2500	2670	2860	3060	3380	4020			1570	1670	1770	1890	2010	2150	2360	2770
2000			2330	2490	2670	2850	3060	3290	3780				1660	1770	1890	2010	2150	2300	2620	
3000			2480	2660	2850	3060	3290	3570	4300				1760	1880	2010	2150	2310	2480	2940	
4000			2650	2850	3060	3290	3550	3970	5070				1880	2010	2150	2310	2480	2740	3410	
5000			2830	3050	3290	3560	3860	4520	6220				2000	2150	2310	2480	2670	3090	4080	
6000			3040	3290	3560	3860	4310	5300	7920				2140	2300	2480	2670	2960	3560	5000	
7000			3280	3560	3860	4200	4970	6590					2300	2480	2670	2900	3200	4300		
8000			3550	3860	4210	4680	5910	8990					2470	2670	2900	3200	3930	5560		
9000			3850	4200	4680	5500	7450						2670	2900	3200	3690	4780	8530		
10,000			4190	4610	5340	6820	10,660						2890	3160	3600	4450	6400			
11,000			4600	5300	6450	9100							3150	3570	4250	5650	11,240			
12,000			5130	6340	8500								3480	4190	5360	8380				
13,000			5940	7900	12,570								3980	5090	7430					
14,000			7270	10,760									4750	6580	13,380					

Figure 5-12

TAKEOFF CLIMB GRADIENT - ONE ENGINE INOPERATIVE

CONDITIONS:

1. Inoperative Propeller - Feathered.
2. Operative Engine:
 - a. Power Lever - Takeoff Power.
 - b. Condition Lever - Takeoff, Climb and Landing.
3. Landing Gear - Down.
4. Wing Flaps - T.O.
5. Climb Speed - 100 KIAS.
6. Windshield and Engine Inlet Anti-Ice - Off.

EXAMPLE:

OAT 16°C
Pressure Altitude 2400 Feet
Weight 9700 Pounds
Takeoff Climb Gradient 3%

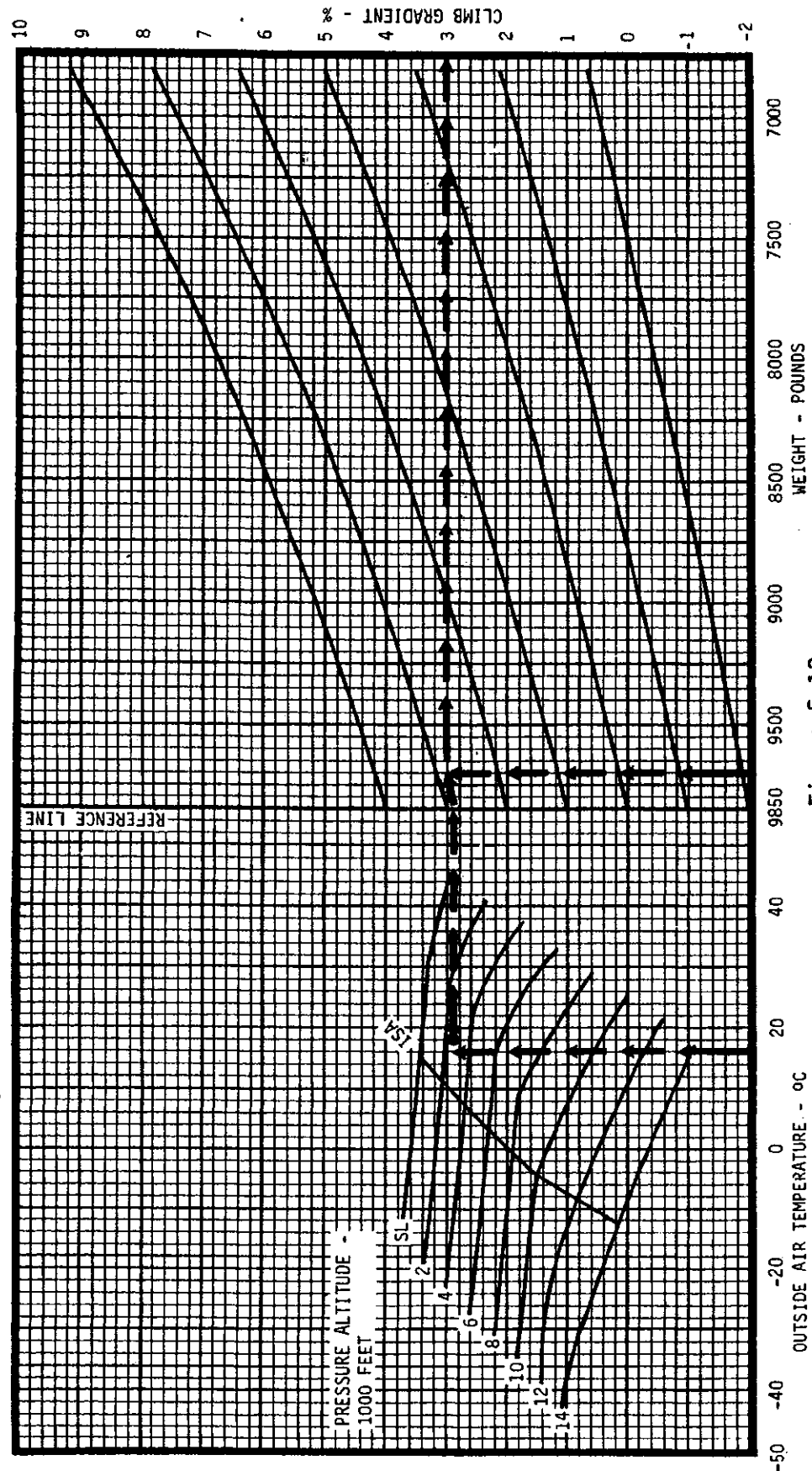


Figure 5-13

RATE-OF-CLIMB - MAXIMUM CLIMB WING FLAPS - UP

CONDITIONS:

1. Power Levers - Takeoff Power.
2. Condition Levers - Takeoff, Climb and Landing.
3. Landing Gear - Up.
4. Windshield and Engine Inlet Anti-Ice - Off.

PRESSURE ALTITUDE FEET	CLIMB SPEED KNOTS
Sea Level to 15,000	140
15,000 to 24,000	130
24,000 to 35,000	118

EXAMPLE:

OAT 16°C
Pressure Altitude 2400 Feet
Weight 9700 Pounds
Rate-of-Climb 2410 Ft./Min.
Climb Speed 140 Knots

**OPERATION ABOVE 33,000 FEET RESTRICTED
TO AIRPLANES INCORPORATING SK441-36**

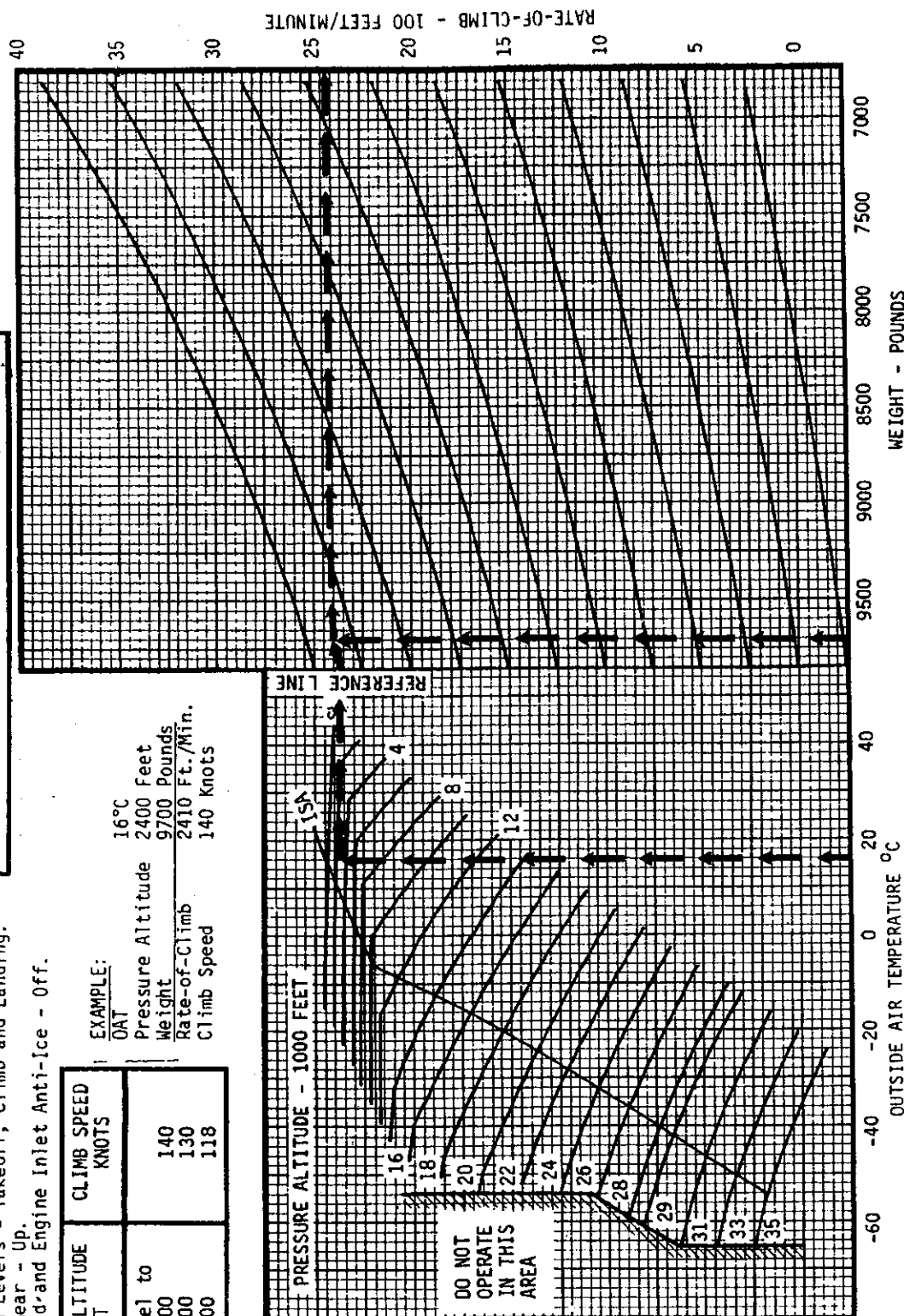


Figure 5-14

RATE-OF-CLIMB - ALL ENGINES OPERATING **WING FLAPS - T. O.**

- CONDITIONS:**
1. Power Levers - Takeoff Power.
 2. Condition Levers - Takeoff, Climb and Landing
 3. Landing Gear - Up.
 4. Windshield and Engine Inlet Anti-Ice - Off.

PRESSURE ALTITUDE - FEET	CLIMB SPEED KIAS
Sea Level to 15,000	130
15,000 to 24,000	120
24,000 to 35,000	107

OPERATION ABOVE 33,000 FEET RESTRICTED TO AIRPLANES INCORPORATING SK441-36

Example:
OAT 16°C
Pressure Altitude 2400 Feet
Weight 9200 Pounds
Rate-of-Climb 2240 Ft./Min.
Climb Speed 130 Knots

- NOTE:**
1. With windshield and engine inlet anti-ice systems on, decrease rate-of-climb by 400 feet.
 2. With optional dual anti-ice windshield and engine inlet anti-ice systems on, decrease rate-of-climb by 540 feet per minute.

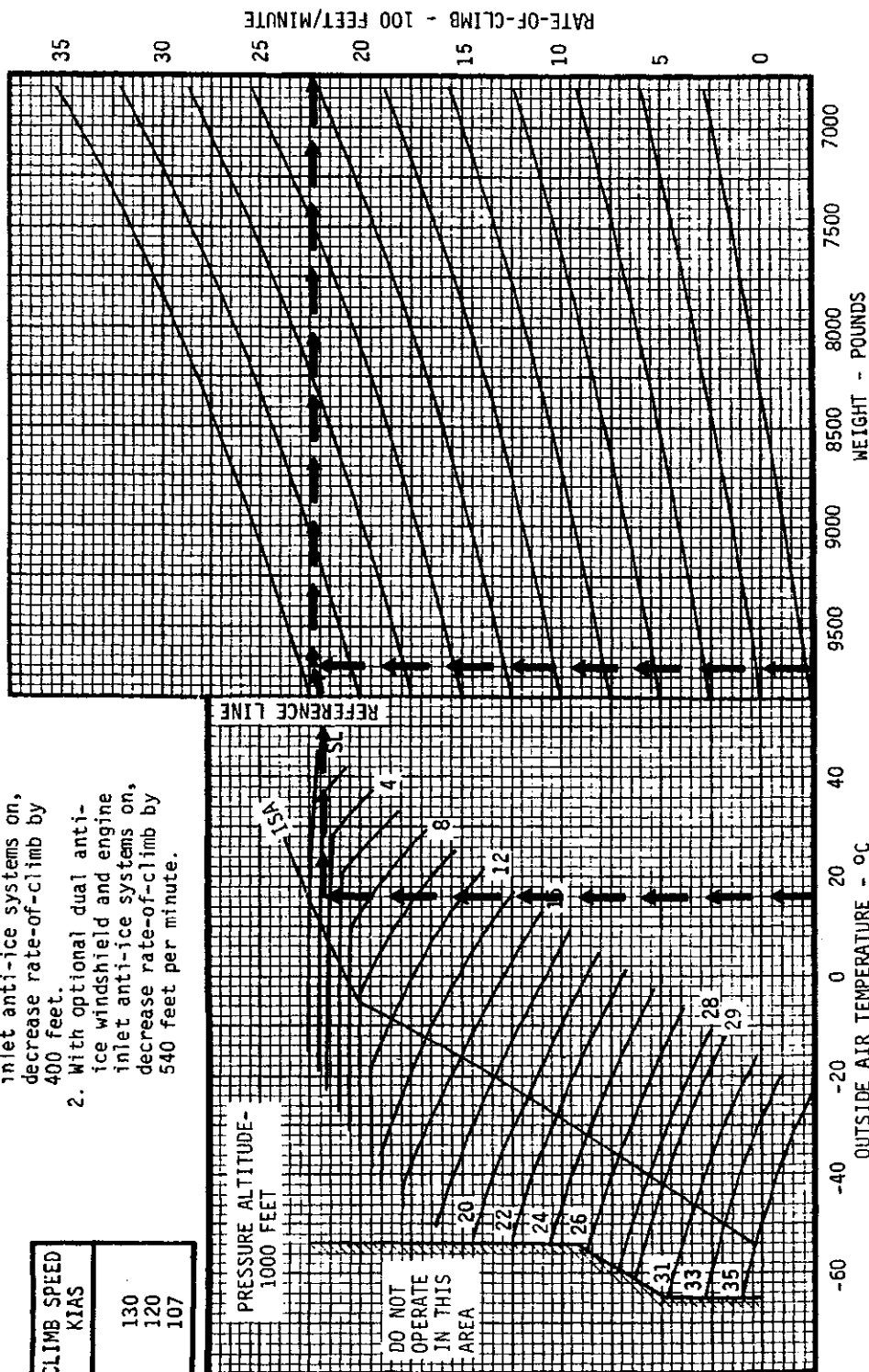
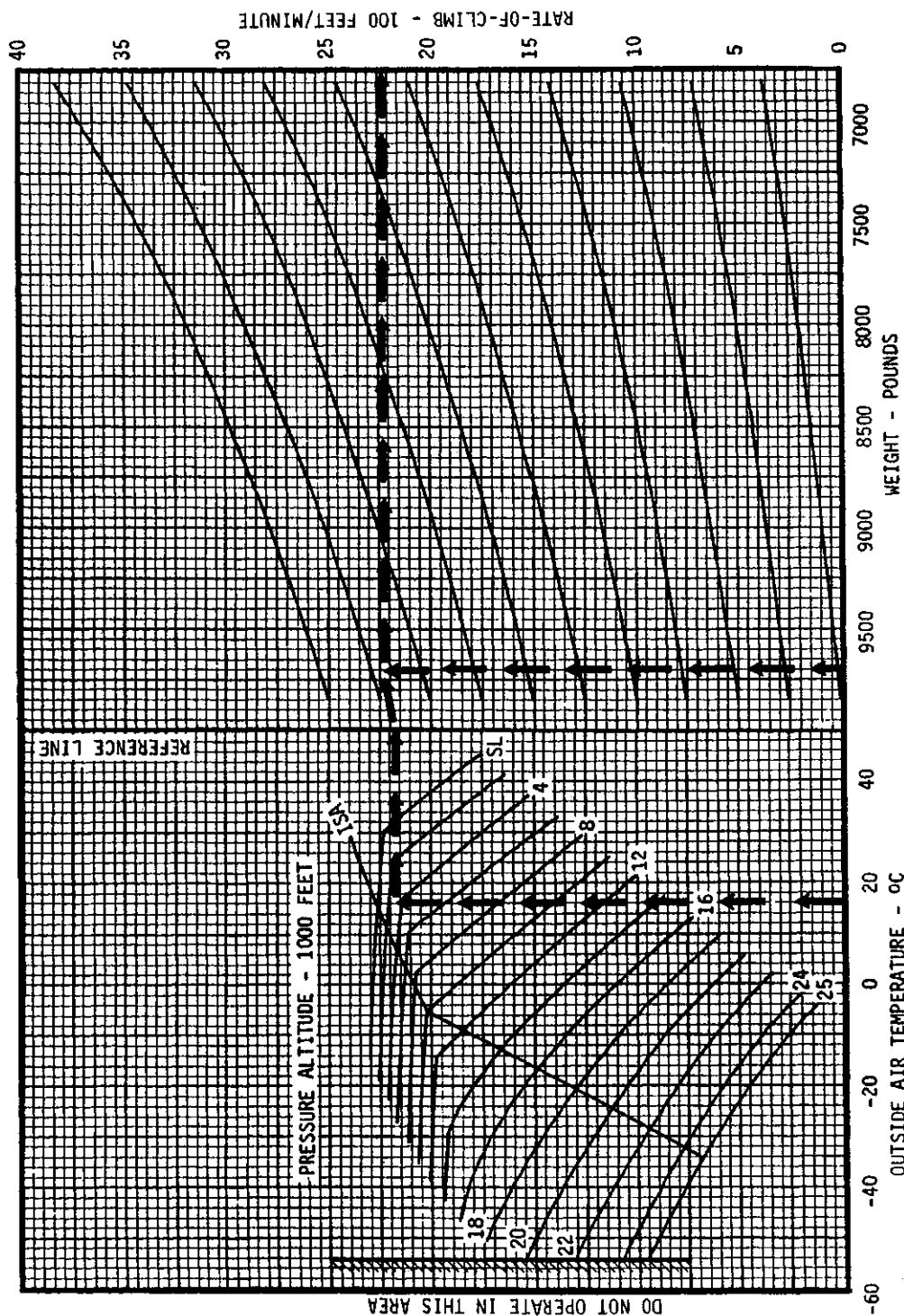


Figure 5-15

RATE-OF-CLIMB - CRUISE CLIMB



CONDITIONS:

1. Power Levers - 1738 Foot-Pounds Torque.
2. Condition Levers - 96% RPM.
3. Landing Gear - Up.
4. Wing Flaps - Up.
5. Windshield and Engine Inlet Anti-Ice - Off.
6. Airspeed - 160 KIAS.

NOTE:

1. Above 25,000 feet, use Rate-of-Climb - Maximum Climb, see Figure 5-14.

EXAMPLE:

OAT	16°C
Pressure Altitude	2400 Feet
Weight	9700 Pounds
Rate-of-Climb	2235 Ft/Min

Figure 5-16

RATE-OF-CLIMB - ONE ENGINE INOPERATIVE

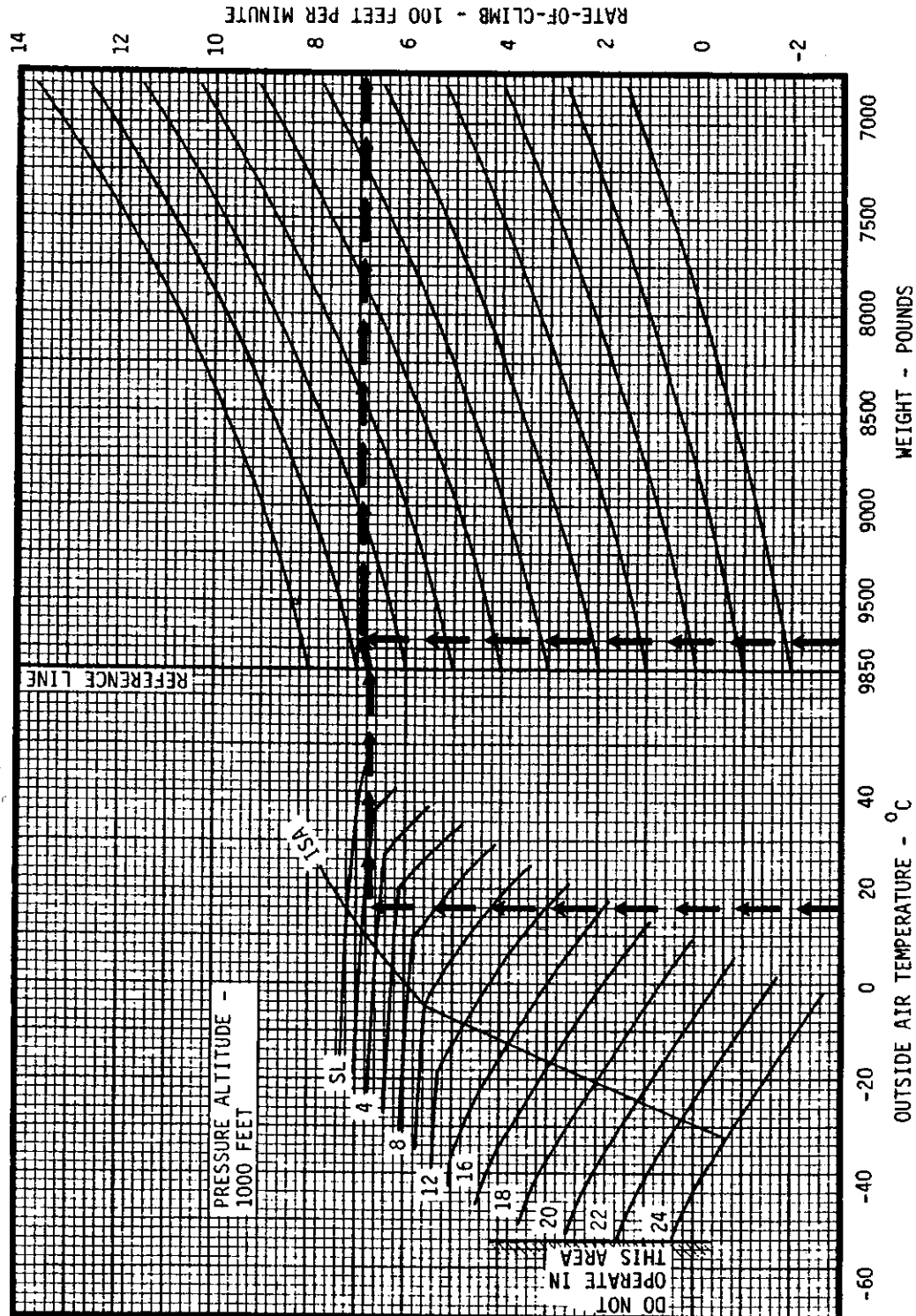


Figure 5-17

CONDITIONS:

1. Inoperative Propeller - Feathered.
2. Operative Engine:
 - a. Power Lever - Takeoff Power.
 - b. Condition Lever - Takeoff, Climb and Landing.
3. Landing Gear - Up.
4. Wing Flaps - Up.
5. Climb Speed - 120 KIAS.
6. Windshield and Engine Inlet Anti-Ice - Off.
7. Wings Banked Approximately 3° to 4° with a 2/3 to 3/4 ball slip indicated on the turn and bank indicator into the operative engine.

NOTE:

Approximate effect of configuration on inoperative engine rate-of-climb.

Subtract values listed below from value obtained in above graph. Effects for a combination of gear or flaps may be obtained by adding the effects for each.

Gear Down - 300 Ft/Min
Flaps T.O. - 200 Ft/Min
Flaps Land - 800 Ft/Min

EXAMPLE:

OAT	16°C
Pressure Altitude	2400 Feet
Weight	9700 Pounds
Rate-of-Climb	690 Ft/Min

RATE-OF-CLIMB - BALKED LANDING CLIMB

CONDITIONS:

1. Power Levers - Takeoff Power.
2. Condition Levers - Takeoff, Climb and Landing.
3. Landing Gear - Down.
4. Wing Flaps - Land.
5. Airspeed - 99 KIAS.

NOTE:

1. With windshield and engine inlet anti-ice systems on, decrease rate-of-climb by 230 feet per minute.
2. With optional dual anti-ice windshield and engine inlet anti-ice systems on, decrease rate-of-climb by 360 feet per minute.

EXAMPLE:

OAT 7°C
Pressure Altitude 1700 Feet
Weight 8322 Pounds
Rate-of-climb 2060 Ft/Min

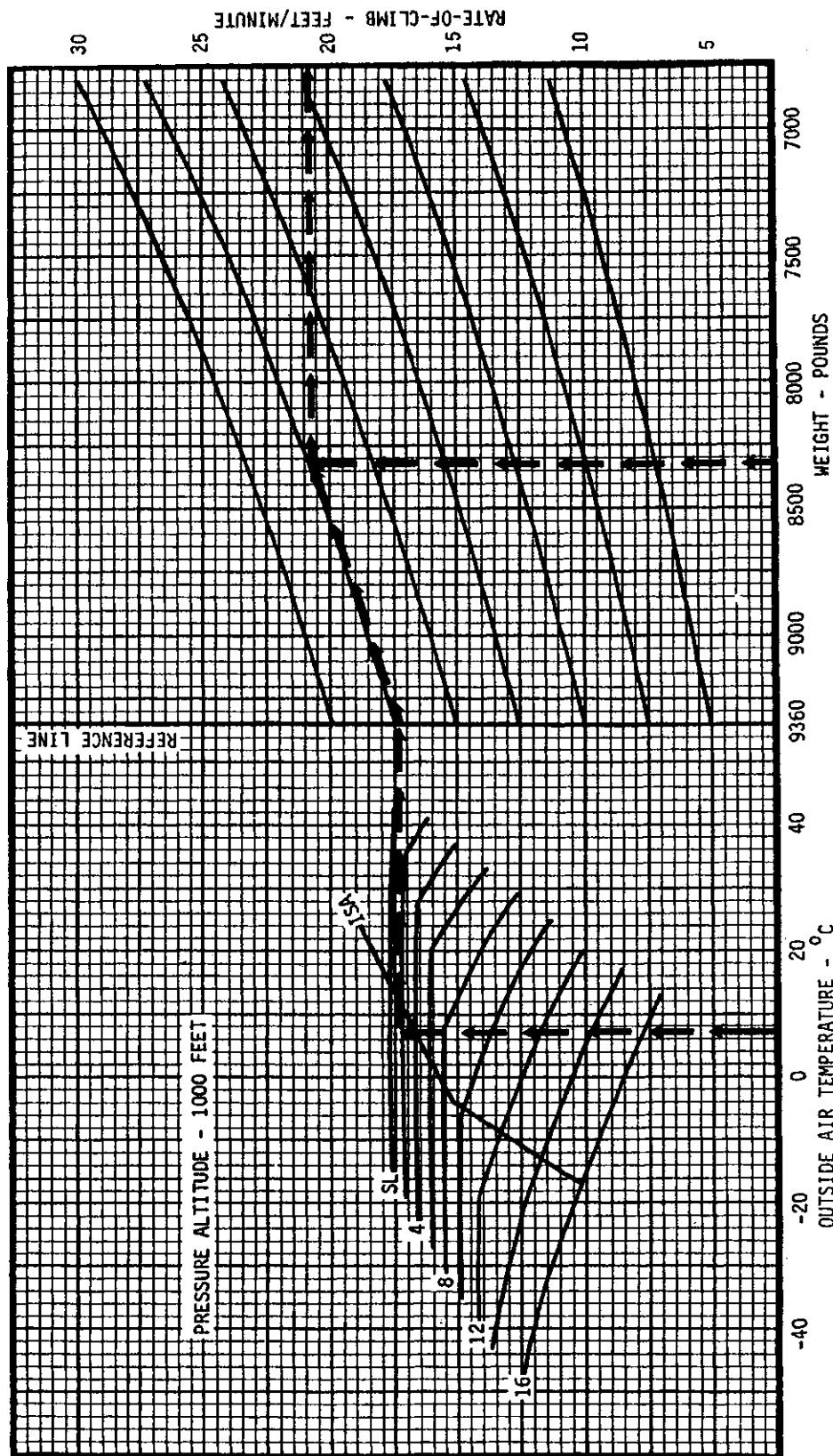


Figure 5-18

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I ONE ENGINE INOPERATIVE SERVICE CEILING

OPERATION ABOVE 33,000 FEET RESTRICTED
TO AIRPLANES INCORPORATING SK441-36

CONDITIONS:

1. One Engine Inoperative Climb Configuration.
2. Climb Speed - 120 KIAS.
3. Windshield and Engine Inlet Anti-Ice - Off.

NOTE:

1. One engine inoperative service ceiling is the maximum altitude where the airplane has the capability of climbing 50 feet per minute with one engine inoperative and propeller feathered.
2. Increase indicated service ceiling 100 feet for each 0.10 inches Hg. altimeter setting greater than 29.92.
3. Decrease indicated service ceiling 100 feet for each 0.10 inches Hg. altimeter setting less than 29.92.
4. This chart provides performance information to aid in route selection when operating under FAR 135.181 and 91.119 requirements.

EXAMPLE:

OAT at Enroute Altitude	-20°C
Enroute Altitude	22,400 Feet
Weight	8800 Pounds

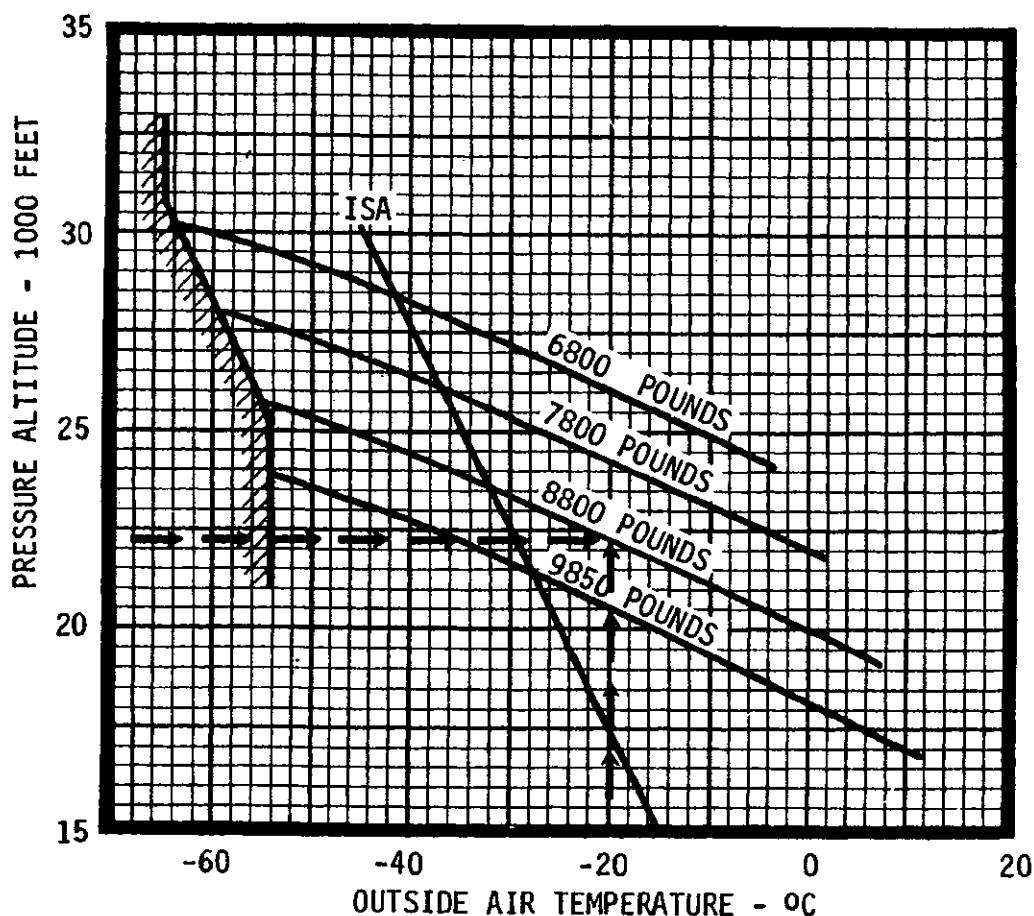


Figure 5-19

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TIME, FUEL AND DISTANCE TO CLIMB - MAXIMUM CLIMB

OPERATION ABOVE 33,000 FEET RESTRICTED
TO AIRPLANES INCORPORATING SK441-36

CONDITIONS:

1. Power
Levers - Maximum Continuous Power.
2. Condition
Levers - Takeoff, Climb and Landing.
3. Landing Gear - Up.
4. Wing Flaps - Up.
5. Windshield and Engine Inlet
Anti-Ice - Off.

PRESSURE ALTITUDE - FEET	CLIMB SPEED KIAS
Sea Level to 15,000	140
15,000 24,000	140
24,000 35,000	130
35,000	118

NOTE:

1. Time, fuel and distance for the climb are determined by taking the difference between the airport altitude and initial cruise altitude conditions.
2. For total fuel used, add 75 pounds for start, taxi and runup.

EXAMPLE:

OAT at Takeoff 16°C
OAT at Cruise -30.6°C
Airport Pressure Altitude 2400 Feet
Cruise Altitude 18,000 Feet
Initial Climb Weight 9700 Pounds
Time to Climb (7.9 - 1.0) 6.9 Minutes
Fuel to Climb (97 - 14) 83 Pounds
Distance to Climb (21 - 2) 19 Miles

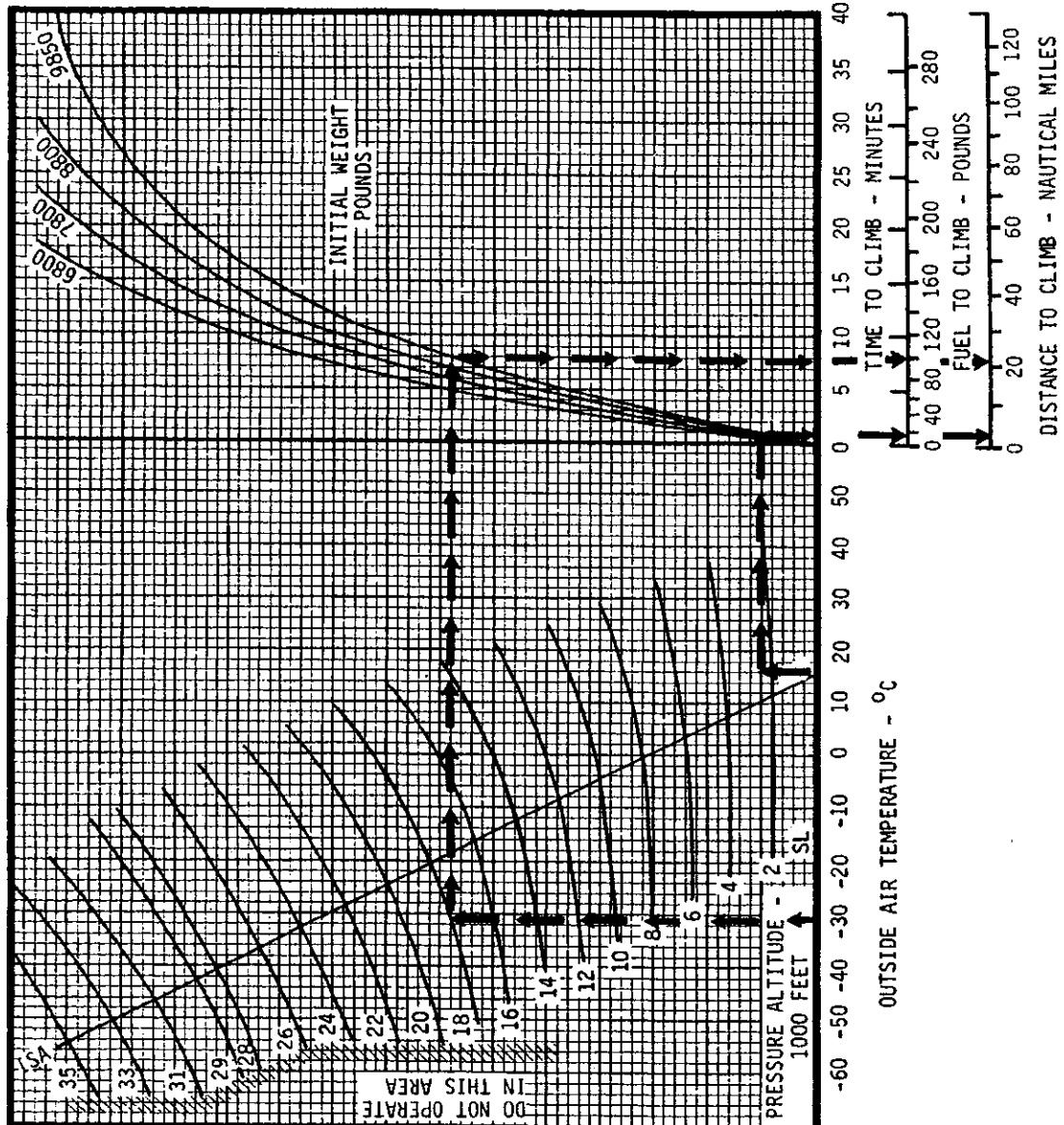
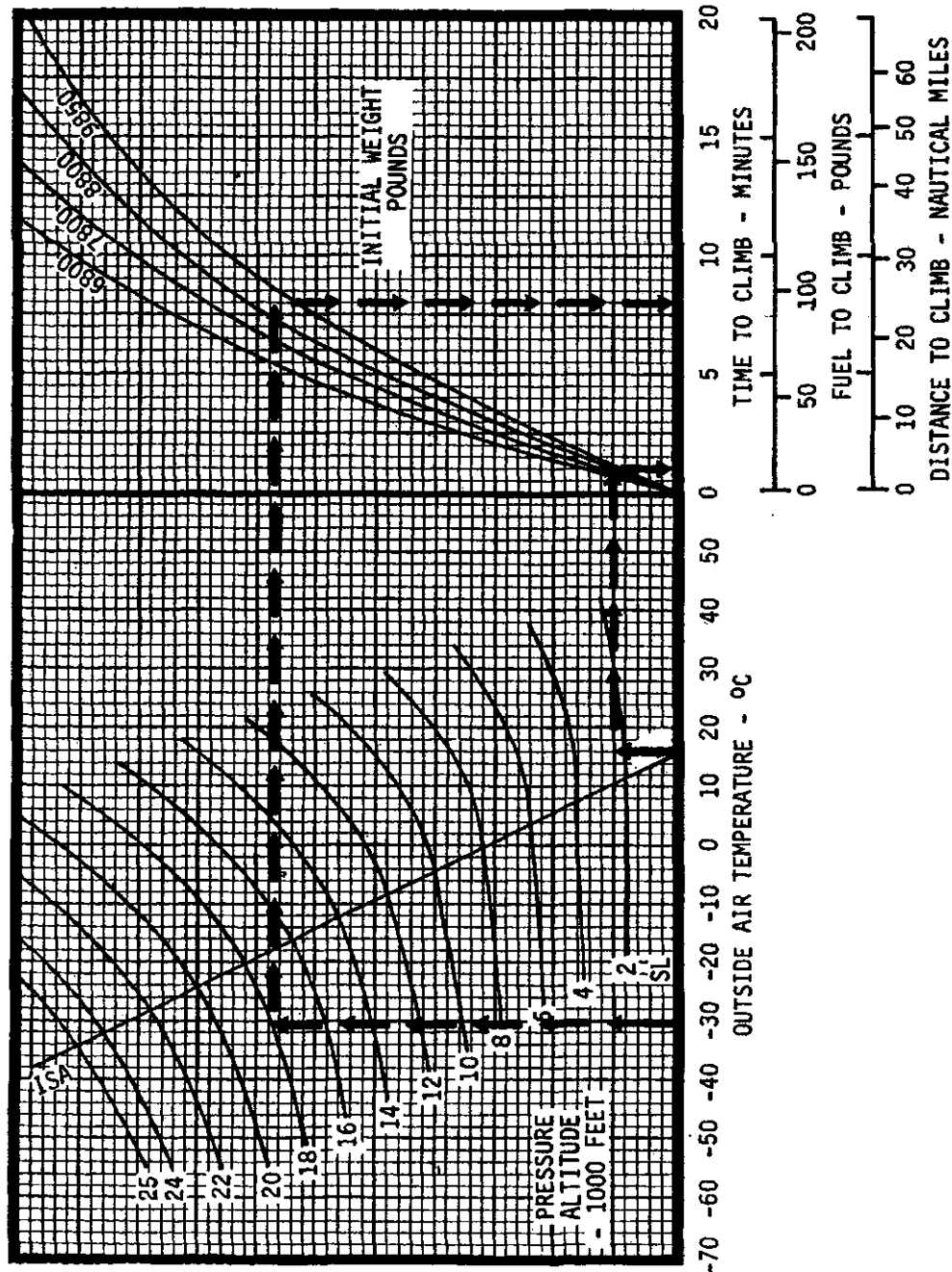


Figure 5-20

TIME, FUEL AND DISTANCE TO CLIMB - CRUISE CLIMB



CONDITIONS:

1. Power Levers - 1738 Ft-Lbs.
2. Condition Levers - 96% RPM.
3. Landing Gear - Up.
4. Wing Flaps - Up.
5. Windshield and Engine Inlet Anti-ice - Off.
6. Airspeed - 160 KIAS.

NOTE:

1. Time, fuel and distance for the climb are determined by taking the difference between the airport altitude and initial cruise conditions.
2. For total fuel used, add 75 pounds for start, taxi and runup.
3. Above 25,000 feet, use maximum climb chart; see Figure 5-20.

EXAMPLE:

OAT at Takeoff	16°C
OAT at Cruise	-30.6°C
Airport Pressure Altitude	2400 Feet
Cruise Altitude	18,000 Feet
Initial Climb Weight	9700 Pounds
Time to Climb (8-1)	7 Minutes
Fuel to Climb (93-11)	82 Pounds
Distance to Climb (24-2.5)	21.5 Miles

Figure 5-21

MAXIMUM RECOMMENDED CRUISE POWER

CONDITIONS:

- Both engines operating in normal mode.
- Condition Levers - 96% RPM.
- Landing Gear - UP.
- Wing Flaps - UP.
- Fuel Used - JET A.
- Windshield Anti-Ice - OFF.

NOTE:

- Power is limited by airspeed, torque or EGT as indicated below.
 - EGT Limited (450°C).
 - Airspeed Limited ($V_{MO} = 245$ KIAS).
 - Torque Limited (1738 Foot-Pounds).

EXAMPLE:

Altitude

18,000

OAT

-31°C (ISA -10°C)

Weight

9700 Pounds

Airspeed (Approximation Method)

293 KTAS (230 KIAS)

Fuel Flow

654 Lbs/Hr

PRESSURE ALTITUDE FEET		TEMPERATURE °C		POWER	FUEL FLOW PER ENGINE LBS/HR	TOTAL FUEL FLOW LBS/HR	AIRSPEED					
							6850 LBS		8350 LBS		9850 LBS	
		OAT	IOAT				KIAS	KTAS	KIAS	KTAS	KIAS	KTAS
ISA -30°C	Sea Level	-15	-9	TORQUE LIMITED	413	826	VMO LIMITED	230	VMO LIMITED	230	VMO LIMITED	230
	2000	-19	-13	↓	403	806	↓	236	↓	236	↓	236
	4000	-23	-16		393	786		243		243		243
	6000	-27	-20		383	766		250		250		250
	8000	-31	-24		374	748		257		257		257
	10,000	-35	-27		366	732		264		264		264
	12,000	-39	-31		359	718		272		272		272
	14,000	-43	-35		353	706		280	244	280	243	278
	16,000	-47	-38		347	694	243	287	242	286	240	284
	18,000	-51	-42	EGT LIMITED	342	684	241	294	240	292	238	290
ISA -20°C	Sea Level	-5	1	TORQUE LIMITED	408	816	VMO LIMITED	234	VMO LIMITED	234	VMO LIMITED	234
	2000	-9	-3	↓	398	796	↓	241	↓	241	↓	241
	4000	-13	-6		388	776		247		247		247
	6000	-17	-10		379	758		255		255		255
	8000	-21	-14		370	740		262		262		262
	10,000	-25	-17		362	724		270		270		270
	12,000	-29	-21		355	710		278		278	243	277
	14,000	-33	-25		349	698	243	285	242	284	240	282
	16,000	-37	-28		344	688	241	291	240	289	238	287
	18,000	-41	-32	EGT LIMITED	336	672	238	296	236	295	235	292
	20,000	-45	-36		323	646	234	301	233	299	230	296
	22,000	-49	-39		304	608	228	302	226	300	224	297
	24,000	-53	-43		285	570	221	303	219	301	217	297

Figure 5-22 (Sheet 1 of 4)

MAXIMUM RECOMMENDED CRUISE POWER

**OPERATION ABOVE 33,000 FEET RESTRICTED
TO AIRPLANES INCORPORATING SK441-36**

CONDITIONS:

1. Both engines operating in normal mode.
2. Condition Levers - 96% RPM.
3. Landing Gear - Up.
4. Wing Flaps - Up.
5. Fuel Used - Jet A.
6. Windshield Anti-Ice - Off.

NOTE:

Power is limited by airspeed, torque or EGT as indicated below.

- a. EGT Limited (450°C).
- b. Airspeed Limited (V_{MO} = 245 KIAS).
- c. Torque Limited (1738 Foot-Pounds).

PRESSURE ALTITUDE FEET		TEMPERATURE °C		POWER	FUEL FLOW PER ENGINE LBS/HR	TOTAL FUEL FLOW LBS/HR	AIRSPEED					
		OAT	TOAT				6850 LBS		8350 LBS		9850 LBS	
							KIAS	KTAS	KIAS	KTAS	KIAS	KTAS
ISA - 10°C	Sea Level	5	11	TORQUE LIMITED	404	808	V _{MO} LIMITED	239	V _{MO} LIMITED	239	V _{MO} LIMITED	239
	2000	1	8	↓	394	788	↓	245	↓	245	↓	245
	4000	-3	4	↓	384	768	↓	252	↓	252	↓	252
	6000	-7	0	↓	375	750	↓	260	↓	260	↓	260
	8000	-11	-3	↓	367	734	↓	267	↓	267	↓	267
	10,000	-15	-7	↓	359	718	↓	275	↓	275	↓	275
	12,000	-19	-11	↓	352	704	244	283	242	281	241	280
	14,000	-23	-14	↓	346	692	241	289	240	287	238	285
	16,000	-27	-18	EGT LIMITED	340	680	239	295	237	293	235	290
	18,000	-31	-22	↓	327	654	234	298	232	296	230	293
	20,000	-35	-26	↓	306	612	227	298	225	296	223	293
	22,000	-39	-30	↓	288	576	220	299	218	296	216	293
	24,000	-43	-34	↓	270	540	214	300	211	297	208	292
	26,000	-47	-38	↓	252	504	207	301	204	297	201	292
	28,000	-50	-42	↓	236	472	200	301	197	296	193	290
	29,000	-52	-44	↓	228	456	197	301	194	296	189	290
	31,000	-56	-48	↓	212	424	190	301	186	295	181	287
33,000	-60	-52	↓	197	394	183	301	179	294	173	284	
35,000	-64	-56	↓	183	366	175	299	170	290	162	278	
ISA	Sea Level	15	22	TORQUE LIMITED	401	802	V _{MO} LIMITED	243	V _{MO} LIMITED	243	V _{MO} LIMITED	243
	2000	11	18	↓	391	782	↓	250	↓	250	↓	250
	4000	7	14	↓	381	762	↓	257	↓	257	↓	257
	6000	3	10	↓	373	746	↓	265	↓	265	↓	265
	8000	-1	7	↓	364	728	↓	272	↓	272	↓	272
	10,000	-5	3	↓	357	714	244	281	243	279	241	277
	12,000	-9	-1	↓	351	702	242	286	240	285	239	283
	14,000	-13	-4	EGT LIMITED	339	678	238	290	236	288	234	286
	16,000	-17	-8	↓	323	646	232	292	230	290	228	287
	18,000	-21	-12	↓	306	612	226	293	224	291	221	288
	20,000	-25	-16	↓	289	578	220	295	218	292	215	289
	22,000	-29	-20	↓	272	544	213	296	211	293	208	289
	24,000	-33	-24	↓	255	510	207	297	204	293	201	288
	26,000	-37	-28	↓	239	478	200	297	197	292	193	287
	28,000	-40	-32	↓	223	446	193	297	189	291	185	285
	29,000	-42	-34	↓	215	430	189	296	186	291	181	283
	31,000	-46	-38	↓	200	400	182	296	178	289	172	280
33,000	-50	-42	↓	186	372	175	295	170	287	163	276	
35,000	-54	-46	↓	173	346	167	293	161	283	153	268	

Figure 5-22 (Sheet 2 of 4)

MAXIMUM RECOMMENDED CRUISE POWER

OPERATION ABOVE 33,000 FEET RESTRICTED
TO AIRPLANES INCORPORATING SK441-36

CONDITIONS:

- Both engines operating in normal mode.
- Condition Levers - 96% RPM.
- Landing Gear - UP.
- Wing Flaps - UP.
- Fuel Used - JET A.
- Windshield Anti-Ice - OFF.

NOTE:

- Power is limited by airspeed, torque or EGT as indicated below.
 - EGT Limited (450°C).
 - Airspeed Limited (V_{MO} = 245 KIAS).
 - Torque Limited (1738 Foot-Pounds).

PRESSURE ALTITUDE FEET		TEMPERATURE °C		POWER	FUEL FLOW PER ENGINE LBS/HR	TOTAL FUEL FLOW LBS/HR	AIRSPEED					
		OAT	IOAT				6850 LBS		8350 LBS		9850 LBS	
							KIAS	KTAS	KIAS	KTAS	KIAS	KTAS
ISA +10°C	Sea Level	25	32	TORQUE LIMITED	399	798	V _{MO} LIMITED	247	V _{MO} LIMITED	247	V _{MO} LIMITED	247
	2000	21	28	↓	389	778	254	254	254	254	254	
	4000	17	24	EGT LIMITED	380	760	262	262	262	262	262	
	6000	13	21	↓	371	742	269	269	269	244	269	
	8000	9	17	↓	361	722	244	277	243	276	241	274
	10,000	5	13	↓	347	694	239	280	238	278	236	276
	12,000	1	9	↓	331	662	234	282	232	280	230	278
	14,000	-3	5	↓	316	632	228	284	226	282	224	279
	16,000	-7	1	↓	300	600	222	286	220	283	218	280
	18,000	-11	-2	↓	285	570	217	287	215	285	212	281
	20,000	-15	-6	↓	270	540	211	290	209	287	206	283
	22,000	-19	-10	↓	255	510	205	291	203	288	199	283
	24,000	-23	-14	↓	240	480	199	292	196	288	192	283
	26,000	-27	-18	↓	225	450	193	293	190	288	185	282
	28,000	-30	-22	↓	211	422	186	292	182	287	177	279
	29,000	-32	-24	↓	204	408	182	292	178	286	173	277
	31,000	-36	-28	↓	189	378	175	291	170	283	164	273
33,000	-40	-32	↓	176	352	168	289	162	280	154	267	
35,000	-44	-37	↓	163	326	160	286	153	275	142	256	
ISA +20°C	Sea Level	35	42	TORQUE LIMITED	399	798	V _{MO} LIMITED	251	V _{MO} LIMITED	251	V _{MO} LIMITED	251
	2000	31	38	EGT LIMITED	384	768	258	258	258	258	241	258
	4000	27	34	↓	368	736	244	265	242	264	235	262
	6000	23	30	↓	352	704	239	268	237	266	230	264
	8000	19	27	↓	336	672	233	270	232	268	224	266
	10,000	15	23	↓	321	642	228	272	227	270	219	268
	12,000	11	19	↓	306	612	223	274	221	272	213	269
	14,000	7	15	↓	292	584	218	276	216	274	207	271
	16,000	3	11	↓	278	556	212	278	210	275	201	272
	18,000	-1	7	↓	264	528	207	280	204	277	196	273
	20,000	-5	3	↓	251	502	202	282	199	279	190	274
	22,000	-9	-1	↓	238	476	196	284	193	280	183	275
	24,000	-13	-5	↓	224	448	191	286	187	281	176	275
	26,000	-17	-9	↓	211	422	185	287	181	281	168	274
	28,000	-20	-12	↓	198	396	178	287	174	280	164	271
	29,000	-22	-15	↓	192	384	175	287	170	279	155	269
	31,000	-26	-19	↓	179	358	168	286	163	277	145	264
33,000	-30	-23	↓	166	332	161	284	155	273	131	257	
35,000	-34	-27	↓	154	308	153	280	145	266	124	242	

Figure 5-22 (Sheet 3 of 4)

MAXIMUM RECOMMENDED CRUISE POWER

**OPERATION ABOVE 33,000 FEET RESTRICTED
TO AIRPLANES INCORPORATING SK441-36**

CONDITIONS:

1. Both engines operating in normal mode.
2. Condition Levers - 96% RPM.
3. Landing Gear - UP.
4. Wing Flaps - UP.
5. Fuel Used - JET A.
6. Windshield Anti-Ice - OFF.

NOTE:

1. Power is limited by airspeed, torque or EGT as indicated below.
 - a. EGT Limited (450°C).
 - b. Airspeed Limited (V_{MO} = 245 KIAS).
 - c. Torque Limited (1738 Foot-Pounds).

	PRESSURE ALTITUDE FEET	TEMPERATURE °C		POWER	FUEL FLOW PER ENGINE LBS/HR	TOTAL FUEL FLOW LBS/HR	AIRSPEED					
		OAT	IOAT				6850 LBS		8350 LBS		9850 LBS	
							KIAS	KTAS	KIAS	KTAS	KIAS	KTAS
ISA + 30°C	Sea Level	45	51	EGT LIMITED	374	748	242	252	240	251	239	249
	2000	41	48		357	714	237	255	235	253	234	251
	4000	37	44		342	684	232	257	231	255	229	253
	6000	33	40		327	654	227	259	226	258	224	255
	8000	29	36		312	624	222	262	221	260	218	257
	10,000	25	32		298	596	217	264	215	261	213	259
	12,000	21	28		284	568	212	266	210	263	207	260
	14,000	17	24		270	540	207	267	204	265	202	261
	16,000	13	21		257	514	201	269	199	266	196	262
	18,000	9	17		244	488	196	271	194	267	190	263
	20,000	5	13		232	464	192	274	189	269	185	264
	22,000	2	9		220	440	186	276	183	271	179	264
	24,000	-3	5		208	416	181	277	177	272	172	264
	26,000	-7	1		197	394	176	278	172	272	166	263
	28,000	-10	-3		185	370	170	279	165	271	158	260
	29,000	-12	-5		180	360	167	279	161	270	154	258
	31,000	-16	-9		168	336	160	278	154	268	144	251
	33,000	-20	-13		157	314	153	277	146	264	133	241
	35,000	-24	-18		145	290	145	273	136	255	--	--

Figure 5-22 (Sheet 4 of 4)

MAXIMUM RANGE CRUISE PERFORMANCE

CONDITIONS:

1. Both engines operating in normal mode.
2. Condition Levers - 96% RPM.
3. Power Levers - AS REQUIRED to obtain the airspeed shown.
4. Landing Gear - UP.
5. Wing Flaps - UP.
6. Windshield and Engine Inlet Anti-Ice - OFF.
7. Fuel Used - JET A.

NOTE:

1. Fuel flows shown are values obtained at 8350 pounds cruise weight.
2. Where values are not presented, use Maximum Recommended Cruise Power, see Figure 5-22.

EXAMPLE:

Altitude 18,000 Feet
 OAT -31°C (ISA -10°C)
 Weight 9700 Pounds
 Fuel Flow (Approximation Method) 216 Lbs/Hr Per Engine
 (432 Lbs/Hr Total)
 Airspeed (Approximation Method) 185 KIAS (237 KTAS)

PRESSURE ALTITUDE FEET		TEMPERATURE °C		FUEL FLOW PER ENGINE LBS/HR	TOTAL FUEL FLOW LBS/HR	AIRSPEED					
						6850 LBS		8350 LBS		9850 LBS	
						KIAS	KTAS	KIAS	KTAS	KIAS	KTAS
ISA -30°C	Sea Level	-15	-11	355	710	236	223	237	223	239	224
	2000	-19	-15	338	676	231	223	232	224	233	226
	4000	-23	-19	322	644	226	225	226	225	228	227
	6000	-27	-22	306	612	220	225	221	226	222	227
	8000	-31	-26	290	581	214	225	215	226	216	228
	10,000	-35	-30	275	551	208	226	209	227	211	229
	12,000	-39	-34	261	523	201	226	203	227	205	229
	14,000	-43	-38	249	497	196	226	198	228	200	230
	16,000	-47	-42	235	471	191	227	192	229	195	232
	18,000	-51	-46	224	448	185	228	188	231	191	234
ISA -20°C	Sea Level	-5	-1	343	687	231	222	232	223	234	224
	2000	-9	-5	327	653	226	223	227	224	228	225
	4000	-13	-8	310	621	220	224	221	224	222	226
	6000	-17	-12	296	592	214	224	216	226	217	227
	8000	-21	-16	281	562	209	225	210	226	212	228
	10,000	-25	-20	268	536	204	226	205	228	206	229
	12,000	-29	-24	255	511	199	227	200	229	201	230
	14,000	-33	-28	243	486	193	228	195	229	198	233
	16,000	-37	-32	231	463	188	229	190	231	192	234
	18,000	-41	-35	221	441	182	229	185	233	188	236
	20,000	-45	-39	210	419	179	231	180	234	185	239
	22,000	-49	-43	200	400	173	232	176	236	181	242
	24,000	-53	-47	191	383	168	234	173	239	177	245

Figure 5-23 (Sheet 1 of 4)

MAXIMUM RANGE CRUISE PERFORMANCE

OPERATION ABOVE 33,000 FEET RESTRICTED
TO AIRPLANES INCORPORATING SK441-36

CONDITIONS:

1. Both engines operating in normal mode.
2. Condition Levers - 96% RPM.
3. Power Levers - AS REQUIRED to obtain the airspeed shown.
4. Landing Gear - UP.
5. Wing Flaps - UP.
6. Windshield and Engine Inlet Anti-Ice - OFF.
7. Fuel Used - JET A.

NOTE:

1. Fuel flows shown are values obtained at 8350 pounds cruise weight.
2. Where values are not presented, use Maximum Recommended Cruise Power, see Figure 5-22.

PRESSURE ALTITUDE FEET		TEMPERATURE °C		FUEL FLOW PER ENGINE LBS/HR	TOTAL FUEL FLOW LBS/HR	AIRSPEED					
						6850 LBS		8350 LBS		9850 LBS	
		OAT	IOAT			KIAS	KTAS	KIAS	KTAS	KIAS	KTAS
ISA-10°C	Sea Level	5	10	334	668	227	222	228	223	229	224
	2000	1	6	317	634	221	223	222	224	224	225
	4000	-3	2	302	604	216	223	217	225	218	226
	6000	-7	-2	285	571	210	224	211	225	212	226
	8000	-11	-6	272	545	204	224	206	226	207	227
	10,000	-15	-10	260	520	200	226	201	227	203	229
	12,000	-19	-14	248	496	194	227	196	229	198	231
	14,000	-23	-18	236	473	190	228	191	230	193	232
	16,000	-27	-21	226	453	184	229	187	232	189	235
	18,000	-31	-25	216	432	180	231	182	234	185	237
	20,000	-35	-29	206	413	175	232	178	236	182	241
	22,000	-39	-33	198	395	171	234	174	238	178	244
	24,000	-43	-37	189	378	166	236	170	241	175	248
	26,000	-47	-40	181	363	163	239	167	244	172	252
	28,000	-51	-44	175	350	159	242	164	249	167	253
	29,000	-53	-46	171	342	157	243	161	250	164	254
	31,000	-56	-50	163	326	153	245	156	250	160	256
33,000	-60	-54	157	313	148	246	152	252	157	260	
35,000	-64	-58	154	308	144	249	150	257	154	265	
ISA	Sea Level	15	20	325	651	223	222	224	223	225	224
	2000	11	16	308	617	217	222	218	223	219	224
	4000	7	12	293	586	211	223	212	224	214	225
	6000	3	8	279	558	206	223	207	225	208	226
	8000	-1	4	264	528	200	225	201	225	203	227
	10,000	-5	0	253	505	195	225	197	227	199	229
	12,000	-9	-4	241	481	190	227	192	228	194	231
	14,000	-13	-8	230	461	185	228	187	230	190	233
	16,000	-17	-11	221	441	180	229	183	232	187	236
	18,000	-21	-15	211	422	176	231	179	234	182	239
	20,000	-25	-19	202	405	172	233	175	237	179	242
	22,000	-29	-23	195	389	168	235	172	240	177	247
	24,000	-33	-26	187	375	164	238	169	244	173	251
	26,000	-37	-30	180	360	161	241	165	247	170	254
	28,000	-41	-34	174	348	157	243	162	251	166	257
	29,000	-43	-36	171	342	155	245	160	253	164	258
	31,000	-46	-40	164	328	151	248	156	255	158	259
33,000	-50	-44	156	312	148	252	150	255	154	262	
35,000	-54	-48	152	304	143	253	147	259	152	268	

Figure 5-23 (Sheet 2 of 4)

MAXIMUM RANGE CRUISE PERFORMANCE

OPERATION ABOVE 33,000 FEET RESTRICTED
TO AIRPLANES INCORPORATING SK441-36

CONDITIONS:

- Both engines operating in normal mode.
- Condition Levers - 96% RPM.
- Power Levers - AS REQUIRED to obtain the airspeed shown.
- Landing Gear - UP.
- Wing Flaps - UP.
- Windshield and Engine Inlet Anti-Ice - OFF.
- Fuel Used - JET A.

NOTE:

- Fuel flows shown are values obtained at 8350 pounds cruise weight.
- Where values are not presented, use Maximum Recommended Cruise Power, see Figure 5-22.

PRESSURE ALTITUDE FEET		TEMPERATURE °C		FUEL FLOW PER ENGINE LBS/HR	TOTAL FUEL FLOW LBS/HR	AIRSPEED					
						6850 LBS		8350 LBS		9850 LBS	
		OAT	IOAT			KIAS	KTAS	KIAS	KTAS	KIAS	KTAS
ISA +10°C	Sea Level	25	30	318	636	219	222	220	223	221	224
	2000	21	26	302	603	213	222	214	223	215	224
	4000	17	22	286	573	208	223	209	224	209	224
	6000	13	18	271	543	202	223	203	224	204	226
	8000	9	14	259	517	197	224	198	226	199	227
	10,000	5	10	246	492	191	225	193	227	195	229
	12,000	1	7	235	471	187	226	189	229	191	232
	14,000	-3	3	224	447	182	227	183	229	186	233
	16,000	-7	-1	215	429	177	229	179	232	183	236
	18,000	-11	-5	206	412	172	231	175	234	179	239
	20,000	-15	-9	199	397	168	233	172	238	176	244
	22,000	-19	-13	191	381	165	235	169	241	174	248
	24,000	-23	-16	184	367	161	239	165	245	171	252
	26,000	-27	-20	178	356	158	242	163	249	167	255
	28,000	-31	-24	172	344	155	246	160	253	164	260
	29,000	-33	-26	169	338	153	248	158	255	161	260
31,000	-36	-30	164	328	150	251	155	259	157	263	
33,000	-40	-34	157	315	147	256	150	260	153	265	
35,000	-44	-37	152	304	143	258	145	261	---	---	
ISA +20°C	Sea Level	35	40	313	626	215	222	216	223	217	224
	2000	31	36	297	593	210	222	211	223	212	224
	4000	27	32	281	562	204	223	205	224	206	225
	6000	23	29	266	533	199	223	200	225	201	226
	8000	19	25	254	507	193	224	195	226	196	227
	10,000	15	21	241	481	188	225	189	226	191	229
	12,000	11	17	230	460	183	226	185	228	187	231
	14,000	7	13	220	440	179	228	180	230	183	233
	16,000	3	9	210	420	173	229	175	232	179	236
	18,000	-1	5	202	403	170	232	172	234	175	239
	20,000	-5	1	194	387	165	233	168	238	173	244
	22,000	-9	-3	187	373	161	235	165	241	171	249
	24,000	-13	-7	181	362	158	239	163	246	168	253
	26,000	-17	-10	175	351	155	243	160	251	164	256
	28,000	-21	-14	170	340	152	247	157	255	161	260
	29,000	-23	-16	167	334	151	249	155	256	159	262
31,000	-26	-20	162	323	148	253	152	260	156	266	
33,000	-30	-23	156	313	145	257	148	263	---	---	

Figure 5-23 (Sheet 3 of 4)

MAXIMUM RANGE CRUISE PERFORMANCE

CONDITIONS:

1. Both engines operating in normal mode.
2. Condition Levers - 96% RPM.
3. Power Levers - AS REQUIRED to obtain the airspeed shown.
4. Landing Gear - UP.
5. Wing Flaps - UP.
6. Windshield and Engine Inlet Anti-Ice - OFF.
7. Fuel Used - JET A.

NOTE:

1. Fuel flows shown are values obtained at 8350 pounds cruise weight.
2. Where values are not presented, use Maximum Recommended Cruise Power, see Figure 5-22.

PRESSURE ALTITUDE FEET		TEMPERATURE °C		FUEL FLOW PER ENGINE LBS/HR	TOTAL FUEL FLOW LBS/HR	AIRSPEED					
						6850 LBS		8350 LBS		9850 LBS	
						KIAS	KTAS	KIAS	KTAS	KIAS	KTAS
ISA +30°C	Sea Level	45	50	308	616	212	222	213	223	214	224
	2000	41	46	292	585	207	223	208	224	208	225
	4000	37	42	277	555	201	223	203	225	203	226
	6000	33	38	263	525	196	224	197	225	199	227
	8000	29	34	249	498	190	225	191	226	193	227
	10,000	25	31	237	474	185	226	186	227	188	229
	12,000	21	27	226	452	180	226	182	228	184	231
	14,000	17	23	214	429	174	227	176	229	180	233
	16,000	13	19	206	411	171	229	172	231	176	236
	18,000	9	15	198	395	166	230	169	234	172	239
	20,000	5	11	190	380	162	232	165	237	171	245
	22,000	1	7	183	367	158	236	162	241	168	250
	24,000	-3	3	178	356	155	239	160	247	165	254
	26,000	-7	-1	173	346	152	243	158	252	162	257
	28,000	-11	-4	167	335	150	248	155	255	158	261
	29,000	-13	-6	165	330	148	250	153	258	157	265
	31,000	-16	-10	159	319	145	254	149	260	---	---
	33,000	-20	-14	156	311	143	259	146	265	---	---

Figure 5-23 (Sheet 4 of 4)

RANGE PROFILE

**OPERATION ABOVE 33,000 FEET RESTRICTED
TO AIRPLANES INCORPORATING SK441-36**

CONDITIONS:

1. Takeoff Weight - 9850 Pounds.
2. Maximum Climb Performance to Cruise Altitude.
3. 96% RPM During Cruise (Normal Mode).
4. Zero Wind.
5. Standard Day.
6. Windshield and Engine Inlet Anti-Ice - OFF.

NOTE:

1. Fuel Density - 6.7 pounds per gallon.
2. Range computations include fuel required for start, taxi, takeoff, climb to altitude, cruise, descent and 45 minutes reserve at the cruise power and altitude.
3. The distances shown are the sum of the distances to climb, cruise and descend.

EXAMPLE:

Altitude	18,000 Feet
Power	Maximum Cruise Power
Fuel	3183 Pounds
Range	1240 Nautical Miles

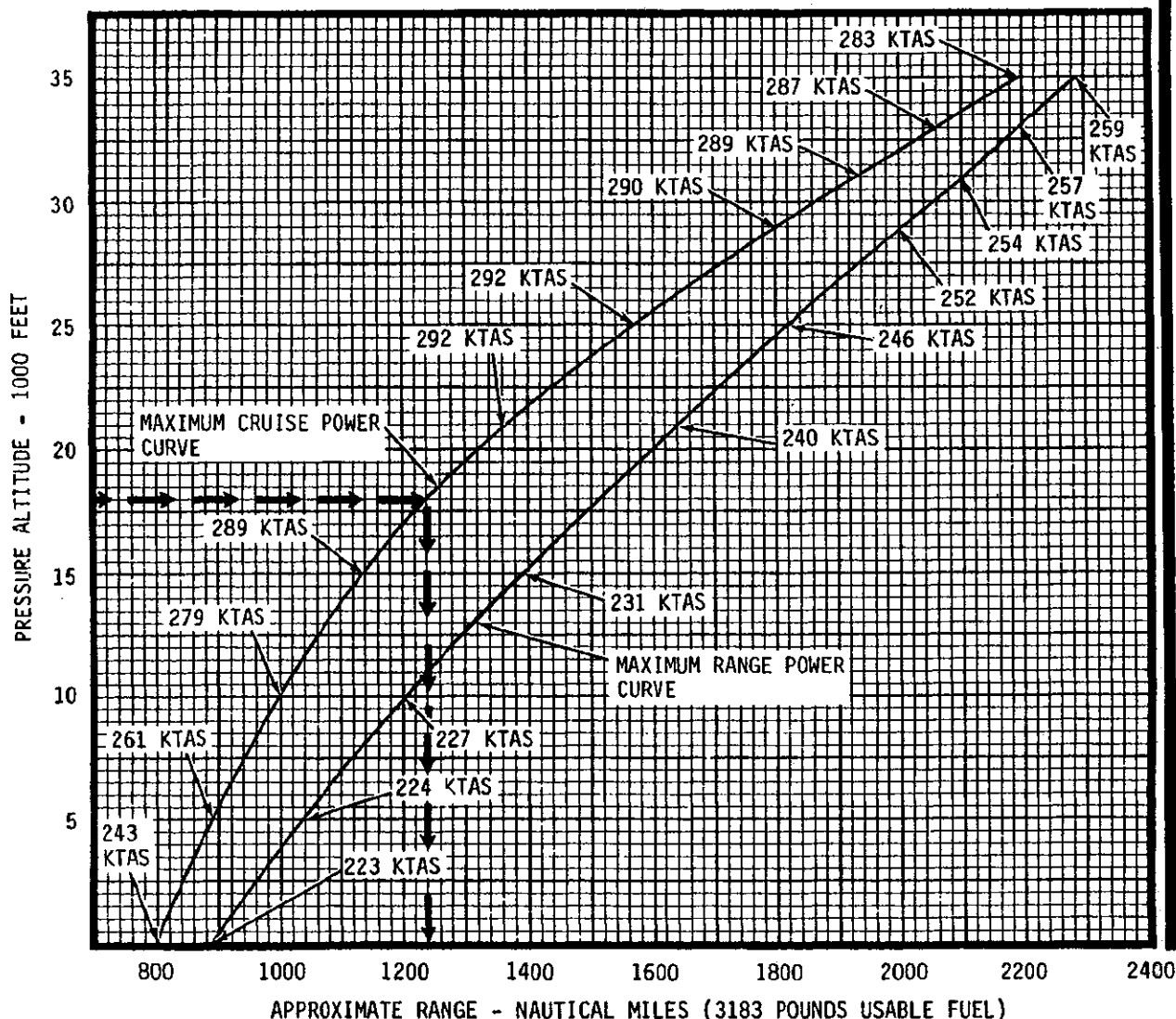


Figure 5-24

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ENDURANCE PROFILE

OPERATION ABOVE 33,000 FEET RESTRICTED
TO AIRPLANES INCORPORATING SK441-36'

NOTE:

1. Fuel Density - 6.7 pounds per gallon.
2. Endurance computations include fuel required for start, taxi, takeoff, climb to altitude, cruise, descent and 45 minutes reserve at the cruise power and altitude.
3. The endurance shown is the sum of the times to climb, cruise and descend.

CONDITIONS:

1. Takeoff Weight - 9850 Pounds.
2. Maximum Climb Performance to Cruise Altitude.
3. 96% RPM During Cruise (Normal Mode).
4. Standard Day.
5. Windshield and Engine Inlet Anti-Ice - OFF.

EXAMPLE:

Altitude	18,000 Feet
Power	Maximum Cruise Power
Fuel	3183 Pounds
Endurance	4.3 Hours

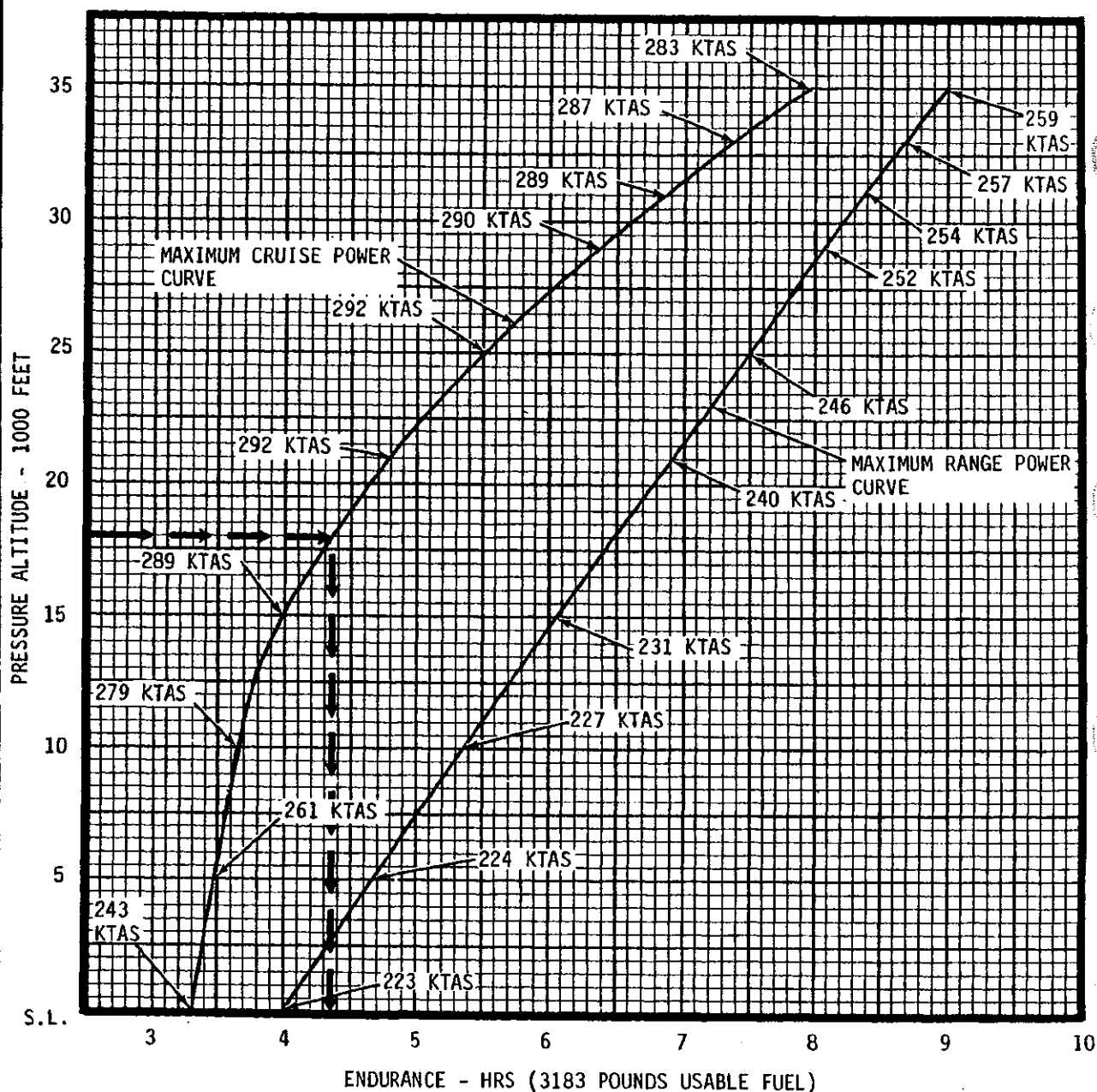


Figure 5-25

HOLDING TIME

EXAMPLE:

1. Required Holding Time	45 Minutes (0.75 Hours)
Holding Pressure Altitude	18,000 Feet
Fuel Required	310 Pounds
2. Fuel Available for Holding	924 Pounds
Holding Pressure Altitude	18,000 Feet
Holding Time	2.27 Hours

CONDITIONS:

- Both Engines Operating in Normal Mode.
- Condition Levers - 96% RPM.
- Landing Gear - UP.
- Wing Flaps - UP.
- Power Levers - Set to 750 Foot-Pounds.
- Windshield and Engine Inlet Anti-Ice - OFF.

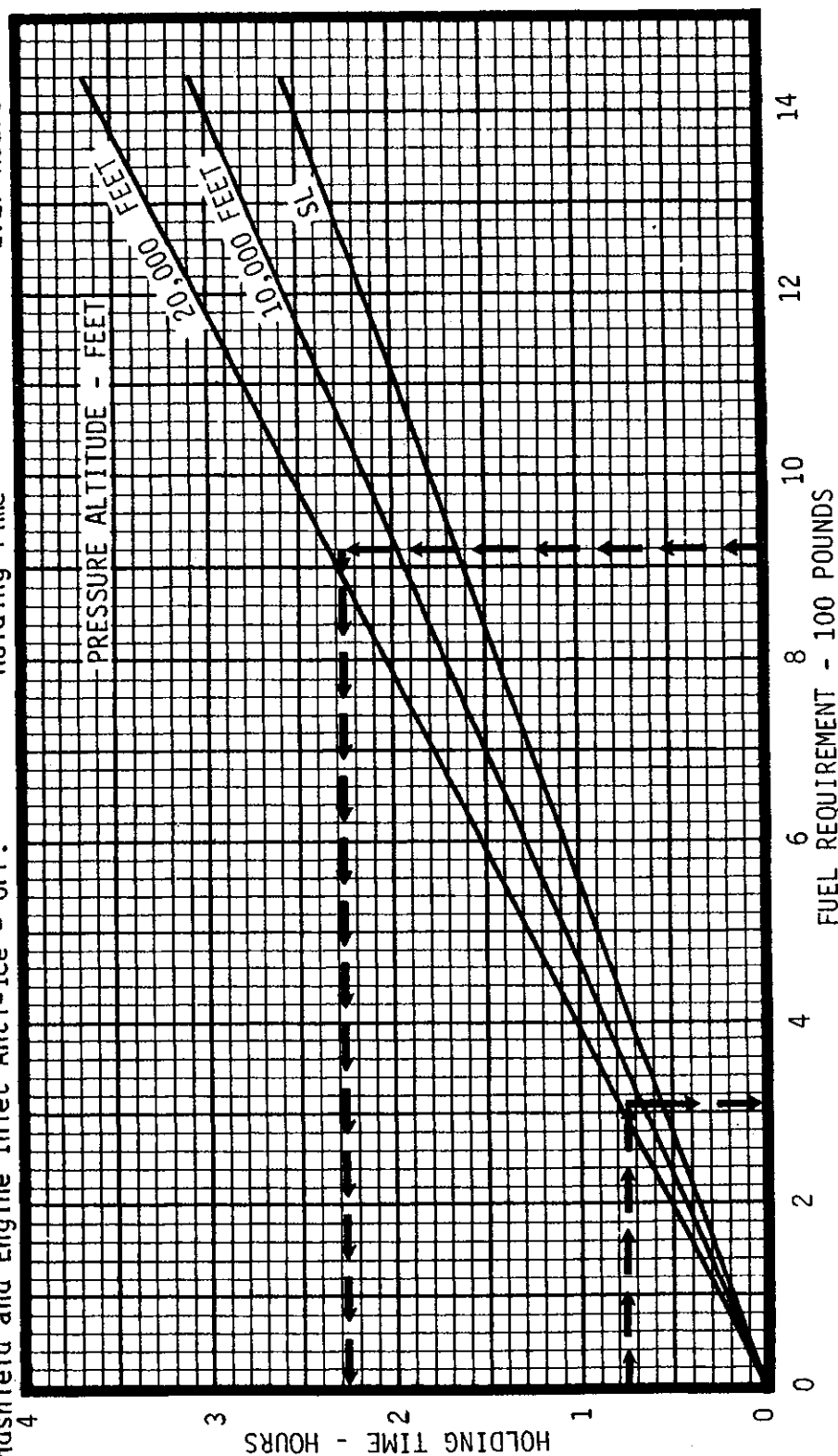


Figure 5-26

TIME, FUEL AND DISTANCE TO DESCEND NORMAL DESCENT

OPERATION ABOVE 33,000 FEET RESTRICTED
TO AIRPLANES INCORPORATING SK441-36

CONDITIONS:

1. Power Levers - Adjust to Maintain 1500 FPM Rate of Descent.
2. Condition Levers - 96% RPM.
3. Landing Gear - UP.
4. Wing Flaps - UP.
5. Airspeed = 200 KIAS.
(Do Not Exceed .55 Mach.)

EXAMPLE (CRUISE CONDITION):

Initial Altitude	18,000 Feet
Final Altitude	1700 Feet
Time to Descend (12 -1.1)	10.9 Minutes
Fuel to Descend (84 -9)	75 Pounds
Distance to Descend (45 -4)	41 N. Miles

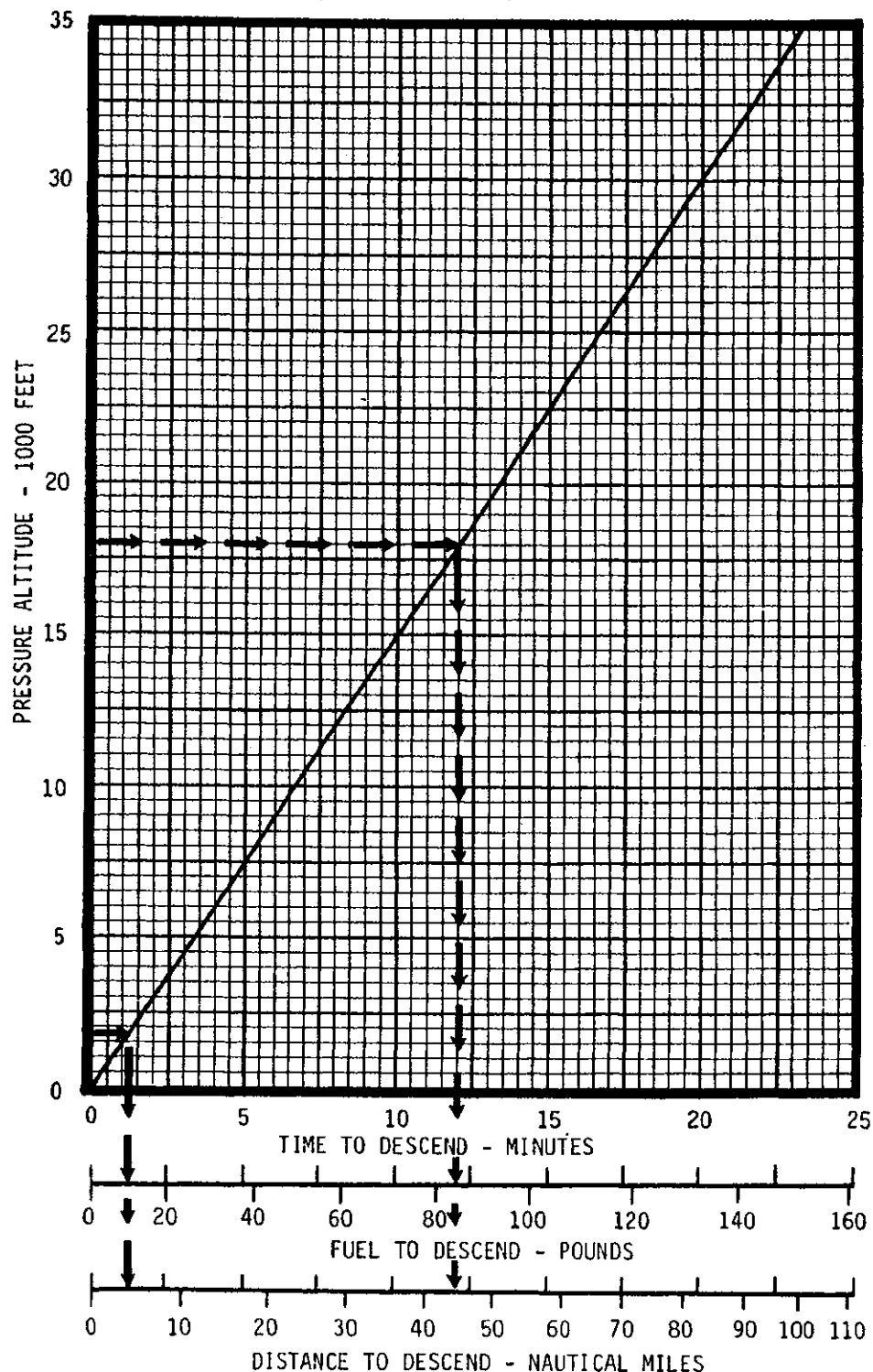


Figure 5-27

TIME, FUEL AND DISTANCE TO DESCEND MAXIMUM DESCENT

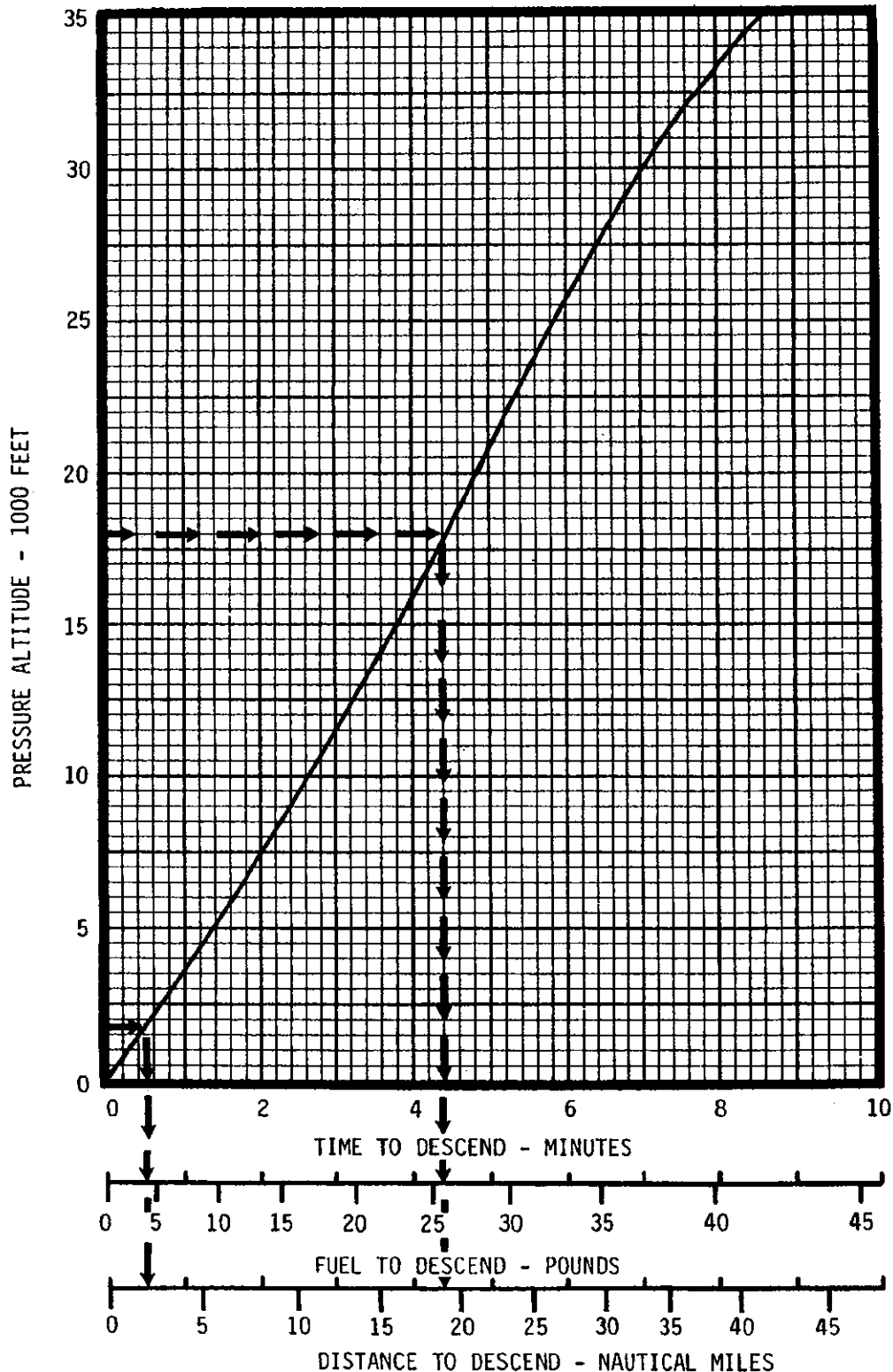
OPERATION ABOVE 33,000 FEET RESTRICTED
TO AIRPLANES INCORPORATING SK441-36

CONDITIONS:

1. Power Levers - FLIGHT IDLE.
2. Condition Levers - 96% RPM
3. Landing Gear - UP.
4. Wing Flaps - UP.
5. Airspeed - 230 KIAS
(Do Not Exceed .55 Mach.)

EXAMPLE:

Initial Altitude	18,000 Feet
Final Altitude	1700 Feet
Time to Descend (4.4 - 0.5)	3.9 Min.
Fuel to Descend (26 - 4)	22 Pounds
Distance to Descend (19 - 2)	17 N. Miles



NORMAL LANDING DISTANCE WITHOUT PROPELLER REVERSING

CONDITIONS:

1. Power Levers - Flight Idle before touchdown.
- Grnd Idle after touchdown.
2. Condition Levers - Takeoff, Climb and Landing.
3. Landing Gear - Down.
4. Wing Flaps - Land.
5. Level, Hard Surface Runway.
6. Maximum Effective Braking.

NOTE:

1. If necessary to land with wing flaps up, the approach speed should be increased above the normal approach speed by 15 knots. Total landing distances can increase as much as 75%.
2. Decrease total distances by 2% for each 5 knots headwind. For operations with tailwinds up to 10 knots, increase total distances by 5% for each 2 knots wind.

EXAMPLE:

QAT 7°C
Pressure Altitude 1700 Feet
Landing Weight 8322 Pounds
Headwind Component 16 Knots
Ground Roll (Approximation Method) 1100 Feet
(1030 Feet With Wind Correction)
Total Distance Over 50 Foot Obstacle (Approximation Method) 1880 Feet
(1760 Feet With Wind Correction)
Approach Speed 96 Knots

WEIGHT - POUNDS	SPEED AT 50-FOOT OBSTACLE KIAS	PRESSURE ALTITUDE - FEET	-20°C		-10°C		0°C		10°C		20°C		30°C		40°C		50°C	
			GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE FEET	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE FEET	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE FEET	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE FEET	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE FEET	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE FEET	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE FEET	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE FEET
9360	99	Sea Level	950	1700	990	1750	1030	1800	1070	1850	1120	1900	1160	1950	1200	2000	1250	2050
		1000	990	1760	1040	1810	1080	1860	1130	1910	1170	1960	1220	2020	1270	2070	1310	2120
		2000	1050	1810	1090	1870	1140	1920	1190	1980	1230	2030	1280	2090	1330	2140	---	---
		3000	1100	1870	1150	1930	1200	1990	1240	2040	1290	2100	1340	2160	1390	2220	---	---
		4000	1150	1940	1200	2000	1250	2050	1310	2110	1360	2170	1410	2240	1460	2300	---	---
		5000	1210	2000	1260	2060	1320	2130	1370	2190	1420	2250	1480	2310	1530	2380	---	---
		6000	1270	2070	1330	2130	1380	2200	1440	2270	1490	2330	1550	2400	1600	2460	---	---
		7000	1330	2140	1390	2210	1450	2280	1510	2340	1560	2410	1620	2480	---	---	---	---
		8000	1400	2220	1460	2290	1520	2360	1580	2430	1630	2500	1690	2570	---	---	---	---
		9000	1460	2290	1530	2370	1590	2440	1650	2510	1710	2580	1770	2650	---	---	---	---
		10,000	1530	2370	1600	2450	1660	2520	1720	2600	1780	2670	1840	2750	---	---	---	---
		11,000	1600	2450	1670	2530	1730	2610	1800	2690	1860	2760	1920	2840	---	---	---	---
		12,000	1680	2540	1740	2620	1810	2700	1870	2780	1940	2860	---	---	---	---	---	---
		13,000	1750	2630	1820	2710	1890	2790	1950	2880	2020	2960	---	---	---	---	---	---
		14,000	1820	2720	1900	2800	1970	2890	2030	2970	2100	3060	---	---	---	---	---	---
8800	96	Sea Level	870	1620	910	1670	950	1710	990	1760	1030	1810	1080	1850	1120	1900	1160	1950
		1000	920	1670	960	1720	1000	1770	1050	1820	1090	1870	1130	1920	1180	1970	1220	2020
		2000	970	1730	1010	1780	1060	1830	1100	1880	1150	1930	1190	1980	1240	2040	---	---
		3000	1020	1780	1070	1840	1110	1890	1160	1940	1210	2000	1250	2050	1300	2110	---	---
		4000	1070	1840	1120	1900	1170	1960	1220	2010	1270	2070	1320	2130	1370	2180	---	---
		5000	1130	1910	1180	1960	1230	2020	1280	2080	1330	2140	1380	2200	1440	2260	---	---
		6000	1190	1970	1240	2030	1290	2100	1350	2160	1400	2220	1450	2280	1500	2340	---	---
		7000	1250	2040	1300	2110	1360	2170	1410	2230	1470	2300	1520	2360	---	---	---	---
		8000	1310	2110	1370	2180	1420	2250	1480	2310	1540	2380	1590	2450	---	---	---	---
		9000	1370	2190	1430	2260	1490	2330	1550	2390	1610	2460	1670	2530	---	---	---	---
		10,000	1440	2260	1500	2340	1560	2410	1620	2480	1680	2550	1740	2620	---	---	---	---
		11,000	1510	2340	1570	2420	1630	2490	1700	2560	1760	2640	1820	2710	---	---	---	---
		12,000	1580	2430	1640	2500	1710	2580	1770	2650	1830	2730	---	---	---	---	---	---
		13,000	1650	2510	1720	2590	1780	2670	1850	2750	1910	2830	---	---	---	---	---	---
		14,000	1730	2600	1790	2680	1860	2760	1930	2840	1990	2920	---	---	---	---	---	---

Figure 5-29 (Sheet 1 of 2)

Publication Affected: Model 441 (1 thru 172) Pilot's Operating Handbook (thru Revision 15, dated 17 December 2001).

Airplane Serial Numbers: Airplanes 441-0001 thru 441-0172.

Description of Change: Section 5 Performance.

Filing Instructions: Insert this temporary revision into the Model 441 (1 thru 172) POH adjacent to page 5-51.

Removal Instructions: This temporary revision must be removed and discarded when revision 16 has been collated into the FAA Approved Airplane Flight Manual.

In Section 5, Performance, insert the temporary revision pages adjacent to page 5-51. Replace the information on the existing "NORMAL LANDING DISTANCE (WITHOUT PROPELLER REVERSING)" chart (Figure 5-29 Sheet 2 of 2) with that shown on the opposite page.

APPROVED BY

FAA APPROVED UNDER FAR 21 SUBPART J
The Cessna Aircraft Co
Delegation Option Authorization DOA-230428-CE

Stanley H. Carroll Executive Engineer

ME

DATE OF APPROVAL 30 JULY 2003

NORMAL LANDING DISTANCE WITHOUT PROPELLER REVERSING

CONDITIONS:

1. Power Levers - Flight Idle before touchdown
- Grind Idle after touchdown
2. Condition Lever - Takeoff, Climb and Landing
3. Landing Gear - Down
4. Wing Flaps - Land
5. Level, Hard Surface Runway
6. Maximum Effective Braking

NOTE:

1. If necessary to land with wing flaps Up, the approach speed should be increased above normal approach speed by 15 knots. Total landing distance can increase as much as 75%.
2. Decrease total distances by 2% for each 5 knots headwind. For operations with tailwinds up to 10 knots, increase total distances by 5% for each 2 knots of wind.

WEIGHT - POUNDS	SPEED AT 50-FOOT OBSTACLE KIAS	PRESSURE ALTITUDE - FEET	-20°C		-10°C		0°C		10°C		20°C		30°C		40°C		50°C	
			GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE
7800	93	Sea Level	740	1520	780	1570	810	1610	850	1650	880	1700	920	1750	960	1810	990	1840
		1000	790	1570	820	1620	860	1670	900	1710	930	1760	970	1810	1010	1860	1050	1910
		2000	830	1630	870	1680	910	1730	950	1780	990	1830	1030	1880	1070	1930	1110	1980
		3000	880	1690	920	1740	960	1790	1000	1840	1040	1890	1080	1950	1130	2000	1170	2050
		4000	930	1740	970	1800	1010	1850	1050	1910	1090	1970	1140	2020	1190	2080	1230	2140
		5000	980	1810	1020	1860	1070	1920	1110	1980	1160	2040	1210	2100	1260	2160	1310	2220
		6000	1030	1870	1080	1930	1130	1990	1180	2060	1220	2120	1270	2180	1320	2250	1370	2320
		7000	1090	1940	1140	2010	1190	2070	1240	2140	1290	2200	1340	2270	1390	2360	1440	2430
		8000	1150	2020	1200	2080	1250	2150	1300	2220	1360	2290	1410	2360	1460	2440	1510	2510
		9000	1210	2090	1260	2160	1320	2230	1370	2300	1430	2370	1480	2440	1530	2540	1580	2630
		10,000	1270	2170	1330	2240	1390	2320	1440	2390	1500	2460	1550	2540	1600	2630	1650	2720
		11,000	1340	2250	1400	2330	1450	2400	1510	2480	1570	2560	1620	2630	1670	2760	1720	2860
		12,000	1410	2340	1470	2420	1520	2500	1580	2580	1640	2660	1700	2760	1760	2860	1820	2960
		13,000	1480	2430	1540	2510	1600	2590	1660	2670	1720	2760	1780	2860	1840	2960	1900	3060
		14,000	1550	2520	1610	2600	1670	2690	1730	2780	1790	2880	1860	2960	1920	3060	1980	3160
6800	93	Sea Level	610	1520	640	1560	680	1610	690	1660	720	1710	750	1770	780	1820	810	1860
		1000	650	1570	680	1620	710	1680	740	1730	770	1780	800	1840	830	1890	860	1930
		2000	690	1630	720	1680	750	1740	780	1800	820	1860	850	1920	880	1980	910	2000
		3000	730	1700	760	1750	800	1810	830	1870	870	1930	900	1990	940	2060	970	2100
		4000	770	1760	810	1820	850	1890	880	1950	920	2020	960	2090	1000	2160	1040	2220
		5000	820	1830	860	1900	900	1970	940	2040	980	2110	1020	2180	1060	2250	1100	2300
		6000	870	1910	910	1980	950	2050	1000	2130	1040	2200	1080	2280	1130	2350	1170	2430
		7000	920	1990	970	2070	1010	2140	1060	2220	1100	2300	1150	2380	1200	2460	1240	2540
		8000	980	2080	1020	2160	1070	2240	1120	2320	1160	2400	1210	2490	1260	2580	1310	2670
		9000	1040	2170	1080	2250	1130	2340	1180	2420	1230	2510	1280	2600	1330	2690	1380	2780
		10,000	1100	2260	1150	2360	1200	2440	1250	2530	1300	2630	1350	2720	1400	2810	1450	2900
		11,000	1160	2360	1210	2460	1260	2550	1310	2650	1370	2750	1420	2840	1470	2940	1520	3030
		12,000	1220	2470	1270	2570	1330	2670	1380	2770	1440	2870	1490	2970	1540	3070	1590	3160
		13,000	1280	2580	1340	2680	1400	2790	1460	2900	1510	3000	1560	3100	1610	3200	1660	3300
		14,000	1350	2700	1410	2810	1470	2920	1530	3030	1580	3140	1640	3240	1690	3340	1740	3440

Figure 5-29 (Sheet 2 of 2)

NORMAL LANDING DISTANCE WITHOUT PROPELLER REVERSING

CONDITIONS:

1. Power Levers - Flight Idle before touchdown.
- Grnd Idle after touchdown.
2. Condition Levers - Takeoff, Climb and Landing.
3. Landing Gear - Down.
4. Wing Flaps - Land.
5. Level, Hard Surface Runway.
6. Maximum Effective Braking.

NOTE:

1. If necessary to land with wing flaps Up, the approach speed should be increased above the normal approach speed by 15 knots. Total landing distances can increase as much as 75%.
2. Decrease total distances by 2% for each 5 knots headwind. For operations with tailwinds up to 10 knots, increase total distances by 5% for each 2 knots wind.

WEIGHT - POUNDS	SPEED AT 50-FOOT OBSTACLE KIAS	PRESSURE ALTITUDE - FEET	-20°C		-10°C		0°C		10°C		20°C		30°C		40°C		50°C	
			GROUND ROLL - 50-FOOT OBSTACLE FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE FEET	GROUND TO CLEAR 50-FOOT ROLL - OBSTACLE FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE FEET	GROUND TO CLEAR 50-FOOT ROLL - OBSTACLE FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE FEET	GROUND TO CLEAR 50-FOOT ROLL - OBSTACLE FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE FEET	GROUND TO CLEAR 50-FOOT ROLL - OBSTACLE FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE FEET	GROUND TO CLEAR 50-FOOT ROLL - OBSTACLE FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE FEET	GROUND TO CLEAR 50-FOOT ROLL - OBSTACLE FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE FEET		
7800	93	Sea Level	740	1520	780	1570	810	1610	850	1650	880	1700	920	1750	960	1790	990	1840
		1000	790	1570	1620	860	1670	900	1710	930	1760	970	1810	1010	1860	1050	1910	
		2000	830	1630	1680	910	1730	950	1780	990	1830	1030	1880	1070	1930	1110	1990	
		3000	880	1680	1740	960	1790	1000	1840	1040	1890	1080	1950	1130	2000	1170	2060	
		4000	930	1740	1800	1010	1850	1060	1910	1100	1970	1140	2020	1190	2080	1230	2140	
		5000	980	1810	1860	1020	1860	1070	1920	1110	1980	1160	2040	1210	2100	1260	2160	
		6000	1030	1870	1930	1080	1930	1130	1990	1180	2060	1220	2120	1270	2200	1320	2250	
		7000	1090	1940	2010	1140	2010	1190	2070	1240	2140	1290	2200	1340	2270	1390	2350	
		8000	1150	2020	2080	1200	2080	1250	2150	1300	2220	1360	2290	1410	2350	1460	2440	
		9000	1210	2090	2160	1260	2160	1320	2230	1370	2300	1430	2370	1480	2440	1530	2500	
		10,000	1270	2170	2240	1330	2240	1390	2320	1440	2390	1500	2460	1550	2540	1600	2630	
		11,000	1340	2250	2330	1400	2330	1450	2400	1510	2500	1570	2560	1620	2630	1670	2720	
		12,000	1410	2340	2420	1470	2420	1520	2500	1580	2580	1640	2660	1700	2760	1760	2860	
		13,000	1480	2430	2510	1540	2510	1600	2590	1660	2670	1720	2760	1780	2860	1840	2960	
		14,000	1550	2520	2600	1610	2600	1670	2690	1730	2780	1790	2880	1850	2960	1910	3060	
6800	93	Sea Level	610	1520	640	1560	660	1610	690	1660	720	1710	750	1770	790	1820	820	1870
		1000	650	1570	1620	680	1670	710	1680	740	1730	770	1780	800	1840	830	1900	
		2000	690	1630	1690	720	1690	750	1740	780	1800	820	1860	850	1920	890	1980	
		3000	730	1700	1760	760	1750	800	1810	830	1870	870	1930	910	2000	940	2060	
		4000	770	1760	1820	810	1820	850	1890	880	1950	920	2020	960	2090	1000	2160	
		5000	820	1830	860	1900	900	2000	940	2040	980	2110	1020	2180	1060	2250		
		6000	870	1910	910	1980	950	2050	1000	2130	1040	2200	1080	2280	1130	2350		
		7000	920	1990	970	2070	1010	2140	1060	2220	1100	2300	1150	2380	1190	2460		
		8000	980	2080	1020	2160	1070	2240	1120	2320	1160	2400	1210	2490	1250	2580		
		9000	1040	2170	1080	2250	1130	2340	1180	2420	1230	2510	1280	2600	1330	2690		
		10,000	1100	2260	1150	2350	1200	2440	1250	2530	1300	2630	1350	2720	1400	2810		
		11,000	1160	2360	1210	2460	1260	2550	1310	2650	1360	2750	1410	2840	1460	2930		
		12,000	1220	2470	1270	2570	1330	2670	1380	2770	1440	2870	1490	2960	1540	3050		
		13,000	1290	2580	1340	2680	1400	2790	1450	2900	1510	3000	1560	3100	1610	3200		
		14,000	1350	2700	1410	2810	1470	2920	1530	3030	1580	3140	1630	3250	1680	3350		

Figure 5-29 (Sheet 2 of 2)

NORMAL LANDING DISTANCE WITH PROPELLER REVERSING

CONDITIONS:

1. Power Levers - Flight Idle before touchdown.
- Grnd Idle After Touchdown, then maximum allowable reverse.
2. Condition Levers - Takeoff, Climb and Landing.
3. Landing Gear - Down.
4. Wing Flaps - Land.
5. Level, Hard Surface Runway.
6. Maximum Effective Braking.

NOTE:

1. If necessary to land with wing flaps up, the approach speed should be increased above the normal approach speed by 15 knots. Total landing distances will increase appreciably.
2. Decrease total distances by 2% for each 5 knots headwind. For operations with tailwinds up to 10 knots, increase total distances by 5% for each 2 knots wind.

EXAMPLE:
DAT
Pressure Altitude 7°C
Landing Weight 1700 Feet
Headwind Component 8322 Pounds
Ground Roll (Approximation Method) 16 Knots
(964 Feet With Wind Correction)
Total Distance Over 50 Foot Obstacle 1810 Feet
(Approximation Method)
(1694 Feet With Wind Correction)
Approach Speed 96 Knots

WEIGHT - POUNDS	SPEED AT 50-FOOT OBSTACLE - KIAS	PRESSURE ALTITUDE - FEET	-20°C			-10°C			0°C			10°C			20°C			30°C			40°C			50°C		
			GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE - FEET	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE - FEET	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE - FEET	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE - FEET	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE - FEET	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE - FEET	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE - FEET	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE - FEET	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE - FEET	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE - FEET	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE - FEET	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE - FEET
9360	99	Sea Level	890	1640	930	1690	970	1740	1010	1780	1050	1830	1090	1880	1130	1930	1170	1980	1210	2010	1250	2060	1290	2070	1330	2090
		1000	930	1690	970	1740	1020	1790	1060	1840	1100	1890	1150	1940	1190	1990	1230	2050	1270	2060	1310	2080	1350	2100	1390	2120
		2000	980	1750	1020	1800	1070	1850	1110	1900	1160	1960	1200	2010	1240	2060	1280	2100	1320	2080	1360	2110	1400	2130	1440	2160
		3000	1030	1810	1080	1860	1120	1910	1170	1970	1220	2020	1260	2080	1300	2100	1340	2120	1380	2150	1420	2170	1460	2190	1500	2210
		4000	1080	1860	1130	1920	1180	1980	1230	2040	1280	2090	1330	2110	1370	2130	1410	2150	1450	2180	1490	2200	1530	2220	1570	2240
		5000	1140	1930	1190	1990	1240	2050	1290	2110	1340	2170	1390	2230	1430	2230	1470	2250	1510	2280	1550	2300	1590	2320	1630	2340
		6000	1190	1990	1250	2050	1300	2120	1350	2180	1400	2240	1450	2280	1490	2280	1530	2300	1570	2330	1610	2350	1650	2370	1690	2390
		7000	1250	2060	1310	2130	1360	2190	1420	2260	1470	2320	1520	2360	1560	2360	1600	2380	1640	2400	1680	2420	1720	2440	1760	2460
		8000	1310	2130	1370	2200	1430	2270	1480	2330	1540	2400	1600	2470	1640	2470	1680	2490	1720	2510	1760	2530	1800	2550	1840	2570
		9000	1380	2210	1440	2280	1500	2350	1560	2420	1620	2490	1680	2560	1720	2560	1760	2580	1800	2600	1840	2620	1880	2640	1920	2660
		10,000	1440	2280	1500	2350	1560	2430	1620	2500	1680	2570	1740	2640	1780	2640	1820	2660	1860	2680	1900	2700	1940	2720	1980	2740
		11,000	1510	2360	1570	2440	1630	2510	1700	2600	1760	2680	1830	2750	1870	2750	1910	2770	1950	2790	1990	2810	2030	2830	2070	2850
		12,000	1580	2440	1640	2520	1700	2600	1770	2680	1840	2750	1910	2850	1950	2850	1990	2870	2030	2890	2070	2910	2110	2930	2150	2950
		13,000	1650	2530	1720	2610	1780	2690	1850	2770	1920	2860	1960	2950	2000	2950	2040	2970	2080	2990	2120	3010	2160	3030	2200	3050
		14,000	1720	2620	1790	2700	1860	2780	1920	2860	1990	2950	2030	3010	2070	3010	2110	3040	2150	3060	2190	3090	2240	3110	2280	3130
8800	96	Sea Level	820	1560	850	1610	890	1650	930	1690	970	1740	1010	1780	1050	1830	1090	1880	1130	1890	1170	1930	1210	1980	1250	2050
		1000	860	1610	900	1660	940	1700	980	1750	1020	1800	1060	1840	1100	1890	1140	1940	1180	1960	1220	2000	1260	2070	1300	2100
		2000	910	1660	950	1710	990	1760	1030	1810	1070	1860	1120	1910	1160	1990	1200	2010	1240	2030	1280	2100	1320	2130	1360	2160
		3000	950	1720	1000	1770	1040	1820	1080	1870	1130	1920	1180	1970	1220	2060	1260	2090	1300	2110	1340	2130	1380	2170	1420	2210
		4000	1000	1770	1050	1830	1090	1880	1140	1930	1190	1990	1250	2040	1300	2100	1340	2130	1380	2150	1420	2170	1460	2210	1500	2240
		5000	1060	1830	1100	1890	1150	1950	1200	2000	1250	2060	1300	2110	1340	2130	1380	2150	1420	2170	1460	2210	1500	2240	1540	2280
		6000	1110	1900	1160	1990	1210	2010	1260	2070	1310	2130	1360	2190	1400	2230	1440	2280	1480	2300	1520	2330	1560	2370	1600	2400
		7000	1170	1960	1220	2020	1270	2080	1320	2090	1370	2210	1420	2250	1460	2300	1500	2350	1540	2370	1580	2400	1620	2440	1660	2480
		8000	1230	2030	1280	2090	1340	2160	1390	2220	1440	2280	1490	2320	1530	2360	1570	2400	1610	2430	1650	2460	1690	2500	1730	2540
		9000	1290	2100	1340	2170	1400	2230	1450	2300	1500	2370	1550	2420	1600	2460	1640	2490	1680	2520	1720	2550	1760	2580	1800	2610
		10,000	1350	2170	1410	2240	1470	2310	1520	2380	1580	2450	1630	2500	1670	2530	1710	2560	1750	2590	1790	2620	1830	2650	1870	2680
		11,000	1420	2250	1480	2320	1540	2390	1590	2460	1650	2530	1700	2600	1740	2640	1780	2670	1820	2700	1860	2730	1900	2760	1940	2790
		12,000	1480	2330	1550	2400	1610	2480	1660	2550	1720	2620	1770	2680	1810	2710	1850	2740	1890	2770	1930	2800	1970	2830	2010	2860
		13,000	1550	2410	1620	2490	1680	2560	1740	2640	1800	2710	1850	2790	1900	2830	1940	2860	1980	2890	2020	2920	2060	2950	2100	2980
		14,000	1620	2490	1690	2570	1750	2650	1820	2730	1860	2810	1900	2950	1940	2980	1980	3010	2020	3040	2060	3070	2100	3100	2140	3130

Figure 5-30 (Sheet 1 of 2)

NORMAL LANDING DISTANCE WITH PROPELLER REVERSING

CONDITIONS:

1. Power Levers - Flight Idle before touchdown.
- Grnd Idle after touchdown, then maximum allowable reverse.
 2. Condition Levers - Takeoff, Climb and Landing.
 3. Landing Gear - Down.
 4. Wing Flaps - Land.
 5. Level, Hard Surface Runway.
 6. Maximum Effective Braking.
1. If necessary to land with wing flaps Up, the approach speed should be increased above the normal approach speed by 15 knots. Total landing distances will increase appreciably.
 2. Decrease total distances by 2% for each 5 knots headwind. For operations with tailwinds up to 10 knots, increase total distances by 5% for each 2 knots wind.

WEIGHT - POUNDS	SPEED AT 50-FOOT OBSTACLE ALTITUDE KIAS	-20°C			-10°C			0°C			10°C			20°C			30°C			40°C			50°C		
		GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	
7800	93	Sea Level	690	1470	720	1510	750	1550	1600	790	820	1640	850	1680	890	1730	1770	920	1770	920	1730	1790	1840	980	1840
		1000	730	1520	760	1560	800	1610	1650	830	870	1700	900	1740	940	1790	1850	980	1850	980	1850	1910	1970	1030	1970
		2000	770	1570	810	1620	840	1660	1710	880	920	1760	950	1800	990	1850	1920	1050	1920	1050	1920	1990	2060	1070	2060
		3000	820	1620	850	1670	890	1720	1770	930	970	1820	1010	1870	1050	1930	2000	1110	2000	1110	2000	2070	2140	1130	2140
		4000	860	1680	900	1730	940	1780	1830	980	1020	1880	1070	1940	1110	2000	2070	1170	2070	1170	2070	2150	2220	1190	2220
		5000	910	1740	950	1790	990	1850	1900	1040	1080	1960	1120	2020	1170	2100	2170	1230	2170	1230	2170	2250	2320	1250	2320
		6000	960	1800	1000	1860	1050	1910	1970	1090	1140	2030	1190	2090	1230	2150	2220	1290	2220	1290	2220	2300	2370	1310	2370
		7000	1010	1860	1060	1930	1110	1990	2050	1150	1200	2110	1250	2170	1290	2260	2330	1350	2260	1350	2260	2340	2410	1370	2410
		8000	1070	1930	1120	2000	1170	2060	2130	1260	1310	2190	1310	2260	1350	2340	2410	1410	2340	1410	2340	2420	2490	1430	2490
		9000	1130	2010	1180	2070	1230	2140	2210	1330	1380	2280	1450	2430	1520	2530	2600	1470	2530	1470	2530	2610	2680	1490	2680
6800	93	Sea Level	560	1470	590	1520	620	1560	1610	640	670	1660	700	1710	730	1760	1810	760	1810	760	1760	1830	1890	800	1890
		1000	600	1530	630	1570	650	1620	1670	680	710	1730	740	1780	770	1810	1860	800	1860	800	1810	1880	1940	830	1940
		2000	630	1580	660	1630	690	1690	1740	720	760	1800	790	1850	820	1900	1950	850	1950	850	1900	1970	2030	880	2030
		3000	670	1640	700	1700	740	1750	1810	770	800	1870	850	1930	880	1980	2040	900	2040	900	1980	2050	2110	930	2110
		4000	710	1700	750	1760	780	1820	1880	820	850	1950	890	2010	930	2080	2140	950	2140	950	2080	2150	2210	980	2210
		5000	760	1770	790	1830	830	1900	1960	870	900	2030	940	2100	980	2170	2230	1000	2230	1000	2170	2240	2300	1030	2300
		6000	800	1840	840	1910	880	1980	2050	920	960	2120	1000	2190	1040	2220	2280	1060	2280	1060	2220	2290	2350	1090	2350
		7000	850	1920	890	1990	930	2060	2140	1020	1070	2200	1120	2300	1160	2370	2430	1180	2430	1180	2370	2440	2500	1210	2500
		8000	900	2000	940	2080	990	2150	2230	1030	1080	2270	1200	2340	1240	2400	2460	1260	2460	1260	2400	2470	2530	1290	2530
		9000	960	2090	1000	2170	1040	2250	2330	1090	1130	2360	1250	2450	1290	2550	2610	1310	2610	1310	2550	2620	2680	1340	2680
6800	93	10,000	1010	2180	1060	2260	1100	2350	1150	1200	2400	1260	2500	1300	2580	2640	1330	2640	1330	2580	2650	2710	1360	2710	
		11,000	1070	2270	1120	2360	1160	2460	1210	1260	2450	1320	2540	1360	2620	2680	1390	2680	1390	2620	2690	2750	1420	2750	
		12,000	1130	2380	1180	2470	1230	2570	1280	1330	2660	1400	2760	1440	2820	2880	1470	2880	1470	2820	2890	2950	1500	2950	
		13,000	1190	2480	1240	2580	1290	2680	1340	1390	2750	1460	2890	1500	2970	3030	1530	3030	1530	2970	3040	3100	1560	3100	
		14,000	1250	2590	1300	2700	1360	2810	1410	1460	2910	1520	3020	1560	3100	3160	1590	3160	1590	3100	3170	3230	1620	3230	
		15,000	1310	2700	1360	2810	1420	2920	1470	1520	3020	1580	3130	1620	3170	3230	1650	3230	1650	3170	3240	3300	1680	3300	
		16,000	1370	2810	1420	2920	1480	3030	1530	1580	3130	1640	3190	1680	3240	3300	1710	3300	1710	3240	3310	3370	1740	3370	
		17,000	1430	2920	1480	3030	1540	3140	1590	1640	3240	1700	3290	1740	3340	3400	1770	3400	1770	3340	3410	3470	1800	3470	
		18,000	1490	3030	1540	3140	1600	3250	1650	1700	3340	1760	3390	1800	3440	3500	1830	3500	1830	3440	3510	3570	1860	3570	
		19,000	1550	3140	1600	3250	1660	3360	1710	1760	3450	1820	3500	1860	3550	3610	1890	3610	1890	3550	3620	3680	1920	3680	

Figure 5-30 (Sheet 2 of 2)

ENGINE INOPERATIVE LANDING DISTANCE WITHOUT PROPELLER REVERSING

CONDITIONS:

1. Inoperative Propeller - Feathered.
2. Operative Engine:
 - a. Power Lever - Flight Idle Before Touchdown.
 - Grnd Idle After Touchdown.
 - b. Condition Lever - Takeoff, Climb and Landing
 - c. Landing Gear - Down.
3. Wing Flaps - Land.
4. Level, Hard Surface Runway.
5. Braking - As Required to Maintain Directional Control.

NOTE:

1. If necessary to land with wing flaps up, the approach speed should be increased above the normal approach speed by 15 knots. Total landing distances will increase appreciably.
2. Decrease total distances by 2% for each 5 knots headwind. For operations with tailwinds up to 10 knots, increase total distances by 5% for each 2 knots wind.

EXAMPLE:

Pressure Altitude 7°
Landing Weight 1700 Feet
Headwind Component 8322 Pounds
Ground Roll (Approximation Method) 16 Knots
Total Distance Over 50 Foot Obstacle (Approximation Method) 1450 Feet
Total Distance Over 50 Foot Obstacle (Approximation Method) 2300 Feet
Approach Speed (2153) Feet With Wind Correction 96 Knots

WEIGHT - POUNDS	SPEED AT 50-FOOT OBSTACLE KIAS	PRESSURE ALTITUDE - FEET	-20°C		-10°C		0°C		10°C		20°C		30°C		40°C		50°C	
			GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE
9360	99	Sea Level	1230	2060	1290	2130	1350	2190	1410	2260	1470	2330	1530	2390	1590	2460	1650	2530
		1000	1300	2140	1360	2210	1420	2270	1480	2240	1540	2410	1610	2490	1670	2560	1730	2630
		2000	1370	2210	1430	2290	1500	2360	1560	2430	1630	2500	1690	2580	1760	2650	1820	2720
		3000	1440	2300	1510	2370	1580	2450	1640	2520	1710	2600	1780	2680	1850	2760	1910	2860
		4000	1520	2380	1590	2460	1660	2540	1730	2620	1800	2700	1870	2780	1940	2860	2000	2970
		5000	1600	2470	1670	2550	1740	2630	1820	2720	1890	2800	1970	2890	2040	2970	2100	3080
		6000	1680	2560	1760	2650	1830	2730	1910	2820	1990	2910	2060	3000	2140	3080	2200	3190
		7000	1770	2660	1850	2750	1930	2840	2010	2930	2100	3040	2180	3110	2260	3150	2340	3280
		8000	1860	2760	1940	2860	2020	2950	2100	3040	2180	3130	2270	3230	2360	3250	2440	3350
		9000	1950	2860	2040	2980	2120	3060	2200	3150	2290	3250	2370	3350	2480	3370	2560	3470
		10,000	2050	2970	2130	3070	2220	3170	2310	3270	2390	3370	2480	3470	2590	3500	2680	3590
		11,000	2140	3080	2230	3190	2320	3290	2410	3390	2500	3490	2590	3600	2700	3610	2790	3700
		12,000	2240	3200	2400	3300	2430	3410	2520	3520	2610	3620	2700	3710	2810	3720	2900	3830
		13,000	2350	3310	2440	3420	2540	3540	2630	3640	2720	3750	2810	3800	2920	3830	3010	3940
		14,000	2450	3440	2550	3550	2650	3660	2740	3780	2840	3890	2930	3940	3030	3970	3120	4050
8800	96	Sea Level	1130	1950	1190	2010	1240	2080	1300	2140	1350	2200	1410	2260	1470	2330	1520	2390
		1000	1200	2020	1260	2090	1310	2150	1370	2220	1430	2280	1490	2350	1550	2420	1610	2490
		2000	1270	2100	1330	2170	1390	2230	1450	2300	1510	2370	1570	2440	1630	2510	1690	2580
		3000	1340	2180	1400	2250	1460	2320	1530	2390	1590	2460	1660	2540	1720	2610	1780	2680
		4000	1410	2260	1480	2330	1540	2410	1610	2480	1680	2560	1750	2640	1810	2710	1870	2800
		5000	1490	2340	1560	2420	1630	2500	1700	2580	1770	2660	1840	2740	1910	2820	1970	2930
		6000	1570	2430	1640	2510	1710	2600	1790	2680	1860	2760	1930	2850	2010	2930	2070	3050
		7000	1650	2520	1730	2610	1800	2700	1880	2780	1950	2870	2030	2960	2100	3070	2160	3150
		8000	1740	2620	1820	2710	1900	2800	1980	2900	2050	2980	2130	3070	2200	3180	2260	3270
		9000	1830	2720	1910	2810	1990	2910	2070	3000	2150	3090	2230	3180	2300	3300	2360	3400
		10,000	1920	2830	2010	2920	2090	3020	2170	3110	2250	3210	2340	3300	2400	3430	2460	3530
		11,000	2020	2930	2100	3030	2190	3130	2280	3230	2360	3330	2440	3430	2500	3500	2560	3580
		12,000	2120	3050	2200	3150	2290	3250	2380	3350	2470	3450	2580	3580	2640	3610	2700	3700
		13,000	2220	3160	2310	3270	2400	3370	2490	3480	2590	3580	2690	3710	2750	3740	2810	3830
		14,000	2320	3280	2410	3390	2510	3500	2600	3600	2690	3710	2790	3830	2850	3820	2910	3910

Figure 5-31 (Sheet 1 of 2)

ENGINE INOPERATIVE LANDING DISTANCE WITHOUT PROPELLER REVERSING

CONDITIONS:

1. Inoperative Propeller - Feathered.
2. Operative Engine:
 - a. Power Lever - Flight Idle Before Touchdown.
 - Grnd Idle After Touchdown.
 - b. Condition Lever - Takeoff, Climb and Landing
3. Landing Gear - Down.
4. Wing Flaps - Land.
5. Level, Hard Surface Runway.
6. Braking - As Required to Maintain Directional Control.

NOTE:

1. If necessary to land with wing flaps up, the approach speed should be increased above the normal approach speed by 15 knots. Total landing distances will increase appreciably.
2. Decrease total distances by 2% for each 5 knots headwind. For operations with tailwinds up to 10 knots, increase total distances by 5% for each 2 knots wind.

WEIGHT - POUNDS	SPEED AT 50-FOOT OBSTACLE KIAS	PRESSURE ALTITUDE - FEET	-20°C		-10°C		0°C		10°C		20°C		30°C		40°C		50°C	
			GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE
7800	93	Sea Level	950	1810	1000	1870	1050	1930	1100	1990	1150	2040	1190	2110	1250	2170	1300	2230
		1000	1010	1880	1060	1940	1110	2000	1160	2060	1220	2130	1270	2190	1320	2260	1370	2320
		2000	1080	1950	1130	2020	1180	2080	1230	2150	1290	2210	1340	2280	1400	2350	----	----
		3000	1140	2030	1200	2100	1250	2160	1310	2230	1370	2300	1420	2370	1480	2450	----	----
		4000	1210	2110	1270	2180	1330	2250	1390	2320	1450	2400	1510	2470	1570	2550	----	----
		5000	1280	2190	1340	2270	1400	2340	1470	2420	1530	2500	1600	2580	1660	2660	----	----
		6000	1360	2280	1420	2360	1490	2440	1550	2520	1620	2600	1690	2690	1760	2770	----	----
		7000	1430	2370	1500	2460	1570	2540	1640	2630	1710	2710	1780	2800	----	----	----	----
		8000	1520	2470	1590	2560	1660	2650	1730	2740	1810	2830	1880	2920	----	----	----	----
		9000	1600	2570	1680	2660	1750	2760	1830	2850	1900	2940	1980	3040	----	----	----	----
6800	93	Sea Level	770	1770	810	1830	850	1890	890	1960	930	2020	970	2080	1010	2150	1060	2220
		1000	820	1840	870	1910	910	1970	950	2040	990	2110	1040	2180	1080	2250	1130	2320
		2000	880	1920	920	1990	970	2060	1010	2130	1060	2200	1110	2280	1150	2350	----	----
		3000	940	2000	980	2070	1030	2150	1080	2220	1130	2300	1180	2380	1230	2460	----	----
		4000	1000	2090	1050	2170	1100	2240	1150	2330	1200	2410	1260	2500	1310	2580	----	----
		5000	1060	2180	1120	2260	1170	2350	1230	2440	1280	2520	1340	2620	1400	2710	----	----
		6000	1130	2280	1190	2370	1250	2460	1310	2550	1370	2640	1430	2740	1490	2840	----	----
		7000	1210	2380	1270	2480	1330	2570	1390	2670	1450	2770	1510	2870	----	----	----	----
		8000	1280	2490	1350	2590	1410	2700	1480	2800	1540	2900	1610	3010	----	----	----	----
		9000	1360	2610	1430	2720	1500	2820	1570	2930	1630	3040	1700	3160	----	----	----	----
		10,000	1450	2730	1520	2840	1590	2960	1660	3070	1730	3190	1800	3310	----	----	----	----
		11,000	1540	2860	1610	2980	1680	3100	1750	3220	1820	3340	1900	3470	----	----	----	----
		12,000	1620	3000	1700	3120	1770	3250	1850	3370	1920	3500	----	----	----	----	----	----
		13,000	1720	3140	1790	3270	1870	3400	1950	3530	2020	3670	----	----	----	----	----	----
		14,000	1810	3290	1890	3430	1970	3560	2050	3700	2130	3840	----	----	----	----	----	----

Figure 5-31 (Sheet 2 of 2)

NORMAL TAKEOFF DISTANCE MANUAL MODE

CONDITIONS:

1. Power Levers - Takeoff Power Before Brake Release.
2. Wing Flaps - T.O.
3. Level, Hard Surface, Dry Runway.
4. Rotate - 98 KIAS.
5. Engine Inlet Anti-Ice Switches - Off.

NOTE:

1. If full power is applied without brakes set, distances apply from point where full power is applied.
2. Decrease distance 6% for each 10 knots headwind.
3. Increase distance 3% for each 2 knots tailwind.

EXAMPLE:

Weight 9700 Pounds
OAT 16°C
Pressure Altitude 2400 Feet
Headwind Component 19 Knots
Ground Run (Approximation Method) 2240 Feet
(1985 Feet With Wind Correction)
Total Distance Required 3080 Feet
(Approximation Method)
(2729 Feet With Wind Correction)

WEIGHT - POUNDS	TAKEOFF TO 50-FOOT OBSTACLE SPEED - KIAS	PRESSURE ALTITUDE - FEET	-20°C			-10°C			0°C			10°C			20°C			30°C			40°C			50°C		
			GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE
9850	110	Sea Level	1440	2000	1530	2130	1630	2260	1740	2400	1840	2550	1960	2700	2110	2920	2350	3300	2700	3610	2920	3830	2350	3300	2700	3610
		1000	1530	2120	1630	2260	1740	2400	1850	2550	1960	2710	2090	2880	2290	3180	2550	3610	2090	3180	2290	3180	2550	3610	2090	3180
		2000	1620	2250	1730	2390	1850	2550	1970	2720	2090	2890	2230	3070	2490	3480	2830	3940	2230	3070	2490	3480	2830	3940	2230	3070
		3000	1730	2390	1840	2550	1970	2710	2100	2890	2240	3090	2400	3300	2620	3640	3160	4500	2400	3300	2620	3640	3160	4500	2400	3300
		4000	1840	2540	1970	2710	2100	2890	2240	3300	2590	3580	2880	4050	3280	4760	3590	5300	2880	4050	3280	4760	3590	5300	2880	4050
		5000	1960	2700	2100	2890	2240	3340	2590	3580	2820	3920	3160	4500	3590	5300	3830	5650	3160	4500	3590	5300	3830	5650	3160	4500
		6000	2100	2900	2260	3110	2420	3640	2830	3940	3100	4350	3480	5020	3920	5500	4350	6100	3480	5020	3920	5500	4350	6100	3480	5020
		7000	2260	3110	2440	3370	2630	3940	2830	4110	3440	4920	3830	5650	4350	6100	4920	6700	3830	5650	4350	6100	4920	6700	3830	5650
		8000	2440	3360	2650	3670	2880	4010	3130	4410	3640	5100	4350	6100	4920	6700	5100	6900	4350	6100	4920	6700	5100	6900	4350	6100

Figure 5-32

RATE-OF-CLIMB - ALL ENGINES OPERATING MANUAL MODE

PRESSURE ALTITUDE FEET	CLIMB SPEED KIAS
Sea Level to 15,000	130
24,000	120
35,000	107

CONDITIONS:

1. Power Levers - TAKEOFF POWER (Manual Mode).
2. Wing Flaps - T.O.
3. Landing Gear - UP.
4. Windshield and Engine Inlet Anti-Ice - OFF.
5. Weight - 9850 Pounds.

**OPERATION ABOVE 33,000 FEET RESTRICTED
TO AIRPLANES INCORPORATING SK441-36**

EXAMPLE:

OAT 16°C
Pressure Altitude 2400 Feet
Rate-of-Climb 2170 Ft/Min.
Climb Speed 130 Knots

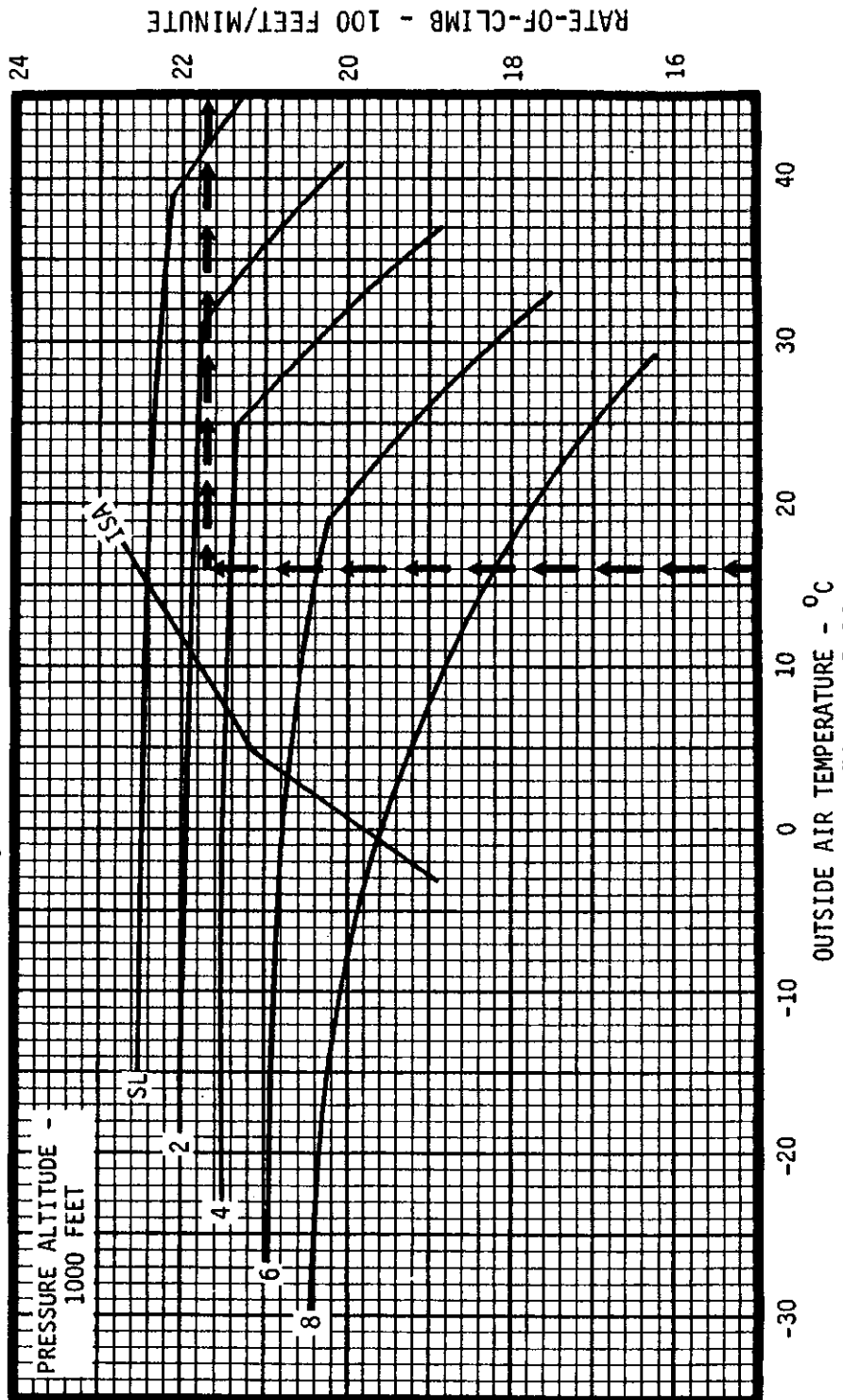
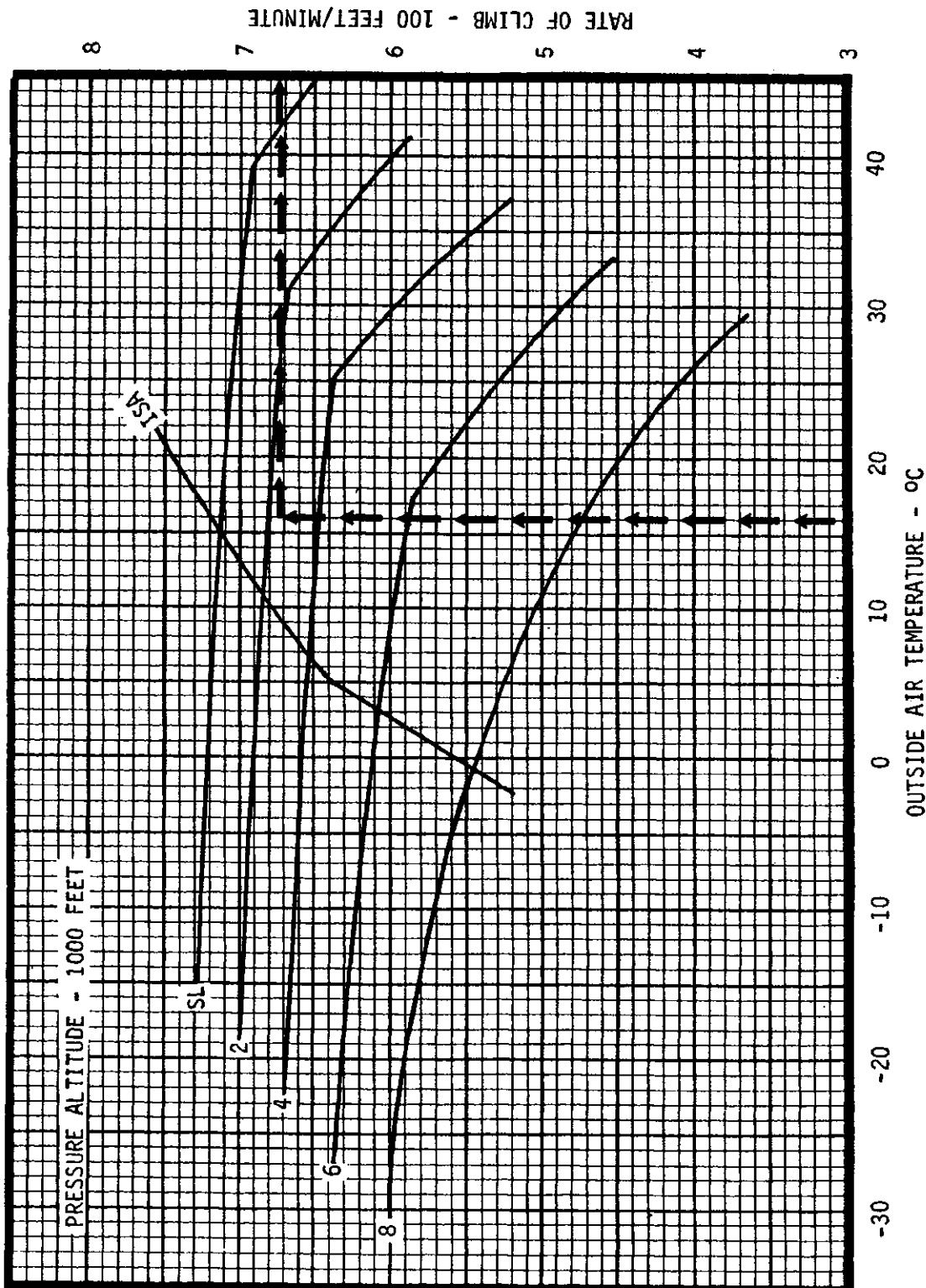


Figure 5-33

RATE-OF-CLIMB - ONE ENGINE INOPERATIVE MANUAL MODE



CONDITIONS:

1. Inoperative Propeller - FEATHERED.
2. Operative Engine Power Lever - TAKEOFF POWER (Manual Mode).
3. Landing Gear - UP.
4. Wing Flaps - UP.
5. Climb Speed - 120 KIAS.
6. Weight - 9850 Pounds.
7. Windshield and Engine Inlet Anti-Ice - OFF.

EXAMPLE:

OAT 16°C.
Pressure Altitude 2400 Feet
Rate-of-Climb 675 Ft./Min.

Figure 5-34

RATE-OF-CLIMB - BALKED LANDING**MANUAL MODE****CONDITIONS:**

1. Power Levers - TAKEOFF POWER.
2. Landing Gear - DOWN.
3. Wing Flaps - LAND.

4. Airspeed - 99 KIAS.

5. Weight - 9850 Pounds.

6. Windshield and Engine Inlet

Anti-Ice - OFF.

EXAMPLE:

OAT

7°C.

Pressure Altitude 1700 Feet

Weight 8322 Pounds

Rate-of-Climb 1730 Ft./Min.

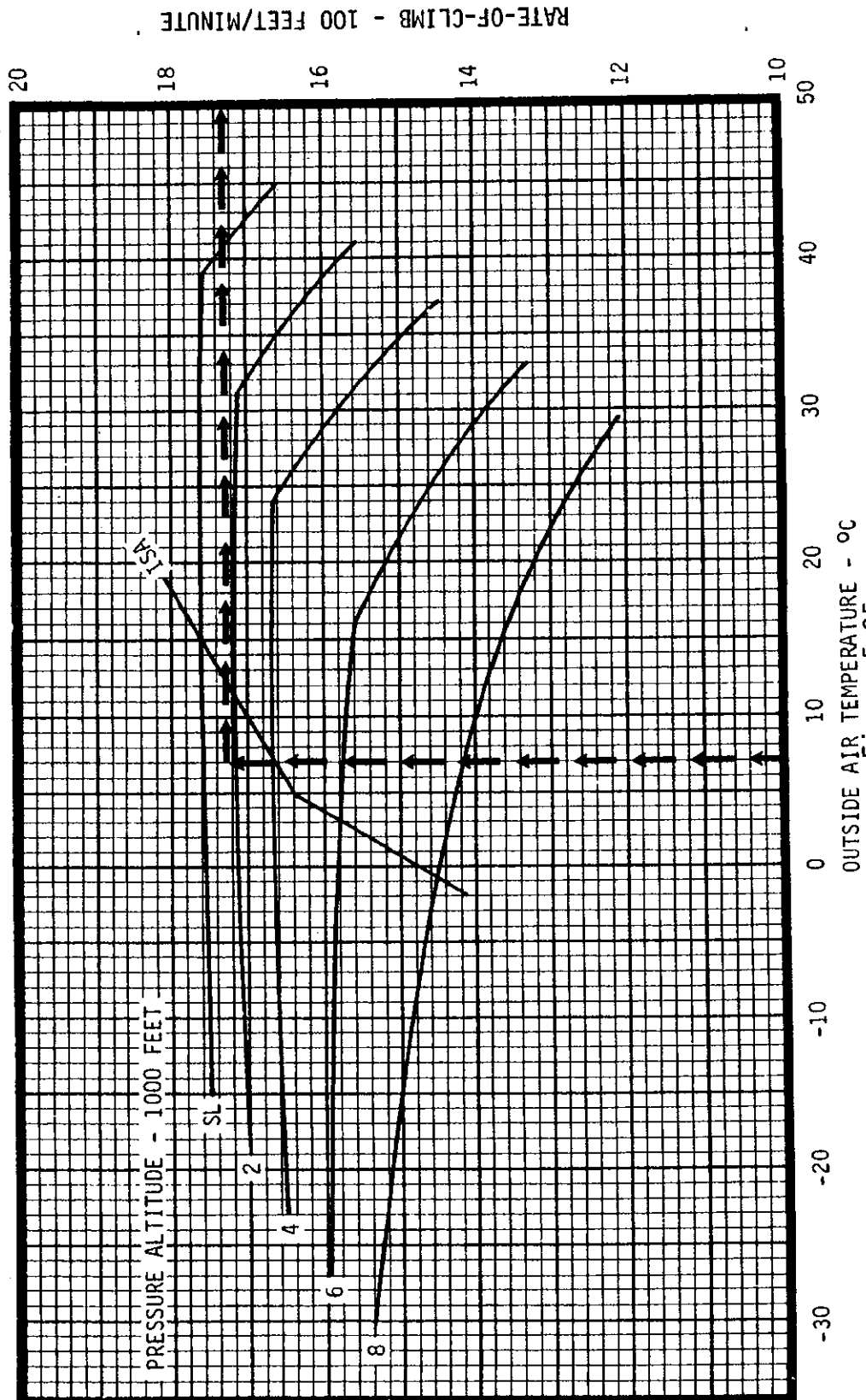


Figure 5-35

SECTION 6

WEIGHT & BALANCE/EQUIPMENT LIST

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DETERMINATION FOR FLIGHT .	6-4		

INTRODUCTION

Section 6 of this handbook provides procedures for establishing the airplane's basic empty weight and moment and procedures for determining the weight and balance for flight. This section also describes all items on the Weight and Balance Data sheet which was provided with the airplane (Located in the back of this handbook in a plastic envelope) as delivered from Cessna Aircraft Company.

AIRPLANE WEIGHING PROCEDURES

To Establish Basic Empty Weight

The airplane must be weighed in the following configuration.

1. Wing flaps shall be fully retracted and all other control surfaces shall be in neutral.
2. Service engine oil and landing gear/wing flap hydraulic fluid reservoir as required to obtain a normal full indication.
3. Check landing gear down and parking brake released.
4. Remove all equipment and items not to be included in basic empty weight such as tools, contents in cabinets and drawers and floor-mats.
5. All equipment and furnishings must be in their standard location to facilitate corrections to "Airplane Standard Empty Weight" and "Center-of-Gravity" location.
6. All seats shall be properly installed on tracks and placed in the most forward position against the seat stop. All seat backs shall be in the vertical position and seat belts crossed on the seat cushion.
7. Close all baggage doors, main cabin door and emergency exit window.
8. Clean the airplane inside and out.
9. Remove all snow, ice or water which may be on the airplane.
10. Weigh the airplane in a closed hangar to avoid errors caused by air currents.
11. Defuel the airplane in accordance with the following steps:

WARNING

Conduct all defueling operations at a safe distance from other airplanes and buildings. Fire fighting equipment must be readily available. Attach two ground wires from different points on the airplane to separate approved grounding stakes. The use of two ground wires will prevent ungrounding of the airplane due to accidental disconnecting of either wire.

- a. Turn off all electrical power.
- b. Turn crossfeed selector OFF.
- c. Remove engine cowl.
- d. Disconnect the engine fuel supply line on each engine and insert these lines into suitable fuel containers.
- e. Apply external power to the airplane.
- f. Energize the main fuel boost pumps until fuel flow is terminated.

CAUTION

Immediately shut off the boost pumps when they stop pumping to prevent damage to the boost pumps.

- g. Drain the remaining fuel through the fuel drain and crossfeed valves into an appropriate container. Each drain should remain open until the defueling rate slows to approximately 1 drop per second.
- h. The fuel remaining on-board after defueling is residual fuel and is included in the basic empty weight.
- i. Drainable unusable fuel must be added after the weighing to obtain basic empty weight. Figure 6-1 includes the weight and arms necessary to add the drainable unusable fuel.

12. Leveling.

NOTE

The airplane must be level during weighing to determine the center-of-gravity. Always level laterally before leveling longitudinally.

- a. On landing gear.
 - (1) Inflate the main gear struts to maximum extension and the nose gear strut to minimum extension.
 - (2) Place scales under nose wheel and each main wheel.
 - (3) For lateral leveling, place a spirit level directly on the seat tracks over the main gear fuselage station 177.45. Adjust the main gear tire or strut pressure to center the bubble.
 - (4) To level longitudinally, unscrew the two screws approximately 1/4 inch at "Level Point" on the right side of the fuselage at Stations 248.25 and 272.65. Place the level on these screws and level longitudinally by adjusting the nose wheel tire or strut pressure to center the bubble.

b. On Jack Points.

CAUTION

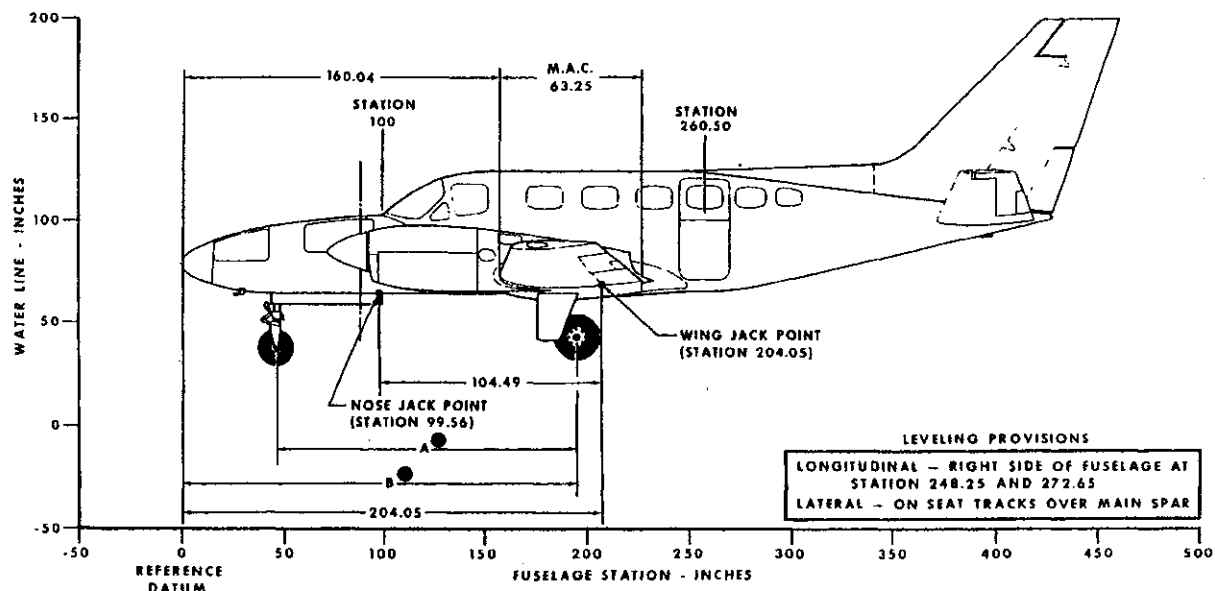
- Keep the airplane level while jacking to prevent slipping off jack points and damaging the airplane.
- Jack pads, provided with the airplane, must be installed in each jack point prior to jacking the airplane.

NOTE

When possible, secure nose gear strut to prevent extension. This will allow minimum total jacking height.

- (1) Raise the airplane with the three hoisting jacks until all wheels are clear of the floor.
 - (2) For lateral leveling, place a spirit level directly on the seat tracks over the main spar Fuselage Station 177.45. Raise or lower the jacks under the wing jack points until the level bubble centers.
 - (3) To level longitudinally, unscrew the two "Level Point" screws approximately 1/4 inch on the right side of the fuselage at Stations 248.25 and 272.65. Place a level on these screws and raise or lower the nose jack until the level bubble centers.
13. When weighing on the wheels or jack points with mechanical scales, ensure the scales are in calibration within the past 6 months, and used per the applicable manufacturer's recommendations. When weighing on the wheels, deflate or inflate the gear struts and/or tires until the airplane is level. Gear struts and/or tires must be serviced per airplane maintenance manual before airplane is placed back into service.
 14. When weighing on the jack points with electronic weighing scales, attach the electronic weighing cells to the proper mounting adapters to prevent slipping.
 - a. Prepare the electronic weighing kit, which has been calibrated or certified correct in the last 12 months, for use by following the manufacturer's instructions provided with the weighing kit. Adjust all jacks simultaneously until the cells are in contact with the jack points. Continue jacking, keeping the airplane level, until the airplane is supported at the jack points only.
 15. Determine scale reading, scale drift and tare from all three scales.
 16. Lower the airplane and clear the weighing cells as soon as the readings are obtained.

AIRPLANE WEIGHING FORM



AIRPLANE AS WEIGHED TABLE

POSITION	SCALE READING	SCALE DRIFT	TARE	NET WEIGHT
LEFT WING				
RIGHT WING				
NOSE				
AIRPLANE TOTAL AS WEIGHED				

FUSELAGE STATION OF AFT WEIGHING POINT _____
 CG ARM OF AIRPLANE AS WEIGHED USING JACK POINTS OR WHEELS* _____
 IF WEIGHED ON JACK POINTS, USE 104.49
 IF WEIGHED ON WHEELS, USE DIMENSION A _____
 NOSE NET WEIGHT _____
 TOTAL AS WEIGHED _____ INCHES AFT OF DATUM

NOTE
IT IS THE RESPONSIBILITY OF THE OPERATOR TO INSURE THAT THE AIRPLANE IS LOADED PROPERLY.

- LEGEND**
- MUST BE MEASURED AFTER AIRPLANE IS LEVEL AND ON SCALES
 - * IF WEIGHED ON WHEELS, CROSS OUT "JACK POINTS OR" IF WEIGHED ON JACK POINTS, CROSS OUT "OR WHEELS"
 - ▲ INCLUDES ALL UNDRAINABLE FLUIDS AND OIL

BASIC EMPTY WEIGHT AND CENTER OF GRAVITY TABLE

ITEM		WEIGHT - POUNDS	CG ARM - INCHES	MOMENT (INCH-POUNDS/100)
▲ AIRPLANE (CALCULATED OR AS WEIGHED)				
DRAINABLE UNUSABLE FUEL AT 6.7 POUNDS PER GALLON	LEFT AND RIGHT WING	44.0	186.7	82.15
BASIC EMPTY WEIGHT				

Figure 6-1

17. Computations (refer to Figure 6-1).

- a. Enter the scale reading, scale drift and tare from all three scales in the columns in the Airplane As Weighed Table. Compute and enter values for Net Weight and Airplane Total As Weighed columns.
- b. Determine the center-of-gravity arm of the airplane using the formula presented in Figure 6-1.
- c. Enter the total Net Weight and Center-of-gravity Arm in the Basic Empty Weight and Center-of-gravity Table columns. Multiply the Weight (Pounds) entry times the Center-of-gravity Arm (Inches) entry to determine Moment (Inches-Pounds/100) entry. Total each of the three columns to determine basic empty weight, center-of-gravity arm and moment.

NOTE

An attempt should be made to verify the results of each weighing, when data for comparison is available.

- d. Enter Basic Empty Weight, CG arm and moment in the Weight and Balance Record, see Figure 6-4.

WEIGHT AND BALANCE DETERMINATION FOR FLIGHT

The following is a sample weight and balance determination. For an actual determination for your airplane, refer to the equivalent illustrations on the Weight and Balance Data sheet provided in your airplane.

To compute the weight and balance for your airplane, use Figures 6-2 through 6-4 as follows:

Take the Basic Empty Weight and Moment/100 from the latest entry shown on the Weight and Balance Data sheet or Weight and Balance Record and enter them in item 1 (Basic Empty Weight) of Figure 6-3. For this sample, assume a weight of 5862 pounds and moment/100 of 10007.4.

NOTE

A blank Weight and Balance Form is provided, for the operator's convenience, at the end of this section.

Determine arm, weight and Moment/100 of the crew, passengers, baggage and cabinet contents from Figure 6-2 and enter them under Payload Computations in Figure 6-3. The crew and passenger loading table is applicable only when the CG of the occupant is at the location specified.

If the seats are in any other position than stated in Figure 6-2, the moment must be computed by multiplying occupant weight times the arm in inches. A point 9 inches forward of the intersection of the seat bottom and seat back with seat cushions compressed can be assumed to be the occupant CG. For a reference in determining the arm, the forward face of the cabin doorway structure is fuselage station 249.00.

See Figure 6-3. Total the Payload Computations items and enter the resulting Weight and Moment/100 in item 2.

See Figure 6-3. Total items 1 (Basic Empty Weight) and 2 (Payload) to determine appropriate entries for item 3 (Zero Fuel Weight).

See Figure 6-3. Item 4 (Fuel Loading) is determined from the applicable columns of Figure 6-2.

Total items 3 and 4 to determine 5 (Ramp Weight). Enter item 5 in Figure 6-2 to determine if the loading is within allowable limits. If the point falls within the envelope, the loading is approved. If the point falls outside the envelope, it will be necessary to redistribute the load.

See Figure 6-3. Subtract item 6 (Less Fuel For Taxiing) from item 5 (Ramp Weight) to determine item 7 (Takeoff Weight). The moment of the fuel used for taxiing is determined by the difference in moments of the fuel loaded and the fuel remaining after taxi. Enter item 7 in Figure 6-2 to determine if the loading is within allowable limits (takeoff weight must never exceed 9850 pounds). If the point falls outside of the envelope, it will be necessary to redistribute the load.

Refer to Section 5 for estimated fuel used during the flight. Determine the estimated weight of the fuel to be used. The moment is determined by the difference in moments of the fuel remaining after taxi and the fuel remaining after reaching the destination. Obtain Moment/100 from Figure 6-2. Enter the total of these weights and Moment/100 in item 8 (Less Fuel To Destination).

Item 9 (Landing Weight) is determined by subtracting item 8 from item 7. Enter item 9 in Figure 6-2 to determine if the loading is within allowable limits. If the point falls within the envelope, the loading is approved. If the point falls outside the envelope, it will be necessary to redistribute the load.

WEIGHT AND BALANCE RECORD

The Weight and Balance Record, see Figure 6-4, provides a record to reflect the continuous history of changes in airplane structure and/or equipment which affects the weight and balance of the airplane.

The Basic Empty Weight of your airplane is entered at the appropriate location on the Weight and Balance Data sheet as delivered from the factory. Changes to the structure or equipment should be entered on the Weight and Balance Record when any modifications are made to the airplane. It is the responsibility of the airplane owner to assure this record is up to date, as all loadings will be based on the latest entry.

SECTION 6
WEIGHT & BALANCE

Cessna
MODEL 441

WEIGHT AND MOMENT TABLES

CREW AND PASSENGERS
FORWARD AND AFT FACING SEATS

WEIGHT (POUNDS)	1ST OR 2ND SEATS ARM = 137"	3RD OR 4TH SEATS ARM = 178"	5TH OR 6TH SEATS ARM = 209"	7TH OR 8TH SEATS ARM = 249"	TOILET OR 11TH SEATS ARM = 285"	9TH OR 10TH SEATS ARM = 296"
MOMENT/100						
10	13.7	17.8	20.9	24.9	28.5	29.6
20	27.4	35.6	41.8	49.8	57.0	59.2
30	41.1	53.4	62.7	74.7	85.5	88.8
40	54.8	71.2	83.6	99.6	114.0	118.4
50	68.5	89.0	104.5	124.5	142.5	148.0
60	82.2	106.8	125.4	149.4	171.0	177.6
70	95.9	124.6	146.3	174.3	199.5	207.2
80	109.6	142.4	167.2	199.2	228.0	236.8
90	123.3	160.2	188.1	224.1	256.5	265.4
100	137.0	178.0	209.0	249.0	285.0	296.0
110	150.7	195.8	229.9	273.9	313.5	325.6
120	164.4	213.6	250.8	298.8	342.0	355.2
130	178.1	231.4	271.7	323.7	370.5	384.8
140	191.8	249.2	292.6	348.6	399.0	414.4
150	205.5	267.0	313.5	373.5	427.5	444.0
160	219.2	284.8	334.4	398.4	456.0	473.6
170	232.9	302.6	355.3	423.3	484.5	503.2
180	246.6	320.4	376.2	448.2	513.0	532.8
190	260.3	338.2	397.1	473.1	541.5	562.4
200	274.0	356.0	418.0	498.0	570.0	592.0
210	287.7	373.8	438.9	522.9	598.5	621.6
220	301.4	391.6	459.8	547.8	627.0	651.2
230	315.1	409.4	480.7	572.7	655.5	680.8
240	328.8	427.2	501.6	597.6	684.0	710.4
250	342.5	445.0	522.5	622.5	712.5	740.0
260	356.2	462.8	543.4	647.4	741.0	769.6
270	369.9	480.6	564.3	672.3	769.5	799.2
280	383.6	498.4	585.2	697.2	798.0	828.8
290	397.3	516.2	606.1	722.1	826.5	858.4
300	411.0	534.0	627.0	747.0	855.0	888.0

FUEL *

WEIGHT (POUNDS)	MOMENT/100 ARM VARIES	WEIGHT (POUNDS)	MOMENT/100 ARM VARIES	WEIGHT (POUNDS)	MOMENT/100 ARM VARIES	WEIGHT (POUNDS)	MOMENT/100 ARM VARIES
20	37.48	820	1514.21	1620	2972.17	2420	4413.74
40	74.92	840	1550.82	1640	3008.34	2440	4449.88
60	112.32	860	1587.41	1660	3044.50	2460	4486.01
80	149.68	880	1623.99	1680	3080.65	2480	4522.13
100	187.00	900	1660.56	1700	3116.79	2500	4558.24
120	224.28	920	1697.11	1720	3152.92	2520	4594.34
140	261.53	940	1733.66	1740	3189.05	2540	4630.43
160	298.75	960	1770.20	1760	3225.16	2560	4666.52
180	335.93	980	1806.73	1780	3261.27	2580	4702.59
200	373.07	1000	1843.25	1800	3297.38	2600	4738.66
220	410.19	1020	1879.76	1820	3333.47	2620	4774.71
240	447.28	1040	1916.26	1840	3369.55	2640	4810.76
260	484.33	1060	1952.75	1860	3405.63	2660	4846.80
280	521.36	1080	1989.24	1880	3441.70	2680	4882.83
300	558.37	1100	2025.72	1900	3477.77	2700	4918.85
320	595.34	1120	2062.19	1920	3513.83	2720	4954.86
340	632.29	1140	2098.65	1940	3549.88	2740	4990.86
360	669.22	1160	2135.11	1960	3585.92	2760	5026.84
380	706.12	1180	2171.55	1980	3621.96	2780	5062.82
400	743.00	1200	2208.00	2000	3658.00	2800	5098.80
420	779.89	1220	2244.52	2020	3693.98	2820	5134.75
440	816.77	1240	2281.03	2040	3729.95	2840	5170.73
460	853.62	1260	2317.53	2060	3765.93	2860	5206.19
480	890.46	1280	2354.02	2080	3801.91	2880	5242.00
500	927.27	1300	2390.50	2100	3837.88	2900	5277.82
520	964.07	1320	2426.96	2120	3873.85	2920	5313.64
540	1000.85	1340	2463.41	2140	3909.83	2940	5349.46
560	1037.61	1360	2499.84	2160	3945.80	2960	5385.30
580	1074.36	1380	2536.26	2180	3981.77	2980	5421.14
600	1111.09	1400	2572.67	2200	4017.75	3000	5457.00
620	1147.80	1420	2609.07	2220	4053.72	3020	5492.86
640	1184.50	1440	2645.45	2240	4089.70	3040	5528.72
660	1221.18	1460	2681.82	2260	4125.68	3060	5564.60
680	1257.85	1480	2718.17	2280	4161.66	3080	5600.48
700	1294.51	1500	2754.52	2300	4197.64	3100	5636.38
720	1331.15	1520	2790.84	2320	4233.63	3120	5672.28
740	1367.78	1540	2827.15	2340	4269.61	3140	5708.19
760	1404.40	1560	2863.45	2360	4305.60	3160	5744.12
780	1441.00	1580	2899.73	2380	4341.60	3180	5780.05
800	1477.60	1600	2936.00	2400	4377.60	3183	5785.58

* FUEL WEIGHT BASED ON 6.7 LB/GAL.
FOR ADDITIONAL FUEL INFORMATION,
REFER TO SECTION 8.

BAGGAGE AND CABINET CONTENTS

WEIGHT (POUNDS)	AVIONICS BAY ARM = 32"	NOSE COMPARTMENT ARM = 71"	DUAL FORWARD REFRESHMENT CENTER ARM = 160"	FORWARD REFRESHMENT CENTER ARM = 164"	AFT CABIN			
					AFT CABIN FLOOR ARM = 281"	BAY "A" ARM = 301"	BAY "B" ARM = 317"	AFT REFRESHMENT CENTER ARM = 309"
MOMENT/100								
10	3.2	7.1	16.0	16.4	28.1	30.1	31.7	30.9
20	6.4	14.2	32.0	32.8	56.2	60.2	63.4	61.8
30	9.6	21.3	48.0	49.2	84.3	90.3	95.1	92.7
40	12.8	28.4		65.6	112.4	120.4	126.8	123.6
50	16.0	35.5		82.0	140.5	150.5	156.5	154.5
60	19.2	42.6			168.6	180.6	190.2	
70	22.4	49.7			196.7	210.7	221.9	
80	25.6	56.8			224.8	240.8	253.6	
90	28.8	63.9			252.9	270.9	285.3	
100	32.0	71.0			281.0	301.0	317.0	
110	35.2	78.1			309.1	331.1		
120	38.4	85.2			337.2	361.2		
130	41.6	92.3			365.3	391.3		
140	44.8	99.4			393.4	421.4		
150	48.0	106.5			421.5	451.5		
160	51.2	113.6			449.6	481.6		
170	54.4	120.7			477.7	511.7		
180	57.6	127.8			505.8	541.8		
190	60.8	134.9			533.9	571.9		
200	64.0	142.0			562.0	602.0		
210	67.2	149.1			590.1	632.1		
220	70.4	156.2			618.2	662.2		
230	73.6	163.3			646.3	692.3		
240	76.8	170.4			674.4	722.4		
250	80.0	177.5			702.5	752.5		
260		184.6			730.6	782.6		
270		191.7			758.7	812.7		
280		198.8			786.8	842.8		
290		205.9			814.9	872.9		
300		213.0			843.0	903.0		
310		220.1			871.1	933.1		
320		227.2			899.2	963.2		
330		234.3			927.3	993.3		
340		241.4			955.4	1023.4		
350		248.5			983.5	1053.5		
360					1011.6	1083.6		
370					1039.7	1113.7		
380					1067.8	1143.8		
390					1095.9	1173.9		
400					1124.0	1204.0		

CREW AND PASSENGER SEATS
AND BAGGAGE MOMENT ARMS

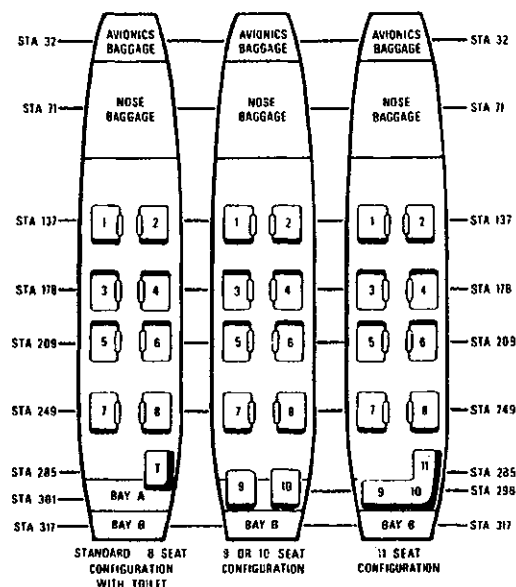


Figure 6-2 (Sheet 1 of 4)

1544-2

WEIGHT AND MOMENT TABLES

CREW AND PASSENGERS
FORWARD AND AFT FACING SEATS WITH JUMP SEAT

WEIGHT (POUNDS)	1ST OR 2ND SEAT ARM = 137"	4TH SEAT ARM = 178"	JUMP 3RD SEAT ARM = 186"	5TH OR 6TH SEAT ARM = 208"	7TH OR 8TH SEAT ARM = 249"	TOILET OR 11TH SEAT ARM = 285"	9TH OR 10TH SEAT ARM = 296"
MOMENT/100							
10	13.7	17.8	18.6	20.9	24.9	28.5	29.6
20	27.4	35.6	37.2	41.8	49.8	57.0	59.2
30	41.1	53.4	55.8	62.7	74.7	85.5	88.8
40	54.8	71.2	74.4	83.6	99.6	114.0	118.4
50	68.5	89.0	93.0	104.5	124.5	142.5	148.0
60	82.2	106.8	111.6	125.4	149.4	171.0	177.6
70	95.9	124.6	130.2	146.3	174.3	199.5	207.2
80	109.6	142.4	148.8	167.2	199.2	228.0	236.8
90	123.3	160.2	167.4	188.1	224.1	256.5	266.4
100	137.0	178.0	186.0	209.0	249.0	285.0	296.0
110	150.7	195.8	204.6	229.9	273.9	313.5	325.6
120	164.4	213.6	223.2	250.8	298.8	342.0	355.2
130	178.1	231.4	241.8	271.7	323.7	370.5	384.8
140	191.8	249.2	260.4	292.6	348.6	399.0	414.4
150	205.5	267.0	279.0	313.5	373.5	427.5	444.0
160	219.2	284.8	297.6	334.4	398.4	456.0	473.6
170	232.9	302.6	316.2	355.3	423.3	484.5	503.2
180	246.6	320.4	334.8	376.2	448.2	513.0	532.8
190	260.3	338.2	353.4	397.1	473.1	541.5	562.4
200	274.0	356.0	372.0	418.0	498.0	570.0	592.0
210	287.7	373.8	390.6	438.9	522.9	598.5	621.6
220	301.4	391.6	409.3	459.8	547.8	627.0	651.2
230	315.1	409.4	427.8	480.7	572.7	655.5	680.8
240	328.8	427.2	446.4	501.6	597.6	684.0	710.4
250	342.5	445.0	465.0	522.5	622.5	712.5	740.0
260	356.2	462.8	483.6	543.4	647.4	741.0	769.6
270	369.9	480.6	502.2	564.3	672.3	769.5	799.2
280	383.6	498.4	520.8	585.2	697.2	798.0	828.8
290	397.3	516.2	539.4	606.1	722.1	826.5	858.4
300	411.0	534.0	558.0	627.0	747.0	855.0	888.0

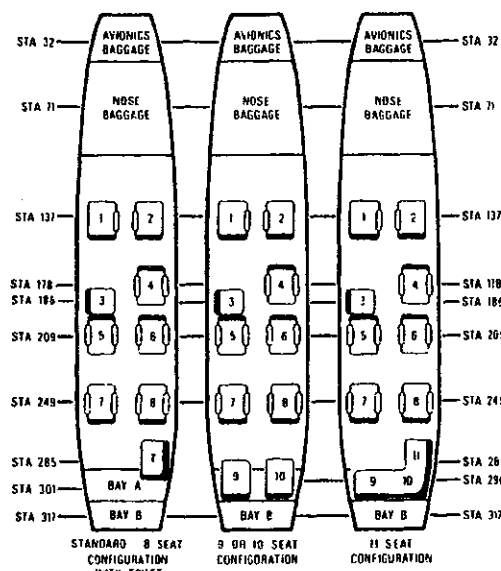
FUEL *

WEIGHT (POUNDS)	MOMENT/100 ARM VARIES	WEIGHT (POUNDS)	MOMENT/100 ARM VARIES	WEIGHT (POUNDS)	MOMENT/100 ARM VARIES	WEIGHT (POUNDS)	MOMENT/100 ARM VARIES
20	37.48	820	1514.21	1620	2972.17	2420	4413.74
40	74.92	840	1550.82	1640	3008.34	2440	4449.88
60	112.32	860	1587.41	1660	3044.50	2460	4486.01
80	149.68	880	1623.99	1680	3080.65	2480	4522.13
100	187.00	900	1660.56	1700	3116.79	2500	4558.24
120	224.28	920	1697.11	1720	3152.92	2520	4594.34
140	261.53	940	1733.66	1740	3189.05	2540	4630.43
160	298.75	960	1770.20	1760	3225.16	2560	4666.52
180	335.93	980	1806.73	1780	3261.27	2580	4702.59
200	373.07	1000	1843.25	1800	3297.38	2600	4738.66
220	410.19	1020	1879.76	1820	3333.47	2620	4774.71
240	447.28	1040	1916.26	1840	3369.55	2640	4810.76
260	484.33	1060	1952.75	1860	3405.63	2660	4846.80
280	521.36	1080	1989.24	1880	3441.70	2680	4882.83
300	558.37	1100	2025.72	1900	3477.77	2700	4918.85
320	595.34	1120	2062.19	1920	3513.83	2720	4954.86
340	632.29	1140	2098.65	1940	3549.88	2740	4990.86
360	669.22	1160	2135.11	1960	3585.92	2760	5026.84
380	706.12	1180	2171.55	1980	3621.96	2780	5062.82
400	743.00	1200	2208.00	2000	3658.00	2800	5098.80
420	779.89	1220	2244.52	2020	3693.98	2820	5134.79
440	816.77	1240	2281.03	2040	3729.95	2840	5170.79
460	853.62	1260	2317.53	2060	3765.93	2860	5206.79
480	890.46	1280	2354.02	2080	3801.91	2880	5242.78
500	927.27	1300	2390.50	2100	3837.88	2900	5278.78
520	964.07	1320	2426.96	2120	3873.85	2920	5314.76
540	1000.85	1340	2463.41	2140	3909.83	2940	5350.76
560	1037.61	1360	2499.84	2160	3945.80	2960	5386.75
580	1074.36	1380	2536.26	2180	3981.77	2980	5422.74
600	1111.09	1400	2572.67	2200	4017.75	3000	5458.72
620	1147.80	1420	2609.07	2220	4053.72	3020	5494.71
640	1184.50	1440	2645.45	2240	4089.70	3040	5530.70
660	1221.18	1460	2681.82	2260	4125.68	3060	5566.69
680	1257.85	1480	2718.17	2280	4161.66	3080	5602.68
700	1294.51	1500	2754.52	2300	4197.64	3100	5638.67
720	1331.15	1520	2790.84	2320	4233.63	3120	5674.66
740	1367.78	1540	2827.15	2340	4269.61	3140	5710.65
760	1404.40	1560	2863.45	2360	4305.60	3160	5746.64
780	1441.00	1580	2899.73	2380	4341.59	3180	5782.63
800	1477.60	1600	2936.00	2400	4377.58	3200	5818.62

* FUEL WEIGHT BASED ON 6.7 LB./GAL.
FOR ADDITIONAL FUEL INFORMATION,
REFER TO SECTION 8.

BAGGAGE AND CABINET CONTENTS

WEIGHT (POUNDS)	AVIONICS BAY ARM = 32"	NOSE COMPARTMENT ARM = 71"	FORWARD REFRESHMENT CENTER ARM = 164"	AFT CABIN FLOOR ARM = 281"	BAY "A" ARM = 301"	BAY "B" ARM = 317"	AFT REFRESHMENT CENTER ARM = 309"
MOMENT/100							
10	3.2	7.1	16.4	28.1	30.1	31.7	30.9
20	6.4	14.2	32.8	56.2	60.2	63.4	61.8
30	9.6	21.3	49.2	84.3	90.3	95.1	92.7
40	12.8	28.4	65.6	112.4	120.4	126.8	123.6
50	16.0	35.5	82.0	140.5	150.5	158.5	154.5
60	19.2	42.6		168.6	180.6	190.2	
70	22.4	49.7		196.7	210.7	221.9	
80	25.6	56.8		224.8	240.8	253.6	
90	28.8	63.9		252.9	270.9	285.3	
100	32.0	71.0		281.0	301.0	317.0	
110	35.2	78.1		309.1	331.1		
120	38.4	85.2		337.2	361.2		
130	41.6	92.3		365.3	391.3		
140	44.8	99.4		393.4	421.4		
150	48.0	106.5		421.5	451.5		
160	51.2	113.6		449.6	481.6		
170	54.4	120.7		477.7	511.7		
180	57.6	127.8		505.8	541.8		
190	60.8	134.9		533.9	571.9		
200	64.0	142.0		562.0	602.0		
210	67.2	149.1		590.1	632.1		
220	70.4	156.2		618.2	662.2		
230	73.6	163.3		646.3	692.3		
240	76.8	170.4		674.4	722.4		
250	80.0	177.5		702.5	752.5		
260		184.6		730.6	782.6		
270		191.7		758.7	812.7		
280		198.8		786.8	842.8		
290		205.9		814.9	872.9		
300		213.0		843.0	903.0		
310		220.1		871.1	933.1		
320		227.2		899.2	963.2		
330		234.3		927.3	993.3		
340		241.4		955.4	1023.4		
350		248.5		983.5	1053.5		
360				1011.6	1083.6		
370				1039.7	1113.7		
380				1067.8	1143.8		
390				1095.9	1173.9		
400				1124.0	1204.0		

CREW AND PASSENGER SEATS
AND BAGGAGE MOMENT ARMS

WEIGHT AND MOMENT TABLES

CREW AND FORWARD
FACING NON ADJUSTABLE PASSENGER SEATS

WEIGHT (POUNDS)	1ST OR 2ND SEATS ARM = 137"	3RD OR 4TH SEATS ARM = 163"	5TH OR 6TH SEATS ARM = 196"	7TH OR 8TH SEATS ARM = 224"	9TH SEAT ARM = 252"	10TH OR 11TH SEATS ARM = 280"
MOMENT/100						
10	13.7	16.8	19.6	22.4	25.2	28.0
20	27.4	33.6	39.2	44.8	50.4	56.0
30	41.1	50.4	58.8	67.2	75.6	84.0
40	54.8	67.2	78.4	89.6	100.8	112.0
50	68.5	84.0	98.0	112.0	126.0	140.0
60	82.2	100.8	117.6	134.4	151.2	168.0
70	95.9	117.6	137.2	156.8	176.4	196.0
80	109.6	134.4	156.8	179.2	201.6	224.0
90	123.3	151.2	176.4	201.6	226.8	252.0
100	137.0	168.0	196.0	224.0	252.0	280.0
110	150.7	184.8	215.6	246.4	277.2	308.0
120	164.4	201.6	235.2	268.8	302.4	336.0
130	178.1	218.4	254.8	291.2	327.6	364.0
140	191.8	235.2	274.4	313.6	352.8	392.0
150	205.5	252.0	294.0	336.0	378.0	420.0
160	219.2	268.8	313.6	358.4	403.2	448.0
170	232.9	285.6	333.2	380.8	428.4	476.0
180	246.6	302.4	352.8	403.2	453.6	504.0
190	260.3	319.2	372.4	425.6	478.8	532.0
200	274.0	336.0	392.0	448.0	504.0	560.0
210	287.7	352.8	411.6	470.4	529.2	588.0
220	301.4	369.6	431.2	492.8	554.4	616.0
230	315.1	386.4	450.8	515.2	579.6	644.0
240	328.8	403.2	470.4	537.6	604.8	672.0
250	342.5	420.0	490.0	560.0	630.0	700.0
260	356.2	436.8	509.6	582.4	655.2	728.0
270	369.9	453.6	529.2	604.8	680.4	756.0
280	383.6	470.4	548.8	627.2	705.6	784.0
290	397.3	487.2	568.4	649.6	730.8	812.0
300	411.0	504.0	588.0	672.0	756.0	840.0

FUEL *

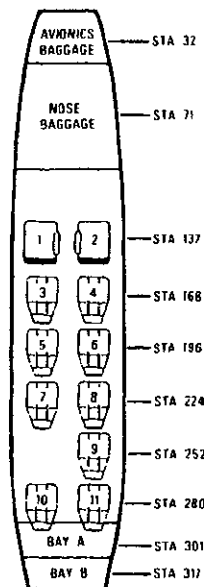
WEIGHT (POUNDS)	MOMENT/100 ARM VARIES	WEIGHT (POUNDS)	MOMENT/100 ARM VARIES	WEIGHT (POUNDS)	MOMENT/100 ARM VARIES	WEIGHT (POUNDS)	MOMENT/100 ARM VARIES
20	37.48	820	1514.21	1620	2972.17	2420	4413.74
40	74.92	840	1550.82	1640	3008.34	2440	4449.88
60	112.32	860	1587.41	1660	3044.50	2460	4486.01
80	149.68	880	1623.99	1680	3080.65	2480	4522.13
100	187.00	900	1660.56	1700	3116.79	2500	4558.24
120	224.28	920	1697.11	1720	3152.92	2520	4594.34
140	261.53	940	1733.66	1740	3189.05	2540	4630.43
160	298.75	960	1770.23	1760	3225.16	2560	4666.52
180	335.93	980	1806.73	1780	3261.27	2580	4702.59
200	373.07	1000	1843.25	1800	3297.38	2600	4738.66
220	410.19	1020	1879.76	1820	3333.47	2620	4774.71
240	447.28	1040	1916.26	1840	3369.55	2640	4810.76
260	484.33	1060	1952.75	1860	3405.63	2660	4846.80
280	521.36	1080	1989.24	1880	3441.70	2680	4882.83
300	558.37	1100	2025.72	1900	3477.77	2700	4918.85
320	595.34	1120	2062.19	1920	3513.83	2720	4954.86
340	632.29	1140	2098.65	1940	3549.88	2740	4990.86
360	669.22	1160	2135.11	1960	3585.92	2760	5026.84
380	706.12	1180	2171.55	1980	3621.96	2780	5062.82
400	743.00	1200	2208.00	2000	3658.00	2800	5098.80
420	779.89	1220	2244.52	2020	3693.98	2820	5134.59
440	816.77	1240	2281.03	2040	3729.95	2840	5170.39
460	853.62	1260	2317.53	2060	3765.93	2860	5206.19
480	890.46	1280	2354.02	2080	3801.91	2880	5242.00
500	927.27	1300	2390.50	2100	3837.88	2900	5277.82
520	964.07	1320	2426.96	2120	3873.85	2920	5313.64
540	1000.85	1340	2463.41	2140	3909.83	2940	5349.46
560	1037.61	1360	2499.84	2160	3945.80	2960	5385.30
580	1074.36	1380	2536.26	2180	3981.77	2980	5421.14
600	1111.09	1400	2572.67	2200	4017.75	3000	5457.00
620	1147.83	1420	2609.07	2220	4053.72	3020	5492.86
640	1184.50	1440	2645.45	2240	4089.70	3040	5528.72
660	1221.18	1460	2681.82	2260	4125.68	3060	5564.60
680	1257.85	1480	2718.17	2280	4161.66	3080	5600.48
700	1294.51	1500	2754.52	2300	4197.64	3100	5636.38
720	1331.15	1520	2790.94	2320	4233.63	3120	5672.28
740	1367.78	1540	2827.15	2340	4269.61	3140	5708.19
760	1404.40	1560	2863.45	2360	4305.60	3160	5744.12
780	1441.00	1580	2899.73	2380	4341.60	3180	5780.05
800	1477.60	1600	2936.00	2400	4377.60	3183	5785.58

* FUEL WEIGHT BASED ON 6.7 LB/GAL.
FOR ADDITIONAL FUEL INFORMATION,
REFER TO SECTION 8.

BAGGAGE CONTENTS

WEIGHT (POUNDS)	AVIONICS BAY ARM = 32"	NOSE COMPARTMENT ARM = 71"	AFT CABIN	
			BAY "A" ARM = 301"	BAY "B" ARM = 317"
			MOMENT/100	
10	3.2	7.1	30.1	31.7
20	6.4	14.2	60.2	63.4
30	9.6	21.3	90.3	95.1
40	12.8	28.4	120.4	126.8
50	16.0	35.5	150.5	158.5
60	19.2	42.6	180.6	190.2
70	22.4	49.7	210.7	221.9
80	25.6	56.8	240.8	253.6
90	28.8	63.9	270.9	285.3
100	32.0	71.0	301.0	317.0
110	35.2	78.1	331.1	
120	38.4	85.2	361.2	
130	41.6	92.3	391.3	
140	44.8	99.4	421.4	
150	48.0	106.5	451.5	
160	51.2	113.6	481.6	
170	54.4	120.7	511.7	
180	57.6	127.8	541.8	
190	60.8	134.9	571.9	
200	64.0	142.0	602.0	
210	67.2	149.1	632.1	
220	70.4	156.2	662.2	
230	73.6	163.3	692.3	
240	76.8	170.4	722.4	
250	80.0	177.5	752.5	
260		184.6	782.6	
270		191.7	812.7	
280		198.8	842.8	
290		205.9	872.9	
300		213.0	903.0	
310		220.1	933.1	
320		227.2	963.2	
330		234.3	993.3	
340		241.4	1023.4	
350		248.5	1053.5	
360			1083.6	
370			1113.7	
380			1143.8	
390			1173.9	
400			1204.0	

CREW AND PASSENGER SEATS
AND BAGGAGE MOMENT ARMS



11 SEAT CONFIGURATION

Figure 6-2 (Sheet 3 of 4)

WEIGHT AND MOMENT TABLES

EXAMPLE:

Takeoff Weight	9850 Pounds
Moment/100	17,511.7 Inch-Pounds
Center of Gravity	177.78 Inches

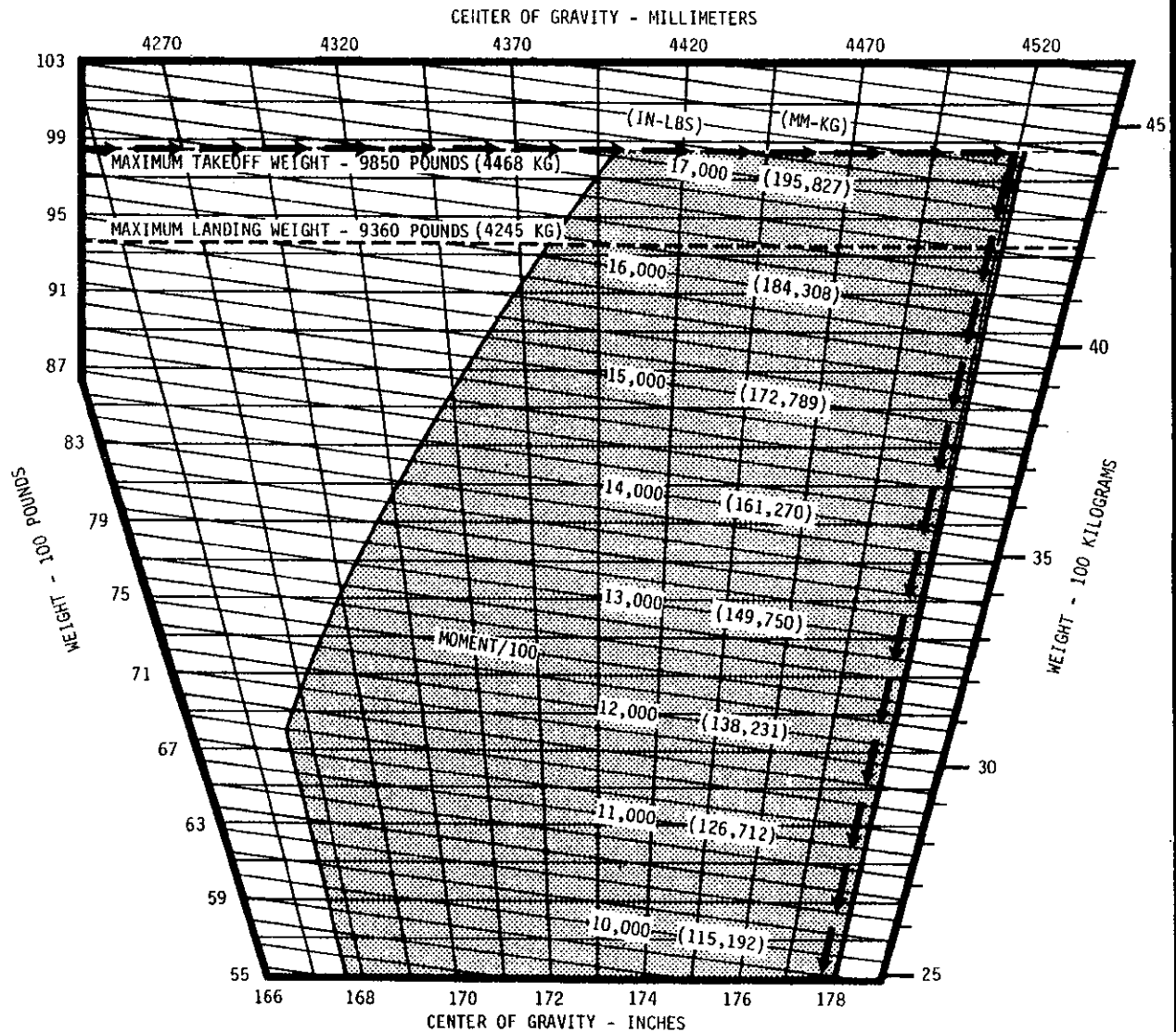


Figure 6-2 (Sheet 4 of 4)

SAMPLE WEIGHT AND BALANCE FORM

PAYLOAD COMPUTATIONS					ITEM	WEIGHT	MOMENT/ 100
ITEM OCCUPANTS OR CARGO	ARM	WEIGHT	MOMENT/ 100	1.	BASIC EMPTY WEIGHT	5862	10,007.4
				2.	PAYLOAD	1583	3117.7
SEAT 1	137	170	232.9	3.	ZERO FUEL WEIGHT (sub-total) (Do not exceed maxi- mum zero fuel weight of 8500 pounds)	7445	13,125.1
SEAT 2	137	170	232.9				
SEAT 3	178	170	302.6				
SEAT 4	178	170	302.6				
SEAT 5	209	170	355.3				
SEAT 6	209	170	355.3				
SEAT 7	249	170	423.3				
SEAT 8	249	170	423.3				
SEAT _				4.	FUEL LOADING	2480	4522.1
SEAT _				5.	RAMP WEIGHT (sub-total (Do not exceed maxi- mum ramp weight of 9925 pounds)	9925	17,647.2
SEAT _				6.	LESS FUEL FOR TAXIING	-75	-135.5
TOILET				7.	TAKEOFF WEIGHT (Do not exceed maximum takeoff weight of 9850 pounds)	9850	17,511.7
BAGGAGE				8.	LESS FUEL TO DESTINATION	-2000	-3634.4
AVIONICS				9.	LANDING WEIGHT (Do not exceed maximum landing weight of 9360 pounds)	7850	13,877.3
NOSE	71	79	56.1				
AFT CABIN FLOOR							
BAY A	301	144	433.4				
BAY B				Totals must be within approved weight and C.G. limits. It is the responsi- bility of the operator to insure that the airplane is loaded properly. The Basic Empty Weight C.G. is noted on the Airplane Weighing Form. If the airplane has been altered, refer to the Weight and Balance Record for this information.			
CABINET CONTENTS							
PAYLOAD	---	1583	3117.7				

Figure 6-3

WEIGHT AND BALANCE RECORD

(CONTINUOUS HISTORY OF CHANGES IN STRUCTURE OR EQUIPMENT
AFFECTING WEIGHT AND BALANCE)

[illegible]

Figure 6-4

EQUIPMENT LIST

For a complete list of the required and optional equipment installed in the airplane as delivered from the manufacturer, refer to the equipment list furnished with the airplane.

WEIGHT AND BALANCE COMPUTATION FORM

PAYLOAD COMPUTATIONS				R E F	ITEM	WEIGHT	MOMENT/ 100
ITEM OCCUPANTS OR CARGO	ARM	WEIGHT	MOMENT/ 100	1.	BASIC EMPTY WEIGHT		
				2.	PAYLOAD		
SEAT 1				3.	ZERO FUEL WEIGHT (sub-total) (Do not exceed maxi- mum zero fuel weight of 8500 pounds)		
SEAT 2							
SEAT 3							
SEAT 4							
SEAT 5				4.	FUEL LOADING		
SEAT 6				5.	RAMP WEIGHT (sub-total (Do not exceed maxi- mum ramp weight of 9925 pounds)		
SEAT 7							
SEAT 8							
SEAT _				6.	LESS FUEL FOR TAXIING		
SEAT _				7.	TAKEOFF WEIGHT (Do not exceed maximum takeoff weight of 9850 pounds)		
SEAT _							
TOILET							
BAGGAGE				8.	LESS FUEL TO DESTINATION		
AVIONICS				9.	LANDING WEIGHT (Do not exceed maximum landing weight of 9360 pounds)		
NOSE							
AFT CABIN FLOOR							
BAY A							
BAY B							
CABINET CONTENTS							
PAYLOAD							

Totals must be within approved weight and C.G. limits. It is the responsibility of the operator to insure that the airplane is loaded properly. The Basic Empty Weight C.G. is noted on the Airplane Weighing Form. If the airplane has been altered, refer to the Weight and Balance Record for this information.

AIRCRAFT LOAD DATA SHEET

Aircraft Type:-Cessna 441 Conquest.

Registration:-VH-TAZ.

Issue 5 Date:-2/08/2007 Expiry Date:- 02/08/2010

Approved Loading System:-Aeronautical Engineers Australia

Trimsheet No. AV1330TS/362 for Cessna 441 Conquest (2) VH-TAZ.

Dated 05/08/04.

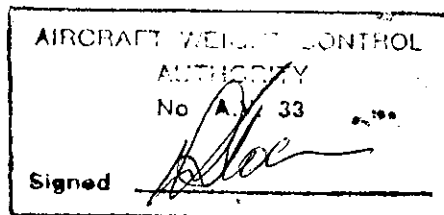
Aircraft Weight and Centre of Gravity Data.

<u>Item.</u>	<u>Weight Kg.</u>	<u>Arm mm.</u>	<u>Index Units Kg/mm.</u>	<u>Configuration</u>
Empty	2944	4370	12866756	Passenger 9 Seats Total.

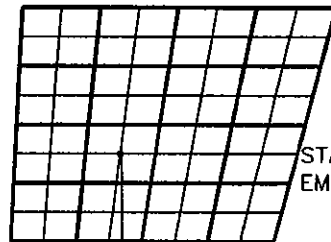
Notes:- Aircraft weighed with unusable fuel, full oils, and equipment as listed.

Club seating with seats 3 and 4 forward facing. Forward refreshment centre and R.H. Documents cabinet fitted.

Aircraft Datum is 2540 mm Forward of forward pressure bulkhead



INSTRUCTIONS FOR USE OF TRIMSHEET



START HERE WITH
EMPTY WT AND ARM

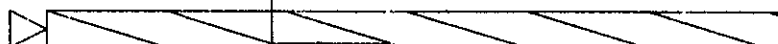
EMPTY WEIGHT (KG)

MOVE ACROSS TO THE
LEFT THE REQUIRED
No. OF DIVISIONS
(2 SHOWN)

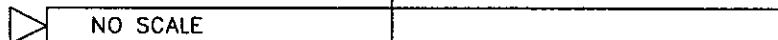


WEIGHT KG

MOVE ACROSS TO THE
RIGHT THE REQUIRED
No. OF DIVISIONS
(1 SHOWN)



MOVE DOWN VERTICALLY
IF NO SCALE

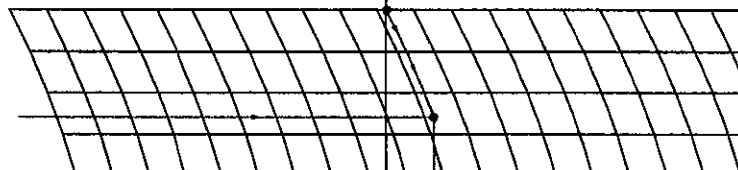


NO SCALE

TOTAL ALL WEIGHTS TO
GIVE ZERO FUEL WEIGHT

ZERO FUEL WEIGHT (KG)

SELECT FUEL QUANTITY.
MOVE FROM TOP TO SELECTED
QUANTITY RUNNING PARALLEL
TO FUEL LINES.



FUEL WEIGHT (KG)

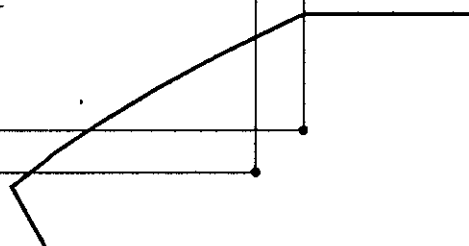
ADD ZERO FUEL WEIGHT
PLUS FUEL WEIGHT TO
GIVE TAKE OFF WEIGHT

TAKE OFF WEIGHT (KG)

MAX. TAKE OFF WEIGHT

AIRCRAFT
TAKE OFF
WEIGHT (kg)

AIRCRAFT
ZERO FUEL
WEIGHT (KG)



ENSURE THAT BOTH
THE INTERSECTION
POINTS LIE WITHIN THE
ENVELOPE.

NOTE: THE AIRCRAFT
ZERO FUEL WEIGHT
MUST BE NO GREATER
THAN THE MAX. ZERO
FUEL WEIGHT.

TASAIR PTY LTD

CESSNA 441 CONQUEST 2

Conquest Pilot
Operating Manual

Amendment N° 1

10 August 2004

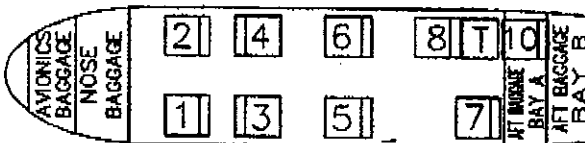
SECTION 1

33.2 Conquest 2 trim sheet

Cessna 441 Conquest

9/6 Seat Configuration with VG Kit (STC SA00487SE)

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SEE OPERATIONS OR
FLIGHT MANUAL FOR
INSTRUCTIONS ON
USING THIS TRIMSHEET.

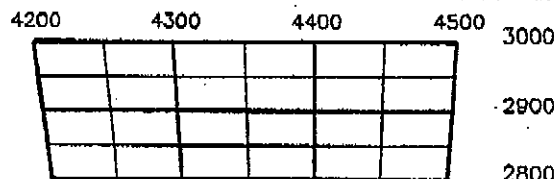
DATE:	
FLIGHT NO.:	
DEPART TIME:	
DEPART FROM:	
DESTINATION:	
VIA:	
AIRCRAFT:	
CAPTAIN:	
CO-PILOT:	

FOR 6 SEAT CONFIGURATION,
SEATS 7, 8 & 10 ARE REMOVED
& TOILET IS INSTALLED.

LOADING DECLARATION

I HEREBY CERTIFY THAT THE AIRCRAFT IS
LOADED IN ACCORDANCE WITH THE COMPANY
OPERATIONS MANUAL AND THAT THE
INFORMATION PRESENTED IN THIS DOCUMENT
IS CORRECT.SIGNED _____
DATE _____

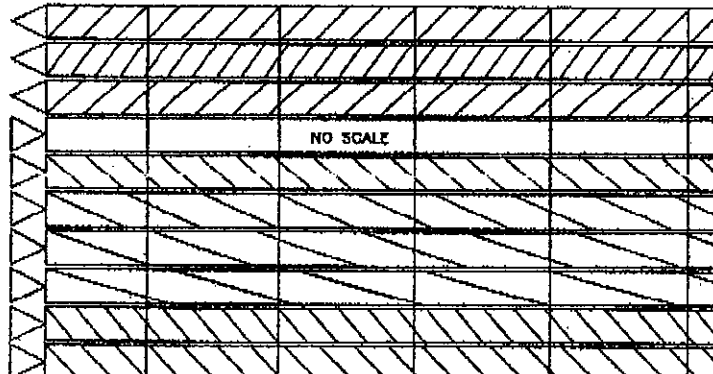
EMPTY ARM (mm)



EMPTY WEIGHT (KG)

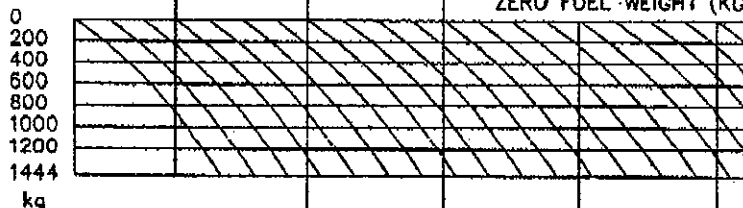
KG/div.

Avionics Baggage	20
Nose Baggage	20
Seats 1 & 2	86
Seats 3 & 4 (Aft Facing)	86
Seats 5 & 6	86
Seat 8	86
Seat 7	86
Seat 10	86
Aft Baggage Bay A	20
Aft Baggage Bay B	20



ZERO FUEL WEIGHT (KG)

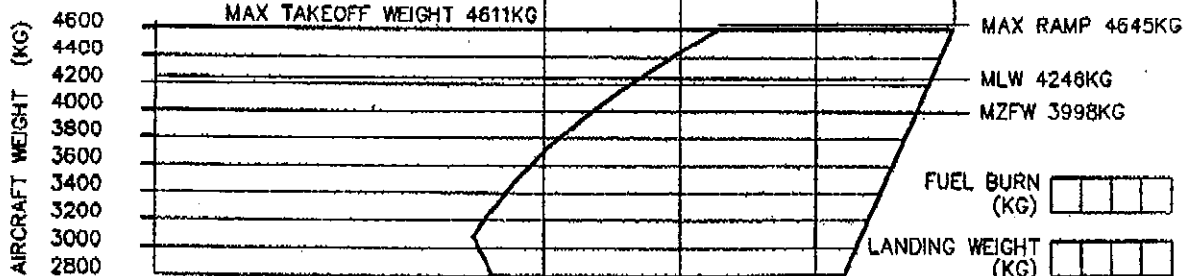
Fuel SG = 0.803



RAMP WEIGHT (KG)

LESS TAXI WEIGHT (KG)

TAKE OFF WEIGHT (KG)

THE ATS VG SYSTEM CONSISTS
OF 24 VORTEX GENERATORS.
IF 5 OR MORE ARE MISSING,
OR IF ANY ARE DAMAGED, THE
AIRCRAFT MUST BE OPERATED
IN ACCORDANCE WITH THE
ORIGINAL PILOT'S OPERATING
HANDBOOK AND FAA
APPROVED AIRPLANE FLIGHT
MANUAL.

TRIMSHEET No. AV1330TS/362

AEA Job #: AV11464.001

Issue 1:1

DATE: 05/08/04

Approved By: B. Boyes W584329

B

Cessna 441 Conquest
9/6 Seat Configuration with VG Kit (STC SA00487SE)

FILE: 102362.tr

VH-TAZ

AERONAUTICAL ENGINEERS AUSTRALIA

Ph: (08) 9414 7011 Fax: (08) 9414 7022

SECTION 7

AIRPLANE & SYSTEMS DESCRIPTIONS

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INTRODUCTION

Section 7 of this handbook provides a description and operation of the airplane and its systems.

NOTE

System descriptions for optional systems and equipment are presented in Section 9.

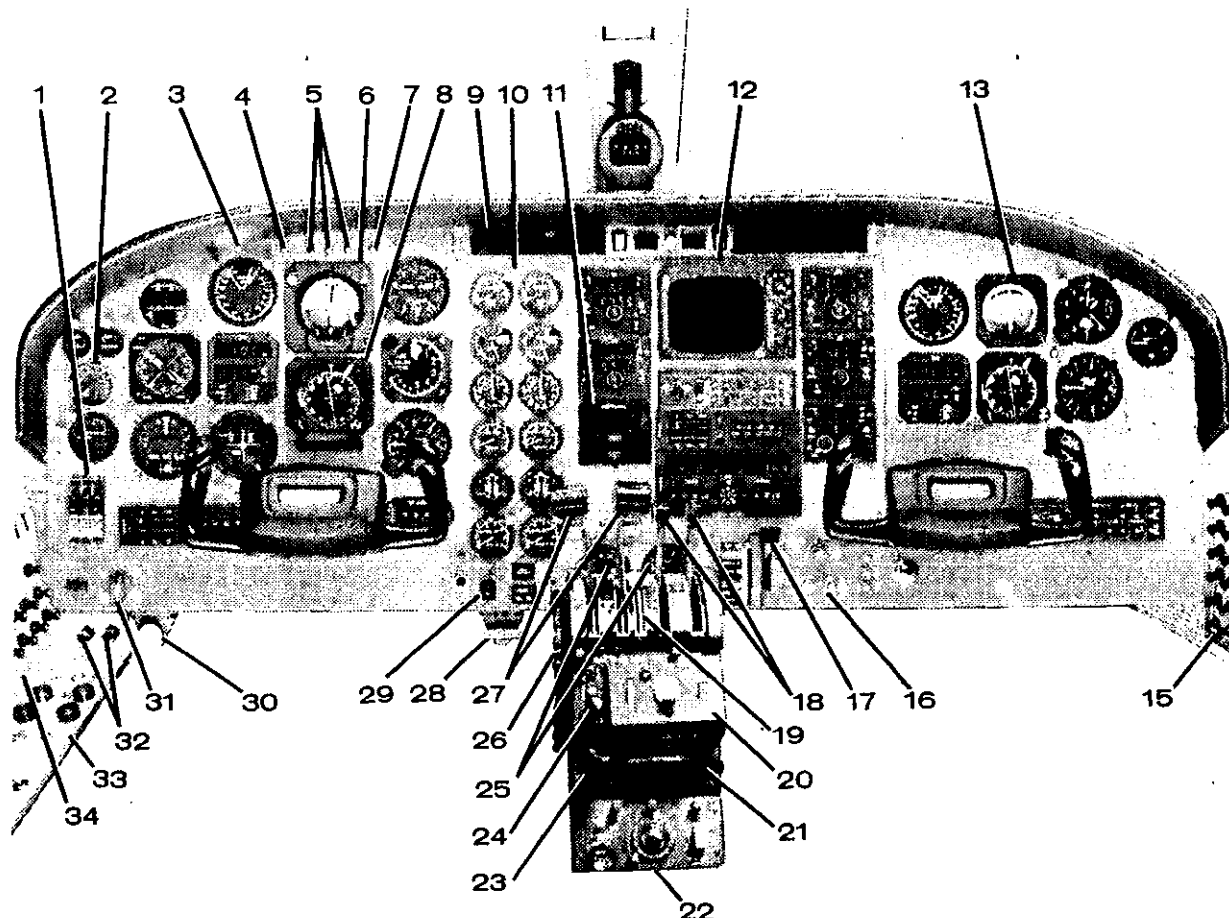
AIRFRAME

The 441 Conquest is an 8- to 11-place, all-metal, low-wing airplane. The fuselage and nacelles are of semi-monocoque construction. The wing and horizontal and vertical tail surfaces are of conventional aluminum construction. The center wing assembly contains 3 main spars which attach to the fuselage at bulkhead locations. The outer panel wing has 2 main spars which attach to the center wing assembly spars. The retractable landing gear is a tricycle design using an air-over-oil nose gear shock strut and oil-over-air main gear shock struts.

INSTRUMENT PANEL

The instrument panel, see Figure 7-1, contains the instruments and controls necessary for safe flight. The instrument panel presented is typical, as it contains all standard items and a good selection of popular optional equipment. The function and operation of the instrument panel features not described here have been explained in this section or Section 9 under the applicable system.

INSTRUMENT PANEL

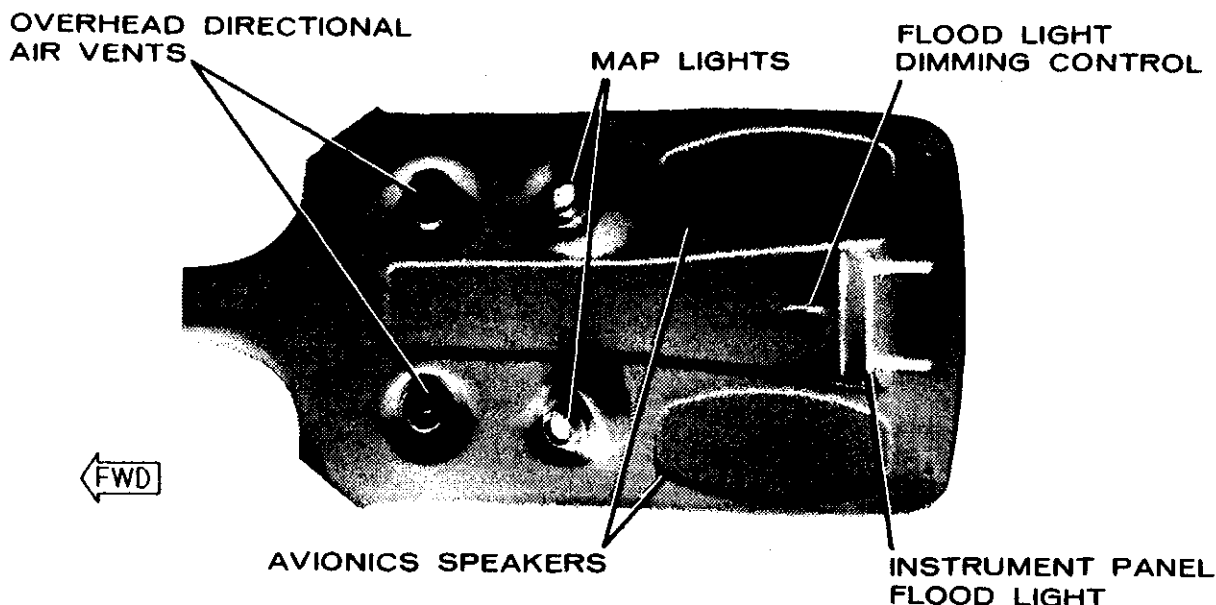


1. VOLTMETER AND AMMETERS	18. CONDITION LEVERS
2. OUTSIDE AIR TEMPERATURE GAGE	19. POWER AND CONDITION LEVERS
3. PILOT'S FLIGHT INSTRUMENT GROUP	FRICITION LOCK
4. AUTOPILOT OFF ANNUNCIATOR	20. AUTOPILOT (IFCS) CONTROL HEAD
5. MARKER BEACON LIGHTS	21. RUDDER TRIM CONTROL
6. FLIGHT DIRECTOR FDI	22. PRESSURIZATION CONTROL PANEL
7. ALTITUDE ALERT ANNUNCIATOR (OPTIONAL)	23. AILERON TRIM CONTROL
8. FLIGHT DIRECTOR HSI	24. PROPELLER SYNCHROPHASER CONTROLS
9. ANNUNCIATOR PANEL	25. CABIN PRESSURIZATION INDICATORS
10. ENGINE INSTRUMENT GROUP	26. ELEVATOR TRIM CONTROL
11. FLIGHT DIRECTOR MODE SELECTOR	27. POWER LEVERS
12. AVIONICS CONTROL PANEL	28. EMERGENCY LANDING GEAR EXTENSION T-HANDLE
13. COPILOT'S FLIGHT INSTRUMENT GROUP	29. LANDING GEAR SYSTEM CONTROLS AND INDICATORS
14. DELETED (NOT USED)	30. PARKING BRAKE CONTROL
15. RIGHT SIDE PANEL	31. FUEL CROSSFEED SELECTOR
16. ENVIRONMENTAL AND CABIN AIR CONTROLS	32. IGNITION OVERRIDE SWITCHES
17. WING FLAP POSITION SWITCH	33. LEFT SIDE CONSOLE
	34. LEFT SIDE PANEL

Figure 7-1

OVERHEAD CONSOLE

The overhead console, see Figure 7-2, includes the avionics speakers, instrument panel flood light with dimming control and pilot and copilot overhead directional air vents and map lights.



5714P6024

Figure 7-2

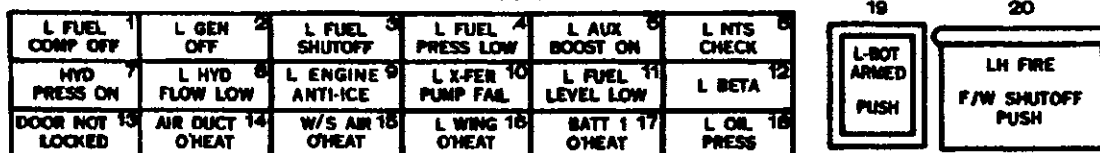
ANNUNCIATOR PANEL

The annunciator panel, see Figure 7-3, is located below the glare shield on the center instrument panel. The panel annunciates items of interest to the pilot in the applicable color of red, amber, green or white. Additional annunciators are provided on the airplane for specific standard or optional avionics systems; these annunciators are described with their associated systems in this section and Section 9.

When a hazardous condition exists, requiring immediate corrective action, a red warning light will illuminate. When an impending possibly dangerous condition exists, requiring attention but not necessarily immediate action, an amber light will illuminate. A green or white light will illuminate to indicate a safe or normal configuration, condition of performance, operation of essential equipment or to attract attention and impart information for routine action purposes.

A press-to-test button is provided in the center of the annunciator panel. With the battery and avionics switches ON and the press-to-test switch actuated, annunciator illumination will occur on all annunciator panel lights, monopole monitor lights (airplanes not incorporating Cessna Service Bulletin CQB01-1R2), Ignitor on lights, fire warning lights, landing gear position and unlocked lights, marker beacon lights, GA and DH lights on pilot's FDI, BC light in pilot's course indicator and optional RNAV annunciators. If the power levers are retarded or wing flaps extended beyond the APPR. position, the landing gear warning horn will sound, if the landing gear is not down and locked.

ANNUNCIATOR PANEL



NOTE

- The numbered annunciator lights correspond to the following descriptive text items.
- On airplanes 441-0049 thru 441-0172, the master lighting switch must be positioned to DAY during daylight operations to ensure maximum illumination of the annunciator panel lights.

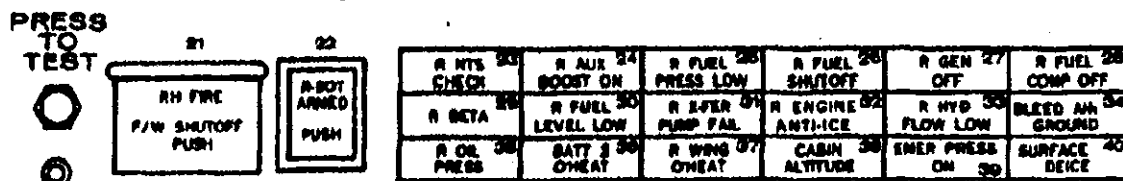
1. The amber left fuel computer of light advises the FUEL COMPUTER switch is off or the fuel computer was deenergized by the fuel computer monitor circuit.
2. The amber left generator off light, above 60% engine RPM, advises the L GEN switch is off or a generator malfunction exists.
3. The amber left fuel shutoff light advises the left engine fuel flow has been terminated at the firewall.
4. The amber left fuel pressure low light advises failure of the left main or auxiliary fuel boost pump. Momentary illumination of the light is normal when switching from one fuel boost pump to the other.
5. The amber left auxiliary boost pump light advises the left auxiliary boost pump is in operation. Illumination is normal when the L FUEL BOOST switch is positioned to AUX or during fuel crossfeed when operating the right engine from the left tank. The light will also illuminate if the main boost pump should fail as the auxiliary boost pump will automatically engage.
6. The amber left negative torque sensing check light should illuminate during the NTS check to verify proper operation of the negative torque sensing system. This light is for check purposes only and will not indicate inflight NTS operation.
7. The amber hydraulic pressure on light advises hydraulic pressure is being applied to the landing gear or wing flap retraction and extension system.
8. The amber left hydraulic flow low light advises insufficient flow exists for normal system operation.
9. Illumination of the green left engine anti-ice on light indicates that the valve which allows bleed air flow to the engine air inlet is open when the engine inlet heat switch is turned on. Verification of the light indication can be checked by observing engine torque decrease during normal operation. This indicates bleed air is flowing to the engine inlet.
10. The amber left transfer pump fail light indicates failure of the forward and/or aft fuel transfer ejector pump in the left wing tank. Expect unusable fuel quantity to increase, particularly in uncoordinated flight and climbs or descents. The light can also be used as a low fuel warning as it will illuminate when the total fuel quantity in the left tank is less than 80 pounds or less than 580 pounds with the combination main and auxiliary fuel boost pumps OFF.
11. The amber left fuel level low light advises between 150 and 250 pounds of fuel remains in the left main tank.
12. The amber left beta light advises the propeller is capable of being reversed. Light illumination is normal during ground operation.
13. The red door not locked light advises the main cabin door is not secured for flight.
14. The amber air duct overheat light advises air temperature in the cabin distribution duct is above 157°C.
15. The red windshield air overheat light advises the duct temperature for windshield bleed air is above 157°C.
16. The red left wing overheat light advises the inboard wing leading edge temperature is above 149°C due to a failure of the bleed air supply line. The left engine bleed air firewall shutoff will automatically actuate, terminating bleed air flow.
17. The red #1 (forward) battery overheat light will be off when the battery temperature is less than 63°C. When the battery temperature is between 63°C and 71°C, the light will illuminate steadily. When the battery temperature is above 71°C, or the PRESS TO TEST switch is actuated, the light will flash.
18. The red left oil pressure light advises the left engine oil pressure is less than 40 PSI.
19. The optional white left fire bottle armed light advises the left engine fire extinguisher is armed and electrically capable of being fired. Pressing the bottle armed light will discharge the fire extinguisher.
20. The red left engine fire warning light advises the engine compartment temperature has exceed normal operating temperatures. Lifting the clear plastic cover and pressing the left engine warning light will arm the optional fire extinguisher, disable the generator and close the bleed air and fuel firewall shutoff valves. The light will go out after the engine compartment has cooled to a normal temperature.

Figure 7-3 (Sheet 1 of 3)

1 August 1977

Revision 11 - 2 January 1985

ANNUNCIATOR PANEL

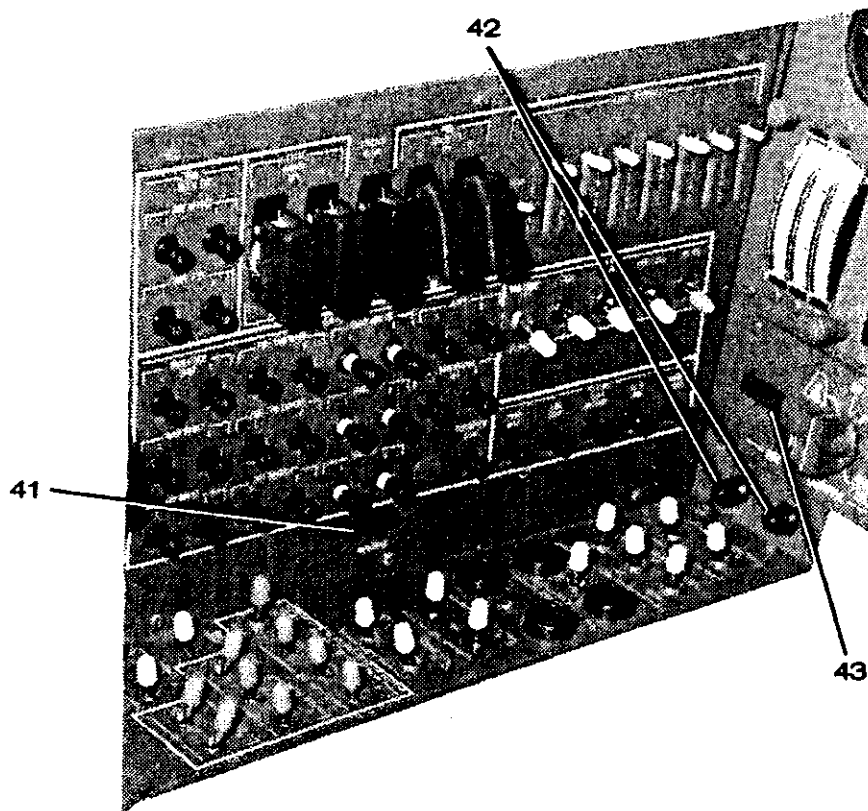


21. The red right engine fire warning light advises the engine compartment temperature has exceeded normal operating temperatures. Lifting the clear plastic cover and pressing the left engine warning light will arm the optional fire extinguisher, disable the generator and close the bleed air and fuel firewall shutoff valves. The light will go out after the engine compartment has cooled to a normal temperature.
22. The optional white right fire bottle armed light advises the right engine fire extinguisher is armed and electrically capable of being fired. Pressing the bottle armed light will discharge the fire extinguisher.
23. The amber right negative torque sensing check light should illuminate during the NTS check to verify proper operation of the negative torque sensing system. This light is for check purposes only and will not indicate inflight NTS operation.
24. The amber right auxiliary boost pump light advises the left auxiliary boost pump is in operation. Illumination is normal when the R FUEL BOOST switch is positioned to AUX or during fuel crossfeed when operating the left engine from the right tank. The light will also illuminate if the main boost pump should fail as the auxiliary boost pump will automatically engage.
25. The amber right fuel pressure low light advises failure of the left main or auxiliary fuel boost pump. Momentary illumination of the light is normal when switching from one fuel boost pump to the other.
26. The amber right fuel shutoff light advises the right engine fuel flow has been terminated at the firewall.
27. The amber right generator off light, above 60% engine RPM, advises the R GEN switch is off or a generator malfunction exists.
28. The amber right fuel computer off light advises the FUEL COMPUTER switch is off or the fuel computer was deenergized by the fuel computer monitor circuit.
29. The amber right beta light advises the propeller is capable of being reversed. Light illumination is normal during ground operation.
30. The amber right fuel level low light advises between 150 and 250 pounds of fuel remains in the right main tank.
31. The amber right transfer pump fail light indicates failure of the forward and/or aft fuel transfer ejector pump in the right wing tank. Expect unusable fuel quantity to increase, particularly in uncoordinated flight and climbs or descents. The light can also be used as a low fuel warning as it will illuminate when the total fuel quantity in the right tank is less than 80 pounds or less than 580 pounds with the combination main and auxiliary fuel boost pumps OFF.
32. Illumination of the green right engine anti-ice on light indicates that the valve which allows bleed air flow to the engine air inlet is open when the engine inlet heat switch is turned on. Verification of the light indication can be checked by observing engine torque decrease during normal operation. This indicates bleed air is flowing to the engine inlet.
33. The amber right hydraulic flow low light advises insufficient flow exists for normal system operation.
34. The amber bleed air ground light advises the pressurization source selector is positioned to GND.
35. The red right oil pressure light advises the right engine oil pressure is less than 40 PSI.
36. The red #2 (aft) battery overheat light will be off when the battery temperature is less than 63°C. When the battery temperature is between 63°C and 71°C, the light will illuminate steadily. When the battery temperature is above 71°C, or the PRESS TO TEST switch is actuated, the light will flash.
37. The red right wing overheat light advises the inboard wing leading edge temperature is above 149°C due to a failure of the bleed air supply line. The right engine bleed air firewall shutoff will automatically actuate, terminating bleed air flow.
38. The red cabin altitude light advises cabin altitude is above 10,900 feet (airplanes not incorporating SK441-36) or 11,500 feet (airplanes incorporating SK441-36).
39. The red emergency pressurization light advises emergency pressurization was automatically selected due to an air cycle machine overheat.
40. The green surface deice light, upon actuation of the DEICE BOOTS switch, advises the deice boots have achieved proper operating pressure. The light will illuminate during the tail boot cycle and again during the wing boot cycle.

Figure 7-3 (Sheet 2 of 3)

ANNUNCIATOR LIGHTS

A22757



5714P6008

NOTE

Additional system annunciator lights are provided for landing gear position, propeller synchrophaser and avionics systems. These annunciators are discussed with the applicable system in this section and Section 9.

- * 41. Illumination of the LEFT FAIL or RIGHT FAIL monopole monitor light advises that one of the two engine speed signals has failed on the left or right engine. Light illumination is also used in completing the electronic fuel control high-power monitor check.
- 42. Illumination of the left or right ignition on lights advises the engine ignitor plugs are energized.
- 43. Illumination of the fuel crossfeed IN TRANSIT light advises the fuel crossfeed valves are not fully opened or closed, or do not coincide with the selector switch position.

* Airplanes not incorporating Cessna Service Bulletin CQB01-1R2.

FLIGHT CONTROLS SYSTEM

The flight controls consist of the ailerons, elevators and rudder and their respective trim systems. All of these surfaces are statically mass balanced.

AILERON SYSTEM

Each aileron, see Figure 7-4, is attached to the rear main wing spar at two points. The aileron is actuated by a yoke assembly which is attached to a wheel in the wing. The wheel is actuated by cables attached to the pilot's control wheel. The aileron system is interconnected with the rudder system through a spring assembly.

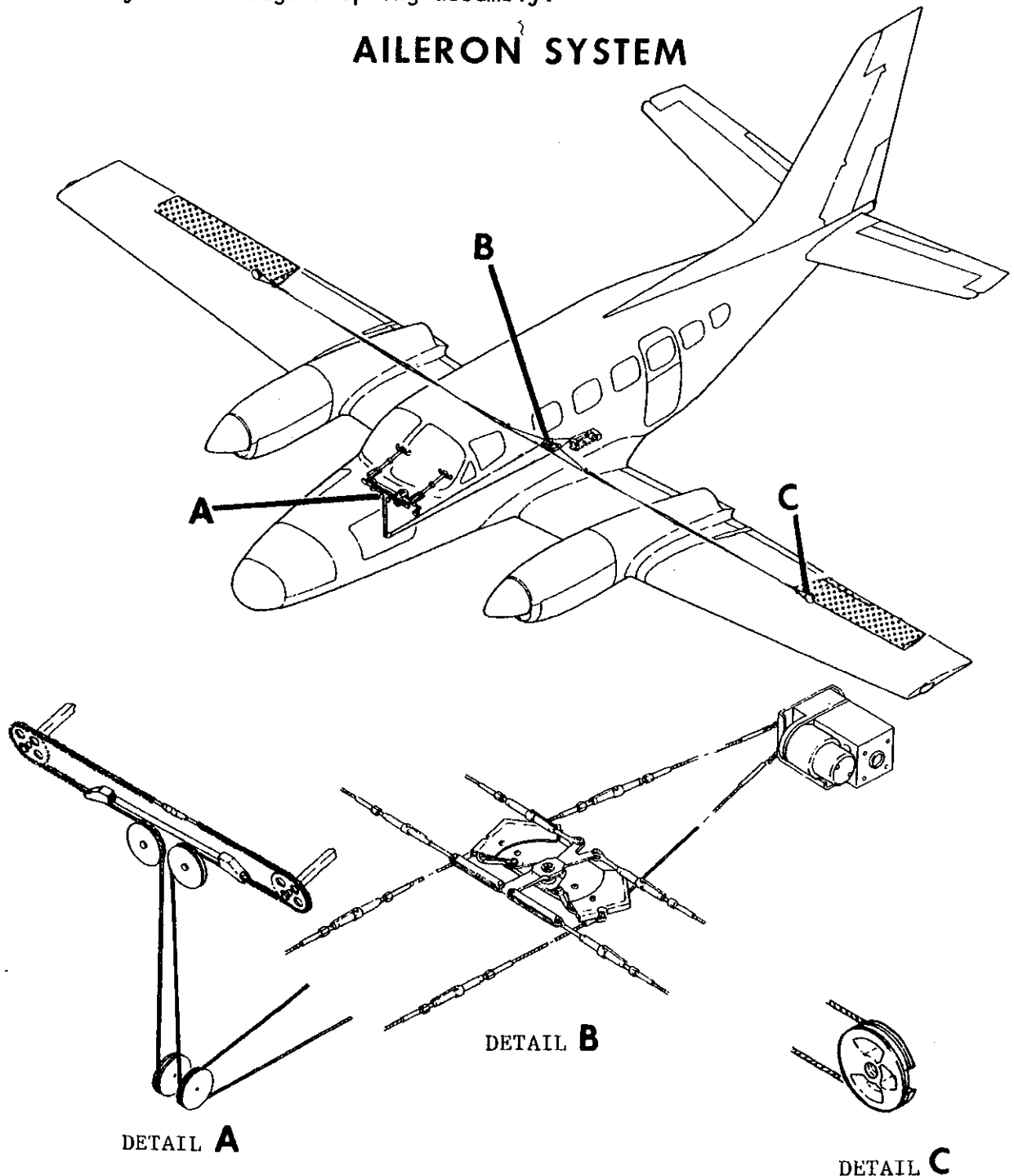


Figure 7-4

AILERON TRIM SYSTEM

Aileron trim, see Figure 7-5, is achieved by a trim tab attached to the left aileron with a full length piano-type hinge. The trim tab is actuated by a push-pull rod which is attached to a jack screw type actuator in the wing. The actuator is driven by cables attached to the trim control knob on the cockpit control pedestal.

AILERON TRIM SYSTEM

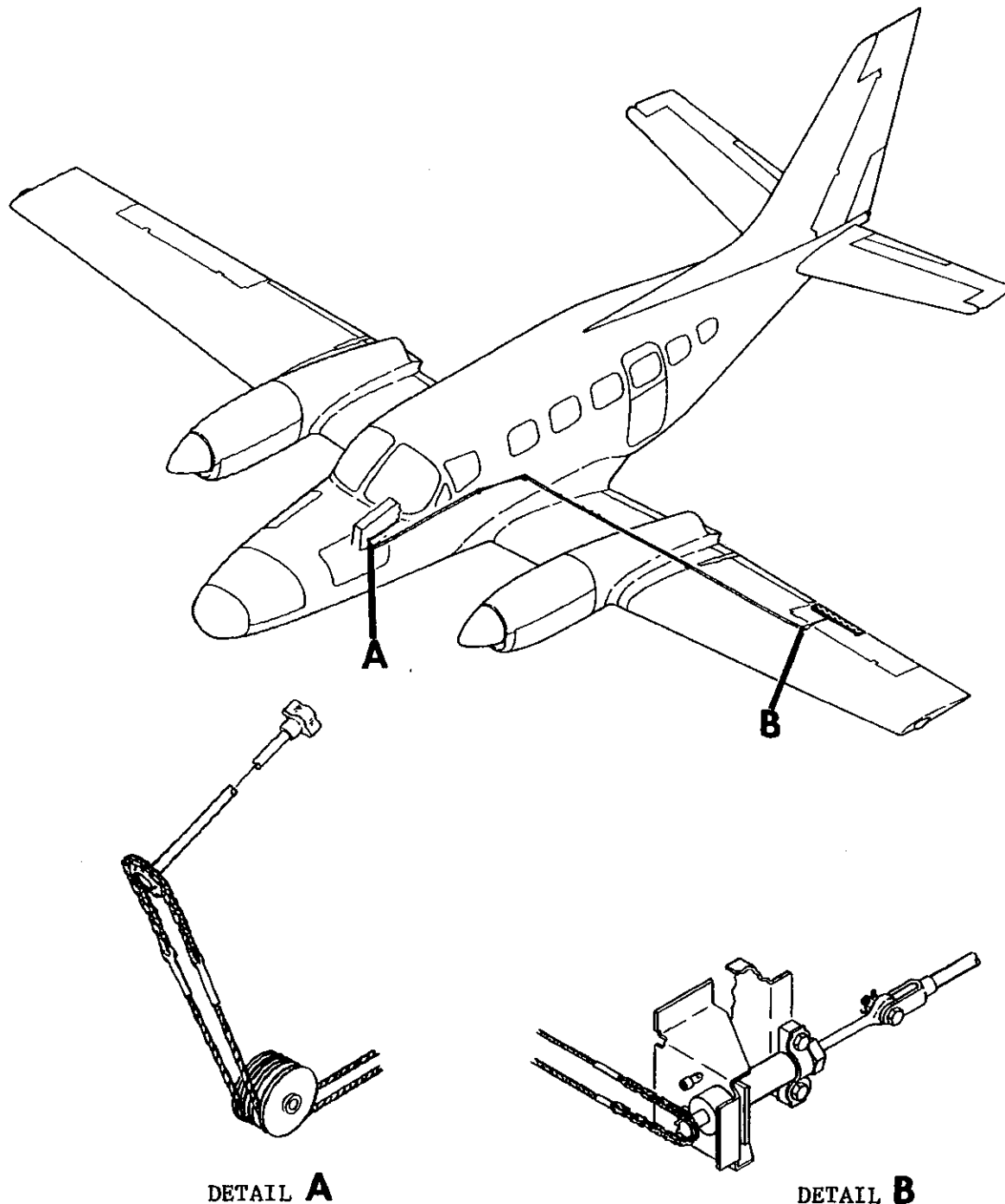


Figure 7-5

ELEVATOR SYSTEM

The two elevator control surfaces, see Figure 7-6, are connected by a torque tube. The resulting elevator assembly is attached to the rear spar of the horizontal stabilizer at six points. The elevator assembly is actuated by a push-pull rod which is attached to a bell crank in the empennage. The bell crank is actuated by cables attached to the pilot's control wheel.

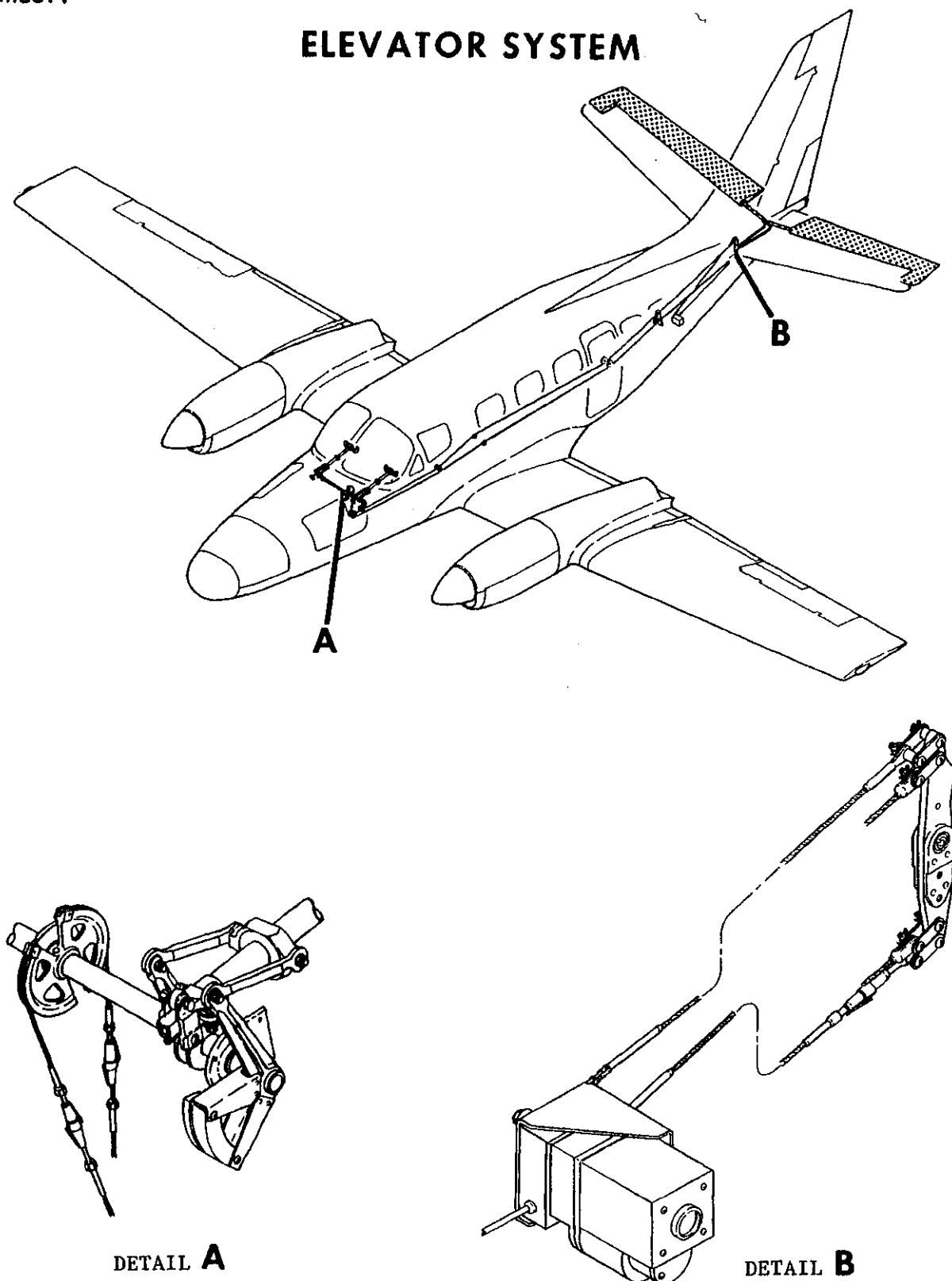
ELEVATOR SYSTEM

Figure 7-6

ELEVATOR TRIM SYSTEM

Elevator trim, see Figure 7-7, is achieved by an elevator trim tab attached to the right and left elevators with a full length piano-type hinge. The trim tabs are actuated by push-pull rods which are attached to dual jack screw type actuators in the horizontal stabilizer. The actuators are driven by cables attached to the trim control wheel on the cockpit control pedestal.

ELEVATOR TRIM SYSTEM

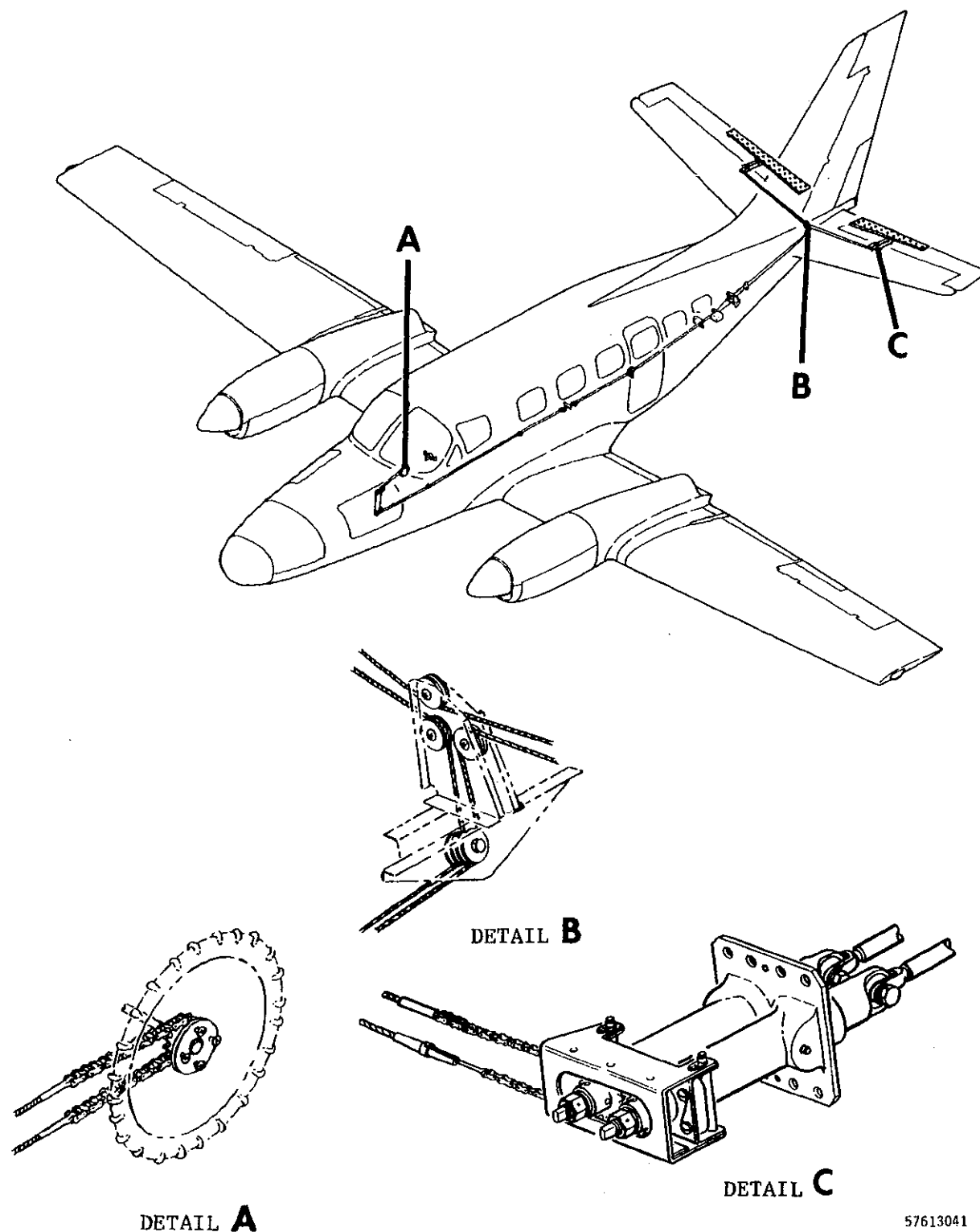


Figure 7-7

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RUDDER SYSTEM

The rudder, see Figure 7-8, is attached to the vertical stabilizer rear main spar at three points. The rudder is actuated by a bell crank attached to the bottom of the rudder. The bell crank is actuated by cables attached to the cockpit rudder pedals. The rudder system is interconnected with the aileron system through a spring assembly.

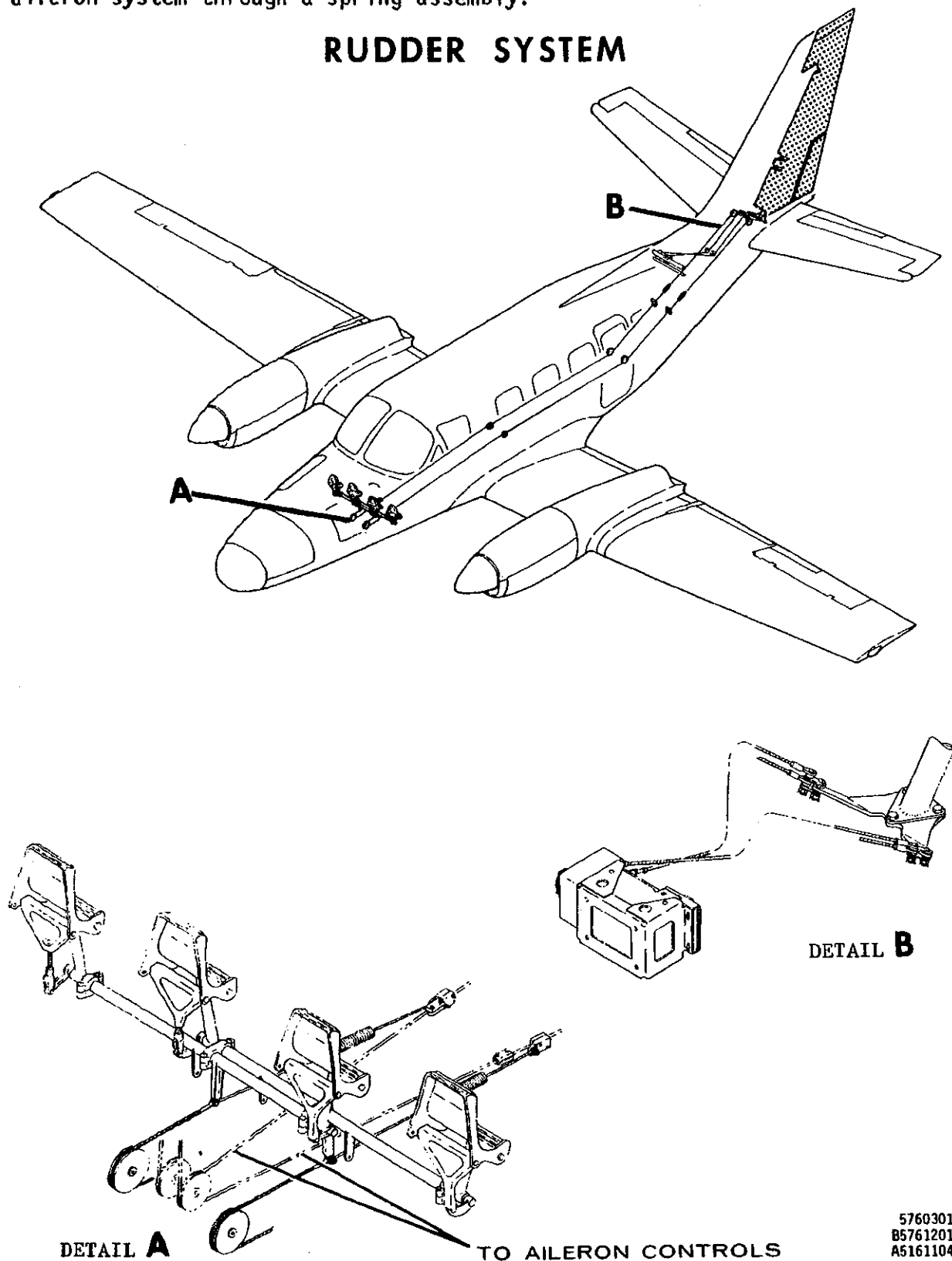
RUDDER SYSTEM57603014
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Figure 7-8

RUDDER TRIM SYSTEM

Rudder trim, see Figure 7-9, is achieved by a trim tab attached to the lower half of the rudder with a full length piano-type hinge. The trim tab is actuated by a push-pull rod which is attached to a jack screw type actuator in the vertical stabilizer. The actuator is driven by cables attached to the rudder trim wheel on the cockpit control pedestal. The rudder trim tab also acts as a servo tab so that aerodynamic forces on the tab will move the rudder to the selected position, which reduces the forces required to activate the rudder in flight.

RUDDER TRIM SYSTEM

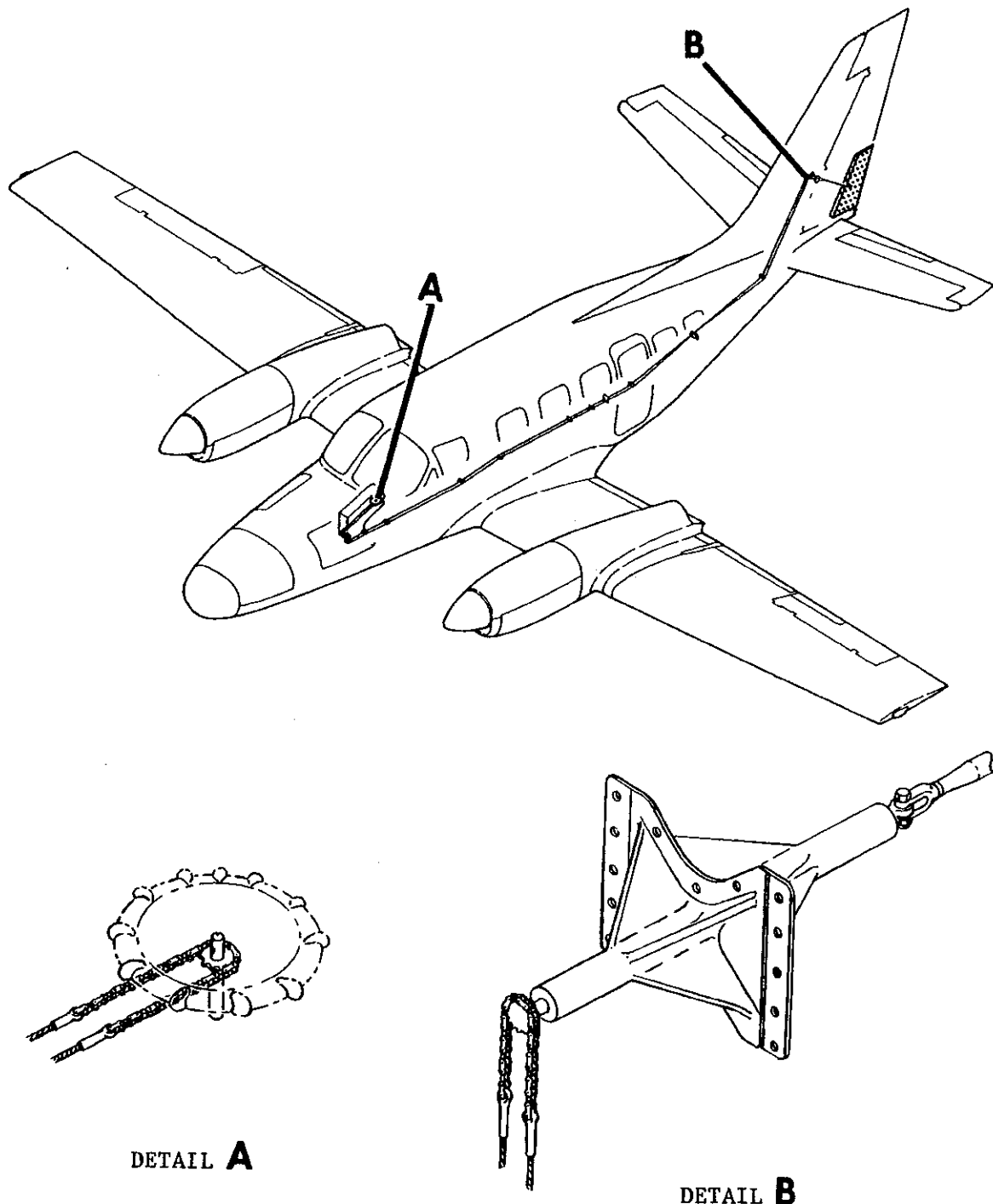


Figure 7-9

NOSEWHEEL STEERING SYSTEM

The nosewheel steering system, see Figure 7-10, consists of the rudder pedals, nose gear, bungee spring assembly and cables. During ground operation, the nose gear automatically engages the nosewheel steering system, allowing normal directional control.

NOSEWHEEL STEERING SYSTEM

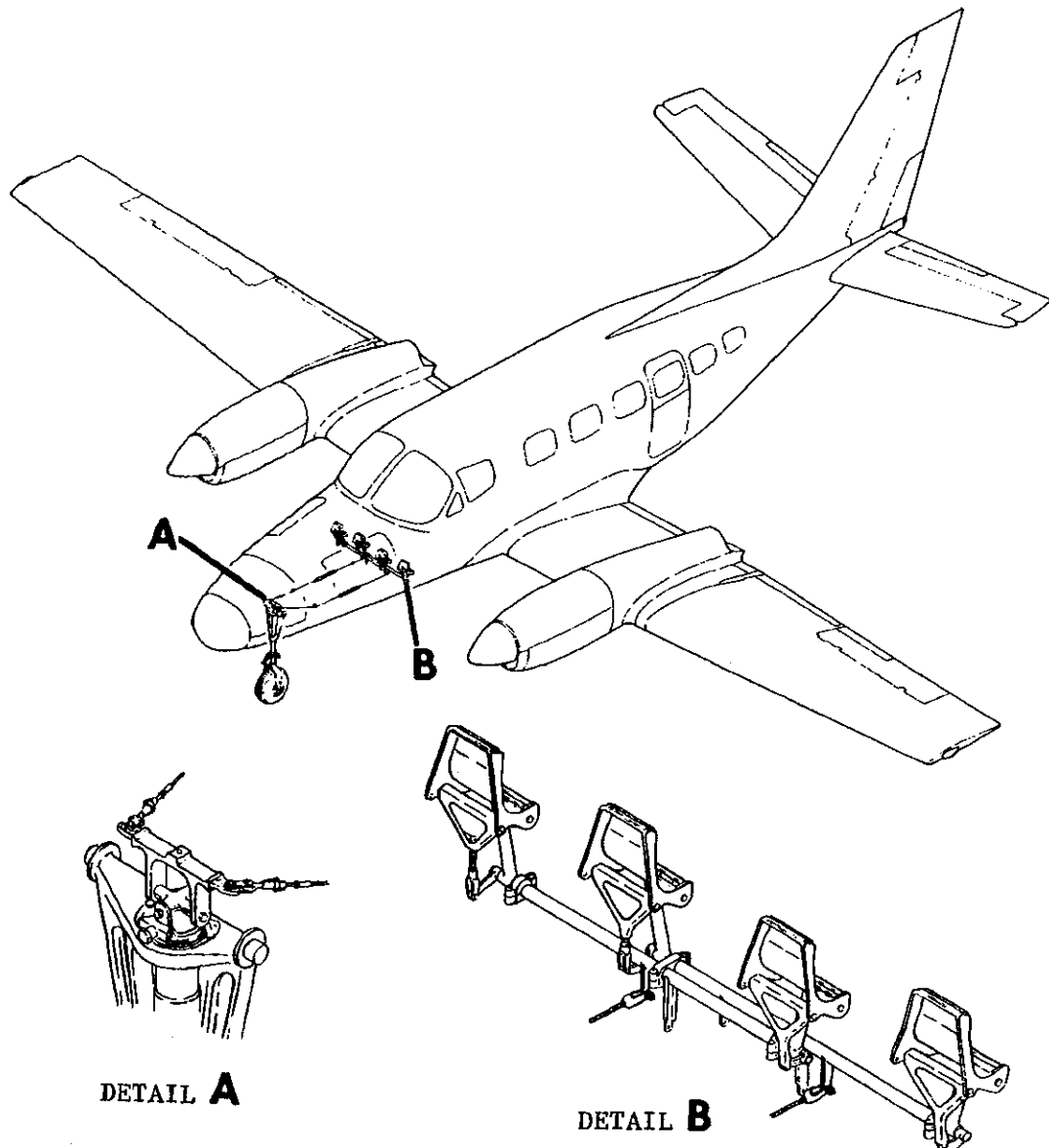


Figure 7-10

The minimum turning distance is presented in Figure 7-11. Always use as large a radius of turn as is practical. Turning tighter than necessary requires excessive braking on the inboard wheel which decreases the tire life.

NOTE

Minimum turning distance is effected with inboard wheel brake locked, full rudder and differential power.

MINIMUM TURNING DISTANCE

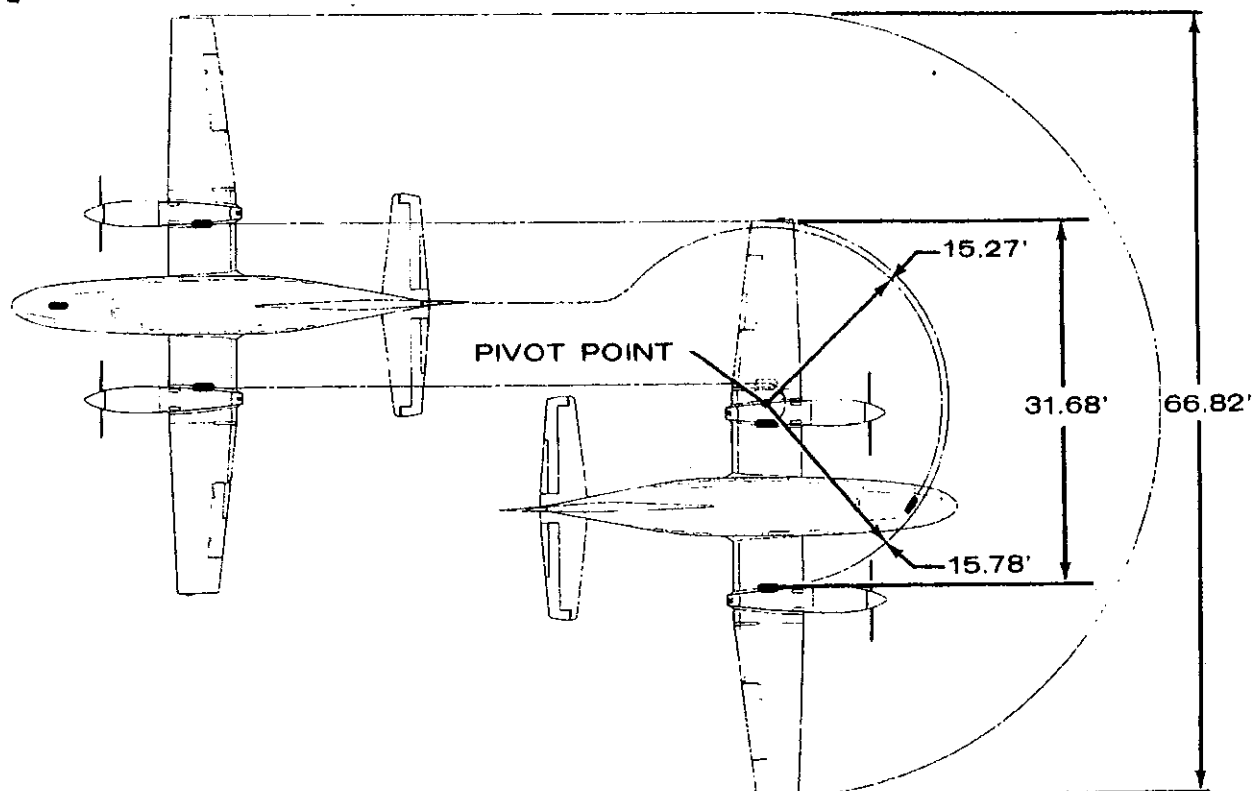


Figure 7-11

WING FLAPS SYSTEM

The wing flaps, see Figure 7-12, are the extensible Fowler type. Each wing flap (two per side) is mounted on tracks which are attached to the wing rear spar. The wing flap sections are actuated by push-pull rods attached to bell cranks in the wing. The bell cranks in each wing are interconnected with push-pull rods. Each inboard push-pull rod is attached to the center bell crank which is actuated by a hydraulic flap actuator.

The hydraulically operated flap actuator is controlled by the wing flap position switch, see Figure 7-1. This switch incorporates a preselect feature which allows the pilot to select the amount of flap extension desired. With the wing flaps set at the UP, T.O., APPR or LAND positions, the corresponding inboard wing flap extensions are 0°, 10°, 20° and 30°. The outboard wing flaps are mechanically linked to the inboard sections, extending at a slower rate. When the inboard wing flaps are fully extended (30°), the outboard wing flaps are extended 20°.

Selecting the UP, T.O., APPR or LAND position on the wing flap selector switch causes the hydraulically operated flap actuator to drive the flaps toward the selected position. When the actual flap position equals the selected position, limit switches will electrically actuate the flap control valve which stops the flow of hydraulic fluid to the hydraulic flap actuator. The wing flaps will complete the extension cycle in approximately 15 seconds with both engines operating.

Each engine's hydraulic pump supplies hydraulic pressure to actuate the wing flaps. The HYD PRESS ON indicator lights, see Figure 7-3, will remain on until the wing flaps reach their selected position. The hydraulic reservoir, located in the inboard left wing, incorporates a sight gage for checking the fluid level. The sight gage, incorporated into the reservoir

filler cap is flush with the upper wing skin and should be checked during the preflight inspection. If the sight gage is dark in color, the reservoir does not require servicing. If the sight gage is clear, service the reservoir before flight. On airplane serials 441-0001 thru 441-0116, reservoir pressure will automatically relieve when the cap is opened. On airplane serials 441-0117 thru 441-0172, a pressure relief valve is provided on the lower surface of the wing to allow system pressure to be relieved before removing the reservoir cap.

WING FLAPS SYSTEM

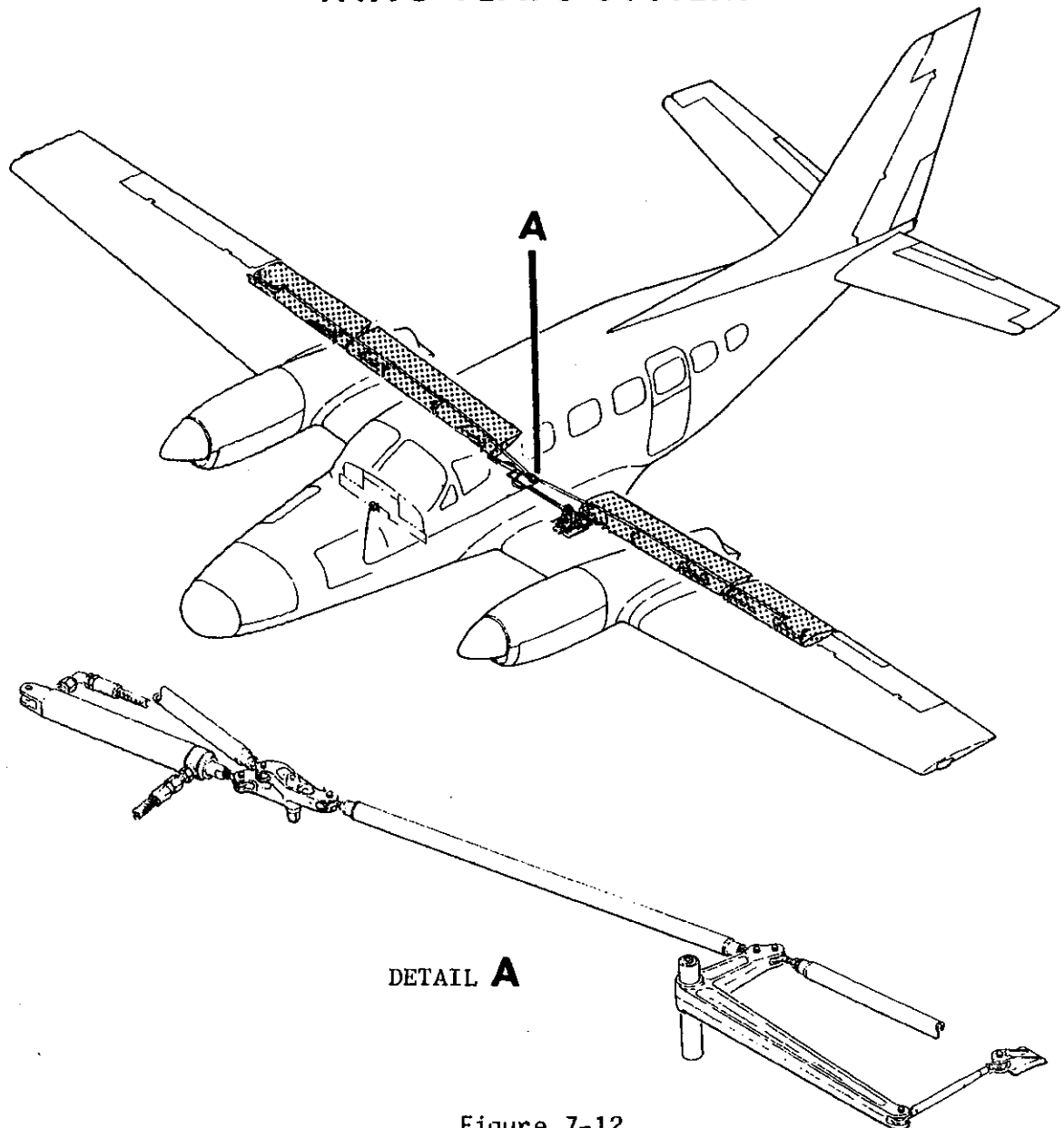


Figure 7-12

LANDING GEAR SYSTEM

The retractable tricycle landing gear, see Figure 7-13, is electrically controlled and hydraulically actuated. The individual landing gear actuators incorporate an internal lock to hold the landing gear in the extended position. The landing gear is held in the retracted position by mechanical uplocks that are released hydraulically during gear extension. The landing gear completes the retraction cycle in approximately 5.0 seconds with both engines operating.

Each engine's hydraulic pump supplies hydraulic pressure to actuate the landing gear. The actuation cycle time increases with the loss of an engine-driven hydraulic pump. The hydraulic reservoir, located in the inboard left wing, incorporates a sight gage, see Figure 7-14, for checking the fluid level. The sight gage, incorporated into the reservoir filler cap is flush with the upper wing skin and should be checked during the pre-flight inspection. If the sight gage is dark in color, the reservoir does not require servicing. If the sight gage is clear, service the reservoir before flight. On airplane serials 441-0001 thru 441-0116, reservoir pressure will automatically relieve when the cap is opened. On airplane serials 441-0117 thru 441-0172, a pressure relief valve is provided on the lower surface of the wing to allow system pressure to be relieved before removing the reservoir cap.

An electrically actuated gear control valve controls the flow of hydraulic fluid to the individual gear cylinders. The gear control valve receives power through the landing gear position switch. During ground operation, accidental gear retraction, regardless of gear switch position, is prevented by a safety switch located on each main landing gear shock strut. The weight of the airplane compresses the shock struts, causing the safety switches to open, thus preventing electrical power from reaching the gear control valve.

LANDING GEAR SYSTEM

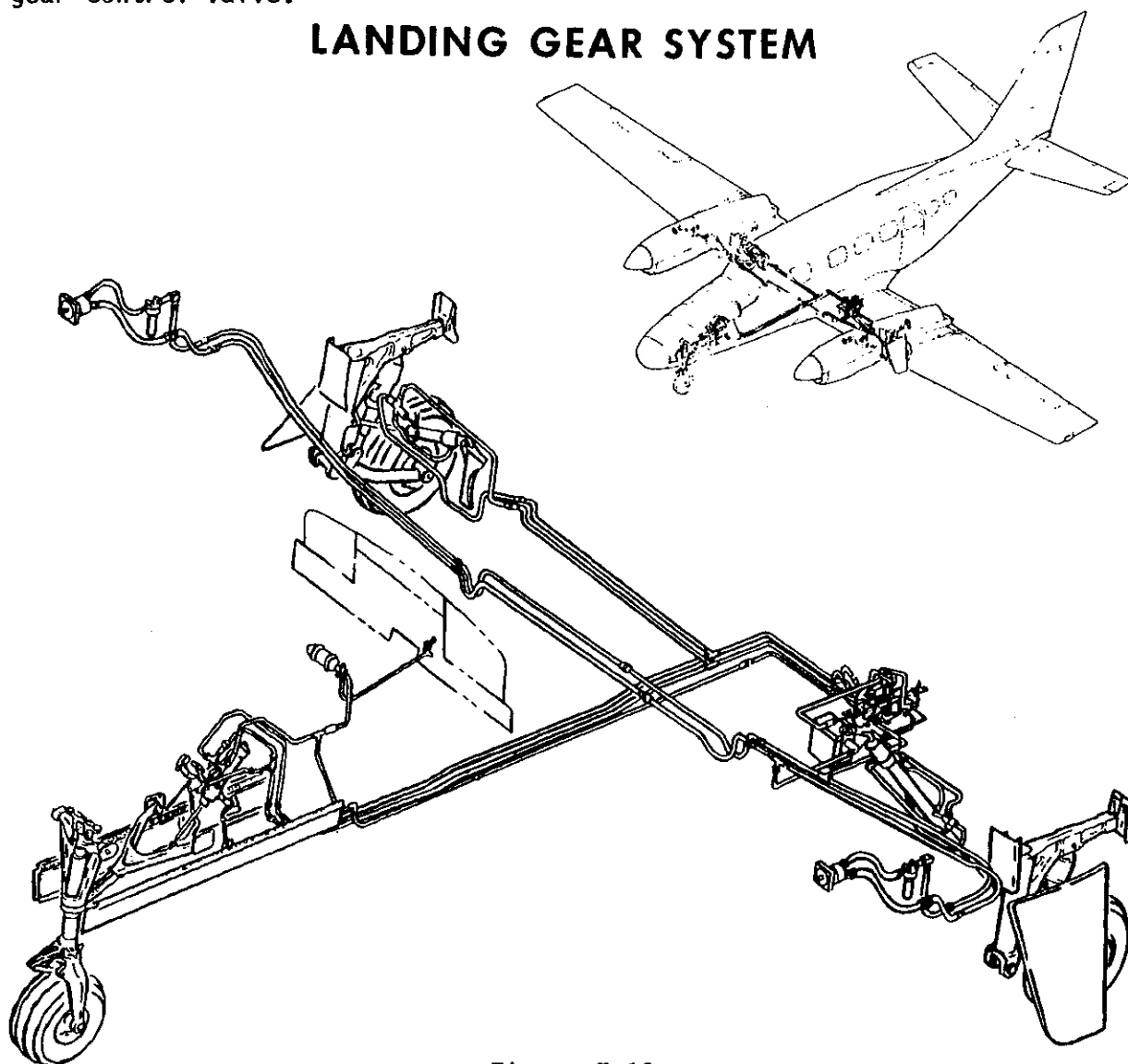


Figure 7-13

HYDRAULIC SYSTEM SCHEMATIC

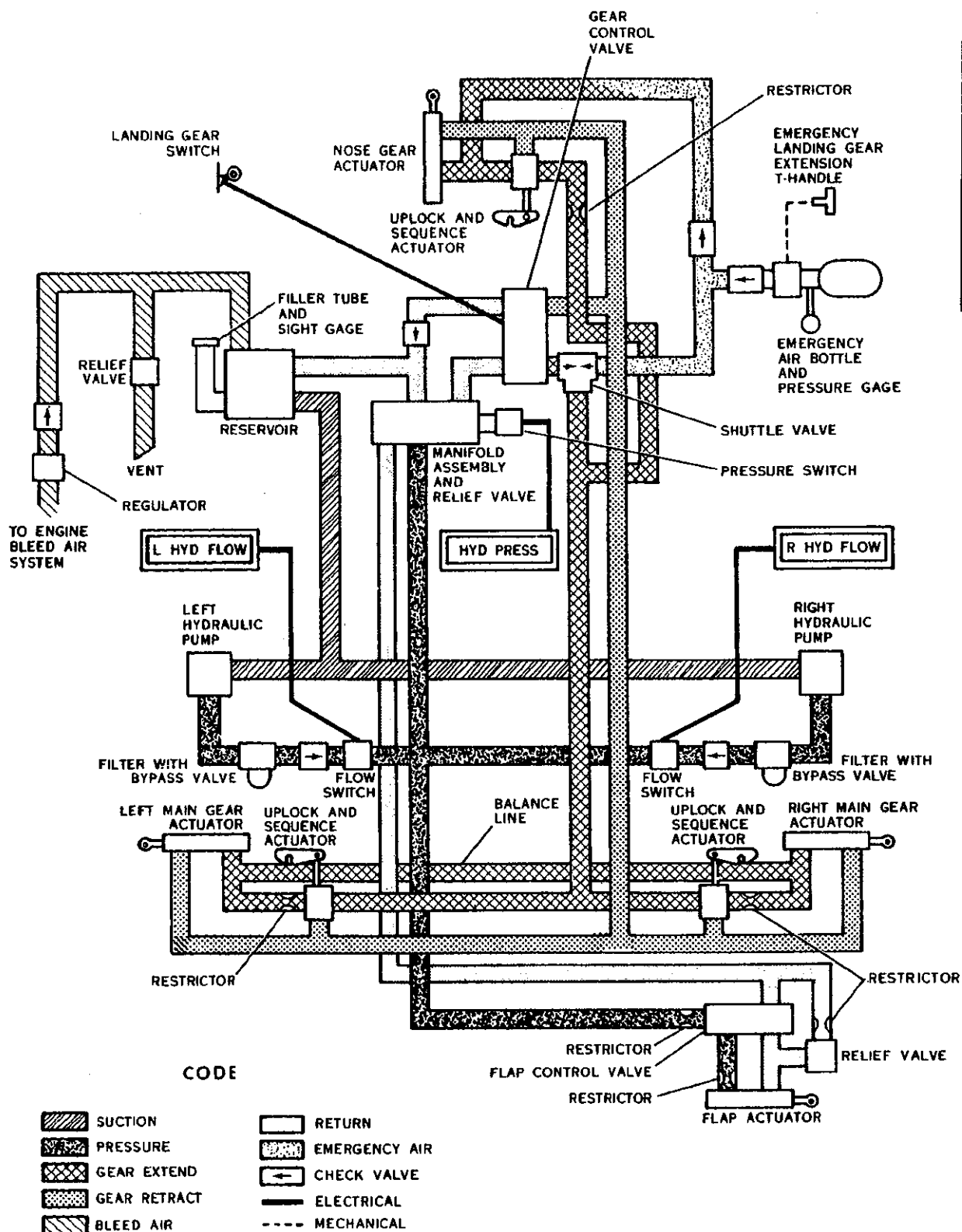


Figure 7-14

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The landing gear doors are mechanically linked to their respective landing gear, retracting and extending with each landing gear. The landing gear is operated by a switch, see Figure 7-1, which is identified by a wheel-shaped knob. The switch positions are UP and DOWN. To operate the gear, pull out the landing gear switch and move it to the desired position. This allows electrical power to energize the gear control valve and the hydraulic pressure to drive the landing gear toward the selected position. The hydraulic pressure light, located on the annunciator panel, see Figure 7-3, will remain on until the landing gear is locked into position. The system also incorporates a left and right hydraulic flow low light which illuminates when insufficient flow exists for normal system operation.

LEFT AND RIGHT MAIN LANDING GEAR SAFETY SWITCHES

A landing gear safety switch (squat switch) is located on each main landing gear strut to control ground and airborne operation of certain equipment.

The left landing gear safety switch prevents landing gear retraction, reduces stall vane deice heat and enables engine starting through the use of the starter motor while the airplane is on the ground. When the airplane is airborne, the left switch disables use of the engine motoring switch and allows operation of the unfeathering pumps during airtstarts.

The right landing gear safety switch allows the landing gear warning horn to sound if the landing gear selector switch is moved to the retracted position while the airplane is on the ground. On the ground it also maintains the safety and outflow pressurization valves in the open position to prevent cabin pressurization and disables flight-hour recorder and Davtron Digital Clock flight time operation. Airborne, the right switch allows the pressurization system, flight-hour recorder and Davtron clock flight time readout to function.

LANDING GEAR POSITION LIGHTS

Four landing gear position indicator lights, see Figure 7-15, are contained in two modules located beneath the avionics control panel just left of the center of the instrument panel. One module contains three of these lights (one for each gear) which are green and will illuminate when each landing gear is fully extended and locked. The other light module is red and will illuminate when any or all the gears are unlocked (intermediate position). When the gear unlocked light and gear down lights are not illuminated, the landing gear is in the UP and locked position.

LANDING GEAR WARNING HORN

The landing gear warning horn is controlled by the power levers and/or the wing flap position. The warning horn will sound intermittently if either or both power levers are retarded below approximately 1/8 inch forward of the flight idle detent with the landing gear retracted or if the wing flaps are lowered beyond the APPR. position with the landing gear in any position except extended and locked. The warning horn is also connected to the UP position of the landing gear position switch and will sound if the switch is placed in the UP position while the airplane is on the ground. The system can be checked by activating the PRESS-TO-TEST button, see Figure 7-3, located on the annunciator panel while retarding one power lever at a time. Also, lowering the wing flaps beyond the APPR. position with the PRESS-TO-TEST button activated will cause the landing gear warning horn to sound.

A warning horn disable switch is provided adjacent to the landing gear switch. During rapid descents with the power levers in flight idle, the horn disable switch can be used to silence the landing gear warning horn. Once the power levers are advanced, the horn will be reset. When the wing flaps are extended beyond the APPR. position and the landing gear is not down and locked, the horn cannot be silenced by the horn disable switch.

LANDING GEAR EMERGENCY EXTENSION SYSTEM

The landing gear emergency extension system, see Figure 7-15, consists of a red emergency landing gear extension T-handle, a blowdown bottle, located in the nose baggage compartment, and associated plumbing. The procedure for emergency gear extension is given in Section 3. Pulling the emergency control releases dry nitrogen under pressure into the shuttle valve, causing the shuttle valve to move from the hydraulic to air position. The nitrogen then flows into the uplocks which releases the gear to the free-fall position, and then into the landing gear cylinders, which drives the landing gear into the down and locked position. A shuttle valve prevents the nitrogen from entering the wing flap hydraulic system.

॥ श्रीगणेशाय नमः ॥

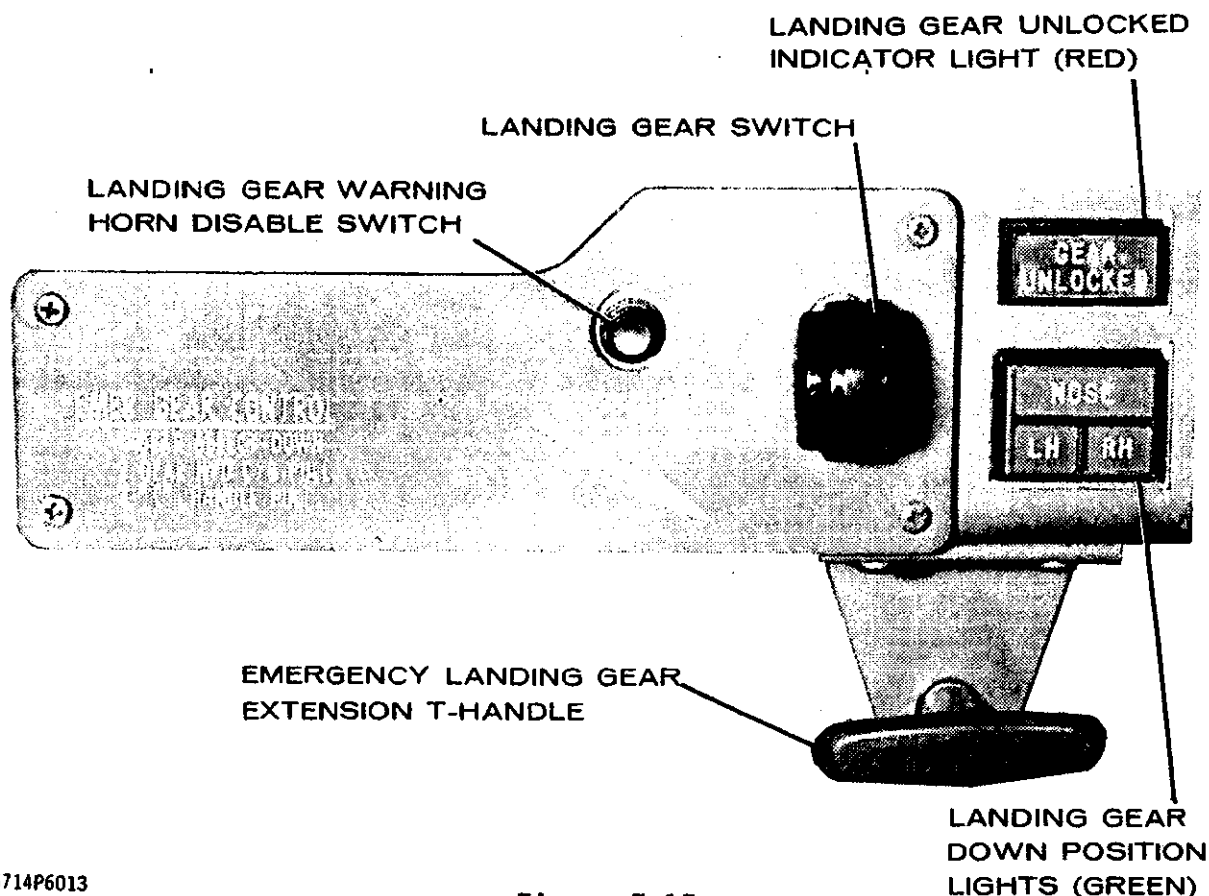
Journal of Interpersonal Violence 26(10)

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 $\mathcal{L}_{\text{reg}} = \frac{1}{2} \sum_{i=1}^n \|\mathbf{w}_i\|^2$

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EMERGENCY LANDING GEAR EXTENSION SYSTEM

5714P6013

Figure 7-15

NOTE

The landing gear cannot be retracted after emergency gear extension until the system has been ground serviced.

LANDING GEAR SHOCK STRUTS

Shock absorption is provided on each main landing gear by an oil-over-air shock strut which is between the upper trunnion and lower trailing link. This strut is composed of an upper barrel assembly and a lower piston assembly. The lower piston assembly, which fits inside the upper barrel assembly, contains an orifice and tapered metering pin which vary the resistance to shock according to severity transmitted to the upper barrel assembly.

Shock absorption is provided on the nose landing gear by an air-over-oil shock strut. This strut is composed of an upper barrel assembly and a lower piston assembly. The upper barrel assembly fits inside the trunnion. The lower piston assembly, which fits inside the upper barrel assembly, contains an orifice and tapered metering pin that vary the resistance to shock according to severity transmitted to the upper barrel assembly.

Landing gear shock struts should be checked before each flight to ensure they are not collapsed. This can readily be determined by a visual inspection of the shock strut lower piston assembly. If the unpainted surface of the lower piston assembly is not visible, the shock strut is fully collapsed and must be serviced before the airplane is operated.

FUEL SYSTEM

The fuel system, see Figure 7-16, consists of left and right fuel tanks, crossfeed system, engine fuel system, quantity and flow instrumentation and necessary lines; controls, valves, pumps, etc., to complete the system.

FUEL TANKS

The fuel tanks are an integral portion of the sealed wet wing. Each tank supplies fuel to its respective engine for all operations except crossfeeding.

Each fuel tank contains a fuel filler, feed and vent lines, fuel quantity measuring systems, drain valves, a hopper tank, transfer ejector pumps, electric boost pumps and other required hardware to complete the system.

Each fuel tank is serviced through a flush filler located in the top outboard surface of each wing.

A combination flush fuel vent and overflow tube assembly is located on the lower surface of the wing inboard from the fuel fillers. The flush fuel vent is non-icing by design.

Fuel quantity measuring is accomplished by capacitance-type probes located in each main tank and an independent low fuel warning system.

Drain valves are provided on the lower surface of each fuel tank to remove moisture and other contaminants from the tank.

The funnel-shaped hopper is located in the inboard end of each main tank, see Figure 7-17. Transfer ejector pumps continuously flow fuel into the hopper to assure a constant fuel supply for the submerged combination main and auxiliary boost pumps.

The transfer ejector pumps, located in the forward and aft inboard end of each fuel tank, transfer fuel from the lowest points of each fuel tank to the hopper. These ejector pumps utilize existing fuel pressure in conjunction with a venturi to produce a high-volume flow. As the high pressure fuel (motive flow) 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. Motive flow for operation of the transfer ejector pumps is continuously provided whenever the respective combination main or auxiliary boost pump is in operation. Continuous scavenging of fuel from the lowest points of each fuel tank ensures the maximum usable fuel in all normal flight attitudes.

Main and auxiliary fuel boost pumps are located in the bottom of each hopper tank, ensuring an adequate fuel supply to the selected engine(s). The main boost pump, actuated by positioning the FUEL BOOST switch to MAIN, provides fuel pressure for engine operation and motive flow for the transfer ejector pumps. Should the main boost pump fail, the pressure drop will be sensed by the auxiliary boost pump which will assume the duty of the main boost pump. Failure of the main boost pump will be indicated by illumination of the applicable left or right AUX BOOST ON annunciator light. The auxiliary boost pump can also be actuated by positioning the FUEL BOOST switch to the AUX position.

Failure of both the main and auxiliary fuel boost pumps will raise significantly the amount of unusable fuel remaining in the respective tank. Begin crossfeed operation from the operative side before the fuel level on the inoperative side reaches 150 pounds during level coordinated flight and 300 pounds during attitudes other than level.

FUEL SYSTEM SCHEMATIC

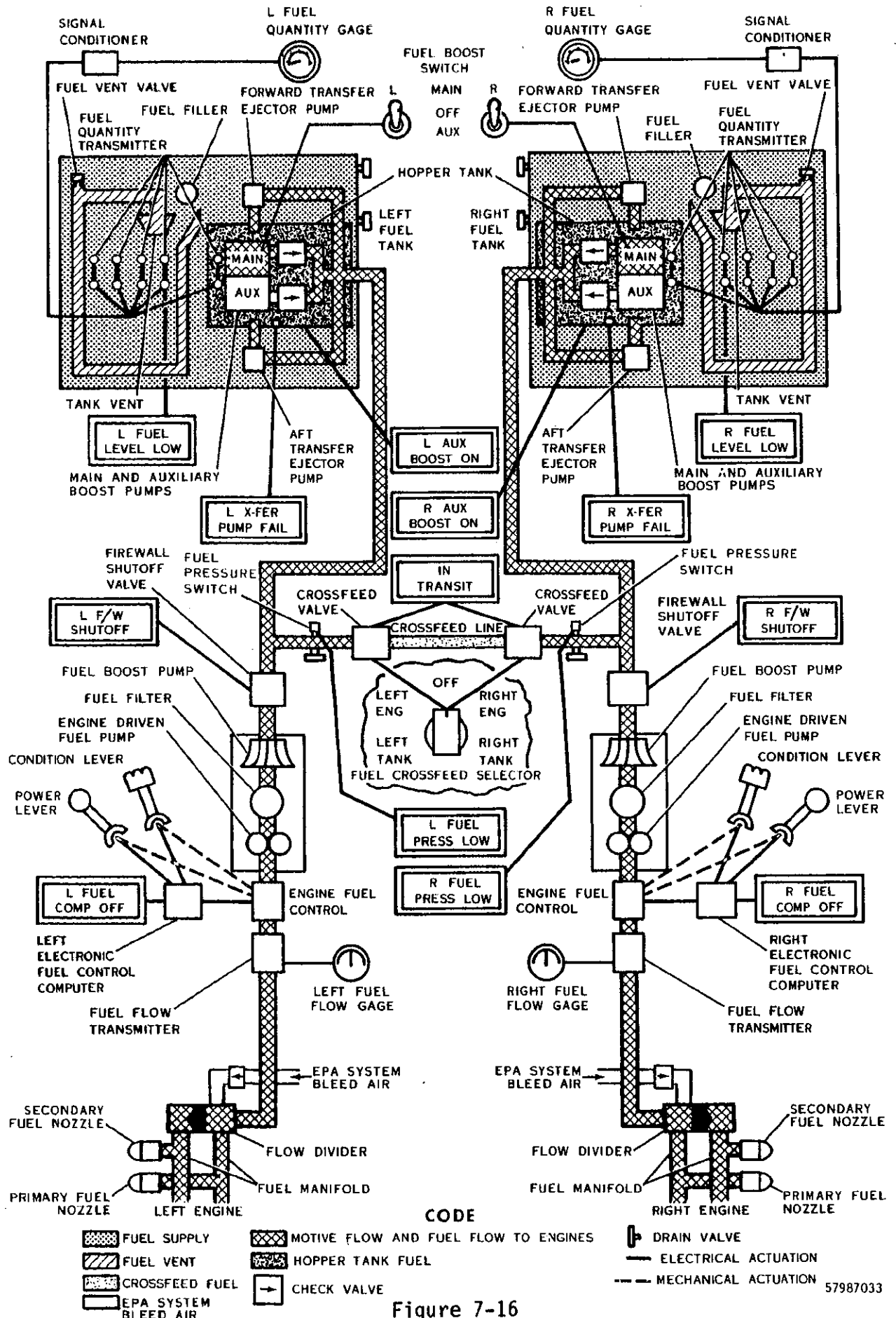


Figure 7-16

CROSSFEED SYSTEM

The crossfeed system, see Figure 7-16, consists of a single crossfeed line interconnecting each nacelle, two crossfeed valves, a 3-position crossfeed selector switch and necessary wiring and plumbing to complete the system.

When the crossfeed selector is positioned to OFF, both crossfeed valves are closed, allowing no fuel to flow from one side of the airplane to the other side. A green IN TRANSIT light adjacent to the crossfeed selector switch illuminates whenever the crossfeed valves are not fully opened or closed or do not coincide with the selector switch position.

In the LH ENG position, both engines feed from the right fuel tank. To accomplish this, both crossfeed valves are electrically opened, the left main boost pump is deenergized and the right auxiliary boost pump is energized. With both right main and right auxiliary boost pumps operating, sufficient fuel flow is available to assure continued normal operation of both engines at all power settings. Excess fuel leaving the right fuel tank and not required by the engines will be transferred to the left fuel tank. This transfer rate is normally 400 to 500 pounds per hour during the crossfeed operation.

WING FUEL HOPPER TANK SCHEMATIC

LEFT SIDE ONLY SHOWN

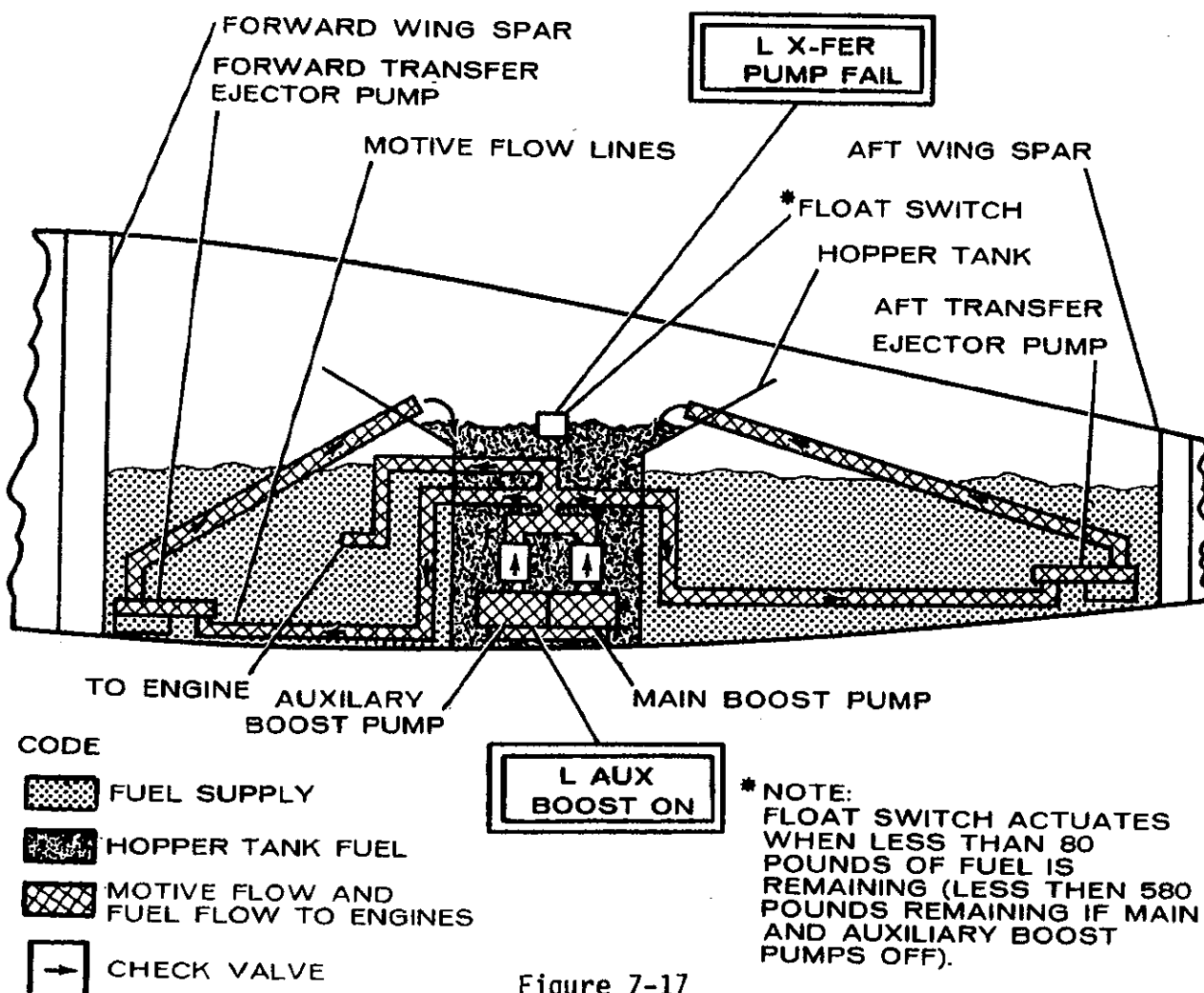


Figure 7-17

In the RH ENG position, both engines feed from the left fuel tank. To accomplish this, both crossfeed valves are electrically opened, the right main boost pump is deenergized and the left auxiliary boost pump is energized. With both left main and left auxiliary boost pumps operating, sufficient fuel flow is available to assure continued normal operation of both engines at all power settings. Excess fuel leaving the left fuel tank and not required by the engines will be transferred to the right fuel tank. This transfer rate is normally 400 to 500 pounds per hour during the cross-feed operation.

FUEL FLOW GAGES

The right and left fuel flow gages, see Figure 7-1, indicate the fuel consumption of each engine in pounds per hour. When power is removed from the gage, the needle will indicate in the OFF range.

FUEL QUANTITY GAGE

A capacitance-type fuel quantity gage, see Figure 7-1, is provided for each fuel tank. The gages are calibrated in pounds and accurately reflect the weight of fuel contained in each fuel tank. When power is removed from the gage, the needle will indicate in the OFF range.

FUEL LEVEL LOW WARNING LIGHTS

The L and R FUEL LEVEL LOW warning lights, see Figure 7-3, provide a warning when the left and/or right fuel tanks contain between 150 and 250 pounds of fuel and the main and/or auxiliary boost pumps are operating. These lights are actuated by fuel quantity transmitters located in each fuel tank. Each light operates independently from the fuel quantity indicating system.

ENGINE FUEL SYSTEM

General

The engine fuel system obtains fuel from the selected main tanks and delivers it to the engine for all phases of operation. The engine fuel and control system includes a fuel control unit, pumps, filters, flow divider and drain valve and fuel manifold and nozzle assemblies. The system provides fuel flow to satisfy the speed and power demands of the engine.

Each engine is equipped with an electronic fuel control system (normal mode operation) and a manual backup system (manual mode operation).

The fuel manifold and nozzle assemblies, mounted on the turbine plenum, deliver fuel to the combustion chamber through five primary and ten secondary fuel nozzles. The primary nozzles are for starting and initial acceleration. During all other phases of operation, fuel is provided by both primary and secondary nozzles.

The fuel flow divider and drain valve, mounted at the bottom of the turbine section, directs fuel flow to the nozzles. The valve delivers metered fuel flow to the primary nozzles during starting and maintains atomization during acceleration. When sufficient flow is provided to the primary nozzles, the fuel is bypassed to the secondary nozzles. The drain valve provides a path for purging fuel from the fuel nozzles during shutdown. An inlet filter is provided to prevent valve or nozzle blockage through all phases of operation. In the event the filter becomes clogged, fuel is bypassed around the filter to sustain engine operation.

The fuel control system incorporates a fuel pump assembly, fuel filter and fuel control assembly. The fuel control system provides filtered and metered fuel to the engine.

The engine-driven fuel pump assembly is mounted on the fuel control drive pad on the input housing assembly and is driven through a fuel control drive gear in the reduction gear system. The fuel pump assembly incorporates a high pressure pump assembly, rotary boost pump, pressure relief valve, fuel filter, filter bypass valve, and thermostatic anti-icing valve. The fuel pump assembly delivers filtered fuel to the fuel control assembly for metering.

The fuel control assembly, which is controlled by the electronic fuel computer, is attached to the rear of the fuel pump assembly and driven through the fuel pump assembly. The fuel control assembly incorporates a pressure control valve, mechanical and electrical shutoff valves, enrichment valve, overspeed governor adjustment, bypass valve adjustment and ground idle speed adjustment to control fuel flow to the engine.

The fuel filter is a component of the fuel pump assembly. Inlet fuel to the high pressure fuel pump is routed through the fuel filter to insure clean fuel through all phases of operation. In the event the filter becomes clogged, fuel is bypassed around the filter to sustain engine operation.

A sensing probe, located in the compressor inlet section, senses compressor inlet air temperature and compensates the acceleration and power fuel flow schedule for changes in inlet air temperature.

The EPA fuel purge system is installed to remove fuel from the engines during shutdown. Upon shutdown, compressed air stored in the purge canister blows out all fuel remaining in the engine downstream of the fuel control unit. This purged fuel is burned by the engine during the shutdown. The purge cycle is actuated by pressing and holding the engine stop button for five seconds. The compressed air is pressurized bleed air supplied by the engine. To charge the purge canister, the engine must have operated at 95% RPM or more since the previous shutdown.

ELECTRONIC FUEL COMPUTERS

In the engine fuel control system are two solid-state electronic fuel computers, one for each engine, located underneath the cabin floorboard aft of the copilot seat. Each computer receives the following inputs: Power requested (power lever potentiometer), RPM requested (condition lever potentiometer), engine torque (torque indicating system), engine temperature (EGT system), engine RPM (propeller governor monopole-primary input), engine RPM (fuel control monopole-secondary input), engine inlet air temperature (T2 sensor) and Mach number ($\Delta P/P$ transducer).

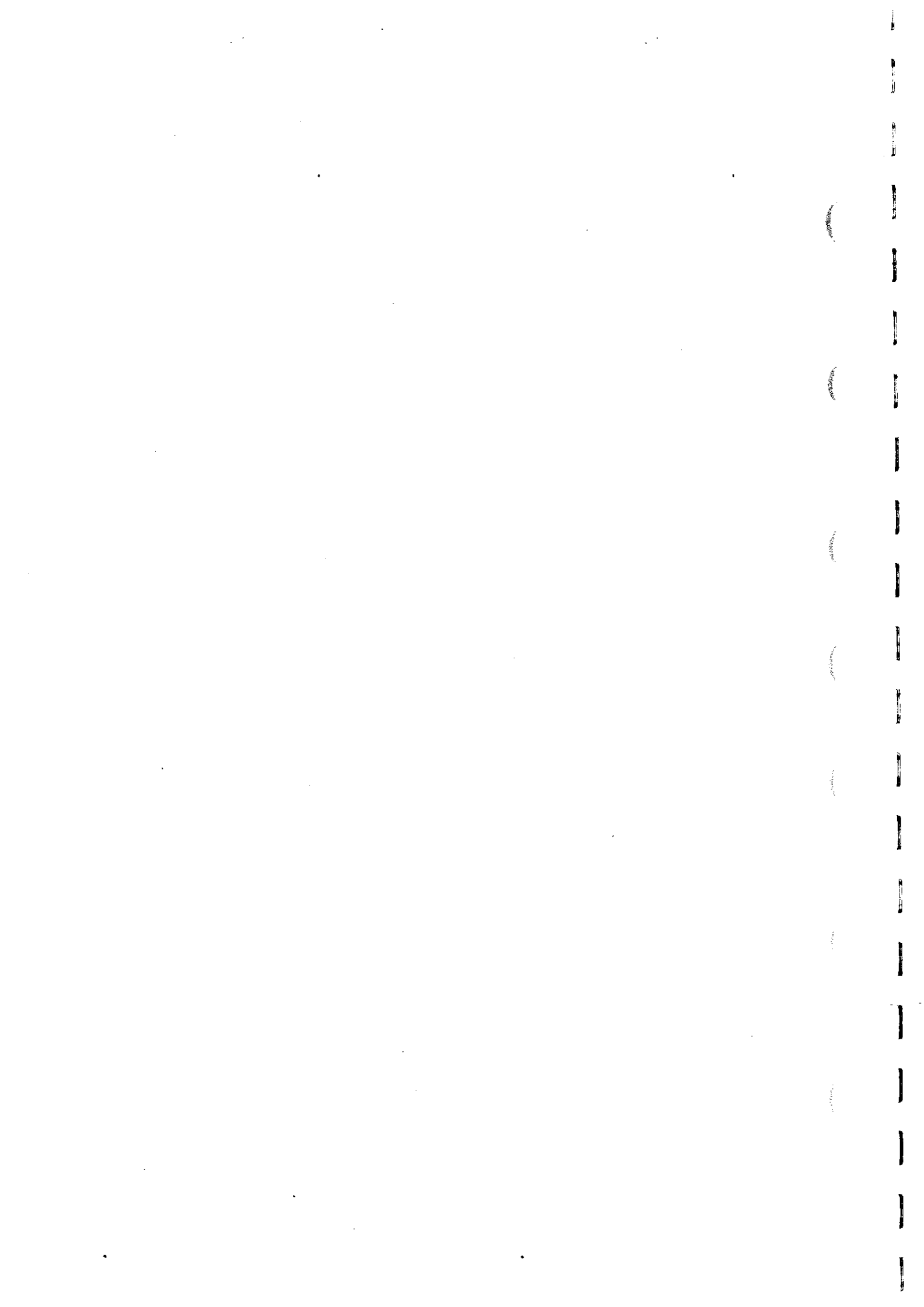
The computer regulates fuel flow and engine speed through output signals to the fuel control unit (fuel control torque motor) and the propeller governor (propeller governor torque motor).

The fuel computers have a self monitoring feature that automatically transfers from normal mode to manual mode in case of the following malfunctions: Loss of power lever electrical input, low voltage (automatic reset) and disagreement within the computer between the power requested and the output signal to the fuel control. This protection is restricted to specific operating ranges of the power lever and condition lever.

The electronic fuel control system makes possible integral automatic starting, single red line EGT, and torque/temperature limiting (optional on some airplanes).

BRAKE SYSTEM

The airplane is provided with an independent, hydraulically actuated brake system for each main wheel. A hydraulic master cylinder is attached to each pilot's rudder pedal. Hydraulic lines and hoses are routed from each master cylinder to the wheel cylinder on each brake assembly. No manual adjustment is necessary on these brakes. The brakes can be operated from either pilot's or copilot's pedals. The parking brake system consists of a manually operated handle assembly, see Figure 7-1, connected to the parking brake valves located in each main brake line. When pressure is applied to the brake system, and the parking brake handle is pulled, the valve holds pressure on the brake assemblies until released. To release parking brakes, push the parking brake handle in. It is not necessary to depress the rudder pedals when releasing the parking brake.



ELECTRICAL SYSTEM

GENERAL

Electrical power is supplied through a split-bus arrangement, see Figure 7-18. In the split-bus system, there are left and right main electrical buses with each bus generally supplying power to systems or circuits associated with that particular side of the airplane. For example, the right main bus supplies electrical power to all of the starting circuits, controls, and instrumentation for the right engine, as well as other circuits dealing with the right side of the airplane.

Power for each of the main buses is obtained from a combination starter-generator, mounted on each engine, which supplies power to the main bus of that side. When the starter-generator operates in the generator mode, it can supply up to 200 amperes of direct current at the normal bus voltage of 28.5 volts DC. Operation of each generator is controlled by separate generator control units located under the cabin floor in front of the pilot's seat.

Two 22 ampere-hour, 24 volt nickel-cadmium (NiCad) batteries are provided to supply power for starting the engines and provide emergency power to the airplane when required. The batteries are located under the baggage area in the left side of the nose compartment. Actuation of the battery switch(es) to the "ON" position closes the battery contactors and connects both batteries in parallel to the battery bus. The battery bus is linked to each main bus through 250 ampere current limiters (fuses) located in the battery relay box, aft of the batteries in the nose compartment. The battery bus and current limiters provide a tie between the left and right main buses so that if one generator should fail, electrical power will still be maintained by the single generator. If both generators are not operating, power on both buses will still be maintained by the battery bus. Since the batteries have only a combined 44 ampere-hour capacity when fully charged, it is important to quickly reduce electrical load as much as possible if both generators should fail.

A hot battery bus is provided to supply power to essential circuits regardless of the position of the battery switch(es). This bus is energized anytime the batteries are connected to the airplane. The hot battery bus supplies power to four essential circuits, see Figure 7-18. The circuits are protected by fuses located aft of the batteries in the nose compartment.

During operation on the ground, airplane power may be obtained from an external auxiliary power unit (APU). The APU voltage should first be set to 28 volts DC before plugging the unit into the external power receptacle located on the bottom of the fuselage aft of the cabin door. With the APU energized, the unit will be connected to the battery bus and will supply power to the airplane. The batteries will be disabled and unaffected by the position of the battery switch(es). The circuitry does not allow the APU and the batteries to be connected at the same time, thus preventing uncontrolled battery charging by the APU. With APU power applied to the main bus, the generators will be inoperative to prevent potentially damaging current surges.

Power for starting the engines may be obtained either from the airplane batteries or an APU capable of producing 800 amperes minimum and limited to 1700 amperes maximum. It is recommended that an auxiliary power unit be used for all engine starting below ambient temperatures of -12°C due to the reduced capacity of the NiCad batteries and the sluggishness of the engines in cold temperatures. Use of an APU at other ambient temperatures will also prolong battery life.

When using the batteries to start the engines, it is recommended that the left engine be started first since an extra set of starting cables are provided to the left starter to help reduce power losses in the starting circuit. Once the left engine is running, the left generator can be brought on the line to recharge the batteries. After the batteries have been sufficiently recharged, the right engine can be crossstarted using power from the batteries and assisted by the left generator. This results in a much easier engine start; therefore, only one starting cable is provided to the right starter.

NOTE

Insure all circuit breakers are engaged, and serviceable fuses are installed before all flights. Never operate with any blown fuses or disengaged circuit breakers without a thorough knowledge of the consequences.

GENERATOR OPERATION

Each generator is controlled by it's own generator control unit (GCU). The GCU provides voltage regulation, reverse current sensing, overvoltage protection, and generator load sharing. Pilot operation of the generators is controlled by individual left and right generator control switches, labeled RESET, OFF, and ON. With the switch in the OFF position, the generator line contactor will be open electrically isolating the generator from the airplane. When it is desired to bring the generator on the line, the switch should first be activated momentarily to the RESET position. This will cause the GCU to build the generator up to it's normal voltage of 28.5 volts DC. When the switch is returned to the OFF position, the generator will be operating at it's normal voltage, but the line contactor will still be open. Moving the generator control switch to the ON position will normally cause the GCU to close the line contactor, bringing the generator on the line. If the airplane voltage is more than 0.3 volt above generator voltage, the line contactor will remain open to prevent reverse-current flow into the generator. This may occur if the GCU's are not adjusted properly. If the line contactor remains open, the generator can usually be brought on line by turning the opposite generator off momentarily.

Illumination of the left or right GEN OFF annunciator light occurs whenever the line contactor for that generator is open.

With both generators operating, a paralleling circuit in each GCU senses the voltage of the opposite generator and will adjust it's own voltage accordingly, until both units are operating at an average voltage setting. This allows generator loads to match within 25 amperes. If the GCU's are out of adjustment, the paralleling circuitry may not be able to function properly, resulting in one generator carrying the entire load.

Another function of the generator control units is overvoltage protection. If either GCU senses a voltage greater than approximately 32 volts, depending on the length of time that the overvoltage condition exists the GCU will open the line contactor and collapse the field of the generator, totally disabling it. The generator will also be disabled whenever the firewall shutoff button for that engine is pushed.

In normal operation, prior to starting an engine it is recommended that the generator control switch for that side be turned off. This is especially important for an airstart. Even though the generator is disabled during the start it will become operational at an engine speed of 60% rpm. If the engine is rapidly accelerating at this point, as during an airstart, the generator voltage may increase too rapidly for the GCU to control and will create a voltage transient on the airplane bus. In some cases this will cause a current surge into the opposite generator, causing it to drop off the line. The generator switch should be turned ON only after engine speed has stabilized.

During a normal engine shutdown, pressing the engine stop button will immediately disable the generator. For other types of engine shutdowns, reverse-current will begin to flow into the generator as it winds down. When this reverse-current reaches approximately 150 amperes, the GCU will automatically open the line contactor. A lockout circuit prevents an auxiliary power unit and the generators from supplying power to the bus the same time. Therefore, when an APU is connected to the airplane and supplying power, a generator will not come on the line when its control switch is placed to the ON position. Open hot battery bus fuses (located in the nose compartment) can also prevent the availability of generator power. A momentary power interruption, such as when power is transferred from an APU to the batteries, may cause the generator disable relay to latch-in if the hot bus fuses are open. If the generator disable relay becomes latched, actuation of the 60% manual speed switch will unlatch it.

GENERATOR CONTROL UNITS

The generator control units regulate the starter-generator modes of operation. Below 60% RPM, each starter-generator operates as a starter. Above 60% RPM, each starter-generator operates as a generator. Should a generator exceed the normal operating voltage, the generator control unit will take the affected generator off the line.

BATTERIES

Two 22 ampere-hour nickel-cadmium batteries are located in the left nose baggage compartment under the upholstered floor panel. Access to the battery disconnects is gained by folding back the carpeting and unfastening the two quick release fasteners in each of the two access doors.

Starting the engines with an external power source is a highly recommended practice that should be exercised whenever possible to prolong the life of the batteries and to conserve battery power for times when battery starts must be accomplished. When it is anticipated that the airplane will be idle for a period of more than two days, it is advisable to disconnect the batteries to prevent frequency memory circuits or other equipment that may be powered by the hot battery bus from draining the batteries. Installed equipment containing frequency memory circuits must be reset any time the batteries are disconnected as the loss of electrical power will disable the memory function.

Proper care of the batteries is extremely important and will normally ensure availability of adequate cranking power for engine starts. The batteries should be inspected and serviced in accordance with requirements defined in the Airplane Maintenance Manual, which specify that the electrolyte must be checked every 50 flight hours, and the batteries must be reconditioned every 100 flight hours. Operating conditions that require numerous starts and short engine operating times may necessitate more frequent servicing of the batteries to maintain peak efficiency and to prolong battery life.

BATTERY AND GENERATOR SWITCHES

Separate battery and generator switches, see Figure 7-19, are provided as a means of checking for a malfunctioning generator circuit and to permit such a circuit to be turned off. If a generator circuit fails or malfunctions, or when one engine is not running, the switch for that generator should be turned off. Operation should be continued on the functioning generator, using only necessary electrical equipment. If both generator circuits should malfunction, equipment can be operated at short intervals on the battery alone. In either case, a landing should be made as soon as practical to check and repair the circuits.

VOLTMETER AND AMMETERS

A voltmeter and 2 ammeters, see Figure 7-1, are located on the left stationary instrument panel. These indicators continuously display bus voltage and right and left generator output in amperes. A two-position selector switch (spring loaded to L GEN), adjacent to the left generator ammeter, allows left generator output or battery charge rate to be displayed. In the normal position (L GEN), the left ammeter displays left generator output. In the BATT position, the left ammeter will display battery charge rate.

CIRCUIT BREAKERS AND SWITCH BREAKERS

All electrical systems in the airplane are protected by push-to-reset type circuit breakers or switch breakers, see Figure 7-19. Should an overload occur in any circuit, the resulting heat rise will cause the controlling circuit breaker to "pop" out, opening the circuit or allowing the switch breaker to return to the OFF position. After allowing to cool for approximately three minutes, the circuit breaker may be pushed in (until a click is heard or felt) or the switch breaker may be returned to the ON position to reenergize the circuit.

ELECTRICAL SYSTEM SCHEMATIC

(Airplanes Not Incorporating SK441-37)

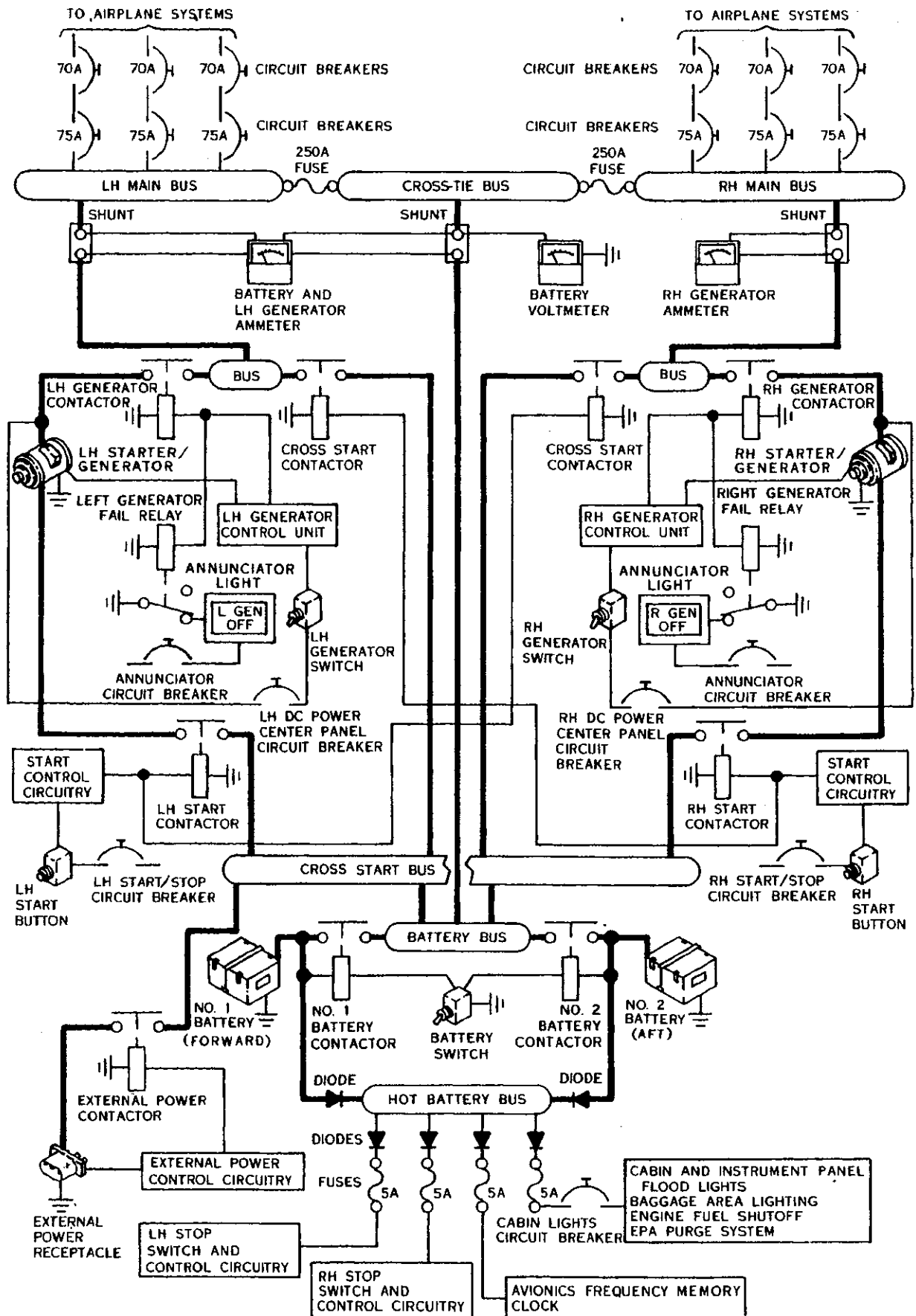


Figure 7-18

57987085B

ELECTRICAL SYSTEM SCHEMATIC

(Airplanes Incorporating SK441-37)

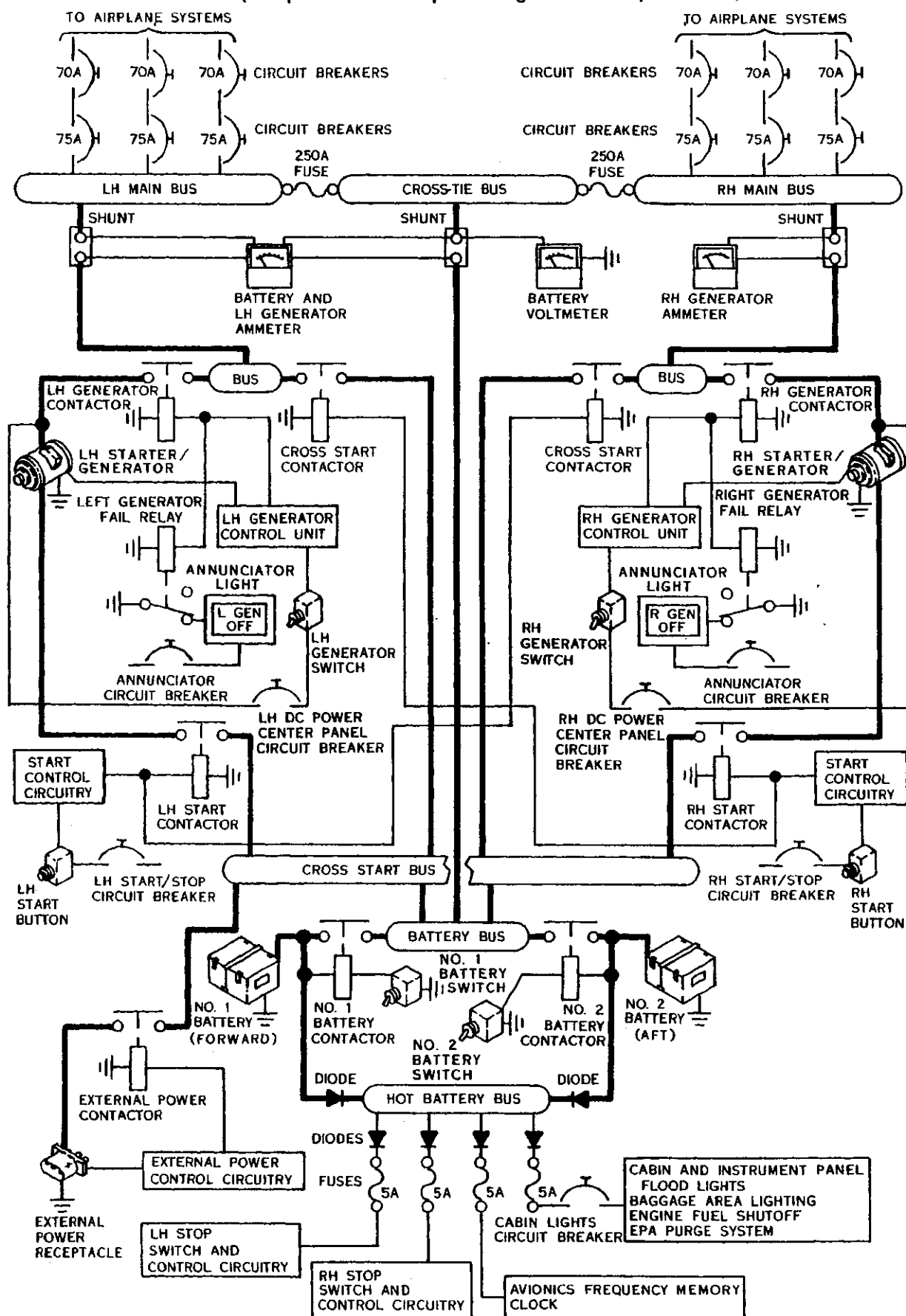
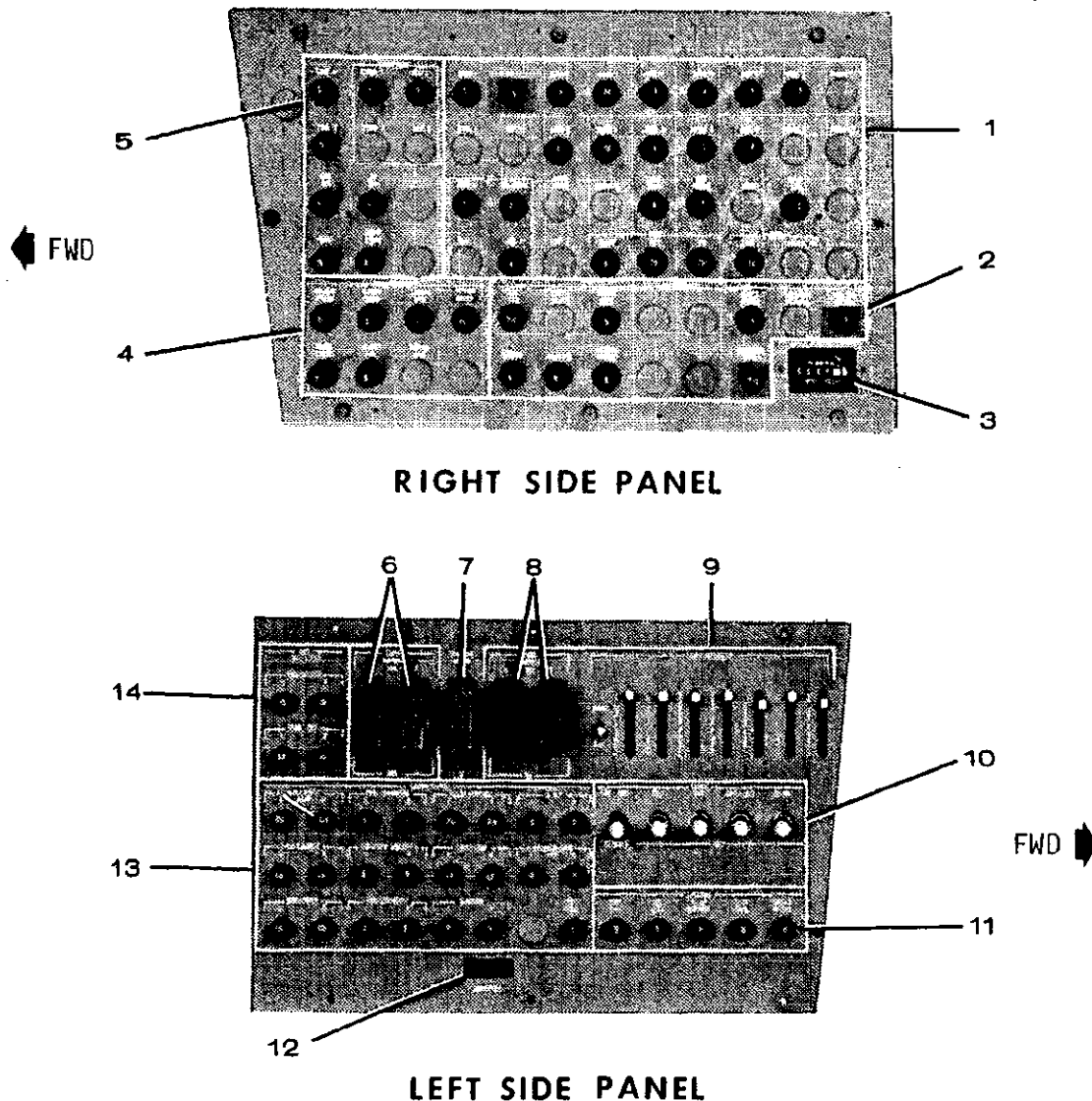


Figure 7-18A

57987085A

SIDE PANELS AND SIDE CONSOLE

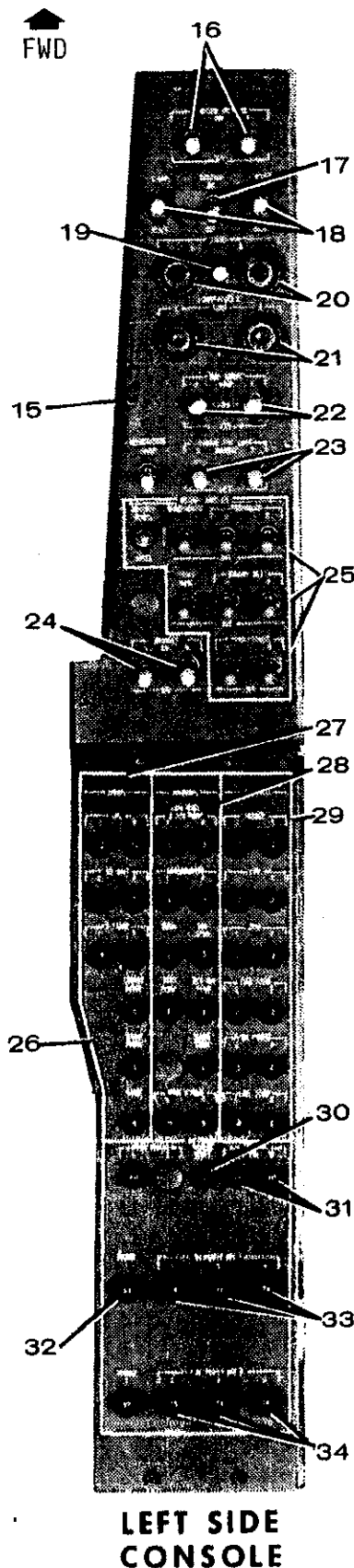
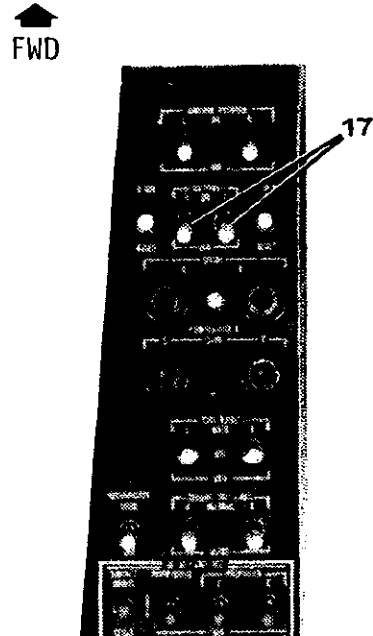


1. AVIONICS CIRCUIT BREAKERS
2. ACCESSORIES CIRCUIT BREAKERS
3. HOUR METER (OPTIONAL)
4. ENVIRONMENTAL CIRCUIT BREAKERS
5. INSTRUMENTATION CIRCUIT BREAKERS
6. MANUAL MODE STARTING SWITCHES
7. STARTER MOTOR SWITCH
8. FUEL COMPUTER SWITCHES
9. COCKPIT LIGHTING CONTROLS
10. EXTERNAL LIGHTING SWITCHES
11. SYSTEMS CIRCUIT BREAKERS
12. MONOPOLE MONITOR LIGHTS
13. ENGINE AND FUEL CIRCUIT BREAKERS
14. FIRE DETECTION AND EXTINGUISHING CIRCUIT BREAKERS

5784P6017L
5784P6018L

Figure 7-19 (Sheet 1 of 2)

SIDE PANELS AND SIDE CONSOLE

LEFT SIDE
CONSOLEAIRPLANES INCORPORATING
SK441-37

15. PILOT'S LH SIDE CONSOLE
16. IGNITION OVERRIDE SWITCHES
17. BATTERY SWITCH(ES)
18. GENERATOR SWITCHES
19. PROPELLER UNFEATHER SWITCH
20. ENGINE START BUTTONS
21. ENGINE STOP BUTTONS
22. FUEL BOOST PUMP SWITCHES
23. TORQUE-EGT LIMIT SWITCHES
24. AVIONICS BUS SWITCHES
25. ICE PROTECTION SYSTEMS SWITCHES
26. PILOT'S LH CIRCUIT BREAKER SIDE CONSOLE
27. INTERIOR LIGHTING CIRCUIT BREAKERS
28. WARNING SYSTEMS CIRCUIT BREAKERS
29. ENGINE INSTRUMENT CIRCUIT BREAKERS
30. DC POWER RESET CIRCUIT BREAKER
31. DC POWER CONTROL PANEL CIRCUIT BREAKERS
32. DC POWER FEEDER CIRCUIT BREAKERS
33. LH MAIN DC POWER BUS BREAKERS
34. RH MAIN DC POWER BUS CIRCUIT BREAKERS

Figure 7-19 (Sheet 2 of 2)

EXTERNAL POWER RECEPTACLE

An external power receptacle is installed on the bottom of the fuselage aft of the cabin door. The receptacle accepts a standard external power source plug.

LIGHTING SYSTEM

EXTERNAL LIGHTING

The airplane is equipped with three navigation lights, two retractable landing lights, a taxi light, two anti-collision lights and two wing deice lights (right light is optional) and optional recognition lights (refer to Section 9).

Navigation Lights

The navigation lights are located in each wing tip and on the fuselage tailcone. These lights are energized with the navigation lights switch breaker on the left side panel, refer to Figure 7-20. Proper operation can be checked by observing reflections on the ground below the tail light and from objects surrounding the airplane to ensure the lights are illuminated.

Landing Lights

The retractable landing lights are located in the lower surface of the wing tips. These lights are extended, retracted and illuminated by the landing light switch on the left side panel, refer to Figure 7-20. With the switch positioned to EXT, the landing lights will extend and illuminate. In the OFF (center) position, the lights will remain extended but will not illuminate. In the RETRACT position, the lights will retract flush with the respective wing tip. It is recommended that the landing light extension speed be limited to 180 KIAS to improve the landing light service life.

Taxi Light

The taxi light, attached to the nose gear, provides adequate illumination for night taxiing. The taxi light is controlled by the taxi light switch breaker on the left side panel, refer to Figure 7-20.

Anti-Collision Lights

The anti-collision lights, with individual power supplies, are located in the wing tips. These lights are actuated by the anti-collision lights switch breaker on the left side panel, refer to Figure 7-20.

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.

Wing Deice Lights

The wing deice lights (right light is optional) are installed in the wing fillet area and illuminate the inboard wing leading edge deice boots. The lights allow the pilot to check for ice accumulation on the wing leading edges. The lights are actuated by the deice light switch breaker on the left side panel, see Figure 7-20.

All exterior lighting should be checked for proper operation before night flying. Cockpit recognition of operational exterior lighting can be determined by looking for illumination on the ground by the various lights.

COCKPIT AND EXTERNAL LIGHTING CONTROLS

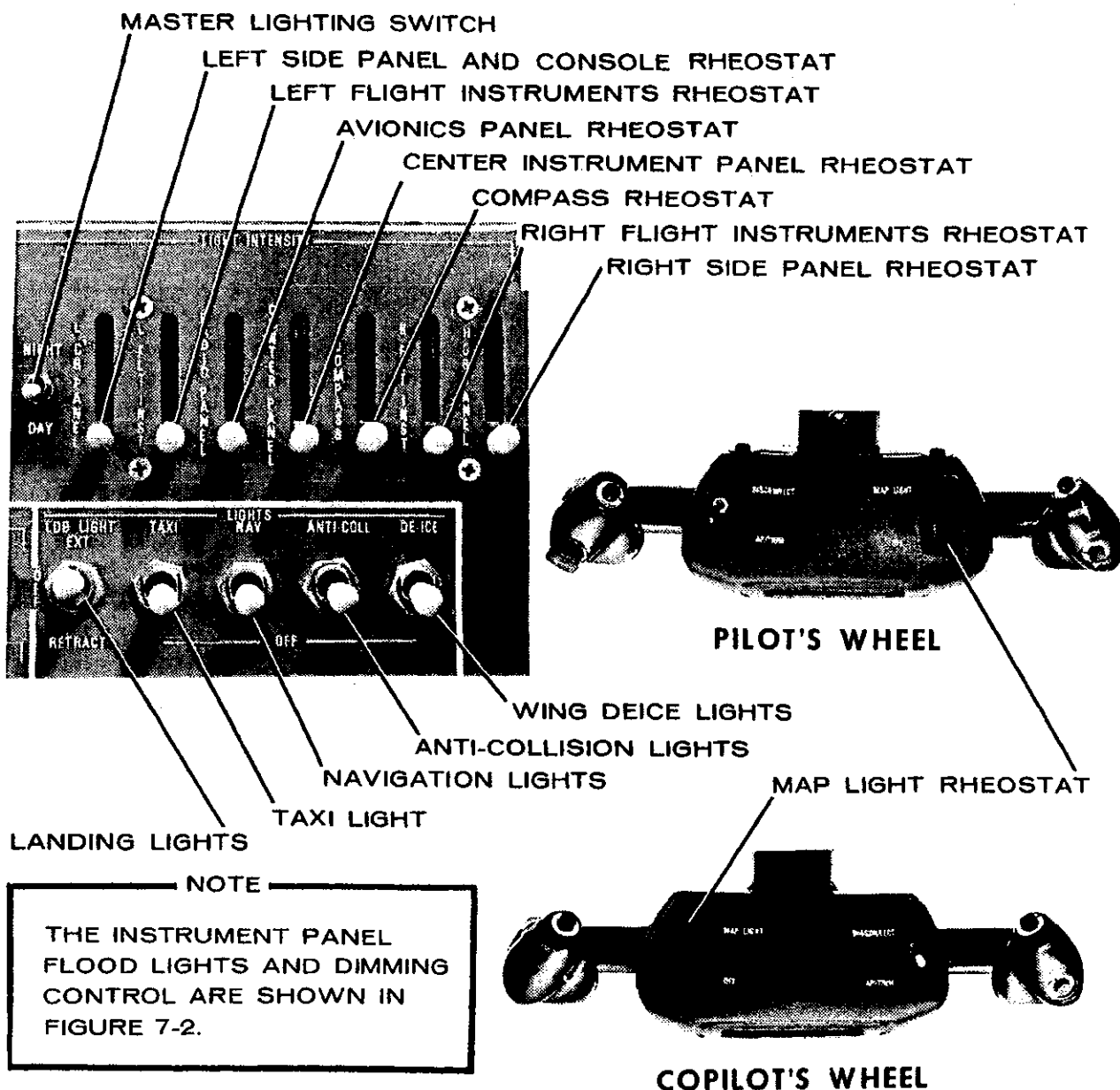


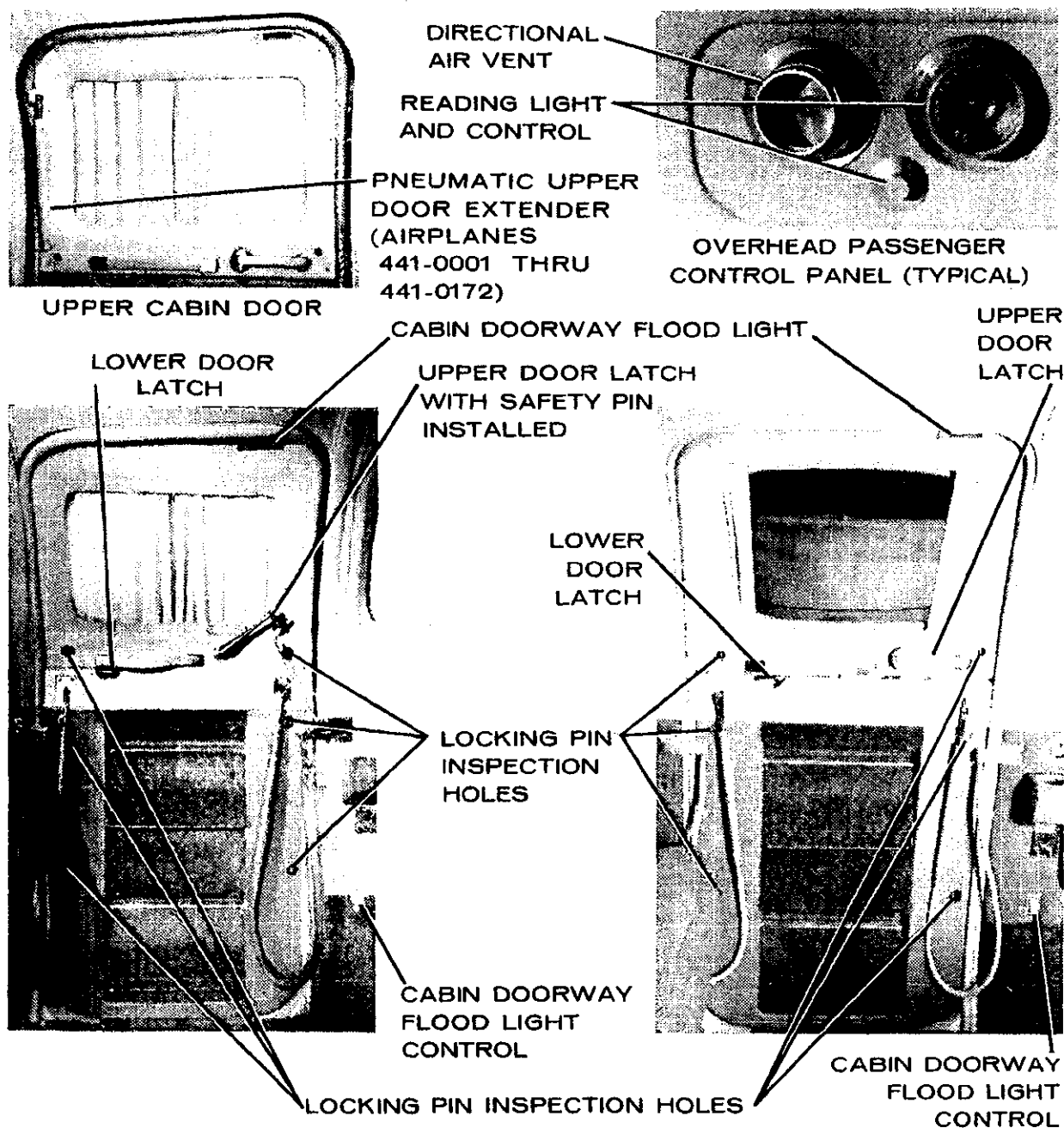
Figure 7-20

INTERNAL LIGHTING

The airplane is equipped with lighting for baggage areas (optional), cabin doorway, cockpit controls and indicators, cockpit illumination and cabin illumination.

An optional baggage area light is provided for the nose baggage area. The light is actuated when the nose baggage door is opened and is extinguished when the door is closed.

The cabin doorway and instrument panel floodlight provides adequate illumination for night boarding. These lights are controlled by a switch immediately inside the cabin doorway, see Figure 7-21, or by a switch on the instrument panel, see Figure 7-1.

CABIN DOOR, CABIN LIGHTING AND CONTROLS

AIRPLANES 441-0001 THRU 441-0034
AND 441-0036 THRU 441-0070

AIRPLANES 441-0035 AND
441-0071 THRU 441-0172

5714P6008
5714P6007
5714P6039

Figure 7-21

Cockpit lighting is provided by the overhead instrument panel flood-light and adjustable map lights, instrument postlights and internal instrument lighting. All cockpit lights are variable intensity and are controlled by rheostats on the top of the pilot's control wheel or on the left side panel, see Figure 7-20.

NOTE

On airplanes 441-0049 thru 441-0172, the master lighting switch must be positioned to DAY during daylight operations to insure maximum illumination of the annunciator panel lights.

Individual reading lights and controls, see Figure 7-21, are provided in the cabin for each passenger seat.

PITOT/STATIC PRESSURE SYSTEM

The pitot/static pressure system, see Figure 7-22, consists of two totally separate systems; one for the pilot's instruments and the second system for copilot's instruments.

PILOT'S SYSTEM

The pilot's pitot system consists of a heated pitot tube mounted on the lower left side of the fuselage nose, pilot's airspeed indicator and required plumbing.

The pilot's static system consists of a heated static source located on each side of the aft fuselage, a condensate drain valve located below the copilot's instrument panel on the side wall and the static system instruments (rate-of-climb, altimeter and airspeed indicators).

CAUTION

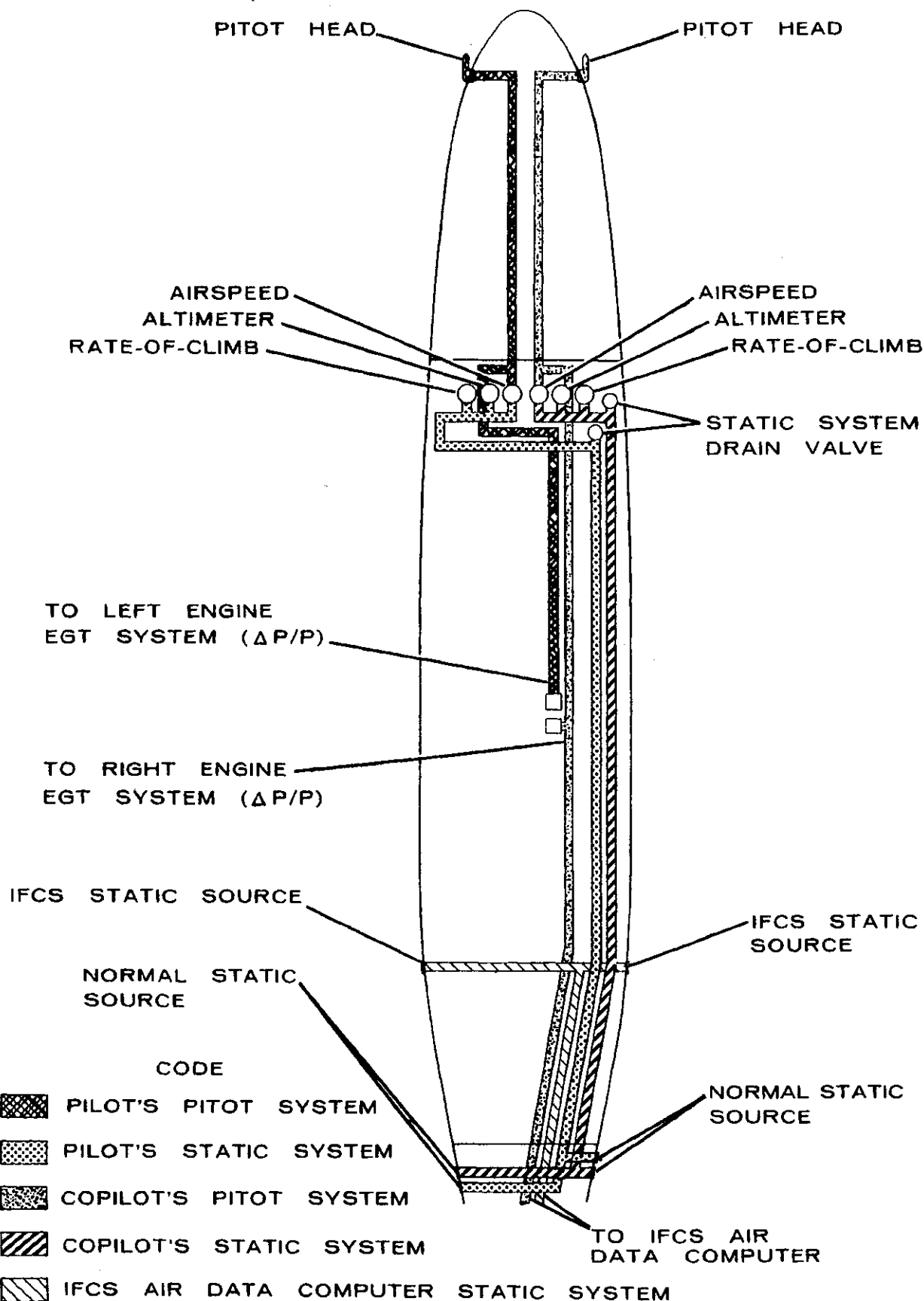
Do not open the condensate drain valve while the cabin is pressurized as flight instrument damage will result.

Pitot and static heat is controlled by the left pitot/static switch located on the left side console. Actuation of the switch electrically heats the pitot head and static sources to maintain system operation during icing conditions. Do not operate for prolonged periods while on the ground to prevent overheating the pitot head heating elements. The copilot's instruments are used as a back-up system, should the pilot's instruments fail.

INTEGRATED FLIGHT CONTROL SYSTEM AIR DATA STATIC SYSTEM

The Integrated Flight Control System (IFCS) air data system provides an accurate pitot air and static air reference for the Integrated Flight Control System. The system consists of an independent heated static source located on each side of the aft fuselage, appropriate plumbing, and the air data computer, which is located on the aft side of the aft pressure bulkhead. The air data computer is connected to the static system and to the copilot's (RH) pitot tube plumbing. Static heat is controlled by the left pitot/static switch located on the left side console.

PITOT/STATIC PRESSURE SYSTEM SCHEMATIC



57983004

Figure 7-22

COPILOT'S SYSTEM

The copilot's pitot system consists of a heated pitot tube mounted on the lower right side of the fuselage nose, copilot's airspeed indicator and required plumbing.

The copilot's static system consists of a heated static source located on each side of the aft fuselage, a condensate drain valve located below the copilot's instrument panel adjacent to the pilot's system drain valve, and the static system instruments (rate-of-climb, altimeter and airspeed indicators).

CAUTION

Do not open the condensate drain valve while the cabin is pressurized as flight instrument damage will result.

The static system also provides a static reference for the cabin differential pressure indicator.

Pitot and static heat is controlled by the right pitot/static switch located on the left side console. Actuation of the switch electrically heats the pitot head and static sources to maintain system operation during icing conditions. Do not operate for prolonged periods while on the ground to prevent overheating the pitot head heating elements.

INSTRUMENT AIR SYSTEM

The instrument air system, see Figure 7-23, provides a source of bleed air pressure for the gyro instruments. The system consists of a water separator and filter, a pressure regulator, pressure indicator, gyro instruments and plumbing.

Bleed air flows from the engines, through an 18 PSI pressure regulator, to a water separator and air filter and then through another pressure regulator where the air pressure is reduced to approximately 2.5 PSI. The air then flows through the gyro instruments and is routed overboard. The pressure being applied to the gyros is constantly presented on the pressure indicator. During single-engine operation, adequate pressure will be available to provide normal system operation.

FLIGHT INSTRUMENTS

PILOT'S INSTRUMENTS

The basic flight instruments for the pilot, see Figure 7-1, consist of the flight director indicator (FDI), horizontal situation indicator (HSI), airspeed indicator, rate-of-climb indicator and servo-driven encoding altimeter.

The FDI contains an electrically driven gyro which allows presentation of pitch and roll information; if the gyro should become unreliable, a red and white barber pole warning flag will appear. Skid information is presented on the FDI inclinometer; inaccuracy can only result if the indicator is not level in the instrument panel. With the airplane on level ground, the ball should be centered between the two vertical white bars. Additional information is presented on the FDI which is discussed later in this section.

INSTRUMENT AIR SYSTEM SCHEMATIC

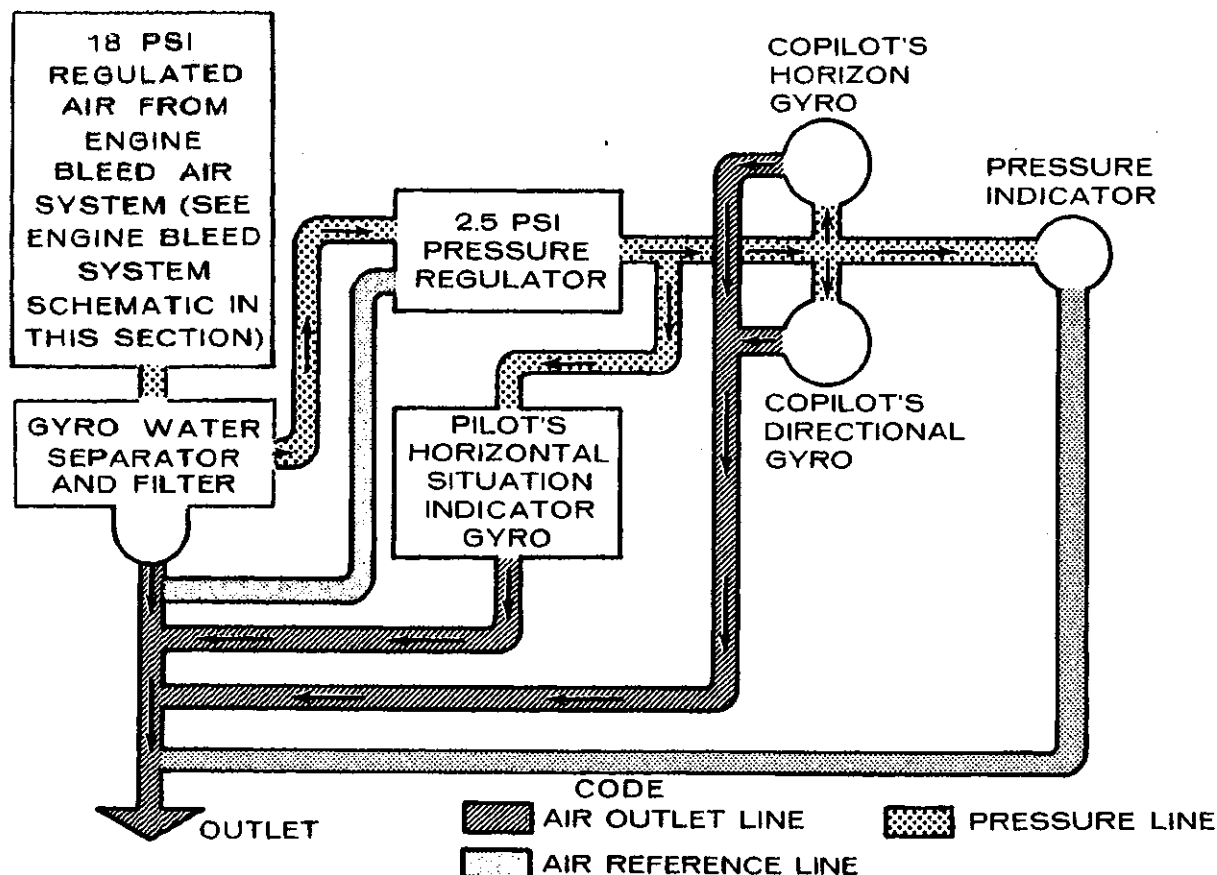


Figure 7-23

The HSI contains an air-driven gyro and an electrically servo'd compass card which allows presentation of magnetic heading information. After the engines are started and the compass card is initially set, precessional errors are automatically removed by the compass slaving system. Normal operation is indicated when the slaving indicator oscillates about the null point (45° fixed reference line on the HSI). Failure of the system is indicated by presentation of a HDG warning flag.

The conventional airspeed and rate-of-climb indicators operate mechanically from pitot and static pressures provided by the pilot's pitot and static systems. Operation of these indicators can be determined by cross-checking with the copilot's instruments. If the cross-check reveals an error, climb or descend the airplane and watch the indicators for the appropriate change. If anticipated changes are not indicated on the pilot's instruments, it is reasonable to assume pitot or static source blockage has occurred. If the possibility of pitot or static system icing is present, actuation of the left pitot/static switch will remove the pitot ice and may remove the static system ice (depends on location of the ice in the static system). If pilot's and copilot's systems are inoperative, refer to the optional angle-of-attack system or fly attitude and power references.

The encoding altimeter requires a static source for altitude reference and electrical power to drive the indicator display. If an electrical power failure occurs, a warning flag will be presented. Proper altimeter operation can be verified by cross-checking with the standby barometric altimeter. Refer to 400 Encoding Altimeter in this section for additional information.

COPILOT'S INSTRUMENTS

The basic flight instruments for the copilot consist of pressure-driven horizon and directional gyros, optional electric turn and bank indicator, airspeed indicator, rate-of-climb indicator and barometric altimeter.

The pressure-driven horizon and directional gyros are checked by observing the instrument air pressure indicator for a normal indication. Operation of the directional and horizon gyros can be checked during taxiing by watching for an abnormally slow erection rate and erratic operation. In flight, the directional gyro can be checked by flying a standard rate turn and observing the directional gyro for a turning rate of 3 degrees per second. Also, the precession rate in straight and level flight should not exceed 5 degrees in 10 minutes. The horizon gyro operation can be checked by establishing a level flight attitude; the gyro should indicate wings level within 1 degree. Initiate a 20-degree bank for a 180-degree turn, then smoothly return to level flight; gyro should indicate wings level within 3 degrees. Establish level flight at 150 KIAS; gyro should indicate level airplane within 1 degree. Smoothly pitch airplane nose down 10 degrees, then return to level flight; gyro should indicate level flight within 1 degree. After shutdown of the airplane on the ground, abnormal noise coming from either gyro can indicate a near failure condition.

Operation of the optional turn-and-bank needle can be checked by initiating a standard rate turn and cross-checking the turn rate with the directional gyro. An indicated standard rate turn should show a turning rate of 3 degrees per second on the directional gyro. After shutdown of the airplane on the ground, abnormal noise coming from the turn and bank indicator can indicate a near failure condition. The ball part of the turn and bank is virtually failure proof. Inaccuracy can result only if the indicator is not level in the instrument panel. With the airplane on level ground, the ball should be centered in the race.

The airspeed, rate-of-climb and barometric altimeter indicators are conventional instruments which reference the copilot's pitot and static systems. Operation can be verified by cross-checking with the pilot's instruments. Pitot and static system heaters are actuated by the R PITOT/-STATIC heat switch.

1000A INTEGRATED FLIGHT CONTROL SYSTEM (TYPE IF-1050A)

The Cessna 1000A Integrated Flight Control System (IFCS) provides a capability of automatic flight control or manual control with precision flight direction provided by computed command information. In addition, a horizontal situation display, coupled to NAV 1, is provided to keep the pilot informed of his navigational situation. The complete presentation for the system is displayed on the flight director indicator (FDI), the mode selector, the autopilot control head, the horizontal situation indicator (HSI), and the autopilot mode repeater annunciators on the pilot's panel.

Operation of the manual and automatic system is basically the same. The difference is whether the pilot follows the flight director commands manually or allows the autopilot to fly the airplane.

Precision flight direction information for manual control is provided on the FDI, see Figure 7-28, by means of a symbolic airplane and pitch and roll command bars. The pilot flies the symbolic airplane to the two

command bars, thus following the calculated flight path determined by the computer. Flight director engagement is accomplished by engaging the autopilot or can be independently engaged by depressing the FD switch.

A horizontal situation indicator (HSI), see Figure 7-27, displays a pictorial presentation of the airplane's position relative to VOR radials, localizer, and glide slope beams. The HSI also gives heading reference with respect to magnetic north and provides selection of the desired heading, VOR radials and LOC headings as selected on NAV 1.

For automatic flight, the autopilot/yaw damper switch on the autopilot control head, see Figure 7-24, is placed in the AP/YD position. Pitch and roll manual command controls are located on this control head. All other normal modes of flight are controlled from the mode selector, see Figure 7-26.

The autopilot/yaw damper switch, when in the AP/YD position, also energizes the yaw damper system. With the exception of applying power, this system functions independently of the autopilot or flight director. Placing the autopilot/yaw damper switch in the YD position energizes the yaw damper without turning on the autopilot or flight director.

An automatic autopilot disengage function is provided to automatically disengage the autopilot any time the airplane rolls more than 45° from a level flight attitude. The operational capability of the disengage function should be tested before takeoff by pressing the PREFLIGHT TEST button, located on the autopilot control head. When the test button is pressed with the autopilot engaged, a test voltage is inserted into the autopilot, causing autopilot disengagement. Do not press this button in flight; it is for ground check only. Restrain control wheel movement during the test.

The autopilot off (A/P OFF) light, located adjacent to the flight director indicator, will illuminate when the autopilot is disengaged by any means other than the airplane control wheel AP/TRIM disconnect switch. When the A/P OFF light illuminates, the autopilot disengage horn will produce a short tone lasting 1 to 2 seconds with decreasing amplitude. The A/P OFF light will remain on until it is cancelled by pressing the airplane control wheel AP/TRIM disconnect switch.

The pilot's and copilot's control wheels, see Figure 7-25, incorporate switches for Integrated Flight Control System related operations. An electric elevator trim switch is provided on the pilot's left control horn and an autopilot and electric elevator trim (AP/TRIM) disconnect switch is provided on both control wheels. Also, both control wheels incorporate a pitch synchronization button. Flight director go-around mode is initiated by pressing the GA button located on the left power lever.

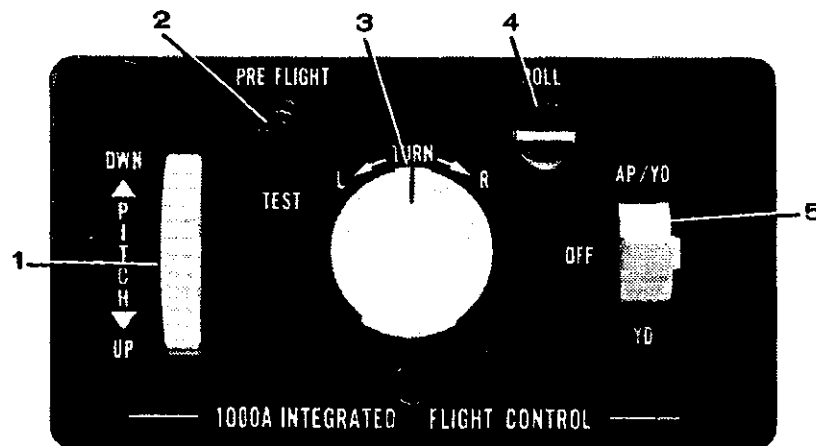
NOTE

The following additional features are incorporated when either a P/N 46210-8001 or P/N 46210-8004 replacement autopilot/flight director computer is installed:

Rotation of the pitch command wheel disengages the GS ENG mode.

The NAV ENG and GS ENG lights on the mode selector and the NAV and GS lights on the mode repeater annunciator will blink whenever NAV (VOR or LOC) mode and/or GS modes are engaged and a respective flag condition exists for more than 3 seconds.

AUTOPILOT CONTROL HEAD

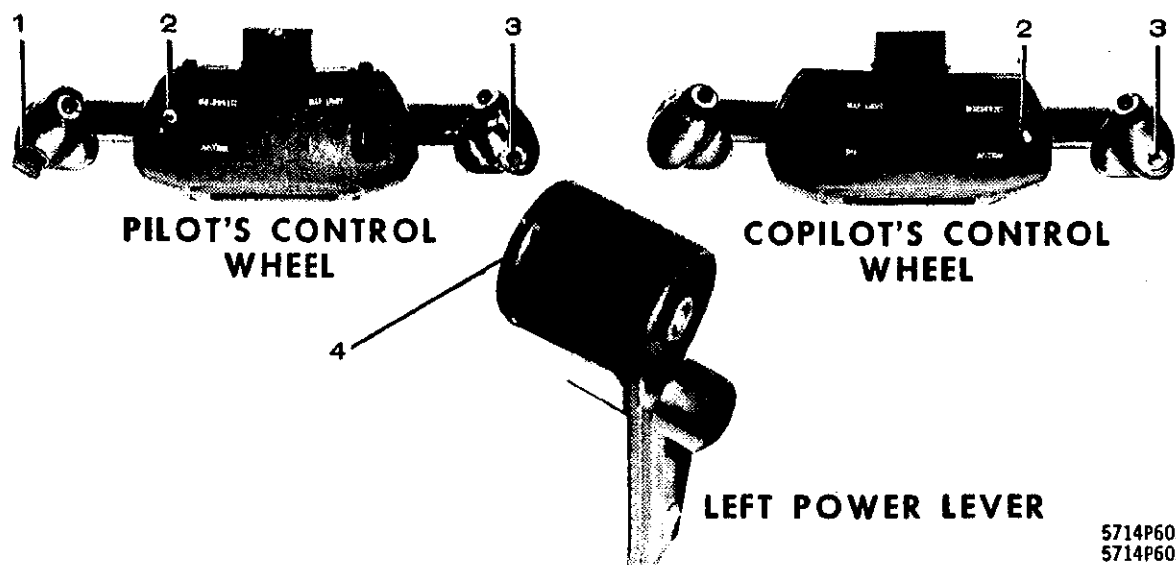


5714P6018

1. **AUTOPILOT PITCH COMMAND WHEEL** - Controls pitch attitude of the airplane. When rotated, commands pitch up or down as indicated by the legend on the control head. Pitch attitude is proportional to displacement of the control from the engage position. Rotation of the wheel disengages the Altitude Hold mode. The wheel is inoperative when GA or GS are engaged.
2. **PREFLIGHT TEST BUTTON** - Pressing this switch with the autopilot engaged inserts a test voltage into the autopilot causing autopilot disconnect.
3. **AUTOPILOT TURN COMMAND KNOB** - Must be centered for FD or AP engagement. Commands roll attitude proportional to control rotation. Maximum command is nominally 25 degrees roll attitude. Disabled in GA mode. Rotation out of detent disengages HDG or NAV modes.
4. **ROLL TRIM INDICATOR** - Indicates direction of autopilot roll effort. Continuous deflection in either direction during steady flight indicates that manual adjustment of the airplane aileron trim is required in the same direction.
5. **AUTOPILOT/YAW DAMPER SWITCH** - Magnetically held three-position switch. In the center position, the system is off. Placing the switch in the AP/YD position engages the autopilot, yaw damper and flight director. The AP and FD annunciators on the mode selector will light, and the yaw damper flag on the turn and bank indicator will be pulled out of view. In the YD position, only the yaw damper system is engaged.

Figure 7-24

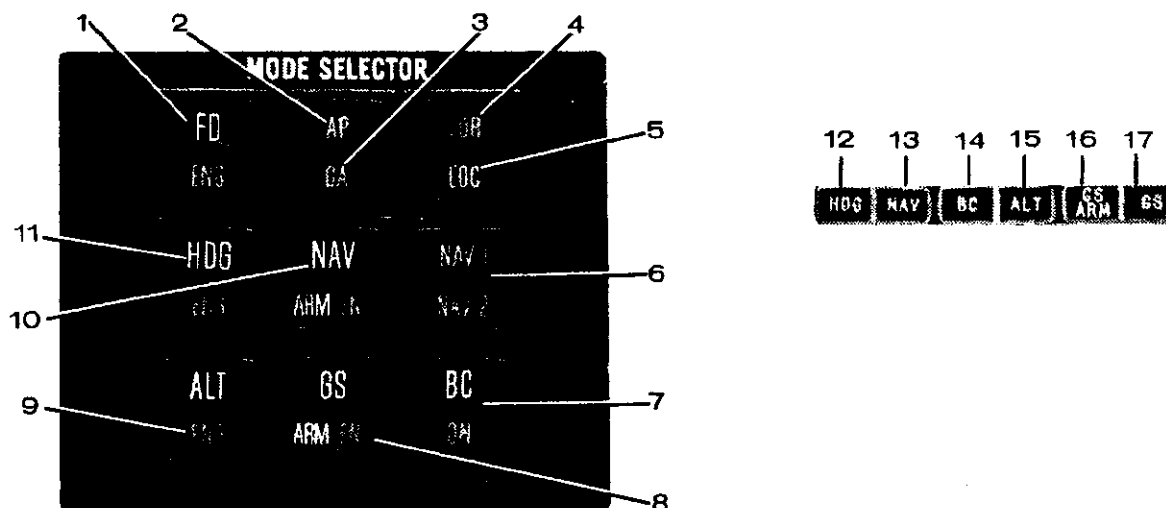
CONTROL WHEELS AND POWER LEVER CONTROLS



1. **ELECTRIC ELEVATOR TRIM SWITCH** - When moved forward to the DN position, the elevator trim tab moves in the nose-down direction; conversely, moving the switch aft to the UP position moves the tab in the nose-up direction. Operation of the electric trim switch disconnects autopilot and yaw damper when the autopilot engage switch is in AP/YD position. A short (1 to 2 second) decreasing tone is heard and the AP OFF annunciator lights. Operation of the electric trim switch has no effect on the flight director or yaw damper.
2. **AUTOPILOT/ELECTRIC ELEVATOR TRIM DISCONNECT SWITCH** - Disconnects the autopilot and/or yaw damper and a short (1 to 2 second) tone with decreasing amplitude is heard in the cockpit. Disables electric trim if a fault exists in the electric trim. Operation cancels A/P OFF light, if illuminated.
3. **PITCH SYNCHRONIZATION BUTTON** - When the FD or AP are engaged, the pitch axis is instantaneously synchronized to present pitch attitude. If desired, with autopilot engaged, the button may be held and the airplane can be flown manually to a new pitch attitude which the system will maintain when the button is released. To resynchronize the pitch axis when operating in flight director mode, the button can be depressed once after the new attitude is established. Releasing the button establishes the new attitude reference in the system. Depressing the button also disengages the altitude hold mode. The button operation is inhibited during GA or glide slope operation.
4. **GO-AROUND (GA) SWITCH** - When pressed, the flight director GA mode is engaged. The GA annunciators on the mode selector and FDI will light; all other modes are cancelled and the autopilot is Disconnected. The GA mode provides a preset pitch-up and a wings-level command. With GA mode engaged, repressing the GA switch, selecting the HDG mode, or reengaging the autopilot will cancel the GA mode.

Figure 7-25

MODE SELECTOR AND MODE REPEATER ANNUNCIATORS



5714P6019
5714P6016

1. FLIGHT DIRECTOR (FD) MODE SWITCH/
ANNUNCIATOR - Momentarily depressing switch engages or disengages the flight director (FD). The engage (ENG) annunciator illuminates green when mode is engaged. Flight director mode can be engaged with or without the autopilot engaged by the FD switch on the mode selector. If autopilot has been previously engaged and flight director is not desired, FD mode switch may be pushed to stow the flight director roll and pitch commands out of view. With the master lighting switch to NIGHT, FD will illuminate white.
2. AUTOPILOT (AP) ANNUNCIATOR
LIGHT - AP annunciates green when autopilot is engaged.
3. GO-AROUND (GA) ANNUNCIATOR
LIGHT - GA annunciates green when go-around mode is engaged.
4. VOR ANNUNCIATOR LIGHT - VOR annunciates green when selected NAV receiver is tuned to VOR frequency.
5. LOC ANNUNCIATOR LIGHT - LOC annunciates green when selected NAV receiver is tuned to localizer frequency.
6. NAV 1/NAV 2 SWITCH/
ANNUNCIATOR - Alternate action manual switch that selects NAV 1 or NAV 2 navigation system for coupling to IFCS. Appropriate segment annunciates green when selected.
7. BACK COURSE (BC/ON) SWITCH/
ANNUNCIATOR - Reverse directional and course deviation signals in the computer to enable the IFCS for back course tracking in either NAV 1 or NAV 2, as selected. Selection of BC also reverses the CDI display on NAV 2 non-HSI type indicators whenever NAV 2 is tuned to a localizer frequency regardless of the IFCS status. ON annunciates green when mode is engaged. With the master lighting switch to NIGHT, BC will illuminate white.

Figure 7-26 (Sheet 1 of 3)

MODE SELECTOR AND MODE REPEATER ANNUNCIATORS

8. GLIDESLOPE (GS) SWITCH/
ANNUNCIATOR - Momentarily depressing switch, when the navigation (NAV) mode is engaged and the navigational receiver is tuned to the localizer frequency, will arm the glideslope (GS) mode. The GS mode switch will illuminate amber color when armed. The engage (ENG) annunciator will illuminate green when the glideslope is captured. Glideslope (GS) mode switch must be engaged to accomplish an autopilot coupled or flight director instrument landing system approach. ENG annunciator blinks when the selected glideslope signal is invalid. Momentarily depressing the glideslope (GS) a second time will disengage glideslope mode. With the master lighting switch to NIGHT, GS will illuminate white. Glideslope will arm with front or back course selected.
9. ALTITUDE (ALT) MODE SWITCH/
ANNUNCIATOR - Momentarily depressing switch engages or disengages altitude hold mode. ENG annunciates green when mode is engaged. With the master lighting switch to NIGHT, ALT will illuminate white.
10. NAV MODE ARM/ENG SWITCH/
ANNUNCIATOR - Momentarily depressing switch engages NAV ARM or the NAV ENG mode, dependent on HDG mode status and position of the airplane relative to the beam center. NAV mode is either VOR or LOC, whichever frequency is tuned on the selected navigation receiver. If HDG mode is not engaged, NAV ENG mode will engage immediately and be annunciated by NAV ENG lighting green. The airplane will turn to intercept the beam at a fixed intercept angle. If HDG mode is engaged and beam displacement is greater than a preset amount on the course deviation indicator, (1/2 scale for VOR enroute, full scale for VOR with APPR flaps and localizer operation), the HDG mode will remain engaged and the NAV ARM mode will engage. An amber ARM annunciation will appear below the white NAV. The airplane will continue on the selected heading until the beam displacement decreases to less than the preset amount. ENG will automatically annunciate, HDG mode will disengage, ARM annunciation will extinguish, and the airplane will then turn to capture the beam at a fixed intercept angle. With the master lighting switch to NIGHT, NAV will illuminate white.
11. HEADING (HDG) MODE SWITCH/
ANNUNCIATOR - Momentarily depressing switch engages or disengages the heading mode. ENG annunciates green when mode is engaged. With the master lighting switch to NIGHT, HDG will illuminate white. Heading mode engagement will cancel GA and NAV modes.
12. HDG ANNUNCIATOR - Indicates autopilot or flight director is engaged in heading mode. When navigation mode is armed, HDG annunciator remains illuminated.
13. NAV ANNUNCIATOR - Indicates autopilot or flight director is engaged in NAV ENG mode.
14. BC ANNUNCIATOR - Indicates back course is selected.

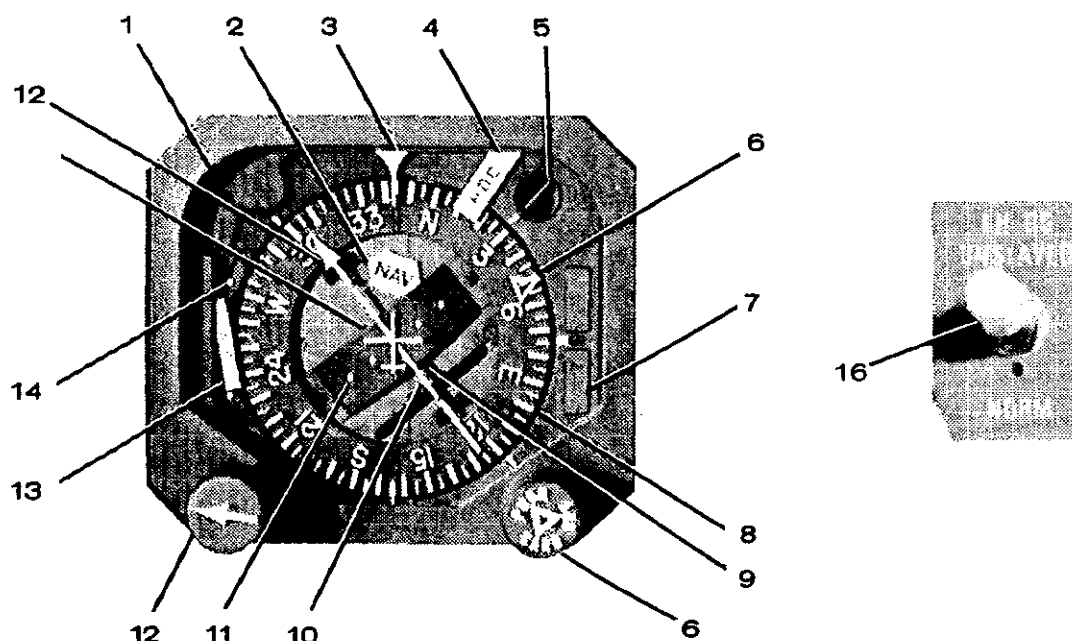
Figure 7-26 (Sheet 2 of 3)

MODE SELECTOR AND MODE REPEATER ANNUNCIATORS

- 15. ALT ANNUNCIATOR - Indicates autopilot or flight director is engaged in ALT mode.
- 16. GS ARM ANNUNCIATOR - Indicates autopilot or flight director is in glideslope ARM mode.
- 17. GS ANNUNCIATOR - Indicates autopilot or flight director is engaged in glideslope mode.

Figure 7-26 (Sheet 3 of 3)

HORIZONTAL SITUATION INDICATOR



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1. HORIZONTAL SITUATION INDICATOR (HSI) - Provides a pictorial presentation of the airplane position relative to VOR radials, localizer and glideslope beams. It also gives heading reference with respect to magnetic north and provides selection of desired heading, VOR radials and LOC runway heading.
2. HSI NAV FLAG - Flag in view indicates the NAV signal being received is inadequate.
3. HSI HEADING REFERENCE - Indicates airplane heading on compass card.
4. HSI HEADING FLAG - Flag in view indicates the heading data is not reliable.
5. HSI GYRO SLAVING INDICATOR - Displays synchronization of compass card with respect to the magnetic flux detector unit. The heading selector knob may be used at any time to accomplish synchronization of the compass card reading with the magnetic heading as indicated by zeroing the slaving indicator. A slaved condition is present when the slaving indicator oscillates about the null point (45° fixed reference line on the HSI).

Figure 7-27 (Sheet 1 of 2)

FLIGHT DIRECTOR INDICATOR

12. FDI PITCH ATTITUDE SCALE - Movable scale with 5°, 10°, 15° and 20° marks referenced against the symbolic airplane.
13. FDI RISING RUNWAY - (Applicable only with optional radio altimeter.) Bar comes into view at approximately 200 feet altitude and rises with descending altitude.
14. FDI SYMBOLIC AIRPLANE - Airplane attitude is displayed by the relationship between the fixed symbolic airplane and the movable background. The position of the symbolic airplane is not adjustable. During flight director operation, the symbolic airplane is flown to align its center dot with the command bars to satisfy the flight director commands.

Figure 7-28 (Sheet 2 of 2)

STALL WARNING SYSTEM

A stall warning system is required equipment which consists of a stall warning transmitter vane located in the left wing tip leading edge, a flight deck warning horn and the necessary wiring to complete the system. Information concerning optional angle-of-attack system is contained in applicable supplement in Section 9.

The stall warning horn will sound at least 5 to 10 KIAS above the stall in all flight configurations. Proper operation of the warning system can be checked during preflight inspection by moving the stall warning vane; the horn should sound. Condition of the stall warning vane heater should also be checked during preflight by actuating the STALL anti-ice switch and feeling the vane for heat.

ICE PROTECTION EQUIPMENT (FLIGHT IN ICING CONDITIONS)

Flight in icing conditions, as defined by the FAA, is allowed when the following equipment is installed and operational: wing, empennage and propeller deice boots; pilot's windshield anti-ice; heated stall warning vane or optional heated angle-of-attack lift sensor vane; heated pitot source; heated static source; wing deice light; and engine air inlet anti-icing. The wing and empennage deice boots are designed to remove ice after it has formed rather than prevent its formation. The propeller deice boots will also remove accumulated ice; however, they should be activated prior to entering icing conditions. The remainder of the equipment is designed to prevent ice accumulation and should be activated prior to entering icing conditions.

DEICE BOOT SYSTEM

The deice boot system consists of pneumatic air operated boots (See Figure 7-28A), an annunciator light to monitor system operation and necessary hardware to complete the system.

The deice boots are attached to the leading edges of the wing and horizontal and vertical stabilizers. The boots expand and contract, using pressure and vacuum generated by engine bleed air. Normally, vacuum is

applied to all of the boots to hold them against the leading edge surfaces. When a deice boot cycle is initiated, the vacuum is removed and bleed air pressure is applied to inflate the boots. This change in contour will break the ice accumulation on the leading edges. Ice formation aft of this area will then be removed by normal in-flight air forces. A normal boot inflation sequence is 6 seconds for empennage boots followed by 6 seconds for the wing boots. The system should be cycled when ice accumulates to between 1/4 and 1/2 inch.

The deice boots are inflated each time that the deice boot switch is activated. The RESET position is used to stop a cycle, should it ever become necessary. A light on the annunciator panel, marked SURFACE DEICE, will illuminate when the tail boots become inflated to a pressure of 11 PSI or more, extinguishes momentarily and illuminates again when the wing boots inflate. If less than 11 PSI is available, the light will not illuminate, indicating that icing conditions should be avoided. Prior to flight in icing conditions, operation of the boots should be functionally checked on the ground or in flight with the OAT above -40°C.

CAUTION

Operation below -40°C can result in permanent damage to the deice boots.

WINDSHIELD ANTI-ICE SYSTEM

CAUTION

Do not operate windshield anti-ice in ambient temperature above 4°C for more than 10 seconds.

The windshield anti-ice system uses engine bleed air to prevent ice accumulations on the pilot's windshield. Windshield anti-ice is available as an option for the copilot's windshield. The system operates on the bleed air supplied from either or both engines (See Figure 7-28A).

The windshield anti-ice system is activated by the WINDSHIELD switch. When the switch is activated, bleed air from the engines is routed to the nose section where it flows through a heat exchanger that lowers the temperature of the air before it is routed to the outlet nozzles at the windshield. A door on the heat exchanger exhaust opens automatically when the system is turned on and bleed air temperature is controlled to 135°C by a motor-operated valve in the ram air inlet duct.

If the temperature of the bleed air reaching the outlet nozzle exceeds 157.0°C, a solenoid valve automatically terminates the bleed air supply to the windshield and a W/S AIR O'HEAT light on the annunciator panel will illuminate. The system may sense an overheat condition and cycle on and off once after initial turn on if windshield anti-ice was inadvertently selected with both engines inoperative. The windshield heat switch should be turned off if the bleed air flow is not automatically terminated or if the system cycles on and off twice after initial turn on. Failure to turn the system off will result in continuous cycling of the windshield heat.

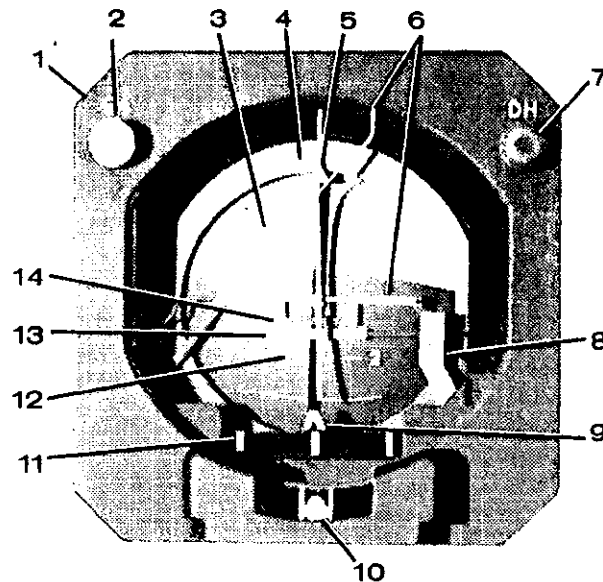
The windshield bleed airflow will stop any time the power levers are retarded to FLIGHT IDLE and the landing gear is down and locked. The windshield bleed airflow will operate continuously at FLIGHT IDLE with the landing gear up and locked.

HORIZONTAL SITUATION INDICATOR

6. HSI HEADING BUG AND HEADING SELECTOR KNOB - Heading bug displays selected heading relative to the compass card. It is positioned by rotating the heading selector knob. The bug rotates with the compass card. Pushing in and rotating the knob sets the compass card manually.
7. APPR ANNUNCIATOR - Lights green to annunciate a LOC frequency is tuned on NAV 1 receiver or when an RNAV approach is selected.
8. HSI COMPASS CARD - Displays airplane heading relative to the HSI heading index. It is slaved to correct for normal precessional errors. Each graduation represents 5 degrees.
9. HSI FROM FLAG - Indicates direction of the VOR station relative to the selected course. The indicator shown has the white triangular-shaped flag retracted.
10. HSI COURSE DEVIATION BAR - Displays displacement from the VOR or localizer course center. Does not reverse with back course engagement.
11. HSI COURSE DEVIATION DOTS - Indicates airplane displacement from VOR or localizer beam center. Full scale course deviation bar displacement (2 dots) represents the following deviation from beam center; VOR $\pm 10^\circ$, localizer approximately $\pm 2-1/2^\circ$.
12. HSI COURSE CURSOR AND COURSE SELECTOR KNOB - Course cursor is positioned on the compass card by rotating the course selector knob; this selects a VOR radial or LOC runway heading. It rotates with the compass card.
13. HSI GLIDESLOPE FLAG - Flag in view obscures the pointer and scale, indicating the received glideslope signal is inadequate.
14. HSI GLIDESLOPE POINTER AND SCALE - Displays deviation of airplane from an ILS glideslope. Full scale deflection (2 dots) of the glideslope pointer represents $\pm 0.7^\circ$ from beam center.
15. HSI TO FLAG - Indicates direction of the VOR station relative to the selected course. Displays TO when a LOC frequency is selected. The indicator shown has the white triangular-shaped flag retracted.
16. DIRECTIONAL GYRO SLAVING SWITCH - Switch allows selection of unslaved or slaved (NORM) mode of operation for the HSI compass card.

Figure 7-27 (Sheet 2 of 2)

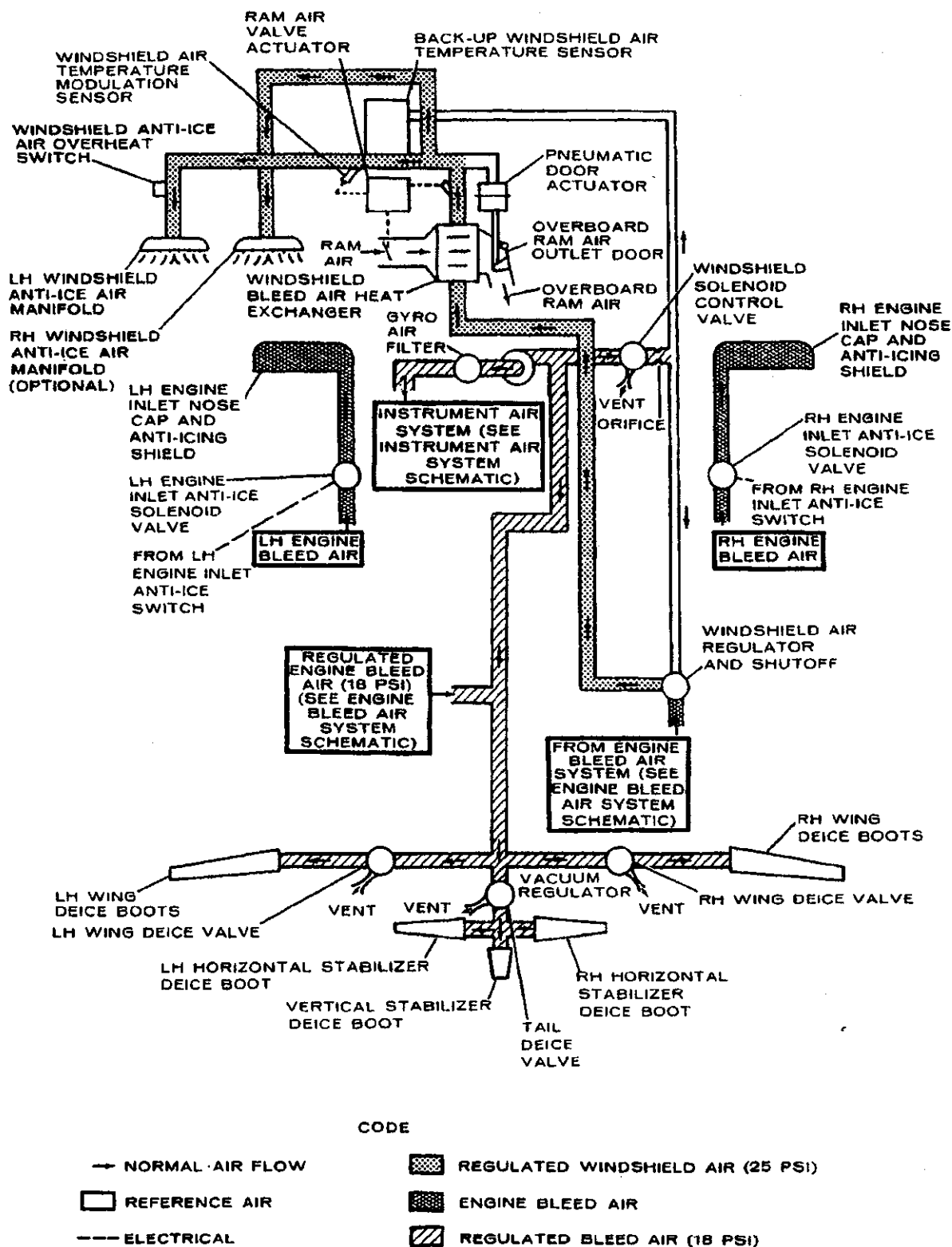
FLIGHT DIRECTOR INDICATOR



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1. **FLIGHT DIRECTOR INDICATOR (FDI)** - Displays airplane attitude as a conventional attitude gyro and displays commands for flight director operation.
2. **FDI GO-AROUND (GA) ANNUNCIATOR** - Indicates pilot has selected Go-Around Mode on flight director.
3. **FDI ATTITUDE BACKGROUND** - Moves with respect to symbolic airplane to display airplane pitch and roll attitude.
4. **FDI ROLL ATTITUDE SCALE** - Movable scale with 0°, 10°, 20°, 30°, 60° and 90° marks, indicated with respect to roll attitude index.
5. **FDI ROLL ATTITUDE INDEX** - Displays airplane roll attitude against the roll attitude scale.
6. **FDI COMMAND BARS** - Displays computed steering commands referenced to the dot on the symbolic airplane to intercept and maintain a desired flight path.
7. **FDI DECISION HEIGHT (DH) ANNUNCIATOR** - Indicates airplane has reached preset decision height selected on the optional radio altimeter.
8. **FDI GYRO OFF FLAG** - Flag in view indicates gyro electrical power is interrupted or gyro is not up to the proper speed required for erection.
9. **FDI EXPANDED LOCALIZER INDICATOR** - Indicates deviation from localizer course center line. Full scale displacement from center is approximately 0.3 degrees.
10. **FDI INCLINOMETER** - Indicates slip or skid to the left or right by displacement of the ball.
11. **FDI EXPANDED LOCALIZER SCALE** - Indicates deviation from localizer beam center line. Full scale is approximately 0.3° either side of beam center.

Figure 7-28 (Sheet 1 of 2)



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Figure 7-28A

PROPELLER DEICE SYSTEM

The propeller deice system consists of electrically heated boots on the propeller blades. Each boot consists of an inboard and outboard heating element which receives its electrical power through a deice timer. To reduce power drain, the timer directs current to the propeller boots in cycles between elements in the following sequence:

Heating Period Number 1 - Outboard Halves

Heating Period Number 2 - Inboard Halves

Each heating period lasts approximately 20 seconds.

A reading below the green arc on either the left or right propeller deice ammeter indicates that the blades of the propeller are not being deiced uniformly.

WARNING

When uneven deicing of the propeller blades on either engine is indicated, it is imperative that the associated propeller deice system switch breaker be turned OFF. Uneven deicing of the blades will result in propeller unbalance and can lead to engine failure.

Abnormal operation of the propeller deice system is indicated by engine/propeller roughness or by tripping of the L and/or R PROPELLER switch breakers. Failure of the L or R PROPELLER circuit breaker to stay reset indicates failure of the applicable propeller deice system.

ENGINE AIR INLET ANTI-ICING

The engine air inlet anti-icing system consists of an inlet anti-icing valve and an inlet anti-icing shield that is contoured around the lower portion of the inlet air duct (See Figure 7-28A). High temperature bleed air is routed through the anti-icing valve to the shield when the ENGINE INLET anti-ice switch breakers are activated to prevent formation of ice. The left and right ENGINE ANTI-ICE annunciator lights will illuminate whenever the respective engine inlet anti-ice switches are placed in the ON position.

On airplanes incorporating SK441-68, regardless of the position of the engine inlet anti-ice switches, the ENGINE ANTI-ICE annunciator lights will also illuminate whenever bleed air pressure is detected in the engine inlet nose caps and anti-icing shields. This provides annunciation in the event that the engine inlet anti-ice solenoid valve does not completely close upon placing the anti-ice switch to the OFF position.

CAUTION

Do not operate engine anti-ice in ambient temperatures above 4°C for more than 10 seconds. Engine operation in temperatures above 4°C with engine inlet anti-icing bleed air flowing can cause inlet distortion and compressor rubs resulting in permanent degradation in engine power.

If a left or right ENGINE ANTI-ICE annunciator light illuminates with the respective anti-ice switch in the OFF, position, the pilot should follow the appropriate Abnormal Procedure in Section 3.

AVIONICS

The airplane comes equipped with the following avionics equipment as standard. Information concerning optional avionics equipment is contained in the applicable supplements in Section 9.

NOTE

When tuned to a weak NAV signal, keying the COM transmitter may cause momentary interference within the NAV receiver causing a NAV flag to appear. Should circumstances warrant, ATC should be requested to assign another COM frequency.

AVIONICS MASTER SWITCHES

Two avionics bus switches, see Figure 7-19, are provided on the left side console. Basically, the L AVIONICS BUS switch controls power to the No. 1 avionic circuit breakers while the R AVIONICS BUS switch controls power to the No. 2 avionics circuit breakers and the autopilot. Complete information is presented in the Avionics Bus Failure procedure in Section 3, Abnormal Procedures.

The 1000 audio control panel provides for amplification of the audio signals for the speaker system and allows audio switching for the cockpit and cabin speakers, headsets, intercom and microphone. The audio panel may be installed in a single configuration, where pilot and copilot utilize the same panel, or in dual configuration, which has one panel for each pilot. All operating controls and indicators are located on the front of the panel (see Figure 7-29).

NOTE

- In a dual configuration, it is recommended that headsets be used by the pilot and copilot instead of speakers to avoid possible audio feedback. If pilot and copilot are tuned to different frequencies they will hear each others sidetone on headsets.
- The receiver selector switches that are used on the audio control panel are determined by the avionics equipment installed in the airplane. Unused switches are identified with a black boot on the switch handle.

COM 1 is delivered as the designated emergency receiver/transmitter and in the event of a failure of the control panel, communications can be maintained through COM 1 by selecting EMER COM position.

For Airplanes 441-0071, thru 441-0172, with a single audio control panel installation, the control panel receives power from the bus opposite to that supplying the designated emergency receiver-transmitter. The control panel, therefore, will not be entirely disabled upon loss of a single bus. Removing power from the audio control panel does not prevent its use in the EMER COM position. Although power distribution to the audio control panel is cross-bussed, the circuit breaker is appropriately labeled as to which panel it controls.

AUDIO CONTROL PANEL

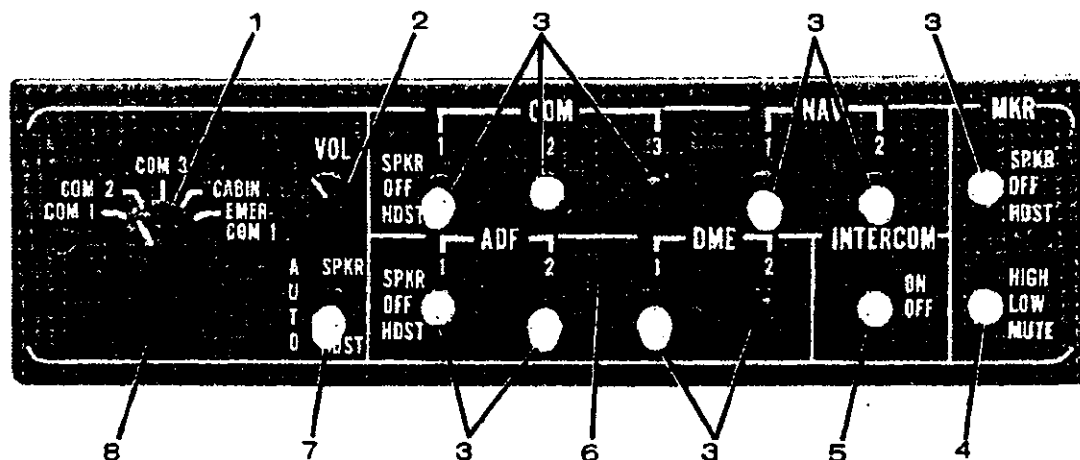


Figure 7-29 (Sheet 1 of 2)

AUDIO CONTROL PANEL

1. **FUNCTION SWITCH** - Selects desired function, except INTERCOM, for the pilot's and copilot's microphone. The associated audio for each function is automatically selected. Speaker/headset selection for the function switch audio is selected by the AUTO SPKR/HDST switch.
2. **VOL CONTROL** - Controls volume for cockpit speaker and headset audio.
3. **SPKR/OFF/HDST RECEIVER SELECTOR SWITCHES** - Provides audio to either speaker or headset. The OFF position terminates audio output. Switches may be selected individually or in any combination. These audio signals will be muted whenever any mic key is actuated for COM 1, 2 or 3 operation.
4. **HIGH/LOW/MUTE MARKER BEACON SELECTOR SWITCH** - Selects marker beacon receiver sensitivity, HIGH or LOW. MUTE, a momentary contact switch position, cuts off marker beacon audio for approximately 30 seconds. When MUTE position is released, switch returns to LOW.
5. **INTERCOM SWITCH** - Switches on the pilot and the copilot microphones for intercommunication between each other. All other receiver modes may be selected while in intercom mode. However, when any of the mic keys are actuated for COM 1, 2 or 3 operation, intercom audio and all receiver mode audio are muted. The intercom, audio can be selected for either speaker or headset operation by the AUTO/SPKR/HDST switch. Normally, intercom operation is conducted in the AUTO HDST mode.

NOTE

INTERCOM operation with AUTO/SPKR selected is only intended for use with an oxygen mask microphone, where audio feedback will not be encountered from an open microphone.

6. **SIDETONE VOLUME CONTROL** - Sets the COM 1, 2 and 3 sidetone volume. This control is set with a screwdriver through the front panel and is intended as a preset volume adjustment to be made at the time of installation, or as required by the individual operator.
7. **AUTO SPKR/HDST SWITCH** - Selects audio for either speaker or headset operation for the audio selected by the function switch including the associated sidetone from the COM transmitter and the intercommunication audio selected by the INTERCOM switch.
8. **CABIN CALL** - Back-lighted green indicator that lights when the cabin microphone switch is actuated to signal the cockpit that the cabin wishes to communicate via the cabin microphone and speaker. Cockpit communication with the cabin is made by setting the function switch to the CABIN position. Normal incoming audio from the other modes is not interrupted when the function switch is set to CABIN position.

Figure 7-29 (Sheet 2 of 2)

1000 AUTOMATIC DIRECTION FINDER (TYPE 1046A)

The 1000 automatic direction finder (ADF) provides continuous, visual bearing indications of the direction from which LF or MF signals are being received. It can be used for plotting position, for homing, and for aural reception of AM signals between 200 kHz and 1699 kHz. In addition, a crystal-controlled, beat frequency oscillator (BFO) permits identification of stations transmitting keyed CW signals (Morse Code).

The 1000 ADF permits presetting three frequencies of which two (input and active) are displayed on electronic readouts. As new input frequencies are selected, they may be transferred to active status by means of pushbutton. The previous active frequency is stored in memory and may be recalled by means of a pushbutton. A control is provided to permit selecting the operating frequency directly from the frequency selector knobs, if desired.

To prevent accidental operation, the frequency related pushbuttons (XFER and RECALL) must be pressed for at least 1/4 second to change frequencies. In addition, a safety circuit is provided which prevents inadvertently entering the same frequency twice and unintentionally erasing the previous memory frequency.

A "frequency memory" voltage is provided so that the preset frequencies are not lost when the receiver is turned off. This voltage is provided directly from the hot battery bus and is present even with the battery switch off. To prevent battery discharge during periods of long term storage, a FREQ MEM circuit breaker is provided on the right side console.

NOTE

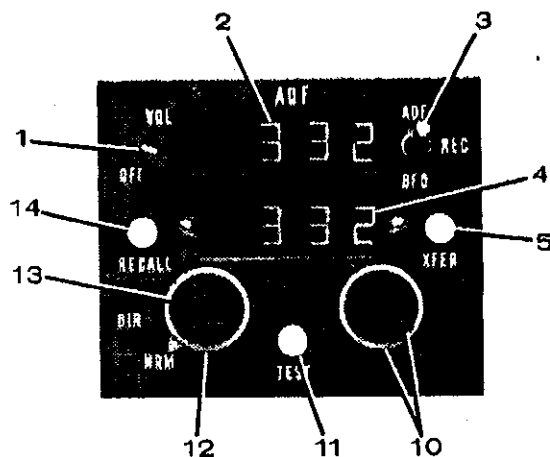
If the "frequency memory" voltage is interrupted, all stored frequencies for the ADF will be lost. Subsequent operation of the system, with the "frequency memory" voltage restored, will require new frequency inputs.

The 1000 ADF consists of a receiver, panel-mounted control head, radio magnetic indicator (RMI) and sense and loop antennas. All operating controls are shown in Figure 7-30.

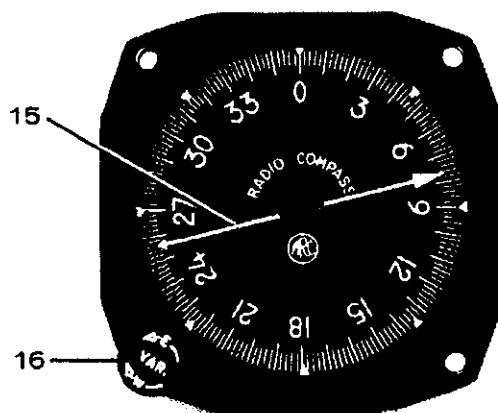
The RMI double bar pointer indicates the bearing of the radio station from which the signal is received. An automatic pointer-stow feature alerts the pilot to non-ADF operation by slewing the pointer to the 3 o'clock position when the BFO or REC mode of operation is selected.

The operating frequency and band is selected in 1-kHz increments by three frequency selector switches. The frequency selected is displayed digitally. The operating mode (BFO, REC or ADF) is selected by a function switch. A pushbutton switch is used to test signal reliability during ADF operation.

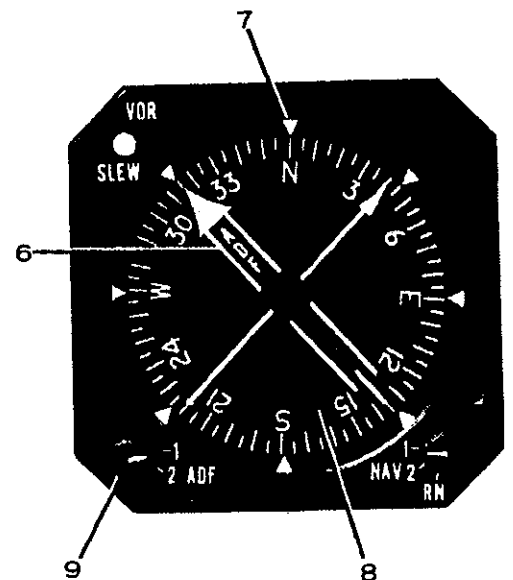
ADF CONTROLS AND INDICATORS



CONTROL UNIT



OPTIONAL INDICATOR



STANDARD INDICATOR

1. OFF/VOL CONTROL - Clockwise rotation applies power. Further clockwise rotation increases audio level.
2. ACTIVE FREQUENCY READOUT - Displays active frequency which is being received.
3. FUNCTION SWITCH - Selects operating mode:
 ADF - Set operates as automatic direction finder and pointer indicates direction from which signal is being received.
 REC - Set operates as communications receiver and pointer is stowed at 3 o'clock.
 BFO - Set operates as a communication receiver, beat frequency oscillator is activated for identification of keyed CW signals (Morse Code), and pointer is stowed at 3 o'clock.
4. INPUT FREQUENCY READOUT - Displays frequency selected by frequency selectors in NRM mode. Blanked in DIR mode.
5. XFER PUSHBUTTON - Transfers input frequency to active frequency which is being received. The previous active frequency is stored in memory. The previous memory frequency is lost. Pushbutton action is delayed by 1/4 second to prevent accidental actuation. Does not function in DIR.

Figure 7-30 (Sheet 1 of 2)

ADF CONTROLS AND INDICATORS

NOTE

The XFER pushbutton transfers the same frequency to the active input only once, regardless of how many times the pushbutton is pressed. This prevents accidentally loading the same frequency twice and unintentionally erasing the previous memory frequency.

6. DOUBLE-BAR POINTER - Indicates bearing of selected ADF station.
7. HEADING INDEX - Indicates airplane magnetic heading on the azimuth card.
8. ROTATING AZIMUTH CARD - Rotates as airplane turns so airplane magnetic heading is continuously displayed under the heading index.
9. ADF FUNCTION SWITCH - Selects signals from ADF 1 or optional ADF 2 for display by the double-bar pointer.
10. 1 and 10 kHz
FREQUENCY SELECTORS - Outer knob selects frequency in 1 kHz steps; inner knob selects frequency in 10 kHz steps.
11. TEST PUSHBUTTON - Pushbutton used with ADF function to test bearing reliability. When pushed in, pointer is slewed; when released, if bearing is reliable, pointer returns to its original position. Also tests the active and input frequency readouts. When pushed in, readouts display 1888.
12. DIR/NRM SELECTOR - Selects direct or normal mode:
DIR - Active frequency selected directly by frequency selectors. Input frequency readout is blanked.
NRM - Input frequency selected by frequency selectors. Active frequency is controlled with XFER or RECALL pushbuttons.
13. 100 kHz FREQUENCY SELECTOR - Selects frequency in 100 kHz steps.
14. RECALL PUSHBUTTON - Recalls frequency stored in memory to active frequency. Previous active frequency is stored in memory. Pushbutton action delayed by 1/4 second to prevent accidental actuation. Does not function in DIR mode.
15. BAR POINTER - Indicates bearing of selected station.
16. VAR - Rotates Dial to introduce relative, magnetic or true bearing information.

Figure 7-30 (Sheet 2 of 2)

1000 COMMUNICATION SYSTEM (TYPE 1038A)

The Cessna 1000 communication system is an airborne communication system capable of receiving and transmitting on any one of 720 frequencies. The frequencies are spaced 25 kHz apart and cover a frequency range of 118.000 through 135.975 MHz. The receiver/transmitter frequency is synthesizer-controlled and tuned automatically when the frequency is selected on the control unit. The receiver section is equipped with an automatic squelch circuit which automatically compensates for varying noise levels. The squelch threshold is manually adjustable.

The communication receiver-transmitter provides for three presettable frequencies of which two (input and active) are displayed on electronic readouts. As new input frequencies are selected, they may be transferred to active status by means of a pushbutton. The previous active frequency is stored in memory and may be recalled by means of a pushbutton.

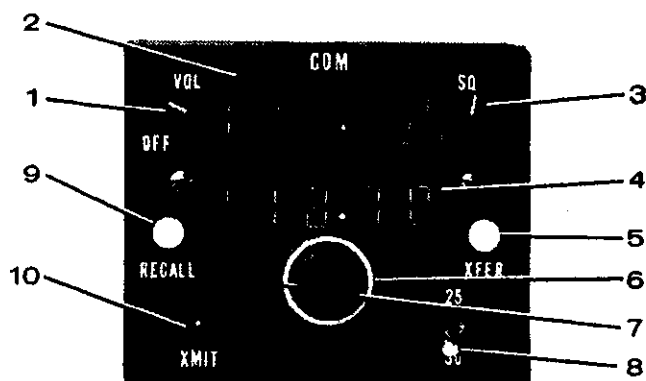
To prevent accidental operation, the frequency related pushbuttons (XFER and RECALL) must be pressed for at least 1/4 second to change frequencies. In addition, a safety circuit is provided which prevents inadvertently entering the same frequency twice.

A "frequency memory" voltage is provided so that the preset frequencies are not lost when the receiver-transmitter is turned off. This voltage is provided directly from the hot battery bus and is present even with the battery switch off. To prevent battery discharge during periods of long term storage, a FREQ MEM circuit breaker is provided on the right side console.

NOTE

- If the "frequency memory" voltage is interrupted, all stored comm frequencies will be lost. Subsequent operation, with the "frequency memory" voltage restored, will require new frequency inputs.
- When tuned to a weak NAV signal, keying the COMM transmitter may cause momentary interference within the NAV receiver causing a NAV flag to appear. Should circumstances warrant, ATC should be requested to assign another COMM frequency.

COMMUNICATION CONTROL PANEL



1. VOL CONTROL SWITCH - Clockwise rotation applies power. Further clockwise rotation increases audio level.
2. ACTIVE FREQUENCY READOUT - Displays active frequency which is being received and transmitted. The last digit (0 or 5 kHz) is not displayed.
3. SQ CONTROL - Controls threshold of automatic squelch circuit. Counter-clockwise rotation increases squelch action (silences receiver).

Figure 7-31 (Sheet 1 of 2)

COMMUNICATION CONTROL PANEL

4. INPUT FREQUENCY READOUT - Displays frequency directly selected by frequency selectors. This frequency cannot be used to transmit/receive until it is transferred to active frequency readout. The last digit (0 or 5 kHz) is not displayed.
5. XFER PUSHBUTTON - Transfers input frequency to active frequency which is being received and transmitted. The previous active frequency is stored in memory. The previous memory frequency is lost. The pushbutton action is delayed by 1/4 second to prevent accidental actuation.

NOTE

The XFER pushbutton transfers the same frequency to the active input only once, regardless of how many times the pushbutton is pressed. This prevents accidentally loading the same frequency twice and unintentionally erasing the previous memory frequency.

6. WHOLE MEGAHERTZ SELECT KNOB - Selects receiver-transmitter input frequency in 1 MHz steps.
7. FRACTIONAL MEGAHERTZ SELECT KNOB - Selects receiver-transmitter input frequency in 50 kHz steps.
8. 25/50 SWITCH - In the 50 position, the input frequency changes in whole 50 kHz steps. In the 25 position, 25 kHz is added to each 50 kHz step to obtain frequencies ending in 25 and 75 kHz.
9. RECALL PUSHBUTTON - Recalls frequency stored in memory to active frequency. Previous active frequency is stored in memory. Pushbutton action delayed by 1/4 second to prevent accidental actuation.
10. XMIT LIGHT - Indicates proper transmitter operation when lighted.

Figure 7-31 (Sheet 2 of 2)

The 1000 communication system consists of two panel-mounted module control units, see Figure 7-31, two remotely located receiver/transmitter units, a VHF communication antenna and interconnecting cables. The system utilizes the airplane's audio switch panel, microphone, headphone and speaker systems.

All of the required operating controls are mounted on the front panel of the module control unit except the microphone switch.

Nose compartment equipment cooling is provided by a cooling fan which circulates air from the nosewheel well into the avionics bay. The fan is controlled by the EQUIP FANS circuit breaker.

800 DISTANCE MEASURING EQUIPMENT (TYPE 876A)

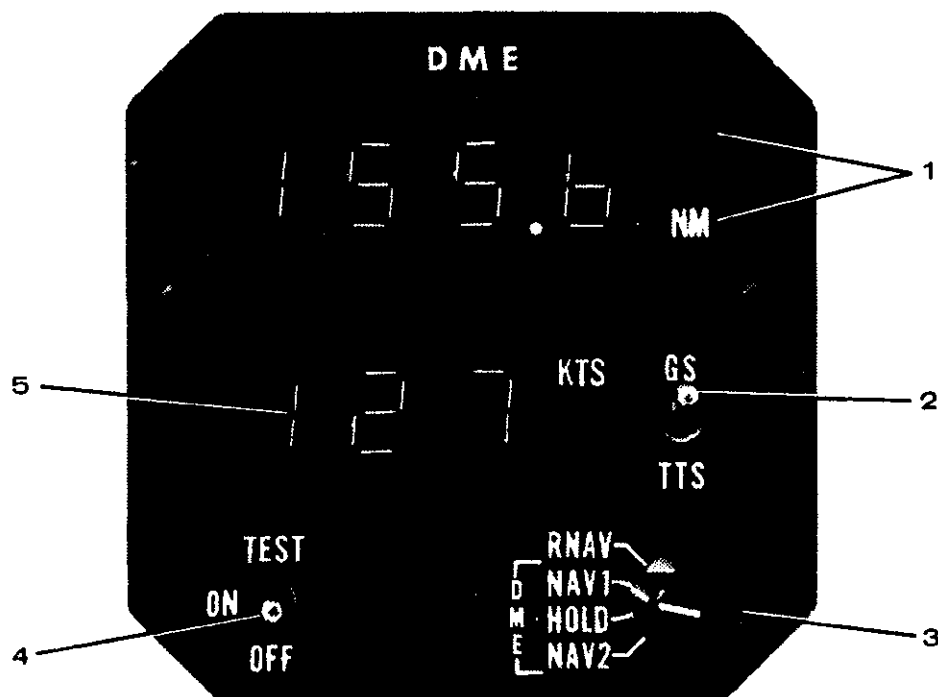
The Cessna 800 DME is the airborne "interrogator" portion of a navigation system which supplies continuous, accurate, direct-line distance information from a fixed ground station to the airplane in flight.

Except for selection of the operating channel, which is selected by the VHF navigation receiver, the DME is capable of independent operation. The equipment consists of a panel-mounted control unit which contains all of the operating controls and displays, see Figure 7-32, and a remotely mounted receiver-transmitter. The receiver-transmitter transmits interrogating pulse pairs on 100 channels between 1041 MHz and 1150 MHz; it receives associated ground-to-air replies between 978 MHz and 1213 MHz. The control unit digitally displays distances up to 200 nautical miles and either ground speed or time-to-station information, as selected.

The RNAV function of the DME is operational only when the optional 800 Area Navigation System is installed and operational. If dual DMEs are installed, either or both units can be switched to NAV 1 or NAV 2.

Nose compartment equipment cooling is provided by a cooling fan which circulates air from the nosewheel well into the avionics bay. The fan is controlled by the EQUIP FANS circuit breaker.

DME CONTROLS



1. RN/NM DISTANCE-TO-STATION DISPLAY - In NAV 1, NAV 2, or HOLD mode, displays distance to selected VOR/DME station in nautical miles; only NM (Nautical Miles) designation lights. In RNAV mode, displays distance to selected waypoint in nautical miles; both RN (RNAV) and NM designations light.
2. GS/TTS SELECTOR SWITCH - In NAV 1, NAV 2, or HOLD mode, selects display of ground speed (GS) or time to station (TTS). In RNAV mode, selects display of ground speed (GS) or time to waypoint (TTS).

Figure 7-32 (Sheet 1 of 2)

DME CONTROLS

3. DME MODE SELECTOR SWITCH - Selects DME operating mode:
- RNAV - Selects area navigation operation using NAV 2 receiver.
 - NAV 1 - Selects DME operation with No. 1 VHF navigation set; enables channel selection by NAV 1 frequency selector switches.
 - HOLD - Selects DME memory circuit; DME remains channeled to station to which it was channeled when HOLD was selected; display of distance continues to be nautical miles to that station. Both the NAV 1 and NAV 2 sets may be set to new operating frequencies.

NOTE

In the HOLD mode, there is no annunciation of the VOR/DME station frequency. Station identification can be verified by monitoring the coded identification audio signal.

- NAV 2 - Selects DME operation with No. 2 VHF navigation set; enables channel selection by NAV 2 frequency selector switches.
4. TEST/ON-OFF SWITCH - Controls application of power to DME circuits (turns equipment on or off); selects display lamp test for DME and RNAV displays.
5. KTS/MIN DISPLAY - Displays ground speed in knots or time-to-station in minutes:
- GS/TTS Switch - GS. Displays ground speed to or from station in knots (airplane must be flying directly to or from the VOR/DME station for accurate indication).
 - GS/TTS Switch - TTS. Displays time to VOR/DME station in minutes at the ground speed component indicated.
 - GS/TTS in RNAV mode - Displays either ground speed or time to waypoint as described above. Airplane track must be directly to or away from the waypoint for accurate indications.

Figure 7-32 (Sheet 2 of 2)

400 ENCODING ALTIMETER (TYPE EA-401A)

The Cessna 400 encoding altimeter is an electrically driven instrument that provides the pilot with a visual display of the airplane's altitude. The altimeter also includes an optical encoder which automatically produces a logic code that corresponds to the sensed altitude. This code is supplied to the transponder in the airplane to generate replies to Mode C (altitude reporting) interrogations from the ground controller.

The 400 encoding altimeter, see Figure 7-33, is a panel-mounted barometric altimeter with an altitude range of -1000 to +35,000 feet. Altitude is displayed by a dial and a digital readout. The dial is graduated in numerical divisions which represent increments of 100 feet, with subdivision markings for every 20 feet. The dial pointer completes one revolution for every 1000 feet of altitude change. The digital readout displays airplane altitude in increments of hundreds and thousands of feet only. When power is removed from the altimeter, a striped warning flag appears across the digital altitude display to indicate a "power-off" condition.

NOTE

The power off warning flag is a power warning only.

Local atmospheric pressure corrected to sea level is set into the altimeter with a manually operated baroset knob, and is displayed on a four-digit readout, either in inches of mercury or in millibars (as ordered). This altimeter setting does not affect the output of the optical encoder, since the encoder is always referenced to standard pressure (sea level; 29.92 inches of mercury or 1013.2 millibars).

Except for introducing the altimeter setting with the baroset knob, operation of the altimeter is completely automatic. The baroset knob and the display indicators are shown in Figure 1.

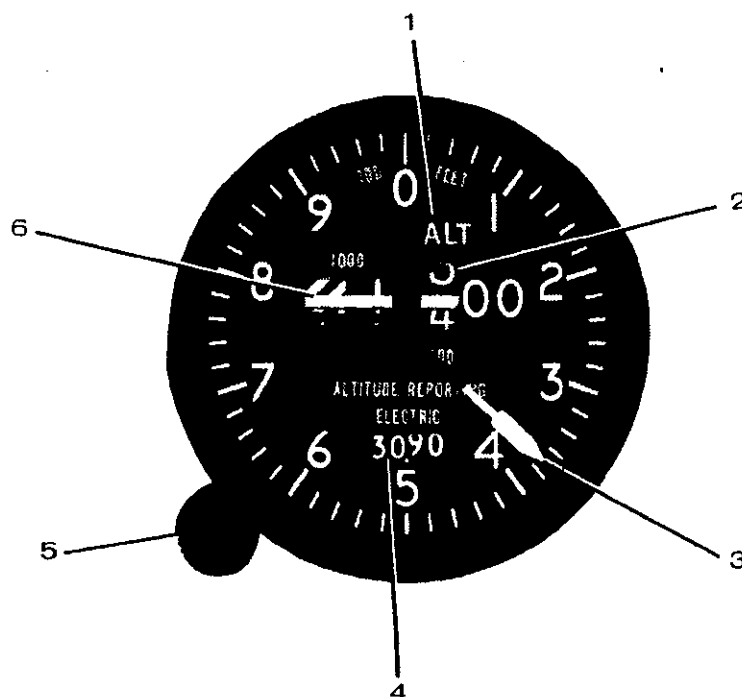
The altitude alerter is a panel-mounted unit which includes all of the operating controls and indicators and the preselector logic circuits.

Altitude information for use in the altitude alerter is supplied electronically from the encoding altimeter. Three Minilever switches, mounted on the front panel of the unit, are used to select any altitude between 100 and 35,000 feet in 100-foot increments; the selected altitude is displayed on a digital readout. The preselector control and indicators and an ALERT indicator are also included on the front panel of the unit. All Controls and indicators for the altitude alerter are shown in Figure 2.

The altitude capture function is selected by a white pushbutton switch (ARM) which energizes the preselector logic circuits. For altitude capture function operation, the Integrated Flight Control System must be turned on but not already engaged in a vertical mode (altitude hold or glideslope coupled). When the Minilever switches are set to the desired altitude and the white ARM pushbutton is pushed in, an amber ARMD panel lamp lights to indicate that the function is "armed." When the airplane reaches the selected altitude, the amber ARMD lamp turns off, and a green CPLD panel lamp on the alerter and the altitude hold (alt) lamp on the autopilot mode selector lights to indicate that IFCS altitude hold mode is operational. If the Minilever switches are repositioned after the preselector has been armed but before altitude hold is engaged, the logic circuits are reset and must be rearmed by again pushing in the ARM switch.

The alert indicator consists of a three-lamp display and a one-second aural tone. The alerting range levels are variable within limits for individual airplane requirements and may be preset for each airplane. As factory installed, a green indicator lamp lights when the airplane altitude is within ± 300 feet of the selected altitude. When the airplane enters an altitude band from 300 feet to 1000 feet above or below the selected altitude, an amber HI ALERT or LO ALERT lamp lights and simultaneously, the one-second tone is heard. A remotely mounted amber ALT ALERT lamp illuminates when either the HI ALERT or LO ALERT lamps light. At altitudes above or below the 1000-foot alerting range, the alert function does not operate.

ENCODING ALTIMETER INDICATOR



1. ZERO-TO-THOUSAND FOOT

ALTITUDE DISPLAY DIAL - Calibrated in 10 numerical graduations which represent increments of 100 feet; the subdivisions of each graduation represents increments of 20 feet.

2. ALTITUDE READOUT - Displays altitude above 100 feet on three-section counter in increments of 10,000, 1000 and 100 feet. When altitude is below 10,000 feet, a diagonally striped flag appears in the 10,000-foot window.

3. ZERO-TO-THOUSAND FOOT

ALTITUDE DISPLAY POINTER - Directly indicates airplane altitude between 0 and 1000 feet; for altitudes above 1000 feet, indicates the last three digits of altitude (hundreds, tens and ones).

4. ALTIMETER SETTING READOUT - Displays altimeter setting set into the altimeter with the baroset knob on the four-digit counter.

5. BAROSET KNOB - Used to enter local altimeter setting; clockwise rotation increases pressure setting, counterclockwise rotation decreases setting.

6. POWER-OFF WARNING FLAG - Appears across altitude readout when power is removed from altimeter to indicate that readout is not reliable.

NOTE

The power off warning flag is a power warning only.

Figure 7-33

LOCATOR BEACON (MODEL DMELT-6 and -6C)

The locator beacon system is a battery-operated, sweep-tone emergency radio transmitter incorporating an antenna mounted in the dorsal fin and a transmitter located in the right side of the tail cone aft of the tail cone access panel. The transmitter contains an integral 3-position switch which can be reached by removing the plug button located adjacent to the locator beacon placard. Normally, the switch is in the ARM (AUTOMATIC "G" OPERATION) position; this position allows the transmitter to be activated automatically by the "G" switch. The ON (EMERGENCY & TEST) position should be used only to test the equipment or whenever a rescue is desired. The OFF (AFTER RESCUE) position should be used only after the rescue as this position will disable all emergency transmissions.

The locator beacon transmits on both 243.0 MHz (UHF) and 121.5 MHz (VHF) emergency frequencies simultaneously. The locator beacon, provided for operation in Canada, transmits only on the 121.5 MHz (VHF) emergency frequency.

Transmitter power is provided by an alkaline battery pack inside the transmitter case.

NOTE

The battery pack must be changed no later than the date specified on the outside of the locator beacon case and on the battery pack.

400 MARKER BEACON (TYPE R-402A)

The Cessna 400 Marker Beacon (Type R-402) consists of a 75 MHz marker beacon receiver, antenna and three instrument panel mounted lights, see Figure 7-33B. Marker beacon audio is controlled by a speaker/headset switch on the audio control panel. Volume level of the marker beacon audio is controlled through the audio control panel volume control. Sensitivity of the marker beacon is controlled by a HIGH/LOW/MUTE switch on the audio switch panel. On airplanes 441-0001 thru 441-0072, illumination capability of the marker beacon lights can be tested by pressing the PRESS-TO-TEST switch located in the center of the annunciator panel. When this switch is actuated, all three marker beacon lights should illuminate. On airplanes 441-0073 thru 441-0172, illumination capability of the marker beacon lights can be checked by actuation of the marker beacon test switch located to the right of the marker beacon lights.

A marker beacon audio mute capability is available to greatly reduce the marker beacon audio level. The audio mute is controlled by the HIGH/LOW/MUTE switch on the audio panel. Momentarily placing the switch to the MUTE position will greatly suppress marker beacon audio for approximately 30 seconds.

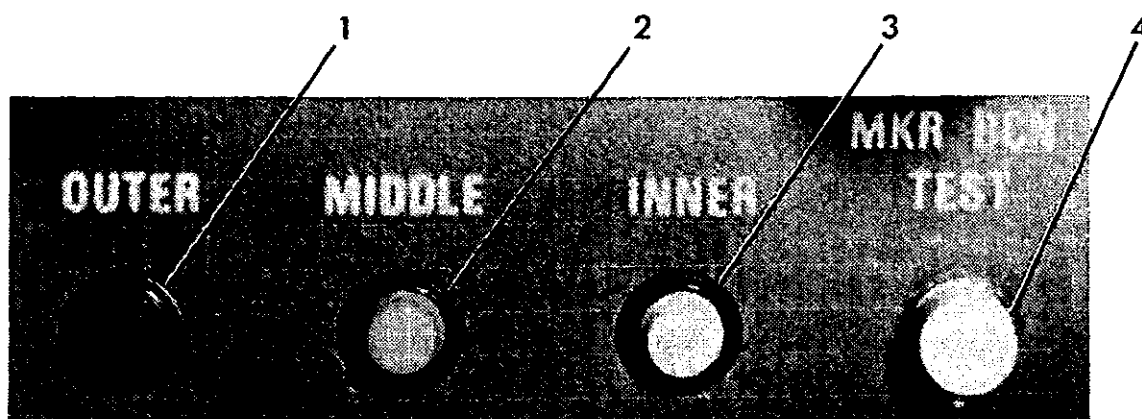
The marker beacon provides visual and aural indications of the 75 MHz ILS marker beacon signals as each marker is passed. The three most currently used marker facilities and their characteristics are listed in Figure 7-33A.

MARKER FACILITIES

MARKER	IDENTIFYING TONE	LIGHT*
INNER	CONTINUOUS 6 DOTS PER SEC (3000 HZ)	WHITE
MIDDLE	ALTERNATE DOTS AND DASHES (1300 HZ)	AMBER
OUTER	2 DASHES PER SEC (400 HZ)	BLUE
*WHEN THE IDENTIFYING TONE IS RECEIVED, THE RESPECTIVE INDICATING LIGHT WILL BLINK ACCORDINGLY.		

Figure 7-33A

400 MARKER BEACON INDICATOR LIGHTS



1014P6075

1. OUTER MARKER BEACON
INDICATOR LIGHT - Indicates passage of outer marker beacon. The OUTER light is blue.
2. MIDDLE MARKER BEACON
INDICATOR LIGHT - Indicates passage of middle marker beacon. The MIDDLE light is amber.
3. INNER MARKER BEACON
INDICATOR LIGHT - Indicates passage of inner marker beacon. The INNER light is white.
4. MARKER BEACON TEST SWITCH
(Airplanes 441-0073 thru 441-0172) - Switch actuation illuminates all three marker beacon indicator lights.

Figure 7-33B

1000 NAVIGATION SYSTEM (TYPE 1048A)

The Cessna 1000 navigation system receives and interprets VHF omnidirectional range (VOR), localizer, glide slope and marker beacon signals. The receiver has 200 VOR/localizer channels with a frequency of 108.00 MHz to 117.95 MHz with 50 kHz channel spacing; 40 automatically tuned glide slope channels with a frequency range of 329.15 MHz to 335.00 MHz (108.10 MHz to 111.95 MHz on the indicator) with 50 kHz spacing; and an automatically tuned marker beacon frequency of 75.00 MHz. The range of the system is line-of-sight.

The 1000 navigation system consists of two panel-mounted synthesizer-controlled control units, two remotely located receivers, navigation indicators and antennas for VOR/LOC, glide slope and marker beacon operation along with the necessary connecting cables. NAV 1 data is presented on the pilot's HSI while NAV 2 data is presented on the pilot's course indicator. When the optional copilot's flight director display is installed, NAV 2 data is presented on the copilot's HSI and repeated on the pilot's course indicator. The system uses the airplane microphone, headphones, audio switch panel and overhead speaker for the audio circuits.

The navigation receiver provides for three presettable frequencies of which two (input and active) are displayed on electronic readouts. As new input frequencies are selected, they may be transferred to active status by means of a pushbutton. The previous active frequency is stored in memory and may be recalled by means of a pushbutton.

To prevent accidental operation, the frequency related pushbuttons (XFER and RECALL) must be pressed for at least 1/4 second to change frequencies. In addition, a safety circuit is provided which prevents inadvertently entering the same frequency twice.

A "Frequency Memory" voltage is provided so that the preset frequencies are not lost when the receiver is turned off. This voltage is provided directly from the hot battery bus and is present even with the battery switch off. To prevent battery discharge during periods of long term storage, a FREQ MEM circuit breaker is provided on the right side console.

NOTE

If the "Frequency Memory" voltage is interrupted, all stored NAV frequencies will be lost. Subsequent operation, with the "Frequency Memory" voltage restored, will require new frequency inputs.

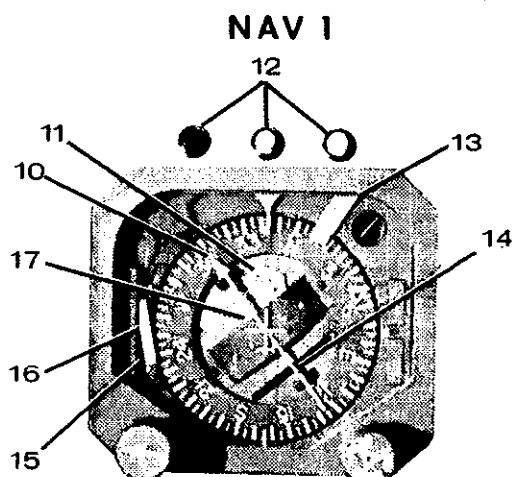
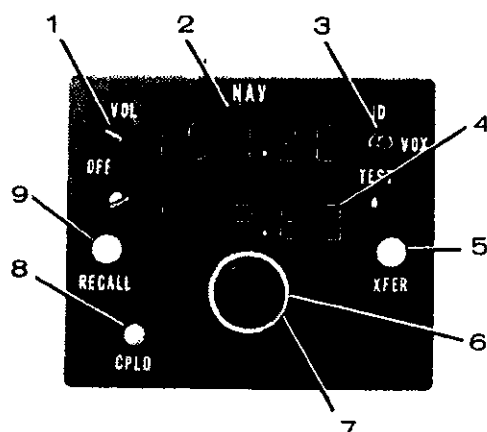
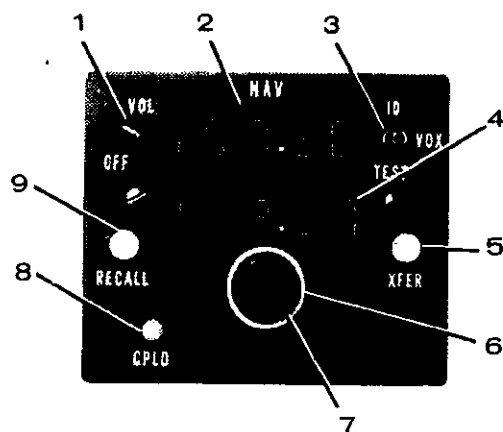
All operating controls, see Figure 7-34, for the 1000 navigation system are located on the front panel of the module control unit except for the course selection which is selected by the pilot's HSI (NAV 1) and pilot's course indicator (NAV 2). When the optional copilot's flight director display is installed, course selection is accomplished on the pilot's HSI (NAV 1) and copilot's HSI (NAV 2).

In addition, a speaker-phone selector switch is provided. The airplane microphone transmitter switch button cuts out the navigation receiver audio circuit when the button is depressed for transmitting on another system.

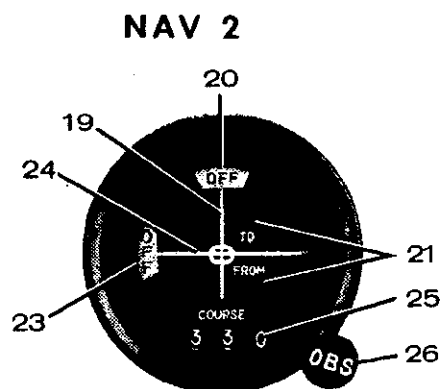
NOTE

When tuned to a weak NAV signal, keying the COMM transmitter may cause momentary interference within the NAV receiver causing a NAV flag to appear. Should circumstances warrant, ATC should be requested to assign another COMM frequency.

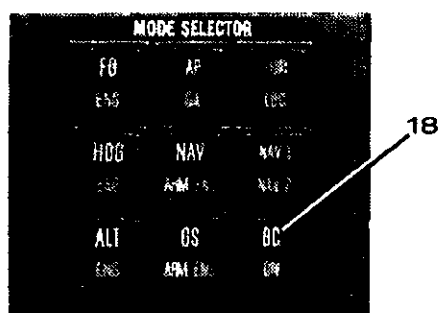
NAVIGATION CONTROL UNITS AND INDICATORS



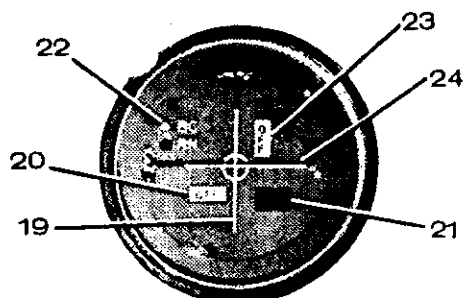
HSI (NAV 1)



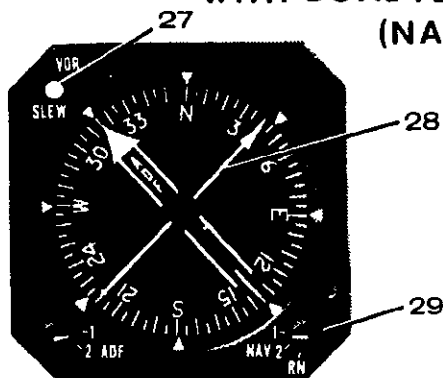
PILOT'S COURSE INDICATOR
(NAV 2)



MODE SELECTOR
(NAV 1 AND
NAV 2)



PILOT'S COURSE INDICATOR
WITH DUAL FLIGHT DIRECTORS
(NAV 2)



RMI (NAV 1 AND NAV 2)

Figure 7-34 (Sheet 1 of 3)

NAVIGATION CONTROL UNITS AND INDICATORS

1. OFF/VOL CONTROL - Primary power and volume control. Clockwise rotation applies power. Further clockwise rotation increases audio level.
 2. ACTIVE FREQUENCY READOUT - Displays active frequency which is being received.
 3. ID/VOX/TEST SWITCH - Selects mode as follows:
 - ID - Provides audio Morse Code station identification.
 - VOX - Provides audio voice station identification or other voice transmissions.
 - TEST - Provides self-test for VOR navigation circuits, the readouts and CPLD lamp.
 4. INPUT FREQUENCY READOUT - Displays frequency directly selected by frequency selectors. This frequency cannot be used to receive until it is transferred to active frequency readout.
 5. XFER PUSHBUTTON - Transfers input frequency to active frequency which is being received. The previous active frequency is stored in memory. The previous memory frequency is lost. Pushbutton action is delayed by 1/4 second to prevent accidental actuation.
- NOTE**
- The XFER pushbutton transfers the same frequency to the active input only once, regardless of how many times the pushbutton is pressed. This prevents accidentally loading the same frequency twice and unintentionally erasing the previous memory frequency.
6. MEGAHERTZ SELECTOR - Selects navigation input frequency in 1 MHz steps.
 7. FRACTIONAL MEGAHERTZ SELECTOR - Selects navigation receiver input frequency in .05 MHz steps.
 8. CPLD LAMP - Lights when the receiver is coupled to the autopilot.
 9. RECALL PUSHBUTTON - Recalls frequency stored in memory to active frequency. Previous active frequency is stored in memory. Pushbutton action is delayed by 1/4 second to prevent accidental actuation.
 10. HSI COURSE CURSOR AND COURSE SELECTOR KNOB - Course cursor is positioned on the compass card by rotating the course selector knob; this selects a VOR radial or LOC runway heading. It rotates with the compass card.
 11. HSI NAV FLAG - Flag in view indicates the NAV signal being received is inadequate.
 12. MARKER BEACON LIGHTS - Indicates passage of applicable marker beacon. Outer marker beacon light is blue, middle marker beacon light is amber and inner marker beacon light is white.
 13. HSI HEADING FLAG - Flag in view indicates the heading data is not reliable.
 14. HSI COURSE DEVIATION BAR - Displays displacement from the VOR or localizer course center. Does not reverse with back course engaged.

Figure 7-34 (Sheet 2 of 3)

NAVIGATION CONTROL UNITS AND INDICATORS

15. HSI GLIDE SLOPE FLAG - Flag in view obscures the pointer and scale, indicating the received glide slope signal is inadequate.
16. HSI GLIDE SLOPE POINTER AND SCALE - Displays deviation of airplane from an ILS glide slope. Full scale deflection (2 dots) of the glide slope pointer represents $\pm 0.7^\circ$ from beam center.
17. HSI TO FLAG - Indicates direction of the VOR station relative to the selected course. Displays TO when a LOC frequency is selected. The indicator shown has the white triangular-shaped flag retracted.
18. BACK COURSE (BC) SWITCH/ANNUNCIATOR - Momentary switch engages or disengages back course. For localizer use only. BC annunciates green when mode is engaged and white when off. BC operation is operational with or without autopilot or flight director engaged.
19. COURSE DEVIATION POINTER - Indicates course deviation from selected omni bearing or localizer centerline. Reverses sense direction with localizer back course selection on IFCS mode selection.
20. VOR/LOCALIZER OFF FLAG - Flag in view indicates VOR or localizer indication is not reliable.
21. TO-FROM INDICATOR - Operates only with a VOR or localizer signal. Indicates whether selected course is TO or FROM station. With usable localizer signal, shows TO.
22. BACK COURSE (BC) ANNUNCIATOR - Indicates NAV 2 localizer back course is selected. BC operation is available with or without autopilot or flight director engaged.
23. GLIDE SLOPE OFF FLAG - Flag in view indicates glide slope indication is not reliable.
24. GLIDE SLOPE DEVIATION POINTER - Indicates deviation from normal glide slope.
25. COURSE INDICATOR - Indicates VOR course selected on NAV 2 or reciprocal of selected course. Set in localizer front course bearing for both front and back course approaches.
26. OMNI BEARING SELECTOR (OBS) - Selects bearing to or from VOR station.
27. VOR SLEW SWITCH - Momentary contact switch used to verify VOR or RNAV indication. When pressed, single-bar pointer should slew away from present indication; when switch is released, normal operation is indicated if single-bar pointer returns to original indication.
28. SINGLE-BAR POINTER - Indicates magnetic bearing to VOR station or RNAV waypoint, as selected by function switch.
29. NAV 1/NAV 2/RN FUNCTION SWITCH - Selects signals from NAV 1, NAV 2 or optional RNAV computer for display by the single-bar pointer.

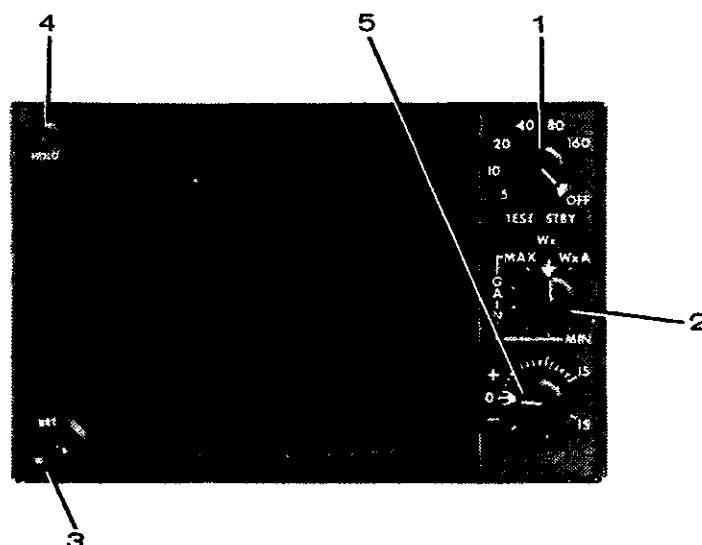
Figure 7-34 (Sheet 3 of 3)

RDR-160 RADAR

The Bendix RDR-160 radar, is used to detect significant enroute weather formations within a range of 160 nautical miles, to preclude undesirable penetration of heavy weather and its usually associated turbulence. The RDR-160 Weather Radar System consists of an indicator mounted in the center of the instrument panel and a combination transceiver/parabolic-dish antenna located in the nose radome. Power is provided by the airplane's 28-volt DC system. All controls for the system are located on the front panel of the indicator, see Figure 7-35. Internally generated range marks appear as evenly spaced concentric arcs on the display to assist in determining range to the weather target or terrain feature under observation. Azimuth reference marks are also provided as an aid in determining the relative bearing to the target. System function in use as well as the range and range marks in use are digitally displayed on the screen in the upper corners. The radar's Hold mode permits the display to be "frozen" on the screen for extended periods in order to evaluate the significance of storm movement. Switching back to scan instantly reveals the direction and distance the target has moved during the hold period. In the Weather Alert mode, the display flashes a warning to the pilot of any heavy rainfall areas within the display range. This is accomplished by alternately switching the contour/normal display modes approximately 4 times per antenna scan. The pilot then sees the contoured portion of any storm cell as a flashing on/off display.

In addition to its primary function of weather detection, the radar also enables excellent mapping of prominent terrain features such as lakes, bays, rivers, inlets, shorelines, channel markers and offshore oil rigs.

RDR-160 RADAR CONTROLS



1. FUNCTION SWITCH - Controls application of power and selects weather radar operating ranges as follows:
 - OFF - Removes power from the weather radar (turns equipment off).
 - STBY - Applies power to system for warmup (warmup time is approximately 2 minutes). STBY position maintains system at ready status when it is desired to suspend operation for short periods.

Figure 7-35 (Sheet 1 of 2)

RDR-160 RADAR CONTROLS

- TEST - Applies drive to antenna, activates test circuit and indicator display test pattern to determine operability of system.
- 5, 10, 20, 40, 80, 160 - Energizes system and selects respective nautical mile maximum range.

NOTE

Each time the function switch position is changed, the indicator presentation is automatically erased so that information on the newly selected function may be presented without confusion.

2. Wx-GAIN/Wx-ALERT SWITCH - Selects weather radar or terrain mapping mode of operation.
- Wx - Places indicator in automatic contour mode. Contoured storm cells will be outlined by lighter shades automatically.
- GAIN - Places indicator in terrain mapping mode. Disables contour feature and activates manual gain control. All targets will be presented on the indicator in up to 3 different intensities, depending upon the strength of the target and the gain setting used.
- Wx A - When the mode selector is in the Wx A position, any contoured storm cells will be displayed as a continuous cycling of the dark hole and the brightest shade of color at approximately 4 times per antenna scan. Should a dark hole remain unchanged with the radar Wx A mode, the area does not represent contour level rainfall.
3. BRT CONTROL - Controls the brightness of the indicator display.
4. HOLD BUTTON - Provides antenna hold/scan selection. Pushing the button in places the system in the hold mode. Pushing the button in a second time transfers the system to normal scan operation.
- HOLD - Present weather or terrain mapping image is retained (frozen) on the indicator screen in order to evaluate the significance of any storm cell movement. Switching back to scan reveals the direction and distance targets have moved during the hold period. In the hold mode, the antenna continues to scan and the display will continue to be presented as long as power to the system is not interrupted and the display range remains unchanged.
- SCAN - The SCAN position places the antenna in a 90° scan mode ±45° to each side of the airplane's longitudinal axis.
5. TILT - Electrically adjust the antenna feedhorn to move the radar beam through a range of 15° up to 15° down relative to the airplane's longitudinal axis. The tilt control must be accurately adjusted to paint weather at large distances. Utilize the pilot's ADI to help determine proper tilt angle.

Figure 7-35 (Sheet 2 of 2)

1000 RADIO MAGNETIC INDICATOR (TYPE IN-1004A)

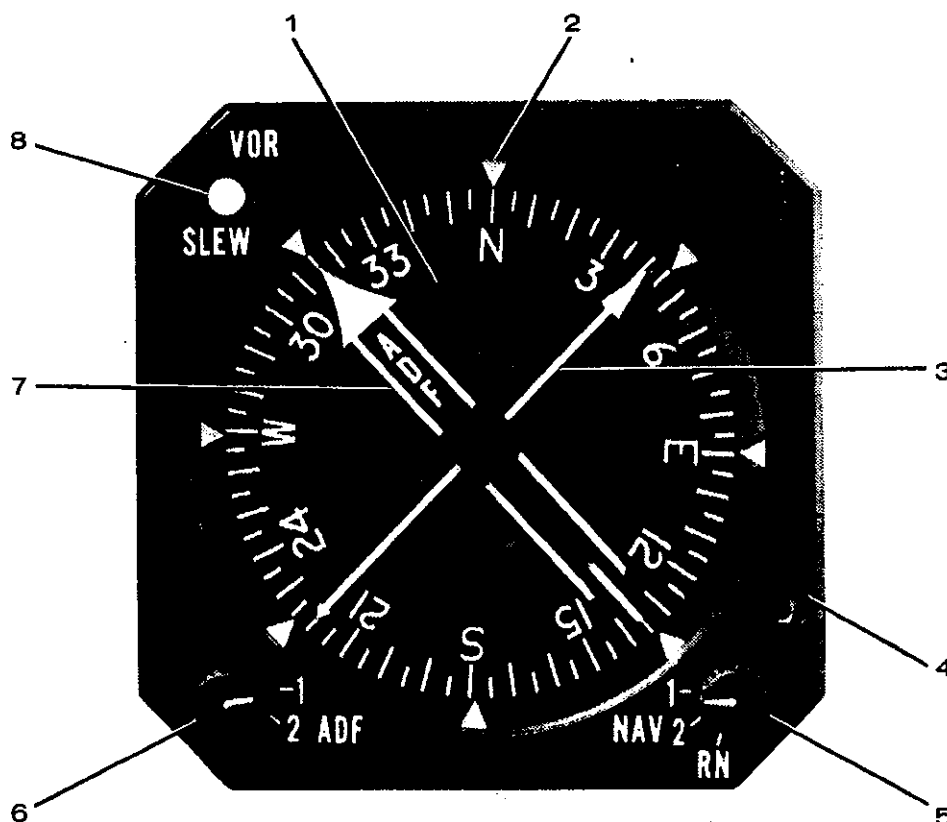
The Cessna 1000 RMI is a panel-mounted unit which includes both a radio magnetic indicator (RMI) assembly and a VHF RMI converter circuit. It is used in conjunction with other airborne navigation sets to aid the pilot in navigating and maintaining direction of the airplane. Use of the RMI eliminates the need for many of the numerical and graphical computations normally associated with air navigation.

The RMI converter circuit interprets the navigation signal from either of two VHF navigation receivers, as selected, and combines it with magnetic heading information from a stabilized heading source to provide continuous airplane-to-omnirange bearing. This information is displayed by the RMI.

The RMI display consists of a rotating azimuth card, a fixed heading index, a double-bar pointer, and a single-bar pointer, see Figure 7-36. The azimuth card is slaved to the magnetic heading signal and rotates as the airplane turns so that the magnetic heading of the airplane is continuously displayed at the heading index. A two-position switch on the lower left corner of the RMI selects input signals from one of two ADF receivers to be applied to the double-bar pointer of the display. A three-position switch on the lower right corner selects operation of the single-bar pointer by information from either of two VHF navigation receivers or from the optional RNAV computer. When the switch is set to either NAV 1 or NAV 2, the navigation signals from the selected receiver are applied to the RMI converter circuits for interpretation and are then displayed by the single-bar pointer.

When the switch is set to RN, signals from the optional RNAV computer are coupled to the single-bar pointer for display and a green annunciator lamp (RN) on the RMI lights. If the switch is set to RN and RNAV operation has not been selected on the DME control, the lamp flashes. The two RMI pointers display the magnetic bearing to the selected ADF and VOR stations or RNAV waypoint. Either of the pointers can be temporarily displaced to verify the displayed information. The VOR test is accomplished with the VOR SLEW button located on the face of the indicator. The ADF test is accomplished with the TEST button located on the face of the ADF control head.

RMI INDICATOR



1. ROTATING AZIMUTH CARD - Rotates as airplane turns so airplane magnetic heading is continuously displayed under the heading index.
2. HEADING INDEX - Indicates airplane magnetic heading on the azimuth card.
3. SINGLE-BAR POINTER - Indicates magnetic bearing to VOR station or RNAV waypoint, as selected by function switch.
4. AREA NAVIGATION (RN) ANNUNCIATOR - Light should normally be out. Flashing light indicates function switch has selected RNAV operation and optional area navigation system is not operating.
5. NAV 1/NAV 2/RN FUNCTION SWITCH - Selects signals from NAV 1, NAV 2 or optional RNAV computer for display by the single-bar pointer.
6. ADF FUNCTION SWITCH - Selects signals from ADF 1 or optional ADF 2 for display by the double-bar pointer.
7. DOUBLE-BAR POINTER - Indicates bearing of selected ADF station.
8. VOR SLEW SWITCH - Momentary contact switch used to verify VOR or RNAV indication. When pressed, single-bar pointer should slew away from present indication; when switch is released, normal operation is indicated if single-bar pointer returns to original indication.

Figure 7-36

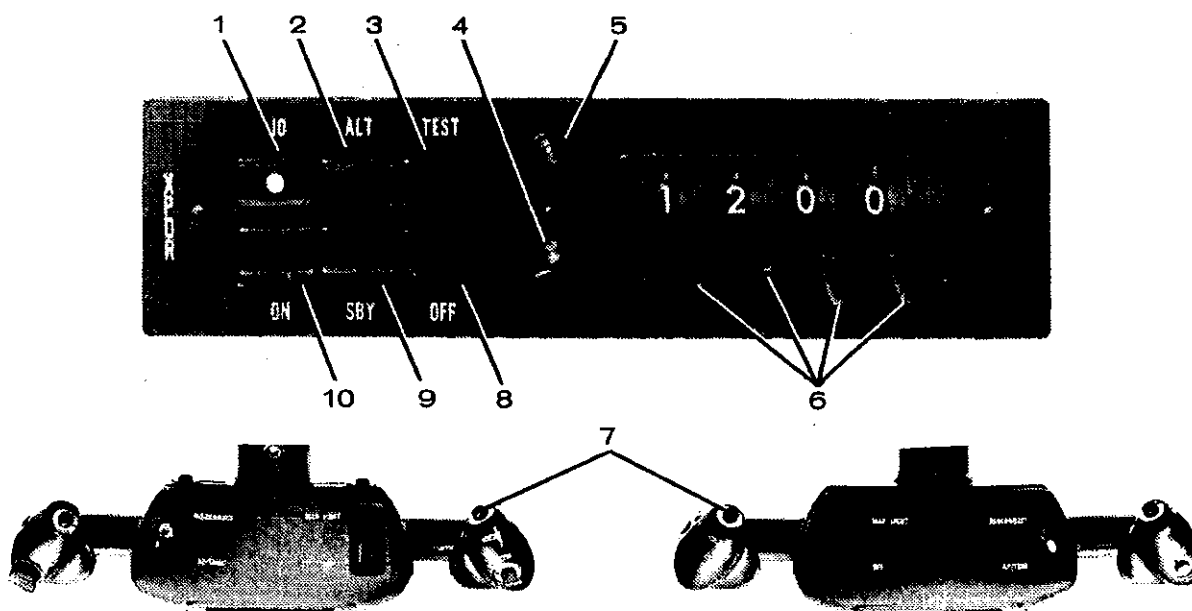
800 TRANSPONDER (TYPE 859A)

The Cessna 800 Transponder is the airborne component of an Air Traffic Control Radar Beacon System (ATCRBS). The transponder enables the ATC ground controller to "see" and identify the airplane, while in flight, on the control center radar scope.

The 800 Transponder consists of a panel-mounted receiver-transmitter and an externally mounted antenna. The transponder receives interrogating pulse signals on 1030 MHz and transmits coded reply signals on 1090 MHz. It is capable of replying to Mode A (airplane identification) and Mode C (altitude reporting) interrogations on a selective reply basis on any of 4096 information code selections. Altitude reporting is provided in 100-foot increments between -1000 feet and +35,000 feet.

All 800 Transponder operating controls, see Figure 7-37, are located on the front panel of the receiver-transmitter. Except for the selection of the Mode A reply code, the IDENT pulse on command and setting the barometric pressure on the encoding altimeter, operation of the transponder is automatic as soon as the equipment is turned on.

TRANSPONDER CONTROL PANEL



PILOT'S CONTROL WHEEL

COPILOT'S CONTROL WHEEL

1. ID (IDENT) PUSHBUTTON SWITCH - (Momentary) When pressed, selects transmission of special identifier pulse with regular reply pulses to effect immediate airplane identification on controller's display.
2. ALT PUSHBUTTON SWITCH - Turns set on; enables Mode A or Mode C operation, selected automatically by interrogating signal.

Figure 7-37 (Sheet 1 of 2)

TRANSPONDER CONTROL PANEL

3. TEST PUSHBUTTON SWITCH - (Momentary) When pressed, selects internally generated interrogation signal to self-test equipment. Steady glow of reply lamp indicates satisfactory operation.
4. LIGHT SENSOR - Senses ambient cockpit light to automatically control intensity of reply lamp brilliance.
5. REPLY LAMP - Flashes to indicate transmission of reply pulses; glows steadily to indicate transmission of ident pulse; glows steadily with maximum brilliance during satisfactory self-test operation. (Also glows steadily during initial warmup when transponder is in standby mode.)
6. MODE A REPLY-CODE SELECTOR SWITCHES AND INDICATORS (4) - Selects and displays airplane identification code.
7. REMOTE ID SWITCH - Same as panel-mounted ID pushbutton switch.
8. OFF PUSHBUTTON SWITCH - Turns set off.
9. SBY PUSHBUTTON SWITCH - Applies warmup or standby power.
10. ON PUSHBUTTON SWITCH - Turns set on; enables Mode A operation.

Figure 7-37 (Sheet 2 of 2)

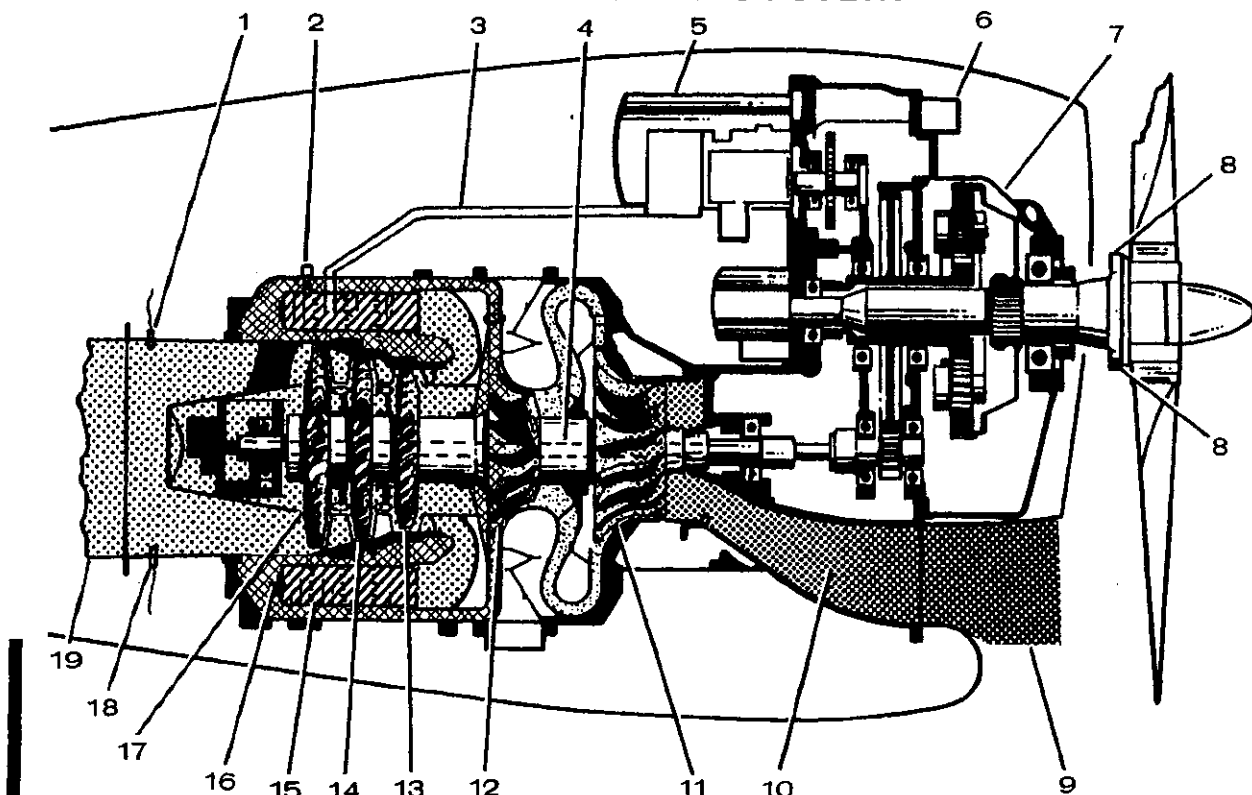
POWERPLANT SYSTEM

The airplane is equipped with two fixed-shaft turboprop engines. The engines are flat rated at 635.5 shaft horsepower each. At 100% engine RPM, the propeller operates at 2000 RPM.

The major components of the engine power section, see Figure 7-38, consist of a two-stage centrifugal compressor, an annular combustion chamber and a three-stage axial flow turbine. During operation, ambient air flows into the air inlet and into the center of the first stage centrifugal compressor. The air is decelerated and compressed as the centrifugal compressor throws the air to the outer edges of the first stage. This first stage air then flows to the second stage centrifugal compressor where the air compression process is repeated. The compressed air then flows into the plenum surrounding the combustion chamber then into the combustion chamber. Fuel is injected into the combustion chamber, mixed with the compressed air, and ignited. The ignited fuel air mixture rapidly expands with a great increase in temperature and pressure. This air then flows out of the combustion chamber through a three-stage axial flow turbine. In this manner, most of the heat and velocity energy is removed from the air and converted into rotating mechanical energy to drive the centrifugal compressor and propeller. Labyrinth seals are provided between the various turbine and compressor wheels to prevent the back flow of hot gasses from one stage to another.

As can be seen from Figure 7-38, all centrifugal compressor and axial flow turbine wheels are fixed to one through shaft; therefore, all activities mentioned above are occurring at the same time. The centrifugal compressor compresses the inflow air and the axial flow turbine rotates the shaft which rotates the compressor, etc. The majority of the power developed is used to continue this process. The remaining power is transferred from the fixed shaft to the propeller gear case and then to the propeller. The basic engine and its operation is quite simple. The complexity occurs when adding the necessary controls, instrumentation, subsystems and safety devices to assure reliable and desired operation. These items are discussed in the following paragraphs.

POWERPLANT SYSTEM



CODE

-  RAM AIR
-  RAM AIR COMPRESSED AFTER FLOWING THROUGH FIRST STAGE OF CENTRIFUGAL COMPRESSOR
-  FIRST STAGE COMPRESSOR AIR COMPRESSED AFTER FLOWING THROUGH SECOND STAGE OF CENTRIFUGAL COMPRESSOR
-  SECOND STAGE COMPRESSOR AIR IS INJECTED WITH FUEL AND IGNITED
-  BURNED FUEL AIR MIXTURE GREATLY EXPANDS AND ESCAPES THROUGH THE THREE STAGES OF THE AXIAL FLOW TURBINE INTO THE ENGINE TAILPIPE. THE AIR FLOWING THROUGH THE AXIAL FLOW TURBINE TURNS THE COMPRESSOR AND PROVIDES THE INPUT TO THE PROPELLER REDUCTION GEAR CASE.

1. EGT PROBE (T5)	11. FIRST STAGE CENTRIFUGAL COMPRESSOR
2. IGNITOR	12. SECOND STAGE CENTRIFUGAL COMPRESSOR
3. FUEL LINE	13. FIRST STAGE AXIAL FLOW TURBINE
4. POWER SHAFT	14. SECOND STAGE AXIAL FLOW TURBINE
5. STARTER GENERATOR	15. COMBUSTION CHAMBER
6. OIL VENT VALVE	16. FUEL NOZZLE
7. PROPELLER GEAR CASE	17. THIRD STAGE AXIAL FLOW TURBINE
8. PROPELLER START LOCK	18. PRESSURE SENSOR (P5)
9. AIR INLET	19. TAIL PIPE EDUCTOR
10. INLET TEMPERATURE (T2)	

Figure 7-38

PROPELLER AND CONTROL

A hydraulically actuated, constant-speed, full-feathering propeller is an integral feature of the engine. The propeller governing system is interconnected with the negative torque sensing system (and the fuel control system electrically in normal mode). Engine oil pressure, feathering springs and propeller blade counterweights are used to set the propeller blade angles for the desired operating condition. The engine oil pressure is increased in pressure by the propeller governor and transferred to the propeller through a beta tube. The propeller counterweights and feathering spring attempt to move the propeller blades to full feather while the oil pressure attempts to move the propeller blades to reverse pitch. Propeller blade angle can thus be set as desired by use of the power and condition levers which control the amount of oil pressure exerted in the propeller hub assembly.

Before starting the engine, the propeller blades must be on the start locks. This is required to minimize propeller drag and resultant high turbine temperatures during the start. Additionally, the start locks provide the only means by which the propeller can be set for a functional check of the overspeed governor. Each propeller blade is equipped with a start lock. During shutdown, when the propeller centrifugal force is falling off, the spring-loaded start lock will move toward the hub and engage the hub locking detent if the propeller is in reverse pitch. After engine start, the centrifugal force will be greater than the spring force, therefore, the locks will attempt to retract. A high shear load between the propeller hub locking detent and the start lock will prevent the lock from being retracted. The shear load can be relieved by moving the power lever toward reverse, thus releasing the start locks.

If the propeller start locks are not engaged before starting, they can be engaged by actuating the unfeathering pump switch with the power lever in full reverse. This switch operates an electric oil pump which pumps oil from the engine sump into the propeller to move the blades toward reverse as is done on a normal shutdown. The returned oil will collect in the engine accessory gear case and will not return to the oil sump because the engine-driven oil scavenge pumps are not operating. Consequently, the engine oil level will appear low if checked at this time. Motoring the propeller approximately 5 to 10 seconds with the STARTER MOTOR switch will return this oil to the sump. This is not required if a normal start is conducted.

Feathering the propeller is achieved by dumping the oil pressure in the propeller hub assembly. This can be accomplished by stopping the engine-driven oil pump (engine shutdown) or by positioning the condition lever to EMER SHUTOFF. The EMER SHUTOFF position of the condition lever will actuate the manual fuel shutoff valve to shut down the engine and then dump the propeller oil pressure to feather the propeller.

ENGINE CONTROLS

The basic engine controls, see Figure 7-1, consist of power levers, condition levers, control lever friction locks, negative torque sensing system and a torque and temperature limiting system (optional some airplanes). A power lever and condition lever are provided for each engine. The left friction lock adjusts the friction of the power levers while the right friction lock adjusts the friction of the condition levers.

Power Levers

The power lever drives a potentiometer and a push-pull cable. Movement of the power lever adjusts the potentiometer for electronic fuel computer reference, when the engine is operating in normal mode. When the engine is operating in manual mode, the potentiometer is not functional. The push-pull cable drives the manual fuel valve in the engine compartment.

The power lever controls engine operation in the beta and propeller governing modes. Beta mode is used during ground operation only. In beta mode the propeller blade angles are controlled hydraulically by the power levers. In propeller governing mode the power lever controls fuel flow, either electrically in normal mode operation or hydromechanically in manual mode operation, and the propeller blade angles are governor controlled to maintain proper engine speed.

Normal (computer) mode operation prevents beta mode operation in flight as long as the power levers are not retarded below the flight idle position. In manual mode, L or R BETA lights may be experienced in flight idle due to the reduced fuel flow available, forcing the propellers into fine pitch against the flight idle blade angle hydraulic stops, and due to the subsequent inability to maintain propeller governing.

Prior to landing in normal (computer) mode engine operation, with the condition levers in TAKEOFF, CLIMB AND LANDING and the power lever at flight idle, engine fuel flow assumes a scheduled value to obtain predictable drag during the landing. In manual mode, the flight idle position will provide significantly more drag due to the lower fixed fuel flow scheduling (normal mode fuel is scheduled through underspeed governing by the fuel flow computer).

The power levers are never retarded below flight idle in flight. Retarding the power levers to ground idle after landing provides the hydraulic coupling necessary for beta mode operation.

Condition Levers

Each condition lever drives a potentiometer and a shutoff cable. Movement of the condition lever in the range between START AND TAXI and TAKEOFF, CLIMB AND LANDING, adjusts the electronic fuel computer speed when the engine is operating in normal mode. The shutoff cable attaches to the fuel control manual fuel shutoff valve, the propeller feather valve and a switch for actuation of the EPA purge system. When the condition lever is in the engine's normal operating range, the shutoff cable is disengaged. Lifting the condition lever and pulling it back from the START AND TAXI position to the EMER SHUT-OFF position engages the shutoff cable and causes the engine fuel supply to be shut off, the EPA purge system to actuate and the propeller oil pressure to be dumped, allowing the propeller to feather.

As was indicated in the power lever discussion, engine speed in normal mode can be controlled by underspeed fuel scheduling (ground operations) or propeller governing (flight operations). The condition lever is used to select the RPM at which the governor will control in the normal mode.

During flight operations with the condition lever at TAKEOFF, CLIMB AND LANDING, the propeller governor will control engine speed at 100% RPM. With the condition lever at CRUISE, the propeller governor will control engine speed at 96% RPM. With the condition lever positioned between these two extremes, engine RPM will vary proportionally to condition lever position. The condition levers should not be retarded below CRUISE while in flight except to feather an engine.

When the engine is operating in flight in a manual mode (electronic fuel control inoperative), the condition levers only functions are feather and fuel shutoff. Engine speed will be controlled by the propeller governor at 100% RPM.

Negative Torque Sensing System

The negative torque sensing system operates automatically, thus no controls are provided for the pilot. Operational capability of the system should be checked before the first flight of each day. Negative torque occurs when the propeller drives the engine rather than the engine driving the propeller. When negative torque does occur, the propeller pitch will automatically increase toward the feather position to a level that will reduce the drag of the windmilling propeller. Negative torque can occur during any normal operation when the fuel flow schedule is excessively low and will not support the engine power requirements to maintain positive torque. Negative torque sensing will always occur during an engine failure before the propeller is feathered and during low altitude normal mode operation at flight idle.

Torque And Temperature Limiting System (Optional Some Airplanes)

The torque and temperature limiting system provides protection against exceeding the maximum allowable torque and EGT limits. The system consists of left side panel switches, signals from the torque and EGT sensing systems, and the electronic fuel control computers.

When the TORQUE-EGT LIMIT switches are positioned to MANUAL, maximum torque and EGT must be monitored and manually set by the pilot. When the switches are positioned to AUTO, torque and EGT signals from the torque transducers and the EGT thermocouples are supplied to the fuel computer to produce fuel scheduling that will limit torque and EGT. Torque limiting occurs as a function of engine speed, thus will vary, depending upon the condition lever position, from 1669 to 1738 foot-pounds torque as RPM varies from 100% to 96% RPM. EGT and torque limiting can occur only when the fuel computers are operational and the RPM is above 80%.

CAUTION

- Advancing the power levers in excess of one lever width beyond the initial point of torque limiting may exceed the torque limiting system capability. When operating in normal mode with torque and temperature limiting switch in AUTO, advance the power lever slightly ahead of the point where takeoff power is attained. When operating in any other configuration, advance the power lever only sufficiently to attain the appropriate torque or EGT limit. When operating in normal mode, the red line EGT marking is applicable.
- Approach torque and temperature limits slowly to avoid transient overshoots.

ENGINE INSTRUMENTATION

The engine instrumentation, see Figure 7-1, consists of oil pressure and temperature, fuel flow, torque, EGT, % RPM, monopole speed sensor monitoring (airplanes not incorporating Cessna Service Bulletin CQB01-1R2), negative torque sensing system check annunciator, and outside air temperature indicators. All indicators are placarded as to their operational parameters. In addition, some of the more important parameters of the above mentioned items are annunciated on the annunciator panel, see Figure 7-3. All of the above mentioned instrumentation requires electrical power to function.

Engine Torque Indicating System

The engine torque system consists of a geared, engine-driven torque sensor, a transducer and cockpit indicator. The torque sensor, using engine oil pressure, produces an oil pressure which is transmitted to the transducer. A second oil pressure, generated by the case pressure, is also transmitted to the transducer. The difference between the two pressures is converted to an electrical signal by the transducer for display on the cockpit indicator. The torque indicator is calibrated in foot-pounds. When power is removed from the system, the torque indicating pointer will stow below zero in the OFF band. During cruise operations, a slight oscillation of the torque indicating needle is normal due to characteristics of the engine oil pressure which is used to generate the raw torque signal.

The negative torque sensing system check annunciator light provides indication of the operational capability of the NTS system. This indicator is for check purposes only and will not illuminate during a negative torque condition.

Exhaust Gas Temperature Indicating System

The exhaust gas temperature indicating system consists of temperature probes located in the engine tailpipe, an EGT compensator, engine RPM input, an OAT sensor (T2) input, a flight Mach number transducer (Δ P/P) input, fuel control computer and a cockpit EGT gage. The exhaust gas temperature probes convert exhaust gas heat to electrical signals and averages them together to arrive at one temperature signal. This signal is conditioned for ambient air temperature changes and RPM. The Δ P/P transducer provides a positive compensation. This calculated signal is then presented on the EGT indicator in °C. When power is removed from the system, the EGT indicating pointer will stow below zero in the OFF band.

The EGT system operates in two different ranges, compensated EGT and a calculated single red line EGT. When the engine is operating below 80% RPM in normal mode or at any RPM when operating in manual mode, the EGT indicator presents compensated EGT. When the engine is operating above 80% RPM in normal mode only, the EGT indicator presents a calculated single red line EGT.

Engine Speed Systems

The engine tachometer system consists of an engine-driven tachometer generator which converts rotary mechanical energy to an electrical speed signal and displays this information on the cockpit tachometer indicator. The tachometer is calibrated in % RPM. The large outer scale presents total engine speed. For ease in reading the outer scale, an inner scale is provided which indicates units and tenths of % RPM. During normal operation, the OFF flag is retracted.

Two monopole speed systems are provided for each engine to provide engine speed information to the electronic fuel control. Each speed sensor is engine-driven and sends an electrical pulse signal to the electronic fuel control. The propeller governor monopole provides the primary input signal to the electronic fuel computer while the secondary fuel control monopole also provides the primary speed signal for the optional propeller synchrophaser system. If either monopole should fail, the applicable MONOPOLE FAIL annunciator will illuminate (airplanes not incorporating Cessna Service Bulletin CQB01-1R2).

Fuel Flow Indicating System

The temperature compensated fuel flow indicating system consists of a cockpit fuel flow indicator and a fuel flow transducer located downstream of the engine-driven fuel pump. The transducer converts fuel flow to an electrical signal which is displayed on the fuel flow indicator. The flow indicator is calibrated in pounds per hour flow. When power is removed from the system, the fuel flow indicating pointer will stow below zero in the OFF band.

Oil Pressure and Temperature Indicating System

Oil pressure and temperature are electrically displayed on a combination engine indicator. Oil pressure and temperature are mechanically sensed and electrically transmitted. Oil pressure is presented in pounds per square inch while oil temperature is presented in °C. The indicators are marked for their operating parameters. A failure in the oil pressure transmitting wiring system will cause the oil pressure gage to deflect to full scale. The OIL PRESS annunciator light operates from a totally separate system, thus providing a backup system for oil pressure indication.

OAT/EGT Indicating System

The electrical outside air temperature indicating system consists of an OAT probe located in the air cycle machine air inlet and a cockpit OAT/EGT indicator. When correcting the indicated OAT for ram recovery, use only the chart shown in Section 5.

The temperature indicator has an inner and outer scale. The outer scale presents indicated OAT in °C while the inner scale presents a conservative maximum EGT in °C for use when either or both engines are operating in manual mode. Refer to Section 3 for manual mode operational information.

ENGINE OIL SYSTEM

The engine oil system is used to lubricate and cool engine moving parts and accessories, to control the propeller, and to operate the torque sensing system. The basic components of the system are the oil sump, engine-driven oil pump, oil filter, oil cooler, propeller control system (previously described) and the three oil scavenge pumps.

The engine oil is contained in a sump tank located under the compressor section of the engine. The oil level is checked and serviced through an oil filler door located on the right side of the engine cowling. Refer to Section 8 for servicing instructions. Oil flows from the oil sump to the engine-driven oil pump which provides lubrication for the engine bearings and gears. After the pressurized oil leaves the oil pump, it is routed through an oil filter. If the filter becomes clogged, oil pressure will bypass the filter. The scavenge pumps, two in the reduction gear housing and one in the turbine section, return lubricating oil to the engine sump via the oil cooler. During engine starting, the oil vent valve allows gear case air to enter the oil pumps to decrease starting loads. At 60% RPM, the oil pumps will return to normal operation.

Indication of a filter bypass is indicated by a red button located approximately 9 inches above the oil filler door hinge on the right side of the engine. This indicator should be checked during periodic maintenance. If the button is flush, the filter is operating normally. If the red button is extended from its mounting plate, the filter is being bypassed. After maintenance has corrected the cause of the filter bypass, the system can be reset by pushing in on the red button.

IGNITION SYSTEM

The ignition system consists of two igniters in each engine, a capacitor discharge ignition coil, IGNITION OVERRIDE switches and Ignition on annunciator lights.

With the IGNITION OVERRIDE switches positioned to OFF (normal position), ignition is automatically energized at 10% RPM during the engine start and is terminated at 60% RPM by the fuel computer speed switching functions or by manual mode speed switching. After ignition shutoff at 60% RPM, combustion in the engine is self-sustaining. With the IGNITION OVERRIDE switches positioned to ON, ignition is continuously provided to prevent the possibility of a flameout. This position will shorten ignitor plug life; therefore, it should only be used in unusual situations such as probable ice ingestion, and landings on runways with standing water, etc. Refer to Section 2 for ignition duty cycle limits. The Ignition on annunciator lights, located directly forward of the ignition override switches will illuminate whenever the ignitors are energized.

FUEL CONTROL SYSTEM

The fuel control system provides filtered and metered fuel to the engine. The system consists of a fuel pump assembly, fuel filter, fuel control assembly and an overspeed governor. The engine-driven fuel pump assembly delivers filtered fuel to the fuel control assembly for metering. The fuel filter is a component of the fuel pump assembly. Inlet fuel to the high pressure fuel pump is routed through the fuel filter to insure clean fuel through all phases of operation. In the event that the filter becomes clogged, fuel is bypassed around the filter to sustain engine operation. The fuel control assembly is regulated by the electronic fuel control for normal mode operation and a manual backup system for manual mode operation. The fuel control assembly regulates fuel flow to the engine and contains a mechanical fuel shutoff valve and an electrical fuel shutoff valve connected in series. The overspeed governor restricts fuel flow through a flyweight; thus, limiting engine RPM.

MANUAL FUEL CONTROL

Each engine is provided with a manual mode of operation for the fuel control. The manual mode of operation is a back up for the electronic mode (normal mode operation) and will be used should the electronic fuel computer become inoperative for any reason. Malfunctioning electronic fuel computers should be corrected as soon as practical. All manual mode operations should be conducted utilizing Manual Mode procedures outlined in Section 3 (Abnormal Procedures) and Manual Mode performance charts contained in Section 5.

When operating in manual mode, the pilot directly controls the engine fuel schedule with the power lever which is mechanically connected to the propeller pitch control and hydromechanical unit. When operating in manual mode, some of the refinements of normal mode operation are not available. In addition, many of the switching functions, done automatically during normal mode operation must now be manually accomplished by the pilot. Refer to the Abnormal Procedures for operating procedures.

The major operational differences are as follows:

1. Condition lever is inoperative except for the emergency shutoff and propeller feather function. The engine speed will be mechanically maintained by the propeller governor at a nominal 100% RPM.
2. Fuel enrichment required for initial light-off and engine acceleration is provided by pressing the engine start button.
3. During all manual mode operations, engine response to power lever advances is slower than normal. Therefore, all engine accelerations, particularly during ground operations, should be accomplished at a moderate rate while monitoring EGT for normal response. Fuel enrichment may be used as required.
4. During engine starting, ignition and starter/generator functions must be manually operated using the manual start switch.
5. Minimize the use of bleed air accessories as much as practical during low power operations. The GND position of the pressurization source selector is inoperative during manual mode operation.
6. The Manual Mode Check and High Power Monitor Check are not accomplished for the engine operating in manual mode.
7. Optional torque and temperature limiting is inoperative on the manual mode engine. Torque and EGT must be monitored and manually adjusted by the pilot.
8. When operating in manual mode, airplane performance is changed. Refer to the manual mode performance charts in Section 5.

9. During all manual mode operations, only compensated EGT will be presented. Do not exceed the maximum EGT limits specified in Figure 2-5.
10. The optional propeller synchrophaser is inoperative when either or both engines are operating in manual mode.
11. If one engine is in manual mode, switch the other engine to manual mode before landing to insure symmetric engine power and drag response.
12. If practical, before landing, turn off engine and windshield bleed air before fully retarding the power levers to FLIGHT IDLE. If this is impractical, retard the levers slowly as FLIGHT IDLE is approached, evaluating the propeller drag to prevent unexpected high descent rates. The low flight idle fuel flows associated with manual mode operation can cause a significant increase in propeller drag.
13. Propeller reversing is not permitted for the engine operating in manual mode. GND IDLE is permitted and will provide effective deceleration during touchdown and the initial part of the landing roll.

ENGINE START SYSTEM

When the engine start button is pressed momentarily, the batteries or auxiliary power unit provides electrical energy to the starter-generator which begins engine rotation. The only engine instrument showing any indication at this time is the tachometer. The open oil vent valve permits air to be taken into the inlet of the lubrication and scavenge pumps to reduce their pumping load, making more of the starter's power available for turning the engine.

As the engine speed increases during the cranking period, the compressor section increases the airflow through the power section. This airflow clears the combustion area of vapors and provides sufficient air to support combustion. At 10% RPM, the ignition system energizes and the fuel solenoid valve opens to permit fuel flow to the five primary (start) nozzles. The fuel flow indicator begins to indicate and shortly thereafter the EGT gage will show a rapid temperature rise, indicating that light-off has occurred. When operating in manual mode, additional fuel enrichment must be provided by pressing the engine start button to insure light-off and proper engine acceleration. This enrichment function is automatically provided in normal mode.

As the engine continues to accelerate, fuel enrichment will automatically be provided to maintain a starting EGT of approximately 695°C. EGT must be monitored during the start to assure that maximum temperature limits are not exceeded. Automatic maximum EGT limiting is not provided during the start cycle. Oil pressure also will begin to show a rise. Beyond about 30% RPM, the fuel flow will climb steadily upwards with RPM. Engine operation during this period of acceleration is completely automatic. The pilot should guard the stop button while monitoring the start, ready to terminate the start sequence should the temperature become excessive or should the engine stop accelerating at any speed during the start. Operation in the critical RPM range between 18 and 28 percent RPM should be avoided except for the transient stage during the start.

About 60% RPM, the engine is self-sustaining and the fuel computer speed switch will deenergize the starter-generator relay and the ignition system and close the oil vent valve to permit normal operation of the lubrication system. The starter-generator now may be used as a generator.

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An increasing fuel flow is permitted by the fuel control in response to a rising signal it receives from the compressor pressure, which causes the engine to rise in speed. This increasing fuel flow produces more fuel pressure. When fuel pressure has risen sufficiently, the flow divider opens, allowing fuel flow to the secondary (high flow) nozzles, and acceleration continues. The fuel flow will be observed to decrease and the engine will come to a stabilized speed under control of the underspeed governor.

If a starting system relay failure or landing gear safety switch failure should occur, the engines can be airstarted (refer to the airstart procedures in Section 3). Airstarts are identical to ground starts except that the unfeathering pump is automatically energized instead of the starter.

The engine start sequence can occur only if the engine stop button has been pushed to cancel any aborted starts and reset the start logic.

ENGINE STOP SYSTEM

Engine operation can be terminated by pressing the engine stop button, positioning the condition lever to EMER SHUT-OFF or by pressing the firewall shutoff button. The engine stop button is normally used for this function; however, if normal shutdown does not occur, or if an emergency situation exists, the condition lever should be used followed by pressing the firewall shutoff button.

During a normal shutdown, the engine stop button should be pressed and held for 5 seconds minimum. During this period of time, the engine fuel supply is terminated by the fuel control assembly electrically operated valve, the EPA fuel purge system actuates (if engine speed exceeded 95% RPM before shutdown) to purge fuel from the engine fuel components and propeller oil pressure decreases allowing the propeller to advance toward feather. The power lever should be held in reverse, to allow start lock engagement. If the engine stop button is held less than 5 seconds, the purge system may not actuate and some tailpipe smoking will possibly occur.

During a shut down with the condition lever, the engine fuel supply is terminated mechanically at the fuel control assembly and the EPA fuel purge system is activated. A condition lever shut down should always be followed by pressing the engine stop button to shut off the fuel electrically and prevent undesired fuel flow prior to attempting an engine start. During inflight engine shutdown, windmilling in the critical RPM range between 18 and 28 percent RPM should be avoided.

FIRE DETECTION AND EXTINGUISHING SYSTEM

Each engine fire detection and optional extinguishing system consists of two heat sensors located in the engine compartment, a compressed gas, single-shot fire bottle located in the wheel well and two annunciator/-actuators located on the annunciator panel.

When the annunciator panel PRESS TO TEST button is pressed, the fire warning lights should illuminate. During normal operation, if an overheat condition should occur, the applicable fire warning light will illuminate. Lifting the clear plastic cover guard and pressing the red fire annunciator will close the bleed air and fuel firewall shutoff valves, disable the generator and arm the optional fire extinguishing system, if installed. Pressing the white fire bottle armed light will deploy the fire extinguisher contents into the engine compartment. After the engine compartment cools, the red fire warning light will extinguish.

ENGINE BLEED AIR

Discharge ports are located on each engine on the discharge side of the second stage centrifugal compressor. These ports provide hot pressurized bleed air for cabin pressurization, emergency pressurization and hydraulic reservoir pressure (Figure 7-38A). The bleed air system also provides air for engine inlet anti-ice, windshield anti-ice and surface deice boots (Figure 7-28A) and is an energy source for the pressure-driven gyro instrument air system (Figure 7-23) and the vacuum-operated pressurization control system (Figure 7-38B). As the amount of bleed air extraction increases, due to operation of the previously mentioned bleed air systems, the engine power available will decrease. As the various bleed air systems are operated, the affect will be a lowering of the maximum altitude at which full power will be available. The bleed air firewall shutoff valves automatically return to their normally open position upon loss of electrical power.

Actuation of the engine inlet anti-ice switches will allow the hot bleed air to flow around the engine inlet to prevent ice formation in the inlet. After flowing around the inlet, the bleed air is exhausted into the nacelle surrounding the engine. Operation of the windshield anti-ice and cabin pressurization systems will be discussed later in this section.

STARTER MOTOR SWITCH

The Starter Motor Switch is located on the left side panel (see Figure 7-19). Either engine starter-generator can be controlled with this switch to motor the engine independent of the start logic for ground engine clearing. Lifting the cover guard and activating the three-position switch either up for the left engine or down for the right engine will initiate and maintain engine rotation. The switch is deactivated in flight through the landing gear safety switch. Fuel should be shut off through the use of the engine stop button prior to using the Starter Motor Switch. Ignition override should also be checked off and starting cycle limitations should be observed.

ENGINE MOUNTS

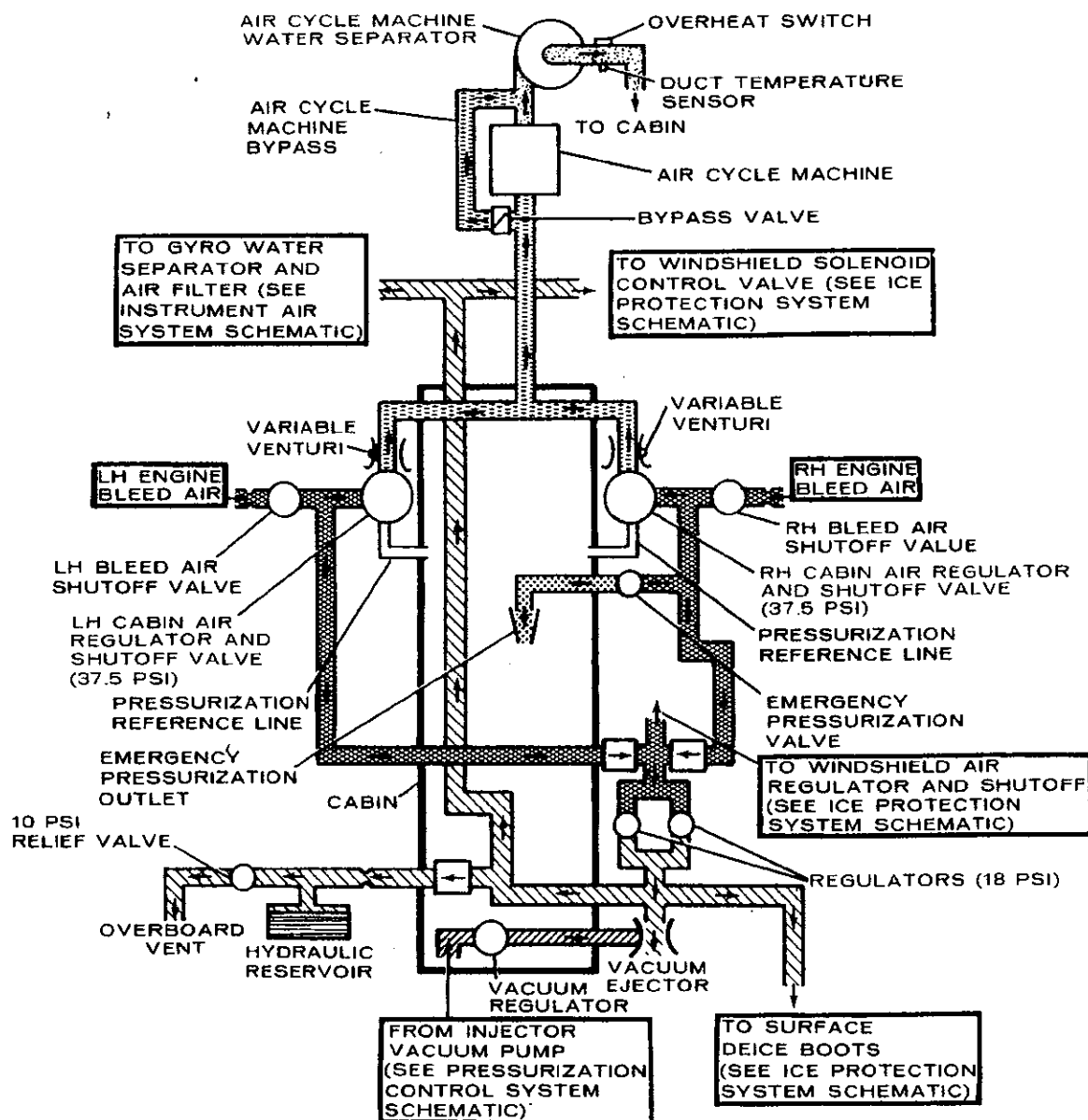
The engines are attached to the nacelle structure by a tubular steel engine mount. Vibration isolators are provided at the engine-to-mount interface to sustain operational loads and to provide absorption for engine vibrations.

AIR DISTRIBUTION SYSTEM

This system provides heating, cooling, ventilation, defrosting and pressurization for the cabin. Engine bleed air is extracted from the engine compressor section. This hot bleed air is then routed through a wing leading edge lines to the air cycle machine in the fuselage nose compartment (See Figure 7-38A). The air cycle machine cools the air to the desired level and distributes it to the cabin air distribution system.

During normal operation, most functions are automatic. Manual adjustments are only required for individual comfort, such as cabin rate-of-climb and cabin temperature. Controls and indicators used in the air distribution system are shown in Figure 7-39.

ENGINE BLEED AIR SYSTEM SCHEMATIC



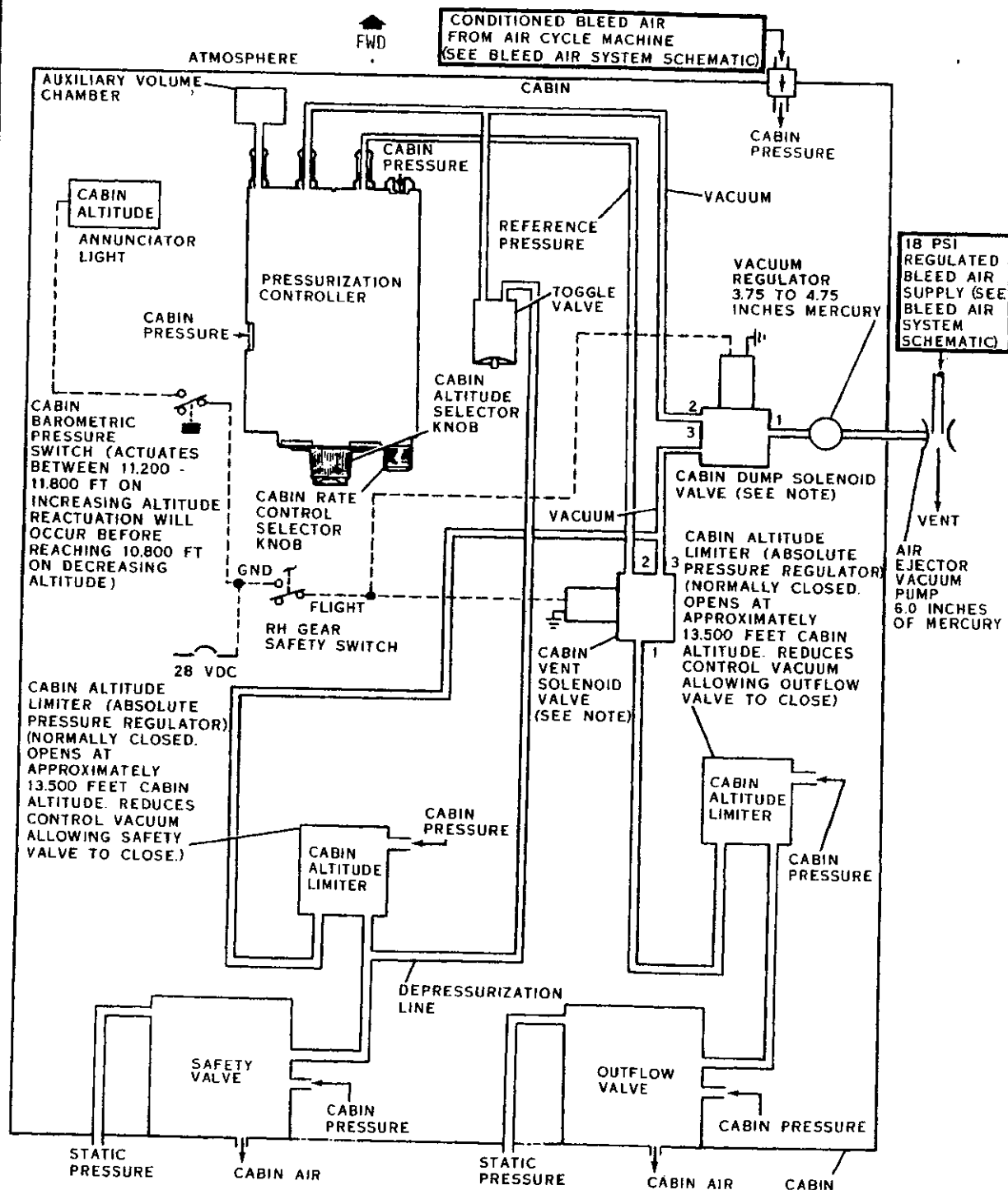
CODE

ORIFICE	CONDITIONED AIR	VACUUM
CHECK VALVE	REFERENCE AIR	ENGINE BLEED AIR
NORMAL AIRFLOW DIRECTION	EMERGENCY PRESSURIZATION BLEED AIR	REGULATED BLEED AIR (18 PSI)
		REGULATED BLEED AIR (37.5 PSI)

57987084

Figure 7-38A

PRESSURIZATION CONTROL SYSTEM SCHEMATIC



57986030

Figure 7-38B

CABIN PRESSURIZATION SYSTEM CONTROLS AND INDICATORS

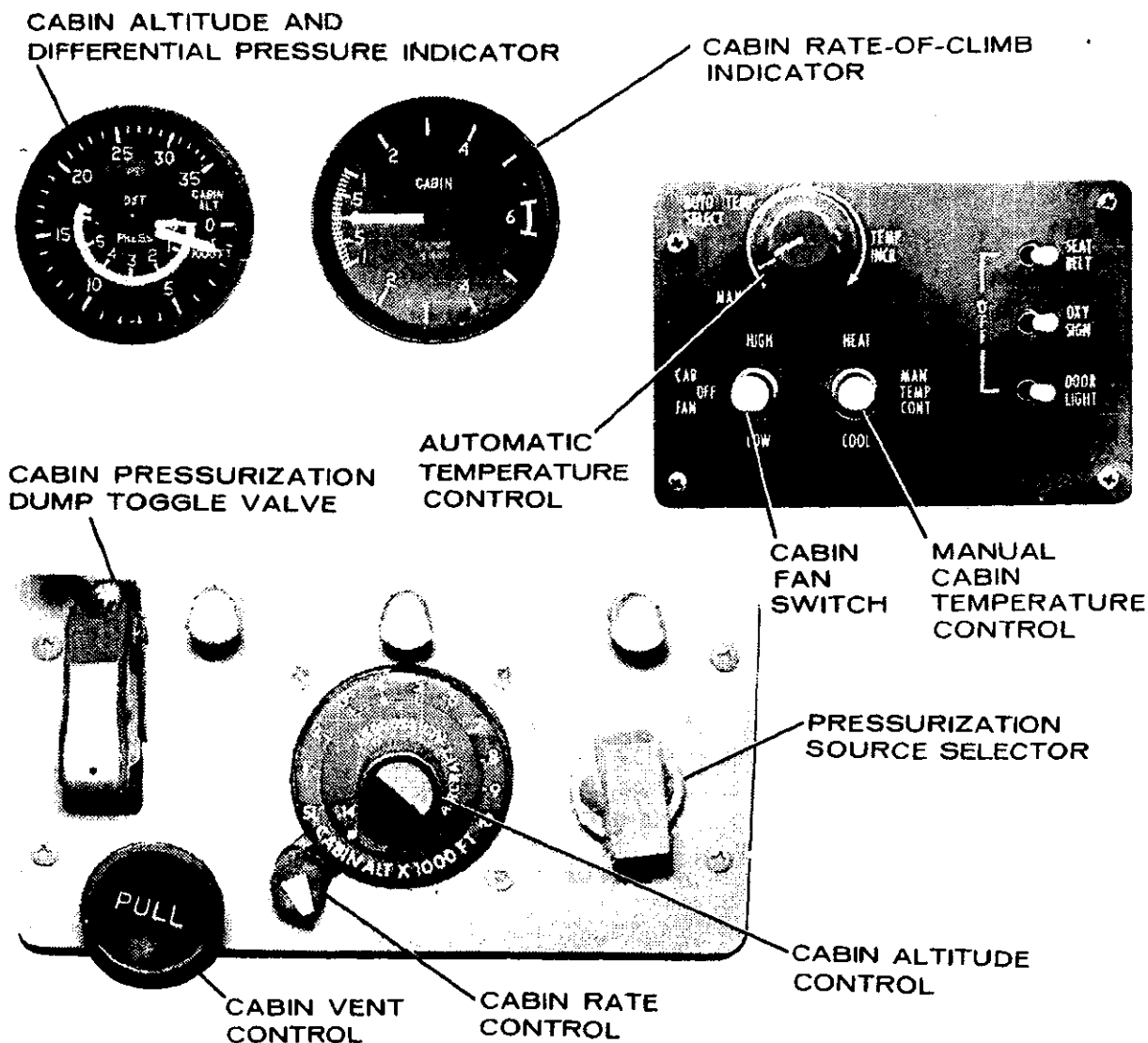


Figure 7-39

PRESSURIZATION SCHEDULE

OPERATION ABOVE 33,000 FEET RESTRICTED
TO AIRPLANES INCORPORATING SK441-36

AIRPLANE ALTITUDE	CABIN ALTITUDE
SEA LEVEL TO 14,700 FEET	SEA LEVEL
17,900 FEET	2000 FEET
21,300 FEET	4000 FEET
24,900 FEET	6000 FEET
28,800 FEET	8000 FEET
33,000 FEET	10,000 FEET
35,000 FEET	10,900 FEET

Figure 7-40

CABIN AIR SYSTEM

The cabin air system, see Figure 7-41, provides for cabin heating, cooling, ventilation and windshield defrosting. The system consists of a ram air inlet in the nose section, an air cycle machine, a cabin ventilation fan, and air ducts that route air to the cabin air outlets. Air outlets are located at the base of each windshield and crew window for defrosting purposes. Passenger compartment warm air is provided by full length air outlets located on the left and right side of the cabin just above the floor. Cool air is provided by individual overhead air outlets. Crew compartment air is provided by air outlets located in the overhead console and by foot warmer valves located on the lower cockpit side walls forward of each seat and a flood air outlet on the floor adjacent to the copilot's seat.

Ventilation

Ventilation is required only when the airplane is operating depressurized since cabin pressurization cannot be maintained with the cabin vent control pulled out. When the cabin vent control is pulled out, air is drawn from the ram air inlet in the nose of the airplane and is routed through ducts to the cabin air outlets. The velocity of the air moving through the overhead air ducts can be increased by positioning the CAB FAN switch to either HIGH or LOW.

Defrosting

Windshield and cockpit side window defrosting is controlled by the foot warmer valves located on each lower side wall forward of the pilot's and copilot's seats. Positioning the foot warmer valves to DEF will direct defrosting air flow to the windshields. The cabin fan must be off to permit maximum defrosting air flow. Defrosting capability can also be increased by turning the cabin flood air control to the ON position.

Heating And Cooling

Bleed air from the engines is routed to a compressor in the air cycle machine which raises the pressure and temperature of the bleed air. The air is then routed through a heat exchanger where the temperature is lowered further while the pressure remains high. The cooled high pressure air then passes through a turbine wheel and then out to a larger diameter air duct, which causes the air pressure to drop, causing a sharp drop in the air temperature. The conditioned air then enters a water separator where it is filtered and the excess water is removed. This cold air is then mixed with hot bleed air which bypassed the air cycle machine. The ratio of hot to cold air is controlled by a mixing valve. If a cooler cabin temperature is selected, the mixing valve will decrease the amount of hot air being mixed with the cold air. If a warmer cabin temperature is selected, the mixing valve will increase the amount of hot air being mixed with the cold air. The mixing valve will move constantly to maintain the desired cabin temperature commanded by the automatic cabin temperature control.

NOTE

A guarded air inlet for the Automatic Cabin Temperature Control sensor is located on the aft cabin baggage step. Items such as luggage and coats must be kept clear of this inlet in order for the cabin environmental system to function properly.

Automatic Cabin Temperature Control

The AUTO TEMP SELECT knob is used to set the desired cabin temperature. If the automatic temperature control should fail, manual control is available when the knob is rotated full counterclockwise to the MAN position.

Manual Temperature Control Switch

The MAN TEMP CONT switch, see Figure 7-39, is used as a manual back-up system should automatic cabin temperature control system fail. Actuation of the switch to COOL will electrically drive the mixing valve to decrease the amount of hot bleed air mixed with the cold air cycle machine outflow air. Actuation of the switch to HEAT will electrically drive the mixing valve to increase the amount of hot bleed air mixed with the cold air cycle machine outflow air. Refer to Automatic Cabin Temperature Control Failure in the Abnormal Procedures for additional information.

Cabin Fan

Air flow rate to the overhead outlets can be increased by a fan installed in the inlet to the overhead ducts. Fan operation is controlled by a three-position switch located to the right of the wing flap position selector. This CAB FAN switch, see Figure 7-39, allows the fan to operate in off, low or high.

CABIN VENT CONTROL

The cabin vent control, see Figure 7-39, controls the ram air valve located in the duct from the air cycle machine to the cabin air distribution system. Pulling the control allows fresh air from the ram air inlet in the nose to enter the cabin air distribution system.

FOOT WARMER VALVES

A foot warmer valve is located on each cockpit lower side wall forward of each seat. Positioning the valve to OFF terminates air flow. Positioning the valve to DEF provides defrost air to the windshield and cockpit side window. Positioning the valve to HEAT allows heated air to flow from the foot warmer.

ENVIRONMENTAL CABIN FLOOD SYSTEM

An additional air outlet is located on the crew compartment floor inboard of the copilot's seat. This outlet provides a high-volume flow of air which floods the crew and passenger compartments, resulting in faster and more efficient cooling or heating. Airflow is controlled by a valve under the floor which is connected to a control knob aft of the copilot's seat. When the knob is turned to the ON position, conditioned air is diverted through the valve and out through the floor outlet. Positioning the control knob to OFF shuts off air to the floor outlet and allows flow to the overhead and aft cabin floor outlets.

PRESSURIZATION

The airplane will normally be operated in the pressurized mode. Figure 7-40 presents the maximum available airplane altitude for various cabin altitudes. During one engine inoperative operations, an adequate supply of bleed air will be available for normal pressurization operation. If the air cycle machine should fail, pressurized operation can continue using emergency pressurization until supplemental oxygen is used or the airplane descends until oxygen requirement is satisfied.

To provide cabin pressurization, a constant source of air and a method of controlling the flow of air into and out of the airplane to achieve the desired differential pressure and resultant cabin altitude is required. In this system the inflow of engine bleed air to the cabin is constant and the outflow of air is controlled by the cabin pressure outflow valve. A spring is always attempting to close the outflow valve to restrict the outflow of air and cause the cabin to descend. Offsetting the spring is the control air (vacuum) regulated by the cabin pressure controller. This tends to pull the outflow valve off the seat and allow air to escape, causing the cabin to ascend. In the event that the control vacuum should exceed limits due to a malfunction, a cabin safety valve is provided to prevent cabin differential pressure from exceeding 6.3 PSI. If the cabin pressure outflow valve should malfunction, the cabin safety valve will take over the differential pressure control and exhaust cabin air. The cabin safety valve is also used to depressurize the cabin when the cabin pressurization toggle valve is positioned to DE-PRESSURIZE. On airplane touchdown, the right main gear safety switch actuates a solenoid valve that opens the cabin dump solenoid valve which opens both the cabin pressure outflow valve and the cabin safety valve.

Engine bleed air is used as the source of high pressure air to provide cabin pressurization. During normal operations, the bleed air is modulated through the air cycle machine to provide the desired cooling. From the air cycle machine, the conditioned air is routed through a check valve, which prevents back flow of air in the event emergency pressurization is used. The conditioned air then enters the cabin air distribution system. During emergency pressurization, air flows directly to the cabin from the right engine bleed air source without passing through the air cycle machine. This results in uncontrollable and ever increasing cabin temperature. Emergency pressurization is selected by positioning the pressurization source selector to the EMER position. Emergency pressurization is also automatically selected if the air cycle machine overheats. If the cabin altitude should exceed approximately 10,900 feet, (airplanes not incorporating SK441-36) or 11,500 feet (airplanes incorporating SK441-36), a cabin altitude warning light on the annunciator panel will illuminate, indicating a need for oxygen.

The pressurization controls and indicators, see Figure 7-39, consist of a pressurization source selector, a cabin altitude control, a cabin rate control, a cabin vent control and a cabin pressurization dump toggle valve, which are located on the lower control quadrant. A cabin rate-of-climb indicator and a combination cabin altimeter and differential pressure indicator are located on the instrument panel forward of the control quadrant.

The pressurization source selector located on the pressurization controller, see Figure 7-39, is a six-position switch labeled OFF, LH, RH, BOTH, GND and EMER. In the OFF position, both bleed air cabin pressurization flow control valves are closed which allows no bleed air to enter the cabin. In the GND position with the engines operating in normal (computer) mode below 80% RPM, the flow control valves are opened and the restrictors in the sonic mass flow control venturis are withdrawn from the venturi throats allowing high bleed air flow through the air cycle machine for maximum cabin ventilation for ground use only. A BLEED AIR GROUND annunciator light will illuminate whenever the selector is in the GND position. The venturi throat restrictors will automatically be reinserted upon increasing engine operation above 80% or transferring to manual mode engine operation. In the LH or RH position, the respective flow control valve will open, allowing conditioned engine bleed air to enter the cabin. In the BOTH position, the left and right flow control valves will open, which

allows both left and right conditioned engine bleed air to enter the cabin. In the EMER position, the emergency pressurization valve opens, which allows hot bleed air from the right engine to bypass the air cycle machine and flow directly to the cabin. Cabin temperature will rise uncontrollably. The bleed air firewall shutoff valves and the cabin pressurization flow control valves will automatically return to or stay in their normally open positions upon loss of electrical power insuring continued cabin pressurization.

Note that the EMER PRESS ON annunciation light will not illuminate upon manual selection of the EMER position on the source selector. The annunciator light illuminates only when emergency pressurization is activated automatically through an air cycle machine overheat condition.

The cabin altitude and rate controls, see Figure 7-39, enable the pilot to select the desired cabin altitude and the desired cabin rate-of-climb. The selected values can be maintained until a cabin altitude is reached which results in a 6.3 PSI differential between cabin and atmosphere. To obtain the optimum benefit from the cabin altitude and rate controls, set in the cruise pressure altitude plus 500 feet on the inner AIRCRAFT ALT scale just prior to takeoff with the rate control arrow positioned straight up. For cruising altitudes below the inner scale values, always select the destination field pressure altitude plus 200 feet on the outer scale. The selection should be made slowly to provide maximum comfort. Adjust the cabin rate control as the climb progresses such that the selected cabin altitude is reached at approximately the same time the airplane reaches cruising altitude.

The cover guarded cabin pressurization dump toggle valve is used to select depressurized operation should a pressurization related emergency occur. Lifting the cover guard and positioning the toggle valve to DEPRESSURIZE will pneumatically actuate the cabin safety outflow valve to the full open position. This action will immediately allow the cabin altitude to increase to the airplane altitude.

Control of cabin pressurization is a pneumatic function independent of electrical control except that electrical power is required to dump the cabin upon landing through use of the main landing gear safety switch.

The cabin rate-of-climb indicator, see Figure 7-39, visually displays the rate in feet-per-minute, that the cabin altitude is changing. The indicator is calibrated in 100 feet-per-minute increments to 1000 feet and in 1000 feet-per-minute increments to 6000 feet in both up and down directions.

The combination cabin altimeter and differential pressure indicator, see Figure 7-39, is a dual purpose gage. It indicates cabin altitude to 35,000 feet and displays the differential pressure in PSI between the cabin and the atmosphere.

OXYGEN SYSTEM

NOTE

For airplanes incorporating SK441-36 or the Quick-Don Oxygen Mask option, refer to the Quick-Don Oxygen Mask System Supplement in Section 9 of this handbook for oxygen duration chart and description and operation of pilots' and copilots' oxygen masks.

The oxygen system provides adequate oxygen flow rates up to maximum operating altitude for individual oxygen service for the pilot, copilot and each passenger position. The standard oxygen system consists of a pressure

CABIN AIR SYSTEM SCHEMATIC

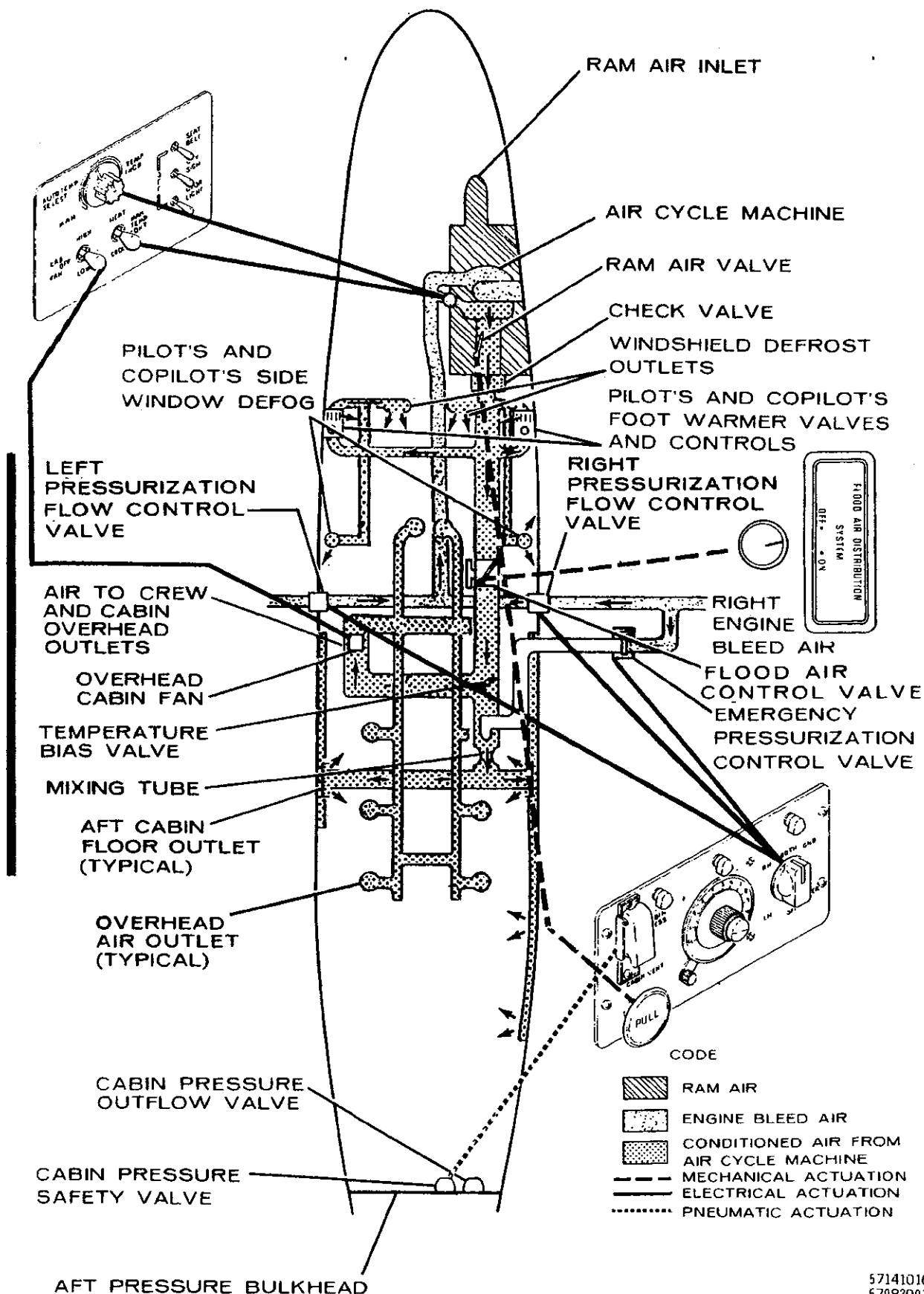
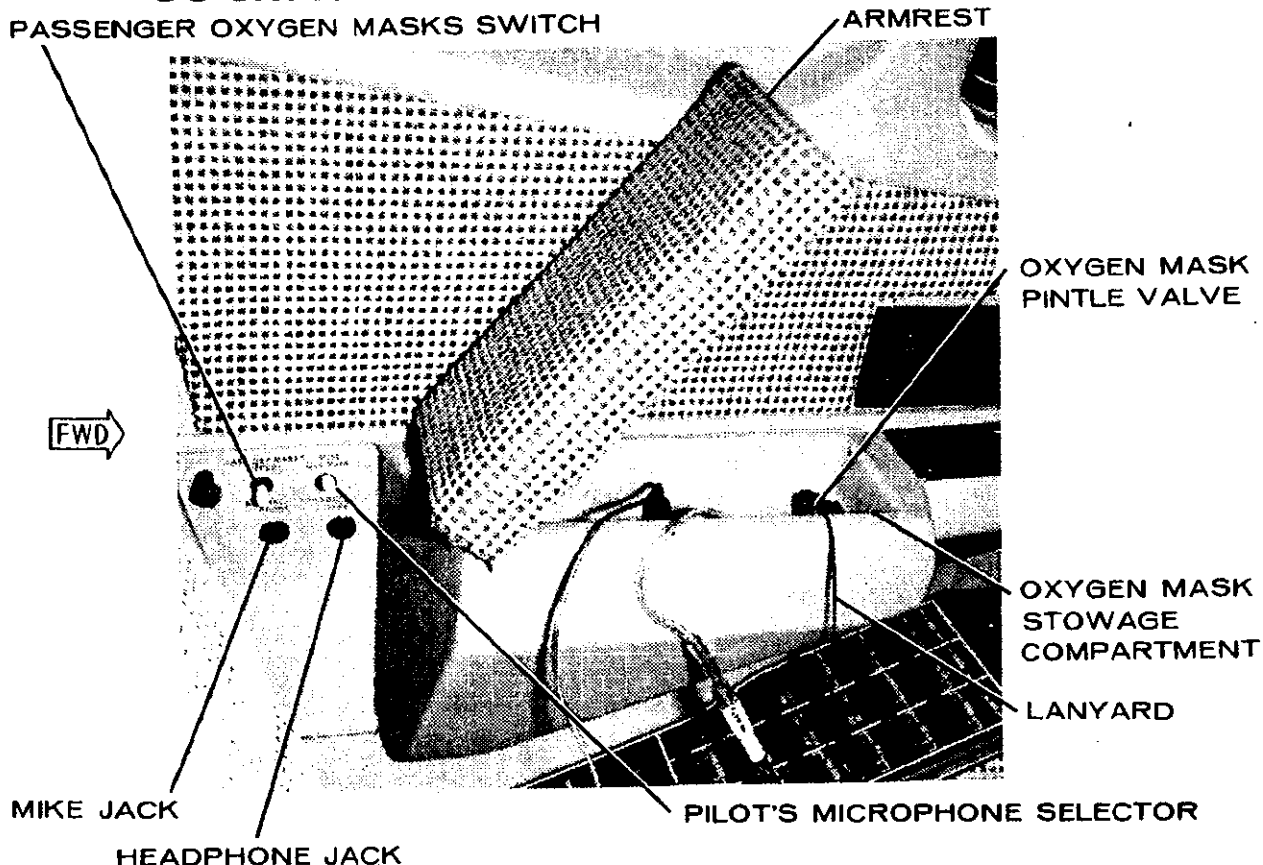


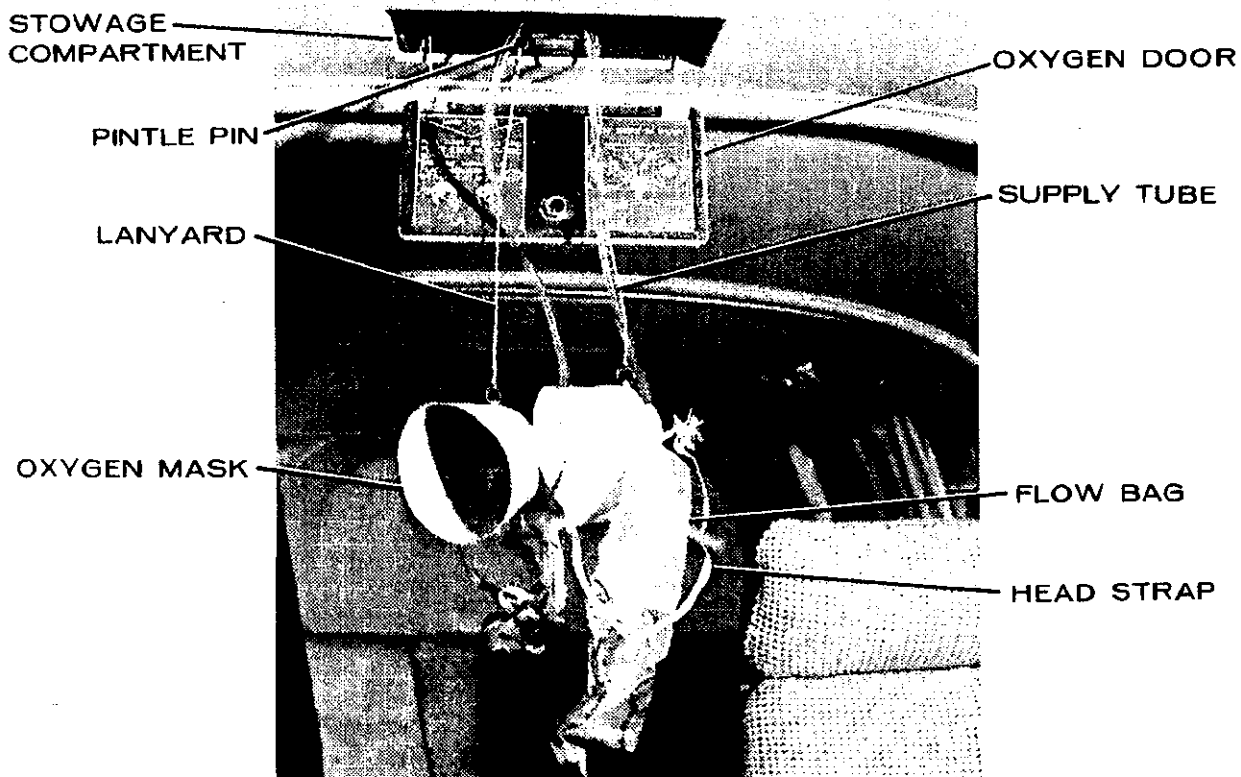
Figure 7-41

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COCKPIT AND CABIN OXYGEN OUTLETS



PILOT'S SIDE SHOWN; IDENTICAL CONTROLS ARE PROVIDED FOR THE COPILOT



PASSENGER'S OVERHEAD OXYGEN COMPARTMENT AS VIEWED FROM PASSENGER SEAT WITH DOOR OPEN AND MASK DEPLOYED.

Figure 7-42

gage, altitude compensating regulator, 11.0 cubic foot bottle, oxygen masks for each seat position and necessary plumbing. The optional oxygen system replaces the 11.0 cubic foot oxygen bottle with a 114.9 cubic foot oxygen bottle and replaces the standard copilot's mask with a pilot's type oxygen mask. The oxygen bottle is located in the tailcone area.

Should the cabin altitude exceed 14,500 feet, a barometric pressure switch will automatically and electrically actuate the overhead passenger oxygen door solenoids, which will deploy the oxygen doors and drop the continuous flow masks at each passenger seat location. The pilot's and copilot's oxygen outlets are located inside the stowage compartment under the outboard armrests, see Figure 7-42. Oxygen flow to the passenger's masks and standard copilot's mask is indicated by inflation of a green bag within the oxygen flow bag or by an in-line flow indicator in the plastic supply tube. Oxygen flow to the pilot's mask and optional copilot's mask is indicated by an oxygen flow indicator. Oxygen will not flow from the masks until the lanyard on the respective mask has been pulled, which removes the pintle pin. This conserves oxygen in the event that all masks are not used. When oxygen is no longer required, reinstall all removed pintle pins, stow oxygen masks and close doors.

The passenger oxygen mask system operates automatically as a function of cabin altitude when the PASS OXY MASKS drop switch, located aft of the pilot's armrest, see Figure 7-42, is in the NORMAL position. The masks can also be deployed by placing the switch to the DEPLOY position. Passenger oxygen masks may be deployed manually on an individual basis by inserting a ball point pen, pencil or other pointed object into the 1/8 inch oxygen door release access hole located on the lower cover of the mask drop box.

When the oxygen system is in use, the pilot and copilot must position their MIC selector switches, located aft of their armrests, see Figure 7-43, in the OXY MASK position in order to talk through the oxygen mask microphone. For normal headset operation, position the MIC selector switch to the HEADSET position.

BAGGAGE COMPARTMENTS

Five baggage locations, see Figure 1-3, are available: one in the nose baggage compartment, one in the forward nose section (avionics bay), and three in the aft cabin area.

These baggage areas are intended primarily for low-density items such as luggage and briefcases. When loading high-density objects, insure that adequate protection is available to prevent damage to any of the airplane's primary structure. Without optional equipment installed, 250 pounds can be carried in the forward nose section (avionics bay), 350 pounds in the nose baggage compartment, 400 pounds in the aft cabin Bay A, 100 pounds in the aft cabin Bay B and 400 pounds in the aft cabin area forward of Bay A. With optional equipment installed, refer to Section 2 or the loading placards in your airplane's baggage compartments.

WARNING

- The transportation of hazardous materials is discouraged. However, if transport of this material is necessary, it shall be done in accordance with FAR 103 and any other applicable regulations.
- Under no circumstances, allow the loading of people or animals in the nose baggage area.

OXYGEN DURATION CHART

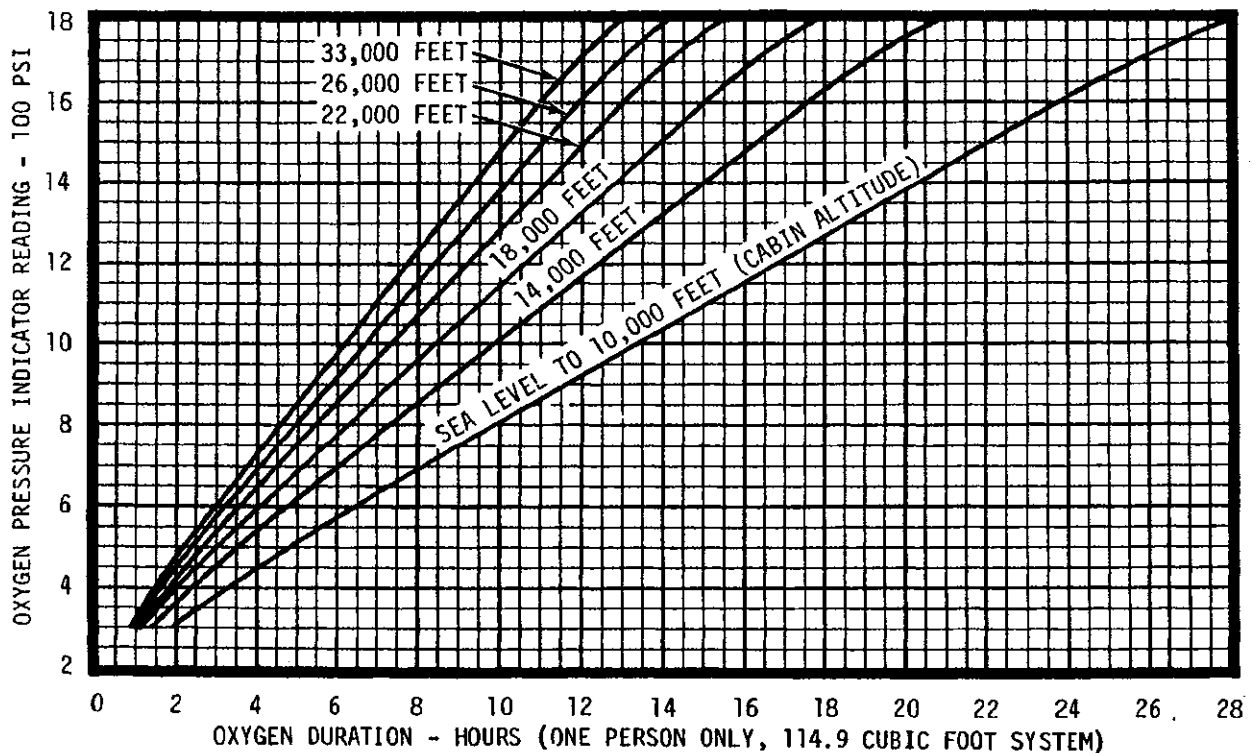
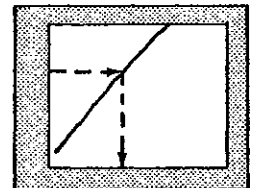
11.0 AND 114.9 CUBIC FOOT SYSTEMS

* Airplanes Not Incorporating SK441-36

WARNING

The 11.0 cubic foot system is provided for emergency descent only; therefore, no duration data is provided. Under the most optimistic conditions of 10,000-foot cabin, fully serviced bottle and standard seat configuration, approximately 19.2 minutes of oxygen is available. Under pessimistic conditions of 33,000-foot cabin, fully serviced bottle and standard seat configuration, the oxygen duration is 13.2 minutes if emergency descent procedures are followed.

$$\frac{\text{OXYGEN DURATION IN HOURS}}{\text{NUMBER OF PERSONS}} = \text{TOTAL HOURS DURATION}$$



*For airplanes incorporating AK441-6 or SK441-36, refer to Section 9 Supplement Quick-Don Oxygen Masks for oxygen duration chart.

Figure 7-43

AIRPLANE TIE-DOWN PROVISIONS AND JACK POINTS

A wing tie-down fitting is provided in the lower outboard surface of each wing nacelle. The fittings retract into the nacelle when not in use. A tail tie-down fitting is located on the fuselage bottom, below the empennage. In addition, the nose gear can be secured with ropes attached to the nose gear assembly above the scissors linkage.

Three jack points are provided on the underside of the airplane. The main gear jack points are located aft and outboard of each main gear door hinge. The nose gear jack point is located aft of the left nose gear door hinge.

SEATS, SEAT BELTS AND SHOULDER HARNESSSES

PILOT AND COPILOT PROVISIONS

The pilot and copilot seats are attached to seat rails located on each side of the cockpit area. The seats are adjustable fore and aft on seat rails by lifting the handle located on the forward face of the seat and are also adjustable in height and tilt.

Seat belts are provided for both seats and are attached to the seat structure. The shoulder harnesses attach aft and outboard of the pilot's and copilot's seats to overhead structure. The opposite end of each harness can be attached to the outboard pilot's or copilot's seat belt. An adjustment is provided between the attach points. With the optional shoulder harnesses, inertia reels are bolted to overhead structure aft and outboard of the pilot's and copilot's seats. The opposite end of the harnesses attach to the seat belts with a detachable fastener. The inertia reels allow normal fore and aft movement of the occupants until a violent movement occurs, at which time the reel will lock, restricting forward movement of the seat occupant.

PASSENGER PROVISIONS

The individual passenger seats in the 8- to 11-place configuration are attached to continuous seat rails located on each side of the cabin area. The seats are adjustable fore and aft, within the limits of the seat stops, by raising the handle located on the front of the seat. Seat back recline angle can be adjusted by a button on the side of each seat arm rest. Seat armrests can be raised or lowered by a lever in the forward edge of the armrest. Insure the seat stop pins are engaged with the holes in the seat rails before takeoff and landing. Each seat is equipped with a seat belt which is attached to the seat structure.

The passenger seats in the optional high-density 11-place configuration are attached to continuous seat rails located on each side of the cabin area. The seats are adjustable fore and aft, within the limits of the seat stops, by raising up on the stop pin lever located near the outside edge of each foot rest. The seats do not have reclining backs. Insure that the seat stop pins are engaged with the holes in the seat rails before takeoff and landing. Each seat is equipped with a seat belt which is attached to the seat structure.

DOORS, WINDOWS AND EXITS

CABIN DOOR

The main cabin door is a two-section, outward opening, airstair door. The lower section folds down to provide two steps for ease in boarding and deplaning passengers, while the top portion folds up.

The (lower) door handle is located such that the upper door must be open to gain access to it. In addition, the locking pin receptacles can be visually inspected for positive engagement; refer to Figure 7-21. It is important, to ensure positive locking, that the upper door inner handle be rotated fully clockwise against the stop before being stowed. If the door is fully locked (overcenter), white vertical lines will show against green backgrounds in all six locking pin inspection holes and the latching hook.

WARNING

Failure to properly latch the cabin door can allow it to open in flight.

As an additional safety feature, a cabin door warning light is provided. This light is located in the annunciator panel, refer to Figure 7-3, and is illuminated when the cabin door is not securely latched.

CAUTION

When entering or exiting airplanes equipped with a pneumatic lower door extender, ensure lower cabin door is fully extended before putting weight on steps.

WINDOWS

Eight windows are provided on each side of the airplane. All windows are non-opening, except the foul weather windows located forward of the pilot's and copilot's side windows. The foul weather windows may be opened during all ground operations and in flight operations with the cabin depressurized. Airspeed is not restricted with the foul weather windows open.

EMERGENCY EXIT WINDOW

The forward rectangular window on the right side of the passenger compartment can be removed for emergency exit. To remove the window, pull off the plastic cover over the emergency release handle under the window. Turn the release handle to release the window retainers, then pull the window in and down.

Some airplanes are equipped with an externally openable emergency exit window, see Figure 7-44. A locking pin is installed in the window frame to prevent undesirable entry into the cabin via the emergency exit window. When the locking pin is installed, neither the internal or external handles can be moved, thus the emergency exit cannot be removed. Ensure the pin is removed before flight to allow unassisted emergency exit window removal from the outside of the airplane, should such action be necessary.

EMERGENCY EXIT WINDOW OPENING

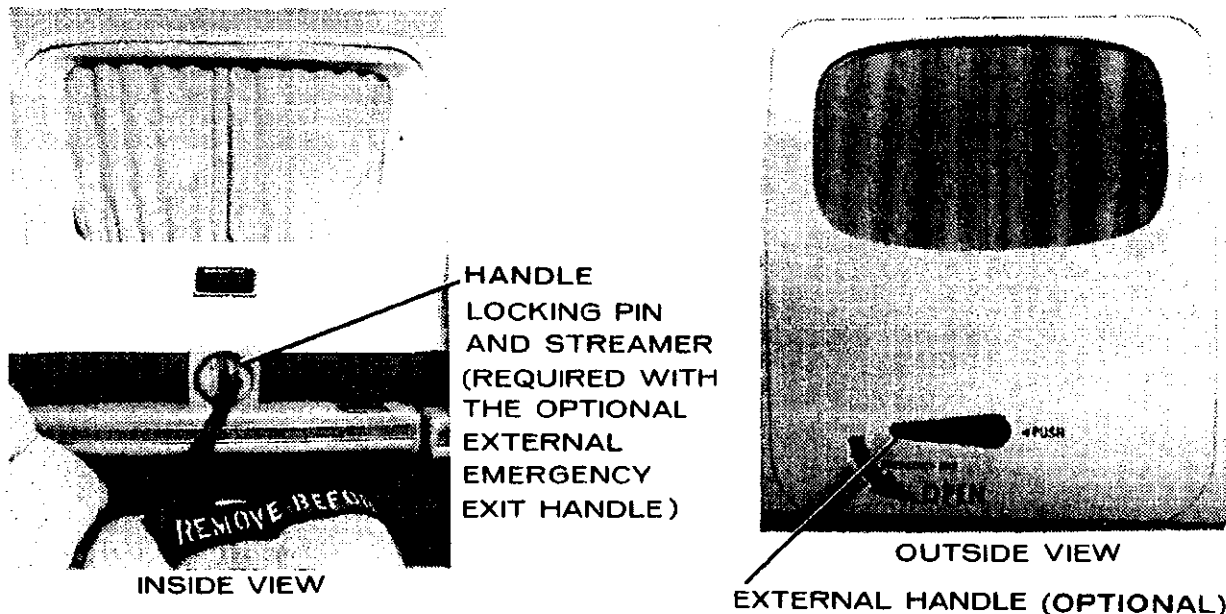


Figure 7-44

5714P6037
5714P6038

CABIN FEATURES

CABIN FIRE EXTINGUISHER

A portable 2-1/2 pound Halon 1211 fire extinguisher is provided in case of an inadvertent cabin fire. The fire extinguisher, located beneath the copilot's seat, should be checked prior to each flight to ensure that bottle pressure, as indicated by the gage on the bottle, is within the green arc (approximately 125 pounds per square inch). To operate the bottle:

1. Loosen the retaining clamp and remove extinguisher from bracket.
2. Hold bottle upright, pull retaining pin, and press lever to discharge.

NOTE

- Begin discharge 5 feet from fire, at base of the flame, and sweep as required across the flame.
- Extinguisher should be recharged after each use.

CONTROL LOCKS

A control column lock is provided to restrict the control column from moving. This restriction holds the elevators in a nose down position and the ailerons in a neutral position, thus preventing damage to the control surfaces in gusty wind conditions.

On airplanes 441-0001 thru 441-0070, except those incorporating AK441-3, the rudder is secured with an optional internal rudder gustlock or by placing an external control surface lock over the vertical stabilizer and rudder. If neither rudder lock is available, caster the nose wheel to the full left or right position. This action will deflect the rudder against its stop, thus restricting rudder movement.

On airplanes 441-0071 thru 441-0172, and earlier serials incorporating AK441-3, the rudder is secured with an optional rudder gustlock located at the tail of the airplane. To engage the lock, center the rudder, ensure the elevator is fully down, then move the external rudder lock handle to the lock position. The rudder lock is disengaged by rotating the external rudder lock handle to the unlock position. The rudder lock handle is located above the left horizontal stabilizer in the side of the fuselage. If the airplane is not equipped with a rudder gustlock caster the nose wheel to the full left or right position. This action will deflect the rudder against its stop, thus restricting rudder movement.

WARNING

Ensure all control locks are removed before starting the engines.

**PROPELLER SYNCHROPHASER
(OPTIONAL SOME AIRPLANES)**

The propeller synchrophaser system (if installed), see Figure 7-45, is designed to match propeller phase angle of the two engines. The propeller RPM and phase angle of the slaved (left) engine will follow changes in RPM and phase angle of the master (right) engine over a limited range. The synchrophaser will operate normally during all power decreases and small power increases. Under a failed condition, the system will limit engine speed separation to ± 1.2 percent. Extending the landing gear will automatically turn the synchrophaser OFF, if inadvertently left on. In addition, the synchrophaser will automatically shut down when the master engine goes to the manual mode. This eliminates the slaved engine speed from being offset more than 1%.

With the synchrophasing switch in the OFF position, the system is deenergized. With the synchrophasing switch in the ON position, engine speed on both engines will increase slowly, then slowly decrease. During this period of synchrophaser engagement, engine torque can vary ± 60 foot-pounds. Proper synchrophaser operation will begin approximately 20 seconds after switch engagement except airplanes incorporating SK441-79.

NOTE

Manually synchronize the propellers closely before synchrophaser engagement. If the propellers are not closely synchronized, a power lever split can result after synchrophaser engagement.

The synchrophaser PHASE LOCK light will illuminate approximately 20 seconds after switch engagement. Proper synchrophaser operation will be indicated by continuous illumination of the light. After light illumination, the ADJ knob may be adjusted as required to achieve the desired noise

SECTION 8

AIRPLANE HANDLING, SERVICE AND MAINTENANCE

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INTRODUCTION

Section 8 of this handbook provides information on cleaning, inspection, servicing and maintenance of the airplane.

If your airplane is to retain the new plane performance and dependability, certain inspection and maintenance requirements must be followed. It is wise to follow a planned schedule of lubrication and preventive maintenance based on climatic and flying conditions encountered in your locality.

NOTE

It is the responsibility of the owner to ensure that all airworthiness directives and maintenance of the airplane are done when required and in accordance with Federal Aviation Regulations.

Keep in touch with your Cessna Propjet Service Station and take advantage of their knowledge and experience. They know your airplane and how to maintain it. They will remind you when lubrications and oil changes are necessary, and about other seasonal and periodic services.

All correspondence concerning your airplane should include the airplane model and serial number. This information may be obtained from the FAR-45 required identification plate located on the lower forward corner of the cabin doorframe. Refer to the Airplane Maintenance Manual for an illustration of the identification plate.

PUBLICATIONS

Various publications and flight operation aids are furnished in the airplane when delivered from the factory. These items are listed as follows:

**CUSTOMER CARE PROGRAM HANDBOOK
PILOT'S OPERATING HANDBOOK AND FAA APPROVED AIRPLANE
FLIGHT MANUAL
PILOT'S ABBREVIATED CHECKLIST
CESSNA SALES AND SERVICE DIRECTORY
AVIONICS WIRING DIAGRAMS**

The following additional publications, plus many other supplies that are applicable to your airplane, are available from your Cessna Propjet Service Station.

**INFORMATION MANUAL (Contains Pilot's Operating Handbook and FAA
Approved Airplane Flight Manual Information)
MAINTENANCE MANUALS, PARTS CATALOGS AND WIRING DIAGRAM
MANUAL FOR YOUR AIRPLANE
ENGINE AND ACCESSORIES
AVIONICS EQUIPMENT**

Your Cessna Propjet Service Station has a Customer Care Supplies and Publications Catalog covering all available items, many of which they keep on hand. They will be happy to place an order for any item which is not in stock.

NOTE

A Pilot's Operating Handbook and FAA Approved Airplane Flight Manual which is lost or destroyed may be replaced by contacting your Cessna Propjet Service Station. An affidavit containing the owner's name, airplane serial number and registration number must be included in replacement requests because the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual is identified for specific airplanes only.

CESSNA OWNER ADVISORIES

Cessna Owner Advisories are sent to Cessna airplane owners at no charge to inform them about mandatory and/or beneficial aircraft service requirements and product improvements.

United States Aircraft Owners

If your aircraft is registered in the U.S., appropriate Cessna Owner Advisories will be mailed to you automatically according to the latest aircraft registration name and address provided to the FAA.

If you require a duplicate Owner Advisory to be sent to an address different from the FAA aircraft registration address, please complete and return an Owner Advisory Application (otherwise no action is required on your part).

International Aircraft Owners

To receive Cessna Owner Advisories, please complete and return an Owner Advisory Application, form D5514-13.

Receipt of a valid Owner Advisory Application will establish your Cessna Owner Advisory service (duplicate Owner Advisory service for U.S. aircraft owners) for one year, after which you will be sent a renewal notice.

CESSNA SERVICE INFORMATION SUBSCRIPTION PROGRAM

A subscription service for Maintenance Manual, Illustrated Parts Catalog, Conquest Service Bulletins, Service Newsletters and Supplier Service Notices are available directly from the Cessna Customer Services Department. Your Cessna Service Facility will be glad to supply you with details concerning this subscription program, and stands ready, through their Service Department, to supply you with fast and efficient service.

AIRPLANE INSPECTION PERIODS

Federal Aviation Regulations Part 91.169(e) defines the inspection requirements for turbopropeller-powered multiengine airplane. Chapter 5 of the Airplane Maintenance Manual contains the inspection program recommended by Cessna Aircraft Company.

Additional inspections may be required by the FAA. These inspections are issued in the form of Airworthiness Directives and can apply to the airframe, engines and/or components of the airplane. It is the owner's responsibility to ensure compliance with these directives. In some cases, the Airworthiness Directives require repetitive compliance; therefore, the owner should ensure inadvertent noncompliance does not occur at future inspection intervals.

NOTE

Refer to FAR Parts 43 and 91 for properly certified agency or personnel to accomplish the inspections. Contact your local Cessna Service Facility for additional information.

CESSNA CONTINUOUS INSPECTION PROGRAM

The Cessna Continuous Inspection Program has been developed to provide a modern progressive inspection schedule that satisfies the complete airplane inspection requirements and to help you realize maximum utilization of your airplane at a minimum cost and down-time. Under this program, your airplane is inspected and maintained in a 600-hour cycle or 18 calendar months. This cycle is composed of five phases with a phase being performed at 100-hour intervals.

The procedures for the Cessna Continuous Inspection Program have been carefully worked out by the factory and are followed by the Cessna Service Facility organization. The complete familiarity of Cessna Service Facilities with Cessna equipment and factory-approved procedures provides the highest level of service possible to Cessna owners.

1 August 1977

Revision 13 - 2 November 1987

8-3

CESSNA CUSTOMER CARE PROGRAM

Specific benefits and provisions of the Cessna Warranty for your airplane plus other important benefits for you are contained in your Customer Care Handbook supplied with your airplane. You will want to thoroughly review this publication and keep it in your airplane at all times.

PROJET CESCO SYSTEM

Propjet CESCO is Cessna's Computerized Maintenance Records System. This comprehensive system provides you with an accurate and simple method of monitoring and scheduling inspections. Service Information Letters or Conquest Service Bulletins, Service Kits, Airworthiness Directives as well as scheduled and unscheduled maintenance activities. For detailed information about Propjet CESCO, refer to the Propjet CESCO Instruction Manual.

SERVICING REQUIREMENTS

For quick and ready reference, quantities, materials, and specifications for frequently used service items (such as fuel, oil, etc.) are shown in this section.

In addition to the Preflight Inspection covered in Section 4, complete servicing, inspection, and test requirements for your airplane are detailed in the Airplane Maintenance Manual. The Maintenance Manual outlines all items which require attention at 100-, 200- and 600-hour intervals plus those items which require servicing, inspection, and/or testing at special intervals.

It is recommended that you contact your Cessna Service Facility concerning these requirements and begin scheduling your airplane for service at the recommended intervals.

Depending on various flight operations, your local government aviation agency may require additional service, inspections, or tests. For these regulatory requirements, owners should check with local aviation officials where the airplane is being operated.

AIRPLANE FILE

- A. To be displayed in the airplane at all times:
 - (1) Standard Airworthiness Certificate (FAA Form 8100-2).
 - (2) Aircraft Registration Certificate (AC Form 8050-3).
 - (3) Aircraft Radio Station License (if transmitter is installed, Federal Communication commission Form 556).
 - (4) Radio Telephone Station License (Federal Communication Commission Form 409, if Flitefone III Radio Telephone is installed).
- B. To be carried in the airplane at all times:
 - (1) Weight and Balance Data Sheets and associated papers (all copies of the Repair and Alteration Form, FAA Form 337, if applicable).
 - (2) Equipment List.
 - (3) Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.
 - (4) Pilot's Checklist.

C. To be made available upon request:

- (1) Airframe Logbook.
- (2) Engine Logbooks.
- (3) Propeller Logbooks.

Most of the items listed are required by the United States Federal Aviation Regulations. Since the regulations of other nations may require other documents and data, owners of airplanes not registered in the United States should check with their own aviation officials to determine their individual requirements.

Cessna recommends that these items, plus Cessna Customer Care Program Handbook, Customer Care Card and Pilot's Checklist Cards be carried in the airplane at all times.

PREVENTIVE MAINTENANCE

Part 43 of the FAR's allows the holder of a pilot certificate, issued under Part 61, to perform preventive maintenance on any airplane owned or operated by him that is not used in air carrier service. Refer to FAR Part 43 for a list of preventive maintenance items the pilot is authorized to accomplish.

NOTE

- Prior to performance of preventive maintenance, review the applicable procedures in the Airplane Maintenance Manual to insure the procedure is properly completed.
- All maintenance other than preventive maintenance must be accomplished by appropriately licensed personnel. Contact your Cessna Service Facility for additional information.
- Pilots operating airplanes of other than United States registry should refer to the regulations of the country of certification for information on preventive maintenance that may be performed by pilots.

ALTERATIONS OR REPAIRS TO THE AIRPLANE

Alterations or repairs to the airplane must be accomplished by appropriately licensed personnel. If alterations are considered, the FAA should be consulted to ensure that the airworthiness of the airplane is not violated.

GROUND HANDLING

TOWING

The airplane should be moved on the ground with the aid of the nosewheel towing bar provided with the airplane. The tow bar is designed to attach to the nose gear strut fork.

CAUTION

Remove all control locks before ground handling. When using the tow bar, never exceed the placard nosewheel turning radius limits shown on the nose gear strut (approximately 55° either side of center). Structural damage can occur if the turn limits are exceeded (an inspection of the nose gear stop blocks must be made per the airplane maintenance manual if turn limits are exceeded). Do not push or pull on propellers or control surfaces when moving the airplane on the ground.

Should towing operations be required which cannot be accomplished with the nosewheel towing bar, the airplane can be towed using a yoke-type tow bar and a tow vehicle.

A qualified person should be stationed in the pilot seat during all phases of towing to watch for hazardous conditions and to stop the airplane with the airplane brakes in the event the tow bar breaks or becomes uncoupled. In congested areas, station wing and/or tail walkers to ensure adequate clearance between airplane and adjacent equipment and structures.

Refer to the airplane maintenance manual for additional towing procedure information.

PARKING

Parking is normally accomplished with the nosewheel aligned straight ahead. This minimizes stress on the nose gear during starting and simplifies the steering during subsequent departures from the parking area. If gusty wind conditions prevail, lock the controls to prevent unnecessary control surface movement. When parking the airplane, head into the wind and set the parking brake.

CAUTION

Do not set parking brakes when the brakes are overheated or during cold weather when accumulated moisture may freeze the brakes.

When setting the parking brake is impractical, chock the main and nose wheels to prevent airplane movement.

TIE-DOWN

Proper tie-down procedure is the best precaution against damage to a parked airplane by gusty or strong winds. To tie down the airplane securely, proceed as follows:

1. Head airplane into the wind, if possible.
2. Set parking brake.

CAUTION

Do not set parking brakes when the brakes are overheated or during cold weather when accumulated moisture may freeze the brakes.

3. Start and Ignition Circuit Breakers - PULL.

NOTE

Inadvertent engine motoring or starts will be minimized by disengaging the start and ignition circuit breakers.

4. Install pitot tube covers, if available.
5. Secure rudder with the rudder gust lock (if installed). If a rudder gust lock is not available, caster the nose wheel to the extreme left or right position.
6. Set elevator, aileron and rudder trim tabs to neutral so that the trim tabs fair with the control surfaces.
7. Install control column lock in the pilot's control column, if available. If column lock is not available, tie the pilot's control wheel full aft with a seat belt.
8. If dusty conditions exist or if the last flight of the day has been completed, install the engine inlet and exhaust covers to protect the engines from debris. The covers may be installed after the engines have cooled down (EGT indicators showing "off scale" temperatures).
9. Attach ropes or chains of at least 700 pounds tensile strength to the three tie-down fittings. Secure the opposite ends of the ropes or chains to ground anchors. Two of the tie-down fittings are located on the lower outboard surface of each engine nacelle at the wing leading edge. These flush mounted fittings are extended by pushing forward on the tab and pulling the fitting down. The third tie-down fitting is the tailcone tail skid. For further security, tie nose gear with a rope attached above the nose gear torque link. The other end should be attached to a substantial ground anchor. The rope angle to the ground should be 45 degrees. Attach a second rope in a similar manner to the opposite side of the nose gear. Ensure that the rope will not chafe on the nose gear or that damage will not occur to the nose gear.

JACKING AND LEVELING

Three jack points are provided on the underside of the airplane. One jack point is located just aft of the nosewheel well, and one is located on the lower surface of each wing, inboard and in-line with the wing flap hinge.

NOTE

- Pull the flight hour recorder circuit breaker to prevent the flight hour recorder from recording while the airplane is on jacks and battery switch is in the ON position. The circuit breaker is located on the right side panel above the hour meter.
- Jacks, ideally suited to the airplane, can be supplied by the Cessna Aircraft Company. Three jacks are required to lift the airplane.

To level the airplane longitudinally and laterally, use the three jacking points provided on the airplane. Level longitudinally by backing out the two screws at "Level Point" on the right outside fuselage (opposite cabin door) at Stations 272.65 and 248.25 and place a spirit level on these screws, then level longitudinally. To level laterally, place a spirit level directly on the seat tracks at Station 177.45 (over the main spar). Refer to the Airplane Maintenance Manual for additional information.

FLYABLE STORAGE

Flyable storage applies to all airplanes which will not be flown for an indefinite period (less than 60 days) but which are to be kept ready to fly with the least possible preparation. If the airplane is to be stored temporarily, or indefinitely, refer to the Airplane Maintenance Manual for proper storage procedures. The Airplane Maintenance Manual also provides amplification for the following procedures.

1. If the airplane is to be inactive for less than 60 days:
 - a. At the beginning of the period of idleness, the engine shall be operated for a minimum of ten minutes at approximately 75% RPM to ensure coverage of all internal engine parts with oil.
 - b. Allow engine to cool, then inspect engine inlet area to ensure it is clean and dry.
 - c. Cap, plug or cover engine inlet and exhaust openings. Ensure that these openings remain adequately sealed during period of idleness to prevent entrance of water or foreign matter. The covers may be installed after the engines have cooled down (EGT indicators showing "off scale" temperatures).
 - d. Engines preserved in the above manner for less than 60 days require no depreservation.
 - e. There shall be no renewal of the 1 to 60-day preservation.

2. If the airplane is to be inactive for 60 to 180 days:
 - a. At the beginning of the period of idleness, the engine shall be operated for a minimum of ten minutes at approximately 75% RPM to ensure coverage of all internal engine parts with oil. During engine run, the engine speed must exceed 95% RPM momentarily to actuate the EPA Fuel Purge System.
 - b. Allow engine to cool. Disconnect fuel line between fuel control assembly and fuel flow divider and drain valve and connect a line to drain overboard.
 - c. Disconnect fuel supply line at inlet connection on fuel pump assembly and connect a low pressure (2 to 5 PSI) source of filtered (ten micron nominal) MIL-L-6081, Grade 1010 oil to the inlet connection.
 - d. Deenergize the ignition system. Motor engine with starter-generator until the system flows oil only out of the fuel line.

CAUTION

- Use START and STOP buttons to perform engine motoring operation. Do not use the START MOTOR switch.
- Do not exceed the starter-generator duty cycle limitations specified in Section 2.

- e. Reconnect lines that were disconnected in steps b and c.
 - f. Inspect engine to assure that inlet area is clean and dry.
 - g. Cap, plug or cover engine inlet and exhaust openings. Ensure these openings remain adequately sealed during period of idleness to prevent entrance of water or foreign matter.
 - h. Once every 60 days of idleness, depreserve and represerve engine.
 - i. The 60 to 180 day preservation procedures may be removed once by repeating the above procedure.
3. Place a contrasting colored plastic tape over static ports, install pitot tube covers and windshield deice inlet scoop plug to prevent entry of foreign objects.
 4. Keep the fuel tanks full to minimize condensation in the fuel tanks.
 5. If the airplane will be out of service for 5 days or more, disconnect batteries and as necessary, clean and coat the intercell hardware with a light coat of neutral nonconductive grease, such as petroleum jelly, to prevent corrosion. Batteries must be maintained in accordance with Marathon Battery Instruction Manual, BA-89.
 6. If the airplane is stored outside, tie-down airplane in accordance with the tie-down procedures in this section.
 7. Chock the main landing gear tires; do not set the parking brake if a long period of inactivity is anticipated as brake seizing can result.
 8. Every two weeks move airplane to prevent flat areas on tires. Mark tires with tape to ensure tires are rotated approximately 90° from previous position.

9. Drain fuel sumps every 30 days and check for water accumulation. Prolonged storage of the airplane will result in a water buildup in the fuel which "leaches out" the fuel anti-icing additive(s) EGME and/or DIEGME. An indication of this is when an excessive amount of water accumulates in the fuel tank sumps. Refer to Fuel Additives in this section for minimum allowable EGME or DIEGME concentrations.

SERVICING

NOTE

Refer to the Airplane Maintenance Manual for complete servicing requirements.

CABIN FIRE EXTINGUISHER

The optional cabin fire extinguisher is attached to the lower front seat structure of the copilot's seat. On a regular basis, check the following:

1. Check fire extinguisher for secure attachment to copilot's seat.
2. Check yellow plastic tamper tag for condition.
3. Ensure trigger safety lock ring is installed.
4. Check pressure gage for correct indication. If extinguisher is weighed, it should weigh at least 4.5 pounds. If the extinguisher weighs less than 4.5 pounds, remove the extinguisher for inspection and recharging by a qualified fire extinguisher agency. Such agencies are listed under "Fire Extinguishers" in the telephone directory.
5. Approximately 8 seconds of use is available in a fully serviced extinguisher.

FUEL

Service fuel tanks after each flight. Keep full to retard condensation in the tanks. Tank capacities are 237.5 usable gallons for each fuel tank when filled to the bottom of the fuel filler standpipe. Do not fill above the bottom of the standpipe.

The following fuels are approved for use:

FUEL GRADE (1)	SPECIFIC WEIGHT (POUNDS PER U.S. GALLON AT 60°F)	COLOR
JET A	6.7	COLORLESS
JET A-1	6.7	COLORLESS
JET B	6.7	COLORLESS
JP-4	6.5	COLORLESS
JP-5	6.8	COLORLESS
JP-8	6.7	COLORLESS
* Grade 80/87 Aviation Gasoline	6.0	RED
* Grade 100LL Aviation Gasoline (2)	6.0	BLUE

* Aviation gasoline (80/87 and 100LL) is approved for emergency use only on airplanes 441-0001 thru 441-0106 and 441-0109 incorporating SK441-28 and airplanes 441-0107, 441-0108, and 441-0110 thru 441-0172 and is limited according to the grade(s) used. A record of total aviation gasoline used must be recorded in the Airplane Engines Maintenance Records.

CAUTION

- Aviation gasoline is restricted to emergency use only and may result in significant reductions in performance. Refer to Section 5 for possible performance effects with aviation gasoline usage.
- The electronic fuel computer(s) must be on and operational for takeoff when aviation gasoline is used.
- Refer to Section 8, and to the Airplane and Engine Maintenance Manuals, for servicing information and additional procedures to be followed whenever a change in fuel type is made.

(1) NATO equivalents of the above fuels may be used.

FUEL

Service fuel tanks after each flight. Keep full to retard condensation in the tanks. Tank capacities are 237.5 usable gallons for each fuel tank when filled to the bottom of the fuel filler standpipe. Do not fill above the bottom of the standpipe.

The following fuels are approved for use:

FUEL GRADE (1)	SPECIFIC WEIGHT (POUNDS PER U.S. GALLON AT 60°F)	COLOR
JET A	6.7	COLORLESS
JET A-1	6.7	COLORLESS
JET B	6.7	COLORLESS
JP-4	6.5	COLORLESS
JP-5	6.8	COLORLESS
JP-8	6.7	COLORLESS
* Grade 80/87 Aviation Gasoline	6.0	RED
* Grade 100LL Aviation Gasoline (2)	6.0	BLUE

* Aviation gasoline (80/87 and 100LL) is approved for emergency use only on airplanes 441-0001 thru 441-0106 and 441-0109 incorporating SK441-28 and airplanes 441-0107, 441-0108, and 441-0110 thru 441-0172 and is limited according to the grade(s) used. A record of total aviation gasoline used must be recorded in the Airplane Engines Maintenance Records.

CAUTION

- Aviation gasoline is restricted to emergency use only and may result in significant reductions in performance. Refer to Section 5 for possible performance effects with aviation gasoline usage.
- The electronic fuel computer(s) must be on and operational for takeoff when aviation gasoline is used.
- Refer to Section 8, and to the Airplane and Engine Maintenance Manuals, for servicing information and additional procedures to be followed whenever a change in fuel type is made.

(1) NATO equivalents of the above fuels may be used.

(2) Aviation gasoline is approved for emergency use only in the following proportions:

(a) Aviation gasoline MIL-G-5572D, Grade 80/87, not in excess of 1000 gallons per 100 hours of operation, may be used for emergency fuel operation.

(b) Aviation gasoline ASTM-D-910, Grade 100LL, not in excess of 250 gallons (U.S.) per 100 hours of operation, may be used for emergency fuel operations.

(c) Total aviation gasoline usage must be limited to 7000 gallons during any 3000 hour period. If combinations of the above aviation gasolines are used, the following formula is required for establishing proportions of combinations during any 3000 hour period:

$$\frac{\text{Amount of } 100\text{LL, Gallons}}{7000 \text{ Gallons}} + \frac{\text{Amount of } 80/87, \text{ Gallons}}{30,000 \text{ Gallons}} = 1.0$$

(d) If 25 percent or more of aviation gasoline is used at any time, one quart of aviation grade oil must be added to the mixture per 100 gallons of aviation gasoline. To hasten mixing the oil with the gasoline, first add the prescribed quantity of oil to the fuel tank and then add the gasoline. The type of oil used must be a mineral based non-synthetic oil conforming to MIL-L-6082.

NOTE

Aviation oils conforming to MIL-L-6082 specification are used as lubricating oils for aircraft reciprocating (piston) engines. Most major oil companies can supply these oils. Either grade 1065 or 1100 may be used. The following brand names are supplied for reference:

Brayco 480 Oil

Brayco 475 Oil

Exxon Aviation Oil 100

Exxon Aviation Oil 65

Texaco Aircraft Oil 100

Texaco Aircraft Oil 65

Mobil Aero Red Band Oil

Hancock 60020 Oil

Aero Shell 100 Oil

If some other brand is desired, contact the oil company area office for availability of oils which conform to MIL-L-6082.

CAUTION

Care should be exercised during fueling operations to avoid damaging deice boots with fueling hose.

FUEL ADDITIVES

A variety of fuels may be used in the airplane; however, each must have an anti-icing additive, in compliance with MIL-I-27686 or MIL-I-85470, incorporated or added into the fuel during refueling. One of the following additives is required for anti-icing protection:

Ethylene Glycol Monomethyl Ether (EGME) (MIL-I-27686).

Diethylene Glycol Monomethyl Ether (DIEGME) (MIL-I-85470).

It is recommended that fuel anti-icing additive be used to control bacteria and fungi. The anti-ice additives EGME/DIEGME have shown, through service experience, that they provide acceptable protection from microorganisms such as bacteria and fungi that can rapidly multiply and cause serious corrosion in tanks and may block filters, screens and fuel metering equipment.

WARNING

Proper mixing of EGME or DIEGME compound with the fuel is extremely important. A concentration in excess of that recommended (0.15 percent by volume maximum) will result in detrimental effects to the fuel tanks, such as deterioration of protective primer and sealants and damage to o-rings and seals in the fuel system and engine. Use only blending equipment that is recommended by the manufacturer to obtain proper proportioning.

CAUTION

JP-4 and JP-5 fuel per MIL-T-5624 and JP-8 fuel per MIL-T-83133A contain the correct premixed quantity of an approved type of anti-icing fuel additive and no additional anti-ice compounds should be added.

PROCEDURE FOR ADDING FUEL ANTI-ICING ADDITIVE

When the airplane is being refueled, use the following procedure to blend anti-icing additive to nontreated fuel:

1. Attach 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. It is also combustible. Before using this material, 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 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.

CHECKING FUEL ADDITIVE CONCENTRATION

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 of additive can be checked using an anti-icing additive concentration test kit.

For additional information about this kit, refer to Chapter 12 of the Maintenance Manual. It is imperative that the instructions for the test kit be followed explicitly when checking the additive concentration.

The additive 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.

CAUTION

If the fuel additive concentration has fallen below 0.035% by volume, the airplane should be defueled and refueled.

If additional anti-static protection is desired, the following additives are approved for use:

Shell ASA3
Dupont Stadis 450

CAUTION

These additives shall not exceed a maximum concentration of 1 part per million by weight.

If additional biocidal protection is desired, an additive is permitted for use in certain conditions. Fuel tank maintenance practices are of prime importance in controlling microbial growth. However, other factors such as climate, airplane design, route structure and utilization also affect microbial growth; therefore, occasional use of a biocide may be required. Biocide additive may be used on a limited basis, defined as intermittent or non-continuous use in a single application, to sterilize airplane fuel systems suspected, or found to be contaminated by microbial organisms.

For those operators, where the need for biocide use is dictated, Pratt & Whitney Canada Inc. recommends, as a guide, a dosage interval of once a month. This interval can then be adjusted, either greater or lesser, as an operator's own experience dictates. An engine operated in private and corporate airplanes, where utilization rates are relatively low, may use the additive continuously. The following additive is permitted for use:

Sohio Biobor JF

CAUTION

This additive shall not exceed a maximum concentration of 270 parts per million by weight.

FUEL CONTAMINATION

Fuel contamination is usually the result of foreign material present in the fuel system, and may consist of water, rust, sand, dirt, microbes, or bacterial growth. In addition, additives that are not compatible with fuel or fuel system components can cause the fuel to become contaminated.

Before the first flight of the day, and after each refueling, use a clear sampler and drain at least one sampler full of fuel from the fuel tank sump drains, the fuel strainer drains and the crossfeed line drains to determine if contaminants are present, and that the airplane has been fueled with the proper fuel.

If contamination is detected, drain all fuel drain points again. Take repeated samples from all fuel drain points until all contamination has been removed. If the airplane has been serviced with improper fuel grade or if, after repeated sampling, evidence of contamination still exists, the fuel tanks should be completely drained and the fuel system cleaned. Do not fly the airplane with contaminated or unapproved fuel.

In addition, owners/operators who are not acquainted with a particular fixed base operator should verify that the fuel supply has been checked for contamination and is properly filtered before allowing the airplane to be serviced. Also, fuel tanks should be kept full between flights, provided weight and balance considerations will permit, to reduce the possibility of water condensing on the inside walls of partially filled tanks.

To further reduce the possibility of contaminated fuel, routine maintenance of the fuel system should be performed in accordance with the airplane Maintenance Manual. Only the proper fuel as defined in Section 2 of this handbook should be used, and fuel additives should not be used unless approved by Cessna and the Federal Aviation Administration.

WARNING

It is the pilot's responsibility to ensure that the airplane's fuel supply is clean before flight. Any traces of solid contaminants such as rust, sand, pebbles, dirt, microbes and bacterial growth or liquid contamination resulting from water, improper fuel type, or additives that are not compatible with the fuel or fuel system components must be considered hazardous. Carefully sample fuel from all fuel drain locations during each preflight inspection and after every refueling.

REQUIRED OVERSPEED GOVERNOR CHECK WITH CHANGE IN FUEL TYPE

An overspeed governor check must be performed any time a change in fuel is made between jet fuel grades and aviation gasoline grades or aviation gasoline grades and jet fuel grades or a mixture of the two fuel grades. Prior to performing the Overspeed Governor Check defined in Section 4, the following must be accomplished:

1. Allow fuel boost pumps to operate a minimum of 3 minutes prior to engine start to ensure fuel mixing in the hopper tank.
2. Allow 3 minutes of engine operation at 100% RPM to ensure proper fuel line purging and adequate oil temperature stabilization.

OIL

WARNING

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.

When adding oil, service the engines with the type and brand which is currently being used in the engines. Refer to the airplane and engine log book. Do not mix brands and/or types of oils.

Check oil level before each flight and fill to capacity. Do not operate below the ADD mark on the dipstick.

NOTE

If oil dip stick indicates oil is abnormally low and operation of the propeller unfeathering switch has occurred, it is possible the engine oil has been transferred to the engine gear case. If this is suspected, motor the applicable engine for 5 to 10 seconds and recheck the oil level.

The following oils are approved for use:

NOTE

Due to the higher viscosity of MIL-L-23699, Type II oils, starting difficulties or slow cranking of the engines can be encountered at ambient temperatures below approximately -12°C. This problem will be more in evidence after the airplane has cold soaked for several hours. Engine preheat is recommended. MIL-L-7808G, Type I oils should be used in lieu of Type II if engines are not preheated at these lower ambient temperatures.

OIL BRAND AND TRADE NAME	VISCOSITY TYPE RATING	APPLICABLE MIL SPECIFICATION	TIME BETWEEN OIL CHANGE
Brayco 880H	Type I	MIL-L-7808F	400 Hours
Brayco 880H	Type I	MIL-L-7808G	400 Hours
Brayco 880 Conojet	Type I	MIL-L-7808D	400 Hours
British Petroleum Aero Turbine Oil 15	Type I	MIL-L-7808D	400 Hours
Caltex SATO 15	Type I	MIL-L-7808D	400 Hours
Continental Conojet	Type I	MIL-L-7808D	400 Hours
Exxon 2389	Type I	MIL-L-7808G	400 Hours
Hancock Airturb Syn Lube	Type I	MIL-L-7808F	400 Hours
Mobil Avrex-S Turbo 256	Type I	MIL-L-7808G	400 Hours
Regent SATO 15	Type I	MIL-L-7808D	400 Hours
Stauffer Jet I	Type I	MIL-L-7808F	400 Hours
Stauffer Jet I	Type I	MIL-L-7808G	400 Hours
Sinclair Turbo S Oil 15	Type I	MIL-L-7808D	400 Hours
Texaco SATO 15	Type I	MIL-L-7808D	400 Hours
Castrol 205	Type II	MIL-L-23699	800 Hours
Castrol 5000	Type II	MIL-L-23699	800 Hours
Cal Tech RPM Jet Engine Oil 5	Type II	MIL-L-23699	800 Hours
Chevron, Jet Engine Oil 5	Type II	MIL-L-23699	800 Hours
Exxon 2380 (Enco/Esso) Turbo Oil	Type II	MIL-L-23699	800 Hours
Mobil Jet Oil II	Type II	MIL-L-23699	800 Hours
Stauffer Jet II	Type II	MIL-L-23699	800 Hours
Texaco Starjet 5	Type II	MIL-L-23699	800 Hours
Texaco SATO 7730	Type II	MIL-L-23699	800 Hours

OXYGEN (Aviators Breathing Oxygen - Specification MIL-O-27210)

Check pressure gage for anticipated requirements before each flight. Refill whenever pressure drops below 300 PSI.

The small oxygen cylinder, when fully charged and allowed to stabilize at a temperature of 21.1°C, contains approximately 11.0 cubic feet of oxygen under a pressure of 1800 PSI. The large oxygen cylinder, when fully charged and allowed to stabilize at a temperature of 21.1°C, contains approximately 114.9 cubic feet of oxygen under a pressure of 1850 PSI. Filling pressures will vary, however, due to the ambient temperature in the filling area, and because of the temperature rise resulting from compression of the oxygen. Because of this, merely filling to 1800 or 1850 PSI will not result in a properly filled cylinder. Fill to the pressures indicated in Figure 8-2 for the ambient temperature.

WARNING

Oil, grease, or other lubricants in contact with oxygen create a serious fire hazard, and such contact must be avoided when handling oxygen equipment.

Either the 11.0 or 114.9 cubic foot oxygen cylinder is serviced through a filler valve located in the aft tailcone of the airplane.

OXYGEN SERVICING CHART

AMBIENT TEMPERATURE °C	FILLING PRESSURE PSIG	AMBIENT TEMPERATURE °C	FILLING PRESSURE PSIG
-17.8	1600	21.1	1925
-12.2	1650	26.7	1950
-6.7	1675	32.2	2000
-1.1	1725	37.8	2050
4.4	1775	43.3	2100
10.0	1825	48.9	2150
15.6	1875	54.4	2200

THE NUMBERS SHOWN ABOVE ARE APPLICABLE TO 1800 PSI OXYGEN BOTTLES. IF AN 1850 PSI OXYGEN BOTTLE IS INSTALLED, INCREASE EACH FILLING PRESSURE BY 50 PSI.

Figure 8-2

LANDING GEAR AND WING FLAPS HYDRAULIC RESERVOIR (Hydraulic Fluid MIL-H-5606)

Check the reservoir fluid level through the sight gage incorporated into the reservoir filler cap. The flush filler cap is located in the upper wing surface of the inboard left wing. If the sight gage is dark in color, the reservoir does not require servicing. If the sight gage is clear, service as required to maintain fluid level to approximately 1/2 inch from the bottom of the sight gage. Reservoir capacity is approximately 1 pint when landing gear is down and locked and wing flaps are retracted.

TIRES

Tire pressure should be maintained at 95 PSI for the main wheel tires and 50 PSI for the nosewheel tire.

FLUSH TOILET RESERVOIR

The optional flush toilet uses a reservoir tank which contains water and chemicals. The reservoir tank should be removed and serviced after excessive use or after 35 or 40 cycles of the system. Service the reservoir with a 2-quart solution of water and a 3-ounce package of Monogram QA-08 or 3-ounce package of Chemkare DG-19 chemical.

CAUTION

During cold weather operation, where cabin temperatures can fall below 0°C, ethylene glycol base anti-freeze mixed to manufacturer's instructions, may be added to the reservoir tank to prevent freezing of the flush solution.

AIRPLANE CLEANING AND CARE**PAINTED SURFACES**

The painted exterior surfaces of your new airplane require an initial curing period which may be as long as 90 days after the finish is applied. During this curing period, some precautions should be taken to avoid damaging the finish or interfering with the curing process. The finish should be cleaned only by washing with clean water and mild soap, followed by a rinse water and drying with cloths or a chamois. Do not use polish or wax, which would exclude air from the surface, during this 90-day curing period. Do not rub or buff the finish and avoid 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.

PROPELLERS

Preflight inspection of propeller blades for nicks and wiping them occasionally with an oily cloth to clean off grass and bug stains will assure long, trouble-free service. It is vital that small nicks on the propeller, particularly near the tips and on the leading edges, are dressed out as soon as possible since these nicks produce stress concentrations, and if ignored, may result in cracks. Never use an alkaline cleaner on the blades; remove grease and dirt with Stoddard solvent.

LANDING GEAR

Cessna Service Facility mechanics have been trained in the proper adjustment and rigging procedures of the landing gear system. To assure trouble-free gear operation, have your Cessna Service Facility check the gear regularly and make any necessary adjustments. Only properly trained mechanics should attempt to repair or adjust the landing gear components and system.

DEICE BOOTS

The deice boots 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 and propeller 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 (MEK, non-leaded gasoline, etc.) which can harm the boot material.

Clean the boots with mild soap and water, then rinse thoroughly with clean water.

NOTE

- Temperature of water for cleaning deice boots shall not exceed 140°F.
- 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 Janitorial Supplies, 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 in surface deice boots can be repaired temporarily without removing the boots and the conductive coating can be renewed. Your Cessna Service Facility has the proper materials and know-how to do this correctly.

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 components which might be adversely affected by the solvent. Refer to the Airplane Maintenance Manual for proper lubrication of controls and 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.

Blot up any spilled liquid promptly with cleansing tissue or rags. Don't pat the spot; press the blotting material firmly and hold it for several seconds. Continue blotting until no more liquid is taken up. Scrape off sticky materials with a dull knife, then spot-clean the area.

Oily spots may be cleaned with household spot removers, using sparingly. Before using any solvent, read the instructions on the container and test it on an obscure place on the fabric to be cleaned. Never saturate the fabric with a volatile solvent; it may damage the padding and backing materials.

WARNING

- Use all cleaning agents in accordance with the manufacturer's recommendations.
- The use of toxic or inflammable cleaning agents is discouraged. If these cleaning agents are used, ensure adequate ventilation is provided to prevent harm to the user and/or damage to the airplane.

Soiled upholstery and carpet may be cleaned with foam-type detergent, used according to the manufacturer's instructions. To minimize wetting the fabric, keep the foam as dry as possible and remove it with a vacuum cleaner.

The plastic trim, instrument panel and control knobs need only be wiped with a damp cloth. Oil and grease on the control wheel and control knobs can be removed with a cloth moistened with kerosene. Volatile solvents, such as mentioned in paragraphs on care of the windshield, must never be used since they soften and craze the plastic.

WINDOWS AND WINDSHIELDS

The cabin windows and windshield panels are constructed of prestretched acrylic in lieu of the cast acrylic used on unpressurized airplanes. Stretched acrylic was chosen to provide the added safety offered by the ability to withstand higher stress concentration and improved resistance to crack propagation. The surface hardness of acrylic is approximately equal to that of copper or brass. Care must be exercised to avoid scratches and gouges which may be caused by dirty, hard or rough cloth used for cleaning. Do not use a canvas cover on the windshield unless freezing rain or sleet is anticipated. Canvas covers may scratch the plastic surface.

Proper window care and maintenance are particularly important in a pressurized airplane. If the airplane must be flown with a cracked window, DO NOT PRESSURIZE the cabin. When cleaning and waxing windshield and windows, use only the following prescribed methods and materials.

Windshield and Window Maintenance Procedures

The following procedures provide the most current information regarding cleaning and servicing windshields and windows. Improper cleaning, or use of unapproved cleaning agents can cause damage to the windows.

Cleaning Instructions:

CAUTION

Windshields and windows are easily damaged by improper handling and cleaning techniques.

1. Place airplane inside hangar or in shaded area and allow to cool from heat of sun's direct rays.
2. Using clean (preferably running) water, flood the surface. Use bare hands with no jewelry to feel and dislodge any dirt or abrasive materials.
3. Using a mild soap or detergent (such as a dishwashing liquid) in water, wash the surface. Again use only the bare hand to provide rubbing force. (A clean cloth may be used to transfer the soap solution to the surface, but extreme care must be exercised to prevent scratching the surface.)
4. For soils which cannot be removed by a mild detergent, use Type II aliphatic naphtha applied with a soft clean cloth as a cleaning solvent. Be sure to frequently refold the cloth to avoid re-depositing soil and/or scratching windshield with any abrasive particles.
5. Rinse surface thoroughly with clean fresh water and dry with a clean cloth.

CAUTION

Do not use any of the following on or for cleaning windshields and windows: methanol, denatured alcohol, gasoline, benzene, xylene, methyl-ethyl-ketone, acetone, carbon tetrachloride, lacquer thinners, commercial or household window cleaning sprays. When in doubt, do not use it.

6. Hard polishing wax should be applied to acrylic surfaces. (The wax has an index of refraction nearly the same as transparent acrylic and will tend to mask any shallow scratches on the windshield surface.)
7. Acrylic surfaces may be polished using a polish meeting Federal Specification P-P-560 applied per the manufacturer's instructions.

NOTE

When applying and removing wax and polish, use a clean soft cloth.

Windshield and Window Preventive Maintenance

NOTE

Utilization of the following techniques will help minimize windshield and window crazing.

1. Keep all surfaces of windshields and windows clean.
2. If desired, wax acrylic surfaces.
3. Do not park or store airplane where it might be subjected to direct contact with or vapors from: methanol, denatured alcohol, gasoline, benzene, xylene, methyl-ethyl-ketone, acetone, carbon tetrachloride, lacquer thinners, commercial or household window cleaning sprays, paint strippers, or other types of solvents.
4. Do not use solar screens or shields installed on inside of airplane or leave sun visors up against windshield. The reflected heat from these items causes elevated temperatures which accelerate crazing and may cause formation of bubbles in the inner ply of multiple ply windshields.

Materials Required

MATERIAL	MANUFACTURER	USE
Mild soap or detergent (hand dishwashing type without abrasives)	Commercially available	Cleaning windshields and windows.
Aliphatic naphtha Type II conforming to Federal Specification TT-N-95	Commercially available	Removing deposits which cannot be removed with mild soap solution on acrylic windshields and windows.
*Polishing wax:		Waxing acrylic windshield and windows.
Turtle Wax (paste)	Turtle Wax, Inc. Chicago, IL 60638	
Great Reflections Paste Wax	E.I. du Pont de Nemours and Co. (Inc) Wilmington, DE 19898	
Slip-stream Wax (paste)	Classic Chemical Grand Prairie, TX 75050	
Acrylic polish conforming to Federal Specification P-P-560 such as:		Cleaning and polishing acrylic windshields and windows.
Permatex plastic cleaner Number 430D	Permatex Company, Inc. Kansas City, KS 66115	
Soft cloth, such as:		Applying and removing wax and polish.
Cotton flannel or cotton terry cloth material	Commercially Available	
*These are the only polishing waxes tested and approved for use by Cessna Aircraft Company.		

OXYGEN MASKS

The pilot's mask is a permanent-type mask which contains a microphone for radio transmissions. The remaining masks are basically the same as the pilot's, except they do not have the microphone provision. All masks can be cleaned with alcohol. Additional masks and hoses are available from your Cessna Service Facility.

