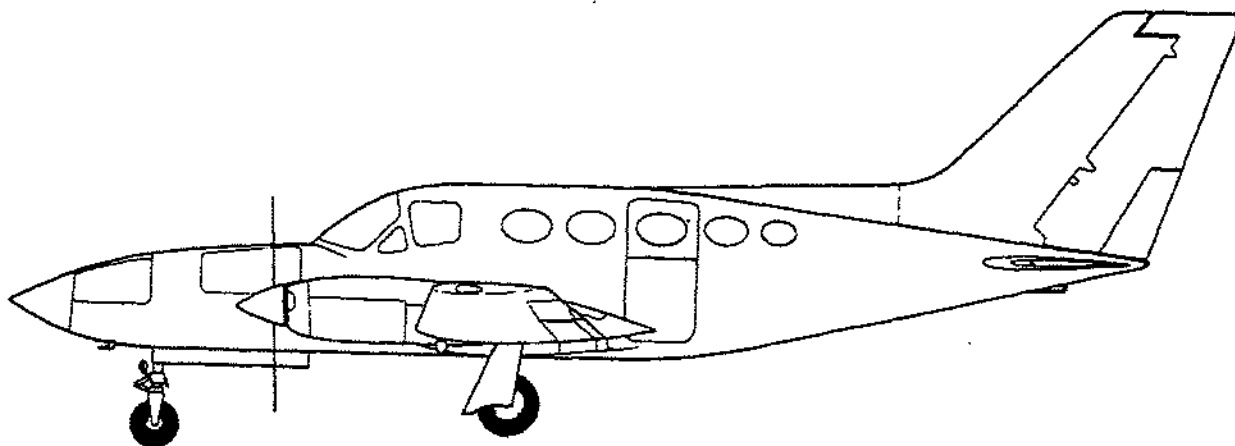


PILOT'S OPERATING HANDBOOK and FAA APPROVED AIRPLANE FLIGHT MANUAL



CESSNA AIRCRAFT COMPANY

1981 MODEL 414A

FAA APPROVED IN NORMAL
CATEGORY BASED ON CAR
PART 3 THIS DOCUMENT MUST
BE CARRIED IN THE AIRPLANE
AT ALL TIMES

Serial Number 414A 0665

Registration Number JRK

THIS HANDBOOK INCLUDES THE MATERIAL REQUIRED
TO BE FURNISHED TO THE PILOT BY CAR PART 3 AND
CONSTITUTES THE FAA APPROVED AIRPLANE FLIGHT MANUAL.

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CESSNA AIRCRAFT COMPANY

Wallace Division
Wichita, Kansas

 Member of GAMA

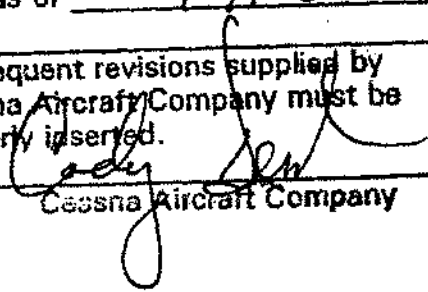
3 NOVEMBER 1980

THIS MANUAL WAS PROVIDED FOR THE AIRPLANE
IDENTIFIED ON THE TITLE PAGE ON _____.
SUBSEQUENT REVISIONS SUPPLIED BY CESSNA
AIRCRAFT COMPANY MUST BE PROPERLY IN-
SERTED.

CESSNA AIRCRAFT COMPANY, PAWNEE DIVISION

This manual is issued to replace one origin-
ally provided for the airplane identified on
the cover page on 7-10-81.
All revisions, if any, have been incorpor-
ated as of 7-11-80.

Subsequent revisions supplied by
Cessna Aircraft Company must be
properly inserted.


Cessna Aircraft Company

CONGRATULATIONS

Welcome to the ranks of Cessna owners! 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, either for business or pleasure, 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's equipment, operating procedures, performance, and suggestions for its servicing and care. We urge you to read it from cover to cover, and to refer to it frequently.

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- FACTORY APPROVED SERVICE EQUIPMENT to provide you efficient and accurate workmanship.
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A current Worldwide Customer Care Directory accompanies your new Cessna. The Directory is revised frequently, and a current copy can be obtained from any Cessna Dealer. Make your Directory one of your cross-country flight planning aids; a warm welcome awaits you at every Cessna Dealer.

PERFORMANCE AND SPECIFICATIONS

MAXIMUM WEIGHT:	
Ramp	6785 Pounds
Takeoff	6750 Pounds
Landing	6750 Pounds
Zero Fuel	6515 Pounds
*SPEED, BEST POWER MIXTURE:	
Maximum - 20,000 Feet	235 KTAS
Maximum Recommended Cruise	
74.8% Power at 10,000 Feet	193 KTAS
74.8% Power at 24,500 Feet	224 KTAS
*RANGE, RECOMMENDED LEAN MIXTURE:	
Maximum Recommended Cruise	
74.8% Power at 10,000 Feet	382 Nautical Miles,
(600 Pounds Usable Fuel)	2.06 Hours and 191 KTAS
74.8% Power at 10,000 Feet	665 Nautical Miles,
(900 Pounds Usable Fuel)	3.53 Hours and 191 KTAS
74.8% Power at 10,000 Feet	984 Nautical Miles,
(1236 Pounds Usable Fuel)	5.18 Hours and 192 KTAS
74.8% Power at 24,500 Feet	404 Nautical Miles,
(600 Pounds Usable Fuel)	2.03 Hours and 219 KTAS
74.8% Power at 24,500 Feet	730 Nautical Miles,
(900 Pounds Usable Fuel)	3.50 Hours and 220 KTAS
74.8% Power at 24,500 Feet	1099 Nautical Miles,
(1236 Pounds Usable Fuel)	5.15 Hours and 221 KTAS
Maximum Range	
10,000 Feet (600 Pounds Usable Fuel)	532 Nautical Miles,
	3.69 Hours and 143 KTAS
10,000 Feet (900 Pounds Usable Fuel)	899 Nautical Miles,
	6.27 Hours and 143 KTAS
10,000 Feet (1236 Pounds Usable Fuel)	1327 Nautical Miles,
	9.34 Hours and 141 KTAS
25,000 Feet (600 Pounds Usable Fuel)	482 Nautical Miles,
	2.70 Hours and 181 KTAS
25,000 Feet (900 Pounds Usable Fuel)	855 Nautical Miles,
	4.73 Hours and 183 KTAS
25,000 Feet (1236 Pounds Usable Fuel)	1293 Nautical Miles,
	7.20 Hours and 181 KTAS
RATE-OF-CLIMB AT SEA LEVEL:	
All Engines	1520 Feet Per Minute
Single-Engine	290 Feet Per Minute
SERVICE CEILING:	
All Engines	30,800 Feet
Single-Engine	19,850 Feet
TAKEOFF PERFORMANCE: (98 KIAS, 0° Wing Flaps And 6750 Pounds Weight)	
Ground Roll	2185 Feet
Total Distance Over 50-Foot Obstacle	2595 Feet
LANDING PERFORMANCE: (94 KIAS, 45° Wing Flaps And 6750 Pounds Weight)	
Ground Roll	1013 Feet
Total Distance (Over 50-Foot Obstacle)	2393 Feet
STANDARD EMPTY WEIGHTS: (Approximate)	
414A Chancellor	4358 Pounds
414A Chancellor II	4533 Pounds
414A Chancellor III	4767 Pounds
BAGGAGE ALLOWANCE:	1500 Pounds
WING LOADING:	29.89 Pounds Per Square Foot
POWER LOADING:	10.89 Pounds Per Horsepower
FUEL CAPACITY: (Total)	
Standard (206 Gallons Usable)	213.4 Gallons
OIL CAPACITY: (Total)	26 Quarts
ENGINES:	
Continental Six-Cylinder, Turbocharged, Fuel-Injected Engines	
310 Rated Horsepower At 2700 Propeller RPM And 38.0 Inches Hg. Manifold Pressure To 20,000 Feet (For Takeoff and Single-Engine Operation), 298 Horsepower at 2600 RPM and 38.0 Inches Hg. Manifold Pressure to 20,000 Feet (Normal Operating Power).	
PROPELLERS:	
Constant Speed, Full Feathering, Three-Bladed 6'4.5" Diameter	
	0850334-38

*Range data includes allowances for start, taxi, takeoff, climb, descent and 45-minute reserve at the particular cruise power and altitude. Speeds shown are based on estimated 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 the Cessna Aircraft Company under carefully documented conditions and will vary with individual airplanes and numerous factors affecting flight performance.

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 1981 Model 414A airplane designated by the serial number and registration number shown on the Title Page of this handbook. This information is based on data available at the time of publication.

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 aircraft according to FAA records at the time of revision issuance, and to Internationally Registered aircraft 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 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 the handbook. Pages affected by the current revision are indicated by an asterisk (*) preceding the pages listed.

LOG OF EFFECTIVE PAGES

Dates of issue for original and revised pages are:

Original	3 Nov 1980	Revision 2	1 Jun 1994
Revision 1	2 Apr 1982		

Page	Date	Page	Date
Title	3 Nov 80	1-5 thru 1-8	3 Nov 80
Assignment Record	3 Nov 80	1-9 /1-10	3 Nov 80
i thru ii	3 Nov 80	2-1 thru 2-3	3 Nov 80
* iii thru iv	1 Jun 94	2-4	2 Apr 82
Contents	3 Nov 80	2-5 thru 2-16	3 Nov 80
1-1 thru 1-2	3 Nov 80	2-17/2-18	3 Nov 80
1-3 thru 1-4	2 Apr 82	3-1	2 Apr 82

LOG OF EFFECTIVE PAGES (Continued)

Page	Date	Page	Date
3-2 thru 3-10	3 Nov 80	* 6-8A/6-8B	1 Jun 94
3-11	2 Apr 82	6-9	3 Nov 80
3-12	3 Nov 80	6-10	2 Apr 82
3-13 thru 3-14	2 Apr 82	6-11	3 Nov 80
3-15 thru 3-16	3 Nov 80	6-12	2 Apr 82
3-17 thru 3-18	2 Apr 82	6-13 thru 6-26	3 Nov 80
3-19 thru 3-30	3 Nov 80	6-27/6-28	3 Nov 80
3-31	2 Apr 82	7-1 thru 7-2	2 Apr 82
3-32 thru 3-33	3 Nov 80	7-3 thru 7-27	3 Nov 80
3-34	2 Apr 82	* 7-28	1 Jun 94
4-1	3 Nov 80	7-29	2 Apr 82
4-2	2 Apr 82	7-30 thru 7-34	3 Nov 80
4-3 thru 4-9	3 Nov 80	7-35 thru 7-36	2 Apr 82
4-10 thru 4-12	2 Apr 82	7-37 thru 7-57	3 Nov 80
4-13 thru 4-19	3 Nov 80	7-58	2 Apr 82
4-20 thru 4-21	2 Apr 82	* 8-1 thru 8-2	1 Jun 94
4-22 thru 4-25	3 Nov 80	* 8-2A	1 Jun 94
4-26	2 Apr 82	* 8-2B (blank)	1 Jun 94
4-27 thru 4-32	3 Nov 80	8-3 thru 8-5	3 Nov 80
4-33/4-34	3 Nov 80	8-6 thru 8-8	2 Apr 82
5-1 thru 5-40	3 Nov 80	8-9 thru 8-10	3 Nov 80
5-41/5-42	3 Nov 80	8-11	2 Apr 82
6-1 thru 6-7	3 Nov 80	8-12 thru 8-13	3 Nov 80
6--8	2 Apr 82	8-14	2 Apr 82
		* 8-15 thru 8-18	1 Jun 94
		* 8-19/8-20	1 Jun 94
		* 9-1 thru 9-3/9-4	1 Jun 94
		Index-1 thru Index-8	2 Apr 82

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**

D1594-2-13PH

TABLE OF CONTENTS

SECTION	PAGE
1 GENERAL	1-1
2 LIMITATIONS	2-1
3 EMERGENCY PROCEDURES	3-1
4 NORMAL PROCEDURES	4-1
5 PERFORMANCE	5-1
6 WEIGHT & BALANCE/EQUIPMENT LIST.....	6-1
7 AIRPLANE & SYSTEMS DESCRIPTIONS	7-1
8 AIRPLANE HANDLING, SERVICE & MAINTENANCE	8-1
9 SUPPLEMENTS.....	9-1
ALPHABETICAL INDEX	Index-1

SECTION 1
GENERAL**TABLE OF CONTENTS**

	Page		Page
INTRODUCTION	1-1	SYMBOLS, ABBREVIATIONS	
ENGINES	1-1	AND TERMINOLOGY	1-6
THREE-VIEW DRAWING	1-2	General Airspeed Ter-	
PROPELLERS	1-3	minology and Symbols . .	1-6
FUEL	1-3	Meteorological	
OIL	1-3	Terminology	1-7
MAXIMUM CERTIFICATED WEIGHTS	1-4	Power Terminology	1-7
STANDARD AIRPLANE WEIGHTS . .	1-4	Airplane Performance	
SPECIFIC LOADINGS	1-4	and Flight Planning	
CABIN, BAGGAGE AND ENTRY		Terminology	1-8
DIMENSIONS	1-5	Weight and Balance	
		Terminology	1-8

INTRODUCTION

This handbook consists of 9 sections and an alphabetical index as shown on the Contents page. This handbook includes the material required to be furnished to the pilot by CAR Part 3. It also contains supplemental data supplied by Cessna Aircraft Company. Specific information can be rapidly found by referring to the Contents page for the appropriate section, then referring to the Table Of Contents on the first page of the appropriate section, or by the use of the Alphabetical Index.

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

ENGINES

Number of Engines: 2

Manufacturer: Teledyne Continental Motors

Engine Model
Number: TS10-520-NB

Engine Type: Turbocharged, fuel-injected, direct drive, air cooled, horizontally opposed, six-cylinder, 520 cubic-inch displacement.

Horsepower: 310 rated horsepower at 2700 propeller RPM and 38.0 inches Hg. manifold pressure to the critical altitude of 20,000 feet.

THREE-VIEW DRAWING

* MAXIMUM HEIGHT OF AIRPLANE WITH
NOSE GEAR DEPRESSED IS 11.9'.

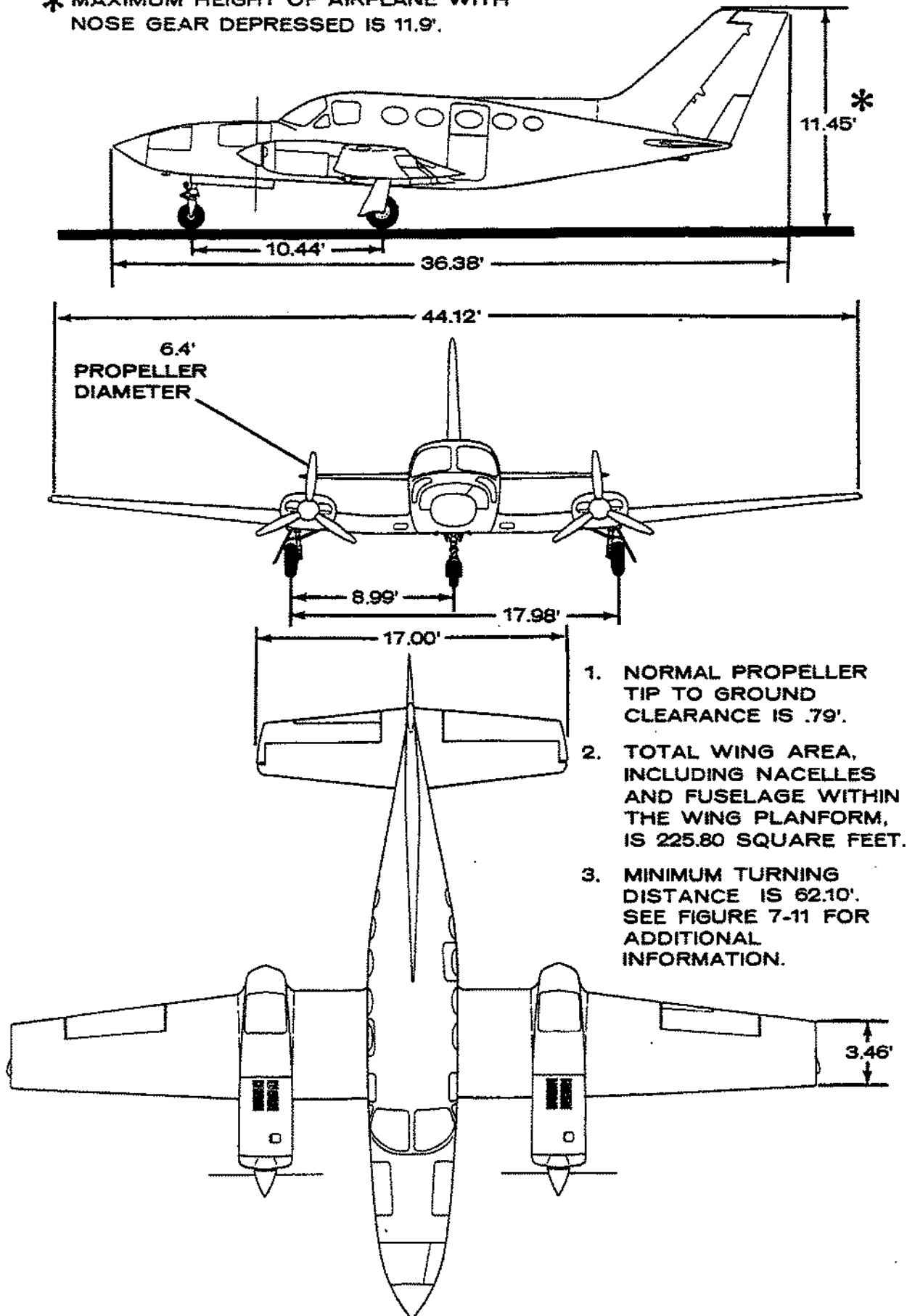


Figure 1-1

PROPELLERS

Number of
Propellers: 2

Manufacturer: McCauley Accessory Division, Cessna Aircraft Company

Propeller Part
Number: 0850334-38

Number of Blades: 3

Propeller
Diameter: 6'4.5"

Propeller Type: Constant speed, full feathering, nonreversible hydraulically actuated

Blade Range: (At 30-Inch Station)
a. Low Pitch $14.9^{\circ} \pm 0.2^{\circ}$
b. Feather $81.2^{\circ} \pm 0.3^{\circ}$

FUEL (Approved Fuel Grades and Colors)*

PRIMARY - 100 (Formerly 100/130) Grade Aviation Fuel (Green).
ALTERNATE - 100LL Grade Aviation Fuel (Blue).

*Isopropyl alcohol or ethylene glycol monomethyl ether may be added to the fuel supply. Additive concentrations shall not exceed 1% for isopropyl alcohol or .15% for ethylene glycol monomethyl ether. Refer to Section 8 for additional information.

Total Fuel Capacity (U.S. Gallons) - 213.4

Usable Fuel (U.S. Gallons) - 206.0

OIL

Grade: Aviation grade engine oil. Refer to Section 8 for additional information.

Viscosity:

SAE Rating	Ambient Temperature - °C (°F)
50	Above 4.4 (40)
30	Below 4.4 (40)
Multiviscosity	Unrestricted - After 25 Hours

Total Sump
Capacity: 12 quarts per engine

Drain and Refill
Quantity:

13 quarts per engine including one quart for oil filter.

Oil Quantity
Operating Range:

Do not operate engine on less than 9 quarts. To minimize loss of oil through breather, fill to 10-quart level for normal flights of less than 3 hours. For extended flight, fill to capacity.

NOTE

Dip stick indicates the quantity of oil in the engine and does not account for the 1 quart of oil in the oil filter.

MAXIMUM CERTIFICATED WEIGHTS

Maximum Ramp

Weight: 6785 pounds

Maximum Takeoff

Weight: 6750 pounds

Maximum Landing

Weight: 6750 pounds

Maximum Zero

Fuel Weight: 6515 pounds

Maximum Weights
in Baggage
Compartments:

- a. Left and Right Wing Lockers - 200 pounds each.
- b. Avionics Bay - 250 pounds less installed optional equipment. Refer to the loading placard in the airplane avionics baggage bay.
- c. Nose Bay - 350 pounds less installed optional equipment. Refer to the loading placard in the airplane nose baggage bay.
- d. Aft Cabin (Bay A) See Figure 1-2 - 400 pounds (200 Pounds Per Side).
- e. Aft Cabin (Bay B) See Figure 1-2 - 100 pounds (50 Pounds Per Side).

STANDARD AIRPLANE WEIGHTS

Standard Empty
Weight:

4358 pounds for 414A Chancellor (4533 pounds for 414A Chancellor II) (4767 pounds for 414A Chancellor III)

Maximum Useful
Load:

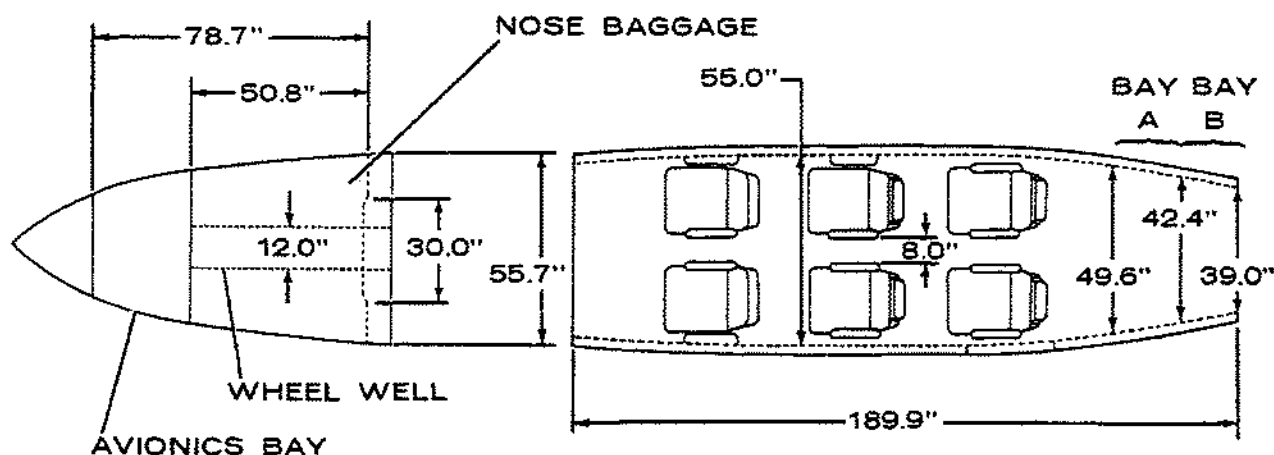
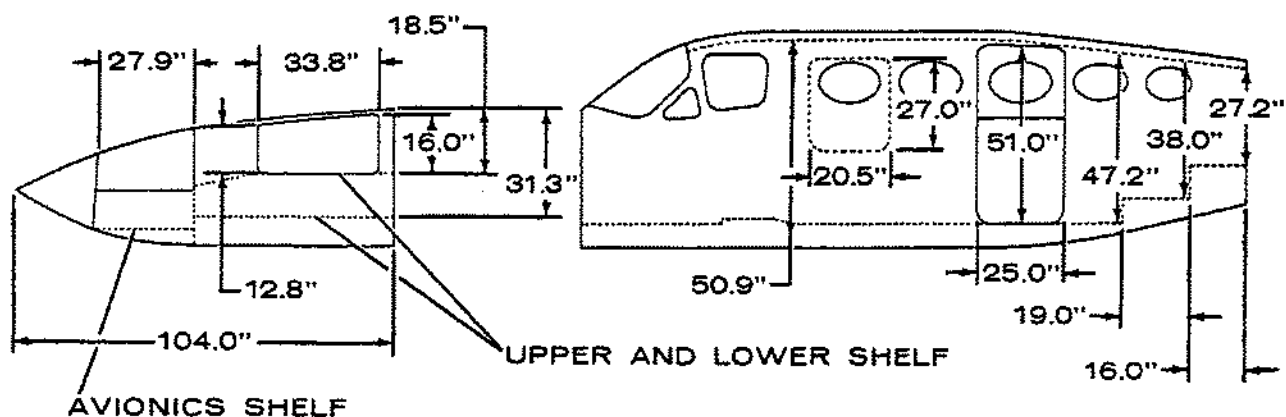
2427 pounds for 414A Chancellor (2252 pounds for 414A Chancellor II) (2018 pounds for 414A Chancellor III)

SPECIFIC LOADINGS

Wing Loading: 29.89 pounds per square foot

Power Loading: 10.89 pounds per horsepower

CABIN, BAGGAGE AND ENTRY DIMENSIONS



BAGGAGE COMPARTMENT VOLUME - CUBIC FEET

AVIONICS BAY	11.0
NOSE	25.0
WING LOCKER EACH (STD)	9.25
AFT CABIN (BAY A AND B)	30.6

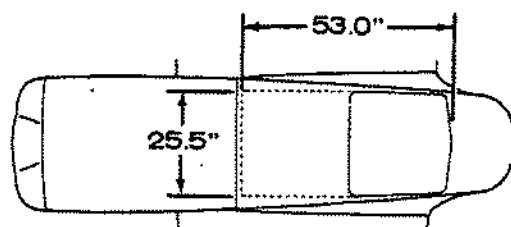


Figure 1-2

SYMBOLS, ABBREVIATIONS AND TERMINOLOGY

GENERAL AIRSPEED TERMINOLOGY AND SYMBOLS

CAS	<u>Calibrated Airspeed</u> is the indicated speed corrected for position and instrument error. Calibrated airspeed is equal to true airspeed in standard atmosphere at sea level.
G	<u>G</u> is acceleration due to gravity.
IAS	<u>Indicated Airspeed</u> is the speed as shown on the airspeed indicator. IAS values published in this handbook assume zero instrument error.
KCAS	<u>Calibrated Airspeed</u> expressed in knots.
KIAS	<u>Indicated Airspeed</u> expressed in knots.
KTAS	<u>True Airspeed</u> expressed in knots.
TAS	<u>True Airspeed</u> is the airspeed relative to undisturbed air which is the CAS corrected for altitude, temperature and compressibility.
V _A	<u>Maneuvering Speed</u> is the maximum speed at which application of full available aerodynamic control will not overstress the airplane.
V _{FE}	<u>Maximum Flap Extended Speed</u> is the highest speed permissible with wing flaps in a prescribed extended position.
V _{LE}	<u>Maximum Landing Gear Extended Speed</u> is the maximum speed at which an airplane can be safely flown with the landing gear extended.
V _{LO}	<u>Maximum Landing Gear Operating Speed</u> is the maximum speed at which the landing gear can be safely extended or retracted.
V _{MC A}	<u>Air Minimum Control Speed</u> is the minimum flight speed at which the airplane is directionally controllable as determined in accordance with Federal Aviation Regulations. Airplane certification conditions include one engine becoming inoperative and windmilling; not more than a 50° bank towards the operative engine; takeoff power on operative engine; landing gear up; flaps in takeoff position; and most rearward CG.
V _{NE}	<u>Never Exceed Speed</u> is the speed limit that may not be exceeded at any time.
V _{NO}	<u>Maximum Structural Cruising Speed</u> is the speed that should not be exceeded except in smooth air and then only with caution.

V _{SE}	<u>Intentional One Engine Inoperative Speed</u> is a minimum speed selected by the manufacturer for intentionally rendering one engine inoperative in flight for pilot training.
V _X	<u>Best Angle-of-Climb Speed</u> is the airspeed which delivers the greatest gain of altitude in the shortest possible horizontal distance.
V _Y	<u>Best Rate-of-Climb Speed</u> is the airspeed which delivers the greatest gain in altitude in the shortest possible time.

METEOROLOGICAL TERMINOLOGY

°C	Temperature in degrees Celsius.
°F	Temperature in degrees Fahrenheit.
ISA	International Standard Atmosphere in which: (1) The air is a dry perfect gas; (2) The temperature at sea level is 15° Celsius (59° Fahrenheit); (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 -56.5°C (-69.7°F) is -1.98°C (-3.5°F) per 1000 feet.
OAT	Outside Air Temperature is the free air static temperature, obtained either from inflight temperature indications adjusted for instrument error and compressibility effects or ground meteorological sources.
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.
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

BHP	Brake horsepower means the power delivered at the propeller shaft of an airplane engine.
Critical Altitude	The maximum altitude at which in standard temperature it is possible to maintain a specified power.
Maximum Continuous Power	The power developed in a standard atmosphere from sea level to the critical altitude at the maximum RPM and manifold pressure approved for use during periods of unrestricted duration.

RPM The revolutions per minute (RPM) of an engine refers to the rotational speed of the propeller shaft, as shown on a tachometer.

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 that speed after liftoff and with gear in transit, 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.

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.

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 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.

SECTION 2

LIMITATIONS

TABLE OF CONTENTS

	Page		Page
INTRODUCTION	2-1	FLIGHT CREW LIMITS	2-7
AIRSPPEED LIMITATIONS	2-2	OPERATION LIMITS	2-7
ENGINE LIMITATIONS	2-3	FUEL LIMITATIONS	2-7
MISCELLANEOUS INSTRUMENT		MAXIMUM OPERATING ALTITUDE	
MARKINGS	2-6	LIMIT	2-8
WEIGHT LIMITS	2-6	CABIN PRESSURIZATION	
MANEUVER LIMITS	2-7	LIMIT	2-8
FLIGHT LOAD FACTOR LIMITS . .	2-7	REQUIRED PLACARDS	2-9

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.

AIRSPPEED LIMITATIONS (See Figure 2-1)**AIRSPPEED LIMITATIONS TABLE**

SPEED	KIAS	KCAS	REMARKS
Maneuvering Speed V_A (Knots)	145	144	Do not make abrupt control movements above this speed.
Maximum Flap Extended Speed V_{FE} (Knots) 150 450	177 146	175 145	Do not exceed this speed with the given flap setting.
Maximum Gear Operating Speed V_{LO} (Knots)	177	175	Do not extend or retract landing gear above this speed.
Maximum Gear Extended Speed V_{LE} (Knots)	177	175	Do not exceed this speed with landing gear extended.
Air Minimum Control Speed - V_{MCA} (Knots)	79	79	This is the minimum flight speed at which the airplane is controllable with one engine inoperative and with a 50° bank towards the operative engine.
One Engine Inoperative Best Rate-of-Climb Speed V_Y (Knots)	108	108	This speed delivers the greatest gain in altitude in the shortest possible time with one engine inoperative at sea level, standard day conditions and 6750 pounds weight.
Never Exceed Speed V_{NE} (Knots)	237	232	Do not exceed this speed in any operation.
Maximum Structural Cruising Speed V_{NO} (Knots)	203	200	Do not exceed this speed except in smooth air and then only with caution.

Figure 2-1

Airspeed Indicator Markings: See Figure 2-2

AIRSPEED INDICATOR TABLE

MARKING	KIAS VALUE OR RANGE	SIGNIFICANCE
Red Radial	79	Air minimum control speed.
White Arc	71 to 146	Operating speed range with 45° wing flaps. Lower limit is maximum weight stalling speed in landing configuration. Upper limit is maximum speed permissible with wing flaps extended 45°.
Green Arc	81 to 203	Normal operating range. Lower limit is maximum weight stalling speed with flaps and landing gear retracted. Upper limit is maximum structural cruising speed.
Blue Radial	108	One engine inoperative best rate-of-climb speed at sea level standard day conditions and 6750 pounds weight.
Yellow Arc	203 to 237	Caution range. Operations must be conducted with caution and only in smooth air.
Red Radial	237	Maximum speed for all operations.

Figure 2-2

ENGINE LIMITATIONS

Number of Engines: 2

Engine Manufacturer: Teledyne Continental Motors

Engine Model Number: TS10-520-NB

Engine Operating Limits:

a. Maximum power for takeoff and single engine operation.

Altitude - Feet	Allowable Manifold Pressure - Inches Hg.	Engine RPM	Rated Horse- power	Time	Max. Head Temp. oF	Max. Oil Temp. oF
S.L. to 20,000	38.0	2700	310	Continuous	460	240
22,000	35.2	2700	285	Continuous	460	240
24,000	32.3	2700	264	Continuous	460	240
26,000	29.8	2700	242	Continuous	460	240
28,000	27.4	2700	219	Continuous	460	240
30,000	25.0	2700	197	Continuous	460	240

b. Maximum normal operating power.

Altitude- Feet	Allowable Manifold Pressure- Inches Hg.	Engine- RPM	Rated Horse- power	Time	Max. Head Temp. °F	Max. Oil Temp. °F
S.L. to 20,000	38.0	2600	298	Continuous	460	240
22,000	35.2	2600	282	Continuous	460	240
24,000	32.3	2600	260	Continuous	460	240
26,000	29.8	2600	240	Continuous	460	240
28,000	27.4	2600	216	Continuous	460	240
30,000	25.0	2600	195	Continuous	460	240

Oil Pressure:

a. Minimum: 10 PSI (Idle Power)

b. Maximum: 100 PSI

Oil Viscosity:

SAE Rating	Ambient Temperature - °C (°F)
50	Above 4.4 (40)
30	Below 4.4 (40)
Multiviscosity	Unrestricted - After 25 Hours

Propellers:

a. Number of Propellers: 2

b. Manufacturer: McCauley Accessory Division, Cessna Aircraft Company

c. Part Number: 0850334-38

d. Number of Blades: 3

e. Diameter: 6'4.5"

f. Blade Range: (At 30-Inch Station)

(1) Low Pitch $14.9^{\circ} \pm 0.2^{\circ}$ (2) Feather $81.2^{\circ} \pm 0.3^{\circ}$

g. Operating Limits: 2700 RPM maximum speed

Engine Instrument Markings:**a. Tachometer:**

- (1) Normal Operating 2100 to 2450 RPM (Green Arc)
- (2) Takeoff and engine inoperative 2600 to 2700 RPM (Yellow Arc).
- (3) Maximum 2700 RPM (Red Radial)

b. Manifold Pressure:

- (1) Normal Operating 17.0 to 31.5 Inches Hg. Manifold Pressure (Green Arc)
- (2) Conditional Normal Operating 31.5 to 34.0 Inches Hg. Manifold Pressure at 2200 to 2300 RPM (Narrow Green Arc)
 - (a) 2450 RPM Mark at 31.5 Inches Hg. Manifold Pressure
 - (b) 2300 RPM Mark at 34.0 Inches Hg. Manifold Pressure
- (3) Maximum 38.0 Inches Hg. Manifold Pressure (Red Radial)

c. Oil Temperature:

- (1) Normal Operating 75 to 240°F (Green Arc)
- (2) Maximum 240°F (Red Radial)

d. Oil Pressure:

- (1) Minimum Operating 10 PSI (Red Radial)
- (2) Normal Operating 30 to 60 PSI (Green Arc)
- (3) Maximum 100 PSI (Red Radial)

e. Cylinder Head Temperature:

- (1) Normal Operating 200 to 460°F (Green Arc)
- (2) Maximum 460°F (Red Radial)

f. Fuel Flow:

- (1) Minimum Operating 0 Pounds per hour (3.0 PSI) (Red Radial)
- (2) Normal Operating 10.0 Pounds per hour (3.5 PSI) to 186.0 Pounds per hour (21.1 PSI) (Green Arc)
 - (a) Green Dots 45% Power - 64.5 Pounds per hour (5.9 PSI)
55% Power - 77.0 Pounds per hour (6.9 PSI)
65% Power - 89.0 Pounds per hour (7.9 PSI)
75% Power - 102.0 Pounds per hour (9.3 PSI)

- (b) Blue Arc - Takeoff and Engine Inoperative Climb
 - 28,000 Feet - 129.0 Pounds per hour (12.6 PSI)
 - 26,000 Feet - 141.0 Pounds per hour (14.2 PSI)
 - 24,000 Feet - 154.3 Pounds per hour (16.1 PSI)
 - 22,000 Feet - 169.3 Pounds per hour (18.4 PSI)
- (c) Blue Triangle (77.5% Power) - 120.0 Pounds per hour (11.4 PSI)
(Cruise Climb and Best Power)
- (d) White Triangle (Maximum Normal Operating Power) 170 Pounds
per hour (18.5 PSI)
- (e) White Arc - Takeoff and Engine Inoperative Power to 21,000 Feet
180.0 Pounds per hour (20.1 PSI) to 186.0 Pounds per hour (21.1
PSI)

(3) Maximum Operating 195.0 Pounds per hour (22.5 PSI) (Red Radial)

(4) On Face of Indicator: FUEL FLOW LBS/HR T.O. & ENG. INOP
MAX CLIMB 77.5% CLIMB CRUISE POWER

MISCELLANEOUS INSTRUMENT MARKINGS

Instrument Vacuum:

- a. Red Line: 4.75 Inches Hg.
- b. Green Arc: 4.75 to 5.25 Inches Hg.

Oxygen Pressure:

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

WEIGHT LIMITS

Maximum Ramp Weight: 6785 Pounds

Maximum Takeoff Weight: 6750 Pounds

Maximum Landing Weight: 6750 Pounds

Maximum Zero Fuel Weight: 6515 Pounds

Maximum Weights in Baggage Compartments:

- a. Left and Right Wing Lockers - 200 pounds each.
- b. Avionics Bay - 250 pounds less installed optional equipment.
- c. Nose Bay - 350 pounds less installed optional equipment.
- d. Aft Cabin (Bay A) - 400 pounds (200 Pounds Per Side).
- e. Aft Cabin (Bay B) - 100 pounds (50 Pounds Per Side).

Center of Gravity Limits (Gear Extended):

- a. Aft Limit: 160.04 inches aft of reference datum (33% MAC) at 6750 pounds or less.
- b. Forward Limit: 151.27 inches aft of reference datum (19.0% MAC) at 6750 pounds or less and 147.82 inches aft of reference datum (13.5% MAC) at 5800 pounds or less with straight line variation between these points.
- c. See Weight and Balance Data in Section 6 for loading schedule. The reference datum is 100 inches forward of the forward face of the fuselage bulkhead forward of the rudder pedals. The mean aerodynamic chord (MAC) is 62.65 inches in length. The leading edge of the MAC is 139.37 inches aft of the reference datum.

MANEUVER LIMITS

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

FLIGHT LOAD FACTOR LIMITS

The design load factors are 150% of the following, and in all cases the structure exceeds design loads.

At Design Takeoff Weight of 6750 Pounds:

- a. Landing gear up, wing flaps 0° +3.6G to -1.44G
- b. Landing gear down, wing flaps 45° 0.0G to +2.0G

FLIGHT CREW LIMITS

Minimum Flight Crew for FAR 91 operations is one pilot.

OPERATION LIMITS

The standard airplane is approved for day and night operation under VFR conditions. With the proper optional equipment installed, the airplane is approved for day and night IFR operations and flight into icing conditions as defined by the FAA.

FUEL LIMITATIONS (See Figure 2-3)

Fuel Pressure:

- a. Minimum: 3.0 PSI (0 Pounds Per Hour)
- b. Maximum: 22.5 PSI (195.0 Pounds Per Hour)

Fuel Quantity:

- a. Minimum fuel for takeoff is 20 gallons in each main tank.

Maneuvering Fuel:

- a. Maximum side slip duration time is 30 seconds. The airplane is considered in a side slip anytime the turn and bank "ball" is more than one half ball out of the center (coordinated flight) position.

Fuel (Approved Fuel Grades And Colors):

- PRIMARY - 100 (Formerly 100/130) Grade Aviation Fuel (Green).
ALTERNATE - 100LL Grade Aviation Fuel (Blue).

Total Fuel Capacity (U.S. Gallons) - 213.4

Usable Fuel (U.S. Gallons) - 206.0

MAXIMUM OPERATING ALTITUDE LIMIT

Without Oxygen Equipment: 25,000 Feet
With Oxygen Equipment: 30,000 Feet

CABIN PRESSURIZATION LIMIT

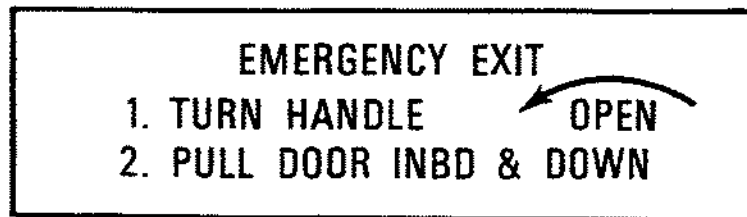
Maximum: 5.3 PSI
Normal: 0.0 to 5.0 PSI

Cabin Shall Be Depressurized During:

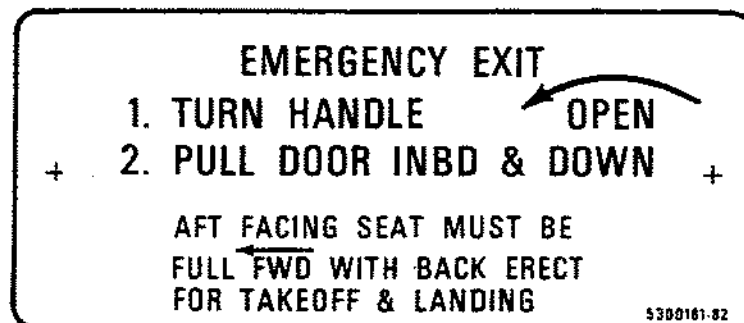
- a. Takeoff.
- b. Landing.
- c. In flight when both engines are operating on hot alternate air.
- d. All ground operations.

REQUIRED PLACARDS

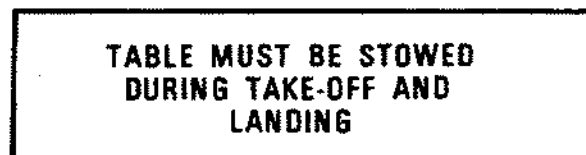
On Emergency Exit Window Trim:



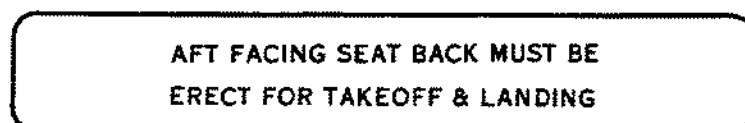
On Emergency Exit Window Trim (With Optional Right Aft Facing Seat):



On Executive Table Top And Writing Desk Top:

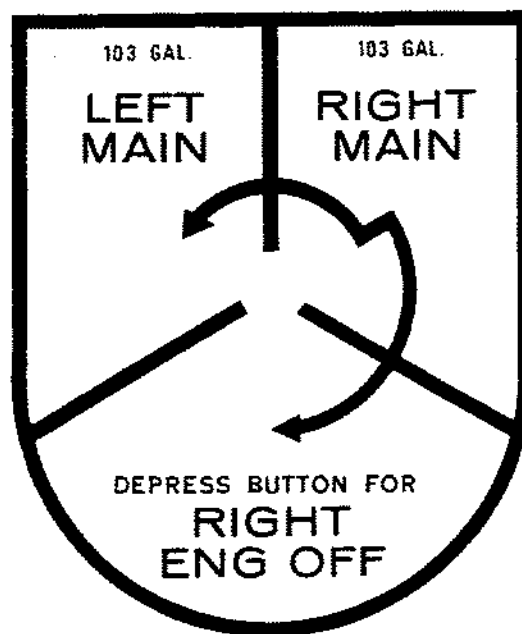
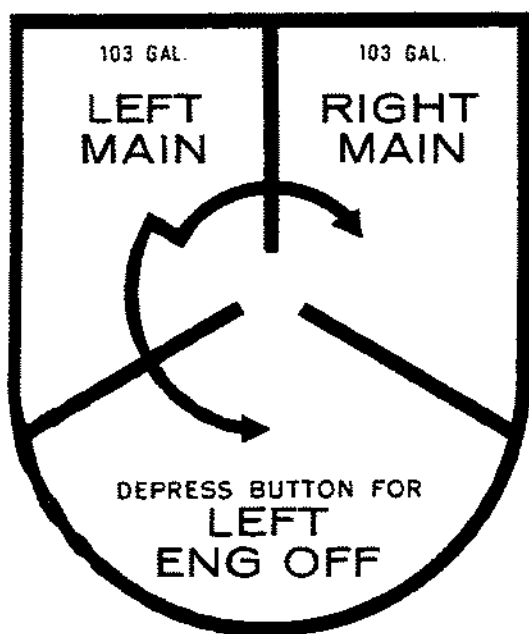


On Wall Opposite Emergency Exit Window:



Left Left Engine Fuel Selector:

On Right Engine Fuel Selector:



On Floor Forward of Fuel Selectors:

SET FUEL SELECTOR VALVES TO LEFT MAIN FOR LEFT ENGINE AND RIGHT MAIN FOR RIGHT ENGINE FOR TAKEOFF, DESCENT, LANDING, AND ALL NORMAL OPERATIONS.

TAKEOFF AND LAND WITH AUXILIARY FUEL PUMPS ON.

EMERGENCY CROSSFEED SHUTOFF VALVE MUST BE OPEN FOR ALL NORMAL OPERATIONS.

100 GRADE AVIATION FUEL MINIMUM.

On Floor Forward of Fuel Emergency Crossfeed Shutoff Valve:

**EMERGENCY CROSSFEED
SHUTOFF VALVE
PULL
TO SHUT OFF**

In Recess on Fuel Emergency Crossfeed Shutoff Valve Bezel (Visible When Lever is Up):

**LEVER UP
CROSSFEED
OFF**

On Pilot's Sun Visor:

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.

AIR MINIMUM CONTROL SPEED	79 KIAS
MAXIMUM GEAR OPERATING SPEED	177 KIAS
MAXIMUM GEAR EXTENDED SPEED	177 KIAS
MAXIMUM FLAP EXTENDED SPEED, 15° FLAP	177 KIAS
MAXIMUM FLAP EXTENDED SPEED, 45° FLAP	146 KIAS
MAXIMUM MANEUVERING SPEED	145 KIAS

LANDING WITH CABIN PRESSURIZED PROHIBITED.

THIS AIRPLANE IS APPROVED FOR DAY-NIGHT VFR CONDITIONS. IT IS APPROVED FOR DAY-NIGHT IFR CONDITIONS AND FLIGHTS INTO ICING CONDITIONS IF THE PROPER EQUIPMENT IS INSTALLED AND OPERATIONAL.

Near Heater and Pressurization Heat Exchanger Controls:

OPEN ONE
CONTROL
MINIMUM
FOR
HEATER
OPERATION

Near Pressurization Controls:

PRESSURIZE

+ CABIN

DEPRESSURIZE

RAM DUMP
PULL

+

PRESS AIR
PULL
TO DUMP

+

If Optional Unfeathering Accumulators Are Installed:

PROP UNFEATHERING ACCUMULATORS
ARE INSTALLED ON THIS AIRPLANE

Near Engine Induction Alternate Air Controls:

LH RH

+ +

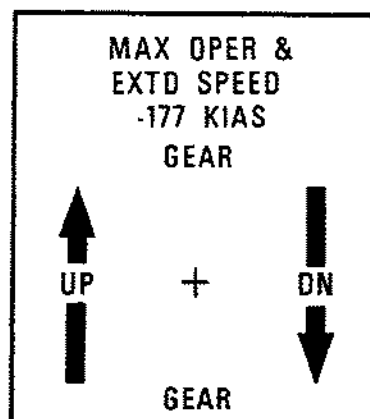
+ ALT AIR
PULL
TO OPEN +

+

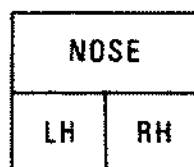
Induction Air Controls (Optional EL Panel Installed):



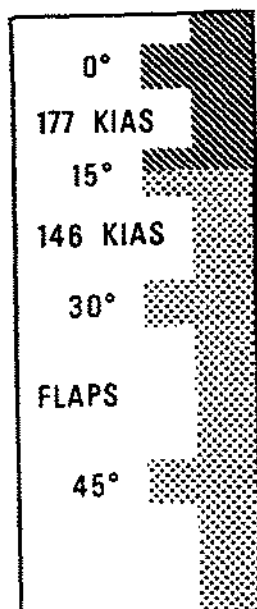
Around Landing Gear Selector Switches:



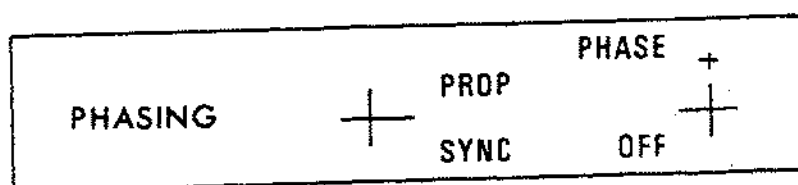
On Landing Gear Indicator Lights:



Adjacent to Wing Flap Position Switch:



Near Propeller Synchrophaser Switch, If Optional Propeller Synchrophaser is Installed:



On Engine Control Pedestal:

T.O. Range on Elevator Trim Tab Indicator
2° Nose Down to 8° Nose Up:



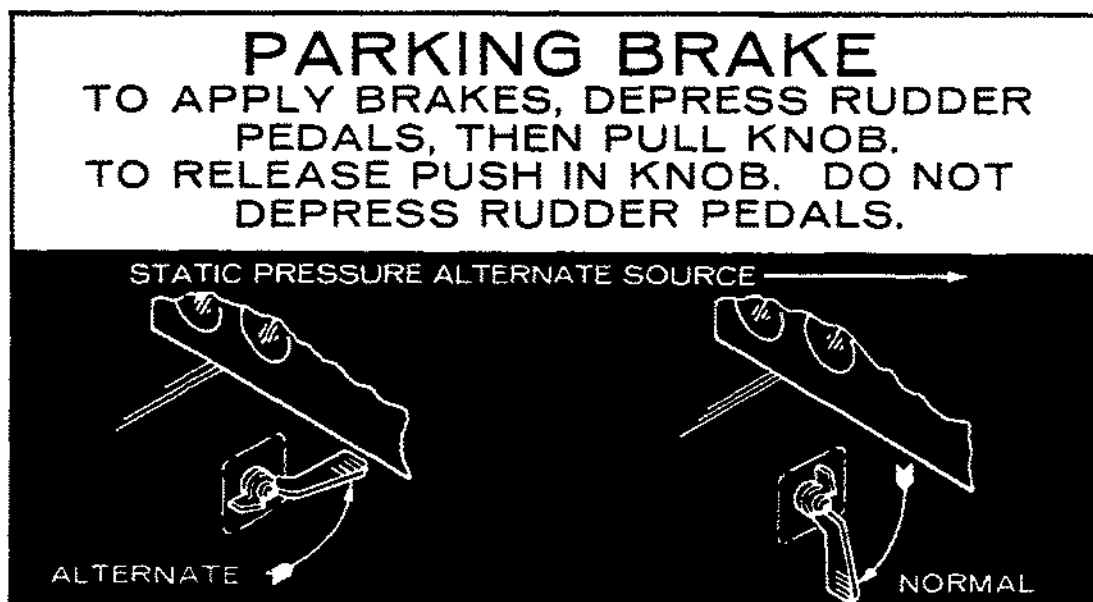
Rudder Trim Indicator:



Aileron Trim Indicator:



Adjacent to Static Source in Pilot's Compartment:



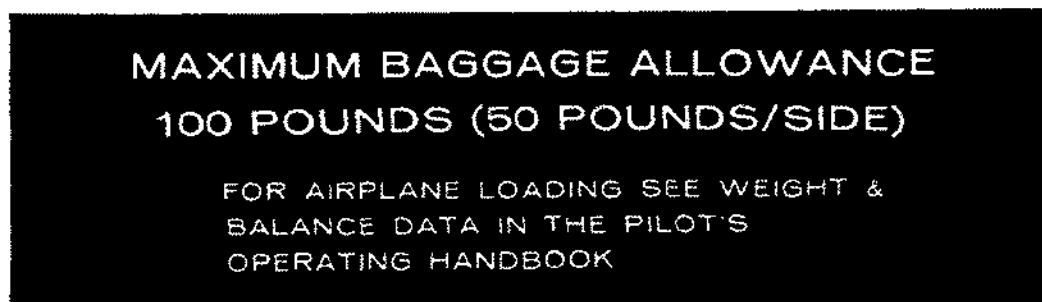
On Pilot's Compartment Right Sidewall:



On Horizontal Part of First Baggage Step (Station 257):

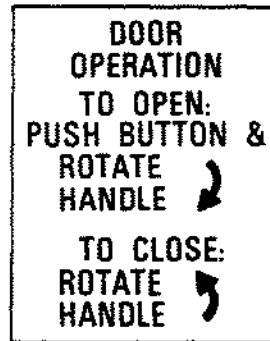


On Horizontal Part of Second Baggage Step (Station 276):



Near Upper Cabin Door Latch Mechanism:

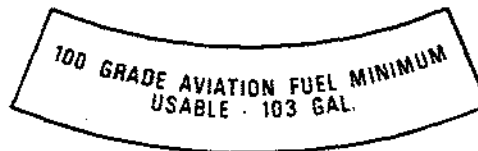
External:



Internal:



Near Main Tank Filler Cap:



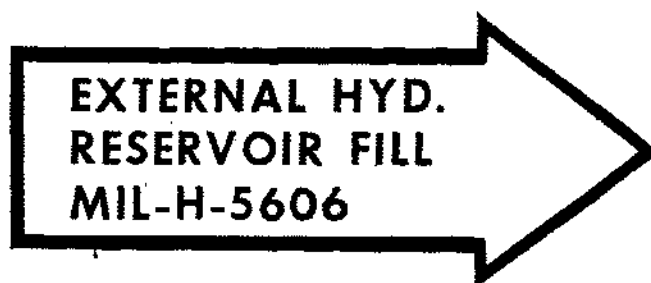
On Wing Locker Doors:



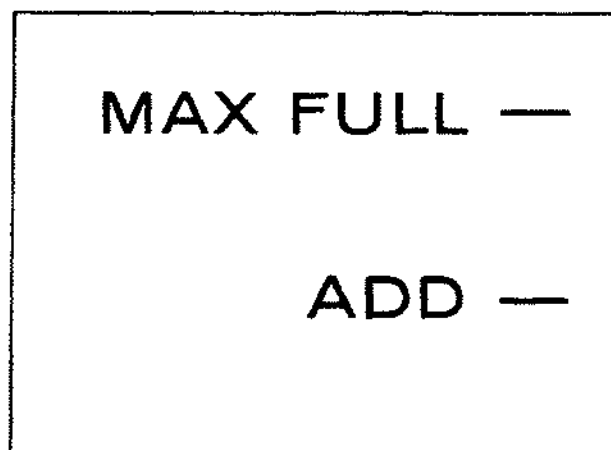
Inside Nose Baggage Doors:



Inside Left Nose Baggage Door:



On Hydraulic Reservoir:



On Avionics Bay Door Forward Partition:



**SECTION 3
EMERGENCY PROCEDURES****TABLE OF CONTENTS**

	Page		Page
INTRODUCTION	3-1	AMPLIFIED EMERGENCY	
EMERGENCY PROCEDURES		PROCEDURES	3-15
ABBREVIATED CHECKLIST . . .	3-2	Engine Inoperative Airspeeds	
Engine Inoperative		For Safe Operations . . .	3-15
Procedures	3-2	Engine Inoperative	
Fire Procedures	3-6	Procedures	3-16
Emergency Descent		Maximum Glide	3-22
Procedures	3-7	Fire Procedures	3-22
Emergency Landing		Emergency Descent	
Procedures	3-7	Procedures	3-24
Fuel System Emergency		Emergency Landing	
Procedures	3-10	Procedures	3-25
Electrical System Emer-		Fuel System Emergency	
gency Procedures	3-10	Procedures	3-29
Avionics Bus Failure . . .	3-11	Electrical System	
Landing Gear Emergency		Emergency Procedures . .	3-30
Procedures	3-11	Avionics Bus Failure . . .	3-30
Flight Instruments Emergency		Landing Gear Emergency	
Procedures	3-12	Procedures	3-31
Engine Inlet Air System		Flight Instruments	
Icing Emergency		Emergency Procedures . .	3-32
Procedures	3-12	Engine Inlet Air System	
Pressurization System		Icing Emergency	
Emergency Procedures . .	3-12	Procedures	3-32
Propeller		Pressurization System	
Synchrophaser	3-13	Emergency Procedures . .	3-33
Emergency Exit Window		Propeller Synchrophaser . .	3-34
Removal	3-13	Emergency Exit Window	
Spins	3-14	Removal	3-34
		Spins	3-34

INTRODUCTION

Section 3 of this handbook describes the recommended procedures for emergency situations. The first part of this section provides emergency 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.

EMERGENCY PROCEDURES ABBREVIATED CHECKLIST

NOTE

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

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

SINGLE-ENGINE AIRSPEEDS FOR SAFE OPERATION

Conditions:	
1. Takeoff Weight 6750 Pounds	3. Standard Day, Sea Level
2. Landing Weight 6750 Pounds	
(1) Air Minimum Control Speed	79 KIAS
(2) Intentional One Engine Inoperative Speed	98 KIAS
(3) One Engine Inoperative Best Angle-of-Climb Speed	100 KIAS
(4) One Engine Inoperative Best Rate-of-Climb Speed (Wing Flaps UP)	108 KIAS

Figure 3-1

ENGINE INOPERATIVE PROCEDURES

ENGINE SECURING PROCEDURE

1. Throttle - CLOSE.
2. Mixture - IDLE CUT-OFF.
3. Propeller - FEATHER.
4. Fuel Selector - OFF (Feel For Detent).
5. Auxiliary Fuel Pump - OFF.
6. Magneto Switches - OFF.
7. Propeller Synchrophaser - OFF (Optional System).
8. Alternator - OFF.
9. Cowl Flap - CLOSE.

ENGINE FAILURE DURING TAKEOFF (Speed Below 98 KIAS Or Gear Down)

1. Throttles - CLOSE IMMEDIATELY.
2. Brake Or Land And Brake - AS REQUIRED.

ENGINE FAILURE AFTER TAKEOFF (Speed Above 98 KIAS With Gear Up Or In Transit)

1. Mixtures - FULL RICH.
2. Propellers - FULL FORWARD.
3. Throttles - FULL FORWARD (38.0 Inches Hg.).
4. Landing Gear - CHECK UP.
5. Inoperative Engine:
 - a. Throttle - CLOSE.
 - b. Mixture - IDLE CUT-OFF.
 - c. Propeller - FEATHER.
6. Establish Bank - 5° toward operative engine.
7. Climb To Clear 50-Foot Obstacle - 98 KIAS.
8. Climb At One Engine Inoperative Best Rate-of-Climb Speed - 108 KIAS.
9. Trim Tabs - ADJUST 5° bank toward operative engine with approximately 1/2 ball slip indicated on the turn and bank indicator.
10. Cowl Flap - CLOSE (Inoperative Engine).
11. Inoperative Engine - SECURE as follows:
 - a. Fuel Selector - OFF (Feel For Detent).
 - b. Auxiliary Fuel Pump - OFF.
 - c. Magneto Switches - OFF.
 - d. Alternator - OFF.
12. As Soon As Practical - LAND.

ENGINE FAILURE DURING FLIGHT (Speed Above V_{MC}A)

1. Inoperative Engine - DETERMINE.
 2. Operative Engine - ADJUST as required.
- Before Securing Inoperative Engine:
3. Fuel Flow - CHECK. If deficient, position auxiliary fuel pump to ON.
 4. Fuel Selectors - MAIN TANKS (Feel For Detent).
 5. Fuel Quantity - CHECK.
 6. Oil Pressure and Oil Temperature - CHECK.
 7. Magneto Switches - CHECK ON.
 8. Mixture - ADJUST. Lean until manifold pressure begins to increase, then enrichen as power increases.

If Engine Does Not Start, Secure As Follows:

9. Inoperative Engine - SECURE.
 - a. Throttle - CLOSE.
 - b. Mixture - IDLE CUT-OFF.
 - c. Propeller - FEATHER.
 - d. Fuel Selector - OFF (Feel For Detent).
 - e. Auxiliary Fuel Pump - OFF.
 - f. Magneto Switches - OFF.
 - g. Propeller Synchrophaser - OFF (Optional System).
 - h. Alternator - OFF.
 - i. Cowl Flap - CLOSE.
10. Operative Engine - ADJUST.
 - a. Power - AS REQUIRED.
 - b. Mixture - ADJUST for power.
 - c. Fuel Selector - AS REQUIRED (Feel For Detent).
 - d. Auxiliary Fuel Pump - ON.
 - e. Cowl Flap - AS REQUIRED.

11. Trim Tabs - ADJUST 5° bank toward operative engine with approximately 1/2 ball slip indicated on the turn and bank indicator.
12. Electrical Load - DECREASE to minimum required.
13. As Soon As Practical - LAND.

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

1. Rudder - APPLY towards operative engine.
2. Power - REDUCE to stop turn.
3. Pitch Attitude - LOWER NOSE to accelerate above V_{MC_A} .
4. Inoperative Engine Propeller - FEATHER.
5. Operative Engine - INCREASE POWER as airspeed increases above V_{MC_A} .
6. Inoperative Engine - SECURE.
7. Trim Tabs - ADJUST 5° bank toward operative engine with approximately 1/2 ball slip indicated on the turn and bank indicator.
8. Operative Engine Cowl Flap - AS REQUIRED.

ENGINE INOPERATIVE LANDING

1. Fuel Selector - MAIN TANK (Feel For Detent).
2. Auxiliary Fuel Pump - ON (Operative Engine).
3. Alternate Air Control - IN.
4. Mixture - FULL RICH or lean as required for smooth operation.
5. Propeller Synchrophaser - OFF (Optional System).
6. Propeller - FULL FORWARD.
7. Approach - 108 KIAS with excessive altitude.
8. Landing Gear - DOWN within gliding distance of field.
9. Wing Flaps - DOWN when landing is assured.
10. Speed - DECREASE below 94 KIAS only if landing is assured.
11. Air Minimum Control Speed - 79 KIAS.

ENGINE INOPERATIVE GO-AROUND (Speed Above 98 KIAS)

- | |
|--|
| <ol style="list-style-type: none">1. Throttle - FULL FORWARD (38.0 Inches Hg.).2. Wing Flaps - UP (If Extended).3. Positive Rate-of-Climb - ESTABLISH.4. Landing Gear - UP. |
|--|
5. Cowl Flap - OPEN.
 6. Climb at One Engine Inoperative Best Rate-of-Climb Speed - 108 KIAS.
 7. Trim Tabs - ADJUST 5° bank toward operative engine with approximately 1/2 ball slip indicated on the turn and bank indicator.

AIRSTART**Airplane Without Optional Propeller Unfeathering System:**

1. Auxiliary Fuel Pump - CHECK OFF. If ON or LOW, purge engine by turning OFF auxiliary fuel pump, mixture to IDLE CUT-OFF, throttle full open, magneto switches OFF, and rotating engine 15 revolutions with starter.
2. Magneto Switches - ON.
3. Fuel Selector - MAIN TANK (Feel For Detent).
4. Throttle - FORWARD approximately one and one-half inches.
5. Mixture - FULL RICH then retard approximately two inches.
6. Propeller - FORWARD of detent.
7. Starter Button - PRESS.
8. Primer Switch - ACTIVATE.
9. Starter and Primer Switch - RELEASE when engine fires.
10. Auxiliary Fuel Pump - LOW.
11. Mixture - ADJUST for smooth engine operation.
12. Power - INCREASE after cylinder head temperature reaches 200°F with gradual mixture enrichment as power increases.
13. Cowl Flap - AS REQUIRED.
14. Alternator - ON.

Airplane With Optional Propeller Unfeathering System:

1. Auxiliary Fuel Pump - CHECK OFF. If ON or LOW, purge engine by turning OFF auxiliary fuel pump, mixture to IDLE CUT-OFF, throttle full open, magneto switches OFF, and rotating engine 15 revolutions with starter.
2. Magneto Switches - ON.
3. Fuel Selector - MAIN TANK (Feel For Detent).
4. Throttle - FORWARD approximately one and one-half inches.
5. Mixture - FULL RICH then retard approximately two inches.
6. Propeller - FULL FORWARD.
7. Propeller - RETARD to detent when propeller reaches 1000 RPM.
8. Auxiliary Fuel Pump - LOW.
9. Mixture - ADJUST for smooth engine operation.
10. Power - INCREASE after cylinder head temperature reaches 200°F with gradual mixture enrichment as power increases.
11. Cowl Flap - AS REQUIRED.
12. Alternator - ON.

BOTH ENGINES FAILURE DURING CRUISE FLIGHT

- | |
|--|
| <ol style="list-style-type: none">1. Wing Flaps - UP.2. Landing Gear - UP.3. Propellers - FEATHER. |
|--|
4. Cowl Flaps - CLOSE.
 5. Airspeed - 120 KIAS (See Figure 3-3).
 6. Landing - Refer to FORCED LANDING (Complete Power Loss) in this section.

FIRE PROCEDURES

FIRE ON THE GROUND (Engine Start, Taxi And Takeoff With Sufficient Distance Remaining To Stop)

1. Throttles - CLOSE.
 2. Brakes - AS REQUIRED.
 3. Mixtures - IDLE CUT-OFF.
 4. Battery - OFF (Use Gang Bar).
 5. Magnetos - OFF (Use Gang Bar).
6. Evacuate airplane as soon as practical.

FLIGHT WING OR ENGINE FIRE

1. Both Auxiliary Fuel Pumps - OFF.
2. Operative Engine Fuel Selector - MAIN TANK (Feel For Detent).
3. Emergency Crossfeed Shutoff - OFF (Pull Up).
4. Appropriate Engine - SECURE.
 - a. Throttle - CLOSE.
 - b. Mixture - IDLE CUT-OFF.
 - c. Propeller - FEATHER.
 - d. Fuel Selector - OFF (Feel For Detent).
- e. Magnetos - OFF.
- f. Propeller Synchrophaser - OFF (Optional System).
- g. Alternator - OFF.
- h. Cowl Flap - CLOSE.
5. Cabin Heater - OFF.
6. Land and evacuate airplane as soon as practical.

INFLIGHT CABIN ELECTRICAL FIRE OR SMOKE

1. Electrical Load - REDUCE to minimum required.
2. Fuel Selectors - MAIN TANK (Feel For Detent).
3. Emergency Crossfeed Shutoff - OFF (Pull Up).
4. Attempt to isolate the source of fire or smoke.
5. Cabin Air Controls - OPEN all vents including windshield defrost.
CLOSE if intensity of smoke increases.
6. Pressurization Air Contamination Procedure - INITIATE if required.
7. Land and evacuate airplane as soon as practical.

EMERGENCY DESCENT PROCEDURES

PREFERRED PROCEDURE

1. Throttles - IDLE.
2. Propellers - FULL FORWARD.
3. Mixtures - ADJUST for smooth engine operation.
4. Wing Flaps - UP.
5. Landing Gear - UP.
6. Moderate Bank - INITIATE.
7. Airspeed - 235 KIAS.

IN TURBULENT ATMOSPHERIC CONDITIONS

1. Throttles - IDLE.
2. Propellers - FULL FORWARD.
3. Mixtures - ADJUST for smooth engine operation.
4. Wing Flaps - DOWN 45°.
5. Landing Gear - DOWN.
6. Moderate Bank - INITIATE.
7. Airspeed - 146 KIAS.

EMERGENCY LANDING PROCEDURES

FORCED LANDING (With Power)

1. Landing Site - CHECK. Overfly site at 105 KIAS and 15° wing flaps.
2. Landing Gear - DOWN if surface is smooth and hard.
 - a. Normal Landing - INITIATE. Keep nosewheel off ground as long as practical.
3. Landing Gear - UP if surface is rough or soft.
 - a. Approach - 105 KIAS with 15° wing flaps.
 - b. Pressurization Air Controls - PULL.
 - c. All Switches Except Magnetos - OFF.
 - d. Mixtures - IDLE CUT-OFF.
 - e. Magneto Switches - OFF.
 - f. Fuel Selectors - OFF (Feel For Detent).
 - g. Emergency Crossfeed Shutoff - OFF (Pull Up).
 - h. Landing Attitude - NOSE HIGH.

FORCED LANDING (Complete Power Loss)

1. Mixtures - IDLE CUT-OFF.
2. Propellers - FEATHER.
3. Fuel Selectors - OFF (Feel For Detent).
4. Emergency Crossfeed Shutoff - OFF (Pull Up).
5. All Switches Except Battery - OFF.
6. Approach - 120 KIAS.
7. If Smooth and Hard Surface:
 - a. Landing Gear - DOWN within gliding distance of field.
 - (1) Landing Gear Switch - DOWN.
 - (2) GEAR HYD Circuit Breaker - PULL.
 - (3) Emergency Gear Extension T-Handle - PULL.
 - (4) Gear Down Lights - ON; Unlocked Light - OFF.
 - (5) Gear Warning Horn - CHECK.
 - b. Wing Flaps - AS REQUIRED.
 - c. Approach - 105 KIAS.
 - d. Battery Switch - OFF.
 - e. Normal Landing - INITIATE. Keep nosewheel off ground as long as practical.
8. If Rough or Soft Surface:
 - a. Landing Gear - UP.
 - b. Wing Flaps - DOWN 15°.
 - c. Approach - 105 KIAS.
 - d. Battery Switch - OFF.
 - e. Landing Attitude - NOSE HIGH.

LANDING WITH FLAT MAIN GEAR TIRE

1. Landing Gear - Leave DOWN.
2. Fuel Selectors - SELECT main tank on same side as defective tire; feel for detent.
3. Fuel Selectors - MAIN TANKS (Feel For Detent) before landing.
4. Wind should be headwind or crosswind opposite the defective tire.
5. Wing Flaps - DOWN 45°.
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 the inflated tire and lower the nosewheel to the ground immediately for positive steering.
8. Use full aileron in landing roll to lighten the load on the defective tire.
9. Apply brakes only on the inflated tire 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 DEFECTIVE MAIN GEAR

1. Fuel Selectors - SELECT main tank on the same side as defective gear; feel for detent.
2. Fuel Selectors - MAIN TANKS (Feel For Detent) before landing.
3. Emergency Crossfeed Shutoff - OFF (Pull Up).
4. Wind - HEADWIND or crosswind opposite defective gear.
5. Landing Gear - DOWN.
6. Wing Flaps - DOWN 45°.
7. Approach - ALIGN AIRPLANE with the edge of runway opposite the defective landing gear.
8. Battery Switch - OFF.
9. Land wing low toward operative landing gear. Lower nosewheel immediately for positive steering.
10. Ground Loop - INITIATE into defective landing gear.
11. Mixtures - IDLE CUT-OFF.
12. Use full aileron in landing roll to lighten the load on the defective gear.
13. Apply brakes only on the operative landing gear to hold desired rate of turn and shorten landing roll.
14. Fuel Selectors - OFF (Feel For Detent).
15. Airplane - EVACUATE.

LANDING WITH FLAT NOSE GEAR TIRE

1. Landing Gear - Leave DOWN.
2. Passengers and Baggage - MOVE AFT.
3. Approach - 105 KIAS with 15° wing flaps.
4. Landing Attitude - NOSE HIGH.
5. Nose - HOLD OFF during landing roll.
6. Brakes - MINIMUM in landing roll.
7. Throttles - RETARD in landing roll.
8. Control Wheel - FULL AFT until airplane stops.
9. Minimize additional taxiing to prevent further damage.

LANDING WITH DEFECTIVE NOSE GEAR

1. If Smooth and Hard Surface:
 - a. Baggage and Passengers - MOVE AFT.
 - b. Landing Gear - DOWN.
 - c. Approach - 105 KIAS with 15° wing flaps.
 - d. All Switches Except Magnetos - OFF.
 - e. Landing Attitude - NOSE HIGH.
 - f. Mixtures - IDLE CUT-OFF.
 - g. Magneto Switches - OFF.
 - h. Nose - LOWER as speed dissipates.
2. If Rough or Sod Surface:
 - a. Landing Gear - UP.
 - b. Approach - 105 KIAS with 15° wing flaps.
 - c. All Switches Except Magnetos - OFF.
 - d. Landing Attitude - NOSE HIGH.
 - e. Mixtures - IDLE CUT-OFF.
 - f. Magneto Switches - OFF.
 - g. Fuel Selectors - OFF (Feel For Detent).
 - h. Emergency Crossfeed Shutoff - OFF (Pull Up).

LANDING WITHOUT FLAPS (0° Extension)

1. Mixtures - FULL RICH or lean as required for smooth operation.
2. Propellers - FULL FORWARD.
3. Fuel Selectors - MAIN TANKS (Feel For Detent).
4. Minimum Approach Speed - 107 KIAS (See Figure 5-25).
5. Landing Gear - DOWN.

DITCHING

1. Landing Gear - UP.
2. Approach - HEADWIND if high winds.
PARALLEL to SWELLS if light wind and heavy swells.
3. Wing Flaps - DOWN 45°.
4. Power - AS REQUIRED. (300 Feet Per Minute Descent).
5. Airspeed - 105 KIAS minimum.
6. Attitude - DESCENT ATTITUDE through touchdown.

FUEL SYSTEM EMERGENCY PROCEDURES

ENGINE-DRIVEN FUEL PUMP FAILURE

1. Fuel Selector - MAIN TANK (Feel For Detent).
2. Auxiliary Fuel Pump - ON.
3. Cowl Flap - AS REQUIRED.
4. Mixture - FULL RICH. Adjust fuel flow to coincide with power setting.
5. As Soon As Practical - LAND.
6. Crossfeed is unusable if the other engine is operating.

ELECTRICAL SYSTEM EMERGENCY PROCEDURES

ALTERNATOR FAILURE (Single)

1. Electrical Load - REDUCE.
2. If Circuit Breaker is tripped:
 - a. Turn off affected alternator.
 - b. Reset affected alternator circuit breaker.
 - c. Turn on affected alternator switch.
 - d. If circuit breaker reopens, turn off alternator.
3. If Circuit Breaker does not trip:
 - a. Select affected alternator on voltammeter and monitor output.
 - b. If output is normal and failure light remains on, disregard fail indication and have indicator checked after landing.
 - c. If output is insufficient, turn off alternator and reduce electrical load to one alternator capacity.
 - d. If complete loss of alternator output occurs, check field fuse and replace if necessary.
 - e. If an intermittent light indication accompanied by voltammeter fluctuation is observed; turn off affected alternator and reduce load to one alternator capacity.
 - f. Restrict on remaining alternator to 80% of rated load.

ALTERNATOR FAILURE (Dual)

1. Electrical Load - REDUCE.
2. If Circuit Breakers are tripped:
 - a. Turn off alternators.
 - b. Reset circuit breakers.
 - c. Turn on left alternator and monitor output on voltammeter.
 - d. If alternator is charging, leave it on. Disregard failure light if still illuminated.
 - e. If still inoperative, turn off left alternator.
 - f. Repeat steps c through e for right alternator.
 - g. If circuit breakers reopen, prepare to terminate flight.
3. If Circuit Breakers have not tripped:
 - a. Turn off alternators.
 - b. Check field fuses and replace as required.
 - c. Turn on left alternator and monitor output on voltammeter.
 - d. If alternator is charging, leave it on. Disregard failure light if still illuminated.
 - e. If still inoperative, turn off left alternator.
 - f. Repeat steps c through e for right alternator.
 - g. If both still inoperative, turn off alternators and turn on emergency power alternator field switch.
 - h. Repeat steps c through e for each alternator.
 - i. If still inoperative, turn off alternators, nonessential electrical items and prepare to terminate flight.

AVIONICS BUS FAILURE

1. Avionics Bus Switch - OFF.
2. Emergency Power Avionics Bus Switch - ON.

LANDING GEAR EMERGENCY PROCEDURES**HYD PRESS LIGHT ILLUMINATED AFTER GEAR CYCLE**

1. Landing Gear Switch - RAPIDLY RECYCLE.
2. If HYD PRESS light still illuminated:
 - a. Landing Gear - DOWN.
 - b. GEAR HYD Circuit Breaker - PULL.
 - c. If HYD PRESS light remains illuminated - LAND as soon as practical.

LANDING GEAR DOWN AND LOCKED LIGHT ILLUMINATED WITH GEAR HANDLE UP AND HYD PRESS LIGHT OUT

Perform "LANDING GEAR WILL NOT EXTEND HYDRAULICALLY" Checklist.

LANDING GEAR WILL NOT EXTEND HYDRAULICALLY

1. Airspeed - 130 KIAS or less.
2. Landing Gear Switch - DOWN.
3. GEAR HYD 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 up locks have released.
7. Gear Warning Horn - CHECK.
8. As Soon As Practical - LAND.

LANDING GEAR WILL NOT RETRACT HYDRAULICALLY

1. Landing Gear Switch - DOWN.
2. Gear Down Lights - ON; Unlocked Light - OFF.
3. Gear Warning Horn - CHECK.
4. As Soon As Practical - LAND.

FLIGHT INSTRUMENTS EMERGENCY PROCEDURES**VACUUM PUMP FAILURE (Attitude And Directional Gyros)**

1. Failure indicated by left or right red failure button exposed on vacuum gage.
2. Automatic valve will select operative source.
3. Vacuum Pressure - CHECK proper vacuum from operative source.

OBSTRUCTION OR ICING OF STATIC SOURCE

1. Static Source - ALTERNATE.
2. Excess Altitude and Airspeed - MAINTAIN to compensate for change in calibration (See Figures 5-2 and 5-4).

ENGINE INLET AIR SYSTEM ICING EMERGENCY PROCEDURES**AIR INLET OR FILTER ICING**

- | |
|--|
| <ol style="list-style-type: none">1. Alternate Air Control(s) - PULL OUT.2. Propeller(s) - INCREASE (2550 RPM For Normal Cruise).3. Mixture(s) - LEAN as required. |
|--|
4. Pressurization Air Control(s) - PULL LH and/or RH as necessary.
 - a. With Both Pressurization Air Sources Dumped:
 - (1) Cabin Vent Control - PULL.
 - (2) Cabin Pressurization Switch - DEPRESSURIZE.
 - b. Above 10,000 Feet with both pressurization air sources dumped:
 - (1) If Supplementary Oxygen is Not Available - EMERGENCY DESCENT TO 10,000 FEET.
 - (2) If Supplementary Oxygen is Available:
 - (a) Oxygen Knob - PULL ON.
 - (b) Assure each occupant is using oxygen.
 - (c) Descend as soon as practical to 10,000 Feet.

PRESSURIZATION SYSTEM EMERGENCY PROCEDURES**IMPENDING SKIN PANEL OR WINDOW FAILURE**

1. Cabin Pressurization Switch - DEPRESSURIZE.
2. Cabin Vent Control - PULL.
3. Pressurization Air Controls - PULL.
4. If Above 10,000 Feet and Supplementary Oxygen is Not Available - EMERGENCY DESCENT TO 10,000 FEET.
5. If Above 10,000 Feet and Supplementary Oxygen is Available:
 - a. Oxygen Knob - PULL ON.
 - b. Assure each occupant is using oxygen.
 - c. Descend as soon as practical to 10,000 Feet.

CABIN OVERPRESSURE (Over 5.3 PSI)

1. Pressurization Air Controls - PULL.
2. If Above 10,000 Feet and Supplementary Oxygen is Not Available - EMERGENCY DESCENT TO 10,000 FEET.
3. If Above 10,000 Feet and Supplementary Oxygen is Available:
 - a. Oxygen Knob - PULL ON.
 - b. Assure each occupant is using oxygen.
 - c. Descend as soon as practical to 10,000 Feet.

LOSS OF PRESSURIZATION ABOVE 10,000 FEET

1. Without Supplementary Oxygen - EMERGENCY DESCENT TO 10,000 FEET.
2. With Supplementary Oxygen:
 - a. Oxygen Knob - PULL ON.
 - b. Assure each occupant is using oxygen.
 - c. Descend as soon as practical to 10,000 Feet.

PRESSURIZATION AIR CONTAMINATION

1. Pressurization Air Control(s) - PULL LH and/or RH as necessary.
 - a. With Both Air Sources Dumped:
 - (1) Cabin Vent Control - PULL.
 - (2) Cabin Pressurization Switch - DEPRESSURIZE.
2. Above 10,000 Feet with Both Air Sources Dumped:
 - a. If Supplementary Oxygen is Not Available - EMERGENCY DESCENT TO 10,000 FEET.
 - b. If Supplementary Oxygen is Available:
 - (1) Oxygen Knob - PULL ON.
 - (2) Assure each occupant is using oxygen.
 - (3) Descend as soon as practical to 10,000 Feet.

PROPELLER SYNCHROPHASER**ENGINE INOPERATIVE PROCEDURE**

1. Propeller Synchrophaser - OFF (Optional System).

SYNCHROPHASER FAILURE

1. Propeller Synchrophaser - OFF (Optional System).
2. Propeller Synchrophaser Circuit Breaker - PULL (Optional System).

EMERGENCY EXIT WINDOW REMOVAL

1. Emergency Release Handle Plastic Cover - PULL OFF.
2. Release Handle - TURN COUNTERCLOCKWISE.
3. Emergency Exit Window - PULL IN and DOWN.

SPINS

1. Throttles - CLOSE IMMEDIATELY.
2. Ailerons - NEUTRALIZE.
3. Rudder - HOLD FULL RUDDER opposite the direction of rotation.
4. Control Wheel - FORWARD BRISKLY, 1/2 turn 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.

ENGINE INOPERATIVE AIRSPEEDS FOR SAFE OPERATION

The most critical time for an engine failure condition in a multi-engine 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 and a blue radial at the one engine inoperative best rate-of-climb speed to facilitate instant recognition. The following paragraphs present a detailed discussion of the problems associated with engine failures during takeoff.

AIR MINIMUM CONTROL SPEED

The multi-engine airplane must reach the air minimum control speed (79 KIAS) before full control deflections can counteract the adverse rolling and yawing tendencies associated with one engine inoperative and full power operation on the other engine. This speed is indicated by a red radial on the airspeed indicator.

INTENTIONAL ONE ENGINE INOPERATIVE SPEED

Although the airplane is controllable at the air minimum control speed, the airplane performance is so far below optimum that continued flight near the ground is improbable. A more suitable intentional one engine inoperative speed is 98 KIAS. At this speed, altitude can be maintained more easily while the landing gear is being retracted and the propeller is being feathered.

ONE ENGINE INOPERATIVE BEST ANGLE-OF-CLIMB SPEED

The one engine inoperative best angle-of-climb speed becomes important when there are obstacles ahead on takeoff. Once the one engine inoperative best angle-of-climb speed is reached, altitude becomes more important than airspeed until the obstacle is cleared. The one engine inoperative best angle-of-climb speed is approximately 100 KIAS with wing flaps and landing gear up.

ONE ENGINE INOPERATIVE BEST RATE-OF-CLIMB SPEED

The one engine inoperative best rate-of-climb speed becomes important when there are no obstacles ahead on takeoff, or when it is difficult to maintain or gain altitude in single-engine emergencies. The one engine inoperative best rate-of-climb speed is 108 KIAS with wing flaps and landing gear up. This speed is indicated by a blue radial on the airspeed indicator.

The variations of wing flaps up one engine inoperative best rate-of-climb speed with altitude are shown in Section 5. For one engine inoperative best climb performance, the wings should be banked 5° toward the operative engine with approximately 1/2 ball slip indicated on the turn and bank indicator.

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

ENGINE INOPERATIVE PROCEDURES**ENGINE SECURING PROCEDURE**

1. Throttle - CLOSE.
 2. Mixture - IDLE CUT-OFF.
 3. Propeller - FEATHER.
4. Fuel Selector - OFF (Feel For Detent).
 5. Auxiliary Fuel Pump - OFF.
 6. Magneto Switches - OFF.
 7. Propeller Synchrophaser - OFF (Optional System).
 8. Alternator - OFF.
 9. Cowl Flap - CLOSE.

ENGINE FAILURE DURING TAKEOFF (Speed Below 98 KIAS Or Gear Down)

1. Throttles - CLOSE IMMEDIATELY.
 2. Brake Or Land And Brake - AS REQUIRED.

NOTE

The distance required for the airplane to be accelerated from a standing start to 98 KIAS 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 TAKEOFF (Speed Above 98 KIAS With Gear Up Or In Transit)

1. Mixtures - FULL RICH.
 2. Propellers - FULL FORWARD.
 3. Throttles - FULL FORWARD (38.0 Inches Hg.).
 4. Landing Gear - CHECK UP.
 5. Inoperative Engine:
 - a. Throttle - CLOSE.
 - b. Mixture - IDLE CUT-OFF.
 - c. Propeller - FEATHER.

6. Establish Bank - 5° toward operative engine.
7. Climb to Clear 50-Foot Obstacle - 98 KIAS.
8. Climb at One Engine Inoperative Best Rate-of-Climb Speed - 108 KIAS.
9. Trim Tabs - ADJUST 5° bank toward operative engine with approximately 1/2 ball slip indicated on the turn and bank indicator.
10. Cowl Flap - CLOSE (Inoperative Engine).
11. Inoperative Engine - SECURE as follows:
 - a. Fuel Selector - OFF (Feel For Detent).
 - b. Auxiliary Fuel Pump - OFF.
 - c. Magneto Switches - OFF.
 - d. Alternator Switch - OFF.
12. As Soon As Practical - LAND.

Upon engine failure after reaching 98 KIAS on takeoff, the multi-engine pilot has a significant advantage over a single-engine pilot, for he has a choice of stopping or continuing the takeoff. This would be similar to the choice facing a single-engine pilot who has suddenly lost slightly more than half of his takeoff power. In this situation, the single-engine pilot would be extremely reluctant to continue the takeoff if he had to climb over obstructions. However, if the failure occurred at an altitude as high or higher than surrounding obstructions, he would feel free to maneuver for a landing back at the airport.

Fortunately, the airplane accelerates through this "area of decision" in just a few seconds. However, to make an intelligent decision in this type of emergency, one must consider the field length, obstruction height, field elevation, air temperature, headwind, and takeoff weight. The flight paths illustrated in Figure 3-2 indicate that the "go no-go area of decision" is bounded by: (1) the point at which 98 KIAS is reached and (2) the point where the obstruction altitude is reached. An engine failure in this area requires an immediate decision. Beyond this area, the airplane, within the limitations of single-engine climb performance shown in Section 5, may be maneuvered to a landing back at the airport.

ENGINE FAILURE DURING TAKEOFF GO NO-GO DECISION

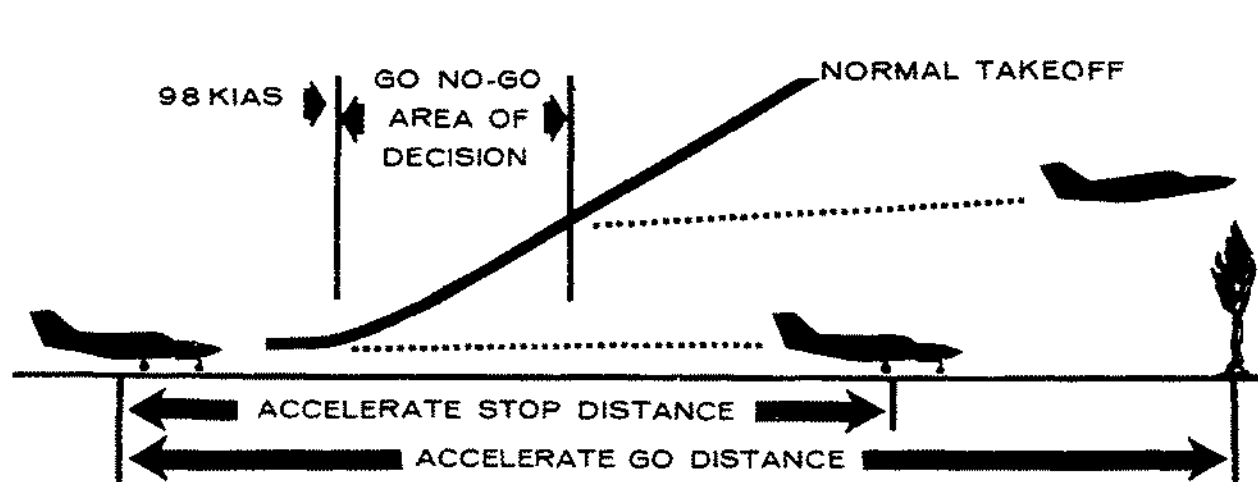


Figure 3-2

At sea level standard day, with zero wind and 6750 pounds weight, the distance to accelerate to 98 KIAS and stop is 4245 feet, while the total unobstructed distance required to takeoff and climb over a 50-foot obstacle after an engine failure at 98 KIAS is 3885 feet. This total distance over an obstacle can be reduced slightly under more favorable conditions of weight, headwind, or obstruction height. However, it is recommended that in most cases it would be better to discontinue the takeoff, since any slight mismanagement of single-engine procedure would more than offset the small distance advantage offered by continuing the takeoff. Still higher field elevations will cause the engine failure takeoff distance to lengthen disproportionately until the altitude is reached where a successful takeoff is improbable unless the airspeed and height above the runway at engine failure are great enough to allow a slight deceleration and altitude loss while the airplane is being prepared for an engine inoperative climb.

During engine inoperative takeoff procedures over an obstacle, only one condition presents any appreciable advantage; this is headwind. A decrease of approximately 6% 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) discontinuing a takeoff upon engine failure is advisable under most circumstances; (2) 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; (3) climb or continued level flight at moderate altitude is improbable with the landing gear extended and the propeller windmilling; (4) in no case should the airspeed be allowed to fall below the intentional one engine inoperative 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; and (5) if the requirement for an immediate climb is not present, allow the airplane to accelerate to the one engine inoperative best rate-of-climb speed as this is the optimum climb speed and will always provide the best chance of climb or least altitude loss.

WARNING

The propeller on the inoperative engine must be feathered, landing gear retracted and wing flaps up or continued flight may be impossible.

ENGINE OVERSPEED

Should an overspeed condition occur, the pilot should reduce airspeed as quickly as possible by closing both throttles. On reaching an airspeed below 120 KIAS and above the one engine inoperative best rate-of-climb speed (Blue Radial), set the propeller control on the overspeeding engine for feather. If propeller will not feather, the power on the normally operating engine should be advanced to maximum and the power on the overspeeding engine should be advanced to 50 RPM below the maximum allowable RPM (Red Line). Maintain the one engine inoperative best rate-of-climb speed (Blue Radial) and land as soon as practical. This will provide more

than zero thrust at altitudes up to approximately 10,000 feet. During landing, the application of partial throttle on the malfunctioning engine (within limits of the tachometer red line) will minimize asymmetrical thrust.

ENGINE FAILURE DURING FLIGHT (Speed Above Air Minimum Control Speed)

1. Inoperative Engine - DETERMINE. Idle engine same side as idle foot.
2. Operative Engine - ADJUST as required.

Before Securing Inoperative Engine:

3. Fuel Flow - CHECK. If deficient, position auxiliary fuel pump switch to ON.
4. Fuel Selectors - MAIN TANKS (Feel For Detent).
5. Fuel Quantity - CHECK. Switch to opposite MAIN TANK if necessary.
6. Oil Pressure and Oil Temperature - CHECK. Shutdown engine if oil pressure is low.
7. Magneto Switches - CHECK ON.
8. Mixture - ADJUST. Lean until manifold pressure begins to increase, then enrichen as power increases.

If Engine Does Not Start, Secure As Follows:

9. Inoperative Engine - SECURE.
 - a. Throttle - CLOSE.
 - b. Mixture - IDLE CUT-OFF.
 - c. Propeller - FEATHER.
 - d. Fuel Selector - OFF (Feel For Detent).
 - e. Auxiliary Fuel Pump - OFF.
 - f. Magneto Switches - OFF.
 - g. Propeller Synchrophaser - OFF (Optional System).
 - h. Alternator Switch - OFF.
 - i. Cowl Flap - CLOSE.
10. Operative Engine - ADJUST.
 - a. Power - AS REQUIRED.
 - b. Mixture - ADJUST for power.
 - c. Fuel Selector - AS REQUIRED (Feel For Detent).
 - d. Auxiliary Fuel Pump - ON.
 - e. Cowl Flap - AS REQUIRED.
11. Trim Tabs - ADJUST 5° bank toward operative engine with approximately 1/2 ball slip indicated on the turn and bank indicator.
12. Electrical Load - DECREASE to minimum required.
13. As Soon As Practical - LAND.

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 120 pounds per side. When crossfeeding, maintain level flight, maintain altitude greater than 1000 feet AGL and position inoperative engine auxiliary fuel pump to LOW.

ENGINE FAILURE DURING FLIGHT (Speed Below Air Minimum Control Speed)

1. Rudder - APPLY towards operative engine.
2. Power - REDUCE to stop turn.
3. Pitch Attitude - LOWER NOSE to accelerate above air minimum control speed.
4. Inoperative Engine Propeller - FEATHER.
5. Operative Engine - INCREASE POWER as airspeed increases above air minimum control speed.
6. Inoperative Engine - SECURE.
7. Trim Tabs - ADJUST 5° bank toward operative engine with approximately 1/2 ball slip indicated on the turn and bank indicator.

8. Operative Engine Cowl Flap - AS REQUIRED.

ENGINE INOPERATIVE LANDING

1. Fuel Selector - MAIN TANK (Feel For Detent).
2. Auxiliary Fuel Pump - ON (Operative Engine).
3. Alternate Air Control - IN.
4. Mixture - FULL RICH or lean as required for smooth operation.
5. Propeller Synchrophaser - OFF (Optional System).
6. Propeller - FULL FORWARD.
7. Approach at 108 KIAS with excessive altitude.
8. Landing Gear - DOWN within gliding distance of field.
9. Wing Flaps - DOWN when landing is assured.
10. Decrease speed below 94 KIAS only if landing is assured.
11. Air Minimum Control Speed - 79 KIAS.

ENGINE INOPERATIVE GO-AROUND (Speed Above 98 KIAS)**WARNING**

Level flight may not be possible for certain combinations of weight, temperature and altitude. In any event, do not attempt an engine inoperative go-around after wing flaps have been extended beyond 15°.

1. If absolutely necessary and speed is above 98 KIAS, increase engine speed to 2700 RPM and apply full throttle.
2. Wing Flaps - UP (If Extended).
3. Positive Rate-of-Climb - ESTABLISH.
4. Landing Gear - UP.
5. Cowl Flap - OPEN.
6. Climb at 108 KIAS (99 KIAS With Obstacles Directly Ahead).
7. Trim Tabs - ADJUST 5° bank toward operative engine with approximately 1/2 ball slip indicated on the turn and bank indicator.

AIRSTART (After Feathering)

Airplane Without Optional Propeller Unfeathering System:

1. Auxiliary Fuel Pump - CHECK OFF. If ON or LOW, purge engine by turning OFF auxiliary fuel pump, mixture to IDLE CUT-OFF, throttle full open, magneto switches OFF, and rotating engine 15 revolutions with starter.

2. Magneto Switches - ON.
3. Fuel Selector - MAIN TANK (Feel For Detent).
4. Throttle - FORWARD approximately one and one-half inches.
5. Mixture - FULL RICH then retard approximately two inches.
6. Propeller - FORWARD of detent.
7. Starter Button - PRESS.
8. Primer Switch - ACTIVATE.
9. Starter and Primer Switch - RELEASE when engine fires.
10. Auxiliary Fuel Pump - LOW.
11. Mixture - ADJUST for smooth engine operation.
12. Power - INCREASE after cylinder head temperature reaches 200°F with gradual mixture enrichment as power increases.
13. Cowl Flap - AS REQUIRED.
14. Alternator - ON.

Airplane With Optional Propeller Unfeathering System:

1. Auxiliary Fuel Pump - CHECK OFF. If ON or LOW, purge engine by turning OFF auxiliary fuel pump, mixture to IDLE CUT-OFF, throttle full open, magneto switches OFF, and rotating engine 15 revolutions with starter.
2. Magneto Switches - ON.
3. Fuel Selector - MAIN TANK (Feel For Detent).
4. Throttle - FORWARD approximately one and one-half inches.
5. Mixture - FULL RICH then retard approximately two inches.
6. Propeller - FULL FORWARD.

NOTE

The propeller will automatically windmill when the propeller lever is moved out of the FEATHER position.

7. Propeller - RETARD to detent when propeller reaches 1000 RPM.
8. Auxiliary Fuel Pump - LOW.
9. Mixture - ADJUST for smooth engine operation.
10. Power - INCREASE after cylinder head temperature reaches 200°F with gradual mixture enrichment as power increases.
11. Cowl Flap - AS REQUIRED.
12. Alternator - ON.

BOTH ENGINES FAILURE DURING CRUISE FLIGHT

1. Wing Flaps - UP.
2. Landing Gear - UP.
3. Propellers - FEATHER.
4. Cowl Flaps - CLOSE.
5. Airspeed - 120 KIAS (See Figure 3-3).

NOTE

Vacuum instruments will be inoperative. Electrical power available will be limited to the amount of energy contained in the battery.

6. Landing - Refer to FORCED LANDING (Complete Power Loss) in this section.

MAXIMUM GLIDE

In the event of an all engines failure condition, maximum gliding distance can be obtained by feathering both propellers, and maintaining approximately 120 KIAS with landing gear and wing flaps up. The speed which provides the "absolute maximum" glide distance varies with weight as shown in Figure 3-3.

MAXIMUM GLIDE

BEST GLIDE SPEED

CONDITIONS:

1. Landing Gear - UP.
2. Wing Flaps - UP.
3. Propellers - FEATHERED.
4. Cowl Flaps - CLOSED.
5. Best Glide Speed.
6. Zero Wind.

WEIGHT POUNDS	KIAS
6750	120
6200	115
5700	110
5200	105

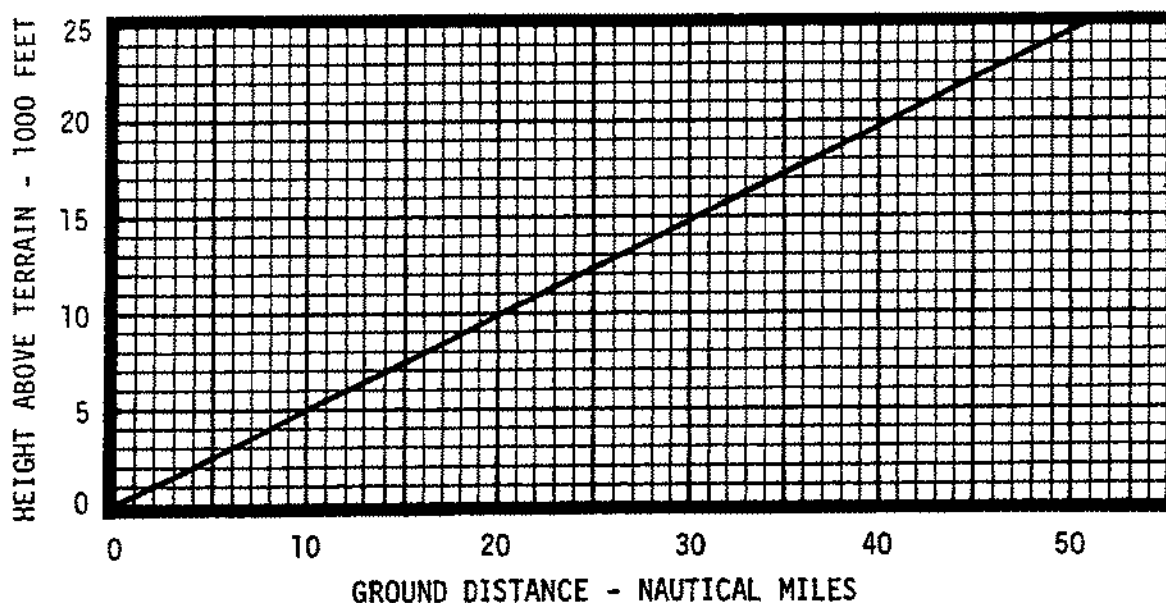
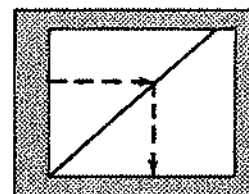


Figure 3-3

FIRE PROCEDURES

Refer to Section 9 if Fire Detection and Extinguishing System is installed.

FIRE ON THE GROUND (Engine Start, Taxi And Takeoff With Sufficient Distance Remaining To Stop)

1. Throttles - CLOSE.
2. Brakes - AS REQUIRED.
3. Mixtures - IDLE CUT-OFF.
4. Battery - OFF (Use Gang Bar).
5. Magnetos - OFF (Use Gang Bar).
6. Evacuate airplane as soon as practical.

INFLIGHT WING OR ENGINE FIRE

1. Both Auxiliary Fuel Pumps - OFF.
2. Operative Engine Fuel Selector - MAIN TANK (Feel For Detent).
3. Emergency Crossfeed Shutoff - OFF (Pull Up).
4. Appropriate Engine - SECURE.
 - a. Throttle - CLOSE.
 - b. Mixture - IDLE CUT-OFF.
 - c. Propeller - FEATHER.
 - d. Fuel Selector - OFF (Feel For Detent).
 - e. Magnetos - OFF.
 - f. Propeller Synchrophaser - OFF (Optional System).
 - g. Alternator - OFF.
 - h. Cowl Flap - CLOSE.
5. Cabin Heater - OFF.
6. Land and evacuate airplane as soon as practical.

INFLIGHT CABIN ELECTRICAL FIRE OR SMOKE

1. Electrical Load - REDUCE to minimum required.
2. Fuel Selectors - MAIN TANK (Feel For Detent).
3. Emergency Crossfeed Shutoff - OFF (Pull Up).
4. Attempt to isolate the source of fire or smoke.
5. Cabin Air Controls - OPEN all vents including windshield defrost.
CLOSE if intensity of smoke increases.
6. Pressurization Air Contamination Procedure - INITIATE if required.

CAUTION

Opening the foul weather windows or emergency exit window will create a draft in the cabin and may intensify a fire.

7. Land and evacuate airplane as soon as practical.

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 compartment and wing leading edge and lower surfaces. Leaks in the fuel system, oil system, or exhaust system can lead to a ground or inflight 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 corrected 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 inflight must be controlled as quickly as possible in an attempt to prevent major structural damage. Both auxiliary fuel pumps should be turned off and the emergency crossfeed shutoff pulled up to reduce pressure on the total fuel system (each auxiliary pump pressurizes a crossfeed line to the opposite fuel selector). The engine on the wing in which the fire exists should be shut down and its fuel selector positioned to OFF even though the fire may not have originated in the fuel system. The cabin heater draws fuel from the crossfeed system and should also be turned off. Descent for landing should be initiated immediately.

An open emergency exit or foul weather window produces a low pressure in the cabin. To avoid drawing the fire into the cabin, the emergency exit and foul weather window should be kept closed. This condition is aggravated with the landing gear and flaps extended. Therefore, the pilot should lower the gear as late in the landing approach as possible. A no-flap landing should also be attempted if practical.

A fire or smoke in the cabin should be controlled by identifying and shutting down the faulty system. Smoke may be removed by opening the cabin air controls. If the smoke increases in intensity when the air controls are opened, they should be closed as this indicates a possible fire in the heater or nose compartment. Normally the pressurization air system will remove smoke from the cabin; however, if the smoke is intense, it may be necessary to initiate the pressurization air contamination procedure presented in this section. When the smoke is intense, the pilot may choose to expel the smoke through the foul weather windows. The foul weather windows should be closed immediately if the fire becomes more intense when the windows are opened.

EMERGENCY DESCENT PROCEDURES

PREFERRED PROCEDURE

1. Throttles - IDLE.
2. Propellers - FULL FORWARD.
3. Mixtures - ADJUST for smooth engine operation.
4. Wing Flaps - UP.
5. Landing Gear - UP.
6. Moderate Bank - INITIATE until descent attitude has been established.
7. Airspeed - 235 KIAS.

IN TURBULENT ATMOSPHERIC CONDITIONS

1. Throttles - IDLE.
2. Propellers - FULL FORWARD.
3. Mixtures - ADJUST for smooth engine operation.
4. Wing Flaps - DOWN 45°.
5. Landing Gear - DOWN.
6. Moderate Bank - INITIATE until descent attitude has been established.
7. Airspeed - 146 KIAS.

EMERGENCY LANDING PROCEDURES**FORCED LANDING (With Power)**

1. Drag over selected field with 15° wing flaps and 105 KIAS noting type of terrain and obstructions.
2. Plan a wheels-down landing if surface is smooth and hard.
 - a. Execute a normal landing, keeping nosewheel off ground until speed is decreased.
3. If terrain is rough or soft, plan a wheels-up landing as follows:
 - a. Approach at 105 KIAS with 15° wing flaps.
 - b. Pressurization Air Controls - PULL.
 - c. All Switches Except Magneto Switches - OFF.
 - d. Mixtures - IDLE CUT-OFF.
 - e. Magneto Switches - OFF.
 - f. Fuel Selectors - OFF (Feel For Detent).
 - g. Emergency Crossfeed Shutoff - OFF (Pull Up).
 - h. Land in a slightly nose-high attitude.

NOTE

On smooth sod with landing gear retracted, the airplane will slide straight ahead about 800 feet with very little damage.

FORCED LANDING (Complete Power Loss)

1. Mixtures - IDLE CUT-OFF.
2. Propellers - FEATHER.
3. Fuel Selectors - OFF (Feel For Detent).
4. Emergency Crossfeed Shutoff - OFF (Pull Up).
5. All Switches Except Battery Switch - OFF.
6. Approach - 120 KIAS.
7. If field is smooth and hard, plan a landing as follows:
 - a. Landing Gear - DOWN within gliding distance of field.
 - (1) Landing Gear Switch - DOWN.
 - (2) GEAR HYD Circuit Breaker - PULL.
 - (3) Emergency Gear Extension T-Handle - PULL.
 - (4) Gear Down Lights - ON; Unlocked Light - OFF.
 - (5) Gear Warning Horn - CHECK.
 - b. Wing Flaps - EXTEND as necessary within gliding distance of field.
 - c. Approach - 105 KIAS.
 - d. Battery Switch - OFF.
 - e. Make a normal landing, keeping nosewheel off the ground as long as practical.
8. If field is rough or soft, plan a wheels-up landing as follows:
 - a. Landing Gear - UP.
 - b. Approach at 105 KIAS with 15° wing flaps.
 - c. Battery Switch - OFF.

- d. Land in a slightly nose-high attitude.

NOTE

On smooth sod with landing gear retracted, the airplane will slide straight ahead about 800 feet with very little damage.

LANDING WITH FLAT MAIN GEAR TIRE

If a blowout occurs during takeoff, proceed as follows:

1. Landing Gear - Leave DOWN.

NOTE

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

2. Fuel Selectors - Turn to main tank on same side as defective tire and feel for detent.

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.

3. Fuel Selectors - Left Engine - LEFT MAIN (Feel For Detent).
Right Engine - RIGHT MAIN (Feel For Detent).
4. Select a runway with a crosswind from the side opposite the defective tire, if a crosswind landing is required.
5. Wing Flaps - DOWN 45°.
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 only on the inflated tire 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 DEFECTIVE MAIN GEAR

1. Fuel Selectors - Turn to main tank on same side as defective gear and feel for detent. Proceed to destination to reduce fuel load.

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.

2. Fuel Selectors - Left Engine - LEFT MAIN (Feel For Detent).
Right Engine - RIGHT MAIN (Feel For Detent).
3. Emergency Crossfeed Shutoff - OFF (Pull Up).
4. 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.
5. Landing Gear - DOWN.
6. Wing Flaps - DOWN 45°.
7. In approach, align airplane with edge of runway opposite the defective landing gear, allowing room for a ground-loop in landing roll.
8. Battery Switch - OFF.
9. Land slightly wing-low toward the operative landing gear and lower the nosewheel immediately for positive steering.
10. Start moderate ground-loop into defective landing gear until airplane stops.
11. Mixtures - IDLE CUT-OFF.
12. Use full aileron in landing roll to lighten the load on the defective landing gear.
13. Apply brakes only on the operative landing gear to maintain desired rate of turn and minimize the landing roll.
14. Fuel Selectors - OFF (Feel For Detent).
15. Evacuate the airplane as soon as it stops.

LANDING WITH FLAT NOSE GEAR TIRE

If a blowout occurred on the nose gear tire during takeoff, 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. Do not exceed aft flight center of gravity limits.
3. Approach at 105 KIAS with 15° wing flaps.
4. Land in a nose-high attitude with or without 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. Throttles - RETARD in 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 NOSE GEAR

1. If Smooth and Hard Surface:
 - a. Move disposable load to baggage area and passengers to available rear seat space. Do not exceed aft flight center of gravity limits.
 - b. Landing Gear - DOWN.
 - c. Approach at 105 KIAS with 15° wing flaps.
 - d. All Switches Except Magneto Switches - OFF.
 - e. Land in a slightly nose-high attitude.
 - f. Mixtures - IDLE CUT-OFF.
 - g. Magneto Switches - OFF.
 - h. Hold nose off throughout ground roll. Lower gently as speed dissipates.
2. If Rough or Sod Surface:

NOTE

This procedure will produce a minimum amount of airplane damage on smooth runways. This procedure is also recommended for short, rough or uncertain field conditions where passenger safety, rather than minimum airplane damage is the prime consideration.

- a. Landing Gear - UP.
- b. Approach at 105 KIAS with 15° wing flaps.
- c. All Switches Except Magneto Switches - OFF.
- d. Land in a slightly nose-high attitude.
- e. Mixtures - IDLE CUT-OFF.
- f. Magneto Switches - OFF.
- g. Fuel Selectors - OFF (Feel For Detent).
- h. Emergency Crossfeed Shutoff - OFF (Pull Up).

LANDING WITHOUT FLAPS (0° Extension)

1. Mixtures - FULL RICH or lean as required for smooth operation.
2. Propellers - FULL FORWARD.
3. Fuel Selectors - MAIN TANKS (Feel For Detent).
4. Minimum Approach Speed - 107 KIAS (See Figure 5-25).
5. Landing Gear - DOWN.

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 - DOWN 45°.
4. Carry sufficient power to maintain approximately 300 feet per minute rate-of-descent.
5. Airspeed - 105 KIAS at 5800 pounds weight. 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.

FUEL SYSTEM EMERGENCY PROCEDURES**ENGINE-DRIVEN FUEL PUMP FAILURE**

1. Fuel Selector - MAIN TANK (Feel For Detent).
2. Auxiliary Fuel Pump - ON.
3. Cowl Flap - AS REQUIRED.
4. Mixture - FULL RICH. Adjust fuel flow to coincide with power setting.
5. As Soon as Practical - LAND.
6. Crossfeed is unusable if other engine is operating.

NOTE

If both an engine-driven fuel pump and an auxiliary fuel pump fail on the same side of the airplane, the failing engine cannot be supplied with fuel from the opposite main tank since that auxiliary fuel pump will operate on the low pressure setting as long as the corresponding engine-driven fuel pump is operative.

ELECTRICAL SYSTEM EMERGENCY PROCEDURES

ALTERNATOR FAILURE (Single)

Indicated By Illumination Of Failure Light

1. Electrical Load - REDUCE.
2. If Circuit Breaker is tripped:
 - a. Turn off affected alternator.
 - b. Reset affected alternator circuit breaker.
 - c. Turn on affected alternator switch.
 - d. If circuit breaker reopens, turn off alternator.
3. If Circuit Breaker does not trip:
 - a. Select affected alternator on voltmeter and monitor output.
 - b. If output is normal and failure light remains on, disregard fail indication and have indicator checked after landing.
 - c. If output is insufficient, turn off alternator and reduce electrical load to one alternator capacity.
 - d. If complete loss of alternator output occurs, check field fuse and replace if necessary. Spare fuses are located on the left side of the console forward of the field fuses.
 - e. If an intermittent light indication accompanied by voltmeter fluctuation is observed, turn off affected alternator and reduce load to one alternator capacity.
 - f. Restrict load on remaining alternator to 80% of the rated load.

ALTERNATOR FAILURE (Dual)

Indicated By Illumination Of Failure Lights

1. Electrical Load - REDUCE.
2. If Circuit Breakers are tripped:
 - a. Turn off alternators.
 - b. Reset circuit breakers.
 - c. Turn on left alternator and monitor output on voltmeter.
 - d. If alternator is charging, leave it on. Disregard failure light if still illuminated.
 - e. If still inoperative, turn off left alternator.
 - f. Repeat steps c through e for right alternator.
 - g. If circuit breakers reopen, prepare to terminate flight.
3. If Circuit Breakers have not tripped:
 - a. Turn off alternators.
 - b. Check field fuses and replace if necessary. Spare fuses are located on the left side of the console forward of the field fuses.
 - c. Turn on left alternator and monitor output on voltmeter.
 - d. If alternator is charging, leave it on. Disregard failure light if still illuminated.
 - e. If still inoperative, turn off left alternator.
 - f. Repeat steps c through e for right alternator.
 - g. If both alternators are still inoperative, turn off alternators and turn on emergency power alternator field switch.
 - h. Repeat steps c through e for each alternator.
 - i. If still inoperative, turn off alternator, nonessential electrical items and prepare to terminate flight.

AVIONICS BUS FAILURE

1. Avionics Bus Switch - OFF.
2. Emergency Power Avionics Bus Switch - ON.

LANDING GEAR EMERGENCY PROCEDURES**HYD PRESS LIGHT ILLUMINATED AFTER GEAR CYCLE**

1. Landing Gear Switch - RAPIDLY RECYCLE.
2. If HYD PRESS light still illuminated:
 - a. Landing Gear - DOWN.
 - b. GEAR HYD Circuit Breaker - PULL.
 - c. If HYD PRESS light remains illuminated - LAND as soon as practical.

NOTE

Insure the GEAR HYD circuit breaker is reset before further extension or retraction of the landing gear is attempted.

LANDING GEAR DOWN AND LOCKED LIGHT ILLUMINATED WITH GEAR HANDLE UP AND HYD PRESS LIGHT OUT

Perform "LANDING GEAR WILL NOT EXTEND HYDRAULICALLY" Checklist.

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.

LANDING GEAR WILL NOT EXTEND HYDRAULICALLY

1. Airspeed - 130 KIAS or less.

NOTE

As low an airspeed as practical is recommended as a lower airspeed will decrease the airloads on the nose gear during extension, thereby insuring the greatest probability of gear extension.

2. Landing Gear Switch - DOWN.
3. GEAR HYD 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 up locks have released.

7. Gear Warning Horn - CHECK.
8. As Soon As Practical - LAND.

CAUTION

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

LANDING GEAR WILL NOT RETRACT HYDRAULICALLY

1. Landing Gear Switch - DOWN.
2. Gear Down Lights - ON; Unlocked Light - OFF.
3. Gear Warning Horn - CHECK.
4. As Soon as Practical - LAND.

FLIGHT INSTRUMENTS EMERGENCY PROCEDURES

VACUUM PUMP FAILURE (Attitude And Directional Gyros)

1. Failure indicated by left or right red failure button exposed on vacuum gage.
2. Automatic valve will select operative source.
3. Vacuum Pressure - CHECK proper vacuum from operative source.

OBSTRUCTION OR ICING OF STATIC SOURCE

1. Static Source - ALTERNATE. Alternate static source is for pilot's instruments only when dual static system is installed.
2. Excess Altitude and Airspeed - MAINTAIN to compensate for change in calibration.

NOTE

See Figures 5-2 and 5-4 for airspeed and altimeter corrections with static source to ALTERNATE.

ENGINE INLET AIR SYSTEM ICING EMERGENCY PROCEDURES

AIR INLET OR FILTER ICING

1. Alternate Air Control(s) - PULL OUT.
2. Propeller(s) - INCREASE (2550 RPM For Normal Cruise).
3. Mixture(s) - LEAN as required.
4. Pressurization Air Control(s) - PULL LH and/or RH as necessary.
 - a. With Both Pressurization Air Sources Dumped:
 - (1) Cabin Vent Control - PULL.
 - (2) Cabin Pressurization Switch - DEPRESSURIZE.

- b. Above 10,000 Ft. with both pressurization air sources dumped:
 - (1) If Supplementary Oxygen is Not Available - EMERGENCY DESCENT TO 10,000 FEET.
 - (2) If Supplementary Oxygen is Available:
 - (a) Oxygen Knob - PULL ON.
 - (b) Assure each occupant is using oxygen.
 - (c) Descend as soon as practical to 10,000 Feet.

PRESSURIZATION SYSTEM EMERGENCY PROCEDURES

IMPENDING SKIN PANEL OR WINDOW FAILURE

1. Cabin Pressurization Switch - DEPRESSURIZE.
2. Cabin Vent Control - PULL.
3. Pressurization Air Controls - PULL.
4. If Above 10,000 Feet and Supplementary Oxygen is Not Available - EMERGENCY DESCENT TO 10,000 FEET.
5. If Above 10,000 Feet and Supplementary Oxygen is Available:
 - a. Oxygen Knob - PULL ON.
 - b. Assure each occupant is using oxygen.
 - c. Descend as soon as practical to 10,000 Feet.

CABIN OVERPRESSURE (Over 5.3 PSI)

1. Pressurization Air Controls - PULL.
2. If Above 10,000 Feet and Supplementary Oxygen is Not Available - EMERGENCY DESCENT TO 10,000 FEET.
3. If Above 10,000 Feet and Supplementary Oxygen is Available:
 - a. Oxygen Knob - PULL ON.
 - b. Assure each occupant is using oxygen.
 - c. Descend as soon as practical to 10,000 Feet.

LOSS OF PRESSURIZATION ABOVE 10,000 FEET

1. Without Supplementary Oxygen - EMERGENCY DESCENT TO 10,000 FEET.
2. With Supplementary Oxygen:
 - a. Oxygen Knob - PULL ON.
 - b. Assure each occupant is using oxygen.
 - c. Descend as soon as practical to 10,000 Feet.

PRESSURIZATION AIR CONTAMINATION

1. Pressurization Air Control(s) - PULL LH and/or RH as necessary.
 - a. With Both Air Sources Dumped:
 - (1) Cabin Vent Control - PULL.
 - (2) Cabin Pressurization Switch - DEPRESSURIZE.
2. Above 10,000 Feet with Both Air Sources Dumped:
 - a. If Supplementary Oxygen is Not Available - EMERGENCY DESCENT TO 10,000 FEET.
 - b. If Supplementary Oxygen is Available:
 - (1) Oxygen Knob - PULL ON.
 - (2) Assure each occupant is using oxygen.
 - (3) Descend as soon as practical to 10,000 Feet.

PROPELLER SYNCHROPHASER

ENGINE INOPERATIVE PROCEDURES

1. Propeller Synchrophaser - OFF (Optional System).

SYNCHROPHASER FAILURE

1. Propeller Synchrophaser - OFF (Optional System).
2. Propeller Synchrophaser Circuit Breaker - PULL (Optional System).

EMERGENCY EXIT WINDOW REMOVAL

The forward oval cabin window on the right side of the passenger compartment should be removed as follows:

1. Emergency Release Handle Plastic Cover - PULL OFF.
2. Release Handle - TURN COUNTERCLOCKWISE.
3. Emergency Exit Window - PULL IN and DOWN.

SPINS

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

1. Throttles - CLOSE IMMEDIATELY.
2. Ailerons - NEUTRALIZE.
3. Rudder - HOLD FULL RUDDER opposite the direction of rotation.
4. Control Wheel - FORWARD BRISKLY, 1/2 turn 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 4
NORMAL PROCEDURES
TABLE OF CONTENTS

	Page		Page
INTRODUCTION	4-1	Before Taxiing	4-13
Preflight Inspection	4-2	Taxiing	4-14
NORMAL PROCEDURES		Before Takeoff	4-14
ABBREVIATED CHECKLIST . . .	4-5	Takeoff	4-16
Airspeeds For Safe		After Takeoff	4-17
Operation	4-5	Climb	4-18
Before Starting Engines . .	4-5	Cruise	4-19
Starting Engines	4-6	Descent	4-22
Before Taxiing	4-6	Before Landing	4-23
Taxiing	4-6	Balked Landing	4-25
Before Takeoff	4-6	After Landing	4-25
Takeoff	4-6	Shutdown	4-25
After Takeoff	4-7	Stall	4-26
Climb	4-7	Maneuvering Flight	4-26
Cruise	4-7	Procedures For Practice	
Descent	4-7	Demonstration Of V_{MC_A} . .	4-26
Before Landing	4-7	Night Flying	4-28
After Landing	4-7	Cold Weather Operation . .	4-29
Shutdown	4-8	Alternate Induction Air . .	4-31
AMPLIFIED NORMAL		Noise Abatement	4-32
PROCEDURES	4-9	Oxygen Use And The	
Preflight Inspection . . .	4-9	Pressurized	
Before Starting Engines . .	4-10	Airplane	4-33/4-34
Starting Engines	4-11		

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.

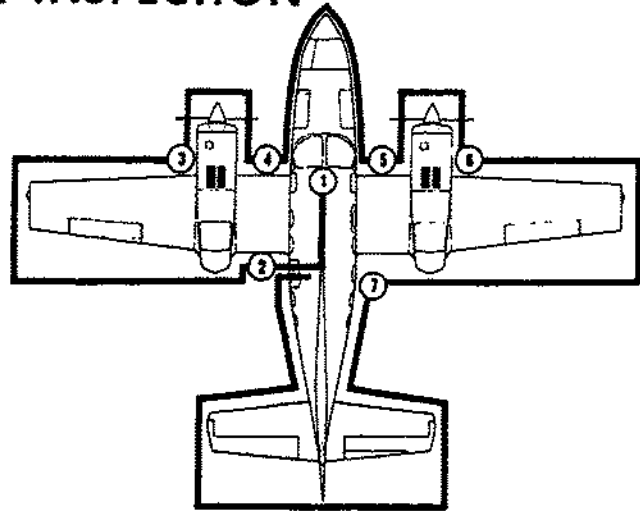
NOTE

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.

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.
- Refer to Section 8 for quantities, materials and specifications of frequently used service items.



- 1
 - a. Control Lock(s) - REMOVE and stow.
 - b. Parking Brake - SET.
 - c. Static Source Selector - NORMAL.
 - d. All Switches - OFF.
 - e. All Circuit Breakers - IN.
 - f. Voltammeter Selector - BATT.
 - g. Oxygen - ON; Quantity, Masks and Hoses - CHECK; Oxygen - OFF.
 - h. Landing Gear Switch - DOWN.
 - i. Trim Tab Controls (3) - SET for takeoff.
 - j. Left Fuel Selector - LEFT MAIN (Feel For Detent).
 - k. Right Fuel Selector - RIGHT MAIN (Feel For Detent).
 - l. Emergency Crossfeed Shutoff - OPEN (Push Down).
 - m. Battery Switch - ON.
 - n. Fuel Gages - CHECK quantity and operation.
 - o. *Fuel Totalizer - SET.
 - p. Wing Flaps - DOWN 45°.
 - q. Anti-Collision Lights - CHECK operation.
 - r. *Electric Windshield - CHECK operation by observing discharge on voltammeter if inflight use is anticipated. Ensure system is turned off after operational check.
 - s. Pitot, Stall and Vent Heat Switch(es) - ON 20 seconds then OFF. Ensure pitot tube cover(s) are removed before actuating pitot heat switch(es).
 - t. Navigation Lights - ON.
 - u. Windshields and Windows - CHECK for cracks and general condition.
 - v. *Cabin Fire Extinguisher - CHECK SECURITY.
- 2
 - a. Battery Compartment Cover - SECURE.
 - b. Wing Locker Baggage Door - SECURE.
 - c. Wing Flap - CHECK security and attachment.
 - d. Control Surface Lock - REMOVE, if installed.
 - e. Aileron and Tab - CHECK condition, freedom of movement and tab position.
 - f. Navigation Light - CHECK operation.
 - g. Landing Light Filament - CHECK condition.
 - h. Stall Warning Vane - CHECK freedom of movement, audible warning and warm.
 - i. Main Tank Fuel Vent - CLEAR.
 - j. Bottom Outboard Wing - CHECK for fuel leaks or stains.
 - k. Main Tank Fuel Quantity - CHECK; Cap - SECURE.
 - l. *Outboard Deice Boot - CHECK condition and security.
 - m. Main Tank Fuel Sumps - DRAIN (2 Drains).
 - n. Fuel Strainer - DRAIN.
- 3
 - a. Engine Compartment General Condition - CHECK for fuel, oil, hydraulic fluid and exhaust leaks or stains.
 - b. Intake Air and Intercooler Opening - CLEAR.
 - c. Oil Level - CHECK minimum 9 quarts.
 - d. Propeller and Spinner - EXAMINE for nicks, security and oil leaks.
 - e. Engine Openings - CLEAR.
 - f. *Inboard Deice Boot - CHECK condition and security.
 - g. Main Gear, Strut, Door, Tire and Wheel Well - CHECK.
 - h. Wing Tie Down - REMOVE.
 - i. Crossfeed Line - DRAIN.
 - j. Lower Fuselage, Nose and Center Section - CHECK for fuel and oil leaks or stains and antenna security.
 - k. Heat Exchanger Opening - CLEAR.
 - l. *Engine Fire Extinguisher Bottle Pressure - CHECK temp/charge pressure schedule.

Figure 4-1 (Sheet 1 of 2)

PREFLIGHT INSPECTION

- 4
- Hydraulic Fluid Reservoir Level - CHECK.
 - Emergency Landing Gear Blow Down Bottle Pressure - CHECK in the green arc. Check that red ring is not showing on the control rod. If red ring is visible, refer to the Airplane Service Manual before flight.
 - Nose Baggage Door - SECURE.
 - Avionics Bay Door - SECURE.
 - Nose Gear, Strut, Stop Block, Door, Tire and Wheel Well - CHECK.
 - Tie Down - REMOVE.
 - Pitot Cover - REMOVE; Pitot Tube - CLEAR and WARM.
 - Ram Air Inlet - CLEAR.
 - *Pitot Cover - REMOVE; Pitot Tube - CLEAR and WARM.
 - *Oxygen Overboard Discharge Indicator - CHECK green disc installed.
 - Heater Inlet and Outlet - CLEAR.
 - Baggage Door - SECURE.
- 5
- Heat Exchanger Opening - CLEAR.
 - *Inboard Deice Boot - CHECK condition and security.
 - Lower Fuselage, Nose and Center Section - CHECK for fuel and oil leaks or stains and antenna security.
 - Main Gear, Strut, Door, Tire and Wheel Well - CHECK.
 - Wing Tie Down - REMOVE.
 - Crossfeed Line - DRAIN.
 - *Engine Fire Extinguisher Bottle Pressure - CHECK temp/charge pressure schedule.
 - *Air Conditioning Outlet Air Opening - CLEAR.
 - Intake Air and Intercooler Opening - CLEAR.
 - Oil Level - CHECK minimum 9 quarts.
 - Propeller and Spinner - EXAMINE for nicks, security and oil leaks.
 - Engine Openings - CLEAR.
- 6
- *Air Conditioning Fluid Level - CHECK.
 - *Air Conditioning Inlet Air Opening - CHECK DOOR CLOSED.
 - Engine Compartment General Condition - CHECK for fuel, oil, hydraulic fluid and exhaust leaks or stains.
 - Fuel Strainer - DRAIN.
 - Main Tank Fuel Sumps - DRAIN (2 Drains).
 - *Outboard Deice Boot - CHECK condition and security.
 - Main Tank Fuel Quantity - CHECK; Cap - SECURE.
 - Fuel Vent - CLEAR.
 - Bottom Outboard Wing - CHECK for fuel leaks or stains.
 - *Landing Light Filament - CHECK condition.
 - Navigation Light - CHECK operation.
 - Control Surface Lock - REMOVE, if installed.
 - Aileron and Servo Tab - CHECK condition, freedom of movement and tab position. Move aileron up; tab should move down.
 - Wing Flap - CHECK security and attachment.
 - Wing Locker Baggage Door - SECURE.
 - *Alcohol Deice Tank - CHECK quantity.
- 7
- Static Port(s) - CLEAR. Do not blow into static ports.
 - Tailcone Drain Holes - CHECK clear of obstructions.
 - *Deice Boots - CHECK condition and security.
 - Control Surface Lock(s) - REMOVE, if installed.
 - Elevator and Tab - CHECK condition, freedom of movement and tab position.
 - Rudder and Tab - CHECK condition, freedom of movement and tab position. Move rudder right; tab should move left.
 - Tie Down - REMOVE.
 - *Deice Boots - CHECK condition and security.
 - *Rudder Lock - RELEASED.
 - Static Port(s) - CLEAR. Do not blow into static ports.
 - Cabin Door and Seal - CHECK security and condition.
 - Wing Flaps - UP. Visually check retraction.
 - Battery Switch - OFF.
 - Navigation Lights - OFF.

*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 6750 Pounds
2. Landing Weight 6750 Pounds
3. Sea Level, Standard Day

(1) Air Minimum Control Speed	79 KIAS
(2) Takeoff and Climb to 50 Feet (0° Wing Flaps)	98 KIAS
(3) All Engines Best Angle-of-Climb Speed (0° Wing Flaps)	88 KIAS
(4) All Engines Best Rate-of-Climb Speed (0° Wing Flaps)	108 KIAS
(5) All Engines Landing Approach Speed (45° Wing Flaps)	94 KIAS
(6) Maneuvering Speed	145 KIAS
(7) Structural Cruise Speed	203 KIAS
(8) Never Exceed Speed	237 KIAS
(9) Speed for Transition to Balked Landing Conditions	82 KIAS
(10) Maximum Demonstrated Crosswind Velocity	19 KNOTS

Figure 4-2

BEFORE STARTING ENGINES

1. Preflight - COMPLETE.
2. Cabin Door - LATCHED and SECURE.
3. Control Locks - REMOVE.
4. Seat, Seat Belts and Shoulder Harness - ADJUST and SECURE.
5. Fuel Selectors - MAIN TANKS.
6. Landing Gear Switch - DOWN.
7. Mixtures, Propellers and Throttles - SET.
8. All Switches and Circuit Breakers - SET.
9. Battery and Alternators - ON.
10. Landing Gear Position Indicator Lights - Check green lights ON.
11. Annunciator Panel - PRESS-TO-TEST.
12. Lights - AS REQUIRED.

STARTING ENGINES

1. Propellers - CLEAR.
2. Magneto Switches - ON.
3. Engines - START.
4. Auxiliary Fuel Pumps - LOW.
5. Engine Instruments - CHECK.

BEFORE TAXIING

1. Avionics - ON and SET.

TAXIING

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

BEFORE TAKEOFF

1. Engine Runup - COMPLETE.
 - a. Throttles - 1700 RPM.
 - b. L and R HYD FLOW Lights - OFF.
 - c. Alternators - CHECK.
 - d. Vacuum System - CHECK.
 - e. Magnetos - CHECK.
 - f. Propellers - CHECK.
 - g. Engine Instruments - CHECK.
 - h. Throttles - 1000 RPM.
2. Fuel Quantity - CHECK.
3. Fuel Selectors - MAIN TANKS.
4. Emergency Crossfeed Shutoff - CHECK OPEN (Push Down).
5. Cowl Flaps - OPEN.
6. Trim Tabs - SET.
7. Wing Flaps - UP.
8. Propeller Synchrophaser - OFF (Optional System).
9. Flight Instruments and Avionics - SET.
10. Lights - AS REQUIRED.
11. All Cabin Doors and Windows - CLOSED.
12. Pressurization - SET.
13. Annunciator Panel - CLEAR.
14. Auxiliary Fuel Pumps - ON.
15. Flight Controls - CHECK.
16. Ice Protection - AS REQUIRED.
17. Seat Belts and Shoulder Harness - SECURE.

TAKEOFF

1. Power - SET FOR TAKEOFF.
2. Mixtures - CHECK fuel flows in the white arc.
3. Engine Instruments - CHECK.
4. Air Minimum Control Speed - 79 KIAS.
5. Takeoff and Climb to 50 Feet - 98 KIAS at 6750 pounds. Refer to Section 5 for speeds at reduced weights.

AFTER TAKEOFF

1. Landing Gear - RETRACT.
2. Best Angle-of-Climb Speed - 88 KIAS at sea level to 92 KIAS at 20,000 feet with obstacle.
3. Best Rate-of-Climb Speed - 108 KIAS at sea level and 6750 pounds. Refer to Section 5 for speed at reduced weight.

CLIMB

1. Power - SET.
2. Mixtures - ADJUST.
3. Cowl Flaps - AS REQUIRED.
4. Pressurization - SET.

CRUISE

1. Cruise Power - SET.
2. Mixtures - LEAN.
3. Cowl Flaps - AS REQUIRED.
4. Propellers - SYNCHRONIZE manually.
5. Propeller Synchrophaser - ON.
6. Auxiliary Fuel Pumps - OFF or LOW if required.
7. Fuel Selectors - MAIN TANKS.
8. Cabin Altitude and Delta Pressure - CHECK.

DESCENT

1. Fuel Selectors - MAIN TANKS.
2. Auxiliary Fuel Pumps - ON.
3. Pressurization - SET.
4. Power - AS REQUIRED.
5. Cowl Flaps - CLOSE.
6. Mixtures - ADJUST.
7. Altimeter - SET.

BEFORE LANDING

1. Seat Belts and Shoulder Harness - SECURE.
2. Propeller Synchrophaser - OFF (Optional System).
3. Wing Flaps - AS REQUIRED.
4. Landing Gear - DOWN.
5. Mixtures - ADJUST.
6. Propellers - FULL FORWARD.
7. Approach Speed - 94 KIAS at 6750 pounds. Refer to Section 5 for speeds at reduced weights.

AFTER LANDING

1. Auxiliary Fuel Pumps - LOW.
2. Cowl Flaps - OPEN.
3. Wing Flaps - UP.

SHUTDOWN

1. Parking Brake - SET if brakes are cool.
2. Accessory Switches - OFF.
3. Auxiliary Fuel Pumps - OFF.
4. Engines - SHUT DOWN.
5. Battery, Alternator And Magneto Switches - OFF.

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 tail surface hinges, fuel and oil quantity and security of fuel and oil filler caps. 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, the flight and trim tab controls should be double-checked for free and correct movement and security. The security of all inspection plates on the airplane should be checked following periodic inspections. Since avionics and heater maintenance requires the mechanic to work in the nose compartments, the nose compartment doors are opened for access to equipment. Therefore, it is important after such maintenance to double-check the security of these doors. If the airplane has been waxed or polished, check the external static pressure source holes for stoppage.

If the airplane has been exposed to much ground handling in a crowded hangar, it should be checked for dents and scratches on wings, main tanks, 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 on the intake air filters and engine cooling fins. 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.

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 and abrasion on leading edges of the horizontal tail. Stone damage to the propeller can seriously reduce the fatigue life of the blades.

Airplanes that are operated from rough fields, especially at high altitudes, are subjected to abnormal landing gear abuse. Check frequently all components of the landing gear retracting mechanisms, shock struts, tires and brakes. Undue landing and taxi loads will be subjected on the airplane structure when the shock struts are insufficiently extended. 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.

While operating in the pressurized mode, an immediate depressurization would cause extreme passenger discomfort. For this reason, it is important to inspect the cabin door seal for condition. Also, the emergency exit, windows and windshields must be free of cracks and deep scratches.

Satisfactory operation of the pitot tube(s) and stall warning transmitter heating elements is determined by observing a discharge on the voltammeter when the pitot and stall heat switches are turned ON. The effectiveness of these heating elements may be verified by cautiously feeling the heat of these devices while the 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 blowdown valve assembly should be reset at the blowdown bottle in the left nose compartment. Check the valve assembly position. If the red band is visible, the blowdown bottle must be serviced in accordance with the airplane Service 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. Cabin Door - LATCHED and SECURE.
3. Control Locks - REMOVE.
4. Seat, Seat Belts and Shoulder Harness - ADJUST and SECURE.
5. Brakes - SET.
6. Fuel Selectors - Left Engine - LEFT MAIN (Feel For Detent).
Right Engine - RIGHT MAIN (Feel For Detent).
7. Landing Gear Switch - DOWN.
8. Mixtures - FULL RICH.
9. Propellers - FULL FORWARD.
10. Throttles - OPEN ONE INCH.
11. All Switches - OFF.
12. Circuit Breakers - IN.
13. Emergency Power Alternator Field Switch - OFF.
14. Emergency Power Avionics Bus Switch - OFF.
15. Avionics Bus Switch - OFF.
16. Auxiliary Fuel Pump Switches - OFF.
17. Battery and Alternators - ON.
18. Master Light Dimming Switch - AS REQUIRED.
19. Landing Gear Position Indicator Lights - Check green lights ON.
20. Annunciator Light Panel - PRESS-TO-TEST.
21. Altimeter and Clock - SET.
22. Fuel Quantity - CHECK.
23. Cabin Air Controls - AS REQUIRED.
24. Alternate Air Controls - IN.
25. External Lights - AS REQUIRED.

NOTE

Ground operation of the high intensity anti-collision lights can be of considerable annoyance to ground personnel and other pilots.

STARTING (Left Engine First Without External Power)

1. Propeller - CLEAR.
2. Magneto Switches - ON.
3. Engine - START.
 - a. Starter Button - PRESS.
 - b. Primer Switch - Left Engine - LEFT.
Right Engine - RIGHT.

CAUTION

- If the primer is activated for excessive periods of time with the engine inoperative on the ground or during flight, damage may be incurred to the engine and/or airplane due to fuel accumulation in the induction system. Similar conditions may develop when the engine is shutdown with the auxiliary fuel pump ON.
- Should fuel priming or auxiliary fuel pump operation periods in excess of 60 seconds occur, the engine manifold must be purged by one of the following procedures:
 - a. With auxiliary fuel pump OFF, allow manifold to drain at least 5 minutes or until fuel ceases to flow out of the drain under the nacelle.
 - b. If circumstances do not allow natural draining periods recommended above, with the auxiliary fuel pump OFF, magnetos OFF, mixture IDLE CUT-OFF and throttle FULL OPEN, turn engine with starter or by hand a minimum of 15 revolutions.

4. Auxiliary Fuel Pump - LOW to purge vapor from fuel system.
5. Throttle - 800 to 1000 RPM.
6. Oil Pressure - 10 PSI minimum in 30 seconds in normal weather, or 60 seconds in cold weather. If no indication appears, shutdown engine and investigate.
7. Right Engine - START. Repeat steps 1 through 6.
8. Alternators - CHECK.

STARTING ENGINES (Left Engine First With External Power)

1. Battery Switch - ON.
2. Alternator Switches - OFF.
3. External Power Source - ATTACH.

NOTE

For complete external power source operation refer to Section 7.

4. Propeller - CLEAR.
5. Magneto Switches - ON.
6. Engine - START.
 - a. Starter Button - PRESS.
 - b. Primer Switch - Left Engine - LEFT.
Right Engine - RIGHT.

CAUTION

- If the primer is activated for excessive periods of time with the engine inoperative on the ground or during flight, damage may be incurred to the engine and/or airplane due to fuel accumulation in the induction system. Similar conditions may develop when the engine is shutdown with the auxiliary fuel pump ON.
- Should fuel priming or auxiliary fuel pump operation periods in excess of 60 seconds occur, the engine manifold must be purged by one of the following procedures:
 - a. With auxiliary fuel pump OFF, allow manifold to drain at least 5 minutes or until fuel ceases to flow out of the drain under the nacelle.
 - b. If circumstances do not allow natural draining periods recommended above, with the auxiliary fuel pump OFF, magnetos OFF, mixture IDLE CUT-OFF and throttle FULL OPEN, turn engine with starter or by hand a minimum of 15 revolutions.

7. Auxiliary Fuel Pump - LOW to purge vapor from fuel system.
8. Throttle - 800 to 1000 RPM.
9. Oil Pressure - 10 PSI minimum in 30 seconds in normal weather, or 60 seconds in cold weather. If no indication appears, shutdown engine and investigate.
10. Right Engine - START. Repeat steps 4 through 9.
11. External Power Source - REMOVE.
12. Alternator Switches - ON.
13. Alternators - CHECK.

The left engine is normally started first because the cable from the battery to this engine is much shorter permitting more electrical power to be delivered to the starter. If battery is low, the left engine should start more readily.

When using an external power source, it is recommended that the airplane be started with the alternator switches OFF.

NOTE

Release starter button as soon as engine fires or engine will not accelerate and flooding can result.

The continuous flow fuel injection system will start spraying fuel in the engine intake ports as soon as the primer switch is actuated and the throttle and mixture controls are opened. If the auxiliary pump is turned on accidentally while the engine is stopped with the throttle open and the mixture rich, liquid fuel will collect temporarily in the cylinder intake ports. The quantity of fuel deposited will depend upon the amount of throttle opening and the length of time the pump has been operating. If this happens, it is advisable to wait a few minutes until the fuel drains away, then turn the propeller through 15 complete revolutions. This is done to prevent the possibility of engine damage due to hydrostatic lock before starting the engine. To avoid flooding, begin cranking the engine prior to priming the engine.

Engine mis-starts, characterized by weak intermittent explosions followed by black puffs of smoke from the exhaust, are the result of flooding or overpriming. This situation is more apt to develop in hot weather, or when the engines are hot. If it occurs, repeat the starting procedure with the throttle approximately 1/2 open, the mixture in IDLE CUT-OFF and the primer switch OFF. As the engine fires, move the mixture control to FULL RICH and close the throttle to idle.

If an engine is underprimed, as may occur in cold weather with a cold engine, repeat the starting procedure while holding the primer switch ON for 5 to 10 seconds until the engine fires.

If cranking longer than 30 seconds is required, allow starter-motor to cool five minutes before cranking again since excessive heat may damage the armature windings.

After the engines are started, the auxiliary fuel pumps should be switched to LOW to provide for improved purging and vapor clearing in the fuel system.

BEFORE TAXIING

1. Avionics Bus Switch - ON.
2. Avionics - SET.
3. Lights - AS REQUIRED.
4. Cabin Temperature - AS REQUIRED.
 - a. If heating and defrosting is required:
 - (1) Cabin Vent Control - PUSH IN.
 - (2) Pressurization Air Temperature Controls - FULL CLOCKWISE.
 - (3) Forward and Aft Cabin Air Knobs - PULL OUT.
 - (4) Defrost Knob - AS REQUIRED.
 - (5) Cabin Heat Knob - AS REQUIRED.
 - (6) Cabin Heat Switch - ON.
 - (7) Heat Registers - AS REQUIRED.
 - b. If ventilation is required:
 - (1) Cabin Vent Control - PULL OUT.
 - (2) Pressurization Air Temperature Controls - FULL COUNTERCLOCKWISE.
 - (3) Forward and Aft Cabin Air Knobs - PULL OUT.
 - (4) Cabin Fan Switch - NORMAL or HIGH.
 - (5) Heat Registers - AS REQUIRED.
5. Brakes - RELEASE. Pushing in the parking brake knob releases the trapped brake fluid, allowing the brakes to be released.

TAXIING

1. Throttles - AS REQUIRED.
2. Brakes - CHECK.
3. Flight Instruments - CHECK.

A steerable nosewheel, interconnected with the rudder system, provides positive control up to 18° left or right, and free turning from 18° to 52° 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 operation of the turn-and-bank indicator and directional gyro should also be checked during taxiing. When turning right, the turn-and-bank needle should deflect right while the ball goes left and directional gyro heading increases in numerical value. In a left turn the converse is true. At this time the artificial horizon should be up to speed and indicating a level attitude.

Most of the engine warm-up should be done during taxiing, with just enough power to keep the airplane moving. Engine speed should not exceed 1000 RPM while the oil is cold.

Do not operate engines at high RPM when taxiing over gravel or loose material that may cause damage to the propeller blades.

BEFORE TAKEOFF

1. Brakes - SET.
2. Engine Runup:
 - a. Throttles - 1700 RPM.
 - b. L and R HYD FLOW Lights - OFF.
 - c. Alternators - CHECK.
 - d. Vacuum System - CHECK 4.75 to 5.25 inches Hg.
 - e. Magnetos - CHECK 150 RPM maximum drop with a maximum differential of 50 RPM.

- f. Propellers - CHECK feathering to 1200 RPM; return to high RPM (Full Forward Position).

CAUTION

During propeller feathering checks, do not allow the propeller RPM to fall below 1000 RPM as this may damage the hub mechanism.

- g. Engine Instruments - CHECK green arc.
h. Throttles - 1000 RPM.

NOTE

It is important that the engine oil temperature be within the normal operating range prior to applying takeoff power. Even cautious power applications with cool oil may result in momentarily exceeding the 38.0 inches Hg. manifold pressure limit. Refer to Section 7 if momentary overboost of manifold pressure occurs.

3. Fuel Quantity - CHECK.
4. Fuel Selectors - RECHECK - Left Engine - LEFT MAIN (Feel For Detent).
Right Engine - RIGHT MAIN (Feel For Detent).
5. Emergency Crossfeed Shutoff - RECHECK OPEN (Push Down).
6. Alternate Air Controls - IN.
7. Cowl Flaps - OPEN.
8. Trim Tabs - SET elevator, aileron and rudder tabs in the TAKEOFF range.
9. Wing Flaps - UP.
10. Propeller Synchrophaser - OFF (Optional System).
11. Flight Instruments and Avionics - SET.
12. Lights - AS REQUIRED.
13. All Cabin Doors and Windows - CLOSED.
14. Alternate Air Controls - IN.
15. Pressurization Air Controls - PUSH IN and LOCK.
16. Cabin Pressurization Switch - PRESSURIZE.
17. Cabin Rate - ARROW UP (Optional System).
18. Cabin Altitude - SET 500 feet above field pressure altitude (Optional System).
19. Cabin Vent Control - PUSH IN.
20. Annunciator Panel - CLEAR.
21. Auxiliary Fuel Pumps - ON.
22. Flight Controls - CHECK, free and correct.
23. Ice Protection Equipment - AS REQUIRED.
24. Seat Belts and Shoulder Harness - SECURE.
25. Brakes - RELEASE. Push in parking brake control.

Full throttle checks on the ground are not recommended unless there is good reason to suspect that the engines are not operating properly. Do not runup the engines over loose gravel or cinders because of possible stone damage or abrasion to the propeller tips.

If the ignition system produces an engine speed drop in excess of 150 RPM, or if the drop in RPM between the left and right magneto differs by more than 50 RPM, continue warm-up a minute or two longer before rechecking the system. If there is doubt concerning operation of the ignition system, checks at higher engine speed will usually confirm if a deficiency exists. In general, a drop in excess of 150 RPM is not considered acceptable.

A careful check should be made of the vacuum system. The minimum and maximum allowable suctions are 4.75 and 5.25 inches Hg., respectively, on the instrument. Good alternator condition is also important for instrument flight since satisfactory operation of all avionics equipment and electrical instruments is essential. The alternators are checked during engine runup (1700 RPM) by positioning the selector switch in the L ALT and R ALT position and observing the charging rate on the voltammeter.

A simple last minute recheck of important items should include a quick glance to see if all switches are ON, the mixture and propeller controls are forward, all flight controls have free and correct movement and the fuel selectors are properly positioned.

NOTE

Make sure that weight does not exceed 6750 pounds before attempting takeoff.

A mental review of all single-engine speeds, procedures and field length requirements should be made prior to takeoff.

TAKEOFF

1. Power - 2700 RPM and FULL THROTTLE.

NOTE

Apply full throttle smoothly to avoid propeller surging and excessive manifold pressures. Refer to Section 7 if momentary overboost of manifold pressure occurs.

2. Mixtures - CHECK fuel flows in the white arc.
3. Engine Instruments - CHECK.
4. Air Minimum Control Speed - 79 KIAS.
5. Elevator Control - Raise nosewheel at 93 KIAS.
6. Lift-Off - 98 KIAS.

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 Rate-of-Climb 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.

Since the use of full throttle is not recommended in the static runup, closely observe full-power engine operation early in the takeoff run. The maximum allowable manifold pressure of 38.0 inches Hg. manifold pressure should not be exceeded. Throttle action should be smooth and slow in order that the waste gate can become operative as early as possible. Signs of rough engine operation, unequal power between engines, or sluggish engine acceleration are good cause for discontinuing the takeoff. If this occurs, make a thorough full throttle static runup before another takeoff is attempted.

Full throttle operation is recommended on takeoff since it is important that a speed well above air minimum control speed (79 KIAS) be obtained as rapidly as possible. It is desirable to accelerate the airplane to 98 KIAS (intentional one engine inoperative speed) before lift-off for additional safety in case of an engine failure. This safety may have to be compromised slightly where short and rough fields prohibit such high speed before takeoff.

For crosswind takeoffs, additional power may be carried on the upwind engine until the rudder becomes effective. The airplane is accelerated to a slightly higher than normal takeoff 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.

A takeoff with one main tank full and the opposite tank low on fuel creates a lateral unbalance. This is not recommended since gusty air or premature lift-off could create a serious control problem.

After takeoff, it is important to maintain the intentional one engine inoperative climb speed (98 KIAS) to 50 feet. As the airplane accelerates still further to all engines best rate-of-climb speed (108 KIAS), it is good practice to climb rapidly to an altitude at which the airplane is capable of circling the field on one engine.

AFTER TAKEOFF

1. Brakes - APPLY momentarily.
2. Landing Gear - RETRACT. Check gear unlocked and HYD PRESS lights off.
3. Best Angle-of-Climb Speed (Sea Level) - 88 KIAS after reaching 50 feet if immediate obstacle clearance is a consideration.
4. Best Rate-of-Climb Speed - 108 KIAS at sea level and 6750 pounds. Refer to Section 5 for climb speed at altitude and reduced weight.
5. Auxiliary Fuel Pumps - CHECK ON.

To establish climb configuration, retract the landing gear, set climb power, check auxiliary fuel pumps on and adjust the mixtures for the selected power setting.

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.

Power reduction will vary according to the requirements of the traffic pattern or surrounding terrain, weight, field elevation, temperature, environmental considerations and engine condition. However, a normal after takeoff power setting is 2450 RPM and 31.5 inches Hg. manifold pressure.

CLIMB

CRUISE CLIMB

1. Power - 2450 RPM and 31.5 inches Hg.
2. Airspeed - 115 to 140 KIAS.
3. Mixtures - ADJUST to climb fuel flow.
4. Cowl Flaps - AS REQUIRED.
5. Cabin Altitude Control - SET SLOWLY after cabin pressure has stabilized. Reset cabin altitude control to destination field pressure altitude plus 500 feet (outer scale) or cruise altitude plus 500 feet (inner scale) whichever gives the highest cabin altitude (Optional System).
6. Cabin Rate Control - SET to reach selected cabin altitude at approximately the same time the airplane reaches cruise altitude (Optional System).
7. Propellers - SYNCHRONIZE manually.
8. Quadrant Friction Lock - TIGHTEN securely (With Synchrophaser Installed).
9. Propeller Synchrophaser - PHASE (Optional System). Light should illuminate continuously.
 - a. Phasing Knob - ADJUST for desired position.

MAXIMUM CLIMB

1. Power - 2600 RPM and FULL THROTTLE below 20,000 feet.
Placarded manifold pressure above 20,000 feet.
2. Airspeed - 108 KIAS.
3. Mixtures - FULL RICH below 20,000 feet (White Triangle).
LEAN as required above 20,000 feet (Blue Arc).
4. Cowl Flaps - AS REQUIRED.
5. Cabin Altitude Control - SET SLOWLY after cabin pressure has stabilized. Reset cabin altitude control to destination field pressure altitude plus 500 feet (outer scale), or cruise altitude plus 500 feet (inner scale) whichever gives the highest cabin altitude (Optional System).
6. Cabin Rate Control - SET to reach selected cabin altitude at approximately the same time the airplane reaches cruise altitude (Optional System).

Power settings for climb must be limited to 2600 RPM and 38.0 inches Hg. manifold pressure below 20,000 feet and placarded manifold pressures above 20,000 feet.

Normal cruising climb is recommended where practical and should be conducted at 115 to 140 KIAS, using approximately 77.5% power (2450 RPM and 31.5 inches Hg. manifold pressure). The mixture should be leaned in this type of climb to give the desired fuel flow in the climb dial range (blue triangle) which is approximately best power mixture.

If it is necessary to climb rapidly to clear mountains or reach favorable winds at high altitudes, the all engines best rate-of-climb speed of 108 KIAS should be used with maximum normal operating power. During maximum performance climbs, the mixture should remain at the white triangle up to the engine critical altitude and at the appropriate climb power range above critical altitude. It is recommended that the auxiliary fuel pumps be ON, and the mixture remain at the climb mixture setting for approximately 5 minutes after establishing cruising flight before leaning is initiated. This procedure will eliminate fuel vaporization problems likely to occur from rapid altitude changes.

If an obstruction ahead requires a steep climb angle, the airplane should be flown at the all engines best angle-of-climb speed with wing flaps up and maximum normal operating power. This speed varies from 88 KIAS at sea level to 92 KIAS at 20,000 feet.

If the optional pressurization system is installed, adjust the cabin altitude and cabin rate controls as follows. After the cabin pressure has stabilized, slowly reset the cabin altitude control to the destination field pressure altitude plus 500 feet on the outer scale or cruise altitude plus 500 feet on the inner scale. Make the selection which will provide the highest cabin altitude. When a cabin altitude change is required, 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. This will permit a high airplane rate-of-climb to be used and still provide a comfortable environment for the passengers.

During cruise climbs, positioning the propeller synchrophaser to PHASE will eliminate the unpleasant audio beat accompanying unsynchronized operation. The propeller synchronizer can also provide a significant reduction in cabin vibration.

With the propellers slightly out of synchronization so that an audio beat is obtained approximately once each 5 seconds, it should be noted that the vibration level of the cabin and instrument panel will increase and decrease at a rate of approximately once each 20 seconds. Optimum operation will be obtained by manually synchronizing the propellers and positioning the synchrophaser switch to PHASE. Best propeller synchronizing is obtained by making the final adjustment of the propeller controls in a DECREASE RPM direction. For best operation, securely tighten the quadrant friction lock to prevent the slaved propeller control from creeping.

CRUISE

1. Cruise Power - 2100 to 2450 RPM and 17.0 to 31.5 inches Hg. or 2200 to 2300 RPM and 17.0 to 34.0 inches Hg.

NOTE

Maintain sufficient power for pressurization requirements.

2. Mixtures - LEAN for desired cruise fuel flow as determined from your power computer. Recheck mixtures if power, altitude or OAT changes.
3. Cowl Flaps - AS REQUIRED.
4. Propellers - SYNCHRONIZE manually.
5. Quadrant Friction Lock - TIGHTEN securely (With Synchrophaser Installed).
6. Propeller Synchrophaser - PHASE (Optional System). Light should illuminate continuously.
 - a. Phasing Knob - ADJUST for desired phasing position.
7. Auxiliary Fuel Pumps - OFF or LOW, if required.
 - a. Crossfeeding - LOW.
8. Fuel Selectors - Left Engine - LEFT MAIN (Feel For Detent).
Right Engine - RIGHT MAIN (Feel For Detent).

NOTE

Turn auxiliary fuel pumps to LOW and mixtures to FULL RICH when switching tanks.

9. Cabin Altitude Control - SET SLOWLY if cruising altitude changes. Reset cabin altitude control to destination field pressure altitude plus 500 feet (outer scale), or cruise altitude plus 500 feet (inner scale) whichever gives the highest cabin altitude (Optional System).
10. Cabin Rate Control - ARROW UP.
11. If Cabin Altitude Light Illuminates (cabin altitude above 10,000 feet) - DESCEND or use supplementary oxygen as follows:
 - a. Mask - Connect mask and hose assembly and put mask on.
 - b. Hose Coupling - Plug into oxygen outlet inside access door in outboard armrest.
 - c. Oxygen Flow Indicator - Check Flow. (Indicator Toward Mask Indicates Proper Flow.)
 - d. Disconnect hose coupling when not in use.
12. Trim Tabs - ADJUST.

Normal cruising requires between 50% and 70% power. The manifold pressure and RPM settings required to obtain these powers at various altitudes and outside air temperatures can be determined with your cruise computer. A maximum cruising power of approximately 74.8% (31.5 inches Hg. manifold pressure and 2450 RPM or 34.0 inches Hg. manifold pressure and 2300 RPM) may be used if desired. Various percent powers can be obtained with a number of combinations of manifold pressure, engine speed, altitude and outside air temperature. For a given throttle setting, select the lowest engine speed in the green arc range that will give smooth engine operation without evidence of laboring.

CAUTION

The use of 34.0 inches Hg. manifold pressure (narrow green arc on manifold pressure gage) is restricted to the 2200 to 2300 RPM range only.

The use of lower power settings and the selection of cruise altitude on the basis of the most favorable wind conditions are significant factors that should be considered on every trip to reduce fuel consumption. Additional range can be achieved when operating at select power combinations, see Figure 5-21, by leaning to peak exhaust gas temperature (EGT) for Best Economy mixture. This setting results in an airspeed loss of 4 KTAS and range increase of 8% compared to the Recommended Lean mixture. Do not lean to the extent that engine roughness or excessive speed loss occurs.

CAUTION

Operation at Best Economy mixture is not recommended until oil consumption stabilizes or during the first 50 hours of operation. The purpose of this interval of operation at higher power levels (65% to 77.5% power) is to insure proper seating of the rings and is applicable to new engines, and engines in service following cylinder replacement or top overhaul of one or more cylinders.

When leaning, accomplish the procedure as precisely as possible. A little extra effort in setting the mixtures will yield significant dividends.

For normal cruise conditions, your cruise computer should be utilized to set the fuel flows. The cruise computer is based on indicated OAT, therefore, the ram rise does not have to be subtracted. The cruise computer is marked with two fuel flow scales. These scales are provided to insure that you can obtain the maximum performance and utilization from your airplane. The inner fuel flow scale (marked Recommended Lean) should be utilized for all normal cruise performance. Data shown in Section 5 are based on Recommended Lean mixture. The outer fuel flow scale (marked Best Power) will provide maximum speed for a given power setting. The speed will be approximately two knots greater than the speed with Recommended Lean mixture.

The cowl flaps should be adjusted to maintain the cylinder head temperature within the normal operating range (green arc).

Best propeller synchrophasing is obtained by making the final adjustment of the propeller controls in a DECREASE RPM direction. Manually synchronize the propellers as closely as possible and tighten the quadrant friction lock securely. Position the synchrophaser switch to PHASE. The phasing knob should then be adjusted until the desired sound and vibration characteristics are obtained. This setting will vary from flight to flight. If non-synchronized operation occurs during long cruise flights, manually re-synchronize the propeller controls as closely as possible and synchronized operation should reoccur. Securely tighten the quadrant friction lock, then adjust the phasing knob as desired.

On long cruise flights, where the slaved governor can eventually operate near either end of its operating range, it may be necessary to periodically select the OFF position, reset the propeller controls and reengage the synchrophaser.

If the optional pressurization system is installed, 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.

Normal operations may be conducted without supplemental oxygen for extended periods up to a cabin altitude of approximately 10,000 feet. An oxygen system is required when the cabin altitude exceeds 10,000 feet. An altitude warning light will illuminate when the cabin altitude is higher than 10,000 feet, at which time oxygen should be used by all occupants.

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.

For flight in an icing environment, refer to the Alternate Induction Air paragraphs in this section and other sections dealing with flight in an icing environment.

DESCENT

1. Fuel Selectors - Left Engine - LEFT MAIN (Feel For Detent).
Right Engine - RIGHT MAIN (Feel For Detent).
2. Auxiliary Fuel Pumps - ON.
3. Cabin Pressurization - SET (Optional System).
 - a. Cabin Altitude - SET SLOWLY. During the initial portion of the letdown, set the cabin altitude control to field pressure altitude plus 500 feet (outer scale) (Optional System).
 - 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 500 feet (Optional System).
4. Power - AS REQUIRED to maintain engine temperatures in the green.

NOTE

Maintain sufficient power for pressurization requirements (manifold pressure in the green arc).

5. Mixtures - ADJUST for smooth operation with gradual enrichment as altitude is lost.
6. Cowl Flaps - CLOSE.
7. Propeller Synchrophaser - AS REQUIRED (Optional System).
8. Altimeter - SET.

Power should be reduced slowly to a manifold pressure and RPM which will provide the desired airspeed and rate-of-descent. Sufficient power should be maintained, however, to keep cylinder head temperatures in the green arc and maintain cabin pressurization. The optimum engine speed in a descent is usually the lowest one in the RPM green arc range that will allow cylinder head temperature to remain in the recommended operating range.

The combination of high pressure altitudes and above-standard temperatures has a significant effect on engine operation. Power output at any manifold pressure or power setting will be lower at high ambient temperatures than under standard atmospheric conditions. As temperatures increase, a constant fuel flow rate will result in a progressively richer mixture.

When operating at high altitudes and/or high ambient temperatures, careful attention should be paid to proper leaning of the mixture for both fuel economy and engine performance. This is especially important during prolonged low-power or idle-power operation. Overly rich mixtures during a long idle-power descent from cruising altitude could result in loss of power. During low-power operations, mixtures should always be leaned for smooth operation.

If the optional pressurization system is installed, the cabin altitude control should be set to give a cabin altitude equal to field pressure altitude plus 500 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 500 feet. This system 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.

If synchronized operation is lost during large power changes, manually re-synchronize the propeller controls as closely as possible and synchronized operation should reoccur. Securely tighten the quadrant friction lock, then adjust the phasing knob as desired.

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 altimeter at all altitudes below 10,000 feet.

If fuel has been consumed at uneven rates between the two main tanks because of prolonged one engine flight, it is desirable to balance the fuel load by operating both engines from the fullest tank. However, if there is sufficient fuel in both tanks, even though they may have unequal quantities, it is important to switch the left and right fuel selectors to the left and right main tanks, respectively; feel for detent; and check the auxiliary fuel pumps ON for the landing. This will provide an adequate fuel flow to each engine if a balked landing is necessary.

BEFORE LANDING

1. Seat Belts and Shoulder Harness - SECURE.
2. Propeller Synchrophaser - OFF (Optional System).
3. Alternate Air Controls - CHECK IN. .
4. Wing Flaps - DOWN 15° below 177 KIAS.
5. Landing Gear - DOWN below 177 KIAS.
6. Landing Gear Position Indicator Lights - Check down lights ON;
Unlocked Light - OFF.
7. Cabin Differential Pressure - ZERO DIFFERENTIAL.
8. Mixtures - FULL RICH or lean as required for smooth operation.
9. Propellers - FULL FORWARD.

10. Wing Flaps - DOWN 45° below 146 KIAS.
11. Minimum Multi-Engine Approach Speed - 94 KIAS at 6750 pounds.
Refer to Section 5 for speeds at reduced weights.

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 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 propeller controls are full forward, the mixtures are set for smooth operation, and the cabin pressure is at zero differential pressure.

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 94 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 closing the throttles while passing the 50-foot point and initiating a flare into the landing attitude.

Normally, the throttles are continuously retarded 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 and brakes applied as required. An abrupt power reduction at five feet altitude could result in a hard landing if the airplane is near stall speed. 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.

When a short ground run is the major consideration, the airplane is held off until a full stall touchdown occurs. 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 with the least effort by using the crab method. However, either the wing-low, crab or combination method may be used. Crab the airplane into the wind in a normal approach using a minimum flap setting for the field length. Immediately before touchdown, the airplane is aligned with the flight path by applying down-wind rudder. The landing is made in nearly three-point attitude, and the nosewheel is lowered to the runway immediately after touchdown. A straight course is maintained with the steerable nosewheel and occasional braking if necessary.

BALKED LANDING

1. Increase engine speed to 2700 RPM and apply full throttle if necessary.
2. Balked Landing Transition Speed - 82 KIAS.
3. 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.

4. Wing Flaps - 15°.
5. Trim airplane for climb.
6. Cowl Flaps - OPEN.
7. Wing Flaps - UP as soon as all obstacles are cleared and a safe altitude and airspeed are obtained.

AFTER LANDING

1. Auxiliary Fuel Pumps - LOW during landing roll.
2. Cowl Flaps - OPEN.
3. Wing Flaps - UP.

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.

After leaving the active runway, the wing flaps should be retracted. Be sure the wing flaps switch is identified before placing it in the UP position. The auxiliary fuel pump switches are turned to LOW during the landing roll.

SHUTDOWN

1. Parking Brake - SET if brakes are cool.
2. Avionics Bus Switch - OFF.
3. All Switches Except Battery, Alternator and Magneto Switches - OFF.
4. Auxiliary Fuel Pumps - OFF.

NOTE

The fuel pumps must be turned OFF prior to stopping engines.

5. Throttles - IDLE.
6. Mixtures - IDLE CUT-OFF.
7. Battery and Alternators - OFF.
8. Magneto Switches - OFF, after engines stop.
9. Control Locks - INSTALL.
10. Fuel Selectors - OFF if a long period of inactivity is anticipated (Feel For Detent).
11. Cabin Door - CLOSE after checking internal upper door handle stowed in the lock plate.

With the mixture levers in IDLE CUT-OFF, the fuel flow is effectively blocked at the fuel metering unit. Thus, it is unnecessary to place the fuel selectors in the OFF position if the airplane is receiving normal usage. However, if a long period of inactivity is anticipated, the fuel selectors should be turned OFF to preclude any possible fuel seepage that might develop through the metering valve.

To preclude battery discharge when the airplane is temporarily inactive, refer to FLYABLE STORAGE Section 8 for applicable servicing instructions.

STALL

The stall characteristics of the airplane are conventional. Aural warning is provided by the stall warning horn between 5 and 10 KIAS above the stall in all configurations. The stall is also preceded by a mild aerodynamic buffet which increases in intensity as the stall is approached. The power-on stall occurs at a very steep pitch angle with or without flaps. It is difficult to inadvertently stall the airplane during normal maneuvering.

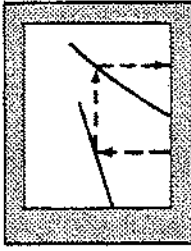
MANEUVERING FLIGHT

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 VMCA

Single-engine procedures should be practiced in anticipation of an emergency. This practice should be conducted at a safe altitude, with full power operation on both engines, and should be started at a safe speed of at least 115 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. In order to simulate an engine failure, set both engines at full power operation; then at a chosen speed, pull the throttle control of one engine to idle, and proceed with single-engine emergency procedures. Simulated single-engine flight characteristics can be practiced by setting propeller RPM to simulate a critical engine inoperative condition as shown in Figure 4-3.

RPM TO SIMULATE CRITICAL (LEFT) ENGINE INOPERATIVE AND FEATHERED



CONDITIONS:

1. Propellers in Low Pitch (Full Forward Position).
2. Manifold Pressure Adjusted to Obtain Proper RPM.

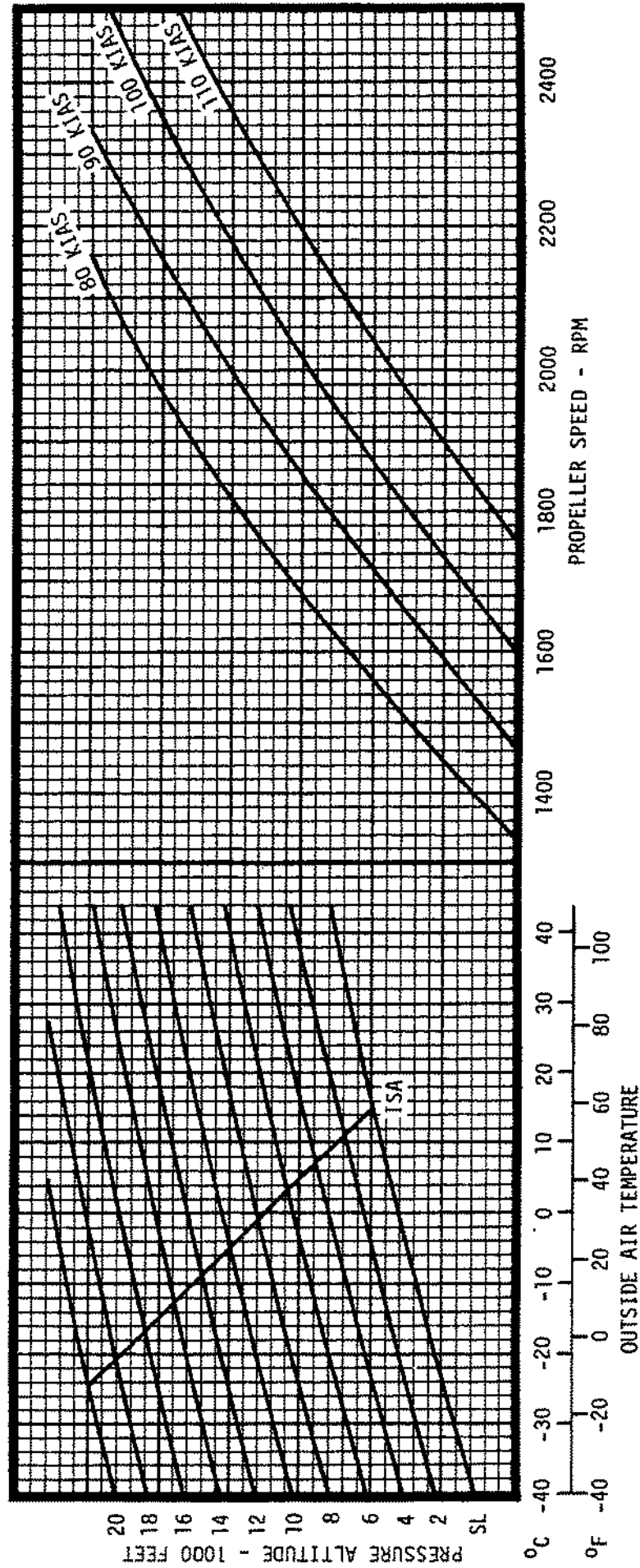


Figure 4-3

1. Wing Flaps - UP.
2. Landing Gear - UP.
3. Airspeed - V_{SSE} (98 KIAS) or above.
4. Inoperative Engine - IDLE POWER.
5. Operative Engine - 2700 RPM and FULL THROTTLE.
6. Airspeed - DECREASE at approximately 1 knot per second until V_{MCA} (red radial) or stall warning, whichever occurs first, is obtained.

V_{SSE} is used in training and is not a limitation. It is recommended, however, that except for training, demonstrations, takeoffs and landings, this airplane should not be flown at a speed slower than V_{SSE} .

Under no circumstances should V_{MCA} 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.

Operation of the anti-collision lights should be checked by observing the reflections on the ground and on the wing tips. After starting the engines, the retractable landing lights (the right landing light is optional equipment) 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. The landing lights, if used during taxiing, should be used intermittently to avoid excessive drain on the battery. In the engine runups, special attention should be directed to alternator operation by individually turning the voltmeter selector switch to L ALT, R ALT and BATT and noting response on the voltmeter.

Night takeoffs are conventional, although the gear retraction operation is usually delayed slightly to insure that the airplane is well clear of the runway.

In cruising flight, the interior lighting intensity should be decreased to the minimum which will provide adequate instrument legibility.

COLD WEATHER OPERATION

Whenever possible, external preheat should be utilized in cold weather. The use of preheat materially reduces the severity of conditions imposed on both engines and electrical systems. It is the preferred or best method of starting engines in extremely cold weather. 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. Refer to the Airplane Service Manual for additional information when operating in extremely cold weather.

When the oil pressure gage is extremely slow in indicating pressure, it may be advisable to fill the pressure line to the gage with kerosene or JP-4.

NOTE

During cold weather operation it is advisable to rotate propellers through four complete revolutions, by hand, before starting engines.

PRESSURIZATION AIR TEMPERATURE CONTROLS

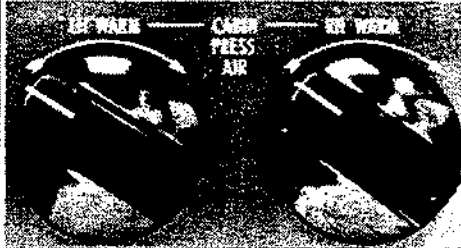
OUTSIDE AIR TEMPERATURE AT GROUND LEVEL	MANUAL SHUTOFF CONTROL POSITION	
ABOVE 21.1°C (70°F)	BOTH CONTROLS — FULL COUNTERCLOCKWISE	
1.7°C TO 21.1°C (35°F TO 70°F)	RIGHT CONTROL ONLY — FULL CLOCKWISE	
BELOW 1.7°C (35°F)	BOTH CONTROLS — FULL CLOCKWISE	

Figure 4-4

If preheat is not available, external power should be used for starting because of the higher cranking power required and the decreased battery output at low temperatures. The starting procedure is normal; however, if the engines do not start immediately, it may be necessary to position the primer switch to LEFT or RIGHT for 5 to 10 seconds.

Manual pressurization air temperature controls have been provided to increase passenger comfort and heating system efficiency during cold weather operation. These manual controls, see Figure 4-4, are located on the instrument panel.

During cold weather operation, it is suggested that the right or both the right and left pressurization air temperature controls be rotated full clockwise. This will allow higher pressurization air temperatures, eliminating cold air drafts and decreasing cabin heater requirements.

Figure 4-4 can be used as a guide in positioning the pressurization air temperature controls. If the position of the right or both temperature controls is questionable due to the temperature at ground level, it is suggested that the colder temperature be assumed. If it then becomes too warm in the cabin, the manual control(s) may be rotated counterclockwise to emit cooling air. This procedure is recommended as it allows a more rapid cabin temperature adjustment.

NOTE

When necessary to position only one control full clockwise, rotate the right control as this will allow the left heat exchanger to provide cool air through the upper cabin air outlets, when desired.

After a suitable warm-up period (2 to 5 minutes at 1000 RPM, if preheat is not used) accelerate the engines several times to higher RPM. The propellers should be operated through several complete cycles to warm the governors and propeller hubs. 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 can be adversely affected.

NOTE

The waste gate actuators will not operate satisfactorily with engine oil temperatures below the lower limit of the operating range 23.9°C (75°F). With oil temperatures near the bottom of the operating range, the throttle motions should be very slow and care exercised to prevent exceeding the 38.0 inches Hg. manifold pressure limit.

During operation in cold wet weather, the possibility of brake freezing exists; therefore, special precautions should be taken. 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, insure alcohol has evaporated from the ramp prior to starting engines as a fire could result.

If neither heat nor alcohol are available, frozen brakes can sometimes be freed by cycling the brakes asymmetrically while applying engine power. Caution should be exercised if the airplane is setting on ice or in close proximity to other parked airplanes.

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. Insure wheels are stopped before retracting wheels to prevent buildup of ice or slush in the wheel wells.

During cruise, the propellers should be exercised at half-hour intervals to flush the cold oil from the governors and propeller hubs. Electrical equipment should be managed to assure adequate alternator charging throughout the flight, since cold weather adversely affects battery capacity.

During letdown, watch engine temperatures closely and carry sufficient power to maintain them above operating minimums.

The pitot heat and stall warning heater switches should be turned ON at least 5 minutes before entering potential icing conditions (2 minutes if on ground) so that these units will be warm enough to prevent formation of ice. Preventing ice is preferable to attempting its removal once it has formed.

ALTERNATE INDUCTION AIR

The induction system employed on this airplane is not significantly affected by icing. However, a manually operated alternate induction air system is incorporated to assure satisfactory operation. Should the induction air inlet, or the induction system air filter become obstructed, the alternate air doors should be manually opened by turning and pulling the alternate air controls full open, which will admit warm unfiltered air to the engines. This system will provide continued satisfactory engine operation.

Since the higher intake air temperature when using alternate intake air results in a decrease in engine power and turbocharger capability, it is recommended that the alternate intake air not be utilized until indications of intake filter icing, (decreased manifold pressure) are actually observed.

Should additional power be required, the following procedures may be employed:

1. Increase RPM as required.
2. Move throttles forward to maintain desired manifold pressure.
3. Readjust mixture controls for smooth engine operation.

WARNING

Should it become necessary to use heated alternate air, the pressurization air controls must be pulled out to prevent nacelle fumes from entering the cabin. The cabin vent control should also be pulled out and the cabin pressurization switch positioned to DEPRESSURIZE to provide cabin ventilation. Placing the controls in the DUMP position will result in the cabin being depressurized. Therefore, if the flight altitude is above 10,000 feet, all occupants should use oxygen or initiate Emergency Descent Procedures.

During ground operation, the alternate air doors should be closed to prevent engine damage caused by ingesting debris through unfiltered air inlet.

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 at maximum normal operating power is 76.6 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 11,900 feet for operation up to the maximum altitude of 30,000 feet, it should be pointed out that the expected time that a person will remain conscious in the event the cabin must be depressurized 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 10,000 feet. This indication is controlled by a barometric switch which senses cabin altitudes and is functional when the battery switch is ON.

An oxygen system is required when the cabin altitude exceeds 10,000 feet. 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.

SECTION 5
PERFORMANCE
TABLE OF CONTENTS

	Page		Page
INTRODUCTION	5-1	NORMAL TAKEOFF DISTANCE . . .	5-22
Demonstrated Operating		ACCELERATE STOP DISTANCE . .	5-24
Temperature	5-2	ACCELERATE GO DISTANCE . . .	5-25
INTRODUCTION TO TABULATED		RATE-OF-CLIMB	
PERFORMANCE	5-2	Maximum Climb	5-26
Example	5-2	Cruise Climb	5-27
SAMPLE FLIGHT	5-5	One Engine Inoperative . .	5-28
Airplane Configuration . .	5-5	BALKED LANDING CLIMB	
Takeoff Airport		Rate-of-Climb	5-29
Conditions	5-5	ENGINE INOPERATIVE SERVICE	
Cruise Conditions	5-6	CEILING	5-30
Landing Airport		TIME, FUEL AND DISTANCE TO	
Conditions	5-6	CLIMB	
Sample Calculations	5-6	Maximum Climb	5-31
AIRSPEED CALIBRATION		Cruise Climb	5-32
Normal Static Source . . .	5-13	CRUISE PERFORMANCE	
Alternate Static Source . .	5-14	Sea Level	5-33
ALTIMETER CORRECTION		5000 Feet	5-33
Normal Static Source . . .	5-15	10,000 Feet	5-34
Alternate Static Source . .	5-16	15,000 Feet	5-34
TEMPERATURE RISE DUE TO RAM		20,000 Feet	5-35
RECOVERY	5-17	23,500 Feet	5-35
TEMPERATURE CONVERSION		25,000 Feet	5-35
OF TO °C	5-18	RANGE PROFILE	5-36
PRESSURE CONVERSION -		ENDURANCE PROFILE	5-37
INCHES OF MERCURY TO		HOLDING TIME	5-38
MILLIBARS	5-19	TIME, FUEL AND DISTANCE TO	
STALL SPEEDS	5-20	DESCEND	5-39
WIND COMPONENT	5-21	NORMAL LANDING DISTANCE . . .	5-40

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 makes no allowance for wind and/or navigational errors. Allowances for start, taxi, takeoff, climb, descent and 45 minutes reserve fuel at the particular cruise power are provided in the range profile chart.

To determine pressure altitude at origin and destination airports, add 100 feet to field elevation for each .1 inch Hg. below 29.92 or subtract 100 feet from field elevation for each .1 inch Hg. above 29.92.

DEMONSTRATED OPERATING TEMPERATURE

Satisfactory engine cooling has been demonstrated for this airplane with an outside air temperature 23°C (41°F) above standard. This is not to be considered as an operating limitation. Reference should be made to Section 2 for engine operating limitations.

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.

EXAMPLE

Given:		Find:	
Weight	6500 Pounds	Takeoff Speed	_____ KIAS
Temperature	(16°C) 61°F	Ground Roll	_____ Feet
Pressure Altitude	2400 Feet	Total Distance	
Headwind	19 Knots	to Clear 50-	
		Foot Obstacle	_____ Feet

Weight Pounds	Takeoff and Climb Speed KIAS	Pressure Altitude Feet	10°C (50°F)		20°C (68°F)	
			Ground Roll - Feet	Total Distance to Clear 50-Ft - Feet	Ground Roll - Feet	Total Distance to Clear 50-Ft - Feet
6750	98	2000	2350	2770	2570	3030
		3000	2500	2930	2730	3210
6200	94	2000	1880	2220	2100	2480
		3000	2040	2400	2230	2620

Approximation Method

Extract from the chart the next increment of weight, altitude and temperature which is more conservative than the actual conditions [i.e.: 6750 pounds, 3000 feet and 20°C (68°F)].

Takeoff and Climb Speed	98 KIAS
Ground Roll	2730 Feet
Total Distance to Clear 50-Foot Obstacle	3210 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 (6500 pounds) is 6200 pounds plus $300/550$ or .55 times the difference between 6200 pounds and 6750 pounds [i.e.: 6200-pound value + .55 (6750-pound value - 6200-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 (61°F) is 10°C plus $6/10$ or .6 times the difference between 10°C and 20°C [i.e.: 10°C value + .6 (2000 value - 10°C value)].

Interpolating Values for Normal Takeoff Distance:

Ground Roll (7 interpolations required)

Altitude interpolation
at 10°C (50°F) and 6750
pounds

$$= 2000\text{-foot value} + [.4 (3000\text{-foot value} - 2000\text{-foot value})]$$

$$= 2350 \text{ feet} + [.4 (2500 \text{ feet} - 2350 \text{ feet})]$$

$$= 2350 \text{ feet} + [60 \text{ feet}]$$

$$= \underline{2410 \text{ feet}}$$

Altitude interpolation
at 20°C (68°F) and 6750
pounds

$$= 2000\text{-foot value} + [.4 (3000\text{-foot value} - 2000\text{-foot value})]$$

$$= 2570 \text{ feet} + [.4 (2730 \text{ feet} - 2570 \text{ feet})]$$

$$= 2570 \text{ feet} + [64 \text{ feet}]$$

$$= \underline{2634 \text{ feet}}$$

Altitude interpolation
at 10°C (50°F) and 6200
pounds

$$= 2000\text{-foot value} + [.4 (3000\text{-foot value} - 2000\text{-foot value})]$$

$$= 1880 \text{ feet} + [.4 (2040 \text{ feet} - 1880 \text{ feet})]$$

$$= 1880 \text{ feet} + [64 \text{ feet}]$$

$$= \underline{1944 \text{ feet}}$$

Altitude interpolation
at 20°C (68°F) and 6200
pounds

$$= 2000\text{-foot value} + [.4 (3000\text{-foot value} - 2000\text{-foot value})]$$

$$= 2100 \text{ feet} + [.4 (2230 \text{ feet} - 2100 \text{ feet})]$$

$$= 2100 \text{ feet} + [52 \text{ feet}]$$

$$= \underline{2152 \text{ feet}}$$

The Normal Takeoff Distance chart, with altitude interpolation, looks as follows:

Weight Pounds	Takeoff and Climb Speed KIAS	Pressure Altitude Feet	10°C (50°F)		20°C (68°F)	
			Ground Roll - Feet	Total Distance to Clear 50-Ft - Feet	Ground Roll - Feet	Total Distance to Clear 50-Ft - Feet
6750	98	2400	2410	----	2634	----
6200	94	2400	1944	----	2152	----

Weight interpolation
at 10°C (50°F) and 2400
feet

$$= 6200\text{-pound value} + [.55 (6750\text{-pound value} - 6200\text{-pound value})]$$

$$= 1944 \text{ feet} + [.55 (2410 \text{ feet} - 1944 \text{ feet})]$$

$$= 1944 \text{ feet} + [256 \text{ feet}]$$

$$= \underline{2200 \text{ feet}}$$

Weight interpolation
at 20°C (68°F) and 2400
feet

$$= 6200\text{-pound value} + [.55 (6750\text{-pound value} - 6200\text{-pound value})]$$

$$= 2152 \text{ feet} + [.55 (2634 \text{ feet} - 2152 \text{ feet})]$$

$$= 2152 \text{ feet} + [265 \text{ feet}]$$

$$= \underline{2417 \text{ feet}}$$

Takeoff and Climb Speed

$$= 6200\text{-pound value} + [.55 (6750\text{-pound value} - 6200\text{-pound value})]$$

$$= 94 \text{ KIAS} + [.55 (98 \text{ KIAS} - 94 \text{ KIAS})]$$

$$= 94 \text{ KIAS} + [2.2 \text{ KIAS}]$$

$$= \underline{96 \text{ KIAS}}$$

The Normal Takeoff Distance chart, with altitude and weight interpolation, looks as follows:

Weight Pounds	Takeoff and Climb Speed KIAS	Pressure Altitude Feet	10°C (50°F)		20°C (68°F)	
			Ground Roll - Feet	Total Distance to Clear 50-Ft - Feet	Ground Roll - Feet	Total Distance to Clear 50-Ft - Feet
6500	96	2400	2200	----	2417	----

$$\begin{aligned}
 \text{Temperature interpolation at 2400 feet and 6500 pounds} &= 10^{\circ}\text{C} (50^{\circ}\text{F}) \text{ value} + [.6 (20^{\circ}\text{C} (68^{\circ}\text{F}) \text{ value} - 10^{\circ}\text{C} (50^{\circ}\text{F}) \text{ value})] \\
 &= 2200 \text{ feet} + [.6 (2417 \text{ feet} - 2200 \text{ feet})] \\
 &= 2200 \text{ feet} + [130 \text{ feet}] \\
 &= \underline{2330 \text{ feet}}
 \end{aligned}$$

The Normal Takeoff Distance chart, with altitude, weight and temperature, looks as follows:

Weight Pounds	Takeoff and Climb Speed KIAS	Pressure Altitude Feet	16°C (61°F)	
			Ground Roll - Feet	Total Distance to Clear 50-Ft - Feet
6500	96	2400	2330	----

Ground Roll with 19-knot headwind

$$\begin{aligned}
 &= 2330 \text{ feet} - [2330 \text{ feet} \left(\frac{19 \text{ knots headwind}}{10 \text{ knots headwind}} \right) (7\%)] \\
 &= 2330 \text{ feet} - 310 \text{ feet} \\
 &= \underline{2020 \text{ feet}}
 \end{aligned}$$

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 2744 feet (no wind) and 2379 feet (19-knot headwind).

SAMPLE FLIGHT

The following is an example of a typical flight using the performance data contained in Figures 5-9 through 5-25. The approximation method is used in tabular performance except where noted.

AIRPLANE CONFIGURATION

Airplane Weight 6500 Pounds
Usable Fuel Load 978 Pounds

TAKEOFF AIRPORT CONDITIONS

Field Length 5000 Feet (Runway 23)
Temperature 16°C (61°F)
Field Pressure Altitude 2400 Feet
Wind 270° at 25 Knots
Obstacles None

CRUISE CONDITIONS

Distance	600 Nautical Miles
Cruise Altitude	17,500 Feet
Temperature	-10°C (14°F)
Wind	15-Knot Tailwind
Power	Maximum Recommended Cruise Power at Recommended Lean Mixture

LANDING AIRPORT CONDITIONS

Field Length	3500 Feet (Runway 19)
Temperature	7°C (45°F)
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 5-9)

- (1) The angle between the runway and the prevailing wind is 40°.
- (2) Enter Figure 5-9 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 6750 pounds weight; the takeoff and climb speed is 98 KIAS.
- (2) Proceed horizontally right from 3000-foot pressure altitude to the vertical columns for 20°C (68°F). The takeoff ground run is 2730 feet and the total distance required to clear a 50-foot obstacle is 3210 feet without wind correction. With a 19-knot headwind component, the corrected takeoff ground run is 2367 feet and the corrected total distance required is 2783 feet.

$$\frac{19 \text{ Knots Headwind}}{10 \text{ Knots Headwind}} (7\%) = 13.3\%$$

$$\begin{aligned} \text{Corrected Takeoff} &= 2730 \text{ feet} - [13.3\% (2730 \text{ feet})] \\ \text{Ground Run} &= 2730 \text{ feet} - [363 \text{ feet}] \\ &= \underline{2367 \text{ feet}} \end{aligned}$$

$$\begin{aligned} \text{Corrected Total} &= 3210 \text{ feet} - [13.3\% (3210 \text{ feet})] \\ \text{Distance Required} &= 3210 \text{ feet} - [427 \text{ feet}] \\ &= \underline{2783 \text{ feet}} \end{aligned}$$

Accelerate Stop Distance (Figure 5-11)

- (1) Enter Figure 5-11 at 6750 pounds weight; engine failure speed is 98 KIAS.

- (2) Proceed horizontally right from 3000-foot pressure altitude to the vertical columns for 20°C (68°F). The distance required to accelerate to 98 KIAS and stop is 5070 feet without wind correction. With a 19-knot headwind component, the accelerate stop distance can be reduced by:

$$\frac{19 \text{ Knots Headwind}}{4 \text{ Knots Headwind}} (3\%) = 14.25\%$$

$$\begin{aligned} \text{Corrected Accelerate} &= 5070 \text{ feet} - [14.25\% (5070 \text{ feet})] \\ \text{Stop Distance} &= 5070 \text{ feet} - [722 \text{ feet}] \\ &= \underline{4348 \text{ feet}} \end{aligned}$$

Accelerate Go Distance (Figure 5-12)

- (1) Enter Figure 5-12 at 6750 pounds weight; engine failure speed is 98 KIAS.
- (2) Proceed horizontally right from 3000-foot pressure altitude to the vertical columns for 20°C (68°F). The distance required to clear a 50-foot obstacle, after losing an engine at 98 KIAS, is 5090 feet without wind correction. With a 19-knot headwind component, the distance can be reduced by:

$$\frac{19 \text{ Knots Headwind}}{10 \text{ Knots Headwind}} (6\%) = 11.4\%$$

$$\begin{aligned} \text{Corrected Accelerate} &= 5090 \text{ feet} - [11.4\% (5090 \text{ feet})] \\ \text{Go Distance} &= 5090 \text{ feet} - [580 \text{ feet}] \\ &= \underline{4510 \text{ feet}} \end{aligned}$$

NOTE

- The distance required to accelerate go using the approximation method is often so great that a more exact value should be obtained using the interpolation method.
- The interpolation method gives an accelerate go distance of 4111 feet without wind or 3642 feet with 19 knots of headwind.

Rate-Of-Climb — Maximum Climb (Figure 5-13)

- (1) Enter Figure 5-13 at 16°C (61°F).
- (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 6500-pound line.
- (4) Proceed horizontally right to obtain rate-of-climb. (1500 Feet per minute)
- (5) Enter the climb speed data to determine the climb speed corrected for 2400 feet. (108 KIAS)

Rate-Of-Climb — Cruise Climb (Figure 5-14)

- (1) Enter Figure 5-14 at 16°C (61°F).
- (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 6500-pound line.
- (4) Proceed horizontally right to obtain rate-of-climb. (1055 Feet per minute)
- (5) Climb speed is 120 KIAS for all conditions.

Rate-Of-Climb — Single Engine (Figure 5-15)

- (1) Enter Figure 5-15 at 16°C (61°F).
- (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 6500-pound line.
- (4) Proceed horizontally right to obtain rate-of-climb. (280 Feet per minute)
- (5) Enter the climb speed data to determine the climb speed corrected for 2400 feet. (108 KIAS)

Time, Fuel And Distance To Climb — Cruise Climb (Figure 5-19,

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 5-19 at 16°C (61°F).
- (2) Proceed vertically up to 2400-foot pressure altitude line.
- (3) Proceed horizontally right to the 6500-pound line.
- (4) Proceed vertically down to obtain time to climb (2.3 minutes), fuel to climb (9.5 pounds) and distance to climb (5 nautical miles).

Cruise Condition:

- (5) Enter Figure 5-19 at -10°C (14°F).
- (6) Proceed vertically up to 17,500-foot pressure altitude line.
- (7) Proceed horizontally right to the 6500-pound line.
- (8) Proceed vertically down to obtain time to climb (22.0 minutes), fuel to climb (88 pounds) and distance to climb (52 nautical miles).

Final Calculations:

$$\begin{aligned}\text{Time to Climb} &= \text{Cruise time to climb} - \text{Airport time to climb} \\ &= 22 \text{ minutes} - 2.3 \text{ minutes} \\ &= \underline{20 \text{ minutes}}\end{aligned}$$

Fuel to Climb = Cruise fuel to climb - Airport fuel to climb
= 88 pounds - 9.5 Pounds
= 78.5 pounds (add 32 pounds for start, taxi and runup) (110.5 pounds total)

Distance to Climb = Cruise distance to climb - Airport distance to climb
= 52 nautical miles - 5 nautical miles
= 47 nautical miles
Adjusted for wind (use 60% of the wind at altitude for climb wind),
= 47 ± wind contribution
= 47 + [$\frac{20 \text{ minutes}}{60 \text{ minutes}}$ (.6 x 15 knots)]
= 47 nautical miles + 3 nautical miles
= 50 nautical miles

Time, Fuel And Distance To Descend (Figure 5-24)

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 5-24 at the cruise altitude of 17,500 feet.
- (2) Proceed horizontally right to the guideline.
- (3) Proceed vertically down to obtain time to descend (14.4 minutes), fuel to descend (34 pounds) and distance to descend (48 nautical miles).

Landing Airport Condition:

- (4) Enter Figure 5-24 at the airport altitude of 1700 feet.
- (5) Proceed horizontally right to the guideline.
- (6) Proceed vertically down to obtain time to descend (2.0 minutes), fuel to descend (5 pounds) and distance to descend (6.5 nautical miles).

Final Calculations:

Time to Descend = Cruise time to descend - Airport time to descend
= 14.4 minutes - 2.0 minutes
= 12.4 minutes

Fuel to Descend	= Cruise fuel to descend - Airport fuel to descend
	= 34 pounds - 5 pounds
	= <u>29 pounds</u>
Distance to Descend	= Cruise distance to descend - Airport distance to descend.
	= 48 nautical miles - 6.5 nautical miles
	= 41.5 nautical miles
	Adjusted for wind (use 40% of the wind at altitude for descent wind),
	= 41.5 ± wind contribution
	= 41.5 + [$\frac{12.4 \text{ minutes}}{60 \text{ minutes}}$ (.4 x 15 knots)]
	= 41.5 nautical miles + 1.2 nautical miles
	= <u>42.7 nautical miles</u>

Cruise Performance With Recommended Lean Mixture (Figure 5-20)

Maximum recommended cruise can be obtained with either 2450 RPM and 31.5 Inches Hg. manifold pressure or 2300 RPM and 34 Inches Hg. manifold pressure.

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 15,000-foot data at 2450 RPM and 31.5 Inches Hg. manifold pressure.
- (2) Use -15°C (5°F) data for a power of 74.8%, airspeed of 199 KTAS and a total fuel flow of 204 pounds per hour.
- (3) Correcting for a weight of 6500 pounds, the airspeed increases to:

$$199 \text{ KTAS} + \frac{(6750 \text{ pounds} - 6500 \text{ pounds})}{1000 \text{ pounds}} (6 \text{ KTAS}) =$$

$$199 \text{ KTAS} + 1.5 \text{ KTAS} = 200 \text{ KTAS}$$

Using the interpolation method, interpolating altitude, temperature and weight, the actual performance is 72.5% power, 204 KTAS and total fuel flow of 198 pounds per hour.

In the above calculations, for convenience, the weight was assumed to be equal to the takeoff weight of 6500 pounds. More realistic data can be determined if the average cruise weight is used. This average cruise weight is determined as follows:

$$\text{Cruise Fuel} = \frac{\text{Total distance} - \text{climb distance} - \text{descent distance}}{\frac{\text{True airspeed}}{+ \text{wind correction}}} \times [\text{Total fuel flow per hour}]$$

$$= \frac{600 \text{ Nautical Miles} - 50 \text{ Nautical Miles} - 42.7 \text{ Nautical Miles}}{204 \text{ KTAS} + 15 \text{ Knot Tailwind}} \times [198 \text{ pounds per hour}]$$

$$= \frac{507.3 \text{ Nautical miles}}{219} \times 198 \text{ pounds per hour}$$

$$= 2.32 \text{ hours} \times 198 \text{ pounds per hour}$$

$$= \underline{458 \text{ pounds}}$$

$$\text{Average Cruise Weight} = \text{Takeoff weight} - \text{start, taxi and climb fuel} - \frac{\text{Cruise fuel}}{2}$$

$$= 6500 \text{ pounds} - 110.5 \text{ pounds} - \frac{458 \text{ pounds}}{2}$$

$$= \underline{6161 \text{ pounds}}$$

$$\text{Average Cruise Speed} = \text{True airspeed from Figure 5-20} + \text{weight correction}$$

$$= 204 \text{ KTAS} + 6 \left(\frac{340}{1000} \right)$$

$$= \underline{206 \text{ KTAS}}$$

$$\text{Average Ground Speed} = 206 \text{ KTAS} + \text{tailwind}$$

$$= 206 \text{ KTAS} + 15 \text{ knots}$$

$$= \underline{221 \text{ knots}}$$

$$\text{Distance During Cruise} = \text{Total distance} - \text{Climb distance} - \text{Descent distance}$$

$$= 600 - 50 - 42.7$$

$$= \underline{507.3 \text{ Nautical Miles}}$$

$$\text{Time During Cruise} = \frac{\text{Cruise distance}}{\text{ground speed}}$$

$$= \frac{507.3}{221}$$

$$= \underline{2.30 \text{ hours}}$$

Normal Landing Distance (Figure 5-25)

$$\text{Landing Weight} = \text{Takeoff weight} - \text{climb fuel} - \text{cruise fuel} - \text{descent fuel}$$

$$= 6500 \text{ pounds} - 110.5 \text{ pounds} - 458 \text{ pounds} - 29 \text{ pounds}$$

$$= \underline{5903 \text{ pounds}}$$

Wind = 210° at 17 knots. Determine headwind component from Figure 5-9. (16 knots headwind)

Enter Figure 5-25 at 6200 pounds; the approach speed is 91 KIAS. Proceed horizontally right from 2000-foot pressure altitude to the vertical column for 10°C (50°F). The landing distance ground roll is 890 feet and the total distance required to clear a 50-foot obstacle is 2270 feet without wind correction. With a 16-knot headwind component, the corrected ground roll distance is 783 feet and the corrected total distance required is 1998 feet.

$$\frac{16 \text{ Knots Headwind}}{4 \text{ Knots Headwind}} (3\%) = 12\%$$

Corrected Landing = 890 feet - [12% (890)]
Ground Roll = 890 feet - 107 feet
= 783 feet

Corrected Total = 2270 - [12% (2270)]
Distance Required = 2270 feet - 272 feet
= 1998 feet

Rate-Of-Climb — Balked Landing Climb (Figure 5-16)

- (1) Enter Figure 5-16 at 7°C (45°F).
- (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 5903-pound weight line.
- (4) Proceed horizontally right to determine the rate-of-climb. (1035 Feet per minute)

Total Fuel Required = Start, taxi and climb fuel + cruise fuel + descent fuel
= 111 pounds + 458 pounds + 29 pounds = 598 pounds (Without Holding Fuel)
or 598 pounds + 97 pounds = 695 pounds (With 45 Minutes Holding Fuel)

Holding Time (Figure 5-23)

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]
= 978 pounds - [111 pounds + 458 pounds + 29 pounds]
= 380 pounds

- (1) Enter Figure 5-23 at 380 pounds of fuel available.
- (2) Proceed vertically up to the intersection with the guideline.
- (3) Proceed horizontally left to obtain holding time available. (2.9 hours)

AIRSPED CALIBRATION NORMAL STATIC SOURCE

NOTE:

1. Indicated airspeed assumes zero instrument error.
2. The following calibrations are not valid in the prestall buffet.
3. The following calibrations are valid for the pilot's and copilot's airspeed indicators when the standard or optional dual static system is installed.

Gear Up Flaps 0°		Gear Down Flaps 15°		Gear Down Flaps 45°	
KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
70	70	70	71	70	71
80	80	80	81	80	80
90	90	90	91	90	90
--	--	--	--	94 *	93 *
100	100	100	100	100	99
110	110	110	109	110	109
120	119	120	119	120	117
140	139	130	128	130	127
160	158	140	138	140	136
180	178	150	147	145	140
200	197	160	157	---	---
220	216	170	166	---	---
230	226	179	175	---	---
237	232	---	---	---	---

*Recommended Minimum All Engines Approach Speed At 6750 Pounds With 45° Wing Flaps.

Figure 5-1

AIRSPEED CALIBRATION ALTERNATE STATIC SOURCE

NOTE:

1. Indicated airspeed assumes zero instrument error.
2. The following calibrations are not valid in the prestall buffet.
3. The following calibrations are valid for pilot's and copilot's airspeed indicators when the standard static system is installed.
4. An alternate static source is not available for copilot's instruments when optional dual static system is installed.

Gear Up Flaps 0°		Gear Down Flaps 15°		Gear Down Flaps 45°	
KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
---	---	---	---	70	75
80	89	80	85	80	83
90	98	90	94	90	92
---	---	---	---	92 *	93 *
100	108	100	102	100	100
110	117	110	111	110	109
120	126	120	119	120	117
140	144	130	128	130	126
160	163	140	136	140	134
180	181	150	145	150	143
200	199	160	153	---	---
220	218	180	170	---	---
240	236	---	---	---	---

*Recommended Minimum All Engines Approach Speed At 6750 Pounds With 45° Wing Flaps.

Figure 5-2

ALTIMETER CORRECTION NORMAL STATIC SOURCE

NOTE:

1. Add correction to indicated altimeter reading.
2. The following calibrations are valid for the pilot's and copilot's altimeters when the standard or optional dual static system is installed.

Altitude	Sea Level			10,000 Feet			20,000 Feet		
Gear	Up	Down	Down	Up	Down	Down	Up	Down	Down
Flaps	0°	15°	45°	0°	15°	45°	0°	15°	45°
KIAS	Feet	Feet	Feet	Feet	Feet	Feet	Feet	Feet	Feet
70	+3	+8	+5	+3	+10	+6	+5	+14	+9
80	+1	+6	0	+1	+7	0	+2	+11	0
90	0	+4	-5	0	+5	-6	0	+7	-9
94*	----	----	-8	----	----	-9	----	----	-14
100	-1	0	-10	-2	0	-12	-3	0	-17
110	-2	-5	-19	-2	-6	-22	-3	-9	-33
120	-2	-8	-25	-3	-9	-29	-4	-14	-43
140	-13	-21	-50	-15	-24	-63	-22	-37	-90
160	-21	-39	----	-24	-49	----	-36	-68	----
180	-31	-58	----	-39	-78	----	-55	-110	----
200	-55	----	----	-69	----	----	-100	----	----
220	-73	----	----	-90	----	----	-130	----	----
230	-87	----	----	-111	----	----	-157	----	----
237	-100	----	----	-132	----	----	-183	----	----

*Recommended Minimum All Engines Approach Speed At 6750 Pounds With 45° Wing Flaps.

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 5-3

ALTIMETER CORRECTION ALTERNATE STATIC SOURCE

NOTE:

1. Add correction to indicated altimeter reading.
2. The following calibrations are valid for pilot's and copilot's altimeters when the standard static system is installed.
3. An alternate static source is not available for copilot's instruments when the optional dual static system is installed.

Altitude	Sea Level			10,000 Feet			20,000 Feet		
Gear	Up	Down	Down	Up	Down	Down	Up	Down	Down
Flaps	0°	15°	45°	0°	15°	45°	0°	15°	45°
KIAS	Feet	Feet	Feet	Feet	Feet	Feet	Feet	Feet	Feet
80	64	36	24	87	48	32	120	67	44
90	68	28	16	91	38	22	127	53	30
92 *	68	26	14	91	36	19	127	49	26
100	68	18	5	92	24	6	128	34	8
120	63	-11	-30	85	-15	-41	122	-20	-57
140	51	-48	-76	69	-65	-103	95	-90	-143
160	36	-102	----	49	-138	----	68	-191	----
180	12	-174	----	16	-235	----	22	-326	----
200	-13	----	----	-18	----	----	-24	----	----
220	-51	----	----	-70	----	----	-96	----	----
240	-90	----	----	-123	----	----	-170	----	----

*Recommended Minimum All Engines Approach Speed At 6750 Pounds With 45° Wing Flaps

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 5-4

TEMPERATURE RISE DUE TO RAM RECOVERY

RECOVERY FACTOR (K) = .90

- NOTE:
1. Subtract temperature rise from indicated outside air temperature to obtain true outside air temperature

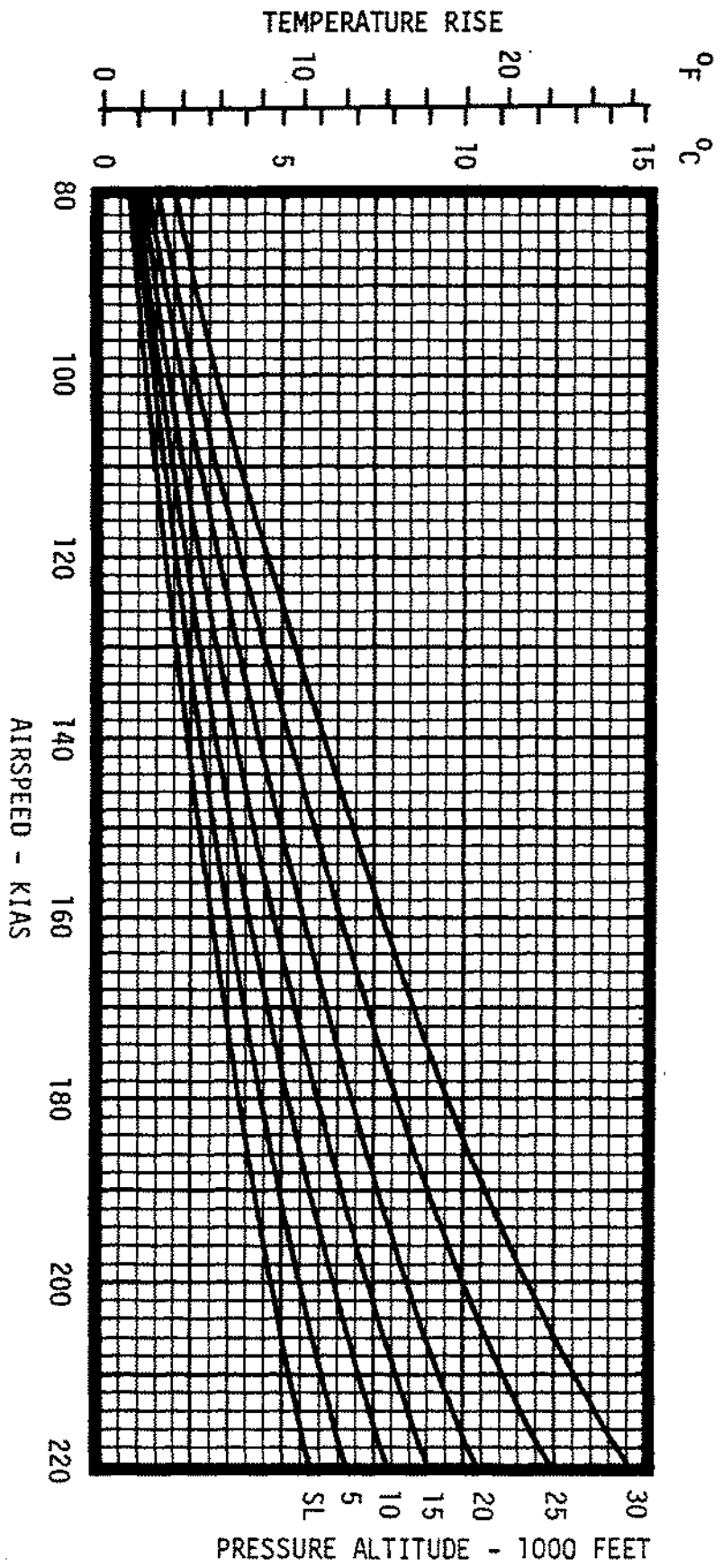
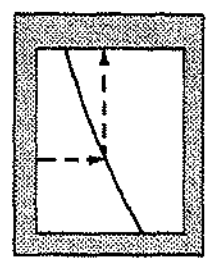


Figure 5-5

TEMPERATURE CONVERSION FROM FAHRENHEIT TO CELSIUS

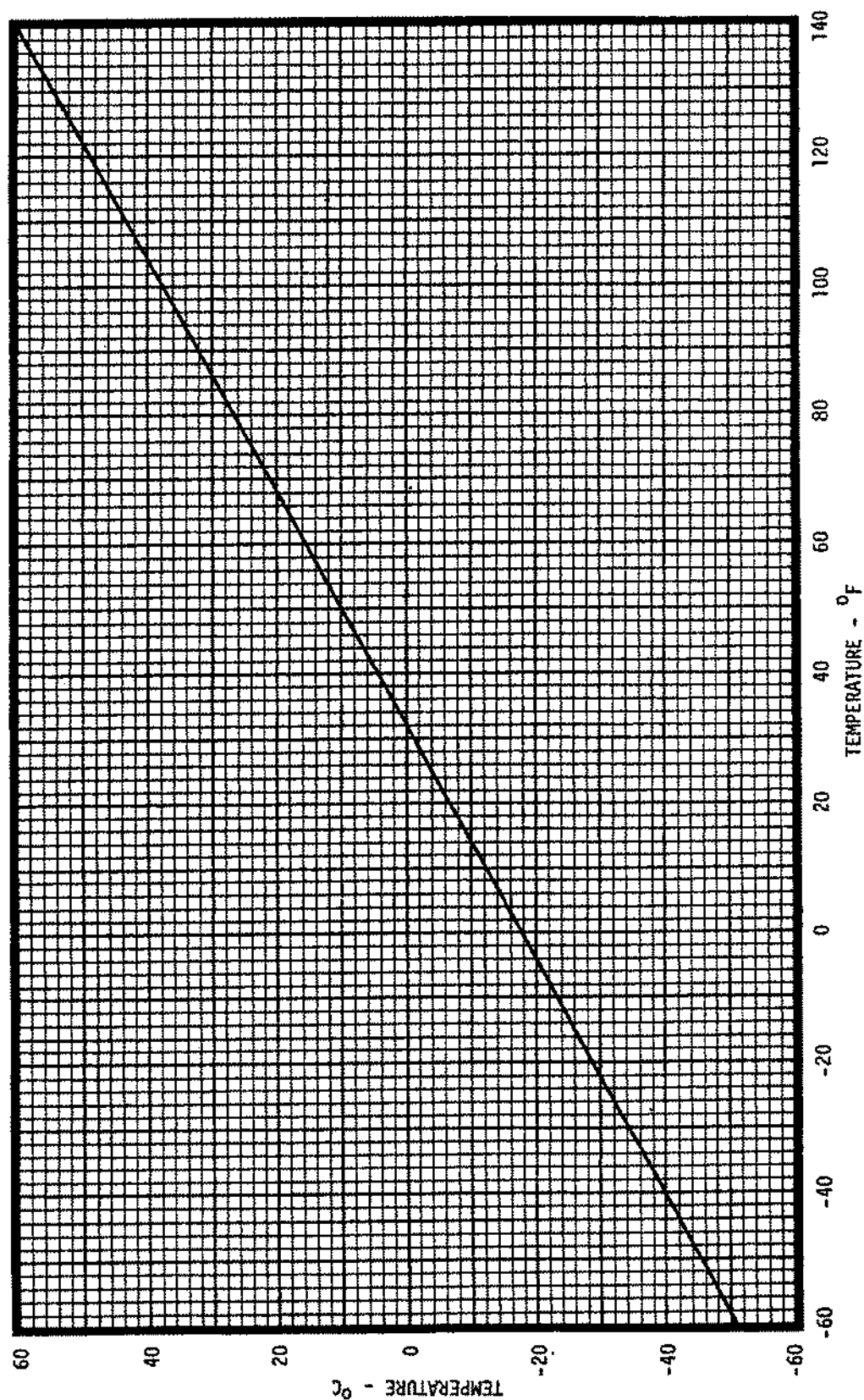
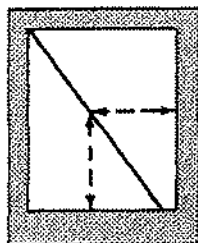


Figure 5-6

PRESSURE CONVERSION INCHES OF MERCURY TO MILLIBARS

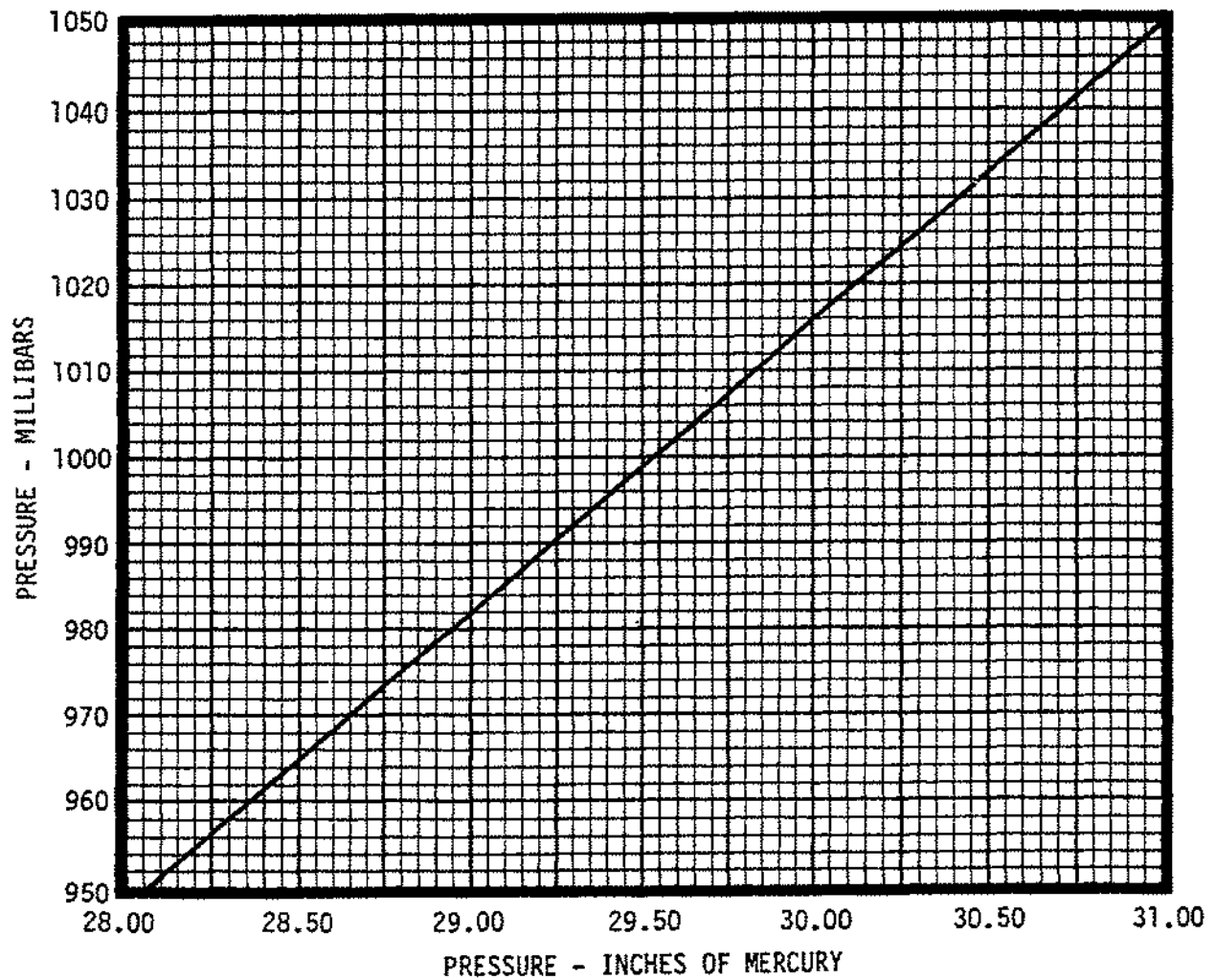
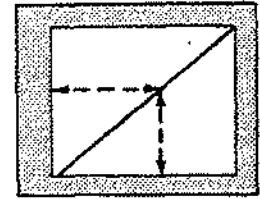


Figure 5-7

STALL SPEEDS

CONDITIONS:
Throttles - IDLE

NOTE:
Maximum altitude lost during
a stall is 300 feet.

WEIGHT Pounds	Configuration		ANGLE OF BANK							
			0°		20°		40°		60°	
	Flaps	Gear	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
6750	0°	Up	82	82	85	85	94	94	116	116
	15°	Down	76	77	79	80	87	88	111	110
	45°	Down	71	72	73	74	82	82	103	102
6200	0°	Up	79	79	81	81	90	90	111	111
	15°	Down	73	74	76	77	84	85	105	105
	45°	Down	67	69	70	71	79	79	98	97
5700	0°	Up	75	75	78	78	86	86	107	107
	15°	Down	70	71	72	73	80	81	101	101
	45°	Down	65	66	67	68	74	75	94	93
5200	0°	Up	72	72	74	74	82	82	102	102
	15°	Down	67	68	69	70	77	78	96	96
	45°	Down	61	63	63	65	71	72	90	89

Figure 5-8

WIND COMPONENT

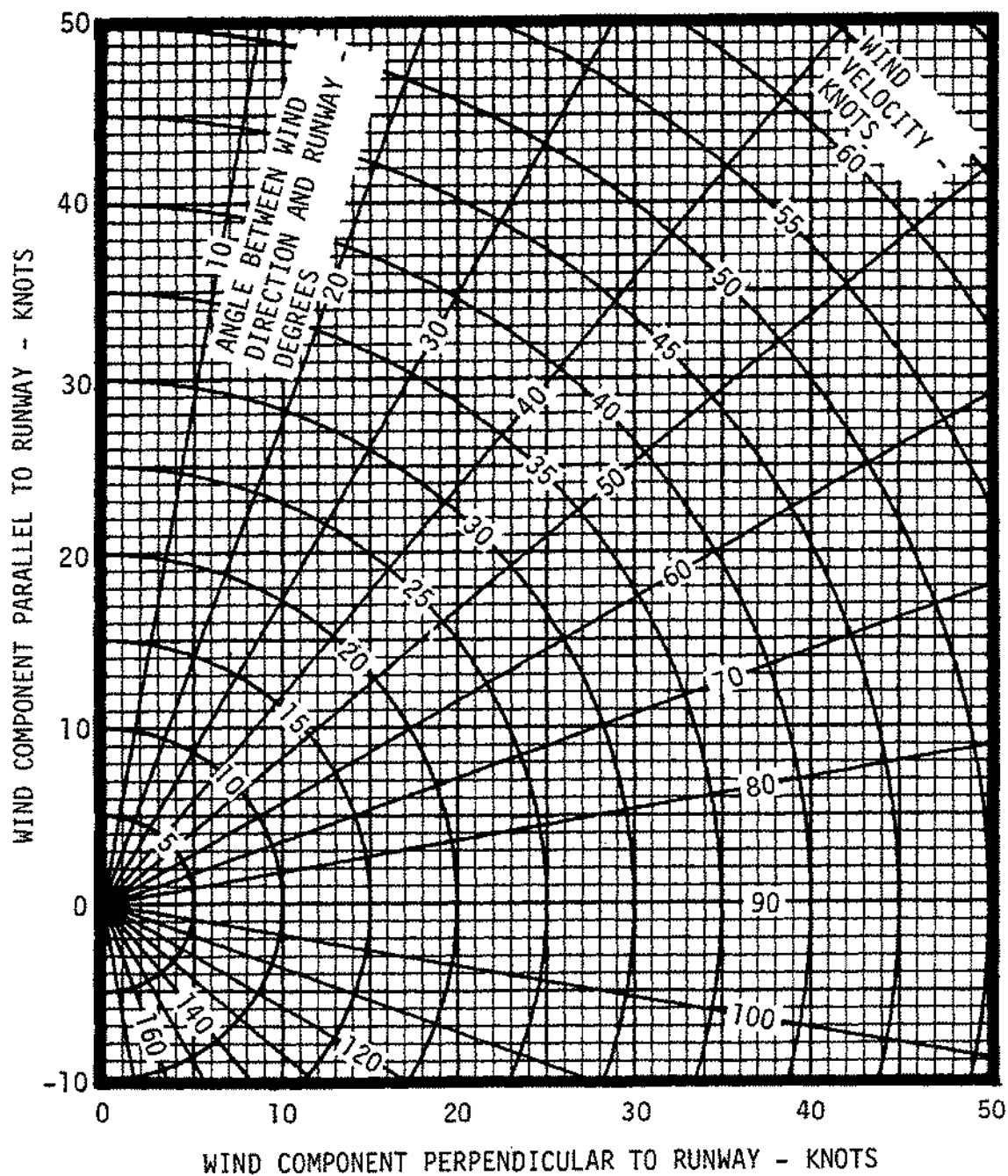
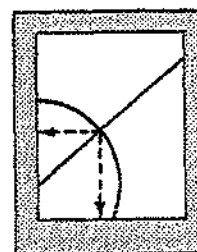


Figure 5-9

NORMAL TAKEOFF DISTANCE

CONDITIONS:

1. 2700 RPM and 38.0 Inches Hg. Manifold Pressure Before Brake Release.
2. Mixtures - CHECK Fuel Flows In the White Arc.
3. Wing Flaps - UP.
4. Cowl Flaps - OPEN.
5. Level, Hard Surface, Dry Runway.

NOTE:

1. If full power is applied without brakes set, distances apply from point where full power is applied.
2. Decrease distance 7% for each 10 knots headwind.
3. Increase distance 5% for each 2 knots tailwind.

WEIGHT- POUNDS	TAKEOFF TO 50- FOOT OBSTACLE SPEED- KIAS	PRESSURE ALTITUDE- FEET	-20°C (-4°F)		-10°C (14°F)		0°C (32°F)		10°C (50°F)	
			GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50 FEET	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50 FEET	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50 FEET	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50 FEET
6750	98	Sea Level	1560	1870	1710	2040	1870	2230	2040	2430
		1000	1660	1970	1810	2150	1980	2350	2220	2620
		2000	1760	2080	1920	2270	2150	2530	2350	2770
		3000	1860	2200	2090	2450	2280	2680	2500	2930
		4000	2020	2370	2210	2590	2420	2830	2650	3100
		5000	2150	2500	2350	2740	2570	2990	2820	3280
		6000	2280	2650	2500	2900	2730	3170	3000	3480
		7000	2420	2800	2650	3070	2910	3360	3190	3690
		8000	2580	2970	2830	3250	3100	3570	3400	3920
		9000	2740	3150	3010	3450	3310	3790	3630	4170
		10,000	2930	3350	3210	3670	3530	4030	3880	4440
6200	94	Sea Level	1280	1540	1400	1680	1530	1830	1670	1990
		1000	1360	1630	1480	1770	1620	1930	1770	2100
		2000	1440	1720	1570	1870	1720	2040	1880	2220
		3000	1530	1810	1670	1980	1820	2150	2040	2400
		4000	1620	1910	1770	2090	1980	2320	2160	2530
		5000	1720	2030	1920	2250	2100	2450	2300	2680
		6000	1870	2180	2040	2380	2230	2590	2440	2840
		7000	1980	2300	2170	2520	2370	2750	2600	3010
		8000	2110	2440	2310	2670	2530	2920	2770	3190
		9000	2250	2590	2460	2830	2690	3100	2950	3390
		10,000	2390	2740	2620	3000	2870	3290	3150	3610
5700	90	Sea Level	1050	1280	1150	1390	1250	1510	1360	1640
		1000	1120	1350	1220	1460	1330	1590	1450	1730
		2000	1180	1420	1290	1540	1410	1680	1530	1830
		3000	1260	1500	1370	1630	1490	1770	1630	1930
		4000	1330	1580	1460	1720	1590	1880	1730	2040
		5000	1420	1670	1550	1820	1690	1990	1880	2200
		6000	1510	1770	1650	1930	1830	2140	2000	2330
		7000	1600	1880	1780	2070	1950	2260	2130	2470
		8000	1730	2010	1890	2200	2070	2400	2260	2620
		9000	1840	2130	2020	2330	2200	2540	2410	2780
		10,000	1960	2260	2150	2470	2350	2700	2570	2950
5200	86	Sea Level	850	1040	930	1130	1010	1230	1100	1330
		1000	900	1100	980	1190	1070	1290	1160	1400
		2000	960	1160	1040	1260	1130	1370	1240	1480
		3000	1010	1220	1110	1330	1200	1440	1310	1570
		4000	1080	1290	1170	1400	1280	1520	1390	1660
		5000	1140	1360	1250	1480	1360	1610	1480	1750
		6000	1220	1440	1330	1570	1450	1710	1580	1860
		7000	1300	1530	1410	1660	1540	1810	1680	1970
		8000	1380	1620	1510	1760	1640	1920	1820	2110
		9000	1470	1720	1630	1890	1770	2060	1940	2240
		10,000	1580	1840	1730	2000	1890	2180	2060	2380

Figure 5-10 (Sheet 1 of 2)

NORMAL TAKEOFF DISTANCE

CONDITIONS:

1. 2700 RPM and 38.0 Inches Hg. Manifold Pressure Before Brake Release.
2. Mixtures - CHECK Fuel Flows In the White Arc.
3. Wing Flaps - UP.
4. Cowl Flaps - OPEN.
5. Level, Hard Surface, Dry Runway.

NOTE:

1. If full power is applied without brakes set, distances apply from point where full power is applied.
2. Decrease distance 7% for each 10 knots headwind.
3. Increase distance 5% for each 2 knots tailwind.

WEIGHT- POUNDS	TAKEOFF TO 50- FOOT OBSTACLE SPEED- KIAS	PRESSURE ALTITUDE- FEET	20°C (68°F)		30°C (86°F)		40°C (104°F)	
			GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50 FEET	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50 FEET	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50 FEET
6750	98	Sea Level	2290	2720	2510	2980	2750	3270
		1000	2430	2870	2660	3150	2920	3460
		2000	2570	3030	2820	3330	3100	3660
		3000	2730	3210	3000	3520	3290	3880
		4000	2900	3400	3190	3730	3500	4120
		5000	3090	3600	3390	3960	3730	4370
		6000	3290	3820	3610	4210	3980	4650
		7000	3500	4060	3850	4470	4250	4950
		8000	3740	4310	4110	4760	4540	5270
		9000	3990	4590	4400	5070	4850	5630
		10,000	4270	4890	4700	5410	5200	6010
6200	94	Sea Level	1820	2170	1990	2370	2230	2660
		1000	1930	2300	2160	2560	2370	2810
		2000	2100	2480	2290	2710	2510	2970
		3000	2230	2620	2440	2860	2670	3140
		4000	2360	2770	2590	3030	2840	3330
		5000	2510	2930	2750	3210	3020	3530
		6000	2670	3110	2930	3410	3220	3750
		7000	2850	3300	3120	3620	3430	3990
		8000	3040	3500	3330	3850	3660	4240
		9000	3240	3720	3560	4090	3920	4520
		10,000	3460	3960	3800	4360	4190	4820
5700	90	Sea Level	1490	1790	1620	1950	1770	2120
		1000	1580	1890	1720	2060	1880	2240
		2000	1670	1990	1830	2170	2050	2430
		3000	1780	2110	1990	2340	2170	2560
		4000	1930	2270	2110	2480	2310	2710
		5000	2050	2400	2240	2620	2460	2880
		6000	2180	2540	2390	2780	2620	3050
		7000	2320	2700	2540	2950	2790	3240
		8000	2480	2860	2710	3130	2970	3440
		9000	2640	3040	2890	3330	3170	3660
		10,000	2820	3230	3090	3550	3390	3900
5200	86	Sea Level	1190	1450	1300	1570	1420	1710
		1000	1270	1530	1380	1660	1500	1810
		2000	1350	1610	1470	1750	1600	1910
		3000	1430	1700	1560	1850	1700	2020
		4000	1520	1800	1660	1960	1810	2140
		5000	1620	1910	1760	2080	1960	2310
		6000	1720	2020	1910	2240	2090	2440
		7000	1860	2170	2040	2370	2230	2590
		8000	1980	2300	2170	2520	2370	2750
		9000	2110	2440	2310	2670	2530	2920
		10,000	2260	2600	2470	2840	2700	3110

Figure 5-10 (Sheet 2 of 2)

ACCELERATE STOP DISTANCE

CONDITIONS:

1. 2700 RPM and 38.0 Inches Hg. Manifold Pressure Before Brake Release.
2. Mixtures - CHECK Fuel Flows In the White Arc.
3. Wing Flaps - UP.
4. Cowl Flaps - OPEN.
5. Level, Hard Surface, Dry Runway.
6. Engine Failure at Engine Failure Speed.
7. 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 distance 3% for each 4 knots headwind.
3. Increase distance 5% for each 2 knots tailwind.

WEIGHT - POUNDS	ENGINE FAILURE SPEED - KIAS	PRESSURE ALTITUDE - FEET	TOTAL DISTANCE - FEET						
			-20°C -4°F	-10°C +14°F	0°C 32°F	+10°C +50°F	+20°C +68°F	+30°C +86°F	+40°C +104°F
6750	98	Sea Level	3370	3590	3820	4120	4390	4670	4980
		1000	3530	3760	4060	4320	4600	4900	5240
		2000	3700	3990	4250	4530	4830	5150	5500
		3000	3880	4180	4460	4750	5070	5410	5790
		4000	4120	4390	4680	4990	5330	5690	6090
		5000	4320	4610	4920	5250	5610	5990	6420
		6000	4540	4840	5170	5520	5900	6320	6770
		7000	4770	5090	5440	5810	6220	6660	7140
		8000	5010	5360	5730	6130	6560	7030	7550
		9000	5280	5640	6040	6460	6920	7420	7980
		10,000	5560	5950	6370	6820	7310	7850	8450
6200	94	Sea Level	2780	2960	3150	3340	3560	3780	4090
		1000	2910	3100	3300	3510	3730	4030	4290
		2000	3050	3250	3460	3680	3970	4230	4510
		3000	3200	3410	3630	3910	4170	4440	4740
		4000	3360	3580	3850	4110	4380	4670	4990
		5000	3530	3800	4050	4310	4600	4910	5250
		6000	3740	3990	4250	4540	4840	5170	5530
		7000	3930	4190	4470	4770	5100	5450	5840
		8000	4130	4410	4710	5030	5370	5750	6160
		9000	4350	4640	4960	5300	5670	6070	6510
		10,000	4580	4890	5230	5590	5990	6410	6880
5700	90	Sea Level	2300	2450	2600	2760	2930	3120	3310
		1000	2410	2560	2720	2890	3080	3270	3480
		2000	2530	2690	2860	3040	3230	3430	3710
		3000	2650	2820	3000	3190	3390	3650	3890
		4000	2780	2960	3150	3350	3610	3840	4100
		5000	2920	3110	3310	3560	3790	4040	4310
		6000	3060	3260	3510	3740	3980	4250	4540
		7000	3220	3460	3690	3930	4190	4480	4780
		8000	3410	3640	3880	4140	4420	4720	5050
		9000	3590	3830	4090	4360	4660	4980	5330
		10,000	3780	4030	4310	4600	4920	5260	5630
5200	86	Sea Level	1870	1990	2110	2240	2380	2520	2680
		1000	1960	2080	2210	2350	2490	2650	2810
		2000	2050	2180	2320	2460	2610	2780	2950
		3000	2150	2290	2430	2580	2750	2920	3110
		4000	2260	2400	2550	2710	2890	3070	3270
		5000	2370	2520	2680	2850	3030	3230	3480
		6000	2490	2650	2820	3000	3190	3430	3660
		7000	2620	2790	2970	3190	3390	3620	3860
		8000	2750	2930	3150	3350	3570	3810	4070
		9000	2900	3110	3310	3530	3760	4020	4290
		10,000	3070	3270	3490	3720	3970	4240	4530

Figure 5-11

ACCELERATE GO DISTANCE**CONDITIONS:**

1. 2700 RPM and 38.0 Inches Hg. Manifold Pressure Before Brake Release.
2. Mixtures - CHECK Fuel Flows In The White Arc.
3. Wing Flaps - UP.
4. Cowl Flaps - OPEN.
5. Level Hard Surface Dry Runway.
6. Engine Failure At Engine Failure Speed.
7. Landing Gear Up On In Transit And Propeller Feathered During Climb.
8. Maintain Engine Failure Speed Until Clear of Obstacle.

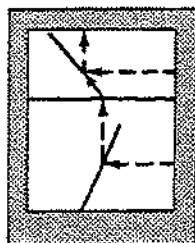
NOTE:

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 2% for each knot of tailwind.
4. Distance in boxes represent rates of climb less than 50 ft/min.

WEIGHT - POUNDS	ENGINE FAILURE - SPEED - KIAS	PRESSURE ALTITUDE - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE - FEET						
			-20°C -40°F	-10°C +14°F	0°C 32°F	+10°C +50°F	+20°C +68°F	+30°C +86°F	+40°C +104°F
6750	98	Sea Level	2590	2870	3200	3600	4160	4830	5800
		1000	2730	3030	3390	3880	4430	5190	6330
		2000	2880	3210	3640	4120	4740	5610	6970
		3000	3050	3440	3860	4390	5090	6090	7770
		4000	3270	3650	4110	4690	5480	6660	8780
		5000	3460	3870	4380	5030	5930	7340	10,160
		6000	3660	4110	4670	5410	6450	8190	12,170
		7000	3890	4380	5000	5840	7070	9280	15,500
		8000	4140	4680	5380	6330	7820	10,770	-----
		9000	4410	5010	5800	6910	8750	12,990	-----
		10,000	4710	5380	6280	7600	9970	16,780	-----
6200	94	Sea Level	2070	2270	2500	2770	3080	3470	4010
		1000	2180	2390	2640	2930	3270	3740	4280
		2000	2290	2520	2790	3090	3510	3970	4570
		3000	2420	2660	2940	3320	3730	4240	4910
		4000	2550	2810	3160	3520	3960	4520	5290
		5000	2690	3010	3340	3740	4220	4850	5720
		6000	2880	3190	3540	3970	4510	5210	6220
		7000	3040	3370	3760	4230	4830	5260	6810
		8000	3220	3580	4000	4520	5180	6100	7520
		9000	3420	3810	4270	4840	5590	6650	8410
		10,000	3630	4060	4560	5200	6050	7300	9560
5700	90	Sea Level	1690	1840	2010	2200	2430	2690	2990
		1000	1770	1930	2110	2320	2560	2840	3170
		2000	1860	2030	2230	2450	2700	3000	3420
		3000	1960	2140	2350	2580	2860	3230	3630
		4000	2060	2260	2480	2730	3070	3420	3860
		5000	2170	2380	2620	2930	3250	3630	4110
		6000	2290	2510	2800	3100	3440	3870	4400
		7000	2420	2690	2960	3280	3660	4120	4710
		8000	2580	2840	3140	3480	3900	4400	5060
		9000	2730	3010	3330	3710	4160	4720	5460
		10,000	2900	3200	3540	3950	4440	5070	5910
5200	86	Sea Level	1360	1480	1610	1750	1910	2100	2310
		1000	1430	1550	1690	1840	2010	2210	2440
		2000	1500	1630	1770	1940	2120	2330	2570
		3000	1570	1710	1870	2040	2240	2460	2720
		4000	1650	1800	1970	2150	2360	2600	2880
		5000	1740	1900	2070	2270	2490	2750	3100
		6000	1830	2000	2190	2400	2640	2950	3290
		7000	1940	2110	2310	2540	2830	3130	3490
		8000	2040	2240	2450	2720	3000	3320	3720
		9000	2160	2380	2620	2880	3180	3540	3970
		10,000	2300	2520	2770	3050	3380	3700	4240

Figure 5-12

54847044



RATE-OF-CLIMB - MAXIMUM CLIMB

ALTITUDE - FEET	CLIMB SPEED - KIAS
SL	108
20,000	107
30,000	104

CONDITIONS:
 1. 2600 RPM and 38.0 Inches Hg.*
 2. Mixture - Fuel Flow White Triangle.
 3. Landing Gear - UP.
 4. Wing Flaps - UP.
 5. Cowl Flaps - OPEN.
 *Above 20,000 Feet, Use Placarded Manifold Pressure

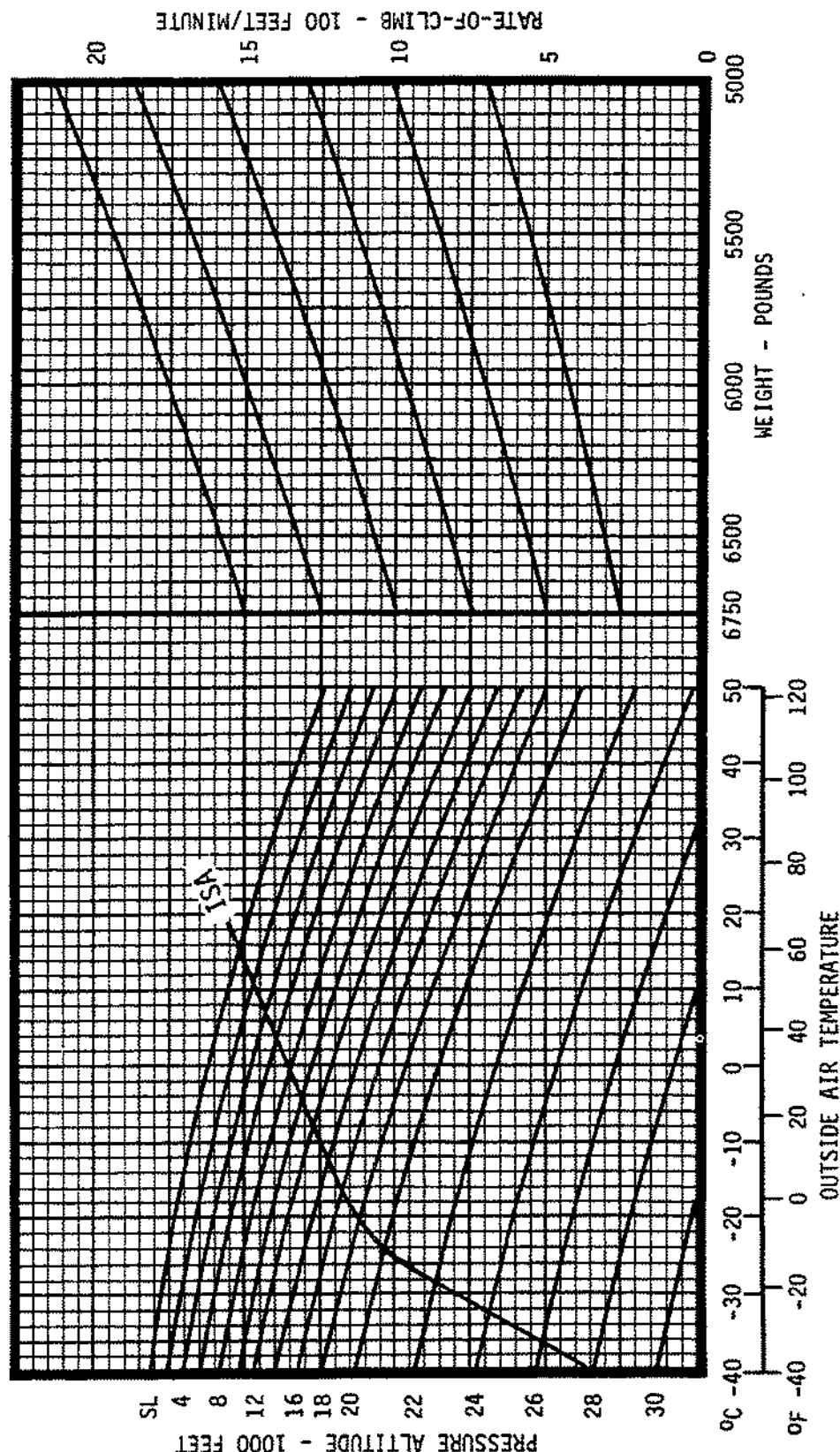
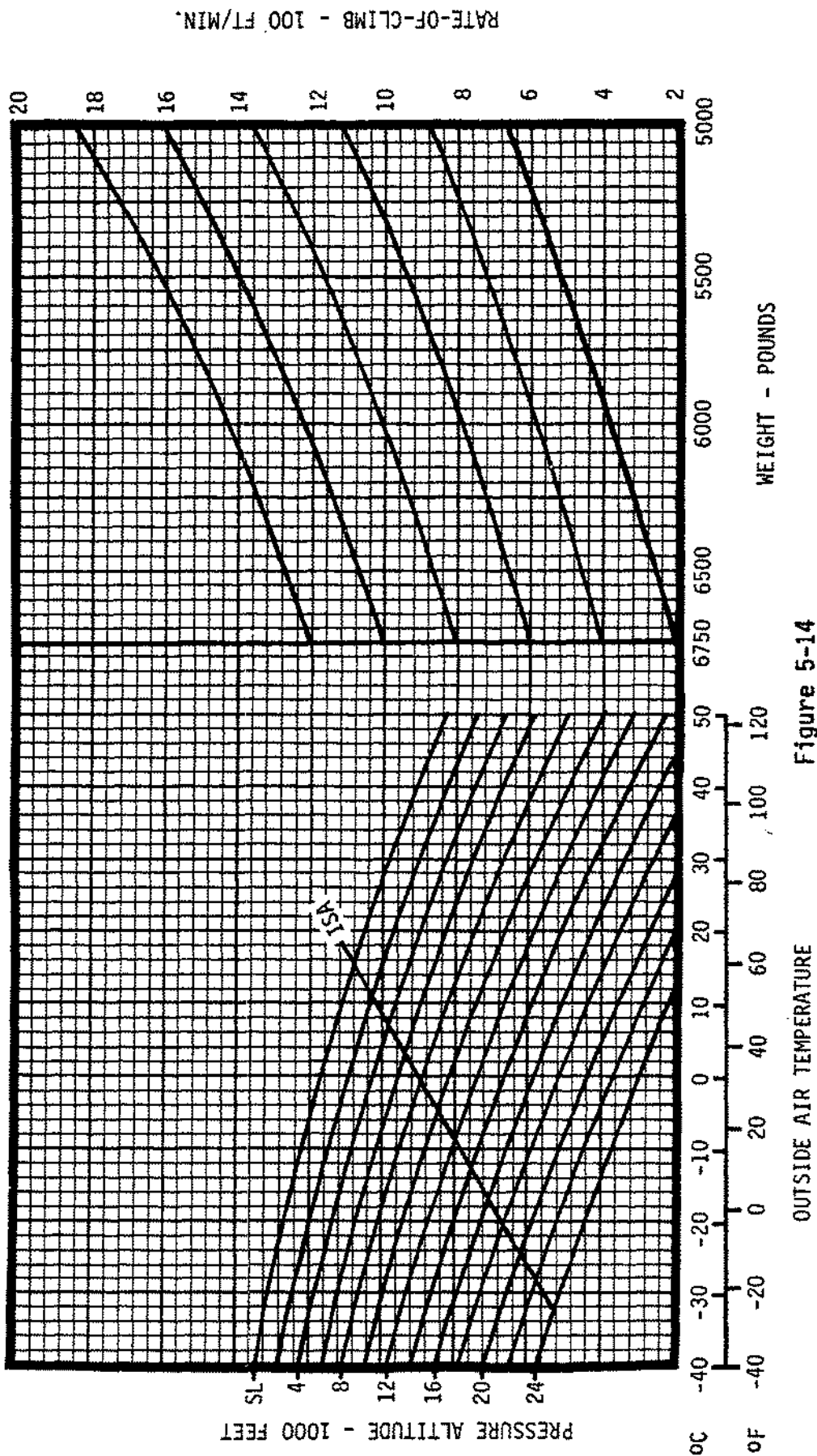
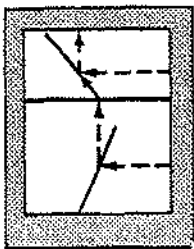


Figure 5-13

RATE-OF-CLIMB - CRUISE CLIMB

CONDITIONS:

1. 2450 RPM and 31.5 Inches Hg.
2. Landing Gear - UP.
3. Wing Flaps - UP.
4. Cowl Flaps - AS REQUIRED.
5. Airspeed - 120 KIAS.
6. Mixtures - 120 Lbs/Hr Fuel Flow (Blue Triangle).



54847040

RATE-OF-CLIMB - ONE ENGINE INOPERATIVE

WEIGHT POUNDS	CLIMB SPEED - KIAS			
	SEA LEVEL	10,000	20,000	
6750	108	105	103	
6250	105	103	101	
5750	102	101	100	

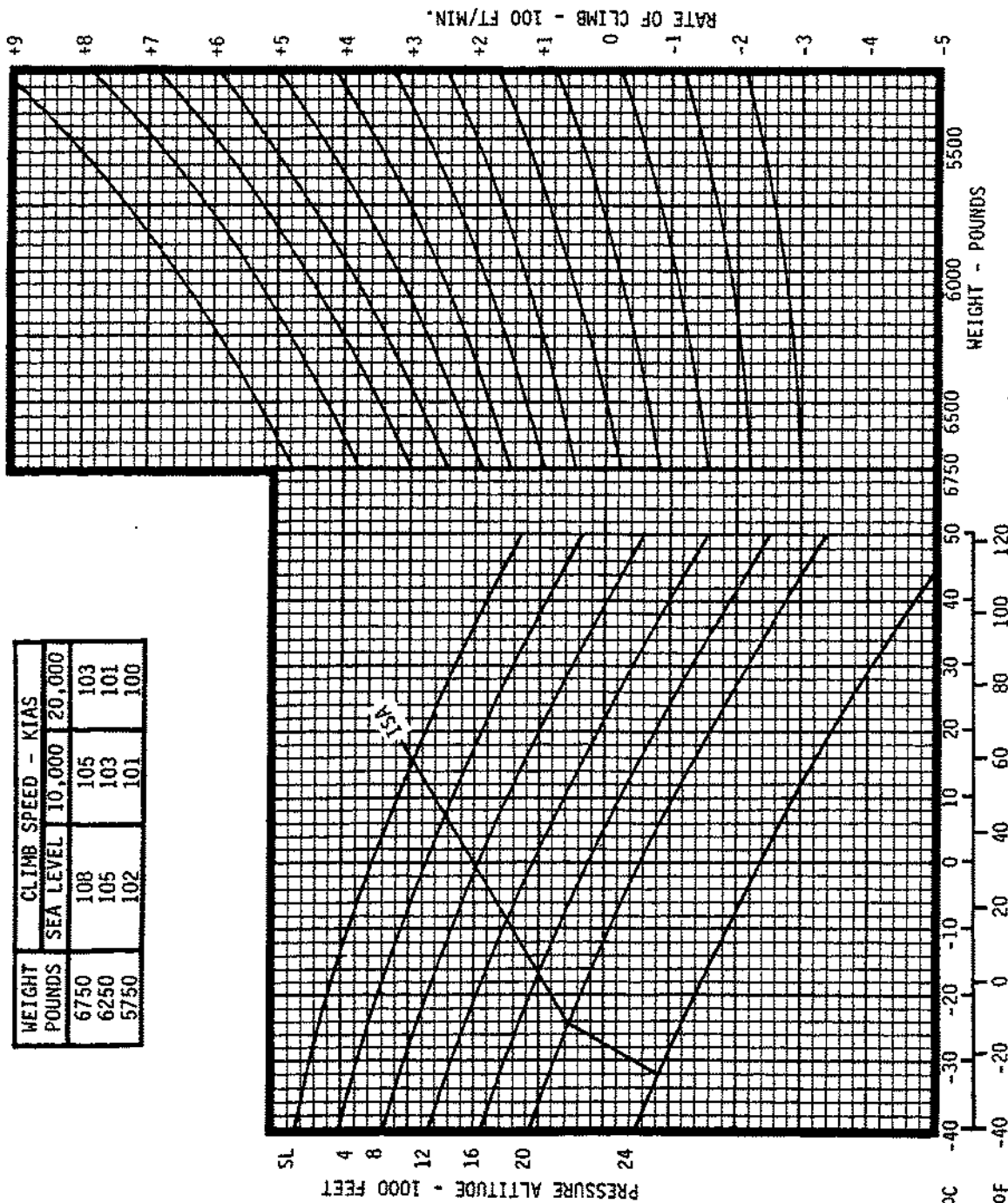
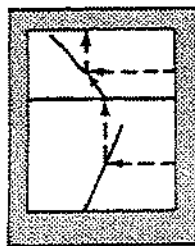


Figure 5-15



CONDITIONS:

1. 2700 RPM and 38.0 Inches Hg.*
2. Mixture - Check Fuel Flow in White Arc.*
3. Landing Gear - UP.
4. Wing Flaps - UP.
5. Inoperative Propeller - FEATHERED.
6. Wings Banked 50 Toward Operative Engine with Approximately 1/2 Ball Turn and Bank Indicator.
7. Cowl Flaps - Closed on Inoperative Engine.

*Above 20,000 feet, Use Placarded Manifold Pressure and Climb Fuel Flow.

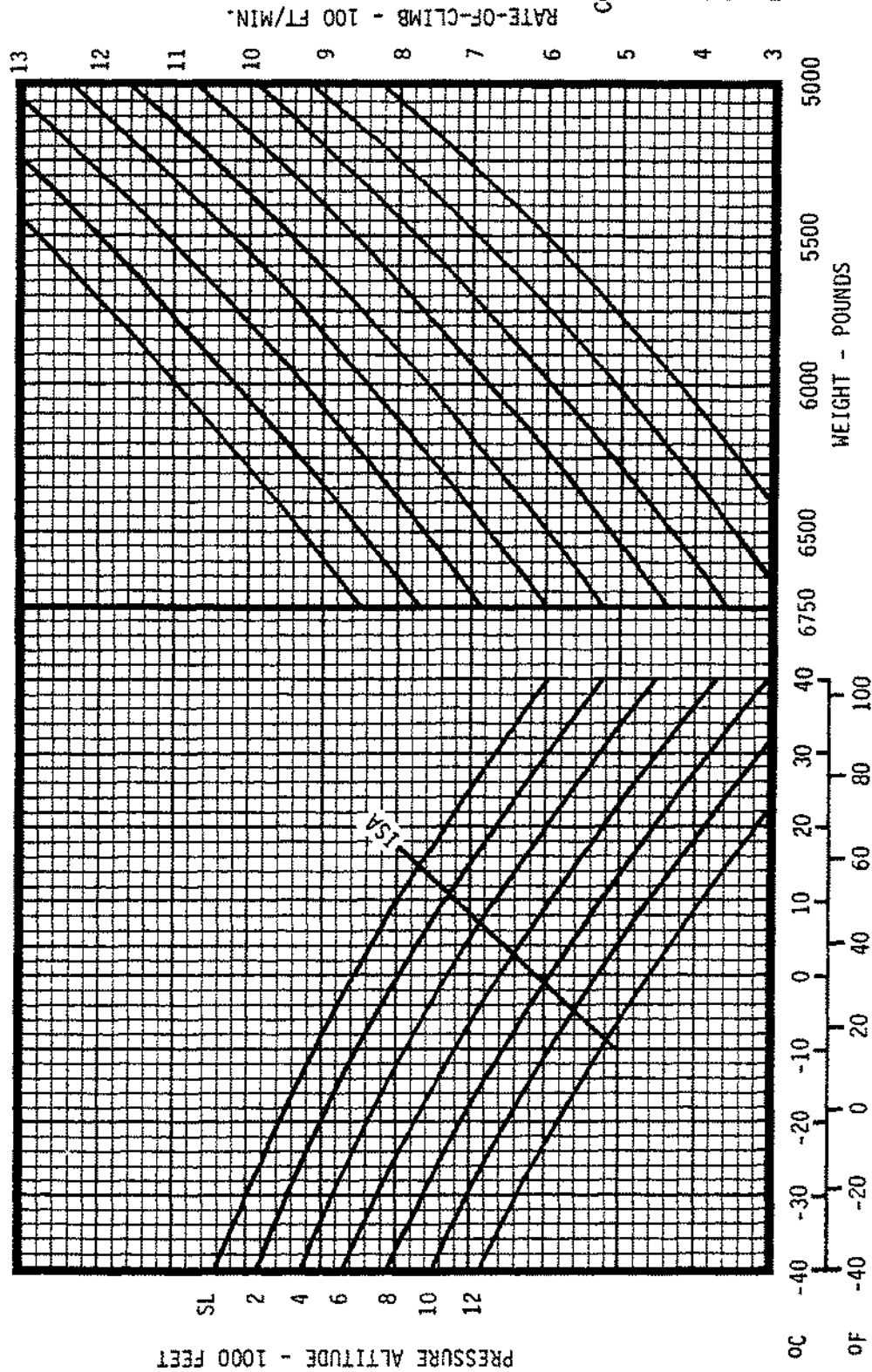
NOTE: Approximate Effect of Configuration on Single-Engine Rate-of-Climb.

Subtract values listed below from value obtained in the graph. Effects for a combination of gear, flap or windmilling propeller may be obtained by adding the effects for each.

Inoperative Engine	400 Ft/Min
Windmilling	350 Ft/Min
Gear Down	200 Ft/Min
Flaps Down 150	800 Ft/Min
Flaps Down 450	

54847041

RATE-OF-CLIMB - BALKED LANDING CLIMB



- CONDITIONS:
1. 2700 RPM and 38.0 Inches Hg.
 2. Mixtures - Check Fuel Flows In White Arc.
 3. Landing Gear - DOWN.
 4. Wing Flaps - 45°.
 5. Cowl Flaps - OPEN.
 6. Climb Speed ~ 82 KIAS.

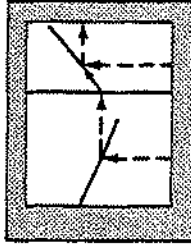


Figure 5-16

54847042

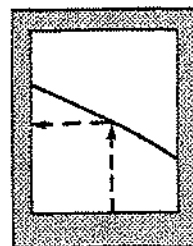
ENGINE INOPERATIVE SERVICE CEILING

CONDITIONS:

1. One Engine Inoperative Climb Configuration.

NOTE:

1. 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 feathered.
2. Increase indicated service ceiling 100 feet for each 0.10 inch Hg. altimeter setting greater than 29.92.
3. Decrease indicated service ceiling 100 feet for each 0.10 inch 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.



WEIGHT POUNDS	CLIMB SPEED - KIAS		
	SL	10,000	20,000
6750	108	105	103
6200	105	103	101
5700	102	101	100
5200	99	98	97

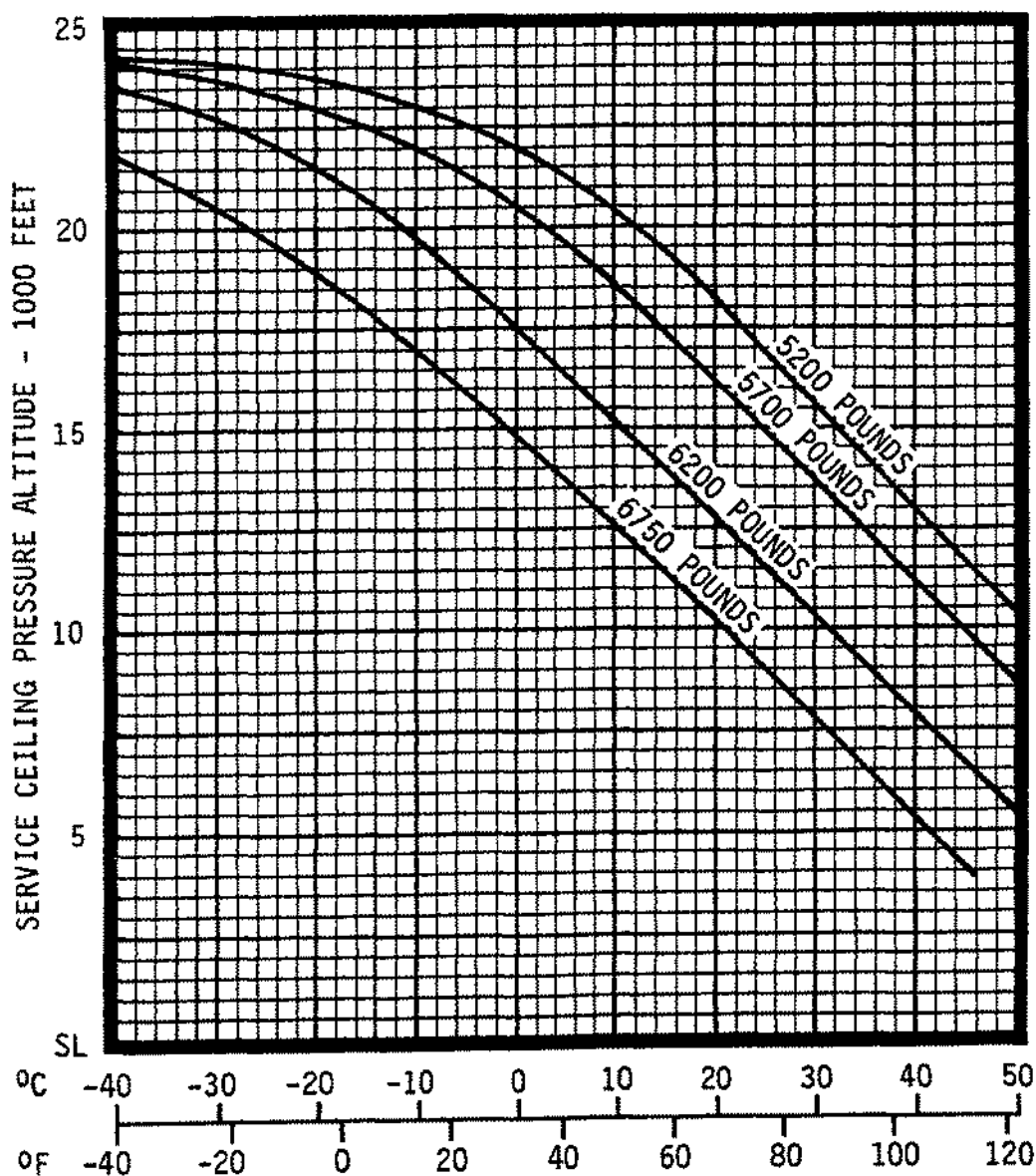
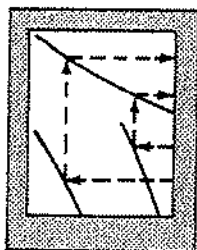


Figure 5-17



CONDITIONS:

1. 2600 RPM and 38.0 Inches Hg.*
2. Mixture - Check Fuel Flow in White Triangle.
3. Landing Gear - UP.
4. Wing Flaps - UP.
5. Cowl Flaps - OPEN.

*Above 20,000 Feet, Use Placarded Manifold Pressure

NOTE:

1. Time, Fuel and Distance for the Climb are Determined by Taking the Difference Between the Airport Altitude and Initial Cruise.
2. For Total Fuel Used, Add 32 Pounds for Start, Taxi and Takeoff.

54847045

TIME, FUEL AND DISTANCE TO CLIMB - MAXIMUM CLIMB

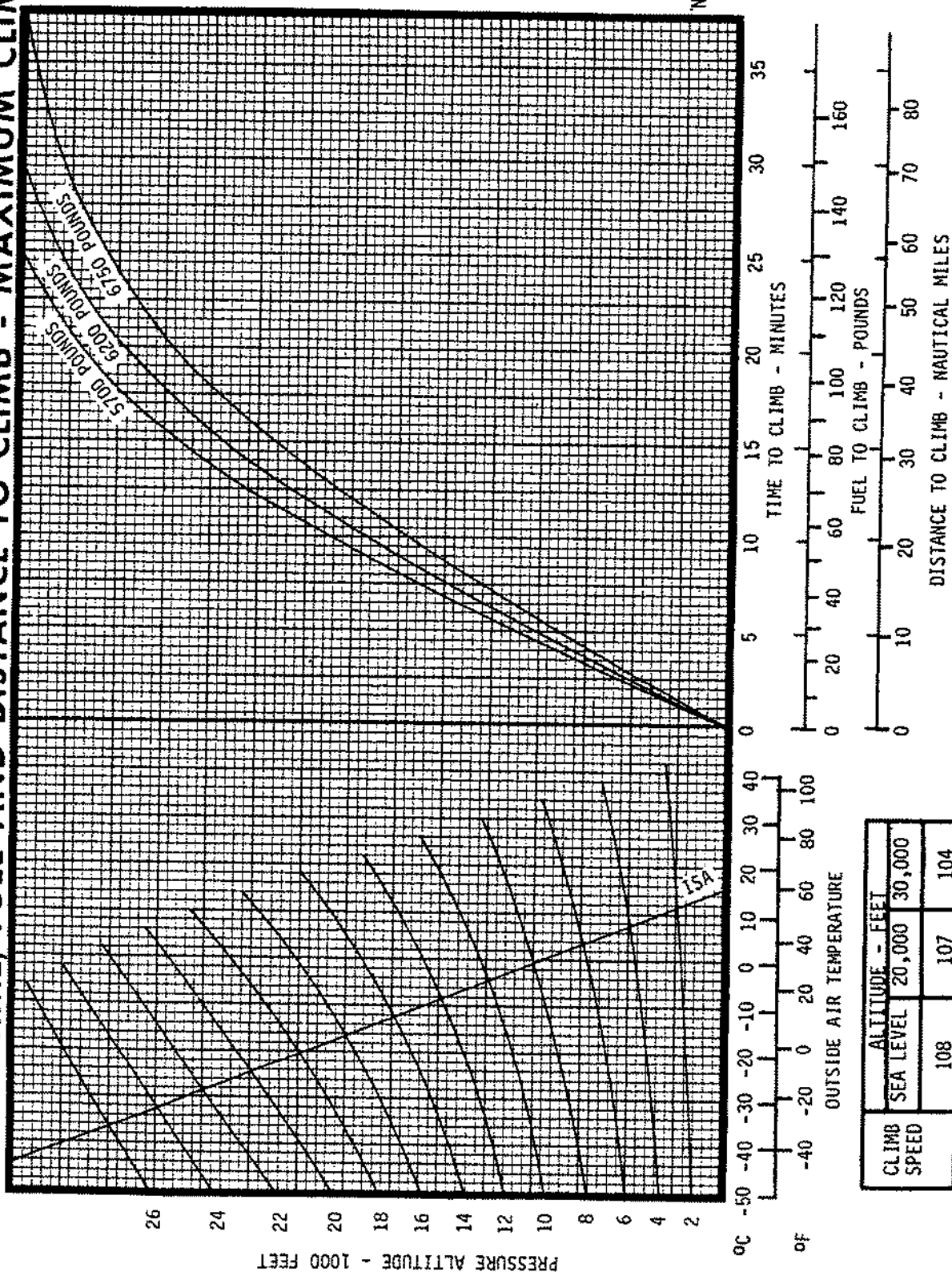
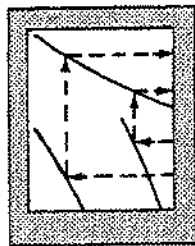
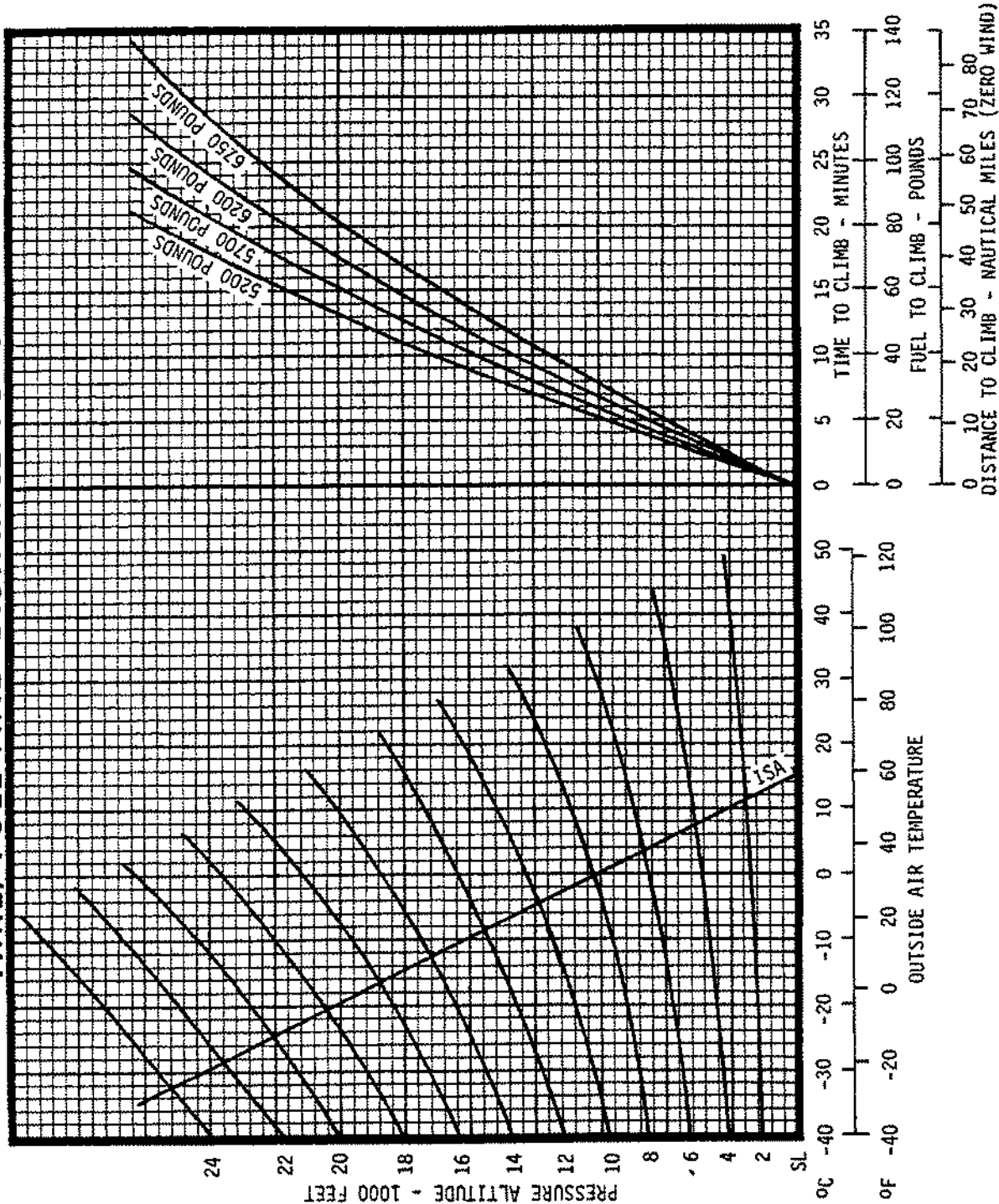


Figure 5-18

TIME, FUEL AND DISTANCE TO CLIMB - CRUISE CLIMB



CONDITIONS:

1. 2450 RPM And 31.5 Inches Hg.
2. Landing Gear - UP.
3. Wing Flaps - UP
4. Cowl Flaps - AS REQUIRED.
5. Airspeed - 120 KIAS.
6. Mixtures - 120 Pounds/Hour Fuel Flow (Blue Triangle).

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 32 pounds for start, taxi and takeoff.

Figure 5-19

CRUISE PERFORMANCE
WITH RECOMMENDED LEAN MIXTURE**NOTE:**

1. At Sea Level, increase speed by 4 KTAS for each 1000 pounds below 6750 pounds.
2. At 5000 feet, increase speed by 5 KTAS for each 1000 pounds below 6750 pounds.
3. Operations at peak EGT may be utilized with power settings within the boxes if the airplane is equipped with the optional EGT system.

ALTITUDE	RPM	MP	-50°C (23°F)			15°C (STD TEMP) (59°F)			35°C (95°F)		
			PERCENT BHP	KTAS	TOTAL LB/HR	PERCENT BHP	KTAS	TOTAL LB/HR	PERCENT BHP	KTAS	TOTAL LB/HR
SEA LEVEL	2450	31.5	79.5	174	215	74.8	174	204	70.2	173	192
	2450	29.0	73.5	169	200	69.2	169	189	64.9	167	178
	2450	27.0	67.9	164	186	63.9	163	175	60.0	162	166
	2450	25.5	62.9	159	173	59.2	158	164	55.6	156	155
	2300	34.0	79.5	174	215	74.8	174	204	70.2	173	192
	2300	32.5	76.8	172	208	72.3	172	197	67.9	171	185
	2300	30.5	72.2	168	197	68.0	167	186	63.8	166	175
	2300	29.0	67.6	163	185	63.6	163	175	59.7	162	165
	2300	27.0	62.3	158	171	58.6	157	163	55.0	155	154
	2300	25.0	57.3	153	160	53.9	151	151	50.6	149	143
	2200	34.0	74.5	170	203	70.2	169	191	65.8	168	180
	2200	33.0	72.2	168	197	68.0	167	186	63.8	166	175
	2200	31.0	67.9	164	186	63.9	163	175	60.0	162	166
	2200	29.0	63.3	159	174	59.6	158	165	55.9	156	156
	2200	27.0	58.3	154	162	54.9	152	154	51.5	150	146
	2200	25.0	53.7	148	151	50.5	146	143	47.4	144	135
	2100	31.5	64.6	160	177	60.8	160	168	57.0	158	159
	2100	29.0	59.3	155	164	55.8	154	156	52.4	152	148
	2100	27.5	55.0	150	154	51.8	148	146	48.6	146	138
	2100	25.5	50.3	144	143	47.4	142	135	44.5	139	128
			-15°C (5°F)			5°C (STD TEMP) (41°F)			25°C (77°F)		
5000 FEET	2450	31.5	79.5	182	215	74.8	182	204	70.2	181	192
	2450	29.5	73.5	177	200	69.2	176	189	64.9	175	178
	2450	27.5	68.1	171	186	64.1	170	176	60.1	169	166
	2450	25.5	63.3	166	174	59.6	165	165	55.9	163	156
	2300	34.0	79.5	182	215	74.8	182	204	70.2	181	192
	2300	33.0	76.8	180	208	72.3	179	197	67.9	178	185
	2300	31.0	72.4	175	197	68.1	175	186	63.9	174	175
	2300	29.0	68.1	171	186	64.1	170	176	60.1	169	166
	2300	27.0	62.6	165	172	58.9	164	163	55.3	162	155
	2300	25.5	57.6	159	160	54.3	158	152	50.9	155	144
	2200	34.0	74.7	178	203	70.3	177	192	66.0	176	180
	2200	33.0	72.4	175	197	68.1	175	186	63.9	174	175
	2200	31.0	68.2	171	186	64.2	171	176	60.2	169	167
	2200	29.0	63.6	166	175	59.9	165	166	56.2	163	157
	2200	27.0	58.6	160	163	55.2	159	154	51.8	156	146
	2200	25.5	54.3	155	152	51.1	153	145	48.0	150	137
	2100	32.0	65.2	168	179	61.4	167	169	57.6	165	160
	2100	29.5	59.6	162	165	56.1	160	157	52.6	158	148
	2100	27.5	55.6	156	156	52.4	155	148	49.1	152	140
	2100	26.0	51.3	150	145	48.3	148	138	45.3	145	130

Figure 5-20 (Sheet 1 of 3)

**CRUISE PERFORMANCE
WITH RECOMMENDED LEAN MIXTURE**

NOTE:

- At 10,000 Feet, increase speed by 5 KTAS for each 1000 pounds below 6750 pounds.
- At 15,000 Feet, increase speed by 6 KTAS for each 1000 pounds below 6750 pounds.
- Operations at Peak EGT may be utilized with power settings within the boxes if the airplane is equipped with the optional EGT system.

ALTITUDE	RPM	MP	-25°C (-13°F)			-5°C (STD TEMP) (23°F)			15°C (59°F)		
			PERCENT BHP	KTAS	TOTAL LB/HR	PERCENT BHP	KTAS	TOTAL LB/HR	PERCENT BHP	KTAS	TOTAL LB/HR
10,000 FEET	2450	31.5	79.5	191	215	74.8	190	204	70.2	189	192
	2450	29.5	73.5	185	200	69.2	184	189	64.9	182	178
	2450	27.5	68.2	179	186	64.2	178	176	60.2	176	167
	2450	26.0	63.6	174	175	59.9	172	166	56.2	169	157
	2300	34.0	79.5	191	215	74.8	190	204	70.2	189	192
	2300	33.0	76.8	188	208	72.3	188	197	67.9	186	185
	2300	31.0	72.5	184	198	68.3	183	187	64.1	181	176
	2300	29.0	68.2	179	186	64.2	178	176	60.2	176	167
	2300	27.0	62.9	173	173	59.2	171	164	55.6	168	155
	2300	25.5	58.0	166	161	54.6	164	153	51.2	161	145
	2200	34.0	74.8	186	204	70.5	185	192	66.1	184	181
	2200	33.0	72.5	184	198	68.3	183	187	64.1	181	176
	2200	31.0	68.6	179	187	64.5	178	177	60.5	176	167
	2200	29.0	63.9	174	175	60.2	173	166	56.4	170	157
	2200	27.5	59.3	168	164	55.8	166	156	52.4	163	148
	2200	25.5	55.0	162	154	51.8	159	146	48.6	155	138
	2100	32.0	65.9	176	180	62.1	175	171	58.2	172	162
	2100	30.0	60.3	169	167	56.8	167	158	53.2	164	150
	2100	28.0	56.3	164	157	53.0	161	149	49.7	158	141
	2100	26.0	52.3	157	148	49.3	155	140	46.2	150	132
			-35°C (-30°F)			-15°C (STD TEMP) (6°F)			5°C (42°F)		
			PERCENT BHP	KTAS	TOTAL LB/HR	PERCENT BHP	KTAS	TOTAL LB/HR	PERCENT BHP	KTAS	TOTAL LB/HR
15,000 FEET	2450	31.5	79.5	200	215	74.8	199	204	70.2	197	192
	2450	29.5	73.5	193	200	69.2	192	189	64.9	190	178
	2450	27.5	68.4	187	187	64.4	186	177	60.4	183	167
	2450	26.0	63.9	181	175	60.2	179	166	56.4	176	157
	2300	34.0	79.5	200	215	74.8	199	204	70.2	197	192
	2300	33.0	76.8	197	208	72.3	196	197	67.9	194	185
	2300	31.0	72.7	192	198	68.4	191	187	64.2	189	176
	2300	29.0	68.4	187	187	64.4	186	177	60.4	183	167
	2300	27.0	63.3	180	174	59.6	178	165	55.9	175	156
	2300	25.5	58.3	173	162	54.9	171	154	51.5	166	146
	2200	34.0	75.0	195	204	70.6	194	193	66.2	192	181
	2200	33.0	72.7	192	198	68.4	191	187	64.2	189	176
	2200	31.5	68.9	188	188	64.9	186	178	60.8	183	168
	2200	29.5	64.2	182	176	60.5	180	167	56.7	177	158
	2200	27.5	59.9	175	166	56.4	173	157	52.9	169	149
	2200	26.0	55.6	169	156	52.4	166	148	49.1	160	140
	2100	32.5	66.6	185	182	62.7	183	172	58.8	180	163
	2100	30.5	60.9	177	168	57.4	175	160	53.8	171	151
	2100	28.0	57.0	171	159	53.6	168	151	50.3	163	143
	2100	26.5	53.3	165	150	50.2	161	142	47.1	152	134

Figure 5-20 (Sheet 2 of 3)

CRUISE PERFORMANCE**WITH RECOMMENDED LEAN MIXTURE**

NOTE:

1. At 20,000 Feet, increase speed by 6 KTAS for each 1000 pounds below 6750 pounds.
2. At 23,500 Feet, increase speed by 6 KTAS for each 1000 pounds below 6750 pounds.
3. At 25,000 Feet, increase speed by 7 KTAS for each 1000 pounds below 6750 pounds.
4. Operations at peak EGT may be utilized with power settings within the boxes if the airplane is equipped with the optional EGT system.

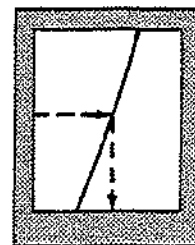
ALTITUDE	RPM	MP	-45°C (-48°F)			-25°C (STD TEMP) (-12°F)			-5°C (24°F)		
			PERCENT BHP	KTAS	TOTAL LB/HR	PERCENT BHP	KTAS	TOTAL LB/HR	PERCENT BHP	KTAS	TOTAL LB/HR
20,000 FEET	2450	31.5	79.5	209	215	74.8	208	204	70.2	206	192
	2450	29.5	73.5	202	200	69.2	201	189	64.9	198	178
	2450	27.5	68.6	196	187	64.5	193	177	60.5	190	167
	2450	26.0	64.1	189	176	60.3	187	167	56.6	182	158
	2300	34.0	79.5	209	215	74.8	208	204	70.2	206	192
	2300	33.0	76.8	206	208	72.3	205	197	67.9	202	185
	2300	31.0	72.9	201	198	68.6	200	187	64.3	197	176
	2300	29.0	68.6	196	187	64.5	193	177	60.5	190	167
	2300	27.0	63.6	188	175	59.9	186	166	56.2	181	157
	2300	25.5	58.6	180	163	55.2	176	154	51.8	168	146
	2200	34.0	75.2	204	204	70.8	203	193	66.4	200	182
	2200	33.0	72.9	201	198	68.6	200	187	64.3	197	176
	2200	31.5	69.2	196	189	65.2	194	178	61.1	191	169
	2200	29.5	64.6	190	177	60.8	187	168	57.0	183	159
	2200	28.0	60.3	183	167	56.8	180	158	53.2	173	150
	2200	26.0	56.3	176	157	53.0	171	149	49.7	158	141
	2100	32.5	66.9	193	183	63.0	191	173	59.1	187	164
	2100	30.5	61.6	185	170	58.0	182	161	54.4	176	153
	2100	28.5	57.6	178	160	54.3	174	152	50.9	164	144
	2100	27.0	54.3	172	152	51.1	166	145	----	----	----
			-52°C (-61°F)			-32°C (STD TEMP) (-25°F)			-12°C (11°F)		
23,500 FEET	2450	31.0	77.0	213	209	72.5	212	198	68.0	208	186
	2450	29.5	73.5	209	200	69.2	206	189	64.9	203	178
	2450	27.5	68.8	202	188	64.8	199	178	60.8	194	168
	2450	26.0	64.2	194	176	60.4	191	167	56.7	184	158
	2300	29.5	68.7	202	188	64.7	199	177	60.7	194	168
	2300	27.5	63.8	194	175	60.0	190	166	56.3	183	157
	2300	26.0	59.0	185	163	55.5	180	155	52.1	161	147
	2200	30.0	64.9	196	178	61.1	193	169	57.3	186	160
	2200	28.0	60.6	188	167	57.1	184	159	53.5	172	150
	2200	26.0	57.0	181	159	53.6	174	151	----	----	----
			-54°C (-66°F)			-34°C (STD TEMP) (-30°F)			-14°C (6°F)		
25,000 FEET	2450	31.0	77.0	216	209	72.5	214	198	68.0	211	186
	2450	29.5	73.5	211	200	69.2	209	189	64.9	205	178
	2450	27.5	68.9	204	188	64.9	202	178	60.8	196	168
	2450	26.0	64.2	197	176	60.5	193	167	56.7	184	158
	2300	29.0	68.9	204	188	64.9	202	178	60.8	196	168
	2300	27.0	63.9	196	175	60.2	192	166	56.4	183	157
	2300	26.0	59.3	188	164	55.8	182	156	----	----	----
	2200	30.0	65.2	199	179	61.4	195	169	57.6	187	160
	2200	28.0	60.9	191	168	57.4	186	160	53.8	170	151
	2200	27.0	57.6	184	160	54.3	176	152	----	----	----

Figure 5-20 (Sheet 3 of 3)

RANGE PROFILE

CONDITIONS:

1. Takeoff Weight - 6750 Pounds.
2. Cruise Climb to Desired Altitude.
3. Recommended Lean Fuel Flow.
4. Zero Wind
5. Standard Day.



NOTE:

1. Range computations include fuel required for start, taxi, takeoff, cruise climb to altitude, cruise, descent and 45 minutes reserve fuel at the particular cruise power.
2. The distances shown are the sum of the distances to climb, cruise and descend.

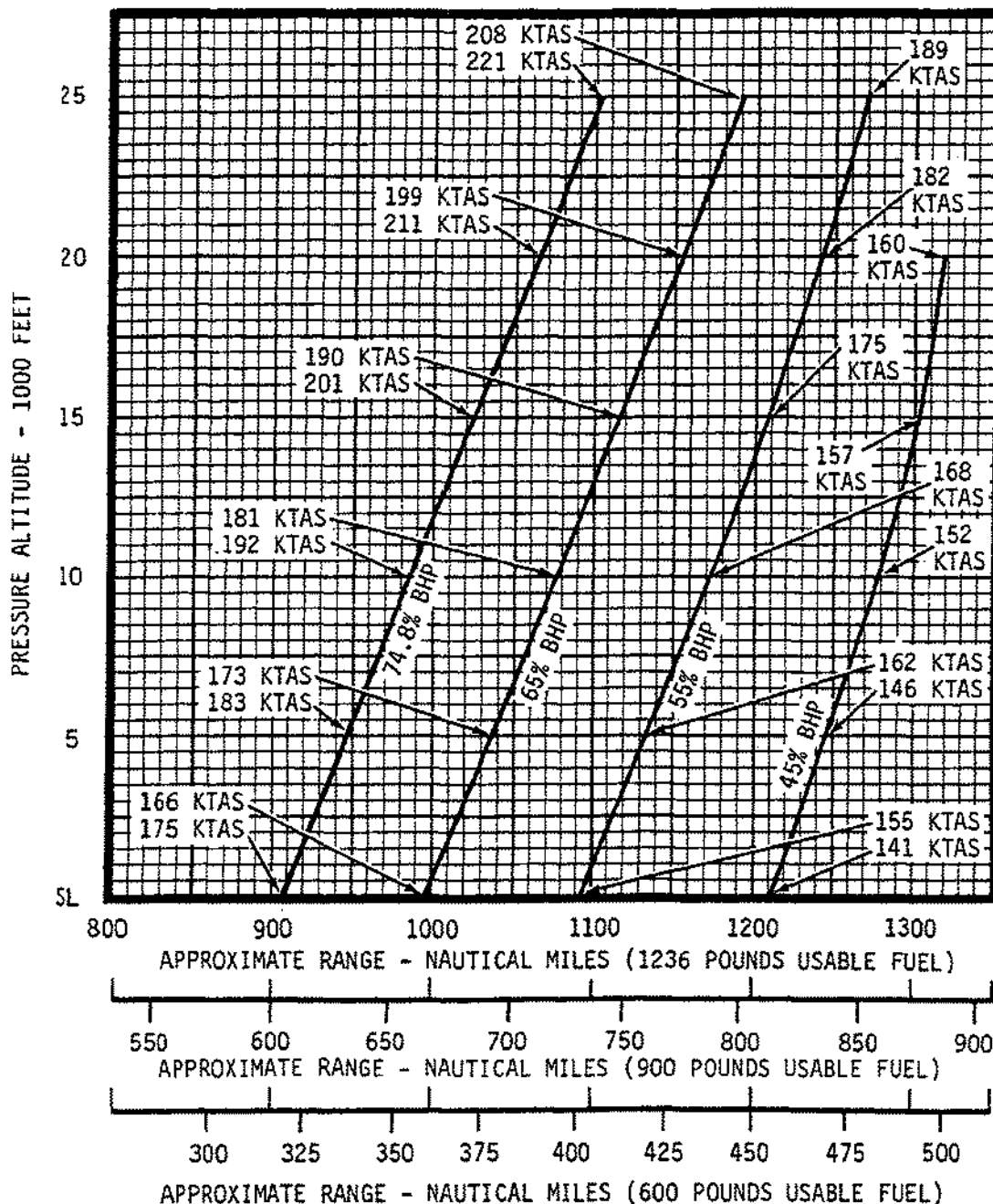


Figure 5-21

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ENDURANCE PROFILE

CONDITIONS:

1. Takeoff Weight - 6750 Pounds.
2. Cruise Climb to Desired Altitude.
3. Recommended Lean Fuel Flow.
4. Standard Day.

NOTE:

1. Endurance computations include fuel required for start, taxi, takeoff, cruise climb to altitude, cruise, descent and 45 minutes reserve fuel at the particular cruise power.
2. The endurance shown is the sum of the times to climb, cruise and descend.

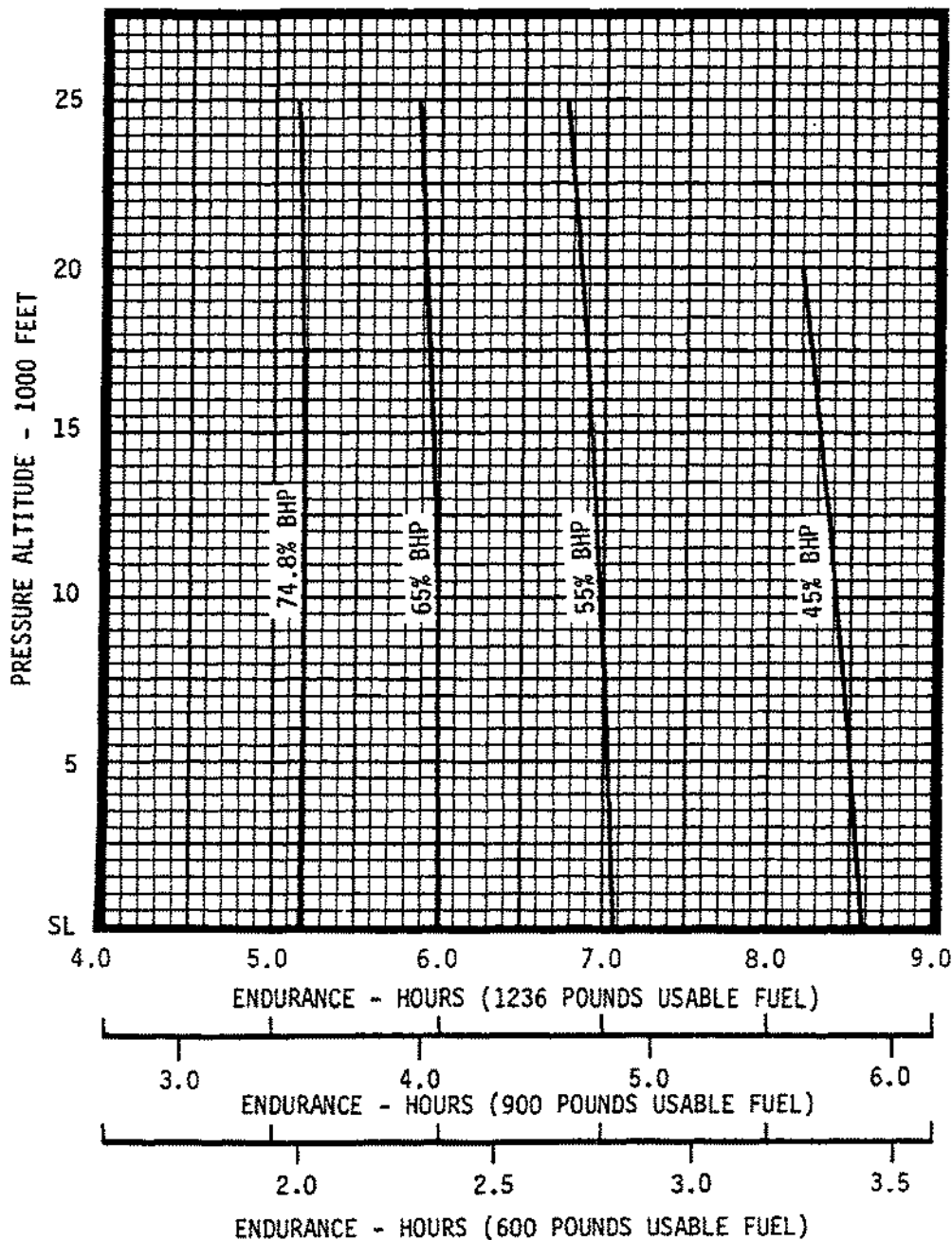
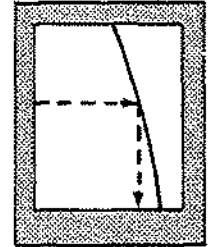


Figure 5-22

54847043

HOLDING TIME

CONDITIONS:

1. 2100 RPM and 24 Inches Hg.
Manifold Pressure (45% Power).
2. Recommended Lean Fuel Flow
(129 Pounds Per Hour Total).

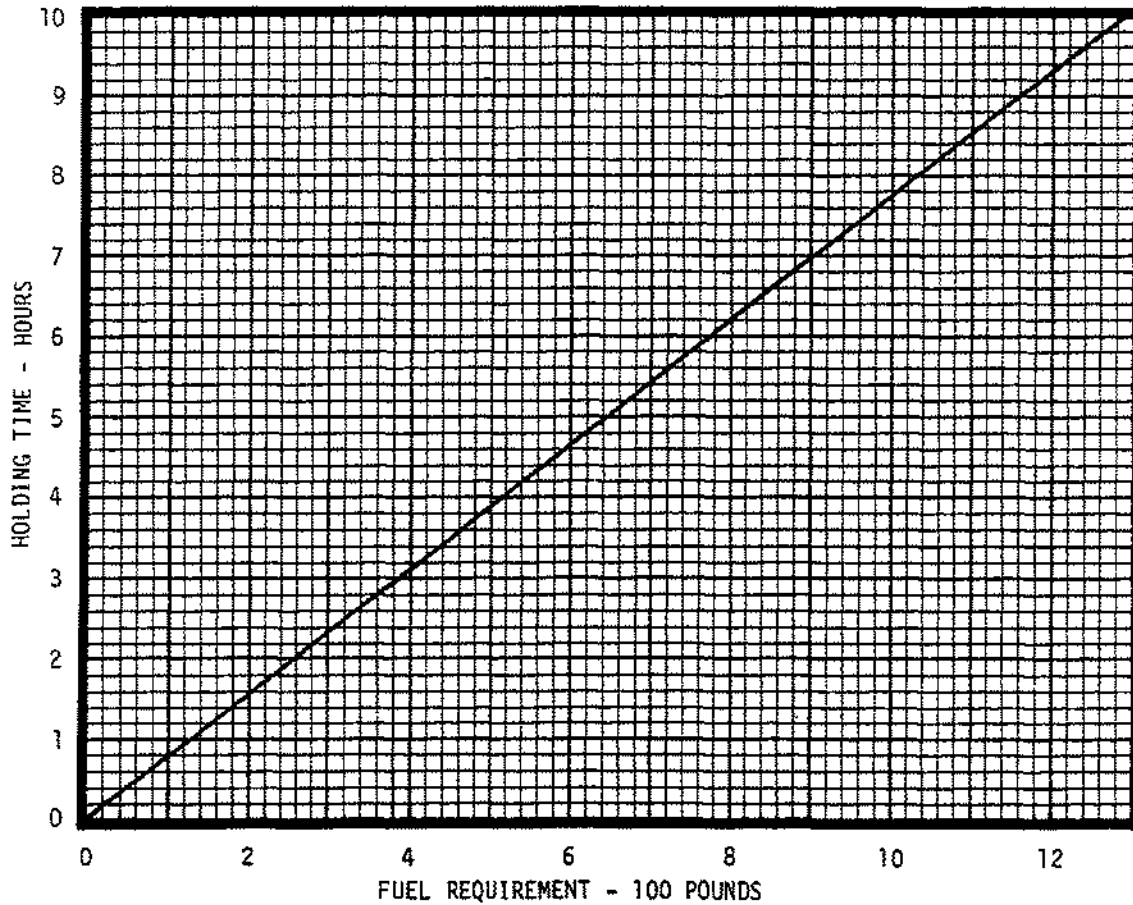
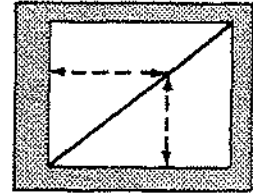


Figure 5-23

TIME, FUEL AND DISTANCE TO DESCEND

CONDITIONS:

1. Power - 2200 RPM and 24.5 Inches Hg. Manifold Pressure.
2. Landing Gear - UP.
3. Wing Flaps - UP.
4. Airspeed - 180 KIAS
5. Cowl Flaps - CLOSED.

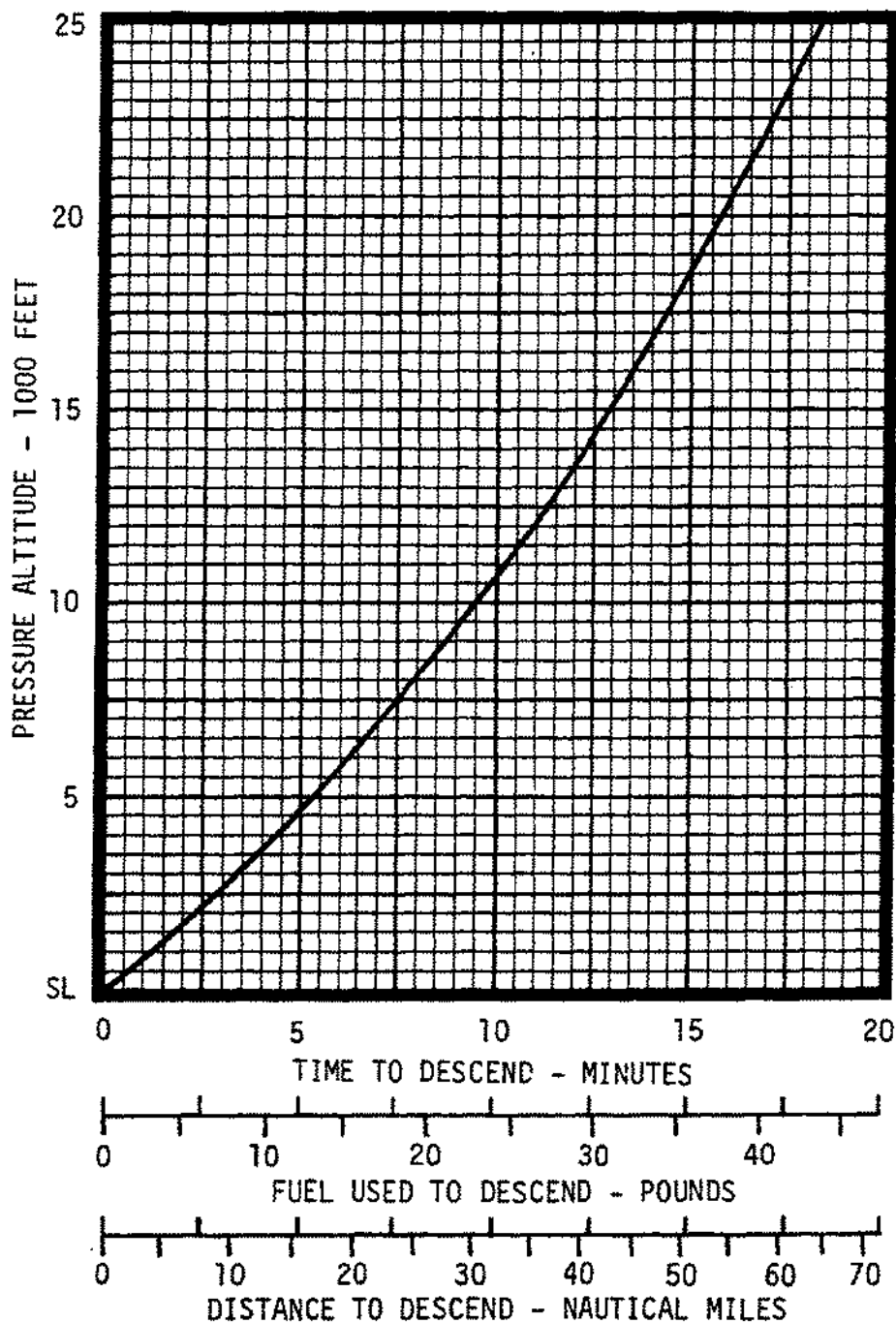
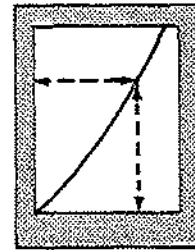


Figure 5-24

NORMAL LANDING DISTANCE

CONDITIONS:

1. Throttles - IDLE.
2. Landing Gear - DOWN.
3. Wing Flaps - 45°.
4. Cowl Flaps - CLOSE.
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 13 knots. Expect total landing distance to increase by 35%.
2. Decrease total distances by 3% for each 4 knots headwind. For operations with tailwinds up to 10 knots, increase total distances by 8% for each 3 knots wind.

WEIGHT- POUNDS	SPEED AT 50-FOOT OBSTACLE KIAS	PRESSURE ALTITUDE - FEET	-20°C (-4°F)		-10°C (14°F)		0°C (32°F)		10°C (50°F)	
			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
6750	94	Sea Level	890	2270	930	2310	970	2350	1000	2380
		1000	930	2310	960	2340	1000	2380	1040	2420
		2000	960	2340	1000	2380	1040	2420	1080	2460
		3000	1000	2380	1040	2420	1080	2460	1120	2500
		4000	1040	2420	1080	2460	1120	2500	1160	2540
		5000	1070	2450	1120	2500	1160	2540	1200	2580
		6000	1120	2500	1160	2540	1200	2580	1250	2630
		7000	1160	2540	1200	2580	1250	2630	1300	2680
		8000	1200	2580	1250	2630	1300	2680	1350	2730
		9000	1250	2630	1300	2680	1350	2730	1400	2780
		10,000	1300	2680	1350	2730	1400	2780	1450	2830
6200	91	Sea Level	740	2120	770	2150	800	2180	830	2210
		1000	770	2150	800	2180	830	2210	860	2240
		2000	800	2180	830	2210	860	2240	890	2270
		3000	830	2210	860	2240	890	2270	930	2310
		4000	860	2240	890	2270	930	2310	960	2340
		5000	890	2270	930	2310	960	2340	1000	2380
		6000	930	2310	960	2340	1000	2380	1040	2420
		7000	960	2340	1000	2380	1040	2420	1080	2460
		8000	1000	2380	1040	2420	1080	2460	1120	2500
		9000	1040	2420	1080	2460	1120	2500	1160	2540
		10,000	1080	2460	1120	2500	1160	2540	1210	2590
5700	86	Sea Level	620	2000	640	2020	670	2050	690	2070
		1000	640	2020	670	2050	690	2070	720	2100
		2000	660	2040	690	2070	720	2100	740	2120
		3000	690	2070	720	2100	740	2120	770	2150
		4000	720	2100	740	2120	770	2150	800	2180
		5000	740	2120	770	2150	800	2180	830	2210
		6000	770	2150	800	2180	830	2210	860	2240
		7000	800	2180	830	2210	860	2240	890	2270
		8000	830	2210	860	2240	900	2280	930	2310
		9000	860	2240	900	2280	930	2310	970	2350
		10,000	900	2280	930	2310	970	2350	1000	2380
5200	84	Sea Level	570	1950	590	1970	620	2000	640	2020
		1000	590	1970	620	2000	640	2020	660	2040
		2000	610	1990	640	2020	660	2040	690	2070
		3000	640	2020	660	2040	690	2070	710	2090
		4000	660	2040	690	2070	710	2090	740	2120
		5000	690	2070	710	2090	740	2120	770	2150
		6000	710	2090	740	2120	770	2150	800	2180
		7000	740	2120	770	2150	800	2180	830	2210
		8000	770	2150	800	2180	830	2210	860	2240
		9000	800	2180	830	2210	860	2240	890	2270
		10,000	830	2210	860	2240	890	2270	930	2310

Figure 5-25 (Sheet 1 of 2)

NORMAL LANDING DISTANCE

CONDITIONS:

1. Throttles - IDLE.
2. Landing Gear - DOWN
3. Wing Flaps - 45°.
4. Cowl Flaps - CLOSE.
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 13 knots. Expect total landing distance to increase by 35%.
2. Decrease total distances by 3% for each 4 knots headwind. For operations with tailwinds up to 10 knots, increase total distances by 8% for each 3 knots wind.

WEIGHT- POUNDS	SPEED AT 50-FOOT OBSTACLE KIAS	PRESSURE ALTITUDE - FEET	20°C (68°F)		30°C (86°F)		40°C (104°F)	
			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
6750	94	Sea Level	1040	2420	1070	2450	1110	2490
		1000	1070	2450	1110	2490	1150	2530
		2000	1110	2490	1150	2530	1190	2570
		3000	1150	2530	1190	2570	1230	2610
		4000	1200	2580	1240	2620	1280	2660
		5000	1240	2620	1290	2670	1330	2710
		6000	1290	2670	1330	2710	1380	2760
		7000	1340	2720	1390	2770	1430	2810
		8000	1390	2770	1440	2820	1490	2870
		9000	1450	2830	1500	2880	1550	2930
6200	91	10,000	1500	2880	1550	2930	1610	2990
		Sea Level	860	2240	890	2270	920	2300
		1000	890	2270	920	2300	950	2330
		2000	920	2300	960	2340	990	2370
		3000	960	2340	990	2370	1020	2400
		4000	990	2370	1030	2410	1060	2440
		5000	1030	2410	1070	2450	1100	2480
		6000	1070	2450	1110	2490	1140	2520
		7000	1110	2490	1150	2530	1190	2570
		8000	1160	2540	1200	2580	1230	2610
5700	86	9000	1200	2580	1240	2620	1280	2660
		10,000	1250	2630	1290	2670	1330	2710
		Sea Level	720	2100	740	2120	760	2140
		1000	740	2120	770	2150	790	2170
		2000	770	2150	800	2180	820	2200
		3000	800	2180	820	2200	850	2230
		4000	830	2210	860	2240	880	2260
		5000	860	2240	890	2270	920	2300
		6000	890	2270	920	2300	950	2330
		7000	930	2310	960	2340	990	2370
5200	84	8000	960	2340	990	2370	1030	2410
		9000	1000	2380	1030	2410	1070	2450
		10,000	1040	2420	1070	2450	1110	2490
		Sea Level	660	2040	680	2060	710	2090
		1000	690	2070	710	2090	730	2110
		2000	710	2090	740	2120	760	2140
		3000	740	2120	760	2140	790	2170
		4000	770	2150	790	2170	820	2200
		5000	790	2170	820	2200	850	2230
		6000	820	2200	850	2230	880	2260
		7000	860	2240	890	2270	910	2290
		8000	890	2270	920	2300	950	2330
		9000	920	2300	960	2340	990	2370
		10,000	960	2340	990	2370	1030	2410

Figure 5-25 (Sheet 2 of 2)

SECTION 6

WEIGHT & BALANCE/EQUIPMENT LIST

TABLE OF CONTENTS

	Page		Page
INTRODUCTION	6-1	WEIGHT AND BALANCE	
AIRPLANE WEIGHING		RECORD	6-5
PROCEDURES	6-1	EQUIPMENT LIST	6-9
WEIGHT AND BALANCE		WEIGHT AND BALANCE	
DETERMINATION FOR FLIGHT	6-4	FORM	6-27/6-28

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. An equipment list, provided at the end of this section, provides arms and weights of all equipment available for installation on the airplane.

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 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.
5. Adjust all seats to the normal operating position.
6. Close all baggage doors, main cabin door and emergency exit window.
7. Clean the airplane inside and out.
8. Remove all snow, ice or water which may be on the airplane.
9. Weigh the airplane in a closed hangar to avoid errors caused by air currents.
10. 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.

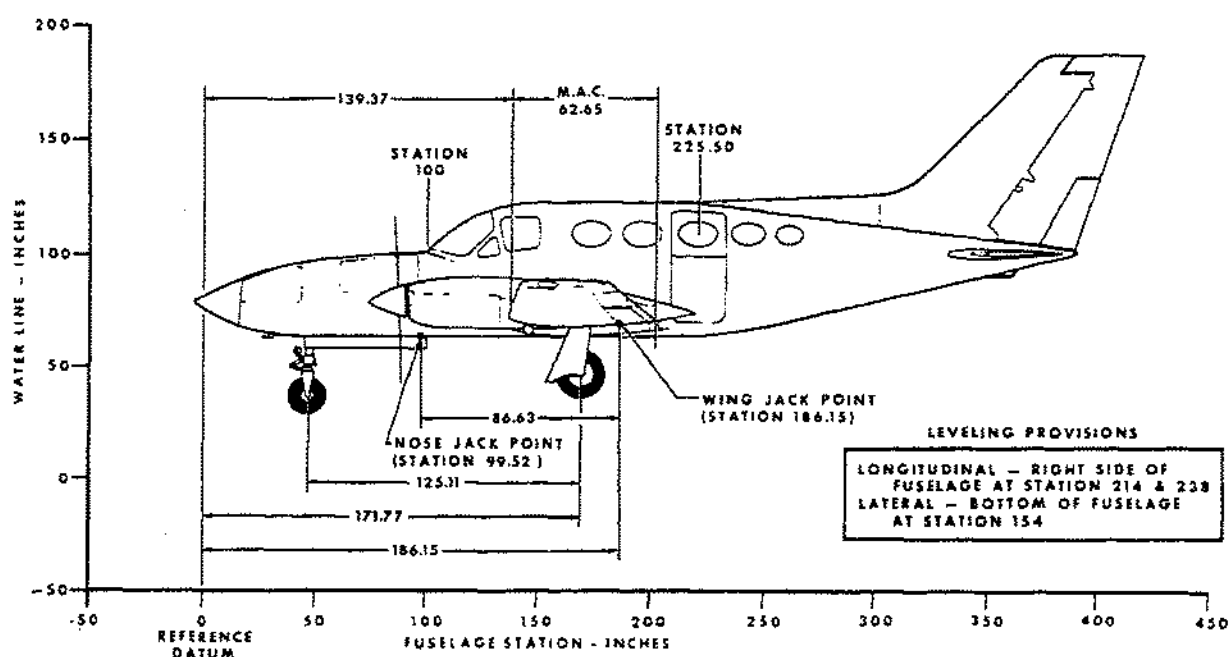
- a. Turn off all electrical power.
 - b. Turn fuel selectors OFF.
 - c. Remove engine cowling.
 - d. Disconnect inlet fuel supply hose at the inlet side of the engine-driven fuel pump.
 - e. Connect defueling hose to inlet fuel supply hose.
 - f. Turn fuel selectors ON and defuel wing until all possible fuel is removed.
 - g. Drain the remaining fuel through the drain valves into an appropriate container.
 - (1) The main tanks are drained by opening the drain valve on the bottom of each tank sump. The main tank fuel lines are drained by removing a fuel sump drain valve located at the wing gap fairings, inboard of the respective engine nacelle. The right and left fuel filters are drained aft of the main spar inboard of each main fuel tank.
 - (2) Each drain should remain open until the defueling rate slows to approximately 1 drop per second.
 - (3) Drain fuel selector valves and fuel crossfeed lines.
 - 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.
11. The airplane must be level when weighed.
- a. For longitudinal leveling, two bolts are located on the right side of the fuselage at stations 214.00 and 238.00. Unscrew these two bolts approximately 1/4 inch so a spirit level can be placed on them.
 - b. For lateral leveling, use a spirit level on the underside of the fuselage at station 154.0.
12. When weighing on the wheels or jack points with mechanical scales, insure that the scales are in calibration 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.

CAUTION

- Keep the airplane level while jacking to prevent the airplane from slipping off the jacks and damaging the airplane.
- Jack pads, provided with the airplane, must be installed in each wing jack point prior to jacking the airplane.

13. 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 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.
14. Determine scale reading, scale drift and tare from all three scales.
15. 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 _____ IF WEIGHED ON JACK POINTS, USE 86.63. IF WEIGHED ON WHEELS, USE 125.11

CG ARM OF AIRPLANE AS WEIGHED USING JACK POINTS OR WHEELS * _____ INCHES AFT OF DATUM

TOTAL AS WEIGHED _____ NOSE NET WEIGHT _____

NOTE

IT IS THE RESPONSIBILITY OF THE OPERATOR TO INSURE THAT THE AIRPLANE IS LOADED PROPERLY.

LEGEND

- IF WEIGHED ON WHEELS CROSS OUT "JACK
POINTS OR": IF WEIGHED ON JACK POINTS
CROSS OUT "OR WHEELS"
- INCLUDES ALL UNDRAINABLE FLUIDS AND
FILL 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 POUNDS PER GALLON	LEFT AND RIGHT WING	41.0	165.2	67.7
BASIC EMPTY WEIGHT				

Figure 6-1

16. Computations (see Figure 6-1).
- 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 the Net Weight and Airplane Total As Weighed columns.
 - Determine the CG arm of the airplane using the formula presented in Figure 6-1, if the jack points are used for weighing. If the airplane is weighed on the wheels, use the following formula.

$$\text{CG Arm of Airplane As Weighed} = 171.77 - \frac{125.11 W_N}{W_T} = \text{Inches Aft of Datum}$$

where W_N = net weight on nosewheel and W_T = total net weight on all three wheels

- Enter the total Net Weight and CG Arm in the Basic Empty Weight and Center of Gravity Table columns. Multiply the Weight (Lbs) entry times the CG Arm (In) entry to determine Moment (In-Lbs/100) entry. Total each of the three columns to determine basic empty weight, CG arm and moment.

NOTE

An attempt should be made to verify the results of each weighing, when data for comparison is available.

- 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 in Figure 6-4 and enter them in on item 1 (Basic Empty Weight) of Figure 6-3. For this sample, assume a weight of 4628 pounds and moment/100 of 7122.

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 212.87.

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).

See Figure 6-3. Subtract item 6 (Less Fuel For Taxiing) from item 5 (Ramp Weight) to determine item 7 (Takeoff Weight). Enter item 7 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.

Refer to Section 5 for estimated fuel used during the flight. After determining the fuel used, obtain the appropriate weights and 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 affect 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.

WEIGHT AND MOMENT TABLES

CREW AND PASSENGERS

WEIGHT (POUNDS)	1ST OR 2ND SEATS ARM = 137"	3RD OR 4TH SEATS		5TH OR 6TH SEATS ARM = 218"	TOILET SEAT ARM = 250"	7TH OR 8TH SEATS ARM = 261"
		FORWARD FACING ARM = 175"	AFT FACING ARM = 178"			
		MOMENT/100				
10	14	18	18	22	25	26
20	27	35	36	44	50	52
30	41	52	53	65	75	78
40	55	70	71	87	100	104
50	68	88	89	109	125	130
60	82	105	107	131	150	157
70	96	122	125	153	175	183
80	110	140	142	174	200	209
90	123	158	160	196	225	235
100	137	175	178	218	250	261
110	151	192	196	240	275	287
120	164	210	214	262	300	313
130	178	228	231	283	325	339
140	192	245	249	305	350	365
150	206	262	267	327	375	392
160	219	280	285	349	400	418
170	233	298	303	371	425	444
180	247	315	320	392	450	470
190	260	332	338	414	475	496
200	274	350	356	436	500	522
210	288	368	374	458	525	548
220	301	385	392	480	550	574
230	315	402	409	501	575	600
240	329	420	427	523	600	626
250	342	438	445	545	625	652
260	356	455	463	567	650	679
270	370	472	481	589	675	705
280	384	490	498	610	700	731
290	397	508	516	632	725	757
300	411	525	534	654	750	783

FUEL

GALLONS (AT 6.0 POUNDS PER GALLON)	WEIGHT (POUNDS)	MOMENT/100 ARMS Varies	GALLONS (AT 6.0 POUNDS PER GALLON)	WEIGHT (POUNDS)	MOMENT/100 ARMS Varies
5	30	50	105	630	1022
10	60	99	110	660	1070
15	90	148	115	690	1113
20	120	197	120	720	1166
25	150	246	125	750	1214
28	168	275	130	780	1262
30	180	294	135	810	1310
35	210	343	140	840	1359
40	240	392	145	870	1407
45	270	440	150	900	1455
50	300	489	155	930	1503
55	330	537	160	960	1550
56	336	547	165	990	1598
60	360	585	170	1020	1646
65	390	635	175	1050	1694
70	420	683	180	1080	1742
75	450	731	185	1110	1790
80	480	780	190	1140	1838
85	510	828	195	1170	1886
90	540	877	200	1200	1934
95	570	925	204	1224	1971
100	600	973			

BAGGAGE AND CABINET CONTENTS

WEIGHT (POUNDS)	AVIONICS BAY ARM = 32"	NOSE COMPARTMENT ARM = 71"	WING LOCKERS ARM = 186"	AFT CABIN			
				BAY "A" ARM = 266"	BAY "B" ARM = 282"	REFRESHMENT BAR ARM = 279"	OVERHEAD CABINET ARM = 282"
MOMENT/100							
10	3	7	19	26	28		28
20	6	14	37	53	56	56	56
30	10	21	56	80	85		
40	13	28	74	106	113		
50	16	36	93	133	141		
60	19	43	112	160	169		
70	22	50	130	186	197		
80	25	57	149	213	226		
90	29	64	167	239	254		
100	32	71	186	266	282		
110	35	78	205	293			
120	38	85	223	319			
130	42	92	242	346			
140	45	99	260	372			
150	48	107	279	399			
160	51	114	298	426			
170	54	121	316	452			
180	58	128	335	479			
190	61	135	353	505			
200	64	142	372	532			
210	67	149	391	559			
220	70	156	409	585			
230	74	163	428	612			
240	77	170	446	638			
250	80	178	465	665			
260		185	484	692			
270		192	502	718			
280		199	521	745			
290		206	539	771			
300		213	558	798			
310		220	577	825			
320		227	595	851			
330		234	614	878			
340		241	632	904			
350		248	651	931			
360			670	958			
370			688	984			
380			707	1011			
390			725	1037			
400			744	1064			

CREW AND PASSENGER SEATS
AND BAGGAGE MOMENT ARMS

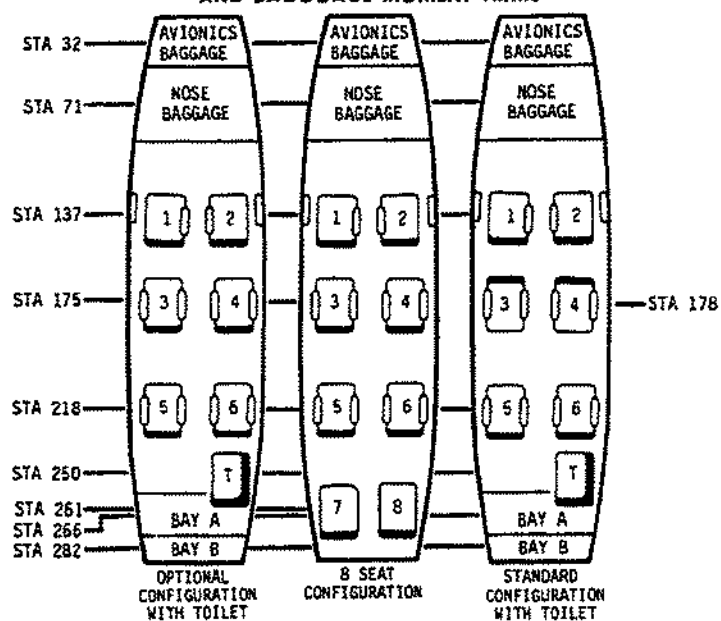


Figure 6-2 (Sheet 1 of 2)

WEIGHT AND MOMENT TABLES

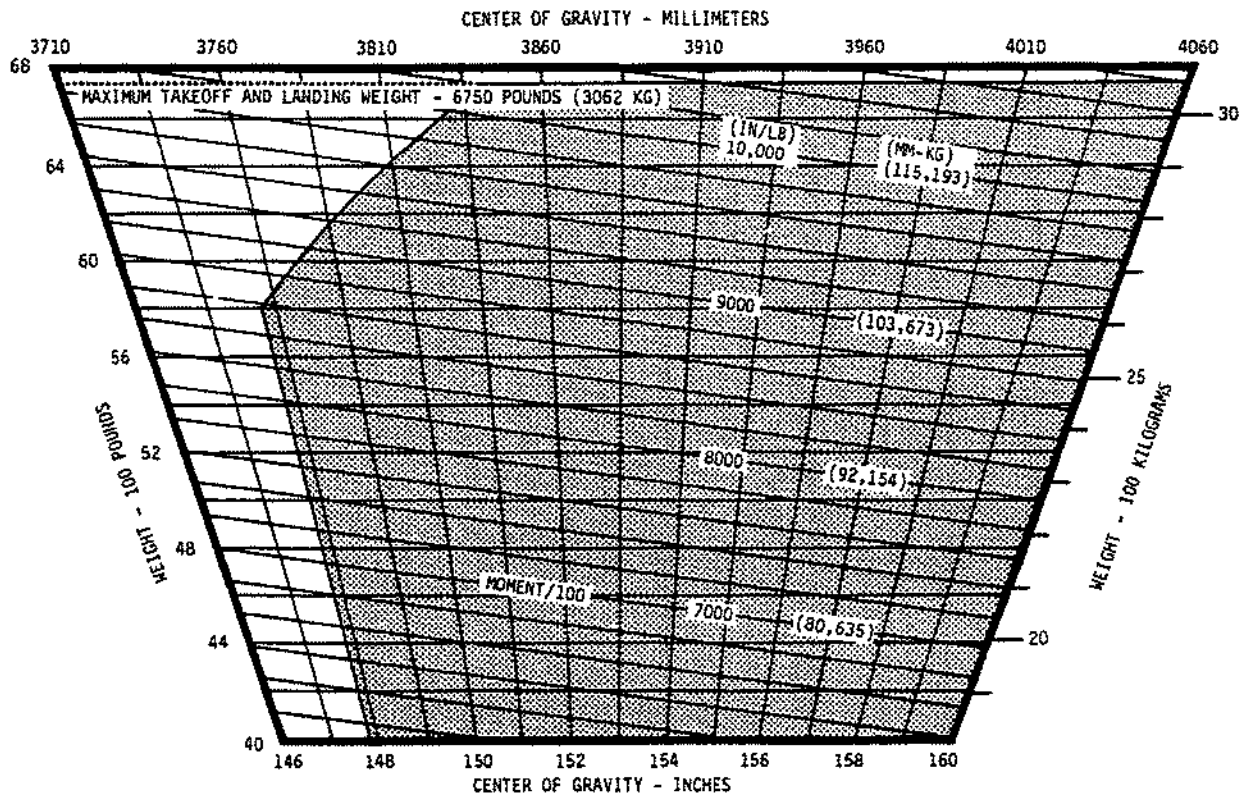
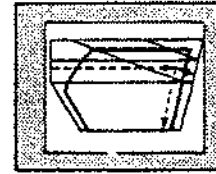


Figure 6-2 (Sheet 2 of 2)

SAMPLE WEIGHT AND BALANCE FORM

PAYLOAD COMPUTATIONS				R E F	ITEM	WEIGHT	MOMENT/ 100
ITEM OCCUPANTS OR CARGO	ARM	WEIGHT	MOMENT/ 100	1.	BASIC EMPTY WEIGHT	4628	7122
SEAT 1	137	160	219	2.	PAYLOAD	907	1419
SEAT 2	137	170	233	3.	ZERO FUEL WEIGHT (sub-total) (Do not exceed maximum zero fuel weight of 6515 pounds)	5535	8541
SEAT 3	175	120	210	4.	FUEL LOADING	800	1294
SEAT 4	175	190	332	5.	RAMP WEIGHT (sub-total) (Do not exceed maximum ramp weight of 6785 pounds)	6335	9835
SEAT 5	218	160	349	6.	LESS FUEL FOR TAXIING	35	58
SEAT 6				7.	TAKEOFF WEIGHT (Do not exceed maximum takeoff weight of 6750 pounds)	6300	9777
SEAT 7				8.	LESS FUEL TO DESTINATION	597	968
SEAT 8				9.	LANDING WEIGHT (Do not exceed maximum landing weight of 6750 pounds)	5703	8809
TOILET							
BAGGAGE							
WING LOCKERS							
AVIONICS							
NOSE	71	107	76				
BAY A							
BAY B							
CABINET CONTENTS							
PAYLOAD	---	907	1419				

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.

Figure 6-3

LOADING**WARNING**

If a tail ground strike has occurred or there is evidence of any damage to the tailcone or empennage area, the airplane must be examined by a qualified aircraft mechanic and repaired, if necessary, before the next flight.

Due to differences in optional equipment installed on the airplane, a wide center of gravity range exists. Under certain loading conditions, it is possible to exceed the aft CG limits which could cause the tail to tip and allow the tail bumper to strike the ground. The force of a tail ground strike could damage internal aircraft structure, resulting in possible interference with elevator control system operation.

To prevent tail tipping during airplane loading, it is recommended that owners and operators study their individual airplane's weight and balance information to become familiar with its capabilities and limitations. When loading, it is recommended the following steps be followed:

1. During unusual loading conditions where the airplane aft CG limits could possibly be exceeded, use a suitable padded tail stand under the tailcone, whenever possible. The tail stand should be removed by a crew member or ground service personnel only when airplane loading is complete.
2. Load the baggage in the nose and avionics compartments prior to boarding of the crew and passengers.
3. Avoid carrying baggage in the aft cabin.
4. When boarding people, have the pilot or person who is to occupy the copilot seat be the first to board with remaining persons filling the most forward seats first and the aft seats last. Arrange to have heavier people occupy the most forward seats.
5. When unloading the aircraft, have one person remain in the copilot or pilot seat while the other flight deck occupant goes aft to open the door. Arrange to have the passengers in the aft seats to be the first to deplane.

EQUIPMENT LIST

THE FOLLOWING IS A LIST OF EQUIPMENT INSTALLED IN THE AIRPLANE WHEN DELIVERED BY THE MANUFACTURER. DATUM STATION 0.0 IS 100.0 INCHES FORWARD OF THE AFT FACE OF THE FUSELAGE BULKHEAD JUST FORWARD OF THE RUDDER PEDALS.

POSITIVE ARMS ARE DISTANCES AFT OF DATUM STATION 0.0.

AN ASTERISK (*) INDICATES EXCHANGE WEIGHT.

THE TOTAL OPTIONAL EQUIPMENT WEIGHT AND MOMENT IS THE WEIGHT OF THE OPTION PACKAGE ONLY AND NOT THE SUM OF ALL ITEMS LISTED.

INSTALLATION APPROVAL OF EQUIPMENT INCLUDED IN THIS LIST IS MAINTAINED EITHER BY THE MANUFACTURER'S STC WITH THE APPROVAL NUMBER NOTED WITH EQUIPMENT OR IN THE MANUFACTURER'S TYPE DESIGN FILE IN ACCORDANCE WITH THE DELEGATION OPTION AUTHORIZATION CE-3.

**SECTION A
REQUIRED EQUIPMENT**

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
	WHEEL-MAIN GEAR	9910393	2		17.5	171.8
	TIRE-MAIN GEAR 650X10 8 PLY	C262003210	2		29.6	171.8
	BRAKE-MAIN GEAR	9910393	3		28.5	171.8
	TUBE-MAIN GEAR	C262023105	2		5.6	171.8
	WHEEL-NOSE GEAR	9910194	5	1	5.5	47.0
	TIRE-NOSE GEAR 600X6 6 PLY III	9910336	1	1	9.8	47.0
	TUBE-NOSE GEAR	C262023102	1	1	1.7	47.0
	ENGINE CMC 6 CYL	TS10-520NB	2		861.6	115.4
	CONTROLLER VAR & THROTTLE BODY	633388	10	2	14.8	140.1
	TURBOCHARGERS AIR RESEARCH	635630	1	2	60.0	139.8
	FILTER AIR INDUCTION	9913001	1	2	2.5	135.8
	OIL RADIATOR	637132		2	15.0	115.4
	OIL FILTER & ADAPTER	631641		2	5.4	127.5
	FUEL PUMP-ENGINE DRIVEN CMC	641583-639	1	2	5.2	125.0

SECTION A
REQUIRED EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
75	FUEL PUMP-BOOST	9910202	2	2	7.0	174.7
	PROP 3-BLADE * /82NEA-5.5	3AF32C505-		2	140.0	87.4
	POLISHED PROP SPINNER & BKHD	D5212D5214		2	9.8	83.5
	PROP SPINNER & BULKHEAD	03534D3796		2	9.9	83.5
76D	PROP GOVERNOR LH 3 STD	DCF29007/T		1	2.8	96.5
	PROP GOVERNOR LH W/SYNC T3	DCFS29008/		1	3.9	96.5
	PROP GOVERNOR LH W/SYNC/UNF2/T3	DCFUS29001		1	4.0	96.5
	PROP GOVERNOR LH W/UNF /T3	DCFU290013		1	2.9	96.5
76D	PROP GOVERNOR RH 3 STD	DCF29007/T		1	2.8	96.5
	PROP GOVERNOR RH W/SYNC T3	DCFS29007/		1	2.9	96.5
	PROP GOVERNOR RH W/SYNC/UNF3/T3	DCFUS29001		1	3.0	96.5
	PROP GOVERNOR RH W/UNF /T3	DCFU290013		1	2.9	96.5
77	AIRSPEED INDICATOR	C661040212		1	0.7	112.6
	AIRSPEED INDICATOR TAS LH	C661045316		1	2.8	112.6
04	ALTIMETER	C661014101		1	1.1	112.6
01A	ALTIMETER FT & MILIBARS	C661025101		1	1.1	112.6
	400 ENCODING ALTIMETER-INCHES	EA-401A		1	2.6	111.9
	400 ENCODING ALTIMETER-MILIBARS	EA-401A		1	2.6	111.9
	800 ENCODING ALTIMETER-INCHES	EA-801A		1	2.8	111.9
675A	800 ENCODING ALTIMETER-MILIBARS	EA-801A		1	2.8	111.9
	TACHOMETER-DUAL	C668017110		1	1.8	112.6
09	TACHOMETER-SYNCHRONOUS, DUAL	C668016110		1	1.8	112.6
	FUEL QUANTITY INDICATOR-DUAL	9910232	1	1	1.1	112.6
39	FUEL FLOW INDICATOR-DUAL STD	C662020116		1	2.1	158.0
	FUEL FLOW GAGE & MGMT COMPUTER	9910395	8	1	2.2	114.6
	GAGE-MANIFOLD PRESSURE-DUAL	C662026113		1	1.1	112.6
	GAGE-UNIT LEFT ENGINE COMB	C662019101		1	1.1	112.6
	GAGE-UNIT RIGHT ENGINE COMB	C662019101		1	1.1	112.6
	RATE OF CHANGE CABIN PRESSURE	C668517101		1	0.9	115.8
	COMPASS	C660501401		1	0.7	118.3

SECTION A
REQUIRED EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
	DIFF & ALT CABIN PRESSURE	C668516104		1	0.5	115.8
	STALL WARNING HORN	9910080		1	0.0	114.0
	STALL WARNING TRANSMITTER	186-14		1	0.2	142.6
11	ANGLE OF ATTACK SYSTEM	0800302		3	1.0	124.6
	ALTERNATOR 50 AMP	CM641668		1	24.3	98.8
16A	ALTERNATOR 100 AMP	9910385		2	36.9	98.8
	VOLTAGE REGULATOR	9910126		3	1.7	132.7
	STROBE LIGHTS ASSY	9910366162		3	3.5	157.5
96A	LIGHT ASSY HIGH INTENSITY	9910366364		2	4.0	157.5
96B	LIGHT ASSY (ICAO)	9910366566		2	4.4	157.5
	LIGHT POWER SUPPLY	9910368		3	3.5	157.5
96A	LIGHT POWER SUPPLY (HI INT)	9910368		2	3.8	168.8
96B	LIGHT POWER SUPPLY (ICAO)	9910368		2	3.8	168.8
	BATTERY 24 VOLTS	R-2425		1	40.0	171.5
	MASTER SWITCH	8501KA		3	0.3	123.0
	SEAT-PILOT ADJUSTABLE	0812782		1	15.3	140.0
	SEAT-PILOT ADJUSTABLE LEATHER	0812782		1	15.7	140.0
89	SEAT-PILOT VERT ADJUST TILTING	0812780		1	22.9	140.8
89 L	SEAT-PILOT VERT ADJ TILT LTHR	0812780		1	23.5	140.8
	SAFETY BELT-SHOULDER HARNESS	CM4008E9		1	0.6	151.5
181	SAFETY BELT-SHOULDER HARNS-REEL	5119565		11	0.9	151.8
	OUTFLOW VALVE-CABIN PRESSURE	103576		9	1.3	287.9
20	OUTFLOW VALVE-CABIN PRESSURE	103576		17	1.3	287.9
	SOLENOID VALVE	3423000		9	0.4	280.3
	SAFETY VALVE CABIN PRESSURE	103576		5	1.3	287.9
	PILOT'S OPERATING HANDBOOK	DI594R1-13PH		1	1.4	144.0

SECTION B STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
	CONTROLS & AUTOFLIGHT					
53301	GYRO-DIRECTIONAL C661053-0101			1	2.6	113.0
53302	GYRO-DIRECT G-502A			1	3.6	113.0
53303	GYRO-DIRECT G-504A			1	3.5	113.0
53304	GYRO-HSI (3 IN) IG-832A			1	5.0	113.0
	GYRO-HSI (4 IN) IG-895A			1	5.3	113.0
	GYRO-HORIZONTAL C661055-0103			1	1.9	112.5
53310	GYRO-HORIZ G-5198-1			1	2.5	112.5
53311	GYRO-ADI (3-IN) G-550A			1	3.5	112.5
53312	GYRO-ADI (4-IN) G-1050A			1	5.0	112.5
53000	400B NAV-O-MATIC INSTL			1	16.6	198.4
53000	COMPUTER CA-550A/FD & MOUNT			1	6.3	303.1
53000	CONTROLLER C-530A			1	1.7	109.7
53000	ACTUATOR PA-495A-1 & MOUNT			1	4.1	294.6
53000	ACTUATOR PA-495A-2 & MOUNT			1	4.1	220.0
53000	ACTUATOR TA-495A & MOUNT			1	2.1	300.4
53000	ALTITUDE SENSOR AS-895A			1	2.3	318.6
53100	400B NAV-O-MATIC SLAVED DG OPT			1	2.8	215.4
53100	FLUX DETECTOR CT-504A			1	0.5	361.9
53101	SLAVE ACCESS W/O BS SA-832A			1	0.8	35.0
53102	SLAVE ACCESS W/BS SA-832B			1	2.2	35.0
53200	400B NAV-O-MATIC HSI (3 IN) OPT			1	3.1	213.6
53201	CONVERTER B-445A & MOUNT			1	1.3	33.0
53200	FLUX DETECTOR CT-504A			1	0.5	361.9
53202	SLAVE ACCESS W/O BS SA-832A			1	0.8	35.0
53203	SLAVE ACCESS W/BS SA-832B			1	2.2	35.0
53400	YAW DAMPER INSTL YD-840B			1	3.9	234.3
53400	ACTUATOR PA-495A-1 & MOUNT			1	4.1	298.2
55000	400B IFCS INSTL			1	25.1	197.1
55000	COMPUTER CA-550A/FD & MOUNT			1	6.3	303.1

SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
55000	CONTROLLER C-531A			1	1.5	109.7
55000	ACTUATOR PA-495A-1 & MOUNT			1	4.1	294.6
55000	ACTUATOR PA-495A-2 & MOUNT			1	4.1	220.0
55000	ACTUATOR TA-495A & MOUNT			1	2.1	300.4
55000	ALTITUDE SENSOR AS-895A			1	2.3	318.6
55000	MODE SELECTOR S-550A			1	2.6	112.9
55001	CONVERTER B-445A & MOUNT			1	1.3	33.0
55000	FLUX DETECTOR CT-504A			1	0.5	361.9
55002	SLAVE ACCESS W/O BS SA-832A			1	0.8	35.0
55003	SLAVE ACCESS W/BS SA-832B			1	2.2	35.0
56000	800B IFCS INSTL			1	24.6	190.9
56000	COMPUTER CA-550A/FD & MOUNT			1	6.3	303.1
56000	CONTROLLER C-830FD			1	1.5	109.7
56000	ACTUATOR PA-495A-1 & MOUNT			1	4.1	294.6
56000	ACTUATOR PA-495A-2 & MOUNT			1	4.1	220.0
56000	ACTUATOR TA-495A & MOUNT			1	2.1	300.4
56000	ALTITUDE SENSOR AS-895A			1	2.3	318.6
56000	MODE SELECTOR S-550A			1	2.6	112.9
56001	CONVERTER B-445A & MOUNT			1	1.3	33.0
56000	FLUX DETECTOR CT-504A			1	0.5	361.9
56003	SLAVE ACCESS W/O BS SA-832A			1	0.8	35.0
56004	SLAVE ACCESS W/BS SA-832B			1	2.2	35.0
56000	YAW DAMPER INSTL			1	3.9	234.3
56000	ACTUATOR PA-495A-1 & MOUNT			1	4.1	298.2
57000	HSI & ADI 3 IN OPTION, RH			1	3.3	211.8
57000	INDICATOR IN-832R			1	0.8	112.9
57001	CONVERTER B-445A & MOUNT			1	1.3	33.0
57000	FLUX DETECTOR CT-504A			1	0.5	361.9
57002	SLAVE ACCESS W/O BS SA-832A			1	0.8	35.0
57003	SLAVE ACCESS W/BS SA-832B			1	2.2	35.0

SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
27	CORROSION PROOFING-INTERNAL	5600009009		1	10.5	194.2
33	ELECTRIC ELEVATOR TRIM	5618105		7	3.2	216.7
47B	GUST LOCK-RUDDER PROPELLER	5130387		1	1.1	375.6
77	PROP UNFEATHERING SYSTEM	5650116		1	10.8	111.7
76D	PROP SYNCHROPHASER SYSTEM	5618124		1	2.7	134.8
76E	PROP SYNC & UNFEATH SYSTEM INSTRUMENTS	5650116		2	13.5	116.2
675A	ALTITUDE ALERTER AA-801A			1	0.8	114.0
675B	ALTITUDE ALERTER AA-801A			1	0.8	114.0
624B	400 ENCODING ALTIMETER-INCHES	EA-401A		1	2.6	111.9
624D	400 ENCODING ALTIMETER-MILIBARS	EA-401A		1	2.6	111.9
676A	800 ENCODING ALTIMETER-INCHES	EA-801A		1	2.8	111.9
676A	ALTITUDE ALERTER AA-801A			1	0.8	114.0
676B	800 ENCODING ALTIMETER-MILIBARS	EA-801A		1	2.8	111.9
676B	ALTITUDE ALERTER AA-801A			1	0.8	114.0
23A	CLOCK-ELECTRIC	C664509101		1	0.4	114.1
	CLOCK-DIGITAL, ELECTRONIC	C664510101		1	0.6	114.1
08	RATE OF CLIMB INDICATOR	C661C35101		1	0.9	113.1
	INSTANT VERTICAL SPEED IND	C661C09101		1	1.9	113.1
	TURN & BANK INDICATOR (3 IN)STD	C661C31101		1	1.4	112.1
534	GYRO-COMPUTER G-840A			1	2.6	112.8
560	GYRO-COMPUTER G-840A			1	2.6	112.8
03	FLIGHT HOUR RECORDER, PNL MTD			1	0.8	112.1
03A	HEATER HOUR METER INSTL	CM2926		1	0.4	96.0
02	ECONOMY MIXTURE	C664503101		1	3.5	123.2
07	RH PANEL & PLUMBING SYSTEM	9910247		2	4.1	112.5
0710	ALTIMETER FT & INCHES	5114244		5	1.1	112.6
01B	ALTIMETER FT & MILIBARS	C661C14101		1	1.1	112.6
0720	AIRSPEED INDICATOR	C661C25101		1	1.1	112.6
		C661C40216		1	0.7	112.6

SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
04A	AIR SPEED INDICATOR (TAS)	C661040216		1	2.8	112.6
0730	RATE OF CLIMB INDICATOR	C661035101		1	0.9	113.1
08A	INSTANT VERTICAL SPEED IND	C661009101		1	1.9	113.1
0740	GYRO-DIRECTIONAL	C661053101		1	2.6	113.0
53305	GYRO-HSI (3 IN) IG-832A			1	5.0	113.0
0750	GYRO-HORIZONTAL	C661055103		1	1.9	112.5
53313	GYRO-ADI (3-IN) G-550A			1	3.5	112.5
0760	DUAL PITOT SYSTEM	5614202	1	1	1.3	54.6
0770	STATIC SOURCE-DUAL	5114220	5	1	0.3	257.0
19	TURN & BANK INDICATOR (3 IN)	C661031101		1	1.4	112.1
19A	TURN & BANK INDICATOR (2 IN)	C661032101		1	1.2	114.5
45	FUEL LOW LEVEL WARNING	5118628	5	1	0.6	152.0
	PNEUMATIC					
	VACUUM PUMPS-PWR FOR GYROS	212CW		2	3.8	126.3
32	VACUUM PUMPS-PWR FOR WING DEICE	442CW		2	6.5	126.3
194	VACUUM PUMPS-PWR FOR KNOWN ICE	442CW		2	6.5	126.3
	ELECTRICAL					
26	CONVERTER 110 VOLT	5618118	4	1	3.3	273.8
52	LIGHT-TAXI	5618101	8	1	1.5	54.6
49	LIGHT-LANDING RH (RETRACTABLE)	5118652	1	1	4.6	161.5
48	LIGHT-ICE DETECTION LH	5618701	1	1	0.4	133.5
48A	LIGHT-ICE DETECTION RH	5618701	2	1	0.4	133.5
43	LIGHT-COURTESY-NACELLE & NOSE	0851862	8	1	1.1	141.3
85	TIMER-COURTESY LIGHT	5618712	1	1	0.4	128.6
87A	STATIC DISCHARGE WICKS-SET OF 8	5100015	10	1	0.4	296.6
46	GROUND SERVICE PLUG	5118116	4	1	4.3	173.4
54	VERTICAL TAIL FLOOD LIGHT	40200001		1	2.9	291.0
	ELECTRONICS					
400	400 NAV/COM INSTL NO. 1			1	3.9	70.3
400	TRANSCIEIVER RT-485A & MOUNT			1	6.3	109.4

SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
40001	INDICATOR IN-486AC			1	2.1	111.9
40002	400 NAV/COM INSTL NO. 2			1	3.9	70.3
40002	TRANSCIEVER RI-485A & MOUNT			1	6.3	109.4
40003	INDICATOR IN-485AC			1	2.1	111.9
40103	INDICATOR IN-486AC			1	2.1	111.9
40004	400 GLIDESLOPE INSTL NO. 1			1	3.2	51.0
40004	RECEIVER R-443B & MOUNT			1	3.3	33.0
40004	ANTENNA CI-212			1	0.2	7.4
40044	400 GLIDESLOPE INSTL NO. 2			1	3.2	51.0
40044	RECEIVER R-443B & MOUNT			1	3.3	33.0
40044	ANTENNA COUPLER & CABLE			1	0.3	7.4
40005	400 ADF INSTL			1	3.2	91.9
40005	RECEIVER R-446A & MOUNT			1	4.0	109.4
40006	INDICATOR IN-346A			1	1.1	111.9
40106	ACCESSORY UNIT RA-446A			1	1.4	140.0
40105	ANTENNA-LDOP L-346A			1	1.6	162.4
40005	ANTENNA-SENSE			1	1.9	195.3
40007	400 MARKER BEACON INSTL			1	3.2	33.0
40007	RECEIVER R-402A & MOUNT			1	1.1	33.0
40007	ANTENNA CI-102			1	0.8	73.0
10000	1000 COM INSTL NO. 1			1	3.9	72.9
10000	TRANSCIEVER RI-1038A & MOUNT			1	6.6	33.0
10000	CONTROL C-1038A & MOUNT			1	2.0	112.9
10001	1000 COM INSTL NO. 2			1	3.9	72.9
10001	TRANSCIEVER RI-1038A & MOUNT			1	6.6	33.0
10001	CONTROL C-1038A & MOUNT			1	2.0	112.9
10002	1000 NAV INSTL NO. 1			1	2.9	72.4
10102	RECEIVER R-1048A & MOUNT			1	4.5	33.0
10112	RECEIVER R-1048B & MOUNT			1	5.0	33.0
10002	CONTROL C-1048A & MOUNT			1	2.0	112.9

SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
10003	INDICATOR IN-1049AC			1	1.7	111.9
10004	1000 NAV INSTL NO. 2			1	2.9	72.4
10104	RECEIVER R-1048A & MOUNT			1	4.5	33.0
10114	RECEIVER R-1048B & MOUNT			1	5.0	33.0
10004	CONTROL C-1048A & MOUNT			1	2.0	112.9
10005	INDICATOR IN-1048AC			1	1.6	111.9
10105	INDICATOR IN-1049AC			1	1.7	111.9
10006	1000 GLIDESLOPE INSTL NO. 1			1	3.2	51.0
10006	RECEIVER R-1043A & MOUNT			1	2.6	33.0
10006	ANTENNA CI-212			1	0.2	7.4
10066	1000 GLIDESLOPE INSTL NO. 2			1	3.2	51.0
10066	RECEIVER R-1043A & MOUNT			1	2.6	33.0
10066	ANTENNA COUPLER & CABLE			1	0.3	13.9
10007	1000 ADF INSTL			1	3.2	118.9
10007	RECEIVER R-846A & MOUNT			1	4.6	33.0
10007	CONTROL C-1046A & MOUNT			1	2.0	112.5
10007	POWER SUPPLY P-1000A			1	1.2	33.0
10008	INDICATOR IN-346A			1	1.1	111.9
10009	ACCESSORY UNIT RA-846A			1	1.4	140.0
10107	ANTENNA-LOOP L-346A			1	1.6	162.4
10007	ANTENNA-SENSE	9751002 28		1	1.9	195.3
10010	400 MARKER BEACON INSTL	9751042 1		1	3.2	33.0
10010	RECEIVER R-402A & MOUNT			1	1.1	33.0
10010	ANTENNA CI-102			1	0.8	73.0
20001	HAND MICROPHONE			1	0.4	120.3
20002	HEADSET & BOOM MIC COMBINATION			1	0.3	110.0
20003	800 AUDIO AMPLIFIER AA-108			1	1.2	111.9
20004	1000 AUDIO AMPLIFIER F1010A			1	1.6	111.9
20005	FWD PRESSURE BULKHEAD FEEDTHRU			1	0.5	100.0
20006	AVIONICS BUS			1	4.5	142.3

SECTION B STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
20007	APPROACH PLATE HOLDERS			2	0.2	124.6
20008	JUNCTION BLOCK			1	2.6	31.5
20009	CABLE COVER INSTL	9756118	1	1	1.4	42.1
20011	ANTENNA-COM NO. 1 A-29C			1	1.6	105.8
20012	ANTENNA-COM NO. 2 VF10-122			1	1.6	417.0
20013	ANTENNA-DUAL NAV C1120-200			1	2.3	376.7
20021	AVIONICS COOLING-PANEL			1	0.9	111.0
20022	AVIONICS COOLING-NOSE (ONE)			1	2.4	25.7
20023	AVIONICS COOLING-NOSE (TWO)			1	4.3	29.7
20024	BLOWER INSTL			1	1.0	125.6
20025	SPEAKER INSTL	9754125	1	1	3.3	195.2
20031	SHELF INSTL	9715028	1	1	2.2	36.4
20032	COVER SHELF	9756112	1	1	7.0	30.0
622	400 TRANSPONDER INSTL NO. 1	9756113	1	1	0.6	121.7
622	TRANSCIEVER RT-459A & MOUNT			1	3.2	109.5
622	ANTENNA L10-216			1	0.3	134.0
622C	400 TRANSPONDER INSTL NO. 2			1	0.6	134.1
622C	TRANSCIEVER RT-459A & MOUNT			1	3.2	109.5
622C	ANTENNA L10-216			1	0.3	158.8
623	800 TRANSPONDER INSTL NO. 1			1	0.6	121.7
623	TRANSCIEVER RT-859A & MOUNT			1	3.2	109.5
623	ANTENNA L10-216			1	0.3	134.0
623B	800 TRANSPONDER INSTL NO. 2			1	0.6	134.1
623B	TRANSCIEVER RT-859A & MOUNT			1	3.2	109.5
623B	ANTENNA L10-216			1	0.3	158.8
681	400 DME INSTL NO. 1			1	2.9	60.7
681	TRANSCIEVER RTA-476A & MOUNT			1	9.8	33.0
681	CONTROL C-476A			1	1.7	111.0
681	ANTENNA L10-216			1	0.3	38.0
681C	400 DME INSTL NO. 2			1	2.9	72.9

SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
681C	TRANSCEIVER RTA-476A & MOUNT			1	9.8	33.0
681C	CONTROL C-476A			1	1.7	111.0
681C	ANTENNA L10-216			1	0.3	74.7
681C	MULTIPLEXER MU876A & MOUNT			1	1.1	33.0
681F	800 DME INSTL NO. 1			1	2.9	60.7
681F	TRANSCEIVER RTA-876A & MOUNT			1	9.3	33.0
681F	CONTROL C-876A			1	1.7	111.0
681F	ANTENNA L10-216			1	0.3	38.0
681G	800 DME INSTL NO. 2			1	2.9	72.9
681G	TRANSCEIVER RTA-876A & MOUNT			1	9.3	33.0
681G	CONTROL C-876A			1	1.7	111.0
681G	ANTENNA L10-216			1	0.3	74.7
677	HORIZONTAL SITUATION INDICATOR			1	3.2	213.0
677	(3 IN) TO BE USED W/O AUTOPILOT					
67701	CONVERTER B-445A & MOUNT			1	1.3	33.0
677	FLUX DETECTOR CT-504A			1	0.5	361.9
67702	SLAVE ACCESS W/O BS SA-832A			1	0.8	35.0
67703	SLAVE ACCESS W/BS SA-832B			1	2.2	35.0
692	MARKER BEACON MUTE TIMER R-14A			1	0.1	33.0
629G	RDR-150 RADAR INSTL			1	3.0	59.1
629G	TRANSCEIVER RT-131A & MOUNT			1	13.0	24.9
629G	INDICATOR IN-152A & MOUNT			1	6.8	103.9
629G	WAVEGUIDE			1	2.6	18.0
629G	ANTENNA DA-144A			1	3.6	9.0
629G	REFLECTOR AA-1212A			1	1.2	7.5
629G	RADOME NOSE			1*	-0.3	7.4
629P	RDR-150 RADAR INSTL (COLOR)			1	3.0	59.1
629P	TRANSCEIVER RT-131A & MT			1	13.0	24.9
629P	INDICATOR IN-2026A			1	11.0	103.9
629P	WAVEGUIDE			1	2.6	18.0

SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
629P	REFLECTOR AA-1212A			1	1.2	7.5
629P	ANTENNA OA-144A			1	3.6	9.0
629P	RADOME NOSE			1*	-0.3	7.4
629D	RDR-160 RADAR INSTL			1	3.0	57.5
629D	TRANSCIEVER, ANTENNA & MOUNT			1	10.5	11.0
629D	INDICATOR IN-152A & MOUNT			1	6.8	103.9
629D	RADOME NOSE			1*	-0.3	7.4
627F	RDR-160 RADAR INSTL (COLOR)			1	3.0	57.5
627F	TRANSCIEVER, ANTENNA & MT			1	10.5	11.0
627F	INDICATOR IN-2026A			1	11.0	103.9
627F	RADOME NOSE			1*	-0.3	7.4
627G	RADAR CHECK LIST CONTROL UNIT			1	1.5	113.0
627H	RADAR CHECK LIST PROGRAMMER			1	0.5	135.0
629U	PRIMUS 200 COLOR RADAR INSTL			1	3.0	57.5
629U	XCVR & ANT RT A-1003 & MT			1	18.0	11.0
629U	INDICATOR DI-2008 & MT			1	11.0	103.9
629U	RADOME NOSE (XCHANGE)			1*	-0.3	73.5
633D	CULLINS HF-200 NSIL			1	2.7	152.4
633D	CONTROL HEAD CTL-201	9752007155		1	1.1	112.9
633D	TRANSCIEVER TCR-200	9756031242		1	6.4	33.0
633D	POWER AMPLIFIER PWR-200	9756031243		1	7.4	33.0
633D	ANT & COUPLER AAC-200	9751094		1	11.0	308.3
63300	R. F. FILTER A2597			1	1.1	33.0
63300	ANTENNA-STRAIGHT, 30 FEET			1	1.3	218.0
65100	400 ADF INSTL NO. 2			1	3.2	91.9
65100	RECEIVER R-446A & MOUNT			1	4.0	109.4
65101	INDICATOR IN-346A			1	1.1	111.9
65102	INDICATOR IN-13A-1			1	1.4	111.9
65103	ACCESSORY UNIT RA-446A			1	1.4	140.0
65104	ACCESSORY UNIT RA-446A			1	1.4	140.0

SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	HEIGHT (POUNDS)	ARM (INCHES)
65105	INVERTER DV-1060A	9751002 29 9751042 2		1	5.2	33.0
65106	ANTENNA-LOOP L-346A				1.6	219.0
65100	ANTENNA-SENSE			1	1.9	195.3
65600	1000 ADF INSTL NO. 2				3.2	118.9
65600	RECEIVER R-846A & MOUNT			1	4.6	33.0
65600	CONTROL C-1046A & MOUNT				2.0	112.5
65600	POWER SUPPLY P-1000A			1	1.2	33.0
65601	INDICATOR IN-346A				1.1	111.9
65602	INDICATOR IN-13A-1			1	1.4	111.9
65603	ACCESSORY UNIT RA-846A				1.4	140.0
65604	ACCESSORY UNIT RA-846A			1	1.4	140.0
65605	INVERTER DV-1060A				5.2	33.0
65606	ANTENNA-LOOP L-346A	9751002 29 9751042 2		1	1.6	219.0
65600	ANTENNA-SENSE				1.9	195.3
66000	ADF IN-346B			1	1.3	111.9
66200	ADF RA-446A				1.4	140.0
66300	ADF RA-846A			1	1.4	140.0
68500	400 AREA NAVIGATION INSTL				2.8	111.0
68501	INDICATOR IN-1048AC			1	1.6	111.9
68502	INDICATOR IN-1049AC				1.7	111.9
68500	COMPUTER RN-478A & MOUNT			1	5.1	112.0
68700	800 AREA NAVIGATION INSTL				2.8	72.5
68700	COMPUTER RN-878A & MOUNT			1	5.4	112.0
67200	AA-215 RADIO ALTIMETER INSTL				0.5	195.5
67200	TRANSCIEVER RT-220			1	6.8	279.0
67200	INDICATOR RA-215				2.6	112.0
67200	ANTENNA AT-220			1	0.8	244.4
68800	AA-100 RADIO ALTIMETER INSTL				0.5	216.0
68800	TRANSCIEVER RT-100			1	3.6	320.0
68800	INDICATOR RA-100				1.3	112.0

SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
68800	ANTENNA AT-100			1	1.1	284.6
67000	400 RMI INSTL			1	1.2	95.0
67000	INDICATOR IN-404A			1	2.3	111.0
67000	INVERTER DV-1060A			1	5.2	33.0
67100	1000 RMI INSTL			1	1.2	95.0
67100	INDICATOR IN-1004A			1	2.4	111.0
67100	INVERTER DV-1060A			1	5.2	33.0
668	AERONETIC 7100 RMI INSTL			1	1.2	95.0
668	INDICATOR 5207131-014			1	1.6	111.0
668	CONVERTER 5207100-002			1	1.7	33.0
7900	RADOME NOSE	9711019	1	1*	-0.3	7.4
674A	FLITEPHONE III (CABIN CONTROL)			1	21.3	281.2
674B	FLITEPHONE III (COCKPIT CONTROL)			1	12.2	294.4
14100	COMBINATION BOOM MIC & HEADSET	9754030	5	1	0.4	120.9
141A	COMBINATION BOOM MIC & HEADSET	9754030	6	2	0.8	120.9
141D	COMBINATION BOOM MIC & HEADSET	9754030	5	1	0.4	120.9
5500	BOOM MIC	5618110	1	1	0.6	138.7
55A	PASSENGER MIC AFT CABIN I/C	9715030	1	1	1.0	186.4
	FURNISHINGS					
	SEAT-COPILOT ADJUSTABLE STD	0812782	2	1	15.1	140.0
AL	SEAT-COPILOT ADJUSTABLE-LEATHER	0812782	2	1	15.7	140.0
89A	SEAT-COPILOT VERT ADJUST TILT	0812780	2	1	22.9	140.8
89AL	SEAT-COPILOT VERT ADJ TILT LTHR	0812780	2	1	23.5	140.8
	SAFETY BELT-SHOULDER HARNS	CM400869		1	1.1	153.1
18100	INERTIA REEL INSTL-COPILOT	5119565	1	1	1.3	153.1
	STD SEATING INSTL	5619203	1	1	15.1	263.6
11100	SEATING OPTION NO. 1 INSTL	5619203	2	1	11.6	265.8
11200	SEATING OPTION NO. 2 INSTL	5619203	3	1	11.6	264.6
11300	SEATING OPTION NO. 3 INSTL	5619203	4	1	8.2	266.5

SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
11400	SEATING OPTION NO. 4 INSTL	5619203		5	8.2	264.5
	SEAT-3RD PLACE AFT FACING	5619154		13	25.6	170.5
111	SEAT-3RD PLACE FWD FACING	5619153		14	24.0	182.5
113	SEAT-3RD PLACE FWD FACING	5619153		14	24.0	182.5
	SEAT-4TH PLACE AFT FACING	5619154		14	25.6	170.5
111	SEAT-4TH PLACE FWD FACING	5619153		15	24.0	182.5
113	SEAT-4TH PLACE FWD FACING	5619153		15	24.0	182.5
	SEAT-5TH PLACE FWD FACING	5619153		16	24.0	225.2
	SEAT-6TH PLACE FWD FACING	5619153		14	24.0	225.2
111	SEAT-7TH PLACE FWD FACING	5119412		15	15.2	266.0
112	SEAT-7TH PLACE FWD FACING	5119412		15	15.2	266.0
113	SEAT-7TH PLACE FWD FACING	5119412		15	15.2	266.0
114	SEAT-7TH PLACE FWD FACING	5119412		15	15.2	266.0
113	SEAT-8TH PLACE FWD FACING	5119412		15	15.2	266.0
114	SEAT-8TH PLACE FWD FACING	5119412		15	15.2	266.0
99600	SEATS, ALL LTHR	5619203800		1	2.4	197.9
996A1	SEATS, ALL LTHR OPT 1	5619203802		1	3.0	216.2
996A2	SEATS, ALL LTHR OPT 2	5619203804		1	3.0	211.0
996B3	SEATS, ALL LTHR OPT 3	5619203806		1	3.6	224.5
996B4	SEATS, ALL LTHR OPT 4	5619203808		1	3.6	220.6
99700	SEAT TRIM LTHR	5619203810		1	0.6	197.9
997A1	SEAT TRIM LTHR OPT 1	5619203812		1	0.8	216.2
997A2	SEAT TRIM LTHR OPT 2	5619203814		1	0.8	211.0
997B3	SEAT TRIM LTHR OPT 3	5619203816		1	0.9	224.5
997B4	SEAT TRIM LTHR OPT 4	5619203818		1	0.9	220.6
104J	STOWAGE DRAWER 3RD AFT SEAT	5319031		2	5.4	176.5
104H	STOWAGE DRAWER 3RD FWD SEAT	5319031		4	5.4	176.5
104L	STOWAGE DRAWER 4TH AFT SEAT	5319031		1	5.4	176.5
104K	STOWAGE DRAWER 4TH FWD SEAT	5319031		3	5.4	176.5

SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
104M	STOWAGE DRAWER 5TH FWD SEAT	3319031		4	5.4	219.2
104N	STOWAGE DRAWER 6TH FWD SEAT	5319031		3	5.4	219.2
998	SIDE PANELS, ALL LEATHER	5600300800		1	3.6	186.0
17	BAGGAGE RETAINER (NOSE)	5113016		1	1.0	43.0
130B	TOILET, DIVIDER, RACK & CURTAIN	5119435		3	37.6	238.8
130A	TOILET, CURTAIN & TISSUE HOLDER	5119435		1	22.5	239.2
130E	FLUSH TOILET, CURTAIN & HOLDER	5119567		2	35.0	251.2
130F	FLUSH TOILET, DIVIDER & RACK	5119567		1	50.2	247.3
128	REFRESHMENT CENTER	5119467		1	28.1	273.0
128Q	THERMOS CARRIER FWD CABIN	5119071		1	8.8	156.9
65	OXYGEN SYS 11.0 CU. FT.	5114006		1	14.9	88.8
63	OXYGEN SYS 114.9 CU. FT.	5217541		5	54.9	41.5
63A	OXYGEN SYS 114.9 CU. FT.			1	54.9	41.5
97	TINTED WINDOWS	5111601		24	1.5	165.0
138Y	STEREO INSTL W/AVN	9715029		3	11.8	170.4
138G	STEREO INSTL W/O AVN	9715029		4	1.9	235.7
35C	EXTENDER INSTL WR CABIN DOOR	5111134		1	2.2	32.0
42	AVIONICS BAY ACCESS DOOR	5113001		18	1.0	51.2
41	FENDER INSTL-NOSE GEAR	5042021		1	3.4	156.0
28	CURTAIN, FLIGHT DECK DIVIDER	5119465		5	13.6	155.1
120G	FLIGHT DECK DIVIDER & CURTAIN	5119465		4	1.4	155.1
120L	INSTRUMENT CONSOLE/ALT&AIRSP	5119465		1	0.2	145.7
84A	SIGNS/SEAT BELT, OXYGEN & CLOCK	5119465		2	9.8	194.0
124A	EXECUTIVE TABLE LH	5119138		3	9.8	194.0
124B	EXECUTIVE TABLE RH	5119138		4		
199A	PAINT, ALUMIGRIP	5600350000		1*		
31	GAA CONVERSION KIT	5600011		4	1.0	43.6
31E	LBA CONVERSION K	5600002		5	0.0	212.9

SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
37A	EMERGENCY EQUIPMENT	5114243	6	1	5.2	130.7
44	FIRE EXTINGUISHER HALON	5118705	13	1	16.8	133.6
44B	NACELLE FIRE EXTINGUISHER	5114586	1	1	31.6	173.8
177	FIRE EXTINGUISHER, CABIN FLOOD	9754083	47	1	3.7	312.4
177A	LOCATOR BEACON	9754083	42	1	3.7	312.4
177B	LOCATOR BEACON (CANADA)	9754083	42	1	3.7	312.4
	LOCATOR BEACON (CANADA)					
	AIR CONDITIONING & ANTI-ICE					
20	CABIN PRESSURE CONTROL VARIABLE	5614600	4	1*	2.0	116.1
15	AIR CONDITIONING INSTL	5114524	7	1	116.9	158.3
15M	AIR OUTLETS-TOILET	5114578	23	1	2.3	263.1
15N	AIR OUTLETS-7TH & TOILET	5114578	41	1	2.3	263.1
92	VENTILATING FAN SYSTEM	5114579	1	1	21.4	155.3
30	DE-ICE PROPELLER	5250131	6	1	10.9	101.7
67	DE-ICE WING & TAIL, PART PLBG	5115565	4	1	3.6	167.7
32	DE-ICE WING & TAIL-TOTAL SYSTEM	5115565	3	1	42.2	182.8
194	DE-ICE SYSTEM FLIGHT IN ICING	5114400	3	1	75.7	158.4
94A	WINDSHIELD ANTI-ICE, ALCOHOL	5114136	4	1	30.7	189.1
78	FUSELAGE ICE PROTECTION PLATES	5113115188		1	5.1	90.7
88	STATIC SOURCE-DUAL HEATED	5114220	6	1	0.3	257.0

WEIGHT AND BALANCE 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 maximum zero fuel weight of 6515 pounds)		
SEAT ____							
SEAT ____							
SEAT ____				4.	FUEL LOADING		
SEAT ____							
SEAT ____				5.	RAMP WEIGHT (sub-total) (Do not exceed maximum ramp weight of 6785 pounds)		
SEAT ____							
SEAT ____				6.	LESS FUEL FOR TAXIING		
TOILET							
BAGGAGE				7.	TAKEOFF WEIGHT (Do not exceed maximum takeoff weight of 6750 pounds)		
WING LOCKERS							
AVIONICS				8.	LESS FUEL TO DESTINATION		
NOSE							
BAY A				9.	LANDING WEIGHT (Do not exceed maximum landing weight of 6750 pounds)		
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.

SECTION 7

AIRPLANE & SYSTEMS DESCRIPTIONS

TABLE OF CONTENTS

	<u>Page</u>		<u>Page</u>
INTRODUCTION	7-3	LIGHTING SYSTEM	7-28
AIRFRAME	7-3	External Lighting	7-28
INSTRUMENT PANEL	7-3	Internal Lighting	7-29
Overhead Console	7-5	PITOT PRESSURE SYSTEM	7-31
Annunciator Panel	7-5	STATIC PRESSURE SYSTEM	7-31
FLIGHT CONTROLS SYSTEM	7-7	VACUUM SYSTEM	7-33
Aileron System	7-8	FLIGHT INSTRUMENTS	7-33
Aileron Trim System	7-9	STALL WARNING SYSTEM	7-35
Elevator System	7-10	AVIONICS	7-35
Elevator Trim System	7-11	Avionics Interference	7-35
Rudder System	7-12	Avionics Master Switches	7-35
Rudder Trim System	7-13	ENGINES	7-36
NOSEWHEEL STEERING SYSTEM	7-14	Engine Controls	7-36
WING FLAPS SYSTEM	7-15	Engine Oil System	7-37
LANDING GEAR SYSTEM	7-17	Ignition System	7-37
Landing Gear Hydraulic		Fuel Injection System	7-37
System	7-19	Cowl Flap System	7-37
Landing Gear Position		Starting System	7-38
Lights	7-19	Engine Instruments	7-38
Landing Gear Warning Horn	7-20	Engine Mounts	7-38
Landing Gear Emergency		Engine Break-In	
Extension System	7-20	Procedure	7-38
Landing Gear Shock Struts	7-21	Turbo-System	7-38
FUEL SYSTEM	7-21	CABIN AIR SYSTEM	7-42
Main Tanks	7-21	Heating and Defrosting	7-42
Fuel Selectors	7-21	Cabin Heat Switch Breaker	7-43
Emergency Crossfeed		Cabin Fan Switch	7-43
Shutoff Lever	7-23	Cabin Air Temperature	
Auxiliary Fuel Pump		Control Knob	7-43
Switches	7-23	Forward Cabin Air Knob	7-43
Fuel Drain Valves	7-23	Aft Cabin Air Knob	7-43
Fuel Flow Gage	7-23	Defrost Knob	7-43
Fuel Quantity Gage	7-24	Heater Overheat Warning	
Fuel Low Level Warning		Light	7-43
Lights	7-24	Heater Operation for	
Engine-Driven Fuel Pumps	7-24	Heating and Defrosting	7-45
BRAKE SYSTEM	7-24	Heater Used for	
ELECTRICAL SYSTEM	7-25	Ventilation	7-45
Battery and Alternator		CABIN PRESSURIZATION SYSTEM	7-45
Switches	7-25	Operating Details	7-45
Emergency Power Alternator		Standard Pressurization	
Field Switch	7-25	System	7-47
Overvoltage Relays	7-25	Optional Pressurization	
Voltammeter	7-25	System	7-49
Circuit Breakers and		OXYGEN SYSTEM	7-51
Switch Breakers	7-28	114.9 Cubic Foot System	7-52
External Power Receptacle	7-28	11.0 Cubic Foot System	7-53

TABLE OF CONTENTS (CONTINUED)

	<u>Page</u>		<u>Page</u>
PASSENGER LOADING	7-53	DOORS, WINDOWS AND EXITS . .	7-55
BAGGAGE COMPARTMENTS	7-54	Cabin Door	7-55
AIRPLANE TIE-DOWN PROVISIONS		Windows	7-56
AND JACK POINTS	7-54	Emergency Exit Window . . .	7-56
SEATS, SEAT BELTS AND		CONTROL LOCKS	7-57
SHOULDER HARNESSSES	7-55	PROPELLERS	7-57
Pilot and Copilot		PROPELLER SYNCHROPHASER . . .	7-57
Provisions	7-55	CABIN FEATURES	7-59
Passenger Provisions	7-55		

INTRODUCTION

Section 7 of this handbook provides a description and operation of the airplane and its systems.

NOTE

Operational procedures for optional systems and equipment are presented in Section 9.

AIRFRAME

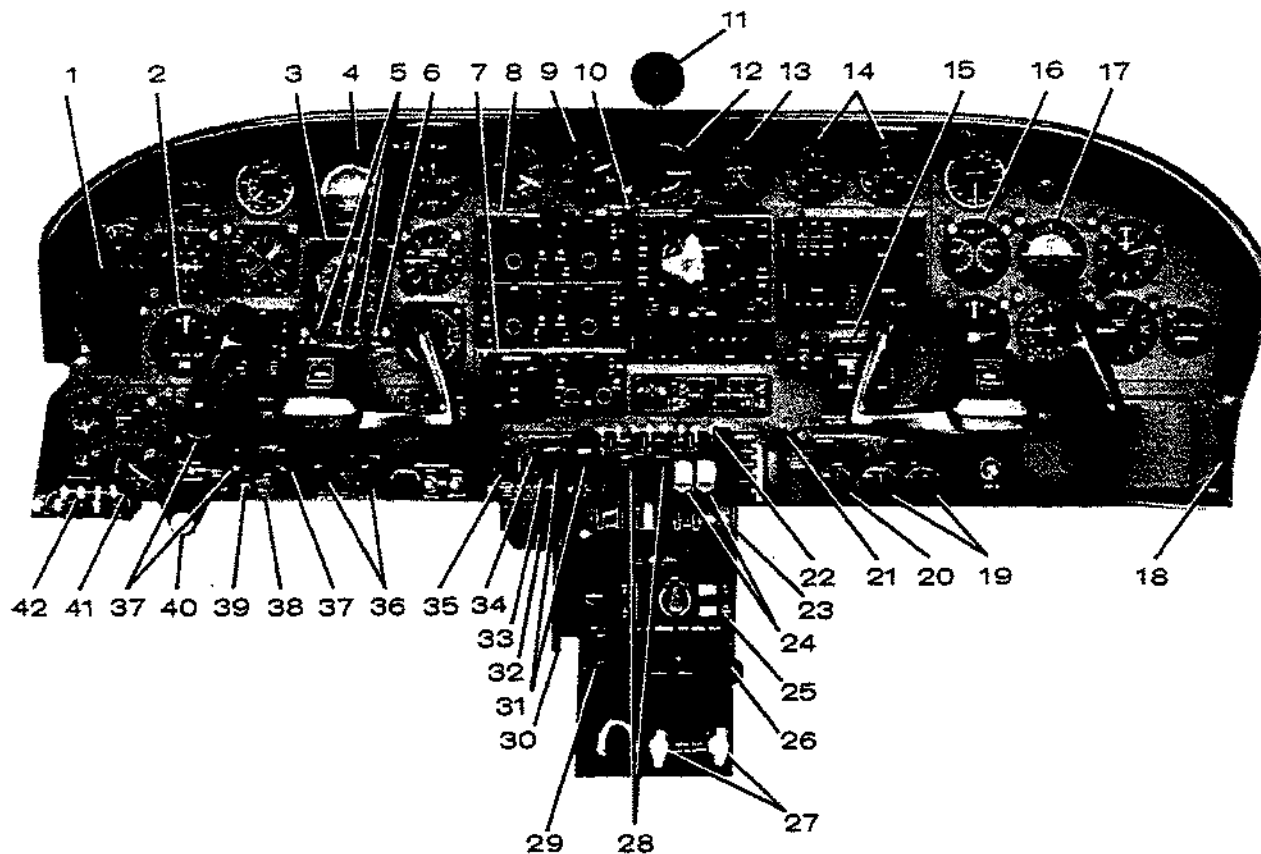
The Model 414 Chancellor is a 6-to 8-place, all-metal, low-wing, pressurized airplane. The fuselage and empennage are of semimonocoque construction. The cabin area is sealed and structurally reinforced for pressurization. The wing and horizontal and vertical tail surfaces are of conventional aluminum construction. The wing uses 2 main spars which attach to the carry-thru spars. The retractable landing gear is a tricycle design using air-over-oil shock struts.

The 414 Chancellor II and 414 Chancellor III are identical to the 414 Chancellor except a selection of popular optional equipment has been included as standard equipment.

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. ANNUNCIATOR PANEL	21. FLAP POSITION SWITCH
2. FLIGHT INSTRUMENT GROUP	22. LIGHT DIMMING CONTROLS
3. FLIGHT DIRECTOR HSI (OPTIONAL)	23. QUADRANT FRICTION LOCK
4. FLIGHT DIRECTOR FDI (OPTIONAL)	24. MIXTURE CONTROLS
5. MARKER BEACON LIGHTS (OPTIONAL)	25. AUTOPILOT CONTROL HEAD (OPTIONAL)
6. MARKER BEACON TEST SWITCH (OPTIONAL)	26. RUDDER TRIM CONTROL
7. FLIGHT DIRECTOR MODE SELECTOR (OPTIONAL)	27. COWL FLAP CONTROLS
8. AVIONICS CONTROL PANEL	28. PROPELLER CONTROLS
9. ENGINE INSTRUMENT GROUP	29. AILERON TRIM CONTROL
10. PROPELLER SYNCHROPHASER SWITCH (OPTIONAL)	30. ELEVATOR TRIM CONTROL
11. COMPASS	31. THROTTLE CONTROLS
12. FUEL FLOW GAGE	32. EMERGENCY LANDING GEAR EXTENSION T-HANDLE
13. ECONOMY MIXTURE INDICATOR (OPTIONAL)	33. LANDING GEAR POSITION INDICATOR LIGHTS
14. COMBINATION ENGINE GAGES	34. GEAR UNLOCKED LIGHT
15. FIRE DETECTION PANEL (OPTIONAL)	35. LANDING GEAR SWITCH
16. FUEL QUANTITY GAGE	36. ALTERNATE AIR CONTROLS
17. RIGHT FLIGHT INSTRUMENT GROUP (OPTIONAL)	37. CABIN PRESSURIZATION CONTROLS AND INDICATORS
18. RIGHT SIDE CONSOLE	38. OXYGEN CONTROL
19. PRESSURIZATION AIR TEMPERATURE CONTROLS	39. CABIN DOOR LIGHT SWITCH
20. HEATER AND CABIN AIR CONTROL PANEL	40. PARKING BRAKE CONTROL
	41. OXYGEN CYLINDER PRESSURE GAGE (OPTIONAL)
	42. LEFT SIDE CONSOLE

Figure 7-1

OVERHEAD CONSOLE

The overhead console, see Figure 7-2, includes the avionics speaker and instrument panel floodlight and aisle courtesy lights with dimming control and pilot and copilot overhead directional air vents.

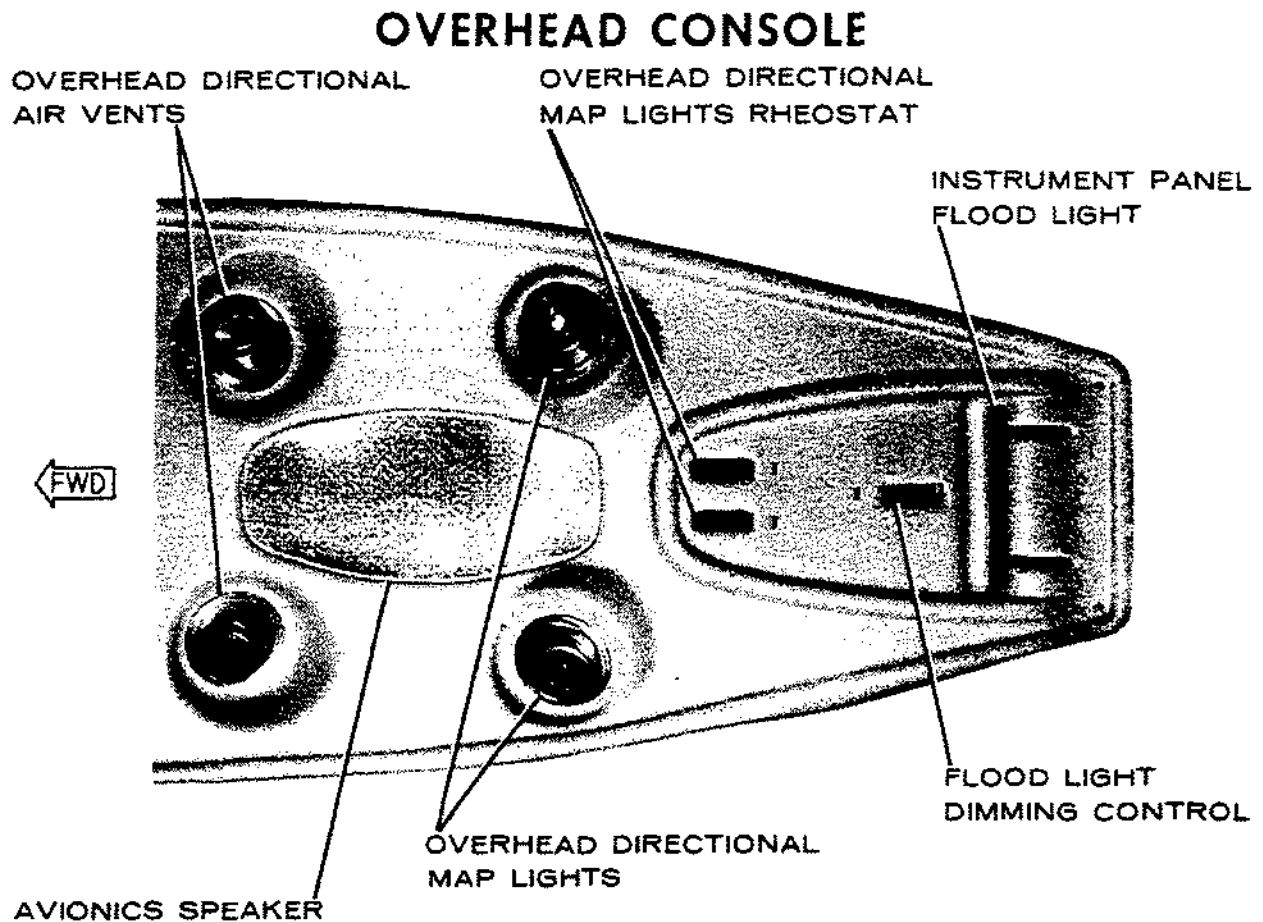


Figure 7-2

ANNUNCIATOR PANEL

The annunciator panel, see Figure 7-3, is located on the left side of the pilot's instrument panel. The panel annunciates items of interest to the pilot in the applicable color of red, amber, green or white. No dimming capability of the annunciator lights is provided.

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 to the left of the annunciator panel. When the button is pressed, all annunciator panel lights, landing gear position and unlocked lights, propeller synchrophaser light and marker beacon lights will be tested and should illuminate. If the throttles are retarded or flaps are extended more than 15 degrees, the gear warning horn will sound when the button is pressed.

ANNUNCIATOR PANEL

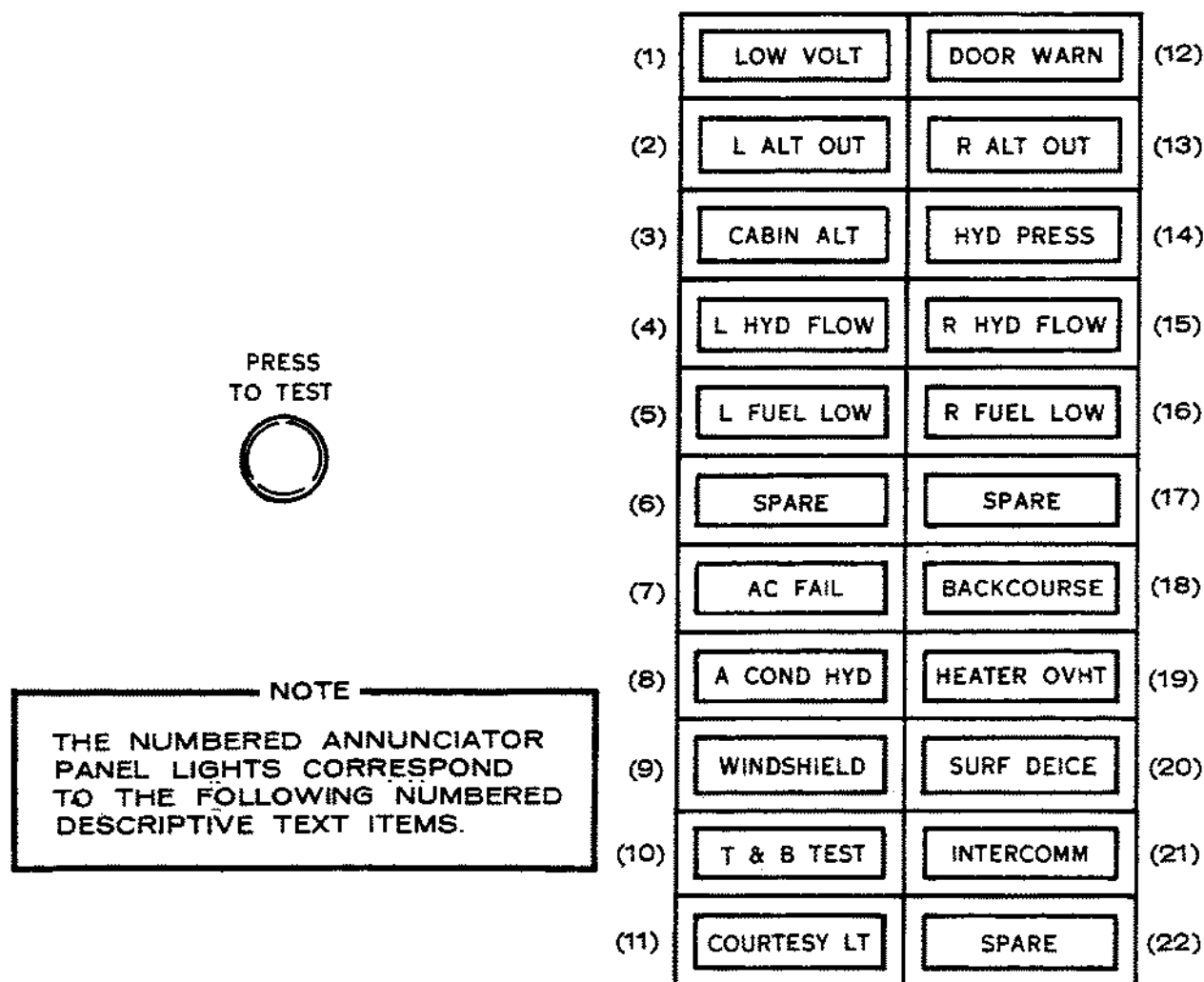


Figure 7-3

NOTE

A spare light lens is installed in each blank location of the annunciator panel when the optional system is not installed. These lenses can be replaced with the appropriate lens when additional optional equipment is installed.

The following numbered items, see Figure 7-3, describe the applicable system condition when the annunciator light is illuminated.

1. The red low voltage light advises that the airplane bus voltage is less than 25 volts.
2. The amber left alternator out light advises that the left alternator is not generating.

3. The amber cabin altitude light advises that cabin altitude is above 10,000 feet.
4. The amber left hydraulic flow light advises that insufficient flow exists at 1000 propeller RPM or above and that the cause may be a result of pump, lines, filter or bypass valve failure.
5. The amber left main tank fuel low light advises that approximately 60 pounds of fuel remains in the left main tank.
6. The white spare light is reserved for optional equipment.
7. The amber alternating current failure light advises that a loss of AC power has occurred.
8. The green air conditioning hydraulic pressure light advises that the optional air conditioning compressor is in operation.
9. The green electric windshield heater light advises that the heating elements in the optional electric windshield are operating.
10. The green turn-and-bank test light will only illuminate when the press-to-test button is pushed and power is being provided to the turn-and-bank electrical circuit.
11. The white courtesy light advises that the overhead flight deck flood light and main cabin door entry lights are illuminated.
12. The red door warning light advises that the main cabin door is not secured for flight.
13. The amber right alternator out light advises that the right alternator is not generating.
14. The amber hydraulic pressure light advises that hydraulic pressure is being applied to the landing gear retraction and extension system.
15. The amber right hydraulic flow light advises that insufficient flow exists at 1000 propeller RPM or above and that the cause may be a result of pump, lines, filter or bypass valve failure.
16. The amber right main tank fuel low light advises that approximately 60 pounds of fuel remains in the right main tank.
17. The white spare light is reserved for optional equipment.
18. The amber back course light advises that the optional navigation equipment is programmed for a back course approach.
19. The amber heater overheat light advises that the heater has reached an abnormal temperature and has been automatically deenergized. Once this light illuminates, the heater cannot be operated until resetting of the safety device has been completed.
20. The green surface deice light advises that the optional tail deice boots have reached full inflation pressure.
21. The white intercom light advises that the optional flight deck or passenger compartment microphone switch is pressed and communication is possible.
22. The white spare light is reserved for optional equipment.

FLIGHT CONTROLS SYSTEM

The flight controls consist of the ailerons, elevators and rudder and their respective trim systems. All of these surfaces are constructed of aluminum and 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 bell crank which is attached to a wheel in the wing. The wheel is actuated by cables attached to the pilot's control wheel. When the rudder is actuated, a spring assembly, interconnected to the aileron system, causes the ailerons to automatically assist the turn.

AILERON SYSTEM

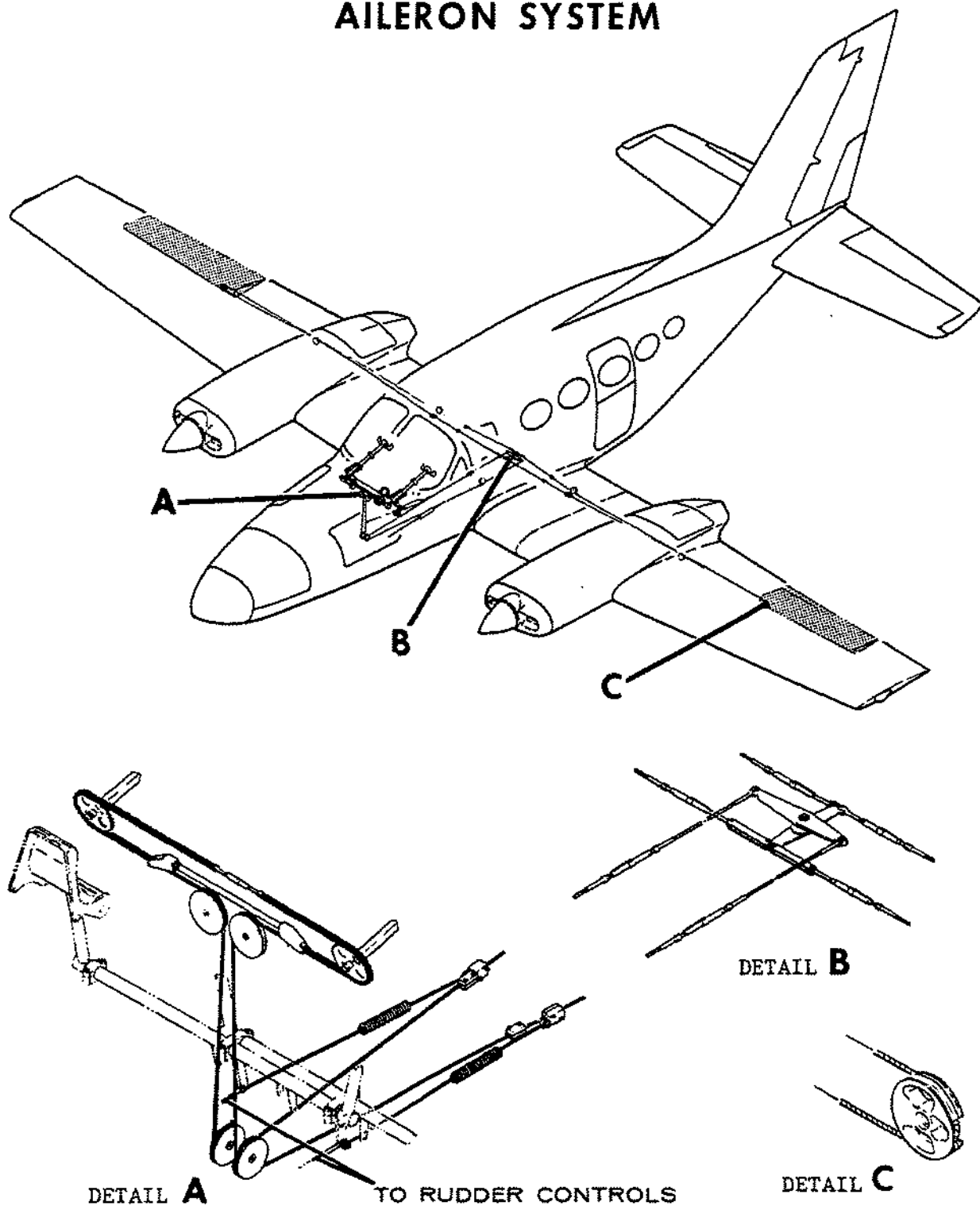


Figure 7-4

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. The aileron trim tab also acts as a servo tab so that aerodynamic forces on the tab will move the ailerons to the selected position, which reduces the forces required to activate the ailerons in flight.

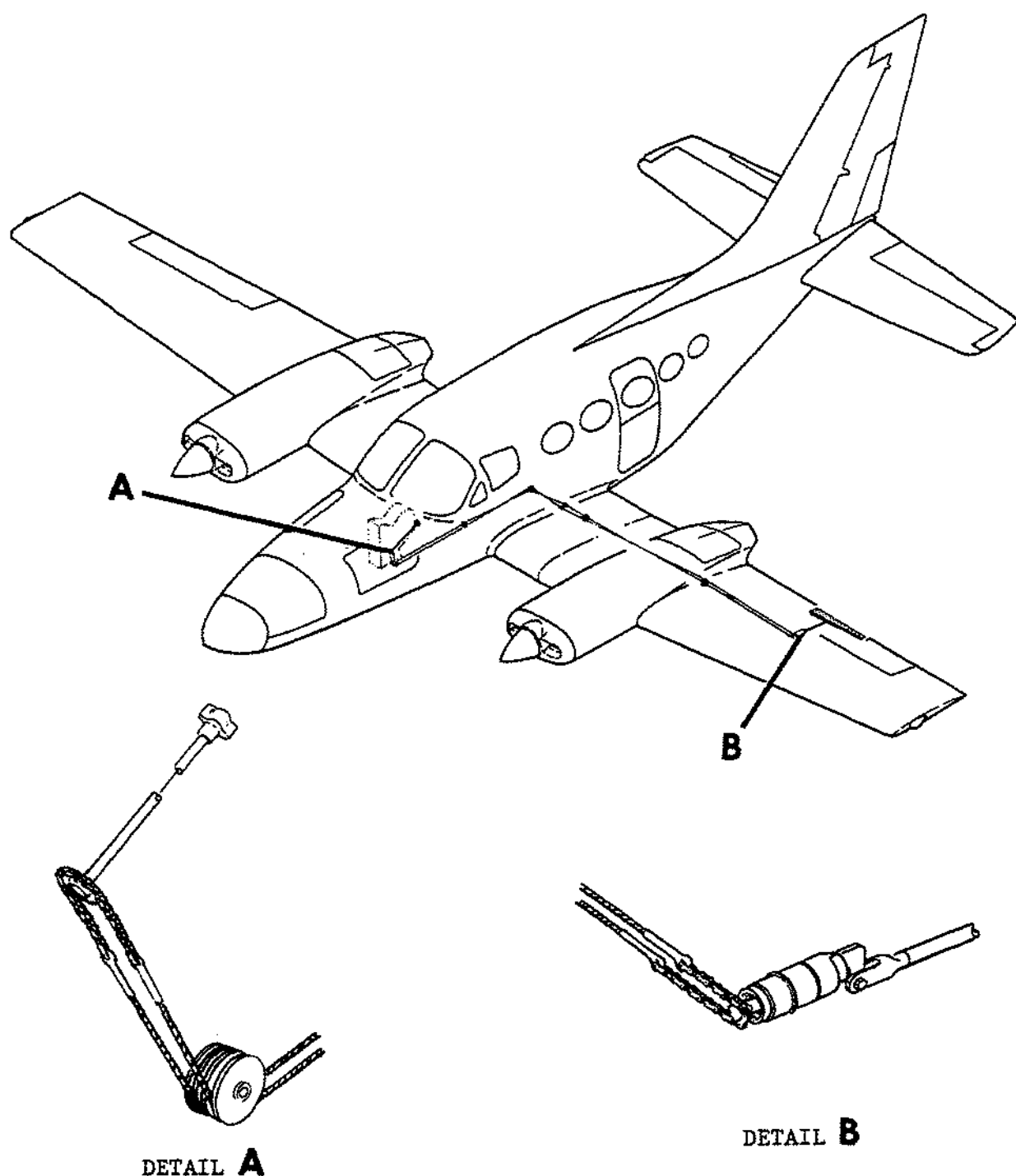
AILERON TRIM SYSTEM

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

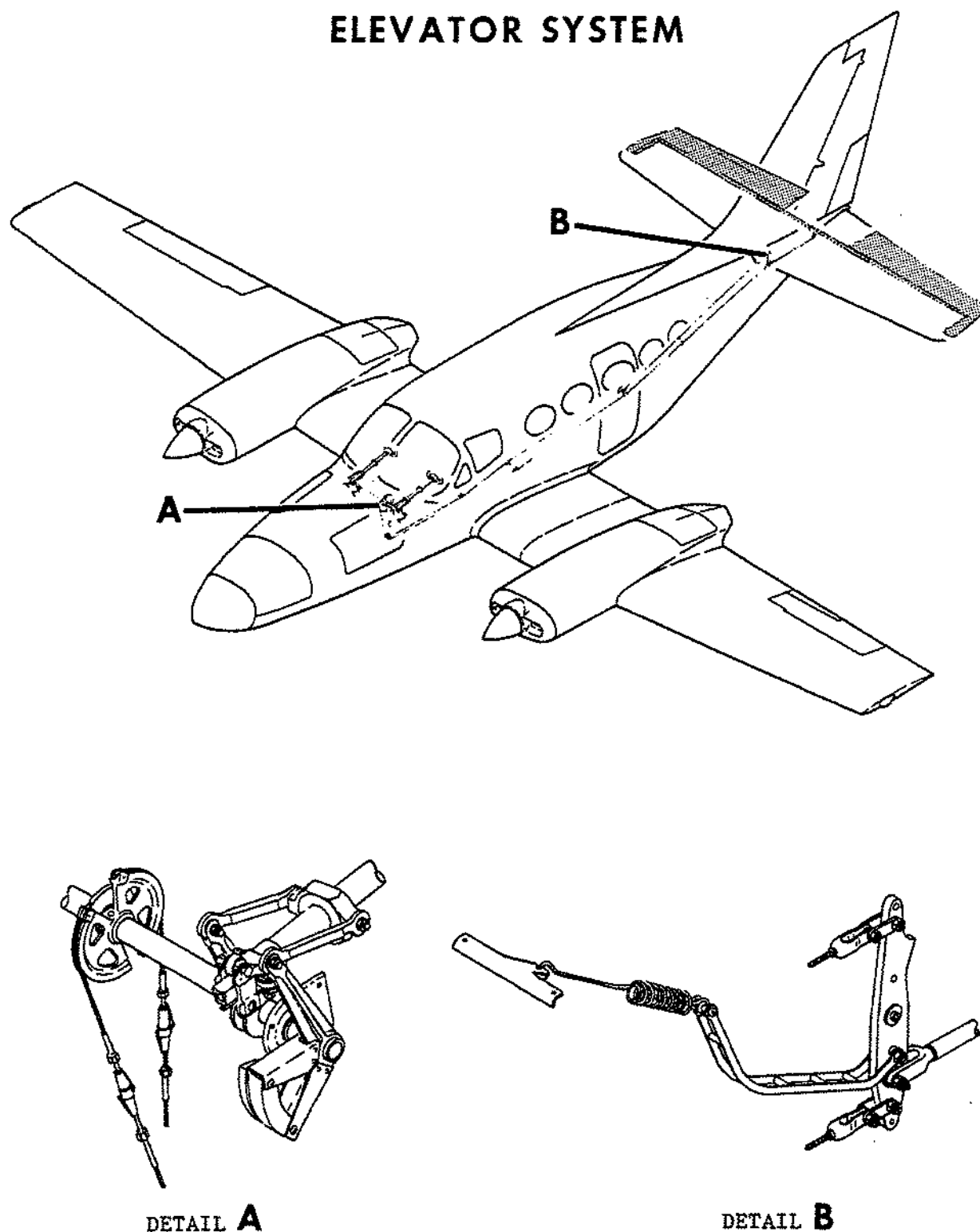


Figure 7-6

ELEVATOR TRIM SYSTEM

Elevator trim, see Figure 7-7, is achieved by an elevator trim tab attached to the right elevator 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 horizontal stabilizer. The actuator is driven by cables attached to the trim control wheel on the cockpit control pedestal.

ELEVATOR TRIM SYSTEM

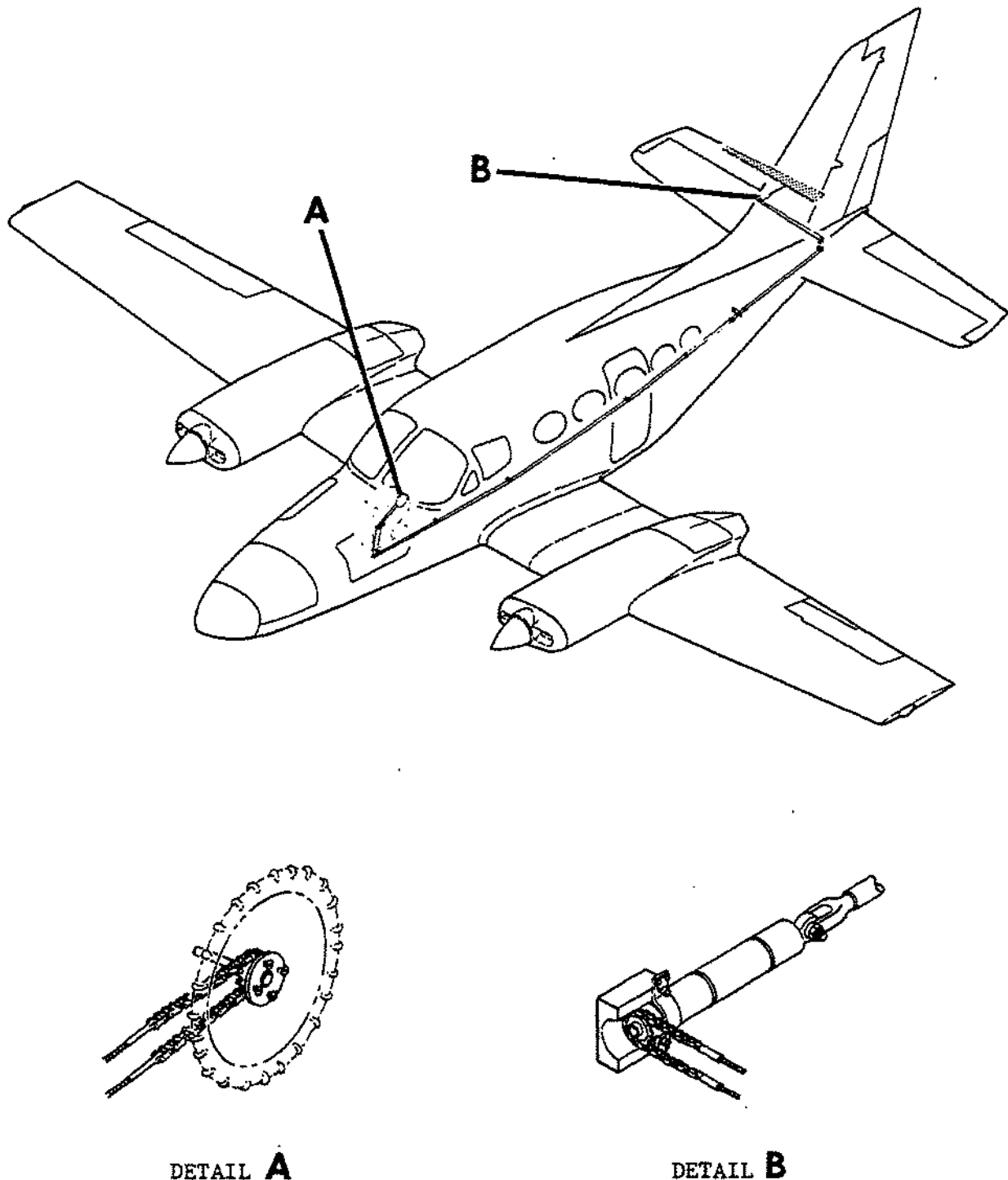


Figure 7-7

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. When the rudder is actuated, a cable and spring assembly that is connected to the aileron system causes the ailerons to automatically assist the turn.

RUDDER SYSTEM

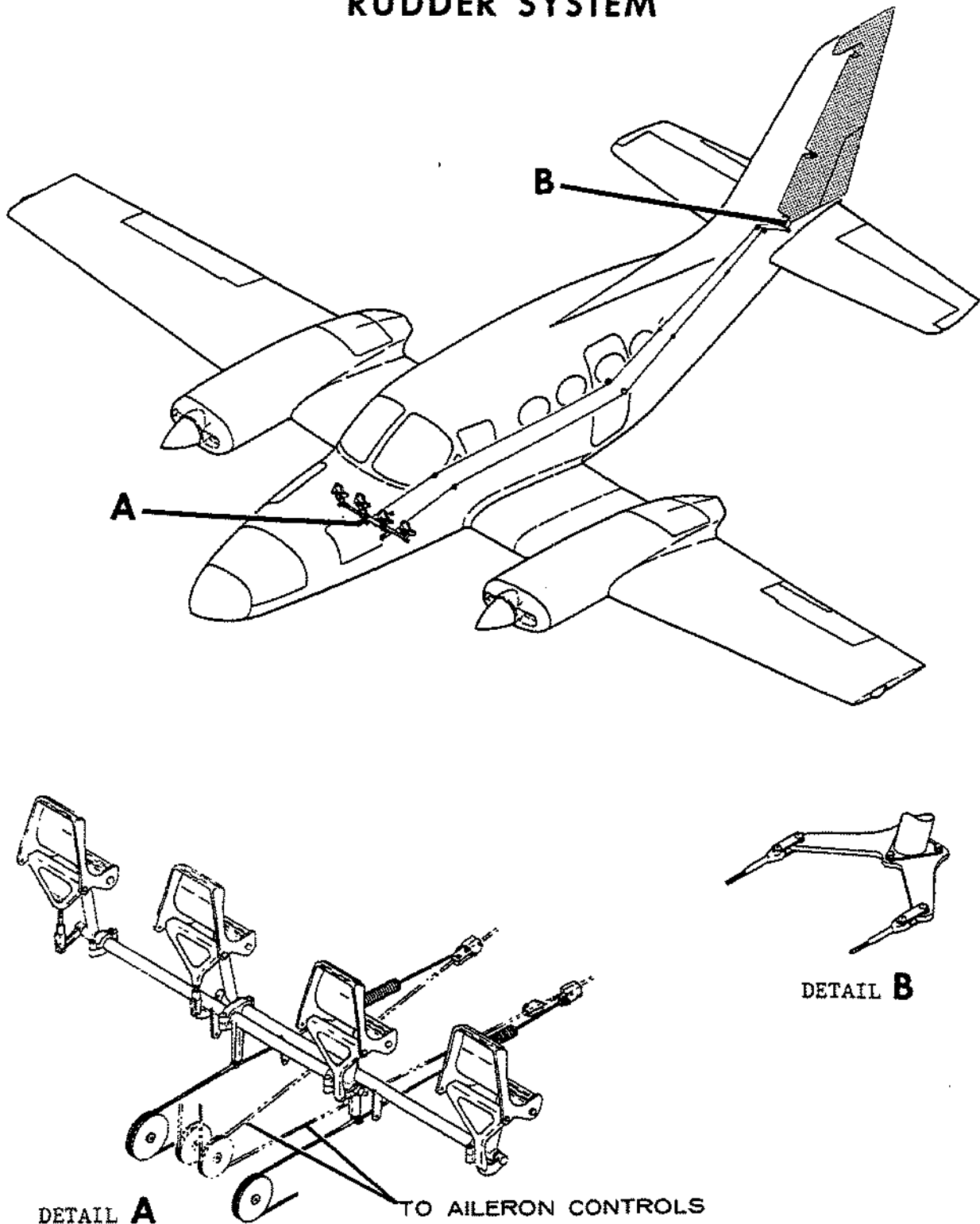


Figure 7-8

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.

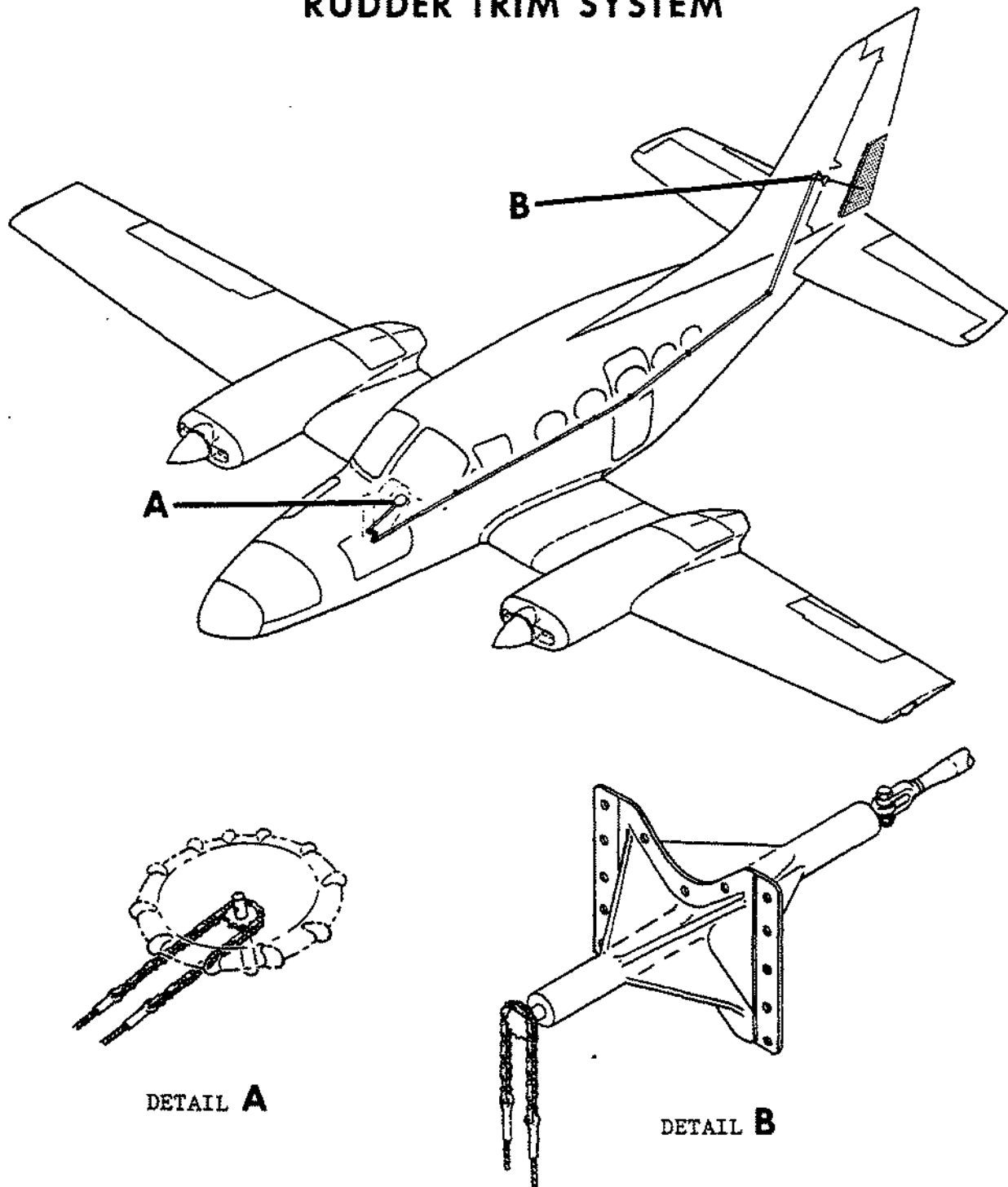
RUDDER TRIM SYSTEM

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

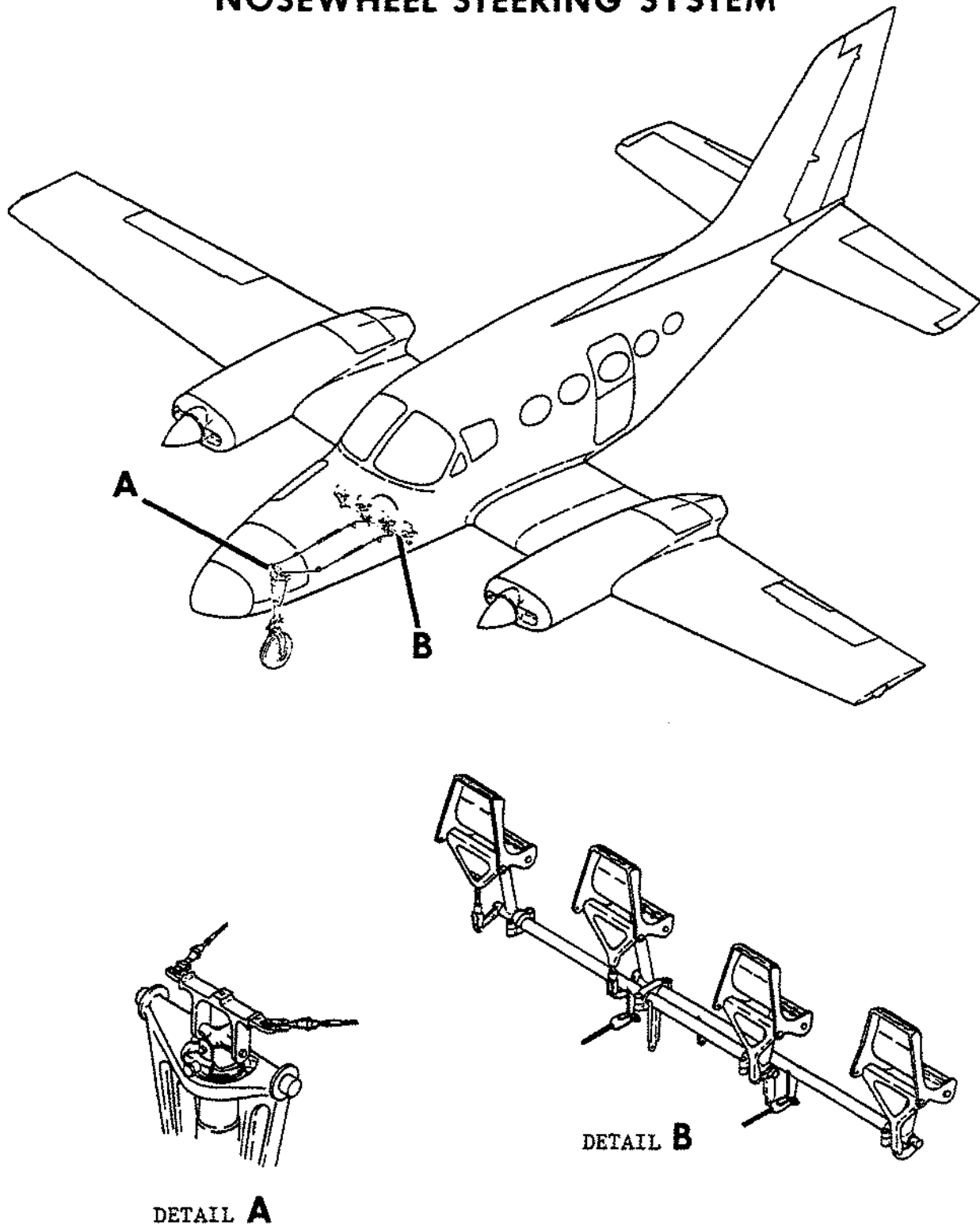


Figure 7-10

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.

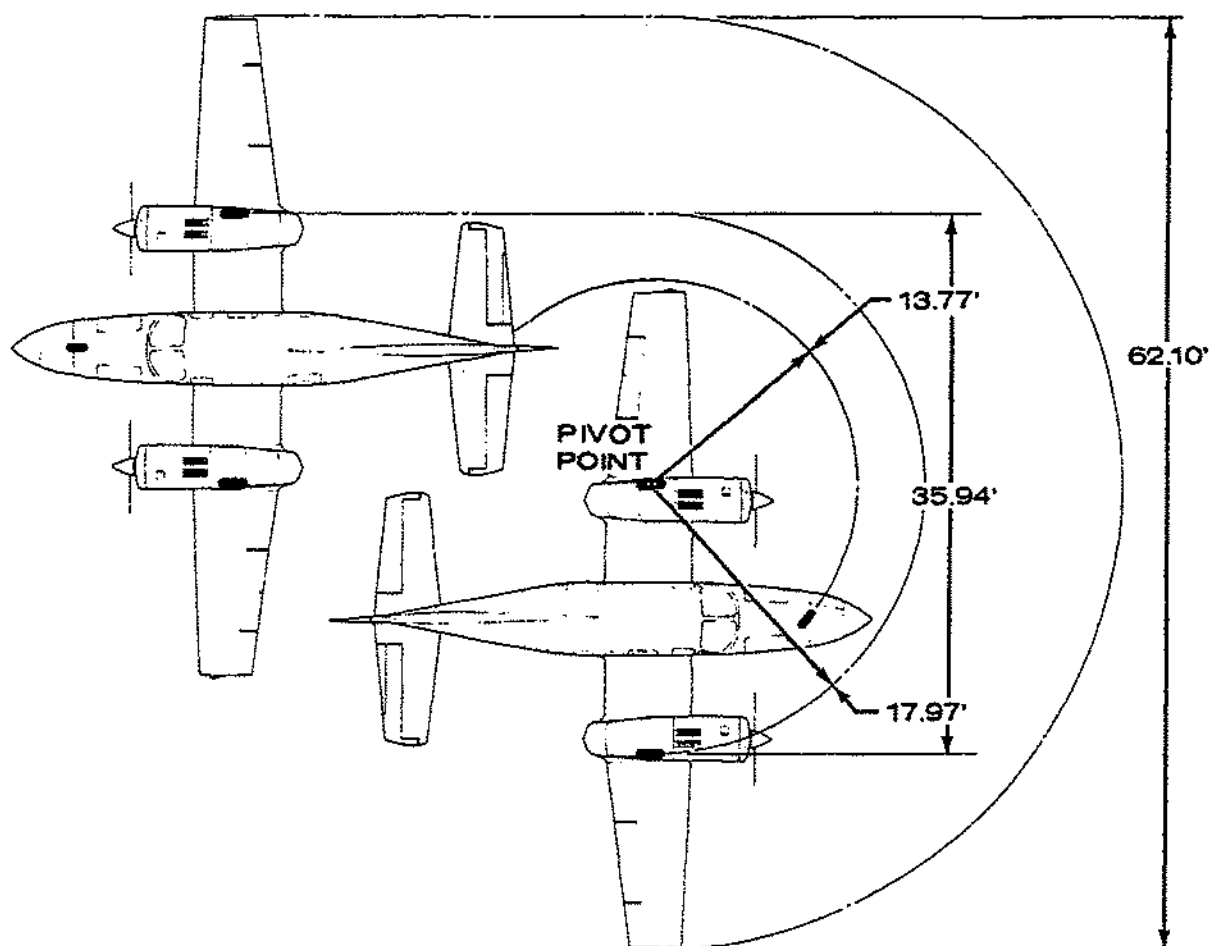
MINIMUM TURNING DISTANCE

Figure 7-11

WING FLAPS SYSTEM

The wing flaps, see Figure 7-12, are of the split flap design. Each wing flap (two per side) is attached to the rear wing main spar lower surface and is actuated by two push-pull rods attached to bell cranks in the wing. The bell cranks in each wing are ganged together with push-pull rods. Each inboard push-pull rod is attached to a cable which is actuated by an electric motor with reduction gear in the fuselage center section.

The electric flap motor is controlled by the wing flap position switch, see Figure 7-1, in the cockpit. This switch incorporates a preselect

feature which allows the pilot to select the amount of flap extension desired. When the 0°, 15°, 30° or 45° position is selected, the flap motor is electrically actuated and drives the flaps toward the selected position. As the flaps move, an intermediate cable feeds position information back to the preselect assembly. When the actual flap position equals the selected position, a microswitch deenergizes the flap motor.

WING FLAPS SYSTEM

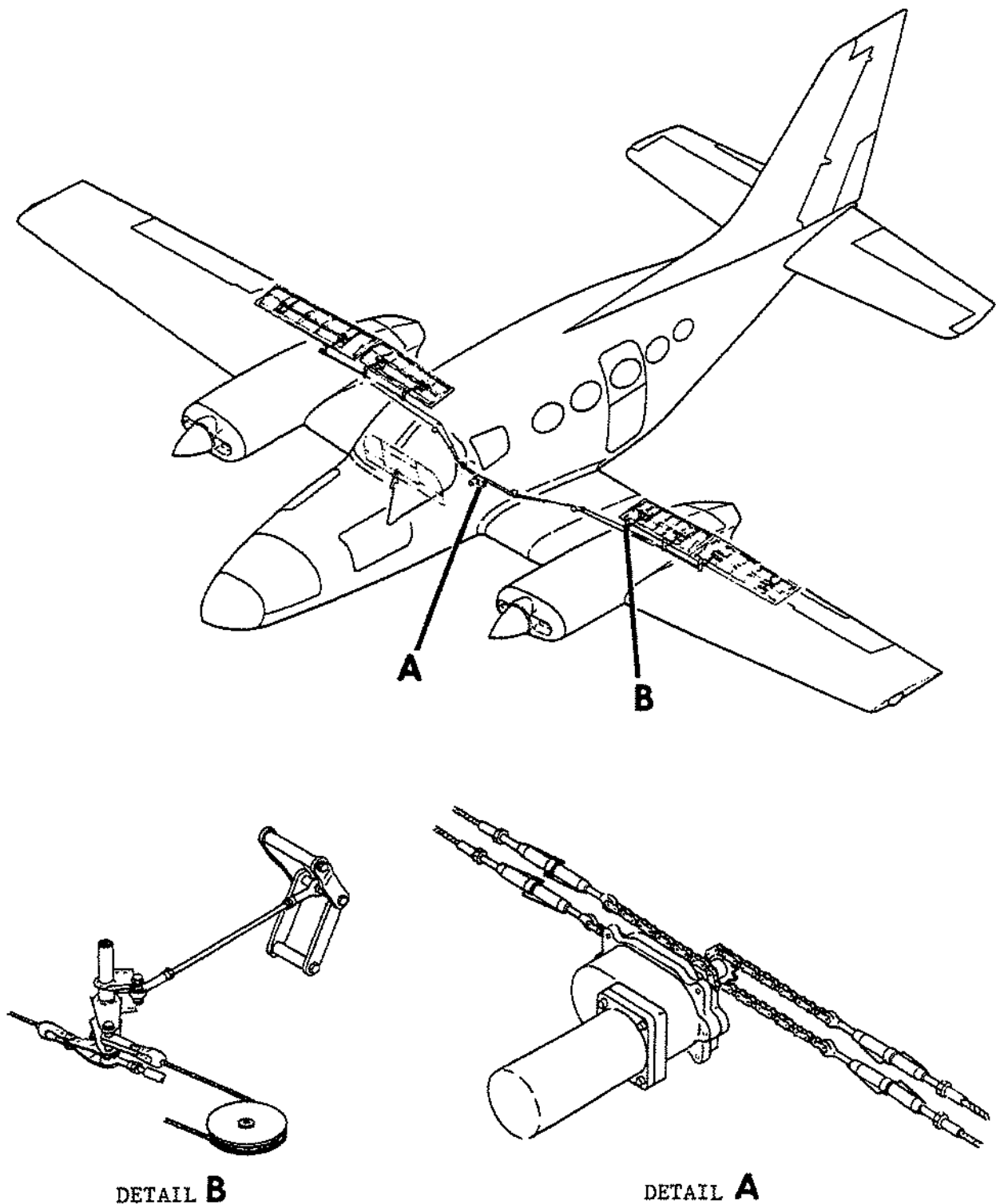


Figure 7-12

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. During ground operation, accidental gear retraction, regardless of gear switch position, is prevented by a safety switch located on the left landing gear shock strut. The weight of the airplane compresses the shock strut, causing the safety switch to open, thus preventing electrical power from reaching the landing gear control valve.

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 7-16, 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 towards 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 light which illuminates at low engine RPM or in the event of a hydraulic pump failure.

LANDING GEAR SYSTEM

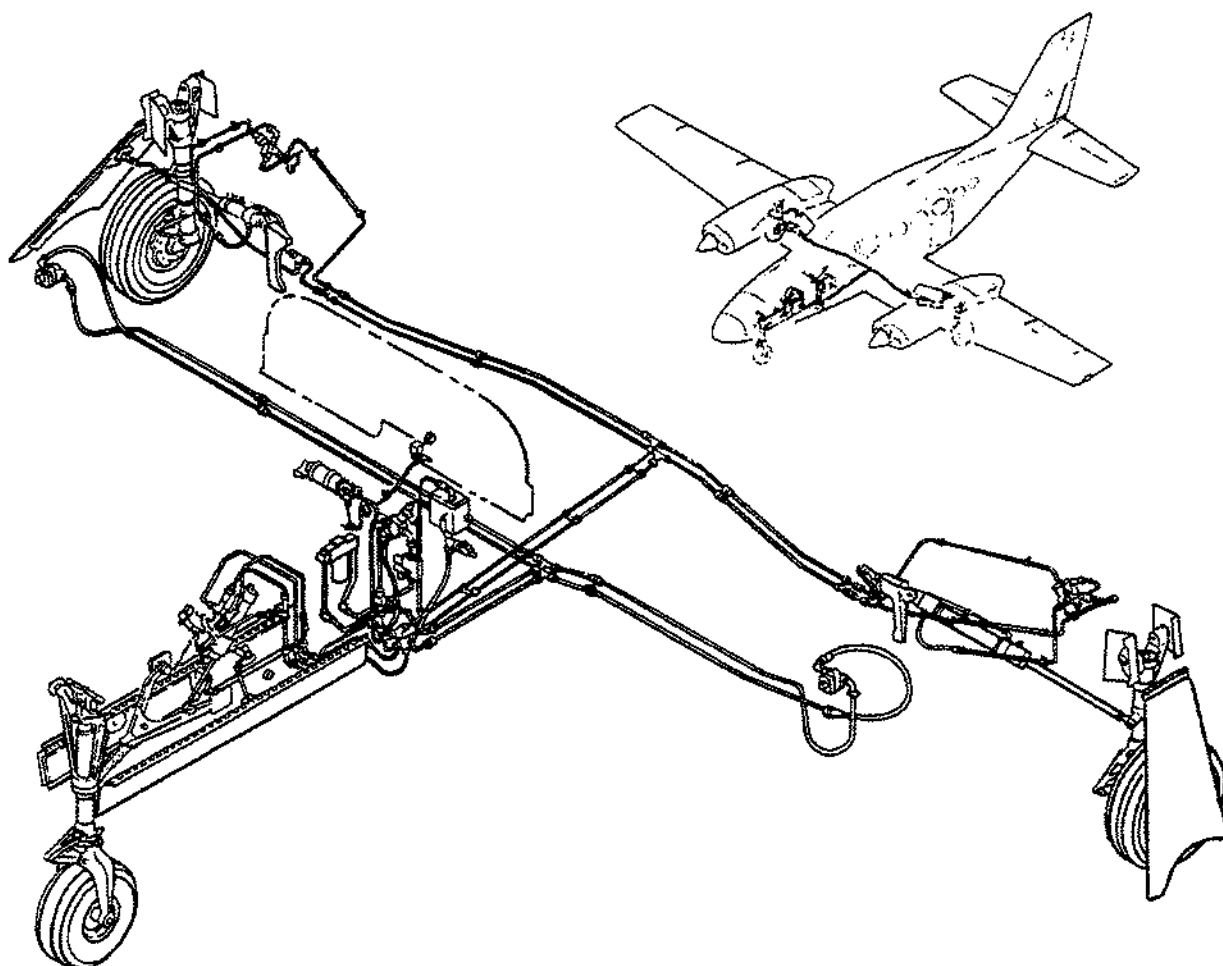
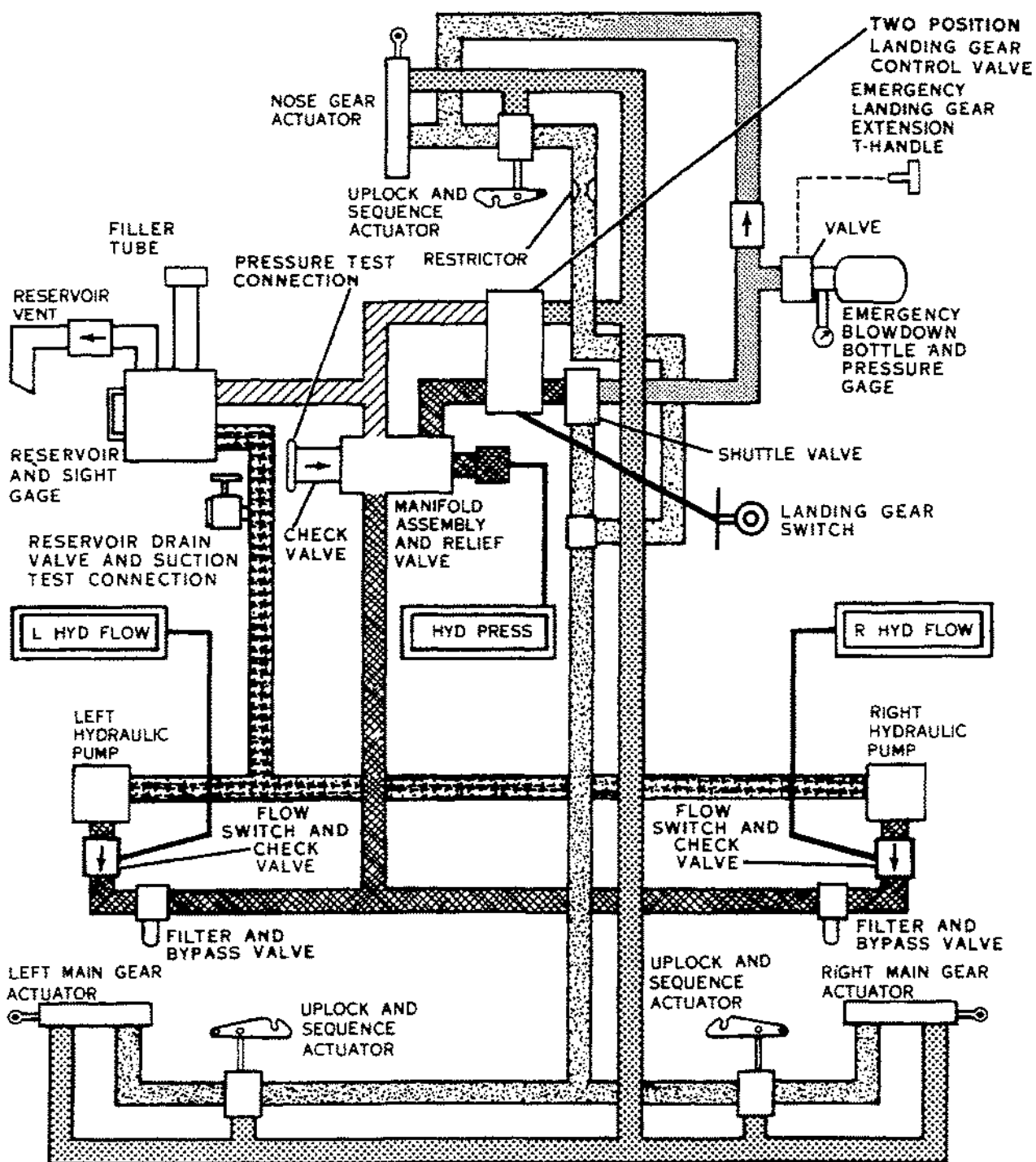


Figure 7-13

HYDRAULIC SYSTEM SCHEMATIC



CODE

----- MECHANICAL	 RETURN
 SUCTION	 EMERGENCY AIR
 PRESSURE	 CHECK VALVE
 GEAR EXTEND	— ELECTRICAL
 GEAR RETRACT	

Figure 7-14

LANDING GEAR HYDRAULIC SYSTEM

Hydraulic pressure at 1750 psi is supplied on demand by the hydraulic pump which is mounted on each engine, see Figure 7-14. The hydraulic reservoir, located in the nose baggage compartment, see Figure 7-15, incorporates a sight gage for checking the fluid level while the gear is extended. 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. The landing gear completes the retraction cycle in approximately 4.5 seconds at maximum engine RPM. The actuation cycle time increases as engine RPM decreases or with the loss of an engine-driven hydraulic pump.

HYDRAULIC RESERVOIR SIGHT GAGE AND EMERGENCY BLOW DOWN BOTTLE PRESSURE GAGE

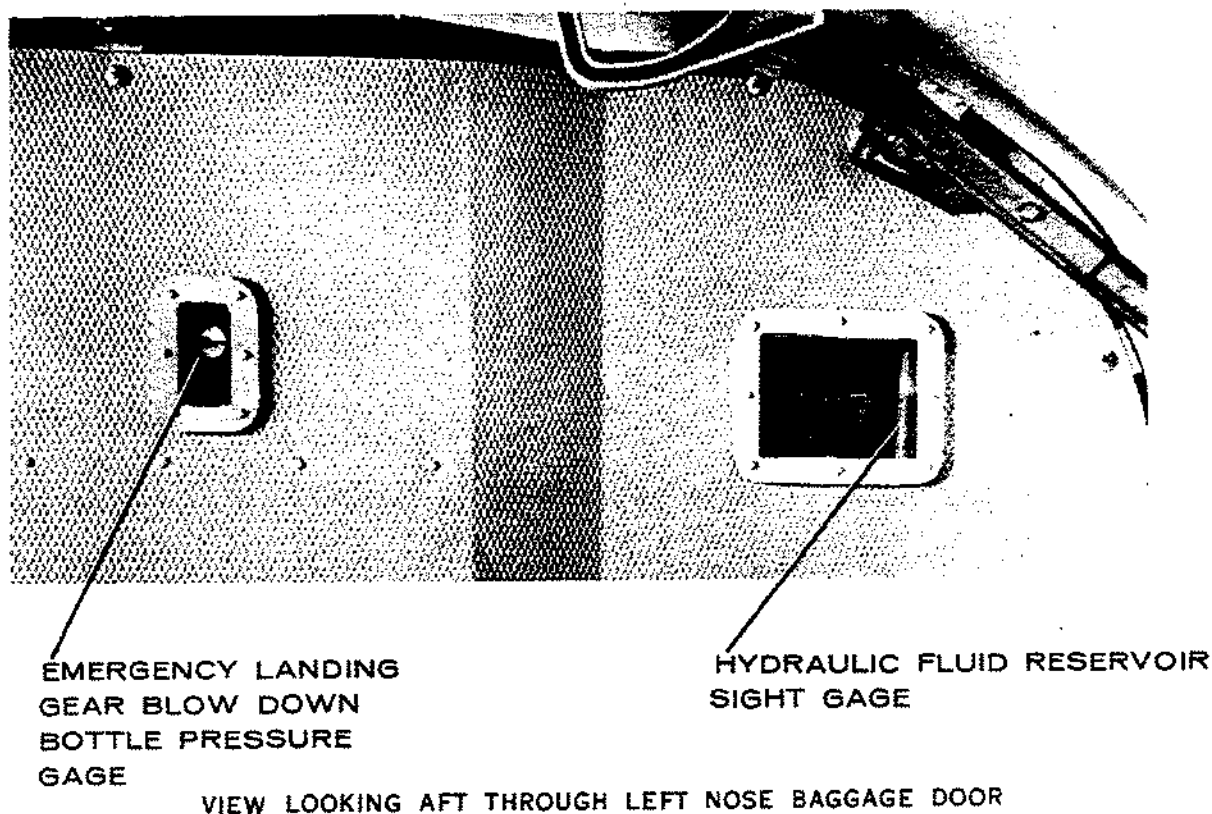


Figure 7-15

LANDING GEAR POSITION LIGHTS

Four landing gear position indicator lights, see Figure 7-16, 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 throttles and the wing flap position. The warning horn will sound intermittently if either throttle is retarded below approximately 15.0 inches Hg. manifold pressure with the landing gear retracted or if the wing flaps are lowered past the 15° position with the landing gear in any position except extended and locked. The warning horn can be activated by either the wing flap position switch or by throttle position as each functions independently of the other. 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 near the annunciator panel while retarding one throttle at a time. Also, lowering the wing flaps past the 15° position with the PRESS-TO-TEST button activated will cause the landing gear warning horn to sound.

LANDING GEAR EMERGENCY EXTENSION SYSTEM

The landing gear emergency extension system, see Figure 7-16, consists of a red emergency 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, caus-

EMERGENCY LANDING GEAR EXTENSION SYSTEM

LANDING GEAR SWITCH

LANDING GEAR UNLOCKED
INDICATOR LIGHT (RED)

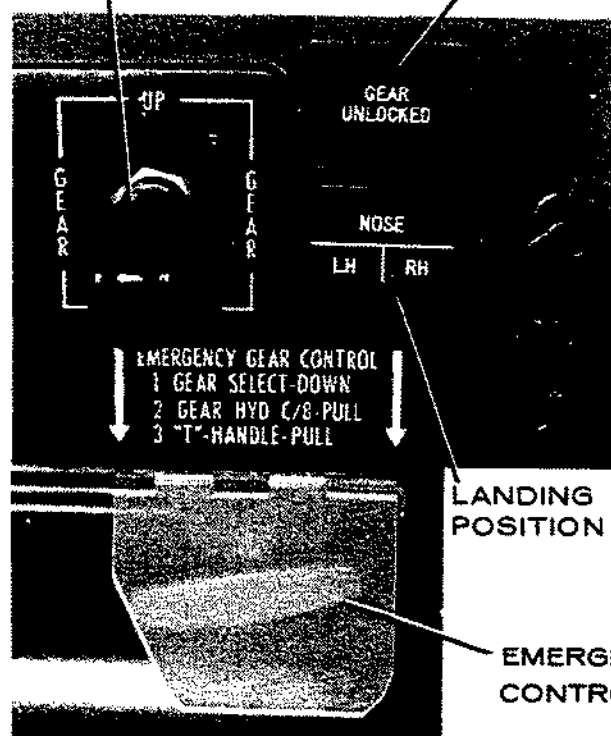


Figure 7-16

ing the shuttle valve to move from the hydraulic to the 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.

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 gear by an air-over-oil shock strut. This strut is composed of two basic parts: an upper barrel assembly and an inner tube assembly which fits inside the upper barrel assembly. The inner barrel assembly contains an orifice and tapered metering pin which vary the resistance to shock according to severity transmitted to the upper barrel assembly.

FUEL SYSTEM

The fuel system, see Figure 7-17, consists of two main tanks, two fuel selectors, emergency crossfeed shutoff valves and necessary components to complete the system.

MAIN TANKS

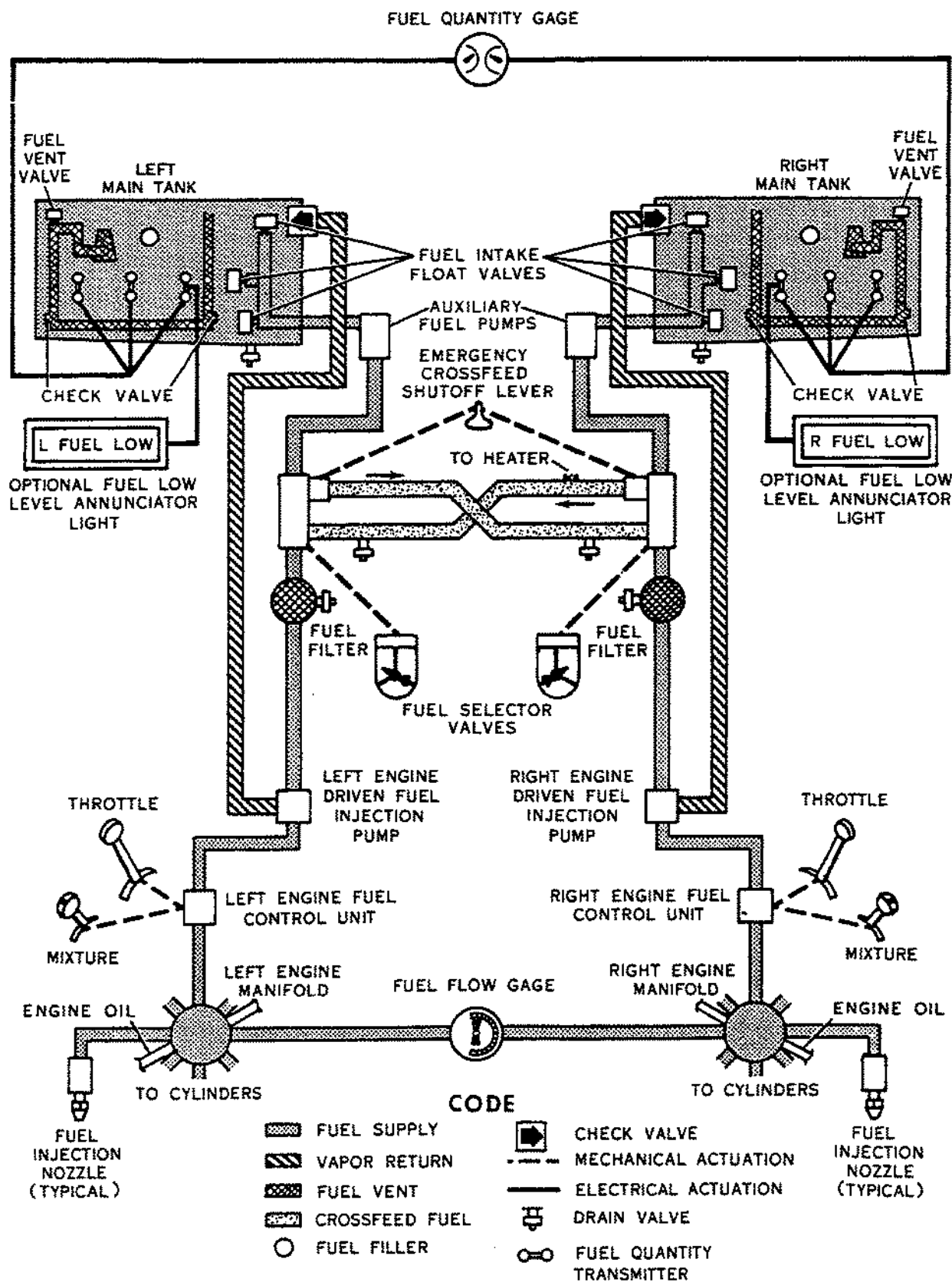
The main fuel tanks are an integral portion of the sealed wet wing. These tanks supply their respective engine with fuel for normal operations, including takeoffs and landings. An auxiliary fuel pump, located outside the tank, provides fuel pressure for priming during engine start. In the event of an engine fuel pump failure, the auxiliary fuel pump will supply fuel to the engine if the auxiliary fuel pump switches are on. The main tank is vented to the atmosphere by a combination flush vent and a .50-inch diameter drain located on the lower surface of the wing. The flush mounted vent eliminates the need for heated vents. The fuel tanks are serviced through a flush filler located in the top surface of each wing.

FUEL SELECTORS

Two fuel selectors, one for each engine, are provided on the floor between the pilot and copilot seats. The selectors allow selection of main fuel, crossfeed and off.

During normal flight operations, position the left fuel selector to LEFT MAIN and the right fuel selector to RIGHT MAIN. This allows fuel to flow from each main tank, through the fuel selector, to the respective engine-driven fuel pump. Fuel may be crossfed from the left main tank to the right engine or from the right main tank to the left engine. Both engines will be supplied with fuel from the right main tank when both fuel selectors are positioned to RIGHT MAIN. Conversely, both engines will be supplied with fuel from the left main tank when both fuel selectors are positioned to LEFT MAIN. The crossfeed function is used for balancing asymmetric fuel loads and supplying the engine-driven fuel pump from the

FUEL SYSTEM SCHEMATIC



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Figure 7-17

opposite main tank. The LEFT ENG OFF position or RIGHT ENG OFF position (the center button must be depressed as the selector valve is rotated to the off position) on the fuel selectors allows no fuel to flow to the engine-driven fuel pump.

The fuel selector handles form the pointers for the selectors. The ends of the handles are arrow-shaped and point to the position on the selector placard which corresponds to the position of the control valves.

EMERGENCY CROSSFEED SHUTOFF LEVER

A two-position emergency crossfeed shutoff lever is located between the fuel selector handles. When the shutoff lever is pulled up, crossfeeding of main tank fuel and heater operation is stopped. This lever is for emergency crossfeed control only, since its function is to isolate the fuel crossfeed lines from the fuel tanks in the event of a nacelle, wing or center section fire or a wheels up landing.

AUXILIARY FUEL PUMP SWITCHES

A 3-position auxiliary fuel pump switch, see Figure 7-19, is provided for each main fuel tank pump providing 5.5 PSI pressure for vapor clearing and purging. In the LOW position, the auxiliary fuel pumps operate at low speed. The ON position runs the auxiliary fuel pumps at low speed, as long as the engine-driven pumps are functioning. With an engine-driven pump failure and the switch in the ON position, the auxiliary pump on that side will switch to high speed automatically, providing sufficient fuel for all partial-power engine operations.

FUEL DRAIN VALVES

Fuel quick-drain valves are provided for each fuel tank, fuel filter and crossfeed line. The drains provide a location for removing moisture and sediment from the fuel system. The drains, located on the lower surface of the main tanks, are actuated by depressing the lower portion of the valve. A special screwdriver is provided with the airplane which allows a 2-ounce sample to be drained and inspected without fuel spillage.

FUEL FLOW GAGE

The fuel flow gage, see Figure 7-1, is a dual instrument which indicates the approximate fuel consumption of each engine in pounds per hour. The fuel flow gage used with the injection system senses the pressure at which fuel is delivered to the engine spray nozzles. Since fuel pressure at this point is approximately proportional to the fuel consumption of the engine, the gage is marked as a flowmeter.

The gage dial is marked with arc segments corresponding to proper fuel flow for various power settings and maximum power altitudes and is used as a guide to quickly set the mixtures. These gage markings are predicated on the use of 100 grade aviation fuel. Increase fuel flow 2% above markings when 100LL grade aviation fuel is used.

The gage has takeoff, climb and cruise markings for various percentages of power. The takeoff range (white arc) presents the desired fuel flow (full rich schedule for proper engine cooling) for full power (2700 RPM and 38.0 inches Hg. manifold pressure) operation under all conditions up to

20,000 feet altitude. A white triangle represents the desired fuel flow for maximum normal operating power (38.0 inches Hg. at 2600 RPM) for operation at all conditions up to 20,000 feet altitude. The climb range (blue segments) presents the desired fuel flow for best power mixture at 75% power with an enriched mixture for higher power settings to allow proper engine cooling during climb conditions. The cruise range presents the desired fuel flow for recommended lean mixture at the specified percent power.

FUEL QUANTITY GAGE

The dual indicating fuel quantity gage, see Figure 7-1, is calibrated in pounds and will accurately indicate the weight of fuel contained in the tanks regardless of whether 100 grade aviation or 100LL grade aviation fuel is used; however, fuel density varies with temperature, therefore a full tank will weigh more on a cold day than on a warm day. This will be reflected by the weight shown on the gage. A gallons scale is provided in blue on the indicator for convenience in allowing the pilot to determine the approximate volume of fuel on board. The volume markings are predicated on the use of 100 grade aviation fuel. Reduce the indicated gallonage reading by 4% when 100LL grade aviation fuel is used.

FUEL LOW LEVEL WARNING LIGHTS

The optional fuel low level warning lights, see Figure 7-3, provide a warning when the left and/or right main tanks contain approximately 60 pounds of fuel. The warning is provided by the L FUEL LOW and R FUEL LOW lights located on the annunciator panel. These lights are actuated by a float switch located in each main fuel tank. Each light operates independently from the fuel quantity indicating system.

ENGINE-DRIVEN FUEL PUMPS

Each engine is equipped with a mechanically driven fuel pump which provides fuel to the metering unit. Each pump also contains a bypass which returns excess fuel and vapor to the main tanks at all times. Should these pumps fail, the main tank auxiliary pumps can provide sufficient fuel flow for all partial-power engine operations. These auxiliary pumps, however, operate at a fixed pressure, consequently the mixture must be leaned when operating at a low power setting to prevent flooding in the engines. Conversely, if an engine-driven pump failure should occur during high power operation, adequate fuel flow may not be available to insure rated power and adequate engine cooling.

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 the parking brakes, push the parking brake handle in. It is not necessary to depress the rudder pedals when releasing the parking brake.

ELECTRICAL SYSTEM

Electrical energy, see Figure 7-18, is supplied by a 28-volt, negative-ground, direct current system powered by an alternator on each engine. The electrical system has independent circuits for each side with each alternator having its own regulator and overvoltage protection relay. The voltage regulators are connected to provide proper load sharing. A 24-volt battery is located in the left stub wing. Immediate detection of low system voltage is provided by a LOW VOLT light on the annunciator panel, see Figure 7-3. The light will illuminate when the airplane bus voltage decreases below approximately 25 volts.

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.

BATTERY AND ALTERNATOR SWITCHES

Separate battery and alternator switches, see Figure 7-19, are provided as a means of checking for a malfunctioning alternator circuit and to permit such a circuit to be turned off. If an alternator circuit fails or malfunctions, or when one engine is not running, the switch for that alternator should be turned off. Operation should be continued on the functioning alternator, using only necessary electrical equipment. If both alternator 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.

EMERGENCY POWER ALTERNATOR FIELD SWITCH

An emergency power alternator field switch, see Figure 7-19, is located on the aft top side of the side console. The switch is used when the alternators will not self-excite. Placing the switch in the ON position provides excitation from the battery even through the battery is considered to have failed.

OVERVOLTAGE RELAYS

Two overvoltage relays in the electrical system constantly monitor their respective alternator output. Should an alternator exceed the normal operating voltage, the overvoltage relay will trip, taking the affected alternator off the line. The overvoltage relay can be reset by cycling the applicable alternator switch.

VOLTTAMMETER

A voltammeter, see Figure 7-19, located on the left side console, is provided to monitor alternator current output, battery charge or discharge rate and bus voltage. A selector switch, see Figure 7-19, labeled L ALT, R ALT, BATT, and VOLTS is located to the left of the voltammeter. By positioning the switch to L ALT, R ALT, or BATT position, the respective alternator or battery amperage can be monitored. By positioning the switch to the VOLTS position, the electrical system bus voltage can be monitored.

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LEFT AND RIGHT SIDE CONSOLES

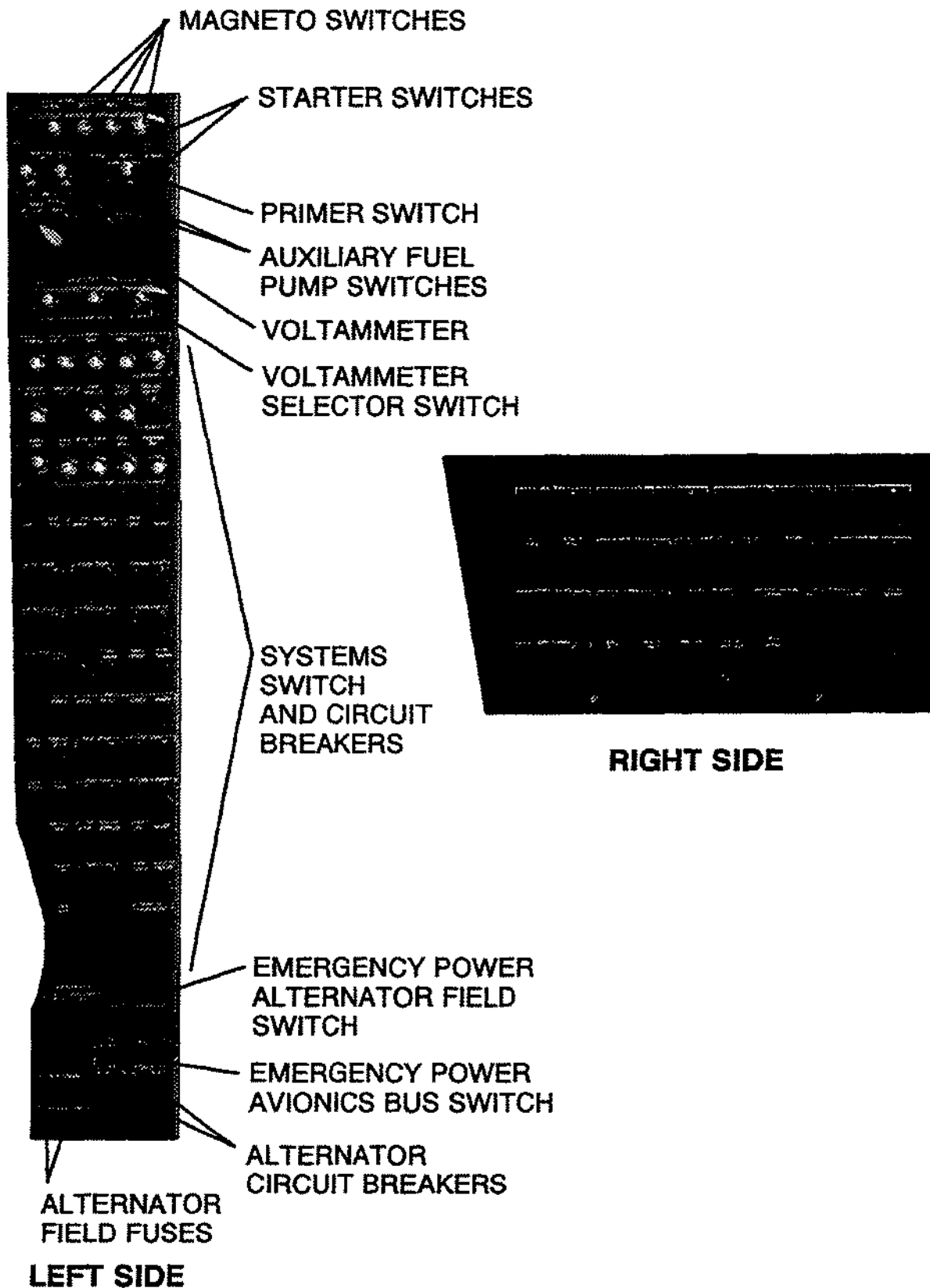


Figure 7-19

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 7-17. 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. However, the circuit breaker should not be held in nor the switch breaker forced to remain in the ON position if it opens the circuit a second time as this indicates a short circuit.

EXTERNAL POWER RECEPTACLE

An optional external power receptacle may be installed in the left wing aft nacelle fairing. The receptacle accepts a standard AN-type external power source plug. The following precautions must be observed when starting an airplane using an external power source:

1. Avionics Master Switch - OFF.
2. Battery Switch - ON (The battery will tend to absorb transients that are present in some external power sources).
3. Alternator Switches - OFF.
4. Airplane Voltammeter - READ battery voltage.

NOTE

Set External Power Source Output Voltage to 28 volts.

5. External Power Source - TURN OFF before connecting to airplane.
6. External Power Source - ATTACH and TURN ON.
7. Airplane Voltammeter - READ VOLTAGE (If external power source is properly connected, the reading will be greater than when reading battery voltage only).

LIGHTING SYSTEM

EXTERNAL LIGHTING

The airplane is equipped with four navigation lights, two retractable landing lights (right light is optional), an optional taxi light, two anti-collision lights and two optional wing deice lights.

Navigation Lights

The navigation lights are located in the tailcone stinger and in each wing tip assembly. These lights are energized with the navigation lights switch breaker on the side console, see Figure 7-19. Proper operation can be checked by observing reflections on the ground below the tail light and from objects surrounding the airplane.

Landing Lights

The retractable landing lights (right light is optional) are located in the lower surface of the wing tips. These lights are extended, retracted and illuminated by the landing light switch breaker on the side console, see Figure 7-19. With the switch positioned to LDG, 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 Lights

The optional 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 side console, see Figure 7-19.

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 light switch breaker on the side console, see Figure 7-19.

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 optional wing deice lights are installed in the outboard side of each engine nacelle and illuminate the outboard 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 side console, see Figure 7-19.

All exterior lighting should be checked for proper operation before night flying. Cockpit recognition of operational exterior lighting can be determined by looking for ground illumination by the various lights.

INTERNAL LIGHTING

The airplane is equipped with lighting for baggage areas, cabin doorway, cockpit controls and indicators, cockpit illumination and cabin illumination.

COCKPIT LIGHTING CONTROLS

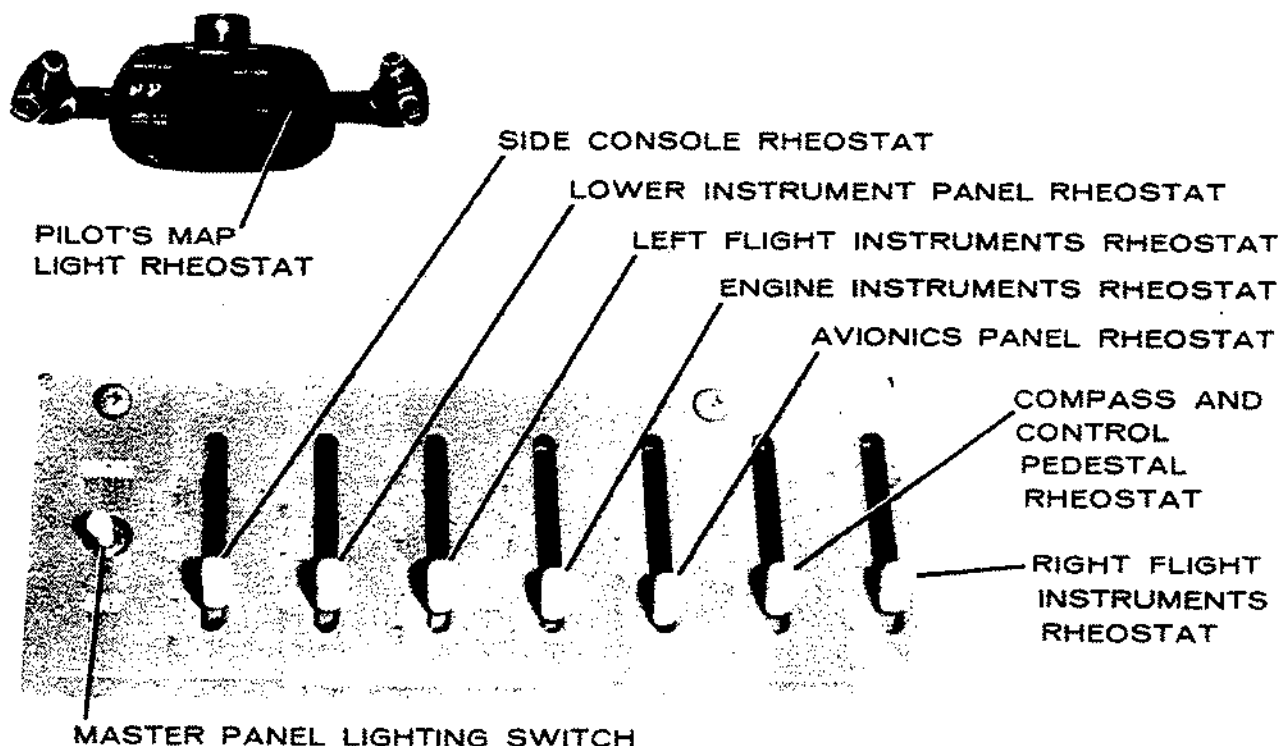


Figure 7-20

Optional baggage area lights are provided for both wing lockers and the nose baggage areas. The lights are actuated when the applicable baggage door is opened and extinguish 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. An optional timer is available which will automatically extinguish the cabin doorway and instrument panel floodlights 15 minutes after leaving the airplane if the lights were not switched off. The system operation is as follows:

1. The cabin doorway and instrument panel floodlights can be actuated by either of the two switches described above. Any time the lights come on, the timer begins to count down for 15 minutes.
2. With the cabin door closed, the lights will operate in a normal fashion (i.e., lights out, movement of either switch turns lights on; lights on, movement of either switch turns lights off), unless the timer has extinguished the lights, thus requiring cycling of either switch to turn the lights on again.
3. Opening the door will turn the lights on unless the timer extinguished the lights, in which case, one movement of the door switch is also required in order to turn the lights on.
4. With the cabin door open, the lights will always be on unless the timer has turned them off. Movement of the door switch is required to reset the lights to on for an additional 15 minutes.
5. Closing the door will extinguish the lights only if the system is switched off. If the system is on, the timer must continue to run down to extinguish the lights.

CABIN LIGHTING AND CONTROLS

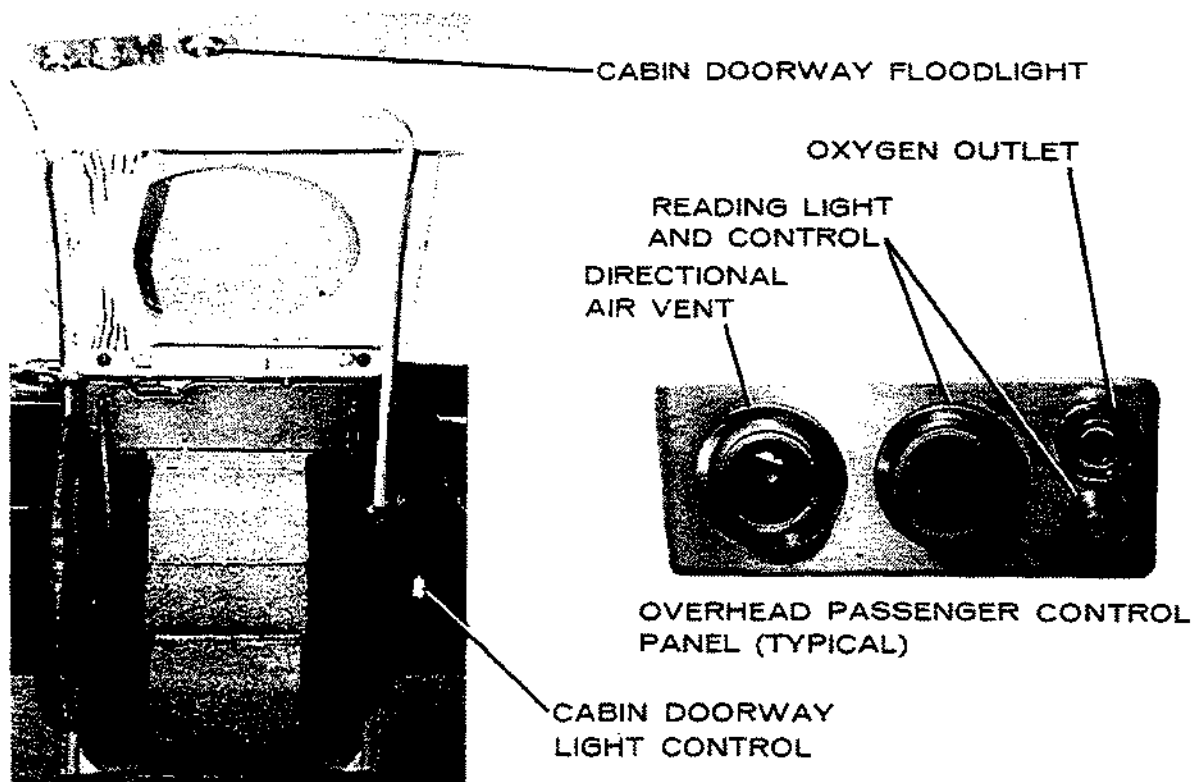


Figure 7-21

Cockpit lighting is provided by the instrument panel floodlight, instrument postlights and overhead map lights. All cockpit lights are variable intensity and are controlled by rheostats on the top of the control pedestal and pilot's control wheel, see Figure 7-20.

NOTE

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 PRESSURE SYSTEM

The standard pitot pressure system, see Figure 7-22, consists of an electrically heated pitot tube mounted on the left side at the bottom of the fuselage nose, suitable plumbing and an airspeed indicator.

When the pitot heat switch is placed in the ON position, the heating elements in the pitot tube are electrically heated to maintain proper operation of the system during icing conditions. Do not operate for prolonged periods while on the ground to prevent overheating of the heating elements.

When the optional copilot's instruments are installed, a second pitot system is used. This second pitot head is located on the right side at the bottom of the fuselage nose and is connected to the copilot's airspeed indicator. This dual system allows a completely independent second presentation of airspeed pitot pressure. Pitot heat for the additional head is controlled by an additional pitot heat switch located adjacent to the standard pitot heat switch.

STATIC PRESSURE SYSTEM

Static pressure for the pilot's airspeed, altimeter and rate-of-climb indicators, see Figure 7-22, is obtained by a normal external static source or an alternate internal static source should the external source fail.

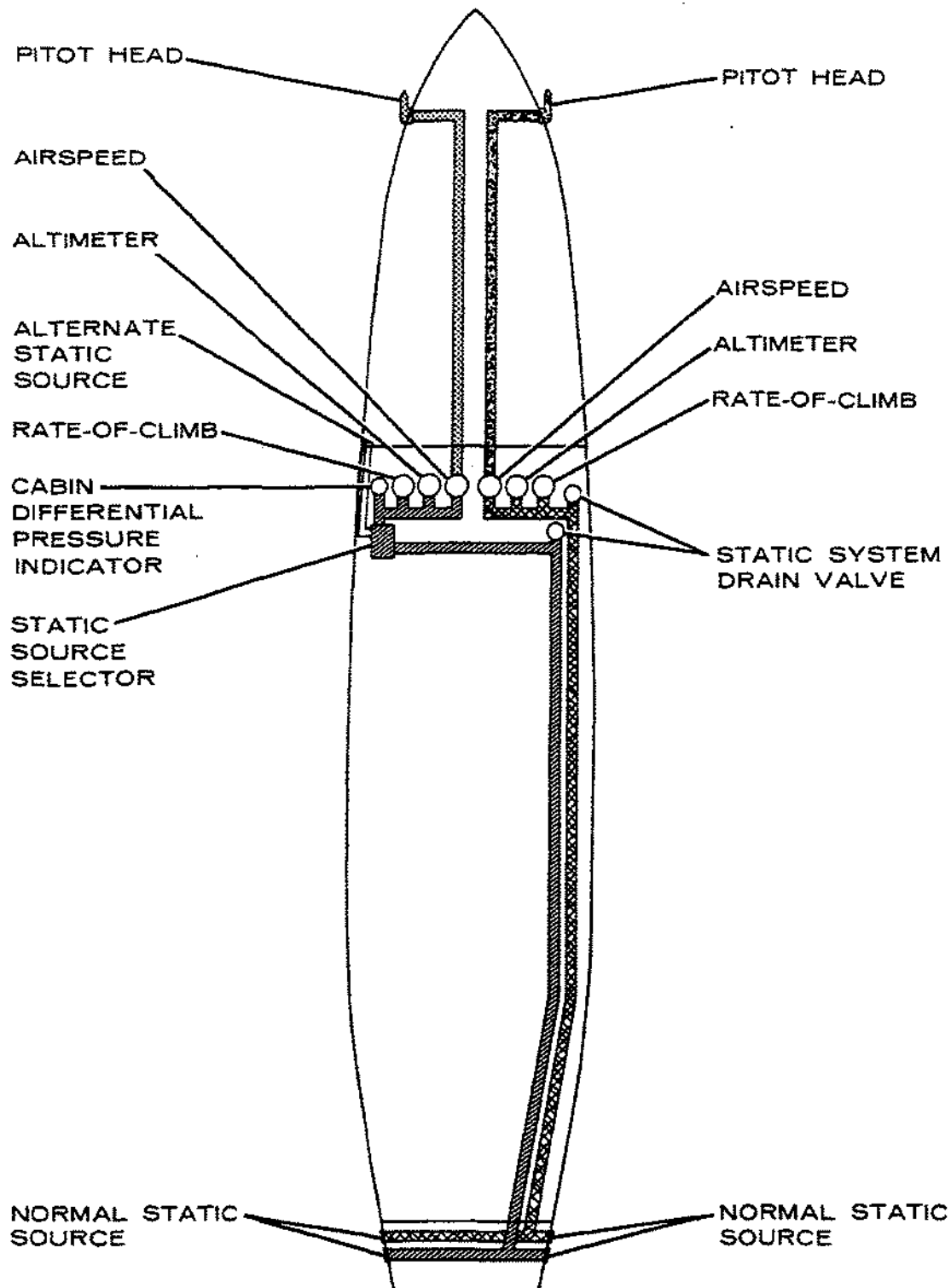
A static source selector, installed in the static system directly below the parking brake handle, allows selection of the normal or alternate static source. When the selector is positioned to NORMAL, the pilot's instruments reference the static source located aft of the main cabin door. When the selector is positioned to ALTERNATE, the pilot's instruments reference the alternate static source in the nose compartment. Refer to Section 5 for airspeed and altimeter corrections when the static source is positioned to ALTERNATE. A drain valve is located behind the map pocket on the copilot's side.

CAUTION

Do not open the drain valve while the cabin is pressurized as flight instrument damage will result.

When the optional copilot's instruments are installed, a second set of static ports are installed aft of the main cabin door below the standard static ports. The added static ports are manifolded together and are used as a reference for the copilot's instruments only. This dual system allows a completely independent second static pressure source. No alternate static source is provided for the copilot's instruments. Optional static port heaters are controlled by the stall and vent heat switch.

PITOT STATIC SYSTEM SCHEMATIC



CODE

-  PILOT'S PITOT SYSTEM
-  PILOT'S STATIC SYSTEM
-  COPILOT'S PITOT SYSTEM (OPTIONAL)
-  COPILOT'S STATIC SYSTEM (OPTIONAL)

Figure 7-22

VACUUM SYSTEM

A vacuum system, see Figure 7-23, is installed to provide a source of vacuum for the vacuum instruments. The system consists of an engine-driven vacuum pump on each engine, a pressure relief valve for each pump, a common vacuum manifold, a vacuum air filter, a suction gage and gyro instruments.

Each vacuum pump pulls a vacuum on the common manifold, exhausting the air overboard. The maximum amount of vacuum pulled on the manifold by each vacuum pump is controlled to a preset level by each pressure relief valve. Should either of the pumps fail, a check valve is provided in each end of the manifold to isolate the inoperative vacuum pump from the system.

The exhaust air side of each attitude gyro is connected to the vacuum manifold thus providing a smooth steady vacuum for the gyros. The vacuum pressure being applied to the gyros is constantly presented on the suction gage. This gage also provides failure indicators for the left and right vacuum pumps. These indicators are small red buttons located in the lower portion of the suction gage which are spring-loaded to the extended (failed) position. When normal vacuum is applied in the manifold, the failure buttons are pulled flush with the gage face. Should insufficient vacuum occur on either side, the respective red button will extend. No corrective action is required by the pilot, as the system will automatically isolate the failed vacuum source, allowing normal operation on the remaining operative vacuum pump.

The inlet air side of the attitude gyros are connected to a common vacuum air filter which cleans the ambient nose compartment air before allowing it to enter the gyros.

FLIGHT INSTRUMENTS

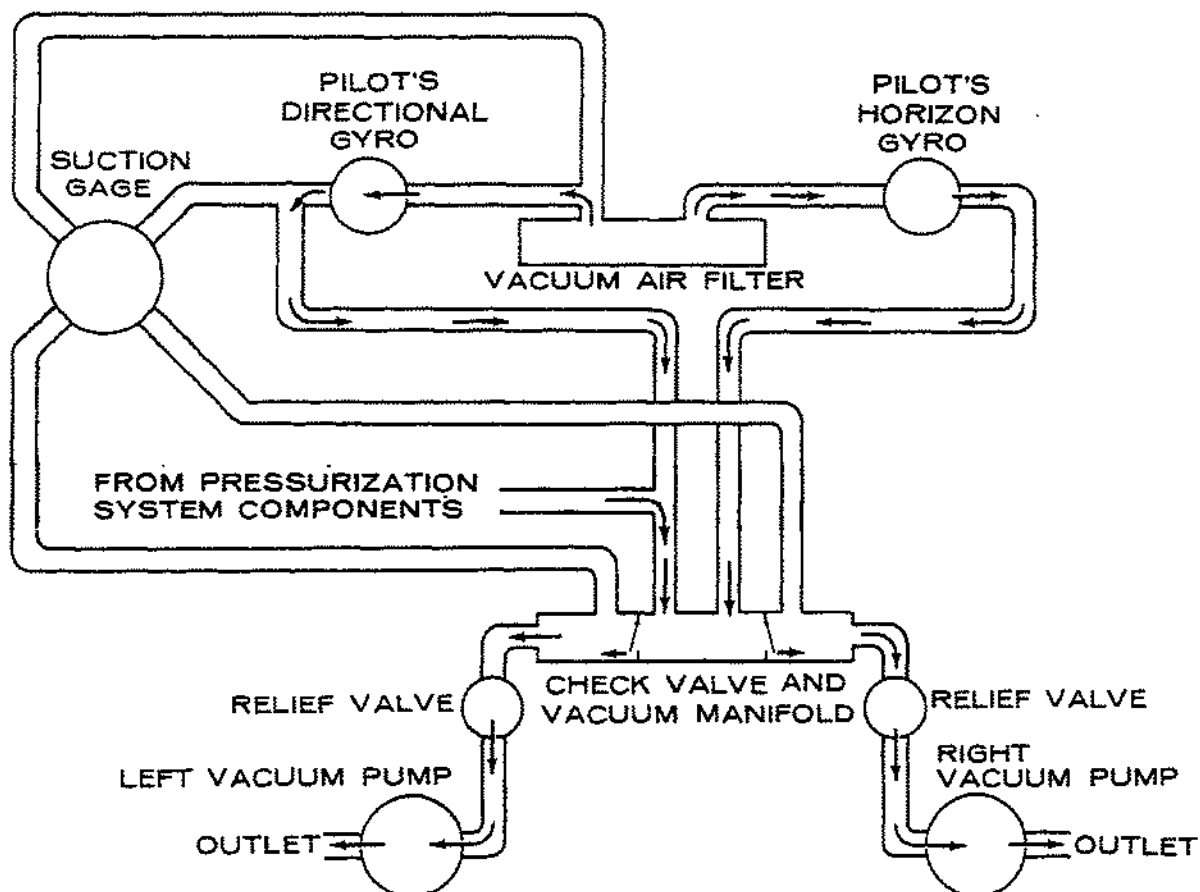
The basic flight instruments, see Figure 7-1, consist of airspeed, altimeter and rate-of-climb indicators, electric turn-and-bank and vacuum horizon and directional gyros.

Operation of the airspeed, altimeter and rate-of-climb indicators can be determined by cross-checking the copilot's instruments, if installed. Also, when a climb or descent is initiated, these instruments should indicate the appropriate change. If no change is indicated, it is reasonable to assume static source blockage has occurred and the alternate static source should be selected. If the possibility of static source icing is present, actuation of the stall and vent heat switch might deice the static sources, allowing a return to the normal static source, if the optional heated static sources are installed. If only the airspeed indicator appears to be affected when the climb or descent is initiated, it is reasonable to assume a pitot system blockage has occurred. If the possibility of pitot source icing is present, actuation of the pitot heat switch will clear the ice blockage. Reference the optional copilot's instruments and optional angle-of-attack indicator for airspeed information until a reliable airspeed indication can be obtained. If neither optional system is installed, fly attitude and power references.

Operation of the 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. Pushing the PRESS-TO-TEST

VACUUM SYSTEM SCHEMATIC

STANDARD SYSTEM



OPTIONAL SYSTEM

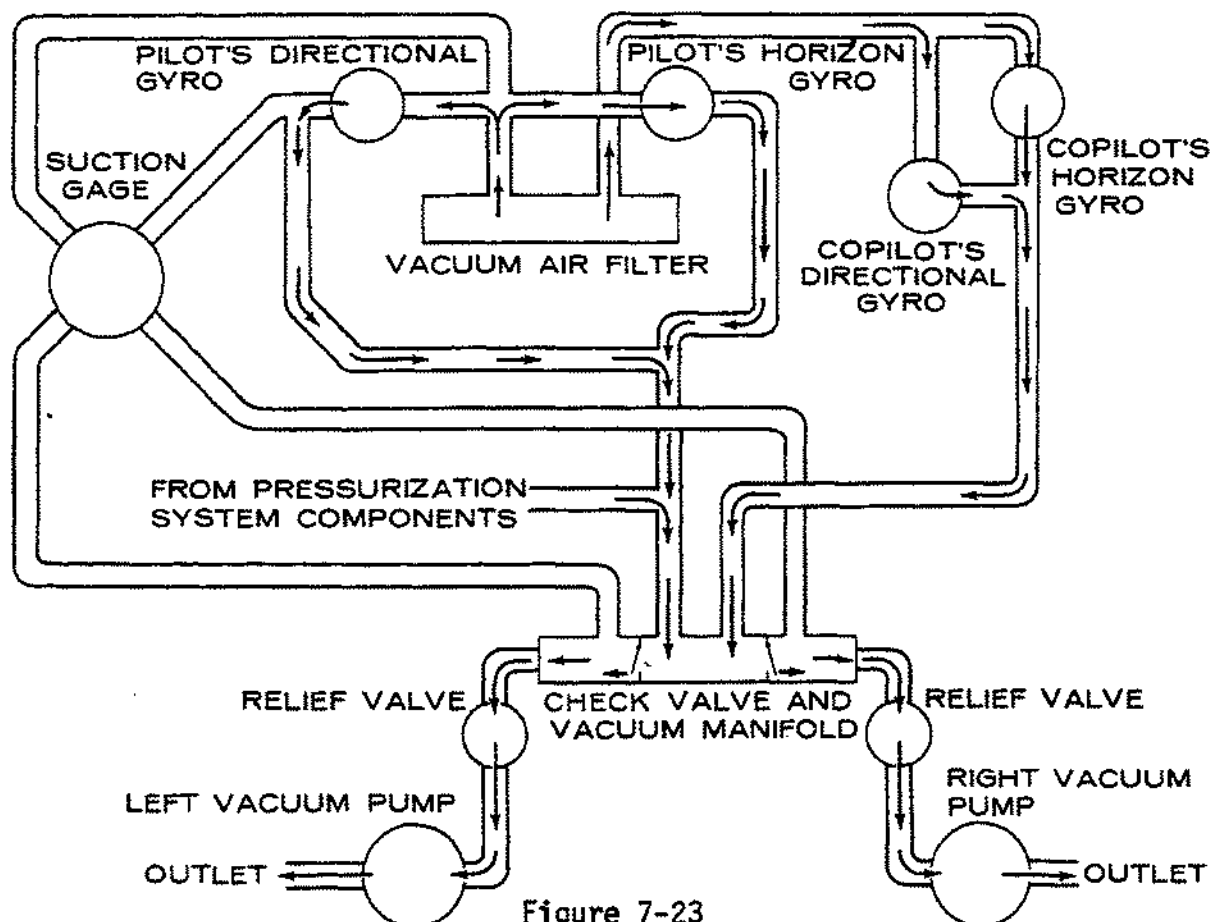


Figure 7-23

button adjacent to the annunciator panel will illuminate the T & B TEST annunciator light if power is being applied to the turn-and-bank indicator. After shutdown of the airplane on the ground, abnormal noise coming from the turn-and-bank 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.

Operation of the directional and horizon gyros can be checked during taxiing by watching for an abnormally slow erection rate and erratic operation. After shutdown of the airplane on the ground, abnormal noise coming from either gyro can indicate a near failure condition. Checking the suction gage for proper vacuum and no failure buttons exposed will assure proper gyro vacuum is available.

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.

STALL WARNING SYSTEM

A stall warning system is required equipment which consists of a stall warning transmitter vane located in the left outboard wing leading edge, a flight deck warning horn and the necessary wiring to complete the system.

The stall warning horn will sound 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 and vent heat switch and feeling the vane for heat.

AVIONICS

AVIONICS INTERFERENCE

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 optional avionics master switches are provided with factory installed avionics. The master switch breaker, labeled AVIONICS BUS, is located on the top forward section of the side console, see Figure 7-19. This switch supplies power from the battery bus through a circuit breaker located forward of the battery box to the individual avionics circuit breakers and is used for all normal operations. An emergency power

avionics bus switch breaker labeled EMER POWER AVIONICS BUS is located in the lower section of the outside console and is protected by a red switch guard cover, see Figure 7-19. This switch supplies power from the alternator bus to the individual avionics circuit breakers. The emergency power avionics bus switch is recommended for use only when the avionics bus switch associated wiring or battery circuits become inoperative.

ENGINES

The airplane is equipped with two, 6-cylinder, turbocharged fuel-injected engines with provisions for cabin pressurization. Each engine is rated at 310 horsepower at 2700 RPM and 38.0 inches Hg. manifold pressure. Each engine is provided with an oil pump, fuel pump, vacuum pump, propeller governor, tachometer generator, starter and alternator.

ENGINE CONTROLS

The control pedestal contains all engine controls except the alternate air controls. The three primary engine controls are in groups of two at the top of the pedestal; starting from left to right they are: (1) throttle, (2) propeller and (3) mixture.

Throttle Control

The throttle control lever, see Figure 7-1, is used to increase or decrease the engine power by moving the butterfly valve in the fuel-air control unit.

Propeller Control

The propeller control lever, see Figure 7-1, is used to change the propeller pitch to maintain or set a desired engine RPM.

Mixture Control

The mixture control lever, see Figure 7-1, is used to control the amount of fuel to be metered by the fuel-air control unit.

Quadrant Friction Lock

A quadrant friction lock, see Figure 7-1, is provided to prevent the three primary engine controls (six total levers) from creeping once they have been set. The locking knob (approximately one and one-half inches in diameter) is located on the right side of the pedestal.

Cowl Flap Control

Two cowl flap controls, see Figure 7-1, are located just below the rudder trim tab wheel; one control for each engine. These controls are used to set the cowl flaps in any position from full open to full closed. A locking feature is provided for each control to prevent inadvertent cowl flap position change. Rotating the control clockwise engages the locking mechanism.

Alternate Air Control

An alternate air control is provided for each engine, see Figure 7-1. These mechanically actuated, two-position controls are located on the instrument panel below the pilot's control wheel. Normally, the controls are pushed in, providing cold filtered ram air to the engines. When the controls are pulled fully out, warm unfiltered air from inside the cowl is provided to the engines. A locking feature is provided for each control to prevent inadvertent alternate air control position change. Rotating the control clockwise engages the locking mechanism.

Oil Heated Manifold Valve

The fuel manifold valves are heated with engine oil to reduce the possibility of power loss due to fuel system icing. The manifold valve, located on the top-forward part of the engine case, regulates metered fuel distribution to the injector nozzles.

ENGINE OIL SYSTEM

The engines installed in the airplane have a wet sump type, pressure lubricating system. Oil temperature is controlled by a thermally operated valve which either routes oil through the externally mounted cooler or bypasses the oil around the cooler. Oil is routed through internal passages to all moving parts of the engine which require lubrication.

In addition to providing lubrication and cooling for the engine, the oil is used for control of the propeller, actuating the turbocharger waste gate and for lubricating the turbocharger.

Oil pressures from both engines are routed into the fuselage, to the left and right engine gages, see Figure 7-1, where direct oil pressure readings are mechanically displayed. The oil temperatures of both engines are measured on the output side of the oil coolers. The measurements are electrically transmitted to the left and right engine gages where the oil temperatures are displayed.

IGNITION SYSTEM

Each engine is equipped with a dual ignition system. The ignition systems are entirely independent from each other such that a failure of any part of one system will have no effect on the other system. Each system consists of a magneto located on the rear engine accessory case, ignition harness to distribute the electrical energy and a spark plug in each engine cylinder. The left magneto fires the lower right and upper left spark plugs while the right magneto fires the upper right and lower left spark plugs. When the primary circuit of each magneto is electrically grounded by placing the magneto switch in the OFF position, the magneto will not produce a spark. With the magneto switch positioned to ON, the primary magneto circuit is ungrounded, allowing a high voltage spark to be produced to fire the spark plugs. During engine starting, a high voltage vibrator supplements the magneto spark to assure a fast start.

FUEL INJECTION SYSTEM

Fuel is supplied to the engine using a low-pressure injection system. The fuel is injected into the cylinder head adjacent to the intake valve on all cylinders. This continuous flow type injection system controls fuel flow to match engine airflow. A manual mixture control and a flow gage, see Figure 7-1, indicating fuel flow are provided for precise leaning at any combination of altitude and power setting. There are no moving parts in this system except for the engine-driven fuel injection pump.

COWL FLAP SYSTEM

A cowl flap system, consisting of a cowl flap located on the bottom of the nacelle, is provided for each engine to allow manual control of the engine cooling airflow. Cowl flap actuation is achieved by use of a push-pull cable assembly. The cowl flap controls, located on the lower control pedestal, allow any intermediate position to be selected. A locking feature is provided for each control to prevent inadvertent cowl flap control position change. Rotating the control fully clockwise engages the locking mechanism.

STARTING SYSTEM

The starting system consists of a 24-volt lead acid battery, a direct-drive starter mounted on each engine, a starter button for each engine and necessary wiring and components to complete the system.

The starter is engaged when the starter button, located on the side console, is pushed, see Figure 7-19. Pushing the button closes the starting contactor, allowing the starter to be energized. While the starter is energized, a starting vibrator provides a high-voltage current through the left magneto at a retarded position to assist the normal magneto ignition during the start.

ENGINE INSTRUMENTS

Engine instrumentation for each engine, see Figure 7-1, consists of mechanical oil pressure, electrical oil temperature and electrical cylinder head temperature presented on the combination engine gage, a mechanical manifold pressure gage, electric tachometer and mechanical fuel flow gage. The gages are placarded as to their operational parameters.

ENGINE MOUNTS

The engine is mounted to the nacelle structure by four engine mounts. Each mount incorporates two rubber pads capable of sustaining operational loads and providing absorption for engine vibrations.

ENGINE BREAK-IN PROCEDURE

The engine underwent a run-in at the factory and is ready for the full range of use. It is, however, recommended that cruising be accomplished at 65% to 77.5% power until a total of 50 hours has accumulated or oil consumption has stabilized.

CAUTION

The purpose of operating at 65% to 77.5% power with Best Power or Recommended Lean mixture is to insure proper seating of the rings and is applicable to new engines, and engines in service following cylinder replacement or top overhaul of one or more cylinders.

The airplane is delivered from the factory with corrosion preventative oil in the engine. This oil allows fast ring seating and should not be used any longer than 25 hours. If, during the first 25 hours, oil must be added, use only aviation grade straight mineral oil conforming to Specification MIL-L-6082. Refer to Section 8 for additional oil servicing information.

TURBO-SYSTEM

Each engine is equipped with a turbocharger and related components to allow rated power to 20,000 feet.

The engines work and act just like any normally aspirated engines; however, because the engines are turbocharged, some of the engine characteristics are different. The intent of this section is to point out some of the items that are affected by turbocharging, and outline the correct procedures to be followed.

For a better understanding of the Turbo-System, let us follow the induction air through the engine until it is expelled as exhaust gases. Reference should be made to the Turbo-System Schematic shown in Figure 7-24 when reading through the following steps.

1. Engine induction air is taken in through the ram air inlet (1), located in the bottom of the engine nacelle, at which point it passes through a filter and then into the compressor (2).
2. The compressor compresses the induction air.
3. Most of the pressurized induction air from the compressor then passes through an intercooler (7), then into the cylinders through the induction manifold (3). A small portion of this pressurized air is routed to the cabin for pressurization.
4. The air and fuel are burned and the exhaust gases are then routed to the turbine through the exhaust manifold (4).
5. The exhaust gases drive the turbine (5) which, in turn, drives the compressor.
6. The turbine has enough power to allow the engine to operate in excess of the maximum 38.0 inches Hg. manifold pressure. Therefore, in order not to exceed 38.0 inches Hg. manifold pressure, a bypass or waste gate (6) is used so the excess exhaust gas will be expelled overboard instead of passing through the turbine.

TURBO-SYSTEM SCHEMATIC

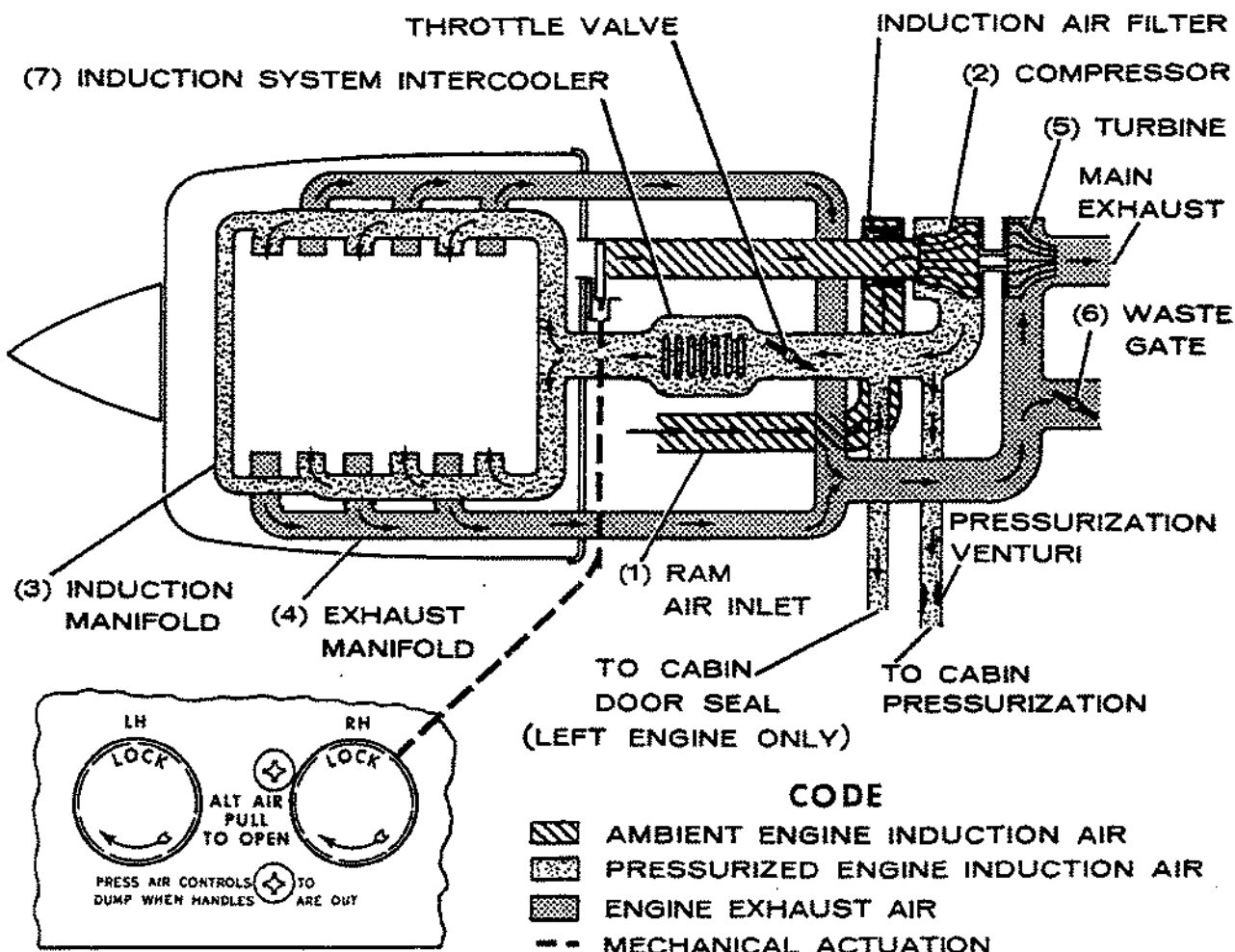


Figure 7-24

It can be seen from studying steps (1) through (6) that anything that affects the flow of induction air into the compressor, or the flow of exhaust gases into the turbine, will increase or decrease the speed of the turbocharger. This resultant change in flow will have no effect on the engine if the waste gate is still open, because the waste gate position will automatically change to hold compressor discharge pressure constant. The waste gate automatically maintains allowable compressor discharge pressure when below 20,000 feet with full throttle and full RPM. Above 20,000 feet, the throttles must be retarded to maintain the manifold pressure within the allowable limits. When the waste gate is closed, any change in the turbocharger speed will mean a change in engine operation. Anything that causes an increase or decrease in turbine speed will cause an increase or decrease in manifold pressure. If turbine speed increases, the manifold pressure increases; if the turbine speed decreases, the manifold pressure decreases. Any change in exhaust flow to the turbine or ram induction air pressure, whether it is an increase or decrease, will be magnified approximately 8 to 10 times by the compression ratio and the change in flow through the exhaust system.

Manifold Pressure Variation With Altitude

At full throttle, the turbocharger is capable of maintaining the maximum allowable 38.0 inches Hg. manifold pressure, well above 20,000 feet; however, engine operating limitations establish the maximum manifold pressure that may be used. From 20,000 feet to higher altitudes, the throttles must be retarded to maintain the manifold pressure within the allowable limits.

Manifold Pressure Variation With Airspeed

When the waste gate is open at low altitude, changes in airspeed have little or no effect on manifold pressure. However, at high altitudes when the waste gate is closed, manifold pressure will vary with variations in airspeed. This is because any change in pressure at the compressor inlet is magnified 8 to 10 times at the compressor outlet due to compression ratio and exhaust flow changes.

Fuel Flow Variations With Changes In Manifold Pressure

The engine-driven fuel pump output is regulated by engine speed and compressor discharge pressure. Engine fuel flow is regulated by fuel pump output and the metering effects of the throttle and mixture control. When the waste gate is open, fuel flow will vary directly with manifold pressure, engine speed, mixture or throttle position. In this case, manifold pressure is controlled by throttle position and the waste gate controller, while fuel flow varies with throttle movement and manifold pressure.

When the waste gate is closed and manifold pressure changes are due to turbocharger output, as discussed previously, fuel flow will follow manifold pressure even though the throttle position is unchanged. This means that fuel flow adjustments required by the pilot are minimized to the following: (1) small initial adjustments on takeoff or climb-out for the proper rich climb setting, (2) lean-out in cruise to the recommended lean cruise setting, and (3) return to the full rich position for approach and landing.

Manifold Pressure Variation With Increasing Or Decreasing Fuel Flow

When the waste gate is open, movement of the mixture control has little or no effect on the manifold pressure of the turbocharged engine.

When the waste gate is closed, any change in fuel flow to the engine will have a corresponding change in manifold pressure. That is, increasing the fuel flow will increase the manifold pressure and decreasing the fuel flow will decrease the manifold pressure. This is because an increased fuel flow to the engine increases the mass flow of the exhaust. This turns the turbocharger faster, increasing the induction airflow and raising the manifold pressure.

Momentary Overboost Of Manifold Pressure

Under some circumstances (such as rapid throttle movement, especially with cold oil) it is possible that the engine can be overboosted above the maximum allowable 38.0 inches Hg. manifold pressure. This would most likely be experienced during the takeoff roll or during a change to full throttle operation in flight. Therefore, it is still necessary that the pilot observe and be prepared to control the manifold pressure.

Slight overboosting is not considered detrimental to the engine so long as it is momentary. Momentary overboost of 2 to 3 inches Hg. manifold pressure can usually be controlled by slower throttle movement and no corrective action is required when momentary overboost corrects itself and is followed by normal engine operation. However, if overboosting of this nature persists, or if the amount of overboost goes as high as 4 inches Hg. manifold pressure or more, the controller system should be checked for necessary replacement or adjustment of components.

Altitude Operation

Turbocharged airplanes can maintain higher power settings and fuel flows to higher altitudes than are possible with normally aspirated airplanes. As a result, turbocharged airplanes climb faster and higher. Due to the higher fuel flows and the more rapid temperature and barometric pressure changes during these climbs, fuel vaporization in the fuel lines is more probable than with normally aspirated airplanes. Fuel vaporization is usually indicated by fuel flow fluctuations and can be eliminated by pressurizing the fuel system with the auxiliary fuel pumps. Refer to the Normal Procedures Checklist for recommended positioning of the auxiliary fuel pump switches.

High Altitude Engine Acceleration

The engines will accelerate normally from idle to full throttle with full rich mixture at any altitude below 20,000 feet. At higher altitudes, it is usually necessary to lean the mixture to get smooth engine operation from idle to maximum power. At altitudes above 25,000 feet, and with temperatures above standard, it takes one to two minutes for the turbine to accelerate from idle to maximum RPM, although adequate power is available in 20 to 30 seconds. If fuel flow has been interrupted for any reason, the mixture should be leaned until the engine begins to accelerate as shown by an increase in manifold pressure (with throttle open). Thereafter, adjust the mixture control for smooth engine operation.

Engine Shutdown

After extended periods of ground engine operation above 1600 RPM or when the cylinder head temperature indicator shows values within the upper half of the green arc, reduce power to between 600 and 800 RPM for a period of not less than 2 to 3 minutes prior to engine shutdown. This procedure is intended to reduce internal turbocharger temperatures and preclude the possibility of premature accumulation of carbon on the turbine shaft seals.

CABIN AIR SYSTEM

The cabin air system provides for cabin heating, ventilating and defrosting. The system consists of an air inlet in the nose, a cabin fan, a gasoline combustion-type heater, pressurization air temperature controls, and controllable heat outlets in the cabin. Two heat outlets are located at the base of the windshield for defrosting purposes. One outlet duct is located on each side of the aft cabin and two are located on the forward pressure bulkhead, see Figure 7-25 or 7-26.

Cabin heating and ventilating is accomplished by the cabin air DEFROST, AFT and FWD controls, see Figure 7-25 or 7-26. The overhead directional vents also supply unheated ventilating air in the pressurized mode. Forced ventilation is obtained with the two-speed cabin fan which may be operated independently of the heater. When the heater is actuated, the fan automatically operates in low speed; if additional airflow is desired, the HIGH position may be selected.

HEATING AND DEFROSTING

Depressurized

Fresh air is picked up from the air inlet in the nose of the airplane, heated by the heater, and directed to the pilot and passenger compartments. The heating and ventilating air is not recirculated, but exhausts overboard through the cabin pressure regulating valve.

The heating system can be used for ventilation by placing the cabin fan switch, see Figure 7-19, in either the NORMAL or HIGH position. The fan provides unheated fresh air to the cabin through the cabin heat outlets. In flight, ram air pressure can be used for ventilation by placing the cabin heat switch to the OFF position, pulling out the cabin air knobs and opening the heat outlets as desired.

Pressurized

Pressurization air is heated by the heater and ducted to the pilot and passenger compartments. To increase passenger comfort and heating system efficiency, the pressurization air temperature controls, see Figure 4-3, may be rotated fully clockwise. This will allow higher pressurization air temperatures, reducing cabin heater requirements. With the left pressurization air temperature control rotated fully clockwise, the overhead vents will supply warm air.

CABIN HEAT SWITCH BREAKER

The cabin heater is controlled by a two-position cabin heat switch breaker, see Figure 7-19. Switch positions are ON and OFF. Placing the switch breaker in the ON position starts and maintains heater operation and turns the cabin fan on low.

CABIN FAN SWITCH

The ventilating fan is controlled by a three-position cabin fan switch, see Figure 7-19. Switch positions are NORMAL, OFF and HIGH.

CABIN AIR TEMPERATURE CONTROL KNOB

The cabin air temperature is controlled by the cabin heat knob, see Figure 7-1. Clockwise rotation of this knob increases the desired temperature.

This knob adjusts a thermostat, which in turn controls heated air temperature in a duct located just aft of the heater. When the temperature of the heated air exceeds the setting of the thermostat, the thermostat automatically opens and shuts off the heater. When the heated air cools to the thermostat setting, the heater starts again. Thus the heater cycles on and off to maintain an even air temperature. Operation is identical for the pressurized and depressurized modes.

FORWARD CABIN AIR KNOB

The forward cabin air knob directs warm air to two outlets located on the forward pressure bulkhead. These direct outlets allow fast warm-up when the airplane is on the ground. Airflow through the direct outlets is completely shut off by pushing the knob all the way in. The knob may be set at any intermediate position to regulate the quantity of air to the pilot's compartment.

AFT CABIN AIR KNOB

The aft cabin air knob controls airflow to all passenger compartment heat registers. When the knob is pulled out, the air flows to heat registers in the passengers' compartment. Airflow to the heat registers is completely shutoff by pushing the knob all the way in. The knob may be set in any intermediate position to regulate the quantity of air to the cabin.

DEFROST KNOB

Windshield defrosting and defogging is controlled by the push-pull defrost knob. When the knob is pulled out, air flows from the defroster outlets at the base of the windshield. When the knob is pushed all the way in, airflow to the defroster outlets is shut off. The knob may be set in any intermediate position to regulate the defroster airflow.

HEATER OVERHEAT WARNING LIGHT

An amber overheat warning light provided in the annunciator panel is labeled HEATER OVHT, see Figure 7-3. When illuminated, the light indicates that the heater overheat switch has been actuated and that the temperature of the air in the heater has exceeded 163°C (325°F). Once the heater overheat switch has been actuated, the heater turns off and cannot be

CABIN AIR SYSTEM SCHEMATIC

DEPRESSURIZED MODE, HEATER ON

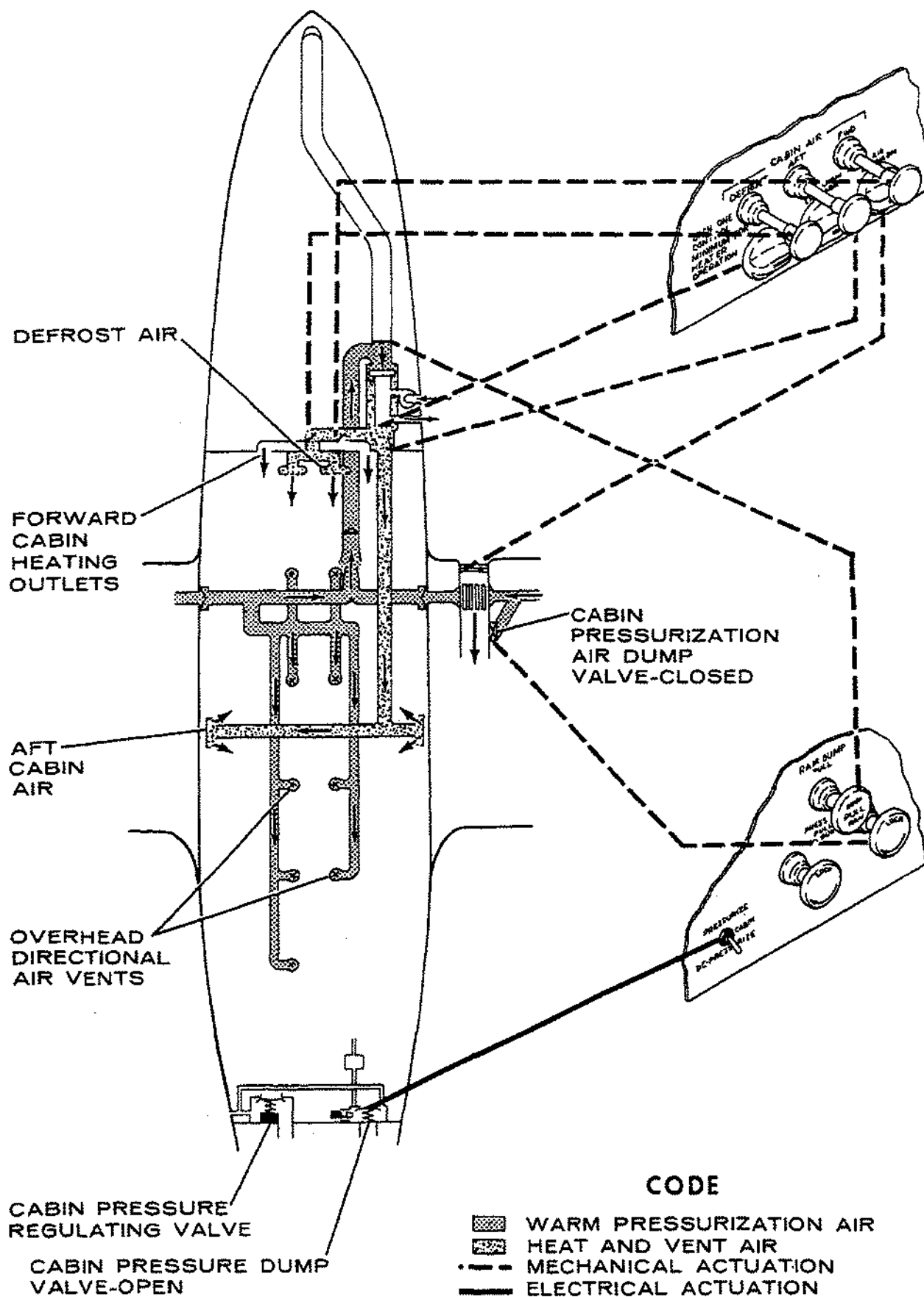


Figure 7-25

restarted until the overheat switch, located in the right forward nose compartment, has been reset. This switch is accessible from inside the nose wheel well. Prior to resetting the overheat switch, the heater should be thoroughly checked to determine the reason for the malfunction.

HEATER OPERATION FOR HEATING AND DEFROSTING

- (1) Battery Switch - ON.
- (2) Pressurization Air Controls - PUSH IN.
- (3) Cabin Vent Control - PUSH IN.
- (4) Cabin Air Knobs - PULL OUT.
- (5) Defrost Knob - Adjust as desired (if defrosting is desired).
- (6) Cabin Heat Knob - MAX or as desired.
- (7) Pressurization Air Temperature Controls - CLOCKWISE.
- (8) Cabin Heat Switch - ON.
- (9) Heat Registers - As desired.

NOTE

- If no warm air is coming out of the registers within one minute, turn cabin heat switch breaker OFF and try another start. If heater still does not start, no further starting attempt should be made.
- During heater operation, defrost and/or cabin air knobs must be out.

HEATER USED FOR VENTILATION

- (1) Battery Switch - ON.
- (2) Cabin Air Knobs - PULL OUT as desired.
- (3) Cabin Fan Switch - NORMAL or HIGH as desired.
- (4) Heat Registers - As desired.

CABIN PRESSURIZATION SYSTEM

OPERATING DETAILS

The airplane may be operated in either the pressurized mode or depressurized mode. The mode selection is made with the cabin pressurization switch and/or the cabin vent control, see Figure 7-27 or 7-29. Mode of operation should be selected prior to takeoff. If a mode selection must be made while airborne, the cabin vent control should be moved very slowly to minimize pressure transients which would cause discomfort to the passengers.

Pressurization air is supplied from each engine turbocharger through the sonic venturi (flow limiter), the heat exchanger and then into the cabin. Adequate flow to maintain pressurization is provided by either engine at normal power settings. Power changes should be made smoothly to prevent sudden changes in pressurization air inflow resulting in cabin pressure transients.

The pressurization controls and indicators of your airplane, see Figure 7-27 (standard system) or 7-29 (optional system), consist of right and left pressurization air controls, a cabin vent control, a cabin pressurization switch, a cabin rate-of-climb indicator and a combination cabin altimeter and differential pressure indicator.

CABIN AIR SYSTEM SCHEMATIC **PRESSURIZED MODE, HEATER ON**

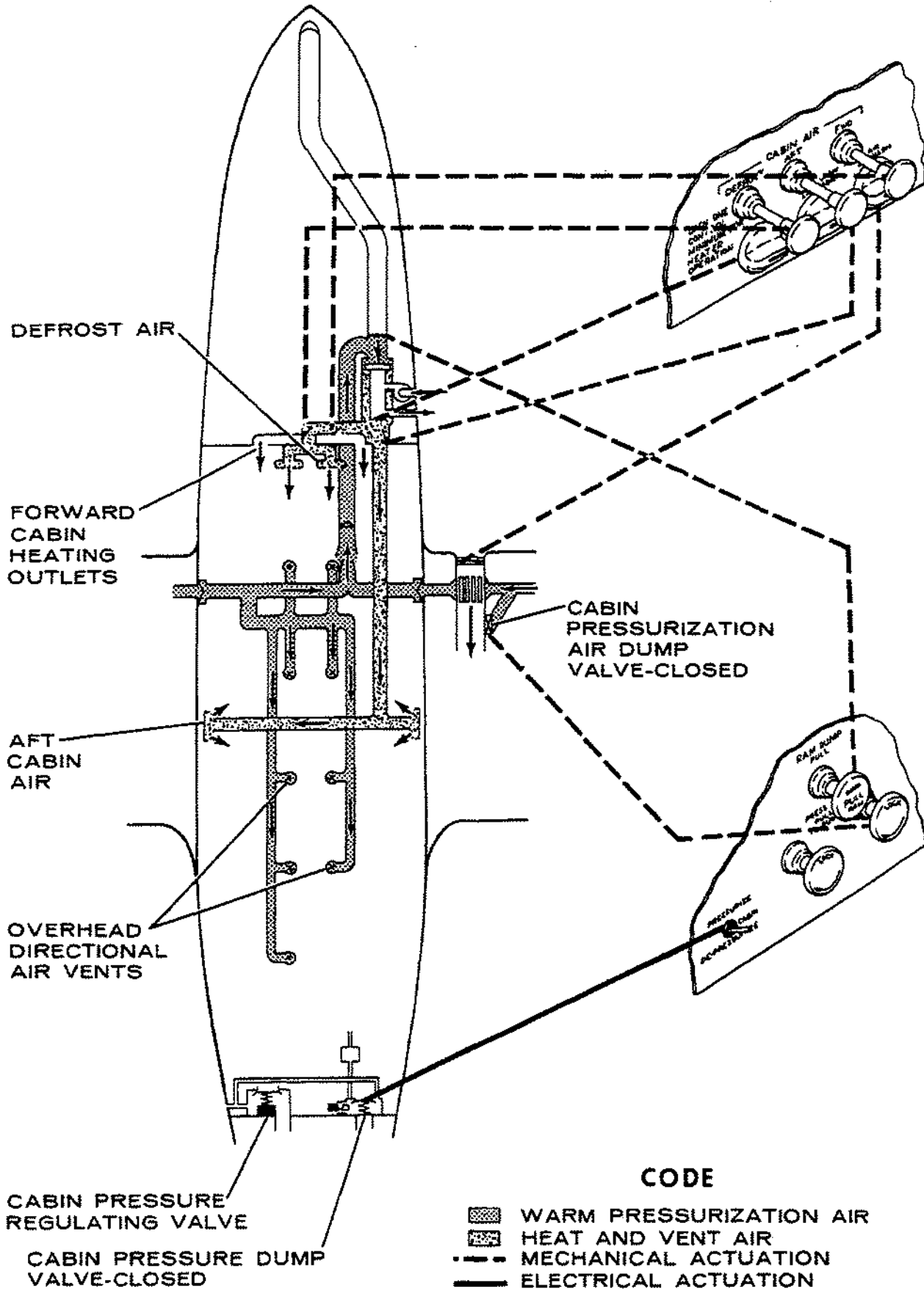


Figure 7-26

A warning light, which illuminates at approximately 10,000 feet cabin altitude indicating a need for oxygen, is located in the annunciator panel.

To optimize normal operation in the pressurized mode, position the pressurization controls as follows:

1. Pressurization Air Controls - PUSH IN for all flight operations and ground operation when additional ground ventilation is desired.
2. Cabin Vent Control - PUSH IN for all flight operations and normal ground operation.
- PULL OUT for additional ground ventilation.
3. Cabin Pressurization Switch - PRESSURIZE.

To optimize normal operation in the depressurized mode, position the pressurization controls as follows:

1. Pressurization Air Controls - PUSH IN if heater operation or additional ground ventilation is desired.
- PULL OUT if heater operation is not desired.
2. Cabin Vent Control - PUSH IN if in-flight heater operation is desired.
- PULL OUT if additional ground ventilation is desired.
3. Cabin Pressurization Switch - DEPRESSURIZE.

STANDARD PRESSURIZATION SYSTEM

The PRESSURIZE position of the cabin pressurization switch, see Figure 7-26, provides for cabin pressurization at altitudes above 8000 feet. The cabin altitude is maintained at 8000 feet at all airplane altitudes between 8000 and 23,120 feet. From 23,120 feet to the operating ceiling of 30,000 feet, 5.0 PSI differential is maintained between cabin and atmosphere.

Until reaching 8000 feet, the cabin rate-of-climb, see Figure 7-27, will be equal to the airplane rate-of-climb. At 8000 feet, the cabin rate-of-climb will drop to zero as pressurization begins. The cabin rate-of-climb will remain approximately at this indication until the airplane has reached an altitude of 23,120 feet. Above this altitude, the cabin altitude will again begin to ascend as the airplane ascends, but at a lesser rate than the airplane rate-of-climb because of the difference in ambient air density and cabin air density. The cabin altitude reaches approximately 10,000 feet at an airplane altitude of 26,500 feet; at this time the altitude warning light on the annunciator panel will illuminate, indicating the need for oxygen.

The cabin differential pressure of 5.0 PSI is limited by the pressure regulator valve, see Figure 7-26, located in the aft portion of the cabin. This valve automatically permits air to leave the cabin to maintain the desired pressure. If the regulating valve should fail in the closed position, a dump valve, see Figure 7-26, also located in the aft portion of the cabin, operates as a safety valve to regulate maximum cabin differential pressure at 5.3 PSI. This is a dual function valve which functions as a cabin dump when the DEPRESSURIZE position is selected with the cabin pressurization switch.

The cabin altitude which is maintained at a given airplane altitude is shown in Figure 7-28.

STANDARD PRESSURIZATION CONTROLS AND INDICATORS

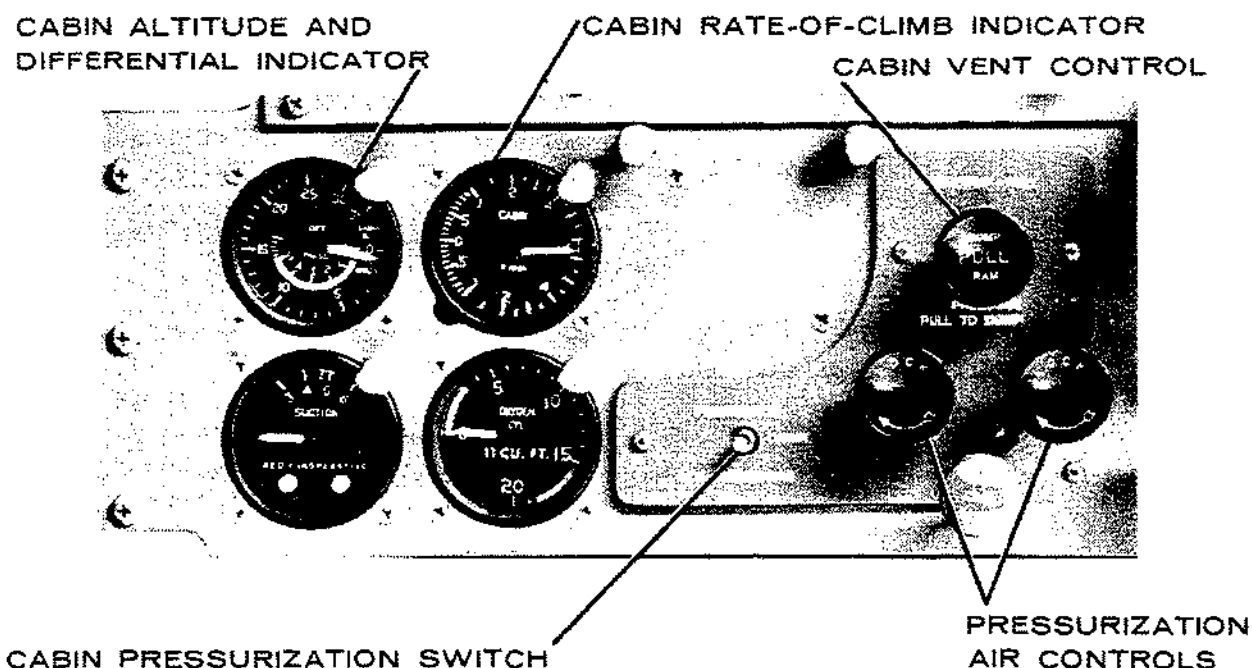


Figure 7-27

The aft cabin dump valve is used during ground operation to assure the cabin pressure differential is zero. The dump valve is opened automatically by the landing gear safety switch when the weight of the airplane is on the landing gear or can be opened manually by selecting the DEPRESSURIZE position of the cabin pressurization switch. Normally, the cabin pressurization switch can be left in the PRESSURIZE position. However, should a malfunction occur or if a landing is attempted above 8000 feet pressure altitude, select the DEPRESSURIZE position. This airplane is not certified for landings with the cabin pressurized.

NOTE

The airplane cannot be pressurized on the ground as the landing gear safety switch circuit is interconnected with the aft cabin dump valve circuit.

STANDARD PRESSURIZATION SCHEDULE

AIRPLANE ALTITUDE	CABIN ALTITUDE
SEA LEVEL TO 8000 FEET	SAME AS AIRPLANE ALTITUDE
8000 to 23,120 FEET	8000 FEET
24,790 FEET	9000 FEET
26,500 FEET	10,000 FEET
28,260 FEET	11,000 FEET
30,000 FEET	11,950 FEET

Figure 7-28

In the event that an emergency should require immediate depressurization, place the cabin pressurization switch in the DEPRESSURIZE position, see Figure 7-25, and pull out the cabin vent control. These actions electrically open the aft cabin dump valve and mechanically open the ram air inlet butterfly valve located in the nose; however, pressurization air will still flow into the cabin.

OPTIONAL PRESSURIZATION SYSTEM

For the pressurization system to operate, the cabin pressurization switch must be in the PRESSURIZE position and the cabin vent control and pressurization air controls must be pushed in, see Figure 7-29. The desired cabin altitude can then be selected by the cabin altitude control and the desired cabin rate-of-climb can be selected by the cabin rate control, see Figure 7-29. The selected values can be maintained until a cabin altitude is reached which results in a 5.0 PSI differential between the cabin and atmosphere. To obtain the optimum benefit from the cabin altitude control and the cabin rate control, set in the field pressure altitude plus 500 feet on the outer CABIN ALT scale just prior to takeoff with the arrow on the cabin rate control positioned straight up. After takeoff, with the cabin pressure stabilized, slowly reset the cabin altitude control to cruise altitude plus 500 feet on the inner AIRCRAFT ALT scale or destination field pressure altitude plus 500 feet on the outer CABIN ALT scale. Make the selection which will provide the highest cabin altitude. For cruising altitudes below the inner scale values, always select the destination field pressure altitude plus 500 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 that the airplane reaches cruising altitude.

OPTIONAL PRESSURIZATION CONTROLS AND INDICATORS

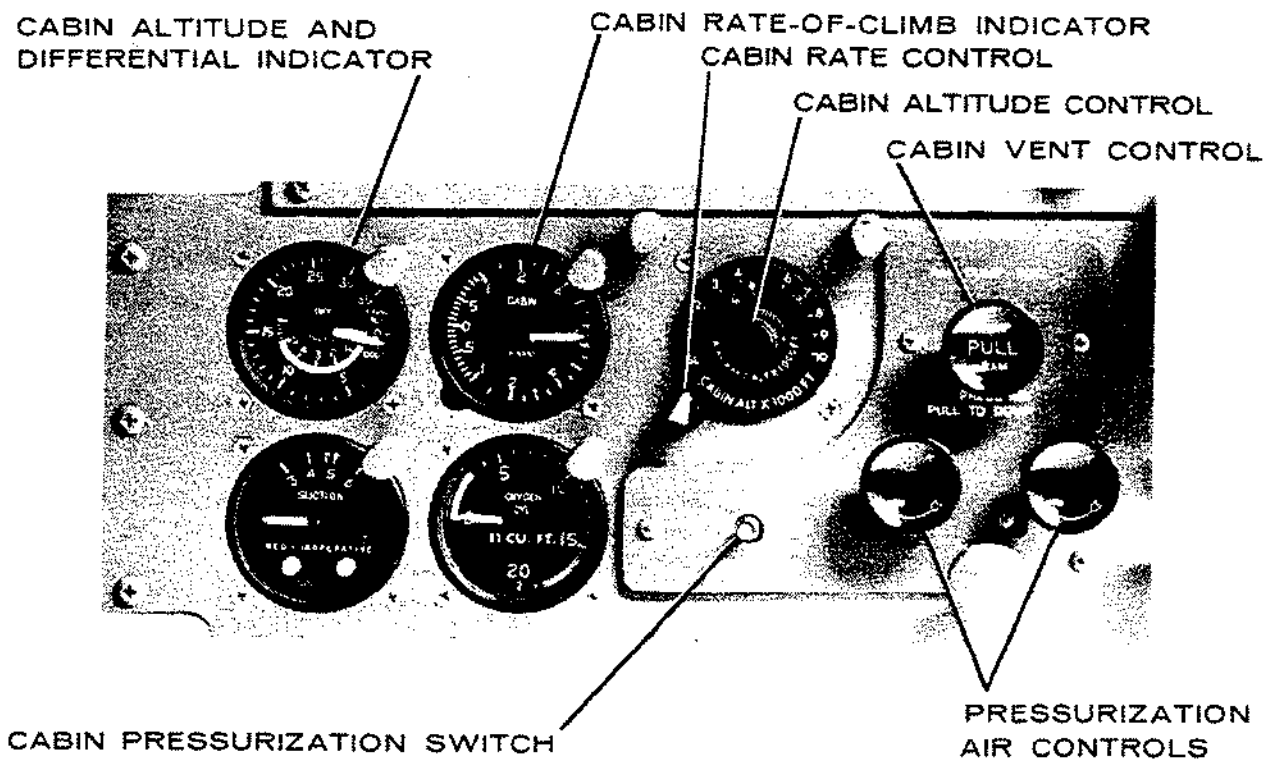


Figure 7-29

The above procedure is recommended because once the engines have been started and a source of vacuum is available, the pressure control system will begin to "climb" to the preset cabin altitude; thus, if cabin altitude required for cruise is selected too soon, the pressure control system will have climbed to an altitude approaching the desired cabin altitude before the airplane leaves the ground. Since the cabin pressure can never be less than outside ambient pressure, the cabin will be unpressurized until the airplane "catches up" with the pressure control system or the desired cabin altitude is reached, whichever occurs first. This will result in no cabin rate control being available as the cabin rate-of-climb will be equal to the airplane rate-of-climb.

The cabin differential pressure of 5.0 PSI is limited by the pressure regulator valve, see Figure 7-26, located in the aft portion of the cabin. This valve automatically permits air to leave the cabin to maintain the desired pressure. If the regulating valve should fail in the closed position, a dump valve, see Figure 7-26, also located in the aft portion of the cabin, operates as a safety valve to regulate maximum cabin differential pressure to 5.3 PSI. This is a dual function valve which also functions as a cabin dump when the DEPRESSURIZE position is selected with the cabin pressurization switch.

OPTIONAL PRESSURIZATION SCHEDULE

AIRPLANE ALTITUDE	CABIN ALTITUDE
SEA LEVEL TO 10,060 FEET	SEA LEVEL
13,910 FEET	2000 FEET
16,850 FEET	4000 FEET
19,920 FEET	6000 FEET
23,120 FEET	8000 FEET
26,500 FEET	10,000 FEET
30,000 FEET	11,950 FEET

Figure 7-30

The aft cabin dump valve is used during ground operation to assure the cabin pressure differential is zero. The dump valve is opened automatically by the landing gear safety switch when the weight of the airplane is on the landing gear or can be opened manually by selecting the DEPRESSURIZE position of the cabin pressurization switch. Normally, the cabin pressurization switch can be left in the PRESSURIZE position. However, should a malfunction occur or if the cabin altitude is inadvertently set at a lower altitude than field pressure altitude, select the DEPRESSURIZE position. It is important, therefore, to select a cabin altitude approximately 500 feet above field pressure altitude and check cabin pressure differential at zero prior to landing. This will prevent any cabin pressure transients on landing and provide maximum passenger comfort.

NOTE

The airplane cannot be pressurized on the ground as the landing gear safety switch circuit is interconnected with the aft cabin dump valve circuit.

The lowest cabin altitude which can be maintained at any given airplane altitude is shown in the chart in Figure 7-30.

OXYGEN SYSTEM

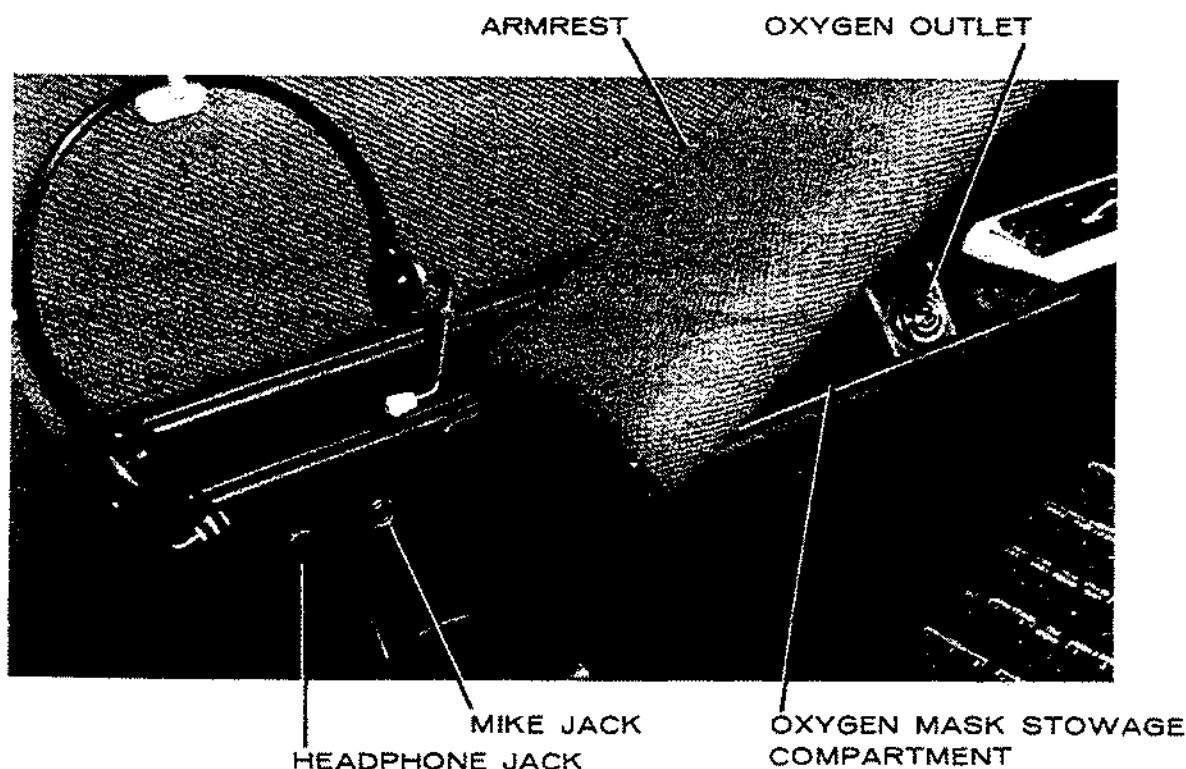
The oxygen system provides individual service for the pilot, copilot and each passenger. The oxygen supply is stored in either an 11.0 or 114.9 cubic foot bottle located in the nose compartment. Cabin plumbing, including outlets for each occupant, is standard with each airplane and will vary with individual airplane seating configuration. The oxygen control, pressure gage (see Figure 7-1), bottle, regulator and nose compartment plumbing are optional.

The oxygen system is activated by pulling the oxygen control knob, see Figure 7-1, to the ON position, allowing oxygen to flow from the regulator to all cabin outlets. A normally closed valve in each oxygen outlet is opened by inserting the connector of the mask and hose assembly. After flights using oxygen, the pilot should insure that the oxygen system has been deactivated by unplugging all masks and pushing the oxygen control knob completely to the OFF position.

NOTE

If the oxygen control knob is left in an intermediate position between ON and OFF, it may allow low pressure oxygen to bleed through the regulator into the nose compartment of the airplane.

COCKPIT OXYGEN OUTLETS



PILOT'S SIDE SHOWN; IDENTICAL CONTROLS ARE PROVIDED FOR THE COPILOT.

Figure 7-31

The oxygen system, with optional 114.9 cubic foot oxygen bottle, provides adequate oxygen flow rates up to 30,000 feet cabin altitude and is suitable for cruising at altitudes in excess of 25,000 feet for extended periods, see Figure 7-32. The oxygen outlets for the pilot and copilot are located inside the stowage compartment under the outboard armrests, see Figure 7-31. Oxygen outlets for passengers are located overhead of each seat position, see Figure 7-21. The pilot, copilot and passengers shall always use the blue hose assemblies.

OXYGEN DURATION CHART

114.9 CUBIC FOOT OXYGEN SYSTEM

$$\frac{\text{OXYGEN DURATION IN HOURS}}{\text{NUMBER OF PERSONS}} = \text{TOTAL HOURS DURATION}$$

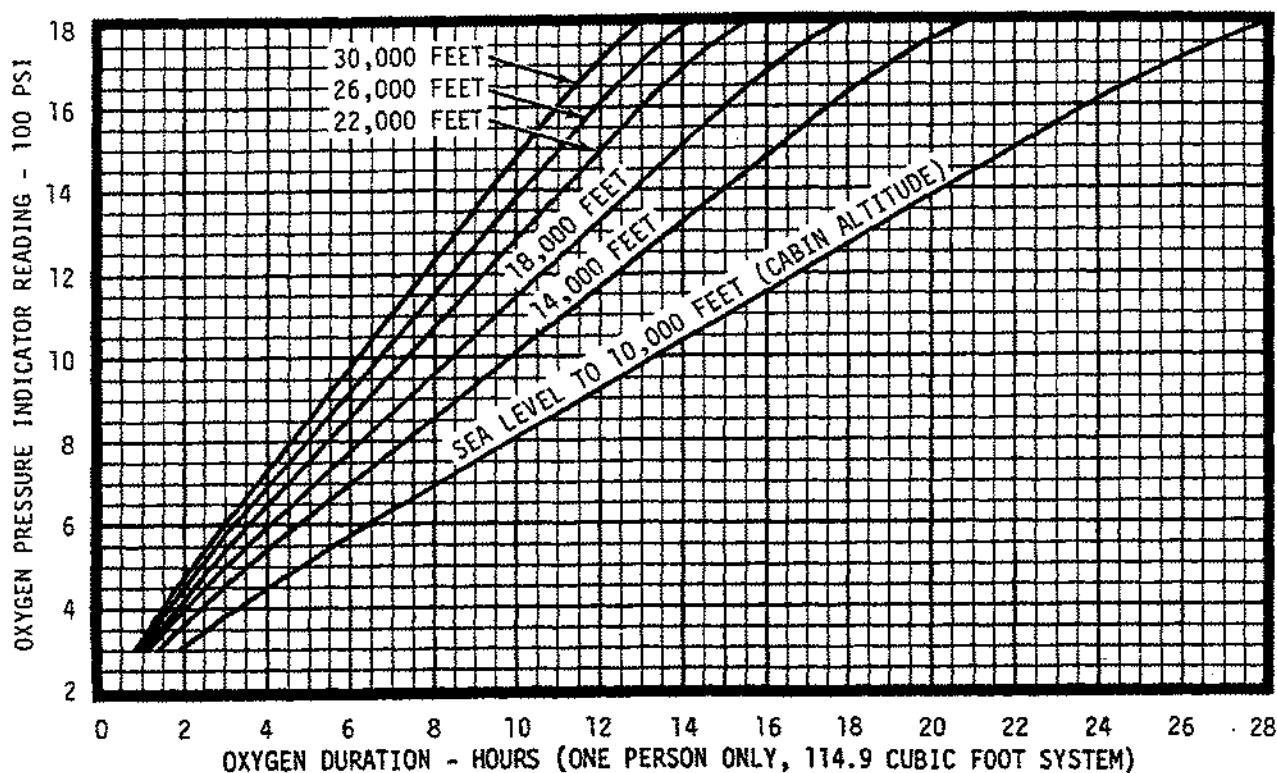
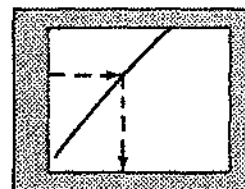


Figure 7-32

The oxygen system with optional 11.0 cubic foot bottle provides adequate oxygen flow rates up to 30,000 feet cabin altitude, see Figure 7-33. This system is designed solely to provide for emergency descents as described in Section 3. The system is calibrated for two different altitude ranges, which are: 14,000 to 22,000 feet cabin altitude and 22,000 to 30,000 feet cabin altitude. Selection of the desired altitude range is accomplished by appropriate selection of color-coded hose assemblies. The oxygen outlets for the pilot and copilot are located inside the stowage compartment under the outboard armrests, see Figure 7-31. Oxygen outlets for passengers are located overhead of each seat position, see Figure 7-21. The pilot shall always use the red hose assembly.

NOTE

Some airplanes are delivered with red oxygen hose mask connectors only. If your airplane is so equipped, disregard all information pertaining to orange oxygen hose mask connectors.

OXYGEN CONSUMPTION RATE CHART**11.0 CUBIC FOOT OXYGEN SYSTEM****OXYGEN DURATION CALCULATION:**

TOTAL OXYGEN DURATION (HOURS) = OXYGEN PRESSURE INDICATOR READING ÷ [OXYGEN CONSUMPTION (PSI/HR) × NUMBER OF PASSENGERS + PILOT CONSUMPTION RATE].

CABIN ALTITUDE RANGE-FEET	HOSE ASSEMBLY COLOR	CONSUMPTION PSI/HR
14,000 22,000	ORANGE	965
22,000 30,000	RED	1352

Figure 7-33

PASSENGER LOADING

Due to the differences in installed optional equipment on the airplane, a wide CG range exists. Under certain passenger loading conditions, it is possible to exceed the aft CG limits, which can lead to tail tipping. To prevent this from occurring, owners and pilots should study their airplane's weight and balance information to become familiar with the airplane's capabilities and limitations. It is recommended that the loading of passengers be as follows:

- (1) Load the baggage in the nose and avionics compartments prior to boarding of the crew and passengers.
- (2) Avoid carrying baggage in the aft cabin.
- (3) When boarding people, have the pilot, or person who is to occupy the copilot seat, be the first to board with the remaining people filling the most forward seats first and the aft seats last. Arrange to have the heavier people occupy the most forward seats.
- (4) When unloading the airplane, have one person remain in the copilot or pilot seat while the other flight deck occupant goes aft to open the door. Arrange to have the passengers in the aft seats be the first to deplane.

BAGGAGE COMPARTMENTS

Six baggage locations, see Figure 1-3, are available: two in the fuselage nose section, two in the aft cabin area and one location in the aft portion of each engine nacelle.

These baggage areas are intended primarily for low-density items such as luggage and briefcases. The floors of the wing locker baggage areas are primary structure. Therefore, care should be exercised during loading and unloading to prevent damage. 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, 120 pounds can be carried in each wing locker, 250 pounds in the avionics bay, 350 pounds in the nose baggage compartment, 400 pounds in the aft cabin Bay A and 100 pounds in the aft cabin Bay B. 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 or wing lockers. These areas do not qualify for carriage of animate objects.

AIRPLANE TIE-DOWN PROVISIONS AND JACK POINTS

A wing tie-down fitting is provided on the lower surface of each wing aft of each main gear. The fittings retract into the wing when not in use. The empennage is secured at the tail tie-down fitting located on the fuselage bottom, below the elevator hinge line. 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 inboard of an in-line with the wing flap hinge. The nose gear jack point is located aft of the left nose gear door hinge. Jack pads, which are provided with the airplane, are required to be installed in each wing jack point before the airplane can be jacked.

SEATS, SEAT BELTS AND SHOULDER HARNESSSES

PILOT AND COPILOT PROVISIONS

The pilot and copilot seats are secured to seat pan assemblies which are attached to the forward main spar carry-thru structure. The seats are adjustable fore and aft on seat rails by lifting the handle located on the forward face of the seat.

Seat belts are provided for both seats and are attached to airplane structure on the floor. 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 permanently 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 passenger seats 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. If the optional adjustable seats are installed, a second handle is provided on the front of the seat which allows reclining of the seat back. 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. An optional stowage drawer may be installed beneath each seat.

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.

CAUTION

When entering or exiting airplane, equipped with pneumatic lower door extender, ensure lower cabin door is fully extended before putting weight on steps.

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, see Figure 7-34.

As an additional safety feature, a cabin door warning light is provided. This light is located in the annunciator panel, see Figure 7-3, and is illuminated when the cabin door is not securely latched.

Cabin door sealing is provided by a pneumatic tube door seal that is inflated by pressurization air from the left engine. With the left engine operating and the cabin door closed and locking pins fully engaged, the door seal is inflated to provide positive fuselage to door sealing. When the cabin door locking pins are disengaged, the door seal is depressurized to allow the door to be opened and closed easily.

WINDOWS

Seven windows are provided on each side of the airplane. All windows are fixed except the foul weather windows located forward of the pilot's and copilot's side windows. These foul weather windows can 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 oval cabin window on the right side of the passenger compartment can be removed for emergency exit. Pull off the plastic cover over the emergency release handle under the window. Turn the release handle counterclockwise to release the window retainers, then pull the window in and down.

CABIN DOOR SAFETY AND LOCKING PINS

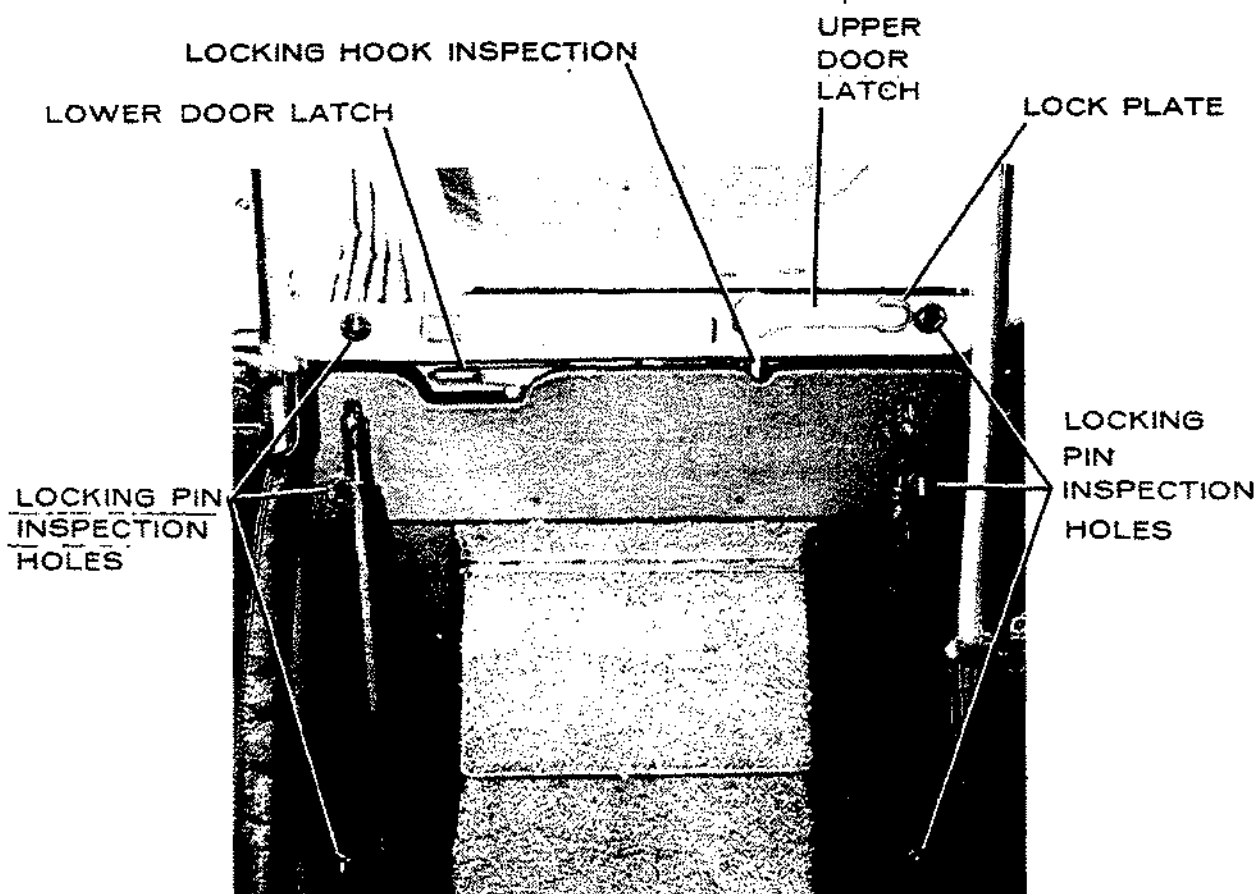


Figure 7-34

CONTROL LOCKS

A control column lock is provided to restrict the control column from moving. This restriction holds the ailerons in a neutral position and the elevators approximately 10° down, thus preventing damage to the control surfaces in gusty wind conditions.

The rudder is secured with the optional rudder gust lock. To engage the lock, center the rudder, insure 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 optional rudder lock is not installed, the rudder can be secured by placing an external control surface lock over the vertical stabilizer and rudder. If neither rudder lock is available, caster the nosewheel to the full left or right position. This action will deflect the rudder against its stop, thus restricting rudder movement.

WARNING

Insure all control locks are removed before starting the engines.

PROPELLERS

The airplane is equipped with all-metal, three-bladed, constant-speed, full-feathering, single-acting, governor-regulated propellers. Each propeller utilizes oil pressure which opposes the force of springs and counterweights to obtain correct pitch for engine load. Oil pressure from the propeller governor drives the blades toward low pitch (increasing RPM) while the springs and counterweights drive blades toward high pitch (decreasing RPM). The source of oil pressure for propeller operation is furnished by the engine oil system, boosted in pressure by the governor gear pump, and supplied to the propeller hub through the engine crankshaft flange.

To feather the propeller blades, the propeller control levers on the control pedestal must be placed in the feather position. Unfeathering the propeller is accomplished by positioning the propeller control lever to the increase RPM position. The optional unfeathering system uses accumulator air and oil to force the propeller out of feather and into the low pitch condition.

PROPELLER SYNCHROPHASER

The optional propeller synchrophaser system, see Figure 7-35, is designed to match propeller RPM and 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. This limited range feature prevents the left engine from losing more than 50 propeller RPM should the right engine be feathered with the synchrophaser system on.

With the function switch in the OFF position, the system is deenergized and the automatic phaser RPM control is positioned to its mid-range to insure normal operation when next turned on. When the left engine is manually synchronized to the right engine and the synchrophaser switch is positioned to PHASE, the propeller RPM of the left and right engines will be automatically synchronized. The phase relationship of the left engine propeller relative to the right engine propeller can be adjusted by rotating the phasing knob. After initial synchrophaser engagement, the propellers will remain synchronized and can be phased as long as the RPM

difference between the left and right engines does not exceed 50 RPM. When the RPM difference between the left and right engines exceeds 100 RPM, the synchrophaser light will flash and the automatic phaser control circuits will be disabled, causing the actuator drive motor to stop at a random position. If the propeller control of the left engine is again adjusted as close as possible to the right engine, the synchrophaser light will illuminate continuously and the propeller RPM of the left and right engines will be automatically synchronized.

Make certain that both engines are functioning properly with the synchrophaser turned OFF. Since the left propeller is slaved to the right propeller, and the slaving range is limited, the synchrophaser should not be operated at either extreme of the RPM governing range.

For best operation, it is important to guard against propeller control creeping by setting the quadrant friction lock tightly, see Figure 7-1. On extended flights, it may be necessary to periodically switch to the OFF position, reset the propeller control levers and reengage the synchrophaser.

NOTE

Manually synchronize the propellers as close as possible prior to selecting the PHASE position.

PROPELLER SYNCHROPHASER

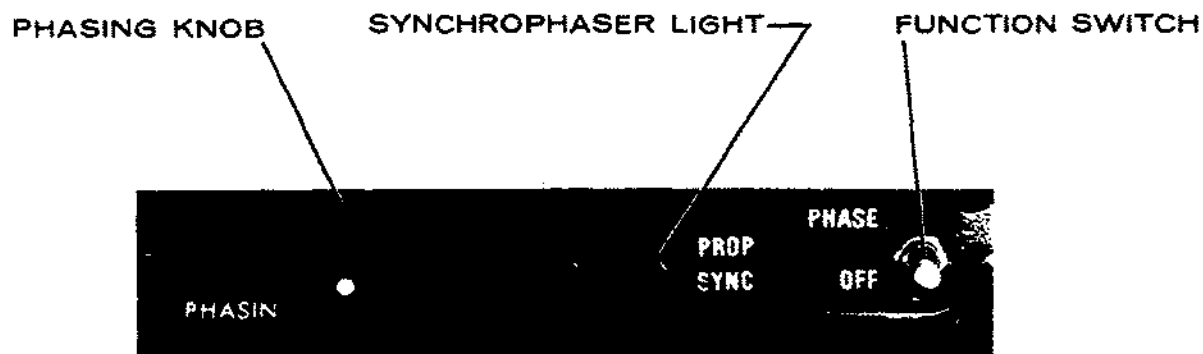


Figure 7-35

CABIN FEATURES

CABIN FIRE EXTINGUISHER (If Installed)

A portable 2½ 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 PSI). 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.

SECTION 8

AIRPLANE HANDLING, SERVICE AND MAINTENANCE

TABLE OF CONTENTS

	Page
INTRODUCTION	8-1
Publications	8-2
OWNER NOTIFICATION SYSTEM	8-2
INSPECTION REQUIREMENTS	8-2
Cessna Progressive Care Program	8-3
Cessna Customer Care Program	8-3
Servicing Requirements	8-4
Airplane File	8-4
Preventive Maintenance	8-5
ALTERATIONS OR REPAIRS TO THE AIRPLANE	8-5
GROUND HANDLING	8-5
Towing	8-5
Parking	8-6
Tie-Down	8-6
JACKING AND LEVELING	8-7
FLYABLE STORAGE	8-7
SERVICING	8-9
Fuel	8-9
Oil	8-11
Oxygen	8-12
Air Conditioning Reservoir	8-13
Landing Gear Hydraulic Reservoir	8-13
Alcohol Windshield Deice Reservoir	8-13
Battery	8-13
Tires	8-13
Flush Toilet Reservoir	8-13
AIRPLANE CLEANING AND CARE	8-14
Painted Surfaces	8-14
Propeller	8-14
Landing Gear	8-14
Deice Boots	8-14
Engines	8-15
Interior Care	8-15
Windows and Windshields	8-16
Oxygen Masks	8-19/8-20

INTRODUCTION

Section 8 of this handbook provides information on cleaning, inspection, servicing and maintenance of the airplane.

If your airplane is to retain 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.

Keep in touch with your Cessna Service Station and take advantage of his knowledge and experience. He knows your airplane and how to maintain it. He 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 lo-

cated on the forward door post. Refer , to the Airplane Service 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 HANDBOOK
PILOT'S OPERATING HANDBOOK AND FAA APPROVED AIRPLANE FLIGHT
MANUAL
PILOT'S CHECKLIST
CRUISE COMPUTER
WORLDWIDE CUSTOMER CARE DIRECTORY

The following additional publications, plus many other supplies that are applicable to your airplane, are available from your Cessna Service Station.

INFORMATION MANUAL (Contains Pilot's Operating Handbook and FAA Approved
Airplane Flight Manual Information)
SERVICE MANUALS AND PARTS CATALOGS FOR:
AIRPLANE
ENGINE AND ACCESSORIES
AVIONICS

Your Cessna Service Station has a Customer Care Supplies Catalog covering all available items, many of which he keeps on hand. He 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 Service Station. An affidavit containing the owner's name, airplane serial number and registration number must be included in replacement requests since the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual is identified for specific airplanes only.

OWNER NOTIFICATION SYSTEM

As the owner of a Cessna, you will receive applicable Cessna Owner Advisories at no charge. Owner Advisories are used to announce Service Bulletins, Service Information Letters and Service Newsletters to Cessna airplane owners of record.

If the airplane is registered in the United States, Owner Advisories are mailed to the latest airplane registration name and address on record with the FAA. Owner Advisory service to FAA owners of record is automatic and continuous, without any additional action required of the owner. However, the owner is required to notify the FAA whenever the registration address or ownership changes. If the owner requires a duplicate Owner Advisory to be sent to an address different than the FAA airplane registration address, the owner must complete and return to Cessna an Owner Advisory Application form part number D5514-1-13.

If the airplane is not registered in the United States, Owner Advisories are initially mailed to the address that is provided to Cessna on the Owner Advisory Application or Warranty Registration Application card. This address will be used for one year unless Cessna is notified otherwise. Prior to the end of one year, Cessna will send a renewal notice to the owner. The renewal notice must be completed and returned to Cessna to continue this service for another year.

Owner Advisory Applications are available from a Cessna Service Station or directly from Cessna Parts Distribution by ordering part number D5514-1-13.

A subscription service for Service Bulletins and other service information is available directly from Cessna Propeller Aircraft Product Support. Your Cessna Service Station 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.

INSPECTION REQUIREMENTS

As required by Federal Aviation Regulations, all civil airplanes of U.S. registry must undergo a complete inspection (annual) each twelve calendar months. In addition to the required annual inspection, airplanes operated commercially (for hire) must have a complete inspection every 100 hours of operation.

In lieu of the above requirements, an airplane may be inspected in accordance with a progressive inspection schedule, which allows the work load to be divided into smaller operations that can be accomplished in shorter time periods.

The Cessna Progressive Care Program has been developed to provide a modern progressive inspection schedule that satisfies the complete airplane inspection requirements of both the 100-hour and annual inspections as applicable to Cessna airplanes.

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 insure compliance with these directives. In some cases, the Airworthiness Directives require repetitive compliance; therefore, the owner should insure inadvertent noncompliance does not occur at future inspection intervals.

NOTE

Refer to FAR Parts 43 and 91 for properly certificated agency or personnel to accomplish the inspections. Contact your local Cessna dealer for additional information.

CESSNA CUSTOMER CARE PROGRAM

The Cessna Progressive Care Program has been designed to help you realize maximum utilization of your airplane at a minimum cost and downtime. Under this program, your airplane is inspected and maintained in four operations at 50-hour intervals during a 200-hour period. The operations are recycled each 200 hours and are recorded in a specially provided Aircraft Inspection Log as each operation is conducted.

The Cessna Aircraft Company recommends Progressive Care for airplanes that are being flown 200 hours or more per year, and the 100-hour inspection for all other airplanes. The procedures for the Progressive Care Program and the 100-hour inspection have been carefully worked out by the factory and are followed by the Cessna Dealer Organization. The complete familiarity of Cessna Dealers with Cessna equipment and factory-approved procedures provides the highest level of service possible at lower cost to Cessna owners.

CESSNA PROGRESSIVE CARE PROGRAM

Specific benefits and provisions of the Cessna Warranty plus other important benefits for you are contained in your Customer Care Handbook supplied with your airplane. You will want to thoroughly review this Handbook and keep it in your airplane at all times.

Coupons attached to the Handbook entitle you to an initial inspection and either a Progressive Care Operation No. 1 or the first 100-hour inspection within the first 6 months of ownership at no charge to you. If you take delivery from your Dealer, the initial inspection will have been performed before delivery of the airplane to you. If you pick up your airplane at the factory, plan to take it to your Dealer reasonably soon after you take delivery, so the initial inspection may be performed allowing the Dealer to make any minor adjustments which may be necessary.

You will also want to return to your Dealer either at 50 hours for your first Progressive Care Operation, or at 100 hours for your first 100-hour inspection depending on which program you choose to establish for your airplane. While these important inspections will be performed for you by any Cessna Dealer, in most cases you will prefer to have the Dealer from whom you purchased the airplane accomplish this work.

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 Service Manual. The Service Manual outlines all items which require attention at 50, 100, and 200 hour intervals plus those items which require servicing, inspection, and/or testing at special intervals.

Since Cessna Dealers conduct all service, inspection, and test procedures in accordance with applicable Service Manuals, it is recommended that you contact your Dealer concerning these requirements and begin scheduling your airplane for service at the recommended intervals.

Cessna Progressive Care ensures that these requirements are accomplished at the required intervals to comply with the 100-hour or annual inspection as previously covered.

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

There are miscellaneous data, information and licenses that are a part of the airplane file. The following is a checklist for that file. In addition, a periodic check should be made of the latest Federal Aviation Regulations to insure that all data requirements are met.

- A. To be displayed in the airplane at all times:
 - (1) Aircraft Airworthiness Certificate (FAA Form 8100-2).
 - (2) Aircraft Registration Certificate (AC Form 8050-3).
 - (3) Aircraft Radio Station License (Form FCC-556, if transmitter installed).
 - (4) Radio Telephone Station License (Form FCC-407, if Flitefone III Radio Telephone is installed).
- B. To be carried in the airplane at all times:
 - (1) Weight and Balance, and associated papers (latest copy of the Repair and Alteration Form, Form 337, if applicable).
 - (2) Airplane 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) Airplane Log Book.
 - (2) Engine Log Books.

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 the power computer, Customer Care Handbook and Customer Care Card, 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 Service Manual to insure the procedure is properly completed.
- All maintenance other than preventive maintenance must be accomplished by appropriately licensed personnel. Contact your Cessna Dealer 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 insure 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 nose-wheel towing bar provided with the airplane. The tow bar is designed to attach to the nose gear strut fork.

CAUTION

Remove all rudder locks before ground handling. When using the tow bar, never exceed the nosewheel turning radius limits of 52° either side of the center. Structural damage may occur if the 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, refer to the Airplane Service Manual for proper power towing procedures using either the nose or main landing gear.

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 and the optional rudder gust lock is not installed, restrict rudder travel with an external rudder gust lock or caster the nosewheel to the extreme right or left position. This forces the rudder against the rudder stop which minimizes buffeting of the rudder in gusty weather. 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.

With the mixture levers in IDLE CUT-OFF, the fuel flow is effectively blocked at the fuel metering unit. Thus, it is unnecessary to place the fuel selectors in the OFF position if the airplane is receiving normal usage. However, if a long period of inactivity is anticipated, the fuel selectors should be turned OFF to preclude any possible fuel seepage that might develop through the metering valve.

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. Close engine cowl flaps after engines have cooled sufficiently.
2. Set parking brake and install control locks to restrict travel of all movable surfaces.

CAUTION

Do not set parking brake when the brakes are overheated or during cold weather when accumulated moisture may freeze the brakes.

3. If a rudder gust lock is not available, caster the nosewheel to the extreme left or right positions.
4. Install pitot tube cover(s) if available.
5. Set elevator, aileron and rudder trim tabs to neutral, so the trim tabs fair with the control surfaces.
6. Use ropes or chains of at least 700 pounds tensile strength. Secure the nose gear with a rope or chain attached above the nose gear torque link. The other end should be attached to a substantial ground anchor. The rope or chain angle to the ground should be 45 degrees. Attach a second rope or chain in a similar manner to the opposite side of the nose gear. Secure the tail tie-down fitting in a similar manner.

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. Jack pads, which are provided with the airplane, are required to be installed in each wing jack point before the airplane can be jacked.

NOTE

- To prevent the flight hour recorder from recording while the airplane is on jacks and the battery switch is in the ON position, remove fuse located in the side console. Reinstall fuse when finished.
- Special two-ton 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 214.00 and 238.00 and place a spirit level on these screws, then level longitudinally. To level laterally, place a spirit level at Station 154.00 (aft of front spar) on the underside of fuselage. Refer to the Airplane Service Manual for additional information.

FLYABLE STORAGE

Flyable storage applies to all airplanes which will not be flown for an indefinite period 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 Service Manual for proper storage procedures.

Airplanes which are not in daily flight should have the propellers rotated, by hand, six revolutions at least once each week. In damp climates and in storage areas where the daily temperature variation can cause condensation, propeller rotation should be accomplished more frequently. Rotating the propeller and stopping at 45° to 90° from it's original position redistributes residual oil on the cylinder walls, crankshaft and gear surfaces and repositions the pistons in the cylinders, thus minimizing

corrosion. Rotate propellers as follows:

1. Throttles - IDLE.
2. Mixtures - IDLE CUT-OFF.
3. Magneto Switches - OFF.
4. Propellers - ROTATE CLOCKWISE. Manually rotate propellers six revolutions, standing clear of arc of propeller blades. Stop the propeller 45° to 90° from it's original position.

Keep fuel tanks full to minimize condensation in the fuel tanks. Maintain battery at full charge to prevent electrolyte from freezing in cold weather. If the optional 1000 series avionics and/or optional fuel flow indicating system are installed, the battery will discharge continuously, regardless of battery switch position. This flow of current is required to maintain the memories of the referenced equipment. If the airplane is not in frequent use (inactive for longer than two days), battery discharge can be avoided by disconnecting the battery or disengaging the FREQ MEM circuit breaker for the avionics or CABIN LTS circuit breaker for the fuel flow indicating system.

NOTE

- A malfunctioning nose baggage or wing locker light will completely deplete the battery in approximately four days, depending on the degree of charge and condition of the battery.
- Airplanes inactive for long periods of time should have the battery serviced in accordance with BATTERY servicing, this section.

If the airplane is stored outside, tie-down airplane in anticipation of high winds. Secure airplane as follows:

1. Secure rudder with the optional rudder gust lock or with a control surface lock over the fin and rudder. If a lock is not available, caster the nosewheel to the full left or right position.
2. Install pitot tube cover(s) if available.
3. Set elevator, aileron and rudder trim tabs to neutral so the trim tabs fair with the control surfaces.
4. Install control column lock in pilot's control column, if available. If column lock is not available, tie the pilot's control wheel full aft with a seat belt.
5. Tie ropes or chains of at least 700 pounds tensile strength to the wing tie-down fittings located on the underside of each wing, aft of the main landing gear. Secure the opposite ends of the ropes or chains to ground anchors. 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.
6. Secure a rope (no chains or cables) to the upper nose gear trunnion and secure opposite end of rope to a ground anchor. Chock the nose landing gear tire.
7. Secure the middle of a rope or chain to the tail tie-down fitting. Pull each end of the rope or chain at a 45-degree angle and secure to ground anchors at each side of the tail.
8. At the end of 30 days, the airplane should be flown for 30 minutes until oil and cylinder temperatures reach normal operating range. If the airplane is not flown at the end of 30 days, the airplane should be placed in temporary or indefinite storage.

SERVICING**NOTE**

Refer to the Airplane Service Manual for complete servicing requirements.

FUEL (Approved Fuel Grades And Colors)

- PRIMARY - 100 (Formerly 100/130) Grade Aviation Fuel (Green)
ALTERNATE - 100LL Grade Aviation Fuel (Blue)

Service after each flight. Keep tanks full to retard condensation in the tanks. Tank capacities are:

Each Main Tank - 106.7 Gallons

Isopropyl alcohol or ethylene glycol monomethyl ether may be added to the fuel supply in quantities not to exceed 1% or .15% by volume, respectively, of the total. Refer to Fuel Additive paragraphs in this section for additional information.

WARNING

- Do not operate any avionics or electrical equipment on the airplane during fueling. Do not allow open flame or smoking in the vicinity of the airplane while fueling.
- During all fueling operations, fire fighting equipment must be available. Two ground wires from different points on the airplane to separate approved grounding stakes shall be used.

Fuel Additive

Strict adherence to recommended preflight draining instructions as called for in Section 4 will eliminate any free water accumulations from the tank sumps. While small amounts of water may still remain in solution in the gasoline, it will normally be consumed and go unnoticed in the operation of the engine.

One exception to this can be encountered when operating under the combined effect of: 1) use of certain fuels, with 2) high humidity conditions on the ground 3) followed by flight at high altitude and low temperature (flight levels of 20,000 feet or above and temperatures of -28.9°C (-20°F) or below). Under these unusual conditions small amounts of water in solution can precipitate from the fuel stream and freeze in sufficient quantities to induce partial icing of the engine fuel injection system.

While these conditions are quite rare and will not normally pose a problem to owners and operators, they do exist in certain areas of the world and consequently must be dealt with, when encountered.

Therefore, to alleviate the possibility of fuel icing occurring under these unusual conditions it is permissible to add isopropyl alcohol or ethylene glycol monomethyl ether (EGME) compound to the fuel supply.

The introduction of alcohol or EGME compound into the fuel provides two distinct effects: 1) it absorbs the dissolved water from the gasoline and 2) alcohol has a freezing temperature depressant effect.

Alcohol, if used, is to be blended with the fuel in a concentration of 1% by volume. Concentrations greater than 1% are not recommended since they can be detrimental to fuel tank materials.

The manner in which the alcohol is added to the fuel is significant because alcohol is most effective when it is completely dissolved in the fuel. To insure proper mixing the following is recommended:

1. For best results the alcohol should be added during the fueling operation by pouring the alcohol directly on the fuel stream issuing from the fueling nozzle.
2. An alternate method that may be used is to premix the complete alcohol dosage with some fuel in a separate clean container (approximately 2-3 gallon capacity) and then transferring this mixture to the tank prior to the fuel operation.

Any high quality isopropyl alcohol may be used, such as:

Anti-icing fluid (MIL-F-5566) or
Isopropyl alcohol (Federal Specification TT-I-735a).

Figure 8-1 provides alcohol-fuel ratio mixing information.

Ethylene glycol monomethyl ether (EGME) compound in compliance with MIL-I-27686 or Phillips PFA-55MB, if used, must be carefully mixed with the fuel in concentrations not to exceed 0.15% by volume.

CAUTION

- Mixing of the EGME compound with the fuel is extremely important because concentration in excess of that recommended (0.15 percent by volume maximum) will result in detrimental affects 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 components. Use only blending equipment that is recommended by the manufacturer to obtain proper proportioning.
- Do not allow the concentrated EGME compound to come in contact with the airplane finish or fuel cell as damage can result.

Prolonged storage of the airplane will result in a water buildup in the fuel which "leeches out" the additive. An indication of this is when an excessive amount of water accumulates in the fuel tank sumps. The concentration can be checked using a differential refractometer. It is imperative that the technical manual for the differential refractometer be followed explicitly when checking the additive concentration.

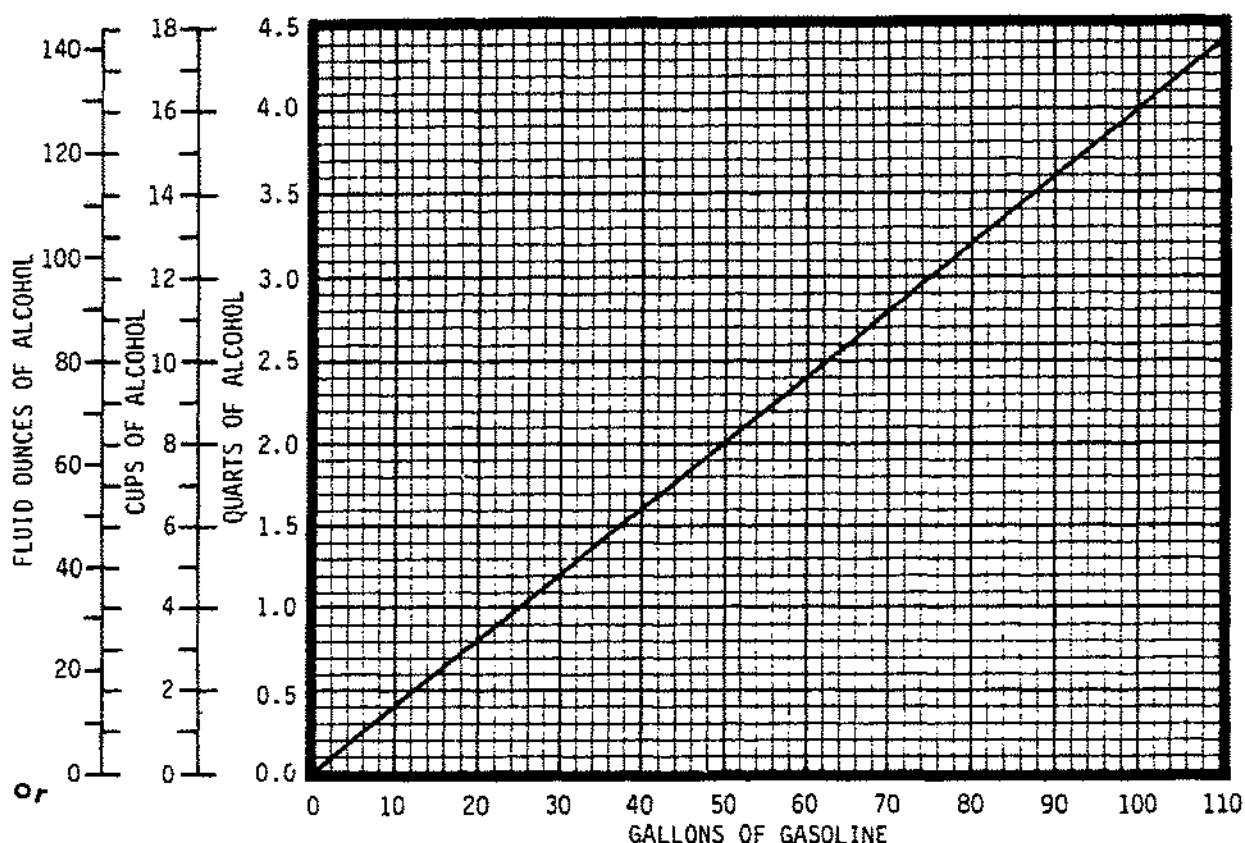
ALCOHOL - FUEL MIXING RATIO CHART

Figure 8-1

OIL (Aviation Grade Engine Oil; SAE 50 Above 4.4°C (40°F), SAE 30 Below 4.4°C (40°F) or Multiviscosity Unrestricted Temperature Range - Filter Element 643226 or 643227)

Multiviscosity oil is recommended for use after the first 25 hours of engine operation for improved starting and turbocharger controller operation in temperatures below 4.4°C (40°F). When operating temperatures overlap indicated ranges, use the lighter grade of oil. Ashless dispersant oil, conforming to the latest issue of Continental Motors Specification MHS-24 must be used. No oil additives are approved for use. Airplanes equipped with short filters (4.80 inches) should change the oil and filter every 50 hours or six months, whichever occurs first. Airplanes equipped with long filters (5.80 inches), may extend the recommended oil change interval to 100 hours or six months, whichever occurs first. Reduce oil and filter change intervals for prolonged operation in dusty areas, cold climates, or when short flights and long idle periods result in sludging conditions.

NOTE

For faster ring seating and improved oil control, your Cessna was delivered from the factory with corrosion preventive oil conforming to MIL-C-6529, Type II. This break-in oil must be used only for the first 25 hours of operation; at that time it must be replaced with ashless dispersant oil. If oil must be added during this first 25 hours of operation, use straight mineral oil conforming to MIL-L-6082.

Check oil level before each flight. Do not operate on less than 9 quarts. To minimize loss of oil through breather, fill to 10-quart level for normal flights of less than 3 hours. For extended flight, fill to capacity which is 13 quarts for each engine sump including 1 quart for oil filter.

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 (70°F), 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 (70°F), 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.

The 11.0 cubic foot capacity cylinder is serviced through a filler valve located on the forward face of the left nose baggage door jamb, and the 114.9 cubic foot capacity cylinder is serviced through the right nose baggage door in a similar manner.

OXYGEN SERVICING CHART

AMBIENT TEMPERATURE		FILLING PRESSURE PSIG	AMBIENT TEMPERATURE		FILLING PRESSURE PSIG
°C	°F		°C	°F	
-17.8	0	1600	21.1	70	1925
-12.2	10	1650	26.7	80	1950
-6.7	20	1675	32.2	90	2000
-1.1	30	1725	37.8	100	2050
4.4	40	1775	43.3	110	2100
10.0	50	1825	48.9	120	2150
15.6	60	1875	54.4	130	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

AIR CONDITIONING RESERVOIR (Hydraulic Fluid MIL-H-5606)

Check reservoir fluid level above screen bottom. Reservoir capacity is 2.75 quarts.

LANDING GEAR HYDRAULIC RESERVOIR (Hydraulic Fluid MIL-H-5606)

Check reservoir fluid level; fill as required to maintain fluid level between the ADD and MAX FULL marks. Reservoir capacity is approximately 1.2 quarts when the landing gear is down and locked.

ALCOHOL WINDSHIELD DEICE RESERVOIR (Isopropyl Alcohol MIL-F-5566)

Check reservoir fluid level; fill as required. Reservoir capacity is 3.0 gallons.

BATTERY

Low electrolyte level, inadequate charging and long idle periods in a discharged condition can cause batteries to become sulfated and unserviceable. Airplanes intended to be idle for long periods of time should have the batteries removed and placed on charge.

NOTE

Water consumption will increase during warmer temperatures and should be checked regularly. Fifty (50) hour inspection intervals are recommended, but may need to be reduced to maintain proper electrolyte level, depending on use and weather conditions.

TIRES

Tire pressure should be maintained at 70 PSI for the main wheel tires and 35 PSI for the nosewheel tire.

FLUSH TOILET RESERVOIR

The optional flush toilet uses a reservoir tank that 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 DG-19 chemical.

CAUTION

During cold weather operation, where cabin temperatures can fall below 0°C (32°F), an ethylene glycol base anti-freeze should 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.

Once the finish has cured completely, it may be waxed with a good automotive wax. A heavier coating of wax on the leading edges of the wings, tail, engine nose cap and propeller spinner will help reduce the abrasion encountered in these areas.

PROPELLER

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 Dealer's mechanics have been trained in the proper adjustment of the landing gear system. To assure trouble-free gear operation, have your Cessna Dealer 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 optional 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 (Methyl-Ethyl-Ketone, 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

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 No.1 and ICEX.

AGE MASTER No.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 No. 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.

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 Station 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 other components which might be adversely affected by the solvent. Refer to the Airplane Service Manual for proper lubrication of components after engine cleaning.

INTERIOR CARE

To remove dust and loose dirt from the upholstery, headliner and carpet, clean the interior regularly with a vacuum cleaner.

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, used sparingly. Before using any solvent, read the instructions of 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, insure 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 paragraph 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 improve 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 a dirty, hard or rough cloth used for cleaning. To prevent possible damage, items such as wrist watch, rings, etc. should be removed before cleaning windshield and windows. 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.

CAUTION

Windshields and windows (acrylic or glass) 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 (preferable 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. On acrylic windshields and windows only, if soils which cannot be removed by a mild detergent remain, Type II aliphatic naphtha applied with a soft clean cloth may be used as a cleaning solvent. Be sure to frequently refold the cloth to avoid redepositing soil and/or scratching windshield with any abrasive particles. **DO NOT USE** aliphatic naphtha on glass windshields.
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, MEK, acetone, carbon tetrachloride, lacquer thinners, commercial or household window cleaning sprays. Additionally, strong acids or bases may destroy antistatic coatings on glass windshields. When in doubt, do not use it.
- Never use an abrasive cleaner, wax, or polish on glass windshields.

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 polish meeting Federal Specification P-P-560 applied per the manufacturer's instructions.

NOTE

When applying or removing wax or polish, use a clean soft cloth.

8. Glass windshields may have rain repellent applied per the manufacturer's instructions. Caution should be used not to get rain repellent on painted surfaces surrounding the glass windshield. **DO NOT USE** rain repellent on acrylic surfaces.

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. Carefully cover all surfaces during any painting, powerplant cleaning or other procedure that calls for the use of any type of solvents or chemicals. The following coatings are approved for use in protecting surfaces from solvent attack:
 - a. White Spray Lab, MIL-C-6799, Type I, Class II.
 - b. WPL-3 Masking Paper - St. Regis, Newton, MA.
 - c. 5 X N - Poly-Spotstick - St. Regis, Newton, MA.
 - d. Protex 40 - Mask Off Company, Monrovia, CA and Southwest Paper Co., Wichita, KS.
 - e. Protex 10VS - Mask Off Company, Monrovia, CA and Southwest Paper Co., Wichita, KS.
 - f. Scotch 344 Black Tape - 3M Company.
4. Do not park or store airplane where it might be subjected to direct contact with or vapors from ethanol, denatured alcohol, gasoline, benzene, xylene, MEK, acetone, carbon tetrachloride, lacquer thinners, commercial or household window cleaning sprays, paint strippers, or other types of solvents.
5. Do not leave survivors up against windshield when not in use. The reflected heat from these items causes elevated temperatures on the windshield. If solar screens are installed on the inside of the airplane, make sure they are the silver appearing, reflective type.
6. Do not use power drill motor or any powered device to clean, polish or wax windshield.

Materials Required for Acrylic Windshields and Windows

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: (Refer to Note 1)		Waxing acrylic windshields 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 403D	Permatex Company, Inc. Kansas City, KS 66115	
Soft cloth, such as:		
Cotton flannel or cotton terry cloth material	Commercially available	Applying and removing wax and polish.

(Continued on next page)

Materials Required for Glass Windshields

MATERIAL	MANUFACTURER	USE
Mild soap or detergent hand dishwashing type without abrasives)	Commercially available	Cleaning windshields and windows.
Rain repellent: (Refer to Note 2)		Optional for rain shedding on glass windshields only.
REPCON or RAIN-X	UNELKO Corp., 727 E. 110 St., Chicago, IL 60628	

NOTE 1: These are the only polishing waxes tested and approved for use by Cessna Aircraft Company.

NOTE 2: This is the only rain repellent 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 Station.

SECTION 9

SUPPLEMENTS

TABLE OF CONTENTS

	Page
INTRODUCTION	9-3
SUPPLEMENTS - GENERAL:	
2 AIR CONDITIONING SYSTEM	(3 pages)
3 ALCOHOL WINDSHIELD DEICE SYSTEM	(2 pages)
4 ANGLE-OF-ATTACK	(2 pages)
5 DAVTRON 811B DIGITAL CLOCK	(2 pages)
6 DEICE BOOT SYSTEM	(4 pages)
7 ECONOMY MIXTURE INDICATOR	(2 pages)
8 ELECTRICAL ELEVATOR TRIM	(1 page)
9 AC ELECTRICAL WINDSHIELD ANTI-ICE SYSTEM	(2 pages)
10 DC ELECTRICAL WINDSHIELD ANTI-ICE SYSTEM	(2 pages)
11 FLIGHT IN ICING CONDITIONS (w / AC ELECTRICAL WINDSHIELD)	(4 pages)
11A FLIGHT IN ICING CONDITIONS (w / DC ELECTRICAL WINDSHIELD)	(4 pages)
12 FIRE DETECTION AND EXTINGUISHING SYSTEM	(2 pages)
14 FUEL FLOW INDICATING SYSTEM	(1 pages)
15 MANUALLY ADJUSTABLE SEAT	(2 pages)
17 PROPELLER DEICE SYSTEM	(2 pages)
18 YAW DAMPER	(2 pages)
SUPPLEMENTS - AVIONICS:	
21 400 ENCODING ALTIMETER (TYPE EA-401A)	(3 pages)
22 800 ENCODING ALTIMETER/ALERTING/PRESELECT (TYPE EA-801A)	(6 pages)
23 400 AREA NAVIGATION SYSTEM (TYPE RN-478A)	(5 pages)
24 800 AREA NAVIGATION SYSTEM (TYPE RN-878A)	(6 pages)
26 800 AUDIO CONTROL PANEL	(2 pages)
27 1000 AUDIO CONTROL PANEL	(6 pages)
29 400 AUTOMATIC DIRECTION FINDER (TYPE R-446A)	(4 pages)
30 1000 AUTOMATIC DIRECTION FINDER (TYPE 1046A)	(5 pages)
31 400B NAVOMATIC/AUTOPILOT SYSTEM (TYPE AF-550A)	(12 pages)
32 CC-2024B CHECKLIST DISPLAY	(12 pages)
33 1000 COMMUNICATION SYSTEM (TYPE RT-1038A)	(3 pages)
34 400 DME (TYPE RTA-476A)	(3 pages)
35 800 DME (TYPE RTA-876A)	(4 pages)
36 400 AND 1000 GLIDESLOPE (TYPE IR-443B AND TYPE R-1043A)	(2 pages)
37 HF-200 TRANSCEIVER	(2 pages)
38 400B INTEGRATED FLIGHT CONTROLS SYSTEM (TYPE IF-550A)	(17 pages)
39 800B INTEGRATED FLIGHT CONTROLS SYSTEM (TYPE IF-550A)	(16 pages)
40 LOCATOR BEACON (DMELT-6 AND -6C)	(1 pages)
41 400 MARKER BEACON (TYPE R-402A)	(2 pages)
42 1000 NAVIGATION SYSTEM (TYPE 1048A)	(4 pages)
44 400 NAV/COM SYSTEM (TYPE RT-485A)	(8 pages)
45 AA-100 RADIO ALTIMETER SYSTEM	(2 pages)
46 AA-215 RADIO ALTIMETER SYSTEM	(2 pages)
47 400 RADIO MAGNETIC INDICATOR (TYPE IN-404A)	(3 pages)
48 1000 RADIO MAGNETIC INDICATOR (TYPE IN-1004A)	(3 pages)
49 RADIO MAGNETIC INDICATOR (7100 RMI)	(3 pages)
50 FLITEFONE III RADIO TELEPHONE	(2 pages)
51 400 TRANSPONDER (TYPE 459A)	(4 pages)
52 800 TRANSPONDER (TYPE 859A)	(3 pages)
53 RDR-150 AND RDR-160 WEATHER RADAR	(3 pages)
54 RDR-150 COLOR DISPLAY WEATHER RADAR	(4 pages)
55 WEATHER RADAR COLOR DISPLAY PRIMUS-200	(4 pages)

LOG OF REVISIONS

Supplement pages which have been added/revised/deleted since the original issue of this manual are listed below.

Supplement Number and Name:		Pages Added/ Deleted/Revised		Revision Number/Date
2	Air Conditioning System	1 of 3	(Revised)	Revision 1 - 2 Apr 1982
6	Deice Boot System	1 of 4	(Revised)	Revision 1 - 2 Apr 1982
6	Deice Boot System	2 of 4	(Revised)	Revision 1 - 2 Apr 1982
6	Deice	3 of 4	(Revised)	Revision 1 - 2 Apr 1982
6	Deice Boot System	4 of 4	(Revised)	Revision 1 - 2 Apr 1982
8	Electric Elevator Trim	1 of 1	(Revised)	Revision 1 - 2 Apr 1982
9	AC Electrical Windshield Anti-Ice System	1 of 2	(Revised)	Revision 2 - 1 Jun 1994
10	DC Electrical Windshield Anti-Ice System	1 of 2	(Added)	Revision 2 - 1 Jun 1994
10	DC Electrical Windshield Anti-Ice System	2 of 2	(Added)	Revision 2 - 1 Jun 1994
11	Flight in Icing Conditions (w/AC Electrical Windshield)	1 of 4	(Revised)	Revision 2 - 1 Jun 1994
11	Flight in Icing Conditions (w/AC Electrical Windshield)	2 of 4	(Revised)	Revision 2 - 1 Jun 1994
11	Flight in Icing Conditions (w/AC Electrical Windshield)	3 of 4	(Revised)	Revision 2 - 1 Jun 1994
11	Flight in Icing Conditions (w/AC Electrical Windshield)	4 of 4	(Revised)	Revision 2 - 1 Jun 1994
11A	Flight in Icing Conditions (w/DC Electrical Windshield)	1 of 4	(Added)	Revision 2 - 1 Jun 1994
11A	Flight in Icing Conditions (w/DC Electrical Windshield)	2 of 4	(Added)	Revision 2 - 1 Jun 1994
11A	Flight in Icing Conditions (w/DC Electrical Windshield)	3 of 4	(Added)	Revision 2 - 1 Jun 1994
11A	Flight in Icing Conditions (w/DC Electrical Windshield)	4 of 4	(Added)	Revision 2 - 1 Jun 1994
12	Fire Detection and Extinguishing System	2 of 2	(Revised)	Revision 1 - 2 Apr 1982
27	100 Audio Control Panel	1 of 4	(Revised)	Revision 1 - 2 Apr 1982
27	100 Audio Control Panel	2 of 6	(Revised)	Revision 1 - 2 Apr 1982
27	100 Audio Control Panel	3 of 6	(Revised)	Revision 1 - 2 Apr 1982
27	100 Audio Control Panel	4 of 6	(Revised)	Revision 1 - 2 Apr 1982
27	100 Audio Control Panel	5 of 6	(Revised)	Revision 1 - 2 Apr 1982
27	100 Audio Control Panel	6 of 6	(Revised)	Revision 1 - 2 Apr 1982
31	Navomatic Autopilot System	2 of 12	(Revised)	Revision 1 - 2 Apr 1982
31	Navomatic Autopilot System	3 of 12	(Revised)	Revision 1 - 2 Apr 1982
38	400B Integrated Flight Control System	2 of 17	(Revised)	Revision 1 - 2 Apr 1982
38	400B Integrated Flight Control System	3 of 17	(Revised)	Revision 1 - 2 Apr 1982

LOG OF REVISIONS (Continued)

Supplement Number and Name:		Pages Added/ Deleted/Revised	Revision Number/Date
39	800B Integrated Flight Control System	2 of 16 (Revised)	Revision 1 - 2 Apr 1982
39	800B Integrated Flight Control System	3 of 16 (Revised)	Revision 1 - 2 Apr 1982
55	Weather Radar-Color Display Primus 200	1 of 4 (Revised)	Revision 1 - 2 Apr 1982
55	Weather Radar-Color Display Primus 200	2 of 4 (Revised)	Revision 1 - 2 Apr 1982

INTRODUCTION

Section 9 of this handbook provides supplemental information for optional equipment which may be installed on the airplane. Each supplement covers one item of optional equipment. To make it easier to locate a particular supplement within Section 9, supplements are arranged in alphabetical order and assigned reference numbers which are listed in sequence.

AIR CONDITION SYSTEM

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the air conditioning system.

Description

The air conditioning system, see Figure 1, consists of a hydraulically driven compressor and condenser in the right nacelle, two evaporators aft of the pilot's and copilot's seats, a control panel, located on the lower part of the left instrument panel, and a green monitor light on the annunciator panel.

The hydraulic drive for the compressor consists of an engine-driven hydraulic pump, a hydraulic fluid reservoir, an unloading valve and a hydraulic motor. During normal engine operation, with the air conditioning system switch to OFF or CIRCULATE, the unloading valve routes hydraulic fluid from the hydraulic pump back to the reservoir so that the hydraulic motor is disengaged; the green monitor light, see Figure 7-3, will be OFF during this condition. When the air conditioning system switch is turned to COOL, the unloading valve forces hydraulic fluid to flow from the hydraulic pump to the hydraulic motor and opens the condenser air inlet door. During preflight inspections, the spring-loaded condenser air inlet door may be actuated by hand without harm to the system. The hydraulic motor drives the compressor to provide conditioned air to the cabin. The green monitor light will come on when the compressor is operating and will cycle off when the cabin temperature corresponds with the temperature control rheostat setting. The monitor light may flicker for two to three minutes prior to turning off due to the required work load on the hydraulic system as the temperature condition becomes satisfied.

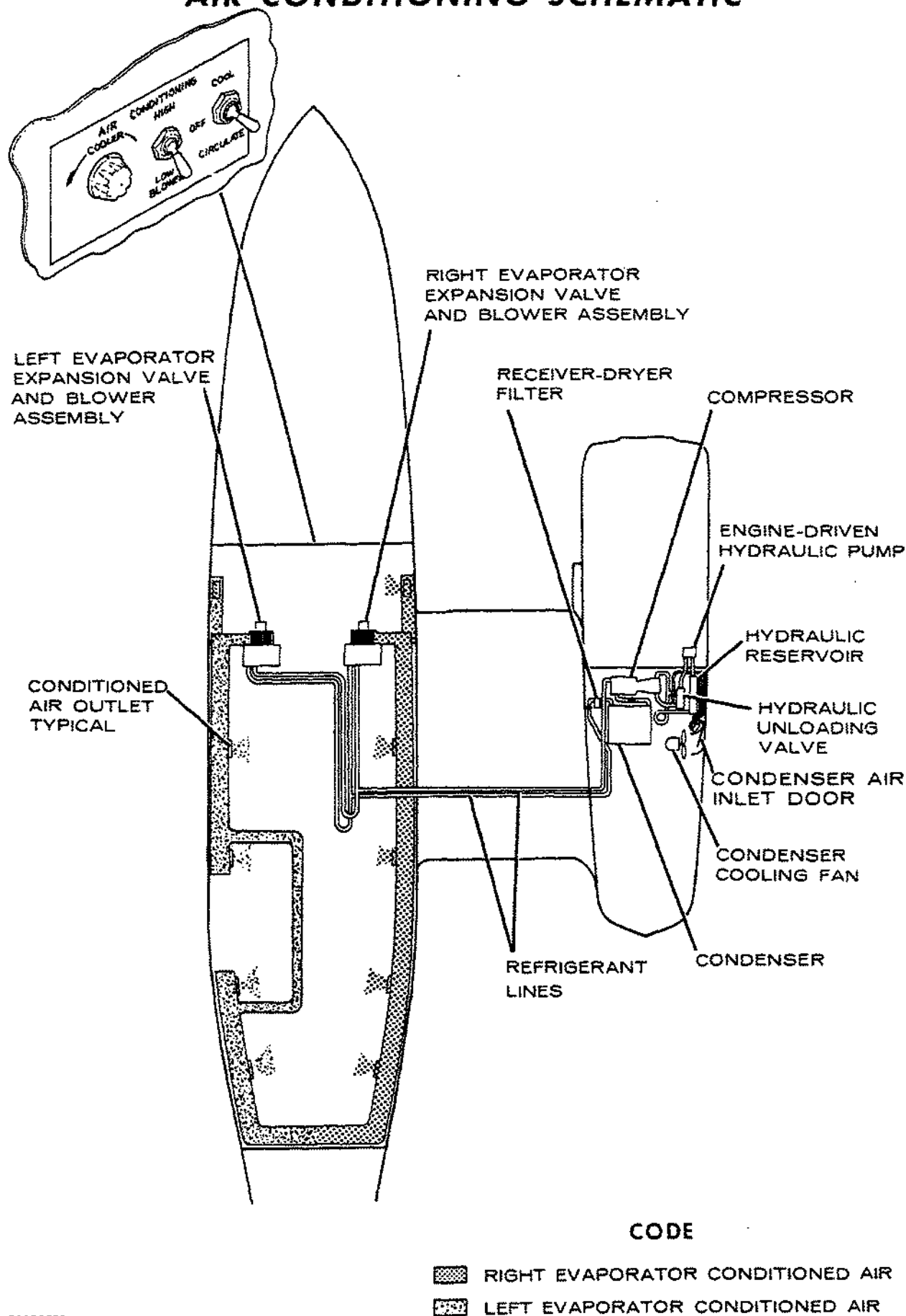
The two evaporators and blower motors distribute conditioned air to the cabin area via overhead ducts. Circuit breakers are provided for each blower, right and left, to allow limited operation of the system.

The system control panel consists of two switches and a rheostat. The system switch, placarded COOL-OFF-CIRCULATE, controls the mode of operation. The blower switch, placarded HIGH-LOW, controls the blower speed. The blower will operate whenever the system switch is in either the COOL or CIRCULATE mode. The temperature control rheostat, placarded COOLER, controls the temperature of the conditioned air. Clockwise rotation of the temperature control lowers the air temperature.

CAUTION

- To prevent damage to the air conditioning compressor, Do Not operate the air conditioning system in COOL when the outside air temperature is below 20°F (-6.7°C).
- When the outside air temperature is greater than 20°F (-6.7°C), freon loss and servicing intervals may be reduced by placing the air conditioning selector switch in COOL for 5 minutes each week.

AIR CONDITIONING SCHEMATIC



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Figure 1

SECTION 2 — LIMITATIONS

- A. System must be "OFF" or "CIRCULATE" for takeoff, landing and single-engine operation.
- B. Required Placards:
 - 1. Inside Right Wing Locker Baggage Door.
 - a. "MAXIMUM BAGGAGE - 120 LBS."

SECTION 3 — EMERGENCY PROCEDURES

- A. Engine Inoperative Procedures
 - 1. Air Conditioner - OFF or CIRCULATE.

SECTION 4 — NORMAL PROCEDURES

- A. Starting Procedures
 - 1. Air Conditioner - Check OFF.
- B. Before Taxi
 - 1. Air Conditioner - As Desired.
- C. Before Takeoff
 - 1. Air Conditioner - OFF or CIRCULATE.
- D. After Takeoff
 - 1. Air Conditioner - As Desired.
- E. Before Landing
 - 1. Air Conditioner - OFF or CIRCULATE.
- F. After Landing
 - 1. Air Conditioner - As Desired.

SECTION 5 — PERFORMANCE

Not Applicable.

ALCOHOL WINDSHIELD DEICE SYSTEM

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the alcohol windshield deice system.

Description

The alcohol windshield deice system consists of an alcohol tank, a pump, a dispersal tube for each windshield and a switch breaker.

The alcohol tank, located in the aft end of the right wing locker, has a 3.0-gallon capacity. The tank should be filled with isopropyl alcohol only. Water dilution of the alcohol is not recommended, as any water contained in the alcohol will reduce the efficiency of ice removal and may freeze on the windshield at very low temperatures. The pump, located adjacent to the tank, provides positive pressure to each windshield dispersal tube. A dispersal tube, located at the forward base of each windshield, provides flow pattern control throughout the airplane's speed envelope. Each tube contains five holes which should be inspected and cleaned with a small diameter wire as necessary.

Abnormal operation of the alcohol windshield deice system is indicated by the switch breaker tripping to the OFF position or failure of alcohol to flow onto the windshield.

SECTION 2 — LIMITATIONS

- A. Discontinue alcohol dispersal 20 seconds before reaching minimum descent altitude.
- B. Do not operate system longer than 3 minutes without alcohol flow.

SECTION 3 — EMERGENCY PROCEDURES

Not Applicable.

SECTION 4 — NORMAL PROCEDURES

- A. Preflight Inspection
 - 1. Windshield Dispersal Tubes - CHECK condition and cleanliness.
 - 2. Alcohol Tank Level - CHECK. Full tank provides approximately 1 hour of continuous operation. If alcohol deicing is installed on left or right windshield only, approximately 2 hours of continuous operation is available.
- B. Before Takeoff
 - 1. Alcohol Windshield Switch - ON. Allow 10 seconds for alcohol flow to begin. Check 5 dispersal holes for flow at the base of each windshield.
 - 2. Alcohol Windshield Switch - OFF.

C. In Flight

1. During Icing Encounters:

- a. Alcohol Windshield Switch - ON.

NOTE

For operation in continuous enroute icing conditions, allow approximately 1/8 to 1/4 inch of ice to accumulate. The windshield deice system can be used as an anti-ice system by continuous use and should be so used during the approach to landing. However, the maximum endurance with a 3.0-gallon tank is approximately 1.0 hour of continuous operation. If alcohol deicing is installed on left or right windshield only, approximately 2 hours of continuous operation is available. Airspeed should be 140 KIAS or below for best results.

- b. Alcohol Windshield Switch - OFF after ice removal.

D. Approach to Landing

WARNING

The windshield deice switch breaker must be positioned OFF 20 seconds prior to reaching minimum descent altitude. The alcohol film must be allowed to evaporate before a clear field of vision through the windshield is available.

SECTION 5 — PERFORMANCE

Not Applicable.

ANGLE-OF-ATTACK SYSTEM

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the angle-of-attack system.

Description

The angle-of-attack system, see Figure 1, is a sensitive lift measurement device which provides a continuous evaluation of lift performance of the airplane, regardless of weight, wing loading, attitude, air density, turbulence, and gear/flap configuration. The system consists of an indicator, stall warning horn test switch, computer and lift sensor. The lift sensor is located in the leading edge of the left wing. The standard airplane stall warning system is removed and its function is assumed by the angle-of-attack system.

The red "SLOW" zone on the left side of the indicator shows the trend toward stall. The stall warning horn will sound at least 5 KCAS above the airplane stall speed.

A PRESS-TO-TEST feature is incorporated to test the general condition of the system. When the test switch is pressed, the pointer should move to the SLOW end of the scale and the stall warning horn should sound.

ANGLE-OF-ATTACK INDICATOR

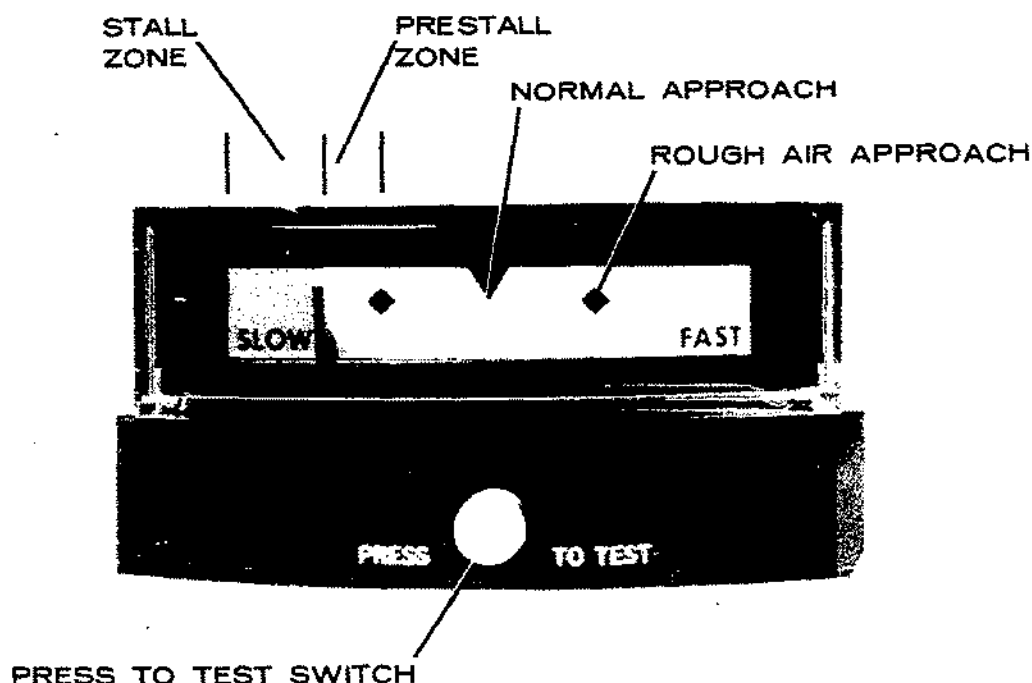


Figure 1

SECTION 2 — LIMITATIONS

The angle-of-attack indicating system may be used as a reference system but does not replace the airspeed indicator as a primary instrument. Operations utilizing the angle-of-attack indicating system, except as stated herein, are not approved.

SECTION 3 — EMERGENCY PROCEDURES

Not Applicable.

SECTION 4 — NORMAL PROCEDURES**A. Preflight Inspection**

1. Stall Warning Vane - CHECK freedom of movement and audible warning. Gently push the vane down to the stop; the indicator pointer should move to the full right FAST legend. Gently push the vane up to the stop; the indicator pointer should move to the full left SLOW legend and the prestall warning horn should activate.

NOTE

Satisfactory operation of the stall warning transmitter heating element is determined by observing a discharge on the voltammeter when the stall heat switch is turned on. The operation of the heating element may be verified by cautiously feeling the heat of this device while the switch is on.

B. Descent

1. Angle-of-Attack Indicator - CROSS-CHECK with airspeed indicator.

For a normal approach to landing, the pointer should be aligned with the center-mark. Alignment of the pointer with the "FAST" diamond provides a more comfortable airspeed margin for an approach in turbulent or gusty conditions.

To correct for an off-speed condition a small attitude correction should be held while waiting to see the result on the indicator. "Chasing" the pointer may result in a longitudinal, pilot-induced oscillation. The instrument is intended to be used as a reference to assist in determining the proper speed for the landing approach. The airspeed indicator is still the primary instrument for speed control.

SECTION 5 — PERFORMANCE

Not Applicable.

DAVTRON 811B DIGITAL CLOCK

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the Davtron 811B digital clock.

Description

The Davtron 811B, 24-hour, digital clock, see Figure 1, is a solid-state timing device which presents real time, flight time and elapsed time. The clock's internal memory is maintained, regardless of the airplane battery switch position, by a nonchargeable clock battery. This clock battery should be replaced every three years. The clock's light emitting diode (LED) displays require airplane electrical power.

All operating controls (four switches) are provided on the face of the clock.

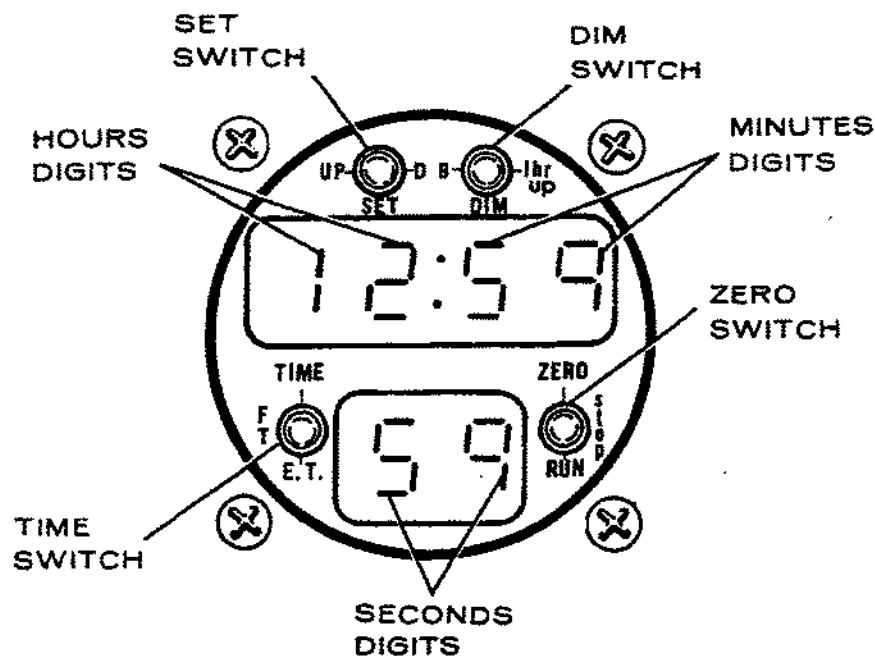
The SET switch is used to make minor corrections to the real time memory of the clock. This switch should be used only after checking the clock with an accurate time reference such as the National Bureau of Standards time broadcast. If the clock is found to be inaccurate, position the SET switch to UP for the number of seconds the clock is slow or to D for the number of seconds the clock is fast. The flight time and elapsed time functions will operate normally during the setting of the real time function, therefore, the elapsed time display can be used to time the holding of the SET switch.

The DIM switch is used to make one-hour changes to the real time and to set the light intensity for day and night flight operations. If real time changes of hours only are required, each momentary actuation of the DIM switch to the 1 hr position will advance the real time one hour. During daylight operations, the switch should be positioned to B. During night operations, the DIM position will decrease illumination intensity to a desirable level.

The ZERO switch is used to zero, stop or run the flight time or elapsed time functions. Actuation of the switch to the ZERO position will zero the elapsed time and zero the flight time if the airplane battery switch is in the OFF position. Actuation of the switch to the STOP position will stop the elapsed time function. Actuation of the switch to the RUN position will start the elapsed time function.

The TIME switch is used to display real time, flight time or elapsed time in hours, minutes and seconds in the two display windows. When the switch is positioned to TIME, the real time will be displayed.

When the switch is positioned to ET, the elapsed time will be displayed. When the switch is positioned to FT, the flight time will be displayed. The flight time function is wired through the landing gear safety switch; thus, flight time can only be accumulated when the weight of the airplane is off the landing gear.

DIGITAL CLOCK

1. SET SWITCH - Used to correct real time in seconds. UP position advances real time while D position retards real time.
2. DIM SWITCH - Used to set display illumination intensity and to advance real time in one-hour increments.
3. ZERO SWITCH - Used to stop, start and zero the elapsed time function. The flight time function can also be zeroed if the airplane battery switch is OFF.
4. TIME SWITCH - Used to display real time, flight time or elapsed time functions in hours, minutes and seconds.

Figure 1

SECTION 2 — LIMITATIONS

Not Applicable.

SECTION 3 — EMERGENCY PROCEDURES

Not Applicable.

SECTION 4 — NORMAL PROCEDURES**A. Before Starting The Engines**

1. Zero Switch - ZERO momentarily to zero the elapsed flight time functions.
2. Dim Switch - AS REQUIRED.

SECTION 5 — PERFORMANCE

Not Applicable.

DEICE BOOT SYSTEM

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the deice boot system.

Description

This system is designed to remove ice after accumulation, rather than prevent ice formation.

The deice boot system consists of pneumatically operated boots, engine-driven pneumatic pumps, 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 stabilizers. The boots expand and contract, using pressure and vacuum from the engine-driven vacuum pumps. Normally, vacuum is applied to all boots to hold them against the leading edge surfaces. When a deicing cycle is initiated, the vacuum is removed from the boots and a pressure is applied to "blow up" the boots. This change in contour will break the ice accumulation on the leading edges. Ice formations aft of this area will then be removed by normal in-flight air forces.

The deice system will operate satisfactorily on either or both engines. During single-engine operation, suction to the gyros will drop momentarily during the boot inflation cycle.

The deicing system is manually controlled by actuating the surface deice switch each time a deice cycle is desired. The switch will instantly spring back to OFF; however, a 12-second delay action by the sequencing system will complete the deicing inflation cycle.

The sequencing system inflates the tail section boots for approximately 6 seconds, then the wing boots for the next 6 seconds. The annunciator light, see Figure 7-3, should illuminate when the tail section boots reach proper operating pressure. No cyclic illumination after selecting a deice cycle indicates insufficient pressure for proper system operation and icing conditions should be avoided. The system may be recycled 6 seconds after the light goes out or anytime thereafter as required.

SECTION 2 — LIMITATIONS

Not Applicable.

SECTION 3 — EMERGENCY PROCEDURES

Not Applicable.

DEICE BOOT SYSTEM SCHEMATIC

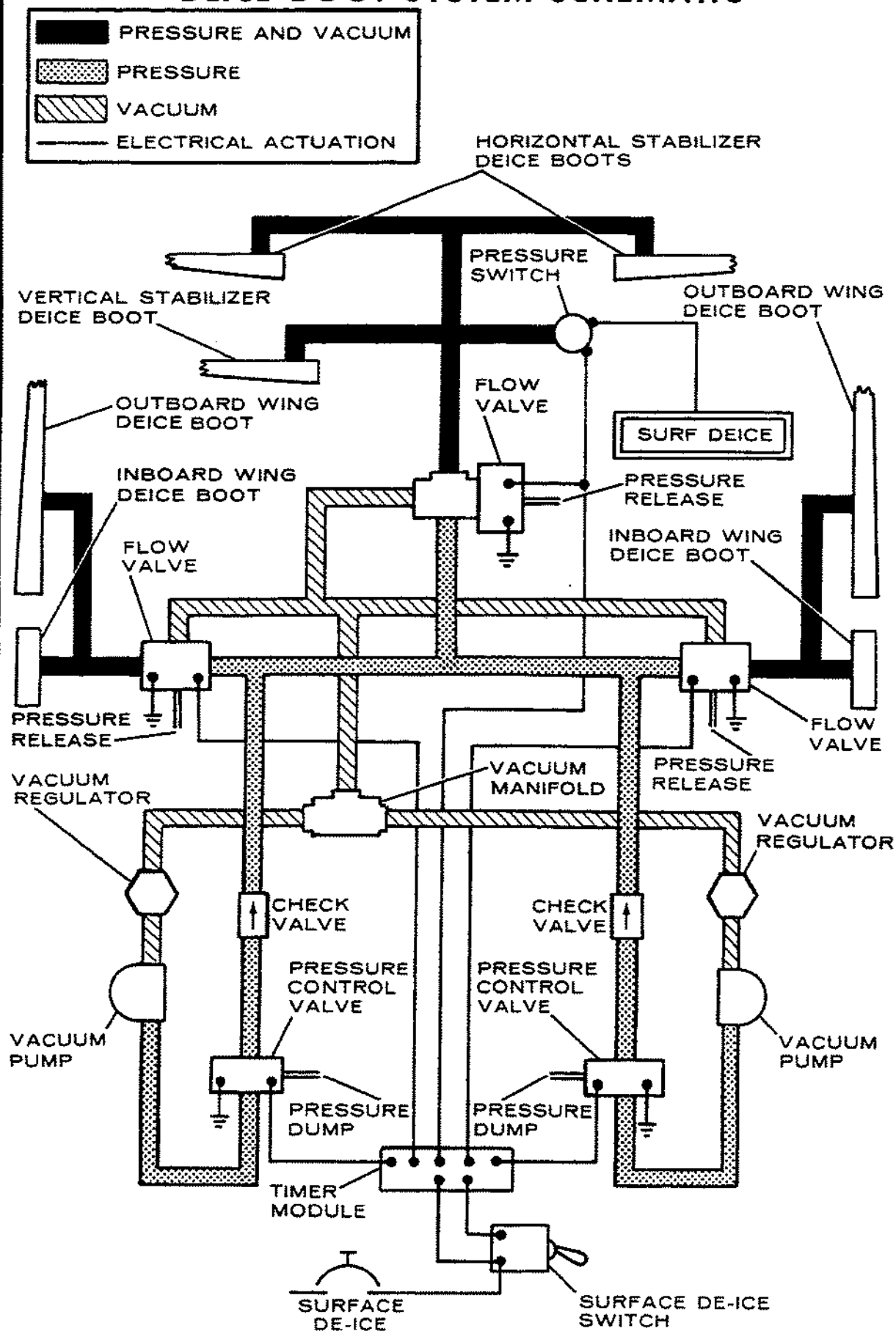


Figure 1

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SECTION 4 — NORMAL PROCEDURES

A. Preflight Inspection

1. Deice Boots - CHECK for tears, abrasions and cleanliness.

B. Before Takeoff

1. Surface Deice Switch - ACTUATE. Visually check operation of boots and annunciator light ON.

NOTE

Actuating the surface deice switch will result in one complete inflation and deflation cycle lasting approximately 45 seconds.

C. Inflight

1. During Icing Encounters.

- a. Surface Deice Switch - ACTUATE when ice accumulates between 1/4 to 1/2 inch. Repeat as necessary, allowing at least 45 seconds between actuations.

NOTE

- Accumulation of a 1/2 inch of ice can cause a cruise speed reduction of up to 30 knots as well as heavy buffet and a significant stall speed increase. Increase power as required to maintain desired airspeed.
- Prestall buffet and stall speeds increase slightly when deice boots are actuated. Maintain extra speed, especially during an approach, before actuating the boots.
- After prolonged icing encounters, increase engine power to maintain desired airspeed as ice accumulates on the unprotected areas.
- Maintain extra airspeed on approach to compensate for the increased prestall buffet associated with ice on the unprotected areas.

2. Leave icing conditions as soon as possible if airplane is not equipped for flight in icing conditions.

NOTE

Since wing, horizontal stabilizer and vertical stabilizer deice boots alone do not provide adequate protection for the entire airplane, icing conditions should be avoided whenever possible unless the airplane is equipped for flight in icing conditions. Refer to Flight In Icing Conditions supplement for details. If icing is encountered, close attention should be given to the pitot-static system, propellers, induction systems and other components subject to icing.

SECTION 5 — PERFORMANCE

- A. When climbing through areas of light to moderate icing conditions, use cruise climb airspeeds and maximum climb power (full power) settings to preclude ice buildup on the fuselage undersurface and lower wing surfaces and minimize the exposure time to icing conditions.
- B. During prolonged icing encounters in cruise, increase engine power to 75% or greater to maintain cruise speed as ice accumulates on the unprotected areas and preclude ice buildup on the fuselage undersurface and lower wing surfaces.
- C. Prestall buffet and stall speeds increase slightly when deice boots are actuated. Maintain extra speed, especially during an approach, before actuating the boots.
- D. Maintain extra airspeed on approach to compensate for the increased prestall buffet associated with ice on the unprotected areas and the increased weight.
- E. Airplane general performance is decreased with ice on the unprotected areas.

ECONOMY MIXTURE INDICATOR

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the economy mixture indicator.

Description

The Cessna Economy Mixture Indicator is an exhaust gas temperature (EGT) sensing device which is used to aid the pilot in selecting the most desirable fuel-air mixture for cruising flight at less than 77.5% power. The EGT varies with the ratio of fuel-to-air mixture entering the engine cylinders.

SECTION 2 — LIMITATIONS

- A. All exhaust gas temperature (EGT) operation must be accomplished in accordance with Figure 1.

MIXTURE DESCRIPTION CHART

MIXTURE DESCRIPTION	EXHAUST GAS TEMPERATURE	TAS LOSS FROM BEST POWER	RANGE INCREASE FROM BEST POWER
BEST POWER (Maximum Speed)	PEAK MINUS 130°F (Enrichen)	0 KNOTS	0%
RECOMMENDED LEAN (Section 5 And Power Computer Performance)	PEAK MINUS 50°F (Enrichen)	2 KNOTS	7%
BEST ECONOMY *	PEAK EGT	6 KNOTS	15%

* FOR POWER SETTINGS OF 55% OR LESS WITH RPM IN THE GREEN ARC OR FOR POWER SETTINGS OF 55% TO 65% WITH 2200 RPM OR LESS

Figure 1

SECTION 3 — EMERGENCY PROCEDURES

Not Applicable.

SECTION 4 — NORMAL PROCEDURES

- (1) In takeoff and full power climb, lean the mixtures as indicated by the white or blue markings on the fuel flow indicator.

NOTE

Leaning in accordance with markings on the fuel flow indicator will provide sufficiently rich mixture for engine cooling. Leaner mixtures are not recommended for power settings in excess of 77.5%.

- (2) In level flight (at less than 77.5% power), lean the mixture to peak EGT, then enrich as desired, using Figure 1 as a guide. For Best Economy mixture at power settings of 55 to 65% at 2200 RPM or lower, or power settings up to 55% for any RPM in the green arc, the engines may be operated at peak EGT.

CAUTION

Operation at Best Economy mixture is not recommended until oil consumption stabilizes or during the first 50 hours of operation. The purpose of operating at 65 to 77.5% power with Best Power or Recommended Lean mixture is to insure proper seating of the rings and is applicable to new engines, and engines in service following cylinder replacement or top overhaul of one or more cylinders. Operation leaner than peak EGT is not approved.

NOTE

- Changes in altitude, OAT, or power settings require the EGT to be rechecked and the mixture reset.
- Operation up to one minute at peak EGT is authorized at power settings of 77.5% or less to establish peak EGT reference.
- Operation at peak EGT is authorized for normal continuous operation at power settings of 55 to 65% at 2200 RPM or lower, or power settings up to 55% for any RPM in the green arc. See Figure 1 for approved operating limits.

- (3) Use rich mixture (or mixture appropriate for field elevation) in idle descents or landing approaches. Leaning technique for cruise descents may be with EGT reference method (at least every 5000 feet) or by simply enriching to avoid engine roughness.

SECTION 5 — PERFORMANCE

Not Applicable.

ELECTRIC ELEVATOR TRIM

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the electric elevator trim.

Description

The electric elevator trim system consists of an electrically operated drive motor and clutch assembly, which receives power through a "momentary on" two-way trim switch and an emergency disengage switch.

SECTION 2 — LIMITATIONS

- A. Disengage electric elevator trim if malfunction occurs.
- B. Required Placards:
 - 1. On Pilot's Control Wheel
 - a. "AP/TRIM DISC"
 - b. "DN" - "UP"

SECTION 3 — EMERGENCY PROCEDURES

- A. Electric Elevator Trim Malfunction.
 - 1. Elevator Control - OVERPOWER as required.
 - 2. Control Wheel AP/TRIM DISC Switch - DEPRESS.
 - 3. Reduce airspeed below V_{NE} .
 - 4. Manual Trim - AS REQUIRED.

SECTION 4 — NORMAL PROCEDURES

- A. Trim Switch - ACTUATE as desired.

NOTE

To check the operation of the AP/TRIM DISC switch: actuate the elevator trim switch with the AP/TRIM DISC switch depressed. Observe that the manual trim wheel and indicator do not rotate when the elevator trim switch is actuated.

SECTION 5 — PERFORMANCE

Not Applicable.

AC ELECTRICAL WINDSHIELD ANTI-ICE SYSTEM

SECTION 1 - GENERAL

This supplement provides information which must be observed when operating the alternating current (AC) electrical windshield.

Description

The AC electrical windshield anti-ice system consists of an electrically heated element on the pilot's windshield, an inverter, an annunciator light, a heat sensor and a switch breaker.

The inverter, located in the right wing stub, supplies AC power to the windshield. The heat sensor cycles the power to the windshield, providing temperature control. The green function indicator light, see Figure 7-3, will illuminate during each heating cycle.

If the indicator does not illuminate periodically, check the bulb by pressing the PRESS-TO-TEST button. A secondary means of checking proper windshield operation can be made by monitoring the voltammeter. When the voltammeter selector switch is positioned to BATT, a change in charge or discharge rate will be noted during each heating cycle.

Abnormal operation of the electrical windshield anti-ice system is indicated by the switch breaker tripping to the OFF position or failure of the indicator light to illuminate. Failure of the switch breaker to stay reset indicates that windshield anti-icing is impossible.

SECTION 2 - LIMITATIONS

If the pilot's windshield is covered with ice, do not leave the electrical windshield anti-ice switch on for more than 20 seconds. Operation in excess of 20 seconds will cause an overheat condition which can result in failure of the windshield heating element and/or permanent distortion of the windshield.

SECTION 3 - EMERGENCY PROCEDURES

Not Applicable.

SECTION 4 - NORMAL PROCEDURES

A. Before Takeoff

1. Electrical Windshield Anti-Ice Switch - ON momentarily. Check voltammeter for discharge and WINDSHIELD annunciator light for illumination.

NOTE

Turn off windshield anti-ice switch as soon as the voltammeter and the annunciator light have been checked.

B. Inflight

1. Electrical Windshield Anti-Ice Switch - ON before entering visible moisture with outside air temperature below 4.4°C (40°F).
2. Leave icing conditions as soon as possible if airplane is not equipped for flight in icing conditions.

NOTE

Since the electrical windshield anti-ice system alone does not provide adequate protection for the entire airplane, icing conditions should be avoided whenever possible unless the airplane is equipped for flight in icing conditions. Refer to Flight in Icing Conditions supplement for details. If icing is encountered, close attention should be given to the pitot-static system, propellers, induction systems, wing and stabilizer leading edges and other components subject to icing.

C. After Landing

1. Electrical Windshield Anti-Ice Switch - OFF.

SECTION 5 - PERFORMANCE

Not Applicable.

DC ELECTRICAL WINDSHIELD ANTI-ICE SYSTEM

SECTION 1 - GENERAL

This supplement provides information which must be observed when operating the direct current (DC) electrical windshield.

Description

The DC electrical windshield anti-ice system consists of two electrically heated rectangular areas: one large mat (primary heated area) and an additional small mat (secondary heated area), a resistance wire sensor embedded in the windshield, a hi-low relay, a remote temperature controller, a fuse, a circuit breaker and a three-position temperature selector switch. With the switch in HI, only the large mat is heated. With the switch in LO, both mats are heated at a lower power density.

Power for the electrical windshield is supplied by the airplane's DC bus bar. The temperature controller, in conjunction with the resistance wire sensor embedded in the windshield provides ON-OFF control of the DC power through the use of the relay. The temperature sensor, an integral part of the windshield, is located in the large mat heated area.

SECTION 2 - LIMITATIONS

If the pilot's windshield is covered with ice, do not leave the electrical windshield anti-ice switch on for more than 20 seconds. Operation in excess of 20 seconds will cause an overheat condition which can result in failure of the windshield heating element and/or permanent distortion of the windshield.

The electrical windshield must be on HIGH with outside air temperature below -12°C (10°F) when in visible moisture.

Required Placards:

MAGNETIC COMPASS
DEVIATIONS GREATER
THAN 10° CAN BE
EXPECTED WHEN D.C.
HEATED WINDSHIELD
IS IN OPERATION.

SECTION 3 - EMERGENCY PROCEDURES

Not Applicable.

SECTION 4 - NORMAL PROCEDURES

A. Before Takeoff

1. Electrical Windshield Anti-Ice Switch - HIGH momentarily. Check voltammeter for discharge and WINDSHIELD annunciator light for illumination.

NOTE

Turn off windshield anti-ice switch as soon as the voltammeter and the annunciator light have been checked.

B. Inflight

1. Electrical Windshield Anti-ice Switch - LOW before entering visible moisture with outside air temperature below 4.4°C (40°F) and above -12°C (10°F). HIGH before entering visible moisture with outside air temperature below -12°C (10°F).

NOTE

- When using the electrical windshield on LOW, correct indicated outside air temperature (see Section 5 for ram rise correction) for your particular altitude and airspeed to ensure the outside air temperature is not below -12°C (10°F).
- If ice begins to accumulate on the heated portion of the windshield while operating on LOW, switch to HIGH.
- After icing conditions are encountered with the windshield on HIGH, do not use LOW until the entire heated portion of the windshield is clear of ice.
- The magnetic compass will not be reliable with the electrical heated windshield in operation.

2. Leave icing conditions as soon as possible if airplane is not equipped for flight in icing conditions.

NOTE

Since the electrical windshield anti-ice system alone does not provide adequate protection for the entire airplane, icing conditions should be avoided whenever possible unless the airplane is equipped for flight in icing conditions. Refer to Flight In Icing Conditions supplement for details. If icing is encountered, close attention should be given to the pitot-static system, propellers, induction systems, wing and stabilizer leading edges and other components subject to icing.

C. After Landing

1. Electrical Windshield Anti-Ice Switch - OFF.

SECTION 5 - PERFORMANCE

Not Applicable.

FLIGHT IN ICING CONDITIONS (AIRPLANES WITH AC ELECTRICAL WINDSHIELD)

SECTION 1 - GENERAL

NOTE

To determine which optional electrical windshield is installed, check the electrical windshield anti-ice switch. The AC windshield switch is labeled OFF and ON. The DC windshield switch is labeled HIGH, LOW and OFF.

This supplement provides information which must be observed when operating the ice protection equipment for flight in icing conditions.

Description

An icing equipment package is available which allows flight in icing conditions as defined by the FAA. The package consists of the following: heated stall warning vane or optional heated angle-of-attack lift sensor vane; heated pitot head (one minimum required); electric propeller deice boots (including fuselage ice protection plates); wing (inboard and outboard), stabilizer and fin deice boots; electrical windshield heated panel (pilot's side only); heated static ports; left ice detection light and 100 - ampere alternators.

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.

SECTION 2 - LIMITATIONS

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 head (one minimum required).
3. Deice System Kit [Cessna drawing 5114400, Factory Kit (FK) No. 194].
 - a. Electric propeller deice boots.
 - b. Wing (inboard and outboard) stabilizer and fin deice boots (including left ice detection light).
 - c. Electrical anti-ice windshield heated panel (pilot's side only).
 - d. Heated static ports.
4. 100 - ampere alternators.

If the pilot's windshield is covered with ice, do not leave the electrical windshield anti-ice switch on for more than 20 seconds. Operation in excess of 20 seconds will cause an overheat condition which can result in failure of the windshield heating element and/or permanent distortion of the windshield.

SECTION 3 - EMERGENCY PROCEDURES

- A. If uneven deicing of propeller blades is indicated by excessive vibration:
1. Propellers - EXERCISE to MAX RPM.
 2. Propeller Ammeter - CHECK for proper operation by periodic fluctuations within the green arc. If ammeter reading is below the green arc, the propeller blades may not be deicing uniformly:
 - a. If both propellers are reading below the green arc:
 - (1) Propeller Deice Switch - OFF.
 - b. If either propeller is reading below the green arc:
 - (1) PROP DEICE Circuit Breaker - Pull L or R circuit breaker as required.
 3. If vibration continues, leave icing conditions as soon as possible.

CAUTION

Do not operate propeller deice for prolonged periods when propellers are not turning.

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

SECTION 4 - NORMAL PROCEDURES

- A. Preflight Inspection
1. Pitot Heat Switch(es) - ON 20 seconds - OFF (Ensure Pitot Covers Are Removed).
 2. Stall and Vent Heat Switch - ON 20 seconds - OFF.
 3. Deice Boots - CHECK for tears, abrasions, and cleanliness.
 4. Fuel Vents - CLEAR.
 5. Pitot Tube(s) - CLEAR and WARM.
 6. Static Ports - CLEAR and WARM.

CAUTION

Do not operate system heaters for prolonged periods on the ground.

NOTE

Stall and vent heat switch operates stall vane heater or optional angle-of-attack lift sensor vane, and static port heaters. Pitot heat switch operates pitot heater(s).

B. Before Takeoff

1. Surface Deice Switch - ACTUATE. Visually check operation of boots and annunciator light ON.

NOTE

Actuating the surface deice switch will result in one complete inflation and deflation cycle lasting approximately 45 seconds.

2. Propeller Deice Switch - ON momentarily. Check propeller ammeter.

NOTE

Proper operation of propeller deice system is indicated by periodic fluctuations, within the green arc, on the propeller ammeter.

3. Electrical Windshield Anti-Ice Switch - ON momentarily. Check voltammeter for discharge and WINDSHIELD annunciator light for illumination.

NOTE

Turn off windshield anti-ice switch as soon as the voltammeter and the annunciator light have been checked.

C. Inflight

1. Before visible moisture is encountered with outside air temperature below 4.4°C (40°F):
 - a. Pitot Heat Switch - ON.
 - b. Stall and Vent Heat Switch - ON.
 - c. Propeller Deice Switch - ON.

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

Energizing the propeller deice system early in icing conditions will prevent ice buildup which will be thrown off and can chip the fuselage paint.

- d. Electrical Windshield Anti-Ice Switch - ON.
- 2. During Icing Encounters:
 - a. Surface Deice Switch - ACTUATE when ice accumulates between 1/4 to 1/2 inch. Repeat as necessary, allowing at least 45 seconds between actuations.

NOTE

Accumulation of 1/2 inch of ice can cause a cruise speed reduction of up to 30 knots as well as heavy buffet and a significant stall speed increase. Increase power as required to maintain desired airspeed.

- D. After Landing
 - 1. Electrical Windshield Anti-Ice Switch - OFF.

SECTION 5 - PERFORMANCE

- A. When climbing through areas of light to moderate icing conditions, use cruise climb airspeeds and maximum climb power (full power) settings to preclude ice buildup on the fuselage undersurface and lower wing surfaces and minimize the exposure time to icing conditions.
- B. During prolonged icing encounters in cruise, increase engine power to 75% or greater to maintain cruise speed as ice accumulates on the unprotected areas and preclude ice buildup on the fuselage under surface and lower wing surfaces.
- C. Prestall buffet and stall speeds increase slightly when deice boots are actuated. Maintain extra speed, especially during an approach, before actuating the boots.
- D. Maintain extra airspeed on approach to compensate for the increased prestall buffet associated with ice on the unprotected areas and the increased weight. Maintaining extra airspeed on approach will increase the landing distance.
- E. Airplane general performance is decreased with ice on the unprotected areas.

FLIGHT IN ICING CONDITIONS (AIRPLANES WITH DC ELECTRICAL WINDSHIELD)

SECTION 1 - GENERAL

NOTE

To determine which optional electrical windshield is installed, check the electrical windshield anti-ice switch. The AC windshield switch is labeled OFF and ON. The DC windshield switch is labeled HIGH, LOW and OFF.

This supplement provides information which must be observed when operating the ice protection equipment for flight in icing conditions.

Description

An icing equipment package is available which allows flight in icing conditions as defined by the FAA. The package consists of the following: heated stall warning vane or optional heated angle-of-attack lift sensor vane; heated pitot head (one minimum required); electric propeller deice boots (including fuselage ice protection plates); wing (inboard and outboard), stabilizer and fin deice boots; electrical windshield heated panel (pilot's side only); heated static ports; left ice detection light and 100 - ampere alternators.

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.

SECTION 2 - LIMITATIONS

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 head (one minimum required).
3. Deice System Kit [Cessna drawing 5114400, Factory Kit (FK) No. 194].
 - a. Electric propeller deice boots.
 - b. Wing (inboard and outboard) stabilizer and fin deice boots (including left ice detection light).
 - c. Electrical anti-ice windshield heated panel (pilot's side only).
 - d. Heated static ports.
4. 100 - ampere alternators.

If the pilot's windshield is covered with ice, do not leave the electrical windshield anti-ice switch on for more than 20 seconds. Operation in excess of 20 seconds will cause an overheat condition which can result in failure of the windshield heating element and/or permanent distortion of the windshield.

The electrical windshield must be on HIGH with outside air temperature below -12°C (10°F) when in visible moisture.

REQUIRED PLACARDS:

1. MAGNETIC COMPASS DEVIATIONS GREATER THAN 10° CAN BE EXPECTED WHEN D.C. HEATED WINDSHIELD IS IN OPERATION.

SECTION 3 - EMERGENCY PROCEDURES

- A. If uneven deicing of propeller blades is indicated by excessive vibration:
1. Propellers - EXERCISE to MAX RPM.
 2. Propeller Ammeter - CHECK for proper operation by periodic fluctuations within the green arc.
 3. If reading is below the green arc indicating that the propeller blades may not be deicing uniformly:
 - a. Propeller Deice Switch - OFF.
 4. If ammeter reading for either propeller is below the green arc, indicating the propeller blades may not be deicing uniformly:
 - a. PROP DEICE Circuit Breaker - PULL L or R circuit breaker as required.
 5. If vibration continues, leave icing conditions as soon as possible.

CAUTION

Do not operate propeller deice for prolonged periods when propellers are not turning.

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

SECTION 4 - NORMAL PROCEDURES

- A. Preflight Inspection
1. Pitot Heat Switch(es) - ON 20 seconds - OFF (Ensure Pitot Covers Are Removed).
 2. Stall and Vent Heat Switch - ON 20 seconds - OFF.
 3. Deice Boots - CHECK for tears, abrasions, and cleanliness.
 4. Fuel Vents - CLEAR.
 5. Pitot Tube(s) - CLEAR and WARM.
 6. Static Ports - CLEAR and WARM.

CAUTION

Do not operate system heaters for prolonged periods on the ground.

NOTE

Stall and vent heat switch operates stall vane heater or optional angle-of-attack lift sensor vane, and static port heaters. Pitot heat switch operates pitot heater(s).

B. Before Takeoff

1. Surface Deice Switch - ACTUATE. Visually check operation of boots and annunciator light ON.

NOTE

Positioning the surface deice switch to ACTUATE will result in one complete inflation and deflation cycle lasting approximately 45 seconds.

2. Propeller Deice Switch - ON momentarily. Check propeller ammeter.

NOTE

Proper operation of propeller deice system is indicated by periodic fluctuations, within the green arc, on the propeller ammeter.

3. Electrical Windshield

- Anti-Ice Switch - HIGH momentarily. Check voltammeter for discharge and WINDSHIELD annunciator light for illumination.

NOTE

Turn off windshield anti-ice switch as soon as the voltammeter and the annunciator light have been checked.

C. Inflight

1. Before visible moisture is encountered with outside air temperature below 4.4°C (40°F):
 - a. Pitot Heat Switch - ON.
 - b. Stall and Vent Heat Switch - ON.
 - c. Propeller Deice Switch - ON.

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.

- d. Electrical Windshield Anti-Ice Switch - LOW with outside air temperature above -12°C (10°F). HIGH with outside air temperature below -12°C (10°F).

NOTE

- When using the electrical windshield on LOW, correct indicated outside air temperature (see Section 5 for ram air temperature rise correction) for your particular altitude and airspeed to ensure the outside air temperature is not below -12°C (10°F).
- If ice begins to accumulate on the heated portion of the windshield while operating on LOW, switch to HIGH.
- After icing conditions are encountered with the windshield on HIGH, do not use LOW until the entire heated portion of the windshield is clear of ice.
- The magnetic compass will not be reliable with the electrical heated windshield in operation.

2. During Icing Encounters:

- a. Surface Deice Switch - ACTUATE when ice accumulates between 1/4 to 1/2 inch. Repeat as necessary, allowing at least 45 seconds between actuations.

NOTE

Accumulation of 1/2 inch of ice can cause a cruise speed reduction of up to 30 knots as well as heavy buffet and a significant stall speed increase. Increase power as required to maintain desired airspeed.

D. After Landing

1. Electrical Windshield Anti-Ice Switch - OFF.

SECTION 5 - PERFORMANCE

- A. When climbing through areas of light to moderate icing conditions, use cruise climb airspeeds and maximum climb power (full power) settings to preclude ice buildup on the fuselage undersurface and lower wing surfaces and minimize the exposure time to icing conditions.
- B. During prolonged icing encounters in cruise, increase engine power to 75% or greater to maintain cruise speed as ice accumulates on the unprotected areas and preclude ice buildup on the fuselage under surface and lower wing surfaces.
- C. Prestall buffet and stall speeds increase slightly when deice boots are actuated. Maintain extra speed, especially during an approach, before actuating the boots.
- D. Maintain extra airspeed on approach to compensate for the increased prestall buffet associated with ice on the unprotected areas and the increased weight. Maintaining extra airspeed on approach will increase the landing distance.
- E. Airplane general performance is decreased with ice on the unprotected areas.

FIRE DETECTION AND EXTINGUISHING SYSTEM

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the fire detection and extinguishing system.

Description

The fire detection and extinguishing system consists of three major components: three heat sensitive detectors located in each engine accessory compartment; an annunciator and actuator panel; see Figure 2; and a compressed Freon single-shot gas bottle in each engine accessory compartment

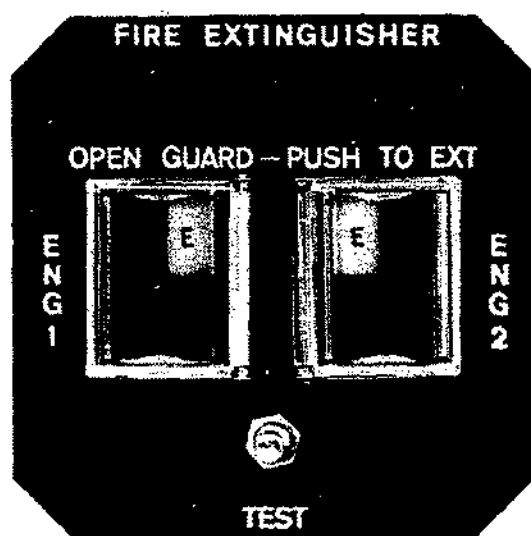
A test function is provided to test the bottle firing cartridge and annunciator lights. When the test switch is pushed, all lights should illuminate; if any light fails to illuminate, replace the bulb. If the green light does not illuminate, check the bottle pressure gages for correct pressure as shown in Figure 1. If the bottle pressure is adequate, replace the firing cartridge in the fire extinguisher. Any other light failure, after replacing bulbs and firing cartridge, indicates a malfunction in the unit or associated wiring.

AMBIENT TEMPERATURE Vs RECOMMENDED PRESSURE

Ambient Temperature-°C	-40.0	-28.9	-17.8	-6.7	+4.4	+15.6	+26.7	+37.8	+48.9
Ambient Temperature-°F	-40	-20	0	+20	+40	+60	+80	+100	+120
Recommended Operating Pressure-PSIG	127 to 155	148 to 180	174 to 212	207 to 251	249 to 299	304 to 354	367 to 417	442 to 492	532 to 582

Figure 1

FIRE DETECTION AND EXTINGUISHING SYSTEM



ANNUNCIATION		
LEGEND	COLOR	CAUSE OF ILLUMINATION
FIRE	RED	FIRE CONDITION EXISTING IN ENGINE COMPARTMENT
E	AMBER	FIRE EXTINGUISHER CONTAINER EMPTY
OK	GREEN	FIRE CARTRIDGE AND ASSOCIATED WIRING IS IN OPERATIONAL CONDITION

Figure 2

If an overheat condition is detected, the appropriate FIRE light will annunciate the engine to be extinguished. To activate the extinguisher, open the guard for the appropriate engine and press the FIRE light. Freon, under pressure, will be discharged to the engine and engine accessory compartments. The amber light E will illuminate after the extinguisher has been discharged and will continue to show empty until a new bottle is installed. The FIRE light will remain illuminated until compartment temperatures cool.

SECTION 2 — LIMITATIONS

Not Applicable.

SECTION 3 — EMERGENCY PROCEDURES

If a fire warning light indicates an engine compartment fire and is confirmed or if a fire is observed without a fire warning light:

1. Both Auxiliary Fuel Pumps - OFF.
2. Operative Engine Fuel Selector - MAIN TANK (Feel For Detent).
3. Emergency Crossfeed Shutoff - OFF (Pull Up).
4. Appropriate Engine - SECURE.
 - a. Throttle - CLOSE.
 - b. Mixture - IDLE CUT-OFF.
 - c. Propeller - FEATHER.
 - d. Fuel Selector - OFF (Feel For Detent).
 - e. Cowl Flap - CLOSE.
 - f. Open the appropriate guard and push FIRE light.
- g. Magnetos - OFF.
- h. Propeller Synchrophaser - OFF (Optional System).
- i. Alternator - OFF.
5. Cabin Heater - OFF.
6. Land as soon as practical.

NOTE

Best results may be obtained if the airflow through the nacelle is reduced by slowing the airplane (as slow as practical) prior to actuating the extinguisher.

SECTION 4 — NORMAL PROCEDURES

A. Before Takeoff

1. Test Switch - PRESS. All lights should illuminate.

SECTION 5 — PERFORMANCE

Not Applicable.

FUEL FLOW INDICATING SYSTEM

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the electronic fuel flow indicating system.

Description

The electronic fuel flow indicating system consists of a dual needle indicator and a fuel flow transducer for each engine. The flow transducer generates electrical pulses, which represents a measure of fuel flow rate, and transmits these pulses to the indicator as input frequency. The indicator then converts the frequency signals into an analog output which is displayed by the indicator as fuel flow rate in pounds per hour. These gage markings are predicated on the use of 100 grade aviation fuel. Increase fuel flow 2% above markings when 100LL grade aviation fuel is used. In addition, these pulses provide information to a totalizer within the indicator. The totalizer indicates the quantity of fuel remaining or consumed, even if power is removed from the normal power input circuit.

The electronic fuel flow indicator has a digital totalizer, a DIM/CLR knob and a counter switch. The totalizer displays either the fuel remaining or the fuel consumed for both the left and right engines or full tanks. The DIM/CLR knob controls the light intensity of the totalizer and resets the totalizer counter to zero. The counter switch is used to set 10-pound and 100-pound increments of fuel for totalizer use.

NOTE

If the "memory" voltage is interrupted, such as when the airplane battery is removed and reinstalled, the totalizer display will not indicate accurately until the counter has been reset.

SECTION 2 — LIMITATIONS

Same as standard fuel flow gage contained in Section 2 of this manual.

SECTION 3 — EMERGENCY PROCEDURES

Not Applicable.

SECTION 4 — NORMAL PROCEDURES

A. Preflight Inspection

1. Counter Switch - ACTUATE until totalizer reads equal to the amount of fuel in the tanks if a fuel remaining reading is desired.
2. DIM/CLR Switch - CLR if a fuel consumed reading is desired.

NOTE

If fuel is added before a flight, insure that the totalizer is adjusted to reflect the additional fuel.

SECTION 5 — PERFORMANCE

Not Applicable.

MANUALLY ADJUSTABLE SEAT

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the manually adjustable seats.

Description

The manually adjustable pilot and copilot seats are secured to seat pan assemblies which are attached to the forward main spar carry-thru structure. The seats may be adjusted fore and aft, vertically and tilted to any desired position within the limits of the seat by using the controls located on the front of the seat, see Figure 1.

An optional lumbar support is available for the pilot's and copilot's seat backs. The support is designed to provide increased comfort during long flights. The support is basically an air-tight, foam-filled cushion which can be adjusted in size and shape as governed by external forces and the operation of the bleed valve.

MANUALLY ADJUSTABLE SEAT CONTROLS

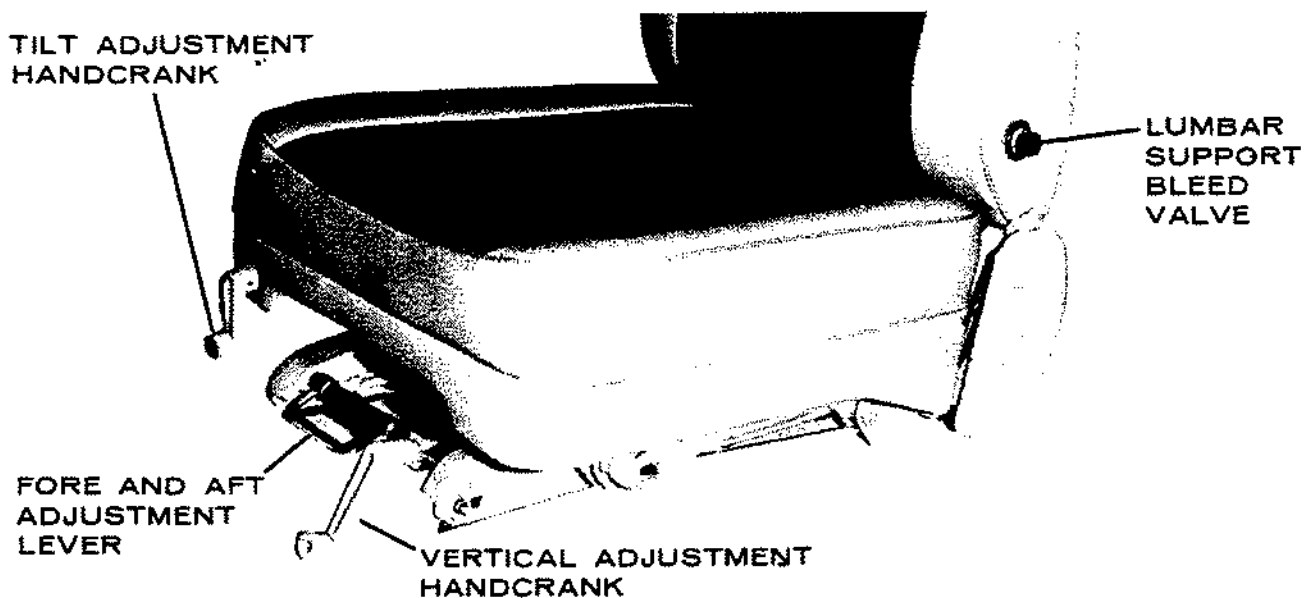


Figure 1

SECTION 2 — LIMITATIONS

Not Applicable.

SECTION 3 — EMERGENCY PROCEDURES

A. Loss of Cabin Pressure

1. Lumbar Support Bleed Valve - PRESS as required to decrease inflation.

SECTION 4 — NORMAL PROCEDURES

Controls for the manually adjustable seats, see Figure 1, are located at the forward side of the seat. Rotating the handcrank, located at the forward right corner of the seat, tilts the back. Rotating the handcrank, located at the forward left corner of the seat, raises and lowers the seat. The fore and aft adjustment lever is located at the forward side of the seat near the center. It is recommended that the seat be moved to the aft position prior to making tilt or vertical adjustments, to provide maximum handcrank clearance.

With the optional lumbar support installed and the seat adjusted as desired, lean back in a comfortable position and press the lumbar support bleed valve as required to achieve the desired level of support. During a climb to high altitude, cabin pressure will slowly decrease relative to the air pressure in the lumbar support, thus the support will expand. This can be corrected by bleeding off the excessive expansion by pressing the lumbar support bleed valve as required. During descents, the cabin pressure will slowly increase relative to the air pressure in the lumbar support, thus the support will contract. This can be corrected by unloading the seat back and pressing the bleed valve as required.

SECTION 5 — PERFORMANCE

Not Applicable.

PROPELLER DEICE SYSTEM

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the propeller deice system.

Description

The propeller deice system consists of electrically heated boots on the propeller blades. Each boot consists of an inboard and outboard heating element, which receive their electrical power through a deice timer. To reduce power drain and maintain propeller balance, the timer directs current to the propeller boots in cycles between elements and between propellers.

The timer directs current to the propeller boots in cycles between boot elements and between propellers in the following sequence:

- Heating Period No. 1 - Outboard Halves - right engine blades.
- Heating Period No. 2 - Inboard Halves - right engine blades.
- Heating Period No. 3 - Outboard Halves - left engine blades.
- Heating Period No. 4 - Inboard Halves - left engine blades.

Each heating period lasts approximately 20 seconds.

A reading below the green arc on the propeller deice ammeter indicates that the blades of the propeller are not being deiced uniformly.

WARNING

When uneven deicing of the propeller blades is indicated, it is imperative that the deice system be turned OFF. Uneven deicing of the blades can result in propeller unbalance and engine failure.

Abnormal operation of the propeller deice system is indicated by the deice switch breaker tripping to the OFF position. Failure of the switch breaker to stay reset indicates that deicing is impossible for the propellers.

SECTION 2 — LIMITATIONS

Not Applicable.

SECTION 3 — EMERGENCY PROCEDURES

- A. If uneven deicing of propeller blades is indicated by excessive vibration:
1. Propellers - EXERCISE to MAX RPM.
 2. Propeller Ammeter - CHECK for proper operation by periodic fluctuations within the green arc. If reading is below the green arc indicating that the propeller blades may not be deiced uniformly:
 - a. Propeller Deice Switch - OFF.

CAUTION

Do not operate propeller deice for prolonged periods when propellers are not turning.

SECTION 4 — NORMAL PROCEDURES

- A. Preflight Inspection
1. Propeller Heating Elements - CHECK condition and attachment.
- B. Before Takeoff
1. Propeller Deice Switch - ON momentarily. Check propeller ammeter.
- C. Inflight
1. Propeller Deice Switch - ON before entering visible moisture with outside air temperature below 4.4°C (40°F).

NOTE

Energizing the propeller deice system early in icing conditions will prevent ice build up which will be thrown off and can chip the fuselage paint.

2. Leave icing conditions as soon as possible if airplane is not equipped for flight in icing conditions.

NOTE

Since propeller deice boots alone do not provide adequate protection for the entire airplane, icing conditions should be avoided whenever possible unless the airplane is equipped for flight in icing conditions. Refer to Ice Protection Equipment (Flight In Icing Conditions) supplement for details. If icing is encountered, close attention should be given to the pitot-static system, propellers, induction systems, wing and stabilizer leading edges and other components subject to icing.

SECTION 5 — PERFORMANCE

Not Applicable.

YAW DAMPER

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the yaw damper system.

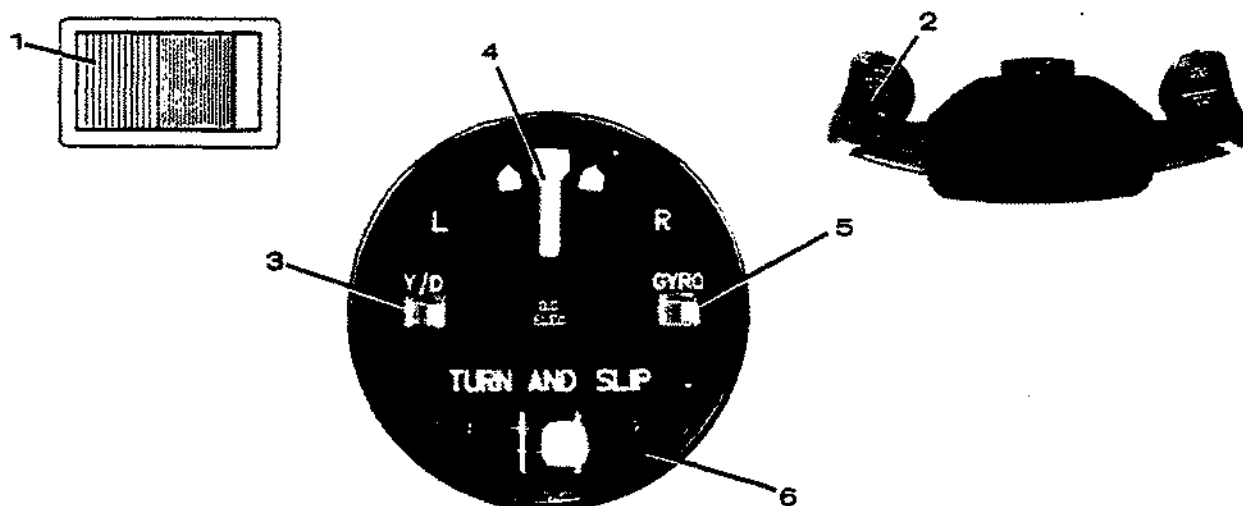
Description

The yaw damper is an independent system that may be engaged at any time regardless of the state of the autopilot or flight director. When engaged, the yaw damper provides yaw axis stabilization. The panel-mounted gyro computer turn-and-slip indicator, see Figure 1, provides yaw rate signals to operate the rudder servo. If an 800B Integrated Flight Control System is installed, the yaw damper is automatically engaged with the basic autopilot engagement and cannot be disengaged with the autopilot ON except by pulling the YAW DAMP circuit breaker.

NOTE

The flags in the turn-and-slip indicator will retract whenever power is applied to this unit.

YAW DAMPER CONTROLS AND INDICATOR



1. YAW DAMPER ON-OFF SWITCH - Turns yaw damper on and holds it on until switch is turned off or control wheel autopilot disengage switch is depressed.
2. CONTROL WHEEL
AUTOPILOT/ELECTRIC ELEVATOR
TRIM DISENGAGE SWITCH (RED) - When depressed, turns yaw damper off.
3. Y/D FLAG - When yellow flag disappears, indicates power is supplied to the yaw damper computer.
4. RATE-OF-TURN POINTER - Indicates rate and direction of airplane yaw movement.
5. GYRO FLAG - When red flag disappears, indicates power is applied to the gyro.
6. SLIP INDICATOR - Indicates slip or skid when ball is displaced from center.

Figure 1

SECTION 2 — LIMITATIONS

- A. Disengage yaw damper if malfunction occurs.
- B. Required Placards:
 - 1. On Circuit Breaker Panel:
 - a. "YAW DAMP"
 - 2. Near Yaw Damper Switch:
 - a. "YAW DAMP-ON-OFF"
 - b. If yaw damper switch is located on the autopilot control head, change item "a" to "YAW ON."
 - 3. On Pilot's Control Wheel:
 - a. "AUTOPILOT - DISENGAGE" (also disengages yaw damper).

SECTION 3 — EMERGENCY PROCEDURES

- A. Hardover Rudder Deflection
 - 1. Rudder - OVERPOWER. Requires approximately 70 pounds.
 - 2. Autopilot Disengage Switch - DISENGAGE.
 - 3. Yaw Damper Circuit Breaker - PULL.
 - 4. If optional autopilot installed - REENGAGE if desired.
- B. Excessive Rudder Forces (Gear Train Jammed)
 - 1. Rudder pedal forces in excess of normal control forces required to overpower the slip clutch in the event of a jammed servo actuator will not exceed 70 pounds.

SECTION 4 — NORMAL PROCEDURES

- A. Engagement
 - 1. Yaw Damper ON-OFF Switch - ON. With 800B Integrated Flight Control System installed, the yaw damper is automatically engaged with the autopilot.
 - 2. Gyro and Y/D Flags - VERIFY that both are out of view.
- B. Disengagement
 - 1. Autopilot Disengage Switch - DISENGAGE (Or)
 - 2. Yaw Damper ON-OFF Switch - OFF. With 800B Integrated Flight Control System installed, the yaw damper is disabled by pulling the YAW DAMP circuit breaker.

SECTION 5 — PERFORMANCE

Not Applicable.

400 ENCODING ALTIMETER (TYPE EA-401A)

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the 400 encoding altimeter.

Description

The Cessna 400 encoding altimeter (Type EA-401A) 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 Air Traffic Control Radar Beacon System transponder in the airplane to generate replies to Mode C (altitude reporting) interrogations from the ground controller.

The 400 encoding altimeter, see Figure 1, 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. Friction-induced lag and jumping of the display is reduced by the use of a combined aneroid sensor and motor-driven display. Electronic damping circuits in the unit insure that the display follows altitude changes rapidly with no overshoot. When power is removed from the altimeter, a striped warning flag appears across the digital altitude display to indicate a "power-off" condition.

Except for setting pressure, operation of the altimeter is completely automatic. Ambient atmospheric pressure, set into the altimeter with a manually operated baroset knob, is displayed on a four-digit readout, either in inches of mercury or in millibars (as ordered). The pressure 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 millibars).

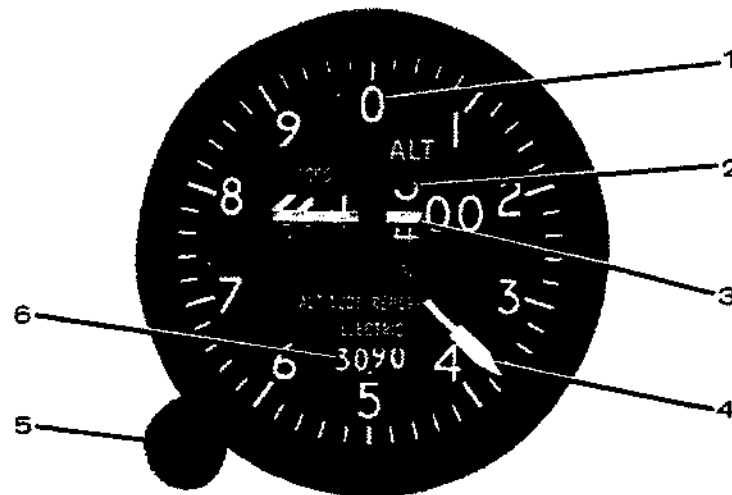
SECTION 2 — LIMITATIONS

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

SECTION 3 — EMERGENCY PROCEDURES

- A. Encoding Altimeter Failure (Warning Flag Showing)
 - 1. ALT Circuit Breaker - CHECK IN.
 - 2. If warning flag is still showing, use the standby barometric altimeter.

400 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. POWER-OFF WARNING FLAG - Appears across altitude readout when power is removed from altimeter to indicate that readout is not reliable.
4. 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 (ones, tens and hundreds).
5. BAROSET KNOB - Used to set in atmospheric pressure; clockwise rotation increases pressure setting, counterclockwise rotation decreases pressure setting.
6. ATMOSPHERIC PRESSURE READOUT - Displays atmospheric pressure set into the altimeter with the baro set knob on the four-digit counter.

Figure 1

SECTION 4 — NORMAL PROCEDURES

A. Altimeter Operation

1. Baroset Knob - TURN as necessary to set readout to required pressure.
2. Power Off Warning Flag - VERIFY that flag is not in view.

WARNING

Do not attempt to use altimeter indication for flight information if warning flag is in view. Flag indicates that power has been removed from the altimeter.

3. Altitude Display - Below 1000 feet, read altitude on display pointer and dial. Above 1000 feet, read altitude on altitude readout plus pointer and dial indication for last two digits (for example, for an altitude of 12,630 feet, read 12,600 feet on readout and read 30 feet on pointer and dial).

B. Altitude Encoding Operation.

Operation of the altitude encoding function of the altimeter is completely automatic as soon as power is applied to the altimeter and the warning flag is out of view. However, for transmission of the altitude information to the ground controller, the Mode C (ALT) function must be selected on the transponder.

SECTION 5 — PERFORMANCE

Not Applicable.

800 ALTITUDE ENCODING/ALERTING/PRESELECT (TYPE EA-801A)

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the 800 encoding altimeter.

Description

The Cessna 800 encoding altimeter (Type EA-801A) is an electrically driven instrument that senses airplane altitude and provides the pilot with a visual display of the altitude. It also includes an optical encoder which automatically produces a logic code corresponding to the sensed altitude. This code is supplied to the Air Traffic Control Radar Beacon System transponder in the airplane to generate replies to Mode C (altitude reporting) interrogations from the ground controller. A second altitude information output from the altimeter can be coupled to airplane accessory equipment such as an altitude alerter or an autopilot altitude preselector circuit.

The altitude alerter (Type AA-801A) is an accessory unit used with the 800 encoding altimeter to supply a preselected altitude capture signal to arm the altitude hold function of the Integrated Flight Control System. It also provides visual and aural warnings when the airplane deviates from the selected altitude.

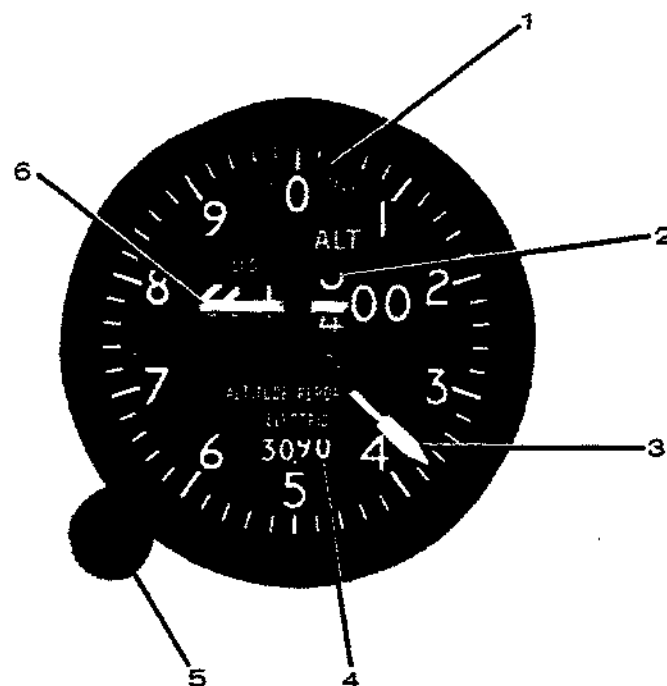
The encoding altimeter is a panel-mounted barometric altimeter with an altitude range of -1000 to +35,000 feet. Altitude is displayed by a dial and a digital readout. The dial is graduated in 10 numerical divisions which represent increments of 100 feet, with subdivision markings for every 20 feet; the 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. Friction-induced lag and jumping of the display is reduced by the use of a combined aneroid sensor and motor-driven display. Electronic damping circuits in the unit insure that the display follows altitude changes rapidly with no overshoot. When power is removed from the altimeter, a striped warning flag appears across the digital altitude display to indicate a "power-off" condition.

Ambient atmospheric pressure 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). The pressure 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.

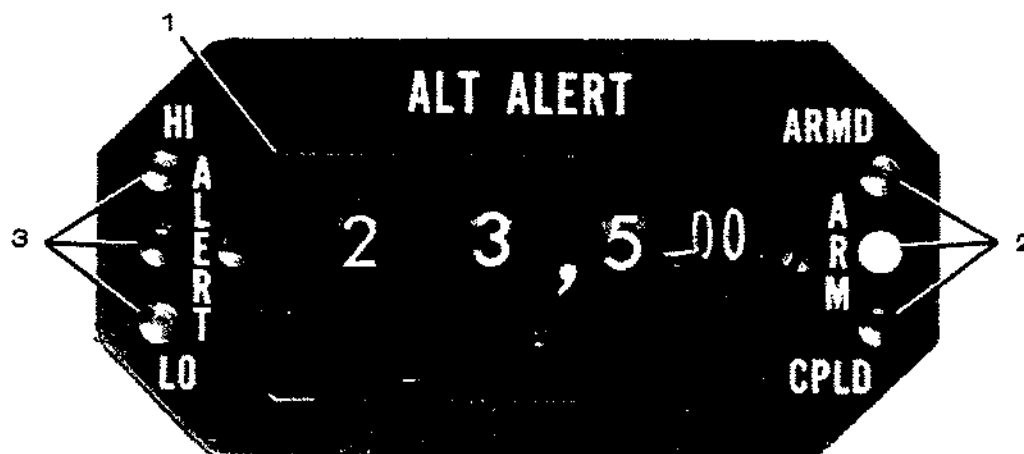
ENCODING ALTIMETER INDICATOR



1. ZERO-TO-THOUSAND FOOT
ALTITUDE DISPLAY DIAL - Calibrated in 10 numerical graduations which represent increments of 100 feet; the subdivisions of each graduation represent 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 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 last three digits of altitude (ones, tens, and hundreds).
4. ALTIMETER SETTING READOUT - Displays altimeter setting set into altimeter with baro set knob on a four-digit counter.
5. BAROSET KNOB - Used to set in local altimeter setting; clockwise rotation increases 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.

Figure 1

ALTITUDE ALERTER INDICATOR



1. ALTITUDE SELECTOR AND DISPLAY - Minilever switches (3) select desired altitude between 100 and 35,000 feet in 100-foot increments. Digital readout displays selected altitude.
2. ALTITUDE CAPTURE CONTROL AND INDICATORS - Selector switch and two-lamp indicator which operate as follows:
 - a. ARM Pushbutton Switch - Arms altitude capture function of Alserter, provided Integrated Flight Control System is turned on and not already engaged in a vertical mode (Altitude hold or glide slope coupled).
 - b. ARMD Amber Lamp - Lights when ARM pushbutton switch is pushed in and altitude capture function is enabled.
 - c. CPLD Green Lamp - Lights when airplane reaches selected altitude and Integrated Flight Control System altitude hold mode is automatically engaged.
3. ALTITUDE ALERT INDICATOR - Three-lamp indicator which operates within a preestablished range on either side of the selected altitude, as follows:
 - a. ALERT Green Lamp - Lights when airplane altitude is within 300 feet of the selected altitude.
 - b. HI ALERT Amber Lamp - Lights when airplane altitude is between 300 and 1000 feet above the selected altitude.
 - c. LO ALERT Amber Lamp - Lights when airplane altitude is between 300 and 1000 feet below the selected altitude.
 - d. ALT ALERT Amber Lamp - This remotely located lamp illuminates when either the HI ALERT or LO ALERT lamps illuminate.

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 glide slope 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 flight director mode selector lights to indicate that 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.

SECTION 2 — LIMITATIONS

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

SECTION 3 — EMERGENCY PROCEDURES

- A. Encoding Altimeter Failure (Warning Flag Showing)
 - 1. ENC ALT Circuit Breaker - CHECK IN.
 - 2. If warning flag is still showing, use the standby barometric altimeter.

SECTION 4 — NORMAL PROCEDURES

- A. Altimeter Operation
 - 1. Baroalt Knob - TURN as necessary to set readout to local altimeter setting.
 - 2. Power-off Warning Flag - VERIFY that flag is not in view.

WARNING

Do not attempt to use altimeter indication for flight information if warning flag is in view. Flag indicates that power has been removed from altimeter.

3. Altitude Display - Below 1000 feet, read altitude on display pointer and dial. Above 1000 feet, read altitude on altitude readout plus pointer and dial indication for last two digits (for example, for an altitude of 12,630 feet, read 12,600 feet on readout; read 30 feet on pointer and dial).

B. Altitude Encoding and Accessory Operation

Operation of the altitude encoding and accessory information functions of the altimeter is completely automatic as soon as power is applied to the altimeter and the warning flag is out of view. However, for transmission of the altitude information to the ground controller, the Mode C (ALT) function must be selected on the transponder.

C. Altitude Alert

NOTE

The altitude alerter must be used with a properly functioning 800 encoding altimeter for all operation.

During flight, altitude alert operation of the altitude alerter is automatic within the preestablished alert range. Operation may be verified on the ground as follows:

1. Apply power to the equipment. Altimeter power-off warning flag should disappear.
2. Set altitude selector switches to slightly more than 1000 feet above the altitude indicated on the encoding altimeter. Altitude is displayed on readout.
3. Begin to turn altimeter baroset knob to set altimeter reading to agree with selected altitude. When altitude reading reaches lower limit of alert range, one-second tone is heard and amber LO ALERT lamp lights.
4. Continue to turn baroset knob for selected altitude. When altitude reading is within altitude tolerance of alerter, the LO ALERT lamp goes out and the green ALERT lamp lights.
5. Turn baroset knob for altitude above altitude tolerance of alerter. Green lamp goes out, one-second tone is heard, and amber HI ALERT lamp lights.
6. Continue to turn baroset knob until altitude reading is above alert range. Just as altitude leaves alert range, the HI ALERT lamp goes out.
7. Turn off power; power-off warning flag appears.
8. Turn baroset knob to reset altimeter as required.

D. Altitude Capture

Altitude capture operation may be verified on the ground as follows:

1. Turn on airplane power. Power-off warning flag on altimeter should disappear.
2. Turn on Integrated Flight Control System and verify that a vertical mode is not selected.
3. Set altitude selector switches to desired altitude; altitude is displayed on readout.
4. Push in ARM pushbutton switch. Amber ARMD lamp lights.
5. Turn altimeter baroset knob to set altimeter reading to displayed alerter altitude. When altimeter is set, ARMD lamp goes out and green CPLD lamp lights. The altitude hold indicator lamp on the flight director mode selector will also light.
6. Turn off power. Power-off warning flag appears and all indicator lamps go out.
7. Turn baroset knob to reset altimeter as required.

E. Altitude Capture Operating Notes

1. If the altitude selector switches are moved to a new position after the ARM pushbutton has been pushed in but before the altitude is captured, the alerter logic is reset and the ARM pushbutton must be pushed again to enable the new altitude.
2. After altitude capture, and altitude hold mode is established; if the airplane leaves the selected altitude, the green CPLD lamp will remain lit. The altitude deviation will be indicated by the altitude ALERT lamps and the discrepancy between the selected altitude displayed on the alerter and the airplane altitude displayed by the altimeter.
3. If the altitude selector switches are set to a different altitude after altitude capture, the Integrated Flight Control System will remain in the altitude hold mode but the green CPLD lamp will go out to indicate that the altitude displayed is not the altitude at which the airplane is being held.
4. If altitude hold is manually selected on the flight director mode selector prior to automatic altitude capture, the ARMD lamp will go out, the CPLD lamp will not light, and the capture logic circuits will have to be reset for the next use. The function may be reset after altitude hold is disengaged.

SECTION 5 — PERFORMANCE

Not Applicable.

400B NAV-O-MATIC AUTOPILOT SYSTEM (TYPE AF-550A)

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the 400B Nav-O-Matic autopilot system.

Description

The 400B Nav-O-Matic autopilot system is a two-axis autopilot system that controls the ailerons and elevators to maintain the airplane in a desired attitude. A horizon gyro and directional gyro are provided to display attitude and heading. An optional HSI, see Figure 3, can be installed in place of the directional gyro.

All controls and indicators necessary to properly operate the autopilot are shown in Figures 1 and 2, except for the autopilot disconnect test button, the autopilot off light, the back course selector switch and the navigation receiver selector switch.

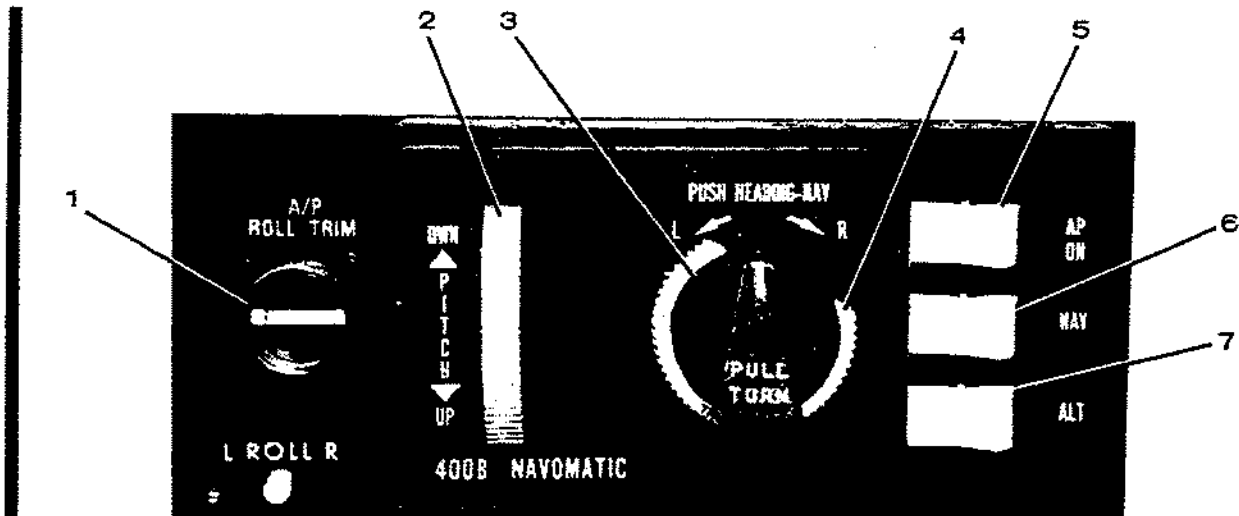
An automatic autopilot disengage function is provided which automatically disengages the autopilot anytime the airplane pitches up or down more than a normal amount from a level flight attitude. The operational capability of the disengage function should be tested before takeoff by pressing the autopilot disconnect test button, located adjacent to the autopilot control head. When the test button is pressed with the autopilot engaged, a test voltage is inserted into the autopilot, causing slight aft control column movement and autopilot disengagement. Do not press this button in flight. Inflight actuation of the test button with the autopilot engaged will cause the airplane to pitch up sharply and disengage the autopilot.

The autopilot off (A/P OFF) light, located adjacent to the horizon gyro, will illuminate when the autopilot is disengaged by any means other than the airplane control wheel disengage switch. Whenever the autopilot is disengaged by any means, 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 autopilot disengage switch.

The back course selector switch, located on the left instrument panel, is only used when conducting localizer approaches. With the navigation receiver set to a localizer frequency, positioning the switch to BACK COURSE will reverse the appropriate signals to provide for back course operation for either autopilot or manual flight. Except with an HSI type indicator, selecting BACK COURSE causes reversal of the course deviation indicator indication, whether or not the autopilot is being used.

The navigation receiver selector switch, located on the left instrument panel when dual navigation receivers are installed, allows the autopilot to operate in conjunction with either navigation receiver. If a non-slaved directional gyro is installed, no course datum information is available.

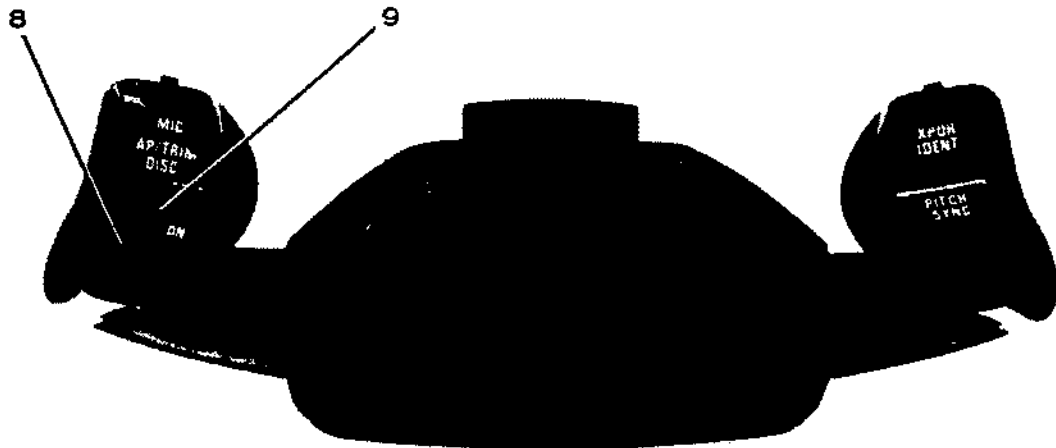
AUTOPILOT CONTROL HEAD AND AIRPLANE CONTROL WHEEL



1. AUTOPILOT PITCH COMMAND WHEEL - Controls pitch attitude of the airplane. Rotating up, commands airplane pitch up proportional to rotation of the wheel. Rotating down, commands airplane pitch down.
2. 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. Indicator is active with autopilot and/or flight director engaged or disengaged.
3. AUTOPILOT TURN COMMAND KNOB - When knob is pulled out in the center detent position, the knob can be rotated left or right which will command a left or right bank. The control knob when pushed in, sets the autopilot in directional gyro heading or navigation mode if either are selected.
4. AUTOPILOT LATERAL TRIM CONTROL - When the autopilot turn command knob is pulled out and centered, with no lateral modes engaged and the airplane manually trimmed for existing flight conditions, the control is used to trim the autopilot for a wings level attitude.
5. AUTOPILOT ON-OFF SWITCH - Controls primary power to autopilot.

Figure 1 (Sheet 1 of 2)

AUTOPILOT CONTROL HEAD AND AIRPLANE CONTROL WHEEL



6. AUTOPILOT NAVIGATION

ENGAGE SWITCH - Pressing the NAV side of the switch with the autopilot turn command knob pushed in provides capture and track of VOR (omni) or LOC (localizer) signals, depending upon the selected navigation receiver frequency, and RNAV course, if installed. Pressing the left side of the switch resets the switch and returns autopilot directional control to the directional gyro HDG selector knob (heading bug). The navigation mode can also be disengaged by pulling the autopilot turn command knob.

7. ALTITUDE HOLD ENGAGE SWITCH - Commands the airplane to maintain the pressure altitude existing at the moment of selection. Engagement may be accomplished in climb, descent or level flight. This mode can be used with all lateral command modes. With the autopilot navigation mode engaged, altitude hold will automatically disengage when a glide slope signal is captured.

8. AIRPLANE CONTROL WHEEL

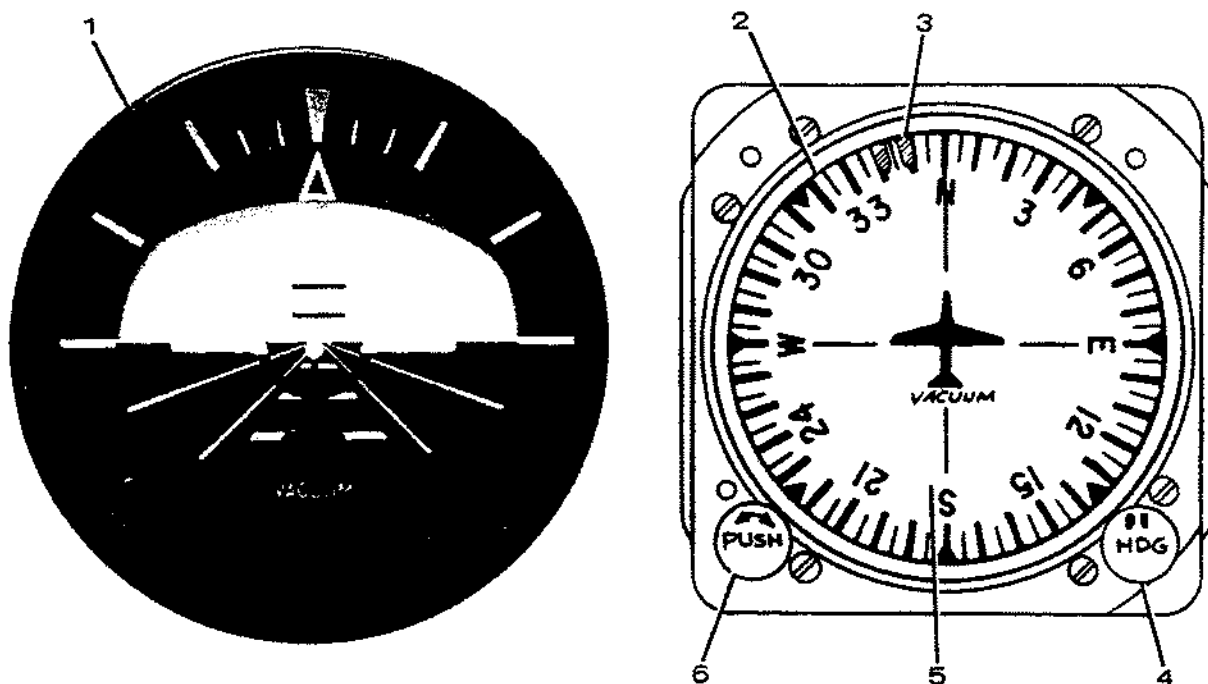
ELECTRIC TRIM SWITCH - When moved forward to the DN position, the elevator trim tab moves in the nose-down direction; conversely, moving the switch aft to the UP position moves the trim tab in the nose-up direction. The electric trim switch is inoperative when the autopilot is engaged.

9. AUTOPILOT/ELECTRIC ELEVATOR

TRIM DISENGAGE SWITCH (RED) - Disengages the autopilot and a short (1 to 2 seconds) tone with decreasing amplitude is heard in the cockpit. Disables the electric trim while the switch is depressed.

Figure 1 (Sheet 2 of 2)

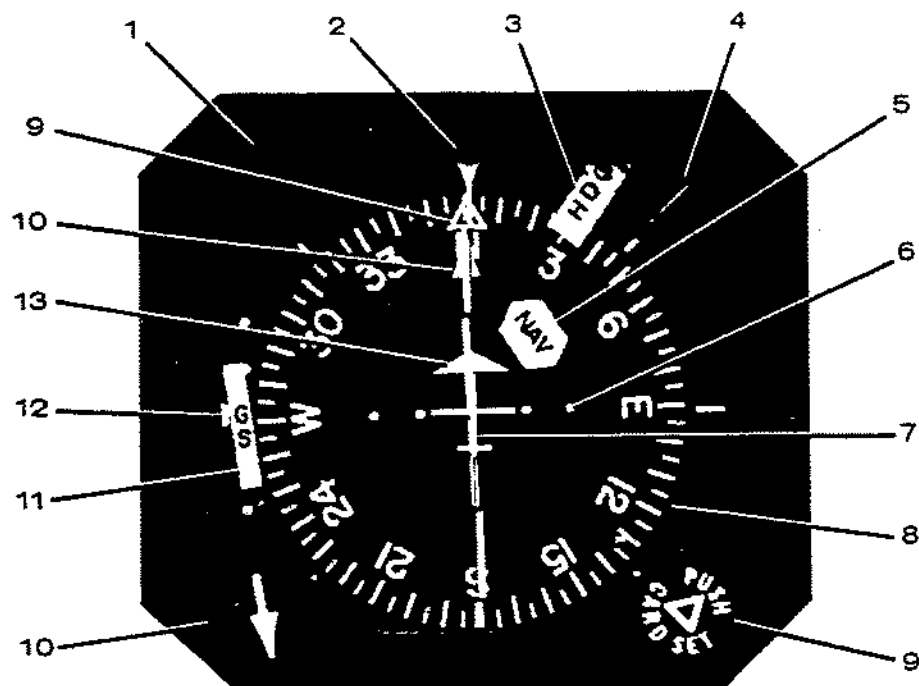
HORIZON AND DIRECTIONAL GYROS



1. HORIZON GYRO - Displays airplane attitude as a conventional attitude gyro. The roll reference scale indicates 0, 10, 20, 30, 60 and 90° of bank.
2. DIRECTIONAL GYRO - The unslaved directional gyro, or optional slaved directional gyro, displays heading of the airplane when properly set to agree with the magnetic compass.
3. HEADING BUG - Displays the selected heading relative to the compass card.
4. HEADING SELECTOR KNOB - The heading bug is positioned by rotating the directional gyro HDG selector knob.
5. COMPASS CARD - Rotates to display airplane heading.
6. COMPASS CARD KNOB - When pushed in, allows manual setting of the compass card to agree with the magnetic compass. The unslaved directional gyro compass card must be reset periodically to compensate for precessional errors in the gyro.

Figure 2

HORIZONTAL SITUATION INDICATOR



1. HORIZONTAL SITUATION INDICATOR (HSI) - Provides a pictorial presentation of the airplane position relative to VOR radials, RNAV course, localizer and glide slope beams. It also gives heading reference with respect to magnetic north and provides selection of desired heading, VOR radials, RNAV course, and LOC runway heading.
2. HSI HEADING REFERENCE - Indicates airplane heading on compass card.
3. HSI HEADING FLAG - Flag in view indicates the heading data is not reliable.
4. 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).
5. HSI NAV FLAG - Flag in view indicates the NAV receiver signal being received is inadequate.

Figure 3 (Sheet 1 of 2)

HORIZONTAL SITUATION INDICATOR

6. HSI COURSE DEVIATION DOTS - Full scale course deviation bar displacement (2 dots) represents the following deviation from beam center; VOR $\pm 10^\circ$, localizer approximately $\pm 2^\circ$, RNAV enroute ± 5 nautical miles, RNAV approach $\pm 1\text{--}1/4$ nautical miles.
7. HSI COURSE DEVIATION BAR - Displays displacement from the VOR, RNAV or localizer course center.
8. HSI COMPASS CARD - The compass card displays airplane heading. It is slaved to correct for normal precessional errors. Each graduation represents 5 degrees.
9. 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.
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, RNAV course or LOC runway heading. It rotates with the compass card.
11. HSI GLIDE SLOPE FLAG - Flag in view indicates glide slope receiver signal is inadequate.
12. HSI GLIDE SLOPE POINTER, SCALE AND FLAG - Displays deviation of airplane from an ILS glide slope. Flag obscures scale when the signal being received is not adequate. Full scale deflection of the glide slope pointer represents $\pm 0.7^\circ$.
13. HSI TO-FROM FLAG - Indicates direction of the VOR station relative to the selected course.

Figure 3 (Sheet 2 of 2)

SECTION 2 — LIMITATIONS

- A. Autopilot must be off for takeoff, landing and all operations with wing flaps down more than 15° .
- B. Approach VOR radial at an angle of 135° or less prior to engaging navigation mode.
- C. Approach localizer at an angle of 90° or less prior to engaging navigation mode.
- D. Approach glide slope from below.
- E. Disengage autopilot if malfunction occurs.
- F. Maximum speed for autopilot operation is 230 KIAS.

G. Required placards:

1. On Circuit Breaker Panel
 - a. "AUTOPILOT" - "COMP" - "ACT" - "WARN" (3 Circuit Breakers).
 - b. "ELECT TRIM"
2. Near Autopilot Control Head
 - a. "A/P TEST - BEFORE EACH FLT"
3. On Instrument Panel
 - a. "AUTOPILOT - NAV-1 - NAV-2"
 - b. "FRONT - BACK"
4. On Instrument Panel Near Autopilot Off Light (Near Horizon Gyro)
 - a. "A/P OFF"
5. On Pilot's Control Wheel
 - a. "AUTOPILOT - DISENGAGE"
 - b. "ELEV TRIM - DISENGAGE"
 - c. "UP-DN"

SECTION 3 — EMERGENCY PROCEDURES

A. Autopilot Malfunction

1. Elevator Or Aileron Control - OVERPOWER as required.
2. All Airplane Control Wheel Disengage Switches - DISENGAGE.

NOTE

- All airplane control wheel disengage switches should be simultaneously disengaged to prevent having to immediately distinguish between an autopilot or an electric elevator trim malfunction.
- Sustained elevator overpower will result in the autopilot trimming against the overpower force.

B. Engine Failure

1. Airplane Control Wheel Autopilot Disengage Switch - DISENGAGE.
2. Operative Engine - ADJUST as required.
3. Inoperative Engine - SECURE.
4. Trim Tabs - ADJUST.
5. Autopilot - REENGAGE if desired.

NOTE

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

C. Possible altitude loss if autopilot malfunctions (includes altitude loss prior to pilot recognition):

1. Cruise Configuration - 600 feet.
2. Approach Configuration - 200 feet.

D. Airplane control wheel forces required to overpower the autopilot (prior to autopilot elevator trimming against the overpower force) will not exceed:

1. Elevator - 40 pounds.
2. Aileron - 20 pounds.

- E. 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:
1. Elevator - 50 pounds.
 2. Aileron - 20 pounds.

SECTION 4 - NORMAL PROCEDURES

I. BEFORE TAKEOFF

- A. Autopilot Automatic Disconnect Check (With Engines Running And Gyros Erected)
1. Autopilot Turn Command Knob - PULL OUT and CENTER.
 2. Autopilot Lateral Trim Control - CENTER.
 3. Autopilot On-Off Switch - ON.

NOTE

The roll servo will engage immediately. The pitch servo will engage after pitch synchronization as evidenced by the autopilot pitch command wheel coming to rest.

4. Airplane Control Wheel - HOLD to reduce movement.
5. Autopilot Disconnect Test Button - PUSH and HOLD.
6. Verify the following:
 - a. Autopilot On-Off Switch - OBSERVE disengage.
 - b. Autopilot Off Light - OBSERVE illumination.
 - c. Autopilot Disengage Horn - OBSERVE 1 to 2 second aural tone.
7. Airplane Control Wheel
Autopilot Disengage Switch - PUSH to turn off the autopilot off light.

II. BASIC AUTOPILOT OPERATION

- A. Before Engagement
1. Airplane Elevator, Aileron And Rudder Trim - ADJUST.
- B. Engagement
1. Autopilot Turn Command Knob - PULL OUT and CENTER.
 2. Autopilot Lateral Trim Control - CENTER.
 3. Autopilot On-Off Switch - ON.
 4. Autopilot Lateral Trim Control - ADJUST.

NOTE

- Airplane rudder trim should be adjusted as required to center the turn and bank "ball". Airplane aileron trim may have to be readjusted to compensate for large airspeed changes.
- If the airplane will not maintain the correct attitude with the autopilot engaged; disengage the autopilot, manually retrim the airplane to obtain wings level with the turn and bank "ball" centered, then reengage the autopilot.

- C. Turn Commands
 - 1. Autopilot Turn Command Knob - PULL OUT and ROTATE as desired.
- D. Pitch Commands
 - 1. Altitude Hold Engage Switch - CHECK OFF.
 - 2. Autopilot Pitch Command Wheel - ROTATE as desired.
- E. Disengagement
 - 1. Autopilot On-Off Switch - OFF. (Or)
 - 2. Airplane Control Wheel Autopilot Disengage Switch - DISENGAGE.

NOTE

- If the autopilot is either disengaged with the control head on-off switch or is automatically disengaged due to a system malfunction, the autopilot off light will continuously illuminate and a 1 to 2 second aural tone will occur. The autopilot off light may be extinguished by cycling the airplane control wheel autopilot disengage switch.
- Normal autopilot disengagement should be conducted with the airplane control wheel autopilot disengage switch. The autopilot off light will not illuminate but the 1 to 2 second aural tone will occur.

III. ALTITUDE HOLD COUPLING

- A. Engagement
 - 1. Altitude Hold Engage Switch - ALT.
- B. Disengagement (Altitude Hold Coupling)
 - 1. Altitude Hold Engage Switch - OFF.

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

- Altitude hold mode should be disengaged before actuating the autopilot pitch command wheel. Autopilot pitch command wheel rotation will not disengage altitude hold mode.
- Altitude hold mode will automatically disengage on a coupled ILS approach when the glide slope is captured.

IV. HEADING SELECT FUNCTION

- A. Engagement
 - 1. Directional Gyro Heading Selector Knob - ROTATE bug to the desired magnetic heading.
 - 2. Autopilot Turn Command Knob - PUSH to engage.
 - 3. Directional Gyro Heading Selector Knob - ADJUST for any subsequent desired heading.
- B. Disengagement (Heading Select Function)
 - 1. Autopilot Turn Command Knob - PULL. (Or)
 - 2. Autopilot Navigation Engage Switch - NAV.

V. ILS/LOCALIZER COUPLING

A. Engagement

1. Instrument Panel Navigation Receiver Selector Switch - NAV 1 or NAV 2 if dual navigation receivers are installed.
2. Course Selector Knob - ADJUST to localizer front course bearing for both front and back course approaches.
3. Instrument Panel Back Course Switch - FRONT or BACK as applicable. Check annunciator light if back course is selected.
4. Wing Flaps - DOWN 15° if all engines operative.
5. Airspeed - 110 to 130 KIAS (120 To 130 KIAS If Engine Inoperative).
6. Directional Gyro Heading Selector Knob - ROTATE bug for radar vectors and/or 30° to 45° localizer intercept angle.
7. Autopilot Turn Command Knob - PUSH to engage heading mode.
8. When course deviation indicator moves off of the peg:
 - a. With course datum on selected navigation receiver:
 - (1) Autopilot Navigation Engage Switch - NAV.
 - b. Without course datum on selected navigation receiver:
 - (1) Directional Gyro Heading Selector Knob - ADJUST to coincide with localizer inbound heading.
 - (2) Autopilot Navigation Engage Switch - NAV.

NOTE

- Navigation mode is not recommended for tracking outbound on a back course localizer approach due to the possibility of capturing a false glide slope.
- In course datum systems, the navigation course information required by the autopilot is provided automatically from the course setting function on the HSI or CDI.
- In non-course datum systems, the navigation course information required by the autopilot is provided separately from the heading bug on the directional gyro.
- Airplane deviation from the selected localizer course or VOR radial beam is supplied directly to the autopilot from the CDI or HSI.

9. Altitude Hold Engage Switch - CHECK automatic disengagement at glide slope capture.
- OFF if localizer approach only. Adjust autopilot pitch command wheel for proper descent.

NOTE

- Glide slope must be approached from below.
- Back course mode disables the glide slope couple function.

10. Landing Gear - DOWN at outer marker if all engines operative.
11. Airspeed - 110 to 130 KIAS (120 To 130 KIAS If Engine Inoperative).
12. Landing Gear - DOWN within gliding distance of field, if engine inoperative landing.
13. Wing Flaps - DOWN 45° when landing is assured, if engine inoperative landing.

NOTE

Autopilot must be off when wing flaps are down more than 15°.

- B. Disengagement (ILS/Localizer Coupling)
1. Autopilot Turn Command Knob - PULL. (Or)
2. Autopilot Navigation Engage Switch - OFF.

NOTE

Complete autopilot disengagement should normally be conducted at the appropriate minimums with the airplane control wheel autopilot disengage switch.

VI. VOR COUPLING (Airplane Configurations for VOR Approach - Refer To ILS/Localizer Coupling Procedure)

A. Engagement

1. Instrument Panel Navigation Receiver Selector Switch - NAV 1 or NAV 2.
2. Course Selector Knob - ADJUST to desired VOR course.
3. Directional Gyro Heading Selector Knob - ROTATE bug to obtain airplane heading within 135° of desired VOR course.
4. Autopilot Turn Command Knob - PUSH to engage heading mode.

5. When the airplane is within 135° of desired VOR course:
 - a. With course datum on selected navigation receiver:
 - (1) Autopilot Navigation Engage Switch - NAV.
 - b. Without course datum on selected navigation receiver:
 - (1) Directional Gyro Heading Selector Knob - ADJUST to VOR course heading.
 - (2) Autopilot Navigation Engage Switch - NAV.

NOTE

- When the airplane is established on course, the computer will automatically switch into a "track" mode. When course changes greater than 20° are required, disengage the autopilot navigation engage switch, rotate the course selector knob and then reengage the autopilot navigation engage switch.
- In course datum systems, the navigation course information required by the autopilot is provided automatically from the course setting function on the HSI or CDI.
- In non-course datum systems, the navigation course information required by the autopilot is provided separately from the heading bug on the directional gyro.

- B. Disengagement (VOR Coupling)
 1. Autopilot Navigation Engage Switch - OFF. (Or)
 2. Autopilot Turn Command Knob - PULL to disengage.

NOTE

Complete autopilot disengagement should normally be conducted on a VOR approach at the appropriate minimums with the airplane control wheel autopilot disengage switch.

SECTION 5 — PERFORMANCE

Not Applicable.

CHECKLIST DISPLAY UNIT CC-2024B

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the CC-2024B Checklist Display Unit.

Description

The Bendix CC-2024B Checklist Display, an option to the RDR-150, RDR-160 and RDR-1100 color radar systems, is operated by a control unit accessible to the pilot and copilot. Power for the unit is provided through the color radar indicator. All controls are located on the front panel of the control unit, see Figure 1. In addition, a telephone type socket on the control unit accepts the plug from the CK-2029A hand held keyboard programmer which is required to program the checklist. Programming is accomplished by manipulating a complete set of alphanumeric keys, plus an assortment of symbols, on the keyboard. No internal batteries are required since power is derived from the checklist control unit.

The system can be programmed to provide 16 pages of checklist information. Each page contains a maximum of 12 lines with up to 32 alphanumeric characters in each line. Instructions for use are printed on the back of the keyboard. The keyboard remains connected to the checklist control unit only during the initial programming or when updating the program is desired. When not in use, the keyboard may be stored in any convenient place, e.g., the glove compartment.

The checklist may be programmed to operate in either the SIMPLE mode or in the SMART mode which includes an index of checklists. Programming instructions in either of these modes is provided in Bendix Checklist Pilots Manual ASC-853.

SECTION 2 — LIMITATIONS

Not Applicable.

SECTION 3 — EMERGENCY PROCEDURES

Not APPLICABLE.

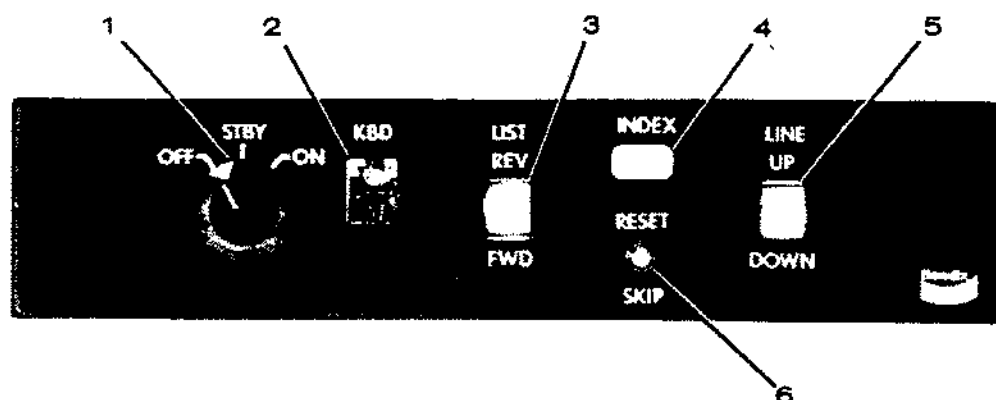
SECTION 4 — NORMAL PROCEDURES

1. Radar Function Switch - AS REQUIRED for normal radar display.
2. Checklist Function Switch - ON. First page of checklist will be displayed and will override any radar display.
3. List Button - AS REQUIRED.
4. Line Button - AS REQUIRED.

SECTION 5 — PERFORMANCE

Not Applicable.

CHECKLIST DISPLAY CONTROLS



1. FUNCTION SWITCH - Turns unit on and off and selects the following functions:
 - OFF - Removes primary power from the unit. The radar indicator in the system will operate normally.
 - STBY - Applies power to the unit allowing normal radar display but maintains the checklist on alert.
 - ON - Applies power to the unit.
 - SMART mode displays INDEX page.
 - SIMPLE mode displays page 1.
2. KBD - Receptacle for a connecting CK-2029A keyboard for programming.
3. LIST FWD/REV SWITCH - Moves the checklist presentation one page or list forward or backward.
4. INDEX
 - SIMPLE Mode - Displays first checklist page with top line highlighted.
 - SMART Mode - Displays first index page of checklists with top list highlighted. When the desired list is selected (using the LINE button), pressing the INDEX button again displays the highlighted checklist. Pressing the INDEX button a third time returns the display to the index page with the last checklist used highlighted.

Figure 1 (Sheet 1 of 2)

CHECKLIST DISPLAY CONTROLS

5. LINE UP/DOWN SWITCH - When a page or checklist is selected, the first line is highlighted in white. Pressing the LINE switch downward once, "checks off" an item and moves the highlighter to the next line. Pressing the LINE switch upward reverses the procedure.
- SIMPLE Mode - Highlighted line is white, other lines are blue.
- SMART Mode - Highlighted line is white, unchecked lines are yellow and checked off lines are blue.
6. SKIP/RESET Button
(SMART Mode only) - Pressing SKIP/RESET button causes the highlighted item to be stored in a "skip list" and the next line is highlighted. As a reminder the letters "SK" will flash in the upper right corner alternately with the page number. Pressing the INDEX button will display the "skip list" in yellow. The items are now checked off using the LINE DOWN switch. As each item on the "skip list" is checked off, it will disappear from the display and remaining items will move up.

Figure 1 (Sheet 2 of 2)

1000 COMMUNICATION SYSTEM (TYPE 1038A)

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the 1000 communication system.

Description

The Cessna 1000 communication system (Type 1038A) 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 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 communication system consists of a panel-mounted module control unit, see Figure 1, a remotely located receiver-transmitter unit, a VHF communication antenna and interconnecting cables. The system utilizes the airplane's microphone, headphone and speaker systems.

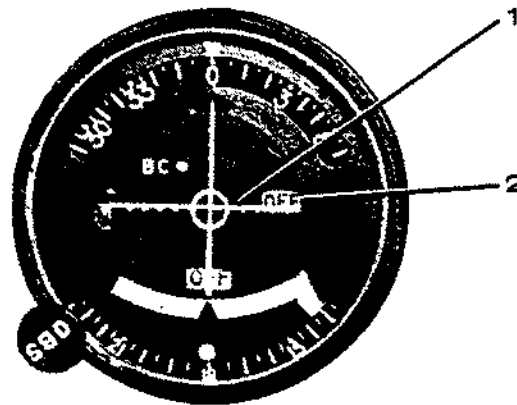
All of the required operating controls are mounted on the front panel of the module control unit except the microphone switch, emergency frequency selector and master lamp test switch.

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 FAN circuit breaker.

SECTION 2 — LIMITATIONS

Not Applicable.

GLIDE SLOPE INDICATOR



1. GLIDE SLOPE DEVIATION INDICATOR - Indicates deviation from normal glide slope.
2. GLIDE SLOPE OFF FLAG - When visible, flag indicates unreliable glide slope signal or improperly operating equipment. The flag disappears when a reliable glide slope signal is being received.

Figure 1

SECTION 4 — NORMAL PROCEDURES

A. Glide Slope Operation

1. Turn on associated VHF navigation set.
2. Select localizer frequency; the paired glide slope frequency will be automatically selected.
3. Identify localizer station and make certain that the glide slope OFF flag is out of sight.

SECTION 5 — PERFORMANCE

Not Applicable.

HF-200 TRANSCEIVER

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the HF-200 transceiver.

Description

The Collins 200 HF transceiver is an airborne, 20-channel, single sideband (SSB) radio with a compatible amplitude modulated (AM) transmitting-receiving system for long-range voice communications in the 2.0 to 22.9999 MHz frequency range. The system consists of a panel-mounted receiver/exciter (see Figure 1), a remote-mounted power amplifier/power supply, an antenna coupler and an externally mounted, fixed wire, medium/high frequency antenna.

A channel selector knob determines the operating frequency of the transceiver which has a preprogrammed frequency memory circuit board installed to provide the desired operating frequencies. A mode selector control is provided to supply the type of emission for the channel, either sideband; AM; split-channel, reduced-carrier telephone mode; or split-channel, suppressed-carrier telephone mode. A volume knob, clarifier knob and squelch knob are provided to assist in audio operation during the receiver mode.

The system utilizes the airplane microphone, headphone and speaker. Operation and description of audio control panels used in conjunction with this radio are shown and described in Section 9 of this handbook.

SECTION 2 — LIMITATIONS

Not Applicable.

SECTION 3 — EMERGENCY PROCEDURES

Not Applicable.

SECTION 4 — NORMAL PROCEDURES

A. To Receive.

1. HF Com Switch - ON.
2. HF Com Audio Switch - SPEAKER or PHONE (On Audio Control Panel).
3. OFF/VOL Control - CLOCKWISE. Allow 15 minutes warmup (time required for frequency standard to stabilize).
4. Channel Selector - SELECT desired frequency. (Use the pullout channel/frequency card to correlate channel number and frequency.)
5. Mode Selector - AS REQUIRED.
6. Squelch Control - ADJUST the audio gain counterclockwise for normal noise output; then, slowly adjust clockwise until the receiver is silent.
7. Clarifier Control - ADJUST when upper single sideband RF signal is being received for maximum clarity.

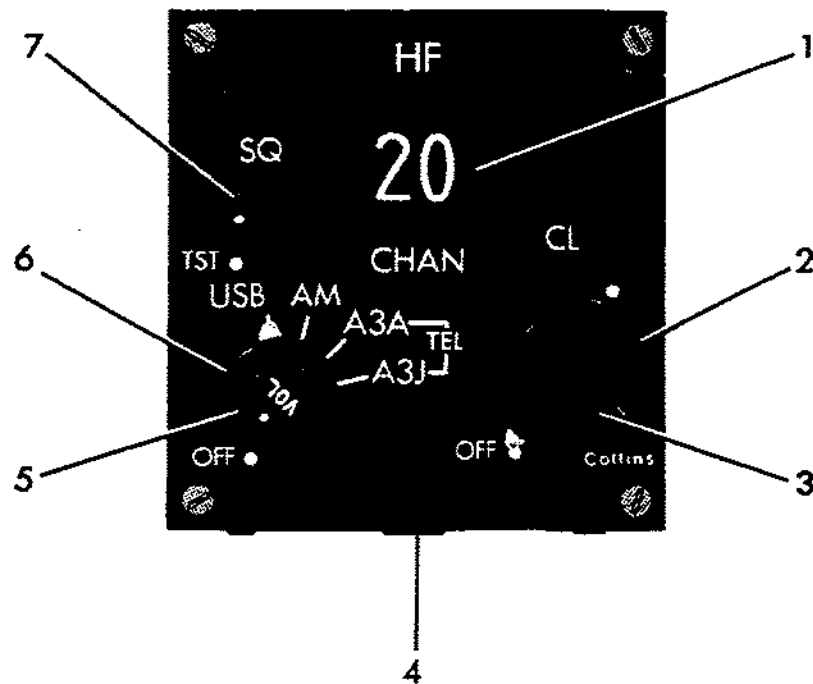
B. To Transmit.

1. Microphone Selector Switch - HF COMM (On Audio Control Panel).
2. Microphone Switch - Press.

SECTION 5 — PERFORMANCE

Not Applicable.

HF-200 TRANSCEIVER CONTROLS



1. CHANNEL WINDOW - Displays selected operating channel.
2. CLARIFIER CONTROL - Switch portion enables (out of detent) or disables (OFF position) clarifier function. Rotating the control permits tuning the received frequency ± 100 Hz (USB or TEL modes only). The clarifier function is automatically disabled during transmit.
3. CHANNEL SELECTOR CONTROL - Selects desired channel.
4. CHANNEL/FREQUENCY CARD - Pulls out to provide an index of transmit and receive frequencies programmed for each of the 20 channels.
5. ON/OFF/VOL CONTROL - Controls application of primary power to the entire system and varies audio gain.
6. MODE CONTROL - Selects system mode of operation.
 - AM - Selects compatible AM operation and full AM reception.
 - USB - Selects upper sideband operation for long-range voice communications.
 - TEL - Used for public correspondence telephone, ship to shore.
7. SQUELCH CONTROL - Squelch position enables (out of detent) or disables (Test Position) squelch function. Rotating the control sets the squelch threshold.

Figure 1

400B INTEGRATED FLIGHT CONTROL SYSTEM (TYPE IF-550A)

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the 400B Integrated Flight Control System.

Description

The Cessna 400B Integrated Flight Control System (IFCS) (Type IF-550A) provides a capability of automatic flight control or manual control with precision flight direction provided by computed command information. The complete presentation for the system is displayed on the flight director indicator (FDI), the mode selector and the horizontal situation indicator (HSI).

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 4, by means of a symbolic airplane and pitch and roll command bars. The pilot flies the airplane to satisfy the two command bars, thus following the calculated flight path determined by the computer.

A horizontal situation indicator (HSI), see Figure 3, 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, LOC runway heading and RNAV course, if installed. Course datum is available on Nav 1 and Nav 2.

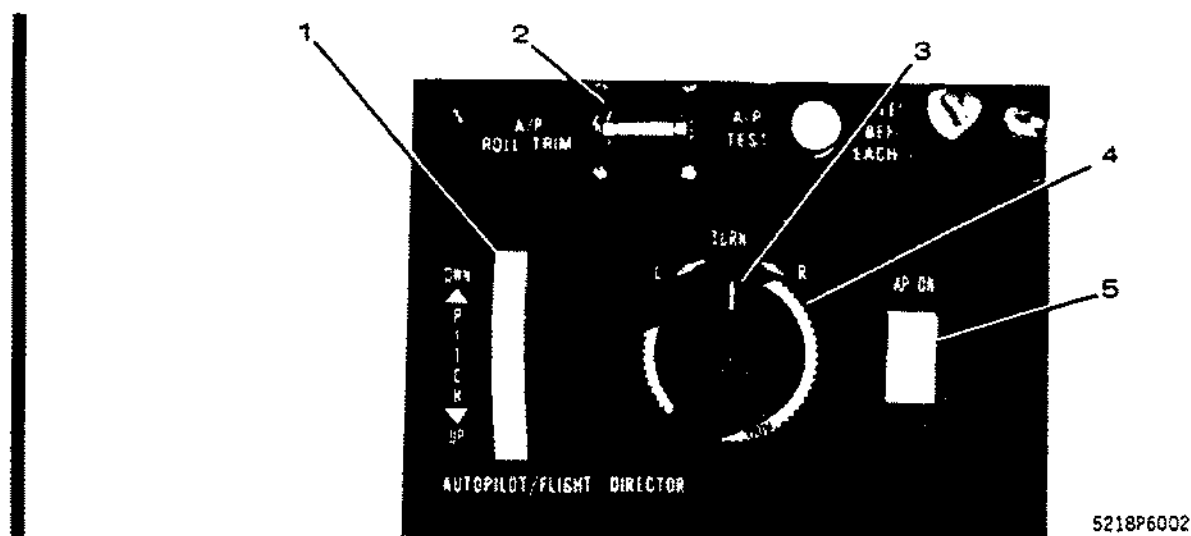
For automatic flight, the autopilot on-off switch on the autopilot control head, see Figure 1, is activated. Pitch and roll manual command controls are also located on this control head. All other normal modes of flight are controlled from the mode selector, see Figure 2.

An automatic autopilot disengage function is provided to automatically disengage the autopilot any time the airplane pitches up or down more than a normal amount from a level flight attitude. The operational capability of the disengage function should be tested before takeoff by pressing the autopilot disconnect test button, located adjacent to the autopilot control head. When the test button is pressed with the autopilot engaged, a test voltage is inserted into the autopilot, causing slight aft control column movement and autopilot disengagement. Do not press this button in flight. Inflight actuation of the test button, with the autopilot engaged, will cause the airplane to pitch up sharply and disengage the autopilot.

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 disengage switch. Whenever the autopilot is disengaged by any means, 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 DISC switch.

The pilot's control wheel, see Figure 1, incorporates four switches for other related autopilot operations. Three of the switches, which are mounted on the left side of the control wheel, provide for operation of electric elevator trim, autopilot disengage and electric elevator trim disengage. The fourth switch, located on the right side of the control wheel, provides for operation of the flight director pitch synchronization. The left throttle control, see Figure 7-1, incorporates the GA switch, which provides for operation in the go-around mode. When pressed, the flight director GA mode is engaged if the FD or AP mode is engaged. The GA annunciator will light, all other modes are cancelled and the autopilot is disengaged. The GA mode provides a preset pitch-up and wings level command. Repressing the GA switch, selecting the HDG mode or reengaging the autopilot will cancel the GA mode.

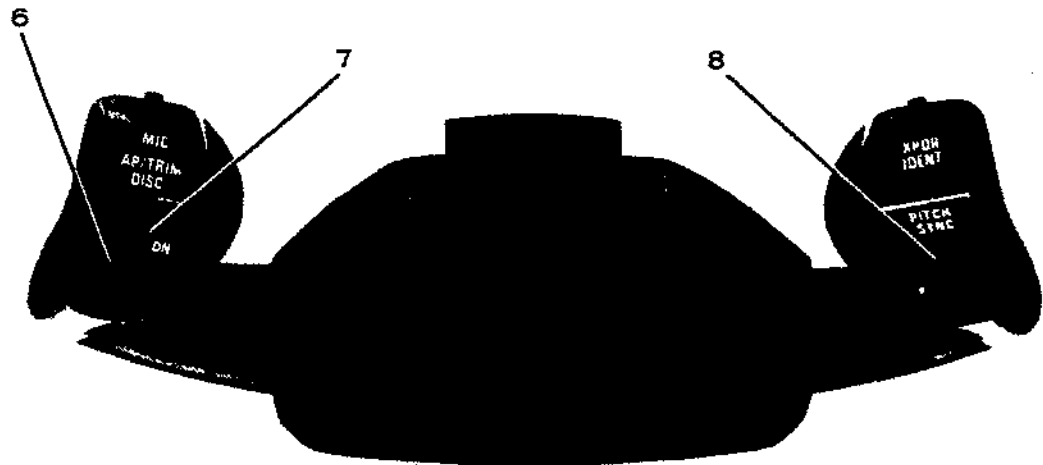
400B IFCS AUTOPILOT CONTROL HEAD AND AIRPLANE CONTROL WHEEL



1. AUTOPILOT PITCH COMMAND WHEEL - Controls pitch attitude of the airplane. Rotating up, commands airplane pitch up proportional to rotation of the wheel. Rotating down, commands airplane pitch down.
2. 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. Indicator is active with autopilot and/or flight director engaged or disengaged.
3. AUTOPILOT TURN COMMAND KNOB - Controls roll attitude of the airplane. When turned left or right, the knob will command a left or right bank accordingly. When moved from the center detent position, it disconnects the heading (HDG) or navigation (NAV) modes if selected on the mode selector.

Figure 1 (Sheet 1 of 2)

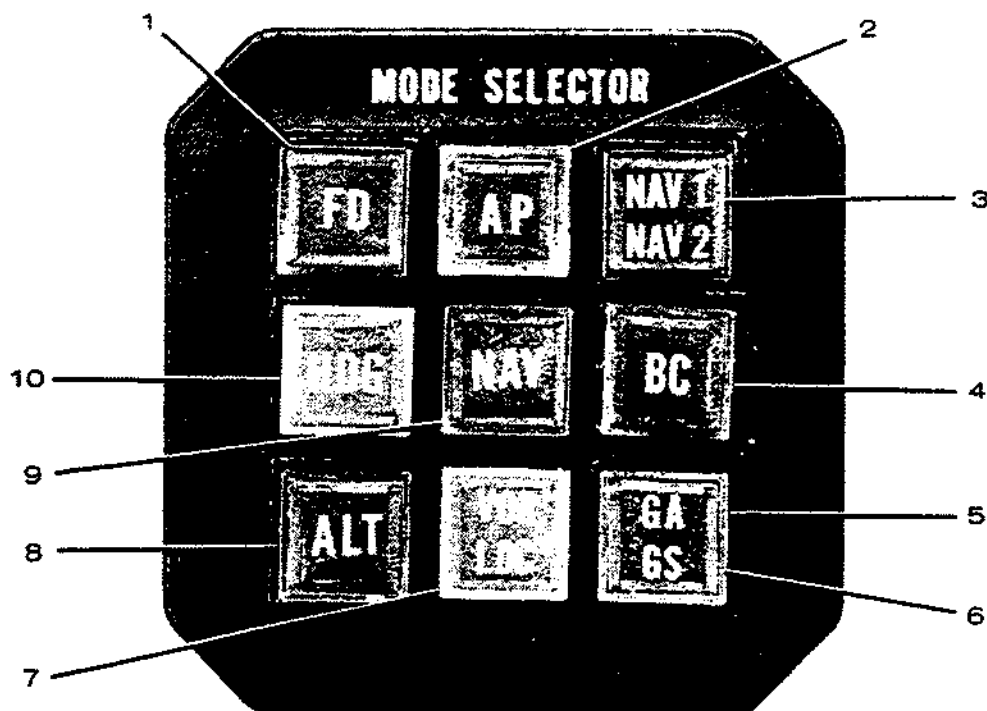
400B IFCS AUTOPILOT CONTROL HEAD AND AIRPLANE CONTROL WHEEL



4. AUTOPILOT LATERAL TRIM CONTROL - When the turn command knob is centered, with no lateral modes engaged and the airplane manually trimmed for existing flight conditions, the control is used to trim the IFCS for a wings level attitude.
5. AUTOPILOT ON-OFF SWITCH - Engages autopilot when in the ON position if all interlocks are valid. The autopilot annunciator on the mode selector will light when the autopilot is engaged.
6. ELECTRIC 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. The electric trim switch is inoperative when the autopilot is engaged.
7. AUTOPILOT/ELECTRIC ELEVATOR TRIM DISENGAGE SWITCH (RED) - Disengages the autopilot and a short (1 to 2 seconds) tone with decreasing amplitude is heard in the cockpit. Disables the electric trim while the switch is depressed.
8. PITCH SYNCHRONIZATION (PITCH SYNC) BUTTON - When the FD mode is engaged, the pitch command bar will automatically synchronize to the pitch command at the time of engagement. To resynchronize the pitch command bar after a new pitch attitude is established, manually depress, but do not hold, the PITCH SYNC button on the control wheel. Depressing the button also disengages the altitude hold mode.

Figure 1 (Sheet 2 of 2)

400B IFCS MODE SELECTOR



1. FLIGHT DIRECTOR MODE
SELECTOR BUTTON - Engages or disengages the flight director mode. The FD annunciator will light and command bars on the FDI will appear.
2. AUTOPILOT MODE SELECTOR
ANNUNCIATOR LIGHT - Lights when the autopilot is engaged.
3. NAV 1 - NAV 2
MODE SELECTOR BUTTON - Selects the navigation receiver for IFCS operation. The receiver that is connected to the IFCS is annunciated. Pressing the button will transfer the IFCS to the other receiver with appropriate annunciation.
4. BACK COURSE MODE
SELECTOR BUTTON - Engages or disengages the back course mode and is used with localizer operation only. With the autopilot or flight director off or on and the navigation receiver set to a localizer frequency, the back course mode will reverse the appropriate signals to provide for back course operation for either automatic or manual flight. Except with an HSI type indicator, selecting the back course mode causes reversal of the course deviation indication, whether or not the IFCS is being used. The back course annunciator will light when the back course mode is engaged.
5. GO-AROUND MODE
SELECTOR ANNUNCIATOR LIGHT - The go-around annunciator will light when the go-around mode is engaged.

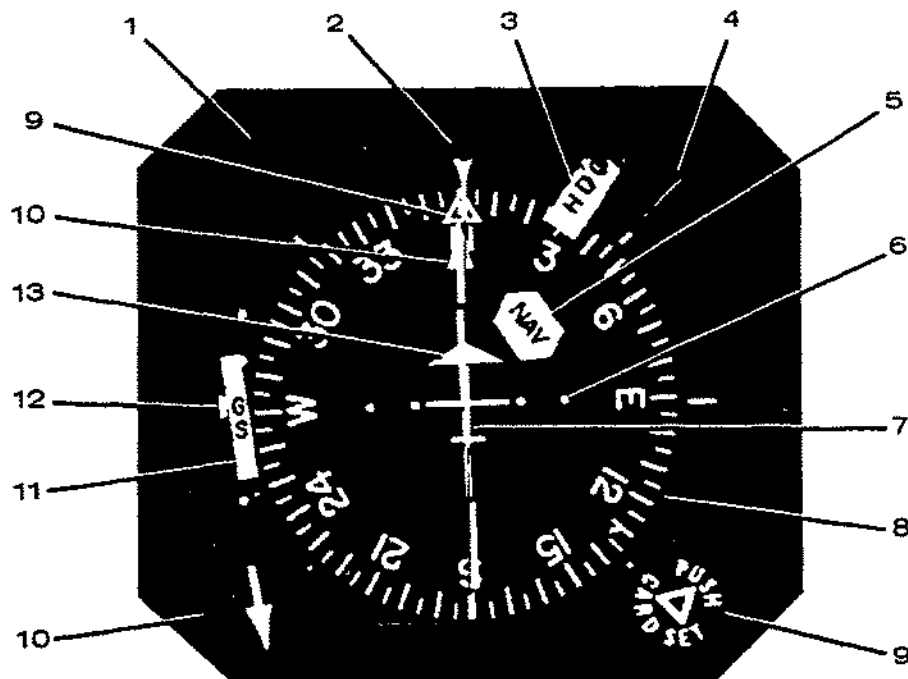
Figure 2 (Sheet 1 of 2)

400B IFCS MODE SELECTOR

6. GLIDE SLOPE MODE
SELECTOR ANNUNCIATOR LIGHT - When the NAV/LOC mode is engaged and the glide slope automatically engages, the glide slope annunciator will light.
7. VOR/LOCALIZER MODE
SELECTOR ANNUNCIATOR LIGHT - When the AP or FD navigation mode is engaged, either the VOR or LOC annunciator will light to reflect the frequency selected on the navigation receiver. The VOR/LOC light will only illuminate while in the AP or FD navigation mode.
8. ALTITUDE HOLD
MODE SELECTOR BUTTON - Engages or disengages the altitude hold mode. The ALT annunciator will light when the mode is engaged. Engagement may be accomplished in either climb, descent or level flight, which commands the airplane to maintain the pressure altitude existing at the moment of selection. This mode can be used with all lateral command modes. In the NAV-LOC mode, altitude hold will automatically disengage when the glide slope engages. The go-around mode, when engaged, will also disengage the altitude hold mode. When the optional 800 encoding altimeter system is installed, altitude hold can be engaged automatically by the optional altitude/preselect system.
9. NAV MODE SELECTOR BUTTON - Engagement provides for capture and track of the VOR (omni) or LOC (localizer), dependent upon the frequency selected on the navigation receiver. During NAV-LOC operation, the glide slope mode will automatically engage only at the beam center and when the beam is approached from below. If the go-around switch on the left throttle control is actuated, the navigation mode will automatically be cancelled and all associated annunciator lights will go out.
10. HEADING MODE SELECTOR BUTTON - Engages the heading mode, which commands the airplane to turn to and maintain a heading selected on the HSI. The HDG annunciator will light when the mode is engaged. A new heading may be selected at any time and will result in a command to turn to the new heading with a bank angle of approximately 25°. The heading mode will cancel the go-around mode.

Figure 2 (Sheet 2 of 2)

400B IFCS HORIZONTAL SITUATION INDICATOR



1. HORIZONTAL SITUATION INDICATOR (HSI) - Provides a pictorial presentation of the airplane position relative to VOR radials, RNAV course, localizer and glide slope beams. It also gives heading reference with respect to magnetic north and provides selection of desired heading, VOR radials, RNAV course and LOC runway heading.
2. HSI HEADING REFERENCE - Indicates airplane heading on compass card.
3. HSI HEADING FLAG - Flag in view indicates the heading data is not reliable.
4. 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).
5. HSI NAV FLAG - Flag in view indicates the navigation receiver signal being received is inadequate.

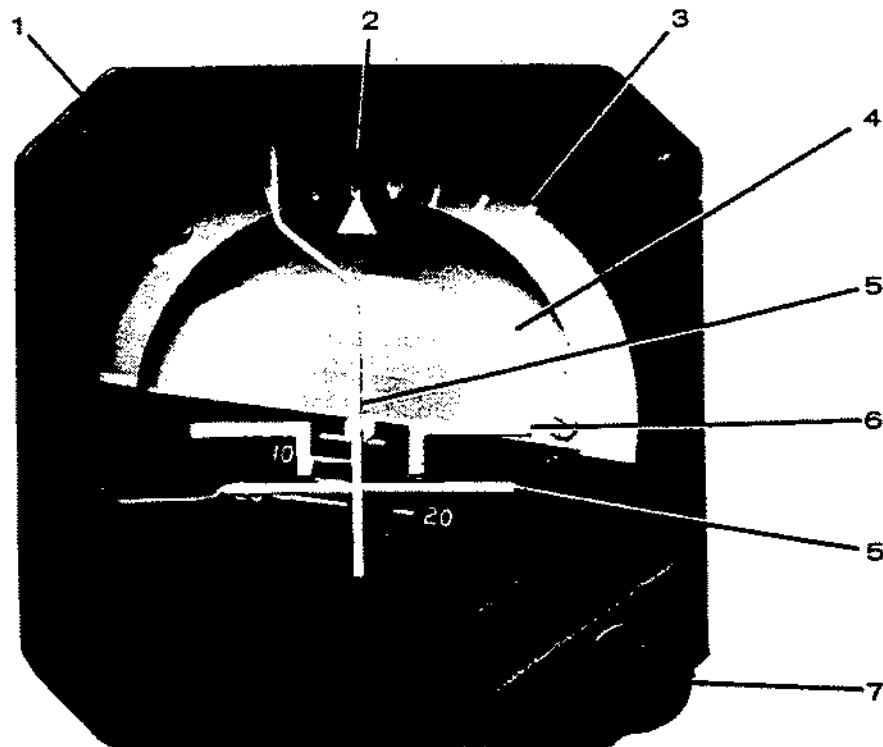
Figure 3 (Sheet 1 of 2)

400B IFCS HORIZONTAL SITUATION INDICATOR

6. HSI COURSE DEVIATION DOTS - Full scale course deviation bar displacement (2 dots) represents the following deviation from beam center; VOR $\pm 10^\circ$, localizer approximately $\pm 2-1/2^\circ$, RNAV enroute ± 5 nautical miles, RNAV approach $\pm 1-1/4$ nautical miles.
7. HSI COURSE DEVIATION BAR - Displays displacement from the VOR, RNAV or localizer course center.
8. HSI COMPASS CARD - The compass card displays airplane heading. It is slaved to correct for normal precessional errors. Each graduation represents 5 degrees.
9. HSI HEADING BUG AND HEADING SELECTOR KNOB -
 - When knob is rotated in the normal (out) position, selects airplane autopilot heading and positions heading bug to indicate selected heading on the compass card.
 - When knob is pushed in and rotated, permits setting of the compass card to agree with the magnetic compass. The course cursor and course deviation bar will rotate with the compass card.
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, RNAV course or LOC runway heading. It rotates with the compass card.
11. HSI GLIDE SLOPE FLAG - Flag in view indicates the glide slope receiver signal is inadequate.
12. HSI GLIDE SLOPE POINTER, SCALE AND FLAG - Displays deviation of airplane from an ILS glide slope. Flag obscures scale when the signal being received is not adequate. Full scale deflection of the glide slope pointer represents $\pm 0.7^\circ$.
13. HSI TO-FROM FLAG - Indicates direction of the VOR station relative to the selected course. Displays TO when a LOC frequency is selected.

Figure 3 (Sheet 2 of 2)

400B IFCS FLIGHT DIRECTOR INDICATOR



1. FLIGHT DIRECTOR INDICATOR (FDI) - Displays airplane attitude as a conventional attitude gyro and displays commands for flight director operation.
2. FDI ROLL ATTITUDE INDEX - Displays airplane roll attitude read against roll attitude scale.
3. FDI ROLL ATTITUDE SCALE - Movable scale marked at 0, ± 10 , ± 20 , ± 30 , ± 60 and ± 90 degrees.
4. FDI PITCH ATTITUDE SCALE - Moves with respect to the symbolic airplane to display airplane pitch and roll attitude. The scale is graduated at 0, ± 5 , ± 10 , ± 15 and ± 20 degrees.
5. FDI COMMAND BARS - Displays computed steering commands referenced to the dot in the symbolic airplane.
6. FDI SYMBOLIC AIRPLANE - Airplane attitude is displayed by the relationship between the fixed symbolic airplane and the movable background. The symbolic airplane is normally aligned with the horizon line for normal cruise attitude. During flight director operation, the symbolic airplane is flown to align its center dot with the command bars to satisfy the flight director commands.
7. FDI SYMBOLIC AIRPLANE ALIGNMENT KNOB - Provides manual positioning of the symbolic airplane for pitch attitude alignment.

Figure 4

SECTION 2 — LIMITATIONS

- A. Autopilot must be off for takeoff, landing and all operations with wing flaps down more than 15°.
- 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. Approach glide slope from below.
- E. Disengage autopilot if malfunction occurs.
- F. Maximum speed for autopilot operation is 230 KIAS.
- G. Required Placards:
 - 1. On Circuit Breaker Panel
 - a. "AUTOPILOT" - "COMP" - "ACT" - "WARN" (3 Circuit Breakers)
 - b. "TRIM POWER"
 - 2. Near Autopilot Control Head
 - a. "A/P TEST - BEFORE EACH FLIGHT"
 - 3. On Instrument Panel Near Autopilot Off Light (Near Flight Director Indicator)
 - a. "A/P OFF"
 - 4. On Pilot's Control Wheel
 - a. "AUTOPILOT-DISENGAGE"
 - b. "ELEV TRIM - DISENGAGE"
 - c. "PITCH SYNC"
 - d. "UP - DN"
 - 5. On Left Throttle Control
 - a. "GA"

SECTION 3 — EMERGENCY PROCEDURES

- A. Autopilot Malfunction
 - 1. Elevator Or Aileron Control - OVERPOWER as required.
 - 2. All Airplane Control Wheel Disengage Switches - DISENGAGE.

NOTE

- All airplane control wheel disengage switches should be simultaneously disengaged to prevent having to immediately distinguish between an autopilot or an electric elevator trim malfunction.
- Sustained elevator overpower will result in the autopilot trimming against the overpower source.

- B. Engine Failure
 - 1. Airplane Control Wheel Autopilot Disengage Switch - DISENGAGE.
 - 2. Operative Engine - ADJUST as required.
 - 3. Inoperative Engine - SECURE.
 - 4. Trim Tabs - ADJUST.
 - 5. Autopilot - REENGAGE if desired.

NOTE

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

- C. Possible altitude loss if autopilot malfunctions (includes altitude loss prior to pilot recognition):
 - 1. Cruise Configuration - 600 feet.
 - 2. Approach Configuration - 200 feet.
- D. Airplane control wheel forces required to overpower the autopilot (prior to autopilot elevator trimming against the overpower force) will not exceed:
 - 1. Elevator - 40 pounds.
 - 2. Aileron - 20 pounds.
- E. 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:
 - 1. Elevator - 50 pounds.
 - 2. Aileron - 20 pounds.

SECTION 4 — NORMAL PROCEDURES

I. BEFORE TAKEOFF

- A. Autopilot Automatic Disconnect Check (With Engines Running And Gyros Erected)
 - 1. Autopilot Turn Command Knob - CENTER.
 - 2. Autopilot Lateral Trim Control - CENTER.
 - 3. Autopilot On-Off Switch - ON. Observe annunciation on mode selector.

NOTE

The roll servo will engage immediately. The pitch servo will engage after pitch synchronization as evidenced by the autopilot pitch command wheel coming to rest.

- 4. Flight Director Mode Selector Button - ENGAGE. Observe annunciation.
 - 5. Airplane Control Wheel - HOLD to reduce movement.
 - 6. Autopilot Disconnect Test Button - PUSH and HOLD.
 - 7. Verify the following:
 - a. Flight Director Indicator - OBSERVE up command.
 - b. Autopilot On-Off Switch - OBSERVE disengage.
 - c. Autopilot Off Light - OBSERVE illumination.
 - d. Autopilot Disengage Horn - OBSERVE 1 to 2 second aural tone.
 - 8. Airplane Control Wheel
Autopilot Disengage Switch - PUSH to turn off the autopilot off light.
 - 9. Flight Director Mode Selector Button - DISENGAGE.
- ##### II. BASIC AUTOPILOT OPERATION (FLIGHT DIRECTOR ON OR OFF)
- A. Before Engagement
 - 1. Airplane Elevator, Aileron and Rudder Trim - ADJUST.
 - B. Engagement
 - 1. Autopilot Turn Command Knob - CENTER DETENT.
 - 2. Autopilot Lateral Trim Control - CENTER.
 - 3. Airplane Control Wheel
Pitch Synchronization Button - MOMENTARILY DEPRESS to synchronize the flight director pitch command bar to the flight attitude if the flight director is engaged.

4. Autopilot On-Off Switch - ON. Observe annunciation.
5. Autopilot Lateral Trim Control - ADJUST.

NOTE

- Airplane rudder trim should be adjusted as required to center the turn and bank "ball". Airplane aileron trim may have to be readjusted to compensate for large airspeed changes.
- If the airplane will not maintain the correct attitude with the autopilot engaged, disengage the autopilot, manually retrim the airplane to obtain wings level with the turn and bank "ball" centered, then reengage the autopilot.

- C. Turn Commands:
 1. Autopilot Turn Command Knob - ROTATE as desired.
- D. Pitch Commands:
 1. Altitude Hold Mode Selector Button - CHECK DISENGAGED.
 2. Autopilot Pitch Command Wheel - ROTATE as desired.
- E. Disengagement:
 1. Autopilot On-Off Switch - OFF. (Or)
 2. Airplane Control Wheel
Autopilot Disengage Switch - DISENGAGE. (Or)
 3. Left Throttle Control
Go-Around (GA) Switch - ENGAGE. Refer to Go-Around Operation.

NOTE

- If the autopilot is either disengaged with the control head on-off switch or is automatically disengaged due to a system malfunction, the autopilot off light will continuously illuminate and a 1 to 2 second aural tone will occur. The autopilot off light may be extinguished by cycling the airplane control wheel autopilot disengage switch.
- Normal autopilot disengagement should be conducted with the airplane control wheel autopilot disengage switch. The autopilot off light will not illuminate but the 1 to 2 second aural tone will occur.
- Autopilot disengagement with the left throttle control go-around (GA) switch will not illuminate the autopilot off light but will give a 1 to 2 second aural tone. Refer to Go-Around Operation.

III. BASIC FLIGHT DIRECTOR OPERATION (AUTOPILOT OFF)

A. Engagement

1. Autopilot Turn Command Knob - CENTER DETENT.
2. Flight Director
Mode Selector Button - ENGAGE. Observe annunciation and flight director command bars.
3. Flight Director Symbolic
Airplane Alignment Knob - ALIGN with flight director pitch command bar.
4. Autopilot Lateral Trim Control - ADJUST as required to center the flight director roll command bar.

B. Basic Pitch Commands:

1. Manually fly the airplane to the desired pitch attitude.
2. Airplane Control Wheel
Pitch Synchronization Button - MOMENTARILY DEPRESS to synchronize the pitch command bar to the flight attitude.

NOTE

In a flight director only mode (autopilot off), the flight director pitch command bar will automatically synchronize to the pitch attitude at the time of engagement. If a new pitch attitude is flown, the airplane control wheel pitch synchronization button should be depressed to synchronize the flight director command bar to that attitude.

C. Altitude Hold, Heading Select and Navigation Coupling

NOTE

Altitude hold, heading select and navigation coupling procedures are identical to the procedures that follow 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.

D. Disengagement (Flight Director):

1. Flight Director Mode Selector Button - DISENGAGE.

IV. ALTITUDE HOLD COUPLING (FLIGHT DIRECTOR AND/OR AUTOPILOT MODES)

A. Engagement:

1. With Basic IFCS:
 - a. Altitude Hold Mode Selector Button - ENGAGE at desired altitude. Observe annunciation.

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.

NOTE

Once armed, the altitude alert/preselect can be disarmed only 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.

- B. Disengagement (Altitude Hold Coupling):
 1. Altitude Hold Mode Selector Button - DISENGAGE. (Or)
 2. Airplane Control Wheel Pitch Synchronization Button - MOMENTARILY DEPRESS.

WARNING

Do not attempt to use the encoding altimeter indicator for flight information if warning flag is in view. The flag indicates that power has been removed from the encoding altimeter.

NOTE

- The altitude hold mode selector button must be disengaged before actuating the autopilot pitch wheel. Autopilot pitch wheel rotation will not disengage the altitude hold mode.
- Altitude hold mode will automatically disengage in the coupled ILS mode when the glide slope is captured.

V. HEADING SELECT FUNCTION (FLIGHT DIRECTOR AND/OR AUTOPILOT MODES)

A. Engagement:

1. Autopilot Turn Command Knob - CENTER DETENT.
2. Directional Gyro
Heading Selector Knob - ROTATE bug to desired magnetic heading.
3. Heading Mode Selector Button - ENGAGE. Observe annunciation.
4. Directional Gyro
Heading Selector Knob - ADJUST for any subsequent desired heading.

NOTE

When an optional copilot's horizontal situation indicator or autopilot directional gyro is installed, the pilot's heading bug controls the heading when NAV 1 receiver is selected and the copilot's heading bug controls heading when NAV 2 receiver is selected.

B. Disengagement (Heading Select Function):

1. Heading Mode Selector Button - DISENGAGE. (Or)
2. Autopilot Turn Command Knob - ROTATE. (Or)
3. Navigation Mode Selector Button - ENGAGE.

VI. ILS/LOCALIZER COUPLING (FLIGHT DIRECTOR AND/OR AUTOPILOT MODE)

A. Engagement:

1. NAV 1 - NAV 2 Mode Selector Button - SELECT NAV 1 or NAV 2. Observe proper 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 - ENGAGE as applicable. Observe BC annunciation on mode selector.
4. Wing Flaps - DOWN 15° if all engines operative.
5. Airspeed - 110 to 130 KIAS (120 to 130 KIAS If Engine Inoperative).
6. Directional Gyro
Heading Selector Knob - ROTATE bug for radar vectors and/or 30° to 45° localizer intercept angle.
7. Autopilot Turn Command Knob - CENTER DETENT.
8. Heading Mode Selector Button - ENGAGE. Observe annunciation.

9. When course deviation indicator moves off the peg:
 - a. Navigation Mode
Selector Button - ENGAGE. Observe NAV and LOC annunciation on mode selector; HDG annunciation on mode selector will go out.

NOTE

Navigation mode is not recommended for tracking outbound on a back course localizer approach due to the possibility of capturing a false glide slope.

10. Altitude Hold
Mode Selector - CHECK automatic disengage at glide slope capture. Observe ALT annunciator on the mode selector goes out and GS annunciator illuminates.
 - OFF if localizer approach only. Adjust autopilot pitch command wheel for proper descent.

NOTE

- Glide slope must be approached from below.
- Back course disables IFCS glide slope couple function.

11. Landing Gear - DOWN at outer marker if all engines operative.
12. Airspeed - Maintain 110 to 130 KIAS (120 to 130 KIAS if Engine Inoperative).
13. Landing Gear - DOWN within gliding distance of field, if engine inoperative landing.
14. Wing Flaps - DOWN when landing is assured, if engine inoperative landing.

NOTE

Autopilot must be off when wing flaps are down more than 15°.

- B. Disengagement (ILS/Localizer Coupling):
 1. Navigation Mode Selector Button - DISENGAGE. (Or)
 2. Autopilot Turn Command Knob - ROTATE.

NOTE

Complete autopilot disengagement should normally be conducted at the appropriate minimums with the airplane control wheel disengage switch.

VII. VOR COUPLING (FLIGHT DIRECTOR AND/OR AUTOPILOT MODE) (AIRPLANE CONFIGURATION FOR VOR APPROACH - REFER TO ILS/LOCALIZER COUPLING PROCEDURES)

A. Engagement

1. NAV 1 - NAV 2 Mode Selector Button - SELECT NAV 1 or NAV 2. Observe proper annunciation.
2. Course Selector Knob - ADJUST to desired VOR course.
3. Directional Gyro Heading Selector Knob - ROTATE bug to within 135° of desired VOR course.
4. Autopilot Turn Command Knob - CENTER DETENT.
5. Heading Mode Selector Button - ENGAGE. Observe annunciation.
6. When airplane is within 135° of desired VOR course:
 - a. Navigation Mode Selector Button - ENGAGE. Observe NAV and VOR annunciation on mode selector; HDG annunciation on mode selector will go out.

NOTE

- The autopilot will intercept and track the selected VOR radial compensating for wind correction.
- When the airplane is established on course, the computer will automatically switch into a "track" mode. When course changes greater than 20° are required, disengage the navigation mode selector, rotate the course selector knob and then reengage the navigation mode selector.

B. Disengagement (VOR Coupling):

1. Navigation Mode Selector Button - DISENGAGE. (Or)
2. Autopilot Turn Command Knob - ROTATE.

NOTE

Complete autopilot disengagement should normally be conducted on a VOR approach at the appropriate minimums with the airplane control wheel autopilot disengage switch.

VIII. GO-AROUND OPERATION (FLIGHT DIRECTOR AND/OR AUTOPILOT MODE)

A. Left Throttle Control

Go-Around Switch - ENGAGE. Observe GA and FD annunciation on mode selector if not already engaged.

NOTE

The go-around mode gives a wings level, pitch up command (4° to 6° nose up) on the flight director indicator pitch command bar only. Actuation of go-around mode disengages the autopilot.

- B. Disengagement (Go-Around):
1. Left Throttle Control Go-Around Switch - CYCLE. (Or)
 2. Heading Mode Selector Button - ENGAGE. (Or)
 3. Autopilot On-Off Switch - ON.

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.

SECTION 5 — PERFORMANCE

Not Applicable.

SECTION 5
PERFORMANCE
TABLE OF CONTENTS

	Page		Page
INTRODUCTION	5-1	NORMAL TAKEOFF DISTANCE . . .	5-22
Demonstrated Operating		ACCELERATE STOP DISTANCE . .	5-24
Temperature	5-2	ACCELERATE GO DISTANCE . . .	5-25
INTRODUCTION TO TABULATED		RATE-OF-CLIMB	
PERFORMANCE	5-2	Maximum Climb	5-26
Example	5-2	Cruise Climb	5-27
SAMPLE FLIGHT	5-5	One Engine Inoperative . .	5-28
Airplane Configuration . .	5-5	BALKED LANDING CLIMB	
Takeoff Airport		Rate-of-Climb	5-29
Conditions	5-5	ENGINE INOPERATIVE SERVICE	
Cruise Conditions	5-6	CEILING	5-30
Landing Airport		TIME, FUEL AND DISTANCE TO	
Conditions	5-6	CLIMB	
Sample Calculations	5-6	Maximum Climb	5-31
AIRSPEED CALIBRATION		Cruise Climb	5-32
Normal Static Source . . .	5-13	CRUISE PERFORMANCE	
Alternate Static Source . .	5-14	Sea Level	5-33
ALTIMETER CORRECTION		5000 Feet	5-33
Normal Static Source . . .	5-15	10,000 Feet	5-34
Alternate Static Source . .	5-16	15,000 Feet	5-34
TEMPERATURE RISE DUE TO RAM		20,000 Feet	5-35
RECOVERY	5-17	23,500 Feet	5-35
TEMPERATURE CONVERSION		25,000 Feet	5-35
OF TO °C	5-18	RANGE PROFILE	5-36
PRESSURE CONVERSION -		ENDURANCE PROFILE	5-37
INCHES OF MERCURY TO		HOLDING TIME	5-38
MILLIBARS	5-19	TIME, FUEL AND DISTANCE TO	
STALL SPEEDS	5-20	DESCEND	5-39
WIND COMPONENT	5-21	NORMAL LANDING DISTANCE . . .	5-40

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 makes no allowance for wind and/or navigational errors. Allowances for start, taxi, takeoff, climb, descent and 45 minutes reserve fuel at the particular cruise power are provided in the range profile chart.

To determine pressure altitude at origin and destination airports, add 100 feet to field elevation for each .1 inch Hg. below 29.92 or subtract 100 feet from field elevation for each .1 inch Hg. above 29.92.

DEMONSTRATED OPERATING TEMPERATURE

Satisfactory engine cooling has been demonstrated for this airplane with an outside air temperature 23°C (41°F) above standard. This is not to be considered as an operating limitation. Reference should be made to Section 2 for engine operating limitations.

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.

EXAMPLE

Given:		Find:	
Weight	6500 Pounds	Takeoff Speed	_____ KIAS
Temperature	(16°C) 61°F	Ground Roll	_____ Feet
Pressure Altitude	2400 Feet	Total Distance	
Headwind	19 Knots	to Clear 50-	
		Foot Obstacle	_____ Feet

Weight Pounds	Takeoff and Climb Speed KIAS	Pressure Altitude Feet	10°C (50°F)		20°C (68°F)	
			Ground Roll - Feet	Total Distance to Clear 50-Ft - Feet	Ground Roll - Feet	Total Distance to Clear 50-Ft - Feet
6750	98	2000	2350	2770	2570	3030
		3000	2500	2930	2730	3210
6200	94	2000	1880	2220	2100	2480
		3000	2040	2400	2230	2620

Approximation Method

Extract from the chart the next increment of weight, altitude and temperature which is more conservative than the actual conditions [i.e.: 6750 pounds, 3000 feet and 20°C (68°F)].

Takeoff and Climb Speed	98 KIAS
Ground Roll	2730 Feet
Total Distance to Clear 50-Foot Obstacle	3210 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 (6500 pounds) is 6200 pounds plus $300/550$ or .55 times the difference between 6200 pounds and 6750 pounds [i.e.: 6200-pound value + .55 (6750-pound value - 6200-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 (61°F) is 10°C plus $6/10$ or .6 times the difference between 10°C and 20°C [i.e.: 10°C value + .6 (2000 value - 10°C value)].

Interpolating Values for Normal Takeoff Distance:

Ground Roll (7 interpolations required)

Altitude interpolation
at 10°C (50°F) and 6750
pounds = 2000-foot value + [.4 (3000-foot value -
2000-foot value)]

= 2350 feet + [.4 (2500 feet - 2350 feet)]

= 2350 feet + [60 feet]

= 2410 feet

Altitude interpolation
at 20°C (68°F) and 6750
pounds = 2000-foot value + [.4 (3000-foot value -
2000-foot value)]

= 2570 feet + [.4 (2730 feet - 2570 feet)]

= 2570 feet + [64 feet]

= 2634 feet

Altitude interpolation
at 10°C (50°F) and 6200
pounds = 2000-foot value + [.4 (3000-foot value -
2000-foot value)]

= 1880 feet + [.4 (2040 feet - 1880 feet)]

= 1880 feet + [64 feet]

= 1944 feet

Altitude interpolation
at 20°C (68°F) and 6200
pounds = 2000-foot value + [.4 (3000-foot value -
2000-foot value)]

= 2100 feet + [.4 (2230 feet - 2100 feet)]

= 2100 feet + [52 feet]

= 2152 feet

The Normal Takeoff Distance chart, with altitude interpolation, looks as follows:

Weight Pounds	Takeoff and Climb Speed KIAS	Pressure Altitude Feet	10°C (50°F)		20°C (68°F)	
			Ground Roll - Feet	Total Distance to Clear 50-Ft - Feet	Ground Roll - Feet	Total Distance to Clear 50-Ft - Feet
6750	98	2400	2410	----	2634	----
6200	94	2400	1944	----	2152	----

Weight interpolation
at 10°C (50°F) and 2400
feet

$$= 6200\text{-pound value} + [.55 (6750\text{-pound value} - 6200\text{-pound value})]$$

$$= 1944 \text{ feet} + [.55 (2410 \text{ feet} - 1944 \text{ feet})]$$

$$= 1944 \text{ feet} + [256 \text{ feet}]$$

$$= \underline{2200 \text{ feet}}$$

Weight interpolation
at 20°C (68°F) and 2400
feet

$$= 6200\text{-pound value} + [.55 (6750\text{-pound value} - 6200\text{-pound value})]$$

$$= 2152 \text{ feet} + [.55 (2634 \text{ feet} - 2152 \text{ feet})]$$

$$= 2152 \text{ feet} + [265 \text{ feet}]$$

$$= \underline{2417 \text{ feet}}$$

Takeoff and Climb Speed

$$= 6200\text{-pound value} + [.55 (6750\text{-pound value} - 6200\text{-pound value})]$$

$$= 94 \text{ KIAS} + [.55 (98 \text{ KIAS} - 94 \text{ KIAS})]$$

$$= 94 \text{ KIAS} + [2.2 \text{ KIAS}]$$

$$= \underline{96 \text{ KIAS}}$$

The Normal Takeoff Distance chart, with altitude and weight interpolation, looks as follows:

Weight Pounds	Takeoff and Climb Speed KIAS	Pressure Altitude Feet	10°C (50°F)		20°C (68°F)	
			Ground Roll - Feet	Total Distance to Clear 50-Ft - Feet	Ground Roll - Feet	Total Distance to Clear 50-Ft - Feet
6500	96	2400	2200	----	2417	----

$$\begin{aligned}
 \text{Temperature interpolation at 2400 feet and 6500 pounds} &= 10^{\circ}\text{C} (50^{\circ}\text{F}) \text{ value} + [.6 (20^{\circ}\text{C} (68^{\circ}\text{F}) \text{ value} - 10^{\circ}\text{C} (50^{\circ}\text{F}) \text{ value})] \\
 &= 2200 \text{ feet} + [.6 (2417 \text{ feet} - 2200 \text{ feet})] \\
 &= 2200 \text{ feet} + [130 \text{ feet}] \\
 &= \underline{2330 \text{ feet}}
 \end{aligned}$$

The Normal Takeoff Distance chart, with altitude, weight and temperature, looks as follows:

Weight Pounds	Takeoff and Climb Speed KIAS	Pressure Altitude Feet	16°C (61°F)	
			Ground Roll - Feet	Total Distance to Clear 50-Ft - Feet
6500	96	2400	2330	----

Ground Roll with 19-knot headwind

$$\begin{aligned}
 &= 2330 \text{ feet} - [2330 \text{ feet} \left(\frac{19 \text{ knots headwind}}{10 \text{ knots headwind}} \right) (7\%)] \\
 &= 2330 \text{ feet} - 310 \text{ feet} \\
 &= \underline{2020 \text{ feet}}
 \end{aligned}$$

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 2744 feet (no wind) and 2379 feet (19-knot headwind).

SAMPLE FLIGHT

The following is an example of a typical flight using the performance data contained in Figures 5-9 through 5-25. The approximation method is used in tabular performance except where noted.

AIRPLANE CONFIGURATION

Airplane Weight 6500 Pounds
Usable Fuel Load 978 Pounds

TAKEOFF AIRPORT CONDITIONS

Field Length 5000 Feet (Runway 23)
Temperature 16°C (61°F)
Field Pressure Altitude 2400 Feet
Wind 270° at 25 Knots
Obstacles None

CRUISE CONDITIONS

Distance	600 Nautical Miles
Cruise Altitude	17,500 Feet
Temperature	-10°C (14°F)
Wind	15-Knot Tailwind
Power	Maximum Recommended Cruise Power at Recommended Lean Mixture

LANDING AIRPORT CONDITIONS

Field Length	3500 Feet (Runway 19)
Temperature	7°C (45°F)
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 5-9)

- (1) The angle between the runway and the prevailing wind is 40°.
- (2) Enter Figure 5-9 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 6750 pounds weight; the takeoff and climb speed is 98 KIAS.
- (2) Proceed horizontally right from 3000-foot pressure altitude to the vertical columns for 20°C (68°F). The takeoff ground run is 2730 feet and the total distance required to clear a 50-foot obstacle is 3210 feet without wind correction. With a 19-knot headwind component, the corrected takeoff ground run is 2367 feet and the corrected total distance required is 2783 feet.

$$\frac{19 \text{ Knots Headwind}}{10 \text{ Knots Headwind}} (7\%) = 13.3\%$$

$$\begin{aligned} \text{Corrected Takeoff} &= 2730 \text{ feet} - [13.3\% (2730 \text{ feet})] \\ \text{Ground Run} &= 2730 \text{ feet} - [363 \text{ feet}] \\ &= \underline{2367 \text{ feet}} \end{aligned}$$

$$\begin{aligned} \text{Corrected Total} &= 3210 \text{ feet} - [13.3\% (3210 \text{ feet})] \\ \text{Distance Required} &= 3210 \text{ feet} - [427 \text{ feet}] \\ &= \underline{2783 \text{ feet}} \end{aligned}$$

Accelerate Stop Distance (Figure 5-11)

- (1) Enter Figure 5-11 at 6750 pounds weight; engine failure speed is 98 KIAS.

- (2) Proceed horizontally right from 3000-foot pressure altitude to the vertical columns for 20°C (68°F). The distance required to accelerate to 98 KIAS and stop is 5070 feet without wind correction. With a 19-knot headwind component, the accelerate stop distance can be reduced by:

$$\frac{19 \text{ Knots Headwind}}{4 \text{ Knots Headwind}} (3\%) = 14.25\%$$

$$\begin{aligned} \text{Corrected Accelerate} &= 5070 \text{ feet} - [14.25\% (5070 \text{ feet})] \\ \text{Stop Distance} &= 5070 \text{ feet} - [722 \text{ feet}] \\ &= \underline{4348 \text{ feet}} \end{aligned}$$

Accelerate Go Distance (Figure 5-12)

- (1) Enter Figure 5-12 at 6750 pounds weight; engine failure speed is 98 KIAS.
- (2) Proceed horizontally right from 3000-foot pressure altitude to the vertical columns for 20°C (68°F). The distance required to clear a 50-foot obstacle, after losing an engine at 98 KIAS, is 5090 feet without wind correction. With a 19-knot headwind component, the distance can be reduced by:

$$\frac{19 \text{ Knots Headwind}}{10 \text{ Knots Headwind}} (6\%) = 11.4\%$$

$$\begin{aligned} \text{Corrected Accelerate} &= 5090 \text{ feet} - [11.4\% (5090 \text{ feet})] \\ \text{Go Distance} &= 5090 \text{ feet} - [580 \text{ feet}] \\ &= \underline{4510 \text{ feet}} \end{aligned}$$

NOTE

- The distance required to accelerate go using the approximation method is often so great that a more exact value should be obtained using the interpolation method.
- The interpolation method gives an accelerate go distance of 4111 feet without wind or 3642 feet with 19 knots of headwind.

Rate-Of-Climb — Maximum Climb (Figure 5-13)

- (1) Enter Figure 5-13 at 16°C (61°F).
- (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 6500-pound line.
- (4) Proceed horizontally right to obtain rate-of-climb. (1500 Feet per minute)
- (5) Enter the climb speed data to determine the climb speed corrected for 2400 feet. (108 KIAS)

Rate-Of-Climb — Cruise Climb (Figure 5-14)

- (1) Enter Figure 5-14 at 16°C (61°F).
- (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 6500-pound line.
- (4) Proceed horizontally right to obtain rate-of-climb. (1055 Feet per minute)
- (5) Climb speed is 120 KIAS for all conditions.

Rate-Of-Climb — Single Engine (Figure 5-15)

- (1) Enter Figure 5-15 at 16°C (61°F).
- (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 6500-pound line.
- (4) Proceed horizontally right to obtain rate-of-climb. (280 Feet per minute)
- (5) Enter the climb speed data to determine the climb speed corrected for 2400 feet. (108 KIAS)

Time, Fuel And Distance To Climb — Cruise Climb (Figure 5-19,

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 5-19 at 16°C (61°F).
- (2) Proceed vertically up to 2400-foot pressure altitude line.
- (3) Proceed horizontally right to the 6500-pound line.
- (4) Proceed vertically down to obtain time to climb (2.3 minutes), fuel to climb (9.5 pounds) and distance to climb (5 nautical miles).

Cruise Condition:

- (5) Enter Figure 5-19 at -10°C (14°F).
- (6) Proceed vertically up to 17,500-foot pressure altitude line.
- (7) Proceed horizontally right to the 6500-pound line.
- (8) Proceed vertically down to obtain time to climb (22.0 minutes), fuel to climb (88 pounds) and distance to climb (52 nautical miles).

Final Calculations:

$$\begin{aligned}\text{Time to Climb} &= \text{Cruise time to climb} - \text{Airport time to climb} \\ &= 22 \text{ minutes} - 2.3 \text{ minutes} \\ &= \underline{20 \text{ minutes}}\end{aligned}$$

Fuel to Climb = Cruise fuel to climb - Airport fuel to climb
= 88 pounds - 9.5 Pounds
= 78.5 pounds (add 32 pounds for start, taxi and runup) (110.5 pounds total)

Distance to Climb = Cruise distance to climb - Airport distance to climb
= 52 nautical miles - 5 nautical miles
= 47 nautical miles
Adjusted for wind (use 60% of the wind at altitude for climb wind),
= 47 ± wind contribution
= 47 + [$\frac{20 \text{ minutes}}{60 \text{ minutes}}$ (.6 x 15 knots)]
= 47 nautical miles + 3 nautical miles
= 50 nautical miles

Time, Fuel And Distance To Descend (Figure 5-24)

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 5-24 at the cruise altitude of 17,500 feet.
- (2) Proceed horizontally right to the guideline.
- (3) Proceed vertically down to obtain time to descend (14.4 minutes), fuel to descend (34 pounds) and distance to descend (48 nautical miles).

Landing Airport Condition:

- (4) Enter Figure 5-24 at the airport altitude of 1700 feet.
- (5) Proceed horizontally right to the guideline.
- (6) Proceed vertically down to obtain time to descend (2.0 minutes), fuel to descend (5 pounds) and distance to descend (6.5 nautical miles).

Final Calculations:

Time to Descend = Cruise time to descend - Airport time to descend
= 14.4 minutes - 2.0 minutes
= 12.4 minutes

Fuel to Descend	= Cruise fuel to descend - Airport fuel to descend
	= 34 pounds - 5 pounds
	= <u>29 pounds</u>
Distance to Descend	= Cruise distance to descend - Airport distance to descend.
	= 48 nautical miles - 6.5 nautical miles
	= 41.5 nautical miles
	Adjusted for wind (use 40% of the wind at altitude for descent wind),
	= 41.5 ± wind contribution
	= 41.5 + [$\frac{12.4 \text{ minutes}}{60 \text{ minutes}}$ (.4 x 15 knots)]
	= 41.5 nautical miles + 1.2 nautical miles
	= <u>42.7 nautical miles</u>

Cruise Performance With Recommended Lean Mixture (Figure 5-20)

Maximum recommended cruise can be obtained with either 2450 RPM and 31.5 Inches Hg. manifold pressure or 2300 RPM and 34 Inches Hg. manifold pressure.

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 15,000-foot data at 2450 RPM and 31.5 Inches Hg. manifold pressure.
- (2) Use -15°C (5°F) data for a power of 74.8%, airspeed of 199 KTAS and a total fuel flow of 204 pounds per hour.
- (3) Correcting for a weight of 6500 pounds, the airspeed increases to:

$$199 \text{ KTAS} + \frac{(6750 \text{ pounds} - 6500 \text{ pounds})}{1000 \text{ pounds}} (6 \text{ KTAS}) =$$

$$199 \text{ KTAS} + 1.5 \text{ KTAS} = 200 \text{ KTAS}$$

Using the interpolation method, interpolating altitude, temperature and weight, the actual performance is 72.5% power, 204 KTAS and total fuel flow of 198 pounds per hour.

In the above calculations, for convenience, the weight was assumed to be equal to the takeoff weight of 6500 pounds. More realistic data can be determined if the average cruise weight is used. This average cruise weight is determined as follows:

$$\text{Cruise Fuel} = \frac{\text{Total distance} - \text{climb distance} - \text{descent distance}}{\frac{\text{True airspeed}}{+ \text{wind correction}}} \times [\text{Total fuel flow per hour}]$$

$$= \frac{600 \text{ Nautical Miles} - 50 \text{ Nautical Miles} - 42.7 \text{ Nautical Miles}}{204 \text{ KTAS} + 15 \text{ Knot Tailwind}} \times [198 \text{ pounds per hour}]$$

$$= \frac{507.3 \text{ Nautical miles}}{219} \times 198 \text{ pounds per hour}$$

$$= 2.32 \text{ hours} \times 198 \text{ pounds per hour}$$

$$= \underline{458 \text{ pounds}}$$

$$\text{Average Cruise Weight} = \text{Takeoff weight} - \text{start, taxi and climb fuel} - \frac{\text{Cruise fuel}}{2}$$

$$= 6500 \text{ pounds} - 110.5 \text{ pounds} - \frac{458 \text{ pounds}}{2}$$

$$= \underline{6161 \text{ pounds}}$$

$$\text{Average Cruise Speed} = \text{True airspeed from Figure 5-20} + \text{weight correction}$$

$$= 204 \text{ KTAS} + 6 \left(\frac{340}{1000} \right)$$

$$= \underline{206 \text{ KTAS}}$$

$$\text{Average Ground Speed} = 206 \text{ KTAS} + \text{tailwind}$$

$$= 206 \text{ KTAS} + 15 \text{ knots}$$

$$= \underline{221 \text{ knots}}$$

$$\text{Distance During Cruise} = \text{Total distance} - \text{Climb distance} - \text{Descent distance}$$

$$= 600 - 50 - 42.7$$

$$= \underline{507.3 \text{ Nautical Miles}}$$

$$\text{Time During Cruise} = \frac{\text{Cruise distance}}{\text{ground speed}}$$

$$= \frac{507.3}{221}$$

$$= \underline{2.30 \text{ hours}}$$

Normal Landing Distance (Figure 5-25)

$$\text{Landing Weight} = \text{Takeoff weight} - \text{climb fuel} - \text{cruise fuel} - \text{descent fuel}$$

$$= 6500 \text{ pounds} - 110.5 \text{ pounds} - 458 \text{ pounds} - 29 \text{ pounds}$$

$$= \underline{5903 \text{ pounds}}$$

Wind = 210° at 17 knots. Determine headwind component from Figure 5-9. (16 knots headwind)

Enter Figure 5-25 at 6200 pounds; the approach speed is 91 KIAS. Proceed horizontally right from 2000-foot pressure altitude to the vertical column for 10°C (50°F). The landing distance ground roll is 890 feet and the total distance required to clear a 50-foot obstacle is 2270 feet without wind correction. With a 16-knot headwind component, the corrected ground roll distance is 783 feet and the corrected total distance required is 1998 feet.

$$\frac{16 \text{ Knots Headwind}}{4 \text{ Knots Headwind}} (3\%) = 12\%$$

Corrected Landing = 890 feet - [12% (890)]
Ground Roll = 890 feet - 107 feet
= 783 feet

Corrected Total = 2270 - [12% (2270)]
Distance Required = 2270 feet - 272 feet
= 1998 feet

Rate-Of-Climb — Balked Landing Climb (Figure 5-16)

- (1) Enter Figure 5-16 at 7°C (45°F).
- (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 5903-pound weight line.
- (4) Proceed horizontally right to determine the rate-of-climb. (1035 Feet per minute)

Total Fuel Required = Start, taxi and climb fuel + cruise fuel + descent fuel
= 111 pounds + 458 pounds + 29 pounds = 598 pounds (Without Holding Fuel)
or 598 pounds + 97 pounds = 695 pounds (With 45 Minutes Holding Fuel)

Holding Time (Figure 5-23)

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]
= 978 pounds - [111 pounds + 458 pounds + 29 pounds]
= 380 pounds

- (1) Enter Figure 5-23 at 380 pounds of fuel available.
- (2) Proceed vertically up to the intersection with the guideline.
- (3) Proceed horizontally left to obtain holding time available. (2.9 hours)

AIRSPED CALIBRATION NORMAL STATIC SOURCE

NOTE:

1. Indicated airspeed assumes zero instrument error.
2. The following calibrations are not valid in the prestall buffet.
3. The following calibrations are valid for the pilot's and copilot's airspeed indicators when the standard or optional dual static system is installed.

Gear Up Flaps 0°		Gear Down Flaps 15°		Gear Down Flaps 45°	
KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
70	70	70	71	70	71
80	80	80	81	80	80
90	90	90	91	90	90
--	--	--	--	94 *	93 *
100	100	100	100	100	99
110	110	110	109	110	109
120	119	120	119	120	117
140	139	130	128	130	127
160	158	140	138	140	136
180	178	150	147	145	140
200	197	160	157	---	---
220	216	170	166	---	---
230	226	179	175	---	---
237	232	---	---	---	---

*Recommended Minimum All Engines Approach Speed At 6750 Pounds With 45° Wing Flaps.

Figure 5-1

AIRSPEED CALIBRATION ALTERNATE STATIC SOURCE

NOTE:

1. Indicated airspeed assumes zero instrument error.
2. The following calibrations are not valid in the prestall buffet.
3. The following calibrations are valid for pilot's and copilot's airspeed indicators when the standard static system is installed.
4. An alternate static source is not available for copilot's instruments when optional dual static system is installed.

Gear Up Flaps 0°		Gear Down Flaps 15°		Gear Down Flaps 45°	
KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
---	---	---	---	70	75
80	89	80	85	80	83
90	98	90	94	90	92
---	---	---	---	92 *	93 *
100	108	100	102	100	100
110	117	110	111	110	109
120	126	120	119	120	117
140	144	130	128	130	126
160	163	140	136	140	134
180	181	150	145	150	143
200	199	160	153	---	---
220	218	180	170	---	---
240	236	---	---	---	---

*Recommended Minimum All Engines Approach Speed At 6750 Pounds With 45° Wing Flaps.

Figure 5-2

ALTIMETER CORRECTION NORMAL STATIC SOURCE

NOTE:

1. Add correction to indicated altimeter reading.
2. The following calibrations are valid for the pilot's and copilot's altimeters when the standard or optional dual static system is installed.

Altitude	Sea Level			10,000 Feet			20,000 Feet		
Gear	Up	Down	Down	Up	Down	Down	Up	Down	Down
Flaps	0°	15°	45°	0°	15°	45°	0°	15°	45°
KIAS	Feet	Feet	Feet	Feet	Feet	Feet	Feet	Feet	Feet
70	+3	+8	+5	+3	+10	+6	+5	+14	+9
80	+1	+6	0	+1	+7	0	+2	+11	0
90	0	+4	-5	0	+5	-6	0	+7	-9
94*	----	----	-8	----	----	-9	----	----	-14
100	-1	0	-10	-2	0	-12	-3	0	-17
110	-2	-5	-19	-2	-6	-22	-3	-9	-33
120	-2	-8	-25	-3	-9	-29	-4	-14	-43
140	-13	-21	-50	-15	-24	-63	-22	-37	-90
160	-21	-39	----	-24	-49	----	-36	-68	----
180	-31	-58	----	-39	-78	----	-55	-110	----
200	-55	----	----	-69	----	----	-100	----	----
220	-73	----	----	-90	----	----	-130	----	----
230	-87	----	----	-111	----	----	-157	----	----
237	-100	----	----	-132	----	----	-183	----	----

*Recommended Minimum All Engines Approach Speed At 6750 Pounds With 45° Wing Flaps.

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 5-3

ALTIMETER CORRECTION ALTERNATE STATIC SOURCE

NOTE:

1. Add correction to indicated altimeter reading.
2. The following calibrations are valid for pilot's and copilot's altimeters when the standard static system is installed.
3. An alternate static source is not available for copilot's instruments when the optional dual static system is installed.

Altitude	Sea Level			10,000 Feet			20,000 Feet		
Gear	Up	Down	Down	Up	Down	Down	Up	Down	Down
Flaps	0°	15°	45°	0°	15°	45°	0°	15°	45°
KIAS	Feet	Feet	Feet	Feet	Feet	Feet	Feet	Feet	Feet
80	64	36	24	87	48	32	120	67	44
90	68	28	16	91	38	22	127	53	30
92 *	68	26	14	91	36	19	127	49	26
100	68	18	5	92	24	6	128	34	8
120	63	-11	-30	85	-15	-41	122	-20	-57
140	51	-48	-76	69	-65	-103	95	-90	-143
160	36	-102	----	49	-138	----	68	-191	----
180	12	-174	----	16	-235	----	22	-326	----
200	-13	----	----	-18	----	----	-24	----	----
220	-51	----	----	-70	----	----	-96	----	----
240	-90	----	----	-123	----	----	-170	----	----

*Recommended Minimum All Engines Approach Speed At 6750 Pounds With 45° Wing Flaps

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 5-4

TEMPERATURE RISE DUE TO RAM RECOVERY

RECOVERY FACTOR (K) = .90

- NOTE:
1. Subtract temperature rise from indicated outside air temperature to obtain true outside air temperature

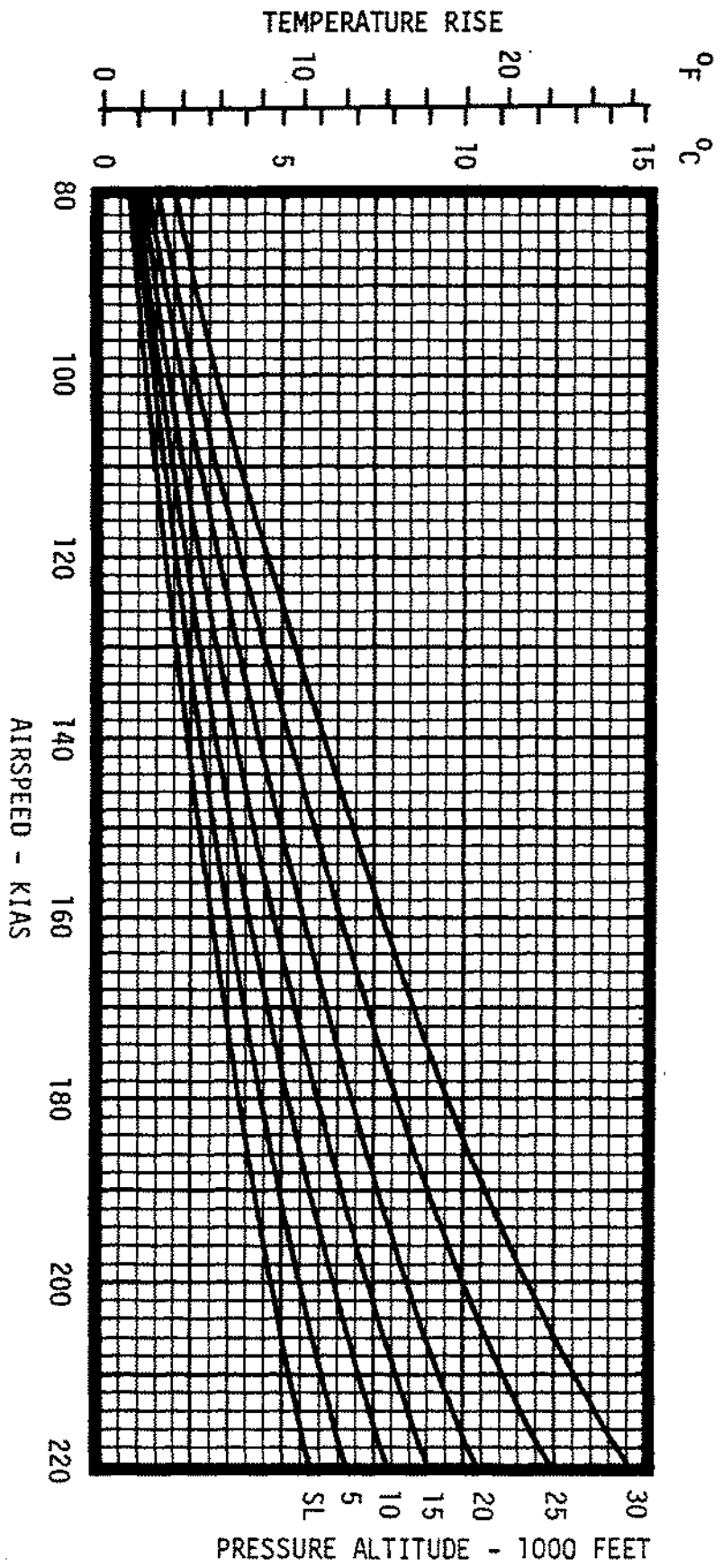
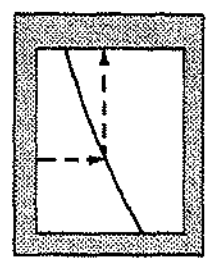


Figure 5-5

TEMPERATURE CONVERSION FROM FAHRENHEIT TO CELSIUS

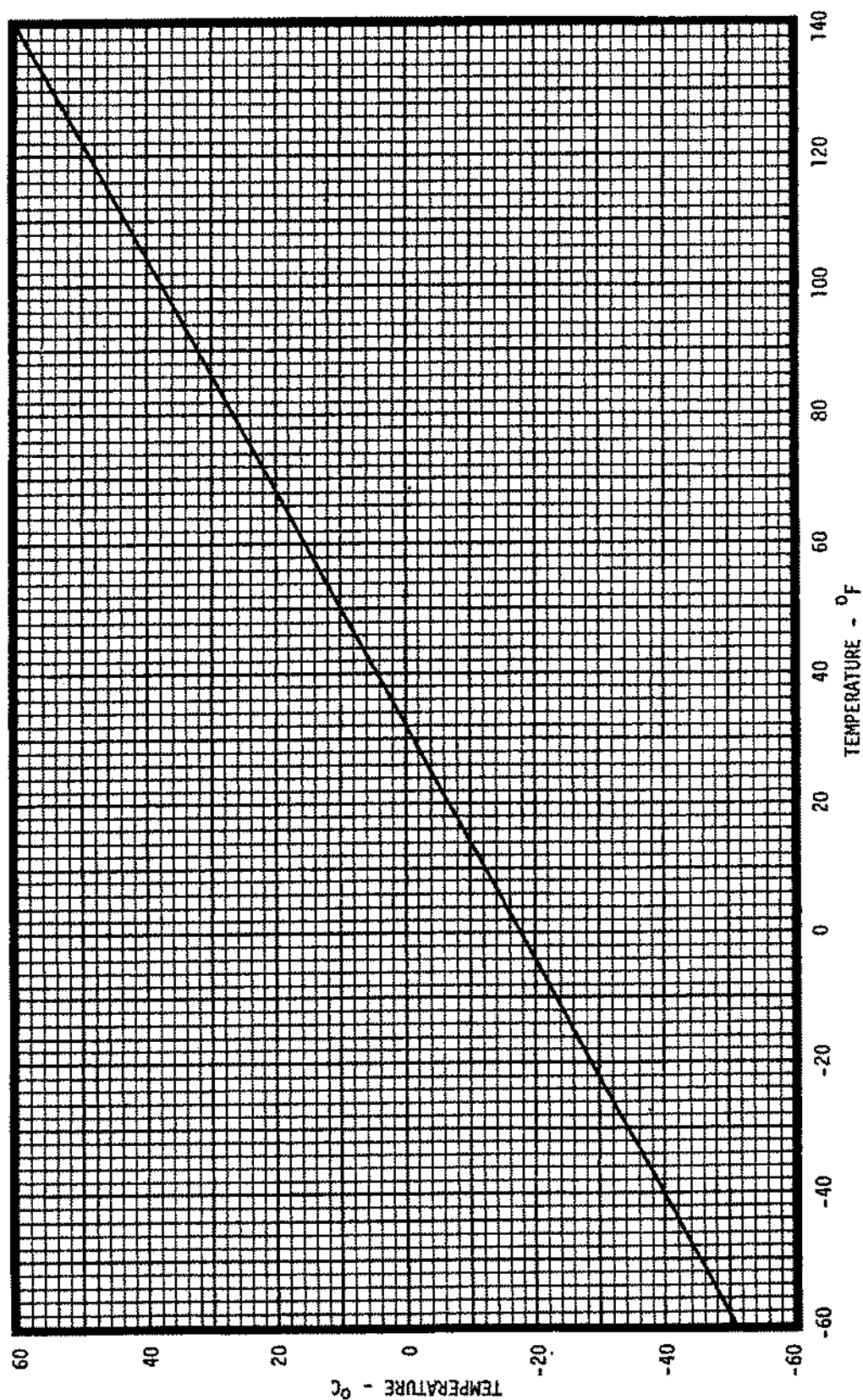
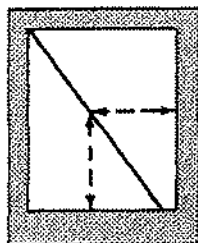


Figure 5-6

PRESSURE CONVERSION INCHES OF MERCURY TO MILLIBARS

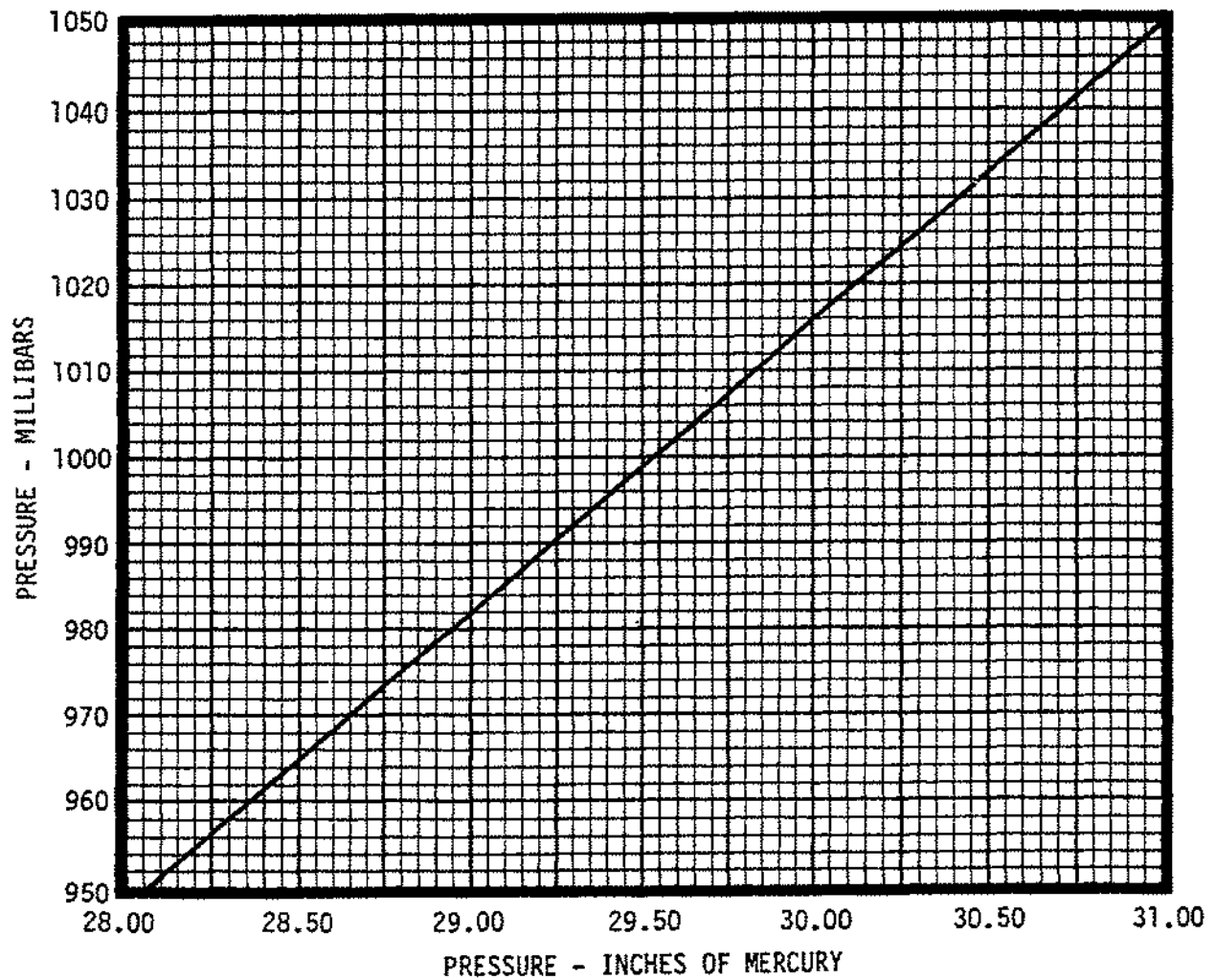
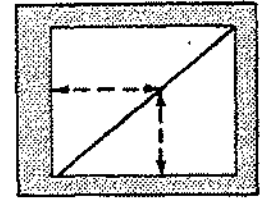


Figure 5-7

STALL SPEEDSCONDITIONS:
Throttles - IDLENOTE:
Maximum altitude lost during
a stall is 300 feet.

WEIGHT Pounds	Configuration		ANGLE OF BANK							
			0°		20°		40°		60°	
	Flaps	Gear	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
6750	0°	Up	82	82	85	85	94	94	116	116
	15°	Down	76	77	79	80	87	88	111	110
	45°	Down	71	72	73	74	82	82	103	102
6200	0°	Up	79	79	81	81	90	90	111	111
	15°	Down	73	74	76	77	84	85	105	105
	45°	Down	67	69	70	71	79	79	98	97
5700	0°	Up	75	75	78	78	86	86	107	107
	15°	Down	70	71	72	73	80	81	101	101
	45°	Down	65	66	67	68	74	75	94	93
5200	0°	Up	72	72	74	74	82	82	102	102
	15°	Down	67	68	69	70	77	78	96	96
	45°	Down	61	63	63	65	71	72	90	89

Figure 5-8

WIND COMPONENT

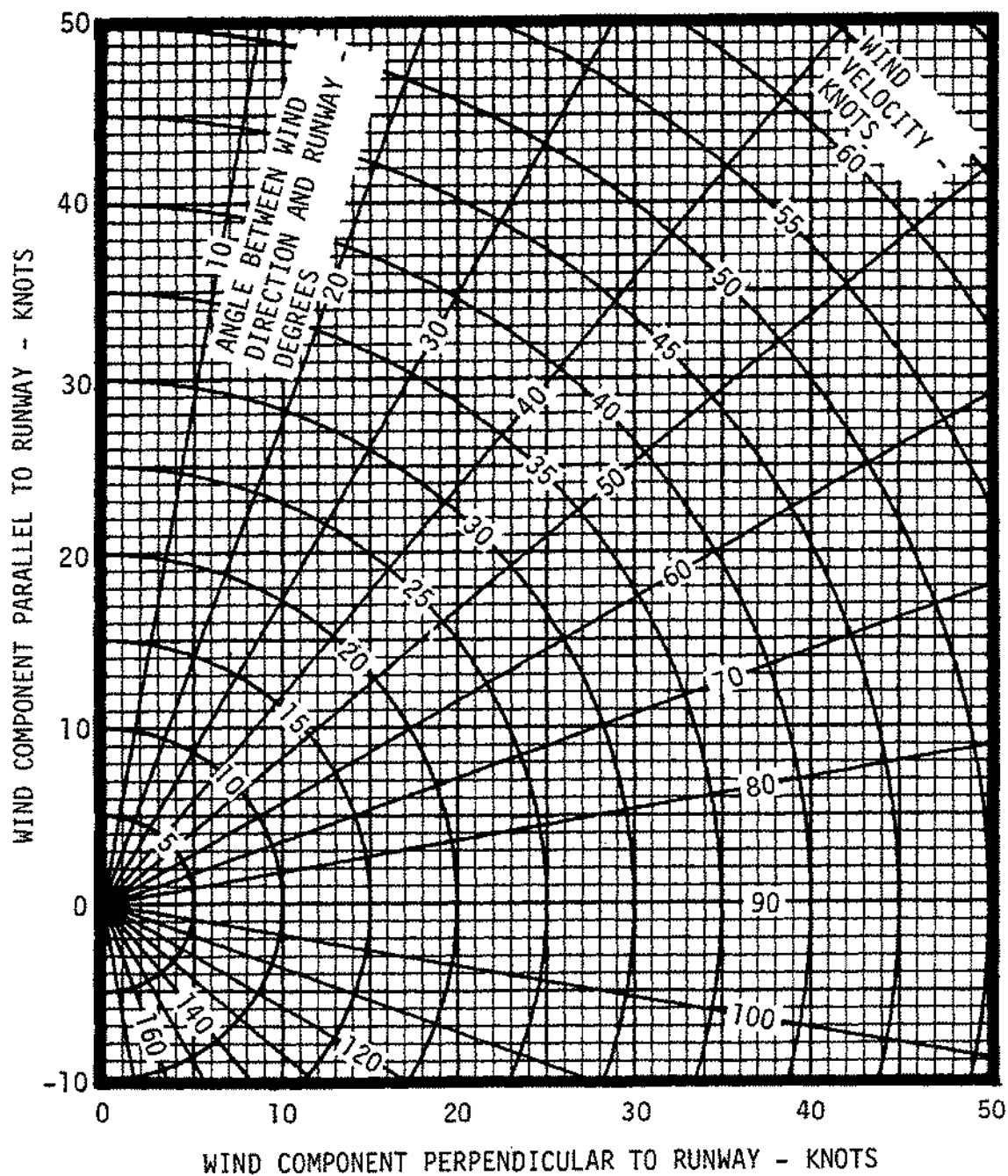
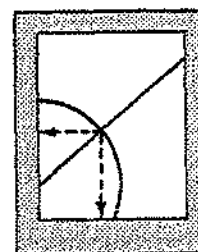


Figure 5-9

NORMAL TAKEOFF DISTANCE

CONDITIONS:

1. 2700 RPM and 38.0 Inches Hg. Manifold Pressure Before Brake Release.
2. Mixtures - CHECK Fuel Flows In the White Arc.
3. Wing Flaps - UP.
4. Cowl Flaps - OPEN.
5. Level, Hard Surface, Dry Runway.

NOTE:

1. If full power is applied without brakes set, distances apply from point where full power is applied.
2. Decrease distance 7% for each 10 knots headwind.
3. Increase distance 5% for each 2 knots tailwind.

WEIGHT- POUNDS	TAKEOFF TO 50- FOOT OBSTACLE SPEED- KIAS	PRESSURE ALTITUDE- FEET	-20°C (-4°F)		-10°C (14°F)		0°C (32°F)		10°C (50°F)	
			GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50 FEET	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50 FEET	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50 FEET	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50 FEET
6750	98	Sea Level	1560	1870	1710	2040	1870	2230	2040	2430
		1000	1660	1970	1810	2150	1980	2350	2220	2620
		2000	1760	2080	1920	2270	2150	2530	2350	2770
		3000	1860	2200	2090	2450	2280	2680	2500	2930
		4000	2020	2370	2210	2590	2420	2830	2650	3100
		5000	2150	2500	2350	2740	2570	2990	2820	3280
		6000	2280	2650	2500	2900	2730	3170	3000	3480
		7000	2420	2800	2650	3070	2910	3360	3190	3690
		8000	2580	2970	2830	3250	3100	3570	3400	3920
		9000	2740	3150	3010	3450	3310	3790	3630	4170
		10,000	2930	3350	3210	3670	3530	4030	3880	4440
6200	94	Sea Level	1280	1540	1400	1680	1530	1830	1670	1990
		1000	1360	1630	1480	1770	1620	1930	1770	2100
		2000	1440	1720	1570	1870	1720	2040	1880	2220
		3000	1530	1810	1670	1980	1820	2150	2040	2400
		4000	1620	1910	1770	2090	1980	2320	2160	2530
		5000	1720	2030	1920	2250	2100	2450	2300	2680
		6000	1870	2180	2040	2380	2230	2590	2440	2840
		7000	1980	2300	2170	2520	2370	2750	2600	3010
		8000	2110	2440	2310	2670	2530	2920	2770	3190
		9000	2250	2590	2460	2830	2690	3100	2950	3390
		10,000	2390	2740	2620	3000	2870	3290	3150	3610
5700	90	Sea Level	1050	1280	1150	1390	1250	1510	1360	1640
		1000	1120	1350	1220	1460	1330	1590	1450	1730
		2000	1180	1420	1290	1540	1410	1680	1530	1830
		3000	1260	1500	1370	1630	1490	1770	1630	1930
		4000	1330	1580	1460	1720	1590	1880	1730	2040
		5000	1420	1670	1550	1820	1690	1990	1880	2200
		6000	1510	1770	1650	1930	1830	2140	2000	2330
		7000	1600	1880	1780	2070	1950	2260	2130	2470
		8000	1730	2010	1890	2200	2070	2400	2260	2620
		9000	1840	2130	2020	2330	2200	2540	2410	2780
		10,000	1960	2260	2150	2470	2350	2700	2570	2950
5200	86	Sea Level	850	1040	930	1130	1010	1230	1100	1330
		1000	900	1100	980	1190	1070	1290	1160	1400
		2000	960	1160	1040	1260	1130	1370	1240	1480
		3000	1010	1220	1110	1330	1200	1440	1310	1570
		4000	1080	1290	1170	1400	1280	1520	1390	1660
		5000	1140	1360	1250	1480	1360	1610	1480	1750
		6000	1220	1440	1330	1570	1450	1710	1580	1860
		7000	1300	1530	1410	1660	1540	1810	1680	1970
		8000	1380	1620	1510	1760	1640	1920	1820	2110
		9000	1470	1720	1630	1890	1770	2060	1940	2240
		10,000	1580	1840	1730	2000	1890	2180	2060	2380

Figure 5-10 (Sheet 1 of 2)

NORMAL TAKEOFF DISTANCE

CONDITIONS:

1. 2700 RPM and 38.0 Inches Hg. Manifold Pressure Before Brake Release.
2. Mixtures - CHECK Fuel Flows In the White Arc.
3. Wing Flaps - UP.
4. Cowl Flaps - OPEN.
5. Level, Hard Surface, Dry Runway.

NOTE:

1. If full power is applied without brakes set, distances apply from point where full power is applied.
2. Decrease distance 7% for each 10 knots headwind.
3. Increase distance 5% for each 2 knots tailwind.

WEIGHT- POUNDS	TAKEOFF TO 50- FOOT OBSTACLE SPEED- KIAS	PRESSURE ALTITUDE- FEET	20°C (68°F)		30°C (86°F)		40°C (104°F)	
			GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50 FEET	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50 FEET	GROUND ROLL - FEET	TOTAL DISTANCE TO CLEAR 50 FEET
6750	98	Sea Level	2290	2720	2510	2980	2750	3270
		1000	2430	2870	2660	3150	2920	3460
		2000	2570	3030	2820	3330	3100	3660
		3000	2730	3210	3000	3520	3290	3880
		4000	2900	3400	3190	3730	3500	4120
		5000	3090	3600	3390	3960	3730	4370
		6000	3290	3820	3610	4210	3980	4650
		7000	3500	4060	3850	4470	4250	4950
		8000	3740	4310	4110	4760	4540	5270
		9000	3990	4590	4400	5070	4850	5630
		10,000	4270	4890	4700	5410	5200	6010
6200	94	Sea Level	1820	2170	1990	2370	2230	2660
		1000	1930	2300	2160	2560	2370	2810
		2000	2100	2480	2290	2710	2510	2970
		3000	2230	2620	2440	2860	2670	3140
		4000	2360	2770	2590	3030	2840	3330
		5000	2510	2930	2750	3210	3020	3530
		6000	2670	3110	2930	3410	3220	3750
		7000	2850	3300	3120	3620	3430	3990
		8000	3040	3500	3330	3850	3660	4240
		9000	3240	3720	3560	4090	3920	4520
		10,000	3460	3960	3800	4360	4190	4820
5700	90	Sea Level	1490	1790	1620	1950	1770	2120
		1000	1580	1890	1720	2060	1880	2240
		2000	1670	1990	1830	2170	2050	2430
		3000	1780	2110	1990	2340	2170	2560
		4000	1930	2270	2110	2480	2310	2710
		5000	2050	2400	2240	2620	2460	2880
		6000	2180	2540	2390	2780	2620	3050
		7000	2320	2700	2540	2950	2790	3240
		8000	2480	2860	2710	3130	2970	3440
		9000	2640	3040	2890	3330	3170	3660
		10,000	2820	3230	3090	3550	3390	3900
5200	86	Sea Level	1190	1450	1300	1570	1420	1710
		1000	1270	1530	1380	1660	1500	1810
		2000	1350	1610	1470	1750	1600	1910
		3000	1430	1700	1560	1850	1700	2020
		4000	1520	1800	1660	1960	1810	2140
		5000	1620	1910	1760	2080	1960	2310
		6000	1720	2020	1910	2240	2090	2440
		7000	1860	2170	2040	2370	2230	2590
		8000	1980	2300	2170	2520	2370	2750
		9000	2110	2440	2310	2670	2530	2920
		10,000	2260	2600	2470	2840	2700	3110

Figure 5-10 (Sheet 2 of 2)

ACCELERATE STOP DISTANCE**CONDITIONS:**

1. 2700 RPM and 38.0 Inches Hg. Manifold Pressure Before Brake Release.
2. Mixtures - CHECK Fuel Flows In the White Arc.
3. Wing Flaps - UP.
4. Cowl Flaps - OPEN.
5. Level, Hard Surface, Dry Runway.
6. Engine Failure at Engine Failure Speed.
7. 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 distance 3% for each 4 knots headwind.
3. Increase distance 5% for each 2 knots tailwind.

WEIGHT - POUNDS	ENGINE FAILURE SPEED - KIAS	PRESSURE ALTITUDE - FEET	TOTAL DISTANCE - FEET						
			-20°C -4°F	-10°C +14°F	0°C 32°F	+10°C +50°F	+20°C +68°F	+30°C +86°F	+40°C +104°F
6750	98	Sea Level	3370	3590	3820	4120	4390	4670	4980
		1000	3530	3760	4060	4320	4600	4900	5240
		2000	3700	3990	4250	4530	4830	5150	5500
		3000	3880	4180	4460	4750	5070	5410	5790
		4000	4120	4390	4680	4990	5330	5690	6090
		5000	4320	4610	4920	5250	5610	5990	6420
		6000	4540	4840	5170	5520	5900	6320	6770
		7000	4770	5090	5440	5810	6220	6660	7140
		8000	5010	5360	5730	6130	6560	7030	7550
		9000	5280	5640	6040	6460	6920	7420	7980
		10,000	5560	5950	6370	6820	7310	7850	8450
6200	94	Sea Level	2780	2960	3150	3340	3560	3780	4090
		1000	2910	3100	3300	3510	3730	4030	4290
		2000	3050	3250	3460	3680	3970	4230	4510
		3000	3200	3410	3630	3910	4170	4440	4740
		4000	3360	3580	3850	4110	4380	4670	4990
		5000	3530	3800	4050	4310	4600	4910	5250
		6000	3740	3990	4250	4540	4840	5170	5530
		7000	3930	4190	4470	4770	5100	5450	5840
		8000	4130	4410	4710	5030	5370	5750	6160
		9000	4350	4640	4960	5300	5670	6070	6510
		10,000	4580	4890	5230	5590	5990	6410	6880
5700	90	Sea Level	2300	2450	2600	2760	2930	3120	3310
		1000	2410	2560	2720	2890	3080	3270	3480
		2000	2530	2690	2860	3040	3230	3430	3710
		3000	2650	2820	3000	3190	3390	3650	3890
		4000	2780	2960	3150	3350	3610	3840	4100
		5000	2920	3110	3310	3560	3790	4040	4310
		6000	3060	3260	3510	3740	3980	4250	4540
		7000	3220	3460	3690	3930	4190	4480	4780
		8000	3410	3640	3880	4140	4420	4720	5050
		9000	3590	3830	4090	4360	4660	4980	5330
		10,000	3780	4030	4310	4600	4920	5260	5630
5200	86	Sea Level	1870	1990	2110	2240	2380	2520	2680
		1000	1960	2080	2210	2350	2490	2650	2810
		2000	2050	2180	2320	2460	2610	2780	2950
		3000	2150	2290	2430	2580	2750	2920	3110
		4000	2260	2400	2550	2710	2890	3070	3270
		5000	2370	2520	2680	2850	3030	3230	3480
		6000	2490	2650	2820	3000	3190	3430	3660
		7000	2620	2790	2970	3190	3390	3620	3860
		8000	2750	2930	3150	3350	3570	3810	4070
		9000	2900	3110	3310	3530	3760	4020	4290
		10,000	3070	3270	3490	3720	3970	4240	4530

Figure 5-11

ACCELERATE GO DISTANCE**CONDITIONS:**

1. 2700 RPM and 38.0 Inches Hg. Manifold Pressure Before Brake Release.
2. Mixtures - CHECK Fuel Flows In The White Arc.
3. Wing Flaps - UP.
4. Cowl Flaps - OPEN.
5. Level Hard Surface Dry Runway.
6. Engine Failure At Engine Failure Speed.
7. Landing Gear Up On In Transit And Propeller Feathered During Climb.
8. Maintain Engine Failure Speed Until Clear of Obstacle.

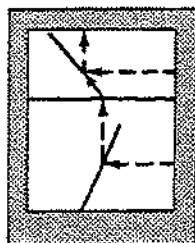
NOTE:

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 2% for each knot of tailwind.
4. Distance in boxes represent rates of climb less than 50 ft/min.

WEIGHT - POUNDS	ENGINE FAILURE - SPEED - KIAS	PRESSURE ALTITUDE - FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE - FEET						
			-20°C -40°F	-10°C +14°F	0°C 32°F	+10°C +50°F	+20°C +68°F	+30°C +86°F	+40°C +104°F
6750	98	Sea Level	2590	2870	3200	3600	4160	4830	5800
		1000	2730	3030	3390	3880	4430	5190	6330
		2000	2880	3210	3640	4120	4740	5610	6970
		3000	3050	3440	3860	4390	5090	6090	7770
		4000	3270	3650	4110	4690	5480	6660	8780
		5000	3460	3870	4380	5030	5930	7340	10,160
		6000	3660	4110	4670	5410	6450	8190	12,170
		7000	3890	4380	5000	5840	7070	9280	15,500
		8000	4140	4680	5380	6330	7820	10,770	-----
		9000	4410	5010	5800	6910	8750	12,990	-----
		10,000	4710	5380	6280	7600	9970	16,780	-----
6200	94	Sea Level	2070	2270	2500	2770	3080	3470	4010
		1000	2180	2390	2640	2930	3270	3740	4280
		2000	2290	2520	2790	3090	3510	3970	4570
		3000	2420	2660	2940	3320	3730	4240	4910
		4000	2550	2810	3160	3520	3960	4520	5290
		5000	2690	3010	3340	3740	4220	4850	5720
		6000	2880	3190	3540	3970	4510	5210	6220
		7000	3040	3370	3760	4230	4830	5260	6810
		8000	3220	3580	4000	4520	5180	6100	7520
		9000	3420	3810	4270	4840	5590	6650	8410
		10,000	3630	4060	4560	5200	6050	7300	9560
5700	90	Sea Level	1690	1840	2010	2200	2430	2690	2990
		1000	1770	1930	2110	2320	2560	2840	3170
		2000	1860	2030	2230	2450	2700	3000	3420
		3000	1960	2140	2350	2580	2860	3230	3630
		4000	2060	2260	2480	2730	3070	3420	3860
		5000	2170	2380	2620	2930	3250	3630	4110
		6000	2290	2510	2800	3100	3440	3870	4400
		7000	2420	2690	2960	3280	3660	4120	4710
		8000	2580	2840	3140	3480	3900	4400	5060
		9000	2730	3010	3330	3710	4160	4720	5460
		10,000	2900	3200	3540	3950	4440	5070	5910
5200	86	Sea Level	1360	1480	1610	1750	1910	2100	2310
		1000	1430	1550	1690	1840	2010	2210	2440
		2000	1500	1630	1770	1940	2120	2330	2570
		3000	1570	1710	1870	2040	2240	2460	2720
		4000	1650	1800	1970	2150	2360	2600	2880
		5000	1740	1900	2070	2270	2490	2750	3100
		6000	1830	2000	2190	2400	2640	2950	3290
		7000	1940	2110	2310	2540	2830	3130	3490
		8000	2040	2240	2450	2720	3000	3320	3720
		9000	2160	2380	2620	2880	3180	3540	3970
		10,000	2300	2520	2770	3050	3380	3700	4240

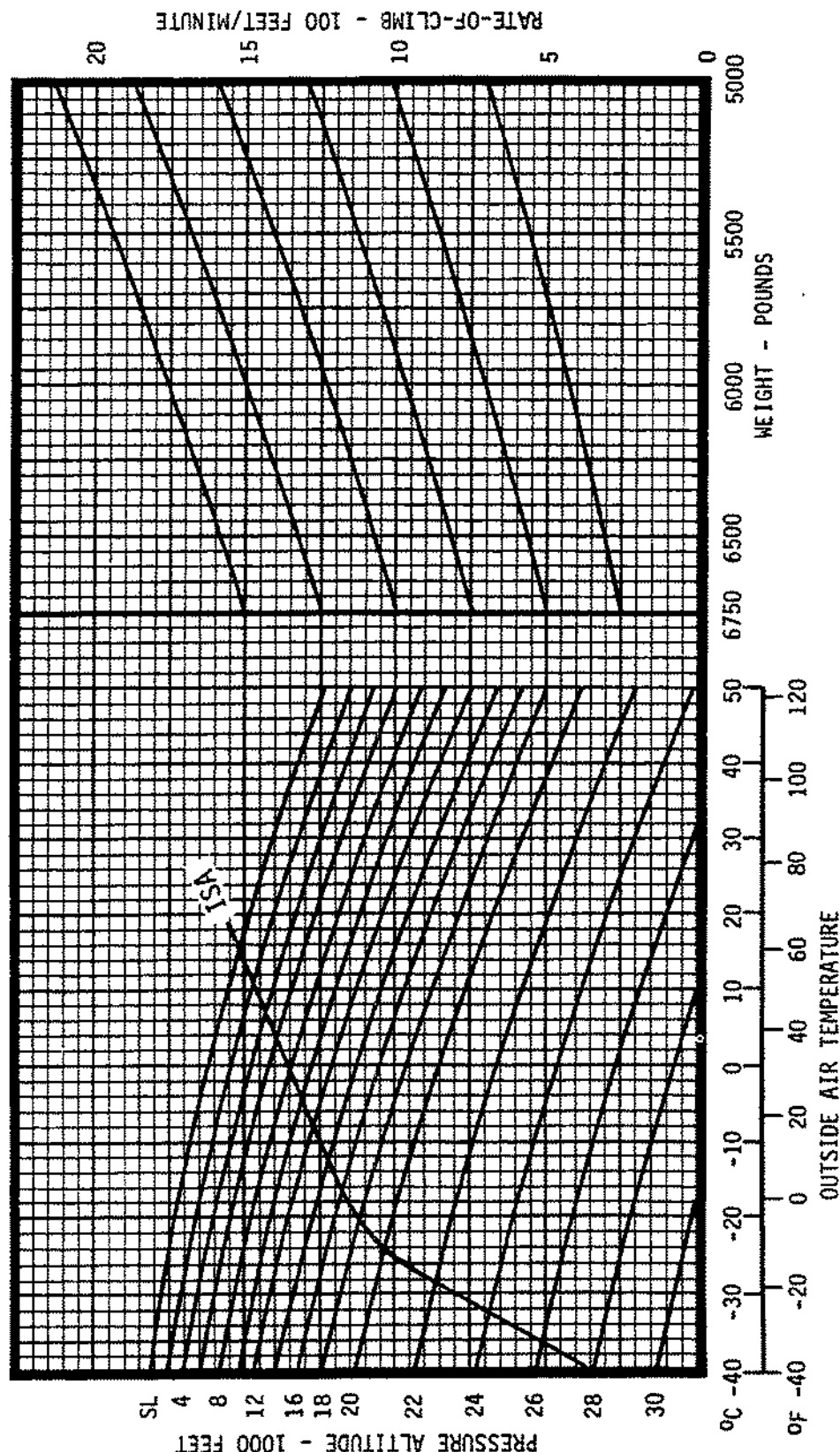
Figure 5-12

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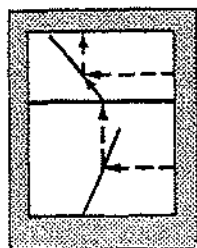
RATE-OF-CLIMB - MAXIMUM CLIMB

ALTITUDE - FEET	CLIMB SPEED - KIAS
SL	108
20,000	107
30,000	104



- CONDITIONS:
1. 2600 RPM and 38.0 Inches Hg.*
 2. Mixture - Fuel Flow White Triangle.
 3. Landing Gear - UP.
 4. Wing Flaps - UP.
 5. Cowl Flaps - OPEN.
- *Above 20,000 Feet, Use Placarded Manifold Pressure

Figure 5-13



RATE-OF-CLIMB - CRUISE CLIMB

CONDITIONS:

1. 2450 RPM and 31.5 Inches Hg.
2. Landing Gear - UP.
3. Wing Flaps - UP.
4. Cowl Flaps - AS REQUIRED.
5. Airspeed - 120 KIAS.
6. Mixtures - 120 Lbs/Hr Fuel Flow (Blue Triangle).

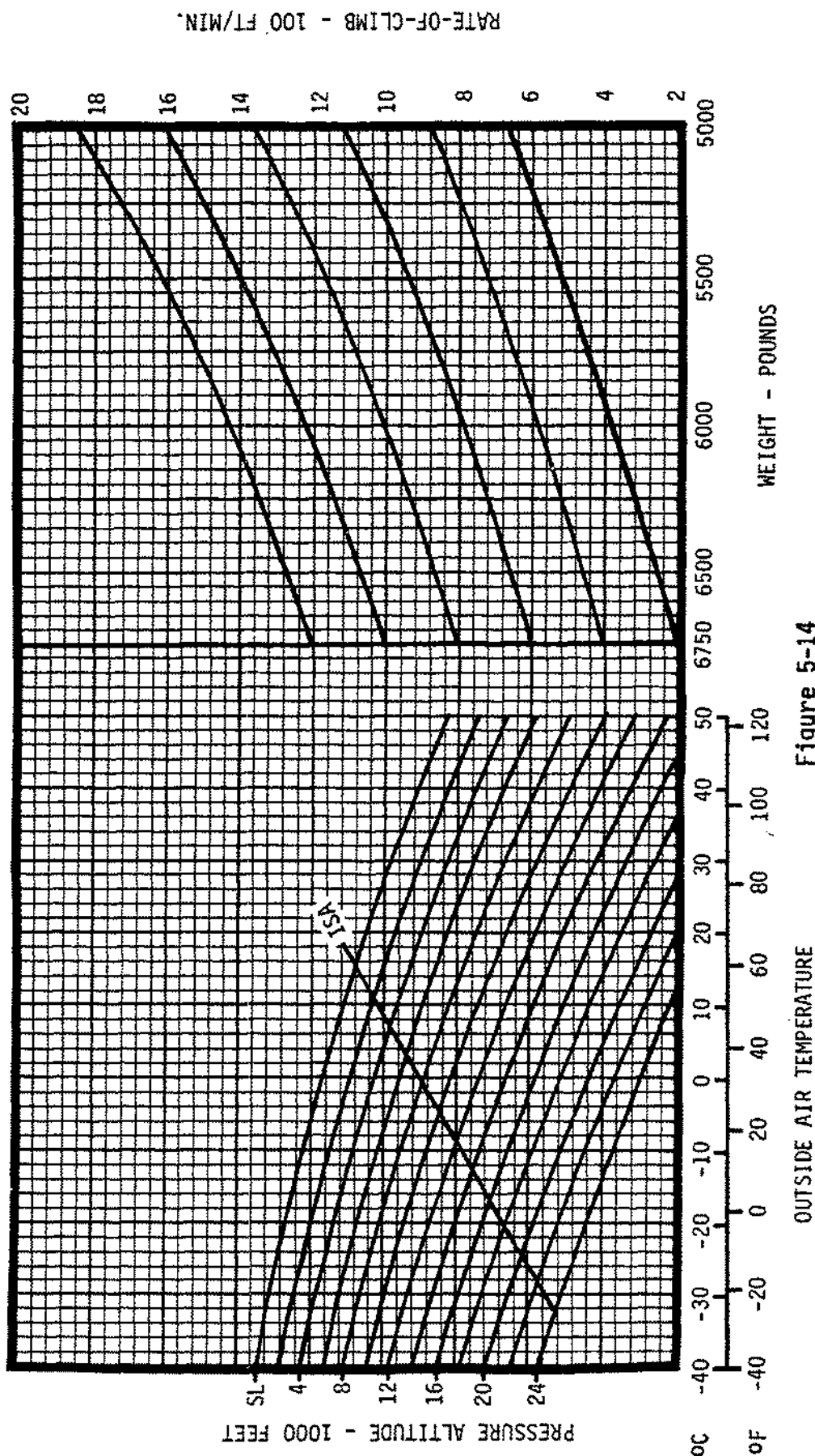
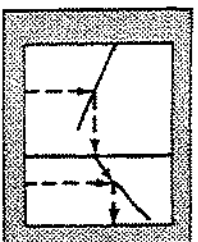
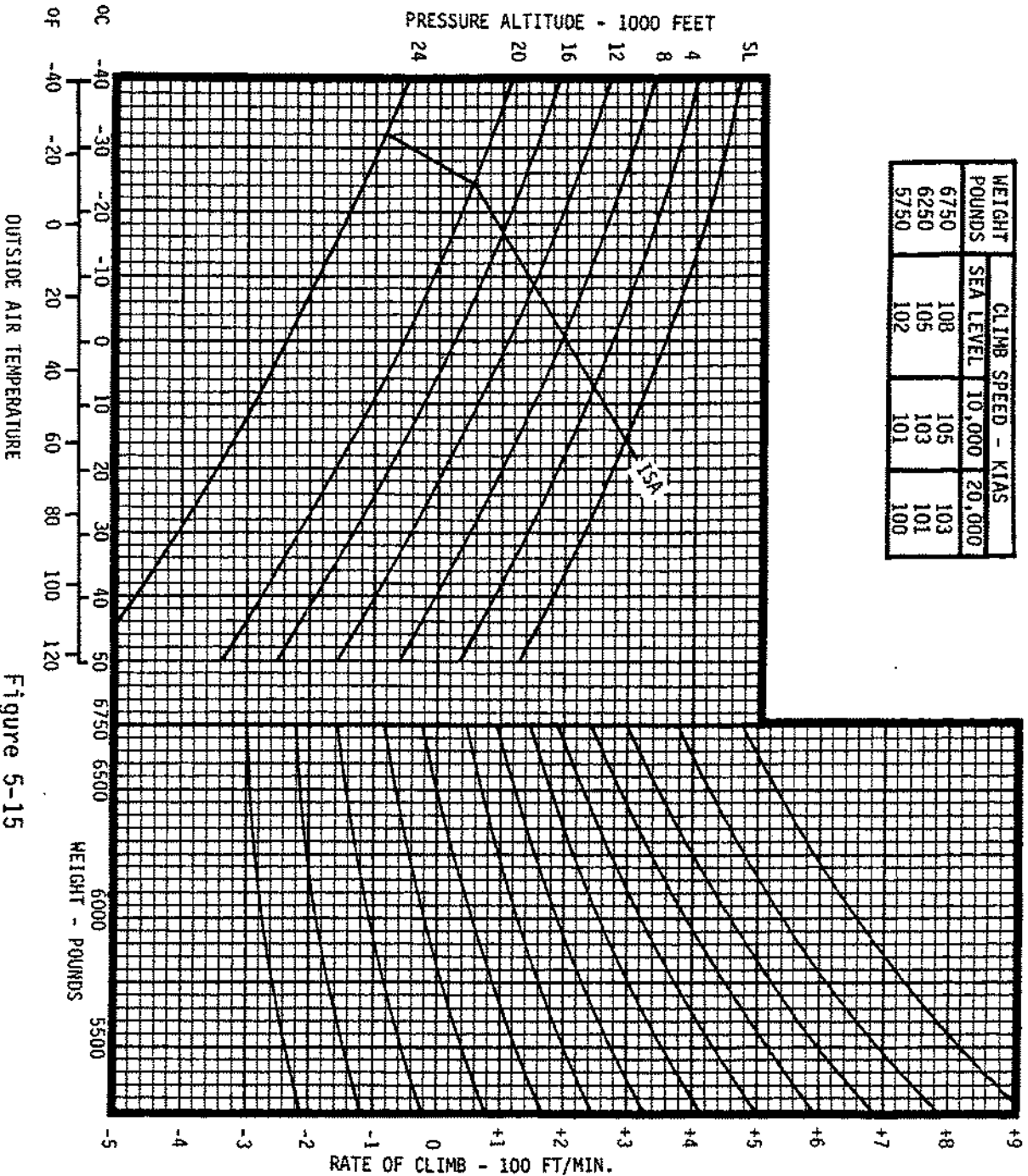


Figure 5-14

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RATE-OF-CLIMB - ONE ENGINE INOPERATIVE

WEIGHT POUNDS	CLIMB SPEED - KIAS			
	SEA LEVEL	10,000	20,000	
6750	108	105	103	
6250	105	103	101	
5750	102	101	100	



CONDITIONS:

1. 2700 RPM and 38.0 Inches Hg.*
2. Mixture - Check fuel flow in White Arc.*
3. Landing Gear - UP.
4. Wing Flaps - UP.
5. Inoperative Propeller - FEATHERED.
6. Wings Banked 50 Toward Operative Engine with Slip Indicated on the Turn and Bank Indicator.
7. Cowl Flaps - Closed on Inoperative Engine.

*Above 20,000 feet, use Placarded Manifold Pressure and Climb Fuel Flow.

NOTE: Approximate Effect of Configuration on Single-Engine Rate-of-Climb.

Subtract values listed below from value obtained in the graph. Effects for a combination of gear, flap or windmilling propeller may be obtained by adding the effects for each.

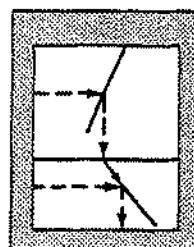
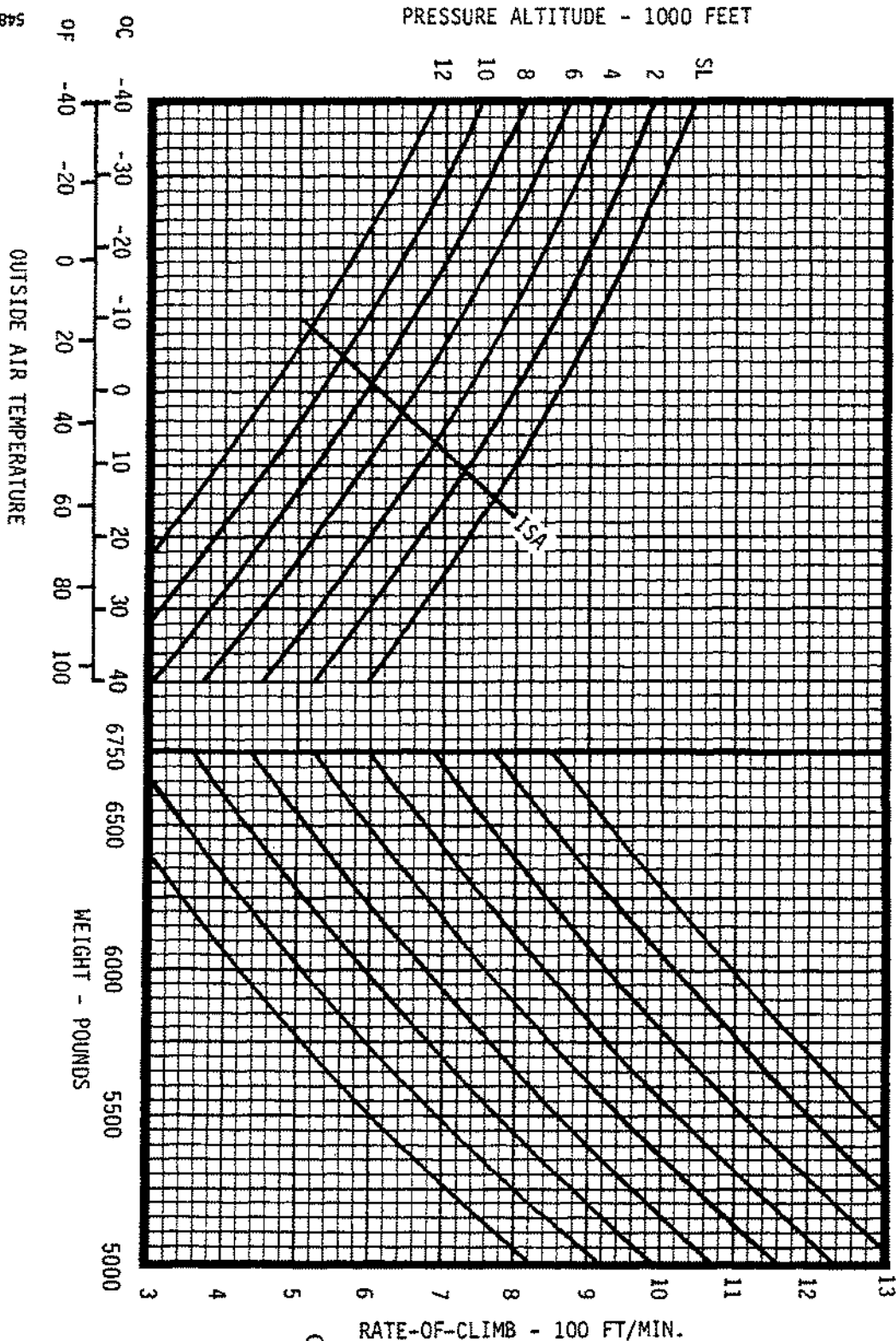
Inoperative Engine	400 ft/min
Windmilling	350 ft/min
Gear Down	200 ft/min
Flaps Down 150	800 ft/min
Flaps Down 450	

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 MODEL
474A

 SECTION 5
 PERFORMANCE

RATE-OF-CLIMB - BALKED LANDING CLIMB



- CONDITIONS:
1. 2700 RPM and 38.0 Inches Hg.
 2. Mixtures - Check Fuel Flows
 3. Landing Gear - DOWN.
In White Arc.
 4. Wing Flaps - 45°.
 5. Cowl Flaps - OPEN.
 6. Climb Speed - 82 KIAS.

Figure 5-16

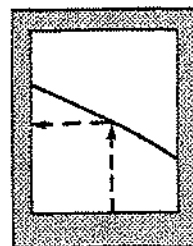
ENGINE INOPERATIVE SERVICE CEILING

CONDITIONS:

1. One Engine Inoperative Climb Configuration.

NOTE:

1. 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 feathered.
2. Increase indicated service ceiling 100 feet for each 0.10 inch Hg. altimeter setting greater than 29.92.
3. Decrease indicated service ceiling 100 feet for each 0.10 inch 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.



WEIGHT POUNDS	CLIMB SPEED - KIAS		
	SL	10,000	20,000
6750	108	105	103
6200	105	103	101
5700	102	101	100
5200	99	98	97

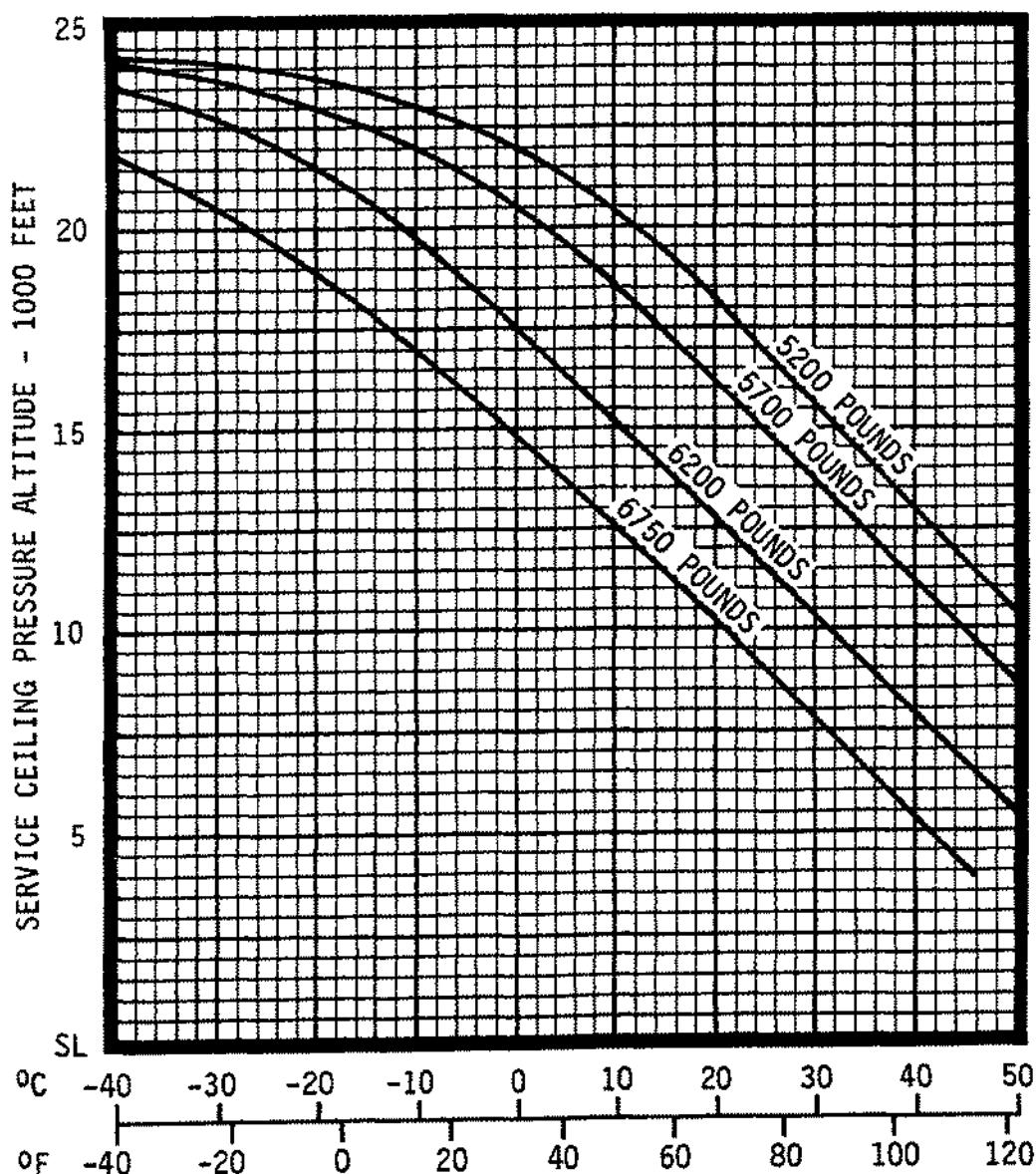
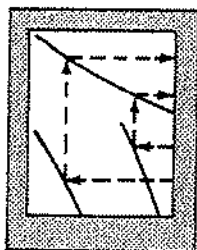


Figure 5-17



CONDITIONS:

1. 2600 RPM and 38.0 Inches Hg.*
2. Mixture - Check Fuel Flow in White Triangle.
3. Landing Gear - UP.
4. Wing Flaps - UP.
5. Cowl Flaps - OPEN.

*Above 20,000 Feet, Use Placarded Manifold Pressure

NOTE:

1. Time, Fuel and Distance for the Climb are Determined by Taking the Difference Between the Airport Altitude and Initial Cruise.
2. For Total Fuel Used, Add 32 Pounds for Start, Taxi and Takeoff.

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TIME, FUEL AND DISTANCE TO CLIMB - MAXIMUM CLIMB

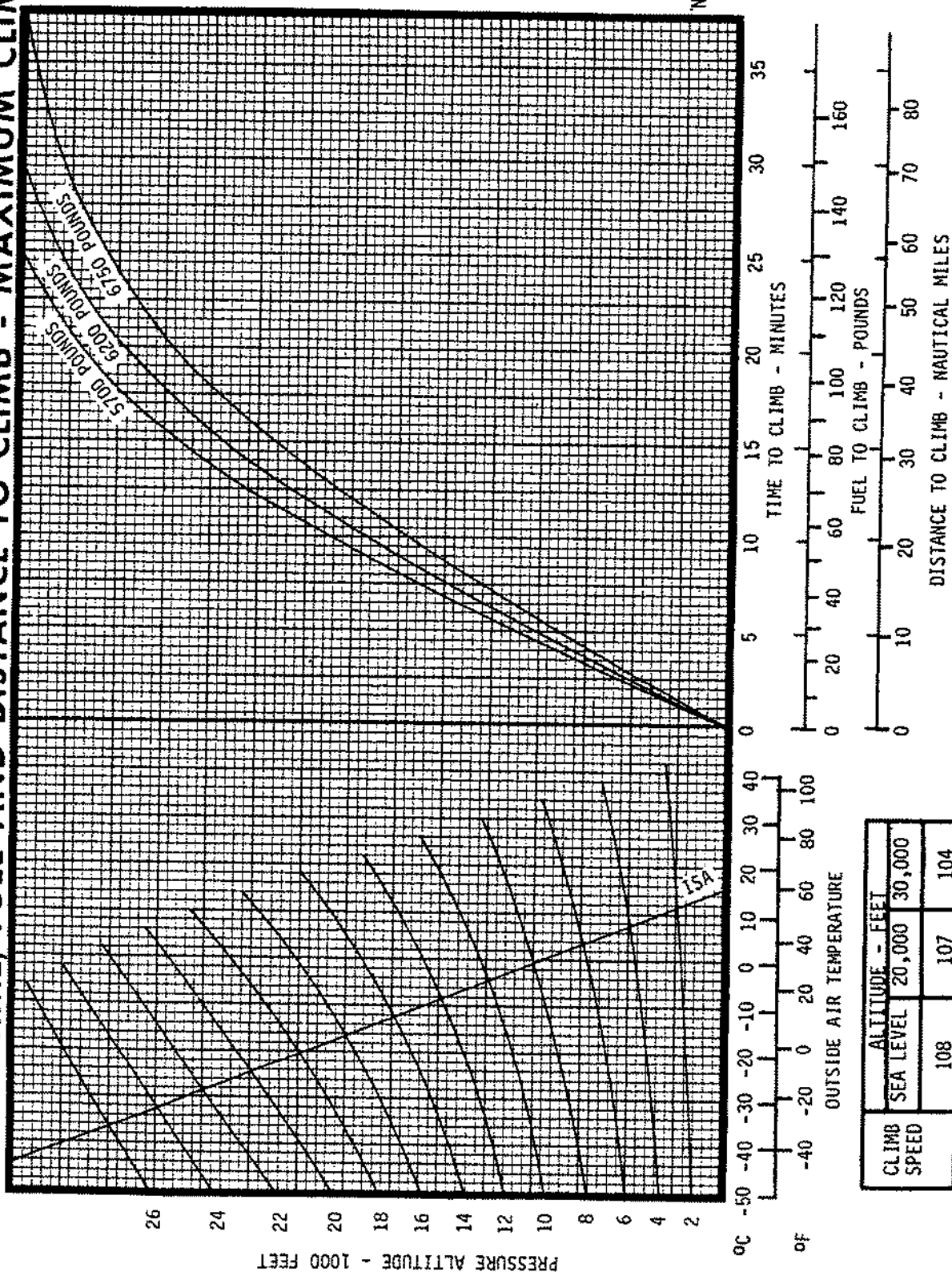


Figure 5-18

CRUISE PERFORMANCE
WITH RECOMMENDED LEAN MIXTURE**NOTE:**

1. At Sea Level, increase speed by 4 KTAS for each 1000 pounds below 6750 pounds.
2. At 5000 feet, increase speed by 5 KTAS for each 1000 pounds below 6750 pounds.
3. Operations at peak EGT may be utilized with power settings within the boxes if the airplane is equipped with the optional EGT system.

ALTITUDE	RPM	MP	-50°C (23°F)			15°C (STD TEMP) (59°F)			35°C (95°F)		
			PERCENT BHP	KTAS	TOTAL LB/HR	PERCENT BHP	KTAS	TOTAL LB/HR	PERCENT BHP	KTAS	TOTAL LB/HR
SEA LEVEL	2450	31.5	79.5	174	215	74.8	174	204	70.2	173	192
	2450	29.0	73.5	169	200	69.2	169	189	64.9	167	178
	2450	27.0	67.9	164	186	63.9	163	175	60.0	162	166
	2450	25.5	62.9	159	173	59.2	158	164	55.6	156	155
	2300	34.0	79.5	174	215	74.8	174	204	70.2	173	192
	2300	32.5	76.8	172	208	72.3	172	197	67.9	171	185
	2300	30.5	72.2	168	197	68.0	167	186	63.8	166	175
	2300	29.0	67.6	163	185	63.6	163	175	59.7	162	165
	2300	27.0	62.3	158	171	58.6	157	163	55.0	155	154
	2300	25.0	57.3	153	160	53.9	151	151	50.6	149	143
	2200	34.0	74.5	170	203	70.2	169	191	65.8	168	180
	2200	33.0	72.2	168	197	68.0	167	186	63.8	166	175
	2200	31.0	67.9	164	186	63.9	163	175	60.0	162	166
	2200	29.0	63.3	159	174	59.6	158	165	55.9	156	156
	2200	27.0	58.3	154	162	54.9	152	154	51.5	150	146
	2200	25.0	53.7	148	151	50.5	146	143	47.4	144	135
	2100	31.5	64.6	160	177	60.8	160	168	57.0	158	159
	2100	29.0	59.3	155	164	55.8	154	156	52.4	152	148
	2100	27.5	55.0	150	154	51.8	148	146	48.6	146	138
	2100	25.5	50.3	144	143	47.4	142	135	44.5	139	128
			-15°C (5°F)			5°C (STD TEMP) (41°F)			25°C (77°F)		
5000 FEET	2450	31.5	79.5	182	215	74.8	182	204	70.2	181	192
	2450	29.5	73.5	177	200	69.2	176	189	64.9	175	178
	2450	27.5	68.1	171	186	64.1	170	176	60.1	169	166
	2450	25.5	63.3	166	174	59.6	165	165	55.9	163	156
	2300	34.0	79.5	182	215	74.8	182	204	70.2	181	192
	2300	33.0	76.8	180	208	72.3	179	197	67.9	178	185
	2300	31.0	72.4	175	197	68.1	175	186	63.9	174	175
	2300	29.0	68.1	171	186	64.1	170	176	60.1	169	166
	2300	27.0	62.6	165	172	58.9	164	163	55.3	162	155
	2300	25.5	57.6	159	160	54.3	158	152	50.9	155	144
	2200	34.0	74.7	178	203	70.3	177	192	66.0	176	180
	2200	33.0	72.4	175	197	68.1	175	186	63.9	174	175
	2200	31.0	68.2	171	186	64.2	171	176	60.2	169	167
	2200	29.0	63.6	166	175	59.9	165	166	56.2	163	157
	2200	27.0	58.6	160	163	55.2	159	154	51.8	156	146
	2200	25.5	54.3	155	152	51.1	153	145	48.0	150	137
	2100	32.0	65.2	168	179	61.4	167	169	57.6	165	160
	2100	29.5	59.6	162	165	56.1	160	157	52.6	158	148
	2100	27.5	55.6	156	156	52.4	155	148	49.1	152	140
	2100	26.0	51.3	150	145	48.3	148	138	45.3	145	130

Figure 5-20 (Sheet 1 of 3)

**CRUISE PERFORMANCE
WITH RECOMMENDED LEAN MIXTURE**

NOTE:

1. At 10,000 Feet, increase speed by 5 KTAS for each 1000 pounds below 6750 pounds.
2. At 15,000 Feet, increase speed by 6 KTAS for each 1000 pounds below 6750 pounds.
3. Operations at Peak EGT may be utilized with power settings within the boxes if the airplane is equipped with the optional EGT system.

ALTITUDE	RPM	MP	-25°C (-13°F)			-5°C (STD TEMP) (23°F)			15°C (59°F)		
			PERCENT BHP	KTAS	TOTAL LB/HR	PERCENT BHP	KTAS	TOTAL LB/HR	PERCENT BHP	KTAS	TOTAL LB/HR
10,000 FEET	2450	31.5	79.5	191	215	74.8	190	204	70.2	189	192
	2450	29.5	73.5	185	200	69.2	184	189	64.9	182	178
	2450	27.5	68.2	179	186	64.2	178	176	60.2	176	167
	2450	26.0	63.6	174	175	59.9	172	166	56.2	169	157
	2300	34.0	79.5	191	215	74.8	190	204	70.2	189	192
	2300	33.0	76.8	188	208	72.3	188	197	67.9	186	185
	2300	31.0	72.5	184	198	68.3	183	187	64.1	181	176
	2300	29.0	68.2	179	186	64.2	178	176	60.2	176	167
	2300	27.0	62.9	173	173	59.2	171	164	55.6	168	155
	2300	25.5	58.0	166	161	54.6	164	153	51.2	161	145
	2200	34.0	74.8	186	204	70.5	185	192	66.1	184	181
	2200	33.0	72.5	184	198	68.3	183	187	64.1	181	176
	2200	31.0	68.6	179	187	64.5	178	177	60.5	176	167
	2200	29.0	63.9	174	175	60.2	173	166	56.4	170	157
	2200	27.5	59.3	168	164	55.8	166	156	52.4	163	148
	2200	25.5	55.0	162	154	51.8	159	146	48.6	155	138
	2100	32.0	65.9	176	180	62.1	175	171	58.2	172	162
	2100	30.0	60.3	169	167	56.8	167	158	53.2	164	150
	2100	28.0	56.3	164	157	53.0	161	149	49.7	158	141
	2100	26.0	52.3	157	148	49.3	155	140	46.2	150	132
			-35°C (-30°F)			-15°C (STD TEMP) (6°F)			5°C (42°F)		
			PERCENT BHP	KTAS	TOTAL LB/HR	PERCENT BHP	KTAS	TOTAL LB/HR	PERCENT BHP	KTAS	TOTAL LB/HR
15,000 FEET	2450	31.5	79.5	200	215	74.8	199	204	70.2	197	192
	2450	29.5	73.5	193	200	69.2	192	189	64.9	190	178
	2450	27.5	68.4	187	187	64.4	186	177	60.4	183	167
	2450	26.0	63.9	181	175	60.2	179	166	56.4	176	157
	2300	34.0	79.5	200	215	74.8	199	204	70.2	197	192
	2300	33.0	76.8	197	208	72.3	196	197	67.9	194	185
	2300	31.0	72.7	192	198	68.4	191	187	64.2	189	176
	2300	29.0	68.4	187	187	64.4	186	177	60.4	183	167
	2300	27.0	63.3	180	174	59.6	178	165	55.9	175	156
	2300	25.5	58.3	173	162	54.9	171	154	51.5	166	146
	2200	34.0	75.0	195	204	70.6	194	193	66.2	192	181
	2200	33.0	72.7	192	198	68.4	191	187	64.2	189	176
	2200	31.5	68.9	188	188	64.9	186	178	60.8	183	168
	2200	29.5	64.2	182	176	60.5	180	167	56.7	177	158
	2200	27.5	59.9	175	166	56.4	173	157	52.9	169	149
	2200	26.0	55.6	169	156	52.4	166	148	49.1	160	140
	2100	32.5	66.6	185	182	62.7	183	172	58.8	180	163
	2100	30.5	60.9	177	168	57.4	175	160	53.8	171	151
	2100	28.0	57.0	171	159	53.6	168	151	50.3	163	143
	2100	26.5	53.3	165	150	50.2	161	142	47.1	152	134

Figure 5-20 (Sheet 2 of 3)

CRUISE PERFORMANCE**WITH RECOMMENDED LEAN MIXTURE**

NOTE:

1. At 20,000 Feet, increase speed by 6 KTAS for each 1000 pounds below 6750 pounds.
2. At 23,500 Feet, increase speed by 6 KTAS for each 1000 pounds below 6750 pounds.
3. At 25,000 Feet, increase speed by 7 KTAS for each 1000 pounds below 6750 pounds.
4. Operations at peak EGT may be utilized with power settings within the boxes if the airplane is equipped with the optional EGT system.

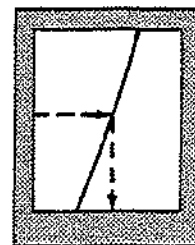
ALTITUDE	RPM	MP	-45°C (-48°F)			-25°C (STD TEMP) (-12°F)			-5°C (24°F)		
			PERCENT BHP	KTAS	TOTAL LB/HR	PERCENT BHP	KTAS	TOTAL LB/HR	PERCENT BHP	KTAS	TOTAL LB/HR
20,000 FEET	2450	31.5	79.5	209	215	74.8	208	204	70.2	206	192
	2450	29.5	73.5	202	200	69.2	201	189	64.9	198	178
	2450	27.5	68.6	196	187	64.5	193	177	60.5	190	167
	2450	26.0	64.1	189	176	60.3	187	167	56.6	182	158
	2300	34.0	79.5	209	215	74.8	208	204	70.2	206	192
	2300	33.0	76.8	206	208	72.3	205	197	67.9	202	185
	2300	31.0	72.9	201	198	68.6	200	187	64.3	197	176
	2300	29.0	68.6	196	187	64.5	193	177	60.5	190	167
	2300	27.0	63.6	188	175	59.9	186	166	56.2	181	157
	2300	25.5	58.6	180	163	55.2	176	154	51.8	168	146
	2200	34.0	75.2	204	204	70.8	203	193	66.4	200	182
	2200	33.0	72.9	201	198	68.6	200	187	64.3	197	176
	2200	31.5	69.2	196	189	65.2	194	178	61.1	191	169
	2200	29.5	64.6	190	177	60.8	187	168	57.0	183	159
	2200	28.0	60.3	183	167	56.8	180	158	53.2	173	150
	2200	26.0	56.3	176	157	53.0	171	149	49.7	158	141
	2100	32.5	66.9	193	183	63.0	191	173	59.1	187	164
	2100	30.5	61.6	185	170	58.0	182	161	54.4	176	153
	2100	28.5	57.6	178	160	54.3	174	152	50.9	164	144
	2100	27.0	54.3	172	152	51.1	166	145	----	----	----
			-52°C (-61°F)			-32°C (STD TEMP) (-25°F)			-12°C (11°F)		
23,500 FEET	2450	31.0	77.0	213	209	72.5	212	198	68.0	208	186
	2450	29.5	73.5	209	200	69.2	206	189	64.9	203	178
	2450	27.5	68.8	202	188	64.8	199	178	60.8	194	168
	2450	26.0	64.2	194	176	60.4	191	167	56.7	184	158
	2300	29.5	68.7	202	188	64.7	199	177	60.7	194	168
	2300	27.5	63.8	194	175	60.0	190	166	56.3	183	157
	2300	26.0	59.0	185	163	55.5	180	155	52.1	161	147
	2200	30.0	64.9	196	178	61.1	193	169	57.3	186	160
	2200	28.0	60.6	188	167	57.1	184	159	53.5	172	150
	2200	26.0	57.0	181	159	53.6	174	151	----	----	----
			-54°C (-66°F)			-34°C (STD TEMP) (-30°F)			-14°C (6°F)		
25,000 FEET	2450	31.0	77.0	216	209	72.5	214	198	68.0	211	186
	2450	29.5	73.5	211	200	69.2	209	189	64.9	205	178
	2450	27.5	68.9	204	188	64.9	202	178	60.8	196	168
	2450	26.0	64.2	197	176	60.5	193	167	56.7	184	158
	2300	29.0	68.9	204	188	64.9	202	178	60.8	196	168
	2300	27.0	63.9	196	175	60.2	192	166	56.4	183	157
	2300	26.0	59.3	188	164	55.8	182	156	----	----	----
	2200	30.0	65.2	199	179	61.4	195	169	57.6	187	160
	2200	28.0	60.9	191	168	57.4	186	160	53.8	170	151
	2200	27.0	57.6	184	160	54.3	176	152	----	----	----

Figure 5-20 (Sheet 3 of 3)

RANGE PROFILE

CONDITIONS:

1. Takeoff Weight - 6750 Pounds.
2. Cruise Climb to Desired Altitude.
3. Recommended Lean Fuel Flow.
4. Zero Wind
5. Standard Day.



NOTE:

1. Range computations include fuel required for start, taxi, takeoff, cruise climb to altitude, cruise, descent and 45 minutes reserve fuel at the particular cruise power.
2. The distances shown are the sum of the distances to climb, cruise and descend.

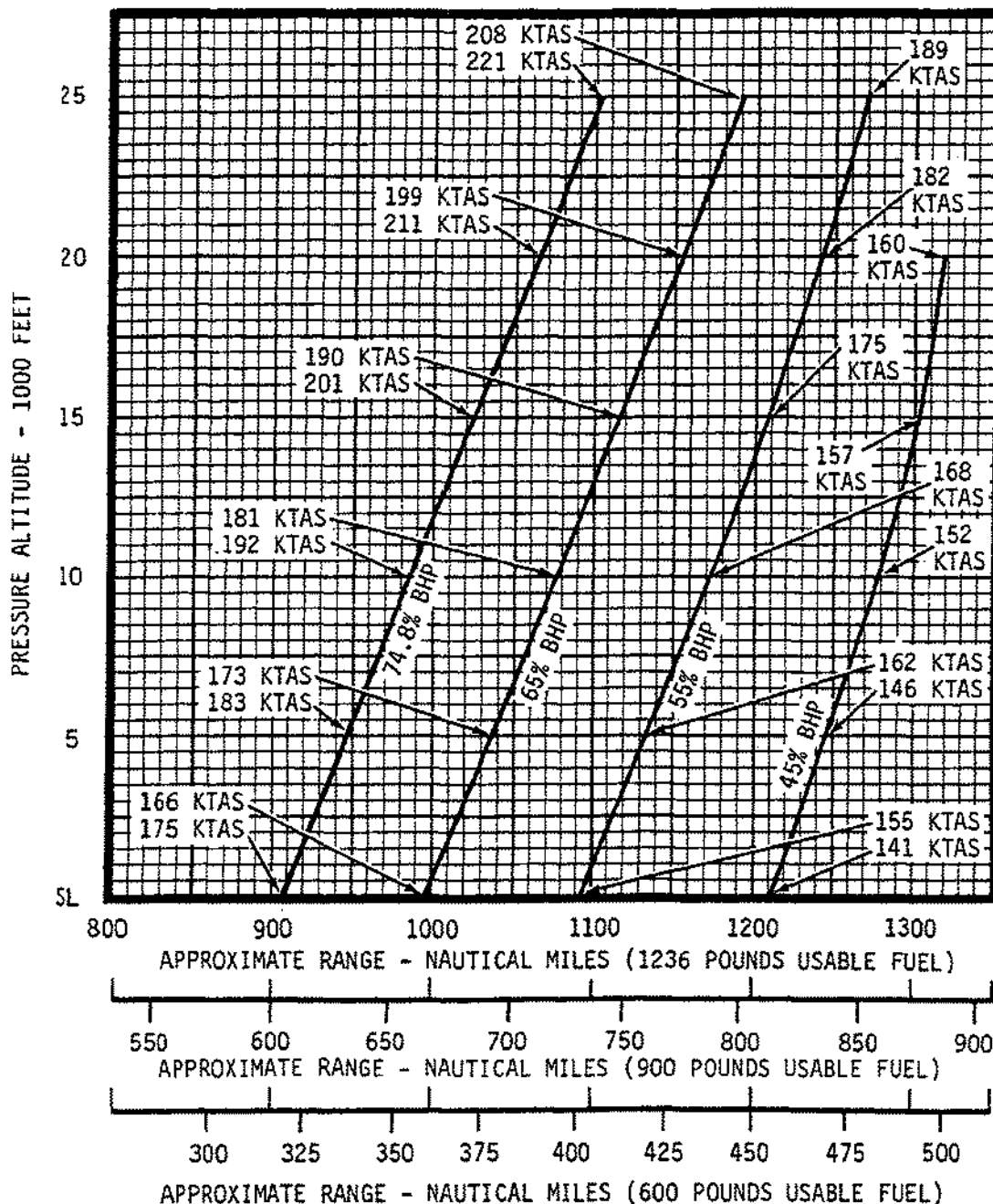


Figure 5-21

54847043

ENDURANCE PROFILE

CONDITIONS:

1. Takeoff Weight - 6750 Pounds.
2. Cruise Climb to Desired Altitude.
3. Recommended Lean Fuel Flow.
4. Standard Day.

NOTE:

1. Endurance computations include fuel required for start, taxi, takeoff, cruise climb to altitude, cruise, descent and 45 minutes reserve fuel at the particular cruise power.
2. The endurance shown is the sum of the times to climb, cruise and descend.

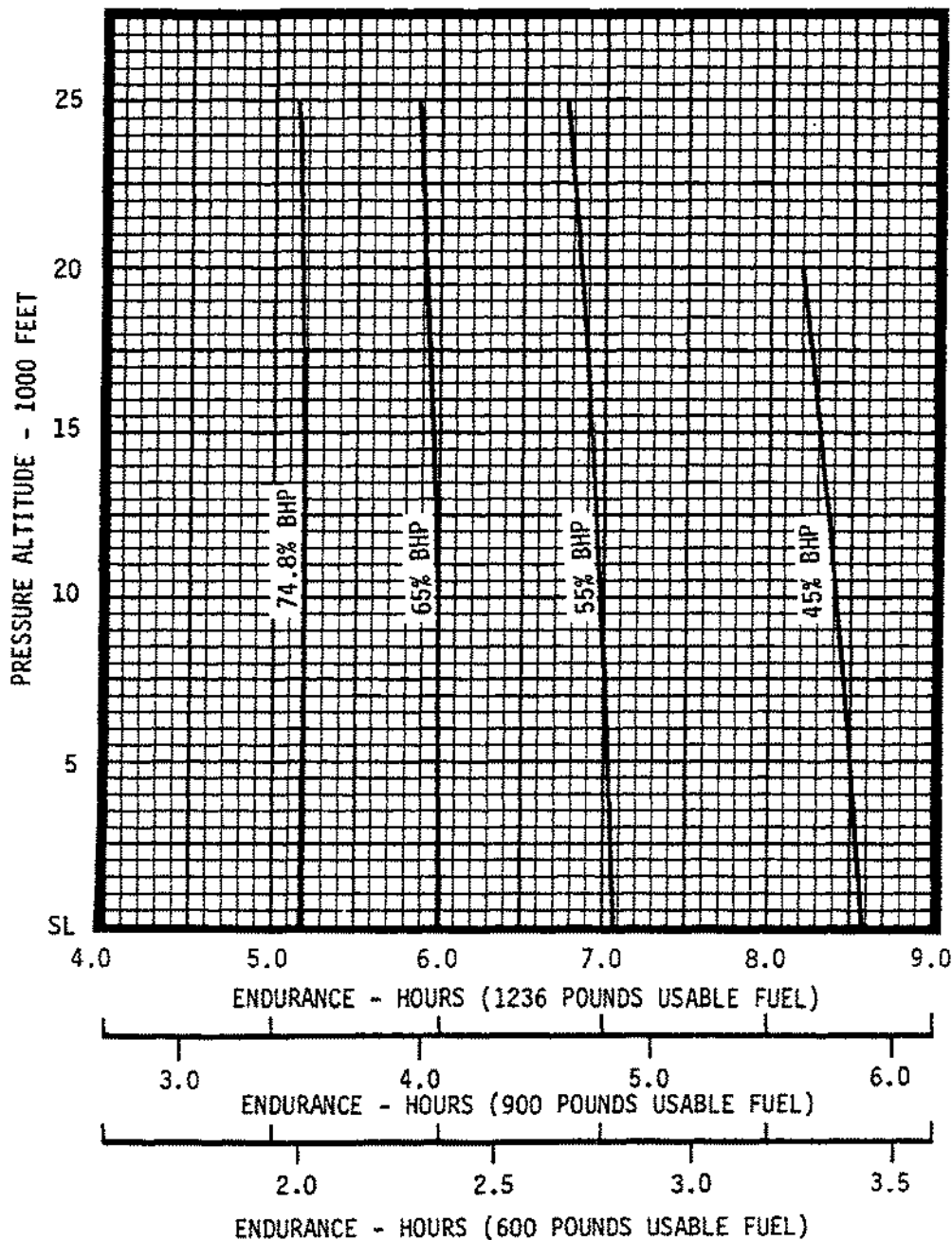
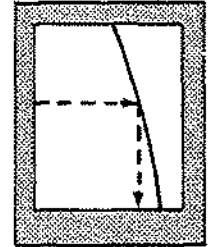


Figure 5-22

54847043

HOLDING TIME

CONDITIONS:

1. 2100 RPM and 24 Inches Hg.
Manifold Pressure (45% Power).
2. Recommended Lean Fuel Flow
(129 Pounds Per Hour Total).

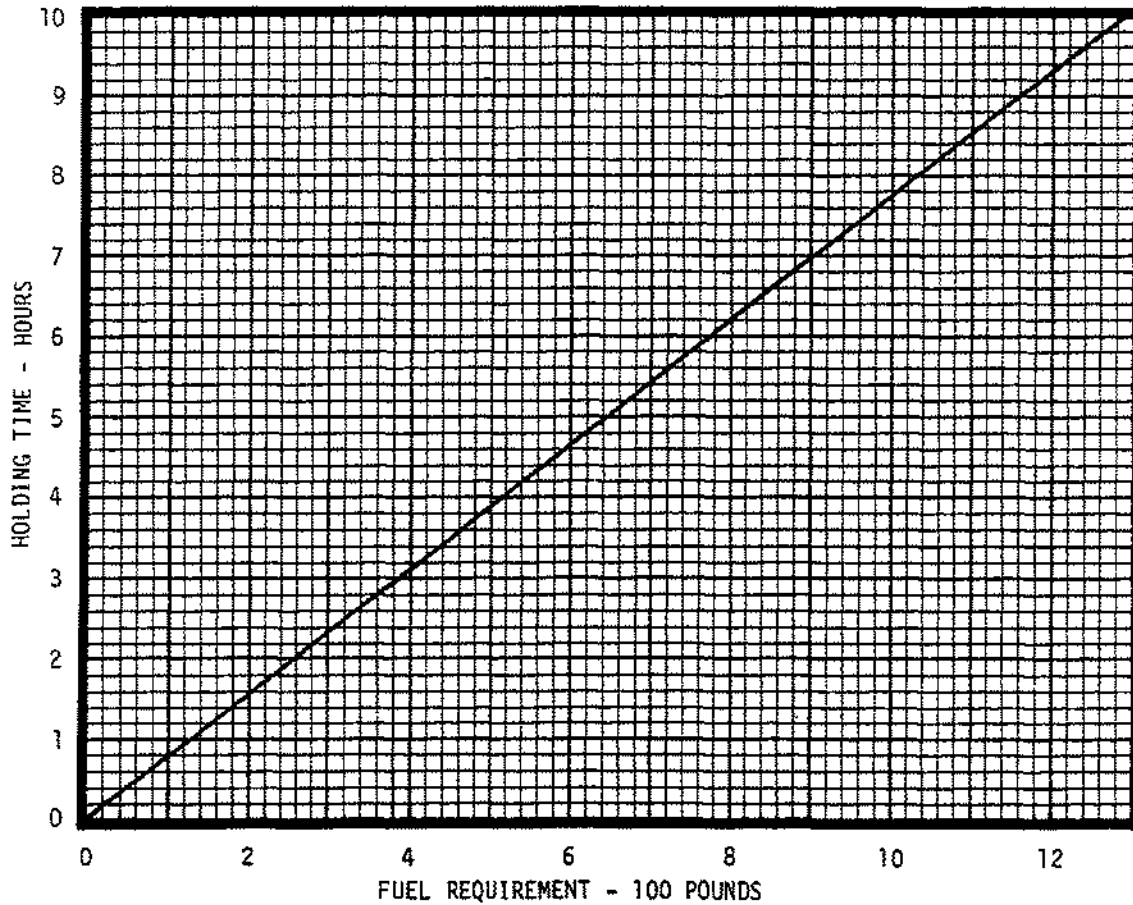
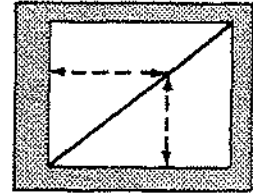


Figure 5-23

TIME, FUEL AND DISTANCE TO DESCEND

CONDITIONS:

1. Power - 2200 RPM and 24.5 Inches Hg. Manifold Pressure.
2. Landing Gear - UP.
3. Wing Flaps - UP.
4. Airspeed - 180 KIAS
5. Cowl Flaps - CLOSED.

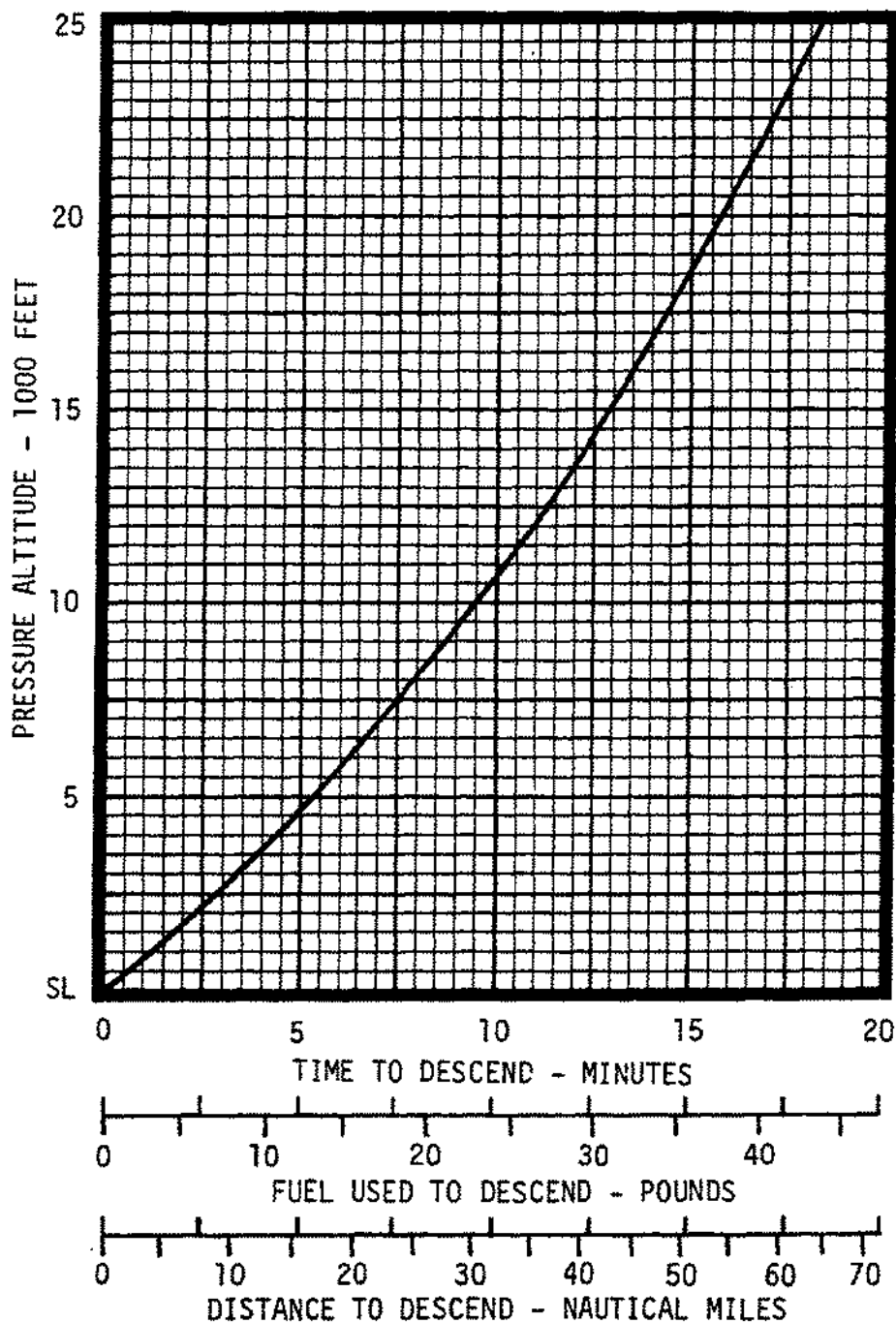
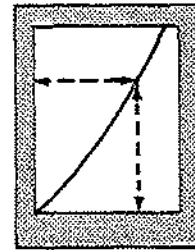


Figure 5-24

NORMAL LANDING DISTANCE

CONDITIONS:

1. Throttles - IDLE.
2. Landing Gear - DOWN.
3. Wing Flaps - 45°.
4. Cowl Flaps - CLOSE.
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 13 knots. Expect total landing distance to increase by 35%.
2. Decrease total distances by 3% for each 4 knots headwind. For operations with tailwinds up to 10 knots, increase total distances by 8% for each 3 knots wind.

WEIGHT- POUNDS	SPEED AT 50-FOOT OBSTACLE KIAS	PRESSURE ALTITUDE - FEET	-20°C (-4°F)		-10°C (14°F)		0°C (32°F)		10°C (50°F)	
			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
6750	94	Sea Level	890	2270	930	2310	970	2350	1000	2380
		1000	930	2310	960	2340	1000	2380	1040	2420
		2000	960	2340	1000	2380	1040	2420	1080	2460
		3000	1000	2380	1040	2420	1080	2460	1120	2500
		4000	1040	2420	1080	2460	1120	2500	1160	2540
		5000	1070	2450	1120	2500	1160	2540	1200	2580
		6000	1120	2500	1160	2540	1200	2580	1250	2630
		7000	1160	2540	1200	2580	1250	2630	1300	2680
		8000	1200	2580	1250	2630	1300	2680	1350	2730
		9000	1250	2630	1300	2680	1350	2730	1400	2780
		10,000	1300	2680	1350	2730	1400	2780	1450	2830
6200	91	Sea Level	740	2120	770	2150	800	2180	830	2210
		1000	770	2150	800	2180	830	2210	860	2240
		2000	800	2180	830	2210	860	2240	890	2270
		3000	830	2210	860	2240	890	2270	930	2310
		4000	860	2240	890	2270	930	2310	960	2340
		5000	890	2270	930	2310	960	2340	1000	2380
		6000	930	2310	960	2340	1000	2380	1040	2420
		7000	960	2340	1000	2380	1040	2420	1080	2460
		8000	1000	2380	1040	2420	1080	2460	1120	2500
		9000	1040	2420	1080	2460	1120	2500	1160	2540
		10,000	1080	2460	1120	2500	1160	2540	1210	2590
5700	86	Sea Level	620	2000	640	2020	670	2050	690	2070
		1000	640	2020	670	2050	690	2070	720	2100
		2000	660	2040	690	2070	720	2100	740	2120
		3000	690	2070	720	2100	740	2120	770	2150
		4000	720	2100	740	2120	770	2150	800	2180
		5000	740	2120	770	2150	800	2180	830	2210
		6000	770	2150	800	2180	830	2210	860	2240
		7000	800	2180	830	2210	860	2240	890	2270
		8000	830	2210	860	2240	900	2280	930	2310
		9000	860	2240	900	2280	930	2310	970	2350
		10,000	900	2280	930	2310	970	2350	1000	2380
5200	84	Sea Level	570	1950	590	1970	620	2000	640	2020
		1000	590	1970	620	2000	640	2020	660	2040
		2000	610	1990	640	2020	660	2040	690	2070
		3000	640	2020	660	2040	690	2070	710	2090
		4000	660	2040	690	2070	710	2090	740	2120
		5000	690	2070	710	2090	740	2120	770	2150
		6000	710	2090	740	2120	770	2150	800	2180
		7000	740	2120	770	2150	800	2180	830	2210
		8000	770	2150	800	2180	830	2210	860	2240
		9000	800	2180	830	2210	860	2240	890	2270
		10,000	830	2210	860	2240	890	2270	930	2310

Figure 5-25 (Sheet 1 of 2)

NORMAL LANDING DISTANCE**CONDITIONS:**

1. Throttles - IDLE.
2. Landing Gear - DOWN
3. Wing Flaps - 45°.
4. Cowl Flaps - CLOSE.
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 13 knots. Expect total landing distance to increase by 35%.
2. Decrease total distances by 3% for each 4 knots headwind. For operations with tailwinds up to 10 knots, increase total distances by 8% for each 3 knots wind.

WEIGHT- POUNDS	SPEED AT 50-FOOT OBSTACLE KIAS	PRESSURE ALTITUDE - FEET	20°C (68°F)		30°C (86°F)		40°C (104°F)	
			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
6750	94	Sea Level	1040	2420	1070	2450	1110	2490
		1000	1070	2450	1110	2490	1150	2530
		2000	1110	2490	1150	2530	1190	2570
		3000	1150	2530	1190	2570	1230	2610
		4000	1200	2580	1240	2620	1280	2660
		5000	1240	2620	1290	2670	1330	2710
		6000	1290	2670	1330	2710	1380	2760
		7000	1340	2720	1390	2770	1430	2810
		8000	1390	2770	1440	2820	1490	2870
		9000	1450	2830	1500	2880	1550	2930
6200	91	10,000	1500	2880	1550	2930	1610	2990
		Sea Level	860	2240	890	2270	920	2300
		1000	890	2270	920	2300	950	2330
		2000	920	2300	960	2340	990	2370
		3000	960	2340	990	2370	1020	2400
		4000	990	2370	1030	2410	1060	2440
		5000	1030	2410	1070	2450	1100	2480
		6000	1070	2450	1110	2490	1140	2520
		7000	1110	2490	1150	2530	1190	2570
		8000	1160	2540	1200	2580	1230	2610
5700	86	9000	1200	2580	1240	2620	1280	2660
		10,000	1250	2630	1290	2670	1330	2710
		Sea Level	720	2100	740	2120	760	2140
		1000	740	2120	770	2150	790	2170
		2000	770	2150	800	2180	820	2200
		3000	800	2180	820	2200	850	2230
		4000	830	2210	860	2240	880	2260
		5000	860	2240	890	2270	920	2300
		6000	890	2270	920	2300	950	2330
		7000	930	2310	960	2340	990	2370
5200	84	8000	960	2340	990	2370	1030	2410
		9000	1000	2380	1030	2410	1070	2450
		10,000	1040	2420	1070	2450	1110	2490
		Sea Level	660	2040	680	2060	710	2090
		1000	690	2070	710	2090	730	2110
		2000	710	2090	740	2120	760	2140
		3000	740	2120	760	2140	790	2170
		4000	770	2150	790	2170	820	2200
		5000	790	2170	820	2200	850	2230
		6000	820	2200	850	2230	880	2260
5200	84	7000	860	2240	890	2270	910	2290
		8000	890	2270	920	2300	950	2330
		9000	920	2300	960	2340	990	2370
		10,000	960	2340	990	2370	1030	2410

Figure 5-25 (Sheet 2 of 2)

SECTION 6

WEIGHT & BALANCE/EQUIPMENT LIST

TABLE OF CONTENTS

	Page		Page
INTRODUCTION	6-1	WEIGHT AND BALANCE	
AIRPLANE WEIGHING		RECORD	6-5
PROCEDURES	6-1	EQUIPMENT LIST	6-9
WEIGHT AND BALANCE		WEIGHT AND BALANCE	
DETERMINATION FOR FLIGHT	6-4	FORM	6-27/6-28

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. An equipment list, provided at the end of this section, provides arms and weights of all equipment available for installation on the airplane.

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 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.
5. Adjust all seats to the normal operating position.
6. Close all baggage doors, main cabin door and emergency exit window.
7. Clean the airplane inside and out.
8. Remove all snow, ice or water which may be on the airplane.
9. Weigh the airplane in a closed hangar to avoid errors caused by air currents.
10. 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.

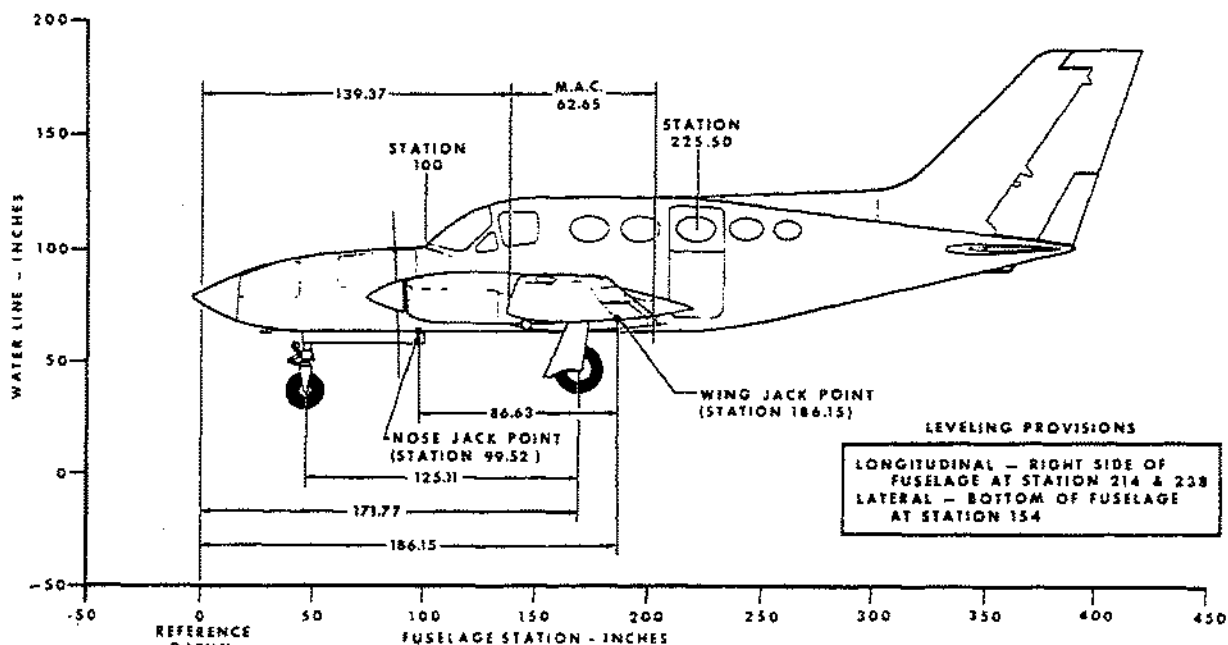
- a. Turn off all electrical power.
 - b. Turn fuel selectors OFF.
 - c. Remove engine cowling.
 - d. Disconnect inlet fuel supply hose at the inlet side of the engine-driven fuel pump.
 - e. Connect defueling hose to inlet fuel supply hose.
 - f. Turn fuel selectors ON and defuel wing until all possible fuel is removed.
 - g. Drain the remaining fuel through the drain valves into an appropriate container.
 - (1) The main tanks are drained by opening the drain valve on the bottom of each tank sump. The main tank fuel lines are drained by removing a fuel sump drain valve located at the wing gap fairings, inboard of the respective engine nacelle. The right and left fuel filters are drained aft of the main spar inboard of each main fuel tank.
 - (2) Each drain should remain open until the defueling rate slows to approximately 1 drop per second.
 - (3) Drain fuel selector valves and fuel crossfeed lines.
 - 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.
11. The airplane must be level when weighed.
- a. For longitudinal leveling, two bolts are located on the right side of the fuselage at stations 214.00 and 238.00. Unscrew these two bolts approximately 1/4 inch so a spirit level can be placed on them.
 - b. For lateral leveling, use a spirit level on the underside of the fuselage at station 154.0.
12. When weighing on the wheels or jack points with mechanical scales, insure that the scales are in calibration 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.

CAUTION

- Keep the airplane level while jacking to prevent the airplane from slipping off the jacks and damaging the airplane.
- Jack pads, provided with the airplane, must be installed in each wing jack point prior to jacking the airplane.

13. 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 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.
14. Determine scale reading, scale drift and tare from all three scales.
15. 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 86.63. IF WEIGHED ON WHEELS, USE 125.31 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

- * IF WEIGHED ON WHEELS CROSS OUT "JACK POINTS OR"; IF WEIGHED ON JACK POINTS CROSS OUT "OR WHEELS"
- ▲ INCLUDES ALL UNDRAINABLE FLUIDS AND FULL 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 POUNDS PER GALLON				
	LEFT AND RIGHT WING	41.0	165.2	67.7
BASIC EMPTY WEIGHT				

Figure 6-1

16. Computations (see Figure 6-1).
- 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 the Net Weight and Airplane Total As Weighed columns.
 - Determine the CG arm of the airplane using the formula presented in Figure 6-1, if the jack points are used for weighing. If the airplane is weighed on the wheels, use the following formula.

$$\text{CG Arm of Airplane As Weighed} = 171.77 - \frac{125.11 W_N}{W_T} = \text{Inches Aft of Datum}$$

where W_N = net weight on nosewheel and W_T = total net weight on all three wheels

- Enter the total Net Weight and CG Arm in the Basic Empty Weight and Center of Gravity Table columns. Multiply the Weight (Lbs) entry times the CG Arm (In) entry to determine Moment (In-Lbs/100) entry. Total each of the three columns to determine basic empty weight, CG arm and moment.

NOTE

An attempt should be made to verify the results of each weighing, when data for comparison is available.

- 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 in Figure 6-4 and enter them in on item 1 (Basic Empty Weight) of Figure 6-3. For this sample, assume a weight of 4628 pounds and moment/100 of 7122.

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 212.87.

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).

See Figure 6-3. Subtract item 6 (Less Fuel For Taxiing) from item 5 (Ramp Weight) to determine item 7 (Takeoff Weight). Enter item 7 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.

Refer to Section 5 for estimated fuel used during the flight. After determining the fuel used, obtain the appropriate weights and 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 affect 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.

WEIGHT AND MOMENT TABLES

CREW AND PASSENGERS

WEIGHT (POUNDS)	1ST OR 2ND SEATS ARM = 137"	3RD OR 4TH SEATS		5TH OR 6TH SEATS ARM = 218"	TOILET SEAT ARM = 250"	7TH OR 8TH SEATS ARM = 261"
		FORWARD FACING ARM = 175"	AFT FACING ARM = 178"			
		MOMENT/100				
10	14	18	18	22	25	26
20	27	35	36	44	50	52
30	41	52	53	65	75	78
40	55	70	71	87	100	104
50	68	88	89	109	125	130
60	82	105	107	131	150	157
70	96	122	125	153	175	183
80	110	140	142	174	200	209
90	123	158	160	196	225	235
100	137	175	178	218	250	261
110	151	192	196	240	275	287
120	164	210	214	262	300	313
130	178	228	231	283	325	339
140	192	245	249	305	350	365
150	206	262	267	327	375	392
160	219	280	285	349	400	418
170	233	298	303	371	425	444
180	247	315	320	392	450	470
190	260	332	338	414	475	496
200	274	350	356	436	500	522
210	288	368	374	458	525	548
220	301	385	392	480	550	574
230	315	402	409	501	575	600
240	329	420	427	523	600	626
250	342	438	445	545	625	652
260	356	455	463	567	650	679
270	370	472	481	589	675	705
280	384	490	498	610	700	731
290	397	508	516	632	725	757
300	411	525	534	654	750	783

FUEL

GALLONS (AT 6.0 POUNDS PER GALLON)	WEIGHT (POUNDS)	MOMENT/100 ARMS Varies	GALLONS (AT 6.0 POUNDS PER GALLON)	WEIGHT (POUNDS)	MOMENT/100 ARMS Varies
5	30	50	105	630	1022
10	60	99	110	660	1070
15	90	148	115	690	1113
20	120	197	120	720	1166
25	150	246	125	750	1214
28	168	275	130	780	1262
30	180	294	135	810	1310
35	210	343	140	840	1359
40	240	392	145	870	1407
45	270	440	150	900	1455
50	300	489	155	930	1503
55	330	537	160	960	1550
56	336	547	165	990	1598
60	360	585	170	1020	1646
65	390	635	175	1050	1694
70	420	683	180	1080	1742
75	450	731	185	1110	1790
80	480	780	190	1140	1838
85	510	828	195	1170	1886
90	540	877	200	1200	1934
95	570	925	204	1224	1971
100	600	973			

BAGGAGE AND CABINET CONTENTS

WEIGHT (POUNDS)	AVIONICS BAY ARM = 32"	NOSE COMPARTMENT ARM = 71"	WING LOCKERS ARM = 186"	AFT CABIN			
				BAY "A" ARM = 266"	BAY "B" ARM = 282"	REFRESHMENT BAR ARM = 279"	OVERHEAD CABINET ARM = 282"
MOMENT/100							
10	3	7	19	26	28		28
20	6	14	37	53	56	56	56
30	10	21	56	80	85		
40	13	28	74	106	113		
50	16	36	93	133	141		
60	19	43	112	160	169		
70	22	50	130	186	197		
80	25	57	149	213	226		
90	29	64	167	239	254		
100	32	71	186	266	282		
110	35	78	205	293			
120	38	85	223	319			
130	42	92	242	346			
140	45	99	260	372			
150	48	107	279	399			
160	51	114	298	426			
170	54	121	316	452			
180	58	128	335	479			
190	61	135	353	505			
200	64	142	372	532			
210	67	149	391	559			
220	70	156	409	585			
230	74	163	428	612			
240	77	170	446	638			
250	80	178	465	665			
260		185	484	692			
270		192	502	718			
280		199	521	745			
290		206	539	771			
300		213	558	798			
310		220	577	825			
320		227	595	851			
330		234	614	878			
340		241	632	904			
350		248	651	931			
360			670	958			
370			688	984			
380			707	1011			
390			725	1037			
400			744	1064			

CREW AND PASSENGER SEATS
AND BAGGAGE MOMENT ARMS

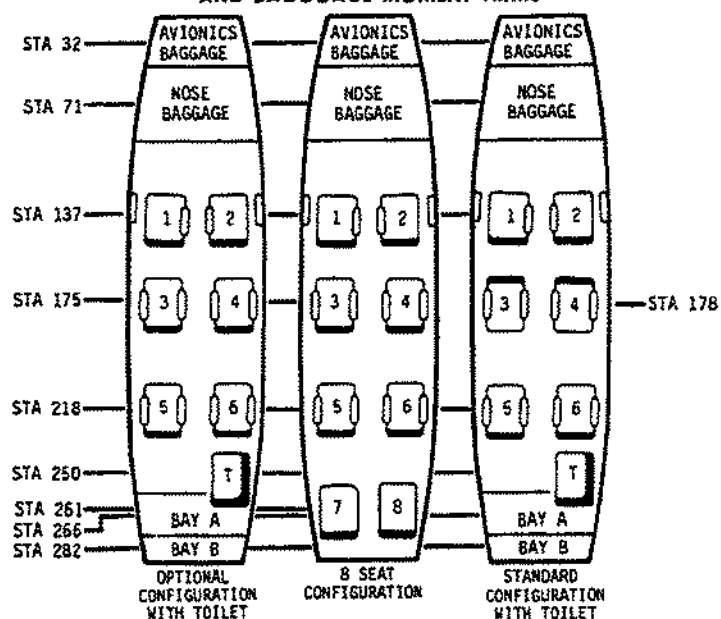


Figure 6-2 (Sheet 1 of 2)

WEIGHT AND MOMENT TABLES

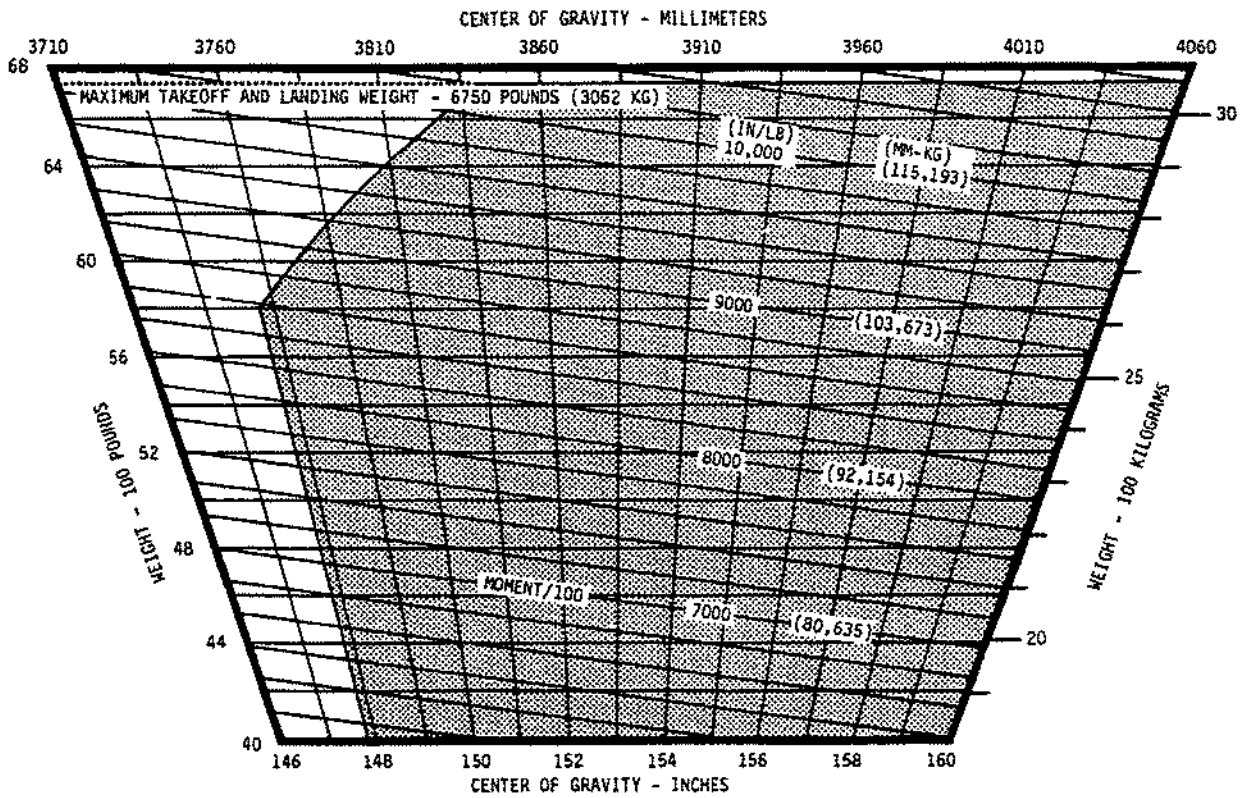
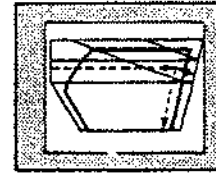


Figure 6-2 (Sheet 2 of 2)

SAMPLE WEIGHT AND BALANCE FORM

PAYLOAD COMPUTATIONS				R E F	ITEM	WEIGHT	MOMENT/ 100
ITEM OCCUPANTS OR CARGO	ARM	WEIGHT	MOMENT/ 100	1.	BASIC EMPTY WEIGHT	4628	7122
SEAT 1	137	160	219	2.	PAYLOAD	907	1419
SEAT 2	137	170	233	3.	ZERO FUEL WEIGHT (sub-total) (Do not exceed maximum zero fuel weight of 6515 pounds)	5535	8541
SEAT 3	175	120	210	4.	FUEL LOADING	800	1294
SEAT 4	175	190	332	5.	RAMP WEIGHT (sub-total) (Do not exceed maximum ramp weight of 6785 pounds)	6335	9835
SEAT 5	218	160	349	6.	LESS FUEL FOR TAXIING	35	58
SEAT 6				7.	TAKEOFF WEIGHT (Do not exceed maximum takeoff weight of 6750 pounds)	6300	9777
SEAT 7				8.	LESS FUEL TO DESTINATION	597	968
SEAT 8				9.	LANDING WEIGHT (Do not exceed maximum landing weight of 6750 pounds)	5703	8809
TOILET							
BAGGAGE							
WING LOCKERS							
AVIONICS							
NOSE	71	107	76				
BAY A							
BAY B							
CABINET CONTENTS							
PAYLOAD	---	907	1419				

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.

Figure 6-3

LOADING**WARNING**

If a tail ground strike has occurred or there is evidence of any damage to the tailcone or empennage area, the airplane must be examined by a qualified aircraft mechanic and repaired, if necessary, before the next flight.

Due to differences in optional equipment installed on the airplane, a wide center of gravity range exists. Under certain loading conditions, it is possible to exceed the aft CG limits which could cause the tail to tip and allow the tail bumper to strike the ground. The force of a tail ground strike could damage internal aircraft structure, resulting in possible interference with elevator control system operation.

To prevent tail tipping during airplane loading, it is recommended that owners and operators study their individual airplane's weight and balance information to become familiar with its capabilities and limitations. When loading, it is recommended the following steps be followed:

1. During unusual loading conditions where the airplane aft CG limits could possibly be exceeded, use a suitable padded tail stand under the tailcone, whenever possible. The tail stand should be removed by a crew member or ground service personnel only when airplane loading is complete.
2. Load the baggage in the nose and avionics compartments prior to boarding of the crew and passengers.
3. Avoid carrying baggage in the aft cabin.
4. When boarding people, have the pilot or person who is to occupy the copilot seat be the first to board with remaining persons filling the most forward seats first and the aft seats last. Arrange to have heavier people occupy the most forward seats.
5. When unloading the aircraft, have one person remain in the copilot or pilot seat while the other flight deck occupant goes aft to open the door. Arrange to have the passengers in the aft seats to be the first to deplane.

EQUIPMENT LIST

THE FOLLOWING IS A LIST OF EQUIPMENT INSTALLED IN THE AIRPLANE WHEN DELIVERED BY THE MANUFACTURER. DATUM STATION 0.0 IS 100.0 INCHES FORWARD OF THE AFT FACE OF THE FUSELAGE BULKHEAD JUST FORWARD OF THE RUDDER PEDALS.

POSITIVE ARMS ARE DISTANCES AFT OF DATUM STATION 0.0.

AN ASTERISK (*) INDICATES EXCHANGE WEIGHT.

THE TOTAL OPTIONAL EQUIPMENT WEIGHT AND MOMENT IS THE WEIGHT OF THE OPTION PACKAGE ONLY AND NOT THE SUM OF ALL ITEMS LISTED.

INSTALLATION APPROVAL OF EQUIPMENT INCLUDED IN THIS LIST IS MAINTAINED EITHER BY THE MANUFACTURER'S STC WITH THE APPROVAL NUMBER NOTED WITH EQUIPMENT OR IN THE MANUFACTURER'S TYPE DESIGN FILE IN ACCORDANCE WITH THE DELEGATION OPTION AUTHORIZATION CE-3.

**SECTION A
REQUIRED EQUIPMENT**

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
	WHEEL-MAIN GEAR	9910393		2	17.5	171.8
	TIRE-MAIN GEAR 650X10 8 PLY	C262003210		2	29.6	171.8
	BRAKE-MAIN GEAR	9910393		3	28.5	171.8
	TUBE-MAIN GEAR	C262023105		2	5.6	171.8
	WHEEL-NOSE GEAR	9910194		5	5.5	47.0
	TIRE-NOSE GEAR 600X6 6 PLY III	9910336		1	9.8	47.0
	TUBE-NOSE GEAR	C262023102		1	1.7	47.0
	ENGINE CMC 6 CYL	TS10-520NB		2	861.6	115.4
	CONTROLLER VAR & THROTTLE BODY	633388		10	14.8	140.1
	TURBOCHARGERS AIR RESEARCH	635630		1	60.0	139.8
	FILTER AIR INDUCTION	9913001		1	2.5	135.8
	OIL RADIATOR	637132		2	15.0	115.4
	OIL FILTER & ADAPTER	631641		2	5.4	127.5
	FUEL PUMP-ENGINE DRIVEN CMC	641583-639		2	5.2	125.0
		1				

SECTION A
REQUIRED EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
75	FUEL PUMP-BOOST	9910202 2		2	7.0	174.7
	PROP 3-BLADE */82NEA-5.5	3AF32C505-		2	140.0	87.4
	POLISHED PROP SPINNER & BKHD	D5212D5214		2	9.8	83.5
	PROP SPINNER & BULKHEAD	03534D3796		2	9.9	83.5
76D	PROP GOVERNOR LH 3 STD	DCF29007/T		1	2.8	96.5
	PROP GOVERNOR LH W/SYNC T3	DCFS29008/		1	3.9	96.5
	PROP GOVERNOR LH W/SYNC/UNF2/T3	DCFUS29001		1	4.0	96.5
	PROP GOVERNOR LH W/UNF /T3	DCFU290013		1	2.9	96.5
76D	PROP GOVERNOR RH 3 STD	DCF29007/T		1	2.8	96.5
	PROP GOVERNOR RH W/SYNC T3	DCFS29007/		1	2.9	96.5
	PROP GOVERNOR RH W/SYNC/UNF3/T3	DCFUS29001		1	3.0	96.5
	PROP GOVERNOR RH W/UNF /T3	DCFU290013		1	2.9	96.5
04	AIRSPEED INDICATOR	C661040212		1	0.7	112.6
	AIRSPEED INDICATOR TAS LH	C661045316		1	2.8	112.6
01A	ALTIMETER	C661014101		1	1.1	112.6
	ALTIMETER FT & MILIBARS	C661025101		1	1.1	112.6
	400 ENCODING ALTIMETER-INCHES	EA-401A		1	2.6	111.9
	400 ENCODING ALTIMETER-MILIBARS	EA-401A		1	2.6	111.9
624E	800 ENCODING ALTIMETER-INCHES	EA-801A		1	2.8	111.9
	800 ENCODING ALTIMETER-MILIBARS	EA-801A		1	2.8	111.9
09	TACHOMETER-DUAL	C668017110		1	1.8	112.6
	TACHOMETER-SYNCHRONOUS, DUAL	C668016110		1	1.8	112.6
39	FUEL QUANTITY INDICATOR-DUAL	9910232 1		1	1.1	112.6
	FUEL FLOW INDICATOR-DUAL STD	C662020116		1	2.1	158.0
	FUEL FLOW GAGE & MGMT COMPUTER	9910395 8		1	2.2	114.6
	GAGE-MANIFOLD PRESSURE-DUAL	C662026113		1	1.1	112.6
	GAGE-UNIT LEFT ENGINE COMB	C662019101		1	1.1	112.6
	GAGE-UNIT RIGHT ENGINE COMB	C662019101		1	1.1	112.6
	RATE OF CHANGE CABIN PRESSURE	C668517101		1	0.9	115.8
	COMPASS	C660501401		1	0.7	118.3

SECTION A
REQUIRED EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
	DIFF & ALT CABIN PRESSURE	C668516104		1	0.5	115.8
	STALL WARNING HORN	9910080		1	0.0	114.0
	STALL WARNING TRANSMITTER	186-14		1	0.2	142.6
11	ANGLE OF ATTACK SYSTEM	0800302		3	1.0	124.6
	ALTERNATOR 50 AMP	CM641668		1	24.3	98.8
16A	ALTERNATOR 100 AMP	9910385		2	36.9	98.8
	VOLTAGE REGULATOR	9910126		3	1.7	132.7
	STROBE LIGHTS ASSY	9910366162		3	3.5	157.5
96A	LIGHT ASSY HIGH INTENSITY	9910366364		2	4.0	157.5
96B	LIGHT ASSY (ICAO)	9910366566		2	4.4	157.5
	LIGHT POWER SUPPLY	9910368		3	3.5	157.5
96A	LIGHT POWER SUPPLY (HI INT)	9910368		2	3.8	168.8
96B	LIGHT POWER SUPPLY (ICAO)	9910368		2	3.8	168.8
	BATTERY 24 VOLTS	R-2425		1	40.0	171.5
	MASTER SWITCH	8501KA		3	0.3	123.0
	SEAT-PILOT ADJUSTABLE	0812782		1	15.3	140.0
	SEAT-PILOT ADJUSTABLE LEATHER	0812782		1	15.7	140.0
89	SEAT-PILOT VERT ADJUST TILTING	0812780		1	22.9	140.8
89 L	SEAT-PILOT VERT ADJ TILT LTHR	0812780		1	23.5	140.8
	SAFETY BELT-SHOULDER HARNESS	CM400869		1	0.6	151.5
181	SAFETY BELT-SHOULDER HARNS-REEL	5119565		11	0.9	151.8
	OUTFLOW VALVE-CABIN PRESSURE	103576		9	1.3	287.9
20	OUTFLOW VALVE-CABIN PRESSURE	103576		17	1.3	287.9
	SOLENOID VALVE	3423000		9	0.4	280.3
	SAFETY VALVE CABIN PRESSURE	103576		5	1.3	287.9
	PILOT'S OPERATING HANDBOOK	DI594R1-13PH		1	1.4	144.0

SECTION B STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
	CONTROLS & AUTOFLIGHT					
53301	GYRO-DIRECTIONAL C661053-0101			1	2.6	113.0
53302	GYRO-DIRECT G-502A			1	3.6	113.0
53303	GYRO-DIRECT G-504A			1	3.5	113.0
53304	GYRO-HSI (3 IN) IG-832A			1	5.0	113.0
	GYRO-HSI (4 IN) IG-895A			1	5.3	113.0
	GYRO-HORIZONTAL C661055-0103			1	1.9	112.5
53310	GYRO-HORIZ G-5198-1			1	2.5	112.5
53311	GYRO-ADI (3-IN) G-550A			1	3.5	112.5
53312	GYRO-ADI (4-IN) G-1050A			1	5.0	112.5
53000	400B NAV-O-MATIC INSTL			1	16.6	198.4
53000	COMPUTER CA-550A/FD & MOUNT			1	6.3	303.1
53000	CONTROLLER C-530A			1	1.7	109.7
53000	ACTUATOR PA-495A-1 & MOUNT			1	4.1	294.6
53000	ACTUATOR PA-495A-2 & MOUNT			1	4.1	220.0
53000	ACTUATOR TA-495A & MOUNT			1	2.1	300.4
53000	ALTITUDE SENSOR AS-895A			1	2.3	318.6
53100	400B NAV-O-MATIC SLAVED DG OPT			1	2.8	215.4
53100	FLUX DETECTOR CT-504A			1	0.5	361.9
53101	SLAVE ACCESS W/O BS SA-832A			1	0.8	35.0
53102	SLAVE ACCESS W/BS SA-832B			1	2.2	35.0
53200	400B NAV-O-MATIC HSI (3 IN) OPT			1	3.1	213.6
53201	CONVERTER B-445A & MOUNT			1	1.3	33.0
53200	FLUX DETECTOR CT-504A			1	0.5	361.9
53202	SLAVE ACCESS W/O BS SA-832A			1	0.8	35.0
53203	SLAVE ACCESS W/BS SA-832B			1	2.2	35.0
53400	YAW DAMPER INSTL YD-840B			1	3.9	234.3
53400	ACTUATOR PA-495A-1 & MOUNT			1	4.1	298.2
55000	400B IFCS INSTL			1	25.1	197.1
55000	COMPUTER CA-550A/FD & MOUNT			1	6.3	303.1

SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
55000	CONTROLLER C-531A			1	1.5	109.7
55000	ACTUATOR PA-495A-1 & MOUNT			1	4.1	294.6
55000	ACTUATOR PA-495A-2 & MOUNT			1	4.1	220.0
55000	ACTUATOR TA-495A & MOUNT			1	2.1	300.4
55000	ALTITUDE SENSOR AS-895A			1	2.3	318.6
55000	MODE SELECTOR S-550A			1	2.6	112.9
55001	CONVERTER B-445A & MOUNT			1	1.3	33.0
55000	FLUX DETECTOR CT-504A			1	0.5	361.9
55002	SLAVE ACCESS W/O BS SA-832A			1	0.8	35.0
55003	SLAVE ACCESS W/BS SA-832B			1	2.2	35.0
56000	800B IFCS INSTL			1	24.6	190.9
56000	COMPUTER CA-550A/FD & MOUNT			1	6.3	303.1
56000	CONTROLLER C-830FD			1	1.5	109.7
56000	ACTUATOR PA-495A-1 & MOUNT			1	4.1	294.6
56000	ACTUATOR PA-495A-2 & MOUNT			1	4.1	220.0
56000	ACTUATOR TA-495A & MOUNT			1	2.1	300.4
56000	ALTITUDE SENSOR AS-895A			1	2.3	318.6
56000	MODE SELECTOR S-550A			1	2.6	112.9
56001	CONVERTER B-445A & MOUNT			1	1.3	33.0
56000	FLUX DETECTOR CT-504A			1	0.5	361.9
56003	SLAVE ACCESS W/O BS SA-832A			1	0.8	35.0
56004	SLAVE ACCESS W/BS SA-832B			1	2.2	35.0
56000	YAW DAMPER INSTL			1	3.9	234.3
56000	ACTUATOR PA-495A-1 & MOUNT			1	4.1	298.2
57000	HSI & ADI 3 IN OPTION, RH			1	3.3	211.8
57000	INDICATOR IN-832R			1	0.8	112.9
57001	CONVERTER B-445A & MOUNT			1	1.3	33.0
57000	FLUX DETECTOR CT-504A			1	0.5	361.9
57002	SLAVE ACCESS W/O BS SA-832A			1	0.8	35.0
57003	SLAVE ACCESS W/BS SA-832B			1	2.2	35.0

SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
27	CORROSION PROOFING-INTERNAL	5600009009		1	10.5	194.2
33	ELECTRIC ELEVATOR TRIM	5618105		7	3.2	216.7
47B	GUST LOCK-RUDDER PROPELLER	5130387		1	1.1	375.6
77	PROP UNFEATHERING SYSTEM	5650116		1	10.8	111.7
76D	PROP SYNCHROPHASER SYSTEM	5618124		1	2.7	134.8
76E	PROP SYNC & UNFEATH SYSTEM INSTRUMENTS	5650116		2	13.5	116.2
675A	ALTITUDE ALERTER AA-801A			1	0.8	114.0
675B	ALTITUDE ALERTER AA-801A			1	0.8	114.0
624B	400 ENCODING ALTIMETER-INCHES	EA-401A		1	2.6	111.9
624D	400 ENCODING ALTIMETER-MILIBARS	EA-401A		1	2.6	111.9
676A	800 ENCODING ALTIMETER-INCHES	EA-801A		1	2.8	111.9
676A	ALTITUDE ALERTER AA-801A			1	0.8	114.0
676B	800 ENCODING ALTIMETER-MILIBARS	EA-801A		1	2.8	111.9
676B	ALTITUDE ALERTER AA-801A			1	0.8	114.0
23A	CLOCK-ELECTRIC	C664509101		1	0.4	114.1
	CLOCK-DIGITAL, ELECTRONIC	C664510101		1	0.6	114.1
08	RATE OF CLIMB INDICATOR	C661C35101		1	0.9	113.1
	INSTANT VERTICAL SPEED IND	C661C09101		1	1.9	113.1
	TURN & BANK INDICATOR (3 IN)STD	C661C31101		1	1.4	112.1
534	GYRO-COMPUTER G-840A			1	2.6	112.8
560	GYRO-COMPUTER G-840A			1	2.6	112.8
03	FLIGHT HOUR RECORDER, PNL MTD			1	0.8	112.1
03A	HEATER HOUR METER INSTL	CM2926		1	0.4	96.0
02	ECONOMY MIXTURE	C664503101		1	3.5	123.2
07	RH PANEL & PLUMBING SYSTEM	9910247		2	4.1	112.5
0710	ALTIMETER FT & INCHES	5114244		5	1.1	112.6
01B	ALTIMETER FT & MILIBARS	C661C14101		1	1.1	112.6
0720	AIRSPEED INDICATOR	C661C25101		1	1.1	112.6
		C661C40216		1	0.7	112.6

SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
04A	AIR SPEED INDICATOR (TAS)	C661040216	RH	1	2.8	112.6
0730	RATE OF CLIMB INDICATOR	C661035101	RH	1	0.9	113.1
08A	INSTANT VERTICAL SPEED IND	C661009101	RH	1	1.9	113.1
0740	GYRO-DIRECTIONAL	C661053101	RH	1	2.6	113.0
53305	GYRO-HSI (3 IN) IG-832A		RH	1	5.0	113.0
0750	GYRO-HORIZONTAL	C661055103	RH	1	1.9	112.5
53313	GYRO-ADI (3-IN) G-550A		RH	1	3.5	112.5
0760	DUAL PITOT SYSTEM	5614202	1	1	1.3	54.6
0770	STATIC SOURCE-DUAL	5114220	5	1	0.3	257.0
19	TURN & BANK INDICATOR (3 IN)	C661031101		1	1.4	112.1
19A	TURN & BANK INDICATOR (2 IN)	C661032101		1	1.2	114.5
45	FUEL LOW LEVEL WARNING PNEUMATIC	5118628	5	1	0.6	152.0
32	VACUUM PUMPS-PWR FOR GYROS STD	212CW		2	3.8	126.3
194	VACUUM PUMPS-PWR FOR WING DEICE	442CW		2	6.5	126.3
	VACUUM PUMPS-PWR FOR KNOWN ICE ELECTRICAL	442CW		2	6.5	126.3
26	CONVERTER 110 VOLT	5618118	4	1	3.3	273.8
52	LIGHT-TAXI	5618101	8	1	1.5	54.6
49	LIGHT-LANDING RH (RETRACTABLE)	5118652	1	1	4.6	161.5
48	LIGHT-ICE DETECTION LH	5618701	1	1	0.4	133.5
48A	LIGHT-ICE DETECTION RH	5618701	2	1	0.4	133.5
43	LIGHT-COURTESY-NACELLE & NOSE	0851862	8	1	1.1	141.3
85	TIMER-COURTESY LIGHT	5618712	1	1	0.4	128.6
87A	STATIC DISCHARGE WICKS-SET OF 8	5100015	10	1	0.4	296.6
46	GROUND SERVICE PLUG	5118116	4	1	4.3	173.4
54	VERTICAL TAIL FLOOD LIGHT ELECTRONICS	40200001		1	2.9	291.0
400	400 NAV/COM INSTL NO. 1			1	3.9	70.3
400	TRANSCIEIVER RT-485A & MOUNT			1	6.3	109.4

SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
40001	INDICATOR IN-486AC			1	2.1	111.9
40002	400 NAV/COM INSTL NO. 2			1	3.9	70.3
40002	TRANSCIEVER RI-485A & MOUNT			1	6.3	109.4
40003	INDICATOR IN-485AC			1	2.1	111.9
40103	INDICATOR IN-486AC			1	2.1	111.9
40004	400 GLIDESLOPE INSTL NO. 1			1	3.2	51.0
40004	RECEIVER R-443B & MOUNT			1	3.3	33.0
40004	ANTENNA CI-212			1	0.2	7.4
40044	400 GLIDESLOPE INSTL NO. 2			1	3.2	51.0
40044	RECEIVER R-443B & MOUNT			1	3.3	33.0
40044	ANTENNA COUPLER & CABLE			1	0.3	7.4
40005	400 ADF INSTL			1	3.2	91.9
40005	RECEIVER R-446A & MOUNT			1	4.0	109.4
40006	INDICATOR IN-346A			1	1.1	111.9
40106	ACCESSORY UNIT RA-446A			1	1.4	140.0
40105	ANTENNA-LDOP L-346A			1	1.6	162.4
40005	ANTENNA-SENSE			1	1.9	195.3
40007	400 MARKER BEACON INSTL			1	3.2	33.0
40007	RECEIVER R-402A & MOUNT			1	1.1	33.0
40007	ANTENNA CI-102			1	0.8	73.0
10000	1000 COM INSTL NO. 1			1	3.9	72.9
10000	TRANSCIEVER RI-1038A & MOUNT			1	6.6	33.0
10000	CONTROL C-1038A & MOUNT			1	2.0	112.9
10001	1000 COM INSTL NO. 2			1	3.9	72.9
10001	TRANSCIEVER RI-1038A & MOUNT			1	6.6	33.0
10001	CONTROL C-1038A & MOUNT			1	2.0	112.9
10002	1000 NAV INSTL NO. 1			1	2.9	72.4
10102	RECEIVER R-1048A & MOUNT			1	4.5	33.0
10112	RECEIVER R-1048B & MOUNT			1	5.0	33.0
10002	CONTROL C-1048A & MOUNT			1	2.0	112.9

SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
10003	INDICATOR IN-1049AC			1	1.7	111.9
10004	1000 NAV INSTL NO. 2			1	2.9	72.4
10104	RECEIVER R-1048A & MOUNT			1	4.5	33.0
10114	RECEIVER R-1048B & MOUNT			1	5.0	33.0
10004	CONTROL C-1048A & MOUNT			1	2.0	112.9
10005	INDICATOR IN-1048AC			1	1.6	111.9
10105	INDICATOR IN-1049AC			1	1.7	111.9
10006	1000 GLIDESLOPE INSTL NO. 1			1	3.2	51.0
10006	RECEIVER R-1043A & MOUNT			1	2.6	33.0
10006	ANTENNA CI-212			1	0.2	7.4
10066	1000 GLIDESLOPE INSTL NO. 2			1	3.2	51.0
10066	RECEIVER R-1043A & MOUNT			1	2.6	33.0
10066	ANTENNA COUPLER & CABLE			1	0.3	13.9
10007	1000 ADF INSTL			1	3.2	118.9
10007	RECEIVER R-846A & MOUNT			1	4.6	33.0
10007	CONTROL C-1046A & MOUNT			1	2.0	112.5
10007	POWER SUPPLY P-1000A			1	1.2	33.0
10008	INDICATOR IN-346A			1	1.1	111.9
10009	ACCESSORY UNIT RA-846A			1	1.4	140.0
10107	ANTENNA-LOOP L-346A			1	1.6	162.4
10007	ANTENNA-SENSE	9751002 28		1	1.9	195.3
10010	400 MARKER BEACON INSTL	9751042 1		1	3.2	33.0
10010	RECEIVER R-402A & MOUNT			1	1.1	33.0
10010	ANTENNA CI-102			1	0.8	73.0
20001	HAND MICROPHONE			1	0.4	120.3
20002	HEADSET & BOOM MIC COMBINATION			1	0.3	110.0
20003	800 AUDIO AMPLIFIER AA-108			1	1.2	111.9
20004	1000 AUDIO AMPLIFIER F1010A			1	1.6	111.9
20005	FWD PRESSURE BULKHEAD FEEDTHRU			1	0.5	100.0
20006	AVIONICS BUS			1	4.5	142.3

SECTION B STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
20007	APPROACH PLATE HOLDERS			2	0.2	124.6
20008	JUNCTION BLOCK			1	2.6	31.5
20009	CABLE COVER INSTL	9756118	1	1	1.4	42.1
20011	ANTENNA-COM NO. 1 A-29C			1	1.6	105.8
20012	ANTENNA-COM NO. 2 VF10-122			1	1.6	417.0
20013	ANTENNA-DUAL NAV C1120-200			1	2.3	376.7
20021	AVIONICS COOLING-PANEL			1	0.9	111.0
20022	AVIONICS COOLING-NOSE (ONE)			1	2.4	25.7
20023	AVIONICS COOLING-NOSE (TWO)			1	4.3	29.7
20024	BLOWER INSTL			1	1.0	125.6
20025	SPEAKER INSTL	9754125	1	1	3.3	195.2
20031	SHELF INSTL	9715028	1	1	2.2	36.4
20032	COVER SHELF	9756112	1	1	7.0	30.0
622	400 TRANSPONDER INSTL NO. 1	9756113	1	1	0.6	121.7
622	TRANSCIEIVER RT-459A & MOUNT			1	3.2	109.5
622	ANTENNA L10-216			1	0.3	134.0
622C	400 TRANSPONDER INSTL NO. 2			1	0.6	134.1
622C	TRANSCIEIVER RT-459A & MOUNT			1	3.2	109.5
622C	ANTENNA L10-216			1	0.3	158.8
623	800 TRANSPONDER INSTL NO. 1			1	0.6	121.7
623	TRANSCIEIVER RT-859A & MOUNT			1	3.2	109.5
623	ANTENNA L10-216			1	0.3	134.0
623B	800 TRANSPONDER INSTL NO. 2			1	0.6	134.1
623B	TRANSCIEIVER RT-859A & MOUNT			1	3.2	109.5
623B	ANTENNA L10-216			1	0.3	158.8
681	400 DME INSTL NO. 1			1	2.9	60.7
681	TRANSCIEIVER RTA-476A & MOUNT			1	9.8	33.0
681	CONTROL C-476A			1	1.7	111.0
681	ANTENNA L10-216			1	0.3	38.0
681C	400 DME INSTL NO. 2			1	2.9	72.9

SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
681C	TRANSCEIVER RTA-476A & MOUNT			1	9.8	33.0
681C	CONTROL C-476A			1	1.7	111.0
681C	ANTENNA L10-216			1	0.3	74.7
681C	MULTIPLEXER MU876A & MOUNT			1	1.1	33.0
681F	800 DME INSTL NO. 1			1	2.9	60.7
681F	TRANSCEIVER RTA-876A & MOUNT			1	9.3	33.0
681F	CONTROL C-876A			1	1.7	111.0
681F	ANTENNA L10-216			1	0.3	38.0
681G	800 DME INSTL NO. 2			1	2.9	72.9
681G	TRANSCEIVER RTA-876A & MOUNT			1	9.3	33.0
681G	CONTROL C-876A			1	1.7	111.0
681G	ANTENNA L10-216			1	0.3	74.7
677	HORIZONTAL SITUATION INDICATOR			1	3.2	213.0
677	(3 IN) TO BE USED W/O AUTOPILOT					
67701	CONVERTER B-445A & MOUNT			1	1.3	33.0
677	FLUX DETECTOR CT-504A			1	0.5	361.9
67702	SLAVE ACCESS W/O BS SA-832A			1	0.8	35.0
67703	SLAVE ACCESS W/BS SA-832B			1	2.2	35.0
692	MARKER BEACON MUTE TIMER R-14A			1	0.1	33.0
629G	RDR-150 RADAR INSTL			1	3.0	59.1
629G	TRANSCEIVER RT-131A & MOUNT			1	13.0	24.9
629G	INDICATOR IN-152A & MOUNT			1	6.8	103.9
629G	WAVEGUIDE			1	2.6	18.0
629G	ANTENNA DA-144A			1	3.6	9.0
629G	REFLECTOR AA-1212A			1	1.2	7.5
629G	RADOME NOSE			1*	-0.3	7.4
629P	RDR-150 RADAR INSTL (COLOR)			1	3.0	59.1
629P	TRANSCEIVER RT-131A & MT			1	13.0	24.9
629P	INDICATOR IN-2026A			1	11.0	103.9
629P	WAVEGUIDE			1	2.6	18.0

SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
629P	REFLECTOR AA-1212A			1	1.2	7.5
629P	ANTENNA OA-144A			1	3.6	9.0
629P	RADOME NOSE			1*	-0.3	7.4
629D	RDR-160 RADAR INSTL			1	3.0	57.5
629D	TRANSCIEVER, ANTENNA & MOUNT			1	10.5	11.0
629D	INDICATOR IN-152A & MOUNT			1	6.8	103.9
629D	RADOME NOSE			1*	-0.3	7.4
627F	RDR-160 RADAR INSTL (COLOR)			1	3.0	57.5
627F	TRANSCIEVER, ANTENNA & MT			1	10.5	11.0
627F	INDICATOR IN-2026A			1	11.0	103.9
627F	RADOME NOSE			1*	-0.3	7.4
627G	RADAR CHECK LIST CONTROL UNIT			1	1.5	113.0
627H	RADAR CHECK LIST PROGRAMMER			1	0.5	135.0
629U	PRIMUS 200 COLOR RADAR INSTL			1	3.0	57.5
629U	XCVR & ANT RT A-1003 & MT			1	18.0	11.0
629U	INDICATOR DI-2008 & MT			1	11.0	103.9
629U	RADOME NOSE (XCHANGE)			1*	-0.3	73.5
633D	CULLINS HF-200 NSIL			1	2.7	152.4
633D	CONTROL HEAD CTL-201	9752007155		1	1.1	112.9
633D	TRANSCIEVER TCR-200	9756031242		1	6.4	33.0
633D	POWER AMPLIFIER PWR-200	9756031243		1	7.4	33.0
633D	ANT & COUPLER AAC-200	9751094		1	11.0	308.3
63300	R. F. FILTER A2597			1	1.1	33.0
63300	ANTENNA-STRAIGHT, 30 FEET			1	1.3	218.0
65100	400 ADF INSTL NO. 2			1	3.2	91.9
65100	RECEIVER R-446A & MOUNT			1	4.0	109.4
65101	INDICATOR IN-346A			1	1.1	111.9
65102	INDICATOR IN-13A-1			1	1.4	111.9
65103	ACCESSORY UNIT RA-446A			1	1.4	140.0
65104	ACCESSORY UNIT RA-446A			1	1.4	140.0

SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	HEIGHT (POUNDS)	ARM (INCHES)
65105	INVERTER DV-1060A	9751002 29 9751042 2		1	5.2	33.0
65106	ANTENNA-LOOP L-346A				1.6	219.0
65100	ANTENNA-SENSE			1	1.9	195.3
65600	1000 ADF INSTL NO. 2				3.2	118.9
65600	RECEIVER R-846A & MOUNT			1	4.6	33.0
65600	CONTROL C-1046A & MOUNT				2.0	112.5
65600	POWER SUPPLY P-1000A			1	1.2	33.0
65601	INDICATOR IN-346A				1.1	111.9
65602	INDICATOR IN-13A-1			1	1.4	111.9
65603	ACCESSORY UNIT RA-846A				1.4	140.0
65604	ACCESSORY UNIT RA-846A			1	1.4	140.0
65605	INVERTER DV-1060A				5.2	33.0
65606	ANTENNA-LOOP L-346A	9751002 29 9751042 2		1	1.6	219.0
65600	ANTENNA-SENSE				1.9	195.3
66000	ADF IN-346B			1	1.3	111.9
66200	ADF RA-446A				1.4	140.0
66300	ADF RA-846A			1	1.4	140.0
68500	400 AREA NAVIGATION INSTL				2.8	111.0
68501	INDICATOR IN-1048AC			1	1.6	111.9
68502	INDICATOR IN-1049AC				1.7	111.9
68500	COMPUTER RN-478A & MOUNT			1	5.1	112.0
68700	800 AREA NAVIGATION INSTL				2.8	72.5
68700	COMPUTER RN-878A & MOUNT			1	5.4	112.0
67200	AA-215 RADIO ALTIMETER INSTL				0.5	195.5
67200	TRANSCIEVER RT-220			1	6.8	279.0
67200	INDICATOR RA-215				2.6	112.0
67200	ANTENNA AT-220			1	0.8	244.4
68800	AA-100 RADIO ALTIMETER INSTL				0.5	216.0
68800	TRANSCIEVER RT-100			1	3.6	320.0
68800	INDICATOR RA-100				1.3	112.0

SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
68800	ANTENNA AT-100			1	1.1	284.6
67000	400 RMI INSTL			1	1.2	95.0
67000	INDICATOR IN-404A			1	2.3	111.0
67000	INVERTER DV-1060A			1	5.2	33.0
67100	1000 RMI INSTL			1	1.2	95.0
67100	INDICATOR IN-1004A			1	2.4	111.0
67100	INVERTER DV-1060A			1	5.2	33.0
668	AERONETIC 7100 RMI INSTL			1	1.2	95.0
668	INDICATOR 5207131-014			1	1.6	111.0
668	CONVERTER 5207100-002			1	1.7	33.0
7900	RADOME NOSE	9711019	1	1*	-0.3	7.4
674A	FLITEPHONE III (CABIN CONTROL)			1	21.3	281.2
674B	FLITEPHONE III (COCKPIT CONTROL)			1	12.2	294.4
14100	COMBINATION BOOM MIC & HEADSET	9754030	5	1	0.4	120.9
141A	COMBINATION BOOM MIC & HEADSET	9754030	6	2	0.8	120.9
141D	COMBINATION BOOM MIC & HEADSET	9754030	5	1	0.4	120.9
5500	BOOM MIC	5618110	1	1	0.6	138.7
55A	PASSENGER MIC AFT CABIN I/C	9715030	1	1	1.0	186.4
	FURNISHINGS					
	SEAT-COPILOT ADJUSTABLE STD	0812782	2	1	15.1	140.0
AL	SEAT-COPILOT ADJUSTABLE-LEATHER	0812782	2	1	15.7	140.0
89A	SEAT-COPILOT VERT ADJUST TILT	0812780	2	1	22.9	140.8
89AL	SEAT-COPILOT VERT ADJ TILT LTHR	0812780	2	1	23.5	140.8
	SAFETY BELT-SHOULDER HARNS	CM400869		1	1.1	153.1
18100	INERTIA REEL INSTL-COPILOT	5119565	1	1	1.3	153.1
	STD SEATING INSTL	5619203	1	1	15.1	263.6
11100	SEATING OPTION NO. 1 INSTL	5619203	2	1	11.6	265.8
11200	SEATING OPTION NO. 2 INSTL	5619203	3	1	11.6	264.6
11300	SEATING OPTION NO. 3 INSTL	5619203	4	1	8.2	266.5

SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
11400	SEATING OPTION NO. 4 INSTL	5619203	5		8.2	264.5
	SEAT-3RD PLACE AFT FACING	5619154	13		25.6	170.5
111	SEAT-3RD PLACE FWD FACING	5619153	14		24.0	182.5
113	SEAT-3RD PLACE FWD FACING	5619153	14		24.0	182.5
	SEAT-4TH PLACE AFT FACING	5619154	14		25.6	170.5
111	SEAT-4TH PLACE FWD FACING	5619153	15		24.0	182.5
113	SEAT-4TH PLACE FWD FACING	5619153	15		24.0	182.5
	SEAT-5TH PLACE FWD FACING	5619153	16		24.0	225.2
	SEAT-6TH PLACE FWD FACING	5619153	14		24.0	225.2
111	SEAT-7TH PLACE FWD FACING	5119412	15		15.2	266.0
112	SEAT-7TH PLACE FWD FACING	5119412	15		15.2	266.0
113	SEAT-7TH PLACE FWD FACING	5119412	15		15.2	266.0
114	SEAT-7TH PLACE FWD FACING	5119412	15		15.2	266.0
113	SEAT-8TH PLACE FWD FACING	5119412	15		15.2	266.0
114	SEAT-8TH PLACE FWD FACING	5119412	15		15.2	266.0
99600	SEATS, ALL LTHR	5619203800			2.4	197.9
996A1	SEATS, ALL LTHR OPT 1	5619203802			3.0	216.2
996A2	SEATS, ALL LTHR OPT 2	5619203804			3.0	211.0
996B3	SEATS, ALL LTHR OPT 3	5619203806			3.6	224.5
996B4	SEATS, ALL LTHR OPT 4	5619203808			3.6	220.6
99700	SEAT TRIM LTHR	5619203810			0.6	197.9
997A1	SEAT TRIM LTHR OPT 1	5619203812			0.8	216.2
997A2	SEAT TRIM LTHR OPT 2	5619203814			0.8	211.0
997B3	SEAT TRIM LTHR OPT 3	5619203816			0.9	224.5
997B4	SEAT TRIM LTHR OPT 4	5619203818			0.9	220.6
104J	STOWAGE DRAWER 3RD AFT SEAT	5319031	2		5.4	176.5
104H	STOWAGE DRAWER 3RD FWD SEAT	5319031	4		5.4	176.5
104L	STOWAGE DRAWER 4TH AFT SEAT	5319031	1		5.4	176.5
104K	STOWAGE DRAWER 4TH FWD SEAT	5319031	3		5.4	176.5

SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
104M	STOWAGE DRAWER 5TH FWD SEAT	3319031		4	5.4	219.2
104N	STOWAGE DRAWER 6TH FWD SEAT	5319031		3	5.4	219.2
998	SIDE PANELS, ALL LEATHER	5600300800		1	3.6	186.0
17	BAGGAGE RETAINER (NOSE)	5113016		1	1.0	43.0
130B	TOILET, DIVIDER, RACK & CURTAIN	5119435		3	37.6	238.8
130A	TOILET, CURTAIN & TISSUE HOLDER	5119435		1	22.5	239.2
130E	FLUSH TOILET, CURTAIN & HOLDER	5119567		2	35.0	251.2
130F	FLUSH TOILET, DIVIDER & RACK	5119567		1	50.2	247.3
128	REFRESHMENT CENTER	5119467		1	28.1	273.0
128Q	THERMOS CARRIER FWD CABIN	5119071		1	8.8	156.9
65	OXYGEN SYS 11.0 CU. FT.	5114006		1	14.9	88.8
63	OXYGEN SYS 114.9 CU. FT.	5217541		5	54.9	41.5
63A	OXYGEN SYS 114.9 CU. FT.			1	54.9	41.5
97	TINTED WINDOWS	5111601		24	1*	
138Y	STEREO INSTL W/AVN	9715029		3	9.5	165.0
138G	STEREO INSTL W/O AVN	9715029		4	11.8	170.4
35C	EXTENDER INSTL WR CABIN DOOR	5111134		1	1.9	235.7
42	AVIONICS BAY ACCESS DOOR	5113001		18	2.2	32.0
41	FENDER INSTL-NOSE GEAR	5042021		1	1.0	51.2
28	CURTAIN, FLIGHT DECK DIVIDER	5119465		5	3.4	156.0
120G	FLIGHT DECK DIVIDER & CURTAIN	5119465		4	13.6	155.1
120L	INSTRUMENT CONSOLE/ALT&AIRSP	5119465		1	1.4	155.1
84A	SIGNS/SEAT BELT, OXYGEN&CLOCK	5119465		2	0.2	145.7
124A	EXECUTIVE TABLE LH	5119138		3	9.8	194.0
124B	EXECUTIVE TABLE RH	5119138		4	9.8	194.0
199A	PAINT, ALUMIGRIP	5600350000		1*		
31	GAA CONVERSION KIT	5600011		4	1.0	43.6
31E	LBA CONVERSION K	5600002		5	0.0	212.9

SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
37A	EMERGENCY EQUIPMENT	5114243	6	1	5.2	130.7
44	FIRE EXTINGUISHER HALON	5118705	13	1	16.8	133.6
44B	NACELLE FIRE EXTINGUISHER	5114586	1	1	31.6	173.8
177	FIRE EXTINGUISHER, CABIN FLOOD	9754083	47	1	3.7	312.4
177A	LOCATOR BEACON	9754083	42	1	3.7	312.4
177B	LOCATOR BEACON (CANADA)	9754083	42	1	3.7	312.4
	LOCATOR BEACON (CANADA)					
	AIR CONDITIONING & ANTI-ICE					
20	CABIN PRESSURE CONTROL VARIABLE	5614600	4	1*	2.0	116.1
15	AIR CONDITIONING INSTL	5114524	7	1	116.9	158.3
15M	AIR OUTLETS-TOILET	5114578	23	1	2.3	263.1
15N	AIR OUTLETS-7TH & TOILET	5114578	41	1	2.3	263.1
92	VENTILATING FAN SYSTEM	5114579	1	1	21.4	155.3
30	DE-ICE PROPELLER	5250131	6	1	10.9	101.7
67	DE-ICE WING & TAIL, PART PLBG	5115565	4	1	3.6	167.7
32	DE-ICE WING & TAIL-TOTAL SYSTEM	5115565	3	1	42.2	182.8
194	DE-ICE SYSTEM FLIGHT IN ICING	5114400	3	1	75.7	158.4
94A	WINDSHIELD ANTI-ICE, ALCOHOL	5114136	4	1	30.7	189.1
78	FUSELAGE ICE PROTECTION PLATES	5113115188		1	5.1	90.7
88	STATIC SOURCE-DUAL HEATED	5114220	6	1	0.3	257.0

WEIGHT AND BALANCE 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 maximum zero fuel weight of 6515 pounds)		
SEAT ____							
SEAT ____							
SEAT ____				4.	FUEL LOADING		
SEAT ____							
SEAT ____				5.	RAMP WEIGHT (sub-total) (Do not exceed maximum ramp weight of 6785 pounds)		
SEAT ____							
SEAT ____				6.	LESS FUEL FOR TAXIING		
TOILET							
BAGGAGE				7.	TAKEOFF WEIGHT (Do not exceed maximum takeoff weight of 6750 pounds)		
WING LOCKERS							
AVIONICS				8.	LESS FUEL TO DESTINATION		
NOSE							
BAY A				9.	LANDING WEIGHT (Do not exceed maximum landing weight of 6750 pounds)		
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.

SECTION 7
AIRPLANE & SYSTEMS DESCRIPTIONS**TABLE OF CONTENTS**

	<u>Page</u>		<u>Page</u>
INTRODUCTION	7-3	LIGHTING SYSTEM	7-28
AIRFRAME	7-3	External Lighting	7-28
INSTRUMENT PANEL	7-3	Internal Lighting	7-29
Overhead Console	7-5	PITOT PRESSURE SYSTEM	7-31
Annunciator Panel	7-5	STATIC PRESSURE SYSTEM	7-31
FLIGHT CONTROLS SYSTEM	7-7	VACUUM SYSTEM	7-33
Aileron System	7-8	FLIGHT INSTRUMENTS	7-33
Aileron Trim System	7-9	STALL WARNING SYSTEM	7-35
Elevator System	7-10	AVIONICS	7-35
Elevator Trim System	7-11	Avionics Interference	7-35
Rudder System	7-12	Avionics Master Switches	7-35
Rudder Trim System	7-13	ENGINES	7-36
NOSEWHEEL STEERING SYSTEM	7-14	Engine Controls	7-36
WING FLAPS SYSTEM	7-15	Engine Oil System	7-37
LANDING GEAR SYSTEM	7-17	Ignition System	7-37
Landing Gear Hydraulic		Fuel Injection System	7-37
System	7-19	Cowl Flap System	7-37
Landing Gear Position		Starting System	7-38
Lights	7-19	Engine Instruments	7-38
Landing Gear Warning Horn	7-20	Engine Mounts	7-38
Landing Gear Emergency		Engine Break-In	
Extension System	7-20	Procedure	7-38
Landing Gear Shock Struts	7-21	Turbo-System	7-38
FUEL SYSTEM	7-21	CABIN AIR SYSTEM	7-42
Main Tanks	7-21	Heating and Defrosting	7-42
Fuel Selectors	7-21	Cabin Heat Switch Breaker	7-43
Emergency Crossfeed		Cabin Fan Switch	7-43
Shutoff Lever	7-23	Cabin Air Temperature	
Auxiliary Fuel Pump		Control Knob	7-43
Switches	7-23	Forward Cabin Air Knob	7-43
Fuel Drain Valves	7-23	Aft Cabin Air Knob	7-43
Fuel Flow Gage	7-23	Defrost Knob	7-43
Fuel Quantity Gage	7-24	Heater Overheat Warning	
Fuel Low Level Warning		Light	7-43
Lights	7-24	Heater Operation for	
Engine-Driven Fuel Pumps	7-24	Heating and Defrosting	7-45
BRAKE SYSTEM	7-24	Heater Used for	
ELECTRICAL SYSTEM	7-25	Ventilation	7-45
Battery and Alternator		CABIN PRESSURIZATION SYSTEM	7-45
Switches	7-25	Operating Details	7-45
Emergency Power Alternator		Standard Pressurization	
Field Switch	7-25	System	7-47
Overvoltage Relays	7-25	Optional Pressurization	
Voltammeter	7-25	System	7-49
Circuit Breakers and		OXYGEN SYSTEM	7-51
Switch Breakers	7-28	114.9 Cubic Foot System	7-52
External Power Receptacle	7-28	11.0 Cubic Foot System	7-53

TABLE OF CONTENTS (CONTINUED)

	<u>Page</u>		<u>Page</u>
PASSENGER LOADING	7-53	DOORS, WINDOWS AND EXITS . .	7-55
BAGGAGE COMPARTMENTS	7-54	Cabin Door	7-55
AIRPLANE TIE-DOWN PROVISIONS		Windows	7-56
AND JACK POINTS	7-54	Emergency Exit Window . . .	7-56
SEATS, SEAT BELTS AND		CONTROL LOCKS	7-57
SHOULDER HARNESES	7-55	PROPELLERS	7-57
Pilot and Copilot		PROPELLER SYNCHROPHASER . . .	7-57
Provisions	7-55	CABIN FEATURES	7-59
Passenger Provisions	7-55		

INTRODUCTION

Section 7 of this handbook provides a description and operation of the airplane and its systems.

NOTE

Operational procedures for optional systems and equipment are presented in Section 9.

AIRFRAME

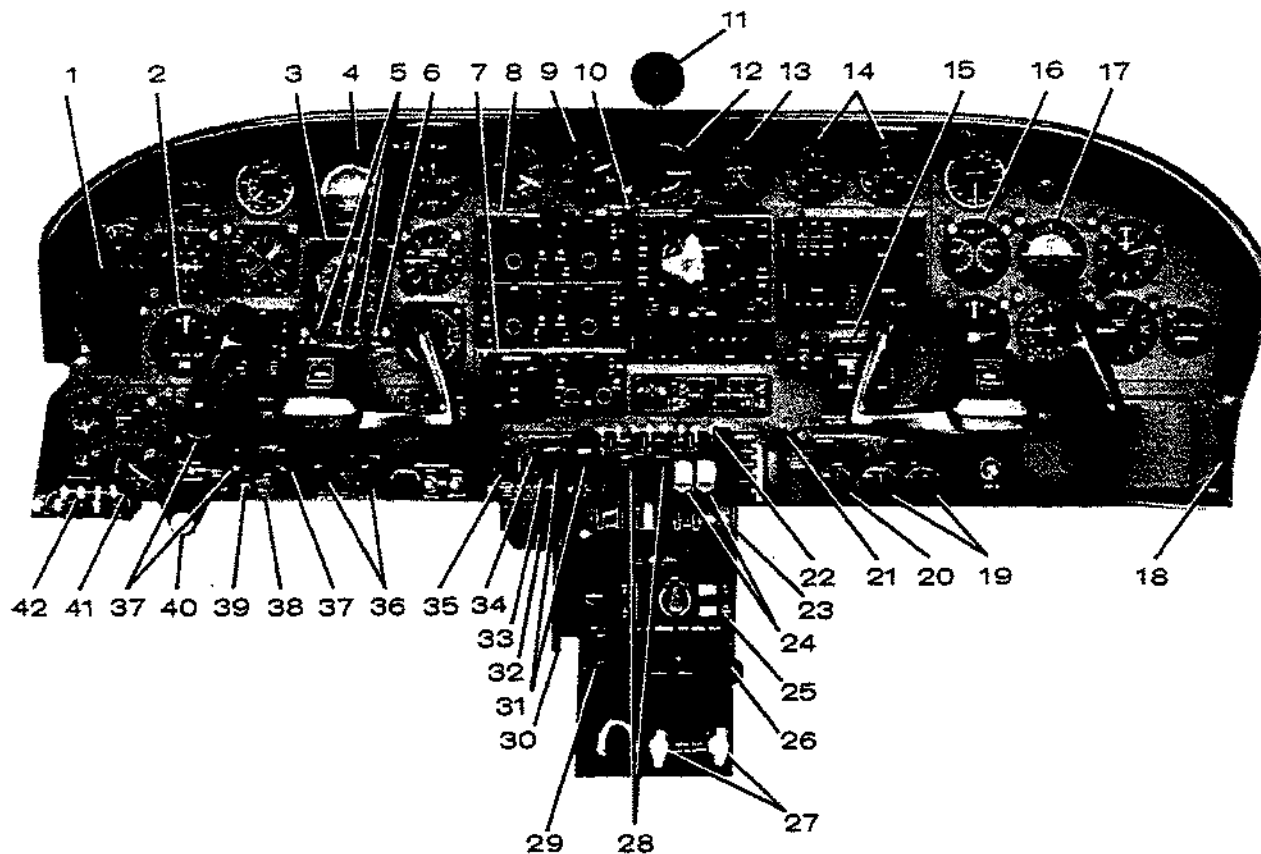
The Model 414 Chancellor is a 6-to 8-place, all-metal, low-wing, pressurized airplane. The fuselage and empennage are of semimonocoque construction. The cabin area is sealed and structurally reinforced for pressurization. The wing and horizontal and vertical tail surfaces are of conventional aluminum construction. The wing uses 2 main spars which attach to the carry-thru spars. The retractable landing gear is a tricycle design using air-over-oil shock struts.

The 414 Chancellor II and 414 Chancellor III are identical to the 414 Chancellor except a selection of popular optional equipment has been included as standard equipment.

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. ANNUNCIATOR PANEL	21. FLAP POSITION SWITCH
2. FLIGHT INSTRUMENT GROUP	22. LIGHT DIMMING CONTROLS
3. FLIGHT DIRECTOR HSI (OPTIONAL)	23. QUADRANT FRICTION LOCK
4. FLIGHT DIRECTOR FDI (OPTIONAL)	24. MIXTURE CONTROLS
5. MARKER BEACON LIGHTS (OPTIONAL)	25. AUTOPILOT CONTROL HEAD (OPTIONAL)
6. MARKER BEACON TEST SWITCH (OPTIONAL)	26. RUDDER TRIM CONTROL
7. FLIGHT DIRECTOR MODE SELECTOR (OPTIONAL)	27. COWL FLAP CONTROLS
8. AVIONICS CONTROL PANEL	28. PROPELLER CONTROLS
9. ENGINE INSTRUMENT GROUP	29. AILERON TRIM CONTROL
10. PROPELLER SYNCHROPHASER SWITCH (OPTIONAL)	30. ELEVATOR TRIM CONTROL
11. COMPASS	31. THROTTLE CONTROLS
12. FUEL FLOW GAGE	32. EMERGENCY LANDING GEAR EXTENSION T-HANDLE
13. ECONOMY MIXTURE INDICATOR (OPTIONAL)	33. LANDING GEAR POSITION INDICATOR LIGHTS
14. COMBINATION ENGINE GAGES	34. GEAR UNLOCKED LIGHT
15. FIRE DETECTION PANEL (OPTIONAL)	35. LANDING GEAR SWITCH
16. FUEL QUANTITY GAGE	36. ALTERNATE AIR CONTROLS
17. RIGHT FLIGHT INSTRUMENT GROUP (OPTIONAL)	37. CABIN PRESSURIZATION CONTROLS AND INDICATORS
18. RIGHT SIDE CONSOLE	38. OXYGEN CONTROL
19. PRESSURIZATION AIR TEMPERATURE CONTROLS	39. CABIN DOOR LIGHT SWITCH
20. HEATER AND CABIN AIR CONTROL PANEL	40. PARKING BRAKE CONTROL
	41. OXYGEN CYLINDER PRESSURE GAGE (OPTIONAL)
	42. LEFT SIDE CONSOLE

Figure 7-1

OVERHEAD CONSOLE

The overhead console, see Figure 7-2, includes the avionics speaker and instrument panel floodlight and aisle courtesy lights with dimming control and pilot and copilot overhead directional air vents.

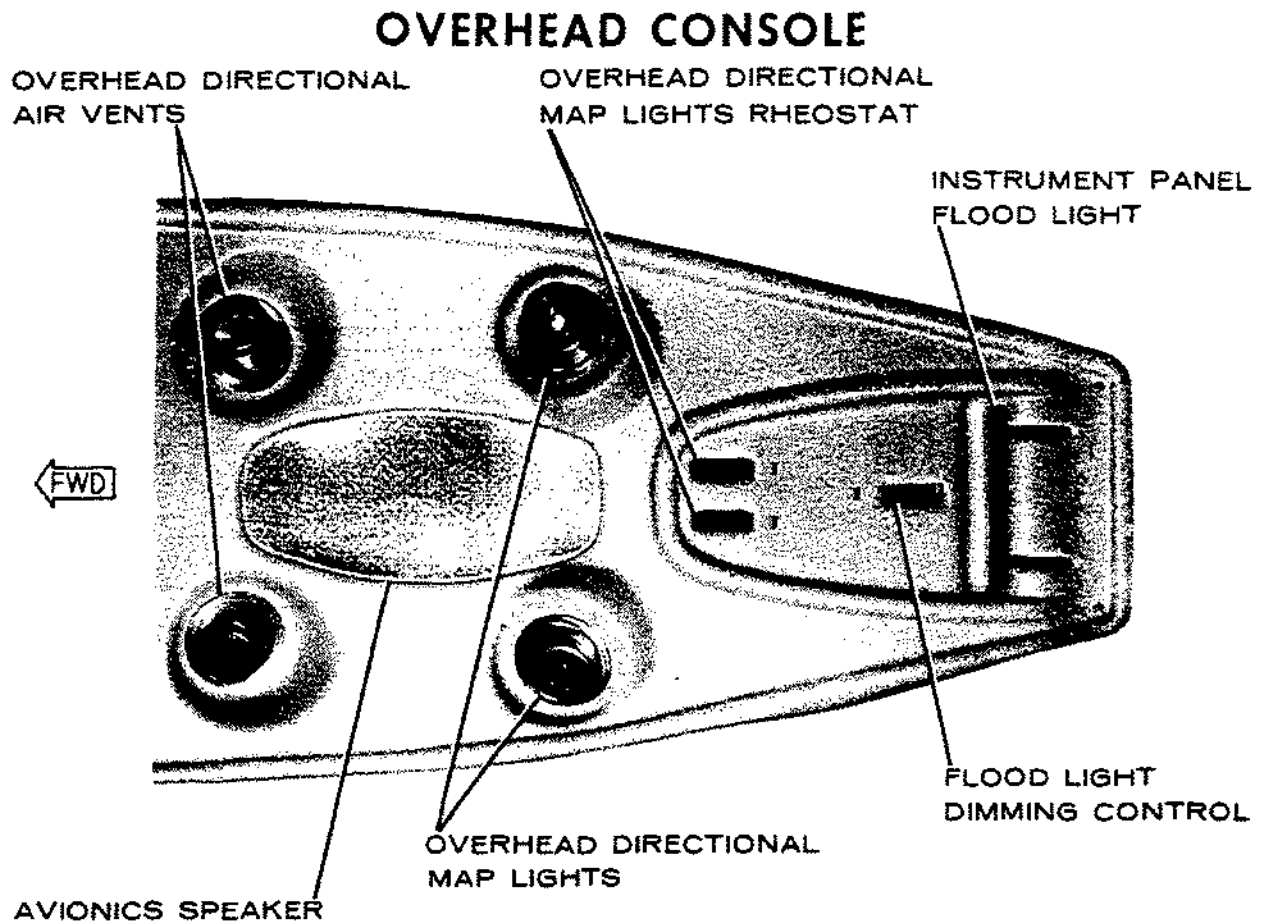


Figure 7-2

ANNUNCIATOR PANEL

The annunciator panel, see Figure 7-3, is located on the left side of the pilot's instrument panel. The panel annunciates items of interest to the pilot in the applicable color of red, amber, green or white. No dimming capability of the annunciator lights is provided.

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 to the left of the annunciator panel. When the button is pressed, all annunciator panel lights, landing gear position and unlocked lights, propeller synchrophaser light and marker beacon lights will be tested and should illuminate. If the throttles are retarded or flaps are extended more than 15 degrees, the gear warning horn will sound when the button is pressed.

ANNUNCIATOR PANEL

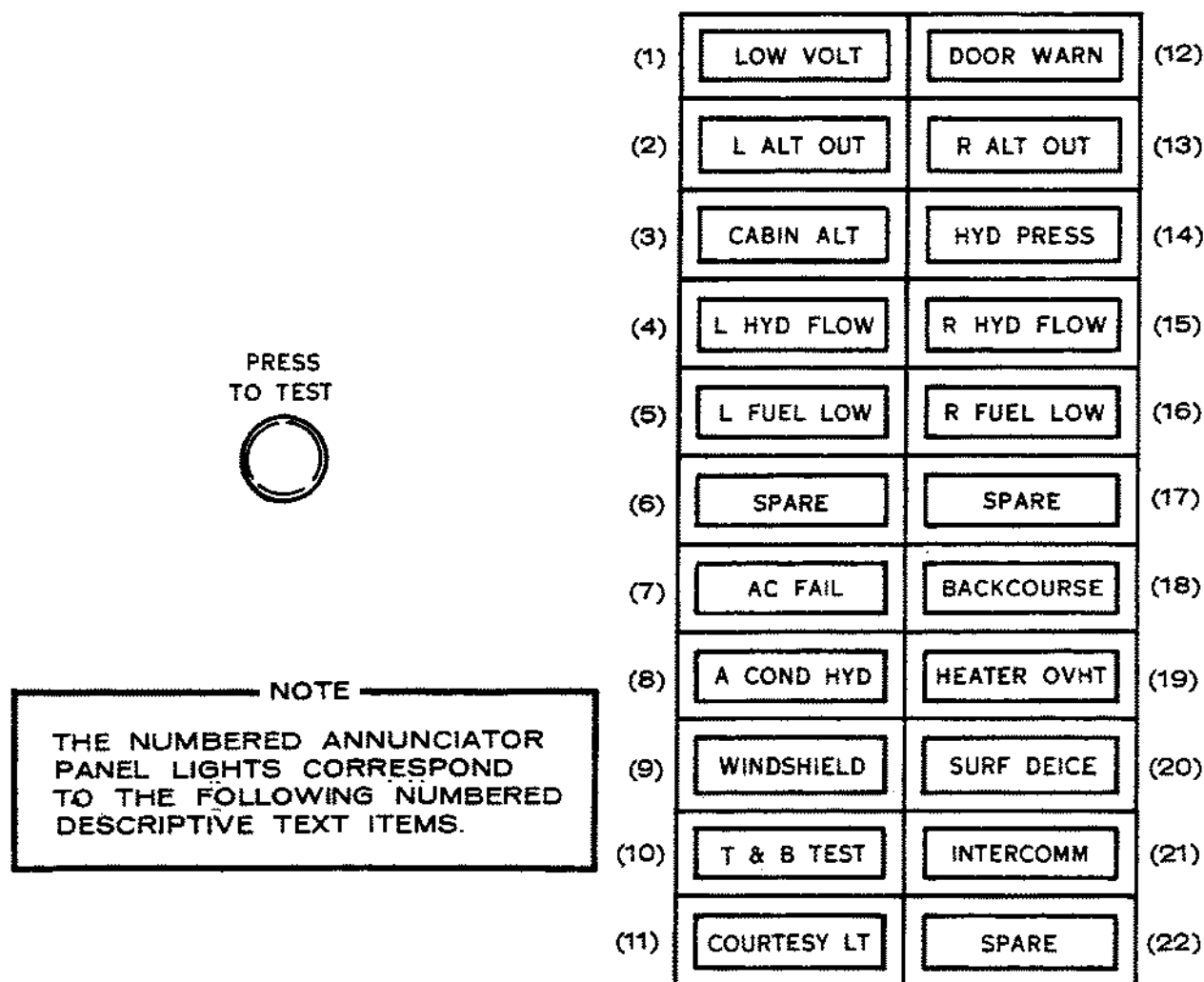


Figure 7-3

NOTE

A spare light lens is installed in each blank location of the annunciator panel when the optional system is not installed. These lenses can be replaced with the appropriate lens when additional optional equipment is installed.

The following numbered items, see Figure 7-3, describe the applicable system condition when the annunciator light is illuminated.

1. The red low voltage light advises that the airplane bus voltage is less than 25 volts.
2. The amber left alternator out light advises that the left alternator is not generating.

3. The amber cabin altitude light advises that cabin altitude is above 10,000 feet.
4. The amber left hydraulic flow light advises that insufficient flow exists at 1000 propeller RPM or above and that the cause may be a result of pump, lines, filter or bypass valve failure.
5. The amber left main tank fuel low light advises that approximately 60 pounds of fuel remains in the left main tank.
6. The white spare light is reserved for optional equipment.
7. The amber alternating current failure light advises that a loss of AC power has occurred.
8. The green air conditioning hydraulic pressure light advises that the optional air conditioning compressor is in operation.
9. The green electric windshield heater light advises that the heating elements in the optional electric windshield are operating.
10. The green turn-and-bank test light will only illuminate when the press-to-test button is pushed and power is being provided to the turn-and-bank electrical circuit.
11. The white courtesy light advises that the overhead flight deck flood light and main cabin door entry lights are illuminated.
12. The red door warning light advises that the main cabin door is not secured for flight.
13. The amber right alternator out light advises that the right alternator is not generating.
14. The amber hydraulic pressure light advises that hydraulic pressure is being applied to the landing gear retraction and extension system.
15. The amber right hydraulic flow light advises that insufficient flow exists at 1000 propeller RPM or above and that the cause may be a result of pump, lines, filter or bypass valve failure.
16. The amber right main tank fuel low light advises that approximately 60 pounds of fuel remains in the right main tank.
17. The white spare light is reserved for optional equipment.
18. The amber back course light advises that the optional navigation equipment is programmed for a back course approach.
19. The amber heater overheat light advises that the heater has reached an abnormal temperature and has been automatically deenergized. Once this light illuminates, the heater cannot be operated until resetting of the safety device has been completed.
20. The green surface deice light advises that the optional tail deice boots have reached full inflation pressure.
21. The white intercom light advises that the optional flight deck or passenger compartment microphone switch is pressed and communication is possible.
22. The white spare light is reserved for optional equipment.

FLIGHT CONTROLS SYSTEM

The flight controls consist of the ailerons, elevators and rudder and their respective trim systems. All of these surfaces are constructed of aluminum and 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 bell crank which is attached to a wheel in the wing. The wheel is actuated by cables attached to the pilot's control wheel. When the rudder is actuated, a spring assembly, interconnected to the aileron system, causes the ailerons to automatically assist the turn.

AILERON SYSTEM

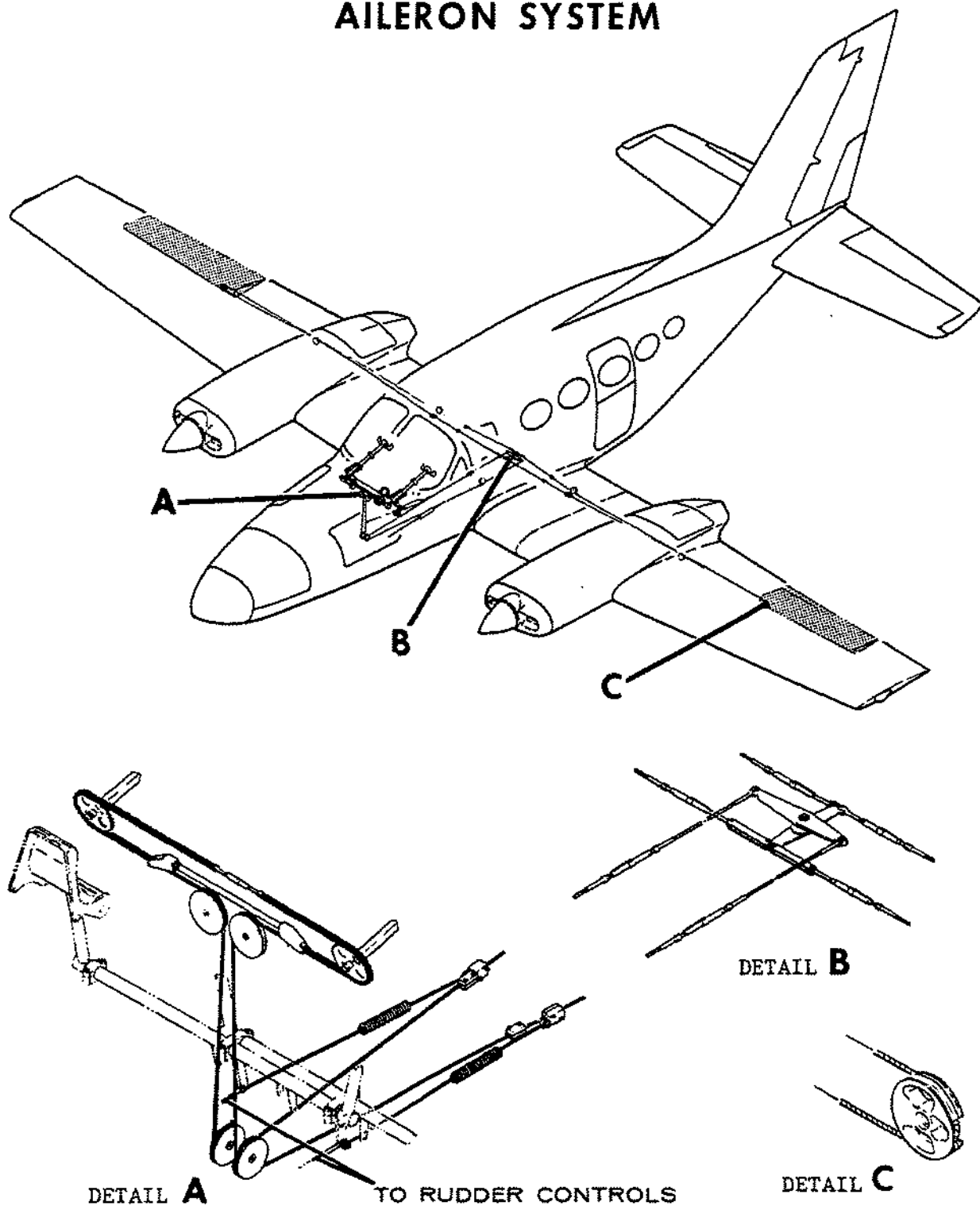


Figure 7-4

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. The aileron trim tab also acts as a servo tab so that aerodynamic forces on the tab will move the ailerons to the selected position, which reduces the forces required to activate the ailerons in flight.

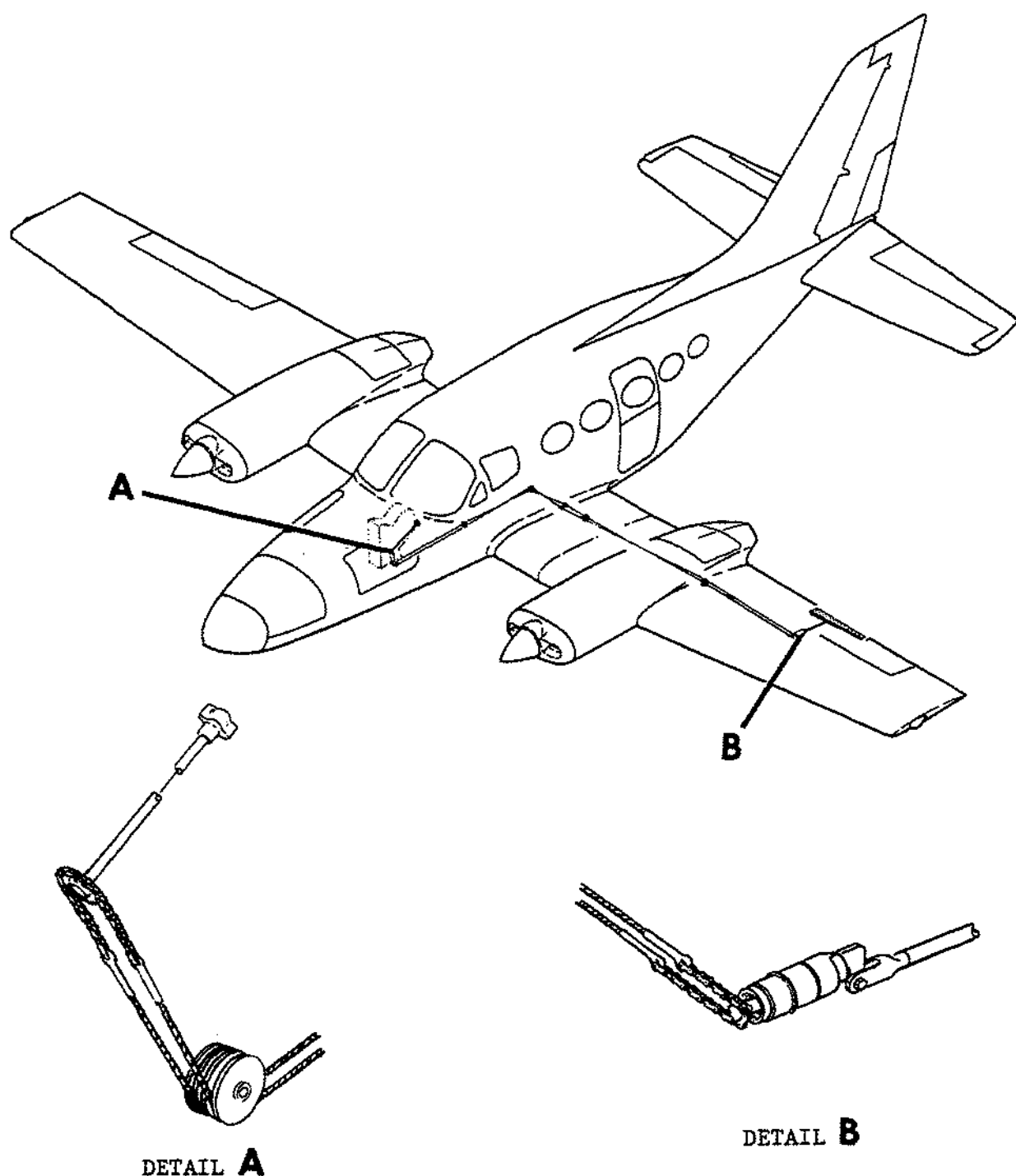
AILERON TRIM SYSTEM

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

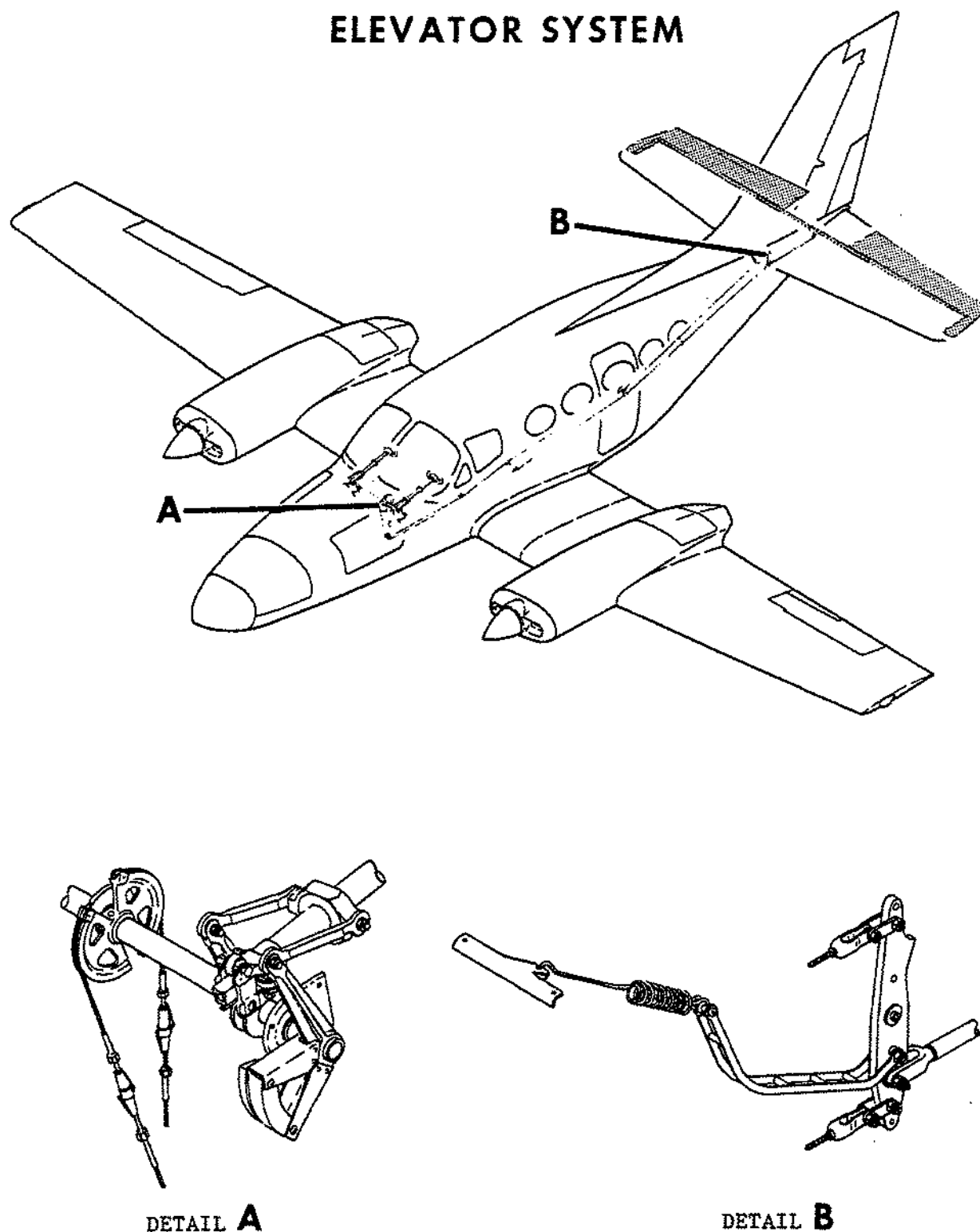


Figure 7-6

ELEVATOR TRIM SYSTEM

Elevator trim, see Figure 7-7, is achieved by an elevator trim tab attached to the right elevator 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 horizontal stabilizer. The actuator is driven by cables attached to the trim control wheel on the cockpit control pedestal.

ELEVATOR TRIM SYSTEM

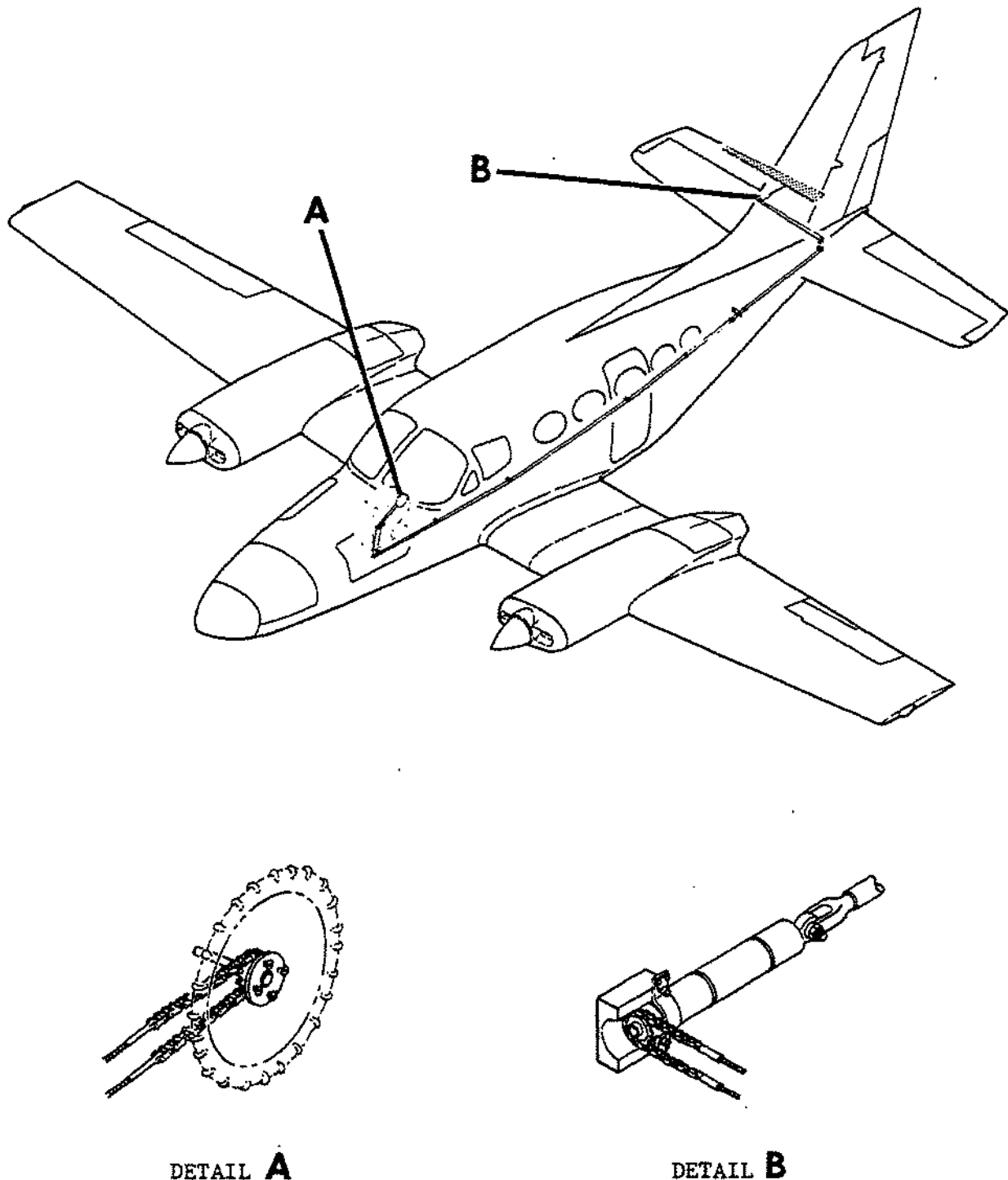


Figure 7-7

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. When the rudder is actuated, a cable and spring assembly that is connected to the aileron system causes the ailerons to automatically assist the turn.

RUDDER SYSTEM

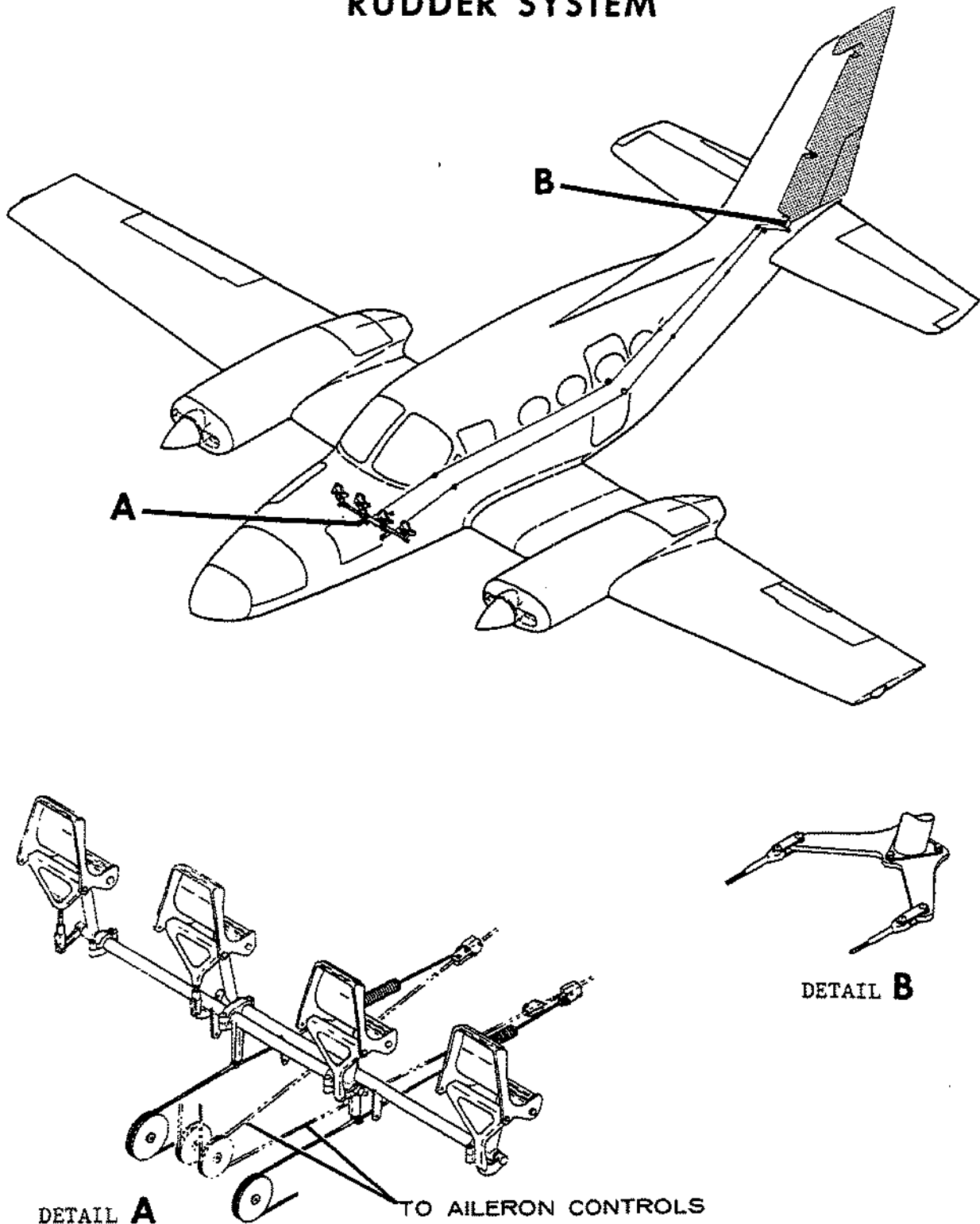


Figure 7-8

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.

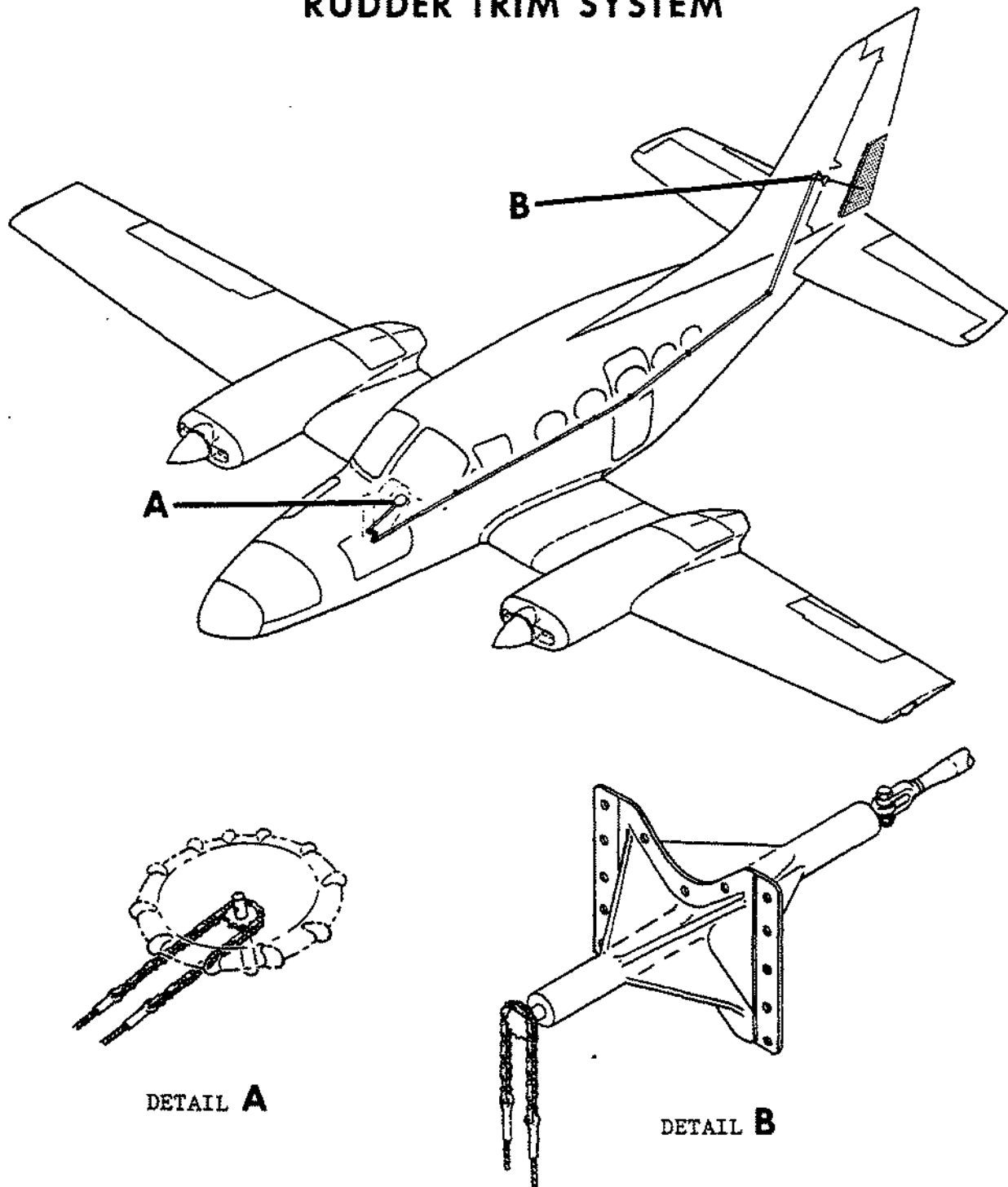
RUDDER TRIM SYSTEM

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

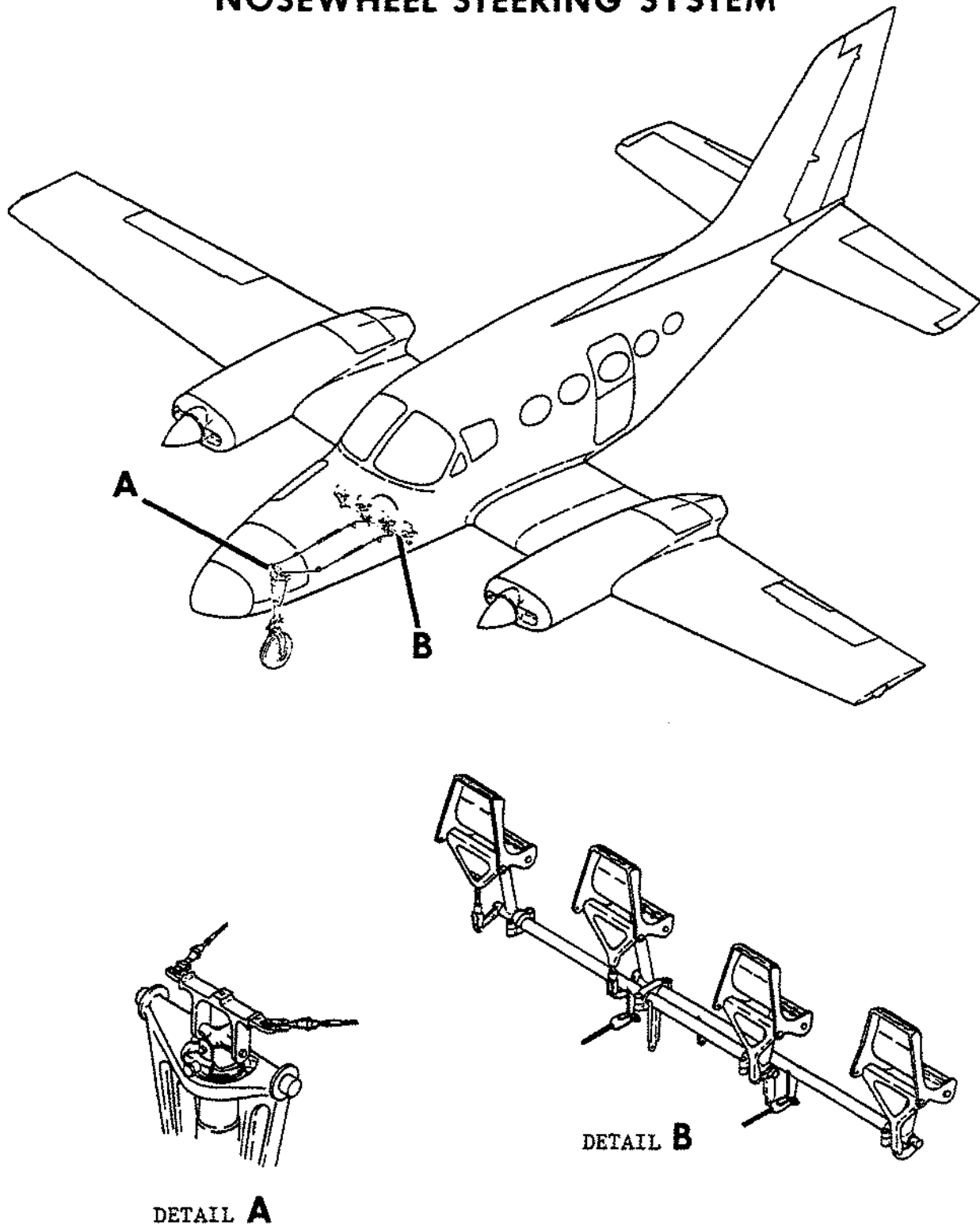


Figure 7-10

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.

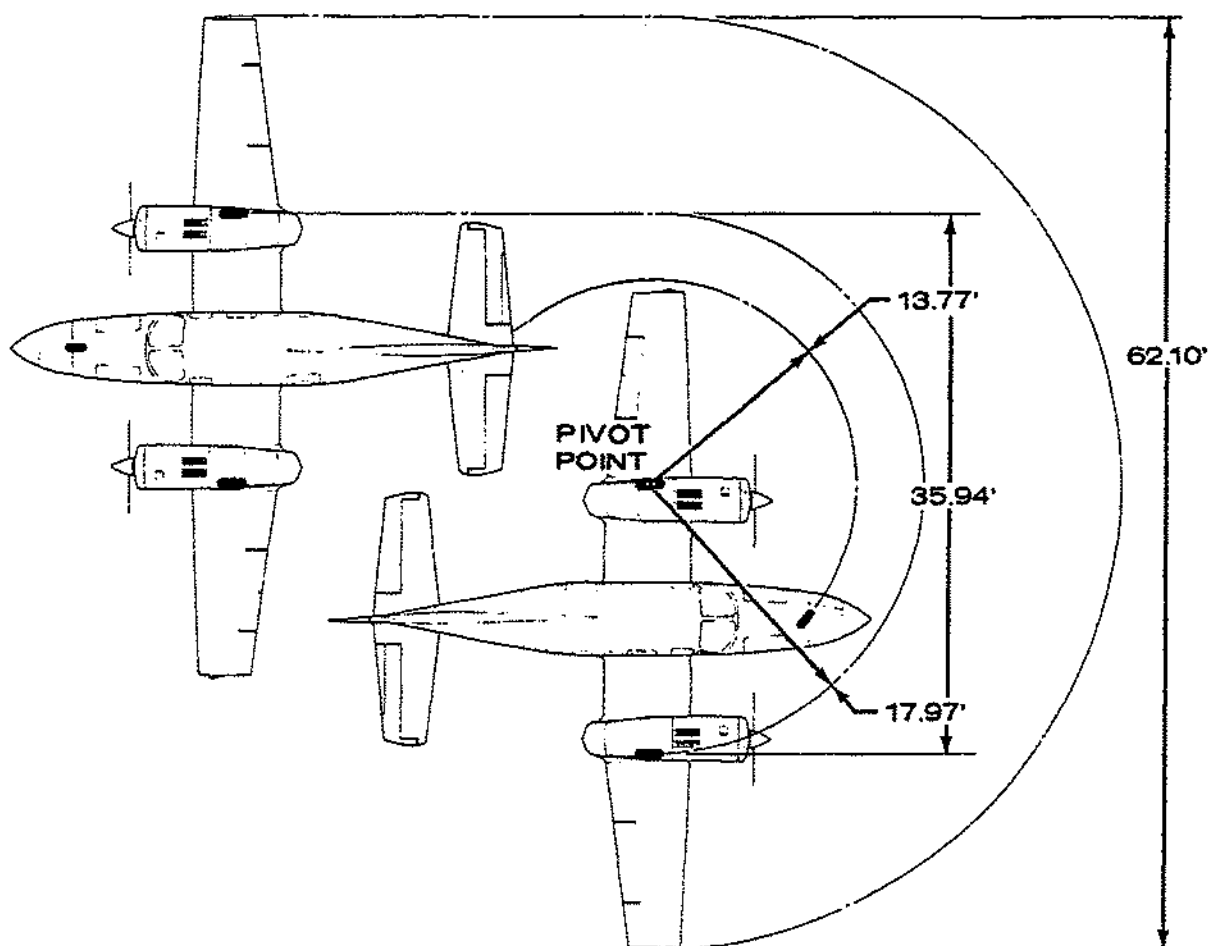
MINIMUM TURNING DISTANCE

Figure 7-11

WING FLAPS SYSTEM

The wing flaps, see Figure 7-12, are of the split flap design. Each wing flap (two per side) is attached to the rear wing main spar lower surface and is actuated by two push-pull rods attached to bell cranks in the wing. The bell cranks in each wing are ganged together with push-pull rods. Each inboard push-pull rod is attached to a cable which is actuated by an electric motor with reduction gear in the fuselage center section.

The electric flap motor is controlled by the wing flap position switch, see Figure 7-1, in the cockpit. This switch incorporates a preselect

feature which allows the pilot to select the amount of flap extension desired. When the 0°, 15°, 30° or 45° position is selected, the flap motor is electrically actuated and drives the flaps toward the selected position. As the flaps move, an intermediate cable feeds position information back to the preselect assembly. When the actual flap position equals the selected position, a microswitch deenergizes the flap motor.

WING FLAPS SYSTEM

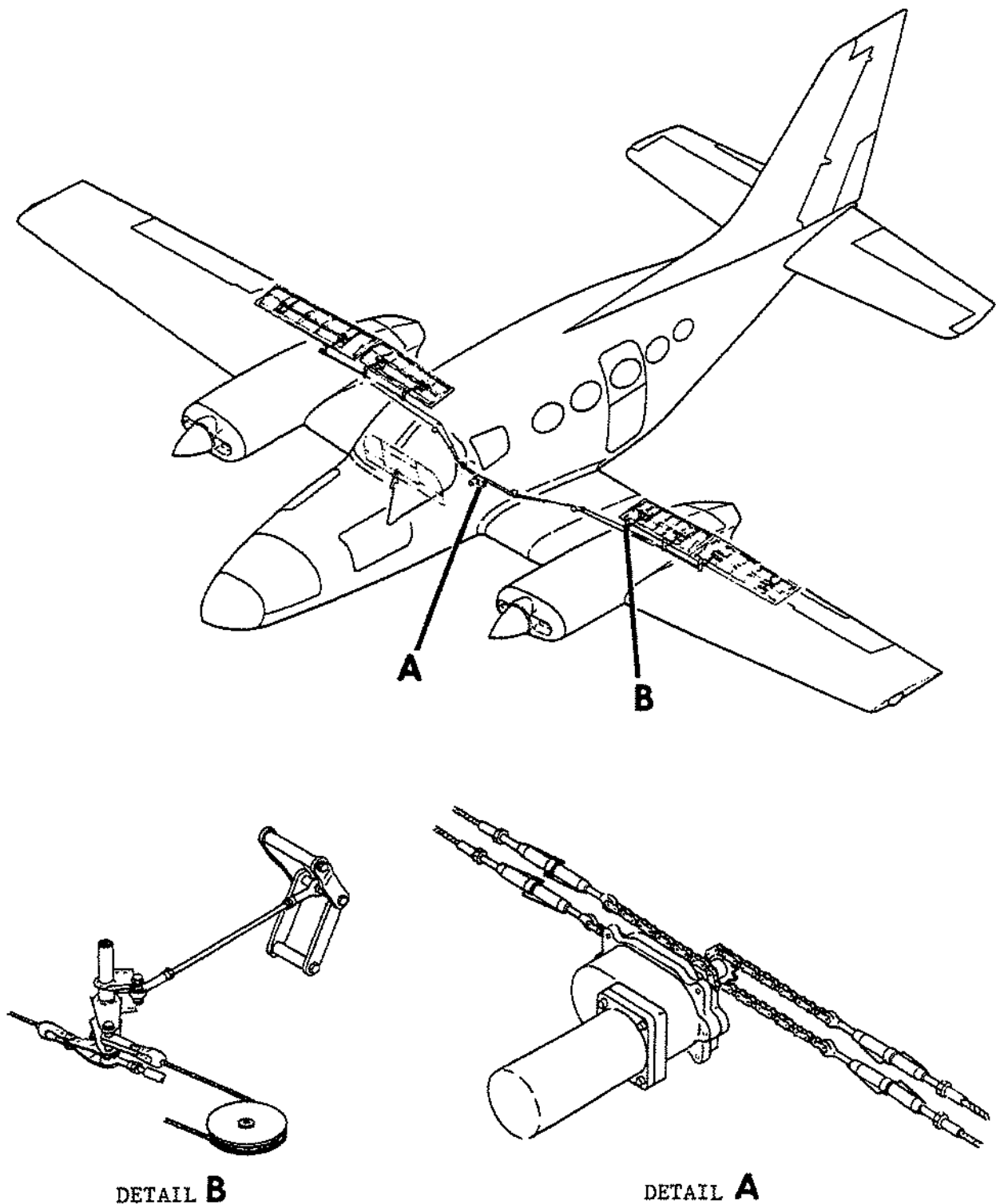


Figure 7-12

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. During ground operation, accidental gear retraction, regardless of gear switch position, is prevented by a safety switch located on the left landing gear shock strut. The weight of the airplane compresses the shock strut, causing the safety switch to open, thus preventing electrical power from reaching the landing gear control valve.

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 7-16, 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 towards 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 light which illuminates at low engine RPM or in the event of a hydraulic pump failure.

LANDING GEAR SYSTEM

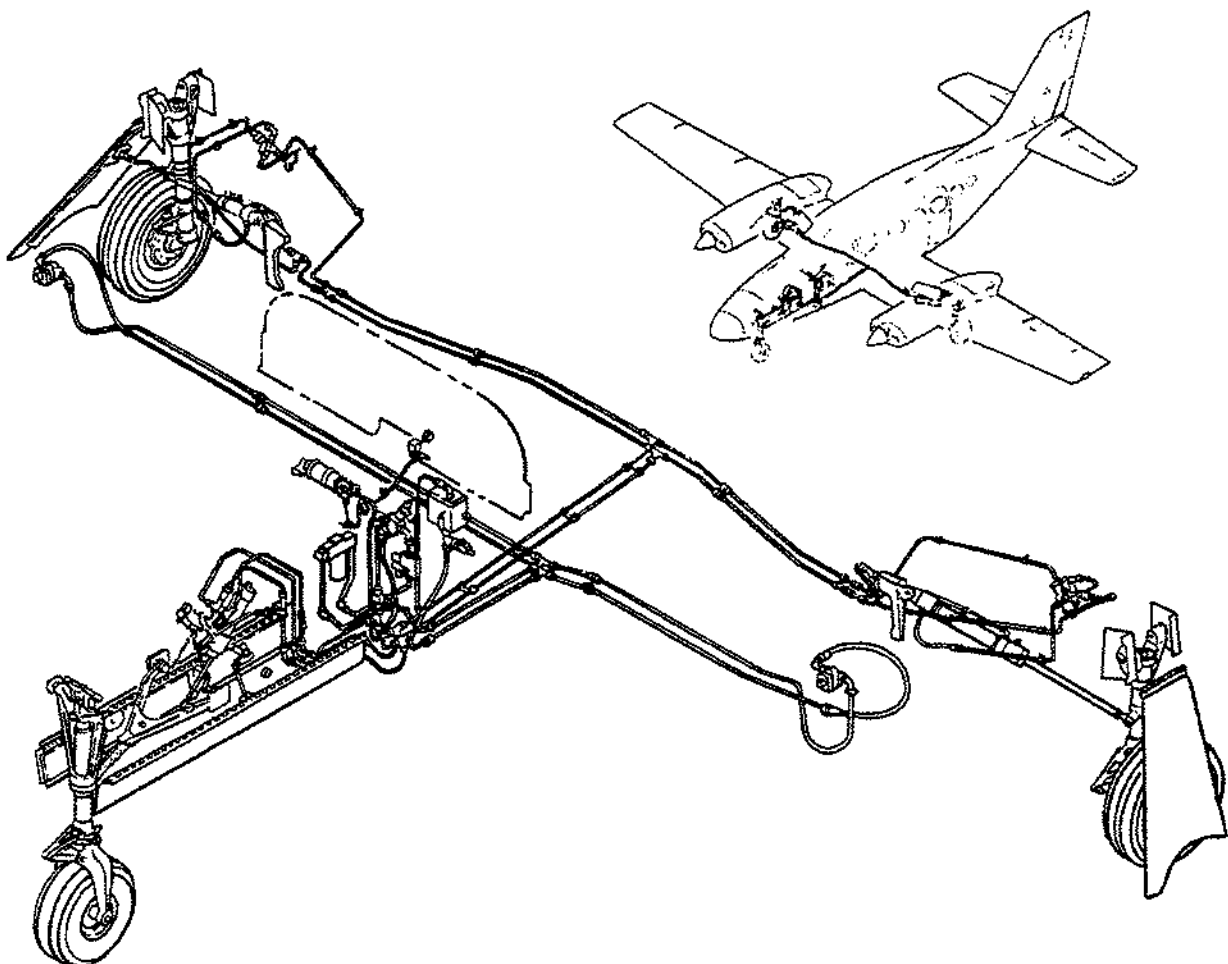
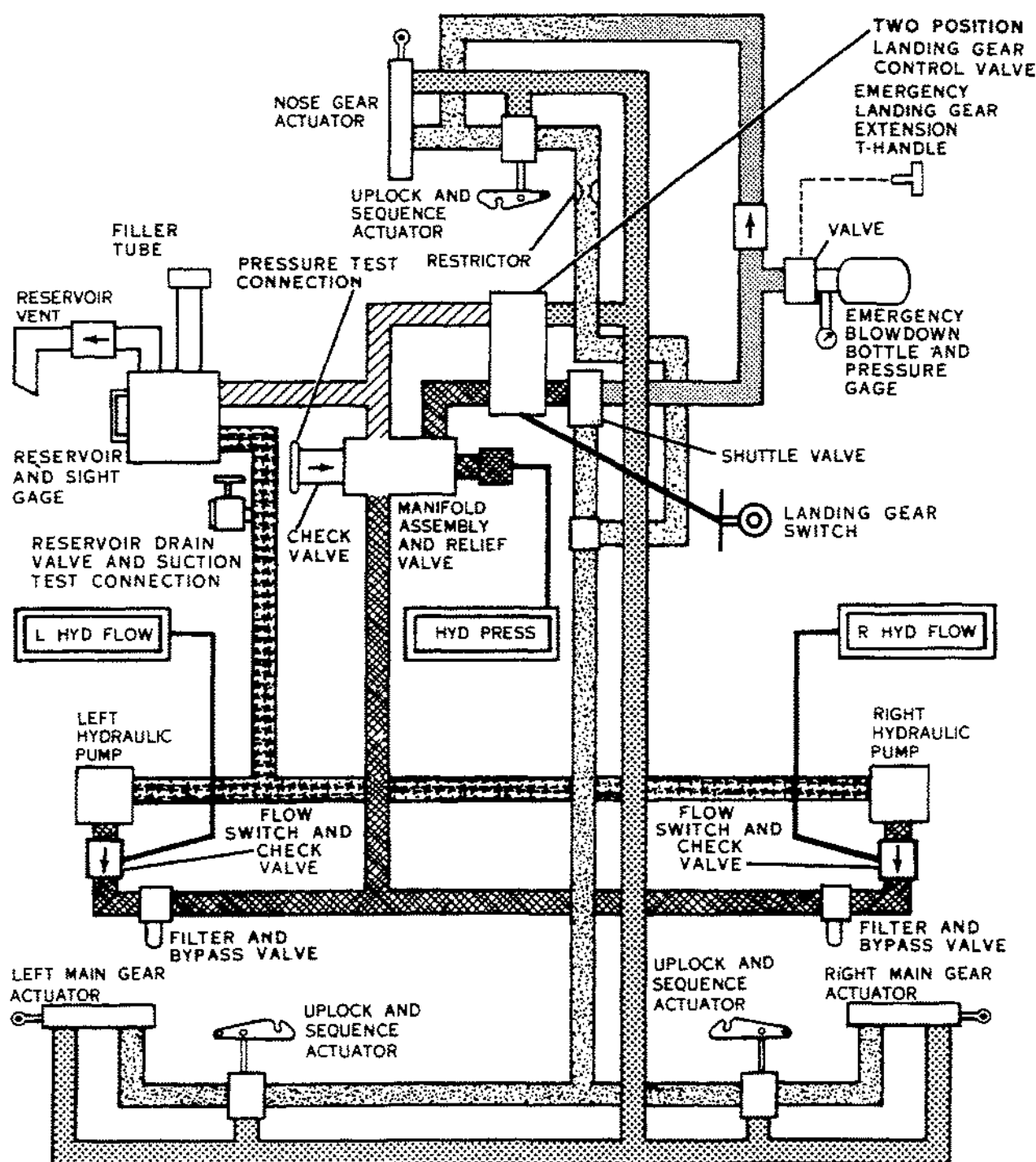


Figure 7-13

HYDRAULIC SYSTEM SCHEMATIC



CODE

----- MECHANICAL	RETURN
SUCTION	EMERGENCY AIR
PRESSURE	CHECK VALVE
GEAR EXTEND	ELECTRICAL
GEAR RETRACT	

Figure 7-14

LANDING GEAR HYDRAULIC SYSTEM

Hydraulic pressure at 1750 psi is supplied on demand by the hydraulic pump which is mounted on each engine, see Figure 7-14. The hydraulic reservoir, located in the nose baggage compartment, see Figure 7-15, incorporates a sight gage for checking the fluid level while the gear is extended. 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. The landing gear completes the retraction cycle in approximately 4.5 seconds at maximum engine RPM. The actuation cycle time increases as engine RPM decreases or with the loss of an engine-driven hydraulic pump.

HYDRAULIC RESERVOIR SIGHT GAGE AND EMERGENCY BLOW DOWN BOTTLE PRESSURE GAGE

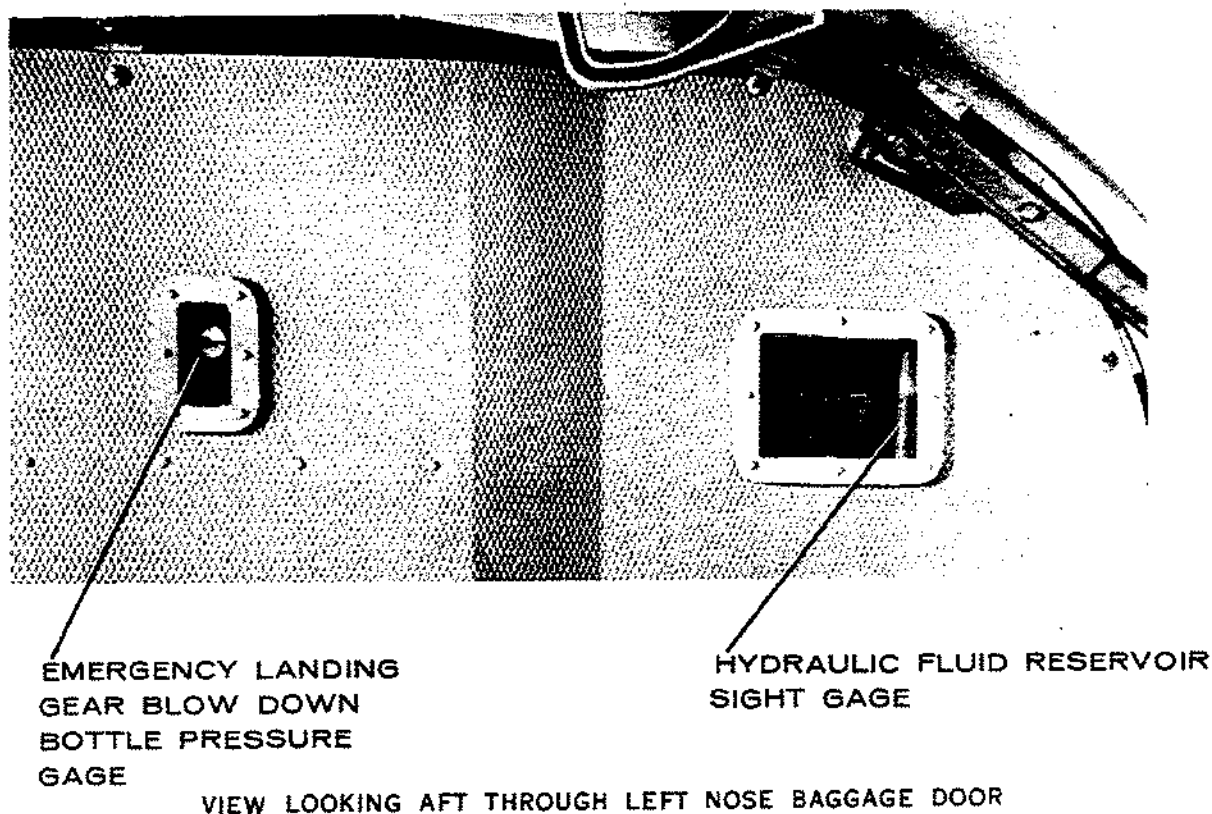


Figure 7-15

LANDING GEAR POSITION LIGHTS

Four landing gear position indicator lights, see Figure 7-16, 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 throttles and the wing flap position. The warning horn will sound intermittently if either throttle is retarded below approximately 15.0 inches Hg. manifold pressure with the landing gear retracted or if the wing flaps are lowered past the 15° position with the landing gear in any position except extended and locked. The warning horn can be activated by either the wing flap position switch or by throttle position as each functions independently of the other. 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 near the annunciator panel while retarding one throttle at a time. Also, lowering the wing flaps past the 15° position with the PRESS-TO-TEST button activated will cause the landing gear warning horn to sound.

LANDING GEAR EMERGENCY EXTENSION SYSTEM

The landing gear emergency extension system, see Figure 7-16, consists of a red emergency 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, caus-

EMERGENCY LANDING GEAR EXTENSION SYSTEM

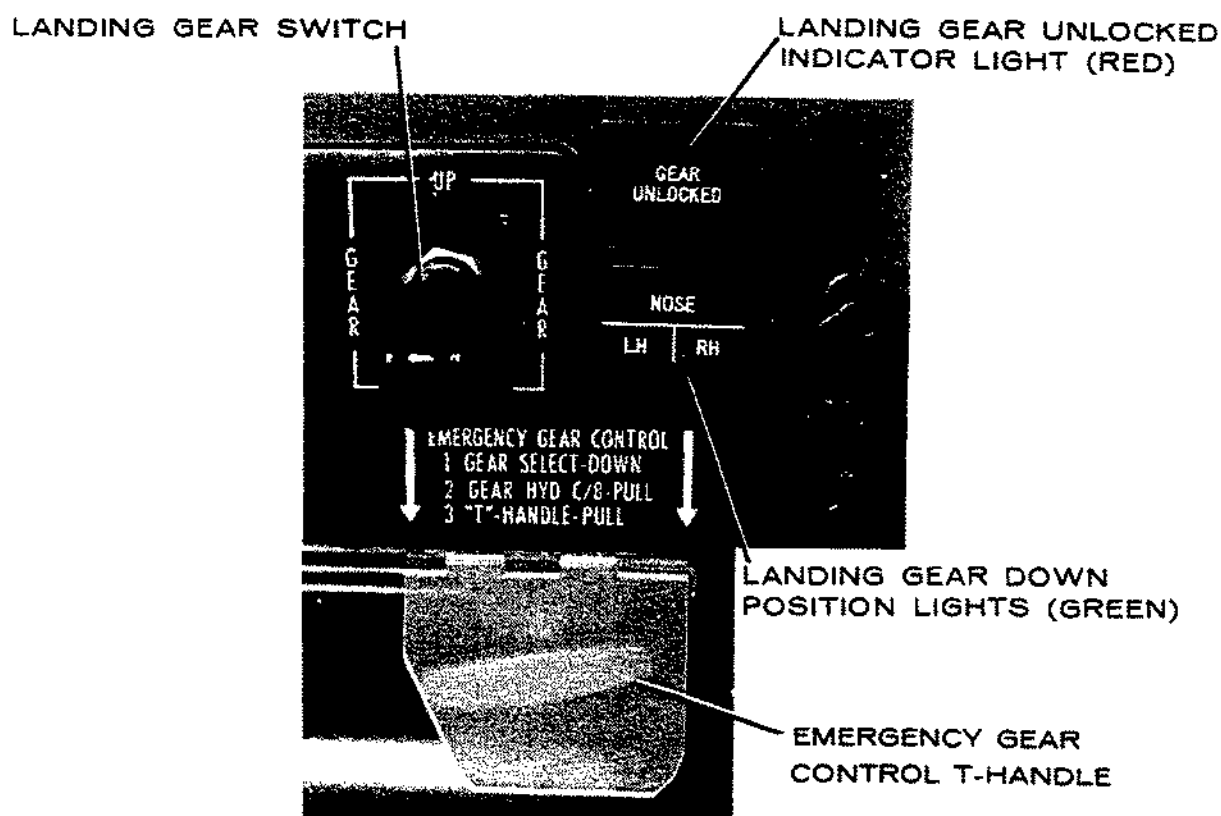


Figure 7-16

ing the shuttle valve to move from the hydraulic to the 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.

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 gear by an air-over-oil shock strut. This strut is composed of two basic parts: an upper barrel assembly and an inner tube assembly which fits inside the upper barrel assembly. The inner barrel assembly contains an orifice and tapered metering pin which vary the resistance to shock according to severity transmitted to the upper barrel assembly.

FUEL SYSTEM

The fuel system, see Figure 7-17, consists of two main tanks, two fuel selectors, emergency crossfeed shutoff valves and necessary components to complete the system.

MAIN TANKS

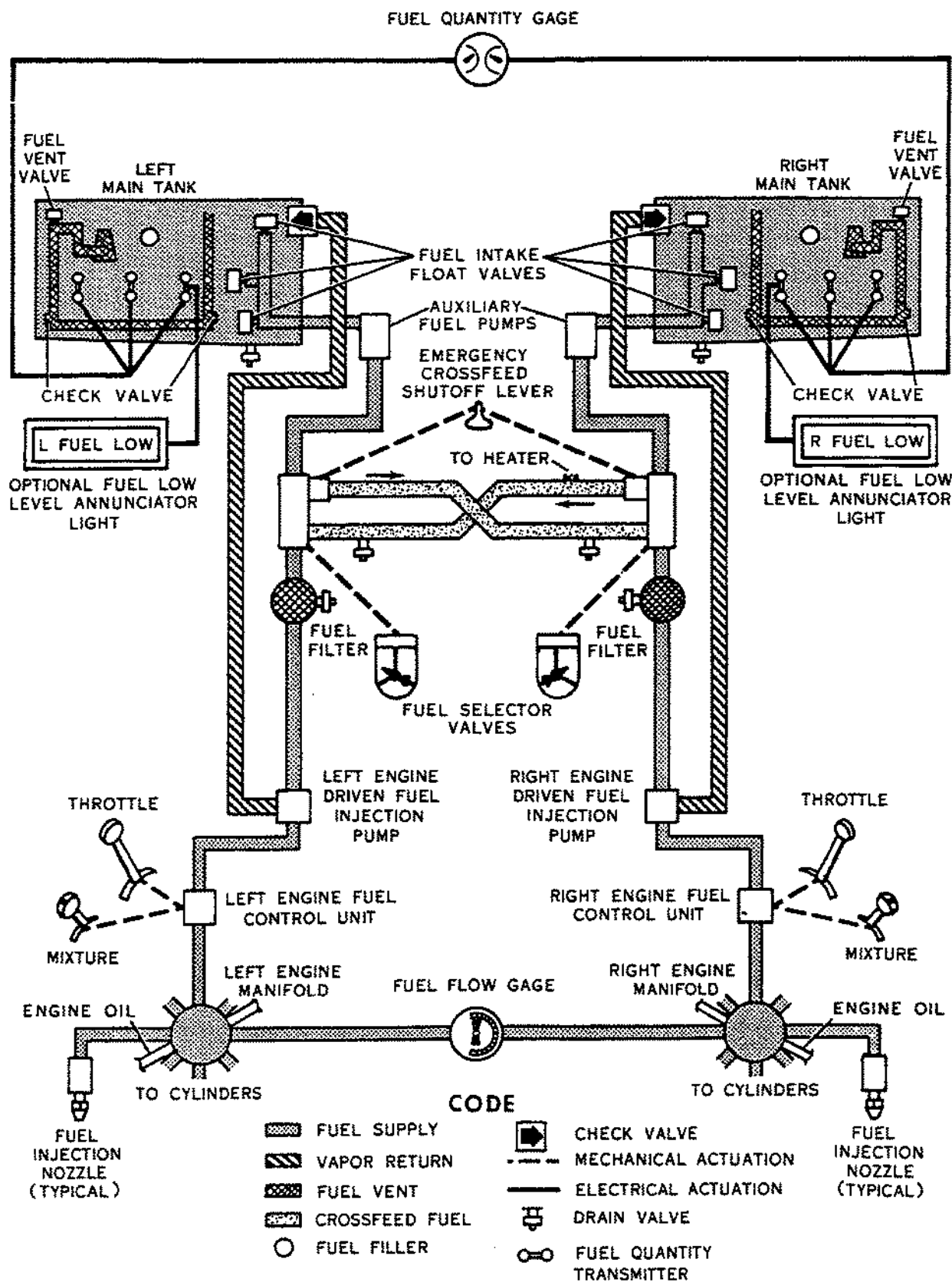
The main fuel tanks are an integral portion of the sealed wet wing. These tanks supply their respective engine with fuel for normal operations, including takeoffs and landings. An auxiliary fuel pump, located outside the tank, provides fuel pressure for priming during engine start. In the event of an engine fuel pump failure, the auxiliary fuel pump will supply fuel to the engine if the auxiliary fuel pump switches are on. The main tank is vented to the atmosphere by a combination flush vent and a .50-inch diameter drain located on the lower surface of the wing. The flush mounted vent eliminates the need for heated vents. The fuel tanks are serviced through a flush filler located in the top surface of each wing.

FUEL SELECTORS

Two fuel selectors, one for each engine, are provided on the floor between the pilot and copilot seats. The selectors allow selection of main fuel, crossfeed and off.

During normal flight operations, position the left fuel selector to LEFT MAIN and the right fuel selector to RIGHT MAIN. This allows fuel to flow from each main tank, through the fuel selector, to the respective engine-driven fuel pump. Fuel may be crossfed from the left main tank to the right engine or from the right main tank to the left engine. Both engines will be supplied with fuel from the right main tank when both fuel selectors are positioned to RIGHT MAIN. Conversely, both engines will be supplied with fuel from the left main tank when both fuel selectors are positioned to LEFT MAIN. The crossfeed function is used for balancing asymmetric fuel loads and supplying the engine-driven fuel pump from the

FUEL SYSTEM SCHEMATIC



58987011

Figure 7-17

opposite main tank. The LEFT ENG OFF position or RIGHT ENG OFF position (the center button must be depressed as the selector valve is rotated to the off position) on the fuel selectors allows no fuel to flow to the engine-driven fuel pump.

The fuel selector handles form the pointers for the selectors. The ends of the handles are arrow-shaped and point to the position on the selector placard which corresponds to the position of the control valves.

EMERGENCY CROSSFEED SHUTOFF LEVER

A two-position emergency crossfeed shutoff lever is located between the fuel selector handles. When the shutoff lever is pulled up, crossfeeding of main tank fuel and heater operation is stopped. This lever is for emergency crossfeed control only, since its function is to isolate the fuel crossfeed lines from the fuel tanks in the event of a nacelle, wing or center section fire or a wheels up landing.

AUXILIARY FUEL PUMP SWITCHES

A 3-position auxiliary fuel pump switch, see Figure 7-19, is provided for each main fuel tank pump providing 5.5 PSI pressure for vapor clearing and purging. In the LOW position, the auxiliary fuel pumps operate at low speed. The ON position runs the auxiliary fuel pumps at low speed, as long as the engine-driven pumps are functioning. With an engine-driven pump failure and the switch in the ON position, the auxiliary pump on that side will switch to high speed automatically, providing sufficient fuel for all partial-power engine operations.

FUEL DRAIN VALVES

Fuel quick-drain valves are provided for each fuel tank, fuel filter and crossfeed line. The drains provide a location for removing moisture and sediment from the fuel system. The drains, located on the lower surface of the main tanks, are actuated by depressing the lower portion of the valve. A special screwdriver is provided with the airplane which allows a 2-ounce sample to be drained and inspected without fuel spillage.

FUEL FLOW GAGE

The fuel flow gage, see Figure 7-1, is a dual instrument which indicates the approximate fuel consumption of each engine in pounds per hour. The fuel flow gage used with the injection system senses the pressure at which fuel is delivered to the engine spray nozzles. Since fuel pressure at this point is approximately proportional to the fuel consumption of the engine, the gage is marked as a flowmeter.

The gage dial is marked with arc segments corresponding to proper fuel flow for various power settings and maximum power altitudes and is used as a guide to quickly set the mixtures. These gage markings are predicated on the use of 100 grade aviation fuel. Increase fuel flow 2% above markings when 100LL grade aviation fuel is used.

The gage has takeoff, climb and cruise markings for various percentages of power. The takeoff range (white arc) presents the desired fuel flow (full rich schedule for proper engine cooling) for full power (2700 RPM and 38.0 inches Hg. manifold pressure) operation under all conditions up to

20,000 feet altitude. A white triangle represents the desired fuel flow for maximum normal operating power (38.0 inches Hg. at 2600 RPM) for operation at all conditions up to 20,000 feet altitude. The climb range (blue segments) presents the desired fuel flow for best power mixture at 75% power with an enriched mixture for higher power settings to allow proper engine cooling during climb conditions. The cruise range presents the desired fuel flow for recommended lean mixture at the specified percent power.

FUEL QUANTITY GAGE

The dual indicating fuel quantity gage, see Figure 7-1, is calibrated in pounds and will accurately indicate the weight of fuel contained in the tanks regardless of whether 100 grade aviation or 100LL grade aviation fuel is used; however, fuel density varies with temperature, therefore a full tank will weigh more on a cold day than on a warm day. This will be reflected by the weight shown on the gage. A gallons scale is provided in blue on the indicator for convenience in allowing the pilot to determine the approximate volume of fuel on board. The volume markings are predicated on the use of 100 grade aviation fuel. Reduce the indicated gallonage reading by 4% when 100LL grade aviation fuel is used.

FUEL LOW LEVEL WARNING LIGHTS

The optional fuel low level warning lights, see Figure 7-3, provide a warning when the left and/or right main tanks contain approximately 60 pounds of fuel. The warning is provided by the L FUEL LOW and R FUEL LOW lights located on the annunciator panel. These lights are actuated by a float switch located in each main fuel tank. Each light operates independently from the fuel quantity indicating system.

ENGINE-DRIVEN FUEL PUMPS

Each engine is equipped with a mechanically driven fuel pump which provides fuel to the metering unit. Each pump also contains a bypass which returns excess fuel and vapor to the main tanks at all times. Should these pumps fail, the main tank auxiliary pumps can provide sufficient fuel flow for all partial-power engine operations. These auxiliary pumps, however, operate at a fixed pressure, consequently the mixture must be leaned when operating at a low power setting to prevent flooding in the engines. Conversely, if an engine-driven pump failure should occur during high power operation, adequate fuel flow may not be available to insure rated power and adequate engine cooling.

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 the parking brakes, push the parking brake handle in. It is not necessary to depress the rudder pedals when releasing the parking brake.

ELECTRICAL SYSTEM

Electrical energy, see Figure 7-18, is supplied by a 28-volt, negative-ground, direct current system powered by an alternator on each engine. The electrical system has independent circuits for each side with each alternator having its own regulator and overvoltage protection relay. The voltage regulators are connected to provide proper load sharing. A 24-volt battery is located in the left stub wing. Immediate detection of low system voltage is provided by a LOW VOLT light on the annunciator panel, see Figure 7-3. The light will illuminate when the airplane bus voltage decreases below approximately 25 volts.

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.

BATTERY AND ALTERNATOR SWITCHES

Separate battery and alternator switches, see Figure 7-19, are provided as a means of checking for a malfunctioning alternator circuit and to permit such a circuit to be turned off. If an alternator circuit fails or malfunctions, or when one engine is not running, the switch for that alternator should be turned off. Operation should be continued on the functioning alternator, using only necessary electrical equipment. If both alternator 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.

EMERGENCY POWER ALTERNATOR FIELD SWITCH

An emergency power alternator field switch, see Figure 7-19, is located on the aft top side of the side console. The switch is used when the alternators will not self-excite. Placing the switch in the ON position provides excitation from the battery even through the battery is considered to have failed.

OVERVOLTAGE RELAYS

Two overvoltage relays in the electrical system constantly monitor their respective alternator output. Should an alternator exceed the normal operating voltage, the overvoltage relay will trip, taking the affected alternator off the line. The overvoltage relay can be reset by cycling the applicable alternator switch.

VOLTTAMMETER

A voltammeter, see Figure 7-19, located on the left side console, is provided to monitor alternator current output, battery charge or discharge rate and bus voltage. A selector switch, see Figure 7-19, labeled L ALT, R ALT, BATT, and VOLTS is located to the left of the voltammeter. By positioning the switch to L ALT, R ALT, or BATT position, the respective alternator or battery amperage can be monitored. By positioning the switch to the VOLTS position, the electrical system bus voltage can be monitored.

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LEFT AND RIGHT SIDE CONSOLES

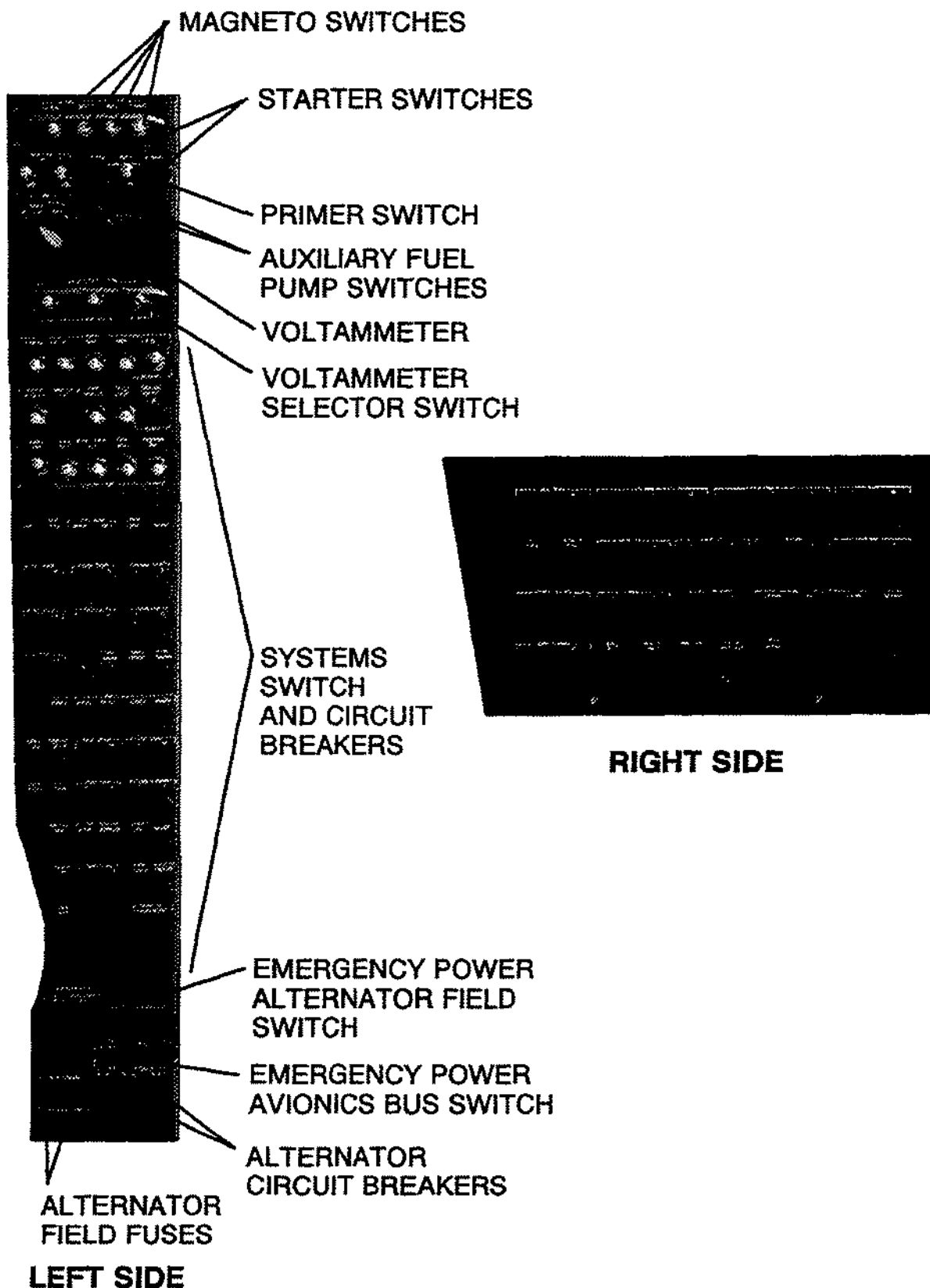


Figure 7-19

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 7-17. 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. However, the circuit breaker should not be held in nor the switch breaker forced to remain in the ON position if it opens the circuit a second time as this indicates a short circuit.

EXTERNAL POWER RECEPTACLE

An optional external power receptacle may be installed in the left wing aft nacelle fairing. The receptacle accepts a standard AN-type external power source plug. The following precautions must be observed when starting an airplane using an external power source:

1. Avionics Master Switch - OFF.
2. Battery Switch - ON (The battery will tend to absorb transients that are present in some external power sources).
3. Alternator Switches - OFF.
4. Airplane Voltammeter - READ battery voltage.

NOTE

Set External Power Source Output Voltage to 28 volts.

5. External Power Source - TURN OFF before connecting to airplane.
6. External Power Source - ATTACH and TURN ON.
7. Airplane Voltammeter - READ VOLTAGE (If external power source is properly connected, the reading will be greater than when reading battery voltage only).

LIGHTING SYSTEM

EXTERNAL LIGHTING

The airplane is equipped with four navigation lights, two retractable landing lights (right light is optional), an optional taxi light, two anti-collision lights and two optional wing deice lights.

Navigation Lights

The navigation lights are located in the tailcone stinger and in each wing tip assembly. These lights are energized with the navigation lights switch breaker on the side console, see Figure 7-19. Proper operation can be checked by observing reflections on the ground below the tail light and from objects surrounding the airplane.

Landing Lights

The retractable landing lights (right light is optional) are located in the lower surface of the wing tips. These lights are extended, retracted and illuminated by the landing light switch breaker on the side console, see Figure 7-19. With the switch positioned to LDG, 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 Lights

The optional 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 side console, see Figure 7-19.

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 light switch breaker on the side console, see Figure 7-19.

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 optional wing deice lights are installed in the outboard side of each engine nacelle and illuminate the outboard 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 side console, see Figure 7-19.

All exterior lighting should be checked for proper operation before night flying. Cockpit recognition of operational exterior lighting can be determined by looking for ground illumination by the various lights.

INTERNAL LIGHTING

The airplane is equipped with lighting for baggage areas, cabin doorway, cockpit controls and indicators, cockpit illumination and cabin illumination.

COCKPIT LIGHTING CONTROLS

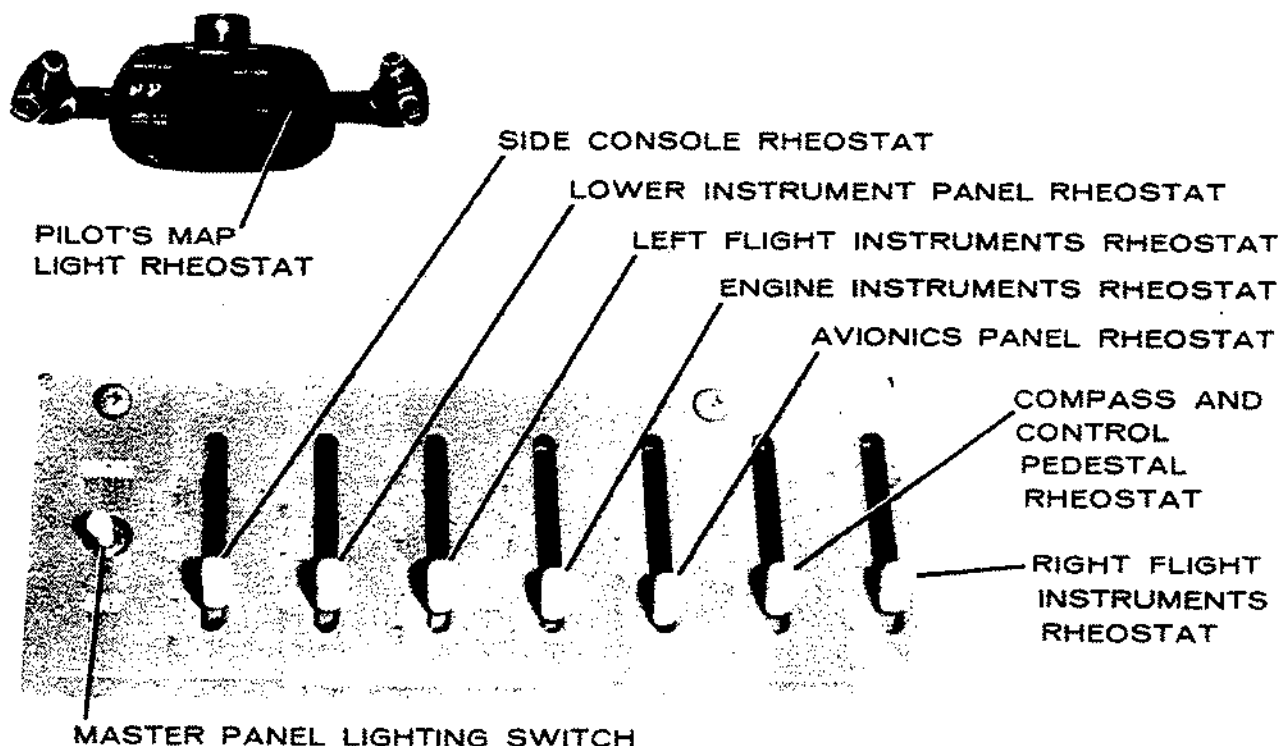


Figure 7-20

Optional baggage area lights are provided for both wing lockers and the nose baggage areas. The lights are actuated when the applicable baggage door is opened and extinguish 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. An optional timer is available which will automatically extinguish the cabin doorway and instrument panel floodlights 15 minutes after leaving the airplane if the lights were not switched off. The system operation is as follows:

1. The cabin doorway and instrument panel floodlights can be actuated by either of the two switches described above. Any time the lights come on, the timer begins to count down for 15 minutes.
2. With the cabin door closed, the lights will operate in a normal fashion (i.e., lights out, movement of either switch turns lights on; lights on, movement of either switch turns lights off), unless the timer has extinguished the lights, thus requiring cycling of either switch to turn the lights on again.
3. Opening the door will turn the lights on unless the timer extinguished the lights, in which case, one movement of the door switch is also required in order to turn the lights on.
4. With the cabin door open, the lights will always be on unless the timer has turned them off. Movement of the door switch is required to reset the lights to on for an additional 15 minutes.
5. Closing the door will extinguish the lights only if the system is switched off. If the system is on, the timer must continue to run down to extinguish the lights.

CABIN LIGHTING AND CONTROLS

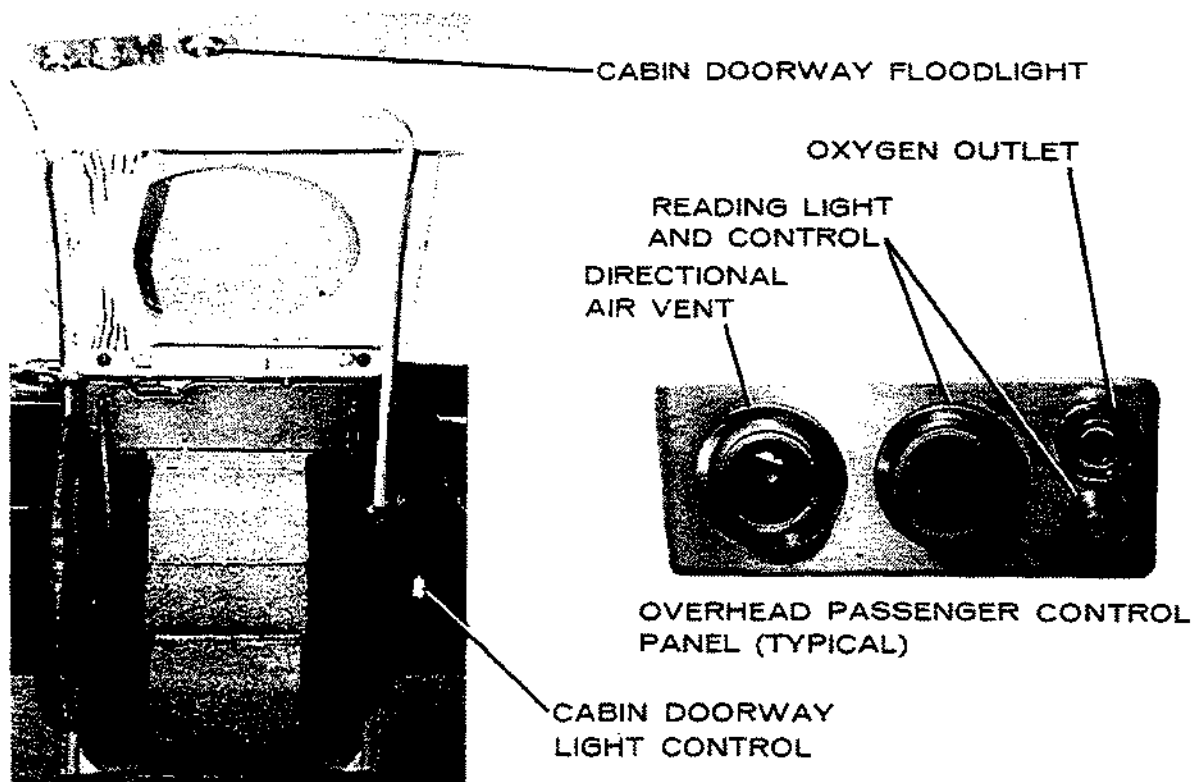


Figure 7-21

Cockpit lighting is provided by the instrument panel floodlight, instrument postlights and overhead map lights. All cockpit lights are variable intensity and are controlled by rheostats on the top of the control pedestal and pilot's control wheel, see Figure 7-20.

NOTE

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 PRESSURE SYSTEM

The standard pitot pressure system, see Figure 7-22, consists of an electrically heated pitot tube mounted on the left side at the bottom of the fuselage nose, suitable plumbing and an airspeed indicator.

When the pitot heat switch is placed in the ON position, the heating elements in the pitot tube are electrically heated to maintain proper operation of the system during icing conditions. Do not operate for prolonged periods while on the ground to prevent overheating of the heating elements.

When the optional copilot's instruments are installed, a second pitot system is used. This second pitot head is located on the right side at the bottom of the fuselage nose and is connected to the copilot's airspeed indicator. This dual system allows a completely independent second presentation of airspeed pitot pressure. Pitot heat for the additional head is controlled by an additional pitot heat switch located adjacent to the standard pitot heat switch.

STATIC PRESSURE SYSTEM

Static pressure for the pilot's airspeed, altimeter and rate-of-climb indicators, see Figure 7-22, is obtained by a normal external static source or an alternate internal static source should the external source fail.

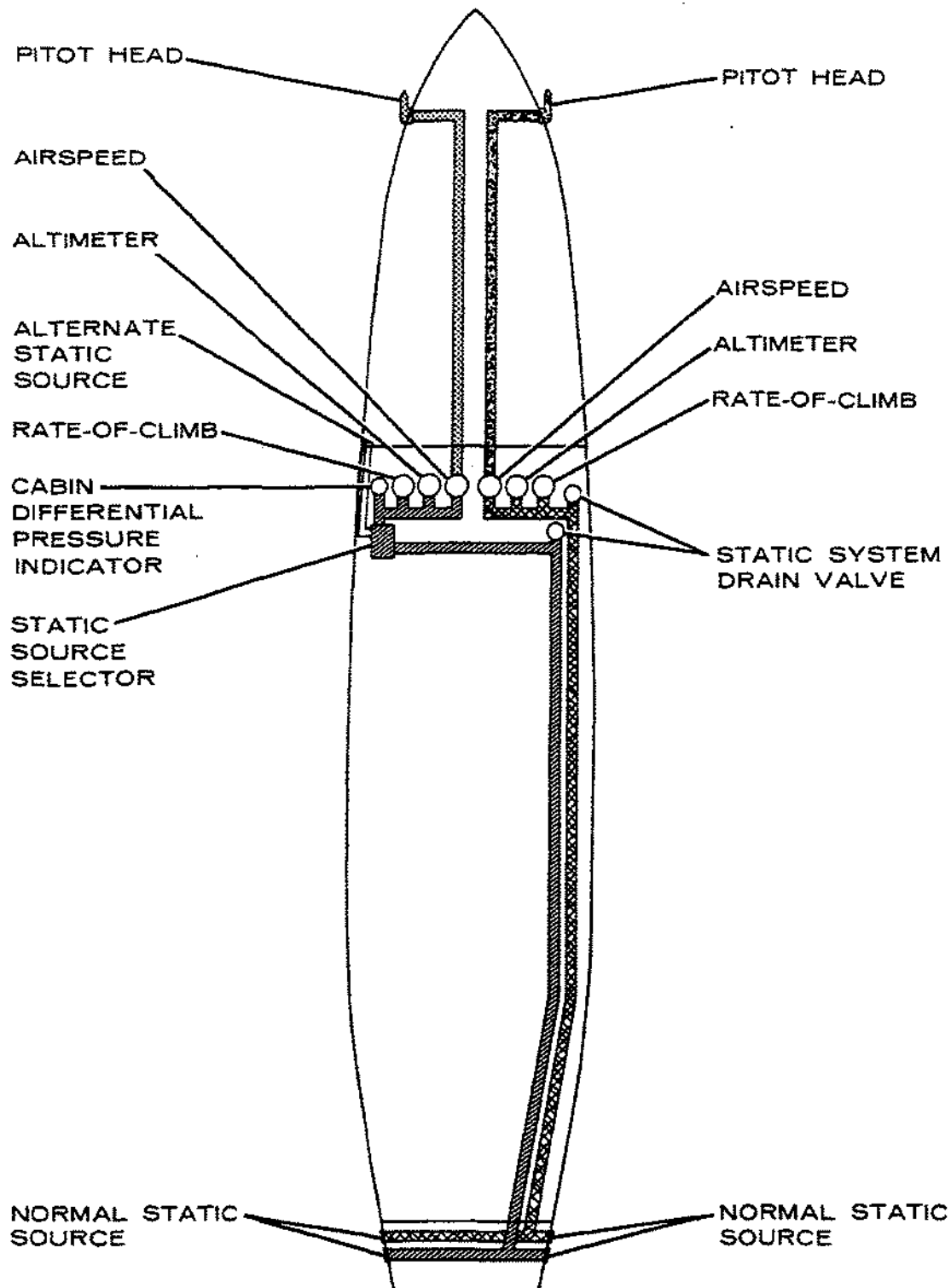
A static source selector, installed in the static system directly below the parking brake handle, allows selection of the normal or alternate static source. When the selector is positioned to NORMAL, the pilot's instruments reference the static source located aft of the main cabin door. When the selector is positioned to ALTERNATE, the pilot's instruments reference the alternate static source in the nose compartment. Refer to Section 5 for airspeed and altimeter corrections when the static source is positioned to ALTERNATE. A drain valve is located behind the map pocket on the copilot's side.

CAUTION

Do not open the drain valve while the cabin is pressurized as flight instrument damage will result.

When the optional copilot's instruments are installed, a second set of static ports are installed aft of the main cabin door below the standard static ports. The added static ports are manifolded together and are used as a reference for the copilot's instruments only. This dual system allows a completely independent second static pressure source. No alternate static source is provided for the copilot's instruments. Optional static port heaters are controlled by the stall and vent heat switch.

PITOT STATIC SYSTEM SCHEMATIC



CODE

-  PILOT'S PITOT SYSTEM
-  PILOT'S STATIC SYSTEM
-  COPILOT'S PITOT SYSTEM (OPTIONAL)
-  COPILOT'S STATIC SYSTEM (OPTIONAL)

Figure 7-22

VACUUM SYSTEM

A vacuum system, see Figure 7-23, is installed to provide a source of vacuum for the vacuum instruments. The system consists of an engine-driven vacuum pump on each engine, a pressure relief valve for each pump, a common vacuum manifold, a vacuum air filter, a suction gage and gyro instruments.

Each vacuum pump pulls a vacuum on the common manifold, exhausting the air overboard. The maximum amount of vacuum pulled on the manifold by each vacuum pump is controlled to a preset level by each pressure relief valve. Should either of the pumps fail, a check valve is provided in each end of the manifold to isolate the inoperative vacuum pump from the system.

The exhaust air side of each attitude gyro is connected to the vacuum manifold thus providing a smooth steady vacuum for the gyros. The vacuum pressure being applied to the gyros is constantly presented on the suction gage. This gage also provides failure indicators for the left and right vacuum pumps. These indicators are small red buttons located in the lower portion of the suction gage which are spring-loaded to the extended (failed) position. When normal vacuum is applied in the manifold, the failure buttons are pulled flush with the gage face. Should insufficient vacuum occur on either side, the respective red button will extend. No corrective action is required by the pilot, as the system will automatically isolate the failed vacuum source, allowing normal operation on the remaining operative vacuum pump.

The inlet air side of the attitude gyros are connected to a common vacuum air filter which cleans the ambient nose compartment air before allowing it to enter the gyros.

FLIGHT INSTRUMENTS

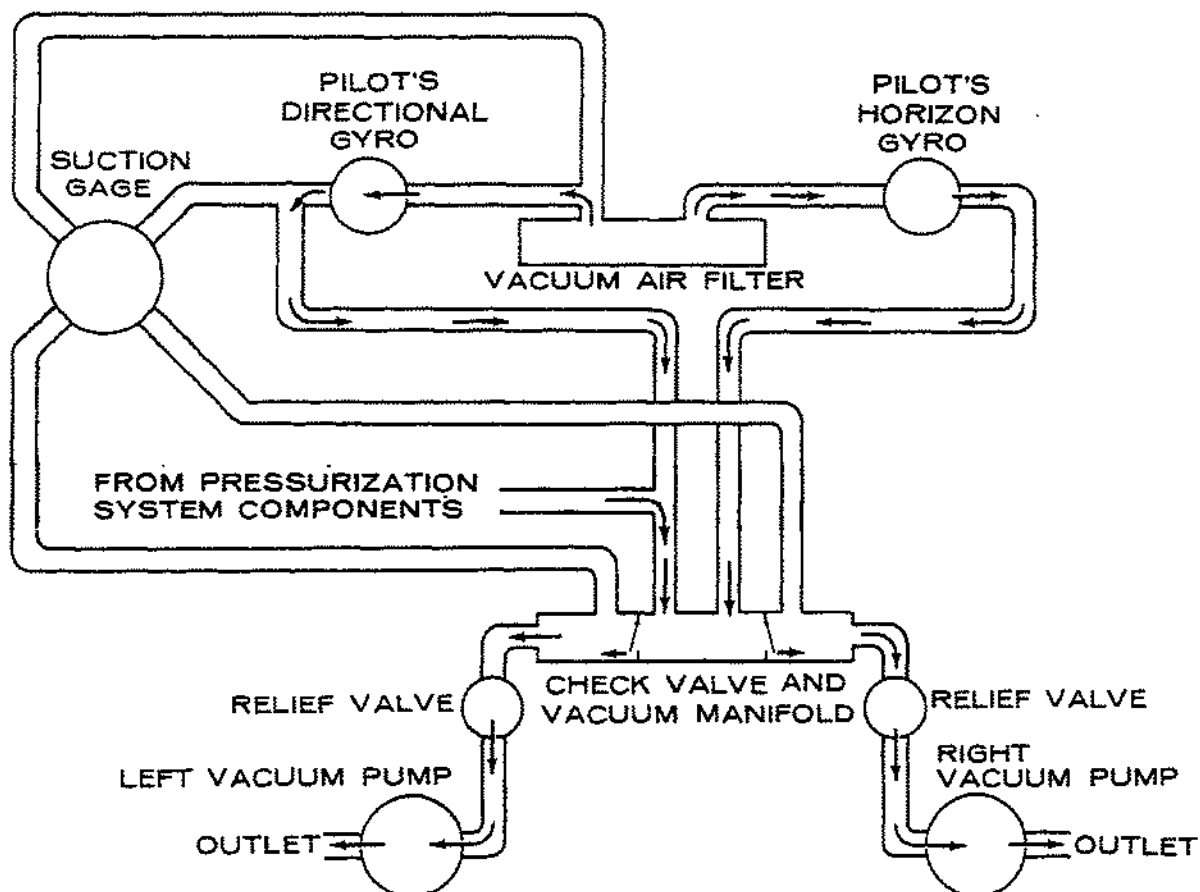
The basic flight instruments, see Figure 7-1, consist of airspeed, altimeter and rate-of-climb indicators, electric turn-and-bank and vacuum horizon and directional gyros.

Operation of the airspeed, altimeter and rate-of-climb indicators can be determined by cross-checking the copilot's instruments, if installed. Also, when a climb or descent is initiated, these instruments should indicate the appropriate change. If no change is indicated, it is reasonable to assume static source blockage has occurred and the alternate static source should be selected. If the possibility of static source icing is present, actuation of the stall and vent heat switch might deice the static sources, allowing a return to the normal static source, if the optional heated static sources are installed. If only the airspeed indicator appears to be affected when the climb or descent is initiated, it is reasonable to assume a pitot system blockage has occurred. If the possibility of pitot source icing is present, actuation of the pitot heat switch will clear the ice blockage. Reference the optional copilot's instruments and optional angle-of-attack indicator for airspeed information until a reliable airspeed indication can be obtained. If neither optional system is installed, fly attitude and power references.

Operation of the 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. Pushing the PRESS-TO-TEST

VACUUM SYSTEM SCHEMATIC

STANDARD SYSTEM



OPTIONAL SYSTEM

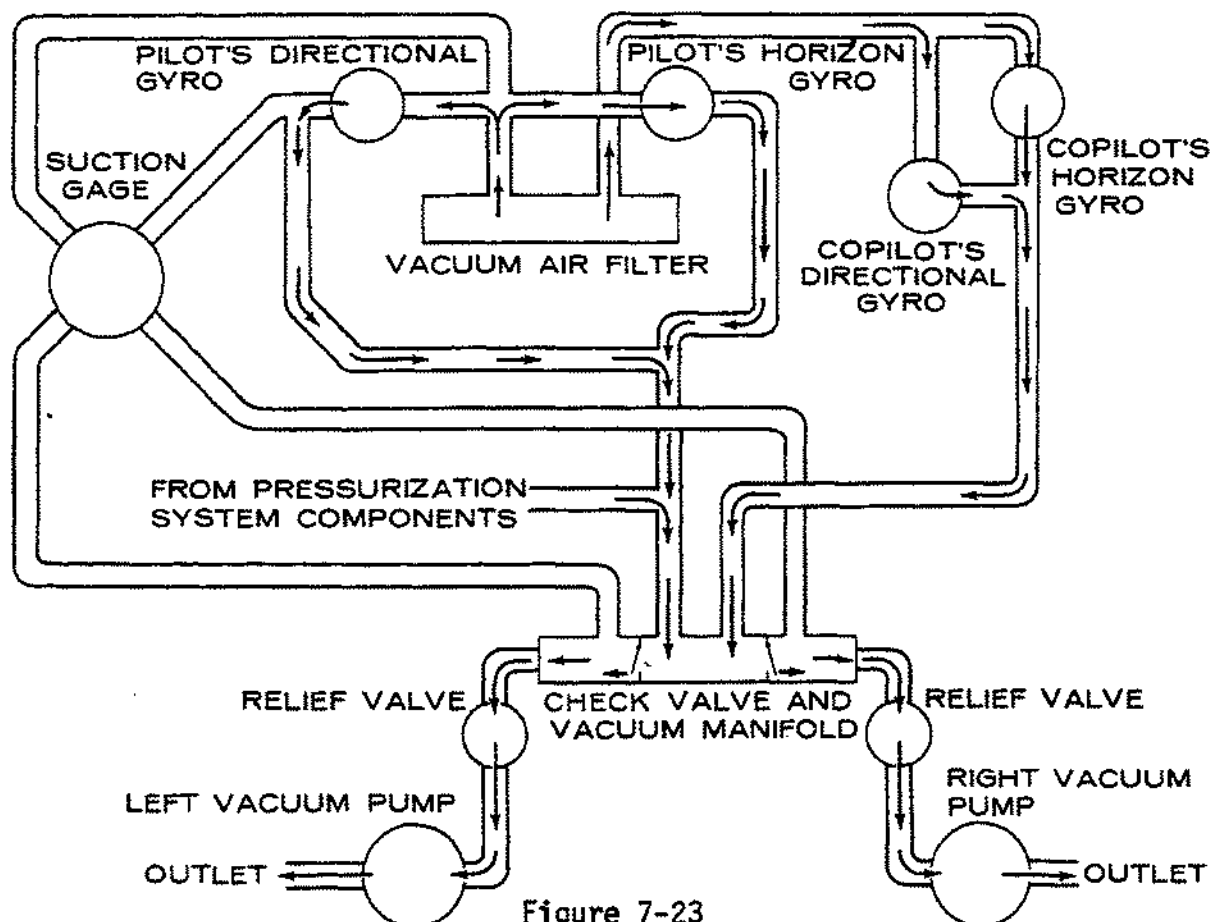


Figure 7-23

button adjacent to the annunciator panel will illuminate the T & B TEST annunciator light if power is being applied to the turn-and-bank indicator. After shutdown of the airplane on the ground, abnormal noise coming from the turn-and-bank 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.

Operation of the directional and horizon gyros can be checked during taxiing by watching for an abnormally slow erection rate and erratic operation. After shutdown of the airplane on the ground, abnormal noise coming from either gyro can indicate a near failure condition. Checking the suction gage for proper vacuum and no failure buttons exposed will assure proper gyro vacuum is available.

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.

STALL WARNING SYSTEM

A stall warning system is required equipment which consists of a stall warning transmitter vane located in the left outboard wing leading edge, a flight deck warning horn and the necessary wiring to complete the system.

The stall warning horn will sound 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 and vent heat switch and feeling the vane for heat.

AVIONICS

AVIONICS INTERFERENCE

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 optional avionics master switches are provided with factory installed avionics. The master switch breaker, labeled AVIONICS BUS, is located on the top forward section of the side console, see Figure 7-19. This switch supplies power from the battery bus through a circuit breaker located forward of the battery box to the individual avionics circuit breakers and is used for all normal operations. An emergency power

avionics bus switch breaker labeled EMER POWER AVIONICS BUS is located in the lower section of the outside console and is protected by a red switch guard cover, see Figure 7-19. This switch supplies power from the alternator bus to the individual avionics circuit breakers. The emergency power avionics bus switch is recommended for use only when the avionics bus switch associated wiring or battery circuits become inoperative.

ENGINES

The airplane is equipped with two, 6-cylinder, turbocharged fuel-injected engines with provisions for cabin pressurization. Each engine is rated at 310 horsepower at 2700 RPM and 38.0 inches Hg. manifold pressure. Each engine is provided with an oil pump, fuel pump, vacuum pump, propeller governor, tachometer generator, starter and alternator.

ENGINE CONTROLS

The control pedestal contains all engine controls except the alternate air controls. The three primary engine controls are in groups of two at the top of the pedestal; starting from left to right they are: (1) throttle, (2) propeller and (3) mixture.

Throttle Control

The throttle control lever, see Figure 7-1, is used to increase or decrease the engine power by moving the butterfly valve in the fuel-air control unit.

Propeller Control

The propeller control lever, see Figure 7-1, is used to change the propeller pitch to maintain or set a desired engine RPM.

Mixture Control

The mixture control lever, see Figure 7-1, is used to control the amount of fuel to be metered by the fuel-air control unit.

Quadrant Friction Lock

A quadrant friction lock, see Figure 7-1, is provided to prevent the three primary engine controls (six total levers) from creeping once they have been set. The locking knob (approximately one and one-half inches in diameter) is located on the right side of the pedestal.

Cowl Flap Control

Two cowl flap controls, see Figure 7-1, are located just below the rudder trim tab wheel; one control for each engine. These controls are used to set the cowl flaps in any position from full open to full closed. A locking feature is provided for each control to prevent inadvertent cowl flap position change. Rotating the control clockwise engages the locking mechanism.

Alternate Air Control

An alternate air control is provided for each engine, see Figure 7-1. These mechanically actuated, two-position controls are located on the instrument panel below the pilot's control wheel. Normally, the controls are pushed in, providing cold filtered ram air to the engines. When the controls are pulled fully out, warm unfiltered air from inside the cowl is provided to the engines. A locking feature is provided for each control to prevent inadvertent alternate air control position change. Rotating the control clockwise engages the locking mechanism.

Oil Heated Manifold Valve

The fuel manifold valves are heated with engine oil to reduce the possibility of power loss due to fuel system icing. The manifold valve, located on the top-forward part of the engine case, regulates metered fuel distribution to the injector nozzles.

ENGINE OIL SYSTEM

The engines installed in the airplane have a wet sump type, pressure lubricating system. Oil temperature is controlled by a thermally operated valve which either routes oil through the externally mounted cooler or bypasses the oil around the cooler. Oil is routed through internal passages to all moving parts of the engine which require lubrication.

In addition to providing lubrication and cooling for the engine, the oil is used for control of the propeller, actuating the turbocharger waste gate and for lubricating the turbocharger.

Oil pressures from both engines are routed into the fuselage, to the left and right engine gages, see Figure 7-1, where direct oil pressure readings are mechanically displayed. The oil temperatures of both engines are measured on the output side of the oil coolers. The measurements are electrically transmitted to the left and right engine gages where the oil temperatures are displayed.

IGNITION SYSTEM

Each engine is equipped with a dual ignition system. The ignition systems are entirely independent from each other such that a failure of any part of one system will have no effect on the other system. Each system consists of a magneto located on the rear engine accessory case, ignition harness to distribute the electrical energy and a spark plug in each engine cylinder. The left magneto fires the lower right and upper left spark plugs while the right magneto fires the upper right and lower left spark plugs. When the primary circuit of each magneto is electrically grounded by placing the magneto switch in the OFF position, the magneto will not produce a spark. With the magneto switch positioned to ON, the primary magneto circuit is ungrounded, allowing a high voltage spark to be produced to fire the spark plugs. During engine starting, a high voltage vibrator supplements the magneto spark to assure a fast start.

FUEL INJECTION SYSTEM

Fuel is supplied to the engine using a low-pressure injection system. The fuel is injected into the cylinder head adjacent to the intake valve on all cylinders. This continuous flow type injection system controls fuel flow to match engine airflow. A manual mixture control and a flow gage, see Figure 7-1, indicating fuel flow are provided for precise leaning at any combination of altitude and power setting. There are no moving parts in this system except for the engine-driven fuel injection pump.

COWL FLAP SYSTEM

A cowl flap system, consisting of a cowl flap located on the bottom of the nacelle, is provided for each engine to allow manual control of the engine cooling airflow. Cowl flap actuation is achieved by use of a push-pull cable assembly. The cowl flap controls, located on the lower control pedestal, allow any intermediate position to be selected. A locking feature is provided for each control to prevent inadvertent cowl flap control position change. Rotating the control fully clockwise engages the locking mechanism.

STARTING SYSTEM

The starting system consists of a 24-volt lead acid battery, a direct-drive starter mounted on each engine, a starter button for each engine and necessary wiring and components to complete the system.

The starter is engaged when the starter button, located on the side console, is pushed, see Figure 7-19. Pushing the button closes the starting contactor, allowing the starter to be energized. While the starter is energized, a starting vibrator provides a high-voltage current through the left magneto at a retarded position to assist the normal magneto ignition during the start.

ENGINE INSTRUMENTS

Engine instrumentation for each engine, see Figure 7-1, consists of mechanical oil pressure, electrical oil temperature and electrical cylinder head temperature presented on the combination engine gage, a mechanical manifold pressure gage, electric tachometer and mechanical fuel flow gage. The gages are placarded as to their operational parameters.

ENGINE MOUNTS

The engine is mounted to the nacelle structure by four engine mounts. Each mount incorporates two rubber pads capable of sustaining operational loads and providing absorption for engine vibrations.

ENGINE BREAK-IN PROCEDURE

The engine underwent a run-in at the factory and is ready for the full range of use. It is, however, recommended that cruising be accomplished at 65% to 77.5% power until a total of 50 hours has accumulated or oil consumption has stabilized.

CAUTION

The purpose of operating at 65% to 77.5% power with Best Power or Recommended Lean mixture is to insure proper seating of the rings and is applicable to new engines, and engines in service following cylinder replacement or top overhaul of one or more cylinders.

The airplane is delivered from the factory with corrosion preventative oil in the engine. This oil allows fast ring seating and should not be used any longer than 25 hours. If, during the first 25 hours, oil must be added, use only aviation grade straight mineral oil conforming to Specification MIL-L-6082. Refer to Section 8 for additional oil servicing information.

TURBO-SYSTEM

Each engine is equipped with a turbocharger and related components to allow rated power to 20,000 feet.

The engines work and act just like any normally aspirated engines; however, because the engines are turbocharged, some of the engine characteristics are different. The intent of this section is to point out some of the items that are affected by turbocharging, and outline the correct procedures to be followed.

For a better understanding of the Turbo-System, let us follow the induction air through the engine until it is expelled as exhaust gases. Reference should be made to the Turbo-System Schematic shown in Figure 7-24 when reading through the following steps.

1. Engine induction air is taken in through the ram air inlet (1), located in the bottom of the engine nacelle, at which point it passes through a filter and then into the compressor (2).
2. The compressor compresses the induction air.
3. Most of the pressurized induction air from the compressor then passes through an intercooler (7), then into the cylinders through the induction manifold (3). A small portion of this pressurized air is routed to the cabin for pressurization.
4. The air and fuel are burned and the exhaust gases are then routed to the turbine through the exhaust manifold (4).
5. The exhaust gases drive the turbine (5) which, in turn, drives the compressor.
6. The turbine has enough power to allow the engine to operate in excess of the maximum 38.0 inches Hg. manifold pressure. Therefore, in order not to exceed 38.0 inches Hg. manifold pressure, a bypass or waste gate (6) is used so the excess exhaust gas will be expelled overboard instead of passing through the turbine.

TURBO-SYSTEM SCHEMATIC

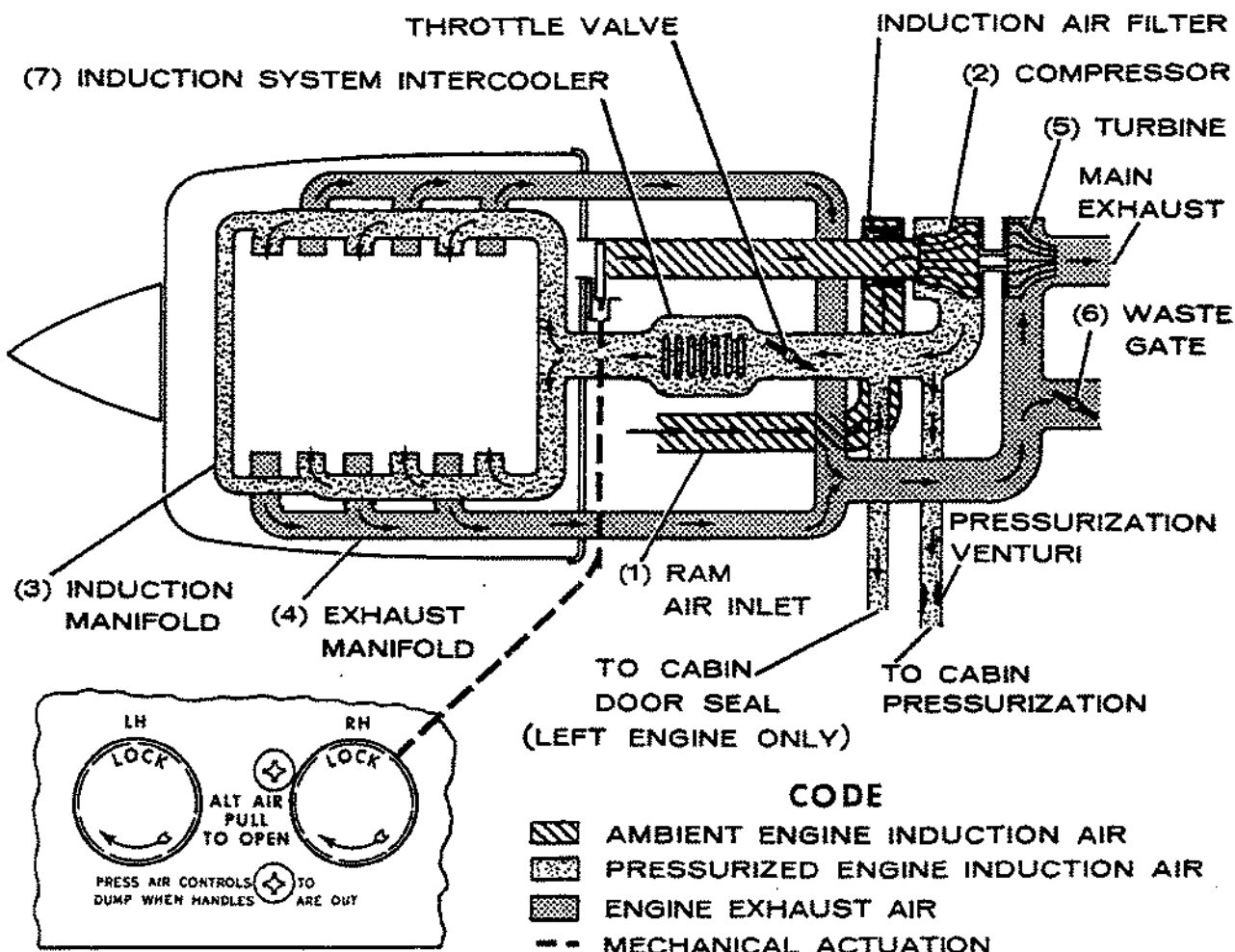


Figure 7-24

It can be seen from studying steps (1) through (6) that anything that affects the flow of induction air into the compressor, or the flow of exhaust gases into the turbine, will increase or decrease the speed of the turbocharger. This resultant change in flow will have no effect on the engine if the waste gate is still open, because the waste gate position will automatically change to hold compressor discharge pressure constant. The waste gate automatically maintains allowable compressor discharge pressure when below 20,000 feet with full throttle and full RPM. Above 20,000 feet, the throttles must be retarded to maintain the manifold pressure within the allowable limits. When the waste gate is closed, any change in the turbocharger speed will mean a change in engine operation. Anything that causes an increase or decrease in turbine speed will cause an increase or decrease in manifold pressure. If turbine speed increases, the manifold pressure increases; if the turbine speed decreases, the manifold pressure decreases. Any change in exhaust flow to the turbine or ram induction air pressure, whether it is an increase or decrease, will be magnified approximately 8 to 10 times by the compression ratio and the change in flow through the exhaust system.

Manifold Pressure Variation With Altitude

At full throttle, the turbocharger is capable of maintaining the maximum allowable 38.0 inches Hg. manifold pressure, well above 20,000 feet; however, engine operating limitations establish the maximum manifold pressure that may be used. From 20,000 feet to higher altitudes, the throttles must be retarded to maintain the manifold pressure within the allowable limits.

Manifold Pressure Variation With Airspeed

When the waste gate is open at low altitude, changes in airspeed have little or no effect on manifold pressure. However, at high altitudes when the waste gate is closed, manifold pressure will vary with variations in airspeed. This is because any change in pressure at the compressor inlet is magnified 8 to 10 times at the compressor outlet due to compression ratio and exhaust flow changes.

Fuel Flow Variations With Changes In Manifold Pressure

The engine-driven fuel pump output is regulated by engine speed and compressor discharge pressure. Engine fuel flow is regulated by fuel pump output and the metering effects of the throttle and mixture control. When the waste gate is open, fuel flow will vary directly with manifold pressure, engine speed, mixture or throttle position. In this case, manifold pressure is controlled by throttle position and the waste gate controller, while fuel flow varies with throttle movement and manifold pressure.

When the waste gate is closed and manifold pressure changes are due to turbocharger output, as discussed previously, fuel flow will follow manifold pressure even though the throttle position is unchanged. This means that fuel flow adjustments required by the pilot are minimized to the following: (1) small initial adjustments on takeoff or climb-out for the proper rich climb setting, (2) lean-out in cruise to the recommended lean cruise setting, and (3) return to the full rich position for approach and landing.

Manifold Pressure Variation With Increasing Or Decreasing Fuel Flow

When the waste gate is open, movement of the mixture control has little or no effect on the manifold pressure of the turbocharged engine.

When the waste gate is closed, any change in fuel flow to the engine will have a corresponding change in manifold pressure. That is, increasing the fuel flow will increase the manifold pressure and decreasing the fuel flow will decrease the manifold pressure. This is because an increased fuel flow to the engine increases the mass flow of the exhaust. This turns the turbocharger faster, increasing the induction airflow and raising the manifold pressure.

Momentary Overboost Of Manifold Pressure

Under some circumstances (such as rapid throttle movement, especially with cold oil) it is possible that the engine can be overboosted above the maximum allowable 38.0 inches Hg. manifold pressure. This would most likely be experienced during the takeoff roll or during a change to full throttle operation in flight. Therefore, it is still necessary that the pilot observe and be prepared to control the manifold pressure.

Slight overboosting is not considered detrimental to the engine so long as it is momentary. Momentary overboost of 2 to 3 inches Hg. manifold pressure can usually be controlled by slower throttle movement and no corrective action is required when momentary overboost corrects itself and is followed by normal engine operation. However, if overboosting of this nature persists, or if the amount of overboost goes as high as 4 inches Hg. manifold pressure or more, the controller system should be checked for necessary replacement or adjustment of components.

Altitude Operation

Turbocharged airplanes can maintain higher power settings and fuel flows to higher altitudes than are possible with normally aspirated airplanes. As a result, turbocharged airplanes climb faster and higher. Due to the higher fuel flows and the more rapid temperature and barometric pressure changes during these climbs, fuel vaporization in the fuel lines is more probable than with normally aspirated airplanes. Fuel vaporization is usually indicated by fuel flow fluctuations and can be eliminated by pressurizing the fuel system with the auxiliary fuel pumps. Refer to the Normal Procedures Checklist for recommended positioning of the auxiliary fuel pump switches.

High Altitude Engine Acceleration

The engines will accelerate normally from idle to full throttle with full rich mixture at any altitude below 20,000 feet. At higher altitudes, it is usually necessary to lean the mixture to get smooth engine operation from idle to maximum power. At altitudes above 25,000 feet, and with temperatures above standard, it takes one to two minutes for the turbine to accelerate from idle to maximum RPM, although adequate power is available in 20 to 30 seconds. If fuel flow has been interrupted for any reason, the mixture should be leaned until the engine begins to accelerate as shown by an increase in manifold pressure (with throttle open). Thereafter, adjust the mixture control for smooth engine operation.

Engine Shutdown

After extended periods of ground engine operation above 1600 RPM or when the cylinder head temperature indicator shows values within the upper half of the green arc, reduce power to between 600 and 800 RPM for a period of not less than 2 to 3 minutes prior to engine shutdown. This procedure is intended to reduce internal turbocharger temperatures and preclude the possibility of premature accumulation of carbon on the turbine shaft seals.

CABIN AIR SYSTEM

The cabin air system provides for cabin heating, ventilating and defrosting. The system consists of an air inlet in the nose, a cabin fan, a gasoline combustion-type heater, pressurization air temperature controls, and controllable heat outlets in the cabin. Two heat outlets are located at the base of the windshield for defrosting purposes. One outlet duct is located on each side of the aft cabin and two are located on the forward pressure bulkhead, see Figure 7-25 or 7-26.

Cabin heating and ventilating is accomplished by the cabin air DEFROST, AFT and FWD controls, see Figure 7-25 or 7-26. The overhead directional vents also supply unheated ventilating air in the pressurized mode. Forced ventilation is obtained with the two-speed cabin fan which may be operated independently of the heater. When the heater is actuated, the fan automatically operates in low speed; if additional airflow is desired, the HIGH position may be selected.

HEATING AND DEFROSTING

Depressurized

Fresh air is picked up from the air inlet in the nose of the airplane, heated by the heater, and directed to the pilot and passenger compartments. The heating and ventilating air is not recirculated, but exhausts overboard through the cabin pressure regulating valve.

The heating system can be used for ventilation by placing the cabin fan switch, see Figure 7-19, in either the NORMAL or HIGH position. The fan provides unheated fresh air to the cabin through the cabin heat outlets. In flight, ram air pressure can be used for ventilation by placing the cabin heat switch to the OFF position, pulling out the cabin air knobs and opening the heat outlets as desired.

Pressurized

Pressurization air is heated by the heater and ducted to the pilot and passenger compartments. To increase passenger comfort and heating system efficiency, the pressurization air temperature controls, see Figure 4-3, may be rotated fully clockwise. This will allow higher pressurization air temperatures, reducing cabin heater requirements. With the left pressurization air temperature control rotated fully clockwise, the overhead vents will supply warm air.

CABIN HEAT SWITCH BREAKER

The cabin heater is controlled by a two-position cabin heat switch breaker, see Figure 7-19. Switch positions are ON and OFF. Placing the switch breaker in the ON position starts and maintains heater operation and turns the cabin fan on low.

CABIN FAN SWITCH

The ventilating fan is controlled by a three-position cabin fan switch, see Figure 7-19. Switch positions are NORMAL, OFF and HIGH.

CABIN AIR TEMPERATURE CONTROL KNOB

The cabin air temperature is controlled by the cabin heat knob, see Figure 7-1. Clockwise rotation of this knob increases the desired temperature.

This knob adjusts a thermostat, which in turn controls heated air temperature in a duct located just aft of the heater. When the temperature of the heated air exceeds the setting of the thermostat, the thermostat automatically opens and shuts off the heater. When the heated air cools to the thermostat setting, the heater starts again. Thus the heater cycles on and off to maintain an even air temperature. Operation is identical for the pressurized and depressurized modes.

FORWARD CABIN AIR KNOB

The forward cabin air knob directs warm air to two outlets located on the forward pressure bulkhead. These direct outlets allow fast warm-up when the airplane is on the ground. Airflow through the direct outlets is completely shut off by pushing the knob all the way in. The knob may be set at any intermediate position to regulate the quantity of air to the pilot's compartment.

AFT CABIN AIR KNOB

The aft cabin air knob controls airflow to all passenger compartment heat registers. When the knob is pulled out, the air flows to heat registers in the passengers' compartment. Airflow to the heat registers is completely shutoff by pushing the knob all the way in. The knob may be set in any intermediate position to regulate the quantity of air to the cabin.

DEFROST KNOB

Windshield defrosting and defogging is controlled by the push-pull defrost knob. When the knob is pulled out, air flows from the defroster outlets at the base of the windshield. When the knob is pushed all the way in, airflow to the defroster outlets is shut off. The knob may be set in any intermediate position to regulate the defroster airflow.

HEATER OVERHEAT WARNING LIGHT

An amber overheat warning light provided in the annunciator panel is labeled HEATER OVHT, see Figure 7-3. When illuminated, the light indicates that the heater overheat switch has been actuated and that the temperature of the air in the heater has exceeded 163°C (325°F). Once the heater overheat switch has been actuated, the heater turns off and cannot be

CABIN AIR SYSTEM SCHEMATIC **DEPRESSURIZED MODE, HEATER ON**

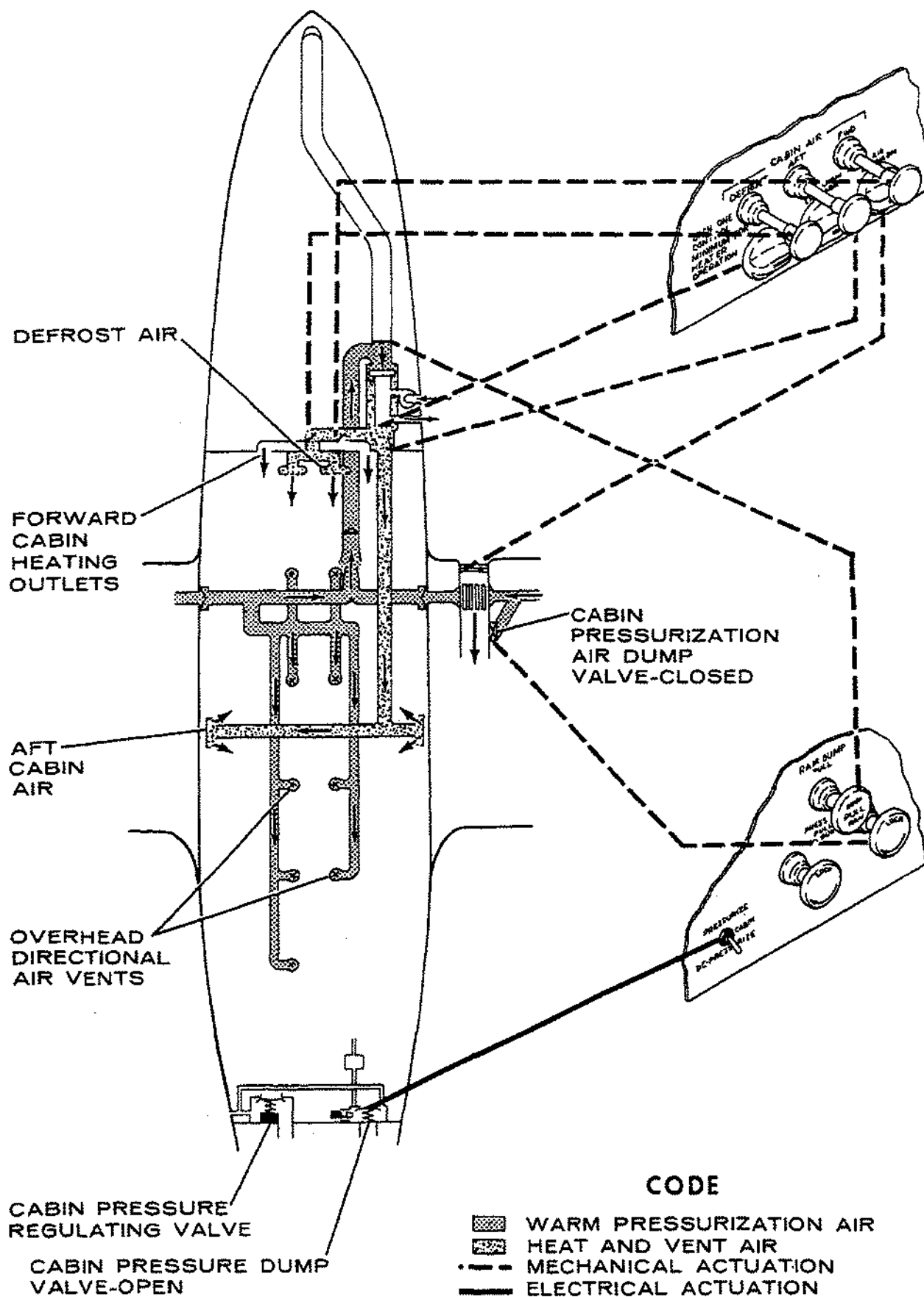


Figure 7-25

restarted until the overheat switch, located in the right forward nose compartment, has been reset. This switch is accessible from inside the nose wheel well. Prior to resetting the overheat switch, the heater should be thoroughly checked to determine the reason for the malfunction.

HEATER OPERATION FOR HEATING AND DEFROSTING

- (1) Battery Switch - ON.
- (2) Pressurization Air Controls - PUSH IN.
- (3) Cabin Vent Control - PUSH IN.
- (4) Cabin Air Knobs - PULL OUT.
- (5) Defrost Knob - Adjust as desired (if defrosting is desired).
- (6) Cabin Heat Knob - MAX or as desired.
- (7) Pressurization Air Temperature Controls - CLOCKWISE.
- (8) Cabin Heat Switch - ON.
- (9) Heat Registers - As desired.

NOTE

- If no warm air is coming out of the registers within one minute, turn cabin heat switch breaker OFF and try another start. If heater still does not start, no further starting attempt should be made.
- During heater operation, defrost and/or cabin air knobs must be out.

HEATER USED FOR VENTILATION

- (1) Battery Switch - ON.
- (2) Cabin Air Knobs - PULL OUT as desired.
- (3) Cabin Fan Switch - NORMAL or HIGH as desired.
- (4) Heat Registers - As desired.

CABIN PRESSURIZATION SYSTEM

OPERATING DETAILS

The airplane may be operated in either the pressurized mode or depressurized mode. The mode selection is made with the cabin pressurization switch and/or the cabin vent control, see Figure 7-27 or 7-29. Mode of operation should be selected prior to takeoff. If a mode selection must be made while airborne, the cabin vent control should be moved very slowly to minimize pressure transients which would cause discomfort to the passengers.

Pressurization air is supplied from each engine turbocharger through the sonic venturi (flow limiter), the heat exchanger and then into the cabin. Adequate flow to maintain pressurization is provided by either engine at normal power settings. Power changes should be made smoothly to prevent sudden changes in pressurization air inflow resulting in cabin pressure transients.

The pressurization controls and indicators of your airplane, see Figure 7-27 (standard system) or 7-29 (optional system), consist of right and left pressurization air controls, a cabin vent control, a cabin pressurization switch, a cabin rate-of-climb indicator and a combination cabin altimeter and differential pressure indicator.

CABIN AIR SYSTEM SCHEMATIC

PRESSURIZED MODE, HEATER ON

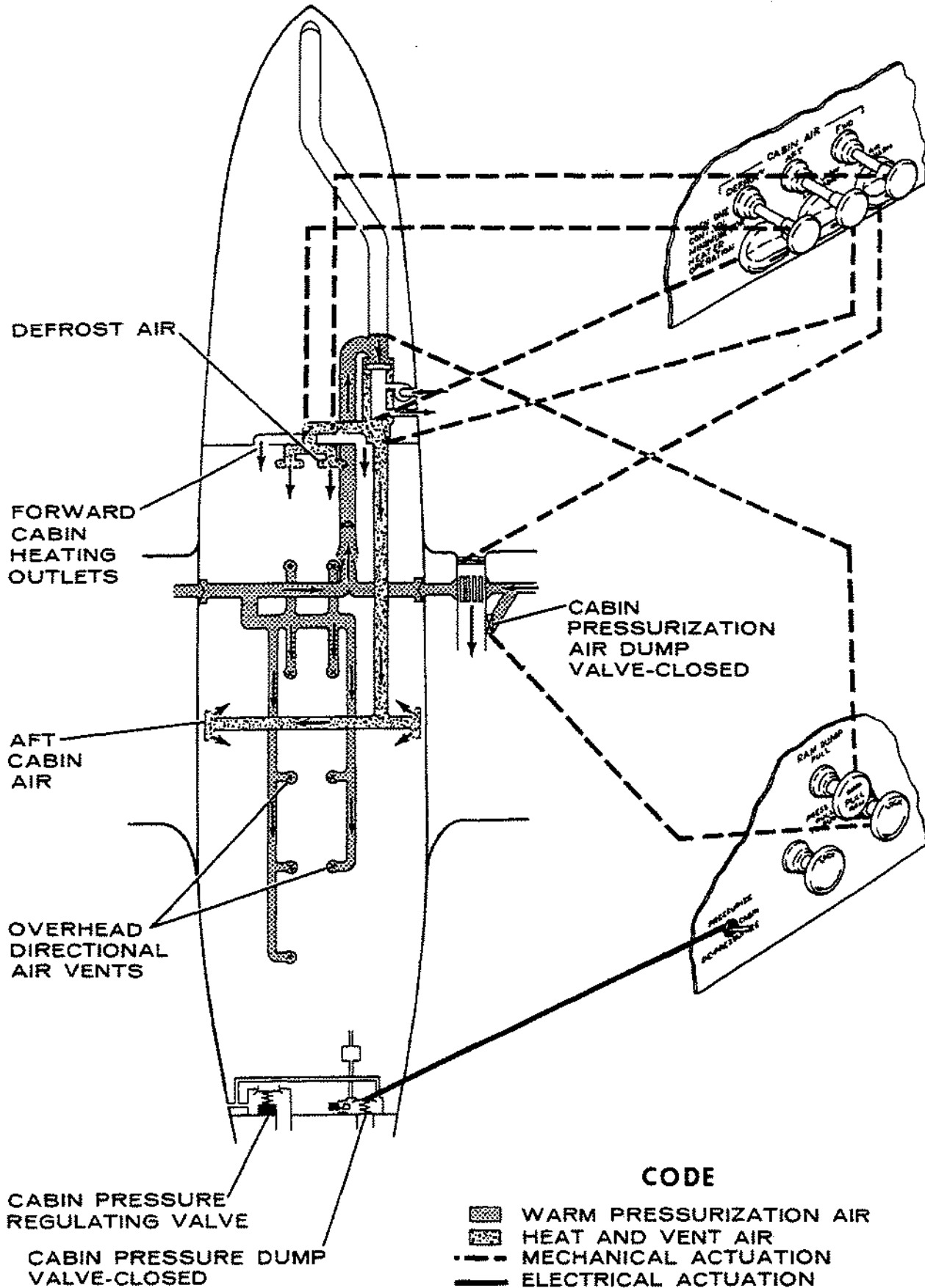


Figure 7-26

A warning light, which illuminates at approximately 10,000 feet cabin altitude indicating a need for oxygen, is located in the annunciator panel.

To optimize normal operation in the pressurized mode, position the pressurization controls as follows:

1. Pressurization Air Controls - PUSH IN for all flight operations and ground operation when additional ground ventilation is desired.
2. Cabin Vent Control - PUSH IN for all flight operations and normal ground operation.
- PULL OUT for additional ground ventilation.
3. Cabin Pressurization Switch - PRESSURIZE.

To optimize normal operation in the depressurized mode, position the pressurization controls as follows:

1. Pressurization Air Controls - PUSH IN if heater operation or additional ground ventilation is desired.
- PULL OUT if heater operation is not desired.
2. Cabin Vent Control - PUSH IN if in-flight heater operation is desired.
- PULL OUT if additional ground ventilation is desired.
3. Cabin Pressurization Switch - DEPRESSURIZE.

STANDARD PRESSURIZATION SYSTEM

The PRESSURIZE position of the cabin pressurization switch, see Figure 7-26, provides for cabin pressurization at altitudes above 8000 feet. The cabin altitude is maintained at 8000 feet at all airplane altitudes between 8000 and 23,120 feet. From 23,120 feet to the operating ceiling of 30,000 feet, 5.0 PSI differential is maintained between cabin and atmosphere.

Until reaching 8000 feet, the cabin rate-of-climb, see Figure 7-27, will be equal to the airplane rate-of-climb. At 8000 feet, the cabin rate-of-climb will drop to zero as pressurization begins. The cabin rate-of-climb will remain approximately at this indication until the airplane has reached an altitude of 23,120 feet. Above this altitude, the cabin altitude will again begin to ascend as the airplane ascends, but at a lesser rate than the airplane rate-of-climb because of the difference in ambient air density and cabin air density. The cabin altitude reaches approximately 10,000 feet at an airplane altitude of 26,500 feet; at this time the altitude warning light on the annunciator panel will illuminate, indicating the need for oxygen.

The cabin differential pressure of 5.0 PSI is limited by the pressure regulator valve, see Figure 7-26, located in the aft portion of the cabin. This valve automatically permits air to leave the cabin to maintain the desired pressure. If the regulating valve should fail in the closed position, a dump valve, see Figure 7-26, also located in the aft portion of the cabin, operates as a safety valve to regulate maximum cabin differential pressure at 5.3 PSI. This is a dual function valve which functions as a cabin dump when the DEPRESSURIZE position is selected with the cabin pressurization switch.

The cabin altitude which is maintained at a given airplane altitude is shown in Figure 7-28.

STANDARD PRESSURIZATION CONTROLS AND INDICATORS

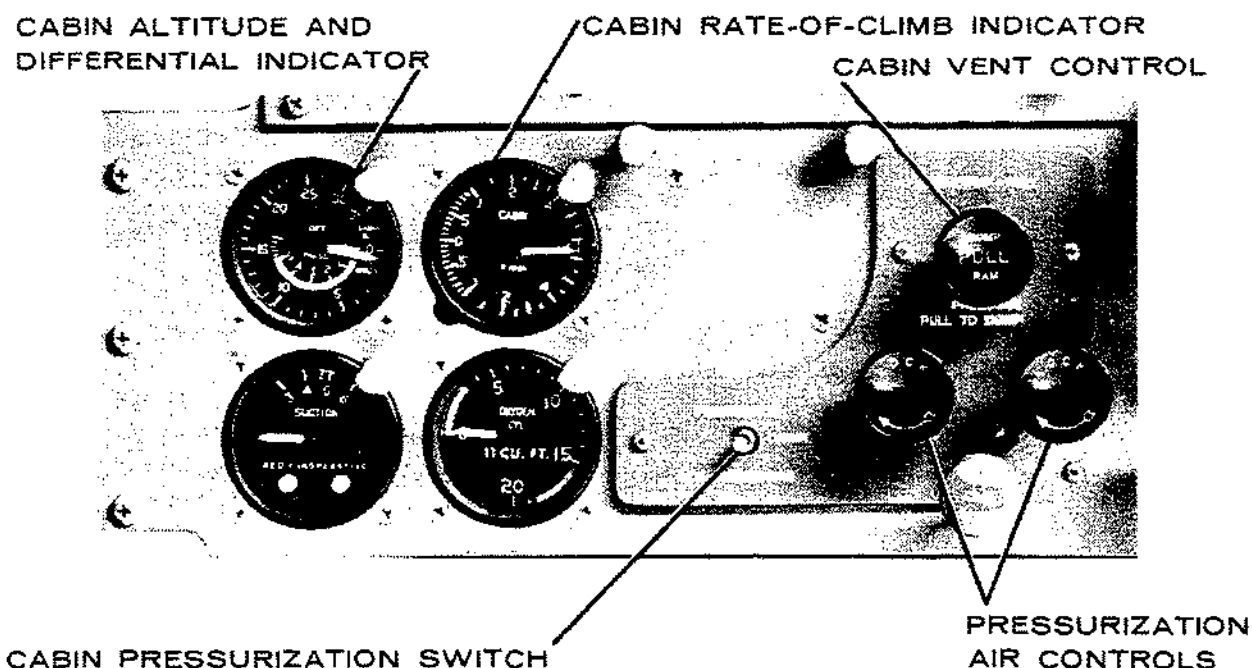


Figure 7-27

The aft cabin dump valve is used during ground operation to assure the cabin pressure differential is zero. The dump valve is opened automatically by the landing gear safety switch when the weight of the airplane is on the landing gear or can be opened manually by selecting the DEPRESSURIZE position of the cabin pressurization switch. Normally, the cabin pressurization switch can be left in the PRESSURIZE position. However, should a malfunction occur or if a landing is attempted above 8000 feet pressure altitude, select the DEPRESSURIZE position. This airplane is not certified for landings with the cabin pressurized.

NOTE

The airplane cannot be pressurized on the ground as the landing gear safety switch circuit is interconnected with the aft cabin dump valve circuit.

STANDARD PRESSURIZATION SCHEDULE

AIRPLANE ALTITUDE	CABIN ALTITUDE
SEA LEVEL TO 8000 FEET	SAME AS AIRPLANE ALTITUDE
8000 to 23,120 FEET	8000 FEET
24,790 FEET	9000 FEET
26,500 FEET	10,000 FEET
28,260 FEET	11,000 FEET
30,000 FEET	11,950 FEET

Figure 7-28

In the event that an emergency should require immediate depressurization, place the cabin pressurization switch in the DEPRESSURIZE position, see Figure 7-25, and pull out the cabin vent control. These actions electrically open the aft cabin dump valve and mechanically open the ram air inlet butterfly valve located in the nose; however, pressurization air will still flow into the cabin.

OPTIONAL PRESSURIZATION SYSTEM

For the pressurization system to operate, the cabin pressurization switch must be in the PRESSURIZE position and the cabin vent control and pressurization air controls must be pushed in, see Figure 7-29. The desired cabin altitude can then be selected by the cabin altitude control and the desired cabin rate-of-climb can be selected by the cabin rate control, see Figure 7-29. The selected values can be maintained until a cabin altitude is reached which results in a 5.0 PSI differential between the cabin and atmosphere. To obtain the optimum benefit from the cabin altitude control and the cabin rate control, set in the field pressure altitude plus 500 feet on the outer CABIN ALT scale just prior to takeoff with the arrow on the cabin rate control positioned straight up. After takeoff, with the cabin pressure stabilized, slowly reset the cabin altitude control to cruise altitude plus 500 feet on the inner AIRCRAFT ALT scale or destination field pressure altitude plus 500 feet on the outer CABIN ALT scale. Make the selection which will provide the highest cabin altitude. For cruising altitudes below the inner scale values, always select the destination field pressure altitude plus 500 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 that the airplane reaches cruising altitude.

OPTIONAL PRESSURIZATION CONTROLS AND INDICATORS

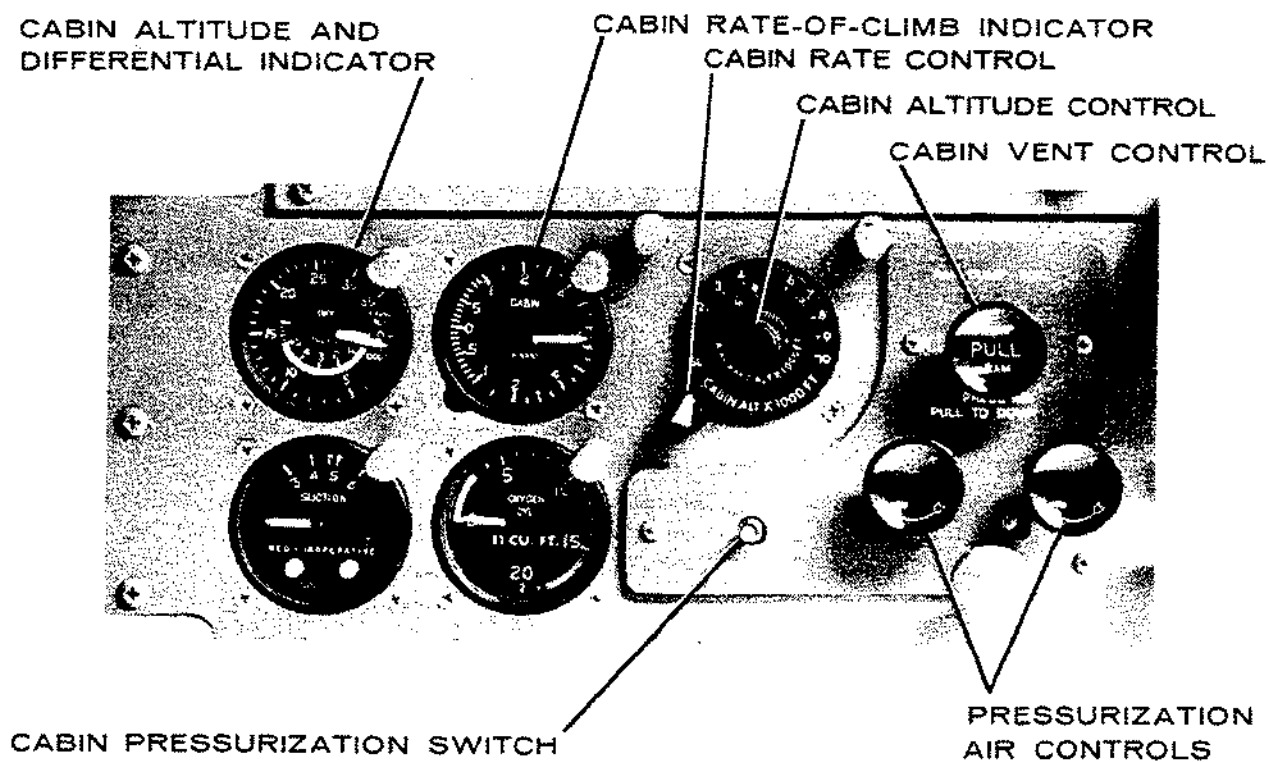


Figure 7-29

The above procedure is recommended because once the engines have been started and a source of vacuum is available, the pressure control system will begin to "climb" to the preset cabin altitude; thus, if cabin altitude required for cruise is selected too soon, the pressure control system will have climbed to an altitude approaching the desired cabin altitude before the airplane leaves the ground. Since the cabin pressure can never be less than outside ambient pressure, the cabin will be unpressurized until the airplane "catches up" with the pressure control system or the desired cabin altitude is reached, whichever occurs first. This will result in no cabin rate control being available as the cabin rate-of-climb will be equal to the airplane rate-of-climb.

The cabin differential pressure of 5.0 PSI is limited by the pressure regulator valve, see Figure 7-26, located in the aft portion of the cabin. This valve automatically permits air to leave the cabin to maintain the desired pressure. If the regulating valve should fail in the closed position, a dump valve, see Figure 7-26, also located in the aft portion of the cabin, operates as a safety valve to regulate maximum cabin differential pressure to 5.3 PSI. This is a dual function valve which also functions as a cabin dump when the DEPRESSURIZE position is selected with the cabin pressurization switch.

OPTIONAL PRESSURIZATION SCHEDULE

AIRPLANE ALTITUDE	CABIN ALTITUDE
SEA LEVEL TO 10,060 FEET	SEA LEVEL
13,910 FEET	2000 FEET
16,850 FEET	4000 FEET
19,920 FEET	6000 FEET
23,120 FEET	8000 FEET
26,500 FEET	10,000 FEET
30,000 FEET	11,950 FEET

Figure 7-30

The aft cabin dump valve is used during ground operation to assure the cabin pressure differential is zero. The dump valve is opened automatically by the landing gear safety switch when the weight of the airplane is on the landing gear or can be opened manually by selecting the DEPRESSURIZE position of the cabin pressurization switch. Normally, the cabin pressurization switch can be left in the PRESSURIZE position. However, should a malfunction occur or if the cabin altitude is inadvertently set at a lower altitude than field pressure altitude, select the DEPRESSURIZE position. It is important, therefore, to select a cabin altitude approximately 500 feet above field pressure altitude and check cabin pressure differential at zero prior to landing. This will prevent any cabin pressure transients on landing and provide maximum passenger comfort.

NOTE

The airplane cannot be pressurized on the ground as the landing gear safety switch circuit is interconnected with the aft cabin dump valve circuit.

The lowest cabin altitude which can be maintained at any given airplane altitude is shown in the chart in Figure 7-30.

OXYGEN SYSTEM

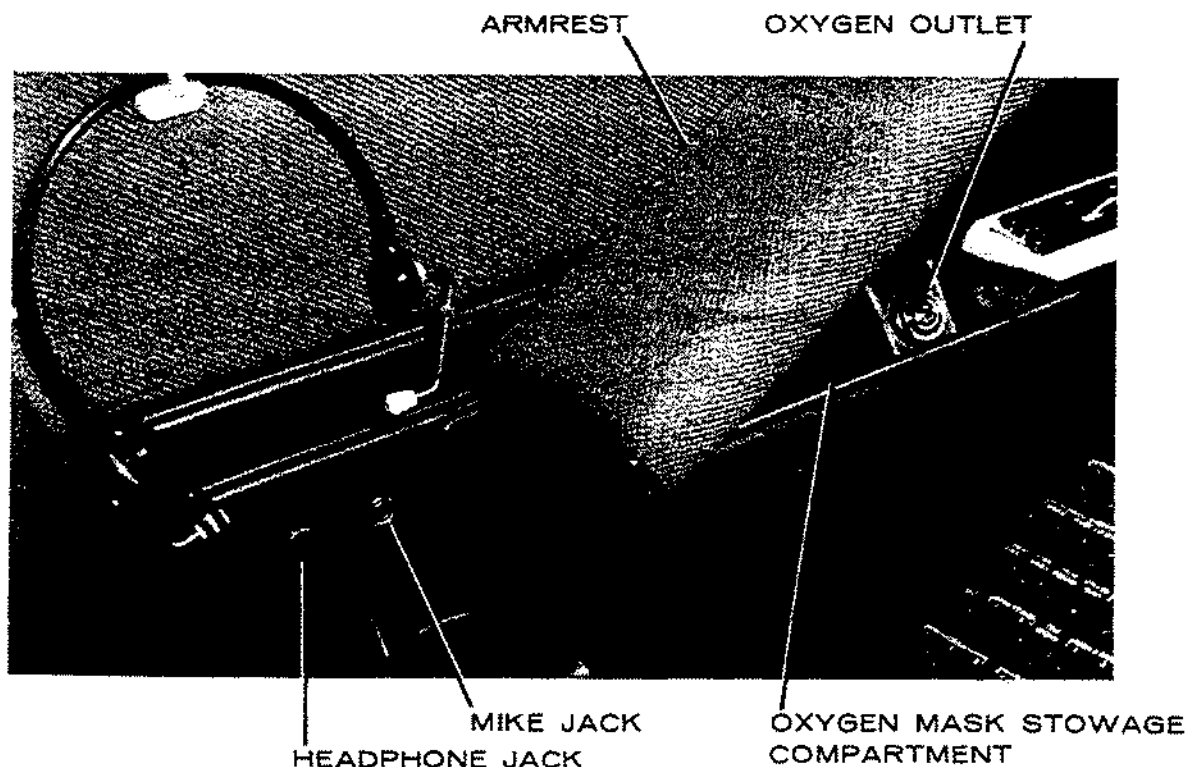
The oxygen system provides individual service for the pilot, copilot and each passenger. The oxygen supply is stored in either an 11.0 or 114.9 cubic foot bottle located in the nose compartment. Cabin plumbing, including outlets for each occupant, is standard with each airplane and will vary with individual airplane seating configuration. The oxygen control, pressure gage (see Figure 7-1), bottle, regulator and nose compartment plumbing are optional.

The oxygen system is activated by pulling the oxygen control knob, see Figure 7-1, to the ON position, allowing oxygen to flow from the regulator to all cabin outlets. A normally closed valve in each oxygen outlet is opened by inserting the connector of the mask and hose assembly. After flights using oxygen, the pilot should insure that the oxygen system has been deactivated by unplugging all masks and pushing the oxygen control knob completely to the OFF position.

NOTE

If the oxygen control knob is left in an intermediate position between ON and OFF, it may allow low pressure oxygen to bleed through the regulator into the nose compartment of the airplane.

COCKPIT OXYGEN OUTLETS



PILOT'S SIDE SHOWN; IDENTICAL CONTROLS ARE PROVIDED FOR THE COPILOT.

Figure 7-31

The oxygen system, with optional 114.9 cubic foot oxygen bottle, provides adequate oxygen flow rates up to 30,000 feet cabin altitude and is suitable for cruising at altitudes in excess of 25,000 feet for extended periods, see Figure 7-32. The oxygen outlets for the pilot and copilot are located inside the stowage compartment under the outboard armrests, see Figure 7-31. Oxygen outlets for passengers are located overhead of each seat position, see Figure 7-21. The pilot, copilot and passengers shall always use the blue hose assemblies.

OXYGEN DURATION CHART

114.9 CUBIC FOOT OXYGEN SYSTEM

$$\frac{\text{OXYGEN DURATION IN HOURS}}{\text{NUMBER OF PERSONS}} = \text{TOTAL HOURS DURATION}$$

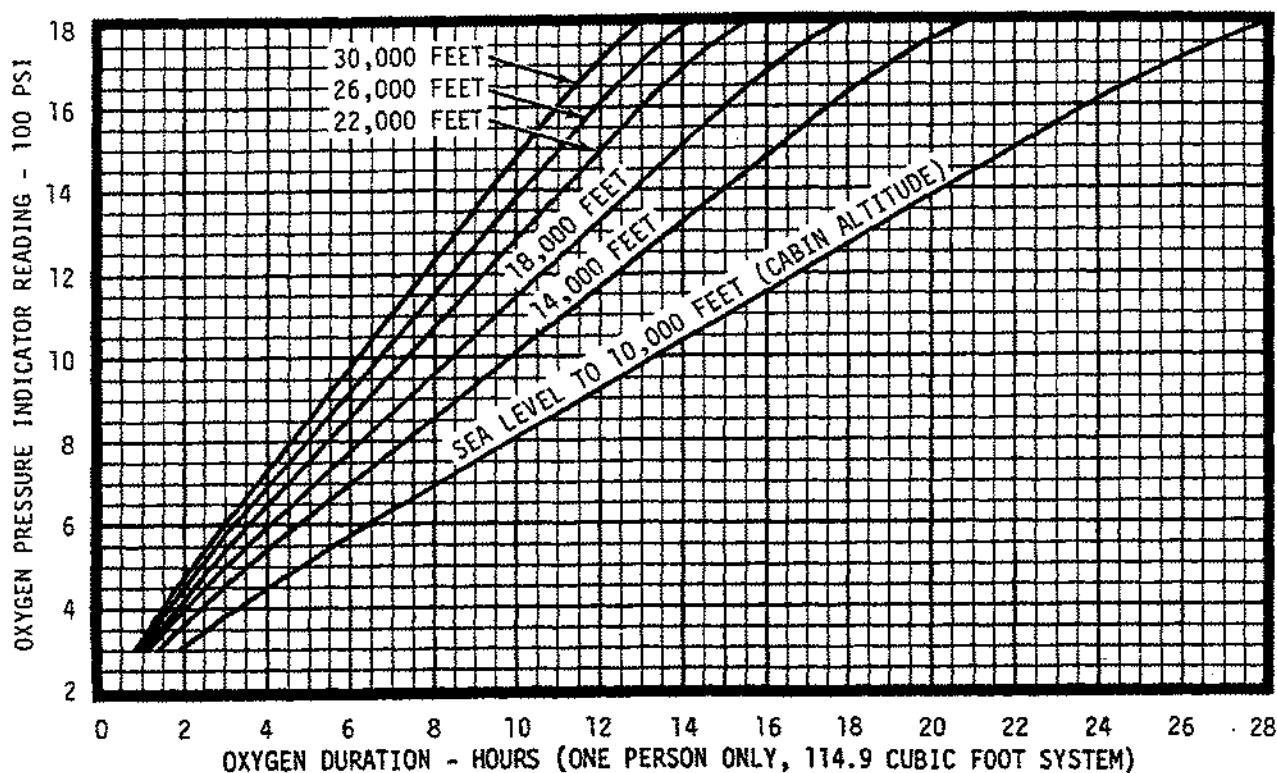
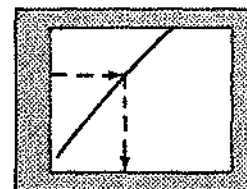


Figure 7-32

The oxygen system with optional 11.0 cubic foot bottle provides adequate oxygen flow rates up to 30,000 feet cabin altitude, see Figure 7-33. This system is designed solely to provide for emergency descents as described in Section 3. The system is calibrated for two different altitude ranges, which are: 14,000 to 22,000 feet cabin altitude and 22,000 to 30,000 feet cabin altitude. Selection of the desired altitude range is accomplished by appropriate selection of color-coded hose assemblies. The oxygen outlets for the pilot and copilot are located inside the stowage compartment under the outboard armrests, see Figure 7-31. Oxygen outlets for passengers are located overhead of each seat position, see Figure 7-21. The pilot shall always use the red hose assembly.

NOTE

Some airplanes are delivered with red oxygen hose mask connectors only. If your airplane is so equipped, disregard all information pertaining to orange oxygen hose mask connectors.

OXYGEN CONSUMPTION RATE CHART**11.0 CUBIC FOOT OXYGEN SYSTEM****OXYGEN DURATION CALCULATION:**

TOTAL OXYGEN DURATION (HOURS) = OXYGEN PRESSURE INDICATOR READING ÷ [OXYGEN CONSUMPTION (PSI/HR) × NUMBER OF PASSENGERS + PILOT CONSUMPTION RATE].

CABIN ALTITUDE RANGE-FEET	HOSE ASSEMBLY COLOR	CONSUMPTION PSI/HR
14,000 22,000	ORANGE	965
22,000 30,000	RED	1352

Figure 7-33

PASSENGER LOADING

Due to the differences in installed optional equipment on the airplane, a wide CG range exists. Under certain passenger loading conditions, it is possible to exceed the aft CG limits, which can lead to tail tipping. To prevent this from occurring, owners and pilots should study their airplane's weight and balance information to become familiar with the airplane's capabilities and limitations. It is recommended that the loading of passengers be as follows:

- (1) Load the baggage in the nose and avionics compartments prior to boarding of the crew and passengers.
- (2) Avoid carrying baggage in the aft cabin.
- (3) When boarding people, have the pilot, or person who is to occupy the copilot seat, be the first to board with the remaining people filling the most forward seats first and the aft seats last. Arrange to have the heavier people occupy the most forward seats.
- (4) When unloading the airplane, have one person remain in the copilot or pilot seat while the other flight deck occupant goes aft to open the door. Arrange to have the passengers in the aft seats be the first to deplane.

BAGGAGE COMPARTMENTS

Six baggage locations, see Figure 1-3, are available: two in the fuselage nose section, two in the aft cabin area and one location in the aft portion of each engine nacelle.

These baggage areas are intended primarily for low-density items such as luggage and briefcases. The floors of the wing locker baggage areas are primary structure. Therefore, care should be exercised during loading and unloading to prevent damage. 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, 120 pounds can be carried in each wing locker, 250 pounds in the avionics bay, 350 pounds in the nose baggage compartment, 400 pounds in the aft cabin Bay A and 100 pounds in the aft cabin Bay B. 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 or wing lockers. These areas do not qualify for carriage of animate objects.

AIRPLANE TIE-DOWN PROVISIONS AND JACK POINTS

A wing tie-down fitting is provided on the lower surface of each wing aft of each main gear. The fittings retract into the wing when not in use. The empennage is secured at the tail tie-down fitting located on the fuselage bottom, below the elevator hinge line. 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 inboard of an in-line with the wing flap hinge. The nose gear jack point is located aft of the left nose gear door hinge. Jack pads, which are provided with the airplane, are required to be installed in each wing jack point before the airplane can be jacked.

SEATS, SEAT BELTS AND SHOULDER HARNESSSES

PILOT AND COPILOT PROVISIONS

The pilot and copilot seats are secured to seat pan assemblies which are attached to the forward main spar carry-thru structure. The seats are adjustable fore and aft on seat rails by lifting the handle located on the forward face of the seat.

Seat belts are provided for both seats and are attached to airplane structure on the floor. 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 permanently 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 passenger seats 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. If the optional adjustable seats are installed, a second handle is provided on the front of the seat which allows reclining of the seat back. 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. An optional stowage drawer may be installed beneath each seat.

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.

CAUTION

When entering or exiting airplane, equipped with pneumatic lower door extender, ensure lower cabin door is fully extended before putting weight on steps.

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, see Figure 7-34.

As an additional safety feature, a cabin door warning light is provided. This light is located in the annunciator panel, see Figure 7-3, and is illuminated when the cabin door is not securely latched.

Cabin door sealing is provided by a pneumatic tube door seal that is inflated by pressurization air from the left engine. With the left engine operating and the cabin door closed and locking pins fully engaged, the door seal is inflated to provide positive fuselage to door sealing. When the cabin door locking pins are disengaged, the door seal is depressurized to allow the door to be opened and closed easily.

WINDOWS

Seven windows are provided on each side of the airplane. All windows are fixed except the foul weather windows located forward of the pilot's and copilot's side windows. These foul weather windows can 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 oval cabin window on the right side of the passenger compartment can be removed for emergency exit. Pull off the plastic cover over the emergency release handle under the window. Turn the release handle counterclockwise to release the window retainers, then pull the window in and down.

CABIN DOOR SAFETY AND LOCKING PINS

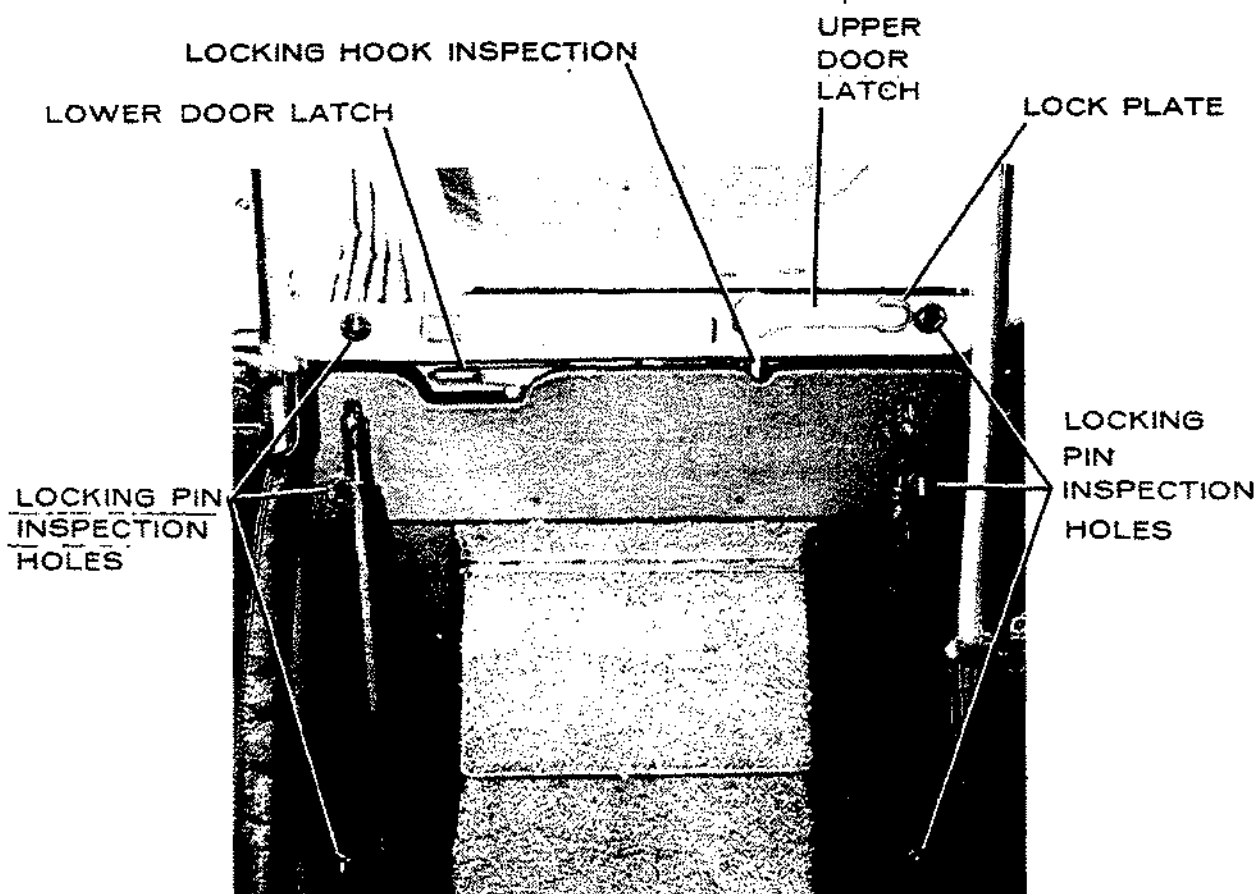


Figure 7-34

CONTROL LOCKS

A control column lock is provided to restrict the control column from moving. This restriction holds the ailerons in a neutral position and the elevators approximately 10° down, thus preventing damage to the control surfaces in gusty wind conditions.

The rudder is secured with the optional rudder gust lock. To engage the lock, center the rudder, insure 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 optional rudder lock is not installed, the rudder can be secured by placing an external control surface lock over the vertical stabilizer and rudder. If neither rudder lock is available, caster the nosewheel to the full left or right position. This action will deflect the rudder against its stop, thus restricting rudder movement.

WARNING

Insure all control locks are removed before starting the engines.

PROPELLERS

The airplane is equipped with all-metal, three-bladed, constant-speed, full-feathering, single-acting, governor-regulated propellers. Each propeller utilizes oil pressure which opposes the force of springs and counterweights to obtain correct pitch for engine load. Oil pressure from the propeller governor drives the blades toward low pitch (increasing RPM) while the springs and counterweights drive blades toward high pitch (decreasing RPM). The source of oil pressure for propeller operation is furnished by the engine oil system, boosted in pressure by the governor gear pump, and supplied to the propeller hub through the engine crankshaft flange.

To feather the propeller blades, the propeller control levers on the control pedestal must be placed in the feather position. Unfeathering the propeller is accomplished by positioning the propeller control lever to the increase RPM position. The optional unfeathering system uses accumulator air and oil to force the propeller out of feather and into the low pitch condition.

PROPELLER SYNCHROPHASER

The optional propeller synchrophaser system, see Figure 7-35, is designed to match propeller RPM and 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. This limited range feature prevents the left engine from losing more than 50 propeller RPM should the right engine be feathered with the synchrophaser system on.

With the function switch in the OFF position, the system is deenergized and the automatic phaser RPM control is positioned to its mid-range to insure normal operation when next turned on. When the left engine is manually synchronized to the right engine and the synchrophaser switch is positioned to PHASE, the propeller RPM of the left and right engines will be automatically synchronized. The phase relationship of the left engine propeller relative to the right engine propeller can be adjusted by rotating the phasing knob. After initial synchrophaser engagement, the propellers will remain synchronized and can be phased as long as the RPM

difference between the left and right engines does not exceed 50 RPM. When the RPM difference between the left and right engines exceeds 100 RPM, the synchrophaser light will flash and the automatic phaser control circuits will be disabled, causing the actuator drive motor to stop at a random position. If the propeller control of the left engine is again adjusted as close as possible to the right engine, the synchrophaser light will illuminate continuously and the propeller RPM of the left and right engines will be automatically synchronized.

Make certain that both engines are functioning properly with the synchrophaser turned OFF. Since the left propeller is slaved to the right propeller, and the slaving range is limited, the synchrophaser should not be operated at either extreme of the RPM governing range.

For best operation, it is important to guard against propeller control creeping by setting the quadrant friction lock tightly, see Figure 7-1. On extended flights, it may be necessary to periodically switch to the OFF position, reset the propeller control levers and reengage the synchrophaser.

NOTE

Manually synchronize the propellers as close as possible prior to selecting the PHASE position.

PROPELLER SYNCHROPHASER

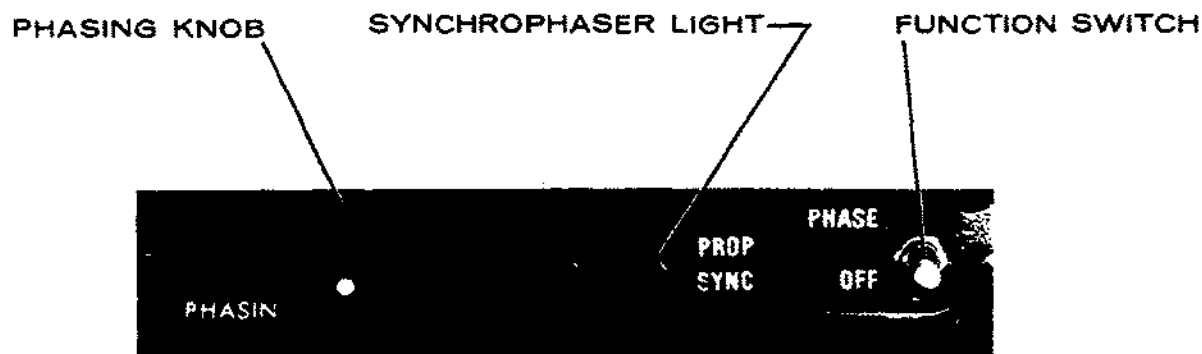


Figure 7-35

CABIN FEATURES

CABIN FIRE EXTINGUISHER (If Installed)

A portable 2½ 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 PSI). 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.

SECTION 8

AIRPLANE HANDLING, SERVICE AND MAINTENANCE

TABLE OF CONTENTS

	Page
INTRODUCTION	8-1
Publications	8-2
OWNER NOTIFICATION SYSTEM	8-2
INSPECTION REQUIREMENTS	8-2
Cessna Progressive Care Program	8-3
Cessna Customer Care Program	8-3
Servicing Requirements	8-4
Airplane File	8-4
Preventive Maintenance	8-5
ALTERATIONS OR REPAIRS TO THE AIRPLANE	8-5
GROUND HANDLING	8-5
Towing	8-5
Parking	8-6
Tie-Down	8-6
JACKING AND LEVELING	8-7
FLYABLE STORAGE	8-7
SERVICING	8-9
Fuel	8-9
Oil	8-11
Oxygen	8-12
Air Conditioning Reservoir	8-13
Landing Gear Hydraulic Reservoir	8-13
Alcohol Windshield Deice Reservoir	8-13
Battery	8-13
Tires	8-13
Flush Toilet Reservoir	8-13
AIRPLANE CLEANING AND CARE	8-14
Painted Surfaces	8-14
Propeller	8-14
Landing Gear	8-14
Deice Boots	8-14
Engines	8-15
Interior Care	8-15
Windows and Windshields	8-16
Oxygen Masks	8-19/8-20

INTRODUCTION

Section 8 of this handbook provides information on cleaning, inspection, servicing and maintenance of the airplane.

If your airplane is to retain 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.

Keep in touch with your Cessna Service Station and take advantage of his knowledge and experience. He knows your airplane and how to maintain it. He 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 lo-

cated on the forward door post. Refer , to the Airplane Service 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 HANDBOOK
PILOT'S OPERATING HANDBOOK AND FAA APPROVED AIRPLANE FLIGHT MANUAL
PILOT'S CHECKLIST
CRUISE COMPUTER
WORLDWIDE CUSTOMER CARE DIRECTORY

The following additional publications, plus many other supplies that are applicable to your airplane, are available from your Cessna Service Station.

INFORMATION MANUAL (Contains Pilot's Operating Handbook and FAA Approved Airplane Flight Manual Information)
SERVICE MANUALS AND PARTS CATALOGS FOR:
AIRPLANE
ENGINE AND ACCESSORIES
AVIONICS

Your Cessna Service Station has a Customer Care Supplies Catalog covering all available items, many of which he keeps on hand. He 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 Service Station. An affidavit containing the owner's name, airplane serial number and registration number must be included in replacement requests since the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual is identified for specific airplanes only.

OWNER NOTIFICATION SYSTEM

As the owner of a Cessna, you will receive applicable Cessna Owner Advisories at no charge. Owner Advisories are used to announce Service Bulletins, Service Information Letters and Service Newsletters to Cessna airplane owners of record.

If the airplane is registered in the United States, Owner Advisories are mailed to the latest airplane registration name and address on record with the FAA. Owner Advisory service to FAA owners of record is automatic and continuous, without any additional action required of the owner. However, the owner is required to notify the FAA whenever the registration address or ownership changes. If the owner requires a duplicate Owner Advisory to be sent to an address different than the FAA airplane registration address, the owner must complete and return to Cessna an Owner Advisory Application form part number D5514-1-13.

If the airplane is not registered in the United States, Owner Advisories are initially mailed to the address that is provided to Cessna on the Owner Advisory Application or Warranty Registration Application card. This address will be used for one year unless Cessna is notified otherwise. Prior to the end of one year, Cessna will send a renewal notice to the owner. The renewal notice must be completed and returned to Cessna to continue this service for another year.

Owner Advisory Applications are available from a Cessna Service Station or directly from Cessna Parts Distribution by ordering part number D5514-1-13.

A subscription service for Service Bulletins and other service information is available directly from Cessna Propeller Aircraft Product Support. Your Cessna Service Station 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.

INSPECTION REQUIREMENTS

As required by Federal Aviation Regulations, all civil airplanes of U.S. registry must undergo a complete inspection (annual) each twelve calendar months. In addition to the required annual inspection, airplanes operated commercially (for hire) must have a complete inspection every 100 hours of operation.

In lieu of the above requirements, an airplane may be inspected in accordance with a progressive inspection schedule, which allows the work load to be divided into smaller operations that can be accomplished in shorter time periods.

The Cessna Progressive Care Program has been developed to provide a modern progressive inspection schedule that satisfies the complete airplane inspection requirements of both the 100-hour and annual inspections as applicable to Cessna airplanes.

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 insure compliance with these directives. In some cases, the Airworthiness Directives require repetitive compliance; therefore, the owner should insure inadvertent noncompliance does not occur at future inspection intervals.

NOTE

Refer to FAR Parts 43 and 91 for properly certificated agency or personnel to accomplish the inspections. Contact your local Cessna dealer for additional information.

CESSNA CUSTOMER CARE PROGRAM

The Cessna Progressive Care Program has been designed to help you realize maximum utilization of your airplane at a minimum cost and downtime. Under this program, your airplane is inspected and maintained in four operations at 50-hour intervals during a 200-hour period. The operations are recycled each 200 hours and are recorded in a specially provided Aircraft Inspection Log as each operation is conducted.

The Cessna Aircraft Company recommends Progressive Care for airplanes that are being flown 200 hours or more per year, and the 100-hour inspection for all other airplanes. The procedures for the Progressive Care Program and the 100-hour inspection have been carefully worked out by the factory and are followed by the Cessna Dealer Organization. The complete familiarity of Cessna Dealers with Cessna equipment and factory-approved procedures provides the highest level of service possible at lower cost to Cessna owners.

CESSNA PROGRESSIVE CARE PROGRAM

Specific benefits and provisions of the Cessna Warranty plus other important benefits for you are contained in your Customer Care Handbook supplied with your airplane. You will want to thoroughly review this Handbook and keep it in your airplane at all times.

Coupons attached to the Handbook entitle you to an initial inspection and either a Progressive Care Operation No. 1 or the first 100-hour inspection within the first 6 months of ownership at no charge to you. If you take delivery from your Dealer, the initial inspection will have been performed before delivery of the airplane to you. If you pick up your airplane at the factory, plan to take it to your Dealer reasonably soon after you take delivery, so the initial inspection may be performed allowing the Dealer to make any minor adjustments which may be necessary.

You will also want to return to your Dealer either at 50 hours for your first Progressive Care Operation, or at 100 hours for your first 100-hour inspection depending on which program you choose to establish for your airplane. While these important inspections will be performed for you by any Cessna Dealer, in most cases you will prefer to have the Dealer from whom you purchased the airplane accomplish this work.

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 Service Manual. The Service Manual outlines all items which require attention at 50, 100, and 200 hour intervals plus those items which require servicing, inspection, and/or testing at special intervals.

Since Cessna Dealers conduct all service, inspection, and test procedures in accordance with applicable Service Manuals, it is recommended that you contact your Dealer concerning these requirements and begin scheduling your airplane for service at the recommended intervals.

Cessna Progressive Care ensures that these requirements are accomplished at the required intervals to comply with the 100-hour or annual inspection as previously covered.

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

There are miscellaneous data, information and licenses that are a part of the airplane file. The following is a checklist for that file. In addition, a periodic check should be made of the latest Federal Aviation Regulations to insure that all data requirements are met.

- A. To be displayed in the airplane at all times:
 - (1) Aircraft Airworthiness Certificate (FAA Form 8100-2).
 - (2) Aircraft Registration Certificate (AC Form 8050-3).
 - (3) Aircraft Radio Station License (Form FCC-556, if transmitter installed).
 - (4) Radio Telephone Station License (Form FCC-407, if Flitefone III Radio Telephone is installed).
- B. To be carried in the airplane at all times:
 - (1) Weight and Balance, and associated papers (latest copy of the Repair and Alteration Form, Form 337, if applicable).
 - (2) Airplane 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) Airplane Log Book.
 - (2) Engine Log Books.

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 the power computer, Customer Care Handbook and Customer Care Card, 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 Service Manual to insure the procedure is properly completed.
- All maintenance other than preventive maintenance must be accomplished by appropriately licensed personnel. Contact your Cessna Dealer 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 insure 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 nose-wheel towing bar provided with the airplane. The tow bar is designed to attach to the nose gear strut fork.

CAUTION

Remove all rudder locks before ground handling. When using the tow bar, never exceed the nosewheel turning radius limits of 52° either side of the center. Structural damage may occur if the 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, refer to the Airplane Service Manual for proper power towing procedures using either the nose or main landing gear.

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 and the optional rudder gust lock is not installed, restrict rudder travel with an external rudder gust lock or caster the nosewheel to the extreme right or left position. This forces the rudder against the rudder stop which minimizes buffeting of the rudder in gusty weather. 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.

With the mixture levers in IDLE CUT-OFF, the fuel flow is effectively blocked at the fuel metering unit. Thus, it is unnecessary to place the fuel selectors in the OFF position if the airplane is receiving normal usage. However, if a long period of inactivity is anticipated, the fuel selectors should be turned OFF to preclude any possible fuel seepage that might develop through the metering valve.

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. Close engine cowl flaps after engines have cooled sufficiently.
2. Set parking brake and install control locks to restrict travel of all movable surfaces.

CAUTION

Do not set parking brake when the brakes are overheated or during cold weather when accumulated moisture may freeze the brakes.

3. If a rudder gust lock is not available, caster the nosewheel to the extreme left or right positions.
4. Install pitot tube cover(s) if available.
5. Set elevator, aileron and rudder trim tabs to neutral, so the trim tabs fair with the control surfaces.
6. Use ropes or chains of at least 700 pounds tensile strength. Secure the nose gear with a rope or chain attached above the nose gear torque link. The other end should be attached to a substantial ground anchor. The rope or chain angle to the ground should be 45 degrees. Attach a second rope or chain in a similar manner to the opposite side of the nose gear. Secure the tail tie-down fitting in a similar manner.

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. Jack pads, which are provided with the airplane, are required to be installed in each wing jack point before the airplane can be jacked.

NOTE

- To prevent the flight hour recorder from recording while the airplane is on jacks and the battery switch is in the ON position, remove fuse located in the side console. Reinstall fuse when finished.
- Special two-ton 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 214.00 and 238.00 and place a spirit level on these screws, then level longitudinally. To level laterally, place a spirit level at Station 154.00 (aft of front spar) on the underside of fuselage. Refer to the Airplane Service Manual for additional information.

FLYABLE STORAGE

Flyable storage applies to all airplanes which will not be flown for an indefinite period 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 Service Manual for proper storage procedures.

Airplanes which are not in daily flight should have the propellers rotated, by hand, six revolutions at least once each week. In damp climates and in storage areas where the daily temperature variation can cause condensation, propeller rotation should be accomplished more frequently. Rotating the propeller and stopping at 45° to 90° from it's original position redistributes residual oil on the cylinder walls, crankshaft and gear surfaces and repositions the pistons in the cylinders, thus minimizing

corrosion. Rotate propellers as follows:

1. Throttles - IDLE.
2. Mixtures - IDLE CUT-OFF.
3. Magneto Switches - OFF.
4. Propellers - ROTATE CLOCKWISE. Manually rotate propellers six revolutions, standing clear of arc of propeller blades. Stop the propeller 45° to 90° from it's original position.

Keep fuel tanks full to minimize condensation in the fuel tanks. Maintain battery at full charge to prevent electrolyte from freezing in cold weather. If the optional 1000 series avionics and/or optional fuel flow indicating system are installed, the battery will discharge continuously, regardless of battery switch position. This flow of current is required to maintain the memories of the referenced equipment. If the airplane is not in frequent use (inactive for longer than two days), battery discharge can be avoided by disconnecting the battery or disengaging the FREQ MEM circuit breaker for the avionics or CABIN LTS circuit breaker for the fuel flow indicating system.

NOTE

- A malfunctioning nose baggage or wing locker light will completely deplete the battery in approximately four days, depending on the degree of charge and condition of the battery.
- Airplanes inactive for long periods of time should have the battery serviced in accordance with BATTERY servicing, this section.

If the airplane is stored outside, tie-down airplane in anticipation of high winds. Secure airplane as follows:

1. Secure rudder with the optional rudder gust lock or with a control surface lock over the fin and rudder. If a lock is not available, caster the nosewheel to the full left or right position.
2. Install pitot tube cover(s) if available.
3. Set elevator, aileron and rudder trim tabs to neutral so the trim tabs fair with the control surfaces.
4. Install control column lock in pilot's control column, if available. If column lock is not available, tie the pilot's control wheel full aft with a seat belt.
5. Tie ropes or chains of at least 700 pounds tensile strength to the wing tie-down fittings located on the underside of each wing, aft of the main landing gear. Secure the opposite ends of the ropes or chains to ground anchors. 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.
6. Secure a rope (no chains or cables) to the upper nose gear trunnion and secure opposite end of rope to a ground anchor. Chock the nose landing gear tire.
7. Secure the middle of a rope or chain to the tail tie-down fitting. Pull each end of the rope or chain at a 45-degree angle and secure to ground anchors at each side of the tail.
8. At the end of 30 days, the airplane should be flown for 30 minutes until oil and cylinder temperatures reach normal operating range. If the airplane is not flown at the end of 30 days, the airplane should be placed in temporary or indefinite storage.

SERVICING**NOTE**

Refer to the Airplane Service Manual for complete servicing requirements.

FUEL (Approved Fuel Grades And Colors)

- PRIMARY - 100 (Formerly 100/130) Grade Aviation Fuel (Green)
ALTERNATE - 100LL Grade Aviation Fuel (Blue)

Service after each flight. Keep tanks full to retard condensation in the tanks. Tank capacities are:

Each Main Tank - 106.7 Gallons

Isopropyl alcohol or ethylene glycol monomethyl ether may be added to the fuel supply in quantities not to exceed 1% or .15% by volume, respectively, of the total. Refer to Fuel Additive paragraphs in this section for additional information.

WARNING

- Do not operate any avionics or electrical equipment on the airplane during fueling. Do not allow open flame or smoking in the vicinity of the airplane while fueling.
- During all fueling operations, fire fighting equipment must be available. Two ground wires from different points on the airplane to separate approved grounding stakes shall be used.

Fuel Additive

Strict adherence to recommended preflight draining instructions as called for in Section 4 will eliminate any free water accumulations from the tank sumps. While small amounts of water may still remain in solution in the gasoline, it will normally be consumed and go unnoticed in the operation of the engine.

One exception to this can be encountered when operating under the combined effect of: 1) use of certain fuels, with 2) high humidity conditions on the ground 3) followed by flight at high altitude and low temperature (flight levels of 20,000 feet or above and temperatures of -28.9°C (-20°F) or below). Under these unusual conditions small amounts of water in solution can precipitate from the fuel stream and freeze in sufficient quantities to induce partial icing of the engine fuel injection system.

While these conditions are quite rare and will not normally pose a problem to owners and operators, they do exist in certain areas of the world and consequently must be dealt with, when encountered.

Therefore, to alleviate the possibility of fuel icing occurring under these unusual conditions it is permissible to add isopropyl alcohol or ethylene glycol monomethyl ether (EGME) compound to the fuel supply.

The introduction of alcohol or EGME compound into the fuel provides two distinct effects: 1) it absorbs the dissolved water from the gasoline and 2) alcohol has a freezing temperature depressant effect.

Alcohol, if used, is to be blended with the fuel in a concentration of 1% by volume. Concentrations greater than 1% are not recommended since they can be detrimental to fuel tank materials.

The manner in which the alcohol is added to the fuel is significant because alcohol is most effective when it is completely dissolved in the fuel. To insure proper mixing the following is recommended:

1. For best results the alcohol should be added during the fueling operation by pouring the alcohol directly on the fuel stream issuing from the fueling nozzle.
2. An alternate method that may be used is to premix the complete alcohol dosage with some fuel in a separate clean container (approximately 2-3 gallon capacity) and then transferring this mixture to the tank prior to the fuel operation.

Any high quality isopropyl alcohol may be used, such as:

Anti-icing fluid (MIL-F-5566) or
Isopropyl alcohol (Federal Specification TT-I-735a).

Figure 8-1 provides alcohol-fuel ratio mixing information.

Ethylene glycol monomethyl ether (EGME) compound in compliance with MIL-I-27686 or Phillips PFA-55MB, if used, must be carefully mixed with the fuel in concentrations not to exceed 0.15% by volume.

CAUTION

- Mixing of the EGME compound with the fuel is extremely important because concentration in excess of that recommended (0.15 percent by volume maximum) will result in detrimental affects 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 components. Use only blending equipment that is recommended by the manufacturer to obtain proper proportioning.
- Do not allow the concentrated EGME compound to come in contact with the airplane finish or fuel cell as damage can result.

Prolonged storage of the airplane will result in a water buildup in the fuel which "leeches out" the additive. An indication of this is when an excessive amount of water accumulates in the fuel tank sumps. The concentration can be checked using a differential refractometer. It is imperative that the technical manual for the differential refractometer be followed explicitly when checking the additive concentration.

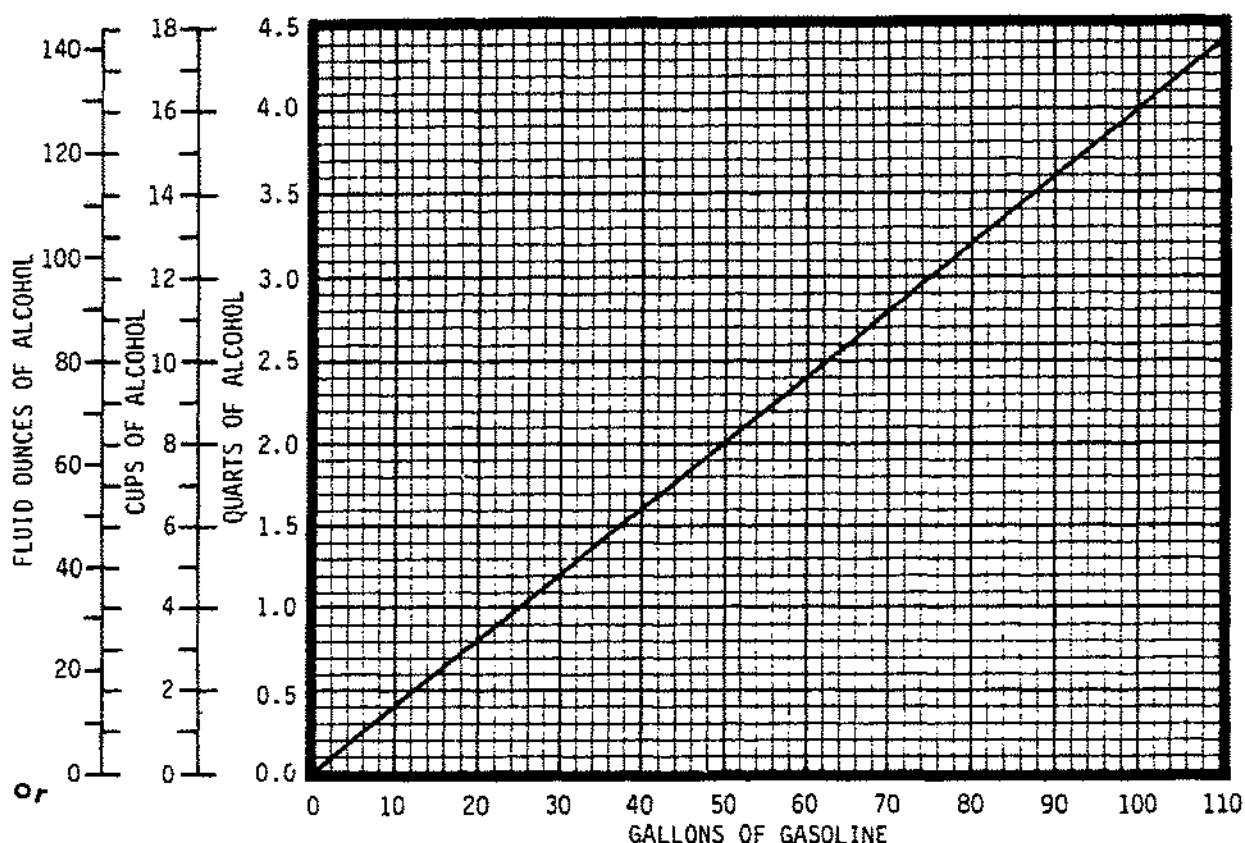
ALCOHOL - FUEL MIXING RATIO CHART

Figure 8-1

OIL (Aviation Grade Engine Oil; SAE 50 Above 4.4°C (40°F), SAE 30 Below 4.4°C (40°F) or Multiviscosity Unrestricted Temperature Range - Filter Element 643226 or 643227)

Multiviscosity oil is recommended for use after the first 25 hours of engine operation for improved starting and turbocharger controller operation in temperatures below 4.4°C (40°F). When operating temperatures overlap indicated ranges, use the lighter grade of oil. Ashless dispersant oil, conforming to the latest issue of Continental Motors Specification MHS-24 must be used. No oil additives are approved for use. Airplanes equipped with short filters (4.80 inches) should change the oil and filter every 50 hours or six months, whichever occurs first. Airplanes equipped with long filters (5.80 inches), may extend the recommended oil change interval to 100 hours or six months, whichever occurs first. Reduce oil and filter change intervals for prolonged operation in dusty areas, cold climates, or when short flights and long idle periods result in sludging conditions.

NOTE

For faster ring seating and improved oil control, your Cessna was delivered from the factory with corrosion preventive oil conforming to MIL-C-6529, Type II. This break-in oil must be used only for the first 25 hours of operation; at that time it must be replaced with ashless dispersant oil. If oil must be added during this first 25 hours of operation, use straight mineral oil conforming to MIL-L-6082.

Check oil level before each flight. Do not operate on less than 9 quarts. To minimize loss of oil through breather, fill to 10-quart level for normal flights of less than 3 hours. For extended flight, fill to capacity which is 13 quarts for each engine sump including 1 quart for oil filter.

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 (70°F), 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 (70°F), 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.

The 11.0 cubic foot capacity cylinder is serviced through a filler valve located on the forward face of the left nose baggage door jamb, and the 114.9 cubic foot capacity cylinder is serviced through the right nose baggage door in a similar manner.

OXYGEN SERVICING CHART

AMBIENT TEMPERATURE		FILLING PRESSURE PSIG	AMBIENT TEMPERATURE		FILLING PRESSURE PSIG
°C	°F		°C	°F	
-17.8	0	1600	21.1	70	1925
-12.2	10	1650	26.7	80	1950
-6.7	20	1675	32.2	90	2000
-1.1	30	1725	37.8	100	2050
4.4	40	1775	43.3	110	2100
10.0	50	1825	48.9	120	2150
15.6	60	1875	54.4	130	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

AIR CONDITIONING RESERVOIR (Hydraulic Fluid MIL-H-5606)

Check reservoir fluid level above screen bottom. Reservoir capacity is 2.75 quarts.

LANDING GEAR HYDRAULIC RESERVOIR (Hydraulic Fluid MIL-H-5606)

Check reservoir fluid level; fill as required to maintain fluid level between the ADD and MAX FULL marks. Reservoir capacity is approximately 1.2 quarts when the landing gear is down and locked.

ALCOHOL WINDSHIELD DEICE RESERVOIR (Isopropyl Alcohol MIL-F-5566)

Check reservoir fluid level; fill as required. Reservoir capacity is 3.0 gallons.

BATTERY

Low electrolyte level, inadequate charging and long idle periods in a discharged condition can cause batteries to become sulfated and unserviceable. Airplanes intended to be idle for long periods of time should have the batteries removed and placed on charge.

NOTE

Water consumption will increase during warmer temperatures and should be checked regularly. Fifty (50) hour inspection intervals are recommended, but may need to be reduced to maintain proper electrolyte level, depending on use and weather conditions.

TIRES

Tire pressure should be maintained at 70 PSI for the main wheel tires and 35 PSI for the nosewheel tire.

FLUSH TOILET RESERVOIR

The optional flush toilet uses a reservoir tank that 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 DG-19 chemical.

CAUTION

During cold weather operation, where cabin temperatures can fall below 0°C (32°F), an ethylene glycol base anti-freeze should 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.

Once the finish has cured completely, it may be waxed with a good automotive wax. A heavier coating of wax on the leading edges of the wings, tail, engine nose cap and propeller spinner will help reduce the abrasion encountered in these areas.

PROPELLER

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 Dealer's mechanics have been trained in the proper adjustment of the landing gear system. To assure trouble-free gear operation, have your Cessna Dealer 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 optional 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 (Methyl-Ethyl-Ketone, 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

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 No.1 and ICEX.

AGE MASTER No.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 No. 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.

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 Station 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 other components which might be adversely affected by the solvent. Refer to the Airplane Service Manual for proper lubrication of components after engine cleaning.

INTERIOR CARE

To remove dust and loose dirt from the upholstery, headliner and carpet, clean the interior regularly with a vacuum cleaner.

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, used sparingly. Before using any solvent, read the instructions of 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, insure 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 paragraph 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 improve 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 a dirty, hard or rough cloth used for cleaning. To prevent possible damage, items such as wrist watch, rings, etc. should be removed before cleaning windshield and windows. 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.

CAUTION

Windshields and windows (acrylic or glass) 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 (preferable 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. On acrylic windshields and windows only, if soils which cannot be removed by a mild detergent remain, Type II aliphatic naphtha applied with a soft clean cloth may be used as a cleaning solvent. Be sure to frequently refold the cloth to avoid redepositing soil and/or scratching windshield with any abrasive particles. **DO NOT USE** aliphatic naphtha on glass windshields.
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, MEK, acetone, carbon tetrachloride, lacquer thinners, commercial or household window cleaning sprays. Additionally, strong acids or bases may destroy antistatic coatings on glass windshields. When in doubt, do not use it.
- Never use an abrasive cleaner, wax, or polish on glass windshields.

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 polish meeting Federal Specification P-P-560 applied per the manufacturer's instructions.

NOTE

When applying or removing wax or polish, use a clean soft cloth.

8. Glass windshields may have rain repellent applied per the manufacturer's instructions. Caution should be used not to get rain repellent on painted surfaces surrounding the glass windshield. **DO NOT USE** rain repellent on acrylic surfaces.

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. Carefully cover all surfaces during any painting, powerplant cleaning or other procedure that calls for the use of any type of solvents or chemicals. The following coatings are approved for use in protecting surfaces from solvent attack:
 - a. White Spray Lab, MIL-C-6799, Type I, Class II.
 - b. WPL-3 Masking Paper - St. Regis, Newton, MA.
 - c. 5 X N - Poly-Spotstick - St. Regis, Newton, MA.
 - d. Protex 40 - Mask Off Company, Monrovia, CA and Southwest Paper Co., Wichita, KS.
 - e. Protex 10VS - Mask Off Company, Monrovia, CA and Southwest Paper Co., Wichita, KS.
 - f. Scotch 344 Black Tape - 3M Company.
4. Do not park or store airplane where it might be subjected to direct contact with or vapors from ethanol, denatured alcohol, gasoline, benzene, xylene, MEK, acetone, carbon tetrachloride, lacquer thinners, commercial or household window cleaning sprays, paint strippers, or other types of solvents.
5. Do not leave survivors up against windshield when not in use. The reflected heat from these items causes elevated temperatures on the windshield. If solar screens are installed on the inside of the airplane, make sure they are the silver appearing, reflective type.
6. Do not use power drill motor or any powered device to clean, polish or wax windshield.

Materials Required for Acrylic Windshields and Windows

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: (Refer to Note 1)		Waxing acrylic windshields 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 403D	Permatex Company, Inc. Kansas City, KS 66115	
Soft cloth, such as:		
Cotton flannel or cotton terry cloth material	Commercially available	Applying and removing wax and polish.

(Continued on next page)

3 November 1980

Revision 2 - 1 June 1994

Materials Required for Glass Windshields

MATERIAL	MANUFACTURER	USE
Mild soap or detergent hand dishwashing type without abrasives)	Commercially available	Cleaning windshields and windows.
Rain repellent: (Refer to Note 2)		Optional for rain shedding on glass windshields only.
REPCON or RAIN-X	UNELKO Corp., 727 E. 110 St., Chicago, IL 60628	

NOTE 1: These are the only polishing waxes tested and approved for use by Cessna Aircraft Company.

NOTE 2: This is the only rain repellent 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 Station.

SECTION 9

SUPPLEMENTS

TABLE OF CONTENTS

	Page
INTRODUCTION	9-3
SUPPLEMENTS - GENERAL:	
2 AIR CONDITIONING SYSTEM	(3 pages)
3 ALCOHOL WINDSHIELD DEICE SYSTEM	(2 pages)
4 ANGLE-OF-ATTACK	(2 pages)
5 DAVTRON 811B DIGITAL CLOCK	(2 pages)
6 DEICE BOOT SYSTEM	(4 pages)
7 ECONOMY MIXTURE INDICATOR	(2 pages)
8 ELECTRICAL ELEVATOR TRIM	(1 page)
9 AC ELECTRICAL WINDSHIELD ANTI-ICE SYSTEM	(2 pages)
10 DC ELECTRICAL WINDSHIELD ANTI-ICE SYSTEM	(2 pages)
11 FLIGHT IN ICING CONDITIONS (w / AC ELECTRICAL WINDSHIELD)	(4 pages)
11A FLIGHT IN ICING CONDITIONS (w / DC ELECTRICAL WINDSHIELD)	(4 pages)
12 FIRE DETECTION AND EXTINGUISHING SYSTEM	(2 pages)
14 FUEL FLOW INDICATING SYSTEM	(1 pages)
15 MANUALLY ADJUSTABLE SEAT	(2 pages)
17 PROPELLER DEICE SYSTEM	(2 pages)
18 YAW DAMPER	(2 pages)
SUPPLEMENTS - AVIONICS:	
21 400 ENCODING ALTIMETER (TYPE EA-401A)	(3 pages)
22 800 ENCODING ALTIMETER/ALERTING/PRESELECT (TYPE EA-801A)	(6 pages)
23 400 AREA NAVIGATION SYSTEM (TYPE RN-478A)	(5 pages)
24 800 AREA NAVIGATION SYSTEM (TYPE RN-878A)	(6 pages)
26 800 AUDIO CONTROL PANEL	(2 pages)
27 1000 AUDIO CONTROL PANEL	(6 pages)
29 400 AUTOMATIC DIRECTION FINDER (TYPE R-446A)	(4 pages)
30 1000 AUTOMATIC DIRECTION FINDER (TYPE 1046A)	(5 pages)
31 400B NAVOMATIC/AUTOPILOT SYSTEM (TYPE AF-550A)	(12 pages)
32 CC-2024B CHECKLIST DISPLAY	(12 pages)
33 1000 COMMUNICATION SYSTEM (TYPE RT-1038A)	(3 pages)
34 400 DME (TYPE RTA-476A)	(3 pages)
35 800 DME (TYPE RTA-876A)	(4 pages)
36 400 AND 1000 GLIDESLOPE (TYPE IR-443B AND TYPE R-1043A)	(2 pages)
37 HF-200 TRANSCEIVER	(2 pages)
38 400B INTEGRATED FLIGHT CONTROLS SYSTEM (TYPE IF-550A)	(17 pages)
39 800B INTEGRATED FLIGHT CONTROLS SYSTEM (TYPE IF-550A)	(16 pages)
40 LOCATOR BEACON (DMELT-6 AND -6C)	(1 pages)
41 400 MARKER BEACON (TYPE R-402A)	(2 pages)
42 1000 NAVIGATION SYSTEM (TYPE 1048A)	(4 pages)
44 400 NAV/COM SYSTEM (TYPE RT-485A)	(8 pages)
45 AA-100 RADIO ALTIMETER SYSTEM	(2 pages)
46 AA-215 RADIO ALTIMETER SYSTEM	(2 pages)
47 400 RADIO MAGNETIC INDICATOR (TYPE IN-404A)	(3 pages)
48 1000 RADIO MAGNETIC INDICATOR (TYPE IN-1004A)	(3 pages)
49 RADIO MAGNETIC INDICATOR (7100 RMI)	(3 pages)
50 FLITEFONE III RADIO TELEPHONE	(2 pages)
51 400 TRANSPONDER (TYPE 459A)	(4 pages)
52 800 TRANSPONDER (TYPE 859A)	(3 pages)
53 RDR-150 AND RDR-160 WEATHER RADAR	(3 pages)
54 RDR-150 COLOR DISPLAY WEATHER RADAR	(4 pages)
55 WEATHER RADAR COLOR DISPLAY PRIMUS-200	(4 pages)

LOG OF REVISIONS

Supplement pages which have been added/revised/deleted since the original issue of this manual are listed below.

Supplement Number and Name:		Pages Added/ Deleted/Revised		Revision Number/Date
2	Air Conditioning System	1 of 3	(Revised)	Revision 1 - 2 Apr 1982
6	Deice Boot System	1 of 4	(Revised)	Revision 1 - 2 Apr 1982
6	Deice Boot System	2 of 4	(Revised)	Revision 1 - 2 Apr 1982
6	Deice	3 of 4	(Revised)	Revision 1 - 2 Apr 1982
6	Deice Boot System	4 of 4	(Revised)	Revision 1 - 2 Apr 1982
8	Electric Elevator Trim	1 of 1	(Revised)	Revision 1 - 2 Apr 1982
9	AC Electrical Windshield Anti-Ice System	1 of 2	(Revised)	Revision 2 - 1 Jun 1994
10	DC Electrical Windshield Anti-Ice System	1 of 2	(Added)	Revision 2 - 1 Jun 1994
10	DC Electrical Windshield Anti-Ice System	2 of 2	(Added)	Revision 2 - 1 Jun 1994
11	Flight in Icing Conditions (w/AC Electrical Windshield)	1 of 4	(Revised)	Revision 2 - 1 Jun 1994
11	Flight in Icing Conditions (w/AC Electrical Windshield)	2 of 4	(Revised)	Revision 2 - 1 Jun 1994
11	Flight in Icing Conditions (w/AC Electrical Windshield)	3 of 4	(Revised)	Revision 2 - 1 Jun 1994
11	Flight in Icing Conditions (w/AC Electrical Windshield)	4 of 4	(Revised)	Revision 2 - 1 Jun 1994
11A	Flight in Icing Conditions (w/DC Electrical Windshield)	1 of 4	(Added)	Revision 2 - 1 Jun 1994
11A	Flight in Icing Conditions (w/DC Electrical Windshield)	2 of 4	(Added)	Revision 2 - 1 Jun 1994
11A	Flight in Icing Conditions (w/DC Electrical Windshield)	3 of 4	(Added)	Revision 2 - 1 Jun 1994
11A	Flight in Icing Conditions (w/DC Electrical Windshield)	4 of 4	(Added)	Revision 2 - 1 Jun 1994
12	Fire Detection and Extinguishing System	2 of 2	(Revised)	Revision 1 - 2 Apr 1982
27	100 Audio Control Panel	1 of 4	(Revised)	Revision 1 - 2 Apr 1982
27	100 Audio Control Panel	2 of 6	(Revised)	Revision 1 - 2 Apr 1982
27	100 Audio Control Panel	3 of 6	(Revised)	Revision 1 - 2 Apr 1982
27	100 Audio Control Panel	4 of 6	(Revised)	Revision 1 - 2 Apr 1982
27	100 Audio Control Panel	5 of 6	(Revised)	Revision 1 - 2 Apr 1982
27	100 Audio Control Panel	6 of 6	(Revised)	Revision 1 - 2 Apr 1982
31	Navomatic Autopilot System	2 of 12	(Revised)	Revision 1 - 2 Apr 1982
31	Navomatic Autopilot System	3 of 12	(Revised)	Revision 1 - 2 Apr 1982
38	400B Integrated Flight Control System	2 of 17	(Revised)	Revision 1 - 2 Apr 1982
38	400B Integrated Flight Control System	3 of 17	(Revised)	Revision 1 - 2 Apr 1982

LOG OF REVISIONS (Continued)

Supplement Number and Name:		Pages Added/ Deleted/Revised	Revision Number/Date
39	800B Integrated Flight Control System	2 of 16 (Revised)	Revision 1 - 2 Apr 1982
39	800B Integrated Flight Control System	3 of 16 (Revised)	Revision 1 - 2 Apr 1982
55	Weather Radar-Color Display Primus 200	1 of 4 (Revised)	Revision 1 - 2 Apr 1982
55	Weather Radar-Color Display Primus 200	2 of 4 (Revised)	Revision 1 - 2 Apr 1982

INTRODUCTION

Section 9 of this handbook provides supplemental information for optional equipment which may be installed on the airplane. Each supplement covers one item of optional equipment. To make it easier to locate a particular supplement within Section 9, supplements are arranged in alphabetical order and assigned reference numbers which are listed in sequence.

AIR CONDITION SYSTEM

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the air conditioning system.

Description

The air conditioning system, see Figure 1, consists of a hydraulically driven compressor and condenser in the right nacelle, two evaporators aft of the pilot's and copilot's seats, a control panel, located on the lower part of the left instrument panel, and a green monitor light on the annunciator panel.

The hydraulic drive for the compressor consists of an engine-driven hydraulic pump, a hydraulic fluid reservoir, an unloading valve and a hydraulic motor. During normal engine operation, with the air conditioning system switch to OFF or CIRCULATE, the unloading valve routes hydraulic fluid from the hydraulic pump back to the reservoir so that the hydraulic motor is disengaged; the green monitor light, see Figure 7-3, will be OFF during this condition. When the air conditioning system switch is turned to COOL, the unloading valve forces hydraulic fluid to flow from the hydraulic pump to the hydraulic motor and opens the condenser air inlet door. During preflight inspections, the spring-loaded condenser air inlet door may be actuated by hand without harm to the system. The hydraulic motor drives the compressor to provide conditioned air to the cabin. The green monitor light will come on when the compressor is operating and will cycle off when the cabin temperature corresponds with the temperature control rheostat setting. The monitor light may flicker for two to three minutes prior to turning off due to the required work load on the hydraulic system as the temperature condition becomes satisfied.

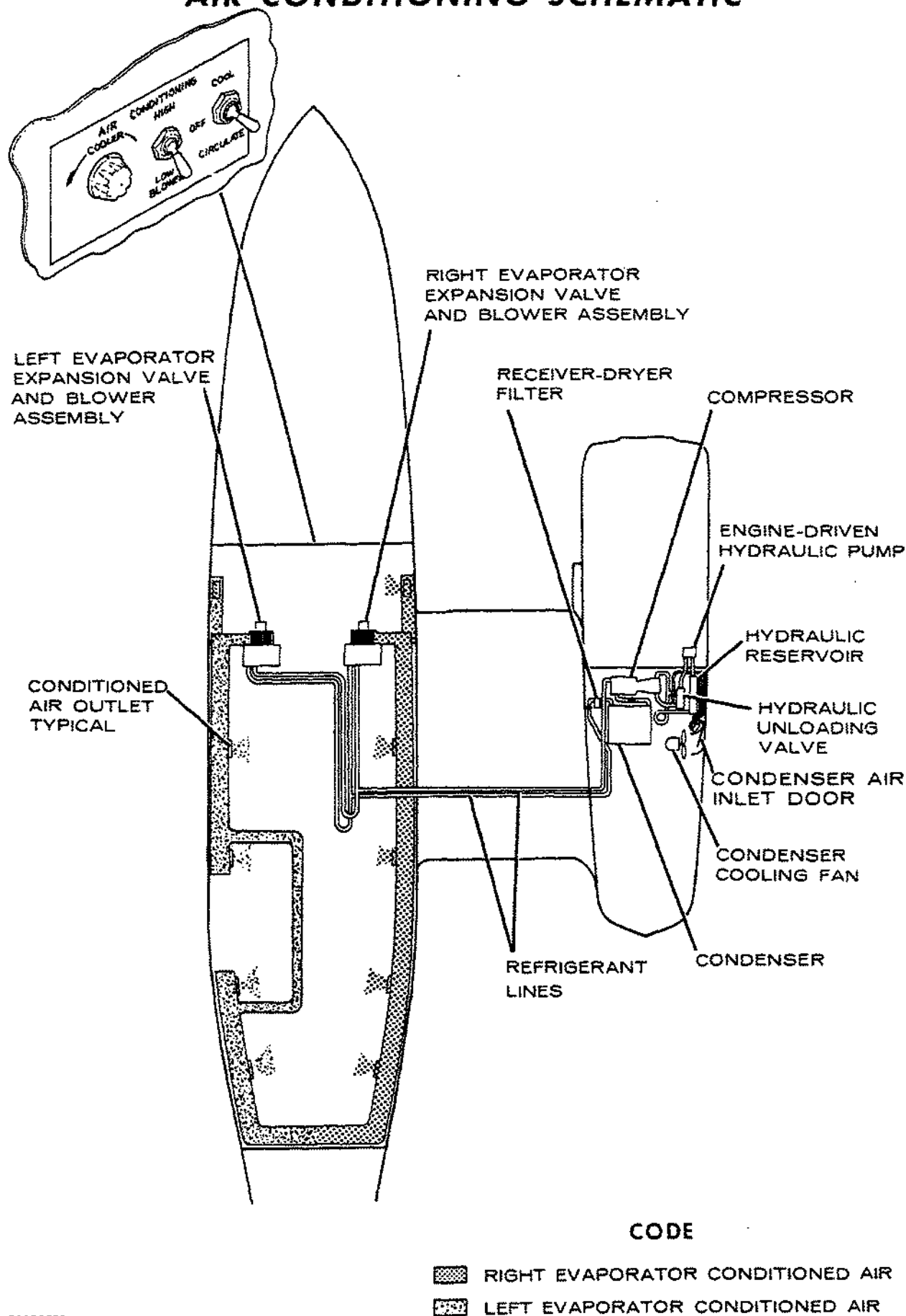
The two evaporators and blower motors distribute conditioned air to the cabin area via overhead ducts. Circuit breakers are provided for each blower, right and left, to allow limited operation of the system.

The system control panel consists of two switches and a rheostat. The system switch, placarded COOL-OFF-CIRCULATE, controls the mode of operation. The blower switch, placarded HIGH-LOW, controls the blower speed. The blower will operate whenever the system switch is in either the COOL or CIRCULATE mode. The temperature control rheostat, placarded COOLER, controls the temperature of the conditioned air. Clockwise rotation of the temperature control lowers the air temperature.

CAUTION

- To prevent damage to the air conditioning compressor, Do Not operate the air conditioning system in COOL when the outside air temperature is below 20°F (-6.7°C).
- When the outside air temperature is greater than 20°F (-6.7°C), freon loss and servicing intervals may be reduced by placing the air conditioning selector switch in COOL for 5 minutes each week.

AIR CONDITIONING SCHEMATIC



51982021

Figure 1

SECTION 2 — LIMITATIONS

- A. System must be "OFF" or "CIRCULATE" for takeoff, landing and single-engine operation.
- B. Required Placards:
 - 1. Inside Right Wing Locker Baggage Door.
 - a. "MAXIMUM BAGGAGE - 120 LBS."

SECTION 3 — EMERGENCY PROCEDURES

- A. Engine Inoperative Procedures
 - 1. Air Conditioner - OFF or CIRCULATE.

SECTION 4 — NORMAL PROCEDURES

- A. Starting Procedures
 - 1. Air Conditioner - Check OFF.
- B. Before Taxi
 - 1. Air Conditioner - As Desired.
- C. Before Takeoff
 - 1. Air Conditioner - OFF or CIRCULATE.
- D. After Takeoff
 - 1. Air Conditioner - As Desired.
- E. Before Landing
 - 1. Air Conditioner - OFF or CIRCULATE.
- F. After Landing
 - 1. Air Conditioner - As Desired.

SECTION 5 — PERFORMANCE

Not Applicable.

ALCOHOL WINDSHIELD DEICE SYSTEM

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the alcohol windshield deice system.

Description

The alcohol windshield deice system consists of an alcohol tank, a pump, a dispersal tube for each windshield and a switch breaker.

The alcohol tank, located in the aft end of the right wing locker, has a 3.0-gallon capacity. The tank should be filled with isopropyl alcohol only. Water dilution of the alcohol is not recommended, as any water contained in the alcohol will reduce the efficiency of ice removal and may freeze on the windshield at very low temperatures. The pump, located adjacent to the tank, provides positive pressure to each windshield dispersal tube. A dispersal tube, located at the forward base of each windshield, provides flow pattern control throughout the airplane's speed envelope. Each tube contains five holes which should be inspected and cleaned with a small diameter wire as necessary.

Abnormal operation of the alcohol windshield deice system is indicated by the switch breaker tripping to the OFF position or failure of alcohol to flow onto the windshield.

SECTION 2 — LIMITATIONS

- A. Discontinue alcohol dispersal 20 seconds before reaching minimum descent altitude.
- B. Do not operate system longer than 3 minutes without alcohol flow.

SECTION 3 — EMERGENCY PROCEDURES

Not Applicable.

SECTION 4 — NORMAL PROCEDURES

- A. Preflight Inspection
 - 1. Windshield Dispersal Tubes - CHECK condition and cleanliness.
 - 2. Alcohol Tank Level - CHECK. Full tank provides approximately 1 hour of continuous operation. If alcohol deicing is installed on left or right windshield only, approximately 2 hours of continuous operation is available.
- B. Before Takeoff
 - 1. Alcohol Windshield Switch - ON. Allow 10 seconds for alcohol flow to begin. Check 5 dispersal holes for flow at the base of each windshield.
 - 2. Alcohol Windshield Switch - OFF.

C. In Flight

1. During Icing Encounters:

- a. Alcohol Windshield Switch - ON.

NOTE

For operation in continuous enroute icing conditions, allow approximately 1/8 to 1/4 inch of ice to accumulate. The windshield deice system can be used as an anti-ice system by continuous use and should be so used during the approach to landing. However, the maximum endurance with a 3.0-gallon tank is approximately 1.0 hour of continuous operation. If alcohol deicing is installed on left or right windshield only, approximately 2 hours of continuous operation is available. Airspeed should be 140 KIAS or below for best results.

- b. Alcohol Windshield Switch - OFF after ice removal.

D. Approach to Landing

WARNING

The windshield deice switch breaker must be positioned OFF 20 seconds prior to reaching minimum descent altitude. The alcohol film must be allowed to evaporate before a clear field of vision through the windshield is available.

SECTION 5 — PERFORMANCE

Not Applicable.

ANGLE-OF-ATTACK SYSTEM

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the angle-of-attack system.

Description

The angle-of-attack system, see Figure 1, is a sensitive lift measurement device which provides a continuous evaluation of lift performance of the airplane, regardless of weight, wing loading, attitude, air density, turbulence, and gear/flap configuration. The system consists of an indicator, stall warning horn test switch, computer and lift sensor. The lift sensor is located in the leading edge of the left wing. The standard airplane stall warning system is removed and its function is assumed by the angle-of-attack system.

The red "SLOW" zone on the left side of the indicator shows the trend toward stall. The stall warning horn will sound at least 5 KCAS above the airplane stall speed.

A PRESS-TO-TEST feature is incorporated to test the general condition of the system. When the test switch is pressed, the pointer should move to the SLOW end of the scale and the stall warning horn should sound.

ANGLE-OF-ATTACK INDICATOR

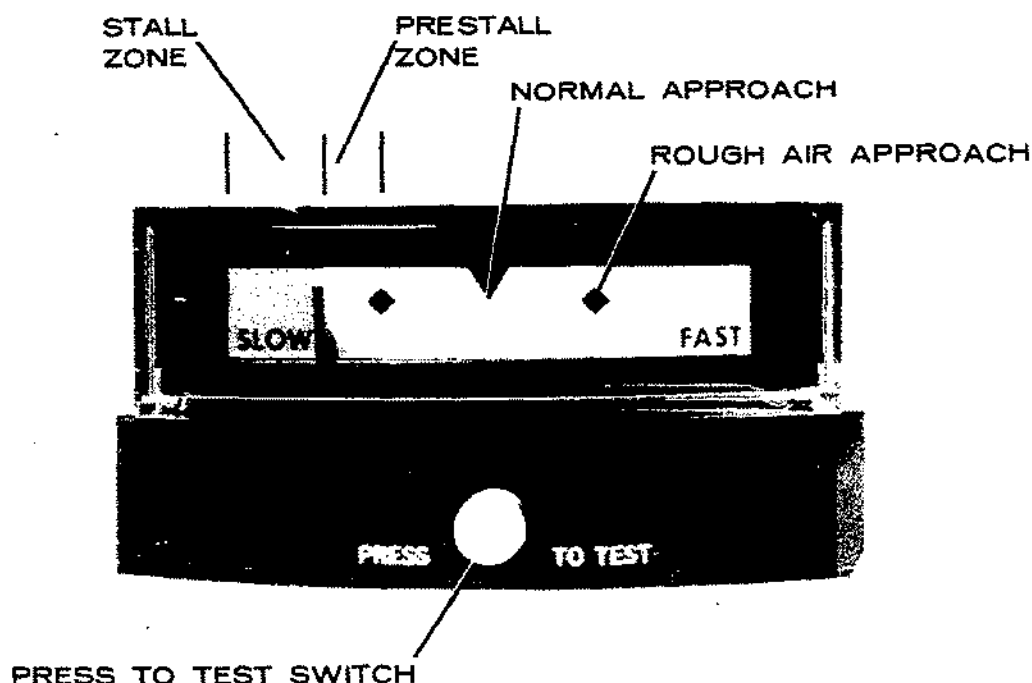


Figure 1

SECTION 2 — LIMITATIONS

The angle-of-attack indicating system may be used as a reference system but does not replace the airspeed indicator as a primary instrument. Operations utilizing the angle-of-attack indicating system, except as stated herein, are not approved.

SECTION 3 — EMERGENCY PROCEDURES

Not Applicable.

SECTION 4 — NORMAL PROCEDURES**A. Preflight Inspection**

1. Stall Warning Vane - CHECK freedom of movement and audible warning. Gently push the vane down to the stop; the indicator pointer should move to the full right FAST legend. Gently push the vane up to the stop; the indicator pointer should move to the full left SLOW legend and the prestall warning horn should activate.

NOTE

Satisfactory operation of the stall warning transmitter heating element is determined by observing a discharge on the voltammeter when the stall heat switch is turned on. The operation of the heating element may be verified by cautiously feeling the heat of this device while the switch is on.

B. Descent

1. Angle-of-Attack Indicator - CROSS-CHECK with airspeed indicator.

For a normal approach to landing, the pointer should be aligned with the center-mark. Alignment of the pointer with the "FAST" diamond provides a more comfortable airspeed margin for an approach in turbulent or gusty conditions.

To correct for an off-speed condition a small attitude correction should be held while waiting to see the result on the indicator. "Chasing" the pointer may result in a longitudinal, pilot-induced oscillation. The instrument is intended to be used as a reference to assist in determining the proper speed for the landing approach. The airspeed indicator is still the primary instrument for speed control.

SECTION 5 — PERFORMANCE

Not Applicable.

DAVTRON 811B DIGITAL CLOCK

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the Davtron 811B digital clock.

Description

The Davtron 811B, 24-hour, digital clock, see Figure 1, is a solid-state timing device which presents real time, flight time and elapsed time. The clock's internal memory is maintained, regardless of the airplane battery switch position, by a nonchargeable clock battery. This clock battery should be replaced every three years. The clock's light emitting diode (LED) displays require airplane electrical power.

All operating controls (four switches) are provided on the face of the clock.

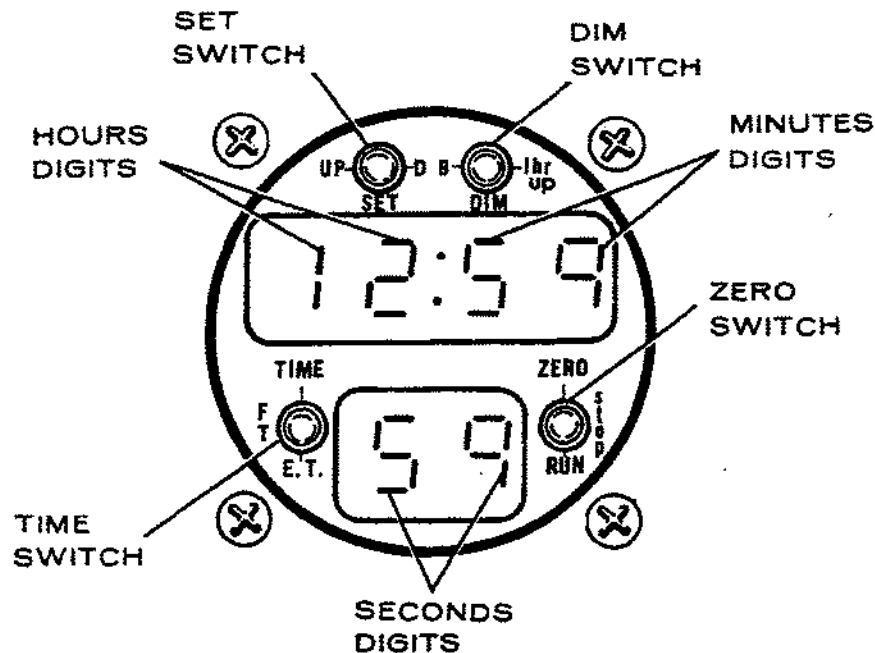
The SET switch is used to make minor corrections to the real time memory of the clock. This switch should be used only after checking the clock with an accurate time reference such as the National Bureau of Standards time broadcast. If the clock is found to be inaccurate, position the SET switch to UP for the number of seconds the clock is slow or to D for the number of seconds the clock is fast. The flight time and elapsed time functions will operate normally during the setting of the real time function, therefore, the elapsed time display can be used to time the holding of the SET switch.

The DIM switch is used to make one-hour changes to the real time and to set the light intensity for day and night flight operations. If real time changes of hours only are required, each momentary actuation of the DIM switch to the 1 hr position will advance the real time one hour. During daylight operations, the switch should be positioned to B. During night operations, the DIM position will decrease illumination intensity to a desirable level.

The ZERO switch is used to zero, stop or run the flight time or elapsed time functions. Actuation of the switch to the ZERO position will zero the elapsed time and zero the flight time if the airplane battery switch is in the OFF position. Actuation of the switch to the STOP position will stop the elapsed time function. Actuation of the switch to the RUN position will start the elapsed time function.

The TIME switch is used to display real time, flight time or elapsed time in hours, minutes and seconds in the two display windows. When the switch is positioned to TIME, the real time will be displayed.

When the switch is positioned to ET, the elapsed time will be displayed. When the switch is positioned to FT, the flight time will be displayed. The flight time function is wired through the landing gear safety switch; thus, flight time can only be accumulated when the weight of the airplane is off the landing gear.

DIGITAL CLOCK

1. SET SWITCH - Used to correct real time in seconds. UP position advances real time while D position retards real time.
2. DIM SWITCH - Used to set display illumination intensity and to advance real time in one-hour increments.
3. ZERO SWITCH - Used to stop, start and zero the elapsed time function. The flight time function can also be zeroed if the airplane battery switch is OFF.
4. TIME SWITCH - Used to display real time, flight time or elapsed time functions in hours, minutes and seconds.

Figure 1

SECTION 2 — LIMITATIONS

Not Applicable.

SECTION 3 — EMERGENCY PROCEDURES

Not Applicable.

SECTION 4 — NORMAL PROCEDURES**A. Before Starting The Engines**

1. Zero Switch - ZERO momentarily to zero the elapsed flight time functions.
2. Dim Switch - AS REQUIRED.

SECTION 5 — PERFORMANCE

Not Applicable.

DEICE BOOT SYSTEM

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the deice boot system.

Description

This system is designed to remove ice after accumulation, rather than prevent ice formation.

The deice boot system consists of pneumatically operated boots, engine-driven pneumatic pumps, 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 stabilizers. The boots expand and contract, using pressure and vacuum from the engine-driven vacuum pumps. Normally, vacuum is applied to all boots to hold them against the leading edge surfaces. When a deicing cycle is initiated, the vacuum is removed from the boots and a pressure is applied to "blow up" the boots. This change in contour will break the ice accumulation on the leading edges. Ice formations aft of this area will then be removed by normal in-flight air forces.

The deice system will operate satisfactorily on either or both engines. During single-engine operation, suction to the gyros will drop momentarily during the boot inflation cycle.

The deicing system is manually controlled by actuating the surface deice switch each time a deice cycle is desired. The switch will instantly spring back to OFF; however, a 12-second delay action by the sequencing system will complete the deicing inflation cycle.

The sequencing system inflates the tail section boots for approximately 6 seconds, then the wing boots for the next 6 seconds. The annunciator light, see Figure 7-3, should illuminate when the tail section boots reach proper operating pressure. No cyclic illumination after selecting a deice cycle indicates insufficient pressure for proper system operation and icing conditions should be avoided. The system may be recycled 6 seconds after the light goes out or anytime thereafter as required.

SECTION 2 — LIMITATIONS

Not Applicable.

SECTION 3 — EMERGENCY PROCEDURES

Not Applicable.

DEICE BOOT SYSTEM SCHEMATIC

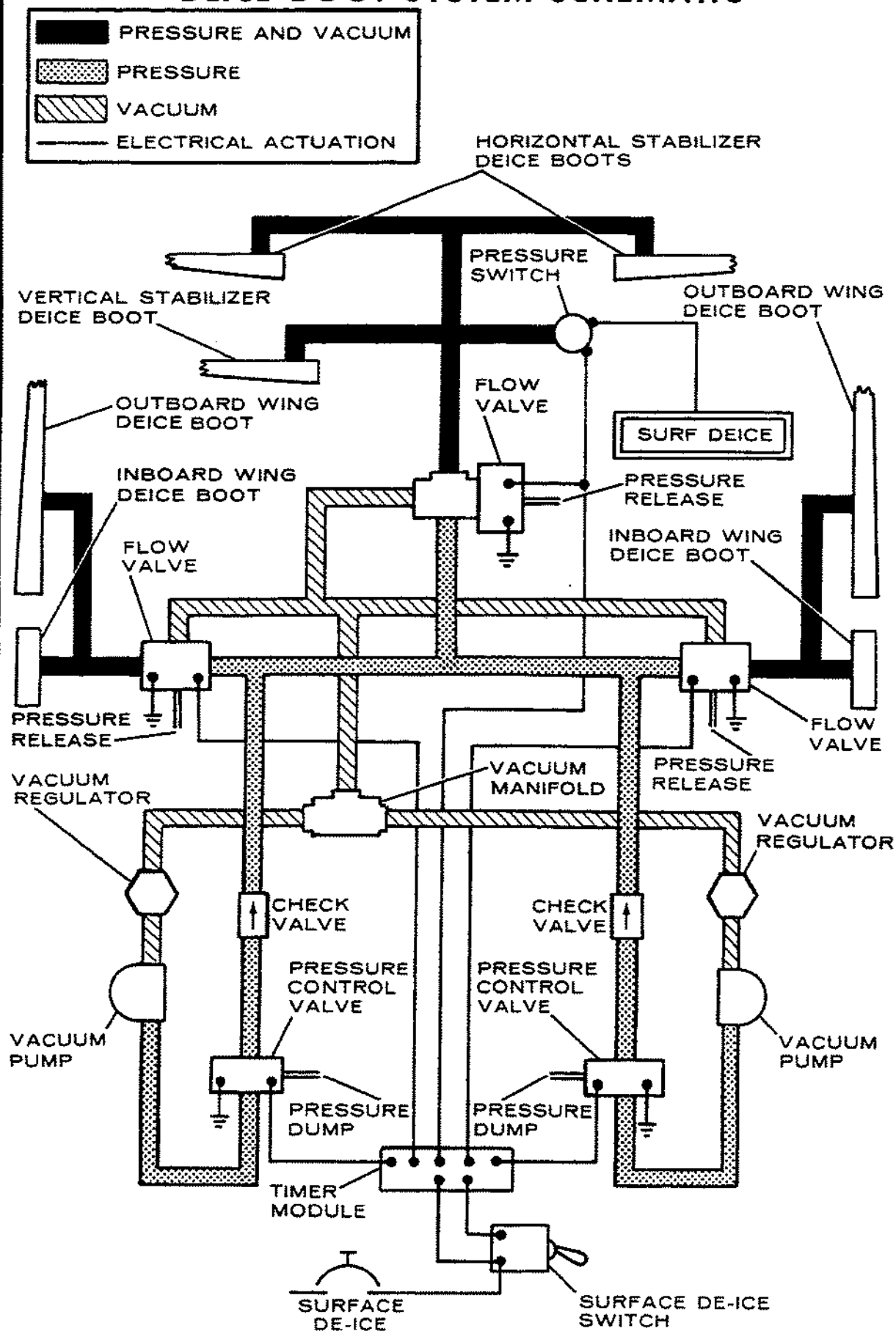


Figure 1

54986005

SECTION 4 — NORMAL PROCEDURES

A. Preflight Inspection

1. Deice Boots - CHECK for tears, abrasions and cleanliness.

B. Before Takeoff

1. Surface Deice Switch - ACTUATE. Visually check operation of boots and annunciator light ON.

NOTE

Actuating the surface deice switch will result in one complete inflation and deflation cycle lasting approximately 45 seconds.

C. Inflight

1. During Icing Encounters.

- a. Surface Deice Switch - ACTUATE when ice accumulates between 1/4 to 1/2 inch. Repeat as necessary, allowing at least 45 seconds between actuations.

NOTE

- Accumulation of a 1/2 inch of ice can cause a cruise speed reduction of up to 30 knots as well as heavy buffet and a significant stall speed increase. Increase power as required to maintain desired airspeed.
- Prestall buffet and stall speeds increase slightly when deice boots are actuated. Maintain extra speed, especially during an approach, before actuating the boots.
- After prolonged icing encounters, increase engine power to maintain desired airspeed as ice accumulates on the unprotected areas.
- Maintain extra airspeed on approach to compensate for the increased prestall buffet associated with ice on the unprotected areas.

2. Leave icing conditions as soon as possible if airplane is not equipped for flight in icing conditions.

NOTE

Since wing, horizontal stabilizer and vertical stabilizer deice boots alone do not provide adequate protection for the entire airplane, icing conditions should be avoided whenever possible unless the airplane is equipped for flight in icing conditions. Refer to Flight In Icing Conditions supplement for details. If icing is encountered, close attention should be given to the pitot-static system, propellers, induction systems and other components subject to icing.

SECTION 5 — PERFORMANCE

- A. When climbing through areas of light to moderate icing conditions, use cruise climb airspeeds and maximum climb power (full power) settings to preclude ice buildup on the fuselage undersurface and lower wing surfaces and minimize the exposure time to icing conditions.
- B. During prolonged icing encounters in cruise, increase engine power to 75% or greater to maintain cruise speed as ice accumulates on the unprotected areas and preclude ice buildup on the fuselage undersurface and lower wing surfaces.
- C. Prestall buffet and stall speeds increase slightly when deice boots are actuated. Maintain extra speed, especially during an approach, before actuating the boots.
- D. Maintain extra airspeed on approach to compensate for the increased prestall buffet associated with ice on the unprotected areas and the increased weight.
- E. Airplane general performance is decreased with ice on the unprotected areas.

ECONOMY MIXTURE INDICATOR

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the economy mixture indicator.

Description

The Cessna Economy Mixture Indicator is an exhaust gas temperature (EGT) sensing device which is used to aid the pilot in selecting the most desirable fuel-air mixture for cruising flight at less than 77.5% power. The EGT varies with the ratio of fuel-to-air mixture entering the engine cylinders.

SECTION 2 — LIMITATIONS

- A. All exhaust gas temperature (EGT) operation must be accomplished in accordance with Figure 1.

MIXTURE DESCRIPTION CHART

MIXTURE DESCRIPTION	EXHAUST GAS TEMPERATURE	TAS LOSS FROM BEST POWER	RANGE INCREASE FROM BEST POWER
BEST POWER (Maximum Speed)	PEAK MINUS 130°F (Enrichen)	0 KNOTS	0%
RECOMMENDED LEAN (Section 5 And Power Computer Performance)	PEAK MINUS 50°F (Enrichen)	2 KNOTS	7%
BEST ECONOMY *	PEAK EGT	6 KNOTS	15%

* FOR POWER SETTINGS OF 55% OR LESS WITH RPM IN THE GREEN ARC OR FOR POWER SETTINGS OF 55% TO 65% WITH 2200 RPM OR LESS

Figure 1

SECTION 3 — EMERGENCY PROCEDURES

Not Applicable.

SECTION 4 — NORMAL PROCEDURES

- (1) In takeoff and full power climb, lean the mixtures as indicated by the white or blue markings on the fuel flow indicator.

NOTE

Leaning in accordance with markings on the fuel flow indicator will provide sufficiently rich mixture for engine cooling. Leaner mixtures are not recommended for power settings in excess of 77.5%.

- (2) In level flight (at less than 77.5% power), lean the mixture to peak EGT, then enrich as desired, using Figure 1 as a guide. For Best Economy mixture at power settings of 55 to 65% at 2200 RPM or lower, or power settings up to 55% for any RPM in the green arc, the engines may be operated at peak EGT.

CAUTION

Operation at Best Economy mixture is not recommended until oil consumption stabilizes or during the first 50 hours of operation. The purpose of operating at 65 to 77.5% power with Best Power or Recommended Lean mixture is to insure proper seating of the rings and is applicable to new engines, and engines in service following cylinder replacement or top overhaul of one or more cylinders. Operation leaner than peak EGT is not approved.

NOTE

- Changes in altitude, OAT, or power settings require the EGT to be rechecked and the mixture reset.
- Operation up to one minute at peak EGT is authorized at power settings of 77.5% or less to establish peak EGT reference.
- Operation at peak EGT is authorized for normal continuous operation at power settings of 55 to 65% at 2200 RPM or lower, or power settings up to 55% for any RPM in the green arc. See Figure 1 for approved operating limits.

- (3) Use rich mixture (or mixture appropriate for field elevation) in idle descents or landing approaches. Leaning technique for cruise descents may be with EGT reference method (at least every 5000 feet) or by simply enriching to avoid engine roughness.

SECTION 5 — PERFORMANCE

Not Applicable.

ELECTRIC ELEVATOR TRIM

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the electric elevator trim.

Description

The electric elevator trim system consists of an electrically operated drive motor and clutch assembly, which receives power through a "momentary on" two-way trim switch and an emergency disengage switch.

SECTION 2 — LIMITATIONS

- A. Disengage electric elevator trim if malfunction occurs.
- B. Required Placards:
 - 1. On Pilot's Control Wheel
 - a. "AP/TRIM DISC"
 - b. "DN" - "UP"

SECTION 3 — EMERGENCY PROCEDURES

- A. Electric Elevator Trim Malfunction.
 - 1. Elevator Control - OVERPOWER as required.
 - 2. Control Wheel AP/TRIM DISC Switch - DEPRESS.
 - 3. Reduce airspeed below V_{NE} .
 - 4. Manual Trim - AS REQUIRED.

SECTION 4 — NORMAL PROCEDURES

- A. Trim Switch - ACTUATE as desired.

NOTE

To check the operation of the AP/TRIM DISC switch: actuate the elevator trim switch with the AP/TRIM DISC switch depressed. Observe that the manual trim wheel and indicator do not rotate when the elevator trim switch is actuated.

SECTION 5 — PERFORMANCE

Not Applicable.

AC ELECTRICAL WINDSHIELD ANTI-ICE SYSTEM

SECTION 1 - GENERAL

This supplement provides information which must be observed when operating the alternating current (AC) electrical windshield.

Description

The AC electrical windshield anti-ice system consists of an electrically heated element on the pilot's windshield, an inverter, an annunciator light, a heat sensor and a switch breaker.

The inverter, located in the right wing stub, supplies AC power to the windshield. The heat sensor cycles the power to the windshield, providing temperature control. The green function indicator light, see Figure 7-3, will illuminate during each heating cycle.

If the indicator does not illuminate periodically, check the bulb by pressing the PRESS-TO-TEST button. A secondary means of checking proper windshield operation can be made by monitoring the voltammeter. When the voltammeter selector switch is positioned to BATT, a change in charge or discharge rate will be noted during each heating cycle.

Abnormal operation of the electrical windshield anti-ice system is indicated by the switch breaker tripping to the OFF position or failure of the indicator light to illuminate. Failure of the switch breaker to stay reset indicates that windshield anti-icing is impossible.

SECTION 2 - LIMITATIONS

If the pilot's windshield is covered with ice, do not leave the electrical windshield anti-ice switch on for more than 20 seconds. Operation in excess of 20 seconds will cause an overheat condition which can result in failure of the windshield heating element and/or permanent distortion of the windshield.

SECTION 3 - EMERGENCY PROCEDURES

Not Applicable.

SECTION 4 - NORMAL PROCEDURES

A. Before Takeoff

1. Electrical Windshield Anti-Ice Switch - ON momentarily. Check voltammeter for discharge and WINDSHIELD annunciator light for illumination.

NOTE

Turn off windshield anti-ice switch as soon as the voltammeter and the annunciator light have been checked.

B. Inflight

1. Electrical Windshield Anti-Ice Switch - ON before entering visible moisture with outside air temperature below 4.4°C (40°F).
2. Leave icing conditions as soon as possible if airplane is not equipped for flight in icing conditions.

NOTE

Since the electrical windshield anti-ice system alone does not provide adequate protection for the entire airplane, icing conditions should be avoided whenever possible unless the airplane is equipped for flight in icing conditions. Refer to Flight in Icing Conditions supplement for details. If icing is encountered, close attention should be given to the pitot-static system, propellers, induction systems, wing and stabilizer leading edges and other components subject to icing.

C. After Landing

1. Electrical Windshield Anti-Ice Switch - OFF.

SECTION 5 - PERFORMANCE

Not Applicable.

DC ELECTRICAL WINDSHIELD ANTI-ICE SYSTEM

SECTION 1 - GENERAL

This supplement provides information which must be observed when operating the direct current (DC) electrical windshield.

Description

The DC electrical windshield anti-ice system consists of two electrically heated rectangular areas: one large mat (primary heated area) and an additional small mat (secondary heated area), a resistance wire sensor embedded in the windshield, a hi-low relay, a remote temperature controller, a fuse, a circuit breaker and a three-position temperature selector switch. With the switch in HI, only the large mat is heated. With the switch in LO, both mats are heated at a lower power density.

Power for the electrical windshield is supplied by the airplane's DC bus bar. The temperature controller, in conjunction with the resistance wire sensor embedded in the windshield provides ON-OFF control of the DC power through the use of the relay. The temperature sensor, an integral part of the windshield, is located in the large mat heated area.

SECTION 2 - LIMITATIONS

If the pilot's windshield is covered with ice, do not leave the electrical windshield anti-ice switch on for more than 20 seconds. Operation in excess of 20 seconds will cause an overheat condition which can result in failure of the windshield heating element and/or permanent distortion of the windshield.

The electrical windshield must be on HIGH with outside air temperature below -12°C (10°F) when in visible moisture.

Required Placards:

MAGNETIC COMPASS
DEVIATIONS GREATER
THAN 10° CAN BE
EXPECTED WHEN D.C.
HEATED WINDSHIELD
IS IN OPERATION.

SECTION 3 - EMERGENCY PROCEDURES

Not Applicable.

SECTION 4 - NORMAL PROCEDURES

A. Before Takeoff

1. Electrical Windshield Anti-Ice Switch - HIGH momentarily. Check voltammeter for discharge and WINDSHIELD annunciator light for illumination.

NOTE

Turn off windshield anti-ice switch as soon as the voltammeter and the annunciator light have been checked.

B. Inflight

1. Electrical Windshield Anti-ice Switch - LOW before entering visible moisture with outside air temperature below 4.4°C (40°F) and above -12°C (10°F). HIGH before entering visible moisture with outside air temperature below -12°C (10°F).

NOTE

- When using the electrical windshield on LOW, correct indicated outside air temperature (see Section 5 for ram rise correction) for your particular altitude and airspeed to ensure the outside air temperature is not below -12°C (10°F).
- If ice begins to accumulate on the heated portion of the windshield while operating on LOW, switch to HIGH.
- After icing conditions are encountered with the windshield on HIGH, do not use LOW until the entire heated portion of the windshield is clear of ice.
- The magnetic compass will not be reliable with the electrical heated windshield in operation.

2. Leave icing conditions as soon as possible if airplane is not equipped for flight in icing conditions.

NOTE

Since the electrical windshield anti-ice system alone does not provide adequate protection for the entire airplane, icing conditions should be avoided whenever possible unless the airplane is equipped for flight in icing conditions. Refer to Flight In Icing Conditions supplement for details. If icing is encountered, close attention should be given to the pitot-static system, propellers, induction systems, wing and stabilizer leading edges and other components subject to icing.

C. After Landing

1. Electrical Windshield Anti-Ice Switch - OFF.

SECTION 5 - PERFORMANCE

Not Applicable.

FLIGHT IN ICING CONDITIONS (AIRPLANES WITH AC ELECTRICAL WINDSHIELD)

SECTION 1 - GENERAL

NOTE

To determine which optional electrical windshield is installed, check the electrical windshield anti-ice switch. The AC windshield switch is labeled OFF and ON. The DC windshield switch is labeled HIGH, LOW and OFF.

This supplement provides information which must be observed when operating the ice protection equipment for flight in icing conditions.

Description

An icing equipment package is available which allows flight in icing conditions as defined by the FAA. The package consists of the following: heated stall warning vane or optional heated angle-of-attack lift sensor vane; heated pitot head (one minimum required); electric propeller deice boots (including fuselage ice protection plates); wing (inboard and outboard), stabilizer and fin deice boots; electrical windshield heated panel (pilot's side only); heated static ports; left ice detection light and 100 - ampere alternators.

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.

SECTION 2 - LIMITATIONS

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 head (one minimum required).
3. Deice System Kit [Cessna drawing 5114400, Factory Kit (FK) No. 194].
 - a. Electric propeller deice boots.
 - b. Wing (inboard and outboard) stabilizer and fin deice boots (including left ice detection light).
 - c. Electrical anti-ice windshield heated panel (pilot's side only).
 - d. Heated static ports.
4. 100 - ampere alternators.

If the pilot's windshield is covered with ice, do not leave the electrical windshield anti-ice switch on for more than 20 seconds. Operation in excess of 20 seconds will cause an overheat condition which can result in failure of the windshield heating element and/or permanent distortion of the windshield.

SECTION 3 - EMERGENCY PROCEDURES

- A. If uneven deicing of propeller blades is indicated by excessive vibration:
1. Propellers - EXERCISE to MAX RPM.
 2. Propeller Ammeter - CHECK for proper operation by periodic fluctuations within the green arc. If ammeter reading is below the green arc, the propeller blades may not be deicing uniformly:
 - a. If both propellers are reading below the green arc:
 - (1) Propeller Deice Switch - OFF.
 - b. If either propeller is reading below the green arc:
 - (1) PROP DEICE Circuit Breaker - Pull L or R circuit breaker as required.
 3. If vibration continues, leave icing conditions as soon as possible.

CAUTION

Do not operate propeller deice for prolonged periods when propellers are not turning.

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

SECTION 4 - NORMAL PROCEDURES

- A. Preflight Inspection
1. Pitot Heat Switch(es) - ON 20 seconds - OFF (Ensure Pitot Covers Are Removed).
 2. Stall and Vent Heat Switch - ON 20 seconds - OFF.
 3. Deice Boots - CHECK for tears, abrasions, and cleanliness.
 4. Fuel Vents - CLEAR.
 5. Pitot Tube(s) - CLEAR and WARM.
 6. Static Ports - CLEAR and WARM.

CAUTION

Do not operate system heaters for prolonged periods on the ground.

NOTE

Stall and vent heat switch operates stall vane heater or optional angle-of-attack lift sensor vane, and static port heaters. Pitot heat switch operates pitot heater(s).

B. Before Takeoff

1. Surface Deice Switch - ACTUATE. Visually check operation of boots and annunciator light ON.

NOTE

Actuating the surface deice switch will result in one complete inflation and deflation cycle lasting approximately 45 seconds.

2. Propeller Deice Switch - ON momentarily. Check propeller ammeter.

NOTE

Proper operation of propeller deice system is indicated by periodic fluctuations, within the green arc, on the propeller ammeter.

3. Electrical Windshield Anti-Ice Switch - ON momentarily. Check voltammeter for discharge and WINDSHIELD annunciator light for illumination.

NOTE

Turn off windshield anti-ice switch as soon as the voltammeter and the annunciator light have been checked.

C. Inflight

1. Before visible moisture is encountered with outside air temperature below 4.4°C (40°F):
 - a. Pitot Heat Switch - ON.
 - b. Stall and Vent Heat Switch - ON.
 - c. Propeller Deice Switch - ON.

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

Energizing the propeller deice system early in icing conditions will prevent ice buildup which will be thrown off and can chip the fuselage paint.

- d. Electrical Windshield Anti-Ice Switch - ON.
- 2. During Icing Encounters:
 - a. Surface Deice Switch - ACTUATE when ice accumulates between 1/4 to 1/2 inch. Repeat as necessary, allowing at least 45 seconds between actuations.

NOTE

Accumulation of 1/2 inch of ice can cause a cruise speed reduction of up to 30 knots as well as heavy buffet and a significant stall speed increase. Increase power as required to maintain desired airspeed.

- D. After Landing
 - 1. Electrical Windshield Anti-Ice Switch - OFF.

SECTION 5 - PERFORMANCE

- A. When climbing through areas of light to moderate icing conditions, use cruise climb airspeeds and maximum climb power (full power) settings to preclude ice buildup on the fuselage undersurface and lower wing surfaces and minimize the exposure time to icing conditions.
- B. During prolonged icing encounters in cruise, increase engine power to 75% or greater to maintain cruise speed as ice accumulates on the unprotected areas and preclude ice buildup on the fuselage under surface and lower wing surfaces.
- C. Prestall buffet and stall speeds increase slightly when deice boots are actuated. Maintain extra speed, especially during an approach, before actuating the boots.
- D. Maintain extra airspeed on approach to compensate for the increased prestall buffet associated with ice on the unprotected areas and the increased weight. Maintaining extra airspeed on approach will increase the landing distance.
- E. Airplane general performance is decreased with ice on the unprotected areas.

FLIGHT IN ICING CONDITIONS (AIRPLANES WITH DC ELECTRICAL WINDSHIELD)

SECTION 1 - GENERAL

NOTE

To determine which optional electrical windshield is installed, check the electrical windshield anti-ice switch. The AC windshield switch is labeled OFF and ON. The DC windshield switch is labeled HIGH, LOW and OFF.

This supplement provides information which must be observed when operating the ice protection equipment for flight in icing conditions.

Description

An icing equipment package is available which allows flight in icing conditions as defined by the FAA. The package consists of the following: heated stall warning vane or optional heated angle-of-attack lift sensor vane; heated pitot head (one minimum required); electric propeller deice boots (including fuselage ice protection plates); wing (inboard and outboard), stabilizer and fin deice boots; electrical windshield heated panel (pilot's side only); heated static ports; left ice detection light and 100 - ampere alternators.

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.

SECTION 2 - LIMITATIONS

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 head (one minimum required).
3. Deice System Kit [Cessna drawing 5114400, Factory Kit (FK) No. 194].
 - a. Electric propeller deice boots.
 - b. Wing (inboard and outboard) stabilizer and fin deice boots (including left ice detection light).
 - c. Electrical anti-ice windshield heated panel (pilot's side only).
 - d. Heated static ports.
4. 100 - ampere alternators.

If the pilot's windshield is covered with ice, do not leave the electrical windshield anti-ice switch on for more than 20 seconds. Operation in excess of 20 seconds will cause an overheat condition which can result in failure of the windshield heating element and/or permanent distortion of the windshield.

The electrical windshield must be on HIGH with outside air temperature below -12°C (10°F) when in visible moisture.

REQUIRED PLACARDS:

1. MAGNETIC COMPASS DEVIATIONS GREATER THAN 10° CAN BE EXPECTED WHEN D.C. HEATED WINDSHIELD IS IN OPERATION.

SECTION 3 - EMERGENCY PROCEDURES

- A. If uneven deicing of propeller blades is indicated by excessive vibration:
1. Propellers - EXERCISE to MAX RPM.
 2. Propeller Ammeter - CHECK for proper operation by periodic fluctuations within the green arc.
 3. If reading is below the green arc indicating that the propeller blades may not be deicing uniformly:
 - a. Propeller Deice Switch - OFF.
 4. If ammeter reading for either propeller is below the green arc, indicating the propeller blades may not be deicing uniformly:
 - a. PROP DEICE Circuit Breaker - PULL L or R circuit breaker as required.
 5. If vibration continues, leave icing conditions as soon as possible.

CAUTION

Do not operate propeller deice for prolonged periods when propellers are not turning.

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

SECTION 4 - NORMAL PROCEDURES

- A. Preflight Inspection
1. Pitot Heat Switch(es) - ON 20 seconds - OFF (Ensure Pitot Covers Are Removed).
 2. Stall and Vent Heat Switch - ON 20 seconds - OFF.
 3. Deice Boots - CHECK for tears, abrasions, and cleanliness.
 4. Fuel Vents - CLEAR.
 5. Pitot Tube(s) - CLEAR and WARM.
 6. Static Ports - CLEAR and WARM.

CAUTION

Do not operate system heaters for prolonged periods on the ground.

NOTE

Stall and vent heat switch operates stall vane heater or optional angle-of-attack lift sensor vane, and static port heaters. Pitot heat switch operates pitot heater(s).

B. Before Takeoff

1. Surface Deice Switch - ACTUATE. Visually check operation of boots and annunciator light ON.

NOTE

Positioning the surface deice switch to ACTUATE will result in one complete inflation and deflation cycle lasting approximately 45 seconds.

2. Propeller Deice Switch - ON momentarily. Check propeller ammeter.

NOTE

Proper operation of propeller deice system is indicated by periodic fluctuations, within the green arc, on the propeller ammeter.

3. Electrical Windshield

- Anti-Ice Switch - HIGH momentarily. Check voltammeter for discharge and WINDSHIELD annunciator light for illumination.

NOTE

Turn off windshield anti-ice switch as soon as the voltammeter and the annunciator light have been checked.

C. Inflight

1. Before visible moisture is encountered with outside air temperature below 4.4°C (40°F):
 - a. Pitot Heat Switch - ON.
 - b. Stall and Vent Heat Switch - ON.
 - c. Propeller Deice Switch - ON.

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.

- d. Electrical Windshield Anti-Ice Switch - LOW with outside air temperature above -12°C (10°F). HIGH with outside air temperature below -12°C (10°F).

NOTE

- When using the electrical windshield on LOW, correct indicated outside air temperature (see Section 5 for ram air temperature rise correction) for your particular altitude and airspeed to ensure the outside air temperature is not below -12°C (10°F).
- If ice begins to accumulate on the heated portion of the windshield while operating on LOW, switch to HIGH.
- After icing conditions are encountered with the windshield on HIGH, do not use LOW until the entire heated portion of the windshield is clear of ice.
- The magnetic compass will not be reliable with the electrical heated windshield in operation.

2. During Icing Encounters:

- a. Surface Deice Switch - ACTUATE when ice accumulates between 1/4 to 1/2 inch. Repeat as necessary, allowing at least 45 seconds between actuations.

NOTE

Accumulation of 1/2 inch of ice can cause a cruise speed reduction of up to 30 knots as well as heavy buffet and a significant stall speed increase. Increase power as required to maintain desired airspeed.

D. After Landing

1. Electrical Windshield Anti-Ice Switch - OFF.

SECTION 5 - PERFORMANCE

- A. When climbing through areas of light to moderate icing conditions, use cruise climb airspeeds and maximum climb power (full power) settings to preclude ice buildup on the fuselage undersurface and lower wing surfaces and minimize the exposure time to icing conditions.
- B. During prolonged icing encounters in cruise, increase engine power to 75% or greater to maintain cruise speed as ice accumulates on the unprotected areas and preclude ice buildup on the fuselage under surface and lower wing surfaces.
- C. Prestall buffet and stall speeds increase slightly when deice boots are actuated. Maintain extra speed, especially during an approach, before actuating the boots.
- D. Maintain extra airspeed on approach to compensate for the increased prestall buffet associated with ice on the unprotected areas and the increased weight. Maintaining extra airspeed on approach will increase the landing distance.
- E. Airplane general performance is decreased with ice on the unprotected areas.

FIRE DETECTION AND EXTINGUISHING SYSTEM

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the fire detection and extinguishing system.

Description

The fire detection and extinguishing system consists of three major components: three heat sensitive detectors located in each engine accessory compartment; an annunciator and actuator panel; see Figure 2; and a compressed Freon single-shot gas bottle in each engine accessory compartment

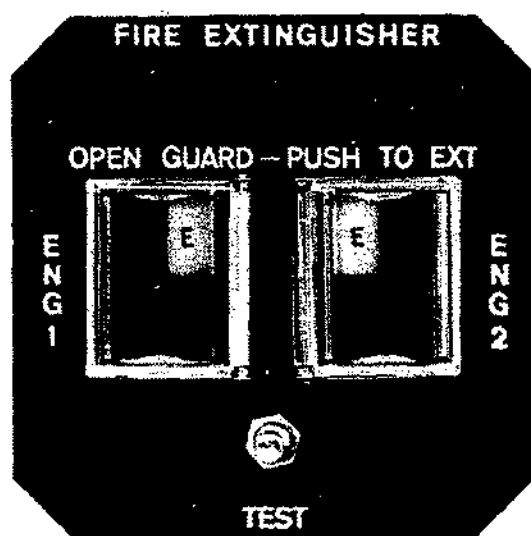
A test function is provided to test the bottle firing cartridge and annunciator lights. When the test switch is pushed, all lights should illuminate; if any light fails to illuminate, replace the bulb. If the green light does not illuminate, check the bottle pressure gages for correct pressure as shown in Figure 1. If the bottle pressure is adequate, replace the firing cartridge in the fire extinguisher. Any other light failure, after replacing bulbs and firing cartridge, indicates a malfunction in the unit or associated wiring.

AMBIENT TEMPERATURE Vs RECOMMENDED PRESSURE

Ambient Temperature-°C	-40.0	-28.9	-17.8	-6.7	+4.4	+15.6	+26.7	+37.8	+48.9
Ambient Temperature-°F	-40	-20	0	+20	+40	+60	+80	+100	+120
Recommended Operating Pressure-PSIG	127 to 155	148 to 180	174 to 212	207 to 251	249 to 299	304 to 354	367 to 417	442 to 492	532 to 582

Figure 1

FIRE DETECTION AND EXTINGUISHING SYSTEM



ANNUNCIATION		
LEGEND	COLOR	CAUSE OF ILLUMINATION
FIRE	RED	FIRE CONDITION EXISTING IN ENGINE COMPARTMENT
E	AMBER	FIRE EXTINGUISHER CONTAINER EMPTY
OK	GREEN	FIRE CARTRIDGE AND ASSOCIATED WIRING IS IN OPERATIONAL CONDITION

Figure 2

If an overheat condition is detected, the appropriate FIRE light will annunciate the engine to be extinguished. To activate the extinguisher, open the guard for the appropriate engine and press the FIRE light. Freon, under pressure, will be discharged to the engine and engine accessory compartments. The amber light E will illuminate after the extinguisher has been discharged and will continue to show empty until a new bottle is installed. The FIRE light will remain illuminated until compartment temperatures cool.

SECTION 2 — LIMITATIONS

Not Applicable.

SECTION 3 — EMERGENCY PROCEDURES

If a fire warning light indicates an engine compartment fire and is confirmed or if a fire is observed without a fire warning light:

1. Both Auxiliary Fuel Pumps - OFF.
2. Operative Engine Fuel Selector - MAIN TANK (Feel For Detent).
3. Emergency Crossfeed Shutoff - OFF (Pull Up).
4. Appropriate Engine - SECURE.
 - a. Throttle - CLOSE.
 - b. Mixture - IDLE CUT-OFF.
 - c. Propeller - FEATHER.
 - d. Fuel Selector - OFF (Feel For Detent).
 - e. Cowl Flap - CLOSE.
 - f. Open the appropriate guard and push FIRE light.
- g. Magnetos - OFF.
- h. Propeller Synchrophaser - OFF (Optional System).
- i. Alternator - OFF.
5. Cabin Heater - OFF.
6. Land as soon as practical.

NOTE

Best results may be obtained if the airflow through the nacelle is reduced by slowing the airplane (as slow as practical) prior to actuating the extinguisher.

SECTION 4 — NORMAL PROCEDURES

A. Before Takeoff

1. Test Switch - PRESS. All lights should illuminate.

SECTION 5 — PERFORMANCE

Not Applicable.

FUEL FLOW INDICATING SYSTEM

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the electronic fuel flow indicating system.

Description

The electronic fuel flow indicating system consists of a dual needle indicator and a fuel flow transducer for each engine. The flow transducer generates electrical pulses, which represents a measure of fuel flow rate, and transmits these pulses to the indicator as input frequency. The indicator then converts the frequency signals into an analog output which is displayed by the indicator as fuel flow rate in pounds per hour. These gage markings are predicated on the use of 100 grade aviation fuel. Increase fuel flow 2% above markings when 100LL grade aviation fuel is used. In addition, these pulses provide information to a totalizer within the indicator. The totalizer indicates the quantity of fuel remaining or consumed, even if power is removed from the normal power input circuit.

The electronic fuel flow indicator has a digital totalizer, a DIM/CLR knob and a counter switch. The totalizer displays either the fuel remaining or the fuel consumed for both the left and right engines or full tanks. The DIM/CLR knob controls the light intensity of the totalizer and resets the totalizer counter to zero. The counter switch is used to set 10-pound and 100-pound increments of fuel for totalizer use.

NOTE

If the "memory" voltage is interrupted, such as when the airplane battery is removed and reinstalled, the totalizer display will not indicate accurately until the counter has been reset.

SECTION 2 — LIMITATIONS

Same as standard fuel flow gage contained in Section 2 of this manual.

SECTION 3 — EMERGENCY PROCEDURES

Not Applicable.

SECTION 4 — NORMAL PROCEDURES

A. Preflight Inspection

1. Counter Switch - ACTUATE until totalizer reads equal to the amount of fuel in the tanks if a fuel remaining reading is desired.
2. DIM/CLR Switch - CLR if a fuel consumed reading is desired.

NOTE

If fuel is added before a flight, insure that the totalizer is adjusted to reflect the additional fuel.

SECTION 5 — PERFORMANCE

Not Applicable.

MANUALLY ADJUSTABLE SEAT

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the manually adjustable seats.

Description

The manually adjustable pilot and copilot seats are secured to seat pan assemblies which are attached to the forward main spar carry-thru structure. The seats may be adjusted fore and aft, vertically and tilted to any desired position within the limits of the seat by using the controls located on the front of the seat, see Figure 1.

An optional lumbar support is available for the pilot's and copilot's seat backs. The support is designed to provide increased comfort during long flights. The support is basically an air-tight, foam-filled cushion which can be adjusted in size and shape as governed by external forces and the operation of the bleed valve.

MANUALLY ADJUSTABLE SEAT CONTROLS

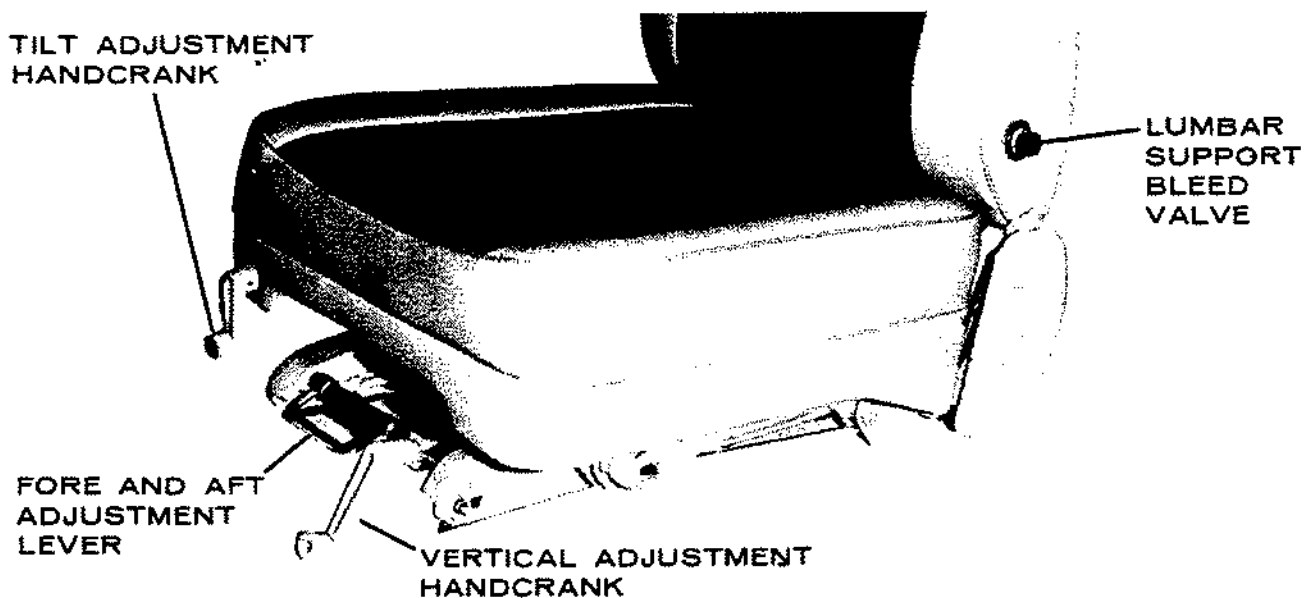


Figure 1

SECTION 2 — LIMITATIONS

Not Applicable.

SECTION 3 — EMERGENCY PROCEDURES

A. Loss of Cabin Pressure

1. Lumbar Support Bleed Valve - PRESS as required to decrease inflation.

SECTION 4 — NORMAL PROCEDURES

Controls for the manually adjustable seats, see Figure 1, are located at the forward side of the seat. Rotating the handcrank, located at the forward right corner of the seat, tilts the back. Rotating the handcrank, located at the forward left corner of the seat, raises and lowers the seat. The fore and aft adjustment lever is located at the forward side of the seat near the center. It is recommended that the seat be moved to the aft position prior to making tilt or vertical adjustments, to provide maximum handcrank clearance.

With the optional lumbar support installed and the seat adjusted as desired, lean back in a comfortable position and press the lumbar support bleed valve as required to achieve the desired level of support. During a climb to high altitude, cabin pressure will slowly decrease relative to the air pressure in the lumbar support, thus the support will expand. This can be corrected by bleeding off the excessive expansion by pressing the lumbar support bleed valve as required. During descents, the cabin pressure will slowly increase relative to the air pressure in the lumbar support, thus the support will contract. This can be corrected by unloading the seat back and pressing the bleed valve as required.

SECTION 5 — PERFORMANCE

Not Applicable.

PROPELLER DEICE SYSTEM

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the propeller deice system.

Description

The propeller deice system consists of electrically heated boots on the propeller blades. Each boot consists of an inboard and outboard heating element, which receive their electrical power through a deice timer. To reduce power drain and maintain propeller balance, the timer directs current to the propeller boots in cycles between elements and between propellers.

The timer directs current to the propeller boots in cycles between boot elements and between propellers in the following sequence:

- Heating Period No. 1 - Outboard Halves - right engine blades.
- Heating Period No. 2 - Inboard Halves - right engine blades.
- Heating Period No. 3 - Outboard Halves - left engine blades.
- Heating Period No. 4 - Inboard Halves - left engine blades.

Each heating period lasts approximately 20 seconds.

A reading below the green arc on the propeller deice ammeter indicates that the blades of the propeller are not being deiced uniformly.

WARNING

When uneven deicing of the propeller blades is indicated, it is imperative that the deice system be turned OFF. Uneven deicing of the blades can result in propeller unbalance and engine failure.

Abnormal operation of the propeller deice system is indicated by the deice switch breaker tripping to the OFF position. Failure of the switch breaker to stay reset indicates that deicing is impossible for the propellers.

SECTION 2 — LIMITATIONS

Not Applicable.

SECTION 3 — EMERGENCY PROCEDURES

- A. If uneven deicing of propeller blades is indicated by excessive vibration:
1. Propellers - EXERCISE to MAX RPM.
 2. Propeller Ammeter - CHECK for proper operation by periodic fluctuations within the green arc. If reading is below the green arc indicating that the propeller blades may not be deiced uniformly:
 - a. Propeller Deice Switch - OFF.

CAUTION

Do not operate propeller deice for prolonged periods when propellers are not turning.

SECTION 4 — NORMAL PROCEDURES

- A. Preflight Inspection
1. Propeller Heating Elements - CHECK condition and attachment.
- B. Before Takeoff
1. Propeller Deice Switch - ON momentarily. Check propeller ammeter.
- C. Inflight
1. Propeller Deice Switch - ON before entering visible moisture with outside air temperature below 4.4°C (40°F).

NOTE

Energizing the propeller deice system early in icing conditions will prevent ice build up which will be thrown off and can chip the fuselage paint.

2. Leave icing conditions as soon as possible if airplane is not equipped for flight in icing conditions.

NOTE

Since propeller deice boots alone do not provide adequate protection for the entire airplane, icing conditions should be avoided whenever possible unless the airplane is equipped for flight in icing conditions. Refer to Ice Protection Equipment (Flight In Icing Conditions) supplement for details. If icing is encountered, close attention should be given to the pitot-static system, propellers, induction systems, wing and stabilizer leading edges and other components subject to icing.

SECTION 5 — PERFORMANCE

Not Applicable.

YAW DAMPER

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the yaw damper system.

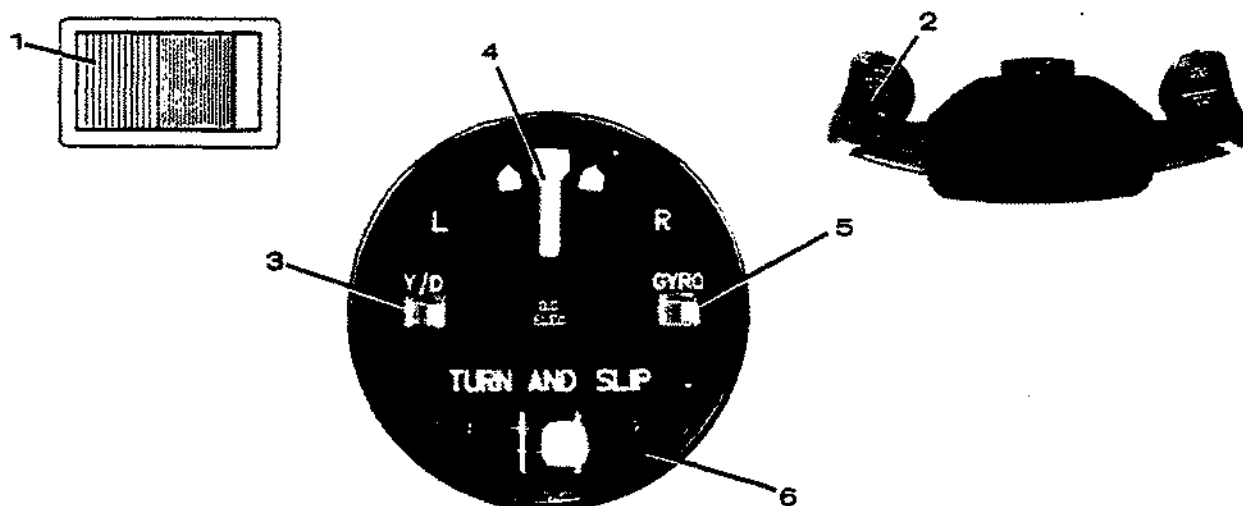
Description

The yaw damper is an independent system that may be engaged at any time regardless of the state of the autopilot or flight director. When engaged, the yaw damper provides yaw axis stabilization. The panel-mounted gyro computer turn-and-slip indicator, see Figure 1, provides yaw rate signals to operate the rudder servo. If an 800B Integrated Flight Control System is installed, the yaw damper is automatically engaged with the basic autopilot engagement and cannot be disengaged with the autopilot ON except by pulling the YAW DAMP circuit breaker.

NOTE

The flags in the turn-and-slip indicator will retract whenever power is applied to this unit.

YAW DAMPER CONTROLS AND INDICATOR



1. YAW DAMPER ON-OFF SWITCH - Turns yaw damper on and holds it on until switch is turned off or control wheel autopilot disengage switch is depressed.
2. CONTROL WHEEL
AUTOPILOT/ELECTRIC ELEVATOR
TRIM DISENGAGE SWITCH (RED) - When depressed, turns yaw damper off.
3. Y/D FLAG - When yellow flag disappears, indicates power is supplied to the yaw damper computer.
4. RATE-OF-TURN POINTER - Indicates rate and direction of airplane yaw movement.
5. GYRO FLAG - When red flag disappears, indicates power is applied to the gyro.
6. SLIP INDICATOR - Indicates slip or skid when ball is displaced from center.

Figure 1

SECTION 2 — LIMITATIONS

- A. Disengage yaw damper if malfunction occurs.
- B. Required Placards:
 - 1. On Circuit Breaker Panel:
 - a. "YAW DAMP"
 - 2. Near Yaw Damper Switch:
 - a. "YAW DAMP-ON-OFF"
 - b. If yaw damper switch is located on the autopilot control head, change item "a" to "YAW ON."
 - 3. On Pilot's Control Wheel:
 - a. "AUTOPILOT - DISENGAGE" (also disengages yaw damper).

SECTION 3 — EMERGENCY PROCEDURES

- A. Hardover Rudder Deflection
 - 1. Rudder - OVERPOWER. Requires approximately 70 pounds.
 - 2. Autopilot Disengage Switch - DISENGAGE.
 - 3. Yaw Damper Circuit Breaker - PULL.
 - 4. If optional autopilot installed - REENGAGE if desired.
- B. Excessive Rudder Forces (Gear Train Jammed)
 - 1. Rudder pedal forces in excess of normal control forces required to overpower the slip clutch in the event of a jammed servo actuator will not exceed 70 pounds.

SECTION 4 — NORMAL PROCEDURES

- A. Engagement
 - 1. Yaw Damper ON-OFF Switch - ON. With 800B Integrated Flight Control System installed, the yaw damper is automatically engaged with the autopilot.
 - 2. Gyro and Y/D Flags - VERIFY that both are out of view.
- B. Disengagement
 - 1. Autopilot Disengage Switch - DISENGAGE (Or)
 - 2. Yaw Damper ON-OFF Switch - OFF. With 800B Integrated Flight Control System installed, the yaw damper is disabled by pulling the YAW DAMP circuit breaker.

SECTION 5 — PERFORMANCE

Not Applicable.

400 ENCODING ALTIMETER (TYPE EA-401A)

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the 400 encoding altimeter.

Description

The Cessna 400 encoding altimeter (Type EA-401A) 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 Air Traffic Control Radar Beacon System transponder in the airplane to generate replies to Mode C (altitude reporting) interrogations from the ground controller.

The 400 encoding altimeter, see Figure 1, 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. Friction-induced lag and jumping of the display is reduced by the use of a combined aneroid sensor and motor-driven display. Electronic damping circuits in the unit insure that the display follows altitude changes rapidly with no overshoot. When power is removed from the altimeter, a striped warning flag appears across the digital altitude display to indicate a "power-off" condition.

Except for setting pressure, operation of the altimeter is completely automatic. Ambient atmospheric pressure, set into the altimeter with a manually operated baroset knob, is displayed on a four-digit readout, either in inches of mercury or in millibars (as ordered). The pressure 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 millibars).

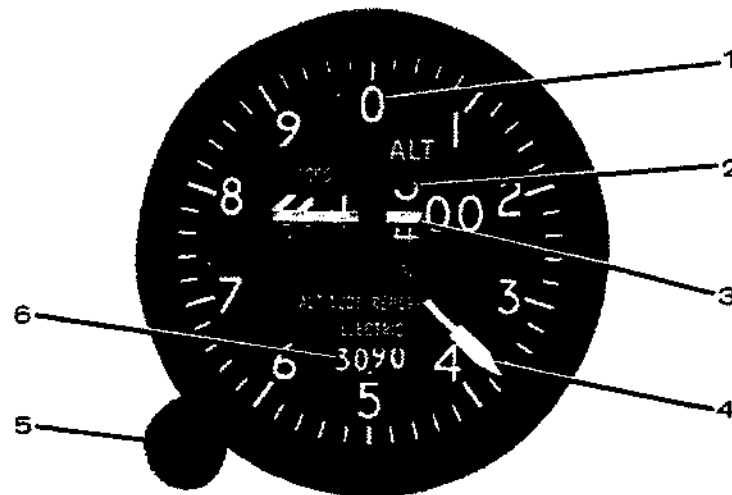
SECTION 2 — LIMITATIONS

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

SECTION 3 — EMERGENCY PROCEDURES

- A. Encoding Altimeter Failure (Warning Flag Showing)
 - 1. ALT Circuit Breaker - CHECK IN.
 - 2. If warning flag is still showing, use the standby barometric altimeter.

400 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. POWER-OFF WARNING FLAG - Appears across altitude readout when power is removed from altimeter to indicate that readout is not reliable.
4. 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 (ones, tens and hundreds).
5. BAROSET KNOB - Used to set in atmospheric pressure; clockwise rotation increases pressure setting, counterclockwise rotation decreases pressure setting.
6. ATMOSPHERIC PRESSURE READOUT - Displays atmospheric pressure set into the altimeter with the baro set knob on the four-digit counter.

Figure 1

SECTION 4 — NORMAL PROCEDURES

A. Altimeter Operation

1. Baroset Knob - TURN as necessary to set readout to required pressure.
2. Power Off Warning Flag - VERIFY that flag is not in view.

WARNING

Do not attempt to use altimeter indication for flight information if warning flag is in view. Flag indicates that power has been removed from the altimeter.

3. Altitude Display - Below 1000 feet, read altitude on display pointer and dial. Above 1000 feet, read altitude on altitude readout plus pointer and dial indication for last two digits (for example, for an altitude of 12,630 feet, read 12,600 feet on readout and read 30 feet on pointer and dial).

B. Altitude Encoding Operation.

Operation of the altitude encoding function of the altimeter is completely automatic as soon as power is applied to the altimeter and the warning flag is out of view. However, for transmission of the altitude information to the ground controller, the Mode C (ALT) function must be selected on the transponder.

SECTION 5 — PERFORMANCE

Not Applicable.

800 ALTITUDE ENCODING/ALERTING/PRESELECT (TYPE EA-801A)

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the 800 encoding altimeter.

Description

The Cessna 800 encoding altimeter (Type EA-801A) is an electrically driven instrument that senses airplane altitude and provides the pilot with a visual display of the altitude. It also includes an optical encoder which automatically produces a logic code corresponding to the sensed altitude. This code is supplied to the Air Traffic Control Radar Beacon System transponder in the airplane to generate replies to Mode C (altitude reporting) interrogations from the ground controller. A second altitude information output from the altimeter can be coupled to airplane accessory equipment such as an altitude alerter or an autopilot altitude preselector circuit.

The altitude alerter (Type AA-801A) is an accessory unit used with the 800 encoding altimeter to supply a preselected altitude capture signal to arm the altitude hold function of the Integrated Flight Control System. It also provides visual and aural warnings when the airplane deviates from the selected altitude.

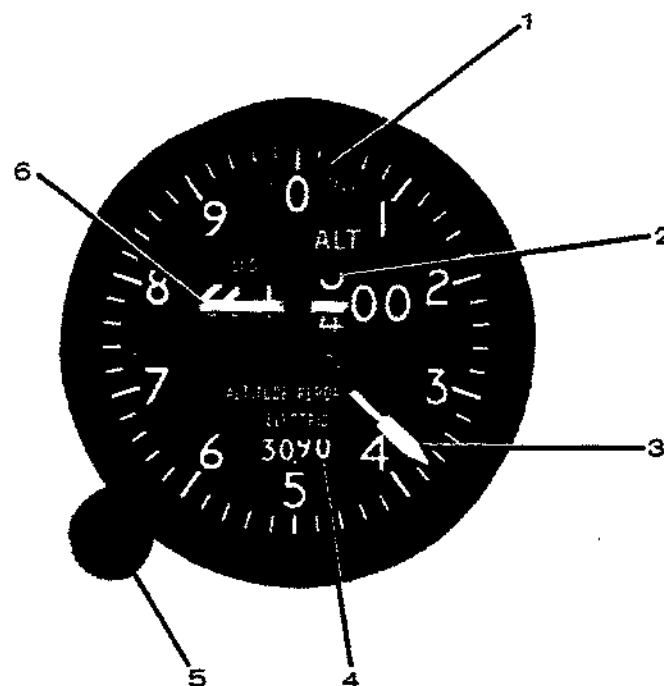
The encoding altimeter is a panel-mounted barometric altimeter with an altitude range of -1000 to +35,000 feet. Altitude is displayed by a dial and a digital readout. The dial is graduated in 10 numerical divisions which represent increments of 100 feet, with subdivision markings for every 20 feet; the 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. Friction-induced lag and jumping of the display is reduced by the use of a combined aneroid sensor and motor-driven display. Electronic damping circuits in the unit insure that the display follows altitude changes rapidly with no overshoot. When power is removed from the altimeter, a striped warning flag appears across the digital altitude display to indicate a "power-off" condition.

Ambient atmospheric pressure 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). The pressure 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.

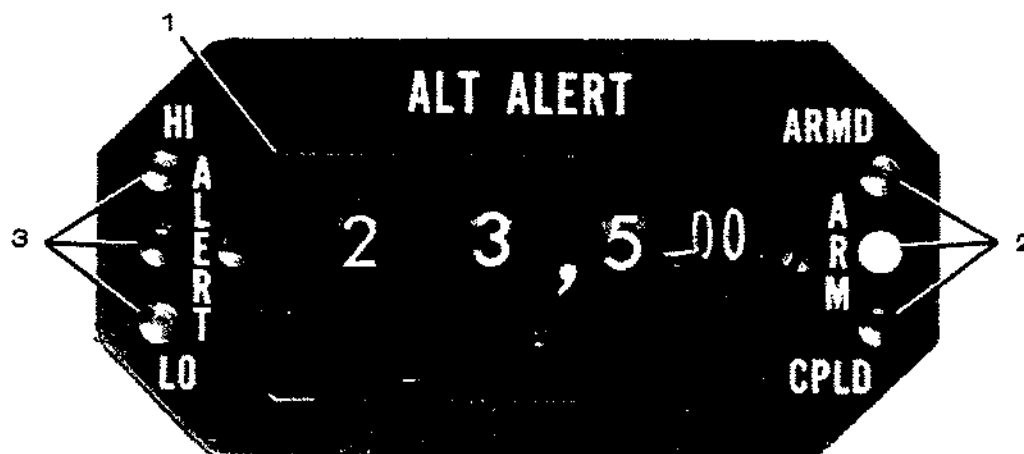
ENCODING ALTIMETER INDICATOR



1. ZERO-TO-THOUSAND FOOT
ALTITUDE DISPLAY DIAL - Calibrated in 10 numerical graduations which represent increments of 100 feet; the subdivisions of each graduation represent 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 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 last three digits of altitude (ones, tens, and hundreds).
4. ALTIMETER SETTING READOUT - Displays altimeter setting set into altimeter with baro set knob on a four-digit counter.
5. BAROSET KNOB - Used to set in local altimeter setting; clockwise rotation increases 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.

Figure 1

ALTITUDE ALERTER INDICATOR



1. ALTITUDE SELECTOR AND DISPLAY - Minilever switches (3) select desired altitude between 100 and 35,000 feet in 100-foot increments. Digital readout displays selected altitude.
2. ALTITUDE CAPTURE CONTROL AND INDICATORS - Selector switch and two-lamp indicator which operate as follows:
 - a. ARM Pushbutton Switch - Arms altitude capture function of Alserter, provided Integrated Flight Control System is turned on and not already engaged in a vertical mode (Altitude hold or glide slope coupled).
 - b. ARMD Amber Lamp - Lights when ARM pushbutton switch is pushed in and altitude capture function is enabled.
 - c. CPLD Green Lamp - Lights when airplane reaches selected altitude and Integrated Flight Control System altitude hold mode is automatically engaged.
3. ALTITUDE ALERT INDICATOR - Three-lamp indicator which operates within a preestablished range on either side of the selected altitude, as follows:
 - a. ALERT Green Lamp - Lights when airplane altitude is within 300 feet of the selected altitude.
 - b. HI ALERT Amber Lamp - Lights when airplane altitude is between 300 and 1000 feet above the selected altitude.
 - c. LO ALERT Amber Lamp - Lights when airplane altitude is between 300 and 1000 feet below the selected altitude.
 - d. ALT ALERT Amber Lamp - This remotely located lamp illuminates when either the HI ALERT or LO ALERT lamps illuminate.

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 glide slope 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 flight director mode selector lights to indicate that 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.

SECTION 2 — LIMITATIONS

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

SECTION 3 — EMERGENCY PROCEDURES

- A. Encoding Altimeter Failure (Warning Flag Showing)
1. ENC ALT Circuit Breaker - CHECK IN.
 2. If warning flag is still showing, use the standby barometric altimeter.

SECTION 4 — NORMAL PROCEDURES

- A. Altimeter Operation
1. Baroalt Knob - TURN as necessary to set readout to local altimeter setting.
 2. Power-off Warning Flag - VERIFY that flag is not in view.

WARNING

Do not attempt to use altimeter indication for flight information if warning flag is in view. Flag indicates that power has been removed from altimeter.

3. Altitude Display - Below 1000 feet, read altitude on display pointer and dial. Above 1000 feet, read altitude on altitude readout plus pointer and dial indication for last two digits (for example, for an altitude of 12,630 feet, read 12,600 feet on readout; read 30 feet on pointer and dial).

B. Altitude Encoding and Accessory Operation

Operation of the altitude encoding and accessory information functions of the altimeter is completely automatic as soon as power is applied to the altimeter and the warning flag is out of view. However, for transmission of the altitude information to the ground controller, the Mode C (ALT) function must be selected on the transponder.

C. Altitude Alert

NOTE

The altitude alerter must be used with a properly functioning 800 encoding altimeter for all operation.

During flight, altitude alert operation of the altitude alerter is automatic within the preestablished alert range. Operation may be verified on the ground as follows:

1. Apply power to the equipment. Altimeter power-off warning flag should disappear.
2. Set altitude selector switches to slightly more than 1000 feet above the altitude indicated on the encoding altimeter. Altitude is displayed on readout.
3. Begin to turn altimeter baroset knob to set altimeter reading to agree with selected altitude. When altitude reading reaches lower limit of alert range, one-second tone is heard and amber LO ALERT lamp lights.
4. Continue to turn baroset knob for selected altitude. When altitude reading is within altitude tolerance of alerter, the LO ALERT lamp goes out and the green ALERT lamp lights.
5. Turn baroset knob for altitude above altitude tolerance of alerter. Green lamp goes out, one-second tone is heard, and amber HI ALERT lamp lights.
6. Continue to turn baroset knob until altitude reading is above alert range. Just as altitude leaves alert range, the HI ALERT lamp goes out.
7. Turn off power; power-off warning flag appears.
8. Turn baroset knob to reset altimeter as required.

D. Altitude Capture

Altitude capture operation may be verified on the ground as follows:

1. Turn on airplane power. Power-off warning flag on altimeter should disappear.
2. Turn on Integrated Flight Control System and verify that a vertical mode is not selected.
3. Set altitude selector switches to desired altitude; altitude is displayed on readout.
4. Push in ARM pushbutton switch. Amber ARMD lamp lights.
5. Turn altimeter baroset knob to set altimeter reading to displayed alerter altitude. When altimeter is set, ARMD lamp goes out and green CPLD lamp lights. The altitude hold indicator lamp on the flight director mode selector will also light.
6. Turn off power. Power-off warning flag appears and all indicator lamps go out.
7. Turn baroset knob to reset altimeter as required.

E. Altitude Capture Operating Notes

1. If the altitude selector switches are moved to a new position after the ARM pushbutton has been pushed in but before the altitude is captured, the alerter logic is reset and the ARM pushbutton must be pushed again to enable the new altitude.
2. After altitude capture, and altitude hold mode is established; if the airplane leaves the selected altitude, the green CPLD lamp will remain lit. The altitude deviation will be indicated by the altitude ALERT lamps and the discrepancy between the selected altitude displayed on the alerter and the airplane altitude displayed by the altimeter.
3. If the altitude selector switches are set to a different altitude after altitude capture, the Integrated Flight Control System will remain in the altitude hold mode but the green CPLD lamp will go out to indicate that the altitude displayed is not the altitude at which the airplane is being held.
4. If altitude hold is manually selected on the flight director mode selector prior to automatic altitude capture, the ARMD lamp will go out, the CPLD lamp will not light, and the capture logic circuits will have to be reset for the next use. The function may be reset after altitude hold is disengaged.

SECTION 5 — PERFORMANCE

Not Applicable.

400 AREA NAVIGATION SYSTEM (TYPE RN-478A)

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the 400 area navigation system.

Description

The Cessna 400 area navigation system (Type RN-478A) consists of an RN-478A area NAV computer (RNAV), a compatible VHF navigation receiver and course deviation indicator and the Type R-476A distance measuring equipment (DME). The RNAV includes converter circuits which operate with the VHF navigation receiver and produce positional information for display by the course deviation indicator. It also includes computer circuits which combine the bearing information from the navigation set with the distance information from the R-476A DME to establish navigation data for selected waypoints. During RNAV operation, a course scalloping suppressor circuit suppresses the spurious navigation signal phases to provide stable waypoint information which enhances autopilot operation.

The course scalloping suppression (radial straightening), may be used to an advantage while tracking inbound or outbound from the VOR station. These advantages may be obtained by programming a waypoint directly over the associated VOR (000.0°/ 000.0 nautical miles) and using RNAV for course smoothing while enroute.

The 400 RNAV includes storage for 3 waypoints.

A "Frequency Memory" voltage is provided so that the preset waypoints are not lost when the area navigation system 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 information for the RNAV display will be lost. Subsequent operation of the system, with the "Frequency Memory" voltage restored, will require reprogramming of waypoints.

All operating controls and displays which are part of the area navigation system are shown and described in Figure 1. Other controls required for operation of the area navigation system are included on the VHF navigation receiver and on the R-476A DME control; these controls are shown and described in the respective supplements included for this equipment. An indicator light is provided adjacent to or integral to the associated HSI or VOR-LOC indicator to denote RNAV operation.

SECTION 2 — LIMITATIONS

Not Applicable.

SECTION 3 — EMERGENCY PROCEDURES

Not Applicable.

400B NAV-O-MATIC AUTOPILOT SYSTEM (TYPE AF-550A)

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the 400B Nav-O-Matic autopilot system.

Description

The 400B Nav-O-Matic autopilot system is a two-axis autopilot system that controls the ailerons and elevators to maintain the airplane in a desired attitude. A horizon gyro and directional gyro are provided to display attitude and heading. An optional HSI, see Figure 3, can be installed in place of the directional gyro.

All controls and indicators necessary to properly operate the autopilot are shown in Figures 1 and 2, except for the autopilot disconnect test button, the autopilot off light, the back course selector switch and the navigation receiver selector switch.

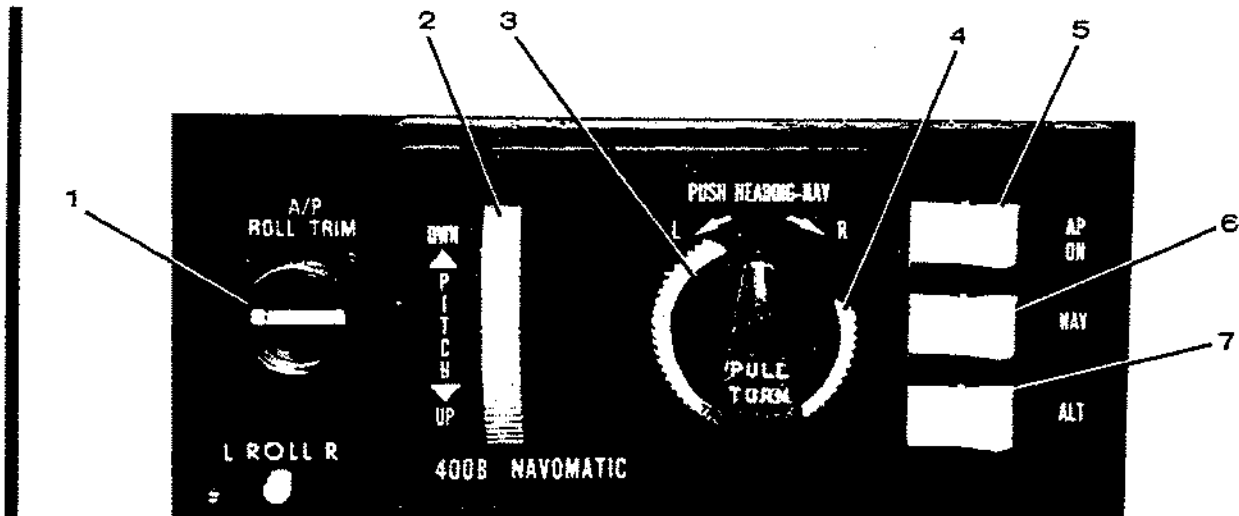
An automatic autopilot disengage function is provided which automatically disengages the autopilot anytime the airplane pitches up or down more than a normal amount from a level flight attitude. The operational capability of the disengage function should be tested before takeoff by pressing the autopilot disconnect test button, located adjacent to the autopilot control head. When the test button is pressed with the autopilot engaged, a test voltage is inserted into the autopilot, causing slight aft control column movement and autopilot disengagement. Do not press this button in flight. Inflight actuation of the test button with the autopilot engaged will cause the airplane to pitch up sharply and disengage the autopilot.

The autopilot off (A/P OFF) light, located adjacent to the horizon gyro, will illuminate when the autopilot is disengaged by any means other than the airplane control wheel disengage switch. Whenever the autopilot is disengaged by any means, 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 autopilot disengage switch.

The back course selector switch, located on the left instrument panel, is only used when conducting localizer approaches. With the navigation receiver set to a localizer frequency, positioning the switch to BACK COURSE will reverse the appropriate signals to provide for back course operation for either autopilot or manual flight. Except with an HSI type indicator, selecting BACK COURSE causes reversal of the course deviation indicator indication, whether or not the autopilot is being used.

The navigation receiver selector switch, located on the left instrument panel when dual navigation receivers are installed, allows the autopilot to operate in conjunction with either navigation receiver. If a non-slaved directional gyro is installed, no course datum information is available.

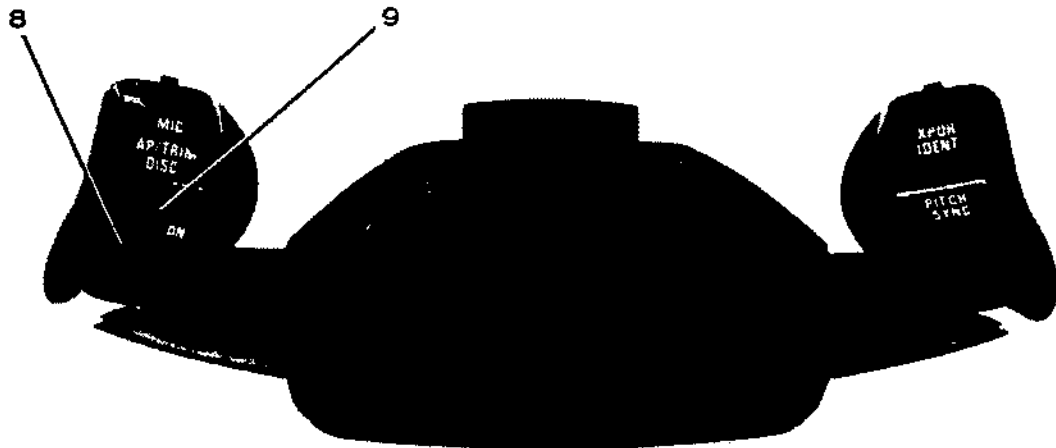
AUTOPILOT CONTROL HEAD AND AIRPLANE CONTROL WHEEL



1. AUTOPILOT PITCH COMMAND WHEEL - Controls pitch attitude of the airplane. Rotating up, commands airplane pitch up proportional to rotation of the wheel. Rotating down, commands airplane pitch down.
2. 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. Indicator is active with autopilot and/or flight director engaged or disengaged.
3. AUTOPILOT TURN COMMAND KNOB - When knob is pulled out in the center detent position, the knob can be rotated left or right which will command a left or right bank. The control knob when pushed in, sets the autopilot in directional gyro heading or navigation mode if either are selected.
4. AUTOPILOT LATERAL TRIM CONTROL - When the autopilot turn command knob is pulled out and centered, with no lateral modes engaged and the airplane manually trimmed for existing flight conditions, the control is used to trim the autopilot for a wings level attitude.
5. AUTOPILOT ON-OFF SWITCH - Controls primary power to autopilot.

Figure 1 (Sheet 1 of 2)

AUTOPILOT CONTROL HEAD AND AIRPLANE CONTROL WHEEL



6. AUTOPILOT NAVIGATION

ENGAGE SWITCH - Pressing the NAV side of the switch with the autopilot turn command knob pushed in provides capture and track of VOR (omni) or LOC (localizer) signals, depending upon the selected navigation receiver frequency, and RNAV course, if installed. Pressing the left side of the switch resets the switch and returns autopilot directional control to the directional gyro HDG selector knob (heading bug). The navigation mode can also be disengaged by pulling the autopilot turn command knob.

7. ALTITUDE HOLD ENGAGE SWITCH - Commands the airplane to maintain the pressure altitude existing at the moment of selection. Engagement may be accomplished in climb, descent or level flight. This mode can be used with all lateral command modes. With the autopilot navigation mode engaged, altitude hold will automatically disengage when a glide slope signal is captured.

8. AIRPLANE CONTROL WHEEL

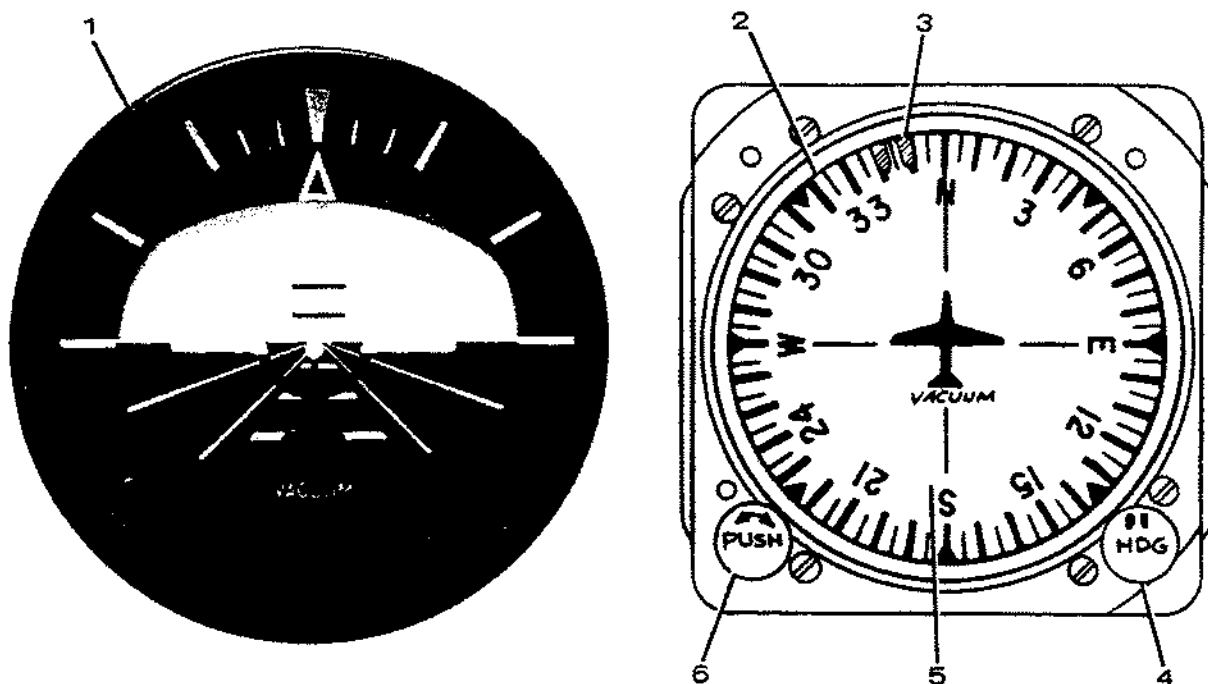
ELECTRIC TRIM SWITCH - When moved forward to the DN position, the elevator trim tab moves in the nose-down direction; conversely, moving the switch aft to the UP position moves the trim tab in the nose-up direction. The electric trim switch is inoperative when the autopilot is engaged.

9. AUTOPILOT/ELECTRIC ELEVATOR

TRIM DISENGAGE SWITCH (RED) - Disengages the autopilot and a short (1 to 2 seconds) tone with decreasing amplitude is heard in the cockpit. Disables the electric trim while the switch is depressed.

Figure 1 (Sheet 2 of 2)

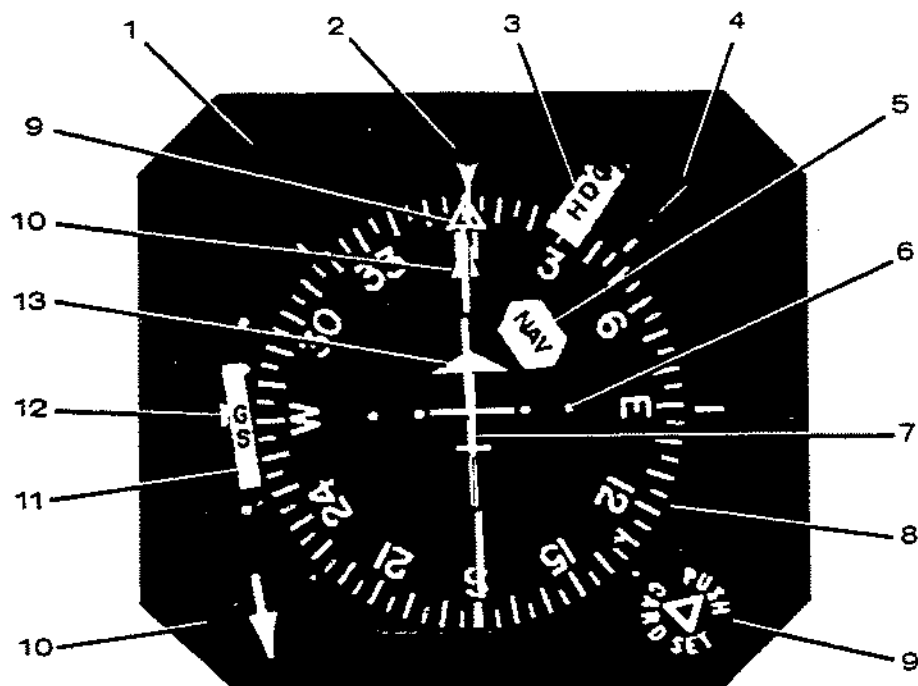
HORIZON AND DIRECTIONAL GYROS



1. HORIZON GYRO - Displays airplane attitude as a conventional attitude gyro. The roll reference scale indicates 0, 10, 20, 30, 60 and 90° of bank.
2. DIRECTIONAL GYRO - The unslaved directional gyro, or optional slaved directional gyro, displays heading of the airplane when properly set to agree with the magnetic compass.
3. HEADING BUG - Displays the selected heading relative to the compass card.
4. HEADING SELECTOR KNOB - The heading bug is positioned by rotating the directional gyro HDG selector knob.
5. COMPASS CARD - Rotates to display airplane heading.
6. COMPASS CARD KNOB - When pushed in, allows manual setting of the compass card to agree with the magnetic compass. The unslaved directional gyro compass card must be reset periodically to compensate for precessional errors in the gyro.

Figure 2

HORIZONTAL SITUATION INDICATOR



1. HORIZONTAL SITUATION INDICATOR (HSI) - Provides a pictorial presentation of the airplane position relative to VOR radials, RNAV course, localizer and glide slope beams. It also gives heading reference with respect to magnetic north and provides selection of desired heading, VOR radials, RNAV course, and LOC runway heading.
2. HSI HEADING REFERENCE - Indicates airplane heading on compass card.
3. HSI HEADING FLAG - Flag in view indicates the heading data is not reliable.
4. 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).
5. HSI NAV FLAG - Flag in view indicates the NAV receiver signal being received is inadequate.

Figure 3 (Sheet 1 of 2)

HORIZONTAL SITUATION INDICATOR

6. HSI COURSE DEVIATION DOTS - Full scale course deviation bar displacement (2 dots) represents the following deviation from beam center; VOR $\pm 10^\circ$, localizer approximately $\pm 2^\circ$, RNAV enroute ± 5 nautical miles, RNAV approach $\pm 1\frac{1}{4}$ nautical miles.
7. HSI COURSE DEVIATION BAR - Displays displacement from the VOR, RNAV or localizer course center.
8. HSI COMPASS CARD - The compass card displays airplane heading. It is slaved to correct for normal precessional errors. Each graduation represents 5 degrees.
9. 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.
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, RNAV course or LOC runway heading. It rotates with the compass card.
11. HSI GLIDE SLOPE FLAG - Flag in view indicates glide slope receiver signal is inadequate.
12. HSI GLIDE SLOPE POINTER, SCALE AND FLAG - Displays deviation of airplane from an ILS glide slope. Flag obscures scale when the signal being received is not adequate. Full scale deflection of the glide slope pointer represents $\pm 0.7^\circ$.
13. HSI TO-FROM FLAG - Indicates direction of the VOR station relative to the selected course.

Figure 3 (Sheet 2 of 2)

SECTION 2 — LIMITATIONS

- A. Autopilot must be off for takeoff, landing and all operations with wing flaps down more than 15° .
- B. Approach VOR radial at an angle of 135° or less prior to engaging navigation mode.
- C. Approach localizer at an angle of 90° or less prior to engaging navigation mode.
- D. Approach glide slope from below.
- E. Disengage autopilot if malfunction occurs.
- F. Maximum speed for autopilot operation is 230 KIAS.

G. Required placards:

1. On Circuit Breaker Panel
 - a. "AUTOPILOT" - "COMP" - "ACT" - "WARN" (3 Circuit Breakers).
 - b. "ELECT TRIM"
2. Near Autopilot Control Head
 - a. "A/P TEST - BEFORE EACH FLT"
3. On Instrument Panel
 - a. "AUTOPILOT - NAV-1 - NAV-2"
 - b. "FRONT - BACK"
4. On Instrument Panel Near Autopilot Off Light (Near Horizon Gyro)
 - a. "A/P OFF"
5. On Pilot's Control Wheel
 - a. "AUTOPILOT - DISENGAGE"
 - b. "ELEV TRIM - DISENGAGE"
 - c. "UP-DN"

SECTION 3 — EMERGENCY PROCEDURES

A. Autopilot Malfunction

1. Elevator Or Aileron Control - OVERPOWER as required.
2. All Airplane Control Wheel Disengage Switches - DISENGAGE.

NOTE

- All airplane control wheel disengage switches should be simultaneously disengaged to prevent having to immediately distinguish between an autopilot or an electric elevator trim malfunction.
- Sustained elevator overpower will result in the autopilot trimming against the overpower force.

B. Engine Failure

1. Airplane Control Wheel Autopilot Disengage Switch - DISENGAGE.
2. Operative Engine - ADJUST as required.
3. Inoperative Engine - SECURE.
4. Trim Tabs - ADJUST.
5. Autopilot - REENGAGE if desired.

NOTE

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

- C. Possible altitude loss if autopilot malfunctions (includes altitude loss prior to pilot recognition):
1. Cruise Configuration - 600 feet.
 2. Approach Configuration - 200 feet.
- D. Airplane control wheel forces required to overpower the autopilot (prior to autopilot elevator trimming against the overpower force) will not exceed:
1. Elevator - 40 pounds.
 2. Aileron - 20 pounds.

- E. 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:
1. Elevator - 50 pounds.
 2. Aileron - 20 pounds.

SECTION 4 - NORMAL PROCEDURES

I. BEFORE TAKEOFF

- A. Autopilot Automatic Disconnect Check (With Engines Running And Gyros Erected)
1. Autopilot Turn Command Knob - PULL OUT and CENTER.
 2. Autopilot Lateral Trim Control - CENTER.
 3. Autopilot On-Off Switch - ON.

NOTE

The roll servo will engage immediately. The pitch servo will engage after pitch synchronization as evidenced by the autopilot pitch command wheel coming to rest.

4. Airplane Control Wheel - HOLD to reduce movement.
5. Autopilot Disconnect Test Button - PUSH and HOLD.
6. Verify the following:
 - a. Autopilot On-Off Switch - OBSERVE disengage.
 - b. Autopilot Off Light - OBSERVE illumination.
 - c. Autopilot Disengage Horn - OBSERVE 1 to 2 second aural tone.
7. Airplane Control Wheel
Autopilot Disengage Switch - PUSH to turn off the autopilot off light.

II. BASIC AUTOPILOT OPERATION

- A. Before Engagement
1. Airplane Elevator, Aileron And Rudder Trim - ADJUST.
- B. Engagement
1. Autopilot Turn Command Knob - PULL OUT and CENTER.
 2. Autopilot Lateral Trim Control - CENTER.
 3. Autopilot On-Off Switch - ON.
 4. Autopilot Lateral Trim Control - ADJUST.

NOTE

- Airplane rudder trim should be adjusted as required to center the turn and bank "ball". Airplane aileron trim may have to be readjusted to compensate for large airspeed changes.
- If the airplane will not maintain the correct attitude with the autopilot engaged; disengage the autopilot, manually retrim the airplane to obtain wings level with the turn and bank "ball" centered, then reengage the autopilot.

- C. Turn Commands
 - 1. Autopilot Turn Command Knob - PULL OUT and ROTATE as desired.
- D. Pitch Commands
 - 1. Altitude Hold Engage Switch - CHECK OFF.
 - 2. Autopilot Pitch Command Wheel - ROTATE as desired.
- E. Disengagement
 - 1. Autopilot On-Off Switch - OFF. (Or)
 - 2. Airplane Control Wheel Autopilot Disengage Switch - DISENGAGE.

NOTE

- If the autopilot is either disengaged with the control head on-off switch or is automatically disengaged due to a system malfunction, the autopilot off light will continuously illuminate and a 1 to 2 second aural tone will occur. The autopilot off light may be extinguished by cycling the airplane control wheel autopilot disengage switch.
- Normal autopilot disengagement should be conducted with the airplane control wheel autopilot disengage switch. The autopilot off light will not illuminate but the 1 to 2 second aural tone will occur.

III. ALTITUDE HOLD COUPLING

- A. Engagement
 - 1. Altitude Hold Engage Switch - ALT.
- B. Disengagement (Altitude Hold Coupling)
 - 1. Altitude Hold Engage Switch - OFF.

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

- Altitude hold mode should be disengaged before actuating the autopilot pitch command wheel. Autopilot pitch command wheel rotation will not disengage altitude hold mode.
- Altitude hold mode will automatically disengage on a coupled ILS approach when the glide slope is captured.

IV. HEADING SELECT FUNCTION

- A. Engagement
 - 1. Directional Gyro Heading Selector Knob - ROTATE bug to the desired magnetic heading.
 - 2. Autopilot Turn Command Knob - PUSH to engage.
 - 3. Directional Gyro Heading Selector Knob - ADJUST for any subsequent desired heading.
- B. Disengagement (Heading Select Function)
 - 1. Autopilot Turn Command Knob - PULL. (Or)
 - 2. Autopilot Navigation Engage Switch - NAV.

V. ILS/LOCALIZER COUPLING

A. Engagement

1. Instrument Panel Navigation Receiver Selector Switch - NAV 1 or NAV 2 if dual navigation receivers are installed.
2. Course Selector Knob - ADJUST to localizer front course bearing for both front and back course approaches.
3. Instrument Panel Back Course Switch - FRONT or BACK as applicable. Check annunciator light if back course is selected.
4. Wing Flaps - DOWN 15° if all engines operative.
5. Airspeed - 110 to 130 KIAS (120 To 130 KIAS If Engine Inoperative).
6. Directional Gyro Heading Selector Knob - ROTATE bug for radar vectors and/or 30° to 45° localizer intercept angle.
7. Autopilot Turn Command Knob - PUSH to engage heading mode.
8. When course deviation indicator moves off of the peg:
 - a. With course datum on selected navigation receiver:
 - (1) Autopilot Navigation Engage Switch - NAV.
 - b. Without course datum on selected navigation receiver:
 - (1) Directional Gyro Heading Selector Knob - ADJUST to coincide with localizer inbound heading.
 - (2) Autopilot Navigation Engage Switch - NAV.

NOTE

- Navigation mode is not recommended for tracking outbound on a back course localizer approach due to the possibility of capturing a false glide slope.
- In course datum systems, the navigation course information required by the autopilot is provided automatically from the course setting function on the HSI or CDI.
- In non-course datum systems, the navigation course information required by the autopilot is provided separately from the heading bug on the directional gyro.
- Airplane deviation from the selected localizer course or VOR radial beam is supplied directly to the autopilot from the CDI or HSI.

9. Altitude Hold Engage Switch - CHECK automatic disengagement at glide slope capture.
- OFF if localizer approach only. Adjust autopilot pitch command wheel for proper descent.

NOTE

- Glide slope must be approached from below.
- Back course mode disables the glide slope couple function.

10. Landing Gear - DOWN at outer marker if all engines operative.
11. Airspeed - 110 to 130 KIAS (120 To 130 KIAS If Engine Inoperative).
12. Landing Gear - DOWN within gliding distance of field, if engine inoperative landing.
13. Wing Flaps - DOWN 45° when landing is assured, if engine inoperative landing.

NOTE

Autopilot must be off when wing flaps are down more than 15°.

- B. Disengagement (ILS/Localizer Coupling)
1. Autopilot Turn Command Knob - PULL. (Or)
2. Autopilot Navigation Engage Switch - OFF.

NOTE

Complete autopilot disengagement should normally be conducted at the appropriate minimums with the airplane control wheel autopilot disengage switch.

VI. VOR COUPLING (Airplane Configurations for VOR Approach - Refer To ILS/Localizer Coupling Procedure)

A. Engagement

1. Instrument Panel Navigation Receiver Selector Switch - NAV 1 or NAV 2.
2. Course Selector Knob - ADJUST to desired VOR course.
3. Directional Gyro Heading Selector Knob - ROTATE bug to obtain airplane heading within 135° of desired VOR course.
4. Autopilot Turn Command Knob - PUSH to engage heading mode.

5. When the airplane is within 135° of desired VOR course:
 - a. With course datum on selected navigation receiver:
 - (1) Autopilot Navigation Engage Switch - NAV.
 - b. Without course datum on selected navigation receiver:
 - (1) Directional Gyro Heading Selector Knob - ADJUST to VOR course heading.
 - (2) Autopilot Navigation Engage Switch - NAV.

NOTE

- When the airplane is established on course, the computer will automatically switch into a "track" mode. When course changes greater than 20° are required, disengage the autopilot navigation engage switch, rotate the course selector knob and then reengage the autopilot navigation engage switch.
- In course datum systems, the navigation course information required by the autopilot is provided automatically from the course setting function on the HSI or CDI.
- In non-course datum systems, the navigation course information required by the autopilot is provided separately from the heading bug on the directional gyro.

- B. Disengagement (VOR Coupling)
 1. Autopilot Navigation Engage Switch - OFF. (Or)
 2. Autopilot Turn Command Knob - PULL to disengage.

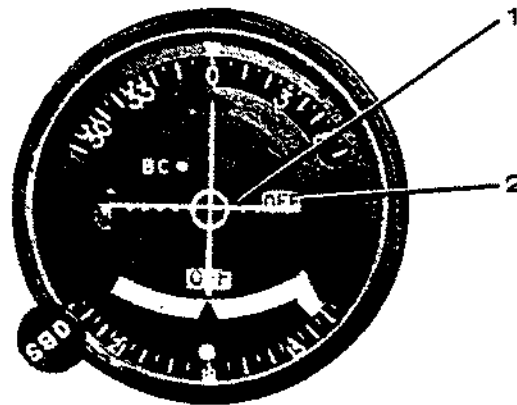
NOTE

Complete autopilot disengagement should normally be conducted on a VOR approach at the appropriate minimums with the airplane control wheel autopilot disengage switch.

SECTION 5 — PERFORMANCE

Not Applicable.

GLIDE SLOPE INDICATOR



1. GLIDE SLOPE DEVIATION INDICATOR - Indicates deviation from normal glide slope.
2. GLIDE SLOPE OFF FLAG - When visible, flag indicates unreliable glide slope signal or improperly operating equipment. The flag disappears when a reliable glide slope signal is being received.

Figure 1

SECTION 4 — NORMAL PROCEDURES

A. Glide Slope Operation

1. Turn on associated VHF navigation set.
2. Select localizer frequency; the paired glide slope frequency will be automatically selected.
3. Identify localizer station and make certain that the glide slope OFF flag is out of sight.

SECTION 5 — PERFORMANCE

Not Applicable.

HF-200 TRANSCEIVER

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the HF-200 transceiver.

Description

The Collins 200 HF transceiver is an airborne, 20-channel, single sideband (SSB) radio with a compatible amplitude modulated (AM) transmitting-receiving system for long-range voice communications in the 2.0 to 22.9999 MHz frequency range. The system consists of a panel-mounted receiver/exciter (see Figure 1), a remote-mounted power amplifier/power supply, an antenna coupler and an externally mounted, fixed wire, medium/high frequency antenna.

A channel selector knob determines the operating frequency of the transceiver which has a preprogrammed frequency memory circuit board installed to provide the desired operating frequencies. A mode selector control is provided to supply the type of emission for the channel, either sideband; AM; split-channel, reduced-carrier telephone mode; or split-channel, suppressed-carrier telephone mode. A volume knob, clarifier knob and squelch knob are provided to assist in audio operation during the receiver mode.

The system utilizes the airplane microphone, headphone and speaker. Operation and description of audio control panels used in conjunction with this radio are shown and described in Section 9 of this handbook.

SECTION 2 — LIMITATIONS

Not Applicable.

SECTION 3 — EMERGENCY PROCEDURES

Not Applicable.

SECTION 4 — NORMAL PROCEDURES

A. To Receive.

1. HF Com Switch - ON.
2. HF Com Audio Switch - SPEAKER or PHONE (On Audio Control Panel).
3. OFF/VOL Control - CLOCKWISE. Allow 15 minutes warmup (time required for frequency standard to stabilize).
4. Channel Selector - SELECT desired frequency. (Use the pullout channel/frequency card to correlate channel number and frequency.)
5. Mode Selector - AS REQUIRED.
6. Squelch Control - ADJUST the audio gain counterclockwise for normal noise output; then, slowly adjust clockwise until the receiver is silent.
7. Clarifier Control - ADJUST when upper single sideband RF signal is being received for maximum clarity.

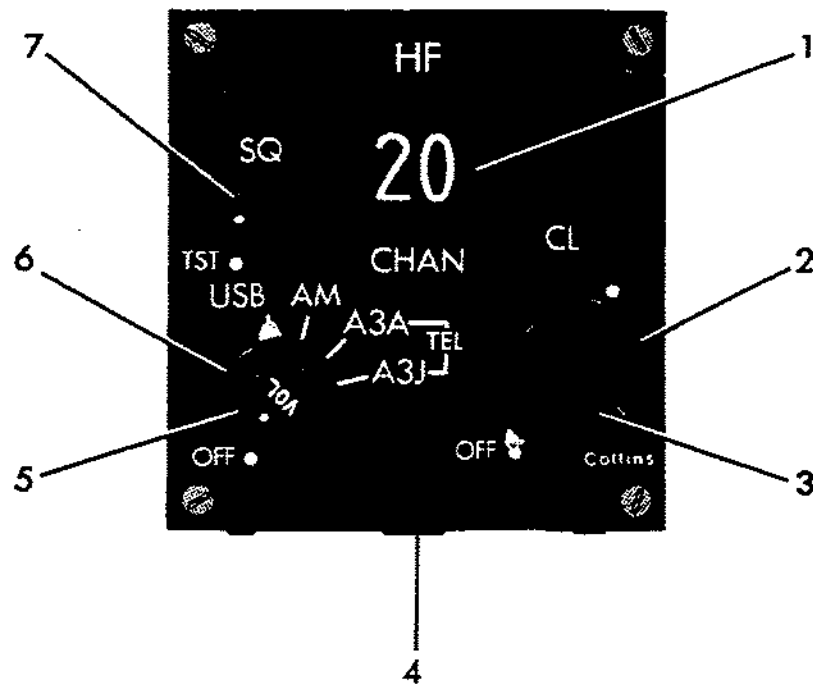
B. To Transmit.

1. Microphone Selector Switch - HF COMM (On Audio Control Panel).
2. Microphone Switch - Press.

SECTION 5 — PERFORMANCE

Not Applicable.

HF-200 TRANSCEIVER CONTROLS



1. CHANNEL WINDOW - Displays selected operating channel.
2. CLARIFIER CONTROL - Switch portion enables (out of detent) or disables (OFF position) clarifier function. Rotating the control permits tuning the received frequency ± 100 Hz (USB or TEL modes only). The clarifier function is automatically disabled during transmit.
3. CHANNEL SELECTOR CONTROL - Selects desired channel.
4. CHANNEL/FREQUENCY CARD - Pulls out to provide an index of transmit and receive frequencies programmed for each of the 20 channels.
5. ON/OFF/VOL CONTROL - Controls application of primary power to the entire system and varies audio gain.
6. MODE CONTROL - Selects system mode of operation.
 - AM - Selects compatible AM operation and full AM reception.
 - USB - Selects upper sideband operation for long-range voice communications.
 - TEL - Used for public correspondence telephone, ship to shore.
7. SQUELCH CONTROL - Squelch position enables (out of detent) or disables (Test Position) squelch function. Rotating the control sets the squelch threshold.

Figure 1

400B INTEGRATED FLIGHT CONTROL SYSTEM (TYPE IF-550A)

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the 400B Integrated Flight Control System.

Description

The Cessna 400B Integrated Flight Control System (IFCS) (Type IF-550A) provides a capability of automatic flight control or manual control with precision flight direction provided by computed command information. The complete presentation for the system is displayed on the flight director indicator (FDI), the mode selector and the horizontal situation indicator (HSI).

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 4, by means of a symbolic airplane and pitch and roll command bars. The pilot flies the airplane to satisfy the two command bars, thus following the calculated flight path determined by the computer.

A horizontal situation indicator (HSI), see Figure 3, 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, LOC runway heading and RNAV course, if installed. Course datum is available on Nav 1 and Nav 2.

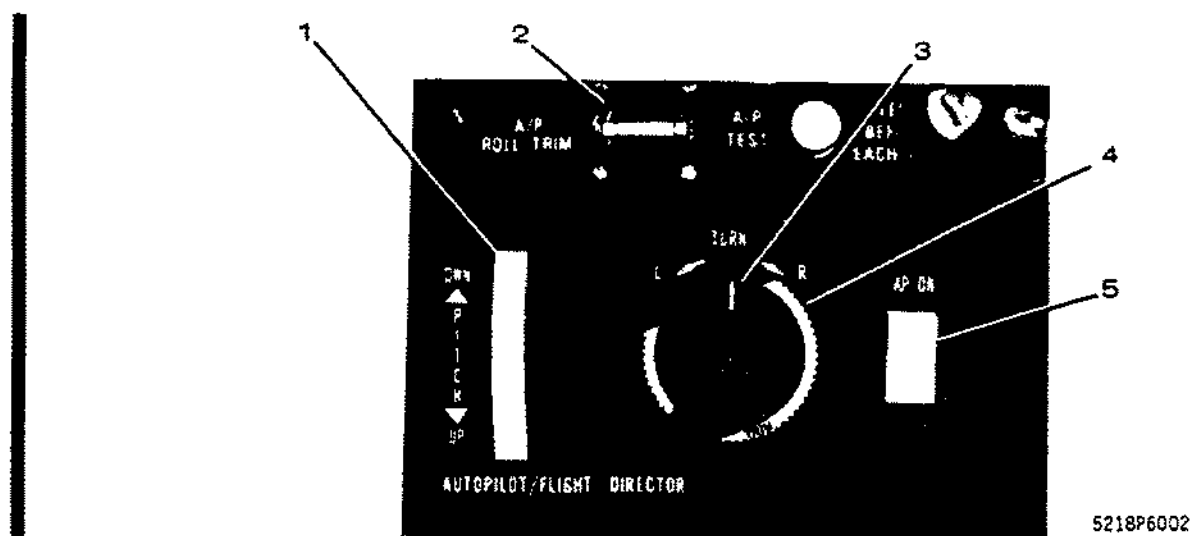
For automatic flight, the autopilot on-off switch on the autopilot control head, see Figure 1, is activated. Pitch and roll manual command controls are also located on this control head. All other normal modes of flight are controlled from the mode selector, see Figure 2.

An automatic autopilot disengage function is provided to automatically disengage the autopilot any time the airplane pitches up or down more than a normal amount from a level flight attitude. The operational capability of the disengage function should be tested before takeoff by pressing the autopilot disconnect test button, located adjacent to the autopilot control head. When the test button is pressed with the autopilot engaged, a test voltage is inserted into the autopilot, causing slight aft control column movement and autopilot disengagement. Do not press this button in flight. Inflight actuation of the test button, with the autopilot engaged, will cause the airplane to pitch up sharply and disengage the autopilot.

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 disengage switch. Whenever the autopilot is disengaged by any means, 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 DISC switch.

The pilot's control wheel, see Figure 1, incorporates four switches for other related autopilot operations. Three of the switches, which are mounted on the left side of the control wheel, provide for operation of electric elevator trim, autopilot disengage and electric elevator trim disengage. The fourth switch, located on the right side of the control wheel, provides for operation of the flight director pitch synchronization. The left throttle control, see Figure 7-1, incorporates the GA switch, which provides for operation in the go-around mode. When pressed, the flight director GA mode is engaged if the FD or AP mode is engaged. The GA annunciator will light, all other modes are cancelled and the autopilot is disengaged. The GA mode provides a preset pitch-up and wings level command. Repressing the GA switch, selecting the HDG mode or reengaging the autopilot will cancel the GA mode.

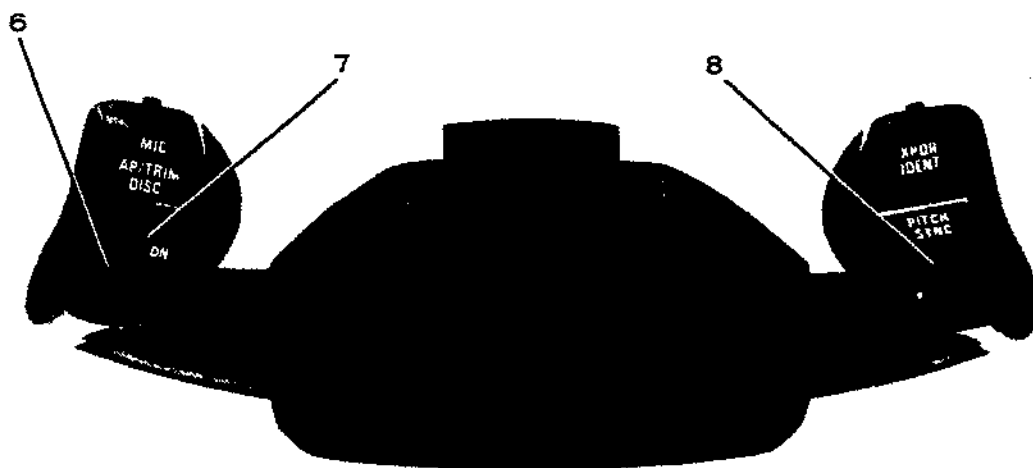
400B IFCS AUTOPILOT CONTROL HEAD AND AIRPLANE CONTROL WHEEL



1. AUTOPILOT PITCH COMMAND WHEEL - Controls pitch attitude of the airplane. Rotating up, commands airplane pitch up proportional to rotation of the wheel. Rotating down, commands airplane pitch down.
2. 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. Indicator is active with autopilot and/or flight director engaged or disengaged.
3. AUTOPILOT TURN COMMAND KNOB - Controls roll attitude of the airplane. When turned left or right, the knob will command a left or right bank accordingly. When moved from the center detent position, it disconnects the heading (HDG) or navigation (NAV) modes if selected on the mode selector.

Figure 1 (Sheet 1 of 2)

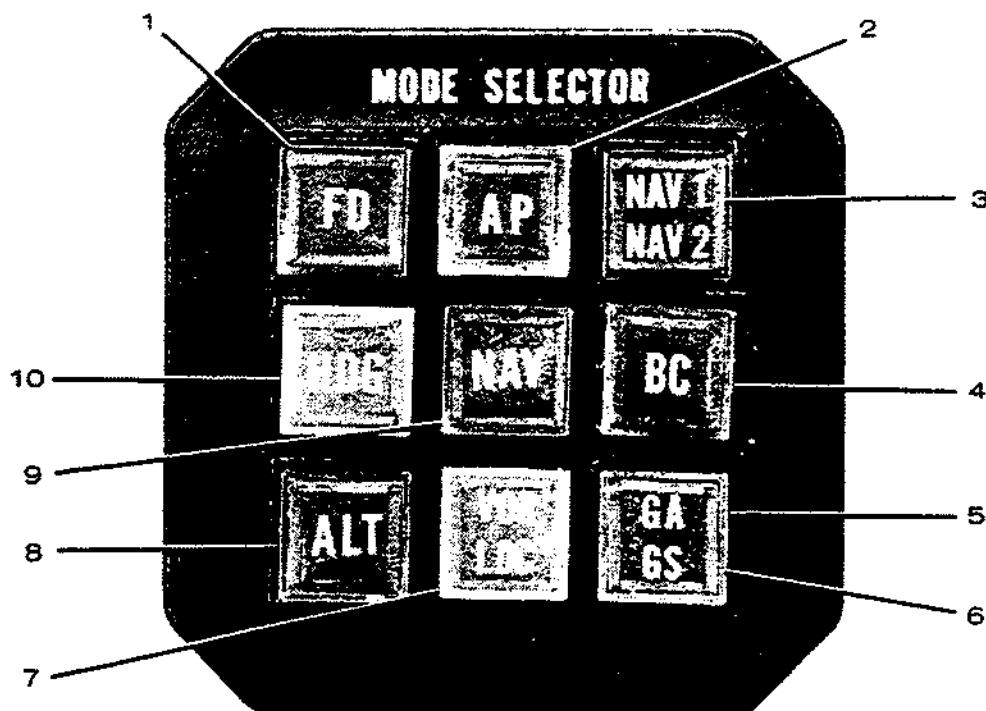
400B IFCS AUTOPILOT CONTROL HEAD AND AIRPLANE CONTROL WHEEL



4. AUTOPILOT LATERAL TRIM CONTROL - When the turn command knob is centered, with no lateral modes engaged and the airplane manually trimmed for existing flight conditions, the control is used to trim the IFCS for a wings level attitude.
5. AUTOPILOT ON-OFF SWITCH - Engages autopilot when in the ON position if all interlocks are valid. The autopilot annunciator on the mode selector will light when the autopilot is engaged.
6. ELECTRIC 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. The electric trim switch is inoperative when the autopilot is engaged.
7. AUTOPILOT/ELECTRIC ELEVATOR TRIM DISENGAGE SWITCH (RED) - Disengages the autopilot and a short (1 to 2 seconds) tone with decreasing amplitude is heard in the cockpit. Disables the electric trim while the switch is depressed.
8. PITCH SYNCHRONIZATION (PITCH SYNC) BUTTON - When the FD mode is engaged, the pitch command bar will automatically synchronize to the pitch command at the time of engagement. To resynchronize the pitch command bar after a new pitch attitude is established, manually depress, but do not hold, the PITCH SYNC button on the control wheel. Depressing the button also disengages the altitude hold mode.

Figure 1 (Sheet 2 of 2)

400B IFCS MODE SELECTOR



1. **FLIGHT DIRECTOR MODE
SELECTOR BUTTON** - Engages or disengages the flight director mode. The FD annunciator will light and command bars on the FDI will appear.
2. **AUTOPILOT MODE SELECTOR
ANNUNCIATOR LIGHT** - Lights when the autopilot is engaged.
3. **NAV 1 - NAV 2
MODE SELECTOR BUTTON** - Selects the navigation receiver for IFCS operation. The receiver that is connected to the IFCS is annunciated. Pressing the button will transfer the IFCS to the other receiver with appropriate annunciation.
4. **BACK COURSE MODE
SELECTOR BUTTON** - Engages or disengages the back course mode and is used with localizer operation only. With the autopilot or flight director off or on and the navigation receiver set to a localizer frequency, the back course mode will reverse the appropriate signals to provide for back course operation for either automatic or manual flight. Except with an HSI type indicator, selecting the back course mode causes reversal of the course deviation indication, whether or not the IFCS is being used. The back course annunciator will light when the back course mode is engaged.
5. **GO-AROUND MODE
SELECTOR ANNUNCIATOR LIGHT** - The go-around annunciator will light when the go-around mode is engaged.

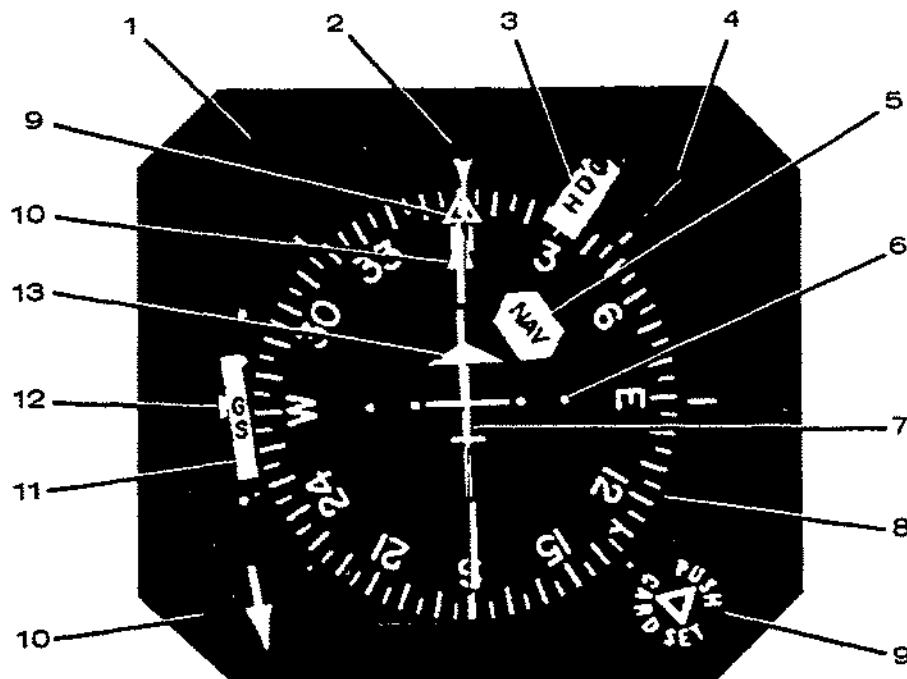
Figure 2 (Sheet 1 of 2)

400B IFCS MODE SELECTOR

6. GLIDE SLOPE MODE
SELECTOR ANNUNCIATOR LIGHT - When the NAV/LOC mode is engaged and the glide slope automatically engages, the glide slope annunciator will light.
7. VOR/LOCALIZER MODE
SELECTOR ANNUNCIATOR LIGHT - When the AP or FD navigation mode is engaged, either the VOR or LOC annunciator will light to reflect the frequency selected on the navigation receiver. The VOR/LOC light will only illuminate while in the AP or FD navigation mode.
8. ALTITUDE HOLD
MODE SELECTOR BUTTON - Engages or disengages the altitude hold mode. The ALT annunciator will light when the mode is engaged. Engagement may be accomplished in either climb, descent or level flight, which commands the airplane to maintain the pressure altitude existing at the moment of selection. This mode can be used with all lateral command modes. In the NAV-LOC mode, altitude hold will automatically disengage when the glide slope engages. The go-around mode, when engaged, will also disengage the altitude hold mode. When the optional 800 encoding altimeter system is installed, altitude hold can be engaged automatically by the optional altitude/preselct system.
9. NAV MODE SELECTOR BUTTON - Engagement provides for capture and track of the VOR (omni) or LOC (localizer), dependent upon the frequency selected on the navigation receiver. During NAV-LOC operation, the glide slope mode will automatically engage only at the beam center and when the beam is approached from below. If the go-around switch on the left throttle control is actuated, the navigation mode will automatically be cancelled and all associated annunciator lights will go out.
10. HEADING MODE SELECTOR BUTTON - Engages the heading mode, which commands the airplane to turn to and maintain a heading selected on the HSI. The HDG annunciator will light when the mode is engaged. A new heading may be selected at any time and will result in a command to turn to the new heading with a bank angle of approximately 25°. The heading mode will cancel the go-around mode.

Figure 2 (Sheet 2 of 2)

400B IFCS HORIZONTAL SITUATION INDICATOR



1. HORIZONTAL SITUATION INDICATOR (HSI) - Provides a pictorial presentation of the airplane position relative to VOR radials, RNAV course, localizer and glide slope beams. It also gives heading reference with respect to magnetic north and provides selection of desired heading, VOR radials, RNAV course and LOC runway heading.
2. HSI HEADING REFERENCE - Indicates airplane heading on compass card.
3. HSI HEADING FLAG - Flag in view indicates the heading data is not reliable.
4. 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).
5. HSI NAV FLAG - Flag in view indicates the navigation receiver signal being received is inadequate.

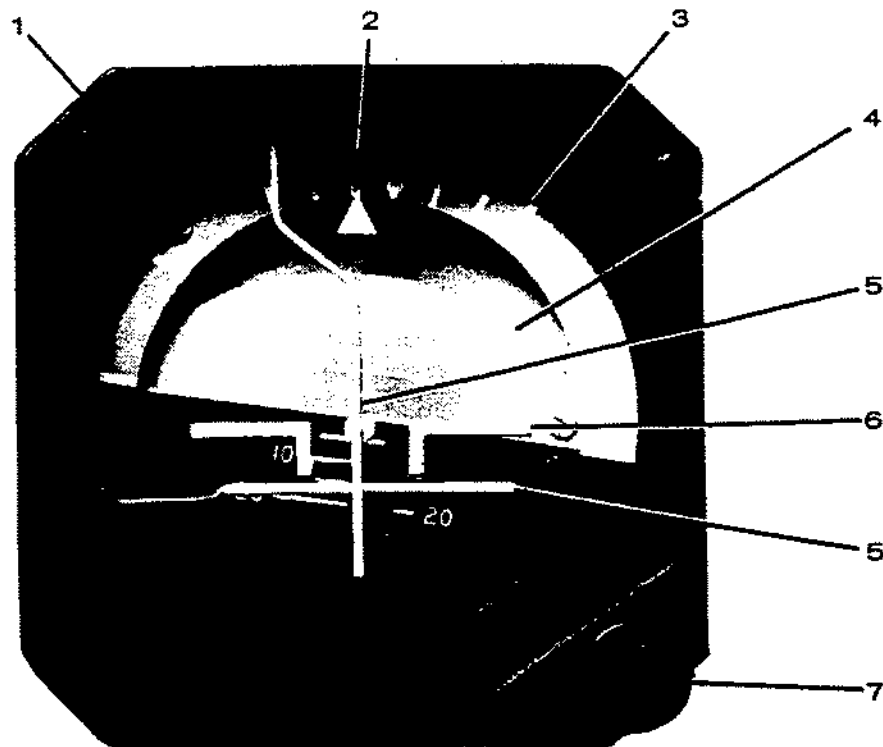
Figure 3 (Sheet 1 of 2)

400B IFCS HORIZONTAL SITUATION INDICATOR

6. HSI COURSE DEVIATION DOTS - Full scale course deviation bar displacement (2 dots) represents the following deviation from beam center; VOR $\pm 10^\circ$, localizer approximately $\pm 2\frac{1}{2}^\circ$, RNAV enroute ± 5 nautical miles, RNAV approach $\pm 1\frac{1}{4}$ nautical miles.
7. HSI COURSE DEVIATION BAR - Displays displacement from the VOR, RNAV or localizer course center.
8. HSI COMPASS CARD - The compass card displays airplane heading. It is slaved to correct for normal precessional errors. Each graduation represents 5 degrees.
9. HSI HEADING BUG AND HEADING SELECTOR KNOB -
 - When knob is rotated in the normal (out) position, selects airplane autopilot heading and positions heading bug to indicate selected heading on the compass card.
 - When knob is pushed in and rotated, permits setting of the compass card to agree with the magnetic compass. The course cursor and course deviation bar will rotate with the compass card.
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, RNAV course or LOC runway heading. It rotates with the compass card.
11. HSI GLIDE SLOPE FLAG - Flag in view indicates the glide slope receiver signal is inadequate.
12. HSI GLIDE SLOPE POINTER, SCALE AND FLAG - Displays deviation of airplane from an ILS glide slope. Flag obscures scale when the signal being received is not adequate. Full scale deflection of the glide slope pointer represents $\pm 0.7^\circ$.
13. HSI TO-FROM FLAG - Indicates direction of the VOR station relative to the selected course. Displays TO when a LOC frequency is selected.

Figure 3 (Sheet 2 of 2)

400B IFCS FLIGHT DIRECTOR INDICATOR



1. FLIGHT DIRECTOR INDICATOR (FDI) - Displays airplane attitude as a conventional attitude gyro and displays commands for flight director operation.
2. FDI ROLL ATTITUDE INDEX - Displays airplane roll attitude read against roll attitude scale.
3. FDI ROLL ATTITUDE SCALE - Movable scale marked at 0, ± 10 , ± 20 , ± 30 , ± 60 and ± 90 degrees.
4. FDI PITCH ATTITUDE SCALE - Moves with respect to the symbolic airplane to display airplane pitch and roll attitude. The scale is graduated at 0, ± 5 , ± 10 , ± 15 and ± 20 degrees.
5. FDI COMMAND BARS - Displays computed steering commands referenced to the dot in the symbolic airplane.
6. FDI SYMBOLIC AIRPLANE - Airplane attitude is displayed by the relationship between the fixed symbolic airplane and the movable background. The symbolic airplane is normally aligned with the horizon line for normal cruise attitude. During flight director operation, the symbolic airplane is flown to align its center dot with the command bars to satisfy the flight director commands.
7. FDI SYMBOLIC AIRPLANE ALIGNMENT KNOB - Provides manual positioning of the symbolic airplane for pitch attitude alignment.

Figure 4

SECTION 2 — LIMITATIONS

- A. Autopilot must be off for takeoff, landing and all operations with wing flaps down more than 15°.
- 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. Approach glide slope from below.
- E. Disengage autopilot if malfunction occurs.
- F. Maximum speed for autopilot operation is 230 KIAS.
- G. Required Placards:
 - 1. On Circuit Breaker Panel
 - a. "AUTOPILOT" - "COMP" - "ACT" - "WARN" (3 Circuit Breakers)
 - b. "TRIM POWER"
 - 2. Near Autopilot Control Head
 - a. "A/P TEST - BEFORE EACH FLIGHT"
 - 3. On Instrument Panel Near Autopilot Off Light (Near Flight Director Indicator)
 - a. "A/P OFF"
 - 4. On Pilot's Control Wheel
 - a. "AUTOPILOT-DISENGAGE"
 - b. "ELEV TRIM - DISENGAGE"
 - c. "PITCH SYNC"
 - d. "UP - DN"
 - 5. On Left Throttle Control
 - a. "GA"

SECTION 3 — EMERGENCY PROCEDURES

- A. Autopilot Malfunction
 - 1. Elevator Or Aileron Control - OVERPOWER as required.
 - 2. All Airplane Control Wheel Disengage Switches - DISENGAGE.

NOTE

- All airplane control wheel disengage switches should be simultaneously disengaged to prevent having to immediately distinguish between an autopilot or an electric elevator trim malfunction.
- Sustained elevator overpower will result in the autopilot trimming against the overpower source.

- B. Engine Failure
 - 1. Airplane Control Wheel Autopilot Disengage Switch - DISENGAGE.
 - 2. Operative Engine - ADJUST as required.
 - 3. Inoperative Engine - SECURE.
 - 4. Trim Tabs - ADJUST.
 - 5. Autopilot - REENGAGE if desired.

NOTE

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

- C. Possible altitude loss if autopilot malfunctions (includes altitude loss prior to pilot recognition):
 - 1. Cruise Configuration - 600 feet.
 - 2. Approach Configuration - 200 feet.
- D. Airplane control wheel forces required to overpower the autopilot (prior to autopilot elevator trimming against the overpower force) will not exceed:
 - 1. Elevator - 40 pounds.
 - 2. Aileron - 20 pounds.
- E. 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:
 - 1. Elevator - 50 pounds.
 - 2. Aileron - 20 pounds.

SECTION 4 — NORMAL PROCEDURES

I. BEFORE TAKEOFF

- A. Autopilot Automatic Disconnect Check (With Engines Running And Gyros Erected)
 - 1. Autopilot Turn Command Knob - CENTER.
 - 2. Autopilot Lateral Trim Control - CENTER.
 - 3. Autopilot On-Off Switch - ON. Observe annunciation on mode selector.

NOTE

The roll servo will engage immediately. The pitch servo will engage after pitch synchronization as evidenced by the autopilot pitch command wheel coming to rest.

- 4. Flight Director Mode Selector Button - ENGAGE. Observe annunciation.
 - 5. Airplane Control Wheel - HOLD to reduce movement.
 - 6. Autopilot Disconnect Test Button - PUSH and HOLD.
 - 7. Verify the following:
 - a. Flight Director Indicator - OBSERVE up command.
 - b. Autopilot On-Off Switch - OBSERVE disengage.
 - c. Autopilot Off Light - OBSERVE illumination.
 - d. Autopilot Disengage Horn - OBSERVE 1 to 2 second aural tone.
 - 8. Airplane Control Wheel
Autopilot Disengage Switch - PUSH to turn off the autopilot off light.
 - 9. Flight Director Mode Selector Button - DISENGAGE.
- ##### II. BASIC AUTOPILOT OPERATION (FLIGHT DIRECTOR ON OR OFF)
- A. Before Engagement
 - 1. Airplane Elevator, Aileron and Rudder Trim - ADJUST.
 - B. Engagement
 - 1. Autopilot Turn Command Knob - CENTER DETENT.
 - 2. Autopilot Lateral Trim Control - CENTER.
 - 3. Airplane Control Wheel
Pitch Synchronization Button - MOMENTARILY DEPRESS to synchronize the flight director pitch command bar to the flight attitude if the flight director is engaged.

4. Autopilot On-Off Switch - ON. Observe annunciation.
5. Autopilot Lateral Trim Control - ADJUST.

NOTE

- Airplane rudder trim should be adjusted as required to center the turn and bank "ball". Airplane aileron trim may have to be readjusted to compensate for large airspeed changes.
- If the airplane will not maintain the correct attitude with the autopilot engaged, disengage the autopilot, manually retrim the airplane to obtain wings level with the turn and bank "ball" centered, then reengage the autopilot.

- C. Turn Commands:
 1. Autopilot Turn Command Knob - ROTATE as desired.
- D. Pitch Commands:
 1. Altitude Hold Mode Selector Button - CHECK DISENGAGED.
 2. Autopilot Pitch Command Wheel - ROTATE as desired.
- E. Disengagement:
 1. Autopilot On-Off Switch - OFF. (Or)
 2. Airplane Control Wheel
Autopilot Disengage Switch - DISENGAGE. (Or)
 3. Left Throttle Control
Go-Around (GA) Switch - ENGAGE. Refer to Go-Around Operation.

NOTE

- If the autopilot is either disengaged with the control head on-off switch or is automatically disengaged due to a system malfunction, the autopilot off light will continuously illuminate and a 1 to 2 second aural tone will occur. The autopilot off light may be extinguished by cycling the airplane control wheel autopilot disengage switch.
- Normal autopilot disengagement should be conducted with the airplane control wheel autopilot disengage switch. The autopilot off light will not illuminate but the 1 to 2 second aural tone will occur.
- Autopilot disengagement with the left throttle control go-around (GA) switch will not illuminate the autopilot off light but will give a 1 to 2 second aural tone. Refer to Go-Around Operation.

III. BASIC FLIGHT DIRECTOR OPERATION (AUTOPILOT OFF)

A. Engagement

1. Autopilot Turn Command Knob - CENTER DETENT.
2. Flight Director
Mode Selector Button - ENGAGE. Observe annunciation and flight director command bars.
3. Flight Director Symbolic
Airplane Alignment Knob - ALIGN with flight director pitch command bar.
4. Autopilot Lateral Trim Control - ADJUST as required to center the flight director roll command bar.

B. Basic Pitch Commands:

1. Manually fly the airplane to the desired pitch attitude.
2. Airplane Control Wheel
Pitch Synchronization Button - MOMENTARILY DEPRESS to synchronize the pitch command bar to the flight attitude.

NOTE

In a flight director only mode (autopilot off), the flight director pitch command bar will automatically synchronize to the pitch attitude at the time of engagement. If a new pitch attitude is flown, the airplane control wheel pitch synchronization button should be depressed to synchronize the flight director command bar to that attitude.

C. Altitude Hold, Heading Select and Navigation Coupling

NOTE

Altitude hold, heading select and navigation coupling procedures are identical to the procedures that follow 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.

D. Disengagement (Flight Director):

1. Flight Director Mode Selector Button - DISENGAGE.

IV. ALTITUDE HOLD COUPLING (FLIGHT DIRECTOR AND/OR AUTOPILOT MODES)

A. Engagement:

1. With Basic IFCS:
 - a. Altitude Hold Mode Selector Button - ENGAGE at desired altitude. Observe annunciation.

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.

NOTE

Once armed, the altitude alert/preselect can be disarmed only 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.

- B. Disengagement (Altitude Hold Coupling):
 1. Altitude Hold Mode Selector Button - DISENGAGE. (Or)
 2. Airplane Control Wheel Pitch Synchronization Button - MOMENTARILY DEPRESS.

WARNING

Do not attempt to use the encoding altimeter indicator for flight information if warning flag is in view. The flag indicates that power has been removed from the encoding altimeter.

NOTE

- The altitude hold mode selector button must be disengaged before actuating the autopilot pitch wheel. Autopilot pitch wheel rotation will not disengage the altitude hold mode.
- Altitude hold mode will automatically disengage in the coupled ILS mode when the glide slope is captured.

V. HEADING SELECT FUNCTION (FLIGHT DIRECTOR AND/OR AUTOPILOT MODES)

A. Engagement:

1. Autopilot Turn Command Knob - CENTER DETENT.
2. Directional Gyro
Heading Selector Knob - ROTATE bug to desired magnetic heading.
3. Heading Mode Selector Button - ENGAGE. Observe annunciation.
4. Directional Gyro
Heading Selector Knob - ADJUST for any subsequent desired heading.

NOTE

When an optional copilot's horizontal situation indicator or autopilot directional gyro is installed, the pilot's heading bug controls the heading when NAV 1 receiver is selected and the copilot's heading bug controls heading when NAV 2 receiver is selected.

B. Disengagement (Heading Select Function):

1. Heading Mode Selector Button - DISENGAGE. (Or)
2. Autopilot Turn Command Knob - ROTATE. (Or)
3. Navigation Mode Selector Button - ENGAGE.

VI. ILS/LOCALIZER COUPLING (FLIGHT DIRECTOR AND/OR AUTOPILOT MODE)

A. Engagement:

1. NAV 1 - NAV 2 Mode Selector Button - SELECT NAV 1 or NAV 2. Observe proper 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 - ENGAGE as applicable. Observe BC annunciation on mode selector.
4. Wing Flaps - DOWN 15° if all engines operative.
5. Airspeed - 110 to 130 KIAS (120 to 130 KIAS If Engine Inoperative).
6. Directional Gyro
Heading Selector Knob - ROTATE bug for radar vectors and/or 30° to 45° localizer intercept angle.
7. Autopilot Turn Command Knob - CENTER DETENT.
8. Heading Mode Selector Button - ENGAGE. Observe annunciation.

9. When course deviation indicator moves off the peg:
 - a. Navigation Mode
Selector Button - ENGAGE. Observe NAV and LOC annunciation on mode selector; HDG annunciation on mode selector will go out.

NOTE

Navigation mode is not recommended for tracking outbound on a back course localizer approach due to the possibility of capturing a false glide slope.

10. Altitude Hold
Mode Selector - CHECK automatic disengage at glide slope capture. Observe ALT annunciator on the mode selector goes out and GS annunciator illuminates.
 - OFF if localizer approach only. Adjust autopilot pitch command wheel for proper descent.

NOTE

- Glide slope must be approached from below.
- Back course disables IFCS glide slope couple function.

11. Landing Gear - DOWN at outer marker if all engines operative.
12. Airspeed - Maintain 110 to 130 KIAS (120 to 130 KIAS if Engine Inoperative).
13. Landing Gear - DOWN within gliding distance of field, if engine inoperative landing.
14. Wing Flaps - DOWN when landing is assured, if engine inoperative landing.

NOTE

Autopilot must be off when wing flaps are down more than 15°.

- B. Disengagement (ILS/Localizer Coupling):
 1. Navigation Mode Selector Button - DISENGAGE. (Or)
 2. Autopilot Turn Command Knob - ROTATE.

NOTE

Complete autopilot disengagement should normally be conducted at the appropriate minimums with the airplane control wheel disengage switch.

VII. VOR COUPLING (FLIGHT DIRECTOR AND/OR AUTOPILOT MODE) (AIRPLANE CONFIGURATION FOR VOR APPROACH - REFER TO ILS/LOCALIZER COUPLING PROCEDURES)

A. Engagement

1. NAV 1 - NAV 2 Mode Selector Button - SELECT NAV 1 or NAV 2. Observe proper annunciation.
2. Course Selector Knob - ADJUST to desired VOR course.
3. Directional Gyro Heading Selector Knob - ROTATE bug to within 135° of desired VOR course.
4. Autopilot Turn Command Knob - CENTER DETENT.
5. Heading Mode Selector Button - ENGAGE. Observe annunciation.
6. When airplane is within 135° of desired VOR course:
 - a. Navigation Mode Selector Button - ENGAGE. Observe NAV and VOR annunciation on mode selector; HDG annunciation on mode selector will go out.

NOTE

- The autopilot will intercept and track the selected VOR radial compensating for wind correction.
- When the airplane is established on course, the computer will automatically switch into a "track" mode. When course changes greater than 20° are required, disengage the navigation mode selector, rotate the course selector knob and then reengage the navigation mode selector.

B. Disengagement (VOR Coupling):

1. Navigation Mode Selector Button - DISENGAGE. (Or)
2. Autopilot Turn Command Knob - ROTATE.

NOTE

Complete autopilot disengagement should normally be conducted on a VOR approach at the appropriate minimums with the airplane control wheel autopilot disengage switch.

VIII. GO-AROUND OPERATION (FLIGHT DIRECTOR AND/OR AUTOPILOT MODE)

A. Left Throttle Control

Go-Around Switch - ENGAGE. Observe GA and FD annunciation on mode selector if not already engaged.

NOTE

The go-around mode gives a wings level, pitch up command (4° to 6° nose up) on the flight director indicator pitch command bar only. Actuation of go-around mode disengages the autopilot.

- B. Disengagement (Go-Around):
1. Left Throttle Control Go-Around Switch - CYCLE. (Or)
 2. Heading Mode Selector Button - ENGAGE. (Or)
 3. Autopilot On-Off Switch - ON.

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.

SECTION 5 — PERFORMANCE

Not Applicable.