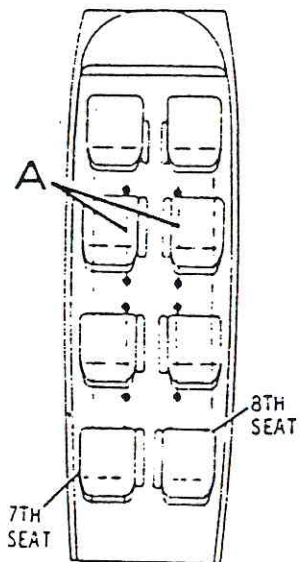
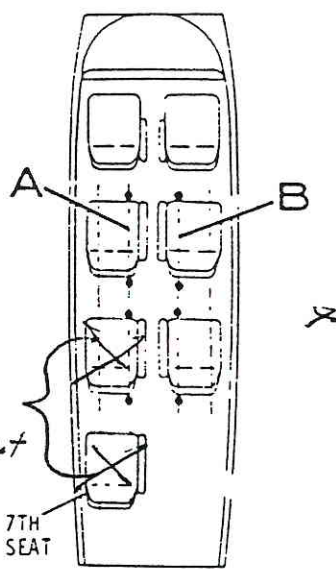


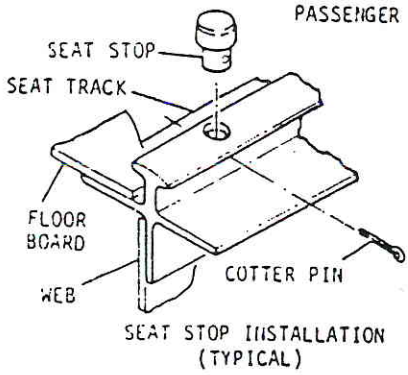
CESSNA AIRCRAFT COMPANY
 MODEL 421
 SERVICE MANUAL



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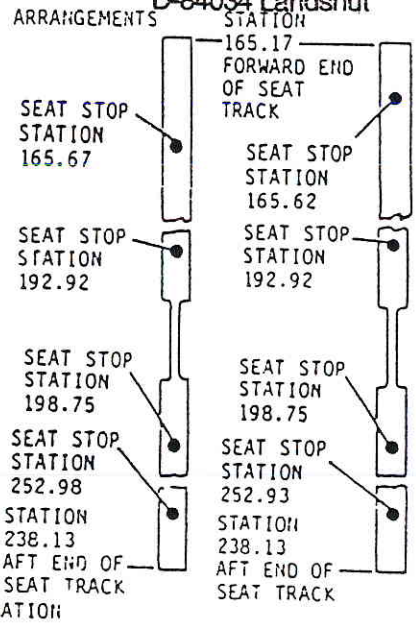
ISAR AVIATION
 Aircraft Sales & Service GmbH
 LBA Nr.: II-A 285
 Flugplatz Ellermühle
 D-84034 Landshut



NOTE 1. 7TH AND 8TH SEAT IS STATIONARY. IF MOUNTED ON A TRACK INSTALL STOP IN ONLY AVAILABLE HOLE.

NOTE 2. WITH TOILET, INSTALL AFT STOP ON RIGHT SIDE AT STATION 233.63.

PASSENGER SEATING ARRANGEMENTS



PASSENGER SEAT STOP LOCATION

DETAIL A DETAIL B

Seating Arrangement Schematic and Seat Stop Locations
 Figure 4 (Sheet 3)



FAA APPROVED Airplane Flight Manual Supplement

FOR

MODELS	SERIALS
T303	T30300001 thru T30300315
310	310R1501 thru 310R2140
335	335-0001 thru 335-0065
340	340A0601 thru 340A1817
401	401-0001 thru 401B0221
402	402-0001 thru 402C1020
404	404-0001 thru 404-0859
411	411-0001 thru 411A0300
414	414-0001 thru 414A1212
421	421-0001 thru 421C1807

Serial No. _____
Registration No. _____

This supplement must be attached to the FAA Approved Airplane Flight Manual or Pilot's Operating Handbook/FAA Approved Airplane Flight Manual when the Auxiliary Fuel Pump Switching System is installed in accordance with Cessna Multi-Engine Service Bulletin MEB88-3.

The information contained herein supplements or supersedes the information of the basic Airplane Flight Manual or Pilot's Operating Handbook/FAA Approved Airplane Flight Manual and all Checklists. For limitations, procedures, and performance information not contained in this supplement, consult the basic Airplane Flight Manual or Pilot's Operating Handbook/FAA Approved Airplane Flight Manual.


FAA APPROVED

D. A. Malone Executive Engineer
Cessna Aircraft Co., Aircraft Div.
Delegation Option Manufacturer, CE-3

Date 2-10-89

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WICHITA, KANSAS USA

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 Member of GAMA
D1625-1-13-RPC-6000-2/89

SECTION 1 GENERAL

AUXILIARY FUEL PUMP SWITCHING SYSTEM

To improve the reliability of the auxiliary fuel pump systems in Cessna conventional twin-engine airplanes (except Model 310 airplanes prior to Model 310C which are not affected by this change), the automatic fuel pressure sensing switch and auxiliary fuel pump switch for each engine have been removed and replaced with new three-position, lever lock, toggle-type auxiliary fuel pump switches and circuitry. This modification provides direct pilot control of the output pressure of the two auxiliary fuel pumps. The switches are labeled AUX PUMP, L (left engine) and R (right engine) and switch positions are LOW, OFF, and HIGH. The LOW position operates the auxiliary pumps at low speed and can be used, when required, to provide supplementary fuel pressure for all normal operations. The switches are OFF in the middle position. The HIGH position is reserved for emergency operation, and operates the pumps at high speed. The HIGH position supplies sufficient fuel flow to sustain partial engine power in the event of an engine-driven fuel pump failure. The switches are locked out of the HIGH position and the switch toggle must be pulled out to clear a detent before it can be moved to the HIGH setting. The toggle need not be pulled to return the switch to OFF.

In Models 340A, 414, 421, 421A and 421B, additional fuel tank selector logic is added to activate the auxiliary fuel tank system in-line fuel pumps when the auxiliary fuel tanks are selected, thereby making the auxiliary tank in-line pump operation independent of the auxiliary fuel pump switches.

SWITCH OPERATION

Operation of the new switching system is simple and straightforward. The new LOW position of the auxiliary fuel pump switches should be used whenever an original manual/handbook or checklist procedure specifies either LOW (PRIME in early 310 or 320 airplanes) or ON. The LOW position is also used anytime there are indications of vapor, as evidenced by a "nervous" fuel flow needle. Auxiliary fuel pumps, if needed, are to be operated on LOW in all conditions except when an engine-driven fuel pump fails.

The new HIGH position supplies sufficient fuel flow to sustain partial engine power and should be used solely to sustain the operation of an engine in the event its engine-driven fuel pump fails. Failure of an engine-driven fuel pump will be evidenced by a sudden reduction in the fuel flow indication **immediately prior to a loss of power** while operating from a fuel tank containing adequate fuel. In an emergency where loss of an engine-driven fuel pump is involved, pull out on the applicable auxiliary fuel pump switch to clear the detent and select the HIGH position. Then adjust the throttle and mixture controls to obtain sat-

isfactory operation. At high manifold pressure and RPM, auxiliary fuel pump output may not be sufficient for normal engine operation. In this case, reduce manifold pressure to a level compatible with the indicated fuel flow. At low powers, the mixture may have to be leaned as necessary for smooth engine operation. If HIGH auxiliary pump output does not restore adequate fuel flow, a fuel leak may exist and the auxiliary pump should be shut off, the engine secured and propeller feathered, and the flight terminated on the remaining engine.

On rare occasions, such as during engine starting in cold weather, the HIGH position (instead of LOW) may be needed for a few seconds to ensure a good ground start or restart in flight.



If the auxiliary fuel pump switches are placed in the HIGH position with the engine-driven fuel pump(s) operating normally, total loss of engine power may occur.

When performing training in single-engine operations, the auxiliary fuel pump of the engine to be shutdown should be turned OFF (if it was on LOW) prior to any simulated engine failure or prior to any intentional engine shutdown to preclude fuel accumulation in the engine intake system.

The following limitations and procedures apply only to the operational changes of the auxiliary fuel pump switches and not the entire procedure.

SECTION 2 LIMITATIONS

The following new placard is provided to identify that the airplane has been modified and show the proper switch positions for normal operation. It is located on the left cabin sidewall near the auxiliary fuel pump switches and must be installed when the airplane is modified in accordance with Cessna Multi-Engine Service Bulletin MEB88-3.

<p>THE AUXILIARY FUEL PUMP SYSTEMS IN THIS AIRPLANE HAVE BEEN MODIFIED BY SERVICE BULLETIN MEB88-3.</p> <hr/> <p>AUX PUMP LOW FOR TAKEOFF, LANDING AND VAPOR CLEARING. AUX PUMP HIGH FOR ENGINE DRIVEN PUMP FAILURE (VERY LOW OR NO FUEL PRESS). SEE POH OR AFM SUPPLEMENT OR SUPPLEMENTAL AFM.</p> <p style="text-align: right;"><small>2505055-6</small></p>
--

The following additional placard is provided to overlay an existing placard (if installed) near the fuel selector.

TAKEOFF AND LAND WITH AUXILIARY FUEL PUMPS LOW

SECTION 3
EMERGENCY PROCEDURES
ENGINE FAILURE DURING FLIGHT
BEFORE SECURING INOPERATIVE ENGINE

Fuel Flow - CHECK. If deficient, position auxiliary fuel pump to HIGH.

IF ENGINE DOES NOT START

Operative Engine - Auxiliary Fuel Pump LOW.

ENGINE INOPERATIVE LANDING

Operative Engine - Auxiliary Fuel Pump LOW.

ENGINE-DRIVEN FUEL PUMP FAILURE

Auxiliary Fuel Pump - HIGH.

AIRSTART

Auxiliary Fuel Pump - CHECK OFF. If on LOW or HIGH, purge engine.

SECTION 4 NORMAL PROCEDURES

BEFORE TAKEOFF

Auxiliary Fuel Pumps - LOW.

AFTER TAKEOFF, CLIMB OR LOW ALTITUDE CRUISE

Auxiliary Fuel Pumps - OFF (LOW if necessary to suppress vapor).

CRUISE (Above 12,000 Feet)

Auxiliary Fuel Pumps - LOW for 5 minutes after leveling off to suppress vapor tendencies.

DESCENT

Auxiliary Fuel Pumps - LOW.

BEFORE LANDING

Auxiliary Fuel Pumps - LOW.

AFTER LANDING

Auxiliary Fuel Pumps - OFF (LOW if necessary to suppress vapor).

PRACTICE SINGLE ENGINE PROCEDURES

Auxiliary Fuel Pumps - OFF.

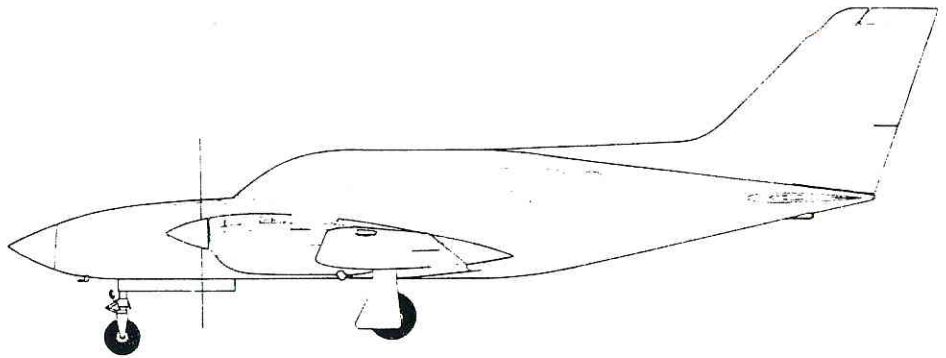
SWITCHING FUEL TANKS

Auxiliary Fuel Pumps - LOW.

SECTION 5 PERFORMANCE

There is no change in airplane performance with the auxiliary fuel pump switching system modification.

and
FAA APPROVED AIRPLANE FLIGHT MANUAL



CESSNA AIRCRAFT COMPANY

1981 MODEL 421C

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

Serial Number 421C1115

Registration Number N2652Y

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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THE CESSNA AIRCRAFT COMPANY

CESSNA AIRCRAFT COMPANY

Wallace Division
Wichita, Kansas

 Member of GAMA

3 NOVEMBER 1980

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 Operating Handbook and FAA Approved 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 and performance; and suggestions for its servicing and care. We urge you to read it from cover to cover, and to refer to it frequently.

Our interest in your flying pleasure has not ceased with your purchase of a Cessna. Worldwide, the Cessna Dealer Organization backed by Cessna Customer Services Department stands ready to serve you. The following services are offered by most Cessna Dealers:

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

We urge all Cessna owners to use the Cessna Dealer Organization to the fullest.

A current Worldwide Customer Care Directory accompanies your new airplane. The Directory is revised frequently, and a current copy can be obtained from your Cessna Dealer. Make your Directory one of your cross-country flight planning aids; a warm welcome awaits you at every Cessna Dealer.

3 November 1980

MAXIMUM WEIGHTS:	
Pamp	7500 Pounds
Takeoff	7450 Pounds
Landing	7200 Pounds
Zero Fuel	6733 Pounds
*SPEED, BEST POWER MIXTURE:	
Maximum - 20,000 Feet	258 KTAS
Maximum Recommended Cruise	
73.5% Power at 10,000 Feet	208 KTAS
73.5% Power at 25,000 Feet	241 KTAS
*RANGE, RECOMMENDED LEAN MIXTURE:	
Maximum Recommended Cruise	
73.5% Power at 10,000 Feet	790 Nautical Miles,
(1236 Pounds Usable Fuel)	3.91 Hours and 205 KTAS
73.5% Power at 10,000 Feet	925 Nautical Miles,
(1404 Pounds Usable Fuel)	4.56 Hours and 205 KTAS
73.5% Power at 10,000 Feet	1060 Nautical Miles,
(1572 Pounds Usable Fuel)	5.21 Hours and 206 KTAS
73.5% Power at 25,000 Feet	882 Nautical Miles,
(1236 Pounds Usable Fuel)	3.91 Hours and 238 KTAS
73.5% Power at 25,000 Feet	1039 Nautical Miles,
(1404 Pounds Usable Fuel)	4.57 Hours and 239 KTAS
73.5% Power at 25,000 Feet	1197 Nautical Miles,
(1572 Pounds Usable Fuel)	5.22 Hours and 239 KTAS
Maximum Range	
10,000 Feet (1236 Pounds Usable Fuel)	1107 Nautical Miles,
	7.19 Hours and 153 KTAS
10,000 Feet (1404 Pounds Usable Fuel)	1294 Nautical Miles,
	8.44 Hours and 153 KTAS
10,000 Feet (1572 Pounds Usable Fuel)	1485 Nautical Miles,
	9.73 Hours and 152 KTAS
25,000 Feet (1236 Pounds Usable Fuel)	1088 Nautical Miles,
	5.74 Hours and 191 KTAS
25,000 Feet (1404 Pounds Usable Fuel)	1284 Nautical Miles,
	6.75 Hours and 192 KTAS
25,000 Feet (1572 Pounds Usable Fuel)	1483 Nautical Miles,
	7.78 Hours and 192 KTAS
RATE-OF-CLIMB AT SEA LEVEL:	
All Engines	1940 Feet Per Minute
Single-Engine	350 Feet Per Minute
SERVICE CEILING:	
All Engines	30,200 Feet
Single-Engine	14,900 Feet
TAKEOFF PERFORMANCE: (100 KIAS, 0° Wing Flaps And 7450 Pounds Weight)	
Ground Roll	1786 Feet
Total Distance Over 50-Foot Obstacle	2323 Feet
LANDING PERFORMANCE: (100 KIAS, 45° Wing Flaps And 7200 Pounds Weight)	
Ground Roll	720 Feet
Total Distance (Over 50-Foot Obstacle)	2293 Feet
STANDARD EMPTY WEIGHTS: (Approximate)	
Golden Eagle 421C	4640 Pounds
Golden Eagle 421C II	4837 Pounds
Golden Eagle 421C III	5048 Pounds
BAGGAGE ALLOWANCE:	1500 Pounds
WING LOADING:	34.7 Pounds Per Square Foot
POWER LOADING:	9.9 Pounds Per Horsepower
FUEL CAPACITY: (Total)	
Standard (205 Gallons Usable)	213.4 Gallons
With One Wing Locker Tank (234 Gallons Usable)	241.8 Gallons
With Two Wing Locker Tanks (262 Gallons Usable)	270.2 Gallons
OIL CAPACITY: (Total)	28 Quarts
ENGINES:	
Six-Cylinder, Geared, Turbocharged, Fuel-Injected Engines	GTS10-520-N
375 Rated Horsepower At 2235 Propeller RPM And 39.0 Inches Hg.	
Manifold Pressure To 20,000 Feet	
PROPELLERS:	
Constant Speed, Full Feathering, Three-Bladed 7'6" Diameter	08E0334-27

*Range data includes allowances for start, taxi, takeoff, climb, descent and 45-minute reserve at the particular cruise power. Speeds 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.

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 421C airplane designated by the serial number and registration number shown on the Title Page of this handbook.

REVISIONS

Changes and/or additions to this handbook will be covered by revisions published by Cessna Aircraft Company. These revisions are distributed to all Cessna Dealers and to owners of U.S. Registered airplanes according to FAA records at the time of revision 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 their Cessna Dealer 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 . . . 0 . . . 3 Nov 1980
 Revision . . . 1 . . . 2 Apr 1982

Page	Date	Page	Date
Title	3 Nov 80	*1-6	2 Apr 82
Assignment Record	3 Nov 80	1-7 thru 1-10	3 Nov 80
i thru ii	3 Nov 80	2-1 thru 2-3	3 Nov 80
*iii thru iv	2 Apr 82	*2-4	2 Apr 82
Contents	3 Nov 80	2-5 thru 2-16	3 Nov 80
1-1 thru 1-3	3 Nov 80	2-17/2-18	3 Nov 80
*1-4	2 Apr 82	*3-1	2 Apr 82
1-5	3 Nov 80	3-2 thru 3-10	3 Nov 80

3 November 1980
 Revision 1 - 2 Apr 1982

Page	Date	Page	Date
*3-11	2 Apr 82	7-3 thru 7-21	3 Nov 80
3-12	3 Nov 80	*7-22	2 Apr 82
*3-13/3-14	2 Apr 82	7-23	3 Nov 80
3-15 thru 3-16	3 Nov 80	*7-24 thru 7-25	2 Apr 82
*3-17	2 Apr 82	7-26 thru 7-27	3 Nov 80
3-18	3 Nov 80	*7-28	2 Apr 82
*3-19	2 Apr 82	7-29 thru 7-35	3 Nov 80
3-20 thru 3-31	3 Nov 80	*7-36 thru 7-37	2 Apr 82
*3-32	2 Apr 82	7-38 thru 7-45	3 Nov 80
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*3-35/3-36	2 Apr 82	7-47	3 Nov 80
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*4-3/4-4	2 Apr 82	*7-61/7-62	2 Apr 82
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*4-10 thru 4-13	2 Apr 82	8-2 thru 8-6	3 Nov 80
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*4-25	2 Apr 82	8-13 thru 8-14	3 Nov 80
4-26 thru 4-27	3 Nov 80	*8-15 thru 8-18	2 Apr 82
*4-28	2 Apr 82	*9-1 thru 9-2	2 Apr 82
4-29 thru 4-34	3 Nov 80	*Index-1 thru Index-6	2 Apr 82
4-35/4-36	3 Nov 80	*Index-7/Index-8	2 Apr 82
5-1 thru 5-40	3 Nov 80		
6-1 thru 6-9	3 Nov 80		
*6-10 thru 6-12	2 Apr 82		
6-13 thru 6-26	3 Nov 80		
6-27/6-28	3 Nov 80		
6-29/6-30	3 Nov 80		
*7-1 thru 7-2	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**

D1595-1-13PH-RPC-300-6/82

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3 November 1980

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SECTION 1 GENERAL

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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: GTS10-520-N

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

Horsepower: 375 rated horsepower at 2235 propeller RPM and 39.0 inches Hg. manifold pressure to the critical altitude of 20,000 feet.

3 November 1980

* MAXIMUM HEIGHT OF AIRPLANE WITH NOSE GEAR DEPRESSED IS 13.41'

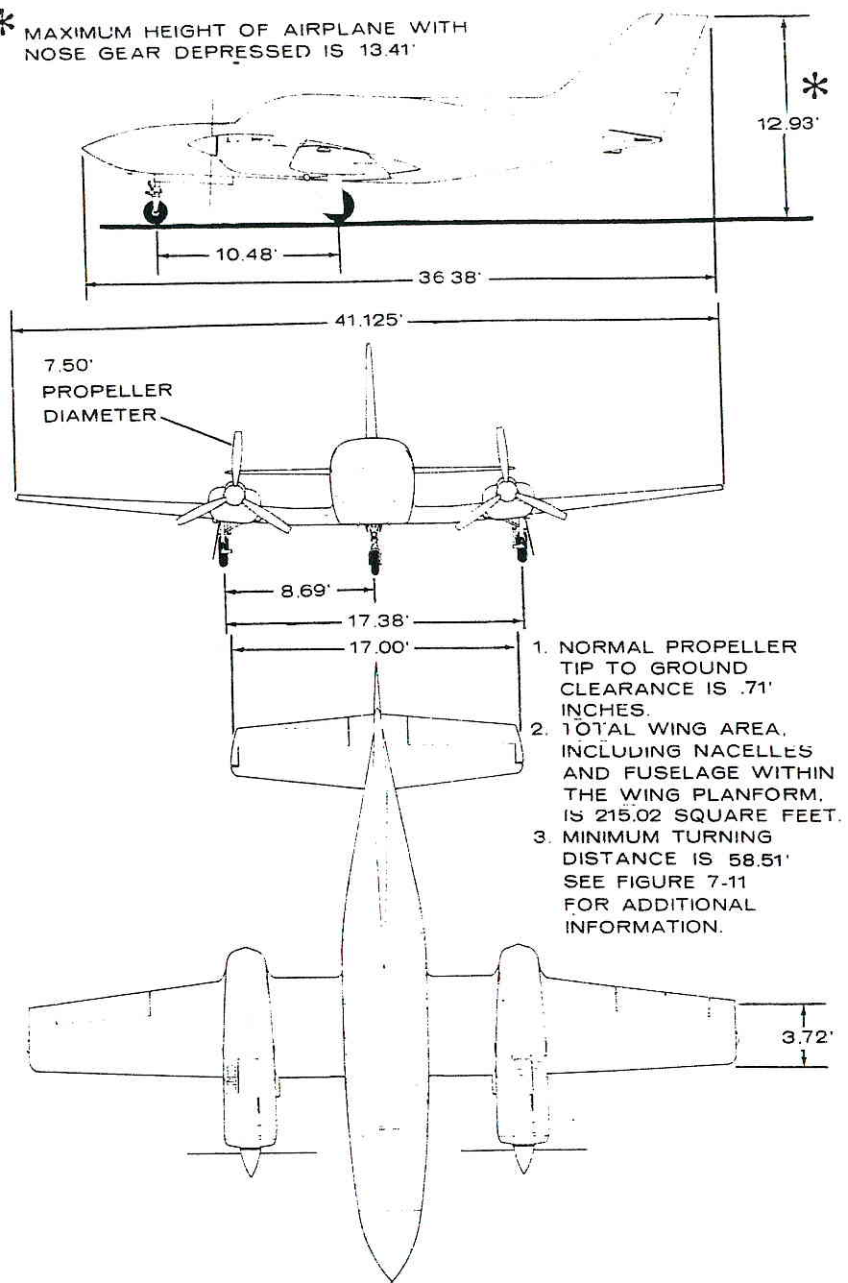


Figure 1-1

Number of Propellers: 2

Manufacturer: McCauley Accessory Division, Cessna Aircraft Company

Propeller Part Number: 0850334-27

Number of Blades: 3

Propeller Diameter: 7'6.0"

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

Blade Range: (At 30-Inch Station)
 a. Low Pitch $16.6^{\circ} \pm 0.2^{\circ}$
 b. Feather $84.6^{\circ} \pm 0.3^{\circ}$

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 and Usable: See Figure 1-2

FUEL TABLE

System	Total Fuel Capacity (U.S. Gallons)	Usable Fuel (U.S. Gallons)
Standard System	213.4	<u>206.0</u>
Standard System with One Optional Wing Locker Tank	241.8	<u>234.0</u>
Standard System with Two Optional Wing Locker Tanks	270.2	262.0

Figure 1-2

OIL

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

STANDARD AIRPLANE WEIGHTS

Standard Empty Weight:	4640 pounds (4837 pounds for 421C II) (5048 pounds for 421C III)
Maximum Useful Load:	2860 pounds (2663 pounds for 421C II) (2452 pounds for 421C III)

SPECIFIC LOADINGS

Wing Loading:	34.7 pounds per square foot
Power Loading:	9.9 pounds per horsepower

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 when corrected for instrument error. 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	Air Minimum Control Speed 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 5° 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 _{SS} E	<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.

Viscosity:

SAE Rating	Ambient Temperature - °C (°F)
50	Above 4.4 (40)
30	Below 4.4 (40)
Multiviscosity	Unrestricted - After 100 Hours

Total Sump

Capacity: 13 quarts per engine

Drain and Refill

Quantity: 14 quarts per engine including one quart for oil filter.

Oil Quantity

Operating Range:

Do not operate engine on less than 9-quart indication. 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: 7500 pounds = 3402 kg *↳ 1000 kg Payload*

Maximum Takeoff

Weight: 7450 pounds = 3379 kg

Maximum Landing

Weight: 7200 pounds

Maximum Zero

Fuel Weight: 6733 pounds

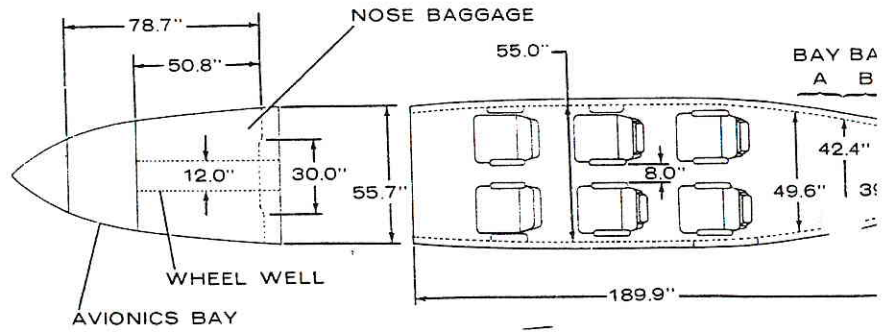
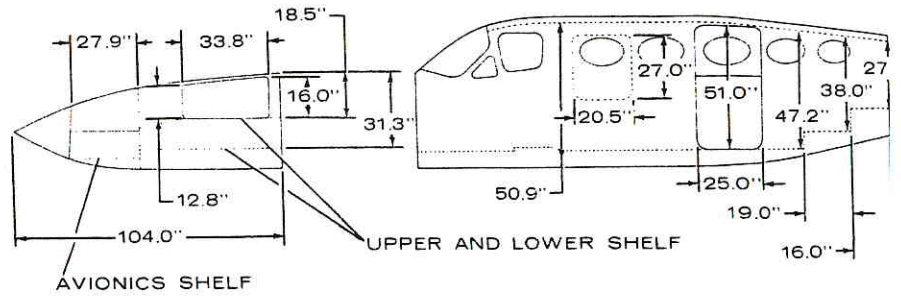
Maximum Weights

in Baggage

Compartments:

- a. Left and Right Wing Lockers - 200 pounds each. When optional wing locker fuel is installed, the applicable wing locker baggage capacity is reduced to 40 pounds.
- 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 1-3 - 400 pounds (200 Pounds Per Side).
- e. Aft Cabin (Bay B) See Figure 1-3 - 100 pounds (50 Pounds Per Side).

CABIN, BAGGAGE AND ENTRY DIMENSIONS GOLDEN EAGLE



BAGGAGE COMPARTMENT VOLUME - CUBIC FEET	
AVIONICS BAY	11.0
NOSE	25.0
WING LOCKER EACH (STD)	7.7
AFT CABIN (BAY A AND B)	30.6

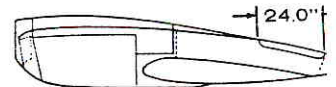
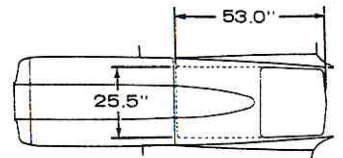


Figure 1-3

3 November 1980

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

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INTRODUCTION

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

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

NOTE

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

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

SPEED	KIAS	KCAS	REMARKS
Maneuvering Speed V_A (Knots)	151	150	Do not make abrupt control movements above this speed.
Maximum Flap Extended Speed V_{FE} (Knots) 150 45°	176 146	175 145	Do not exceed this speed with the given flap setting.
Maximum Gear Operating Speed V_{LO} (Knots)	176	175	Do not extend landing gear above this speed.
Maximum Gear Extended Speed V_{LE} (Knots)	176	175	Do not extend or retract landing gear above this speed.
Air Minimum Control Speed - V_{MC_A} (Knots)	80	82	This is the minimum flight speed at which the airplane is controllable with one engine inoperative and a 5° bank towards the operative engine.
One Engine Inoperative Best Rate-of-Climb Speed V_Y (Knots)	111	111	This speed delivers the greatest gain in altitude in the shortest possible time with one engine inoperative at sea level, standard day conditions and 7450 pounds weight.
Never Exceed Speed V_{NE} (Knots)	240	238	Do not exceed this speed in any operation.
Maximum Structural Cruising Speed V_{NO} (Knots)	201	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

AIRSPED INDICATOR TABLE

MARKING	KIAS VALUE OR RANGE	SIGNIFICANCE
Red Radial	80	Air minimum control speed.
White Arc	77 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	86 to 201	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	111	One engine inoperative best rate-of-climb speed at sea level standard day conditions and 7450 pounds weight.
Yellow Arc	201 to 240	Caution range. Operations must be conducted with caution and only in smooth air.
Red Radial	240	Maximum speed for all operations.

Figure 2-2

ENGINE LIMITATIONS

Number of Engines: 2

Engine Manufacturer: Teledyne Continental Motors

Engine Model Number: GTS10-520-N

Engine Operating Limits for Takeoff and Continuous Operation

a. Maximum power for all operations

Altitude - Feet	Allowable Manifold Pressure - Inches Hg.	Engine RPM	Rated Horsepower	Time	Max. Head Temp. °F	Max. Oil Temp. °F
S.L. to 20,000	39.0	2235	375	Continuous	460	240
22,000	36.5	2235	338	Continuous	460	240
24,000	34.0	2235	312	Continuous	460	240
26,000	31.0	2235	283	Continuous	460	240
28,000	28.0	2235	253	Continuous	460	240
30,000	25.0	2235	225	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 100 Hours

Propellers:

- a. Number of Propellers: 2
- b. Manufacturer: McCauley Accessory Division, Cessna Aircraft Company
- c. Part Number: 0850334-27
- d. Number of Blades: 3
- e. Diameter: 7'6.0" maximum, 7'4.0" minimum
- f. Blade Range: (At 30-Inch Station)
 - (1) Low Pitch 16.6° $\pm 0.2^\circ$
 - (2) Feather 84.6° $\pm 0.3^\circ$
- g. Operating Limits: 2235 RPM maximum speed

Engine Instrument Markings:

- a. Tachometer (Propeller Speed):
 - (1) Normal Operating 1600 to 1900 RPM (Green Arc)
 - (2) 1900 to 2185 (Yellow Arc)
 - (3) Takeoff and Climb 2185 to 2235 RPM (Green Arc)
 - (4) Maximum 2235 RPM (Red Radial)
 - (5) On Face of Indicator: "RPM x 100" "AVOID CONTINUOUS OPERATION IN YELLOW ARC"

b. Manifold Pressure:

- (1) Normal Operating 17.0 to 32.5 Inches Hg. Manifold Pressure (Green Arc)
- (2) Maximum At Indicated Altitudes (Blue Arc)

"ALT. FT x 1000"	"MAX MP" In. Hg.
SL	39.0
20	39.0
22	36.5
24	34.0
26	31.0
28	28.0
30	25.0
- (3) Maximum (20,000 Feet And Below) 39.0 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 (3.4 PSI) (Red Radial)
- (2) Normal Operating 20.0 Pounds per hour (3.9 PSI) to 275.0 Pounds per hour (18.7 PSI) (Green Arc)
 - (a) Green Dots

45% Power - 82.8 Pounds per hour (5.5 PSI)
55% Power - 98.8 Pounds per hour (6.1 PSI)
65% Power - 114.5 Pounds per hour (6.9 PSI)
75% Power - 131.0 Pounds per hour (7.7 PSI)
 - (b) Blue Arc - Takeoff and Climb

28,000 Feet - 161.0 Pounds per hour (9.4 PSI)
26,000 Feet - 185.0 Pounds per hour (11.1 PSI)
24,000 Feet - 206.0 Pounds per hour (12.6 PSI)
22,000 Feet - 224.0 Pounds per hour (14.1 PSI)
20,000 Feet - 240.0 Pounds per hour (15.5 PSI)

- (c) Blue Triangle (75% Power) - 143.0 Pounds per hour (8.3 PSI)
(Cruise Climb and Best Power)
- (d) White Arc - Takeoff and Climb Power to 18,000 Feet 255.0
Pounds per hour (16.8 PSI) to 275.0 Pounds per hour (18.7 PSI)
- (3) Maximum Operating 280.0 Pounds per hour (19.2 PSI) (Red Radial)
- (4) On Face of Indicator: "FUEL FLOW LBS/HR" "T.O." "CLIMB"
"75% 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 PSI
- b. Green Arc: 1550 to 1850 PSI
- c. Red Line: 2000 PSI
- d. The Cubic Foot Capacity Of The Bottle Installed Will Be Indicated On
The Face Of The Gage.

WEIGHT LIMITS

Maximum Ramp Weight: 7500 pounds

Maximum Takeoff Weight: 7450 Pounds

Maximum Landing Weight: 7200 Pounds

Maximum Zero Fuel Weight: 6733 Pounds

Maximum Weights in Baggage Compartments:

- a. Left and Right Wing Lockers - 200 pounds each.
 - (1) If optional wing locker tank(s) are installed, change item "a" on
the appropriate side(s) to 40 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: 157.95 inches aft of reference datum (29.58% MAC) at 7450 pounds or less.
- b. Forward Limit: 152.59 inches aft of reference datum (21.15% MAC) at 7450 pounds or less and 147.14 inches aft of reference datum (12.58% MAC) at 6100 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 63.64 inches in length. The leading edge of the MAC is 139.13 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 7450 Pounds:

- a. Landing gear up, wing flaps 0° +3.6G to -1.44G
- b. Landing gear down, wing flaps 45° +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: 3.4 PSI (0 Pounds Per Hour)
- b. Maximum: 19.2 PSI (280.0 Pounds Per Hour)

Fuel Quantity:

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

Maneuvering Fuel:

- a. Due to possible fuel starvation, 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).

FUEL TABLE

System	Total Fuel Capacity (U.S. Gallons)	Usable Fuel (U.S. Gallons)
Standard System	213.4	206.0
Standard System with One Optional Wing Locker Tank	241.8	<u>234.0</u>
Standard System with Two Optional Wing Locker Tanks	270.2	262.0

Figure 2-3

MAXIMUM OPERATING ALTITUDE LIMIT

Without Oxygen Equipment: 25,000 Feet

With Oxygen Equipment: 30,000 Feet

CABIN PRESSURIZATION LIMIT

Maximum: 5.3 PSI

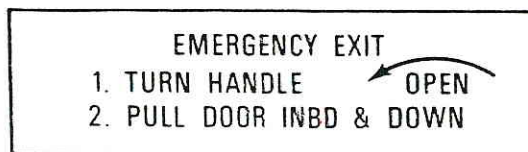
Normal: 0.0 to 5.0 PSI

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

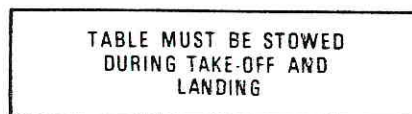
On Emergency Exit Window Trim:



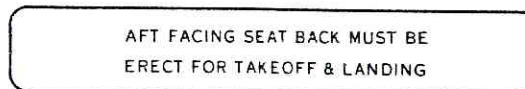
On Emergency Exit Window Trim (With Optional Right Aft Facing Seat):



On Executive Table Top And Writing Desk Top:

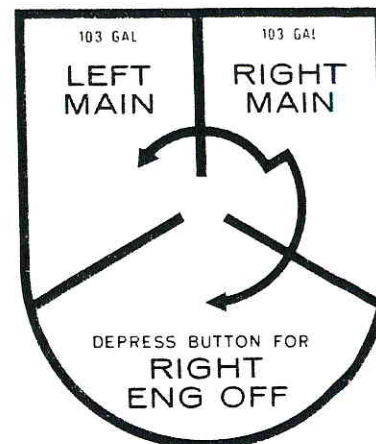
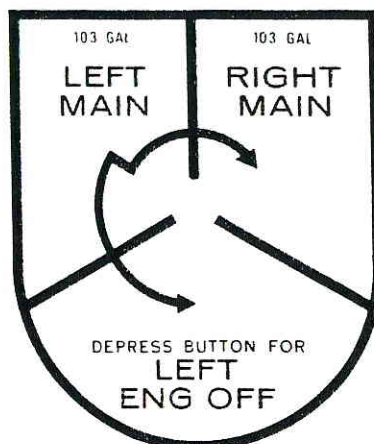


On Wall Opposite Emergency Exit Window:



On Left Engine Fuel Selector:

On Right Engine Fuel Selector:



On Floor Forward of Fuel Selectors:

Standard Configuration

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.

Optional Wing Locker Tanks

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.

- 1 OPERATE ON MAIN TANKS UNTIL FUEL QUANTITY IS LESS THAN 400 LBS PER TANK.**
- 2 BEGIN WING LOCKER FUEL TRANSFER BEFORE MAIN TANK QUANTITY DECREASES BELOW 200 LBS.**
- 3 TRANSFER FUEL IN STRAIGHT AND LEVEL FLIGHT ONLY.**
- 4 TURN TRANSFER PUMPS OFF WHEN LIGHTS ILLUMINATE.**
- 5 USE FUEL CROSSFEED SYSTEM TO BALANCE MAIN FUEL QUANTITIES IF ONE WING LOCKER TANK DOES NOT TRANSFER OR IF A SINGLE WING LOCKER TANK IS INSTALLED.**

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):

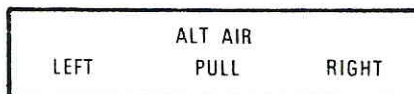
**LEVER UP
CROSSFEED
OFF**

On Pilot's Sun Visor:

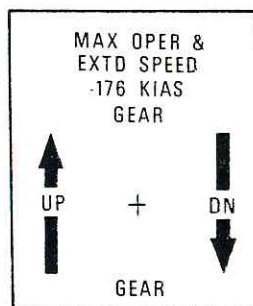
OPERATIONAL LIMITS
 THE MARKINGS AND PLACARDS INSTALLED IN THIS AIRPLANE CONTAIN OPERATING LIMITATIONS WHICH MUST BE COMPLIED WITH WHEN OPERATING THIS AIRPLANE IN THE NORMAL CATEGORY. OTHER OPERATING LIMITATIONS WHICH MUST BE COMPLIED WITH WHEN OPERATING THIS AIRPLANE IN THE NORMAL CATEGORY ARE CONTAINED IN THE "PILOT'S OPERATING HANDBOOK AND FAA APPROVED AIRPLANE FLIGHT MANUAL".
 NO ACROBATIC MANEUVERS, INCLUDING SPINS, APPROVED.
 AIR MINIMUM CONTROL SPEED _____ 80 KIAS
 MAXIMUM GEAR OPERATING SPEED _____ 176 KIAS
 MAXIMUM GEAR EXTENDED SPEED _____ 176 KIAS
 MAXIMUM FLAP EXTENDED SPEED, 15° FLAP _____ 176 KIAS
 MAXIMUM FLAP EXTENDED SPEED, 45° FLAP _____ 146 KIAS
 MAXIMUM MANEUVERING SPEED _____ 151 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.

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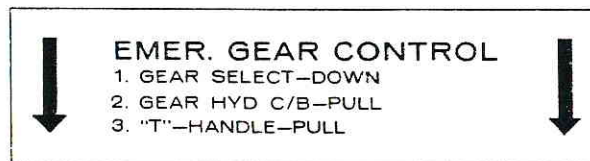
Induction Air Controls (Optional EL Panel Installed):



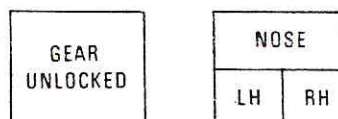
Around Landing Gear Selector Switches:



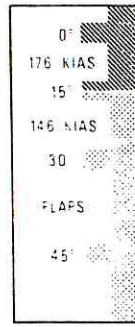
Around Landing Gear Selector Switches (Optional EL Panel Installed):



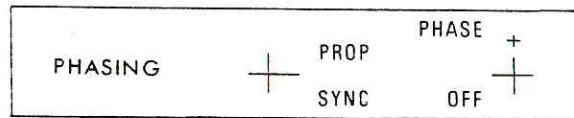
On Landing Gear Indicator Lights:



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 Up to 8° Nose Up:



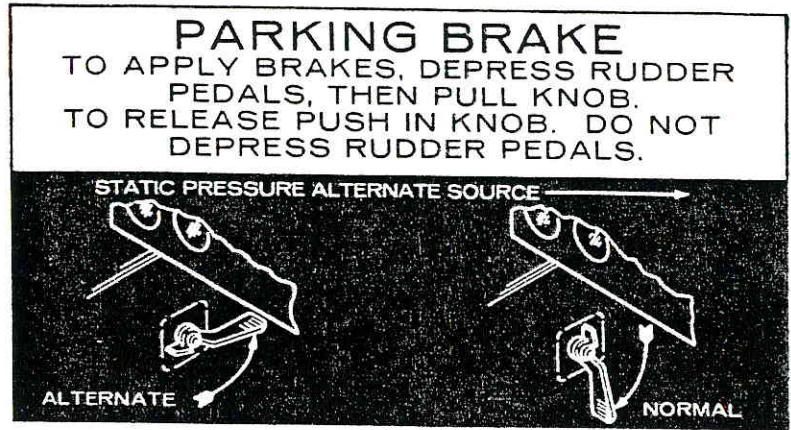
Rudder Trim Indicator:



Aileron Trim Indicator:



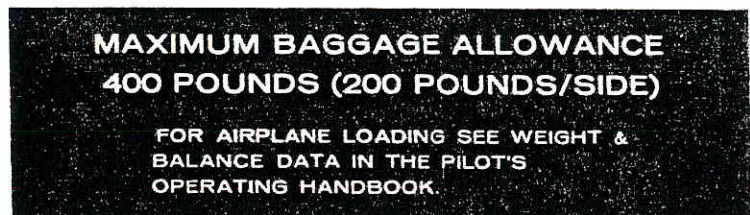
Adjacent to Static Source in Pilot's Compartment:



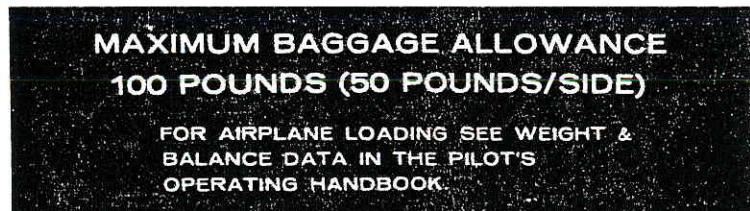
On Pilot's Compartment Right Sidewall:



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:

DOOR
OPERATION
TO OPEN:
PUSH BUTTON &
ROTATE
HANDLE ↻
TO CLOSE:
ROTATE
HANDLE ↻

Internal:



Near Main Tank Filler Cap:



Near Wing Locker Fuel Filler Caps (If Installed):



On Wing Locker Doors:

Standard Configuration:

**MAX
BAGGAGE
200 LBS**

If Optional Wing Locker Tanks
Are Installed:

**MAX
BAGGAGE
40 LBS**

Inside Nose Baggage Doors:

MAXIMUM BAGGAGE
MAX CAPACITY 350 LBS LESS
OPTIONAL EQUIP

Inside Left Nose Baggage Door:

**EXTERNAL HYD.
RESERVOIR FILL
MIL-H-5606**

On Hydraulic Reservoir:

MAX FULL —
ADD —

On Avionics Bay Door Forward Partition:

MAXIMUM BAGGAGE
MAX CAPACITY 250 LBS LESS
OPTIONAL EQUIP



**SECTION 3
EMERGENCY PROCEDURES
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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.

3 November 1980
Revision 1 - 2 Apr 1982

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 7450 Pounds	3. Standard Day, Sea Level
2. Landing Weight 7200 Pounds	
(1) Air Minimum Control Speed	80 KIAS
(2) Intentional One Engine Inoperative Speed	100 KIAS
(3) One Engine Inoperative Best Angle-of-Climb Speed	105 KIAS
(4) One Engine Inoperative Best Rate-of-Climb Speed (Wing Flaps UP)	111 KIAS

Figure 3-1

ENGINE INOPERATIVE PROCEDURES

ENGINE SECURING PROCEDURE

- | |
|---|
| <ol style="list-style-type: none"> 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.

ENGINE FAILURE DURING TAKEOFF (Speed Below 100 KIAS Or Gear Down)

- | |
|--|
| <ol style="list-style-type: none"> 1. Throttles - CLOSE IMMEDIATELY. 2. Brake or Land and Brake - AS REQUIRED. |
|--|

ENGINE FAILURE AFTER TAKEOFF (Speed Above 100 KIAS With Gear Up Or In Transit)

1. Mixtures - FULL RICH.
2. Propellers - FULL FORWARD.
3. Throttles - FULL FORWARD (39.0 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 - 100 KIAS.
8. Climb At One Engine Inoperative Best Rate-of-Climb Speed - 111 KIAS.
9. Trim Tabs - ADJUST 5° bank toward operative engine with approximately 1/2 ball slip indicated on the turn and bank indicator.
10. Inoperative Engine - SECURE as follows:
 - a. Fuel Selector - OFF (Feel For Detent).
 - b. Auxiliary Fuel Pump - OFF.
 - c. Magneto Switches - OFF.
 - d. Alternator - OFF.
11. As Soon As Practical - LAND.

SUDDEN ENGINE ROUGHNESS

1. Power - REDUCE IMMEDIATELY (Both Engines).
 - a. Manifold Pressure - 32.5 Inches Hg. maximum.
 - b. RPM - 1800 MAXIMUM.
2. Propeller Synchrophaser - OFF (Optional System).
3. Rough Engine - DETERMINE.
4. Problem - ANALYZE.
5. Rough Engine - SECURE if roughness cannot be cleared.
6. Operative Engine - ADJUST.
7. Trim Tabs - ADJUST 5° bank toward operative engine with approximately 1/2 ball slip indicated on the turn and bank indicator.
8. As Soon As Practical - LAND.

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

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.
10. Operative Engine - ADJUST.
 - a. Power - AS REQUIRED.
 - b. Mixture - ADJUST for power.
 - c. Fuel Selector - MAIN TANK (Feel For Detent).
 - d. Auxiliary Fuel Pump - ON.
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 VMCA)

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.

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 - 111 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 111 KIAS only if landing is assured.
11. Air Minimum Control Speed - 80 KIAS.

ENGINE INOPERATIVE GO-AROUND (Speed Above 111 KIAS)

1. Throttle - FULL FORWARD (39.0 Inches Hg.).
2. Wing Flaps - UP (If Extended).
3. Positive Rate-of-Climb - ESTABLISH.
4. Landing Gear - UP.
5. Climb at One Engine Inoperative Best Rate-of-Climb Speed - 111 KIAS.
6. 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. 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. Alternator - ON.

BOTH ENGINES FAILURE DURING CRUISE FLIGHT

1. Wing Flaps - UP.
2. Landing Gear - UP.
3. Propellers - FEATHER.
4. Airspeed - 122 KIAS (See Figure 3-3).
5. 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.

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.
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 - 240 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 - 122 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 - 111 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.

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 load on remaining alternator to 80% of the 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).

OBSTRUCTION OR ICING OF AIR INLET EMERGENCY PROCEDURES

1. Alternate Air Control(s) - PULL OUT after loss of 3 inches Hg. manifold pressure.
2. Propeller(s) - INCREASE RPM (Avoid Continuous Operation In The Yellow Arc).
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 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

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 engine inoperative 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 (80 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 100 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 105 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 111 KIAS with wing flaps and landing gear up. The 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.

Procedures in the Amplified Checklist 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.

ENGINE FAILURE DURING TAKEOFF

(Speed Below 100 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 100 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 100 KIAS With Gear Up Or In Transit)

1. Mixtures - FULL RICH.
2. Propellers - FULL FORWARD.
3. Throttles - FULL FORWARD (39.0 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 - 100 KIAS.

8. Climb at One Engine Inoperative Best Rate-of-Climb Speed - 111 KIAS.
9. Trim Tabs - ADJUST 5° bank toward operative engine with approximately 1/2 ball slip indicated on the turn and bank indicator.
10. 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.
11. As Soon as Practical - LAND.

Upon engine failure after reaching 100 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 100 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

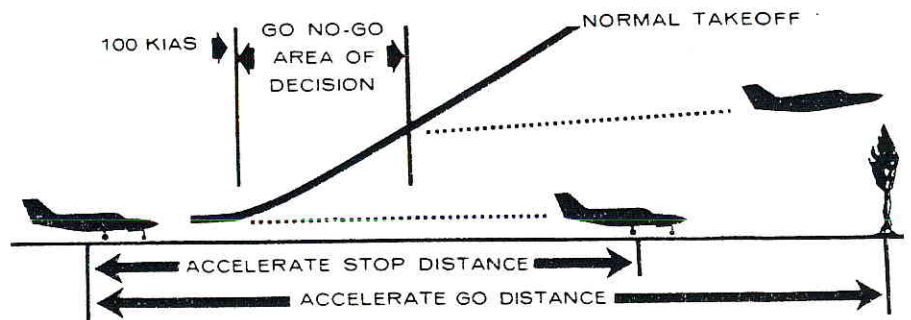


Figure 3-2

At sea level standard day, with zero wind and 7450 pounds weight, the distance to accelerate to 100 KIAS and stop is 3630 feet, while the total unobstructed distance required to takeoff and climb over a 50-foot obstacle after an engine failure at 100 KIAS is 4960 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.

SUDDEN ENGINE ROUGHNESS

1. Power - REDUCE IMMEDIATELY (Both Engines).
 - a. Manifold Pressure - 32.5 inches Hg. maximum.
 - b. RPM - 1800 MAXIMUM.
2. Propeller Synchrophaser - OFF (Optional System).
3. Rough Engine - DETERMINE.
4. Problem - ANALYZE.
5. Rough Engine - SECURE if roughness cannot be cleared.
6. Operative Engine - ADJUST.
7. Trim Tabs - ADJUST 5° bank toward operative engine with approximately 1/2 ball slip indicated on the turn and bank indicator.
8. As Soon As Practical - LAND.

The purpose of the tachometer yellow arc and associated placard is to minimize the possibility of operation with a rough or malfunctioning engine at these RPM's. The GTSIO-520 engine has no restrictions or critical vibration characteristics when operating normally (e.g. all cylinders firing equally); however, certain malfunctions within the engine cause torsional vibrations to be excited in the crankshaft and drive system. These vibrations, when forced at certain levels and frequencies, become destructive to numerous components of the engine and possibly the propeller and its attachment.

Specific items which show early damage from these torsional vibrations are: the magneto rubbers, alternator drives, starter adapter gears, tachometer drive shaft and quill shaft.

If it is necessary to keep a rough engine in operation, the speed of least destructive resonance is 1800 RPM; however, it is recommended that a rough engine be shut down whenever possible. Any rough engine operation calls for a magneto rubber and propeller nut torque inspection as described in Section 7 of the Airplane Service Manual.

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.
10. Operative Engine - ADJUST.
 - a. Power - AS REQUIRED.
 - b. Mixture - ADJUST for power.
 - c. Fuel Selector - MAIN TANK (Feel For Detent).
 - d. Auxiliary Fuel Pump - ON.
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.

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 111 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 111 KIAS only if landing is assured.
11. Air Minimum Control Speed - 80 KIAS.

ENGINE INOPERATIVE GO-AROUND**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 111 KIAS, increase engine speed to 2235 RPM and apply full throttle.
2. Wing Flaps - UP (If Extended).
3. Positive Rate-of-Climb - ESTABLISH.
4. Landing Gear - UP.
5. Climb at 111 KIAS (105 KIAS With Obstacles Directly Ahead).
6. 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. 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. Alternator - ON.

BOTH ENGINES FAILURE DURING CRUISE FLIGHT

1. Wing Flaps - UP.
2. Landing Gear - UP.
3. Propellers - FEATHER.
4. Airspeed - 122 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.

5. 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 122 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. Best Glide Speed.
5. Zero Wind.

WEIGHT POUNDS	KIAS
7450	122
6800	116
6200	111
5600	105

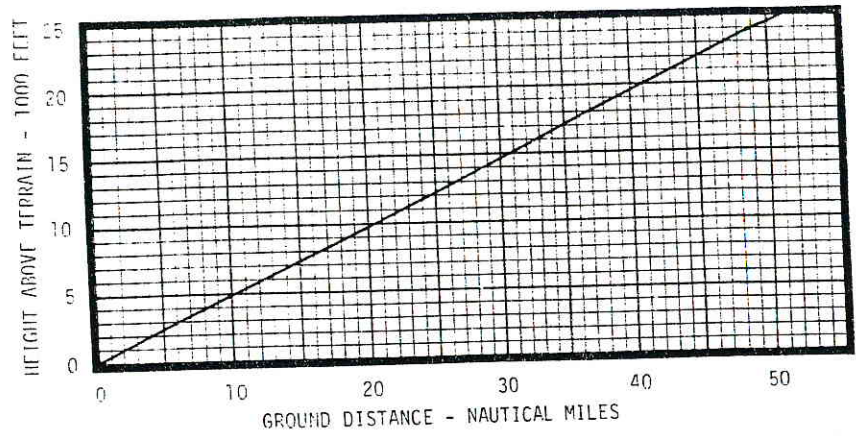
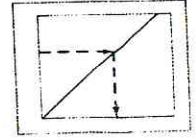


Figure 3-3

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.
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 - 240 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 - WINDMILLING (If Practical).
3. Fuel Selectors - OFF (Feel For Detent).
4. Emergency Crossfeed Shutoff - OFF (Pull Up).
5. All Switches Except Battery Switch - OFF.
6. Approach - 122 KIAS.
7. If field is smooth and hard, plan a landing as follows:
 - a. Landing Gear - DOWN within gliding distance of field.
 - b. Gear Down Lights - ON; Unlocked Light - OFF.
 - c. If gear down lights do not illuminate:
 - (1) GEAR HYD Circuit Breaker - PULL.
 - (2) Emergency Gear Extension T-Handle - PULL.
 - (3) Gear Down Lights - ON; Unlocked Light - OFF.
 - (4) Gear Warning Horn - CHECK.
 - d. Wing Flaps - EXTEND as necessary within gliding distance of field.
 - e. Approach - 105 KIAS.
 - f. Battery Switch - OFF.
 - g. 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.
3. Approach at 111 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.
 - b. Landing Gear - DOWN.
 - c. Approach at 111 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 111 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 - 112 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 minimum 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. Mixture - FULL RICH. Adjust fuel flow to coincide with power setting.
4. As Soon as Practical - LAND.
5. Fuel in opposite main tank 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 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. Spare fuses are located on the left side console forward of the field fuses.
 - 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 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 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 if necessary. Spare fuses are located on the left side console forward of the field fuses.
 - 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 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 gear 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 or 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.

OBSTRUCTION OR ICING OF AIR INLET EMERGENCY PROCEDURES**NOTE**

The cold alternate air inlet will automatically open if the primary air inlet or air filter becomes blocked.

When more than approximately three inches Hg. manifold pressure is lost and the cold alternate air door(s) have not opened, proceed as follows:

1. Alternate Air Control(s) - PULL OUT.
2. Propeller(s) - INCREASE (Avoid Continuous Operation In The Yellow Arc).
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).

SECTION 4
NORMAL PROCEDURES
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INTRODUCTION

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

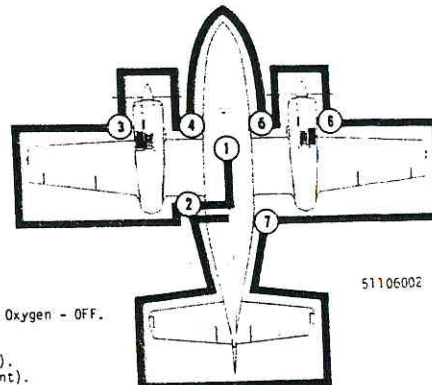
NOTE

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

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.



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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. Voltmeter 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 15°.
 - q. Anti-Collision Lights - CHECK operation.
 - r.*Electric Windshield - CHECK operation by observing discharge on voltmeter 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 warn.
 - 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. Induction System Intercooler Outlet - CLEAR.
 - c. Oil Level - CHECK minimum 9 quarts.
 - d. Propeller and Spinner - EXAMINE for nicks, security and oil leaks.
 - e. Engine Openings - CLEAR.
 - f. Intake Air Opening - CLEAR.
 - g.*Inboard Deice Boot - CHECK condition and security.
 - h. Main Gear, Strut, Door, Tire and Wheel Well - CHECK.
 - i. Wing Tie Down - REMOVE.
 - j. Wing Locker Tank Fuel Filler Cap Vent - CLEAR.
 - k.*Wing Locker Tank Fuel Sump - DRAIN.
 - l.*Wing Locker Tank Fuel Vent - CLEAR and WARM.
 - m. Crossfeed Line - DRAIN.
 - n. Lower Fuselage, Nose and Center Section - CHECK for fuel and oil leaks or stains and antenna security.
 - o. Heat Exchanger Opening - CLEAR.
 - p.*Engine Fire Extinguisher Bottle Pressure - CHECK.
 - q.*Wing Locker Tank Fuel Quantity - CHECK; Cap - SECURE; Cover - INSTALLED.

Figure 4-1 (Sheet 1 of 2)

PREFLIGHT INSPECTION

- 4
 - a. Hydraulic Fluid Reservoir Level - CHECK.
 - b. Emergency Landing Gear Slow 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.
 - c. Nose Baggage Door - SECURE.
 - d. Avionics Bay Door - SECURE.
 - e. Nose Gear, Strut, Stop Block, Door, Tire and Wheel Well - CHECK.
 - f. Tie Down - REMOVE.
 - g. Pitot Cover - REMOVE; Pitot Tube - CLEAR and WARM.
 - h. Ram Air Inlet - CLEAR.
 - i. Pitot Cover - REMOVE; Pitot Tube - CLEAR and WARM.
 - j. Oxygen Overboard Discharge Indicator - CHECK green disc installed.
 - k. Heater Inlet and Outlet - CLEAR.
 - l. Baggage Door - SECURE.

- 5
 - a. Heat Exchanger Opening - CLEAR.
 - b. Inboard Deice Boot - CHECK condition and security.
 - c. Lower Fuselage, Nose and Center Section - CHECK for fuel and oil leaks or stains and antenna security.
 - d. Main Gear, Strut, Door, Tire and Wheel Well - CHECK.
 - e. Wing Tie Down - REMOVE.
 - f. Wing Locker Tank Fuel Sump - DRAIN.
 - g. Wing Locker Tank Fuel Vent - CLEAR and WARM.
 - h. Crossfeed Line - DRAIN.
 - i. Engine Fire Extinguisher Bottle Pressure - CHECK.
 - j. Air Conditioning Outlet Air Opening - CLEAR.
 - k. Intake Air Opening - CLEAR.
 - l. Induction System Intercooler Outlet - CLEAR.
 - m. Oil Level - CHECK minimum 9 quarts.
 - n. Propeller and Spinner - EXAMINE for nicks, security and oil leaks.
 - o. Engine Openings - CLEAR.

- 6
 - a. Air Conditioning Fluid Level - CHECK.
 - b. Air Conditioning Inlet Air Opening - CHECK DOOR CLOSED.
 - c. Wing Locker Tank Fuel Quantity - CHECK; Cap - SECURE; Cover - INSTALLED.
 - d. Engine Compartment General Condition - CHECK for fuel, oil, hydraulic fluid and exhaust leaks or stains.
 - e. Fuel Strainer - DRAIN.
 - f. Main Tank Fuel Sumps - DRAIN (2 Drains).
 - g. Outboard Deice Boot - CHECK condition and security.
 - h. Main Tank Fuel Quantity - CHECK; Cap - SECURE.
 - i. Fuel Vent - CLEAR.
 - j. Bottom Outboard Wing - CHECK for fuel leaks or stains.
 - k. Landing Light Filament - CHECK condition.
 - l. Navigation Light - CHECK operation.
 - m. Control Surface Lock - REMOVE, if installed.
 - n. Aileron - CHECK condition and freedom of movement.
 - o. Wing Flap - CHECK security and attachment.
 - p. Wing Locker Tank Fuel Filler Cap Vent - CLEAR.
 - q. Wing Locker Baggage Door - SECURE.
 - r. Alcohol Deice Tank - CHECK quantity.

- 7
 - a. Static Port(s) - CLEAR. Do not blow into static ports.
 - b. Tailcone Drain Holes - CHECK clear of obstructions.
 - c. Stabilizer Deice Boots - CHECK condition and security.
 - d. Control Surface Lock(s) - REMOVE, if installed.
 - e. Elevator and Tab - CHECK condition, freedom of movement and tab position.
 - f. Rudder and Tab - CHECK condition, freedom of movement and tab position. Move rudder right; tab should move left.
 - g. Tie Down - REMOVE.
 - h. Elevator - CHECK condition, freedom of movement.
 - i. Stabilizer Deice Boots - CHECK condition and security.
 - j. Rudder Lock - RELEASED.
 - k. Static Port(s) - CLEAR. Do not blow into static ports.
 - l. Cabin Door - CHECK security and condition.
 - m. Battery Switch - OFF.
 - n. 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 7450 Pounds	3. Sea Level, Standard Day
2. Landing Weight 7200 Pounds	
(1) Air Minimum Control Speed	80 KIAS
(2) Takeoff and Climb to 50 Feet (0° Wing Flaps)	100 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)	111 KIAS
(5) All Engines Landing Approach Speed (45° Wing Flaps)	100 KIAS
(6) Maneuvering Speed	151 KIAS
(7) Structural Cruise Speed	201 KIAS
(8) Never Exceed Speed	240 KIAS
(9) Speed for Transition to Balked Landing Conditions	100 KIAS
(10) Maximum Demonstrated Crosswind Velocity	17 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. Engine Instruments - CHECK.

BEFORE TAXIING

1. Avionics - SET.

TAXIING

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

BEFORE TAKEOFF

1. Engine Runup - COMPLETE.
 - a. Throttles - 1500 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 - 900 RPM.
2. Fuel Quantity - CHECK.
3. Fuel Selectors - MAIN TANKS.
4. Emergency Crossfeed Shutoff - CHECK OPEN (Push Down).
5. Trim Tabs - SET.
6. Wing Flaps - UP.
7. Flight Instruments and Avionics - SET.
8. Lights - AS REQUIRED.
9. All Cabin Doors and Windows - CLOSED.
10. Pressurization - SET.
11. Annunciator Panel - CLEAR.
12. Auxiliary Fuel Pumps - ON.
13. Flight Controls - CHECK.
14. Ice Protection - AS REQUIRED.
15. 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 - 80 KIAS.
5. Takeoff and Climb to 50 Feet - 100 KIAS at 7450 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 With Wing Flaps Up - 111 KIAS at sea level and 7450 pounds. Refer to Section 5 for speed at reduced weight.

CLIMB

1. Power - SET.
2. Mixtures - ADJUST.
3. Pressurization - SET.

CRUISE

1. Cruise Power - SET.
2. Auxiliary Fuel Pumps - OFF (LOW only if required).
3. Mixtures - LEAN.
4. Propellers - SYNCHRONIZE.
5. Propeller Synchrophaser - AS REQUIRED.
6. Fuel Selectors - MAIN TANKS.
7. Cabin Altitude and Delta Pressure - CHECK.
8. Trim Tabs - ADJUST.

DESCENT

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

BEFORE LANDING

1. Seat Belts and Shoulder Harness - SECURE.
2. Propeller Synchrophaser - AS DESIRED (Optional System).
3. Wing Flaps - AS REQUIRED.
4. Landing Gear - DOWN.
5. Mixtures - ADJUST.
6. Propellers - FULL FORWARD.
7. Approach Speed - 100 KIAS at 7200 pounds. Refer to Section 5 for speeds at reduced weights.

AFTER LANDING

1. Auxiliary Fuel Pumps - OFF.
2. 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 main and optional wing locker 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), stall warning transmitter and optional wing locker fuel tank vent heating elements is determined by observing a discharge on the voltmeter 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 - GND START.
9. Propellers - FULL FORWARD.
10. Throttles - OPEN HALF LEVER WIDTH (At the quadrant).
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. Fuel Totalizer - SET (Optional System).
 - a. Counter Switch - ACTUATE until totalizer reads equal to the amount of fuel in the tanks if a fuel remaining reading is desired.

- b. DIM/CLR Switch - CLR if a fuel consumed reading is desired.

NOTE

If fuel is added before a flight, ensure that the totalizer is adjusted to reflect the additional fuel.

24. Cabin Air Controls - AS REQUIRED.
25. Alternate Air Controls - IN.
26. 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 ENGINES (Left Engine First Without External Power)

1. Propeller - CLEAR.
2. Magneto Switches - ON.
3. Engine - START.

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.

- a. Primer Switch - Left Engine - LEFT and HOLD.
- Right Engine - RIGHT and HOLD.

NOTE

For a hot engine the primer switch and starter button should be pressed simultaneously. For a warm to cold engine hold the primer 4 to 8 seconds prior to pressing the starter button.

- b. Starter Button - PRESS until engine starts. As the engine starts, release the starter but continue to hold the primer switch.
- c. Throttle - ADJUST if necessary to obtain 700 to 800 RPM.
- d. Mixture Lever - FORWARD slowly while continuing to hold the primer switch.
- e. Primer Switch - RELEASE as engine stabilizes.

NOTE

Release the primer switch as soon as the engine stabilizes. Holding the switch on for excessive periods of time at idle may result in flooding and engine stoppage. Premature release of the primer switch, before the engine stabilizes, may result in some momentary engine surging due to fuel vapors in the metered fuel line.

4. Throttle - 750 to 900 RPM.
5. 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.
6. Right Engine - START. Repeat steps 1 through 5.
7. 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.

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.

- a. Primer Switch - Left Engine - LEFT and HOLD.
- Right Engine - RIGHT and HOLD.

NOTE

For a hot engine the primer switch and starter button should be pressed simultaneously. For a warm to cold engine hold the primer 4 to 8 seconds prior to pressing the starter button.

- b. Starter Button - PRESS until engine starts. As the engine starts, release the starter but continue to hold the primer switch.
- c. Throttle - ADJUST if necessary to obtain 700 to 800 RPM.
- d. Mixture Lever - FORWARD slowly while continuing to hold the primer switch..
- e. Primer Switch - RELEASE as engine stabilizes.

NOTE

Release the primer switch as soon as the engine stabilizes. Holding the switch on for excessive periods of time at idle may result in flooding and engine stoppage. Premature release of the primer switch, before the engine stabilizes, may result in some momentary engine surging due to fuel vapors in the metered fuel line.

7. Throttle - 750 to 900 RPM.
8. 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.
9. Right Engine - START. Repeat steps 4 through 8.
10. External Power Source - REMOVE.
11. Alternator Switches - ON.
12. 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 alternator switches OFF.

NOTE

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

The engine priming system will start spraying fuel into the air induction manifold through a start nozzle as soon as the primer switch is activated when the mixture lever is in the GND START, (Idle Cut-Off), position. The metered fuel is cut off by the mixture lever at the metering unit; therefore there will be no flow indication on the fuel flow indicator. If the primer switch is activated for an excessive period of time with the engine stopped, liquid fuel will collect temporarily in the cylinder intake ports. The quantity of fuel deposited will depend on the length of time the primer switch has been activated. If this happens, it is advisable to wait a few minutes until the fuel drains away, then with mixtures at GND START, crank the propeller through 15 complete revolutions without prime. This is done to prevent the possibility of engine damage due to hydrostatic lock.

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 when the engines are hot if the primer is actuated prior to pressing the starter. Check the throttle for proper position (1/2 lever width forward) and attempt to start the engine pressing the starter button prior to the primer.

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.

If the engine primer system will not function due to the start nozzle solenoid being failed closed, the engine may be started as follows:

ALTERNATE STARTING PROCEDURE

1. Throttle - OPEN ONE INCH.
2. Mixture - FULL RICH.
3. Propeller - CLEAR.
4. Magneto Switches - ON.
5. Engine - START.
 - a. Starter Button - PRESS.
 - b. Primer Switch - Left Engine - LEFT.
- Right Engine - RIGHT.
6. Throttles - ADJUST 750 to 900 RPM.
7. Oil Pressure - CHECK.
8. Alternator - CHECK.

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 COUNTER-CLOCKWISE.
 - (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 - 1500 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 100 RPM maximum drop with a maximum differential of 50 RPM. Do not check magnetos above 1900 RPM in the yellow arc.
 - f. Propellers - CHECK feathering to 1000 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 - 900 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 39.0 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. Trim Tabs - SET elevator, aileron and rudder tabs in the TAKEOFF range.
8. Wing Flaps - UP.
9. Propeller Synchrophaser - AS DESIRED (Optional System).
10. Flight Instruments and Avionics - SET.
11. Lights - AS REQUIRED.

12. All Cabin Doors and Windows - CLOSED.
13. Pressurization Air Controls - PUSH IN and LOCK.
14. Cabin Pressurization Switch - PRESSURIZE.
15. Cabin Rate - ARROW UP (Optional System).
16. Cabin Altitude - SET 500 feet above field pressure altitude (Optional System).
17. Alternate Air Controls - IN.
18. Cabin Vent Control - PUSH IN.
19. Annunciator Panel - CLEAR.
20. Auxiliary Fuel Pumps - ON.
21. Flight Controls - CHECK, free and correct.
22. Ice Protection Equipment - AS REQUIRED.
23. Seat Belts and Shoulder Harness - SECURE.
24. 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 100 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 100 RPM is not considered acceptable. Magneto checks should not be made in the yellow arc. The most effective RPM range for detecting magneto roughness is between 1100 and 1500 RPM.

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 (1500 RPM) by positioning the selector switch in the L ALT and R ALT position and observing the charging rate on the voltmeter.

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 7450 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 - 2235 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 - 80 KIAS.
5. Elevator Control - Raise nosewheel at 95 KIAS.
6. Lift-Off - 100 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 39.0 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 (80 KIAS) be obtained as rapidly as possible. It is desirable to accelerate the airplane to 100 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 speed (100 KIAS) to 50 feet. As the airplane accelerates still further to all engines best rate-of-climb speed (111 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 - 111 KIAS at sea level and 7450 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 1900 RPM and 32.5 inches Hg. manifold pressure. In any case, avoid continuous operation in the yellow arc (1900 to 2185 RPM).

CLIMB

CRUISE CLIMB

1. Power - 1900 RPM and 32.5 inches Hg. Avoid continuous operation in the yellow arc.
2. Airspeed - 115 to 140 KIAS.
3. Mixtures - ADJUST to climb fuel flow (Blue Triangle).
4. 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).
5. Cabin Rate Control - SET to reach selected cabin altitude at approximately the same time the airplane reaches cruise altitude (Optional System).
6. Propellers - SYNCHRONIZE manually.
7. Propeller Synchronphaser - AS REQUIRED (Optional System).

MAXIMUM CLIMB

1. Power - 2235 RPM and FULL THROTTLE below 20,000 feet.
Placarded manifold pressure above 20,000 feet.
2. Airspeed - 111 KIAS.
3. Mixtures - FULL RICH below 18,000 feet (White Arc).
LEAN as required above 18,000 feet (Blue Arc).
4. 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).
5. 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 2235 RPM and 39.0 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 75% power (1900 RPM and 32.5 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 111 KIAS should be used with maximum power. During maximum performance climbs, the mixture should remain in the takeoff power range (white arc) up to the engine critical altitude and at the appropriate climb power range (blue arc) 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 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 synchrophaser 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 - 1600 to 1900 RPM and 17.0 to 32.5 inches Hg.

NOTE

Maintain sufficient power for pressurization requirements.

2. Auxiliary Fuel Pumps:
 - a. Main Tanks - OFF (LOW only if required).
 - b. Crossfeeding - LOW.
3. Mixtures - LEAN for desired cruise fuel flow as determined from your power computer. Recheck mixtures if power, altitude or OAT changes.
4. Propellers - SYNCHRONIZE manually.
5. Propeller Synchrophaser - AS REQUIRED (Optional System).
6. Fuel Selectors - Left Engine - LEFT MAIN (Feel For Detent).
Right Engine - RIGHT MAIN (Feel For Detent).
 - a. If wing locker tank(s) are installed, transfer wing locker fuel when main tank fuel quantity is less than 400 pounds. Begin wing locker transfer before main tank quantity decreases below 200 pounds.

NOTE

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

- b. If wing locker tank(s) are installed, crossfeed as required to maintain fuel balance after wing locker tank fuel transfer
7. 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 50 feet (inner scale) whichever gives the highest cabin altitude (Optional System)
8. Cabin Rate Control - ARROW UP.

9. 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.

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.

- 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.
10. 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 75% (32.5 inches Hg. manifold pressure and 1900 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.

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 75% 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.

Manually synchronize the propellers as closely as possible. 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 switching 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 friction lock to prevent the slaved propeller control from creeping.

If wing locker fuel is to be used, use the main tank fuel until 400 pounds or less remains in the main tank(s) which will receive the wing locker fuel; this will prevent overflowing of the main tank(s) when transferring the wing locker fuel. Begin wing locker fuel transfer before the main tank quantity decreases below 200 pounds to prevent depleting the engine fuel supply before the wing locker fuel has been transferred.

There are no separate fuel selector controls for the wing locker fuel tanks. The wing locker fuel is pumped directly into the main tanks with a fuel transfer pump. Indicator lights mounted on the annunciator panel are illuminated by pressure switches to indicate fuel has been transferred. Fuel should be cross-fed as required to maintain fuel balance after wing locker fuel has been transferred.

NOTE

Wing locker transfer pump switches provided on the instrument panel, energize the wing locker fuel transfer pumps for transferring fuel. These switches should be turned ON only to transfer fuel and turned OFF when the indicator lights come on indicating fuel has been transferred.

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.

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.

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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. Propeller Synchrophaser - AS REQUIRED (Optional System).
7. 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.

During descents with progressive power reductions into rough air, the propeller synchrophaser may be positioned to ON. The synchrophaser should be positioned to OFF for large power changes.

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

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

If fuel has been consumed at uneven rates between the two 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 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.

NOTE

Make sure weight does not exceed 7200 pounds before attempting landing.

BEFORE LANDING

1. Seat Belts and Shoulder Harness - SECURE.
2. Propeller Synchrophaser - AS DESIRED (Optional System).
3. Alternate Air Controls - CHECK IN.
4. Wing Flaps - DOWN 15° below 176 KIAS.
5. Landing Gear - DOWN below 176 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 - 100 KIAS at 7200 pounds
Refer to Section 5 for speed 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 100 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 propeller speed to 2235 RPM and apply full throttle if necessary.
2. Balked Landing Transition Speed - 100 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. Wing Flaps - UP as soon as all obstacles are cleared and a safe altitude and airspeed are obtained.

AFTER LANDING

1. Auxiliary Fuel Pumps - OFF during landing roll.
2. 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. Ensure 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 is 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.

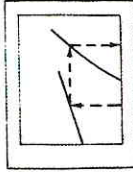
MANEUVERING FLIGHT

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 V_{MCA}

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



CAUTION
(TACHOMETER YELLOW ARC - 1900 TO 2185 RPM)
MANIFOLD PRESSURE SHOULD NOT EXCEED 18 INCHES HG. AND SMOOTH ENGINE OPERATION IS REQUIRED WHEN OPERATING WITHIN THE YELLOW ARC.

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

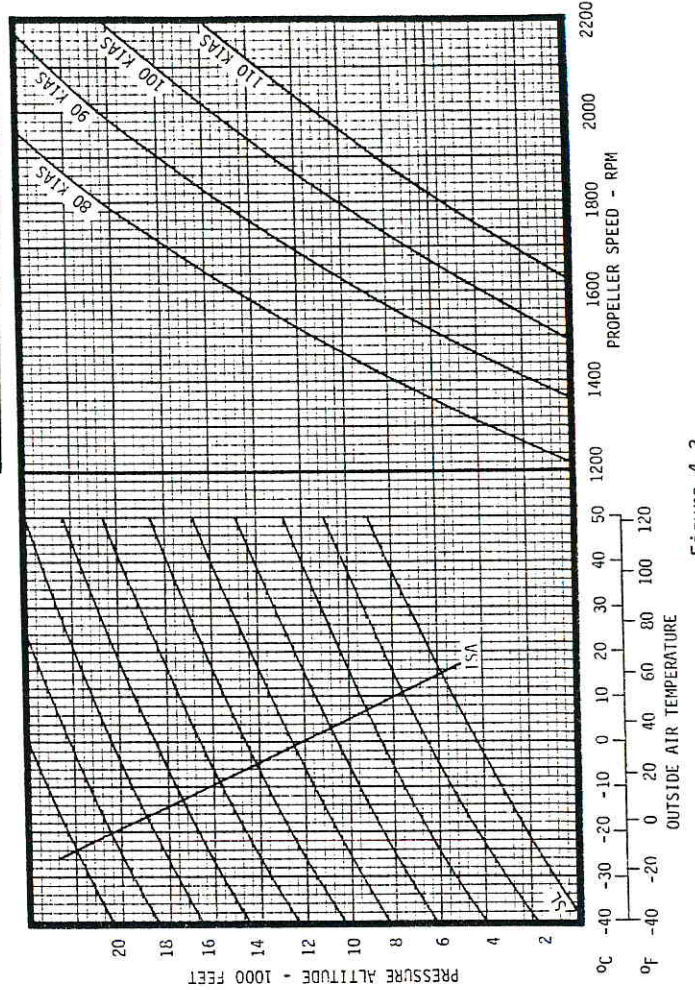


Figure 4-3

1. Wing Flaps - UP.
2. Landing Gear - UP.
3. Airspeed - V_{SSE} (100 KIAS) or above.
4. Inoperative Engine - IDLE POWER.
5. Operative Engine - 2235 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.

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.

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.

PRESSURIZATION AIR TEMPERATURE CONTROLS

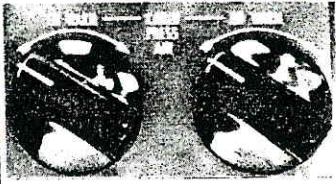
OUTSIDE AIR TEMPERATURE AT GROUND LEVEL	MANUAL SHUTOFF CONTROL POSITION	
ABOVE 21.1°C (70°F)	BOTH CONTROLS — FULL COUNTERCLOCKWISE	
1.7°C TO 21.1°C (35°F TO 70°F)	RIGHT CONTROL ONLY — FULL CLOCKWISE	
BELOW 1.7°C (35°F)	BOTH CONTROLS — FULL CLOCKWISE	

Figure 4-4

After a suitable warm-up period (2 to 5 minutes at 900 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 39.0 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 these engines is considered to be nonicing. However, two alternate induction air systems are incorporated to assure satisfactory operation. Should the induction air inlet, or the induction system air filter become obstructed, magnetically held auxiliary air doors in the engine compartment will automatically open. The opening of these alternate air doors will provide the engine with cool unfiltered air. If a decrease in manifold pressure is again experienced, it is an indication of SEVERE icing conditions and that the alternate air inlet source has iced up. Under these circumstances, the alternate air controls should be pulled full open which will admit warm unfiltered air to the engines. Both systems will provide continued satisfactory engine operation.

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

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

1. Increase RPM as required. Avoid continuous operation in the yellow arc.
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 ducts.

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 continuous power is 76.7 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 11,950 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
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INTRODUCTION

Section 5 of this handbook contains all the performance information required to operate the airplane safely and to help you plan your flights in detail with reasonable accuracy. Safe and precise operation of the airplane requires the pilot to be thoroughly familiar with and understand the data and calculations of this section.

The data on these graphical and tabular charts have been compiled from actual flight tests, with the airplane and engines in good condition, using average pilot techniques. Note that the cruise performance data 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:	Weight Temperature Pressure Altitude Headwind	7100 Pounds (16°C) 61°F 2400 Feet 19 Knots	Find:	Takeoff Speed Ground Roll Total Distance to Clear 50- Foot Obstacle	____ KIAS ____ Feet ____ Feet ____ 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
7450	100	2000	1930	2490	2130	2810
		3000	2050	2650	2270	3000
6800	96	2000	1550	1970	1700	2190
		3000	1650	2090	1810	2340

Approximation Method

Extract from the chart the next increment of weight, altitude and temperature which is more conservative than the actual conditions [i.e.: 7450 pounds, 3000 feet and 20°C (68°F)].

Takeoff and Climb Speed	100 KIAS
Ground Roll	2270 Feet
Total Distance to Clear 50-Foot Obstacle	3000 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 (7100 pounds) is 6800 pounds plus 300/650 or .46 times the difference between 6800 pounds and 7450 pounds [i.e.: 6800-pound value + .46 (7450-pound value - 6800-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 (20°C value - 10°C value)].

Interpolating Values for Normal Takeoff Distance:

$$\begin{aligned} \text{Takeoff and Climb Speed} &= 6800\text{-pound value} + [.46 (7450\text{-pound} \\ &\quad \text{value} - 6800\text{-pound value})] \\ &= 96 \text{ KIAS} + [.46 (100 \text{ KIAS} - 96 \text{ KIAS})] \\ &= 96 \text{ KIAS} + [1.8 \text{ KIAS}] \end{aligned}$$

Ground Roll (7 interpolations required)

$$\begin{aligned} \text{Altitude interpolation} &= 2000\text{-foot value} + [.4 (3000\text{-foot value} - \\ \text{at } 10^\circ\text{C (50}^\circ\text{F) and 7450} &\quad 2000\text{-foot value)}] \\ \text{pounds} &= 1930 \text{ feet} + [.4 (2050 \text{ feet} - 1930 \text{ feet})] \\ &= 1930 \text{ feet} + [48 \text{ feet}] \\ &= \underline{1978 \text{ feet}} \end{aligned}$$

$$\begin{aligned} \text{Altitude interpolation} &= 2000\text{-foot value} + [.4 (3000\text{-foot value} - \\ \text{at } 20^\circ\text{C (68}^\circ\text{F) and 7450} &\quad 2000\text{-foot value)}] \\ \text{pounds} &= 2130 \text{ feet} + [.4 (2270 \text{ feet} - 2130 \text{ feet})] \\ &= 2130 \text{ feet} + [56 \text{ feet}] \\ &= \underline{2186 \text{ feet}} \end{aligned}$$

$$\begin{aligned} \text{Altitude interpolation} &= 2000\text{-foot value} + [.4 (3000\text{-foot value} - \\ \text{at } 10^\circ\text{C (50}^\circ\text{F) and 6800} &\quad 2000\text{-foot value)}] \\ \text{pounds} &= 1550 \text{ feet} + [.4 (1650 \text{ feet} - 1550 \text{ feet})] \\ &= 1550 \text{ feet} + [40 \text{ feet}] \\ &= \underline{1590 \text{ feet}} \end{aligned}$$

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PERFORMANCE

Cessna
MODEL **421C**

$$\begin{aligned} \text{Altitude interpolation at } 20^{\circ}\text{C (68}^{\circ}\text{F) and 6800 pounds} &= 2000\text{-foot value} + [.4 (3000\text{-foot value} - 2000\text{-foot value})] \\ &= 1700 \text{ feet} + [.4 (1810 \text{ feet} - 1700 \text{ feet})] \\ &= 1700 \text{ feet} + [44 \text{ feet}] \\ &= \underline{1744 \text{ feet}} \end{aligned}$$

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
7450	100	2400	1978	----	2186	----
6800	96	2400	1590	----	1744	----

$$\begin{aligned} \text{Weight interpolation at } 10^{\circ}\text{C (50}^{\circ}\text{F) and 2400 feet} &= 6800\text{-pound value} + [.46 (7450\text{-pound value} - 6800\text{-pound value})] \\ &= 1590 \text{ feet} + [.46 (1978 \text{ feet} - 1590 \text{ feet})] \\ &= 1590 \text{ feet} + [178 \text{ feet}] \\ &= \underline{1768 \text{ feet}} \end{aligned}$$

$$\begin{aligned} \text{Weight interpolation at } 20^{\circ}\text{C (68}^{\circ}\text{F) and 2400 feet} &= 6800\text{-pound value} + [.46 (7450\text{-pound value} - 6800\text{-pound value})] \\ &= 1744 \text{ feet} + [.46 (2186 \text{ feet} - 1744 \text{ feet})] \\ &= 1744 \text{ feet} + [203 \text{ feet}] \\ &= \underline{1947 \text{ feet}} \end{aligned}$$

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
7100	98	2400	1768	----	1947	----

$$\begin{aligned}
 \text{Temperature interpolation at 2400 feet and 7100 pounds} &= 10^{\circ}\text{C} (50^{\circ}\text{F}) \text{ value} + [.6 (20^{\circ}\text{C} (68^{\circ}\text{F}) \text{ value} - 10^{\circ}\text{C} (50^{\circ}\text{F}) \text{ value})] \\
 &= 1768 \text{ feet} + [.6 (1947 \text{ feet} - 1768 \text{ feet})] \\
 &= 1768 \text{ feet} + [107 \text{ feet}] \\
 &= \underline{1875 \text{ feet}}
 \end{aligned}$$

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
7100	98	2400	1875	----

Ground Roll with 19-knot headwind

$$\begin{aligned}
 &= 1875 \text{ feet} - [1875 \text{ feet} \left(\frac{19 \text{ knots headwind}}{10 \text{ knots headwind}} \right) (7\%)] \\
 &= 1875 \text{ feet} - 249 \text{ feet} \\
 &= \underline{1626 \text{ feet}}
 \end{aligned}$$

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 2432 feet (no wind) and 2109 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 7100 Pound
Usable Fuel Load 1236 Pound

TAKEOFF AIRPORT CONDITIONS

Field Length 6000 Feet (Runway 2)
Temperature 16°C (61°F)
Field Pressure Altitude 2400 Feet
Wind 270° at 25 Knots
Obstacles No

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 7450 pounds weight; the takeoff and climb speed is 100 KIAS.
- (2) Proceed horizontally right from 3000-foot pressure altitude to the vertical columns for 20°C (68°F). The takeoff ground run is 2270 feet and the total distance required to clear a 50-foot obstacle is 3000 feet without wind correction. With a 19-knot headwind component, the corrected takeoff ground run is 1968 feet and the corrected total distance required is 2601 feet.

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

$$\begin{aligned} \text{Corrected Takeoff} &= 2270 \text{ feet} - [13.3\% (2270 \text{ feet})] \\ \text{Ground Run} &= 2270 \text{ feet} - [302 \text{ feet}] \\ &= \underline{1968 \text{ feet}} \end{aligned}$$

$$\begin{aligned} \text{Corrected Total} &= 3000 \text{ feet} - [13.3\% (3000 \text{ feet})] \\ \text{Distance Required} &= 3000 \text{ feet} - [399 \text{ feet}] \\ &= \underline{2601 \text{ feet}} \end{aligned}$$

Accelerate Stop Distance (Figure 5-11)

- (1) Enter Figure 5-11 at 7450 pounds weight; engine failure speed is 100 KIAS.

- (2) Proceed horizontally right from 3000-foot pressure altitude to the vertical column for 20°C (68°F). The distance required to accelerate to 100 KIAS and stop is 4350 feet without wind correction. With a 19-knot headwind component, the accelerate stop distance can be reduced by:

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

$$\begin{aligned} \text{Corrected Accelerate Stop Distance} &= 4350 \text{ feet} - [14.25\% (4350 \text{ feet})] \\ &= 4350 \text{ feet} - [620 \text{ feet}] \\ &= \underline{3730 \text{ feet}} \end{aligned}$$

Accelerate Go Distance (Figure 5-12)

- (1) Enter Figure 5-12 at 7450 pounds weight; engine failure speed is 100 KIAS.
 (2) Proceed horizontally right from 3000-foot pressure altitude to the vertical column for 20°C (68°F). The distance required to clear a 50-foot obstacle, after losing an engine at 100 KIAS, is 13,540 feet without wind correction. With a 19-knot headwind component, the distance can be reduced by:

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

$$\begin{aligned} \text{Corrected Accelerate Go Distance} &= 13,540 \text{ feet} - [11.4\% (13,540 \text{ feet})] \\ &= 13,540 \text{ feet} - [1544 \text{ feet}] \\ &= \underline{11,996 \text{ feet}} \end{aligned}$$

NOTE

- The distance required to accelerate go using the approximation method is so great, in view of the 6000-foot runway available, that a more exact value should be obtained using the interpolation method.
- The interpolation method gives an accelerate go distance of 6025 feet without wind or 5338 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 7100-pound line.
- (4) Proceed horizontally right to obtain rate-of-climb. (1925 Feet per minute)
- (5) Enter the climb speed data to determine the climb speed corrected for 7100 pounds and 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 7100-pound line.
- (4) Proceed horizontally right to obtain rate-of-climb. (1260 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 7100-pound line.
- (4) Proceed horizontally right to obtain rate-of-climb. (335 Feet per minute)
- (5) Enter the climb speed data to determine the climb speed corrected for 7100 pounds and 2400 feet. (109 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 7100-pound line.
- (4) Proceed vertically down to obtain time to climb (2.2 minutes), fuel to climb (11 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 7100-pound line.
- (8) Proceed vertically down to obtain time to climb (17.4 minutes), fuel to climb (81 pounds) and distance to climb (40 nautical miles).

Final Calculations:

$$\begin{aligned} \text{Time to Climb} &= \text{Cruise time to climb} - \text{Airport time to climb} \\ &= 17.4 \text{ minutes} - 2.2 \text{ minutes} \\ &= \underline{15.2 \text{ minutes}} \end{aligned}$$

Fuel to Climb = Cruise fuel to climb - Airport fuel to climb

= 81 pounds - 11 Pounds

= 70 pounds (add 46 pounds for start, taxi and runup) (116 pounds total)

Distance to Climb = Cruise distance to climb - Airport distance to climb

= 40 nautical miles - 5 nautical miles

= 35 nautical miles

Adjusted for wind (use 60% of the wind at altitude for climb wind),

= 35 nautical miles + wind contribution

= 35 + [$\frac{15.2 \text{ minutes}}{60 \text{ minutes}}$ (.6 x 15 knots)]

= 35 nautical miles + 2.3 nautical miles

= 37.3 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 (16.3 minutes), fuel to descend (52 pounds) and distance to descend (55.5 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 (2.1 minutes), fuel to descend (6 pounds) and distance to descend (6.5 nautical miles).

Final Calculations:

Time to Descend = Cruise time to descend - Airport time to descend

= 16.3 minutes - 2.1 minutes

= 14.2 minutes

Fuel to Descend = Cruise fuel to descend - Airport fuel to descend
 = 52 pounds - 6 pounds
 = 46 pounds

Distance to Descend = Cruise distance to descend - Airport distance to descend.
 = 55.5 nautical miles - 6.5 nautical miles
 = 49.0 nautical miles

Adjusted for wind (use 40% of the wind at altitude for descent wind),
 = 49.0 ± wind contribution
 = 49.0 + [$\frac{14.2 \text{ minutes}}{60 \text{ minutes}}$ (.4 x 15 knots)]
 = 49.0 nautical miles + 1.4 nautical miles
 = 50.4 nautical miles

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

Maximum recommended cruise can be obtained with 1900 RPM and 32.5 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 1900 RPM and 32.5 Inches Hg. manifold pressure.
- (2) Use -15°C (5°F) data for a power of 73.5%, airspeed of 214 KTAS and a total fuel flow of 257 pounds per hour.
- (3) Correcting for a weight of 7100 pounds, the airspeed increases to:

$$214 \text{ KTAS} + \frac{(7450 \text{ pounds} - 7100 \text{ pounds})}{1000 \text{ pounds}} (6 \text{ KTAS}) =$$

$$214 \text{ KTAS} + 2.1 \text{ KTAS} = \underline{216 \text{ KTAS}}$$

Using the interpolation method, interpolating altitude, temperature and weight, the actual performance is 71.2% power, 221 KTAS and total fuel flow of 250 pounds per hour.

In the above calculations, for convenience, the weight was assumed to be equal to the takeoff weight of 7100 pounds. More realistic data can be determined if the average cruise weight is used. This average cruise weight is determined as follows:

$$\begin{aligned}
 \text{Cruise Fuel} &= \frac{\text{Total distance}}{\frac{\text{True airspeed} + \text{wind correction}}{2}} \times [\text{Total fuel flow per hour}] \\
 &= \frac{600 \text{ Nautical Miles} - 37.3 \text{ Nautical Miles} - 50.4 \text{ Nautical Miles}}{221 \text{ KTAS} + 15 \text{ Knot Tailwind}} \times [250 \text{ pounds per hour}] \\
 &= \frac{512.3 \text{ Nautical miles}}{236} \times 250 \text{ pounds per hour} \\
 &= 2.17 \text{ hours} \times 250 \text{ pounds per hour} \\
 &= \underline{543 \text{ pounds}} \\
 \text{Average Cruise Weight} &= \text{Takeoff weight} - \text{start, taxi and climb fuel} - \frac{\text{Cruise fuel}}{2} \\
 &= 7100 \text{ pounds} - 116 \text{ pounds} - \frac{543 \text{ pounds}}{2} \\
 &= \underline{6713 \text{ pounds}} \\
 \text{Average Cruise Speed} &= \text{True airspeed from Figure 5-20} + \text{weight correction} \\
 &= 221 \text{ KTAS} + 6 \left(\frac{387}{1000} \right) \\
 &= \underline{223 \text{ KTAS}} \\
 \text{Average Ground Speed} &= 223 \text{ KTAS} + \text{tailwind} \\
 &= 223 \text{ KTAS} + 15 \text{ knots} \\
 &= \underline{238 \text{ knots}} \\
 \text{Distance During Cruise} &= \text{Total distance} - \text{Climb distance} - \text{Descent distance} \\
 &= 600 - 37.3 - 50.4 \\
 &= \underline{512.3 \text{ Nautical Miles}} \\
 \text{Time During Cruise} &= \frac{\text{Cruise distance}}{\text{ground speed}} \\
 &= \frac{512.3}{238} \\
 &= \underline{2.15 \text{ hours}}
 \end{aligned}$$

Normal Landing Distance (Figure 5-25)

$$\begin{aligned}
 \text{Landing Weight} &= \text{Takeoff weight} - \text{climb fuel} - \text{cruise fuel} - \text{descent fuel} \\
 &= 7100 \text{ pounds} - 116 \text{ pounds} - 543 \text{ pounds} - 46 \text{ pounds} \\
 &= \underline{6395 \text{ pounds}}
 \end{aligned}$$

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

Enter Figure 5-25 at 6600 pounds; the approach speed is 96 KIAS. Proceed horizontally right from 2000-foot pressure altitude to the vertical column for 10°C (50°F). The landing distance ground roll is 630 feet and the total distance required to clear a 50-foot obstacle is 2210 feet without wind correction. With a 16-knot headwind component, the corrected ground roll distance is 554 feet and the corrected total distance required is 1945 feet.

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

Corrected Landing Ground Roll = 630 feet - [12% (630)]
= 630 feet - 76 feet
= 554 feet

Corrected Total Distance Required = 2210 - [12% (2210)]
= 2210 feet - 265 feet
= 1945 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 6395-pound weight line.
- (4) Proceed horizontally right to determine the rate-of-climb. (1490 Feet per minute)

Total Fuel Required = Start, taxi and climb fuel + cruise fuel + descent fuel
= 116 pounds + 543 pounds + 46 pounds = 705 pounds (Without Holding Fuel)
or 705 pounds + 125 pounds = 830 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]
= 1236 pounds - [116 pounds + 543 pounds + 46 pounds]
= 531 pounds

- (1) Enter Figure 5-23 at 531 pounds of fuel available.
- (2) Proceed vertically up to the intersection with the guideline.
- (3) Proceed horizontally left to obtain holding time available. (3.2 hours)

AIRSPEED 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°	
CIAS	KCAS	CIAS	KCAS	CIAS	KCAS
---	---	70	73	70	72
80	82	80	82	80	81
90	91	90	92	90	91
100	101	100	101	100 *	100 *
110	110	110	110	110	110
120	120	120	120	120	119
140	139	130	129	130	129
160	159	140	139	140	139
180	179	150	149	146	145
200	198	160	159	---	---
220	218	170	169	---	---
240	238	176	175	---	---

*Recommended Minimum All Engines Approach Speed At 7200 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°	
CIAS	KCAS	CIAS	KCAS	CIAS	KCAS
---	---	---	---	70	75
80	89	80	85	80	83
90	98	90	94	90	92
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 7200 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	Feet
80	14	16	6	19	22	9	27	31	12	
90	10	10	7	13	14	10	18	20	14	
100 *	9	9	0	12	12	0	17	17	0	
120	-3	0	-6	-4	0	-9	-6	0	-12	
140	-11	-8	-15	-15	-10	-21	-21	-14	-29	
160	-15	-18	---	-20	-24	---	-27	-33	---	
180	-20	---	---	-27	---	---	-37	---	---	
200	-33	---	---	-45	---	---	-63	---	---	
220	-39	---	---	-53	---	---	-73	---	---	
240	-43	---	---	-58	---	---	-80	---	---	

*Recommended Minimum All Engines Approach Speed At 7200 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	Feet
80	64	36	24	87	48	32	120	67	44	
90	68	28	16	91	38	22	127	53	30	
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	----	----	

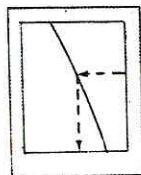
*Recommended Minimum All Engines Approach Speed At 7200 Pounds With 45° Wing Flaps.

ALTITUDE CORRECTION PROCEDURE

$$\boxed{\text{INDICATED ALTITUDE TO FLY}} = \boxed{\text{DESIRED ALTITUDE (MSL)}} - \boxed{\text{ALTIMETER CORRECTION}}$$

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

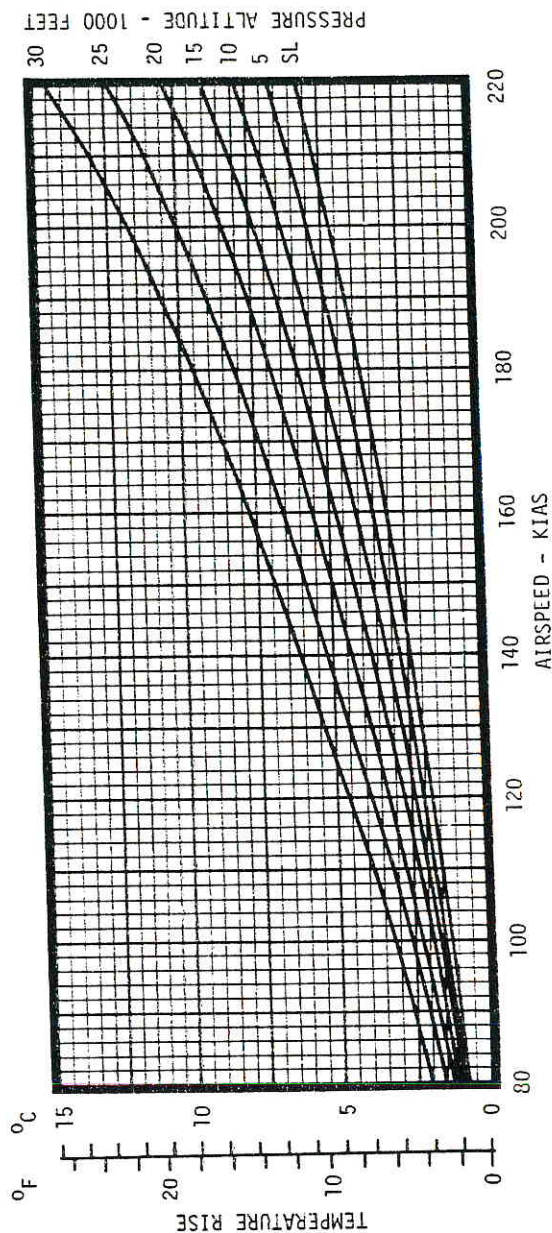
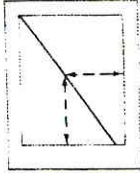


Figure 5-5



TEMPERATURE CONVERSION FROM FAHRENHEIT TO CELSIUS

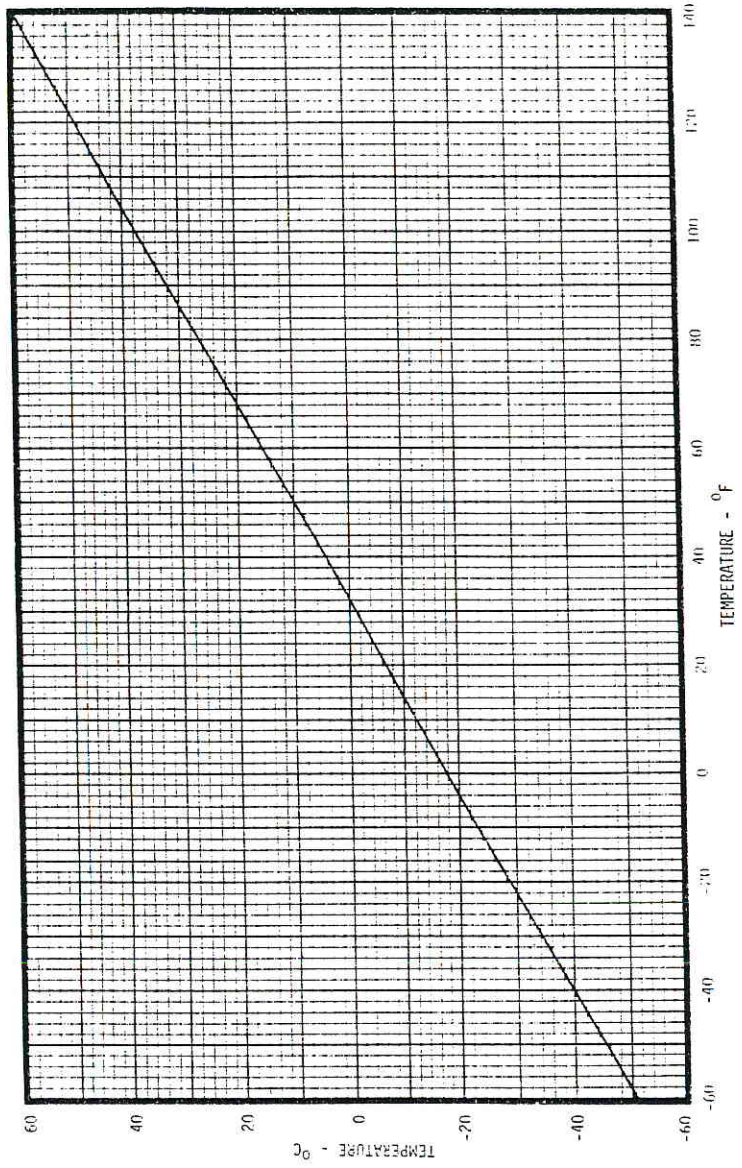


Figure 5-6

PRESSURE CONVERSION INCHES OF MERCURY TO MILLIBARS

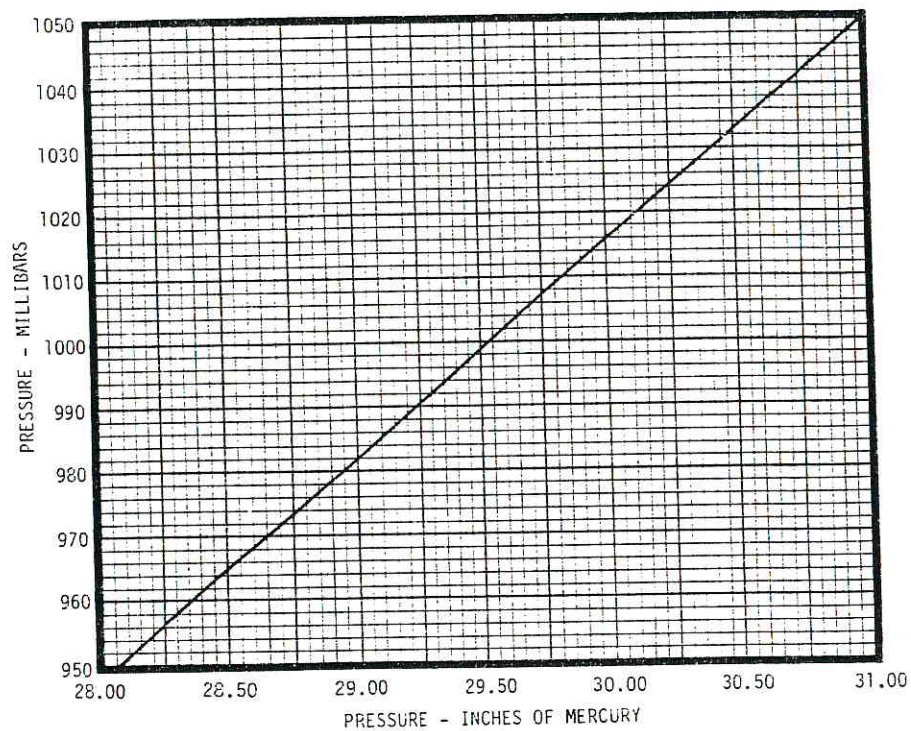
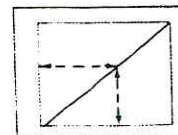


Figure 5-7

STALL SPEEDS

CONDITIONS:

Throttles - IDLE

NOTE:

1. Maximum altitude lost during a conventional stall is 800 feet.
2. Maximum altitude loss during an engine inoperative stall is 550 feet with a maximum pitch below the horizon of 25°.

WEIGHT Pounds	Configuration		ANGLE OF BANK							
			0°		20°		40°		60°	
	Flaps	Gear	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
7450	0°	Up	86	83	89	85	98	94	122	117
	15°	Down	82	80	85	82	95	91	118	113
	45°	Down	77	74	80	76	89	85	110	105
6800	0°	Up	82	79	85	81	94	90	117	112
	15°	Down	78	76	81	78	90	87	113	107
	45°	Down	74	71	76	73	85	81	105	100
6200	0°	Up	78	75	81	78	90	86	112	107
	15°	Down	75	73	77	75	86	83	107	103
	45°	Down	71	68	73	70	81	77	100	95
5600	0°	Up	74	72	77	74	85	82	106	101
	15°	Down	71	69	73	71	81	79	102	98
	45°	Down	67	64	69	66	77	73	95	91

Figure 5-8

WIND COMPONENT

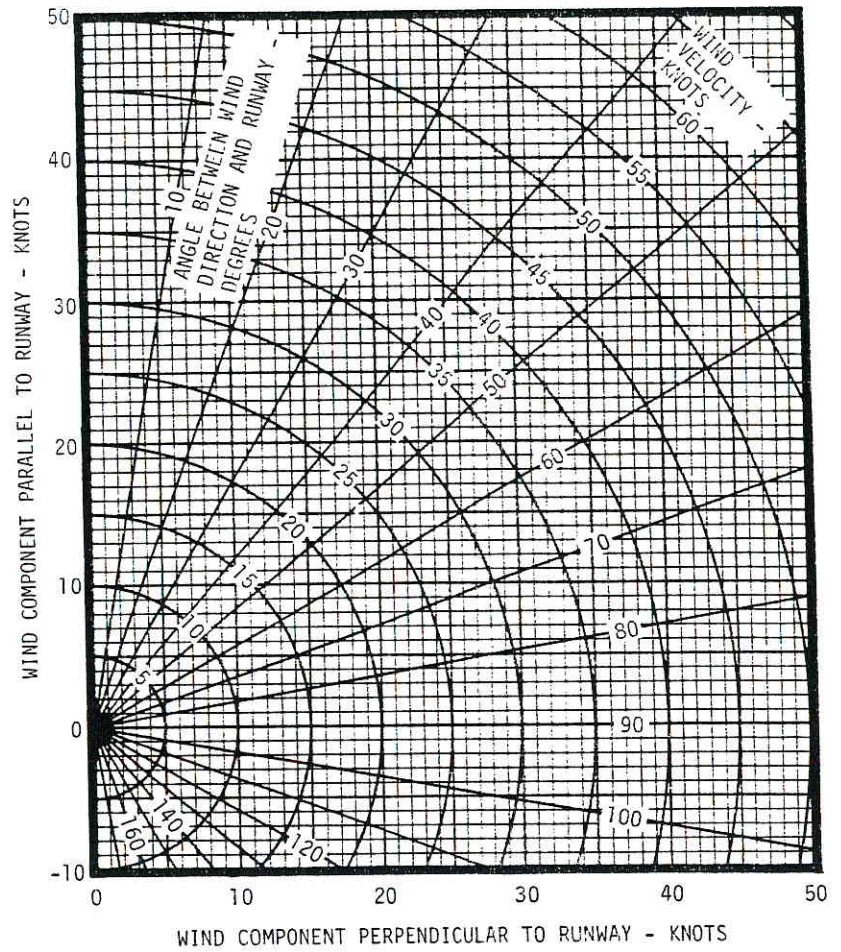
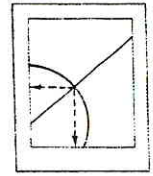


Figure 5-9

NORMAL TAKEOFF DISTANCE

CONDITIONS:

1. 2235 RPM and 39.0 Inches Hg. Manifold Pressure Before Brake Release.
2. Mixtures - CHECK Fuel Flows in the White Arc.
3. Wing Flaps - UP.
4. Level, Hard Surface, Dry Runway.

NOTES:

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 4% 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
7450	100	Sea Level	1280	1610	1410	1780	1550	1960	1710	2200
		1000	1360	1710	1500	1890	1650	2100	1810	2340
		2000	1450	1810	1590	2000	1750	2220	1930	2490
		3000	1540	1920	1690	2120	1860	2360	2050	2650
		4000	1630	2030	1800	2260	1980	2520	2190	2830
		5000	1740	2160	1920	2400	2110	2680	2330	3020
		6000	1850	2300	2040	2560	2250	2860	2490	3230
		7000	1970	2440	2180	2720	2400	3060	2650	3460
		8000	2110	2610	2320	2910	2570	3270	2840	3720
		9000	2250	2780	2480	3110	2740	3510	3030	4010
10,000	2410	2970	2660	3330	2930	3770	3250	4330		
6800	96	Sea Level	1010	1280	1110	1410	1220	1550	1370	1750
		1000	1070	1350	1160	1490	1330	1670	1460	1850
		2000	1140	1430	1280	1610	1410	1770	1550	1970
		3000	1240	1540	1360	1700	1500	1880	1650	2090
		4000	1320	1630	1450	1800	1590	2000	1750	2220
		5000	1400	1730	1540	1910	1690	2120	1870	2360
		6000	1490	1840	1640	2030	1800	2260	1990	2520
		7000	1590	1950	1750	2160	1920	2400	2120	2690
		8000	1700	2080	1870	2300	2050	2560	2270	2880
		9000	1810	2210	1990	2460	2190	2740	2420	3080
10,000	1930	2360	2130	2620	2350	2930	2590	3300		
6200	91	Sea Level	810	1030	890	1130	960	1240	1070	1370
		1000	860	1090	950	1200	1040	1320	1140	1450
		2000	920	1150	1010	1270	1100	1390	1240	1570
		3000	980	1220	1070	1340	1200	1500	1320	1660
		4000	1040	1290	1160	1450	1280	1590	1400	1760
		5000	1130	1390	1240	1530	1360	1690	1490	1870
		6000	1200	1480	1320	1630	1450	1800	1590	1990
		7000	1280	1570	1400	1730	1540	1910	1690	2120
		8000	1360	1670	1500	1840	1640	2030	1810	2260
		9000	1450	1770	1600	1960	1750	2170	1930	2410
10,000	1550	1890	1700	2080	1870	2310	2060	2570		
5600	86	Sea Level	640	820	700	900	770	960	840	1080
		1000	680	860	750	950	820	1040	890	1140
		2000	720	910	790	1000	870	1100	950	1210
		3000	770	970	840	1060	920	1160	1010	1280
		4000	820	1020	900	1120	980	1230	1070	1360
		5000	870	1080	950	1190	1040	1310	1170	1460
		6000	930	1150	1020	1260	1130	1410	1240	1550
		7000	990	1220	1100	1360	1210	1500	1320	1650
		8000	1070	1310	1170	1440	1290	1590	1410	1750
		9000	1140	1400	1250	1530	1370	1690	1510	1870
10,000	1220	1480	1340	1630	1470	1800	1610	1990		

Figure 5-10 (Sheet 1 of 2)

NORMAL TAKEOFF DISTANCE

CONDITIONS:

1. 2235 RPM and 39.0 Inches Hg. Manifold Pressure Before Brake Release.
2. Mixtures - CHECK Fuel Flows in the White Arc.
3. Wing Flaps - UP.
4. Level, Hard Surface, Dry Runway.

NOTES:

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 4% 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
7450	100	Sea Level	1880	2470	2080	2800	2300	3230
		1000	2000	2630	2210	3000	2450	3490
		2000	2130	2810	2360	3210	2620	3730
		3000	2270	3000	2510	3450	2790	4110
		4000	2420	3210	2680	3720	2980	4500
		5000	2580	3450	2860	4030	3190	4970
		6000	2750	3710	3060	4380	3410	5570
		7000	2940	4000	3270	4800	3650	6380
		8000	3150	4330	3500	5290	3910	7570
		9000	3370	4710	3750	5910	4200	9690
		10,000	3610	5160	4020	6730	4510	15,290
6800	96	Sea Level	1510	1940	1660	2180	1840	2460
		1000	1600	2060	1770	2320	1950	2630
		2000	1700	2190	1880	2470	2080	2820
		3000	1810	2340	2000	2640	2220	3020
		4000	1930	2490	2130	2820	2370	3250
		5000	2060	2660	2280	3020	2530	3500
		6000	2190	2840	2430	3240	2700	3790
		7000	2340	3040	2600	3490	2890	4130
		8000	2500	3260	2780	3760	3090	4520
		9000	2680	3500	2970	4060	3310	4990
		10,000	2870	3770	3180	4430	3550	5570
6200	91	Sea Level	1180	1520	1300	1690	1460	1920
		1000	1280	1640	1410	1820	1550	2040
		2000	1360	1740	1500	1930	1650	2170
		3000	1450	1840	1590	2060	1760	2320
		4000	1540	1960	1700	2190	1880	2480
		5000	1640	2080	1810	2340	2000	2650
		6000	1750	2220	1930	2490	2140	2840
		7000	1860	2370	2060	2670	2280	3050
		8000	1990	2530	2200	2860	2440	3290
		9000	2130	2700	2350	3060	2610	3550
		10,000	2270	2890	2510	3300	2790	3850
5600	86	Sea Level	920	1190	1010	1310	1110	1460
		1000	980	1260	1080	1390	1190	1550
		2000	1040	1330	1140	1470	1290	1670
		3000	1110	1410	1240	1590	1370	1780
		4000	1210	1520	1320	1690	1460	1890
		5000	1280	1620	1410	1800	1550	2010
		6000	1360	1720	1500	1910	1660	2150
		7000	1450	1830	1600	2040	1770	2290
		8000	1550	1950	1710	2170	1890	2450
		9000	1650	2070	1820	2320	2010	2630
		10,000	1770	2210	1950	2480	2150	2820

Figure 5-10 (Sheet 2 of 2)

ACCELERATE STOP DISTANCE

CONDITIONS:

1. 2235 RPM and 39.0 Inches Hg. Manifold Pressure Before Brake Release.
2. Mixtures - CHECK Fuel Flows In the White Arc.
3. Wing Flaps - UP.
4. Level, Hard Surface, Dry Runway.
5. Engine Failure at Engine Failure Speed.
6. 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	
7450	100	Sea Level	2900	3090	3290	3510	3750	4010	4300	
		1000	3030	3240	3450	3680	3940	4210	4520	
		2000	3180	3390	3620	3870	4140	4430	4760	
		3000	3340	3560	3800	4060	4350	4670	5020	
		4000	3500	3740	4000	4270	4580	4910	5290	
		5000	3680	3930	4200	4500	4820	5180	5580	
		6000	3860	4130	4420	4740	5080	5470	5900	
		7000	4060	4350	4660	4990	5360	5770	6240	
		8000	4280	4580	4910	5260	5660	6100	6600	
		9000	4510	4830	5180	5560	5980	6450	6990	
		10,000	4750	5090	5460	5870	6320	6830	7410	
6800	96	Sea Level	2330	2480	2640	2850	3040	3240	3470	
		1000	2440	2600	2800	2990	3190	3400	3650	
		2000	2560	2760	2940	3130	3350	3580	3840	
		3000	2710	2890	3080	3290	3520	3760	4040	
		4000	2850	3040	3240	3460	3700	3960	4260	
		5000	2990	3190	3400	3640	3890	4170	4490	
		6000	3140	3350	3580	3830	4100	4400	4730	
		7000	3300	3530	3770	4030	4320	4640	5000	
		8000	3470	3710	3970	4250	4560	4900	5290	
		9000	3650	3910	4180	4480	4810	5180	5590	
		10,000	3850	4120	4420	4730	5090	5480	5920	
6200	91	Sea Level	1890	2010	2140	2280	2430	2590	2790	
		1000	1980	2110	2240	2390	2570	2750	2930	
		2000	2080	2210	2350	2530	2700	2880	3090	
		3000	2180	2320	2500	2660	2840	3030	3250	
		4000	2280	2460	2620	2800	2950	3190	3420	
		5000	2420	2580	2750	2940	3140	3360	3600	
		6000	2540	2710	2890	3090	3300	3540	3800	
		7000	2670	2850	3050	3250	3480	3730	4010	
		8000	2810	3000	3210	3430	3670	3930	4230	
		9000	2960	3160	3380	3610	3870	4150	4470	
		10,000	3120	3330	3560	3810	4090	4390	4730	
5600	86	Sea Level	1500	1600	1700	1800	1920	2040	2180	
		1000	1570	1670	1780	1890	2010	2140	2290	
		2000	1650	1750	1870	1980	2110	2250	2430	
		3000	1730	1840	1960	2080	2220	2390	2560	
		4000	1810	1930	2060	2190	2360	2520	2690	
		5000	1900	2030	2160	2330	2480	2650	2830	
		6000	2000	2130	2290	2440	2610	2790	2980	
		7000	2100	2260	2410	2570	2750	2940	3150	
		8000	2230	2380	2540	2710	2890	3090	3320	
		9000	2350	2500	2670	2850	3050	3260	3500	
		10,000	2470	2640	2820	3010	3220	3450	3700	

Figure 5-11

ACCELERATE GO DISTANCE

CONDITIONS:

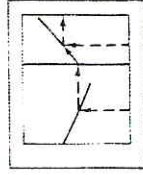
1. 2235 RPM and 39.0 Inches Hg. Manifold Pressure before Brake Release.
2. Mixtures - CHECK Fuel Flows in the White Arc.
3. Wing Flaps - UP.
4. Level Hard Surface Dry Runway.
5. Engine Failure At Engine Failure Speed.
6. Propeller Feathered and Landing Gear Retracted During Climb.
7. Maintain Engine 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 1 knots of tailwind.
4. Distance in boxes represent rates of climb less than 50 ft/min.

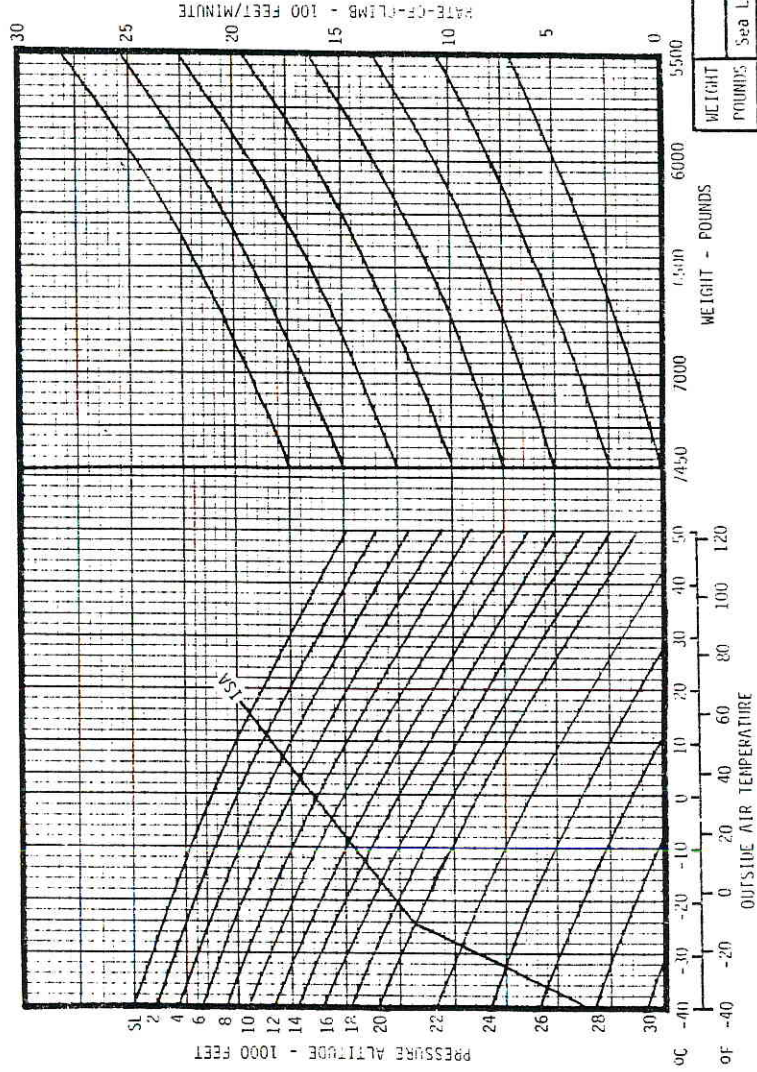
WEIGHT - POUNDS	ENGINE FAILURE SPEED - KIAS	PRESSURE ALTITUDE FEET	TOTAL DISTANCE TO CLEAR 50-FOOT OBSTACLE - FEET							
			-20°C -4°F	-10°C +14°F	0°C 32°F	+10°C +50°F	+20°C +68°F	+30°C +86°F	+40°C +104°F	
7450	100	Sea Level	2390	2770	3290	4120	5600	12,210	-----	
		1000	2550	2980	3590	4630	7020	-----	-----	
		2000	2740	3220	3950	5280	9100	-----	-----	
		3000	2940	3500	4390	6190	13,540	-----	-----	
		4000	3170	3530	4940	7570	-----	-----		
		5000	3440	4220	5670	9990	-----	-----		
		6000	3750	4710	6710	15,590	-----	-----		
		7000	4120	5340	8330	-----	-----	-----		
		8000	4570	6190	11,350	-----	-----	-----		
		9000	5130	7430	-----	-----	-----	-----		
		10,000	5870	9480	-----	-----	-----	-----		
6800	96	Sea Level	1770	2000	2270	2670	3120	4010	5770	
		1000	1880	2120	2460	2870	3470	4510	7070	
		2000	2000	2290	2640	3100	3820	5170	9360	
		3000	2150	2450	2830	3370	4240	6080	14,690	
		4000	2290	2620	3050	3690	4780	7480	-----	
		5000	2450	2810	3310	4060	5490	9990	-----	
		6000	2620	3030	3600	4530	6460	16,070	-----	
		7000	2810	3270	3950	5120	8040	-----	-----	
		8000	3020	3560	4370	5900	10,930	-----	-----	
		9000	3270	3590	4890	7040	-----	-----		
		10,000	3550	4280	5560	8280	-----	-----		
6200	91	Sea Level	1380	1530	1710	1930	2200	2570	3120	
		1000	1460	1620	1810	2050	2380	2800	3420	
		2000	1540	1720	1930	2210	2550	3030	3780	
		3000	1630	1820	2020	2360	2740	3290	4220	
		4000	1730	1960	2210	2530	2960	3610	4780	
		5000	1860	2060	2360	2720	3210	3980	5540	
		6000	1970	2220	2520	2920	3500	4450	6650	
		7000	2100	2370	2710	3160	3840	5050	8470	
		8000	2240	2540	2910	3430	4250	5860	12,200	
		9000	2390	2720	3150	3750	4760	7060	-----	
		10,000	2560	2930	3410	4130	5420	9060	-----	
5600	86	Sea Level	1070	1180	1300	1440	1610	1820	2090	
		1000	1130	1240	1370	1530	1710	1940	2240	
		2000	1190	1310	1450	1620	1820	2070	2430	
		3000	1260	1390	1540	1720	1930	2240	2610	
		4000	1330	1470	1630	1820	2090	2390	2820	
		5000	1400	1550	1730	1960	2230	2570	3050	
		6000	1490	1650	1860	2090	2380	2760	3330	
		7000	1580	1770	1980	2230	2550	2990	3650	
		8000	1690	1880	2110	2380	2740	3240	4050	
		9000	1800	2000	2250	2550	2960	3540	4540	
		10,000	1910	2140	2400	2740	3200	3890	5170	

Figure 5-12



- CONDITIONS:
1. 2235 RPM and 39.0 Inches Hg. to 20,000 Feet. Use Placarded Manifold Pressure Above 20,000 Feet.
 2. Landing Gear - UP.
 3. Wing Flaps - UP.
 4. Mixture at Recommended Fuel Flow.

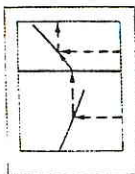
RATE-OF-CLIMB - MAXIMUM CLIMB



WEIGHT POUNDS	CLIMB SPEED - KIAS		
	Sea Level	20,000 Feet	30,000 Feet
7450	111	105	100
6800	106	99	95
6200	99	95	91
5600	95	90	86

Figure 5-13

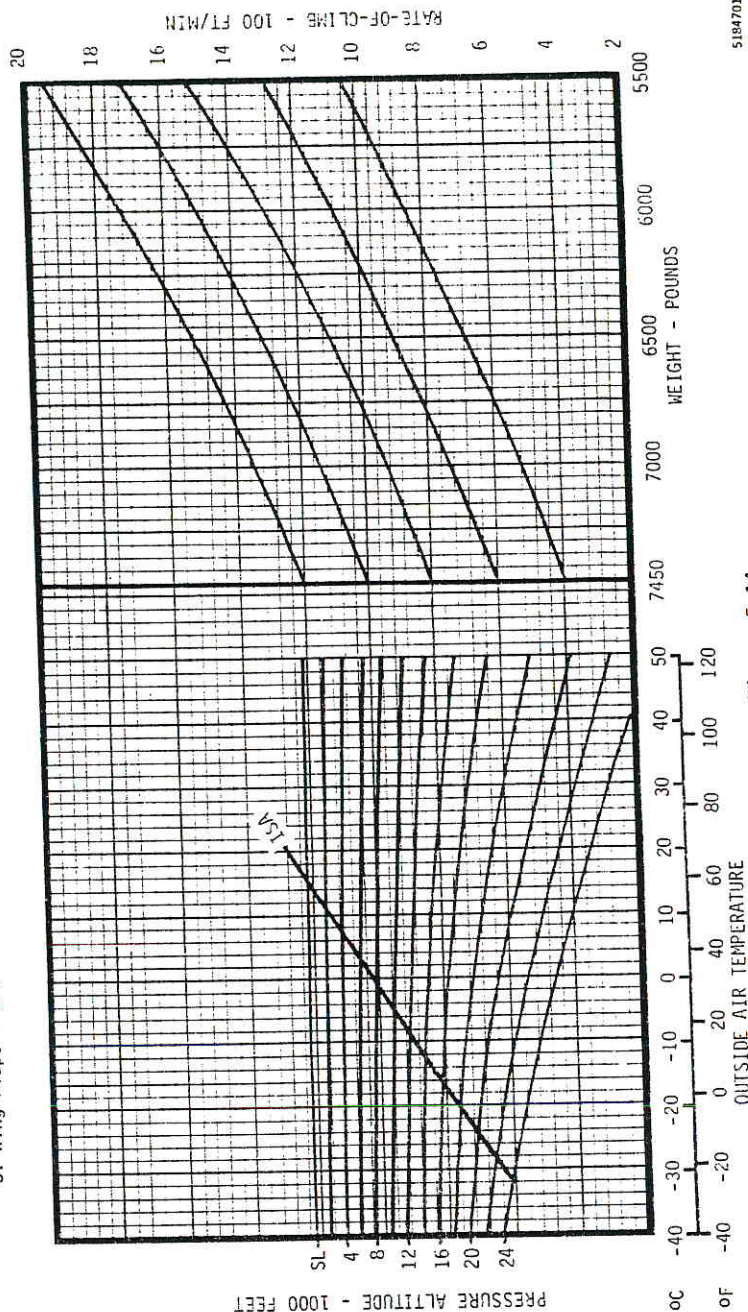
51047015



RATE-OF-CLIMB - CRUISE CLIMB

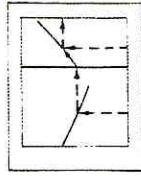
CONDITIONS:

1. 1900 RPM and 32.5 Inches Hg.
2. Landing Gear - UP.
3. Wing Flaps - UP.
4. Airspeed - 120 KIAS.
5. Mixtures - Recommended Fuel Flow.



51847016

F 1 A



- CONDITIONS:
1. 2325 RPM and 29.9 Inches Hg to 20,000 Feet. Use Placarded Manifold Pressure Above 20,000 Feet.
 2. Mixture - CHL3 Fuel.
 3. Landing gear UP.
 4. Wing Flaps - UP.
 5. Inoperative Propeller - FEATHERED.
 6. Wings Banked 5° Toward Operative Engine with Approximately 1/2 Ball Slip Indicated on the turn and Bank Indicator.

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

Subtract values listed below from value obtained in above 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 150 Ft./Min
- Flaps Down 450 Ft./Min

51847017

RATE-OF-CLIMB - ONE ENGINE INOPERATIVE

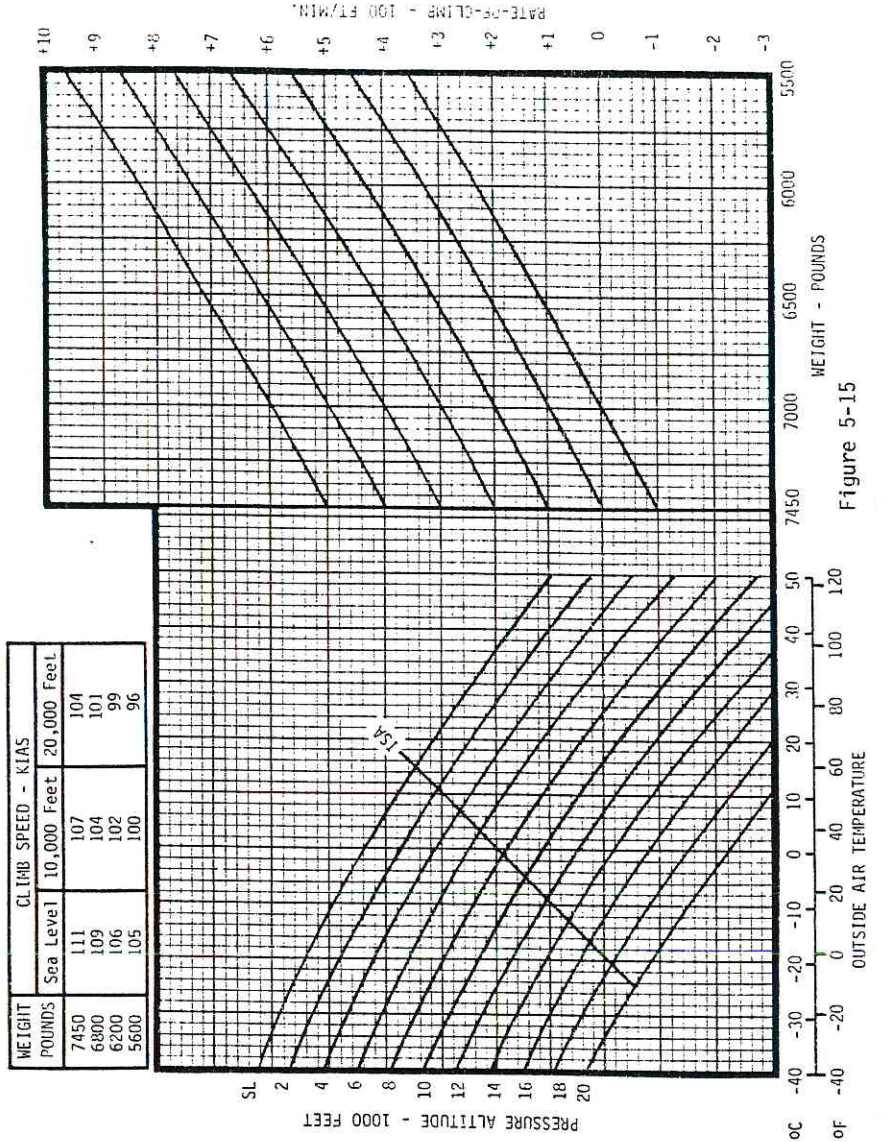
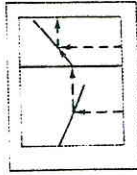
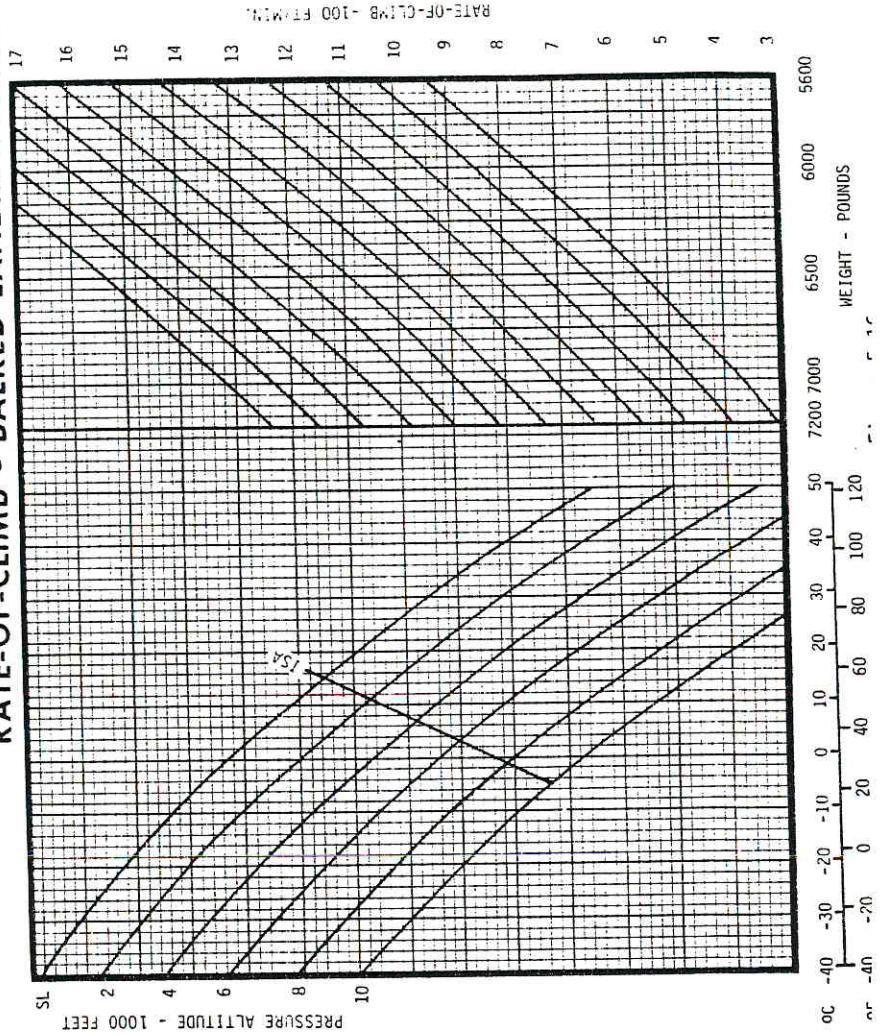


Figure 5-15



- CONDITIONS:
1. 2235 RPM and 39.0 Inches Hg.
 2. Mixtures - CHECK Fuel Flows In The White Arc.
 3. Landing Gear - DOWN.
 4. Wing Flaps - 45°.
 5. Climb Speed - 96 KIAS.

RATE-OF-CLIMB - BALKED LANDING CLIMB

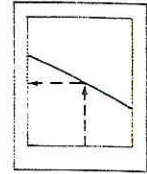


3 November 1980

ENGINE INOPERATIVE SERVICE CEILING

CONDITIONS:

1. 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 inches Hg. altimeter setting greater than 29.92.
3. Decrease indicated service ceiling 100 feet for each 0.10 inches Hg. altimeter setting less than 29.92.
4. This chart provides performance information to aid in route selection when operating under FAR 135.181 and 91.119 requirements.

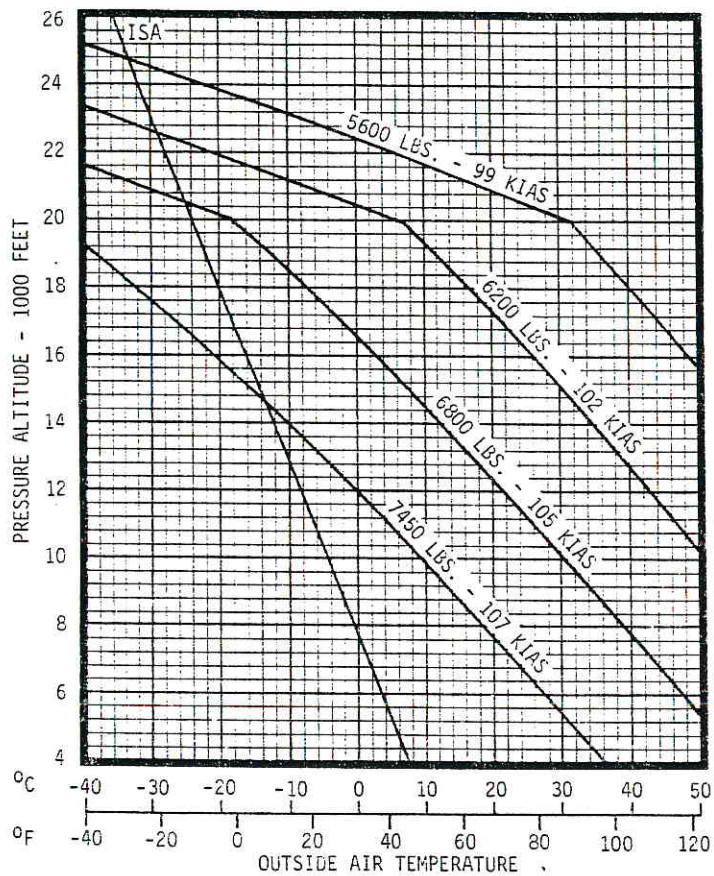
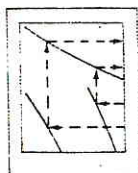


Figure 5-17

E1847004



- CONDITIONS:**
1. 2235 RPM and 39.0 Inches Hg. to 20,000 Feet. Use Placarded Manifold Pressure Above 20,000 Feet.
 2. Landing Gear - UP.
 3. Wing Flaps - UP.
 4. Mixture at Recommended Fuel Flow.

- NOTE:**
1. Time, fuel and distance for the climb are determined by taking the difference between the airport altitude and initial cruise altitude conditions. For total fuel used, add 46 pounds for start, taxi and takeoff.

TIME, FUEL AND DISTANCE TO CLIMB - MAXIMUM CLIMB

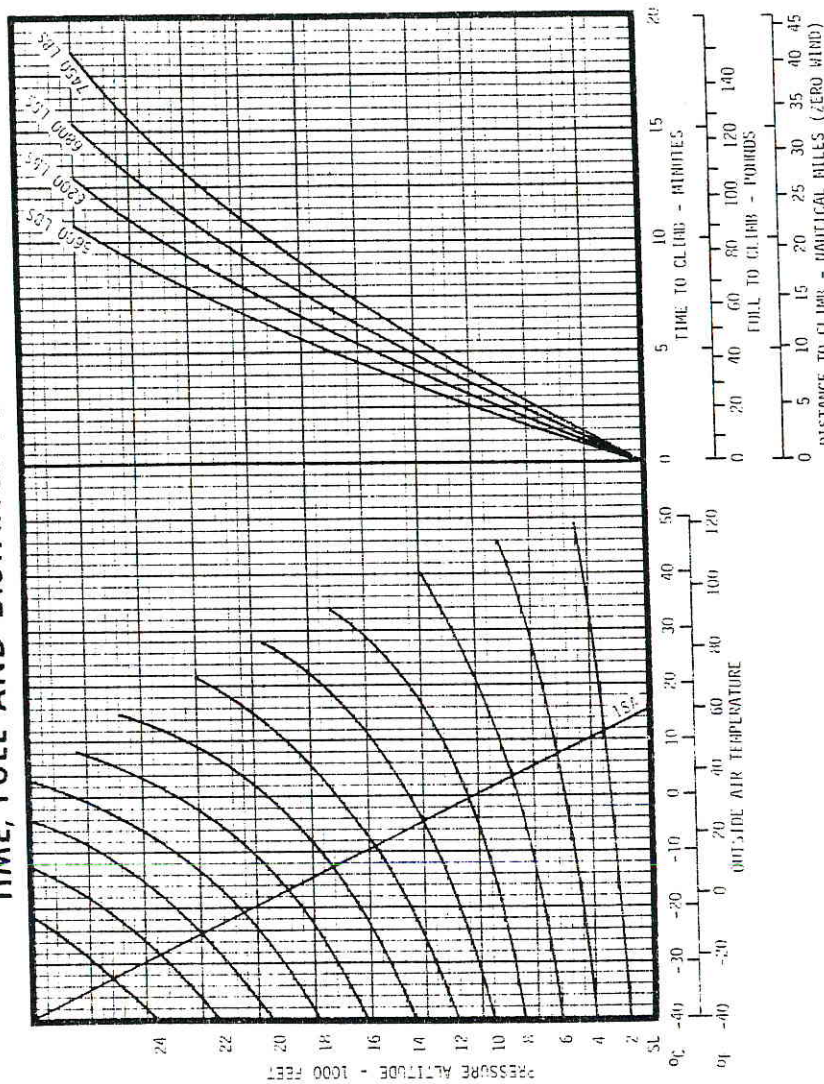
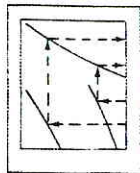


Figure 5-18

3 November 1980



- CONDITIONS:
1. 1900 RPM and 32.5 Inches Hg.
 2. Landing Gear - UP.
 3. Wing Flaps - UP.
 4. Airspeed - 120 KIAS.
 5. 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 46 pounds for start, taxi and takeoff.

TIME, FUEL AND DISTANCE TO CLIMB - CRUISE CLIMB

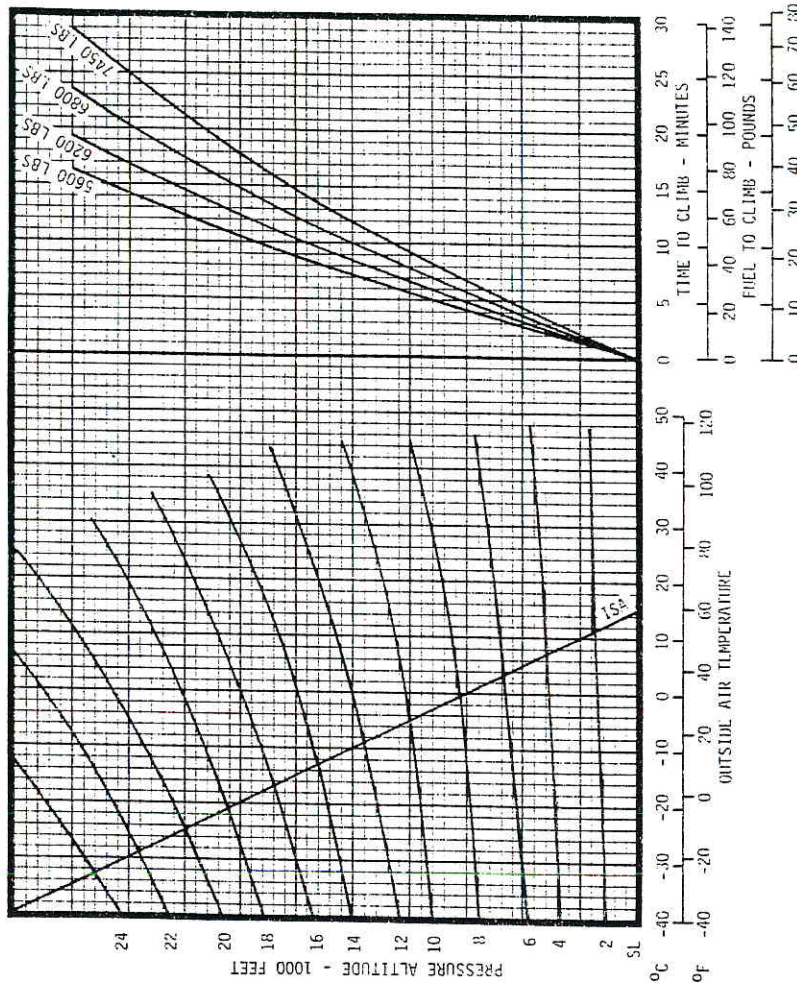


Figure 5-19

CRUISE PERFORMANCE WITH RECOMMENDED LEAN MIXTURE

NOTE:

1. At Sea Level, increase speed by 4 KTAS for each 1000 pounds below 7450 pounds.
2. At 5000 feet, increase speed by 4 KTAS for each 1000 pounds below 7450 pounds.
3. Operations at peak EGT should be utilized with power settings within the boxes if the engine is equipped with the optional EGT system.

ALTITUDE	RPM	MP	-5°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	1900	32.5	78.0	186	271	73.5	186	257	69.0	185	242
	1900	31.0	74.3	183	260	70.0	183	246	65.7	182	231
	1900	29.0	68.8	177	241	64.8	177	228	60.8	176	216
	1900	27.0	63.0	171	223	59.3	171	211	55.7	170	200
	1900	25.0	57.1	165	204	53.8	164	194	50.5	163	183
	1800	32.5	73.2	182	256	69.0	182	242	64.6	181	228
	1800	31.0	69.9	178	245	65.9	178	232	61.8	177	219
	1800	29.0	64.3	173	227	60.6	172	215	56.9	171	204
	1800	27.0	58.8	167	210	55.4	166	199	52.0	165	188
	1800	25.0	53.0	160	191	49.9	159	181	46.9	157	172
	1800	23.0	47.4	152	173	44.7	151	165	42.0	149	156
	1700	32.5	69.2	178	243	65.2	177	230	61.2	177	217
	1700	31.0	65.5	174	230	61.7	174	219	57.9	173	207
	1700	29.0	60.5	169	215	57.0	168	204	53.5	167	193
	1700	27.0	54.9	162	197	51.7	161	187	48.6	160	177
	1700	25.0	49.6	155	180	46.8	154	171	43.9	152	162
	1700	23.0	44.1	147	163	41.6	146	155	39.0	143	147
	1600	32.5	63.4	172	224	59.7	171	212	56.1	170	201
	1600	31.0	60.0	168	213	56.6	168	203	53.1	166	192
	1600	29.0	55.3	163	199	52.1	162	188	48.9	160	178
1600	27.0	50.3	156	183	47.4	155	173	44.5	153	164	
1600	25.0	45.5	149	167	42.9	148	159	40.2	145	151	
			-15°C (5°F)			5°C (STD TEMP) (41°F)			25°C (77°F)		
5000 FEET	1900	32.5	78.0	195	271	73.5	195	257	69.0	194	242
	1900	31.0	74.3	191	260	70.0	191	246	65.7	190	231
	1900	29.0	68.8	185	241	64.8	185	228	60.8	184	216
	1900	27.0	63.0	179	223	59.3	178	211	55.7	177	200
	1900	25.0	57.1	172	204	53.8	171	192	50.5	170	183
	1800	32.5	73.2	190	256	69.0	190	242	64.6	189	228
	1800	31.0	69.9	187	245	65.9	186	232	61.8	185	219
	1800	29.0	64.3	181	227	60.6	180	215	56.9	179	204
	1800	27.0	58.8	174	210	55.4	173	199	52.0	172	188
	1800	25.0	53.0	167	191	49.9	165	181	46.9	164	172
	1800	23.0	47.4	158	173	44.7	157	165	42.0	154	156
	1700	32.5	69.2	186	243	65.2	186	230	61.2	184	217
	1700	31.0	65.5	182	230	61.7	181	219	57.9	180	207
	1700	29.0	60.5	176	215	57.0	175	204	53.5	174	193
	1700	27.0	54.9	169	197	51.7	168	187	48.6	165	177
	1700	25.0	49.6	162	180	46.8	161	171	43.9	158	162
	1700	23.0	44.1	153	163	41.6	151	155	39.0	146	147
	1600	32.5	63.4	179	224	59.7	179	212	56.1	178	201
	1600	31.0	60.0	176	213	56.6	175	203	53.1	173	192
	1600	29.0	55.3	170	199	52.1	169	188	48.9	167	178
1600	27.0	50.3	163	183	47.4	162	173	44.5	159	164	
1600	25.0	45.5	155	167	42.9	153	159	40.2	149	151	

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 7450 pounds.
2. At 15,000 Feet, increase speed by 6 KTAS for each 1000 pounds below 7450 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	1900	32.5	78.0	204	271	73.5	204	257	69.0	203	242
	1900	31.0	74.3	200	260	70.0	200	246	65.7	199	231
	1900	29.0	68.8	194	241	64.8	194	228	60.8	193	216
	1900	27.0	63.0	187	223	59.3	187	211	55.7	185	200
	1900	25.0	57.1	180	204	53.8	179	194	50.5	177	183
	1800	32.5	73.2	199	256	69.0	199	242	64.8	198	228
	1800	31.0	69.9	195	245	65.9	195	232	61.8	194	219
	1800	29.0	64.3	189	227	60.6	188	215	56.9	187	204
	1800	27.0	58.8	182	210	55.4	181	199	52.0	179	186
	1800	25.0	53.0	173	191	49.9	172	181	46.9	169	172
	1800	23.0	47.4	165	173	44.7	162	165	42.0	157	156
	1700	32.5	69.2	194	243	65.2	194	230	61.2	193	217
	1700	31.0	65.5	190	230	61.7	190	219	57.9	188	207
	1700	29.0	60.5	184	215	57.0	183	204	53.5	182	193
	1700	27.0	54.9	176	197	51.7	175	187	48.6	173	177
	1700	25.0	49.6	169	180	46.8	167	171	43.9	163	162
	1700	23.0	44.1	158	163	41.6	155	155	39.0	145	147
	1600	32.5	63.4	188	224	59.7	187	212	56.1	185	201
	1600	31.0	60.0	183	213	56.6	183	203	53.1	181	192
	1600	29.0	55.3	177	199	52.1	176	188	48.9	174	178
1600	27.0	50.3	170	183	47.4	168	173	44.5	164	164	
1600	25.0	45.5	161	167	42.9	158	159	40.2	151	151	
			-35°C (-30°F)			-15°C (STD TEMP) (6°F)			5°C (42°F)		
15,000 FEET	1900	32.5	78.0	214	271	73.5	214	257	69.0	213	242
	1900	31.0	74.3	210	260	70.0	210	246	65.7	208	231
	1900	29.0	68.8	203	241	64.8	203	228	60.8	201	216
	1900	27.0	63.0	196	223	59.3	195	211	55.7	193	200
	1900	25.0	57.1	187	204	53.8	186	194	50.5	183	183
	1800	32.5	73.2	209	256	69.0	208	242	64.8	207	228
	1800	31.0	69.9	205	245	65.9	204	232	61.8	203	219
	1800	29.0	64.3	198	227	60.6	197	215	56.9	195	204
	1800	27.0	58.8	190	210	55.4	189	199	52.0	186	186
	1800	25.0	53.0	181	191	49.9	179	181	46.9	174	172
	1800	23.0	47.4	171	173	44.7	166	165	42.0	153	156
	1700	32.5	69.2	204	243	65.2	203	230	61.2	202	217
	1700	31.0	65.5	199	230	61.7	198	219	57.9	197	207
	1700	29.0	60.5	192	215	57.0	191	204	53.5	189	193
	1700	27.0	54.9	184	197	51.7	183	187	48.6	179	177
	1700	25.0	49.6	175	180	46.8	172	171	43.9	165	162
	1600	32.5	63.4	196	224	59.7	195	212	56.1	194	201
	1600	31.0	60.0	192	213	56.6	191	203	53.1	188	192
	1600	29.0	55.3	185	199	52.1	183	188	48.9	180	178
	1600	27.0	50.3	177	183	47.4	174	173	44.5	167	164

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 7450 pounds.
2. At 25,000 Feet, increase speed by 6 KTAS for each 1000 pounds below 7450 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	-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	1900	32.5	78.0	225	271	73.5	224	257	69.0	223	242
	1900	31.0	74.3	220	260	70.0	220	246	65.7	218	231
	1900	29.0	68.8	213	241	64.8	212	228	60.8	211	216
	1900	27.0	63.0	205	223	59.3	204	211	55.7	201	200
	1900	25.0	57.1	196	204	53.8	194	194	50.5	188	183
	1800	32.5	73.2	219	256	69.0	219	242	64.8	217	228
	1800	31.0	69.9	214	245	65.9	214	232	61.8	212	219
	1800	29.0	64.3	207	227	60.6	206	215	56.9	203	204
	1800	27.0	58.8	199	210	55.4	197	199	52.0	192	188
	1800	25.0	53.0	188	191	49.9	185	181	46.9	175	172
	1700	32.5	69.2	214	243	65.2	213	230	61.2	211	217
	1700	31.0	65.5	208	230	61.7	208	219	57.9	205	207
	1700	29.0	60.5	201	215	57.0	200	204	53.5	196	193
	1700	27.0	54.9	192	197	51.7	189	187	48.6	182	177
	1700	25.0	49.6	181	180	46.8	175	171	---	---	---
	1600	31.0	60.0	200	213	56.6	199	203	53.1	195	192
1600	29.0	55.3	193	199	52.1	190	188	48.9	183	178	
			-54°C (-66°F)			-34°C (STD TEMP) (-30°F)			-14°C (6°F)		
25,000 FEET	1900	32.5	78.0	236	271	73.5	236	257	69.0	234	242
	1900	31.0	74.3	231	260	70.0	231	246	65.7	229	231
	1900	29.0	68.8	223	241	64.8	223	228	60.8	219	216
	1900	27.0	63.0	215	223	59.3	212	211	55.7	207	200
	1900	25.0	57.1	204	204	53.8	200	194	50.5	188	183
	1800	29.0	64.3	217	227	60.6	215	215	56.9	210	204
	1800	27.0	58.8	207	210	55.4	204	199	52.0	195	188
1700	27.0	54.9	199	197	51.7	194	187	---	---	---	

Figure 5-20 (Sheet 3 of 3)

RANGE PROFILE

CONDITIONS:

1. Takeoff Weight - 7450 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, climb, 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.

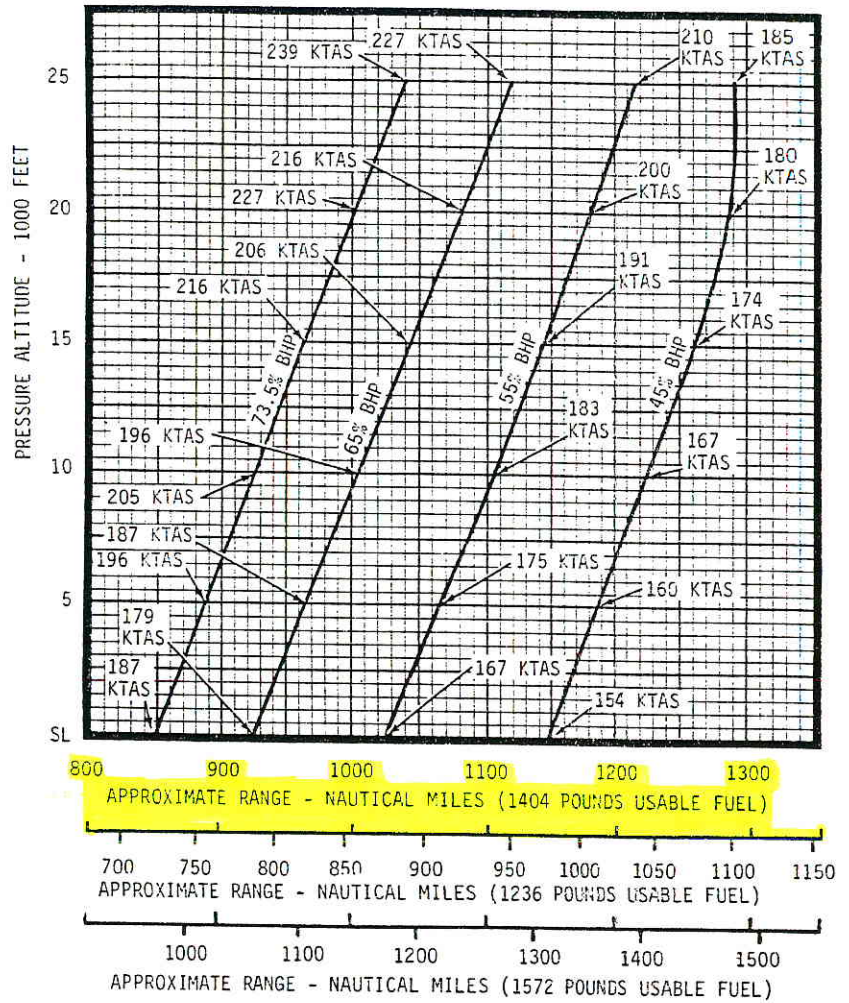
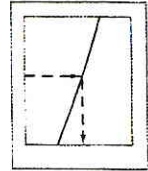


Figure 5-21

51847019

ENDURANCE PROFILE

CONDITIONS:

1. Takeoff Weight - 7450 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, climb, 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.

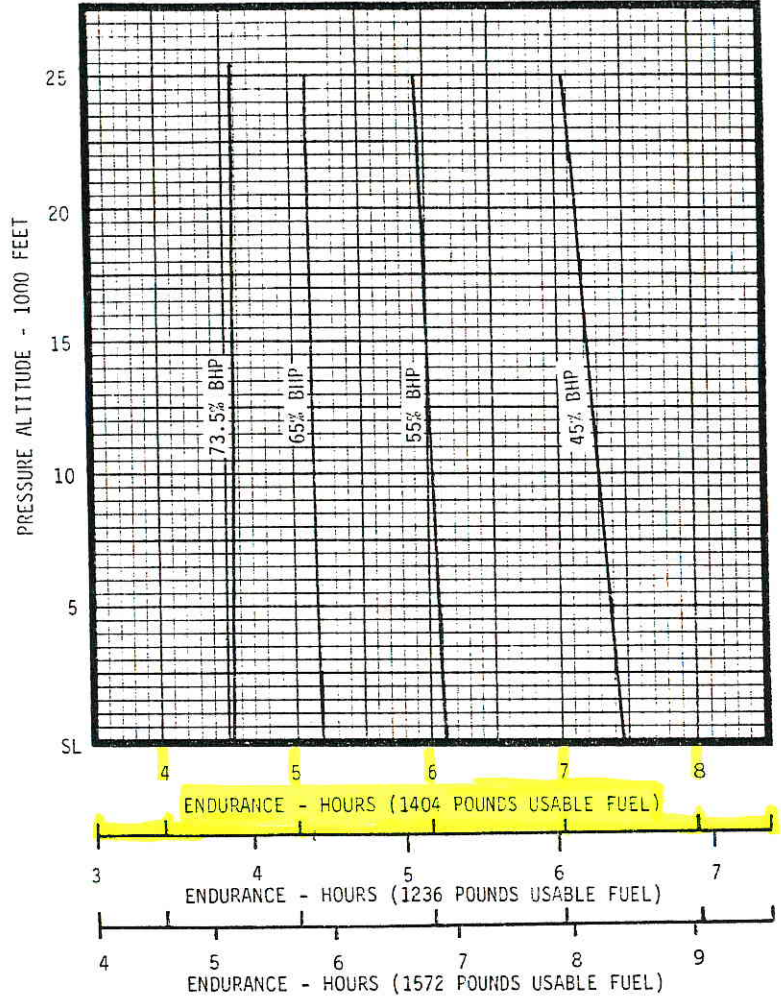
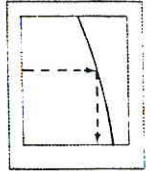


Figure 5-22

51847C

HOLDING TIME

- CONDITIONS:
1. 1800 RPM and 23 Inches Hg. Manifold Pressure (45% Power).
 2. Recommended Lean Fuel Flow (166 Pounds Per Hour Total).

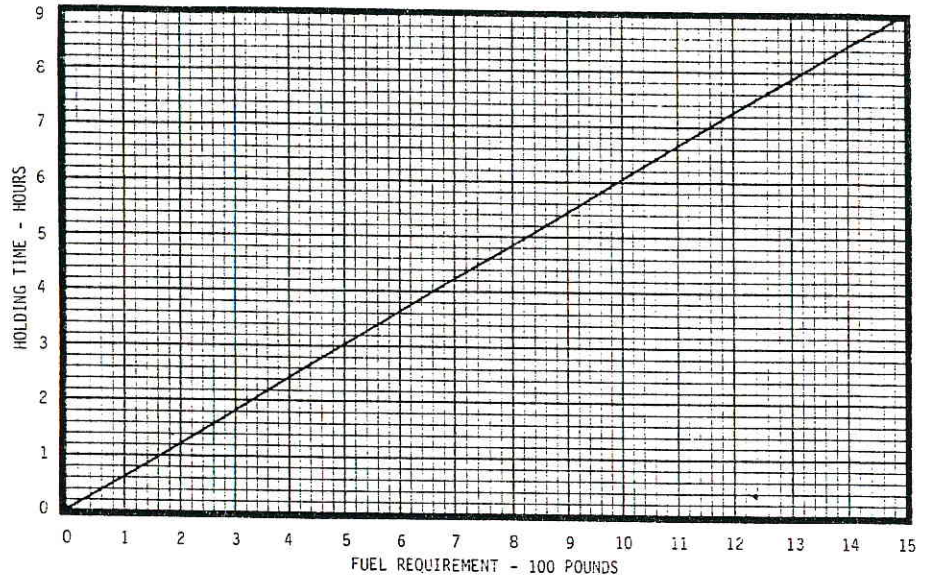
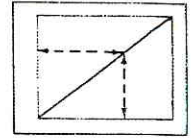


Figure 5-23

TIME, FUEL AND DISTANCE TO DESCEND

CONDITIONS:

1. Power - 1800 RPM and 23 Inches Hg. Manifold Pressure (45% Power).
2. Fuel Flow - RECOMMENDED LEAN (Approximately 83.0 Pounds Per Hour Per Engine).
3. Landing Gear - UP.
4. Wing Flaps - UP.
5. Airspeed - 180 KIAS.

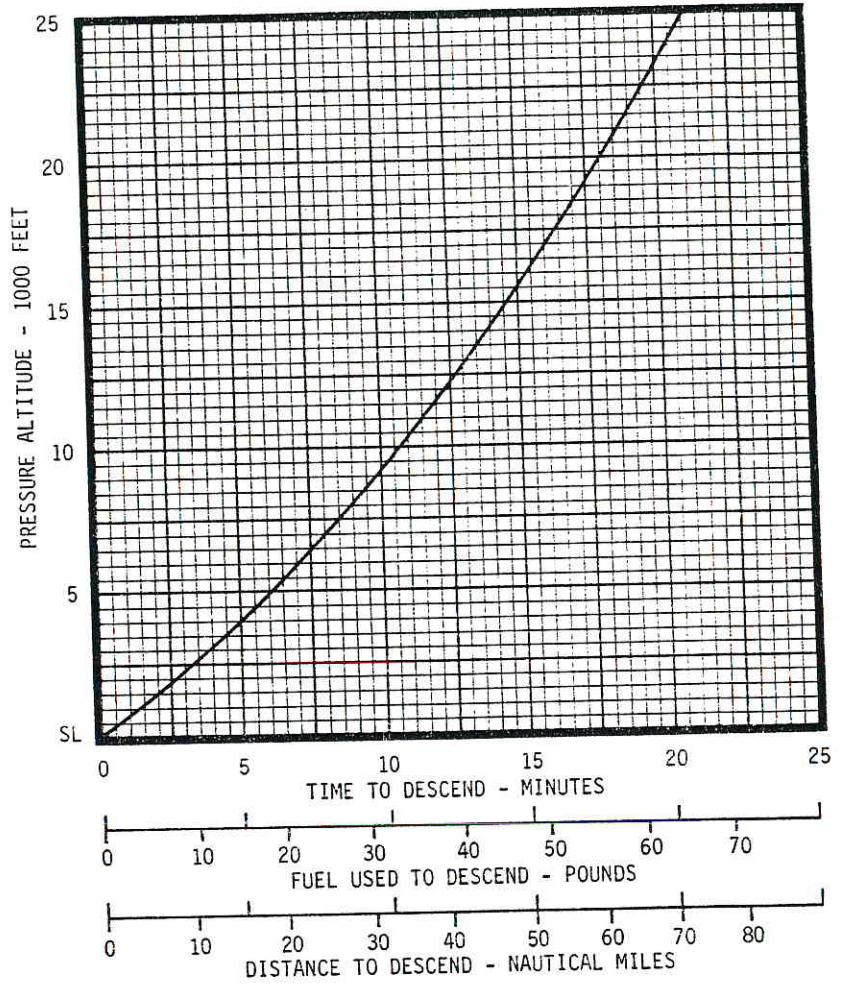
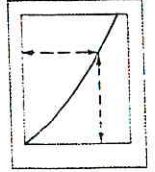


Figure 5-24

NORMAL LANDING DISTANCE

CONDITIONS:

1. Throttles - IDLE at 50 feet above ground level.
2. Landing Gear - DOWN.
3. Wing Flaps - 45°.
4. Touchdown - FULL STALL.
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 12 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 2% 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
7200	100	Sea Level	640	2210	660	2240	690	2260	710	2290
		1000	660	2230	690	2260	710	2290	740	2310
		2000	690	2260	710	2290	740	2310	770	2340
		3000	710	2280	740	2310	770	2340	790	2370
		4000	740	2310	770	2340	800	2370	820	2400
		5000	770	2340	800	2370	830	2400	860	2430
		6000	790	2370	830	2400	860	2430	890	2460
		7000	820	2400	860	2430	890	2460	920	2490
		8000	860	2430	890	2460	920	2500	960	2530
		9000	890	2460	920	2500	960	2530	990	2570
		10,000	920	2500	960	2530	1000	2570	1030	2610
6600	96	Sea Level	530	2100	550	2120	570	2140	590	2160
		1000	550	2120	570	2140	590	2160	610	2180
		2000	570	2140	590	2160	610	2180	630	2210
		3000	590	2160	610	2180	630	2210	660	2230
		4000	610	2180	630	2210	660	2230	680	2250
		5000	630	2210	660	2230	680	2260	710	2280
		6000	660	2230	680	2260	710	2280	730	2310
		7000	680	2250	710	2280	740	2310	760	2340
		8000	710	2280	740	2310	760	2340	790	2360
		9000	740	2310	760	2340	790	2370	820	2400
		10,000	760	2340	790	2370	820	2400	850	2430
6000	91	Sea Level	430	2000	450	2020	460	2040	480	2050
		1000	440	2020	460	2030	480	2050	500	2070
		2000	460	2030	480	2050	500	2070	510	2090
		3000	480	2050	500	2070	510	2090	530	2110
		4000	500	2070	510	2090	530	2110	550	2130
		5000	510	2090	530	2110	550	2130	570	2150
		6000	530	2110	550	2130	580	2150	600	2170
		7000	550	2130	580	2150	600	2170	620	2190
		8000	580	2150	600	2170	620	2190	640	2220
		9000	600	2170	620	2190	640	2220	670	2240
		10,000	620	2190	650	2220	670	2240	690	2270
5400	86	Sea Level	340	1910	350	1930	370	1940	380	1950
		1000	350	1930	370	1940	380	1950	390	1970
		2000	370	1940	380	1950	390	1970	410	1980
		3000	380	1950	390	1970	410	1980	420	2000
		4000	390	1970	410	1980	420	2000	440	2010
		5000	410	1980	420	2000	440	2010	460	2030
		6000	420	2000	440	2010	460	2030	470	2050
		7000	440	2010	460	2030	470	2050	490	2060
		8000	460	2030	480	2050	490	2070	510	2080
		9000	470	2050	490	2070	510	2090	530	2100
		10,000	490	2070	510	2090	530	2110	550	2120

Figure 5-25 (Sheet 1 of 2)

NORMAL LANDING DISTANCE

CONDITIONS:

1. Throttles - IDLE at 50 feet above ground level.
2. Landing Gear - DOWN.
3. Wing Flaps - 45°.
4. Touchdown - FULL STALL.
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 12 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
7200	100	Sea Level	740	2310	760	2340	790	2360
		1000	760	2340	790	2360	820	2390
		2000	790	2370	820	2390	850	2420
		3000	820	2400	850	2420	880	2450
		4000	850	2430	880	2450	910	2480
		5000	890	2460	920	2490	950	2520
		6000	920	2490	950	2520	980	2550
		7000	950	2530	990	2560	1020	2590
		8000	990	2560	1020	2600	1060	2630
		9000	1030	2600	1060	2640	1100	2670
		10,000	1070	2640	1110	2680	1140	2720
6600	96	Sea Level	610	2180	630	2200	650	2220
		1000	630	2210	650	2230	680	2250
		2000	660	2230	680	2250	700	2270
		3000	680	2250	700	2280	730	2300
		4000	710	2280	730	2300	750	2330
		5000	730	2300	760	2330	780	2350
		6000	760	2330	790	2360	810	2380
		7000	790	2360	820	2390	840	2420
		8000	820	2390	850	2420	870	2450
		9000	850	2420	880	2450	910	2480
		10,000	880	2460	910	2490	940	2520
6000	91	Sea Level	500	2070	510	2090	530	2100
		1000	510	2090	530	2100	550	2120
		2000	530	2110	550	2120	570	2140
		3000	550	2130	570	2140	590	2160
		4000	570	2150	590	2170	610	2180
		5000	590	2170	610	2190	630	2210
		6000	620	2190	640	2210	660	2230
		7000	640	2210	660	2240	680	2260
		8000	670	2240	690	2260	710	2280
		9000	690	2260	710	2290	740	2310
		10,000	720	2290	740	2320	770	2340
5400	86	Sea Level	390	1970	410	1980	420	1990
		1000	410	1980	420	2000	440	2010
		2000	420	2000	440	2010	450	2020
		3000	440	2010	450	2030	470	2040
		4000	460	2030	470	2040	490	2060
		5000	470	2050	490	2060	500	2080
		6000	490	2060	510	2080	520	2100
		7000	510	2080	530	2100	540	2120
		8000	530	2100	550	2120	560	2140
		9000	550	2120	570	2140	590	2160
		10,000	570	2140	590	2160	610	2180

Figure 5-25 (Sheet 2 of 2)

SECTION 6
WEIGHT & BALANCE/EQUIPMENT LIST
TABLE OF CONTENTS

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AIRPLANE WEIGHING		RECORD	6-8
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WEIGHT AND BALANCE		WEIGHT AND BALANCE	
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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 and landing gear hydraulic fluid reservoir as required to obtain a normal full indication.
3. Check landing gear down and parking brake released.
4. Remove all equipment and items not to be included in basic empty weight.
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.

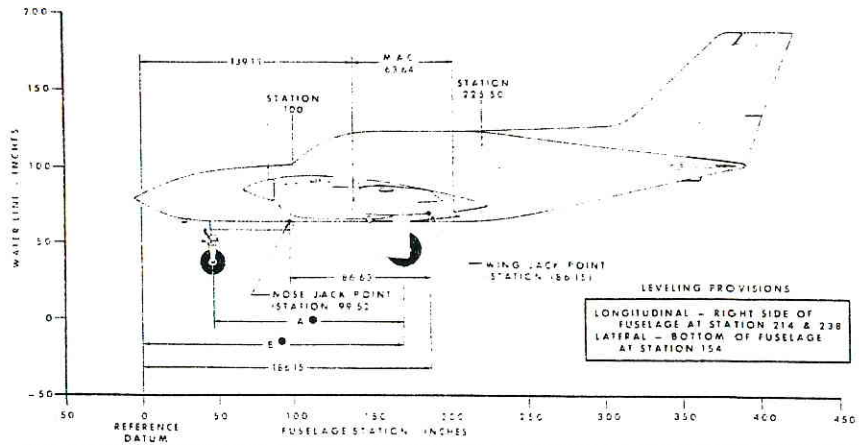
- a. Turn off all electrical power.
 - b. Turn fuel selectors OFF.
 - c. Remove engine cowling.
 - d. Disconnect inlet fuel supply hose at the inlet side of the engine-driven fuel pump.
 - e. Connect defueling hose to inlet fuel supply hose.
 - f. Turn fuel selectors ON and defuel wing until all possible 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) The wing locker fuel tanks are drained by opening a drain valve located on the lower surface of the nacelle aft of each wing locker tank.
 - (3) Each drain should remain open until the defueling rate slows to approximately 1 drop per second.
 - (4) 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 and 238. 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 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 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.

AIRPLANE WEIGHING FORM



AIRPLANE AS WEIGHED TABLE				
POSITION	SCALE READING	SCALE DRIFT	TAPE	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* _____ INCHES AFT OF DATUM * WEIGHED ON JACK POINTS USE 86.52 * WEIGHED ON WHEELS USE 126.17 TOTAL AS WEIGHED _____				

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

- LEGEND:
- MUST BE MEASURED AFTER AIRPLANE IS LEVEL ON DIALS
 - IF WEIGHED ON WHEELS, CROSS OUT JACK POINTS OR IF WEIGHED ON JACK POINTS, CROSS OUT ON WHEELS
 - ▲ INCLUDES ALL UNDRAINABLE FLUIDS & 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
	LEFT WING LOCKER	2.0	176.0
	RIGHT WING LOCKER	2.0	176.0
BASIC EMPTY WEIGHT			

Figure 6-1

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.
16. Computations (see Figure 6-1).
 - a. Enter the scale reading, scale drift and tare from all three scales in the columns in the Airplane As Weighed Table. Compute and enter values for the Net Weight and Airplane Total As Weighed columns.
 - b. 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

- c. 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. Delete printed weight, arm and moments listed for fuel tank configurations not installed in the airplane. 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.

- d. Enter Basic Empty Weight, CG arm and moment in the Weight and Balance Record, see Figure 6-4.

WEIGHT AND BALANCE DETERMINATION FOR FLIGHT

The following is a sample weight and balance determination. For an actual determination for your airplane, refer to the equivalent illustrations on the Weight and Balance Data sheet provided in your airplane.

To compute the weight and balance for your airplane, use Figures 6-2 through 6-4 as follows:

Take the Basic Empty Weight and Moment/100 from the latest entry shown on the Weight and Balance Data sheet or in Figure 6-4 and enter them in item 1 (Basic Empty Weight) of Figure 6-3. For this sample, assume a weight of 4729 pounds and moment/100 of 7310.

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 or cargo 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 item 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 outside of 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 will 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 (LBS.)	NO. SEATS	PASSENGERS		PILOT	COP	TOTAL
		WT.	MOM.			
10	14	14	196	14	196	396
20	28	28	392	28	392	792
30	42	42	588	42	588	1188
40	56	56	784	56	784	1584
50	70	70	980	70	980	1980
60	84	84	1176	84	1176	2376
70	98	98	1372	98	1372	2772
80	112	112	1568	112	1568	3168
90	126	126	1764	126	1764	3564
100	140	140	1960	140	1960	3960
110	154	154	2156	154	2156	4356
120	168	168	2352	168	2352	4752
130	182	182	2548	182	2548	5148
140	196	196	2744	196	2744	5544
150	210	210	2940	210	2940	5940
160	224	224	3136	224	3136	6336
170	238	238	3332	238	3332	6732
180	252	252	3528	252	3528	7128
190	266	266	3724	266	3724	7524
200	280	280	3920	280	3920	7920
210	294	294	4116	294	4116	8316
220	308	308	4312	308	4312	8712
230	322	322	4508	322	4508	9108
240	336	336	4704	336	4704	9504
250	350	350	4900	350	4900	9900
260	364	364	5096	364	5096	10296
270	378	378	5292	378	5292	10692
280	392	392	5488	392	5488	11088
290	406	406	5684	406	5684	11484
300	420	420	5880	420	5880	11880

FUEL

WEIGHT (LBS.)	GALLONS	MOMENT
40	8.0	240
50	10.0	300
60	12.0	360
70	14.0	420
80	16.0	480
90	18.0	540
100	20.0	600
110	22.0	660
120	24.0	720
130	26.0	780
140	28.0	840
150	30.0	900
160	32.0	960
170	34.0	1020
180	36.0	1080
190	38.0	1140
200	40.0	1200
210	42.0	1260
220	44.0	1320
230	46.0	1380
240	48.0	1440
250	50.0	1500
260	52.0	1560
270	54.0	1620
280	56.0	1680
290	58.0	1740
300	60.0	1800

BAGGAGE AND CABINET CONTENTS

WEIGHT (POUNDS)	MOMENT	CABINETS		BAGGAGE		TOTAL
		WT.	MOM.	WT.	MOM.	
10	3	7	21	26	78	105
20	6	14	42	52	156	214
30	9	21	63	78	234	321
40	12	28	84	104	312	424
50	15	35	105	130	390	535
60	18	42	126	156	468	654
70	21	49	147	182	546	781
80	24	56	168	208	624	916
90	27	63	189	234	702	1059
100	30	70	210	260	780	1210
110	33	77	231	286	858	1369
120	36	84	252	312	936	1536
130	39	91	273	338	1014	1711
140	42	98	294	364	1092	1894
150	45	105	315	390	1170	2085
160	48	112	336	416	1248	2284
170	51	119	357	442	1326	2491
180	54	126	378	468	1404	2706
190	57	133	399	494	1482	2929
200	60	140	420	520	1560	3160
210	63	147	441	546	1638	3409
220	66	154	462	572	1716	3666
230	69	161	483	598	1794	3931
240	72	168	504	624	1872	4204
250	75	175	525	650	1950	4485
260	78	182	546	676	2028	4774
270	81	189	567	702	2106	5071
280	84	196	588	728	2184	5376
290	87	203	609	754	2262	5689
300	90	210	630	780	2340	6010

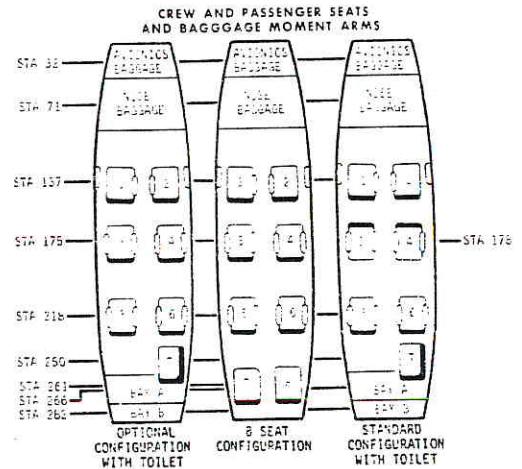


Figure 6-2 (Sheet 1 of 2)

WEIGHT AND MOMENT TABLES

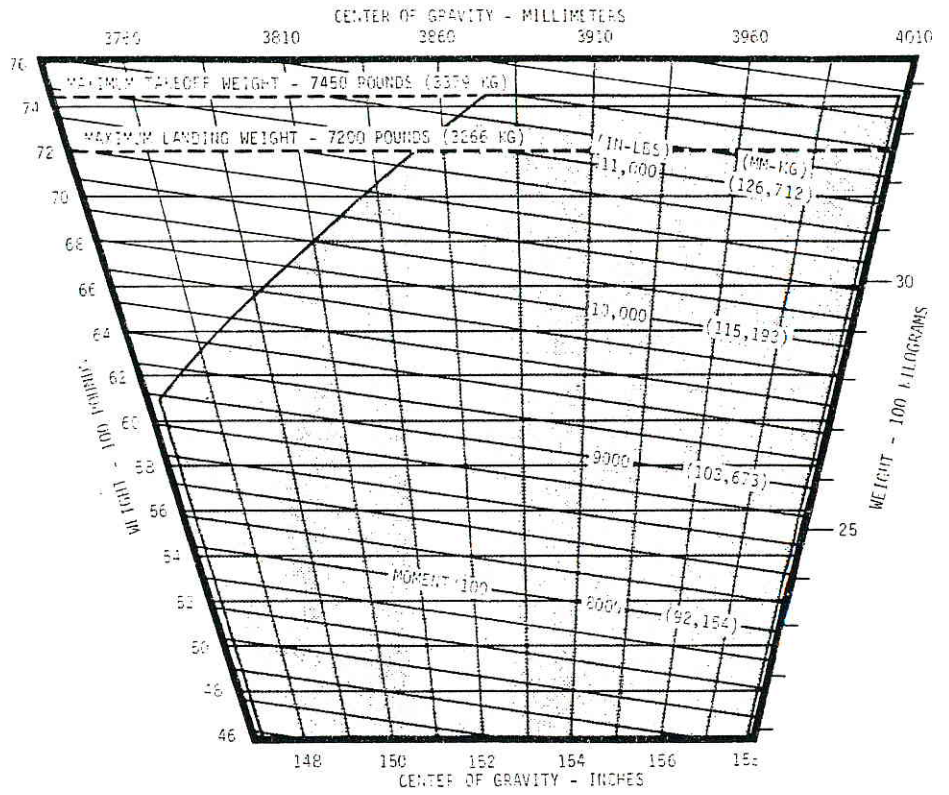
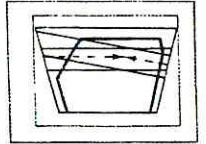


Figure 6-2 (Sheet 2 of 2)

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	4729	7310
				2.	PAYLOAD	1135	1825
SEAT 1	137	180	247	3.	ZERO FUEL WEIGHT (sub-total) (Do not exceed maximum zero fuel weight of 6733 pounds)	5864	9135
SEAT 2	137	180	247				
SEAT 3	175	170	298				
SEAT 4	175	170	298				
SEAT 5	218	145	316				
SEAT 6	218	145	316				
SEAT 7							
SEAT 8							
TOILET				4.	FUEL LOADING		
					(WING)	1236	1991
					(WING LOCKERS)		
BAGGAGE				5.	RAMP WEIGHT (sub-total) (Do not exceed maximum ramp weight of 7500 pounds)	7150	11,209
WING LOCKERS				6.	LESS FUEL FOR TAXIING	50	83
AVIONICS				7.	TAKEOFF WEIGHT (Do not exceed maximum takeoff weight of 7450 pounds)	7100	11,126
NOSE	71	145	103	8.	LESS FUEL TO DESTINATION		
BAY A							
BAY B							
CABINET CONTENTS							
PAYLOAD	---	1135	1825		(WING)	705	1142
					(WING LOCKERS)		
				9.	LANDING WEIGHT (Do not exceed maximum landing weight of 7200 pounds)	6395	9984

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

WEIGHT AND BALANCE RECORD
(CONTINUOUS HISTORY OF CHANGES IN STRUCTURE OR EQUIPMENT AFFECTING WEIGHT AND BALANCE)

DATE	ITEM		DESCRIPTION OF ARTICLE OR MODIFICATION	WEIGHT CHANGE						BASIC EMPTY WEIGHT	
				ADDED (+)			REMOVED (-)				
				WT. (LB)	ARM (IN)	MOMENT /100	WT. (LB)	ARM (IN)	MOMENT /100	WT. (LB)	MOMENT /100
	IN	OUT									

Figure 6-4

EQUIPMENT LIST

The following pages of this handbook contain a comprehensive listing of all equipment available from the factory for the airplane. This equipment list is divided into two sections, the first of which (Section A) lists a equipment required to be installed. The second section (Section B) lists the remaining standard equipment and all available optional equipment.

NOTE

If additional equipment is to be installed, it must be done in accordance with the reference drawing, accessory or service kit instructions, or a separate FAA approval.

A "Mark If Installed" column has been provided after each item in the equipment list. If desired, the operator may check each appropriate item which is installed in his particular airplane. Columns showing weight in pounds and arm in inches provide the weight and center of gravity location for the equipment.

A customized equipment list, detailing only the equipment installed in your airplane as delivered from the factory, is provided with your airplane papers. This list is presented in the same order and format as the comprehensive listing.

EQUIPMENT LIST

THE FOLLOWING IS A COMPLETE LIST OF EQUIPMENT WHICH CAN BE INSTALLED IN THE AIRPLANE WHEN DELIVERED BY CESSNA AIRCRAFT COMPANY. REFER TO THE EQUIPMENT LIST IN THE AIRPLANE FOR A LIST OF EQUIPMENT ACTUALLY INSTALLED WHEN DELIVERED BY CESSNA AIRCRAFT COMPANY.
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 WEIGHTS ARE EXCHANGE WEIGHTS.
INSTALLATION APPROVAL OF EQUIPMENT INCLUDED IN THIS LIST IS MAINTAINED EITHER BY THE MANUFACTURER'S SUPPLEMENTARY TYPE CERTIFICATE WITH THE APPROVAL NUMBER NOTED WITH EQUIPMENT OR IN THE MANUFACTURER'S TYPE DESIGN FILE IN ACCORDANCE WITH 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 650 X 10	9910393		2	17.5	168.4
	TIRE-MAIN GEAR 650 X 10 8-PLY	C262003210		2	29.6	168.4
	TUBE-MAIN GEAR 650 X 10 TYPE 3	C262023105		2	4.8	168.4
	BRAKE-MAIN GEAR	9910393		2	28.5	168.4
	WHEEL-NOSE GEAR 600 X 6	9910194		1	5.5	47.0
	TIRE-NOSE GEAR 600 X 6 6-PLY	9910336		1	9.8	47.0
	TUBE-NOSE GEAR 600 X 6 TYPE 3	C262023102		1	1.7	47.0
	ENGINE 6 CYL LH 375 HP	GTS10-520N		1	512.6	109.1
	ENGINE 6 CYL RH 375 HP	GTS10-520N		1	512.6	109.1
	CONTROLLER, VARIABLE	633388		2	4.0	141.0
	TURBOCHARGERS AIR RESEARCH	641672		2	72.0	148.5
	FILTER AIR INDUCTION	9910018		2	2.5	131.0
	OIL RADIATOR (HARRISON)	641484		2	18.5	122.0
	OIL FILTER	643585		3	6.0	136.0

SECTION A
REQUIRED EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
	FUEL PUMP, ENGINE DRIVEN	641583-639		2	5.6	132.5
	FUEL PUMP, BOOST	9910202 2		2	7.0	174.7
	PROP-3 BLADE-MCCAULEY 90UM80	3FF32C501		2	190.9	83.3
	PROP SPINNER & BULKHEAD	D3534D4506		2	12.9	87.5
75	POLISHED SPINNER & BULKHEAD ST	D5212D5217		2	12.6	87.5
	PROP GOVERNOR 6	DCF290D77		2	3.9	95.3
76D	PROP GOVERNOR SYNCHROPHASER T6	DCFS29UD9/		2	6.7	95.3
77	PROP GOVERNOR UNFEATHERING /T6	DCFU290D13		2	5.9	95.3
76E	PROP GOVERNOR UNFEATH/SYNCH/T6	DCFUS290D9		1	7.0	95.3
	AIRSPEED INDICATOR STD	C661040213		1	0.7	112.6
04	TRUE AIRSPEED INDICATOR STD	C661040216		1	2.8	112.6
	ALTIMETER	C661014101		1	1.1	112.6
01A	ALTIMETER FT & MILIBARS LH	C661025101		1	1.1	112.6
624C	400 ENCODING ALTIMETER-INCHES	EA-401A		1	2.6	113.0
624E	400 ENCODING ALTIMETER-MILIBARS	EA-401A		1	2.6	113.0
675A	800 ENCODING ALTIMETER-INCHES	EA-801A		1	2.8	113.0
675B	800 ENCODING ALTIMETER-MILIBARS	EA-801A		1	2.8	113.0
	TACHOMETER-DUAL	C668C17108		1	1.8	112.6
09	TACHOMETER-SYNCHRONOUS, DUAL	C668016108		1	1.8	112.6
	FUEL QUANTITY INDICATOR	DSFG 1710		1	1.3	112.6
	FUEL FLOW INDICATOR-DUAL STD	C662020110		1	2.7	127.0
39	FUEL FLOW GAGE & MGMT COMPUTER	9910395 6		1	2.0	116.7
	GAGE MANIFOLD PRESSURE	C662026111		1	0.9	116.5
	GAGE-UNIT LEFT ENGINE COMB	C662019101		1	1.2	116.5
	GAGE-UNIT RIGHT	C662019101		1	1.2	116.5
	RATE OF CHANGE, CABIN PRESSURE	C668517101		1	0.9	114.0
	DIFF & ALT CABIN PRESSURE	C668516104		1	2.2	114.0
	COMPASS	C660501401		1	0.7	118.3
	STALL WARNING HORN	9910080 1		1	0.2	114.0
	STALL WARNING TRANSMITTER	186-8		1	0.2	142.5

3 November 1980
Revision 1 - 2 Apr 1982

SECTION 6
WEIGHT & BALANCE

Cessna
MODEL **421C**

SECTION A
REQUIRED EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
11	ANGLE OF ATTACK SYSTEM	0800302		3	1.0	124.1
	ALTERNATOR 50 AMP CMC	641668		2	25.5	96.0
16A	ALTERNATOR 100 AMP	9910385		1	34.8	96.0
	VOLTAGE REGULATOR	9910126		3	1.7	132.7
	BATTERY 24 VOLTS	R-2425		1	40.0	171.5
	MASTER SWITCH	8501KA		3	0.3	123.0
96A	STROBE LIGHTS ASSY	99103661&2		3	3.5	157.5
96B	STROBE LTS (HI IT) ASSY	99103663&4		2	4.0	157.5
	STROBE LTS (ICAO RED) ASSY	99103665&6		2	4.4	157.5
	LIGHT POWER SUPPLY	9910368		1	3.5	157.5
96A	LT (HI INT) POWER SUPPLY	9910368		2	3.8	168.8
96B	LT (ICAO RED) POWER SUPPLY	9910368		2	3.8	168.8
	SEAT-PILOT ADJUSTABLE	0812782		1	15.1	140.0
L	SEAT-PILOT ADJUST LEATHER	0812782		1	15.7	140.0
89	SEAT-PILOT MECH ADJUST	0812780		1	22.9	140.8
89 L	SEAT-PILOT MECH ADJUST LEATHER	0812780		1	23.5	140.8
80454	PILOT-SEAT ELEC TRICAL ADJUST	5118490		1	27.1	140.8
	SAFETY BELT/SHOULDER HARNESS	CM40C8 & 9		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	3423-00		9	0.4	280.3
	VALVE, CABIN PRESSURE	103576		5	1.3	287.9
	PILOT'S OPERATING HANDBOOK AND FAA APPROVED AIRPLANE FLIGHT MANUAL	D1595-1-13PH		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	GYR-J-ADI (4 IN) G-1050A			1	5.0	113.0
53322	GYRO-DIRECT G-504A			1	3.5	112.5
53323	GYRO-ADI (3 IN) G-550A			1	3.5	112.5
53324	GYRO-HSI (3 IN) IG-832A			1	5.0	113.0
530	400B NAV-U-MATIC INSTL			1	16.6	198.4
530	COMPUTER CA-550A/FD & MOUNT			1	6.3	303.1
530	CONTROLLER C-530A			1	1.7	109.7
530	ACTUATOR PA-495A-1 & MOUNT			1	4.1	294.6
530	ACTUATOR PA-495A-2 & MOUNT			1	4.1	220.0
530	ACTUATOR TA-495A & MOUNT			1	2.1	300.4
530	ALTITUDE SENSOR AS-895A			1	2.3	318.6
531	400B NAV-U-MATIC SLAVED JG OPT			1	2.8	215.4
531	FLUX DETECTOR CT-504A			1	0.5	361.9
531	SLAVE ACCESS W/O BS SA-832A			1	0.8	35.0
53101	SLAVE ACCESS W/BS SA-832B			1	2.2	35.0
53102	400J NAV-U-MATIC HSI (3 IN) OPT			1	3.1	213.6
532	CONVERTER B-445A & MOUNT			1	1.3	33.0
53201	FLUX DETECTOR CT-504A			1	0.5	361.9
532	SLAVE ACCESS W/O BS SA-832A			1	0.8	35.0
53202	SLAVE ACCESS W/BS SA-832B			1	2.2	35.0
53203	YAW DAMPLR INSTL YD-840B			1	3.9	234.3

SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
534	ACTUATOR PA-495A-1 & MOUNT			1	4.1	298.2
550	400B IFCS INSTL			1	25.1	197.1
550	COMPUTER CA-550A/FD & MOUNT			1	6.3	303.1
550	CONTROLLER C-531A			1	1.5	109.7
550	ACTUATOR PA-495A-1 & MOUNT			1	4.1	294.6
550	ACTUATOR PA-495A-2 & MOUNT			1	4.1	220.0
550	ACTUATOR TA-495A & MOUNT			1	2.1	300.4
550	ALTITUDE SENSOR AS-895A			1	2.3	318.6
550	MODE SELECTOR S-550A			1	2.6	112.9
55001	CONVERTER B-445A & MOUNT			1	1.3	33.0
550	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
560	800B IFCS INSTL			1	24.6	190.9
560	COMPUTER CA-550A/FD & MOUNT			1	6.3	303.1
560	CONTROLLER C-830FD			1	1.5	109.7
560	ACTUATOR PA-495A-1 & MOUNT			1	4.1	294.6
560	ACTUATOR PA-495A-2 & MOUNT			1	4.1	220.0
560	ACTUATOR TA-495A & MOUNT			1	2.1	300.4
560	ALTITUDE SENSOR AS-895A			1	2.3	318.6
560	MODE SELECTOR S-550A			1	2.6	112.9
56001	CONVERTER B-445A & MOUNT			1	1.3	33.0
560	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
560	YAW DAMPER INSTL			1	3.9	234.3
560	ACTUATOR PA-495A-1 & MOUNT			1	4.1	298.2
570	HS1 & ADI 3 IN OPTICN, RH			1	3.3	211.8
57004	INDICATOR IN-832R			1	0.8	112.9
57001	CONVERTER B-445A & MOUNT			1	1.3	33.0

SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
570	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
27	CABLES STAINLESS STEEL			1*		
27	CORROSION PROOFING - INTERNAL	5100C09900		1	10.5	194.2
33	ELECTRIC ELEVATOR TRIM	5618105 7		1	3.2	216.7
47B	GUST LOCK, RUDDER	5130387 1		1	1.1	375.6
	FUEL SYSTEM					
40	FUEL TANK, WING LCCKER L&R 56 G	5156100 0		1	64.1	164.7
40A	FUEL TANK, WING LCCKER LH 28 G	5156100 1		1	32.0	164.7
40B	FUEL TANK, WING LCCKER RH 28 G	5156100 2		1	32.0	164.7
	PROPELLER					
76E	PROP SYNCHROPHASER/UNFEATHERING	5118717 1		1	11.9	109.3
77	PROP UNFEATHERING SYSTEM	5155C05 4		1	11.3	108.8
76D	PROP SYNCHROPHASER SYSTEM	5118717 2		1	0.6	118.3
	INSTRUMENTS					
675A	ALTITUDE ALERTER AA-801A			1	0.8	113.0
675B	ALTITUDE ALERTER AA-801A			1	0.8	113.0
624B	400 ENCODING ALTIMETER-INCHES	EA-401A		1	2.6	113.0
624D	400 ENCODING ALTIMETER-MILIBARS	EA-401A		1	2.6	113.0
676A	800 ENCODING ALTIMETER-INCHES	EA-801A		1	2.8	113.0
676A	ALTITUDE ALERTER AA-801A			1	0.8	113.0
676B	800 ENCODING ALTIMETER-MILIBARS	EA-801A		1	2.8	113.0
676B	ALTITUDE ALERTER AA-801A			1	0.8	113.0
	CLOCK, ELECTRIC	C664509101		1	0.4	114.1
23A	CLOCK, DIGITAL - ELECTRONIC	C664510101		1	0.6	114.1
	RATE OF CLIMB IND	C661035101		1	0.9	113.1
08	VERTICAL VELOCITY IND	C661009101		1	1.9	113.1
	TURN & BANK INDICATOR	C661031101		1	1.4	112.1
534	GYRO COMPUTER G-840A			1	2.6	112.8

SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
560	GYRO COMPUTER G-840A	9910247		2	2.6	112.8
02	ECONOMY MIXTURE INDICATOR	CM2926		1	3.5	123.2
03	FLIGHT HOUR RECORDER PNL MTD	C664503101		1	0.8	112.5
03A	HEATER HOUR METER INSTL	5114244		1	0.4	96.0
07	RH PANEL & PLUMBING	C661014101		1	4.1	116.9
0710	ALTIMETER RH	C661025101		1	1.1	112.6
01B	ALTIMETER-FI & MILIBARS	C661C40207		1	1.1	112.6
0720	AIRSPEED INDICATOR RH	C661040213		1	0.7	112.6
04A	AIRSPEED INDICATOR IAS RH	C661035101		1	2.8	112.6
0730	RATE OF CLIMB IND RH	C661009101		1	0.9	113.1
08A	VERTICAL VELOCITY IND RH	C661053101		1	1.9	113.1
0740	GYRO-DIRECTIONAL RH			1	2.6	113.0
53305	GYRO-HSI (3 IN) IG-832A	C661055102		1	5.0	113.0
0750	GYRO-HORIZONTAL RH			1	1.9	112.5
53313	GYRO-ADI (3 IN) G-550A	5114225		2	3.5	112.5
760	PITOT TUBE SYSTEM RH	5114220		6	1.3	42.1
770	STATIC SOURCE-DUAL RH	C661031101		1	0.3	257.0
19	TURN & BANK INDICATOR RH 3 IN	9910232		8	1.4	112.1
45	FUEL, LOW LEVEL WARNING SYS			1	0.6	152.0
19A	TURN & BANK INDICATOR 2 INCH PNEUMATIC	C661032101		1	1.2	114.5
32	VACUUM PUMPS-PWR FOR GYROS STD	211CC		2	3.8	126.3
194	VACUUM PUMP, DE-ICE	441CC		2	6.2	126.3
	VACUUM PUMP, FLIGHT IN ICING	441CC		2	6.2	126.3
85	ELECTRICAL			1	0.4	128.6
52	TIMER, COURTESY LIGHTS	5618712		1	1.5	54.6
87A	LIGHT, TAXI	5618101		8	0.4	297.4
46	STATIC DISCHARGE WICKS-SET OF 8	5100015		1	0.4	195.4
	GROUND SERVICE RECEPTACLE	5118116		5	7.8	

SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
49	LIGHT-LANDING RH	5118652	1	1	4.6	161.5
43	LIGHTS, NACELLE BAGGAGE COURTESY	0851862	8	1	1.0	129.1
53A	ELECTROLUMINESCENT PANEL	5118713	1	1	4.9	131.6
48	LIGHT, ICE DETECTION, LH	5027102	6	1	0.4	133.5
48A	LIGHT, ICE DETECTION RH	5027102	10	1	0.4	133.5
26	CONVERTER 110 VOLT	5618118	4	1	3.3	273.8
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	TRANSCIVER RT-485A & MOUNT			1	6.3	109.4
40001	INDICATOR IN-486AC			1	2.1	111.9
40002	400 NAV/COM INSTL NO. 2			1	3.9	70.3
40002	TRANSCIVER RT-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	33.0
40004	RECEIVER R-443B & MOUNT			1	3.3	33.0
40304	ANTENNA CI-212			1	0.2	7.4
40044	400 GLIDESLOPE INSTL NO. 2			1	3.2	33.0
40044	RECEIVER R-443B & MOUNT			1	3.3	33.0
40044	ANTENNA COUPLER & CABLE			1	0.3	7.4
40044	400 ADF INSTL			1	3.2	91.9
40005	RECEIVER R-446A & MOUNT			1	4.0	109.4
40005	INDICATOR IN-346A			1	1.1	111.9
40106	ACCESSORY UNIT RA-446A			1	1.4	140.0
40105	ANTENNA-LOOP L-346A	9751002	28	1	1.6	162.4
40005	ANTENNA-SENSE	9751042	1	1	1.9	195.3
40007	400 MARKER BEACON INSTL			1	3.2	33.0

SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
40007	RECEIVER R-402A & MOUNT			1	1.1	33.0
40007	ANTENNA CI-102			1	0.8	73.0
100	1000 COM INSTL NO. 1			1	3.9	73.0
100	TRANSCIVER RT-1038A & MOUNT			1	6.6	33.0
100	CONTROL C-1038A & MOUNT			1	2.0	112.9
10001	1000 COM INSTL NO. 2			1	3.9	73.0
10001	TRANSCIVER RT-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	76.5
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
10003	INDICATOR IN-1049AC			1	1.7	111.9
10004	1000 NAV INSTL NO. 2			1	2.9	76.5
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
10092	1000 NAV INSTL NO. 3			1	2.9	76.5
10092	RECEIVER R-1048B & MOUNT			1	5.0	33.0
10092	CONTROL C-1048A & MOUNT			1	2.0	112.9
10006	1000 GLIDESLOPE INSTL NO. 1			1	3.2	66.7
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	66.7
10066	RECEIVER R-1043A & MOUNT			1	2.6	33.0
10066	ANTENNA COUPLER & CABLE			1	0.3	7.4
10096	1000 GLIDESLOPE INSTL NO. 3			1	3.2	66.7
10096	RECEIVER R-1043A & MOUNT			1	2.6	33.0
10096	ANTENNA CI-212			1	0.2	14.3

SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
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	112.9
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	73.0
10010	ANTENNA CI-102			1	0.8	122.6
20001	HAND MICROPHONE			1	0.4	122.6
20055	HAND MICROPHONE COPILOT			1	0.4	122.6
20050	SPEAKER INSTL COPILOT			1	0.9	148.5
20002	HEADSET & BOOM MIC COMBINATION			1	0.9	148.5
20003	800 AUDIO AMPLIFIER AA-108			1	0.3	150.6
20004	1000 AUDIO AMPLIFIER F1010A			1	1.2	111.9
20004	1000 AUDIO AMPLIFIER F1010B			1	1.6	111.9
20005	FWD PRESSURE BULKHEAD FEEDTHRU			1	1.6	111.9
20006	AVIONICS BUS			1	0.5	100.0
20007	APPROACH PLATE HOLDERS			1	4.5	130.0
20008	JUNCTION BLOCK			2	0.2	124.6
20009	CABLE COVER INST			1	2.6	33.0
20011	ANTENNA-COM NO. 1 A-29C	9756118		1	1.4	42.1
20012	ANTENNA-COM NO. 2 VF10-122			1	1.6	105.4
20013	ANTENNA-DUAL NAV C1120-200			1	1.6	318.7
20021	AVIONICS COOLINGPANEL			1	2.3	376.7
20022	AVIONICS COOLING-NOSE (ONE)	9756080		1	0.9	110.0
20023	AVIONICS COOLING-NOSE (TWO)	9756098		1	2.4	25.7
				1	4.3	29.7

SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
20024	BLOWER INSTL	9755125	1	1	1.1	125.8
20025	SPEAKER INSTL	9715028	3	1	3.4	195.4
20031	SHELF INSTL	9756112	1	1	2.2	36.4
20032	COVER SHELF	9756113	1	1	7.0	30.0
622	400 TRANSCIVER INSTL NO. 1			1	0.6	78.5
622	TRANSCIVER RT-459A & MOUNT			1	3.2	109.5
622	ANTENNA L10-216			1	0.3	47.5
622C	400 TRANSPONDER INSTL NO. 2			1	0.6	78.5
622C	TRANSCIVER RT-459A & MOUNT			1	3.2	109.5
622C	ANTENNA L10-216			1	0.3	47.5
623	800 TRANSPONDER INSTL NO. 1			1	0.6	78.5
623	TRANSCIVER RT-859A & MOUNT			1	3.2	109.5
623	ANTENNA L10-216			1	0.3	47.5
623B	800 TRANSPONDER INSTL NO. 2			1	0.6	78.5
623B	TRANSCIVER RT-859A & MOUNT			1	3.2	109.5
623B	ANTENNA L10-216			1	0.3	47.5
681	400 DME INSTL NO. 1			1	2.9	79.5
681	TRANSCIVER RTA-476A & MOUNT			1	9.8	33.0
681	CONTROL C-476A			1	1.7	111.0
681	ANTENNA L10-216			1	0.3	107.3
681C	400 DME INSTL NO. 2			1	2.9	79.5
681C	TRANSCIVER RTA-476A & MOUNT			1	9.8	33.0
681C	CONTROL C-476A			1	1.7	111.0
681C	ANTENNA L10-216			1	0.3	107.3
681C	MULTIPLEXER MUB76A & MOUNT			1	1.1	33.0
681F	800 DME INSTL NO. 1			1	2.9	79.5
681F	TRANSCIVER RTA-876A & MOUNT			1	9.3	33.0
681F	CONTROL C-876A			1	1.7	111.0
681F	ANTENNA L10-216			1	0.3	107.5

SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
681G	800 DME INSTL NO. 2			1	2.9	79.5
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	107.5
677	HORIZONTAL SITUATION INDICATOR (3 IN) TO BE USED W/O AUTOPILOT			1	3.2	211.0
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 & MT			1	11.0	103.9
629P	WAVEGUIDE			1	2.6	18.0
629P	ANTENNA DA-144A			1	3.6	9.0
629P	REFLECTOR AA-1212A			1	1.2	7.5
629P	RADOME NOSE			1*	-0.3	7.4
629D	RDR-160 RADAR INSTL			1	3.0	59.1
629D	TRANSCEIVER, ANTENNA & MOUNT	ANT-161A		1	10.5	24.9
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	59.1

SECTION 6
WEIGHT & BALANCE

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SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
627F	TRANSCIEVER, ANTENNA & MT			1	10.5	24.9
627F	INDICATOR IN-2026A & MT			1	11.0	103.9
627F	RAJOME NOSE			1*	-0.3	7.4
627H	RADAR CHECK LIST CONTROL UNIT			1	1.5	113.0
629U	RADAR CHECK LIST PROGRAMMER			1	0.5	135.0
629U	PRIMUS 200 COLOR RADAR INSTL			1	3.0	59.1
629U	XCVR & ANT RTA-1003 & MT			1	18.0	24.9
629U	INDICATOR DI-2008 & MT			1	11.0	103.9
629U	RADOME NOSE (EXCHANGE)			1*	-0.3	7.4
633D	COLLINS HF-200 INSTL			1	2.7	152.4
633D	CONTROL HEAD CTL-2001	975007155		1	1.1	112.9
633D	TRANSCIEVER CR-200 * MT	9756031242		1	6.4	33.0
633D	POWER AMPLIFIER PWR-200	9756031243		1	7.4	33.0
633D	ANT & COUPLER (TAIL)	9751094		1	11.0	308.3
651	400 ADF INSTL NO. 2			1	3.2	100.0
651	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
65105	INVERTER DV-1060A			1	5.2	33.0
65106	ANTENNA-LOOP L-346A	9751002		1	1.6	219.0
651	ANTENNA-SENSE	9751042		1	1.9	195.3
656	1000 ADF INSTL NO. 2			1	3.2	185.0
656	RECEIVER R-846A & MOUNT			1	4.6	33.0
656	CONTROL C-1046A & MOUNT			1	2.0	112.5
656	POWER SUPPLY P-1000A			1	1.2	33.0
65601	INDICATOR IN-346A			1	1.1	111.9
65602	INDICATOR IN-13A-1			1	1.4	111.9
65603	ACCESSORY UNIT RA-846A			1	1.4	140.0

SECTION B
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FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
65604	ACCESSORY UNIT RA-846A			1	1.4	140.0
65605	INVERTER DV-1060A			1	5.2	33.0
65606	ANTENNA-LOOP L-346A	9751002	29	1	1.6	219.0
656	ANTENNA-SENSE	9751042	2	1	1.9	195.3
660	ADF IN-346B			1	1.3	111.9
662	ADF RA-446A			1	1.4	140.0
663	ADF RA-846A			1	1.4	140.0
685	400 AREA NAVIGATION INSTL			1	2.8	111.0
68501	INDICATOR IN-1048AC			1	1.6	111.9
68502	INDICATOR IN-1049AC			1	1.7	111.9
685	COMPUTER RN-478A & MOUNT			1	5.1	110.0
687	800 AREA NAVIGATION INSTL			1	2.8	111.0
687	COMPUTER RN-878A & MOUNT			1	5.4	110.0
672	AA-215 RADIO ALTIMETER INSTL			1	0.5	242.0
672	TRANSCIVER RT-220			1	6.8	277.2
672	INDICATOR RA-215			1	2.6	112.0
672	ANTENNA AT-220			1	0.8	283.6
688	AA-100 RADIO ALTIMETER INSTL			1	0.5	242.0
688	TRANSCIVER RT-100A			1	3.6	277.2
688	INDICATOR AA-100			1	1.7	112.0
688	ANTENNA AT-100			1	1.1	283.6
670	400 RMI INSTL			1	1.2	95.0
670	INDICATOR IN-404A			1	2.3	111.0
670	INVERTER DV-1060A			1	5.2	33.0
671	1000 RMI INSTL			1	1.2	95.0
671	INDICATOR IN-1004A			1	2.4	111.0
671	INVERTER DV-1060A			1	5.2	33.0
668	AERONETIC 7100 RMI INSTL			1	1.2	95.0
668	INDICATOR 520-7137-014			1	1.6	111.0
668	CONVERTER 520-7100-002			1	1.7	33.0

SECTION 6
WEIGHT & BALANCE

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SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
674A	RADIO TELEPHONE FLITEPHONE III			1	21.3	281.3
674B	FLITEPHONE III (COCKPIT-CONTROL			1	12.2	294.4
141	HEADSET W/MIKE PILOT	9754030 5		1	0.4	120.9
141A	HEADSET W/MIKE PILOT & COPILOT	9754030 6		1	0.8	120.9
141D	HEADSET W/MIKE	9754030 5		1	0.4	120.9
55	BOOM MIKE	5618110 1		1	0.8	137.3
55A	PASSENGER MIKE AFT CAB. INTERCO	9715030 1		1	1.0	186.4
79	RADOME NOSE	9711019 1		1*	-0.3	7.4
	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 MECH ADJUSTABLE	0812780 2		1	22.9	140.8
89AL	SEAT-COPILOT MECH ADJUST LEATHR	0812780 2		1	23.5	140.8
	SAFETY BELT/SHOULDER HARNESS	CM40C869		1	0.6	151.5
181	SAFETY BELT/SHOULDER HARNS-REEL	5119565 11		1	0.9	151.8
	SEAT-3RD AFT FACING	5119312 39		1	29.2	170.5
111	SEAT-3RD FWD FACING	5119312 35		1	26.0	182.5
113	SEAT-3RD FWD FACING	5119312 35		1	26.0	182.5
	SEAT-4TH AFT FACING	5119312 38		1	29.2	170.5
111	SEAT-4TH FWD FACING	5119312 36		1	26.0	182.5
113	SEAT-4TH FWD FACING	5119312 36		1	26.0	182.5
	SEAT-5TH FWD FACING	5119312 37		1	26.0	225.2
	SEAT-6TH FWD FACING	5119312 36		1	26.0	225.2
111	SEAT-7TH FWD FACING	5119412 15		1	15.2	266.0
112	SEAT-7TH FWD FACING	5119412 15		1	15.2	266.0
113	SEAT-7TH FWD FACING	5119412 15		1	15.2	266.0
114	SEAT-7TH FWD FACING	5119412 15		1	15.2	266.0
113	SEAT-8TH FWD FACING	5119412 15		1	15.2	266.0
114	SEAT-8TH FWD FACING	5119412 15		1	15.2	266.0

SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
104H	STORAGE DRAWER 3RD AFT SEAT	5119074	1	1	5.4	176.5
104J	STORAGE DRAWER 3RD FWD SEAT	5119074	2	1	5.4	176.5
104L	STORAGE DRAWER 4TH AFT SEAT	5119074	2	1	5.4	176.5
104K	STORAGE DRAWER 4TH FWD SEAT	5119074	1	1	5.4	219.2
104M	STORAGE DRAWER 5TH FWD SEAT	5119074	2	1	5.4	219.2
104N	STORAGE DRAWER 6TH FWD SEAT	5119074	1	1	2.4	197.9
996	SEATS-ALL LTHR STD SEATING	5119300900		1	3.0	216.3
996A1	SEATS-ALL LTHR OPT 1 SEATING	5119300901		1	3.0	211.5
996A2	SEATS-ALL LTHR OPT 2 SEATING	5119300902		1	3.6	224.6
996B3	SEATS-ALL LTHR OPT 3 SEATING	5119300903		1	3.6	220.6
996B4	SEATS-ALL LTHR OPT 4 SEATING	5119300904		1	0.6	197.9
11001	SEAT TRIM-LTHR STD SEATING	5119300910		1	0.8	216.3
11101	SEAT TRIM-LTHR OPT 1 SEATING	5119300911		1	0.8	211.5
11201	SEAT TRIM-LTHR OPT 2 SEATING	5119300912		1	0.9	224.6
11301	SEAT TRIM-LTHR OPT 3 SEATING	5119300913		1	0.9	220.6
11401	SEAT TRIM-LTHR OPT 4 SEATING	5119300914		1	3.6	187.0
998	SIDE PANELS-LTHR	5100011	6	1	1.0	43.6
31	CAA CONVERSION KIT	5600002	2	1	0.0	212.9
31D	LBA CONVERSION KIT	5114006	1	1	14.9	88.8
65	OXYGEN SYS 11.0 CU.FT.	5217541	5	1	54.9	41.5
63	OXYGEN SYS 114.9 CU.FT.	5119467	1	1	28.1	273.0
128	REFRESHMENT BAR	5119435	3	1	37.6	238.8
130B	TOILET, DIVIDER W/RC	5119435	1	1	35.6	245.0
130D	TOILET, DIVIDER W/D RC	5119435	3	1	22.5	239.2
130A	TOILET W/CURTAIN W/RC	5119435	1	1	20.5	250.2
130C	TOILET W/CURTAIN W/D RC	5119435	1	1	49.6	238.0
130J	TOILET W/DIVIDER & DOOR	5119435	5	1	47.6	242.7
130L	TOILET W/DIV & DOOR W/ O RC	5119435	5	1	62.7	250.6
130K	FLUSH TOILET W/DIV & D OOR W/R	5119567	8	1		
130K	FLUSH TOILET W/DIV & D OOR W/R	5119567	8	1	60.7	250.5

SECTION 6
WEIGHT & BALANCE

MODEL 421C

SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
130E	FLUSH TOILET W/CURTAIN W/RC	5119567		2	35.6	260.8
130G	FLUSH TOILET W/CURTAIN W/O RC	5119567		2	33.6	261.4
130F	FLUSH TOILET, DIVIDER W/RC	5119567		1	50.8	254.1
130H	FLUSH TOILET W/DIVIDER W/O RC	5119567		1	48.8	254.1
97	TINTED WINDOWS (EXCHANGE)	5111601		24	1.0	51.2
41	FENDER INSTL-NOSE GEAR)	5042021		1	3.4	156.0
28	CURTAIN, FLIGHT DECK LIGHT MT.	5119465		5	12.6	176.3
138Y	STERED INSTL W/AVN	9715029		3	12.7	177.2
138G	STERED INSTL W/O AVN	9715029		4	194.0	194.0
124A	EXECUTIVE TABLE LH	5119138		1	9.9	194.0
124B	EXECUTIVE TABLE RH	5119138		2	9.9	194.0
42	AVIONICS BAY DOOR	5113001		22	2.2	32.0
128Q	THERMOS CARRIER & BASE	5119071		1	8.8	156.9
120G	FLIGHT DECK DIVIDER W/CURTAIN	5119465		4	13.6	155.1
84A	FASTEN SEAT BELT/OXYGEN SIGN	5119465		2	0.2	145.7
120L	INSTRUMENTS IN DIVIDER RH	5119465		1	1.8	142.6
199A	PAINT, U.S. ALUMIGRIP	5100350000		1*		
	EMERGENCY EQUIPMENT					
37A	FIRE EXTINGUISHER, HAND	5114243		6	5.2	130.7
177	ECONOMY LOCATOR BEACON	9754083		48	2.9	312.0
177A	ECONOMY LOCATOR BEACON-CANADIAN	9754083		38	3.7	312.4
177B	ECONOMY LOCATOR BEACON-CANADIAN	9754083		38	3.7	312.4
44	NACELLE FIRE DETECT & EXT SYS	5118705		10	19.6	135.0
44B	FIRE EXTINGUISHER, FLOOD TYPE	5114586		1	31.6	173.8
	AIR CONDITION & ANTI-ICE					
20	CABIN PRESSURE CONTROL-VARIABLE	5614600		4	2.0	116.1
15	CABIN AIR CONDITIONER, CABIN	5114524		6	111.9	157.6
15M	AIR OUTLETS 7TH-8TH	5114578		23	2.0	263.1
15N	AIR OUTLETS 7TH & TOILET	5114578		41	2.0	263.1

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SECTION
WEIGHT & BALANCE

SECTION B
STANDARD AND OPTIONAL EQUIPMENT

FACTORY KIT	ITEM	PART NUMBER	MARK IF INSTALLED	QTY	WEIGHT (POUNDS)	ARM (INCHES)
92	VENTILATING FAN SYSTEM	5114579	1	1	21.4	155.3
94A	WINDSHIELD-ALCOHOL DEICE	5114136	1	1	30.1	203.9
78	ICE PROTECTION PANEL	5113115710		1	6.2	88.7
32	DE-ICE SYS, WING STABILIZER FIN	5115571	1	1	42.7	199.0
30	DE-ICE, PROPELLER SYSTEM (ELEC)	5118336	5	1	10.1	94.0
194	DE-ICE SYS, FLIGHT IN KNOWN ICE	5114400	4	1	67.9	166.2
67	DE-ICE, WING & TAIL PART PLUMB	5115571	2	1	4.7	174.5
88	STATIC SOURCE, HEATED ALL PORT	5114220	6	1	0.1	293.2

Cessna
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SECTION 6
WEIGHT & BALANCE

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 6733 pounds)		
SEAT ___							
SEAT ___							
SEAT ___							
SEAT ___							
SEAT ___							
SEAT ___							
SEAT ___							
TOILET				4.	FUEL LOADING		
					(WING)		
					(WING LOCKERS)		
BAGGAGE				5.	RAMP WEIGHT (sub-total) (Do not exceed maximum ramp weight of 7500 pounds)		
WING LOCKERS				6.	LESS FUEL FOR TAXING		
AVIONICS				7.	TAKEOFF WEIGHT (Do not exceed maximum takeoff weight of 7450 pounds)		
NOSE				8.	LESS FUEL TO DESTINATION		
BAY A							
BAY B							
CABINET CONTENTS							
PAYLOAD					(WING)		
					(WING LOCKERS)		
				9.	LANDING WEIGHT (Do not exceed maximum landing weight of 7200 pounds)		

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. 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 information.

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SECTION 7
AIRPLANE & SYSTEMS DESCRIPTIONS

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SECTION
AIRPLANE & SYSTEMS DESCRIPTION

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

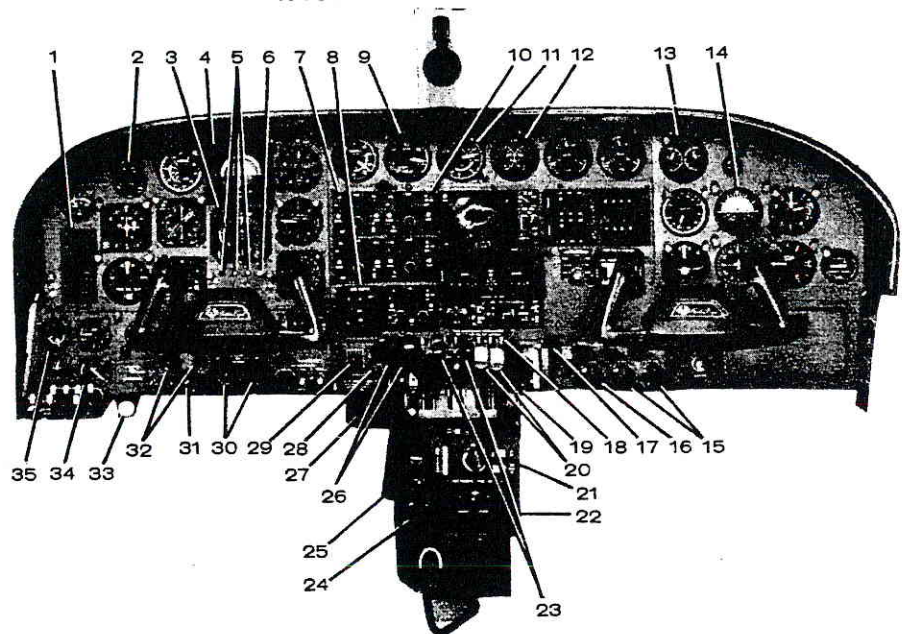
The 421 Golden Eagle is a 6- to 8-place, all-metal, low-wing, pressurized airplane. The fuselage and empennage are of semimonocoque construction. The cabin area is sealed and structurally reinforced for pressurization. The wing, horizontal and vertical tail surfaces are of conventional aluminum construction. 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 421 Golden Eagle II and 421 Golden Eagle III are identical to the 421 Golden Eagle 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 | 17. FLAP POSITION SWITCH |
| 2. FLIGHT INSTRUMENT GROUP | 18. LIGHT DIMMING CONTROLS |
| 3. FLIGHT DIRECTOR HSI (OPTIONAL) | 19. QUADRANT FRICTION LOCK |
| 4. FLIGHT DIRECTOR FDI (OPTIONAL) | 20. MIXTURE CONTROLS |
| 5. MARKER BEACON LIGHTS (OPTIONAL) | 21. AUTOPILOT CONTROL HEAD (OPTIONAL) |
| 6. MARKER BEACON TEST SWITCH (OPTIONAL) | 22. RUDDER TRIM CONTROL |
| 7. AVIONICS CONTROL PANEL | 23. PROPELLER CONTROLS |
| 8. FLIGHT DIRECTOR MODE SELECTOR (OPTIONAL) | 24.AILERON TRIM CONTROL |
| 9. ENGINE INSTRUMENT GROUP | 25. ELEVATOR TRIM CONTROL |
| 10. PROPELLER SYNCHROPHASER SWITCH | 26. THROTTLE CONTROLS |
| 11. FUEL FLOW GAGE | 27. EMERGENCY LANDING GEAR EXTENSION T-HANDLE |
| 12. ECONOMY MIXTURE INDICATOR (OPTIONAL) | 28. LANDING GEAR POSITION INDICATOR LIGHTS |
| 13. FUEL QUANTITY GAGE | 29. LANDING GEAR SWITCH |
| 14. RIGHT FLIGHT INSTRUMENT GROUP (OPTIONAL) | 30. ALTERNATE AIR CONTROLS |
| 15. PRESSURIZATION AIR TEMPERATURE CONTROLS | 31. OXYGEN CONTROL |
| 16. HEATER AND CABIN AIR CONTROL PANEL | 32. PRESSURIZATION AIR CONTROLS |
| | 33. PARKING BRAKE CONTROL |
| | 34. OXYGEN CYLINDER PRESSURE GAGE |
| | 35. CABIN PRESSURIZATION INDICATORS |

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.

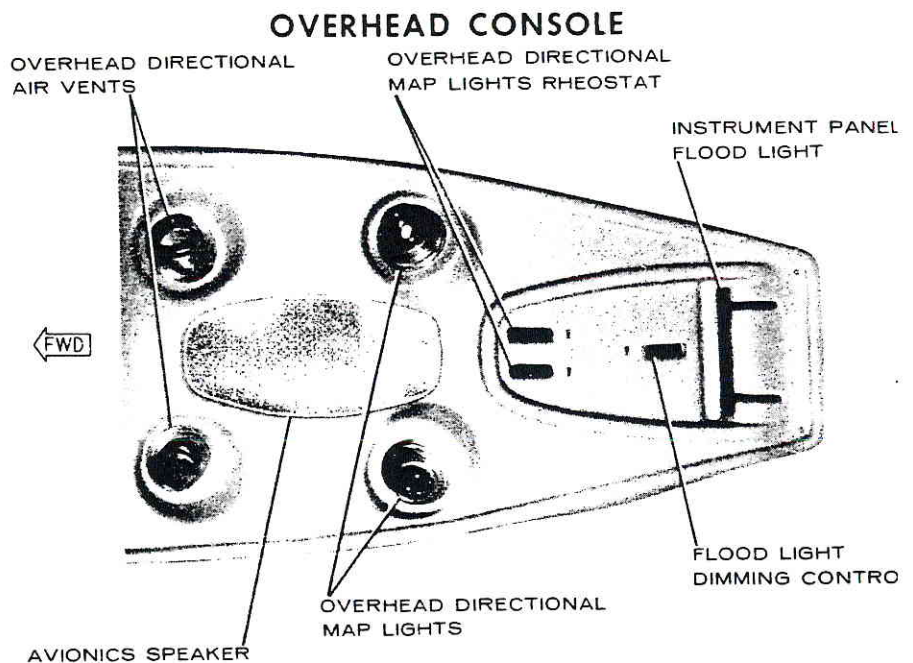


Figure 7-2

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 possible 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, 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 main 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

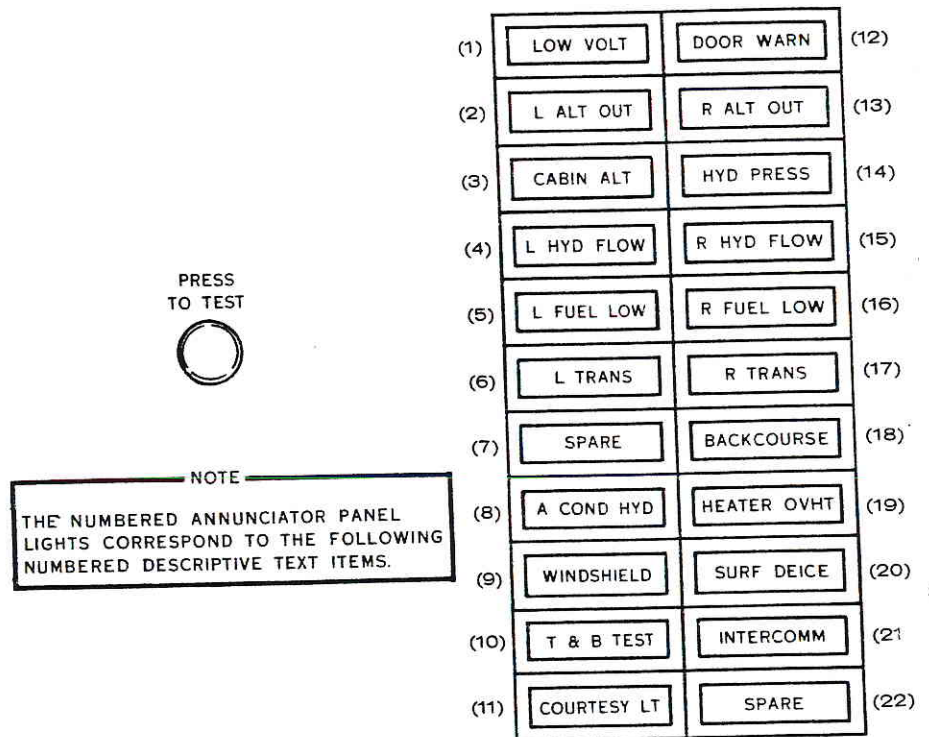


Figure 7-3

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 amber left wing locker fuel transferred light indicates transfer of the optional left wing locker fuel to the left main tank is complete.
7. The white spare light is reserved for optional equipment.
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 amber right wing locker fuel transferred light indicates transfer of the optional right wing locker fuel to the right main tank is complete.
18. The amber back course light advises that the optional navigational 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 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 bellcrank 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

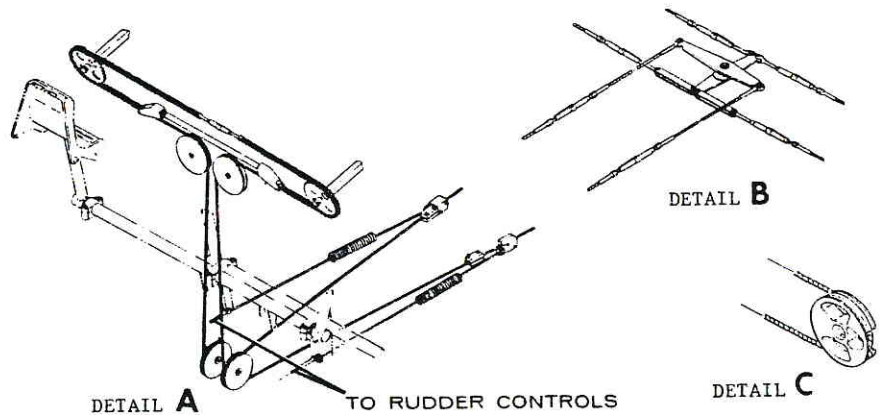
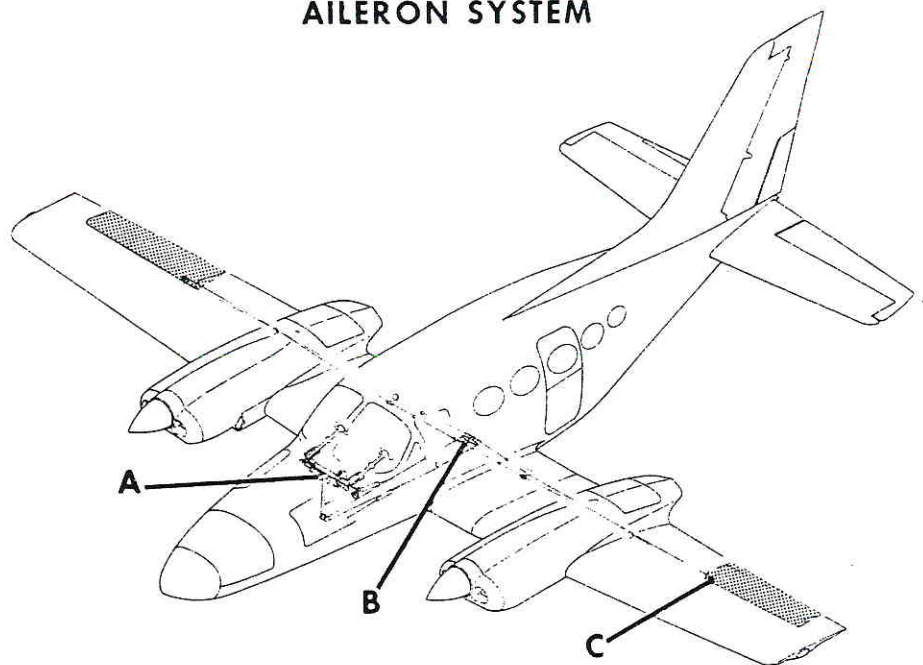


Figure 7-4

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.

AILERON TRIM SYSTEM

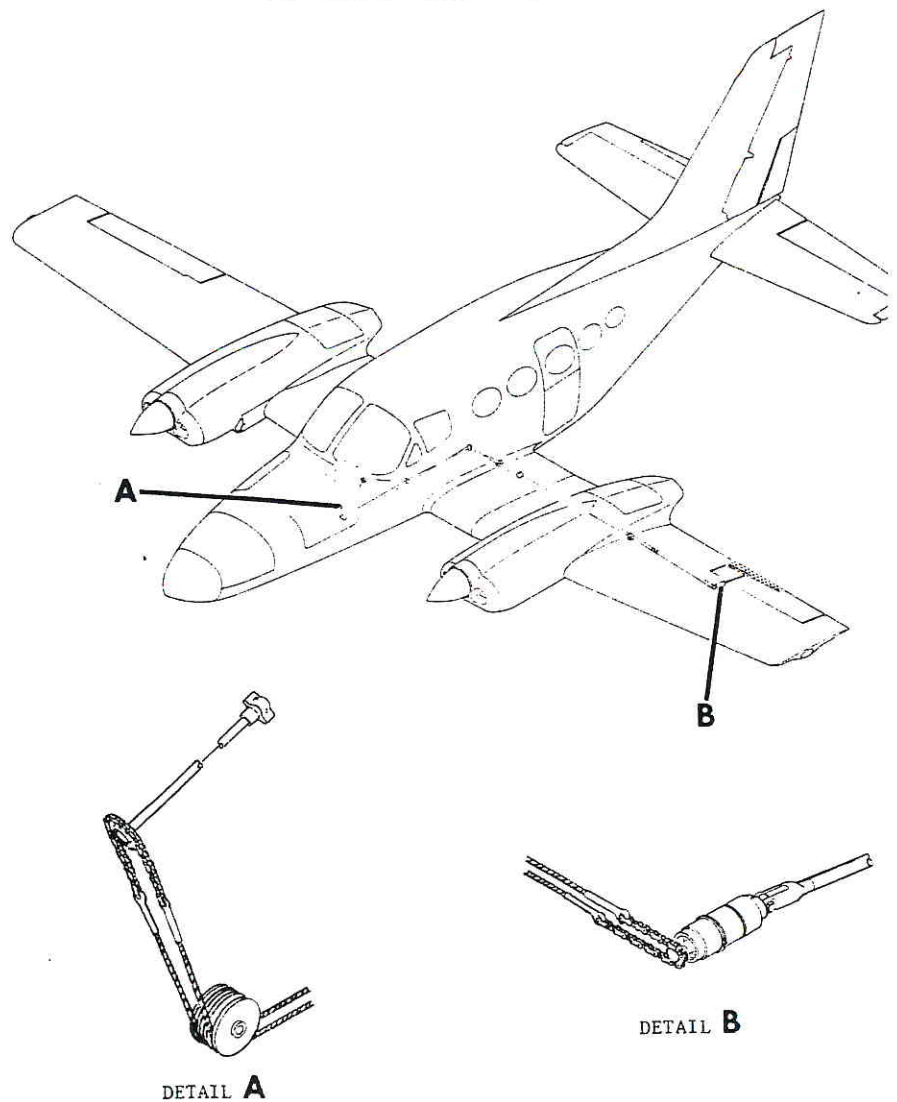


Figure 7-5 .

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

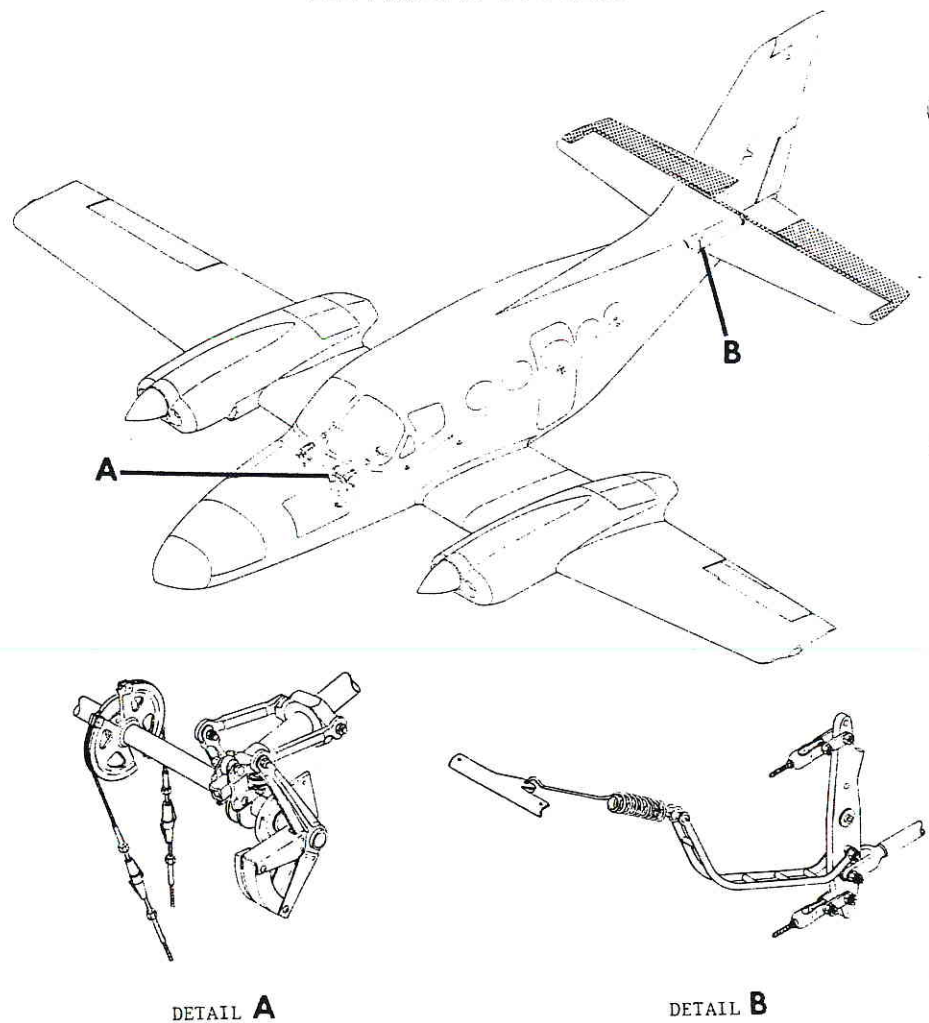


Figure 7-6

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

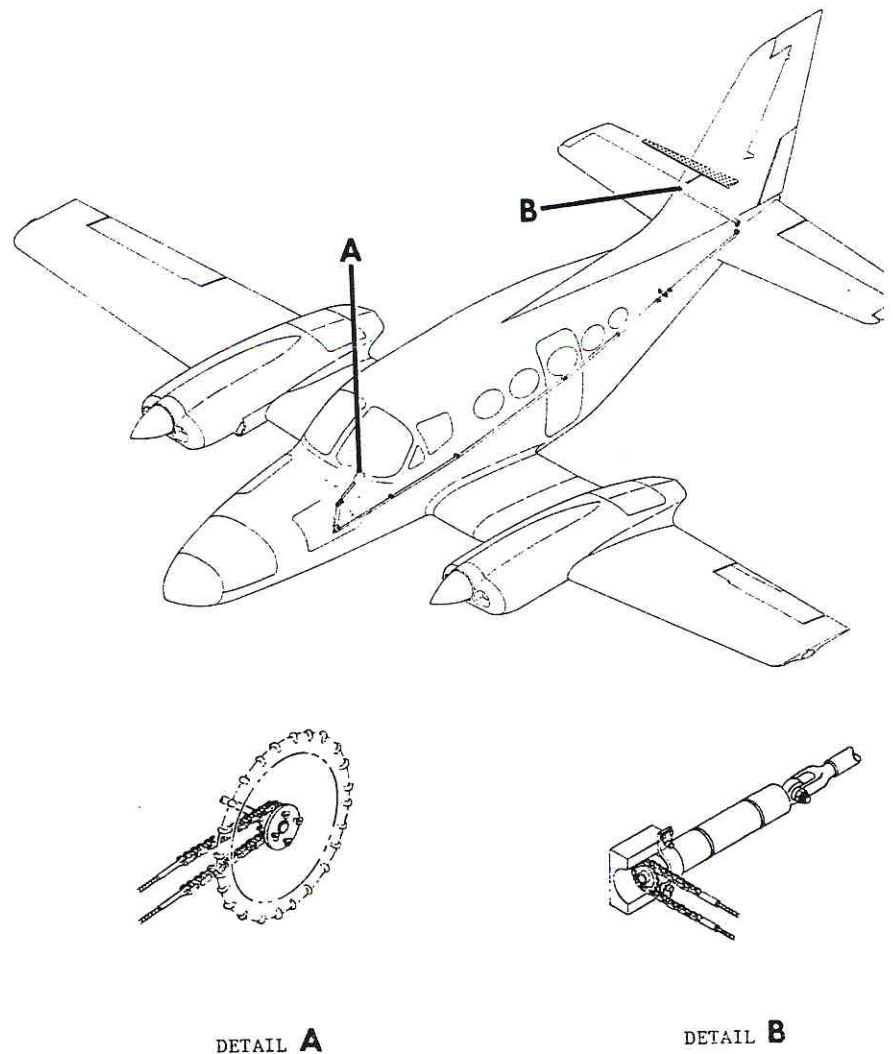


Figure 7-7

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

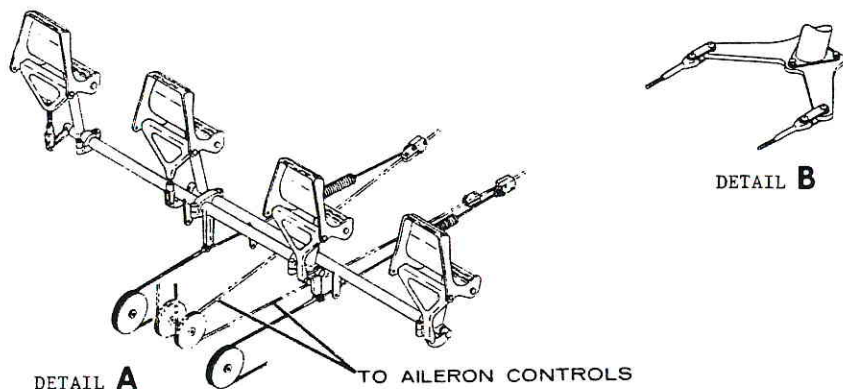
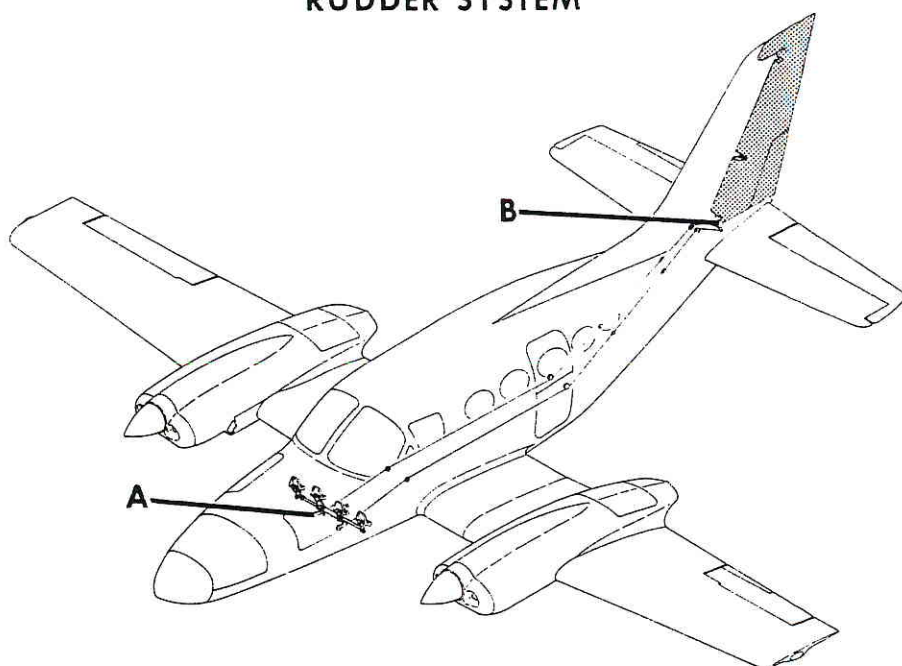


Figure 7-8

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 force required to activate the rudder in flight.

RUDDER TRIM SYSTEM

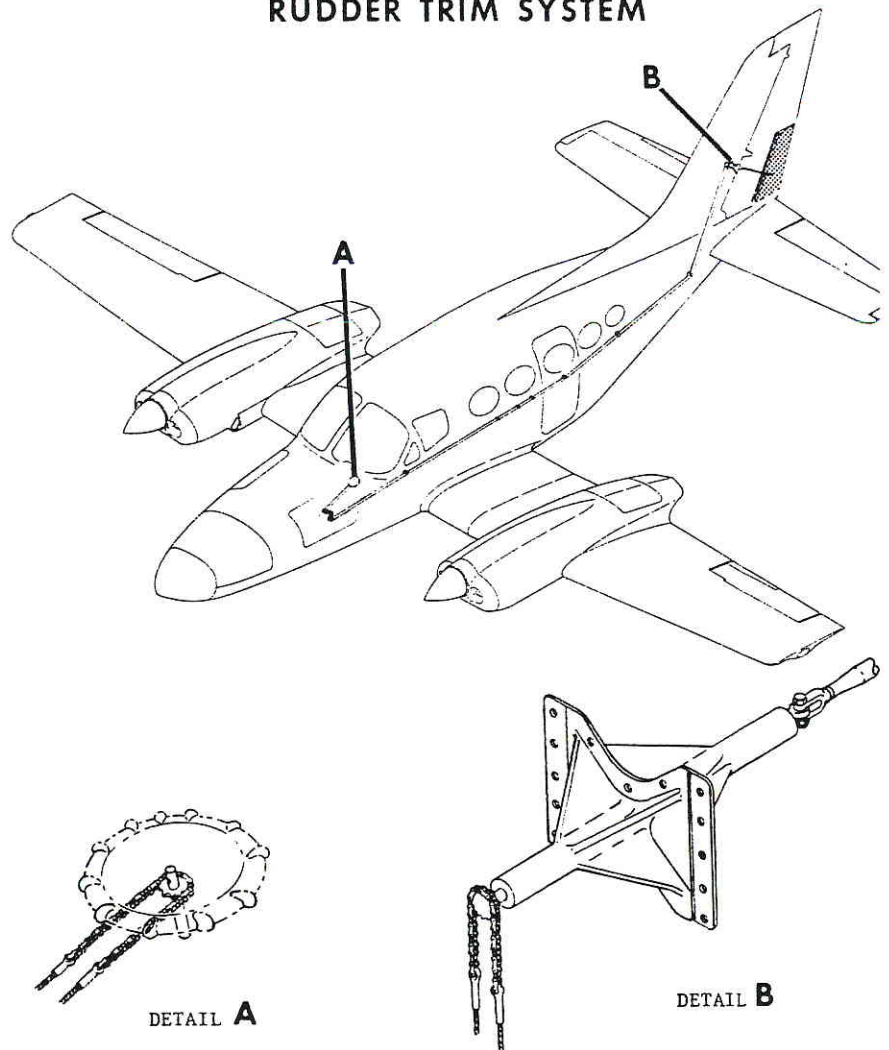
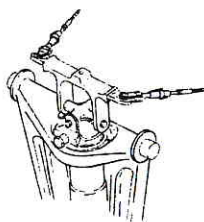
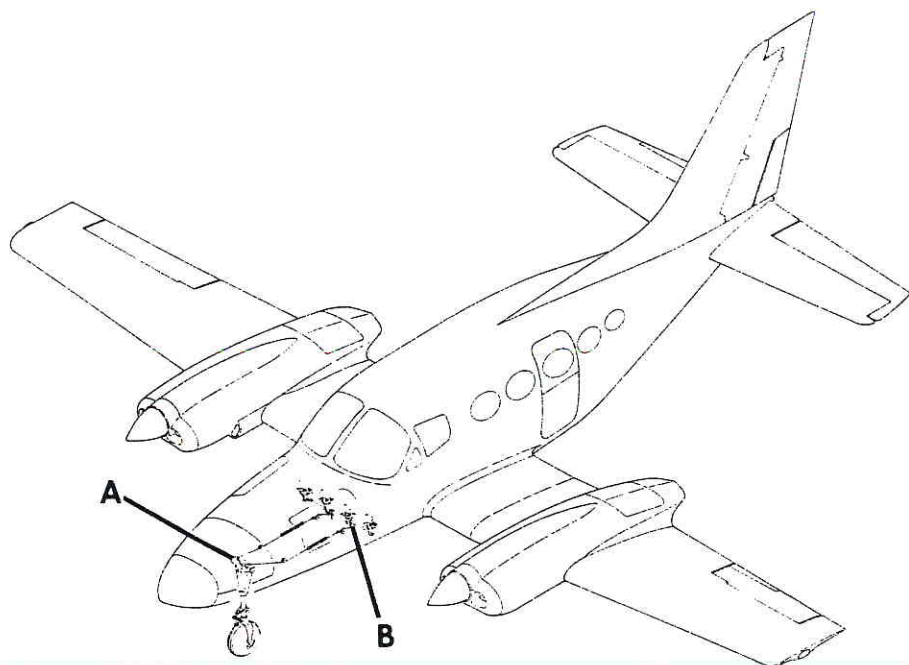


Figure 7-9

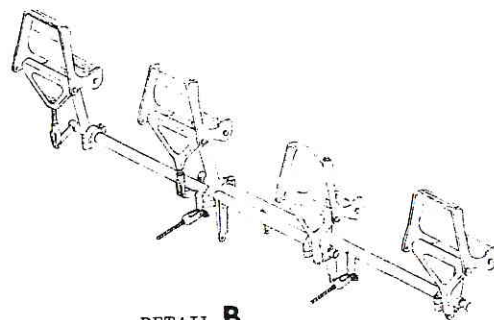
NOSEWHEEL STEERING SYSTEM

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



DETAIL A



DETAIL B

Figure 7-10

The minimum turning distance is presented in Figure 7-11. Always use a large 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

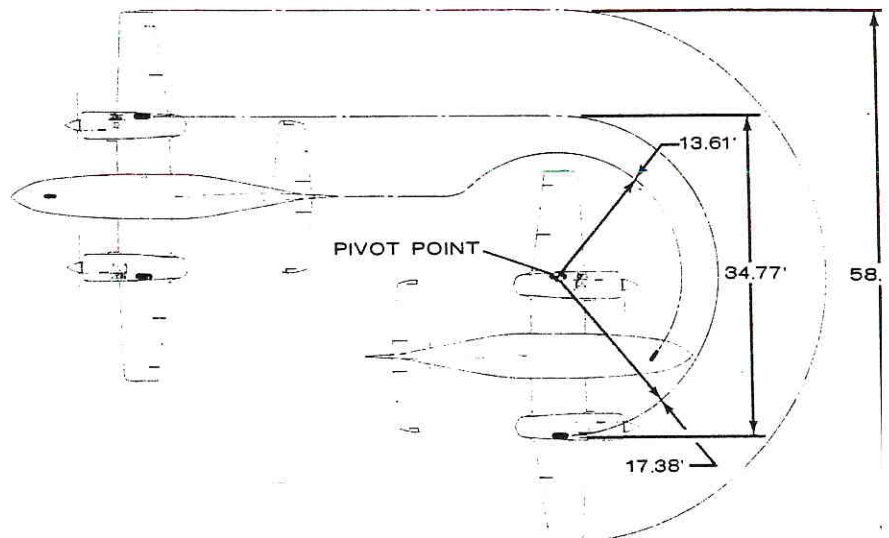


Figure 7-11

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

SECTION 7
AIRPLANE & SYSTEMS DESCRIPTIONS

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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.

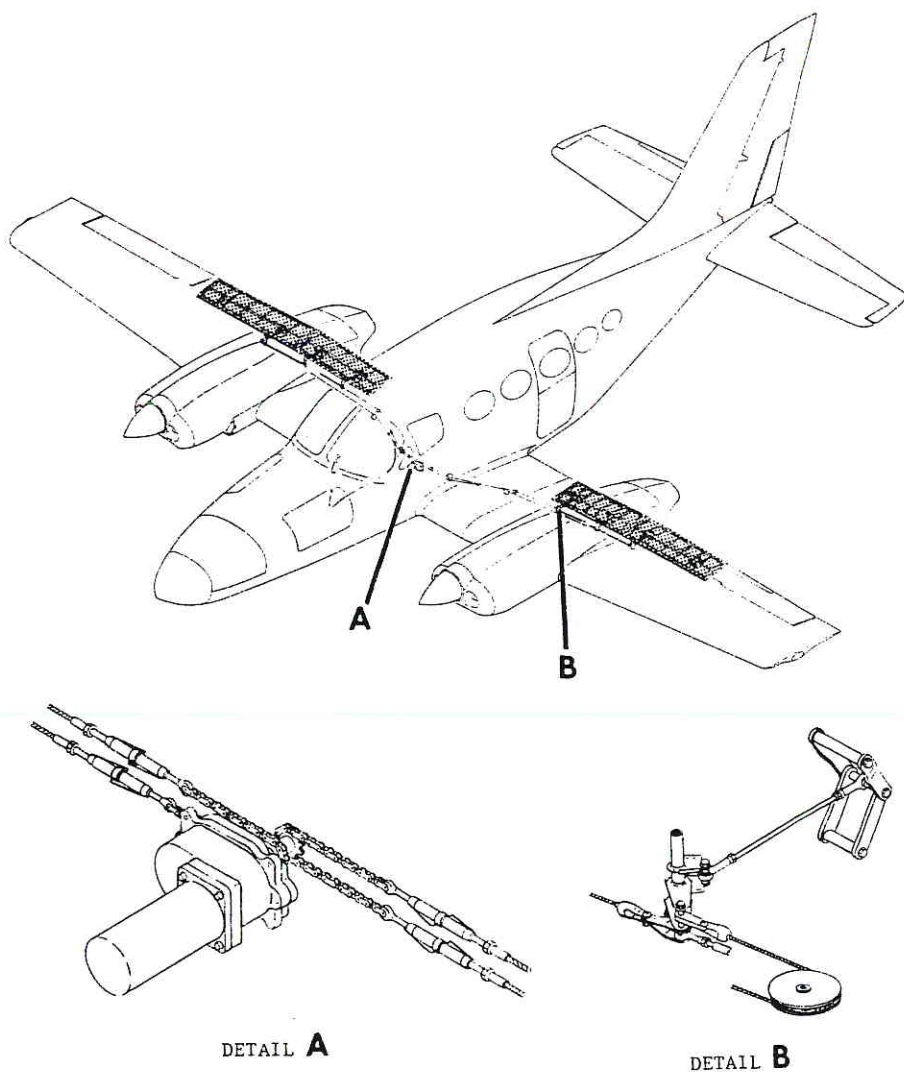


Figure 7-12

HYDRAULIC SYSTEM SCHEMATIC

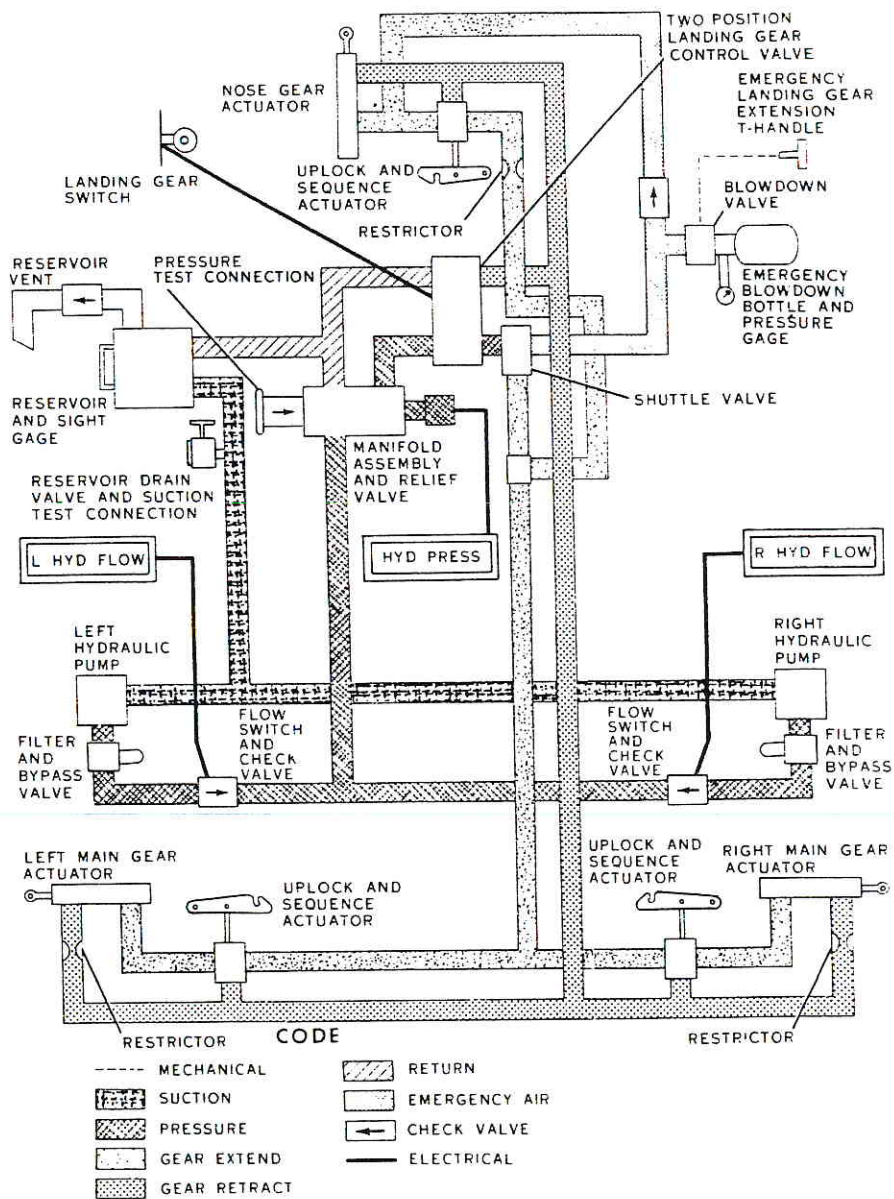


Figure 7-14

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 with the loss of an engine-driven hydraulic pump.

**HYDRAULIC RESERVOIR SIGHT GAGE AND
EMERGENCY BLOW DOWN BOTTLE PRESSURE GAGE**

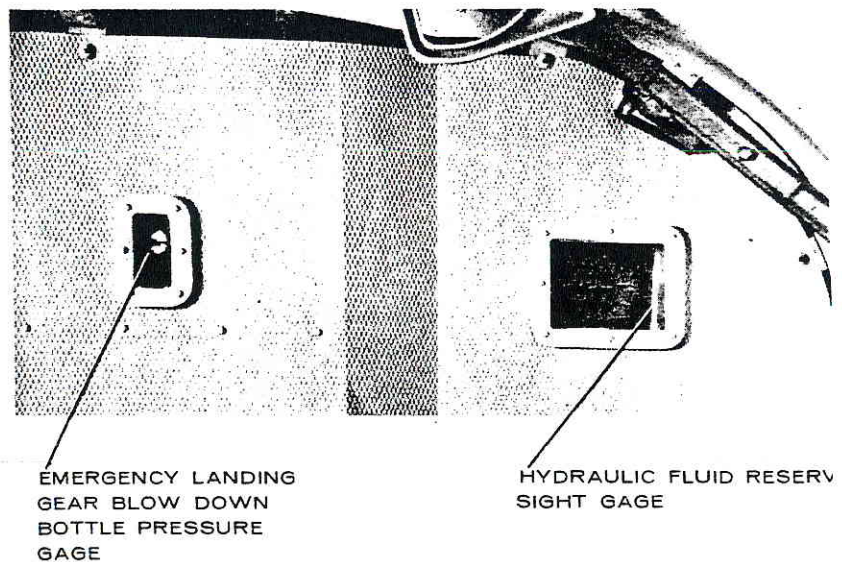


Figure 7-15

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 to the center of the instrument panel. One module contains three of the lights (one for each gear) which are green and will illuminate when the 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 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

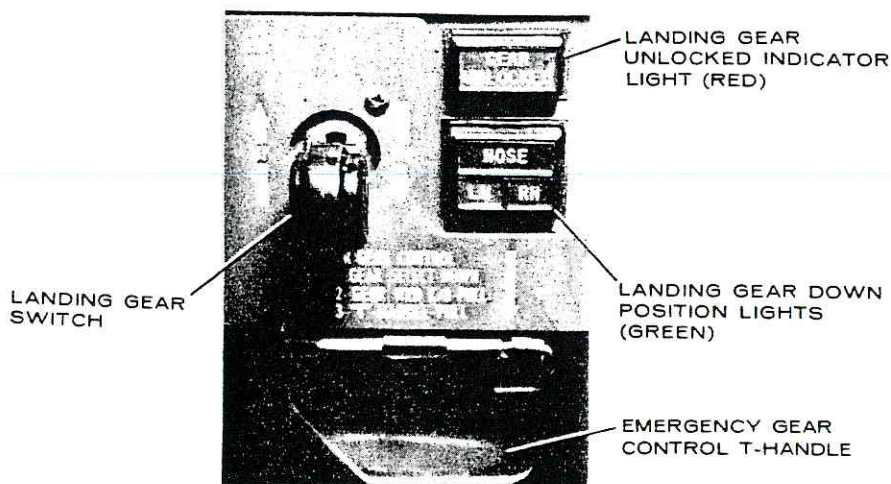


Figure 7-16

ing the shuttle valve to move from the hydraulic to 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 upper barrel assembly.

FUEL SYSTEM

The fuel system, see Figure 7-17, consists of two main tanks, two optional wing locker tanks, two fuel selectors, emergency crossfeed shut 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 operation 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 vent eliminates the need for heated vents. The fuel tanks are serviced through a flush filler located in the top surface of each wing.

WING LOCKER TANKS

An optional wing locker fuel tank is available for installation in the forward portion of each wing locker baggage area. These tanks are bladder type cells which supplement the main tank fuel quantity. This fuel can be fed directly to the engines; instead it is transferred to the main tanks by wing locker fuel transfer pumps. The transfer pumps are manually controlled and should be energized as soon as adequate volume is available to the main tanks to hold the wing locker fuel, to assure early recognition of possible failure of transfer. After the fuel is transferred, a pressure switch in each transfer line will sense a drop in pressure and illuminate the annunciator light, indicating fuel transfer is complete and the applicable wing locker transfer pump should be turned off. These pumps use oil for lubrication; therefore, operation after fuel transfer will shorten pump life. The wing locker fuel tanks are individually vented through the lower surface of each wing. The fuel vent lines are deiced by heaters which are controlled by the stall and vent heat switch. These tanks are serviced through a flush filler located on the top of the engine nacelle.

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 fuel, crossfeed and off.

FUEL SYSTEM SCHEMATIC

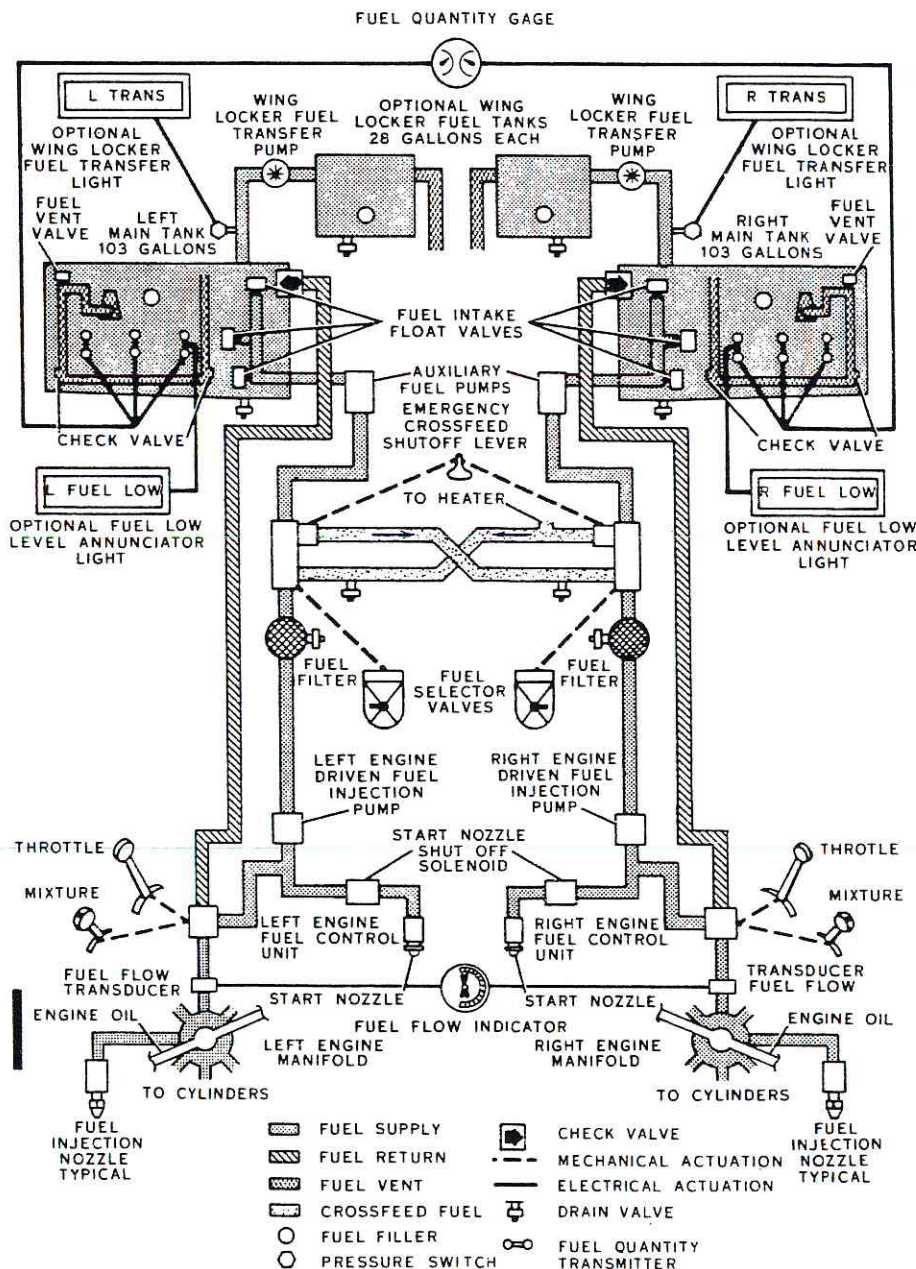


Figure 7-17

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 crossfeed 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 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 pressure. The ON position runs the auxiliary fuel pumps at low pressure, 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 pressure 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. In addition, a quick-drain is provided in each wing local fuel transfer line. The drains provide a location for removing moisture and sediment from the fuel system. The drains are located on the lower surface of the wing nacelle, and main tanks and 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.

ELECTRONIC FUEL FLOW INDICATING SYSTEM

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 represent 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.

The indicator 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 (2235 RPM and 39.0 inches Hg. manifold pressure) operation under all conditions up to 18,000 feet altitude. The climb range (blue arc) presents the desired fuel flow for maximum power above 18,000 feet, which corresponds to the manifold pressure schedule, 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 aviation grade fuel. Reduce the indicated gallonage reading by 4% when 100LL grade aviation fuel is being 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.

OIL HEATED FUEL MANIFOLD VALVE

The fuel manifold valves are heated with engine oil to minimize the possibility of engine power loss induced by ice formation in the valve cavity. The manifold valve, located on the top of the engine case aft of the prop gear housing, regulates metered fuel distribution to the injector nozzles.

ENGINE-DRIVEN FUEL PUMPS

Each engine is equipped with a mechanically driven dual stage fuel pump which provides fuel to the metering unit. 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. The dual stage engine driven pump minimizes any effects of fuel vaporization during operations with the auxiliary boost pumps off. Excess fuel return to the main tanks is provided by the metering unit.

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.

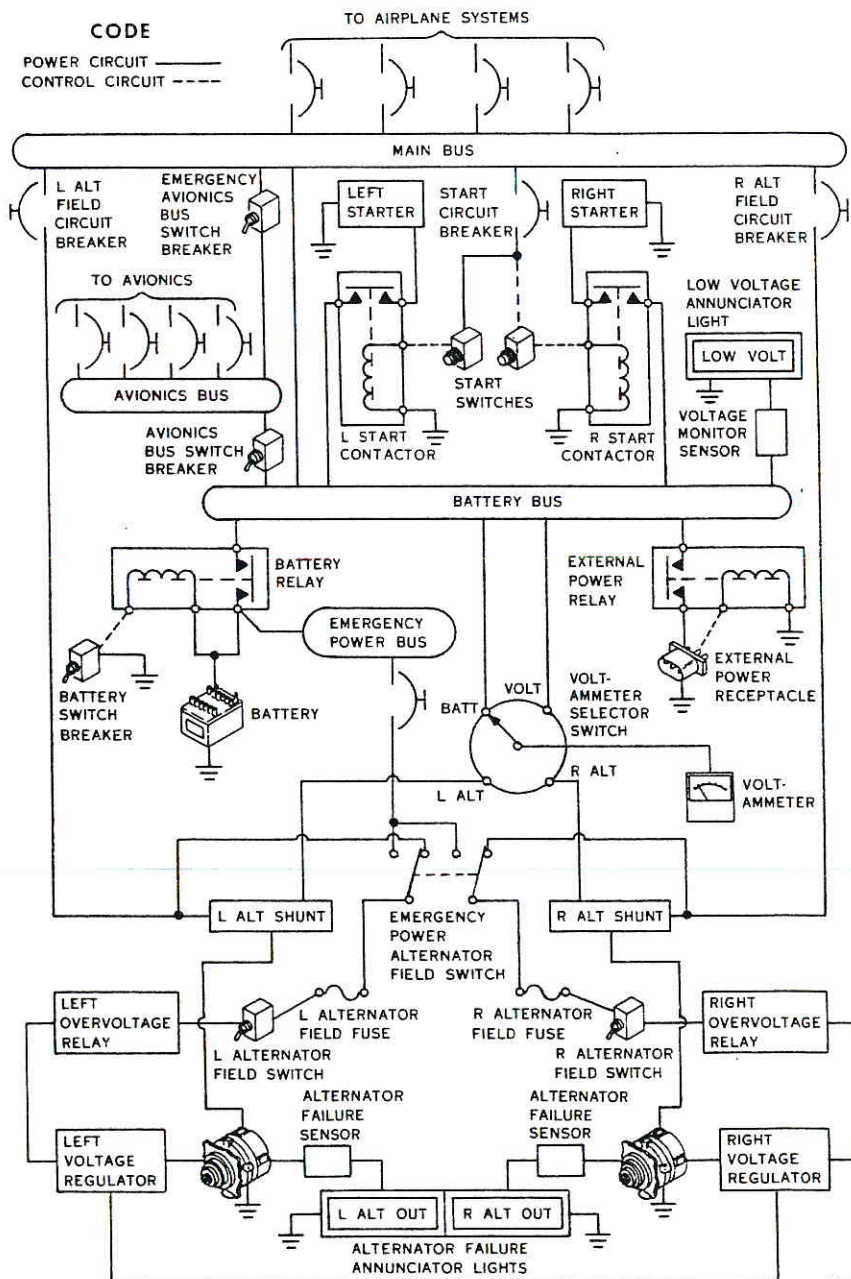
BATTERY AND ALTERNATOR SWITCHES

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 though the battery is considered to have failed.

ELECTRICAL SYSTEM SCHEMATIC



51987009

Figure 7-18

LEFT AND RIGHT SIDE CONSOLES

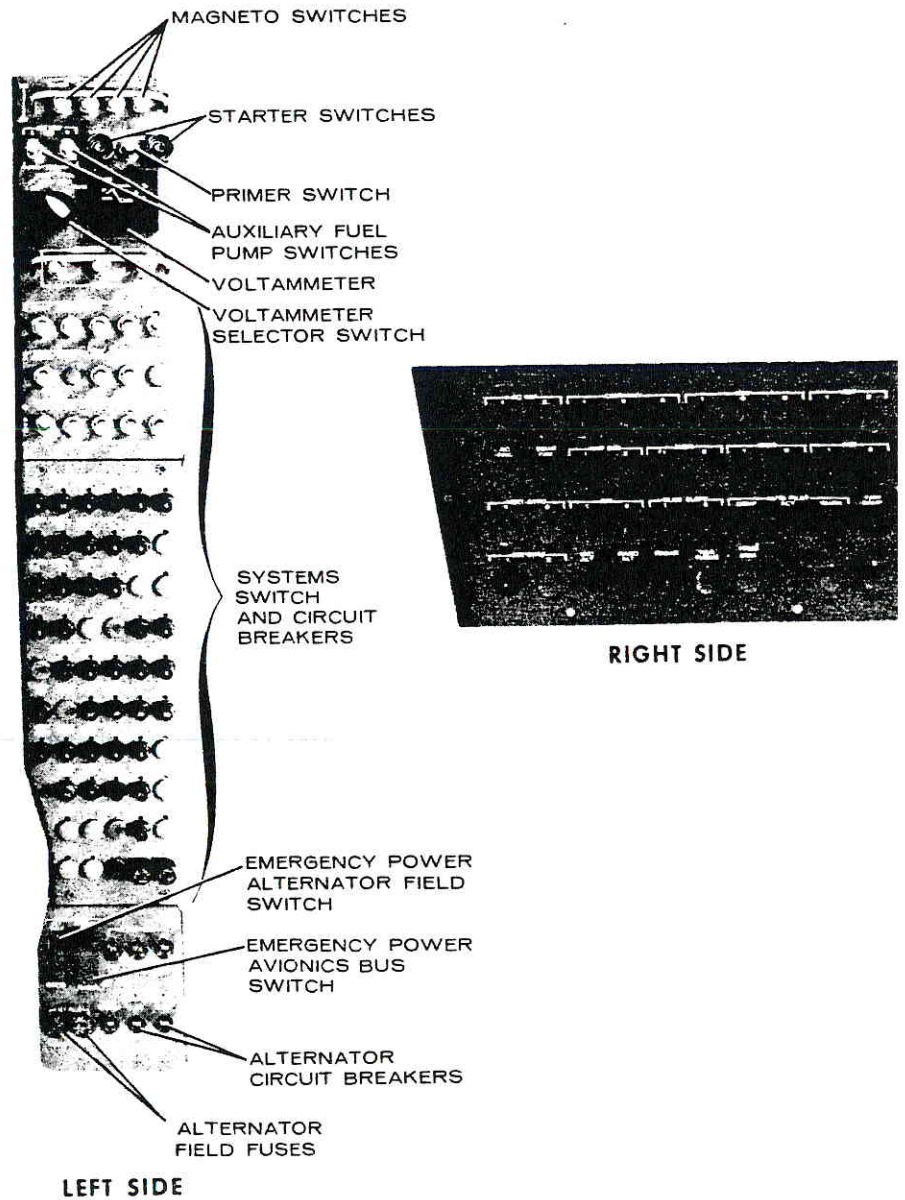


Figure 7-19

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.

VOLTAMMETER

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.

CIRCUIT BREAKERS AND SWITCH BREAKERS

All electrical systems in the airplane are protected by push-to-reset type circuit breakers or switch breakers, see Figure 7-19. Should an overload occur in any circuit, the resulting heat rise will cause the controlling circuit breaker to "pop" out, opening the circuit or allowing the switch breaker to return to the OFF position. After allowing to cool for approximately three minutes, the circuit breaker may be pushed in (until a click is heard or felt) or the switch breaker may be returned to the ON position to reenergize the circuit. 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 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, two optional wing deice lights and two optional vertical tail floodlights.

Navigation Lights

The navigation lights are located in the tailcone stinger and in each wing tip assembly. These lights are energized with the navigation light 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 on 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.

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 or reflections on the ground 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.

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.

COCKPIT LIGHTING AND CONTROLS

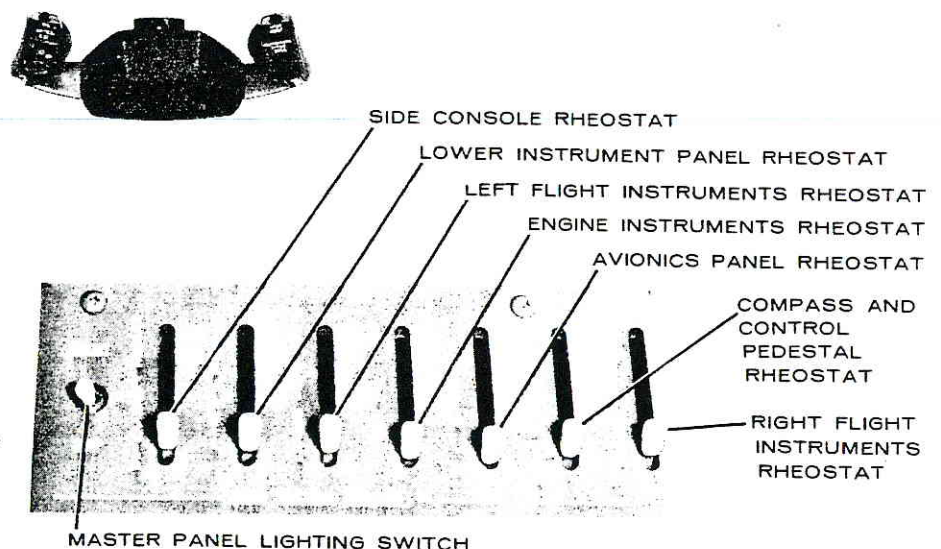


Figure 7-20

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.

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 panel 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.

CABIN LIGHTING AND CONTROLS

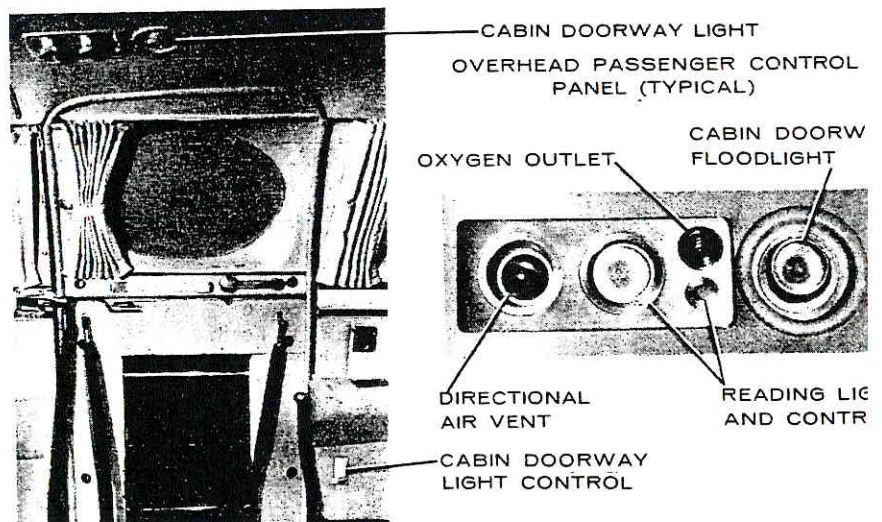


Figure 7-21

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.

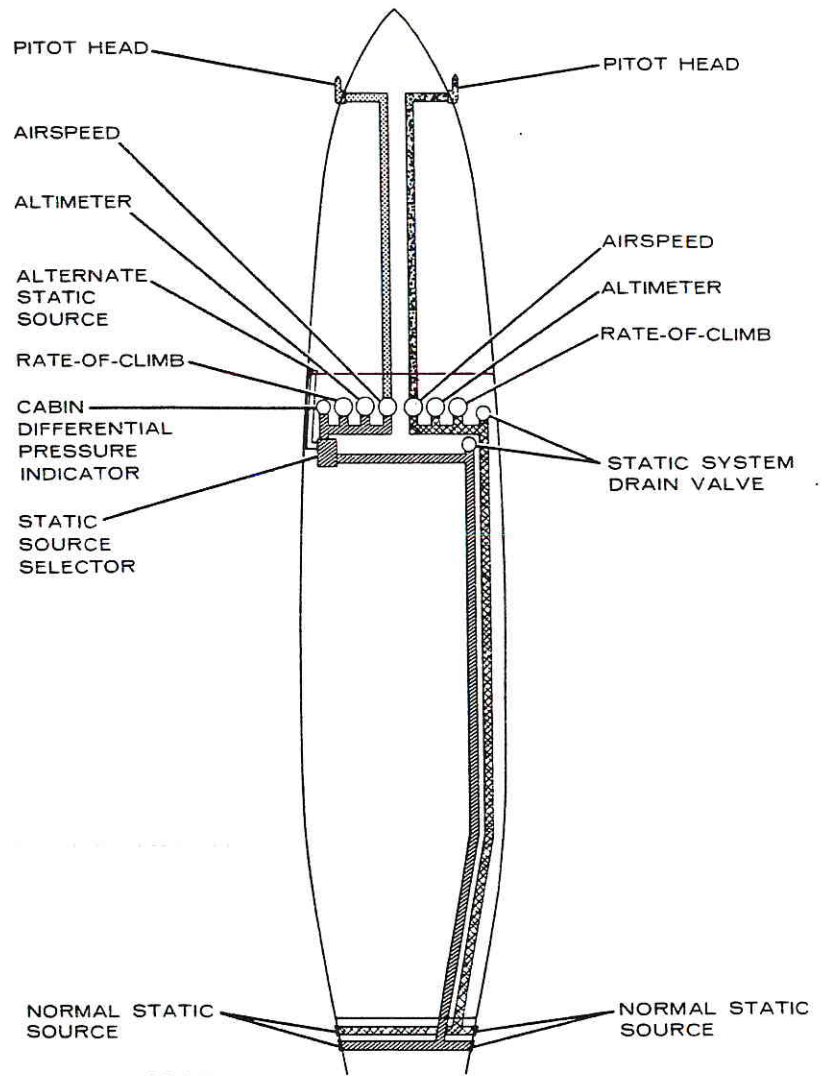
A static source selector, installed in the static system directly below the parking brake handle, allows selection of the normal or alternate static source. When the selector is positioned to NORMAL, the pilot's instruments reference the static source located aft of the main cabin door. When the selector 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 selector 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, pressure relief valve for each pump, a common vacuum manifold, vacuum air filter, 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

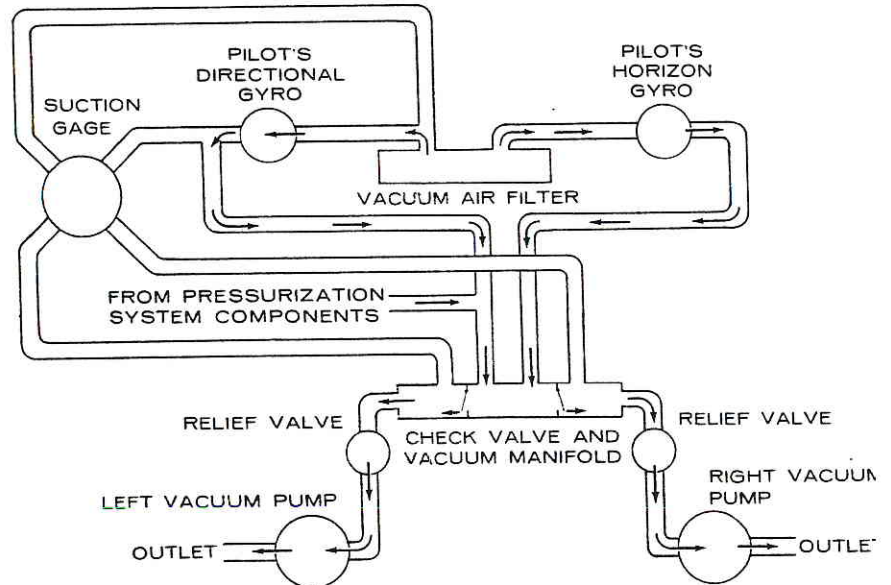
The basic flight instruments, see Figure 7-1, consist of airspeed, altimeter and rate-of-climb indicators, electric turn-and-bank and vacuum horizon and directional gyros.

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

STANDARD SYSTEM



OPTIONAL SYSTEM

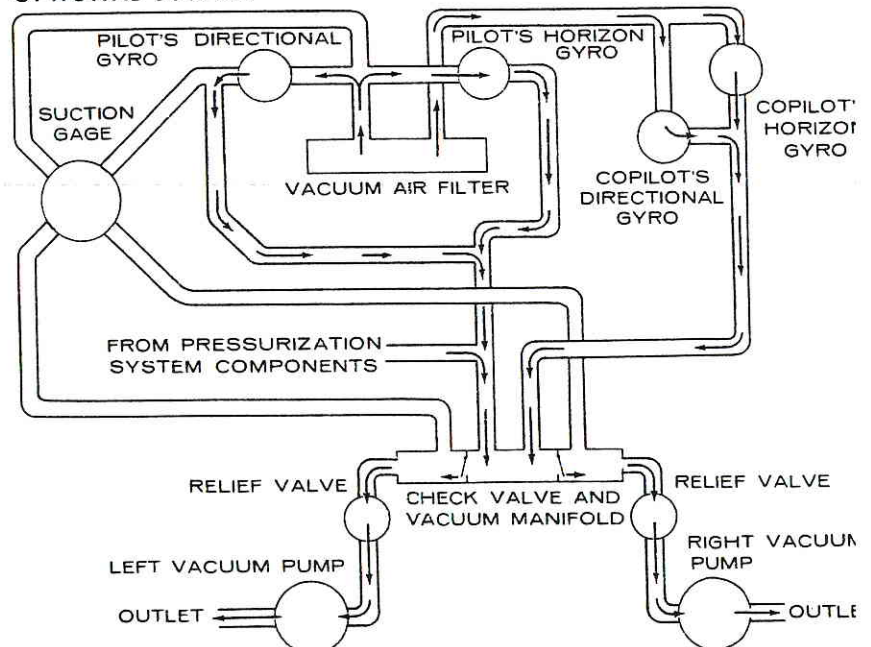


Figure 7-23

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 wing tip 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 side 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, gear driven engines with provisions for cabin pressurization. Each engine is rated at 375 horsepower at 2235 RPM and 39.0 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. A microswitch in the quadrant opens when the mixture lever is aft of the No. 6 position to allow power to be supplied to the start nozzle shut-off solenoid.

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 diameter) is located on the right side of the pedestal.

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 out, warm unfiltered air from inside the cowling 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.

NOTE

The primary alternate air system consists of magnetically held, automatically opening alternate air doors in the engine compartment. The opening of these alternate air doors will provide the engine with cool unfiltered air. A decrease in manifold pressure, indicating that induction system icing has occurred, followed by a return to normal manifold pressure, indicates that the automatic alternate air system is operating. If a decrease in manifold pressure is again experienced, it is an indication that the alternate air inlet source has iced up and the manual alternate air controls should be opened.

Primer Switch

The primer switch is a three position switch (Left, Off, Right) spring loaded to the off position. When the switch is pressed to the left (or right) the left (or right) boost pump is energized to the high position to provide fuel for priming and engine start. Actuation of the primer switch also opens the respective start nozzle shut-off solenoid (if mixture levers are at GND START) to supply fuel to the start nozzle.

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.

ENGINE 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 PRIMER SYSTEM

The start fuel nozzle is located in the top of the air induction manifold (forward of the intercooler). When the mixture lever is at GND STA (or within the first 1/3 of the lever travel forward of GND START) and the primer switch is actuated, fuel is supplied from the auxiliary fuel boost pump discharge port thru the dual stage fuel pump to the start fuel nozzle. This nozzle injects atomized fuel into the induction air to provide engine priming for starting. The system provides reliable engine starting at normal engine temperatures and atmospheric conditions including cold and hot engine starts. If the engine primer system will not function due to the start nozzle solenoid being failed closed or a faulty fuel nozzle, alternate starting procedure is provided using the fuel injection system.

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.

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 75% power until a total of 50 hours has accumulated or oil consumption has stabilized.

CAUTION

The purpose of operating at 65% to 75% 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 preventive 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 inboard side 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 39.0 inches Hg. manifold pressure. Therefore, in order not to exceed 39.0 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.

It can be seen from studying steps (1) through (5) 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 a 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 39.0 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

TURBO-SYSTEM SCHEMATIC

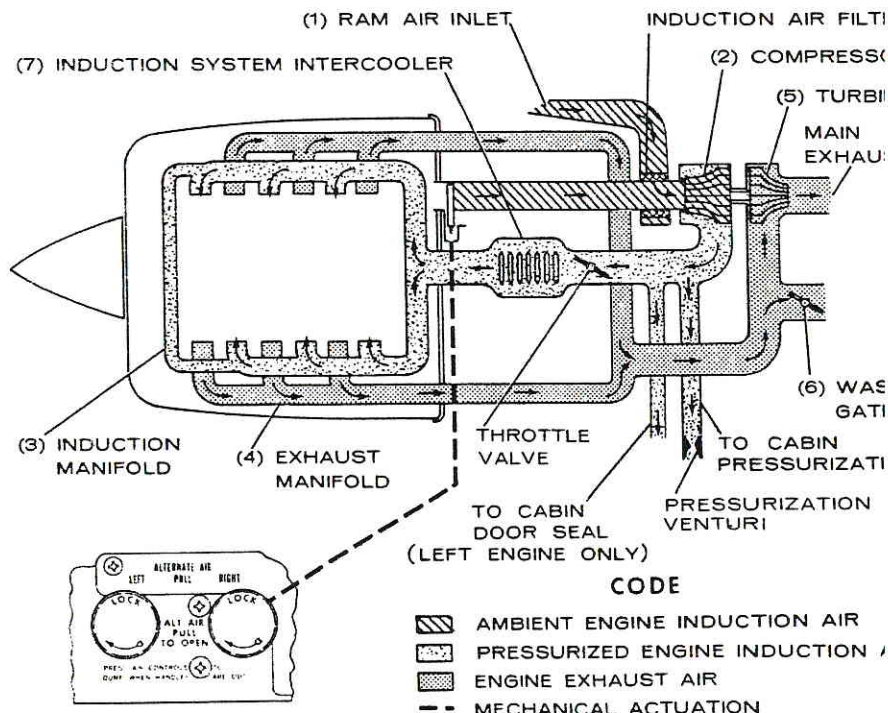


Figure 7-24

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 Variations 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 39.0 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 flow 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 18,000 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 seal.

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 control and heat outlets in the cabin. Two heat outlets are located at the base of the windshield for defrosting purposes. Passenger compartment heat is provided by two plenums with nonadjustable heat outlets, located on the left and right side of the cabin just above the floor. 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. For 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 fan 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.

SECTION 7
AIRPLANE & SYSTEMS DESCRIPTIONS

Cessna
MODEL **421C**

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 the passenger compartment. When the knob is pulled out, the air flows to the heater plenums and th into the passengers' compartment. Airflow to the plenums is complete shutoff by pushing the knob all the way in. The knob may be set in a 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 defrost 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 any intermediate position to regulate the defroster airflow.

HEATER OVERHEAT WARNING LIGHT

An amber overheat warning light provided in the annunciator panel 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 restarted until the overheat switch, located in the right forward 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.

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.

CABIN AIR SYSTEM SCHEMATIC
DEPRESSURIZED MODE, HEATER ON

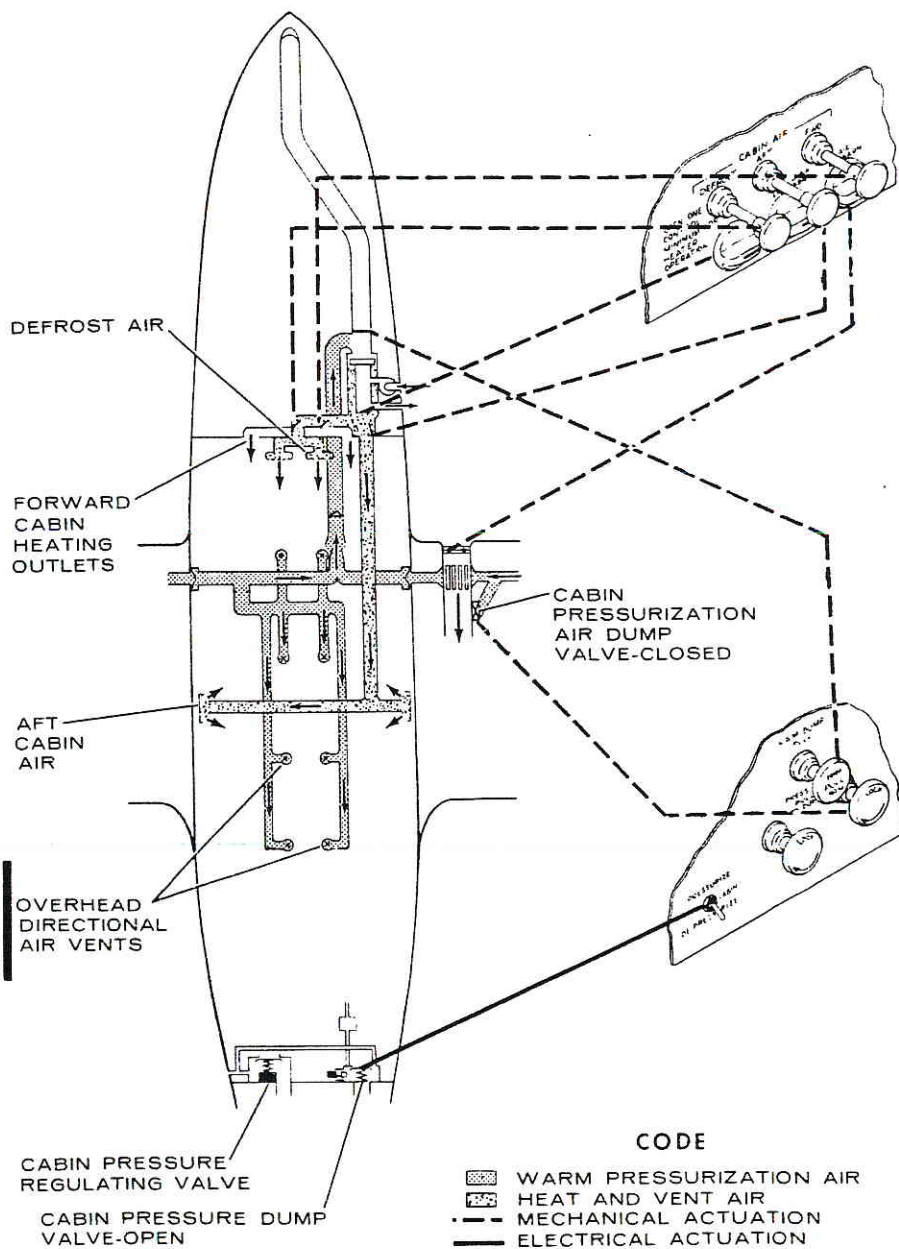


Figure 7-25

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.

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.

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 normal 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 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.

CABIN AIR SYSTEM SCHEMATIC
 PRESSURIZED MODE, HEATER ON

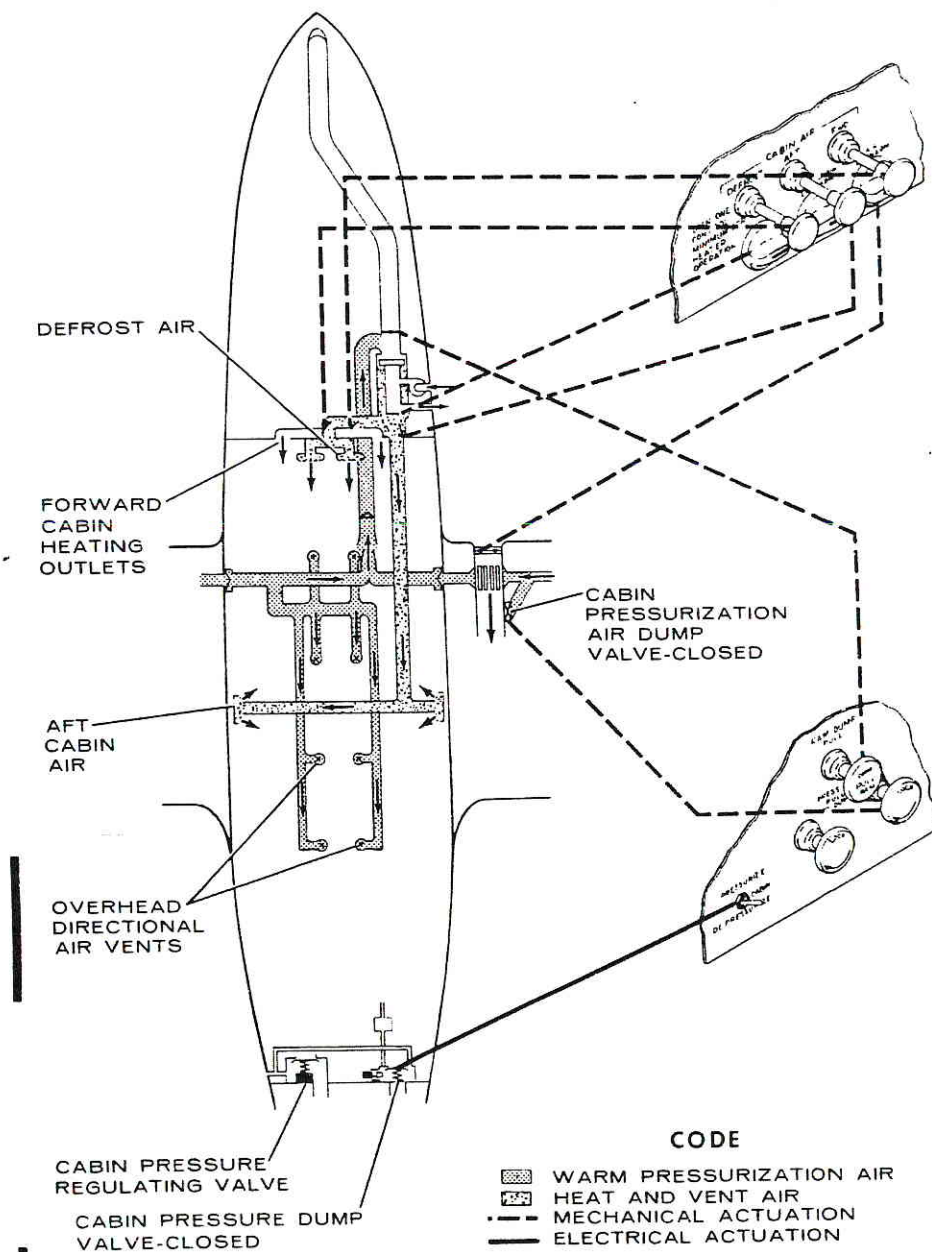


Figure 7-26

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.

STANDARD PRESSURIZATION CONTROLS AND INDICATORS

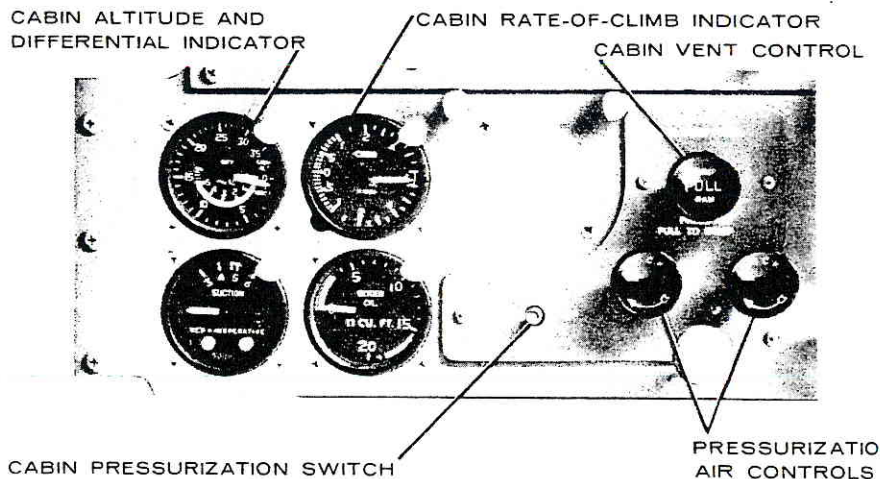


Figure 7-27

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 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

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.

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 cruise pressure altitude plus 500 feet on the inner AIRCRAFT 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

OPTIONAL PRESSURIZATION CONTROLS AND INDICATORS

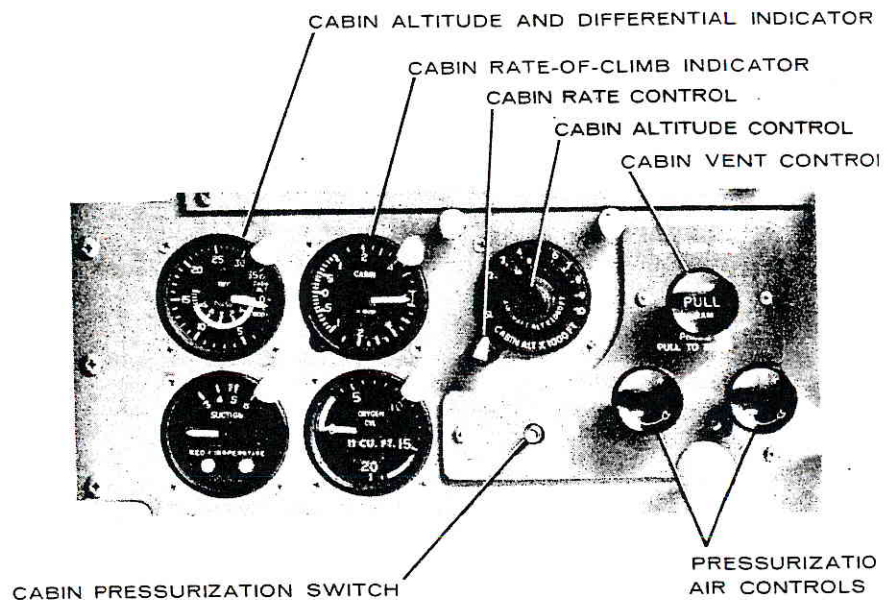


Figure 7-29

select the destination field pressure altitude plus 500 feet on the () 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.

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 higher 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.

Cessna
MODEL **421C**

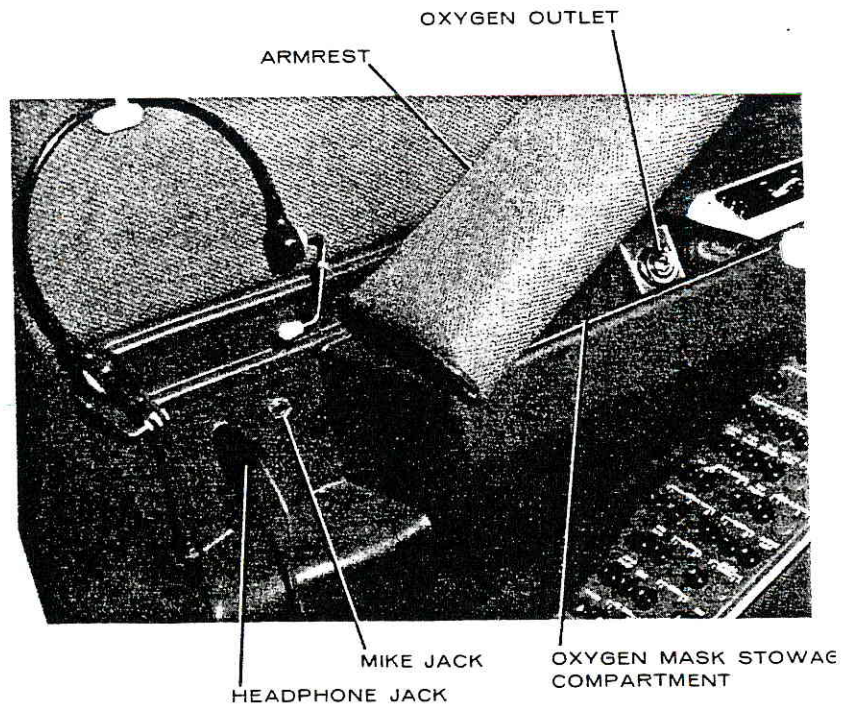
SECTION
AIRPLANE & SYSTEMS DESCRIPTION

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

SECTION 7
AIRPLANE & SYSTEMS DESCRIPTIONS

Cessna
MODEL **421C**

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 SYSTEM

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

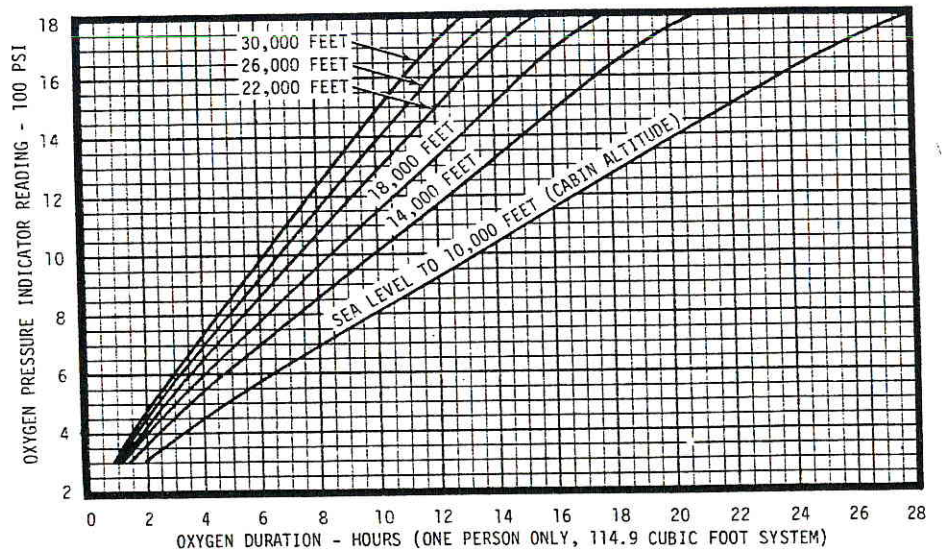
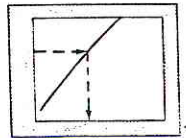


Figure 7-32

Cessna
MODEL **421C**

SECTION
AIRPLANE & SYSTEMS DESCRIPTION

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 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) No baggage allowed 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, 200 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 and 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 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 point of the harness and the seat structure. 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 button is provided on the front of the inboard armrest 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.

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 the 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.

CABIN DOOR SAFETY AND LOCKING PINS

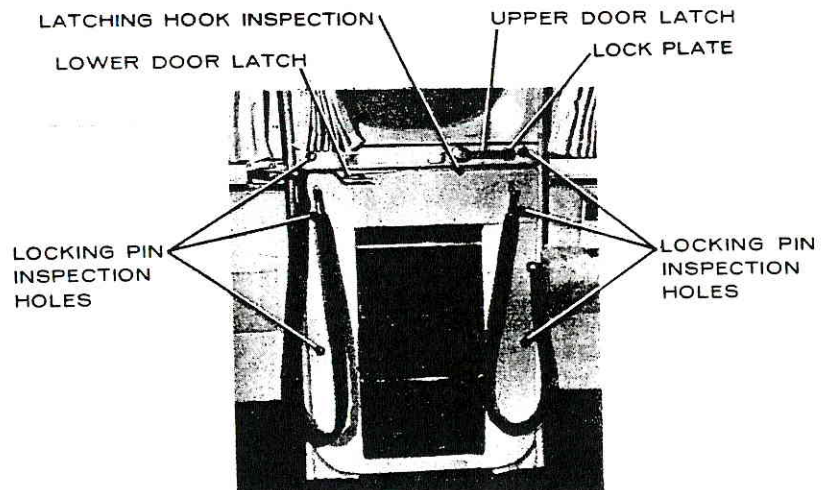


Figure 7-34

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 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.

CONTROL LOCKS

A control column lock is provided to restrict control column movement. This restriction holds the ailerons in a neutral position and the elevator 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 engaged by rotating the external rudder lock handle to the unlock position. The rudder lock handle is located above the left horizontal stabilizer on 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 on 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 accumulated 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) senses the RPM of both engines, compares this data and makes required adjustments to control engine RPM exactly the same. The pilot, by varying the phase control knob, can select the most desirable propeller phase relationship for various flying conditions.

The synchrophaser system consists of two propeller governors incorporating magnetic transducers and electromagnetic control coils, electronic control box, on-off switch and indicator light and potentiometer to adjust phase settings. The transducers create one negative to positive pulse per revolution that is fed into the control box and is used to synchronize the engines by comparing the time of arrival between signals of the two governors. Any error in time between signal comparison causes the governor control coil to change fly weight positions, speeding up the RPM of the slower running engine to bring about synchronization. The pilot, by adjusting the potentiometer, varies propeller phase relationship by changing signal timing between governors.

When the system is initially turned on, only the slower turning propeller is adjusted to increase RPM. This feature keeps the system operating more closely to the manually selected RPM. Also, if an engine is feathered without shutting off the system, there will be no RPM loss by the operating engine below the manually selected RPM.

The on-off light is only an indicator that the system is on or off and in no way is it an indicator of system performance. If the bulb should happen to burn out or otherwise fail during operation, the system is still operative and the bulb may be replaced when convenient to do so.

PROPELLER SYNCHROPHASER

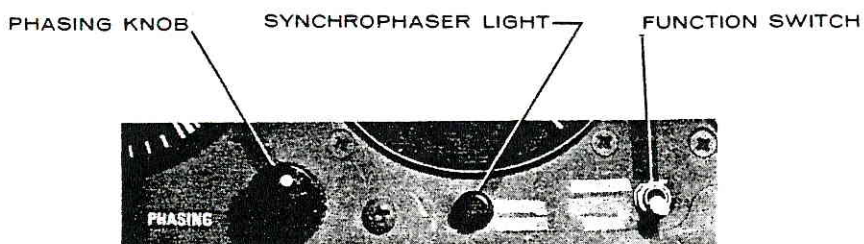


Figure 7-35

For best operation, it is important to guard against propeller control creeping by setting the quadrant friction lock tightly. On extended flights, it may be necessary to periodically switch to the OFF position, reset propeller synchronization manually and reengage the synchrophaser.

NOTE

Manually synchronize propellers within 25 RPM prior to turning system on. After system is operating, RPM adjustment may be made by moving both propeller control levers together. This should keep both governor settings close enough to remain in the synchrophaser's operating range.

If the propellers should go out of synchronization, turn system off; manually synchronize the propellers and turn the system on.

This propeller synchrophaser may be ON for all flight operations including takeoff and landing; however, normal RPM variations during takeoff roll may exceed the synchrophaser capture range causing the synchrophaser to break lock.

CABIN FEATURES**CABIN FIRE EXTINGUISHER (If Installed)**

A portable 1½ 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.

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AIRPLANE HANDLING, SERVICE AND MAINTENANCE

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INTRODUCTION

Section 8 of this handbook provides information on cleaning, inspection, servicing and maintenance of the airplane.

If your airplane is to retain the new plane performance and dependability, certain inspection and maintenance requirements must be followed. It is wise to follow a planned schedule of lubrication and preventive maintenance based on climatic and flying conditions encountered in your locality.

Keep in touch with your Cessna Dealer, 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 located on the forward door post. Refer to the Airplane Service Manual for an illustration of the identification plate.

3 November 1980
Revision 1 - 2 Apr 1982

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 Dealer.

INFORMATION MANUAL (Contains Pilot's Operating Handbook and FAA Approved Airplane Flight Manual Information)
SERVICE MANUALS AND PARTS CATALOGS FOR YOUR
AIRPLANE
ENGINE AND ACCESSORIES
AVIONICS

Your Cessna Dealer 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 Dealer or writing directly to the Customer Services Department, Cessna Aircraft Company, Wichita, Kansas. 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. These Owner Advisories will be mailed to the address that is provided to Cessna on the Warranty Registration Application Card which is included in your Customer Care Handbook. A subscription service for Propjet Service Information Letters is available directly from the Cessna Customer Services Department. Your Cessna Dealer will be glad to supply you with details concerning this subscription program, and stands ready, through his Service Department, to supply you with fast, efficient, low-cost 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 workload 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 airframe inspection requirements of both the 100-hour and annual inspections 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 certified agency or personnel to accomplish the inspections. Contact your local Cessna Dealer for additional information.

CESSNA PROGRESSIVE CARE PROGRAM

The Cessna Progressive Care Program has been developed to provide a modern progressive inspection schedule that satisfies the complete airplane inspection requirements and to help you realize maximum utilization of your airplane at a minimum cost and down-time. Under this program, your airplane is inspected and maintained in 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. The procedures for the Progressive Care Program have been carefully worked out by the factory and are followed by the Cessna Dealer Organization. The complete familiarity of Cessna 421 Dealers with Cessna equipment and factory-approved procedures provides the highest level of service possible at lower cost to Cessna owners.

CESSNA CUSTOMER 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 the Handbook and keep it in your airplane at all times.

Coupons attached to the Customer Care 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.

SECTION 8
HANDLING, SERVICE & MAINTENANCE

Cessna
MODEL **421C**

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 insures 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-401, 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.

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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, Cessna 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.

1. Head airplane into the wind if possible.
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 jack point before the airplane can be jacked.

NOTE

- To prevent the flight hour recorder from recording while the airplane is on jacks and 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 the 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, indefinitely, refer to the Airplane Service Manual for proper storage procedures.

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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 its 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 its 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.

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6. Secure a rope (no chains or cables) to the upper nose gear trunion 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
Each Optional Wing Locker Tank - 28.4 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 called for in Section 4 will eliminate any free water accumulations in 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 operation of the engine.

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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 transfer 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.

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CAUTION

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

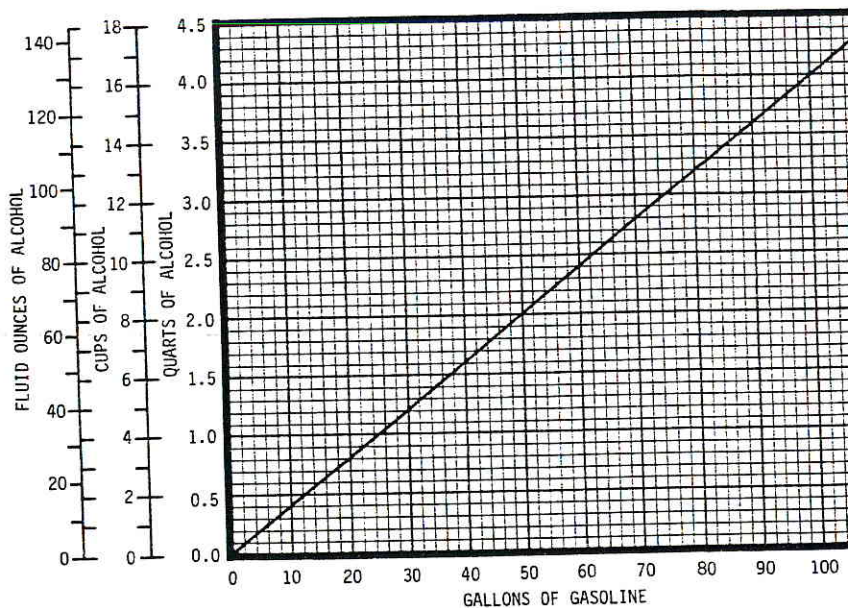
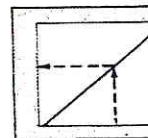


Figure 8-1

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 643227)

Multiviscosity oil is recommended for use after the first 100 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. Replace filters every 100 hours. Change oil every 100 hours or 6 months, whichever occurs first, reduce 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.

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 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 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 battery removed and placed on charge.

NOTE

Water consumption will increase during warmer temperatures and should be checked regularly. Fifty (50) hour 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 80 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.

NOTE

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 and rigging 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 ice adhesion, 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 long, 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 No. 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 No. 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 Dealer 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, insure protection is afforded for components which might be adversely affected by the solvent. Refer to the Airplane Service Manual for proper lubrication of controls and components after engine cleaning.

INTERIOR CARE

To remove dust and loose dirt from the upholstery, headliner and carpet, clean the interior regularly with a vacuum cleaner.

Blot up any spilled liquid promptly with cleansing tissue or rags. Don't pat the spot; press the blotting material firmly and hold it for several seconds. Continue blotting until no more liquid is taken up. Scrape off sticky materials with a dull knife, then spot-clean the area.

Oily spots may be cleaned with household spot removers, used sparingly. Before using any solvent, read the instructions on the container and test it on an obscure place on the fabric to be cleaned. Never saturate the fabric with a volatile solvent; it may damage the padding and backing materials.

WARNING

- Use all cleaning agents in accordance with the manufacturer's recommendations.
- The use of toxic or inflammable cleaning agents is discouraged. If these cleaning agents are used, 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 paragraphs on care of the windshield, must never be used since they soften and craze the plastic.

WINDOWS AND WINDSHIELDS

The cabin windows and windshield panels are constructed of prestretched acrylic in lieu of the cast acrylic used on unpressurized airplanes. Stretched acrylic was chosen to provide the added safety offered by the ability to withstand higher stress concentration and improved resistance to

crack propagation. The surface hardness of acrylic is approximately equal to that of copper or brass. Care must be exercised to avoid scratches and gouges which may be caused by dirty, hard or rough cloth used for cleaning. 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 and those in the airplane service manual.

CAUTION

Do not use the following materials on acrylic plastic: gasoline, benzene, xylene, acetone, carbon tetrachloride, toluene, mek, fire extinguisher fluids, lacquer thinners or window glass cleaners because they will soften the plastic and/or cause crazing in the plastic.

**Cleaning Windshield and Windows
(Except Electrical Windshield)**

Plastic windshields and windows should be kept clean and waxed at all times. To prevent scratches and crazing, wash them carefully with a non abrasive soap or detergent and water, using the palm of the hand to feel and dislodge dirt and mud. A soft cloth, chamois or sponge may be used but only to carry water to the surface. Rinse thoroughly, then dry with clean, damp chamois or rymplecloth. Rubbing the surface of the plastic with a dry cloth builds up an electrostatic charge which attracts dust particles in the air. Wiping with a moist chamois will remove both the dust and this charge. Aliphatic naphtha or kerosene may be used for removing grease and oil.

After removing dirt and grease, if the surface is not badly scratched it should be waxed with a good grade of commercial wax. The wax will fill in minor scratches and help prevent further scratching. Apply a thin, even coat of wax and bring it to a high polish by rubbing lightly with a clean, dry, soft flannel cloth. Do not use a power buffer; the heat generated by the buffing pad may soften the plastic.

Cleaning Electrical Windshield**CAUTION**

Do not attempt to repair scratches in the electrical windshield. Any sanding or polishing will damage the anti-static wires due to their location near the windshield surface. Cleaning and waxing are the only approved maintenance procedures.

SECTION 8
HANDLING, SERVICE & MAINTENANCE

Cessna
MODEL **421C**

Spray a mist of alcohol solution (70% Isopropyl Alcohol; 30% Water) over the windshield and wipe with folded cotton or cheesecloth pads, applying a light pressure to remove dust and dirt particles. Repeat spray and wipe, increase pressure and refold pad to reduce chances of picking up any substance that will scratch the windshield surface.

After cleaning, the windshield should be waxed with "Turtle Wax" brand liquid automotive wax for protection. The wax coating improves appearance and makes cleaning easier.

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 Dealer.

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**SECTION 9
SUPPLEMENTS**

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LOG OF REVISIONS

Supplement pages which have changed since the original issue of this manual are listed below.

Supplement Number and Name	Pages Added/ Deleted/(Revised)	Revision Number and 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 Boot System	3 of 4 (Revised)	Revision 1 - 2 Apr 1982
6 Deice Boot System	4 of 4 (Added)	Revision 1 - 2 Apr 1982
8 Electric Elevator Trim	1 of 1 (Revised)	Revision 1 - 2 Apr 1982
10 Electrical Windshield Anti-ice System	2 of 2 (Revised)	Revision 1 - 2 Apr 1982
11 Flight in Icing Conditions	1 of 4 (Revised)	Revision 1 - 2 Apr 1982
11 Flight in Icing Conditions	4 of 4 (Revised)	Revision 1 - 2 Apr 1982
12 Fire Detection and Extinguishing System	2 of 2 (Revised)	Revision 1 - 2 Apr 1982
27 1000 Audio Control Panel	1 of 6 (Revised)	Revision 1 - 2 Apr 1982
27 1000 Audio Control Panel	2 of 6 (Revised)	Revision 1 - 2 Apr 1982
27 1000 Audio Control Panel	3 of 6 (Revised)	Revision 1 - 2 Apr 1982
27 1000 Audio Control Panel	4 of 6 (Revised)	Revision 1 - 2 Apr 1982
27 1000 Audio Control Panel	5 of 6 (Revised)	Revision 1 - 2 Apr 1982
27 1000 Audio Control Panel	6 of 6 (Revised)	Revision 1 - 2 Apr 1982
31 400B Navomatic Autopilot System	2 of 12 (Revised)	Revision 1 - 2 Apr 1982
31 400B 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
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
44 400 NAV/COM	4 of 6 (Revised)	Revision 1 - 2 Apr 1982
55 Primus-200 Weather Radar - Color Display	1 of 4 (Revised)	Revision 1 - 2 Apr 1982
55 Primus-200 Weather Radar - Color Display	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.

AFT CABIN DIVIDER AND SLIDING DOOR

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the aft cabin divider door.

Description

The aft cabin divider and sliding door provide privacy and separation between the passenger compartment and the lounge area of the passenger compartment.

The divider door is a three-piece assembly with a wood honeycomb core covered with high-pressure plastic laminate. The door slides to left for closing and to the right for opening. A strap is provided to secure the door in the open or STOWED position.

SECTION 2 — LIMITATIONS

- A. The aft cabin divider door must always be in the open and SECURED position for takeoff, landing and whenever removal of smoke from the cabin is required.
- B. Required Placard:

- 1. On the back side of the divider door:

DOOR MUST BE OPEN AND SECURED FOR
TAKEOFF, LANDING AND SMOKE REMOVAL
NO SMOKING WITH DIVIDER CLOSED

SECTION 3 — EMERGENCY PROCEDURES

- A. Emergency Landing, Ditching or Smoke Removal Procedures.
 - 1. Aft Cabin Divider Door - OPEN and SECURED.

SECTION 4 — NORMAL PROCEDURES

- A. Before Takeoff and Landing.
 - 1. Aft Cabin Divider Door - OPEN and SECURED.

SECTION 5 — PERFORMANCE

Not Applicable.

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.

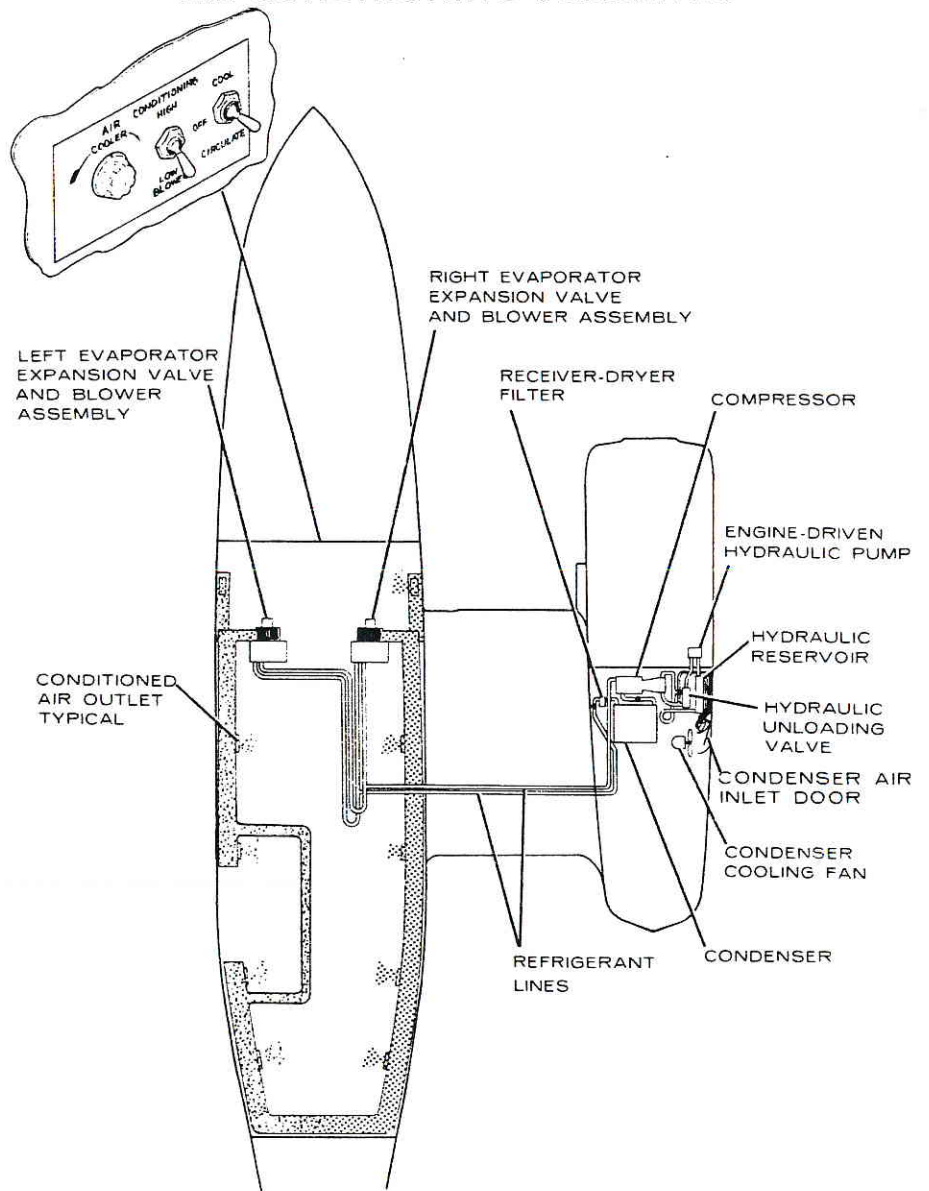
The two evaporators and blower motors distribute conditioned air to the cabin area via overhead ducts. Circuit breakers are provided for each blower, right and left.

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



CODE

- RIGHT EVAPORATOR CONDITIONED AIR
- LEFT EVAPORATOR CONDITIONED AIR

51972021

Figure 1

SECTION 9
SUPPLEMENTS

AIR CONDITIONING SYSTEM

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 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 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 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 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.

3 ALCOHOL WINDSHIELD DEICE SYSTEM

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

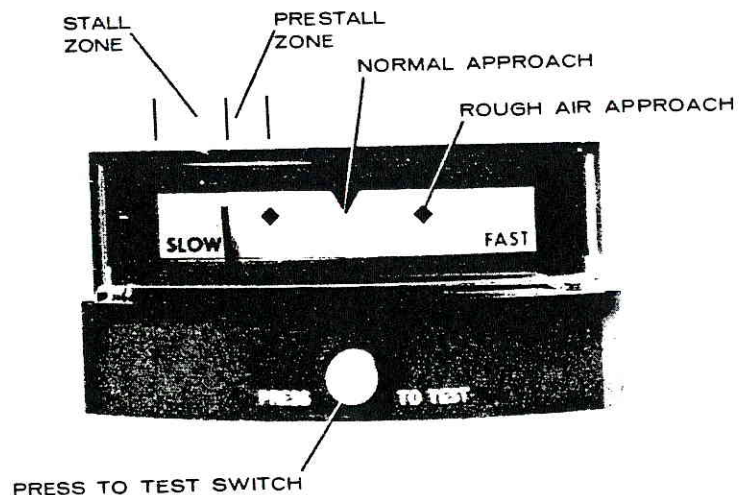


Figure 1

4 ANGLE-OF-ATTACK SYSTEM

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 voltmeter 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.

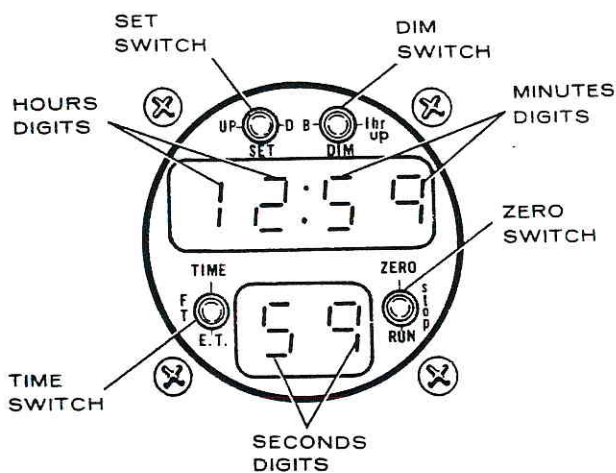
The SET switch is used to make minor corrections to the real time memory of the clock. This switch should be used only after checking the clock with an accurate time reference such as the National Bureau of Standards time broadcast. If the clock is found to be inaccurate, position the SET switch to UP for the number of seconds the clock is slow or to DOWN 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 holdover of the SET switch.

The DIM switch is used to make one-hour changes to the real time and 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 sequencer 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

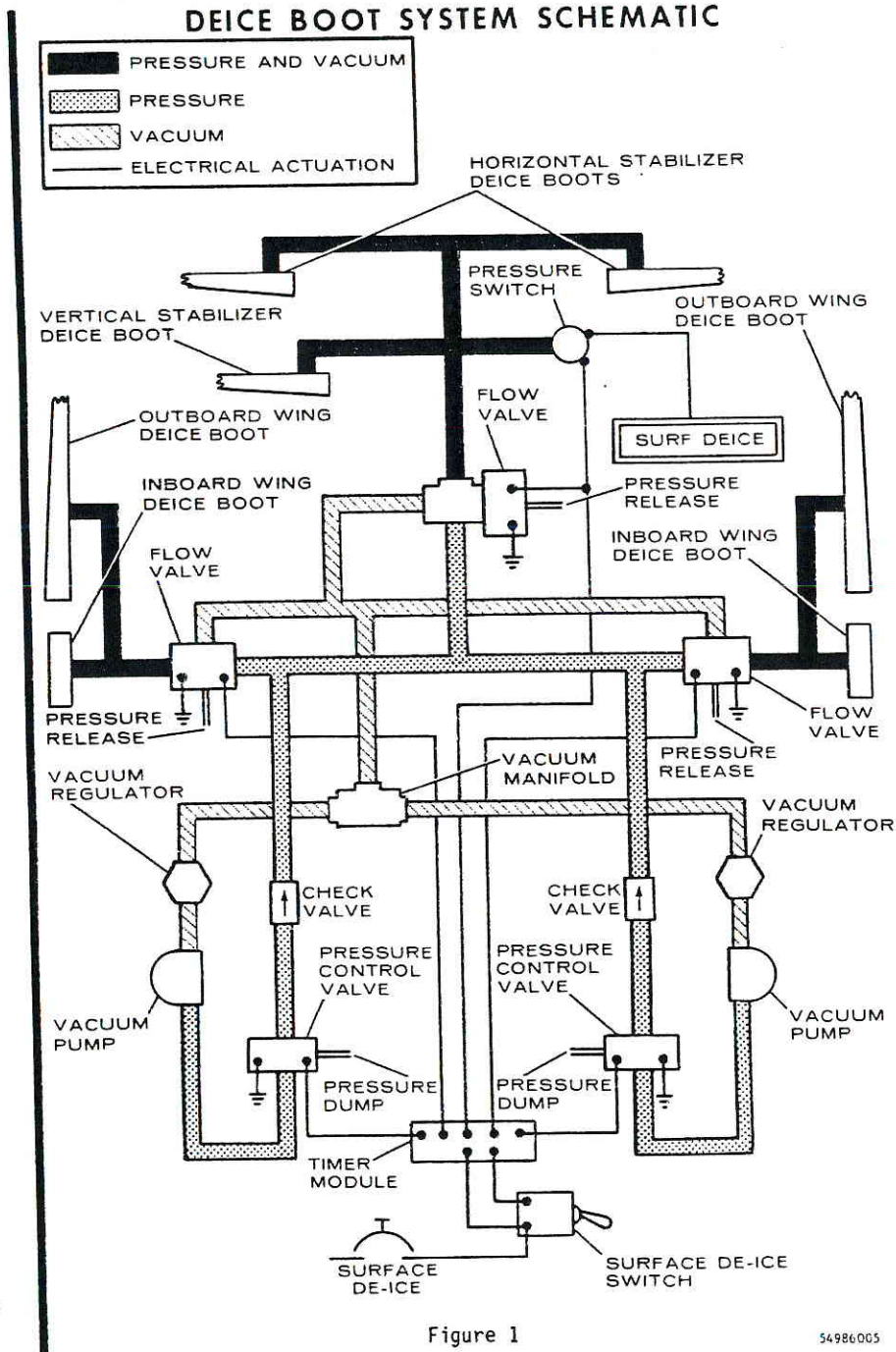


Figure 1

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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.

6 DEICE BOOT SYSTEM

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 75% 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 100°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 1800 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 arc 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 75%.

2. In level flight (at less than 75% 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 1800 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 75% 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 75% 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 1800 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.

NOTE

All control wheel disengage switches should be simultaneously disengaged to prevent having to immediately distinguish between an electric trim or autopilot pitch malfunction.

- 3. Manual Trim - AS REQUIRED.

SECTION 4 — NORMAL PROCEDURES

- A. Elevator Trim Disengage Switch - ELEVATOR TRIM.
- B. Trim Switch - ACTUATE as desired.

NOTE

To check the operation of the disengage switch: actuate the elevator trim switch with the disengage switch in the DISENGAGE position. Observe that the manual trim wheel and indicator do not rotate when the elevator trim switch is actuated.

SECTION 5 — PERFORMANCE

Not Applicable.

ELECTRICAL WINDSHIELD ANTI-ICE SYSTEM

SECTION 1 — GENERAL

This supplement provides information which must be observed when operating the DC electrical windshield.

Description

The electrical windshield anti-ice system consists of two electrically heated rectangular areas: one consisting of 294 square inches (Hi Power large mat) and an additional 141 square inches (Lo Power), a resistance wire sensor imbedded 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 D bus bar. The temperature controller, in conjunction with the resistance wire sensor imbedded in the windshield provides ON-OFF control of the D power through the use of the relay. The temperature sensor, an integral part of the windshield, is located in the high power 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:

1. MAGNETIC COMPASS DEVIATIONS GREATER THAN 10° CAN BE EXPECTED WHEN DC HEATED WINDSHIELD IS IN OPERATION.

SECTION 3 — EMERGENCY PROCEDURES

Not Applicable.

SECTION 4 — NORMAL PROCEDURES

A. Before Takeoff

1. Electrical Windshield Switch - HIGH momentarily. Check voltmeter for discharge and WINDSHIELD annunciator light for illumination.

NOTE

Turn off windshield anti-ice switch as soon as the voltmeter and the annunciator light have been checked.

10 ELECTRICAL WINDSHIELD ANTI-ICE SYSTEM

SECTION 9
SUPPLEMENTS

B. Inflight

1. Electrical Windshield 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

SECTION 1 - GENERAL

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 wing, empennage and propeller deice boots; fuselage ice protection plates; wing deice lights; electrical windshield for the pilot; heated stall warning vane or optional heated angle-of-attack lift sensor vane; heated wing locker fuel tank vents if wing locker tanks are installed; a heated pitot source and 100-ampere alternators.

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. Electrical Windshield Anti-Ice System.
 - b. Inboard and outboard wing and empennage deice boots (including deice lights).
 - c. Propeller deice boots (including fuselage ice protection plates).
4. 100-ampere alternators.
5. Heated wing locker fuel tank vents, if wing locker tanks are installed.

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. Avoid continuous operation in the yellow arc.
 2. Propeller Ammeter - CHECK for proper operation by periodic fluctuations within the green arc.
 3. If ammeter reading for both propellers is below the green arc, indicating 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.

CAUTION

Do not operate propeller deice for prolonged periods when propellers are not turning.

SECTION 4 — NORMAL PROCEDURES

- A. Preflight Inspection
1. Pitot Heat Switch(es) - ON 20 seconds - OFF (Insure 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; Optional Wing Locker Vent(s) - WARM.
 5. Pitot Tube(s) - CLEAR and WARM.
 6. Static Ports - CLEAR and WARM if optional heaters are installed.

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, optional wing locker fuel vent heater, and optional static port heaters. Pitot heat switch(es) 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

C. Inflight

1. Before visible moisture is encountered below 4.4°C (40°F):
 - a. Pitot Heat Switch(es) - ON.
 - b. Stall and Vent Heat Switch - ON.
 - c. Propeller Deice Switch - ON.

NOTE

Energizing the propeller deice early in icing conditions will prevent ice build up which will be thrown off and can chip the fuselage paint.

- 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 heated 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 electric heated windshield in operation.

11 FLIGHT IN ICING CONDITIONS

SECTION 9 SUPPLEMENTS

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 a 1/2 inch of ice may cause a cruise speed reduction of up to 30 knots as well as a significant buffet and stall speed increase. Increase power as required to maintain desired airspeed.

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.

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 located in the leading edge of the wing just inboard of the nacelle.

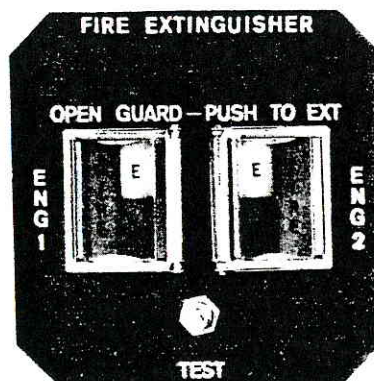
A test function is provided to test the bottle firing cartridge and annunciator lights. When the test switch is pushed, all lights should illuminate; if any light fails to illuminate, replace the bulb. If the green light does not illuminate, check the bottle pressure gages for correct pressure as shown 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
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	531 to 580

Figure 1

FIRE DETECTION AND EXTINGUISHING SYSTEM



ANNUNCIATION		
LEGEND	COLOR	CAUSE OF ILLUMINATION
FIRE	RED	FIRE CONDITION EXISTING IN ENGINE COMPARTMENT
E	AMBER	FIRE EXTINGUISH CONTAINER EMPTY
OK	GREEN	FIRE CARTRIDGE AND ASSOCIATE WIRING IS IN OPERATIONAL CONDITION

Figure 2

12 FIRE DETECTION AND EXTINGUISHING SYSTEM

SECTION 9 SUPPLEMENTS

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. Open the appropriate guard and push FIRE light.
- f. Magnetos - OFF.
- g. Propeller Synchronizer - OFF (Optional System).
- h. 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 (WITH TOTALIZER)

SECTION 1 - GENERAL

This supplement provides information which must be observed when operating the electronic fuel flow indicating system with totalizer.

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 assemblies which are attached to the forward main spar carry-thru structure. The seats may be adjusted fore and aft, vertically and tilted to a 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 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 during the operation of the bleed valve.

MANUALLY ADJUSTABLE SEAT CONTROLS

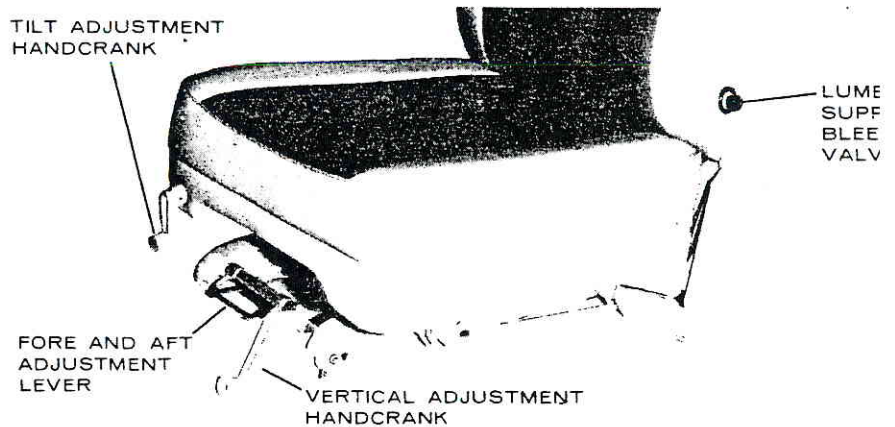


Figure 1

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.

15 MANUALLY ADJUSTABLE SEAT

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 propeller blades. Each boot consists of an inboard and outboard heat 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 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 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. Avoid continuous operation in the yellow arc.
 2. Propeller Ammeter - CHECK for proper operation by periodic fluctuations within the green arc.
 3. If ammeter reading for both propellers is below the green arc, indicating 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.

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.

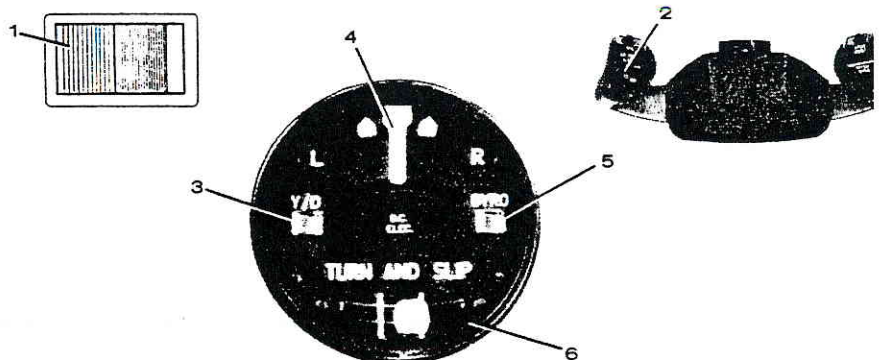
Description

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 or
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 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

18 YAW DAMPER

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 combination aneroid sensor and motor-driven display. Electronic damping circuits in the unit insure that the display follows altitude changes rapidly with 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 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 baroset 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 altitude readout plus pointer and dial indication for last two digits (for example, for altitude of 12,630 feet, read 12,600 feet 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.