Pilot's Operating Handbook

Cardinal

1977 Cessna 177B

Serial No. 17702629
Registration No. N110PF

THIS HANDBOOK INCLUDES THE MATERIAL REQUIRED TO BE FURNISHED TO THE PILOT BY FAR PART 23

CESSNA AIRCRAFT COMPANY
WICHITA, KANSAS, USA

PERFORMANCE –SPECIFICATIONS

SPEED	
Maximum at Sea Level	139 KNOTS
Cruise, 75% Power at 10,000 Ft	130 KNOTS
Cruise: Recommended Lean Mixture with fuel allowance Engine start, taxi, takeoff, climb, and 45% Reserve at 45%	
75% Power at 10,000 Ft	Range 535 NM
49 Gallons Usable Fuel	Time 4.2 Hours
~~75% Power at 10,000 Ft~~	~~Range 675 NM~~
~~60 Gallons Usable Fuel~~	~~Time 5.3 Hours~~
Maximum Range at 10,000 Ft	Range 615 NM
49 Gallons Usable Fuel	Time 6.1 Hours
~~Maximum Range at 10,000 Ft~~	~~Range 780 NM~~
~~60 Gallons Usable Fuel~~	~~Time 7.7 Hours~~
RATE OF CLIMB AT SEA LEVEL	840 FPM
SERVICE CEILING	14,600 FT
TAKEOFF PERFORMANCE:	
Ground Roll	750 FT
Total Distance Over a 50-Ft Obstacle	1400 FT
LANDING PERFORMANCE:	
Ground Roll	600 FT
Total Distance Over a 50-Ft Obstacle	1220 Ft
STALL SPEED (CAS)	
Flaps Up, Power Off	55 KNOTS
Flaps Down, Power Off	46 KNOTS
MAXIMUM WEIGHT	2500 Pounds
STANDARD EMPTY WEIGHT	
Cardinal	1533 Pounds
Cardinal II	1560 Pounds
MAXIMUM USEFUL LOAD	
Cardinal	967 Pounds
Cardinal II	940 Pounds
BAGGAGE ALLOWANCE	120 Pounds
WING LOADING Pounds / S.F.	14.4
POWER LOADING Pounds / HP	13.9
FUEL CAPACITY Total	
Standard Tanks	50 Gallons
~~Long Range Tanks~~	~~61 Gallons~~
OIL CAPACITY	9.Qts
ENGINE	
180 BHP at 2700 RPM	
PROPELLER Constant Speed, Diameter	

NOTE: AIRCRAFT N110PF IS EQUIPPED WITH STANDARD TANKS.

CONGRATULATIONS

Welcome to the ranks of Cessna Owners! Your Cessna has been designed and constructed to give you the most in performance, economy, and comfort. It is our desire that you will find flying it, either for business or pleasure, a pleasant and profitable experience.

This Pilot's Operating Handbook 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.

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- FACTORY APPROVED SERVICE EQUIPMENT to provide you efficient accurate workmanship.

- A STOCK OF GENUINE CESSNA SERVICE PARTS on hand when you need them

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SECTION 1
GENERAL

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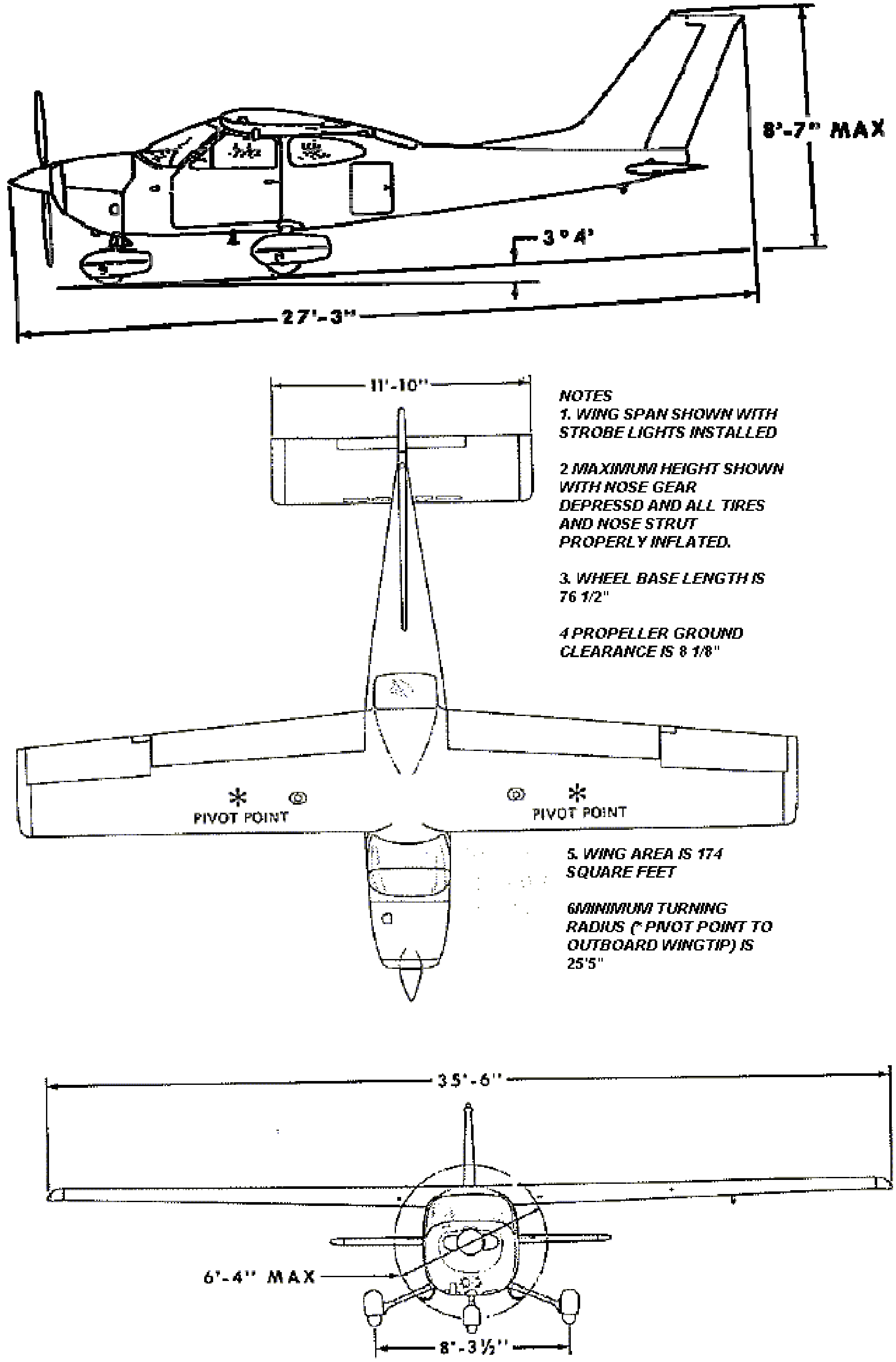

Figure 1-1 Three – View

INTRODUCTION

This handbook contains 9 sections, and includes the material required to be furnished to the pilot by FAR Part 23. It also contains supplemental data supplied by Cessna Aircraft Company.

Section 1 provides basic data and information of general interest and also contains definitions or explanations of symbols, abbreviations, and terminology commonly used.

DESCRIPTIVE DATA

ENGINE

Number of Engines: 1
Engine Manufacturer: Avco Lycoming
Engine Model Number – O-360-AAF6D
Engine Type: Normally-aspirated, direct-drive, air-cooled, horizontally-opposed, carburetor-equipped, four-cylinder engine with 361 cu. In. displacement
Horsepower Rating and Engine Speed: 180 rated BHP at 2700 RPM

PROPELLER

Propeller Manufacturer: McCauley Accessory Division
Propeller Model Number: B2D34C211 / 82PCA – 6
Number of blades: 2
Propeller Diameter, Maximum: 76"
Minimum: 75:
Propeller Type: Constant speed and hydraulically actuated, with a low pitch setting of 12.1° and a high pitch setting of 26.0° (30 inch station)

FUEL

Approved Fuel Grades (and Colors)
- 100 LL Grade Aviation Fuel (Blue)
- 100 (Formerly 100/130 Grade Aviation Fuel (Green)

Fuel Capacity
- Standard Tanks:
  - Total Capacity: 50 gallons
  - Total Capacity, each tank: 25 gallons
  - Total Usable: 49 gallons
- ~~Long-range tanks~~
  - ~~Total Capacity: 61 gallons~~
  - ~~Total Capacity, each tank: 30.5 gallons~~
  - ~~Total Usable: 60 gallons~~

NOTE: AIRCRAFT N110PF IS EQUIPPED WITH STANDARD TANKS.

NOTE

To ensure maximum fuel capacity when refueling, place the fuel selector valve in either LEFT or RIGHT position to prevent cross-feeding

OIL

Oil Grade (Specification)

MIL-L-6082 Aviation Grade Straight Mineral Oil: Use to replenish supply during first 25 hours and at the first 25 hour oil-change. Continue to use until a total of 50 hours has accumulated or oil consumption has stabilized.

NOTE

The airplane was delivered from the factory with a corrosion-preventive aircraft engine oil. This oil should be drained after the first 25 hours of operation.

MIL-L-22851 Ashless Dispersant Oil: This oil <u>must be used</u> after first 50 hours or oil consumption has stabilized

Recommended Viscosity for Temperature Range
- MIL –L-6082 Aviation Grade Straight Mineral Oil
  - SAE 50 above 16°C (60°F)
  - SAE 40 between -1°C (30°F) and 32°C (90°F)
  - SAE 30 between -18°C (0°F) and 21°C (70°F)
  - SAE 20 below -12°C (10°F)
- MIL –L-22851 Ashless Dispersant Oil:
  - SAE 40 or SAE 50 above 16°C (60°F)
  - SAE 40 between -1°C (30°F) and 32°C (90°F)
  - SAE 30 between -18°C (0°F) and 21°C (70°F)
  - SAE 30 below -12°C (10°F)

Oil Capacity
- Sump: 8 quarts
- Total: 9 quarts

MAXIMUM CERTIFICATED WEIGHTS

Takeoff,	Normal Category	2500 pounds
	Utility Category	2200 pounds
Landing	Normal Category	2500 pounds
	Utility Category	2200 pounds

Weight in baggage compartment, Normal Category: Baggage, passenger on auxiliary seat, or cargo area 2 and hatshelf – Station 142 to 185: 120 pounds

NOTE

The maximum combined weight for cargo area 2 and the hatshelf is 120 pounds. The maximum weight capacity for the hatshelf is 25 pounds

Weight in baggage compartment, Utility Category: In this category, the baggage compartment and rear seat must not be occupied

STANDARD AIRPLANE WEIGHTS

Standard Empty Weight,	Cardinal	1533 lbs
	Cardinal II	1560 lbs

Maximum Useful Load

	Normal Category	Utility Category
Cardinal:	967 lbs	667 lbs
Cardinal II	940 lbs	640 lbs

CABIN AND ENTRY DIMENSIONS

Detailed dimensions of the cabin interior and entry door openings are illustrated in Section 6.

BAGGAGE SPACE AND ENTRY DIMENSIONS

Detailed dimensions of the cabin interior and entry door openings are illustrated in Section 6.

SPECIFIC LOADINGS

Wing Loading 14.4 lbs / sq. ft.
Power Loading 13.9 lbs / hp

SYMBOLS, ABBREVIATIONS AND TEMINOLOGY

GENERAL AIRSPEED TEMINOLOGY AND SYMBOLS

KCAS — Knots Calibrated Airspeed is the indicated airspeed corrected for position and instrument error and expressed in knots. Knots calibrated airspeed is equal to KTAS in standard atmosphere at sea level

KIAS — Knots Indicated Airspeed is the speed show on the airspeed indicator and expressed in knots

KTAS — Knots True Airspeed is the airspeed expressed in knots relative to undisturbed air which is KCAS corrected for altitude

V_A — Maneuvering Speed is the maximum speed at which you many use abrupt control travel.

V_{FE} — Maximum Flap Extension Speed is the highest speed permissible with wing flaps in a prescribed extended position

V_{NO} — Maximum Structural Cruising Speed is the speed that should not be exceeded except in smooth air, then only with caution.

V_{Ne} Never Exceed Speed is the speed limit that may not be exceeded at any time.

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

V_{SO} Stalling Speed or the minimum steady flight speed at which the airplane is controllable in the landing configuration at the most forward center of gravity

V_X Best Angle-of-Climb Speed is the speed which results in the greatest gain of altitude in a given horizontal distance

V_Y Best Rate-of-Climb Speed is the speed which results in the greatest gain in a given time

METEOROLOGICAL TERMINOLOGY

OAT Outside Air Temperature is the free air static temperature. It is expressed in either Celsius (formerly Centigrade) or degrees Fahrenheit.

Standard Temperature Standard Temperature is 15°C at sea level pressure altitude and decreases by 2°C for each 1,000 feet of altitude.

Pressure Altitude Pressure Altitude is the altitude read from an altimeter when the altimeter's barometric scale has been set to 29.92 inches of mercury (1013 mb)

ENGINE POWER TERMINOLOGY

BHP Brake Horsepower is the power developed by the engine

RPM Revolutions per minute is the engine speed

MP Manifold Pressure is a pressure measured in the engine's induction system and is expressed in inches of mercury (Hg)

AIRPLANE PERFORMANCE AND FLIGHT PLANNING TERMINOLOGY

Demonstrated Crosswind Velocity 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.

Usable Fuel Usable Fuel is the fuel available for flight planning

Unusable Fuel	Unusable Fuel is the quantity of fuel that can not be safely used in flight
GPH	Gallons per Hour is the amount of fuel (in gallons) consumed per hour.
NMPG	Nautical Miles per Gallon is the distance (in nautical miles) which can be expected per gallon of fuel consumed at a specific power setting and / or flight configuration.
G	G is acceleration due to gravity

WEIGHT AND BALANCE TERMINOLOGY

Reference Datum	Reference Datum is an imaginary plane from which all horizontal distances are measured for balance purposes
Station	Station is a location along the airplane fuselage given in terms of the distance from the reference datum.
Arm	Arm is the horizontal distance from the reference datum to the center of gravity (C.G.) of an item
Moment	Moment is the product of the weight of an item multiplied by its arm. (Moment divided by the constant 1000 is used in this handbook to simplify balance calculations by reducing the number of digits).
Center of Gravity (C.G.)	Center of Gravity is the point at which an airplane, or equipment, would balance if suspended. Its distance from the reference datum is found dividing the total moment by the total weight of the airplane
C.G. Arm	Center of Gravity Arm is the arm obtained by adding the airplane's individual moments and dividing the sum by the total weight.
C.G. Limits	Center of Gravity Limits are the extreme center of gravity locations within which the airplane must be operated at a given weight.
Standard Empty Weight	Standard Empty Weight is the weight of a standard airplane, including unusable fuel, full operating fluids and full engine oil.
Basic Empty Weight	Basic Empty Weight is the standard empty weight plus the weight of optional equipment

Useful Load	Useful Load is the difference between takeoff weight and the basic empty weight.
Gross (Loaded) Weight	Gross (Loaded) Weight is the maximum weight approved for the start of the takeoff run.
Maximum Landing Weight	Maximum Landing Weight is the maximum weight approved for the landing touchdown
Tare	Tare is the weight of chocks, blocks, stands, etc. used in weighing an airplane, and is included in the scale readings. Tare is deducted from the scale reading to obtain the actual (net) airplane weight.

SECTION 2
LIMITATIONS

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INTRODUCTION

Section 2 includes operating limitations, instrument markings and basic placards necessary for the safe operation of the airplane, its engine, standard systems, and standard equipment. The limitations included in this section have been approved by the Federal Aviation Administration. When applicable, limitations associated with optional systems or equipment are included in Section 9.

NOTE

The airspeeds listed in the Airspeed Limitations chart (figure 2-1) and the Airspeed Indicator Markings Chart (Figure 2-2) are based Airspeed Calibration data shown in Section 5 with the normal static source. If the alternate static source is being used, ample margins should be observed to allow for the airspeed calibration variations between the normal and alternate static sources as shown in Section 5.

Your Cessna is certificated under FAA Type Certificate No. A13CE as Cessna Model No 177B.

AIRSPEED LIMITATIONS

Airspeed limitations and their operational significance are shown in figure 2-1.

	SPEED	KCAS	KIAS	REMARKS
V_{NE}	Never Exceed Speed	161	167	Do not exceed this speed in any operation
V_{NO}	Maximum Structural Cruising Speed	134	138	Do not exceed this sped except in smooth air, and then only with caution
V_A	Maneuvering Speed 2500 pounds 2100 pounds 1700 pounds	 101 93 84	 102 93 83	Do not make full or abrupt control movements above this speed.
V_{FE}	Maximum Flap Extended Speed To 10° Flaps 10° to 30° Flaps	 113 90	 115 90	Do not exceed these speeds with the given flap settings
	Maximum Window Open Speed	104	105	Do not exceed this speed with windows open

Figure 2-1 Airspeed Limitations

AIRSPEED INDICATOR MARKINGS

Airspeed indicator markings and their color code significance are shown in figure 2-2.

MARKING	KIAS VALUE OR RANGE	SIGNIFICANCE
White Arc	45 – 90	Full Flap Operating Range. Lower limit is maximum weight V_{SO} in landing configuration. Upper limit is maximum speed permissible with flaps extended.
Green Arc	54 – 138	Normal Operating Range. Lower limit is maximum weight V_S at most forward C.G. with flaps retracted. Upper limit is maximum cruising speed
Yellow Arc	138 – 167	Operations must be conducted with caution and only in smooth air
Red Line	167	Maximum speed for all operations.

Figure 2-2 Airspeed Indicator Markings

POWER PLANT LIMITATIONS

Engine Manufacturer: Avco Lycoming
Engine Serial Number: O-360-A1F6D
Engine Operating Limits for Takeoff and Continuous Operations
Maximum Power: 180 BHP
Maximum Engine Speed: 2700 RPM
Maximum Cylinder Head Temperature: 260°C (500°F)
Maximum Oil Temperature: 118°C (245°F)

Oil Pressure, Minimum 25 psi
Maximum 100 psi
Fuel Pressure, Minimum 2 psi
Maximum 8 psi

Propeller Manufacturer: McCauley Accessory Division
Propeller Model Number: B2D34C211 / 82PCE-6
Propeller Diameter, Maximum: 76 inches
Minimum: 75 inches
Propeller Blade Angle at 30 inch station, Low: 12.1°
High: 26.0°
Propeller Operating Limits: Avoid continuous operations between 1700 and 1900 RPM with less than 10 inches manifold pressure.

POWER PLANT INDICATOR MARKINGS

Power plant instrument markings and their color code significance are shown in figure 2-3

INSTRUMENT	RED LINE MINIMUM LIMIT	GREEN ARC NORMAL OPERATING	YELLOW ARC CAUTION RANGE	RED LINE MAXIMUM LIMIT
Tachometer SL to 8,000 Ft 8,000 Ft and above	------	2100 – 2500 RPM (inner arc) 2100 – 2700 RPM (outer arc)	1700 – 1900 RPM	2700 RPM
Manifold Pressure	------	15 – 24 in Hg.	------	------
Oil Temperature	------	100° - 125° F	------	245°F
Cylinder Head Temperature	------	200° - 500° F	------	500°F
Fuel Pressure	2 psi	2 - 8 psi	------	8 psi
Oil Pressure	25 psi	60 – 90 psi	------	100 psi
Carburetor Air Temperature	------	------	-15°C - 5°C	------

Figure 2-3 Power Plant Instrument Markings

WEIGHT LIMITS

NORMAL CATEGORY

Maximum Takeoff Weight: 2500 lbs
Maximum Landing Weight 2500 lbs
Weight in Baggage Compartment, Normal Category: Baggage, passenger on auxiliary seat, or cargo area 2 and hatshelf – Station 142 to 185 120 lbs.

NOTE

The maximum combined weight capacity for cargo area 2 and the hatshelf is 120 pounds. The maximum weight capacity for the hatshelf is 25 lbs.

UTILITY CATEGORY
Maximum Takeoff Weight: 2200 lbs
Maximum Landing Weight 2200 lbs
Weight in Baggage Compartment: in the utility category, the baggage compartment and rear seat must not be occupied.

CENTER OF GRAVITY LIMITS

NORMAL CATEGORY
Center of Gravity Range:

- Forward: 101.0 inches aft of datum at 2000 lbs or less, to 102.2 inches aft of datum at 225 lbs; to 105.7 inches aft of datum at 2500 pounds, with straight ling variation between points.
- Aft: 114.5 inches aft of datum at all weights
- Reference Datum: 54.0 inches forward of front face of lower portion of firewall

UTILITY CATEGORY
Center of Gravity Range:

- Forward: 101.0 inches aft of datum at 2000 lbs or less, with straight line variation to 102.0 inches aft of datum at 2200 lbs
- Aft: 109 inches aft of datum at all weights
- Reference Datum: 54.0 inches forward of front face of lower portion of firewall

MANEUVER LIMITS
This airplane is certificated in both the normal and utility category. The normal category is applicable to aircraft intended for non-aerobatic operations. These include any maneuvers incidental to normal flying, stalls (except whip stalls) lazy eights, chandelles, and turns in which the angle be bank is not more than 60°. Aerobatic maneuvers, including spins, are not approved.

UTILITY CATEGORY
This airplane is not designed for purely aerobatic flight. However, in the acquisition of various certificates such as commercial pilot, instrument pilot and flight instructor, certain maneuvers are required by the FAA. All of these maneuvers are permitted in this airplane when operated in the utility category.

In the utility category, the baggage compartment and rear seat must not be occupied. No aerobatic maneuvers are approved except those listed below:

MANEUVER	RECOMMENDED ENTRY SPEED*
Chandelles	100 knots
Lazy Eights	100 knots
Steep Turns	100 knots
Spins	Slow Deceleration
Stalls	Slow Deceleration

* Abrupt use of controls is prohibited above 102 knots

Aerobatics that may impose high loads should not be attempted. The important thing to bear in mind in flight maneuvers is that airplane is clean in aerodynamic design and will build up speed quickly with the nose down. Proper speed control is an essential requirement for execution of any maneuver, and care should always be exercised to avoid excessive speed which in turn can impose excessive loads. In the execution of all maneuvers, avoid abrupt use of controls. Intentional spins with flaps extended are prohibited.

FLIGHT LOAD FACTOR LIMITS

NORMAL CATEGORY

Flight Load Factors (Gross Weight – 2500 lbs)

Flaps Up	+ 3.8 g, -1.52 g
Flaps Down	+3.5 g

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

UTILITY CATEGORY

Flight Load Factors (Gross Weight – 2200 lbs)

Flaps Up	+ 4.4 g, -1.7 g
Flaps Down	+3.5 g

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

KINDS OF OPERATION LIMITS

The airplane is equipped for day VFR and may be equipped for night VFR and/or IFR operations. FAR Part 91 establishes the minimum required instrumentation and equipment for these operations. The reference to types of flight operations on the operating limitations placard reflects equipment installed at the time of Airworthiness Certificate issuance.

Flight into known icing conditions is prohibited.

FUEL LIMITATIONS

2 Standard Tanks: 25 gallons each
Total Fuel: 50 US gallons
Total Capacity, each tank: 25 gallons
Usable Fuel; (all flight conditions) 49 US
Unusable Fuel: 1.0 US gallons

~~2 Long Range Tanks: 30.5 gallons each~~
~~Total Fuel: 61~~
~~US gallons~~
~~Total Capacity, each tank: 25 gallons~~
~~Usable Fuel; (all flight conditions) 49 US~~
~~Unusable Fuel: 1.0 US gallons~~

NOTE: AIRCRAFT N110PF IS EQUIPPED WITH STANDARD TANKS.

NOTE

To ensure maximum fuel capacity when refueling, place the fuel selector valve in either LEFT or RIGHT position to prevent cross-feeding.

NOTE

Take off and land with the fuel selector valve in the BOTH ON position.

Approved Fuel Grades (and Colors)
100 LL Grade Aviation Fuel (Blue)
100 (Formerly 100/130 Grade Aviation Fuel (Green)

PLACARDS

The following information is displayed in the form of composite or individual placards.

(1) In full view of the pilot: (The “DAY-NIGHT-VFR-IFR” entry, shown on the example below, will vary as the airplane is equipped.)

This airplane must be operated in compliance with the operating limitations as stated in the form of placards, markings, and manuals.

------------------- MAXIMUMS -------------------

	Normal Category	Utility Category
MANEUVERING SPEED (IAS)	102 knots	102 knots
GROSS WEIGHT	2500 lbs	2200 lbs
FLIGHT LOAD FACTOR		
Flaps Up	+3.8, - 1.52	+4.4, -1.78
Flaps Down	+3.5	+3.5

Normal Category – No acrobatic maneuvers including spins approved.
Utility Category – Baggage compartment and rear seat must not be occupied.

-------------------NO ACROBATIC MANEUVERS APPROVED-------------------
EXCEPT THOSE LISTED BELOW

Maneuver	Recm. Entry Speed	Maneuver	Rec’m. Entry Speed
Chandelles	100 knots	Spins	Slow Deceleration
Lazy Eights	100 knots	Stalls (except whip stalls)	Slow Deceleration
Steep Turns	100 knots		

Altitude loss in stall recovery – 180 feet
Abrupt use of controls prohibited above 102 knots
Spin Recovery: opposite rudder – forward stabilator – neutralize controls. Intentional spins with flaps extended are prohibited. Flight into known icing is prohibited. This airplane is certified for the following flight operations as of the date of original airworthiness certificate:

DAY – NIGHT – VFR – IFR

(2) On control lock

Control Lock – remove before starting engine

(3) On fuel shut-off control (at appropriate location):

Fuel shut-off – pull off

(4) On fuel selector valve (standard tanks):

Both - - 49 gal Left - - 24.5 gal Right - - 24.5 gal Both on for takeoff and landing

~~(5) On fuel selector valve (long-range tanks):~~

~~Both - - 60 gal~~ ~~Left - - 30 gal~~ ~~Right - - 30 gal~~ ~~Both on for takeoff and landing~~

(5) Aft of fuel tank (standard tanks)

Service this airplane with 91 / 96 minimum or 100 / 130 grade aviation gasoline. Total capacity 25 gal. Capacity to line of holes inside filler neck 22.0.

~~(5) Aft of fuel tank (long range tanks)~~

~~Service this airplane with 91 / 96 minimum or 100 / 130 grade aviation gasoline. Total capacity 30 gal. Capacity to line of holes inside filler neck 22.0.~~

(6 In baggage compartment

120 pounds maximum baggage and / or auxiliary seat passenger, including 25 pounds maximum in baggage wall hatshelf. For additional loading instructions, see weight and balance data.

(7) Next to door ventilation window

Do not open window above 105 knots or when using alternate static source.

(8) On wing flap indicator

0° to 10°	(Blue color code and 115 knot callout; also mechanical detent at 10°)
10° - 20° - 30°	(Indices at these positions with white color code and 90 knot callout; also, mechanical detent at 20°)

(9) On manifold gage:

With less than 10” manifold pressure, avoid continuous operation between 1700 – 1900 RPM

(10) On the instrument panel near the over-voltage light

HIGH VOLTAGE

SECTION 3
EMERGENCY PROCEDURES

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INTRODUCTION

Section 3 provides checklist and amplified procedures for coping with emergencies that may occur. Emergencies caused by airplane or engine malfunctions are extremely rare if proper preflight inspections and maintenance are practiced. Enroute weather emergencies can be minimized or eliminated by careful flight planning and good judgment when unexpected weather is encountered. However, should an emergency arise the basic guidelines described in this section should be considered and applied as necessary to correct the problem. Emergency procedures associated with the ELT and other optional systems can be found in Section 9

AIRSPEEDS FOR EMERGENCY OPERATION

Engine failure after takeoff:
Wing Flaps Up ---------- 70 KIAS
Wing Flaps Down ---------- 65 KIAS
Maneuvering Speed
2500 Lbs ---------- 102 KIAS
2100 Lbs ---------- 93 KIAS
1700 Lbs ---------- 83 KIAS
Maximum Glide
2500 Lbs ---------- 75 KIAS
2100 Lbs ---------- 70 KIAS
1700 Lbs ---------- 65 KIAS
Precautionary landing with engine power ---------- 65 KIAS
Landing without engine power
Wing Flaps Up ---------- 75 KIAS
Wing Flaps Down ---------- 65 KIAS

OPERATIONAL CHECKLISTS

ENGINE FAILURES

ENGINE FAILURE DURING TAKEOFF RUN

1. Throttle - - IDLE
2. Brakes - - APPLY
3. Wing Flaps - - RETRACT
4. Mixture - - IDLE CUT-OFF
5. Ignition Switch - - OFF
6. Master Switch - - OFF

ENGINE FAILURE IMMEDIATELY AFTER TAKEOFF

1. Airspeed - - 70 KIAS
2. Mixture - - IDLE CUT-OFF
3. Fuel Shut-off Valve - - OFF (pull sharply to break safety wire)
4. Ignition Switch - - OFF
5. Wing Flaps - - AS REQUIRED
6. Master Switch - - OFF

ENGINE FAILURE DURING FLIGHT

1. Airspeed - - 75 KIAS
2. Carburetor Heat - - ON
3. Fuel Selector - - BOTH
4. Fuel Shutoff Valve - - ON
5. Mixture - - RICH
6. Auxiliary Fuel Pump - - ON for 3-5 seconds with throttle open ½ inch; then OFF
7. Ignition Switch - - BOTH (or START if propeller has stopped).

FORCED LANDINGS

EMERGENCY LANDING WITHOUT ENGINE POWER

1. Airspeed - - 75 KIAS (flaps UP), / 65 KIAS (flaps DOWN)
2. Mixture - - IDLE CUT-OFF
3. Fuel Shut-off Valve - - OFF (pull sharply to break safety wire)
4. Ignition Switch - - OFF
5. Wing Flaps - - AS REQUIRED (30° recommended)
6. Master Switch - - OFF
7. Doors - - UNLATCH PRIOR TO TOUCHDOWN
8. Touchdown - - SLIGHTLY TAIL LOW
9. Brakes - - APPLY HEAVILY

PRECAUTIONARY LANDING WITH ENGINE POWER

1. Airspeed - - 65 KIAS
2. Wing Flaps - - 15°
3. Selected Field - - FLY OVER, noting terrain and obstructions, then retract flaps upon reaching s safe altitude and airspeed
4. Radio and Electrical Switches - - OFF
5. Wing Flaps - - 30° (on final approach)
6. Airspeed - - 65 KIAS
7. Master Switch - - OFF
8. Doors - - UNLATCH PRIOR TO TOUCHDOWN
9. Touchdown - - SLIGHTLY TAIL LOW
10. Ignition Switch - - OFF
11. Brakes - - APPLY HEAVILY

DITCHING

1. Radio - - TRANSMIT MAYDAY on 121.5 MHz, giving location and intentions.
2. Heavy Objects (in baggage area) - - SECURE OR JETTISON
3. Flaps - - 30°
4. Approach - - High Winds, Heavy Seas - - INTO THE WIND
   Light Winds, Heavy swells - - PARALLEL TO SWELLS
5. Power - - ESTABLISH 300 FT / MIN DESCENT AT 60 KIAS
6. Cabin Doors - - UNLATCH
7. Touchdown - - LEVEL ATTITUDE AT 300 FT / MIN DESCENT
8. Face - - CUSHION at touchdown with folded coat
9. Airplane - - EVACUATE through cabin doors. If necessary, open vent window to flood cabin to equalize pressure so doors can be opened.
10. Life Vests and Raft - - INFLATE

FIRES

DURING START ON GROUND

1. Cranking - - CONTINUE to get a start which would suck the flames and accumulated fuel through the carburetor and into the engine.

If engine starts:

2. Power - - 1800 for a few minutes
3. Engine - -SHUDOWN and inspect for damage

If engine fails to start:

4. Cranking - - CONTINUE
5. Fire Extinguisher - - OBTAIN (have ground attendants obtain if not installed)
6. Engine - - SECURE

   a. Master Switch - - OFF
   b. Ignition Switch - - OFF
   c. Fuel Shutoff Valve - - OFF (pull sharply to break safety wire)
7. Fire - - EXTINGUISH using fire extinguisher, wool blanket or dirt
8. Fire damage - - INSPECT, repair damage or replace components or wiring before conducting another flight.

ENGINE FIRE IN FLIGHT

1. Mixture - - IDLE CUT-OFF
2. Fuel shutoff Valve - - OFF (pull sharply to break safety wire)
3. Master Switch - - OFF
4. Cabin Heat and Air - - OFF (except overhead vents)
5. Airspeed - - 105 KIAS (if fire is not extinguished, increase glide)
6. Forced Landing - - EXECUTE (as described in Landing Without Engine Power)

ELECTRICAL FIRE IN FLIGHT

1. Master Switch - - OFF
2. All Other Switches (except ignition switch) - - OFF
3. Vents / Cabin Air / Heat - - CLOSED
4. Fire Extinguisher - - ACTIVATE (if available)

WARNING

After discharging an extinguisher within closed cabin, ventilate the cabin.

If fire appears out and electrical power is necessary for continuance of flight:

5. Master Switch - - ON
6. Circuit Breakers - - CHECK for faulty circuit, do not reset.
7. Radio / Electrical Switches - - ON one at a time, with delay after each until short circuit is localized.
8. Vents / Cabin Air / Heat - - OPEN when it is ascertained that fire is completely extinguished.

CABIN FIRE

1. Master Switch - - OFF
2. Vents / Cabin Air / Heat - - CLOSED to avoid drafts
3. Fire Extinguisher - - ACTIVATE (if available)

WARNING

After discharging an extinguisher within closed cabin, ventilate the cabin.

4. Land the airplane as soon as possible to inspect for damage.

WING FIRE

1. Navigation Light Switch - - OFF
2. Pitot Heat Switch (If installed) - - OFF
3. Strobe Light Switch (if installed) - - OFF

NOTE

Perform a sideslip to keep the flames away from the fuel tank and cabin, and land as soon as possible

ICING

INADVERTANT ICING ENCOUNTER

1. Turn pitot heat switch ON (if installed)
2. Turn back or change altitude to obtain an outside air temperature that is less conducive to icing.
3. Pull cabin heat and defroster controls full out to obtain maximum windshield defroster effectiveness.
4. Increase engine speed to minimize ice build-up on propeller blades.
5. Watch for signs of carburetor air filter ice and apply carburetor heat as required. Unexplained loss of manifold pressure could be caused by carburetor ice or air intake filter ice. Lean the mixture if carburetor heat is used continuously.
6. Plan a landing at the nearest airport. With an extremely rapid ice build-up, select a suitable “off airport” site.
7. With an ice accumulation of ¼ inch or more on the wing leading edges, be prepared for significantly higher stall speed.
8. Leave wing flaps retracted. With a sever ice build-up on the stabilator, the change in wing wake airflow direction caused by wing flap extension could result in a loss of stabilator effectiveness.
9. Perform a landing approach using a forward slip, if necessary for improved visibility.
10. Approach at 75-85 KIAS, depending upon the amount of ice accumulation
11. Perform a landing in a level attitude

STATIC SOURCE BLOCKAGE
(Erroneous Instrument Reading Suspected)

1. Vent windows - - CLOSED
2. Alternate Static Source Valve - - PULL ON
3. Airspeed - - Consult appropriate table in Section 5

LANDING WITH A FLAT MAIN TIRE

1. Wing Flaps - - AS DESIRED (0° to 10° below 115 KIAS; 10° – 30° below 90 KIAS)
2. Make normal approach

3. Touchdown - - GOOD TIRE FIRST, hold airplane off flat tire as long as possible with aileron control.

ELECTRICAL POWER SUPPLY SYSTEM MALFUNCTIONS

OVER-VOLTAGE LIGHT ILLUMINATES

1. Master Switch - - OFF (both sides)
2. Master Switch - - ON
3. Over-Voltage Light - - OFF

If over-voltage light illuminates again:

4. Flight - - TERMINATE as soon as practical.

AMMETER SHOWS DISCHARGE

5. Alternator - - OFF
6. Nonessential Electrical Equipment - - OFF
7. Flight - - TERMINATE as soon as practical

AMPLIFIED PROCEDURES

ENGINE FAILURES

If an engine failure occurs during the takeoff run, the most important thing to do is stop the airplane on the remaining runway. Those extra items on the checklist will provide added safety during a failure of this type.

Prompt lowering of the nose to maintain airspeed and establish a glide attitude is the first response to an engine failure after takeoff. In most cases, the landing should be planned straight ahead with only small changes in direction to avoid obstructions. Altitude and airspeed are seldom sufficient to execute a 180° gliding turn necessary to return to the runway. The checklist procedures assume that adequate time exists to secure the fuel and ignition systems prior to touchdown.

After an engine failure in flight, the best glide speed as shown in figure 3-1 should be established as quickly as possible. While gliding toward a suitable landing area, an effort should be made to identify the cause of the failure. If time permits, an engine restart should be attempted as shown in the checklist. If the engine cannot be restarted, a force landing without power must be completed.

FORCED LANDINGS

If all attempts to restart the engine fail and a forced landing is imminent, select a suitable field and prepare for the landing as discussed in the checklist for engine-off emergency landings.

Before attempting an "off-airport" landing with engine power available, one should drag the landing area at a safe but low altitude to inspect the terrain for obstructions and surface conditions, proceeding as discussed under the Precautionary Landing With Engine Power checklist

Prepare for ditching by securing or jettisoning heavy objects located in the baggage area and collect folded coats for protection of occupants' face at touchdown. Transmit Mayday message on 121.5 MHz giving location and intentions.

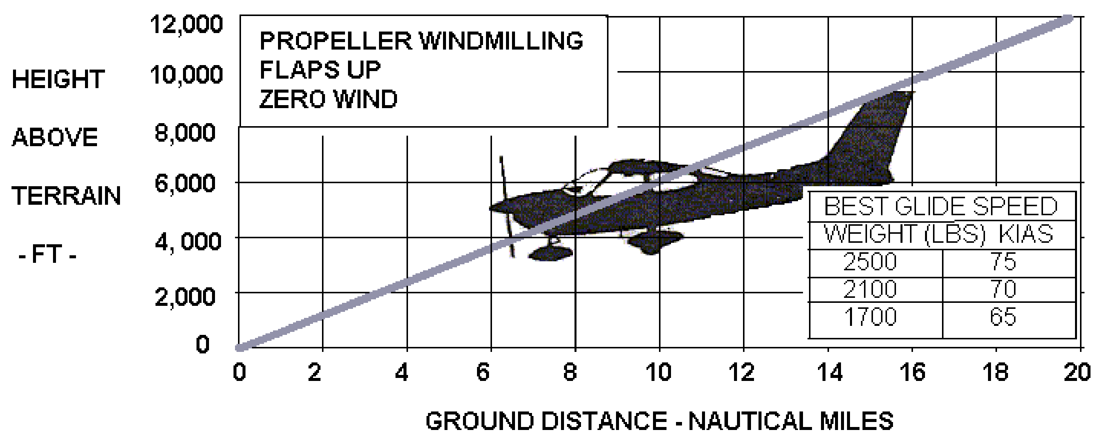

Figure 3-1 Maximum Glide

FIRES

Although engine fires are extremely rare in flight, the steps of the appropriate checklist should be followed if one is encountered. After completion of this procedure, execute a forced landing. Do not attempt to restart the engine.

The initial indication of an electrical fire is usually the odor of burning insulation. The checklist for this problem should result in the elimination of the fire.

EMERGENCY OPERATION IN CLOUDS
(Vacuum System Failure)

In the event of a vacuum system failure during flight in marginal weather, the directional indicator and attitude indicator will be disabled, and the pilot will have to rely on the turn coordinator or the turn and bank indicator if he inadvertently flies into clouds. The following instructions assume that only the electrically-powered turn coordinator or the turn and bank indicator is operative, and that the pilot is not completely proficient in instrument flying.

EXECUTING A 180° TURN IN COUDS

Upon inadvertently entering the clouds, an immediate plan should be made to turn back as follows:

1. Note the time of the minute hand and observe the position of the sweep second hand on the clock.
2. When the sweep second hand indicates the nearest half-minute, initiate a standard rate left turn, holding the turn coordinator symbolic airplane wing opposite the lower left index mark for 60 seconds. Then roll back to level flight by leveling the miniature airplane.
3. Check accuracy of the turn by observing the compass heading which should be the reciprocal of the original heading.
4. If necessary, adjust heading primarily with skidding motions rather than rolling motions so that the compass will read more accurately.
5. Maintain altitude and airspeed by cautious application of stabilator control. Avoid over-controlling by keeping the hands off the control wheel as much as possible and steering only with rudder.

EMERGENCY DESCENT THROUGH CLOUDS

If conditions preclude reestablishment of VFR flight by a 180° turn, a descent through a cloud deck to VFR conditions may be appropriate. If possible, obtain a radio clearance for an emergency descent through clouds. To guard against a spiral dive, choose an easterly or westerly heading to minimize compass card swings due to changing bank angles. In addition, keep hands off the control wheel and steer a straight course with rudder control by monitoring the turn coordinator. Occasionally check the compass heading and make minor corrections to hold an approximate course. Before descending into the clouds, set up a stabilized let-down condition as follows:

1. Apply full rich mixture.
2. Apply full carburetor heat.
3. Reduce power to set up a 500 to 800 ft / min rate of descent.
4. Adjust the stabilator and rudder trim control wheels for a stabilized descent at 80 KIAS.
5. Keep hands off of control wheel.
6. Monitor turn coordinator and make corrections by rudder alone.
7. Adjust rudder trim to relieve unbalanced rudder force, if present.
8. Check trend of compass card movement and make cautious corrections with rudder to stop turn.
9. Upon breaking out of clouds, resume normal cruising flight.

RECOVERY FROM A SPIRAL DIVE

If a spiral is encountered, proceed as follows:

1. Close the throttle.
2. Stop the turn by using coordinated aileron and rudder control to align the symbolic airplane in the turn coordinator with the horizon reference line.
3. Cautiously apply stabilator back pressure to slowly reduce the indicated airspeed to 80 KIAS
4. Adjust the stabilator trim control to maintain an 80 KIAS glide.

5. Keep hands off of the control wheel, using rudder control to hold a straight heading. Use rudder trim to relieve unbalanced rudder force, if present.
6. Apply carburetor heat.
7. Clear engine occasionally, but avoid using enough power to disturb the trimmed glide.
8. Upon breaking out of clouds, resume normal cruising flight.

FLIGHT IN ICING CONDITIONS

Flight into icing conditions is prohibited. An inadvertent encounter with these conditions can best be handled using the checklist procedures. The best procedure, of course, is to turn back or change altitude to escape the icing conditions.

STATIC SOURCE BLOCKED

If erroneous instrument readings are suspected due to water or ice in the pressure lines going to the standard external static pressure source, the alternate static source valve should be pulled on. To avoid the possibility of large errors, the vent windows should not be open when using the alternated static source. The Airspeed Calibration chart (Figure 5-1) reflects the errors under the most adverse condition (vents and windows open) and does not imply that the alternate static source should be used with that configuration. Theses speeds will provide an adequate margin of safety with vents and windows closed.

Altimeter readings may vary as much as 100 feet using the alternate static source with vents and windows open.

SPINS

Should an inadvertent spin occur, the following procedures should be used:

1. RETARD THROTTLE TO IDLE POSITION.
2. PLACE AILERONS IN NEUTRAL POSITION.
3. APPLY AND <u>HOLD</u> FULL RUDDER OPPOSITE TO THE DIRECTION OF ROTATION
4. JUST AFTER THE RUDDER REACHES THE STOP, MOVE THE WHEEL <u>BRISKLY</u> FORWARD FAR ENOUGH TO BREAK THE STALL
5. <u>HOLD</u> THESE CONTROL INPUTS UNTIL ROTATION STOPS. PREMATURE RELAXATION OF THE CONTROL INPUTS MAY EXTEND THE RECOVERY.
6. AS ROTATION STOPS, NEUTRALIZE RUDDER AND MAKE A SMOOTH RECOVERY FROM THE RESULTING DIVE

NOTE

If disorientation precludes a visual determination of the direction of rotation, the symbolic airplane in the turn coordinator or the needle of the turn and bank indicator may be referred to for this information.

For additional information on spins and spin recovery, see the discussion under SPINS in Normal Procedures (Section 4).

ROUGH ENGINE OPERATION OR LOSS OF POWER

CARBURETOR ICING

An unexplained drop in manifold pressure and eventual engine roughness may result from the formation of carburetor ice. To clear the ice, apply full throttle and pull the carburetor heat knot full out until the engine runs smoothly; then remove carburetor head and readjust the throttle. If conditions require the continued use of carburetor heat in cruise flight, use the minimum amount of heat necessary to prevent ice from forming and lean the mixture for smoothest engine operation.

SPARK PLUG FOULING

A slight engine roughness in flight may be caused by one or more spark plugs becoming fouled by carbon or lead deposits. This may be verified by turning the ignition switch momentarily from BOTH to either L or R position. An obvious power loss in single ignition operation is evidence of spark plug or magneto trouble. Assuming that spark plugs are the most likely cause, lean the mixture to the recommended lean setting for cruising flight. If the problem dos not clear up in several minutes, determine if a richer mixture setting will produce smoother operation. If not, proceed to the nearest airport for repairs using the BOTH position of the ignition switch unless extreme roughness dictates the use of single ignition position.

MAGNETO MALFUNCTION

A sudden engine roughness or misfiring is usually evidence of magneto problems. Switching from BOTH to L or R ignition switch position will identify which magneto is malfunctioning. Select different power settings and enrichen the mixture to determine if continued operation on BOTH magnetos is practicable. If not, switch to the good magneto and proceed to the nearest airport for repairs.

LOW OIL PRESSURE

If low oil pressure is accompanied by normal oil temperature, there is a possibility that the oil pressure gage or relief valve is malfunctioning or a leak has developed in the oil line from the engine to the oil pressure gage transducer on the firewall. A leak in this line is not necessarily cause for an immediate precautionary landing because an orifice in the line will prevent a sudden loss of oil from the engine sump. Low electrical system voltage will also cause low oil pressure gage readings. This can be verified by checking the condition of the electrical system and the indications of the other gages in the engine instrument cluster. As electrical system voltage to the instrument cluster drops, all gage readings will drop proportionally. In the event of a suspected mechanical or electrical malfunction, land as soon as practical to properly identify and correct the problem.

If a total loss of oil pressure is accompanied by a rise in oil temperature, there is good reason to suspect an engine failure is imminent. Reduce engine power immediately and select a suitable forced landing field. Use only the minimum power to reach the desired touchdown spot.

ELECTRICAL POWER SUPPLY SYSTEM MALFUNCTIONS

Malfunctions in the electrical power supply system can be detected by periodic monitoring of the ammeter and over-voltage warning light; however, the cause of these malfunctions is usually difficult to determine. A broken alternator drive belt or wiring is most likely the cause of alternator failures, although other factors could cause the problem. A damaged or improperly adjusted voltage regulator can also cause malfunctions. Problems of this nature constitute an electrical emergency and should be dealt with immediately. Electrical power malfunctions usually fall into two categories: excessive rate of charge and insufficient rate of charge. The following paragraphs describe the recommended remedy for each situation.

EXCESSIVE RATE OF CHARGE

After engine starting and heavy electrical usage at low engine speeds (such as extended taxiing) the battery condition will be low enough to accept above-normal charging during the initial part of a flight. However, after thirty minutes of cruising flight, the ammeter should be indicating less than two needle widths of charging current. If the charging rate were to remain above this value on a long flight, the battery would overheat and evaporate the electrolyte at an excessive rate. Electronic components in the electrical system could be adversely affected by higher than normal voltage if a faulty voltage regulator setting is causing the overcharging. To preclude these possibilities, an over-voltage sensor will automatically shut down the alternator and the over-voltage warning light will illuminate if the charge voltage reaches approximately 16 volts. Assuming that the malfunction was only momentary, an attempt should be made to reactivate the alternator system. To do this, turn both sides of the master switch off and on again. If the problem no longer exists, normal alternator charging will resume and the warning light will go off. If the light illuminates again, a malfunction is confirmed. In this even, the flight should be terminated and / or the current drain on the battery minimized because the battery can supply the electrical system for only a limited period of time. If the emergency occurs at night, power must be conserved for the later operation of the wing flaps and possible use of the landing lights during landing.

INSUFFICIENT RATE OF CHARGE

If the ammeter indicates a continuous discharge rate in flight, the alternator is not supplying power to the system and should be shut down since the alternator field circuit may be placing an unnecessary load on the system. All nonessential equipment should be turned off and the flight terminated as soon as practical. As system voltage deteriorates, all of the readings in the engine instrument cluster will drop proportionally. A complete electrical system failure will cause all readings (including oil pressure) to drop to zero.

SECTION 4
NORMAL PROCEDURES

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INTRODUCTION

Section 4 provides checklist and amplified procedures for the conduct of normal operations. Normal procedures associated with Optional Systems can be found in Section 9

SPEEDS FOR NORMAL OPERATION

Unless otherwise noted, he following speeds are based on a maximum weight of 2500 pounds and may be used for any lesser weight. However, to achieve the performance specified in Section 5 for takeoff distances, the speed appropriate to the particular weight must be used.

Takeoff:
- Normal climbout-- 65-75 KIAS
- Short Field Takeoff, Flaps 15°, speed at 50 feet--------------- 57 KIAS

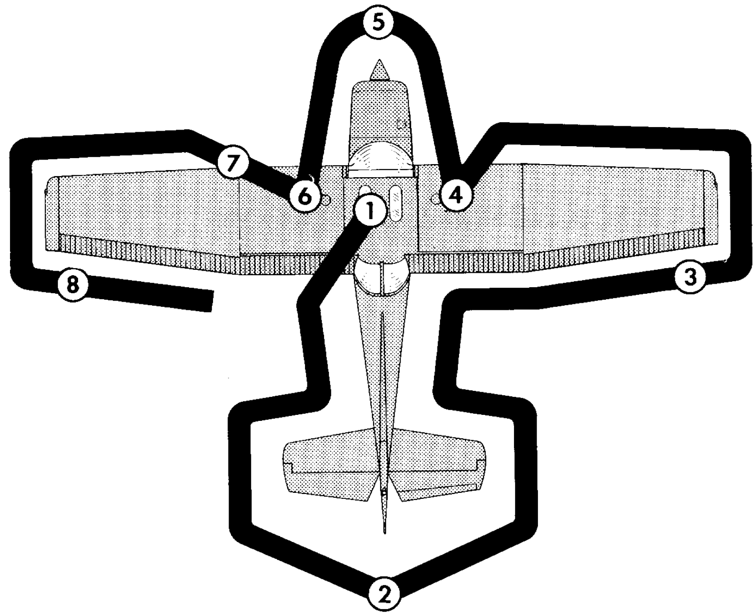
Enroute Climb, Flaps Up:
- Normal--- 75-85 KIAS
- Best Rate of Climb, Sea Level ------------------------------------ 79 KIAS
- Best Rate of Climb, 10,000 feet------------------------------------ 70 KIAS
- Best Angle of Climb, Sea Level ------------------------------------ 65 KIAS
- Best Angle of Climb, 10,000 feet ---------------------------------- 65 KIAS

Landing Approach:
- Normal Approach, Flaps Up ------------------------------------ 70-80 KIAS
- Normal Approach, Flaps 30°------------------------------------ 60-70 KIAS
- Short Field Approach, Flaps 30° ---------------------------------- 61 KIAS

Balked Landing:
- Maximum Power, Flaps 20° -- 65 KIAS

Maximum Recommended Turbulent Air Penetration Speed:
- 2500 Lbs --102 KIAS
- 2100 Lbs -- 93 KIAS
- 1700 Lbs -- 83 KIAS

Maximum Demonstrated Crosswind Velocity:
- Takeoff or Landing --16 Knots



NOTE

Visually check airplane for general condition during walk-around inspection. In cold weather, remove even small accumulations of frost, ice, or snow from wing, tail, and control surfaces. Also, make sure that control surfaces contain no internal accumulations of ice or debris. If a night flight is planned, check operation of all lights and make sure a flashlight is available.

Figure 4-1 Preflight Inspection

CHECKLIST PRCEDURES

PREFLIGHT INSPECTION

(1) CABIN

1. Control Wheel Lock - - REMOVE
2. Ignition Switch - - OFF
3. Master Switch - - ON
4. Fuel Quantity Indicators - - CHECK QUANTITY
5. Master Switch - - OFF
6. Fuel Selector Valve - - BOTH
7. Fuel Shutoff Valve Knob (Safety wired) - - ON
8. Baggage Door - - CHECK for security, lock with key if child's seat is to be occupied

(2) EMPENAGE

1. Rudder Gust Lock - - REMOVE
2. Tail Tie-Down - - DISCONNECT

3. Control Surfaces - - CHECK for freedom of movement and security

(3) RIGHT WING Trailing Edge

1. Aileron - - CHECK for freedom of movement and security
2. Fuel Tank Vent Opening (at wing tip trailing edge) - - CHECK for stoppage

(4) RIGHT WING

1. Wing Tie-Down - - DISCONNECT
2. Main Wheel Tire - - CHECK for proper inflation
3. Before first flight and after each refueling, use sampler cup and drain small quantity of fuel from fuel tank sump quick-drain valve to check for water, sediment and proper fuel grade.
4. Fuel Quantity – CHECK VISUALLY for desired level
5. Fuel Filler Cap - - SECURE

(5) NOSE

1. Static Source Openings (Both sides of fuselage) - - CHECK for stoppage
2. Engine Oil Level - - CHECK; do not operate with less than 6 quarts. Fill to eight quarts for extended flights.
3. Before first flight and after each refueling, use sampler cup and drain small quantity of fuel from fuel tank sump quick-drain valve to check for water, sediment. Check strainer drain closed If water is observed, the fuel system may contain additional water, and further draining of the system at the strainer, fuel tank sumps, fuel selector valve drain plug, fuel vent line drain plugs, and fuel reservoir quick-drain valve will be necessary
4. Propeller and Spinner - - CHECK for nicks, security and oil leaks
5. Carburetor Air Filter (inside left nose cap opening) - - CHECK for condition and cleanliness
6. Landing and Taxi Lights - - CHECK for condition and cleanliness
7. Nose Wheel Strut and Tire - - CHECK for proper inflation
8. Nose Tie-Down - - DISCONNECT

(6) LEFT WING

1. Main Wheel Tire - - CHECK for proper inflation
2. Before first flight and after each refueling, use sampler cup and drain small quantity of fuel from fuel tank sump quick-drain valve to check for water, sediment and proper fuel grade.
3. Fuel Quantity – CHECK VISUALLY for desired level
4. Fuel Filler Cap - - SECURE

(7) LEFT WING LEADING EDGE

1. Stall Warning Opening - - CHECK for stoppage. To check the system, place a clean handkerchief over the vent opening and apply suction; a sound from the waning horn will confirm system operation
2. Pitot Tube Cover - - REMOVE and check for stoppage
3. Wing Tie-Down - - DISCONNECT

(8) LEFT WING Trailing Edge

1. Fuel Tank Vent Opening (at wing tip trailing edge) - - CHECK for stoppage
2. Aileron - - CHECK for freedom of movement and security

BEFORE STARTING ENGINE

1. Preflight Inspection - - COMPLETE
2. Seats, Belts, Shoulder Harnesses - - ADJUST and LOCK
3. Fuel Selector Valve - - BOTH ON
4. Fuel Shutoff Knob - - ON (safety wire secure)
5. Radios, Autopilot, Electrical Equipment - - OFF
6. Brakes - - TEST and SET
7. Cowl Flaps - - OPEN (move lever out of locking hole to reposition)
8. Circuit Breakers - - IN

STARTING ENGINE

1. Mixture - - RICH
2. Propeller - - HIGH RPM
3. Carburetor Heat - - COLD
4. Master Switch - - ON
5. Prime - - AS REQUIRED (I to 6 strokes; none if engine is warm)
6. Throttle - - OPEN ½ INCH
7. Propeller Area - - CLEAR
8. Ignition Switch - - START (release when engine starts)
9. Oil Pressure - - CHECK

BEFORE TAKEOFF

1. Parking Break - - SET
2. Cabin Doors - - CLOSED AND LOCKED
3. Flight Controls - - FREE AND CORRECT
4. Flight Instruments - - CHECK
5. Fuel Shutoff Valve - - CHECK ON
6. Fuel Selector Valve - - BOTH ON
7. Mixture - - RICH (below 3000 feet)
8. Auxiliary Fuel Pump - - CHECK (then OFF)

NOTE

In flight, gravity feed will normally supply satisfactory fuel flow if the engine-driven pump should fail. However, if a fuel pump failure causes the fuel pressure to drop below 2 PSI, use the auxiliary fuel pump to assure proper engine operation.

9. Stabilator and Rudder Trim - - TAKEOFF
10. Throttle - - 1800 RPM
    a. Magnetos - - Check (RPM drop should not exceed 150 RPM on either magneto or 50 RPM differential between the magnetos)
    b. Propeller - - CYCLE from high to low RPM; return to high RPM (full in)
    c. Carburetor Heat - - CHECK for RPM drop
    d. Engine Instruments and Ammeter - - CHECK
    e. Suction Gage - - CHECK
11. Radios - - SET
12. Flashing Beacon, Navigation Lights and / or Strobe Lights - - ON as required
13. Throttle Friction Lock - - ADJUST

TAKEOFF

NORMAL TAKEOFF

1. Wing Flaps - - 0° – 10° (10° preferred)
2. Carburetor Heat - - OFF
3. Power - - FULL THROTTLE AND 2700 RPM
4. Stabilator Control - - LIFT NOSE WHEEL AT 50 KIAS
5. Climb speed - - 65 – 75 KIAS
6. Wing flaps - - RETRACT

SHORT FIELD TAKEOFF

1. Wing Flaps - - 15°
2. Carburetor Heat - - OFF
3. Brakes - - APPLY
4. Power - - FULL THROTTLE AND 2700 RPM
5. Mixture - - FULL RICH (lean for maximum power above 3000 feet)
6. Brakes - - RELEASE
7. Stabilator Control - - LIFT NOSE WHEEL AT 50 KIAS
8. Climb speed - - 57 KIAS until obstacles are cleared)
9. Wing flaps - - RETRACT slowly after obstacles are cleared

ENROUTE CLIMB

NORMAL CLIMB

1. Airspeed - - 75 – 85 KIAS
2. Power - - 24 inches Hg or FULL THROTTLE and 2500 – 2700 RPM
3. Mixture - - FULL RICH (Mixture may be leaned above 3000 feet)

4. Cowl Flaps - - OPEN as required

MAXIMUM PERFORMANCE CLIMB

1. Airspeed - - 79 KIAS at sea level to 70 KIAS at 10,000 feet
2. Power - - FULL THROTTLE and 2700 RPM
3. Mixture - - FULL RICH (mixture may be leaned above 3000 feet)
4. Cowl Flaps - - FULL OPEN

CRUISE

1. Power - - 15-24 INCHES Hg, 2100 – 2700 RPM (no more than 75% power)
2. Stabilator and Rudder Trim - - ADJUST
3. Mixture - - Lean
4. Cowl Flaps - - CLOSED

DESCENT

1. Power - - AS DESIRED

NOTE

Avoid continuous operation between 1700 and 1900 RPM with less than 10 inches Hg

2. Mixture - - RICH or lean for smooth operation
3. Carburetor Heat - - AS REQUIRED to prevent carburetor icing
4. Cowl Flaps - - CLOSED

BEFORE LANDING

1. Seats. Belts, Shoulder Harnesses, - - SECURE
2. Fuel Selector - - BOTH ON
3. Mixture – RICH
4. Carburetor Heat - - ON (apply full heat before closing throttle)
5. Propeller - - HIGH RPM (full in)

LANDING

NORMAL LANDING

1. Airspeed - - 70 – 80 KIAS (flaps UP)
2. Wing Flaps - - AS DESIRED (0° – 10° below 115 KIAS, 10° – 30° below 90 KIAS)
3. Airspeed 60 – 70 KIAS, (flaps DOWN)
4. Stabilator and Ruder Trim - - ADJUST
5. Touchdown - - MAIN WHEELS FIRST
6. Landing Roll - - LOWER NOSE WHEEL GENTLY
7. Braking - - MINIMUM REQUIRED

SHORT FIELD LANDING

1. Airspeed - - 70 – 80 KIAS (flaps UP)
2. Wing Flaps - - 30° (below 90 KIAS)
3. Airspeed - - Maintain at 61 KIAS

4. Stabilator and Ruder Trim - - ADJUST
5. Power - - REDUCE TO IDLE as obstacle is cleared.
6. Touchdown - - MAIN WHEELS FIRST
7. Braking - - APPLY HEAVILY
8. Wing Flaps - - RETRACT for maximum braking effectiveness

BALKED LANDING

1. Power - - FULL THROTTLE AND 2700 RPM
2. Carburetor Heat - - COLD
3. Wing Flaps - - RETRACT to 20°
4. Airspeed - - 65 KIAS
5. Wing Flaps - - RETRACT slowly
6. Cowl Flaps- - OPEN

AFTER LANDING

1. Wing Flaps - - RETRACT
2. Carburetor Heat - - COLD
3. Cowl Flaps- - OPEN

SECURING AIRPLANE

1. Parking Brake - - SET
2. Radios, Electrical Equipment, Autopilot - - OFF
3. Mixture - - IDLE CUT OFF (pull full out)
4. Ignition Switch - - OFF
5. Master Switch - - OFF
6. Control Lock - - INSTALL
7. Fuel Selector - - RIGHT

AMPLIFIED PROCEDURES

STARTING ENGINE

Ordinarily the engine starts easily with one or two strokes of the primer in warm temperatures to six strokes in cold weather, with the throttle open approximately ½ inch. In extremely cold temperatures, it may be necessary to continue priming while cranking. No priming is required when the weather is warm.

Weak intermittent firing followed by puffs of black smoke from the exhaust stack indicates over-priming or flooding. Excess fuel can be cleared from the combustion chambers by the following procedure: Set the mixture control full lean and the throttle full open; then crank the engine through several revolutions with the starter. Repeat the starting procedure without any additional priming.

If the engine is under-primed (most likely in cold weather with a cold engine) it will not fire at all, and additional priming will be necessary. As soon as the cylinders begin to fire, open the throttle slightly to keep it running.

After starting, if the oil pressure does not begin to show pressure within 30 seconds in the summertime and about twice that long in very cold weather, stop the engine and investigate. Lack of oil pressure can cause serious engine damage.

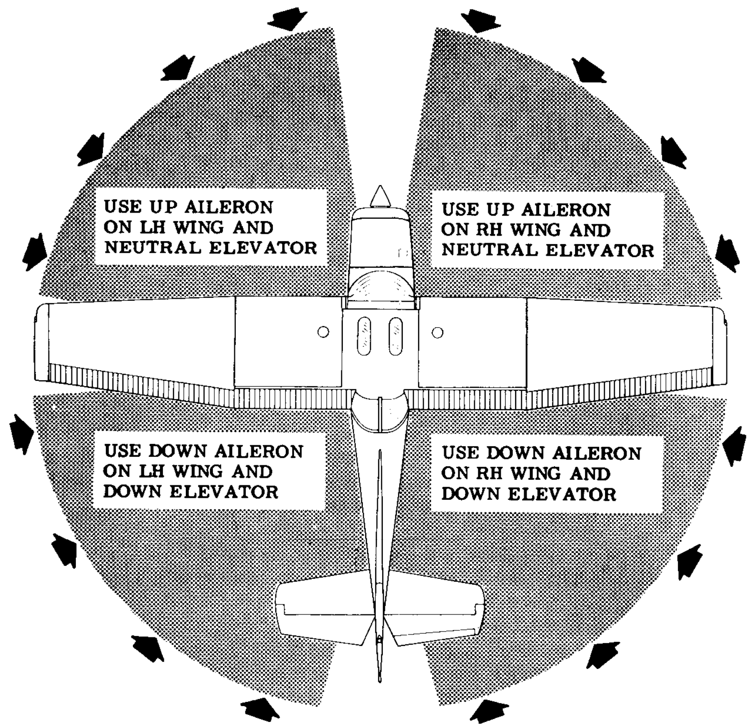
NOTE

Additional details concerning cold weather starting and operation may be found under COLD WEATHER OPERATIONS, paragraphs in this section.

TAXIING

When taxiing, it is important that speed and use of brakes be held to a minimum and that all control be utilized (see Taxiing Diagram, Figure 4-2) to maintain directional control and balance.

The carburetor heat control knob should be pushed full in during all ground operations unless absolutely necessary for smooth engine operation. When the knob is pulled out to the heat position, air entering the engine is not filtered.



CODE	NOTE
WIND DIRECTION ➡	Strong quartering tail winds require caution. Avoid sudden bursts of the throttle and sharp braking when the airplane is in this attitude. Use the steerable nose wheel and rudder to maintain direction.

Figure 4-2. Taxiing Diagram

Taxiing over loose gravel or cinders should be done at low engine speed to avoid abrasion and stone damage to the propeller tips.

BEFORE TAKEOFF

WARM-UP

Since the engine is closely cowled for efficient in-flight engine cooling, precautions should be taken to avoid overheating during prolonged engine operation on the ground. Also, long periods of idling at low RPM may cause fouled spark plugs. If the engine accelerates smoothly, the airplane is ready for takeoff.

MAGNETO CHECK

The magneto check should be made at 1800 RPM as follows. Move the ignition switch first to the R position and note RPM. Next move switch back to BOTH to clear the other set of plugs. Then move switch to L position, note RPM and return the switch to the BOTH position. RPM drop should not exceed 150 RPM on either magneto or show greater than 50 RPM differential between magnetos. A smooth drop off past normal is usually a sign of a too lean or too rich mixture. If there is a doubt concerning operation of the ignition system, RPM checks at a leaner mixture or at higher engine speeds will usually confirm whether deficiency exists.

An absence of RPM drop may be an indication of faulty grounding of one side of the ignition system or should be cause for suspicion that the magneto timing is set in advance of the setting specified.

ALTERNATOR CHECK

Prior to flights where verification of proper alternator and voltage regulator operation is essential (such as night or instrument flights) a positive verification can be made by loading the electrical system momentarily (3 to 5 seconds) with the landing light (if so equipped), or by operation the wing flaps during the engine runup (1800 RPM). The ammeter will remain within a needle width of its initial position if the alternator and voltage regulator are operating properly.

TAKEOFF

POWER CHECK

It is important to check full-throttle engine operation early in the takeoff run. Any sign of rough engine operation or sluggish engine acceleration is good cause for discontinuing the takeoff.

Smooth and uniform throttle application should be used to ensure best engine acceleration and to give long engine life. This technique is important under hot weather conditions which may cause a rich mixture that could hinder engine response if the throttle is applied too rapidly.

Full-throttle runups over loose gravel are especially harmful to propeller tips. When takeoffs must be made over a gravel surface, it is very important that the throttle be advanced slowly. The allows the airplane to start rolling before high RPM is developed, and the gravel will be blow back of the propeller rather than pulled into it. When unavoidable small dents appear in the propeller blades, they should be corrected immediately as described in Section 8 under Propeller Care.

Prior to takeoff from fields above 3,000 feet elevation, the mixture should be leaned to give maximum power.

After full throttle is applied, adjust the throttle friction lock clockwise to prevent the throttle from creeping back from a maximum power position. Similar friction lock adjustment should be made as required in other flight conditions to maintain a fixed throttle setting.

WING FLAP SETTINGS

Takeoffs are accomplished with the wing flaps set in the 0° to 15° position. The preferred flap setting for normal takeoff is 10°. This flap setting (in comparison to flaps-up) produces a shorter ground run, easier lift-off, shorter total distance over the obstacle, and increased visibility over the nose in the initial climb-out.

For minimum takeoff distance, a 15° flap setting should be used. This setting gives approximately 15% shorter ground run and total distance as compared to the 10° flap setting. Flap settings of greater than 15° are not approved for takeoff.

CROSSWIND TAKEOFF

Takeoffs into strong crosswinds normally are performed with the minimum flap setting necessary for the field length, to minimize the drift angle immediately after takeoff. The airplane is accelerated to a speed slightly higher than normal, then pulled off abruptly to prevent possible settling back to the runway while drifting. When clear of the ground, make a coordinated turn into the wind to correct for drift.

ENROUTE CLIMB

Normal climbs are performed at 75 to 85 KIAS with flaps up and reduced power (down to 24 inches of manifold pressure and 2500 RPM) for increased passenger comfort due to lower noise level. The mixture should be full rich below 3000 feet and may be leaned above 3000 feet for smoother engine operation. The best rate-of-climb speeds range from 79 KIAS at sea level to 70 KIAS at 10,000 feet. If an obstacle dictates the use of a steep climb angle, an obstacle clearance speed of 65 KIAS should be used with flaps up and full throttle at all altitudes.

CRUISE

Normal cruising is performed between 55% and 75% power. The corresponding power settings and fuel consumption for various altitudes can be determined by using your Cessna Power Computer or the data in Section 5.

NOTE

Cruising should be done at 65% to 75% power until a total of 50 hours has accumulated or oil consumption has stabilized. This is to ensure 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 Cruise Performance Table, figure 4-3, illustrates the true airspeed and nautical miles per gallon during cruise for various altitudes and percent power.

This table should be used as a guide, along with the available winds aloft information, to determine the most favorable altitude and power setting for a given trip. The selection of cruise altitude on the basis of the most favorable wind conditions and the use of low power settings are significant factors shat should be considered on every trip to reduce fuel consumption.

	75% POWER		65% POWER		55% POWER	
ALTITUDE	KTAS	NMPG	KTAS	NMPG	KTAS	NMPG
Sea Level	120	11.9	112	13.0	103	14.1
5,000 ft	125	12.4	117	13.6	106	14.5
10,000 ft	130	12.9	121	14.1	109	14.9
Standard Conditions						Zero Wind

Figure 4-3 Cruise Performance Table

The tachometer is marked with a green arc from 2100 to 2700 RPM with a step at 2500 RPM. The use of 2500 RPM will allow 75% power at altitudes up to 8000 feet on a standard day. For hot day or high altitude conditions, the cruise RPM may be increased to 2700 RPM. Cruise at 2700 RPM permits the use of 75% power at altitudes up to 10,000 feet on a standard day. However, for reduce noise levels it is desirable to select the lowest RPM in the green arc range for a given power that will provide smooth engine operation.

The cowl flaps should be opened, if necessary, to maintain the cylinder head temperature at approximately three-fourths of the normal operating range (green arc).

Cruise performance data in this handbook and on the power computer is based on a recommended lean mixture setting which should be established as follows:

1. Lean the mixture until the engine becomes rough
2. Enrich the mixture to obtain smooth engine operation; then further enrich the mixture an equal amount.

For best fuel economy at 75% power or less, the engine may be operated at the leanest mixture that results in smooth engine operation. This can result in approximately 10 percent greater range than shown in this handbook accompanied by approximately 4 knots decrease in speed.

Any change in altitude, power or carburetor heat will require a change in the lean mixture setting and recheck of the EGT setting (if installed).

Carburetor ice, as evidenced by an unexplained drop in manifold pressure, can be removed by application of full carburetor heat. Upon regaining the original manifold pressure indication (with heat off), use the minimum amount of heat (by trial and error) to prevent ice from forming. Since heated air causes a richer mixture, readjust the mixture setting if carburetor heat is used continuously in cruising flight.

The use of carburetor heat is recommended during flight in very heavy rain to avoid the possibility of engine stoppage due to excessive water ingestion. The mixture setting should be readjusted for smoothest operation.

MIXTURE DESCRIPTION	EXHAUST GAS TEMPERATURE
RECOMMENDED LEAN (Pilots Operating Handbook and Power Computer)	50° rich of Peak EGT
BEST ECONOMY	Peak EGT

Figure 4-4, EGT Table

LEANING WITH A CESSNA ECONOMY MIXTURE INDICATOR (EGT)

Exhaust gas temperature (EGT) as shown on the optional Cessna Economy Mixture Indicator may be used as an aid for mixture leaning in cruising flight at 75% power of less. To adjust the mixture, using this indicator, lean to establish the peak EGT as a reference point, and then enrichen the mixture by a desired increment based on figures in the table above. As noted in this table, operation at peak EGT provides the best fuel economy. This can result in approximately 10 percent greater range than shown in this handbook accompanied by approximately 4 knots decrease in speed.

When leaning the mixture under some conditions, engine roughness may occur before peak EGT is reached. In this case, use the EGT corresponding to the onset of roughness as the reference point instead of peak EGT.

STALLS

The stall characteristics are conventional and aural warning is provided by a stall warning horn which sounds between 5 and 19 knots above the stall in all configurations.

SPINS

Intentional spins are approved in the airplane (see Section 2). Spins with the rear seats occupied and / or baggage loadings are not approved. Before attempting to perform spins several items should be carefully considered to assure a safe flight. No spins should be attempted without first having received dual instruction both in spin entries and spin recoveries from a qualified instructor who is familiar with the spin characteristics of the Cessna 177B.

The cabin should be clean and loose equipment (including the microphone) should be stowed. For a solo flight in which spins will be conducted, the copilot's seat belt and shoulder harness and rear seat belts should be secured.

The seat belts and shoulder harnesses should be adjusted to provide proper restraint during all anticipated flight conditions. However, care should be taken to ensure that the pilot can easily reach the flight controls and produce maximum control travels.

It is recommended that, where feasible, entries be accomplished at high enough altitude that recoveries are completed 4000 feet or more above ground level. At least 1000 feet of altitude loss should be allowed for a 1-turn spin and recovery, while a 6-turn spin and recovery may require somewhat more than twice that amount. For example, the recommended entry altitude for a 6-turn spin would be 6000 feet above ground level. In any case, entries should be planned so that recoveries are completed well above the minimum 1500 feet above ground level required by FAR 91.71. Another reason for using high altitudes for practicing spins is that a greater field of view is provided which will assist in maintaining pilot orientation.

The normal entry is made from a power-off stall. As the stall is approached, the stabilator control should be smoothly pulled to the full aft position. Just prior to reaching the stall ”break”, rudder control in the desired direction of the spin rotation should be applied so that full rudder deflection is reached almost simultaneously with reaching full nose-up stabilator. A slightly greater rate of deceleration than for normal stall entries or the use of partial power at the entry will assure more consistent and positive entries to the spin. Care should be taken to avoid using aileron control since its application can increase the rotation rate and cause erratic rotation. Both stabilator and rudder controls should be held full with the spin until the spin recovery is initiated. Any inadvertent relaxation of either of these controls could result in the development of a nose-down spiral.

For the purpose of training in spins and spin recoveries, a 1 to 2 turn spin is adequate and should be used. Up to 2 turns the spin will progress to a fairly rapid rate of rotation and a steep attitude. Application of recover controls will produce prompt recoveries of from ¼ to ½ of a turn.

Regardless of how many turns the spin is held or how it is entered, the following recovery technique should be used:

1. VERIFY THAT THROTLE IS IN IDLE POSITION AND AILERONS ARE NEUTRAL
2. APPLY AND HOLD FULL RUDDER OPPOSITE TO THE DIRECTION OF ROTATION.
3. JUST AFTER THE RUDDER REACHES THE STOP, MOVE THE CONTROL WHEEL BRISKLY FORWARD FAR ENOUGH TO BREAK THE STALL
4. HOLD THESE CONTROL INPUTS UNTIL ROTAION STOPS. Premature relaxation of the control inputs may extend the recovery.

5. AS ROTATION STOPS, NEUTRALIZE RUDDER, AND MAKE A SMOOTH RECOVERY FROM THE RESULTING DIVE.

NOTE

If disorientation precludes a visual determination of the direction of rotation, the symbolic airplane in the turn coordinator or the needle of the turn and bank indicator may be referred to for this information.

Variations in the basic airplane rigging or in weight and balance due to installed equipment or cockpit occupancy can cause differences in behavior, particularly in extended spins. These differences are normal and will result in variations in the spin characteristics and in recovery lengths for spins of more than 3 turns. However, the above recovery procedure should always be used and will result in the most expeditious recovery from any spin.

Intentional spins with flaps extended are prohibited, since the high speeds which may occur during recovery are potentially damaging to the flap/wing structure.

LANDING

Normal landing approaches can be made with power on or power off and at any flap setting. Surface winds and air turbulence are usually the primary factors in determining the most comfortable approach speeds. Slips are permitted with any flap setting. Actual touchdown should be made with power off and on the main wheels first. The nose wheel should be lowered smoothly to the runway as speed is diminished

Full down stabilator (control positioned full forward) should not be used during the ground roll. This reduces the weight on the main wheels which causes poor braking and increases the possibility of sliding the tires.

SHORT FIELD LANDING

For a short field landing in smooth air conditions, make an approach at the minimum recommended airspeed of 61 KIAS with full flaps using enough power to control the glide path. (Slightly higher approach speeds should be used under turbulent air conditions.) After all approach obstacles are cleared, progressively reduce power and maintain the approach speed by lowering the nose of the airplane. Touchdown should be made with power off and on the main wheels first. Immediately after touchdown, lower the nose wheel and apply heavy braking as required. For maximum brake effectiveness, retract the flaps, hold the control wheel full back, and apply maximum brake pressure without sliding the tires.

CROSSWIND LANDING

When landing in a crosswind, use the minimum flap setting required for the field length. Although the crab or combination method of drift correction may be used, the wing-low method gives the best control. After touchdown, hold a straight course with the steerable nose wheel and occasionally braking if necessary.

BALKED LANDING

In balked landing (go-around) climb, apply full throttle smoothly, remove carburetor heat, and reduce wing flaps promptly to 20°. Upon reaching 65 KIAS, flaps should be slowly retracted to the full up position.

If obstacles are immediately ahead during the go-around, the wing flaps should be left at 20° until the obstacles are cleared, and, at field elevations above 3000 feet, the mixture should be leaned for maximum power.

COLD WEATHER OPERATION

STARTNG

Prior to starting on a cold morning, it is advisable to pull the propeller through several times by hand to “break loose” or “limber” the oil, thus conserving battery energy.

NOTE

When pulling the propeller through by hand, treat it as if the ignition switch is turned on. A loose or broken ground wire on either magneto could case the engine to fire.

In extremely cold (-30° C and lower) weather, the use of an external pre-heater and an external power source are recommended whenever possible to obtain starting and to reduce wear and abuse to the engine an electrical system. Pre-heat will thaw the oil trapped in the oil cooler, which will probably be congealed prior to starting in extremely cold temperatures. When using an external power source, the position of the master switch is important. Refer to Section 7, paragraph Ground Service Plug Receptacle, for operating details.

Cold weather starting procedures are as follows:

With Preheat:

1. With ignition switch turned off and throttle closed, prime the engine four to eight strokes as the propeller is being turned over by hand.

NOTE

Use heavy strokes of the primer for best atomization of fuel. After priming, push primer all the way in and turn to the locked position to avoid the possibility of the engine drawing fuel through the primer.

2. Mixture - -FULL RICH
3. Propeller - - HIGH RPM
4. Propeller area - - CLEAR
5. Master Switch - - ON
6. Throttle - - OPEN ½ INCH
7. Ignition Switch - - START (release to BOTH when the engine starts).
8. Oil pressure - - CHECK

Without Preheat:

1. Prime the engine six to ten stokes while the propeller is being turned by hand with the throttle closed. Leave the primer charged and ready for a stroke
2. Mixture - -FULL RICH
3. Propeller - - HIGH RPM
4. Propeller area - - CLEAR
5. Master Switch - - ON
6. Ignition Switch - - START
7. Pump throttle rapidly to full open twice. Return to ½ inch open position
8. Release ignition switch to BOTH when engine starts
9. Continue to prime the engine until it is running smoothly, or alternately, pump the throttle rapidly over the first ¼ of total travel.
10. Oil pressure - - CHECK
11. Pull carburetor heat knob full on after the engine has started. Leave on until the engine is running smoothly
12. Primer - -LOCKED

NOTE

If the engine does not start during the first few attempts, or if the engine firing diminishes in strength, it is probable that the plugs have frosted over. Preheat must be used before another start is attempted.

CAUTION

Pumping the throttle may cause raw fuel to accumulate in the air intake air duct, creating a fire hazard in the event of a backfire. If this occurs, maintain a cranking action to suck the flames into the engine. An outside attendant with a fire extinguisher is advised for cold starts without preheat.

During cold weather operation, no indication will be apparent on the oil temperature gage prior to takeoff if outside air temperatures are very cold. After a suitable warm-up period (2 to 5 minutes at 1000 RPM), accelerated the engine smoothly to higher RPM. If the engine accelerates smoothly and the oil pressure remains normal and steady, the airplane is ready for takeoff.

FLIGHT OPERATIONS

Takeoff is made normally with the carburetor heat off. Avoid excessive leaning in cruise. Carburetor heat may be used to overcome any engine roughness due to uneven mixture distribution or ice.

When operating in temperatures below -18°C, avoid using partial carburetor heat. Partial heat may increase the carburetor air temperature to the 0° to 21° C range, where icing is critical under certain atmospheric conditions.

HOT WEATHER

The general warm temperature starting information in this section is appropriated. Avoid prolonged engine operation on the ground.

NOISE ABATEMENT

Increased emphasis on improving the quality of our environmental 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, buy application of the following suggested procedures, and thereby tend to build public support.

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 takeoff and descent for landing should be made so as to avoid prolonged flight at low altitude near noise-sensitive areas.

NOTE

The above recommended procedures do no apply where they would conflict with Air Traffic Control clearances or instructions, or where, in the pilot's judgment, an altitude of les than 2000 feet is necessary for him to adequately exercise his duty to see and avoid other aircraft.

SECTION 5
PERFORMANCE

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NOTE: AIRCRAFT N110PF IS EQUIPPED WITH STANDARD TANKS.

INTRODUCTION

Performance data charts on the following pages are presented so that you may know what to expect from the airplane under various conditions, and also to facilitate the planning of flights in detail and with reasonable accuracy. The data in the charts has been computed from actual flight tests with the airplane and engine in good condition and using average piloting skills.

It should be noted that the performance information presented in the range and endurance profile charts allows for 45 minutes reserve fuel based on 45% power. Fuel flow data for cruise is based on the recommended lean mixture setting. Some indeterminate variables such as mixture leaning technique, fuel metering characteristics, engine and propeller condition, and air turbulence may account for variations of 10% or more in range and endurance. Therefore, it is important to utilize all available information to estimate the fuel required for the particular flight.

USE OF PERFORMANCE CHARTS

Performance data is presented in tabular or graphical form to illustrate the effect of different variables. Sufficiently detailed information is provided in the tables so that conservative values can be selected and used to determine the particular figure with reasonable accuracy.

SAMPLE PROBLEM

The following sample flight problem utilized information from the various charts to determine the predicted performance data for a typical flight. The following information is known:

AIRPLANE CONFIGURATION
Takeoff weight------------------------------ 2450 Pounds
Usable fuel --------------------------------------49 Gallons
TAKEOFF CONDITIONS
Field pressure altitude-------------------------1500 Feet
Temperature ------------ 28°C (16°C above Standard)
Wind component along runway --12 Knot Headwind
Field Length--------------------------------------3500 Feet
CRUISE CONDITIONS
Total Distance ------------------------510 Nautical Miles
Pressure altitude--------------------------------5500 Feet
Temperature ------------ 20°C (16°C above Standard)
Expected Wind Enroute------------10 Knot Headwind
LANDING CONDITIONS
Field pressure altitude-------------------------2200 Feet
Temperature -- 25°C
Field Length--------------------------------------3000 Feet

TAKEOFF

The takeoff chart, figure 5-4, should be consulted, keeping in mind that the distances shown are based on the short field technique. Conservative distances can be established by reading the chart at the next higher value of weight, altitude and temperature. For example, in this particular sample problem, the takeoff distance information presented for a weight of 2500 pound, pressure altitude of 2000 feet and a temperature of 30°C should be used and results in the following:

Ground Roll	955 Feet
Total to clear a 50-foot obstacle	1865 Feet

These distances are well within the available takeoff field length. However, a correction for the effect of wind may be made based on Note 3 of the takeoff chart. The correction for 12-knot headwind is:

(12 knots divided / 9 knots) X 10% = 13% Decrease

This results in the following distance, corrected for wind:

Ground roll	995 feet
Decrease in ground roll (995 X 13%)	129 feet
Corrected ground roll	866 feet
Total distance to clear a 50-foot obstacle, zero wind	1865 feet
Decrease in total distance (1865 feet X 13%)	242 feet
Corrected total distance to clear a 50-foot obstacle	1623 feet

CRUISE

The cruising altitude should be selected based on a consideration of trip length, winds aloft, and the airplane's performance. A cruising altitude and the expected wind enroute have been given for this sample problem. However the power setting selection for cruise must be determined based on several considerations. These include the cruise performance characteristics presented in figure 5-7, the range profile chart presented in figure 5-8, and the endurance profile chart presented in figure 5-9

The relationship between power and range is illustrated by the range profile chart. Considerable fuel savings and longer range result when lower power settings are used.

The range profile chart indicates that use of 65% power ant 5500 feet yields a predicted range of 571 nautical miles with no wind. The endurance profile chart shows a corresponding 4.9 hours. Using this information, the estimated distance can be determined for the expected 10 knot headwind at 5500 feet as follows:

Range, zero wind	571 Nautical Miles
Decrease in range due to wind (4.9 hours X 10 knot headwind)	49 Nautical Miles
Corrected Range	522 Nautical Miles

This indicates that the trip can be made without a fuel stop using approximately 65% power.

The cruise performance chart for 6000 feet pressure altitude is entered using 20°C above standard temperature. These values most nearly correspond to the planned altitude and expected temperature conditions. The power setting chosen is 2400 RPM and 21 inches of manifold pressure which results in the following:

Power	65%
True Airspeed	120 knots
Cruise fuel flow	8.6 GPH

The power computer may be used to determine the power and fuel consumption more accurately during the flight.

FUEL REQUIRED

The total fuel requirement for the flight may be estimated using the performance information

The total fuel requirement for the flight may be estimated using the performance information in figures 5-6 and 5-7. For this sample problem figure 5-6 shows that a normal climb from 2000 feet to 6000 feet requires 1.6 gallons of fuel. The corresponding distance during the climb is 12 nautical miles. These values are for a standard temperature and are sufficiently accurate for most flight planning purposes. However, a further correction for the effect of temperature may be made as noted on the climb chart. The approximate effect of a non-standard temperature is to increase the time, fuel, and distance by 10% for each 10°C above standard temperature, due to the lower rate of climb. In this case, assuming a temperature 16°C above standard, the correction would be:

16°C / 10°C X 10% = 16% Increase

With this factor included, the fuel estimate would be calculated as follows:

Fuel to climb, standard temperature	1.6 gallons
Increase due to non-standard temperature	
(1.6 X 16%)	0.3 gallons
Corrected fuel to climb	1.9 gallons

Using a similar procedure for the distance during climb results in 1.4 nautical miles

The resultant cruise distance is:

Total distance	510 nautical miles
Climb distance	-14 nautical miles
Cruise distance	496 nautical miles

With an expected 10 knot headwind, the ground speed for cruise is predicted to be:

120
-10
110 knots

Therefore, the time required for the cruise portion of the trip is:

496 nautical miles / 110 knots = 4.5 hours

The fuel required for cruise is

4.5 hours X 8.6 gallons per hour = 38.7 gallons

The total estimated fuel required is as follows:

Engine start, taxi, and takeoff	1.4 gallons
Climb	1.9 gallons
Cruise	38.7 gallons
Total fuel required	42 gallons

The will leave a fuel reserve of

49.0 gallons
-42.0 gallons
7.0 gallons

Once the flight is underway, ground speed check will provide a more accurate basis for estimating the time enroute and the corresponding fuel required to complete the trip with ample reserve.

LANDING

A procedure similar to takeoff should be used for estimating the landing distance at the destination airport. Figure 5-10 presents landing distance information for the short field technique. The distances corresponding to 2000 feet pressure altitude and a temperature of 30°C are as follows:

Ground roll	680 feet
Total distance to clear a 50-foot obstacle	1335 feet

A correction for the effect of wind may be made based on Note 2 of the landing chart using the same procedure as outlined for takeoff.

AIRSPEED CALIBRATION
HEATED PITOT

NORMAL STATIC SOURCE

FLAPS UP													
KIAS	40	50	60	70	80	90	100	110	120	130	140	150	160	170
KCAS	44	53	63	72	81	90	99	109	118	127	136	145	154	163
FLAPS 15°														
KIAS	40	50	60	70	80	90								
KCAS	46	54	63	72	81	90								
FLAPS 30°														
KIAS	40	50	60	70	80	90								
KCAS	46	55	63	72	81	90								

ALTERNATE STATIC SOURCE
VENTS AND WINDOWS OPEN

FLAPS UP														
KIAS	40	50	60	70	80	90	100	110	120	130	140	150	160	170
KCAS	45	55	65	74	84	94	104	114	124	134	143	153	163	172
FLAPS 15°														
KIAS	40	50	60	70	80	90								
KCAS	46	56	66	76	86	96								
FLAPS 30°														
KIAS	40	50	60	70	80	90								
KCAS	47	57	66	76	85	94								

Figure 5-1 Airspeed Calibration

TEMPERATURE CONVERSION CHART

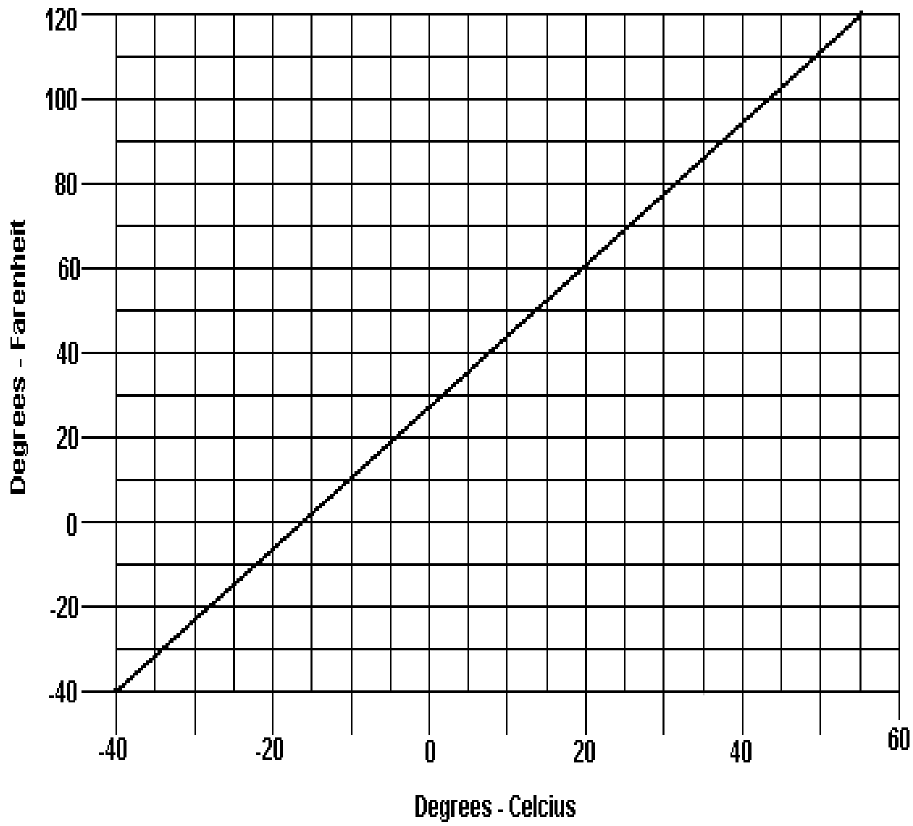

Figure 5-2 Temperature Conversion Chart

STALL SPEEDS

Conditions:
Power Off

Notes:
1. Maximum altitude loss during a stall recovery may be as much at 180 feet
2. KIAS values are approximate

MOST REARWARD CENTER OF GRAVITY

Weight (lbs)	FLAP DEFLECTION	ANGLE OF BANK							
		0°		30°		45°		60°	
		KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
2500	UP	52	55	56	59	62	65	74	78
	30°	45	50	48	54	54	59	64	71
	45°	40	46	43	49	48	55	57	65

MOST FORWARD CENTER OF GRAVITY

Weight (lbs)	FLAP DEFLECTION	ANGLE OF BANK							
		0°		30°		45°		60°	
		KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
2500	UP	54	57	58	61	64	68	76	81
	30°	47	52	51	56	56	62	66	74
	45°	45	50	48	54	54	59	64	71

Figure 5-3. Stall Speeds

TAKEOFF DISTANCE
MAXIMUM WEIGHT 2500 LBS
SHORT FIELD

Conditions:
Flaps 15°
2700 RPM and full throttle prior to brake release
Cowl Flaps Open
Paved, Level, Dry, Runway
Zero wind

Notes:
1. Short field technique as specified in Section 4
2. Prior to takeoff from fields above 3,000 feet elevation, the mixture should be leaned to give maximum power in a full throttle static runup
3. Decrease distances 10% for each 9 knots of headwind. For operation with tailwinds up to 10 knots, increase distance 10% for each 2 knots.
4. Where distance value has been deleted, climb performance after takeoff is less than 150 fpm at takeoff speed
5. For operation on a dry, grass runway, increase distances by 15% of the “ground roll” figure.

Weight (lbs)	Takeoff speed, KIAS		Press Alt (ft)	0°C		10°C		20°C		30°C		40°C	
	Lift off	At 50’		Ground Roll	Total to Clear 50’ OBS	Ground Roll	Total to Clear 50’ OBS	Ground Roll	Total to Clear 50’ OBS	Ground Roll	Total to Clear 50’ OBS	Ground Roll	Total to Clear 50’ OBS
2500	52	57	S.L.	675	1270	725	1355	775	1445	830	1545	890	1650
			1000	735	1385	790	1480	850	1585	910	1695	970	1810
			2000	805	1520	865	1625	930	1740	995	1865	1065	1995
			3000	880	1670	950	1790	1015	1920	1090	2055	1170	2205
			4000	965	1840	1040	1975	1115	2125	1200	2280	1285	2455
			5000	1065	2035	1145	2195	1230	2360	1320	2545	1415	2745
			6000	1170	2270	1260	2450	1355	2645	1455	2860	1560	3100
			7000	1290	2540	1390	2750	1495	2985	1605	3240	----	----
			8000	1425	2685	1535	3120	1655	3400	----	----	----	----

Figure 5-4. Take off Distance (Sheet 1 of 2)

TAKEOFF DISTANCE
2300 and 2100 LBS
SHORT FIELD

REFER TO SHEET 1 FOR APPROPRIATE CONDITIONS AND NOTES

Weight (lbs)	Takeoff speed, KIAS		Press Alt (ft)	0°C		10°C		20°C		30°C		40°C	
	Lift off	At 50'		Ground Roll	Total to Clear 50' OBS	Ground Roll	Total to Clear 50' OBS	Ground Roll	Total to Clear 50' OBS	Ground Roll	Total to Clear 50' OBS	Ground Roll	Total to Clear 50' OBS
2300	50	55	S.L.	555	1050	595	1120	640	1195	685	1720	730	1355
			1000	605	1145	650	1220	700	1300	745	1385	800	1480
			2000	665	1250	710	1335	765	1425	815	1520	875	1620
			3000	725	1365	780	1460	835	1560	895	1670	955	1785
			4000	795	1500	855	1605	915	1720	980	1840	1050	1970
			5000	870	1650	935	1770	1005	1900	1075	2035	1155	2185
			6000	955	1825	1030	1960	1105	2105	1185	2265	1270	2435
			7000	1055	2025	1135	2180	1220	2350	1305	2530	1400	2730
			8000	1160	2260	1250	2440	1345	2635	1445	2850	1550	3090
2100	48	53	S.L.	450	865	485	920	520	980	555	1040	590	1105
			1000	495	940	530	1000	565	1065	605	1130	645	1205
			2000	535	1020	575	1090	615	1160	660	1235	705	1315
			3000	585	1115	630	1190	675	1265	720	1350	770	1440
			4000	640	1215	690	1300	740	1390	790	1480	845	1580
			5000	705	1335	755	1425	810	1525	865	1630	930	1740
			6000	770	1465	830	1570	890	1680	955	1800	1020	1925
			7000	850	1620	910	1735	980	1860	1050	1995	1125	2140
			8000	935	1790	1005	1925	1080	2070	1155	2225	1240	2390

Figure 5-4. Take off Distance (Sheet 2 of 2)

RATE OF CLIMB
MAXIMUM

Conditions:
Flaps Up
2700 RPM
Full Throttle
Cowl Flaps Open

NOTE:
Mixture leaned above 3000 feet for maximum power

WEIGHT LBS	PRESS ALT FT	CLIMB SPEED KIAS	RATE OF CLIMB - FPM			
			-20°C	0°C	20°C	40°C
2500	S.L.	79	970	895	820	745
	2000	77	850	780	705	635
	4000	76	730	660	590	525
	6000	74	610	545	480	410
	8000	72	495	430	365	300
	10000	70	375	315	255	----
	12000	68	260	200	140	----

Figure 5-5. Rate of Climb

TIME, FUEL, AND DISTANCE TO CLIMB
MAXIMUM RATE OF CLIMB

Conditions:
Flaps Up
2700 RPM
Full Throttle
Cowl Flaps Open
Standard Temperature

NOTE:
1. Add 1.4 gallons of fuel for engine start, taxi and takeoff allowance
2. Mixture leaned above 3000 feet for maximum power
3. Increase time, fuel and distance by 10% for each 10°C above standard temperature
4. Distances shown are based on zero wind

WEIGHT LBS	PRESS ALT FT	TEMP °C	CLIMB SPEED KIAS	RATE OF CLIMB - FPM	FROM SEA LEVEL		
					TIME MIN	FUEL USED GALLONS	DISTANCE NM
2500	S.L.	15	79	840	0	0	0
	1000	13	78	790	1	0.3	2
	2000	11	77	740	3	.70.7	3
	3000	9	77	685	4	1.1	5
	4000	7	76	635	6	1.5	7
	5000	5	75	585	7	1.9	10
	6000	3	74	535	9	2.3	12
	7000	1	73	485	11	2.8	15
	8000	-1	72	430	13	3.3	18
	9000	-3	71	380	16	3.8	22
	10,000	-5	70	330	19	4.5	26
	11,000	-7	69	280	22	5.2	30
	12,000	-9	68	230	16	6.0	36

Figure 5-6. Time, Fuel, and Distance to Climb (Sheet 1 of 2)

TIME, FUEL, AND DISTANCE TO CLIMB
NORMAL RATE OF CLIMB – 80 KIAS

Conditions:
Flaps Up
2500 RPM
24” Hg Full Throttle
Cowl Flaps Open
Standard Temperature

NOTE:
1. Add 1.4 gallons of fuel for engine start, taxi and takeoff allowance
2. Mixture leaned above 3000 feet for maximum power
3. Increase time, fuel and distance by 10% for each 10°C above standard temperature
4. Distances shown are based on zero wind

WEIGHT LBS	PRESS ALT FT	TEMP °C	RATE OF CLIMB - FPM	FROM SEA LEVEL		
				TIME MIN	FUEL USED GALLONS	DISTANCE NM
2500	S.L.	15	510	0	0	0
	1000	13	510	2	.4	3
	2000	11	510	4	.8	5
	3000	9	510	6	1.2	8
	4000	7	510	8	1.6	11
	5000	5	510	10	2.0	14
	6000	3	485	12	2.4	17
	7000	1	430	14	2.8	20
	8000	-1	375	17	3.3	24
	9000	-3	320	20	3.8	29
	10,000	-5	265	13	4.4	34
	11,000	-7	210	27	5.2	41
	12,000	-9	155	33	6.2	50

Figure 5-6. Time, Fuel, and Distance to Climb (Sheet 2 of 2)

CRUISE PERFORMANCE
Pressure altitude 2000 feet

Conditions:
2500 pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTE

For best fuel economy at 75% power or less, operate at the leanest mixture that results in smooth engine operation or at peak EGT if an EGT indicator is installed

		20°C BELOW STANDARD TEMP -13°C			STANDARD TEMP 7°C			20°C ABOVE STANDARD TEMP 27°C		
RPM	MP	% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2500	24	---	---	---	78	124	10.5	76	125	10.1
	23	77	120	10.3	74	121	9.9	71	122	9.5
	22	72	117	9.6	70	118	9.2	67	118	8.9
	21	68	114	8.9	65	114	8.6	63	114	8.3
2400	24	---	---	---	76	123	10.3	74	124	9.9
	23	75	119	10.0	72	120	9.6	70	120	9.3
	22	70	116	9.4	68	117	9.0	66	117	8.7
	21	66	113	8.7	64	113	8.4	62	113	8.1
2300	24	77	121	10.3	74	121	9.9	72	122	9.5
	23	73	118	9.7	70	118	9.3	68	118	9.0
	22	68	115	9.0	66	115	8.7	64	115	8.4
	21	64	111	8.4	62	111	8.2	60	111	7.9
2200	24	74	119	9.9	71	119	9.5	69	120	9.2
	23	70	116	9.3	67	116	8.9	65	116	8.6
	22	66	113	8.7	63	113	8.4	61	112	8.1
	21	61	109	8.1	59	109	7.9	57	108	7.6
2100	24	71	117	9.4	68	117	9.0	66	117	8.7
	23	67	114	8.8	65	114	8.5	62	113	8.2
	22	63	110	8.3	61	110	8.0	59	110	7.8
	21	59	106	7.8	57	106	7.5	55	106	7.3
	20	55	102	7.3	53	102	7.1	51	101	6.9
	19	51	98	6.9	49	97	6.7	47	96	6.6
	18	47	93	6.5	45	92	6.3	44	90	6.2

Figure 5-7 Cruise performance (sheet 1 of 6)

CRUISE PERFORMANCE
Pressure altitude 4000 feet

Conditions:
2500 pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTE

For best fuel economy at 75% power or less, operate at the leanest mixture that results in smooth engine operation or at peak EGT if an EGT indicator is installed

		20°C BELOW STANDARD TEMP -13°C			STANDARD TEMP 7°C			20°C ABOVE STANDARD TEMP 27°C		
RPM	MP	% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2500	23	---	---	---	76	125	10.2	73	125	9.8
	22	74	121	9.9	72	121	9.5	69	122	9.2
	21	70	118	9.2	67	118	8.9	65	118	8.6
	20	65	114	8.6	63	114	8.3	61	113	8.0
2400	24	---	---	---	79	127	10.6	76	127	10.2
	23	77	123	10.3	74	123	9.9	72	124	9.6
	22	72	120	9.7	70	120	9.3	68	120	8.9
	21	68	116	9.0	66	116	8.7	63	116	8.4
2300	24	---	---	---	76	125	10.2	74	125	9.8
	23	75	121	10.0	72	122	9.6	70	122	9.2
	22	70	118	9.3	68	118	9.0	66	118	8.7
	21	66	115	8.7	64	114	8.4	62	114	8.1
2200	24	76	122	10.2	73	123	9.8	71	123	9.4
	23	72	119	9.6	69	120	9.2	67	120	8.9
	22	68	116	9.0	65	116	8.6	63	116	8.3
	21	64	112	8.4	61	112	8.1	59	112	7.8
2100	24	73	120	9.7	70	121	9.3	68	121	9.0
	23	69	117	9.1	67	117	8.8	64	117	8.5
	22	65	114	8.6	63	113	8.3	61	113	8.0
	21	61	110	8.0	59	110	7.8	57	109	7.5
	20	57	106	7.5	55	105	7.3	53	104	7.1
	19	53	101	7.1	51	101	6.9	49	99	6.7
	18	49	96	6.7	47	95	6.5	45	93	6.4
	17	45	91	6.3	43	89	6.2	42	86	6.0

Figure 5-7 Cruise performance (sheet 2 of 6)

CRUISE PERFORMANCE
Pressure altitude 6000 feet

Conditions:
2500 pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTE

For best fuel economy at 75% power or less, operate at the leanest mixture that results in smooth engine operation or at peak EGT if an EGT indicator is installed

		20°C BELOW STANDARD TEMP -13°C			STANDARD TEMP 7°C			20°C ABOVE STANDARD TEMP 27°C		
RPM	MP	% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2500	23	---	---	---	78	128	10.5	75	129	10.1
	22	76	125	10.3	74	125	9.8	71	1258	9.5
	21	72	121	9.5	69	121	9.2	67	121	8.8
	20	67	117	8.9	65	117	8.5	63	117	8.3
2400	23	---	---	---	76	127	10.2	74	127	9.8
	22	75	123	10.0	72	124	9.6	69	124	9.2
	21	70	120	9.3	67	120	8.9	65	120	8.6
	20	65	116	8.6	63	116	8.3	61	115	8.1
2300	23	77	125	10.3	74	125	9.9	71	125	9.5
	22	72	122	9.6	70	122	9.2	67	122	8.9
	21	68	118	9.0	65	118	8.6	63	118	8.4
	20	64	114	8.4	61	114	8.1	59	113	7.8
2200	23	74	123	9.9	71	123	9.5	69	123	9.1
	22	70	120	9.3	67	120	8.9	65	119	8.6
	21	66	116	8.7	63	116	8.3	61	115	8.1
	20	61	112	8.1	59	111	7.8	57	111	7.6
2100	23	71	121	9.4	68	121	9.1	66	121	8.7
	22	67	117	8.8	65	117	8.5	62	117	8.2
	21	63	113	8.3	61	113	8.0	59	113	7.8
	20	59	109	7.8	57	109	7.5	55	108	7.3
	19	55	105	7.3	53	104	7.1	51	103	6.9
	18	51	100	6.8	49	99	6.7	47	97	6.5
	17	46	94	6.5	45	92	6.3	43	90	6.2

Figure 5-7 Cruise performance (sheet 3 of 6)

CRUISE PERFORMANCE
Pressure altitude 8000 feet

Conditions:
2500 pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTE

For best fuel economy at 75% power or less, operate at the leanest mixture that results in smooth engine operation or at peak EGT if an EGT indicator is installed

		20°C BELOW STANDARD TEMP -13°C			STANDARD TEMP 7°C			20°C ABOVE STANDARD TEMP 27°C		
RPM	MP	% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2700	21	---	---	---	75	128	10.0	72	128	9.6
	20	73	124	9.7	70	124	9.3	68	124	9.0
	19	68	120	9.0	66	120	8.7	63	119	8.4
	18	63	115	8.3	61	115	8.0	59	114	7.8
2600	22	---	---	---	78	130	10.4	75	130	10.0
	21	76	126	10.2	73	127	9.7	70	127	9.4
	20	71	122	9.4	68	122	9.0	66	122	8.7
	19	66	118	8.7	64	118	8.4	62	117	8.1
2500	22	79	128	10.6	76	129	10.1	73	129	9.8
	21	74	125	9.9	71	125	9.5	69	125	9.1
	20	69	121	9.2	67	121	8.8	64	120	8.5
	19	64	117	8.5	62	116	8.2	60	116	7.9
2400	22	77	127	10.3	74	127	9.9	71	127	9.5
	21	72	123	9.6	69	123	9.2	67	123	8.9
	20	67	119	8.9	65	119	8.6	63	119	8.3
	19	63	115	8.3	61	114	8.0	58	114	7.7
2300	22	74	125	9.9	72	125	9.5	69	125	9.2
	21	70	121	9.3	67	121	8.9	65	121	8.6
	20	65	117	8.6	63	117	8.3	61	117	8.0
	19	61	113	8.0	59	112	7.8	57	112	7.5
2200	22	72	123	9.6	69	123	9.2	67	123	8.8
	21	68	120	8.9	65	119	8.6	63	119	8.3
	20	63	115	8.4	61	115	8.1	59	115	7.8
	19	59	111	7.8	57	110	7.6	55	109	7.3
2100	22	69	121	9.2	67	121	8.8	64	120	8.5
	21	65	117	8.6	63	117	8.3	60	116	8.0
	19	57	108	7.5	55	108	7.3	53	106	7.1
	18	52	103	7.1	51	102	6.8	49	100	6.7
	17	48	98	6.6	47	96	6.5	45	93	6.3

Figure 5-7 Cruise performance (sheet 4 of 6)

CRUISE PERFORMANCE
Pressure altitude 10,000 feet

Conditions:
2500 pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTE

For best fuel economy at 75% power or less, operate at the leanest mixture that results in smooth engine operation or at peak EGT if an EGT indicator is installed

		20°C BELOW STANDARD TEMP -13°C			STANDARD TEMP 7°C			20°C ABOVE STANDARD TEMP 27°C		
RPM	MP	% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2700	20.5	77	130	10.4	75	130	10.0	72	130	9.6
	20	75	128	10.0	72	180	9.6	70	128	9.3
	19	70	124	9.3	68	123	8.9	65	123	8.6
	18	65	119	8.6	63	118	8.3	61	118	8.0
2600	20.5	75	128	10.1	73	128	9.7	70	128	9.3
	20	73	126	9.7	70	126	9.3	68	126	9.0
	19	68	122	9.0	66	121	8.7	63	121	8.4
	18	63	117	8.4	61	116	8.1	59	116	7.8
2500	20.5	74	127	9.8	71	127	9.4	68	126	9.1
	20	71	125	9.5	69	124	9.1	66	124	8.7
	19	66	120	8.8	64	120	8.4	62	119	8.2
	18	62	115	8.1	59	115	7.9	57	114	7.6
2400	20.5	72	125	9.5	69	125	9.1	67	124	8.8
	20	69	123	9.2	67	123	8.8	64	122	8.5
	19	65	118	8.5	62	118	8.2	60	117	8.0
	18	60	114	7.9	58	113	7.7	56	112	7.4
2300	20.5	70	123	9.2	67	123	8.8	65	122	8.5
	20	67	121	8.9	65	121	8.6	63	120	8.3
	19	63	116	8.3	60	116	8.0	58	115	7.7
	18	58	112	7.7	56	111	7.5	54	109	7.2
2200	20.5	68	121	8.9	65	121	8.6	63	120	8.3
	20	65	119	8.6	63	119	8.3	61	118	8.0
	19	61	115	8.1	59	114	7.8	57	113	7.5
	18	57	110	7.5	55	109	7.3	53	107	7.1
2100	20.5	65	119	8.6	63	118	8.3	60	118	8.0
	20	63	116	8.3	61	116	8.0	58	115	7.7
	19	59	112	7.8	56	111	7.5	55	110	7.3
	18	54	107	7.3	52	106	7.0	51	104	6.8
	17	50	101	6.8	48	99	6.6	47	97	6.5
	16	46	94	6.4	44	91	6.2	43	88	6.1

Figure 5-7 Cruise performance (sheet 5 of 6)

CRUISE PERFORMANCE
Pressure altitude 12,000 feet

Conditions:
2500 pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTE

For best fuel economy at 75% power or less, operate at the leanest mixture that results in smooth engine operation or at peak EGT if an EGT indicator is installed

		20°C BELOW STANDARD TEMP -13°C			STANDARD TEMP 7°C			20°C ABOVE STANDARD TEMP 27°C		
RPM	MP	% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2700	19	72	127	9.6	69	127	9.2	67	127	8.9
	18	67	123	8.9	65	122	8.5	62	122	8.2
	17	62	117	8.2	60	117	7.9	58	115	7.7
	16	57	112	7.6	55	110	7.3	53	108	7.1
2600	19	70	126	9.3	68	125	8.9	65	125	8.6
	18	65	121	8.6	63	120	8.3	61	119	8.0
	17	60	115	8.0	58	114	7.7	56	113	7.4
	16	55	109	7.4	53	108	7.1	51	106	6.9
2500	19	68	124	9.1	66	123	8.7	64	123	8.4
	18	64	119	8.4	61	118	8.1	59	117	7.8
	17	59	114	7.8	57	112	7.5	55	111	7.3
	16	54	108	7.2	52	106	7.0	50	104	6.8
2400	19	67	122	8.8	64	121	8.5	62	121	8.2
	18	62	117	8.2	60	116	7.9	58	115	7.6
	17	57	112	7.6	55	110	7.3	53	109	7.1
	16	53	106	7.1	51	104	6.8	49	102	6.7
2300	19	65	120	8.5	62	119	8.2	60	108	7.9
	18	60	115	7.9	58	114	7.7	56	113	7.4
	17	56	110	7.4	53	108	7.2	52	106	7.0
	16	51	103	6.9	49	101	6.7	47	98	6.5
2200	19	63	18	8.3	61	118	8.0	59	116	7.8
	18	59	113	7.8	56	112	7.5	54	111	7.3
	17	54	108	7.2	52	106	7.0	50	104	6.8
	16	50	101	6.7	48	99	6.6	46	95	6.4
2100	19	61	116	8.0	58	115	7.7	56	113	7.5
	18	56	111	7.5	54	109	7.2	52	107	7.0
	17	52	105	7.0	50	103	6.8	48	100	6.6
	16	48	98	6.6	46	95	6.4	44	91	6.2

Figure 5-7 Cruise performance (sheet 6 of 6)

RANGE PROFILE
45 MINUTES RESERVE
49 GALONS USABLE FUEL

Conditions:
2500 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature
Zero Wind

NOTE:

1. This chart allows for the fuel used for engine start, taxi, takeoff and climb, and the distance during a normal climb as shown in figure 5-6
2. Reserve fuel is based on 45 minutes at 45% BHP and is 4.7 gallons

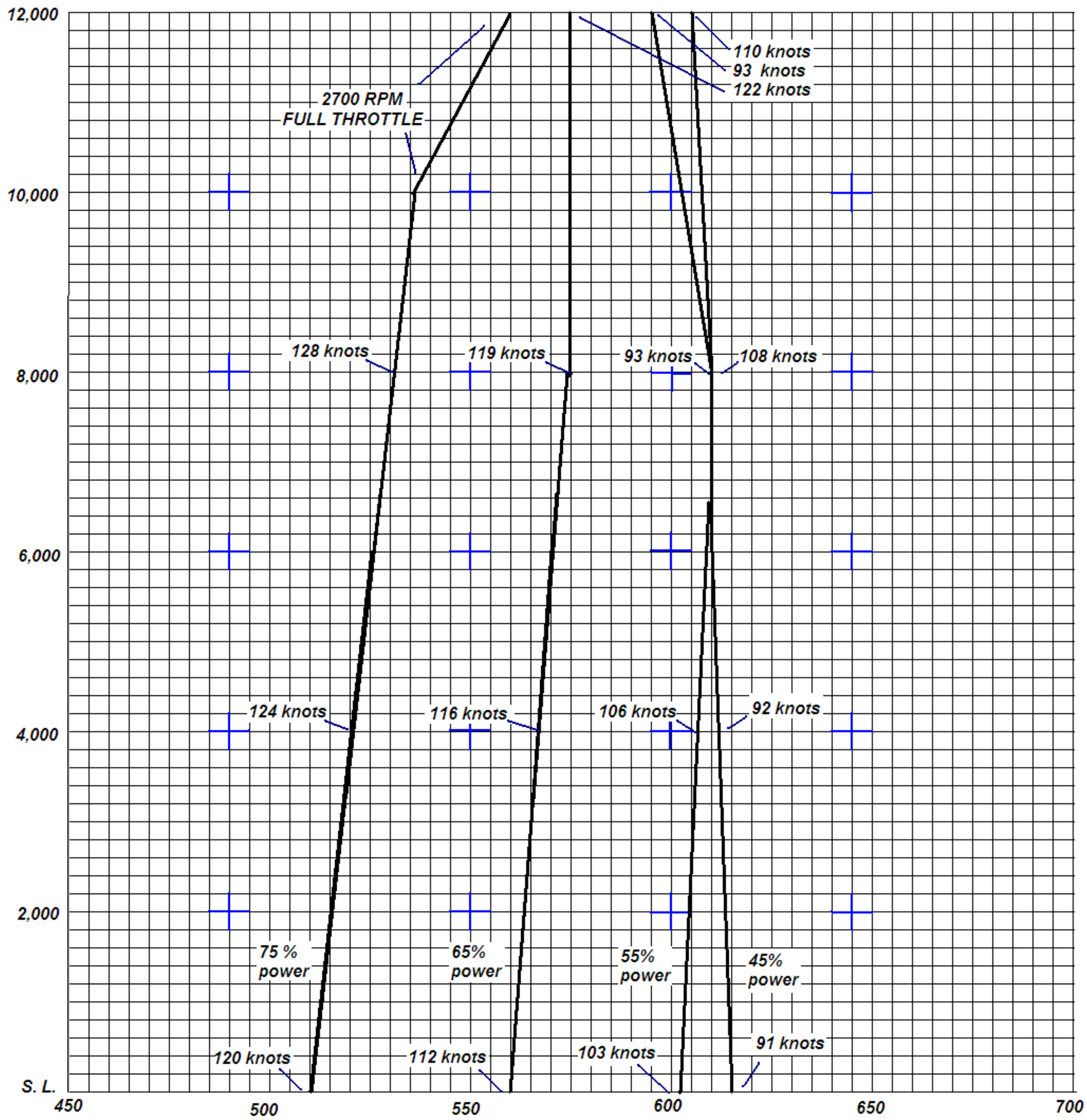

Figure 5-8 Range Performance (sheet 1 of 2)

~~RANGE PROFILE~~
~~45 MINUTES RESERVE~~
~~60 GALONS USABLE FUEL~~

Conditions:
2500 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature
Zero Wind
NOTE:

1. This chart allows for the fuel used for engine start, taxi, takeoff and climb, and the distance during a normal climb as shown in figure 5-6
2. Reserve fuel is based on 45 minutes at 45% BHP and is 4.7 gallons

NOTE: AIRCRAFT N110PF IS EQUIPPED WITH STANDARD TANKS.

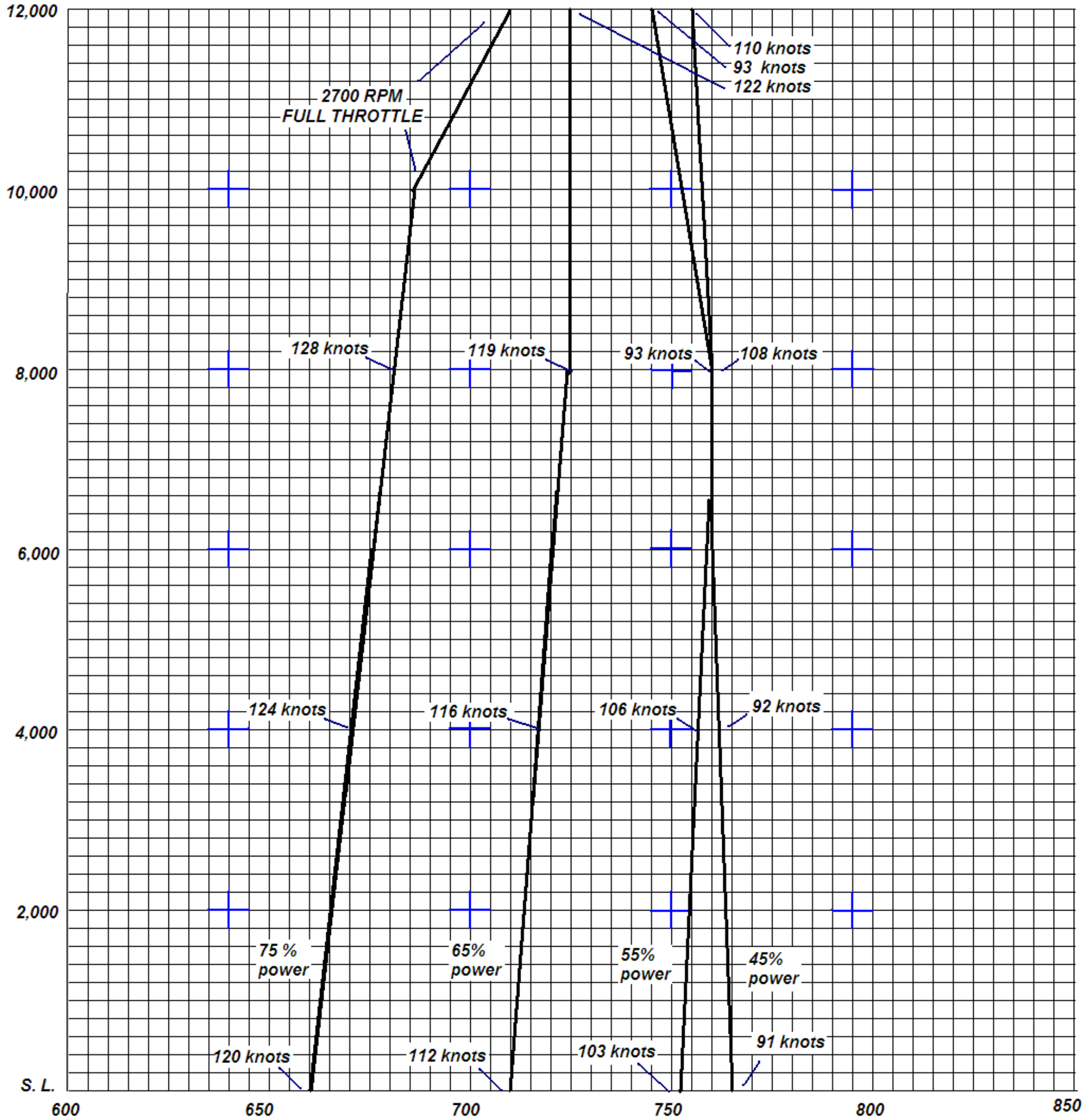

Figure 5-8 Range Performance (sheet 2 of 2)

ENDURANCE PROFILE
45 MINUTES RESERVE
49 GALONS USABLE FUEL

Conditions:
2500 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature
Zero Wind

NOTE:

1. This chart allows for the fuel used for engine start, taxi, takeoff and climb, and the distance during a normal climb as shown in figure 5-6
2. Reserve fuel is based on 45 minutes at 45% BHP and is 4.7 gallons

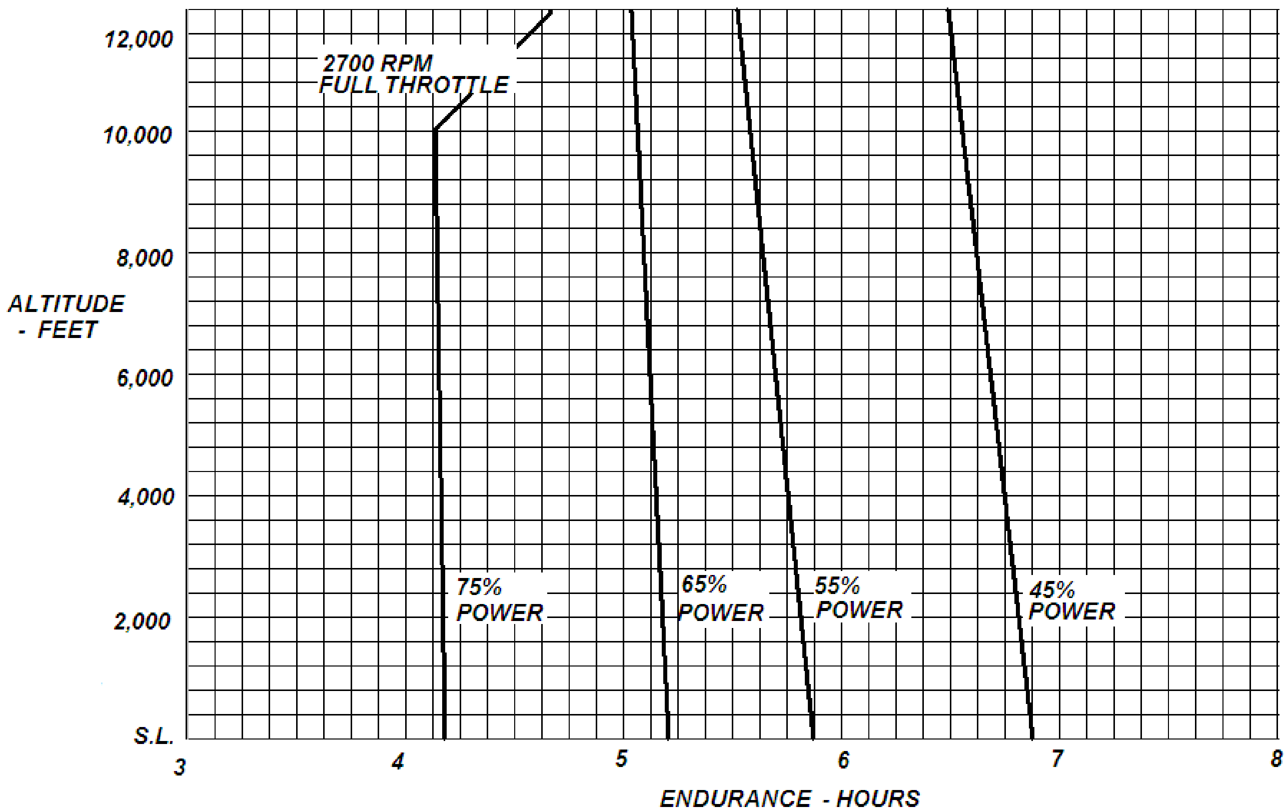

Figure 5-9 Endurance Profile (Sheet 1 of 2)

~~ENDURANCE PROFILE~~
~~45 MINUTES RESERVE~~
~~60 GALONS USABLE FUEL~~

Conditions:
2500 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature
Zero Wind

NOTE:

1. This chart allows for the fuel used for engine start, taxi, takeoff and climb, and the distance during a normal climb as shown in figure 5-6
2. Reserve fuel is based on 45 minutes at 45% BHP and is 4.7 gallons

NOTE: AIRCRAFT N110PF IS EQUIPPED WITH STANDARD TANKS.

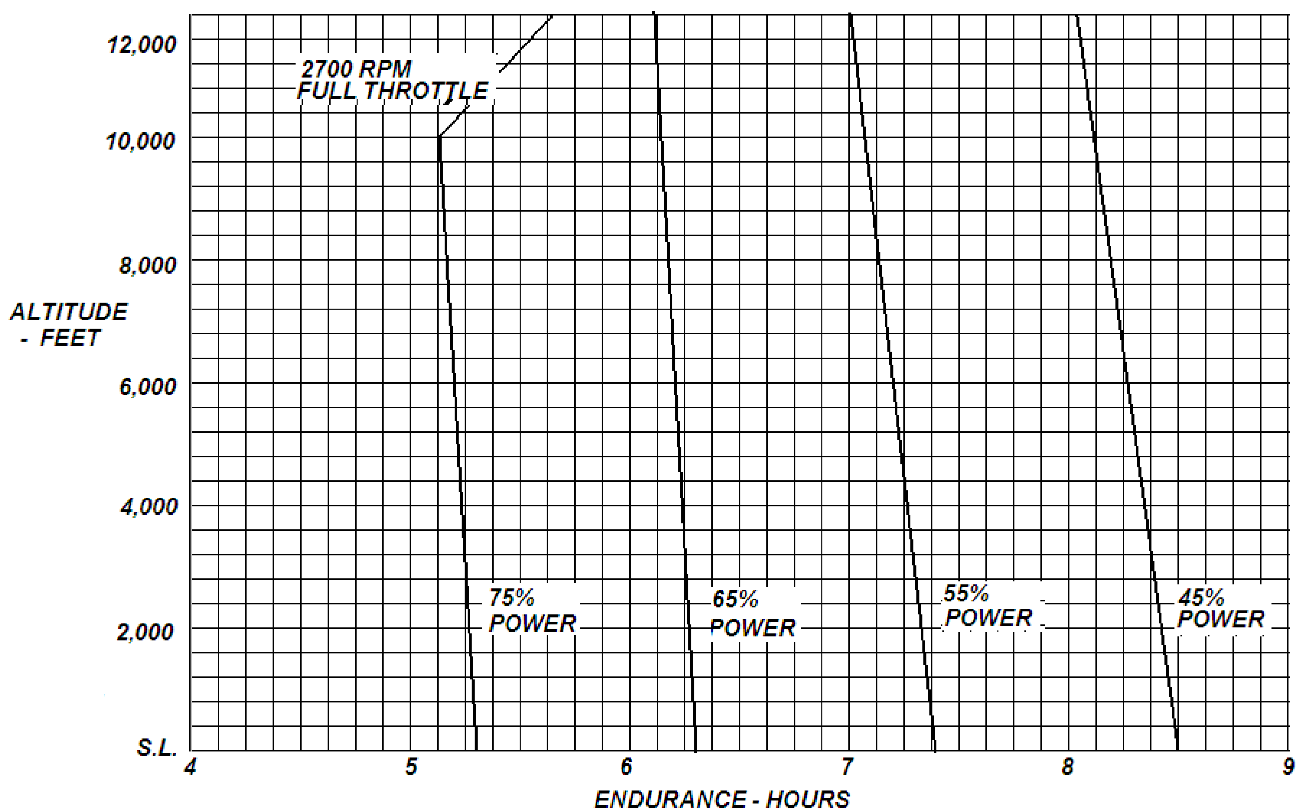

Figure 5-9 Endurance Profile (Sheet2 of 2)

LANDING DISTANCE
SHORT FIELD

Conditions:
Flaps 30°
Power Off
Maximum braking
Paved, Level, Dry, Runway
Zero wind

Notes:

1. Short field technique as specified in Section 4
2. Decrease distances 10% for each 9 knots of headwind. For operation with tailwinds up to 10 knots, increase distance 10% for each 2 knots.
3. For operation on a dry, grass runway, increase distances by 40% of the “ground roll” figure.

Weight (lbs)	SPEED AT 50 FT KIAS	Press Alt (ft)	0°C		10°C		20°C		30°C		40°C	
			Ground Roll	Total to Clear 50’ OBS	Ground Roll	Total to Clear 50’ OBS	Ground Roll	Total to Clear 50’ OBS	Ground Roll	Total to Clear 50’ OBS	Ground Roll	Total to Clear 50’ OBS
2500	61	S.L.	570	1175	590	1205	610	1235	630	1265	650	1295
		1000	590	1205	610	1235	635	1270	655	1300	675	1330
		2000	610	1235	635	1270	655	1300	680	1335	700	1370
		3000	635	1270	660	1305	680	1340	705	1375	730	1410
		4000	660	1310	685	1345	705	1375	730	1410	755	1450
		5000	685	1345	710	1380	735	1420	760	1455	785	1490
		6000	710	1380	735	1420	760	1455	790	1500	815	1535
		7000	735	1420	765	1460	790	1500	820	1540	845	1580
		8000	765	1465	795	1505	820	1545	850	1585	880	1630

Figure 5-10 Landing Distance

SECTION 6
WEIGHT AND BALANCE / EQIPMENT LIST

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Introduction -- 6-1
Airplane weighing procedure -- 6-1
Weight and Balance --- 6-3
Baggage Cargo and Tie-Down -- 6-4
Equipment List -- 6-10

INTRODUCTION

This section describes the procedure for establishing the basic empty weight and moment of the airplane. Sample forms are provided for reference. Procedures for calculating the weight and moment for various operations are also provided. A comprehensive list of all Cessna equipment for this airplane is included at the back of this section.

It should be noted that specific information regarding the weight, arm moment and installed equipment list for this airplane can only be found in the appropriate weight and balance records carried in the airplane.

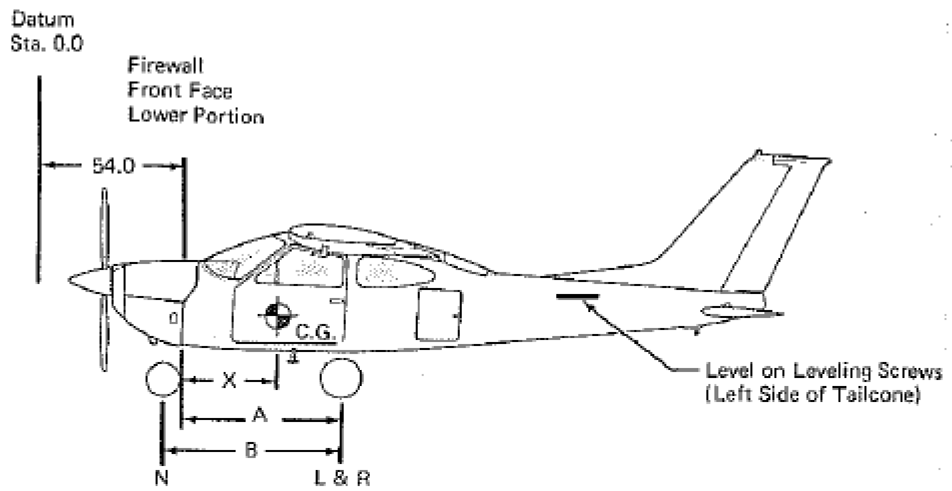
AIRPLANE WEIGHING PROCEDURES

1. Preparation
    a. Inflate tires to recommended operating pressures.
    b. Remove the fuel tank sump quick-drain fittings, fuel selector valve drain plug, and fuel reservoir quick-drain fitting to drain all fuel.
    c. Remove oil sump drain plug to drain all oil.
    d. Move sliding seats to the most forward position
    e. Raise flaps to the fully retracted position
    f. Place all control surfaces in neutral position

2. Leveling
    a. Place scales under each wheel (minimum scale capacity, 500 pounds nose, 1,000 pounds each main)
    b. Deflate the nose tire and/or lower or raise the nose strut to properly center the bubble in the level (see figure 6-1)

3. Weighing
    a. With the airplane level and the brakes released, record the weight shown on each scale. Deduct the tare, if any, from each reading

4. Measuring
    a. Obtain measurement A by measuring horizontally (along the airplane center line) from a line stretched between the main wheel centers to a plumb bob dropped from the firewall.
    b. Obtain measurement B by measuring horizontally and parallel to the airplane center line, from center of nose wheel axle, left side, to a plumb bob dropped from the line between the main wheel centers. Repeat on right side and average measurements.
5. Using weights from (3) and measurements form (4) the airplane weight and C.G. can be determined.
6. Basic Empty Weight can be determined by completing Figure 6-1.



SCALE POSITION	SCALE READING	TARE	SYMBOL	NET WEIGHT
LEFT WHEEL			L	
RIGHT WHEEL			R	
NOSE WHEEL			N	
SUM OF NET WEIGHTS (AS WEIGHED)			W	

$$X = \text{Arm} = (A) - \frac{N \times B}{W} \;;\; X = (\quad) \; \frac{(\quad)\,X\,(\quad)}{(\quad)} = (\quad)\ \text{IN}$$

C.G. ARM = 54 + X IN.

ITEM	Weight (lbs) X C.G. Arm (in) = Moment/1000 (lbs-in)		
Airplane weight (from item 6)			
Add: oil (9 qts. @t 7.5 lbs/gal	17.0	45	.765
Add: Unusable Fuel (1 gal @ 6 lbs/gal	6.0	100.0	.600
Equipment changes			
Basic Empty Weight			

Figure 6-1 Sample Airplane Weighing

Airplane Model			SERIAL NUMBER				PAGE NUMBER				
Date	Item Nr.		Description of Article or Modification	ADDED (+)			REMOVED (-)			RUNNING BASIC EMPTY WEIGHT	
	IN	OUT		WT (LB)	ARM (IN.)	MOMENT (/1000)	WT (LB)	ARM (IN.)	MOMENT (/1000)	WT (LB)	MOMENT (/1000)

Figure 6-2 Sample Weight and Balance Record

WEIGHT AND BALANCE

The following information will enable you to operate your Cessna within the prescribed weight and center of gravity limitations. To figure weight and balance, use the Sample Problem, Loading Graph, and Center of Gravity Moment Envelope as follows:

Take the basic empty weight and moment from appropriated weight and balance records carried in your airplane, and enter them in the column title "YOUR AIRPLANE" on the Sample Loading Problem.

NOTE

In addition to the basic empty weight and moment noted on these records, the c.g. arm (fuselage station) is also shown, but need not be used on the Sample Loading Problem. The moment which is shown must be divided by 1000 and this value used as the moment/1000 on the loading problem.

Use the Loading Graph to determine the moment/1000 for each additional item to be carried; then list these on the loading problem

NOTE

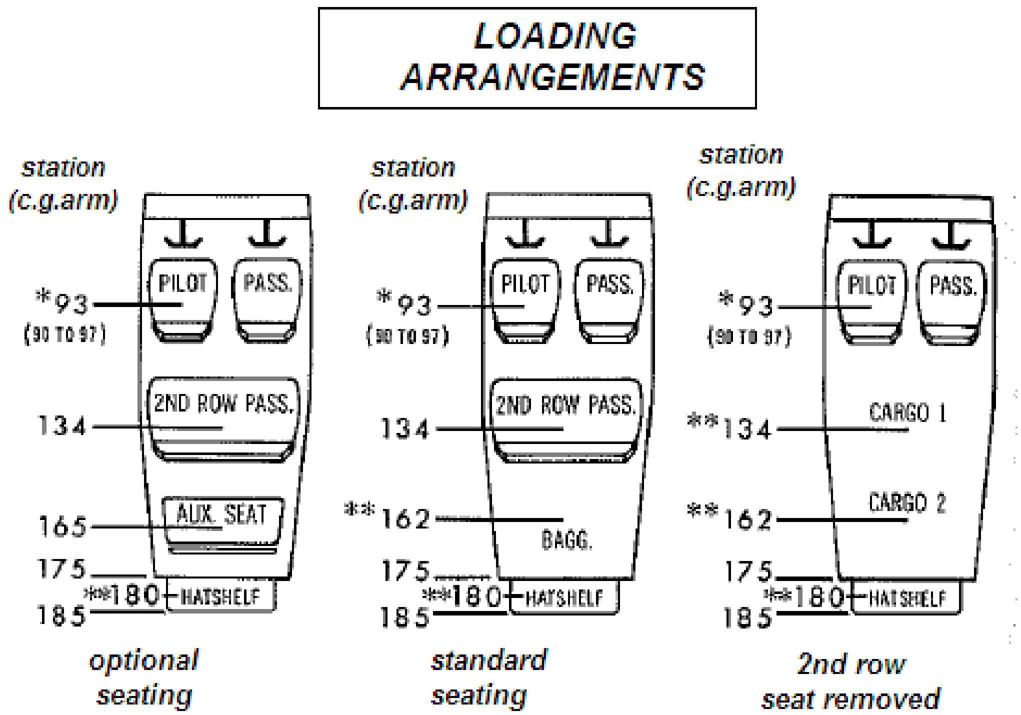
Loading Graph information for the pilot, passengers, baggage/cargo and hatshelf is based on seats positioned for average occupants and baggage / cargo or hatshelf items loaded in the center of these areas as shown on the Loading Arrangements diagram. For loadings which may differ from these, the Sample Loading Problem lists fuselage stations for these items to indicated their forward and aft. c.g. range limitation (seat travel and baggage / cargo or hatshelf area limitation.) Additional moment calculations, based on the actual weight and c.g. arm (fuselage station) of the being loaded, must be made if the position of the load is different from that shown on the Loading Graph. A reduced fuel weight may be measured for use with heavy cabin loadings by filling both tanks to the 22 gallon marker of 43 gallons (258 pounds) usable. Both tanks may be filled for maximum range, provided maximum takeoff weight is not exceeded.

Total the weights and moments/1000 and plot these values on the Center of Gravity Moment Envelope to determine whether the point falls within the envelope, and if the loading is acceptable.

BAGGAGE AND CARGO TIE-DOWN

A nylon baggage net is provided to secure baggage in the area aft of the rear seat and on the hat shelf. Four eyebolts serve as attaching points for the net. Two eyebolts for the forward tie-down straps are located on the cabin floor near each sidewall forward of the baggage door, and two eyebolts are located below the side windows near the aft baggage wall.

A cargo tie-down kit consisting of eight tie-down attachments is available if one desires to remove the rear seat (and auxiliary seat, if installed) and utilize the rear cabin area to haul cargo. Two tie-down block attachments clamp to the aft end of the two outboard front seat rails and are locked in place by a bolt which must be tightened to a minimum of fifty inch-pounds. Six latch plates tie-down attachments bolt to standard attach points in the cabin floor. The six attach points are located as follows: two are located inboard and approximately 17 inches aft of the rear door posts at station 140; two are located at the forward edge of the baggage door at station 155; and two are located just forward of the aft baggage wall at station 173; the maximum allowable cabin floor loading is 200 pounds per square foot; however, when items with small or sharp support areas are carried, the installation of ¼ inch plywood floor is recommend to protect the aircraft structure. The maximum rated load weight capacity for each of the six latch plate tie-downs is 140 pounds and is 100 pounds for the two seat rail tie-downs. Rope, straps or cable used for tie-downs should be rated at a minimum of ten times the load capacity of the tie-down fittings used. Weight and balance calculation for cargo in the area of the second row seat (CARGO 1) and the baggage area (CARGO2) can be figured on the Loading Graph using the lines labeled 2nd Row Passengers or Cargo 1 and / or baggage, Passenger on Auxiliary Seat, or Cargo 2 and Hatshelf respectively. If the position of cargo loads is different from that shown on the Loading Arrangements diagram, the moment must be determined by multiplying the weight by the actual c.g. arm.

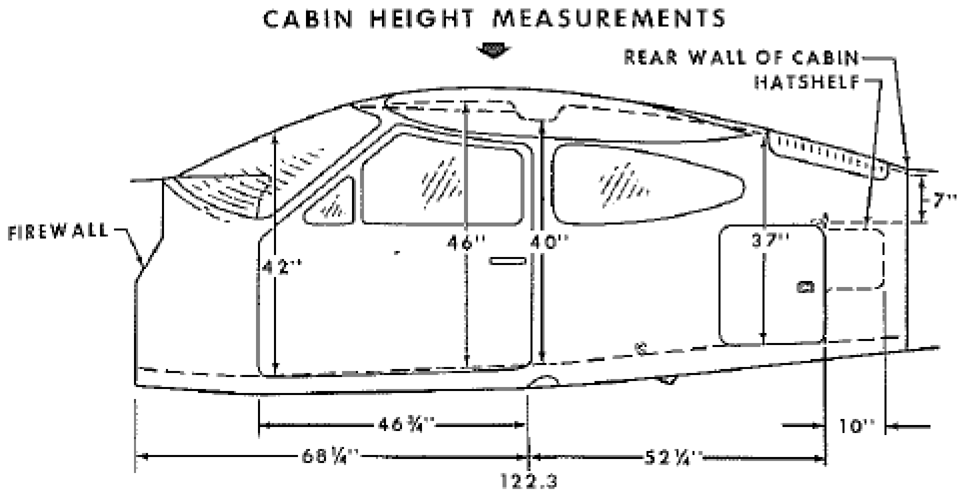


**Pilot or passenger center of gravity on adjustable seats positioned for average occupant. Numbers in parentheses indicate forward and aft limits of occupant center of gravity range.*

***Arm measured to the center of the area shown.*

NOTE: The aft baggage wall (approximately station 175) can be used as a convenient interior reference point for determining the location of baggage area fuselage stations.

Figure 6-3 Loading Arrangements



	WIDTH (TOP)	WIDTH (BOTTOM	HEIGHT (FRONT	HEIGHT (CENTER)	HEIGHT (REAR)	WIDTH
CABIN DOOR	23”	47 ½ “	23”	43”	38”	• LWR WINDOW LINE
BAGGAGE DOOR	17 ½”	17 ½”	20 ½ “	---	20”	* CABIN FLOOR

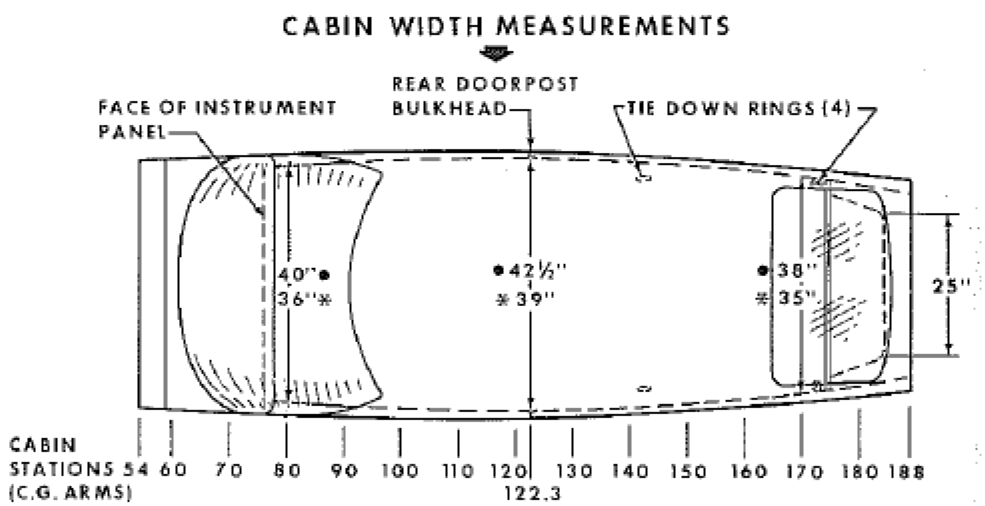
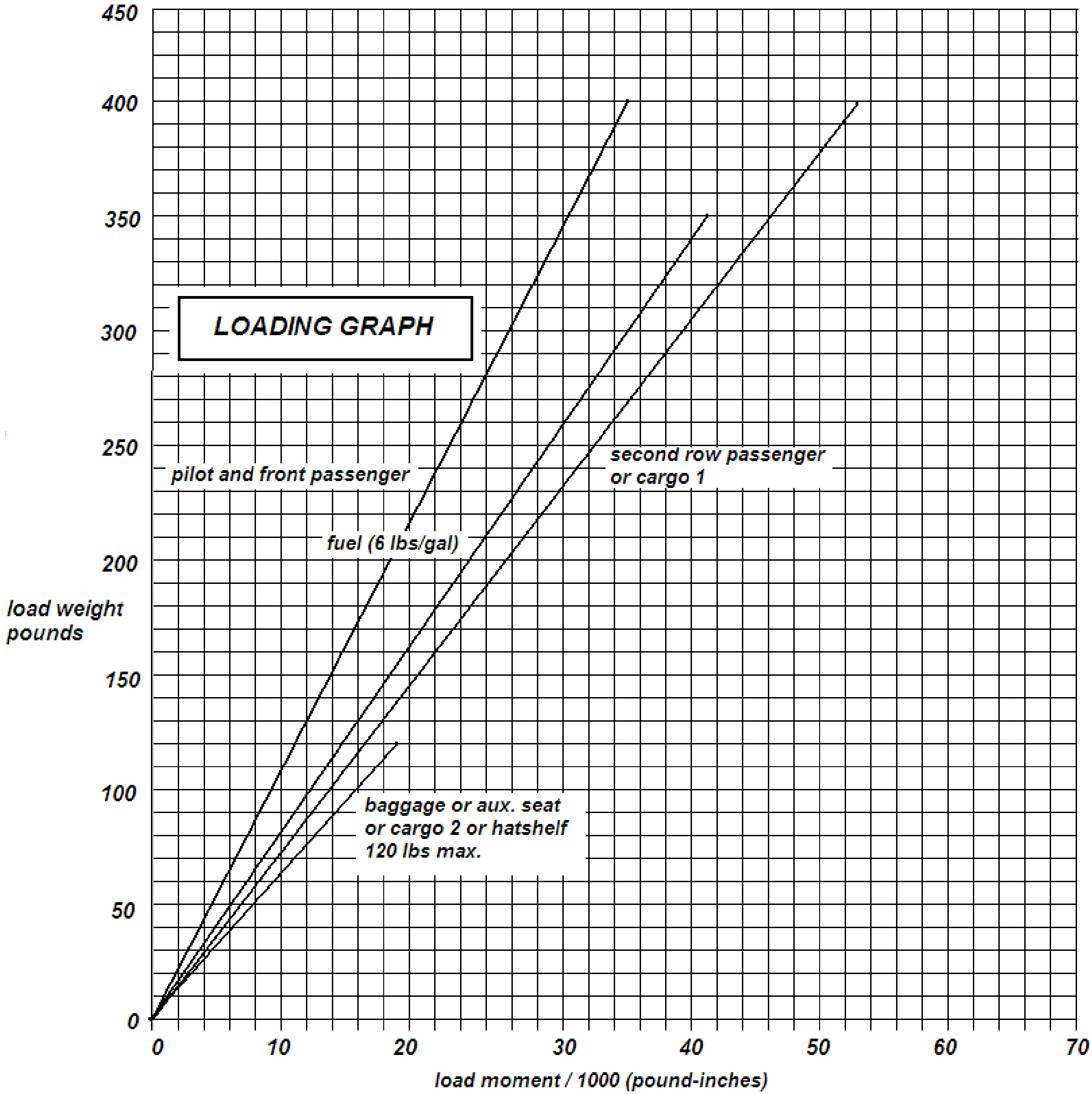


Figure 6-4 Internal Cabin Dimensions

SAMPLE LOADING PROBLEM	SAMPLE AIRPLANE		YOUR AIRPLANE	
	Weight (lbs)	Moment (in-lbs/1000)	Weight (lbs)	Moment (in-lbs/1000)
Basic empty weight shown is for aircraft N110PF as calculated from factory, 2-2-1988	1,646.60	171.07	1646.6	171.07
Fuel (60 Gal at 6 # / gal				
Standard Tanks (49 gallons)				
Long Range tanks (not installed)				
Reduced Fuel (43 gallons)	258	28.90		
Pilot and Front Passenger (station 90 to 97)	340	31.62		
Second Row Passengers	170	22.78		
Cargo 1 Replacing Second Row Seat (station 126 to 142)				
Baggage, Passenger on Auxiliary Seat or Cargo 2 and Hatshelf (station 142 to 185) 120 lbs maximum	85.4	13.83		
TOTAL WEIGHT AND MOMENT	2,500.00	268.20		

FIGURE 6-5



NOTE:

1. Line representing adjustable seats shows the pilot and front passenger center of gravity on adjustable seats positioned for an average occupant. Refer to the Loading Arrangement Diagram for forward and aft limits of occupant c.g. range.
2. Hatshelf maximum load = 25 pounds

Figure 6-6 Loading Graph

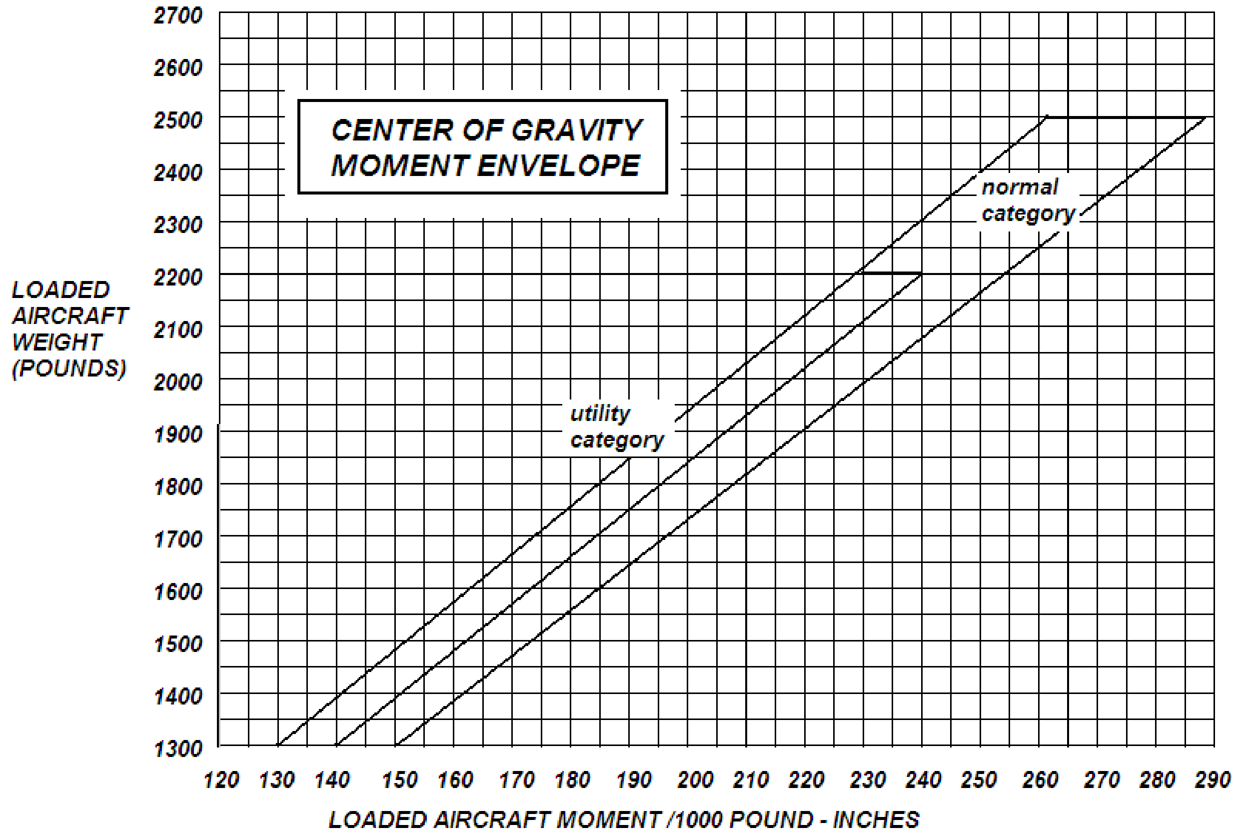


Figure 6-7 Center of Gravity Moment Envelope

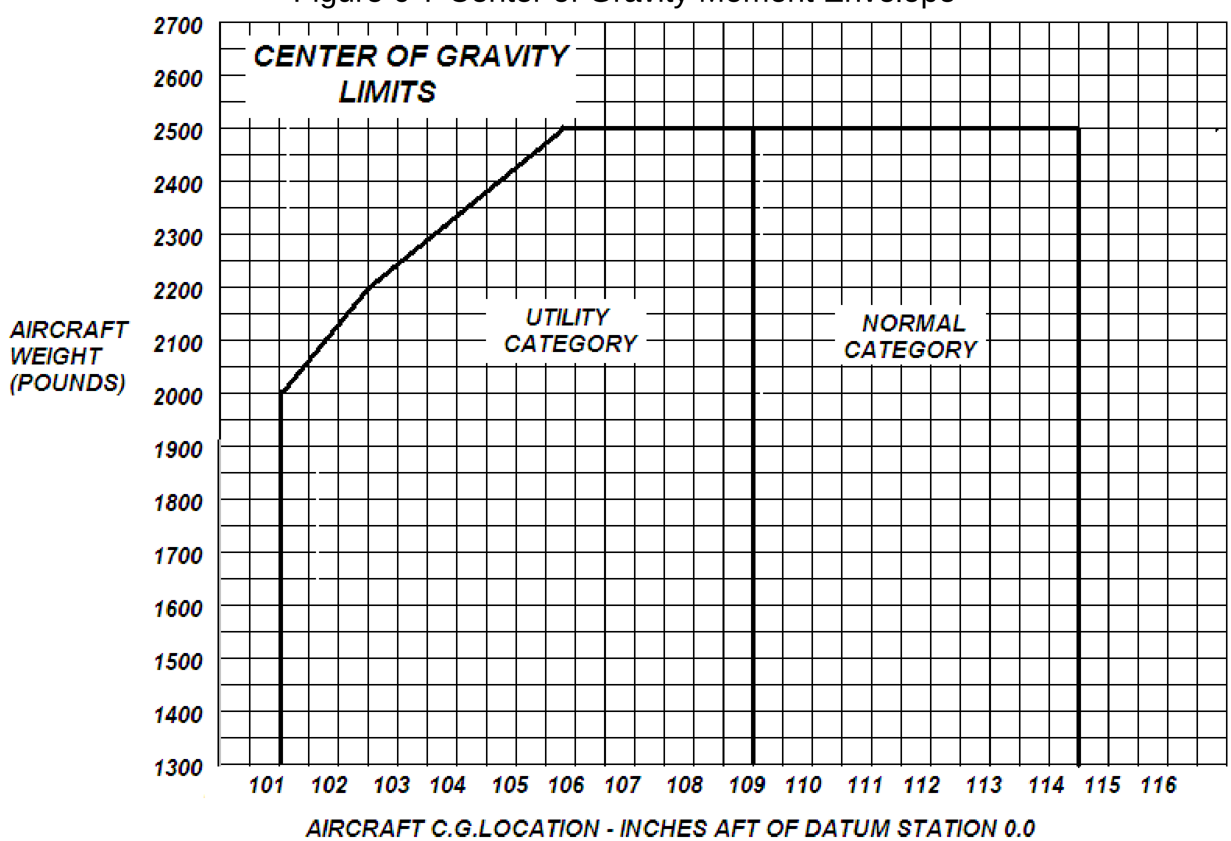


Figure 6-8 Center of Gravity Limits

EQUIPMENT LIST

The following equipment list is a comprehensive list of all Cessna equipment available for this airplane. A separate equipment list of items installed in your specific airplane is provided in your aircraft file. The following list and the specific list for your airplane have a similar order of listing.

This equipment list provides the following information:

An item number gives the identification number for the item. Each number is prefixed with a letter which identifies the descriptive grouping (example: A. Powerplant & Accessories) under which it is listed. Suffix letters identify the equipment as a required item, a standard item or an optional item. Suffix letters are as follows:

-R = required items of equipment for FAA certification
-S = standard equipment items
-O = optional equipment items replacing required or standard items
-A = optional equipment items which are in addition to required or standard items

A reference column provides the drawing number for the item.

NOTE

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

Columns showing weight (in pounds) and arm (in inches) provide the weight and center of gravity location for the equipment.

NOTE

Unless otherwise indicated, true values (not net change values) for the weight and arm are shown. Positive arms are distances aft of the airplane datum; negative arms are distances forward of the datum.

NOTE

Asterisks (*) after the weight and arm indicate complete assembly installation. Some major components of the assembly are listed on the lines immediately following. The summation of these major components does not necessarily equal the complete assembly installation.

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	A. POWERPLANT & ACCESSORIES			
A01-R	ENGINE, LYCOMING O-360-A1F6D (INCLUDES STARTER, DUAL MAGNETO, ALTERNATOR, CARBURETOR, & OIL FILTER W/INTEGRAL MOUNT)	1750001-3	296.3	38.7
A05-R	FILTER, CARBURETOR AIR	C294510-0601	1.5	30.0
A17-R	OIL COOLER, (STEWART-WARNER 8406E)	1750001	2.5	52.0
	OR (HARRISON 8526250)	1750001	2.5	52.0
A33-R	PROPELLER, CONSTANT SPEED (MCCAULEY B2D34C211/82PCA-6)	C161008-0106	49.8	21.0
A37-R	GOVERNOR, PROPELLER (MCCAULEY C290D3/T12)	C161031-0106	3.0	51.5
A41-R	SPINNER INSTALLATION, PROPELLER	1750050	3.5*	17.9*
	SPINNER DOME	0752637	2.0	15.5
	AFT SPINNER BULKHEAD	1750051-1	1.0	24.2
	FWD SPINNER SPACER BULKHEAD	1750051-4	0.5	14.7
A61-S	VACUUM SYSTEM INSTL, ENGINE-DRIVEN	1713217	4.6*	54.2*
	DRY VACUUM PUMP	C431003	2.7	50.5
	FILTER ASSY	1201075-2	0.5	61.0
	VACUUM GAGE	C668509-0101	0.1	74.0
	VACUUM RELIEF VALVE	C482001-0401	0.5	60.2
	HARDWARE	1713217	0.8	56.4
A70-O	PRIMING SYSTEM, 3-CYLINDER (NET CHANGE)	1756003-3	0.5	42.0
A73-A	VALVE, OIL QUICK DRAIN (NET CHANGE)	1701015-1	0.0	- -
	B. LANDING GEAR & ACCESSORIES			
B01-R-1	WHEEL, BRAKE & TIRE ASSY, 6.00X6 MAIN(TWO) (MCCAULEY)	C163016-0128	37.4*	123.5*
	WHEEL ASSY, MCCAULEY D-30580 (EACH)	C163004-0104	6.2	123.8
	BRAKE ASSY, MCCAULEY C-30018-4 (LEFT)	C163032-0109	1.8	120.5
	BRAKE ASSY, MCCAULEY C-30018-4 (RIGHT)	C163032-0108	1.8	120.5
	TIRE, 6-PLY BLACKWALL (EACH)	C262003-0204	8.7	123.8
	TUBE (EACH)	C262023-0102	1.9	123.8
B01-R-2	WHEEL, BRAKE & TIRE ASSY, 6.00X6 MAIN(TWO) (CLEVELAND)	1241156-38	39.8*	123.5*
	WHEEL ASSY, CLEVELAND 40-133 (EACH)	C163001-0104	7.4	123.8
	BRAKE ASSY, CLEVELAND 30-75 (LEFT)	C163030-0113	1.9	120.5
	BRAKE ASSY, CLEVELAND 30-75 (RIGHT)	C163030-0114	1.9	120.5
	TIRE, 6-PLY BLACKWALL (EACH)	C262003-0204	8.7	123.8
	TUBE (EACH)	C262023-0102	1.9	123.8
B04-R-1	WHEEL & TIRE ASSY, 5.00X5 NOSE (MCCAULEY)	C163018-0101	9.3*	47.2*
	WHEEL ASSY, MCCAULEY	C163005-0201	3.0	47.2
	TIRE, 4-PLY BLACKWALL	C262003-0102	5.1	47.2
	TUBE	C262023-0101	1.2	47.2
B04-R-2	WHEEL & TIRE ASSY, 5.00X5 NOSE (CLEVELAND)	1241156-2	8.3*	47.2*
	WHEEL ASSY, CLEVELAND 40-77	1241156-12	2.4	47.2
	TIRE, 4-PLY BLACKWALL	C262003-0102	4.7	47.2
	TUBE	C262023-0101	1.2	47.2
B10-S	FAIRING INSTALLATION, WHEEL & BRAKE	0741638	18.5*	108.6*
	NOSE WHEEL FAIRING		3.8	49.2
	MAIN WHEEL FAIRING (EACH)		5.6	125.8
B16-A	AXLE, HEAVY DUTY (SET OF TWO) (NET CHANGE)	0541171	1.0	123.5
	C. ELECTRICAL SYSTEMS			
C01-R	BATTERY, 12 VOLT, 25 AMP HOUR	0511319	23.0	184.5
C01-O	BATTERY, 12 VOLT, 33 AMP HOUR	0712605-1	27.1	184.5
C04-R	REGULATOR, 14 VOLT, 60 AMP ALTERNATOR	C611001-0201	0.6	58.5
C07-A	GROUND SERVICE PLUG RECEPTACLE	1770004-1	2.5	66.0
C16-A	HEATING SYSTEM, PITOT (NET CHANGE)	1720099-4	0.9	112.5
C22-A	INSTRUMENT POST LIGHTS & EL PANEL INSTL.	1701030-2	2.3	74.0
C25-A-1	MAP LIGHT, CONTROL WHEEL MOUNTED	1770019-6	0.2	83.0
C25-A-2	MAP LIGHT & MIKE SWITCH, CONTROL WHEEL MOUNTED	1770019-4	0.3	81.9
C31-A	COURTESY LIGHTS (SET OF THREE)	1770005-2	1.0	109.0
C34-R	PUMP, BENDIX ELECTRIC FUEL	1216012	2.0	53.0
C37-R	LIGHTS, NAVIGATION (SET OF THREE)	1770002	1.0	139.5
C40-A	DETECTORS, NAVIGATION LIGHT (SET OF TWO)	0701013	NEGL	- -
C43-R	LIGHT INSTALLATION, OMNIFLASH BEACON	1731000	1.9*	254.4*
	FLASHER POWER SUPPLY (IN TAILCONE)	C594502-0201	0.7	267.4
	LIGHT ASSY. (ON FIN TIP)	C621001-0106	0.6	293.6
	SWITCH, CIRCUIT BREAKER, AND WIRING		0.3	134.3
	RESISTOR (MEMCOR)	0R95-1.5	0.3	273.9
C46-A	STROBE LIGHTS, WING TIP MOUNTED	2001013	3.0*	106.4*
	FLASHER POWER SUPPLY (SET OF TWO)	C622007-0101	2.3	107.9
	STROBE TUBE, WING TIP (SET OF TWO)	C622006-0101	0.3	106.5
C49-S	LANDING LIGHT INSTL, COWL MOUNTED	1701017	1.7*	41.0*
	LAMP (G.E.)	4522	0.8	39.2

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
C49-O	LANDING & TAXI LIGHT INSTL, COWL MOUNTED	1701026	3.1	39.3
	D. INSTRUMENTS			
D01-R	INDICATOR, AIRSPEED	C661064-0105	0.6	72.9
D01-O	INDICATOR, TRUE AIRSPEED	1713375	0.7	73.1
D04-A	STATIC SOURCE, ALTERNATE	1701018-3	0.5	86.0
D07-R	ALTIMETER, SENSITIVE (50 FT MARKINGS)	C661071-0101	1.0	72.5
D07-O-1	ALTIMETER, SENSITIVE (FEET & MILLIBARS)	C661071-0102	1.0	72.5
D07-O-2	ALTIMETER, SENSITIVE (20 FT. MARKINGS)	C661025-0102	1.0	72.5
D10-A	ALTIMETER, SENSITIVE - SECOND UNIT INSTL. (MAKES DUAL ALTIMETER SYSTEM)	2001015	0.8	71.9
D16-A-1	ENCODING ALTIMETER (REQUIRES RELOCATING REGULAR ALTIMETER)	1701031-1	3.0	69.6
D16-A-2	ENCODING ALTIMETER, FEET & MILLIBARS (REQUIRES RELOCATING REGULAR ALTIMETER)	1701031-2	3.0	69.6
D16-A-3	ENCODING ALTIMETER, BLIND (INSTRUMENT PANEL MOUNTING NOT REQUIRED)	1701033	1.7*	62.0
	ENCODING ALTIMETER	C744001-0101	1.3	61.8
D22-A	INDICATOR, CARBURETOR AIR TEMPERATURE	1713216-4	1.2*	68.7*
	TEMPERATURE SENDER	0550209	0.1	37.7
	GAGE	S1311-3	1.0	73.2
D25-S	CLOCK INSTALLATION	1713222-1	0.4*	96.2*
	ELECTRIC CLOCK			
D28-R	COMPASS, MAGNETIC	C664508-0101	0.3	73.6
D37-R	GAGE CLUSTER, LEFT FUEL & OIL PRESSURE	C660501-0101	0.5	82.0
D40-R	GAGE CLUSTER, RIGHT FUEL & OIL TEMP	C669515-0104	0.5	74.0
D43-R	GAGE CLUSTER, CYL. HEAD TEMP & AMMETER	C669516-0105	0.5	74.0
D49-O	INDICATOR, ECONOMY MIXTURE	C669517-0103	0.5	74.0
D58-R	GAGE, FUEL PRESSURE	1701012-1	0.6	66.8
D64-S	GYRO INSTALLATION	C662023-0102	0.5	73.0
	(REQUIRES ITEM A61-S VACUUM SYSTEM)	1713217-5	6.0*	70.7*
	DIRECTIONAL INDICATOR	C661075	2.5	71.9
	ATTITUDE INDICATOR	C661076	2.1	72.1
	HOSES, FITTINGS, SCREWS, CLAMPS	1713217	1.4	66.4
D64-O-1	GYRO INSTALLATION (REQUIRES ITEM A61-S VACUUM SYSTEM)	1713217&1201126	6.4*	70.8*
	DIRECTIONAL INDICATOR W/HDG SELECTOR	1201126	2.9	71.9
	ATTITUDE INDICATOR	C661076	2.1	72.1
	HOSES, FITTINGS, SCREWS, CLAMPS	1713217	1.4	66.4

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
D64-O-2	GYRO INSTALLATION FOR NAV-O-MATIC 300A (REQUIRES ITEM A61-S VACUUM SYSTEM)	1713253-1	6.7*	70.9*
	DIRECTIONAL INDICATOR	40760-0104	3.2	72.0
	ATTITUDE INDICATOR	C661076	2.1	72.1
	HOSES, FITTINGS, SCREWS, CLAMPS	1713253	1.4	66.4
D67-A	HOURMETER INSTL.	1701029-1	0.5	64.7
D73-R	GAGE, MANIFOLD PRESSURE	C662035-0102	0.9	73.0
D82-S	INDICATOR, OUTSIDE AIR TEMP (C668507-0101)	1713353-2	0.1	85.9
D85-R	TACHOMETER INSTALLATION, ENGINE	1706061	0.9*	70.3*
	RECORDING TACHOMETER, INDICATOR	C668020-0114	0.7	73.0
	TACH FLEXIBLE SHAFT (ASES 1605-24)	S-1605-2	0.2	61.0
D88-S	INDICATOR, TURN COORDINATOR (C661003-0504)	1713223-1	1.3	72.4
D88-O-1	INDICATOR, TURN COORDINATOR (ARC42320-0014) (USE WITH NAV-O-MATICS 200A & 300A)	3930144&3930145	1.9	71.6
D88-O-2	INDICATOR, TURN AND BANK (S-1413N2)	1713220-1	2.0	71.6
D91-S	INDICATOR, RATE-OF-CLIMB (C661080-0101)	1700128-1	0.9	72.6
	E. CABIN ACCOMMODATIONS			
E02-S	ARM RESTS, REAR SEAT (SET OF TWO)	0514079	2.0	137.3
E05-R	SEAT, FIXED HEIGHT - PILOT	1714096-18	13.0	101.0
E05-O	SEAT, INFINITE ADJUST - PILOT	0514123	23.0	98.0
E07-S	SEAT, FIXED HEIGHT - CO-PILOT	1714096-18	13.0	101.0
E07-O	SEAT, INFINITE ADJUST - CO-PILOT	0514123	23.0	98.0
E09-S	SEAT, REAR (ONE PIECE BACK CUSHION)	1714098-19	28.4	139.0
E09-O	SEAT, REAR (TWO PIECE BACK CUSHION)	1714097-32	29.4	139.0
E11-A	SEAT INSTL., AUXILIARY FOLD-AWAY	0501009	7.7	168.8
E15-R	BELT ASSY, PILOT LAP	S-2275-115	1.0	93.0
E15-S	SHOULDER HARNESS ASSY, PILOT	S-2275-205	0.6	93.0
E19-O	SHOULDER HARNESS INERTIA REEL INSTL, PILOT & CO-PILOT (NET CHANGE)	1701027	1.0	155.4
E23-S	BELT & SHOULDER HARNESS ASSY, CO-PILOT	S-2275-16	1.6	93.0
E27-S	BELT ASSY, REAR OCCUPANT LAP (SET OF TWO)	S-1746-16	2.0	135.0
E27-O	BELT & SHOULDER HARNESS ASSY, REAR OCCUPANT (SET OF TWO)	S-2275-11	3.2	135.0
E29-A	BELT ASSY, AUXILIARY FOLD-AWAY SEAT	S-1746-5	0.8	168.8
E33-A	CARPET, BLACK (NET CHANGE)	CES-1164	0.0	--
E35-A-1	LEATHER SEATING (NET CHANGE)	CES-1164	2.0	120.0
E35-A-2	SEATS, VINYL CUSHION (NET CHANGE)	CES-1164	0.0	--
E43-A	VENTILATION SYSTEM, REAR SEAT	1706052-1	1.8	124.5

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
E49-A	CUP HOLDERS, RETRACTABLE (SET OF TWO)	1701023	0.1	74.5
E50-A	HEADRESTS, FRONT (SET OF TWO)	1215073-11	1.4	107.0
E51-A	HEADRESTS, REAR (SET OF TWO)	1215073-11	1.4	148.0
E53-A	MIRROR, REAR VIEW	1713224-1	0.3	72.4
E55-S	SUN VISORS (SET OF TWO)	1701001-1	1.0	93.0
E57-A	WINDOWS, TINTED (SET OF SIX) (NET CHANGE)	1701010	0.0	- -
E65-S	BAGGAGE NET	2015009	0.5	162.0
E71-A	CARGO TIE-DOWN INSTL. (STOWED) (USE CARGO INSTL. ARM)	1712017-1	1.4	- -
E75-A	STRETCHER INSTALLATION (BOXED) (USE ACTUAL INSTALLED WEIGHT & ARM)	0700164	- -	- -
E85-A	CONTROLS INSTALLATION, DUAL	1760007	6.3*	76.0*
	CONTROL WHEEL, RIGHT SIDE		1.4	82.6
	RUDDER PEDALS, RIGHT SIDE (SET OF TWO)		1.1	62.1
E93-R	HEATING SYSTEM, CABIN & CARBURETOR AIR (INCLUDES EXHAUST SYSTEM)	1706061 1754001	17.5	36.0
	F. PLACARDS & WARNING			
F01-R	PLACARD, OPERATIONAL LIMITATIONS, VFR, DAY AND NIGHT	1705037-9	NEGL	- -
F01-O	PLACARD, OPERATIONAL LIMITATIONS, VFR/IFR, DAY AND NIGHT	1705037-10	NEGL	- -
F04-R	INDICATOR, AUDIBLE PNEUMATIC STALL WARNING	1706014	0.5	115.5
	G. AUXILIARY EQUIPMENT			
G01-A	LIFT HANDLES, TAILCONE (SET OF TWO)	1712150-1	1.2	252.7
G07-A	RINGS, AIRPLANE HOISTING	1700122-1	1.8	120.7
G13-A	CORROSION PROOFING, INTERNAL	1700123	6.0	140.0
G16-A	STATIC DISCHARGE INSTL. (SET OF TEN)	2001017-1	0.3	226.0
G19-A	STABILATOR ABRASION BOOT	1701019-3	2.7	276.5
G22-S	TOW BAR (STOWED)	0501019	1.6	162.0
G25-S	PAINT, OVERALL EXTERIOR	1704015	10.9*	159.5*
	OVERALL WHITE BASE (96,266 SQ.IN.)		10.5	157.0
	COLOR STRIPING SCHEME		0.4	228.1
G28-A	JACK PAD ASSY (SET OF TWO)	1700129-1	1.2	127.7
G31-A	CABLES, CORROSION RESISTANT (NET CHANGE)	1700123	0.0	- -

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
G55-A	FIRE EXTINGUISHER INSTALLATION	1701008-3	3.0*	125.5*
	FIRE EXTINGUISHER	C421001-0101	2.6	125.5
	FIRE EXTINGUISHER BRACKET	C421001-0102	0.3	125.5
G88-A	WINTERIZATION KIT INSTALLATION, ENGINE	1752121-13	0.6*	35.4*
	BREATHER TUBE INSULATION		0.2	53.3
	TWO COWL INLET AIR COVERS (INSTALLED)		0.3	25.0
G92-O	WINGS, EXT. RANGE-60 GAL.FUEL (NET CHANGE)	1701024-1	3.6	118.8
G96-A	CABIN STEP INSTL. (SET OF TWO)	1701028	2.0	103.0
	H. AVIONICS & AUTOPILOTS			
H01-A	CESSNA 300 ADF	3910159-5	7.3*	79.1*
	RECEIVER WITH BFO (R-546E)	41240-0101	2.3	69.5
	INDICATOR (IN-346A)	40980-1001	0.9	71.0
	ADF LOOP ANTENNA & WIRING	3960104-1	2.2	90.8
	ADF SENSE ANTENNA & CABLES	1770000-623	0.2	177.0
	MTG. BOX, WIRING & HDWR.		1.7	71.9
H04-A	NARCO DME 190	3910166-3	7.4*	73.3*
	TRANSCEIVER (3312-400)	3930165	4.9	68.8
	MOUNTING BOX	3930165	0.6	68.4
	DME ANTENNA	3960133-1	0.2	148.3
H07-A	CESSNA 400 GLIDESLOPE	3910157-3	4.8*	146.4*
	RECEIVER (R-443B) (40 CHANNEL)	42100-0000	2.1	181.3
	MOUNTING, RIGID	36450-0000	0.3	181.3
	ANTENNA & COVER ASSEMBLY	1200098-1	0.2	91.0
H10-A	PANTRONICS HF TRANSCEIVER, FIRST UNIT	3910156-1	26.0*	139.8*
	TRANSCEIVER (PT10-A)	C582103-0102	3.1	68.5
	MOUNTING BOX		0.8	68.5
	REMOTE POWER SUPPLY (PT-10PS-14)	C582103-0201	8.5	184.3
	ANTENNA LOAD BOX (OX10-RL-14)	C589502-0101	4.2	200.8
	ANTENNA WIRE, 351 IN. LONG	1770000-614	0.3	218.2
	CABLE INSTL.	3950123-14	2.5	111.8
	AUDIO CONTROL PANEL INSTL.	3970121-1	1.9	69.3
	HEADSET INSTL.	3970125-3	0.2	70.5
	MICROPHONE INSTL., HAND-HELD	3970124-2	0.3	75.9
	NOISE FILTER AUDIO (S-1915-1)	3940148-2	0.1	32.3
	RADIO COOLING	3930152-4	1.4	68.2
	RELAY INSTL., SPLIT BUS BAR	3970126-1	0.4	64.9
	SPEAKER INSTL., CABIN (596504-0201)	3970123-3	1.5	111.0
	MISC. HDWR.		0.8	190.6

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
H11-A-1	PANTRONICS HF TRANSCEIVER, SECOND UNIT	3910156-2	20.2*	157.2*
	TRANSCEIVER (PT10-A)	C582103-0102	3.1	68.5
	MOUNTING BOX		0.8	68.5
	REMOTE POWER SUPPLY (PT-10PS-14)	C582103-0201	8.5	184.3
	ANTENNA LOAD BOX (OX10-RL-14)	C589502-0101	4.2	200.8
	ANTENNA WIRE, 351 IN. LONG	1770000-614	0.3	218.2
	CABLE INSTL.	3950123-14	2.5	111.8
	MISC. HDWR.		0.8	190.6
H11-A-2	PANTRONICS HF TRANSCEIVER, THIRD UNIT	3910156-15	20.2*	157.2*
	SAME AS 2ND UNIT (ITEM H11-A-1)			
H11-A-3	SUNAIR SSB HF TRANSCEIVER, SECOND UNIT	3910158-2	22.7*	155.1*
	TRANSCEIVER, SINGLE SIDE BAND (ASB-125)	99680	4.5	68.5
	MOUNTING BOX		0.8	68.5
	REMOTE POWER SUPPLY (PA-1010A)	99682	8.9	188.3
	ANTENNA LOAD BOX (CU-110)	99816	4.9	200.8
	ANTENNA WIRE, 351 IN. LONG	1770000-614	0.3	218.2
	CABLE INSTL.	3950123-11	2.5	111.8
	MISC. HDWR.		0.8	190.6
H11-A-4	SUNAIR SSB HF TRANSCEIVER, THIRD UNIT	3910158-6	22.7*	155.1*
	SAME AS 2ND UNIT (ITEM H11-A-3)			
H13-A-1	CESSNA 400 MARKER BEACON	3910164-2	2.7*	151.8*
	RECEIVER (R-402A)	42410-5114	0.7	204.6
	ANTENNA, L-SHAPED ROD	0770681-1	0.7	200.8
H13-A-2	BENDIX MARKER BEACON	3910174-3	3.8*	170.8*
	RECEIVER ASSEMBLY (GM-247A	400412-4706	1.6	181.7
	ANTENNA ASSEMBLY, L SHAPED ROD	0770681-1	0.7	200.8
H16-A-1	CESSNA 300 TRANSPONDER	3910127-15	3.8*	75.3*
	RECEIVER-TRANSMITTER (RT-359A)	41420-1114	2.7	68.5
	ANTENNA (A-109)	41530-0001	0.3	192.6
H16-A-2	CESSNA 400 TRANSPONDER (EXPORT USE)	3910128-22	4.0*	75.0*
	RECEIVER-TRANSMITTER (RT-459A)	41470-1114	2.8	68.5
	ANTENNA (A-109A)		0.3	192.6
H19-A	CESSNA 300 VHF TRANSCEIVER, FIRST UNIT	3910155-1	15.0*	90.7*
	TRANSCEIVER (RT-524A)	31390-1514	6.4	68.0
	MOUNTING BOX (M-514A)	30420-0000	0.7	68.0
	CABLE INSTL, 300 XCVR	3950123-15	0.5	75.5
	ANTENNA & CABLE, LEFT VHF COM	3960113-1	1.0	109.9
	AUDIO CONTROL PANEL INSTL.	3970121-1	1.9	69.3
	HEADSET INSTL.	3970125-3	0.2	70.5
	MICROPHONE INSTL., HAND-HELD		0.3	75.9
	RADIO COOLING	3930152-4	1.4	68.2
	RELAY INSTL., SPLIT BUS BAR	3970126-1	0.4	64.9

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	SPEAKER INSTL., CABIN (596504-0201)	3970123-3	1.5	111.0
	MISC. HDWR.		0.7	68.5
H20-A	CESSNA 300 VHF TRANSCEIVER, SECOND UNIT	3910155-2	9.3*	72.9*
	TRANSCEIVER (RT-524A)	31390-1514	6.4	68.0
	MOUNTING BOX (M-514A)	30420-0000	0.7	68.0
	CABLE INSTL, 300 XCVR	3950123-15	0.5	75.5
	ANTENNA & CABLE, RIGHT VHF	3960113-2	1.0	109.9
	MISC. HDWR.		0.7	68.5
H22-A-1	CESSNA 300 NAV/COM, 160 CH, FIRST UNIT WITH VOR/LOC	3910151-3	16.7*	88.8*
	RECEIVER-TRANSMITTER (RT-308C)	42450-1114	6.4	68.0
	VOR/LOC INDICATOR (IN-514B)	45010-1000	0.6	73.5
	NOTE--1ST NAV/COM INSTALLATION COMPONENTS ARE AS FOLLOWS--			
	ANTENNA & CABLE, LEFT VHF COM	3960113-1	1.0	109.9
	ANTENNA & CABLE, OMNI	3960102-3	1.5	227.1
	AUDIO CONTROL PANEL INSTL.	3970121-1	1.9	69.3
	HEADSET INSTL.	3970125-3	0.2	70.5
	MICROPHONE INSTL., HAND-HELD	3970124-2	0.3	75.9
	NOISE FILTER AUDIO (S-1915-1)	3940148-2	0.1	32.3
	RADIO COOLING	3930152-4	1.4	68.2
	RELAY INSTL., SPLIT BUS BAR	3970126-1	0.4	64.9
	SPEAKER INSTL., CABIN (596504-0201)	3970123-3	1.5	111.0
	MTG. BOX, WIRING & HDWR.		1.4	66.9
H22-A-2	CESSNA 300 NAV/COM, 720 CH, FIRST UNIT WITH VOR/LOC	3910150-5	17.2*	88.2*
	RECEIVER-TRANSMITTER (RT-328T)	43340-1124	6.9	68.0
	VOR/LOC INDICATOR (IN-514B)	45010-1000	0.6	73.5
	INSTL COMPONENTS SAME AS H22-A-1			
H22-A-3	CESSNA 300 NAV/COM, 720 CH, FIRST UNIT WITH VOR/ILS	3910152-5	17.3*	88.1*
	RECEIVER-TRANSMITTER (RT-328T)	43340-1124	6.9	68.0
	VOR/ILS INDICATOR (IN-525B)	45010-2000	0.7	73.5
	INSTL COMPONENTS SAME AS H22-A-1			
H25-A-1	CESSNA 300 NAV/COM, 160 CH, SECOND UNIT WITH VOR/LOC	3910151-4	9.6*	72.5*
	RECEIVER-TRANSMITTER (RT-308C)	42450-1114	6.4	68.0
	VOR/LOC INDICATOR (IN-514B)	45010-1000	0.6	73.5
	NOTE--2ND NAV/COM INSTALLATION COMPONENTS ARE AS FOLLOWS--			

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	ANTENNA & CABLE, RIGHT VHF COM	3960113-2	1.0	109.9
	ANTENNA COUPLER & CABLE (S-2086-1)	3960111-1	0.2	65.0
	MTG. BOX, WIRING & HDWR.		1.4	66.9
H25-A-2	CESSNA 300 NAV/COM, 720 CH, SECOND UNIT WITH VOR/LOC	3910150-6	10.1*	72.3*
	RECEIVER-TRANSMITTER (RT-328T)	43340-1124	6.9	68.0
	VOR/LOC INDICATOR (IN-514B)	45010-1000	0.6	73.5
	INSTL COMPONENTS SAME AS H25-A-1			
H28-A-1	EMERGENCY LOCATOR TRANSMITTER	0401008-3	2.0*	197.4*
	TRANSMITTER (LEIGH SHARC 7)	C589510-0209	1.8	197.7
	ANTENNA	C589510-0203	0.1	195.5
	CABLE & HDWR.		0.1	194.8
H28-A-2	EMERGENCY LOCATOR TRANSMITTER (FOR USE IN CANADA)	0401008-6	1.8*	197.4*
	TRANSMITTER (LEIGH SHARC 7)	C589510-0212	1.6	197.7
	ANTENNA	C589510-0107	0.1	195.5
	CABLE & HDWR.		0.1	194.8
H31-A-1	NAV-O-MATIC 200A AUTOPILOT	3910162	10.2*	107.9*
	COMPUTER & MOUNT (ARC 43610-1000)	3930144-2	1.6	67.5
	TURN COORDINATOR (NET CHANGE)	3930144-2	0.6	69.9
	ROLL ACTUATOR INSTL.	1200237-9	6.7	125.5
	RELAY INSTALLATION	3970128-3	0.1	67.0
	CABLES AND HARDWARE		1.2	85.9
H31-A-2	NAV-O-MATIC 300A AUTOPILOT	3910163	11.6*	105.5*
	CONTROLLER & MOUNT (ARC 42660-1000)	3930145-2	1.8	67.5
	GYRO INSTALLATION (NET CHANGE)	1713253-1	0.7	72.0
	TURN COORDINATOR (NET CHANGE)	3930145-2	0.6	69.9
	ROLL ACTUATOR INSTL.	1200237-4	7.2	125.1
	RELAY INSTALLATION	3970128-3	0.1	67.0
	CABLES AND HARDWARE		1.2	85.9
H55-A	MICROPHONE-HEADSET COMBINATION (INCLUDES MIKE SWITCH)	3970112-2	0.5	72.4
	J. SPECIAL OPTION PACKAGES			
J01-A	CARDINAL II EQUIPMENT	1700002	27.5*	95.2*
	CONSISTS OF THE FOLLOWING ITEMS			
	C16-A HEATED PITOT	1720099-4	0.9	112.5
	C31-A COURTESY LIGHTS	1770005-2	1.0	109.0
	C40-A NAV LIGHT DETECTORS	0701013	NEGL	- -

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	D01-O TRUE AIRSPEED IND. (NET CHANGE)	1713375	0.1	74.3
	D04-A STATIC AIR ALTERNATE SOURCE	1701018-3	0.5	86.0
	E85-A DUAL CONTROLS	1760007	6.3	76.0
	H22-A-1 CESSNA 300 NAV/COM, FIRST UNIT	3910151-3	16.7	88.8
	H28-A-1 EMERGENCY LOCATOR TRANSMITTER	0401008-3	2.0	197.4
J04-A-1	CARDINAL II NAV PAC (NET CHANGE)	3910161-3	21.2*	75.2*
	CONSISTS OF THE FOLLOWING ITEMS			
	H01-A CESSNA 300 ADF WITH BFO	3910159-5	7.3	79.1
	H16-A-1 CESSNA 300 TRANSPONDER	3910127-15	3.8	75.3
	H22-A-2 CESSNA 300 NAV/COM, FIRST UNIT	3910150-5	17.2	88.2
	H22-A-1 CESSNA 300 NAV/COM REPLACED	3910151-3	-16.7	88.8
	H25-A-1 CESSNA 300 NAV/COM, SECOND UNIT	3910151-4	9.6	72.5
J04-A-2	CARDINAL II NAV PAC (NET CHANGE) (FOR EXPORT ONLY)	3910161-6	18.5*	74.9*
	CONSISTS OF THE FOLLOWING ITEMS			
	H01-A CESSNA 300 ADF WITH BFO	3910159-5	7.3	79.1
	H22-A-2 CESSNA NAV/COM, FIRST UNIT	3910150-5	17.2	88.2
	FILTER INSTALLATION	41260-0000	1.1	62.0
	H22-A-1 NAV/COM FIRST UNIT REPLACED		-16.7	88.2
	H25-A-1 CESSNA 300 NAV/COM, SECOND UNIT	3910151-4	9.6	72.5
8/2/88	AR850		.8	63.5

SECTION 7
AIRPLANE AND SYSTEMS DESCRIPTIONS

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Automatic Audio Selector Switch ---------- 7-28
Audio Selector Switches ---------- 7-28
Microphone-Headset ---------- 7-28
Static Dischargers ---------- 7-29

INTRODUCTION

This section provides description and operation of the airplane systems. Some equipment described herein is optional and may not be installed in the airplane. Refer to Section 9, Supplements, for details of other optional systems and equipment.

AIRFRAME

The Cardinal is an all-metal, four-place, high-wing, single-engine airplane equipped with tricycle landing gear, and designed for general utility purposes.

The construction of the fuselage is a conventional formed sheet metal bulkhead and skin design referred to as semi-monocoque. Incorporated into the fuselage structure are a flat floorboard extending from the firewall to the back of the baggage compartment, large cabin door openings, and a baggage door opening. Major items of structure include a forward carry-through spar and a forged aluminum main carry-through spar to which the wings are attached. The lower aft portion of the fuselage center section contains the forgings and structure for the main landing gear. A reinforced tail skid / tie-down ring is installed on the tailcone for the tailcone protection.

The full cantilever, modified laminar flow wings with integral fuel tanks are constructed of a forward spar, main spar, conventional formed sheet metal ribs and aluminum skin. The integral fuel tanks are formed by the forward spar, two sealing ribs, and an aft fuel tank spar forward of the main spar. The Frise-type ailerons and single-slot type flaps are of the conventional formed sheet metal ribs and smooth aluminum skin construction. The ailerons are equipped with ground adjustable trim tabs on the inboard end of the trailing edge, and balance weights in the leading edges.

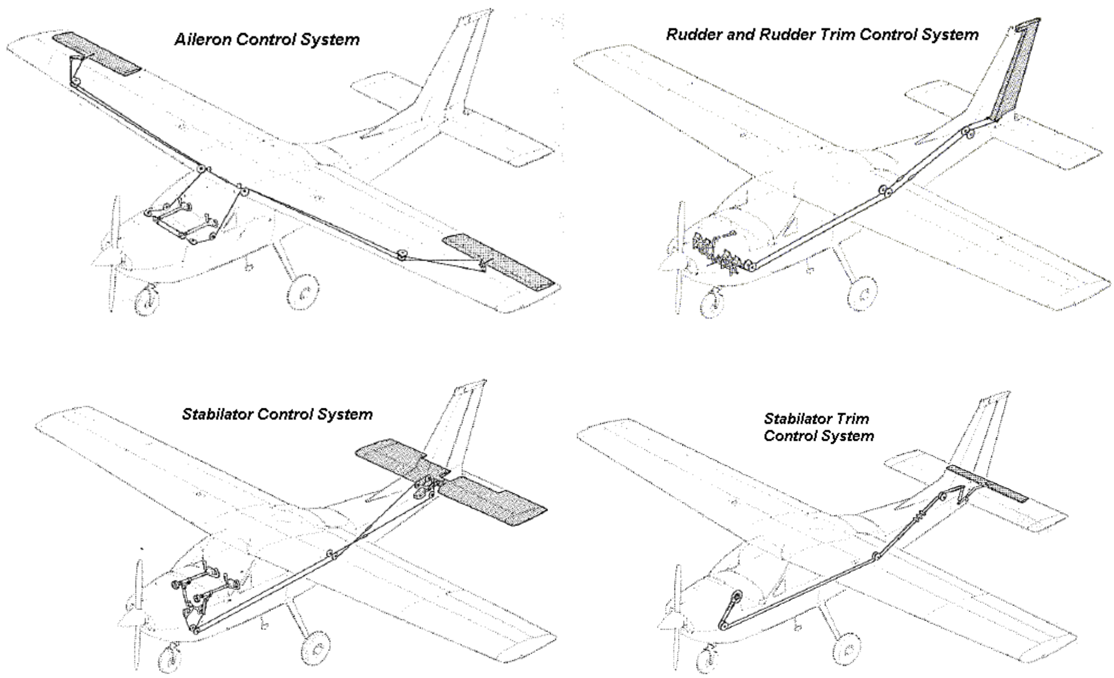
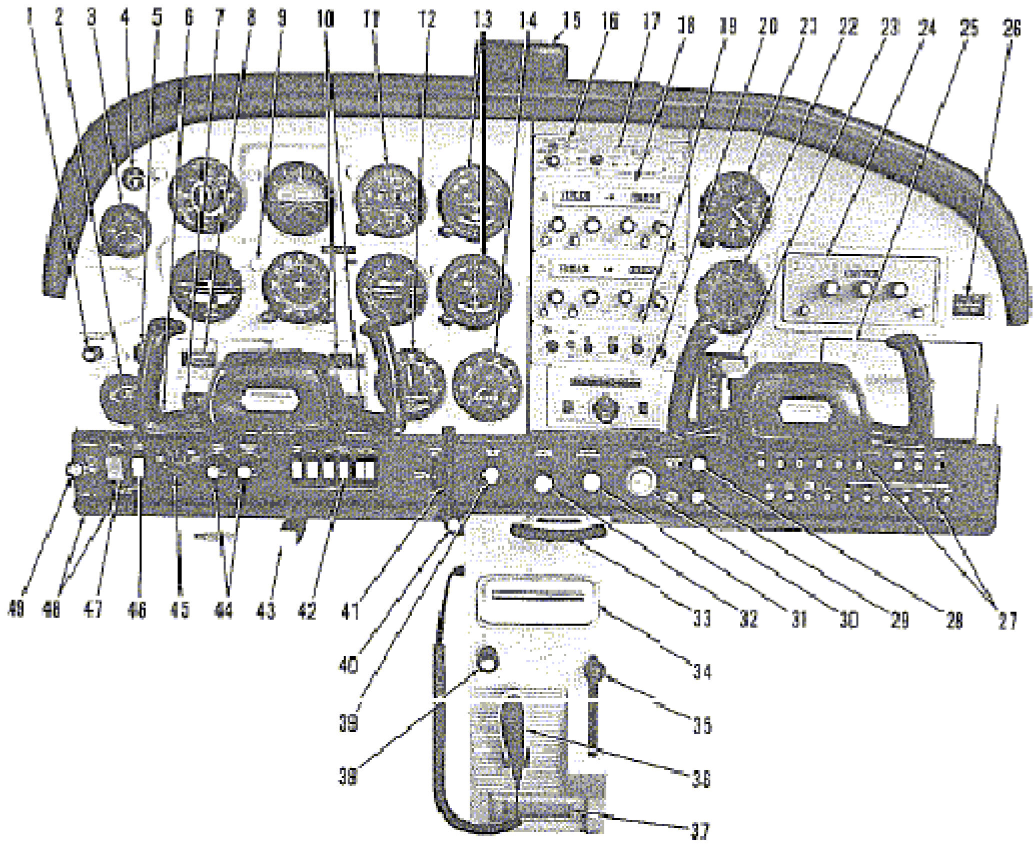


Figure 7-1 Flight Controls and Trim Systems

The empennage (tail assembly) consists of a conventional vertical stabilizer and rudder, and a stabilator. The vertical stabilizer and rudder are of conventional construction consisting of formed sheet metal forward and aft spars, and formed sheet metal ribs covered with aluminum skin. The tip of the rudder is designed with a leading edge overhang which contains a balance weight. The stabilator is a combination of the horizontal stabilizer and elevator, and incorporates a 40% span anti-servo trim tab. The stabilator is constructed of a torque transmitting primary spar, and aft spar, formed sheet metal ribs, and aluminum skin. The stabilator contains a beam mounted balance weight attached to the center of the primary spar and extending into the fuselage tailcone. The leading edge contains four inverted slots formed of sheet metal and positioned to place two on each side of the fuselage.

FLIGHT CONTROLS

The airplane's flight control system consists of conventional aileron and rudder control surfaces and a stabilator (combined horizontal stabilizer and elevator) (see figure 7-1). The control surfaces are manually operated through mechanical linkage using a control wheel for the aileron and stabilator, and rudder / brake pedals for the rudder.



1	Static Pressure Alternate Source Valve	26	Flight Hour Recorder
2	Economy Mixture Indicator	27	Circuit Breakers
3	Clock	28	Defroster Control Knob
4	Suction gage	29	Cabin Air / Heat Control Knob
5	Fuel Pressure Gage	30	Mixture Control Knob
6	Over-Voltage Warning Light	31	Propeller Control Knob
7	Ammeter and Oil Pressure Gages	32	Throttle (With Friction Lock)
8	Cylinder head Temperature and Left Fuel Quantity Indicator	33	Rudder Trim Control Wheel
9	Flight Instrument Group	34	Ashtray
10	Right Fuel Quantity Indicator and Oil Temperature Gage	35	Cowl Flap Control Lever
11	Encoding Altimeter	36	Microphone
12	Manifold Pressure Gage	37	Courtesy Light
13	Omni Course Indicators	38	Cigar Lighter
14	Tachometer	39	Carburetor Heat Control Knob
15	Rear View Mirror	40	Fuel Shutoff Valve Control Knob
16	Marker Beacon Indicator Lights and Switches	41	Stabilator Trim Control Wheel
17	Audio Control Panel	42	Electrical Switches
18	Radios	43	Parking Brake Handle
19	Transponder	44	Instruments and Radio Dial Light Rheostats
20	Autopilot Control Unit	45	Ignition Switch
21	Secondary Altimeter	46	Auxiliary Fuel Pump Switch
22	ADF Bearing Indicator	47	Master Switch
23	Wing Flap Switch and Position Indicator	48	Phone and Auxiliary Mike Jacks
24	ADF Radio	49	Primer
25	Map Compartment		

Figure 7-2 Instrument Panel

TRIM SYSTEMS

Manually operated rudder and stabilator trim is provided. Rudder trimming is accomplished through a bungee connected to the rudder control system and a trim control wheel mounted on the control pedestal. Rudder trimming is accomplished by rotating the horizontally mounted trim control wheel either left or right to the desired trim position. Rotating the trim wheel to the right will trim nose-right; conversely, rotating it to the left will trim nose-left. Stabilator trimming is accomplished through the stabilator trim tab by utilizing the vertically mounted trim control wheel. Forward rotation of the trim wheel will trim nose-down; conversely, aft rotation will trim nose up.

INSTRUMENT PANEL

The instrument panel (see Figure 7-2) is designed around the basic “T” configuration. The gyros are located immediately in front of the pilot and arranged vertically over the control column. The airspeed indicator and altimeter are located to the left and right of the gyros respectively. The remainder of the flight instruments are located around the basic “T”. Engine and electrical instruments and fuel quantity indicators are arranged around the base of the control wheel shaft. An alternate static source valve control knob and two additional instruments may be installed along the left edge of the instrument panel. Avionics equipment is stacked approximately on the centerline of the panel, with the right side of the panel containing the wing flap switch and indicator, map compartment, and space for additional instruments and avionics equipment. A switch and control panel, at the lower edge of the instrument panel, contains most of the switches, controls, and circuit breakers necessary to operate the airplane. The left side of the panel contains the primer, master switch, auxiliary fuel pump switch, ignition switch, panel light intensity, controls and electrical switches for installed equipment. The center area contains the stabilator trim control wheel, carburetor heat control knob, throttle, propeller control, and mixture control. The right side of the panel contains the defroster control knob, cabin air / heat control knob and circuit breakers. A pedestal, extending from the edge of the switch and control panel to the floorboard, contains the rudder trim control wheel, an ashtray, a cigar lighter, the cowl flap control lever, and the microphone bracket. A fuel shutoff valve is positioned at the upper left corner of the pedestal, and a parking brake handle is mounted under the switch and control panel, in front of the pilot.

For details concerning the instruments, switches, circuit breakers, and controls on this panel, refer in this section to the description of the systems to which these items are related.

GROUND CONTROL

Effective ground control while taxiing is accomplished through nose wheel steering by using the rudder pedals; left rudder to steer left and right rudder pedal to steer right. When a rudder pedal is depressed, a spring-loaded steering bungee (which is connected to the nose gear and to the rudder bars) will turn the nose wheel through an arc of approximately 9° each side of center. By applying either left or right brake, the degree of turn may be increased up to 45° each side of center.

Moving the airplane by hand is most easily accomplished by attaching a tow bar to the nose gear strut. If a tow bar is not available, or pushing is required, us the main landing gear struts as push points. Do not use .the vertical or horizontal surfaces to move the airplane. If the airplane is to be towed by vehicle, never turn the nose wheel more than 45° either side of center or structural damage to the nose gear could result.

The minimum turning radius of the airplane, using differential braking and nose wheel steering during taxi, is approximately 25 feet 5 inches. To obtain a minimum radius turn during ground handling, the airplane may be rotated around either main gear by pressing down at a tailcone bulk head just forward of the stabilator to raise the nose wheel off of the ground.

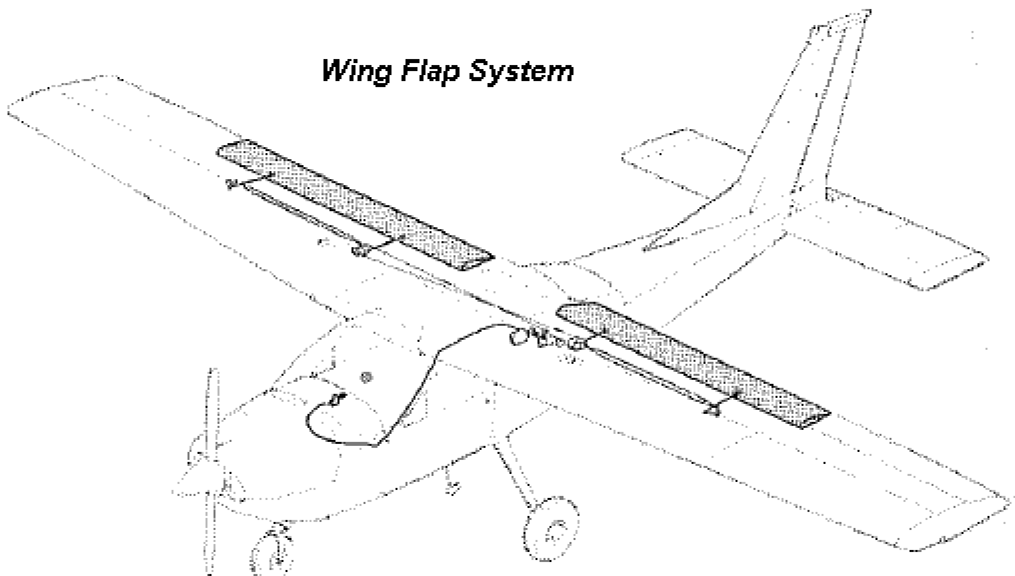


Figure 7-3, Wing Flap System

WING FLAP SYSTEM

The wing flaps are of the large span, single–slot type (see figure 7-3), and are extended or retracted by positioning the wing flap switch lever on the instrument panel to the desired flap deflection position. The switch lever is moved up or down in a slotted panel that provides mechanical stops at the 10° and 20° positions. For flap settings greater that 10, move the switch lever to the right to clear the stop and position it as desired. A scale and pointer on the left side of the switch lever indicates flap travel in degrees. The wing flap system circuit breaker is protected by a 15-amp circuit breaker, labeled FLAP, on the right side of the instrument panel.

LANDING GEAR SYSTEM

The landing gear is of the tricycle type with a steerable nose wheel, two main wheels, and wheel fairings. Shock absorption is provided by the tubular spring-steel main landing gear struts and the air/oil nose gear shock strut. Each main gear wheel is equipped with a hydraulically actuated disc-type brake on the inboard side of each wheel, and an aerodynamic fairing over each brake.

BAGGAGE COMPARTMENT

The baggage compartment consists of the area from the back of the rear passenger seats to the aft cabin bulkhead. Mounted to the aft cabin bulkhead, and extending aft of it, is a hatshelf. Access to the baggage compartment and the hatshelf is gained through a lockable baggage door on the left side of the airplane, or from within the airplane cabin. A baggage net with six tie-down straps is provided for securing baggage and is attached by tying the straps to the tie-down rights provided in the airplane. A cargo tie-down kit may also be installed. For further information on baggage and cargo tie-down, refer to Section 6. When loading the airplane, children should not be placed or permitted in the baggage compartment unless a child's seat is installed, and any material that might be hazardous to the airplane or occupants should not be place anywhere in the airplane. For baggage area and door dimensions refer to Section 6.

SEATS

The seating arrangement consists of two separate adjustable seats for the pilot and front passenger, and a solid or split-backed fixed seat in the rear. A child's seat may also be installed aft of the rear seats. The pilot's and front passenger's seats are available in two different designs: four-way and six-way adjustable.

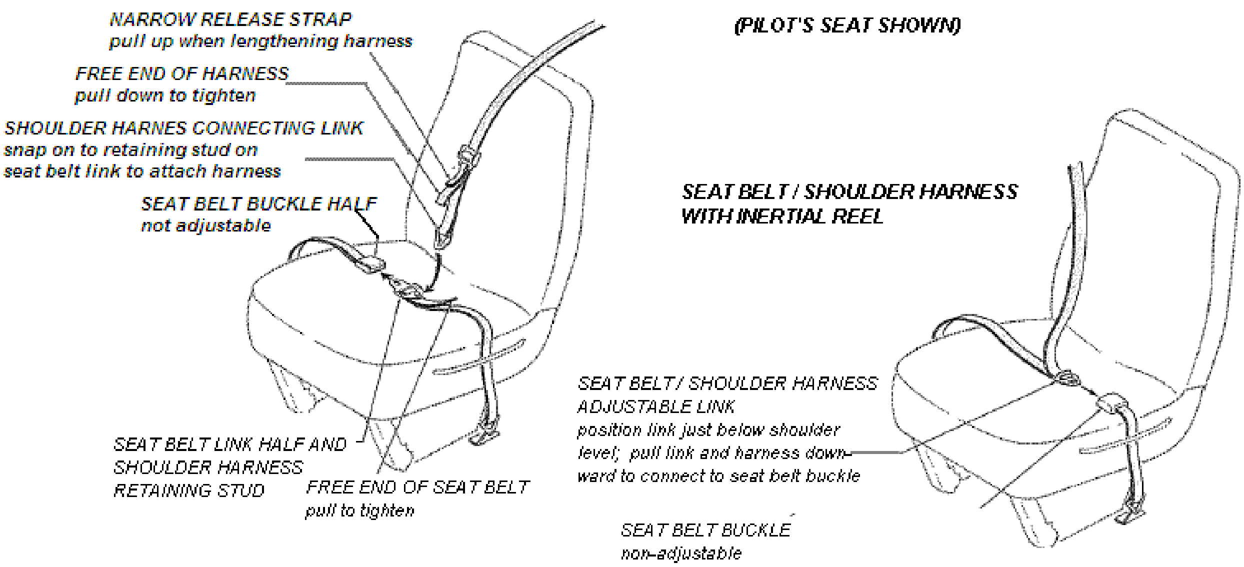


Figure 7-4 Seat belts and shoulder harness

Four-way may be moved forward and aft, and the seat back angle changed. To position the seat, lift the lever under the left corner of the seat, slide into position, release the lever, and check that the seat is locked in place. The seat back is spring-loaded to the vertical position. To adjust its position, rotate the knob on the right rear side of the seat and reposition the back. The seat backs will also fold full forward.

The six-way seats may be moved forward or aft, adjusted for height, and the seat back angle is infinitely adjustable. Position the seat by lifting the tubular handle, under the center of the seat bottom, and slide the seat into position; then release the lever and check that the seat is locked in place. Raise or lower either seat by rotating a crank under the left corner of the seat. Seat back angle is adjustable by rotating a crank under the right corner of either seat. The seat bottom angle will change as the seat back angle changes, providing proper support. The seat backs will also fold full forward.

The rear passenger's seats consist of a fixed one-piece seat bottom with either one-piece or individually adjustable seat backs. The one-piece back is adjusted by a lever under the center of the seat bottom between the passengers. Two adjustment levers are provided for the individually adjustable backs. These levers are under the left and right corners of the seat bottom. All seat back configurations are spring-loaded to the vertical position. To adjust either type of seat back, lift the adjustment lever and reposition the back.

Headrests are available for any of the seat configurations. To adjust the headrest, apply enough pressure to it to raise or lower it to the desired level. The headrest may be removed at any time by raising it until it disengages from the top of the seat back.

SEAT BELTS AND SHOULDER HARNESSES

All seat positions are equipped with seat belts (see Figure 7-4). The pilot's and front passenger's seats are also equipped with separate shoulder harnesses; separate shoulder harnesses are available for the remaining seat positions. Integrated seat belt / shoulder harnesses with inertial reels can be furnished for the pilot's and front passenger's positions if desired.

SEAT BELTS

The seat belts used with the pilot's and front passenger's seats and the child's seat (if installed) are attached to fittings on the floorboard. The buckle half is inboard of each seat and the link half is outboard of each seat. The belts for the rear seat are attached to the seat frame, with the link halves on the left and right sides of the seat bottom and the buckles at the center of the seat bottom.

To use the seat belts for the front seats, position the seat as desired, and then lengthen the link half of the belt as needed by grasping the sides of the link and pulling against the belt. Insert and lock the belt link into the buckle. Tighten the belt to a snug fit. Seat belts for the rear seats and the child's seat are sued in the same manner as the belts for the front seats. To release the seat belts, grasp the top of the buckle opposite the link and pull upward.

SHOULDER HARNESSES

Each front seat shoulder harness is attached to a rear doorpost above the window line and is stowed behind a stowage sheath above the cabin door. To stow the harness, fold it and place it behind the sheath. When rear seat shoulder harnesses are furnished, they are attached adjacent to the lower corners of the rear window. Each rear seat harness is stowed behind a stowage sheath above an aft side window. No harness is available for the child's seat.

To use a front or rear seat shoulder harness, fasten and adjust the seat belt first. Lengthen the harness as required by pulling on the connecting link on the end of the harness and the narrow release strap. Snap the connecting link firmly onto the retaining stud on the seat belt link half. Then adjust to length. A properly adjusted harness will permit the occupant to lean forward enough to sit completely erect, but prevent excessive forward movement and contact with objects during sudden deceleration. Also, the pilot will want the freedom to reach all controls easily.

Removing the shoulder harness is accomplished by pulling upward on the narrow release strap, and removing the harness connecting link from the stud on the seat belt link. In an emergency, the shoulder harness may be removed by releasing the seat belt first and allowing the harness, still attached to the link half of the seat, to drop to the side of the seat.

INTEGRATED SEAT BELT / SHOULDER HARNESSES WITH INERTIA REELS
Integrated seat belt / shoulder harnesses with inertial reels are available for the pilot and front seat passenger. (See Figure 7-4). The seat belt / shoulder harnesses extend from inertia reels located in the cabin ceiling to attach point's inboard of the two front seats. A separate seat belt half and buckle is located outboard of the seats. Inertia reels allow complete freedom of body movement. However, in the event of a sudden deceleration, they will lock automatically to protect the occupants.

NOTE

The inertial reels are located for maximum shoulder harness comfort and safe retention of the seat occupants. This location requires that the shoulder harnesses cross near the top so that the right hand inertia reel serves the pilot and the left hand reel serves the front passenger. When fastening the harness, check to ensure the proper harness is being used.

To use the seat belt / shoulder harness, position the adjustable metal link on the harness at about shoulder level, pull the link and harness downward, and insert the link in the seat belt buckle. Adjust belt tension across the lap by pulling upward on the shoulder harness. Removal is accomplished by releasing the seat belt buckle, which will allow the inertia reel to pull the harness inboard of the seat.

ENTRANCE DOORS AND CABIN WINDOWS

Entry to, and exit from the airplane is accomplished through either of two entry doors, one on each side of the cabin at the front seat position (refer to section 6 for cabin and cabin door dimensions.) The doors incorporate a recessed exterior door handle, a conventional interior door handle, a key-operated door lock (left door only), a door stop mechanism, and a ventilation window.

To open the doors from outside the airplane, utilize the recessed door handle near the aft edge of each door depress the forward end of the handle to rotate it out of its recess, and then pull outboard. To close or open the doors from inside the airplane, use the conventional door handle and arm rest. The inside door handle is a three-position handle having a placard at its base with the positions OPEN, CLOSE and LOCK shown on it. The handle is spring-loaded to the CLOSE (up) position. When the door has been pulled shut and latched, lock it by rotating the door handle forward to the LOCK position. Both cabin doors should be locked prior to flight, and should not be opened intentionally during flight.

NOTE

Accidental opening of a cabin door in flight due to improper closing does not constitute a need to land the airplane. The best procedure is to set up the airplane in a trimmed condition at approximately 80 knots, momentarily shove the door outward slightly, and forcefully close and lock the door.

Exit from the airplane is accomplished by rotating the door handle full aft to the OPEN position and pushing the door open. To lock the airplane, lock the right cabin door with the inside handle, close the left cabin door, and using the ignition key, lock the door.

Both cabin doors are equipped with a crank-operate ventilation window in the lower front corner of the fixed door window. The crank, located below each ventilation window opens the window when rotated forward and closes it when rotated aft. A placard, listing restrictions and usage, is located adjacent to the crank handle. The windows should not be opened at airspeeds above 105 knots, or when the alternated static source is in use. All other cabin windows are of the fixed type and cannot be opened.

CONTROL LOCKS

A control lock is provided to lock the ailerons and stabilator control surfaces in a neutral position and prevent damage to these systems by wind buffeting while the airplane is parked. The lock consists of a shaped steel rod with a red metal flag attached to it. The flag is labeled CONTROL LOCK, REMOVE BEFORE STARTING ENGINE. To install the control lock, align the hole on the right side of the pilot’s control wheel with the hole in the right side of the shaft collar on the instrument panel and insert the rod into the aligned holes. Proper installation of the lock will place the red flag over the ignition switch. In areas where gusty winds occur, a control surface lock should be installed over the vertical stabilizer and rudder. The control lock and any other type of locking device should be removed prior to starting the engine.

ENGINE

The airplane is powered by a horizontally-opposed four-cylinder overhead-valve, air cooled, carbureted engine with a wet sump oil system. The engine is a Lycoming Model O-360-A1F6D and is rated at 10 horsepower at 2700 RPM. Major accessories mounted on the engine include a direct-drive starter and belt-driven alternator on the front of the engine, and dual magnetos, and engine-driven fuel pump, a full flow oil filter, a propeller governor, and a vacuum pump on the rear of the engine.

ENGINE CONTROLS

Engine manifold pressure is controlled by a throttle located on the lower center portion of the instrument panel. The throttle operates in a conventional manner; in the full forward position, the throttle is open and in the full aft position, it is closed. A friction lock, which is a round knurled disk, is located at the base of the throttle and is operated by rotating the lock clockwise to increase friction or counterclockwise to decrease it.

The mixture control, mounted above the right corner of the control pedestal, is a red knob with raised points around the circumference and is equipped with a lock button in the end of the knot. The rich position is full forward and full aft is the idle cut-off position. For small adjustments, the control may b moved forward by rotating the knob clockwise and aft by rotating the knob counter-clockwise. For rapid or large adjustments, the knob may be moved forward or aft by depressing the lock button in the end of the control, and then positioning the control as desired.

ENGINE INSTRUMENTS

Engine operation is monitored by the following instruments: oil pressure gage, oil temperature gage, cylinder head temperature gage, tachometer, manifold pressure gage, and fuel pressure gage. An economy mixture (EGT) indicator and carburetor air temperature gage are also available.

The oil pressure gage, located below and to the left of the pilot's control wheel shaft is operated electrically and by oil pressure. A direct pressure oil line from the engine delivers oil at engine operating pressure to a transducer. The transducer then transmits the oil pressure electronically to the gage. Gage markings indicate that the minimum idling pressure is 25 psi (red line), the normal operating range is 60 to 90 psi (green arc) and maximum pressure is 100 psi (red line.)

Oil temperature is indicated by a gage located below and to the right of the pilot's control wheel shaft. The gage is operated by an electrical-resistance type temperature sensor which receives power from the airplane electrical system. Oil temperature limitations are the normal operating range (green arc) which is 38°C (100°F) to 118°C (245°F), and the maximum (red line) which is 118°C (245°F).

The cylinder head temperature gage is located directly to the left of the pilot's control wheel shaft. An electrical-resistance type temperature sensor, which receives power from the airplane electrical system, operates the gage. Temperature limitations are ht normal operating range (green arc) which is 93°C (200°F) to 260°C (500°F) and the maximum (red line) is 260°C (500°F)

The engine-driven mechanical tachometer is located near the lower center portion of the instrument panel. The instrument is calibrated in increments of 100 RPM and indicates both engine and propeller speed. An hour meter below the center of the tachometer dial records elapsed engine time n hours and tenths. Instrument makings include a normal operating range (stepped green arc) of 2100 to 2700 RPM with a step at the 2500 RPM indicator mark. The normal operating range upper is 2500 RPM and increases to 2700 RPM at 8000 feet. 2500 to 2700 RPM may be used at any altitude during hot day conditions. Maximum (red line) at any altitude is 2700 RPM. A yellow arc 1700 to 1900 RPM is provided to caution the pilot against engine operation at or below 10 inches Hg manifold pressure in the 1700 to 1900 RPM range.

The manifold pressure gage is mounted to the left of the tachometer. The gage is direct reading and indicates induction air manifold pressure in inches of mercury. It has a normal operating range (green arc) of 15 to 24 inches of mercury.

A fuel pressure gage, on the lower left side of the instrument panel, indicates fuel pressure to the carburetor in pounds per square inch. The gage is operated by fuel pressure from the output side of the engine-driven and/or electric auxiliary fuel pump. Gave markings are in 1 psi increments with a red line at 2 psi and 8 psi. A green arc extends from 2 psi to 8 psi is indicated the normal operating range.

An economy mixture (EGT) indicator is available for the airplane and is located on the extreme lower end of the instrument panel. A thermocouple probe is the engine tailpipe measures exhaust gas temperature and transmits it to the indicator. The indicator serves as a visual aid to the pilot in adjusting cruise mixture. Exhaust gas temperature varies with fuel-to-air ratio, power, and RPM. However, the difference between peak EGT and the EGT at the cruise mixture setting is essentially constant and this provides a useful leaning aid. The indicator is equipped with a manually positioned peak EGT reference pointer.

A carburetor air temperature gage may be installed on the left side of the instrument panel to help detect carburetor icing conditions. The gage is marked in 5 increments, from -30°C to +30°C, and has a yellow arc between -15°C and +5°C which indicates the temperature range most conducive to icing in the carburetor. A placard on the lower half of the gage face reads KEEP NEEDLE OUT OF YELLOW ARC DURING POSSIBLE CARBUETOR ICING CONDITIONS.

NEW ENGINE BREAK-IN AND OPERATION

The engine underwent a run-in at the factory and is ready for the full range of use. It is, however, suggested that cruising be accomplished at 65% to 75% power until a total of 50 hours has accumulated or oil consumption has stabilized. This will ensure proper seating of the rings.

The airplane is delivered from the factory with corrosion preventive oil in the engine. If, during the first 25 hours, oil must be added, use only aviation grade straight mineral oil conforming to Specification No. MIL-L-6082.

ENGINE OIL SYSTEM

Oil for engine lubrication and propeller governor operation is supplied from a sump on the bottom of the engine. The capacity of the engine sump is eight quarts (one additional quart is contained in the engine oil filter.) Oil is drawn from the sump through an oil suction strainer into the engine-driven oil pump. From the pump, oil is routed to a bypass valve. If the oil is cold, the bypass valve allows the oil to go directly from the pump to the oil filter. If the oil is hot, the bypass valve routes the oil out of the accessory housing and into a flexible hose leading to the oil cooler on the lower right side of the firewall. Pressure oil from the cooler returns to the accessory housing where it enters the oil filter. The filtered oil then enters a pressure relief valve which regulates engine oil pressure by allowing excessive oil to return to the pump, while the balance of the pressure oil is circulated to various engine parts for lubrication. Residual oil is returned to the sump by gravity flow. Also, engine oil is routed to the propeller governor to provide control pressures to the propeller.

An oil filler cap/oil dipstick is located at the rear of the engine on the right side. The filler cap/dipstick is accessible through an access door in the engine cowling. The engine should not be operated on less than six quarts of oil. To minimize loss of oil through the breather, fill to seven quarts for normal flights of less than three hours. For extended flight, fill to eight quarts (dipstick indication only). For engine oil grade and specifications, refer to Section 8 of this handbook.

An oil quick-drain valve is available to replace the drain plug in the oil sump drain port, and provides quicker, cleaner draining of the engine oil. To drain the oil with this valve installed, slip a hose over the end of the valve and push upward on the end of valve until is snaps into the open position. Spring clips will hold the valve open. After draining, use a suitable tool to snap the valve into the extended (closed) position. And remove the drain hose.

IGNITION-STARTER SYSTEM

Engine ignition is provided by an engine-driven dual magneto, and two spark plugs in each cylinder. The right magneto fires the lower right and upper left spark plugs, and the left magneto fires the lower left and upper right spark plugs. Normal operation is conducted with both magnetos due to the more complete burning of the fuel-air mixture with dual ignition.

Ignition and starter operation is controlled by a rotary type switch located on the left switch and control panel. The switch is labeled clockwise, OFF, R, L, BOTH, and START. The engine should be operated on both magnetos (BOTH position) except for magneto checks. The R and L positions are for checking purposes and emergency use only. When the switch is rotated to the spring-loaded START position, (with the master switch in the ON position), the starter contractor is energized and the starter will crank the engine. When the switch is released, it will automatically return to the BOTH position.

AIR INDUCTION SYSTEM

The engine air induction system receives ram air through the left intake in the cowling nose cap. Just inside the intake is an air filter which removes dust and other foreign matter from the induction air. Airflow passing through the filter enters an airbox at the front of the engine. After passing through the airbox, induction air enters the inlet in the carburetor which is under the engine, and is then ducted to the engine cylinders through intake manifold tubes. In the event carburetor ice is encountered or the intake filter becomes blocked, alternate heated air can be obtained from a shroud around an exhaust riser through a duct to a valve, in the airbox, operated by the carburetor heat control on the instrument panel. Heated air from the muffler shroud is obtained from an unfiltered outside source. Use of full carburetor het at full throttle will result in a power loss of approximately 13%.

EXHAUST SYSTEM.

Exhaust gas from each cylinder passes through riser assemblies to a muffler and tailpipe the muffler is constructed with a shroud around the outside which forms a heating chamber for cabin heater air.

CARBURETOR AND PRIMING SYSTEM

The engine is equipped with an up-draft, float-type, fixed jet carburetor mounted on the bottom of the engine. The carburetor is equipped with an enclosed accelerator pump, simplified fuel passages to prevent vapor locking, an idle cut-off mechanism and a manual mixture control Fuel is delivered to the carburetor by gravity flow from the fuel system. In the carburetor, fuel is atomized, proportionally mixed with intake air and delivered to the cylinders through intake manifold tubes. The proportion of atomized fuel to air is controlled, within limits, by the mixture control on the instrument panel.

For easy starting in cold weather the engine is equipped with a manual primer. The primer is actually a small pump which draws fuel from the fuel strainer with the plunger is pulled out, and injects it into the cylinder intake ports with the plunger is pushed back in. The plunger knob, on the instrument panel, is equipped with a lock, and, after being pushed full in, must be rotated either left or right until the know cannot be pulled out.

COOLING SYSTEM

Ram air for engine cooling enters through two intake openings in the cowling nose cap. The cooling air is directed around the cylinders and other areas of the engine by baffling, and is then exhausted through cowl flaps on the lower aft edge of the cowling. The cowl flaps are mechanically operated from the cabin by means of a cowl flap lever on the right side of the control pedestal. The pedestal is labeled OPEN, COWL FLAPS, CLOSED. During takeoff and high power operation, the cowl flap lever should be placed in the OPEN position for maximum cooling. This is accomplished by moving the lever to the right to clear a locking hole, then moving the lever to the OPEN position. Anytime the4 lever is repositioned, it must first be moved to the right. While in cruise flight, cowl flaps should be adjusted to keep the cylinder head temperature at approximately three-fourths of the normal operating range (green arc.) During extended let-downs, it may be necessary to completely close the cowl flaps by pushing the cowl flap lever down to the CLOSED position.

A winterization kit is available for the airplane. It consists of two baffles for the cowling nose cap air intake openings, insulation for the crankcase breather line and a placard to be installed on the instrument panel. This equipment should be installed for operations in temperatures consistently below -7°C (20°F). Once installed, crankcase breather line insulation is approved for permanent installation regardless of temperature.

PROPELLER

The airplane has an all-metal, two-bladed constant-speed governor-regulated propeller. A setting introduced into the governor with the propeller control establishes the propeller speed, and thus the engine speed to be maintained. The governor then controls the flow of engine oil, boosted to high pressure by the governing pump, to or from a piston in the propeller hub. Oil pressure acting on the piston twists the blades toward high pitch (low RPM). When oil pressure to the piston in the propeller hub is relieved, centrifugal force, assisted by an internal spring, twists toward the low pitch (high RPM).

A control knob on the lower center portion of the instrument panel is used to set the propeller and control engine RPM as desired for various flight conditions. The knob is labeled PROP RPM, PUSH INCREASE. When the control knob is pushed in, blade pitch will decrease, giving a higher RPM. When the control knob is pulled out, the blade pitch is increases, thereby decreasing RPM. The propeller control knob is equipped with a vernier feature which allows slow or fine RPM adjustments by rotating the knob clockwise to increase RPM, and counterclockwise to decrease it. To make rapid or large adjustments, depress the button on the end of the control knob and reposition the control as desired.

FUEL SYSTEM

NOTE: AIRCRAFT N110PF IS EQUIPPED WITH STANDARD TANKS.

The airplane may be equipped with either a standard fuel system or a long range system (see Figure 7-6) both systems consist of two vented integral fuel tanks (one in each wing), a three-position fuel selector valve, fuel reservoir tank, fuel shutoff valve, fuel strainer, manual primer, auxiliary fuel pump, engine-driven fuel pump, and carburetor. Refer to figure 7-5 for fuel quantity for both systems.

FUEL QUANTITY DATA (U S GALLONS)			
TANKS	TOTAL USABLE FUEL ALL FLIGHT CONDITIONS	TOTAL UNUSABLE FUEL	TOTAL FUEL VOLUME
STANDARD (25 Gal Each)	49	1	50
~~LONG RANGE (30 Gal Each)~~	~~60~~	~~1~~	~~61~~

Figure 7-5 Fuel Quantity Data

Fuel flows by gravity from the two integral wing tanks to the three-position selector valve labeled BOTH ON, LEFT, and RIGHT. From the selector valve, fuel flows to a reservoir tank and a shutoff valve. With the shutoff valve knob pushed full in, fuel will then flow through the strainer to an engine-driven, or an electric fuel pump which parallels the engine-driven pump and is used in the event the fuel pressure drops below 2 psi. The engine-driven fuel pump (or electric pump, it in use) then delivers fuel to the carburetor.

NOTE

In the event that engine-driven pump should fail during operations that require high power, the electric fuel pump should be turned on.

From the carburetor, mixed fuel and air flows to the cylinders through intake manifold tubes. The manual primer draws its fuel from the fuel strainer and injects it into the cylinder ports.

The airplane may be serviced to a reduced capacity to permit heavier cabin loadings. This is accomplished by utilizing a marker in the filler nick in either the standard or long range thanks. The marker consists of a series of small holes at the bottom of the filler neck. When both tanks are filled to this level, the total usable fuel is 43 gallons with either the standard or long range tank installations.

Fuel system venting is essential to system operation. Complete blockage of the venting system will result in decreasing fuel flow and eventual engine stoppage. Venting is accomplished by vent lines, one from each fuel tank, which vent overboard at the wing tip opposite the tank. The vent lines are interconnected, providing back-up ventilation for each tank through the opposite fuel tank vent line. A connecting vent line from the right fuel tank vent line to the reservoir tank prevents the reservoir tank from becoming air locked during refueling operations.

Fuel quantity is measured by two float-type fuel quantity transmitters (one in each thank) and indicated by two electrically operated fuel quantity indicators on the lower left portion of the instrument panel. An empty tank is indicated by a red line and the letter E. When an indicator shows an empty tank, approximately 0.5 gallons remains as unusable fuel. The indicators cannot be relied upon for accurate readings during skids, slips, or unusual attitudes. If both indicator pointers should rapidly move to a zero reading, check the cylinder head temperature gage, oil temperature gage, or oil pressure gage for readings. If these gages are not indicating, an electrical malfunction has occurred.

NOTE

Take off with the fuel selector valve handle in the BOTH ON position to prevent inadvertent takeoff on an empty tank. However, during long range flight with the selector in the BOTH ON position, unequal fuel flow from each tank may occur if the wings are not maintained exactly level. Resulting wing heaviness can be alleviated gradually by turning the selector valve handle to the fuel in the “heavy wing”. The recommended cruise fuel management procedure is to use the left and right tank alternately.

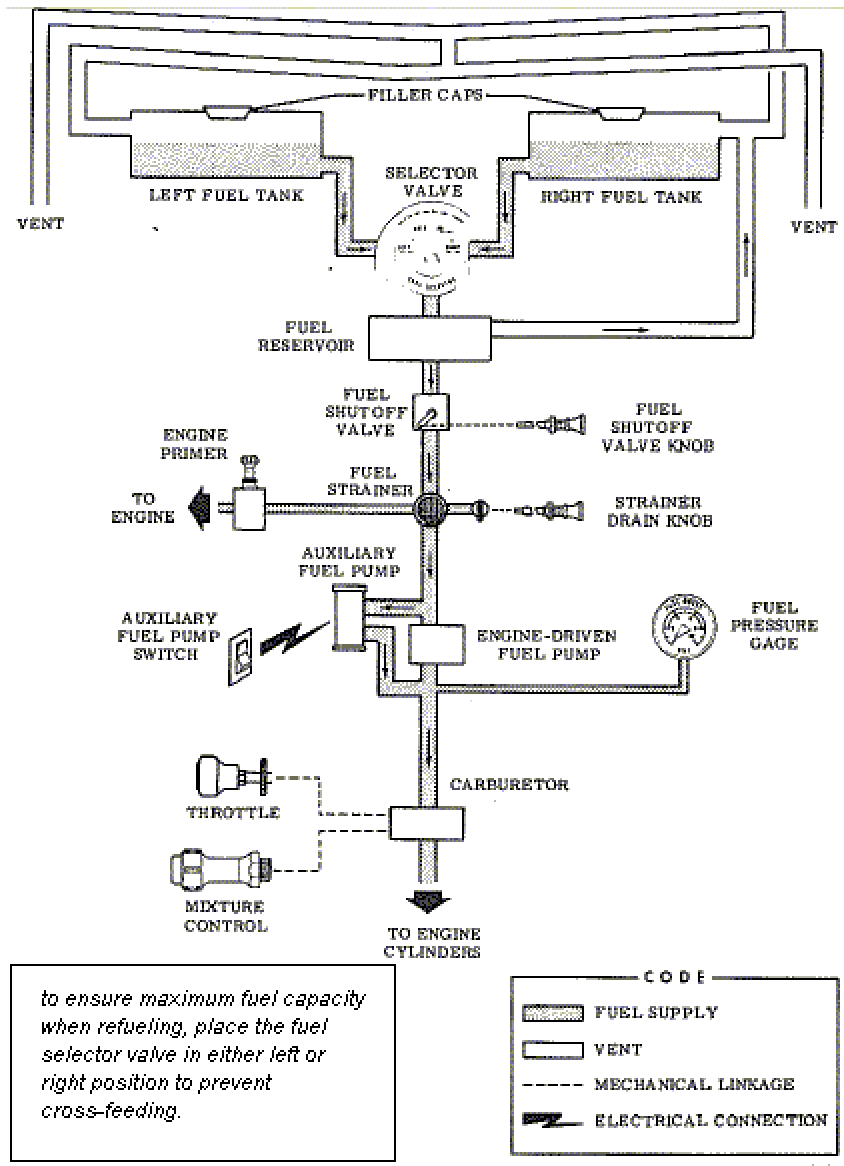


Figure 7-6 Fuel System (Standard and Long Range)

NOTE

With low fuel (1/16th tank or les) a prolonged powered steep descent (1000 feet or more) should be avoided with more than 10 flaps to prevent the possibility of fuel starvation resulting from uncovering the fuel tank outlets. If starvation should occur, leveling the nose and turning on the auxiliary fuel pump should restore engine power within 30 seconds.

The fuel system is equipped with drain valves to provide a means for the examination of fuel in the system for contamination and grade. The system should be examined before the first flight of the day and after each refueling by using the sampler cup provided to drain fuel from the wing tank sumps, and by utilizing the fuel strainer drain under an access panel on the right side of the engine cowling. An additional drain valve is provided in the reservoir tank and should be used to check the fuel if water is detected. The fuel tanks should be fuelled after each flight to prevent condensation.

BRAKE SYSTEM

The airplane has a single-disc, hydraulically-actuated brake on each main landing gear wheel. Each brake is connected, by a hydraulic line, to a master cylinder attached to each of the pilot's rudder pedals. The brakes are operated by applying pressure to the top of either the left (pilot's) or right (copilot's) set of rudder pedals, which are interconnected. When the airplane is parked, both main wheel brakes may be set by utilizing the parking brake which is operated by a handle under the left side of the instrument panel

For maximum brake life, keep the brake systems properly maintained, and minimize bake usage during taxi operations and landings.

Some of the symptoms of impending brake failure are: gradual decrease in braking action after brake application, noisy or dragging brakes, soft of spongy pedals, and excessive travel and weak braking action. If any of these symptoms appear, the brake system is in need of immediate attention. If, during taxi or landing roll, braking action decreases, let up on the pedals and hen re-apply the brakes with heavy pressure. If the brakes become spongy or pedal travel increases, pumping the pedals should build braking pressure. If one brake becomes weak or fails, use the other brake sparingly while using opposite rudder, as required, to offset the good brake.

ELECTRICAL SYSTEM

Electrical energy (see figure 7-7) is supplied by a 14-volt, direct-current system powered by an engine-driven 60-amp alternator. The 12-volt, 33-amp hour battery is located aft of the rear cabin wall. Power is supplied to all electrical circuits through a split bus bar, one side containing electronic system circuits and he other side having general electric system circuits. Both sides of the bus are on at all times except when either an external power source is connected or the starter switch is turned on; then a power contactor is automatically activated to open the circuit to the electronic bus. Isolating the electronic circuits in this manner prevents harmful transient voltages from damaging the transistors in the electronic equipment.

MASTER SWITCH

The master switch is a split-rocker type switch labeled MASTER, and is ON in the up position and OFF in the down position. The right half of the switch, labeled BAT, controls all electrical power to the airplane. The left half, labeled ALT, controls the alternator.

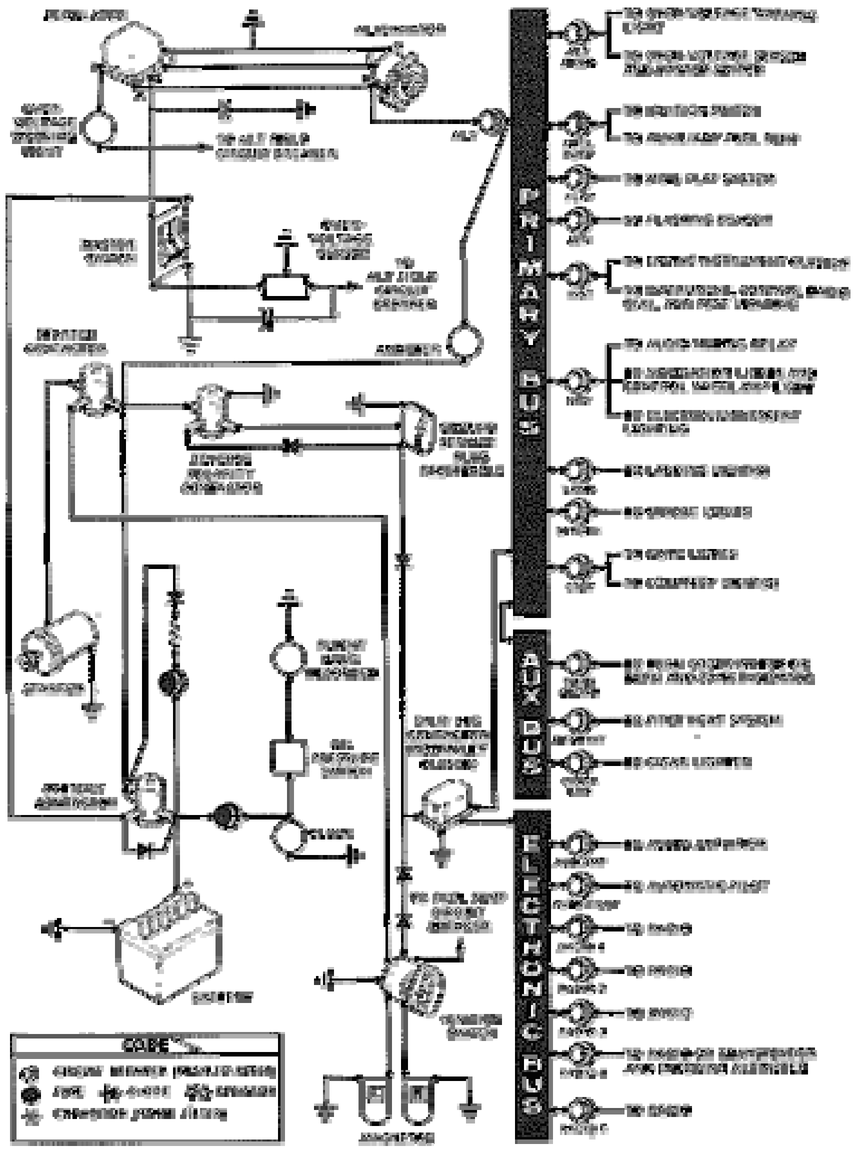


Figure 7-7

Normally, both sides of the master switch should by used simultaneously; however, the BAT side of the switch could be turned ON separately to check equipment when on the ground. The ALT side of the switch, when placed in the OFF position, removes the alternator from the electrical system. With this switch in the OFF position, the entire electrical load is place on the battery. Continued operation with the alternator switch in the OFF position will reduce power low enough to open the battery contactor, remove power from the alternator field, and prevent alternator restart.

AMMETER

The ammeter indicates the flow of current, in amperes, from the alternator to the battery or from the battery to the airplane electrical system. When the engine is operating and the master switch is turned on, the ammeter indicates the charging rate applied to the battery. In the event the alternator is not functioning or the electrical load exceeds the output of the alternator, the ammeter indicates the battery discharge rate.

OVER-VOLTAGE SENSOR AND WARNING LIGHT

The airplane is equipped with an automatic over-voltage protection system consisting of an over-voltage sensor behind the instrument panel and a red warning light, labeled HIGH VOLTAGE, near the ammeter.

In the event an over-voltage occurs, the over-voltage sensor automatically removes alternator field current and shuts down the alternator. The red warning light will then turn on, indicating to the pilot that the alternator is not operating and the battery is supplying all electrical power.

The over-voltage sensor may be reset by turning the master switch off and back on again. If the warning light does not illuminate, normal alternator charging has resumed; however, if the light does illuminate again, a malfunction has occurred, and the flight should be terminated as soon as possible.

The warning light may be tested by momentarily turning off the ALT portion of the master switch and leaving the BAT portion turned on.

CIRCUIT BREAKERS AND FUSES

Most of the electrical circuits in the airplane are protected by “push-to-reset” circuit breakers mounted on the right side of the instrument panel. Exception to this are the battery contactor closing (external power) circuit, clock and flight hour recorder circuits which have fuses mounted near the battery. The cigar lighter also has a manually reset type circuit breaker mounted on the back of the lighter socket.

GROUND SERVICE PLUG RECEPTACLE

A ground service plug receptacle may be installed to permit the use of an external power source for cold weather starting and during lengthy maintenance work on the airplane electrical system (with the exception of electronic equipment) the receptacle is located under a cover plane, on the cowling of the left side of the fuselage.

NOTE

Electrical power for the airplane electrical circuits is provided through a split bus bar having all electronic circuits on one side of the bus and other electrical circuits on the other side of the bus. When an external power source is connected, a contactor automatically opens the circuit to the electronic portion of the split bus bar as a protection against damage to the transistors in the electronic equipment by transient voltages from the power source. Therefore, the external power source can not be used as a source of power when checking electronic components.

Just before connecting an external power source (generator type or battery cart), the master switch should be turned on.

The ground service plug receptacle circuit incorporates a polarity reversal protection. Power from the external power source will flow only if the ground service plug is correctly connected to the airplane. If the plug is accidentally connected, backwards, no power will flow to the electrical system, thereby preventing any damage to electrical equipment.

The battery and external power circuits have been designed to completely eliminate the need to "jumper" across the battery contactor to close it for charging a completely "dead" battery. A special fused circuit in the external power system supplies the needed "jumper" across the contacts so that with a "dead" battery and an external power source applied, turning on the master switch will close the battery contactor.

LIGHTING SYSTEMS

EXTERION LIGHTING

Conventional navigation lights are located on the wing tips and top of the rudder. Landing and taxi lights are installed in the nose cap, and a flashing beacon is mounted on top of the vertical fin. Additional lighting is available and includes a strobe light on each wing tip and two courtesy lights one under each wing, just outboard of the cabin door. The courtesy lights are operated by a switch located on the left rear door post. All exterior lights, except the courtesy lights, are controlled by rocker type switches on the left switch and control panel. The switches are ON in the up position and OFF in the down position.

The flashing beacon should not be used when flying through clouds or overcast; the flashing light reflected from water droplets or particles in the atmosphere, particularly at night, can produce vertigo and loss of orientation.

The two high intensity strobe lights will enhance anti-collision protection. However, the lights should be turned off when taxiing in the vicinity of other aircraft, or during night flight through clouds, fog or haze.

INTERIOR LIGHTS

Instrument and control panel lighting is provided by flood and integral lighting, with post and electroluminescent lighting also available. All light intensity is rheostat controlled. The light intensity in airplanes not equipped with electroluminescent lighting is controlled by two rheostats and control knobs labeled PANEL LIGHTS and ENG-RADIO LIGHTS on the left switch and control panel. If electroluminescent lighting is installed, the rheostat and control knob labeled PANEL LIGHTS is replaced with dual rheostats and two concentric control knobs. The concentric control knobs remain labeled PANEL LIGHTS. If post lighting is installed, the overhead console will contain a slide-type switch on the left side of the console. The switch is labeled PANEL LTS and its positions are labeled FLOOD, BOTH, and POST. The POST and FLOOD positions will select post or flood lighting respectively, and the BOTH position will select a combination of post and flood lighting.

Switches and controls on the lower part of the instrument panel may be lighted by electroluminescent panels which do not require light bulbs for illumination. To utilize this lighting, turn on the NAV light switch and adjust light intensity with the small (inner) control knob labeled PANEL LIGHTS. Electroluminescent lighting is not affected by the selection of post or flood lighting.

Instrument and control panel flood lighting consists of four red flood lights on the underside of the ant-glare shield, and a single red flood light in the forward part of the overhead console. To use flood lighting, place the PANEL LTS selector switch in the FLOOD position and adjust light intensity with the PANEL LIGHTS rheostat control knob.

The instrument panel may be equipped with post lights which are mounted at the edge of each instrument or control and provide direct lighting. The lights are operated by placing the PANEL LTS selector in the POST position and adjusting light intensity with PANEL LIGHTS rheostat control knob. By placing the PANEL LTS selector switch in the BOTH position, he post lights can be used in combination with the standard flood lighting.

The engine instrument cluster, radio-equipment, and magnetic compass have integral lighting and operate independently of post or flood lighting. The lighting intensity of instrument cluster and radio lighting is controlled by the ENG-RADIO LIGHTS rheostat control knob. Magnetic compass lighting intensity is controlled by the PANEL LIGHTS rheostat control knob.

A cabin dome light is located in the aft part of the overhead console, and is operated by a switch adjacent to the light. To turn the light on, move the switch to the right..

The instrument panel control pedestal may be equipped with a courtesy light, mounted at its base, to illuminate the forward cabin floor area. This light is controlled by the courtesy light switch on the left rear door post.

A control wheel map light is available and is mounted on the bottom of the pilot’s control wheel. The light illuminates the lower portion of the cabin just forward of the pilot and is helpful when checking maps and other flight data during night operations. To operate the light, first turn on the NAV light switch; then adjust the map light’s intensity with the knurled disk type rheostat control located at the bottom of the control wheel.

The most probable cause of a light failure is a burned-out bulb; however, in the event any of the lighting systems fail to illuminate when turned on, check the appropriate circuit breaker. If the circuit breaker has opened (whit button popped out (, and there is no obvious indication of a short circuit (smoke or odor), turn off the light switch of the affected lights, reset the breaker, and turn the switch on again. If the breaker opens again, do not reset it.

CABIN HEATING, VENTILATING AND DEFROSTING SYSTEM

The temperature and volume of airflow into the cabin can be regulated to an degree desired by adjustment of a single push-pull control knob labeled CABIN AIR/HEAT (see figure 7-8). When the knob is positioned full in, no air flows into the cabin. As the knob is pulled out to approximately one inch of travel (as noted by a notch on the control shaft), a flow of un-heated fresh air will enter the cabin. Further actuation of the control know (past the notch) toward the full out position blends in heated air in increasing amounts.

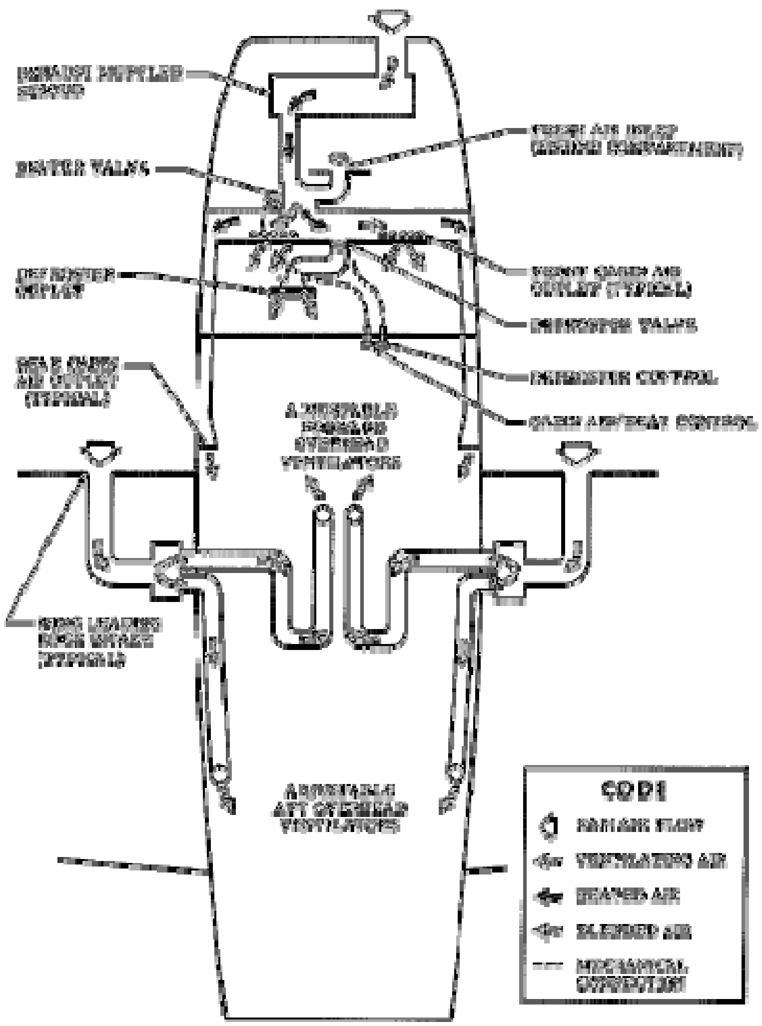


Figure 7-8 Cabin Heat, Ventilating and Defrosting System

Front cabin heat and ventilating air from the main head and ventilating system is supplied by outlet holes spaced across a cabin manifold located just forward of and above the pilot's and copilot's feet. Rear cabin head and air is supplied by two ducts from the manifold, one extending down each side of the cabin of an outlet at the front door post at floor level.

Windshield defrost air is supplied from the same manifold which provides cabin air; therefore, the temperature of the defrosting air is the same as cabin air. A push-pull control knob, labeled DEFROSTER, regulates the volume of air to the windshield. Pull the knob out as needed for defrosting.

Additional cabin ventilation can be obtained from two separately adjustable ventilators above the pilot and front passenger. Two additional ventilators may be installed in the rear cabin ceiling. While on the ground, or at speed up to 195 knots, ventilation airflow can be increased through an openable vent window in each cabin door.

PITOT-STATIC SYSTEM AND INSTRUMENTS

The pitot-static system supplies ram air pressure to the airspeed indicator and static pressure to the airspeed indicator, rate-of-climb indicator and altimeter. The system is composed of a pitot tube mounted on the lower surface of the left wing, tow external static ports, one on each side of the lower forward portion of the fuselage, and the associated plumbing necessary to connect the instruments to the sources.

The airplane may also be equipped with a pitot heat system. The system consists of a heating element in the pitot tube, a rocker-type switch labeled PITOT HEAT on the lower left side of the instrument panel, a 10-amp circuit breaker on the lower right side of the instrument pane, and associated wiring. When the pitot heat switch is turn on, the element is the pitot tube is heated electrically to maintain proper operation in possible icing conditions. Pitot heat should be used only as required.

A static pressure alternate source valve is installed in the left side of the instrument panel for use when the external static source is malfunctioning. This valve supplies static pressure from inside the rear fuselage instead of the external static ports. An external condensate drain, located in the alternate source line under the floorboard is provided for periodic draining of an moisture accumulation.

If erroneous instrument readings are suspected due to water or ice in the pressure lines going to the standard external static pressure source, the alternate static source valve should be pulled on.

Pressures within the rear fuselage will vary with open cabin ventilators and vent windows. Refer to Section 5 for the effect of varying cabin pressures on airspeed and altimeter readings.

AIRSPEED INDICATOR

The airspeed indicator is calibrated in knots and miles per hour. Limitations and range markings include the white arc (47 to 90 knots), green arc (57 to 138 knots), yellow arc (138 to 167 knots), and a red line (167 knots).

If a true airspeed indicator is installed, it is equipped with a rotatable ring which works in conjunction with the airspeed indicator dial in a manner similar to the operation of a flight computer. To operate the indicator, first rotate the ring until pressure altitude is aligned with outside temperature in degrees Fahrenheit. Pressure altitude should not be confused with indicated altitude. To obtain pressure altitude, momentarily set the barometric scale on the altimeter to 29.92 and read pressure altitude on the altimeter. Be sure to return the altimeter barometric scale to the original barometric setting after the pressure altitude has been obtained. Having se the ring to correct for altitude and temperature, then read the airspeed shown on the rotatable ring by the indicator pointer. For best accuracy, this indication should be corrected to calibrated airspeed by referring t the Airspeed Calibration chart in Section 5. Knowing the calibrated airspeed, read true airspeed on the ring opposite the calibrated airspeed.

RATE-OF-CLIMB INDICATOR

The rate-of-climb indicator depicts airplane rate of climb or descent in feet per minute. The pointer is actuated by atmospheric pressure changes resulting from changes of altitude as supplied by static sources.

ALTIMETER

Airplane altitude is depicted by a barometric type altimeter. A knob near the lower left portion of the indicator provides adjustment of the instrument's barometric scale to the current altimeter setting.

VACUUM SYSTEM AND INSTRUMENTS

An engine-driven vacuum system (see figure 7-9) is available and provides the suction necessary to operate the attitude indicator and directional indicator. The system consists of a vacuum pump mounted on the engine, a vacuum relief valve and vacuum system air filter on the aft side of the firewall below the instrument pane, and the instruments (including a suction gage) on the left side of the instrument panel.

ATTITUDE INDICATOR

An attitude indicator is available and gives a visual indication of flight attitude. Bank attitude is presented by a pointer at the opt of the indicator relative to the bank scale which has index marks at 10°, 20°, 30°, 60°, and 90° either side of center mark. Pitch and roll attitudes are presented by a miniature airplane in relation to the horizon bar. A knob at the bottom of the instrument is provided for in-flight adjustment of the miniature airplane to the horizon bar for a more accurate flight attitude indication.

DIRECTIONAL INDICATOR

A directional indicator is available and displays airplane heading on a compass card in relation to a fixed simulated airplane image and index. The directional indicator will precess slightly over a period of time. Therefore, the compass card should be set in accordance with the magnetic compass just prior to takeoff and occasionally re-adjusted on extended flights. A knob on the lower left edge of the instrument is used to adjust the compass card to correct for any precession.

SUCTION GAGE

A suction gage is located at the upper left edge of the instrument panel when the airplane is equipped with a vacuum system. Suction available for operation of the attitude indicator and directional indicator is shown by this gage, which is calibrated in inches of mercury. The desired suction range is 4.6 to 5.4 inches of mercury. A suction reading below this range may indicate a system malfunction, or improper adjustment, and in this case, the indicators should no be considered reliable.

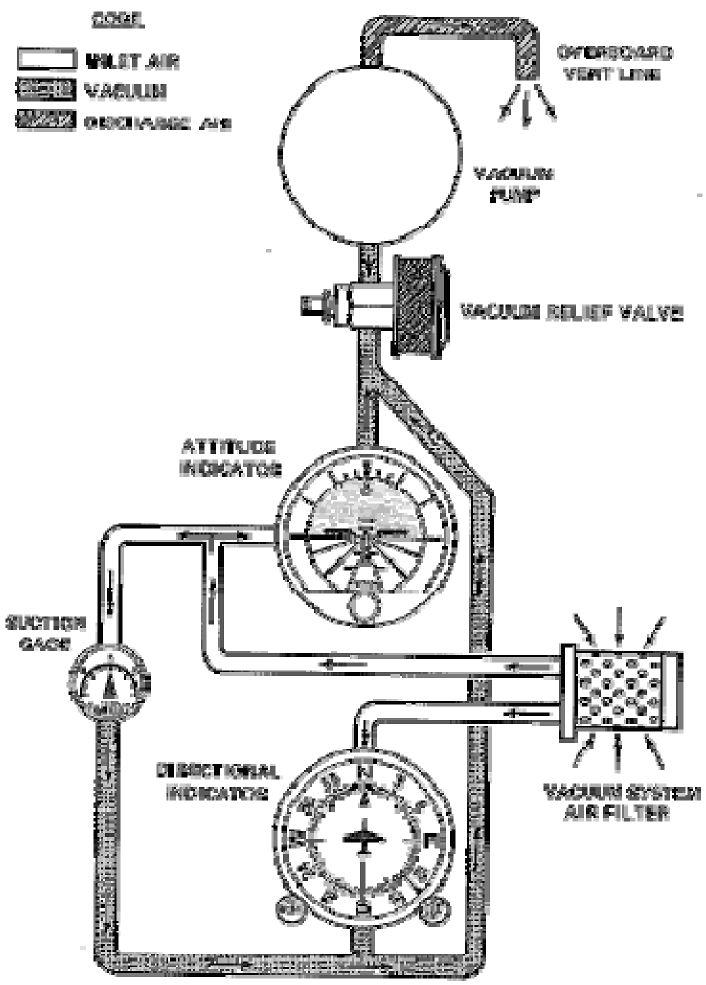


Figure 7-9 Vacuum System

STALL WARNING SYSTEM

The airplane is equipped with a pneumatic-type stall warning system consisting of an inlet in the leading edge of the left wing, and air-operated horn near the upper left corner of the windshield, and associated plumbing. As the airplane approaches a stall, the low pressure on the upper surface of the wings moves forward around the leading edge of the wings. This low pressure creates a differential pressure in the stall warning system which draws air through the warning horn, resulting in an audible warning at 5 to 10 knots above stall in all flight conditions.

The stall warning system should be checked during the preflight inspection by placing a clean handkerchief over the vent opening and applying a suction. A sound from the warning horn will confirm that the system is operative.

AVIIONICS SUPPORT EQUIPMENT.

The airplane may, at the owner's discretion, be equipped with various types of avionics support equipment such as an audio control panel, microphone-headsets, and static dischargers. The following paragraphs discuss these items.

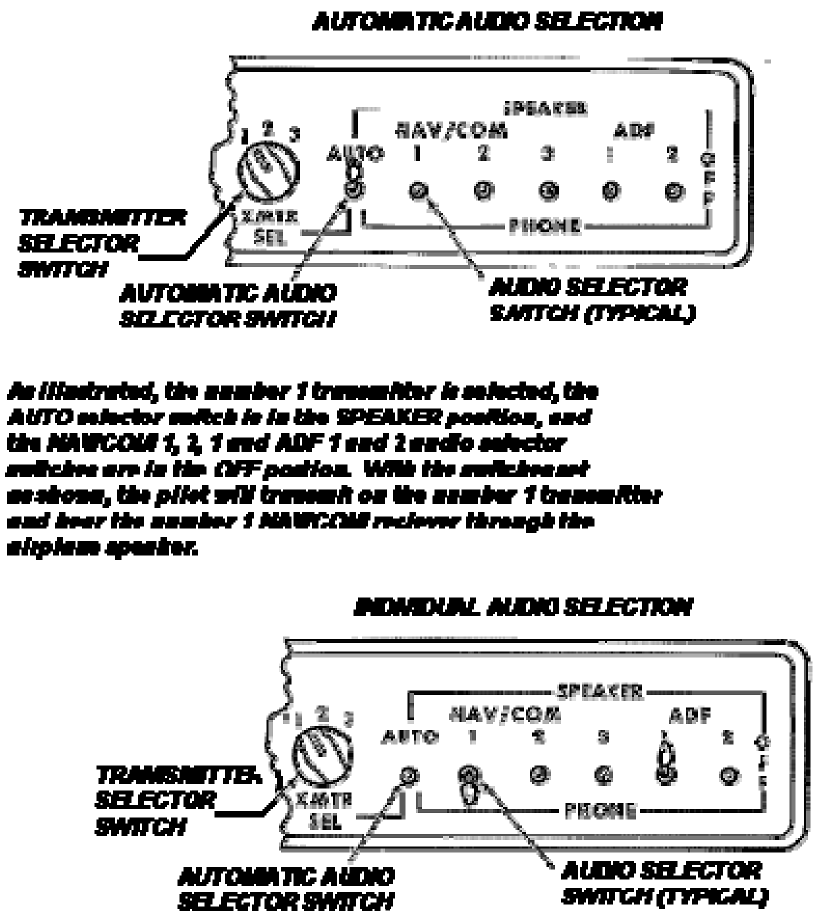


Figure 7-10 Audio Control Panel

AUDIO CONTROL PANEL

Operation of radio equipment is covered in Section 9 of this handbook. When one or more radios are installed, a transmitter/audio switching system is provided (see figure 7-10). The operation of this switching system is described in the following paragraphs.

TRANSMITTER SELECTOR SWITCH

A rotary type transmitter selector switch, labeled XMTER SEL, is provided to connect the microphone to the transmitter the pilot desires to use. To select a transmitter, rotate the switch to the number corresponding to that transmitter. The numbers 1, 2, and 3 above the switch correspond to the top, second, and third transceivers in the avionics stack.

An audio amplifier is required for speaker operation, and is automatically selected, along with the transmitter, by the transmitter selector switch. As an example, if the number 1 transmitter selector is selected, the audio amplifier in the associated NAV / COM receiver is also selected, and functions as the amplifier for ALL speaker audio. In the event the audio amplifier in use fails, as evidenced by loss of all speaker audio, select another transmitter. This should re-establish speaker audio. Headset audio is not affected by audio amplifier operation.

AUTOMATIC AUDIO SELECTOR SWITCH

A toggle switch, labeled AUTO, can be used to automatically match the appropriate NAV / COM receiver audio to the transmitter being selected. To utilize this automatic feature, leave all NAV / COM receiver switches in the OFF (center) position and place the AUTO selector switch in either the SPEAKER or PHONE position, as desired. Once the AUTO selector switch is positioned, the pilot may select any transmitter and its associated NAV / COM receiver audio simultaneously with the transmitter selector switch. If automatic audio selection is not desired, the AUTO selector switch should be placed in the OFF (center) position.

AUDIO SELECTOR SWITCHES

The audio selector switches, labeled NAV / COM 1, 2, and 3 and ADF 1 and 2, allow the pilot to initially pre-tune all NAV / COM and ADF receivers and then individually select and listen to any receiver or combination of receivers. To listen to a specific receiver, first check that the AUTO selector switch is in the OFF (center) position, then place the audio selector switch corresponding to that receiver in either the SPEAKER (up) or PHONE (down) position. To turn off the audio of the selected receiver, place that switch in the OFF (center) position. If desired, the audio selector switches can be positioned to permit the pilot to listen to one receiver on a headset while the passengers listen to another receiver on the airplane speaker.

The ADF 1 and 2 switches may be used anytime ADF audio is desired. If the pilot wants only ADF audio, for station identification or other reasons, the AUTO selector switch (if in use) and all other audio selector switches should be in the OFF position. If simultaneous ADF and NAV / COM audio is acceptable to the pilot, no changes in the existing switch positions is required. Place the ADF 1 or 2 switch in either the SPEAKER or PHONE position and adjust radio volume as desired.

NOTE

If the NAV / COM audio selector switch corresponding to the selected transmitter is in the PHONE position with AUTO selector switch in the SPEAKER position, all audio selector switches placed in the PHONE position will automatically be connected to the airplane speaker and any headsets in use.

MICROPHONE-HEADSET

The microphone-headset combination consist of the microphone and headset combined in a single unit and microphone keying switch located on the left side of the pilot's control wheel. The microphone-headset permits the pilot to conduct radio communications without interrupting other control operations to handle a hand-held microphone. Also, passengers need not listen to all communications. The microphone and headset jacks are located near the lower left corner of the instrument panel.

STATIC DISCHARGERS

If frequent IFR flights are planned, installation of wick-type static dischargers is recommended to improve radio communications during flight through dust or various forms of precipitation (rain, snow, or ice crystals). Under these conditions, the build-up and discharge of static electricity from the trailing edges of the wigs, rudder, stabilator, propeller tip, and radio antennas can result in loss of usable radio signals on all communications and navigation radio equipment. Usually the ADF is the first to be affected and VHF communication equipment is the last to be affected.

Installation of static dischargers reduces interference from the precipitation static, but it is possible to encounter sever precipitation static conditions which might cause the loss of radio signals, even with static discharger installed. Whenever possible, avoid known severe precipitation areas to prevent loss of dependable radio signals. If avoidance is impractical, minimize airspeed and anticipate temporary loss of radio signals while in these areas.

SECTION 8
HANDLING, SERVICE AND MAINTENANCE

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INTRODUCTION

This section contains factor-recommended procedures for proper ground handling and routine care and servicing of your Cessna. It also identifies certain inspection and maintenance requirements which must be followed if your airplane is to retain that new-plane performance and dependability. 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.

IDENTIFICATION PLATE

All correspondence regarding your airplane should include the SERIAL NUMBER. The Serial Number, Model Number, Production Certificate Number (PC) and type Certificate (TC) can be found on the Identification Plate, located on the upper part of the left forward doorpost. Located on the lower forward edge of the left cabin door is a Finish and Trim Plate which contains a code describing the interior color scheme and exterior paint combination of the airplane. The code may be used in conjunction with an applicable Parts Catalog if finish and trim information is needed.

OWNER FOLLOW-UP SYSTEM

Your Cessna Dealer has an Owner Follow-Up System to notify you when he receives information that applies to your Cessna. In addition, if you wish, you may choose to receive similar notification, in eh form of Service Letters, directly from the Cessna Customer Services Department. A subscription form is supplied in your Customer Care Program book for your use, should you choose to request this service. Your Cessna Dealer will be glad to supply you with details concerning these follow-up programs, and stands ready, through his Service Department, to supply you with fast, efficient, low-cost service.

PUBLICATIONS

Various publications and flight operation aids are furnished in the airplane when delivered from the factory. These items are listed below:

- CUSTOMER CARE PROGRAM BOOK
- PILOT'S OPERATING HANDBOOK/SUPPLEMENTS FOR YOUR:
    - AIRPLANE
    - AVIOINICS AND AUTOPILOT
- PILOT'S CHECKLISTS
- POWER COMPUTER
- SALES AND SERVICE DEALER DIRECTORY

The following additional publications, plus many other supplies that are applicable to your airplane, are available from your Cessna Dealer:

- SERVICE MANUALS AND PARTS CATALOGS FOR YOUR:
  - 0 AIRPLANE
  - 0 ENGINE AND ACCESSORIES
  - 0 AVIONICS AND AUTOPILOT

Your Cessna Dealer has a Customer Care Supplies Catalog covering all available items, many of which he keeps on hand. He will be happy place an order for any item which is not in stock.

AIRPLANE FILE

There are miscellaneous data, information and licenses that are 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 Regulations to ensure that all data requirements are met.

1. To be displayed in the airplane at all times:
   a. Aircraft Airworthiness Certificate (FAA Form 8100-2)
   b. Aircraft Registration Certificate (FAA Form 8050-3)
   c. Aircraft Radio Station License, if transmitter installed (FCC Form 556)
2. To be carried in the airplane at all times
   a. Weight and Balance, and associated papers (latest copy of the Repair and Alteration Form, FAA Form 337, if applicable)
   b. Equipment List
3. To be made available upon request:
   a. Airplane Log Book
   b. Engine Log Book

Most of the items listed are required by the United States Federal Regulations. Since the regulations of other 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 Pilot's Operating Handbook, Pilot's Checklists, Power Computer, Customer Care Program boo, and Customer Care Card be carried in the airplane at all times.

AIRPLANE INSPECTION PERIODS

FAA REQUIRED INSPECTIONS

As required by Federal Aviation Regulations, all civil aircraft of U.S. Registry must undergo a complete inspection (annual) each twelve calendar months. In addition to the required ANNUAL inspection, aircraft operated commercially (for hire) must have a complete inspection every 100 hours of operation.

The FAA may require other inspections by the issuance of airworthiness directives applicable to the airplane, engine, propeller and components. It is the responsibility of the owner/operator to ensure compliance with all applicable airworthiness directives and, when the inspections are repetitive, to take appropriate steps to prevent inadvertent noncompliance.

In lieu of the 100 HOUR and ANNUAL inspection requirements, an airplane may be inspected in accordance with a progressive inspection schedule which allows he work to be divided up into smaller operations that can be accomplished in shorter time periods.

The CESSNA PROGRESSIVE CARE PROGRAM has been developed to provide a modern progressive inspection schedule that satisfies the complete airplane inspection requirements of both the 100 HOURS and ANNUAL inspections applicable to Cessna airplanes. The program assists the owner in his responsibility to comply with all FAA inspection requirements, while ensuring timely replacement of life-limited parts and adherence to factor-recommended inspection intervals and maintenance procedures.

CESSNA PROGRESSIVE CARE

The Cessna Progressive Care Program has been designed to help you realize maximum utilization or your airplane at minimum cost and downtime. Under this program, your airplane is inspected and maintained in four operations at 50-hour intervals during a 200-hour period. The operations are recycled each 200 hours and ore recoded in a specially provided Aircraft Inspection Log as each operation is conducted.

The Cessna Aircraft Company recommends Progressive Care for aircraft that are being flown 200 hours or more per hear, and the 100-hour inspection for all other airplanes. The procedures for the Progressive Care Program and the 100-hour inspection have been carefully worked out by the factory and are followed by the Cessna Dealer Organization. The complete familiarity of Cessna Dealers with Cessna equipment and factory-approved procedures provides he highest level of service possible as lower cost to Cessna owners.

Regardless of the inspection method selected by the owner, he should keep in mind that FAR Part 43 and FAR Part 91 establishes the requirement hat properly certified agencies or personnel accomplish all required FAA inspections and most of the manufacturer recommended inspections.

CESSNA CUSTOMER CARE PROGRAM

Specific benefits and provisions of the CESSNA WARRANTY plus other important benefits for you are contained in your CUSTOMER CARE PROGRAM book supplied with your airplane. You will want to thoroughly review your Customer Care Program book and keep it in your airplane at all times.

Coupons attached to the Program book entitle your 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 not 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 deliver, so the initial inspection may be performed allowing the Dealer to make any minor adjustments which may be necessary.

You will also want to return to your Dealer either at 50 hours or 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.

PILOT CONDUCTED PREVENTIVE MANITENANCE

A certified pilot who owns or operates an airplane no used as an air carrier is authorized by FAR Part 43 to perform limited maintenance on his airplane. Refer to FAR Part 43 for a list of the specific maintenance operation which are allowed.

NOTE

Pilots operating airplanes of other than U. S. registry should refer to the regulations of the country of certification for information on preventive maintenance that may be performed by pilots.

A Service Manual should be obtained prior to performing any preventive maintenance to ensure that proper procedures are followed. Your Cessna Dealer should be contacted for further information or for required maintenance which must be accomplished by appropriately licensed personnel.

ALTERATIONS OR REPAIRS

It is essential that the FAA be contacted prior to any alteration on the airplane to ensure that airworthiness of the airplane is not violated. Alterations or repairs to the airplane must be accomplished by licensed personnel.

GROUND HANDLING

TOWING

The airplane is most easily and safely maneuvered by hand with the tow-bar attached to the nose wheel. When towing with a vehicle, do not exceed the nose gear turning angle of 45° either side of center or damage to the gear will result. If the airplane is towed or pushed over a rough surface during hangaring, watch that the normal cushioning action of the nose strut does not cause excessive vertical movement of the tail and resulting contact with low hangar doors or structure. A flat nose tire or deflated strut will also increase tail height.

PARKING

When parking the airplane, head into the wind and set the parking brakes. Do not set the parking brakes during cold weather when accumulated moisture my freeze the brakes, or when the brakes are overheated. Close the cowl flaps, install the control wheel lock and chock the wheels. In severe weather and high wind conditions, tie the airplane down as outlined in the following paragraph.

TIE-DOWN

Proper tie-down procedure is the best precaution against damage to the parked airplane by gusty or strong winds. To tie down he airplane securely, proceed as follows.

1. Set the parking brake and install the control wheel lock
2. Install a surface control lock over the fin and rudder
3. Tie sufficiently strong ropes or chains (700 pounds tensile strength) to the wings and tail tie-down fittings and secure each rope to a ramp tie-down
4. Tie a rope (no chains or cables) to the nose gear strut and secure to a ramp tie-down
5. Install a pitot tube cover.

JACKING

When a requirement exists to jack the entire airplane off the ground, or when wing jack points are used in the jacking operation, refer to the Service Manual for specific procedures and equipment needed.

A jack pad assembly is available to facilitate jacking individual main gear. Prior to the jacking operation, the strut-to-fuselage fairing must be removed. With this fairing removed, the jack pad is then inserted on the tube in the area between the fuselage and the upper end of the tube faring, and the gear jacked as required. When using the individual main jack point, flexibility of the gear strut will cause the main wheel to slide inboard as the wheel is raised, tilting the jack. The jack must then be lowered for a second jacking operation. Do not jack both main wheels simultaneously using individual main gear jack pads.

NOTE

Do not apply pressure on the outboard stabilator surfaces. When pushing on the tailcone, always apply pressure at a bulkhead to avoid buckling the skin

To assist in raising and holding the nose wheel off the ground, weight down the tail by placing sand-bags, or suitable weights, on each side of the stabilator, next to the fuselage. If ground anchors are available, the tail should be securely tied down.

NOTE

Ensure that the nose will be held off the ground under all conditions by means of suitable stands or supports under weight supporting bulkheads near the nose of the airplane.

LEVELING

Longitudinal leveling of the airplane is accomplished by placing a level on leveling screws on the side of the tailcone. Deflate the nose tire and/or raise the nose strut to properly center the bubble in the level. A level placed across the front seat rails, at corresponding points, is used to level the airplane laterally.

FLYABLE STORAGE

Airplanes placed in non-operational storage for a maximum of 30 days or those which receive only intermittent operations use for the first 25 hours are considered in flyable storage status. Every seventh day during these periods, the propeller should be rotated by hand through five revolutions. This action “limbers” the oil and prevents any accumulation of corrosion on engine cylinder walls.

WARNING

For maximum safety, check that the ignition switch is OFF, the throttle is closed, the mixture control is in the idle cut-off position, and the airplane is secured before rotating the propeller by hand. Do not stand within the arc of the propeller blades while turning the propeller.

After 30 days, the airplane should be flow for 30 minutes or a ground runup should be make just long enough to produce an oil temperature within the lower green arc range. Excessive ground runup should be avoided.

Engine runup also helps to eliminate excessive accumulation of water in the fuel system and other air spaces in the engine. Keep fuel tanks full to minimize condensation in the tanks. Keep the battery fully charged to prevent the electrolyte from freezing in cold weather. If the airplane is to be stored temporarily, or indefinitely, refer to the Service Manual for proper storage procedures.

SERVICING

In addition to the PREFLIGHT INSPECTION covered in Section 4, COMPLETE servicing, inspection, and test requirements for your airplane are detailed in the 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 Cessna Dealer concerning these requirements and begin scheduling your airplane for service at the recommended intervals.

Cessna Progressive Care ensures that these requirements are accomplished at the required intervals to comply with the 100-hour or ANNUAL inspection as previously covered.

Depending on various flight operations, your local Government Aviation Agency may require additional service, inspections, or tests. For these regulatory requirements, owners should check with local aviation officials where the airplane is being operated.

For quick and ready reference, quantities, materials, and specifications for frequently used service items are as follows.

ENGINE OIL

GRADE AND VISCOSITY FOR TEMPERATURE RANGE - -

The airplane was delivered from the factory with a corrosion preventive engine oil. This oil should be drained after the first 25 hours of operation and the following oils used as specified for the average ambient air temperature in the operating area.

MIL-L-6082 Aviation Grade Straight Mineral Oil: Use to replenish supply during the first 25 hours and at the first 25-hour oil change. Continue to use until a total of 50 hours has accumulated or oil consumption has stabilized.

SAE 50 above 16°C (60°F)
SAE 40 between -1°C (30°F) and 32°C (90°F)
SAE 30 between -18°C (0°F) and 21°C (70°F)
SAE 20 below -12°C (10°F)

MIL –L-22851 Ashless Dispersant Oil: This oil must be used after the first 50 hours or oil consumption has stabilized.

SAE 40 or SAE 50 above 16°C (60°F)
SAE 40 between -1°C (30°F) and 32°C (90°F)
SAE 30 between -18°C (0°F) and 21°C (70°F)
SAE 30 below -12°C (10°F)

CAPACITY OF ENGINE SUMP – 8 Quarts

Do not operate on less than 6 quarts. To minimize lass of oil through the breather, fill to 7 quarts for normal flights of less than 3 hours. For extended flight, fill to 8 quarts. These quantities refer to oil dipstick readings. During oil and oil filter changes, one additional quart is required when the filter element is changed.

OIL AND OIL FILTER CHANGE

After the first 25 hours of operation, drain engine oil sump and oil cooler, clean the oil suction strainer, and change the filter element. Refill sump with straight mineral oil and use until a total of 50 hours has accumulated or oil consumption has stabilized; then change to dispersant oil. Drain the engine oil sump and oil cooler, clean the oil suction strainer, and change the filter element each 50 hours thereafter. The oil change interval may be extended to 100-hour intervals, provided the oil filter element is changed at 50-hours intervals. Change engine oil at least every six months even Though less than the recommended hours have accumulated. Reduce intervals for prolonged operation in dusty areas, cold climates, or when short flights and long idle periods result in sludging conditions.

FUEL

APPROVED FUEL GRADES (AND COLORS) - -

100 LL Grade Aviation Fuel (Blue)
100 (Formerly 100 / 130) Grade Aviation Fuel (Green)
CAPACITY OF EACH STANDARD TANK - - 25 Gallons
~~CAPACITY OF EACH LONG RANGE TANK - - 30.5 Gallons~~
REDUCED CAPACITY, STANDARD AND LONG RANGE (INDICATED BY SMALL HOLES INSIDE FILLER NECK - - 22 Gallons

NOTE: AIRCRAFT N110PF IS EQUIPPED WITH STANDARD TANKS.

NOTE

To ensure desired fuel capacity when refueling, place the fuel selector valve in either LEFT or RIGHT position to prevent cross-feeding.

LANDING GEAR
NOSE WHEEL TIRE PRESSURE - - 35 psi on 5.00-5, 4-Ply Rated Tire
MAIN WHEEL TIRE PRESSURE - - 30 psi on 6.00-6, 6-Ply Rated Tire
NOSE GEAR SHOCK STRUT - -
Keep filled with MIL-H-5506 hydraulic fluid and inflated with air to 40 psi.

CLEANING AND CARE

WINDSHIELD – WINDOWS
The plastic windshield and windows should by cleaned with an aircraft windshield cleaner. Apply the cleaner sparingly with soft cloths and rub with moderate pressure until all dirt, oil scum and bug stains are removed. Allow the cleaner to dry, then wipe it off with soft flannel cloths.

If a windshield cleaner is not available, the plastic an be cleaned with soft cloths moistened with Stoddard solvent to remove oil and grease.

NOTE

Never use gasoline, benzene, alcohol, acetone, carbon tetrachloride, fire extinguisher or anti-ice fluid, laquer thinner or glass cleaner to clean the plastic. These materials will attack the plastic and may cause it to craze.

Follow by carefully washing with a mild detergent and plenty of water. Rinse thoroughly, then dry with a clean moist chamois. Do not rub the plastic with dry cloth since this builds up an electrostatic charge which attracts dust. Waxing with a good commercial was will finish the cleaning job. A thin, even coat of was, polished out by hand with soft flannel cloths, will fill in minor scratches and help prevent further scratching.

Do not use a canvas cover on the windshield unless freezing rain or sleet is anticipated since the cover may scratch the plastic surface.

PAINTED SURFACES

The painted exterior surfaces of your new Cessna have a durable, long lasting finish and, under normal conditions, require no polishing or buffing. Approximately 15 days are required for the paint to cure completely; in most cases, the curing period will have been completed prior to delivery of the airplane. In the event that polishing or buffing is required within the curing period, it is recommended that the work be done by someone experienced in handling uncured paint. Any Cessna dealer can accomplish this work.

Generally, the painted surfaces can be kept bright by washing with water and mild soap, followed by a rinse with water and drying with cloths or a chamois. Harsh or abrasive soaps or detergents which cause corrosion or scratches should never be used. Remove stubborn oil grease with a cloth moistened with Stoddard solvent.

Waxing is unnecessary to keep the painted surfaces bright. However, if desired, the airplane may be waxed with a good automotive wax. A heavier coating on the leading edges of the wings and tail and on the engine nose cap and propeller spinner will help reduce the abrasion encountered in these areas.

When the airplane is parked outside in cold climates and it is necessary to remove ice before flight, care should be taken to protect the painted surfaces during ice removal with chemical liquids. A 50-50 solution of isopropyl alcohol and water will satisfactorily remove ice accumulations without damaging the paint. A solution with more than 50% alcohol is harmful and should be avoided. While applying the de-icing solution, keep it away from the windshield and cabin windows since the alcohol will attack the plastic and may cause it to craze.

PROPELLER CARE

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. Small nicks on the propeller, particularly near the tips and on the leading edges, should be dressed out as soon as possible since these nicks produce stress concentrations, and if ignored, my result in cracks. Never use an alkaline cleaner on the blades; remove grease and dirt with carbon tetrachloride or Stoddard solvent.

ENGINE CARE

The engine may be cleaned with Stoddard solvent, or equivalent, then dried thoroughly

CAUTION

Particular care should be given to electrical equipment before cleaning. Cleaning fluids should not be allowed to enter magnetos, starter alternator and the like. Protect these components before saturating the engine with solvents. All other openings should also be covered before cleaning the engine assembly. Caustic cleaning solutions should be used cautiously and should always be properly neutralized after their use.

INTERIOR CARE

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

Blot up any spilled liquid promptly with cleansing tissues or rags. Don’t pat the spot; press the blotting material firmly and fold 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 instruction 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.

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.

If your airplane is equipped with leather seating, cleaning of the seats is accomplished using a soft cloth or sponge dipped in mild soap suds. The soap suds, used sparingly, will remove traces of dirt and grease. The soap should be removed with a clean damp cloth.

The plastic trim, headliner, instrument panel and control knobs need only be wiped off with a damp cloth. Oil and grease on the control wheel and control knobs can be removed with a cloth moistened with Stoddard solvent. Volatile solvents, such as mentioned in paragraphs on care of the windshield, must never be used since they soften and craze the plastic.

SECTION 9
SUPPLEMENTS
OPTIONAL SYSTEMS DESCRIPTION&
OPERATING PROCEDURES

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NOTE: MARKED-OUT EQUIPMENT IS NOT INSTALLED ON N10PF.

INTRODUCTION

This section consists of a series of supplements, each covering a single optional system which may be installed in the airplane. Each supplement contains a brief description, and when applicable, operating limitations, emergency and normal procedures, and performance. Other routinely installed items of optional equipment, whose function and operation do not require detailed instructions, are discussed in Section 7.

SUPPLEMENT

EMERGENCY LOCATOR TRANSMITTER (ELT)

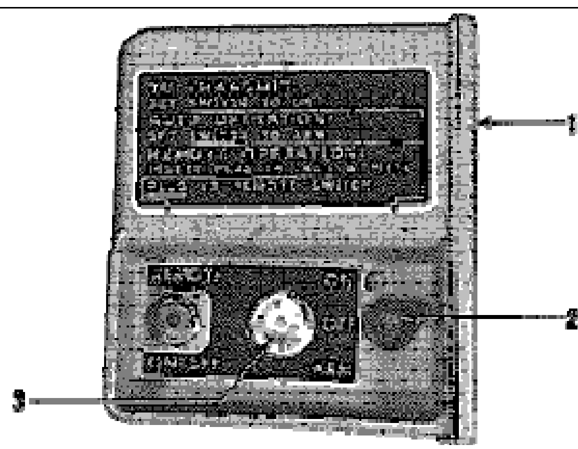
SECTION 1 GENERAL

The ELT consists of a self-contained dual-frequency radio transmitter and battery power supply, and is activated by an impact of 5 G or more as may be experienced in a crash landing. The ELT emits an omni-directional signal on the international distress frequencies of 121.4 and 243.0 MHz. (Some ELT units in export aircraft transmit only on 121.5 MHz). General aviation and commercial aircraft, the FAA and CAO monitor 121.5 MHz and 243.0 MHz is monitored by the military. Following a crash landing the ELT will provide line-of-sight transmission up to 100 miles at 10,000 feet. The duration of ELT transmissions is affected by ambient temperature. At temperatures of +21° to +54°C (+70° to 130°F) continuous transmission for 115 hours can be expected; a temperature of -40°C (-40°F) will shorten the duration to 70 hours.

The ELT is readily identified as a bright orange unit mounted behind the baggage compartment wall in the tailcone. To gain access to the unit, remove the baggage compartment wall. The ELT is operated by a control panel at the forward facing end of the unit (see figure 1)

SECTION 2 LIMITATIONS

There is no change to the airplane limitations when this equipment is installed.



1. COVER – Remove for access to battery
2. FUNCTION SELECTOR SWITCH (3-position toggle switch)
   - -ON – activates transmitter instantly. Used for test purposes and if "g" switch in inoperative
   - -OFF – Deactivates transmitter. Used during shipping, storage and following rescue
   - -ARM – activates transmitter only when "g" switch receives 5g or more impact.
3. ANTENNA RECEPTACLE – Connection to antenna mounted on top of tailcone.

Figure 1 ELT Control Panel

SECTION 3

EMERGENCY PROCEDURES

Immediately after a forced landing where emergency assistance is required, the ELT should be utilized as follows:

1. ENSURE ELT ACTIVATION: Turn a radio transceiver ON and select 121.5 MHz. If the ELT can be heard transmitting, it was activated by the “g” switch and is functioning properly. If no emergency tone is audible, gain access to the ELT and place the function selector switch in the ON position.

2. PRIOR TO SIGHTING RESCUE AIRCRAFT: Conserve airplane battery. Do not activate radio transceiver.

3. AFTER SIGHTING RESCUE AIRCRAFT: Place ELT function selector switch in the OFF position, preventing radio interference. Attempt contact with rescuer with the radio transceiver set to a frequency of 121.5 MHz. If no contact is established, return the function selector switch to ON immediately.

4. FOLLOWIING RESCUE: Place ELT function selector switch in the OFF position, terminating emergency transmissions.

SECTION 4

NORMAL PROCEDURES

As long as the function selector switch remains in the ARM position, the ELT automatically activates following an impact of 5g or more over a short period of time.

Following a lighting strike, or an exceptionally hard landing, the ELT may activate although no emergency exists. To check your ELT for inadvertent activation, select 121.5 MHz on your radio transceiver and listen for an emergency tone transmission. If the ELT can be heard transmitting, place the function selector in the OFF position and the tone should cease. Immediately place the function selector switch in the ARM position to re-set the ELT for normal operation.

SECTION 5

PERFORMANCE

There is no change to the airplane performance data when this equipment is installed.

SUPPLEMENT

The following equipment is not installed.

CESSNA 300 NAV / COM (COM/VOR, No LOC – Type RT-308C)

CESSNA 300 NAV / COM (720 Channel – Type RT-328T)

CESSNA 300 ADF (Type R-546E)
CESSNA 300 TRANSPONDER (Type RT-359A) AND OPTIONAL ENCODING ALTIMETER (TYPE EA-401A)

CESSNA 300 TRANSPONDER (Type RT-359A) AND OPTIONAL ENCODING ALTIMETER (BLIND)

CESSNA 400 TRANSPONDER (Type RT-459A) AND OPTIONAL ENCODING ALTIMETER (TYPE EA-401A)

CESSNA 400 TRANSPONDER (Type RT-459A) AND OPTIONAL ENCODING ALTIMETER (BLIND)

CESSNA 400 MARKER BEACON (Type R-402A)

CESSNA 400 GLIDESLOPE (Type R-443B)

DME (Type 190)

HF TRANSCEIVER (TYPE PT10-A)

SSB HF TRANSCEIVER (TYPE ASB-125)

CESSNA NAVOMATIC 200A AUTOPILOT (TYPE AF-295B)

CESSNA NAVOMATIC 300A AUTOPILOT (TYPE AF-395A)