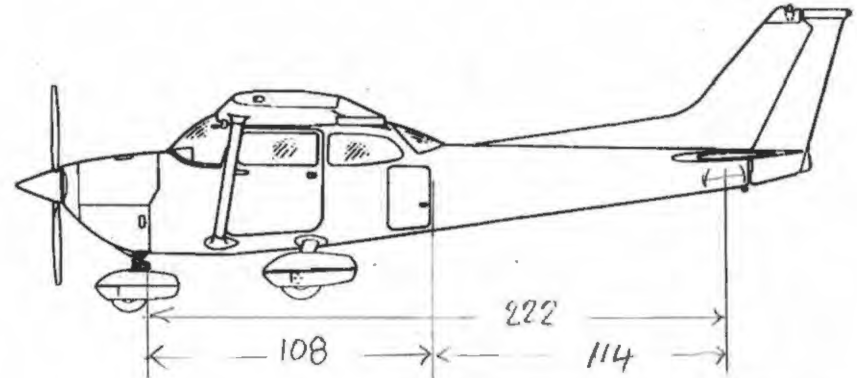
PILOT'S OPERATING HANDBOOK
and
FAA APPROVED AIRPLANE FLIGHT MANUAL



CESSNA AIRCRAFT COMPANY

1980 MODEL R172K

THIS DOCUMENT MUST BE
CARRIED IN THE AIRPLANE
AT ALL TIMES.

Serial No. **R1723306**

Registration No. **VH-YPM**

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

CESSNA AIRCRAFT COMPANY
WICHITA, KANSAS, USA

Member of GAMA

1 JULY 1979

THIS MANUAL WAS PROVIDED FOR THE AIRPLANE IDENTIFIED ON THE TITLE PAGE ON 4-4-2012.

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

CESSNA AIRCRAFT COMPANY, PAWNEE DIVISION

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.

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

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

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

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

PERFORMANCE - SPECIFICATIONS

SPEED:
- Maximum at Sea Level . . . . 133 KNOTS
- Cruise, 80% Power at 6000 Ft . . . . 130 KNOTS

CRUISE: Recommended lean mixture with fuel allowance for engine start, taxi, takeoff, climb and 45 minutes reserve.

80% Power at 6000 Ft	Range	440 NM
49 Gallons Usable Fuel	Time	3.4 HRS
80% Power at 6000 Ft	Range	635 NM
66 Gallons Usable Fuel	Time	4.9 HRS
Maximum Range at 10,000 Ft	Range	575 NM
49 Gallons Usable Fuel	Time	6.1 HRS
Maximum Range at 10,000 Ft	Range	815 NM
66 Gallons Usable Fuel	Time	8.7 HRS

RATE OF CLIMB AT SEA LEVEL . . . . 870 FPM

SERVICE CEILING . . . . 17,000 FT

TAKEOFF PERFORMANCE:
- Ground Roll . . . . 800 FT
- Total Distance Over 50-Ft Obstacle . . . . 1360 FT

LANDING PERFORMANCE:
- Ground Roll . . . . 620 FT
- Total Distance Over 50-Ft Obstacle . . . . 1270 FT

STALL SPEED (CAS):
- Flaps Up, Power Off . . . . 53 KNOTS
- Flaps Down, Power Off . . . . 46 KNOTS

MAXIMUM WEIGHT:
- Ramp . . . . 2558 LBS
- Takeoff or Landing . . . . 2550 LBS

STANDARD EMPTY WEIGHT:
- Hawk XP . . . . 1538 LBS
- Hawk XP II . . . . 1565 LBS

MAXIMUM USEFUL LOAD:
- Hawk XP . . . . 1020 LBS
- Hawk XP II . . . . 993 LBS

BAGGAGE ALLOWANCE . . . . 200 LBS

WING LOADING: Pounds/Sq Ft 14.7

POWER LOADING: Pounds/HP 13.1

FUEL CAPACITY: Total
- Standard Tanks . . . . 52 GAL.
- Long Range Tanks . . . . 68 GAL.

OIL CAPACITY . . . . 9 QTS

ENGINE: Teledyne Continental, Fuel Injection IO-360-KB
195 BHP at 2600 RPM

PROPELLER: Constant Speed, Diameter . . . . 76 IN.

COVERAGE

The Pilot's Operating Handbook in the airplane at the time of delivery from Cessna Aircraft Company contains information applicable to the 1980 Model R172K airplane designated by the serial number and registration number shown on the Title Page of this handbook.

REVISIONS

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

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

NOTE

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

Owners should contact their Cessna Dealer whenever the revision status of their handbook is in question.

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

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

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

LOG OF EFFECTIVE PAGES

Dates of issue for original and revised pages are:
Original . . . . 1 July 1979
Revision 1 . . . . . . 15 November 1979

Page	Date	Page	Date
Title	1 July 1979	5-3 thru 5-27	1 July 1979
Assignment Record	1 July 1979	5-28 Blank	1 July 1979
i thru ii	1 July 1979	6-1	1 July 1979
*iii	15 November 1979	6-2 Blank	1 July 1979
iv	1 July 1979	6-3 thru 6-23	1 July 1979
1-1 thru 1-9	1 July 1979	6-24 Blank	1 July 1979
1-10 Blank	1 July 1979	7-1 thru 7-43	1 July 1979
2-1	1 July 1979	7-44 Blank	1 July 1979
2-2 Blank	1 July 1979	8-1	1 July 1979
2-3 thru 2-13	1 July 1979	8-2 Blank	1 July 1979
2-14 Blank	1 July 1979	8-3 thru 8-17	1 July 1979
3-1 thru 3-9	1 July 1979	8-18 Blank	1 July 1979
3-10 Blank	1 July 1979	*9-1	15 November 1979
3-11 thru 3-18	1 July 1979	9-2	1 July 1979
4-1 thru 4-11	1 July 1979		
4-12 Blank	1 July 1979		
4-13 thru 4-25	1 July 1979		
4-26 Blank	1 July 1979		
5-1	1 July 1979		
5-2 Blank	1 July 1979		

NOTE

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

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SECTION 1
GENERAL

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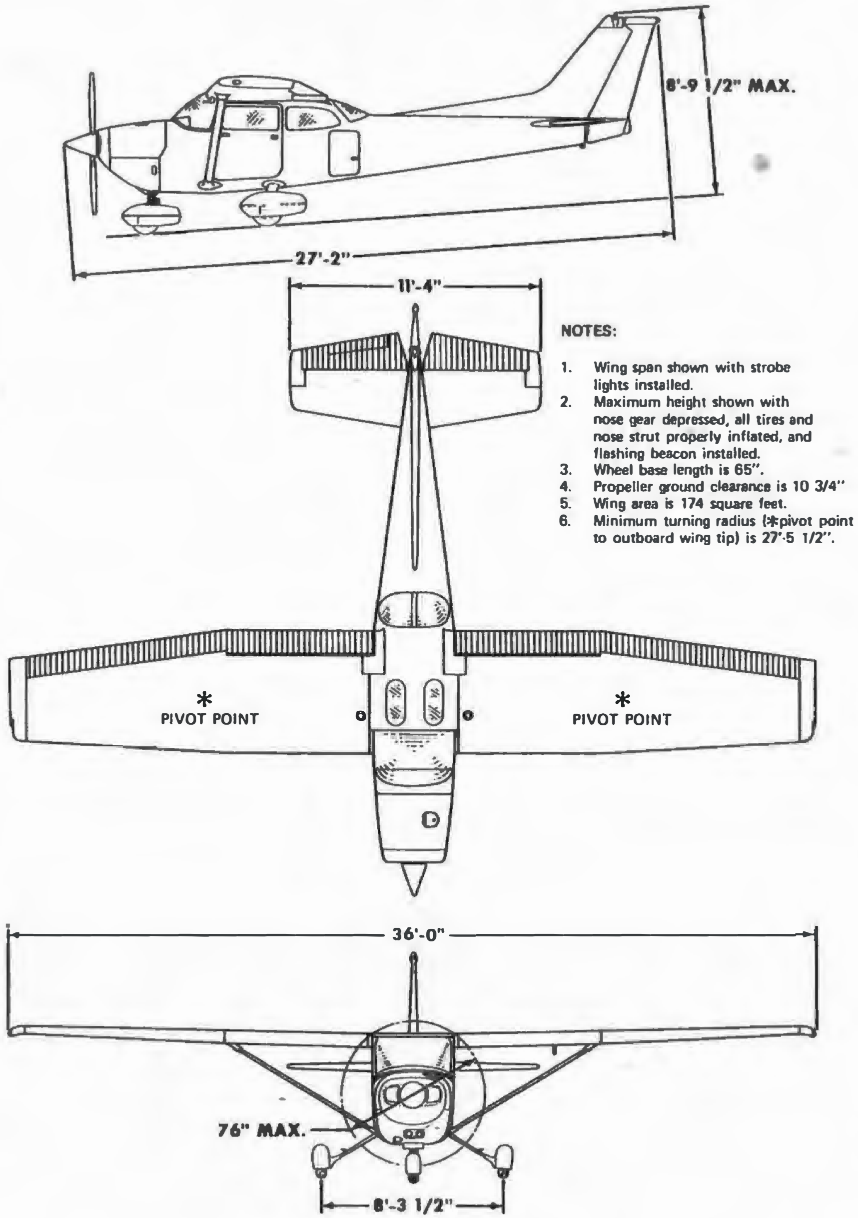

NOTES:

1. Wing span shown with strobe lights installed.
2. Maximum height shown with nose gear depressed, all tires and nose strut properly inflated, and flashing beacon installed.
3. Wheel base length is 65".
4. Propeller ground clearance is 10 3/4"
5. Wing area is 174 square feet.
6. Minimum turning radius (*pivot point to outboard wing tip) is 27'-5 1/2".

Figure 1-1. Three View

INTRODUCTION

This handbook contains 9 sections, and includes the material required to be furnished to the pilot by CAR Part 3. It also contains supplemental data supplied by Cessna Aircraft Company.

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

DESCRIPTIVE DATA

ENGINE

Number of Engines: 1.
Engine Manufacturer: Teledyne Continental.
Engine Model Number: IO-360-KB.
Engine Type: Normally-aspirated, direct-drive, air-cooled, horizontally-opposed, fuel-injected, six-cylinder engine with 360 cu. in. displacement.
Horsepower Rating and Engine Speed: 195 rated BHP at 2600 RPM.

PROPELLER

Propeller Manufacturer: McCauley Accessory Division.
Propeller Model Number: 2A34C203/90DCA-14.
Number of Blades: 2.
Propeller Diameter, Maximum: 76 inches.
Minimum: 74.5 inches.
Propeller Type: Constant speed and hydraulically actuated, with a low pitch setting of 12.0° and a high pitch setting of 25.1° (30 inch station).

FUEL

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

NOTE

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

Fuel Capacity:
- Standard Tanks:
  - Total Capacity: 52 gallons.
  - Total Capacity Each Tank: 26 gallons.
  - Total Usable: 49 gallons.
- Long Range Tanks:
  - Total Capacity: 68 gallons.
  - Total Capacity Each Tank: 34 gallons.
  - Total Usable: 66 gallons.

NOTE

To ensure maximum fuel capacity when refueling and minimize cross-feeding when parked on a sloping surface, place the fuel selector valve in either LEFT or RIGHT position.

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.

- Continental Motors Specification MHS-24 (and all revisions thereto), Ashless Dispersant Oil: This oil **must be used** after first 50 hours or oil consumption has stabilized.

Recommended Viscosity for Temperature Range:
- SAE 20W-50 or SAE 50 above 40°F (4°C).
- SAE 20W-50 or SAE 30 below 40°F (4°C).

NOTE

Multi-viscosity oil with a range of SAE 20W-50 is recommended for improved starting in cold weather.

Oil Capacity:
- Sump: 8 Quarts.
- Total: 9 Quarts.

MAXIMUM CERTIFICATED WEIGHTS

Ramp, Normal Category: 2558 lbs.
Utility Category: 2208 lbs.
Takeoff, Normal Category: 2550 lbs.
Utility Category: 2200 lbs.
Landing, Normal Category: 2550 lbs.
Utility Category: 2200 lbs.
Weight in Baggage Compartment, Normal Category:
- Baggage Area 1 or Passenger on Child's Seat - (Baggage, Station 82 to 108, 200 lbs. maximum; Passenger on Child's Seat, 120 lbs. maximum). See note below.
- Baggage Area 2 - Station 108 to 142: 50 lbs. See note below.

NOTE

The maximum combined weight capacity for baggage areas 1 and 2 is 200 lbs.

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, Hawk XP: 1538 lbs.
Hawk XP II: 1565 lbs.
Maximum Useful Load:

	Normal Category	Utility Category
Hawk XP:	1020 lbs.	670 lbs.
Hawk XP II:	993 lbs.	643 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

Dimensions of the baggage area and baggage door opening are illustrated in detail in Section 6.

SPECIFIC LOADINGS

Wing Loading: 14.7 lbs./sq. ft.
Power Loading: 13.1 lbs./hp.

SYMBOLS, ABBREVIATIONS AND TERMINOLOGY

GENERAL AIRSPEED TERMINOLOGY AND SYMBOLS

KCAS — **Knots Calibrated Airspeed** is 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 shown 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 and temperature.

V_A — **Manuevering Speed** is the maximum speed at which you may use abrupt control travel.

V_{FE} — **Maximum Flap Extended 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_{S_O} — **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 altitude in a given time.

METEOROLOGICAL TERMINOLOGY

OAT — **Outside Air Temperature** is the free air static temperature.

It is expressed in either degrees Celsius or degrees Fahrenheit.

Standard Temperature — **Standard Temperature** is 15°C at sea level pressure altitude and decreases by 2°C for each 1000 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 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 engine power setting and/or flight configuration.

g — g is acceleration due to gravity.

WEIGHT AND BALANCE TERMINOLOGY

Reference Datum	**Reference Datum** is an imaginary vertical 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 by 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 ramp weight and the basic empty weight.
Maximum Ramp Weight	**Maximum Ramp Weight** is the maximum weight approved for ground maneuver. (It includes the weight of start, taxi and runup fuel.)
Maximum Takeoff Weight	**Maximum Takeoff 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 when weighing an airplane, and is included in the scale readings. Tare is deducted from the scale reading to obtain the actual (net) airplane weight.

SECTION 2
LIMITATIONS

TABLE OF CONTENTS

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 and in Section 9 have been approved by the Federal Aviation Administration. Observance of these operating limitations is required by Federal Aviation Regulations.

NOTE

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

NOTE

The airspeeds listed in the Airspeed Limitations chart (figure 2-1) and the Airspeed Indicator Markings chart (figure 2-2) are based on 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. 3A17 as Cessna Model No. R172K.

AIRSPEED LIMITATIONS

Airspeed limitations and their operational significance are shown in figure 2-1. Maneuvering speeds shown apply to normal category operations. The utility category maneuvering speed is 105 KIAS at 2200 pounds.

	SPEED	KCAS	KIAS	REMARKS
V_{NE}	Never Exceed Speed	161	163	Do not exceed this speed in any operation.
V_{NO}	Maximum Structural Cruising Speed	127	129	Do not exceed this speed except in smooth air, and then only with caution.
V_A	Maneuvering Speed: 2550 Pounds 2150 Pounds 1750 Pounds	 103 94 85	 104 95 85	Do not make full or abrupt control movements above this speed.
V_{FE}	Maximum Flap Extended Speed: 10^o Flaps 10^o - 40^o Flaps	 108 84	 110 85	Do not exceed this speed with flaps down.
	Maximum Window Open Speed	161	163	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	38 - 85	Full Flap Operating Range. Lower limit is maximum weight V_{S_O} in landing configuration. Upper limit is maximum speed permissible with flaps extended.
Green Arc	48 - 129	Normal Operating Range. Lower limit is maximum weight V_S at most forward C.G. with flaps retracted. Upper limit is maximum structural cruising speed.
Yellow Arc	129 - 163	Operations must be conducted with caution and only in smooth air.
Red Line	163	Maximum speed for all operations.

Figure 2-2. Airspeed Indicator Markings

POWER PLANT LIMITATIONS

Engine Manufacturer: Teledyne Continental.
Engine Model Number: IO-360-KB.
Engine Operating Limits for Takeoff and Continuous Operations:
- Maximum Power: 195 BHP rating.
- Maximum Engine Speed: 2600 RPM.
- Maximum Cylinder Head Temperature: 460°F (238°C).
- Maximum Oil Temperature: 240°F (116°C).
- Oil Pressure, Minimum: 10 psi.
  Maximum: 100 psi.
- Fuel Pressure, Minimum: 3 psi.
  Maximum: 17 psi (17 gal/hr).

Propeller Manufacturer: McCauley Accessory Division.
Propeller Model Number: 2A34C203/90DCA-14.
Propeller Diameter, Maximum: 76 inches.
Minimum: 74.5 inches.
Propeller Blade Angle at 30 Inch Station, Low: 12.0°.
High: 25.1°.

POWER PLANT INSTRUMENT MARKINGS

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

INSTRUMENT	RED LINE	GREEN ARC	RED LINE
	MINIMUM LIMIT	NORMAL OPERATING	MAXIMUM LIMIT
Tachometer	---	2200 - 2600 RPM	2600 RPM
Manifold Pressure	---	15 - 25 in. Hg	---
Oil Temperature	---	100° - 240°F	240°F
Cylinder Head Temperature	---	200° - 460°F	460°F
Fuel Flow (Pressure)	(3 psi)	4.5 - 11.5 gal/hr	17 gal/hr (17 psi)
Oil Pressure	10 psi	30 - 60 psi	100 psi
Fuel Quantity (Standard Tanks)	E (1.5 Gal. Unusable Each Tank)	---	---
Fuel Quantity (Long Range Tanks)	E (1.0 Gal. Unusable Each Tank)	---	---
Suction	---	4.5 - 5.4 in. Hg.	---

Figure 2-3. Power Plant Instrument Markings

WEIGHT LIMITS

NORMAL CATEGORY

Maximum Ramp Weight: 2558 lbs.
Maximum Takeoff Weight: 2550 lbs.
Maximum Landing Weight: 2550 lbs.

Maximum Weight in Baggage Compartment:
Baggage Area 1 or Passenger on Child's Seat - (Baggage, Station 82 to 108, 200 lbs. maximum; Passenger on Child's Seat 120 lbs. maximum). See note below.
Baggage Area 2 - Station 108 to 142: 50 lbs. See note below.

NOTE

The maximum combined weight capacity for baggage areas 1 and 2 is 200 lbs.

UTILITY CATEGORY

Maximum Ramp Weight: 2208 lbs.
Maximum Takeoff Weight: 2200 lbs.
Maximum Landing Weight: 2200 lbs.
Maximum 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: 35.0 inches aft of datum at 1950 lbs. or less, with straight line variation to 41.0 inches aft of datum at 2550 lbs.
Aft: 47.3 inches aft of datum at all weights.
Reference Datum: Lower portion of front face of firewall.

UTILITY CATEGORY

Center of Gravity Range:
Forward: 35.0 inches aft of datum at 1950 lbs. or less, with straight line variation to 37.5 inches aft of datum at 2200 lbs.
Aft: 40.5 inches aft of datum at all weights.
Reference Datum: Lower portion of front face of firewall.

MANEUVER LIMITS

NORMAL CATEGORY

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 of 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 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	110 knots
Lazy Eights	110 knots
Steep Turns	104 knots
Spins	Slow Deceleration
Stalls (Except Whip Stalls)	Slow Deceleration

*Abrupt use of the controls is prohibited above 104 knots.

Aerobatics that may impose high loads should not be attempted. The important thing to bear in mind in flight maneuvers is that the 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 (Maximum Takeoff Weight - 2550 lbs.):
*Flaps Up . . . . +3.8g, -1.52g
*Flaps Down . . . . +3.0g

*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 (Maximum Takeoff Weight - 2200 lbs.):
*Flaps Up . . . . +4.4g, -1.76g
*Flaps Down . . . . +3.0g

*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: 26 U.S. gallons each.
Total Fuel: 52 U.S. gallons.
Usable Fuel (all flight conditions): 49 U.S. gallons.
Unusable Fuel: 3 U.S. gallons.
2 Long Range Tanks: 34 U.S. gallons each.
Total Fuel: 68 U.S. gallons.
Usable Fuel (all flight conditions): 66 U.S. gallons.
Unusable Fuel: 2 U.S. gallons.

NOTE

To ensure maximum fuel capacity when refueling and minimize cross-feeding when parked on a sloping surface, place the fuel selector valve in either LEFT or RIGHT position.

Fuel remaining in the tank after the fuel quantity indicator reads empty (red line) cannot be safely used in flight.

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

OTHER LIMITATIONS

FLAP LIMITATIONS

Approved Takeoff Range: 0° to 15°.
Approved Landing Range: 0° to 40°.

PLACARDS

The following information must be 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.)

> The markings and placards installed in this airplane contain operating limitations which must be complied with when operating this airplane in the Normal Category. Other operating limitations which must be complied with when operating this airplane in this category or in the Utility Category are contained in the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.
>
> Normal Category - No acrobatic maneuvers, including spins, approved.
>
> Utility Category - No acrobatic maneuvers approved, except those listed in the Pilot's Operating Handbook.
>
> Baggage compartment and rear seat must not be occupied.
>
> Spin Recovery - Opposite rudder - forward elevator - neutralize controls.
>
> Flight into known icing conditions prohibited.
>
> This airplane is certified for the following flight operations as of date of original airworthiness certificate:
>
> DAY—NIGHT—VFR—IFR

2. Near wing flap switch:

> AVOID SLIPS WITH FLAPS EXTENDED

3. On the fuel selector plate (standard tanks):

> BOTH - 49 GAL.
> LEFT - 24.5 GAL.
> RIGHT - 24.5 GAL.
> WHEN SWITCHING FROM DRY TANK
> TURN PUMP ON "HI" MOMENTARILY

On the fuel selector plate (long range tanks):

> BOTH - 66 GAL.
> LEFT - 33 GAL.
> RIGHT - 33 GAL.
> WHEN SWITCHING FROM DRY TANK
> TURN PUMP ON "HI" MOMENTARILY

4. Near fuel tank filler cap (standard tanks):

> FUEL
> 100LL/100 MIN. GRADE AVIATION GASOLINE
> CAP. 26 U.S. GAL.

Near fuel tank filler cap (long range tanks):

> FUEL
> 100LL/100 MIN. GRADE AVIATION GASOLINE
> CAP. 34.0 U.S. GAL.
> CAP. 26.0 U.S. GAL. TO BOTTOM OF FILLER COLLAR

5. On control lock:

> CONTROL LOCK
> REMOVE BEFORE STARTING ENGINE.

6. In baggage compartment:

200 POUNDS MAXIMUM BAGGAGE OR 120 LBS AUX SEAT PASSENGER FORWARD OF BAGGAGE DOOR LATCH 50 POUNDS MAXIMUM BAGGAGE AFT OF BAGGAGE DOOR LATCH MAXIMUM 200 POUNDS COMBINED FOR ADDITIONAL LOADING INSTRUCTIONS SEE WEIGHT AND BALANCE DATA

7. Near manifold pressure/fuel flow gage:

FUEL FLOW
AT FULL THROTTLE

	2600 RPM
SL	16 GPH
4000 FT	14 GPH
8000 FT	12 GPH
12000 FT	10 GPH

8. A calibration card is provided to indicate the accuracy of the magnetic compass in 30° increments.

9. On the flap control indicator:

0° to 10°	(Partial flap range with blue color code and 110 kt callout; also, mechanical detent at 10°.)
10° to 40°	(Indices at these positions with white color code and 85 kt callout; also, mechanical detent at 20°.)

10. Near the airspeed indicator:

MANEUVER SPEED 104 KIAS

11. On the oil filler cap:

OIL 8 QTS

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 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:	
2550 Lbs	104 KIAS
2150 Lbs	95 KIAS
1750 Lbs	85 KIAS
Maximum Glide:	
2550 Lbs	75 KIAS
2150 Lbs	69 KIAS
1750 Lbs	62 KIAS
Precautionary Landing With Engine Power	65 KIAS
Landing Without Engine Power:	
Wing Flaps Up	70 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 (flaps UP).
   65 KIAS (flaps DOWN).
2. Mixture -- IDLE CUT-OFF.
3. Fuel Shutoff Valve -- OFF (pull out).
4. Ignition Switch -- OFF.
5. Wing Flaps -- AS REQUIRED (full down recommended).
6. Master Switch -- OFF.

ENGINE FAILURE DURING FLIGHT

1. Airspeed -- 75 KIAS.
2. Primer -- IN and LOCKED.
3. Fuel Shutoff Valve -- ON (push full in).
4. Fuel Selector Valve -- BOTH.
5. Mixture -- RICH.
6. Throttle -- 1/2 OPEN.
7. Auxiliary Fuel Pump -- LOW for 3-5 seconds then OFF.
8. Ignition Switch -- BOTH (or START if propeller is stopped).

FORCED LANDINGS

EMERGENCY LANDING WITHOUT ENGINE POWER

1. Airspeed -- 70 KIAS (flaps UP).
   65 KIAS (flaps DOWN).
2. Seat Belts and Shoulder Harnesses -- SECURE.
3. Mixture -- IDLE CUT-OFF.
4. Fuel Shutoff Valve -- OFF.
5. All Switches (except master switch) -- OFF.
6. Wing Flaps -- AS REQUIRED (full down recommended).
7. Master Switch -- OFF.
8. Doors -- UNLATCH PRIOR TO TOUCHDOWN.
9. Touchdown -- SLIGHTLY TAIL LOW.
10. Brakes -- APPLY HEAVILY.

PRECAUTIONARY LANDING WITH ENGINE POWER

1. Seat Belts and Shoulder Harnesses -- SECURE.
2. Wing Flaps -- 20°.
3. Airspeed -- 65 KIAS.

4. Selected Field -- FLY OVER, noting terrain and obstructions, then retract flaps upon reaching a safe altitude and airspeed.
5. Avionics Power Switch and Electrical Switches -- OFF.
6. Wing Flaps -- FULL DOWN (on final approach).
7. Airspeed -- 65 KIAS.
8. Master Switch -- OFF.
9. Doors -- UNLATCH PRIOR TO TOUCHDOWN.
10. Touchdown -- SLIGHTLY TAIL LOW.
11. Ignition Switch -- OFF.
12. Brakes -- APPLY HEAVILY.

DITCHING

1. Radio -- TRANSMIT MAYDAY on 121.5 MHz, giving location and intentions and SQUAWK 7700 if transponder is installed.
2. Heavy Objects (in baggage area) -- SECURE OR JETTISON.
3. Seat Belts and Shoulder Harnesses -- SECURE .
4. Wing Flaps -- 20° - 40°.
5. Power -- ESTABLISH 300 FT/MIN DESCENT AT 55 KIAS.
6. Approach -- High Winds, Heavy Seas -- INTO THE WIND.
   Light Winds, Heavy Swells -- PARALLEL TO SWELLS.

NOTE

If no power is available, approach at 65 KIAS with flaps up or at 60 KIAS with 10° flaps.

7. Cabin Doors -- UNLATCH.
8. Face -- CUSHION at touchdown with folded coat.
9. Touchdown -- LEVEL ATTITUDE AT ESTABLISHED RATE OF DESCENT.
10. Airplane -- EVACUATE through cabin doors. If necessary, open window and flood cabin to equalize pressure so doors can be opened.
11. Life Vests and Raft -- INFLATE.

FIRES

DURING START ON GROUND

1. Auxiliary Fuel Pump -- OFF.
2. Mixture -- IDLE CUT-OFF.
3. Parking Brake -- RELEASE.

4. Fire Extinguisher -- OBTAIN (have ground attendants obtain if not installed).
5. Airplane -- EVACUATE.
6. Fire -- EXTINGUISH.

NOTE

If sufficient ground personnel are available (and fire is on ground and not too dangerous) move airplane away from the fire by pushing rearward on the leading edge of the horizontal stabilizer.

7. Fire Damage -- INSPECT, repair damage or replace damaged components or wiring before conducting another flight.

ENGINE FIRE IN FLIGHT

1. Throttle -- CLOSE.
2. Mixture -- IDLE CUT-OFF.
3. Fuel Shutoff Valve -- OFF.
4. Master Switch -- OFF.
5. Cabin Heat and Air -- OFF (except overhead vents).
6. Airspeed -- 105 KIAS (If fire is not extinguished, increase glide speed to find an airspeed which will provide an incombustible mixture).
7. Forced Landing -- EXECUTE (as described in Emergency Landing Without Engine Power).

ELECTRICAL FIRE IN FLIGHT

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

WARNING

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

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

6. Master Switch -- ON.

7. Circuit Breakers -- CHECK for faulty circuit, do not reset.
8. Radio Switches -- OFF.
9. Avionics Power Switch -- ON.
10. Radio/Electrical Switches -- ON one at a time, with delay after each until short circuit is localized.
11. 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 a 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. Strobe Light Switch (if installed) -- OFF.
3. Pitot Heat 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 using flaps only as required for final approach and touchdown.

ICING

INADVERTENT 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 control full out to obtain maximum windshield defroster airflow.
4. Increase engine speed to minimize ice build-up on propeller blades.

5. Watch for signs of induction air filter ice and regain manifold pressure by increasing the throttle setting.
6. Plan a landing at the nearest airport. With an extremely rapid ice build-up, select a suitable "off airport" landing site.
7. With an ice accumulation of 1/4 inch or more on the wing leading edges, be prepared for significantly higher stall speed.
8. Leave wing flaps retracted. With a severe ice build-up on the horizontal tail, the change in wing wake airflow direction caused by wing flap extension could result in a loss of elevator effectiveness.
9. Open left window and, if practical, scrape ice from a portion of the windshield for visibility in the landing approach.
10. Perform a landing approach using a forward slip, if necessary, for improved visibility.
11. Approach at 80 to 90 KIAS depending upon the amount of the accumulation.
12. Perform a landing in level attitude.

STATIC SOURCE BLOCKAGE
(Erroneous Instrument Reading Suspected)

1. Alternate Static Source Valve -- PULL ON.
2. Airspeed -- Consult appropriate calibration tables in Section 5 or climb and approach 3 knots faster than normal.
3. Altitude -- Cruise and approach 25 feet higher than normal.

LANDING WITH A FLAT MAIN TIRE

1. Approach -- NORMAL.
2. Wing Flaps -- FULL DOWN.
3. Touchdown -- GOOD TIRE FIRST, hold airplane off flat tire as long as possible with aileron control.

ELECTRICAL POWER SUPPLY SYSTEM MALFUNCTIONS

AMMETER SHOWS EXCESSIVE RATE OF CHARGE
(Full Scale Deflection)

1. Alternator -- OFF.
2. Alternator Circuit Breaker -- PULL.
3. Nonessential Electrical Equipment -- OFF.
4. Flight -- TERMINATE as soon as practical.

LOW-VOLTAGE LIGHT ILLUMINATES DURING FLIGHT
(Ammeter Indicates Discharge)

NOTE

Illumination of the low-voltage light may occur during low RPM conditions with an electrical load on the system such as during a low RPM taxi. Under these conditions, the light will go out at higher RPM. The master switch need not be recycled since an over-voltage condition has not occurred to de-activate the alternator system.

1. Avionics Power Switch -- OFF.
2. Alternator Circuit Breaker -- CHECK IN.
3. Master Switch -- OFF (both sides).
4. Master Switch -- ON.
5. Low-Voltage Light -- CHECK OFF.
6. Avionics Power Switch -- ON.

If low-voltage light illuminates again:

7. Alternator -- OFF.
8. Nonessential Radio and Electrical Equipment -- OFF.
9. Flight -- TERMINATE as soon as practical.

AMPLIFIED PROCEDURES

ENGINE FAILURE

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 after 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 forced landing without power must be completed.

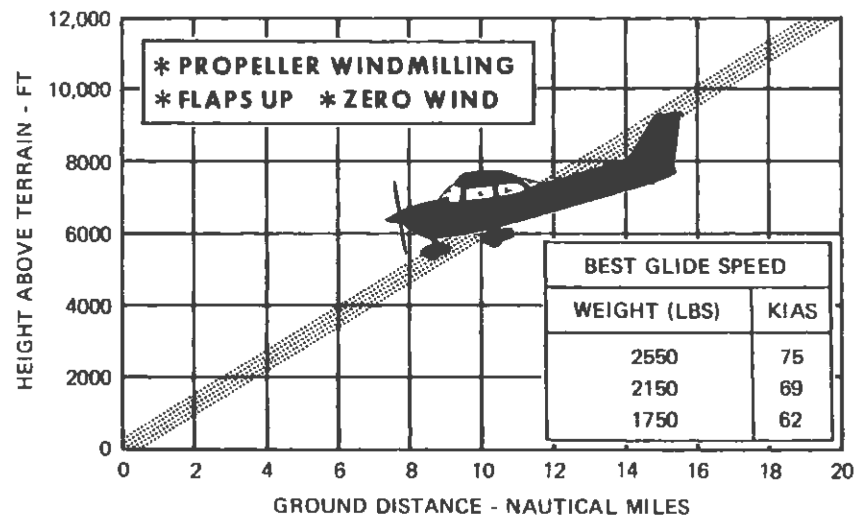

Figure 3-1. Maximum Glide

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 under the Emergency Landing Without Engine Power checklist.

Before attempting an "off airport" landing with engine power available, one should fly over 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 and squawk 7700 if a transponder is installed. Avoid a landing flare because of difficulty in judging height over a water surface.

LANDING WITHOUT ELEVATOR CONTROL

Trim for horizontal flight to an airspeed of approximately 65 KIAS with flaps set to 20° by using throttle and elevator trim control. Then **do not change the elevator trim control setting**; control the glide angle by adjusting power exclusively.

At flareout, the nose-down moment resulting from power reduction is an adverse factor and the airplane may hit on the nose wheel. Consequently, at flareout, the elevator trim control should be adjusted toward the full nose-up position and the power adjusted so that the airplane will rotate to the horizontal attitude for touchdown. Close the throttle at touchdown.

FIRES

Improper starting procedures involving the excessive use of auxiliary fuel pump operation can cause engine flooding and subsequent puddling of fuel on the parking ramp as the excess fuel drains overboard from the intake ports. This is sometimes experienced in difficult starts in cold weather where preheat service is not available. If this occurs, the airplane should be pushed away from the fuel puddle before another engine start is attempted. Otherwise, there is a possibility of raw fuel accumulations in the exhaust system igniting during an engine start, causing a long flame from the tailpipe, and possibly igniting the fuel puddle on the pavement. In the event that this occurs, proceed in accordance with the Fire During Start On Ground checklist.

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 as soon as possible. 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 elimination of the fire.

EMERGENCY OPERATION IN CLOUDS

(Vacuum System Failure)

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

EXECUTING A 180° TURN IN CLOUDS

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

1. Note the compass heading.
2. Note the time of the minute hand and observe the position of the sweep second hand on the clock.
3. 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.
4. Check accuracy of the turn by observing the compass heading which should be the reciprocal of the original heading.
5. If necessary, adjust heading primarily with skidding motions rather than rolling motions so that the compass will read more accurately.
6. Maintain altitude and airspeed by cautious application of elevator control. Avoid overcontrolling 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 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. Reduce power to set up a 500 to 800 ft/min rate of descent.
2. Adjust mixture as required for smooth engine operation.
3. Adjust the elevator trim and rudder trim for a stabilized descent at 75 KIAS.
4. Keep hands off the control wheel.
5. Monitor turn coordinator and make corrections by rudder alone.
6. Adjust rudder trim to relieve unbalanced rudder force, if present.
7. Check trend of compass card movement and make cautious corrections with rudder to stop the turn.
8. 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 elevator back pressure to slowly reduce the airspeed to 75 KIAS.
4. Adjust the elevator trim control to maintain a 75 KIAS glide.
5. Keep hands off the control wheel, using rudder control to hold a straight heading. Use rudder trim to relieve unbalanced rudder force, if present.
6. Clear engine occasionally, but avoid using enough power to disturb the trimmed glide.
7. Upon breaking out of clouds, resume normal cruising flight.

INADVERTENT FLIGHT INTO ICING CONDITIONS

Intentional flight into known icing conditions is prohibited in this airplane. During instrument flight; however, icing conditions may be encountered inadvertently and therefore some corrective action will be required as shown in the checklists. Initiation of a climb is usually the best ice avoidance action to take; however, alternatives are descent to warmer air or to reverse course.

STATIC SOURCE BLOCKED

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

A calibration table is provided in Section 5 to illustrate the effect of the alternate static source on indicated airspeeds. With the windows and vents closed the airspeed indicator may typically read as much as 4 knots slower and the altimeter 50 feet lower in cruise. With the vents open and heater on, these variations increase to 7 knots slower and 50 feet lower respectively. If the alternate static source must be used for landing, airspeed errors of up to 10 knots slower with vents open and 4 knots slower with vents closed can be expected. Altimeter errors remain 50 feet low.

NOTE

In an emergency on airplanes not equipped with an alternate static source, cabin pressure can be supplied to the static pressure instruments by breaking the glass in the face of the rate-of-climb indicator.

SPINS

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

1. RETARD THROTTLE TO IDLE POSITION.
2. PLACE AILERONS IN NEUTRAL POSITION.
3. APPLY AND **HOLD** FULL RUDDER OPPOSITE TO THE DIRECTION OF ROTATION.
4. JUST **AFTER** THE RUDDER REACHES THE STOP, MOVE THE CONTROL WHEEL **BRISKLY** FORWARD FAR ENOUGH TO BREAK THE STALL. Full down elevator may be required at aft center of gravity loadings to assure optimum recoveries.
5. **HOLD** 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 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

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 more likely cause, lean the mixture to the recommended lean setting for cruising flight. If the problem does 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 a single ignition position.

MAGNETO MALFUNCTION

A sudden engine roughness or misfiring is usually evidence of magneto problems. Switching from BOTH to either 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.

If ignition system malfunctions occur at high altitude and high power, as evidenced by roughness and possible backfiring on one or both magnetos, the power should be reduced as required. This condition is an indication of excessive spark plug gaps which, in turn, causes arcing across the magneto points.

ENGINE-DRIVEN FUEL PUMP FAILURE

Failure of the engine-driven fuel pump will be evidenced by a sudden reduction in the fuel flow indication **prior to a loss of power,** while operating with adequate fuel in either or both fuel tanks.

In the event of an engine-driven fuel pump failure during takeoff, immediately **hold** the auxiliary fuel pump switch in the HIGH position until the airplane is well clear of obstacles. Upon reaching a safe altitude, and reducing power to cruise settings, releasing the switch to the LOW position will then provide sufficient fuel flow to maintain engine operation while maneuvering for a landing.

If an engine-driven fuel pump failure occurs during cruising flight, apply full rich mixture and **hold** the auxiliary fuel pump switch in the HIGH position to re-establish fuel flow. Then the LOW position of the fuel pump switch may be used to sustain level flight. If necessary, additional fuel flow is obtainable by holding the pump switch in the HIGH position. If either LOW or HIGH fuel pump switch positions results in rough engine operation lean the mixture as required for smooth operation.

LOW OIL PRESSURE

If low oil pressure is accompanied by normal oil temperature, there is a possibility the oil pressure gage or relief valve is malfunctioning. A leak in the line to the gage is not necessarily cause for an immediate precautionary landing because an orifice in this line will prevent a sudden loss of oil from the engine sump. However, a landing at the nearest airport would be advisable to inspect the source of trouble.

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 required 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 low-voltage warning light; however, the cause of these malfunctions is usually difficult to determine. Broken or loose alternator wiring is most likely the cause of alternator failures, although other factors could cause the problem. A damaged or improperly adjusted alternator control unit 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 can be adversely affected by higher than normal voltage. The alternator control unit includes an over-voltage sensor which normally will automatically shut down the alternator if the charge voltage reaches approximately 31.5 volts. If the over-voltage sensor malfunctions or is improperly adjusted, as evidenced by an excessive rate of charge shown on the ammeter, the alternator should be turned off, alternator circuit breaker pulled, nonessential electrical equipment turned off and the flight terminated as soon as practical.

INSUFFICIENT RATE OF CHARGE

NOTE

Illumination of the low-voltage light and ammeter discharge indications may occur during low RPM conditions with an electrical load on the system, such as during a low RPM taxi. Under these conditions, the light will go out at higher RPM. The master switch need not be recycled since an over-voltage condition has not occurred to de-activate the alternator system.

If the over-voltage sensor should shut down the alternator, or if the alternator circuit breaker should trip, a discharge rate will be shown on the ammeter followed by illumination of the low-voltage warning light. Since this may be a "nuisance" trip-out, an attempt should be made to reactivate the alternator system. To do this, turn the avionics power switch off, check that the alternator circuit breaker is in, then turn both sides of the master switch off and then on again. If the problem no longer exists, normal alternator charging will resume and the low-voltage light will go off. The avionics power switch may then be turned back on. If the light illuminates again, a malfunction is confirmed. In this event, 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 later use of the landing lights and flaps during landing.

SECTION 4
NORMAL PROCEDURES

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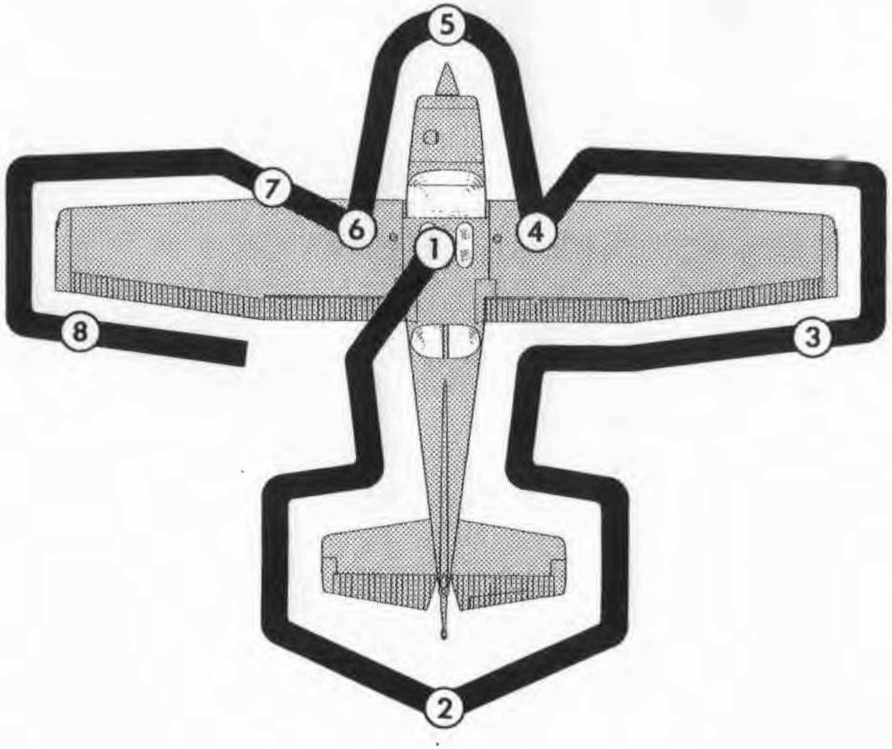
INTRODUCTION

Section 4 provides checklist and amplified procedures for the conduct of normal operation. Normal procedures associated with optional systems can be found in Section 9.

SPEEDS FOR NORMAL OPERATION

Unless otherwise noted, the following speeds are based on a maximum weight of 2550 pounds and may be used for any lesser weight. However, to achieve the performance specified in Section 5 for takeoff distance, the speed appropriate to the particular weight must be used.

Takeoff, Flaps Up:	
Normal Climb Out	75-85 KIAS
Short Field Takeoff, Flaps 10°, Speed at 50 Feet	58 KIAS
Enroute Climb, Flaps Up:	
Normal	85-95 KIAS
Best Rate of Climb, Sea Level	78 KIAS
Best Rate of Climb, 10,000 Feet	73 KIAS
Best Angle of Climb, Sea Level	57 KIAS
Best Angle of Climb, 10,000 Feet	63 KIAS
Landing Approach:	
Normal Approach, Flaps Up	65-75 KIAS
Normal Approach, Flaps 40°	60-70 KIAS
Short Field Approach, Flaps 40°	60 KIAS
Balked Landing:	
Maximum Power, Flaps 20°	55 KIAS
Maximum Recommended Turbulent Air Penetration Speed:	
2550 Lbs	104 KIAS
2150 Lbs	95 KIAS
1750 Lbs	85 KIAS
Maximum Demonstrated Crosswind Velocity:	
Takeoff and Landing	20 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. Prior to flight, check that pitot heater (if installed) is warm to touch within 30 seconds with battery and pitot switches on. If a night flight is planned, check operation of all lights, and make sure a flashlight is available.

Figure 4-1. Preflight Inspection

CHECKLIST PROCEDURES

PREFLIGHT INSPECTION

(1) CABIN

1. Pilot's Operating Handbook -- AVAILABLE IN THE AIRPLANE.
2. Control Wheel Lock -- REMOVE and STOW.
3. Ignition Switch -- OFF.
4. Avionics Power Switch -- OFF.
5. Master Switch -- ON.

WARNING

When turning on the master switch, using an external power source, or pulling the propeller through by hand, treat the propeller as if the ignition switch were on. Do not stand, nor allow anyone else to stand, within the arc of the propeller, since a loose or broken wire, or a component malfunction, could cause the propeller to rotate.

6. Fuel Quantity Indicators -- CHECK QUANTITY.
7. Master Switch -- OFF.
8. Fuel Shutoff Valve -- ON (push full in).
9. Fuel Selector Valve -- BOTH.
10. Trim Controls -- NEUTRAL.
11. Static Pressure Alternate Source Valve (if installed) -- OFF.
12. Baggage Door -- CHECK for security, lock with key if child's seat is to be occupied.

(2) EMPENNAGE

1. Rudder Gust Lock -- REMOVE.
2. Tail Tie-Down -- DISCONNECT.
3. Control Surfaces -- CHECK freedom of movement and security.

(3) RIGHT WING Trailing Edge

1. Aileron -- CHECK freedom of movement and security.

(4) RIGHT WING

1. Wing Tie-Down -- DISCONNECT.

2. Main Wheel Tire -- CHECK for proper inflation.
3. Before first flight of the day 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. Before first flight of the day and after each refueling, use sampler cup and drain small quantity of fuel from fuel reservoir quick-drain valve to check for water, sediment, and proper fuel grade.
2. Static Source Openings (both sides of fuselage) -- CHECK for stoppage.
3. Propeller and Spinner -- CHECK for nicks, security and oil leaks.
4. Landing Lights -- CHECK for condition and cleanliness.
5. Nose Wheel Strut and Tire -- CHECK for proper inflation.
6. Nose Tie-Down -- DISCONNECT.
7. Engine Oil Level -- CHECK. Do not operate with less than six quarts. Fill to eight quarts for extended flight.
8. Before first flight of the day and after each refueling, pull out strainer drain knob for about four seconds to clear fuel strainer of possible water and 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, reservoir drain valve and fuel selector drain plug will be necessary.

(6) LEFT WING

1. Main Wheel Tire -- CHECK for proper inflation.
2. Before first flight of day 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. Pitot Tube Cover -- REMOVE and check opening for stoppage.
2. Fuel Tank Vent Opening -- CHECK for stoppage.
3. 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 horn will confirm system operation.
4. Wing Tie-Down -- DISCONNECT.

(8) LEFT WING Trailing Edge

1. Aileron -- CHECK freedom of movement and security.

BEFORE STARTING ENGINE

1. Preflight Inspection -- COMPLETE.
2. Seats, Belts, Shoulder Harnesses -- ADJUST and LOCK.
3. Fuel Shutoff Valve -- ON (push full in).
4. Fuel Selector Valve -- BOTH.
5. Avionics Power Switch, Autopilot (if installed), Electrical Equipment -- OFF.

CAUTION

The avionics power switch must be OFF during engine start to prevent possible damage to avionics.

6. Brakes -- TEST and SET.
7. Cowl Flap -- OPEN (move lever inboard out of locking hole to reposition).
8. Circuit Breakers -- CHECK IN.

STARTING ENGINE

1. Mixture -- RICH.
2. Propeller -- HIGH RPM.
3. Throttle -- CLOSED.
4. Master Switch -- ON.
5. Auxiliary Fuel Pump Switch -- HIGH.
6. Throttle -- ADVANCE to obtain 8-10 GPH fuel flow then return to CLOSED position.
7. Auxiliary Fuel Pump Switch -- OFF.
8. Propeller Area -- CLEAR.
9. Ignition Switch -- START (release to BOTH when engine starts).

NOTE

The engine should start in two to three revolutions. If it does not continue running, start again at step 3 above. If the engine does not start, leave the auxiliary fuel pump switch off, set the mixture to idle cut-off, open the throttle, and crank until the engine fires (or for approximately 15 seconds). If still unsuccessful, start again using the normal starting procedure after allowing the starter motor to cool.

10. Throttle -- 800 to 1000 RPM.
11. Oil Pressure -- CHECK.
12. Flashing Beacon and Navigation Lights -- ON as required.
13. Avionics Power Switch -- ON.
14. Radios -- ON.

BEFORE TAKEOFF

1. Parking Brake -- SET.
2. Cabin Doors -- CLOSED and LOCKED.
3. Flight Controls -- FREE and CORRECT.
4. Flight Instruments -- SET.
5. Fuel Selector Valve -- BOTH.
6. Elevator and Rudder Trim -- SET.
7. Throttle -- 1800 RPM.
   a. Magnetos -- CHECK (RPM drop should not exceed 150 RPM on either magneto or 50 RPM differential between magnetos).
   b. Propeller -- CYCLE from high to low RPM; return to high RPM (full in).
   c. Engine Instruments and Ammeter -- CHECK.
   d. Suction Gage -- CHECK (4.5 to 5.4 In. Hg.).
   e. Throttle -- 1000 RPM or less.
8. Radios -- SET.
9. Autopilot (if installed) -- OFF.
10. Strobe Lights -- AS DESIRED.
11. Throttle Friction Lock -- ADJUST.
12. Brakes -- RELEASE.

TAKEOFF

NORMAL TAKEOFF

1. Wing Flaps -- 0°- 10° (10° preferred).
2. Power -- FULL THROTTLE and 2600 RPM.
3. Mixture -- LEAN for field elevation per fuel flow placard.
4. Elevator Control -- LIFT NOSE WHEEL at 55 KIAS.
5. Climb Speed -- 75-85 KIAS.

SHORT FIELD TAKEOFF

1. Wing Flaps -- 10°.

2. Brakes -- APPLY.
3. Power -- FULL THROTTLE and 2600 RPM.
4. Mixture -- LEAN for field elevation per fuel flow placard.
5. Brakes -- RELEASE.
6. Elevator Control -- MAINTAIN SLIGHTLY TAIL-LOW ATTITUDE.
7. Climb Speed -- 58 KIAS (until all obstacles are cleared).
8. Wing Flaps -- RETRACT after obstacles are cleared.

ENROUTE CLIMB

NORMAL CLIMB

1. Airspeed -- 85-95 KIAS.
2. Power -- FULL THROTTLE and 2600 RPM.
3. Fuel Selector Valve -- BOTH.
4. Mixture -- LEAN for altitude per fuel flow placard.
5. Cowl Flap -- OPEN as required.

MAXIMUM PERFORMANCE CLIMB

1. Airspeed -- 78 KIAS at sea level to 73 KIAS at 10,000 feet.
2. Power -- FULL THROTTLE and 2600 RPM.
3. Fuel Selector Valve -- BOTH.
4. Mixture -- LEAN for altitude per fuel flow placard.
5. Cowl Flap -- OPEN.

CRUISE

1. Power -- 15-25 INCHES Hg, 2200-2600 RPM (no more than 80% power).
2. Elevator and Rudder Trim -- ADJUST.
3. Mixture -- LEAN for cruise fuel flow using the EGT gage, Cessna Power Computer or the data in Section 5.
4. Cowl Flap -- CLOSED.

DESCENT

1. Fuel Selector Valve -- BOTH.
2. Power -- AS DESIRED.
3. Mixture -- ENRICHEN as required for engine smoothness.
4. Cowl Flap -- CLOSED.

BEFORE LANDING

1. Seats, Belts, Shoulder Harnesses -- ADJUST and LOCK.
2. Fuel Selector Valve -- BOTH.

3. Propeller -- HIGH RPM.
4. Cowl Flap -- CLOSED.
5. Autopilot (if installed) -- OFF.

LANDING

NORMAL LANDING

1. Airspeed -- 65-75 KIAS (flaps UP).
2. Wing Flaps -- AS DESIRED (0° - 10° below 110 KIAS, 10° - 40° below 85 KIAS).
3. Airspeed -- 60-70 KIAS (flaps DOWN).
4. Elevator and Rudder Trim -- ADJUST.
5. Touchdown -- MAIN WHEELS FIRST.
6. Landing Roll -- LOWER NOSE WHEEL GENTLY.
7. Braking -- MINIMUM REQUIRED.

SHORT FIELD LANDING

1. Airspeed -- 65-75 KIAS (flaps UP).
2. Wing Flaps -- FULL DOWN (below 85 KIAS).
3. Airspeed -- MAINTAIN 60 KIAS.
4. Elevator and Rudder Trim -- ADJUST.
5. Power -- REDUCE TO IDLE as obstacle is cleared.
6. Touchdown -- MAIN WHEELS FIRST.
7. Brakes -- APPLY HEAVILY.
8. Wing Flaps -- RETRACT for maximum brake effectiveness.

BALKED LANDING

1. Power -- FULL THROTTLE and 2600 RPM.
2. Wing Flaps -- RETRACT to 20°.
3. Airspeed -- 55 KIAS.
4. Wing Flaps -- RETRACT slowly after reaching 65 KIAS.
5. Cowl Flap -- OPEN.

AFTER LANDING

1. Wing Flaps -- RETRACT.
2. Cowl Flap -- OPEN.

SECURING AIRPLANE

1. Parking Brake -- SET.
2. Avionics Power Switch, Autopilot (if installed), Electrical Equipment -- OFF.
3. Throttle -- IDLE.

4. Mixture -- IDLE CUT-OFF (pull full out).
5. Ignition Switch -- OFF.
6. Master Switch -- OFF.
7. Control Lock -- INSTALL.
8. Fuel Selector Valve -- RIGHT.

AMPLIFIED PROCEDURES

STARTING ENGINE

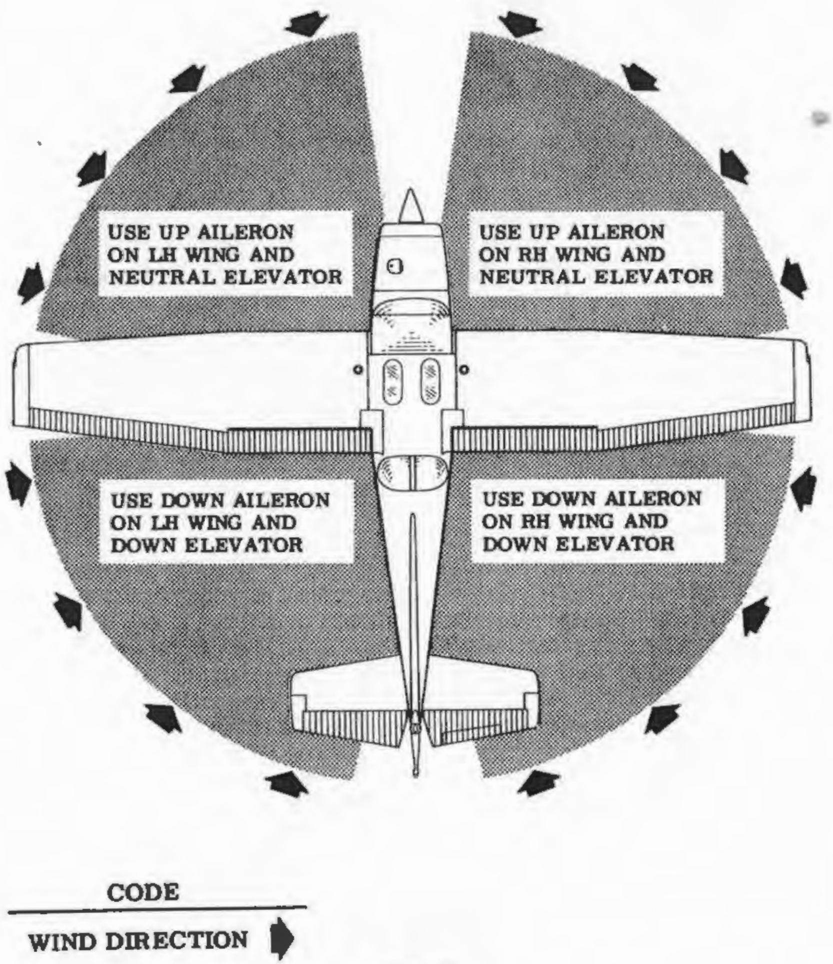
Proper fuel management and throttle adjustments are the determining factors in securing an easy start from your continuous-flow fuel-injection engine. The procedure outlined in this section should be followed closely as it is effective under nearly all operating conditions.

Conventional full rich mixture and high RPM propeller settings are used for starting; the throttle, however, should be fully closed initially. When ready to start, place the auxiliary fuel pump switch in the HIGH position and advance the throttle to obtain 8-10 gal/hr fuel flow. Then close the throttle and turn off the auxiliary fuel pump. Place the ignition switch in the START position. While cranking, slowly advance the throttle until the engine starts. Slow throttle advancement is essential since the engine will start readily when the correct fuel/air ratio is obtained. When the engine has started, reset the throttle to the desired idle speed (800-1000 RPM).

The continuous-flow fuel injection system will inject atomized fuel in the intake ports as soon as the throttle and mixture controls are opened and the auxiliary fuel pump is turned on. If the auxiliary pump is turned on accidentally while the engine is stopped, with the throttle open and the mixture rich, solid fuel will collect temporarily in the cylinder intake ports, the quantity depending on the amount of the throttle opening and the length of time the pump has been operating. If this happens, it is advisable to wait a few minutes until this fuel drains away before starting the engine. To avoid flooding, turn the auxiliary fuel pump switch off promptly when the fuel flow reaches 10 gal/hr during preparation for engine start.

Engine mis-starts characterized by weak, intermittent firing followed by puffs of black smoke from the exhaust are caused by overpriming or flooding. This situation is more apt to develop in hot weather, or when the engine is hot. If it occurs, repeat the starting routine with the throttle approximately 1/2 open, the mixture in idle cut-off and the auxiliary fuel pump switch off. As the engine fires, move the mixture control to full rich and decrease the throttle to idle.

Engine mis-starts characterized by sufficient power to take the engine away from the starter but dying in 3 to 5 revolutions are the result of an excessively lean mixture after the start and can occur in warm or cold temperatures. Repeat the starting procedure but allow additional priming time with the auxiliary fuel pump switch on HIGH before cranking is started. If extremely hot temperatures have caused vapor which prevents a



NOTE

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

start, it will be necessary to hold the auxiliary fuel pump switch in the HIGH position for 5 to 10 seconds or more to flush the vapor through the fuel lines until the fuel flow reaches 10 gal/hr. Then turn off the pump and proceed with normal starting procedures.

If prolonged cranking is necessary, allow the starter motor to cool at frequent intervals, since excessive heat may damage the armature.

After starting, if the oil pressure gage does not begin to show pressure within 30 seconds in normal temperatures and 60 seconds in very cold weather, shut off 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 Operation paragraphs in this section.

TAXIING

When taxiing, it is important that speed and use of brakes be held to a minimum and that all controls be utilized (see Taxiing Diagram, figure 4-2) to maintain directional control and balance. 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 cooling, precautions should be taken to avoid overheating on the ground. Full throttle checks on the ground are not recommended unless the pilot has good reason to suspect that the engine is not turning up properly.

MAGNETO CHECK

The magneto check should be made at 1800 RPM as follows. Move ignition switch first to 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. If there is a doubt concerning operation of the ignition system, RPM checks at higher engine speeds will usually confirm whether a 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 flight where verification of proper alternator and alternator control unit 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, during the engine runup (1800 RPM). The ammeter will remain within a needle width of the initial reading if the alternator and alternator control unit 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.

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. This allows the airplane to start rolling before takeoff RPM is developed, and the gravel will be blown 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.

For maximum engine power, the mixture should be adjusted during the initial takeoff roll to the fuel flow corresponding to the field elevation. (Refer to the fuel flow placard located adjacent to the fuel flow indicator). The power increase is significant above 3000 feet and this procedure should always be employed for field elevations greater than 5000 feet above sea level.

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

Normal takeoffs are accomplished with wing flaps 0°- 10°. Using 10° wing flaps reduces the ground run and total distance over an obstacle by approximately 5 percent.

If 10° wing flaps are used for takeoff, they should be left down until all obstacles are cleared and a safe flap retraction speed of 70 KIAS is reached. To clear an obstacle with wing flaps 10°, an obstacle clearance speed of 58 KIAS should be used.

Soft field takeoffs can be performed with 15° flaps by lifting the airplane off the ground as soon as practical in a slightly tail-low attitude. If no obstacles are ahead, the airplane should be leveled off immediately to accelerate to a safer climb speed. When departing a soft field with an aft C.G. loading, the elevator trim should be adjusted towards the nose down direction to give comfortable control wheel forces during the initial climb. Flap deflections greater than 15° are not approved for takeoff.

With wing flaps retracted and no obstructions ahead, a takeoff climb-out speed of 75-85 KIAS would be most efficient.

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. With the ailerons partially deflected into the wind, 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 85-95 KIAS with flaps up and maximum power for the best combination of engine cooling, rate of climb and forward visibility. The mixture should be leaned in accordance with the fuel flow placard.

If it is necessary to climb rapidly to clear mountains or reach favorable winds or better weather at high altitudes, the best rate-of-climb speed should be used. This speed is 78 KIAS at sea level, decreasing to 73 KIAS at 10,000 feet. Maximum power should be used and the mixture should be leaned according to the fuel flow placard.

If an obstruction ahead requires a steep climb angle, a best angle-of-climb speed should be used with flaps up and maximum power. This speed is 57 KIAS at sea level, increasing to 63 KIAS at 10,000 feet.

CRUISE

Normal cruising is performed between 60% and 80% power. The engine RPM and corresponding 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 80% 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 advantage of higher altitude on both true airspeed and nautical miles per gallon. In addition, the beneficial effect of lower cruise power on nautical miles per gallon at a given altitude can be observed. 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 that should be considered on every trip to reduce fuel consumption.

For reduced noise levels, it is desirable to select the lowest RPM in the

	80% POWER		70% POWER		60% POWER	
ALTITUDE	KTAS	NMPG	KTAS	NMPG	KTAS	NMPG
3000 Feet	126	11.2	119	12.0	110	12.9
6000 Feet	130	11.5	122	12.3	112	13.1
9000 Feet	---	---	125	12.6	114	13.3
Standard Conditions						Zero Wind

Figure 4-3. Cruise Performance Table

green arc range for a given percent power that will provide smooth engine operation. The cowl flap should be opened, if necessary, to maintain the cylinder head temperature at approximately two-thirds of the normal operating range (green arc).

For best fuel economy at 70% power or less, the engine may be operated at one gallon per hour leaner than shown in this handbook and on the power computer. This will result in approximately 8% greater range than shown in this handbook accompanied by approximately a 4 knot decrease in speed.

The fuel injection system employed on this engine is considered to be non-icing. In the event that unusual conditions cause the intake air filter to become clogged or iced over, an alternate intake air valve opens automatically for the most efficient use of either normal or alternate air depending on the amount of filter blockage.

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 80% power or 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 figure 4-4.

Continuous operation at peak EGT is authorized only at 70° power or less. This best economy mixture setting results in approximately 8% greater range than shown in this handbook accompanied by approximately a 4 knot decrease in speed.

NOTE

Operation on the lean side of peak EGT is not approved.

MIXTURE DESCRIPTION	EXHAUST GAS TEMPERATURE
RECOMMENDED LEAN (Pilot's Operating Handbook and Power Computer)	50°F Rich of Peak EGT
BEST ECONOMY (70% Power or Less)	Peak EGT

Figure 4-4. EGT Table

When leaning the mixture, if a distinct peak is not obtained, use the corresponding maximum EGT as a reference point for enrichening the mixture to the desired cruise setting. Any change in altitude or power will require a recheck of the EGT indication.

STALLS

The stall characteristics are conventional and aural warning is provided by a stall warning horn which sounds between 5 and 10 knots above the stall in all configurations.

Power off stall speeds at maximum weight for both forward and aft C.G. are presented in Section 5.

SPINS

Intentional spins are approved in this airplane within certain restricted loadings. Spins with baggage loadings or occupied rear seat(s) are not approved.

However, 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 R172K.

The cabin should be clean and all loose equipment (including the microphone and rear seat belts) should be stowed or secured. For a solo flight in which spins will be conducted, the copilot's seat belt and shoulder harness should also 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 elevator 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 aft elevator. A slightly greater rate of deceleration than for normal stall entries, application of ailerons in the direction of the desired spin, and the use of power at the entry will assure more consistent and positive entries to the spin. As the airplane begins to spin, reduce the power to idle and return the ailerons to neutral. Both elevator and rudder controls should be held full with the spin until the spin recovery is initiated. An 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 or 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 recovery controls will produce prompt recoveries (within 1/4 turn). During extended spins of two to three turns or more, the spin will tend to change into a spiral, particularly to the right. This will be accompanied by an increase in airspeed and gravity loads on the airplane. If this occurs, recovery should be accomplished quickly by leveling the wings and recovering from the resulting dive.

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

1. VERIFY THAT THROTTLE 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 ROTATION STOPS.
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 may be referred to for this information.

Variation in basic airplane rigging or in weight and balance due to installed equipment or right seat 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 the spiraling tendencies for spins of more than 2 turns. However, the aforementioned recovery technique 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

Normal landing approaches can be made with power-on or power-off at speeds of 65-75 KIAS with flaps up, and 60-70 KIAS with flaps down. Surface winds and air turbulence are usually the primary factors in determining the most comfortable approach speeds. Steep slips should be avoided with flap settings greater than 20° due to a slight tendency for the elevator to oscillate under certain combinations of airspeed, sideslip angle, and center of gravity loadings.

Actual touchdown should be made with power-off and on the main wheels first to reduce the landing speed and subsequent need for braking in the landing roll. The nose wheel is lowered to the runway gently after the speed has diminished to avoid unnecessary nose gear loads. This procedure is especially important in rough or soft field landings.

SHORT FIELD LANDING

For a short field landing in smooth air conditions, make an approach at 60 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 strong crosswind, use the minimum flap setting required for the field length. If flap settings greater than 20° are used in sideslips with full rudder deflection, some elevator oscillation may be felt

at normal approach speeds. However, this does not affect control of the airplane. 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 occasional braking if necessary.

BALKED LANDING

In a balked landing (go-around) climb, reduce the wing flap setting to 20° immediately after full power is applied and maintain 55 KIAS until immediate obstacles are cleared. Then slowly retract the wing flaps after accelerating to an airspeed of 65 KIAS. If obstacles must be cleared during the go-around climb, leave the wing flaps in the 10° to 20° range and maintain 55 KIAS until the obstacles are cleared. Lean the mixture according to the fuel flow placard. After clearing any obstacles, the flaps may be retracted as the airplane accelerates to the normal flaps-up climb speed of 85-95 KIAS.

COLD WEATHER OPERATION

STARTING

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 cause the engine to fire.

Starting can be expedited by switching the auxiliary fuel pump to HIGH position and advancing the throttle for a fuel flow of 8-10 gal./hr. for 3 to 6 seconds.

In extremely cold (-18°C and lower) weather, the use of an external preheater and an external power source are recommended whenever possible to obtain positive starting and to reduce wear and abuse to the engine and electrical system. Pre-heat will thaw the oil trapped in the oil cooler, which probably will 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 9, Supplements, for Ground Service Plug Receptacle operating details.

For quick, smooth engine starts in very cold temperatures, use six strokes of the manual primer before cranking, with an additional one or two strokes as the engine starts.

WARM-UP

In very cold weather, no oil temperature indication need be apparent before takeoff. After a suitable warm-up period (2 to 5 minutes at 1000 RPM), with cylinder head temperatures at bottom of green arc, the engine is ready for takeoff if it accelerates smoothly and the oil pressure is normal and steady.

INFLIGHT

During let-down, observe engine temperatures closely and carry sufficient power to maintain them in the recommended operating range.

HOT WEATHER OPERATION

Refer to the general warm temperature starting information under Starting Engine in this section. Avoid prolonged engine operation on the ground.

NOISE ABATEMENT

Increased emphasis on improving the quality of our environment requires renewed effort on the part of all pilots to minimize the effect of airplane noise on the public.

We, as pilots, can demonstrate our concern for environmental improvement, by application of the following suggested procedures, and thereby tend to build public support for aviation:

1. Pilots operating aircraft 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 not apply where

they would conflict with Air Traffic Control clearances or instructions, or where, in the pilot's judgment, an altitude of less than 2000 feet is necessary for him to adequately exercise his duty to see and avoid other aircraft.

The certificated noise level for the Model R172K at 2550 pounds maximum weight is 74.1 dB(A). No determination has been made by the Federal Aviation Administration that the noise levels of this airplane are or should be acceptable or unacceptable for operation at, into, or out of, any airport.

SECTION 5
PERFORMANCE

TABLE OF CONTENTS

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 techniques.

It should be noted that the performance information presented in the range and endurance profile charts allows for 45 minutes reserve fuel at the specified cruise 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 performance figure with reasonable accuracy.

SAMPLE PROBLEM

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

AIRPLANE CONFIGURATION	
Takeoff weight	2500 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	365 Nautical Miles
Pressure altitude	5500 Feet
Temperature	20°C (16°C above standard)
Expected wind enroute	10 Knot Headwind

LANDING CONDITIONS

Field pressure altitude	2000 Feet
Temperature	25°C
Field length	3000 Feet

TAKEOFF

The takeoff distance 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 2550 pounds, pressure altitude of 2000 feet and a temperature of 30°C should be used and results in the following:

Ground roll	1070 Feet
Total distance to clear a 50-foot obstacle	1820 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 2 of the takeoff chart. The correction for a 12 knot headwind is:

$$\frac{12 \text{ Knots}}{9 \text{ Knots}} \times 10\% = 13\% \text{ Decrease}$$

This results in the following distances, corrected for wind:

Ground roll, zero wind	1070
Decrease in ground roll (1070 feet × 13%)	139
Corrected ground roll	931 Feet
Total distance to clear a 50-foot obstacle, zero wind	1820
Decrease in total distance (1820 feet × 13%)	237
Corrected total distance to clear a 50-foot obstacle	1583 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. For this sample problem, a cruise power of approximately 70% will be used.

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 2500 RPM and 22 inches of manifold pressure, which results in the following:

Power	70%
True airspeed	124 Knots
Cruise fuel flow	9.9 GPH

The power computer may be used to determine 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 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 1.5 gallons of fuel. The corresponding distance during the climb is 10 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:

$$\frac{16°C}{10°C} \times 10\% = 16\% \text{ Increase}$$

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

Fuel to climb, standard temperature	1.5
Increase due to non-standard temperature (1.5 × 16%)	0.2
Corrected fuel to climb	1.7 Gallons

Using a similar procedure for the distance during climb results in 12 nautical miles.

The resultant cruise distance is:

Total distance	365
Climb distance	-12
Cruise distance	353 Nautical Miles

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

124
-10
114 Knots

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

$$\frac{353 \text{ Nautical Miles}}{114 \text{ Knots}} = 3.1 \text{ Hours}$$

The fuel required for cruise is:

3.1 hours × 9.9 gallons/hour = 30.7 Gallons

The total estimated fuel required is as follows:

Engine start, taxi, and takeoff	1.4
Climb	1.7
Cruise	30.7
Total fuel required	33.8 Gallons

Once the flight is underway, ground speed checks 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	700 Feet
Total distance to clear a 50-foot obstacle	1390 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.

DEMONSTRATED OPERATING TEMPERATURE

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

AIRSPEED CALIBRATION

NORMAL STATIC SOURCE

FLAPS UP												
KIAS	50	60	70	80	90	100	110	120	130	140	150	160
KCAS	54	62	71	80	89	98	107	117	127	137	147	157
FLAPS 10°												
KIAS	40	50	60	70	80	90	100	110	---	---	---	---
KCAS	49	55	63	72	81	90	99	108	---	---	---	---
FLAPS 40°												
KIAS	40	50	60	70	80	85	---	---	---	---	---	---
KCAS	48	55	63	72	81	86	---	---	---	---	---	---

Figure 5-1. Airspeed Calibration (Sheet 1 of 2)

AIRSPEED CALIBRATION

ALTERNATE STATIC SOURCE

HEATER/VENTS AND WINDOWS CLOSED

FLAPS UP												
NORMAL KIAS	50	60	70	80	90	100	110	120	130	140	150	160
ALTERNATE KIAS	43	57	69	79	90	100	109	119	128	137	147	156
FLAPS 10°												
NORMAL KIAS	40	50	60	70	80	90	100	110	---	---	---	---
ALTERNATE KIAS	32	43	56	68	78	89	98	108	---	---	---	---
FLAPS 40°												
NORMAL KIAS	40	50	60	70	80	85	---	---	---	---	---	---
ALTERNATE KIAS	31	42	54	64	75	81	---	---	---	---	---	---

HEATER/VENTS OPEN AND WINDOWS CLOSED

FLAPS UP												
NORMAL KIAS	50	60	70	80	90	100	110	120	130	140	150	160
ALTERNATE KIAS	42	56	67	77	87	96	106	115	125	134	144	153
FLAPS 10°												
NORMAL KIAS	40	50	60	70	80	90	100	110	---	---	---	---
ALTERNATE KIAS	30	41	55	66	76	85	95	105	---	---	---	---
FLAPS 40°												
NORMAL KIAS	40	50	60	70	80	85	---	---	---	---	---	---
ALTERNATE KIAS	25	37	49	61	72	76	---	---	---	---	---	---

Figure 5-1. Airspeed Calibration (Sheet 2 of 2)

TEMPERATURE CONVERSION CHART

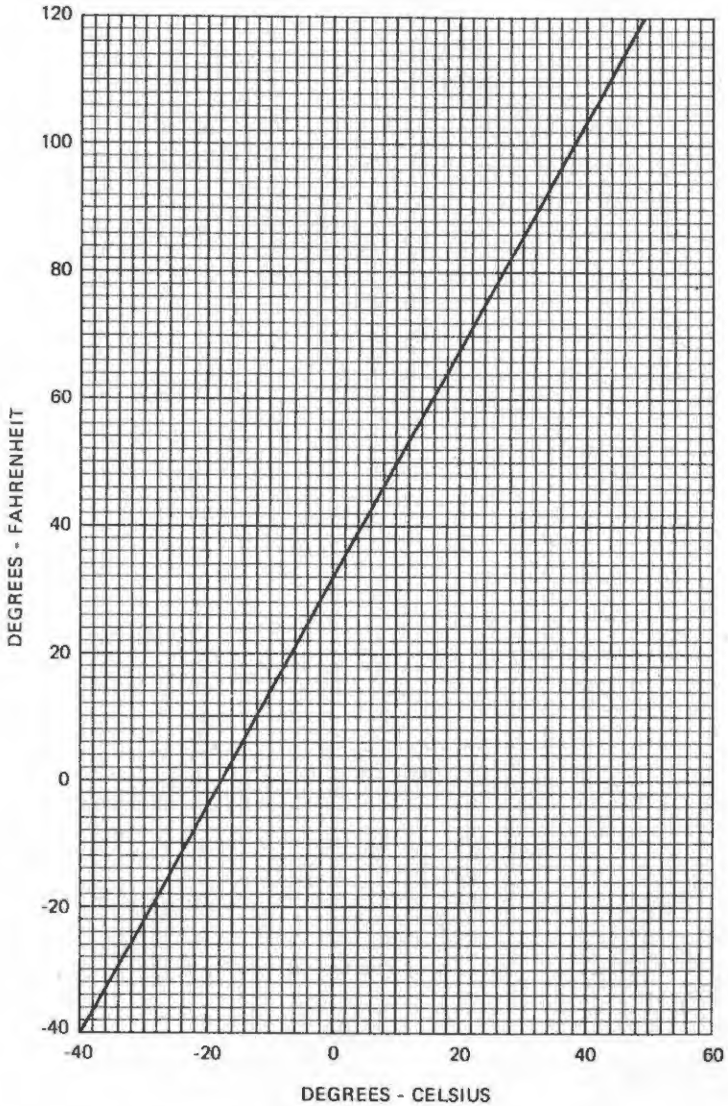


Figure 5-2. Temperature Conversion Chart

STALL SPEEDS

CONDITIONS:
Power Off

NOTES:
1. Maximum altitude loss during a stall recovery may be as much as 160 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
2550	UP	45	53	48	57	54	63	64	75
	10°	42	50	45	54	50	59	59	71
	40°	36	46	39	49	43	55	51	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
2550	UP	49	56	53	60	58	67	69	79
	10°	43	51	46	55	51	61	61	72
	40°	38	48	41	52	45	57	54	68

Figure 5-3. Stall Speeds

TAKEOFF DISTANCE
MAXIMUM WEIGHT 2550 LBS
SHORT FIELD

CONDITIONS:
Flaps 10°
2600 RPM, Full Throttle and Mixture Set at
Placard Fuel Flow Prior to Brake Release
Cowl Flap Open
Paved, Level, Dry Runway
Zero Wind

MIXTURE SETTING	
PRESS ALT	GPH
S.L.	16
2000	15
4000	14
6000	13
8000	12

NOTES:
1. Short field technique as specified in Section 4.
2. Decrease distances 10% for each 9 knots headwind. For operation with tail winds up to 10 knots, increase distances by 10% for each 2 knots.
3. 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 FT		GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS
2550	54	58	S.L.	715	1225	770	1315	830	1410	895	1510	960	1625
			1000	780	1335	840	1435	905	1540	975	1655	1050	1780
			2000	855	1460	920	1570	995	1690	1070	1820	1150	1960
			3000	935	1600	1010	1725	1090	1860	1175	2005	1265	2165
			4000	1025	1760	1110	1900	1195	2055	1290	2220	1390	2405
			5000	1125	1945	1220	2105	1315	2280	1420	2470	1530	2685
			6000	1240	2155	1340	2340	1450	2540	1565	2765	1690	3015
			7000	1365	2405	1480	2615	1600	2850	1730	3115	1870	3415
			8000	1510	2695	1635	2945	1770	3225	1915	3545	2075	3920

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

TAKEOFF DISTANCE
2400 LBS AND 2200 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 FT		GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS
2400	52	56	S.L.	620	1070	670	1145	720	1225	775	1315	835	1410
			1000	680	1165	730	1250	790	1340	845	1435	910	1540
			2000	740	1270	800	1365	860	1465	925	1575	995	1690
			3000	810	1390	875	1495	945	1605	1015	1730	1095	1860
			4000	890	1520	960	1640	1035	1765	1115	1905	1200	2055
			5000	975	1675	1055	1805	1135	1950	1225	2110	1320	2280
			6000	1070	1850	1160	2000	1250	2165	1350	2345	1455	2540
			7000	1180	2050	1275	2220	1380	2410	1490	2620	1610	2850
			8000	1305	2280	1410	2480	1525	2700	1650	2950	1780	3225
2200	50	54	S.L.	510	880	550	940	590	1005	635	1075	680	1150
			1000	555	955	600	1025	645	1095	690	1175	740	1255
			2000	605	1040	655	1115	705	1195	755	1280	810	1370
			3000	660	1135	715	1215	770	1305	825	1400	890	1500
			4000	725	1240	780	1330	840	1430	905	1535	975	1650
			5000	795	1355	855	1460	925	1570	995	1690	1070	1820
			6000	870	1490	940	1605	1015	1730	1095	1865	1175	2010
			7000	955	1645	1035	1770	1115	1915	1205	2065	1295	2235
			8000	1055	1815	1140	1965	1230	2125	1330	2300	1430	2495

Figure 5-4. Takeoff Distance (Sheet 2 of 2)

MAXIMUM RATE OF CLIMB

CONDITIONS:
Flaps Up
2600 RPM
Full Throttle
Mixture Set at Placard Fuel Flow
Cowl Flap Open

MIXTURE SETTING	
PRESS ALT	GPH
S.L.	16
4000	14
8000	12
12,000	10

WEIGHT LBS	PRESS ALT FT	CLIMB SPEED KIAS	RATE OF CLIMB - FPM			
			-20°C	0°C	20°C	40°C
2550	S.L.	78	1040	945	845	750
	2000	77	925	830	740	650
	4000	76	810	720	635	545
	6000	75	695	615	530	445
	8000	74	585	505	425	345
	10,000	73	480	400	320	---
	12,000	72	370	295	220	---

Figure 5-5. Maximum Rate of Climb

TIME, FUEL, AND DISTANCE TO CLIMB

MAXIMUM RATE OF CLIMB

See placard

CONDITIONS:
Flaps Up
2600 RPM
Full Throttle
Mixture Set at Placard Fuel Flow
Cowl Flap Open
Standard Temperature

MIXTURE SETTING	
PRESS ALT	GPH
S.L.	16
4000	14
8000	12
12,000	10

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

WEIGHT LBS	PRESSURE ALTITUDE FT	TEMP °C	CLIMB SPEED KIAS	RATE OF CLIMB FPM	FROM SEA LEVEL		
					TIME MIN	FUEL USED GALLONS	DISTANCE NM
2550	S.L.	15	78	870	0	0	0
	1000	13	78	825	1	0.3	2
	2000	11	77	780	2	0.6	3
	3000	9	77	735	4	1.0	5
	4000	7	76	690	5	1.3	7
	5000	5	76	645	7	1.6	9
	6000	3	75	600	8	2.0	11
	7000	1	75	555	10	2.4	14
	8000	-1	74	510	12	2.7	16
	9000	-3	74	465	14	3.2	19
	10,000	-5	73	420	16	3.6	23
	11,000	-7	73	375	19	4.0	26
	12,000	-9	72	330	22	4.5	31

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

TIME, FUEL, AND DISTANCE TO CLIMB

NORMAL CLIMB - 90 KIAS

See placard

MIXTURE SETTING	
PRESS ALT	GPH
S.L.	16
4000	14
8000	12

CONDITIONS:
Flaps Up
2600 RPM
Full Throttle
Mixture Set at Placard Fuel Flow
Cowl Flap Open
Standard Temperature

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

WEIGHT LBS	PRESSURE ALTITUDE FT	TEMP °C	RATE OF CLIMB FPM	FROM SEA LEVEL		
				TIME MIN	FUEL USED GALLONS	DISTANCE NM
2550	S.L.	15	845	0	0	0
	1000	13	790	1	0.3	2
	2000	11	740	3	0.7	4
	3000	9	685	4	1.0	6
	4000	7	630	6	1.4	8
	5000	5	575	7	1.8	11
	6000	3	525	9	2.2	14
	7000	1	470	11	2.6	18
	8000	-1	415	13	3.1	21

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

CRUISE PERFORMANCE

PRESSURE ALTITUDE 2000 FEET

CONDITIONS:
2550 Pounds
Recommended Lean Mixture
Cowl Flap Closed

NOTE

For best fuel economy at 70% power or less, operate at 1 GPH leaner than shown in this chart or at peak EGT if an EGT indicator is installed.

		20°C BELOW STANDARD TEMP -9°C			STANDARD TEMPERATURE 11°C			20°C ABOVE STANDARD TEMP 31°C		
RPM	MP	% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2600	24	---	---	---	81	126	11.4	78	127	11.0
	23	78	122	11.1	76	122	10.7	73	123	10.3
	22	73	118	10.3	71	119	10.0	68	119	9.6
	21	68	114	9.6	65	114	9.3	63	114	9.0
2500	25	---	---	---	81	126	11.5	79	127	11.1
	24	80	122	11.2	77	123	10.8	74	124	10.5
	23	75	119	10.6	72	120	10.2	70	120	9.9
	22	70	116	9.9	67	116	9.5	65	116	9.2
2400	25	79	122	11.2	76	123	10.8	74	123	10.4
	24	74	119	10.5	72	120	10.2	69	120	9.8
	23	70	116	9.9	67	116	9.5	65	116	9.2
	22	65	112	9.2	63	112	8.9	61	112	8.6
2300	25	74	119	10.5	72	119	10.1	69	120	9.8
	24	70	116	9.9	67	116	9.5	65	116	9.2
	23	65	112	9.2	63	112	8.9	61	112	8.7
	22	61	108	8.6	59	108	8.4	57	107	8.1
2200	25	69	115	9.8	67	115	9.4	64	115	9.1
	24	65	112	9.2	63	112	8.9	61	111	8.6
	23	61	108	8.6	59	108	8.3	57	107	8.1
	22	57	104	8.1	55	103	7.8	53	102	7.6
	21	52	99	7.6	51	98	7.3	49	97	7.1
	20	48	94	7.0	47	93	6.8	45	91	6.6
	19	44	88	6.5	43	87	6.3	41	86	6.2

Figure 5-7. Cruise Performance (Sheet 1 of 6)

CRUISE PERFORMANCE

PRESSURE ALTITUDE 4000 FEET

CONDITIONS:
2550 Pounds
Recommended Lean Mixture
Cowl Flap Closed

NOTE

For best fuel economy at 70% power or less, operate at 1 GPH leaner than shown in this chart or at peak EGT if an EGT indicator is installed.

		20°C BELOW STANDARD TEMP -13°C			STANDARD TEMPERATURE 7°C			20°C ABOVE STANDARD TEMP 27°C		
RPM	MP	% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2600	23	81	126	11.5	79	127	11.1	76	127	10.7
	22	76	122	10.8	73	123	10.4	71	123	10.0
	21	71	119	10.0	68	119	9.7	66	119	9.3
	20	66	114	9.3	63	114	9.0	61	113	8.7
2500	24	82	126	11.6	79	127	11.2	77	128	10.8
	23	77	123	11.0	75	124	10.6	72	124	10.2
	22	73	120	10.3	70	120	9.9	68	120	9.6
	21	68	116	9.6	65	116	9.3	63	116	9.0
2400	24	77	123	10.9	74	124	10.5	72	124	10.2
	23	72	120	10.2	70	120	9.9	68	120	9.5
	22	68	116	9.6	65	116	9.2	63	116	9.0
	21	63	112	8.9	61	111	8.6	59	110	8.4
2300	24	72	120	10.2	70	120	9.9	67	120	9.5
	23	68	116	9.6	65	116	9.3	63	116	9.0
	22	63	112	9.0	61	112	8.7	59	111	8.4
	21	59	108	8.4	57	107	8.1	55	106	7.9
2200	24	68	116	9.6	65	116	9.2	63	115	8.9
	23	63	112	9.0	61	112	8.7	59	111	8.4
	22	59	108	8.4	57	107	8.1	55	106	7.9
	21	55	103	7.9	53	102	7.6	51	101	7.4
	20	51	98	7.3	49	97	7.1	47	95	6.9
	19	46	92	6.8	45	91	6.6	43	89	6.4

Figure 5-7. Cruise Performance (Sheet 2 of 6)

CRUISE PERFORMANCE

PRESSURE ALTITUDE 6000 FEET

CONDITIONS:
2550 Pounds
Recommended Lean Mixture
Cowl Flap Closed

NOTE

For best fuel economy at 70% power or less, operate at 1 GPH leaner than shown in this chart or at peak EGT if an EGT indicator is installed.

		20°C BELOW STANDARD TEMP -17°C			STANDARD TEMPERATURE 3°C			20°C ABOVE STANDARD TEMP 23°C		
RPM	MP	% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2600	23	---	---	---	81	131	11.5	79	131	11.1
	22	79	126	11.2	76	127	10.8	74	127	10.4
	21	74	123	10.5	71	123	10.1	69	123	9.7
	20	69	119	9.7	66	118	9.3	64	118	9.1
2500	23	80	127	11.3	77	128	10.9	75	128	10.6
	22	76	124	10.7	73	124	10.3	70	124	9.9
	21	71	120	10.0	68	120	9.6	66	120	9.3
	20	66	116	9.3	63	116	9.0	61	115	8.7
2400	23	75	124	10.6	72	124	10.2	70	124	9.9
	22	70	120	9.9	68	120	9.6	65	120	9.3
	21	65	116	9.3	63	115	9.0	61	114	8.7
	20	61	111	8.6	59	110	8.4	57	109	8.1
2300	23	71	120	10.0	68	120	9.6	66	120	9.3
	22	66	116	9.3	64	116	9.0	61	115	8.7
	21	61	112	8.7	59	111	8.4	57	110	8.2
	20	57	107	8.1	55	105	7.9	53	105	7.6
2200	23	66	116	9.3	63	116	9.0	61	115	8.7
	22	62	112	8.7	59	111	8.4	57	110	8.2
	21	57	107	8.2	55	106	7.9	53	105	7.7
	20	53	102	7.6	51	101	7.4	49	99	7.2
	19	49	96	7.1	47	95	6.8	45	93	6.7
	18	44	90	6.6	43	89	6.4	41	87	6.2

Figure 5-7. Cruise Performance (Sheet 3 of 6)

CRUISE PERFORMANCE

PRESSURE ALTITUDE 8000 FEET

CONDITIONS:
2550 Pounds
Recommended Lean Mixture
Cowl Flap Closed

NOTE

For best fuel economy at 70% power or less, operate at 1 GPH leaner than shown in this chart or at peak EGT if an EGT indicator is installed.

		20°C BELOW STANDARD TEMP -21°C			STANDARD TEMPERATURE -1°C			20°C ABOVE STANDARD TEMP 19°C		
RPM	MP	% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2600	21	77	127	10.9	74	128	10.5	72	127	10.1
	20	72	123	10.1	69	123	9.8	67	122	9.4
	19	66	118	9.4	64	118	9.0	62	116	8.8
	18	61	113	8.6	59	111	8.3	57	110	8.1
2500	21	74	125	10.4	71	125	10.0	69	124	9.7
	20	69	120	9.7	66	120	9.4	64	119	9.1
	19	64	116	9.0	61	115	8.7	59	113	8.4
	18	59	110	8.4	56	109	8.1	54	108	7.8
2400	21	68	120	9.6	65	119	9.3	63	118	9.0
	20	63	115	9.0	61	114	8.6	59	113	8.4
	19	58	110	8.3	56	108	8.0	54	107	7.8
	18	54	104	7.7	52	103	7.5	50	101	7.2
2300	21	64	116	9.1	62	115	8.7	59	114	8.5
	20	59	111	8.5	57	109	8.2	55	109	7.9
	19	55	105	7.9	53	104	7.6	51	103	7.4
	18	50	100	7.3	48	98	7.0	47	96	6.8
2200	21	60	111	8.5	57	110	8.2	55	109	7.9
	20	55	106	7.9	53	105	7.7	51	103	7.4
	19	51	100	7.4	49	99	7.1	47	97	6.9
	18	47	94	6.8	45	93	6.6	43	91	6.4

Figure 5-7. Cruise Performance (Sheet 4 of 6)

CRUISE PERFORMANCE

PRESSURE ALTITUDE 10,000 FEET

CONDITIONS:
2550 Pounds
Recommended Lean Mixture
Cowl Flap Closed

NOTE

For best fuel economy at 70% power or less, operate at 1 GPH leaner than shown in this chart or at peak EGT if an EGT indicator is installed.

		20°C BELOW STANDARD TEMP -25°C			STANDARD TEMPERATURE -5°C			20°C ABOVE STANDARD TEMP 15°C		
RPM	MP	% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2600	19	69	123	9.8	67	122	9.4	64	121	9.1
	18	64	117	9.0	61	116	8.7	59	115	8.4
	17	58	110	8.3	56	109	8.0	54	108	7.8
	16	53	104	7.6	51	102	7.3	49	100	7.1
2500	19	67	120	9.4	64	119	9.1	62	118	8.8
	18	62	115	8.7	59	113	8.4	57	112	8.2
	17	56	108	8.0	54	107	7.8	52	105	7.5
	16	50	101	7.3	49	99	7.1	47	97	6.8
2400	19	61	114	8.6	59	112	8.3	56	111	8.1
	18	56	108	8.0	54	107	7.8	52	105	7.5
	17	51	102	7.4	49	100	7.2	48	99	7.0
	16	47	95	6.8	45	94	6.6	43	91	6.4
2300	19	57	109	8.2	55	108	7.9	53	107	7.7
	18	53	104	7.6	51	102	7.3	49	100	7.1
	17	48	97	7.0	46	95	6.8	45	94	6.6
2200	19	53	104	7.7	51	103	7.4	49	101	7.2
	18	49	98	7.1	47	97	6.9	45	95	6.7
	17	45	92	6.6	43	90	6.4	42	88	6.2

Figure 5-7. Cruise Performance (Sheet 5 of 6)

CRUISE PERFORMANCE

PRESSURE ALTITUDE 12,000 FEET

CONDITIONS:
2550 Pounds
Recommended Lean Mixture
Cowl Flap Closed

NOTE

For best fuel economy at 70% power or less, operate at 1 GPH leaner than shown in this chart or at peak EGT if an EGT indicator is installed.

		20°C BELOW STANDARD TEMP -29°C			STANDARD TEMPERATURE -9°C			20°C ABOVE STANDARD TEMP 11°C		
RPM	MP	% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2600	18	67	122	9.4	64	121	9.1	62	120	8.8
	17	61	115	8.7	59	114	8.4	57	113	8.1
	16	55	108	7.9	53	107	7.7	51	105	7.4
	15	50	100	7.2	48	99	7.0	46	97	6.7
2500	18	64	119	9.1	62	118	8.8	60	117	8.5
	17	59	112	8.4	57	112	8.1	55	110	7.8
	16	53	106	7.7	51	104	7.4	49	102	7.2
	15	47	97	6.9	45	95	6.7	44	93	6.5
2400	18	58	112	8.3	56	111	8.0	54	109	7.8
	17	54	106	7.7	52	104	7.5	50	103	7.2
	16	49	100	7.1	47	98	6.9	46	96	6.7
	15	44	93	6.6	43	90	6.4	41	88	6.2
2300	18	55	108	7.9	53	106	7.6	51	104	7.4
	17	50	101	7.3	48	100	7.1	47	98	6.8
	16	46	95	6.7	44	93	6.5	43	90	6.3
2200	18	51	103	7.4	49	101	7.1	47	99	6.9
	17	47	96	6.8	45	94	6.6	44	92	6.4

Figure 5-7. Cruise Performance (Sheet 6 of 6)

RANGE PROFILE

45 MINUTES RESERVE
49 GALLONS USABLE FUEL

CONDITIONS:
2550 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature
Zero Wind

NOTE:
This chart allows for the fuel used for engine start, taxi, takeoff and climb, and the distance during a normal climb up to 8,000 feet and maximum climb above 8,000 feet.

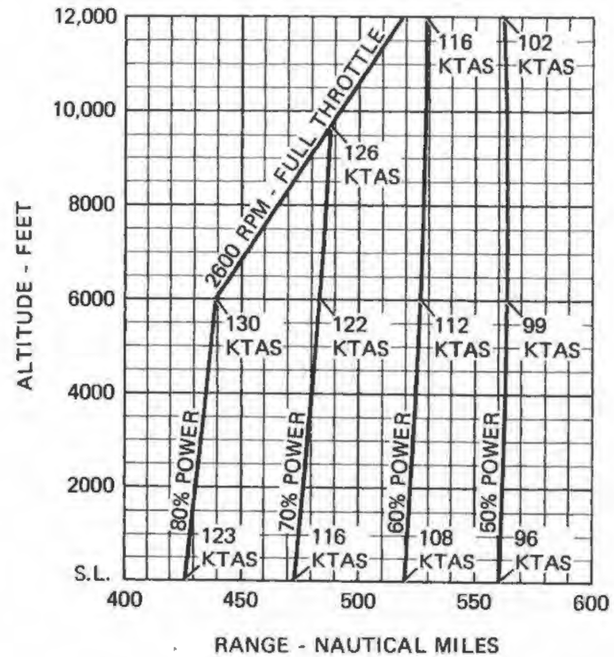


Figure 5-8. Range Profile (Sheet 1 of 2)

RANGE PROFILE
45 MINUTES RESERVE
66 GALLONS USABLE FUEL

CONDITIONS:
2550 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature
Zero Wind

NOTE:
This chart allows for the fuel used for engine start, taxi, takeoff and climb, and the distance during a normal climb up to 8,000 feet and maximum climb above 8,000 feet.

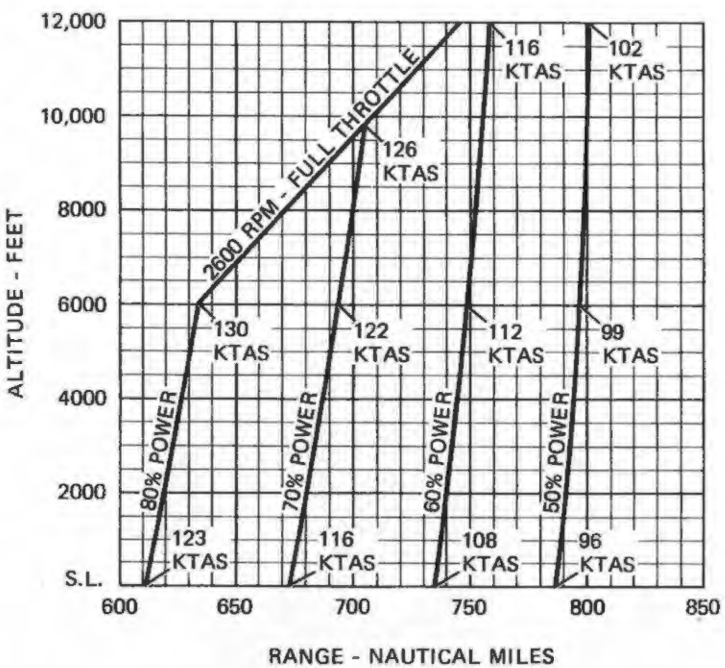


Figure 5-8. Range Profile (Sheet 2 of 2)

ENDURANCE PROFILE
45 MINUTES RESERVE
49 GALLONS USABLE FUEL

CONDITIONS:
2550 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature

NOTE:
This chart allows for the fuel used for engine start, taxi, takeoff and climb, and the time during a normal climb up to 8,000 feet and maximum climb above 8,000 feet.

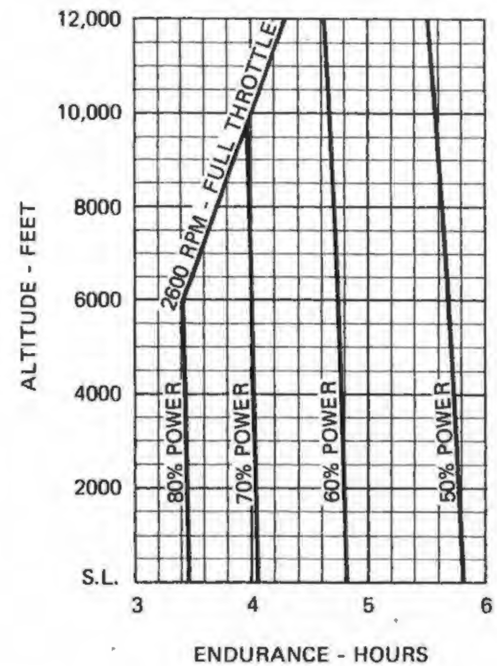
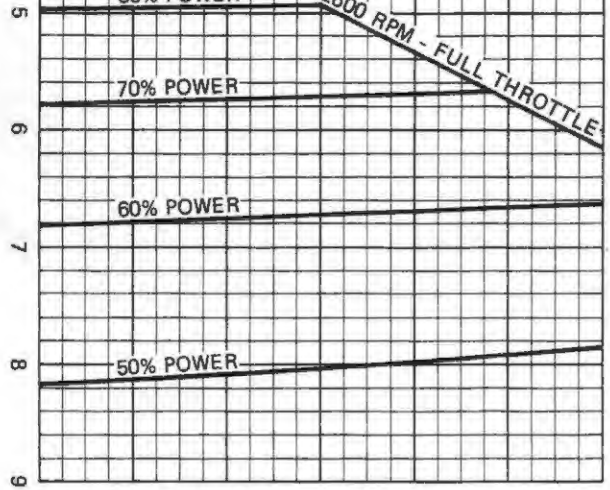


Figure 5-9. Endurance Profile (Sheet 1 of 2)

...DURANCE PROFILE
...5 MINUTES RESERVE
...GALLONS USABLE FUEL

...Cruise

...d for engine start, taxi, takeoff and climb, and the time ...0 feet and maximum climb above 8,000 feet.



Endurance Profile (Sheet 2 of 2)

LANDING DISTANCE

SHORT FIELD

CONDITIONS:
Flaps 40°
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 headwind. For operation with tailwinds up to 10 knots, increase distances by 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	
			GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS
2550	60	S.L.	590	1225	610	1255	630	1285	650	1315	675	1350
		1000	610	1255	630	1285	655	1320	675	1350	700	1390
		2000	630	1285	655	1320	680	1360	700	1390	725	1425
		3000	655	1320	680	1360	705	1395	730	1430	750	1465

SECTION 6
WEIGHT & BALANCE/
EQUIPMENT LIST

TABLE OF CONTENTS

LOAD DATA SHEET - PAGE 1 OF 3 - AEROPLANE WEIGHT

Aeroplane Type:............... CESSNA R172K

Registration Marking:........ **VH-YPM** Serial No: R1723306

ISSUE:.... ONE	DATE:..... 20-Sep-12	EXPIRY:..... INDEFINITE

AEROPLANE WEIGHT AND CENTRE OF GRAVITY DATA:

ITEM	WEIGHT (Kg)	ARM (mm aft of datum)	INDEX UNIT (Kg.mm)	CABIN CONFIGURATION
EMPTY	**804.4**	**953**	**766709**	FOUR SEATS TOTAL
STANDARD CABIN CONFIGURATION STC SA1437CE ISHAM 210 HP ENGINE STC SA2078CH HARTZELL HC-C3YF PROP STC SA1614WE FLINT AUX FUEL TANKS				
THE FOLLOWING IMPERIAL UNITS ARE FOR USE WITH THE PILOTS HANDBOOK & SUPPLEMENTS				
	(lb)	(in)	(in.lb/1000)	
EMPTY	**1773.4**	**37.5**	**66.55**	FOUR SEATS TOTAL

NOTE: The above empty weights include:-

EMPTY - unusable fuel and full oil

NORTH WEST AVIATION PTY LTD
PAUL MITREGA
AUTHORITY NUMBER A109514
PHONE (02) 6723 1236 AH (02) 6723 1407
MOBILE 0429 231 236

LOAD DATA SHEET - PAGE 2 OF 3 - EQUIPMENT LIST

This list details the items included in the empty weight shown in Page 1.

Aeroplane Type:................CESSNA R172K
Registration Marking:........ **VH-YPM** Serial No: R1723306

ISSUE:.... ONE	DATE:..... 20.09.12

ENGINES/PROPELLERS
Continental IO-360-K........ 1
Hartzell HC-C3YF-1RF..... 1

COMPASSES
Magnetic........................... 1
Remote Indicating............ KCS55A

THERMOMETERS
Engine Temp(Cyl.Hd.)...... 1
Oil Temp........................... 1
Outside Air Temp............. 1
Outside Air Temp............. Davtron

INDICATORS
Airspeed........................... 1
Directional Gyro (H.S.I.).... 1
E.G.T................................ 1
Flight Hour........................ 1
Fuel Flow Computer.......... FS450
Gyro Horizon..................... 2
Stall Warning..................... 1
Tacho Non-recording........ Horizon
Trim Indicator.................... 2
Turn Co-ordinator............. 1
Vertical Speed................... 1
Wing Flap Position............ 1
Assigned Altitude.............. 1

RADIO EQUIPMENT (TYPE)

ADF............	ARC R546E
Autopilot.......	STEC 60
Speakers.....	1
G/slope........	ARC R443B
Headsets.....	1
HF Com.......	0
Nav/Com......	ARC RT385A
Audio...........	CESSNA 300
Marker.........	0
Txponder.....	ARC RT359A
Encoder.......	TRANSCAL D120-P2T
GPS............	ARNAV FMS5000
Marker.........	ARC R402A
Intercom.......	SIGTRONICS SPA400

INSTRUMENTS
Altimeters.......................... 2
Ammeters........................... 1
Voltmeters......................... Davtron
Clocks............................... 1

GAUGES
Engine Oil Pressure.......... 1
Fuel Contents.................... 2
Fuel Contents (Aux).......... Dual
Suction Pressure.............. 1

LIGHTS
Anti-collision...................... 1
Inst. Full Panel Flood........ 0
Inst. Flood/Spot................ 0
Landing/Taxi..................... 2
Map Reading..................... 1
Navigation......................... 3
White Strobes (tips).......... 2
Cockpit.............................. 1
Wing Courtesy................... 2

RESTRAINT EQUIPMENT
Rear Bagg Straps............. 0
Inertia Reels...................... 0
Lap-sash Harnesses......... 2
Lap Belts........................... 2

MISCELLANEOUS EQUIPMENT
Dual Controls.................... 1
Fire Ext.(Portable)............ 0
Cabin Heater (Muff).......... 1
Vacuum Pumps................. 1
Heated Pitots.................... 1
Alternate Static................. 1
Electric Trim...................... 0
Wheel Fairings.................. 0
Standby Vacuum .... Precise
Air/Oil Separator............... Airwolf
Sun Visors......................... Rosen

DISPOSABLE LOAD LIST
Torch................................. 0
V.S.Beacon/E.L.T............. 0

NORTH WEST AVIATION PTY LTD
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AUTHORITY NUMBER A109514

LOAD DATA SHEET - PAGE 3 OF 3 - LOADING SYSTEM

Aeroplane Type:............... CESSNA R172K

Registration Marking:........ **VH-YPM** Serial No: R1723306

ISSUE:.... ONE	DATE:..... 20.09.12

The following is valid only for the Empty Weight specified in Page 1 of 3 Aeroplane Weight dated.. 20.09.12 and is based on calculations using Occupant Weights of 60 to 90 Kg each.

NORMAL CATEGORY OPERATIONS:-

1. OCCUPANTS:-

Load Front to Rear (i.e. Front seats first)
Load Heaviest Passengers in front row

2. BAGGAGE COMPARTMENT LIMITATIONS:-

Number of Occupants	Rear Baggage **Minimum**	Rear Baggage **Maximum**
One(pilot)	5 Kg	90 Kg
Two	40 Kg	90 Kg
Three	15 Kg	90 Kg
Four	0	90 Kg

3. FUEL:-

Fuel is limited only by All Up Weight

MAXIMUM TAKE-OFF WEIGHT......1156 Kg (1156.7)

NOTE: If a full Loading Check is required, refer to Instructions and Tables in the Pilots Handbook & Supplements

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INTRODUCTION

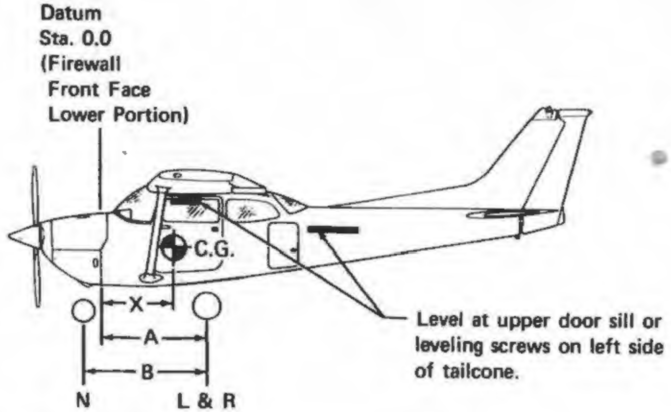
This section describes the procedure for establishing the basic empty weight and moment of the airplane. Sample forms are provided for reference. Procedures for calculating the weight and moment for various operations are also provided. A comprehensive list of all Cessna equipment available for this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

It is the responsibility of the pilot to ensure that the airplane is loaded properly.

AIRPLANE WEIGHING PROCEDURES

1. Preparation:
   a. Inflate tires to recommended operating pressures.
   b. Remove the fuel tank sump quick-drain fittings and fuel selector valve drain plug 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, 1000 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 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 the measurements.
5. Using weights from item 3 and measurements from item 4, the airplane weight and C.G. can be determined.
6. Basic Empty Weight may 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	

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

Item	Weight (Lbs.)	X C.G. Arm (In.) =	Moment/1000 (Lbs.-In.)
Airplane Weight (From Item 5, page 6-3)			
Add: Oil (9 Qts at 7.5 Lbs/Gal)	17	-21.5	-0.4
Add Unusable Fuel:			
Std. Tanks (3 Gal at 6 Lbs/Gal)		46.0	
Long Range Tanks (2 Gal at 6 Lbs/Gal)		45.0	
Equipment Changes			
Airplane Basic Empty Weight			

Figure 6-1. Sample Airplane Weighing

SAMPLE WEIGHT AND BALANCE RECORD

(Continuous History of Changes in Structure or Equipment Affecting Weight and Balance)

AIRPLANE MODEL				SERIAL NUMBER						PAGE NUMBER	
DATE	ITEM NO.		DESCRIPTION OF ARTICLE OR MODIFICATION	WEIGHT CHANGE						RUNNING BASIC EMPTY WEIGHT	
				ADDED (+)			REMOVED (-)				
	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 appropriate weight and balance records carried in your airplane, and enter them in the column titled 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, and baggage is based on seats positioned for average occupants and baggage loaded in the center of the baggage 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 indicate their forward and aft C.G. range limitations (seat travel and baggage area limitation). Additional moment calculations, based on the actual weight and C.G. arm (fuselage station) of the item being loaded, must be made if the position of the load is different from that shown on the Loading Graph.

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.

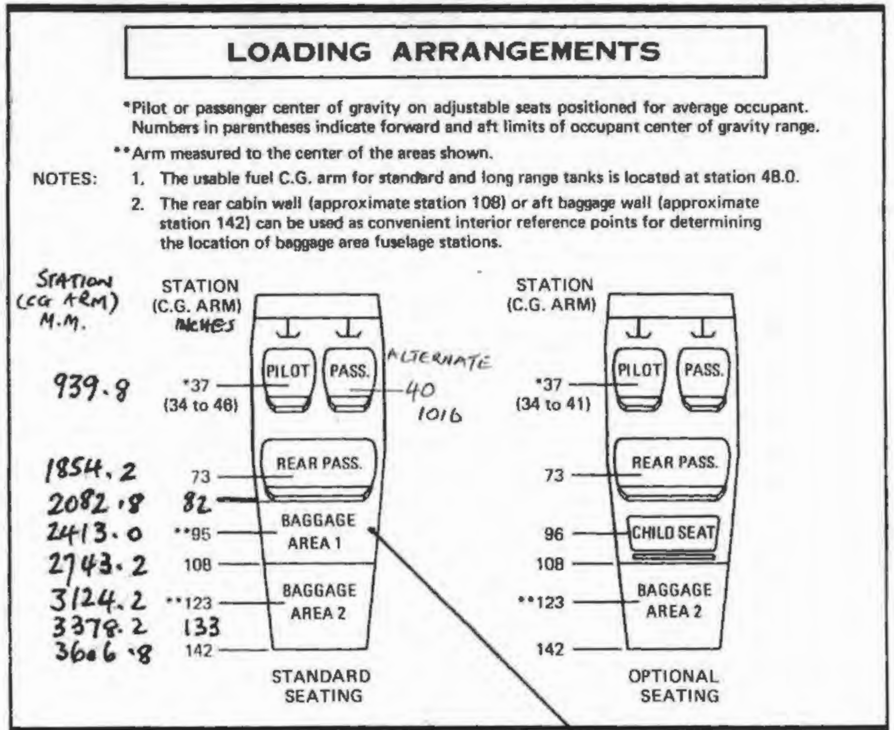
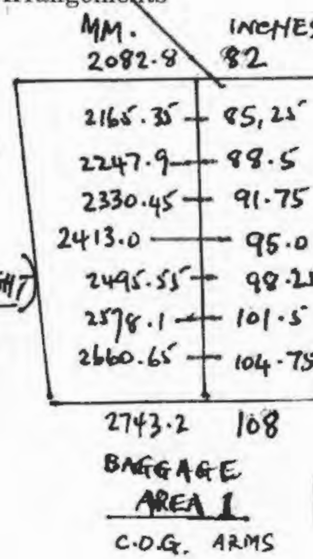


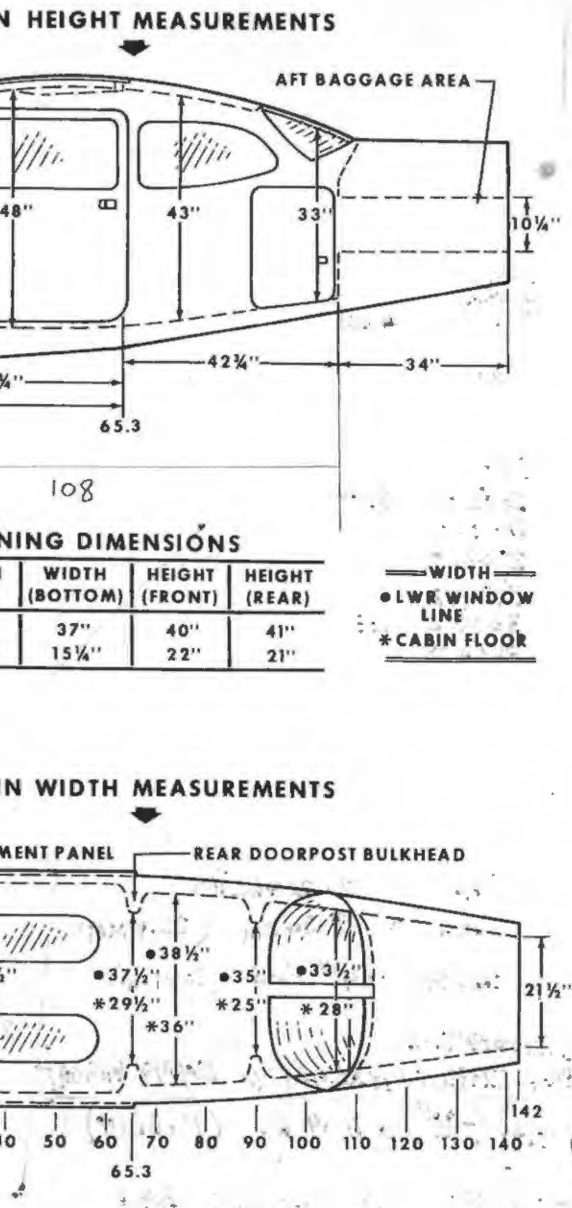
Figure 6-3. Loading Arrangements

1 kg = 2.20462 lbs
1 INCH => 2.54 cm (25.4 MM)
Prop Stn -41" Fwd (1041.4)

* DIFFERENTIAL PROP EFFECT (ALREADY IN EMPTY WEIGHT)
(1041.4) (-41") @ 10.91 kg (11,3617)

* NET EFFECT TO CHANGE BACK TO 2 BLADED PROP.

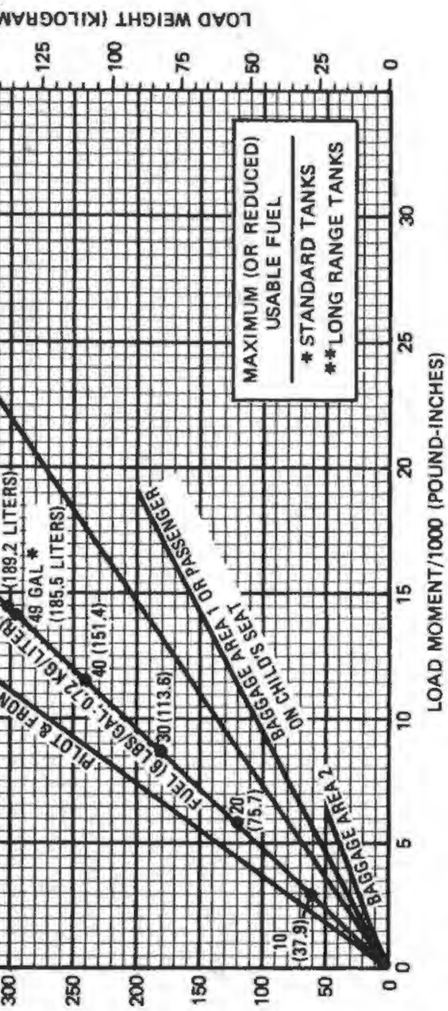




4. Internal Cabin Dimensions

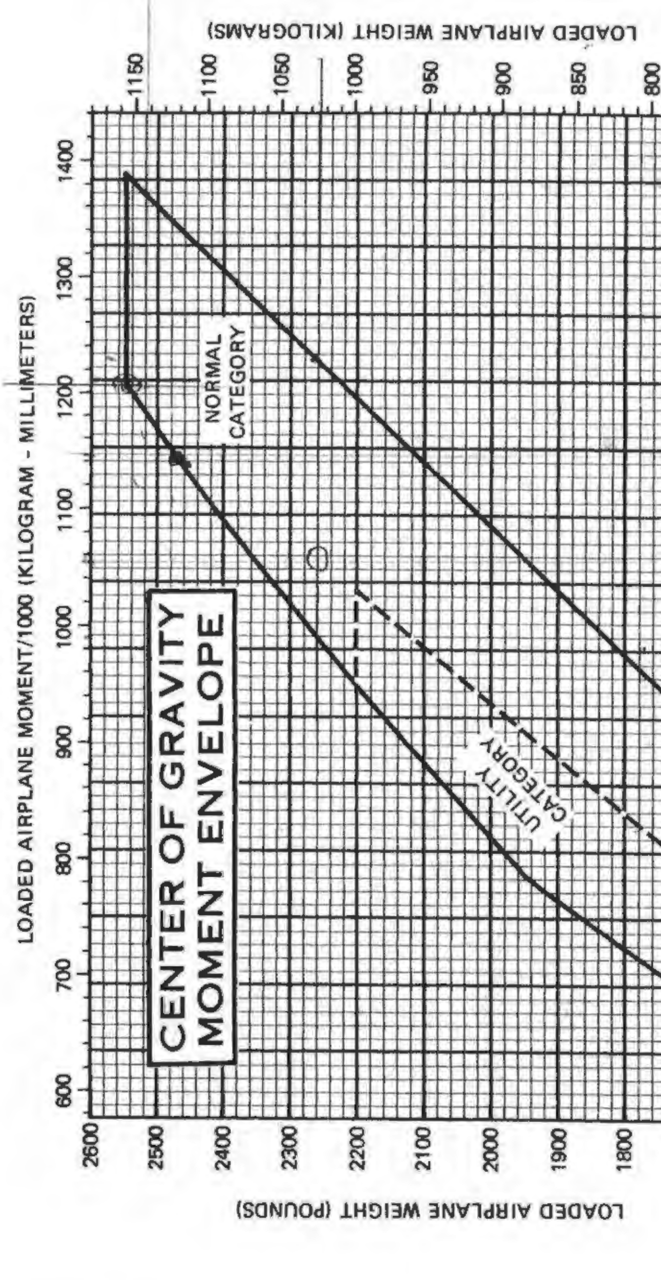
SAMPLE LOADING PROBLEM

SAMPLE LOADING PROBLEM	SAMPLE AIRPLANE Weight (lbs.)	SAMPLE AIRPLANE Moment (lb. - ins. /1000)	YOUR AIRPLANE Weight (lbs.)	YOUR AIRPLANE Moment (lb. - ins. /1000)
1. Basic Empty Weight (Use the data pertaining to your airplane as it is presently equipped. Includes unusable fuel and full oil)	1592	56.7	2804	
2. Usable Fuel (At 6 Lbs./Gal.) Standard Tanks (49 Gal. Maximum)	294	14.1	164	
Long Range Tanks (66 Gal. Maximum)			74	
Reduced Fuel (50 Gal.)				
3. Pilot and Front Passenger (Station 34 to 46)	340	12.6	91	
4. Rear Passengers	170	12.4		
5. * Baggage Area 1 or Passenger on Child's Seat (Baggage, Station 82 to 108 - 200 Lbs. Max.; Passenger on Child's Seat - 120 Lbs. Max.)	162	15.4		
6. * Baggage Area 2 (Station 108 to 142 - 50 Lbs. Max.)				
7. RAMP WEIGHT AND MOMENT	2558	111.2		
8. Fuel allowance for engine start, taxi, and runup	-8	-.4		
9. TAKEOFF WEIGHT AND MOMENT				



NOTE: Line representing adjustable seats shows the pilot or passenger center of gravity on adjustable seats positioned for an average occupant. Refer to the Loading Arrangements diagram for forward and aft limits of occupant C.G. range.

Figure 6-6. Loading Graph



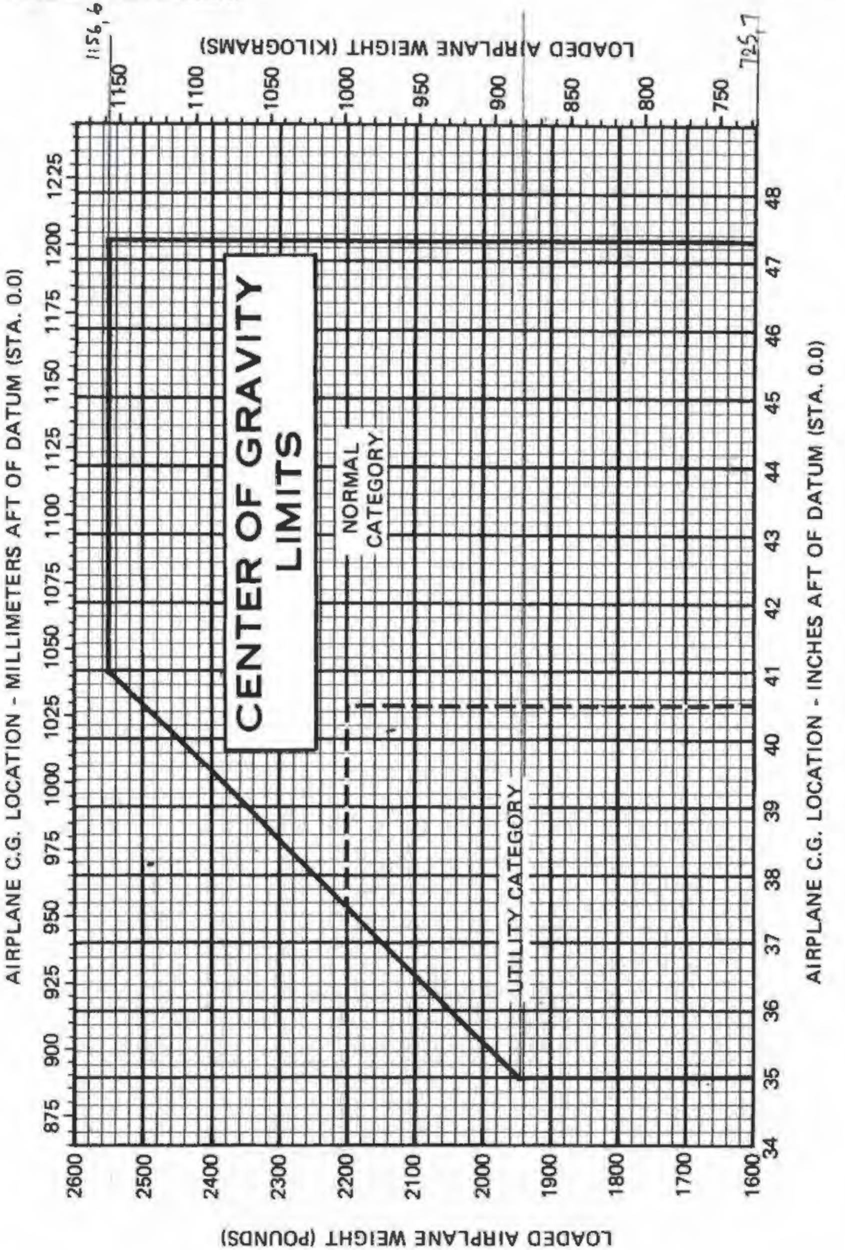


Figure 6-8. Center of Gravity Limits

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 drawing** 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 item weight and arm indicate complete assembly installations. 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
	MCCAULEY 2A34C203/90DCA-10			
A37-R	GOVERNOR, PROPELLER (MCCAULEY C290-D3/T15)	C161031-0108	3.0	-33.5
A41-S	SPINNER INSTALLATION, PROPELLER	0550337	3.4*	-41.4*
	SPINNER DOME	0550338-1	1.5	-44.2
A61-S	VACUUM SYSTEM INSTALLATION	0501054	4.3*	-2.3*
	VACUUM PUMP	C431003-0102	1.8	-3.0
	FILTER	1201075	0.2	4.7
	GAUGE	C668509-0101	0.1	16.2
	RELIEF VALVE & REGULATOR	C482001-0401	0.4	4.5
A70-R	PRIMER SYSTEM, ENGINE		0.5	-12.0
A73-O	OIL QUICK DRAIN VALVE (NET CHANGE)	1701015-3	0.0	- -
	B. LANDING GEAR & ACCESSORIES			
B01-R	WHEEL, BRAKE & TIRE ASSEMBLY, 600 X 6 MAIN (SET OF 2)	C163019-0202	42.5*	57.9*
	WHEEL ASSEMBLY (EACH)	C163006-0101	8.5	58.2
	BRAKE ASSEMBLY (LEFT)	C163032-0115	1.9	54.5
	BRAKE ASSEMBLY (RIGHT)	C163032-0116	1.9	54.5
	TIRE, 6-PLY BLACKWALL (EACH)	C262003-0204	8.7	58.2
	TUBE (EACH)	C262023-0102	2.0	58.2
B04-R	WHEEL & TIRE ASSEMBLY, NOSE	C163018-0104	8.6*	-6.8*
	WHEEL ASSEMBLY, MCCAULEY	C163005-0201	2.4	-6.8
	TIRE, 6 PLY BLACKWALL	C262003-0202	4.7	-6.8
	TUBE	C262023-0101	1.2	-6.8
B10-S	FAIRING INSTALLATION, WHEEL (SET OF THREE)	0541225-3	17.8*	47.1*
	NOSE WHEEL FAIRING		4.0	-4.9

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	MAIN WHEEL FAIRING (EACH)		5.7	60.3
	BRAKE FAIRINGS (2)		0.6	55.0
	C. ELECTRICAL SYSTEMS			
C01-R	BATTERY, 24 VOLT (STANDARD CAPACITY)	C614002-0101	23.2	115.0
C01-O	BATTERY, 24 VOLT (HEAVY DUTY)	C614002-0102	25.2	115.0
C04-R	ALTERNATOR CONTROL UNIT WITH LOW VOLTAGE SENSING	C611005-0101	0.4	3.4
C07-A	GROUND SERVICE PLUG RECEPTACLE	0501058	2.7	-2.0
C16-O	HEATED PITOT SYSTEM (NET CHANGE)	0422355-7	0.6	24.4
C22-A	LIGHTS, INSTRUMENT POST	0513094-20	0.5	17.3
C25-A	LIGHT INSTALLATION, CONTROL WHEEL MOUNTED MAP (INSTALLED WITH E89-O ONLY)	0501068	0.1	21.5
C28-S	LIGHT INSTALLATION, MAP & INSTRUMENT FLOOD--DOORPOST MOUNTED	0700149	0.3	32.0
C31-A	LIGHTS, COURTESY (SET OF TWO)	0521101	0.5	61.0
C40-A	DETECTORS, NAVIGATION LIGHT (SET OF TWO)	0701013	0.0	-
C43-A	LIGHT INSTALLATION, OMNIFLASH BEACON	0506003-5	1.4*	204.7*
	BEACON LIGHT IN FIN TIP	C621001-0102	0.4	242.5
	FLASHER POWER SUPPLY IN VERTICAL TAIL	C594502-0102	0.6	205.1
	RESISTOR - MEMCOR (7174)	0R95-6	0.2	208.3
C46-A	LIGHT INSTALLATION, WING TIP STROBE	0501027-1	3.4*	43.3*
	FLASHER POWER SUPPLY, WING TIP RIB (2)	C622008-0102	2.3	47.0
	STROBE LIGHT,WING TIP (SET OF TWO)	C622006-0107	0.2	40.8
C49-S	LIGHTS, LANDING, COWL MOUNTED - DUAL BULB	0501032	4.1	-18.6
	D. INSTRUMENTS			
D01-R	INDICATOR, AIRSPEED	C661064-0104	0.6	16.0

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
D55-R	GAGE, MANIFOLD PRESSURE & FUEL FLOW	C662037-0108	1.1	16.5
D64-S	GYRO INSTALLATION, ATTITUDE & DIRECTIONAL (NON NAV-O-MATIC)	0501054	6.3*	13.6*
	DIRECTIONAL INDICATOR	C661075-0104	2.7	14.7
	ATTITUDE INDICATOR	C661076-0101	2.5	14.3
D64-O	GYRO INSTALLATION FOR 300 NAV-O-MATIC	0501054	6.9*	13.4*
	DIRECTIONAL INDICATOR (ARC)	40760-0101	3.3	14.3
	ATTITUDE INDICATOR	C661076-0101	2.5	14.3
D67-A	RECORDER, FLIGHT HOUR	0501052	0.5	6.3
D82-S	GAGE, OUTSIDE AIR TEMP (C668507-0101)	0500221	0.1	28.6
D85-R	TACHOMETER INSTALLATION	0506005	1.0*	13.0*
	RECORDING TACH HEAD	C668020-0105	0.6	15.5
D88-S-1	TURN COORDINATOR (28 VOLT OPERATION)	C661003-0505	1.3	15.8
D88-S-2	TURN COORDINATOR (10 TO 30 VOLT)	C661003-0506	1.3	15.8
D88-O	TURN COORDINATOR (FOR AUTO-PILOT USE)	42320-0028	1.3	15.8
D91-A	INDICATOR, VERTICAL SPEED	C661080-0101	1.0	15.7
	E. CABIN ACCOMMODATIONS			
E05-R	SEAT, ADJUSTABLE FORE & AFT, PILOT	0514168	12.6	44.0
E05-O	SEAT, INFINITE ADJUSTING, PILOT	0514171	23.0	41.5
E07-S	SEAT, ADJUSTABLE FORE & AFT, CO-PILOT	0514168	12.6	44.0
E07-O	SEAT, INFINITE ADJUSTING, CO-PILOT	0514171	23.0	41.5
E09-S	SEAT, REAR (ONE PIECE BACK CUSHION)	0514169	22.0	79.5
E09-O	SEAT, REAR (TWO PIECE BACK CUSHION)	0514170	23.0	79.5
E15-R	BELT ASSEMBLY, PILOT LAP	S-2275-103	1.0	37.0
E15-S	SHOULDER HARNESS ASSEMBLY, PILOT	S-2275-201	0.6	37.0
E19-O	INERTIA REEL-SEAT BELT INSTALLATION,	0501046-1	2.0	82.0

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	PILOT & CO-PILOT (NET CHANGE)			
E23-S	BELT & SHOULDER HARNESS ASSY, CO-PILOT	S-2275-3	1.6	37.0
E27-S	SEAT BELT ASSEMBLY, REAR (SET OF TWO)	S-1746-13	2.0	70.0
E27-O	BELT & SHOULDER HARNESS ASSY, 2ND ROW (2)	S-2275-8	3.2	70.0
E33-O	CARPETING, BLACK, NET CHANGE FOR STANDARD		0.0	- -
E35-A-1	SEAT COVERING, VINYL, NET CHANGE		0.0	- -
E35-A-2	SEAT COVERING, LEATHER, NET CHANGE	CES-1151	2.0	62.0
E37-A	WINDOW, RIGHT DOOR HINGED (NET CHANGE)	0501075	2.3	47.0
E39-A	WINDOWS, OVERHEAD CABIN TOP (NET INCREASE)	0511800	0.9	47.9
E43-A	VENTILATION SYSTEM, REAR SEAT	0700322	1.7	50.9
E49-A	CUP HOLDER, RETRACTABLE (SET OF TWO)	0501023	0.1	15.5
E50-A	HEADREST, FRONT (SET OF TWO)	1215073	1.5	47.0
E51-A	HEADREST, REAR (SET OF TWO)	1215073	1.5	86.0
E55-S	SUN VISORS (SET OF 2)	0514166	0.9	32.8
E57-O	TINTED GLASS (ALL AROUND) (NET CHANGE)		0.0	- -
E65-R	BAGGAGE TIE DOWN NET	2015009-8	0.5	95.0
E71-A	RINGS, CARGO TIE DOWN	0500042	1.0	-
E85-A	CONTROLS, DUAL (CO-PILOT'S WHEEL, PEDALS AND TOE BRAKES)	0513335	4.9*	12.4*
	CONTROL WHEEL WITH PROTECTIVE PADDING		2.0	26.0
	RUDDER PEDAL (SET OF TWO)	0510402	1.1	6.8
E87-S	RUDDER TRIM SYSTEM	0513290	1.9	9.4
E88-A	CABIN AIR CIRCULATING FAN (CANNOT BE USED WITH E43-A)	0501072	10.0	100.0
E89-O	ALL PURPOSE CONTROL WHEEL, NET CHANGE	0501068	NEGL	- -
	F. PLACARDS, WARNINGS & MANUALS			
F01-R	PLACARD, OPERATIONAL LIMITATIONS VFR DAY	0505087	0.0	- -
F01-O-1	PLACARD, OPERATIONAL LIMITATIONS VFR DAY-NIGHT	0505087	0.0	- -

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	STRIPE COLOR SCHEME		0.5	88.8
G31-A	CABLES, CORROSION RESISTANT CONTROL (NET CHANGE)	0500036	0.0	-
G55-A-1	FIRE EXTINGUISHER, STD PILOT SEATING	0501011	3.0	45.5
G55-A-2	FIRE EXTINGUISHER, VTL ADJ PILOT SEAT	2401011	3.2	29.0
G58-A	STEPS AND HANDLE, REFUELING	0513415	1.7	17.8
G67-A	RUDDER PEDAL EXTENSIONS, REMOVABLE - SET OF 2 (STOWABLE - INSTALLED ARM SHOWN) (NOT FACTORY INSTALLED)	0701048	2.3	8.0
G88-A	WINTERIZATION KIT INSTALLATION, ENGINE	0501007-1	1.0*	-24.3*
	COVER PLATE, FWD COWL (INSTALLED)	0552132	0.4	-32.0
	COVER PLATE, FWD COWL (STOWED)		0.4	95.0
G92-0	EXTENDED RANGE WINGS (WET WING) NET CHANGE	0501063	-21.4	46.6
	H. AVIONICS & AUTOPILOTS			
H01-A	CESSNA 300 ADF INSTALLATION	3910159-2	8.0*	19.9*
	CONSISTS OF--			
	RECEIVER WITH BFO (R-546E-1)	41420-0001	3.3	12.1
	INDICATOR (IN-346A)	40980-1001	0.9	14.0
	SENSE ANTENNA INSTALLATION	0570400-632	0.2	108.6
	LOOP ANTENNA INSTALLATION	- -	1.4	39.3
	RECEIVER MOUNT, WIRES AND MISC ITEMS		2.2	13.7
H04-A	DME INSTALLATION, NARCO	3910166	7.5*	18.5*
	TRANSCEIVER (DME-190)	3312-406	6.5	11.3
	MOUNT ASSY		0.6	11.3
	ANTENNA INSTALLATION		0.2	86.1
H05-A	FOSTER 511 R-NAV INSTALLATION	3910203-1	3.4*	11.8*
	RECEIVER & MOUNT		2.4	14.5
H07-A	CESSNA 400 GLIDESLOPE (INCLUDES VOR/ILS	3910157	4.4*	81.1*

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	INDICATOR--EXCHANGE FOR VOR/LOC)			
	RECEIVER (R-443B)	42100-0000	2.1	117.0
	ANTENNA (LOCATED UPPER WINDSHIELD)	1200098	0.2	30.0
	VOR/ILS INDICATOR ADDED	46860-2000	1.7	14.7
	VOR/LOC INDICATOR DELETED	46860-1000	-1.6	14.7
H08-A-1	AUTO RADIAL CENTERING INDICATOR ARC/LOC EXCHANGE FOR VOR/LOC IN ITEM H22-A AND H25-A (WT NET CHANGE)		0.2*	14.7*
	ARC/LOC INDICATOR ADDED	46860-1200	1.8	14.7
	VOR/LOC INDICATOR DELETED	46860-1000	-1.6	14.7
H08-A-2	AUTO RADIAL CENTERING INDICATOR ARC/ILS EXCHANGE FOR VOR/ILS, USED WITH H07-A ONLY, WT IS NET CHANGE		0.1*	14.7*
	ARC/ILS INDICATOR ADDED	46860-2200	1.9	14.7
	VOR/ILS INDICATOR DELETED	46860-2000	-1.8	14.7
H11-A-1	PANTRONICS PT10-A HF TRANSCEIVER, 2ND OR 3RD UNIT	3910193-2	20.1*	89.3*
	TRANSCEIVER (PANEL MOUNTED)	C582103-0102	4.2	10.4
	ANTENNA LOAD BOX	C589502-0201	4.2	112.5
	HF POWER SUPPLY (REMOTE)	C582103-0301	8.5	114.4
	POWER & SIGNAL CABLES	3950122-15	2.5	41.0
	ANTENNA INSTALLATION, 351 IN. LONG	3960117-3	0.3	144.4
H11-A-2	SUNAIR ASB-125 HF TRANSCEIVER, 2ND OR 3RD UNIT	3910158-1	22.0*	82.8*
	ANTENNA LOAD BOX	99816	4.9	112.0
	POWER SUPPLY (REMOTE)	99683	8.5	114.0
	TRANSCEIVER (PANEL MOUNTED)	99681	4.6	10.4
	ANTENNA INSTALLATION, 351 IN. LONG	3960117-3	0.3	144.4
H13-A	CESSNA 400 MARKER BEACON	3910164-1	2.3*	34.5*
	RECEIVER (R-402A)	42410-5128	0.7	11.8
	ANTENNA, L SHAPED ROD	0770681-1	0.7	136.0
H16-A-1	CESSNA 300 TRANSPONDER	3910127-17	[illegible]	[illegible]

	ANTENNA	C589511-0109	0.1	122.0
H31-A-1	NAV-O-MATIC 200A	3910162-9	9.2*	51.0*
	CONTROLLER & MOUNT (CA-295B)	3930144-2	1.6	13.1
	TURN COORDINATOR (NET CHNG) (G-300A)	42320-0028	0.0	- -
	RELAY INSTALLATION	3970143	0.4	4.0
	WING INSTALLATION (SERVO IS 3.9 LBS AT 68.9 INCHES)(PA-495)	0522632-4	6.1	68.1
H31-A-2	NAV-O-MATIC 300A (AF395)	3910163-9	10.3*	46.4*
	CONTROLLER-AMPLIFIER & MOUNT (CA-395A)	3930145-19	1.8	13.1
	GYRO INSTALLATION (D64-A-2) (NET CHNG)	0501054	0.6	11.3
	TURN COORDINATOR (NET CHANGE)	42320-0028	0.0	- -
	RELAY INSTALLATION	3970143	0.4	4.0
	WING INSTALLATION (SERVO IS 3.9 LBS AT 68.9 INCHES)(PA-495)	0522632-5	6.1	68.1
	MISC WIRING & HARDWARE ITEMS	42730-4008	1.5	25.1
H34-A	BASIC AVIONICS KIT INSTALLATION	3910186-3	7.0*	52.9*
	RADIO COOLING	3930208	1.1	10.2
	NOISE FILTER INSTALLATION	3940148-1	0.1	-2.0
	COM ANTENNA CABLE, LH VHF	3950122-3	0.4	27.8
	OMNI ANTENNA CABLE		0.6	116.0
	OMNI ANTENNA	3960102-10	0.8	220.8
	COM ANTENNA, LH VHF	3960113-1	0.4	62.4
	CABIN SPEAKER INSTL.	3970123-5	1.2	37.9
	MIKE INSTL, HAND HELD	3970124-5	0.3	17.2
	HEADPHONE INSTL (STOWED ARM SHOWN)	3970125-4	0.2	14.2
	AUDIO CONTROL PANEL INSTL.	3970143	1.9	12.5
H37-A	COM ANTENNA & OMNI COUPLER KIT	3910185	1.0*	25.0*
	COM ANTENNA CABLE, RH VHF	3950122-2	0.4	27.8
	OMNI ANTENNA COUPLER (SIGNAL SPLITTER)	3960111-3	0.2	7.0
	COM ANTENNA, RH VHF	3960113-2	0.4	62.4

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
H43-A	AVIONICS OPTION D NAV-O-MATIC WING PROV.	0522632-2	1.7	68.2
H55-A	MIKE-HEADSET COMBO. INSTL (HEADSET STOWED) (REQUIRES ALL PURPOSE CONTROL WHEEL, ITEM E89-A)	C596530-0101	0.3	13.0
H56-A	MICROPHONE/HEADSET, PADDED (STOWED) (REQUIRES ALL PURPOSE CONTROL WHEEL, ITEM E89-A)	C596531-0101	1.1	- -
	J. SPECIAL OPTION PACKAGES			
J01-A	HAWK-XP II EQUIPMENT CONSISTS OF ITEMS	0500511	26.9*	49.5*
	C16-O HEATED PITOT SYSTEM	0422355-7	0.6	24.4
	C31-A COURTESY LIGHTS	0521101	0.5	61.0
	C40-A NAV LIGHT DETECTORS	0701013	NEGL	- -
	C43-A FLASHING BEACON LIGHT	0506003-3	1.4	204.7
	D01-O TRUE AIRSPEED IND. (NET CHANGE)	0513279	0.1	18.1
	D04-A STATIC AIR, ALTERNATE SOURCE	0501017	0.2	15.5
	E85-A DUAL CONTROLS	0506005	4.9	12.4
	G16-A STATIC DISCHARGERS		0.4	143.2
	H22-A NAV/COM RT-385A VOR/LOC	3910183	8.3	11.9
	H28-A-1 EMERGENCY LOCATER TRANSMITTER	0470419	3.5	116.5
	H34-A BASIC AVIONIC KIT	3910186	7.0	52.9
J04-A	NAV-PAC INSTALLATION (AVAILABLE XP II)		21.3*	18.1*
	H01-A 300 ADF (R-546-E)	3910159-2	8.0	19.9
	H16-A-1 300 TRANSPONDER (RT-359A)	3910127-17	4.0	25.8
	H25-A 300 NAV/COM, 2ND UNIT		8.3	11.9
	H37-A COM ANT. AND NAV COUPLER KIT	3910185	1.0	25.0
J10-A	FLOATPLANE FUSELAGE STRUCTURAL MODIFICATIONS & FITTINGS (FLOATPLANE OPTION C)	0500044-45	7.9	43.0
J13-A	FLOATPLANE COWLDECK V BRACE (INSTALLED)	0513003	1.1	26.2
	(STOWED)		1.1	95.0

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	G58-A STEP & HANDLE, REFUELING	0513415	1.7	17.8
	J10-A FUSELAGE MODIFICATIONS	0500044	7.9	43.0
	J13-A COWL DECK V BRACE (INSTALLED)	0513003	1.1	26.2
	J15-A INTERCONNECT RUDDER-AILERON INSTALLED	0560012	0.5	60.1
	RUDDER CONTROL SPRINGS (STOWED, INSTALLED ARM SHOWN)		1.2	220.5
	NOSE STRUT STUB (STOWED, INSTALLED ARM SHOWN)		3.3	-3.0
J30-A-2	FLOATPLANE EQUIPMENT KIT, COMPLETE--WITH PROP CHANGE & NC CORROSION PROOFING--	0501065	16.8*	43.2*
	A33-O PROPELLER, FLOATPLANE, EXCHANGE		0.0	- -
	F01-O- FLOATPLANE OPERATIONS PLACARD		NEGL	- -
	G07-A RINGS, AIRPLANE HOISTING	0541115	1.1	49.1
	G58-A STEP & HANDLE, REFUELING	0513415	1.7	17.8
	J10-A FUSELAGE STRUCTURE MODIFICATION	0500044	7.9	43.0
	J13-A COWL DECK BRACE--INSTALLED	0513003	1.1	26.2
	J15-A INTERCONNECT RUDDER-AILERON INSTALLED	0560012	0.5	60.1
	RUDDER CONTROL SPRINGS (STOWED) (INSTALLED ARM SHOWN)		1.2	210.5
	NOSE STRUT STUB (STOWED, INSTALLED ARM SHOWN)		3.3	-3.0
J30-A-3	FLOATPLANE EQUIPMENT KIT--WITH NO PROP CHANGE OR CORROSION PROOFING	0501065	12.3	45.4*
	F01-O- FLOATPLANE OPERATION PLACARD		NEGL	- -
	G07-A RINGS, AIRPLANE HOISTING	0541115	1.1	49.1
	G58-A STEP & HANDLE, REFUELING	0513415	1.7	17.8
	J10-A FUSELAGE MODIFICATIONS	0500044	7.9	43.0

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	J13-A COWL DECK BRACE- STOWED	0513003	1.1	95.0
	J15-A INTERCONNECT SYSTEM (STOWED) INSTALLED ARM SHOWN	0560012	0.5	60.1
J30-A-4	FLOATPLANE KIT WITH CORROSION PROOFING BUT NO PROP CHANGE	0501065-5	22.3*	59.6*
	F01-O- FLOATPLANE OPERATIONS PLACARD		NEGL	- -
	G07-A AIRPLANE HOISTING PROVISIONS	0541115	1.1	49.1
	G13-A CORROSION PROOFING, INTERNAL	0500036	10.0	77.0
	G31-A CORROSION RESISTANT CONTROL CABLES		NEGL	- -
	J10-A FUSELAGE MODIFICATIONS	0500044	7.9	43.0
	J13-A COWL DECK BRACE--STOWED	0513003	1.1	95.0
	J15-A INTERCONNECT SYSTEM (STOWED) INSTALLED ARM SHOWN	0560012	0.5	60.1
	G58-A STEP & HANDLE, REFUELING	0513415	1.7	17.8

SECTION 7
AIRPLANE & SYSTEMS DESCRIPTIONS

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

INTRODUCTION

This section provides description and operation of the airplane and its 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 airplane 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, stringer, and skin design referred to as semimonocoque. Major items of structure are the front and rear carry-through spars to which the wings are attached, a bulkhead and forgings for main landing gear attachment at the base of the rear door posts, and a bulkhead with attach fittings at the base of the forward door posts for the lower attachment of the wing struts. Four engine mount stringers are also attached to the forward door posts and extend forward to the firewall.

The externally braced wings, containing the fuel tanks, are constructed of a front and rear spar with formed sheet metal ribs, doublers, and stringers. The entire structure is covered with aluminum skin. The front spars are equipped with wing-to-fuselage and wing-to-strut attach fittings. The aft spars are equipped with wing-to-fuselage attach fittings, and are partial-span spars. Conventional hinged ailerons and single-slotted flaps are attached to the trailing edge of the wings. The ailerons are constructed of a forward spar containing balance weights, formed sheet metal ribs and "V" type corrugated aluminum skin joined together at the trailing edge. The flaps are constructed basically the same as the ailerons, with the exception of the balance weights and the addition of a formed sheet metal leading edge section.

The empennage (tail assembly) consists of a conventional vertical stabilizer, rudder, horizontal stabilizer, and elevator. The vertical stabilizer consists of a spar, formed sheet metal ribs and reinforcements, a wrap-around skin panel, formed leading edge skin, and a dorsal. The rudder is constructed of a formed leading edge skin containing hinge halves, a center wrap-around skin panel, ribs, an aft wrap-around skin panel which is joined at the trailing edge of the rudder by a filler strip, and a ground adjustable trim tab at the base of the trailing edge. The top of the rudder incorporates a leading edge extention which contains a balance weight. The horizontal stabilizer is constructed of a forward and aft spar, ribs and

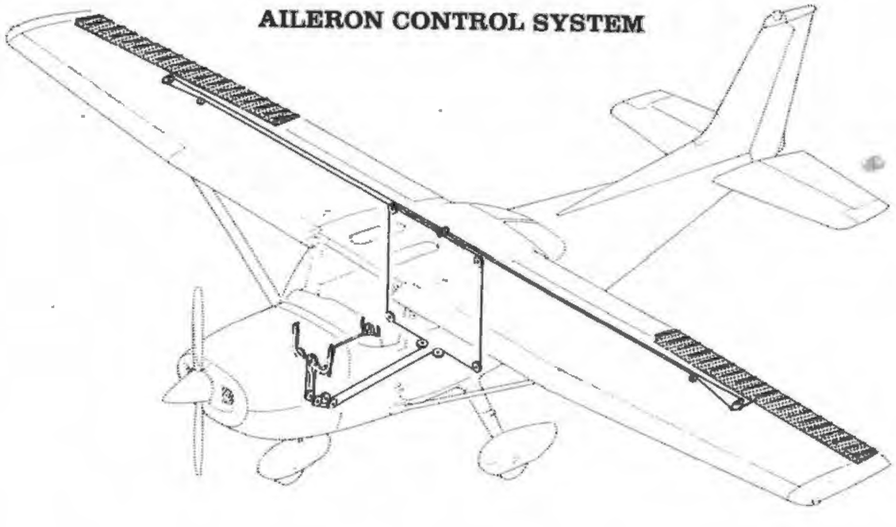
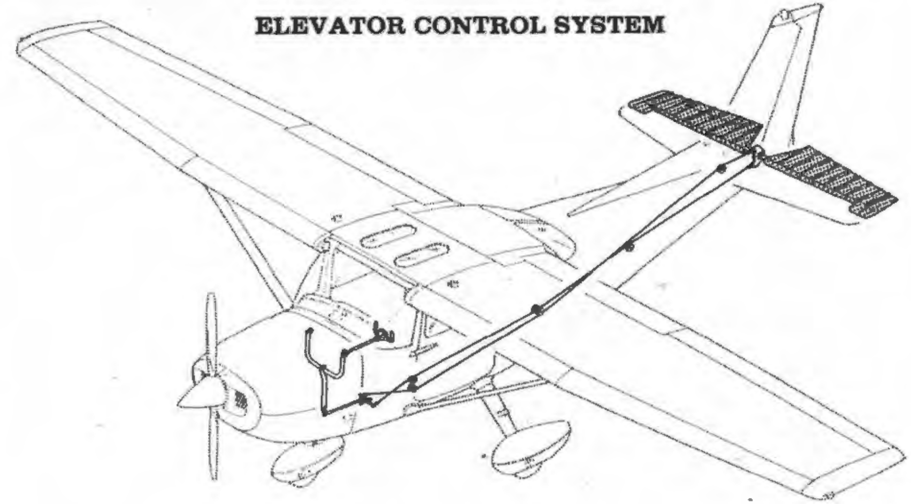


Figure 7-1. Flight Control and Trim Systems (Sheet 1 of 2)



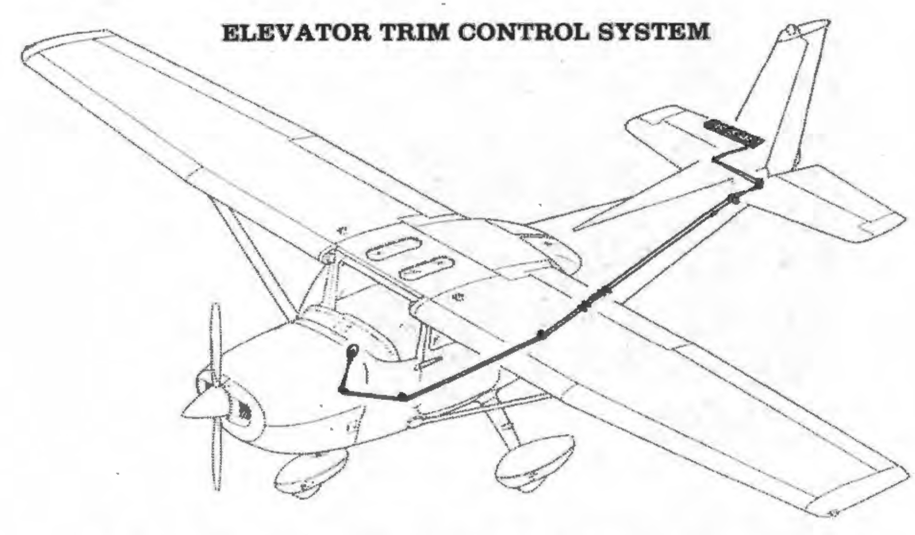
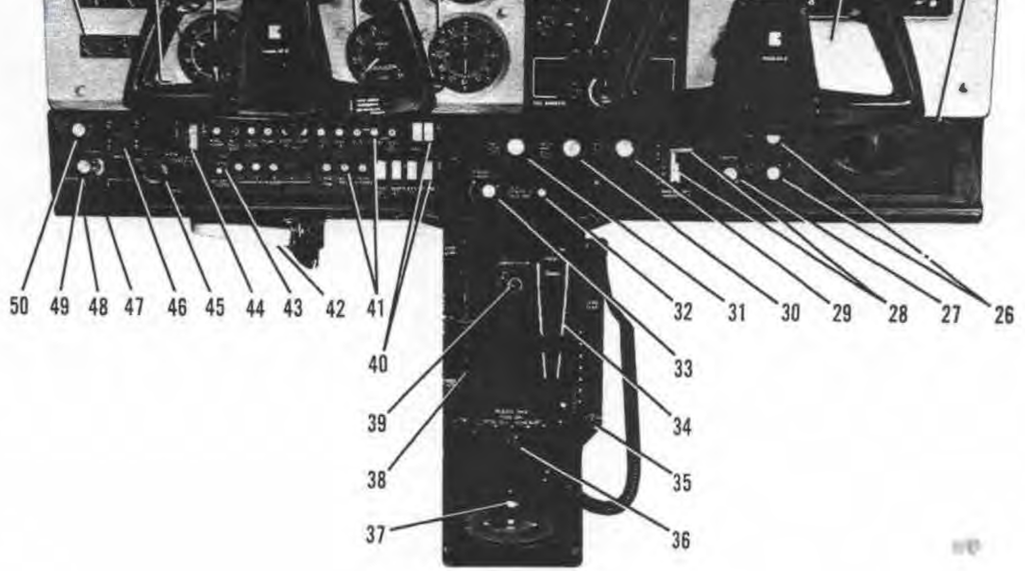


Figure 7-1. Flight Control and Trim Systems (Sheet 2 of 2)



Instrument Panel (Sheet 1 of 2)

1. Cylinder Head Temperature and Oil Temperature Gages
2. Ammeter and Oil Pressure Gage
3. Suction Gage
4. Left Tank and Right Tank Fuel Quantity Indicators
5. Low-Voltage Warning Light
6. Digital Clock
7. Manifold Pressure/Fuel Flow Indicator
8. Flight Instrument Group
9. Airplane Registration Number
10. Tachometer
11. Encoding Altimeter
12. ADF Bearing Indicator
13. Course Deviation Indicators
14. Magnetic Compass
15. Marker Beacon Indicator Lights and Switches
16. Transponder
17. Audio Control Panel
18. Autopilot Control Unit
19. Radios
20. Secondary Altimeter

25. Map Compartment
26. Cabin Heat and Air Control Knobs
27. Cigar Lighter
28. Wing Flap Switch and Position Indicator
29. Mixture Control Knob
30. Propeller Control Knob
31. Throttle (With Friction Lock)
32. Static Pressure Alternate Source Valve
33. Instrument and Radio Dial Light Dimming Rheostats
34. Microphone
35. Cowl Flap Control Lever
36. Rudder Trim Control Lever
37. Fuel Selector Valve Handle
38. Elevator Trim Control Wheel
39. Circulation Fan Control
40. Electrical Switches
41. Circuit Breakers
42. Parking Brake Handle
43. Avionics Power Switch
44. Auxiliary Fuel Pump Switch
45. Ignition Switch

Figure 7-2. Instrument Panel (Sheet 2 of 2 stiffeners, center, left, and right wrap-around skin panels, and formed .eading edge skins. The horizontal stabilizer also contains the elevator rim tab actuator. Construction of the elevator consists of formed leading edge skins, a forward spar, aft channel, ribs, torque tube and bellcrank, left ipper and lower "V" type corrugated skins, and right upper and lower "V" ype corrugated skins incorporating a trailing edge cut-out for the trim ab. The elevator trim tab consists of a spar, rib, and upper and lower "V" ype corrugated skins. The leading edge of both left and right elevator tips ncorporate extensions which contain balance weights.

FLIGHT CONTROLS

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

Extensions are available for the rudder/brake pedals. They consist of a udder pedal face, two spacers and two spring clips. To install an extension, place the clip on the bottom of the extension under the bottom of the udder pedal and snap the top clip over the top of the rudder pedal. Check hat the extension is firmly in place. To remove the extensions, reverse the above procedures.

TRIM SYSTEMS

Manually-operated rudder and elevator trim systems are provided. Rudder trimming is accomplished through a bungee connected to the udder control system and a trim lever, mounted on the control pedestal. Rudder trimming is accomplished by lifting the trim lever up to clear a letent, then moving it either left or right to the desired trim position. Moving the trim lever to the right will trim the airplane nose-right; conversely, moving the lever to the left will trim the airplane nose-left. Elevator trimming is accomplished through the elevator trim tab by utilizing the vertically mounted trim control wheel. Forward rotation of he 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 instruments, fuel quantity indicators, an ammeter, and a low-voltage warning light are near the left edge of the panel. Avionics equipment is stacked approximately on the centerline of the panel, with the right side of the panel containing space for additional instruments and avionics equipment. A switch and control panel at the lower edge of the instrument panel contains the fuel shutoff valve control, primer, master and ignition switches, auxiliary fuel pump switch, circuit breakers, avionics power switch, and electrical switches on the left side, with the engine controls, light intensity controls, and static pressure alternate source valve in the center. The right side of the switch and control panel contains the wing flap switch lever and position indicator, cabin heat and air controls, cigar lighter, and map compartment. A control pedestal, installed below the switch and control panel, contains the elevator trim control wheel and indicator, microphone bracket, cowl flap control lever, and rudder trim control lever. A fuel selector valve handle is located at the base of the pedestal. A parking brake handle is mounted below 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 pedal 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 10° each side of center. By applying either left or right brake, the degree of turn may be increased up to 30° 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, use the wing 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 30° 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 27 feet 5 and 1/2 inches. To obtain a minimum radius turn during ground handling, the airplane may be rotated around either main landing gear by pressing down on a tailcone bulkhead just forward of the horizontal stabilizer to raise the nose wheel off the ground.

WING FLAP SYSTEM

The single-slot type wing flaps (see figure 7-3), are extended or retracted by positioning the wing flap switch lever on the right side of the switch and control 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 than 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 is protected by a 10-amp circuit breaker, labeled FLAP, on the left side of the switch and control 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

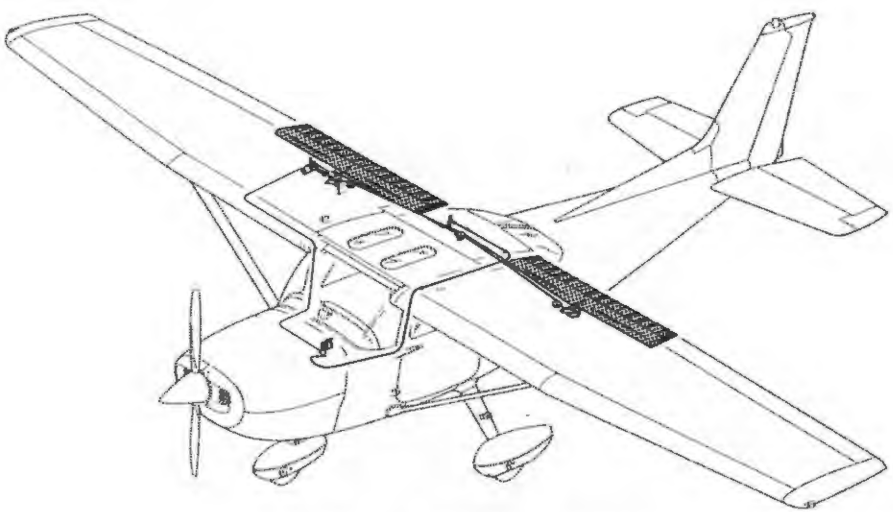


Figure 7-3. Wing Flap System

shock strut. Each main gear wheel is equipped with a hydraulically actuated single disc brake on the inboard side of each wheel, and an aerodynamic fairing over each brake.

BAGGAGE COMPARTMENT

The baggage compartment consists of two areas, one extending from behind the rear passengers' seat to the aft cabin bulkhead, and an additional area aft of the bulkhead. Access to both baggage areas is gained through a lockable baggage door on the left side of the airplane, or from within the airplane cabin. A baggage net with eight tie-down straps is provided for securing baggage and is attached by tying the straps to tie-down rings provided in the airplane. 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 placed anywhere in the airplane. For baggage area and door dimensions, refer to Section 6.

SEATS

The seating arrangement consists of two individually adjustable four-way or six-way seats for the pilot and front seat passenger and a solid back or split-backed fixed seat for rear seat passengers. A child's seat (if installed) is located at the aft cabin bulkhead behind the rear seat.

The four-way seats may be moved forward or aft, and the angle of the seat backs is infinitely adjustable. To position the seat, lift the tubular handle below the center of the seat frame, slide the seat into position, release the handle and check that the seat is locked in place. The seat back angle is controlled by a cylinder lock release button which is spring-loaded to the locked position. The release button is located on the right side, below the forward corner of the seat cushion. To adjust the angle of the seat back, push up on the release button, position the seat back to the desired angle and release the button. When the seat is not occupied, the seat back will automatically fold forward whenever the release button is pushed up.

The six-way seats may be moved forward or aft, and are infinitely adjustable for height and seat back angle. To position the seat, lift the tubular handle under the center of the seat bottom, slide the seat into position, release the handle, and check that the seat is locked in place. Raise or lower the seat by rotating the large crank under the inboard corner of either seat. The seat back is adjusted by rotating the small crank under the outboard 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 passengers' seat consists of a fixed one-piece seat bottom with either one-piece (adjustable to the vertical position or either of two reclining positions) or two-piece (individually, infinitely adjustable) seat backs. The one-piece back is adjusted by a lever located below the center of the seat frame. Two-piece seat backs are adjusted by cylinder lock release buttons recessed into skirts located below the seat frame at the outboard ends of the seat. To adjust the one-piece seat back, raise the lever, position the seat back to the desired angle, release the lever and check that the back is locked in place. To adjust a two-piece seat back, push up on the cylinder lock release button (which is spring-loaded to the locked position), recline the seat back to the desired position, and release the button. When the seats are not occupied, either type of seat back will automatically fold forward whenever the lever is raised or the cylinder lock release button is pushed up.

A child's seat may be installed behind the rear passengers' seat in the forward baggage compartment, and is held in place by two brackets mounted on the floorboard. When not occupied, the seat may be stowed by rotating the seat bottom up and aft until it contacts the aft cabin bulkhead.

Headrests are available for any of the seat configurations except the child's seat. To adjust the headrest, apply enough pressure to it to raise or lower it to the desired level. The headrest may be removed at anytime 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; shoulder harnesses are available for the rear seat positions. Integrated seat belt/shoulder harnesses with inertia reels can be furnished for the pilot's and front passenger's seat positions, if desired.

SEAT BELTS

The seat belts at all seat positions are attached to fittings on the floorboard. The buckle half of the seat belt is inboard of each seat and has a fixed length; the link half of the belt is outboard and is the adjustable part of the belt.

To use the seat belts for the front seats, position the seat as desired, and then lengthen the adjustable half of the belt as needed. Insert and lock the

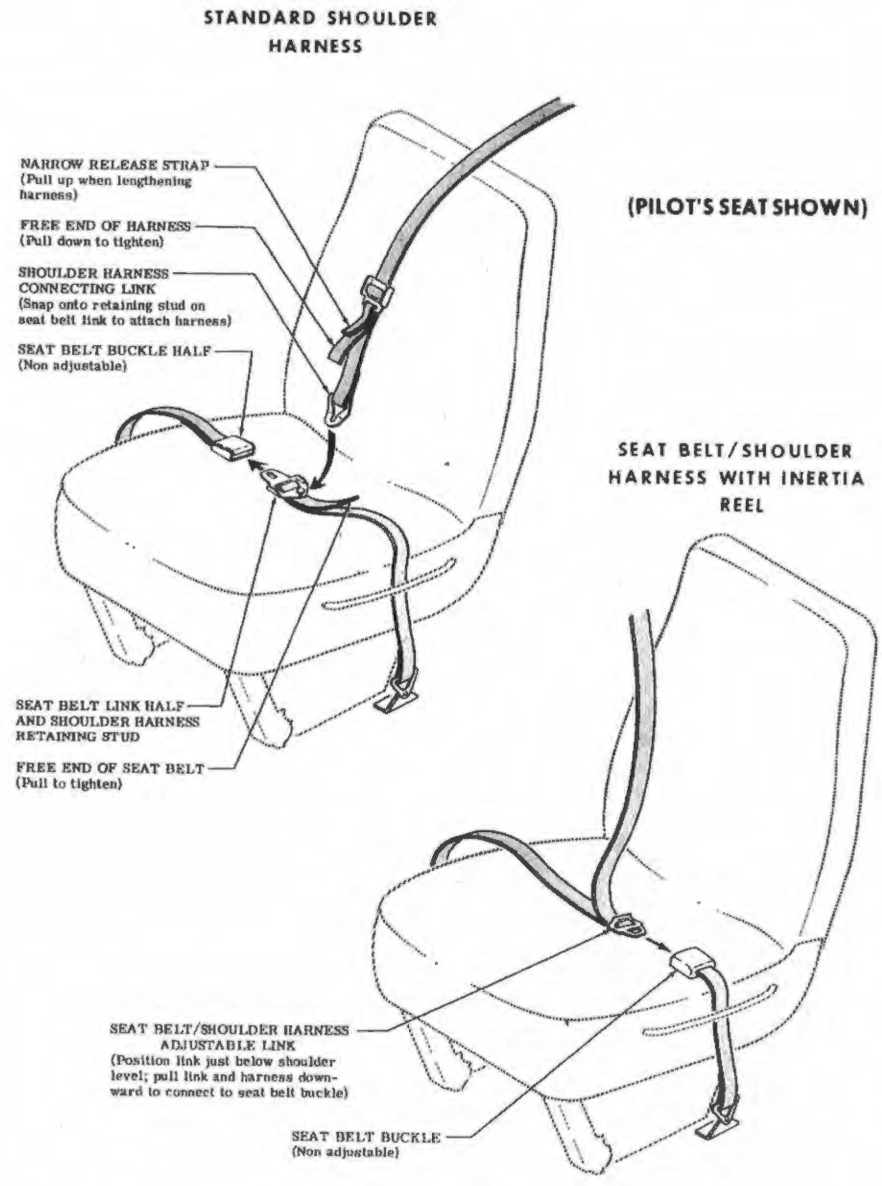


Figure 7-4. Seat Belts and Shoulder Harnesses

belt link into the buckle. Tighten the belt to a snug fit by pulling the free end of the belt. Seat belts for the rear seat, and the child's seat (if installed), are used 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 belt, to drop to the side of the seat.

INTEGRATED SEAT BELT/SHOULDER HARNESSES WITH INERTIA REELS

Integrated seat belt/shoulder harnesses with inertia reels are available for the pilot and front seat passenger. The seat belt/shoulder harnesses extend from inertia reels located in the cabin ceiling to attach points 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 inertia 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 just below shoulder level, pull the link and harness downward, and insert the link into 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 positions (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 an openable window in the left door. An openable right door window is also available.

To open the doors from outside the airplane, utilize the recessed door handle near the aft edge of either door by grasping the forward edge of the handle and pulling outboard. To close or open the doors from inside the airplane, use the combination door handle and arm rest. The inside door handle has three positions and a placard at its base which reads OPEN, CLOSE, and LOCK. 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 (flush with the arm rest). When the handle is rotated to the LOCK position, an over-center action will hold it in that position.

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 75 KIAS, momentarily shove the door outward slightly, and forcefully close and lock the door.

Exit from the airplane is accomplished by rotating the door handle from the LOCK position, past the CLOSE position, 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.

The left cabin door is equipped with an openable window which is held in the closed position by a detent equipped latch on the lower edge of the window frame. To open the window, rotate the latch upward. The window is equipped with a spring-loaded retaining arm which will help rotate the window outward, and hold it there. An openable window is also available for the right door, and functions in the same manner as the left window. If required, either window may be opened at any speed up to 163 KIAS. The cabin top windows (if installed), rear side windows, and rear windows are of the fixed type and cannot be opened.

CONTROL LOCKS

A control lock is provided to lock the aileron and elevator control surfaces to 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 in the top of the pilot's control wheel shaft with the hole in the top of the shaft collar on the instrument panel and insert the rod into the aligned holes. Installation of the lock will secure the ailerons in a neutral position and the elevators in a slightly trailing edge down position. Proper installation of the lock will place the red flag over the ignition switch. In areas where high or 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, six-cylinder, overhead-valve, air-cooled, fuel-injected engine with a wet sump oil system. The engine is a Continental Model IO-360-KB and is rated at 195 horsepower at 2600 RPM. Major accessories include a propeller governor on the front of the engine and dual magnetos, starter, gear-driven alternator, vacuum pump and full flow oil filter on the rear of the engine.

ENGINE CONTROLS

Engine manifold pressure is controlled by a throttle located on the switch and control 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 knob. The rich position is full forward, and full aft is the idle cut-off position. For small adjustments, the control may be moved forward by rotating the knob clockwise, and aft by rotating the knob counterclockwise. 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, and manifold pressure/fuel flow indicator. An economy mixture (EGT) indicator is also available.

The oil pressure gage, located on the left side of the instrument panel, is operated by oil pressure. A direct pressure oil line from the engine delivers oil at engine operating pressure to the oil pressure gage. Gage markings indicate that minimum idling pressure is 10 PSI (red line), the normal operating range is 30 to 60 PSI (green arc), and maximum pressure is 100 PSI (red line).

Oil temperature is indicated by a gage on the left side of the instrument panel. 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 100°F (38°C) to 240°F (116°C), and the maximum (red line) which is 240°F (116°C).

The cylinder head temperature gage, located on the left side of the instrument panel, is operated by an electrical-resistance type temperature sensor on the engine which receives power from the airplane electrical system. Temperature limitations are the normal operating range (green arc) which is 200°F (93°C) to 460°F (238°C), and the maximum (red line) which is 460°F (238°C).

The engine-driven mechanical tachometer is located near the lower portion of the instrument panel to the right of the pilot's control wheel. 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 in hours and tenths. Instrument markings include a normal operating range (green arc) of 2200 to 2600 RPM, and a maximum (red line) of 2600 RPM.

The manifold pressure gage is the left half of a dual-indicating instrument and is located near the lower portion of the instrument panel to the left of the pilot's control wheel. 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 25 inches of mercury.

The fuel flow indicator is the right half of a dual-indicating instrument and is located to the left of the pilot's control wheel. The indicator is a fuel pressure gage calibrated to indicate the approximate gallons per hour of fuel being metered to the engine. The normal operating range (green arc) is from 4.5 to 11.5 gallons per hour, the minimum (red line) is 3 PSI, and the maximum (red line) is 17 gallons per hour (17 PSI).

An economy mixture (EGT) indicator is available for the airplane and is located on the right side of the instrument panel. A thermocouple probe in the left exhaust collector 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 the 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 reference pointer.

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 80% 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 a filter screen on the end of a pick-up tube to the engine-driven oil pump. Oil from the pump passes through the full flow oil filter, a pressure relief valve, and a thermostatically controlled oil cooler. Oil from the cooler is then circulated to the oil galleries and propeller governor. The engine parts are then lubricated by oil from the galleries. After lubricating the engine, the oil returns to the sump by gravity. The oil filter adapter is equipped with a bypass valve which will cause lubricating oil to bypass the filter in the event the filter becomes plugged, or the oil temperature is extremely cold.

An oil filler cap and oil dipstick are located at the rear of the engine on the left side. The filler cap and dipstick are 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, slip a hose over the end of the valve and push upward on the end of the valve until it 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 two engine-driven magnetos, and two spark plugs in each cylinder. The right magneto fires the lower left and upper right spark plugs, and the left magneto fires the lower right and upper left 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 contactor 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

Ram air entering the openings in the front of the engine cowling serves as induction air for the engine. The air is drawn through a cylindrical filter on top of the engine and into the induction airbox. The induction airbox contains an alternate air door which is spring-loaded to the closed position. If the induction air filter becomes blocked, suction created by the engine will open the alternate air door and draw unfiltered air from inside the cowling. An open alternate air door will result in negligible variations in manifold pressure and power. After passing through the airbox, induction air enters the fuel/air control unit, mounted to the induction irbox and is then delivered to the engine cylinders through the induction nanifold.

EXHAUST SYSTEM

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

UEL INJECTION AND MANUAL PRIMING SYSTEM

The engine is equipped with a fuel injection system. The system is omprised of an engine-driven fuel pump, fuel/air control unit, fuel istributor manifold, fuel flow indicator and air-bleed type injector nozles.

Fuel is delivered by the engine-driven fuel pump to the fuel/air control nit on the engine. The fuel/air control unit correctly proportions the fuel ow to the induction air flow. After passing through the control unit, nduction air is delivered to the cylinders through intake manifold tubes, nd metered fuel is delivered to a fuel distributor manifold. The fuel nanifold, through spring tension on a diaphragm and valve, evenly istributes the fuel to an air-bleed type injector nozzle in the intake valve hamber of each cylinder. A pressure line is also attached to the fuel nanifold, and is connected to the fuel flow indicator on the instrument anel.

The engine is equipped with a manual priming system for starting in xtremely cold weather. The primer is a small pump labeled PRIMER, and located on the left switch and control panel below the fuel shutoff valve nob. The primer draws fuel from the fuel strainer when the plunger is illed out, and injects it into the intake manifolds when the plunger is ushed in. The plunger is equipped with a lock, and after being pushed full , must be rotated either left or right until the knob cannot be pulled out.

OOLING SYSTEM

Ram air for engine cooling enters through two intake openings in the ont of the engine cowling. The cooling air is directed around the cylinders d other areas of the engine by baffling, and is then exhausted through a wl flap on the lower aft edge of the cowling. The cowl flap is mechanilly operated from the cabin by means of a cowl flap lever on the right side the control pedestal. The pedestal is labeled COWL FLAP, OPEN, OSED. During takeoff and high power operation, the cowl flap lever ould be placed in the OPEN position for maximum cooling. This is complished by moving the lever to the left to clear a detent, then moving lever up to the OPEN position. Anytime the lever is repositioned, it

must first be moved to the left. While in cruise flight, the cowl flap should be adjusted to keep the cylinder head temperature at approximately two-thirds of the normal operating range (green arc). During extended let-downs, it may be necessary to completely close the cowl flap by pushing the cowl flap lever down to the CLOSED position.

A winterization kit is available for the airplane. Details of this kit are presented in Section 9, Supplements.

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 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 the blades toward 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 INCR. 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 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

The airplane may be equipped with either a standard or long range fuel system (see figure 7-5). The standard system has two vented fuel tanks (one in each wing); the long range fuel system has two vented integral fuel tanks (one in each wing). Both systems include a fuel selector valve, fuel reservoir tank, fuel shutoff valve, auxiliary fuel pump, fuel strainer, manual primer, engine-driven fuel pump and mixture unit, fuel/air control unit, fuel manifold, and fuel injection nozzles. Refer to figure 7-6 for fuel quantity data for both systems.

Fuel flows by gravity from the two wing tanks to a three-position selector valve, labeled BOTH, RIGHT, and LEFT. With the selector valve in either the BOTH, RIGHT, or LEFT position, fuel flows through a fuel reservoir tank, fuel shutoff valve, a bypass in the auxiliary fuel pump (when it is not in operation), and the fuel strainer to the engine-driven fuel pump. The engine-driven fuel pump delivers the fuel to the fuel/air control unit where it is metered and routed to a fuel manifold which distributes it to each cylinder. Vapor and excess fuel from the engine-driven fuel pump and mixture unit are returned to the fuel reservoir tank by a check valve equipped vapor return line, and from the reservoir tank to the wing tanks.

Fuel system venting is essential to system operation. Blockage of the system will result in decreasing fuel flow and eventual engine stoppage. Venting is accomplished by an interconnecting line from the right fuel tank to the left tank. The left fuel tank is vented overboard through a vent line, equipped with a check valve, which protrudes from the bottom surface of the left wing near the wing strut. The right fuel tank filler cap is also vented.

Fuel quantity is measured by two float-type fuel quantity transmitters (one in each fuel tank) and indicated by two electrically-operated fuel quantity indicators on the left side of the instrument panel. The fuel quantity indicators are calibrated in gallons (lower scale) and pounds (upper scale). An empty tank is indicated by a red line and the letter E. When an indicator shows an empty tank, approximately 1.5 gallons remain in a standard tank (approximately 1 gallon remains in a long range tank) as unusable fuel. The indicators cannot be relied upon for accurate readings during skids, slips, or unusual flight attitudes. If both indicator pointers should rapidly move to a zero reading, check the cylinder head temperature and oil temperature gages for operation. If these gages show no indication, an electrical malfunction has occurred.

The fuel selector valve should be in the BOTH position for takeoff, climb, landing, and maneuvers that involve prolonged slips or skids.

NOTE

When the fuel selector valve handle is in the BOTH position in cruising flight, 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 tank in the "heavy" wing.

If the airplane is equipped with the long range fuel system, it may be serviced to a reduced fuel capacity to permit heavier cabin loadings by filling each integral fuel tank to the bottom of the standpipe (scupper)

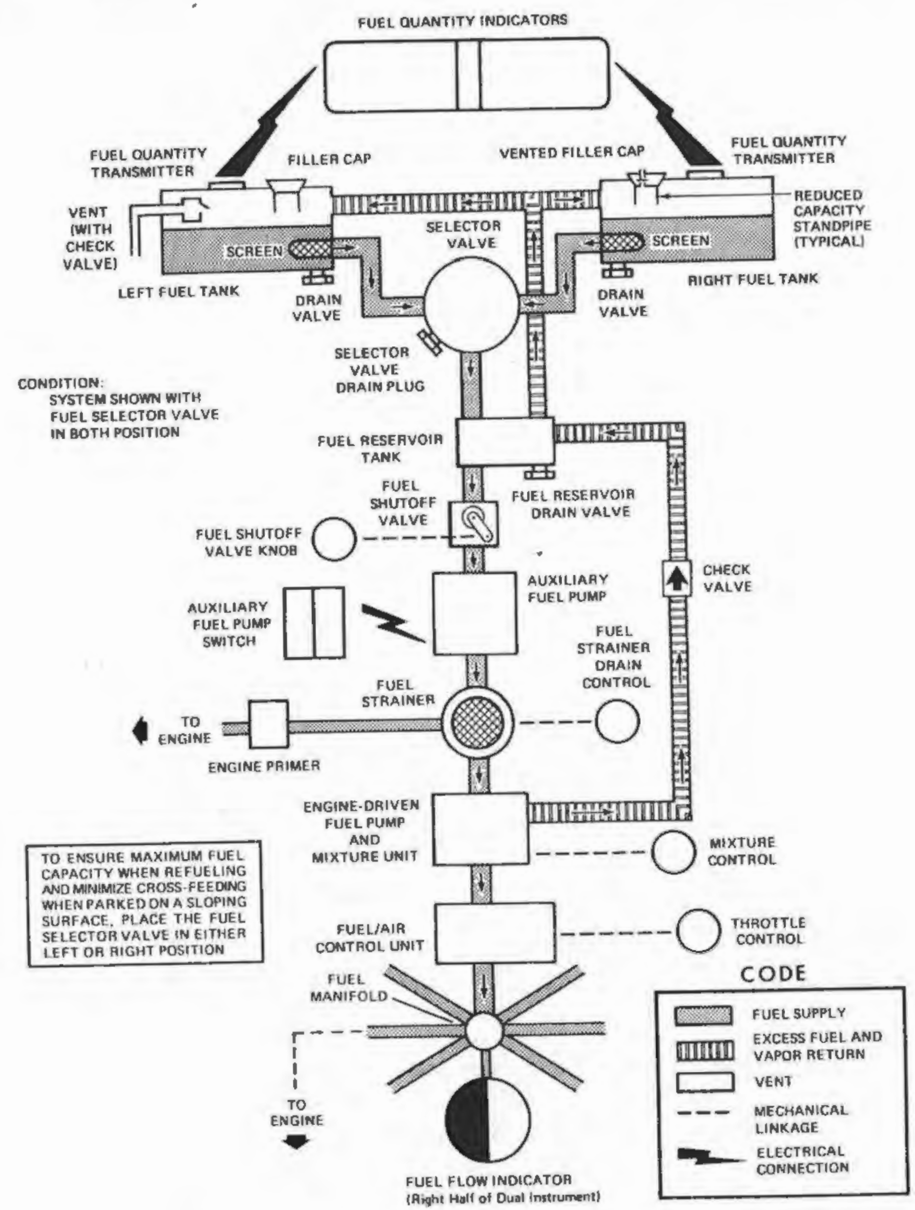


Figure 7-5. Fuel System (Standard and Long Range)

FUEL QUANTITY DATA (U. S. GALLONS)			
TANKS	TOTAL USABLE FUEL ALL FLIGHT CONDITIONS	TOTAL UNUSABLE FUEL	TOTAL FUEL VOLUME
STANDARD (26 Gal. Each)	49	3	52
LONG RANGE (34 Gal. Each)	66	2	68
REDUCED FUEL (26 Gal. Each)	50	2	52

Figure 7-6. Fuel Quantity Data

ocated in the filler collar. Each fuel tank contains 26 gallons (25 gallons ısable in all flight conditions) when filled to this level.

NOTE

> It is not practical to measure the time required to consume all of the fuel in one tank, and, after switching to the opposite tank, expect an equal duration from the remaining fuel. The airspace in both fuel tanks is interconnected by a vent line and, therefore, some sloshing of fuel between tanks can be expected when the tanks are nearly full and the wings are not level.

The auxiliary fuel pump switch, labeled AUX FUEL PUMP, is located ›n the left side of the switch and control panel and is a red and yellow split-ocker switch. The red left half, labeled HIGH, is spring-loaded in the off down) position and the yellow right half is labeled LOW. When the red half s placed in the HIGH position, an interlock within the switch will ıutomatically trip the yellow half of the switch to the LOW position. When he red half of the switch is released, the yellow half will remain in the LOW ›osition until manually returned to the off position. The HIGH position is ısed primarily for engine starting and extreme vapor purging, and is also ısed in the event of an engine-driven fuel pump failure during takeoff or ıigh power operations.

NOTE

> If the auxiliary fuel pump switch is accidentally placed in the HIGH or LOW position with the master switch on, mixture rich, and the engine stopped, the intake manifolds will be flooded.

The LOW position of the switch is used for minor vapor purging and continued engine operation in the event of an engine-driven fuel pump failure. When the switch is placed in the LOW position, the auxiliary fuel pump will operate at one of two flow rates depending on the position of the throttle. With the throttle in a cruise flight position, the pump will provide a high enough fuel flow to maintain flight in the event of an engine-driven fuel pump failure. As the throttle is moved toward the closed position (during letdown, landing, or taxiing), fuel flow provided by the pump is automatically reduced by a throttle-actuated switch, preventing an excessively rich mixture during periods of reduced engine power.

NOTE

> If the engine-driven fuel pump is functioning and the auxiliary fuel pump switch is placed in the LOW position, an excessively rich fuel/air ratio is produced unless the mixture is leaned. Therefore, this switch should be turned off during takeoff.

If it is desired to completely exhaust a fuel tank quantity in flight, the auxiliary fuel pump will be needed to assist in restarting the engine when fuel exhaustion occurs. Therefore, it is recommended that proper operation of the auxiliary fuel pump be verified prior to running a fuel tank dry by placing the auxiliary fuel pump switch in the HIGH position momentarily and checking for a slight rise in fuel flow indication.

To ensure a prompt engine restart in flight after running a fuel tank dry, immediately switch to the tank containing fuel at the first indication of fuel pressure fluctuation and/or power loss. Then place the auxiliary fuel pump switch in the HIGH position momentarily (3 to 5 seconds) with the throttle at least 1/2 open. Excessive use of the HIGH position at high altitude and full rich mixture can cause flooding of the engine as indicated by a short (1 to 2 seconds) period of power followed by a loss of power. This can later be detected by a fuel flow indication accompanied by a lack of power. If flooding does occur, turn off the auxiliary fuel pump switch, and normal propeller windmilling should start the engine in 1 to 2 seconds.

If the propeller should stop (possible at very low airspeeds) before the tank containing fuel is selected, place the auxiliary fuel pump switch in the HIGH position and advance the throttle promptly until the fuel flow indicator registers approximately 1/2 way into the green arc for 1 to 2 seconds duration. Then retard the throttle, turn off the auxiliary fuel pump switch, and use the starter to turn the engine over until a start is obtained.

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 every day and after each refueling, by using the sampler cup provided to drain fuel from the wing tank sumps and fuel reservoir tank, and by utilizing the fuel strainer drain under an access door on the left side of the engine cowling. The fuel tanks should be filled 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. To apply the parking brake, set the brakes with the rudder pedals, pull the handle aft, and rotate it 90° down.

For maximum brake life, keep the brake system properly maintained, and minimize brake 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 or 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 then 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

The airplane is equipped with a 28-volt, direct-current electrical system (see figure 7-7). The system is powered by a gear-driven, 38-amp alternator and a 24-volt battery (a heavy duty battery is available), located on the aft side of the rear cabin bulkhead. Power is supplied to most general electrical and all avionics circuits through the primary bus bar and the avionics bus bar, which are interconnected by an avionics power switch.

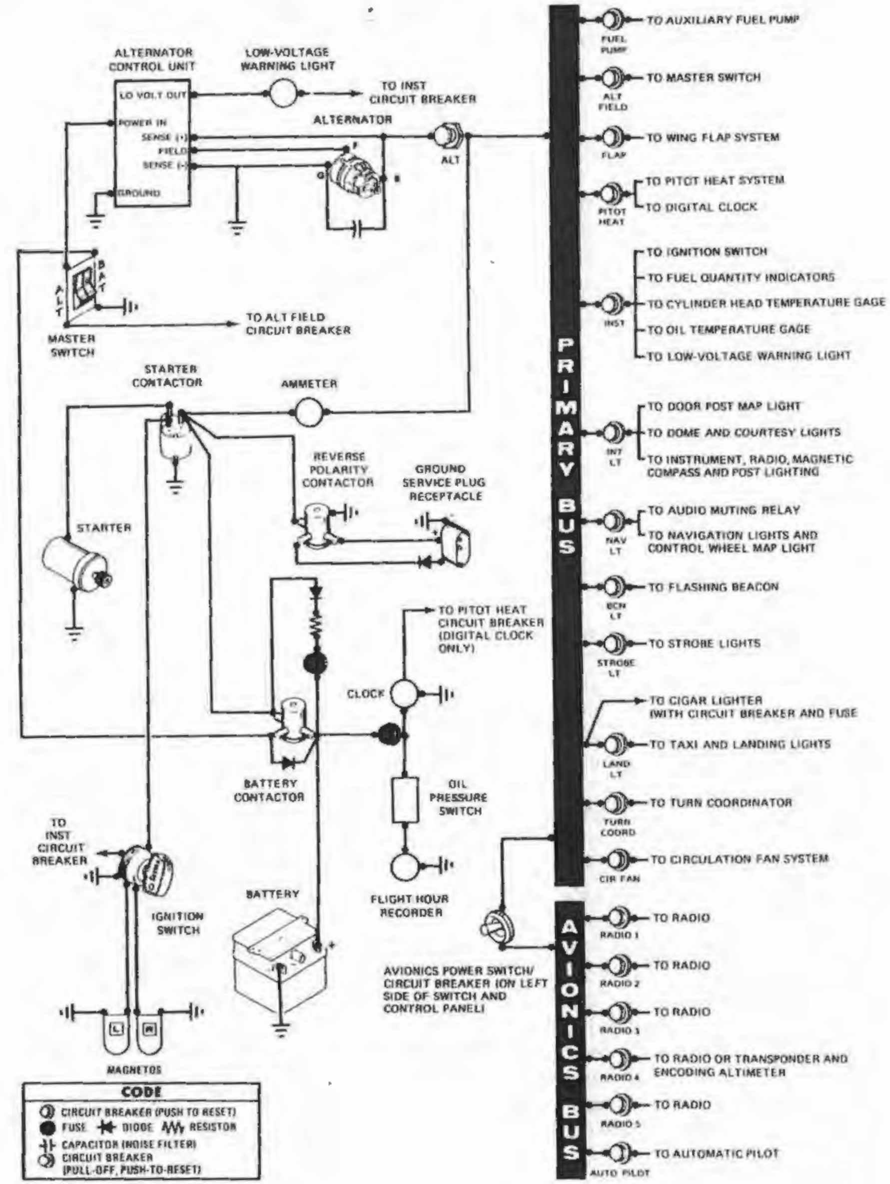


Figure 7-7. Electrical System

The primary bus is on anytime the master switch is turned on, and is not affected by starter or external power usage. Both bus bars are on anytime the master and avionics power switches are turned on.

CAUTION

Prior to turning the master switch on or off, starting the engine, or applying an external power source, the avionics power switch, labeled AVIONICS POWER, should be turned off to prevent any harmful transient voltage from damaging the avionics 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.

Normally, both sides of the master switch should be used simultaneously; however, the BAT side of the switch could be turned ON separately to check equipment while on the ground. To check or use avionics equipment or radios while on the ground, the avionics power switch must be turned on. 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 placed on the battery. Continued operation with the alternator switch in the off position will reduce battery power low enough to open the battery contactor, remove power from the alternator field, and prevent alternator restart.

AVIONICS POWER SWITCH

Electrical power from the airplane primary bus to the avionics bus (see figure 7-7) is controlled by a toggle switch/circuit breaker labeled AVIONICS POWER. The switch is located on the left side of the switch and control panel and is ON in the up position and off in the down position. With the switch in the off position, no electrical power will be applied to the avionics equipment, regardless of the position of the master switch or the individual equipment switches. The avionics power switch also functions as a circuit breaker. If an electrical malfunction should occur and cause the circuit breaker to open, electrical power to the avionics equipment will be interrupted and the switch will automatically move to the off position. If this occurs, allow the circuit breaker to cool approximately two minutes before placing the switch in the ON position again. If the circuit breaker opens again, do not reset it. The avionics power switch should be placed in the off position prior to turning the master switch ON or off, starting the engine, or applying an external power source, and may be utilized in place

of the individual avionics equipment switches.

AMMETER

The ammeter, located adjacent to the oil pressure gage, indicates the amount 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.

ALTERNATOR CONTROL UNIT AND LOW-VOLTAGE WARNING LIGHT

The airplane is equipped with a combination alternator regulator high-low voltage control unit mounted on the engine side of the firewall and a red warning light, labeled LOW VOLTAGE, on the left side of the instrument panel below the oil temperature gage.

In the event an over-voltage condition occurs, the alternator control unit automatically removes alternator field current which shuts down the alternator. The battery will then supply system current as shown by a discharge rate on the ammeter. Under these conditions, depending on electrical system load, the low-voltage warning light will illuminate when system voltage drops below normal. The alternator control unit 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 practicable.

NOTE

Illumination of the low-voltage light and ammeter discharge indications may occur during low RPM conditions with an electrical load on the system, such as during a low RPM taxi. Under these conditions, the light will go out at higher RPM. The master switch need not be recycled since an over-voltage condition has not occurred to de-activate the alternator system.

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

CIRCUIT BREAKERS AND FUSES

Most of the electrical circuits in the airplane are protected by "push-to-reset" type circuit breakers mounted on the left side of the switch and control panel. However, alternator output is protected by a "pull-off" type circuit breaker. In addition to the individual circuit breakers, a toggle switch/circuit breaker, labeled AVIONICS POWER, on the left side of the switch and control panel also protects the avionics systems. The cigar lighter is protected by a manually-reset type circuit breaker on the back of the lighter, and a fuse behind the instrument panel. The control wheel map light (if installed) is protected by the NAV LT circuit breaker and a fuse behind the instrument panel. Electrical circuits which are not protected by circuit breakers are the battery contactor closing (external power) circuit, clock circuit, and flight hour recorder circuit. These circuits are protected by fuses mounted adjacent to the battery.

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 electrical and electronic equipment. Details of the ground service plug receptacle are presented in Section 9, Supplements.

LIGHTING SYSTEMS

EXTERIOR LIGHTING

Conventional navigation lights are located on the wing tips and top of the rudder. Dual landing/taxi lights are installed in the cowl nose cap. Additional lighting is available and includes a flashing beacon mounted on top of the vertical fin, a strobe light on each wing tip, and a courtesy light recessed into the lower surface of each wing slightly outboard of the cabin doors. Details of the strobe light system are presented in Section 9, Supplements. The courtesy lights are operated by the DOME LIGHTS switch located on the overhead console; push the switch to the right to turn the lights on. The remaining exterior lights are operated by rocker

switches on the left switch and control panel; push the rocker up to the ON 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.

INTERIOR LIGHTING

Instrument panel and switch and control panel lighting is provided by flood lighting, integral lighting, and post lighting (if installed). Lighting intensity is controlled by a dual light dimming rheostat equipped with an outer knob labeled PANEL LT, and an inner knob labeled RADIO LT, located below the throttle. A slide-type switch (if installed) on the overhead console, labeled PANEL LIGHTS, is used to select flood lighting in the FLOOD position, post lighting in the POST position, or a combination of post and flood lighting in the BOTH position.

Instrument panel and switch and control panel flood lighting consists of a single red flood light in the forward edge of the overhead console. To use flood lighting, move the slide switch in the overhead console, labeled PANEL LIGHTS, to the FLOOD position and rotate the outer knob on the light dimming rheostat, labeled PANEL LT, clockwise to the desired light intensity.

Post lights (if installed) are mounted at the edge of each instrument and provide direct lighting. To use post lighting, move the slide switch in the overhead console, labeled PANEL LIGHTS, to the POST position and rotate the outer knob on the light dimming rheostat, labeled PANEL LT, clockwise to obtain the desired light intensity. When the PANEL LIGHTS switch is placed in the BOTH position, the flood lights and post lights will operate simultaneously.

The radio equipment, magnetic compass and engine instrument cluster (when post lights are installed) have integral lighting and operate independently of post or flood lighting. The intensity of this lighting is controlled by the inner knob on the light dimming rheostat labeled RADIO LT; rotate the knob clockwise to obtain the desired light intensity. However, for daylight operation, the compass and engine instrument lights may be turned off while still maintaining maximum light intensity for digital readouts in the radio equipment. This is accomplished by rotating the RADIO LT knob full counterclockwise. Check that the flood lights/post lights are turned off for daylight operation by rotating the PANEL LT knob full counterclockwise.

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

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 LT switch; then adjust the map light's intensity with the knurled disk type rheostat control located at the bottom of the control wheel.

A doorpost map light is located on the left forward doorpost. It contains both red and white bulbs and may be positioned to illuminate any area desired by the pilot. The light is controlled by a switch, below the light, which is labeled RED, OFF, and WHITE. Placing the switch in the top position will provide a red light. In the bottom position, standard white lighting is provided. In the center position, the map light is turned off. Red light intensity is controlled by the outer knob on the light dimming rheostat labeled PANEL LT.

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 (white 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 by manipulation of the push-pull CABIN HT and CABIN AIR control knobs (see figure 7-8).

For cabin ventilation, pull the CABIN AIR knob out. To raise the air temperature, pull the CABIN HT knob out approximately 1/4 to 1/2 inch for a small amount of cabin heat. Additional heat is available by pulling the knob out farther; maximum heat is available with the CABIN HT knob pulled out and the CABIN AIR knob pushed full in. When no heat is desired in the cabin, the CABIN HT knob is pushed full in.

Front cabin heat and ventilating air is supplied by outlet holes spaced across a cabin manifold just forward of the pilot's and copilot's feet. Rear cabin heat and air is supplied by two ducts from the manifold, one extending down each side of the cabin to an outlet at the front doorpost at floor level. Windshield defrost air is supplied by two ducts leading from the cabin manifold to outlets near the lower edge of the windshield. Two knobs control sliding valves in either defroster outlet to permit regulation of defroster airflow.

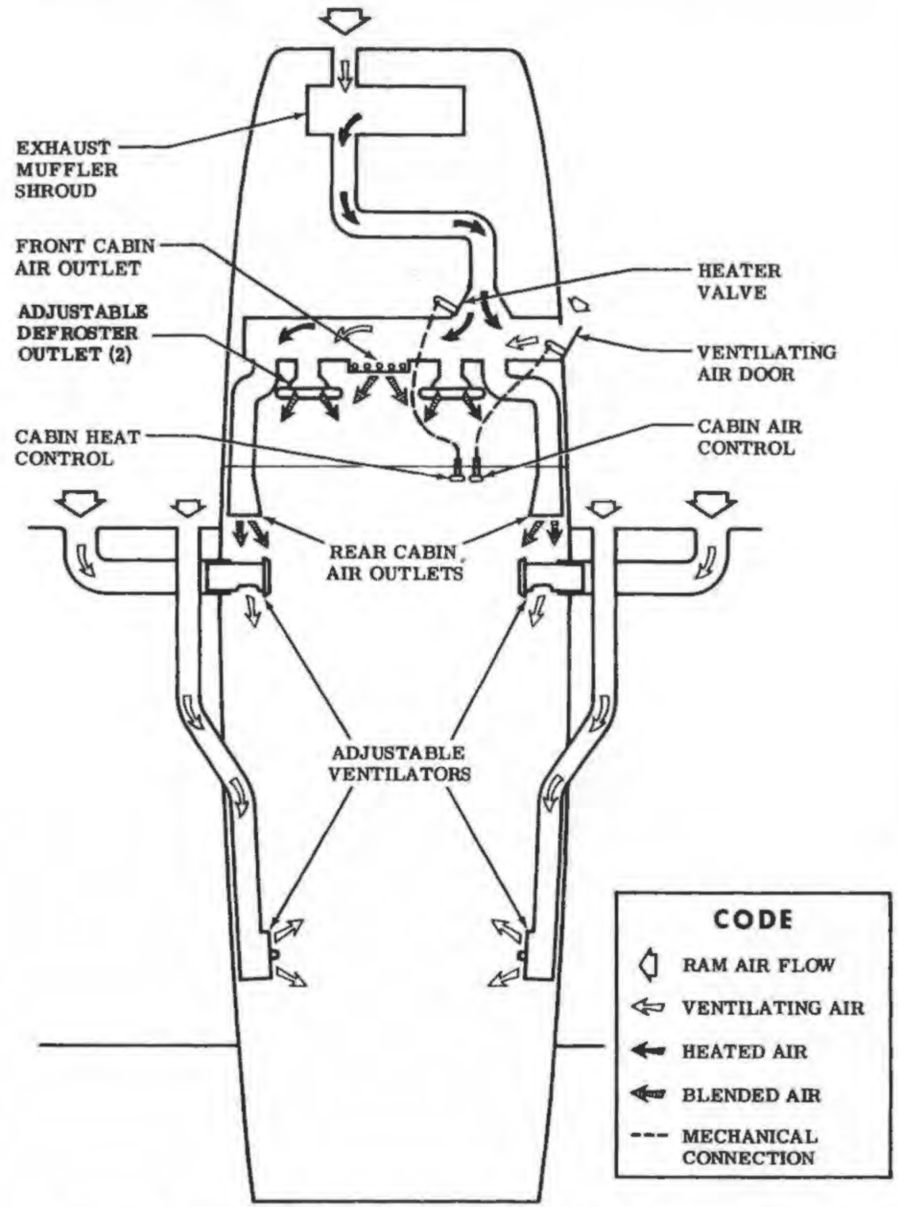


Figure 7-8. Cabin Heating, Ventilating, and Defrosting System

Separate adjustable ventilators supply additional air; one near each upper corner of the windshield supplies air for the pilot and copilot, and two ventilators are available for the rear cabin area to supply air to the rear seat passengers.

PITOT-STATIC SYSTEM AND INSTRUMENTS

The pitot-static system supplies ram air pressure to the airspeed indicator and static pressure to the airspeed indicator, vertical speed indicator and altimeter. The system is composed of either an unheated or heated pitot tube mounted on the lower surface of the left wing, two external static ports on the lower left and right sides of the forward fuselage, and the associated plumbing necessary to connect the instruments to the sources.

The heated pitot system (if installed) consists of a heating element in the pitot tube, a rocker switch labeled PITOT HT, a 5-amp circuit breaker, and associated wiring. The switch and circuit breaker are located on the left side of the switch and control panel. When the pitot beat switch is turned on, the element in 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 may be installed on the switch and control panel below the throttle, and can be used if the external static source is malfunctioning. This valve supplies static pressure from inside the cabin instead of the external static ports.

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

Pressures within the cabin will vary with heater/vents opened or closed. Refer to Sections 3 and 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. Limitation and range markings (in KIAS) include the white arc (38 to 85 knots), green arc (48 to 129 knots), yellow arc (129 to 163 knots), and a red line (163 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 air 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 the pressure altitude on the altimeter. Be sure to return the altimeter barometric scale to the original barometric setting after pressure altitude has been obtained. Having set the ring to correct for altitude and temperature, read the true airspeed shown on the rotatable ring by the indicator pointer. For best accuracy, the indicated airspeed should be corrected to calibrated airspeed by referring to the Airspeed Calibration chart in Section 5. Knowing the calibrated airspeed, read true airspeed on the ring opposite the calibrated airspeed.

VERTICAL SPEED INDICATOR

The vertical speed 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 the static source.

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) 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 panel, and instruments (including a suction gage) on the left side of the instrument panel.

ATTITUDE INDICATOR

The attitude indicator gives a visual indication of flight attitude. Bank attitude is presented by a pointer at the top of the indicator relative to the bank scale which has index marks at 10°, 20°, 30°, 60°, and 90° either side of the center mark. Pitch and roll attitudes are presented by a miniature airplane superimposed over a symbolic horizon area divided into two sections by a white horizon bar. The upper "blue sky" area and the lower "ground" area have arbitrary pitch reference lines useful for pitch attitude control. A knob at the bottom of the instrument is provided for in-flight

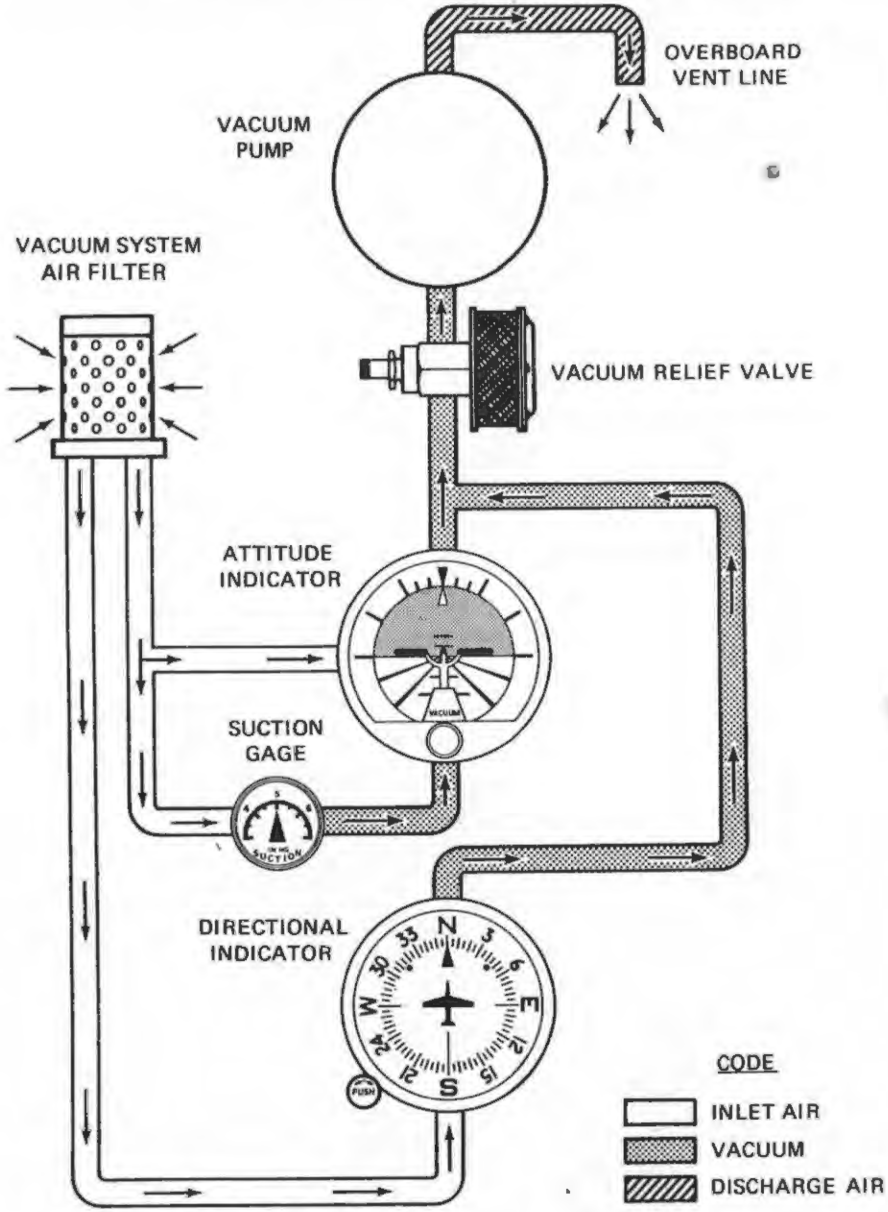


Figure 7-9. Vacuum System

adjustment of the miniature airplane to the horizon bar for a more accurate flight attitude indication.

DIRECTIONAL INDICATOR

A directional indicator displays airplane heading on a compass card in relation to a fixed simulated airplane image and index. The indicator will process 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 precession.

SUCTION GAGE

The suction gage, located on the left side of the instrument panel above the fuel gages, is calibrated in inches of mercury and indicates suction available for operation of the attitude and directional indicators. The desired suction range is 4.5 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 not be considered reliable.

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, an 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 suction. A sound from the warning horn will confirm that the system is operative.

AVIONICS SUPPORT EQUIPMENT

If the airplane is equipped with avionics, various avionics support equipment may also be installed. Equipment available includes two types of audio control panels, microphone-headset installations and control surface static dischargers. The following paragraphs discuss these items. Description and operation of radio equipment is covered in Section 9 of this handbook.

AUDIO CONTROL PANEL

Two types of audio control panels (see figure 7-10) are available for this airplane, depending upon how many transmitters are included. The operational features of both audio control panels are similar and are discussed in the following paragraphs.

TRANSMITTER SELECTOR SWITCH

When the avionics package includes a maximum of two transmitters, a two-position toggle-type switch, labeled XMTR, is provided to switch the microphone to the transmitter the pilot desires to use. If the airplane avionics package includes a third transmitter, the transmitter selector switch is a three-position rotary-type switch, labeled XMTR SEL. The numbers 1, 2, or 1, 2 and 3 adjacent to the selector switches correspond to the first, second and third (from top to bottom) transmitters in the avionics stack. To select a transmitter, place the transmitter selector switch in the position number corresponding to the desired transmitter.

The action of selecting a particular transmitter using the transmitter selector switch simultaneously selects the audio amplifier associated with that transmitter to provide speaker audio. For example, if the number one transmitter is selected, the audio amplifier in the number one NAV/COM is also selected and is used for ALL speaker audio. In the event the audio amplifier in use fails, as evidenced by loss of all speaker audio, selecting an alternate transmitter will reestablish speaker audio using the alternate transmitter audio amplifier. Headset audio is not affected by audio amplifier operation.

AUDIO SELECTOR SWITCHES

Both audio control panels (see figure 7-10) incorporate three-position toggle-type audio selector switches for individual control of the audio from systems installed in the airplane. These switches allow receiver audio to be directed to the airplane speaker or to a headset, and heard singly or in combination with other receivers. To hear a particular receiver on the airplane speaker, place that receiver's audio selector switch in the up (SPEAKER) position. To listen to a receiver over a headset, place that receiver's audio selector switch in the down (PHONE) position. The center (OFF) position turns off all audio from the associated receiver.

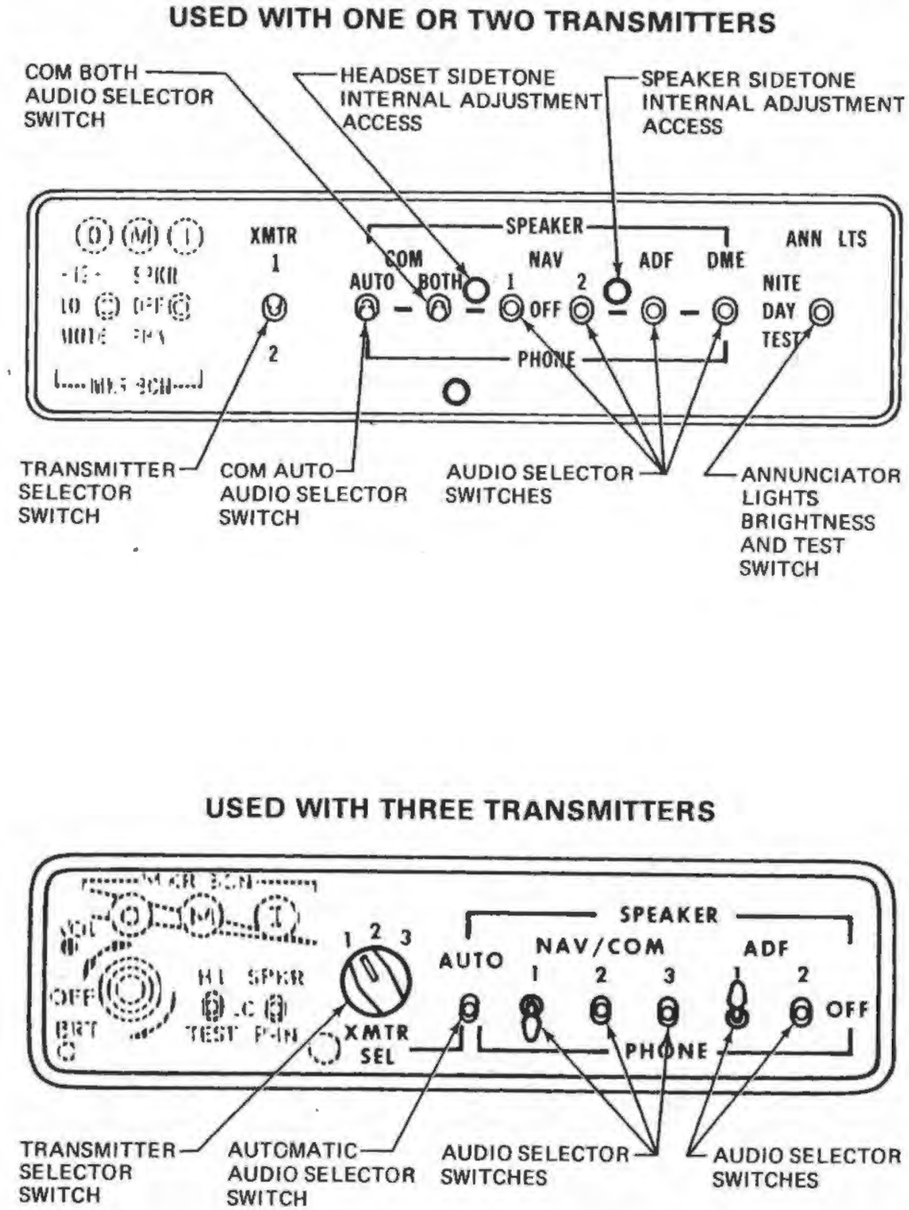


Figure 7-10. Audio Control Panel

NOTE

Volume level is adjusted using the individual receiver volume controls on each radio.

A special feature of the audio control panel used when one or two transmitters are installed is separate control of NAV and COM audio from the NAV/COM radios. With this installation, the audio selector switches labeled NAV, 1 and 2 select audio from the navigation receivers of the NAV/COM radios only. Communication receiver audio is selected by the switches labeled COM, AUTO and BOTH. Description and operation of these switches is described in later paragraphs.

When the audio control panel for three transmitters is installed, audio from both NAV and COM frequencies is combined, and is selected by the audio selector switches labeled NAV/COM, 1, 2 and 3.

COM AUTO AUDIO SELECTOR SWITCH

The audio control panel used with either one or two transmitters incorporates a three-position toggle switch, labeled COM AUTO, which is provided to automatically match the audio of the appropriate NAV/COM communications receiver to the transmitter selected by the transmitter selector switch. When the COM AUTO selector switch is placed in the up (SPEAKER) position, audio from the communications receiver selected by the transmitter selector switch will be heard on the airplane speaker. Switching the transmitter selector switch to the other transmitter automatically switches the other communications receiver audio to the speaker. This automatic audio switching feature may also be utilized when listening on a headset by placing the COM AUTO switch in the down (PHONE) position. If automatic audio selection is not desired, the COM AUTO selector switch should be placed in the center (OFF) position.

COM BOTH AUDIO SELECTOR SWITCH

The audio control panel used with either one or two transmitters incorporates a three-position toggle switch, labeled COM BOTH, which is provided to allow both COM receivers to be monitored at the same time. For example, if the COM AUTO switch is in the SPEAKER position, with the transmitter selector switch in the number one transmitter position, number one communications receiver audio will be heard on the airplane speaker. If it is also desired to monitor the number two communications receiver audio without changing the position of the transmitter selector switch, place the COM BOTH selector switch in the up (SPEAKER) position so that the number two communications receiver audio will be heard in addition to the number one communications receiver audio. This feature can also be used when listening on a headset by placing the COM

BOTH audio selector switch in the down (PHONE) position.

NOTE

The combination of placing the COM AUTO switch in the SPEAKER position and the COM BOTH switch in the PHONE position (or vice versa) is not normally recommended as it will cause audio from both communications receivers (and any other navigation receiver with its audio selector switch in the PHONE position) to be heard on both the airplane speaker and the headset simultaneously.

AUTO AUDIO SELECTOR SWITCH

The audio control panel used with three transmitters incorporates a three-position toggle switch, labeled AUTO, which is provided to automatically match the audio of the appropriate NAV/COM receiver to the selected transmitter. To utilize this automatic feature, leave all NAV/COM audio selector switches in the center (OFF) 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 then 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 center (OFF) position.

NOTE

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

ANNUNCIATOR LIGHTS BRIGHTNESS AND TEST SWITCH

The audio control panel used with either one or two transmitters incorporates a three-position toggle-type switch to control the brightness level of the marker beacon indicator lights (and certain other annunciator lights associated with avionics equipment). When the switch is placed in the center (DAY) position, the indicator lights will show full bright. When this switch is placed in the up (NITE) position, the lights are set to a reduced level for typical night operations and can be further adjusted using the RADIO LT dimming rheostat knob. The down (TEST) position illuminates all lamps (except the ARC light in the NAV indicators) which are controlled by the switch to the full bright level to verify lamp operation.

SIDETONE OPERATION

Cessna radios are equipped with sidetone capability (monitoring of the operator's own voice transmission). While adjusting sidetone, be aware that if the sidetone volume level is set too high, audio feedback (squeal) may result when transmitting.

When the airplane has one or two transmitters, sidetone is provided in both the speaker and headset anytime the COM AUTO selector switch is utilized. Placing the COM AUTO selector switch in the OFF position will eliminate sidetone. Sidetone internal adjustments are available to the pilot through the front of the audio control panel (see figure 7-10). Adjustment can be made by removing the appropriate plug-button from the audio control panel (left button for headset adjustment and right button for speaker adjustment), inserting a small screwdriver into the adjustment potentiometer and rotating it clockwise to increase the sidetone volume level.

When the airplane has three transmitters, sidetone will be heard on either the speaker or a headset as selected with the AUTO selector switch. Sidetone may be eliminated by placing the AUTO selector switch in the OFF position, and utilizing the individual audio selector switches. Adjustment of speaker and headset sidetone volume can only be accomplished by adjusting the sidetone potentiometers located inside the audio control panel.

NOTE

Sidetone is not available on HF transceivers (Type PT10-A and ASB-125), when installed.

MICROPHONE-HEADSET INSTALLATIONS

Three types of microphone-headset installations are offered. The standard system provided with avionics equipment includes a hand-held microphone and separate headset. The keying switch for this microphone is on the microphone. Two optional microphone-headset installations are also available; these feature a single-unit microphone-headset combination which permits the pilot to conduct radio communications without interrupting other control operations to handle a hand-held microphone. One microphone-headset combination is offered without a padded headset and the other version has a padded headset. The microphone-headset combinations utilize a remote keying switch located on the left grip of the pilot's control wheel. The microphone and headset jacks are located near

the lower left corner of the instrument panel. Audio to all three headsets is controlled by the individual audio selector switches and adjusted for volume level by using the selected receiver volume controls.

NOTE

When transmitting, the pilot should key the microphone, place the microphone as close as possible to the lips and speak directly into it.

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 wings, rudder, elevator, propeller tips and radio antennas can result in loss of usable radio signals on all communications and navigation radio equipment. Usually the ADF is first to be affected and VHF communication equipment is the last to be affected.

Installation of static dischargers reduces interference from precipitation static, but it is possible to encounter severe precipitation static conditions which might cause the loss of radio signals, even with static dischargers 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
AIRPLANE HANDLING, SERVICE & MAINTENANCE

TABLE OF CONTENTS

INTRODUCTION

This section contains factory-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 Number (TC) can be found on the Identification Plate, located on the lower part of the left forward doorpost. Located adjacent to the Identification Plate 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 the 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 AND FAA APPROVED AIRPLANE FLIGHT MANUAL
- AVIONICS OPERATION GUIDE
- PILOT'S CHECKLISTS
- POWER COMPUTER
- CUSTOMER CARE DEALER DIRECTORY
- DO'S AND DON'TS ENGINE BOOKLET

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

- INFORMATION MANUAL (Contains Pilot's Operating Handbook Information)
- SERVICE MANUALS AND PARTS CATALOGS FOR YOUR:
  - AIRPLANE
  - ENGINE AND ACCESSORIES
  - 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 to place an order for any item which is not in stock.

NOTE

A Pilot's Operating Handbook and FAA Approved Airplane Flight Manual which is lost or destroyed may be replaced by contacting your Cessna Dealer or writing directly to the Customer Services Department, Cessna Aircraft Company, Wichita, Kansas. An affidavit containing the owner's name, airplane serial number and registration number must be included in replacement requests since the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual is identified for specific airplanes only.

AIRPLANE FILE

There are miscellaneous data, information and licenses that are a part of the airplane file. The following is a checklist for that file. In addition, a periodic check should be made of the latest Federal Aviation Regulations to ensure that all data requirements are met.

A. To be displayed in the airplane at all times:
   1. Aircraft Airworthiness Certificate (FAA Form 8100-2).
   2. Aircraft Registration Certificate (FAA Form 8050-3).
   3. Aircraft Radio Station License, if transmitter installed (FCC Form 556).

B. To be carried in the airplane at all times:
   1. Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.
   2. Weight and Balance, and associated papers (latest copy of the Repair and Alteration Form, FAA Form 337, if applicable).
   3. Equipment List.

C. To be made available upon request:
   1. Airplane Log Book.
   2. Engine Log Book.

Most of the items listed are required by the United States Federal Aviation Regulations. Since the Regulations of other nations may require other documents and data, owners of airplanes not registered in the United States should check with their own aviation officials to determine their individual requirements.

Cessna recommends that these items, plus the Pilot's Checklists, Power Computer, Customer Care Program book 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 the work load to be divided into smaller operations that can be accomplished in shorter time periods.

The CESSNA PROGRESSIVE CARE PROGRAM has been developed to provide a modern progressive inspection schedule that satisfies the complete airplane inspection requirements of both the 100 HOUR and ANNUAL inspections as applicable to Cessna airplanes. 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 factory-recommended inspection intervals and maintenance procedures.

CESSNA PROGRESSIVE CARE

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

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

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 that 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 you to an initial inspection and either a Progressive Care Operation No. 1 or the first 100-hour inspection within the first 6 months of ownership at no charge to you. If you take delivery from your Dealer, the initial inspection will have been performed before delivery of the airplane to you. If you pick up your airplane at the factory, plan to take it to your Dealer reasonably soon after you take delivery, so the initial inspection may be performed allowing the

Dealer to make any minor adjustments which may be necessary.

You will also want to return to your Dealer either at 50 hours for your first Progressive Care Operation, or at 100 hours for your first 100-hour inspection depending on which program you choose to establish for your airplane. While these important inspections will be performed for you by any Cessna Dealer, in most cases you will prefer to have the Dealer from whom you purchased the airplane accomplish this work.

PILOT CONDUCTED PREVENTIVE MAINTENANCE

A certified pilot who owns or operates an airplane not 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 operations 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 alterations 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 30° 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 the 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 may freeze the brakes, or when the brakes are overheated. 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 the 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 wing, tail, and nose tie-down fittings and secure each rope or chain to a ramp tie-down.
4. 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 required.

Individual main gear may be jacked by using the jack pad which is incorporated in the main landing gear strut step bracket. When using the individual gear strut jack pad, 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 the individual main gear jack pads.

If nose gear maintenance is required, the nose wheel may be raised off the ground by pressing down on a tailcone bulkhead, just forward of the horizontal stabilizer, and allowing the tail to rest on the tail tie-down ring.

NOTE

Do not apply pressure on the elevator or outboard stabilizer 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

horizontal stabilizer, 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 located on the left side of the tailcone. Deflate the nose tire and/or lower or raise the nose strut to properly center the bubble in the level. Corresponding points on both upper door sills may be 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 operational 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 flown for 30 minutes or a ground runup should be made 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 -- Aviation Grade SAE 20W-50 or SAE 50 above 40°F (4°C).
Aviation Grade SAE 20W-50 or SAE 30 below 40°F (4°C).
Multi-viscosity oil with a range of SAE 20W-50 is recommended for improved starting in cold weather. Ashless dispersant oil, conforming to Continental Motors Specification MHS-24 (and all revisions thereto), **must be used**.

NOTE

Your Cessna was delivered from the factory with a corrosion preventive aircraft engine oil. If oil must be added during the first 25 hours, use only aviation grade straight mineral oil conforming to Specification No. MIL-L-6082.

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

OIL AND OIL FILTER CHANGE --
After the first 25 hours of operation, drain engine oil sump and replace filter. 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 replace the filter each 50 hours thereafter. The oil change interval may be extended to 100-hour intervals, providing the oil filter is changed at 50-hour intervals. Change engine oil at least every 6 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.

NOTE

During the first 25-hour oil and filter change, a general inspection of the overall engine compartment is required. Items which are not normally checked during a preflight inspection should be given special attention. Hoses, metal lines and fittings should be inspected for signs of oil and fuel leaks, and checked for abrasions, chafing, security, proper routing and support, and evidence of deterioration. Inspect the intake and exhaust systems for cracks, evidence of leakage, and security of attachment. Engine controls and linkages should be checked for freedom of movement through their full range, security of attachment, and evidence of wear. Inspect wiring for security, chafing, burning, defective insulation, loose or broken terminals, heat deterioration, and corroded terminals. A periodic check of these items during subsequent servicing operations is recommended.

FUEL

APPROVED FUEL GRADES (AND COLORS) --
100LL Grade Aviation Fuel (Blue).
100 (Formerly 100/130) Grade Aviation Fuel (Green).

NOTE

Isopropyl alcohol or ethylene glycol monomethyl ether may be added to the fuel supply in quantities not to exceed 1% or .15% by volume, respectively, of the total. Refer to Fuel Additives in later paragraphs for additional information.

CAPACITY EACH STANDARD TANK -- 26 Gallons.
CAPACITY EACH LONG RANGE TANK -- 34 Gallons.

NOTE

To ensure maximum fuel capacity when refueling and minimize cross-feeding when parked on a sloping surface, place the fuel selector valve in either LEFT or RIGHT position.

NOTE

Service the fuel system after each flight, and keep fuel tanks full to minimize condensation in the tanks.

FUEL ADDITIVES --

Strict adherence to recommended preflight draining instructions as called for in Section 4 will eliminate any free water accumulations from the tank sumps. While small amounts of water may still remain in solution in the gasoline, it will normally be consumed and go unnoticed in the operation of the engine.

One exception to this can be encountered when operating under the combined effect of: (1) use of certain fuels, with (2) high humidity conditions on the ground (3) followed by flight at high altitude and low temperature. Under these unusual conditions, small amounts of water in solution can precipitate from the fuel stream and freeze in sufficient quantities to induce partial icing of the engine fuel system.

While these conditions are quite rare and will not normally pose a problem to owners and operators, they do exist in certain areas of the world and consequently must be dealt with, when encountered.

Therefore, to alleviate the possibility of fuel icing occurring under these unusual conditions, it is permissible to add isopropyl alcohol or ethylene glycol monomethyl ether (EGME) compound to the fuel supply.

The introduction of alcohol or EGME compound into the fuel provides two distinct effects: (1) it absorbs the dissolved water from the gasoline and (2) alcohol has a freezing temperature depressant effect.

Alcohol, if used, is to be blended with the fuel in a concentration of 1% by volume. Concentrations greater than 1% are not recommended since they can be detrimental to fuel tank materials.

The manner in which the alcohol is added to the fuel is significant because alcohol is most effective when it is completely dissolved in the fuel. To ensure proper mixing, the following is recommended:

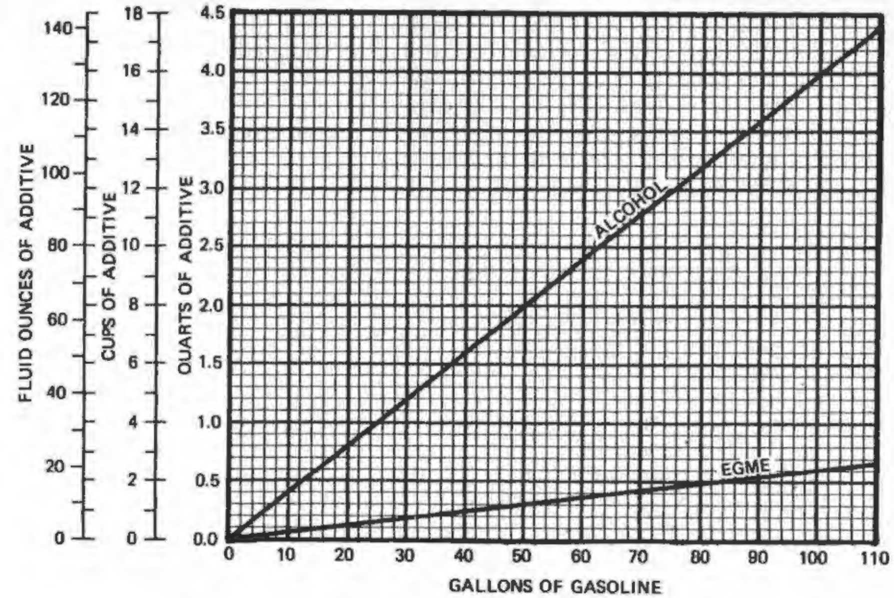


Figure 8-1. Additive Mixing Ratio

1. For best results, the alcohol should be added during the fueling operation by pouring the alcohol directly on the fuel stream issuing from the fueling nozzle.

2. An alternate method that may be used is to premix the complete alcohol dosage with some fuel in a separate clean container (approximately 2-3 gallon capacity) and then transferring this mixture to the tank prior to the fuel operation.

Any high quality isopropyl alcohol may be used, such as Anti-Icing Fluid (MIL-F-5566) or Isopropyl Alcohol (Federal Specification TT-I-735a). Figure 8-1 provides alcohol-fuel mixing ratio information.

Ethylene glycol monomethyl ether (EGME) compound, in compliance with MIL-I-27686 or Phillips PFA-55MB, if used, must be carefully mixed with the fuel in concentrations not to exceed .15% by volume. Figure 8-1 provides EGME-fuel mixing ratio information.

CAUTION

Mixing of the EGME compound with the fuel is extremely important because a concentration in excess of that recommended (.15% by volume maximum) will result in detrimental effects to the fuel tanks, such as deterioration of protective primer and sealants and damage to O-rings and seals in the fuel system and engine components. Use only blending equipment that is recommended by the manufacturer to obtain proper proportioning.

CAUTION

Do not allow the concentrated EGME compound to come in contact with the airplane finish or fuel cell as damage can result.

Prolonged storage of the airplane will result in a water buildup in the fuel which "leeches out" the additive. An indication of this is when an excessive amount of water accumulates in the fuel tank sumps. The concentration can be checked using a differential refractometer. It is imperative that the technical manual for the differential refractometer be followed explicitly when checking the additive concentration.

LANDING GEAR

NOSE WHEEL TIRE PRESSURE -- 45 PSI on 5.00-5, 6-Ply Rated Tire.
MAIN WHEEL TIRE PRESSURE -- 38 PSI on 6.00-6, 6-Ply Rated Tires.
NOSE GEAR SHOCK STRUT --
Keep filled with MIL-H-5606 hydraulic fluid and inflated with air to 45 PSI. Do not over-inflate.

CLEANING AND CARE

WINDSHIELD-WINDOWS

The plastic windshield and windows should be 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 can be cleaned with soft cloths moistened with Stoddard solvent to remove oil and grease.

NOTE

Never use gasoline, benzine, alcohol, acetone, fire extin-

guisher or anti-ice fluid, lacquer 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 a dry cloth since this builds up an electrostatic charge which attracts dust. Waxing with a good commercial wax will finish the cleaning job. A thin, even coat of wax, polished out by hand with clean 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 10 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 and 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 of wax 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. Isopropyl alcohol will satisfactorily remove ice accumulations without damaging the paint. 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, may result in cracks. Never use an alkaline cleaner on the blades; remove grease and dirt with 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 dirt from the upholstery and carpet, clean the interior regularly with a vacuum cleaner.

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

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

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)

TABLE OF CONTENTS

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. As listed in the Table of Contents, the supplements are classified under the headings of major configuration variations, general and avionics, and have been provided with reference numbers. Also, the supplements are arranged alphabetically and numerically to make it easier to locate a particular supplement. Other routinely installed items of optional equipment, whose function and operational procedures do not require detailed instructions, are discussed in Section 7.

Limitations contained in the following supplements are FAA approved. Observance of these operating limitations is required by Federal Aviation Regulations.

SUPPLEMENT

CIRCULATION FAN SYSTEM

SECTION 1
GENERAL

The circulation fan system provides cabin ventilation during ground operations, and a better distribution of cabin air to the passengers during flight operations. The system control is located on the control pedestal, and consists of a rotary control knob, labeled CIRCULATION FAN. The control knob rotates clockwise from OFF through three positions labeled LOW, MED, and HI, providing three blower speeds. System electrical protection is provided by a 5-amp circuit breaker, labeled CIR FAN, on the left side of the switch and control panel.

Additional system components (see figure 1) include a circulation fan and motor located above the extended baggage compartment, system ducting, and four fully adjustable outlets above the cabin side windows. The circulation fan and motor includes an electric motor, equipped with an output shaft on each end, attached to squirrel-cage type blowers within blower housings which provide airflow through the ducts to the cabin outlets.

The volume of airflow through the cabin outlets is controlled by the rotary knob on the control pedestal; adjustable louvers on each outlet control the direction of airflow.

SECTION 2
LIMITATIONS

There is no change to the airplane limitations when the circulation fan system is installed.

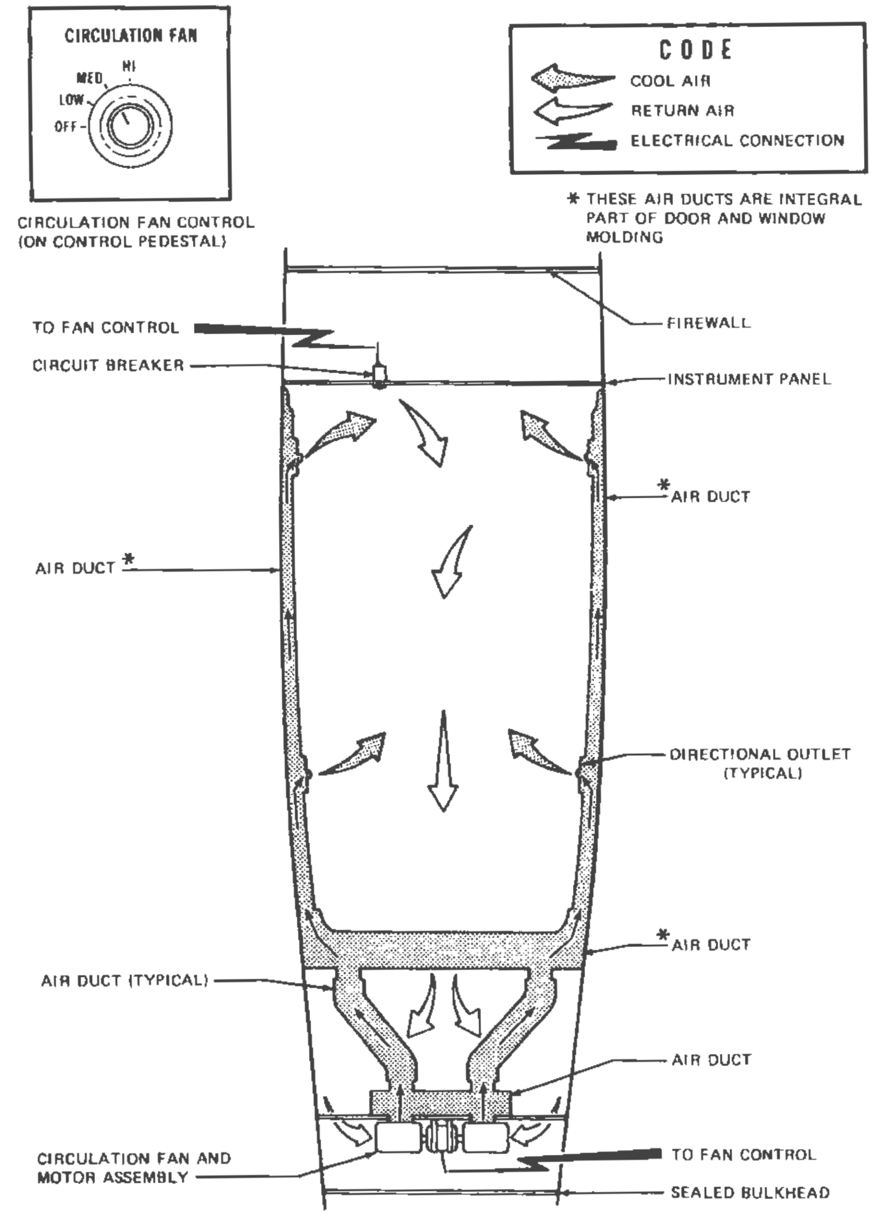


Figure 1. Circulation Fan System

SECTION 3
EMERGENCY PROCEDURES

There is no change to the airplane emergency procedures when the circulation fan system is installed.

SECTION 4
NORMAL PROCEDURES

PREFLIGHT INSPECTION

In hot weather during the preflight (walk-around) inspection, open both cabin doors to aid in cool-down of the cabin before flight.

OPERATION ON GROUND

After preflight inspection and engine start, use the following procedures for best utilization of the system prior to flight.

1. Cabin Window(s) -- OPEN.
2. Cabin Air Control Knob -- PULL OUT.
3. Wing Root Ventilators -- OPEN.
4. CIRCULATION FAN Control Knob -- HI.

BEFORE TAKEOFF

1. Cabin Window(s) -- CLOSED AND LOCKED.

OPERATION IN FLIGHT

The inflight operation of the circulation fan system is basically the same as for ground operation. The cabin air control knob, wing root ventilators, and the circulation fan control knob may be adjusted, as required to provide the desired cabin ventilation.

After landing, the cabin window(s) may be open while taxiing to the tie-down area or ramp to help ventilate the cabin.

SECTION 5
PERFORMANCE

There is no change to the airplane performance when the circulation fan system is installed.

Brad E. Isham
P.O. Box 193
Valley Center, Kansas 67147
(316) 755-0713

FAA APPROVED
AIRPLANE FLIGHT MANUAL SUPPLEMENT
FOR
CESSNA R172K
WITH
BRAD E. ISHAM 210 HORSEPOWER MODIFICATION INSTALLED

Registration Number VH - YPM

Serial Number R1723306

This supplement must be included in Section 9 of the pilot's operating handbook and FAA approved Airplane Flight Manual dated July 1, 1978 or subsequent reissue date when Brad E. Isham 210 brake horsepower (BHP) engine installation is installed in accordance with STC's SE1436CE for the engine, and SA1437CE for the airplane (use of engine and optional Model P-1000 tachometer). The information contained herein supplements or supersedes the basic manual only in those areas listed herein. For limitations, procedures and performance information not contained in this supplement, consult the basic airplane flight manual.

Aircraft Certification Office
Federal Aviation Administration
Wichita, Kansas

FAA Approved: [signature]
Everett W. Pittman, Manager
Date: October 17, 1978
Revision Date: August 4, 2000

Brad E. Isham
P.O. Box 193
Valley Center, Kansas 67147
(316) 755-0713

FAA APPROVED
AIRPLANE FLIGHT MANUAL SUPPLEMENT
FOR
CESSNA R172K
WITH

Isham STC

LOG OF REVISIONS

Revision Number	Pages Affected	Description of Change	Date of Revision	Approved by*
-	all	Original	10/17/78	R.G. Puckett
A	2	Added Floatplane	01/28/82	G.M. Baker
B	all	Reformatted, added revision page, changed address, added engine model designation, revised signature block.	01/28/91	G.M. Baker
C	all	Revised basic manual pages 1 through 4 to an electronic media format, consistency, and added P-1000 Tachometer as Appendix 1 pages 1 through 8.	08/04/00	

* For, Manager, Wichita Aircraft Certification Office

SECTION 1. GENERAL:

This modification consists of two Supplemental Type Certificates (STC). STC SE1436CE allows modification of the Continental IO-360-K and IO-360-KB engine to run at 210 horsepower for takeoff. STC SA1437CE allows use of the modified engine in the Cessna R172K airplanes. If the airplane is equipped with the Horizon Instruments, Inc. P-1000 Digital Tachometer refer to Appendix 1 of this AFMS.

SECTION 2. LIMITATIONS:

Engine Model Number: IO-360-KC/SE1436CE or IO-360-KBC/SE1436CE

Engine Operating Limits for takeoff and continuous operations:
- Takeoff Power -- 5minutes – Full Throttle, 2800 RPM (210 BHP)
- Maximum Continuous Power -- 2600 RPM (195BHP)
- Propeller Blade Angle at 30 inch station:
  - Landplane -- Low 9.7 degrees
  - Floatplane – Low 9.8 degrees

Powerplant Markings:
- Tachometer
  - 2200 through 2600 -- green arc
  - 2601 through 2800 -- yellow arc
  - 2801 -- red radial line
- Fuel Flow:
  - 3 psi - red radial line
  - 4.5 through 11.5 gal/hr -- green arc
  - 18 gal/hr (18.55 psi) – red radial line
- Placards.
  - Adjacent to existing fuel flow placard:

FUEL FLOW
FULL THROTTLE AND 2800 RPM

SL.	17 GPH
4000 FT.	15 GPH
8000 FT.	13 GPH
12000 FT.	11 GPH

FAA Approved
Date: October 17, 1978
Revision A: January 28, 1982
Revision B: January 28, 1991
Revision C: August 4, 2000

SECTION 3. EMERGENCY PROCEDURES -- No Change

SECTION 4. NORMAL PROCEDURES:

Takeoff:

Power -- Full Throttle and 2800 RPM

SECTION 5. PERFORMANCE:

The performance of this airplane equipped with STC SE1436CE and SA1437CE is equal to or better than the performance as listed in the original FAA approved Airplane Flight Manual.

SECTION 6. EQUIPMENT LIST -- No Change

SECTION 7. AIRPLANE & SYSTEMS DESCRIPTIONS -- No Change

SECTION 8. AIRPLANE HANDLING SERVICE & MANITENANCE -- No Change

FAA Approved
Date: October 17, 1978
Revision A: January 28, 1982
Revision B: January 28, 1991
Revision C: Auoust 4. 2000

SECTION 1. GENERAL:

This modification consists of two Supplemental Type Certificates (STC). STC SE1436CE allows modification of the Continental IO-360-K and IO-360-KB engine to run at 210 horsepower for takeoff. STC SA1437CE allows use of the modified engine and the Horizon Instruments, Inc. Model P-1000 Tachometer in the Cessna R172K airplanes.

SECTION 2. LIMITATIONS:

Engine Model Number: IO-360-KC/SE1436CE or
IO-360-KBC/SE1436CE

Engine Operating Limits for takeoff and continuous operations:

Takeoff Power -- 5minutes -- Full Throttle, 2800 RPM (210 BHP)
Maximum Continuous Power -- 2600 RPM (195BHP)
Propeller Blade Angle at 30 inch station:
Landplane -- Low 9.7 degrees
Floatplane -- Low 9.8 degrees

Powerplant Markings:

Tachometer RPM ARC Placarding:
RESTRICTED: 2801+
CAUTION: 2601 -- 2800
NORMAL: 2200 -- 2600

The face of the Tachometer is placarded with the Engine RPM Operating Range information that normally appears on the face of the mechanical tachometer. This includes the red restricted, yellow cautionary or transient, and green normal operation RPM ranges.

A placard is provided to label the newly installed circuit breaker for operation with the P-1000 Tachometer. This placard is placed on the circuit breaker panel. See Figure 1.

TACHOMETER

Figure 1, Circuit Breaker Placard

FAA Approved
Date: October 17, 1978
Revision A: January 28, 1982
Revision B: January 28, 1991
Revision C: August 4, 2000

Fuel Flow:

3 psi – red radial line
4.5 through 11.5 gal/hr -- green arc
18 gal/hr (18.55 psi) – red radial line

A fuel flow placard is added adjacent to the existing fuel flow placard. Figure 2.

FUEL FLOW
FULL THROTTLE AND 2800 RPM
SL. ....17 GPH
4000 FT. ....15 GPH
8000 FT. ....13 GPH
12000 FT. ....11 GPH

Figure 2, Fuel Flow Placard

See SECTION 3. EMERGENCY PROCEDURES -- No change.

SECTION 4. NORMAL PROCEDURES:

Takeoff:

Power – Full Throttle and 2800 RPM

The operation of the Electronic Digital Engine Tachometer is straight-forward. After power is supplied to the Tachometer, the engine is started, and the self tests are performed, the default display of engine RPM appears on the display. The default display is insured via the use of internal timers that will restore the display to the current RPM even in the event that one of the panel buttons becomes stuck or defective.

Internally, two independent tachometers watch the pulses received from each magneto. Each tachometer is accurate to less than 1 RPM and can be individually enabled/disabled via buttons on the face of the Tachometer.

Engine operation ranges are indicated on the large green, yellow and red LEDs, see Figure 3, items D, E, and F.

FAA Approved
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Revision A: January 28, 1982
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Three small LED magneto system ***alert*** indicator lights are located within the "Status" area on the upper left corner of the Tachometer face, see Figure 3, items A, B, and C. The left and right red ***alert*** indicator lights, when illuminated, indicate, because of a loss of ignition signal to the tachometer, a possible malfunction of the respective left or right magneto ignition system.

While performing a magneto check during engine run-up, the red ***alert*** indicator lights will illuminate, thus identifying the grounding of the respective right of left magneto systems.

Ignition Switch Position	Tachometer Magneto Alert Indicators	
	Right	Left
OFF	ON	ON
R	OFF	ON
L	ON	OFF
BOTH	OFF	OFF

Between the left and right red magneto ignition system ***alert*** indicators is a yellow "***RPM Synchronization***" indicator. This small yellow indicator is illuminated when there is a difference of more than 80 RPM between the right and left tachometers. This indicator also may flicker during extreme RPM excursions of the engine.

There are three panel buttons, see Figure 3, items I, J, and K. Each button has two modes of operation:

Press-and-hold,
Press-and-release.

Press-and-hold button operations instruct the Tachometer to perform a specific operation when a button is pressed and held for more than 2/3 of a second.

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Press-and-hold button operations are placarded on the face of the Tachometer above each button.

Similarly, press-and-release button operation instructs the Tachometer to perform a specific operation when a button is pressed and released in less than 2/3 of a second. Press-and-release button operations are placarded on the face of the Tachometer below each button.

PRESS AND HOLD OPERATIONS:

The left button, K, upon depression, will cause the Tachometer to display the non-fractional portion (0000.) of the current accumulated engine hours. When the button is released, the fractional part of the engine hour (.00) is displayed for a short period of time. The clock is started whenever the engine RPM exceeds 800 RPM and is recorded in real hours.

The right button, I, upon depression, will cause the Tachometer to display the current contents of the RPM trap. This trap records the highest engine RPM achieved before the button was pressed.

The middle button, J, upon depression, clears the RPM trap. During depression of the switch, the RPM trap is zeroed. When the button is released, the trap will record the current engine RPM.

PRESS AND RELEASE OPERATIONS:

During normal operation, the Tachometer presents the average of the left and right internal tachometers on the display. However, a mechanism exists to mask either tachometer from the display, leaving the remaining tachometer to display its RPM.

A masked tachometer is indicated by the regular flashing of the right or left signal loss status indicator LEDs. This feature is handy when attempting to determine magneto/ignition problems.

Quickly pressing and releasing the left button, K, causes the Tachometer to mask or un-mask the left internal tachometer.

FAA Approved
Date: October 17, 1978
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Quickly pressing and releasing the right button, I, causes the Tachometer to mask or un-mask the right internal tachometer.

An internal interlock prevents masking both internal tachometers at the same time, therefore preventing total loss of RPM indication.

If the tachometer is masked, pressing the button will un-mask it and allow its RPM to show on the display, and conversely, if the tachometer is un-masked, pressing the button will mask it from display.

Quickly pressing and releasing the center button, J, causes the Tachometer to alternately dim or brighten the LED indicators.

The LED indicators, see Figure 3, items A through F, are bright enough to overcome daylight washout conditions. However, during night operations the large green, yellow, and small red and yellow LEDs are dim-able. The large red LED still operates at full intensity to maximize the possibility of gaining pilot attention during excursion into restricted RPM ranges.

Section V. Performance:

The performance of this airplane equipped with STC SE1436CE, SA1437CE and the P-1000 Tachometer is equal to or better than the performance as listed in the original FAA approved Airplane Flight Manual.

Section VI. Weight & Balance and Equipment List:

Negligible change.

Section VII. System Description:

There is no change to the system description for STC's SE1436CE and SA1437CE. The Horizon Instruments' Model P-1000 Electronic Digital Engine Tachometer is an electronic replacement for the existing mechanical cable-driven tachometer.

FAA Approved
Date: October 17, 1978
Revision A: January 28, 1982
Revision B: January 28, 1991
Revision C: August 4, 2000

The Tachometer differs from the existing mechanical tachometer in the following areas:

The Tachometer is fully electronic and uses timing information from the primary leads ("P-Leads") of both the left-hand and right-hand magneto ignition systems, operating the Tachometer's internal left and right tachometers, to determine engine RPM instead of a rotating cable driving a magnetic slip-clutch analog type display;

The Tachometer uses super-bright LED indicators to indicate normal range engine operation (Green LED), cautionary range operations (Yellow LED), and do-not-exceed or restricted range RPM (Red LED) as substitutes for the ranges normally painted on the tachometer dial.

The primary display consists of four 1/2" high characters on a back-lit Liquid Crystal Display (LCD), easily and clearly visible in daylight and night flying.

Diagnostic features available include: ***alert*** indication of loss of magneto signal, indication that both magnetos are reporting different RPM, and the ability to mask RPM from either magneto.

Magneto test, via the ignition switch, is indicated by the illumination of the grounded magneto system's ***alert*** light and the display of the amount of RPM that the engine has slowed. This is indicated as a negative number on the display (number is preceded by a leading hyphen or minus sign);

LED indicators are dim-able (except the restricted or red-light indicator) to reduce pilot annoyance during night flying;

A specific engine hour is pre-set at the factory to accommodate tachometer changes on non-zero time engines. Engine time may be changed only by Horizon Instruments, Inc., and must be coordinated with an authorized FAA Airframe and Powerplant mechanic or Repair Facility. Horizon Instruments, Inc. must be provided with the certificate number of a Mechanic, or Repair Station with an instrument Rating of Class 2, per FAR 145.31. Refer to Horizon Instruments, Inc. Procedure Document P118042 for additional information.

FAA Approved
Date: October 17, 1978
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Revision B: January 28, 1991
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A) Right Magneto System Alert Indicator
B) RPM Sync Loss Indicator
C) Left Magneto System Alert Indicator
D) Normal Operating Green RPM Range Indicator
E) Cautionary Yellow RPM Range Indicator
F) Restricted Red RPM Range Indicator
G) Limitations Placard
H) 4 Digit LCD Display
I) Right switch for Overspeed Trap display and right tachometer enable/disable
J) Middle switch for Overspeed Trap Clear and LED indicator dimming
K) Left switch for engine hours display and left tachometer enable/disable.

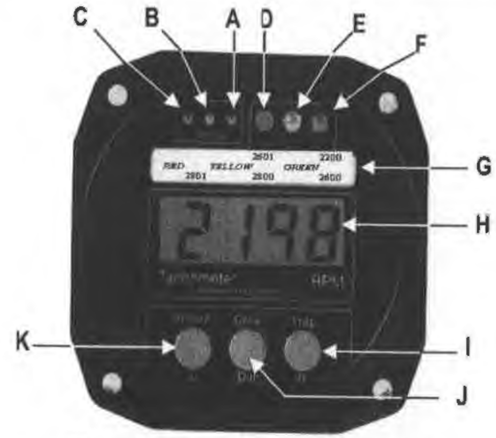


Figure 3, Basic Tachometer Features

FAA Approved
Date: October 17, 1978
Revision A: January 28, 1982
Revision B: January 28, 1991
Revision C: August 4, 2000

SECTION 8. ADDITIONAL INFORMATION:

For additional information about the operation and installation, refer to Horizon Instruments, Inc. Document Number P103050, Operator/Installation Manual.

The exterior of the Tachometer is nameplated with all pertinent operational and configuration information, see Figure 5.

Horizon Instruments, Inc. 556 S. State College Blvd. Fullerton, CA 92631 Model: P-1000 Digital Tachometer H/W P/N: P100-058-619-00 Software P/N: P132001, VERS. 1.06 6-30VDC, 150 MA., 1/2 LB. SERIAL NUMBER: XXXXXXX RESTRICTED: 2801 -- UP CAUTION: 2601 -- 2800 NORMAL: 2200 -- 2600 6 CYLINDERS APPLICATION: R172K WITH STC SA1437CE PATENT NUMBER: 4,811,255

Figure 5, Example of Product Identification Nameplate.

United States Of America
Department of Transportation - Federal Aviation Administration

Supplemental Type Certificate

Number SA1614WE

This Certificate issued to Flint Aero, Inc.
1942 Joe Crosson Drive
El Cajon, California 92020-1236

certifies that the change in the type design for the following product with the limitations and conditions therefore as specified hereon meets the airworthiness requirements of Part 3 *of the Civil Air Regulations.* (See applicable Type Certificate Data Sheet.)

Original Product Type Certificate Number: See Page 3 of this STC

Make: CESSNA

Model: See page 3 of this STC

Description of Type Design Change: Installation of one twelve gallon auxiliary fuel tank in each outboard wing panel in accordance with FAA sealed Flint Aero Master Drawing List No. FA-170, Revision "A", dated January 11, 1983, or later FAA approved revision, or Flint Aero Master Drawing List No. 15171821, Revision "IR", dated May 18, 2006, or later FAA approved revision.
Airplane Flight Manual Supplement FTC453.001, Revision Original, dated March 31, 2006 or later FAA approved revision is also required as part of this modification.

Limitations and Conditions: The limitations and conditions of Aircraft Specification A-799, Data Sheet 3A12, 3A17, Data A4EU, or Data Sheet A18EU apply, except as outlined in page 3 of this STC. A copy of this STC must be included in the permanent records of each airplane modification in accordance with this STC. If the holder agrees to permit another person to use this certificate to alter the product, the Holder shall give the other person written evidence of that permission.

This certificate and the supporting data which is the basis for approval shall remain in effect until surrendered, suspended, revoked or a termination date is otherwise established by the Administrator of the Federal Aviation Administration.

Date of application: August 22, 1967

Date of issuance: February 26, 1968

Date reissued: Mar. 8, 1976, Mar. 14, 1983, Feb. 6, 1987, June 15, 1990, Feb. 25, 2000

Date amended: See Page 5 of this STC

By direction of the Administrator

(Signature)
Manager, Airframe Branch
Los Angeles Aircraft Certification Office
(Title)

Any alteration of this certificate is punishable by a fine of not exceeding $1,000, or imprisonment not exceeding 3 years, or both.

AUX Fuel Tanks

United States Of America
Department of Transportation - Federal Aviation Administration

Supplemental Type Certificate
(Continuation Sheet)

Number SA1614WE

Application: 08/22/67 Issue: 02/26/68 Amendments: See page 5 of this STC
Reissue: 03/08/76, 03/14/83, 02/06/87, 06/15/90, 02/25/2000

Original Product

Type Certificate No.	Models
A-799	170A, 170B
3A12	172, 172A, 172B, 172C, 172D, 172E, 172F, 172G, 172H, 172I, 172K, 172L 172M, 172N, 172P, 172Q, 172R, 172S
A4EU	*F172F, F172G, F172H, F172K, F172L, F172M, F172N
A18EU	*FR172E, FR172F, FR172G, FR172H, FR172J, FR172K
3A17	175, 175A, 175B, 175C, R172K, 172RG, R172E

*Reims Aviation S.A. Cessna Models

LIMITATIONS AND CONDITIONS

Fuel Capacity: Add "24 gal. (23 gal. useable); two 12 gal. aux. tanks in wings at (+50)" to quantities shown in applicable Aircraft Specification or Data Sheet.

Placards: The following placards are required in the locations noted:

For airplanes with transfer pumps. Display placard on instrument panel in view of pilot near on/off switch. "Total Aux. Fuel 24 U.S. Gals (23 Gal. useable). Transfer aux. fuel only in level flight when main is half empty and when main tank is not supplying engine.
Aux. fuel switch must be off during takeoff or landing, filling, and when empty. For utility category operation, aux. tank fuel switch must be off and aux. tanks empty.

Any alteration of this certificate is punishable by a fine of not exceeding $1,000, or imprisonment not exceeding 3 years, or both.

Supplemental Type Certificate

(Continuation Sheet)

Number SA1614WE

Application: 08/22/67 Issue: 02/26/68 Amendments: See page 5 of this STC
Reissue: 03/08/76, 03/14/83, 02/06/87, 06/15/90, 02/25/2000

**Insert grade number on placards for main tanks.

For early airplanes without transfer pumps. Adjacent to each auxiliary tank shut-off valve: " Aux. fuel 12 U.S. Gal. (11.5 gal useable). Transfer Aux. fuel only in level flight when main tank is not supplying fuel to engine. Aux. valve must be off during takeoff, landing, filling, and when empty." In addition, for models covered by Type Certificates 799 and 3A12 only- "Fuel must be off and auxiliary tanks empty for utility category operations."

For Airplanes without transfer pumps. Adjacent to each auxiliary tank filler: "12 U.S. Gal. **Min. Grade AV. Gasoline. Aux. fuel valve must be off before filling".

Flight Manual

FAA-Approved Flint Aero Airplane Flight Manual Supplement, dated March 24, 1970, is required for models 170A and 170B.

For other models without transfer pumps. FAA-Approved Flint Aero Flight Manual Supplement, dated March 14, 1983, is required.

For Placarded airplanes with transfer pumps. FAA-Approved Flint Aero Supplemental Airplane Flight Manual No. 171, dated August 17, 1988, or later FAA Approved Revisions, is required.

For airplanes with transfer pumps and with FAA Approved Airplane Flight Manuals. FAA-Approved Flint Aero Airplane Flight Manual supplement No. 170, dated August 17, 1988, or later FAA Approved Revisions, is required.

Limitation of Applicability

The approval of this change in type design applies to the basic Cessna 170, 172, 175 series landplanes, skiplanes, and floatplanes of the model shown on page 3 of this STC. This approval should not be extended to other aircraft of these models on which other modifications are incorporated unless it is determined that the interrelationship between this change and any previously approved modifications will introduce no adverse effect on the airworthiness of these aircraft.

United States Of America
Department of Transportation - Federal Aviation Administration

Supplemental Type Certificate

(Continuation Sheet)

Number SA1614WE

Application: 08/22/67 Issue: 02/26/68
Reissue: 03/08/76, 03/14/83, 02/06/87, 06/15/90, 02/25/2000

Amendment Dates

1. June 17, 1968
2. March 24, 1970
3. July 29, 1970
4. March 5, 1971
5. June 14, 1971
6. August 7, 1973
7. May 29, 1975
8. March 8, 1976
9. December 3, 1976
10. February 15, 1979
11. June 27, 1980
12. March 20, 1981
13. February 16, 1982, MDL FA170, no revision
14. March 14, 1983, MDL FA170 "A" Rev.
15. August 25, 1988, add R172E
16. February 16, 1993, add Skiplanes
17. May 1, 2006, add 172R and 172S
18. December 6, 2006 add MDL 15171821 Rev "IR"

- END -

FLINT AERO, INC.
1942 Joe Crosson Drive
El Cajon, CA 92020
Doc No.: FTC453.001

FAA APPROVED
AIRPLANE FLIGHT MANUAL SUPPLEMENT

TO THE

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

AND

SUPPLEMENTAL AIRPLANE FLIGHT MANUAL

FOR

CESSNA 170, 172, and 175 AIRPLANES

WITH

FLINT AERO AUXILIARY FUEL TANKS

The information in this document is FAA approved material and must be attached to the FAA Approved Airplane Flight Manual or carried in the airplane if the airplane does not have an FAA approved Airplane Flight Manual when the airplane has been modified by the installation of the Flint Aero Auxiliary Fuel Tanks in accordance with STC SA1614WE

This document is applicable to the Official Pilot's Operating Handbook and FAA Approved Airplane Flight Manual for those Cessna airplanes which require the manual, and to the basic placards and markings for those airplanes without a manual. The following airplanes are included when Flint Aero Inc. Auxiliary Fuel Tanks have been installed, and this document is applicable to the below model landplanes, ski planes, and floatplanes

TC A-799	170A 170B
TC 3A12	172, 172A, 172B, 172C 172D 172E, 172F 172G, 172H 172I, 172K, 172L, 172M, 172N, 172P, 172Q 172R 172S
TC A4EU	* F172F, F172G, F172H, F172K, F172L, F172M, F172N
TC A18EU	* FR172E, FR172F, FR172G, FR172H, FR172J, FR172K
TC 3A17	175, 175A, 175B, 175C, R172K, 172RG, R172E

* Reims Aviation S.A. Cessna Models

The information contained herein appends, supplements, or supersedes the Official Pilot's Operating Handbook and FAA Approved Airplane Flight Manual or the basic placards and markings for Cessna 170, 172 and 175 series airplanes only in those areas listed herein. For limitations, procedures, and performance information not contained in this document, consult the Official Pilot's Operating Handbook and FAA Approved Airplane Flight Manual, or the basic placards and markings for the specific Cessna 170, 172 or 175 series airplanes

FAA Approved Hien Tong
Actg Manager, Flight Test Branch, ANM-160L
Federal Aviation Administration
Los Angeles Aircraft Certification Office
Transport Airplane Directorate

FAA Approved Date 5/8/06

LOG OF PAGES

Rev. No.	Page No.	Page Date	Description	FAA Approved
Original	Title Log Contents 1-12	5/8/06 5/8/06 5/8/06	Complete Supplement	Actg Hien Tong Mgr., Flt. Test Br., ANM-160L FAA, Los Angeles ACO Transport Airplane Directorate Date 5/8/06

FAA Approved Date: __________

TABLE OF CONTENTS

SECTION I – GENERAL

This Flint Aero, Inc. Supplement to the Official Pilot's Operating Handbook and FAA Approved Airplane Flight Manual or the basic placards and markings for Cessna 170, 172 175 series airplanes addresses operations when modified by installation of Flint Aero Auxiliary Fuel Tanks in accordance with STC SA1614WE. New performance data are included herein. The changes to the Performance Specifications are shown in Table 1-1 below.

Table 1-1

PERFORMANCE SPECIFICATIONS WITH INTERNAL AUXILIARY TANKS			
SPEED	Maximum (V_{NO})		No Change
	Max Cruise Power – Standard Day Conditions		No Change
CRUISE	With fuel allowance for engine start, taxi, takeoff, climb and 45 minutes reserve		
	Additional range and endurance for Basic Airplane set in Cruise Power range @10,000 ft with 23 Gal usable auxiliary fuel	Range	292 NM
		Time	2.3 Hrs
CLIMB	Sea Level Std Day Rate of Climb		No Change
	Service Ceiling		No Change
TAKEOFF	Sea Level Std Day Ground Roll		No Change
	Total Distance Over 50 Ft Obstacle		No Change
LANDING	Sea Level Std Day Ground Roll		No Change
	Total Distance Over 50 Ft Obstacle		No Change
STALL	Flaps Up Power Off		No Change
	Flaps Down Power Off		No Change
MAXIMUM WEIGHT	Ramp		No Change
	Takeoff		No Change
	Landing		No Change
STANDARD EMPTY WEIGHT – Basic airplane plus			40 LBS
MAXIMUM USEFUL LOAD – Basic airplane minus			40 LBS
BAGGAGE ALLOWANCE (See applicable POH)			No Change
WING LOADING: lbs./Sq Ft			No Change
POWER LOADING lbs /HP			No Change
FUEL CAPACITY Basic airplane plus 23 usable US gal Aux Fuel			23 GAL
OIL CAPACITY			No Change
ENGINE			No Change
PROPELLER:			No Change

The above performance figures are based on fuel consumption values published in the Official Pilot's Operating Handbook and FAA Approved Airplane Flight Manual or the basic placards and markings for Cessna 170, 172, 175 series airplanes and will vary with individual airplanes and numerous factors affecting flight performance.

SECTION II – LIMITATIONS

1. Airspeed Limitations
No Change

2. Airspeed Indicator Markings
No Change

3. Power Plant Instrument Markings
The following entry is added to the Powerplant Instrument Markings Table:

Power plant markings and their color-code significance

INSTRUMENT	RED LINE (MINIMUM)	GREEN ARC (NORMAL OPERATING)	RED LINE (MAX)
Auxiliary Fuel Tank Quantity Indicators	E (0.5 U.S. Gal. Unusable Each Tank)	------	-----

4. Weight Limits

No change. Refer to current weight and balance documents.

5. Center of Gravity Limits

No change

6. Maneuver Limits

No change

7. Flight Load Factor Limits

No change

8. Kinds of Operations Limits

No change

9. Fuel Limitations

Fuel capacity is increased to the values in Tables 1-2 and 1-3 below

Table 1-2

FUEL CAPACITY, U.S. GALLONS

CESSNA MODELS	172										
	R,S	O	N,P	I,K,L,M	C,D,E,F,G,H	B	172, A	P172D	R172K	172RG	R172E
Total Capacity	80	78	66	66	63	66	66	76	76	90	76
Total Usable	76	73	63	61	59	62	60	65	72	85	69
Total Capacity, Each Main Tank	28	27	21	21	19.5	21	21	26	26	33	26
Total Usable, Each Main Tank	26.5	25	20	19	18	19.5	18.5	21.3	24.5	31	23
Total Capacity, Each Aux Tank	12	12	12	12	12	12	12	12	12	12	12
Total Usable, Each Aux Tank	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5

Table 1-3

FUEL CAPACITY, U.S. GALLONS

CESSNA MODELS	175				F172 (REIMS)		FR172 (REIMS)			170	
	175	175A	175B	175C	F,G,H	K,L,M	N,P	E,F,G,H,J	K	170A	170B
Total Capacity	76	76	76	76	63	66	67	76	76	42	42
Total Usable	66	65	65	65	59	61	63	69	72	37	37
Total Capacity, Each Main Tank	26	26	26	26	19.5	21	21.5	26	26	21	21
Total Usable, Each Main Tank	21.5	21	21	20.7	18	19	20	23	24.5	18.5	18.5
Total Capacity, Each Aux Tank	12	12	12	12	12	12	12	12	12	12	12
Total Usable, Each Aux Tank	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5

9.1 Auxiliary Fuel Tank Transfer Limits

- When feeding from either or both main tanks, do not transfer auxiliary tank fuel into a main fuel tank until it is at least 15.0 gallons below full.
- When feeding from either main tank, begin tank transfer into that tank before its level drops below five gallons remaining.
- Do not transfer auxiliary fuel unless in level flight.

- Do not transfer auxiliary fuel during take off, landing, refueling, and when empty.

Note Main fuel tank quantity below the full level can be determined by reference to fuel quantity gauges and by calculating fuel used by:
1) Estimating engine fuel flow rates versus time.
2) If installed, using engine fuel flow rate indicator vs. time.

10. Placards

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

10.1 In full view of pilot: "Total aux fuel 24 U.S. gals (23 gal useable)." Transfer aux fuel only in level flight when main is half empty and when main tank is not supplying engine. Aux fuel switch must be off during takeoff, landing, filling and when empty. For utility category operation aux tank fuel switch must be off and aux tanks empty."

10.2 At auxiliary fuel tank pump switches:

"Left wing aux fuel 12.0 U.S. gallons 11.5 gallons usable ON OFF"	"Right wing aux fuel 12.0 U.S. gallons 11.5 gallons usable ON OFF"

10.3 Installed adjacent to each auxiliary fuel tank leak detection drain (2 per side)
"Fuel or vapor from drain
requires immediate repairs"

10.4 Installed adjacent to appropriate wing tip tank pump circuit breakers or fuses:

"Aux tank L pump" "Aux tank R pump"

10.5 For Models 172 through models 172M, F172F through F172M, and Models 170A and 170B; forward of each auxiliary tank filler: "12 U.S. gal. 80/87 min. grade Av. gasoline. Aux. fuel switch must be off before filling."

10.6 For Models 172N (S/N 17261445, 17267585-17259309) and F172N, F172P, FR172E through FR172J, FR172K(1977 model), R172E, R172K (S/N R1722000-1722794); forward of each auxiliary tank filler: "12 U.S. gal. 100/130 min. grade Av. Gasoline. Aux. fuel switch must be off before filling."

10.7 For Models 172N (S/N 17261578,17269310-17274009), 172P, 172Q, 172R, 172S, R172K (S/N R1722725 and on), 172RG, FR172K (1978 model on); forward of each auxiliary tank filler: "12 U.S. gal. 100LL/100 min. grade Av. gasoline. Aux. fuel switch must be off before filling."

SECTION III – EMERGENCY PROCEDURES

NOTE

With Flint Aero, Inc. Auxiliary Fuel Tanks installed, fuel transfer to the standard main wing tanks is provided by the auxiliary fuel transfer tank pumps controlled by the auxiliary fuel tank transfer pump switches.

EMERGENCY LANDING WITH OR WITHOUT ENGINE POWER

Auxiliary Fuel Tank transfer pump switches.....OFF

WING FIRE

Auxiliary Fuel Tank transfer pump switches.....OFF

SECTION IV – NORMAL PROCEDURES

PREFLIGHT INSPECTION – AUXILIARY FUEL TRANSFER TANKS

1. Visually inspect external areas of wing around auxiliary fuel tanks for any signs of fuel leakage.
2. Check each auxiliary tank filler cap for security and vent lines for obstructions. Visually check auxiliary fuel tanks for quantity.
3. From each auxiliary fuel tank, drain a sample quantity of fuel. Check for contamination. If any water is visible, drain additional amounts of fuel until all water is expelled from the tank.
4. Master switch on. Check auxiliary fuel tank gauges for fuel quantity.
5. With master switch on, check each auxiliary fuel tank pump for operation by operating each pump separately with auxiliary fuel tank transfer switches. Listen for pump operation. If no noise or vibration, assume pump is not operating. Check for serviceability.

Before Takeoff

a. Add the following to the before takeoff procedure:

Auxiliary fuel tank transfer pump switches................OFF

SECTION V – PERFORMANCE

This performance data address the operation of an airplane incorporating Flint Aero STC SA1614WE Auxiliary Tanks. There are no changes to the Performance Section except for the Range and Endurance charts.

RANGE AND ENDURANCE PROFILES

With the Flint Aero auxiliary fuel tanks installed, the Cessna 170, 172, 175 series airplanes, cruise performance charts are valid for the usable fuel quantity as stated in the basic manual. The addition of two full 12.0 U.S. Gallons (11.5 gal. usable) Flint Aero auxiliary tanks increases the range and endurance shown in the Cessna Owner's Manuals and Pilot's Operating Handbook and FAA Approved Airplane Flight Manuals. The amount of increase in range and endurance will depend on the cruise speed, altitude, and power setting chosen, and will be different for each powerplant and airplane model. The increase in range and endurance of the added fuel can be calculated from the cruise speed and fuel consumption of each model at the altitude and temperature desired. The new airplane range and endurance can then be found by adding the range and endurance increases to the values tabulated in the Cessna manuals.

To calculate the range increase, find the True Airspeed and Gal/Hr fuel consumption for the cruise altitude and power setting desired. Calculate the cruise Miles per Gallon by dividing the Airspeed by the fuel consumption in gallons per mile:

Miles / Hr ÷ Gal / Hr = Miles / Gal.

Then multiply the miles per gallon by 23 gallons, the usable fuel contained in the auxiliary tanks to obtain the added range. Add this value to the range tabulated in the original Cessna manual to get the new range with the Flint Aero auxiliary tanks installed and filled.

To calculate the endurance increase, divide 23 gallons by the fuel consumption:

23 Gallons ÷ Gallons / Hr = Hrs Endurance. Add this number of hours to the endurance tabulated in the original Cessna manual to get the new endurance with the Flint Aero auxiliary tanks.

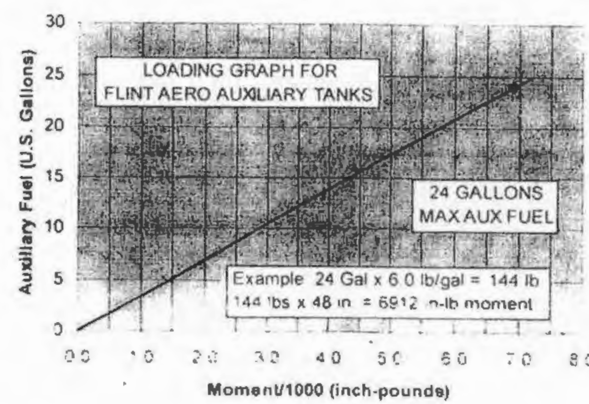
SECTION VI – WEIGHT AND BALANCE/EQUIPMENT LIST

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WEIGHT lbs	ARM inches	MOMEN lb.-in
	J. SPECIAL PACKAGES				
2, 3	Install Flint Aero Aux Fuel Tank Systems	FA170	34.0	49.0	1666
	2 - Unusable fuel in Flint Aero Auxiliary Tanks (1.0 U.S. Gal. Avgas at 6.00 lbs./U.S.gal.)	FA170	6.0	50.0	300
	TOTAL INSTALLATION NET CHANGE		40.0	49.2	1966

In calculating weight and balance for full auxiliary fuel tank: 23 U.S. gal.
Avgas usable x 6.0 lbs./U.S. gal x 48 in. arm = 6624 lb.-in or 6.624 lb.-in./1000
C.G. Arm = total moment divided by total weight.

CENTER-OF-GRAVITY

Center of Gravity range, loading moments, and limits are unchanged. The load moment diagram for the auxiliary fuel tanks is shown below:



SECTION VII – AIRPLANE & SYSTEMS DESCRIPTIONS

1 Fuel Tank Capacities (U.S Gallons)
The Cessna 170, 172, 175 series airplanes have a wide range of fuel capacities. The total and usable fuel quantities for each model are shown in the Owner's Manual or in the Official Pilot's Operating Handbook and FAA Approved Airplane Flight Manual. The Flint Aero Auxiliary Fuel Tanks contain 24 total gallons and 23 usable gallons for all Cessna 170, 172, and 175 series airplanes

2 Operation of Auxiliary Fuel Tanks (transfer)

- To transfer, turn applicable "auxiliary fuel tank transfer switch" on. When auxiliary tanks indicate empty, turn applicable transfer switch off
- As a general procedure, do not transfer auxiliary tank fuel until after burning approximately 15 U.S. gallons of fuel from each main tank.

NOTE: Should the transfer pump fail, it is not possible to transfer fuel from the affected tank in flight.

3 Electrical
Left and right auxiliary fuel transfer tank quantity gauges and pump switches are located on sub panels in left and right wing roots or on the instrument panel or pedestal. The transfer pumps and gauges are powered from the main electrical bus through in-line fuses.

4 Fuel Quantity Data (U.S. Gallons)
Add 23 U.S gallons additional usable fuel to the total fuel available in the Cessna tanks.

In addition to the Cessna main fuel tanks, two auxiliary fuel transfer tanks are installed. The capacity is 12.0 U.S gallons each tank (11.5 usable U.S. gallons each)

These tanks transfer to their respective main wing tank by transfer pumps controlled by switches in the cockpit.

Each auxiliary tank has a water drain and is vented through the fuel filler cap. Fuel gauging is through either individual quantity gauges or a dual gauge.

NOTES

The auxiliary fuel (transfer) tank quantity gauges are similar in operation to the main fuel tank gauges and visual inspection of the tanks during preflight is the best assurance of fuel quantities. There are no provisions for visually determining reduced tank quantity.

The fuel in the auxiliary fuel transfer tanks is available to the engine only through the airplane's main fuel tanks. The main fuel tank gauges are the sole reference gauges for immediately available engine fuel

Should an auxiliary fuel (transfer) tank pump fail, it is not possible to transfer fuel from the affected tank during the flight in progress and the pilot must immediately adjust his range and endurance calculations on the basis of the fuel available through the standard fuel system.

SECTION VIII – AIRPLANE HANDLING, SERVICE AND MAINTENANCE WITH AUXILIARY (TRANSFER) FUEL

NOTE

Before flight, check through the filler neck for auxiliary tank fuel quantity. No provision is made for calculating reduced capacity fuel in the auxiliary fuel tanks.

Horizon Instruments, Inc. Model P-1000 Airplane Flight Manual Supplement

Digital Tacho.

Airplane Flight Manual Supplement
for a

Cessna R172K

This document, by no means, gives the authority to amend or add to any existing Pilot Owners Handbook. This document serves as an example of a Model P-1000 Electronic Digital Engine Tachometer Flight Manual Supplement, which must be approved by the FAA.

This document must be carried in the airplane at all times. It describes the operating procedures for the Horizon Model P-1000 Electronic Digital Engine Tachometer, **PART NUMBER P100-058-619-00, SERIAL NUMBER(S) 1205301** when it has been installed in accordance with Horizon Instruments, Inc. P/N P103050/D **Horizon Instruments, Inc. Model P-1000 Installation & Instruction Manual** and FAA Form 337.

Date: 2/1/2012

LOG OF REVISED PAGES

Revision Number	Pages Attached	Description	FAA Approved	Date
-------	1-7	Original Issue		

TABLE OF CONTENTS

Section I. General: No Change

Section II. Limitations:

This table lists each engines operating range by the lowest RPM within the operating range. Ranges are listed in order from the highest (engine Red-line) on the left side of the table to the lowest on the right side. Note that an RPM range with no colored marking is denoted as a black, or "BLK", range.

TACHOMETER PART NUMBER P100-058-619-00										
RPM ARC PLACARDING										
TOP ARC		ARC 2		ARC 3		ARC 4		LOWEST ARC		CYL
RPM	COLOR	RPM	COLOR	RPM	COLOR	RPM	COLOR	RPM	COLOR	
2800	RED	2799 2600	YEL	2599 2200	GRN	---	---	---	---	6

The face of the P-1000 tachometer is placarded with the Engine RPM Operating Range information that normally appears on the face of the mechanical tachometer. This includes the RED (restricted), YELLOW (cautionary or transient) and GREEN (normal) operation RPM ranges.

A placard is provided to label the newly installed circuit breaker for operation with the P-1000 tachometer. This placard is placed on the circuit breaker panel. Refer to Figure 1.

Tachometer

Figure 1, Circuit Breaker Placard

Section III. Emergency Procedures: No Change

Section IV. Normal Procedures:

The operation of the P-1000 Electronic Digital Engine Tachometer is straightforward. After power is supplied to the Tachometer, the engine is started, and the self-tests are performed, the default display of engine RPM appears on the display. The default display is insured via the use of internal timers that will restore the display to the current RPM even in the event that one of the panel buttons becomes stuck or defective.

Internally, (2) independent tachometers watch the pulses received from each magneto. Each tachometer is accurate to less than 1 RPM and can be individually enabled/disabled via buttons on the face of the Tachometer, refer to items K and I on page 5 of 7.

Engine operating ranges are indicated on the large green, yellow, and red LED's (**L**ight **E**mitting **D**iode). See page 7, items D, E, and F. Three small LED magneto system *alert* indicator lights are located within the **"Status"** area on the upper left corner of the Tachometer face, see items A, B, and C on page 7, figure 2. The left and right red LED *alert* indicator lights, when illuminated, indicate, because of a loss of the ignition signal to the Tachometer, a possible malfunction of the respective left or right magneto ignition system.

While performing a magneto check during engine run-up, the red *alert* indicator lights will illuminate, thus identifying the grounding of the respective right or left magneto systems.

IGNITION SWITCH POSITION	TACHOMETER MAGNETO ALERT INDICATOR LIGHTS	
	LEFT STATUS LED	RIGHT STATUS LED
OFF	ON	ON
RIGHT	ON	OFF
LEFT	OFF	ON
BOTH	OFF	OFF

Between the left and right red magneto ignition system *alert* indicators is a yellow **"RPM Synchronization"** indicator. This small yellow indicator is illuminated when there is a difference of more than 80 RPM between the right and left tachometers. This indicator also may flicker during extreme RPM excursions of the engine.

There are three panel buttons, see items J, K, and I on page 7, figure 2. Each button has two modes of operation:

- Press-and-hold,
- Press-and-release.

Press-and-hold button operations instruct the Tachometer to perform a *specific operation* when a button is pressed and held for more than 2/3 of a second. Press-and-hold button operations are placarded on the face of the Tachometer above each button.

Similarly, press-and-release button operation instructs the Tachometer to perform a specific operation when a button is pressed and released in less than 2/3 of a second. Press-and-release button operations are placarded on the face of the Tachometer below each button.

PRESS AND HOLD OPERATIONS

The left button, K, upon depression, will cause the Tachometer to display

the non-fractional portion (0000.) of the current accumulated engine hours. When the button is released, the fractional part of the engine hours (.00) is displayed for a short period of time. The clock is started whenever the engine RPM exceeds 800 RPM and is recorded in real hours.

The right button, I, upon depression, will cause the Tachometer to display the current contents of the **RPM trap**. This trap records the highest engine RPM achieved before the button was pressed. The middle button, J, upon depression, clears the RPM trap. During depression of the switch, the RPM trap is zeroed. When the button is released, the trap will record the current engine RPM.

PRESS AND RELEASE OPERATIONS

During normal operation, the Tachometer presents the average of the left and right internal tachometers on the display. However, a mechanism exists to **mask** either tachometer from the display, leaving the remaining tachometer to display its RPM.

The regular flashing of the right or left signal loss status indicator LEDs indicates a masked tachometer. This feature is handy when attempting to determine magneto/ignition problems.

Quickly pressing and releasing the left button, K, causes the Tachometer to mask or un-mask the left internal tachometer.

Quickly pressing and releasing the right button, I, causes the Tachometer to mask or un-mask the right internal tachometer.

An internal interlock prevents masking both internal tachometers at the same time, therefore preventing total loss of RPM indication.

If the tachometer is masked, pressing the button will un-mask it and allow its RPM to show on the display, and conversely, if the tachometer is un-masked, pressing the button will mask it from the display.

Quickly pressing and releasing the center button, J, causes the Tachometer to alternately dim or brighten the LED indicators.

The LED indicators, see items A thru F, are bright enough to overcome daylight washout conditions. However, during night operations the large green, yellow, and small red and yellow LEDS are **dim-able**. The large red LED still operates at full intensity to maximize the possibility of gaining pilot attention during excursion into restricted rpm ranges.

Horizon Instruments, Inc.
600 S. Jefferson St., Unit C, Placentia, CA 92870
Ph. (714) 524-1919 Fx. (714) 524-5937

Section V. Performance: No Change

Section VI. Weight & Balance and Equipment List: Negligible Change

Section VII. System Description

The Horizon Instruments' Model P-1000 Electronic Digital Engine Tachometer is an electronic replacement for the existing mechanical cable-driven tachometer.

The Tachometer differs from the existing mechanical tachometer in the following areas:

The Tachometer is fully electronic and uses timing information from the primary leads ("P-Leads") of both the left-hand and right-hand magneto ignition systems, operating the P-1000's internal left and right tachometers, to determine engine rpm instead of a rotating cable driving a magnetic slip-clutch analog type display.

The Tachometer uses super bright LED indicators to indicate normal range engine operation (Green LED), cautionary range operation (Yellow LED), and do-not-exceed or restricted range RPM (Red LED) as substitutes for the ranges normally painted on the tachometer dial.

The primary display consists of four 1/2" high characters on a backlit Liquid Crystal Display (LCD), easily and clearly visible in daylight and night flying.

Diagnostic features available include: *alert* indication of loss of magneto signal, indication that both magnetos are reporting different rpm, and the ability to mask RPM from either magneto.

Magneto test, via the ignition switch, is indicated by the illumination of the grounded magneto system's *alert* light and the display of the amount of RPM that the engine has slowed. This is indicated as a negative number on the display (number is preceded by a leading hyphen or minus sign).

LED indicators are dim-able (except the restricted or red-light indicator) to reduce pilot annoyance during night flying.

A specific engine hour is preset at the factory to accommodate Tachometer changes on non-zero-time engines. Only Horizon Instruments, Inc may change engine time.

Horizon Instruments, Inc.
600 S. Jefferson St., Unit C, Placentia, CA 92870
Ph. (714) 524-1919 Fx. (714) 524-5937

A) Right Magneto Signal Loss Indicator
B) RPM Sync Loss Indicator
C) Left Magneto Signal Loss Indicator
D) Normal Operating Green RPM Mark
E) Cautionary Yellow RPM Arc Indicator
F) Restricted Red RPM Arc Indicator
G) Placard Area
H) 4 Digit LCD Display
I) Right switch for Overspeed Trap display and right tachometer enable/disable.
J) Middle switch for Overspeed Trap Clear and LED dimming.
K) Left switch for engine hours display and left tachometer enable/disable.

Figure 2, P-1000 Features

Section VIII. Additional Information

For additional information about the operation and installation, refer to Horizon Instruments, Inc. Document Number P103050 Horizon Instruments, Inc. Model P-1000 Installation & Instruction Manual.

The exterior of the P-1000 is nameplated with all pertinent operational and configuration information referred to in Figure 3.

Horizon Instruments, Inc
600 S. Jefferson St., Unit C
Placentia, CA 92870, USA
Model P-1000 Digital Tachometer
H/W P/N: P100-100-106-00
Serial Number: 0342401
Red Arc: 2700 - UP
Green Arc: 2699 – 1800
06 Cylinder
Patent Number: 4,811,255

Figure 3, Example of Product Identification Nameplate

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT
OR
SUPPLEMENTAL FLIGHT MANUAL
FOR

AIRCRAFT MODEL: ____________________

SERIAL NUMBER: ____________________

REGISTRATION NUMBER: ____________________

This supplement must be attached to the FAA approved Airplane Flight Manual, when the Precise Flight Standby Vacuum has been installed in accordance with STC(s).
SA2160NM, SA2161NM, SA2162NM, SA2164NM, SA2167NM, SA2168NM, SA2683NM - Aircraft
&
SE1779NM - Lycoming Engine
or
SE1780NM - Continental Engine

The information contained in this document supplements or supersedes the basic manual only in those areas listed. For Limitations, Procedures, and Performance information not contained in this supplement, consult the basic Airplane Flight Manual.

FAA APPROVED: [signature]
Manager,
Special Certification Branch
Seattle Aircraft Certification Office

DATE OF APPROVAL: Feb. 4, 2000

STANDBY VACUUM

SYSTEM DESCRIPTION

A Precise Flight Standby Vacuum System may be installed to provide a temporary vacuum system in the event of a primary vacuum failure. The Standby Vacuum System operates on the differential between the intake manifold and ambient air pressure and is directed through a shuttle valve system to drive your flight instruments.

CAUTION: The use of the Standby Vacuum System requires a degree of Pilot skill and proficiency that is best maintained through practice. It is recommended, upon recurrent IFR training, in VFR conditions, in the presence of a CFI, that the aircraft be flown at the RPM and or Manifold Pressure settings found on the required placard and entered in this AFMS. This procedure will familiarize the pilot with ıitations of using engine manifold vacuum for instrument power and maintaining level flight.

I. OPERATING LIMITATIONS

A. INSTRUCTIONS

1. The Standby Vacuum System is for emergency or standby use only and not for dispatch purposes.
2. Vacuum powered and/or Vacuum gyro directed autopilot operation may be unreliable when the Standby Vacuum System is the sole source of vacuum. Vacuum powered or vacuum gyro directed autopilot should be OFF when operating with a failed primary vacuum system.
3. The Supplemental Vacuum System is not designed to operate pneumatic de-ice systems. DO NOT operate a pneumatic de-ice system when operating with a failed primary vacuum system.
4. Above 10,000 ft. pressure altitude, engine power settings may have to be significantly reduced to provide adequate vacuum power for proper gyro instrument operation.
5. The following placards are required to be in full view of pilot:

I. OPERATING LIMITATIONS (CONT.)

B. PLACARDS

Placard to be located on the push/pull control cable

Placard to be located around the LED for the pump inop warning light.

Placard to be placed in front and in full view of the pilot.

STANDBY VACUUM SYSTEM EQUIPPED: FOR OPERATING INSTRUCTIONS AND LIMITATIONS SEE SUPPLEMENT IN OWNERS MANUAL OR PILOTS OPERATING HANDBOOK

I. OPERATING LIMITATIONS (CONT.)

B. PLACARDS

One of the following placards must be placed in full view of the pilot near the instrument vacuum indicator after appropriate entries have been made.

Approximate Standby Vacuum Available - Altitude - Power Chart for aircraft with Constant Speed Propeller - Maximum Continuous RPM.

PRESS ALT. (FT.)	RPM	MAN. PRESSURE	SVS VACUUM IN. HG MIN.
2000	Max. Cont.		
4000	Max. Cont.		
6000	Max. Cont.		
8000	Max. Cont.		
10,000	Max. Cont.		

Approximate Standby Vacuum Available - Altitude - Power Chart for aircraft with a Fixed Pitch Propeller

PRESS ALT. (FT.)	RPM	SVS VACUUM IN. HG MIN.
2000		
4000		
6000		
8000		
10,000		

II. OPERATING PROCEDURES

A. NORMAL PROCEDURES

1. GROUND CHECK

a. Cycle the Standby Vacuum Control Knob **OUT - ON -** , and return Control Knob **IN - OFF -** position.

2. BEFORE TAKEOFF

a. Idle Engine at low speed, momentarily pull the standby vacuum knob **OUT - ON -** and check vacuum gauge. Normally, the vacuum reading will be slightly higher. After checking system push Standby Vacuum System knob **IN - OFF -**. Check that vacuum gauge has returned to the previous reading.

3. ENROUTE

a. Regularly check vacuum gauge and monitor warning light for proper vacuum system operation.

B. EMERGENCY PROCEDURES

1. PRIMARY VACUUM FAILURE WARNING LIGHT ILLUMINATES

a. Pull the Standby Vacuum System knob **OUT -ON-** and adjust throttle setting as required to maintain adequate vacuum for the primary instruments - Suction Gauge Reading in the Green Arc - If necessary descend to a lower altitude to obtain a larger differential between manifold and ambient pressure. Vacuum power must be closely monitored by checking the vacuum gauge frequently.

b. The SVS is not designed for continued IFR flight. Immediate steps should be taken to return to VFR conditions or to land. If this is not possible, IFR flight should be continued only as long as necessary to return to VFR conditions or land the airplane.

WARNING: FAILURE OF THE VACUUM SYSTEM STILL CONSTITUTES AN EMERGENCY SITUATION REGARDLESS OF THE INSTALLATION OF THE SVS. IT MAY NOT BE POSSIBLE TO MAINTAIN A SAFE ALTITUDE AND MAKE USE OF THE SVS. IN SUCH A SITUATION THE AIRPLANE MUST BE FLOWN USING NON-VACUUM POWERED INSTRUMENTS.

B. EMERGENCY PROCEDURES (CONT.)

c. If descent is impractical:

- Periodically and temporarily reduce power as required to provide adequate vacuum to the aircraft primary instruments.
- Reapply power as required, while comparing vacuum driven gyros against the Turn and Bank Indicator, Turn Coordinator, VSI and/or other flight instruments.
- When an obvious discrepancy is noted between the vacuum driven instruments and other flight instrumentation. Periodically and temporarily reduce power as required to provide adequate vacuum to the aircraft primary instruments.

III. PERFORMANCE

NO CHANGE

- - END - -

Hartzell Propeller Inc.
One Propeller Place
Piqua, OH 45356

HP-R172K-AFMS

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

TO

CESSNA R172K Hawk XP AIRPLANE FLIGHT MANUAL

Aircraft Serial Number: R1723306

Registration Number: VH-YPM

This supplement must be attached to the FAA Approved Airplane Flight Manual when the airplane is modified by the installation of Hartzell (P)HC-G3YF-1RF/F7392 propeller with C-4582-(P) spinner or (P)HC-C3YF-1RF/F7392 propeller with A-2295-1(P) spinner in accordance with STC ____________.

The information contained herein supplements or supersedes the basic manual only in those areas listed herein. For limitations, procedures, and performance information not contained in this supplement, consult the Airplane Flight Manual.

FAA Approved [signature] Date 30 NOV 2004
Charles L. Smalley, Manager
Systems and Flight Test Branch
Chicago ACO, FAA Central Region

HARTZELL PROPELLER

HP-R172K-AFMS

AFM SUPPLEMENT
CESSNA R172K Hawk XP

LOG OF REVISIONS

Revision Number	Revised Pages	Description of Revision	Approved	Date

NOTE: All changes are indicated by a black vertical line along the left margin.

Date 30 NOV 2004

HP-R172K-AFMS

AFM SUPPLEMENT
CESSNA R172K Hawk XP

SECTION 2 - LIMITATIONS

Propeller: Hartzell (P)HC-G3YF-1RF/F7392
Or
Hartzell (P)HC-C3YF-1RF/F7392

Pitch settings, measured at 30 inch station:
Low, 195 HP @ 2600 RPM: 13.6 ± 0.2 degrees

For Aircraft with STCs SE1436CE & SE1437CE
Low, 210 HP @ 2800 RPM: 12.2 ± 0.2 degrees

High 35 ± 1 degrees

Maximum Diameter: 75 inches
Minimum Diameter: 73 inches

Spinner Hartzell C-4582-(P) with (P)HC-G3YF-1RF/F7392
Hartzell A-2295-1(P) with (P)HC-C3YF-1RF/F7392

Power Instruments No change

SECTION 3 - EMERGENCY PROCEDURES

Power-off descent rate with the Hartzell three-blade is greater than the McCauley two-blade configuration. The higher descent rate represents a 13% reduction in glide distance. Reduce maximum glide distances obtained from Figure 3-1 in Pilot's Operating Handbook by 13% to determine maximum glide distance with the Hartzell propeller.

Date 30 NOV 2004

HP-R172K-AFMS

AFM SUPPLEMENT
CESSNA R172K Hawk XP

SECTION 4 – NORMAL PROCEDURES

No Change

SECTION 5 - PERFORMANCE

Aircraft performance with this STC installed is equal to or better than the performance with the original two-blade propeller installed.

Date 30 NOV 2004