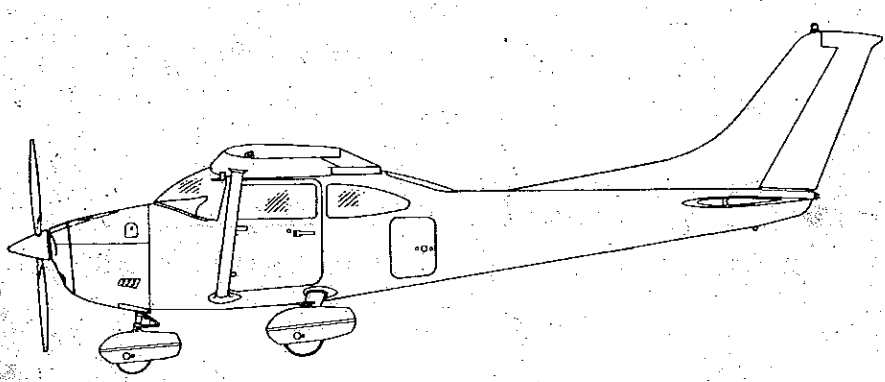
PILOT'S OPERATING HANDBOOK
and
FAA APPROVED AIRPLANE FLIGHT MANUAL



CESSNA AIRCRAFT COMPANY

1981 MODEL 182R

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

Serial No. 18267961

Registration No. N9539H
NWFlyers

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

29 August 1980

CONGRATULATIONS . . . .

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

This Pilot'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		146 KNOTS
Cruise, 75% Power at 8000 Ft		142 KNOTS
CRUISE: Recommended lean mixture with fuel allowance for engine start, taxi, takeoff, climb and 45 minutes reserve.		
75% Power at 8000 Ft	Range	820 NM
88 Gallons Usable Fuel	Time	5.9 HRS
Maximum Range at 10,000 Ft	Range	1025 NM
88 Gallons Usable Fuel	Time	9.6 HRS
RATE OF CLIMB AT SEA LEVEL		865 FPM
SERVICE CEILING		14,900 FT
TAKEOFF PERFORMANCE:		
Ground Roll		805 FT
Total Distance Over 50-Ft Obstacle		1515 FT
LANDING PERFORMANCE:		
Ground Roll		590 FT
Total Distance Over 50-Ft Obstacle		1350 FT
STALL SPEED (KCAS):		
Flaps Up, Power Off		54 KNOTS
Flaps Down, Power Off		49 KNOTS
MAXIMUM WEIGHT:		
Ramp		3110 LBS
Takeoff		3100 LBS
Landing		2950 LBS
STANDARD EMPTY WEIGHT:		
Skylane		1720 LBS
Skylane II		1775 LBS
MAXIMUM USEFUL LOAD:		
Skylane		1390 LBS
Skylane II		1335 LBS
BAGGAGE ALLOWANCE		200 LBS
WING LOADING: Pounds/Sq Ft		17.8
POWER LOADING: Pounds/HP		13.5
FUEL CAPACITY: Total		92 GAL.
OIL CAPACITY		12 QTS
ENGINE: Teledyne Continental 230 BHP at 2400 RPM		O-470-U
PROPELLER: Constant Speed, Diameter		82 IN.

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

COVERAGE

The Pilot's Operating Handbook in the airplane at the time of delivery from Cessna Aircraft Company contains information applicable to the 1981 Model 182R airplane designated by the serial number and registration number shown on the Title Page of this handbook. This information is based on data available at the time of publication.

REVISIONS

Changes and/or additions to this handbook will be covered by revisions published by Cessna Aircraft Company. These revisions are distributed to 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 ..... 29 August 1980

Page	Date
Title	29 August 1980
Assignment Record	29 August 1980
i thru iv	29 August 1980
1-1 thru 1-8	29 August 1980
2-1	29 August 1980
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2-12 Blank	29 August 1980
3-1 thru 3-9	29 August 1980
3-10 Blank	29 August 1980
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4-1 thru 4-11	29 August 1980
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9-4 Blank	29 August 1980

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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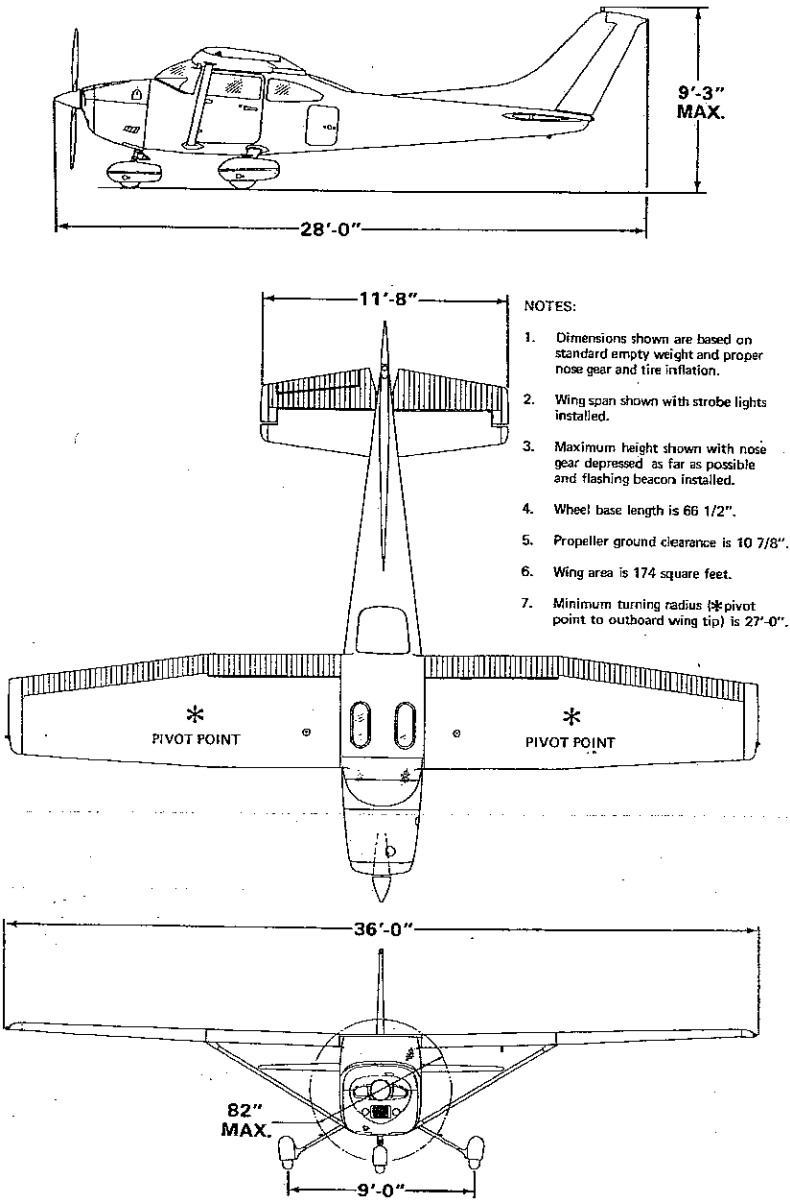

Figure 1-1.. Three View

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: O-470-U.
Engine Type: Normally-aspirated, direct-drive, air-cooled, horizontally-opposed, carburetor-equipped, six-cylinder engine with 470 cu. in. displacement.
Horsepower Rating and Engine Speed: 230 rated BHP at 2400 RPM.

PROPELLER

Propeller Manufacturer: McCauley Accessory Division.
Propeller Model Number: C2A34C204/90DCB-8.
Number of Blades: 2.
Propeller Diameter, Maximum: 82 inches.
Minimum: 80.5 inches.
Propeller Type: Constant speed and hydraulically actuated, with a low pitch setting of 15.0° and a high pitch setting of 29.4° (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.

Total Capacity: 92 gallons.
Total Capacity Each Tank: 46 gallons.
Total Usable: 88 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 to minimize cross-feeding.

OIL

Oil Grade (Specification):

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

NOTE

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

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:

All temperatures, use SAE 20W-50 or
Above 4°C (40°F), use SAE 50.
Below 4°C (40°F), use SAE 30.

NOTE

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

Oil Capacity:

Sump: 12 Quarts.
Total: 13 Quarts (if oil filter installed).

MAXIMUM CERTIFICATED WEIGHTS

Ramp: 3110 lbs.
Takeoff: 3100 lbs.
Landing: 2950 lbs.

Weight in Baggage Compartment:
Baggage Area "A" (or passenger on child's seat) - Station 82 to 109: 120 lbs. See note below.
Baggage Area "B" and - Station 109 to 124: 80 lbs. See note below.
Baggage Area "C" - Station 124 to 134: 80 lbs. See note below.

NOTE

The maximum allowable combined weight capacity for baggage in areas A, B and C is 200 pounds. The maximum allowable weight capacity for baggage in areas B and C is 80 pounds.

STANDARD AIRPLANE WEIGHTS

Standard Empty Weight, Skylane: 1720 lbs.
Skylane II: 1775
Maximum Useful Load, Skylane: 1390 lbs.
Skylane II: 1335 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: 17.8 lbs./sq. ft.
Power Loading: 13.5 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

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INTRODUCTION

Section 2 includes operating limitations, instrument markings, and basic placards necessary for the safe operation of the airplane, its engine, standard systems and standard equipment. The limitations included in this section 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. 3A13 as Cessna Model No. 182R.

AIRSPEED LIMITATIONS

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

	SPEED	KCAS	KIAS	REMARKS
V_{NE}	Never Exceed Speed	175	179	Do not exceed this speed in any operation.
V_{NO}	Maximum Structural Cruising Speed	140	143	Do not exceed this speed except in smooth air, and then only with caution.
V_A	Maneuvering Speed: 3100 Pounds 2600 Pounds 2000 Pounds	 110 101 88	 111 102 88	Do not make full or abrupt control movements above this speed.
V_{FE}	Maximum Flap Extended Speed: To 10^0 Flaps 10^0 - 40^0 Flaps	 137 95	 140 95	Do not exceed these speeds with the given flap settings.
	Maximum Window Open Speed	175	179	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	40 - 95	Full Flap Operating Range. Lower limit is maximum weight V_{S_0} in landing configuration. Upper limit is maximum speed permissible with flaps extended.
Green Arc	50 - 143	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	143 - 179	Operations must be conducted with caution and only in smooth air.
Red Line	179	Maximum speed for all operations.

Figure 2-2. Airspeed Indicator Markings

POWER PLANT LIMITATIONS

Engine Manufacturer: Teledyne Continental.
Engine Model Number: O-470-U.
Maximum Power: 230 BHP rating.
Engine Operating Limits for Takeoff and Continuous Operations:
Maximum Engine Speed: 2400 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 Grade: See Fuel Limitations.
Oil Grade (Specification)
MIL-L-6082 Aviation Grade Straight Mineral Oil or Ashless Dispersant Oil conforming to Continental Motors Specification MHS-24 and all revisions thereto.
Propeller Manufacturer: McCauley Accessory Division.
Propeller Model Number: C2A34C204/90DCB-8
Propeller Diameter, Maximum: 82 inches.
Minimum: 80.5 inches.
Propeller Blade Angle at 30 Inch Station, Low: 15.0°.
High: 29.4°.

POWER PLANT INSTRUMENT MARKINGS

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

INSTRUMENT	RED LINE MINIMUM LIMIT	GREEN ARC NORMAL OPERATING	RED LINE MAXIMUM LIMIT
Tachometer	- - -	2100 - 2400 RPM	2400 RPM
Manifold Pressure	- - -	15-23 in. Hg	- - -
Oil Temperature	- - -	100° - 240°F	240°F
Cylinder Head Temperature	- - -	200° - 460°F	460°F
Oil Pressure	10 psi	30-60 psi	100 psi
Suction	- - -	4.5-5.4 in. Hg	- - -
Fuel Quantity	E (2.0 Gal. Unusable Each Tank)	- - -	- - -

Figure 2-3. Power Plant Instrument Markings

WEIGHT LIMITS

Maximum Ramp Weight: 3110 lbs.
Maximum Takeoff Weight: 3100 lbs.
Maximum Landing Weight: 2950 lbs.
Maximum Weight in Baggage Compartment:
Baggage Area "A" (or passenger on child's seat) - Station 82 to 109: 120 lbs. See note below.
Baggage Area "B"- Station 109 to 124: 80 lbs. See note below.
Baggage Area "C" - Station 124 to 134: 80 lbs. See note below.

NOTE

The maximum allowable combined weight capacity for baggage in areas A, B and C is 200 pounds. The maximum allowable weight capacity for baggage in areas B and C is 80 pounds.

CENTER OF GRAVITY LIMITS

Center of Gravity Range:
Forward: 33.0 inches aft of datum at 2250 lbs. or less, with straight line variation to 40.9 inches aft of datum at 3100 lbs.
Aft: 46.0 inches aft of datum at all weights.
Reference Datum: Front face of firewall.

MANEUVER LIMITS

This airplane is certificated in the normal 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 steep turns in which the angle of bank is not more than 60°.

Aerobatic maneuvers, including spins, are not approved.

FLIGHT LOAD FACTOR LIMITS

Flight Load Factors:
*Flaps Up: +3.8g, -1.52g
*Flaps Down: +2.0g

*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: 46 U.S. gallons each.
Total Fuel: 92 U.S. gallons.
Usable Fuel (all flight conditions): 88 U.S. gallons.
Unusable Fuel: 4 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.

Takeoff and land with the fuel selector valve handle in BOTH position.

Operation on either left or right tank limited to level flight only.

With 1/4 tank or less, prolonged uncoordinated flight is prohibited when operating on either left or right tank in level 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 20°.
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 are contained in the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.
>
> No acrobatic maneuvers, including spins, approved.
>
> 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. On control lock:

> CONTROL LOCK- REMOVE BEFORE STARTING ENGINE

3. On the fuel selector valve plate:

> OFF
> LEFT - 44 GAL. LEVEL FLIGHT ONLY
> BOTH - 88 GAL. ALL FLIGHT ATTITUDES
> BOTH ON FOR TAKEOFF AND LANDING
> RIGHT - 44 GAL. LEVEL FLIGHT ONLY

4. On the baggage door:

120 POUNDS MAXIMUM
BAGGAGE AND/OR AUXILIARY PASSENGER
FORWARD OF BAGGAGE DOOR LATCH AND
80 POUNDS MAXIMUM
BAGGAGE AFT OF BAGGAGE DOOR LATCH
MAXIMUM 200 POUNDS COMBINED
FOR ADDITIONAL LOADING INSTRUCTIONS
SEE WEIGHT AND BALANCE DATA

5. On flap control indicator:

0° to 10°	(Partial flap range with blue code and 140 kt callout; also, mechanical detent at 10°.)
10° to 20° to FULL	(Indices at these positions with white color code and 95 kt callout; also, mechanical detent at 10° and 20°.)

6. Forward of fuel tank filler cap:

FUEL

100LL/100 MIN. GRADE AVIATION GASOLINE
CAP. 46.0 U.S. GAL.
CAP. 34.5 U.S. GAL. TO BOTTOM OF FILLER NECK

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

8. On oil filler cap:

OIL 12 QTS

9. Near airspeed indicator:

MANEUVER SPEED 111 KIAS

10. Forward of each fuel tank filler cap in line with fwd arrow.

FUEL CAP FWD ▲ ARROW ALIGNMENT CAP MUST NOT ROTATE DURING CLOSING

SECTION 3
EMERGENCY PROCEDURES

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TABLE OF CONTENTS (Continued)

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	75 KIAS
Wing Flaps Down	70 KIAS
Maneuvering Speed:	
3100 Lbs	111 KIAS
2600 Lbs	102 KIAS
2000 Lbs	88 KIAS
Maximum Glide:	
3100 Lbs	76 KIAS
2600 Lbs	70 KIAS
2000 Lbs	61 KIAS
Precautionary Landing With Engine Power	70 KIAS
Landing Without Engine Power:	
Wing Flaps Up	75 KIAS
Wing Flaps Down	70 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 -- 75 KIAS (flaps UP).
   70 KIAS (flaps DOWN).
2. Mixture -- IDLE CUT-OFF.
3. Fuel Selector Valve -- OFF.
4. Ignition Switch -- OFF.
5. Wing Flaps -- AS REQUIRED (40° recommended).
6. Master Switch -- OFF.

ENGINE FAILURE DURING FLIGHT

1. Airspeed -- 75 KIAS.
2. Carburetor Heat -- ON.
3. Fuel Selector Valve -- BOTH
4. Mixture -- RICH.
5. Ignition Switch -- BOTH (or START if propeller is stopped).
6. Primer -- IN and LOCKED.

FORCED LANDINGS

EMERGENCY LANDING WITHOUT ENGINE POWER

1. Airspeed -- 75 KIAS (flaps UP).
   70 KIAS (flaps DOWN).
2. Mixture -- IDLE CUT-OFF.
3. Fuel Selector Valve -- OFF.
4. Ignition Switch -- OFF.
5. Wing Flaps -- AS REQUIRED (40° recommended).
6. Master Switch -- OFF.
7. Doors -- UNLATCH PRIOR TO TOUCHDOWN.
8. Touchdown -- SLIGHTLY TAIL LOW.
9. Brakes -- APPLY HEAVILY.

PRECAUTIONARY LANDING WITH ENGINE POWER

1. Airspeed -- 75 KIAS.
2. Wing Flaps -- 20°.
3. Selected Field -- FLY OVER, noting terrain and obstructions, then retract flaps upon reaching a safe altitude and airspeed.
4. Electrical Switches -- OFF.
5. Wing Flaps -- 40° (on final approach).
6. Airspeed -- 70 KIAS.
7. Avionics Power and Master Switches -- OFF.
8. Doors -- UNLATCH PRIOR TO TOUCHDOWN.

9. Touchdown -- SLIGHTLY TAIL LOW.
10. Ignition Switch -- OFF.
11. Brakes -- APPLY HEAVILY.

DITCHING

1. Radio -- TRANSMIT MAYDAY on 121.5 MHz, giving location and intentions and SQUAWK 7700 if transponder is installed.
2. Heavy Objects (in baggage area) -- SECURE OR JETTISON.
3. Flaps -- 20° - 40°.
4. Power -- ESTABLISH 300 FT/MIN DESCENT at 65 KIAS.
5. Approach -- High Winds, Heavy Seas -- INTO THE WIND.
   Light Winds, Heavy Swells -- PARALLEL TO SWELLS.

NOTE

If no power is available, approach at 75 KIAS with flaps up or at 70 KIAS with 10° flaps.

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

FIRES

DURING START ON GROUND

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

If engine starts:

2. Power -- 1700 RPM for a few minutes.
3. Engine -- SHUTDOWN and inspect for damage.

If engine fails to start:

4. Throttle -- FULL OPEN.
5. Mixture -- IDLE CUT-OFF.
6. Cranking -- CONTINUE.

7. Fire Extinguisher -- OBTAIN (have ground attendants obtain if not installed).
8. Engine -- SECURE.
   a. Master Switch -- OFF.
   b. Ignition Switch -- OFF.
   c. Fuel Selector Valve -- OFF.
9. Fire -- EXTINGUISH using fire extinguisher, wool blanket, or dirt.
10. Fire Damage -- INSPECT, repair damage or replace damaged components or wiring before conducting another flight.

ENGINE FIRE IN FLIGHT

1. Mixture -- IDLE CUT-OFF.
2. Fuel Selector Valve -- OFF.
3. Master Switch -- OFF.
4. Cabin Heat and Air -- OFF (except overhead vents).
5. Airspeed -- 100 KIAS (If fire is not extinguished, increase glide speed to find an airspeed which will provide an incombustible mixture).
6. 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 and rotate defroster control clockwise to obtain maximum defroster airflow.
4. Increase engine speed to minimize ice build-up on propeller blades.
5. Watch for signs of carburetor air filter ice and apply carburetor heat as required. An unexplained loss in manifold pressure could be caused by carburetor ice or air intake filter ice. Lean the mixture if carburetor heat is used continuously.
6. Plan a landing at the nearest airport. With an extremely rapid ice build-up, select a suitable "off airport" 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 ice accumulation.
12. Perform a landing in level attitude.

STATIC SOURCE BLOCKAGE
(Erroneous Instrument Reading Suspected)

1. Alternate Static Source Valve (if installed) -- PULL ON.
2. Airspeed -- Consult appropriate table in Section 5.
3. Altitude -- Cruise 50 feet higher and approach 30 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.
4. Directional Control -- MAINTAIN using brake on good wheel as required.

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.

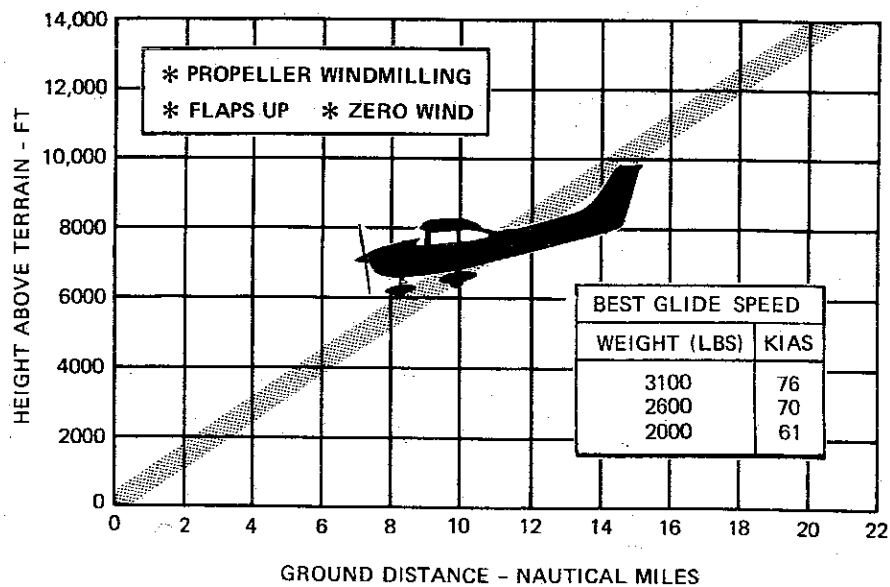


Figure 3-1. Maximum Glide

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 in the checklist for Emergency Landing Without Engine Power.

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.

In a forced landing situation, do not turn off the avionics power and master switches until a landing is assured. Premature deactivation of the switches will disable the encoding altimeter and airplane electrical systems.

LANDING WITHOUT ELEVATOR CONTROL

Trim for horizontal flight with an airspeed of approximately 80 KIAS 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

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

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

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

RECOVERY FROM A SPIRAL DIVE

If a spiral is encountered, proceed as follows:

1. Close the throttle.
2. Stop the turn by using coordinated aileron and rudder control to align the symbolic airplane in the turn coordinator with the horizon reference line.
3. Cautiously apply elevator back pressure to slowly reduce the indicated airspeed to 80 KIAS.
4. Adjust the elevator trim control to maintain an 80 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. Apply carburetor heat.
7. Clear engine occasionally, but avoid using enough power to disturb the trimmed glide.
8. Upon breaking out of clouds, resume normal cruising flight.

INADVERTENT FLIGHT INTO ICING CONDITIONS

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

STATIC SOURCE BLOCKED

If erroneous readings of the static source instruments (airspeed, altimeter and vertical speed) are suspected, the alternate static source valve should be pulled on, thereby supplying static pressure to these instruments from the cabin. Cabin pressures will vary with open ventilators or windows and with airspeed. To avoid the possibility of large errors, the windows should not be open when using the alternate static source.

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 vertical speed indicator.

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 3 knots faster and the altimeter 50 feet higher in cruise. With the vents open, this variation reduces to zero. If the alternate static source must be used for landing, the normal indicated approach speed may be used.

SPINS

Intentional spins are prohibited in this airplane. 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 WHEEL **BRISKLY** FORWARD FAR ENOUGH TO BREAK THE STALL.
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.

ROUGH ENGINE OPERATION OR LOSS OF POWER

CARBURETOR ICING

An unexplained drop in manifold pressure and eventual engine

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

SPARK PLUG FOULING

A slight engine roughness in flight may be caused by one or more spark plugs becoming fouled by carbon or lead deposits. This may be verified by turning the ignition switch momentarily from BOTH to either L or R position. An obvious power loss in single ignition operation is evidence of spark plug or magneto trouble. Assuming that spark plugs are the 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.

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. A broken alternator drive belt or wiring is most likely the cause of alternator failures, although other factors could cause the problem. A defective 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 paragraphs below 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, 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 output is low, 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

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

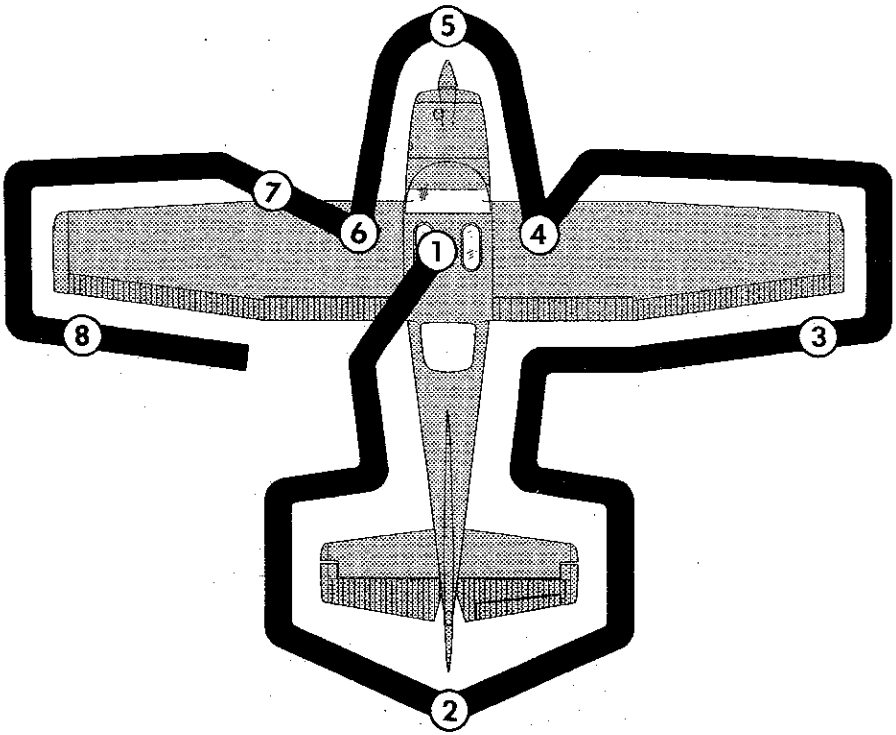
INTRODUCTION

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 takeoff weight or maximum landing weight, 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:	
Normal Climb Out	70-80 KIAS
Short Field Takeoff, Flaps 20°, Speed at 50 Feet	59 KIAS
Enroute Climb, Flaps Up:	
Normal	85-95 KIAS
Best Rate of Climb, Sea Level	81 KIAS
Best Rate of Climb, 10,000 Feet	75 KIAS
Best Angle of Climb, Sea Level	59 KIAS
Best Angle of Climb, 10,000 Feet	66 KIAS
Landing Approach (2950 Lbs):	
Normal Approach, Flaps Up	70-80 KIAS
Normal Approach, Flaps 40°	60-70 KIAS
Short Field Approach, Flaps 40°	61 KIAS
Balked Landing (2950 Lbs):	
Maximum Power, Flaps 20°	55 KIAS
Maximum Recommended Turbulent Air Penetration Speed:	
3100 Lbs	111 KIAS
2600 Lbs	102 KIAS
2000 Lbs	88 KIAS
Maximum Demonstrated Crosswind Velocity:	
Takeoff or Landing	15 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 heat 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.
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 Avionics Cooling Fan -- CHECK AUDIBLY FOR OPERATION.
8. Master Switch -- OFF.
9. Static Pressure Alternate Source Valve (if installed) -- OFF.
10. Fuel Selector Valve -- BOTH.
11. 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. Fuel Tank Vent Opening -- CHECK for stoppage.
3. Main Wheel Tire -- CHECK for proper inflation.

4. 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.
5. Fuel Quantity -- CHECK VISUALLY for desired level.
6. Fuel Filler Cap -- SECURE and vent unobstructed.

(5) NOSE

1. Static Source Openings (both sides of fuselage) --CHECK for stoppage.
2. Propeller and Spinner -- CHECK for nicks, security and oil leaks.
3. Landing Lights -- CHECK for condition and cleanliness.
4. Carburetor Air Filter -- CHECK for restrictions by dust or other foreign matter.
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 nine quarts. Fill to twelve 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, and fuel selector valve 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 and vent unobstructed.

(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 Vane -- CHECK for freedom of movement while master switch is momentarily turned ON (horn should sound when vane is pushed upward).
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, Seat Belts, Shoulder Harnesses -- ADJUST and LOCK.
3. Fuel Selector Valve -- BOTH.
4. 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.

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

STARTING ENGINE

1. Mixture -- RICH.
2. Propeller -- HIGH RPM.
3. Carburetor Heat -- COLD.
4. Throttle -- OPEN 1/2 INCH.
5. Prime -- AS REQUIRED.
6. Master Switch -- ON.
7. Propeller Area -- CLEAR.
8. Ignition Switch -- START (release when engine starts).

NOTE

If engine has been overprimed, start with throttle 1/4 to 1/2 open. Reduce throttle to idle when engine fires.

9. Oil Pressure -- CHECK.
10. Flashing Beacon and Navigation Lights -- ON as required.
11. Avionics Power Switch -- ON.
12. Radios -- ON.

BEFORE TAKEOFF

1. Cabin Doors and Windows -- CLOSED and LOCKED.
2. Parking Brake -- SET.
3. Flight Controls -- FREE and CORRECT.
4. Flight Instruments -- SET.
5. Fuel Selector Valve -- BOTH.
6. Mixture -- RICH.

7. Elevator and Rudder Trim -- TAKEOFF.
8. Throttle -- 1700 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. Carburetor Heat -- CHECK (for RPM drop).
   d. Engine Instruments and Ammeter -- CHECK.
   e. Suction Gage -- CHECK.
9. Throttle -- 800 - 1000 RPM..
10. Radios -- SET.
11. Autopilot (if installed) -- OFF.
12. Strobe Lights (if installed) -- AS DESIRED.
13. Throttle Friction Lock -- ADJUST.
14. Parking Brake -- RELEASE.

TAKEOFF

NORMAL TAKEOFF

1. Wing Flaps -- 0° - 20°.
2. Carburetor Heat -- COLD.
3. Power -- FULL THROTTLE and 2400 RPM.
4. Elevator Control -- LIFT NOSE WHEEL at 50 KIAS.
5. Climb Speed -- 70 KIAS (flaps 20°).
   80 KIAS (flaps UP).
6. Wing Flaps -- RETRACT.

SHORT FIELD TAKEOFF

1. Wing Flaps -- 20°.
2. Carburetor Heat -- COLD.
3. Brakes -- APPLY.
4. Power -- FULL THROTTLE and 2400 RPM.
5. Brakes -- RELEASE.
6. Elevator Control -- MAINTAIN SLIGHTLY TAIL LOW ATTITUDE.
7. Climb Speed -- 59 KIAS (until all obstacles are cleared).
8. Wing Flaps -- RETRACT slowly after reaching 70 KIAS.

ENROUTE CLIMB

NORMAL CLIMB

1. Airspeed -- 85-95 KIAS.
2. Power -- 23 INCHES Hg and 2400 RPM.

3. Fuel Selector Valve -- BOTH.
4. Mixture -- FULL RICH (mixture may be leaned above 5000 feet for smooth engine operation).
5. Cowl Flaps -- OPEN as required.

MAXIMUM PERFORMANCE CLIMB

1. Airspeed -- 81 KIAS at sea level to 75 KIAS at 10,000 feet.
2. Power -- FULL THROTTLE and 2400 RPM.
3. Fuel Selector Valve -- BOTH.
4. Mixture -- FULL RICH (mixture may be leaned above 5000 feet for smooth engine operation).
5. Cowl Flaps -- FULL OPEN.

CRUISE

1. Power -- 15-23 INCHES Hg, 2100-2400 RPM (no more than 75% power).
2. Elevator and Rudder Trim -- ADJUST.
3. Mixture -- LEAN.
4. Cowl Flaps -- CLOSED.

DESCENT

1. Fuel Selector Valve -- BOTH.
2. Power -- AS DESIRED.
3. Carburetor Heat -- FULL HEAT AS REQUIRED to prevent carburetor icing.
4. Mixture -- ENRICHEN as required.
5. Cowl Flaps -- CLOSED.
6. Wing Flaps -- AS DESIRED (0° - 10° below 140 KIAS, 10° - 40° below 95 KIAS).

BEFORE LANDING

1. Seats, Seat Belts, Shoulder Harnesses -- ADJUST and LOCK.
2. Fuel Selector Valve -- BOTH.
3. Mixture -- RICH.
4. Carburetor Heat -- ON (apply full heat before reducing power).
5. Propeller -- HIGH RPM.
6. Autopilot (if installed) -- OFF.

LANDING

NORMAL LANDING

1. Airspeed -- 70-80 KIAS (flaps UP).
2. Wing Flaps -- AS DESIRED (0° - 10° below 140 KIAS, 10° - 40° below 95 KIAS).
3. Airspeed -- 60-70 KIAS (flaps DOWN).
4. Trim -- ADJUST.
5. Touchdown -- MAIN WHEELS FIRST.
6. Landing Roll -- LOWER NOSE WHEEL GENTLY.
7. Braking -- MINIMUM REQUIRED.

SHORT FIELD LANDING

1. Airspeed -- 70-80 KIAS (flaps UP).
2. Wing Flaps -- 40° (below 95 KIAS).
3. Airspeed -- MAINTAIN 61 KIAS.
4. 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 2400 RPM.
2. Carburetor Heat -- COLD.
3. Wing Flaps -- RETRACT to 20°.
4. Climb Speed -- 55 KIAS.
5. Wing Flaps -- RETRACT slowly after reaching 70 KIAS.
6. Cowl Flaps -- OPEN.

AFTER LANDING

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

SECURING AIRPLANE

1. Parking Brake -- SET.
2. Avionics Power Switch, Electrical Equipment -- OFF.

3. Throttle -- IDLE.
4. Mixture -- IDLE CUT-OFF (pulled full out).
5. Ignition Switch -- OFF.
6. Master Switch -- OFF.
7. Control Lock -- INSTALL.
8. Fuel Selector Valve -- RIGHT or LEFT to prevent crossfeeding.

AMPLIFIED PROCEDURES

STARTING ENGINE

Ordinarily the engine starts easily with one or two strokes of the primer in warm temperatures to six strokes in cold weather with the throttle open approximately 1/2 inch. In extremely cold temperatures, it may be necessary to continue priming while cranking. Weak intermittent firing followed by puffs of black smoke from the exhaust stack indicates overpriming or flooding. Excess fuel can be cleared from the combustion chambers by the following procedure: Set the mixture control full lean and the throttle full open; then crank the engine through several revolutions with the starter. Repeat the starting procedure without any additional priming.

If the engine is underprimed (most likely in cold weather with a cold engine) it will not fire at all. Additional priming will be necessary for the next starting attempt. As soon as the cylinders begin to fire, open the throttle slightly to keep it running.

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 gage does not begin to show pressure within 30 seconds in the summertime and about twice that long in very cold weather, stop engine and investigate. Lack of oil pressure can cause serious engine damage. After starting, avoid the use of carburetor heat unless icing conditions prevail.

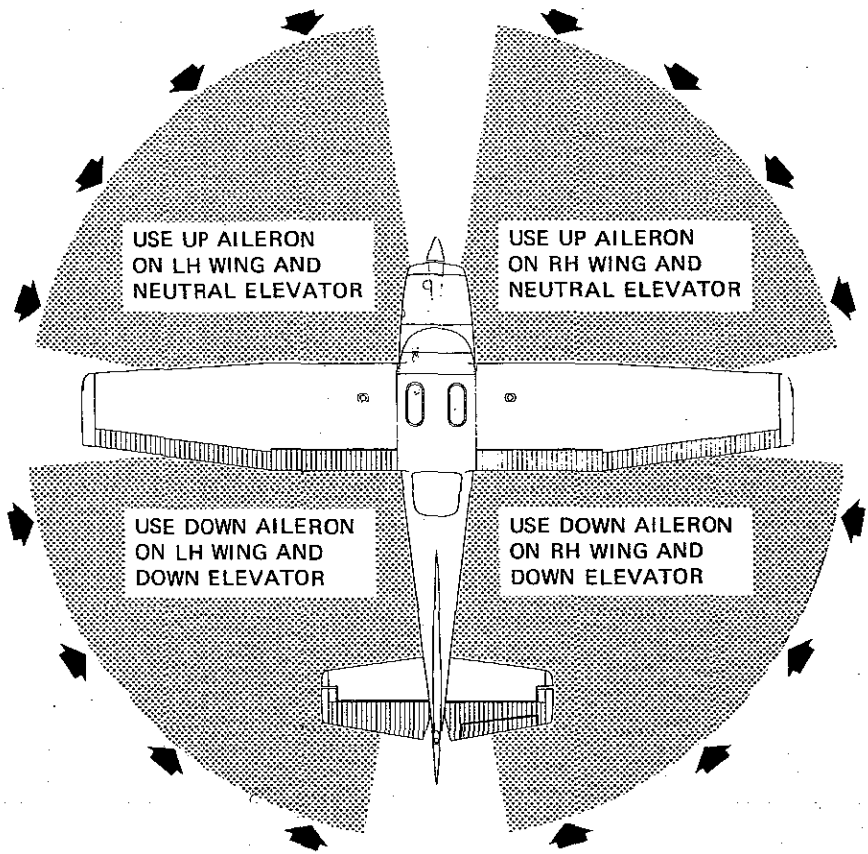
NOTE

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.

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



CODE

WIND DIRECTION

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

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 power 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 1700 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 the 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 flights 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 (1700 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 takeoff power early in the takeoff run. Any sign of rough engine operation or sluggish engine acceleration is good cause for discontinuing the takeoff.

Full power runups over loose gravel are especially harmful to pro-

peller 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 high 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.

After full power is applied, adjust the throttle friction lock clockwise to prevent the throttle from creeping 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° to 20°. Using 20° wing flaps reduces the ground run and total distance over an obstacle by approximately 20 per cent. Flap deflections greater than 20° are not approved for takeoff.

If 20° 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 20°, an obstacle clearance speed of 59 KIAS should be used.

Soft field takeoffs are performed with 20° 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.

With wing flaps retracted and no obstructions ahead, a climb-out speed of 80 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, and 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, 23 In. Hg. or full throttle (whichever is less) and 2400 RPM for the best combination of

engine cooling, rate of climb and forward visibility. If it is necessary to climb rapidly to clear mountains or reach favorable winds at high altitudes, the best rate-of-climb speed should be used with maximum power. This speed is 81 KIAS at sea level, decreasing to 75 KIAS at 10,000 feet.

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 59 KIAS at sea level, increasing to 66 KIAS at 10,000 feet.

The mixture should be full rich during climb at altitudes up to 5000 feet. Above 5000 feet, the mixture may be leaned for smooth engine operation and increased power.

CRUISE

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

NOTE

Cruising should be done at 75% power as much as practical until a total of 50 hours has accumulated or oil consumption has stabilized. This is to ensure proper seating of the rings and is applicable to new engines, and engines in service following cylinder replacement or top overhaul of one or more cylinders.

The Cruise Performance Table, figure 4-3, illustrates the true airspeed and nautical miles per gallon during cruise for various altitudes and percent powers. This table should be used as a guide, along with the available winds aloft information, to determine the most favorable altitudes 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 green arc range for a given percent power that will provide smooth engine operation. The cowl flaps should be opened, if necessary, to maintain the cylinder head temperature at approximately two-thirds of the normal operating range (green arc).

	75% POWER		65% POWER		55% POWER	
ALTITUDE	KTAS	NMPG	KTAS	NMPG	KTAS	NMPG
4000 Feet	137	10.6	129	11.6	118	12.5
6000 Feet	139	10.8	131	11.8	120	12.6
8000 Feet	142	11.0	133	12.0	121	12.8
10,000 Feet	- - -	- - -	135	12.2	123	13.0
Standard Conditions						Zero Wind

Figure 4-3. Cruise Performance Table

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

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

For best fuel economy at 65% power or less, the engine may be operated at the leanest mixture that results in smooth engine operation. This will result in approximately 5% greater range than shown in this handbook accompanied by approximately a 3 knot decrease in speed.

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

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

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

LEANING WITH A CESSNA ECONOMY MIXTURE INDICATOR (EGT)

Exhaust gas temperature (EGT) as shown on the optional Cessna

MIXTURE DESCRIPTION	EXHAUST GAS TEMPERATURE
RECOMMENDED LEAN (Pilot's Operating Handbook and Power Computer)	50°F Rich of Peak EGT
BEST ECONOMY (65% Power or Less)	Peak EGT

Figure 4-4. EGT Table

Economy Mixture Indicator may be used as an aid for mixture leaning in cruising flight at 75% 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 data in figure 4-4.

Continuous operation at peak EGT is authorized only at 65% power or less. This best economy mixture setting results in approximately 5% greater range than shown in this handbook accompanied by approximately a 3 knot decrease in speed.

NOTE

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

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

STALLS

The stall characteristics are conventional and aural warning is provided by a stall warning horn which sounds between 5 and 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.

LANDING

NORMAL LANDING

Landings should be made on the main wheels first to reduce the

landing speed and the subsequent need for braking in the landing roll. The nose wheel is lowered gently to the runway after the speed has diminished to avoid unnecessary nose gear load. This procedure is especially important in rough field landings.

SHORT FIELD LANDING

For a short field landing, make a power-off approach at 61 KIAS with 40° flaps and land on the main wheels first. Immediately after touchdown, lower the nose gear to the ground and apply heavy braking as required. For maximum brake effectiveness after all three wheels are on the ground, retract the flaps, hold full nose up elevator and apply maximum possible brake pressure without sliding the tires.

CROSSWIND LANDING

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

BALKED LANDING

In a balked landing (go-around) climb, the wing flap setting should be reduced to 20° immediately after full power is applied. After all obstacles are cleared and a safe altitude and airspeed are obtained, the wing flaps should be retracted.

COLD WEATHER OPERATION

STARTING

Prior to starting on cold mornings, 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.

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 the 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.

Cold weather starting procedures are as follows:

With Preheat:

1. With ignition switch turned OFF, mixture full rich and throttle open 1/2 inch, prime the engine four to eight strokes as the propeller is being turned over by hand.

NOTE

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

2. Propeller -- CLEAR.
3. Avionics Power Switch -- OFF.
4. Master Switch -- ON.
5. Ignition Switch -- START (release to BOTH when engine starts).
6. Pull carburetor heat on after engine has started, and leave on until the engine is running smoothly.

Without Preheat:

1. Prime the engine six to eight strokes while the propeller is being turned by hand with mixture full rich and throttle open 1/2 inch. Leave the primer charged and ready for stroke.
2. Propeller -- CLEAR.
3. Avionics Power Switch -- OFF.
4. Master Switch -- ON.
5. Ignition Switch -- START.
6. Pump throttle rapidly to full open twice. Return to 1/2 inch open position.
7. Release ignition switch to BOTH when engine starts.
8. Continue to prime engine until it is running smoothly, or alternately, pump the throttle rapidly over first 1/4 of total travel.
9. Oil Pressure -- CHECK.
10. Pull carburetor heat knob full on after engine has started. Leave on until engine is running smoothly.
11. Primer -- LOCK.

NOTE

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

CAUTION

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

OPERATION

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

Rough engine operation in cold weather can be caused by a combination of an inherently leaner mixture due to the dense air and poor vaporization and distribution of the fuel-air mixture to the cylinders. The effects of these conditions are especially noticeable during operation on one magneto in ground checks where only one spark plug fires in each cylinder.

For optimum operation of the engine in cold weather, the appropriate use of carburetor heat is recommended. The following procedures are indicated as a guideline:

1. Use carburetor heat during engine warm-up and ground check. Full carburetor heat may be required for temperatures below -12°C whereas partial heat could be used in temperatures between -12°C and 4°C.
2. Use the minimum carburetor heat required for smooth operation in take-off, climb, and cruise.

NOTE

Care should be exercised when using partial carburetor heat to avoid icing. Partial heat may raise the carburetor air temperature to 0° to 21°C range where icing is critical under certain atmospheric conditions.

3. If the airplane is equipped with a carburetor air temperature gage, it can be used as a reference in maintaining carburetor air temperature at or slightly above the top of the yellow arc by application of carburetor heat.

HOT WEATHER OPERATION

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

NOISE CHARACTERISTICS

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 182R at 3100 pounds maximum weight is 69.1 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	3050 Pounds
Usable fuel	65 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	450 Nautical Miles
Pressure altitude	7500 Feet
Temperature	16°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 3100 pounds, pressure altitude of 2000 feet and a temperature of 30°C should be used and results in the following:

Ground roll	1065 Feet
Total distance to clear a 50-foot obstacle	2035 Feet

These distances are well within the available takeoff field length. However, a correction for the effect of wind may be made based on Note 3 of the takeoff chart. The correction for 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	1065
Decrease in ground roll (1065 feet × 13%)	138
Corrected ground roll	927 Feet
Total distance to clear a 50-foot obstacle, zero wind	2035
Decrease in total distance (2035 feet × 13%)	265
Corrected total distance to clear 50-foot obstacle	1770 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 65% will be used.

The cruise performance chart for 8,000 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 2200 RPM and 21 inches of manifold pressure, which results in the following:

Power	65%
True airspeed	135 Knots
Cruise fuel flow	11.0 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 8000 feet requires 3.5 gallons of fuel. The corresponding distance during the climb is 19 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	3.5
Increase due to non-standard temperature (3.5 × 16%)	0.6
Corrected fuel to climb	4.1 Gallons

Using a similar procedure for the distance during climb results in 22 nautical miles.

The resultant cruise distance is:

Total distance	450
Climb distance	-22
Cruise distance	428 Nautical Miles

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

135
-10
125 Knots

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

$$\frac{428 \text{ Nautical Miles}}{125 \text{ Knots}} = 3.4 \text{ Hours}$$

The fuel required for cruise is:

3.4 hours × 11.0 gallons/hour = 37.4 Gallons

A 45-minute reserve requires:

$$\frac{45}{60} \times 11.0 \text{ gallons/hour} = 8.3 \text{ Gallons}$$

The total estimated fuel required is as follows:

Engine start, taxi, and takeoff	1.7
Climb	4.1
Cruise	37.4
Reserve	8.3
Total fuel required	51.5 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	670 Feet
Total distance to clear a 50-foot obstacle	1480 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

CONDITIONS:
Power required for level flight or maximum power descent.

FLAPS UP													
KIAS	55	60	70	80	90	100	110	120	130	140	150	160	---
KCAS	62	65	72	80	90	99	109	118	128	137	147	156	---
FLAPS 20°													
KIAS	40	50	60	70	80	90	95	---	---	---	---	---	---
KCAS	54	58	63	71	80	90	95	---	---	---	---	---	---
FLAPS 40°													
KIAS	40	50	60	70	80	90	95	---	---	---	---	---	---
KCAS	52	57	63	71	80	90	95	---	---	---	---	---	---

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

AIRSPEED CALIBRATION
ALTERNATE STATIC SOURCE

HEATER/VENTS AND WINDOWS CLOSED

FLAPS UP											
NORMAL KIAS	60	70	80	90	100	110	120	130	140	150	160
ALTERNATE KIAS	60	71	82	92	103	113	123	133	143	153	163
FLAPS 20°											
NORMAL KIAS	50	60	70	80	90	95	---	---	---	---	---
ALTERNATE KIAS	49	60	71	82	92	97	---	---	---	---	---
FLAPS 40°											
NORMAL KIAS	40	50	60	70	80	90	95	---	---	---	---
ALTERNATE KIAS	44	48	60	71	81	90	95	---	---	---	---

HEATER/VENTS OPEN AND WINDOWS CLOSED

FLAPS UP											
NORMAL KIAS	60	70	80	90	100	110	120	130	140	150	160
ALTERNATE KIAS	60	69	79	90	100	110	120	130	140	150	160
FLAPS 20°											
NORMAL KIAS	50	60	70	80	90	95	---	---	---	---	---
ALTERNATE KIAS	47	58	68	78	89	94	---	---	---	---	---
FLAPS 40°											
NORMAL KIAS	40	50	60	70	80	90	95	---	---	---	---
ALTERNATE KIAS	44	47	57	67	77	86	91	---	---	---	---

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

TEMPERATURE CONVERSION CHART

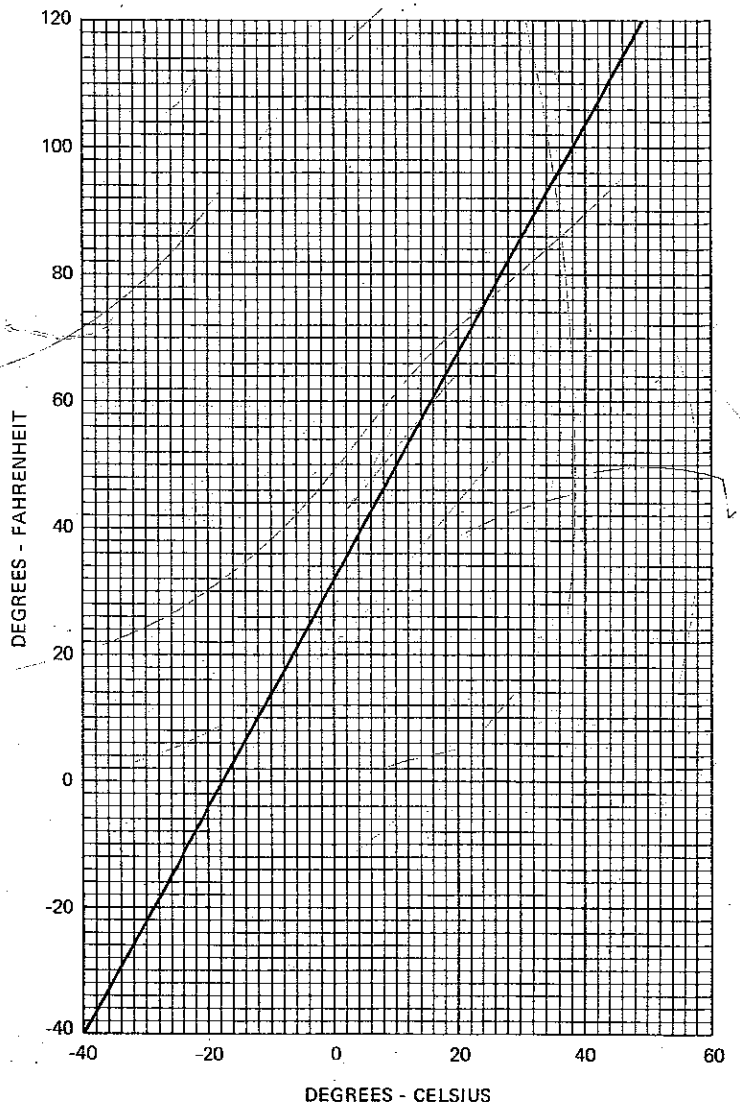


Figure 5-2. Temperature Conversion Chart

STALL SPEEDS

CONDITIONS:
Power Off

NOTES:
1. Altitude loss during a stall recovery may be as much as 250 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
3100	UP	50	54	54	58	60	64	71	76
	20°	42	50	45	54	50	60	59	71
	40°	40	49	43	53	48	58	57	69

MOST FORWARD CENTER OF GRAVITY

WEIGHT LBS	FLAP DEFLECTION	ANGLE OF BANK							
		0°		30°		45°		60°	
		KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
3100	UP	50	56	54	60	60	67	71	79
	20°	42	52	45	56	50	62	59	74
	40°	40	50	43	54	48	60	57	71

Figure 5-3. Stall Speeds

TAKEOFF DISTANCE

MAXIMUM WEIGHT 3100 LBS

SHORT FIELD

CONDITIONS:
Flaps 20°
2400 RPM, Full Throttle and Mixture Set Prior to Brake Release
Cowl Flaps Open
Paved, Level, Dry Runway
Zero Wind

NOTES:
1. Short field technique as specified in Section 4.
2. Prior to takeoff from fields above 5000 feet elevation, the mixture should be leaned to give maximum power in a full throttle, static runup.
3. Decrease distances 10% for each 9 knots headwind. For operation with tailwinds up to 10 knots, increase distances by 10% for each 2 knots.
4. Where distance value has been deleted, climb performance after lift-off is less than 150 fpm at takeoff speed.
5. For operation on a dry, grass runway, increase distances by 15% of the "ground roll" figure.

WEIGHT LBS	TAKEOFF SPEED KIAS		PRESS ALT FT	0°C		10°C		20°C		30°C		40°C	
	LIFT OFF	AT 50 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
3100	50	59	S.L.	720	1365	775	1465	835	1570	895	1680	955	1800
			1000	785	1490	845	1600	910	1720	975	1845	1045	1980
			2000	860	1635	925	1760	995	1890	1065	2035	1140	2185
			3000	940	1800	1010	1940	1085	2090	1165	2255	1250	2430
			4000	1025	1990	1105	2150	1190	2320	1275	2510	1370	2715
			5000	1125	2210	1215	2395	1305	2595	1400	2815	1505	3060
			6000	1235	2470	1330	2685	1435	2925	1540	3190	1655	3490
			7000	1360	2780	1465	3040	1580	3330	1700	3665	- - -	- - -
			8000	1500	3170	1615	3485	1740	3855	- - -	- - -	- - -	- - -

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

TAKEOFF DISTANCE

2800 LBS AND 2500 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
2800	48	56	S.L.	575	1080	615	1155	660	1235	710	1320	760	1410
			1000	625	1175	670	1260	720	1350	770	1440	825	1540
			2000	680	1285	730	1375	785	1475	840	1580	900	1690
			3000	740	1405	800	1505	855	1615	920	1735	985	1860
			4000	810	1540	870	1655	935	1780	1005	1910	1075	2050
			5000	885	1695	955	1825	1025	1965	1100	2115	1180	2280
			6000	970	1875	1045	2025	1125	2185	1210	2355	1295	2545
			7000	1070	2085	1150	2255	1235	2440	1330	2640	1425	2865
			8000	1175	2330	1265	2525	1360	2745	1465	2990	1570	3265
2500	45	53	S.L.	445	845	475	900	510	960	545	1020	585	1085
			1000	485	915	520	975	555	1040	595	1110	635	1185
			2000	525	995	565	1060	605	1135	650	1210	695	1290
			3000	570	1080	615	1155	660	1235	705	1320	755	1410
			4000	625	1180	670	1265	720	1350	770	1445	825	1545
			5000	680	1290	735	1385	790	1480	845	1590	905	1700
			6000	745	1415	805	1520	860	1630	925	1750	990	1875
			7000	820	1560	880	1675	945	1800	1015	1935	1085	2080
			8000	900	1725	965	1855	1040	2000	1115	2155	1195	2320

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

MAXIMUM RATE OF CLIMB

CONDITIONS:
Flaps Up
2400 RPM
Full Throttle
Mixture Full Rich
Cowl Flaps Open

NOTE:
Mixture may be leaned above 5000 feet for smooth engine operation and increased power.

WEIGHT LBS	PRESS ALT FT	CLIMB SPEED KIAS	RATE OF CLIMB - FPM			
			-20°C	0°C	20°C	40°C
3100	S.L.	81	1010	925	845	765
	2000	80	885	805	730	650
	4000	78	760	685	610	540
	6000	77	640	570	495	425
	8000	76	520	450	380	310
	10,000	75	405	335	265	- - -
	12,000	73	285	220	155	- - -
	14,000	72	170	105	- - -	- - -

Figure 5-5. Maximum Rate of Climb

TIME, FUEL, AND DISTANCE TO CLIMB

MAXIMUM RATE OF CLIMB

CONDITIONS:
Flaps Up
2400 RPM
Full Throttle
Mixture Full Rich
Cowl Flaps Open
Standard Temperature

NOTES:
1. Add 1.7 gallons of fuel for engine start, taxi and takeoff allowance.
2. Mixture may be leaned above 5000 feet for smooth engine operation and increased power.
3. Increase time, fuel and distance by 10% for each 10°C above standard temperature.
4. Distances shown are based on zero wind.

WEIGHT LBS	PRESSURE ALTITUDE FT	TEMP °C	CLIMB SPEED KIAS	RATE OF CLIMB FPM	FROM SEA LEVEL		
					TIME MIN	FUEL USED GALLONS	DISTANCE NM
3100	S.L.	15	81	865	0	0	0
	2000	11	80	760	2	0.8	3
	4000	7	78	660	5	1.7	7
	6000	3	77	555	9	2.7	12
	8000	- 1	76	455	13	3.9	18
	10,000	- 5	75	350	18	5.3	25
	12,000	- 9	73	250	25	7.1	36
	14,000	-13	72	145	35	9.7	52

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

TIME, FUEL, AND DISTANCE TO CLIMB

NORMAL CLIMB - 90 KIAS

CONDITIONS:
Flaps Up
2400 RPM
23 Inches Hg or Full Throttle
Mixture Full Rich
Cowl Flaps Open
Standard Temperature

NOTES:
1. Add 1.7 gallons of fuel for engine start, taxi and takeoff allowance.
2. Mixture may be leaned above 5000 feet for smooth engine operation and increased power.
3. Increase time, fuel and distance by 10% for each 10°C above standard temperature.
4. Distances shown are based on zero wind.

WEIGHT LBS	PRESSURE ALTITUDE FT	TEMP °C	RATE OF CLIMB FPM	FROM SEA LEVEL		
				TIME MIN	FUEL USED GALLONS	DISTANCE NM
3100	S.L.	15	540	0	0	0
	2000	11	540	4	1.0	6
	4000	7	540	7	2.1	11
	6000	3	510	11	3.2	17
	8000	- 1	395	16	4.5	25
	10,000	- 5	285	22	6.1	35

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

CRUISE PERFORMANCE

PRESSURE ALTITUDE 2000 FEET

CONDITIONS:
3100 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTE
For best fuel economy at 65% power or less, operate at the leanest mixture that results in smooth engine operation or at peak EGT if an EGT indicator is installed.

		20°C BELOW STANDARD TEMP -9°C			STANDARD TEMPERATURE 11°C			20°C ABOVE STANDARD TEMP 31°C		
RPM	MP	% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2400	22	77	132	13.1	74	133	12.6	71	134	12.2
	21	72	129	12.3	69	130	11.8	67	131	11.4
	20	67	126	11.5	65	126	11.1	63	127	10.7
	19	62	122	10.7	60	122	10.3	58	122	10.0
2300	23	78	133	13.3	75	134	12.8	72	135	12.4
	22	73	130	12.5	70	131	12.0	68	131	11.6
	21	68	126	11.7	66	127	11.3	64	128	10.9
	20	64	123	10.9	62	123	10.5	60	123	10.2
2200	23	73	130	12.5	70	131	12.0	68	131	11.6
	22	69	127	11.7	66	127	11.3	64	128	10.9
	21	64	123	11.0	62	124	10.6	60	124	10.2
	20	60	119	10.2	58	120	9.9	56	120	9.6
2100	23	68	126	11.6	66	127	11.2	64	127	10.8
	22	64	123	10.9	62	123	10.5	60	124	10.2
	21	60	119	10.2	58	120	9.9	56	120	9.6
	20	56	115	9.6	54	115	9.3	52	115	9.0
	19	52	111	9.0	50	110	8.7	48	109	8.5
	18	47	106	8.4	46	105	8.1	44	103	7.9

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

CRUISE PERFORMANCE

PRESSURE ALTITUDE 4000 FEET

CONDITIONS:
3100 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTE
For best fuel economy at 65% power or less, operate at the leanest mixture that results in smooth engine operation or at peak EGT if an EGT indicator is installed.

		20°C BELOW STANDARD TEMP -13°C			STANDARD TEMPERATURE 7°C			20°C ABOVE STANDARD TEMP 27°C		
RPM	MP	% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2400	22	- - -	- - -	- - -	76	137	13.0	73	138	12.5
	21	74	133	12.6	71	134	12.1	69	134	11.7
	20	69	129	11.8	66	130	11.3	64	130	11.0
	19	64	125	10.9	62	126	10.6	60	126	10.2
2300	23	- - -	- - -	- - -	76	138	13.1	74	139	12.6
	22	75	133	12.8	72	134	12.3	70	135	11.9
	21	70	130	12.0	68	131	11.5	65	131	11.2
	20	66	126	11.2	63	127	10.8	61	127	10.4
2200	23	75	133	12.8	72	134	12.3	70	135	11.9
	22	70	130	12.0	68	131	11.6	66	131	11.2
	21	66	127	11.3	64	127	10.9	61	127	10.5
	20	62	123	10.5	59	123	10.2	57	123	9.8
2100	23	70	130	11.9	67	131	11.5	65	131	11.1
	22	66	126	11.2	63	127	10.8	61	127	10.4
	21	62	123	10.5	59	123	10.1	57	123	9.8
	20	57	119	9.8	55	119	9.5	53	118	9.3
	19	53	114	9.2	51	114	8.9	50	113	8.7
	18	49	109	8.6	47	108	8.3	46	106	8.1
	17	45	103	8.0	43	101	7.8	42	100	7.6

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

CRUISE PERFORMANCE

PRESSURE ALTITUDE 6000 FEET

CONDITIONS:
3100 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTE
For best fuel economy at 65% power or less, operate at the leanest mixture that results in smooth engine operation or at peak EGT if an EGT indicator is installed.

		20°C BELOW STANDARD TEMP -17°C			STANDARD TEMPERATURE 3°C			20°C ABOVE STANDARD TEMP 23°C		
RPM	MP	% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2400	22	- - -	- - -	- - -	77	141	13.3	75	142	12.8
	21	75	136	12.9	73	137	12.4	70	138	12.0
	20	71	133	12.1	68	133	11.6	66	134	11.2
	19	66	129	11.2	64	129	10.8	61	129	10.5
2300	22	77	137	13.1	74	138	12.6	71	139	12.2
	21	72	134	12.3	69	134	11.8	67	135	11.4
	20	67	130	11.5	65	130	11.1	63	131	10.7
	19	63	126	10.7	60	126	10.3	58	126	10.0
2200	22	72	134	12.3	69	135	11.9	67	135	11.5
	21	68	130	11.6	65	131	11.1	63	131	10.8
	20	63	126	10.8	61	127	10.4	59	127	10.1
	19	59	122	10.1	57	122	9.7	55	121	9.5
2100	22	67	130	11.5	65	131	11.1	63	131	10.7
	21	63	126	10.8	61	127	10.4	59	127	10.1
	20	59	122	10.1	57	122	9.8	55	122	9.5
	19	55	118	9.5	53	117	9.2	51	116	8.9
	18	51	113	8.8	49	111	8.6	47	110	8.3
	17	47	107	8.2	45	105	8.0	43	103	7.8

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

CRUISE PERFORMANCE

PRESSURE ALTITUDE 8000 FEET

CONDITIONS:
3100 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTE
For best fuel economy at 65% power or less, operate at the leanest mixture that results in smooth engine operation or at peak EGT if an EGT indicator is installed.

		20°C BELOW STANDARD TEMP -21°C			STANDARD TEMPERATURE -1°C			20°C ABOVE STANDARD TEMP 19°C		
RPM	MP	% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2400	21	77	140	13.3	74	141	12.7	72	142	12.3
	20	72	136	12.4	70	137	11.9	67	138	11.5
	19	68	132	11.5	65	133	11.1	63	133	10.7
	18	63	128	10.7	60	128	10.3	58	128	10.0
2300	21	74	137	12.6	71	138	12.1	69	139	11.7
	20	69	134	11.8	66	134	11.3	64	134	11.0
	19	64	130	11.0	62	130	10.6	60	129	10.2
	18	60	125	10.2	58	125	9.9	56	124	9.6
2200	21	69	134	11.8	67	135	11.4	65	135	11.0
	20	65	130	11.1	63	130	10.7	60	130	10.3
	19	61	126	10.3	58	126	10.0	56	125	9.7
	18	56	121	9.7	54	120	9.3	52	119	9.1
2100	21	65	130	11.1	63	130	10.7	60	130	10.3
	20	61	126	10.4	59	126	10.0	57	125	9.7
	19	57	122	9.7	54	121	9.4	53	120	9.1
	18	52	116	9.1	50	115	8.8	49	113	8.5
	17	48	110	8.5	46	108	8.2	45	106	8.0

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

CRUISE PERFORMANCE

PRESSURE ALTITUDE 10,000 FEET

CONDITIONS:
3100 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTE
For best fuel economy at 65% power or less, operate at the leanest mixture that results in smooth engine operation or at peak EGT if an EGT indicator is installed.

		20°C BELOW STANDARD TEMP -25°C			STANDARD TEMPERATURE -5°C			20°C ABOVE STANDARD TEMP 15°C		
RPM	MP	% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2400	20	74	140	12.7	71	141	12.2	69	141	11.8
	19	69	136	11.8	67	137	11.4	64	137	11.0
	18	65	132	11.0	62	132	10.6	60	131	10.2
	17	60	127	10.2	57	126	9.8	55	125	9.5
2300	20	71	137	12.1	68	138	11.6	66	138	11.2
	19	66	133	11.3	64	133	10.9	61	133	10.5
	18	61	129	10.5	59	128	10.1	57	128	9.8
	17	57	123	9.7	55	122	9.4	53	121	9.1
2200	20	67	134	11.4	64	134	11.0	62	134	10.6
	19	62	129	10.6	60	129	10.2	58	129	9.9
	18	58	125	9.9	56	124	9.6	54	123	9.3
	17	53	119	9.2	51	118	8.9	50	116	8.7
2100	20	63	130	10.7	60	130	10.3	58	129	9.9
	19	58	125	10.0	56	124	9.6	54	123	9.4
	18	54	120	9.3	52	119	9.0	50	117	8.8
	17	50	114	8.7	48	112	8.4	46	110	8.2
	16	46	107	8.1	44	104	7.8	42	102	7.6

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

CRUISE PERFORMANCE

PRESSURE ALTITUDE 12,000 FEET

CONDITIONS:
3100 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

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

		20°C BELOW STANDARD TEMP -29°C			STANDARD TEMPERATURE -9°C			20°C ABOVE STANDARD TEMP 11°C		
RPM	MP	% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2400	18	66	136	11.3	64	136	10.9	61	135	10.5
	17	61	130	10.5	59	130	10.1	57	129	9.8
	16	56	124	9.7	54	123	9.4	52	122	9.1
	15	51	117	9.0	50	116	8.7	48	114	8.4
2300	18	63	132	10.8	61	132	10.4	59	131	10.0
	17	58	127	10.0	56	126	9.7	54	125	9.4
	16	54	121	9.3	52	119	9.0	50	117	8.7
	15	49	113	8.6	47	112	8.3	45	109	8.1
2200	18	59	128	10.2	57	128	9.8	55	126	9.5
	17	55	123	9.5	53	121	9.2	51	119	8.9
	16	51	116	8.8	49	114	8.5	47	112	8.3
	15	46	108	8.2	44	106	7.9	43	103	7.7
2100	18	56	124	9.6	54	122	9.3	52	120	9.0
	17	51	117	8.9	49	115	8.7	48	113	8.4
	16	47	110	8.3	45	108	8.1	44	106	7.8

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

CRUISE PERFORMANCE

PRESSURE ALTITUDE 14,000 FEET

CONDITIONS:
3100 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

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

		20°C BELOW STANDARD TEMP -33°C			STANDARD TEMPERATURE -13°C			20°C ABOVE STANDARD TEMP 7°C		
RPM	MP	% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2400	16	58	128	9.9	56	127	9.6	54	125	9.3
	15	53	121	9.2	51	119	8.9	49	117	8.6
	14	48	113	8.5	46	110	8.2	45	108	8.0
2300	16	55	124	9.5	53	123	9.2	51	121	8.9
	15	51	117	8.8	49	115	8.5	47	112	8.3
	14	46	109	8.1	44	106	7.9	42	103	7.7
2200	16	52	120	9.0	50	118	8.8	48	115	8.5
	15	48	112	8.4	46	110	8.1	44	107	7.9
2100	16	49	114	8.5	47	112	8.3	45	109	8.0

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

RANGE PROFILE
45 MINUTES RESERVE
65 GALLONS USABLE FUEL

CONDITIONS:
3100 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 10,000 feet and maximum climb above 10,000 feet.

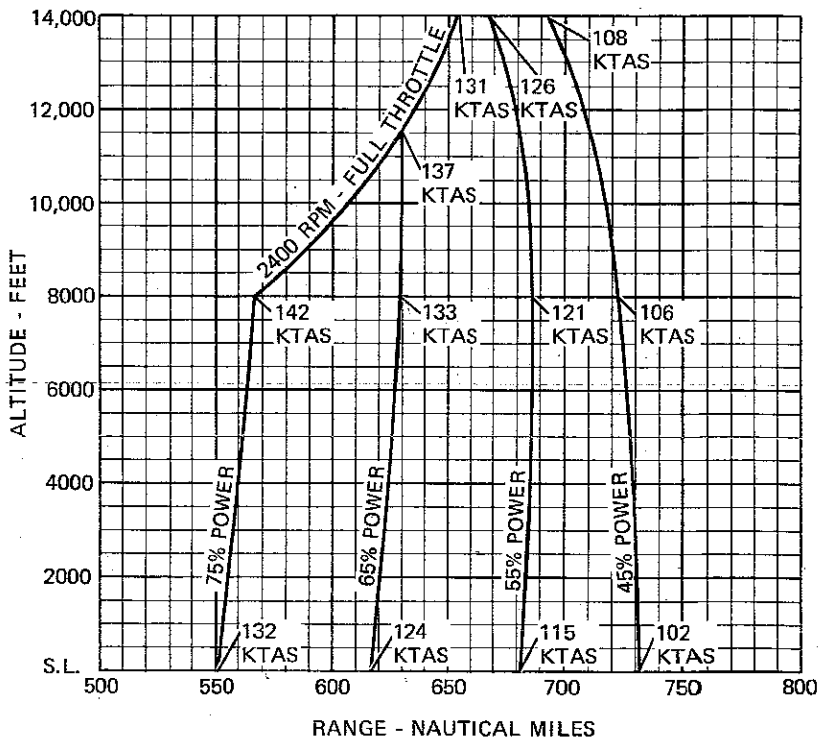


Figure 5-8. Range Profile (Sheet 1 of 2)

RANGE PROFILE

45 MINUTES RESERVE
88 GALLONS USABLE FUEL

CONDITIONS:
3100 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 10,000 feet and maximum climb above 10,000 feet.

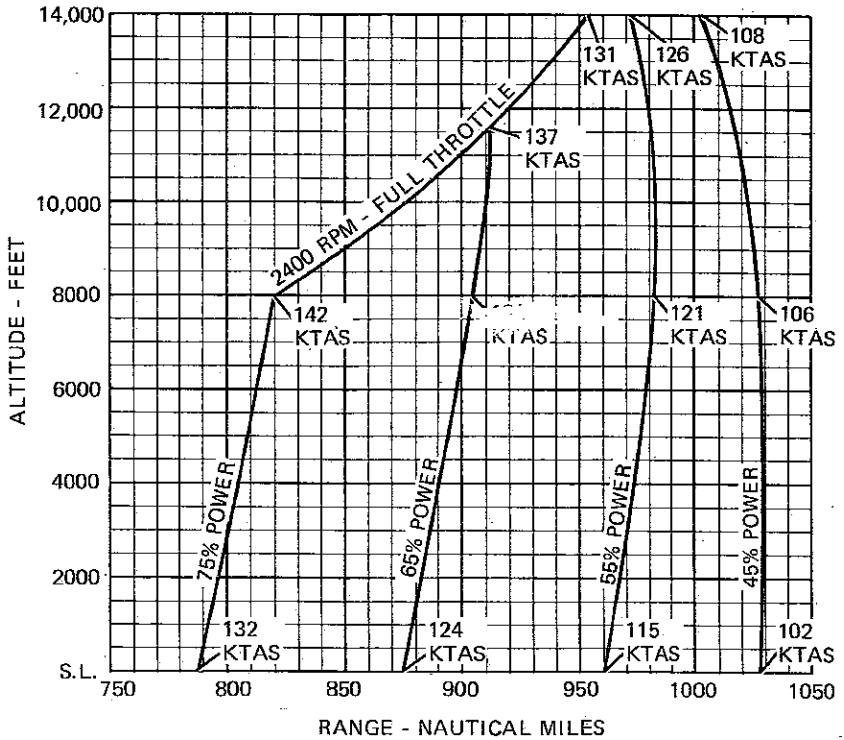


Figure 5-8. Range Profile (Sheet 2 of 2)

ENDURANCE PROFILE
45 MINUTES RESERVE
65 GALLONS USABLE FUEL

CONDITIONS:
3100 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 10,000 feet and maximum climb above 10,000 feet.

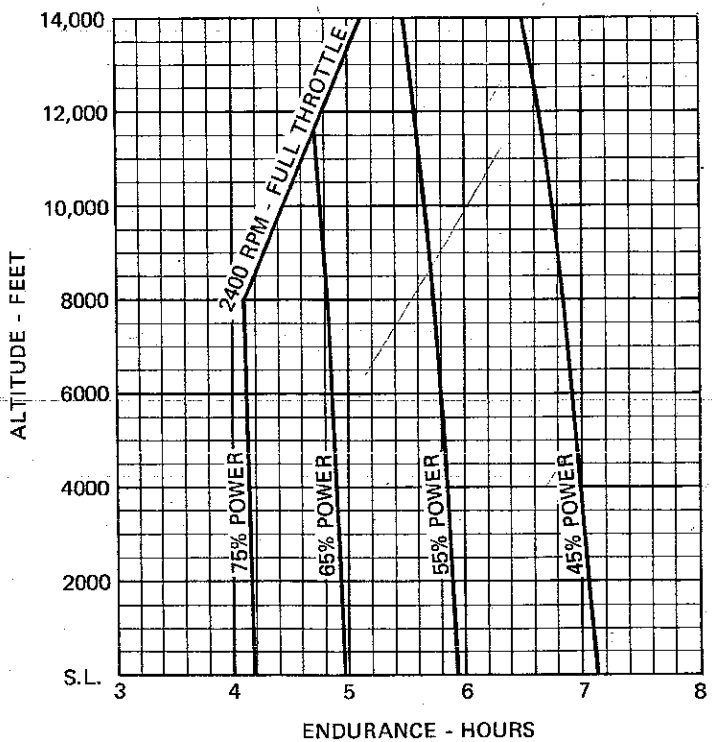


Figure 5-9. Endurance Profile (Sheet 1 of 2)

ENDURANCE PROFILE

45 MINUTES RESERVE
88 GALLONS USABLE FUEL

CONDITIONS:
3100 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 10,000 feet and maximum climb above 10,000 feet.

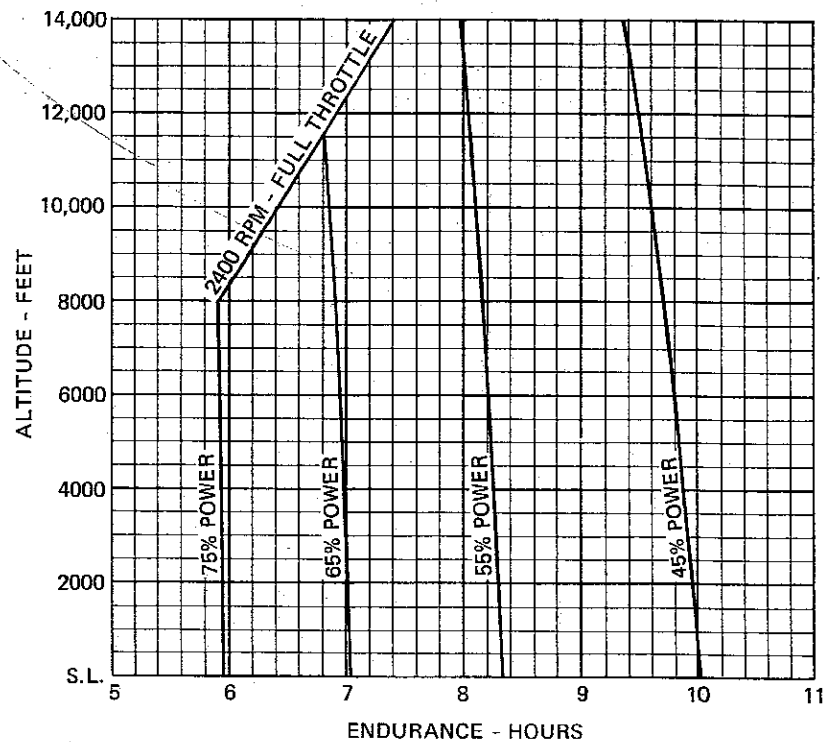


Figure 5-9. Endurance Profile (Sheet 2 of 2)

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
2950	61	S.L.	560	1300	580	1335	600	1365	620	1400	640	1435
		1000	580	1335	600	1365	620	1400	645	1440	665	1475
		2000	600	1370	625	1405	645	1440	670	1480	690	1515
		3000	625	1410	645	1445	670	1485	695	1525	715	1560
		4000	650	1450	670	1485	695	1525	720	1565	740	1600
		5000	670	1485	695	1525	720	1565	745	1610	770	1650
		6000	700	1530	725	1575	750	1615	775	1660	800	1700
		7000	725	1575	750	1615	780	1665	805	1710	830	1750
		8000	755	1625	780	1665	810	1715	835	1760	865	1805

Figure 5-10. Landing Distance

SECTION 6
WEIGHT & BALANCE/ EQUIPMENT LIST

TABLE OF CONTENTS

INTRODUCTION

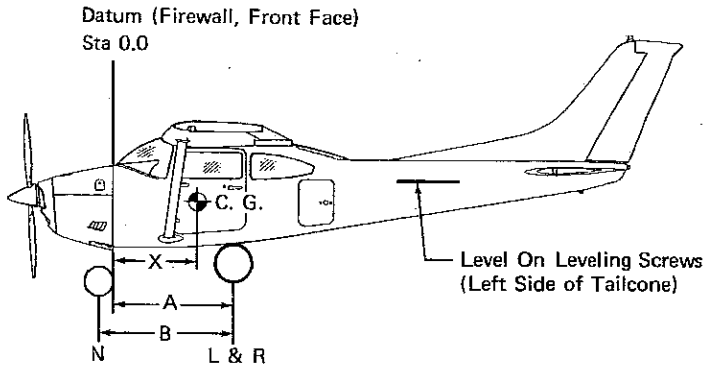
This section describes the procedure for establishing the basic empty weight and moment of the airplane. Sample forms are provided for reference. Procedures for calculating the weight and moment for various operations are also provided. A comprehensive list of all Cessna equipment available for this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

It should be noted that specific information regarding the weight, arm, moment and installed equipment for this airplane as delivered from the factory can only be found in the plastic envelope carried in the back of this handbook.

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, 1000 pounds).
   b. Deflate nose tire and/or lower or raise the nose strut to properly center bubble on 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	

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

Item	Weight (Lbs.)	X C.G. Arm (In.) =	Moment/1000 (Lbs.-In.)
Airplane Weight (From Item 5, page 6-3)			
Add Oil: No Oil Filter (12 Qts at 7.5 Lbs/Gal)		-15.0	
With Oil Filter (13 Qts at 7.5 Lbs/Gal)		-15.0	
Add: Unusable Fuel (4 Gal at 6 Lbs/Gal)	24	48.0	1.2
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/cargo is based on seats positioned for average occupants and baggage/cargo items loaded in the center of these areas as shown on the Loading Arrangements diagram. For loadings which may differ from these, the Sample Loading Problem lists fuselage stations for these items to indicate their forward and aft C.G. range limitation (seat travel and baggage/cargo 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.

BAGGAGE AND CARGO TIE-DOWN

A nylon baggage net having six tie-down straps is provided as standard equipment to secure baggage in the area aft of the rear seat (baggage areas A, B and C). Eight eyebolts serve as attaching points for the

net. Two eyebolts are mounted on the cabin floor near each sidewall just forward of the baggage door approximately at station 92; two eyebolts mount on the floor slightly inboard of each sidewall just aft of the baggage door approximately at station 109; two eyebolts are mounted near the upper forward surface of the shelf area approximately at station 122; and two eyebolts secure at the bottom of the forward portion of the shelf area at station 124. If a child's seat is installed, only the eyebolts at station 109 and the remaining aft eyebolts will be needed for securing the net in the area remaining behind the seat. A placard on the baggage door defines the weight limitations in the baggage areas.

When baggage area A is utilized for baggage only, the four forward eyebolts should be used. When only baggage area B is used, the eyebolts just aft of the baggage door and the eyebolts above or below the shelf area may be used. When only baggage area C is utilized, the eyebolts above and below the shelf area should be used. When the cabin floor (baggage areas A and B) is utilized for baggage, the four forward eyebolts and the eyebolts mounted above or below the shelf area should be used. When there is baggage in areas B and C, the eyebolts just aft of the baggage door and the eyebolts above and below the shelf area should be used. When baggage is contained in all three areas, the two forward eyebolts on the cabin floor, the eyebolts just aft of the baggage door or the eyebolts at the bottom of the forward portion of the shelf area and the eyebolts near the upper forward surface of the shelf area should be used.

Cargo tie-down blocks and latch assemblies are available from any Cessna Dealer if it is desired to remove the rear seat (and child's seat, if installed) and utilize the rear cabin area to haul cargo. Two tie-down blocks may be clamped to the aft end of the two outboard front seat rails and are locked in place by a bolt which must be tightened to a minimum of fifty inch pounds. Seven tie-down latches may be bolted to standard attach points in the cabin floor, including three rear seat mounting points. The seven attach points are located as follows: two are located slightly inboard and just aft of the rear doorposts approximately at station 69; two utilize the aft outboard mounting points of the rear seat; one utilizes the rearmost mounting point of the aft center attach point for the rear seat approximately at station 84 (a second mounting point is located just forward of this point but is not used); and two are located just forward of the center baggage net tie-down eyebolts approximately at station 108. The maximum allowable floor loading of the rear cabin area is 200 pounds/square foot; however, when items with small or sharp support areas are carried, the installation of a 1/4" plywood floor is recommended to protect the airplane structure. The maximum rated load weight capacity for each of the seven tie-downs is 140 pounds and for the two seat rail tie-downs is 100 pounds. Rope, strap, or cable used for tie-down should be rated at a minimum of ten times the load weight capacity of the tie-down fittings used. Weight and balance calculations for cargo in the area of the rear seat

and baggage area can be figured on the Loading Graph using the lines labeled 2nd Row Passengers or Cargo and/or Baggage or Passengers on Child's Seat.

LOADING ARRANGEMENTS

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

**Arms measured to the center of the areas shown.

NOTES:
1. The usable fuel C.G. arm is located at station 46.5.
2. The aft baggage wall (approximate station 134) can be used as a convenient interior reference point for determining the location of baggage area fuselage stations.

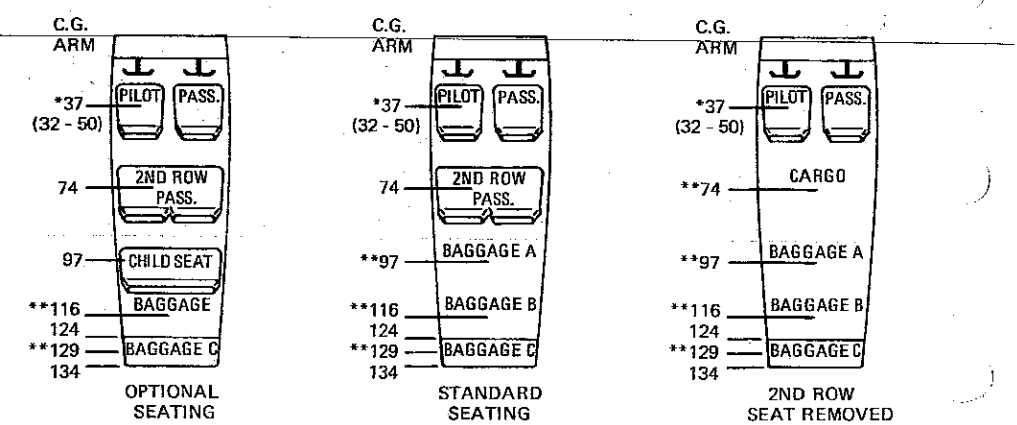


Figure 6-3. Loading Arrangements

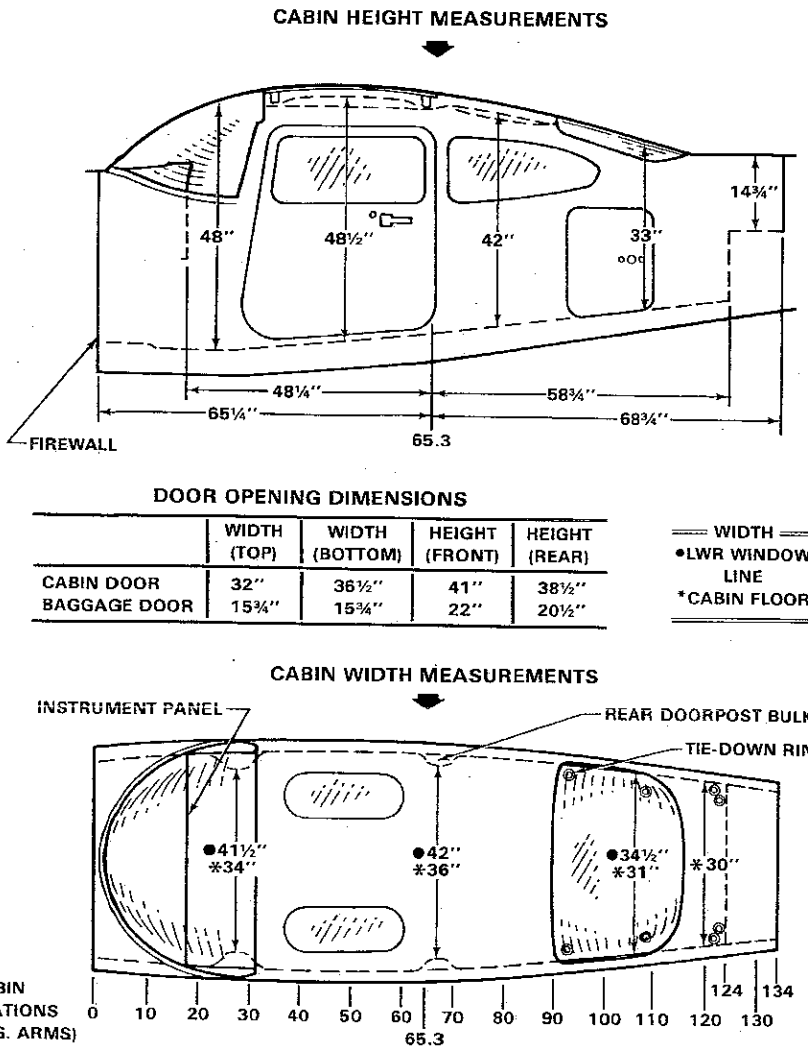
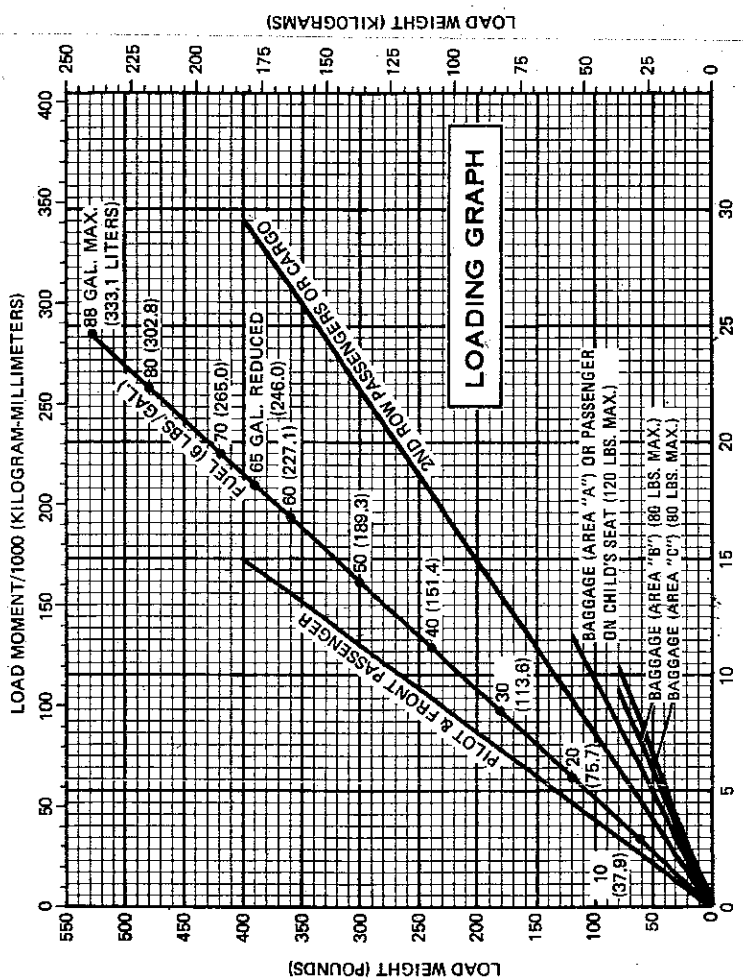


Figure 6-4. Internal Cabin Dimensions

SAMPLE LOADING PROBLEM	SAMPLE AIRPLANE		YOUR AIRPLANE	
	Weight (lbs.)	Moment (lb.-ins. /1000)	Weight (lbs.)	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)	1800	63.3		
2. Usable Fuel (At 6 Lbs./Gal.) Standard Tanks (88 Gal. Maximum)	528	24.6		
Reduced Fuel (65 Gal.)				
3. Pilot and Front Passenger (Station 32 to 50)	340	12.6		
4. Second Row Passengers	340	25.2		
Cargo Replacing Second Row Seats (Sta. 65 to 82)				
5. *Baggage (Area "A") or Passenger on Child's Seat (Sta. 82 to 109) 120 Lbs. Maximum	90	8.7		
6. *Baggage (Area "B") (Sta. 109 to 124) 80 Lbs. Maximum	12	1.4		
7. *Baggage (Area "C") (Sta. 124 to 134) 80 Lbs. Maximum				
8. RAMP WEIGHT AND MOMENT	3110	135.8		
9. Fuel allowance for engine start, taxi and runup	-10	-.5		
10. TAKEOFF WEIGHT AND MOMENT (Subtract step 9 from step 8)	3100	135.3		
11. Locate this point (3100 at 135.3) on the Center of Gravity Moment Envelope, and since this point falls within the envelope, the loading is acceptable, provided that flight time is allowed for fuel burn-off to a maximum of 2950 pounds before landing.				
*The maximum allowable combined weight capacity for baggage in areas A, B, and C is 200 pounds.				
*The maximum allowable combined weight capacity for baggage in areas B and C is 80 pounds.				

Figure 6-5. Sample Loading Problem



NOTE: 1. Line representing adjustable seats shows pilot and front seat 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

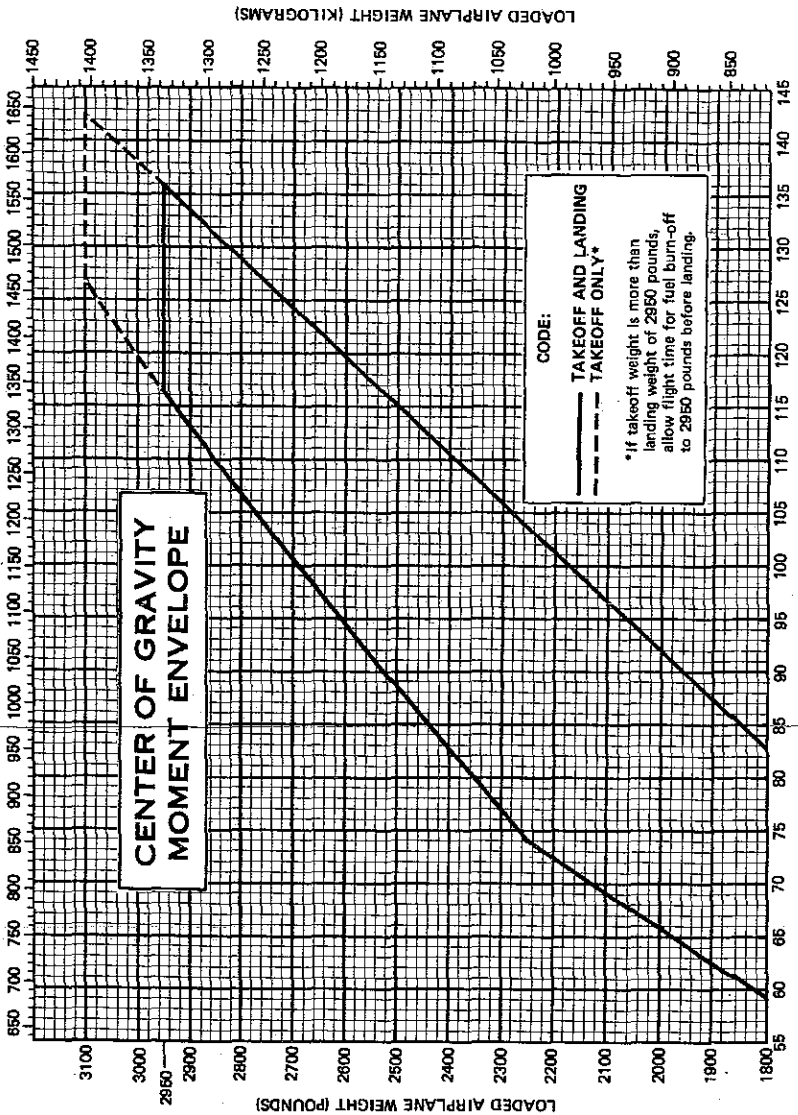


Figure 6-7. Center of Gravity Moment Envelope

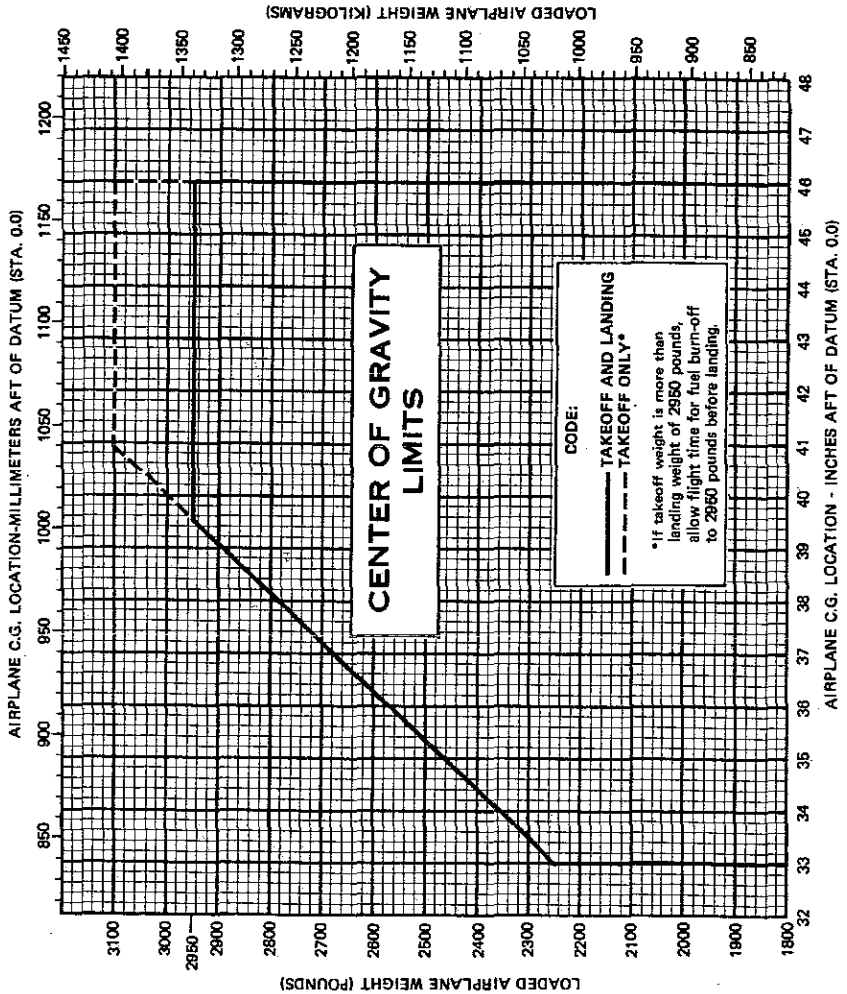


Figure 6-8. Center of Gravity Limits

EQUIPMENT LIST

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

This equipment list provides the following information:

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

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

A **reference 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
	A. POWERPLANT & ACCESSORIES			
A01-R	ENGINE, CONTINENTAL O-470-U -MAGNETOS WITH IMPULSE COUPLING (2) -CARBURETOR, MARVEL SCHEBLER -OIL COOLER-HARRISON -SPARK PLUGS, 18MM X 3/4 20-3A (12) -STARTER, 24 VOLT PRESTOLITE	0750201-19 SLICK-6214 MA-4-5 TCM 627392 SH 200A TCM 635994	443.0* 10.3 5.8 4.6 2.8 17.8	-16.5* -12.0 9.6 -31.5 -19.0 -4.5
A05-R	FILTER, CARBURETOR AIR	0750038-4	1.0	-33.0
A09-R	ALTERNATOR, 28 VOLT, 60 AMP	C611503-0102	10.8	-5.5
A17-D	OIL COOLER, NON-CONGEAL MODINE 1E-1605-D REPLACES OIL COOLER ON ITEM A01-R AND CHANGES ENGINE DESIGNATION TO O-470-U SPEC. 6 (NET CHANGE)	0750201-20	1.5	-31.5
A21-A	OIL FILTER INSTALLATION -ADAPTER ASSEMBLY -FILTER ASSEMBLY, SPIN-ON TYPE	1656025-2 1250922-2 C294507-0102	2.5* 1.4 1.1	4.0* -4.5 -3.5
A33-R	PROPELLER, MCCAULEY C2A34C204/90DC8-8	C161009-0106	50.8	-41.6
A37-R	GOVERNOR, PROPELLER (MCCAULEY C290-D3/T14)	C161031-0107	3.0	-32.5
A41-R	SPINNER INSTALLATION, PROPELLER -SPINNER DOME -FORWARD SPINNER SUPPORT -AFT SPINNER BULKHEAD	0752638-4 0752637-11 1250412-3 0752637-1	3.0* 1.7 0.2 1.1	-42.0* -44.2 -46.5 -37.8
A61-S	VACUUM SYSTEM, ENGINE DRIVEN -VACUUM PUMP	0706003-1 C431003-0102	3.1* 1.8	-1.4* -3.1
A70-A	PRIMING SYSTEM, SIX CYLINDER	0750125	1.0	-15.0
A73-A	OIL QUICK DRAIN VALVE (NET CHANGE)	1701015-4	NEGL	- -
	B. LANDING GEAR & ACCESSORIES			

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
B01-R	WHEEL, BRAKE & TIRE ASSY, 6.00X6 MAIN (2)	C163019B0206	43.4*	58.6*
	-WHEEL ASSEMBLY--MCCAULEY (EACH)	C163006-0103	8.4	58.9
	-BRAKE ASSY, MCCAULEY (LEFT)	C163032-0205	3.0	55.5
	-BRAKE ASSY, MCCAULEY (RIGHT)	C163032-0206	3.0	55.5
	-TIRE, 6 PLY RATED BLACKWALL (EACH)	C262003-0204	8.4	58.9
	-TUBE (EACH)	C262023-0102	2.1	58.9
B04-R-1	WHEEL & TIRE ASSY, 5.00X5 NOSE	I241156-104	9.4*	-7.1*
	-WHEEL ASSY, CLEVELAND 40-77	1241156-12	2.8	-7.1
	-TIRE, 6-PLY RATED BLACKWALL	- -	5.2	-7.1
	-TUBE	C262023-0101	1.4	-7.1
B04-R-2	WHEEL & TIRE ASSY, 5.00X5 NOSE	C163018B0103	10.4*	-7.1*
	-WHEEL ASSEMBLY, MCCAULEY	C163005-0201	3.8	-7.1
	-TIRE, 6 PLY RATED BLACKWALL	- -	5.2	-7.1
	-TUBE	C262023-0101	1.4	-7.1
B10-S	FAIRING INSTALLATION, WHEEL (SET OF 3)	0741638	18.4*	45.9*
	-NOSE WHEEL FAIRING	0543079	3.9	-6.0
	-MAIN WHEEL FAIRING (EACH)	0541223	5.7	60.2
	-BRAKE DISC FAIRING	0741641	0.6	58.0
B16-R	AXLE, STANDARD DUTY MAIN GEAR (SET OF 2)	0541124-1	2.6	58.9
B16-O	AXLE, HEAVY DUTY MAIN GEAR (SET OF 2)	1441003-1	4.5	58.9
	C. ELECTRICAL SYSTEMS			
C01-R	BATTERY, 24 VOLT, STANDARD DUTY	C614002-0101	23.2	130.0
C01-O	BATTERY, 24 VOLT, HEAVY DUTY	C614002-0102	25.2	130.0
C04-R	ALTERNATOR CONTROL UNIT, 28 VOLT WITH HIGH VOLTAGE PROTECTION & LOW VOLTAGE SENSING	C611005-0101	0.4	-0.3
C07-A	GROUND SERVICE PLUG RECEPTACLE	2270017-2	2.8	136.5
C10-A	ELECTRIC ELEVATOR TRIM INSTL	2270007-2	3.8*	217.7*
	-ELECTRIC DRIVE ASSEMBLY		3.3	221.0

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
C19-O	HEATING SYSTEM, PITOT & STALL WARNING SWITCH	0770724-2	0.5	26.5
C22-A	LIGHTS, INSTRUMENT POST	2201003-2	0.5	17.5
C23-A	PANEL LIGHTS, ELECTRO-LUMINESCENT INSTL.	0770419	2.1	16.5
C25-A	MAP LIGHT, CONTROL WHEEL MOUNTED (CHANGES CONTROL WHEEL, E89-O, FROM 1260243-2 TO 1260243-9)	1260243-9	0.1	27.0
C31-A	LIGHTS, COURTESY (NET CHANGE)	0700615-11	0.5	61.7
C40-A	DETECTORS, NAVIGATION LIGHT (SET OF 2)	0701013	NEGL	- -
C43-A	OMNI FLASHING BEACON LIGHT -LIGHT ASSY (IN FIN TIP) -FLASHER ASSY (IN AFT TAIL CONE) -LOADING RESISTOR	0701042-2 C621001-0102 C594502-0102 OR 95-6	1.8* 0.7 0.4 0.2	208.6* 253.0 253.0 212.0
C46-A	STROBE LIGHTS, WHITE (EACH WING TIP) -POWER SUPPLY (AEROFLASH 152-0009) -LIGHT ASSY. (AEROFLASH 73-145) (2)	2201008-1 C622008-0102 C622006-0107	2.6* 2.3 0.3	44.4* 46.7 42.0
C49-S	LIGHT INSTL, COWL MOUNTED LANDING & TAXI -LIGHT BULBS (2)	0770417 4591	1.6* 1.0	-25.3* -32.5
	D. INSTRUMENTS			
D01-R	INDICATOR, AIRSPEED	C661064-0234	0.6	16.0
D01-O	INDICATOR, TRUE AIRSPEED (NET CHANGE)	1201108-21	0.2	16.5
D04-A	STATIC ALTERNATE AIR SOURCE	0701028-1	0.3	14.4
D07-R	ALTIMETER, SENSITIVE	C661071-0101	0.7	15.3
D07-O-1	ALTIMETER, SENSITIVE (FEET & MILLIBARS)	C661071-0102	0.7	15.3

Weight / Balance & Equipment List Revision

Eastern Avionics Radio Shop, Inc. - EKUR160L

Charlotte County Airport (PGD) Punta Gorda FL 33982
941-637-6530

WB ID # : 183
A/C Tail # : N9539H
Register Name : Northwest Flyers, Inc.
Address : P.O. Box 6095
City, State, PC : Mariana, FL. 32447

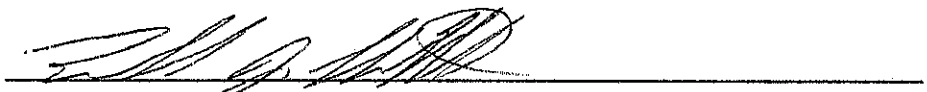
A/C Make : Cessna
A/C Model : 182R
A/C Serial # : 18267961
WO Ref # : 3297
WB Date : Sep-18-2003

Previous data taken from document dated Oct-17-2002 Previous useful load = 1344.00

Model / Part #	Description (LB / IN)	Weight	CG/Arm	Moment
	Previous data ->	1756.00	40.88	71793.40
*REMOVED				
5000B-36	SIGMATEK VACCUUM HORIZON	-2.15	15.00	-32.25
ARC-300	COMPUTER AMPLIFIER p/n 42660-1202	-1.80	15.00	-27.00
DIRECTIONAL GYRO	DIRECTIONAL GYRO p/n 1U262-005-20	-2.60	15.00	-39.00
ROLL ACTUATOR	ROLL SERVO p/n 42964-4900	-3.10	35.00	-108.50
REMOVED	4 Items @	-9.65	21.42	-206.75
*INSTALLED				
52D254M	DIR GYRO	3.00	15.00	45.00
52D267M	ATTITUDE INDICATOR	3.00	15.00	45.00
C-2000	A/P COMPUTER p/n CE2150P14FF10	3.00	15.00	45.00
SERVO PITCH	PITCH SERVO p/n 1C785-3-889	3.00	89.00	267.00
SERVO ROLL	ROLL SERVO p/n 1C785-2-889	3.00	35.00	105.00

WX-900ANT	STORMSCOPE ANTENNA (p/n 78-8060-5970-1)	0.92	95.00	87.40
INSTALLED	7 Items @	18.02	34.73	625.90
NEW DATA >>	NEW USEFUL LOAD = 1335.63	1764.37	40.93	72212.55

This W&B denotes installation of the Century 2000 A/P and the B.F. Goodrich WX-900 Stormscope.



Authorized Individual : EKUR160L Ronald J. Shabbott

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
D07-0-2	ALTIMETER, SENSITIVE (20 FT. MARKINGS)	C661025-0102	0.7	15.3
D10-A	ALTIMETER INSTALLATION (2ND UNIT)	1213681	0.8	16.0
D16-A-1	ENCODING ALTIMETER (REQUIRES RELOCATING STANDARD TYPE ALTIMETER)	1213732	3.0	14.0
D16-A-2	ENCODING ALTIMETER, FEET AND MILLIBARS (REQUIRES RELOCATING STANDARD ALTIMETER)	1213732	3.0	14.0
D16-A-3	ALTITUDE ENCODER, BLIND (INSTRUMENT PANEL INSTALLATION NOT REQUIRED)	0701099-1	1.5*	13.6*
D22-A	GAGE, CARBURETOR AIR TEMPERATURE	0750610-2	1.2	16.0
D25-S	CLOCK, ELECTRIC, DIAL READ	C664508-0102	0.4	16.6
D25-D	CLOCK, ELECTRIC, DIGITAL READOUT	C664511-0102	0.4	16.6
D28-R	COMPASS, MAGNETIC & MOUNT	1213679-3	1.1	20.5
D34-R	INSTRUMENT CLUSTER, ENGINE & FUEL	C669545-0103	1.3	16.5
D49-A	INDICATOR INSTALLATION, ECONOMY MIXTURE	0750609-2	0.7*	8.2*
	-EGT INDICATOR	C668501-0211	0.4	17.1
	-THERMOCOUPLE PROBE	C668501-0204	0.1	-20.5
	-THERMOCOUPLE LEAD WIRE (IC)	C668501-0206	0.1	-0.3
D64-S	GYRO SYSTEM	0701030-2	5.7*	13.3*
	-DIRECTIONAL INDICATOR	C661075-0101	2.1	14.5
	-ATTITUDE INDICATOR	C661076-0102	2.5	14.5
	-HOSES, FITTINGS, SCREWS, CLAMPS ETC.		1.3	11.5
	(ALTERNATE C661075 & C661076 GYRO'S MAY BE USED)			
D64-D	GYRO SYSTEM INSTL. FOR NAV-O-MATIC 300A AUTOPILOT (ITEM H31-A-2)	0701038-1	6.8*	12.4*
	-ATTITUDE INDICATOR	C661076-0102	2.5	14.5
	-DIRECTIONAL INDICATOR	40760-0104	3.3	12.2
	(ALTERNATE C661076 ATTITUDE GYRO'S MAY BE USED)			

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
D67-A	HOURMETER, INSTALLATION -RECORDING INDICATOR -OIL PRESSURE SWITCH	1200744-5 C664503-0101 S1711-1	0.5* 0.1 0.2	7.6* 17.5 -1.0
D73-R	GAGE, MANIFOLD PRESSURE	C662035-0101	0.9	15.8
D82-S	GAGE, OUTSIDE AIR TEMPERATURE	C668507-0101	0.1	28.5
D85-R	TACHOMETER INSTALLATION, ENGINE -RECORDING TACH INDICATOR	0706006 C668020-0117	0.9* 0.7	13.8* 16.9
D88-S-1	INDICATOR, TURN COORDINATOR (28 VOLT ONLY)	C661003-0507	1.0	16.0
D88-S-2	INDICATOR, TURN COORDINATOR (10/30 VOLT)	C661003-0506	1.0	16.0
D88-O-1	INDICATOR TURN COORDINATOR (FOR NOM'S)	42320-0028	1.3	16.0
D88-O-2	INDICATOR, TURN & BANK	S-1303N2	2.0	15.5
D91-S	INDICATOR, VERTICAL SPEED	C661080-0101	1.0	15.4
	E. CABIN ACCOMMODATIONS			
E05-R	SEAT, ADJUSTABLE FORE & AFT - PILOT	0714042-1	13.0	44.0
E05-O	SEAT, ARTICULATING VERT. ADJ. - PILOT	0714043-1	24.0	41.5
E07-S	SEAT, ADJUSTABLE FORE & AFT - CO-PILOT	0714042-1	13.0	44.0
E07-O	SEAT, ARTICULATING VERT. ADJ. - CO-PILOT	0714043-2	24.0	41.5
E09-S	SEAT, 2ND ROW BENCH	0714041-1	23.0	80.5
E11-A	SEAT INSTALLATION, AUXILIARY (CHILDS) -SEAT ASSY, FOLDAWAY (120 LB MAX CAP.) -BELT ASSY, LAP	0501009-5 0714050-4 S1746-5	8.2* 6.9 0.9	104.2* 104.4 101.1
E15-R	BELT ASSY, LAP (PILOT SEAT)	S2275-103	1.0	37.0

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
E15-S	SHOULDER HARNESS ASSY, PILOT	S2275-201	0.6	37.0
E19-O	PILOT & CO-PILOT INERTIA REEL INSTL. (NET CHANGE)	0701077	3.6	92.0
E23-S	BELT & SHOULDER HARNESS ASSY, CO-PILOT	S2275-3	1.6	37.0
E27-S	BELT ASSY, 2ND ROW OCCUPANTS (SET OF 2)	S-1746-1	1.6	74.5
E27-O	BELT & SHOULDER HARNESS ASSY, 2ND ROW	S-2275-7	3.2	74.5
E35-A-1	INTERIOR, VINYL SEAT COVERS (NET CHANGE)	CES-1154	0.0	- -
E35-A-2	INTERIOR, LEATHER SEAT COVERS (NET CHANGE)	CES-1154	2.0	62.3
E37-O	OPENABLE RH CABIN DOOR WINDOW (NET CHANGE)	1217000-6	2.3	47.0
E39-A	WINDOWS, OVERHEAD CABIN TOP (NET CHANGE)	0701017-4	0.6	45.5
E43-A	VENTILATION SYSTEM, 2ND ROW SEATING	0701084-1	3.6	62.3
E47-A	OXYGEN SYSTEM, 4 PORT -OXYGEN CYLINDER-EMPTY -OXYGEN - 48 CU FT @ 1800 PSI -OXYGEN MASKS, PILOT & 3 PASSENGER	2201006-10 C166001-0601 C166005	36.0* 25.0 4.0 1.5	133.4* 143.6 143.6 61.1
E49-A	CUP HOLDER, RETRACTABLE (SET OF 2)	1201124	0.1	16.0
E50-A	HEADREST, 1ST ROW (INSTALLED ARM) (EACH)	1215073-1	0.9	47.0
E51-A	HEADREST, 2ND ROW (INSTALLED ARM) (EACH)	1215073-1	0.9	87.0
E55-S	SUN VISORS (SET OF 2)	0701024-1	1.0	33.0
E59-A	APPROACH PLATE HOLDER	0715083-1	0.1	27.5
E65-S	BAGGAGE TIE DOWN NET	1215042-1	0.5	108.0
E71-A	CARGO TIE DOWN LATCHES & SEAT RAIL CLAMPS (USE INSTALLED CARGO ARM)(STOWED) (NOT FACTORY INSTALLED)	0701029-1	1.2	

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
E85-A	DUAL CONTROLS -WHEEL, PEDALS & TOE BRAKES	0760101 0760650-3	7.3	13.5
E89-O	CONTROL WHEEL, PILOT ALL PURPOSE (NET CHG)	1260243-9	NEGL	- -
E93-R	HEATING SYSTEM, CABIN & CARBURETOR AIR (INCLUDES ENGINE EXHAUST SYSTEM)	0750201	18.0	-16.0
	F. PLACARDS, WARNINGS & MANUALS			
F01-R	PLACARD, OPERATIONAL LIMITATIONS-VFR DAY	0505087-7	NEGL	- -
F01-O-1	PLACARD, OPERATIONAL LIMITATIONS-VFR DAY-NIGHT	0505087-8	NEGL	- -
F01-O-2	PLACARD, OPERATIONAL LIMITATIONS--VFR-IFR/DAY-NIGHT	0505087-9	NEGL	- -
F04-R	INDICATOR, STALL WARNING HORN-AUDIBLE	1670056-1	1.0	17.5
F16-R	PILOT'S OPERATING HANDBOOK AND FAA APPROVED AIRPLANE FLIGHT MANUAL, STOWED	D1196-13PH	1.3	- -
	G. AUXILIARY EQUIPMENT			
G01-A	TAILCONE LIFT HANDLES (SET OF 2)	2201009-1	1.0	186.5
G07-A	HOISTING RINGS, AIRPLANE (NOT FACTORY INSTALLED)	0700612-1	1.5	45.6
G13-A	CORROSION PROOFING, INTERNAL	0760007-1	7.0	70.0
G16-A	STATIC DISCHARGERS (SET OF 10)	1201131-2	0.4	130.5
G19-A	STABILIZER ABRASION BOOTS	0500041-3	2.7	206.0

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
G22-S	TOWBAR, AIRCRAFT (STOWED ARM SHOWN)	0501019-1	1.6	97.0
G25-S	PAINT, OVERALL EXTERIOR, MODIFIED POLY-URETHANE OVERALL WHITE BASE COLORED STRIPE	0704047	12.6* 11.9 0.3	91.6* 92.2 65.2
G31-A	CABLES, CORROSION RESISTANT (NET CHANGE)	0760007-1	0.0	- -
G55-A-1	FIRE EXTINGUISHER, HAND TYPE (FOR USE WITH STANDARD PILOT SEAT)	0701014-1	4.8	35.0
G55-A-2	FIRE EXTINGUISHER, HAND TYPE (FOR USE WITH VERTICAL ADJUSTING PILOT SEAT)	0701014-2	5.0	29.0
G58-A	REFUELING ASSIST STEPS & HANDLES (2)	0701127-1	1.8	15.3
G61-A	WRITING TABLE	1715072-1	3.6	61.5
G67-A	PEDAL EXTENSIONS, RUDDER, REMOVABLE - SET OF 2 (STOWABLE - INSTALLED ARM SHOWN)	0501082-1	2.9	8.0
G89-A	WINTERIZATION KIT, ENGINE WINTER FRONT INSTALLED ARM SHOWN)	0752647-15	1.1* 0.5	-29.9* -34.3
	H. AVIONICS & AUTOPILOTS			
H01-A-1	CESSNA 300 ADF WITH BFO -RECEIVER WITH BFO (R-546E) -INDICATOR (IN-346A) -ADF LOOP ANTENNA & ASSOC. WIRING -SENSE ANTENNA INSTL. -MOUNTING BOX & MISC ITEMS	3910159-1 41240-0001 40980-1001 - - 3960140-1	7.5* 3.3 0.9 2.2 0.3 0.8	23.9* 13.5 16.5 35.2 105.0 13.6
H01-A-2	CESSNA 400 ADF (W/BFO) -RECEIVER WITH DUAL SELECTOR (R-446A) -INDICATOR (IN-346A) ADF LOOP ANTENNA & ASSOC. WIRING	3910160-1 43090-1028 40980-1001 - -	7.5* 3.3 0.9 2.2	23.9* 13.5 16.5 35.2

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	-SENSE ANTENNA INSTL.	3960140-1	0.3	105.0
	-MOUNTING BOX & MISC ITEMS		0.8	13.6
H03-A	AM/FM STEREO RECEIVER & CASSETTE PLAYER	3910209-1	5.5*	32.8*
	-HEADSET (SET OF 2, 4 MAY BE USED)	C596532-0101	2.0	17.5
	-STEREO RECEIVER INSTL.	3930211-1	2.5	13.3
	-ANTENNA & MISC ITEMS	- -	2.0	119.6
H04-A-1	DME INSTALLATION, NARCO	3910166-6	6.3*	14.3*
	-TRANSCEIVER (DME-190)	3312-406	5.2	11.0
	-MOUNT ASSY		0.6	11.0
	-ANTENNA	- -	0.2	88.4
H04-A-2	CESSNA 400 DME INSTALLATION	3910167-16	13.9*	101.9*
	-RECEIVER-TRANSMITTER	44000-0000	8.5	133.7
	-INDICATOR	44020-1000	1.6	14.0
	-ANTENNA	42940-0000	0.2	88.4
H04-A-3	COLLINS DME-451		10.0*	97.9*
	-RECEIVER - TRANSMITTER, TCR-451	622-3670-001	5.3	133.7
	-INDICATOR - CONTROL, IND-450C	622-5588-001	0.9	14.0
	-ANTENNA, ANT-451	622-4011-001	0.2	88.4
H05-A-1	CESSNA 400 R-NAV (USED WITH NAV/COM AND DME)(INDICATOR NET CHANGE)	3910168-18	4.7*	12.0*
	-R-NAV COMPUTER (R-478A)	44100-1000	3.8	12.5
	-INDICATOR ADDED (IN-442AR)	43910-1000	1.0	15.5
	-INDICATOR DELETED, (IN-385A)		-1.6	15.5
H05-A-2	FOSTER R-NAV 511	3910203	3.4*	12.2*
	-COMPUTER-INDICATOR	- -	2.4	12.5
H05-A-3	COLLINS R-NAV, ANS-351C	622-5579-001	3.6	12.3
H07-A	CESSNA 400 GLIDESLOPE (INCLUDES VOR/ILS INDICATOR EXCHANGE FOR VOR/LOC)	3910157	4.0*	100.0*
	-RECEIVER, 40 CHANNEL (R-443B)	42100-0000	2.1	130.1
	-RECEIVER MOUNT	36450-0000	0.3	130.1
	-ANTENNA (MOUNTED ON UPPER WINDSHIELD)	1270098-1	0.2	26.6
	-VOR/ILS INDICATOR (IN-386A)(INDICATOR ACTUAL WT. IS 1.7 LBS	46860-2000	0.1	15.5

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
H08-A-1	AUTO RADIAL CENTERING INDICATOR ARC/LOC EXCHANGE FOR VOR/LOC IN ITEMS H22-A-1 AND H22-A-2 (WT NET CHANGE)	3910196-1	0.2*	15.5*
	-ARC/LOC INDICATOR ADDED	46860-1200	1.8	15.5
	-VOR/LOC INDICATOR DELETED	46860-1000	-1.6	15.5
H08-A-2	AUTO RADIAL CENTERING INDICATOR ARC/ILS EXCHANGE FOR VOR/ILS INDICATOR IN ITEM H07-A ONLY	3910196-2	0.2*	15.5*
	-ARC/ILS INDICATOR (IN-386AC) ADDED	46860-2200	1.9	15.5
	-VOR/ILS INDICATOR (IN-386A) DELETED	46860-2000	1.7	15.5
H11-A	SUNAIR SSB HF TRANSCEIVER (2ND UNIT)	3910158-9	24.5*	93.6*
	-RE-1000 SINGLE SIDE BAND XCVR, ASB-125	99681	5.3	11.7
	-PA1010A REMOTE POWER AMPLIFIER	99683	8.5	138.0
	-CU-110 ANTENNA COUPLER (LOAD BOX)	99816	5.2	117.0
	-ANTENNA INSTL, 351 INCH LONG	3960117	0.3	152.1
H13-A	CESSNA 400 MARKER BEACON	3910164-5	2.4*	72.1*
	-RECEIVER (R-402A)	42410-5128	0.7	11.5
	-ANTENNA, FLUSH MOUNTED IN TAILCONE	1270720-1	1.0	133.4
H16-A-1	CESSNA 300 TRANSPONDER	3910127-19	4.1*	32.5*
	-RECEIVER-TRANSMITTER (RT-359A)	41420-0028	2.7	12.5
	-ANTENNA	42940-0000	0.2	167.0
H16-A-2	CESSNA 400 TRANSPONDER	3910128-13	4.1*	32.5*
	-RECEIVER-TRANSMITTER (RT-459A)	41470-1028	2.8	12.5
	-ANTENNA	42940-0000	0.2	167.0
H22-A-1	CESSNA 300 NAV/COM 720 CH COM INSTALLATION REQUIRES--H34-A TO BE OPERATIONAL 1ST UNIT H37-A TO BE OPERATIONAL 2ND UNIT	3910183-16	7.8*	13.1*
	-RECEIVER-TRANSCEIVER (RT-385A)	46660-1000	5.5	12.5
	-VOR/LOC INDICATOR (IN-385A)	46860-1000	1.6	15.5
	-MOUNT, WIRING & MISC HARDWARE		0.7	11.8
H22-A-2	CESSNA 400 NAV/COM 720 CH COM INSTALLATION REQUIRES--H34-A TO BE OPERATIONAL 1ST UNIT H37-A TO BE OPERATIONAL 2ND UNIT	3910189	7.8*	13.1*
	-RECEIVER-TRANSCEIVER (RT-485A)	47360-1000	5.5	12.5
	-VOR/LOC INDICATOR (IN-385A)	46860-1000	1.6	15.5

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	-MOUNT, WIRING & MISC HARDWARE		0.7	11.8
H28-A-1	EMERGENCY LOCATOR TRANSMITTER	0470419	3.5*	134.6*
	-TRANSMITTER ASSY (D & M DMELT-6-1)	C589511-0117	3.3	134.5
	-ANTENNA ASSY	C589511-0109	0.1	137.8
H28-A-2	EMERGENCY LOCATOR TRANSMITTER (USED IN CANADA	0470419	3.5*	134.6*
	-TRANSMITTER ASSY (D & M DMELT-6-1C)	C589511-0113	3.3	134.5
	-ANTENNA	C589511-0109	0.1	137.8
H31-A-1	NAV-O-MATIC 200A INSTALLATION (AF-295B)	3910162-15	9.8*	54.9*
	-CONTROLLER-AMPLIFIER	43610-1202	1.1	15.0
	-TURN COORDINATOR (D88-O-1)(NET CHANGE)	42320-0028	0.3	16.0
	-WING SERVO INSTALLATION	0700215	6.8	70.6
H31-A-2	NAV-O-MATIC 300A INSTALLATION (AF-395-A)	3910163-15	11.2*	48.9*
	-CONTROLLER-AMPLIFIER (C-395A)	42660-1202	1.4	15.0
	-GYRO INSTALLATION (NET CHANGE)	0701038-1	1.2	8.0
	-TURN COORDINATOR (D88-O-1)(NET CHANGE)	42320-0028	0.3	16.0
	-WING SERVO INSTALLATION	0700215	6.8	70.6
H31-A-3	NAV-O-MATIC 300A INSTALLATION WITH NON-SLAVED HSI		15.8*	53.6*
	-CONTROLLER-AMPLIFIER	42660-2202	1.4	15.0
	-NON-SLAVED HSI, IG-832C	44690-2000	4.5	14.0
	-HSI CONVERTER INSTALLATION		1.1	130.5
	-D88-O-1 TURN COORDINATOR (NET CHANGE)	42320-0028	0.3	16.0
	-WING SERVO INSTALLATION	0700215	5.8	78.6
	-STANDARD DIRECTIONAL IND. DELETED	C661075-0101	-2.9	14.0
	-VOR/ILS INDICATOR DELETED		-1.7	15.5
	-MISC ITEMS & HARDWARE		2.7	58.4
H33-A	INTERCOM SYSTEM (REQUIRES E89-O, ALL PURPOSE CONTROL WHEEL AND E85-A DUAL CONTROLS INSTL.)	3910210-7	2.9*	15.0*
	-JACK INSTALLATION FOR INTERCOM-RH SIDE		0.3	18.0
	-H56-A HEADPHONE-MIKE (SET OF 2)	C596531-0101	2.2	14.0
	-INTERCOM P/C BOARD ASSY	3970149-1	0.1	14.0
	-RH CONTROL WHEEL INSTL (NET CHANGE)	3970153-7	0.3	19.0
H34-A	BASIC AVIONICS KIT (REQUIRED BY AND AVAIL-	3910186-8	8.5*	52.4*

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	ABLE WITH 1ST UNIT ONLY)			
	-CABIN SPEAKER INSTL.	0770750-741	1.9	45.1
	-RADIO COOLING	- -	1.0	12.5
	-NOISE FILTER (ON ALTERNATOR)	3940148-2	0.1	-6.0
	-RECEIVER INSTALLATION KIT	3930186	0.1	15.5
	-CABLE ASSY FOR COM ANTENNA	3950126	0.6	22.0
	-CABLE ASSY FOR OMNI ANTENNA	3950126	1.1	111.4
	-OMNI ANTENNA INSTALLATION	3960142-6	0.6	250.6
	-COM ANTENNA, RH SPIKE ON CABIN TOP	3960113-2	0.5	63.4
	-AUDIO CONTROL PANEL AND WIRING	3970152-1	1.9	12.5
	-HEADSET INSTALLATION	3970137-2	0.2	14.4
	-MICROPHONE INSTALLATION	3970139-1	0.3	17.6
H37-A	ANTENNA & COUPLER KIT (RQD & AVAILABLE WITH 2ND NAV/COM INSTL.)	3910185-6	1.0*	39.3*
	-ANTENNA & CABLE, LH VHF COM		0.8	48.6
	-ANTENNA COUPLER & CABLES (VOR OMNI)	S2212-1	0.2	1.6
H43-A-1	200A AUTOPILOT PARTIAL INSTL (NOT AVAILABLE WITH FACTORY INSTALLED NAV/COMS)	3910154-109	9.8*	54.9*
	-ROLL ACTUATOR INSTALLATION	0700215-5	6.8	70.6
	-COMPUTER INSTL (INCLUDES TURN COORDINATOR NET CHANGE)	3930144-2	1.8	14.1
	-CABLE INSTL.--WING AREA	3950115-6	0.6	34.5
	-CABLE INSTL.--INSTRUMENT PANEL AREA	3950148-5	0.5	12.3
H43-A-2	300A AUTOPILOT FACTORY PARTIAL INSTL (NOT AVAILABLE WITH FACTORY INSTALLED NAV/COMS)	3910154-119	11.4*	48.6*
	-COMPUTER INSTL (INCLUDES GYROS & TURN COORDINATOR NET CHANGE)	3930145-4	3.5	13.0
	-CABLE INSTL.--WING AREA	3950115-6	0.6	34.5
	-CABLE INSTL.--INSTRUMENT PANEL AREA	3950148-6	0.5	12.4
H46-A	ADF ANTI PRECIP SENSE ANTENNA	3910154-64	0.8	141.8
H52-A-1	FLUSH MOUNTED ANTENNA, DUAL COM. (MOUNTED IN LEADING EDGE OF VERTICAL FIN)	3910154-63	1.4	184.6
H52-A-2	FLUSH MOUNTED ANTENNA, SINGLE COM. (MOUNTED IN LEADING EDGE OF VERTICAL FIN)	3910154-92	0.8	192.0
H55-A	MIC-HEADSET COMBINATION, LIGHT WT REQUIRES	C59652[illegible]-0101	0.2	12.0

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	E89-O INSTALLATION			
H56-A	HEADSET-MICROPHONE, PADDED (STOWED) REQUIRES E89-O INSTALLATION	C596531-0101	1.1	14.0
H70-A	REMOTE TRANSPONDER IDENT SWITCH	3910205	0.2	17.0
	J. SPECIAL OPTION PACKAGES			
J01-A	SKYLANE II KIT	- -	54.8*	48.5*
	-C07-A GROUND SERVICE RECEPTACLE	2270017-2	2.8	136.5
	-C19-O HEATED PITOT & STALL WARNING	0770724-1	0.5	26.5
	-C31-A COURTESY ENTRANCE LIGHTS (2)	0700615-9	0.5	61.7
	-C40-A NAV LIGHT DETECTORS (2)	0701013	NEGL	- -
	-C43-A FLASHING BEACON LIGHT	0701042-1	1.8	208.6
	-D01-D TRUE AIRSPEED IND. NET CHANGE	1201108-7	0.2	16.5
	-D04-A STATIC ALTERNATE AIR SOURCE	0701028-1	0.3	14.4
	-D49-A E.G.T.	0750609-2	0.7	8.2
	-E85-A DUAL CONTROLS	0760101-5	6.7	14.1
	-G16-A STATIC DISCHARGERS (SET OF 10)	1201131-2	0.4	130.5
	-H01-A-1 CESSNA 300 ADF (R-546E)	3910159-1	7.5	23.9
	-H16-A-1 CESSNA 300 TRANSPONDER RT-359A	3910127-6	4.1	32.5
	-H22-A-1 CESSNA 300 NAV/COM (RT-385A)	3910183	7.8	13.1
	-H28-A-1 EMERGENCY LOCATOR TRANSMITTER	6470419	3.5	134.6
	-H31-A-1 CESSNA 200A AUTO-PILOT	3910162-15	9.8	54.9
	-H34-A BASIC AVIONICS KIT	3910186	8.5	52.4
J04-A	NAV-PAC (SKYLANE II ONLY) (NET CHANGE)	- -	15.2*	47.0*
	-H07-A 400 GLIDESLOPE (R-443B)	3910157	4.0	100.0
	-H13-A 400 MARKER BEACON	3910164	2.4	72.1
	-H22-A-1 NAV/COM 385 VOR/LOC 2ND UNIT	3910183	7.8	13.1
	-H37-A ANTENNA & COUPLER KIT	3910185	1.0	39.3