Cessna. 1979

180 Skywagon

CESSNA MODEL 180K

INFORMATION MANUAL

+ Sups

NOTICE

AT THE TIME OF ISSUANCE, THIS INFORMATION MANUAL WAS AN EXACT DUPLICATE OF THE OFFICIAL PILOT'S OPERATING HANDBOOK AND FAA APPROVED AIRPLANE FLIGHT MANUAL AND IS TO BE USED FOR GENERAL PURPOSES ONLY.

IT WILL NOT BE KEPT CURRENT AND, THEREFORE, CANNOT BE USED AS A SUBSTITUTE FOR THE OFFICIAL PILOT'S OPERATING HANDBOOK AND FAA APPROVED AIRPLANE FLIGHT MANUAL INTENDED FOR OPERATION OF THE AIRPLANE.

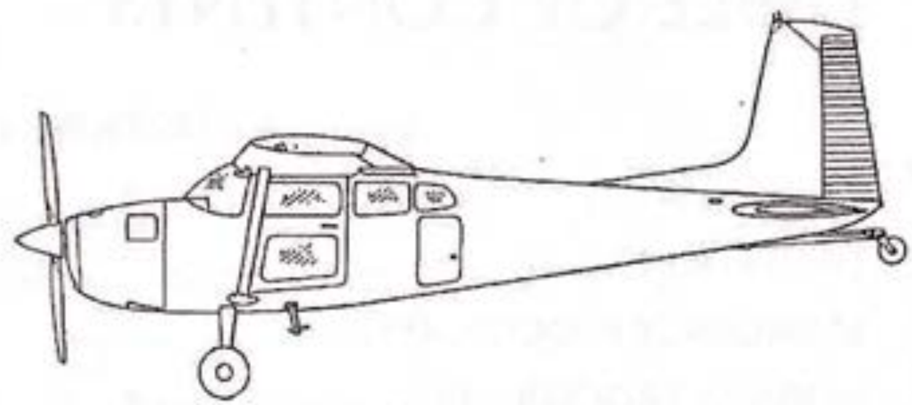
CESSNA AIRCRAFT COMPANY
1 OCTOBER 1978

PERFORMANCE - SPECIFICATIONS

*SPEED:		
Maximum at Sea Level		148 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 at 45% power.		
75% Power at 8000 Ft	Range	825 NM
84 Gallons Usable Fuel	Time	5.9 HRS
Maximum Range at 10,000 Ft	Range	1010 NM
84 Gallons Usable Fuel	Time	9.2 HRS
RATE OF CLIMB AT SEA LEVEL		1100 FPM
SERVICE CEILING		17,700 FT
TAKEOFF PERFORMANCE:		
Ground Roll		625 FT
Total Distance Over 50-Ft Obstacle		1205 FT
LANDING PERFORMANCE:		
Ground Roll		480 FT
Total Distance Over 50-Ft Obstacle		1365 FT
STALL SPEED (CAS):		
Flaps Up, Power Off		53 KNOTS
Flaps Down, Power Off		48 KNOTS
MAXIMUM WEIGHT:		
Ramp		2810 LBS
Takeoff or Landing		2800 LBS
STANDARD EMPTY WEIGHT:		
180 Skywagon		1643 LBS
180 Skywagon II		1694 LBS
MAXIMUM USEFUL LOAD:		
180 Skywagon		1167 LBS
180 Skywagon II		1116 LBS
BAGGAGE ALLOWANCE		170 LBS
WING LOADING: Pounds/Sq Ft		16.1
POWER LOADING: Pounds/HP		12.2
FUEL CAPACITY: Total		88 GAL.
OIL CAPACITY		12 QTS
ENGINE: Teledyne Continental		O-470-U
230 BHP at 2400 RPM		
PROPELLER: Constant Speed, Diameter		82 IN.

* These speeds are one knot higher with optional speed fairings installed.

INFORMATION MANUAL



CESSNA AIRCRAFT COMPANY

1979 MODEL 180K

TABLE OF CONTENTS

SECTION

SECTION 1
GENERAL

TABLE OF CONTENTS

Page

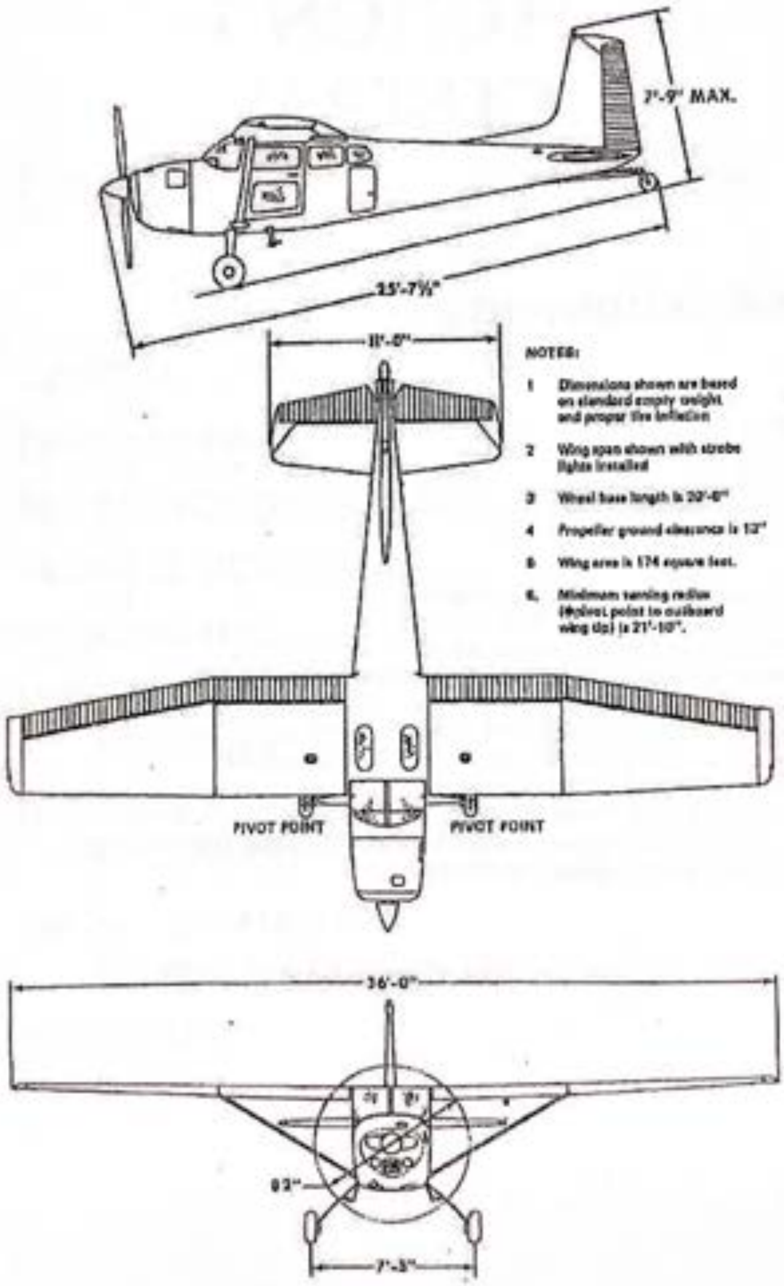


Figure 1-1. Three View

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).
Total Capacity: 88 gallons.
Total Capacity Each Tank: 44 gallons.
Total Usable: 84 gallons.

NOTE

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

OIL

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

NOTE

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

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

Recommended Viscosity for Temperature Range:
SAE 50 above 4°C (40°F).
SAE 10W30 or SAE 30 below 4°C (40°F).

NOTE

Multi-viscosity oil with a range of SAE 10W30 is recommended for improved starting in cold weather.

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

MAXIMUM CERTIFICATED WEIGHTS

Ramp: 2810 lbs.
Takeoff: 2800 lbs.
Landing: 2800 lbs.
Weight in Baggage Compartment:
Baggage Area 1 - Station 82 to 108: 120 lbs.
Baggage Area 2 - Station 108 to 140: 50 lbs.

STANDARD AIRPLANE WEIGHTS

Standard Empty Weight, 180 Skywagon: 1643 lbs.
180 Skywagon II: 1694 lbs.
Maximum Useful Load, 180 Skywagon: 1167 lbs.
180 Skywagon II: 1116 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: 16.1 lbs./sq. ft.
Power Loading: 12.2 lbs./hp.

SYMBOLS, ABBREVIATIONS AND TERMINOLOGY

GENERAL AIRSPEED TERMINOLOGY AND SYMBOLS

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

KIAS — **Knots Indicated Airspeed** is the speed shown on the airspeed indicator and expressed in knots.

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

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

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

V_{NO}	**Maximum Structural Cruising Speed** is the speed that should not be exceeded except in smooth air, then only with caution.
V_{NE}	**Never Exceed Speed** is the speed limit that may not be exceeded at any time.
V_S	**Stalling Speed** or the minimum steady flight speed at which the airplane is controllable.
V_{S_o}	**Stalling Speed** or the minimum steady flight speed at which the airplane is controllable in the landing configuration at the most forward center of gravity.
V_X	**Best Angle-of-Climb Speed** is the speed which results in the greatest gain of altitude in a given horizontal distance.
V_Y	**Best Rate-of-Climb Speed** is the speed which results in the greatest gain in altitude in a given time.

METEOROLOGICAL TERMINOLOGY

OAT	**Outside Air Temperature** is the free air static temperature. It is expressed in either degrees Celsius or degrees Fahrenheit.
Standard Temperature	**Standard Temperature** is 15°C at sea level pressure altitude and decreases by 2°C for each 1000 feet of altitude.
Pressure Altitude	**Pressure Altitude** is the altitude read from an altimeter when the altimeter's barometric scale has been set to 29.92 inches of mercury (1013 mb).

ENGINE POWER TERMINOLOGY

BHP	**Brake Horsepower** is the power developed by the engine.
RPM	**Revolutions Per Minute** is engine speed.
MP	**Manifold Pressure** is a pressure measured in the engine's induction system and is expressed in inches of mercury (Hg).

AIRPLANE PERFORMANCE AND FLIGHT PLANNING TERMINOLOGY

Demonstrated Crosswind Velocity	**Demonstrated Crosswind Velocity** is the velocity of the crosswind component for which adequate control of the airplane during takeoff and landing was actually demonstrated during certification tests. The value shown is not considered to be limiting.
Usable Fuel	**Usable Fuel** is the fuel available for flight planning.
Unusable Fuel	**Unusable Fuel** is the quantity of fuel that can not be safely used in flight.
GPH	**Gallons Per Hour** is the amount of fuel (in gallons) consumed per hour.
NMPG	**Nautical Miles Per Gallon** is the distance (in nautical miles) which can be expected per gallon of fuel consumed at a specific engine power setting and/or flight configuration.
g	**g** is acceleration due to gravity.

WEIGHT AND BALANCE TERMINOLOGY

Reference Datum	**Reference Datum** is an imaginary vertical plane from which all horizontal distances are measured for balance purposes.
Station	**Station** is a location along the airplane fuselage given in terms of the distance from the reference datum.
Arm	**Arm** is the horizontal distance from the reference datum to the center of gravity (C.G.) of an item.
Moment	**Moment** is the product of the weight of an item multiplied by its arm. (Moment divided by the constant 1000 is used in this handbook to simplify balance calculations by reducing the number of digits.)
Center of Gravity (C.G.)	**Center of Gravity** is the point at which an airplane, or equipment, would balance if suspended. Its distance from the reference datum is found by dividing the total moment by the total weight of the airplane.

C.G. Arm	**Center of Gravity Arm** is the arm obtained by adding the airplane's individual moments and dividing the sum by the total weight.
C.G. Limits	**Center of Gravity Limits** are the extreme center of gravity locations within which the airplane must be operated at a given weight.
Standard Empty Weight	**Standard Empty Weight** is the weight of a standard airplane, including unusable fuel, full operating fluids and full engine oil.
Basic Empty Weight	**Basic Empty Weight** is the standard empty weight plus the weight of optional equipment.
Useful Load	**Useful Load** is the difference between ramp weight and the basic empty weight.
Maximum Ramp Weight	**Maximum Ramp Weight** is the maximum weight approved for ground maneuver. (It includes the weight of start, taxi and runup fuel.)
Maximum Takeoff Weight	**Maximum Takeoff Weight** is the maximum weight approved for the start of the takeoff run.
Maximum Landing Weight	**Maximum Landing Weight** is the maximum weight approved for the landing touchdown.
Tare	**Tare** is the weight of chocks, blocks, stands, etc. used when weighing an airplane, and is included in the scale readings. Tare is deducted from the scale reading to obtain the actual (net) airplane weight.

SECTION 2
LIMITATIONS

TABLE OF CONTENTS

INTRODUCTION

Section 2 includes operating limitations, instrument markings, and basic placards necessary for the safe operation of the airplane, its engine, standard systems and standard equipment. The limitations included in this section and in Section 9 have been approved by the Federal Aviation Administration. Observance of these operating limitations is required by Federal Aviation Regulations.

NOTE

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

NOTE

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

Your Cessna is certificated under FAA Type Certificate No. 5A6 as Cessna Model No. 180K.

AIRSPEED LIMITATIONS

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

	SPEED	KCAS	KIAS	REMARKS
V_{NE}	Never Exceed Speed	164	169	Do not exceed this speed in any operation.
V_{NO}	Maximum Structural Cruising Speed	136	139	Do not exceed this speed except in smooth air, and then only with caution.
V_A	Maneuvering Speed:			Do not make full or abrupt control movements above this speed.
	2800 Pounds	107	109	
	2350 Pounds	98	100	
	1900 Pounds	88	90	
V_{FE}	Maximum Flap Extended Speed:			Do not exceed these speeds with the given flap settings.
	10° Flaps	119	120	
	20° - 40° Flaps	91	90	

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	49 - 90	Full Flap Operating Range. Lower limit is maximum weight V_{S_O} in landing configuration. Upper limit is maximum speed permissible with flaps extended.
Green Arc	55 - 139	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	139 - 169	Operations must be conducted with caution and only in smooth air.
Red Line	169	Maximum speed for all operations.

Figure 2-2. Airspeed Indicator Markings

POWER PLANT LIMITATIONS

Engine Manufacturer: Teledyne Continental.
Engine Model Number: O-470-U.
Engine Operating Limits for Takeoff and Continuous Operations:
Maximum Power: 230 BHP.
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.
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	GREEN ARC	YELLOW ARC	RED LINE
	MINIMUM LIMIT	NORMAL OPERATING	CAUTION RANGE	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
Carburetor Air Temperature	---	---	-15° to 5°C	---
Suction	---	4.5 - 5.4 in. Hg.	---	---
Fuel Quantity	E (4.0 Gal. Unusable Each Tank)	---	---	---

Figure 2-3. Power Plant Instrument Markings

WEIGHT LIMITS

Maximum Ramp Weight: 2810 lbs.
Maximum Takeoff Weight: 2800 lbs.
Maximum Landing Weight: 2800 lbs.
Maximum Weight in Baggage Compartment:
  Baggage Area 1 - Station 82 to 108: 120 lbs.
  Baggage Area 2 - Station 108 to 140: 50 lbs.

NOTE

Refer to Section 6 of this handbook for loading arrangements with one or more seats removed for cargo accommodation.

CENTER OF GRAVITY LIMITS

Center of Gravity Range:

Forward: 33.5 inches aft of datum at 2100 lbs. or less, with straight line variation to 38.5 inches aft of datum at 2800 lbs.

Aft: 47.0 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 turns in which the angle of bank is not more than 60°.

Aerobatic maneuvers, including spins, are not approved.

Sideslips should be avoided with flaps extended.

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 and night VFR and may be equipped for 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: 44 U.S. gallons each.

Total Fuel: 88 U.S. gallons.
Usable Fuel (all flight conditions): 84 U.S. gallons.
Unusable Fuel: 4.0 U.S. gallons.

NOTE

To ensure maximum fuel capacity when refueling and to 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 the BOTH ON position.

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

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

OTHER LIMITATIONS

FLAP LIMITATIONS

Approved Takeoff Range: 0° to 20°.
Approved Landing Range: 0° to 40°.

PLACARDS

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

1. On control lock:

CONTROL LOCK - REMOVE BEFORE STARTING ENGINE

2. 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

3. On the fuel selector valve plate:

> BOTH ON - 84 GAL ALL FLIGHT ATTITUDES
> TAKEOFF, LANDING
> RIGHT ON - 40 GAL LEVEL FLIGHT ONLY
> LEFT ON - 40 GAL LEVEL FLIGHT ONLY
> OFF

4. Forward of fuel tank filler cap:

> FUEL
>
> 100LL/100 MIN. GRADE AVIATION GASOLINE
> CAP. 44 U.S. GAL.
> CAP. 34.5 U.S. GAL. TO BOTTOM OF FILLER COLLAR

5. Near airspeed indicator:

MAX SPEED — KIAS	
MANEUVER	109
FLAPS 10°	120
FLAPS 20° - 40°	90

6. On the flap handle:

FLAPS - PULL TO EXTEND		
	RETRACTED	0°
TAKEOFF	1st NOTCH	10°
	2nd NOTCH	20°
LANDING	3rd NOTCH	30°
	4th NOTCH	40°

7. On the inside of baggage door:

REFER TO WEIGHT & BALANCE DATA FOR BAGGAGE /CARGO LOADING.

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

9. On oil filler cap:

OIL
12 QTS

10. On instrument panel:

AVOID SLIPS WITH FLAPS EXTENDED

11. Near extended aft baggage area:

50 POUNDS MAXIMUM LOAD REFER TO WEIGHT & BALANCE DATA FOR BAGGAGE/CARGO LOADING

SECTION 3
EMERGENCY PROCEDURES

TABLE OF CONTENTS

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 . . . . 70 KIAS
- Wing Flaps Down 20° . . . . 65 KIAS

Maneuvering Speed:
- 2800 Lbs . . . . 109 KIAS
- 2350 Lbs . . . . 100 KIAS
- 1900 Lbs . . . . 90 KIAS

Maximum Glide:
- 2800 Lbs . . . . 75 KIAS
- 2400 Lbs . . . . 70 KIAS
- 2000 Lbs . . . . 65 KIAS

Precautionary Landing With Engine Power, Flaps Down . . 65 KIAS

Landing Without Engine Power:
- Wing Flaps Up . . . . 75 KIAS
- Wing Flaps Down . . . . 65 KIAS

OPERATIONAL CHECKLISTS

ENGINE FAILURES

ENGINE FAILURE DURING TAKEOFF RUN

1. Throttle -- IDLE.
2. Control Wheel -- FULL AFT.
3. Brakes -- APPLY.
4. Wing Flaps -- RETRACT during ground roll, to provide more effective braking.
5. Mixture -- IDLE CUT-OFF.
6. Ignition Switch -- OFF.
7. Master Switch -- OFF.

ENGINE FAILURE IMMEDIATELY AFTER TAKEOFF

1. Airspeed -- 70 KIAS.
2. Mixture -- IDLE CUT-OFF.
3. Fuel Selector Valve -- OFF.
4. Ignition Switch -- OFF.
5. Master Switch -- OFF.
6. Wing Flaps -- AS REQUIRED (40° recommended).

ENGINE FAILURE DURING FLIGHT

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

FORCED LANDINGS

EMERGENCY LANDING WITHOUT ENGINE POWER

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

PRECAUTIONARY LANDING WITH ENGINE POWER

1. Wing Flaps -- 20°.
2. Airspeed -- 70 KIAS.
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°.
6. Airspeed -- 65 KIAS.
7. Doors -- UNLATCH PRIOR TO TOUCHDOWN.
8. Avionics Power and Master Switches -- OFF when landing is assured.
9. Touchdown -- 3-POINT ATTITUDE.

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. Seats and Belts -- SECURE.
4. Approach -- High Winds, Heavy Seas -- INTO THE WIND.
   Light Winds, Heavy Swells -- PARALLEL TO SWELLS.
5. Wing Flaps -- 40°.
6. Power -- ESTABLISH 300 FT/MIN DESCENT AT 65 KIAS.
7. Cabin Doors -- UNLATCH.
8. Touchdown -- LEVEL ATTITUDE AT 300 FT/MIN DESCENT.
9. Face -- CUSHION at touchdown with folded coat.
10. Airplane -- EVACUATE through cabin doors. If necessary, open windows and flood cabin to equalize pressure so doors can be opened.
11. 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. Ignition Switch -- START (continue cranking).
5. Throttle -- FULL OPEN.
6. Mixture -- IDLE CUT-OFF.
7. Fire Extinguisher -- OBTAIN (have ground attendants obtain if not installed).
8. Engine -- SECURE.
   a. Ignition Switch -- OFF.
   b. Master Switch -- OFF.
   c. Fuel Selector Valve -- OFF.
9. Fire -- EXTINGUISH using fire extinguisher, wool blanket, or dirt.

NOTE

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

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

ENGINE FIRE IN FLIGHT

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

ELECTRICAL FIRE IN FLIGHT

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

WARNING

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

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

6. Master Switch -- ON.
7. Circuit Breakers -- CHECK for faulty circuit, do not reset.
8. Radio Switches -- OFF.
9. Avionics Power Switch -- ON.
10. Radio/Electrical Switches -- ON one at a time, with delay after each until short circuit is localized.

11. Vents/Cabin Air/Heat -- OPEN when it is ascertained that fire is completely extinguished.

CABIN FIRE

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

WARNING

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

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

WING FIRE

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

NOTE

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

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 open defroster valve to obtain windshield defroster airflow. Adjust cabin air control to get maximum defroster heat and 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 unexpected loss in manifold pressure could be caused by carburetor ice or air intake filter ice. Lean the mixture for smooth operation 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 wheel landing at a speed slightly higher than normal.

STATIC SOURCE BLOCKAGE (Erroneous Instrument Reading Suspected)

1. Alternate Static Source Valve -- PULL ON.
2. Windows -- CLOSED.

LANDING WITH A FLAT MAIN TIRE

1. Tailwheel Lock (if installed) -- LOCKED.
2. Wing Flaps -- FULL DOWN.
3. Touchdown -- 3-POINT ATTITUDE.
4. Aileron Control -- HOLD OFF FLAT TIRE as long as possible.
5. Brakes -- AS REQUIRED TO MAINTAIN DIRECTIONAL CONTROL.

ELECTRICAL POWER SUPPLY SYSTEM MALFUNCTIONS

AMMETER SHOWS EXCESSIVE RATE OF CHARGE (Full Scale Deflection)

1. Alternator -- OFF.
2. Nonessential Electrical Equipment -- OFF.
3. 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. Master Switch -- OFF (both sides).
3. Master Switch -- ON.
4. Low-Voltage Light -- CHECK OFF.
5. Avionics Power Switch -- ON.

If low-voltage light illuminates again:

6. Alternator -- OFF.
7. Nonessential Radio and Electrical Equipment -- OFF.
8. 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.

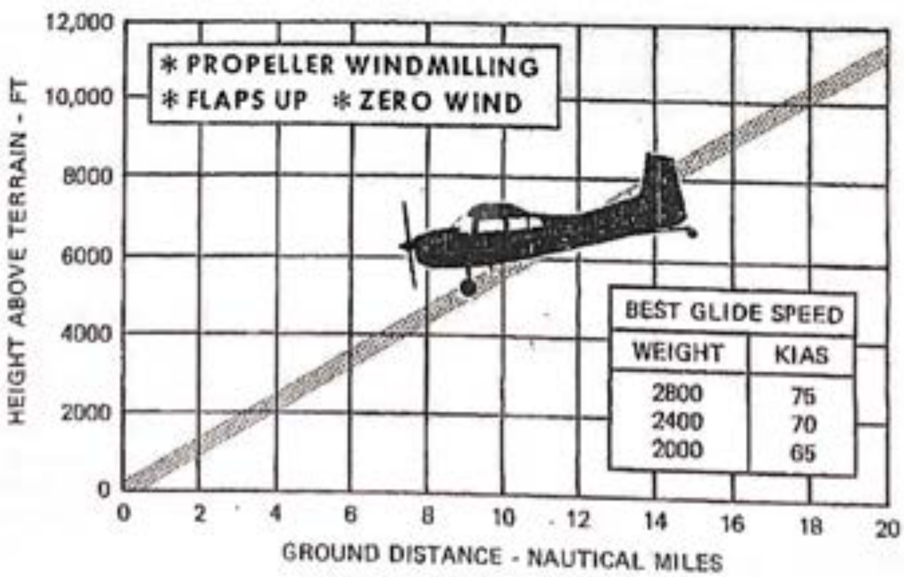


Figure 3-1. Maximum Glide

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 flaps 20° using an airspeed of approximately 80 KIAS by using throttle and trim controls. **Then do not change the trim setting**, and control the glide angle by adjusting power exclusively.

At flareout, the trim should be adjusted toward the full nose up position and power adjusted so that the airplane will rotate to a suitable attitude for touchdown. Close the throttle at touchdown.

FIRES

Improper starting procedures during a difficult cold weather start can cause a backfire which could ignite fuel that has accumulated in the intake duct. In this event, the Fire During Start On Ground checklist should be followed to minimize damage to the airplane.

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 or the turn and bank indicator if he inadvertently flies into clouds. The following instructions assume that only the electrically-powered turn coordinator or the turn and bank indicator is operative, and that the pilot is not completely proficient in instrument flying.

EXECUTING A 180° TURN IN 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 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. Use full carburetor heat.
3. Reduce power to set up a 500 to 800 ft/min rate of descent.
4. Adjust the stabilizer and rudder trim (if installed) control wheels for a stabilized descent at 85 KIAS.
5. Keep hands off control wheel.
6. Monitor turn coordinator and make corrections by rudder alone.
7. Check trend of compass card movement and make cautious corrections with rudder to stop turn.
8. Upon breaking out of clouds, resume normal cruising flight.

RECOVERY FROM A SPIRAL DIVE

If a spiral is encountered, proceed as follows:

1. Close the throttle.
2. Stop the turn by using coordinated aileron and rudder control to align the symbolic airplane in the turn coordinator with the horizon reference line.
3. Cautiously apply elevator back pressure to slowly reduce the airspeed to 85 KIAS.
4. Adjust the stabilizer trim control to maintain an 85 KIAS glide.
5. Keep hands off the control wheel, using rudder control to hold a straight heading.Use rudder trim (if installed) to relieve unbalanced rudder force, if present.
6. Clear engine occasionally, but avoid using enough power to disturb the trimmed glide.
7. Upon breaking out of clouds, resume normal cruising flight.

INADVERTENT FLIGHT INTO ICING CONDITIONS

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 instrument readings are suspected due to water or ice in the pressure lines going to the standard external static pressure source, the alternate static valve should be pulled on. 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 rate-of-climb indicator.

A Calibration Table is provided in Section 5 to illustrate the effect of the alternate static source on indicated airspeeds. However, with the windows closed the airspeed indicator may typically read as much as 5 knots slower and the altimeter 50 feet lower in cruise. If the alternate source must be used for landing, an indicated airspeed 5 knots lower than normal may be used.

SPINS

Intentional spins are prohibited in this airplane. Because of the aural stall warning system, it is not probable that an inadvertent spin will be encountered. However, should a spin occur, the following recovery procedures should be employed:

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. AS THE RUDDER REACHES THE OPPOSITE STOP (APPROXIMATELY 1/4 TURN), MOVE THE CONTROL WHEEL **BRISKLY** FORWARD.
5. **HOLD** THESE CONTROL INPUTS UNTIL ROTATION STOPS.
6. AS ROTATION STOPS, NEUTRALIZE RUDDER, AND MAKE A SMOOTH RECOVERY FROM THE RESULTING DIVE.

NOTE

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

ROUGH ENGINE OPERATION OR LOSS OF POWER

CARBURETOR ICING

An unexplained drop in manifold pressure 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 slightly 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 damaged or improperly adjusted alternator control unit can also cause malfunctions. Problems of this nature constitute an electrical emergency and should be dealt with immediately. Electrical power malfunctions usually fall into two categories: excessive rate of charge and insufficient rate of charge. The 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 or is improperly adjusted, as evidenced by an excessive rate of charge shown on the ammeter, the alternator should be turned off, 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, 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, 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 during landing.

SECTION 4
NORMAL PROCEDURES

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

Page

AMPLIFIED PROCEDURES

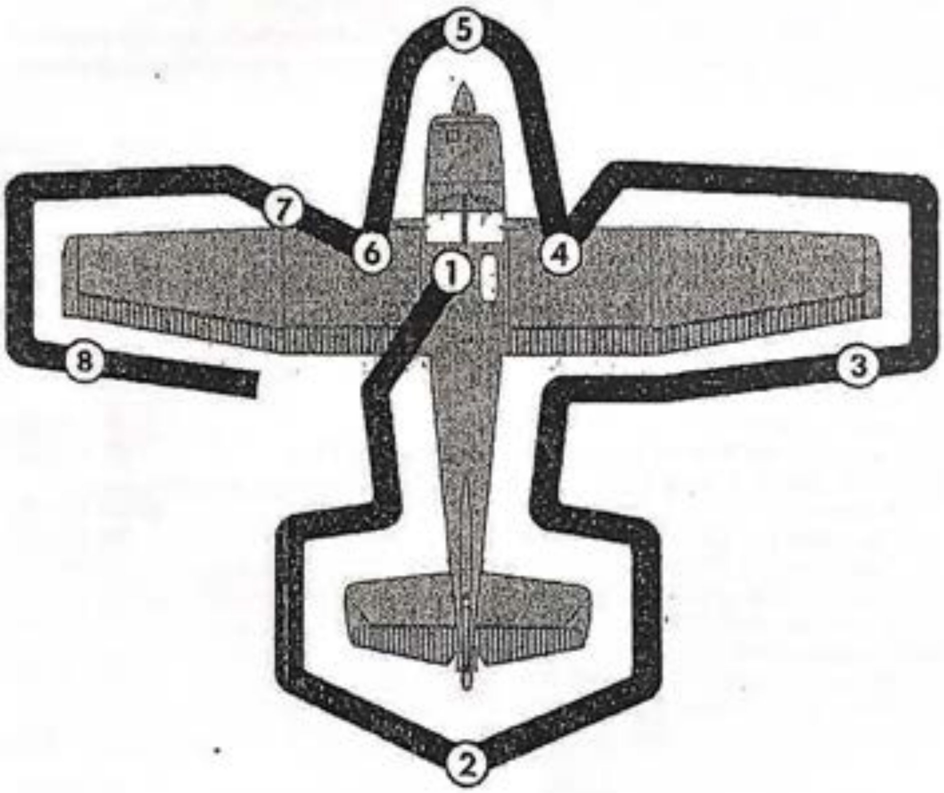
INTRODUCTION

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

SPEEDS FOR NORMAL OPERATION

Unless otherwise noted, the following speeds are based on a maximum weight of 2800 pounds and may be used for any lesser weight. However, to achieve the performance specified in Section 5 for takeoff distances, the speed appropriate to the particular weight must be used.

Takeoff:	
Normal Climb Out	65 KIAS
Short Field Takeoff, Flaps 20°, Speed at 50 Feet	57 KIAS
Enroute Climb, Flaps Up:	
Normal	85-95 KIAS
Best Rate of Climb, Sea Level	81 KIAS
Best Rate of Climb, 10,000 Feet	73 KIAS
Best Angle of Climb, Sea Level	61 KIAS
Best Angle of Climb, 10,000 Feet	63 KIAS
Landing Approach:	
Normal Approach, Flaps Up	70-80 KIAS
Normal Approach, Flaps 40°	60-70 KIAS
Short Field Approach, Flaps 40°	64 KIAS
Balked Landing:	
Maximum Power, Flaps 20°	55 KIAS
Maximum Recommended Turbulent Air Penetration Speed:	
2800 Lbs	109 KIAS
2350 Lbs	100 KIAS
1900 Lbs	90 KIAS
Maximum Demonstrated Crosswind Velocity:	
Takeoff or Landing	12 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. Master Switch -- OFF.
8. Static Pressure Alternate Source Valve (if installed) -- OFF.
9. Fuel Selector Valve -- BOTH ON.
10. Baggage Door -- CHECK securely locked.

(2) EMPENNAGE

1. Rudder Gust Lock -- REMOVE.
2. Tail Tie-Down -- DISCONNECT.
3. Tail Wheel Tire -- CHECK for proper inflation.
4. 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 and fuel line quick-drain valve (located on bottom of fuselage below the cabin door) 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. Carburetor Air Filter -- CHECK for restrictions by dust or other foreign matter.
4. Engine Oil Level -- CHECK. Do not operate with less than nine quarts. Fill to twelve quarts for extended flight.
5. 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, fuel line drain valves, and fuel selector valve drain plug will be necessary.

(6) LEFT WING

1. Fuel Quantity -- CHECK VISUALLY for desired level.
2. Fuel Filler Cap -- SECURE and vent unobstructed.
3. Main Wheel Tire -- CHECK for proper inflation.
4. 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 and fuel line quick-drain valve (located on bottom of fuselage below the cabin door) to check for water, sediment and proper fuel grade.

(7) LEFT WING Leading Edge

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

(8) LEFT WING Trailing Edge

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

BEFORE STARTING ENGINE

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

CAUTION

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

6. Circuit Breakers -- CHECK IN.
7. Wing Flaps -- CHECK, all positions.
8. Cowl Flaps -- OPEN (move lever out of locking detent to reposition).
9. Tail Wheel Lock (if installed) -- UNLOCK.

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.

BEFORE TAKEOFF

1. Parking Brake -- SET.
2. Cabin Doors -- CLOSED and LOCKED.
3. Flight Controls -- FREE and CORRECT.

4. Flight Instruments -- CHECK and SET.
5. Fuel Selector Valve -- BOTH ON.
6. Fuel Quantity Indicators -- RECHECK QUANTITY.
7. Mixture -- RICH.
8. Stabilizer and Rudder Trim (if installed) -- SET.
9. Cowl Flaps -- OPEN.
10. 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.
11. Throttle -- CLOSED, check idle.
12. Avionics Power Switch -- ON.
13. Radios -- SET.
14. Autopilot (if installed) -- OFF.
15. Flashing Beacon, Navigation Lights and/or Strobe Lights -- ON as required.
16. Tail Wheel Lock (if installed) -- AS DESIRED.
17. Parking Brake -- RELEASE.
18. Throttle Friction Lock -- ADJUST.

TAKEOFF

NORMAL TAKEOFF

1. Wing Flaps -- 0° - 20°.
2. Cowl Flaps -- OPEN.
3. Carburetor Heat -- COLD.
4. Power -- FULL THROTTLE and 2400 RPM.
5. Elevator Control -- MODERATELY TAIL LOW.
6. Climb Speed -- 85 KIAS.
7. Wing Flaps -- UP after obstacles are cleared.

SHORT FIELD TAKEOFF

1. Wing Flaps -- 20°.
2. Cowl Flaps -- OPEN.
3. Carburetor Heat -- COLD.
4. Brakes -- APPLY.
5. Power -- FULL THROTTLE and 2400 RPM.
6. Brakes -- RELEASE.
7. Elevator Control -- MAINTAIN TAIL LOW.

8. Climb Speed -- 57 KIAS at maximum takeoff weight (until all obstacles are cleared).
9. Wing Flaps -- RETRACT slowly after obstacles are cleared and 65 KIAS is reached.

ENROUTE CLIMB

NORMAL CLIMB

1. Airspeed -- 85-95 KIAS.
2. Power -- 23 INCHES Hg and 2400 RPM.
3. Fuel Selector Valve -- BOTH ON.
4. Mixture -- FULL RICH (mixture may be leaned above 5000 feet).
5. Cowl Flaps -- OPEN as required.

MAXIMUM PERFORMANCE CLIMB

1. Airspeed -- 81 KIAS (sea level) to 73 KIAS (10,000 feet).
2. Power -- FULL THROTTLE and 2400 RPM.
3. Fuel Selector Valve -- BOTH ON.
4. Mixture -- FULL RICH (mixture may be leaned above 5000 feet).
5. Cowl Flaps -- FULL OPEN.

CRUISE

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

DESCENT

1. Fuel Selector Valve -- BOTH ON.
2. Power -- AS DESIRED.
3. Carburetor Heat -- AS REQUIRED to prevent carburetor icing.
4. Mixture -- ENRICHEN as required for smooth operation.
5. Cowl Flaps -- CLOSED.

BEFORE LANDING

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

3. Mixture -- RICH.
4. Carburetor Heat -- ON (apply full heat before closing throttle).
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 120 KIAS, 20° - 40° below 90 KIAS).
3. Airspeed -- 60-70 KIAS (flaps DOWN).
4. Stabilizer and Rudder Trim (if installed) -- ADJUST.

NOTE

The ability of the airplane to land three-point is dependent upon the stabilizer being adjusted for hands off trim in the glide.

5. Tail Wheel Lock (if installed) -- AS DESIRED
6. Touchdown -- THREE-POINT or WHEELS as desired.
7. Control Wheel -- LOWER TAIL WHEEL gently, then FULL AFT.
8. Brakes -- AS REQUIRED.

SHORT FIELD LANDING

1. Airspeed -- 70-80 KIAS (flaps UP).
2. Wing Flaps -- 40° (below 90 KIAS).
3. Airspeed -- MAINTAIN 64 KIAS.
4. Trim -- ADJUST.
5. Power -- REDUCE to idle as obstacle is cleared.
6. Touchdown -- THREE-POINT.
7. Control Wheel -- FULL AFT.
8. Brakes -- APPLY HEAVILY.
9. 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 65 KIAS.
6. Cowl Flaps -- OPEN.

AFTER LANDING

1. Wing Flaps -- UP.
2. Carburetor Heat -- COLD.
3. Tail Wheel Lock (if installed) -- UNLOCK.
4. Cowl Flaps -- OPEN.
5. Stabilizer and Rudder Trim (if installed) -- SET for takeoff.

SECURING AIRPLANE

1. Parking Brake -- SET.
2. Avionics Power Switch, Electrical Equipment -- OFF.
3. Throttle -- IDLE.
4. Mixture -- IDLE CUT-OFF (pulled full out).

NOTE

Do not open throttle as engine stops since this actuates the accelerator pump.

5. Ignition Switch -- OFF.
6. Master Switch -- OFF.
7. Control Lock -- INSTALL.

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

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.

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

BEFORE TAKEOFF

WARM-UP

Since the engine is closely cowled for efficient in-flight cooling, precautions should be taken to avoid overheating on the ground. Full throttle checks on the ground are not recommended unless the pilot has good reason to suspect that the engine is not turning up properly.

MAGNETO CHECK

The magneto check should be made at 1700 RPM with the propeller control full forward 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 speed 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 its initial position if the alternator and alternator control unit are operating properly.

TAKEOFF

POWER CHECK

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

Full-throttle runups over loose gravel are especially harmful to propeller tips. When takeoffs must be made over a gravel surface, it is very important that the throttle be advanced slowly. This allows the airplane to start rolling before 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 throttle 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

Using 20° wing flaps reduces the total distance over an obstacle by approximately 20 percent. Soft field takeoffs are performed with 20° flaps by lifting the airplane off the ground as soon as practical in a tail-low attitude. However, the airplane should be leveled off immediately to accelerate to a safe climb speed.

If 20° wing flaps are used for takeoff, they should be left down until all obstacles are cleared. To clear an obstacle with 20° flaps, a 57 KIAS climb speed should be used at maximum takeoff weight. Maximum performance takeoff data over an obstacle is tabulated in Section 5 for various weights. If no obstructions are ahead, a best "flaps up" rate-of-climb speed (81 KIAS) would be most efficient. Flap deflections of 30° or 40° are not approved for takeoff.

CROSSWIND TAKEOFF

Takeoffs into strong crosswinds normally are performed with the minimum flap setting necessary for the field length, to minimize the drift angle immediately after takeoff. 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) 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 73 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 61 KIAS at sea level, increasing to 63 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 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 4-2, illustrates the true airspeed and nautical miles per gallon during cruise for various altitudes and

	75% POWER		65% POWER		55% POWER	
ALTITUDE	KTAS	NMPG	KTAS	NMPG	KTAS	NMPG
2000 Feet	134	10.4	126	11.4	117	12.3
5000 Feet	138	10.7	130	11.7	120	12.6
8000 Feet	142	11.0	133	12.0	122	12.9
Standard Conditions						Zero Wind

Figure 4-2. Cruise Performance Table

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

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

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 3 knots 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 heated air causes a richer mixture, readjust the mixture setting when carburetor heat is used continuously in cruising 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 Economy Mixture Indicator may be used as an aid for mixture leaning in

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 4-3. EGT Table

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 4-3.

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 3 knots 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 positions are presented in Section 5.

LANDING

NORMAL LANDING

Since the ability of the elevator to produce a full stall is dependent upon the adjustable stabilizer trim setting, it is important that the airplane be completely trimmed in the approach glide. If the airplane fails to land three-point with the control wheel fully back, it is probable that the adjustable stabilizer is not adjusted for the landing condition.

The landing normally should be three-point. Heavy braking may be used initially in the ground roll if the control wheel is held full back.

SHORT FIELD LANDING

For short field landings, make a power-off approach at 64 KIAS with 40° flaps, and land three-point. Immediately after touchdown, apply heavy braking as required. For maximum brake effectiveness, retract the flaps, hold full up elevator and apply maximum possible brake pressure without sliding the tires.

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 and the cowl flaps opened.

COLD WEATHER OPERATION

STARTING

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

NOTE

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

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

2. Mixture -- FULL RICH.
3. Propeller -- CLEAR.
4. Avionics Power Switch -- OFF.
5. Master Switch -- ON.
6. Throttle -- OPEN 1/2 INCH.
7. Ignition Switch -- START (release to BOTH when engine starts).
8. Pull carburetor heat on after engine has started, and leave on until the engine is running smoothly.
9. Oil Pressure -- CHECK.

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 a stroke.
2. Mixture -- FULL RICH.
3. Propeller -- CLEAR.
4. Avionics Power Switch -- OFF.
5. Master Switch -- ON.
6. Pump throttle rapidly to full open twice. Return to 1/2 inch open position.
7. Ignition Switch -- START (continue to prime engine until it is running smoothly, or alternately, pump the throttle rapidly over the first 1/4 of total travel).
8. Pull carburetor heat on after engine has started. Leave on until engine is running smoothly.
9. Primer -- LOCK.
10. Oil Pressure -- CHECK.

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 takeoff, climb, and cruise.

NOTE

When operating in sub-zero temperatures, care should be exercised when using partial carburetor heat to avoid icing. Partial heat may raise the carburetor air temperature to the 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.
4. Select relatively high manifold pressure and RPM settings for optimum mixture distribution, and avoid excessive manual leaning in cruising flight.
5. Avoid sudden throttle movements during ground and flight operation.

NOISE ABATEMENT

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

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

1. Pilots operating aircraft under VFR over outdoor assemblies of persons, recreational and park areas, and other noise-sensitive areas should make every effort to fly not less than 2000 feet above the surface, weather permitting, even though flight at a lower level may be consistent with the provisions of government regulations.
2. During departure from or approach to an airport, climb after takeoff and descent for landing should be made so as to avoid prolonged flight at low altitude near noise-sensitive areas.

NOTE

The above recommended procedures do not apply where they would conflict with Air Traffic Control clearances or instructions, or where, in the pilot's judgment, an altitude of less than 2000 feet is necessary for him to adequately exercise his duty to see and avoid other aircraft.

The certificated noise level for the Model 180K at 2800 pounds maximum weight is 65.8 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 based on 45% power. Fuel flow data for cruise is based on the recommended lean mixture setting. Some indeterminate variables such as mixture leaning technique, fuel metering characteristics, engine and propeller condition, and air turbulence may account for variations of 10% or more in range and endurance. Therefore, it is important to utilize all available information to estimate the fuel required for the particular flight.

USE OF PERFORMANCE CHARTS

Performance data is presented in tabular or graphical form to illustrate the effect of different variables. Sufficiently detailed information is provided in the tables so that conservative values can be selected and used to determine the particular 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	2700 Pounds
Usable fuel	84 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	775 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 2800 pounds, pressure altitude of 2000 feet and a temperature of 30°C should be used and results in the following:

Ground roll	830 Feet
Total distance to clear a 50-foot obstacle	1600 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	830
Decrease in ground roll (830 feet × 13%)	108
Corrected ground roll	722 Feet
Total distance to clear a 50-foot obstacle, zero wind	1600
Decrease in total distance (1600 feet × 13%)	208
Corrected total distance to clear a 50-foot obstacle	1392 Feet

CRUISE

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

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

The range profile chart indicates that use of 65% power at 7500 feet yields a predicted range of 892 nautical miles with no wind. The endurance profile chart shows a corresponding 6.8 hours. Using this information, the estimated distance can be determined for the expected 10 knot headwind at 7500 feet as follows:

Range, zero wind	892
Decrease in range due to wind (6.8 hours × 10 knot headwind)	68
Corrected range	824 Nautical Miles

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

The cruise performance chart for 8000 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 2.5 gallons of fuel. The corresponding distance during the climb is 14 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	2.5
Increase due to non-standard temperature (2.5 × 16%)	0.4
Corrected fuel to climb	2.9 Gallons

Using a similar procedure for the distance during climb results in 16 nautical miles.

The resultant cruise distance is:

Total distance	775
Climb distance	-16
Cruise distance	759 Nautical Miles

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

$$\begin{array}{r} 135 \\ \underline{-10} \\ 125 \end{array} \text{ Knots}$$

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

$$\frac{759 \text{ Nautical Miles}}{125 \text{ Knots}} = 6.1 \text{ Hours}$$

The fuel required for cruise is:

$$6.1 \text{ hours} \times 11.0 \text{ gallons/hour} = 67.1 \text{ Gallons}$$

The total estimated fuel required is as follows:

Engine start, taxi, and takeoff	1.7
Climb	2.9
Cruise	67.1
Total fuel required	71.7 Gallons

This will leave a fuel reserve of:

$$\begin{array}{r} 84.0 \\ \underline{-71.7} \\ 12.3 \end{array} \text{ Gallons}$$

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	545 Feet
Total distance to clear a 50-foot obstacle	1500 Feet

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

DEMONSTRATED OPERATING TEMPERATURE

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

AIRSPEED CALIBRATION

NORMAL STATIC SOURCE

FLAPS UP										
KIAS	50	60	70	80	90	100	110	120	140	160
KCAS	50	59	69	79	88	98	108	117	137	156
FLAPS 20°										
KIAS	40	50	60	70	80	90	---	---	---	---
KCAS	42	51	61	71	80	90	---	---	---	---
FLAPS 40°										
KIAS	40	50	60	70	80	90	---	---	---	---
KCAS	42	51	61	71	81	91	---	---	---	---

ALTERNATE STATIC SOURCE
CABIN WINDOWS CLOSED, HEATER AND DEFROSTER FULL ON

FLAPS UP										
NORMAL KIAS	50	60	70	80	90	100	110	120	140	160
ALTERNATE KIAS	45	54	65	76	86	97	107	116	135	153
FLAPS 20°										
NORMAL KIAS	50	60	70	80	90	---	---	---	---	---
ALTERNATE KIAS	45	57	68	78	87	---	---	---	---	---
FLAPS 40°										
NORMAL KIAS	50	60	70	80	90	---	---	---	---	---
ALTERNATE KIAS	43	55	66	76	86	---	---	---	---	---

Figure 5-1. Airspeed Calibration

TEMPERATURE CONVERSION CHART

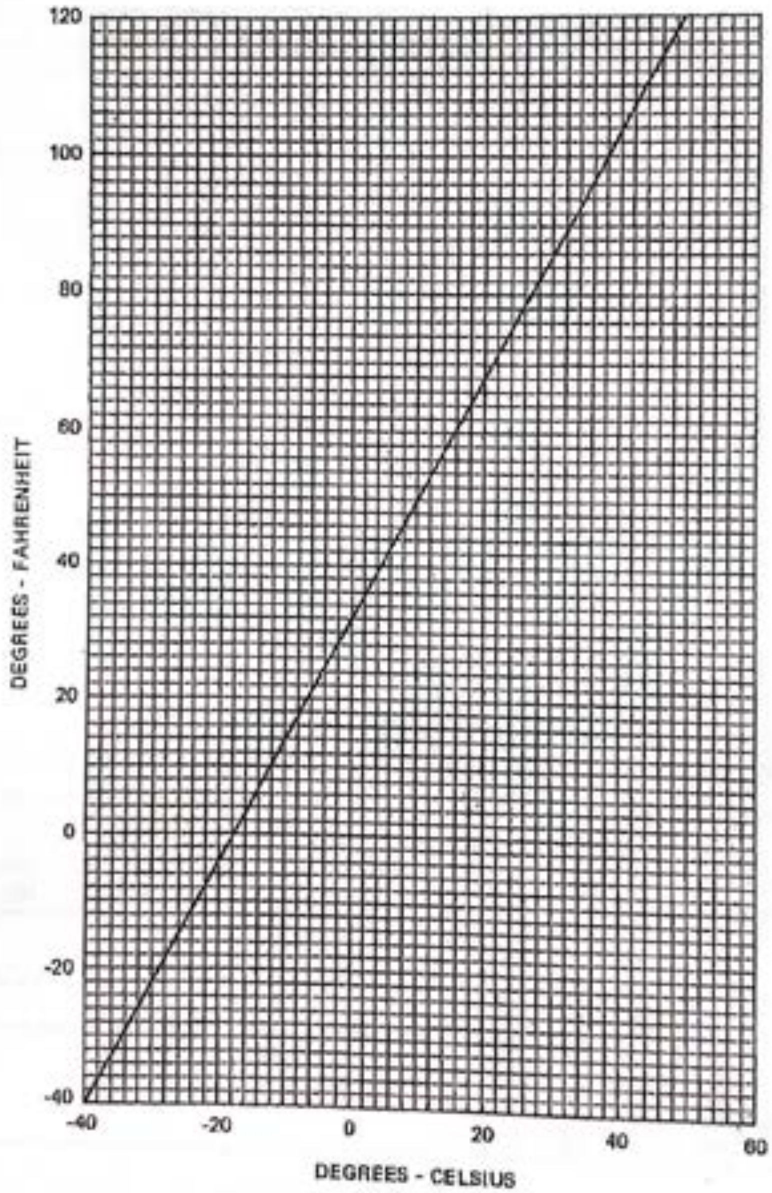


Figure 5-2. Temperature Conversion Chart

STALL SPEEDS

CONDITIONS:
Power Off

NOTES:
1. Altitude loss during a stall recovery may be as much as 200 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
2800	UP	53	53	57	57	63	63	75	75
	20°	48	49	52	53	57	58	68	69
	40°	47	48	51	52	56	57	66	68

MOST FORWARD CENTER OF GRAVITY

WEIGHT LBS	FLAP DEFLECTION	ANGLE OF BANK							
		0°		30°		45°		60°	
		KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
2800	UP	55	55	59	59	65	65	78	78
	20°	50	51	54	55	59	61	71	72
	40°	49	50	53	54	58	59	69	71

Figure 5-3. Stall Speeds

TAKEOFF DISTANCE

MAXIMUM WEIGHT 2800 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. For operation on a dry, grass runway, increase distances by 15% of the "ground roll" figure.

WEIGHT LBS	TAKEOFF SPEED KIAS		PRESS ALT FT	$0^{\circ}C$		$10^{\circ}C$		$20^{\circ}C$		$30^{\circ}C$		$40^{\circ}C$	
	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	52	57	S.L.	560	1090	605	1165	645	1245	695	1330	740	1420
			1000	615	1190	660	1275	705	1365	760	1455	810	1560
			2000	670	1305	720	1395	775	1495	830	1600	890	1715
			3000	735	1430	790	1535	850	1645	910	1765	975	1895
			4000	805	1575	865	1695	930	1820	1000	1955	1070	2100
			5000	885	1745	955	1875	1025	2020	1100	2175	1180	2345
			6000	975	1935	1060	2090	1130	2255	1215	2435	1305	2630
			7000	1075	2160	1160	2340	1245	2530	1340	2745	1440	2980
			8000	1190	2425	1280	2635	1380	2865	1485	3120	1600	3410

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

TAKEOFF DISTANCE

2600 LBS AND 2400 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
2600	50	55	S.L.	475	925	510	985	545	1050	585	1120	625	1195
			1000	515	1005	555	1075	595	1145	635	1225	680	1305
			2000	565	1100	605	1175	650	1255	695	1340	745	1430
			3000	620	1200	665	1285	710	1375	765	1470	815	1570
			4000	675	1320	725	1410	780	1510	835	1620	895	1735
			5000	740	1450	800	1555	860	1670	920	1790	985	1920
			6000	815	1600	880	1720	945	1850	1015	1990	1085	2140
			7000	900	1775	965	1910	1040	2060	1115	2220	1200	2395
			8000	990	1980	1070	2135	1150	2305	1235	2495	1325	2700
2400	48	53	S.L.	395	770	420	825	450	875	485	930	515	990
			1000	430	840	460	895	490	950	525	1015	565	1080
			2000	465	915	500	975	535	1040	575	1105	615	1180
			3000	510	995	550	1065	590	1135	630	1210	675	1290
			4000	560	1090	600	1165	645	1240	690	1325	740	1415
			5000	610	1190	655	1275	705	1365	755	1460	810	1550
			6000	670	1310	720	1405	775	1505	830	1610	890	1725
			7000	740	1445	795	1550	855	1665	915	1785	980	1915
			8000	815	1600	875	1720	940	1850	1010	1990	1080	2140

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

RATE OF CLIMB

MAXIMUM

CONDITIONS:
Flaps Up
2400 RPM
Full Throttle
Cowl Flaps Open

NOTE:
Mixture 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
2800	S.L.	81	1260	1166	1080	995
	2000	80	1115	1030	950	870
	4000	78	980	900	825	750
	6000	77	846	770	700	625
	8000	75	715	645	575	505
	10,000	73	585	520	450	---
	12,000	72	460	395	325	---

Figure 5-5. Rate of Climb

TIME, FUEL, AND DISTANCE TO CLIMB

MAXIMUM RATE OF CLIMB

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

NOTES:
1. Add 1.7 gallons of fuel for engine start, taxi and takeoff allowance.
2. Mixture 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
2800	S.L.	15	81	1100	0	0	0
	1000	13	80	1045	1	0.3	1
	2000	11	80	985	2	0.6	3
	3000	9	79	930	3	1.0	4
	4000	7	78	875	4	1.3	6
	5000	5	77	820	5	1.7	7
	6000	3	77	760	7	2.1	9
	7000	1	76	705	8	2.5	11
	8000	-1	75	650	9	2.9	13
	9000	-3	74	590	11	3.4	15
	10,000	-5	73	535	13	3.8	18
	11,000	-7	73	480	15	4.4	21
	12,000	-9	72	420	17	4.9	24

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
Cowl Flaps Open
Standard Temperature

NOTES:
1. Add 1.7 gallons of fuel for engine start, taxi and takeoff allowance.
2. Mixture 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
2800	S.L.	15	750	0	0	0
	1000	13	750	1	0.4	2
	2000	11	750	3	0.7	4
	3000	9	750	4	1.1	6
	4000	7	750	5	1.5	8
	5000	5	750	7	1.9	10
	6000	3	720	8	2.3	12
	7000	1	655	10	2.7	15
	8000	-1	590	11	3.2	18
	9000	-3	525	13	3.7	21
	10,000	-5	460	15	4.3	24
	11,000	-7	395	17	4.9	28
	12,000	-9	330	20	5.6	33

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

CRUISE PERFORMANCE

PRESSURE ALTITUDE 2000 FEET

CONDITIONS:
2800 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	133	13.1	74	134	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	132	11.6
	21	68	127	11.7	66	127	11.3	64	128	10.9
	20	64	123	10.9	62	123	10.5	60	124	10.2
2200	23	73	130	12.6	70	131	12.0	68	132	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	120	10.2	58	120	9.9	56	120	9.6
2100	23	68	126	11.6	66	127	11.2	64	128	10.8
	22	64	123	10.9	62	124	10.5	60	124	10.2
	21	60	119	10.2	58	120	9.9	56	120	9.6
	20	56	116	9.6	54	116	9.3	52	116	9.0
	19	52	111	9.0	50	111	8.7	48	111	8.5
	18	47	106	8.4	46	106	8.1	44	105	7.9

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

CRUISE PERFORMANCE

PRESSURE ALTITUDE 4000 FEET

CONDITIONS:
2800 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	134	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	134	12.8	72	134	12.3	70	135	11.9
	22	70	130	12.0	68	131	11.6	66	132	11.2
	21	66	127	11.3	64	127	10.9	61	128	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	127	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	119	9.3
	19	53	115	9.2	51	115	8.9	50	114	8.7
	18	49	110	8.6	47	109	8.3	46	109	8.1

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

CRUISE PERFORMANCE

PRESSURE ALTITUDE 6000 FEET

CONDITIONS:
2800 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	134	11.6	66	134	11.2
	19	66	129	11.2	64	129	10.8	61	130	10.5
2300	22	77	137	13.1	74	138	12.6	71	139	12.2
	21	72	134	12.3	69	135	11.8	67	135	11.4
	20	67	130	11.5	65	131	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	127	10.8	61	127	10.4	58	127	10.1
	19	59	122	10.1	57	122	9.7	55	122	9.5
2100	22	67	130	11.5	65	131	11.1	63	131	10.7
	21	63	127	10.8	61	127	10.4	59	127	10.1
	20	59	123	10.1	57	123	9.8	55	122	9.5
	19	55	118	9.5	53	118	9.2	51	118	8.9
	18	51	113	8.8	49	113	8.6	47	112	8.3
	17	47	108	8.2	45	107	8.0	43	108	7.8

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

CRUISE PERFORMANCE

PRESSURE ALTITUDE 8000 FEET

CONDITIONS:
2800 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	137	12.4	70	137	11.9	67	138	11.5
	19	68	133	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	138	12.6	71	138	12.1	69	139	11.7
	20	69	134	11.8	66	134	11.3	64	135	11.0
	19	64	130	11.0	62	130	10.6	60	130	10.2
	18	60	125	10.2	58	125	9.9	56	125	9.6
2200	21	69	134	11.8	67	135	11.4	65	136	11.0
	20	65	130	11.1	63	131	10.7	60	131	10.3
	19	61	126	10.3	58	126	10.0	56	126	9.7
	18	56	121	9.7	54	121	9.3	52	121	9.1
2100	21	65	130	11.1	63	131	10.7	60	131	10.3
	20	61	126	10.4	59	126	10.0	57	126	9.7
	19	57	122	9.7	54	122	9.4	53	121	9.1
	18	52	117	9.1	50	116	8.8	49	116	8.5
	17	48	112	8.5	46	111	8.2	45	110	8.0

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

CRUISE PERFORMANCE

PRESSURE ALTITUDE 10,000 FEET

CONDITIONS:
2800 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	142	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	132	10.2
	17	60	127	10.2	57	127	9.8	55	126	9.5
2300	20	71	138	12.1	68	138	11.6	66	138	11.2
	19	66	133	11.3	64	134	10.9	61	134	10.6
	18	61	129	10.5	59	129	10.1	57	129	9.8
	17	57	124	9.7	55	124	9.4	53	123	9.1
2200	20	67	134	11.4	64	134	11.0	62	134	10.6
	19	62	130	10.6	60	130	10.2	58	130	9.9
	18	58	125	9.9	56	125	9.6	54	124	9.3
	17	53	120	9.2	51	119	8.9	50	119	8.7
2100	20	63	130	10.7	60	130	10.3	58	130	9.9
	19	58	126	10.0	56	126	9.6	54	125	9.4
	18	54	121	9.3	52	120	9.0	50	119	8.8
	17	50	115	8.7	48	114	8.4	46	113	8.2
	16	46	109	8.1	44	108	7.8	42	106	7.6

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

CRUISE PERFORMANCE

PRESSURE ALTITUDE 12,000 FEET

CONDITIONS:
2800 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 -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	136	10.5
	17	61	131	10.5	59	131	10.1	57	130	9.8
	16	56	125	9.7	54	125	9.4	52	124	9.1
	15	51	119	9.0	50	118	8.7	48	117	8.4
2300	18	63	133	10.8	61	133	10.4	59	132	10.0
	17	58	128	10.0	56	127	9.7	54	127	9.4
	16	54	122	9.3	52	121	9.0	50	120	8.7
	15	49	116	8.6	47	115	8.3	45	113	8.1
2200	18	59	129	10.2	57	129	9.8	55	128	9.5
	17	55	124	9.5	53	123	9.2	51	122	8.9
	16	51	118	8.8	49	117	8.5	47	116	8.3
	15	46	111	8.2	44	110	7.9	43	108	7.7
2100	18	56	124	9.6	54	124	9.3	52	123	9.0
	17	51	119	8.9	49	118	8.7	48	117	8.4
	16	47	113	8.3	45	112	8.1	44	110	7.8

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

RANGE PROFILE
45 MINUTES RESERVE
84 GALLONS USABLE FUEL

CONDITIONS:
2800 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature
Zero Wind

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

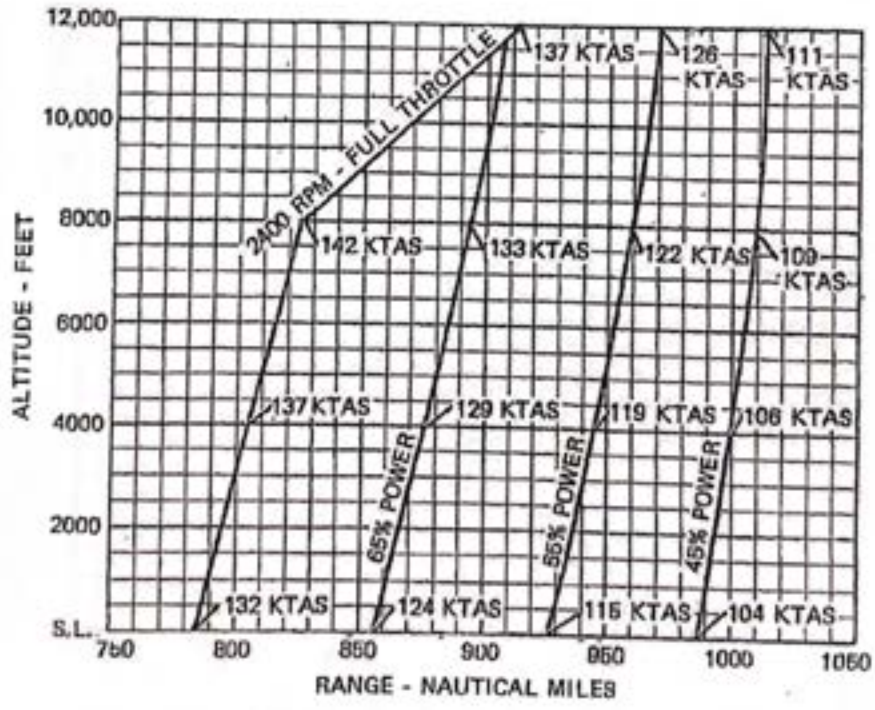


Figure 5-8. Range Profile

ENDURANCE PROFILE
45 MINUTES RESERVE
84 GALLONS USABLE FUEL

CONDITIONS:
2800 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature

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

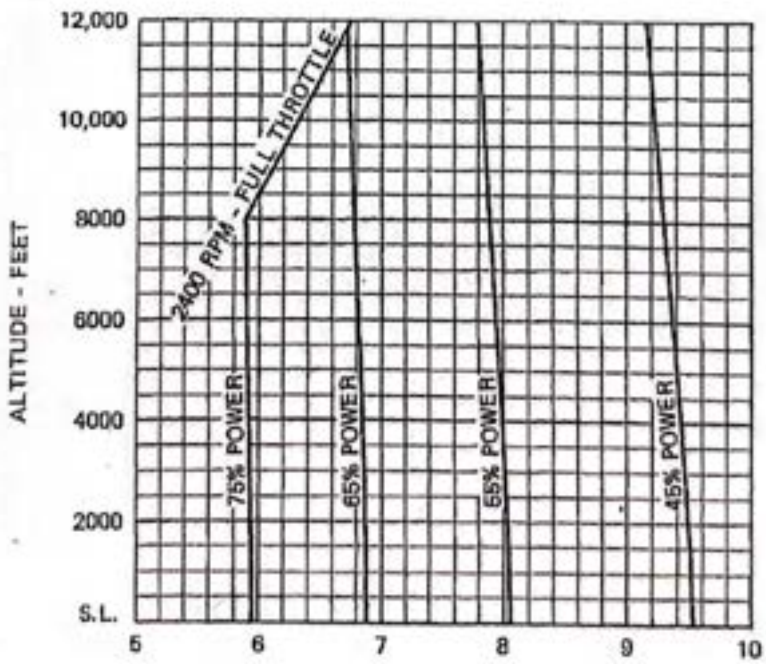


Figure 5-9. Endurance Profile

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
2800	64	S.L.	455	1310	470	1345	490	1385	505	1420	520	1450
		1000	470	1345	490	1385	505	1420	525	1460	540	1495
		2000	490	1385	505	1420	525	1460	545	1500	560	1535
		3000	510	1425	525	1460	545	1500	565	1545	580	1580
		4000	525	1460	545	1505	565	1545	585	1585	605	1630
		5000	545	1505	565	1545	585	1590	605	1630	625	1675
		6000	570	1555	590	1595	610	1640	630	1680	650	1725
		7000	590	1595	610	1640	635	1690	655	1735	675	1780
		8000	615	1650	635	1695	655	1740	680	1790	700	1835

Figure 5-10. Landing Distance

SECTION 6
WEIGHT & BALANCE/ EQUIPMENT LIST

TABLE OF CONTENTS

Page

INTRODUCTION

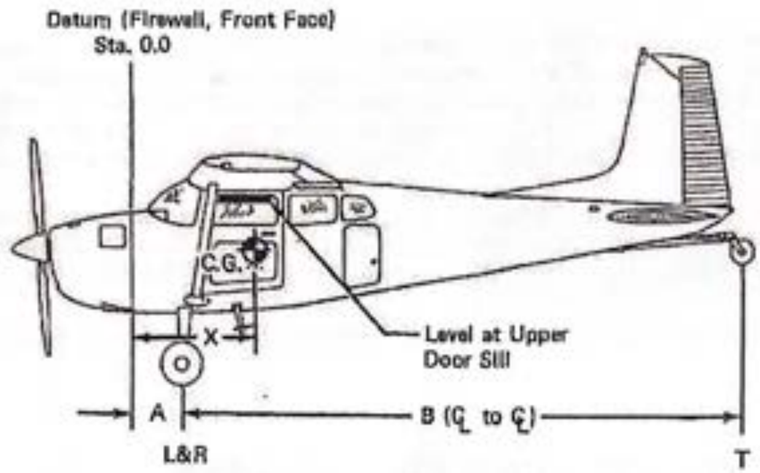
This section describes the procedure for establishing the basic empty weight and moment of the airplane. Sample forms are provided for reference. Procedures for calculating the weight and moment for various operations are also provided. A comprehensive list of all Cessna equipment available for this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

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

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

AIRPLANE WEIGHING PROCEDURES

1. Preparation:
   a. Inflate tires to recommended operating pressures.
   b. Remove the fuel tank sump quick-drain fittings and fuel selector valve drain plug to drain all fuel.
   c. Remove oil sump drain plug to drain all oil.
   d. Move sliding seats to the most forward position.
   e. Raise flaps to the fully retracted position.
   f. Place all control surfaces in neutral position.
2. Leveling:
   a. Place scales under each main wheel (minimum scale capacity, 1000 pounds). Place screw jack on 500 pound minimum capacity scale and place under tail wheel.
   b. Adjust jack on scale to center the bubble in the level (see figure 6-1).
3. Weighing:
   a. With the airplane level and brakes released, record the weight shown on each scale. Deduct the tare, if any, from each reading.
4. Measuring:
   a. Obtain measurement A by measuring horizontally (along the airplane center line) from a line stretched between the main wheel centers (determined from the axle attaching bolt pattern on the inner face of the landing gear spring) to a plumb bob dropped from the firewall.
   b. Obtain measurement B by measuring horizontally and parallel to the airplane center line from the line stretched between main wheel centers to a plumb bob dropped from the center of the tail wheel, left side. Repeat on right side and average the measurements.



Scale Position	Scale Reading	Tare	Symbol	Net Weight
Left Wheel			L	
Right Wheel			R	
Tail Wheel			T	
Sum of Net Weights (As Weighed)			W	

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

Item	Weight (Lbs.)	X C.G. Arm (In.) =	Moment/1000 (Lbs.-In.)
Airplane Weight (From Item 5, page 6-6)			
Add Oil: No Oil Filter (12 Qts at 7.5 Lbs/Gal)		-15	
With Oil Filter (13 Qts at 7.5 Lbs/Gal)		-15	
Add: Unusable Fuel (4 Gal. at 6 Lbs/Gal)	24	48	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

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.

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 or cargo is based on seats positioned for average occupants and baggage or cargo 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 limitations (seat travel or baggage/cargo area limitations). 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.

NOTE

Each loading should be figured in accordance with the above paragraphs. When the loading is light (such as pilot and copilot, and no rear seats or cargo), be sure to check the forward balance limits. When loading is heavy (near gross weight), be sure to check the aft balance limits.

To avoid time consuming delays in cargo and/or passenger shifting, plan your load so that the heaviest cargo and/or passengers are in the forward part of the airplane and the lightest in the rear. Always plan to have any vacant space at the rear of the airplane. For example, do not have passengers occupy the third row seats unless the front and second row seats are to be occupied.

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

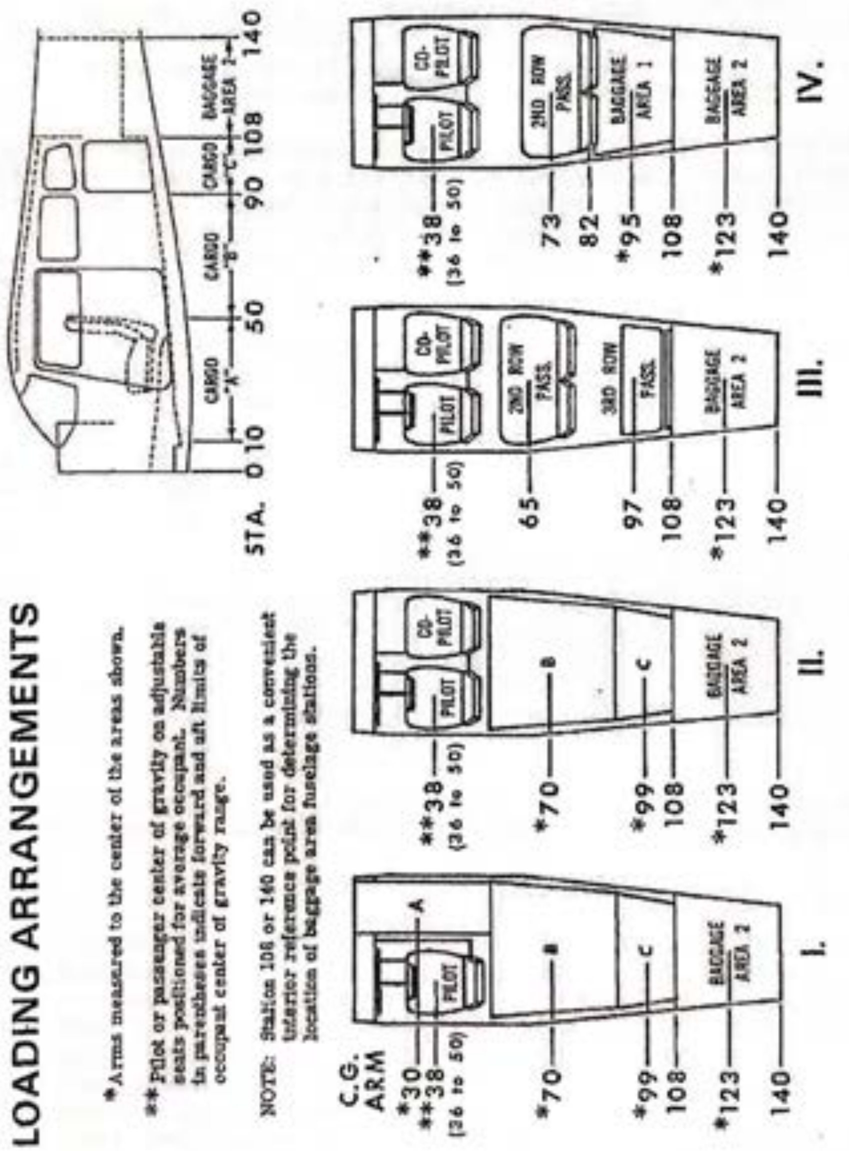


Figure 6-3. Loading Arrangements

Since your Cessna is capable of carrying large amounts of cargo, it will be necessary to properly secure this load before flight. A tie-down kit is available from any Cessna Dealer. Provided in this kit are 6 tie-down blocks that fasten to the seat rails. If more tie-down points are needed, the seat belt attaching points, as well as shoulder harness attaching points, may be used. 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.

The following table shows the maximum allowable cargo weight for each type of attachment:

ITEM	LOCATION	*MAXIMUM LOAD (LBS.)
Seat Rail Tie-Down Assy	On Seat Rail Section Without Lock Pin Holes	200
Seat Rail Tie-Down Assy	On Seat Rail Section With Lock Pin Holes	100
Seat Belt Attachment	Floor or Sidewall	200
Shoulder Strap	Cabin Top	175
"D" Ring Tie-Down	Floor	60

*Rated load per attachment (Cargo Item Wt. ÷ No. Tie-Downs). A sufficient number of attachments to restrain the cargo from shifting should be used in addition to load requirements.

FOR EXAMPLE:
A 400# load would require a minimum of four (4) tie-downs rated at 100# each.

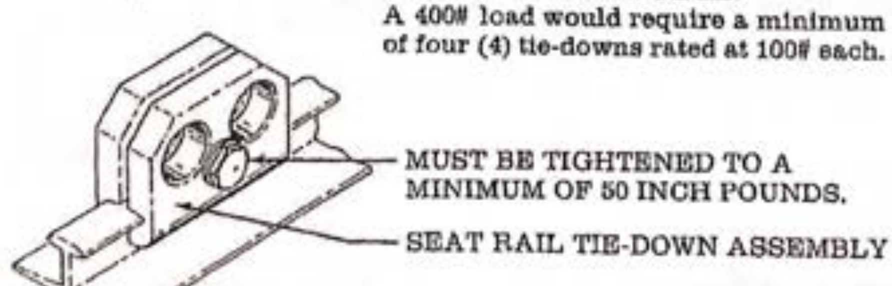
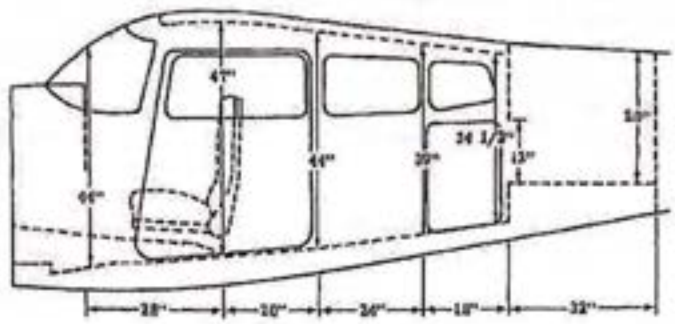


Figure 6-4. Cargo Loading

CABIN HEIGHT MEASUREMENTS



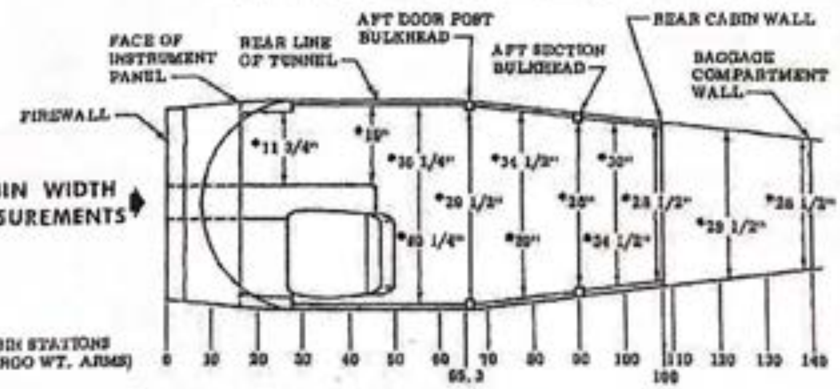
WIDTH

•CABIN FLOOR •LWR. WINDOW LINE

DOOR OPENING DIMENSIONS

	WIDTH (TOP)	WIDTH (BOTTOM)	HEIGHT (FRONT)	HEIGHT (REAR)
CABIN DOOR	32"	37"	41"	38 1/2"
BAGGAGE DOOR	15 1/4"	15 1/2"	22 1/4"	21"

CABIN WIDTH MEASUREMENTS



NOTES:

1. Use the forward face of the rear door post as a reference point to locate C.G. arms. For example, a box with its center of weight located 13 inches forward of the rear door post would have a C.G. arm of (65.3-13.0 = 52.3) 52.3 inches.
2. Maximum allowable cabin floor loading: 200 pounds/square foot. However, when items with small or sharp support areas are carried, the installation of a 1/4" plywood floor is highly recommended to protect the aircraft structure.
3. A maximum of 120 pounds of baggage is permitted in Baggage Area 1 when using the baggage net.
4. A maximum of 50 pounds of baggage is permitted in Baggage Area 2.

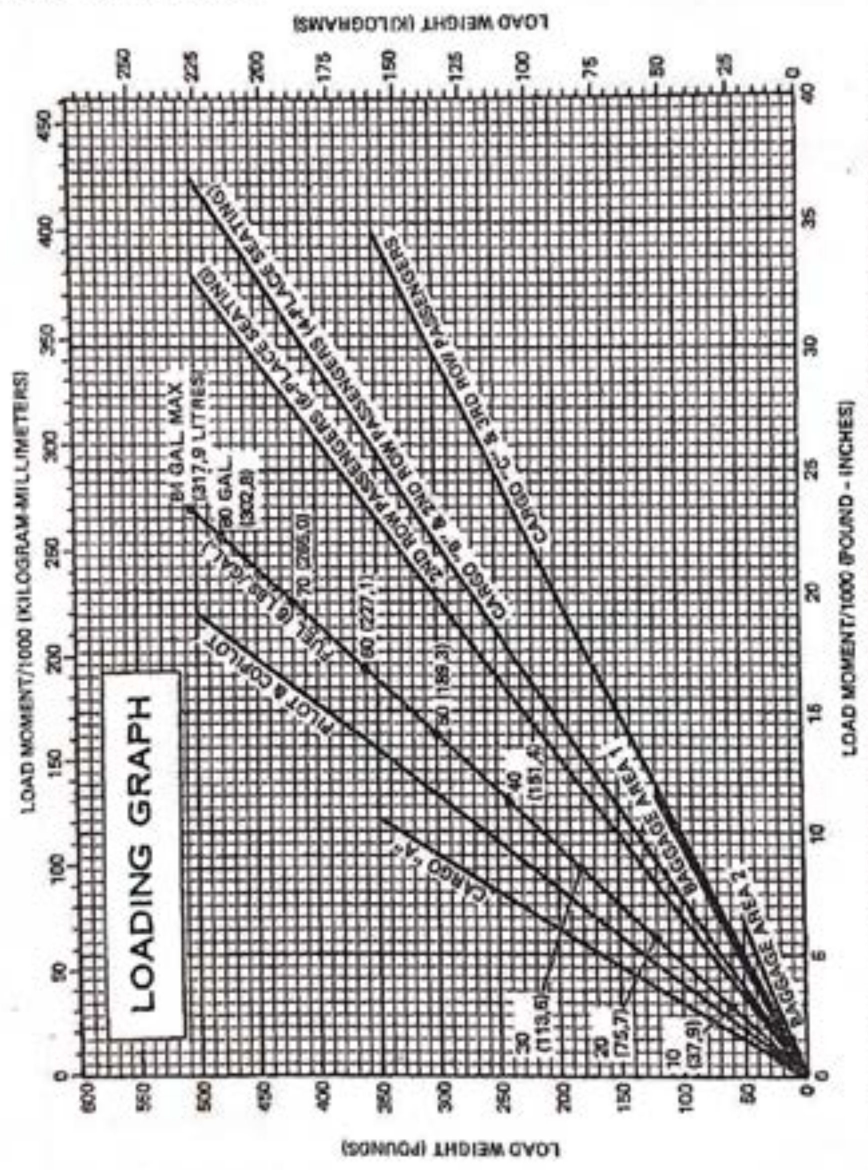
Figure 6-5. Internal Cabin Dimensions

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)	1731	62.8		
2. Usable Fuel (At 6 Lbs./Gal.) Standard Tanks (84 Gal. Maximum)				
Reduced Fuel (65 Gal.)	390	18.1		
3. Pilot and Copilot (Sta. 36 to 50)	340	12.9		
4. 2nd Row Passengers (6-Place Seating)	340	22.1		
2nd Row Passengers (4-Place Seating)				
3rd Row Passengers				
5. *Cargo "A" (Sta. 10 to 50)				
*Cargo "B" (Sta. 50 to 90)				
*Cargo "C" (Sta. 90 to 108)				
Baggage Area 1 (Sta. 82 to 108, 120 Lbs. Max.) .				
Baggage Area 2 (Sta. 108 to 140, 50 Lbs. Max.) .	9	1.1		
6. RAMP WEIGHT AND MOMENT	2810	117.0		
7. Fuel allowance for engine start, taxi and runup	-10	-.5		
8. TAKEOFF WEIGHT AND MOMENT (Subtract step 7 from step 6)	2800	116.5		

9. Locate this point (2800 at 116.5) on the Center of Gravity Moment Envelope, and since this point falls within the envelope, the loading is acceptable.

*Maximum allowable cargo loads will be determined by the type and number of tie-downs used, as well as by the airplane weight and C.G. limitations. Floor loading must not exceed 200 lbs per square foot.

Figure 6-6. Sample Loading Problem



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

Figure 6-7. Loading Graph

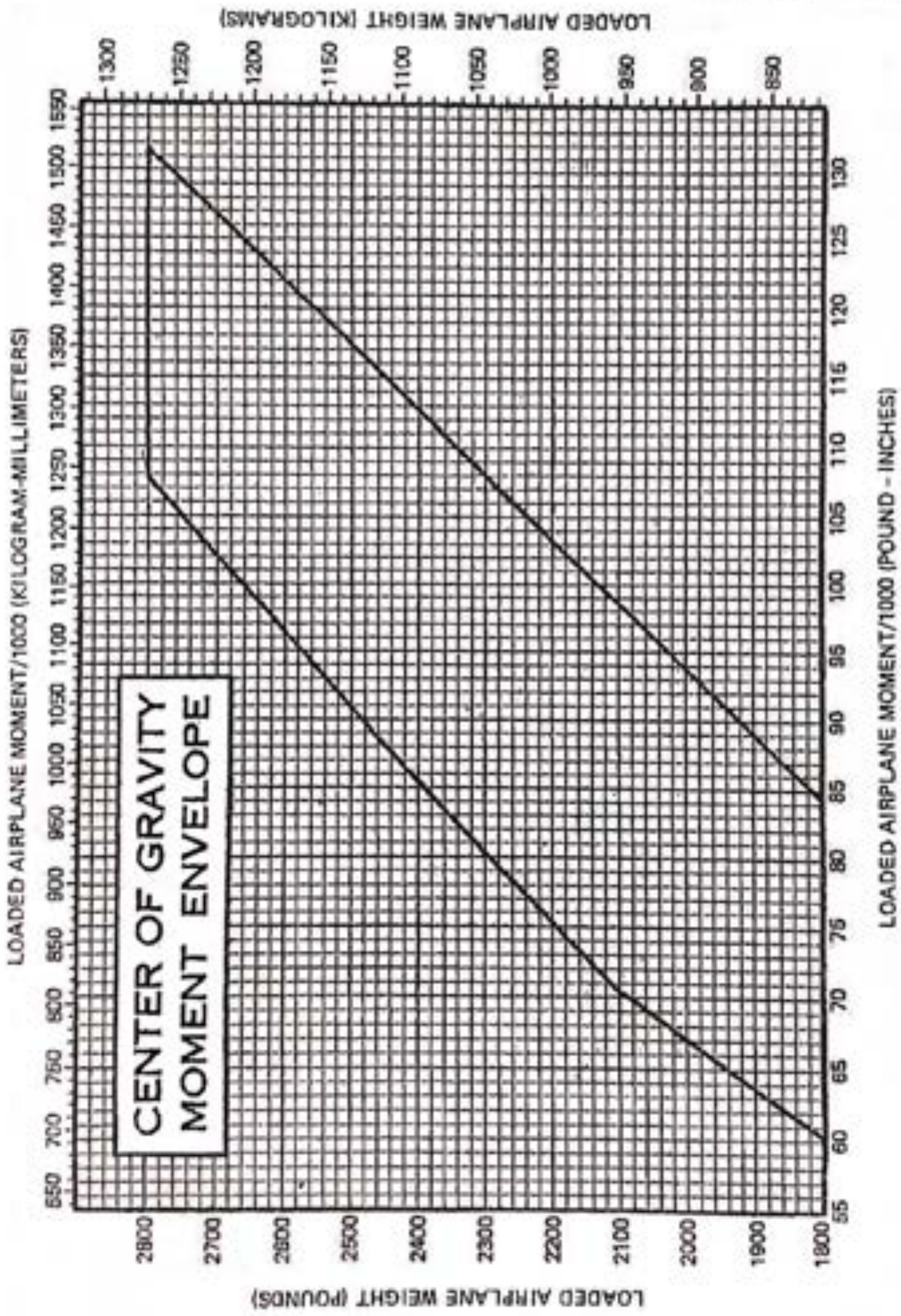


Figure 6-8. Center of Gravity Moment Envelope

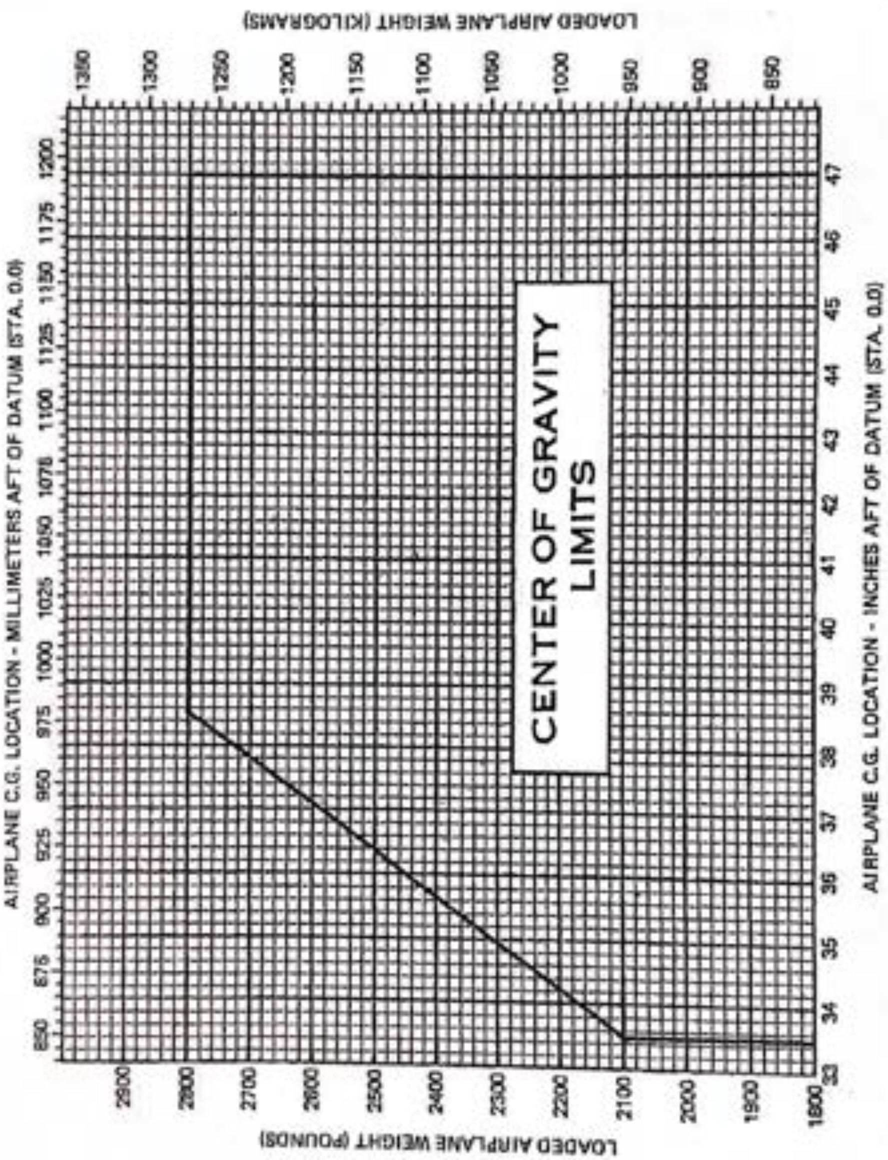


Figure 6-9. Center of Gravity Limits

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, SPEC 3	0750208	446.0*	-17.6*
	TWO MAGNETOS WITH IMPULSE COUPLING	SLICK 662	12.9	-12.0
	OIL COOLER, HARRISON 8531835	TCM 627392	4.6	-31.5
	TWELVE 18MM X 3/4 20-3A SPARK PLUGS	SH 200-A	2.8	-19.0
	CARBURETOR, MARVEL SCHEBLER	MA4-5A	5.8	-9.6
A05-R	FILTER, CARBURETOR AIR	0750038-4	1.0	-33.0
A09-R	ALTERNATOR, 28 VOLT, 60 AMP (C611503-0102)	1250212	10.8	-5.5
A17-O	OIL COOLER, NON-CONGEALING MODINE 1E1605-0	TCM 639171	1.5	-31.5
	REPLACES OIL COOLER ON ITEM A01-R			
	AND CHANGES ENGINE DESIGNATION TO			
	O-470-U SPEC. 2 (NET CHANGE)			
A21-A	FILTER, OIL (FULL FLOW)	0756025	4.5	-4.0
A33-R	PROPELLER, MCCAULEY C2A34C204/90DCB8	C161009-0106	51.4	-40.0
A33-O	PROPELLER, MCCAULEY FLOATPLANE	C161009-0109	52.5	-40.0
	C2A34C204/90DCB8			
A37-R	GOVERNOR, PROPELLER (MCCAULEY) C290D3/T14	C161031-0107	3.0	-32.5
	(WOODWARD A210452)	C161040-0103	3.0	-32.5
	(EDO-AIRE 34-828-01)	C161050-0101	3.0	-32.5
A41-R	SPINNER INSTALLATION, PROPELLER	0752650	4.0*	-40.8*
	SPINNER ASSY	0752042-5	1.4	-44.2
	FORWARD SPINNER SUPPORT	1250412-3	0.2	-46.5
	AFT SPINNER BULKHEAD	0752041-3	2.0	-37.8
A61-A	VACUUM SYSTEM, ENGINE DRIVEN	0701096	3.0*	-1.3*
	VACUUM PUMP	C431003-0102	1.8	-3.0
	SUCTION GAGE	C668509-0101	0.1	17.0
A70-A	PRIMING SYSTEM, 6 CYLINDER	0750125	1.5	-15.0
A73-A	OIL QUICK DRAIN VALVE (NET CHANGE)	1256011	0.0	- -
	B. LANDING GEAR & ACCESSORIES			
B01-R-1	WHEEL, TIRE, TUBE AND BRAKE ASSEMBLY	0741025-9,-10	40.0*	18.1*
	6.00 X 6 6-PLY MAIN (2)	1241156-105		
	WHEEL ASSY (CLEVELAND 40-75B) (EACH)	C163001-0301	6.2	18.5
	TIRE (EACH)	C262003-0204	8.7	18.5
	TUBE (EACH)	C262023-0102	1.8	18.5
	BRAKE ASSY - LH (CLEVELAND 30-52)	C163030-0303	2.8	15.8
	BRAKE ASSY - RH (CLEVELAND 30-52)	C163030-0304	2.8	18.9

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
B01-R-2	WHEEL, TIRE, TUBE AND BRAKE ASSEMBLY 6.00 X 6 6-PLY MAIN (ALTERNATE) (2)	0741025-9, -10 C163019B0204	43.4*	18.1*
	WHEEL ASSY (MCCAULEY) (EACH)	C163006-0102	8.1	18.5
	TIRE (EACH)	C262003-0204	8.7	18.5
	TUBE (EACH)	C262026-0104	1.9	18.5
	BRAKE ASSY - LH (MCCAULEY)	C163032-0207	3.0	15.8
	BRAKE ASSY - RH (MCCAULEY)	C163032-0208	3.0	15.8
B01-O-1	WHEEL, TIRE, TUBE AND BRAKE ASSEMBLY 8.00 X 6 6-PLY MAIN (2)	0741025-11,-12 1241156-133	45.6*	18.1*
	WHEEL ASSY (CLEVELAND 40-75D) (EACH)	C163001-0302	6.2	18.5
	TIRE (EACH)	C262003-0207	10.7	18.5
	TUBE (EACH)	C262023-0104	2.3	18.5
	BRAKE ASSY - LH (CLEVELAND 30-52N)	C163030-0313	2.8	15.8
	BRAKE ASSY - RH (CLEVELAND 30-52N)	C163030-0314	2.8	15.8
B01-O-2	WHEEL, TIRE, TUBE AND BRAKE ASSEMBLY 8.00 X 6 6-PLY MAIN (ALTERNATE) (2)	0741025-11,-12 C163019B0205	46.0*	18.1*
	WHEEL ASSY (MCCAULEY) (EACH)	C163006-0102	6.5	18.5
	TIRE (EACH)	C262003-0207	10.7	18.5
	TUBE (EACH)	C262026-0104	2.3	18.5
	BRAKE ASSY - LH (MCCAULEY)	C163032-0207	3.0	15.8
	BRAKE ASSY - RH (MCCAULEY)	C163032-0208	3.0	15.8
B04-R	WHEEL ANC TIRE ASSEMBLY - TAIL (1) 8.00 PNEUMATIC TYPE TAIL WHEEL	0742155-13	4.5	260.0
B10-A	WHEEL FAIRINGS, SET OF 2, MAIN GEAR ONLY (INCLUDES INSTL OF B01-R-2 WHEELS, NET CHANGE)	0701121	15.0*	21.1*
	WHEEL FAIRINGS, L & RH	0741070	8.8	20.5
B16-O	SKI AXLE ASSY (USED WITH J37-A-1 AND RE-PLACES STANDARD AXLE ASSY)(NOT FACTORY INSTALLED)	0741008-5	10.6	21.6
B22-A	LOCK INSTL., TAIL WHEEL	0710639-7	2.6	79.8
	C. ELECTRICAL SYSTEMS			
C01-R-1	BATTERY, 24 VOLT, STANDARD DUTY	C614001-0105	22.8	112.9
C01-R-2	BATTERY, 24 VOLT, STANDARD DUTY, MANIFOLD	C614002-0101	23.2	112.9
C01-O	BATTERY, 24 VOLT, HEAVY DUTY	C614001-0106	24.8	112.9
C04-R	ALTERNATOR CONTROL UNIT, 28 VOLT, WITH LOW VOLTAGE SENSING	C611005-0101	0.4	-0.3
C07-A	GROUND SERVICE PLUG RECEPTICLE	0701105	2.9	129.4

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
C16-O	HEATING SYSTEM, PITOT (NET CHANGE)	0713473	0.5	26.5
C22-A	LIGHTS, INSTRUMENT POST	0701093	0.5	18.0
C28-A	LIGHT, MAP (DOORPOST MOUNTED)	0700217	0.5	30.5
C31-A	LIGHTS, COURTESY UNDER SIDE WING (2)	0700615	0.5	62.0
C40-A	DETECTORS, NAVIGATION LIGHTS	0701013	NEGL	- -
C43-S	LIGHT, OMNI FLASHING BEACON	0770739	1.7*	192.2*
	LIGHT ASSEMBLY - ON FIN TIP	C621001-0102	0.4	216.5
	FLASHER ASSEMBLY	C594502-0102	0.7	217.2
C46-A	LIGHT INSTALLATION - WING TIP STROBE	0701037	3.2*	41.9*
	POWER SUPPLY-EACH TIP RIB (SET OF 2)	C622008-0102	2.3	46.7
	LIGHT ASSY.,-EACH WING TIP (SET OF 2)	C622006-0101	0.3	42.0
C49-S	LIGHT INSTL., COWL MOUNTED LANDING & TAXI	0770739	1.6*	-25.3*
	LIGHT BULBS (SET OF 2)	GE-4591	1.0	-32.5
	D. INSTRUMENTS			
D01-R	INDICATOR, AIRSPEED	C661064-0211	0.6	16.0
D01-O	INDICATOR, TRUE AIRSPEED (ROTATING RING)	0701101-1	0.8	16.4
D04-A	STATIC INSTRUMENT AIR, ALTERNATE SOURCE	0701097	0.1	14.0
D07-R	ALTIMETER, SENSITIVE (FEET & INCH OF HG)	C661071-0101	1.0	15.0
D07-O-1	ALTIMETER, SENSITIVE (35,000 FT. 20 FT. MARKINGS)	C661025-0102	1.0	15.0
D07-O-2	ALTIMETER, SENSITIVE (FEET & MILLIBARS)	C661071-0102	1.0	15.0
D16-A-1	ALTIMETER, ENCODING (REQUIRES RELOCATION OF REQUIRED ALTIMETER)	0701098	2.9	14.8
D16-A-2	ALTIMETER, ENCODING (FEET & MILLIBARS) (REQUIRES RELOCATION OF REGULAR ALT.)	0701098	2.9	14.8
D16-A-3	ALTITUDE ENCODER, BLIND (INSTRUMENT PANEL INSTALLATION NOT REQUIRED)	0701100-7	1.5	14.4
D22-A	GAGE, CARBURETOR AIR TEMPERATURE	0701102	1.0	5.5
D25-A-1	CLOCK INSTALLATION, ELECTRIC	0701102	0.7*	48.5*
	CLOCK ASSEMBLY	C664508-0102	0.3	17.0
D25-A-2	CLOCK INSTALLATION, ELECTRIC, DIGITAL	0701102-2	0.7*	48.5*
	CLOCK ASSY	C664511-0101	0.3	17.0
D28-R	COMPASS ASSEMBLY, MAGNETIC	0413517-25	0.6	16.0
D38-R	ENGINE CLUSTER, LH & RH FUEL GAUGES	C669537-0103	0.4	16.5
D41-R	ENGINE CLUSTER, CYL HEAD TEMP & OIL TEMP	C669538-0101	0.4	16.5
D43-R	ENGINE CLUSTER, OIL PRESSURE & AMMETER	C669527-0101	0.4	16.5
0-9-A	INDICATOR, ECONOMY MIXTURE (EGT GAGE)	0700225	1.0	6.0
D04-A-1	GYRO INSTALLATION-HEADING AND ATTITUDE	0701096	6.2*	12.7*

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	INDICATORS			
	DIRECTIONAL INDICATOR	C661075-0101	3.0	14.1
	ATTITUDE INDICATOR	C661076-0101	2.0	14.6
	FILTER, HOSES & MISCELLANEOUS PARTS	- -	1.2	6.0
D64-A-2	GYRO SYSTEM ATTITUDE & DIRECTIONAL (FOR	0701096	6.4*	12.2*
	USE WITH NAV-O-MATIC 300A)			
	DIRECTIONAL INDICATOR	40760	3.2	13.0
	ATTITUDE INDICATOR	C661076-0101	2.0	14.6
	FILTER, HOSES & MISCELLANEOUS PARTS		1.2	6.0
D67-A	HOURMETER	0701095	0.5*	11.6*
D73-R	GAGE, MANIFOLD PRESSURE	C662035-0101	0.9	15.5
D82-A	GAGE, OUTSIDE AIR TEMPERATURE	0701010-2	0.1	28.5
D85-R	TACHOMETER INSTALLATION, ENGINE	0718001	0.9*	13.8*
	RECORDING TACH INDICATOR	C668020-0117	0.7	17.0
D88-A-1	INDICATOR, TURN COORDINATOR (C661003-0505)	0701089	1.3	15.7
D88-A-2	INDICATOR, TURN COORDINATOR, USE WITH	42320-0028	1.3	15.7
	NAV-O-MATICS 200A AND 300A			
D88-A-3	INDICATOR, TURN & BANK (S-1303-2)	0701092	2.0	15.0
D88-A-4	TURN COORDINATOR, 10-30 VOLT C661003-0506	0701089	1.3	15.7
D91-A	INDICATOR, RATE OF CLIMB (C661080-0101)	0701094	0.9	15.0
	E. CABIN ACCOMMODATIONS			
E05-R	SEAT, ADJUSTABLE FORE & AFT- PILOT	0714024	12.6	44.0
E05-Q	SEAT, ARTICULATING, VERTICAL ADJ., PILOT	0714025	24.0	41.5
E07-A-1	SEAT, ADJUSTABLE FORE AND AFT CO-PILOT	0714024	12.6	44.0
E07-A-2	SEAT, ARTICULATING VERTICAL ADJ. CO-PILOT	0714025	24.0	41.5
E09-A-1	SEAT ASSY., 2ND ROW 2 PLACE BENCH HI-BACK	0714032	17.9	72.0
E09-A-2	SEAT ASSY., 2ND ROW 2 PLACE BENCH LO-BACK	0714032	16.9	72.0
E09-A-3	SEAT ASSY., 3RD & 4TH INDIVIDUAL	0711703	18.5	72.0
	(4 OR 6 PLACE SEATING)			
E11-A	SEAT ASSY., 3RD ROW BENCH 2 PLACE	0714033	6.0	100.0
E15-R	BELT ASSEMBLY, PILOT SAFETY	S2275	1.0	37.0
E15-S	SHOULDER HARNESS ASSY.-PILOT	S2275	0.6	37.0
E15-D	INERTIA REEL INSTL., PILOT (NET CHANGE)	0701081	1.8	81.6
E19-A	INERTIA REEL INSTALLATION-SEAT BELT AND	0701081	2.1	88.1
	SHOULDER HARNESS FOR PILOT & CO-PILOT			
	(NET CHANGE)			
E23-A	BELT & SHOULDER HARNESS ASSY., CO-PILOT	S2275	1.6	37.0
E27-A-1	BELT ASSY., 2ND ROW LAP (SET OF 2)	S1746	2.0	73.0

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
E27-A-2	BELT & SHOULDER HARNESS ASSY., 2ND ROW (SET OF 2)	S2275	3.2	73.0
E29-A-1	BELT ASSY., 3RD ROW (SET OF 2)	S1746	2.0	97.0
E29-A-2	BELT & SHOULDER HARNESS ASSY., 3RD ROW (SET OF 2)	S2275	3.2	97.0
	NOTE THE INSTALLATION WEIGHT PER INDIVIDUAL SEAT IS SHOWN ABOVE. FOR COMPLETE SEATING INSTALLATION, INCLUDE ONE SEAT BELT (OR BELT & HARNESS ASSY) AND SEAT FOR EACH OCCUPANT FOR WHOM SEATING IS INSTALLED.			
E34-A	UPHOLSTERY INSTL-DELUXE INTERIOR (NET CHG)	0715065	9.2	65.0
E35-A	SEAT COVERING, LEATHER TOTALS 0.5 LB PER OCCUPANT SEAT INSTALLED, WT LISTED IS FOR OPTIONAL 6 PLACE SEATING		3.0	71.2
E39-D	WINDOW, SKYLIGHT, CABIN TOP (NET CHANGE)	0700246	0.6	45.5
E41-R	DOOR ASSY., STD. L.H. OR R.H. (EACH)	0711023	20.2	48.4
E41-O-1	DOOR ASSY., W/STD. UPPER WINDOW, OPT LWR.	0717020	19.6	48.4
E41-O-2	DOOR ASSY., W/DOMED UPPER WINDOW, NO LOWER	0711023	20.5	48.4
E41-O-3	DOOR ASSY., W/DOMED UPPER WINDOW, OPT LWR.	0717020	19.8	48.4
E50-A	HEADREST FRONT ROW SEAT (WT. EACH)	1215073	0.9	46.0
E51-A	HEADREST, 2ND ROW BENCH SEAT (WT. EACH)	1215073	0.9	86.0
E55-A	SUN VISORS (SET OF 2)	0500040	0.8	33.0
E57-O	TINTED WINDOWS (INCL.WINDSHIELD) (NET CHG)	0700183	0.0	- -
E63-A	DOOR INSTALLATION, LITTER	0712013	4.8	119.1
E65-S	BAGGAGE NET (2) (STOWED)	2015009-3	1.2	124.0
E71-A	RINGS, CARGO TIE-DOWN (STOWED)(6 ITEMS) (USE INSTALLED CARGO ARM)	0700763-2	1.1	- -
E75-A	STRETCHER, CUSTOM AIR (USE INSTALLED WT & ARM CHANGE)(NOT FACTORY INSTALLED)	0700164	- -	- -
E85-A	CONTROLS, DUAL (WHEEL, PEDALS & TOE BRAKES	0760000	6.5	12.5
E87-A	TRIM CONTROL (RUDDER)	0760125	3.1	12.4
E89-O	ALL PURPOSE CONTROL WHEEL (NET CHANGE) (INCLUDES MAP LITE AND MIC SWITCH)	0770413-4	0.2	22.5
E93-R	HEATING SYSTEM, CABIN & CARBURETOR AIR (INCLUDES EXHAUST SYSTEM)	0750238	18.0	-16.0
	F. PLACARDS, WARNINGS & MANUALS			
F01-R	PLACARD, OPERATIONAL LIMITATION VFR - DAY	0505087-18	NEGL	- -

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
F01-D-1	PLACARD, OPERATIONAL LIMITATION VFR - DAY/ NIGHT	0505087-14	NEGL	- -
F01-D-2	PLACARD, OPERATIONAL LIMITATION VFR/IFR - DAY/NIGHT	0505087-15	NEGL	- -
F04-R	INDICATOR, STALL WARNING-AUDIBLE	0700185	1.0	17.5
F16-R	PILOT'S OPERATING HANDBOOK AND FAA APPROVED AIRPLANE FLIGHT MANUAL	D1140-13PH	1.3	- -
	G. AUXILIARY EQUIPMENT			
G01-A	LIFT HANDLE INSTL., TAILCONE (SET OF 2)	1612033	0.7	182.0
G07-A	HOISTING RINGS, AIRPLANE (ON CABIN TOP)	0541115	1.0	49.1
G13-A	CORROSION PROOFING-INTERNAL	0700082	10.0	72.0
G16-A	STATIC DISCHARGERS (SET OF 10)	0701086-1	0.2	157.8
G19-A	STABILIZER ABRASION BOOTS	0500041	2.7	206.0
G25-S	PAINT SCHEME, STANDARD OVERALL COVER	0704040	12.4*	90.9*
	OVERALL BASE COVER		11.4	90.3
	ACCENT STRIPE		1.0	97.5
G28-A	JACK POINT INSTL., TAILWHEEL	1601014	0.1	229.5
G31-A	CABLES, CORROSION RESISTANT (NET CHANGE)	0700082	0.0	- -
G55-A-1	FIRE EXTINGUISHER, STD SEAT	0701014-1	3.0	35.0
G55-A-2	FIRE EXTINGUISHER, VERTICAL ADJ SEAT	0701014-4	3.0	29.0
G58-A	REFUELING ASSIST STEPS AND HANDLES	0700219	1.6	16.5
G64-A	OIL DILUTION SYSTEM	0756017	2.0	-0.5
G67-A	PEDAL EXTENSIONS, RUDDER, REMOVABLE - SET OF 2 (STOWABLE - INSTALLED ARM SHOWN)	0701048	2.3	8.0
G70-A	FAIRINGS, SPEED (WING STRUTS)	0723605	0.5	33.5
G84-A	PHOTOGRAPHIC PROVISIONS	0701082	10.5	82.0
G88-A	WINTERIZATION KIT, ENGINE	0700319-4	1.3	-28.1
	WINTERFRONT (INSTALLED ARM SHOWN)		0.4	-35.3
	H. AVIONICS & AUTOPILOTS			
H01-A-1	CESSNA 300 ADF	3910159-9	7.8*	19.9*
	RECEIVER WITH BFO (R-546E)	3930160-4	3.1	12.5
	INDICATOR (IN-346A)	40980-1001	1.0	16.0
	NOTE--INSTL COMPONENTS ARE AS FOLLOWS--			

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	LOOP ANTENNA & ASSOCIATED WIRING	3960104-1	2.1	33.4
	SENSE ANTENNA	0770740-639	0.2	94.8
	RECEIVER MOUNT, WIRING & CIRCUIT BRKR		1.3	8.0
H01-A-2	CESSNA 400 ADF	3910160-4	7.8*	19.9*
	RECEIVER WITH BFO (R-446A)	3930161-4	3.1	12.5
	INDICATOR (IN-346A)	40980-1001	1.0	16.0
	INSTL COMPONENTS SAME AS H01-A-1		3.6	27.6
H04-A	NARCO DME 190 INSTL	3910166-5	6.2*	16.3*
	TRANSCEIVER & MOUNT (DME 190)	3312-400	5.5	12.0
H05-A	FOSTER R-NAV 511	3910203	3.4*	12.2*
	R-NAV COMPUTER-INDICATOR		2.4	12.5
H07-A-1	CESSNA 400 GLIDESLOPE WITH ILS INDICATOR EXCHANGE FOR VOR/LOC	3910157	4.0*	101.3*
	RECEIVER (R-443B)	3940128-3	2.1	132.6
	ANTENNA (CENTER OF UPPER WINDSHIELD)	1200098-1	0.2	29.6
	VOR/ILS INDICATOR (IN-386A) EXCHANGED FOR VOR/LOC IN-385A (ACTUAL WT-1.7 LBS)	46860-2000	0.1	15.5
	ITEM H58-A IS REQUIRED			
H07-A-2	CESSNA 400 GLIDESLOPE INSTALLATION WITH THE VOR/ILS IN-386AC INDICATOR EXCHANGE FOR VOR/ILS IN-386A INDICATOR, ACTUAL INDICATOR WT IS 1.9 LBS		4.2	97.2
	ITEM H58-A IS REQUIRED			
H11-A-1	PANTRONICS HF TRANSCEIVER, 2ND UNIT	3910193-10	20.8*	91.9*
	TRANSCEIVER (PT-10A)	C582103-0102	4.2	11.2
	ANTENNA LOAD BOX (DX10-RL-28)	C589502-0201	4.2	115.5
	REMOTE POWER SUPPLY (PT10-PS-28)	C582103-0201	8.6	131.3
	ANTENNA INSTALLATION (351 INCHES LONG)	3960117-1	0.3	127.7
	H58-A REMOTE RACK IF NOT PREVIOUSLY INSTALLED (WT INCLUDED)	--	--	--
	MISC ITEMS		3.5	60.6
H11-A-2	SUNAIR SSB HF TRANSCEIVER 2ND UNIT	3910158-4	24.0*	88.8*
	TRANSCEIVER, PANEL MOUNTED (ASB-125)	99681	4.5	11.5
	ANTENNA COUPLER (LOAD BOX)	99816	5.2	118.2
	POWER SUPPLY, REMOTE MOUNTED	99683	8.5	131.3
	ANTENNA INSTALLATION (351 INCHES LONG)	3960117-3	0.3	127.7
	H58-A REMOTE RACK IF NOT PREVIOUSLY INSTALLED (WT INCLUDED)	--	--	--
	WIRING CABLES & MISC.		4.2	62.7
H13-A	CESSNA 400 MARKER BEACON	3910164	2.4*	45.3*
	RECEIVER (R-402A)	42410-5128	0.7	12.2
H16-A-1	CESSNA 300 TRANSPONDER INSTL	3910127-18	4.0*	25.6*

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	TRANSCEIVER (RT-359A)	41420-5128	2.9	12.0
	ANTENNA	42940-0000	0.3	126.0
	CABLE INSTALLATION	3950125-32	0.5	50.3
H16-A-2	CESSNA 400 TRANSPONDER INSTL	3910128-12	4.0*	25.6*
	TRANSCEIVER (RT-459-A)	41470-1128	2.9	12.0
	ANTENNA	42940-0000	0.3	126.0
	CABLE INSTALLATION	3950125-32	0.5	50.3
H22-A-1	CESSNA 300 NAV/COM FIRST UNIT	3910183	16.0*	28.8*
	RECEIVER-TRANSMITTER (RT-385A)	46660-1100	5.5	11.0
	VOR/LOC INDICATOR (IN-385A)	46860-1000	1.6	15.5
	H34-A BASIC AVIONICS KIT	3910186-6	7.3	49.0
	MOUNT, WIRING & MISC HARDWARE		1.6	10.8
H22-A-2	CESSNA 300 NAV/COM 720 CH 1ST UNIT	-- --	16.2*	28.6*
	RECEIVER-TRANSCEIVER (RT-385A)	46660-1100	5.5	11.0
	VOR/LOC INDICATOR (IN-385AC)	46860-1000	1.8	15.5
	H34-A BASIC AVIONICS KIT	3910186-6	7.3	49.0
	MOUNT, WIRING & MISC HARDWARE		1.6	10.8
H22-A-3	CESSNA 400 NAV/COM FIRST UNIT	3910189-3	16.0*	28.8*
	RECEIVER-TRANSMITTER (RT-485A)	47360-1100	5.5	11.0
	VOR/LOC INDICATOR (IN-385A)	46860-1000	1.6	15.5
	H34-A BASIC AVIONICS KIT	3910186-6	7.3	49.0
	MOUNT, WIRING & MISC ITEMS		1.6	10.8
H22-A-4	CESSNA 400 NAV/COM W/ OPTIONAL INDICATOR		16.2*	28.6*
	RECEIVER-TRANSCEIVER (RT-485A)	47360-1100	5.5	11.0
	VOR/LOC INDICATOR (IN-385AC)	46860-1200	1.8	15.5
	H34-A BASIC AVIONICS KIT	3910186-6	7.3	49.0
	MOUNT WIRING & MISC HARDWARE		1.6	10.8
H22-A-5	CESSNA 300 NAV/COM --EXPORT ONLY--	3910202	18.2*	40.3*
	RECEIVER-TRANSMITTER (RT-328T)	43340-1124	6.6	11.0
	VOR/LOC INDICATOR (IN-514B)	45010-1000	0.6	16.3
	H34-A BASIC AVIONICS KIT	3910186-6	7.3	49.0
	MOUNTING BOX WIRING & MISC ITEMS		1.6	10.8
	H58-A REMOTE UNIT RACK (FOR VOLT CONV.)		0.9	131.3
	VOLTAGE CONVERTER	41010	1.2	131.3
H22-A-6	CESSNA 300 NAV/COM — EXPORT ONLY —		18.5*	39.6*
	SAME AS H22-A-5 EXCEPT IN-442A			
	INDICATOR/CONVERTER REPLACES IN-514B			
	WEIGHT CHANGE IS 0.3 LB. INCREASE			
H22-A-7	CESSNA 300 NAV/COM — EXPORT ONLY —	3910202	19.6*	38.2*
	RECEIVER-TRANSMITTER (RT-528E-1)		7.0	11.0
	INDICATOR IN-514B	45010-1000	0.6	16.3
	H34-A BASIC AVIONICS KIT		7.3	49.0

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	MOUNT, WIRING & MISC.		2.6	10.8
	H58-A REMOTE UNIT RACK (FOR VOLT CONV.)		0.9	131.3
	VOLTAGE CONVERTER	41010	1.2	131.3
H25-A-1	CESSNA 300 NAV/COM SECOND UNIT	3910185	9.8*	14.4*
	RECEIVER-TRANSMITTER (RT-385A)	46660-1100	5.5	11.0
	VOR/LOC INDICATOR (IN-385A)	46860-1000	1.6	15.5
	H37-A 2ND N/C INSTL. KIT	3910185-5	1.1	35.4
	MOUNTING BOX, WIRING & MISC ITEMS		1.6	10.8
H25-A-2	CESSNA 400 NAV/COM SECOND UNIT		9.8*	14.4*
	RECEIVER-TRANSMITTER (RT-485A)	47360-1100	5.5	11.0
	VOR/LOC INDICATOR (IN-385A)	46660-1100	1.6	15.5
	H37-A 2ND NAV/COM INSTL. KIT	3910185-5	1.1	35.4
	MOUNT, WIRING & MISC HARDWARE		1.6	10.8
H25-A-3	CESSNA 300 NAV/COM 2ND UNIT		10.0*	14.5*
	RECEIVER-TRANSCEIVER (RT-385A)	446660-1100	5.5	11.0
	VOR/LOC INDICATOR (IN-385AC)	46860-1200	1.8	15.5
	H37-A 2ND NAV/COM INSTALLATION KIT	3910185-5	1.1	35.4
	MOUNT, WIRING & MISC HARDWARE		1.6	10.8
H25-A-4	CESSNA 300 NAV/COM 2ND UNIT, EXPORT ONLY		11.1*	26.7*
	RECEIVER-TRANSCEIVER (RT-328T	43340-1124	6.6	11.0
	VOR/LOC INDICATOR (IN-514B)	45010-1000	0.6	16.3
	H37-A 2ND NAV/COM INSTL. KIT		1.1	35.4
	MOUNT, WIRING & MISC ITEMS		1.6	10.8
	VOLTAGE CONVERTER	41010	1.2	131.3
	H58-A NOT RQD IF PREVIOUSLY INSTALLED			
H25-A-5	CESSNA 300 NAV/COM 2ND UNIT, EXPORT ONLY		11.5*	26.1*
	RECEIVER-TRANSCEIVER (RT-528E-1)		7.0	11$0
	INDICATOR (IN-514B)	45010-1000	0.6	16.3
	H37-A 2ND NAV/COM INSTL KIT		1.1	35.4
	VOLTAGE CONVERTER	41010	1.2	131.3
	H58-A NOT RQD IF PREVIOUSLY INSTALLED			
	MOUNT, WIRING & MISC ITEMS		1.6	10.8
H28-A-1	EMERGENCY LOCATOR TRANSMITTER	0470419-7	3.5*	133.2*
	TRANSMITTER (D & M DMELT-6-1)	C589511-0117	3.3	133.1
	ANTENNA	C589511-0109	0.1	135.4
H28-A-2	EMERGENCY LOCATOR TRANSMITTER (USED IN CANADA)	0470419-8	3.5*	133.2*
	TRANSMITTER (D & M DMELT-6-1C)	C589511-0113	3.3	133.1
	ANTENNA	C589511-0109	0.1	135.4
H31-A-1	NAV-O-MATIC 200A INSTALLATION (AF-295B)	3910162-7	9.7*	46.4*
	CONTROLLER AMPLIFIER (CA-295B)	43610-1201	1.1	15.0
	TURN COORDINATOR (ITEM D88-A-2)	42320-0028	1.3	15.7

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	ROLL ACTUATOR INSTL	0700216-4	5.2	65.9
	RELAY INSTALLATION	3910135-3	0.3	16.0
H31-A-2	NAV-O-MATIC 300A INSTALLATION (AF-395A)	3910153	19.3*	37.5*
	CONTROLLER-AMPLIFIER (CA-395A)	42660-1201	1.8	13.0
	GYRO INSTALLATION (ITEM D64-A-2)	0701096	6.4	[illegible]
	RELAY INSTALLATION	3970135-3	0.3	16.0
	TURN COORDINATOR (ITEM D88-A-2)	42320-0028	1.3	15.7
	VACUUM SYSTEM (ITEM A61-A)	C701096	3.0	-1.3
	ROLL ACTUATOR INSTL	0700216-4	5.2	[illegible]
H34-A	BASIC AVIONICS KIT (REQUIRED BY AND AVAILABLE WITH 1ST NAV/COM INSTL. ONLY)	3910186-6	7.3*	49.0*
	RADIO COOLING	3930230-7	1.1	10.2
	RECEIVER-TRANSCEIVER INSTL KIT	3930186-2	0.1	16.7
	NOISE FILTER	3940148-2	0.1	-6.0
	LH COM ANTENNA CABLE ASSY	3950125-4	0.3	29.2
	OMNI ANTENNA CABLE ASSY	3950125-6	0.8	141.8
	OMNI ANTENNA INSTALLATION	3960133-4	0.5	[illegible]
	LH COM ANTENNA INSTALLATION	3960113-1	0.5	52.2
	CABIN SPEAKER INSTALLATION	3970123-4	1.5	33.1
	MICROPHONE INSTALLATION	3970124-6	0.3	17.5
	HEADPHONE INSTALLATION	3970125-2	0.2	12.6
	AUDIO CONTROL PANEL & WIRING	3970131-1	1.9	13.0
H37-A	2ND NAV/COM INSTALLATION KIT	3910185-5	1.1*	33.4*
	RH COM ANTENNA & CABLE	-	0.8	49.3
	OMNI ANTENNA COUPLER		0.2	5.0
H46-A	ADF ANTI-PRECIP ANTENNA	3910163-4	0.9	25.1
H55-A	HEADSET-MIKE COMBINATION INSTALLATION	0773411-4	0.6*	16.3*
	HEADSET (NORMALLY STOWED AT 14.0 ARM) (REQUIRES E89-C)	C596530-0101	0.3	- -
H56-A	PADDED HEADSET/MICROPHONE INSTL., STOWED, REQUIRES E89-C	C596531-0101	1.1	14.0
H58-A	MOUNTING RACK FOR REMOTE AVIONICS UNITS NOTE--ONLY 1 RACK REQUIRED PER PLANE		0.9	131.3
	J. SPECIAL OPTION PACKAGES			
J01-A	180 II EQUIPMENT PACKAGE		50.3*	34.3*
	A61-A VACUUM SYSTEM	0701095	3.0	-1.3
	A73-A OIL QUICK DRAIN VALVE	C661071-0101	0.0	- -
	D07-A GROUND SERVICE RECEPTICLE	0701044	2.9	129.4

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	C16-A HEATED PITOT	0713970	0.5	16.5
	C25-A CONTROL WHEEL MTD MAP LIGHT	0770413	0.1	22.5
	D25-A CLOCK, ELECTRIC	C661003-0505	0.7	48.5
	D64-A-1 GYRO INSTL	C661080-0101	6.2	13.1
	D82-A OUTSIDE TEMP GAGE	0701013	0.1	28.5
	D88-A-1 TURN COORDINATOR	0701089	1.3	15.7
	D91-A RATE OF CLIMB INDICATOR	0701094	0.9	15.0
	E55-A SUN-VISORS (2)	0500040	0.8	33.0
	E85-A DUAL CONTROLS	0760000	6.5	12.5
	G25-A EXTERIOR STYLING NET CHANGE	0704040	NEGL	---
	H01-A 300 ADF	3910159	7.8	19.9
	H22-A-1 300 NAV/COM (RT-385A)	3910183	16.0	28.8
	H28-A-1 EMERGENCY LOCATOR TRANSMITTER		3.5	133.2
J04-A	NAV PAC KIT INSTALLATION		20.2*	37.5*
	H07-A-1 GLIDESLOPE	3910157	4.0	101.3
	H13-A MARKER BEACON	3910164	2.4	45.3
	H16-A-1 CESSNA 300 TRANSPONDER	3910127	4.0	25.6
	H25-A-1 300 NAV/COM, 2ND UNIT	3910183	9.8	14.4
J18-A-1	RUDDER RETURN SPRING INSTALLATION	0742018-1	1.4	180.7
J18-A-2	RUDDER RETURN SPRING PROVISIONS (INCLUDED IN FUSELAGE STRUCTURE BEEF-UP OF ITEMS J30-A-1, -2, -3 & -4)	0742018-2	1.1	176.1
J27-A-1	FLOAT INSTALLATION, EDO MODEL 628-2960 (THIS IS IN ADDITION TO ITEM J30-A-1, FLOATPLANE KIT OPTION A, WITHOUT CORROSION PROOFING PAINT AND CORROSION RESISTANT CABLES) (FOR REF. USE ONLY--WEIGHT AND ARM ARE APPROXIMATELY 547 LBS AT 51.0 IN NET CHANGE) (USE ACTUAL INSTALLED WT & ARM CHANGE)	55770 (EDO)	---	---
J27-A-2	FLOAT INSTALLATION, EDO MODEL 597-2790 (THIS IS IN ADDITION TO ITEM J30-A-1, FLOATPLANE KIT OPTION A, WITHOUT CORROSION PROOFING PAINT & CORROSION RESISTANT CABLES)(FOR REF USE ONLY-- WEIGHT & ARM ARE APPROXIMATELY 280 LBS AT 56.4 IN NET CHANGE)(USE ACTUAL INSTALLED WEIGHT & ARM CHANGE)	42090 (EDO)	---	---
J30-A-1	FLOATPLANE KIT OPTION 'A'	0742000	37.5*	71.9*
	COWL DECK V BRACE	0713103-1	2.7	25.5
	ENGINE MOUNT (NET CHANGE)	0750227	2.8	-41.5
	FUSELAGE STRUCTURE MODIFICATION	0710010	13.6	82.2

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	FLOATPLANE RUDDER AND VERTICAL FIN (NET CHANGE)	0733110 AND 0731001	2.6	208.2
	WATER RUDDER SPRINGS (STOWED)		0.8	100.0
	A33-D PROPELLER CHANGE (NET CHANGE)		1.1	-40.0
	G07-A HOISTING RINGS (CABIN TOP)		1.0	49.7
	G13-A CORROSION PROOFING-INTERNAL		10.0	72.0
	G31-A CORROSION RESISTANT CABLES		0.0	- -
	G58-A REFUELING ASSIST STEP & HANDLE		1.5	16.7
	J18-A-1 RUDDER RETURN SPRING INSTL.		1.4	180.7
J30-A-2	FLOATPLANE KIT OPTION 'B' (SIMILAR TO OPTION 'A' ABOVE EXCEPT WITH THE FOLLOWING ITEMS STOWED) (INSTALLED ARM SHOWN FOR STOWED ITEM)	0742000	34.4*	70.2*
	COWL DECK V BRACE		2.7	25.5
	RUDDER RETURN SPRING INSTALLATION		1.4	180.7
J33-A	SKIPLANE PROVISIONS (STOWED KIT) (CONSISTS OF J18-A-1 & 2, & B22-A)	0742024	5.1	128.3
J37-A-1	SKI INSTALLATION, WHEEL REPLACEMENT (REPLACES B01-R) MAIN SKI MODEL A-3500A TAIL SKI MODEL CT-3200 (B16-D SKI AXLE OR EQUIVALENT MUST BE INSTALLED) (USE ACTUAL INSTALLED WT & ARM CHANGE)	11G1633	- -	- -
J37-A-2	WHEEL SKI INSTALLATION, HYDRAULICALLY ACTUATED, MAIN SKI MODEL C-3200, TAIL SKI MODEL CT-3200 (REGULAR LANDING GEAR USED)	11G1632	- -	- -
	NOTE THE ABOVE SKI INSTALLATIONS ARE FLUI-DYNE AND REQUIRE ACTUAL INSTALLED WEIGHT AND ARM CHANGE (ITEM J33-A ALSO REQUIRED)			
J40-A	PRIMARY EQUIPMENT GROUP		4.3*	26.1*
	C28-A MAP LITE, DOORPOST MOUNTED	0700217	0.5	30.5
	D25-A-1 ELECTRIC CLOCK, DIAL READ	0701102	0.7	48.5
	D82-A OUTSIDE AIR TEMPERATURE IND.	0701010	0.1	28.5
	D88-A-1 TURN COORDINATOR (C661003-0505)	C701089	1.3	15.7
	U91-A VERTICAL SPEED INDICATOR	0701094	0.9	15.0
	E55-A SUN VISORS (2)	0500040	0.8	33.0

SECTION 7
AIRPLANE & SYSTEMS DESCRIPTIONS

TABLE OF CONTENTS

Page

TABLE OF CONTENTS (Continued)

Page

INTRODUCTION

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

AIRFRAME

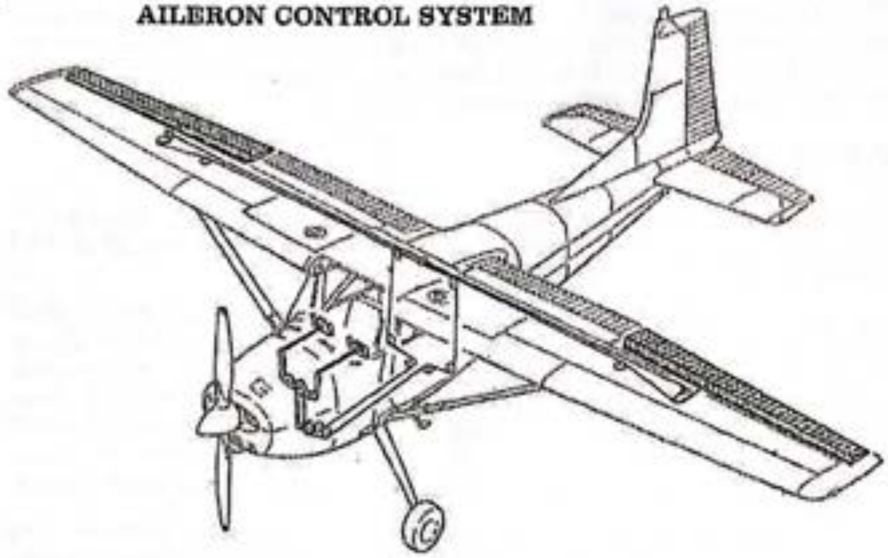
The airplane is an all-metal, four to six-place, high-wing, single-engine airplane equipped with conventional fixed landing gear and designed for general utility purposes.

The construction of the fuselage is a conventional formed sheet metal bulkhead, stringer, and skin design referred to as semimonocoque. Major items of structure are the front and rear carry-through spars to which the wings are attached, a bulkhead and forgings for main landing gear attachment and a bulkhead with attaching plates at the base of the forward doorposts for the lower attachment of the wing struts. Four engine mount stringers are attached to the forward doorposts and extend to the firewall.

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

The empennage (tail assembly) consists of a vertical stabilizer, rudder, horizontal stabilizer, and elevator. The vertical stabilizer consists of a forward and aft spar, formed sheet metal ribs and reinforcements, four skin panels, formed leading edge skins, and a dorsal. The rudder is constructed of a forward and aft spar, formed sheet metal ribs and reinforcements, and a wrap-around skin panel. The top of the rudder incorporates a leading edge extension which contains a balance weight. The horizontal stabilizer is constructed of a forward and aft spar, ribs and stiffeners, center upper and lower skin panels, and two left and two right wrap-around skin panels which also form the leading edges. Construction of the elevator consists of formed leading edge skins, a forward spar, ribs, torque tubes and bellcrank, left upper and lower "V" type corrugated skins, and right upper and lower "V" type corrugated skins. Both elevator tip leading edge extensions incorporate balance weights.

AILERON CONTROL SYSTEM



RUDDER AND RUDDER TRIM
CONTROL SYSTEMS

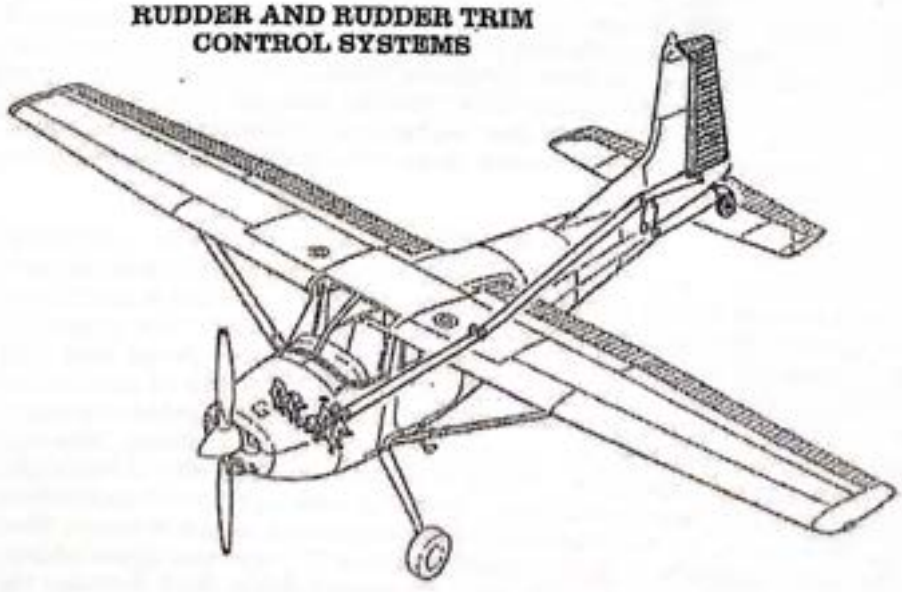
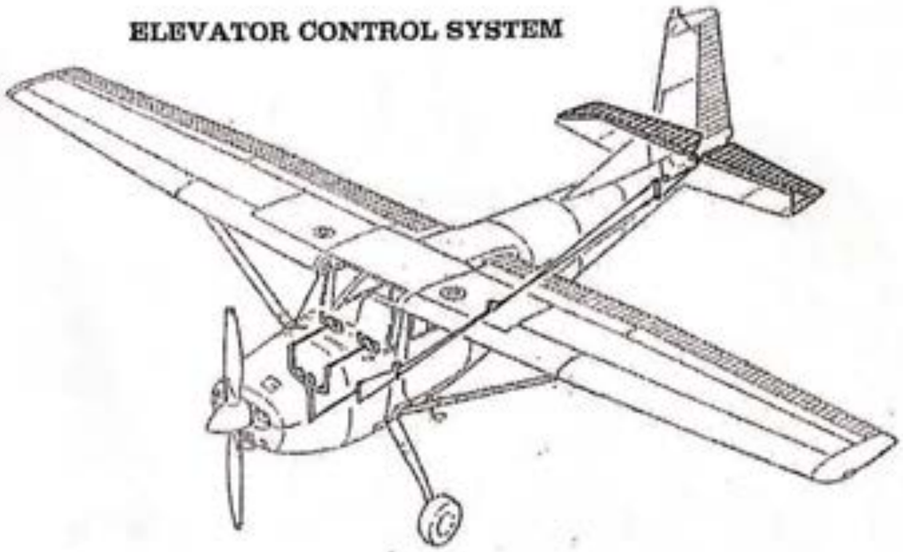


Figure 7-1. Flight Control and Trim Systems (Sheet 1 of 2)

ELEVATOR CONTROL SYSTEM



STABILIZER TRIM
CONTROL SYSTEM

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

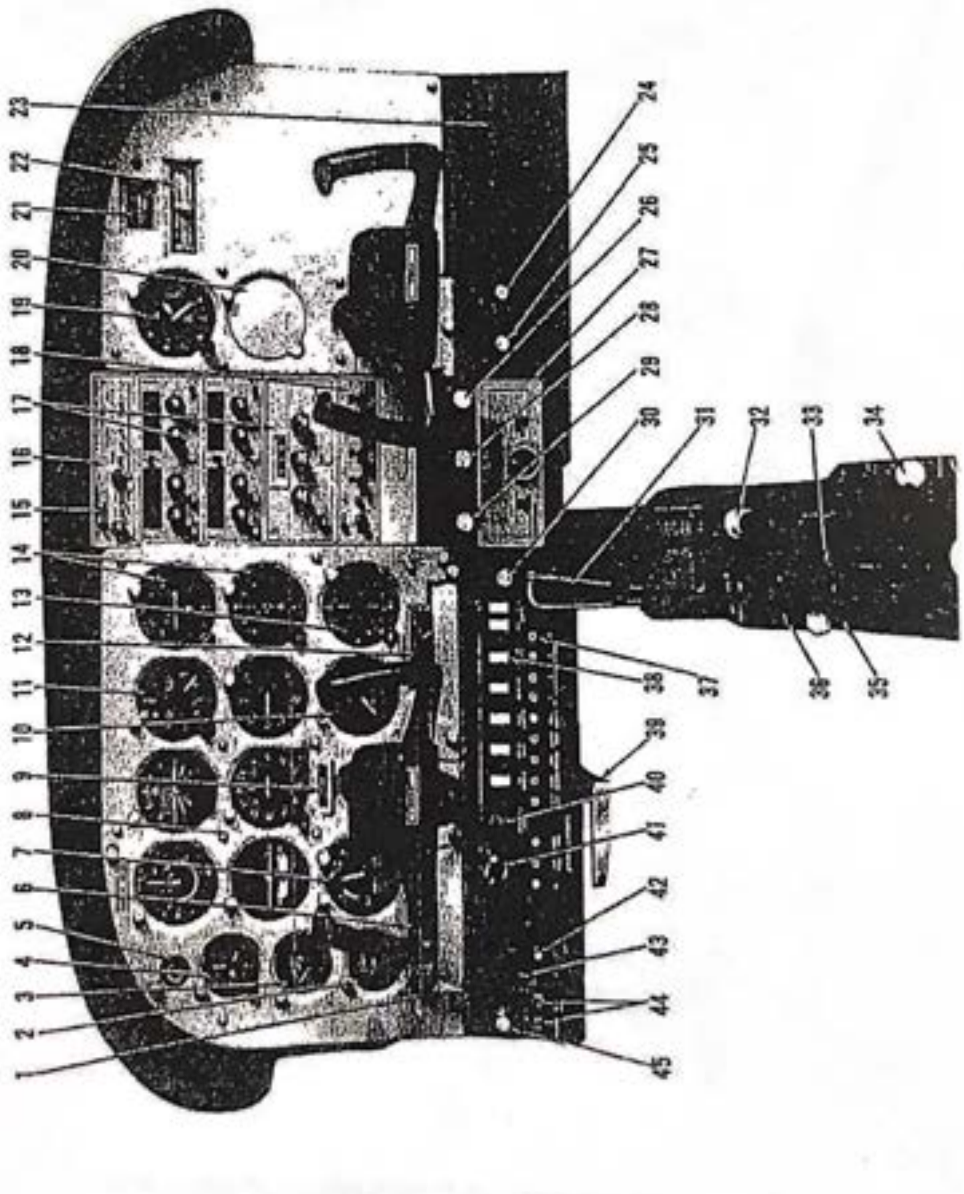


Figure 7-2. Instrument Panel (Sheet 1 of 2)

1. Low-Voltage Warning Light
2. Carburetor Air Temperature Gage
3. Economy Mixture Indicator
4. Clock
5. Suction Gage
6. Ammeter and Oil Pressure Gage
7. Manifold Pressure Gage
8. Flight Instrument Group
9. Airplane Registration Number
10. Tachometer
11. Encoding Altimeter
12. Cylinder Head and Oil Temperature Gages
13. ADF Bearing Indicator
14. Course Deviation and ILS Glideslope Indicators
15. Marker Beacon Indicator Lights and Switches
16. Audio Control Panel
17. Nav/Com and ADF Radios
18. Transponder
19. Secondary Altimeter
20. Additional Instrument and Radio Space
21. Flight Hour Recorder
22. Fuel Quantity Indicators
23. Map Compartment
24. Cabin Air Control
25. Cabin Heat Control
26. Mixture Control
27. Autopilot Control Unit
28. Propeller Control
29. Throttle (With Friction Lock)
30. Carburetor Heat Control
31. Microphone
32. Wing Flap Control Lever
33. Stabilizer Trim Control Wheel
34. Cowl Flap Control Lever
35. Tail Wheel Lock Control Lever
36. Rudder Trim Control Wheel
37. Circuit Breakers
38. Electrical Switches
39. Parking Brake Handle
40. Avionics Power Switch
41. Ignition Switch
42. Static Pressure Alternate Source Valve
43. Master Switch
44. Phone and Auxiliary Microphone Jacks
45. Primer

Figure 7-2. Instrument Panel (Sheet 2 of 2)

FLIGHT CONTROLS

The airplane's flight control system (see figure 7-1) consists of conventional aileron, rudder, and elevator control surfaces. The control surfaces are manually operated through mechanical linkage using a control wheel for the ailerons and elevator, and rudder/brake pedals for the rudder. The elevator control system is equipped with a downspring which provides improved stability in flight.

Rudder pedal extensions are available for either the pilot's or copilot's rudder pedals. The extensions allow the user to position his seat approximately one and one half inches aft of his normal seat position, primarily for improved visibility through the optional domed observation window in the cabin door. A standard rudder pedal face, two spacer blocks, and two clips comprise the rudder pedal extension assembly. The extensions are easily installed by hooking the clip on the bottom of the extension under the bottom of the rudder pedal, and then pressing the top clip over the top of the rudder pedal. Removal is accomplished by grasping the top clip and lifting it up and over the rudder pedal, allowing the extension to fall free.

TRIM SYSTEMS

A manually-operated stabilizer trim system is provided; a rudder trim system may also be installed (see figure 7-1). Stabilizer trimming is accomplished by a movable horizontal stabilizer, actuated by jackscrews, utilizing the vertically-mounted trim control wheel on the left side of the tunnel. Forward rotation of the trim wheel will trim nose-down; conversely, aft rotation will trim nose-up. Rudder trimming is accomplished through a bungee connected to the rudder control system and a trim control wheel mounted horizontally near the forward end of the tunnel. Rudder trimming is accomplished by rotating the trim control wheel either left or right to the desired trim position. Rotating the trim wheel to the right will trim nose-right; conversely, rotating it to the left will trim nose-left.

INSTRUMENT PANEL

The instrument panel (see figure 7-2) is designed around the basic "T" configuration. The gyros are located immediately in front of the pilot, and are arranged vertically. The airspeed indicator and altimeter are located to the left and right of the gyros, respectively. The remainder of the flight instruments are located around the basic "T". The engine instrument cluster is arranged around the base of the pilot's control wheel shaft. Avionics equipment is stacked approximately on the centerline of the panel, with the right side of the panel containing the fuel quantity indicators, cigar lighter, map compartment, and space for additional instruments and avionics equipment. A switch and control panel, at the lower edge of the instrument panel, contains most of the switches, controls, and circuit breakers necessary to operate the airplane. The left side of the panel contains the primer, master switch, static pressure alternate source valve (if installed), ignition switch, avionics power switch, circuit breakers, and electrical switches. The center area contains the carburetor heat control knob, throttle, propeller control, and mixture control. The right side of the panel contains the cabin heat and cabin air control knobs. A tunnel, extending from the firewall to between the front seats contains the stabilizer trim control wheel, rudder trim control wheel (if installed), tail wheel lock control lever (if installed), wing flap control lever, and cowl flap control lever. A fuel selector valve handle is located at the aft end of the tunnel. A parking brake handle is mounted under the switch and control panel in front of the pilot.

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

GROUND CONTROL

Effective ground control while taxiing is accomplished through tail wheel steering by using the rudder pedals; left rudder pedal to steer left and right rudder pedal to steer right. When a rudder pedal is depressed, a cable and spring assembly (which are connected to the tail wheel and to the rudder cable system) will turn the tail wheel through an arc of approximately 24° each side of center, after which it becomes free swiveling. If the airplane is equipped with a tail wheel lock, the tail wheel will rotate 2.5° each side of center with the lock engaged.

Moving the airplane by hand is most easily accomplished by pushing on the wing struts. Stowable lift handles may be installed on either side of the tailcone forward of the horizontal stabilizer to facilitate ground handling. To extend the handles for use, insert a finger in the end of the handle and pull the handle from its recess in the tailcone.

The minimum turning radius of the airplane, using differential braking during taxi is 21' 10".

WING FLAP SYSTEM

The wing flaps are of the single-slot type (figure 7-3) and are extended or retracted by positioning the control lever on the tunnel to the desired flap deflection position. The flap lever is repositioned by depressing the

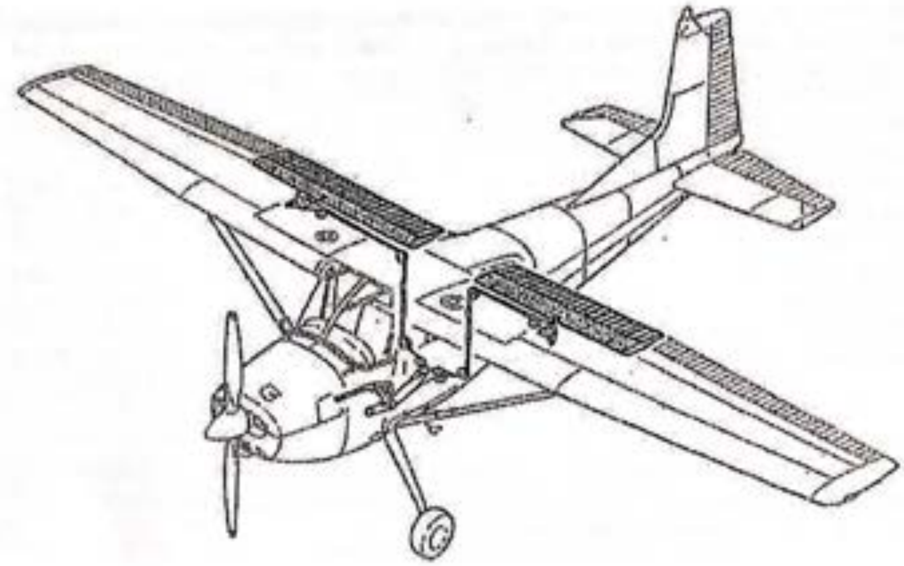


Figure 7-3. Wing Flap System

button on the lever end and raising or lowering the lever to obtain the desired flap deflection. The lever incorporates mechanical latching positions at 0°, 10°, 20°, 30° and 40° of flap extension.

LANDING GEAR SYSTEM

The landing gear is of the conventional type with two main wheels and a steerable tail wheel. The main landing gear may be equipped with wheel/brake fairings. Shock absorption is provided by the leaf spring-steel main landing gear struts, and a tubular steel tail wheel spring. Each main gear is equipped with a hydraulically actuated disc-type brake on the inboard side of each wheel.

The tail wheel may incorporate a manual anti-swivel locking system. The locking lever, located on the cabin floor tunnel, controls a spring-loaded locking lug on the tail wheel assembly. To lock the tail wheel, move the lever aft to the LOCK position. To unlock the tail wheel, move the lever forward to UNLOCK.

BAGGAGE COMPARTMENT

The baggage compartment area is dependent upon the seating arrangement. With four-place seating, baggage area 1 extends from the rear of the 2nd row passenger seats to the aft cabin bulkhead; baggage area 2 extends from the aft cabin bulkhead to station 140. With six-place seating, the 3rd row passenger seats occupy baggage area 1; baggage area 2 extends from the aft cabin bulkhead to station 140. Access to the baggage compartment is gained through a lockable baggage door on the left side of the airplane, or from within the airplane cabin. For information on baggage and cargo tie-down, refer to Section 6. When loading the airplane, children should not be placed or permitted in the baggage compartment, and any material that might be hazardous to the airplane or occupants should not be placed anywhere in the airplane. For baggage area and door dimensions, refer to Section 6.

A litter (stretcher) door may be installed on the left side of the fuselage immediately aft of the baggage door, to permit loading of a litter without removing the cabin door. Details of the litter door installation are presented in Section 9, Supplements.

SEATS

Seating arrangements available consist of a single adjustable pilot's seat or two separate adjustable seats for the pilot and copilot, a second row split-backed bench seat or two individual fixed seats, and a third row bench seat and back.

Four-way pilot and copilot seats may be moved forward or aft, and the seat back angle changed. To position either seat, lift the tubular handle under the center of the seat, slide the seat into position, release the handle, and check that the seat is locked in place. The seat back is spring-loaded to the vertical position. To adjust its position, lift the lever under the right front corner of the seat, reposition the back, release the lever, and check that the back is locked in place. The seat backs will also fold full forward.

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

The second row passenger seats consist of two individual fixed-position seats bolted to a cabin bulkhead. A fixed position one-piece seat bottom with individual adjustable seat backs is also available. Two levers, one on the left and right aft corners of the one-piece seat bottom, are used to adjust the angle of the respective seat backs. To adjust either seat back, lift the adjustment lever and reposition the back. The seat backs are spring-loaded to the vertical position.

The third row passenger's seat consists of a fixed one-piece bench seat hinged at the back, a folding leg and a fixed seat back attached to the aft bulkhead. To stow the seat, rotate the seat bottom up and aft as far as it will go and fold the leg into the seat bottom.

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

SEAT BELTS AND SHOULDER HARNESSES

All seat positions are equipped with seat belts (figure 7-4). The pilot's seat is also equipped with a separate shoulder harness; all remaining seat positions may also be equipped with shoulder harnesses. Integrated seat belt/shoulder harnesses with inertia reels can be furnished for the pilot's and copilot's seat positions if desired.

SEAT BELTS

The seat belts used with the pilot's and copilot's seats, second row seats, and third row seats are attached to fittings on the floorboard. The buckle half is inboard of each seat and the link half is outboard of each seat.

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

SHOULDER HARNESSES

Each front seat harness is attached to a rear door post just above the window line and is stowed behind a stowage sheath mounted above the cabin door. To stow each front seat harness, fold the free end and place it behind the sheath. The center seat shoulder harnesses are attached near the aft windows. Each harness is stowed by fastening the loose end to the adhesive type fastener near the harness attach point. The aft seat shoulder

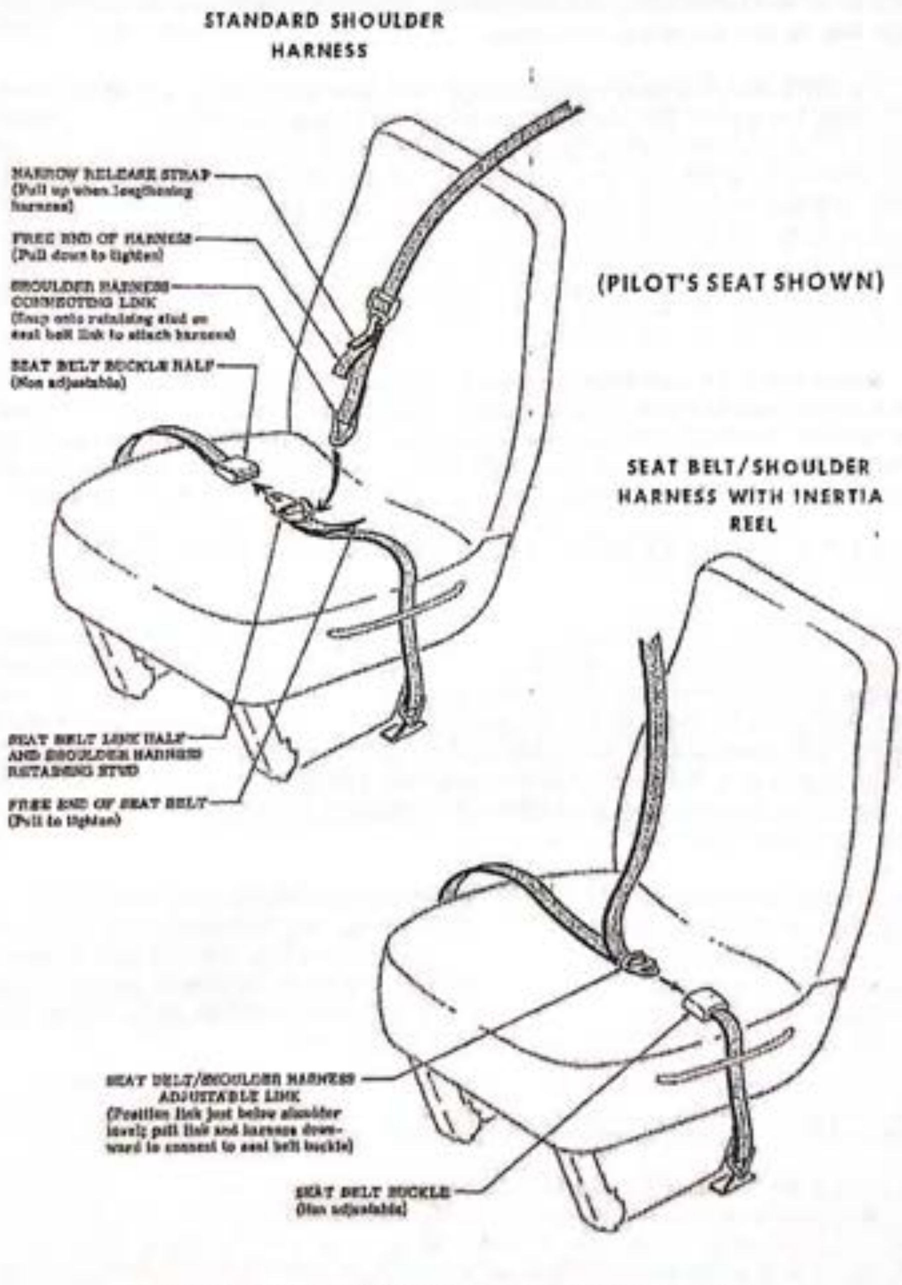


Figure 7-4. Seat Belts and Shoulder Harnesses

harnesses are attached to the rear cabin bulkhead. They are stowed behind clips below the aft cabin windows.

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

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

INTEGRATED SEAT BELT/SHOULDER HARNESSES WITH INERTIA REELS

Integrated seat belt/shoulder harnesses with inertia reels are available for the pilot and copilot. The seat belt/shoulder harnesses extend from inertia reels located in the cabin top structure, through slots in the overhead console marked PILOT and COPILOT, to attach points inboard of the two front seats. A separate seat belt half and buckle is located outboard of the seats. Inertia reels allow complete freedom of body movement. However, in the event of a sudden deceleration, they will lock automatically to protect the occupants.

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

ENTRANCE DOORS AND CABIN WINDOWS

Entry to, and exit from the airplane is accomplished through either of two entry doors, one on each side of the cabin at the front seat positions (refer to Section 6 for cabin and cabin door dimensions). The doors incorporate a recessed exterior door handle, a conventional interior door handle, a key-operated door lock (left door only), a door stop mechanism, and an openable window. The right door has removable hinge pins and a detachable door stop mechanism permitting door removal when large or bulky cargo must be loaded.

To open the doors from outside the airplane, utilize the recessed door handle near the aft edge of each door. Depress the forward end of the handle to rotate it out of its recess, and then pull outward. To close or open the doors from inside the airplane, use the door handle. The inside door handle has three positions and a placard at its base which reads OPEN, CLOSE and LOCK. The handle is spring-loaded to the CLOSE (up) position. When the door has been pulled shut and latched, lock it by rotating the door handle forward to the LOCK position. When the handle is rotated to the LOCK position, an over-center action will hold it in that position. Both cabin doors should be locked prior to flight, and should not be opened intentionally during flight.

NOTE

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

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

Both cabin doors are equipped with openable windows which are held in the closed position by a detent-equipped latch on the lower edge of each window frame. To open either window, rotate the latch upward. The windows are equipped with a spring-loaded retaining arm which will help rotate the window outward and hold it there.

Special windows are available to increase the area of visibility for the pilot and copilot. Two windows in the cabin roof provide visibility above the airplane. Two additional windows in the lower portion of the cabin doors increase visibility below and to each side of the airplane. A pair of openable domed windows, which replace the standard flat windows in the cabin doors, are available for the airplane. Details of this installation are presented in Section 9, Supplements. The cabin top windows, lower door windows (if installed), and rear side windows, are of the fixed type and cannot be opened.

CONTROL LOCKS

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

ENGINE

The airplane is powered by a horizontally-opposed, six-cylinder, overhead-valve, air-cooled, carbureted engine with a wet sump oil system. The engine is a Continental Model O-470-U and is rated at 230 horsepower at 2400 RPM. Major accessories include a propeller governor on the front of the engine and dual magnetos, starter, and belt-driven alternator on the rear of the engine. Provisions are also made for a vacuum pump and a full flow oil filter.

ENGINE CONTROLS

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

The mixture control, located on the lower center portion of the instrument panel, is a red knob with raised points around the circumference and is equipped with a lock button in the end of the knob. The rich position is full forward, and full aft is the idle cut-off position. For small adjustments, the control may be moved forward by rotating the knob clockwise, and aft by rotating the knob counterclockwise. For rapid or large adjustments, the knob may be moved forward or aft by depressing the lock button in the end of the control, and then positioning the control as desired.

ENGINE INSTRUMENTS

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

The oil pressure gage, located below and to the left of the pilot's control wheel shaft, is operated by oil pressure. A direct pressure oil line from the engine delivers oil at engine operating pressure to the oil pressure gage. Gage markings indicate that minimum idling pressure is 10 PSI (red line), the normal operating range is 30 to 60 PSI (green arc), and maximum pressure is 100 PSI (red line).

Oil temperature is indicated by a gage located below and to the right of the pilot's control wheel shaft. The gage is operated by an electrical-resistance type temperature sensor which receives power from the airplane electrical system. Oil temperature limitations are the normal operating range (green arc) which is 100°F (38°C) to 240°F (116°C), and the maximum (red line) which is 240°F (116°C).

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

The engine-driven mechanical tachometer is located to the right side of the pilot's control wheel shaft. The instrument is calibrated in increments of 100 RPM and indicates both engine and propeller speed. An hour meter below the center of the tachometer dial records elapsed engine time in hours and tenths. Instrument markings include a normal operating range (green arc) of 2100 to 2400 RPM, and a maximum allowable (red line) of 2400 RPM.

The manifold pressure gage is located to the left side of the pilot's control wheel shaft. The gage is direct reading and indicates induction air manifold pressure in inches of mercury. It has a normal operating range (green arc) of 15 to 23 inches of mercury.

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

A carburetor air temperature gage may be installed on the left side of the instrument panel to help detect carburetor icing conditions. Details of this installation are presented in Section 9, Supplements.

NEW ENGINE BREAK-IN AND OPERATION

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

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

ENGINE OIL SYSTEM

Oil for engine lubrication and propeller governor operation is supplied from a sump on the bottom of the engine. The capacity of the sump is 12 quarts (one additional quart is required if a full flow oil filter is installed). Oil is drawn from the sump through a filter screen on the end of a pickup tube to the engine-driven oil pump. Oil from the pump passes through an oil pressure screen (full flow oil filter, if installed), a pressure relief valve at the rear of the right oil gallery, and a thermostatically controlled oil cooler. Oil from the cooler is then circulated to the left gallery and propeller governor. The engine parts are then lubricated by oil from the galleries. After lubricating the engine, the oil returns to the sump by gravity. If a full flow oil filter is installed, the filter adapter is equipped with a bypass valve which will cause lubricating oil to bypass the filter in the event the filter becomes plugged, or the oil temperature is extremely cold.

An oil dipstick is located at the rear of the engine on the left side, and an oil filler tube is on top of the crankcase near the front of the engine. The dipstick and oil filler are accessible through doors on the engine cowling. The engine should not be operated on less than nine quarts of oil. To minimize loss of oil through the breather, fill to 10 quarts for normal flights of less than three hours. For extended flight, fill to 12 quarts (dipstick indication only). For engine oil grade and specifications, refer to Section 8 of this handbook.

The oil cooler may be replaced by a non-congealing oil cooler for operations in temperatures consistently below 20°F (-7°C). The non-congealing oil cooler provides improved oil flow at low temperatures. Once installed, the non-congealing oil cooler is approved for permanent use in both hot and cold weather.

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

OIL DILUTION SYSTEM

If an oil dilution system is installed and very low temperatures are anticipated, dilute the oil prior to engine shutdown by energizing the oil dilution switch with the engine operating at 1000 RPM. The Oil Dilution Table, figure 7-5, indicates the dilution time for anticipated temperatures. While diluting the oil, the oil pressure should be watched for any unusual fluctuations that might indicate a screen being clogged with sludge washed down by the fuel.

NOTE

On the first operation of the oil dilution system each season, use the full dilution period, drain the oil, clean the screen, refill with new oil and redilute as required.

If the full dilution time was used, beginning with a full oil sump (12 quarts), subsequent starts and engine warm-up should be prolonged to evaporate enough of the fuel to lower the oil sump level to 13 quarts prior to

TEMPERATURE	0°F (-18°C)	-10°F (-23°C)	-20°F (-29°C)
DILUTION TIME . . .	1.5 Min.	3.75 Min.	6 Min.
FUEL ADDED	1 qt.	2.5 qt.	4 qt.
NOTE: Maximum Sump Capacity for Takeoff is 13 quarts.			

Figure 7-5. Oil Dilution Table

takeoff. Otherwise, the sump may overflow when the airplane is in a nose high attitude.

To avoid progressive dilution of the oil, flights of at least a two-hour duration should be made between oil dilution operations.

IGNITION-STARTER SYSTEM

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

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

AIR INDUCTION SYSTEM

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

EXHAUST SYSTEM

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

CARBURETOR AND PRIMING SYSTEM

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

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

COOLING SYSTEM

Ram air for engine cooling enters through an opening on either side of the spinner. The cooling air is directed around the cylinders and other areas of the engine by baffling, and is then exhausted through cowl flaps on the lower aft edge of the cowling. The cowl flaps are mechanically operated from the cabin by means of a cowl flap lever on the right side of the tunnel, which is labeled COWL FLAPS, FULL OPEN, 3/4, HALF, 1/4, CLOSED. Before starting the engine, and during takeoff and high power operation, the cowl flap lever is normally placed in the FULL OPEN position for maximum cooling. This is accomplished by moving the lever to the right to clear a detent, then moving the lever forward to the FULL OPEN position. Anytime the lever is repositioned, it must first be moved to the right. While in cruise flight, cowl flaps should be adjusted to keep the cylinder head temperature at approximately two-thirds of the normal operating range (green arc). During let-downs, it is recommended that the cowl flaps be closed completely by repositioning the cowl flap lever to the CLOSED position.

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

PROPELLER

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

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

FUEL SYSTEM

The fuel system (see figure 7-6) consists of two vented integral fuel tanks (one in each wing), a four-position selector valve, a fuel strainer with manual drain control, a manual primer (if installed), and a carburetor. Refer to figure 7-7 for fuel quantity data.

Fuel flows by gravity from the two wing tanks to a four-position valve, labeled BOTH ON, LEFT ON, RIGHT ON and OFF. With the selector valve in either the BOTH ON, RIGHT ON or LEFT ON position, fuel flows through a strainer to the carburetor. From the carburetor, mixed fuel and air flows to the cylinders through intake manifold tubes. The manual primer draws its fuel from the fuel strainer and injects it into the intake manifold.

Fuel system venting is essential to system operation. Complete blockage of the venting system will result in a decreasing fuel flow and eventual engine stoppage. Each fuel tank is vented overboard through a vent line which is equipped with a check valve, and protrudes from the surface of the respective wing near the wing strut attach point. Also, an interconnecting vent line is provided between the tanks. The fuel filler caps are equipped with vacuum-operated vents which open, allowing air into the tanks, should the fuel tank vent lines become blocked.

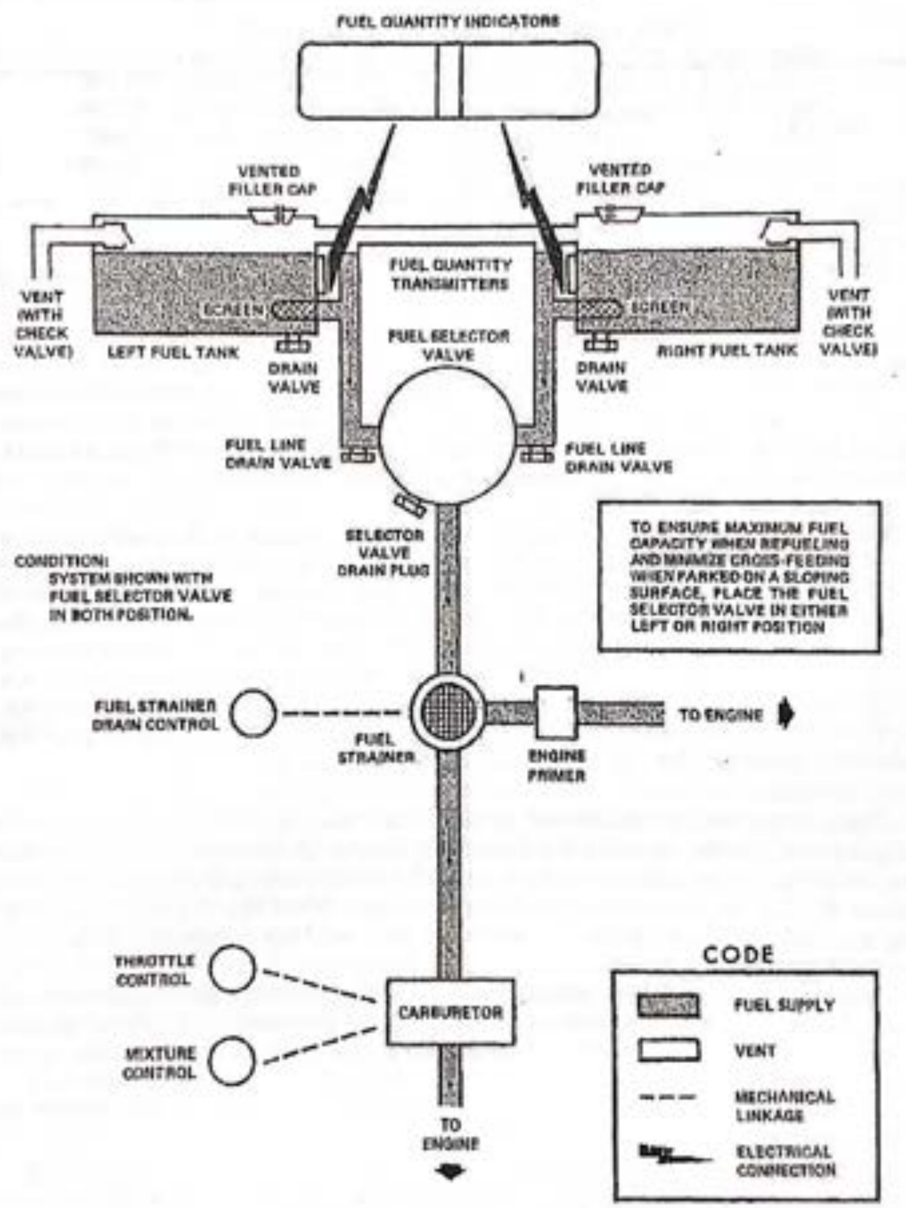


Figure 7-6. Fuel System

FUEL QUANTITY DATA (U. S. GALLONS)			
TANKS	TOTAL USABLE FUEL ALL FLIGHT CONDITIONS	TOTAL UNUSABLE FUEL	TOTAL FUEL VOLUME
STANDARD (44 Gal. Each)	84	4	88

Figure 7-7. Fuel Quantity Data

The airplane may be serviced to a reduced capacity to permit heavier cabin loadings. This is accomplished by filling each tank to the bottom edge of the fuel filler collar, thus giving a reduced fuel load of 34.5 gallons in each tank (32.5 gallons usable in all flight conditions).

Fuel quantity is measured by two float-type fuel quantity transmitters (one in each tank) and indicated by two electrically-operated fuel quantity indicators on the right side of the instrument panel. An empty tank is indicated by a red line and the letter E. When an indicator shows an empty tank, approximately 4.0 gallons remain as unusable fuel for operations on either the LEFT ON or RIGHT ON fuel selector valve positions. An additional 2.0 gallons are available for operations with the fuel selector valve in the BOTH ON position. The indicators cannot be relied upon for accurate readings during skids, slips, or unusual attitudes.

The amount of unusable fuel is relatively small due to the dual outlets of each tank. The maximum unusable fuel quantity, as determined from the most critical flight condition, is about 4.0 gallons total. This quantity was not exceeded by any other reasonable flight condition, including prolonged 2000 foot full-rudder sideslips in the landing configuration.

The fuel selector valve should be in the BOTH ON position for takeoff, climb, landing, and maneuvers that involve prolonged slips or skids. Operation from either LEFT ON or RIGHT ON tank is reserved for level flight only.

NOTE

When the fuel selector valve handle is in the BOTH ON position in cruising flight, unequal fuel flow from each tank may occur if the wings are not maintained exactly level. Resulting wing heaviness can be alleviated gradually by turning the selector valve handle to the tank in the "heavy" wing.

NOTE

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

If a fuel tank quantity is completely exhausted in flight, it is recommended that the fuel selector valve be switched back to the BOTH ON position for the remainder of the flight. This will allow some fuel from the fuller tank to transfer back through the selector valve to the empty tank while in coordinated flight which in turn will prevent fuel starvation when operating in prolonged slips or skids.

The fuel system is equipped with drain valves to provide a means for the examination of fuel in the system for contamination and grade. The system should be examined before the first flight of every day and after each refueling, by using the sampler cup provided to drain fuel from the wing tank sumps, and fuel line drains, and by utilizing the fuel strainer drain under an access panel on the left side of the engine cowling. The fuel tanks should be filled after each flight to prevent condensation.

BRAKE SYSTEM

The airplane has a single-disc, hydraulically-actuated brake on each main landing gear wheel. Each brake is connected, by a hydraulic line, to a master cylinder attached to each of the pilot's rudder pedals. The brakes are operated by applying pressure to the top of either the left (pilot's) or right (copilot's) set of rudder pedals, which are interconnected. When the airplane is parked, both main wheel brakes may be set by utilizing the parking brake which is operated by a handle under the left side of the instrument panel. To apply the parking brake, set the brakes with the rudder pedals, pull the handle aft, and rotate it 90° down.

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

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

ELECTRICAL SYSTEM

The airplane is equipped with a 28-volt, direct-current electrical system (see figure 7-8). The system uses a battery, located aft of the rear cabin wall below the baggage floor, as the source of electrical energy and an engine-driven 60-amp alternator to maintain the battery's state of charge. Power is supplied to most general electrical and all avionics circuits through the primary bus bar and the avionics bus bar, which are interconnected by an avionics power switch. The primary bus bar is on anytime the master switch is turned on, and is not affected by starter or external power usage. Both bus bars are on anytime the master and avionics power switches are on.

CAUTION

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

MASTER SWITCH

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

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

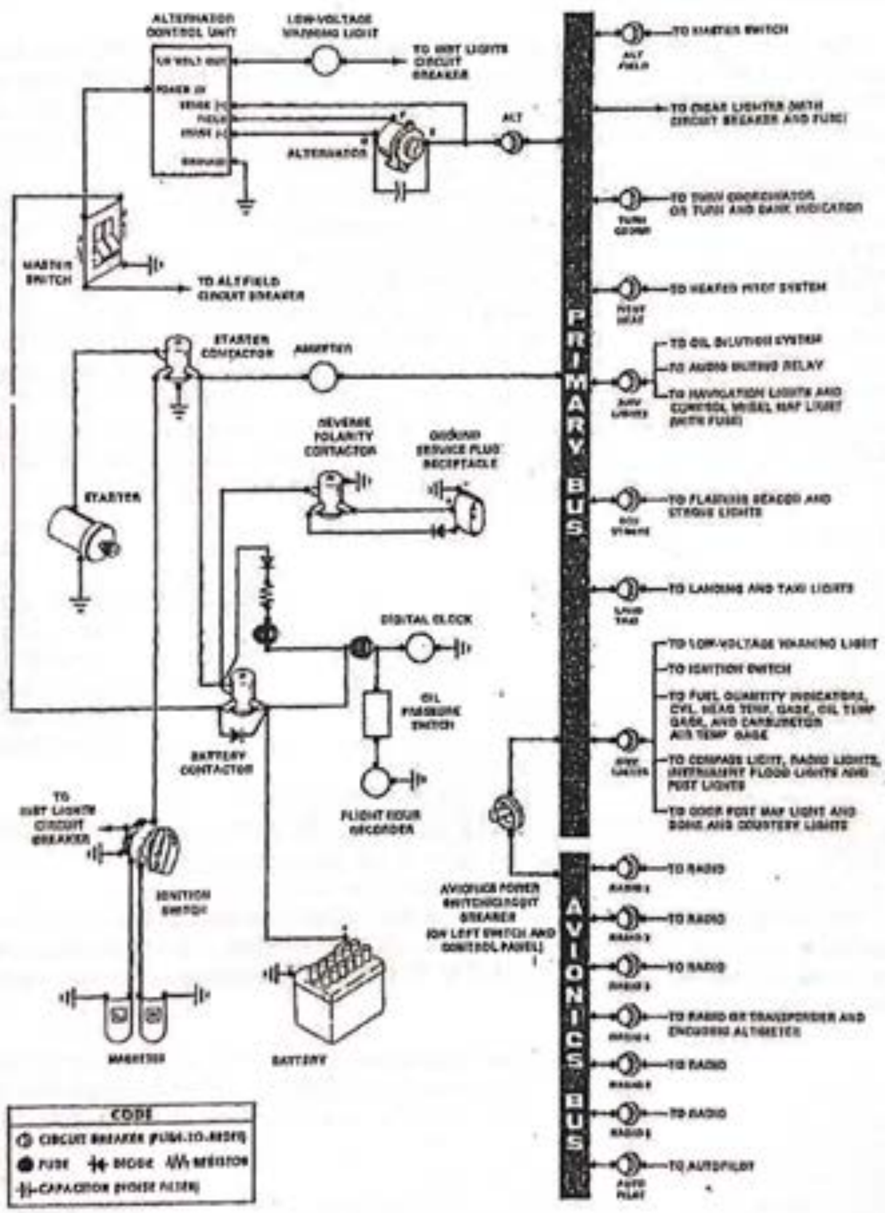


Figure 7-8. Electrical System

AVIONICS POWER SWITCH

Electrical power from the airplane primary bus to the avionics bus (see figure 7-8) is controlled by a toggle-type circuit breaker switch labeled AVIONICS POWER. The switch is located on the left side of the switch and control panel and is ON in the up position and off in the down position. With the switch in the off position, no electrical power will be applied to the avionics equipment, regardless of the position of the master switch or the individual equipment switches. The avionics power switch also functions as a circuit breaker. If an electrical malfunction should occur and cause the circuit breaker to open, electrical power to the avionics equipment will be interrupted and the switch toggle will automatically move to the off position. If this occurs, allow the circuit breaker to cool approximately two minutes before placing the toggle in the ON position again. If the circuit breaker opens again, do not reset it. The avionics power switch should be placed in the off position prior to turning the master switch on or off, starting the engine, or applying an external power source, and may be utilized in place of the individual avionics equipment switches.

AMMETER

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

ALTERNATOR CONTROL UNIT AND LOW-VOLTAGE WARNING LIGHT

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

In the event an over-voltage condition occurs, the alternator control unit automatically removes alternator field current which shuts down the alternator. The battery will then supply system current as shown by a discharge rate on the ammeter. Under these conditions, depending on electrical system load, the low-voltage warning light will illuminate when system voltage drops below normal. The alternator control unit may be reset by turning the master switch off and back on again. If the warning light does not illuminate, normal alternator charging has resumed; however, if the light does illuminate again, a malfunction has occurred, and the flight should be terminated as soon as practicable.

NOTE

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

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

CIRCUIT BREAKERS AND FUSES

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

GROUND SERVICE PLUG RECEPTACLE

A ground service plug receptacle may be installed to permit the use of an external power source for cold weather starting and during lengthy maintenance work on the electrical and electronic equipment. Details of the ground service plug receptacle are presented in Section 9, Supplements.

LIGHTING SYSTEMS

EXTERIOR LIGHTING

Conventional navigation lights are installed on the wing tips and tailcone stinger, dual landing/taxi lights are mounted in the cowling nose cap, and a flashing beacon is located on the top of the vertical fin. Additional lighting is available and includes a courtesy light under each wing just outboard of the cabin and a strobe light on each wing tip. Details of the strobe light system are presented in Section 9, Supplements.

All exterior lights, except the courtesy lights, are controlled by rocker-type switches on the left switch and control panel. The switches are ON in the up position and off in the down position. The courtesy lights are controlled by the dome light switch, labeled DOME/COURTESY, located in the overhead console.

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

INTERIOR LIGHTING

Instrument and control panel lighting is provided by flood lighting and integral lighting. Post lighting is also available. Two rheostat control knobs, labeled RADIO and INSTRUMENT, control the intensity of all instrument and control panel lighting. The rheostat control knobs are located on the left and right sides of the overhead console. A switch on the overhead console, labeled POST-FLOOD, is used to select either flood lighting or post lighting when both are installed.

Instrument panel lighting consists of a flood light equipped with a red lens in the overhead console, and a red flood light mounted under the edge of the instrument panel near the center to illuminate the controls mounted on the tunnel. The magnetic compass, engine instrument clusters, and fuel quantity indicators have integral red lighting, and the radio equipment is illuminated by integral white lighting. Intensity of the overhead flood light, compass light, instrument cluster lights, and tunnel flood light is controlled by the INSTRUMENT rheostat control knob. The intensity of the integral radio and audio control panel lighting is controlled by the RADIO rheostat control knob. If the airplane is equipped with avionics incorporating incandescent digital readouts, the RADIO control knob controls the light intensity of the digital readouts. For daylight operation, the control knob should be rotated full counterclockwise to produce maximum light intensity for the digital readouts only. Clockwise rotation of the control knob will provide normal variable light intensity for nighttime operation.

The instrument panel may be equipped with white post lights mounted at the edge of each instrument, and above the left and right switch and control panels. When post lights are installed, the red lights of the engine instrument clusters and fuel quantity indicators are replaced with white lights and the cluster lighting is connected to the post light switch. Therefore, when flood lighting is used, the instrument clusters and indicators will not have integral lighting. To utilize post lighting, place the switch labeled POST-FLOOD in the POST position. In this position, the overhead flood light will turn off automatically. Post light intensity is adjusted with the INSTRUMENT rheostat control knob.

A control wheel map light may be mounted on the bottom of the pilot's control wheel. The light illuminates the lower portion of the cabin, just forward of the pilot, and is helpful when checking maps and other flight data during night operations. To operate the light, first turn on the NAV LIGHTS switch, then adjust the map light's intensity with the rheostat control knob on the bottom of the control wheel.

A doorpost map light is also offered, and is located on the left forward doorpost. The light contains both red and white bulbs, and may be positioned to illuminate any area desired by the pilot. A switch on the left forward doorpost is labeled RED, OFF, and WHITE. Placing the switch in the top position will provide a red light. In the bottom position, standard white lighting is provided. The center position is OFF. Light intensity is controlled by the INSTRUMENT rheostat control knob.

A cabin dome light is located in the overhead console, and is operated by a switch adjacent to the light. To turn the light on, move the switch to the left. This will also operate the courtesy lights.

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

CABIN HEATING, VENTILATING AND DEFROSTING SYSTEM

The temperature and volume of airflow into the cabin can be regulated by manipulation of the push-pull CABIN HEAT and CABIN AIR control knobs (figure 7-9).

NOTE

> For improved partial heating on mild days, pull out the CABIN AIR knob slightly when the CABIN HEAT knob is out. This action increases the airflow through the system, increasing efficiency, and blends cool outside air with the exhaust manifold heated air.

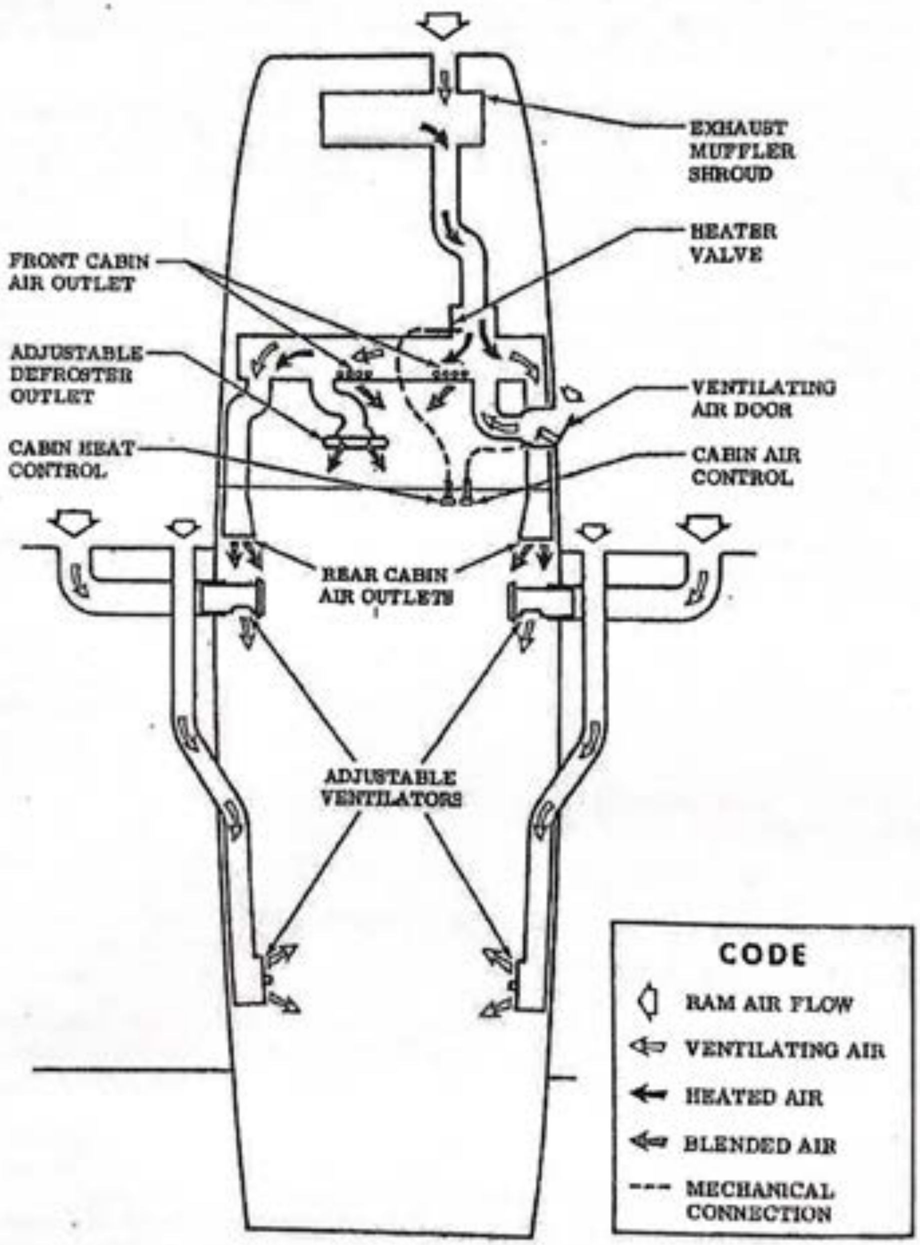


Figure 7-9. Cabin Heating, Ventilating, and Defrosting System

Front cabin heat and ventilating air is supplied by outlet holes spaced across a cabin manifold just forward of the pilot's and copilot's feet. Rear cabin heat and air is supplied by two ducts from the manifold, one extending down each side of the cabin to an outlet at the front door post at floor level. Windshield defrost air is also supplied by a duct leading from the cabin manifold to an outlet on top of the antiglare shield. Defrost airflow is controlled by a slide-type valve on the antiglare shield.

For cabin ventilation, pull the CABIN AIR knob out, with the CABIN HEAT knob pushed full in. To raise the air temperature, pull the CABIN HEAT knob out until the desired temperature is attained. Additional heat is available by pulling the knob out farther; maximum heat is available with the CABIN HEAT knob pulled out and the CABIN AIR knob pushed full in.

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

PITOT-STATIC SYSTEM AND INSTRUMENTS

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

The heated pitot system consists of a heating element in the pitot tube, a rocker-type switch labeled PITOT HEAT, a 5-amp circuit breaker on the switch and control panel, and associated wiring. When the pitot heat switch is turned on, the element in the pitot tube is heated electrically to maintain proper operation in possible icing conditions. Pitot heat should be used only as required.

A static pressure alternate source valve may be installed adjacent to the master switch for use when the external static source is malfunctioning. This valve supplies static pressure from inside the cabin instead of the external static ports.

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

Pressures within the cabin will vary with open cabin ventilators and windows. Refer to Sections 3 and 5 for the effect of the alternate static source on airspeed and altimeter readings with windows closed.

AIRSPEED INDICATOR

The airspeed indicator is calibrated in knots and miles per hour. Limitation and range markings (in KIAS) include the white arc (49 to 90 knots), green arc (55 to 139 knots), yellow arc (139 to 169 knots), and a red line (169 knots).

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

RATE-OF-CLIMB INDICATOR

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

ALTIMETER

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

VACUUM SYSTEM AND INSTRUMENTS

An engine-driven vacuum system (see figure 7-10) is available and provides the suction necessary to operate the attitude indicator and directional indicator. The system consists of a vacuum pump on the engine, a vacuum relief valve and vacuum system air filter on the aft side

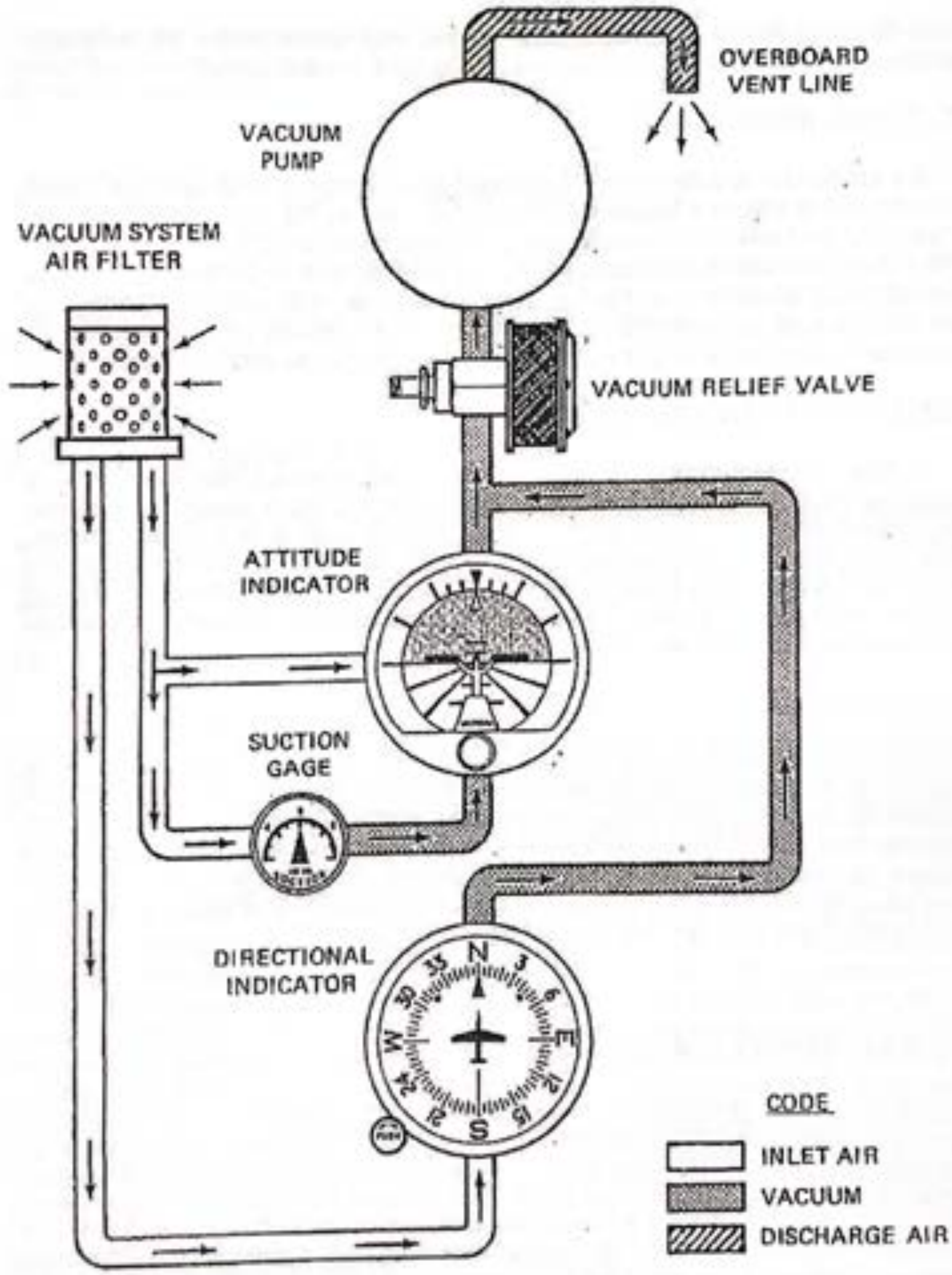


Figure 7-10. Vacuum System

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

ATTITUDE INDICATOR

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

DIRECTIONAL INDICATOR

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

SUCTION GAGE

The suction gage, located on the upper left side of the instrument panel when the airplane is equipped with a vacuum system, is calibrated in inches of mercury and indicates suction available for operation of the attitude and directional indicators. The desired suction range is 4.5 to 5.4 inches of mercury. A suction reading below this range may indicate a system malfunction or improper adjustment, and in this case, the indicators should not be considered reliable.

STALL WARNING SYSTEM

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

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

AVIONICS SUPPORT EQUIPMENT

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

AUDIO CONTROL PANEL

Operation of radio equipment is covered in Section 9 of this handbook. When one or more radios are installed, a transmitter/audio switching system is provided (figure 7-11). The operation of this switching system is described in the following paragraphs.

TRANSMITTER SELECTOR SWITCH

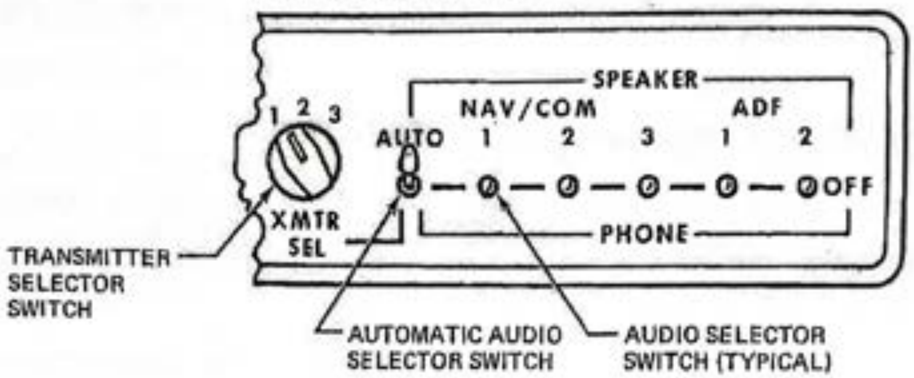
A rotary type transmitter selector switch, labeled XMTR SEL, is provided to connect the microphone to the transmitter the pilot desires to use. To select a transmitter, rotate the switch to the number corresponding to that transmitter. The numbers 1, 2 and 3 above the switch correspond to the top, second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

The audio amplifier in the NAV/COM radio is required for speaker and transmitter operation. The amplifier is automatically selected, along with the transmitter, by the transmitter selector switch. As an example, if the number 1 transmitter is selected, the audio amplifier in the associated NAV/COM receiver is also selected, and functions as the amplifier for ALL speaker audio. In the event the audio amplifier in use fails, as evidenced by loss of all speaker audio and transmitting capability of the selected transmitter, select another transmitter. This should re-establish speaker audio and transmitter operation. Since headset audio is not affected by audio amplifier operation, the pilot should be aware that, while utilizing a headset, the only indication of audio amplifier failure is loss of the selected transmitter. This can be verified by switching to the speaker function.

AUTOMATIC AUDIO SELECTOR SWITCH

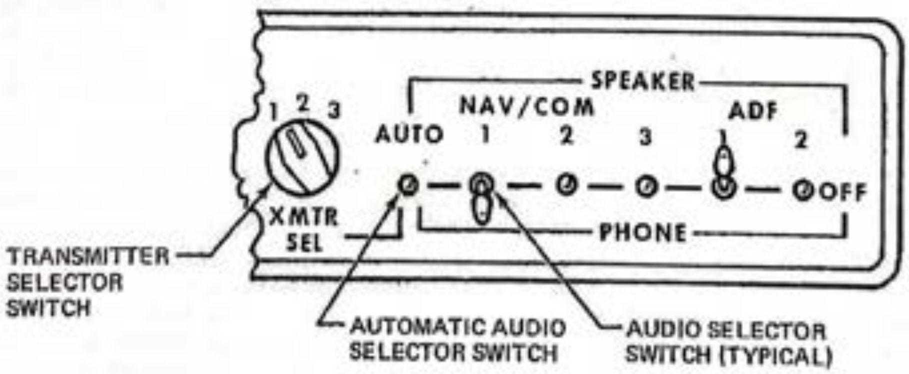
A toggle switch, labeled AUTO, can be used to automatically match the appropriate NAV/COM receiver audio to the transmitter being selected.

AUTOMATIC AUDIO SELECTION



As illustrated, the number 1 transmitter is selected, the AUTO selector switch is in the SPEAKER position, and the NAV/COM 1, 2 and 3 and ADF 1 and 2 audio selector switches are in the OFF position. With the switches set as shown, the pilot will transmit on the number 1 transmitter and hear the number 1 NAV/COM receiver through the airplane speaker.

INDIVIDUAL AUDIO SELECTION



As illustrated, the number 1 transmitter is selected, the AUTO selector switch is in the OFF position, the number 1 NAV/COM receiver is in the PHONE position, and the number 1 ADF is in the SPEAKER position. With the switches set as shown, the pilot will transmit on the number 1 transmitter and hear the number 1 NAV/COM receiver on a headset; while the passengers are listening to the ADF audio through the airplane speaker. If another audio selector switch is placed in either the PHONE or SPEAKER position, it will be heard simultaneously with either the number 1 NAV/COM or number 1 ADF respectively.

Figure 7-11. Audio Control Panel

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

NOTE

Cessna radios are equipped with sidetone capability (monitoring of the operator's own voice transmission). Sidetone will be heard on either the airplane speaker or a headset as selected with the AUTO selector switch. Sidetone may be eliminated by placing the AUTO selector switch in the OFF position, and utilizing the individual radio selector switches. Adjustment of speaker sidetone volume is accomplished by adjusting the sidetone potentiometer located inside the audio control panel. During adjustment, be aware that if the sidetone level is set too high it can cause audio feedback (squeal) when transmitting. Headphone sidetone level adjustment to accommodate the use of the different type headsets is accomplished by adjusting potentiometers in the NAV/COM radios.

AUDIO SELECTOR SWITCHES

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

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

NOTE

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

MICROPHONE-HEADSET INSTALLATIONS

Three types of microphone-headset installations are offered. The standard system provided with avionics equipment includes a hand-held microphone and separate headset. The keying switch for this microphone is on the microphone. Two optional microphone headset installations are also available; these feature a single-unit microphone-headset combination which permits the pilot to conduct radio communications without interrupting other control operations to handle a hand-held microphone. One microphone-headset combination is offered without a padded headset and the other version has a padded headset. The microphone-headset combinations utilize a remote keying switch located on the left grip of the pilot's control wheel. The microphone and headset jacks are located on the left side of the instrument panel. Audio to all three headsets is controlled by the individual audio selector switches and adjusted for volume level by using the selected receiver volume controls.

NOTE

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

STATIC DISCHARGERS

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

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

SECTION 8
AIRPLANE HANDLING, SERVICE & MAINTENANCE

TABLE OF CONTENTS

INTRODUCTION

This section contains factory-recommended procedures for proper ground handling and routine care and servicing of your Cessna. It also identifies certain inspection and maintenance requirements which must be followed if your airplane is to retain that new-plane performance and dependability. It is wise to follow a planned schedule of lubrication and preventive maintenance based on climatic and flying conditions encountered in your locality.

Keep in touch with your Cessna Dealer and take advantage of his knowledge and experience. He knows your airplane and how to maintain it. He will remind you when lubrications and oil changes are necessary, and about other seasonal and periodic services.

IDENTIFICATION PLATE

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

OWNER FOLLOW-UP SYSTEM

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

PUBLICATIONS

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

- CUSTOMER CARE PROGRAM BOOK
- PILOT'S OPERATING HANDBOOK AND FAA APPROVED AIRPLANE FLIGHT MANUAL FOR YOUR
  - AIRPLANE
  - AVIONICS AND AUTOPILOT
- PILOT'S CHECKLISTS
- POWER COMPUTER
- SALES AND SERVICE DEALER DIRECTORY
- DO'S AND DON'TS ENGINE BOOKLET

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

- INFORMATION MANUAL (Contains Pilot's Operating Handbook Information)
- SERVICE MANUALS AND PARTS CATALOGS FOR YOUR
  - AIRPLANE
  - ENGINE AND ACCESSORIES
  - AVIONICS AND AUTOPILOT

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

NOTE

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

AIRPLANE FILE

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

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

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

Cessna recommends that these items, plus the Pilot's Checklists, Power Computer, Customer Care Program book and Customer Care Card, be carried in the airplane at all times.

AIRPLANE INSPECTION PERIODS

FAA REQUIRED INSPECTIONS

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

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

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

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

CESSNA PROGRESSIVE CARE

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

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

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

CESSNA CUSTOMER CARE PROGRAM

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

Coupons attached to the Program book entitle you to an initial inspection and either a Progressive Care Operation No. 1 or the first 100-

hour inspection within the first 6 months of ownership at no charge to you. If you take delivery from your Dealer, the initial inspection will have been performed before delivery of the airplane to you. If you pick up your airplane at the factory, plan to take it to your Dealer reasonably soon after you take delivery, so the initial inspection may be performed allowing the Dealer to make any minor adjustments which may be necessary.

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

PILOT CONDUCTED PREVENTIVE MAINTENANCE

A certified pilot who owns or operates an airplane not used as an air carrier is authorized by FAR Part 43 to perform limited maintenance on his airplane. Refer to FAR Part 43 for a list of the specific maintenance operations which are allowed.

NOTE

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

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

ALTERATIONS OR REPAIRS

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

GROUND HANDLING

When maneuvering the airplane by hand, push at the front spar of the stabilizer adjacent to the fuselage, at the root of the dorsal fin, and at the landing gear or strut root fitting. Do not lift the empennage by the elevator or outboard surfaces of the horizontal stabilizer; likewise, do not shove sideways on the upper portion of the fin. Retractable tailcone lift handles are available to facilitate ground handling.

PARKING

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

TIE-DOWN

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

1. Set the parking brake and install the control wheel lock.
2. Install a surface control lock over the fin and rudder.
3. Tie sufficiently strong ropes or chains (700 pounds tensile strength) to the wing tie-down fittings and secure each rope to a ramp tie-down.
4. Tie a rope or chain to the tail gear tie-down fitting and secure to a ramp tie-down.
5. Install a pitot tube cover.

JACKING

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

A jack pad assembly is available to facilitate jacking individual main gear. When using the individual gear strut jack pad, flexibility of the gear strut will cause the main wheel to slide inboard as the wheel is raised, tilting the jack. The jack must then be lowered for a second jacking operation. Do not jack both main wheels simultaneously using the individual main gear jack pads.

A tail wheel jack pad is available to facilitate raising the tail wheel. The tail wheel may also be raised by the retractable tailcone lift handles (if installed) and allowing the tailcone to rest on a suitable padded stand placed under an aft fuselage bulkhead.

LEVELING

The reference point for leveling the airplane longitudinally is the lower surface of either upper door sill. The tail must be raised until the bubble in the level is centered. Corresponding points on both upper door sills may be used to level the airplane laterally.

FLYABLE STORAGE

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

WARNING

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

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

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

SERVICING

In addition to the PREFLIGHT INSPECTION covered in Section 4, COMPLETE servicing, inspection, and test requirements for your airplane are detailed in the Service Manual. The Service Manual outlines all items which require attention at 50, 100, and 200 hour intervals plus those items which require servicing, inspection, and/or testing at special intervals.

Since Cessna Dealers conduct all service, inspection, and test procedures in accordance with applicable Service Manuals, it is recommended that you contact your Cessna Dealer concerning these requirements and begin scheduling your airplane for service at the recommended intervals.

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

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

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

ENGINE OIL

GRADE -- Aviation Grade SAE 50 Above 4°C (40°F).
Aviation Grade SAE 10W30 or SAE 30 Below 4°C (40°F).
Multi-viscosity oil with a range of SAE 10W30 is recommended for improved starting in cold weather. Ashless dispersant oil, conforming to Continental Motors Specification MHS-24 (and all revisions thereto), must be used.

NOTE

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

CAPACITY OF ENGINE SUMP -- 12 Quarts.
Do not operate on less than 9 quarts. To minimize loss of oil through breather, fill to 10 quart level for normal flights of less than 3 hours. For extended flight, fill to 12 quarts. These quantities refer to oil dipstick level readings. During oil and oil filter changes, one additional quart is required when the filter is changed.

OIL DIPSTICK CALIBRATIONS

The oil dipstick is calibrated for both landplane and floatplane/amphibian use. Oil level readings for the floatplane/amphibian will register below the calibrations for the landplane due to the difference in attitude of the airplane. When checking the oil level, take precautions to assure that you are using the correct calibrations for your airplane.

The landplane side of the dipstick is marked with four lines representing six, eight, ten and twelve quarts. The bottom line is the six quart level and the top line is the twelve quart (full) level. The floatplane/amphibian side of the dipstick has two x marks. The lower mark indicates nine quarts and the upper mark indicates twelve quarts.

OIL AND OIL FILTER CHANGE --

After the first 25 hours of operation, drain engine oil sump and clean the oil pressure screen. If an oil filter is installed, change the filter at this time. Refill sump with straight mineral oil and use until a total of 50 hours has accumulated or oil consumption has stabilized; then change to dispersant oil. On airplanes not equipped with an oil filter, drain the engine oil sump and clean the oil pressure screen each 50 hours thereafter. On airplanes which have an oil filter, the oil change interval may be extended to 100-hour intervals, providing the oil filter is changed at 50-hour intervals. Change engine oil at least every 6 months even though less than the recommended hours have accumulated. Reduce intervals for prolonged operation in dusty areas, cold climates, or when short flights and long idle periods result in sludging conditions.

NOTE

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

FUEL

APPROVED FUEL GRADES (AND COLORS) --
100LL Grade Aviation Fuel (Blue).
100 (Formerly 100/130) Grade Aviation Fuel (Green).
CAPACITY EACH TANK -- 44 Gallons.

REDUCED CAPACITY EACH TANK (WHEN FILLED TO BOTTOM OF FUEL FILLER COLLAR) -- 34.5 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.

LANDING GEAR

MAIN WHEEL TIRE PRESSURE -- 30 PSI on 6.00-6, 6-Ply Rated Tires.
23 PSI on 8.00-6, 6-Ply Rated Tires.
TAIL WHEEL TIRE PRESSURE -- 60 PSI to 70 PSI Max. on 8.00-2.80, 4-Ply Rated Tire.

CLEANING AND CARE

WINDSHIELD-WINDOWS

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

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

NOTE

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

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

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

PAINTED SURFACES

The painted exterior surfaces of your new Cessna have a durable, long lasting finish and, under normal conditions, require no polishing or buffing. Approximately 10 days are required for the paint to cure completely; in most cases, the curing period will have been completed prior to delivery of the airplane. In the event that polishing or buffing is required within the curing period, it is recommended that the work be done by someone experienced in handling uncured paint. Any Cessna Dealer can accomplish this work.

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

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

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

PROPELLER CARE

Preflight inspection of propeller blades for nicks, and wiping them occasionally with an oily cloth to clean off grass and bug stains will assure long, trouble-free service. Small nicks on the propeller, particularly near the tips and on the leading edges, should be dressed out as soon as possible since these nicks produce stress concentrations, and if ignored, may result in cracks. Never use an alkaline cleaner on the blades; remove grease and dirt with Stoddard solvent.

ENGINE CARE

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

CAUTION

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

INTERIOR CARE

The standard interior of your airplane is furnished with wear-resistant, hard surface materials designed for maximum usage with minimum upkeep. However, as with any furnishing, the measure of lasting appearance and endurance afforded by the interior is dependent upon the degree of care.

Materials used on the cabin floor and sidewalls are not easily soiled or stained. Dust and loose dirt should be picked up with a vacuum cleaner. Stubborn dirt can be wiped off with a cloth moistened in clean water. Mild soap suds, used sparingly, will remove grease. The soap should be removed with a clean damp cloth.

Care of the seating materials is identical to care of the furnishings in your home. Vacuum clean the seats regularly to remove dust and loose dirt.

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

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

Soiled upholstery and carpet may be cleaned with foam-type detergent, used according to the manufacturer's instructions. To minimize wetting the fabric, keep the foam as dry as possible and remove it with a vacuum cleaner.

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

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

SECTION 9
SUPPLEMENTS
(Optional Systems Description & Operating Procedures)

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

INTRODUCTION

This section consists of a series of supplements, each covering a single optional system which may be installed in the airplane. Each supplement contains a brief description, and when applicable, operating limitations, emergency and normal procedures, and performance. As listed in the Table of Contents, the supplements are classified under the headings of general and avionics, and are arranged alphabetically and numerically to make it easier to locate a particular supplement. Other routinely installed items of optional equipment, whose function and operational procedures do not require detailed instructions, are discussed in Section 7.

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

SUPPLEMENT

CARBURETOR AIR TEMPERATURE GAGE

SECTION 1
GENERAL

The carburetor air temperature gage provides a means of detecting carburetor icing conditions. The gage is located on the left side of the instrument panel. It is marked in 5° increments from -30°C to +30°C, and has a yellow arc between -15°C and +5°C which indicates the temperature range most conducive to carburetor icing.

SECTION 2
LIMITATIONS

There is no change to the airplane limitations when the carburetor air temperature gage is installed.

SECTION 3
EMERGENCY PROCEDURES

There is no change to the airplane emergency procedures when the carburetor air temperature gage is installed.

SECTION 4
NORMAL PROCEDURES

There is no change to the airplane normal procedures when the carburetor air temperature gage is installed. It is good practice to monitor the gage periodically and keep the needle out of the yellow arc during possible carburetor icing conditions.

SECTION 5
PERFORMANCE

There is no change to the airplane performance when the carburetor air temperature gage is installed.

SUPPLEMENT

DIGITAL CLOCK

SECTION 1
GENERAL

The Astro Tech LC-2 Quartz Chronometer (see figure 1) is a precision, solid state time keeping device which will display to the pilot the time-of-day, the calendar date, and the elapsed time interval between a series of selected events, such as in-flight check points or legs of a cross-country flight, etc. These three modes of operation function independently and can be alternately selected for viewing on the four digit liquid crystal display (LCD) on the front face of the instrument. Three push button type switches directly below the display control all time keeping functions. These control functions are summarized in figures 2 and 3.

The digital display features an internal light (back light) to ensure good visibility under low cabin lighting conditions or at night. The intensity of the back light is controlled by the INSTRUMENT lights rheostat. In addition, the display incorporates a test function (see figure 1) which allows checking that all elements of the display are operating. To activate the test function, press the LH and RH buttons at the same time.

SECTION 2
LIMITATIONS

There is no change to the airplane limitations when the digital clock is installed.

SECTION 3
EMERGENCY PROCEDURES

There is no change to the airplane emergency procedures when the digital clock is installed.

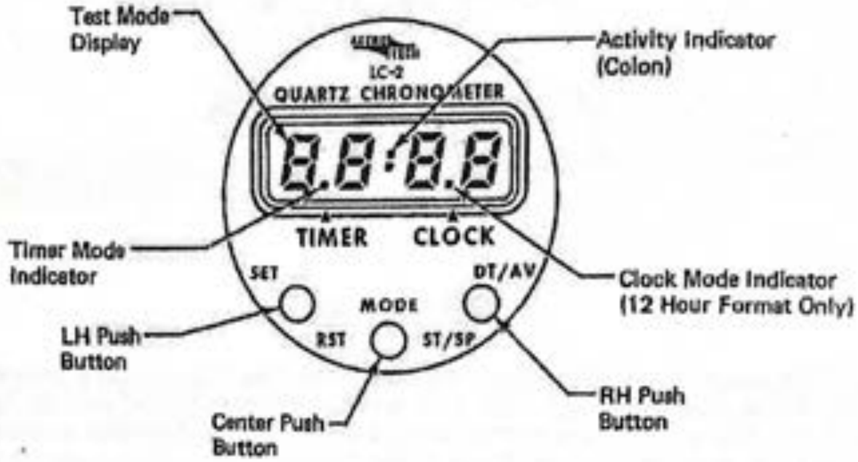


Figure 1. Digital Clock

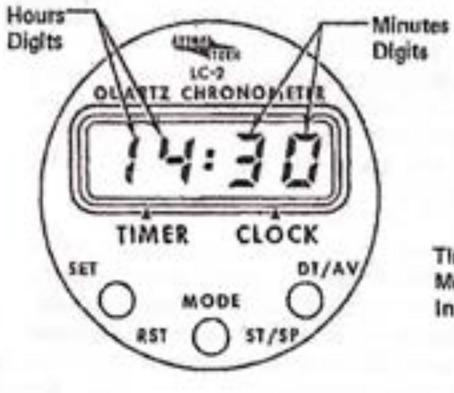
SECTION 4
NORMAL PROCEDURES

CLOCK AND DATE OPERATION

When operating in the clock mode (see figure 2), the display shows the time of day in hours and minutes while the activity indicator (colon) will blink off for one second each ten seconds to indicate proper functioning. If the RH push button is pressed momentarily, while in the clock mode, the calendar date appears numerically on the display with month of year to the left of the colon and day of the month shown to the right of the colon. The display automatically returns to the clock mode after approximately 1.5 seconds. However, if the RH button is pressed continuously longer than approximately two seconds, the display will return from the date to the clock mode with the activity indicator (colon) blinking altered to show continuously or be blanked completely from the display. Should this occur, simply press the RH button again for two seconds or longer, and correct colon blinking will be restored.

NOTE

> The clock mode is set at the factory to operate in the 24-hour format. However, 12-hour format operation may be selected by changing the position of an internal slide switch accessible through a small hole on the bottom of the instrument case. Notice that in the 24-hour format, the clock mode indicator does not appear.

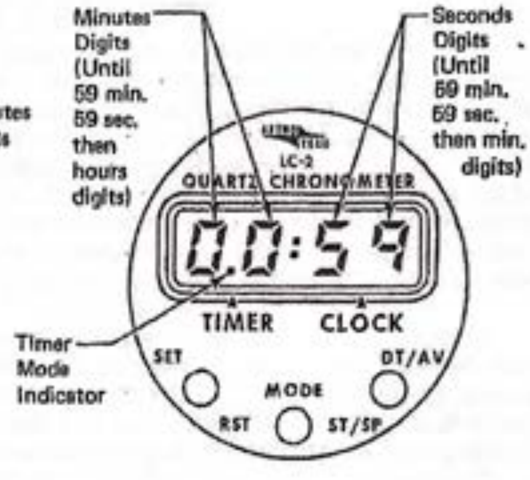


LH Button: Sets date and time of day (when used with RH button).

Center Button: Alternately displays clock or timer status

RH Button: Shows calendar date momentarily; display returns to clock mode after 1.5 seconds.

Figure 2. Clock Mode



LH Button: Resets timer to "zero".

Center Button: Alternately displays clock or timer status

RH Button: Alternately starts and stops timer, timer starts from any previously accumulated total.

Figure 3. Timer Mode

SETTING CORRECT DATE AND TIME

The correct date and time are set while in the clock mode using the LH and RH push buttons as follows: press the LH button once to cause the date to appear with the month flashing. Press the RH button to cause the month to advance at one per second (holding button), or one per push until the correct month appears. Push the LH button again to cause the day of month to appear flashing, then advance as before using RH button until correct day of month appears.

Once set correctly, the date advances automatically at midnight each day until February 29 of each leap year, at which time one day must be added manually.

Pressing the LH button two additional times will cause the time to appear with the hours digits flashing. Using the RH button as before, advance the hour digits to the correct hour as referenced to a known time standard. Another push of the LH button will now cause the minutes digits to flash. Advance the minutes digits to the next whole minute to be reached by the time standard and "hold" the display by pressing the LH button once more. At the exact instant the time standard reaches the value "held" by the display, press the RH button to restart normal clock timing, which will now be synchronized to the time standard.

In some instances, however, it may not be necessary to advance the minutes digits of the clock; for example when changing time zones. In such a case, do not advance the minutes digits while they are flashing. Instead, press the LH button again, and the clock returns to the normal time keeping mode without altering the minutes timing.

TIMER OPERATION

The completely independent 24-hour elapsed timer (see figure 3) is operated as follows: press the center (MODE) push button until the timer mode indicator appears. Reset the display to "zero" by pressing the LH button. Begin timing an event by pressing the RH button. The timer will begin counting in minutes and seconds and the colon (activity indicator) will blink off for 1/10 second each second. When 59 minutes 59 seconds have accumulated, the timer changes to count in hours and minutes up to a maximum of 23 hours, 59 minutes. During the count in hours and minutes, the colon blinks off for one second each ten seconds. To stop timing the event, press the RH button once again and the time shown by the display is "frozen". Successive pushes of the RH button will alternately restart the count from the "held" total or stop the count at a new total. The hold status of the timer can be recognized by lack of colon activity, either continuously on or continuously off. The timer can be reset to "zero" at anytime using the LH button.

SECTION 5
PERFORMANCE

There is no change to the airplane performance when the digital clock is installed.

SUPPLEMENT

DOMED CABIN WINDOWS

SECTION 1
GENERAL

Special domed cabin windows are available to replace the openable flat windows in the cabin doors. These domed windows are tinted green and permit a line of vision beyond the side of the fuselage to provide almost vertical observance of the area beneath the airplane. Each domed window is held in the closed position by two detent-equipped latches.

SECTION 2
LIMITATIONS

The following information must be presented in the form of a placard located just below the lower forward corner of each window:

DO NOT OPEN
WINDOW ABOVE
105 KNOTS

SECTION 3
EMERGENCY PROCEDURES

There is no change to the airplane emergency procedures when domed cabin windows are installed.

SECTION 4
NORMAL PROCEDURES

The domed window operates in a fashion similiar to the standard "flat" openable window. To open the window, rotate the latches upward and push the window open.

SECTION 5
PERFORMANCE

There is a negligible change to the airplane performance when domed cabin windows are installed.

SUPPLEMENT

FLOATPLANE

SECTION 1
GENERAL

INTRODUCTION

This supplement, written especially for operators of the Cessna 180 Skywagon floatplane, provides information not found in the basic handbook. It contains procedures and data required for safe and efficient operation of the airplane equipped with Edo Model 628-2960 floats.

Information contained in the basic handbook for the 180 Skywagon, which is the same as that for the floatplane, is generally not repeated in this supplement.

DESCRIPTIVE DATA

PROPELLER

Propeller Manufacturer: McCauley Accessory Division.
Propeller Model Number: C2A34C204/90DCB-0.
Number of Blades: 2.
Propeller Diameter, Maximum: 90 inches.
Minimum: 88.5 inches.
Propeller Type: Constant speed and hydraulically actuated, with a low pitch setting of 12.9° and a high pitch setting of 26° (30 inch station).

MAXIMUM CERTIFICATED WEIGHTS

Takeoff: 2950 lbs.
Landing: 2950 lbs.
Weight in Baggage Compartment:
Baggage Area 1 - Station 82 to 108: 120 lbs.
Baggage Area 2 - Station 108 to 140: 50 lbs.

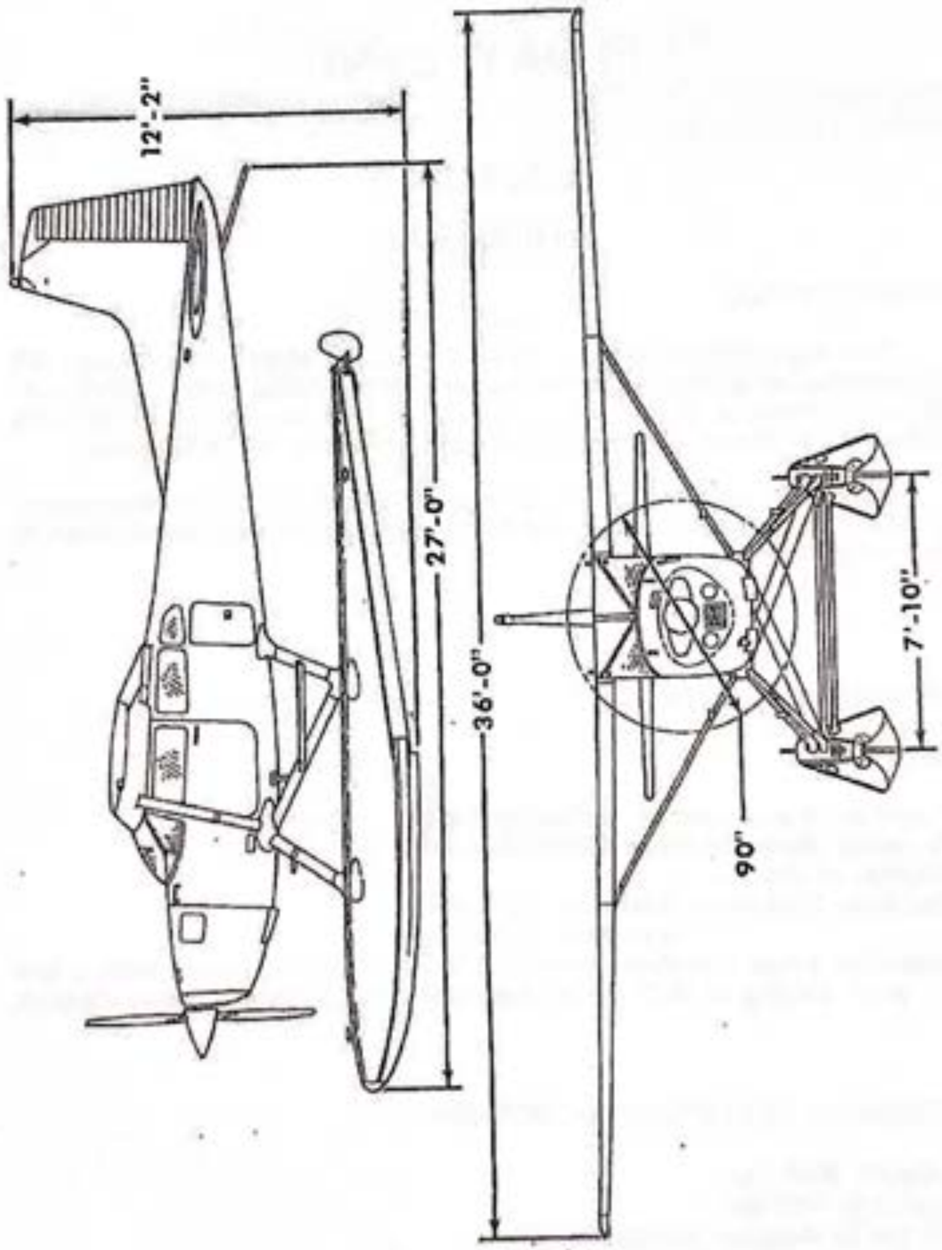


Figure 1. Three View (Sheet 1 of 2)

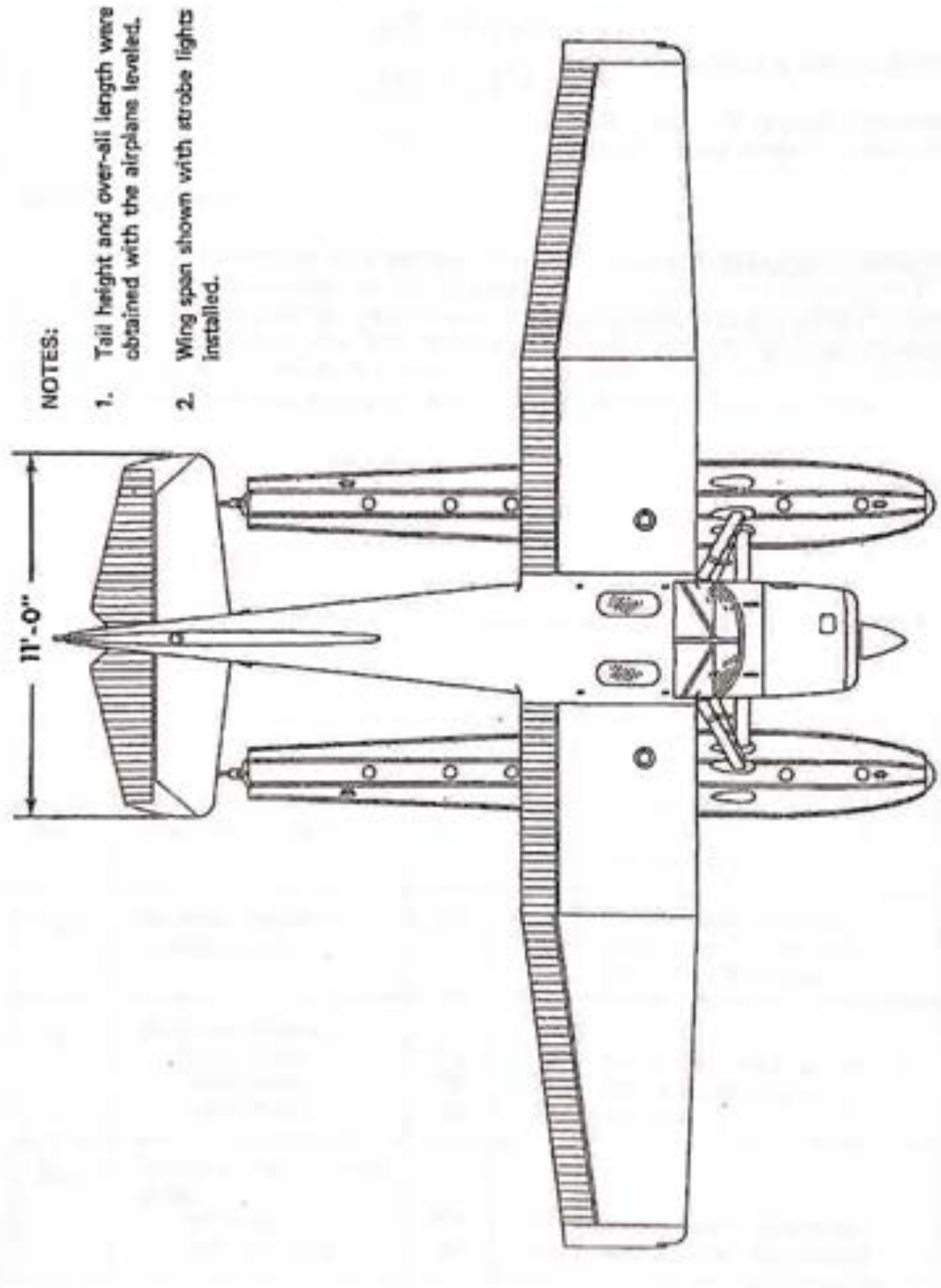


Figure 1. Three View (Sheet 2 of 2)

STANDARD AIRPLANE WEIGHTS

Standard Empty Weight: 1950 lbs.
Maximum Useful Load: 1000 lbs.

SPECIFIC LOADINGS

Wing Loading: 17.0 lbs./sq. ft.
Power Loading: 12.8 lbs./hp.

SECTION 2
LIMITATIONS

INTRODUCTION

Except as shown in this section, the floatplane operating limitations are the same as those for the 180 Skywagon landplane. The limitations in this section apply only to operations of the Model 180K equipped with Edo Model 628-2960 floats. The limitations included in this section have been approved by the Federal Aviation Administration. Observance of these operating limitations is required by Federal Aviation Regulations.

AIRSPEED LIMITATIONS

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

	SPEED	KCAS	KIAS	REMARKS
V_{NE}	Never Exceed Speed	164	169	Do not exceed this speed in any operation.
V_{NO}	Maximum Structural Cruising Speed	136	139	Do not exceed this speed except in smooth air, and then only with caution.
V_A	Maneuvering Speed: 2950 Pounds 2600 Pounds 2250 Pounds	 107 100 93	 109 102 95	Do not make full or abrupt control movements above this speed.
V_{FE}	Maximum Flap Extended Speed: 10^o Flaps 20^o - 40^o Flaps	 118 91	 120 90	Do not exceed these speeds with the given flap settings.

Figure 2. Airspeed Limitations

POWER PLANT LIMITATIONS

Propeller Manufacturer: McCauley Accessory Division.
Propeller Model Number: C2A34C204/90DCB-0.
Propeller Diameter, Maximum: 90 inches.
Minimum: 88.5 inches.
Propeller Blade Angle at 30 Inch Station, Low: 12.9°.
High: 26°.

WEIGHT LIMITS

Maximum Takeoff Weight: 2950 lbs.
Maximum Landing Weight: 2950 lbs.
Maximum Weight in Baggage Compartment:
Baggage Area 1 - Station 82 to 108: 120 lbs.
Baggage Area 2 - Station 108 to 140: 50 lbs.

CENTER OF GRAVITY LIMITS

Center of Gravity Range:
Forward: 36.0 inches aft of datum at 2400 lbs. or less, with straight line variation to 38.8 inches aft of datum at 2950 lbs.
Aft: 43.9 inches aft of datum at all weights.
Reference Datum: Front face of firewall.

MANEUVER LIMITS

The maneuver limits defined in the basic handbook are applicable to the floatplane.

OTHER LIMITATIONS

FLAP LIMITATIONS

Approved Takeoff Range: 0° to 20°.
Approved Landing Range: 0° to 40°.

NOTE

Wing flaps must be retracted to 20° immediately following power application for a balked landing go-around.

PLACARDS

The following information must be displayed in the form of composite or individual placards in addition to those specified in the basic handbook.

1. Near water rudder control:

WATER RUDDER ALWAYS UP EXCEPT WATER TAXIING

2. On instrument panel:

IN FLOATPLANE, AMPHIBIAN AND SKIPLANE RETRACT FLAPS TO 20° IMMEDIATELY AFTER APPLYING POWER FOR BALKED LANDING GO-AROUND.

3. On inside of oil filler access door:

FLOATPLANE ONLY SEE BACK OF DIPSTICK FOR OIL LEVEL UPPER "X" 12 QTS LOWER "X" 9 QTS

4. In full view of the pilot:

CAUTION WHEN FLOATS ARE INSTALLED IT IS POSSIBLE TO EXCEED MAX GROSS WEIGHT WITH ALL SEATS OCCUPIED AND MINIMUM FUEL. CHECK WEIGHT AND BALANCE.

SECTION 3
EMERGENCY PROCEDURES

INTRODUCTION

Checklist and amplified procedures contained in the basic handbook generally should be followed. The additional or changed procedures specifically required for operation of the Model 180K equipped with Edo Model 628-2960 floats are presented in this section.

AIRSPEEDS FOR EMERGENCY OPERATION

The speeds listed below should be substituted, as appropriate, for the speeds contained in Section 3 for the basic handbook.

Engine Failure After Takeoff:	
Wing Flaps Up	70 KIAS
Wing Flaps Down 20°	65 KIAS
Maneuvering Speed:	
2950 Lbs	109 KIAS
2600 Lbs	102 KIAS
2250 Lbs	95 KIAS
Maximum Glide:	
2950 Lbs	75 KIAS
2600 Lbs	70 KIAS
2250 Lbs	65 KIAS
Precautionary Landing With Engine Power, Flaps Down	65 KIAS
Landing Without Engine Power:	
Wing Flaps Up	75 KIAS
Wing Flaps Down	65 KIAS

(OPERATIONAL CHECKLISTS)

ENGINE FAILURE

ENGINE FAILURE DURING TAKEOFF RUN

1. Throttle -- IDLE.
2. Control Wheel -- FULL AFT.
3. Mixture -- IDLE CUT-OFF.
4. Ignition Switch -- OFF.
5. Master Switch -- OFF.

FORCED LANDINGS

EMERGENCY LANDING ON WATER WITHOUT ENGINE POWER

1. Airspeed -- 75 KIAS (flaps UP).
   65 KIAS (flaps DOWN).
2. Mixture -- IDLE CUT-OFF.
3. Fuel Selector Valve -- OFF.
4. Ignition Switch -- OFF.
5. Master Switch -- OFF.
6. Water Rudders -- UP.
7. Wing Flaps -- AS REQUIRED.
8. Doors -- UNLATCH PRIOR TO APPROACH.
9. Touchdown -- SLIGHTLY TAIL LOW.
10. Control Wheel -- HOLD FULL AFT as floatplane decelerates.

EMERGENCY LANDING ON LAND WITHOUT ENGINE POWER

1. Airspeed -- 75 KIAS (flaps UP).
   65 KIAS (flaps DOWN).
2. Mixture -- IDLE CUT-OFF.
3. Fuel Selector Valve -- OFF.
4. Ignition Switch -- OFF.
5. Master Switch -- OFF.
6. Water Rudders -- UP.
7. Wing Flaps -- AS REQUIRED (40° recommended).
8. Doors -- UNLATCH PRIOR TO APPROACH.
9. Touchdown -- LEVEL ATTITUDE.
10. Control Wheel -- FULL AFT (after contact).

(AMPLIFIED PROCEDURES)

MAXIMUM GLIDE

After an engine failure in flight, the best glide speed as shown in figure 3 should be established as quickly as possible.

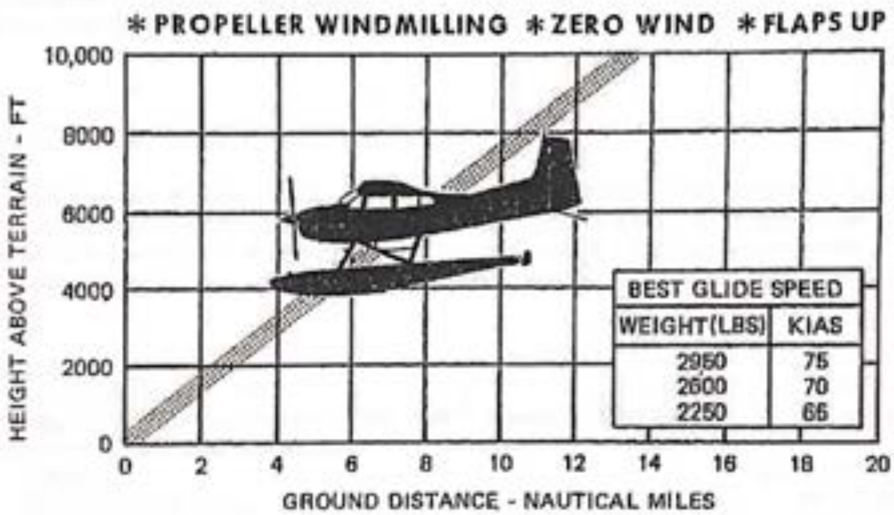


Figure 3. Maximum Glide

SECTION 4
NORMAL PROCEDURES

INTRODUCTION

Checklist and amplified procedures contained in the basic handbook generally should be followed. The additional or changed procedures specifically required for operation of the Model 180K equipped with Edo Model 628-2960 floats are presented in this section.

SPEEDS FOR NORMAL OPERATION

Unless otherwise noted, the following speeds are based on a maximum weight of 2950 pounds and may be used for any lesser weight. However, to achieve the performance specified in Section 5 of this supplement for takeoff distance, the speed appropriate to the particular weight must be used.

Takeoff:
- Normal Climb Out . . . . 70 KIAS
- Maximum Performance, Flaps 20°, Speed at 50 Feet . . . 60 KIAS

Enroute Climb, Flaps Up:
- Normal . . . . 80-90 KIAS
- Best Rate of Climb, Sea Level . . . . 79 KIAS
- Best Rate of Climb, 10,000 Feet . . . . 72 KIAS
- Best Angle of Climb, Sea Level . . . . 63 KIAS
- Best Angle of Climb, 10,000 Feet . . . . 66 KIAS

Landing Approach:
- Normal Approach, Flaps Up . . . . 70-80 KIAS
- Normal Approach, Flaps 40° . . . . 60-70 KIAS
- Maximum Performance Approach, Flaps 40° . . . . 65 KIAS

Balked Landing:
- Maximum Power, Flaps 20° . . . . 55 KIAS

Maximum Recommended Turbulent Air Penetration Speed:
- 2950 Lbs . . . . 109 KIAS
- 2600 Lbs . . . . 102 KIAS
- 2250 Lbs . . . . 95 KIAS

Maximum Demonstrated Crosswind Velocity:
- Takeoff or Landing . . . . 13 KNOTS

(CHECKLIST PROCEDURES)

PREFLIGHT INSPECTION

1. Pilot's Operating Handbook and Floatplane Supplement -- AVAILABLE IN THE AIRPLANE.
2. Floats and Float Fairings -- INSPECT for dents, cracks, scratches, etc.
3. Float Compartments -- INSPECT for water accumulation.

NOTE

Remove rubber balls which serve as stoppers on the standpipe in each float compartment and pump out any accumulation of water. Reinstall rubber balls with enough pressure for a snug fit.

4. Water Rudders -- CHECK freedom of movement and security.
5. Engine Oil Level -- CHECK. Use the side of the dipstick having two x marks. The lower mark indicates nine quarts and the upper mark indicates twelve quarts.

BEFORE STARTING ENGINE

1. Water Rudder Operation -- CHECK VISUALLY.
2. Water Rudders -- DOWN for taxiing (retraction lever positioned full forward).

TAKEOFF

1. Water Rudders -- UP (retraction lever full aft, catch engaged).
2. Wing Flaps -- 20° (second notch).
3. Cowl Flaps -- OPEN.
4. Carburetor Heat -- COLD.
5. Control Wheel -- HOLD FULL AFT.
6. Power -- FULL THROTTLE and 2400 RPM (advance slowly).
7. Control Wheel -- MOVE FORWARD when the nose stops rising to attain planing attitude (on the step).
8. Airspeed -- 45-55 KIAS.
9. Control Wheel -- APPLY LIGHT BACK PRESSURE to lift off.

NOTE

To reduce takeoff water run, the technique of raising one float out of the water may be used. This procedure is described in the amplified procedures in this section.

10. Climb Speed -- 65-75 KIAS. With obstacles ahead, climb at 60 KIAS.
11. Wing Flaps -- UP after all obstacles are cleared.

ENROUTE CLIMB

NORMAL CLIMB

1. Airspeed -- 80-90 KIAS.

MAXIMUM PERFORMANCE CLIMB

1. Airspeed -- 79 KIAS (sea level) to 72 KIAS (10,000 feet).

BEFORE LANDING

1. Water Rudders -- UP.
2. Wing Flaps -- 40°.
3. Airspeed -- 60-70 KIAS.

LANDING

1. Touchdown -- SLIGHTLY TAIL LOW.
2. Control Wheel -- HOLD FULL AFT as floatplane decelerates to taxi speed.

AFTER LANDING

1. Water Rudders -- DOWN.

SECURING AIRPLANE

1. Fuel Selector Valve -- LEFT ON or RIGHT ON to minimize cross-feeding and ensure maximum fuel capacity when refueling.

(AMPLIFIED PROCEDURES)

TAXIING

Taxi with water rudders down. It is best to limit the engine speed to 800 RPM for normal taxi because water piles up in front of the float bow at higher engine speeds. Taxiing with higher engine RPM may result in engine overheating and propeller erosion and will not appreciably increase the taxi speed.

During all low speed taxi operations, the elevator should be positioned to keep the float bows out of the water as far as possible. Normally, this requires holding the elevator control full aft.

For minimum taxi speed in close quarters, use idle RPM with full carburetor heat and a single magneto. This procedure is recommended for short periods of time only.

Although taxiing is very simple with the water rudders, it is sometimes necessary to "sail" the floatplane under high wind conditions. In addition to the normal flight controls, the wing flaps and cabin doors will aid in "sailing". Water rudders should be retracted during "sailing".

Rudder trim (if installed) may be used to reduce rudder pedal forces while taxiing in crosswinds or for extended sailing in one direction.

To taxi great distances, it may be advisable to taxi on the step with the water rudders retracted. Turns on the step may be made with safety providing they are not too sharp and if ailerons are used to counteract any overturning tendency.

TAKEOFF

Apply full throttle smoothly and hold the control wheel full aft. When the nose stops rising, move the control wheel forward slowly to place the floatplane on the step. Slow control movement and light control pressures produce the best results. Attempts to force the floatplane into the planing attitude will generally result in loss of speed and delay in getting on the step. The floatplane will assume a planing attitude which permits acceleration to takeoff speed (45-55 KIAS) at which time the floatplane will fly off smoothly.

The use of 20° wing flaps (second notch) throughout the takeoff run is recommended. Upon reaching a safe altitude and airspeed, retract the wing flaps slowly, especially when flying over glassy water because a loss of altitude is not very apparent over such a surface.

To clear an obstacle after takeoff with 20° wing flaps, use an obstacle clearance speed of 60 KIAS for maximum performance. Takeoff distances are shown in Section 5 for this technique, and on water conditions that are smooth but non-glassy. Under some adverse combinations of takeoff weight, pressure altitude, and air temperature, operation on glassy water may require significantly longer takeoff distances to accelerate to the lift-off speed, and allowance should be made for this.

If liftoff is difficult due to high lake elevation or glassy water, the following procedure is recommended: With the floatplane in the planing attitude, apply full aileron to raise one float out of the water. When one float leaves the water, apply slight elevator back pressure to complete the takeoff. Care must be taken to stop the rising wing as soon as the float is clear of the water, and in crosswinds, raise only the downwind wing. With one float out of the water, the floatplane accelerates to takeoff speed almost instantaneously.

If porpoising is encountered while on the step, apply additional control wheel back pressure to correct the excessively nose-low attitude. If this does not correct the porpoising, immediately cut power and allow the floatplane to slow to taxi speed at which time the takeoff can be initiated again.

For a crosswind takeoff, start the takeoff run with wing flaps up, ailerons partially deflected into the wind, and water rudders extended for better directional control. Flaps should be extended to 20° and the water rudders retracted when the floatplane is on the step; the remainder of the takoff is normal. If the floats are lifted from the water one at a time, the downwind float should be lifted first.

ENROUTE CLIMB

Normal climbs are performed at 80-90 KIAS with flaps up, 23 in. Hg (or full throttle) 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 79 KIAS at sea level, decreasing to 72 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 63 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

Observe the same engine operational limitations as for the landplane. Cruise power settings and the corresponding performance data are shown on the Cruise Performance charts, figure 9 of this supplement. Range and endurance information is shown in figures 10 and 11 of this supplement.

LANDING

Power-off landings may be made with any flap setting and, in most cases, touchdown should be at the slowest possible airspeed. Performance data is shown in Section 5 for this power-off technique with full flaps.

With glassy water, it is recommended that a power approach and landing be made with 20° wing flaps at a low rate of descent. The floatplane should be flown onto the water with no flare since the height above glassy water is difficult to judge. Power should be reduced and back pressure increased upon contacting the surface. If this glassy water techinique is used in conjunction with an obstacle clearance approach, allowance should be made for appreciably longer total distances than are shown in Section 5 to clear a 50-foot obstacle.

BALKED LANDING

In a balked landing (go-around) climb, the wing flap setting must be reduced to 20° immediately after full power is applied.

NOISE ABATEMENT

The certificated noise level for the Model 180K Floatplane at 2950 pounds maximum weight is 73.4 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

INTRODUCTION

The information presented in the Introduction, Use of Performance Charts, and Sample Problem paragraphs in Section 5 of the basic handbook is applicable to the floatplane. Using this information, and the performance charts in this supplement, complete flight planning may be accomplished.

Cruise performance data in this supplement applies to the Model 180K equipped with Edo Model 628-2960 floats and is based on a standard day temperature as shown on the charts. The effect of temperature variations from standard can be determined by using the applicable cruise charts in the basic handbook for the landplane.

DEMONSTRATED OPERATING TEMPERATURE

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

AIRSPEED CALIBRATION

NORMAL STATIC SOURCE

FLAPS UP										
KIAS	50	60	70	80	90	100	110	120	140	160
KCAS	50	60	69	79	89	98	108	117	137	156
FLAPS 20°										
KIAS	40	50	60	70	80	90	---	---	---	---
KCAS	40	50	60	70	80	90	---	---	---	---
FLAPS 40°										
KIAS	40	50	60	70	80	90	---	---	---	---
KCAS	39	49	59	70	80	91	---	---	---	---

Figure 4. Airspeed Calibration

STALL SPEEDS

CONDITIONS:
Power Off

NOTES:
1. Altitude loss during a stall recovery may be as much as 200 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
2950	UP	53	53	57	57	63	63	75	75
	20°	49	49	53	53	58	58	69	69
	40°	49	48	53	52	58	57	69	68

MOST FORWARD CENTER OF GRAVITY

WEIGHT LBS	FLAP DEFLECTION	ANGLE OF BANK							
		0°		30°		45°		60°	
		KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
2950	UP	55	55	59	59	65	66	78	78
	20°	51	51	55	55	61	61	72	72
	40°	50	49	54	53	59	58	71	69

Figure 5. Stall Speeds

TAKEOFF DISTANCE

MAXIMUM PERFORMANCE

CONDITIONS:
Flaps 20°
2400 RPM and Full Throttle
Cowl Flaps Open
Zero Wind

NOTE:
Decrease distances 10% for each 9 knots headwind.

WEIGHT LBS	TAKEOFF SPEED KIAS		PRESS ALT FT	0°C		10°C		20°C		30°C		40°C	
	LIFT OFF	AT 50 FT		WATER RUN	TOTAL TO CLEAR 50 FT OBS	WATER RUN	TOTAL TO CLEAR 50 FT OBS	WATER RUN	TOTAL TO CLEAR 50 FT OBS	WATER RUN	TOTAL TO CLEAR 50 FT OBS	WATER RUN	TOTAL TO CLEAR 50 FT OBS
2950	54	60	S.L.	1005	1670	1105	1820	1215	1985	1340	2165	1475	2365
			1000	1140	1875	1255	2050	1385	2240	1535	2455	1695	2690
			2000	1300	2120	1435	2325	1595	2550	1770	2805	1965	3090
			3000	1490	2410	1655	2655	1845	2925	2055	3235	2300	3585
			4000	1725	2765	1925	3055	2155	3390	2420	3775	2725	4210
			5000	2010	3200	2265	3560	2550	3975	2885	4460	3280	5020
2700	52	58	S.L.	760	1295	830	1405	910	1520	995	1650	1090	1785
			1000	855	1440	935	1565	1025	1700	1125	1850	1235	2010
			2000	965	1615	1060	1755	1165	1910	1280	2085	1410	2275
			3000	1095	1815	1205	1980	1330	2165	1470	2365	1625	2595
			4000	1250	2050	1380	2245	1530	2465	1685	2710	1880	2980
			5000	1435	2335	1595	2570	1770	2830	1975	3125	2205	3465

Figure 6. Takeoff Distance

RATE OF CLIMB

MAXIMUM

CONDITIONS:
Flaps Up
2400 RPM
Full Throttle
Cowl Flaps Open

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

WEIGHT LBS	PRESS ALT FT	CLIMB SPEED KIAS	RATE OF CLIMB - FPM		
			0°C	20°C	40°C
2950	S.L.	79	1035	950	860
	2000	77	900	820	735
	4000	76	770	690	615
	6000	74	640	565	490
	8000	73	510	440	---
	10,000	72	385	315	---

Figure 7. Rate of Climb

TIME, FUEL, AND DISTANCE TO CLIMB

MAXIMUM RATE OF CLIMB

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

NOTES:
1. Add 1.7 gallons of fuel for engine start, taxi and takeoff allowance.
2. Mixture 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
2950	S.L.	15	79	970	0	0	0
	1000	13	78	915	1	0.4	1
	2000	11	77	855	2	0.7	3
	3000	9	77	800	3	1.1	4
	4000	7	76	745	5	1.5	6
	5000	5	75	685	6	2.0	8
	6000	3	74	630	8	2.4	10
	7000	1	74	570	9	2.9	12
	8000	-1	73	515	11	3.5	15
	9000	-3	72	460	13	4.0	18
	10,000	-5	72	400	16	4.7	21

Figure 8. Time, Fuel, and Distance to Climb (Sheet 1 of 2)

TIME, FUEL, AND DISTANCE TO CLIMB

NORMAL CLIMB - 85 KIAS

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

NOTES:

1. Add 1.7 gallons of fuel for engine start, taxi and takeoff allowance.
2. Mixture 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
2950	S.L.	15	630	0	0	0
	1000	13	630	2	0.4	2
	2000	11	630	3	0.9	5
	3000	9	630	5	1.3	7
	4000	7	630	6	1.8	9
	5000	5	630	8	2.2	12
	6000	3	595	10	2.7	14
	7000	1	530	11	3.3	17
	8000	-1	460	13	3.8	20
	9000	-3	390	16	4.5	24
	10,000	-5	325	19	5.2	29

Figure 8. Time, Fuel, and Distance to Climb (Sheet 2 of 2)

CRUISE PERFORMANCE

PRESSURE ALTITUDE 2000 FEET

CONDITIONS
2950 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.

		STANDARD TEMPERATURE 11°C		
RPM	MP	% BHP	KTAS	GPH
2400	22	74	116	12.6
	21	69	113	11.8
	20	65	110	11.1
	19	60	106	10.3
2300	23	75	117	12.8
	22	70	114	12.0
	21	66	111	11.3
	20	62	107	10.5
2200	23	70	114	12.0
	22	66	111	11.3
	21	62	107	10.6
	20	58	103	9.9
2100	23	66	110	11.2
	22	62	107	10.5
	21	58	103	9.9
	20	54	99	9.3
	19	50	94	8.7
	18	46	89	8.1

Figure 9. Cruise Performance (Sheet 1 of 5)

CRUISE PERFORMANCE

PRESSURE ALTITUDE 4000 FEET

CONDITIONS:
2950 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.

		STANDARD TEMPERATURE 7°C		
RPM	MP	% BHP	KTAS	GPH
2400	22	76	120	13.0
	21	71	116	12.1
	20	66	113	11.3
	19	62	109	10.6
2300	23	76	120	13.1
	22	72	117	12.3
	21	68	114	11.5
	20	63	110	10.8
2200	23	72	117	12.3
	22	68	114	11.6
	21	64	110	10.9
	20	59	106	10.2
2100	23	67	114	11.5
	22	63	110	10.8
	21	59	106	10.1
	20	55	102	9.5
	19	51	97	8.9
	18	47	92	8.3

Figure 9. Cruise Performance (Sheet 2 of 5)

CRUISE PERFORMANCE

PRESSURE ALTITUDE 6000 FEET

CONDITIONS:
2950 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.

		STANDARD TEMPERATURE 3°C		
RPM	MP	% BHP	KTAS	GPH
2400	22	77	123	13.3
	21	73	120	12.4
	20	68	116	11.6
	19	64	112	10.8
2300	22	74	120	12.8
	21	69	117	11.8
	20	65	113	11.1
	19	60	109	10.3
2200	22	69	117	11.9
	21	65	113	11.1
	20	61	109	10.4
	19	57	105	9.7
2100	22	65	113	11.1
	21	61	109	10.4
	20	57	105	9.8
	19	53	100	9.2
	18	49	95	8.6
	17	45	88	8.0

Figure 9. Cruise Performance (Sheet 3 of 5)

CRUISE PERFORMANCE

PRESSURE ALTITUDE 8000 FEET

CONDITIONS:
2950 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.

		STANDARD TEMPERATURE -1°C		
RPM	MP	% BHP	KTAS	GPH
2400	21	74	123	12.7
	20	70	119	11.9
	19	65	115	11.1
	18	60	110	10.3
2300	21	71	120	12.1
	20	66	116	11.3
	19	62	112	10.6
	18	58	107	9.9
2200	21	67	117	11.4
	20	63	113	10.7
	19	58	108	10.0
	18	54	103	9.3
2100	21	63	113	10.7
	20	59	108	10.0
	19	54	103	9.4
	18	50	98	8.8
	17	46	91	8.2

Figure 9. Cruise Performance (Sheet 4 of 5)

CRUISE PERFORMANCE

PRESSURE ALTITUDE 10,000 FEET

CONDITIONS:
2950 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.

		STANDARD TEMPERATURE -5°C		
RPM	MP	% BHP	KTAS	GPH
2400	20	71	122	12.2
	19	67	118	11.4
	18	62	113	10.6
	17	57	108	9.8
2300	20	68	119	11.6
	19	64	115	10.9
	18	59	110	10.1
	17	55	104	9.4
2200	20	64	116	11.0
	19	60	111	10.2
	18	56	106	9.6
	17	51	100	8.9
2100	20	60	111	10.3
	19	56	107	9.6
	18	52	101	9.0
	17	48	94	8.4
	16	44	85	7.8

Figure 9. Cruise Performance (Sheet 5 of 5)

RANGE PROFILE
45 MINUTES RESERVE
84 GALLONS USABLE FUEL

CONDITIONS:
2950 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature
Zero Wind

NOTES:
1. This chart allows for the fuel used for engine start, taxi, takeoff and climb, and the distance during a normal climb as shown in figure 8 of this supplement.
2. Reserve fuel is based on 45 minutes at 45% BHP and is 6 gallons.

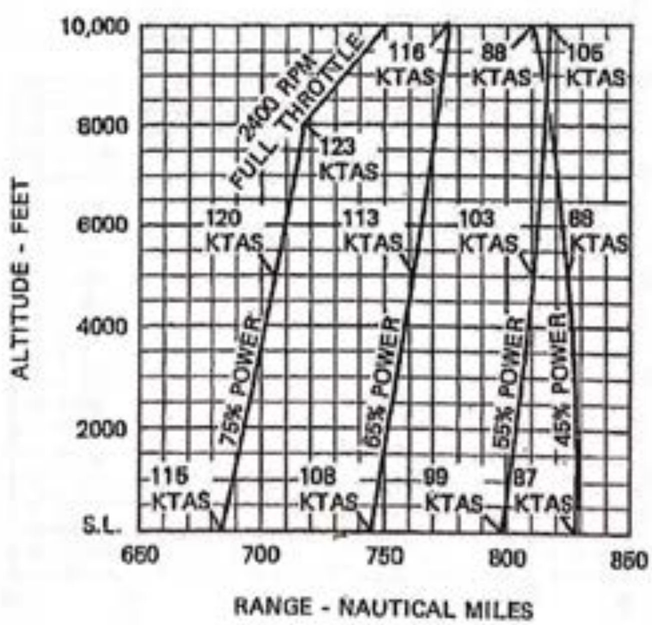


Figure 10. Range Profile

ENDURANCE PROFILE
45 MINUTES RESERVE
84 GALLONS USABLE FUEL

CONDITIONS:
2950 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature

NOTES:
1. This chart allows for the fuel used for engine start, taxi, takeoff and climb, and the time during a normal climb as shown in figure 8 of this supplement.
2. Reserve fuel is based on 45 minutes at 45% BHP and is 6 gallons.

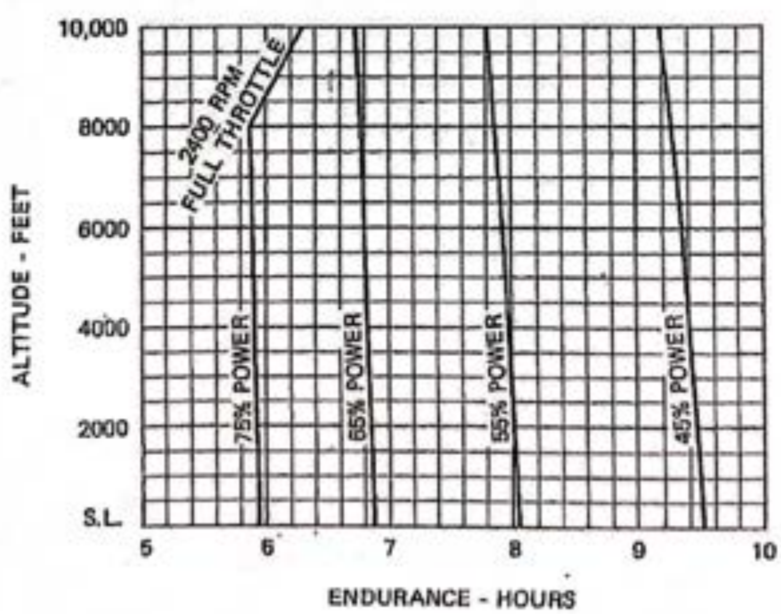


Figure 11. Endurance Profile

LANDING DISTANCE

MAXIMUM PERFORMANCE

CONDITIONS:
Flaps 40°
Power Off
Zero Wind

NOTES:
1. Refer to Section 4 for recommended technique if water surface is glassy.
2. Decrease distances 10% for each 9 knots headwind.

WEIGHT LBS	SPEED AT 50 FT KIAS	PRESS ALT FT	0°C		10°C		20°C		30°C		40°C	
			WATER RUN	TOTAL TO CLEAR 50 FT OBS	WATER RUN	TOTAL TO CLEAR 50 FT OBS	WATER RUN	TOTAL TO CLEAR 50 FT OBS	WATER RUN	TOTAL TO CLEAR 50 FT OBS	WATER RUN	TOTAL TO CLEAR 50 FT OBS
2950	65	S.L.	695	1655	720	1695	750	1745	775	1785	800	1830
		1000	720	1695	750	1745	775	1790	800	1835	830	1880
		2000	750	1745	775	1790	805	1840	830	1885	860	1935
		3000	775	1790	805	1840	835	1890	865	1940	890	1985
		4000	805	1840	835	1890	865	1945	895	1995	925	2045
		5000	835	1895	870	1950	900	2000	930	2055	960	2105

Figure 12. Landing Distance

SECTION 6
WEIGHT & BALANCE

INTRODUCTION

Weight and balance information contained in the basic handbook generally should be used, and will enable you to operate the floatplane within the prescribed weight and center of gravity limitations. The changed information specifically required for operation of the Model 180K equipped with Edo Model 628-2960 floats is presented in this section.

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

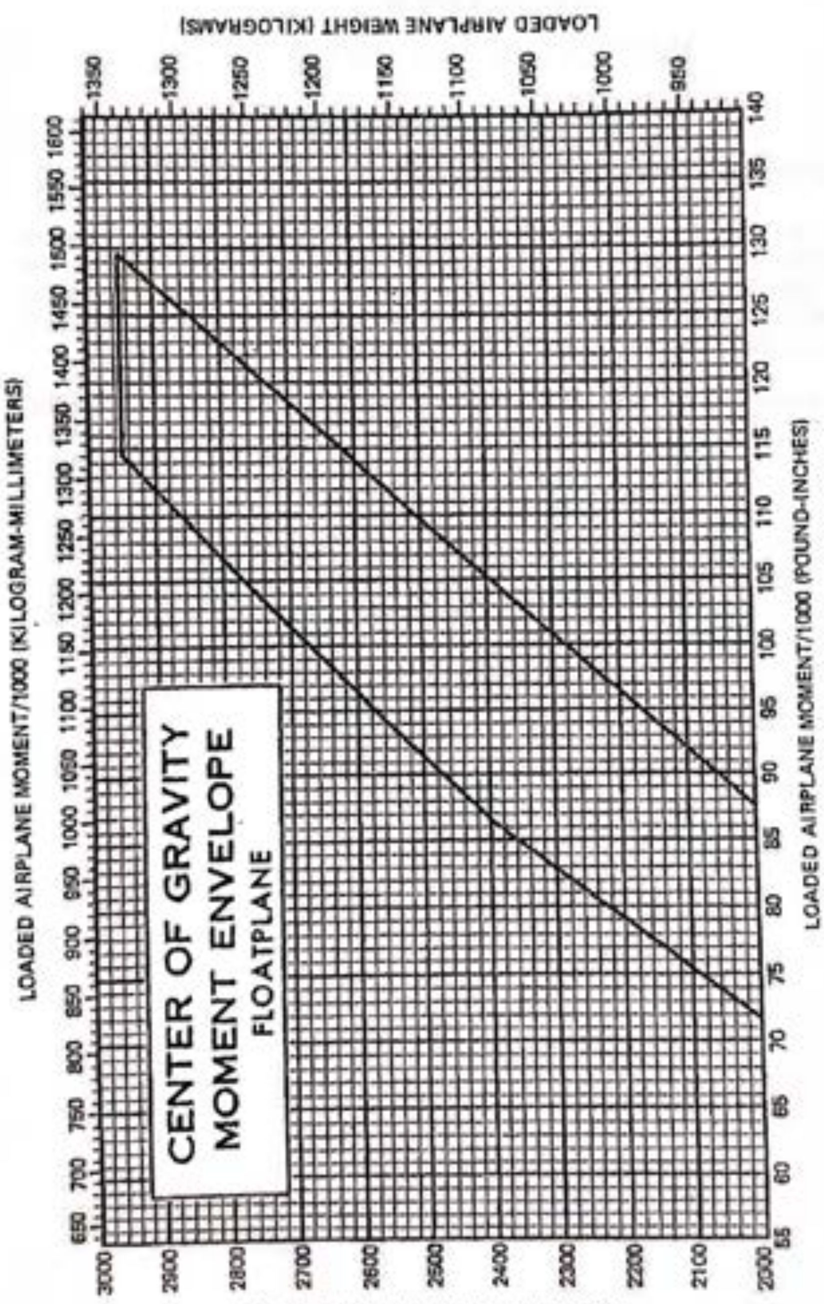


Figure 13. Center of Gravity Moment Envelope

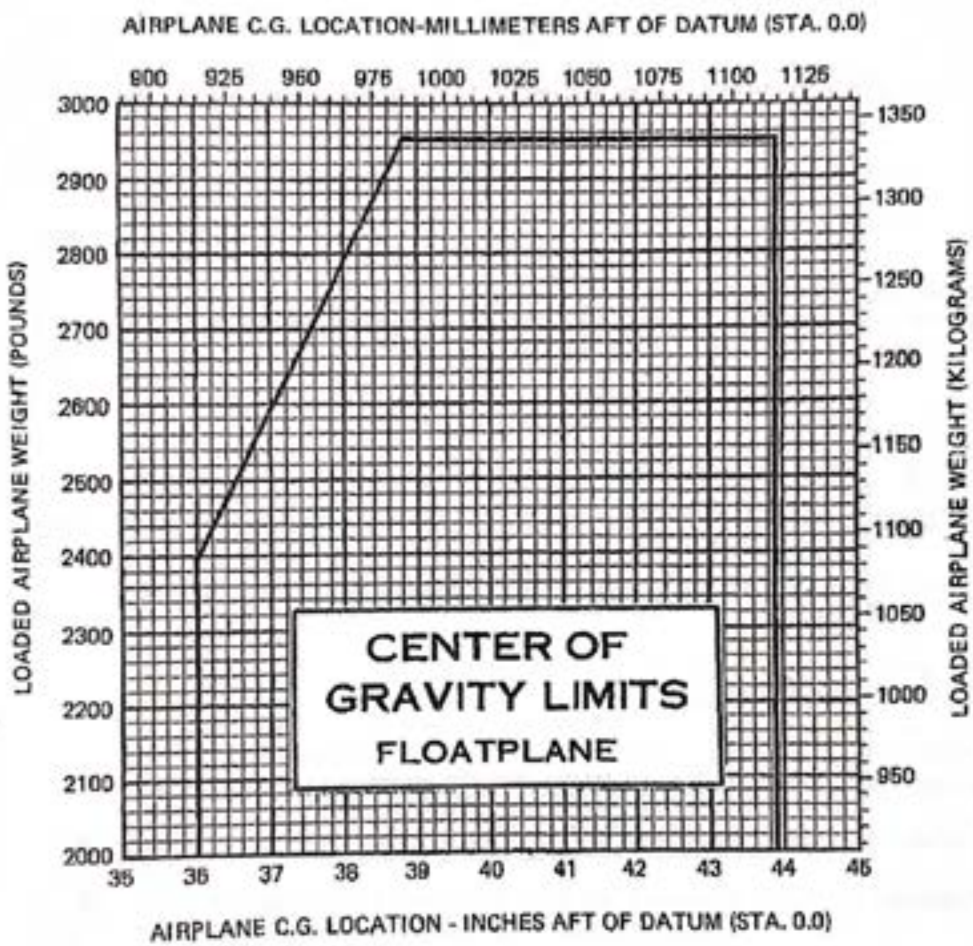


Figure 14. Center of Gravity Limits

SECTION 7
AIRPLANE & SYSTEMS DESCRIPTIONS

INTRODUCTION

This section contains a description of the modifications and equipment associated specifically with the installation of Edo Model 628-2960 floats on the Model 180K.

THE FLOATPLANE

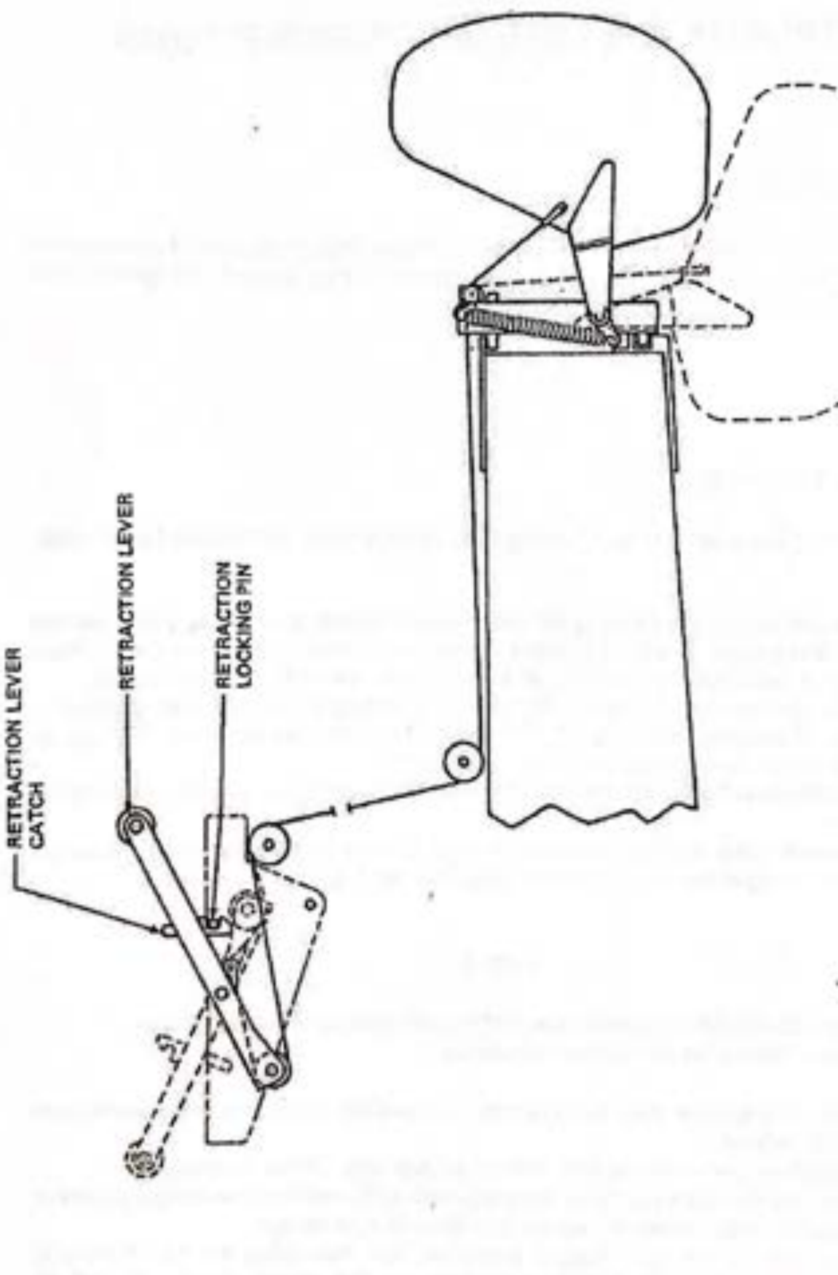
The floatplane is identical to the landplane with the following exceptions:

1. Floats, incorporating a water rudder steering system, replace the landing gear. A water rudder retraction lever, connected to the dual water rudders by cables, is located on the cabin floor tunnel.
2. A larger dorsal fin is installed for additional directional stability.
3. An additional structural "V" brace is installed between the top of the front doorposts and the cowl deck.
4. Additional fuselage structure is added to support the float installation.
5. A centering spring assembly and cables are added to the rudder control system to improve stability in flight.

NOTE

If the floatplane is returned to the landplane configuration, these items need not be removed.

6. The floatplane has additional corrosion proofing and stainless steel cables.
7. Hoisting provisions are added to the top of the fuselage.
8. The left-hand cabin door is equipped with removable hinge pins for ease of door removal when loading large cargo.
9. Fueling steps and assist handles are mounted on the forward fuselage, and steps are mounted on the wing struts to aid in refueling the floatplane.



CONDITION: WATER RUDDERS RETRACTED - RETRACTION LEVER ROTATED FULL AFT AND LATCHED.

Figure 15. Water Rudder Retraction System

10. The standard propeller is replaced with a propeller of larger diameter (90 inches).
11. A reinforced engine mount replaces the standard engine mount.
12. Cowl flap linkage is extended to increase the opening of the cowl flaps for improved engine cooling.
13. Floatplane placards are added.

WATER RUDDER SYSTEM

Retractable water rudders (figure 15), mounted at the aft end of each float, are connected by a system of cables and springs to the rudder pedals. Normal rudder pedal operation moves the water rudders to provide steering control (figure 16) for taxiing.

A water rudder retraction lever, located on the cabin floor tunnel, is used to manually raise and lower the water rudders. During takeoff, landing, and in flight, the retraction lever should be full aft in the RETRACT position. With the lever in this position, the water rudders are up. When the lever is moved full forward to the EXTEND position, the water rudders are down.

The retraction lever incorporates a spring-loaded catch device located near the mid-point of the lever. The catch is designed to latch over a locking pin when the retraction lever is pulled aft to RETRACT, thereby securing the lever in the retracted position.

Pulling the exposed end of the retraction lever catch aft, while pushing downward slightly on the retraction lever with the right hand, will release the lever from the retraction locking pin. The lever then can be allowed to rotate full forward to extend the water rudders for taxiing.

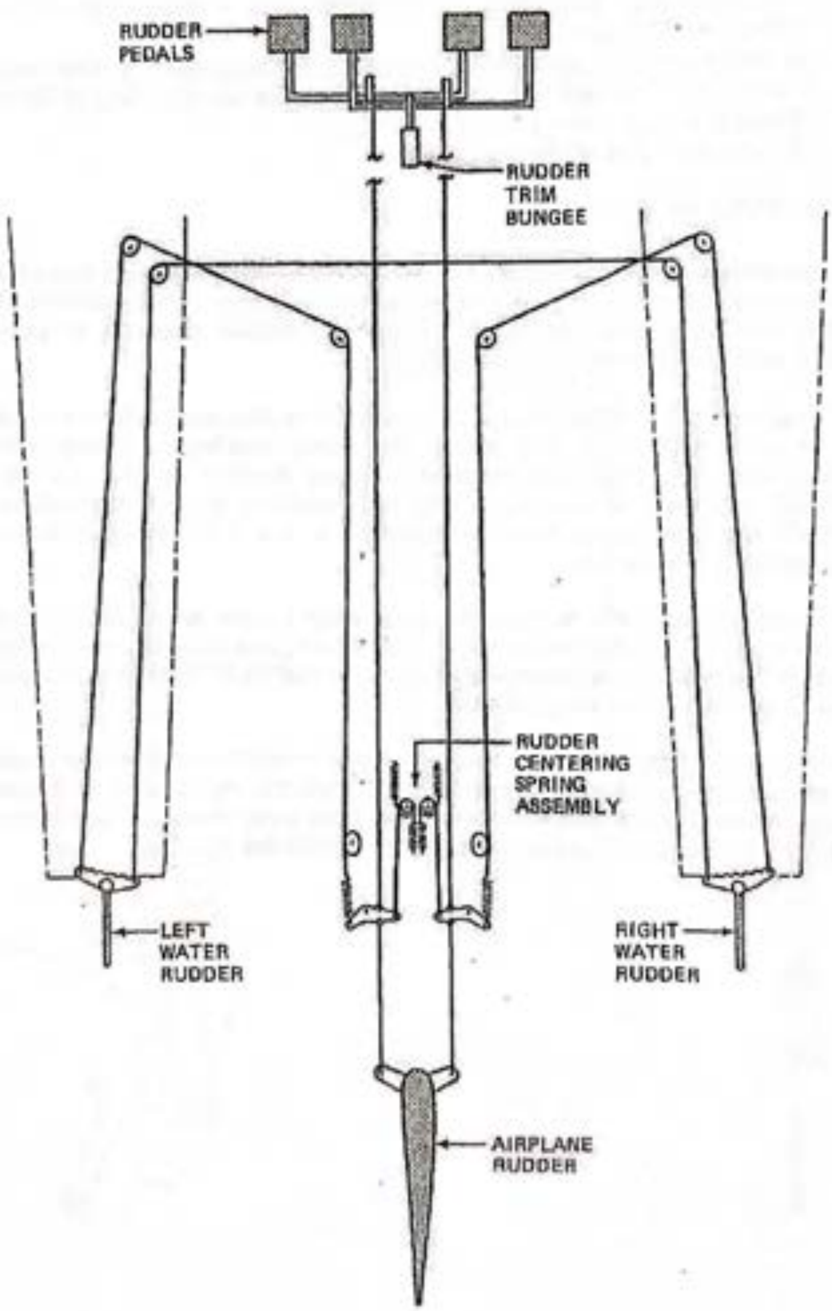


Figure 16. Water Rudder Steering System

SECTION 8
AIRPLANE HANDLING, SERVICE & MAINTENANCE

INTRODUCTION

Section 8 of the basic handbook applies, in general, to the floatplane. The following recommended procedures apply specifically to floatplane operation. (Cleaning and maintenance of the floats should be accomplished as suggested in the Edo Corporation Service and Maintenance Manual for Floats.)

MOORING

Proper securing of the floatplane can vary considerably, depending on the type of operation involved and the facilities available. Each operator should use the method most appropriate for his operation. Some of the most common mooring alternatives are as follows:

1. The floatplane can be moored to a buoy, using a yoke tied to the forward float cleats, so that it will freely weathervane into the wind.
2. The floatplane can be secured to a dock using the fore and aft cleats of one float, although this method is generally not recommended unless the water is calm and the floatplane is attended.
3. The floatplane may be removed from the water (by use of a special lift under the spreader bars) and secured by using the wing tie-down rings and float cleats. If conditions permit the floatplane to be beached, ensure that the shoreline is free of rocks or abrasive material that may damage the floats.

SERVICING

Service the airplane in accordance with Section 8 of the basic handbook. Special attention should be given to engine oil servicing of the floatplane. The following servicing information is contained in the basic handbook, and is repeated here for your convenience.

OIL

The oil dipstick is calibrated for both landplane and floatplane/amphibian use. The floatplane/amphibian side of the dipstick has two x marks. The lower mark indicates nine quarts and the upper mark indicates twelve quarts. When checking the oil level, take precautions to assure that you are using the correct calibrations for your airplane.

SUPPLEMENT

GROUND SERVICE PLUG RECEPTACLE

SECTION 1
GENERAL

The ground service plug receptacle permits the use of an external power source for cold weather starting and lengthy maintenance work on the electrical and electronic equipment. The receptacle is located behind a door on the left side of the fuselage approximately three feet aft of the baggage compartment door.

NOTE

If no avionics equipment is to be used or worked on, the avionics power switch should be turned off. If maintenance is required on the avionics equipment, it is advisable to utilize a battery cart external power source to prevent damage to the avionics equipment by transient voltage. Do not crank or start the engine with the avionics power switch turned on.

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

SECTION 2
LIMITATIONS

The following information must be presented in the form of a placard located on the inside of the ground service plug access door:

> CAUTION 24 VOLTS D.C.
> This aircraft is equipped with alternator and a negative ground system.
> OBSERVE PROPER POLARITY
> Reverse polarity will damage electrical components.

SECTION 3
EMERGENCY PROCEDURES

There is no change to the airplane emergency procedures when the ground service plug receptacle is installed.

SECTION 4
NORMAL PROCEDURES

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

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

SECTION 5
PERFORMANCE

There is no change to the airplane performance when the ground service plug receptacle is installed.

SUPPLEMENT

WINTERIZATION KIT

SECTION 1
GENERAL

The winterization kit consists of two cover plates (with placards) to partially cover the cowl nose cap opening, a restrictive cover plate for the induction air inlet, insulation for the engine crankcase breather line, and a placard to be installed on the map compartment door. This equipment should be installed for operations in temperatures consistently below 20°F (-7°C). Once installed, the crankcase breather insulation is approved for permanent use, regardless of temperature.

NOTE

The cover plate should be installed on the front of the induction air filter rather than between the filter and the airbox.

SECTION 2
LIMITATIONS

The following information must be presented in the form of placards when the airplane is equipped with a winterization kit.

1. On each cover plate:

REMOVE WHEN OAT EXCEEDS 20°F

2. On the map compartment door in the cabin:

> WINTERIZATION KIT MUST BE REMOVED WHEN OUTSIDE AIR TEMPERATURE IS ABOVE 20°F.

SECTION 3
EMERGENCY PROCEDURES

There is no change to the airplane emergency procedures when the winterization kit is installed.

SECTION 4
NORMAL PROCEDURES

There is no change to the airplane normal procedures when the winterization kit is installed.

SECTION 5
PERFORMANCE

There is no change to the airplane performance when the winterization kit is installed.

SUPPLEMENT

EMERGENCY LOCATOR TRANSMITTER (ELT)

SECTION 1
GENERAL

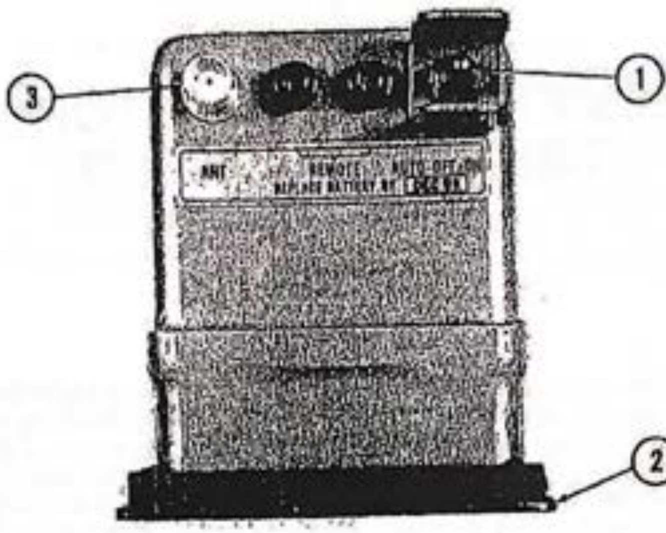
The ELT consists of a self-contained dual-frequency radio transmitter and battery power supply, and is activated by an impact of 5g or more as may be experienced in a crash landing. The ELT emits an omni-directional signal on the international distress frequencies of 121.5 and 243.0 MHz. (Some ELT units in export aircraft transmit only on 121.5 MHz.) General aviation and commercial aircraft, the FAA, and CAP monitor 121.5 MHz, and 243.0 MHz is monitored by the military. Following a crash landing, the ELT will provide line-of-sight transmission up to 100 miles at 10,000 feet. The ELT supplied in domestic aircraft transmits on both distress frequencies simultaneously at 75 mw rated power output for 50 continuous hours in the temperature range of -4°F to +131°F (-20°C to +55°C). The ELT unit in export aircraft transmits on 121.5 MHz at 25 mw rated power output for 50 continuous hours in the temperature range of -4°F to +131°F (-20°C to +55°C).

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

SECTION 2
LIMITATIONS

The following information must be presented in the form of a placard located on the baggage compartment wall.

> EMERGENCY LOCATOR TRANSMITTER
> INSTALLED AFT OF THIS PARTITION.
> MUST BE SERVICED IN ACCORDANCE
> WITH FAR PART 91.52



1. FUNCTION SELECTOR SWITCH (3-position toggle switch):

   ON - Activates transmitter instantly. Used for test purposes and if "g" switch is inoperative.

   OFF - Deactivates transmitter. Used during shipping, storage and following rescue.

   AUTO - Activates transmitter only when "g" switch receives 5g or more impact.

2. COVER - Removable for access to battery pack.

3. ANTENNA RECEPTACLE - Connects to antenna mounted on top of tailcone.

Figure 1. ELT Control Panel

SECTION 3
EMERGENCY PROCEDURES

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

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

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

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

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

SECTION 4
NORMAL PROCEDURES

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

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

SECTION 5
PERFORMANCE

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

AEROCET
PO Box 2119
265 Shannon Lane
Priest River, ID 83856

FAA APPROVED

SUPPLEMENTAL AIRPLANE FLIGHT MANUAL FOR CESSNA 180J & 180K SERIES FLOATPLANES

Modified with Kenmore Air Harbor STC # SA649NW
And
Equipped With AEROCET 3500 or 3500L Seaplane Floats

Registration No. C-FWJC
Serial No. 18053044

The information contained in this document is FAA approved material which must be applied together with the basic FAA approved airplane placards and markings and/or FAA approved Airplane Flight Manual. This supplemental manual must be carried in the airplane when it is modified by the installation of the Aerocet Model 3500 or 3500L seaplane floats in accordance with Supplemental Type Certificate (STC) No. SA00137SE. The information contained in this document supersedes the basic airplane markings and placards and/or Flight Manual covered in the items contained herein. For Limitations, Procedures, and Performance information not contained in this supplement, consult the basic airplane markings and placards, and/or Flight Manual.

FAA Approved: ____________
Manager, Special Certification Branch
Seattle Aircraft Certification Office

Date: Jan 22, 2001

AEROCET
PO Box 2119
266 Shannon Lane
Priest River, ID 83856

LOG OF REVISIONS PAGE

REV.	PAGES AFFECT.	DESCRIPTION	FAA APPROVED

JAN 22 2001

SECTION 1. GENERAL

This supplemental manual, applicable to those Cessna Model 180J & 180K Series airplanes,modified with Kenmore Air harbor STC SA649NW, and equipped with Aerocet Model 3500 or 3500L Seaplane Floats, provides information and limitations not included in the basic FAA approved markings and placards, and/or Airplane Flight Manual. Whenever the words "Not Applicable" (NA) appear in this supplemental manual, they are used to indicate that the related information may not be the same as that shown in the Cessna markings and placards, and/or Flight Manual are not required by the airplane certification basis and, therefore, should not be referenced. The aircraft is to be operated under the "NORMAL CATEGORY" only.

PERFORMANCE - SPECIFICATIONS

SPEED: NA
CRUISE: NA
RATE OF CLIMB AT SEA LEVEL: NA
SERVICE CEILING: NA
TAKEOFF PERFORMANCE: NA
LANDING PERFORMANCE: NA
STALL SPEED (POWER OFF, FORWARD CG):
FLAPS UP: 57.9 KCAS 66.5 MPH CAS
FLAPS DOWN: 53.4 KCAS 61.4 MPH CAS
MAXIMUM WEIGHT:
RAMP (DOCK): 3190 LBS.
TAKE-OFF & LANDING: 3190 LBS.
EMPTY WEIGHT: SEE ACTUAL WT. & BALANCE FORM FOR AIRCRAFT
MAXIMUM USEFUL LOAD: REF. ACTUAL WT. & BALANCE FORM FOR A/C
BAGGAGE ALLOWANCE:
IN AIRPLANE: NO CHANGE
IN EACH FLOAT 100 LBS.
(CAUTION: ASSURE CG RANGE IS PROPER WHEN LOADING)
WING LOADING: NA
POWER LOADING: NA
RANGE: NA
FUEL CAPACITY: NO CHANGE
OIL CAPACITY: NO CHANGE
ENGINE: NO CHANGE
PROPELLER: NO CHANGE

FAA APPROVED DATE: JAN 22 2001

SECTION 2. LIMITATIONS

CENTER OF GRAVITY LIMITS:

Center of Gravity Range: (inches aft of reference datum)

(+40.0) to (+45.0) at 3190 lbs. Max. G.W.
(+38.0) to (+45.0) at 2400 lbs. or less with a straight line variation between points given.

WEIGHT LIMITS:

Maximum Ramp (Dock) Weight:	3190 lbs.
Maximum Takeoff Weight:	3190 lbs.
Maximum Landing Weight:	3190 lbs.
Maximum Weight in Baggage Compartment:	NO CHANGE
Maximum Weight in Float Baggage Compartment	100 lbs. each.

AIRSPEED LIMITS:

	CAS (KTS)	CAS (MPH)
Never Exceed Speed (Vne)	NO CHANGE	NO CHANGE
Max. Structural Cruising (Vno)	NO CHANGE	NO CHANGE
Max. Maneuvering speed (Va)	NO CHANGE	NO CHANGE
Max. Speed with Flaps (Vfe)	NO CHANGE	NO CHANGE

AIR SPEED INDICATOR MARKINGS:

The airspeed indicator shall be marked with a radial redline at 192 MPH for S/N 18052285 thru 18052620. 194 MPH for S/N 18052621 and on.

If the radial line is on the indicator glass,-the glass and bezel should also have a white slippage mark.

Apart from the redline mark, the airspeed indicator markings are the same as shown in the basic markings/Flight manual. Due to differences in airspeed calibration and speeds with floats installed, the indicated stall speeds and maximum structural cruising speed vary slightly from airspeed indicator markings.

FAA APPROVED DATE: JAN 22 2001

PLACARDS:

Aerocet P/N 35-70008 Placard is located on after part of console near water rudder handle in the "RETRACT" position:

"WATER RUDDER
ALWAYS UP
EXCEPT
WATER TAXIING"

Aerocet P/N 35-70009 Placard is installed on left side of cabin in full view of the pilot:

"FLOATPLANE WITH
AEROCET 3500 FLOATS

NEVER EXCEED SPEED: 167 KTS. (192 MPH) (IAS)
MAX. MANEUVERING SPEED: 108 KTS. (124 MPH) (IAS)
MAX. GROSS WEIGHT: 3190 LBS.
CG RANGE
(+40.0) TO (+46.0) AT 3190 LBS. MAX. GROSS WT.
(+36.0) TO (+46.0) AT 2400 LBS. OR LESS WITH A STRAIGHT
LINE VARIATION BETWEEN POINTS GIVEN FOR WT. & BAL.
SEE LOADING SCHEDULE."

SECTION 3. EMERGENCY PROCEDURES:

Emergency procedures in the FAA approved airplane placards and /or Flight Manual generally apply except for airspeeds which may be different. Emergency landings on water should be done with water rudders up, aircraft slightly tail low on touchdown, and control wheel held full aft as the floatplane decelerates on the water. Emergency landings on land should be done with water rudders up, aircraft in a level attitude on touchdown, and the control wheel full aft after contact. If damage occurs to the floats causing compartments to flood, aggressively shift the weight (people & baggage) in the opposite direction of damage in order to balance the aircraft over the buoyant compartments.

SECTION 4. NORMAL PROCEDURES: (NOTE: THESE ITEMS SUPPLEMENT THE CESSNA NORMAL PROCEDURES- BE SURE AND FOLLOW THE CESSNA PROCEDURES EXCEPT AS NOTED BELOW)

Before Entering the Floatplane.

1. Inspect the floats and attachment for dents, cracks, punctures, etc.

2. Remove rubber plugs (which serve as stoppers on the standpipe in each float compartment) and pump out any accumulation of water. Reinstall rubber stoppers with enough pressure for a snug fit. (If there is an excess of water, investigate the leakage)

3. When checking engine oil level, use the side of the dipstick having two "X" marks. The lower mark indicates nine quarts and the upper mark indicates twelve quarts.

Before Starting Engine.

1. Water Rudder Operation - "CHECK VISUALLY"
2. Water Rudders - "DOWN FOR TAXIING"
3. Water Rudders - "CHECK FREEDOM OF MOVEMENT & SECURITY

Takeoff

1. Water Rudders - "UP" (retraction handle aft)
2. Wing Flaps - "20 DEGREES" (second notch)
3. Control Wheel - "HOLD FAR AFT INITIALLY"
4. Power - "FULL THROTTLE & MAX RPM (advance slowly)
5. Control Wheel - "MOVE FORWARD TO ATTAIN PLANING ATTITUDE"
6. Control Wheel - "APPLY LIGHT BACK PRESSURE TO LIFT OFF"
7. Wing Flaps - "UP AFTER OBSTACLES ARE CLEARED"

Before Landing

1. Water Rudders - "UP"
2. Wing Flaps - "DOWN"

Landing

1. Touchdown - "SLIGHTLY TAIL LOW"
2. Control Wheel - "HOLD FULL AFT THROUGH DECELERATION"

FAA APPROVED DATE: JAN 22 2002

Balked Landing - "RETRACT FLAPS TO 20 DEG. IMMEDIATELY AFTER APPLYING FULL POWER FOR GO-AROUND"

After Landing - "WATER RUDDERS DOWN"

Securing Aircraft - "FUEL SELECTOR TO RIGHT OR LEFT TANK POSITION TO PREVENT CROSSFEEDING"

SECTION 5. PERFORMANCE:

Airspeed Calibration - Essentially unchanged

STALL SPEEDS:

POWER OFF, FORWARD CG, 3190 LBS

FLAPS UP:	57.9 KCAS	66.6 MPH CAS
FLAPS DOWN:	53.4 KCAS	61.4 MPH CAS

NOTE: ALTITUDE LOSS DURING STALL RECOVERY MAY BE AS MUCH AS 200 FEET.

SECTION 6. WEIGHT AND BALANCE:

The airplane equipped with Aerocet 3500 or 3500L Floats must be loaded in accordance with the limitations in Section 2. These are shown as an aircraft weight/moment envelope or an aircraft weight versus c.g. location chart on page 9.

Note: It is the responsibility of the airplane owner and pilot to insure that the airplane is loaded properly.

SECTION 7. AIRPLANE AND SYSTEMS DESCRIPTIONS:

In addition to the Aerocet 3500 Float Installation the aircraft must incorporate the Cessna approved seaplane kit. As a result of these installations, the floatplane is identical to the landplane with the following exceptions:

AEROCET MODIFICATIONS: Floats, incorporating a water rudder steering system, replace the landing gear. A water rudder retraction lever, connected to the water rudders by cables, is located on the cabin floor tunnel.

CESSNA MODIFICATIONS:
1. An additional structural "V" brace is installed between the top of the front door posts and the cowl deck.
2. Additional fuselage structure is added to support the float installation.

FAA APPROVED DATE: JAN 22 2001

3. A centering spring assembly and cables are added to the rudder control system to improve stability in flight.

NOTE

If the floatplane is returned to the landplane configuration, these items need not be removed.

4. The floatplane has additional corrosion proofing and stainless steel cables.
5. Hoisting provisions are added to the top of the fuselage.
6. The left-hand cabin door is equipped with removable hinge pins for ease of door removal when loading large cargo.
7. Fueling steps and assist handles are mounted on the forward fuselage, and steps are mounted on the wing struts to aid in refueling the floatplane. Inboard fuel fillers are added when long range fuel tanks are installed.

NOTE

A reduction of approximately five gallons of usable fuel in each tank will result if inboard fillers are used to fill the long range fuel tanks.

8. Floatplane placards are added.

NOTE: Refer to the appropriate Cessna Pilots Operating Handbook for other seaplane changes which apply to individual 180 models.

SECTION 8. AIRPLANE HANDLING, SERVICE, AND MAINTENANCE

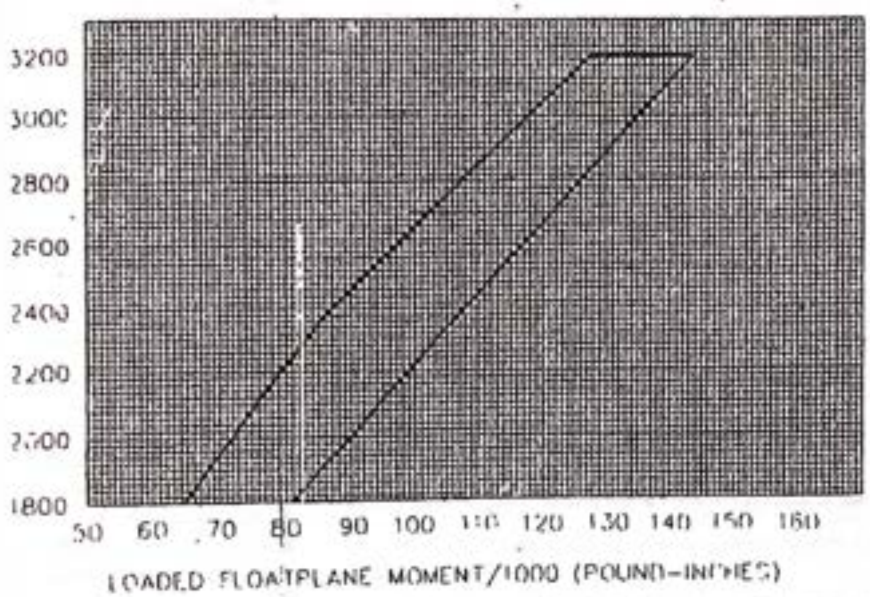
Information not required

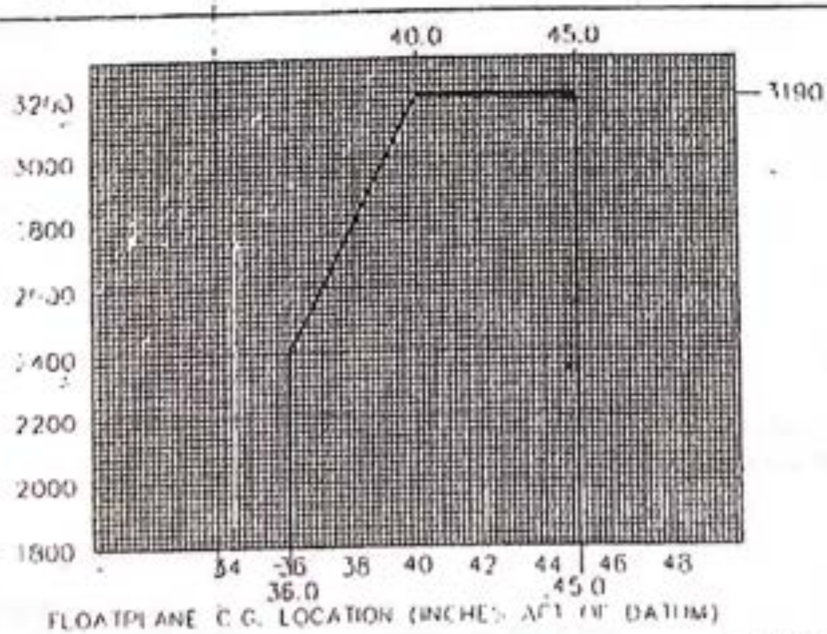
FAA APPROVED DATE: JAN 22 2001

AEROCET

PO Box 2119
265 Shannon Lane
Priest River, ID 83856

40.0 to 45.0 at 3190 lbs
36.0 to 45.0 at 2400 lbs





SUPPLEMENT

FUSC 75Gal usable

TANKS (BLADDER-TYPE FUEL)

SECTION 1
GENERAL

INTRODUCTION

This supplement is written especially for operators of the Cessna 180 Skywagon, including the Amphibian, Floatplane and Skiplane configurations. It provides information not found in the basic handbook and contains procedures and data required for safe and efficient operation of the airplane equipped with bladder-type fuel tanks in lieu of standard integral fuel tanks.

Information contained in the basic handbook for the 180 Skywagon, which is the same as that for an airplane with bladder-type fuel tanks, is generally not repeated in this supplement.

FUEL

Fuel Capacity:
- Standard Bladder-Type Tanks:
  - Total Capacity: 61 U.S. gallons.
  - Total Capacity Each Tank: 30.5 U.S. gallons.
  - Total Usable: 56 U.S. gallons.
- Long Range Bladder-Type Tanks:
  - FUSC Total Capacity: 80 U.S. gallons.
  - Total Capacity Each Tank: 40 U.S. gallons.
  - Total Usable: 75 U.S. gallons.

NOTE

A reduction of approximately five gallons of usable fuel in each tank will result if inboard fillers are used to fill the long range bladder-type tanks.

STANDARD EMPTY WEIGHTS

Standard Bladder-Type Tanks:
- Standard Empty Weight: Increased by 2 lbs.

Maximum Useful Load: Reduced by 2 lbs.
Long Range Bladder-Type Tanks:
Standard Empty Weight: Increased by 14 lbs.
Maximum Useful Load: Reduced by 14 lbs.

SECTION 2
LIMITATIONS

INTRODUCTION

Except as shown in this section, the operating limitations for an airplane with bladder-type fuel tanks are the same as for the 180 Skywagon having standard integral fuel tanks. The limitations included in this section have been approved by the Federal Aviation Administration. Observance of these operating limitations is required by Federal Aviation Regulations.

FUEL LIMITATIONS

Standard Bladder-Type Tanks: 30.5 U.S. gallons each.
Total Fuel: 61 U.S. gallons.
Usable Fuel (all flight conditions): 56 U.S. gallons
Unusable Fuel: 5.0 U.S. gallons.
Long Range Bladder-Type Tanks: 40 U.S. gallons each.
Total Fuel: 80 U.S. gallons.
Unusable Fuel (all flight conditions): 75 U.S. gallons.
Unusable Fuel: 5.0 U.S. gallons.

NOTE

A reduction of approximately five gallons of usable fuel in each tank will result if inboard fillers are used to fill the long range bladder-type tanks.

PLACARDS

The following information must be displayed in the form of composite or individual placards in addition to (or replacing) those specified in the basic handbook.

1. On fuel selector valve plate (standard bladder-type tanks):

BOTH ON - 58 GAL. ALL FLIGHT ATTITUDES TAKEOFF, LANDING RIGHT ON - 29 GAL. LEVEL FLIGHT ONLY LEFT ON - 29 GAL. LEVEL FLIGHT ONLY OFF

On fuel selector valve plate (long range bladder-type tanks):

BOTH ON - 75 GAL. ALL FLIGHT ATTITUDES TAKEOFF, LANDING RIGHT ON - 37 GAL. LEVEL FLIGHT ONLY LEFT ON - 37 GAL. LEVEL FLIGHT ONLY OFF

2. Forward of fuel tank filler cap (standard bladder-type tanks):

SERVICE THIS AIRPLANE WITH 100LL/100 MIN. AVIATION GRADE GASOLINE - CAPACITY 30.5 GAL.

Forward of outboard fuel tank filler cap (long range bladder-type tanks):

SERVICE THIS AIRPLANE WITH 100LL/100 MIN. AVIATION GRADE GASOLINE - CAPACITY 40.0 GAL.

3. Near inboard fuel tank filler cap (when long range bladder-type tanks and auxiliary refueling equipment are installed):

TO FILL TANKS TO MAXIMUM CAPACITY USE OUTBOARD FILLERS

SERVICE THIS AIRPLANE WITH 100 LL/100 MIN. AVIATION GRADE GASOLINE - CAPACITY 35.0 GAL.

SECTION 3
EMERGENCY PROCEDURES

There is no change to the airplane emergency procedures when bladder-type fuel tanks are installed.

SECTION 4
NORMAL PROCEDURES

There ere is no change to the airplane normal procedures when bladder-fuel uel tanks are installed.

SECTION 5
PERFORMANCE

With h bladder-type fuel tanks, range and endurance are reduced from own in the 84-gallon usable fuel range and endurance profile charts the basic handbook, or the appropriate supplement (Amphibian, Float-lane, Skiplane). For approximate range and endurance, reduce the rformance data shown by 39% for standard bladder-type tanks and 12% r long range bladder-type tanks filled through outboard fillers.

SECTION 6
WEIGHT & BALANCE

INTRODUCTION

Weight and balance information contained in the basic handbook, and appropriate supplements, generally should be used, and will enable you to operate the airplane within the prescribed weight and center of gravity limitations. The changed information specifically required for the 180 Skywagon with bladder-type fuel tanks is presented in this section.

USABLE FUEL CENTER OF GRAVITY ARM

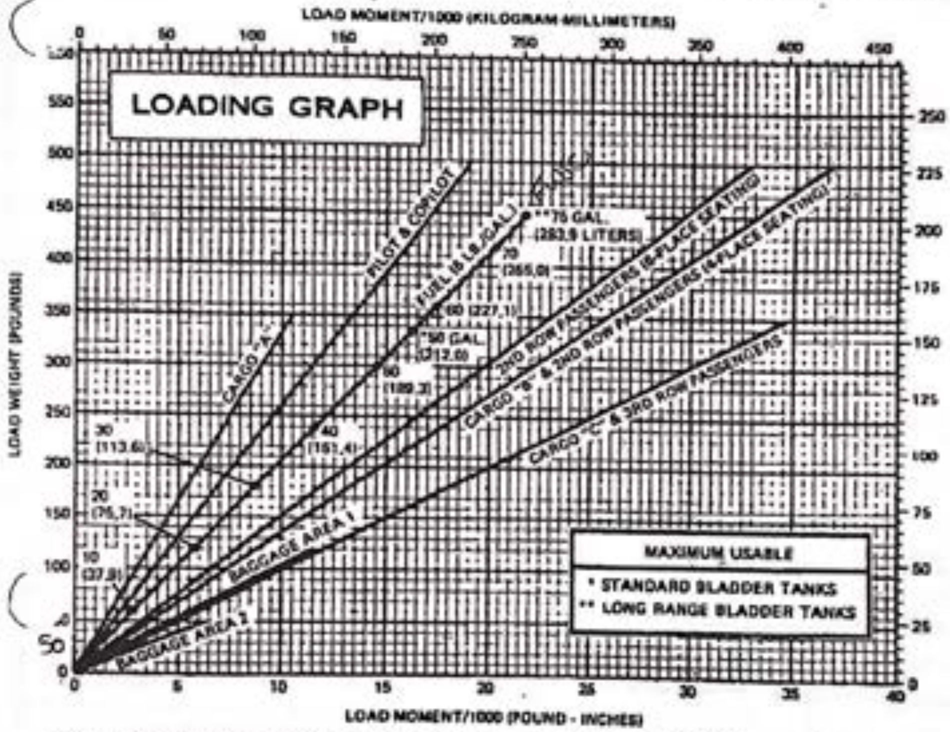
The usable fuel C.G. arm is located at station 48.0.

SAMPLE AIRPLANE WEIGHING

Unusable fuel calculations shown in the sample airplane weighing diagram in the basic handbook should be replaced with the information given in figure 1.

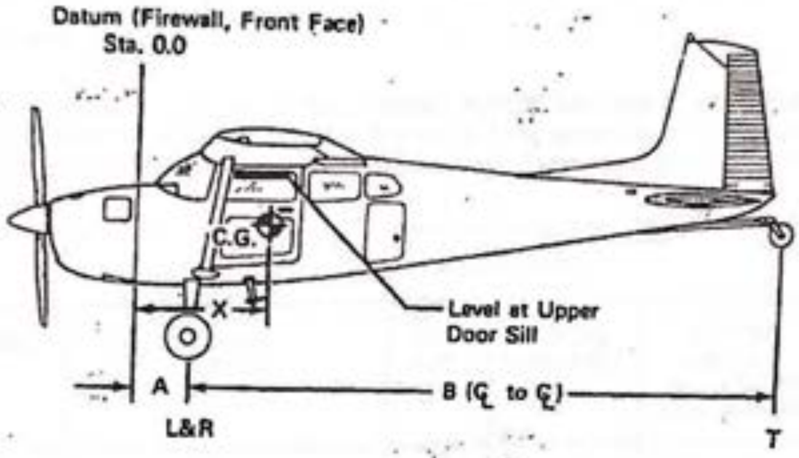
LOADING GRAPH

Fuel calculations shown in the loading graph in the basic handbook should be replaced with the information given in figure 2.



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

Figure 2. Loading Graph



Scale Position	Scale Reading	Tare	Symbol	Net Weight
Left Wheel			L	
Right Wheel			R	
Tail Wheel			T	
Sum of Net Weights (As Weighed)			W	

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

Item	Weight (Lbs.)	X C.G. Arm (In.) =	Moment/1000 (Lbs.-In.)
Airplane Weight (From Item 5, page 6-6)			
Add Oil: No Oil Filter (12 Qts at 7.5 Lbs/Gal)		-15	
With Oil Filter (13 Qts at 7.5 Lbs/Gal)		-15	
Add: Unusable Fuel Std. or L.R. Tanks (5 Gal at 6 Lbs/Gal)	30	46	1.4
Equipment Changes			
Airplane Basic Empty Weight			

Figure 1. Sample Airplane Weighing

SECTION 7
IRPLANE & SYSTEMS DESCRIPTIONS

UEL SYSTEM

The fuel system consists of two vented rubber bladder tanks (one in ch wing), a four-position selector valve, a fuel strainer with manual ain control, a manual primer and a carburetor. Refer to figure 3 for fuel antity data.

FUEL QUANTITY DATA (U.S. GALLONS)				
FUEL TANKS	FUEL LEVEL (QUANTITY EACH TANK)	TOTAL FUEL	TOTAL UNUSABLE	TOTAL USABLE ALL FLIGHT CONDITIONS
.NDARD LADDER-TYPE	FULL (30.5)	61	5	56
ON RANGE R-TYPE	FULL (40)	80	5	75
ONG RANGE LADDER-TYPE	INBOARD FILLERS (35)	70	5	65

Figure 3. Fuel Quantity Data

SECTION 8
AIRPLANE HANDLING
SERVICE & MAINTENANCE

TRODUCTION

ection 8 of the basic handbook, and appropriate supplements, applies .neral to airplanes equipped with bladder-type fuel tanks.

EL

CITY EACH STANDARD BLADDER-TYPE TANK -- 30.5 Gallons.
PACITY EACH LONG RANGE BLADDER-TYPE TANK -- 40 Gallons.
PACITY EACH LONG RANGE BLADDER-TYPE TANK USING BOARD FILLERS -- 35 Gallons.