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.

COVERAGE

Pilot's Operating Handbook in the airplane at the time of delivery from Cessna Aircraft Company contains information applicable to the 1979 Model 180K airplane designated by the serial number and registration number shown on the Title Page of this handbook.

REVISIONS

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

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

NOTE

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

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

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

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

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

LOG OF EFFECTIVE PAGES

Dates of issue for original and revised pages are:
Original . . . . . 1 October 1978

Page	Date	Page	Date
Title	1 October 1978	6-1	1 October 1978
Assignment Record	1 October 1978	6-2 Blank	1 October 1978
i thru iv	1 October 1978	6-3 thru 6-27	1 October 1978
1-1 thru 1-8	1 October 1978	6-28 Blank	1 October 1978
2-1	1 October 1978	7-1 thru 7-41	1 October 1978
2-2 Blank	1 October 1978	7-42 Blank	1 October 1978
2-3 thru 2-11	1 October 1978	8-1	1 October 1978
2-12 Blank	1 October 1978	8-2 Blank	1 October 1978
3-1 thru 3-9	1 October 1978	8-3 thru 8-15	1 October 1978
3-10 Blank	1 October 1978	8-16 Blank	1 October 1978
3-11 thru 3-18	1 October 1978	9-1 thru 9-3	1 October 1978
4-1 thru 4-11	1 October 1978	9-4 Blank	1 October 1978
4-12 Blank	1 October 1978		
4-13 thru 4-22	1 October 1978		
5-1	1 October 1978	NOTE	
5-2 Blank	1 October 1978	Refer to Section 9 Table of Contents for supplements applicable to optional systems.	
5-3 thru 5-25	1 October 1978		
5-26 Blank	1 October 1978		

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SECTION 1
GENERAL

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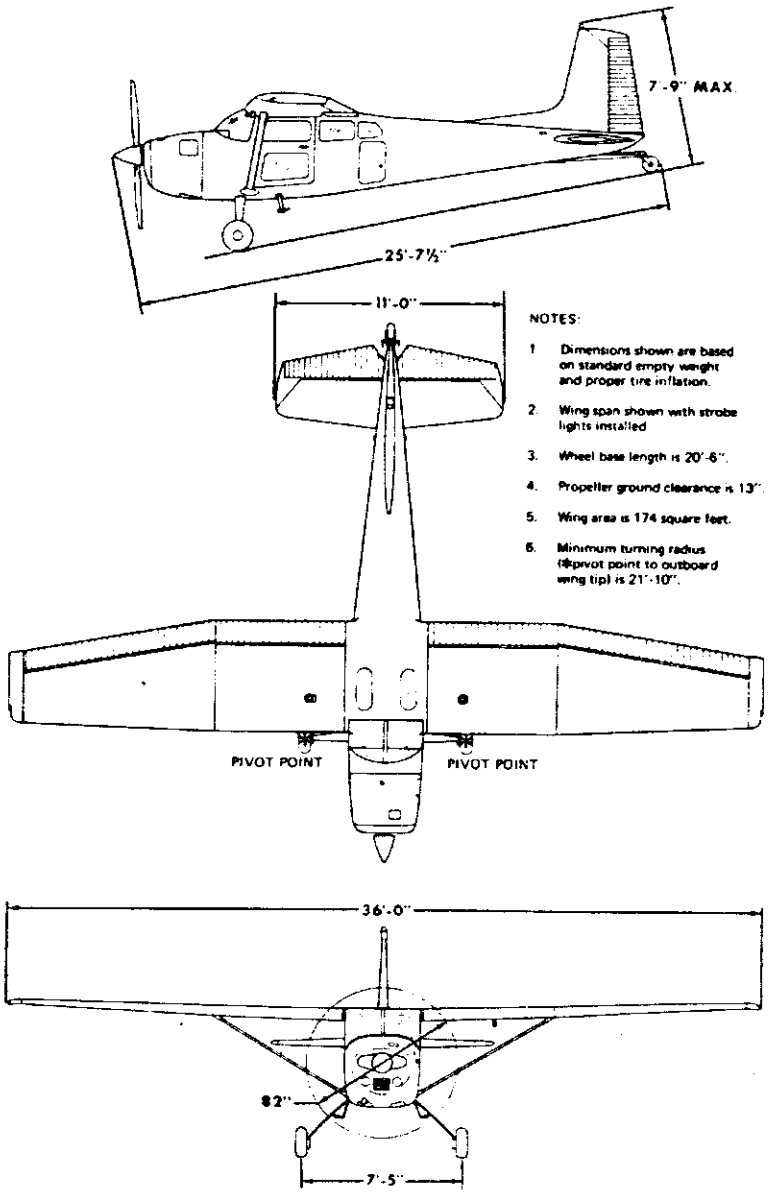

Figure 1-1. Three View

INTRODUCTION

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

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

DESCRIPTIVE DATA

ENGINE

Number of Engines: 1.
Engine Manufacturer: Teledyne Continental.
Engine Model Number: O-470-U.
Engine Type: Normally-aspirated, direct-drive, air-cooled, horizontally-opposed, carburetor equipped, six-cylinder engine with 470 cu. in. displacement.
Horsepower Rating and Engine Speed: 230 rated BHP at 2400 RPM.

PROPELLER

Propeller Manufacturer: McCauley Accessory Division.
Propeller Model Number: C2A34C204/90DCB-8.
Number of Blades: 2.
Propeller Diameter, Maximum: 82 inches.
Minimum: 80.5 inches.
Propeller Type: Constant speed and hydraulically actuated, with a low pitch setting of 15.0° and a high pitch setting of 29.4° (30 inch station).

FUEL

Approved Fuel Grades (and Colors):
100LL Grade Aviation Fuel (Blue).
100 (Formerly 100/130) Grade Aviation Fuel (Green).
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: 2800 Pounds 2350 Pounds 1900 Pounds	 107 98 88	 109 100 90	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	 119 91	 120 90	Do not exceed these speeds with the given flap settings.

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 MINIMUM LIMIT	GREEN ARC NORMAL OPERATING	YELLOW ARC CAUTION RANGE	RED LINE MAXIMUM LIMIT
Tachometer	- - -	2100 - 2400 RPM	- - -	2400 RPM
Manifold Pressure	- - -	15-23 in. Hg	- - -	- - -
Oil Temperature	- - -	100° - 240°F	- - -	240°F
Cylinder Head Temperature	- - -	200° - 460°F	- - -	460°F
Oil Pressure	10 psi	30-60 psi	- - -	100 psi
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

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INTRODUCTION

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

AIRSPEEDS FOR EMERGENCY OPERATION

Engine Failure After Takeoff:	
Wing Flaps Up	70 KIAS
Wing Flaps Down 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.

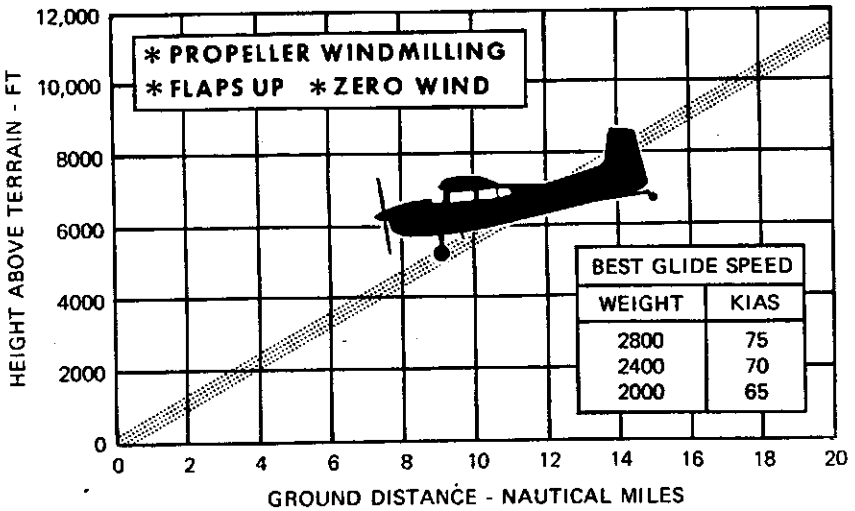


Figure 3-1. Maximum Glide

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)

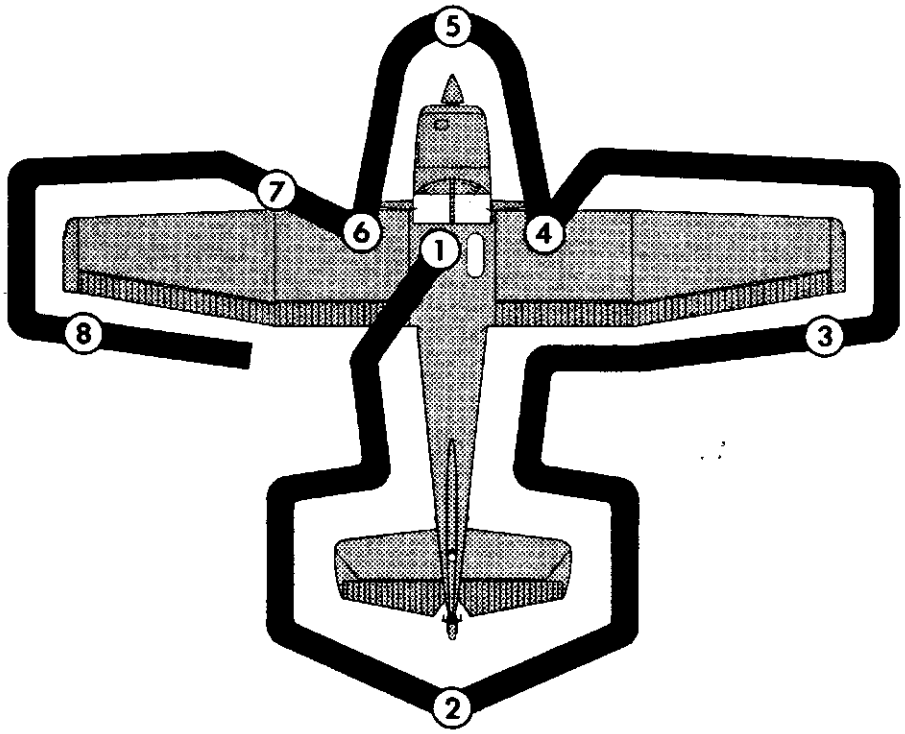
INTRODUCTION

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	85 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 corres-

pond 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:

135
-10
125 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 hours × 11.0 gallons/hour = 67.1 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:

84.0
-71.7
12.3 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

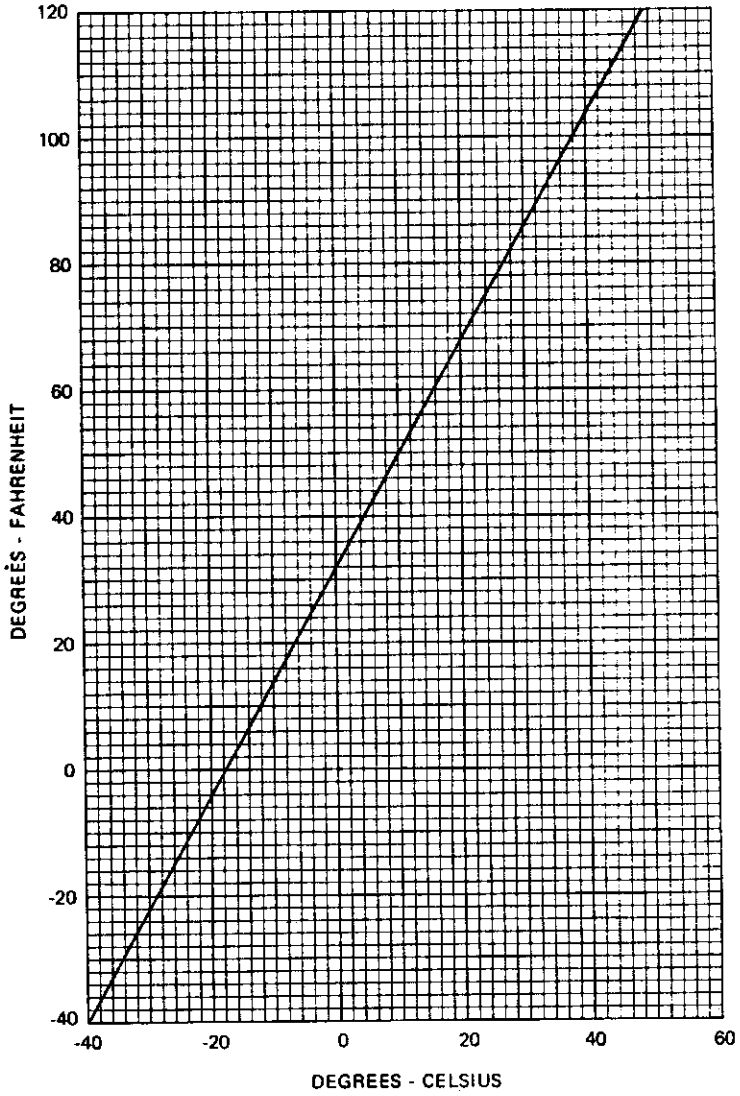


Figure 5-2. Temperature Conversion Chart

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°C		10°C		20°C		30°C		40°C	
	LIFT OFF	AT 50 FT		GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS
2800	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	1050	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	1560
			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	1250	1165	1080	995
	2000	80	1115	1030	950	870
	4000	78	980	900	825	750
	6000	77	845	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 .26	1
	2000	11	80	985	2	0.6 .57	3
	3000	9	79	930	3	1.0 .95	4
	4000	7	78	875	4	1.3 1.31	6
	5000	5	77	820	5	1.7 1.45	7
	6000	3	77	760	7	2.1 1.79	9
	7000	1	76	705	8	2.5 2.13	11
	8000	-1	75	650	9	2.9 2.47	13
	9000	-3	74	590	11	3.4 2.89	15
	10,000	-5	73	535	13	3.8 3.22	18
	11,000	-7	73	480	15	4.4 3.74	21
	12,000	-9	72	420	17	4.9 4.17	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	12.5	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	115	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	59	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	106	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	135	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	10.5
	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	125	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.

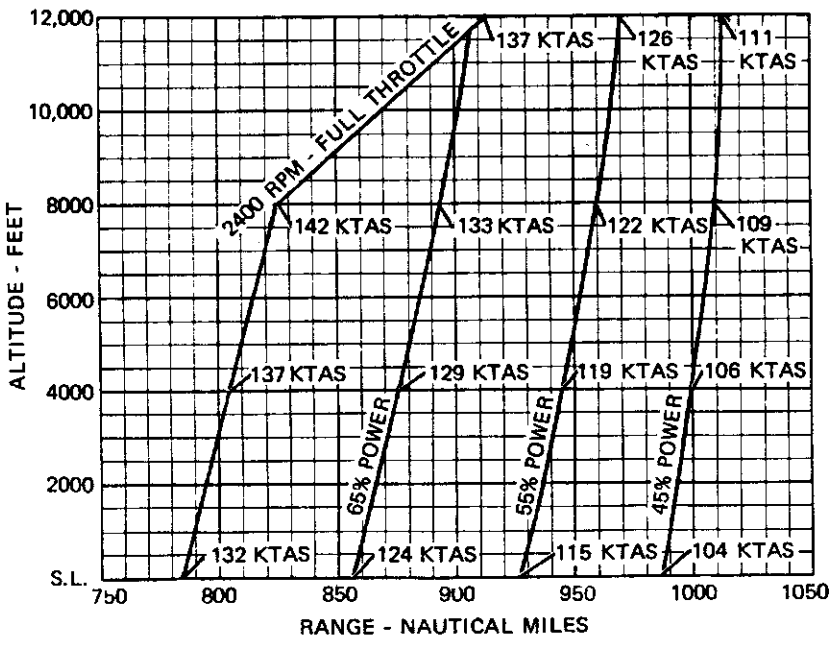


Figure 5-8. Range Profile

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.

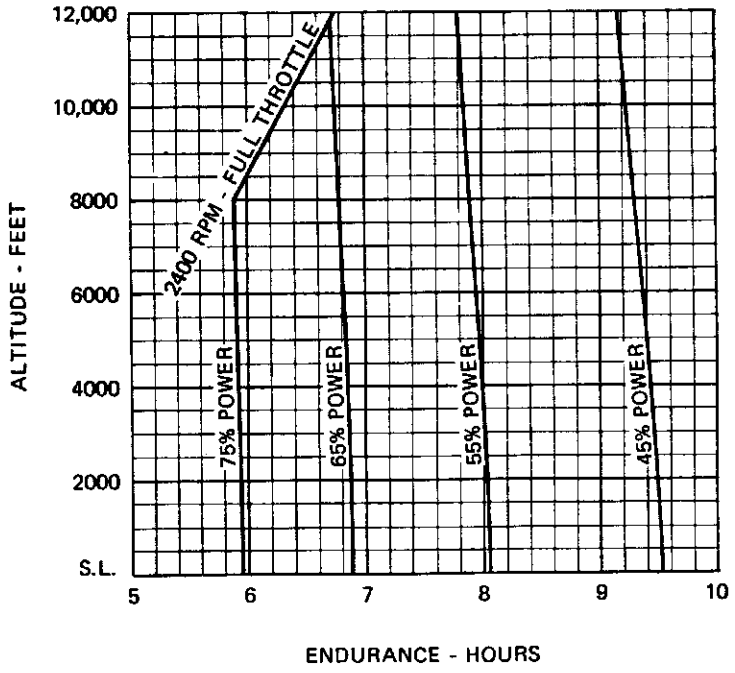


Figure 5-9. Endurance Profile

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

INTRODUCTION

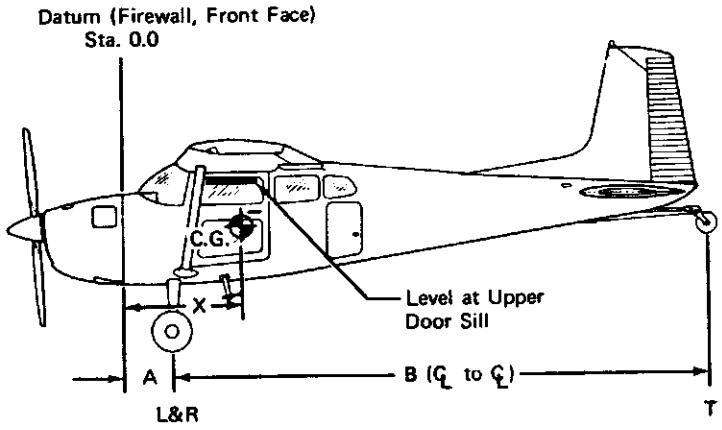
This section describes the procedure for establishing the basic empty weight and moment of the airplane. Sample forms are provided for reference. Procedures for calculating the weight and moment for various operations are also provided. A comprehensive list of all Cessna equipment available for this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

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

Item	Weight (Lbs.)	X C.G. Arm (In.) =	Moment/1000 (Lbs.-In.)
Airplane Weight (From Item 5, page 6-6)			
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. In	ITEM NO. Out	DESCRIPTION OF ARTICLE OR MODIFICATION	WEIGHT CHANGE ADDED (+) Wt. (lb.)	ADDED (+) Arm (In.)	ADDED (+) Moment /1000	WEIGHT CHANGE REMOVED (-) Wt. (lb.)	REMOVED (-) Arm (In.)	REMOVED (-) Moment /1000	RUNNING BASIC EMPTY WEIGHT Wt. (lb.)	RUNNING BASIC EMPTY WEIGHT 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.

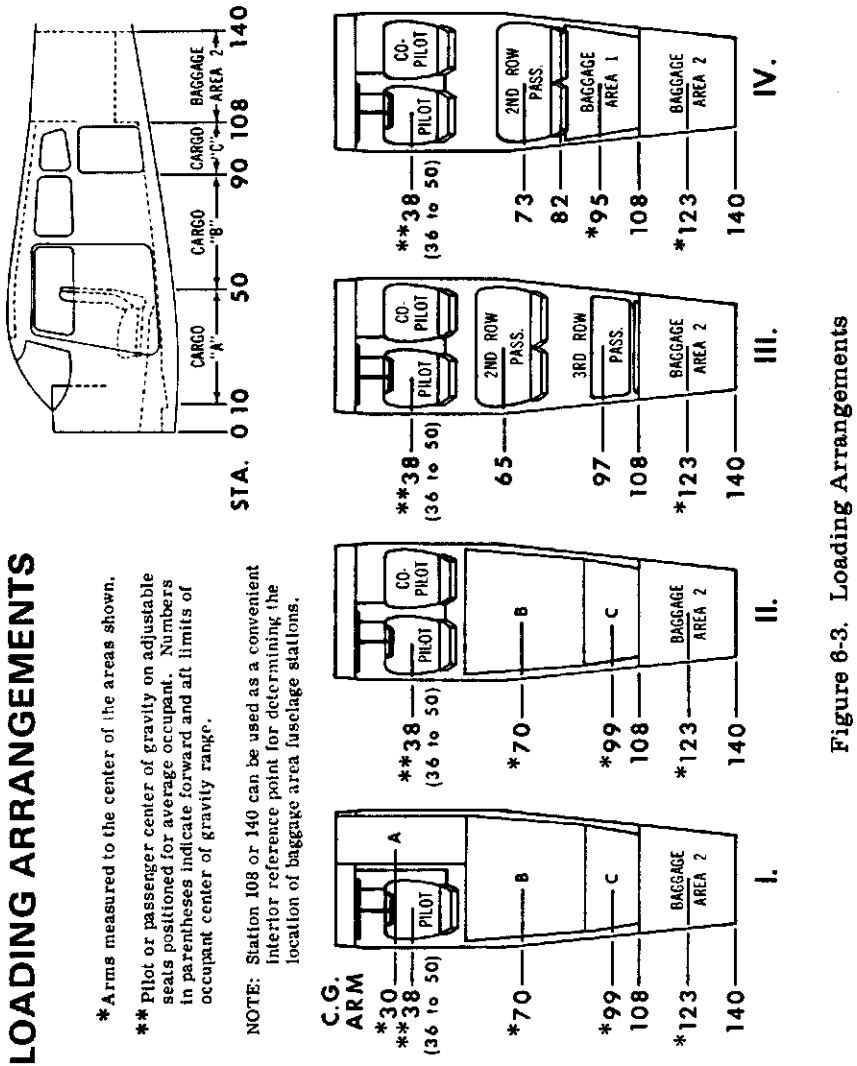


Figure 6-3. Loading Arrangements

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.

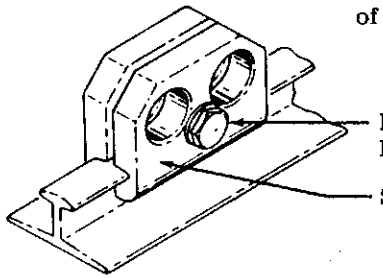
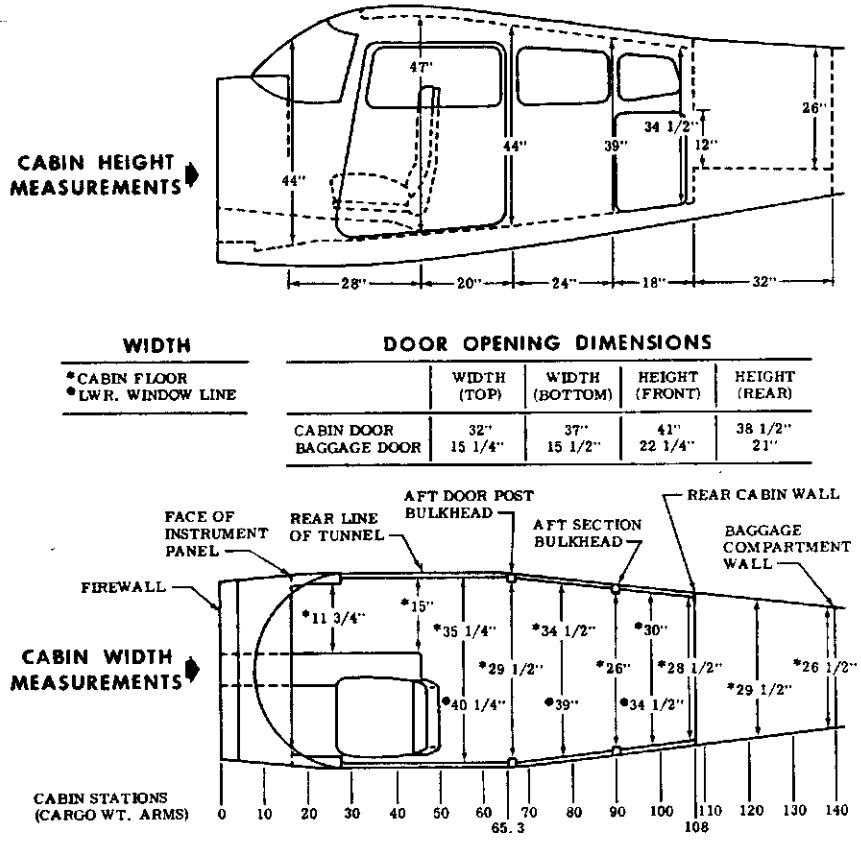


Figure 6-4. Cargo Loading



WIDTH	DOOR OPENING DIMENSIONS			
	WIDTH (TOP)	WIDTH (BOTTOM)	HEIGHT (FRONT)	HEIGHT (REAR)
*CABIN FLOOR *LWR. WINDOW LINE				
CABIN DOOR	32"	37"	41"	38 1/2"
BAGGAGE DOOR	15 1/4"	15 1/2"	22 1/4"	21"

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.

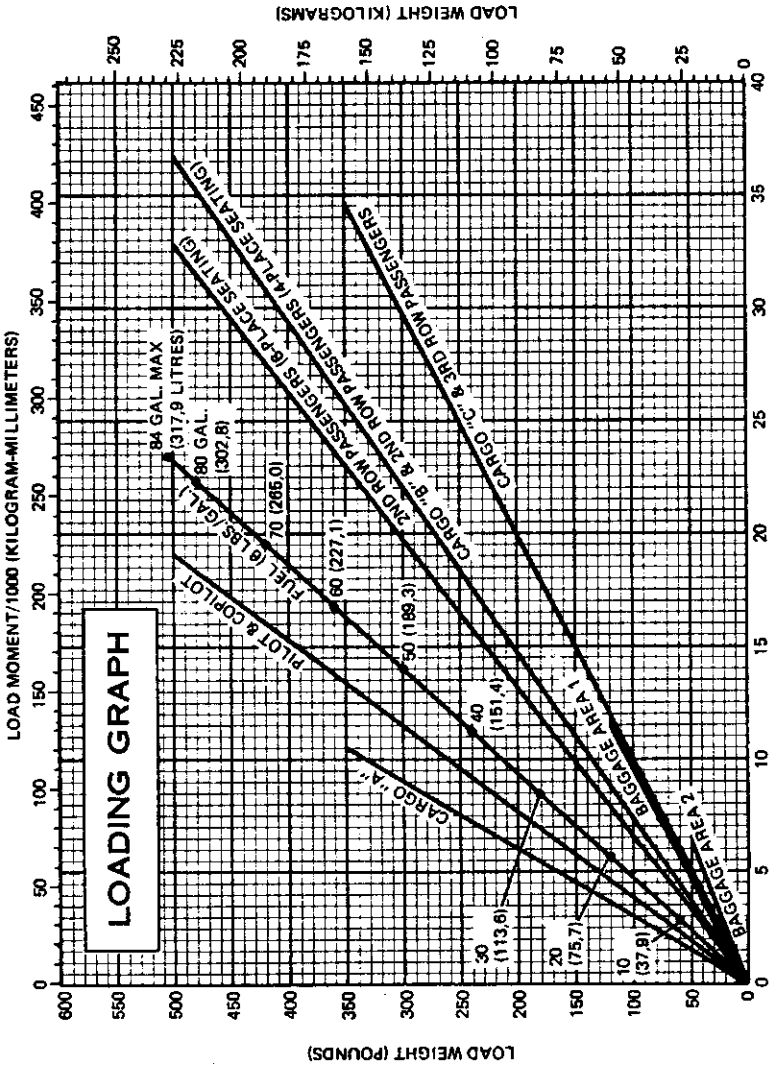
Figure 6-5. Internal Cabin Dimensions

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

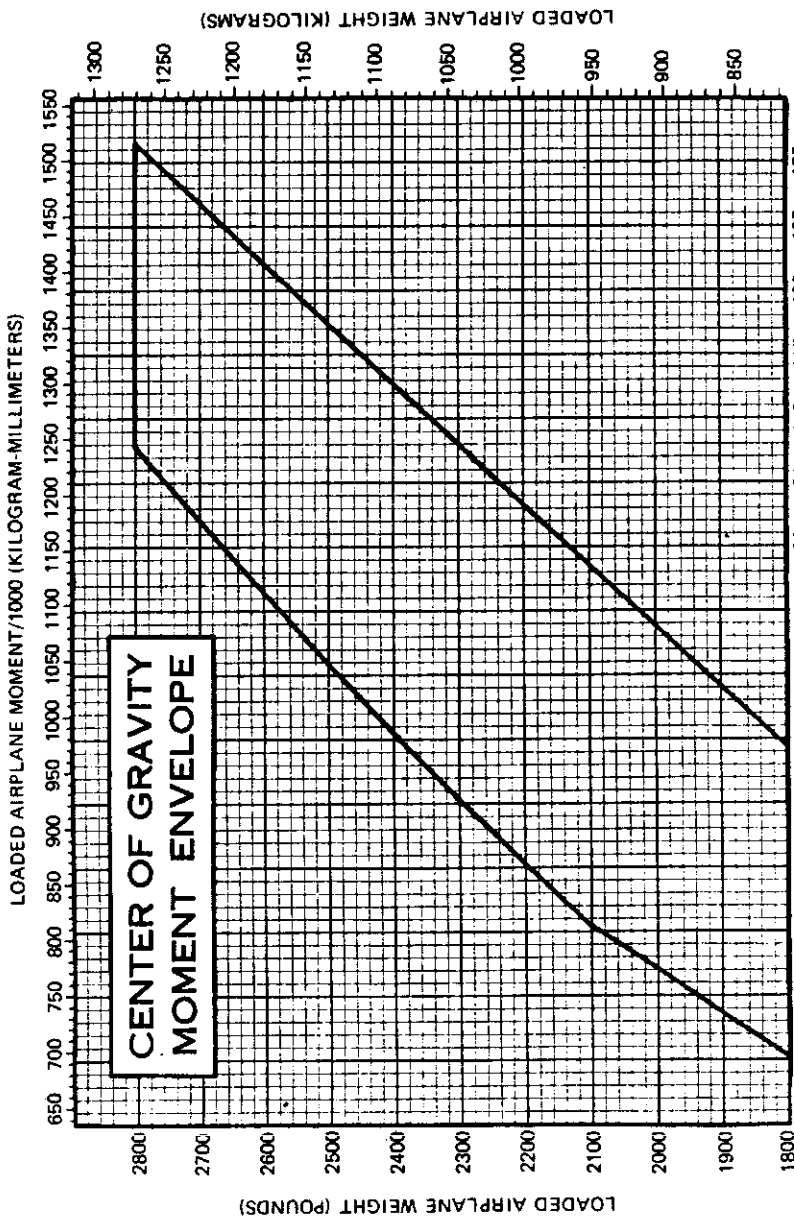


Figure 6-8. Center of Gravity Moment Envelope

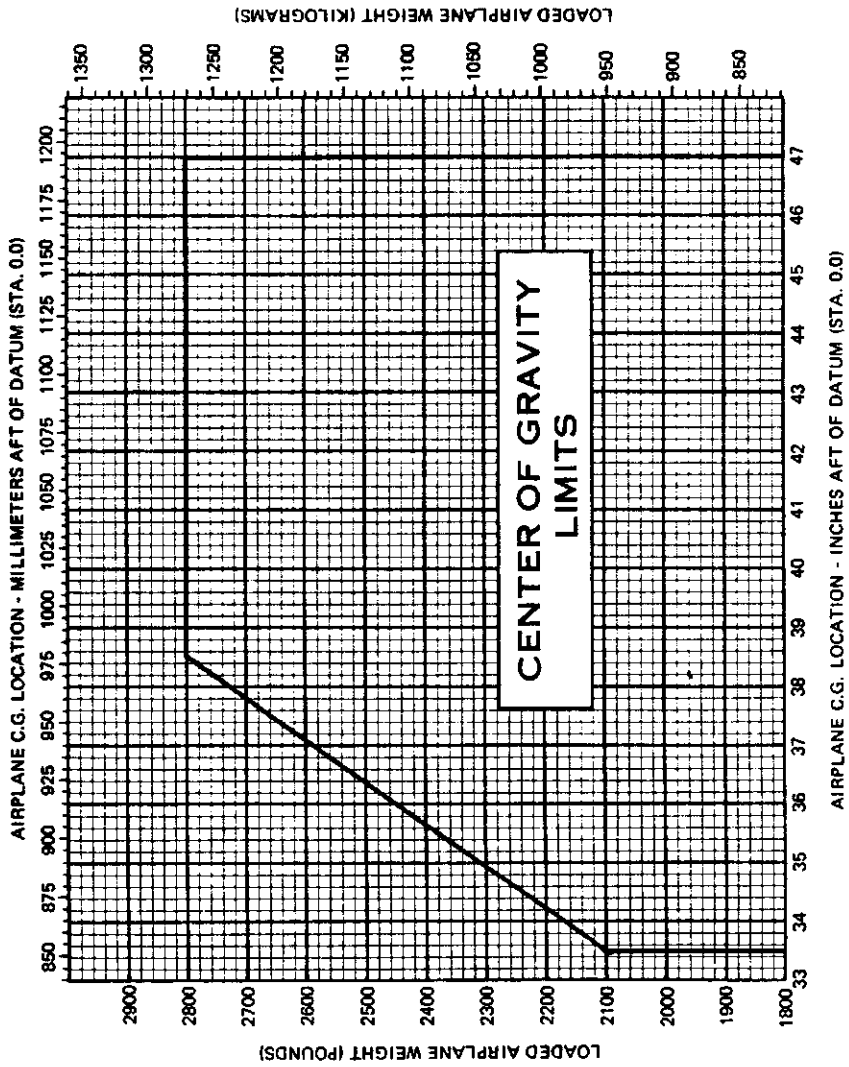


Figure 6-9. Center of Gravity Limits

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 C2A34C204/90DCBO	C161009-0109	52.5	-40.0
A37-R	GOVERNOR, PROPELLER (MCCAULEY) C29003/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	0741025-9, -10	43.4*	18.1*
	6.00 X 6 6-PLY MAIN (ALTERNATE) (2)	C16301980204		
	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	0741025-11,-12	45.6*	18.1*
	8.00 X 6 6-PLY MAIN (2)	1241156-133		
	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	0741025-11,-12	46.0*	18.1*
	8.00 X 6 6-PLY MAIN (ALTERNATE) (2)	C16301980205		
	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 AND TIRE ASSEMBLY - TAIL (1)	0742155-13	4.5	260.0
	8.00 PNEUMATIC TYPE TAIL WHEEL			
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 REPLACES 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)	0713970	0.5	26.3
C22-A	LIGHTS, INSTRUMENT POST	0701093	0.5	18.0
C28-A	LIGHT, MAP (OCCUPANT MOUNTED)	0700217	0.5	30.5
C31-A	LIGHTS, COURTESY UNDER SIDE WING (2)	0700615	0.5	52.0
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	0413517-20	0.6	16.0
D39-R	ENGINE CLUSTER, LH & RH FUEL GAUGES	C669537-0103	0.4	16.5
D41-R	ENGINE CLUSTER, CYL HEAD TEMP & OIL TEMP	C669536-0101	0.4	16.5
D43-R	ENGINE CLUSTER, OIL PRESSURE & AMMETER	C669527-0101	0.4	16.5
D49-A	INDICATOR, ECONOMY MIXTURE (EGT GAGE)	0700222	1.0	6.0
D64-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 USE WITH NAV-O-MATIC 300A)	0701096	6.4*	12.2*
	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 NAV-O-MATICS 200A AND 300A	42320-0028	1.3	15.7
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-O	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 (4 OR 6 PLACE SEATING)	0711703	18.5	72.0
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-O	INERTIA REEL INSTL., PILOT (NET CHANGE)	0701081	1.8	81.6
E19-A	INERTIA REEL INSTALLATION-SEAT BELT AND SHOULDER HARNESS FOR PILOT & CO-PILOT (NET CHANGE)	0701081	2.1	88.1
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
E39-0	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
E41-0-1	DOOR ASSY., W/STD. UPPER WINDOW, OPT LWR.	0717020	19.6	48.4
E41-0-2	DOOR ASSY., W/DOMED UPPER WINDOW, NO LOWER	0711023	20.5	48.4
E41-0-3	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
E57-0	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
E89-0	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
F01-0-1	PLACARD, OPERATIONAL LIMITATION VFR - DAY/NIGHT	0505087-14	NEGL	- -
F01-0-2	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
	LOCP 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	3910157	4.0*	101.3*
	EXCHANGE FOR VOR/LOC			
	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	42540-0000	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 REQD 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 REQD 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	3.2	69.9
	RELAY INSTALLATION	3910139-3	0.3	140.0
H31-A-2	NAV-O-MATIC 300A INSTALLATION (AF-395A)	3910153	10.3*	27.6*
	CONTROLLER-AMPLIFIER (CA-395A)	42660-1201	1.8	13.0
	GYRO INSTALLATION (ITEM D84-A-2)	0701396	6.4	12.2
	RELAY INSTALLATION	3970135-3	0.3	140.0
	TURN COORDINATOR (ITEM D88-A-2)	42320-0028	1.3	15.7
	VACUUM SYSTEM (ITEM A61-A)	0701396	3.0	-1.3
	ROLL ACTUATOR INSTL	0700216-4	3.2	69.9
H34-A	BASIC AVIONICS KIT (REQUIRED BY AND AVAILABLE WITH 1ST NAV/COM INSTL. ONLY)	3910136-6	7.3*	49.0*
	RADIO CEILING	3930230-9	1.1	10.2
	RECEIVER-TRANSCEIVER INSTL KIT	3930186-2	0.1	16.7
	NOISE FILTER	3990143-2	0.1	-6.0
	LH COM ANTENNA CABLE ASSY	3990125-4	0.3	25.2
	OMNI ANTENNA CABLE ASSY	3990125-9	0.8	141.8
	OMNI ANTENNA INSTALLATION	3990132-4	0.5	220.0
	LH COM ANTENNA INSTALLATION	3990113-1	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	19.6
	AUDIO CONTROL PANEL & WIRING	3970131-1	1.9	13.0
H37-A	2ND NAV/COM INSTALLATION KIT	3910185-5	1.1*	35.4*
	RH COM ANTENNA & CABLE		0.3	79.3
	OMNI ANTENNA COUPLER		0.2	5.0
H40-A	ADF ANTI-PRECIP ANTENNA	3910168-4	0.9	75.1
H55-A	HEADSET-MIKE COMBINATION INSTALLATION	3770413-*	0.6*	16.3*
	HEADSET (NORMALLY STOWED AT 14.0 ARM) (REQUIRES E69-C)	C596330-0101	0.3	- -
H56-A	PADDED HEADSET/MICROPHONE INSTL., STOWED, REQUIRES L69-C	C596331-0101	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			
J31-A	180 II EQUIPMENT PACKAGE		50.3*	44.3*
	A61-A VACUUM SYSTEM	0701095	3.0	-1.3
	C73-A OIL QUICK DRAIN VALVE	C661071-0101	0.0	- -
	C87-A GROUND SERVICE RECEPTICLE	0701044	2.9	123.4

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
A33-0	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 (B16-0 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)	0701089	1.3	15.7
	D91-A VERTICAL SPEED INDICATOR	0701094	0.9	15.0
	E55-A SUN VISORS (2)	0500040	0.8	33.0

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.

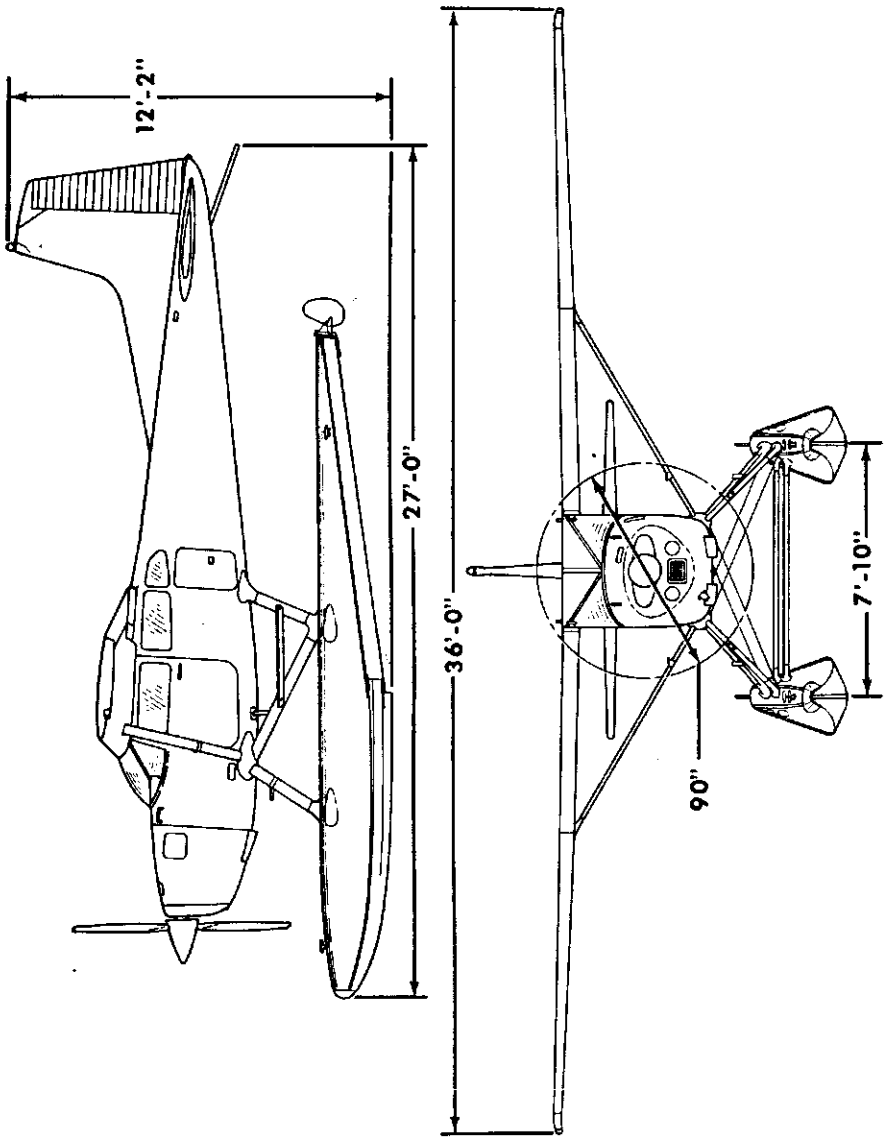


Figure 1. Three View (Sheet 1 of 2)

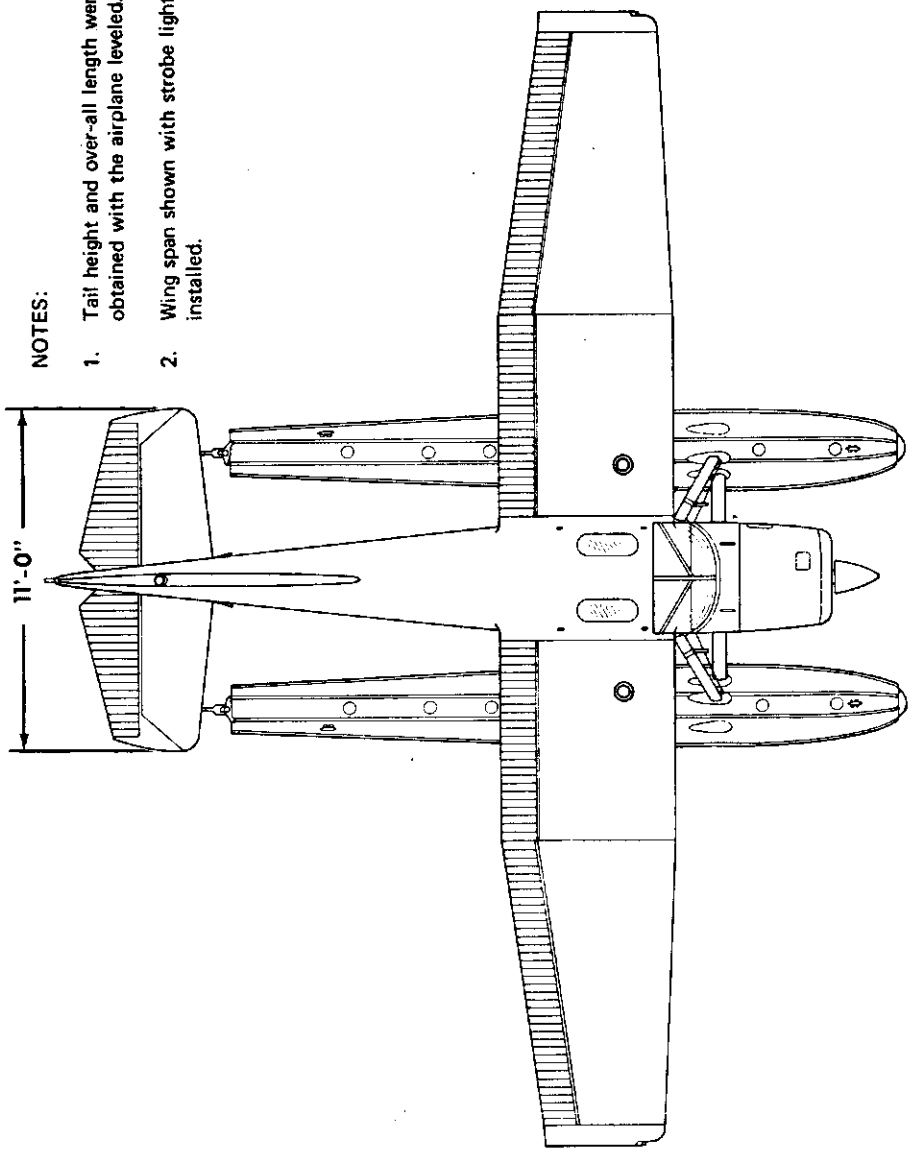


Figure 1. Three View (Sheet 2 of 2)

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: 10^0 Flaps 20^0 - 40^0 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.

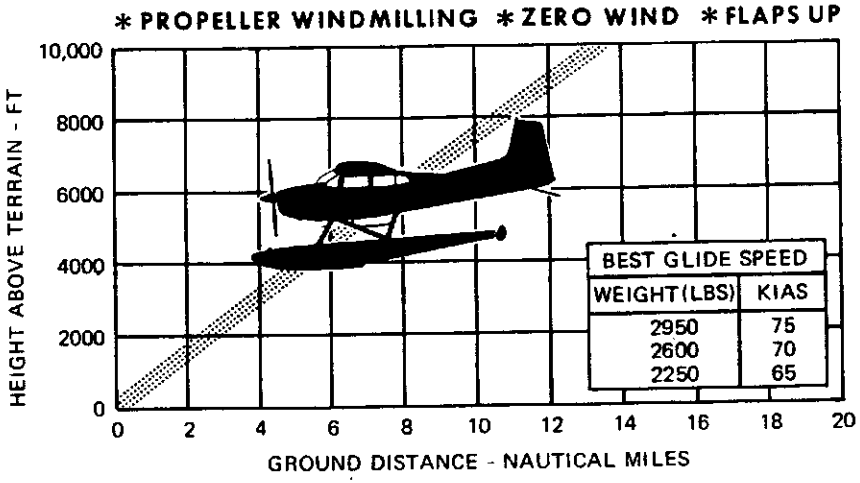


Figure 3. Maximum Glide

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 liftoff 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	65	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	1695	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	12.6
	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.

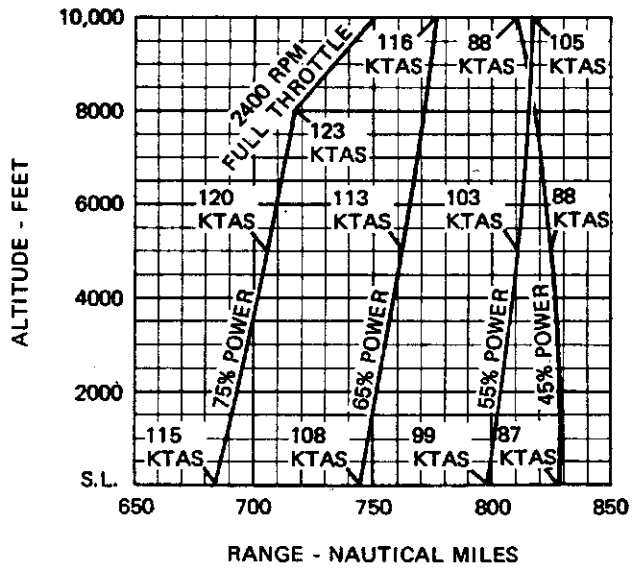


Figure 10. Range Profile

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.

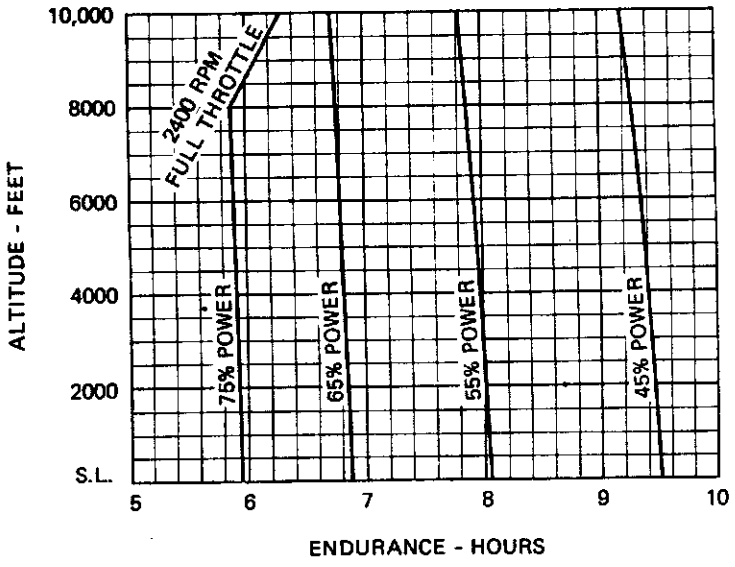


Figure 11. Endurance Profile

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.

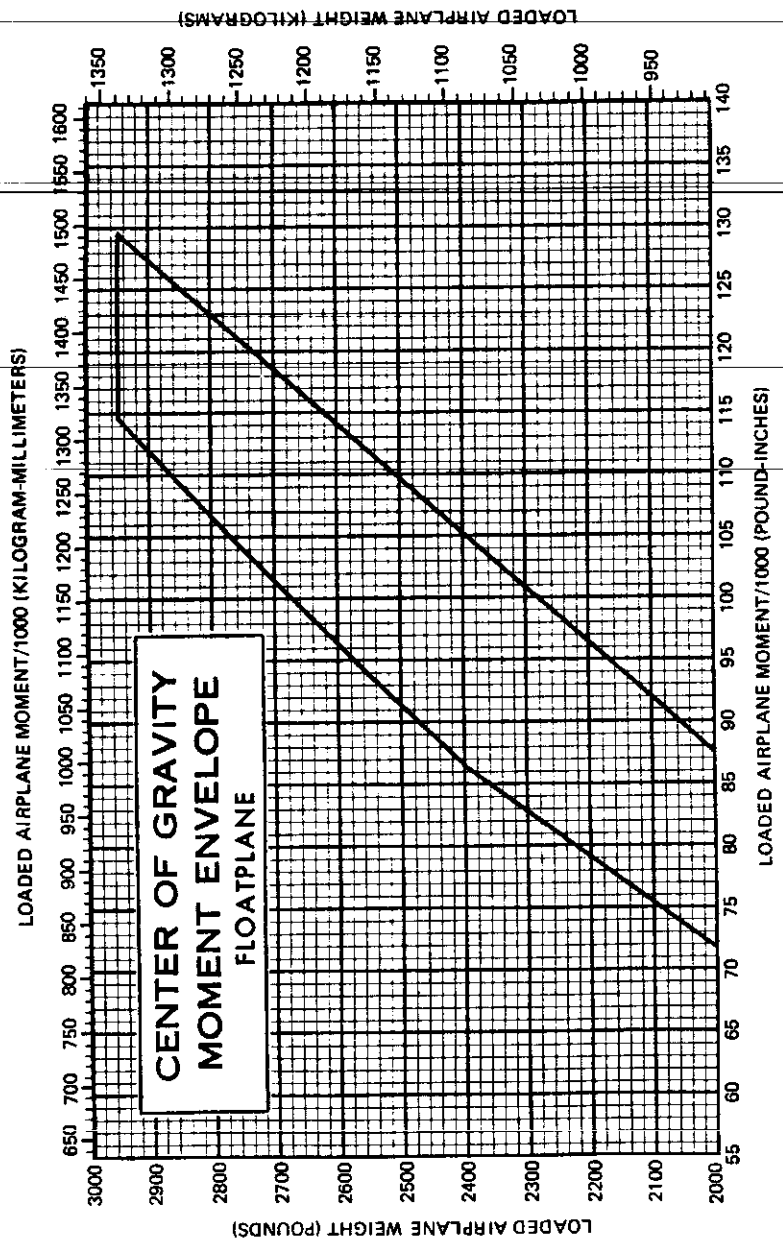


Figure 13. Center of Gravity Moment Envelope

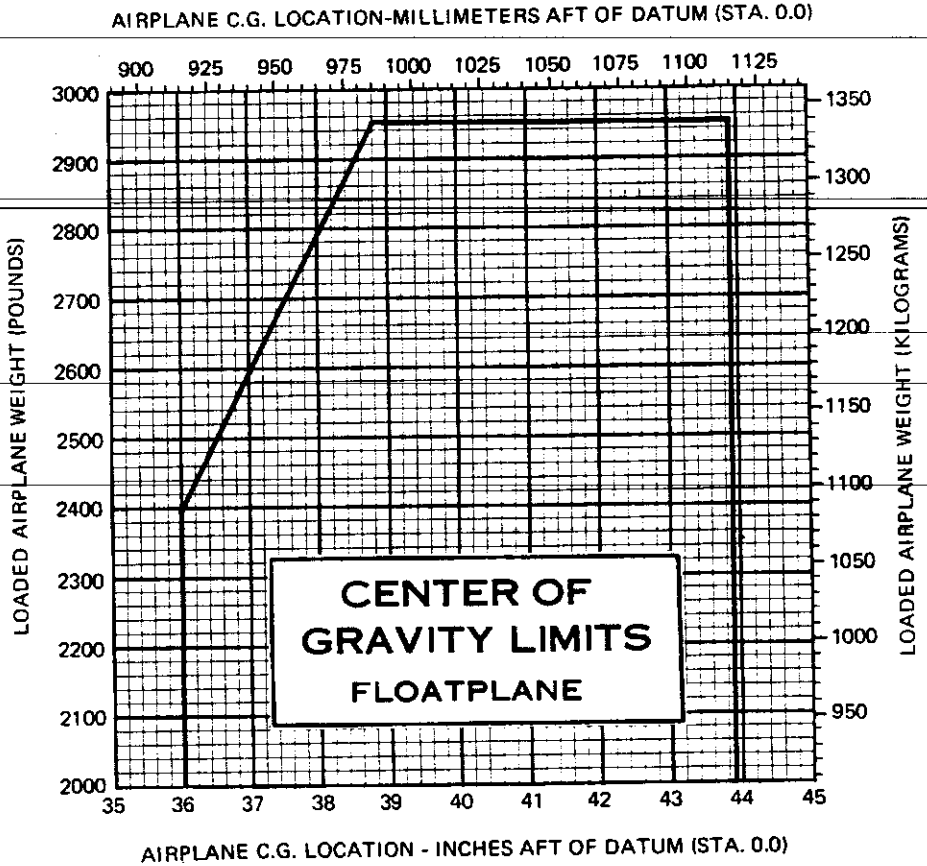


Figure 14. Center of Gravity Limits