Cessna®

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1974

WORLD'S LARGEST PRODUCER OF GENERAL AVIATION AIRCRAFT SINCE 1956

MODEL 310

OWNER'S MANUAL

PERFORMANCE AND SPECIFICATIONS

GROSS WEIGHT:	
Takeoff	5300 lbs.
Landing	5300 lbs.
SPEED BEST POWER MIXTURE:	
Maximum - Sea Level	205 Knots
Maximum Recommended Cruise 75% Power at 6500 ft.	192 Knots
RANGE, RECOMMENDED LEAN MIXTURE:	
Maximum Recommended Cruise	
75% Power at 6500 ft. 600 lbs., No Reserve	672 Naut. Mi. 3.55 hrs. 189 Knots
75% Power at 6500 ft. 978 lbs., No Reserve	1092 Naut. Mi. 5.77 hrs. 189 Knots
75% Power at 6500 ft. 1218 lbs., No Reserve	1359 Naut. Mi. 7.18 hrs. 189 Knots
Maximum Range	
10,000 ft., 600 lbs., No Reserve	834 Naut. Mi. 5.25 hrs. 159 Knots
10,000 ft., 978 lbs., No Reserve	1360 Naut. Mi. 8.56 hrs. 159 Knots
10,000 ft., 1218 lbs., No Reserve	1693 Naut. Mi. 10.66 hrs. 159 Knots
RATE OF CLIMB AT SEA LEVEL:	
Twin Engine	1495 fpm.
Single Engine	327 fpm.
SERVICE CEILING:	
Twin Engine	19,500 ft.
*Single Engine	6680 ft.
TAKEOFF PERFORMANCE: Takeoff Speed (78 KIAS 15° Flaps)	
Ground Run	1519 ft.
Total Distance Over 50-foot Obstacle	1795 ft.
LANDING PERFORMANCE: Approach Speed (89 KIAS, 5300 lbs.)	
Ground Roll	582 ft.
Total Distance Over 50-foot Obstacle	1697 ft.
EMPTY WEIGHT: (Approximate)	
310	3214 lbs.
310 II	3392 lbs.
BAGGAGE ALLOWANCE:	600 lbs.
WING LOADING:	29.6 lbs./sq. ft.
POWER LOADING:	10.2 lbs./hp.
FUEL CAPACITY: TOTAL	
Standard	102 gals.
With Auxiliary Tanks (40 gal. usable)	143 gals.
With Auxiliary Tanks (63 gal. usable)	166 gals.
With Auxiliary Tanks (63 gal. usable) and Wing Locker Tanks	207 gals.
OIL CAPACITY: TOTAL	6.0 gals.
ENGINES:	
Continental 6-Cylinder, Fuel Injection Engines 260 Rated HP at 2625 RPM	IO-470-VO
PROPELLERS:	
Constant Speed, Full Feathering,	
Two Blade (Std) 81" Diameter	D2AF34C71-L1/84JF-3
Three Blade (Opt) 78" Diameter	3AF32C87-L1/82NC-4

*Single engine service ceiling increases 425 feet for each 30 minutes of flight.

THIS OWNER'S MANUAL COVERS THE OPERATION OF 310 AND 310II AIRCRAFT SERIAL 0901 THRU 1300

D1562-13

CONGRATULATIONS . . . .

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

This Owner's Manual has been prepared as a guide to help you get the most pleasure and utility from your aircraft. It contains information about your Cessna's equipment, operating procedures, and performance; and suggestions for its servicing and care. We urge you to read it from cover to cover, and to refer to it frequently.

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

THE CESSNA WARRANTY -- it is designed to provide you with the most comprehensive coverage possible:

a. No exclusions
b. Coverage includes parts and labor
c. Available at Cessna Dealers worldwide
d. Best in the industry

Specific benefits and provisions of warranty plus other important benefits for you are contained in your Customer Care Program book supplied with your aircraft. Warranty service is available to you at any authorized Cessna Dealer throughout the world upon presentation of your Customer Care Card which establishes your eligibility under the warranty.

FACTORY TRAINED PERSONNEL to provide you with courteous expert service.

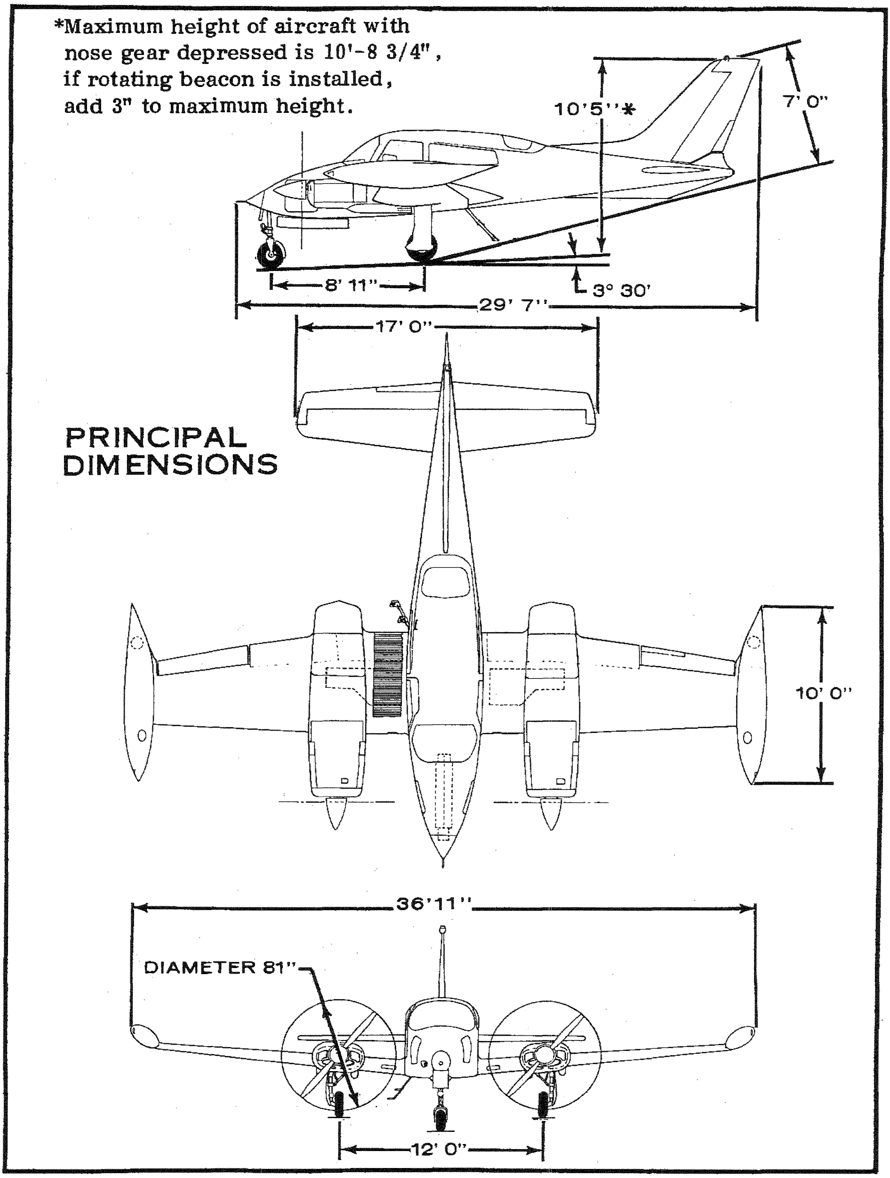
FACTORY APPROVED SERVICE EQUIPMENT to provide you with the most efficient and accurate workmanship possible.

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

THE LATEST AUTHORITATIVE INFORMATION FOR SERVICING CESSNA AIRCRAFT, since Cessna Dealers have all of the Service Manuals and Parts Catalogs, kept current by Service Letters and Service News Letters, published by Cessna Aircraft Company.

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

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


*Maximum height of aircraft with nose gear depressed is 10'-8 3/4", if rotating beacon is installed, add 3" to maximum height.
10'5"*
7' 0"
8' 11"
3° 30'
29' 7"
17' 0"
PRINCIPAL DIMENSIONS
10' 0"
36'11"
DIAMETER 81"
12' 0"

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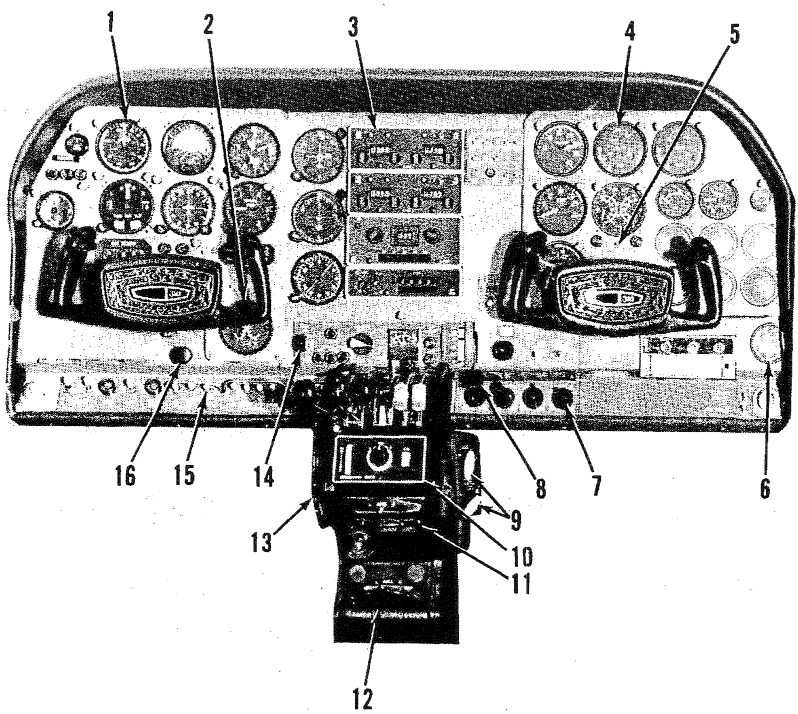
*This manual describes the operation and performance of both the Cessna 310 and 310 II aircraft. Equipment described as "Optional" denotes that the subject equipment is optional on the 310 aircraft. Much of this equipment is standard on the 310 II.

INSTRUMENT PANEL



1 FLIGHT INSTRUMENT GROUP
2 ECONOMY MIXTURE INDICATOR (OPTIONAL)
3 AVIONICS CONTROL PANEL (OPTIONAL)
4 ENGINE INSTRUMENT GROUP
5 FUEL QUANTITY SELECTOR SWITCH (OPTIONAL)
6 OXYGEN CYLINDER PRESSURE GAGE (OPTIONAL)
7 HEATER AND CABIN AIR CONTROL PANEL
8 FLAP POSITION SWITCH
9 ALTERNATE AIR CONTROLS
10 AUTOPILOT CONTROL HEAD (OPTIONAL)
11 RUDDER TRIM CONTROL
12 AILERON TRIM CONTROL
13 ELEVATOR TRIM CONTROL
14 LANDING GEAR POSITION SWITCH
15 LEFT-HAND SWITCH PANEL
16 OXYGEN CONTROL KNOB (OPTIONAL)

310

SECTION I
OPERATING CHECKLIST

One of the first steps in obtaining the utmost performance, service, and flying enjoyment from your Cessna is to familiarize yourself with your aircraft's equipment, systems, and controls. This can best be done by reviewing this equipment while sitting in the aircraft. Those items whose function and operation are not obvious are covered in Section II.

Section I lists, in Pilot's Checklist form, the steps necessary to operate your aircraft efficiently and safely. It covers briefly all the points that you should know concerning the information you need for a typical flight.

The flight and operational characteristics of your aircraft are normal in all respects. All controls respond in the normal way within the entire range of operation.

MAKE A PREFLIGHT INSPECTION IN ACCORDANCE WITH FIGURE 1-1.

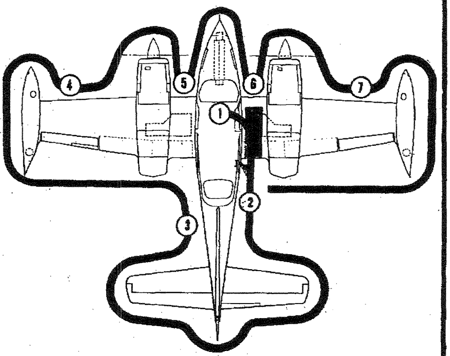
BEFORE STARTING THE ENGINES

(1) Preflight Inspection - COMPLETE.
(2) Control Lock(s) - REMOVE.
(3) Seats, Seat Belts and Shoulder Harness - ADJUST and SECURE.
(4) Brakes - TEST and SET.
(5) Landing Gear Switch - DOWN.
(6) Emergency Alternator Field Switch - OFF.
(7) Emergency Avionics Power Switch - OFF.
(8) Avionics Master Switch - OFF.
(9) Circuit Breakers - IN.
(10) All Switches - OFF.
(11) Battery and Alternators - ON.

PREFLIGHT INSPECTION

NOTE

- Visually check inspection plates and general aircraft condition during walk-around inspection. If night flight is planned, check operation of all lights and make sure a flashlight is available.
- Refer to inside back cover of this manual for quantities, materials, and specifications of frequently used service items.



(1)
a. Control Lock (s) - REMOVE and STOW.
b. Parking Brake - SET
c. All Switches - OFF.
d. All Circuit Breakers - IN.
e. Landing Gear Switch - DOWN.
f. Left Fuel Selector - LEFT MAIN (feel for detent).
g. Right Fuel Selector - RIGHT MAIN (feel for detent).
h. Trim Tab Controls (3) - NEUTRAL.
i. Oxygen - CHECK quantity, masks, and hoses - OFF.
j. Battery Switch - ON.
k. Fuel Gages - CHECK quantity and operation.
l. Wing Flaps - EXTEND.

(2)
a. Baggage Door - SECURE.
b. Static Port - CLEAR.
c. Deice Boots - CHECK condition and security, if installed.
d. Control Surface Locks - REMOVE, elevator and rudder.
e. Elevators and Tab - CHECK condition, freedom of movement, and tab position.
f. Tie Down - REMOVE.
g. Rudder and Tab - CHECK condition, freedom of movement, and tab position.

(3)
a. Static Port - CLEAR.
b. Wing Locker Baggage Door - SECURE.
c. Battery Compartment Cover - SECURE.
d. Flap - CHECK security and attachment.
e. Bottom Outboard Wing - CHECK for fuel stains.
f. Control Surface Lock - REMOVE.
g. Aileron and Tab - CHECK condition, freedom of movement, and tab position.
h. Tip Tank Transfer Pump - LISTEN for operation.
i. Fuel Sump (Main Tank) - DRAIN.
j. Fuel Vent and Sniffle Valve - CLEAR.
k. Fuel Quantity (Main Tank) - CHECK, cap secure.
l. Deice Boot - CHECK condition and security, if installed.
m. Stall Warning Vane - CHECK freedom of movement and audible warning.
n. Wing Tie Down - REMOVE.

Figure 1-1 (Sheet 1 of 2)

(4)
a. Fuel Quantity (Auxiliary Tank) - CHECK, cap secure.
b. Fuel Vent (Wing Locker Tank) - CLEAR, if installed.
c. Fuel Sump (Auxiliary Tank and Wing Locker Transfer Line, if installed) - DRAIN.
d. Fuel Strainer - DRAIN.
e. Fuel Quantity (Wing Locker Tank) - CHECK, cap secure, if installed.
f. Oil Level - CHECK, minimum 9 quarts.
g. Engine Compartment General Condition - CHECK for fuel, oil and exhaust leaks or stains.
h. Propeller and Spinner - EXAMINE for nicks, security and oil leaks.
i. Leading Edge Air Intake - CLEAR.
j. Main Gear Strut, Doors and Tire - CHECK.
k. Fuel Sump (Wing Locker Tank) - DRAIN, if installed.

(5)
a. Nose Access Panel - SECURE.
b. Nose Gear, Strut, Doors and Tire - CHECK.
c. Lower Fuselage, Nose and Center Section - CHECK for fuel stains.
d. Pitot Cover - REMOVE, if installed.
e. Pitot Tube - CLEAR.
f. Tie Down - REMOVE.
g. Heater Inlet - CLEAR.
h. Nose Access Panel - SECURE.

(6)
a. Leading Edge Air Intake - CLEAR.
b. Crossfeed Lines - DRAIN.
c. Fuel Sump (Wing Locker Tank) - DRAIN, if installed.
d. Main Gear, Strut, Doors and Tire - CHECK.
e. Fuel Quantity (Wing Locker Tank) - CHECK, cap secure, if installed.
f. Oil Level - CHECK, minimum 9 quarts.
g. Engine Compartment General Condition - CHECK, for fuel, oil and exhaust leaks or stains.
h. Propeller and Spinner - EXAMINE for nicks, security and oil leaks.
i. Fuel Vent (Wing Locker Tank) - CLEAR, if installed.
j. Fuel Sump (Auxiliary Tank and Wing Locker Transfer Line, if installed) - DRAIN.
k. Fuel Strainer - DRAIN.
l. Fuel Quantity (Auxiliary Tank) - CHECK, cap secure.

(7)
a. Wing Tie Down - REMOVE.
b. Deice Boot - CHECK condition and security, if installed.
c. Fuel Quantity (Main Tank) - CHECK, cap secure.
d. Fuel Vent and Sniffle Valve - CLEAR.
e. Fuel Sump (Main Tank) - DRAIN.
f. Tip Tank Transfer Pump - LISTEN for operation.
g. Control Surface Lock - REMOVE.
h. Aileron - CHECK condition and freedom of movement.
i. Bottom Outboard Wing - CHECK for fuel stains.
j. Wing Flap - CHECK security and attachment.
k. Wing Locker Baggage Door - SECURE.
l. Battery Switch - OFF.

Figure 1-1 (Sheet 2 of 2)

NOTE

When using an external power source, do not turn on battery or alternator switches until external power is disconnected, to avoid damage to the alternators and a weak battery draining off part of the current being supplied by the external source.

(12) Lighting Rheostats - AS REQUIRED.
(13) Altimeter and Clock - SET.
(14) Heater Overheat and T & B - PRESS-TO-TEST.
(15) Landing Gear Position Indicator Lights - CHECK (press to test as required).
(16) Cabin Air Controls - AS REQUIRED.
(17) Fuel Quantity - CHECK.
(18) Throttles - OPEN ONE INCH.
(19) Propellers - FULL FORWARD.
(20) Mixtures - FULL RICH.
(21) Fuel Selectors - Left Engine - LEFT MAIN (feel for detent).
Right Engine - RIGHT MAIN (feel for detent).
(22) Alternate Air Controls - IN.

STARTING ENGINES (Left Engine First)

NORMAL START (NO EXTERNAL POWER)

(1) Propeller - CLEAR.
(2) Magneto Switches - ON.
(3) Engine - START.
(a) Starter Button - PRESS.
(b) Primer Switch - Left Engine - LEFT.
Right Engine - RIGHT.

CAUTION

- If the primer is activated for excessive periods of time with the engine inoperative on the ground or during flight, damage may be incurred to the engine and/or aircraft due to fuel accumulation in the induction system.

- During very hot weather, caution should be exercised to prevent overpriming the engines.

- Should fuel priming or auxiliary fuel pump operation periods in excess of 60 seconds occur, the engine manifold must be purged by one of the following procedures:
  (a) With auxiliary fuel pump OFF, allow manifold to drain at least 5 minutes or until fuel ceases to flow out of the drain under the nacelle.
  (b) If circumstances do not allow natural draining periods recommended above, with the auxiliary fuel pump OFF, magnetos OFF, mixture idle cut-off and throttle full open, turn engine with starter or by hand a minimum of 15 revolutions.

(4) Auxiliary Fuel Pump - LOW (to purge vapor from fuel system).
(5) Throttle - 1000 to 1200 RPM.
(6) Oil Pressure - 10 PSI minimum in 30 seconds in normal weather or 60 seconds in cold weather. If no indication appears, shutdown engine and investigate.
(7) Right Engine - START (repeat steps 1 through 6).
(8) Alternators - CHECK.
(9) Wing Flaps - UP.
(10) Rotating Beacon - ON.
(11) Avionics Master Switch - ON.
(12) Radios - SET.

STARTING ENGINES (Left Engine First)

WITH EXTERNAL POWER SOURCE

(1) Battery and Alternators - OFF.
(2) External Power Source - PLUG IN.
(3) Propeller - CLEAR.
(4) Magneto Switches - ON.
(5) Engine - START.
  (a) Starter Button - PRESS.
  (b) Primer Switch - Left Engine - LEFT.
  Right Engine - RIGHT.

CAUTION

- If the primer is activated for excessive periods of time with the engine inoperative on the ground or during flight, damage may be incurred to the engine and/or aircraft due to fuel accumulation in the induction system.
- During very hot weather, caution should be exercised to prevent overpriming the engines.
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(6) Auxiliary Fuel Pump - LOW (to purge vapor from fuel system).

(7) Throttle - 1000 to 1200 RPM.
(8) Oil Pressure - 10 PSI minimum in 30 seconds in normal weather or 60 seconds in cold weather. If no indication appears, shutdown engine and investigate.
(9) Right Engine - START (repeat steps 3 through 8).
(10) External Power Source - UNPLUG.
(11) Battery and Alternators - ON.
(12) Alternators - CHECK.
(13) Wing Flaps - UP.
(14) Rotating Beacon - ON.
(15) Avionics Master Switch - ON.
(16) Radios - SET.

BEFORE TAKEOFF

(1) Brakes - SET.
(2) Engine Runup:
   (a) Throttles - 1700 RPM.
   (b) Alternators - CHECK.
   (c) Magnetos - CHECK (150 RPM maximum drop with a maximum differential of 50 RPM).
   (d) Propellers - CHECK feathering to 1200 RPM; return to high RPM (full forward position).
   (e) Engine Instruments - CHECK green arc.
   (f) Vacuum System - CHECK (4.75 to 5.25 inches Hg.).
   (g) Throttles - 1000 RPM.

NOTE

It is important that the engine oil temperature be within the normal operating range prior to applying takeoff power.

(3) Flight Controls - CHECK free and correct.
(4) Trim Tabs - SET.
(5) Alternate Air Controls - Check IN.
(6) Fuel Selectors - RECHECK - Left Engine - LEFT MAIN (feel for detent).
Right Engine - RIGHT MAIN (feel for detent).

(7) Wing Flaps - UP.
(8) Cabin Door and Window - CLOSED and LOCKED.
(9) Fuel Quantity - CHECK.
(10) If Electric Gyro Horizon is installed, Gyro Horizon - PULL to erect.
(11) Flight Instruments and Radios - SET.
(12) Lights - AS REQUIRED.
(13) Auxiliary Fuel Pumps - ON.
(14) Brakes - RELEASE.

TAKEOFF

NORMAL TAKEOFF

(1) Power - FULL THROTTLE and 2625 RPM.

NOTE

Apply full throttle smoothly to avoid propeller surging.

(2) Mixtures - LEAN for field elevation.

NOTE

Leaning during the takeoff roll is normally not necessary; however, should maximum takeoff or subsequent engine-out performance be desired, fuel flow should be adjusted to match field elevation.

(3) Elevator Control - Raise nosewheel at 78 KIAS.
(4) Minimum Control Speed - 75 KIAS.
(5) Break Ground at 90 KIAS.

MAXIMUM PERFORMANCE TAKEOFF

(1) Wing Flaps - DOWN 15°.
(2) Power - FULL THROTTLE and 2625 RPM.
(3) Mixtures - LEAN for field elevation.
(4) Elevator Control - Raise nosewheel at 73 KIAS.
(5) Minimum Control Speed - 75 KIAS.
(6) Break Ground at 78 KIAS - Hold speed until all obstacles are cleared.

AFTER TAKEOFF

(1) Brakes - APPLY momentarily.
(2) Landing Gear - RETRACT (check red light OFF).
(3) Wing Flaps - UP (after obstacles are cleared if maximum performance takeoff)
(4) Climb Speed - 107 KIAS (multi-engine best rate-of-climb speed).
(5) Auxiliary Fuel Pumps - OFF.

CLIMB

NORMAL CLIMB

(1) Power - 24 inches Hg. and 2450 RPM.
(2) Airspeed - 115-130 KIAS.
(3) Mixtures - ADJUST to climb fuel flow.
(4) Auxiliary Fuel Pumps - ON (above 12,000 feet altitude to minimize vapor formation).

> NOTE
>
> During very hot weather, if there is an indication of vapor in the fuel system (fluctuating fuel flow) or anytime when climbing above 12,000 feet, turn the auxiliary fuel pumps ON until cruising altitude has been obtained and the system is purged (usually 5 to 15 minutes after establishing cruising flight).

MAXIMUM PERFORMANCE CLIMB

(1) Power - FULL THROTTLE and 2625 RPM.
(2) Airspeed - 107 KIAS at sea level; 105 KIAS at 10,000 feet.
(3) Mixtures - ADJUST for altitude and power.
(4) Auxiliary Fuel Pumps - ON (above 12,000 feet altitude to minimize vapor formation).

> NOTE
>
> During very hot weather, if there is an indication of vapor in the fuel system (fluctuating fuel flow) or anytime when climbing above 12,000 feet, turn the auxiliary fuel pumps ON until cruising altitude has been obtained and the system is purged (usually 5 to 15 minutes after establishing cruising flight). It is recommended that the mixture remain at the climb mixture setting for approximately 5 minutes after establishing cruising flight before leaning is initiated.

CRUISING

(1) Cruise Power - 15-24 inches Hg. and 2100-2450 RPM.
(2) Mixtures - LEAN for desired cruise fuel flow as determined from your power computer. Recheck mixtures if power, altitude or OAT changes.
(3) Fuel Selectors - Left Engine - LEFT MAIN (feel for detent).
Right Engine - RIGHT MAIN (feel for detent).
    (a) If optional 40 gal. auxiliary tanks are installed, fuel selectors - MAIN TANKS for 60 minutes.
    (b) If optional 63 gal. auxiliary tanks are installed, fuel selectors - MAIN TANKS for 90 minutes.
    (c) Usable auxiliary fuel quantity is based on level flight.
    (d) If wing locker tanks are installed, fuel selectors - MAIN TANKS or, after wing locker tanks are transferred and main tank quantity is less than 180 pounds each - AUXILIARY TANKS.

NOTE

Turn auxiliary fuel pumps to LOW and mixtures to FULL RICH when switching tanks.

(e) If wing locker tanks are installed, crossfeed - SELECT as required to maintain fuel balance after wing locker tank fuel transfer.

(4) Trim Tabs - ADJUST.

LETDOWN

(1) Power - AS REQUIRED.

(2) Mixtures - ADJUST for smooth operation with gradual enrichment as altitude is lost.

BEFORE LANDING

(1) Fuel Selectors - Left Engine - LEFT MAIN (feel for detent).
Right Engine - RIGHT MAIN (feel for detent).

(2) Auxiliary Fuel Pumps - ON.

(3) Alternate Air Controls - Check IN.

(4) Mixtures - FULL RICH or lean as required for smooth operation.

(5) Propellers - FULL FORWARD.

(6) Wing Flaps - DOWN 15° below 160 KCAS.

(7) Landing Gear - DOWN below 140 KCAS.

(8) Landing Gear Position Indicator Lights - CHECK down lights ON; unlocked light - OFF.

(9) Wing Flaps - DOWN 15° to 35° below 140 KCAS.

(10) Minimum Multi-Engine Approach Speed - 89 KIAS.

(11) Minimum Single-Engine Control Speed - 75 KIAS.

LANDING

(1) Touchdown - Main wheels first.

(2) Landing Roll - Lower nosewheel gently.

(3) Brakes - AS REQUIRED.

GO-AROUND (Multi-Engine)

(1) Increase engine speed to 2625 RPM and apply full throttle if necessary.
(2) Reduce flaps setting to 15°.
(3) Trim aircraft for climb.
(4) Retract wing flaps as soon as all obstacles are cleared and a safe altitude and airspeed are obtained.

> NOTE
>
> Do not retract landing gear if another landing approach is to be conducted.

AFTER LANDING

(1) Auxiliary Fuel Pumps - LOW (during landing roll).
(2) Wing Flaps - UP.

SECURE AIRCRAFT

(1) Auxiliary Fuel Pumps - OFF.
(2) Avionics Master Switch - OFF.
(3) All Switches except Battery, Alternator and Magneto Switches - OFF.
(4) Throttles - IDLE.
(5) Propellers - FULL FORWARD.
(6) Mixtures - IDLE CUT-OFF.
(7) Fuel Selectors - OFF (if a long period of inactivity is anticipated).

> NOTE
>
> Do not leave the fuel selectors in the intermediate position as fuel from the main tip tanks will transfer into the auxiliary tanks.

(8) Magneto Switches - OFF, after engines stop.
(9) Battery and Alternators - OFF.
(10) Parking Brake - SET.
(11) Control Lock(s) - INSTALL.
(12) Cabin Door - CLOSE.

NOTE

To securely latch the cabin door from the outside, the exterior door handle must be rotated clockwise to its stop.

Notes

SECTION II
DESCRIPTION AND OPERATING DETAILS

The following paragraphs supply a general description of some systems and equipment in the aircraft. This section also covers, in somewhat greater detail, some of the items in Checklist Form in Section I. Only those items of the Checklist requiring further explanation will be covered here.

PREFLIGHT INSPECTION

The preflight inspection, described in Section I, is recommended for the first flight of the day. Inspection procedures for subsequent flights are normally limited to brief checks of the tail surface hinges, fuel and oil quantity, and security of fuel and oil filler caps. If the aircraft has been in extended storage, has had recent major maintenance, or has been operated from marginal airports, a more extensive preflight inspection is recommended.

After major maintenance has been performed, the flight and trim tab controls should be double-checked for free and correct movement and security. The security of all inspection plates on the aircraft should be checked following periodic inspection. Since radio and heater maintenance requires the mechanic to work in the nose compartment, the nose compartment access panels are opened for access to equipment. Therefore, it is important after such maintenance to double-check the security of these access panels. If the aircraft has been waxed or polished, check the external static pressure source holes for stoppage.

If the aircraft has been exposed to much ground handling in a crowded hangar, it should be checked for dents and scratches on wings, tip tanks, fuselage, and tail surfaces, as well as damage to navigation and landing lights, de-ice boots, and radio antenna. Outside storage for long periods may result in water and obstructions in airspeed system lines, condensation in fuel tanks, and dust and dirt on the intake air filters and engine cooling fins. Outside storage in windy or gusty areas, or adjacent to taxiing aircraft calls for special attention to control surface stops, hinges and brackets to detect the presence of wind damage.

If the aircraft has been operated from muddy fields or in snow and slush, check the main gear wheel and nose gear wheel wells for obstructions and cleanliness. Operation from a gravel or cinder field will require extra attention to propeller tips and abrasion on leading edges of the horizontal tail. Stone damage to the outer six inches of the propeller tips can seriously reduce the fatigue life of the blades.

Aircraft that are operated from rough fields, especially at high altitudes, are subjected to abnormal landing gear abuse. Check frequently all components of the landing gear retracting mechanisms, shock struts, tires and brakes.

To prevent loss of fuel in flight, make sure main and auxiliary fuel tank filler caps are tightly sealed. The main fuel tank vents beneath the tip tanks should also be inspected for obstructions, ice or water, especially after operation in cold, wet weather.

The interior inspection will vary according to the mission and the optional equipment installed. Prior to high-altitude flights, it is important to check the condition and quantity of oxygen face masks and hose assemblies. The oxygen supply system should be functionally checked to insure that it is in working order. The oxygen pressure gage should indicate between 300 and 1800 PSI depending upon the anticipated requirements.

Satisfactory operation of the pitot tube, stall warning transmitter and main fuel tank vent heating elements is determined by observing a discharge on the ammeter when the pitot heat switch is turned ON. The effectiveness of the pitot tube and stall warning transmitter heating elements may be verified by cautiously feeling the heat of both devices while the pitot heat switch is ON.

Flights at night and in cold weather involve a careful check of other specific areas which will be discussed later in this section.

STARTING ENGINES

The left engine is normally started first because the cable from the battery to this engine is much shorter permitting more electrical power to be delivered to the starter. If battery is low, the left engine should start more readily.

When using an external power source, it is recommended to start the aircraft with the battery and alternator switches OFF.

NOTE

Release starter switch as soon as engine fires or engine will not accelerate and flooding can result.

The continuous flow fuel injection system will start spraying fuel in the engine intake ports as soon as the primer switch is actuated and the throttle and mixture controls are opened. To avoid flooding, begin cranking the engine prior to priming the engine.

In hot weather with a hot engine, a fluctuating fuel flow slightly lower than normal may be obtained. This is an indication of vaporized fuel and the starter should not be energized until a steady fuel flow indication is obtained.

NOTE

Caution should be exercised to prevent overpriming the engine in hot weather.

Engine mis-starts characterized by weak, intermittent explosions, followed by black puffs of smoke from the exhaust are the result of flooding or overpriming. This situation is more apt to develop in hot weather, or when the engines are hot. If it occurs, repeat the starting procedure with the throttle approximately 1/2 open, the mixture in IDLE CUT-OFF and the primer switch OFF. As the engine fires, move the mixture control to FULL RICH and close the throttle to idle.

If an engine is underprimed, as may occur in cold weather with a cold engine, repeat the starting procedure while holding the primer switch on for 5 to 10 seconds until the engine fires.

If cranking longer than 30 seconds is required, allow starter-motor to cool five minutes before cranking again, since excessive heat may damage the armature windings.

After the engines are started, the auxiliary fuel pumps should be switched to LOW to provide for improved purging and vapor clearing in the fuel system.

TAXIING

A steerable nosewheel, interconnected with the rudder system, provides positive control up to 18° left or right, and free turning from 18° to 55° for sharp turns during taxiing. Normal steering may be aided through use of differential power and differential braking on the main wheels. These aids are listed in the preferred order of use.

> NOTE
>
> If the aircraft is parked with the nosewheel castered in either direction, initial taxiing should be done with caution. To straighten the nosewheel, use full opposite rudder and differential power instead of differential braking. After a few feet of forward travel, the nosewheel will steer normally.

At some time early in the taxi run, the brakes should be tested, and any unusual reaction, such as uneven braking, should be noted. If brake operation is not satisfactory, the aircraft should be returned to the tie-down location and the malfunction corrected. The operation of the turn-and-bank indicator and directional gyro should also be checked during taxiing.

Most of the engine warm-up should be done during taxiing, with just enough power to keep the aircraft moving. Engine speed should not exceed 1000 RPM while the oil is cold.

BEFORE TAKEOFF (Use the Pilot's Checklist)

Use the Pilot's Checklist in the aircraft to prevent the possibility of overlooking an important check item.

Most of the warm-up will have been conducted during taxi, and additional warm-up before takeoff should be restricted to the checks outlined in Section I.

Full throttle checks on the ground are not recommended unless there is good reason to suspect that the engines are not operating properly. Do not runup the engines over loose gravel or cinders because of possible stone damage or abrasion to the propeller tips.

If the ignition system produces an engine speed drop in excess of 150 RPM, or if the drop in RPM between the left and right magnetos differs by more than 50 RPM, continue warm-up a minute or two longer, before rechecking the system. If there is doubt concerning operation of the ignition system, checks at higher engine speed will usually confirm if a deficiency exists. In general, a drop in excess of 150 RPM is not considered acceptable.

If instrument flights are contemplated, a careful check should be made of the vacuum system. The minimum and maximum allowable suctions are 4.75 and 5.25 inches Hg., respectively, on the instrument. Good alternator condition is also important for instrument flight, since satisfactory operation of all radio equipment and electrical instruments is essential. The alternators are checked during engine runup (1700 RPM) by positioning the selector switch in the L ALT and R ALT position and observing the charging rate on the volt-ammeter.

A simple last minute recheck of important items should include a quick glance to see if all switches are ON, the mixture and propeller pitch levers are forward, all flight controls have free and correct movement, and the fuel selectors are properly positioned.

A mental review of all single-engine speeds, procedures, and field length requirements should be made prior to takeoff.

TAKEOFF

Since the use of full throttle is not recommended in the static runup, closely observe full-power engine operation early in the takeoff run. Signs of rough engine operation, unequal power between engines, or sluggish engine acceleration are good cause for discontinuing the takeoff. If this occurs, you are justified in making a thorough, full throttle, static runup before another takeoff is attempted.

For maximum engine power, the mixture should be adjusted during the initial acceleration for smooth engine operation at the field elevation. The engine acceleration is increased significantly with fuel leaning above 3000 feet and this procedure always should be employed for field elevations greater than 5000 feet above sea level.

Full throttle operation is recommended on takeoff since it is important that a speed well above minimum single-engine control speed (75 KIAS) be obtained as rapidly as possible. It is desirable to accelerate the aircraft to 90 KIAS (recommended safe single-engine speed) while still on the ground for additional safety in case of an engine failure. This safety may have to be compromised slightly where short and rough fields prohibit such high speed before takeoff.

MULTI-ENGINE AIRSPEED NOMENCLATURE		KIAS
(1)	Multi-Engine Best Rate-of-Climb	107
(2)	Multi-Engine Best Angle-of-Climb	81
(3)	Takeoff and Climb to 50 Ft.	90
(4)	Landing Approach from 50 Ft.	89

Figure 2-1

After takeoff it is important to maintain the recommended safe single-engine climb speed (90 KIAS). As you accelerate still further to best single-engine rate-of-climb speed (102 KIAS), it is good practice to climb rapidly to an altitude at which the aircraft is capable of circling the field on one engine.

After obstruction height is reached, power may be reduced and climb speeds may be established as described in Section I.

For crosswind takeoffs, additional power may be carried on the upwind engine until the rudder becomes effective. The aircraft is accelerated to a slightly higher than normal takeoff speed, and then is pulled off abruptly to prevent possible settling back to the runway while drifting. When clear of the ground, a coordinated turn is made into the wind to correct for drift.

A takeoff with one tip tank full and the opposite tank empty creates a lateral unbalance at takeoff speed. This is not recommended since gusty air or premature lift-off could create a serious control problem.

Performance data for normal takeoff, accelerate stop distance and single-engine takeoff are presented in Section VI.

AFTER TAKEOFF

To establish climb configuration, retract the landing gear, adjust power for climb, turn off the auxiliary fuel pumps and adjust the mixture for the power setting selected.

Before retracting the landing gear, apply the brakes momentarily to stop the main wheels. Centrifugal force caused by the rapidly-rotating wheels expands the diameter of the tires, and if ice or mud has accumulated in the wheel wells, the rotating wheels may rub as they enter.

On long runways, the landing gear should be retracted at the point over the runway where a wheels-down forced landing on that runway would become impractical. However, on short runways it may be preferable to retract the landing gear after the aircraft is safely airborne.

Power reduction will vary according to the requirements of the traffic pattern or surrounding terrain, gross weight, field elevation, temperature and engine condition. However, a normal "after takeoff" power setting is 24 inches Hg. and 2450 RPM.

CLIMB

To save time and fuel for the over-all trip, it is recommended that the normal cruising climb be conducted at 115-130 KIAS using approximately 75% power (24 inches Hg. manifold pressure and 2450 RPM).

The mixture should be leaned in this type of climb to give the desired fuel flow in the climb dial range which is approximately best power mixture.

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 varies from 107 KIAS at sea level to 105 KIAS at 10,000 feet. During maximum performance climbs, the mixture should be leaned to the appropriate altitude markings on the fuel flow gage. It is recommended that the auxiliary fuel pumps be on at altitudes above 12,000 feet for the duration of the climb and approximately 5 to 15 minutes after establishing cruising flight. It is also recommended that the mixture remain at the climb mixture setting for approximately 5 minutes after establishing cruising flight before leaning is initiated. This procedure will eliminate fuel vaporization problems likely to occur from rapid altitude changes.

If an obstruction ahead requires a steep climb angle, the aircraft should be flown at the best angle-of-climb speed with flaps up and maximum power. The speed varies from 81 KIAS at sea level to 96 KIAS at 15,000 feet. Performance data for maximum climb, cruise climb and single-engine climb are presented in Section VI.

CRUISE

Tabulated cruising information is provided for normal power and altitudes in Section VI. These charts are based on 600, 978 and 1218 pounds of fuel for cruise, recommended lean mixture, 5300 pounds gross weight, zero wind, and no fuel reserve. Allowances for warm-up, takeoff and climb, headwinds, variations in mixture leaning technique, and fuel reserve should be estimated, and the endurance and range shown in the charts should be modified accordingly. Fuel allowances for takeoff and climb are given in Section VI.

Normal cruising requires between 60% and 70% power. The manifold pressure and RPM settings required to obtain these powers at various altitudes and outside air temperatures can be determined with your power computer. A maximum cruising power of approximately 75% (24 inches Hg., and 2450 RPM) may be used if desired. Various percent powers can be obtained with a number of combinations of manifold pressures, engine speeds, altitudes, and outside air temperatures. However, at full throttle and constant engine speed, a specific power can be obtained at only one altitude for each given air temperature.

The power computer is marked with two fuel flow scales. These scales are provided to ensure that you can obtain the maximum performance and utilization from your Cessna. The inner fuel flow scale (marked recommended lean) should be utilized for all normal cruise performance. Data shown in Section VI are based on recommended lean mixture. The outer fuel flow scale (marked best power) will provide maximum speed for a given power setting. The speed will be approximately two knots greater than the speed with recommended lean mixture. Operation at best power mixture will significantly increase exhaust system, engine valve and ring life, particularly the exhaust system. For additional cruise fuel flow setting information, refer to Fuel Flow Management in this section.

For a given throttle setting, select the lowest engine speed in the green arc range that will give smooth engine operation without evidence of laboring.

For best propeller synchronizing, the final adjustment of the propeller pitch levers should be made in a DECREASE RPM direction.

Refer to the optional fuel system paragraphs in Section VII for proper fuel system management when the auxiliary fuel tanks and/or the wing locker fuel tanks are used.

ALTERNATE INDUCTION AIR SYSTEM

The induction air system on these engines is considered to be non-icing. However, to preclude the possibility of the alternate induction air door or control freezing up the manually-operated alternate induction air system should be utilized prior to entering suspected induction icing conditions. Induction icing conditions are considered to exist any time the temperature is below 35°F with visible moisture present or any time the temperature is below 35°F and the temperature/dew point spread is less than 5°F.

The use of alternate intake air results in higher induction air temperatures and decreases engine power. Therefore, it is recommended that the alternate induction air system be used only if icing conditions are expected.

Should additional power be required, while utilizing the alternate induction air system, the following procedure should be employed.

(1) Push propeller levers full forward for 2625 RPM. This will insure that the maximum power available is being used.
(2) Move throttles forward until maximum manifold pressure is reached.
(3) Readjust mixture control for smooth engine operation.

During ground operation, the alternate air doors should be closed to prevent engine damage caused by ingesting debris through unfiltered air ducts.

STALL

The stall characteristics of the aircraft are conventional. Aural warnings are provided by the stall warning horn between 4 and 9 knots above the stall in all configurations. The stall is also preceded by a mild aerodynamic buffet which increases in intensity as the stall is approached. The power-on stall occurs at a very steep angle, with or without flaps. It is difficult to inadvertently stall the aircraft during normal maneuvering.

Power-off stall speeds at maximum weight and various bank angles are presented in Section VI.

MANEUVERING FLIGHT

No aerobatic maneuvers, including spins, are approved in this aircraft. The aircraft is, however, conventional in all respects through the maneuvering range encountered in normal flight.

SPINS

Intentional spins are not permitted in this aircraft. Should a spin occur, however, the following recovery procedures should be employed:

(1) Cut power on both engines.
(2) Apply full rudder opposing the direction of rotation.
(3) Approximately 1/2 turn after applying rudder, push control wheel forward briskly.
(4) To expedite recovery, add power to the engine toward the inside of the direction of turn.
(5) Pull out of resulting dive with smooth, steady control pressure.

LETDOWN

Letdowns should be initiated far enough in advance of estimated landing to allow a gradual rate of descent at cruising speed. It should be at approximately 500 fpm for passenger comfort, using enough power to keep the engines warm. This will prevent undesirable low cylinder head temperatures caused by low power settings at cruise speed. The optimum engine speed in a letdown is usually the lowest one in the RPM green arc range that will allow cylinder heat temperatures to remain in the recommended operating range.

To prevent confusion in interpreting which 10,000 foot segment of altitude is being displayed on the altimeter, a striped warning segment is exposed on the face of the altimeter at all altitudes below 10,000 feet.

BEFORE LANDING

If fuel has been consumed at uneven rates between the two main tanks because of prolonged single-engine flight, it is desirable to balance the fuel load by operating both engines from the fullest tank. However, if there is sufficient fuel in both tanks, even though they may have unequal quantities, it is important to switch the left and right selector valves to the left and right main tanks respectively, and feel for detent, for the landing. This will provide an adequate fuel flow to each engine if a full-power go-around is necessary.

Landing gear extension before landing is easily detected by a slight change in aircraft trim and a slight "bump" as the gear locks down. Illumination of the gear-down indicator lights (green), is further proof that the gear is down and locked. The gear unlocked indicator light (red) will illuminate when the gear uplocks are released and will remain illuminated while the gear is in transit.

The unlocked light will extinguish when the gear has locked down. If it is reasonably certain that the gear is down and one of the gear-down indicator lights is still not illuminated, the malfunction could be caused by a burned out light bulb. This can be checked by pushing-to-test. If the bulb is burned out, it can be replaced with the bulb from either the compass light, turn-and-bank test light, or the landing gear up indicator light.

A simple last-minute recheck on final approach should confirm that all applicable switches are ON, the gear-down indicator lights (green) are illuminated, the gear unlocked indicator light (red) is extinguished, and the propeller and mixture controls are full forward.

LANDING

Landings are simple and conventional in every respect. If power is used in landing approaches, it should be eased off cautiously near touchdown, because the "power-on" stall speed is considerably less than the "power-off" stall speed. An abrupt power reduction at five feet altitude could result in a hard landing if the aircraft is near stall speed.

Landings on hard-surface runways are performed with 35° flaps from 89 KIAS approach, using as little power as practicable. A normal flare-out is made, and power is reduced in the flare-out. The landing is made on the main wheels first, and remaining engine power is cut immediately after touchdown. The nosewheel is gently lowered to the ground and brakes applied as required. Short field landings on rough or soft runways are done in a similar manner except that the nose wheel is lowered to the runway at a lower speed to prevent excessive nose gear loads.

Crosswind landings are performed with the least effort by using the crab method. However, either the wing-low, crab or combination method may be used. Crab the aircraft into the wind in a normal approach, using a minimum flap setting for the field length. Immediately before touchdown, the aircraft is aligned with the flight path by applying down-wind rudder. The landing is made in nearly three-point attitude, and the nosewheel is lowered to the runway immediately after touchdown. A straight course is maintained with the steerable nosewheel and occasional braking if necessary.

Landing performance data is presented in Section VI.

AFTER LANDING

Heavy braking in the landing roll is not recommended because skidding the main wheels is probable, with resulting loss of the braking effectiveness and damage to the tires. It is best to leave the flaps fully extended throughout the landing roll to aid in decelerating the aircraft. After leaving the active runway, the flaps should be retracted. Be sure the flap switch is identified before placing it in the UP position. The auxiliary fuel pump switches normally are turned to LOW while taxiing to the hangar. The fuel pumps must be turned OFF prior to stopping engines.

Parking is normally accomplished with the nosewheel aligned straight ahead. This simplifies the steering during subsequent departures from the parking area. However, if gusty wind conditions prevail, the nosewheel should be castered to the extreme right or left positon. This forces the rudder against the rudder stop which minimizes buffeting of the rudder in gusty wind.

With the mixture levers in IDLE CUT-OFF, the fuel flow is effectively blocked at the fuel metering unit. Thus, it is unnecessary to place the fuel selector valve handles in the OFF psoition if the aircraft is receiving normal usage. However, if a long period of inactivity is anticipated, the fuel selector valve handles should be turned OFF to preclude any possible fuel seepage that might develop through the metering valve.

NOTE

Do not leave the fuel selector handles in an intermediate position, as fuel from the main tip tanks will transfer into the auxiliary tanks.

NIGHT FLYING

Before starting engines for a night flight, rheostats should be turned on and adjusted to provide enough illumination to check all switches, controls, etc.

Navigation lights are then checked by observing illumination in the small peep holes in the inboard leading edges of the wing tip tanks and reflection from the pavement or ground below the tail light. The operation of the rotating beacons should be checked by observing the reflections on the ground and on the tip tanks and wings. The retractable landing lights (the right landing light is optional equipment) may be extended and checked momentarily. Returning the landing light switches to OFF turns the lights off but leaves them extended ready for instant use.

Before taxi, the interior lighting intensity is normally decreased to the minimum at which all the controls and switches are visible. The taxi light should be turned on prior to taxiing at night. The landing lights, if used during taxiing, should be used intermittently to avoid excessive drain on the batteries. In the engine runups, special attention should be directed to alternator operation by individually turning the selector switch to L ALT and R ALT and noting response on the voltammeter.

Night takeoffs are conventional, although gear retraction operation is usually delayed slightly to insure the aircraft is well clear of the runway.

In cruising flight, the interior lighting intensity should be decreased to the minimum which will provide adequate instrument legibility. This intensity should be readjusted periodically during flight as the degree of night vision adaptation or exterior ambient light level changes. Care should be exercised when increasing the intensity of illumination to preclude inadvertent deterioration of night vision adaptation.

COLD WEATHER OPERATION

Whenever possible, external preheat should be utilized in cold weather. The use of preheat materially reduces the severity of conditions imposed on both engines and electrical systems. It is the preferred or best method of starting engines in extremely cold weather. Preheat will thaw the oil trapped in the oil coolers and oil filters, which will probably be congealed prior to starting in very cold weather. When the oil pressure gage is extremely slow in indicating pressure, it may be advisable to fill the pressure line to the gage with kerosene or JP4.

> NOTE
>
> During cold weather operation it is advisable to rotate propellers through four complete revolutions, by hand, before starting engines.

If preheat is not available, external power should be used for starting because of the higher cranking power required and the decreased battery output at low temperatures. The starting procedure is normal; however, if the engines do not start immediately, it may be necessary to position the primer switch to LEFT or RIGHT for 5 to 10 seconds.

After a suitable warm-up period (2 to 5 minutes at 1000 RPM, if preheat is not used) accelerate the engines several times to higher RPM. The propellers should be operated through several complete cycles to warm the governors and propeller hubs. If the engines accelerate smoothly and the oil pressure remains normal and steady, the aircraft is ready for takeoff.

During operation in cold wet weather, the possibility of brake freezing exists, therefore special precautions should be taken. If ice is found on the brakes during preflight inspection, heat the brakes with a ground heater until the ice melts and all traces of moisture are removed. If a ground heater is not available, spray or pour isopropyl alcohol (MIL-F-5566) on the brakes to remove the ice.

CAUTION

If brakes are deiced using alcohol, insure alcohol has evaporated from the ramp prior to starting engines as a fire could result.

If neither heat or alcohol are available, frozen brakes can sometimes be freed by cycling the brakes assymetrically while applying engine power. Caution should be exercised if the aircraft is setting on ice or in close proximity to other parked aircraft.

After takeoff from slush covered runways or taxiways, leave landing gear down for a short period to allow wheels to decelerate. This will allow centrifugal force to throw off any accumulated slush which should preclude frozen brakes on landing. Insure wheels are stopped before retracting wheels to prevent buildup of ice or slush in the wheel wells.

During cruise the propellers should be exercised at half-hour intervals to flush the cold oil from the governors and propeller hubs. Electrical equipment should be managed to assure adequate alternator charging throughout the flight, since cold weather adversely affects battery capacity.

During letdown, watch engine temperature closely and carry sufficient power to maintain them above operating minimums.

The pitot, tip tank vents and stall warning heater switches should be turned ON at least 5 minutes before entering potential icing conditions (2 minutes if on the ground) so that these units will be warm enough to prevent formation of ice. Preventing ice is preferable to attempting its removal once it has formed.

Refer to Section VII for optional cold weather equipment.

FUEL SYSTEM

Fuel for each engine is supplied by a main tank (50 gallons usable) on each wing tip. Each engine has its own complete fuel system; the two systems are interconnected only by a cross-feed for emergency use. Vapor and excess fuel from the engines are returned to the main fuel tanks. Submerged electric auxiliary pumps in the main fuel tanks supply fuel for priming and starting, and for engine operation as a backup system to the engine-driven pumps. See Figure 2-2 for Fuel System Schematic and optional fuel systems paragraphs in Section VII for additional information.

NOTE

During very hot weather, if there is an indication of vapor in the fuel system (fluctuating fuel flow) or anytime when climbing above 12,000 feet, turn the auxiliary fuel pumps ON until cruising altitude has been obtained and the system is purged (usually 5 to 10 minutes after establishing cruising flight). It is recommended that the mixture remain at the climb mixture setting for approximately 5 minutes after establishing cruising flight before leaning is initiated.

A continuous duty tip tank transfer pump is installed in each main tip tank. The pumps assure availability of all tip tank fuel to the engine supply line during high angles of descent. Each pump is electrically protected by the respective landing light circuit breaker. When the right-hand landing light is not installed, a circuit breaker is installed to protect the right-hand transfer pump. During preflight inspection these pumps can be checked for operation by listening for a pulsing sound emanating from the aft tip tank fairings with the battery switch in the ON position.

FUEL SELECTOR VALVE HANDLES

The fuel selector valve placards are marked LEFT ENGINE OFF, LEFT MAIN and RIGHT MAIN for the left engine selector, and RIGHT ENGINE OFF, RIGHT

FUEL SYSTEM . . . . schematic

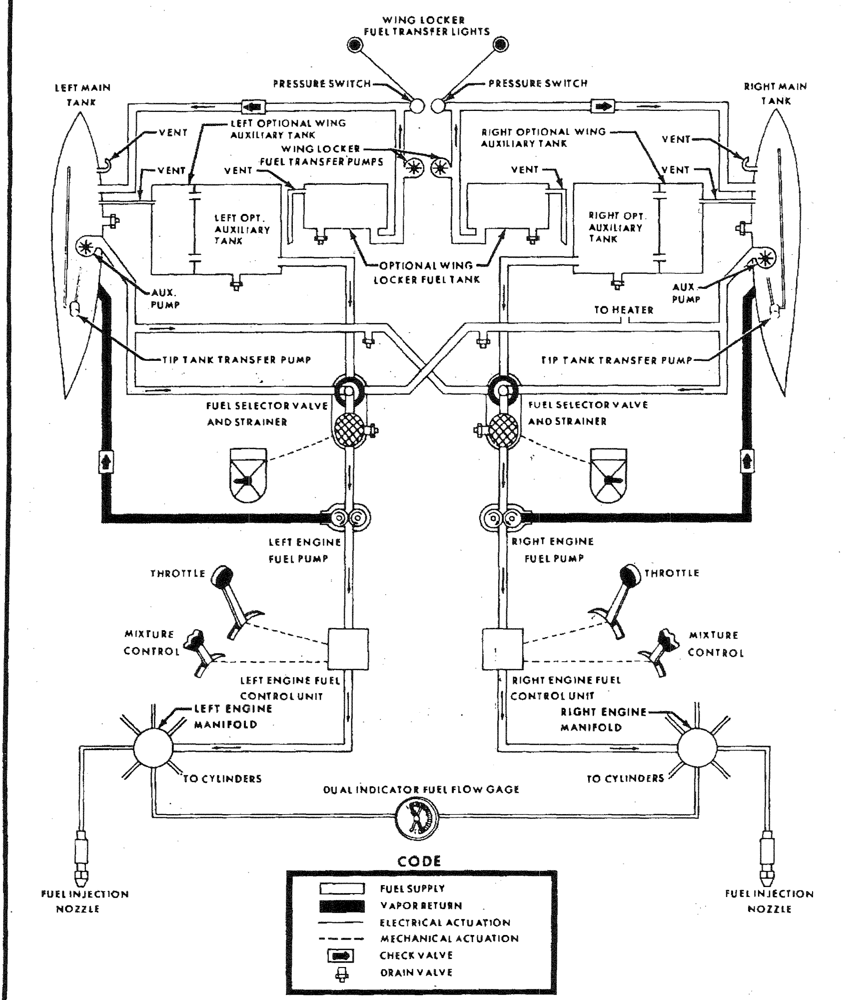


Figure 2-2

MAIN and LEFT MAIN for the right engine selector. The cross-feed position of each selector valve is the one marked for the opposite main tank.

The fuel selector valve handles form the pointers for the selectors. The ends of the handles are arrow-shaped and point to the position on the selector placard which corresponds to the valve position.

NOTE

- The fuel selector valve handles should be turned to LEFT MAIN for the left engine and RIGHT MAIN for the right engine, during takeoff, landing and all emergency operations.

- When fuel selector valve handles are changed from one position to another, the auxiliary fuel pumps should be switched to LOW, the mixture should be in FULL RICH and the pilot should feel for the detent to insure that fuel selector valve is properly positioned.

AUXILIARY FUEL PUMP SWITCHES

The LOW position runs the auxiliary fuel pumps at low speed, providing 36 pounds per hour fuel flow for purging. The ON position runs the auxiliary fuel pumps at low speed, as long as the engine-driven pumps are functioning. With an engine-driven pump failure and the switch in the ON position, the auxiliary pump on that side will switch to high speed automatically, providing sufficient fuel for all engine operations including emergency takeoff. The auxilairy fuel pump will not run in any position unless the engine oil pressure on that side is at least 20 PSI.

FUEL FLOW GAGE

The fuel flow gage, see Figure 2-3, is a dual instrument which indicates the approximate fuel consumption of each engine in pounds per hour. The fuel flow gage used with the Continental injection system senses the pressure at which fuel is delivered to the engine spray nozzles. Since fuel pressure at this point is approximately proportional to the fuel consumption of the engine, the gage is marked as a flowmeter.

The gage dial is marked with arc segments corresponding to proper fuel flow for various power settings and is used as a guide to quickly set the mixtures. The gage has markings for takeoff, climb and cruise power settings for various altitudes. The takeoff and climb markings indicate maximum performance mixtures for maximum power available for altitudes shown (2625 RPM and full throttle), making it practical to lean the mixtures on a high-altitude takeoff.

In the cruise power range, recommended lean mixtures are attained when the fuel flow pointers cover the green segment for that percentage of power. In the takeoff and climb range, each segment represents a maximum-power mixture for an altitude range; the low flow edge is the setting for the marked altitude and the high flow edge is the setting for a thousand feet lower. The sea level segment represents the range for maximum rated power at sea level.

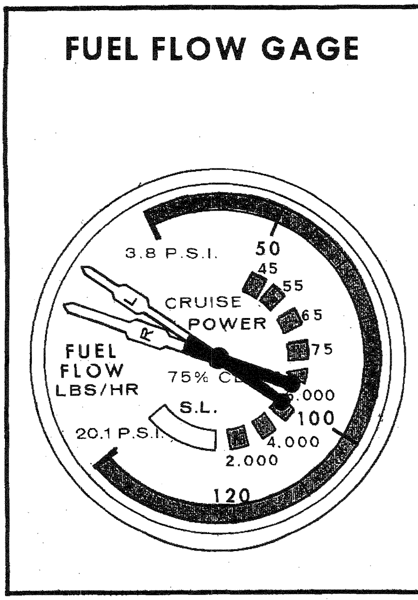


Figure 2-3

NOTE

The fuel flow settings on the takeoff and climb power segments of the dial are for 2625 RPM and full throttle, only. Climb power settings at lower RPM should be taken from your power computer.

FUEL FLOW MANAGEMENT

For normal cruise conditions, your power computer should be utilized to set the fuel flows for the recommended lean mixtures. The power computer is based on true OAT, which is obtained by subtracting the ram rise from the indicated OAT. A ram rise chart is provided in the pilot's checklist.

When range is not a primary consideration for setting the fuel flows, the Best Power Scale provided on the power computer should be used. This setting will result in a higher airspeed as well as increase the engine and component life because of the lower operating temperatures.

When the optional Economy Mixture Indicator (EGT) is provided, refer to Section VII.

FUEL QUANTITY INDICATOR

The fuel quantity indicators are calibrated in pounds and will accurately indicate the weight of fuel contained in the tanks. Since fuel density varies with temperature, a full tank will weigh more on a cold day than on a warm day. This will be reflected by the weight shown on the gage. A gallons scale is provided in blue on the indicator for convenience in allowing the pilot to determine the approximate volume of fuel on board.

FUEL STRAINER AND TANK SUMP DRAINS

See Preflight Inspection, Figure 1-1.

ELECTRICAL SYSTEM

Electrical energy is supplied by a 28-volt, negative-ground, direct-current system powered by a standard 50 ampere or optional 100 ampere engine-driven alternator on each engine. The electrical system has independent circuits for each side with each alternator having its own regulator and overvoltage protection relay. The voltage regulators are connected to provide proper load sharing. Two 12-volt batteries, connected in series, are located in the left wing just outboard of the engine nacelle. An optional external power receptacle can be installed in the aft nacelle fairing. The receptacle accepts a standard external power source plug. See Figure 2-4 for Electrical Power Distribution Schematic.

BATTERY AND ALTERNATOR SWITCHES

Separate battery and alternator switches are provided as a means of checking for a malfunctioning alternator circuit and to permit such a circuit to be cutoff. If an alternator circuit fails or malfunctions, or when one engine is not running, the switch for that alternator should be turned off. Operation should

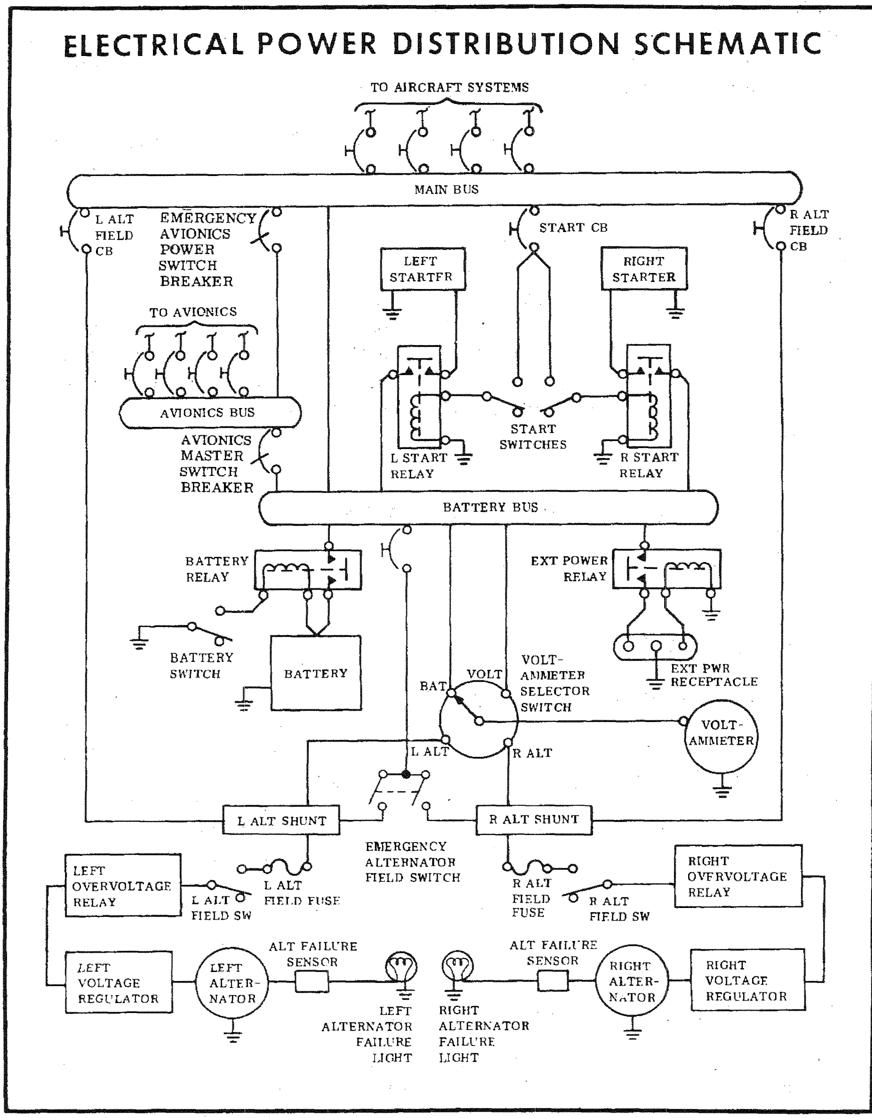

ELECTRICAL POWER DISTRIBUTION SCHEMATIC
TO AIRCRAFT SYSTEMS
MAIN BUS
L ALT FIELD CB
EMERGENCY AVIONICS POWER SWITCH BREAKER
START CB
R ALT FIELD CB
LEFT STARTER
RIGHT STARTER
TO AVIONICS
AVIONICS BUS
AVIONICS MASTER SWITCH BREAKER
L START RELAY
START SWITCHES
R START RELAY
BATTERY BUS
BATTERY RELAY
EXT POWER RELAY
BATTERY SWITCH
BATTERY
BAT
VOLT
VOLT-AMMETER SELECTOR SWITCH
EXT PWR RECEPTACLE
VOLT-AMMETER
L ALT
R ALT
L ALT SHUNT
R ALT SHUNT
EMERGENCY ALTERNATOR FIELD SWITCH
LEFT OVERVOLTAGE RELAY
L ALT FIELD FUSE
L ALT FIELD SW
R ALT FIELD FUSE
R ALT FIELD SW
RIGHT OVERVOLTAGE RELAY
ALT FAILURE SENSOR
ALT FAILURE SENSOR
LEFT VOLTAGE REGULATOR
LEFT ALTERNATOR
RIGHT ALTERNATOR
RIGHT VOLTAGE REGULATOR
LEFT ALTERNATOR FAILURE LIGHT
RIGHT ALTERNATOR FAILURE LIGHT

Figure 2-4

be continued on the functioning alternator, using only necessary electrical equipment. If both alternator circuits should malfunction, equipment can be operated at short intervals and for a limited amount of time on the battery alone. In either case, a landing should be made as soon as practical to check and repair the circuits.

EMERGENCY ALTERNATOR FIELD SWITCH

An emergency alternator field switch is provided in the alternator system and is located on the circuit breaker panel. The emergency alternator field switch is used when the alternators will not self excite. Placing the switch in the ON position, provides excitation from the battery even though the battery is considered to have failed.

OVERVOLTAGE RELAYS

Two overvoltage relays in the electrical system constantly monitor their respective alternator output. Should an alternator exceed the normal operating voltage, that voltage relay will trip, taking the affected alternator off the line. The voltage relay can be reset by cycling the applicable alternator switch.

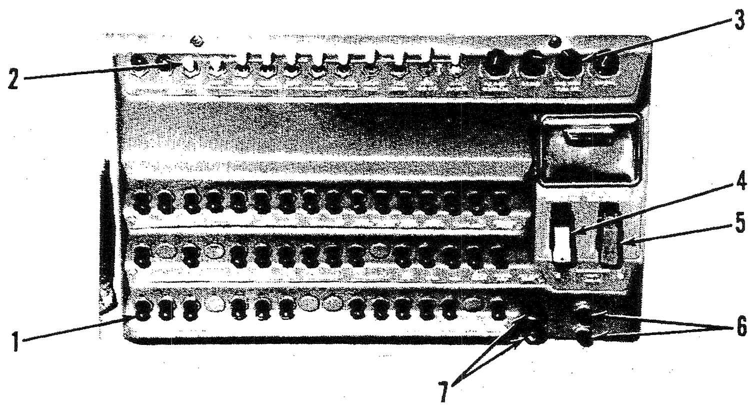
VOLTAMMETER

A voltammeter, located on the instrument panel, is provided to monitor alternator current output, battery charge or discharge rate and bus voltage. A selector switch, labeled L ALT, R ALT, BAT and VOLTS is located to the left of the voltammeter. By positioning the switch to L ALT, R ALT, or BAT position, the respective alternator or battery amperage can be monitored. By positioning the switch to the VOLTS position, the electrical system bus voltage can be monitored.

CIRCUIT BREAKERS AND SWITCH BREAKERS

All electrical circuits in the aircraft are protected by push-to-reset type circuit breakers or switch breakers (except the alternator field circuit which is protected by a fuse). Should an overload occur in any circuit, the resulting heat rise will cause the controlling circuit breaker to "pop" out, opening the circuit or allowing the switch breaker to return to the OFF position. After allowing the circuit breaker to cool for approximately three minutes, it may be pushed in (until a click is heard or felt) to re-energize the circuit. However,

CIRCUIT BREAKER PANEL



1. SYSTEM CIRCUIT BREAKERS
2. SYSTEM SWITCHES
3. LIGHTING RHEOSTAT PANEL
4. EMERGENCY ALTERNATOR FIELD SWITCH
5. EMERGENCY AVIONICS POWER SWITCH
6. LEFT AND RIGHT ALTERNATOR CIRCUIT BREAKERS
7. LEFT AND RIGHT ALTERNATOR FIELD FUSES

Figure 2-5

the circuit breaker should not be held in if it opens the circuit a second time, as this indicates a short circuit.

ROTATING BEACON

The rotating beacon should not be used when flying through clouds, fog or haze. The reflection of the rotating light beam can cause disorientation or vertigo. If optional strobe lights are installed, refer to Section VII for additional information.

LANDING GEAR SYSTEM

The electrically-operated landing gear is fully retractable and incorporates a steerable nosewheel. To help prevent accidental retraction, an automatic safety switch on the left shock strut prevents retraction as long as the weight of the aircraft is sufficient to compress the strut. The landing gear is operated by a switch, which is identified by a wheel-shaped knob. The switch positions are UP, off (center) and DOWN. To operate the gear, pull-out the switch knob and move to the desired position.

LANDING GEAR POSITION LIGHTS

Four landing gear position lights are provided, one above and three below the landing gear switch. The upper light is red and will illuminate when any or all the gears are unlocked (intermediate position). The three lower lights (one for each gear) are green and will illuminate when each gear is fully extended and locked. When the gear unlocked light and gear down lights are not illuminated, the landing gear is in the UP and locked position. The lights are push-to-test type with rotatable dimming shutters.

LANDING GEAR WARNING HORN

The landing gear warning horn is controlled by the throttles and the flap preselect handle. The warning horn will sound an intermittent note if either throttle is retarded below approximately 12 inches Hg. manifold pressure with the landing gear retracted or if the flap handle is lowered past the 15° position with the landing gear in any position except extended and locked. The warning horn can be activated by either the flap handle or by throttle position as each functions independently of the other. The warning horn is also connected to the UP position of the landing gear switch and will sound if the switch is placed in the UP position while the aircraft is on the ground.

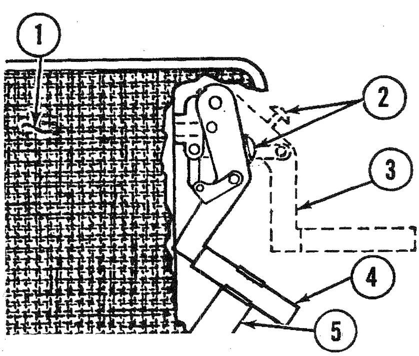
> NOTE
>
> Do not pull landing gear warning circuit breaker to silence horn as this would also turn off the landing gear indicator lights.

LANDING GEAR HANDCRANK

A landing gear handcrank, see Figure 2-6, for manually lowering the landing gear is located just below the right front edge of the pilot's seat. Normally the crank is folded and stowed in a clip beside the seat. To use the crank, tilt pilot's seat aft (std) or raise pilot's seat (opt), pull crank out from its storage clip and unfold it until it locks in operating position. The procedure for manually lowering the landing gear is given in Section III. To stow the crank, push the lock release button on the crank handle, fold handle and insert it in the storage clip.

> NOTE
>
> The handcrank handle must be stowed in its clip before the gear will operate electrically. When the handle is placed in the operating position, it disengages the landing gear motor from the actuator gear.

LANDING GEAR HANDCRANK



1. PILOT'S SEAT
2. RELEASE BUTTON
3. HANDCRANK (EXTENDED)
4. HANDCRANK (STOWED)
5. STOWAGE CLAMP

Figure 2-6

HEATING,VENTILATING AND DEFROSTING SYSTEM

A cabin heating, ventilating and windshield defrosting system, see Figure 2-7, is standard equipment in your aircraft. The system consists of an air inlet on the right side of the nose, a ventilating fan, a gasoline combustion-type heater, and controllable heat outlets in the cabin. Two outlets are located at the base of the windshield for defrosting purposes, one is located on the forward cabin bulkhead and one on each side of the forward cabin. Two additional outlets are located in the aft passenger compartment on the aft face of the main spar. Refer to Section VII for operation of the Air Conditioning System.

HEATING AND DEFROSTING

Fresh air is picked up from the front opening in the nose of the aircraft, heated by the heater, and ducted to the pilot and passenger compartments. The heat and vent air is not recirculated, but exhausts overboard through a passenger compartment air outlet.

The cabin heater depends upon the aircraft fuel system for its fuel supply. Fuel pressure is supplied by a fuel pump mounted on the heater assembly; the main fuel system auxiliary fuel pumps need not be turned on for proper heater operation.

On the ground, the cabin heating system can be used for ventilation by placing the cabin fan switch in the CABIN FAN position. The fan provides unheated, fresh air to the cabin through the cabin heat registers. In flight, the fan becomes inoperative and the heating system can be used for ventilation by placing the cabin heat switch to the OFF position, turning the cabin air knobs to OPEN, and opening the heat registers as desired.

CABIN HEAT SWITCH

The cabin heat switch is a three position, center-off, toggle switch. Placing the switch in the HEAT position maintains cabin heater operation. Placing the switch in the FAN position provides ventilation for the cabin while the aircraft is on the ground.

CABIN AIR TEMPERATURE CONTROL KNOB

The cabin air temperature control knob is labeled TEMP CONTROL, CLOSED (counterclockwise position), and OPEN (clockwise position).

HEATING, VENTILATING AND DEFROST SYSTEM

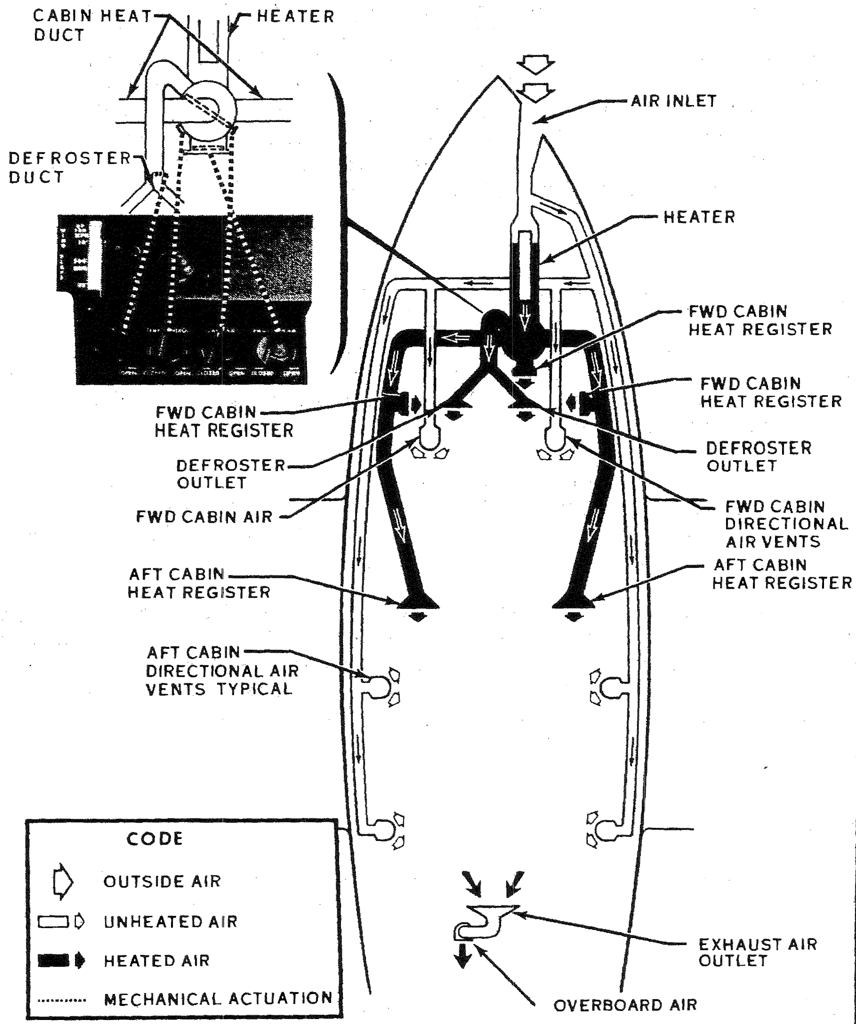


Figure 2-7

Heater output is controlled by adjustment of the cabin air temperature control knob. This knob adjusts a thermostat, which in turn controls heated air temperature in a duct located just aft of the heater. When the temperature of the heated air exceeds the setting of the thermostat, the thermostat automatically opens and shuts off the heater. When the heated air cools to the thermostat setting, the heater starts again. Thus, the heater continuously cycles on and off to maintain an even air temperature. The heater also will be cycled by a thermoswitch in the cabin air duct, which shuts off the heater when the duct temperature reaches approximately 220°F. When the duct temperature drops to a normal operating level, the heater will restart automatically. The action of this switch is independent of the cabin thermostat setting, and is not adjustable in flight.

FORWARD CABIN AIR KNOB

The forward cabin air knob control directs warm air to the outlet located on the forward cabin bulkhead. This direct outlet allows fast warm-up when the aircraft is on the ground. Airflow through the direct outlet is completely shut off when the knob is turned to CLOSED. The knob may be set at any intermediate position to regulate the quantity of air to the pilot's compartment.

CABIN AIR KNOB

The airflow to all the heat registers in the passenger compartment is controlled by the CABIN AIR knob. When the knob is turned to OPEN, the air flows to the heat registers in the passenger compartment. Airflow to the heat registers is completely shutoff by turning the knob to CLOSED. The knob may be set in any intermediate position to regulate the quantity of air to the cabin.

CABIN HEAT REGISTERS

Two cabin heat registers are located on the aft side of the main spar beneath the pilot's and copilot's seats and one on each side in the forward cabin. Each register is provided with a lever operated, rotary-type valve which controls the amount of air coming from the heat registers. Each register is plainly marked for open or closed and may be placed in any intermediate position to regulate the amount of air coming from the registers.

DEFROST KNOB

Windshield defrosting and defogging is controlled by operating the knob labeled DEFROST. When the knob is turned to OPEN, the air flows from the defroster outlets at the base of the windshield. When the knob is turned to CLOSED, airflow to the defroster outlets is shut off. The knob may be set in any intermediate position to regulate the defroster airflow.

HEATER OVERHEAT WARNING LIGHT

An amber overheat warning light is provided and is labeled HEATER OVERHEAT. When illuminated, the light indicates that the heater overheat switch has been actuated and that the temperature of the air in the heater has exceeded 325°F. Once the heater overheat switch has been actuated, the heater turns off and cannot be restarted until the overheat switch, located in the right forward nose compartment, has been reset. Prior to having the overheat switch reset, the heater should be thoroughly checked to determine the reason for the malfunction.

HEATER OPERATION FOR HEATING AND DEFROSTING

(1) Battery Switch - ON.
(2) Cabin Air Knob - OPEN.
(3) Defrost Knob - Adjust as desired (if defrosting is desired).
(4) Temperature Control Knob - OPEN.
(5) Cabin Heat Switch - HEAT.
(6) Heat Registers - As Desired.

Cabin heated air temperature may be increased during operation in extremely cold weather by manually adjusting the defrost, forward cabin and aft cabin air controls to reduce total airflow into the cabin.

NOTE

If warm air is not felt coming out of the registers within one minute, turn cabin heat switch OFF, check circuit breaker and try another start. If heater still does not start, no further starting attempt should be made.

> NOTE
>
> During heater operation, defrost and/or cabin air knobs must be open.

HEATER USED FOR VENTILATION

(1) Battery Switch - ON.
(2) Cabin Air Knob - Open as desired.
(3) Cabin Fan Switch - FAN.
(4) Heat Registers - As Desired.

VENTILATING SYSTEM

In addition to the ventilation provided by the cabin heating system, a separate ventilation system obtains ram air from the air inlet just forward of the heater and ducts it to the directional vents. The ventilating system functions only in flight, since it depends entirely on ram air pressure. For ground ventilation, the ventilating fan of the heating system must be used.

STATIC PRESSURE ALTERNATE SOURCE VALVE

A static pressure alternate source valve, installed in the static system, directly below the parking brake handle, supplies an alternate static source should the external source malfunction. This valve also permits draining condensate from the static lines. When open, this valve vents to the static pressure in the cabin. Since this pressure is relatively low, the airspeed indicator and the altimeter will show slightly higher readings than normal. Therefore, the alternate static source should be used primarily as a drain valve to restore the original system. If the alternate static source must be used during flight increase indicated airspeeds approximately 10 knots and altitudes approximately 80 feet. Consult the pilot's checklist for an accurate calibration. If the dual heated pitot system is installed with or without the weather radar refer to Section VII for airspeed calibrations.

PITOT HEAT SWITCH

When the pitot heat switch is placed in the ON position, the heating element in the pitot tube, stall warning transmitter and the main fuel tank vents are electrically heated to maintain proper operation of the system during icing conditions. The switch should always be in the OFF position while on the ground to prevent overheating of the heating elements.

With optional systems installed, actuation of the pitot heat switch also anti-ices the wing locker tank fuel vents, angle of attack lift sensor vane, dual pitot heads and dual static sources.

EMERGENCY EXIT

For emergency exit, the pilot's window (left side) can be jettisoned. Pull off the plastic cover over the emergency release ring under the window and pull the ring to release the window retainers, then push the window out.

OVERHEAD CONSOLE

The overhead console, see Figure 2-8, includes the instrument panel light and control, avionics speaker, headphone jack, microphone jack, and individual pilot and copilot oxygen jacks.

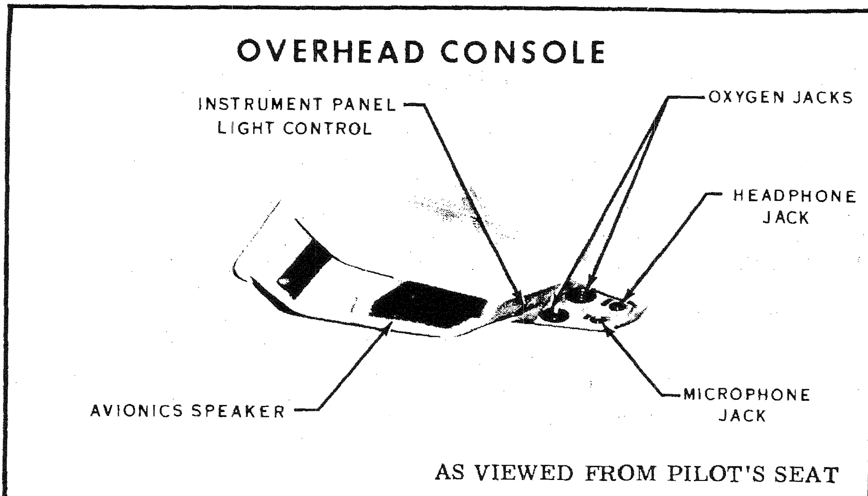


Figure 2-8

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 aircraft 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.

Notes

SECTION III
EMERGENCY PROCEDURES

ENGINE INOPERATIVE PROCEDURES

ENGINE FAILURE DURING TAKEOFF - SPEED BELOW 90 KIAS
(With Sufficient Runway Remaining)

(1) Throttles - CLOSE immediately.
(2) Brakes - AS REQUIRED.

NOTE

The distance required for the aircraft to be accelerated from a standing start to 90 KIAS on the ground, and then decelerate to a stop with heavy braking is presented in the Accelerate Stop Distance Chart in Section VI for various combinations of conditions.

ENGINE FAILURE AFTER TAKEOFF - SPEED ABOVE 90 KIAS
(Without Sufficient Runway Ahead)

(1) Mixture - AS REQUIRED for altitude.
(2) Propellers - FULL FORWARD.
(3) Throttles - FULL FORWARD.
(4) Landing Gear - UP.
(5) Inoperative Engine:
 (a) Throttle - CLOSE.
 (b) Mixture - IDLE CUT-OFF.
 (c) Propeller - FEATHER.
(6) Establish Bank - 5° toward operative engine.
(7) Climb to Clear Obstacle - 90 KIAS.
(8) Climb at Best Single-Engine Climb Speed - 102 KIAS.
(9) Wing Flaps - UP (if extended) in small increments.

(10) Trim Tabs - ADJUST (5° bank toward operative engine).

(11) Inoperative Engine - SECURE as follows:
   (a) Fuel Selector - OFF.
   (b) Auxiliary Fuel Pump - OFF.
   (c) Magneto Switches - OFF.
   (d) Alternator Switch - OFF.

(12) As Soon as Practical - LAND.

SUPPLEMENTARY INFORMATION CONCERNING ENGINE-OUT DURING TAKEOFF

The most critical time for an engine-out conditon in a multi-engine aircraft is during a two or three second period late in the takeoff run while the aircraft is accelerating to a safe engine-failure speed. A detailed knowledge of recommended single-engine airspeeds, see Figure 3-1, is essential for safe operation of this aircraft.

The airspeed indicator is marked with a red radial line at the minimum single-engine control speed and a blue radial line at the best single-engine rate-of-climb speed to facilitate instant recognition. The following paragraphs present a detailed discussion of the problems associated with engine failures during takeoff.

SINGLE-ENGINE AIRSPEED NOMENCLATURE		KIAS
(1)	Minimum Single-Engine Control Speed (red radial) .	75
(2)	Recommended Safe Single-Engine Speed	90
(3)	Best Single-Engine Angle-of-Climb Speed	93
(4)	Best Single-Engine Rate-of-Climb Speed (Flaps Up) (blue radial)	102

Figure 3-1

MINIMUM SINGLE-ENGINE CONTROL SPEED. The multi-engine aircraft must reach the minimum control speed (75 KIAS) before full control deflections can counteract the adverse rolling and yawing tendencies associated with one engine inoperative and full power operation on the other engine. This speed is indicated by a red radial line on the airspeed indicator.

RECOMMENDED SAFE SINGLE-ENGINE SPEED. Although the aircraft is controllable at the minimum control speed, the aircraft performance is so far below optimum that continued flight near the ground is improbable. A more suitable recommended safe single-engine speed is 90 KIAS since at this speed, altitude can be maintained more easily while the landing gear is being retracted and the propeller is being feathered.

BEST SINGLE-ENGINE ANGLE-OF-CLIMB SPEED. The best single-engine angle-of-climb speed becomes important when there are obstacles ahead on takeoff. Once the best single-engine angle-of-climb speed is reached, altitude becomes more important than airspeed until the obstacle is cleared. The best single-engine angle-of-climb speed is approximately 93 KIAS with flaps up.

BEST SINGLE-ENGINE RATE-OF-CLIMB SPEED (FLAPS UP). The best single-engine rate-of-climb speed becomes important when there are no obstacles ahead on takeoff, or when it is difficult to maintain or gain altitude in single-engine emergencies. The best single-engine rate-of-climb speed is 102 KIAS with flaps up. This speed is indicated by a blue radial line on the airspeed indicator. The variation of flaps-up best rate-of-climb speed with altitude is shown in Section VI. For best climb performance, the wings should be banked 5° toward the operative engine.

Upon engine failure after reaching 90 KIAS on takeoff, the multi-engine pilot has a significant advantage over a single-engine pilot, for he has the choice of stopping or continuing the takeoff. This would be similar to the choice facing a single-engine pilot who has suddenly lost slightly more than half of his takeoff power. In this situation, the single-engine pilot would be extremely reluctant to continue the takeoff if he had to climb over obstructions. However, if the failure occurred at an altitude as high or higher than surrounding obstructions, he would feel free to maneuver for a landing back at the airport.

Fortunately the aircraft accelerates through this "area of decision" in just a few seconds. However, to make an intelligent decision in this type of an emergency, one must consider the field length, obstruction height, field elevation, air temperature, headwind, and the gross weight. The flight paths illustrated in Figure 3-2 indicate that the "area of decision" is bounded by: (1) the point at which 90 KIAS is reached and (2) the point where the obstruction altitude is reached. An engine failure in this area requires an immediate decision. Beyond this area, the aircraft, within the limitations of single-engine climb performance shown in Section VI, may be maneuvered to a landing back at the airport.

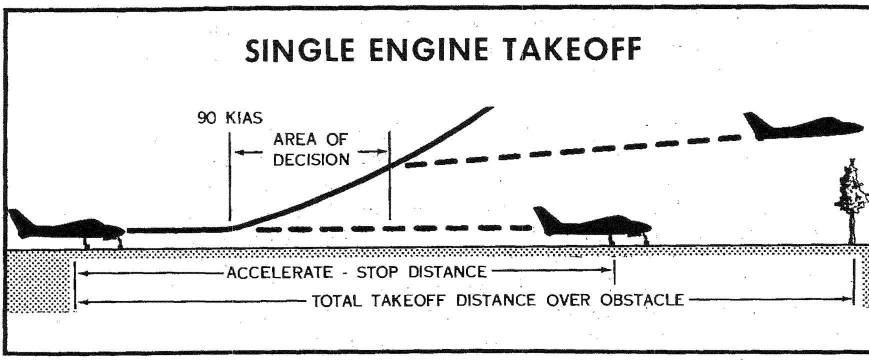
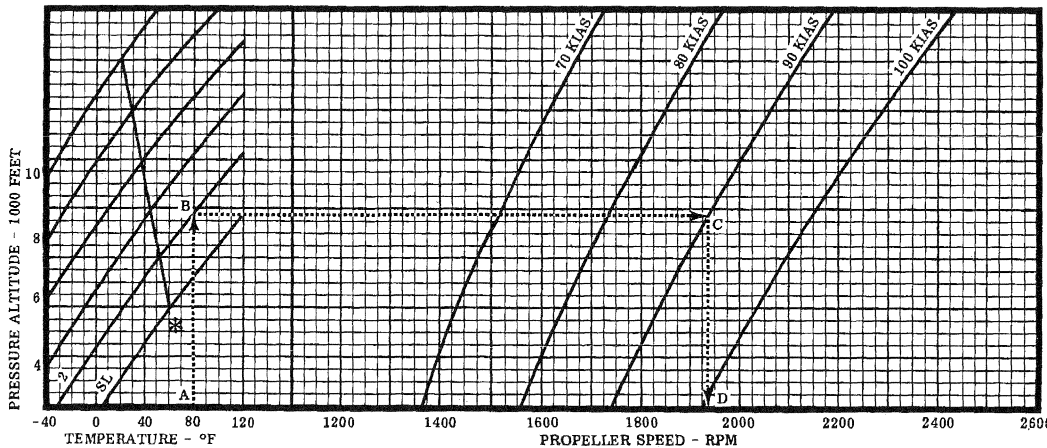


Figure 3-2

At sea level standard day with zero wind and 5300 pounds gross weight, the distance to accelerate to 90 KIAS and stop is 3400 feet, while the total unobstructed area required to takeoff and climb over a 50 foot obstacle after an engine failure at 90 KIAS is 4600 feet. This total distance over an obstacle can be reduced slightly under more favorable conditions of gross weight, headwind, or obstruction height. However, it is recommended that in most cases it would be better to discontinue the takeoff, since any slight mismanagement of the single-engine procedure would more than offset the small distance advantage offered by continuing the takeoff. The advantage of discontinuing the takeoff is even more obvious at higher altitudes where the corresponding distances are 3850 and 8340 respectively, at 2000 feet. Still higher field elevations will cause the single-engine takeoff distance to lengthen disproportionately until an altitude is reached where a successful takeoff is improbable unless the airspeed and height above the runway at engine failure are great enough to allow a slight deceleration and altitude loss while the aircraft is being prepared for a single-engine climb.

During single-engine takeoff procedures over an obstacle, only one condition presents any appreciable advantage; this is headwind. A decrease of approximately 1% in ground distance required to clear a 50 foot obstacle can be gained for each 1 knot of headwind. Excessive speed above best single-engine climb speed at engine failure is not nearly as advantageous as one might expect since deceleration is rapid and ground distance is used up quickly at higher speeds while the aircraft is being cleaned up for climb. However, the extra speed is important for controllability.

RPM TO SIMULATE CRITICAL (LEFT) ENGINE FEATHERED



*STANDARD TEMPERATURE

CONDITIONS

1. Propeller Control Full High RPM - Full Low Pitch
2. Manifold Pressure Adjust to Obtain Proper RPM

EXAMPLE

A. Temperature - 80°F
B. Pressure Altitude - 2000 Feet
C. Airspeed - 90 KIAS
D. Propeller Speed - 1935 RPM

Figure 3-3

The following facts should be used as a guide at the time of engine failure: (1) discontinuing a takeoff upon engine failure is advisable under most circumstances; (2) altitude is more valuable to safety after takeoff than is airspeed in excess of the best single-engine climb speed since excess airspeed is lost much more rapidly than is altitude; (3) climb or continued level flight at moderate altitude is improbable with the landing gear extended and the propeller windmilling; (4) in no case should the airspeed be allowed to fall below the engine-out best angle-of-climb speed, even though altitude is lost, since this speed will always provide a better chance of climb, or a smaller altitude loss, than any lesser speed. The single-engine best rate-of-climb speed will provide the best chance of climb or the least altitude loss, and is preferable unless there are obstructions which make a steep climb necessary.

Single-engine procedures should be practiced in anticipation of an emergency. This practice should be conducted at a safe altitude, with full power operation on both engines, and should be started at a safe speed of at least 105 KIAS. As recovery ability is gained with practice, the starting speed may be lowered in small increments until the feel of the aircraft in emergency conditions is well known. Practice should be continued until: (1) an instinctive corrective reaction is developed, and the corrective procedure is automatic; and (2) airspeed, altitude, and heading can be maintained easily while the aircraft is being prepared for a climb. In order to simulate an engine failure, set both engines at full power operation, then at a chosen speed, pull the mixture control of one engine into IDLE CUT-OFF, and proceed with single-engine emergency procedures. Simulated single-engine procedures can also be practiced by setting propeller RPM to simulate critical engine inoperative as shown in Figure 3-3.

ENGINE FAILURE DURING FLIGHT

(1) Inoperative Engine - DETERMINE (idle engine same side as idle foot).
(2) Power - INCREASE as required.
(3) Mixture - ADJUST for altitude.

Before securing inoperative engine:

(4) Fuel Flow - CHECK, if deficient, position auxiliary fuel pump switch to ON.

> NOTE
>
> If fuel selector valve is in AUXILIARY TANK position, switch to MAIN TANK and feel for detent.

(5) Fuel Quantity - CHECK, and switch to opposite MAIN TANK if necessary.
(6) Oil Pressure and Oil Temperature - CHECK, shutdown engine if oil pressure is low.
(7) Magneto Switches - CHECK.

If proper corrective action was taken, engine will restart. If it does not, secure as follows:

(8) Inoperative Engine - SECURE.
  (a) Throttle - CLOSED.
  (b) Mixture - IDLE CUT-OFF.
  (c) Propeller - FEATHER.
  (d) Fuel Selector - OFF.
  (e) Auxiliary Fuel Pump - OFF.
  (f) Magneto Switches - OFF.
  (g) Alternator Switch - OFF.
(9) Operative Engine - ADJUST.
  (a) Power - AS REQUIRED.
  (b) Mixture - ADJUST for power.
  (c) Fuel Selector - MAIN TANK (feel for detent).
  (d) Auxiliary Fuel Pump - ON.
(10) Trim Tabs - ADJUST (5° bank toward operative engine).
(11) Electrical Load - DECREASE to minimum required.
(12) As Soon as Practical - LAND.

ENGINE RESTARTS IN FLIGHT (After Feathering)

AIRCRAFT WITHOUT OPTIONAL PROPELLER UNFEATHERING SYSTEM INSTALLED

(1) Magneto Switches - ON.
(2) Fuel Selector - MAIN TANK (feel for detent).
(3) Throttle - FORWARD approximately one inch.
(4) Mixture - FULL RICH.

(5) Propeller - FORWARD of detent.
(6) Starter Button - PRESS.
(7) Primer Switch - ACTIVATE.
(8) Starter and Primer Switch - RELEASE when engine fires.
(9) Power - INCREASE slowly until cylinder head temperature reaches 200°F.

> NOTE
>
> If start is unsuccessful, turn magneto switches OFF retard mixture to IDLE CUT-OFF, open throttle fully, and engage starter for several revolutions. Then repeat air start procedures.

AIRCRAFT WITH OPTIONAL PROPELLER UNFEATHERING SYSTEM INSTALLED

(1) Magneto Switches - ON.
(2) Fuel Selector - MAIN TANK (feel for detent).
(3) Throttle - FORWARD approximately one inch.
(4) Mixture - FULL RICH.
(5) Propeller - FULL FORWARD.

> NOTE
>
> The propeller will automatically windmill when the propeller lever is moved out of the FEATHER position.

(6) Propeller - RETARD to detent when propeller reaches 1000 RPM.
(7) Power - INCREASE slowly until cylinder head temperature reaches 200°F.

FIRE PROCEDURES

FIRE ON THE GROUND (Engine Start, Taxi, and Takeoff with Sufficient Distance Remaining to Stop)

(1) Throttles - CLOSE.
(2) Brakes - AS REQUIRED.

(3) Mixtures - IDLE CUT-OFF.
(4) Battery - OFF (use gang bar).
(5) Magnetos - OFF (use gang bar).
(6) Evacuate aircraft as soon as practical.

IN FLIGHT WING OR ENGINE FIRE

(1) Both Auxiliary Fuel Pumps - OFF.
(2) Appropriate Engine - SECURE.
    (a) Mixture - IDLE CUT-OFF.
    (b) Propeller - FEATHER.
    (c) Fuel Selector - OFF.
    (d) Alternator - OFF.
    (e) Magnetos - OFF.
(3) Cabin Heater - OFF.
(4) Land and evacuate aircraft as soon as practical.

IN FLIGHT CABIN FIRE OR SMOKE

(1) Electrical Load - REDUCE to minimum required.
(2) Attempt to isolate the source of fire or smoke.
(3) Wemacs - OPEN.
(4) Cabin Air Controls - OPEN (all vents including windshield defrost)
    If intensity of smoke increases - CLOSE.

CAUTION

Opening the foul weather window or cabin door will create a draft in the cabin and may intensify a fire.

(5) Land and evacuate aircraft as soon as practical.

SUPPLEMENTARY INFORMATION CONCERNING AIRCRAFT FIRES

With the use of modern installation techniques and material the probability of an aircraft fire occuring in your aircraft is extremely remote. However, in the event a fire is encountered, the following information will be helpful in dealing with the emergency as quickly and safely as possible.

The preflight checklist is provided to aid the pilot in detecting conditions which could contribute to an aircraft fire. As a fire requires both fuel and an ignition source, close preflight inspection should be given to the engine compartment and wing leading edge and lower surfaces. Leaks in the fuel system, oil system, or exhaust system can lead to a ground or airborne fire.

> NOTE
>
> Flight should not be atempted with known fuel, oil, or exhaust leaks. The presence of fuel, unusual oil or exhaust stains may be an indication of system leaks and should be carefully investigated prior to flight.

If an aircraft fire is discovered on the ground or during takeoff, but prior to committed flight, the aircraft is to be landed and/or stopped and the passengers and crew evacuated as soon as practical.

Fires originating inflight must be controlled as quickly as possible in an attempt to prevent major structural damage. Both auxiliary fuel pumps should be turned off to reduce pressure on the total fuel system (each auxiliary pump pressurizes a crossfeed line to the opposite fuel selector). The engine on the wing in which the fire exists should be shut down and its fuel shut off even though the fire may not have originated in the fuel system. The cabin heater draws fuel from crossfeed system and should also be turned off. Descent for landing should be initiated immediately.

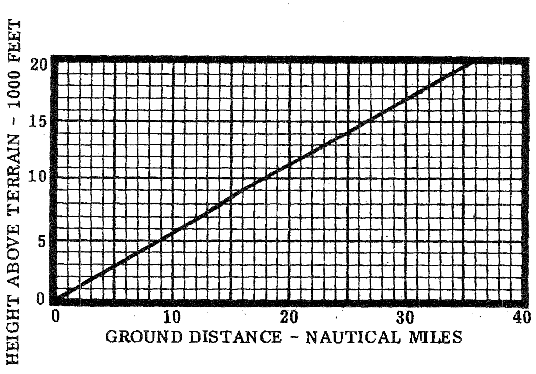
An open door or foul weather window produces a low pressure in the cabin. To avoid drawing the fire into the cabin, the door and foul weather windows should be kept closed. This condition is aggravated with the landing gear and flaps extended. Therefore, the pilot should lower the gear as late in the landing approach as possible. A no-flap landing should also be attempted if practical.

A fire or smoke in the cabin should be controlled by identifying and shutting down the faulty system. Smoke may be removed by opening the cabin air controls and wemacs. If the smoke increases in intensity when the air controls are opened they should be closed as this indicates a possible fire in the heater or nose compartment. When the smoke is intense, the pilot may choose to expell the smoke through the foul weather window. The foul weather window should be closed immediately if the fire becomes more intense when the window is opened.

MAXIMUM GLIDE

In the event of a double-engine failure condition, maximum gliding distance can be obtained by feathering both propellers, and maintaining approximately 96 KIAS with the landing gear and wing flaps up. Refer to Maximum Glide, Figure 3-4, for maximum glide data.

MAXIMUM GLIDE



WING FLAPS UP
LANDING GEAR UP
FEATHERED PROPELLERS
ZERO WIND

BEST GLIDE SPEED

WEIGHT POUNDS	KIAS
4500	89
4900	94
5300	96

Figure 3-4

SINGLE-ENGINE APPROACH AND LANDING

(1) Mixture - FULL RICH.
(2) Propeller - FULL FORWARD.
(3) Approach at 94 KIAS with excessive altitude.
(4) Landing Gear - DOWN within glide distance of field.
(5) Wing Flaps - DOWN when landing is assured.
(6) Decrease speed below 89 KIAS only when landing is assured.
(7) Minimum Single-Engine Control Speed - 75 KIAS.

FORCED LANDING

(Precautionary Landing with Power)

(1) Drag over selected field with flaps 15° and 90 KIAS noting type of terrain and obstructions.
(2) Plan a wheels-down landing if surface is smooth and hard.
(3) Execute a normal landing, keeping nosewheel off ground until speed is decreased.
(4) If terrain is rough or soft, plan a wheels-up landing as follows:
   (a) Select a smooth grass-covered runway, if possible.
   (b) Landing Gear Switch - UP.
   (c) Approach at 89 KIAS with flaps down only 15°.
   (d) All Switches Except Magneto Switches - OFF.
   (e) Unlatch cabin door prior to flare-out.

> NOTE
>
> Be prepared for a mild tail buffet as the cabin door is opened.

   (f) Mixtures - IDLE CUT-OFF (both engines).
   (g) Magneto Switches - OFF.
   (h) Fuel Selectors - OFF.
   (i) Land in a slightly tail-low attitude.

> NOTE
>
> Aircraft will slide straight ahead about 500 feet on smooth sod with very little damage.

FORCED LANDING (Complete Power Loss)

(1) Mixtures - IDLE CUT-OFF.
(2) Propellers - FEATHER then rotate to HORIZONTAL position with starter if time permits.
(3) Fuel Selectors - OFF.
(4) All Switches Except Battery Switch - OFF.
(5) Approach at 94 KIAS.
(6) If field is smooth and hard, plan a landing as follows:
   (a) Landing Gear - DOWN within glide distance of field.
   (b) Wing Flaps - EXTEND as necessary when within glide distance of field.
   (c) Battery Switch - OFF.
   (d) Make a normal landing, keeping nosewheel off the ground as long as practical.
(7) If field is rough or soft, plan a wheels-up landing as follows:
   (a) Select a smooth, grass-covered runway if possible.
   (b) Landing Gear - UP.
   (c) Approach at 90 KIAS with flaps down only 15°.
   (d) Battery Switch - OFF.
   (e) Unlatch cabin door prior to flare-out.

> NOTE
>
> Be prepared for a mild tail buffet as cabin door is opened.

   (f) Land in a slightly tail-low attitude.

> NOTE
>
> Aircraft will slide straight ahead about 500 feet on smooth sod with very little damage.

GO-AROUND (SINGLE-ENGINE)

(1) If absolutely necessary and speed is above 90 KIAS, increase engine speed to 2625 RPM and apply full throttle.
(2) Landing Gear - UP.
(3) Wing Flaps - UP (if extended).
(4) Climb at 102 KIAS (93 KIAS with obstacles directly ahead).
(5) Trim aircraft for single-engine climb.

SYSTEM EMERGENCY PROCEDURES

FUEL SYSTEM

ENGINE DRIVEN FUEL PUMP FAILURE

(1) Fuel Selector - MAIN TANK (feel for detent).
(2) Auxiliary Fuel Pump - ON.
(3) Mixture - ADJUST for smooth engine operation.
(4) As Soon as Practical - LAND.
(5) Fuel in auxiliary and opposite main tank is unusable.

NOTE

If both an engine-driven fuel pump and an auxiliary fuel pump fail on the same side of the aircraft, the failing engine cannot be supplied with fuel from the opposite MAIN tank since that auxiliary fuel pump will operate on the low pressure setting as long as the corresponding engine fuel pump is operative.

ELECTRICAL SYSTEM

ALTERNATOR FAILURE (SINGLE)
(Indicated by illumination of failure light)

(1) Electrical Load - REDUCE.
(2) If Circuit Breaker is Tripped:
  (a) Shut off affected alternator.
  (b) Reset affected alternator circuit breaker.
  (c) Turn on affected alternator switch.

(d) If circuit breaker reopens, turn off alternator.

(3) If Circuit Breaker does not Trip:

(a) Select affected alternator on voltammeter and monitor output.

(b) If output is normal and failure light remains on, disregard fail indication and have indicator checked after landing.

(c) If output is insufficient, turn off alternator and reduce electrical load to one alternator capacity.

(d) If complete loss of alternator output occurs, check field fuse and replace if necessary. Spare fuses are located in the glove box.

(e) If an intermittent light indication accompanied by ammeter fluctuation is observed, shut off affected alternator and reduce load to one alternator capacity.

ALTERNATOR FAILURE (DUAL)
(Indicated by illumination of failure lights)

(1) Electrical Load - REDUCE.

(2) If Circuit Breakers are Tripped:

(a) Shut off alternators.

(b) Reset circuit breakers.

(c) Turn on left alternator and monitor output on voltammeter.

(d) If alternator is charging, leave it on (disregard failure light if still illuminated).

(e) If still inoperative, shut off left alternator.

(f) Repeat steps (c) thru (e) for right alternator.

(f) If circuit breakers reopen, prepare to terminate flight.

(3) If Circuit Breakers have not Tripped:

(a) Shut off alternators.

(b) Check field fuses and replace as required. Spare fuses are located in the glove box.

(c) Turn on left alternator and monitor output on voltammeter.

(d) If alternator is charging, leave it on (disregard failure light if still illuminated).

(e) If still inoperative, shut off left alternator.

(f) Repeat steps (c) thru (e) for right alternator.

(g) If both still inoperative, shut off alternators and turn on emergency alternator field switch.

(h) Repeat steps (c) thru (e) for each alternator.

(i) If still inoperative, shut off alternators and prepare to terminate flight.

FLIGHT INSTRUMENTS

OBSTRUCTION OR ICING OF STATIC SOURCE

(1) Alternate Static Source - OPEN.
(2) Excess Altitude and Airspeed - MAINTAIN to compensate for change in calibration. Increase indicated airspeed approximately 10 knots and altitudes approximately 80 feet.

> NOTE
>
> - Refer to Pilot's Checklist for accurate airspeed and altimeter corrections with alternate static source OPEN.
> - Be sure the alternate static source is closed for all normal operations.

VACUUM PUMP FAILURE (Attitude and Directional Gyros)

(1) Red indicator on gage will show failure.
(2) Automatic valve will select operative source.

ELECTRIC DIRECTIONAL GYRO

If optional electric gyro is installed:

(1) If gyro power fail light illuminates, position gyro power switch to STANDBY.
(2) If light does not go out, check gyro circuit breaker - IN.

LANDING GEAR SYSTEM

LANDING GEAR WILL NOT EXTEND ELECTRICALLY

When the landing gear will not extend electrically, it may be extended manually in accordance with the following steps:

> NOTE
>
> The handcrank handle must be stowed in its clip before the gear will operate electrically. When the handle is placed in the operating position, it disengages the landing gear motor from the actuator gear.

(1) Before proceeding manually, check landing gear circuit breakers with landing gear switch DOWN. If circuit breakers are tripped, allow 3 minutes for them to cool before resetting.
(2) If Circuit Breaker is Not Tripped - PULL.
(3) Landing Gear Switch - NEUTRAL (center).
(4) Pilot's Seat - TILT full aft (std) or RAISE (opt).
(5) Hand Crank - EXTEND and LOCK. (See Figure 2-6.)
(6) Rotate Crank - CLOCKWISE four turns past point where gear down lights come on (approximately 52 turns).

> NOTE
>
> During manual extension of the gear, never release the hand crank to let it turn freely of its own accord.

(7) Gear Down Lights - CHECK.
(8) Gear Unlocked Light - CHECK.
(9) Gear Warning Horn - CHECK with throttle retarded.
(10) Hand Crank - PUSH BUTTON and STOW.
(11) As Soon as Practical - LAND.

LANDING GEAR WILL NOT RETRACT ELECTRICALLY

(1) Do not try to retract manually.

> NOTE
>
> The landing gear should never be retracted with the manual system, as undue loads will be imposed and cause excessive wear on the cranking mechanism.

(2) Landing Gear - DOWN.
(3) Gear-Down Lights - CHECK.
(4) Gear Unlocked Light - CHECK.
(5) Gear Warning Horn - CHECK.
(6) As Soon as Practical - LAND.

AIR INLET OR FILTER ICING

(1) Alternate Air Controls - PULL OUT.
(2) Propellers - INCREASE (2550 RPM for normal cruise).
(3) Mixtures - LEAN as required.

LANDING EMERGENCIES

LANDING WITH FLAT MAIN GEAR TIRE

If a blowout occurs during takeoff, and the defective main gear tire is identified, proceed as follows:

(1) Landing Gear - UP.
(2) Fuel Selectors - Turn to main tank on same side as defective tire and feel for detent. Proceed to destination to reduce fuel load.

> NOTE
>
> Fuel should be used from this tank first to lighten the load on this wing prior to attempting a landing, if inflight time permits. However, an adequate supply of fuel should be left in this tank so that it may be used during landing.

(3) Fuel Selectors - Left Engine - LEFT MAIN (feel for detent).
Right Engine - RIGHT MAIN (feel for detent).

(4) Select a runway with a crosswind from the side opposite the defective tire, if a crosswind landing is required.

(5) Landing Gear Switch - DOWN (below 140 KCAS).

(6) Check landing gear down indicator lights (green) for indication and gear unlocked light (red) out.

(7) Wing Flaps - DOWN. Extend flaps to 35°.

(8) In approach, align aircraft with edge of runway opposite the defective tire, allowing room for a mild turn in the landing roll.

(9) Land slightly wing-low on side of inflated tire and lower nosewheel to ground immediately, for positive steering.

(10) Use full aileron in landing roll, to lighten load on defective tire.

(11) Apply brake only on the inflated tire, to minimize landing roll and maintain directional control.

(12) Stop aircraft to avoid further damage, unless active runway must be cleared for other traffic.

LANDING WITH FLAT NOSE GEAR TIRE

If a blowout occurs on the nose gear tire during takeoff, prepare for a landing as follows:

(1) Landing Gear - Leave DOWN.

> NOTE
>
> Do not attempt to retract the landing gear if a nose gear tire blowout occurs. The nose gear tire may be distorted enough to bind the nosewheel strut within the wheel well and prevent later gear extension.

(2) Move disposable load to baggage area and passengers to available rear seat space.

(3) Flaps - DOWN. Extend flaps from 0° to 15°, as desired.

(4) Land in a nose-high attitude with or without power.

(5) Maintain back pressure on control wheel to hold nosewheel off the ground in landing roll.

(6) Use minimum braking in landing roll.
(7) Throttles - RETARD in landing roll.
(8) As landing roll speed diminishes, hold control wheel fully aft until aircraft is stopped.
(9) Avoid further tire damage by holding additional taxi to a minimum.

LANDING WITH DEFECTIVE MAIN GEAR

Reduce the fuel load in the tank on the side of the faulty main gear as explained in paragraph Landing With Flat Main Gear Tire. When fuel load is reduced, prepare to land as follows:

(1) Fuel Selectors - Left Engine - LEFT MAIN (feel for detent).
Right Engine - RIGHT MAIN (feel for detent).
(2) Select a wide, hard surface runway, or if necessary a wide sod runway. Select a runway with crosswind from the side opposite the defective landing gear, if a crosswind landing is necessary.
(3) Landing Gear - DOWN.
(4) Wing Flaps - DOWN 35°.
(5) In approach, align aircraft with edge of runway opposite the defective landing gear, allowing room for a ground-loop in landing roll.
(6) Battery Switch - OFF.
(7) Land slightly wing-low toward the operative landing gear and lower the nosewheel immediately, for positive steering.
(8) Start moderate ground-loop toward defective landing gear until aircraft stops.
(9) Mixtures - IDLE CUT-OFF (both engines).
(10) Use full aileron in landing roll to lighten the load on the defective landing gear.
(11) Apply brake only on the operative landing gear to maintain directional control and minimize the landing roll.
(12) Fuel Selectors - OFF.
(13) Evacuate the aircraft as soon as it stops.

LANDING WITH DEFECTIVE NOSE GEAR

Sod-Runway—Main Gear Retracted

This procedure will produce a minimum amount of aircraft damage on smooth runways. This procedure is also recommended for short, rough, or uncertain field conditions where passenger safety, rather than minimum aircraft damage, is the prime consideration.

(1) Select a smooth, grass-covered runway, if possible.
(2) Landing Gear - UP.
(3) Approach at 94 KIAS with wing flaps down only 15°.
(4) All Switches Except Magneto Switches - OFF.
(5) Unlatch cabin door prior to flare-out.

> NOTE
>
> Be prepared for mild tail buffet as the cabin door is opened.

(6) Land in a slightly tail-low attitude.
(7) Mixtures - IDLE CUT-OFF (both engines).
(8) Magneto Switches - OFF.
(9) Fuel Selectors - OFF.

;mooth Hard Surface Runway—Main Gear Extended

(1) Move disposable load to baggage area, and passengers to available rear seat space.
(2) Select a smooth, hard surface runway.
(3) Landing Gear - DOWN.
(4) Approach at 94 KIAS with wing flaps down only 15°.
(5) All Switches Except Magneto Switches - OFF.
(6) Land in a slightly tail-low attitude.
(7) Mixtures - IDLE CUT-OFF (both engines).
(8) Magneto Switches - OFF.
(9) Hold nose off throughout ground roll. Lower gently as speed dissipates.

˥ITCHING

(1) Plan approach into wind, if winds are high and seas are heavy. With heavy swells and light wind, land parallel to swells, being careful not to allow wing tip to hit first.
(2) Approach with landing gear retracted, wing flaps 35°, and enough power to maintain approximately 300 ft/min. rate-of-descent at approximately 95 KIAS at 4600 pounds gross weight.

(3) Maintain a continuous descent until touchdown, to avoid flaring and touching down tail-first, pitching forward sharply, and decelerating rapidly. Strive for initial contact at fuselage area below rear cabin section (point of maximum longitudinal curvature of fuselage).

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SECTION IV
OPERATING LIMITATIONS

OPERATIONS AUTHORIZED

Your Cessna with standard equipment, exceeds the requirements of airworthiness as set forth by the United States Government, and is certified under FAA Type Certificate No. 3A10.

With standard equipment, the aircraft is approved for day and night operation under VFR. Additional optional equipment is available to increase its utility and to make it authorized for use under IFR day and night operation. Your Cessna Dealer will be happy to assist you in selecting equipment best suited to your needs.

MANEUVERS-NORMAL CATEGORY

The aircraft exceeds the requirements of the Federal Aviation Regulations, set forth by the United States Government for airworthiness. Spins and aerobatic maneuvers are not permitted in normal category aircraft in compliance with these regulations. In connection with the foregoing, the following gross weight and flight load factors apply:

Maximum Takeoff Weight	5300 lbs.
Maximum Landing Weight	5300 lbs.
*Flight Load Factor (at design gross weight)	
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 exceeds design loads.

Your aircraft must be operated in accordance with all FAA approved markings, placards, and checklists in the aircraft. If there is any information in this Owner's Manual that contradicts the FAA approved markings, placards, and checklists, it is to be disregarded.

AIRSPEED LIMITATIONS (CAS)

Maximum Structural Cruising Speed	
Level Flight or Climb	183 KCAS
Maximum Speed	
Flaps Extended 15°	160 KCAS
Flaps Extended 15° - 35°	140 KCAS
Gear Extended	140 KCAS
Never Exceed Speed (glide or dive, smooth air)	224 KCAS
*Maneuvering Speed	148 KCAS

*The maximum speed at which you can use abrupt control travel.

AIRSPEED INDICATOR INSTRUMENT MARKINGS

The following is a list of the calibrated airspeed limitations for the aircraft.

Never Exceed (glide or dive, smooth air) .	224 KCAS (red line)
Caution Range	183-224 KCAS (yellow arc)
Normal Operating Range	74-183 KCAS (green arc)
Flap Operating Range	64-140 KCAS (white arc)
Minimum Control Speed	75 KCAS (red radial line)
Best Single-Engine Rate of Climb . . .	102 KCAS (blue radial line)

ENGINE OPERATION LIMITATIONS

Maximum Power and Speed . . . . . . (for all operations)	260 BHP at 2625 RPM

ENGINE INSTRUMENT MARKINGS

OIL TEMPERATURE

Normal Operating Range	75° to 240°F (green arc)
Maximum Temperature	240°F (red line)

OIL PRESSURE

Idling Pressure	10 PSI (red line)
Normal Operating Range	30 to 60 PSI (green arc)
Maximum Pressure	100 PSI (red line)

CYLINDER HEAD TEMPERATURE

Normal Operating Range	200° to 460°F (green arc)
Maximum Temperature	460°F (red line)

MANIFOLD PRESSURE

Normal Operating Range	15 to 24 inches Hg (green arc)

TACHOMETER

Normal Operating Range	2100 to 2450 RPM (green arc)
Maximum Engine Rated Speed . . .	2625 RPM (red line)

FUEL FLOW

Normal Operating Range	0 to 138 Lbs/Hr (green arc)
Minimum and Maximum Fuel Flows . .	0 and 138 Lbs/Hr (red line)
	3.8 and 20.10 PSI (red line)

BAGGAGE COMPARTMENTS

Your aircraft has been designed for passenger carrying capability. As a result, no provisions have been made for the transportation of cargo. There are four baggage locations: two in the aft cabin area and one location in the aft portion of each engine nacelle.

These baggage areas are intended primarily for low density items such as luggage and brief cases. The floors of these areas are primary structure; therefore, care should be exercised during loading and unloading to prevent damage. When loading high density objects, insure that adequate protection is available to prevent damage to any aircraft primary structure. If baggage is carried, it is necessary to properly locate and secure this load before flight.

BAGGAGE TIE-DOWN

Two hundred pounds of baggage is allowed at Station 96 behind the standard 310 seats without the use of tie-downs. Any baggage stored at Station 96, with the individual seats in the Model 310, require tie-downs. Tie-downs for Station 96 are directly forward and directly aft of the Station 96 area. In all seating arrangements, standard or optional, baggage at Station 124 is limited to 160 pounds and must be secured by tie-downs. These tie-downs are directly aft of the Station 96 baggage area and directly aft of the Station 124 baggage area. It is not recommended that any of the baggage tie-downs extend from the aft side of Station 124 to the forward side of Station 96.

WEIGHT AND BALANCE

The following information will enable you to operate your Cessna within the prescribed weight and center of gravity limitations. To figure the weight and balance for your particular aircraft, use Figures 4-1, 4-2 and 4-3 as follows:

Take the licensed Empty Weight and Moment/1000 from the Weight and Balance Data sheet, plus any changes noted on forms FAA-337, carried in your aircraft, and write them down in the proper columns of Figure 4-1. Using Figure 4-2, determine the moment/1000 of each item to be carried. Total the weights and moments/1000 and use Figure 4-3 to determine whether the point falls within the envelope and if the loading is acceptable.

LOADING CHART

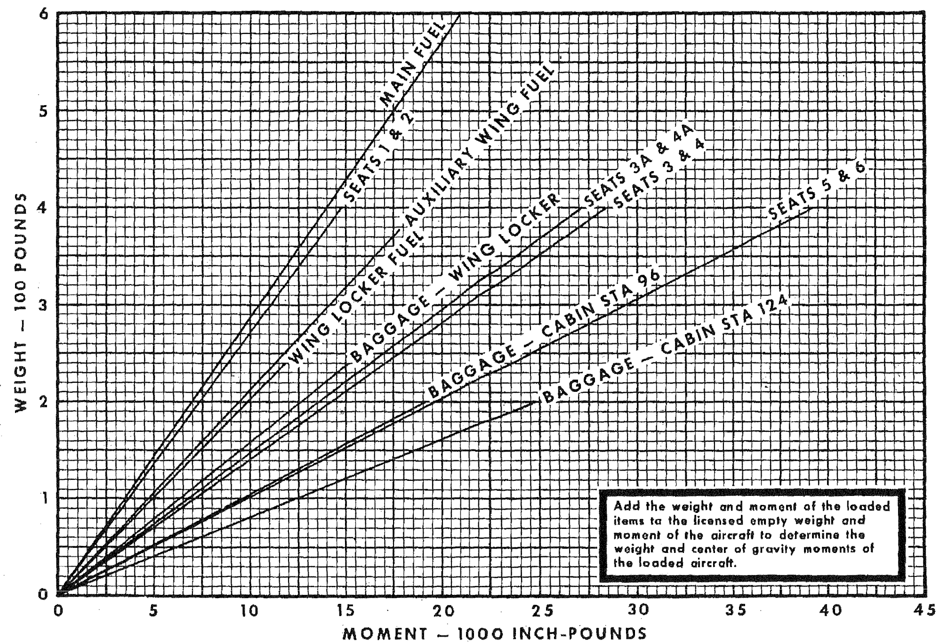
The loading chart, see Figure 4-2, is provided as a convenient method of determining the moment in inch-pounds of items to be loaded in the aircraft. This chart applies only when the CG of the occupant is at the location specified under Moment Arms in Figure 4-2. If the seat is in any other position, the moment must be computed by multiplying occupant weight times the arm in inches. A point midway between the fore and aft seat rollers can be assumed to be the occupant and seat CG.

The forward face of the cabin doorway structure is Station 20.00.

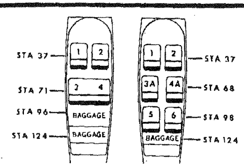
SAMPLE PROBLEM	Sample Aircraft		Your Aircraft	
	Weight (lbs)	Moment (lb-ins.)	Weight (lbs)	Moment (lb-ins.)
1. Licensed Empty Weight (Sample Problem) . .	3411.0	121.9		
2. Oil *(24 Qts x 1.875 lb/qt) . .	45.0	-0.2	45.0	-0.2
3. Pilot and Passengers				
Seats 1 and 2 . . .	340.0	12.6		
Seats 3 and 4 . . .				
Seats 3A and 4A . . .	340.0	23.1		
Seats 5 and 6 . . .	340.0	33.3		
4. Fuel (gals. x 6 lbs/gal)				
Main Tanks (100 gals) .	600.0	21.0		
Auxiliary Tanks (40 gals)	124.0	5.8		
Auxiliary Tanks (63 gals)				
Wing Locker Tanks (40 gals)				
5. Baggage				
(Sta. 96.0)				
(124.0)				
(Wing Lockers) . . .	100.0	6.3		
6. Total Aircraft Weight (Loaded)	5300.0	223.8		
7. Locate this point (5300 at 223.8) on Figure 4-3 and since this point falls within the envelope, the loading is acceptable.				
*Note: Normally full oil may be assumed for all flights.				

Figure 4-1

LOADING CHART



MOMENT ARMS



Item	Station-Inches
Oil	-3.5
Main Fuel	35.0
Auxiliary Wing Fuel	47.0
Wing Locker Fuel	49.0
Wing Locker Baggage	63.0

Figure 4-2

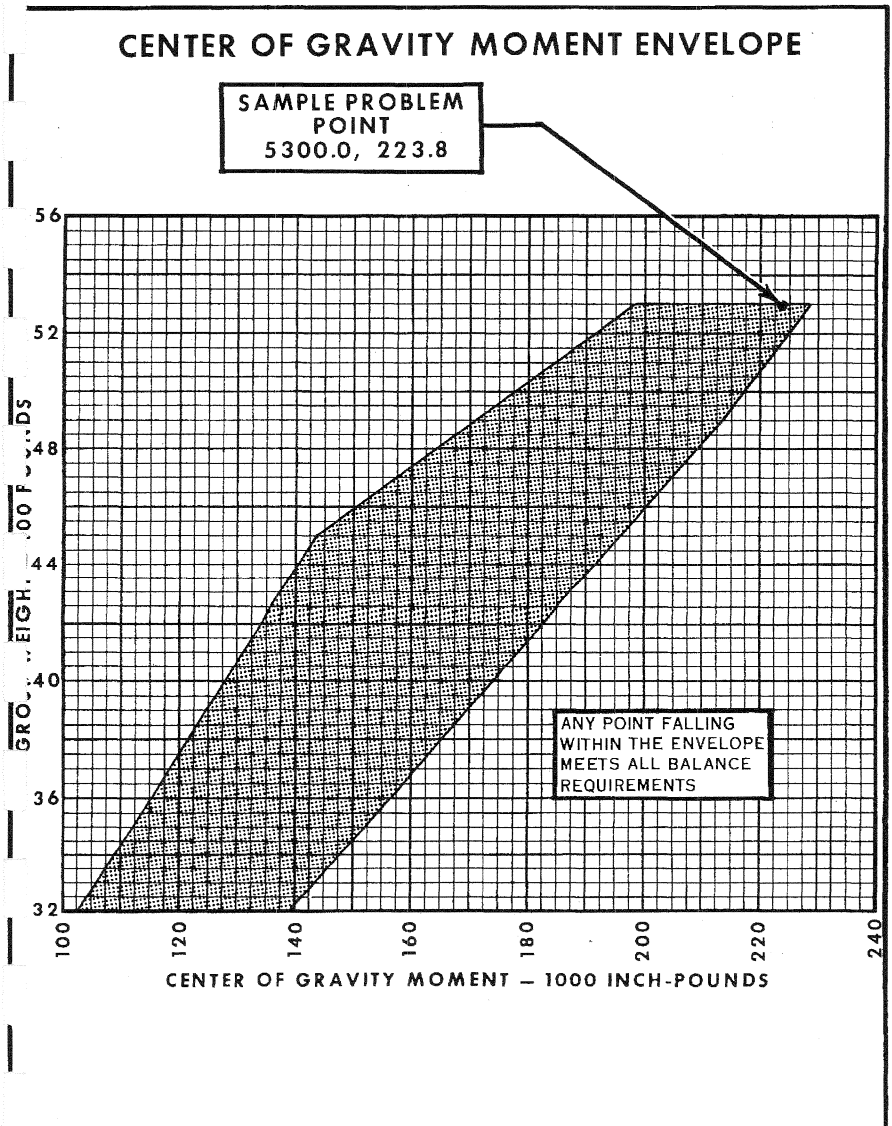

CENTER OF GRAVITY MOMENT ENVELOPE
SAMPLE PROBLEM POINT 5300.0, 223.8
ANY POINT FALLING WITHIN THE ENVELOPE MEETS ALL BALANCE REQUIREMENTS
56
52
48
44
40
36
32
100
120
140
160
180
200
220
240
CENTER OF GRAVITY MOMENT — 1000 INCH-POUNDS

Figure 4-3

Notes ....

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SECTION V
CARE OF THE AIRCRAFT

If your aircraft is to retain that new-plane performance and dependability, certain inspection and maintenance requirements must be followed. It is wise to follow a planned schedule of lubrication and preventive maintenance based on climatic and flying conditions encountered in your locality.

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

MAA IDENTIFICATION PLATE

All correspondence concerning your Cessna should include the aircraft model and serial number. This information may be obtained from the FAR required MAA (Manufactures Aircraft Association) plate located on the main cabin door forward post. Refer to the aircraft Service Manual for an illustrated breakdown of the MAA plate.

GROUND HANDLING

The aircraft should be moved on the ground with the aid of the nosewheel towing bar provided with each aircraft. The tow bar is designed to attach to the nose gear strut fork. Do not tow by tail tie-down fitting.

NOTE

Remove all rudder locks before ground handling to prevent possible damage to the rudder interconnect pulley bracket. When using the tow bar, never exceed the nosewheel turning radius limits of 55° either side of center. Structural damage may occur if the turn limits are exceeded. Do not push or pull on propellers or control surfaces when moving the aircraft on the ground.

MOORING YOUR AIRCRAFT

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

(1) Set the parking brake and install control wheel lock.
(2) Tie strong ropes or chains (700 pounds tensile strength) to wing tie-down fittings.
(3) Caster the nosewheel to the extreme left or right position.
(4) Tie a strong rope or chain (700 pounds tensile strength) to the tail tie-down fitting. (Do not impose side loads on tie-down fitting.)
(5) Recommend installation of pitot tube cover.

WINDOWS AND WINDSHIELD

The plastic windshield and windows should be kept clean and waxed at all times. To prevent scratches and crazing, wash them carefully with plenty of soap and water, using the palm of the hand to feel and dislodge dirt and mud. A soft cloth, chamois or sponge may be used, but only to carry water to the surface. Rinse thoroughly, then dry with a clean, moist chamois. Rubbing the surface of the plastic with a dry cloth builds up an electrostatic charge which attracts dust particles in the air. Wiping with a moist chamois will remove both the dust and this charge.

Remove oil and grease with a cloth moistened with kerosene. Never use gasoline, benzine, acetone, carbon tetrachloride, fire extinguisher fluid, lacquer thinner or glass cleaner. These materials will soften the plastic and may cause it to craze.

After removing dirt and grease, if the surface is not badly scratched, it should be waxed with a good grade of commercial wax. The wax will fill in minor scratches and help prevent further scratching. Apply a thin, even coat of wax and bring it to a high polish by rubbing lightly with a clean, dry soft flannel cloth. Do not use a power buffer; the heat generated by the buffeting pad may soften the plastic.

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

PAINTED SURFACES

The painted exterior surfaces of your new Cessna require an initial curing period which may be as long as 90 days after the finish is applied. During this curing period some precautions should be taken to avoid damaging the finish or interfering with the curing process. The finish should be cleaned only by washing with clean water and mild soap, followed by a rinse water and drying with cloths or a chamois. Do not use polish or wax, which would exclude air from the surface, during this 90-day curing period. Do not rub or buff the finish and avoid flying through rain, hail, or sleet.

Once the finish has cured completely, it may be waxed with a good automotive wax. A heavier coating of wax on the leading edges of the wings, tail, engine nose cap and propeller spinner will help reduce the abrasion encountered in these areas.

PROPELLER CARE

Preflight inspection of propeller blades for nicks, and wiping them occasionally with an oily cloth to clean off grass and bug stains will assure long, trouble-free service. It is vital that small nicks on the propellers, particularly near the tips and on the leading edges, are dressed out as soon as possible since these nicks produce stress concentrations, and if ignored, may result in cracks. Never use an alkaline cleaner on the blades; remove grease and dirt with Stoddard solvent. Do not feather propeller below 700 RPM as this may damage the hub mechanism.

INTERIOR CARE

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

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

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

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

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

FLYABLE STORAGE

Flyable storage applies to all aircraft which will not be flown for an indefinite period but which are to be kept ready to fly with the least possible preparation. If the aircraft is to be stored temporarily, or indefinitely, refer to the Service Manual for proper storage procedures.

Aircraft which are not in daily flight should have the propellers rotated, by hand, five revolutions at least once each week. In damp climates and in storage areas where the daily temperature variation can cause condensation, propeller rotation should be accomplished more frequently. Rotating the propeller an odd number of revolutions, redistributes residual oil on the cylinder walls, crankshaft and gear surfaces and repositions the pistons in the cylinders, thus preventing corrosion. Rotate propellers as follows:

(1) Throttle - IDLE.
(2) Mixtures - IDLE CUT-OFF.
(3) Magneto Switches - OFF.

(4) Propellers - ROTATE CLOCKWISE. Manually rotate propellers five revolutions, standing clear of arc of propeller blades.

Keep fuel tanks full to minimize condensation in the fuel tanks. Maintain battery at full charge to prevent electrolyte from freezing in cold weather. If the aircraft is stored outside, tie-down aircraft in anticipation of high winds. Secure aircraft as follows:

(1) Secure rudder with the optional rudder gust lock or with a control surface lock over the fin and rudder. If a lock is not available, caster the nosewheel to the full left or right position.
(2) Install control column lock in pilot's control column, if available. If column lock is not available, tie the pilot's control wheel full aft with a seat belt.
(3) Tie ropes or chains to the wing tie-down fittings located on the underside of each wing. Secure the opposite ends of the ropes or chains to ground anchors. Chock the main landing gear tires; do not set the parking brake if a long period of inactivity is anticipated as brake seizing can result.
(4) Secure a rope (no chains or cables) to the upper nose gear trunnion and secure opposite end of rope to a ground anchor. Chock the nose landing gear tire.
(5) Secure the middle of a rope to the tail tie-down fitting. Pull each end of rope at a 45-degree angle and secure to ground anchors at each side of the tail.
(6) After 30 days, the aircraft should be flown for 30 minutes or run engines on the ground until oil temperatures reach operating temperatures.

NOTE

Excessive ground operation is to be avoided so that maximum cylinder head temperatures are not exceeded.

INSPECTION REQUIRMENTS

As required by Federal Aviation Regulations, all civil aircraft of U.S. registry must undergo a complete inspection (annual) each twelve calendar months.

In addition to the required ANNUAL inspection, aircraft operated commercially (for hire) must have a complete inspection every 100 hours of operation.

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

The CESSNA PROGRESSIVE CARE PROGRAM has been developed to provide a modern progressive inspection schedule that satisfies the complete aircraft inspection requirements of both the 100 HOUR and ANNUAL inspections as applicable to Cessna aircraft.

CESSNA PROGRESSIVE CARE

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

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

CESSNA CUSTOMER CARE PROGRAM

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

Coupons attached to the Program book entitle you to an initial inspection and either a Progressive Care Operation No. 1 or the first 100-hour inspection within the first 6 months of ownership at no charge to you. If you take delivery from your Dealer, the initial inspection will have been performed before delivery of the aircraft to you. If you pick up your aircraft at the factory, plan to take it to your Dealer reasonably soon after you take delivery, so the initial inspection may be performed allowing the Dealer to make any minor adjustments which may be necessary.

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

SERVICING REQUIREMENTS

For quick and ready reference, quantities, materials, and specifications for frequently used service items (such as fuel, oil, etc.) are shown on the inside back cover of this manual.

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

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

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

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

OWNER FOLLOW-UP SYSTEM

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

PUBLICATIONS

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

CUSTOMER CARE PROGRAM BOOK

OWNER'S MANUALS FOR YOUR
- AIRCRAFT
- AVIONICS*

POWER COMPUTER

SALES AND SERVICE DEALER DIRECTORY

DO'S AND DON'TS ENGINE BOOKLET

*The applicable Owner's Manual is provided with each optional avionics installation.

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

SERVICE MANUALS AND PARTS CATALOGS FOR YOUR
- AIRCRAFT
- ENGINE AND ACCESSORIES
- AVIONICS

Your Cessna Dealer has a current catalog of all Customer Services Supplies that are available, many of which he keeps on hand. Supplies which are not in stock, he will be happy to order for you.

AIRCRAFT FILE

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

A. To be displayed in the aircraft at all times:

(1) Aircraft Airworthiness Certificate (FAA Form 8100-2).
(2) Aircraft Registration Certificate (AC Form 8050-3).
(3) Aircraft Radio Station License (Form FCC-556, if transmitter installed).

B. To be carried in the aircraft at all times:

(1) Weight and Balance, and associated papers (latest copy of the Repair and Alteration Form, Form FAA-337, if applicable).
(2) Aircraft Equipment List.
(3) Pilot's Checklist.

C. To be made available upon request:

(1) Aircraft Log Book.
(2) Engine Log Books.

Most of the items listed are required by the United States Federal Aviation Regulations. Since the regulations of other nations may require other documents and data, owners of exported aircraft should check with their own aviation officials to determine their individual requirements.

Cessna recommends that these items plus the Owner's Manual, power computer, Customer Care Program book and Customer Care Card, be carried in the aircraft at all times.

Notes ....

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SECTION VI
OPERATIONAL DATA

The operational data on the following pages are presented for two purposes; first, so that you may know what to expect from your aircraft under various conditions and second, to enable you to plan your flights in detail and with reasonable accuracy.

A power setting selected from the range charts usually will be more efficient than a random setting, since it will permit accurate fuel flow settings and your fuel consumption can be estimated closely. You will find that using the charts and your power computer will pay dividends in over-all efficiency.

The data in the charts has been compiled from actual flight tests with the aircraft and engines in good condition, and using average piloting techniques. Note also that the range charts make no allowances for wind, navigational errors, warm-up, takeoff, climb, etc. You must estimate these variables for yourself and make allowances accordingly.

AIRSPEED NOMENCLATURE SUMMARY
GROSS WEIGHT 5300 POUNDS

MULTI-ENGINE	KIAS	SINGLE ENGINE	KIAS
Takeoff & Climb to 50 Ft. (0° Flaps)	90	Minimum Control Speed	75
Best Angle of Climb Speed	81	Takeoff & Climb to 50 Ft. (0° Flaps)	90
Best Rate-of-Climb Speed	107	Best Angle of Climb Speed	93
Landing Approach Speed (35° Flaps)	89	Best Rate-of-Climb Speed	102
Maneuvering Speed	148	Landing Approach Speed (35° Flaps)	94
Structural Cruise Speed	183	When Landing is Assured	89
Never Exceed Speed (Red Line)	224		

AIRSPEED CORRECTION TABLE

FLAPS 0°		FLAPS 15° *		FLAPS 35° **	
KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
70	70	70	71	60	62
80	80	80	81	70	71
100	101	90	91	80	81
120	121	100	101	90	91
140	142	110	111	100	100
160	162	120	122	110	110
180	183	130	132	120	120
200	203	140	142	130	129
220	224	150	152	140	139
		160	162		

*Maximum Flap Speed 160 KCAS (15°) **Maximum Flap Speed 140 KCAS (35°)

NOTE: The above calibrations are valid for pilot's and copilot's airspeed indicators when using normal static source and the standard pitot static system only. Refer to Pilot's Checklist if alternate static source is used or a dual pitot system is installed.

Figure 6-1

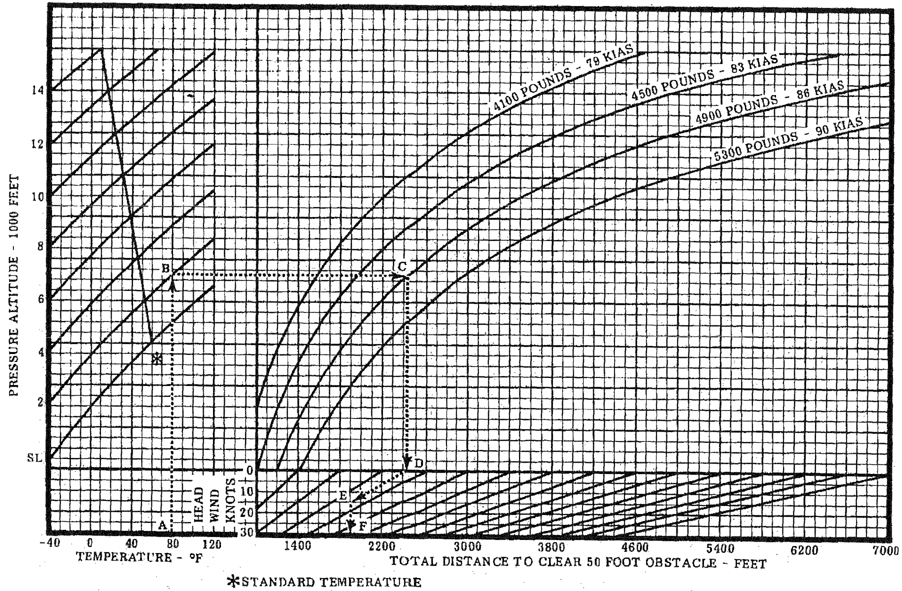
STALL SPEED CHART

Knots (IAS is Approximate)
5300 Pounds Gross Weight

CONFIGURATION	ANGLE OF BANK 0°		20°		40°		60°	
	IAS	CAS	IAS	CAS	IAS	CAS	IAS	CAS
Gear and Flaps Up	74	74	77	77	85	85	104	105
Gear Down and Flaps 15°	71	72	73	74	81	82	100	101
Gear Down and Flaps 35°	62	64	64	66	71	73	89	90

Figure 6-2

NORMAL TAKEOFF DISTANCE



CONDITIONS

1. Level Hard Surface Runway
2. Wing Flaps - UP
3. Full Throttle and 2625 RPM Before Releasing Brakes
4. Mixture at Recommended Fuel Flow
5. Maintain Speed to 50 Feet

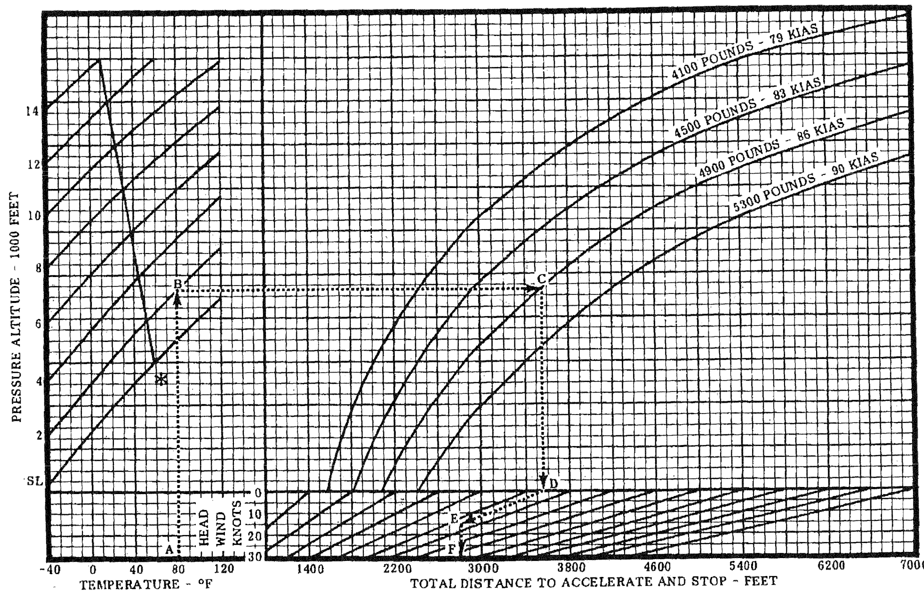
EXAMPLE

A. Temperature - 80°F
B. Pressure Altitude - 2000 Feet
C. Gross Weight - 4900 Pounds
D. Total Distance to Clear 50 Foot Obstacle (No Wind) - 2420 Feet
E. Headwind - 15 Knots
F. Total Distance to Clear 50 Foot Obstacle (15 Knot Headwind) - 1900 Feet

NOTE: Ground Run is Approximately 87% of Total Distance. Increase Total Distance by 3.5% for Operation on Firm Dry Sod Runway.

Figure 6-3

ACCELERATE STOP DISTANCE



✱ STANDARD TEMPERATURE

CONDITIONS

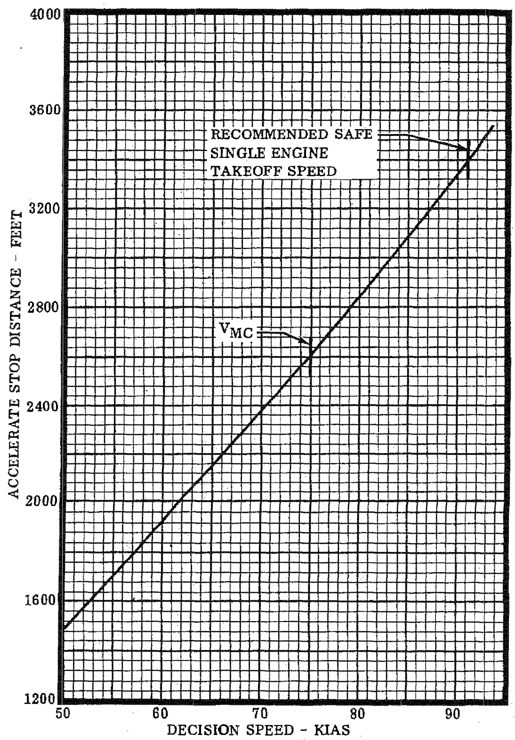
1. Level Hard Surface Runway
2. Wing Flaps - UP
3. Full Throttle and 2625 RPM Before Releasing Brakes
4. Mixture at Recommended Fuel Flow
5. Engine Failure at Takeoff Speed
6. Heavy Braking After Engine Failure

EXAMPLE

A. Temperature - 80°F
B. Pressure Altitude - 2000 Feet
C. Gross Weight - 4900 Pounds
D. Total Distance to Stop (No Wind) - 3560 Feet
E. Headwind - 15 Knots
F. Total Distance to Stop (15 Knot Headwind) - 2820 Feet

Figure 6-4

DISTANCE TO ACCELERATE STOP Vs DECISION SPEED



CAUTION:

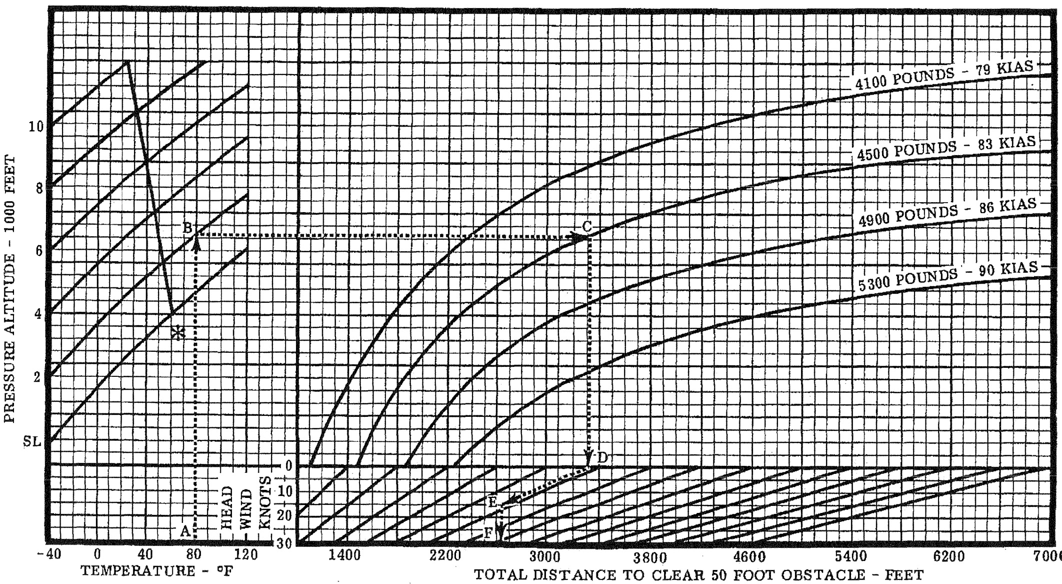
1. Safe Continued Takeoff on Single Engine is Improbable Below Safe Single Engine Speed. (See Section III)
2. Single Engine Control is Improbable Below V_{MC}.

CONDITIONS

1. Level Hard Surface Runway
2. Wing Flaps - UP
3. Full Throttle and 2625 RPM Before Brake Release
4. Mixture at Recommended Fuel Flow
5. Engine Failure at Decision Speed
6. Heavy Braking After Engine Failure
7. Weight 5300 Pounds
8. Sea Level Standard Day

Figure 6-5

SINGLE ENGINE TAKEOFF DISTANCE



✻STANDARD TEMPERATURE

CONDITIONS

1. Level Hard Surface Runway
2. Wing Flaps - UP
3. Full Throttle and 2625 RPM Before Releasing Brakes
4. Mixture at Recommended Fuel Flow
5. Engine Failure at Takeoff Speed
6. Propeller Feathered and Gear Retracted During Climb
7. Maintain Speed to 50 Feet

EXAMPLE

A. Temperature - 80°F
B. Pressure Altitude - 2000 Feet
C. Gross Weight - 4500 Pounds
D. Total Distance to Clear 50 Foot Obstacle (No Wind) - 3320 Feet
E. Headwind - 15 Knots
F. Total Distance to Clear 50 Foot Obstacle (15 Knot Headwind) - 2630 Feet

Figure 6-6

MULTI-ENGINE CLIMB DATA AT 5300 POUNDS

NOTE: DECREASE RATE-OF-CLIMB 20 FT/MIN FOR EACH 10°F ABOVE STANDARD TEMPERATURE FOR A PARTICULAR ALTITUDE.

MAXIMUM CLIMB

SEA LEVEL 59°F			5000 FT. 41°F			10,000 FT. 23°F			15,000 FT. 5°F			20,000 FT. -12°F		
Best Climb KIAS	Rate of Climb Ft/Min	Lbs of Fuel Used	Best Climb KIAS	Rate of Climb Ft/Min	From S.L. Fuel Used	Best Climb KIAS	Rate of Climb Ft/Min	From S.L. Fuel Used	Best Climb KIAS	Rate of Climb Ft/Min	From S.L. Fuel Used	Best Climb KIAS	Rate of Climb Ft/Min	From S.L. Fuel Used
107	1495	24	106	1136	39	105	782	56	104	427	80	104	66	136

NOTE: FULL THROTTLE, 2625 RPM, MIXTURE AT RECOMMENDED FUEL FLOW, FLAPS AND GEAR UP. FUEL USED INCLUDES WARM-UP AND TAKEOFF

CRUISE CLIMB

NOTE: 2450 RPM, 24 IN. MP TO 5000 FT. FULL THROTTLE AFTERWARDS.

POWER SETTING		Climb KIAS	5000 FT. 41°F			10,000 FT. 23°F			15,000 FT. 5°F		
			FROM SEA LEVEL			FROM SEA LEVEL			FROM SEA LEVEL		
RPM	M.P.		Dist. Nautical Miles	Time Min.	Fuel Used Lbs.	Dist. Nautical Miles	Time Min.	Fuel Used Lbs.	Dist. Nautical Miles	Time Min.	Fuel Used Lbs.
2450	24	120	10.3	5.0	40	24.8	11.5	59	58.1	25.2	93

NOTE: WARM-UP AND TAKEOFF ALLOWANCE 24 POUNDS FUEL AT SEA LEVEL. MIXTURE AT RECOMMENDED FUEL FLOW, FLAPS AND GEAR UP.

Figure 6-7

MAXIMUM PERFORMANCE TAKEOFF 15° FLAPS

Gross Weight Pounds	KIAS at Takeoff	KIAS at Obstacle	Head Wind Knots	DENSITY ALTITUDE: SEA LEVEL 59°F Ground Run	SEA LEVEL 59°F Total Distance over 50 Ft Obstacle	2500 FT 50°F Ground Run	2500 FT 50°F Total Distance over 50 Ft Obstacle	5000 FT 41°F Ground Run	5000 FT 41°F Total Distance over 50 Ft Obstacle	7500 FT 32°F Ground Run	7500 FT 32°F Total Distance over 50 Ft Obstacle
5300	78	78	0	1519	1795	1911	2234	2453	2837	3234	3702
			15	1130	1360	1435	1700	1865	2188	2485	2885
			30	805	988	1025	1244	1353	1622	1845	2158

Figure 6-8

SINGLE ENGINE CLIMB DATA

Gross Weight Pounds	SEA LEVEL 59°F Best Climb KIAS	SEA LEVEL 59°F Rate of Climb Ft/Min	2500 FT 50°F Best Climb KIAS	2500 FT 50°F Rate of Climb Ft/Min	5000 FT 41°F Best Climb KIAS	5000 FT 41°F Rate of Climb Ft/Min	7500 FT 32°F Best Climb KIAS	7500 FT 32°F Rate of Climb Ft/Min	10,000 FT 23°F Best Climb KIAS	10,000 FT 23°F Rate of Climb Ft/Min
5300	102	327	100	224	98	119	97	15	96	-89
4900	99	400	97	298	96	195	95	92	94	-10
4500	96	463	94	360	93	265	92	151	91	47

NOTE: Flaps and gear up, inoperative propeller-feathered, wing banked 5° toward operating engine, full throttle, 2625 RPM and mixture at recommended leaning schedule. Decrease rate of climb 10 FT/MIN for each 10°F above standard temperature for particular altitude.

Figure 6-9

SINGLE ENGINE SERVICE CEILING

BEST CLIMB SPEED APPROXIMATELY 102 KIAS

Gross Weight Pounds	OUTSIDE AIR TEMPERATURE °F: -10	0	10	20	30	40	50
	ALTITUDE-FEET						
5300	7550	7380	7180	6970	6750	6560	6400
4900	9300	9100	8900	8650	8400	8170	7900
4500	10,600	10,400	10,200	9900	9630	9400	9100

NOTE: Table provides performance information to aid in route selection when operating under FAR 135.145 and FAR 91.119 requirements.

Increase indicated service ceilings 100 feet for each 0.10 inch Hg. altimeter setting greater than 29.92.

Decrease indicated service ceilings 100 feet for each 0.10 inch Hg. altimeter setting less than 29.92.

The service ceilings are the highest attainable while maintaining a minimum rate-of-climb of 50 ft/min.

Figure 6-10

CRUISE PERFORMANCE WITH RECOMMENDED LEAN MIXTURE AT 2500 FT

RPM	MP	%BHP	KTAS	Total Lbs./Hr	Endurance 600 Lbs.	Range 600 lbs. (Naut. Mi.)	Endurance 978 Lbs.	Range 978 lbs. (Naut. Mi.)	Endurance 1218 Lbs.	Range 1218 lbs. (Naut. Mi.)
2450	24	74	181	168	3.57	645	5.82	1051	7.25	1310
	23	70	177	158	3.80	672	6.19	1094	7.71	1363
	22	66	172	147	4.08	703	6.65	1146	8.29	1428
	21	62	168	139	4.32	724	7.04	1180	8.76	1468
2300	24	68	175	153	3.92	685	6.39	1117	7.96	1392
	23	64	170	143	4.20	714	6.84	1163	8.52	1448
	22	60	165	135	4.44	734	7.24	1197	9.02	1491
	21	56	160	127	4.72	756	7.70	1234	9.59	1538
2200	23	58	163	131	4.58	746	7.47	1216	9.30	1514
	22	55	158	124	4.84	765	7.89	1248	9.82	1553
	21	50	151	116	4.17	780	8.43	1272	10.50	1585
	20	47	146	110	5.45	796	8.89	1298	11.07	1616
2100	22	49	150	113	5.31	794	8.65	1294	10.78	1612
	21	46	144	107	5.61	809	9.14	1318	11.38	1640
	20	43	137	101	5.94	816	9.68	1330	12.06	1657
	19	40	131	97	6.19	812	10.08	1322	12.56	1647
	18	37	120	90	6.67	802	10.87	1307	13.53	1627

CRUISE PERFORMANCE IS BASED ON STANDARD CONDITIONS, ZERO WIND, (50°F) RECOMMENDED LEAN MIXTURE, 600, 978 and 1218 LBS. OF FUEL (NO RESERVE), AND 5300 POUNDS GROSS WEIGHT.

NOTE: See Range Profile, Figure 6-12, for range including climb.

CRUISE PERFORMANCE WITH RECOMMENDED LEAN MIXTURE AT 5000 FT

RPM	MP	%BHP	KTAS	Total Lbs./Hr	Endurance 600 Lbs.	Range 600 lbs. (Naut. Mi.)	Endurance 978 Lbs.	Range 978 lbs. (Naut. Mi.)	Endurance 1218 Lbs.	Range 1218 lbs. (Naut. Mi.)
2450	24	77	188	174	3.45	649	5.62	1057	7.00	1316
	23	73	184	164	3.66	673	5.96	1096	7.43	1366
	22	68	178	154	3.90	695	6.35	1132	7.91	1410
	21	64	174	145	4.14	718	6.74	1170	8.40	1458
2300	24	70	181	157	3.82	690	6.23	1125	7.76	1401
	23	66	175	148	4.05	711	6.61	1160	8.23	1444
	22	62	171	139	4.32	739	7.04	1205	8.76	1499
	21	58	166	131	4.60	764	7.47	1240	9.30	1544
2200	23	61	170	136	4.41	749	7.19	1221	8.96	1521
	22	57	164	128	4.69	770	7.64	1255	9.52	1563
	21	53	159	121	4.96	787	8.08	1283	10.07	1599
	20	50	154	115	5.22	802	8.50	1306	10.59	1627
2100	22	51	155	118	5.08	789	8.29	1287	10.32	1602
	21	48	150	111	5.41	812	8.81	1323	10.97	1647
	20	45	145	106	5.66	818	9.23	1334	11.49	1660
	19	42	136	99	6.06	826	9.88	1347	12.30	1677
	18	39	127	94	6.38	812	10.40	1323	12.96	1649

CRUISE PERFORMANCE IS BASED ON STANDARD CONDITIONS, ZERO WIND, (41°F) RECOMMENDED LEAN MIXTURE, 600, 978 AND 1218 LBS. OF FUEL (NO RESERVE), AND 5300 POUNDS GROSS WEIGHT.

NOTE: See Range Profile, Figure 6-12, for range including climb.

Figure 6-11 (Sheet 1 of 3)

CRUISE PERFORMANCE WITH RECOMMENDED LEAN MIXTURE AT 7500 FT

RPM	MP	%BHP	KTAS	Total Lbs./Hr	Endurance 600 Lbs.	Range 600 lbs. (Naut. Mi.)	Endurance 978 Lbs.	Range 978 lbs. (Naut. Mi.)	Endurance 1218 Lbs.	Range 1218 lbs. (Naut. Mi.)
2450	22	71	186	159	3.77	700	6.15	1142	7.66	1422
	21	67	181	150	4.00	723	6.52	1179	8.12	1468
	20	63	176	141	4.26	750	6.94	1221	8.64	1520
	19	58	170	132	4.55	772	7.41	1257	9.23	1565
2300	22	64	177	144	4.17	740	6.79	1205	8.46	1501
	21	60	172	136	4.41	759	7.19	1237	8.96	1541
	20	56	166	127	4.72	785	7.70	1280	9.59	1594
	19	53	161	121	4.96	800	8.08	1304	10.07	1625
2200	22	58	169	132	4.55	769	7.41	1253	9.23	1561
	21	55	165	126	4.76	784	7.76	1278	9.67	1593
	20	52	160	119	5.04	806	8.22	1314	10.24	1637
	19	48	153	112	5.36	818	8.73	1332	10.88	1660
2100	21	50	156	115	5.22	817	8.50	1330	10.59	1657
	20	47	150	110	5.45	818	8.89	1335	11.07	1662
	19	44	144	101	5.94	854	9.68	1392	12.06	1734
	18	40	132	97	6.19	818	10.08	1332	12.56	1660

CRUISE PERFORMANCE IS BASED ON STANDARD CONDITIONS, ZERO WIND, (32°F) RECOMMENDED LEAN MIXTURE, 600, 978 AND 1218 LBS. OF FUEL (NO RESERVE), AND 5300 POUNDS GROSS WEIGHT.

NOTE: See Range Profile, Figure 6-12, for range including climb.

CRUISE PERFORMANCE WITH RECOMMENDED LEAN MIXTURE AT 10,000 FT

RPM	MP	%BHP	KTAS	Total Lbs./Hr	Endurance 600 Lbs.	Range 600 lbs. (Naut. Mi.)	Endurance 987 Lbs.	Range 978 lbs. (Naut. Mi.)	Endurance 1218 Lbs.	Range 1218 lbs. (Naut. Mi.)
2450	20	65	182	147	4.08	743	6.65	1211	8.29	1510
	19	61	177	137	4.38	775	7.14	1263	8.89	1573
	18	57	171	129	4.65	794	7.58	1295	9.44	1612
	17	53	164	121	4.96	815	8.08	1327	10.07	1654
2300	20	59	174	133	4.51	784	7.35	1278	9.16	1593
	19	55	168	125	4.80	805	7.82	1312	9.74	1634
	18	51	161	117	5.13	824	8.36	1343	10.41	1672
	17	48	154	111	5.41	835	8.81	1360	10.97	1694
2200	20	54	166	123	4.88	811	7.95	1321	9.90	1646
	19	50	159	116	5.17	820	8.43	1338	10.50	1666
	18	47	152	109	5.50	836	8.97	1364	11.17	1699
	17	44	138	104	5.77	799	9.40	1301	11.71	1621
2100	20	49	157	113	5.31	832	8.65	1355	10.78	1689
	19	46	149	107	5.61	837	9.14	1363	11.38	1697
	18	43	141	102	5.88	829	9.59	1352	11.94	1683
	17	40	121	96	6.25	758	10.19	1235	12.69	1538

CRUISE PERFORMANCE IS BASED ON STANDARD CONDITIONS, ZERO WIND, (23°F) RECOMMENDED LEAN MIXTURE, 600, 978 AND 1218 LBS. OF FUEL (NO RESERVE), AND 5300 POUNDS GROSS WEIGHT.

NOTE: See Range Profile, Figure 6-12, for range including climb.

Figure 6-11 (Sheet 2 of 3)

CRUISE PERFORMANCE WITH RECOMMENDED LEAN MIXTURE AT 15,000 FT

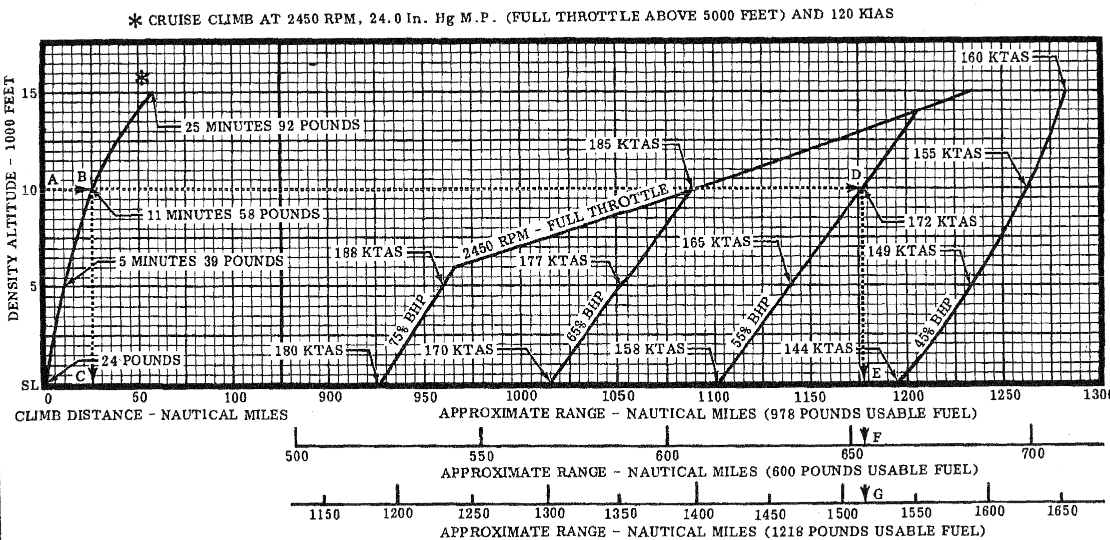
RPM	MP	%BHP	KTAS	Total Lbs./Hr	Endurance 600 Lbs.	Range 600 lbs. (Naut. Mi.)	Endurance 978 Lbs.	Range 978 lbs. (Naut. Mi.)	Endurance 1218 Lbs.	Range 1218 lbs. (Naut. Mi.)
2450	16	53	170	121	4.96	841	8.08	1370	10.07	1707
	15	48	156	112	5.36	836	8.73	1362	10.88	1698
	14	44	140	104	5.77	809	9.40	1318	11.71	1641
2300	16	48	156	112	5.36	836	8.73	1362	10.88	1698
	15	44	140	104	5.77	809	9.40	1318	11.71	1641
2200	16	44	140	104	5.77	809	9.40	1318	11.71	1641

CRUISE PERFORMANCE IS BASED ON STANDARD CONDITIONS, ZERO WIND, (5.5°F) RECOMMENDED LEAN MIXTURE, 600, 978 AND 1218 LBS. OF FUEL (NO RESERVE), AND 5300 POUNDS GROSS WEIGHT.

NOTE: See Range Profile, Figure 6-12, for range including climb.

Figure 6-11 (Sheet 3 of 3)

RANGE PROFILE



NOTES

1. Maximum Range is not Changed Appreciably with Variations in Climb Power Setting and Climb Speed.
2. Climb Fuel Includes Allowance for Start, Taxi, and Takeoff.

CONDITIONS

1. Starting Weight - 5300 Pounds
2. Cruise Climb to Desired Cruise Altitude
3. Cruise Fuel Flow, Recommended Lean Mixture
4. Zero Wind
5. 45 Minutes Reserve Fuel (80 Pounds) at 45% BHP

EXAMPLE

A. Cruise Altitude - 10,000 Feet
B. Time and Fuel Used to Climb from Sea Level to 10,000 Feet - 11 Minutes and 58 Pounds
C. Climb Distance - 25 Nautical Miles
D. Cruise Power and Speed - 55% BHP and 172 KTAS
E. Range - 1177 Nautical Miles (978 Pounds Usable Fuel - Optional)
F. Range - 653 Nautical Miles (600 Pounds Usable Fuel - Standard)
G. Range - 1517 Nautical Miles (1218 Pounds Usable Fuel - Optional)

Figure 6-12

LANDING PERFORMANCE

Gross Weight Pounds	KIAS at Obstacle	SEA LEVEL 59°F		2500 FT. 50°F		5000 FT. 41°F		7500 FT. 32°F	
		Ground Run	Total Distance Over 50 Foot Obstacle	Ground Run	Total Distance Over 50 Foot Obstacle	Ground Run	Total Distance Over 50 Foot Obstacle	Ground Run	Total Distance Over 50 Foot Obstacle
5300	89	582	1697	626	1741	675	1790	729	1844
4900	86	490	1605	527	1642	568	1683	613	1728
4500	82	406	1521	437	1552	471	1586	509	1624
4100	78	331	1446	356	1471	384	1499	414	1529

NOTE: WING FLAPS 35°, POWER OFF, HARD SURFACE RUNWAY, ZERO WIND MAXIMUM BRAKING EFFORT, REDUCE LANDING DISTANCE 10% FOR EACH 10 KNOTS HEADWIND.

NOTE: INCREASE DISTANCE BY 25% OF GROUND RUN FOR OPERATION ON FIRM SOD RUNWAYS.

Figure 6-13

Notes

SECTION VII
OPTIONAL SYSTEMS

This section contains a description, operating procedures, and performance data (when applicable) for some of the optional equipment which may be installed in your aircraft. Contact your Cessna Dealer for a complete list of available optional equipment.

AVIONICS MASTER SWITCHES

Two avionics master switches are provided with factory installed avionics. The master switch breaker labeled AVN MASTER is located in the top forward section of the side console. This switch supplies power from the battery bus through a circuit breaker located aft of the battery box and to the individual avionics circuit breakers and is used for all normal operations. An emergency avionics master switch breaker labeled EMG AVN PWR is located in the lower section of the side console and is protected by a red switch guard cover. This switch supplies power from the alternator bus to the individual avionics circuit breakers. The emergency avionics master switch is recommended for use only when the avionics master switch, associated wiring or battery circuits become inoperative.

NORMAL OPERATION

(1) Battery Master Switch - ON.
(2) Avionics Master Switch - ON after engine start.
(3) Radios - SET.

EMERGENCY OPERATION

(1) Emergency Avionics Power Switch - ON.

AUXILIARY FUEL SYSTEM (40 and 63 Gallon Options)

The auxiliary tanks are available in either of two sizes; 20 U.S. gallon usable each wing or 31.5 U.S. gallon usable each wing. The auxiliary tanks are installed in each wing just outboard of each engine nacelle and feed directly to the fuel selector valves. Fuel vapor and excesss fuel from the engines are returned to the main fuel tanks. The auxiliary tank is vented into the main tank. The main tank is in turn vented to the atmosphere.

When the selector valve handles are in the AUXILIARY position, the left auxiliary tank feeds the left engine and the right auxiliary tank feeds the right engine. The fuel quantity indicator continuously indicates fuel remaining in the tanks selected. When the fuel selector handles are in the AUXILIARY position, AUX TANK indicator lights will illuminate and the fuel quantity gage will indicate the fuel in the auxiliary tanks (pounds in white and gallons in blue). When the fuel selector handles are in the MAIN position, the fuel quantity gage will indicate the fuel in the main tanks. A three-position switch, spring-loaded to center, allows checking fuel quantity in the tanks not selected. The switch, adjacent to the auxiliary tank indicator lights, is labeled MAIN and AUX. By positioning the switch to the appropriate tank position, the fuel quantity in that tank will be indicated on the fuel quantity gage.

If the auxiliary tanks are to be used, select fuel from the main tanks for 60 minutes with 20 gallon tank and 90 minutes with 31.5 gallon tank prior to switching to auxiliary tanks. This is necessary to provide space in the main tanks for vapor and fuel returned from the engine-driven fuel pumps. If sufficient space is not available in the main tanks for this diverted fuel, the tanks can overflow through the vent line. Since part of the fuel from the auxiliary tanks is diverted back to the main tanks instead of being consumed by the engines, the auxiliary tanks will run dry sooner than may be anticipated. However, the main endurance will be increased by the returned fuel. The total usable fuel supply is available during cruising flight only. An engine failure or engine driven pump failure results in the auxiliary fuel on the side of the failure being unusable. Operation on the auxiliary fuel tanks near the ground (below 1000 feet AGL) is not recommended.

OPTIONAL WING LOCKER FUEL SYSTEM

Optional wing locker fuel tanks (20 gal. usable each wing) are installed in the forward portion of the nacelle wing lockers. There are no separate fuel selector controls for the wing locker fuel tanks. The wing locker fuel is pumped directly into the main tanks with a fuel transfer pump. Indicator lights mounted on the instrument panel are illuminated by pressure switches to indicate fuel has been transferred. The wing locker fuel should not be transferred until there is 180 lbs. or less in the main fuel tanks to prevent overflow of the main tank fuel. Fuel should be crossfed as required to maintain fuel balance after wing locker fuel has been transferred.

NOTE

Wing locker transfer pump switches provided on the instrument panel, energize the wing locker fuel transfer pumps for transferring fuel. These switches should be turned ON only to transfer fuel and turned OFF when the indicator lights come ON indicating fuel has been transferred.

OXYGEN SYSTEM

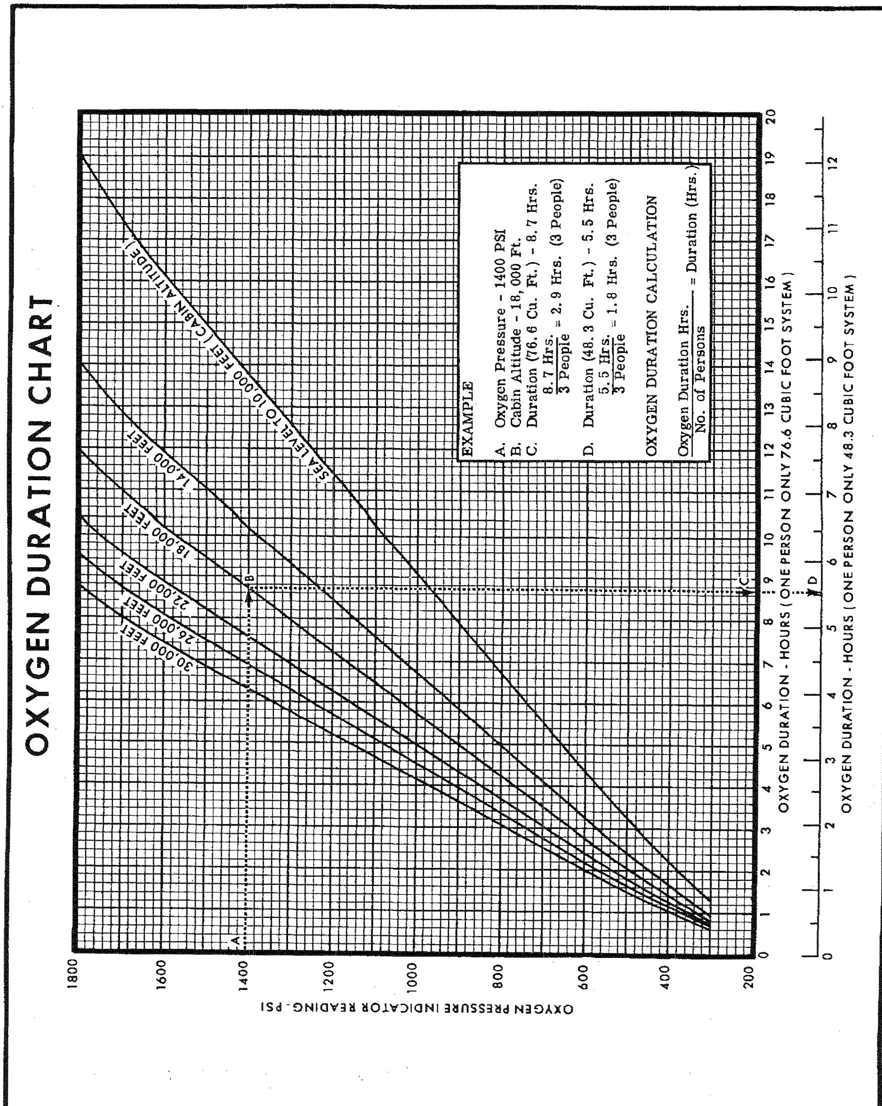
The oxygen system is designed to provide adequate oxygen flow rates for altitudes up to 30,000 feet. The pilot and passengers shall always use the blue hose assemblies. The system consists of a 48.3 or 76.6 cubic foot oxygen bottle, an altitude compensated regulator, oxygen bottle pressure indicator, a mechanically actuated on-off valve and the necessary outlets and plumbing. See Figure 7-1 for oxygen consumption rates at various altitudes.

OXYGEN SYSTEM OPERATION

The oxygen system is activated by pulling the oxygen knob to the ON position, allowing oxygen to flow from the regulator to all cabin outlets. A normally closed valve in each oxygen outlet is opened by inserting the connector of the mask and hose assembly. After flights using oxygen, the pilot should ensure that the oxygen system has been inactivated by unplugging all masks and pushing the oxygen knob completely to the OFF position.

NOTE

If the oxygen knob is left in an intermediate position between ON and OFF, it may allow low pressure oxygen to bleed through the regulator into the nose compartment of the aircraft.



OXYGEN DURATION CHART
SEA LEVEL TO 10,000 FEET (CABIN ALTITUDE)
14,000 FEET
18,000 FEET
22,000 FEET
26,000 FEET
30,000 FEET
EXAMPLE
A. Oxygen Pressure - 1400 PSI
B. Cabin Altitude - 18,000 Ft.
C. Duration (76.6 Cu. Ft.) - 8.7 Hrs.
8.7 Hrs. / 3 People = 2.9 Hrs. (3 People)
D. Duration (48.3 Cu. Ft.) - 5.5 Hrs.
5.5 Hrs. / 3 People = 1.8 Hrs. (3 People)
OXYGEN DURATION CALCULATION
Oxygen Duration Hrs. / No. of Persons = Duration (Hrs.)
OXYGEN PRESSURE INDICATOR READING - PSI
OXYGEN DURATION - HOURS (ONE PERSON ONLY 76.6 CUBIC FOOT SYSTEM)
OXYGEN DURATION - HOURS (ONE PERSON ONLY 48.3 CUBIC FOOT SYSTEM)

Figure 7-1

Before Flight:

(1) Oxygen Knob - PULL ON.
(2) Oxygen Pressure Gauge - Check for sufficient pressure for anticipated flight requirements. (See figure 7-1.)
(3) Check that oxygen masks and hose assemblies are available.

During Flight:

WARNING

Permit no smoking when using oxygen. Oil, grease, soap, lipstick, lip balm, and other fatty materials constitute a serious fire hazard when in contact with oxygen. Be sure hands and clothing are oil-free before handling oxygen equipment.

(1) Mask - Connect mask and hose assembly and put mask on.
(2) Hose Coupling - Plug into overhead console.
(3) Oxygen Flow Indicator - Check Flow. (Indicator toward mask indicates proper flow.)
(4) Disconnect hose coupling from console when not in use.

AMBIENT TEMPERATURE °F	FILLING PRESSURE PSIG		AMBIENT TEMPERATURE °F	FILLING PRESSURE PSIG
0	1600		70	1925
10	1650		80	1950
20	1675		90	2000
30	1725		100	2050
40	1775		110	2100
50	1825		120	2150
60	1875		130	2200

Example - If ambient temperature is 70°F, fill oxygen cylinder to approximately 1925 psig - as close to this pressure as the gage can be read. Upon cooling, the cylinder should have approximately 1800 psi pressure.

Figure 7-2

OXYGEN SYSTEM SERVICING

The oxygen cylinder, when fully charged, contains 48.3 or 76.6 cubic feet of oxygen, under a pressure of 1800 psi at 70°F. Filling pressures will vary, however, due to the ambient temperature in the filling area, and because of the temperature rise resulting from compression of the oxygen. Because of this, merely filling to 1800 psi will not result in a properly filled cylinder. Fill to the pressures indicated in Figure 7-2 for the ambient temperature.

NOTE

Oil, grease, or other lubricants in contact with oxygen create a serious fire hazard, and such contact must be avoided when handling oxygen equipment.

The cylinder is serviced through an external filler valve located just above the aft end of the nosewheel doors. The Servicing Requirements table, located on the inside back cover of the manual, lists the correct type of oxygen for refilling the cylinder.

The face masks used with the oxygen system are the partial-rebreathing type. The pilot's mask is a permanent type mask, while the remainder are the semi-permanent type. They may be cleaned with alcohol or used as disposable masks. Additional masks and hose assemblies are available from your Cessna Dealer.

COLD WEATHER EQUIPMENT

WINTERIZATION KIT

A winterization kit consisting of engine cooling air inlet restrictor baffles is available for use during continuous operation in very low temperature conditions. These baffles may be installed as an assist in maintaining engine cylinder head temperatures in recommended temperature range. The winterization kit must be removed at temperatures of 20°F or above.

PROPELLER DEICE SYSTEM

The propeller deice system consists of electrically heated boots on the propeller blades. Each boot consists of two heating elements "Outboard" and "Inboard," which receive their electrical power through a deice timer. To reduce power drain and maintain propeller balance, the timer directs current to the propeller boots in cycles between boot elements and between propellers.

NORMAL OPERATION

To operate the propeller deice system proceed as follows:

(1) Battery Switch - ON
(2) Propeller Deice Switch Breaker - ON (up position).
(3) Ammeter - CHECK.

NOTE

- Periodic fluctuation (2 bladed 8 to 12 Amp. and 3 bladed 12 to 18 Amp.) of the propeller deice ammeter pointer indicates normal operation of the deicing elements of first one propeller and then the other.

- To check all the heating elements of both propellers and the deice timer for normal operation, the system must be left ON for approximately two and one-half minutes.

The timer directs current to the propeller boots in cycles between boot elements and between propellers in the following cycling sequence:

Heating Period No. 1 - Outboard halves - right engine blades.
Heating Period No. 2 - Inboard halves - right engine blades.
Heating Period No. 3 - Outboard halves - left engine blades.
Heating Period No. 4 - Inboard halves - left engine blades.

Each heating period lasts for approximately one-half minute.

EMERGENCY OPERATION

Abnormal operation of the propeller deice system is indicated by the propeller deice switch breaker tripping to the OFF position. Failure of the switch breaker to stay reset indicates that deicing is impossible for the propellers.

A reading below 8 Amp. (2 bladed) and 12 Amp. (3 bladed) on the propeller deice ammeter indicates that the blades of the propeller are not being deiced uniformly.

> WARNING
>
> When uneven deicing of the propeller blades is indicated, it is imperative that the deicing system be turned OFF. Uneven deicing of the blades can result in propeller unbalance and engine failure.

DEICE BOOT SYSTEM

OPERATING CHECKLIST

Before Entering Aircraft

(1) During the exterior inspection, check the boots for tears, abrasions, and cleanliness. Have boots cleaned and any major damage repaired before takeoff.

During Engine Runup

(1) Position deice switch to ACTUATE and check inflation and deflation cycles. The pressure indicator light (amber in color) should light when the system reaches 10 PSI. The system may be recycled as soon as the light goes OFF, or as required.

> NOTE
>
> The deice system is manually controlled. Every time a deicing cycle is desired, the switch must be positioned to ACTUATE. The switch will instantly spring back to OFF, but a 6 second delay action in the timing relay will complete the deicing inflation cycle.

(2) Check boots visually for complete deflation to the vacuum hold-down position.

> NOTE
>
> Complete inflation and deflation cycle will last approximately 30 seconds.

In Flight

(1) When ice has accumulated to approximately 1/2 inch thick on the leading edges, position deice switch to ACTUATE.

After Landing

(1) Check boots for damage and cleanliness. Remove any accumulations of engine oil or grease.

OPERATING DETAILS

Cycling the deice boots produces no adverse aerodynamic effects in any attitude within the allowable flight limitations.

Deice boots are intended to remove ice after it has accumulated rather than preventing its formation. If the rate of ice accumulation is slow, best results can be obtained by leaving the deice system OFF until 1/4 to 3/4 inch of ice has accumulated. After clearing this accumulation with one or two cycles of operation, the system should remain OFF until a significant quantity of ice has again accumulated. Rapid cycling of the system is not recommended, as this may cause the ice to grow outside the contour of the inflated boots, preventing its removal.

> NOTE
>
> Since wing and horizontal stabilizer deice boots alone do not provide adequate protection for the entire aircraft, known icing conditions should be avoided whenever possible. If icing is encountered close attention should be given to the pitot-static system, propellers, induction systems, and other components subject to icing.

The deice system will operate satisfactorily on either or both engines. During single-engine operation, suction to the gyros will drop momentarily during the boot inflation cycle.

DEICE BOOT CARE

Deice boots have a special, electrically-conductive coating to bleed off static charges which cause radio interference and may perforate the boots. Fueling and other servicing operations should be done carefully, to avoid damaging this conductive coat or tearing the boots.

Keep the boots clean and free from oil and grease, which swell the rubber. Wash the boots with mild soap and water, using benzol or unleaded gasoline, if necessary, to remove stubborn grease. Do not scrub the boots and be sure to wipe off all solvent before it dries.

Small tears and abrasions can be repaired temporarily without removing the boots and the conductive coating can be renewed. Your Cessna Dealer has the proper materials and know-how to do this correctly.

ALCOHOL WINDSHIELD DEICE SYSTEM

The alcohol windshield deice system consists of an alcohol tank, a pump, left and right-hand dispersal tubes, and a switch breaker.

The alcohol tank, located in the aft end of the right wing locker, has a 3.0 gallon capacity. The tank should be filled with isopropyl alcohol only. Water dilution of the alcohol is not recommended, as any water contained in the alcohol will reduce the efficiency of ice removal and may freeze on the windshield at very low temperatures. The pump located adjacent to the tank provides positive pressure to the windshield dispersal tubes. The left and right-hand dispersal tubes located at the forward base of the windshield provide flow pattern control throughout the aircraft's speed envelope. Each tube contains five holes which should be inspected and cleaned with a small diameter wire as necessary.

OPERATING CHECKLIST

Before Entering Aircraft

(1) During the exterior inspection, check the windshield dispersal tubes for cleanliness. Check the tank alcohol level. Flow requirements are 3.0 gallons per hour of continuous operation.

During Engine Runup

(1) Position the windshield deice switch breaker to ON. Allow approximately 10 seconds for flow to begin. Assure that each of the five holes in left and right-hand dispersal tubes are flowing alcohol. Return the windshield deice switch breaker to the OFF position.

Normal Operation

To operate the windshield deice system, proceed as follows:

(1) Windshield Deice Switch Breaker - ON.

> NOTE
>
> For operation in continuous enroute icing conditions, allow approximately 1/8 to 1/4 inch of ice to accumulate. The windshield deice system can be used as an anti-ice system by continuous use and should be so used during the approach to landing. However, the maximum endurance with a 3-gallon tank is approximately 1.0 hour of continuous operation. Airspeed should be 140 KIAS or below for best results.

(2) Windshield - CHECK (allow approximately 10 seconds for alcohol flow to begin).

(3) When windshield ice is removed, windshield deice switch breaker - OFF.

> WARNING
>
> The windshield deice switch breaker must be positioned OFF 20 seconds prior to reaching minimum descent altitude. The alcohol film must be allowed to evaporate before a clear field of vision through the windshield is available.

Emergency Operation

Abnormal operation of the alcohol windshield deice system is indicated by the switch breaker tripping to the OFF position or failure of alcohol to flow onto the windshield. Do not leave system on more than 3 minutes without alcohol flow.

PROPELLER SYNCHRONIZER

The propeller synchronizer matches propeller RPM of the two engines on the aircraft. The propeller RPM of the slave (right) engine will follow changes in RPM of the master (left) engine over a limited range. This limited range feature prevents the slave engine losing more than a fixed amount of propeller RPM in case the master engine is feathered with the synchronizer ON. The synchronizer switch in the OFF position will automatically actuate the synchronizer to the center of its range before stopping, to insure that the control will function normally when next turned on. The system indicator light should light when the synchronizer switch is in the ON position.

In addition to maintaining propeller synchronization and elimination of the unpleasant audio beat accompanying unsynchronized operation, the propeller synchronizer can also provide a significant reduction in cabin vibration by maintaining an optimum angular or phase relationship between the two propellers.

With the propeller slightly out of synchronization so that an audio beat is obtained approximately once each 5 seconds, it should be noted that the vibration level of the cabin and instrument panel will increase and decrease at a rate of approximately once each 20 seconds. Optimum operation will be obtained by manually synchronizing the propellers and engaging the synchronizer during the period of minimum vibration. The angular relationship of the propellers should be maintained for extended periods of time unless disturbed by moderate atmospheric turbulence.

NOTE

- Manually synchronize and phase the engines prior to switching the propeller synchronizer system ON.
- The propeller synchronizer must be switched OFF during takeoff, landing and single-engine operation.

ECONOMY MIXTURE INDICATOR

The Cessna Economy Mixture Indicator is an exhaust gas temperature sensing device which is used to aid the pilot in selecting the optimum fuel-air mixture for cruising flight at less than 75% power. Exhaust gas temperature (EGT) varies with the ratio of fuel-to-air mixture entering the engine cylinders.

OPERATING INSTRUCTIONS

(1) In takeoff and full power climb, lean the mixture as indicated by the white or blue markings on the fuel flow indicator.

NOTE

Leaning in accordance with markings on the fuel flow indicator will provide sufficiently rich mixture for engine cooling. Leaner mixtures are not recommended for power settings in excess of 75%.

(2) In level flight (or cruising climb at less than 75% power), lean the mixture to peak EGT, then enrichen as desired using Figure 7-3 as a guide.

NOTE

- Changes in altitude, OAT or power settings require the EGT to be rechecked and the mixture reset.
- Operation at peak EGT is not authorized for normal continuous operation, except to establish peak EGT for reference. Operating leaner than peak EGT minus 25°F (enrichen) is not approved.

(3) Use rich mixture (or mixture appropriate for field elevation) in idle descents or landing approaches. Leaning technique for cruise descents may be with EGT reference method (at least every 5000 feet) or by simply enriching to avoid engine roughness, if numerous power reductions are made.

MIXTURE DESCRIPTION	EXHAUST GAS TEMPERATURE	TAS LOSS FROM BEST POWER	RANGE INCREASE FROM BEST POWER
BEST POWER (Maximum Speed)	Peak Minus 75°F (enrichen)	0 KNOTS	0%
RECOMMENDED LEAN (Owners Manual & Computer Performance)	Peak Minus 25°F (enrichen)	2 KNOTS	10%

Figure 7-3

ELECTRIC ELEVATOR TRIM

The electric elevator trim system consists of an electrically operated drive motor and clutch assembly, which receives power through a momentary ON two way switch and an emergency disengage switch.

NORMAL OPERATION

To operate the electric elevator trim system proceed as follows:

(1) Battery Switch - ON.
(2) Elevator Trim Disengage Switch - ELEVATOR TRIM.
(3) Trim Switch - ACTUATE (AS DESIRED).
(4) Elevator Position Indicator - CHECK.

> NOTE
>
> To check the operation of the disengage switch, actuate the elevator trim switch with the disengage switch in the disengage position. Observe that the manual trim wheel and indicator do not rotate when the elevator trim switch is actuated.

EMERGENCY OPERATION

Electric Elevator Trim System Failure

(1) Elevator Trim Disengage Switch - DISENGAGE.

> NOTE
>
> The disengage switch removes all power from the system and places motor and clutch circuits to ground.

(2) Manual Trim - AS REQUIRED.

DUAL HEATED PITOT SYSTEM

The dual heated pitot airspeed system consists of two pitot heads manifolded together and located on the sides of the fuselage just forward of the pilot's compartment.

WITHOUT WEATHER RADAR INSTALLED

When the system is installed without the radar nose, the standard pitot head remains in the normal position and indicates on the pilot's airspeed indicator in the normal manner. Refer to Pilot's Checklist for airspeed calibrations for the pilot's indicator when using normal or alternate static source. The dual pitot system indicates on the copilot's airspeed indicator. The following table presents the copilot's airspeed calibrations when using normal static source. Refer to Pilot's Checklist for airspeed calibrations for the copilot's indicator when using alternate static source.

NORMAL STATIC SOURCE WITHOUT WEATHER RADAR INSTALLED AIRSPEED CORRECTION TABLE			
Gear Position Flap Position KCAS	Up 0° KIAS	Down 15° KIAS	Down 35° KIAS
70	65	59	64
80	78	74	77
100	99	98	99
120	119	119	120
140	139	140	140
160	158	160	
180	178		
200	198		
220	218		

Figure 7-4

WITH WEATHER RADAR INSTALLED

When the optional weather radar is installed, the standard pitot head is deleted and only the two side pitot heads are installed. In this configuration both the pilot and copilot's airspeed indicators are connected to the optional pitot heads. The airspeed calibrations with this configuration are shown in the following table. Refer to Pilot's Checklist for airspeed calibrations when using alternate static source.

NORMAL STATIC SOURCE WITH WEATHER RADAR INSTALLED			
AIRSPEED CORRECTION TABLE			
Gear Position Flap Position KCAS	Up 0° KIAS	Down 15° KIAS	Down 35° KIAS
70	61	61	64
80	75	74	77
100	98	97	98
120	118	118	119
140	138	138	140
160	158	158	
180	178		
200	199		
220	219		

Figure 7-5

AIR CONDITIONING SYSTEM

The optional air conditioning system consists of the following major components: a pair of evaporators, an electrically driven compressor and condenser module and control panel.

The control panel, located on the right instrument panel, provides two switches for the selection of the AIR CONDITIONING or VENTILATE mode and for blower speed control. As the system is electrically driven, it is important to monitor the voltammeter to prevent battery discharge.

The evaporators are located on the aft baggage shelf and direct conditioned air into the cabin. The compressor and condenser module, located in the aft cabin, liquify the Freon gas and remove the heat absorbed by the evaporators. The heat is then exhausted overboard through the underside of the fuselage. All condensation from the evaporators is drained overboard by a pair of condensate drain lines.

LIMITATIONS

(1) The aircraft must be equipped with dual 100 amp. alternators.
(2) Air conditioning must be in the OFF or VENTILATE position for take-off and landing.

NORMAL PROCEDURES

Preflight Inspection

(1) Inspect overboard heat and condensate drain lines for obstructions.

Before Starting Engines

(1) Air Conditioning Switch - OFF.

Before Taxiing

CAUTION

During ground operation, monitor battery discharge rate by positioning voltammeter selector to BAT. Turn off nonessential electrical loads if voltammeter indicates discharge of the battery.

(1) Air Conditioning Switch - AS DESIRED.
(2) Blower Switch - AS DESIRED.

Before Takeoff

(1) Air Conditioning Switch - OFF or VENTILATE.

After Takeoff

(1) Air Conditioning Switch - AS DESIRED.
(2) Blower Switch - AS DESIRED.

Before Landing

(1) Air Conditioning Switch - OFF or VENTILATE.

After Landing

> CAUTION
>
> During ground operation, monitor battery discharge rate by positioning voltammeter selector to BAT. Turn off nonessential electrical loads if voltammeter indicates discharge of the battery.

(1) Air Conditioning Switch - AS DESIRED.
(2) Blower Switch - AS DESIRED.

EMERGENCY PROCEDURES

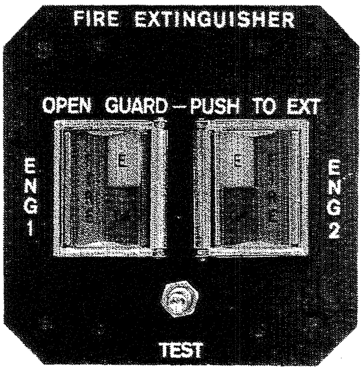
Engine Inoperative Procedures

(1) Air Conditioning Switch - OFF or VENTILATE.

FIRE DETECTION AND EXTINGUISHING SYSTEM

The fire detection and extinguishing system consists of three major components: three heat sensitive detectors located in each engine accessory compartment; an annunciator and actuator panel (see Figure 7-6); and a compressed Freon single shot gas bottle in each engine accessory compartment.

A test function is provided to test the system circuitry. When the test switch is pushed all lights should illuminate, if any light fails to illuminate replace the bulb. If the green light does not illuminate after replacing the bulb, replace firing cartridge in fire extinguisher. Any other light failure, after replacing bulbs and firing cartridge, indicates malfunction in unit or associated wiring.



Annunciation		
Legend	Color	Cause of illumination
Fire	Red	Fire condition existing in engine compartment
E	Amber	Fire extinguisher container empty
OK	Green	Fire cartridge and associated wiring is in operational condition

Figure 7-6

If an overheat condition is detected, the appropriate FIRE light will annunciate the engine to be extinguished. To activate the extinguisher, open the guard for the appropriate engine and press the FIRE light. Freon, under pressure, will be discharged to the engine and engine accessory compartments. The amber light E (Figure 7-6) will illuminate after the extinguisher has been discharged and will continue to show empty until a new bottle is installed. The FIRE light will remain illuminated until compartment temperatures cool.

OPERATING CHECKLIST

NORMAL

Before Takeoff

(1) Press the test switch - all lights should illuminate.

EMERGENCY

If a fire warning light indicates an engine compartment fire and is confirmed or if a fire is observed without a fire warning light:

(1) Shut down the appropriate engine as follows:
  (a) Mixture control - IDLE CUT-OFF.
  (b) Propeller - FEATHER.
  (c) Magnetos - OFF.
  (d) Fuel selector - OFF.
(2) Open the appropriate guard and push FIRE light.
(3) Land as soon as practical.

NOTE

Better results may be obtained if the airflow through the nacelle is reduced by slowing the aircraft (as slow as practical) prior to actuating the extinguisher.

SERVICING

The system should be checked each 100 hours or annual inspection whichever occurs first.

Check the pressure gage on each bottle to ensure the following pressures:

PRESSURE TEMPERATURE CORRECTION TABLE

Temp °F	-60	-40	-20	0	+20	+40	+60	+80	+100	+120
Gage	110	127	148	174	207	249	304	367	442	532
Actual	134	155	180	212	251	299	354	417	492	582

If these pressures are not indicated, have the bottle serviced.

LOCATOR BEACON (Model SHARC-7)

The locator beacon system is a sweep tone emergency radio transmitter incorporating an externally mounted whip antenna and a transmitter with an integral three position switch, all located on the left side of the fuselage tailcone. The switch can be reached by removing the plug button located adjacent to the locator beacon placard. Normally, the switch is in the ARM (AUTOMATIC "G" OPERATION) position; this position allows the transmitter to be activated automatically by the "G" switch. The ON (EMERGENCY & TEST) position should be used only to test the equipment or whenever a rescue is desired. The OFF (AFTER RESCUE) position should be used only after the rescue as this position will disable all emergency transmissions.

The locator beacon transmits on both UHF and VHF emergency frequencies simultaneously.

> NOTE
>
> The battery pack should be changed on an annual basis.

NORMAL PROCEDURES

(1) Antenna - CHECK (during preflight inspection).
(2) Locator Beacon Switch - ARM (for all flight operations).

EMERGENCY PROCEDURES

Before Landing

(1) If time permits, use aircraft radio (121.5 MHz) to transmit distress call; include aircraft position if possible.

After Landing

(1) Plug Button - REMOVE (located on left side of tailcone).
(2) Locator Beacon Switch - ON.

After Rescue

(1) Locator Beacon Switch - OFF.

ANGLE OF ATTACK SYSTEM

The angle of attack system is a sensitive lift measurement device which provides a continuous evaluation of lift performance of the aircraft, regardless of weight, wing loading, attitude, air density, turbulence, and gear/flap configuration. The system consists of an indicator , see Figure 7-7, stall warning horn test switch, computer and lift sensor. The lift sensor is located in the leading edge of the left wing. The standard aircraft stall warning system is removed and its function is assumed by the angle of attack system.

For a normal approach to landing, the pointer should be aligned with the center mark. Alignment of the pointer with the "FAST" diamond provides a more comfortable airspeed margin for an approach in turbulent or gusty conditions.

The red "SLOW" zone on the left side of the indicator shows the trend toward stall. The stall warning horn will sound between 4 and 9 knots above the aircraft stall speed.

To correct for an off-speed condition a small attitude correction should be held while waiting to see the result on the indicator. "Chasing" the pointer may result in a longitudinal pilot induced oscillation. The instrument is intended to be used as a reference to assist in determining the proper speed for the landing approach. The airspeed indicator is still the primary instrument for speed control.

A PRESS-TO-TEST feature is incorporated to test the general condition of the system prior to flight. When the test button is pressed, the pointer should move to the SLOW end of the scale and the stall warning horn should sound.

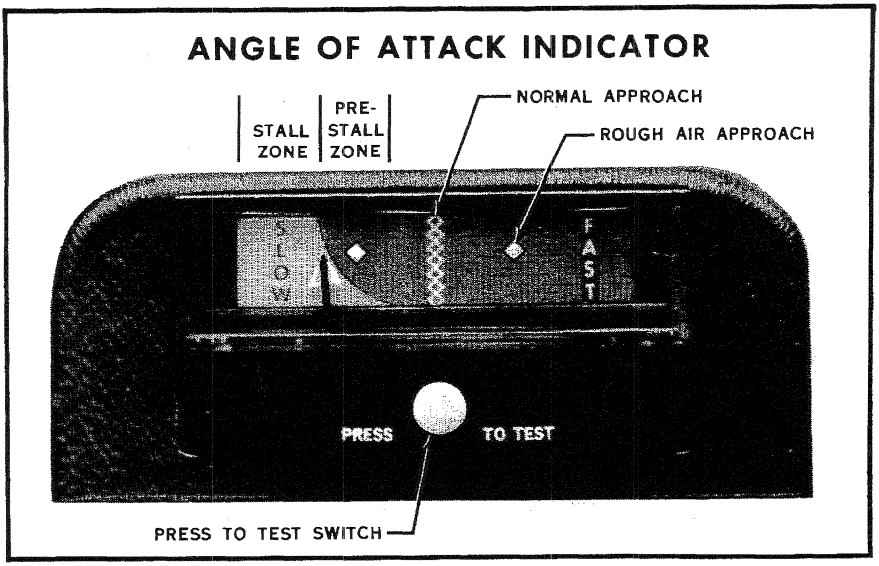


Figure 7-7

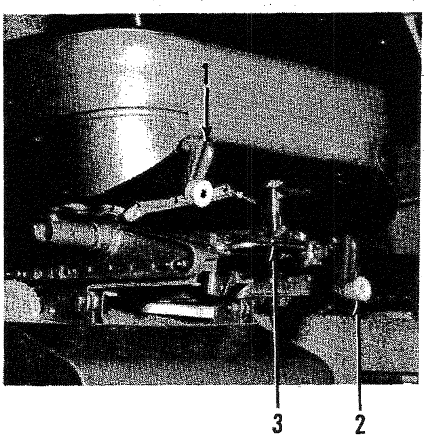
MANUAL AND ELECTRICAL ADJUSTABLE SEATS

The optional manually or electrically adjustable pilot's and copilot's seats are available to add to your flying comfort. Either of these seats may be adjusted fore and aft or vertically, and tilted to any desired position, within the limits of the seat.

MANUALLY ADJUSTED SEAT CONTROLS

Controls for the optional manually adjustable seats are located at the front of the seat. Rotating the handcrank (1, Figure 7-8), at the forward right-hand corner of the seat, tilts the back. Rotating the handcrank (2, Figure 7-8), at the forward left-hand corner of the seat, raises and lowers the seat. The fore and aft adjustment lever (3, Figure 7-8) is located at the forward side of the seat near the center. It is recommended that the seat be moved to the aft position prior to making tilt or vertical adjustments, to provide maximum handcrank clearance.

MANUALLY ADJUSTABLE SEAT



1. TILT ADJUSTMENT HANDCRANK
2. VERTICAL ADJUSTMENT HANDCRANK
3. FORE AND AFT ADJUSTMENT LEVER

Figure 7-8

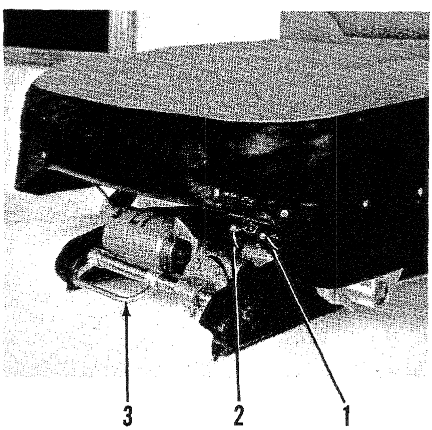
ELECTRICALLY ADJUSTED SEAT CONTROLS

Controls for the optional electrically adjustable seats are located at the forward side of the seat at the left-hand corner. Activating the left-hand switch (1, Figure 7-9) tilts the back. Activating the right-hand switch (2, Figure 7-9) raises and lowers the seat. The fore and aft adjustment lever (3, Figure 7-9) is located at the forward side of the seat near the center. Both engines should be started prior to making tilt or vertical adjustemens to the seats to preclude excessive battery drain.

NOTE

It is recommended that the loads on seat backs and bottoms be partially relieved while making vertical or tilt adjustments.

ELECTRICALLY ADJUSTABLE SEAT



1. TILT ACTIVATION SWITCH
2. VERTICAL ACTIVATION SWITCH
3. FORE AND AFT ADJUSTMENT LEVER

Figure 7-9

STROBE LIGHTS

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

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SERVICING REQUIREMENTS *

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FUEL: AVIATION GRADE 100/130 MINIMUM

(Low lead fuels are approved for use) - Service after each flight. Keep full to retard condensation in the tanks. Tank capacities are:

Each Main Tank - 51.0 Gallons
Each Auxiliary Tank - 20.5 Gallons (40 Gallon Option)
Each Auxiliary Tank - 32.0 Gallons (63 Gallon Option)
Each Wing Locker Tank - 20.5 Gallons

FUEL DRAINS:

Fuel tanks, strainers and crossfeed lines - Drain about (2) ounces of fuel before first flight of day and after each refueling.

OIL: AVIATION GRADE ENGINE OIL; SAE 50 ABOVE 40°F AND SAE 10W30 OR SAE 30 BELOW 40°F - FILTER ELEMENT C294505-0102

If optional oil filter is not installed, change oil and clean screen every 25 hours. Change engine oil and replace filter element every fifty hours, or, every six months even though less than 50 hours have been accumulated. Reduce periods for prolonged operation in dusty areas, cold climates, or when short flights and long idle periods result in sludging conditions. Always change oil whenever oil on dipstick appears dirty.

> NOTE
>
> For faster ring seating and improved oil control, your Cessna was delivered from the factory with straight mineral (non-detergent) conforming to specification MIL-L-6082. This break-in oil must be used only for the first 25 hours of operation, at that time it must be replaced with detergent oil.

Check oil level before each flight. Do not operate on less than 9 quarts. To minimize loss of oil through breather, fill to 10 quart level for normal flights of less than 3 hours. For extended flight, fill to capacity which is 13 quarts for each engine sump including 1 quart for oil filter.

OXYGEN: AVIATORS BREATHING OXYGEN - SPECIFICATION MIL-O-27210

Check pressure gage for anticipated requirements before each flight. Refill whenever pressure drops below 300 psi. See figure 7-2 for servicing procedures.

ALCOHOL DEICE RESERVOIR - ISOPROPYL ALCOHOL MIL-F-5566

Check reservoir fluid level, fill as required. Reservoir capacity 3.0 gallons.

TIRES

Main 60 psi; Nose 40 psi.

INDUCTION AIR FILTER - ELEMENT 9913001-1

Service every 50 hours, more often under dusty conditions.

VACUUM SYSTEM FILTER - ELEMENT (STANDARD C294501-0103) (OPTIONAL C294501-0203)

* For complete servicing requirements, refer to the aircraft Service Manual.

Cessna

SALES AND SERVICE

"TAKE YOUR CESSNA HOME
FOR SERVICE AT THE SIGN
OF THE CESSNA SHIELD".

CESSNA AIRCRAFT COMPANY

WICHITA, KANSAS