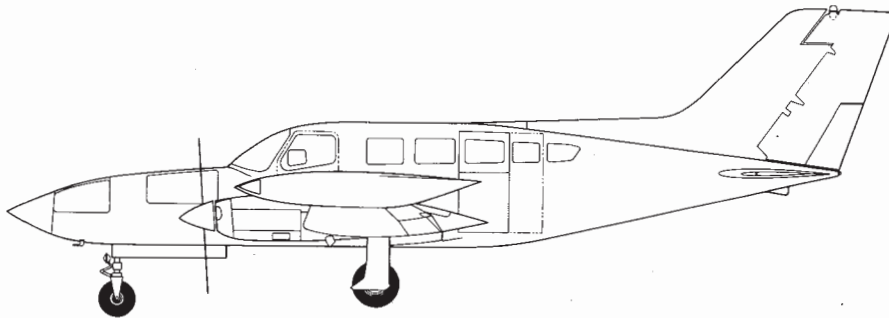


PILOT'S OPERATING HANDBOOK and FAA APPROVED AIRPLANE FLIGHT MANUAL



CESSNA AIRCRAFT COMPANY

1977 MODEL 402B

Serial Number _____

Registration Number _____

THIS DOCUMENT MUST BE CARRIED
IN THE AIRPLANE AT ALL TIMES

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

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CESSNA AIRCRAFT COMPANY
Wallace Division
Wichita, Kansas

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1 OCTOBER 1976
Revision 1 - 1 January 1978

INTRODUCTION
PERFORMANCE AND SPECIFICATIONS

Cessna
MODEL **402B**

PERFORMANCE AND SPECIFICATIONS

WEIGHT:	
Takeoff	6300 Pounds
Landing	6200 Pounds
*SPEED, BEST POWER MIXTURE:	
Maximum - 16,000 Feet	229 KTAS
Maximum Recommended Cruise	
75% Power at 10,000 Feet	192 KTAS
75% Power at 20,000 Feet	210 KTAS
*RANGE, RECOMMENDED LEAN MIXTURE:	
Maximum Recommended Cruise	
75% Power at 10,000 Feet	425 Nautical Miles,
(600 Pounds Usable Fuel)	2.32 Hours and 189 KTAS
75% Power at 10,000 Feet	778 Nautical Miles,
(978 Pounds Usable Fuel)	4.17 Hours and 190 KTAS
75% Power at 10,000 Feet	1004 Nautical Miles,
(1218 Pounds Usable Fuel)	5.34 Hours and 191 KTAS
75% Power at 20,000 Feet	448 Nautical Miles,
(600 Pounds Usable Fuel)	2.36 Hours and 207 KTAS
75% Power at 20,000 Feet	833 Nautical Miles,
(978 Pounds Usable Fuel)	4.21 Hours and 208 KTAS
75% Power at 20,000 Feet	1080 Nautical Miles,
(1218 Pounds Usable Fuel)	5.38 Hours and 209 KTAS
Maximum Range	
10,000 Feet (600 Pounds Usable Fuel)	487 Nautical Miles,
	3.21 Hours and 149 KTAS
10,000 Feet (978 Pounds Usable Fuel)	911 Nautical Miles,
	6.09 Hours and 148 KTAS
10,000 Feet (1218 Pounds Usable Fuel)	1186 Nautical Miles,
	7.98 Hours and 148 KTAS
20,000 Feet (600 Pounds Usable Fuel)	488 Nautical Miles,
	2.85 Hours and 173 KTAS
20,000 Feet (978 Pounds Usable Fuel)	937 Nautical Miles,
	5.45 Hours and 173 KTAS
20,000 Feet (1218 Pounds Usable Fuel)	1231 Nautical Miles
	7.21 Hours and 171 KTAS
RATE-OF-CLIMB AT SEA LEVEL:	
All Engines	1610 Feet Per Minute
Single-Engine	225 Feet Per Minute
SERVICE CEILING:	
All Engines	26,180 Feet
Single-Engine	11,320 Feet
TAKEOFF PERFORMANCE: (91 KIAS, 0° Wing Flaps And 6300 Pounds Weight)	
Ground Roll	1695 Feet
Total Distance Over 50-Foot Obstacle	2220 Feet
LANDING PERFORMANCE: (95 KIAS, 45° Wing Flaps And 6200 Pounds Weight)	
Ground Roll	777 Feet
Total Distance (Over 50-Foot Obstacle)	1765 Feet
STANDARD EMPTY WEIGHTS: (Approximate)	
Businessliner 402	3873 Pounds
Businessliner 402 II	4002 Pounds
Utililiner 402	3904 Pounds
Utililiner 402 II	4033 Pounds
BAGGAGE ALLOWANCE:	1340 Pounds
WING LOADING:	32.20 Pounds Per Square Foot
POWER LOADING:	10.50 Pounds Per Horsepower
FUEL CAPACITY: (Total)	
Standard (100 Gallons Usable)	102 Gallons
With Auxiliary Tanks (40 Gallons Usable)	143 Gallons
With Auxiliary Tanks (63 Gallons Usable)	166 Gallons
With Auxiliary Tanks (63 Gallons Usable) And Wing Locker Tanks	207 Gallons
OIL CAPACITY: (Total)	26 Quarts
ENGINES:	
Six-Cylinder, Turbocharged, Fuel-Injected Engines	TS10-520-E
300 Rated Horsepower At 2700 Propeller RPM And 34.5 Inches Hg.	
Manifold Pressure To 16,000 Feet	
PROPELLERS:	
Constant Speed, Full Feathering, Three-Bladed 6'4.5" Diameter	0850334-16

NOTE: Range data includes allowances for start, taxi, takeoff, climb, descent and 45-minute reserve at 45% power.

*Speeds based on Estimated Mid-Cruise Weight.

SECTION 4
NORMAL PROCEDURES
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INTRODUCTION

Section 4 of the Pilot's Operating Handbook describes the recommended procedures for normal operations. The first part of this section provides normal procedural action required in an abbreviated checklist form. Amplification of the abbreviated checklist is presented in the second part of this section.

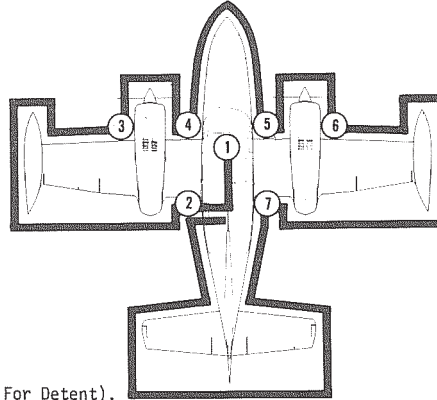
NOTE

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

PREFLIGHT INSPECTION

NOTE

- Visually check inspection plates and general airplane condition during walk-around inspection. If night flight is planned, check operation of all lights and make sure a flashlight is available.
- Refer to Section 8 for quantities, materials, and specifications of frequently used service items.



- ①
 - a. Control Lock(s) - REMOVE and stow.
 - b. Parking Brake - SET.
 - c. Alternate Static Source - CLOSED.
 - d. All Switches - OFF.
 - e. All Circuit Breakers - IN.
 - f. Landing Gear Switch - DOWN.
 - g. Left Fuel Selector - LEFT MAIN (Feel For Detent).
 - h. Right Fuel Selector - RIGHT MAIN (Feel For Detent).
 - i. Trim Tab Controls (3) - NEUTRAL.
 - j. Oxygen - ON; Quantity, Masks and Hoses - CHECK; Oxygen - OFF.
 - k. Battery Switch - ON.
 - l. Navigation and Anti-Collision Lights - ON.
 - m. Fuel Gages - CHECK quantity and operation.
 - n. Wing Flaps - DOWN 45°.
 - o. Pitot, Stall and Vent Heat Switches - ON 20 seconds then OFF. Insure pitot tube cover(s) are removed before actuating pitot heat switch(es).
 - p. Windshields and Windows - CHECK for cracks and general condition.
 - q.*Electric Windshield - CHECK operation by observing discharge on voltmeter if inflight use is anticipated. Insure system is turned off after operational check.
- ②
 - a. Wing Locker Baggage Door - SECURE.
 - b. Battery Compartment Cover - SECURE.
 - c. Wing Flap - CHECK security and attachment.
 - d. Bottom Outboard Wing - CHECK for fuel leaks or stains.
 - e. Control Surface Lock - REMOVE, if installed.
 - f. Aileron and Tab - CHECK condition, freedom of movement and tab position.
 - g. Tip Tank Transfer Pump - LISTEN for operation.
 - h. Main Tank Fuel Vent - CLEAR.
 - i. Navigation and Anti-Collision Lights - CHECK operation.
 - j. Landing Light Filament - CHECK condition.
 - k. Main Tank Fuel Sump - DRAIN.
 - l. Fuel Vent and Sniffle Valve - CLEAR.
 - m. Main Tank Fuel Quantity - CHECK; Cap - SECURE.
 - n.*Deice Boot - CHECK condition and security.
 - o. Stall Warning Vane - CHECK freedom of movement and audible warning.
 - p. Wing Tie Down - REMOVE.
 - q.*Auxiliary Tank Fuel Quantity - CHECK; Cap - SECURE.
 - r.*Auxiliary Tank and Wing Locker Transfer Line Fuel Sump - DRAIN.
 - s. Fuel Strainer - DRAIN.
 - t.*Wing Locker Tank Fuel Vent - CLEAR and WARM.
- ③
 - a.*Wing Locker Tank Fuel Quantity - CHECK; Cap - SECURE.
 - b. Cowl Flap - SECURE.
 - c. Engine Compartment General Condition - CHECK for fuel, oil and exhaust leaks or stains.
 - d. Oil Level - CHECK minimum 9 quarts.
 - e. Propeller and Spinner - EXAMINE for nicks, security and oil leaks.
 - f. Cowl Flap - SECURE.
 - g.*Deice Boot - CHECK condition and security.
 - h. Main Gear, Strut, Doors, Tire and Wheel Well - CHECK.
 - i.*Wing Locker Tank Fuel Sump - DRAIN.
 - j. Crossfeed Line - DRAIN.

Figure 4-1 (Sheet 1 of 2)

PREFLIGHT INSPECTION

- ④ a. Nose Baggage Door - SECURE.
b. Avionics Bay Door - SECURE.
c. Nose Gear, Strut, Doors, Tire and Wheel Well - CHECK.
d. Pitot Cover(s) - REMOVE; Pitot Tube(s) - CLEAR and WARM.
e. Lower Fuselage, Nose and Center Section - CHECK for fuel and oil leaks or stains and antenna security.
f. Tie Down - REMOVE.
g. Heater Inlet - CLEAR.
h. Nose Baggage Door - SECURE.
- ⑤ a. Crossfeed Line - DRAIN.
b. Leading Edge Air Intake - CLEAR.
c.*Wing Locker Tank Fuel Sump - DRAIN.
d. Main Gear, Strut, Doors, Tire and Wheel Well - CHECK.
e. Cowl Flap - SECURE.
f.*Deice Boot - CHECK condition and security.
g.*Air Conditioning Outlet Air Opening - CLEAR.
h.*Wing Locker Tank Fuel Quantity - CHECK; Cap - SECURE.
i. Oil Level - CHECK minimum 9 quarts.
j. Engine Compartment General Condition - CHECK for fuel, oil and exhaust leaks or stains.
k. Propeller and Spinner - EXAMINE for nicks, security and oil leaks.
l. Cowl Flap - SECURE.
- ⑥ a.*Air Conditioning Inlet Air Openings - CLEAR.
b.*Wing Locker Tank Fuel Vent - CLEAR and WARM.
c.*Auxiliary Tank and Wing Locker Transfer Line Fuel Sump - DRAIN.
d. Fuel Strainer - DRAIN.
e.*Deice Boot - CHECK, condition and security.
f.*Auxiliary Tank Fuel Quantity - CHECK; Cap - SECURE.
g. Wing Tie Down - REMOVE.
h. Main Tank Fuel Quantity - CHECK; Cap - SECURE.
i. Navigation and Anti-Collision Lights - CHECK operation.
j. Fuel Vent and Sniffle Valve - CLEAR.
k. Main Tank Fuel Sump - DRAIN.
l.*Landing Light Filament - CHECK condition.
m. Main Tank Fuel Vent - CLEAR.
n. Tip Tank Transfer Pump - LISTEN for operation.
o. Control Surface Lock - REMOVE, if installed.
p. Aileron - CHECK condition and freedom of movement.
q. Bottom Outboard Wing - CHECK for fuel leaks or stains.
r. Wing Flap - CHECK security and attachment.
s. Wing Locker Baggage Door - SECURE.
t.*Alcohol Windshield Deice Tank - CHECK quantity.
- ⑦ a. Static Port(s) - CLEAR.
b.*Deice Boots - CHECK condition and security.
c. Control Surface Lock(s) - REMOVE, if installed.
d. Elevator and Tab - CHECK condition, freedom of movement, and tab position.
e. Rudder and Tab - CHECK condition, freedom of movement and tab position.
f. Navigation and Anti-Collision Lights - CHECK operation.
g. Tie Down - REMOVE.
h.*Deice Boot - CHECK condition and security.
i. Static Port(s) - CLEAR.
j. Cabin Door - CHECK security and condition.
k. Battery Switch - OFF.
l. Navigation and Anti-Collision Lights - OFF.

*Denotes items to be checked if the applicable optional equipment is installed on your airplane.

Figure 4-1 (Sheet 2 of 2)

**NORMAL PROCEDURES
ABBREVIATED CHECKLIST****NOTE**

This Abbreviated Normal Procedures Checklist is included as a supplement to the Amplified Normal Procedures Checklist. Use of the Abbreviated Normal Procedures Checklist should not be used until the flight crew has become familiar with the airplane and systems. All amplified normal procedure items must be accomplished regardless of which checklist is used.

AIRSPEEDS FOR SAFE OPERATION

Conditions:	
1. Takeoff Weight 6300 Pounds	3. Sea Level, Standard Day
2. Landing Weight 6200 Pounds	
(1) Air Minimum Control Speed	82 KIAS
(2) Takeoff and Climb to 50 Feet (0° Wing Flaps) . . .	91 KIAS
(3) All Engines Best Angle-of-Climb Speed (0° Wing Flaps)	86 KIAS
(4) All Engines Best Rate-of-Climb Speed (0° Wing Flaps)	109 KIAS
(5) All Engines Landing Approach Speed (45° Wing Flaps)	95 KIAS
(6) Maneuvering Speed	156 KIAS
(7) Structural Cruise Speed	199 KIAS
(8) Never Exceed Speed	230 KIAS
(9) Speed for Transition to Balked Landing Conditions	83 KIAS
(10) Maximum Demonstrated Crosswind Velocity	16 KNOTS

Figure 4-2

BEFORE STARTING ENGINES

1. Preflight - COMPLETE.
2. Cabin Door(s) - LATCHED and SECURE.
3. Crew Door (If Installed) - CLOSED and LOCKED.
4. Control Locks - REMOVE.
5. Seat, Seat Belts and Shoulder Harness - ADJUST and SECURE.
6. Fuel Selectors - MAIN TANKS.
7. Landing Gear Switch - DOWN.
8. Mixtures, Propellers and Throttles - SET.
9. All Switches and Circuit Breakers - SET.
10. Battery and Alternators - ON.
11. Landing Gear Position Indicator Lights - Check green lights ON.
12. Annunciator Panel - PRESS-TO-TEST.
13. Lights - AS REQUIRED.

STARTING ENGINES

1. Propellers - CLEAR.
2. Magneto Switches - ON.
3. Engines - START.
4. Auxiliary Fuel Pumps - LOW.
5. Engine Instruments - CHECK.

BEFORE TAXIING

1. Avionics - ON and SET.
2. Wing Flaps - UP.

TAXIING

1. Brakes - CHECK.
2. Flight Instruments - CHECK.

BEFORE TAKEOFF

1. Engine Runup - COMPLETE.
2. Fuel Quantity - CHECK.
3. Fuel Selectors - MAIN TANKS.
4. Cowl Flaps - OPEN.
5. Trim Tabs - SET.
6. Wing Flaps - UP.
7. Propeller Synchrophaser - OFF (Optional System).
8. Flight Instruments and Avionics - SET.
9. Lights - AS REQUIRED.
10. All Cabin Doors and Windows - CLOSED.
11. Annunciator Panel - CLEAR.
12. Auxiliary Fuel Pumps - ON.
13. Flight Controls - CHECK.
14. Ice Protection - AS REQUIRED.
15. Seat Belts and Shoulder Harness - SECURE.

TAKEOFF

1. Power - SET FOR TAKEOFF.
2. Mixtures - CHECK fuel flows in the white arc.
3. Engine Instruments - CHECK.
4. Air Minimum Control Speed - 82 KIAS.
5. Takeoff and Climb to 50 Feet - 91 KIAS at 6300 pounds. Refer to Section 5 for speeds at reduced weights.

AFTER TAKEOFF

1. Landing Gear - RETRACT.
2. Best Angle-of-Climb Speed - 86 KIAS at sea level to 91 KIAS at 16,000 Feet with obstacle.
3. Best Rate-of-Climb Speed - 109 KIAS at sea level and 6300 pounds. Refer to Section 5 for speed at altitude and at reduced weight.

CLIMB**CRUISE CLIMB**

1. Power - SET.
2. Mixtures - ADJUST.
3. Cowl Flaps - AS REQUIRED.

DESCENT

1. Power - AS REQUIRED.
2. Cowl Flaps - CLOSE.
3. Mixtures - ADJUST.
4. Altimeter - SET.

BEFORE LANDING

1. Seat Belts and Shoulder Harness - SECURE.
2. Propeller Synchrophaser - OFF (Optional System).
3. Fuel Selectors - MAIN TANKS.
4. Auxiliary Fuel Pumps - ON.
5. Wing Flaps - AS REQUIRED.
6. Landing Gear - DOWN.
7. Mixtures - ADJUST.
8. Propellers - FULL FORWARD.
9. Approach Speed - 95 KIAS at 6200 pounds. Refer to Section 5 for speeds at reduced weight.
10. Air Minimum Control Speed - 82 KIAS.

AFTER LANDING

1. Auxiliary Fuel Pumps - LOW.
2. Cowl Flaps - OPEN.
3. Wing Flaps - UP.

SHUTDOWN

1. Parking Brake - SET if brakes are cool.
2. Accessory Switches - OFF.
3. Auxiliary Fuel Pumps - OFF.
4. Engines - SHUT DOWN.
5. Battery, Alternator And Magneto Switches - OFF.

AMPLIFIED NORMAL PROCEDURES**PREFLIGHT INSPECTION**

The Preflight Inspection, described in Figure 4-1, 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 airplane has been in extended storage, has had recent major maintenance or has been operated from marginal airports, a more extensive exterior 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 airplane should be checked following periodic inspections. Since avionics and heater maintenance requires the mechanic to work in the nose compartment, the nose compartment doors are opened for access to equipment. Therefore, it is important after such maintenance to double-check the security of these doors. If the airplane has been waxed or polished, check the external static pressure source holes for stoppage.

If the airplane has been exposed to much ground handling in a crowded hangar, it should be checked for dents and scratches on wings, main tanks, fuselage and tail surfaces, as well as damage to navigation and landing lights, deice boots and avionics antennas. 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 airplanes, calls for special attention to control surface stops, hinges and brackets to detect presence of wind damage.

If the airplane has been operated from muddy fields or in snow or slush, check the main gear 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 propeller can seriously reduce the fatigue life of the blades.

Airplanes 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. Undue landing and taxi loads will be subjected on the airplane structure when the shock struts are insufficiently extended. A completely collapsed (zero extension) shock strut could cause a malfunction in the landing gear retraction system.

To prevent loss of fuel in flight, make sure the main and auxiliary fuel tank filler caps are tightly sealed. The main fuel tank vents on the lower surface of the 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 planned flight 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 300 to 1800 PSI (44.0 cubic foot system) or 300 to 1850 PSI (114.9 cubic foot system) depending upon the anticipated requirements.

Satisfactory operation of the pitot tube(s), stall warning transmitter and optional wing locker fuel tank vent heating elements is determined by observing a discharge on the voltmeter when the pitot and stall heat switches are turned ON. The effectiveness of these heating elements may be verified by cautiously feeling the heat of these devices while the switches are ON.

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

NOTE

The pilot is responsible to assure that the airplane is loaded within the weight and C.G. limits.

BEFORE STARTING ENGINES

1. Preflight Inspection - COMPLETE.
2. Cabin Door(s) - LATCHED and SECURE.
3. Crew Door (If Installed) - CLOSED and LOCKED.
4. Control Locks - REMOVE.
5. Seat, Seat Belts and Shoulder Harness - ADJUST and SECURE.
6. Brakes - SET.
7. Fuel Selectors - Left Engine - LEFT MAIN (Feel For Detent).
Right Engine - RIGHT MAIN (Feel For Detent).
8. Landing Gear Switch - DOWN.
9. Mixtures - FULL RICH.
10. Propellers - FULL FORWARD.
11. Throttles - OPEN ONE INCH.
12. All Switches - OFF.
13. Circuit Breakers - IN.
14. Emergency Power Alternator Field Switch - OFF.
15. Emergency Power Avionics Bus Switch - OFF.
16. Avionics Bus Switch - OFF.
17. Auxiliary Fuel Pump Switches - OFF.
18. Battery and Alternators - ON.

NOTE

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

19. Master Light Dimming Switch - AS REQUIRED.
20. Landing Gear Position Indicator Lights - Check green lights ON.
21. Annunciator Light Panel - PRESS-TO-TEST.
22. Cowl Flaps - OPEN.
23. Altimeter and Clock - SET.
24. Fuel Quantity - CHECK.
25. Cabin Air Controls - AS REQUIRED.
26. Alternate Air Controls - IN.
27. Anti-Collision Lights - ON.

STARTING ENGINES (Left Engine First Without 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 airplane due to fuel accumulation in the induction system. Similar conditions may develop when the engine is shutdown with the auxiliary fuel pump ON.
- 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 - 800 to 1000 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.

STARTING ENGINES (Left Engine First With External Power)

1. Battery and Alternators - OFF.
2. External Power Source - ATTACH.
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 airplane due to fuel accumulation in the induction system. Similar conditions may develop when the engine is shutdown with the auxiliary fuel pump ON.
- 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.

6. Auxiliary Fuel Pump - LOW to purge vapor from fuel system.
7. Throttle - 800 to 1000 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 - REMOVE.
11. Battery and Alternators - ON.
12. Alternators - CHECK.

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 that the airplane be started with the battery and alternator switches OFF.

NOTE

Release starter button 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. If the auxiliary pump is turned on accidentally while the engine is stopped with the throttle open and the mixture rich, liquid fuel will collect temporarily in the cylinder intake ports. The quantity of fuel deposited will depend upon the amount of throttle opening and the length of time the pump has been operating. If this happens, it is advisable to wait a few minutes until the fuel drains away, then turn the propeller through 15 complete revolutions. This is done to prevent the possibility of engine damage due to hydrostatic lock before starting the engine. To avoid flooding, begin cranking the engine prior to priming the engine.

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.

BEFORE TAXIING

1. Avionics Bus Switch - ON.
2. Avionics - SET.
3. Wing Flaps - UP.
4. Lights - AS REQUIRED.
5. Cabin Temperature - AS REQUIRED.
 - a. If heating and defrosting is required:
 - (1) Forward and Aft Cabin Air Knobs - PULL OUT.
 - (2) Defrost Knob - AS REQUIRED.
 - (3) Cabin Heat Knob - AS REQUIRED.
 - (4) Cabin Heat Switch - ON.
 - (5) Cabin Fan Switch - AS REQUIRED.
 - b. If ventilation is required:
 - (1) Forward and Aft Cabin Air Knobs - PULL OUT.
 - (2) Defrost Knob - PULL OUT.
 - (3) Cabin Fan Switch - AS REQUIRED.
6. Brakes - RELEASE. Pushing the parking brake knob in releases the trapped brake fluid, allowing the brakes to be released.

TAXIING

1. Throttles - AS REQUIRED.
2. Brakes - CHECK.
3. Flight Instruments - CHECK.

A steerable nosewheel, interconnected with the rudder system, provides positive control up to 180° left or right, and free turning from 180° to 550° 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. Do not use excessive brake on the inboard side to effect a turning radius as decreased tire life will result.

NOTE

If the airplane is parked with the nosewheel casted 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.

When taxiing near buildings or other stationary objects, observe the minimum turning radius limits as stated in Figure 7-11. No abnormal precautions are required when taxiing in conditions of high winds.

At some time early in the taxi run, the brakes should be checked for any unusual reaction, such as uneven braking. The operation of the turn-and-bank indicator and directional gyro should also be checked during taxiing. When turning right, the turn-and-bank needle should deflect right while the ball goes left and directional gyro heading increases in numerical value. In a left turn the converse is true. At this time the artificial horizon should be up to speed and indicating a level attitude.

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

Do not operate engines at high RPM when taxiing over gravel or loose material that may cause damage to the propeller blades.

BEFORE TAKEOFF

1. Brakes - SET.
2. Engine Runup:
 - a. Throttles - 1700 RPM.
 - b. Alternators - CHECK.
 - c. Vacuum System - CHECK 4.75 to 5.25 inches Hg.
 - d. Magnetos - CHECK 150 RPM maximum drop with a maximum differential of 50 RPM.
 - e. Propellers - CHECK feathering to 1200 RPM; return to high RPM (Full Forward Position).

CAUTION

During propeller feathering checks, do not allow the propeller RPM to fall below 1000 RPM as this may damage the hub mechanism.

- f. Engine Instruments - CHECK green arc.
- g. Throttles - 1000 RPM.

NOTE

It is important that the engine oil temperature be within the normal operating range prior to applying takeoff power. Even cautious power applications with cool oil may result in momentarily exceeding the 34.5 inches Hg. manifold pressure limit. Refer to Section 7 if momentary overboost of manifold pressure occurs.

- 3. Fuel Quantity - CHECK.
- 4. Fuel Selectors - RECHECK - Left Engine - LEFT MAIN (Feel For Detent).
Right Engine - RIGHT MAIN (Feel For Detent).
- 5. Alternate Air Controls - IN.
- 6. Trim Tabs - SET elevator, aileron and rudder tabs in the TAKEOFF range.
- 7. Cowl Flaps - OPEN.
- 8. Wing Flaps - UP.
- 9. Propeller Synchrophaser - OFF (Optional System).
- 10. Flight Instruments and Avionics - SET.
- 11. Lights - AS REQUIRED.
- 12. All Cabin Doors and Windows - CLOSED.
- 13. Annunciator Panel - CLEAR.
- 14. Auxiliary Fuel Pumps - ON.
- 15. Flight Controls - CHECK, free and correct.
- 16. Ice Protection Equipment - AS REQUIRED.
- 17. Seat Belts and Shoulder Harness - SECURE.
- 18. Brakes - RELEASE. Push in parking brake control.

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 magneto 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.

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 avionics 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 voltmeter.

A simple last minute recheck of important items should include a quick glance to see if all switches are ON, the mixture and propeller controls 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

1. Power - 2700 RPM and FULL THROTTLE.

NOTE

Apply full throttle smoothly to avoid propeller surging and excessive manifold pressures. Refer to Section 7 if momentary overboost of manifold pressure occurs.

2. Mixtures - CHECK fuel flows in the white arc.
3. Engine Instruments - CHECK.
4. Air Minimum Control Speed - 82 KIAS.
5. Elevator Control - Raise nosewheel at 83 KIAS.
6. Lift-Off - 91 KIAS at 6300 pounds. Refer to Section 5 for speed at reduced weight.

Since the use of full throttle is not recommended in the static runup, closely observe full-power engine operation early in the takeoff run. The maximum allowable manifold pressure of 34.5 inches Hg. manifold pressure should not be exceeded. Throttle action should be smooth and slow in order that the waste gate can become operative as early as possible. Signs of rough engine operation, unequal power between engines, or sluggish engine acceleration are good cause for discontinuing the takeoff. If this occurs, make a thorough full throttle static runup before another takeoff is attempted.

Full throttle operation is recommended on takeoff since it is important that a speed well above air minimum control speed (82 KIAS) be obtained as rapidly as possible. It is desirable to accelerate the airplane to 91 KIAS (recommended safe single-engine speed) before lift-off 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.

For crosswind takeoffs, additional power may be carried on the upwind engine until the rudder becomes effective. The airplane 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 main tank full and the opposite tank low on fuel creates a lateral unbalance. This is not recommended since gusty air or premature lift-off could create a serious control problem.

After takeoff, it is important to maintain the recommended safe single-engine climb speed (91 KIAS) to 50 feet. As the airplane accelerates still further to all engines best rate-of-climb speed (109 KIAS), it is good practice to climb rapidly to an altitude at which the airplane is capable of circling the field on one engine.

AFTER TAKEOFF

1. Brakes - APPLY momentarily.
2. Landing Gear - RETRACT. Check red light off.
3. Best Angle-of-Climb
Speed (Sea Level) - 86 KIAS after reaching 50 feet if immediate obstacle clearance is a consideration. Refer to following text for climb speed at altitude.
4. Best Rate-of-Climb Speed - 109 KIAS at sea level and 6300 pounds. Refer to Section 5 for climb speed at altitude and reduced weight.
5. Auxiliary Fuel Pumps - AS REQUIRED.

To establish climb configuration, retract the landing gear and wing flaps, set climb power, auxiliary fuel pumps as required to prevent fuel flow fluctuations, and adjust the mixtures for the selected power setting.

Before retracting the landing gear, apply the brakes momentarily to stop the rotation of 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 airplane is safely airborne.

Power reduction will vary according to the requirements of the traffic pattern or surrounding terrain, weight, field elevation, temperature, environmental considerations and engine condition. However, a normal after takeoff power setting is 2450 RPM and 29.5 inches Hg. manifold pressure.

CLIMB

CRUISE CLIMB

1. Power - 2450 RPM and 29.5 inches Hg.
2. Airspeed - 115 to 140 KIAS.
3. Mixtures - ADJUST to climb fuel flow.
4. Cowl Flaps - AS REQUIRED.
5. Auxiliary Fuel Pumps - ON above 12,000 feet pressure altitude to minimize vapor formation.
6. Propellers - SYNCHRONIZE manually.
7. Quadrant Friction Lock - TIGHTEN securely (With Synchrophaser Installed).
8. If SK414-10 Is Not Installed:
 - a. Propeller Synchrophaser - SYNC (Optional System). Light should illuminate continuously.
9. If SK414-10 Is Installed:
 - a. Propeller Synchrophaser - PHASE (Optional System). Light should illuminate continuously.
 - (1) Phasing Knob - ADJUST for desired phasing position.

MAXIMUM CLIMB

1. Power - 2700 RPM and FULL THROTTLE below 16,000 feet.
Placarded manifold pressure above 16,000 feet.
2. Airspeed - 109 KIAS.
3. Mixtures - FULL RICH below 16,000 feet.
LEAN as required above 16,000 feet.
4. Cowl Flaps - AS REQUIRED.
5. Auxiliary Fuel Pumps - ON above 12,000 feet altitude to minimize vapor formation.

Power settings for climb must be limited to 2700 RPM and 34.5 inches Hg. manifold pressure below 16,000 feet and placarded manifold pressures above 16,000 feet.

Normal cruising climb is recommended where practical and should be conducted at 115 to 140 KIAS, using approximately 75% power (2450 RPM and 29.5 inches Hg. manifold pressure). The mixture should be leaned in this type of climb to give the desired fuel flow in the climb dial range (blue segment) which is approximately best power mixture.

If it is necessary to climb rapidly to clear mountains or reach favorable winds at high altitudes, the all engines best rate-of-climb speed of 109 KIAS should be used with maximum power. During maximum performance climbs, the mixture should remain in the takeoff power range up to the engine critical altitude and at the appropriate climb power range above critical altitude. 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 airplane should be flown at the all engines best angle-of-climb speed with wing flaps up and maximum power. This speed varies from 86 KIAS at sea level to 91 KIAS at 16,000 feet.

During cruise climbs, positioning the propeller synchrophaser to SYNC (if SK414-10 is not installed) or PHASE (if SK414-10 is installed) will eliminate the unpleasant audio beat accompanying unsynchronized operation. The propeller synchrophaser can also provide a significant reduction in cabin vibration.

With the propellers 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. If SK414-10 is not installed, optimum operation will be obtained by manually synchronizing the propellers and positioning the synchrophaser to SYNC during the period of minimum vibration. If SK414-10 is installed, optimum operation will be obtained by manually synchronizing the propellers and positioning the synchrophaser to PHASE. Best propeller synchronizing is obtained by making the final adjustment of the propeller controls in a DECREASE RPM direction. For best operation, securely tighten the quadrant friction lock to prevent the slaved propeller control from creeping.

CRUISE

1. Cruise Power - 2100 to 2450 RPM and 15.0 to 29.5 inches Hg. or 2200 to 2300 RPM and 15.0 to 32.0 inches Hg.
2. Mixtures - LEAN for desired cruise fuel flow as determined from your power computer. Recheck mixtures if power, altitude or OAT changes.
3. Cowl Flaps - AS REQUIRED.
4. Propellers - SYNCHRONIZE manually.
5. Quadrant Friction Lock - TIGHTEN securely (With Synchrophaser Installed).
6. If SK414-10 Is Not Installed:
 - a. Propeller Synchrophaser - SYNC (Optional System). Light should illuminate continuously.
 - b. In Smooth Air After Propellers Are Synchronized - PHASE; Phasing Knob - ADJUST for desired phasing position (Optional System).
7. If SK414-10 Is Installed:
 - a. Propeller Synchrophaser - PHASE (Optional System). Light should illuminate continuously.
 - (1) Phasing Knob - ADJUST for desired phasing position.
8. Auxiliary Fuel Pumps - LOW when switching tanks.
9. Fuel Selectors - Left Engine - LEFT MAIN (Feel For Detent). Right Engine - RIGHT MAIN (Feel For Detent).
 - a. If optional 40-gallon auxiliary tanks are installed, fuel selectors - MAIN TANKS for 60 minutes.
 - b. If optional 63-gallon 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.
- The auxiliary fuel tanks are to be used in cruise flight only.

- e. If wing locker tanks are installed, crossfeed - SELECT as required to maintain fuel balance after wing locker tank fuel transfer.
10. If oxygen use is desired, proceed as follows:
 - a. Mask - Connect mask and hose assembly and put mask on.

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.

- b. Hose Coupling - Plug into oxygen outlet inside access door in outboard armrest.
 - c. Oxygen Flow Indicator - Check Flow. (Indicator Toward Mask Indicates Proper Flow).
 - d. Disconnect hose coupling when not in use.
11. Trim Tabs - ADJUST.

Normal cruising requires between 50% 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% (29.5 inches Hg. manifold pressure and 2450 RPM or 32.0 inches Hg. manifold pressure and 2300 RPM) may be used if desired. Various percent powers can be obtained with a number of combinations of manifold pressure, engine speed, altitude and outside air temperature. 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.

CAUTION

The use of 32.0 inches Hg. manifold pressure (narrow green arc on manifold pressure gage) is restricted to the 2200 to 2300 RPM range only.

The use of lower power settings and the selection of cruise altitude on the basis of the most favorable wind conditions are significant factors that should be considered on every trip to reduce fuel consumption. Additional range can be achieved when operating at select power combinations, see Figure 5-20, by leaning to peak exhaust gas temperature (EGT) for Best Economy mixture. This setting results in an airspeed loss of 4 KTAS and range increase of 8% compared to the Recommended Lean mixture. Do not lean to the extent that engine roughness or excessive speed loss occurs.

CAUTION

Operation at Best Economy mixture is not recommended until oil consumption stabilizes or during the first 50 hours of operation. The purpose of this interval of operation at higher power levels (65% to 75% power) is to insure proper seating of the rings and is applicable to new engines, and engines in service following cylinder replacement or top overhaul of one or more cylinders.

When leaning, accomplish the procedure as precisely as possible. A little extra effort in setting the mixtures will yield significant dividends.

For normal cruise conditions, your power computer should be utilized to set the fuel flows. The power computer is based on true OAT, which is obtained by subtracting the ram rise from the indicated OAT. The power computer is marked with two fuel flow scales. These scales are provided to insure that you can obtain the maximum performance and utilization from your airplane. The inner fuel flow scale (marked Recommended Lean) should be utilized for all normal cruise performance. Data shown in Section 5 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 increase the life of the exhaust system, turbocharger and engine valves and rings.

The cowl flaps should be adjusted to maintain the cylinder head temperature within the normal operating range (green arc).

If SK414-10 is not installed, best propeller synchronizing is obtained by making the final adjustment of the propeller controls in a DECREASE RPM direction. Manually synchronize the propellers as closely as possible and tighten the quadrant friction lock securely. During the period of minimum vibration, position the synchrophaser to SYNC. After propeller synchronizing has occurred (approximately 3 seconds after selecting the SYNC position) select the PHASE position for increased sensitivity. The phasing knob should then be adjusted until the desired sound and vibration characteristics are obtained. This setting will vary from flight to flight. During operation in any atmospheric turbulence, it is probable that greater or more rapid phasing changes will be required than are possible with the PHASE position. Under such conditions, operation in the SYNC position will provide the most satisfactory operation. On long cruise flights, where the slaved governor can eventually operate near either end of its operating range, it may be necessary to periodically select the OFF position, reset the propeller controls and re-engage the synchrophaser.

If SK414-10 is installed, best propeller synchrophasing is obtained by making the final adjustment of the propeller controls in a DECREASE RPM direction. Manually synchronize the propellers as closely as possible and tighten the quadrant friction lock securely. Position the synchrophaser switch to PHASE. The phasing knob should then be adjusted until the desired sound and vibration characteristics are obtained. This setting will vary from flight to flight. If non-synchronized operation occurs during long cruise flights, manually re-synchronize the propeller controls as closely as possible and synchronized operation should reoccur. Securely tighten the quadrant friction lock, then adjust the phasing knob as desired.

If auxiliary fuel tanks are to be used, select main fuel for 60 minutes of flight (with 40-gallon auxiliary tanks) or 90 minutes of flight (with 63-gallon auxiliary tanks). This is necessary to provide space in the main tanks for vapor and fuel returned from the engine-driven fuel pumps when operating on auxiliary fuel. If sufficient space is not available in the main tanks for this diverted fuel, the tanks can overflow through the overboard fuel vents. After this period of time (60 to 90 minutes), set mixtures to FULL RICH, auxiliary fuel boost pumps to LOW, select the auxiliary fuel tank position on the fuel selectors and feel for detent. The engines will now operate on the auxiliary tank fuel; the fuel quantity indicator will automatically reference the auxiliary fuel tanks. Lean the mixtures as required.

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 tank 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.

After consuming the auxiliary tank fuel, set mixtures to FULL RICH, auxiliary fuel boost pumps to LOW, select the main tank position on the fuel selectors and feel for detent. After transitioning back to the main tanks, lean the mixtures as required and position auxiliary fuel pump switches to OFF.

If wing locker fuel is to be used, use the main tank fuel until 180 pounds or less remains in the main tank(s) which will receive the wing locker fuel; this will prevent overflowing of the main tank(s) when transferring the wing locker fuel.

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 annunciator panel are illuminated by pressure switches to indicate fuel has been transferred. Wing locker fuel transfer time is approximately 1 hour. Fuel should be cross-fed 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.

For flight in an icing environment, refer to the Alternate Induction Air paragraphs in this section.

DESCENT

1. Power - AS REQUIRED to maintain engine temperatures in the green.
2. Cowl Flaps - CLOSE.
3. Mixtures - ADJUST for smooth operation with gradual enrichment as altitude is lost.
4. Propeller Synchrophaser - AS REQUIRED (Optional System).
5. Altimeter - SET.

Descents should be initiated far enough in advance of estimated landing to allow a gradual rate of descent at cruise 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 descent is usually the lowest one in the RPM green arc range that will allow cylinder head temperatures to remain in the recommended operating range.

If SK414-10 is not installed, during descents with progressive power reductions into rough air, position the propeller synchrophaser to SYNC for less sensitive control. The synchrophaser should be positioned to OFF for large power changes. Upon completion of any large power changes, the synchrophaser may be reengaged for the remainder of the descent. Manually synchronize the propellers, securely tighten the quadrant friction lock, then select the SYNC position of the synchrophaser.

If SK414-10 is installed, and synchronized operation is lost during large power changes, manually resynchronize the propeller controls as closely as possible and synchronized operation should reoccur. Securely tighten the quadrant friction lock, then adjust the phasing knob as desired.

During the descent, the mixtures should be gradually enriched to maintain smooth engine operation. This procedure will provide sufficient fuel flow for the descent; however, if a higher power setting (i.e. balked landing) is required before landing, the mixtures must be readjusted to obtain the correct fuel flow.

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

1. Seat Belts and Shoulder Harness - SECURE.
2. Propeller Synchrophaser - OFF (Optional System).
3. Fuel Selectors - Left Engine - LEFT MAIN (Feel For Detent).
Right Engine - RIGHT MAIN (Feel For Detent).
4. Auxiliary Fuel Pumps - ON.
5. Alternate Air Controls - CHECK IN.
6. Wing Flaps - DOWN 15° below 160 KIAS.
7. Landing Gear - DOWN below 140 KIAS.
8. Landing Gear Position Indicator Lights - Check down lights ON;
Unlocked Light - OFF.
9. Mixtures - FULL RICH or lean as required for smooth operation.
10. Propellers - FULL FORWARD.
11. Wing Flaps - DOWN 45° below 140 KIAS.
12. Minimum Multi-Engine Approach Speed - 95 KIAS at 6200 pounds.
Refer to Section 5 for speeds
at reduced weights.
13. Air Minimum Control Speed - 82 KIAS.

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 fuel selectors to the left and right main tanks, respectively; feel for detent; and check the auxiliary fuel pumps ON for the landing. This will provide an adequate fuel flow to each engine if a balked landing is necessary.

NOTE

Make sure weight does not exceed 6200 pounds before attempting landing.

Landing gear extension before landing is easily detected by a slight change in airplane 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 the press-to-test button. If the bulb is burned out, it can be replaced with the bulb from any post light, or the landing gear unlocked 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, the propeller controls are full forward, and the mixtures are set for smooth operation.

Landings are simple and conventional in every respect. If power is used in landing approaches, it should be eased off cautiously near touch-down, 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 airplane is near stall speed.

Landings on hard-surface runways are performed with 45° flaps and 95 KIAS during the 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 nosewheel 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 airplane into the wind in a normal approach using a minimum flap setting for the field length. Immediately before touchdown, the airplane 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.

BALKED LANDING

1. Increase engine speed to 2700 RPM and apply full throttle if necessary.
2. Balked Landing Transition Speed - 83 KIAS.
3. Landing Gear - RETRACT during IFR go-around or simulated IFR go-around after establishing a positive rate of climb.

NOTE

- Experience indicates that retracting the landing gear during an operational VFR go-around, when an immediate landing is contemplated, has been conducive to gear up landings.
- Always follow the Before Landing Checklist.

4. Wing Flaps - 15°.
5. Trim airplane for climb.
6. Cowl Flaps - OPEN.
7. Wing Flaps - UP as soon as all obstacles are cleared and a safe altitude and airspeed are obtained.

AFTER LANDING

1. Auxiliary Fuel Pumps - LOW during landing roll.
2. Cowl Flaps - OPEN.
3. Wing Flaps - UP.

Maximum braking effectiveness is obtained by applying full even pressure to the toe brakes without locking the wheels and applying full back pressure to the control column. This procedure is recommended only for emergency stops as excessive brake pad and tire wear will occur. Maximum brake wear occurs at high speed. This brake wear can be reduced using aerodynamic braking supplemented with the use of wheel brakes. Maximum aerodynamic braking occurs with the wing flaps fully extended and the control wheel held aft to keep the nose off the runway as long as possible.

After leaving the active runway, the wing flaps should be retracted. Be sure the wing flaps switch is identified before placing it in the UP position. The auxiliary fuel pump switches are turned to LOW during the landing roll.

SHUTDOWN

1. Parking Brake - SET if brakes are cool.
2. Avionics Bus Switch - OFF.
3. All Switches Except Battery, Alternator and Magneto Switches - OFF.
4. Auxiliary Fuel Pumps - OFF.

NOTE

The fuel pumps must be turned OFF prior to stopping engines.

5. Throttles - IDLE.
6. Mixtures - IDLE CUT-OFF.
7. Battery and Alternators - OFF.
8. Magneto Switches - OFF, after engines stop.
9. Control Locks - INSTALL.
10. Fuel Selectors - OFF if a long period of inactivity is anticipated (Feel For Detent).
11. Cabin Door - CLOSE.

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 selectors in the OFF position if the airplane is receiving normal usage. However, if a long period of inactivity is anticipated, the fuel selectors should be turned OFF to preclude any possible fuel seepage that might develop through the metering valve.

NOTE

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

STALL

The stall characteristics of the airplane are conventional. Aural warning is provided by the stall warning horn between 4 and 9 KCAS 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 pitch angle with or without flaps. It is difficult to inadvertently stall the airplane during normal maneuvering.

MANEUVERING FLIGHT

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

SECTION 3
EMERGENCY PROCEDURES**TABLE OF CONTENTS**

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INTRODUCTION

Section 3 of the Pilot's Operating Handbook describes the recommended procedures for emergency situations. The first part of this section provides emergency procedural action required in an abbreviated checklist form. Amplification of the abbreviated checklist is presented in the second part of this section.

NOTE

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

EMERGENCY PROCEDURES ABBREVIATED CHECKLIST

Procedures in the Abbreviated Checklist portion of this section outlined in black are immediate-action items and should be committed to memory.

SINGLE-ENGINE AIRSPEEDS FOR SAFE OPERATION

Conditions:	
1. Takeoff Weight 6300 Pounds	3. Standard Day, Sea Level
2. Landing Weight 6200 Pounds	
(1) Air Minimum Control Speed	82 KIAS
(2) Recommended Safe Single-Engine Speed	91 KIAS
(3) Best Single-Engine Angle-of-Climb Speed	98 KIAS
(4) Best Single-Engine Rate-of-Climb Speed (Wing Flaps UP)	103 KIAS

Figure 3-1

ENGINE INOPERATIVE PROCEDURES

ENGINE SECURING PROCEDURE

1. Throttle - CLOSE.
2. Mixture - IDLE CUT-OFF.
3. Propeller - FEATHER.
4. Fuel Selector - OFF (Feel For Detent).
5. Auxiliary Fuel Pump - OFF.
6. Magneto Switches - OFF.
7. Propeller Synchrophaser - OFF (Optional System).
8. Alternator - OFF.
9. Cowl Flap - CLOSE.

ENGINE FAILURE DURING TAKEOFF (Speed Below 91 KIAS)

1. Throttles - CLOSE IMMEDIATELY.
2. Brakes - AS REQUIRED.

ENGINE FAILURE AFTER TAKEOFF (Speed Above 91 KIAS With Gear Up Or In Transit)

1. Mixtures - FULL RICH.
2. Propellers - FULL FORWARD.
3. Throttles - FULL FORWARD (34.5 Inches Hg.).
4. Landing Gear - CHECK 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 50-Foot Obstacle - 91 KIAS.
8. Climb At Best Single-Engine Rate-of-Climb Speed - 103 KIAS.
9. Trim Tabs - ADJUST 5° bank toward operative engine with approximately 1/2 ball slip indicated on the turn and bank indicator.
10. Cowl Flap - CLOSE (Inoperative Engine).
11. Inoperative Engine - SECURE as follows:
 - a. Fuel Selector - OFF (Feel For Detent).
 - b. Auxiliary Fuel Pump - OFF.
 - c. Magneto Switches - OFF.
 - d. Alternator - OFF.
12. As Soon As Practical - LAND.

ENGINE FAILURE DURING FLIGHT

1. Inoperative Engine - DETERMINE.
2. Operative Engine - ADJUST as required.

Before Securing Inoperative Engine:

3. Fuel Flow - CHECK. If deficient, position auxiliary fuel pump to ON.
4. Fuel Selectors - MAIN TANKS (Feel For Detent).
5. Fuel Quantity - CHECK.
6. Oil Pressure and Oil Temperature - CHECK.
7. Magneto Switches - CHECK ON.
8. Mixture - ADJUST. Lean until manifold pressure begins to increase, then enrichen as power increases.

If Engine Does Not Start, Secure As Follows:

9. Inoperative Engine - SECURE.
 - a. Throttle - CLOSE.
 - b. Mixture - IDLE CUT-OFF.
 - c. Propeller - FEATHER.
 - d. Fuel Selector - OFF (Feel For Detent).
 - e. Auxiliary Fuel Pump - OFF.
 - f. Magneto Switches - OFF.
 - g. Propeller Synchrophaser - OFF (Optional System).
 - h. Alternator - OFF.
 - i. Cowl Flap - CLOSE.
10. Operative Engine - ADJUST.
 - a. Power - AS REQUIRED.
 - b. Mixture - ADJUST for power.
 - c. Fuel Selector - AS REQUIRED (Feel For Detent).

NOTE

- Auxiliary fuel on the side of the failed engine is unusable.
- Position operative engine fuel selector to MAIN TANK and feel for detent if below 1000 feet AGL or if nearest airport is within range of fuel remaining in MAIN TANK. If necessary, range can be extended by using wing locker fuel, opposite main fuel or auxiliary fuel on the side of the operative engine. Crossfeed as required to maintain lateral balance.

- d. Auxiliary Fuel Pump - ON.
- e. Cowl Flap - AS REQUIRED.
11. Trim Tabs - ADJUST 5° bank toward operative engine with approximately 1/2 ball slip indicated on the turn and bank indicator.
12. Electrical Load - DECREASE to minimum required.
13. As Soon As Practical - LAND.

ENGINE INOPERATIVE LANDING

1. Fuel Selector - MAIN TANK (Feel For Detent).
2. Auxiliary Fuel Pump - ON (Operative Engine).
3. Alternate Air Control - IN.
4. Mixture - FULL RICH or lean as required for smooth operation.
5. Propeller Synchrophaser - OFF (Optional System).
6. Propeller - FULL FORWARD.
7. Approach - 105 KIAS with excessive altitude.
8. Landing Gear - DOWN within gliding distance of field.
9. Wing Flaps - DOWN when landing is assured.
10. Speed - DECREASE below 95 KIAS only if landing is assured.
11. Air Minimum Control Speed - 82 KIAS.

ENGINE INOPERATIVE GO-AROUND (Speed Above 91 KIAS)

WARNING

Level flight may not be possible for certain combinations of weight, temperature and altitude. In any event, do not attempt an engine inoperative go-around after wing flaps have been extended beyond 15°.

1. Throttle - FULL FORWARD (34.5 Inches Hg.).
2. Positive Rate-of-Climb - ESTABLISH.
3. Landing Gear - UP.
4. Wing Flaps - UP.
5. Cowl Flaps - OPEN.
6. Climb at Best Single-Engine Rate-of-Climb Speed - 103 KIAS.
7. Trim Tabs - ADJUST 5° bank toward operative engine with approximately 1/2 ball slip indicated on the turn and bank indicator.

AIRSTART

Airplane Without Optional Propeller Unfeathering System:

1. Auxiliary Fuel Pump - CHECK OFF. If ON or LOW, purge engine by turning OFF auxiliary fuel pump, mixture to IDLE CUT-OFF, throttle full open, magneto switches OFF, and rotating engine 15 revolutions with starter.
2. Magneto Switches - ON.
3. Fuel Selector - MAIN TANK (Feel For Detent).
4. Throttle - FORWARD approximately one and one-half inches.
5. Mixture - FULL RICH then retard approximately two inches.
6. Propeller - FORWARD of detent.
7. Starter Button - PRESS.
8. Primer Switch - ACTIVATE.
9. Starter and Primer Switch - RELEASE when engine fires.
10. Auxiliary Fuel Pump - LOW.
11. Mixture - ADJUST for smooth engine operation.
12. Power - INCREASE after cylinder head temperature reaches 200°F with gradual mixture enrichment as power increases.
13. Cowl Flap - AS REQUIRED.
14. Alternator - ON.

Airplane With Optional Propeller Unfeathering System:

1. Auxiliary Fuel Pump - CHECK OFF. If ON or LOW, purge engine by turning OFF auxiliary fuel pump, mixture to IDLE CUT-OFF, throttle full open, magneto switches OFF, and rotating engine 15 revolutions with starter.
2. Magneto Switches - ON.
3. Fuel Selector - MAIN TANK (Feel For Detent).
4. Throttle - FORWARD approximately one and one-half inches.
5. Mixture - FULL RICH then retard approximately two inches.
6. Propeller - FULL FORWARD.
7. Propeller - RETARD to detent when propeller reaches 1000 RPM.
8. Auxiliary Fuel Pump - LOW.
9. Mixture - ADJUST for smooth engine operation.
10. Power - INCREASE after cylinder head temperature reaches 200°F with gradual mixture enrichment as power increases.
11. Cowl Flap - AS REQUIRED.
12. Alternator - ON.

BOTH ENGINES FAILURE DURING CRUISE FLIGHT

1. Wing Flaps - UP.
2. Landing Gear - UP.
3. Propellers - FEATHER.
4. Cowl Flaps - CLOSE.
5. Airspeed - 120 KIAS (See Figure 3-4).
6. Landing - Refer to FORCED LANDING (Complete Power Loss) in this section.

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 airplane as soon as practical.

INFLIGHT WING OR ENGINE FIRE

1. Both Auxiliary Fuel Pumps - OFF.
2. Appropriate Engine - SECURE.
 - a. Throttle - CLOSE.
 - b. Mixture - IDLE CUT-OFF.
 - c. Propeller - FEATHER.
 - d. Fuel Selector - OFF (Feel For Detent).
 - e. Magnetos - OFF.
 - f. Propeller Synchrophaser - OFF (Optional System).
 - g. Alternator - OFF.
 - h. Cowl Flap - CLOSE.
3. Cabin Heater - OFF.
4. Land and evacuate airplane as soon as practical.

INFLIGHT 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.
CLOSE if intensity of smoke increases.

CAUTION

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

5. Land and evacuate airplane as soon as practical.

EMERGENCY DESCENT PROCEDURES

PREFERRED PROCEDURE

1. Throttles - IDLE.
 2. Propellers - FULL FORWARD.
 3. Mixtures - ADJUST for smooth engine operation.
 4. Wing Flaps - UP.
 5. Landing Gear - UP.
 6. Moderate Bank - INITIATE.
7. Airspeed - 225 KIAS.

IN TURBULENT ATMOSPHERIC CONDITIONS

1. Throttles - IDLE.
 2. Propellers - FULL FORWARD.
 3. Mixtures - ADJUST for smooth engine operation.
 4. Wing Flaps - DOWN 45°.
 5. Landing Gear - DOWN.
 6. Moderate Bank - INITIATE.
7. Airspeed - 140 KIAS.

EMERGENCY LANDING PROCEDURES

FORCED LANDING (With Power)

1. Landing Site - CHECK. Overfly site at 105 KIAS and 15° wing flaps.
2. Landing Gear - DOWN if surface is smooth and hard.
 - a. Normal Landing - INITIATE. Keep nosewheel off ground as long as practical.
3. Landing Gear - UP if surface is rough or soft.
 - a. Approach - 105 KIAS with 15° wing flaps.
 - b. All Switches Except Magnetos - OFF.
 - c. Emergency Exit Window - OPEN.
 - d. Mixtures - IDLE CUT-OFF.
 - e. Magneto Switches - OFF.
 - f. Fuel Selectors - OFF (Feel For Detent).
 - g. Landing Attitude - NOSE HIGH.

FORCED LANDING (Complete Power Loss)

1. Mixtures - IDLE CUT-OFF.
2. Propellers - FEATHER.
3. Fuel Selectors - OFF (Feel For Detent).
4. All Switches Except Battery - OFF.
5. Approach - 120 KIAS.
6. If Smooth and Hard Surface:
 - a. Landing Gear - DOWN within gliding distance of field.
 - b. Wing Flaps - AS REQUIRED.
 - c. Battery Switch - OFF.
 - d. Emergency Exit Window - OPEN.
 - e. Normal Landing - INITIATE. Keep nosewheel off ground as long as practical.
7. If Rough or Soft Surface:
 - a. Landing Gear - UP.
 - b. Wing Flaps - DOWN 15°.
 - c. Approach - 105 KIAS.
 - d. Battery Switch - OFF.
 - e. Emergency Exit Window - OPEN.
 - f. Landing Attitude - NOSE HIGH.

LANDING WITH FLAT MAIN GEAR TIRE

1. Landing Gear - Leave DOWN.
2. Fuel Selectors - SELECT main tank on same side as defective tire; feel for detent.
3. Fuel Selectors - MAIN TANKS (Feel For Detent) before landing.
4. Wind should be headwind or crosswind opposite the defective tire.
5. Wing Flaps - DOWN 45°.
6. In approach, align airplane with edge of runway opposite the defective tire, allowing room for a mild turn in the landing roll.
7. Land slightly wing low on the side of the inflated tire and lower the nosewheel to the ground immediately for positive steering.
8. Use full aileron in landing roll to lighten the load on the defective tire.
9. Apply brakes only on the inflated tire to minimize landing roll and maintain directional control.
10. Stop airplane to avoid further damage unless active runway must be cleared for other traffic.

LANDING WITH DEFECTIVE MAIN GEAR

1. Fuel Selectors - SELECT main tank on the same side as defective gear; feel for detent.
2. Fuel Selectors - MAIN TANKS (Feel For Detent) before landing.
3. Wind - HEADWIND or crosswind opposite defective gear.
4. Landing Gear - DOWN.
5. Wing Flaps - DOWN 45°.
6. Approach - ALIGN AIRPLANE with the edge of runway opposite the defective landing gear.
7. Battery Switch - OFF.
8. Land wing low toward operative landing gear. Lower nosewheel immediately for positive steering.
9. Ground Loop - INITIATE into defective landing gear.
10. Mixtures - IDLE CUT-OFF.
11. Use full aileron in landing roll to lighten the load on the defective gear.
12. Apply brakes only on the operative landing gear to hold desired rate of turn and shorten landing roll.
13. Fuel Selectors - OFF (Feel For Detent).
14. Airplane - EVACUATE.

LANDING WITH FLAT NOSE GEAR TIRE

1. Landing Gear - Leave DOWN.
2. Passengers and Baggage - MOVE AFT.
3. Approach - 105 KIAS with 15° wing flaps.
4. Landing Attitude - NOSE HIGH.
5. Nose - HOLD OFF during landing roll.
6. Brakes - MINIMUM in landing roll.
7. Throttles - RETARD in landing roll.
8. Control Wheel - FULL AFT until airplane stops.
9. Minimize additional taxiing to prevent further damage.

LANDING WITH DEFECTIVE NOSE GEAR

1. If Smooth and Hard Surface:
 - a. Baggage and Passengers - MOVE AFT.
 - b. Landing Gear - DOWN.
 - c. Approach - 105 KIAS with 15° wing flaps.
 - d. All Switches Except Magnetos - OFF.
 - e. Landing Attitude - NOSE HIGH.
 - f. Mixtures - IDLE CUT-OFF.
 - g. Magneto Switches - OFF.
 - h. Nose - LOWER as speed dissipates.
2. If Rough or Sod Surface:
 - a. Landing Gear - UP.
 - b. Approach - 105 KIAS with 15° wing flaps.
 - c. All Switches Except Magnetos - OFF.
 - d. Emergency Exit Window - OPEN.
 - e. Landing Attitude - NOSE HIGH.
 - f. Mixtures - IDLE CUT-OFF.
 - g. Magneto Switches - OFF.
 - h. Fuel Selectors - OFF (Feel For Detent).

LANDING WITHOUT FLAPS (0° Extension)

1. Mixtures - FULL RICH or lean as required for smooth operation.
2. Propellers - FULL FORWARD.
3. Fuel Selectors - MAIN TANKS (Feel For Detent).
4. Minimum Approach Speed - 108 KIAS (See Figure 5-25).
5. Landing Gear - DOWN.

DITCHING

1. Landing Gear - UP.
2. Approach - HEADWIND if high winds.
PARALLEL to SWELLS if light wind and heavy swells.
3. Wing Flaps - DOWN 45°.
4. Power - AS REQUIRED (300 Feet Per Minute Descent).
5. Airspeed - 105 KIAS minimum.
6. Attitude - DESCENT ATTITUDE through touchdown.

FUEL SYSTEM EMERGENCY PROCEDURES**ENGINE-DRIVEN FUEL PUMP FAILURE**

1. Fuel Selector - MAIN TANK (Feel For Detent).
2. Auxiliary Fuel Pump - ON.
3. Cowl Flap - OPEN.
4. Mixture - FULL RICH. Adjust fuel flow to coincide with power setting.
5. As Soon As Practical - LAND.
6. Fuel in auxiliary and opposite main tank is unusable.

ELECTRICAL SYSTEM EMERGENCY PROCEDURES**ALTERNATOR FAILURE (Single)**

1. Electrical Load - REDUCE.
2. If Circuit Breaker is tripped:
 - a. Turn 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.
 - e. If an intermittent light indication accompanied by voltammeter fluctuation is observed, turn off affected alternator and reduce load to one alternator capacity.

ALTERNATOR FAILURE (Dual)

1. Electrical Load - REDUCE.
2. If Circuit Breakers are tripped:
 - a. Turn off alternators.
 - b. Reset circuit breakers.
 - c. Turn on left alternator and monitor output on voltmeter.
 - d. If alternator is charging, leave it on. Disregard failure light if still illuminated.
 - e. If still inoperative, turn off left alternator.
 - f. Repeat steps c through e for right alternator.
 - g. If circuit breakers reopen, prepare to terminate flight.
3. If Circuit Breakers have not tripped:
 - a. Turn off alternators.
 - b. Check field fuses and replace as required.
 - c. Turn on left alternator and monitor output on voltmeter.
 - d. If alternator is charging, leave it on. Disregard failure light if still illuminated.
 - e. If still inoperative, turn off left alternator.
 - f. Repeat steps c through e for right alternator.
 - g. If both still inoperative, turn off alternators and turn on emergency power alternator field switch.
 - h. Repeat steps c through e for each alternator.
 - i. If still inoperative, turn off alternators, nonessential electrical items and prepare to terminate flight.

AVIONICS BUS FAILURE

1. Avionics Bus Switch - OFF.
2. Emergency Power Avionics Bus Switch - ON.

LANDING GEAR EMERGENCY PROCEDURES

LANDING GEAR WILL NOT EXTEND ELECTRICALLY

1. Landing Gear Motor Circuit Breaker - CHECK IN with landing gear switch DOWN.
2. Landing Gear Motor Circuit Breaker - PULL.
3. Landing Gear Switch - NEUTRAL (Center).
4. Pilot's Seat - ADJUST as required.
5. Handcrank - EXTEND AND LOCK.
6. Rotate Crank - CLOCKWISE four turns past gear down lights on (Approximately 54 Turns).
7. Gear Down Lights - ON; Unlocked Light - OFF.
8. Gear Warning Horn - CHECK.
9. Handcrank - PUSH BUTTON and STOW.
10. As Soon As Practical - LAND.

LANDING GEAR WILL NOT RETRACT ELECTRICALLY

1. Do not try to retract manually.
2. Landing Gear - DOWN.
3. Gear Down Lights - ON; Unlocked Light - OFF.
4. Gear Warning Horn - CHECK.
5. As Soon As Practical - LAND.

FLIGHT INSTRUMENTS EMERGENCY PROCEDURES**VACUUM PUMP FAILURE (Attitude And Directional Gyros)**

1. Failure indicated by left or right red failure button exposed on vacuum gage.
2. Automatic valve will select operative source.
3. Vacuum Pressure - CHECK proper vacuum from operative source.

OBSTRUCTION OR ICING OF STATIC SOURCE

1. Alternate Static Source - OPEN.
2. Excess Altitude and Airspeed - MAINTAIN to compensate for change in calibration (See Figures 5-2 and 5-4).

AIR INLET OR FILTER ICING EMERGENCY PROCEDURES

- | |
|---|
| <ol style="list-style-type: none">1. Alternate Air Control(s) - PULL OUT.2. Propeller(s) - INCREASE (2550 RPM For Normal Cruise).3. Mixtures(s) - LEAN as required. |
|---|

PROPELLER SYNCHROPHASER**ENGINE INOPERATIVE PROCEDURES**

1. Propeller Synchrophaser - OFF (Optional System).

SYNCHROPHASER FAILURE

1. Propeller Synchrophaser - OFF (Optional System).
2. Propeller Synchrophaser Circuit Breaker - PULL (Optional System).

EMERGENCY EXIT WINDOW

1. Emergency Release Handle Plastic Cover - PULL OFF.
2. Safety Clip - PUSH FORWARD.
3. Emergency Release Handle - PULL FULL AFT.
4. Emergency Exit Window - PUSH OUT and UP until the up-lock brace holds the window open.

SPINS

- | |
|--|
| <ol style="list-style-type: none">1. Throttles - CLOSE IMMEDIATELY.2. Rudder - FULL RUDDER opposite the direction of rotation.3. Control Wheel - FORWARD BRISKLY, 1/2 turn after applying full rudder. Neutralize rudder after rotation stops.4. Inboard Engine - INCREASE POWER to slow rotation.5. Control Wheel - PULL after rotation has stopped to recover from resultant dive. Apply smooth steady control pressure. |
|--|

AMPLIFIED EMERGENCY PROCEDURES**NOTE**

A complete knowledge of the procedures set forth in this section will enable the pilot to cope with various emergencies that can be encountered; however, this does not diminish the fact that the primary responsibility of the pilot is to maintain control at all times. Good judgment and precise action are essential and can only be developed through frequent practice of emergency and simulated single-engine procedures. The pilot must have a thorough knowledge of all emergency procedures so that in the event of an emergency, reaction will be precise and done with confidence. This is required so the pilot can cope with the demands of an emergency situation.

SINGLE-ENGINE AIRSPEEDS FOR SAFE OPERATION

The most critical time for an engine failure condition in a multi-engine airplane is during a two or three second period late in the takeoff run while the airplane is accelerating to a safe engine failure speed. A detailed knowledge of recommended single-engine airspeeds is essential for safe operation of the airplane.

The airspeed indicator is marked with a red radial at the air minimum control speed and a blue radial 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.

AIR MINIMUM CONTROL SPEED

The multi-engine airplane must reach the air minimum control speed (82 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 on the airspeed indicator.

RECOMMENDED SAFE SINGLE-ENGINE SPEED

Although the airplane is controllable at the air minimum control speed, the airplane performance is so far below optimum that continued flight near the ground is improbable. A more suitable recommended safe single-engine speed is 91 KIAS. 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 98 KIAS with wing flaps and landing gear up.

BEST SINGLE-ENGINE RATE-OF-CLIMB SPEED

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 103 KIAS with wing flaps and landing gear up. This speed is indicated by a blue radial on the airspeed indicator.

The variations of wing flaps up best single-engine rate-of-climb speed with altitude are shown in Section 5. For best single-engine climb performance, the wings should be banked 5° toward the operative engine.

ENGINE INOPERATIVE PROCEDURES

ENGINE SECURING PROCEDURE

1. Throttle - CLOSE.
2. Mixture - IDLE CUT-OFF.
3. Propeller - FEATHER.
4. Fuel Selector - OFF (Feel For Detent).
5. Auxiliary Fuel Pump - OFF.
6. Magneto Switches - OFF.
7. Propeller Synchrophaser - OFF (Optional System).
8. Alternator - OFF.
9. Cowl Flap - CLOSE.

ENGINE FAILURE DURING TAKEOFF (Speed Below 91 KIAS)

1. Throttles - CLOSE IMMEDIATELY.
2. Brakes - AS REQUIRED.

NOTE

The distance required for the airplane to be accelerated from a standing start to 91 KIAS on the ground, and to decelerate to a stop with heavy braking, is presented in the Accelerate Stop Distance Chart in Section 5 for various combinations of conditions.

ENGINE FAILURE AFTER TAKEOFF (Speed Above 91 KIAS With Gear Up Or In Transit)

1. Mixtures - FULL RICH.
2. Propellers - FULL FORWARD.
3. Throttles - FULL FORWARD (34.5 Inches Hg.).
4. Landing Gear - CHECK 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 50-Foot Obstacle - 91 KIAS.

8. Climb at Best Single-Engine Rate-of-Climb Speed - 103 KIAS.
9. Trim Tabs - ADJUST 5° bank toward operative engine with approximately 1/2 ball slip indicated on the turn and bank indicator.
10. Cowl Flap - CLOSE.
11. Inoperative Engine - SECURE as follows:
 - a. Fuel Selector - OFF (Feel For Detent).
 - b. Auxiliary Fuel Pump - OFF.
 - c. Magneto Switches - OFF.
 - d. Alternator Switch - OFF.
12. As Soon as Practical - LAND.

Upon engine failure after reaching 91 KIAS on takeoff, the multi-engine pilot has a significant advantage over a single-engine pilot, for he has a 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 airplane accelerates through this "area of decision" in just a few seconds. However, to make an intelligent decision in this type of emergency, one must consider the field length, obstruction height, field elevation, air temperature, headwind, and takeoff weight. The flight paths illustrated in Figure 3-2 indicate that the "go no-go area of decision" is bounded by: (1) the point at which 91 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 airplane, within the limitations of single-engine climb performance shown in Section 5, may be maneuvered to a landing back at the airport.

ENGINE FAILURE DURING TAKEOFF GO NO-GO DECISION

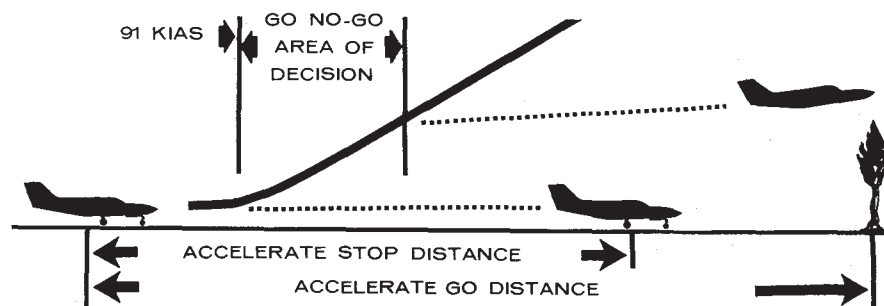


Figure 3-2

At sea level standard day, with zero wind and 6300 pounds weight, the distance to accelerate to 91 KIAS and stop is 3035 feet, while the total unobstructed distance required to takeoff and climb over a 50-foot obstacle after an engine failure at 91 KIAS is 4940 feet. This total distance over an obstacle can be reduced slightly under more favorable conditions of 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 single-engine procedure would more than offset the small distance advantage offered by continuing the takeoff. Still higher field elevations will cause the engine failure takeoff distance to lengthen disproportionately until the 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 airplane 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 2 knots of headwind. Excessive speed above best single-engine rate-of-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 airplane is being cleaned up for climb. However, the extra speed is important for controllability.

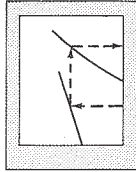
The following facts should be used as a guide at the time of engine failure: (1) discontinuing a takeoff upon engine failure is advisable under most circumstances; (2) altitude is more valuable to safety after takeoff than is airspeed in excess of the best single-engine rate-of-climb speed since excess 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 best single-engine 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 for climb or the least altitude loss, and is preferable unless there are obstructions which make a steep climb necessary.

WARNING

The propeller on the inoperative engine must be feathered, landing gear retracted and wing flaps up or continued flight may be impossible.

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 airplane in emergency conditions is well known. It should be noted that as the speed is reduced, directional control becomes more difficult. Emphasis should be placed on stopping the initial large yaw angles by the IMMEDIATE application of rudder supplemented by banking slightly away from the yaw. 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 airplane is being

RPM TO SIMULATE CRITICAL (LEFT) ENGINE INOPERATIVE AND FEATHERED



- CONDITIONS:
1. Propellers in Low Pitch (Full Forward Position).
 2. Manifold Pressure Adjusted to Obtain Proper RPM.

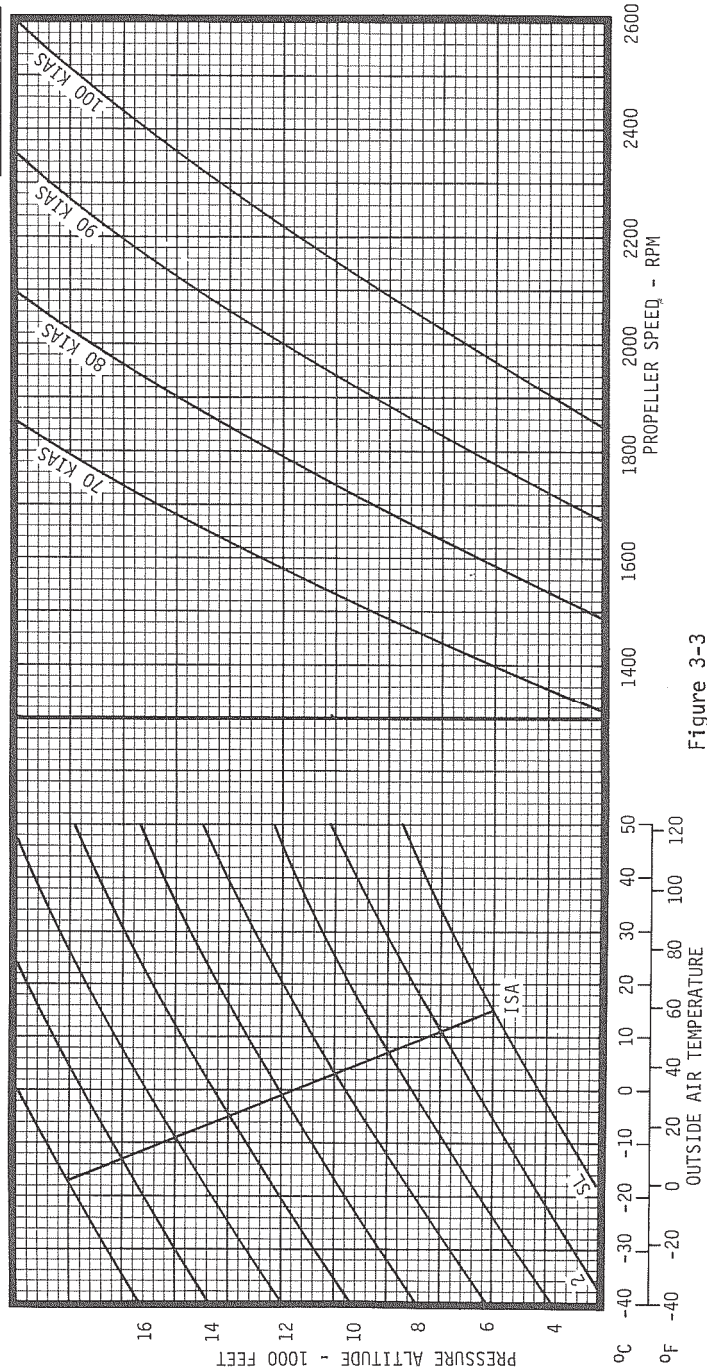


Figure 3-3

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 throttle control of one engine to idle, and proceed with single-engine emergency procedures. Simulated single-engine flight characteristics can be practiced by setting propeller RPM to simulate a critical engine inoperative condition as shown in Figure 3-3.

ENGINE OVERSPEED

Should an overspeed condition occur, the pilot should reduce airspeed as quickly as possible by closing both throttles. On reaching an airspeed below 120 KIAS and above the best single-engine rate-of-climb speed (Blue Radial), set the RPM control on the nonfunctional engine for feather. If propeller will not feather, the power on the normally operating engine should be advanced to maximum and the power on the overspeeding engine should be advanced to 50 RPM below the maximum allowable RPM (Red Line). Maintain the best single-engine rate-of-climb speed (Blue Radial) and land as soon as practical. This will provide more than zero thrust at altitudes up to approximately 10,000 feet. During landing, the application of partial throttle on the malfunctioning engine (within limits of the tachometer red line) will minimize asymmetrical thrust.

ENGINE FAILURE DURING FLIGHT

1. Inoperative Engine - DETERMINE. Idle engine same side as idle foot.
2. Operative Engine - ADJUST as required.

Before Securing Inoperative Engine:

3. Fuel Flow - CHECK. If deficient, position auxiliary fuel pump switch to ON.
4. Fuel Selectors - MAIN TANKS (Feel For Detent).
5. Fuel Quantity - CHECK. 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 ON.
8. Mixture - ADJUST. Lean until manifold pressure begins to increase, then enrichen as power increases.

If Engine Does Not Start, Secure As Follows:

9. Inoperative Engine - SECURE.
 - a. Throttle - CLOSE.
 - b. Mixture - IDLE CUT-OFF.
 - c. Propeller - FEATHER.
 - d. Fuel Selector - OFF (Feel For Detent).
 - e. Auxiliary Fuel Pump - OFF.
 - f. Magneto Switches - OFF.
 - g. Propeller Synchrophaser - OFF (Optional System).
 - h. Alternator Switch - OFF.
 - i. Cowl Flap - CLOSE.
10. Operative Engine - ADJUST.
 - a. Power - AS REQUIRED.
 - b. Mixture - ADJUST for power.
 - c. Fuel Selector - MAIN TANK (Feel For Detent).

NOTE

Auxiliary fuel on the side of the failed engine is unusable.

NOTE

Position operative engine fuel selector to MAIN TANK and feel for detent if below 1000 feet AGL or if nearest airport is within range of fuel remaining in MAIN TANK. If necessary, range can be extended by using wing locker fuel, opposite main fuel or auxiliary fuel on the side of the operative engine. Crossfeed as required to maintain lateral balance.

- d. Auxiliary Fuel Pump - ON.
- e. Cowl Flap - AS REQUIRED.
- 11. Trim Tabs - ADJUST 5° bank toward operative engine with approximately 1/2 ball slip indicated on the turn and bank indicator.
- 12. Electrical Load - DECREASE to minimum required.
- 13. As Soon As Practical - LAND.

ENGINE INOPERATIVE LANDING

- 1. Fuel Selector - MAIN TANK (Feel For Detent).
- 2. Auxiliary Fuel Pump - ON (Operative Engine).
- 3. Alternate Air Control - IN.
- 4. Mixture - FULL RICH or lean as required for smooth operation.
- 5. Propeller Synchrophaser - OFF (Optional System).
- 6. Propeller - FULL FORWARD.
- 7. Approach at 105 KIAS with excessive altitude.
- 8. Landing Gear - DOWN within gliding distance of field.
- 9. Wing Flaps - DOWN when landing is assured.
- 10. Decrease speed below 95 KIAS only if landing is assured.
- 11. Air Minimum Control Speed - 82 KIAS.

ENGINE INOPERATIVE GO-AROUND**WARNING**

Level flight may not be possible for certain combinations of weight, temperature and altitude. In any event, do not attempt an engine inoperative go-around after wing flaps have been extended beyond 15°.

- 1. If absolutely necessary and speed is above 91 KIAS, increase engine speed to 2700 RPM and apply full throttle.
- 2. Positive Rate-of-Climb - ESTABLISH.
- 3. Landing Gear - UP.
- 4. Wing Flaps - UP, if extended.
- 5. Cowl Flap - OPEN.
- 6. Climb at 103 KIAS (98 KIAS With Obstacles Directly Ahead).
- 7. Trim Tabs - ADJUST 5° bank toward operative engine with approximately 1/2 ball slip indicated on the turn and bank indicator.

AIRSTART (After Feathering)

Airplane Without Optional Propeller Unfeathering System:

- 1. Auxiliary Fuel Pump - CHECK OFF. If ON or LOW, purge engine by turning OFF auxiliary fuel pump, mixture to IDLE CUT-OFF, throttle full open, magneto switches OFF, and rotating engine 15 revolutions with starter.

SECTION 3
EMERGENCY PROCEDURES

(AMPLIFIED PROCEDURES)

Cessna
MODEL **402B**

2. Magneto Switches - ON.
3. Fuel Selector - MAIN TANK (Feel For Detent).
4. Throttle - FORWARD approximately one and one-half inches.
5. Mixture - FULL RICH then retard approximately two inches.
6. Propeller - FORWARD of detent.
7. Starter Button - PRESS.
8. Primer Switch - ACTIVATE.
9. Starter and Primer Switch - RELEASE when engine fires.
10. Auxiliary Fuel Pump - LOW.
11. Mixture - ADJUST for smooth engine operation.
12. Power - INCREASE after cylinder head temperature reaches 200°F with gradual mixture enrichment as power increases.
13. Cowl Flap - AS REQUIRED.
14. Alternator - ON.

Airplane With Optional Propeller Unfeathering System:

1. Auxiliary Fuel Pump - CHECK OFF. If ON or LOW, purge engine by turning OFF auxiliary fuel pump, mixture to IDLE CUT-OFF, throttle full open, magneto switches OFF, and rotating engine 15 revolutions with starter.
2. Magneto Switches - ON.
3. Fuel Selector - MAIN TANK (Feel For Detent).
4. Throttle - FORWARD approximately one and one-half inches.
5. Mixture - FULL RICH then retard approximately two inches.
6. Propeller - FULL FORWARD.

NOTE

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

7. Propeller - RETARD to detent when propeller reaches 1000 RPM.
8. Mixture - ADJUST for smooth engine operation.
9. Auxiliary Fuel Pump - LOW.
10. Power - INCREASE after cylinder head temperature reaches 200°F with gradual mixture enrichment as power increases.
11. Cowl Flap - AS REQUIRED.
12. Alternator - ON.

BOTH ENGINES FAILURE DURING CRUISE FLIGHT

1. Wing Flaps - UP.
2. Landing Gear - UP.
3. Propellers - FEATHER.
4. Cowl Flaps - CLOSE.
5. Airspeed - 120 KIAS (See Figure 3-4).

NOTE

Vacuum instruments will be inoperative. Electrical power available will be limited to the amount of energy contained in the battery.

6. Landing - Refer to FORCED LANDING (Complete Power Loss) in this section.