

# **SECTION IV**

## **NORMAL PROCEDURES**

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*All airspeeds quoted in this section are indicated airspeeds (IAS)*

**AIRSPEDS FOR SAFE OPERATION**

**Take-off**

Lift-off .....	71 kts/82 mph
50 Ft. ....	77 kts/89 mph

**Maximum Climb**

Best Rate ( $V_y$ ) .....	96 kts/110 mph
Best Angle ( $V_x$ ) .....	77 kts/89 mph

Cruise Climb ..... 107 kts/123 mph

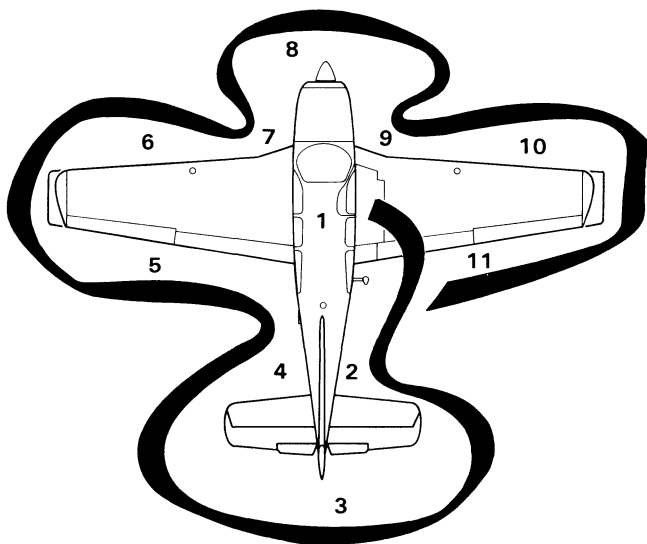
**Maximum Turbulent Air**

Penetration .....	134 kts/154 mph
Balked Landing .....	70 kts/81 mph
Landing Approach .....	70 kts/81 mph

**Maximum Demonstrated**

Crosswind .....	17 kts/20 mph
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## PREFLIGHT INSPECTION



Emergency Locator Transmitter - ARMED  
Location may vary with individual airplanes

### 1. CABIN:

- a. Parking Brake - SET
- b. Control Lock - REMOVE
- c. All Switches - OFF

### 2. RIGHT FUSELAGE:

- a. Baggage Compartment Door - SECURE
- b. Static Pressure Button - UNOBSTRUCTED

**3. EMPENNAGE:**

- a. Control Surfaces - CHECK
- b. Tie Down - REMOVE
- c. Position Light - CHECK
- d. Cabin Air Intake - CHECK

**4. LEFT FUSELAGE:**

- a. Static Pressure Button - UNOBSTRUCTED
- b. All Antennas - CHECK

**5. LEFT WING TRAILING EDGE:**

- a. Flap - CHECK
- b. Aileron - CHECK
- c. Wing Tip - CHECK
- d. Position Light - CHECK

**6. LEFT WING LEADING EDGE:**

- a. Stall Warning - CHECK
- b. Pitot Tube - CHECK (Remove Cover)
- c. Fuel Tank - CHECK QUANTITY; Filler Cap - SECURE.
- d. Cabin Air Intake - CHECK
- e. Tie Down and Chocks - REMOVE

**7. LEFT LANDING GEAR:**

- a. Wheel Well Door, Tire and Strut - CHECK
- b. Fuel Vent - CHECK
- c. Fuel Sump - DRAIN
- d. Fuel Selector Valve Sump - DRAIN; Cover - SECURE

**8. NOSE SECTION:**

- a. Left Cowl Flap - CHECK
- b. Engine Oil - CHECK (see Servicing, Section 8), Cap and Dipstick - SECURE
- c. Left Cowl - SECURE
- d. Propeller - CHECK, General Condition, Nicks, etc.
- e. Wheel Well Doors, Tire and Strut - CHECK
- f. Induction Air Intake - CLEAR
- g. Landing Lights - CHECK
- h. Engine - CHECK GENERAL CONDITION
- i. Right Cowl - SECURE
- j. Right Cowl Flap - CHECK
- k. Chocks - REMOVE

**9. RIGHT LANDING GEAR:**

- a. Fuel Vent - CHECK
- b. Fuel Sump - DRAIN
- c. Wheel Well Door, Tire and Strut - CHECK

**10. RIGHT WING LEADING EDGE:**

- a. Cabin Air Intake - CHECK
- b. Tie Down and Chocks - REMOVE
- c. Fuel Tank - CHECK QUANTITY; Filler Cap - SECURE

**11. RIGHT WING TRAILING EDGE:**

- a. Position Light - CHECK
- b. Wing Tip - CHECK
- c. Aileron - CHECK
- d. Flap - CHECK

*CAUTION*

NEVER TAXI IF ANY STRUT IS FLAT.

## **BEFORE STARTING**

1. Seats - POSITION AND LOCK; Seat Backs - UPRIGHT
2. Seat Belts and Shoulder Harnesses - FASTEN
3. Parking Brake - SET
4. All Avionics - OFF
5. Circuit Breakers - IN
6. Landing Gear Handle - DOWN; Safety System - CHECK (If installed)
7. Flaps - UP
8. Cowl Flaps - OPEN
9. Light Switches - As Required
10. Electric Elevator Trim Switch - OFF (If installed)
11. Fuel Selector Valve - CHECK OPERATION; SELECT TANK MORE NEARLY FULL
12. Battery and Alternator Switches - ON (If external power is used, turn Alternator Switch - OFF)
13. Fuel Quantity Indicators - CHECK QUANTITY

## **WARNING**

Do not take off if gages indicate in yellow arc or with less than 13 gallons in each tank.

## **EXTERNAL POWER**

When using external power, it is very important that the following precautions be observed:

1. The airplane has a negative ground system. Exercise care to avoid reversed polarity. Be sure to connect the positive lead of the external power unit to the positive terminal of the airplane's external power receptacle and the negative lead to the negative terminal of the external power receptacle. A positive voltage must also be applied to the small guide pin.

2. To prevent arcing, make certain no power is being supplied when the connection is made.
3. Make certain that the battery switch is ON, all avionics and electrical switches OFF, and a battery is in the system before connecting an external power unit. This protects the voltage regulators and associated electrical equipment from voltage transients (power fluctuations).

### **STARTING ENGINE USING AUXILIARY POWER UNIT**

1. Alternator, Electrical, and Avionics Equipment - OFF
2. Auxiliary Power Unit - CONNECT
3. Auxiliary Power Unit - SET OUTPUT (13.5 to 14.25 volts)
4. Auxiliary Power Unit - ON
5. Engine - START using normal procedures
6. Auxiliary Power Unit - OFF (after engine has been started)
7. Auxiliary Power Unit - DISCONNECT
8. Alternator Switch - ON

### **STARTING**

#### *CAUTION*

Vernier-type engine controls should not be rotated clockwise after being advanced to the full forward position.

1. Mixture - FULL RICH
2. Propeller - HIGH RPM
3. Throttle - FULL OPEN
4. Auxiliary Fuel Pump - On until fuel flow peaks then OFF



5. Throttle - Approximately 1/4 inch open.
6. Magneto/Start Switch - START position; release to BOTH position when engine fires

*CAUTION*

Do not engage starter for more than 30 seconds in any 4-minute time period.

7. In Event of Overprime Condition:
  - a. Mixture - IDLE CUT-OFF
  - b. Throttle - OPEN
  - c. Magneto/Start Switch - START position
  - d. As engine fires, reduce throttle to IDLE and advance the mixture control to FULL RICH

*NOTE*

During hot starts, the Auxiliary Fuel Pump is turned on momentarily after starting to purge system, then turned off.

8. Throttle - 1000 to 1200 RPM
9. Oil Pressure - CHECK
10. External Power (if used) - DISCONNECT
11. Alternator Switch - ON; CHECK FOR CHARGING
12. All Engine Indicators - CHECK

*CAUTION*

The ammeter indication should be less than 25% of full charge at 1000 to 1200 rpm within two minutes, with no additional electrical equipment on. If not, turn off the battery and generator switches and do not take off.

## **AFTER STARTING, AND TAXI**

1. Brakes - RELEASE AND CHECK
2. Avionics Equipment - ON, AS REQUIRED
3. Lights - AS REQUIRED

### *CAUTION*

Do not operate engine above 1200 RPM until oil temperature reaches 75°F (24°C).

## **BEFORE TAKEOFF**

1. Parking Brake - SET
2. Seat Belts and Shoulder Harnesses - CHECK

### **NOTE**

All reclining seats must be in the upright position during takeoff.

3. Avionics - CHECK
4. Engine Instruments - CHECK
5. Flight Instruments - CHECK AND SET

### **NOTE**

To ensure adequate gyro pressure when operating two air-driven gyros during ground operation and/or holding prior to takeoff, maintain an engine speed of 700-800 rpm in order to keep needle in the green arc on the instrument pressure gage. With a requirement of three or more air-driven gyros, maintain an engine speed of 1200 rpm.

6. Ammeter - CHECK - for stabilized indication between 0 and 25% of full charge at 1000 to 1200 rpm.
7. Auxiliary Fuel Pump - CHECK OFF
8. Throttle - 1700 RPM
9. Propeller - EXERCISE to obtain approximately 300 to 400 rpm drop; return to high rpm
10. Magnetos - CHECK at 1700 rpm (variance between individual magnetos should not exceed 50 rpm, maximum drop not to exceed 150 rpm.)
11. Trim - SET
  - a. Aileron - NEUTRAL (if installed)
  - b. Elevator - 0° (3° nose up if only front seats are occupied)
12. Flaps - Check operation, then UP
13. Door and Windows - SECURE
14. Flight Controls - CHECK PROPER DIRECTION, FULL TRAVEL AND FREEDOM OF MOVEMENT
15. Mixture - FULL RICH (or as required by field elevation)
16. Brakes - RELEASED
17. Instruments - CHECK (Make final check of manifold pressure, fuel flow, and rpm at the start of the take-off run.)

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## **TAKE-OFF**

Take-Off Power ..... Full Throttle, 2700 rpm

1. Power - SET TAKE-OFF POWER (Mixture - SET as required by field elevation)
2. Brakes - RELEASE THEN ACCELERATE to recommended speeds
3. Landing Gear - RETRACT (when positive rate of climb is established and insufficient runway remains for landing)
4. Airspeed - ESTABLISH DESIRED CLIMB SPEED (when clear of obstacles)

## **CLIMB**

Maximum Continuous ..... Full Throttle, 2700 rpm  
Cruise Climb ..... 25 in. Hg (or full throttle) 2500 rpm

1. Engine Temperatures - MONITOR
2. Power - SET AS DESIRED.
3. Mixture - SET FUEL FLOW

## **CRUISE**

See Cruise Charts in PERFORMANCE Section.

1. Cowl Flaps - CLOSED
2. Power - SET
3. Mixture - SET FUEL FLOW

## LEANING USING THE EXHAUST GAS TEMPERATURE INDICATOR (EGT)

A thermocouple-type exhaust gas temperature (EGT) probe is mounted in the exhaust system. This probe is connected to an indicator on the instrument panel. The indicator is calibrated in degrees Fahrenheit. Use EGT system to lean the fuel/air mixture when cruising at 75% power or less in the following manner:

1. Lean the mixture and note the point on the indicator that the temperature peaks and starts to fall.
  - a. CRUISE (LEAN) MIXTURE - Increases the mixture until the EGT shows a drop of 25°F below peak on the rich side of peak.
  - b. BEST POWER MIXTURE - Increase the mixture until the EGT shows a drop of 100°F below peak on the rich side of peak.

### *CAUTION*

Do not continue to lean mixture beyond that necessary to establish peak temperature.

2. Continuous operation is recommended at 25°F or more below peak EGT only on the rich side of peak.
3. Changes in altitude and power settings require the peak EGT to be rechecked and the mixture reset.

## **DESCENT**

1. Altimeter - SET
2. Cowl Flaps - CLOSED
3. Power - AS REQUIRED (avoid prolonged idle settings and low cylinder head temperatures)
4. Mixture - ENRICH AS REQUIRED

## **BEFORE LANDING**

1. Seat Belts and Shoulder Harnesses - SECURE

### **NOTE**

All reclining seats must be in the upright position during landing.

2. Fuel Selector Valve - SELECT TANK MORE NEARLY FULL
3. Cowl Flaps - AS REQUIRED
4. Mixture - FULL RICH (or as required by field elevation)
5. Landing Gear - DOWN and CHECK. (Observe maximum extension speed)
6. Landing and Taxi Lights - AS REQUIRED
7. Flaps - DOWN (Observe maximum extension speed)
8. Airspeed - ESTABLISH LANDING APPROACH SPEED.
9. Propeller - HIGH RPM
10. Electric Elevator Trim Switch - OFF (If installed)

## **BALKED LANDING**

1. Power - FULL THROTTLE, 2700 RPM
2. Airspeed - 70 kts/81 mph until clear of obstacles, then trim to normal climb speed
3. Flaps - UP
4. Landing Gear - UP
5. Cowl Flaps - OPEN

## **AFTER LANDING**

1. Landing and Taxi Lights - AS REQUIRED
2. Flaps - UP
3. Trim Tab - SET TO 0°
4. Cowl Flaps - OPEN

## **SHUTDOWN**

1. Brakes - SET
2. Electrical and Radio Equipment - OFF
3. Throttle - CLOSE
4. Mixture - IDLE CUT-OFF
5. Magneto/Start Switch - OFF, after engine stops
6. Battery and Alternator Switches - OFF
7. Control Lock - INSTALL, if conditions warrant.
8. Install wheel chocks and release brakes if the airplane is to be left unattended.

## **ENVIRONMENTAL SYSTEMS**

### **OXYGEN SYSTEM**

#### ***PREFLIGHT***

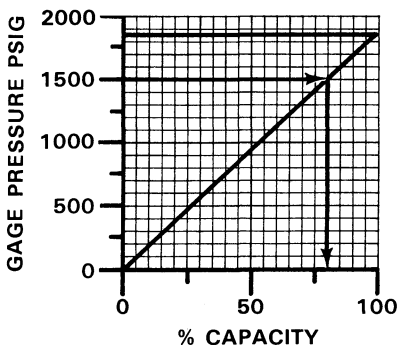
1. Check Oxygen Pressure Gage for pressure reading.
2. Determine percent of full system.
3. Multiply oxygen duration in minutes by percent of full bottle.



**EXAMPLE:**

People .....	5
Gage Pressure .....	1500 psig
Oxygen Available (from chart) .....	80%
Cylinder Capacity (full) .....	49 cu ft
Altitude (planned flight) .....	15,000 ft
Full Bottle Duration (from chart) .....	149 min
Duration (80% full) .....	119 min

**OXYGEN AVAILABLE WITH  
PARTIALLY FULL BOTTLE**



**OXYGEN DURATION**

The recommended masks are provided with the system. They are designed to be adjustable to fit the average person, with minimum leakage of oxygen.

**CAUTION**

Since 90% of the system efficiency is determined by the fit of the oxygen mask, make certain the masks fit properly and are in good condition.

*OXYGEN DURATION CHART (Full Bottle)*

Duration in minutes at the following altitudes:

Bottle Capacity	Persons Using	12,500 FT	15,000 FT	20,000 FT
49 cu ft	1	1014	746	507
	2	507	373	253
	3	338	248	169
	4	253	186	126
	5	202	149	101
	6	169	124	84

NOTE

To calculate duration times for the 114 cu. ft. bottle capacity use 230% of chart values.

**WARNING**

NO SMOKING when using oxygen.

*IN FLIGHT*

The use of oxygen is recommended to be in accordance with current FAR operating rules.

1. Oxygen Control Valve - OPEN SLOWLY
2. Mask - INSERT FITTING, DON MASK (adjust mask for proper fit)
3. Oxygen - CHECK INDICATOR FOR FLOW

*AFTER USING*

1. Discontinue use by unplugging mask from outlet.

### NOTE

Closing the control valve while in flight is not necessary due to automatic sealing of the outlet when the mask is unplugged. However, it is desirable to shut off supply when not in use.

2. Oxygen Control Valve - CLOSED (may be accomplished during shut-down)

### HEATING AND VENTILATION

Refer to the SYSTEMS DESCRIPTION Section for operation of heating and ventilation controls.

### COLD WEATHER OPERATION

#### PREFLIGHT INSPECTION

All accumulations of ice, snow and frost must be removed from the wings, tail, control surfaces and hinges, propeller, windshield, fuel cell filler caps, crankcase vents, and fuel vents. If such accumulations are not removed completely, the airplane shall not be flown. The deposits will not blow off in flight. While an adverse weight factor is clearly involved in the case of heavy deposits, it is less obvious that even slight accumulations will disturb or completely destroy the designed aerodynamic properties of the airfoils.

The normal preflight procedures should then be completed, with particular attention given to check of flight controls for complete freedom of movement.

## ENGINE

Use engine oil in accordance with Consumable Materials in the HANDLING, SERVICING AND MAINTENANCE Section. Always pull the propeller through by hand, opposite the direction of rotation, several times to clear the engine and "limber up" the cold, heavy oil before using the starter. This will also lessen the load on the battery if external power is not used.

Under very cold conditions, it may be necessary to preheat the engine prior to a start. Particular attention should be given to the oil cooler, engine sump and propeller hub to ensure proper preheat. A start with congealed oil in the system may produce an indication of normal pressure immediately after the start, but then the oil pressure may decrease when residual oil in the engine is pumped back with the congealed oil in the sump. If an engine heater capable of heating both the engine sump and cooler is not available, the oil should be drained while the engine is hot and stored in a warm area until the next flight.

If there is no oil pressure within the first 30 seconds of running, or if oil pressure drops after a few minutes of ground operation, shut down and check for broken oil lines, oil cooler leaks or the possibility of congealed oil.

### NOTE

It is advisable to use external power for starting in cold weather.

During warm-up, monitor engine temperatures closely, since it is quite possible to exceed the cylinder head temperature limit in trying to bring up the oil temperature.

Exercise the propeller several times to remove cold oil from the pitch change mechanism. The propeller should also be cycled occasionally in flight.

During letdown and landing, give special attention to engine temperatures, since the engine will have a tendency toward overcooling.

### **ICING CONDITIONS**

Flight in Known Icing Conditions Prohibited.

### **ENGINE BREAK-IN INFORMATION**

See Systems Description section

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