

# CHEROKEE 140

PA-28-140

## Owner's Handbook



Piper Aircraft Corporation, Vero Beach, Florida  
U.S. A.

## NOTICE

THIS HANDBOOK IS NOT DESIGNED, NOR CAN ANY HANDBOOK SERVE, AS A SUBSTITUTE FOR ADEQUATE AND COMPETENT FLIGHT INSTRUCTION, OR KNOWLEDGE OF THE CURRENT AIRWORTHINESS DIRECTIVES, THE APPLICABLE FEDERAL AIR REGULATIONS, AND ADVISORY CIRCULARS. IT IS NOT INTENDED TO BE A GUIDE OF BASIC FLIGHT INSTRUCTION, NOR A TRAINING MANUAL.

THE HANDBOOK IS DESIGNED:

1. TO HELP YOU OPERATE YOUR CHEROKEE WITH SAFETY AND CONFIDENCE.
2. TO MORE FULLY ACQUAINT YOU WITH THE BASIC PERFORMANCE AND HANDLING CHARACTERISTICS OF THE AIRPLANE.
3. TO MORE FULLY EXPLAIN YOUR CHEROKEE'S OPERATION THAN IS PERMISSIBLE TO SET FORTH IN THE AIRPLANE FLIGHT MANUAL.

IF THERE IS ANY INCONSISTENCY BETWEEN THIS HANDBOOK AND THE AIRPLANE FLIGHT MANUAL APPROVED BY THE F.A.A., THE AIRPLANE FLIGHT MANUAL SHALL GOVERN.

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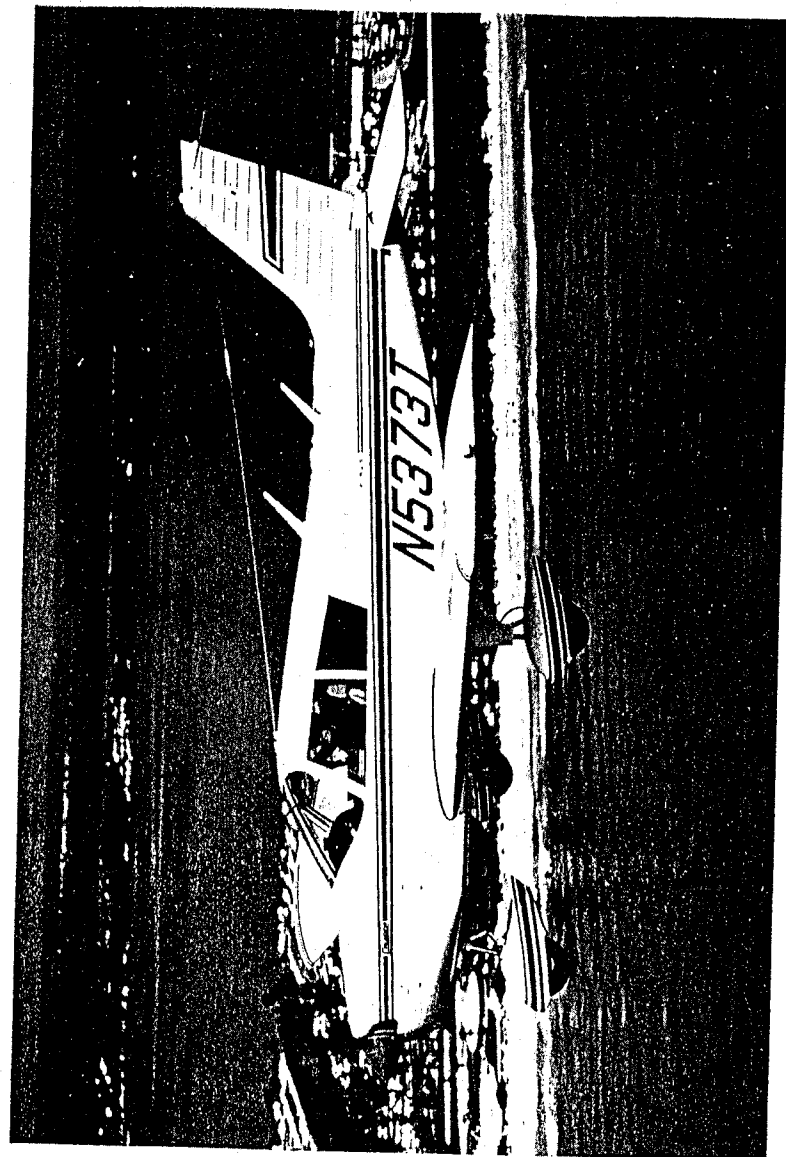
Revised text and illustrations shall be indicated by a black vertical line in the margin opposite the change. A line opposite the page number will indicate that material was relocated.

Additional copies of this manual, Piper No. 761 512, may be obtained from your Piper Dealer.

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## SECTION I

## SPECIFICATIONS

## PERFORMANCE

The following performance figures apply to standard airplanes flown at a gross weight of 2150 pounds under standard conditions at sea level, or stated altitude. Any deviation from standard equipment may result in changes in performance.

GROSS WEIGHT	2150
Take-off Run (ft) (flaps up)	800
Take-off Distance Over 50-ft Obstacle (ft) (flaps up)	1700
Best Rate of Climb Speed (mph)	89
Rate of Climb (ft per min)	631
Service Ceiling (ft)	10,950
Absolute Ceiling	13,000
Top Speed (mph)	139 (142*)
Cruising Speed (75% power, sea level) (mph)	121 (124*)
Optimum Cruising Speed (75% power, 7000 ft, mph)	132 (135*)
Instructional Power Cruise Speed (60% power, sea level)	108 (110*)
Fuel Consumption (gal per hr 75%)	8.4
Fuel Consumption (gal per hr 50%)	5.6

\*WITH WHEEL FAIRINGS

## SECTION I

## CHEROKEE 140

## SPECIFICATIONS (cont):

## PERFORMANCE

GROSS WEIGHT 2150

Cruising Range (75% power, sea level, mi)	495 (710**)
Cruising Range (75% power, 7000 ft, mi)	540 (780**)
Optimum Cruising Range (55% power, 10,000 ft)	670 (930**)
Instructional Power Cruising Range (60% power, sea level)	575 (800**)
Stalling Speed (flaps down, mph)	55
Landing Roll (flaps down, ft)	535 *

\*This value applies only for the conditions indicated on the landing distance versus density altitude chart.

## WEIGHTS

Gross Weight (lbs)	2150
Empty Weight (Standard) (lbs)	1250
USEFUL LOAD (Standard) (lbs)	900

## POWER PLANT

Engine - Lycoming	O-320-E3D
Rated Horsepower and Speed (rpm)	150 at 2700
Bore (inches)	5.125
Stroke (inches)	3.875
Displacement (cubic inches)	319.8
Compression Ratio	7:1
Dry Weight (pounds)	276
Oil Sump Capacity (qts)	8
Propeller (Sensenich)	M74DM

\*\*WITH RESERVE FUEL (50 GAL)

## CHEROKEE 140

## SECTION I

## SPECIFICATIONS (cont):

## FUEL AND OIL

Fuel Capacity (U.S. gal) Standard	36
Fuel Capacity (U.S. gal) Reserve	50
Oil Capacity (qts)	8
Fuel, Aviation Grade (Minimum Octane)	80/87
(Specified Octane)	80/87
(Alternate Fuels)	See page 53

## BAGGAGE

Maximum Baggage (lbs)	200***
Baggage Space (cubic ft)	22

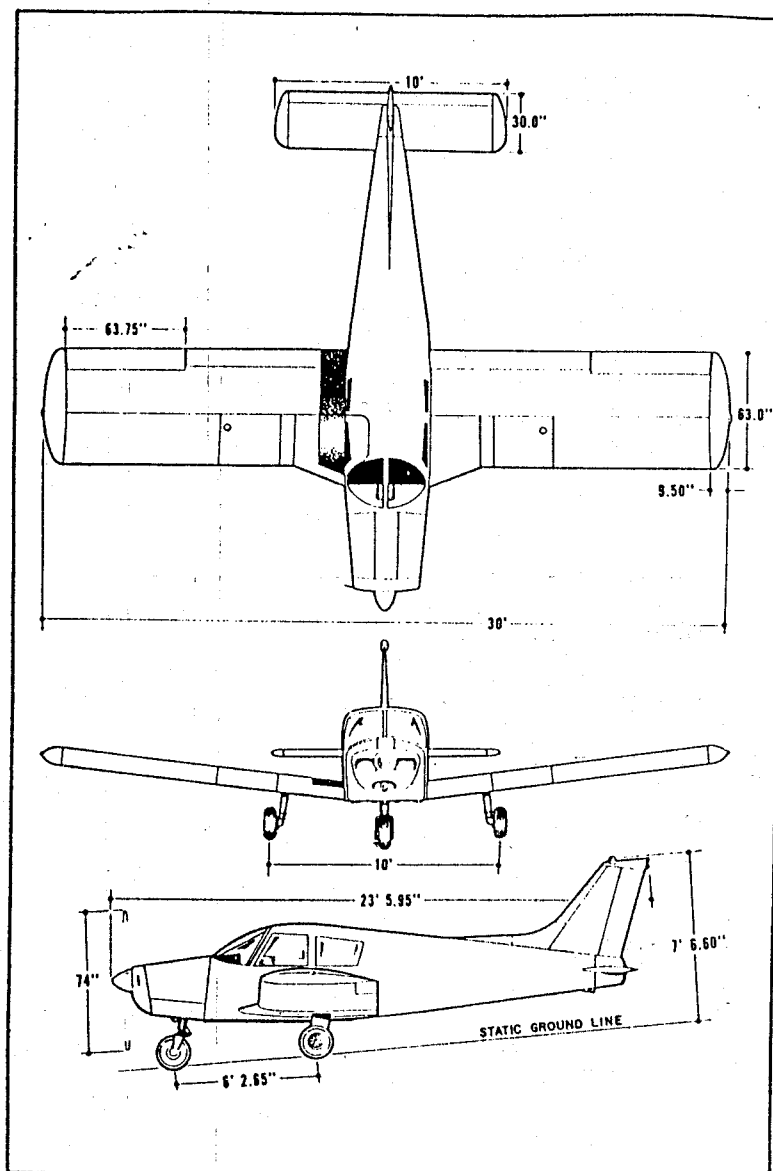
## DIMENSIONS

Wing Span (ft)	30
Wing Area (sq ft)	160
Wing Loading (lbs per sq ft)	13.4
Length (ft)	23.3
Height (ft)	7.3
Power Loading (lbs per hp)	14.3

## LANDING GEAR

Wheel Base (ft)	6.2
Wheel Tread (ft)	10.0
Tire Pressure (lbs)	Nose 24
	Main 24
Tire Size	Nose (4 ply rating) 6.00 x 6
	Main (4 ply rating) 6.00 x 6

\*\*\*EXCEPT WHEN FAMILY SEATS AND SAFETY FAMILY BELTS ARE INSTALLED, 340 LBS IS PERMITTED. FAMILY SEATS NOT FACTORY INSTALLED IN FLITE LINER.



## SECTION II

## DESIGN INFORMATION

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## SECTION II

## DESIGN INFORMATION

## ENGINE AND PROPELLER

The Lycoming O-320-E3D engine installed in the Cherokee PA-28-140 is rated at 150 horsepower at 2700 rpm. This engine has a compression ratio of 7 to 1 and requires 80/87 minimum octane fuel. Refer to Fuel Requirements, page 53, when using alternate fuels. The engine is equipped with direct drive or optional geared drive starter, a 60 ampere alternator, dual magnetos, vacuum pump drive, diaphragm type fuel pump and a float carburetor.

Exhaust gases are carried through a system constructed of heavy gauge stainless steel which incorporates heater shrouds to provide cabin heat, defrosting, and carburetor deicing.

The propeller used on the PA-28-140 is a Sensenich M74DM fixed-pitch aluminum alloy unit. Its diameter is 74 inches with a standard pitch of 58 inches. All performance figures are based on the standard 58 inch pitch propeller.

Cowling on the Cherokee is designed to cool the engine in all normal flight conditions, including protracted climb, without the use of cowl flaps or cooling flanges.

The throttle quadrant is in the lower center of the instrument panel and contains the throttle and mixture control. A friction lock on the right side of the quadrant prevents creeping of the controls. To the right of the quadrant is the carburetor heat control that provides maximum carburetor heat when fully ON. Air passes through a highly efficient dry type filter when the carburetor heat is OFF.

The Flite Liner incorporates a throttle detent adjusted to the 60% power location for the throttle control. When the throttle is set in this detent, the tachometer needle will match the white radial decal indicating 2265 RPM on the glass of the tachometer at 3500 feet altitude. The arcs of this decal represent 60% power at sea level (2180 RPM) and 7000 feet (2345 RPM). Thus an economical 60% power setting can be easily obtained up to 7000 feet altitude.

## STRUCTURES

All structures are of aluminum alloy construction and are designed to ultimate load factors well in excess of normal requirements. All exterior surfaces are primed with etching primer and painted with acrylic lacquer.

The wings are attached to each side of the fuselage by inserting the butt ends of the respective main spars into a spar box carry through which is an integral part of the fuselage structure, providing, in effect, a continuous main spar with splices at each side of the fuselage. There are also fore and aft attachments at the rear spar and at an auxiliary front spar.

The wing airfoil section is a laminar flow type, NACA65<sub>2</sub>-415 with the maximum thickness about 40% aft of the leading edge. This permits the main spar carry through structure to be located under the rear seat providing unobstructed cabin floor space ahead of the rear seat.

## LANDING GEAR

The three landing gears use a Cleveland 6.00 x 6 wheel, the main wheels being provided with brake drums and Cleveland single disc hydraulic brake assemblies. The nose wheel and the main gear both use 6.00 x 6 four ply tires. All the tires have tubes.

The nose gear is steerable through a 44° arc by use of the rudder pedals. A spring device is incorporated in the rudder pedal torque tube assembly to aid in rudder centering and to provide rudder trim. The nose gear steering mechanism also incorporates a hydraulic shimmy dampener.

The oleo struts are of the air-oil type with normal extension being 3.25 inches for the nose gear and 4.50 inches for the main gear under normal static (empty weight of airplane plus full fuel and oil) load.

The brakes are actuated by a hand lever and a master cylinder which is located below and near the center of the instrument panel. The toe brakes and the hand lever have their own brake cylinders but they both use a common reservoir. The parking brake is incorporated in the lever brake and is operated by pulling back on the lever and depressing the knob attached to the top of the handle. To release the parking

brake, pull back on the brake lever to disengage the catch mechanism; then allow the handle to swing forward.

## CONTROL SYSTEM

Dual controls are provided as standard equipment with a cable system used between the controls and the surfaces. The horizontal tail is of the all movable slab type, with an anti-servo tab acting as a longitudinal trim tab. It is actuated by a control wheel on the floor between the front seats. The stabilator provides extra stability and control with less size, drag, and weight than conventional tail surfaces. The differential action of the ailerons tends to eliminate adverse yaw in turning maneuvers and reduces the amount of coordination required in normal turns.

The flaps are manually operated, balanced for light operating forces and spring loaded to return to the up position. A past-center lock incorporated in the actuating linkage holds the flap when it is in the up position so that it may be used as a step on the right side. The flap will not support a step load except when in the full up position, so it must be completely retracted when used as a step. The flaps have three extended positions, 10, 25 and 40 degrees.

## FUEL SYSTEM

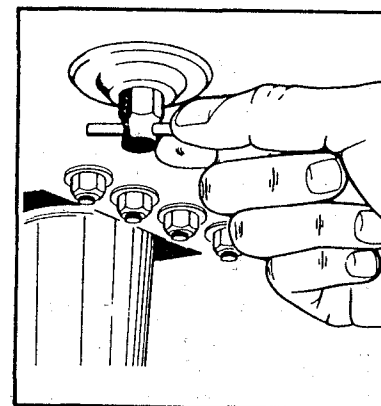
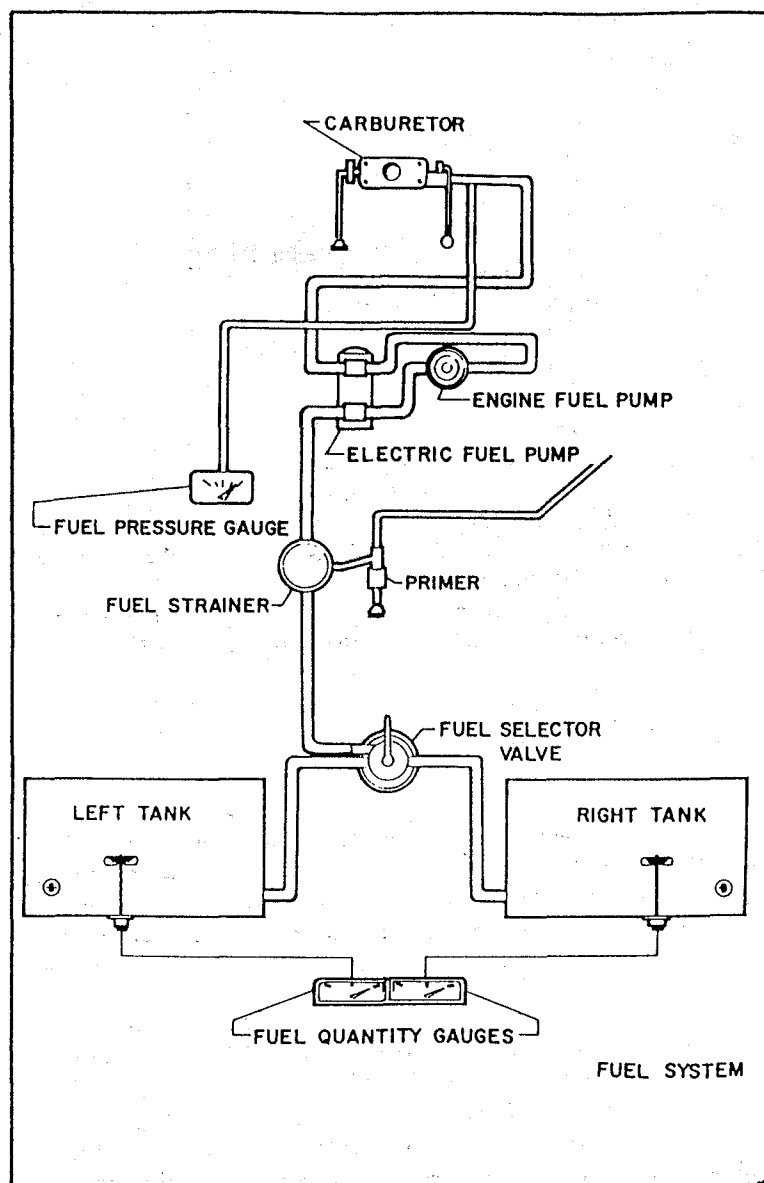
Fuel is stored in two twenty-five gallon tanks which are secured to the leading edge structure of each wing by screws and nut plates to allow easy removal for service or inspection.

The standard quantity of fuel is 36 gallons for the Cherokee 140. To obtain the standard quantity of fuel, fill the tanks to the bottom of the filler neck indicator.

An auxiliary electric fuel pump is provided for use in case of failure of the engine driven pump. The electric pump should be on for all take-offs and landings and when switching tanks.

The fuel strainer is equipped with a quick drain and is located on the front lower left corner of the firewall. This strainer should be drained regularly to check for water or sediment accumulation. To drain the lines from the tanks, the tank selector valve must be switched





Fuel Strainer

to each tank in turn, with the electric pump on, and the gascolator drain valve opened. Each tank has an individual quick drain located at the bottom, inboard, rear corner.

Fuel quantity and pressure are indicated on gauges located in the engine gauge cluster on the left side of the instrument panel.

### ELECTRICAL SYSTEM

The electrical system includes a 12 volt 60 ampere alternator, battery, voltage regulator, overvoltage relay, and master switch relay. The battery and master switch relay are located beneath the baggage compartment floor. Access for service or inspection is obtained by raising the hinged floor panel. The regulator and overvoltage relay are located on the forward left side of the fuselage behind the instrument panel.

Electrical switches are located on the right center instrument panel, and the circuit breakers are located on the lower right instrument panel. A rheostat switch on the right side of the switch panel controls the navigation lights and the intensity of the instrument panel light.

Standard electrical accessories include starter, electric fuel pump, stall warning indicator, cigar lighter, and ammeter. Navigation lights, anti-collision light, landing light and instrument panel lighting are offered as optional accessories.

The Flite Liner includes as standard electrical accessories; starter, electrical fuel pump, stall warning indicator, ammeter, navigation lights, anti-collision light, landing light and instrument panel lights.

Circuit provisions are made to handle a complete complement of communications and navigational equipment.

The alternator system offers many advantages over the generator system. The main advantage is full electrical power output at much lower engine RPM and results in improved radio and electrical equipment operation. Since the alternator output is available all the time, the battery will be charging almost continuously. This will make cold weather starting easier.

In generator systems, the ammeter indicates battery discharge. In the Cherokee electrical system the ammeter displays in amperes the load placed on the alternator. With all electrical equipment except the master switch in the OFF position, the ammeter will indicate the amount of charging current demanded by the battery. As each item of electrical equipment is turned on, the current will increase to a total appearing on the ammeter. This total includes the battery. The maximum continuous load for night flight with radios on is about 30 amperes. This 30 ampere value plus approximately 2 amperes for a fully charged battery will appear continuously under these flight conditions.

The master switch is a split switch with the left half operating the master relay and the right half energizing the alternator. The switch is interlocked so that the alternator cannot be operated without the battery. For normal operation, be sure both halves are turned on.

Maintenance on the alternator should prove to be a minor factor. Should service be required, contact the local Piper Dealer. Do not take off with a fully discharged battery as 3 volts are needed to excite the alternator.

### HEATING AND VENTILATING SYSTEM

Heat for the cabin interior and the defroster system is provided by

a heater muff attached to the exhaust system. The amount of heat desired can be regulated with the controls located on the far right side of the instrument panel. If unusual odors are noticed, the heat should be shut off and the system inspected for leaks. The air flow may be regulated between the front and rear seats by the use of the levers located on top of the heat ducts next to the control console.

Fresh air inlets are located in the leading edge of the wing at the intersection of the tapered and straight sections. A large adjustable outlet is located on the side of the cabin near the floor at each seat location, overhead air outlets are offered as optional equipment. Cabin air is exhausted through an outlet located below the rear seat floor panel.

On Flite Liner overhead air outlets are not offered as optional equipment.

### CABIN FEATURES

The instrument panel of the Cherokee is designed to accommodate the customary advanced flight instruments and all the normally required power plant instruments. The artificial horizon and directional gyro are vacuum operated through use of a vacuum pump installed on the engine, while the turn indicator is electrically operated. A vacuum gauge is mounted on the far right side of the instrument panel. A natural separation of the flight group and power group is provided by placing the flight group in the upper instrument panel and the power group in the sub-panel center. The radios and circuit breakers located on the right hand instrument panel have extra circuits provided for a complete line of optional radio equipment. The microphone is located on the console cover, see illustration, page 15, item 38 and page 10, item 20.

The front seats are adjustable fore and aft, and recline for pilot-passenger comfort and ease of entry and exit. A family seat installation is available which provides two additional seats. Each family seat is capable of carrying a full size adult which gives the Cherokee 140 4-place capability. Optional headrests and vertically adjustable, front seats are also available.

A single strap shoulder harness controlled by an inertia reel is standard equipment for the front seats, and is offered as an option for the rear seats when they are installed. The shoulder strap is routed over the shoulder adjacent to the windows and attached to the inboard lap strap in the general area of the occupant's inboard hip.

A check of the inertia reel mechanism is made by pulling sharply on the strap. The reel will lock in place under this test and prevent the strap from extending. Under normal movement the strap will extend and retract as required.

The Flite Liner has all of the above features except, there is only one radio installed, optional headrests, vertically adjustable front seats, and family seats are not available.

#### AIR CONDITIONING\*

The air conditioning system is a recirculating air system. The major items include; evaporator, condenser, compressor, blower, switches and temperature controls.

The evaporator is located behind the left rear side of the baggage compartment. This cools the air that is used for air conditioning.

The condenser is mounted on a retractable scoop located on the bottom of the fuselage and to the rear of the baggage compartment area. The scoop extends when the air conditioner is "ON" and retracts to a flush position when the system is "OFF."

The compressor is mounted on the forward right underside of the engine. It has an electric clutch which automatically engages or disengages the compressor to the belt drive system of the compressor.

An electrical blower is mounted on the aft side of the rear cabin panel. Air from the baggage area is drawn through the evaporator by the blower and distributed through an overhead duct to individual outlets located adjacent to each occupant.

The switches and temperature control are located on the lower right side of the instrument panel in the climate control center panel. The temperature control regulates the desired temperature of the cabin. Turn the control clockwise for increased cooling, counterclockwise for decreased cooling.

\*Optional Equipment.

Located inboard of the temperature control is the fan speed switch and the air conditioning "ON-OFF" switch. The fan can be operated independently of the air conditioning. However, it must be on for air conditioner operation. Turning either switch off will disengage the compressor clutch and retract the condenser door. Cooling air should be felt within one minute after the air conditioner is turned on.

#### NOTE

If the system is not operating in 5 minutes turn the system "OFF" until the fault is corrected.

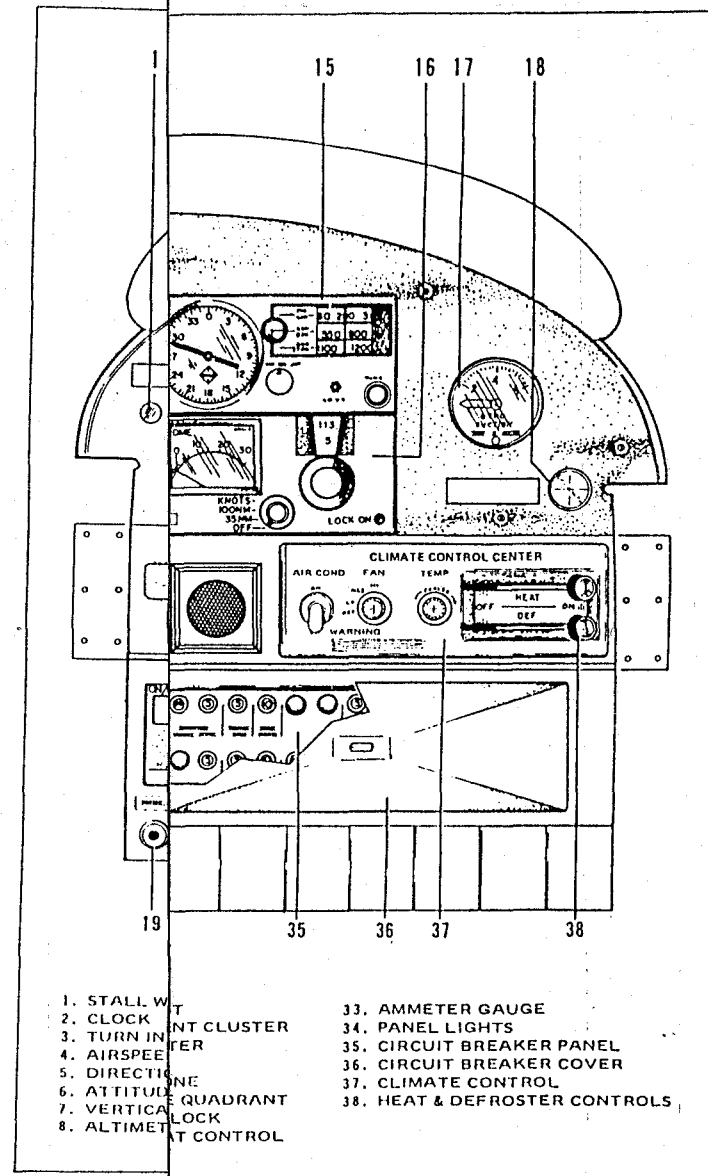
The "FAN" switch allows operation of the fan with the air conditioner turned "OFF" to aid cabin air circulation if desired. A "LOW," "MED" or "HIGH" flow of air can be selected to the air conditioner outlets located in the overhead duct. The outlets can be adjusted or turned off by each occupant to obtain individual cooling effect.

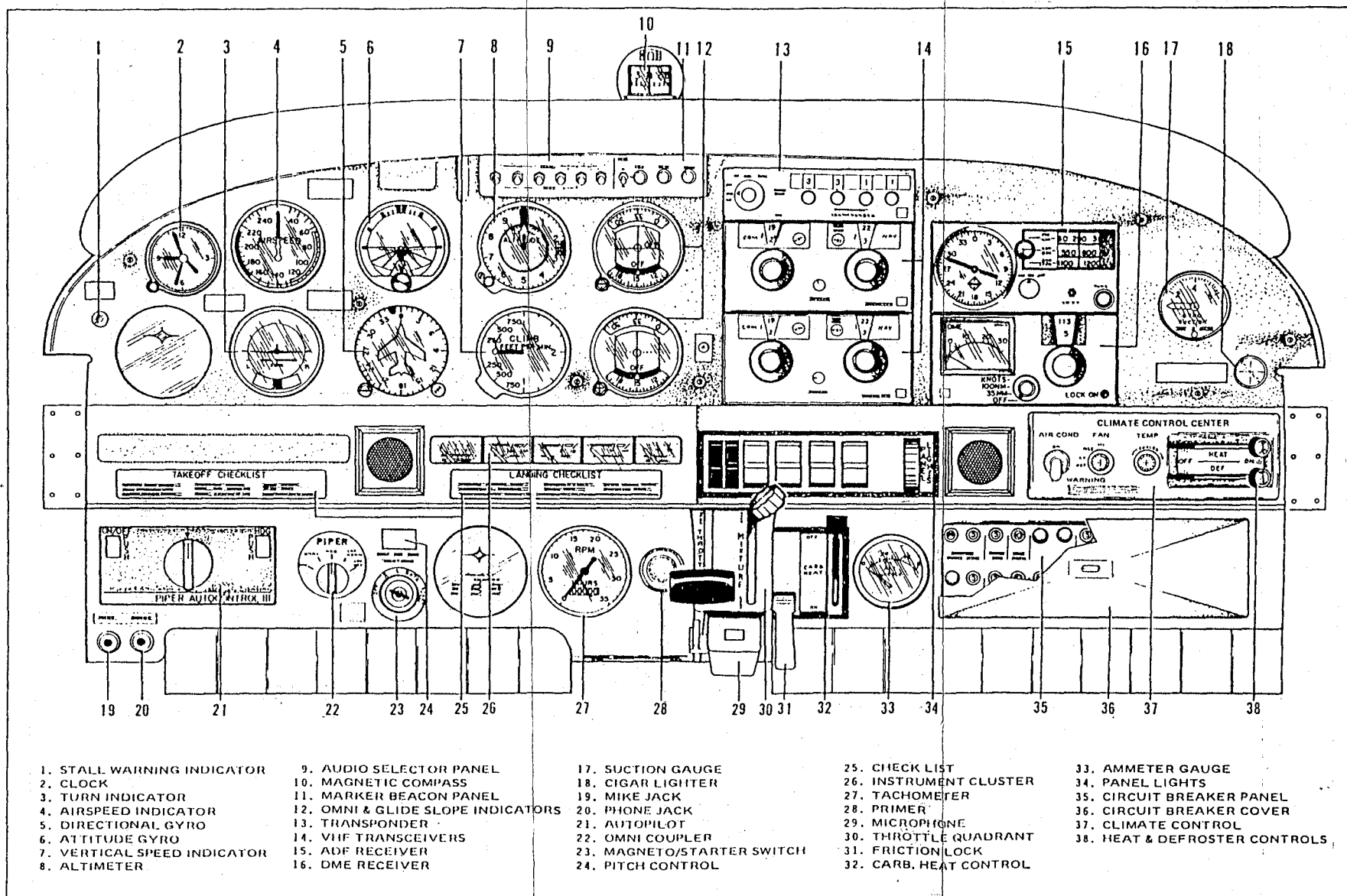
The "DOOR OPEN" indicator light is located to the left of the radio stack in front of the pilot. The light illuminates whenever the condenser door is open and remains on until the door is closed.

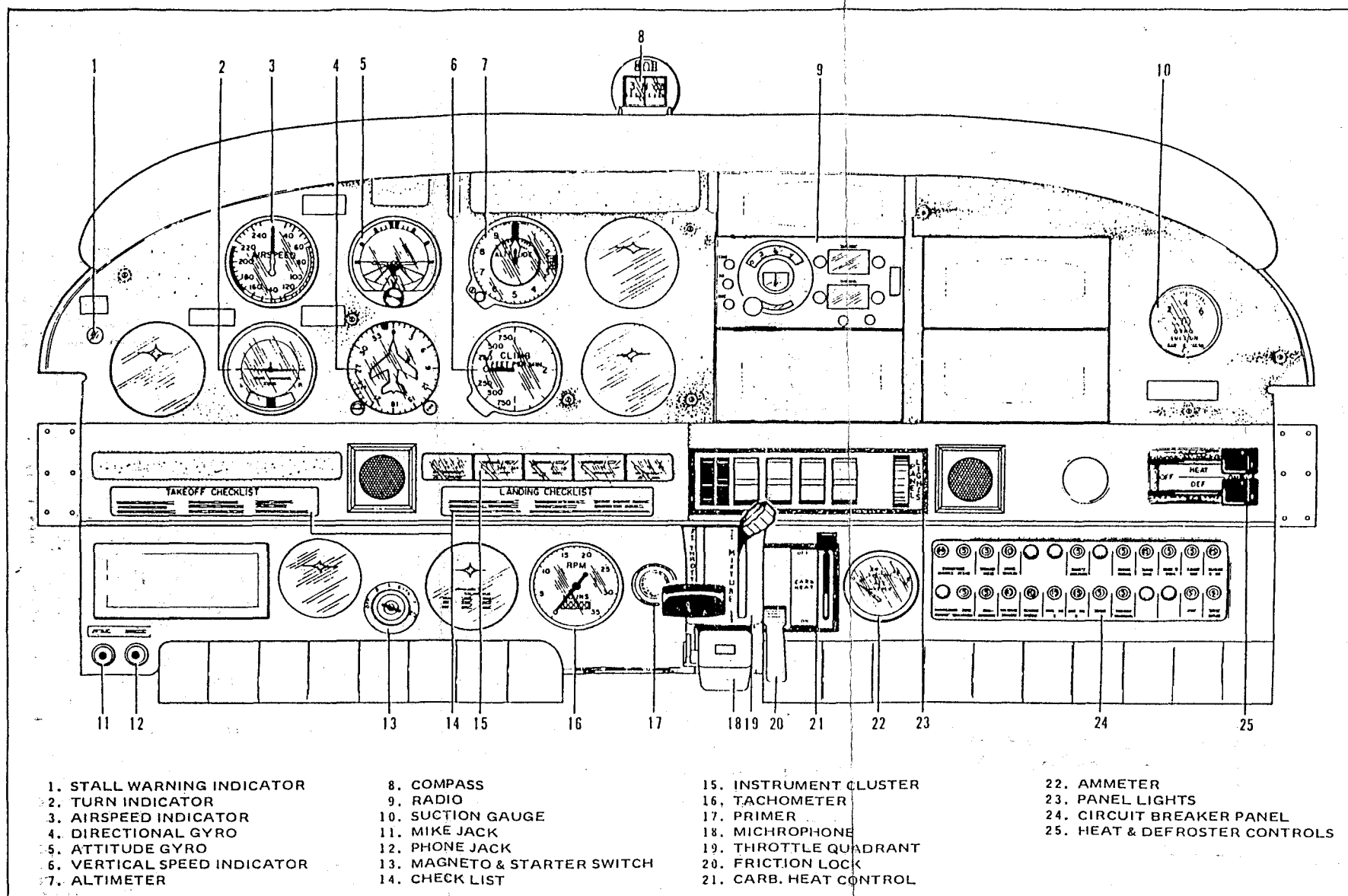
A circuit breaker located on the circuit breaker panel protects the air conditioning electrical system.

Whenever the throttle is in the full throttle position, it actuates a micro switch which disengages the compressor and retracts the scoop. This is done to obtain maximum power and maximum rate of climb. The fan continues to operate and the air will remain cool for approximately one minute. When the throttle is retarded approximately 1/4 inch, the clutch will engage and the scoop will extend, again supplying cool, dry air.

## NOTES

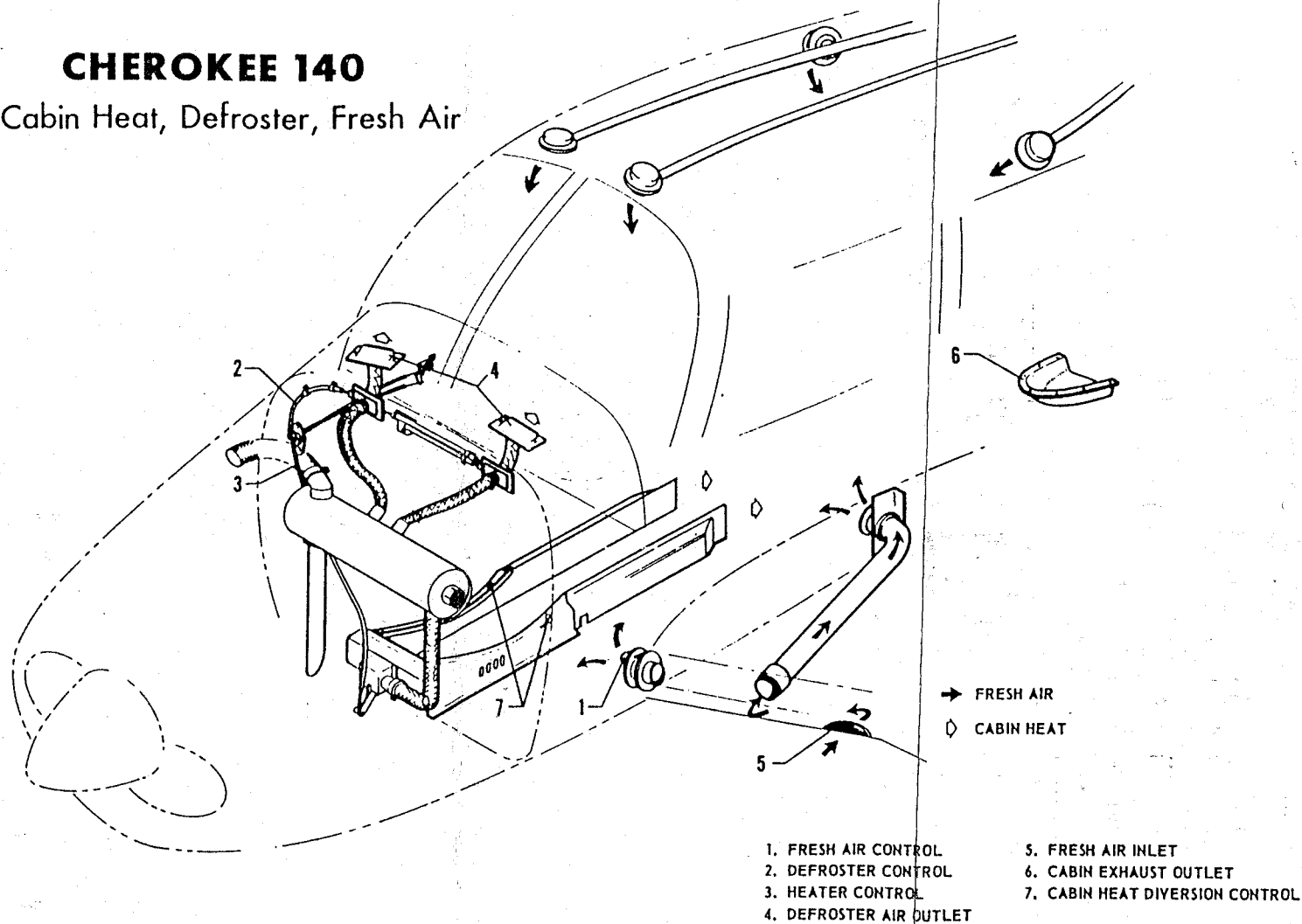






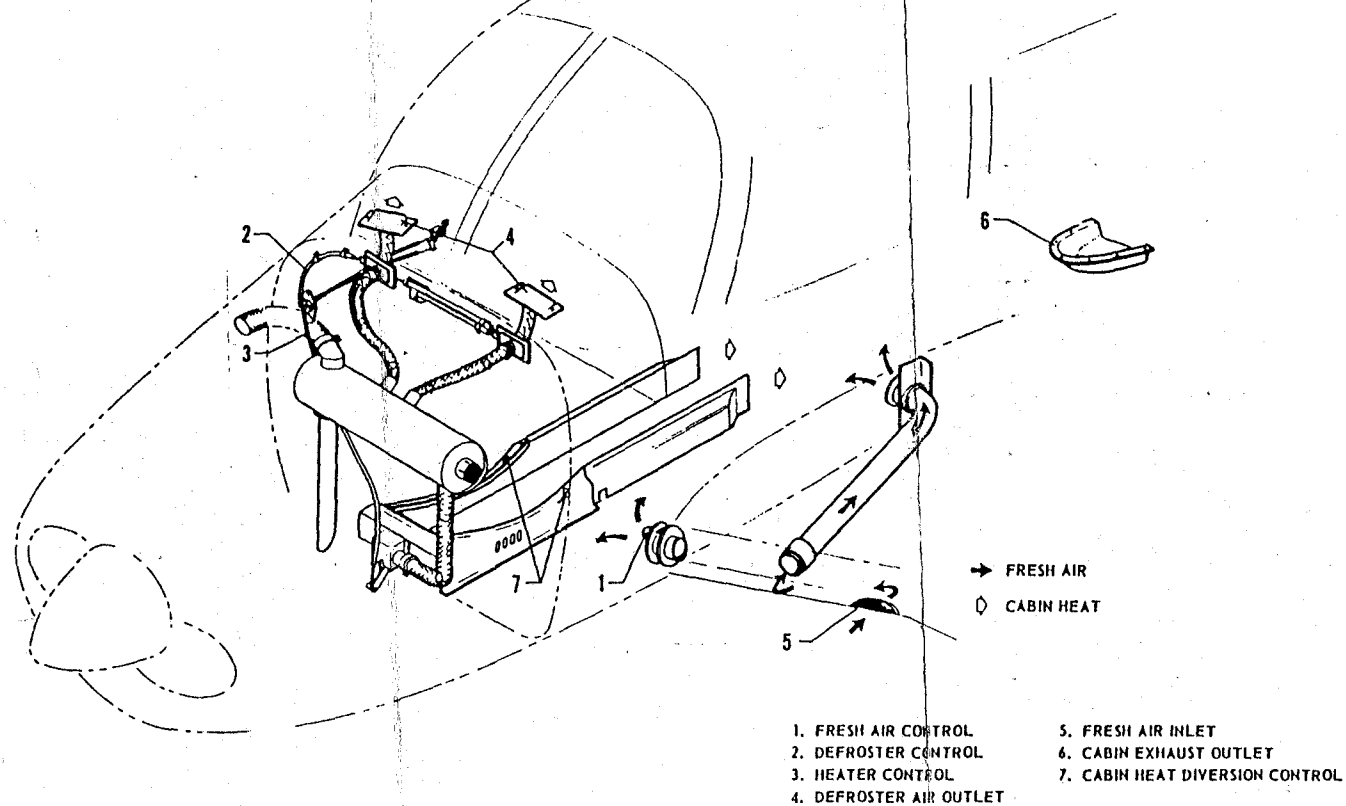
# **CHEROKEE 140**

Cabin Heat, Defroster, Fresh Air



## CHEROKEE 140

Cabin Heat, Defroster, Fresh Air



FLITE LINER



## SECTION III

### OPERATING INSTRUCTIONS

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2. a. Check for external damage, operational interference of control surfaces or hinges.
  - b. Insure that wings and control surfaces are free of snow, ice or frost.
3. a. Visually check fuel supply, secure caps.
  - b. Drain all fuel system sumps and lines.
  - c. Check that fuel system vents are open.
4. a. Check landing gear shock struts for proper inflation.
  - b. Check tires for cuts, wear and proper inflation.
  - c. Check brake blocks and discs for wear and damage.
5. a. Inspect windshield for cleanliness.
  - b. Check the propeller and spinner for defects or nicks.
  - c. Check for obvious fuel or oil leaks.
  - d. Check oil level, 8 quarts maximum. (Insure dipstick is properly seated.)
    - e. Inspect cowlings and inspection covers for security.
    - f. Check nose wheel tire for inflation, wear.
    - g. Check nose wheel shock strut for proper inflation.
    - h. Check for foreign matter in air inlets.
6. a. Stow tow bar and control locks, if used.
  - b. Check baggage for proper storage and security.
  - c. Close and secure the baggage compartment door.
7. a. Upon entering aircraft ascertain that all primary flight controls operate properly.
  - b. Close and secure the cabin door.
  - c. Check that required papers are in order and in the aircraft.
  - d. Fasten seat belts and shoulder harness. Check function of inertia reel.

### STARTING ENGINE

1. Set parking brake ON.
2. Set the carburetor heat control in the full COLD (OFF) position.
3. Select the desired tank with fuel selector valve.

### Starting Engine When Cold:

1. Open throttle approximately 1/4 inch.
2. Turn the master switch ON.
3. Turn the electric fuel pump ON.
4. Move the mixture control to FULL RICH.
5. Engage the starter by rotating magneto switch clockwise and pressing in.
6. When the engine fires, advance throttle to desired setting. If the engine does not fire within five to ten seconds, disengage starter and prime with one to three strokes of the priming pump. Repeat the starting procedure.

### Starting Engine When Hot:

1. Open the throttle approximately 1/2 inch.
2. Turn the master switch ON.
3. Turn the electric fuel pump ON.
4. Put mixture control in IDLE CUT-OFF.
5. Engage the starter by rotating magneto switch clockwise and pressing in. When the engine fires, advance the mixture control and move the throttle to desired setting.

### Starting Engine When Flooded:

1. Open the throttle full.
2. Turn the master switch ON.
3. Turn the electric fuel pump OFF.
4. Put mixture control in IDLE CUT-OFF.
5. Engage the starter by rotating magneto switch clockwise and pressing in. When the engine fires, advance the mixture control and retard the throttle.

### Starting With External Power Source:

An optional feature known as Piper External Power (PEP) allows the operator to use an external battery to crank the engine without having to gain access to the aircraft battery.

The procedure is as follows:

1. Turn aircraft MASTER SWITCH to OFF.
2. Connect RED lead of PEP kit jumper cable to POSITIVE (+) terminal of external 12 volt battery and BLACK lead to NEGATIVE (-) terminal.

3. Insert plug of jumper cable into socket located on aircraft fuselage.
4. Turn aircraft MASTER SWITCH to ON and proceed with NORMAL engine starting technique.
5. After engine has been started, turn MASTER SWITCH to OFF and remove jumper cable plug from aircraft.
6. Turn aircraft MASTER SWITCH to ON and check alternator ammeter for indication of output. DO NOT ATTEMPT FLIGHT IF THERE IS NO INDICATION OF ALTERNATOR OUTPUT.

When the engine is firing evenly, advance the throttle to 800 RPM. If oil pressure is not indicated within thirty seconds, stop the engine and determine the trouble. In cold weather it will take a few seconds longer to get an oil pressure indication. If the engine has failed to start, refer to the "Lycoming Operating Handbook, Engine Troubles and Their Remedies."

Starter manufacturers recommend that cranking periods be limited to thirty seconds with a two minute rest between cranking periods. Longer cranking periods will shorten the life of the starter.

#### WARM-UP

As soon as the engine starts, the oil pressure should be checked. If no pressure is indicated within thirty seconds, stop the engine and determine the trouble. In cold weather it will take a few seconds longer to get an oil pressure indication. Warm-up the engine at 800 to 1200 RPM.

Take-off may be made as soon as ground check is completed, providing that the throttle may be opened fully without back firing or skipping, and without reduction in engine oil pressure.

#### GROUND CHECK

Check the magnetos at 2000 RPM by switching from Both to Right then back to Both before switching to Left. Differential drop should not exceed 50 RPM while the total drop on either magneto should not exceed 175 RPM.

Check both the oil temperature and pressure. The temperature may be low for some time if the engine is being run for the first time of the day, but as long as the pressure is within limits the engine is ready for take-off.

Carburetor heat should also be checked prior to take-off to be sure that the control is operating properly and to clear any ice which may have formed during taxiing. Avoid prolonged ground operation with carburetor heat ON as the air is unfiltered.

Operation of the engine driven fuel pump should be checked while taxiing or during pretake-off engine run up by switching off the electric fuel pump and observing fuel pressure. The electric fuel pump should be on during take-off to prevent loss of power should the engine driven pump fail. The engine is warm enough for take-off when the throttle can be opened without the engine faltering. For air conditioner ground check refer to page 31.

Mixture should be set full rich, except a minimum amount of leaning is permitted for smooth engine operation when taking off at high elevation.

#### TAKE-OFF

Just before take-off the following items should be checked:

- |                            |                           |
|----------------------------|---------------------------|
| 1. Fuel on proper tank     | 7. Seat backs erect       |
| 2. Electric fuel pump - on | 8. Fasten belts/harness   |
| 3. Engine gages checked    | 9. Trim tab - set         |
| 4. Flaps - set             | 10. Controls - free       |
| 5. Carb. heat off          | 11. Door - latched        |
| 6. Mixture - set           | 12. Air conditioner - off |

In the conventional take-off procedure set the trim control slightly aft of neutral. Allow the airplane to accelerate to 50 to 60 miles per hour, then ease back on the wheel enough to let the airplane fly itself from the ground. Premature or excessive raising of the nose will result in a delayed take-off. After take-off let the aircraft accelerate to the desired climb speed by lowering the nose slightly.

#### Short Field, Obstacle Clearance:

Lower the flaps to 25° (second notch), accelerate to 55-60 miles per hour and ease back on the control wheel to rotate. After breaking ground, accelerate to the best angle of climb speed, 78 miles per hour. Slowly retract the flaps when the obstacle has been cleared and continue climb at 89 miles per hour.

#### Short Field, No Obstacles:

Lower the flaps to 25° (second notch) accelerate to 55-60 miles per hour. Ease back on the control wheel to rotate and accelerate to best rate of climb speed, 89 miles per hour. Slowly retract the flaps while climbing out.

#### Soft Field, No Obstacle:

Lower the flaps to 25° (second notch), accelerate aircraft and pull nose gear from the ground as soon as possible, lift off at lowest possible airspeed. Accelerate just above the ground to best rate of climb speed, 89 miles per hour. Climb out while slowly retracting the flaps.

#### Soft Field, Obstacle Clearance:

Lower flaps to 25° (second notch), accelerate aircraft, pull nose gear off as soon as possible and lift off at lowest possible airspeed. Accelerate just above the ground to best angle of climb speed, 78 miles per hour to climb past obstacle clearance height, continue climb while accelerating to best rate of climb speed, 89 miles per hour and slowly retract the flaps.

### CLIMB

The best rate of climb airspeed at gross weight is 89 miles per hour while the best angle of climb airspeed is 78 miles per hour. At lighter than gross weight these speeds are reduced. The recommended enroute climbing speed of 100 miles per hour provides increased visibility over the nose. Shallow turns of a few degrees will also aid forward visibility during climb out. The air conditioner may be turned on after all obstacles have been cleared.

### STALLS

Stall characteristics of the Cherokee are conventional. Visual stall warning is provided by a red light located on the left side of the instrument panel which is turned on automatically between 5 and 10 miles per hour above stall speed. Gross weight stalling speed with power off and full flaps is 55 miles per hour at 2150 pounds. With flaps up this speed is increased 9 miles per hour.

Intentional spins are prohibited in the normal category airplane. Lazy eights and chandelles may be performed in the normal category provided a 60° angle of bank and/or a 30° angle of pitch is not exceeded. For approved maneuvers and entry speeds refer to the Flight Manual.

STALL SPEED TABLE

Angle of Bank	Flaps 40°	Flaps Retracted
0°	55 MPH	64 MPH
20°	57 MPH	66 MPH
40°	63 MPH	73 MPH
60°	78 MPH	91 MPH
Power Off - Gross Weight 2150 lbs.		

## CRUISING

The cruising speed is determined by many factors including power setting, altitude, temperature, loading and equipment installed on the airplane.

The normal cruising power is 75% of the rated horsepower of the engine. True airspeeds which may be obtained at various altitudes and power settings can be determined from the charts in Section IV of this handbook.

Use of the mixture control in cruising flight reduces fuel consumption significantly, especially at higher altitudes, and reduces lead deposits when the alternate fuels are used. The mixture should be leaned when 75% power or less is being used. If any doubt exists as to the amount of power being used, the mixture should be in the FULL RICH position for all operations. Always enrich the mixture before increasing power settings.

To lean the mixture, pull the mixture control until the engine becomes rough, indicating that the lean mixture limit has been reached in the leaner cylinders. Then enrich the mixture by pushing the control towards the instrument panel until engine operation becomes smooth.

The continuous use of carburetor heat during cruising flight decreases engine efficiency. Unless icing conditions in the carburetor are severe, do not cruise with the heat on. Apply full carburetor heat slowly and only for a few seconds at intervals determined by icing severity.

In order to keep the airplane in best lateral trim during cruising flight, the fuel should be used alternately from each main tank. It is recommended that one main tank be used for one hour after take-off; the other main tank used until nearly exhausted, then return to the first main tank.

## MANEUVERS

The airplane is approved for certain aerobatic maneuvers, provided it is loaded within the approved weight and center of gravity limits. (See Airplane Flight Manual.) The maneuvers are spins, steep turns, lazy eights and chandelles. Spins are prohibited when air conditioning is installed.

## APPROACH AND LANDING

## Landing check list:

- |                        |                          |
|------------------------|--------------------------|
| 1. Fuel on proper tank | 4. Seat backs erect      |
| 2. Mixture - rich      | 5. Flaps - set (115 MPH) |
| 3. Elec. fuel pump on  | 6. Fasten belts/harness  |
|                        | 7. Air conditioner - off |

The airplane should be trimmed to an approach speed of about 85 miles per hour with flaps up. The flaps can be lowered at speeds up to 115 miles per hour, approach speed is reduced 3 miles per hour for each notch of flaps used. Carburetor heat should not be applied unless there is an indication of carburetor icing, since the use of carburetor heat causes a reduction in power which may be critical in case of a go-around. Full throttle operation with carburetor heat on is likely to cause detonation.

The amount of flap used during landings and the speed of the aircraft at contact with the runway should be varied according to the landing surface and existing conditions, both windwise and loadwise. It is generally good practice to contact the ground at the minimum possible safe speed consistent with existing conditions.

Normally, the best technique for short and slow landings is to use full flap and enough power to maintain the desired airspeed and approach flight path. Mixture should be full rich, fuel on the fullest tank, carburetor heat off, and electric fuel pump on. Reduce the speed during the flareout and contact the ground close to the stalling speed (55 to 65 MPH). After ground contact hold the nose wheel off as long as possible. As the airplane slows down, drop the nose and apply the brakes. There will be less chance of skidding the tires if the flaps are retracted before applying the brakes. Braking is most effective when back pressure is applied to the control wheel, putting most of the aircraft weight on the main wheels. In high wind conditions, particularly in strong crosswinds, it may be desirable to approach the ground at higher than normal speeds with partial or no flaps.

## STOPPING ENGINE

At the pilot's discretion, the flaps should be raised and the electric

fuel pump turned off. After parking, the air conditioner and radios should be turned off and the engine stopped by pulling the mixture control to idle cut-off. The throttle should be left full aft to avoid engine vibration while stopping. When alternate fuels are used, the engine should be run up to 1200 RPM for one minute prior to shutdown to clean out any unburned fuel.

### MOORING

The Cherokee should be moved on the ground with the aid of the nose wheel tow bar provided with each plane and secured in the baggage compartment. Tie downs may be secured to rings provided under each wing, and to the tail skid. The aileron and stabilator control wheel shaft are secured by looping the seat belt through the control wheel and pulling it tight. The rudder is held in position by its connections to the nose wheel steering, and normally does not have to be secured. The flaps are locked when in the full up position, and should be left retracted.

### WEIGHT AND BALANCE

It is the responsibility of the owner and pilot to determine that the airplane remains within the allowable weight vs. center of gravity envelope while in flight. For weight and balance data see the Airplane Flight Manual and Weight and Balance Form supplied with each airplane.

### OPERATING TIPS

The following Operating Tips are of particular value in the operation of the Cherokee 140.

1. Learn to trim for take-off so that only a very light back pressure on the wheel is required to lift the airplane off the ground.
2. The best speed for take-off is about 60 MPH under normal conditions. Trying to pull the airplane off the ground at too low an airspeed decreases the controllability of the airplane in event of engine failure.

3. Flaps may be lowered at airspeeds up to 115 MPH. To reduce flap operating loads, it is desirable to have the airplane at a slower speed before extending the flaps.

4. Before attempting to reset any circuit breaker, allow a two to five minute cooling off period.

5. Before starting the engine, check that all radio switches, light switches, and the pitot heat switch are in the off position so as not to create an overloaded condition when the starter is engaged.

6. The overvoltage relay is provided to protect the electronics equipment from a momentary overvoltage condition (approximately 16.5 volts and up), or a catastrophic regulator failure. In the event of a momentary condition, the relay will open and the ammeter will indicate "0" output from the alternator. The relay may be reset by switching the ALT switch to OFF for approximately 30 seconds and then returning the ALT switch to ON. If after recycling the ALT switch the condition persists, the flight should be terminated as soon as practical, reduce the battery load to a minimum.

7. The vacuum gauge is provided to monitor the pressure available to assure the correct operating speed of the vacuum driven gyroscopic flight instruments, it also monitors the condition of the common air filter by measuring the flow of air thru the filter.

If the vacuum gauge registers lower than  $5'' \pm .10''$  Hg at 2000 RPM, the following items should be checked before flight:

- a. Common air filter, could be dirty or restricted.
- b. Vacuum lines could be collapsed or broken.
- c. Vacuum pump, worn.
- d. Vacuum regulator, not adjusted correctly. The pressure, even though set correctly, can read lower under two conditions: (1) Very high altitude, above 12000 feet, (2) Low engine RPM usually on approach or during training maneuvers. This is normal and should not be considered a malfunction.

### PIPER AUTOMATIC LOCATOR

The Piper Automatic Locator, when installed, is located in the aft portion of the fuselage just below the stabilator leading edge and is accessible through a plate on the right side of the fuselage. It is an emergency locator transmitter which meets the requirements of FAR

91.52. It is automatically activated by a longitudinal force of 5 to 7 g's and transmits a distress signal on both 121.5 MHz and 243.0 MHz for a period of 48 hours in low temperature areas to 100 hours in high temperature areas. The unit operates on a self contained battery.

The battery has a useful life of four years. However, to comply with FAA regulations, it must be replaced after two years of shelf life or service life. The battery should also be replaced if the transmitter has been used in an emergency situation or if the accumulated test time exceeds one hour. The replacement date is marked on the transmitter label.

The unit has a three position selector switch placarded "OFF," "ARM" and "ON." The "ARM" position is provided to set the unit to the automatic position so that it will transmit only after impact and continue to transmit until the battery power is drained to depletion or the switch is manually moved to the "OFF" position. The "ARM" position is selected when the locator is installed at the factory and should remain in that position whenever the unit is installed in the aircraft. The "ON" position is provided so the unit can be used as a portable transmitter or in the event the automatic feature was not triggered by impact or to check the function of the transmitter periodically.

The "OFF" position is provided for the purpose of changing the battery or if used as a portable transmitter or rearming the unit if it should be activated for any reason.

#### NOTE

If the switch has been placed in the "ON" position for any reason, the "OFF" position has to be selected before selecting "ARM." If "ARM" is selected directly from the "ON" position the transmitter will continue to transmit in the "ARM" position.

Attached to the unit is a portable antenna, provided so that the locator may be removed from the aircraft, in case of an emergency, and used as a portable signal transmitter.

The locator should be checked during the Ground Check to make certain the unit has not been accidentally activated. Check by tuning a radio receiver to 121.5 MHz. If you hear an oscillating audio sound the locator may have been activated and should be turned off immediately. Reset to "ARM" position and check again to insure against outside interference.

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### EMERGENCY PROCEDURES

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## OPTIONAL EQUIPMENT

## AIR CONDITIONING

To operate the air conditioning system either on the ground or in flight:

1. Start the engine (ground operation).
2. Turn the air conditioning "Master" switch to "ON."
3. Turn "TEMP" control to desired temperature. Clockwise rotation increases cooling.
4. Select desired "FAN" position, "LOW," "MED" or "HIGH."

## AIR CONDITIONER OPERATIONAL CHECK PROCEDURE

Prior to take-off the air conditioner should be checked for proper operation as follows:

1. Check aircraft Master Switch ON.
2. Select desired "FAN" position, "LOW," "MED" or "HIGH."
3. Turn the air conditioner control switch to "ON" - the "Air Cond. Door Open" warning light will turn on, thereby indicating proper air conditioner condenser door actuation.
4. Turn the air conditioner control switch to "OFF" - the "Air Cond. Door Open" warning light will go out, thereby indicating the air conditioner condenser door is in the up position.

5. If the "Air Cond. Door Open" light does not respond as specified above, an air conditioner system or indicator bulb malfunction is indicated, and further investigation should be conducted prior to flight.

The above operational check may be performed during flight if an inflight failure is suspected.

## AIR CONDITIONER EFFECTS ON AIRPLANE PERFORMANCE

Operation of the air conditioner will cause slight decreases in the cruise speed and range of the Cherokee 140. Power from the engine is required to run the compressor, and the condenser door, when extended, causes a slight increase in drag. When the air conditioner is turned off there is normally no measurable difference in climb, cruise or range performance of the airplane.

## NOTE

To insure maximum climb performance the air conditioner must be turned off manually before take-off to disengage the compressor and retract the condenser door. Also the air conditioner must be turned off manually before the landing approach in preparation for a possible go-around.

Although the cruise speed and range are only slightly affected by the air conditioner operation, these changes should be considered in preflight planning. To be conservative, the following figures assume that the compressor is operating continuously while the airplane is airborne. This will be the case only in extremely hot weather.

1. The decrease in true airspeed is approximately 5 mph at 75% power and 4 mph at 50% power.
2. The decrease in range may be as much as 28 statute miles for the 36 gal. (standard) capacity and as much as 39 statute miles for the 50 gal. (reserve) capacity.

## NOTE

To read power from the Power vs. Density Altitude Chart in this manual, add 50 rpm to the value observed on the tachometer when the air conditioner is operating.

The climb performance of Cherokee 140 is not compromised measurably with the air conditioner operating since the compressor is de-clutched and the condenser door is retracted, both automatically, when a full throttle position is selected. When the full throttle position is not used or in the event of a malfunction which caused the compressor to operate and the condenser door to be extended, a decrease in rate of climb of as much as 100 fpm can be expected. Should a malfunction occur which prevents condenser door retraction when the compressor is turned off, a decrease in rate of climb of as much as 50 fpm can be expected.

## SECTION IV

## EMERGENCY PROCEDURES

## INTRODUCTION

This section contains procedures that are recommended if an emergency condition should occur during ground operation, take-off, or in flight. These procedures are suggested as the best course of action for coping with the particular condition described, but are not a substitute for sound judgement and common sense. Since emergencies rarely happen in modern aircraft, their occurrence is usually unexpected, and the best corrective action may not always be obvious. Pilots should familiarize themselves with the procedures given in this section and be prepared to take appropriate action should an emergency arise.

Most basic emergency procedures, such as power off landings, are a part of normal pilot training. Although these emergencies are discussed herein, this information is not intended to replace such training, but only to provide a source of reference and review, and to provide information on procedures which are not the same for all aircraft. It is suggested that the pilots review standard emergency procedures periodically to remain proficient in them.

## GROUND OPERATIONS

## ENGINE FIRE DURING START

Engine fires during start are usually the result of over priming. The procedures below are designed to draw the excess fuel back into the induction system:

1. If engine has not started:
  - a. Mixture - Idle cut-off
  - b. Throttle - Open
  - c. Turn engine with starter (This is an attempt to pull the fire into the engine.)
2. If engine has already started and is running, continue operating to try pulling the fire into the engine.

3. In either case stated in (1) and (2), if the fire continues longer than a few seconds, the fire should be extinguished by the best available external means.

4. If external fire extinguishing is to be applied:

- a. Fuel Selector Valves - Off
- b. Mixture - Idle cut-off

## TAKE-OFF

### ENGINE POWER LOSS DURING TAKE-OFF

The proper action to be taken if loss of power occurs during take-off will depend on circumstances.

1. If sufficient runway remains for a normal landing, land straight ahead.

2. If insufficient runway remains, maintain a safe airspeed and make only a shallow turn to avoid obstructions. Use of flaps depends on circumstances. Normally, flaps should be fully extended for touchdown.

3. If you have gained sufficient altitude to attempt a restart, proceed as follows:

- a. MAINTAIN SAFE AIRSPEED
- b. FUEL SELECTOR - SWITCH TO ANOTHER TANK CONTAINING FUEL
- c. ELECTRIC FUEL PUMP - CHECK ON
- d. MIXTURE - CHECK RICH
- e. CARBURETOR HEAT - ON

### NOTE

If engine failure was caused by fuel exhaustion, power will not be regained after tanks are switched until empty fuel lines are filled, which may require up to ten seconds.

If power is not regained, proceed with the POWER OFF LANDING procedure.

## IN FLIGHT

### ENGINE POWER LOSS IN-FLIGHT

Complete engine power loss is usually caused by fuel flow interruption, and power will be restored shortly after fuel flow is restored. If power loss occurs at low altitude, the first step is to prepare for an emergency landing (See POWER OFF LANDING). Maintain an airspeed of at least 80 MPH IAS, and if altitude permits, proceed as follows:

1. Fuel Selector - switch to another tank containing fuel.
2. Electric Fuel Pump - On
3. Mixture - Rich
4. Carburetor Heat - On
5. Engine Gauges - check for an indication of the cause of Power Loss.
6. Primer - Check Locked
7. If no fuel pressure is indicated, check tank selector position to be sure it is on a tank containing fuel.

When Power is Restored:

8. Carburetor Heat - Off
9. Electric Fuel Pump - Off

If the above steps do not restore power, prepare for an emergency landing. If time permits:

1. Ignition Switch - "L" then "R" then back to "BOTH".
2. Throttle and Mixture - Different settings. (This may restore power if problem is too rich or too lean a mixture, or partial fuel system restriction).
3. Try another fuel tank - (Water in the fuel could take some time to be used up, and allowing the engine to windmill may restore power. If power loss is due to water, fuel pressure indications will be normal).

## NOTE

If engine failure was caused by fuel exhaustion, power will not be regained after tanks are switched until empty fuel lines are filled, which may require up to ten seconds.

If power is not restored, proceed with POWER OFF LANDING procedures.

## POWER OFF LANDING

If loss of power occurs at altitude, trim the aircraft for best gliding angle (80 MPH IAS) (Air Cond. Off) and look for a suitable field. If measures taken to restore power are not effective, and if time permits, check your charts for airports in the immediate vicinity; it may be possible to land at one if you have sufficient altitude. If possible, notify the FAA by radio of your difficulty and intentions. If another pilot or passenger is aboard, let them help.

When you have located a suitable field, establish a spiral pattern around this field. Try to be at 1000 feet above the field at the downwind position, to make a normal approach. Excess altitude may be lost by widening your pattern, using flaps or slipping, or a combination of these.

Touchdowns should normally be made at the lowest possible airspeed, with full flaps.

When committed to landing:

1. Ignition - Off
2. Master Switch - Off
3. Fuel Selector - Off
4. Mixture - Idle Cut-Off
5. Seat Belt Tight, Shoulder Harness in Place

## FIRE

The presence of fire is noted through smoke, smell, and heat in the cabin. It is essential that the source of the fire be promptly identified through instrument readings, character of the smoke, or other indications, since the action to be taken differs somewhat in each case.

## Source of fire - Check

1. Electrical Fire (smoke in cabin):
  - a. Master Switch - Off
  - b. Vents - Open
  - c. Cabin Heat - Off
  - d. Land as soon as possible.
2. Engine Fire (In Flight):
  - a. Fuel Selector - Off
  - b. Throttle - Closed
  - c. Mixture - Idle cut-off
  - d. Heater - Off (In all cases of fire)
  - e. Defroster - Off (In all cases of fire)
  - f. If terrain permits, land immediately.

The possibility of an engine fire in flight is extremely remote. The procedure given above is general and pilot judgment should be the deciding factor for action in such an emergency.

## LOSS OF OIL PRESSURE

Loss of oil pressure may be either partial or complete. A partial loss of oil pressure usually indicates a malfunction in the oil pressure regulating system, and a landing should be made as soon as possible to investigate the cause, and prevent engine damage.

A complete loss of oil pressure indication may signify oil exhaustion or may be the result of a faulty gauge. In either case, proceed toward the nearest airport, and be prepared for a forced landing. If the problem is not a pressure gauge malfunction, the engine

## SECTION IV

### CHEROKEE 140

may stop suddenly. Maintain altitude until such time as a dead stick landing can be accomplished. Don't change power settings unnecessarily, as this may hasten complete power loss.

Depending on the circumstances, it may be advisable to make an off airport landing while power is still available, particularly if other indications of actual oil pressure loss, such as sudden increase in temperatures, or oil smoke, are apparent, and an airport is not close.

If engine stoppage occurs, proceed to POWER OFF LANDING.

#### LOSS OF FUEL PRESSURE

1. Electric boost pump - On
2. Fuel Selector - Check on Full Tank

If problem is not an empty fuel tank, land as soon as practicable, and have engine driven fuel pump checked.

#### HIGH OIL TEMPERATURE

An abnormally high oil temperature indication may be caused by a low oil level, an obstruction in the oil cooler, damaged or improper baffle seals, a defective gauge, or other causes. Land as soon as practicable at an appropriate airport and have the cause investigated.

A steady rapid rise in oil temperature is a sign of trouble. Land at the nearest airport and let a mechanic investigate the problem. Watch the oil pressure gauge for an accompanying loss of pressure.

#### ALTERNATOR FAILURE

Loss of alternator output is detected through a zero reading on the ammeter. Before executing the following procedure, insure that the reading is zero and not merely low by actuating an electrically powered device, such as the landing light. If no increase in the ammeter reading is noted, alternator failure can be assumed.

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## SECTION IV

1. Reduce electrical load.
2. Alternator circuit breakers - Check
3. "Alt" switch - Off (for 30 seconds), Then On.

If the ammeter continues to indicate no output, or alternator will not stay reset, turn off "Alt" switch, maintain minimum electrical load and land as soon as practical. All electrical load is being supplied by the battery.

#### ENGINE ROUGHNESS

Engine roughness is usually due to carburetor icing which is indicated by a drop in RPM, and may be accompanied by a slight loss of airspeed or altitude. If too much ice is allowed to accumulate, restoration of full power may not be possible; therefore, prompt action is required.

1. Carburetor heat-on (See Note). RPM will decrease slightly and roughness will increase. Wait for a decrease in engine roughness or an increase in RPM, indicating ice removal. If no change in approximately one minute, return carburetor heat to COLD. If the engine is still rough, try steps below.

- a. Mixture - Adjust for maximum smoothness. Engine will run rough if too rich or too lean.
- b. Electric Fuel Pump - On
- c. Fuel Selector - Change to other tank to see if fuel contamination is the problem.
- d. Engine Gauges - Check for abnormal readings. If any gauge readings are abnormal, proceed accordingly.
- e. Magneto Switch - "L" then "R", then back to "BOTH". If operation is satisfactory on either magneto, proceed on that magneto at reduced power, with mixture full rich, to a landing at the first available airport.

If roughness persists, prepare for a precautionary landing at pilots discretion.

## NOTE

Partial carburetor heat may be worse than no heat at all, since it may partially melt ice, which will refreeze in the intake system. When using carburetor heat, therefore, always use full heat, and when ice is removed return the control to the full cold position.

## SPINS

Intentional spins are prohibited in the normal category airplane and the utility category airplane when air conditioning is installed. For approved maneuvers as a utility category airplane, refer to the Flight Manual.

1. THROTTLE - IDLE
2. RUDDER - FULL OPPOSITE TO DIRECTION OF ROTATION
3. CONTROL WHEEL - FULL FORWARD
4. RUDDER - NEUTRAL (WHEN ROTATION STOPS).
5. CONTROL WHEEL - AS REQUIRED TO SMOOTHLY REGAIN LEVEL FLIGHT ATTITUDE.

## OPEN DOOR

The cabin door on the Cherokee is double latched, so the chances of it springing open in flight at both the top and bottom are remote. However, should you forget the upper latch, or not fully engage the lower latch, the door may spring partially open. This will usually happen at take-off or soon afterward. An open door will not affect normal flight characteristics, and a normal landing can be made with the door open.

If both upper and lower latches open, the door will trail slightly open, and airspeed will be reduced slightly.

To close the door in flight, proceed as follows:

1. Slow aircraft to 100 MPH IAS.
2. Cabin Vents - Close
3. Storm Window - Open

4. If upper latch is open - latch. If lower latch is open - open top latch, push door further open, and then close rapidly. Latch top latch.

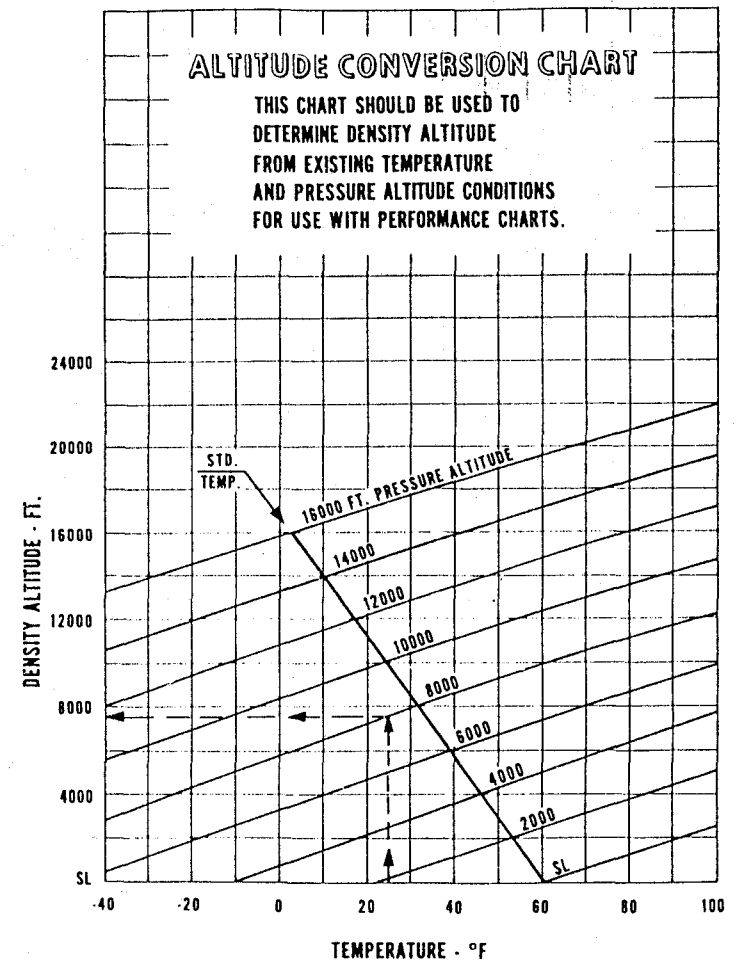
A slip in the direction of the open door will assist in latching procedure.

## SECTION V

### PERFORMANCE CHARTS

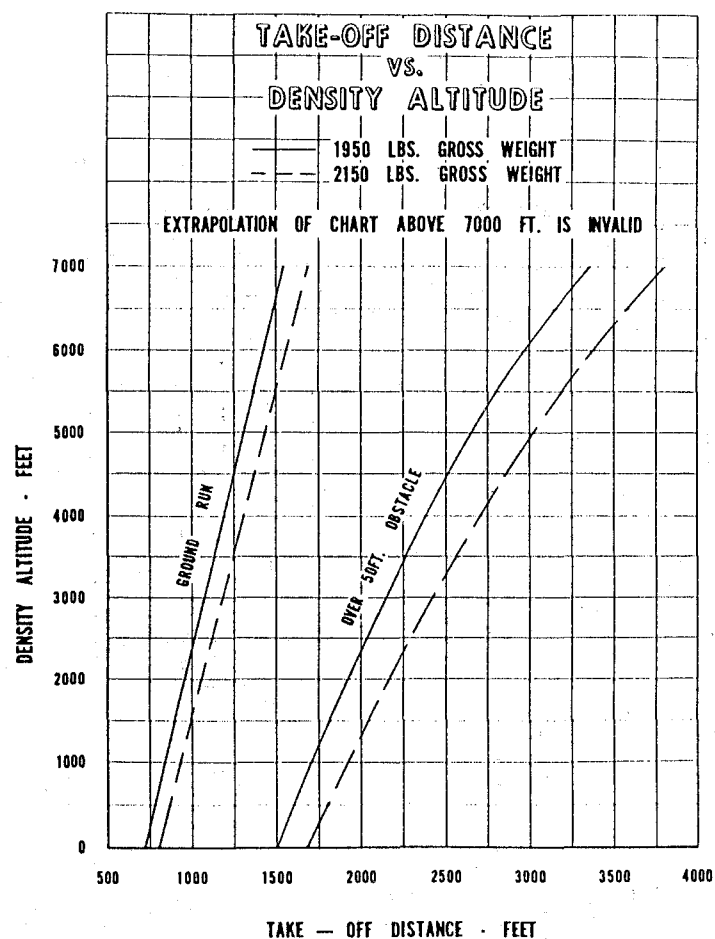
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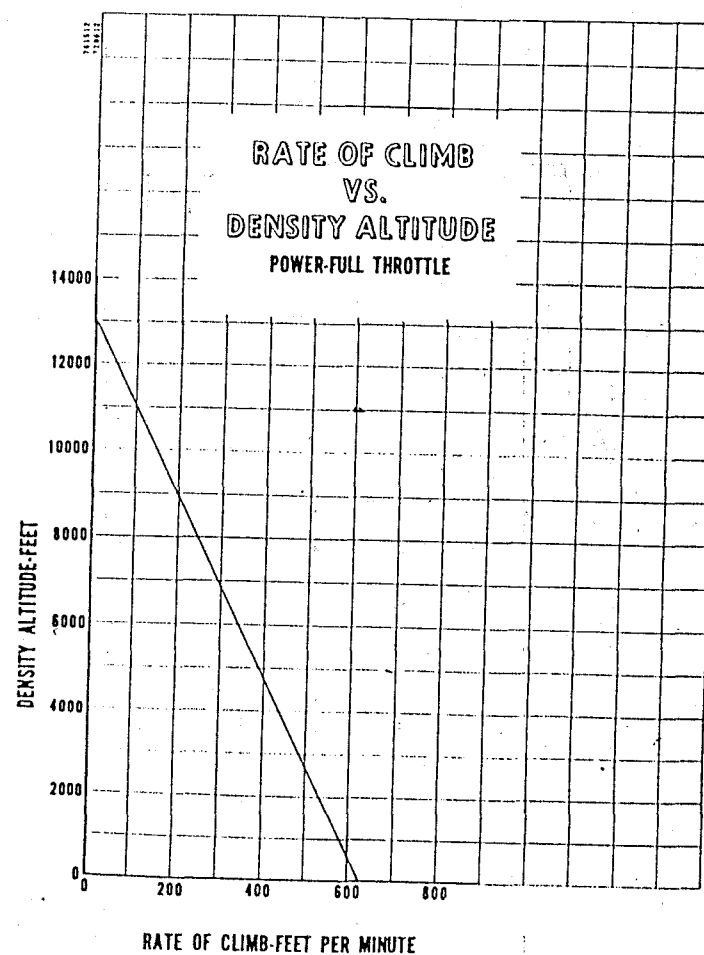




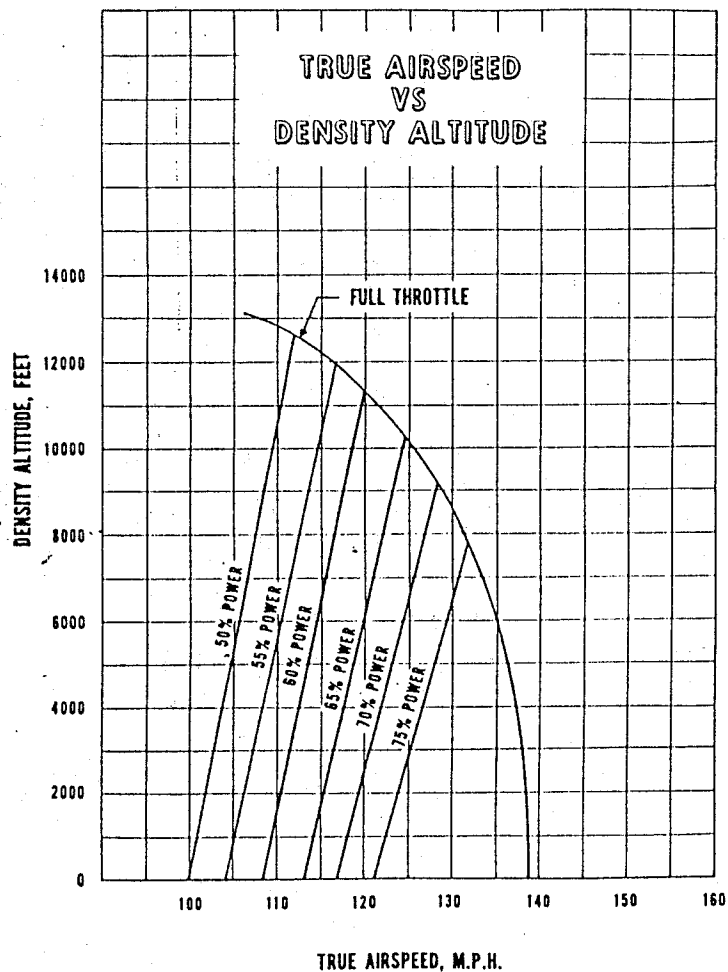
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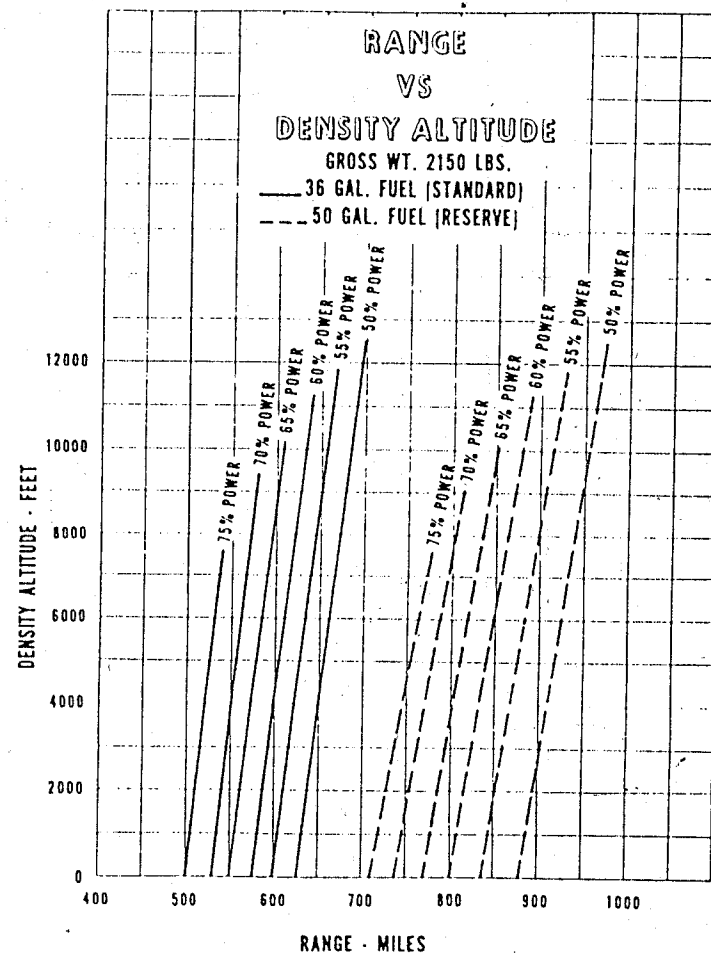


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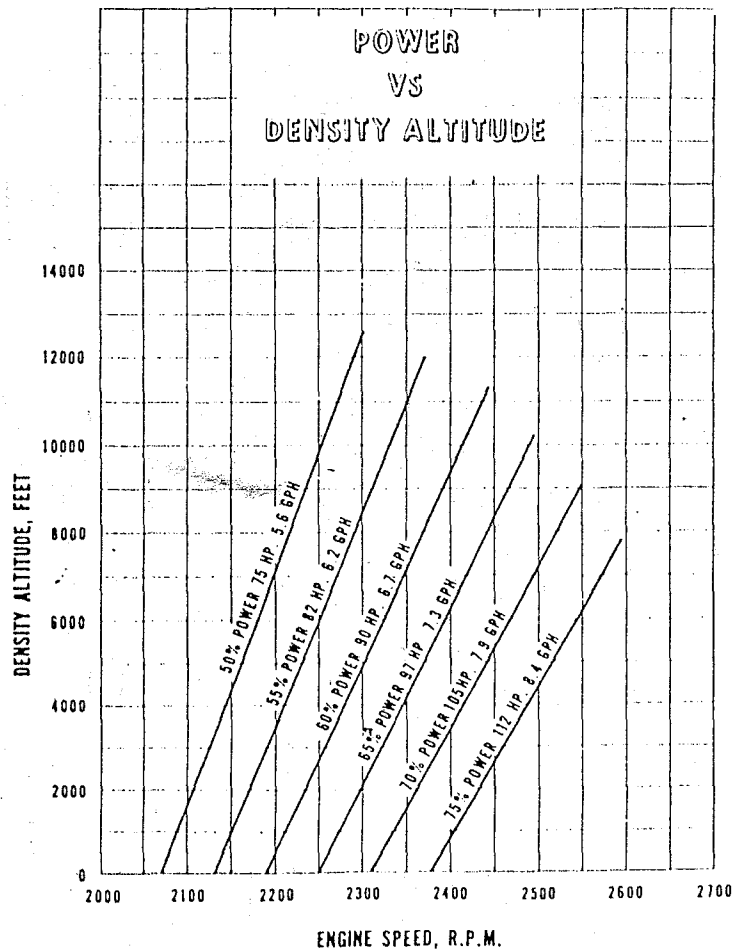
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INSTALLATION ON CRUISE SPEEDS)

## PA-28-140 PIPER CHEROKEE



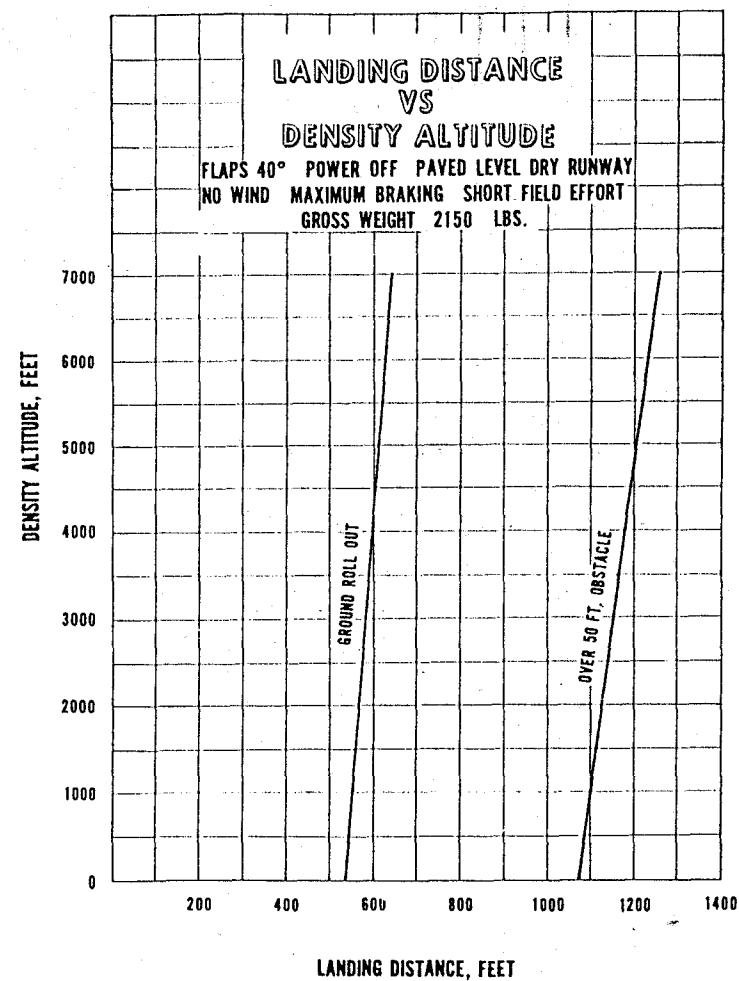
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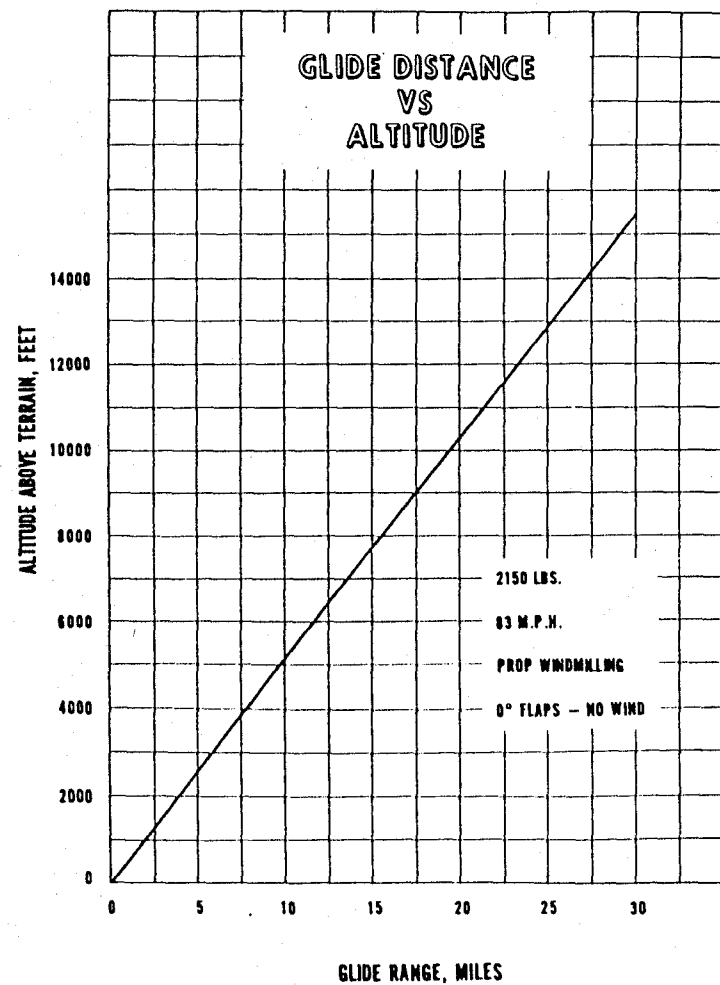
(SEE SECTION III FOR EFFECTS OF AIR CONDITIONER  
INSTALLATION ON ENGINE POWER DETERMINATION)

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NOTES

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(AIR CONDITIONER MUST BE TURNED OFF IF INSTALLED)

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**GENERAL MAINTENANCE**

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## SECTION VI

## GENERAL MAINTENANCE

This section contains information for minor maintenance of the airplane. For further maintenance assistance refer to the Cherokee 140 Service Manual. Any complex repairs or modification should be accomplished by a Piper Certified Service Center or equivalent.

## TIRE INFLATION

For maximum service from the tires, inflate them to the proper pressure of 24 pounds for all three wheels. Interchange the tires on the main wheels, if necessary, to produce even wear. All wheels and tires are balanced before original installation, and the relationship of the tire, tube and wheel should be maintained, if at all possible. Out of balance wheels can cause extreme vibration on take-off. In the installation of new components, it may be necessary to rebalance the wheel with the tires mounted.

## BATTERY SERVICE

The 12 volt battery is located in a stainless steel container under the baggage compartment floor. This container should be drained occasionally by opening the rubber cap on the drain tube. Check the battery for proper fluid level (below the baffle plates) and use a hydrometer to determine the density of the battery fluid.

If the battery is discharged, charge it before take-off as three volts are needed to excite the alternator. To recharge, start at a 4 ampere rate and finish with a 2 ampere rate. Quick charges are not recommended.

## BRAKE SERVICE

The brake system is filled with MIL-H-5606 (petroleum base) hydraulic fluid. This should be checked at every 100 hour inspection and replenished when necessary by filling the brake reservoir on the firewall to the indicated level. If the system as a whole has to be refilled with fluid, this should be done by filling with the fluid under pressure from the brake end of the system. This will eliminate air from the system as it is being filled.

If after extended service the brake blocks become worn excessively, they are easily replaced with new segments. Brake clearances require no adjustments.

## LANDING GEAR SERVICE

Main wheels are easily removed by taking off the hub cap, axle nut, and the two bolts holding the brake segment in place, after which the wheel slips easily from the axle.

Tires are removed from the wheels by first deflating the tire, removing the three through bolts, and separating the wheel halves.

Landing gear oleo struts should be checked for proper strut exposures and fluid leaks. The required extensions for the strut when under normal static load (empty weight of airplane plus full fuel and oil) is 3.25 inches for the nose gear and 4.50 inches for the main gear. Should the strut exposure be below that required, it should be determined whether air or oil is required by first raising the airplane on jacks. Depress the valve core to allow air to escape from the strut housing chamber. Remove the filler plug and slowly raise the strut to full compression. If the strut has sufficient fluid it will be visible up to the bottom of the filler plug hole and will then only require proper inflation.

Should fluid be below the bottom of the filler plug hole, oil should be added. Replace the plug with valve core removed, attach a clear plastic hose to the valve stem of the filler plug and submerge the other end in a container of hydraulic fluid (MIL-H-5606). Fully compress and extend the strut several times thus drawing fluid from the container and expelling air from the strut chamber. To allow fluid to enter the

bottom chamber of the main gear strut housing, the torque link assembly must be disconnected to let the strut be extended a minimum of 10 inches. (The nose gear torque links need not be disconnected.) Do not allow the strut to extend more than 12 inches. When air bubbles cease to flow through the hose, compress the strut fully and again check fluid level. Reinstall the valve core and filler plug, and the main gear torque links if disconnected. With fluid in the strut housing at the correct level, attach a strut pump to the air valve and inflate the oleo strut to the correct height when the airplane is on the ground.

In jacking the airplane for landing gear or other servicing use two hydraulic jacks and a tail stand. Place 350 pounds of ballast on the base of the tail stand before jacking up the airplane. The hydraulic jacks should be placed under the jack points on the bottom of the wing and the airplane should be jacked up until the tail skid is at the correct height to attach the tail stand. With the tail stand attached continue raising the airplane to the desired height.

## FUEL REQUIREMENTS

The minimum aviation grade fuel for the PA-28-140 is 80/87. Since the use of lower grades can cause serious engine damage in a short period of time, the engine warranty is invalidated by the use of lower octanes.

Whenever 80/87 is not available, the lowest lead 100 grade should be used. (See Fuel Grade Comparison Chart, next page.) Refer to the latest issue of Lycoming Service Instruction No. 1070 for additional information.

The continuous use, more than 25% of the operating time, of the higher leaded fuels can result in increased engine deposits, both in the combustion chamber and in the engine oil. It may require increased spark plug maintenance and more frequent oil changes. The frequency of spark plug maintenance and oil drain periods will be governed by the amount of lead per gallon and the type of operation. Operation at full rich mixture requires more frequent maintenance periods; therefore, it is important to use proper approved mixture leaning procedures.

Reference the latest issue of Lycoming Service Letter No. L185 for care, operation and maintenance of the airplane when using the higher leaded fuel.

A summary of the current grades as well as the previous fuel designations are shown in the following chart:

FUEL GRADE COMPARISON CHART

Previous Commercial Fuel Grades (ASTM-D910)			Current Commercial Fuel Grades (ASTM-D910-75)			Current Military Fuel Grades (MIL-G-5572E) Amendment No. 3		
Grade	Color	Max. TEL ml/U.S. gal.	Grade	Color	Max. TEL ml/U.S. gal.	Grade	Color	Max. TEL ml/U.S. gal.
80/87	red	0.5	80	red	0.5	80/87	red	0.5
91/98	blue	2.0	* 100LL	blue	2.0	none	none	none
100/130	green	3.0	100	green	** 3.0	100/130	green	** 3.0
115/145	purple	4.6	none	none	none	115/145	purple	4.6

\* - Grade 100LL fuel in some over seas countries is currently colored green and designated as "100LL."

\*\* - Commercial fuel grade 100 and grade 100/130 (both of which are colored green) having TEL content of up to 4 ml/U.S. gallon are approved for use in all engines certificated for use with grade 100/130 fuel.

## OIL REQUIREMENTS

The capacity of the O-320 series engine is 8 quarts, and the minimum safe quantity is 2 quarts. It is recommended that the oil be changed every 50 hours and sooner under unfavorable operating conditions. Intervals between oil changes can be increased as much as 100% on engines equipped with full flow cartridge type oil filters, provided the element is replaced each 50 hours of operation and the specified octane fuel is used. Should fuel other than the specified octane rating for the power plant be used, refer to the latest issue of Lycoming Service Letter No. L185 and Lycoming Service Instruction No. 1014 for additional information and recommended service procedures. The following grades are recommended for the specified temperatures:

Temperatures above 60°F	SAE 50
Temperatures between 30°F to 90°F	SAE 40
Temperatures between 0°F to 70°F	SAE 30
Temperatures below 10°F	SAE 20

Either mineral oil or anti-dispersant oil may be used, but the two types of oil may never be mixed.

## CARE OF AIR FILTER

The carburetor air filter must be cleaned at least once every 50 hours. Under extremely adverse conditions of operation it may be necessary to clean the filter daily. Extra filters are inexpensive and a spare should be kept on hand and used as a rapid replacement.

The filter manufacturer recommends that the filter be tapped gently to remove dirt particles. Do not blow out with compressed air.

## CARE OF WINDSHIELD AND WINDOWS

A certain amount of care is needed to keep the plexiglas windows clean and unmarred. The following procedure is recommended:

1. Flush with clean water and dislodge excess dirt, mud, etc. with your hand.
2. Wash with mild soap and water. Use a soft cloth or sponge, do not rub.
3. Remove oil, grease or sealing compounds with a soft cloth and kerosene.
4. After cleaning, apply a thin coat of hard polishing wax. Rub lightly with a soft cloth.
5. A severe scratch or mar may be removed by using jeweler's rouge to rub out the scratch, smoothing, and then applying wax.

## LEVELING AND RIGGING

Leveling the aircraft for purposes of weighing or rigging is accomplished as follows:

1. Partially withdraw two machine screws located immediately below the left front side window. These screws are leveling points and the airplane is longitudinally level when a level placed on the heads of these screws indicates level.

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## TYPE OF LUBRICANT

IDENTIFICATION LETTER	LUBRICANT	SPECIFICATION	PREFERRED PRODUCT AND VENDOR
A	LUBRICATING OIL, GENERAL PURPOSE, LOW TEMP.	MIL-L-7870	
B	LUBRICATING OIL, AIRCRAFT RECIPROCATING ENGINE (PISTON) GRADE AS SPECIFIED SAE 50 ABOVE 60°F AIR TEMP. SAE 40 30° TO 60°F AIR TEMP. SAE 30 0° TO 30°F AIR TEMP. SAE 20 BELOW 10°F AIR TEMP.	MIL-L-6082	
C	HYDRAULIC FLUID, PETROLEUM BASE	MIL-H-5606	
D	GREASE, AIRCRAFT AND INSTRUMENT, GEAR AND ACTUATOR SCREW	MIL-G-23827	
E	GREASE, AIRCRAFT, HIGH TEMP.		TEXACO MARFAK ALL PURPOSE GREASE, MOBIL GREASE 77 (OR MOBILUX EP2), SHELL ALVANIA EP GREASE 2
F	PARKER "O" RING LUBRICANT		
G	AERO LUBRIPLATE		FISKE BROS. REFINING CO.
H	FLUOROCARBON RELEASE AGENT DRY LUBRICANT	"MS-122	
I	GREASE, LUBRICATION GEN. PURPOSE AIRCRAFT	MIL-G-7711	

## SPECIAL INSTRUCTIONS

- AIR FILTER - TO CLEAN FILTER, TAP GENTLY TO REMOVE DIRT PARTICLES. DO NOT BLOW OUT WITH COMPRESSED AIR OR USE OIL. REPLACE FILTER IF PUNCTURED OR DAMAGED.
- BEARINGS AND BUSHINGS - CLEAN EXTERIOR WITH A DRY TYPE SOLVENT BEFORE LUBRICATING.
- WHEEL BEARINGS - DISASSEMBLE AND CLEAN WITH A DRY TYPE SOLVENT. ASCERTAIN THAT GREASE IS PACKED BETWEEN THE BEARING ROLLER AND CONE. DO NOT PACK GREASE IN WHEEL HOUSING.
- OIL STRUTS AND BRAKE RESERVOIR - FILL PER INSTRUCTIONS ON UNIT OR CONTAINER, OR REFER TO SERVICE MANUAL, SECTION II.
- "O" RING, CONTROL SHAFT BUSHING (WITH 1.125 INCH SHAFT ONLY) - DISASSEMBLE "O" RING. RETAINER PLATES FROM INSTRUMENT PANEL, LUBRICATE "O" RING AND REASSEMBLE.
- LUBRICATION POINTS - WIPE ALL LUBRICATION POINTS CLEAN OF OLD GREASE, OIL, DIRT, ETC. BEFORE LUBRICATING.
- INTERVALS BETWEEN OIL CHANGES CAN BE INCREASED AS MUCH AS 100% ON ENGINES EQUIPPED WITH FULL FLOW (CARTRIDGE TYPE) OIL FILTERS - PROVIDED THE ELEMENT IS REPLACED EACH 50 HOURS OF OPERATION AND THE SPECIFIED OCTANE FUEL IS USED. SHOULD FUEL OTHER THAN THE SPECIFIED OCTANE RATING FOR THE POWER PLANT BE USED, REFER TO THE LATEST REVISION OF LYCOMING SERVICE LETTER NO. L186 FOR ADDITIONAL INFORMATION AND RECOMMENDED SERVICE PROCEDURES.

## SPECIAL INSTRUCTIONS (cont)

- AILERON HINGES WITH TEFLON SLEEVES SHOULD NOT BE LUBRICATED. AILERON HINGES WITHOUT TEFLON SLEEVES SHOULD FIRST BE CLEANED WITH A DRY TYPE SOLVENT THEN LUBRICATED WITH MIL-L-7870 LUBRICATING OIL.
- THIS TRANSMISSION TO BE 1/2 FULL OF GREASE. APPLY GREASE DURING ASSEMBLY AND LUBRICATE TRANSMISSION BALL NUT AND SCREW WITH MIL-G-23827 GREASE.

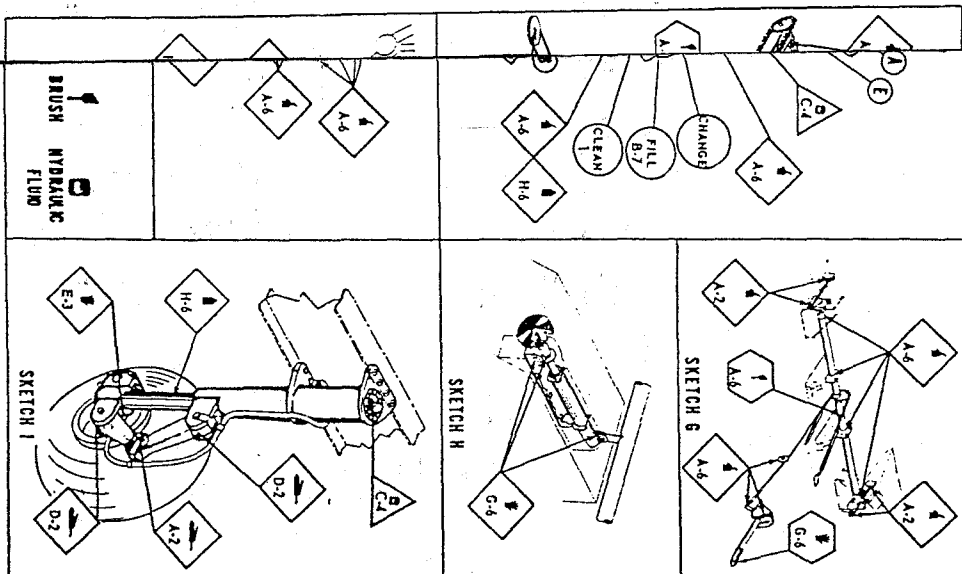
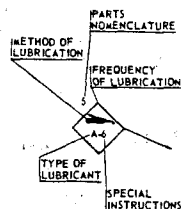
## NOTES

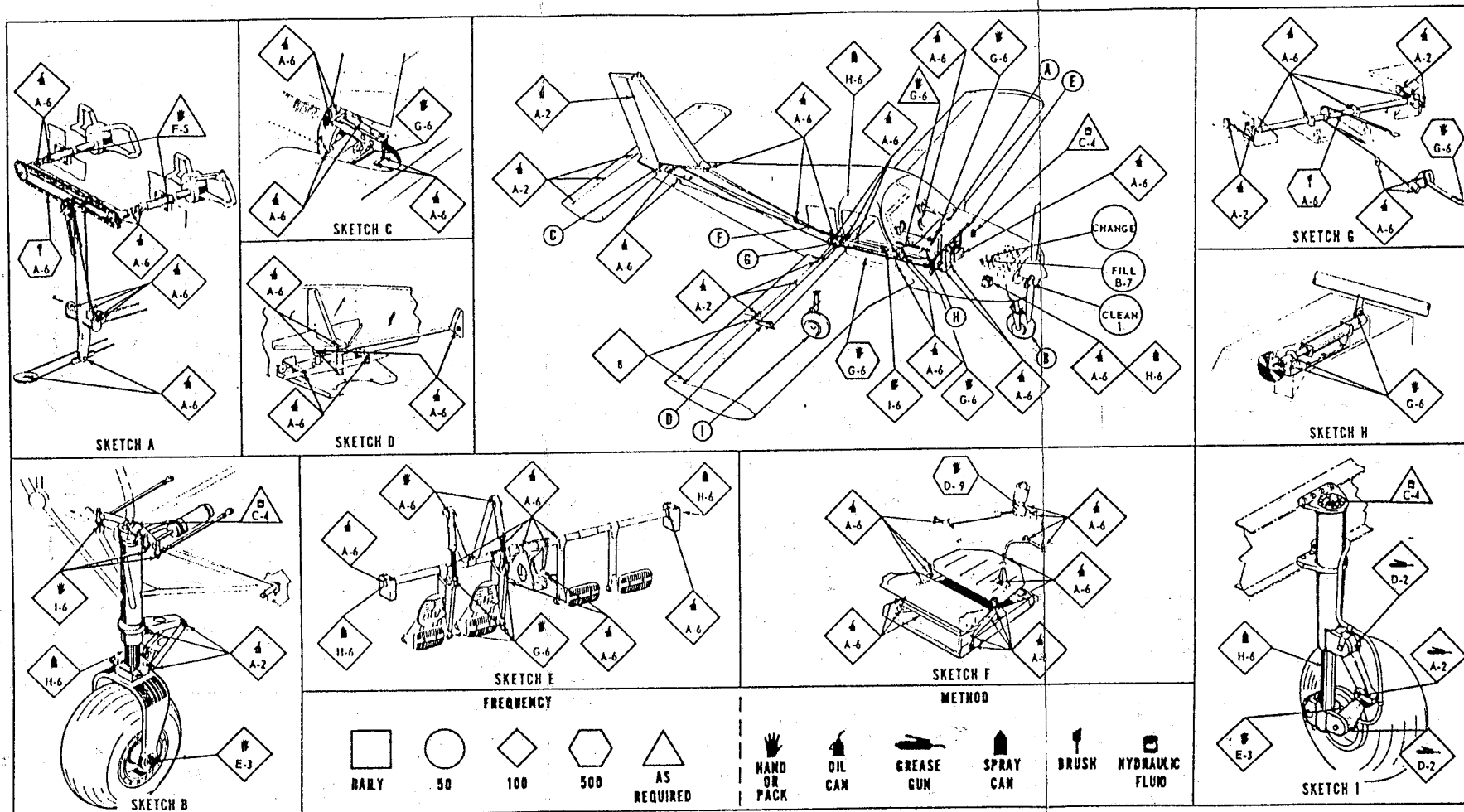
- PILOT AND PASSENGER SEATS - LUBRICATE TRACK ROLLERS AND STOP PINS AS REQUIRED. (TYPE OF LUBRICANT: "A")
- WHEEL BEARINGS REQUIRE CLEANING AND REPACKING AFTER EXPOSURE TO AN ABNORMAL QUANTITY OF WATER.
- FUEL SELECTOR VALVE - LUBRICATE FUEL SELECTOR VALVE AS REQUIRED, REFER TO PIPER SERVICE LETTER NO. 351.
- SEE LYCOMING SERVICE INSTRUCTIONS NO. 1014 FOR USE OF DETERGENT OIL.

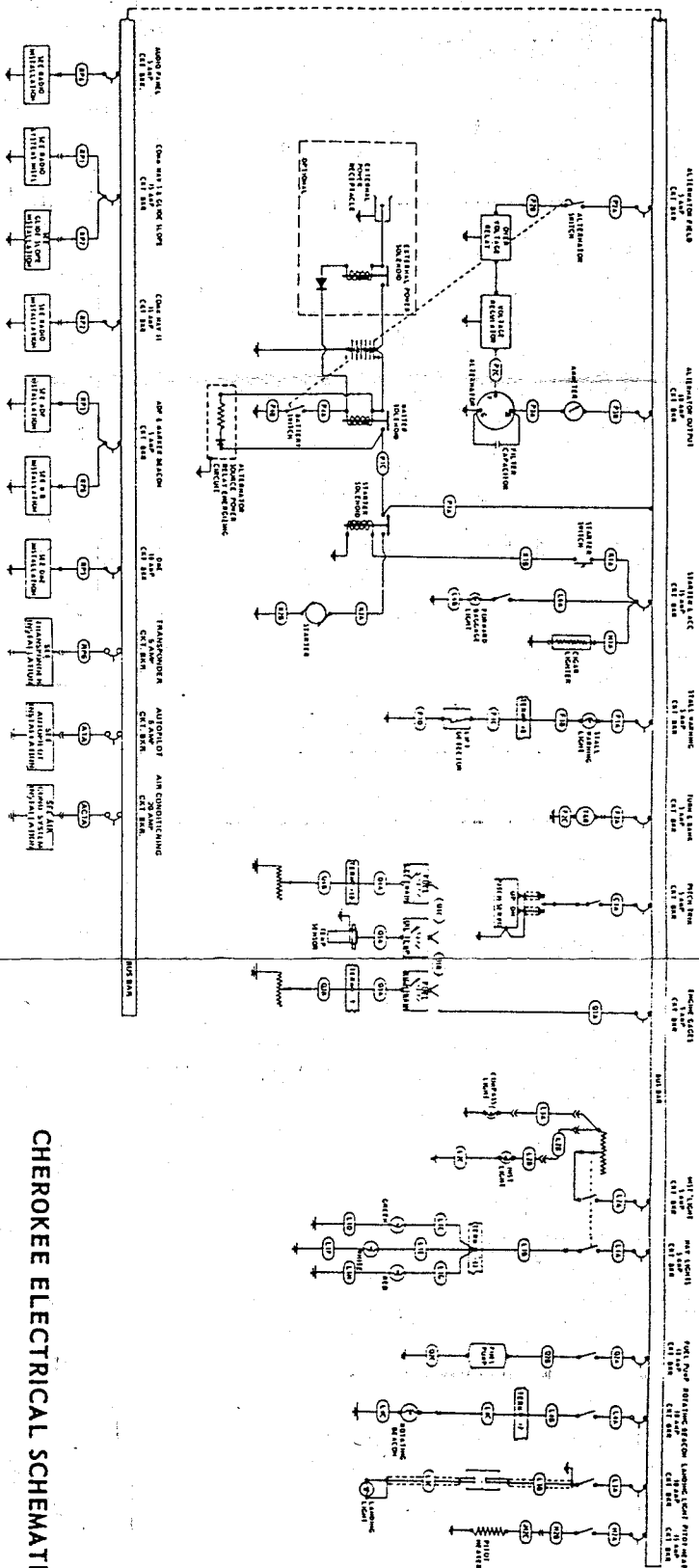
## CAUTIONS

- DO NOT USE HYDRAULIC FLUID WITH A CASTOR OIL OR ESTER BASE.
- DO NOT OVER-LUBRICATE COCKPIT CONTROLS.
- DO NOT APPLY LUBRICANT TO RUBBER PARTS.

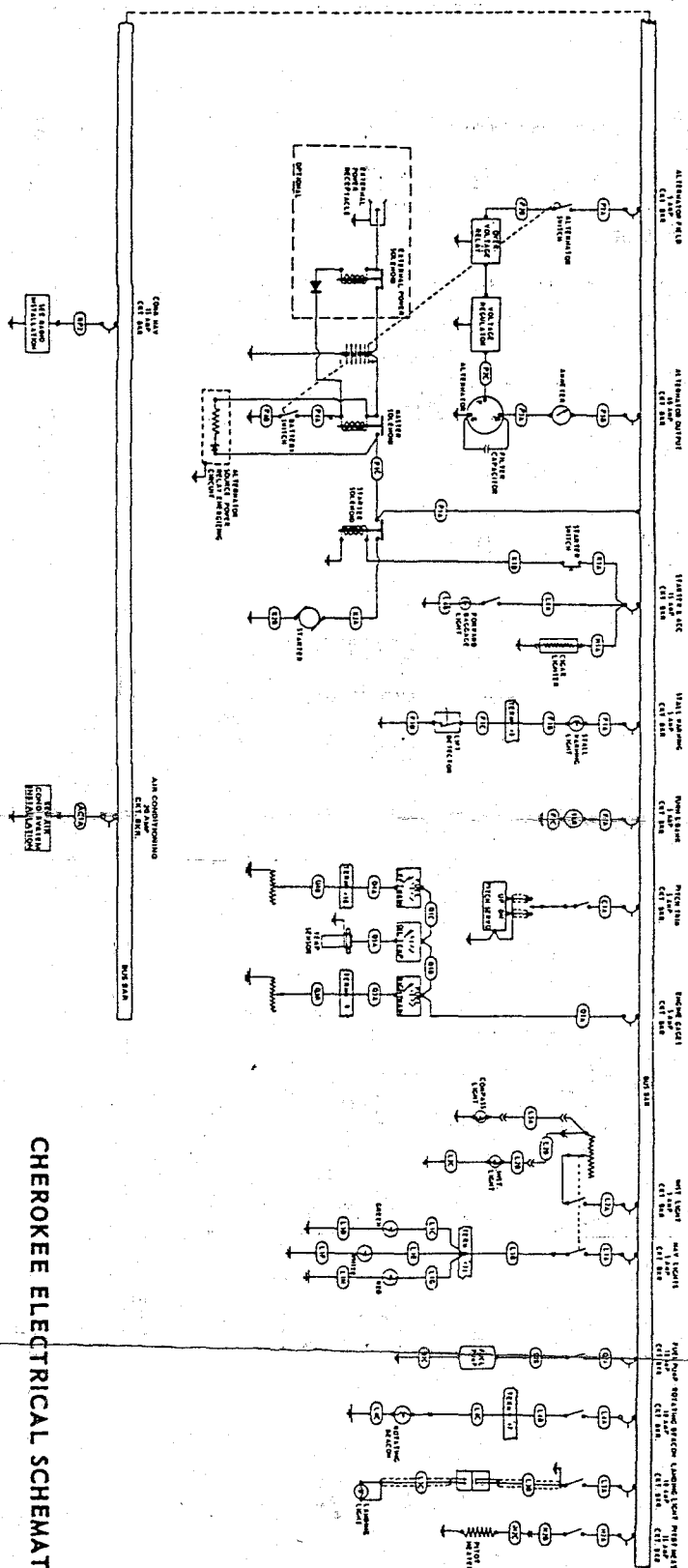
## EXAMPLE







CHEROKEE ELECTRICAL SCHEMATIC



**FLITE LINER**

2. To put the airplane in a longitudinally level position on scales, first block the main gear oleos in the fully extended position, then deflate the nose wheel tire until the proper attitude is obtained. For rigging only, the airplane may be placed on jacks for leveling.

3. To level the airplane laterally, place a level across the baggage compartment floor along the rear bulkhead.

Rigging: Although the fixed flight surfaces cannot be adjusted for rigging purposes, it may be necessary upon occasion to check the position of these surfaces. The movable surfaces all have adjustable stops, as well as adjustable turnbuckles on the cables or push-pull tubes, so that their range of travel can be altered. The positions and angular travels of the various surfaces are as follows:

1. Wings:  $7^{\circ}$  dihedral,  $2^{\circ}$  washout.
2. Stabilator Travel:  $18^{\circ}$  up,  $2^{\circ}$  down, tolerance  $\pm 1^{\circ}$ .
3. Fin should be vertical and in line with center of fuselage.
4. Aileron Travel:  $30^{\circ}$  up,  $15^{\circ}$  down, tolerance  $\pm 2^{\circ}$ .
5. Flap Travel  $10^{\circ}$ ,  $25^{\circ}$ ,  $40^{\circ}$ , tolerance  $\pm 2^{\circ}$ .
6. Rudder Travel:  $27^{\circ}$  right and left, tolerance  $\pm 2^{\circ}$ .
7. Stabilator Tab Travel:  $3^{\circ}$  up,  $12^{\circ}$  down, tolerance  $\pm 1^{\circ}$ .

Cable tensions for the various controls are as follows:

Rudder:  $40 \pm 5$  lbs.      Stabilator:  $40 \pm 5$  lbs.  
 Ailerons:  $40 \pm 5$  lbs.      Stabilator Trim:  $10 \pm 1$  lb.  
 Flaps:  $10 \pm 1$  lb.

#### SERIAL NUMBER PLATE

The serial number plate is located near the stabilator on the left side of the airplane and also at the cabin entrance. Refer to this number for service or warranty matters.

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