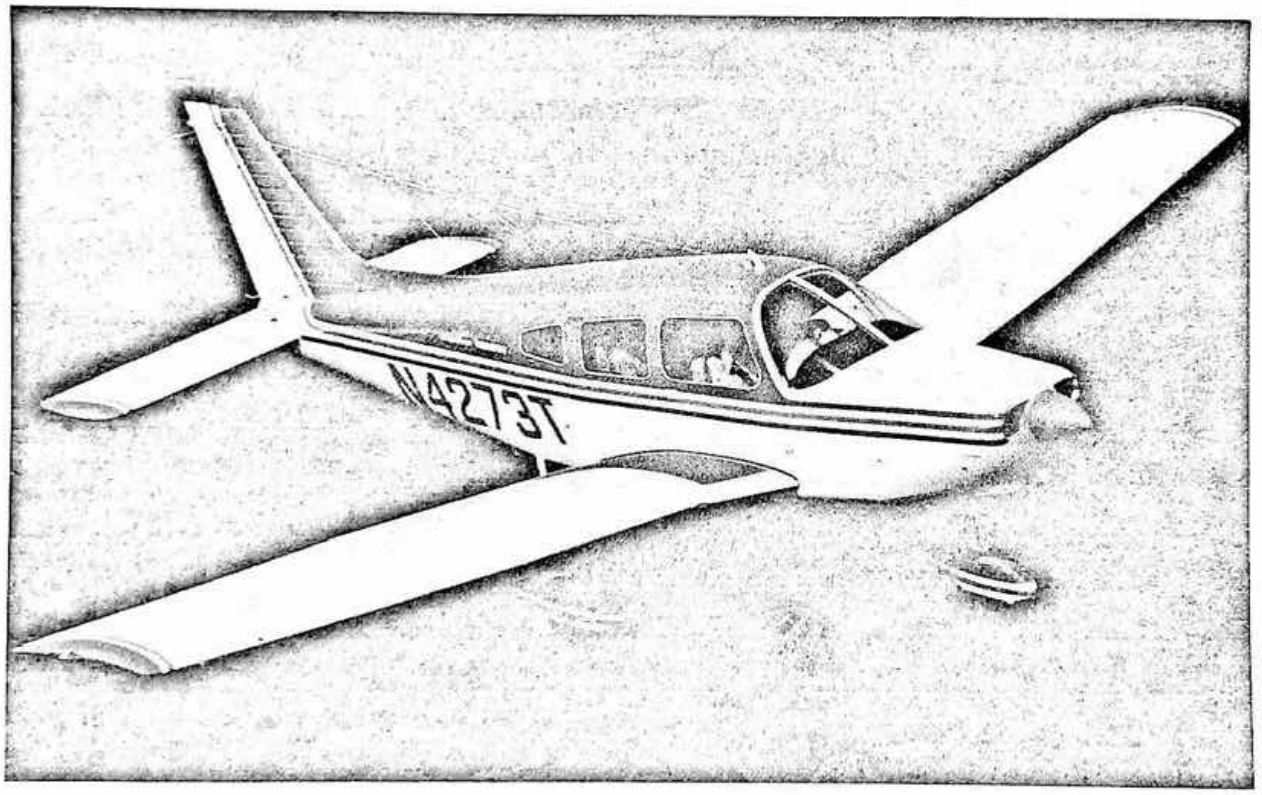
THE

cherokee WARRIOR

PILOT'S OPERATING MANUAL



BY

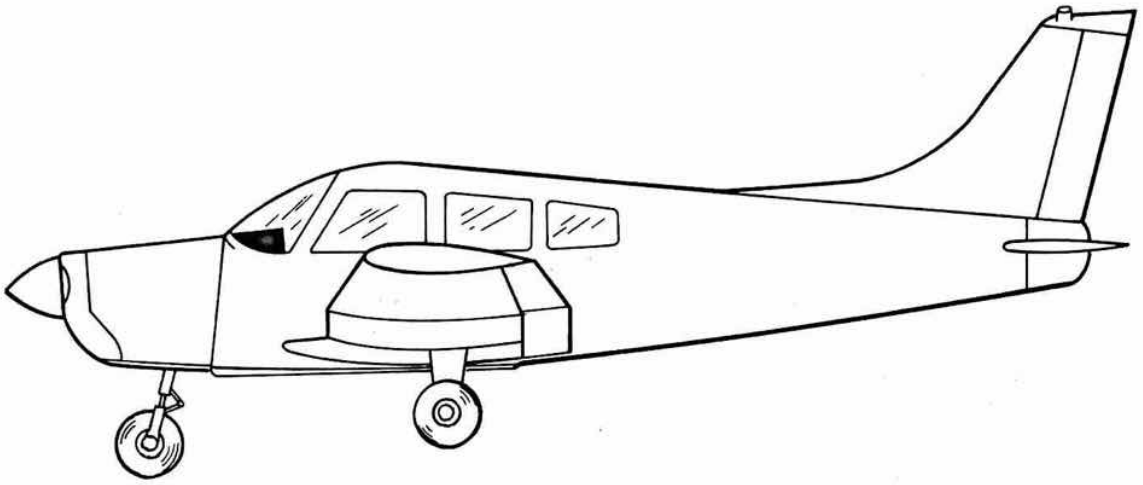
PIPER

This manual is incomplete without an APPROPRIATE FAA APPROVED AIRPLANE FLIGHT MANUAL and an APPROPRIATE WEIGHT AND BALANCE REPORT.

AIRPLANE FLIGHT MANUAL

FOR

CHEROKEE WARRIOR



NOTE

THIS MANUAL MUST BE KEPT IN THE AIRPLANE AT ALL TIMES

MANUFACTURER'S MODEL PA-28-151

MANUFACTURER'S SERIAL 28- 7415614

REGISTRATION - N 44290

FAA APPROVED BY: H. W. Barnhouse

H. W. BARNHOUSE
PIPER AIRCRAFT CORPORATION
D. O. A. NO. SO–1
VERO BEACH, FLORIDA

DATE OF APPROVAL: JULY 25, 1973

APPROVAL BASIS: CAR 3 AND FAR PART 21, SUBPART J.

REPORT: VB-573
MODEL: PA-28-151

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AIRPLANE FLIGHT MANUAL

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AIRPLANE FLIGHT MANUAL LOG OF REVISIONS

Revision	Revised Pages	Description and Revision	FAA Approved Date
1	All	Completely revised to printed format for assembly into Pilot's Operating Manual 761 563.	H. W. Barnhouse August 1, 1973
	3-5	Revised spin recovery technique, item 3. c.	
2	3-i	Revised Table of Contents	
	3-1	Revised Item C. Propeller Limitations	
	3-2	Revised Airspeed Range	
	3-7	Revised Stall Speed Chart	
	3-9	Revised List of Supplements	
	3-13	Added page and Supplement B	
	3-14	Added page	H. W. Barnhouse
	3-15	Added page and Supplement C	August 30, 1973
	3-16	Added page	
3	Title	Added PAC Approval Form. (NOTE: AIRCRAFT DELIVERED WITH MANUALS PRIOR TO THIS REVISION DO NOT REQUIRE THIS REVISION.)	D. H. Trompler May 31, 1974
4	3-i	Added Item D. Installation of Piper AutoControl IIIB to supplements.	
	3-9	Added Item D. Installation of Piper AutoControl IIIB.	D. H. Trompler
	3-17, 3-18, 3-19, 3-20	Added pages (AutoControl IIIB info).	June 14 1974
5	3-i	Changed Section IV title from Supplements to Optional Equipment: under Section IV - revised item A.: deleted item B.; revised remaining item nos.; added AutoControl III to new item C.	
	3-9	Changed Section IV title from Supplements to Optional Equipment; revised NOTE; revised item A.; deleted item B.; revised remaining item letters; added AutoControl III to new item C.	

AIRPLANE FLIGHT MANUAL LOG OF REVISIONS (cont)

Revision	Revised Pages	Description and Revision	FAA Approved Date
5 (cont)	3-11	Deleted (With Pitch Trim Switch) from item A. Electric Pitch Trim Installation.	
	3-13	Deleted item B. AutoControl III Installation.	
	3-15	Changed item C. to B.; added new items 2. b. (1) and (2); revised remaining item nos.; deleted item 3 - Performance.	
	3-17	Changed item D. to C.; added AutoControl III to title.	Ward Evans Ward Evans Jan. 17, 1975
	3-20	Deleted IIIB designation from items c. (1) and (2).	
6	3-2	Added ser. no. effectivity to Flaps Extended speed; added new Flaps Extended speed; added ser. no. effectivity to White Arc instrument marking; added new White Arc instrument marking.	
	3-3	Added ser. no. effectivity to Landing Check List; added new Landing Check List.	Ward Evans Ward Evans July 14, 1975
	3-5	Revised item 3. (Spin procedure).	
7	3-20	Revised item c. (1).	Ward Evans Ward Evans Dec. 1, 1975
8	3-1	Revised item B. Fuel.	Ward Evans Ward Evans April 16, 1976
9	3-15	Revised Supplement B. AutoFlite II Installation.	Ward Evans Ward Evans June 3, 1977

AIRPLANE FLIGHT MANUAL LOG OF REVISIONS (cont)

Revision	Revised Pages	Description of Revision	Approved Date
11	3-20	Revised item c.(1)	D.H. Trompler November 10, 1988

SECTION I

LIMITATIONS

The following limitations must be observed in the operation of this airplane:

A. ENGINE
Lycoming O-320-E3D

ENGINE LIMITS
For all operations 2700 RPM, ~~150 HP~~ 160 HP

B. FUEL
~~80/87~~ 100 octane aviation fuel minimum grade

C. PROPELLER
Sensenich 74DM6, maximum diameter 74 inches. Minimum diameter 72 inches. Static RPM at maximum permissible throttle setting: Not over 2375, not under 2275. No additional tollerance permitted.

McCauley 1C160/EGM7653, maximum diameter 76 inches. Minimum diameter 74.5 inches. Static RPM at maximum permissible throttle setting: Not over 2400, not under 2300. No additional tollerance permitted.

D. POWER INSTRUMENTS

OIL TEMPERATURE	
Green Arc (Normal Operating Range)	75° F to 245° F
Red Line (Maximum)	245° F
OIL PRESSURE	
Green Arc (Normal Operating Range)	60 PSI to 90 PSI
Yellow Arc (Caution Range)	25 PSI to 60 PSI
Red Line (Minimum)	25 PSI
Red Line (Maximum)	90 PSI
FUEL PRESSURE	
Green Arc (Normal Operating Range)	.5 PSI to 8 PSI
Red Line (Minimum)	.5 PSI
Red Line (Maximum)	8 PSI
TACHOMETER	
Green Arc (Normal Operating Range)	500 to 2700 RPM
Red Line (Maximum Continuous Power)	2700 RPM

E. AIRSPEED LIMITATIONS AND AIRSPEED INSTRUMENT MARKINGS (Calibrated Airspeed)

NEVER EXCEED	176 MPH
MAXIMUM STRUCTURAL CRUISE	140 MPH
MANEUVERING	124 MPH
FLAPS EXTENDED (Ser. nos. 7415001 through 7515449)	125 MPH
FLAPS EXTENDED (Ser. nos. 7615001 and up)	115 MPH
MAXIMUM POSITIVE LOAD FACTOR	(Normal Category) 3.8
MAXIMUM POSITIVE LOAD FACTOR	(Utility Category) 4.4
MAXIMUM NEGATIVE LOAD FACTOR	No inverted maneuvers approved

AIRSPEED INSTRUMENT MARKINGS

Red Radial Line (Never Exceed)	176 MPH (153 KTS)
Yellow Arc (Caution Range) (Smooth Air Only)	140 MPH to 176 MPH (122 KTS to 153 KTS)
Green Arc (Normal Operating Range)	64.5 MPH to 140 MPH (56 KTS to 122 KTS)
White Arc (Flap Down Range) (Ser. nos. 7415001 through 7515449)	58 MPH to 125 MPH (50 KTS to 109 KTS)
White Arc (Flap Down Range) (Ser. nos. 7615001 and up)	58 MPH to 115 MPH (50 KTS to 100 KTS)

F. MAXIMUM WEIGHT

Normal Category	2325 LBS
Utility Category	1950 LBS

G. BAGGAGE CAPACITY 200 LBS

H. C. G. RANGE

The datum used is 78.4 inches ahead of wing leading edge at the intersection of the straight and tapered section.

1. Normal Category

Weight (Pounds)	Forward Limit (In. Aft of Datum)	Rearward Limit (In. Aft of Datum)
2325	87.0	93.0
1950	83.0	93.0

2. Utility Category

Weight (Pounds)	Forward Limit (In. Aft of Datum)	Rearward Limit (In. Aft of Datum)
1950	83.0	86.5

Straight line variation between points given.

NOTE

It is the responsibility of the airplane owner and the pilot to insure that the airplane is properly loaded. See Weight and Balance Section for proper loading instructions.

I. MANEUVERS

1. Normal Category - All acrobatic maneuvers including spins prohibited.
2. Utility Category - Approved maneuvers for Utility Category only.

	Entry Speed
Steep Turns	124 MPH
Lazy Eights	124 MPH
Chandelles	124 MPH

J. PLACARDS

In full view of the pilot:

"THIS AIRPLANE MUST BE OPERATED AS A NORMAL OR UTILITY CATEGORY AIRPLANE IN COMPLIANCE WITH THE OPERATING LIMITATIONS STATED IN THE FORM OF PLACARDS, MARKINGS AND MANUALS.

ALL MARKINGS AND PLACARDS ON THIS AIRPLANE APPLY TO ITS OPERATION AS A UTILITY CATEGORY AIRPLANE. FOR NORMAL AND UTILITY CATEGORY OPERATIONS, REFER TO THE AIRPLANE FLIGHT MANUAL.

NO ACROBATIC MANEUVERS ARE APPROVED FOR NORMAL CATEGORY OPERATIONS. SPINS ARE PROHIBITED FOR NORMAL AND UTILITY CATEGORIES."

In full view of the pilot, the following takeoff and landing check lists will be installed:

TAKEOFF CHECK LIST

Fuel on proper tank	Mixture set	Fasten belts/harness
Electric fuel pump on	Seat backs erect	Trim tab - set
Engine gauges checked		Controls - free
Flaps - set		Door - latched
Carb heat off		

1. On aircraft with ser. nos. 7415001 through 7515449. 7415614

LANDING CHECK LIST

Fuel on proper tank		Flaps - set (125 mph)
Mixture rich	Seat backs erect	Fasten belts/harness
Electric fuel pump on		

2. On aircraft with ser. nos. 7615001 and up.

LANDING CHECK LIST

Fuel on proper tank		Flaps - set (115 mph)
Mixture rich	Seat backs erect	Fasten belts/harness
Electric fuel pump on		

Adjacent to upper door latch:

"ENGAGE LATCH BEFORE FLIGHT."

On the instrument panel in full view of the pilot:

"DEMONSTRATED CROSSWING COMPONENT 20 MPH."

On inside of the baggage compartment door:

"BAGGAGE MAXIMUM 200 LBS"
"UTILITY CATEGORY OPERATION - NO BAGGAGE OR AFT PASSENGERS ALLOWED. NORMAL CATEGORY OPERATION - SEE AIRPLANE FLIGHT MANUAL WEIGHT AND BALANCE SECTION FOR BAGGAGE AND AFT PASSENGER LIMITATIONS."

In full view of the pilot:

"ROUGH AIR OR MANEUVERING SPEED - 124 MPH."

"UTILITY CATEGORY OPERATION - NO AFT PASSENGERS ALLOWED."

On the instrument panel in full view of the pilot when the oil cooler winterization kit is installed:

"OIL COOLER WINTERIZATION PLATE TO BE REMOVED WHEN AMBIENT TEMPERATURE EXCEEDS 50° F."

In full view of the pilot:

"UTILITY CATEGORY ONLY."

ACROBATIC MANEUVERS ARE LIMITED TO THE FOLLOWING:

	ENTRY SPEED
SPINS PROHIBITED	
STEEP TURNS	124 MPH
LAZY EIGHTS	124 MPH
CHANDELLES	124 MPH

On the instrument panel in full view of the pilot when the supplementary white strobe lights are installed:

"WARNING - TURN OFF STROBE LIGHTS WHEN TAXIING IN VICINITY OF OTHER AIRCRAFT, OR DURING FLIGHT THROUGH CLOUD, FOG OR HAZE."

SECTION II

PROCEDURES

1. The stall warning system is inoperative with the master switch off.

2. Electric fuel pump must be on for both landing and takeoff.

3. Intentional spins are prohibited. In the event that an unintentional spin is encountered, recovery can be accomplished by immediately using the following procedures:

    a. THROTTLE - IDLE
    b. AILERONS - NEUTRAL
    c. RUDDER - FULL OPPOSITE TO DIRECTION OF ROTATION
    d. CONTROL WHEEL - FULL FORWARD
    e. RUDDER - NEUTRAL (WHEN ROTATION STOPS)
    f. CONTROL WHEEL - AS REQUIRED TO SMOOTHLY REGAIN LEVEL FLIGHT ATTITUDE

4. Except as noted above, all operating procedures for this airplane are normal.

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SECTION III

PERFORMANCE

The following performance figures were obtained during FAA type tests and may be realized under conditions indicated with the airplane and engine in good condition and with average piloting technique. All performance is given for 2325 pounds.

Loss of altitude during stalls varied from 100 to 275 feet, depending on configuration and power.

Stalling speeds, in mph, power off, versus angle of bank (Calibrated Airspeed):

Angle of Bank	0°	20°	40°	50°	60°
Flaps Up	64.5	67	74	80	91
Flaps Down	58	60	66	72	82

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SECTION IV

OPTIONAL EQUIPMENT

NOTE

THE INFORMATION CONTAINED IN THIS SECTION APPLIES WHEN THE RELATED EQUIPMENT IS INSTALLED IN THE AIRCRAFT.

A. Electric Pitch Trim Installation

B. AutoFlite II Installation

C. Installation of Piper AutoControl III and/or AutoControl IIIB

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A. ELECTRIC PITCH TRIM INSTALLATION

The following emergency information applies in case of electric pitch trim malfunction:

1. In case of malfunction, disengage electric pitch trim by pushing pitch trim switch on instrument panel to OFF position.

2. In an emergency, electric pitch trim may be overpowered using manual pitch trim.

3. In cruise configuration, malfunction results in 10° pitch change and 200 ft altitude variation.

4. In approach configuration, a malfunction can result in a 5° pitch change and 50 ft altitude loss.

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B. AUTOFLITE II INSTALLATION

This supplement must be used in conjunction with the applicable FAA Approved Airplane Flight Manual when Piper AutoFlite II, Model AK430 is installed in accordance with STC SA1406SW or STC SA3066SW-D. The information contained herein supplements the information of the basic Airplane Flight Manual; for limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

1. LIMITATIONS
   a. Autopilot use prohibited above 170 MPH CAS.
   b. Autopilot OFF during takeoff and landing.

2. PROCEDURES
   a. Normal Operation
      (1) Engagement
         (a) Rocker switch on instrument panel - ON.
         (b) Interrupt switch on left hand side of pilot's control wheel - RELEASED.

      (2) Disengagement
         (a) Depress interrupt switch on pilot's control wheel (or)
         (b) Rocker switch on instrument panel - OFF.

      (3) Heading Changes
         (a) Depress interrupt switch, make heading change, release interrupt switch.
         (b) Move trim knob on instrument for drift correction from a constant heading.
         (c) Move turn command knob on instrument for right or left banked turns.

      (4) OMNI Tracker
         (a) Center turn command knob and push IN to engage tracker.
         (b) Trim knob - push IN for high sensitivity.

   b. Emergency Operation
      (1) In case of malfunction DEPRESS and hold interrupt switch on pilot's control wheel.
      (2) Rocker switch on instrument panel - OFF.
      (3) Unit may be overpowered manually.
      (4) In climb, cruise or descent configuration a malfunction with a 3 second delay in recovery initiation results in 60 bank and 320' altitude loss. Maximum altitude loss measured at 170 MPH CAS in a descent.
      (5) In approach configuration a malfunction with a 1 second delay in recovery initiation results in 15 bank and 20' altitude loss.

3. PERFORMANCE

No change.

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C. INSTALLATION OF PIPER AUTOCONTROL III AND/OR AUTOCONTROL IIIB

1. LIMITATIONS
   a. Autopilot OFF during takeoff and landing.
   b. Autopilot use prohibited above 140 MPH CAS.

2. PROCEDURES
   a. PREFLIGHT
      (1) Roll Section
         (a) Place Radio Coupler in "Heading" mode and place A/P ON/OFF switch in the "ON" position to engage roll section. Rotate roll command knob Left and Right and observe control wheel describes a corresponding Left and Right turn, then center knob.
         (b) Set proper D.G. Heading on D.G. and turn Heading Indice to aircraft heading. Engage "Heading" mode switch and rotate Heading Indice right and left. Aircraft control wheel should turn same direction as Indice. While D.G. indice is set for a left turn, grasp control wheel and override the servo to the right. Repeat in opposite direction for right turn.
         (c) If VOR signal available check Omni mode on Radio Coupler by swinging Omni needle left and right slowly. Observe that control wheel rotates in direction of needle movement.
         (d) Disengage by placing the A/P ON/OFF switch to the "OFF" position.

   b. IN-FLIGHT
      (1) Trim airplane (ball centered).
      (2) Check air pressure or vacuum to ascertain that the Directional Gyro and Attitude Gyro are receiving sufficient air.
      (3) Roll Section
         (a) To engage, center Roll Command Knob, place the A/P ON/OFF switch to the "ON" position. To turn rotate roll command knob in desired direction. (Maximum angle of bank should not exceed 30°.)
         (b) For heading mode, set Directional Gyro with Magnetic Compass. Push directional gyro HDG knob in, rotate to aircraft heading. Place the console HDG ON/OFF switch to the "ON" position. To select a new aircraft heading, push D.G. heading knob IN and rotate, in desired direction of turn, to the desired heading.

NOTE

In HDG mode the maximum bank angles are limited to approximately 20° and single command, heading changes should be limited to 150°. (HDG Indice not more than 150° from actual aircraft heading.)

(4) VOR

(a) To Intercept:

1. Using OMNI Bearing Selector, dial desired course, inbound or outbound.
2. Set identical heading on Course Selector D.G.
3. After aircraft has stabilized, position coupler mode selector knob to OMNI mode. As aircraft nears selected radial, interception and crosswind correction will be automatically accomplished without further switching.

NOTE

If aircraft position is less than 45° from selected radial, aircraft will intercept before station. If position is more than 45°, interception will occur after station passage. As the aircraft nears the OMNI station, (1/2 mile) the zone of confusion will direct an "S" turn in alternate directions as the OMNI indicator needle swings. This alternate banking limited to the standard D.G. bank angle, is an indication of station passage.

(b) To select new course:

1. To select a new course or radial, rotate the HDG indice to the desired HDG (match course).
2. Rotate OBS to the new course. Aircraft will automatically turn to the intercept heading for the new course.

(c) To change stations:

1. If same course is desired, merely tune receiver to new station frequency.
2. If different course is desired, position coupler mode selector to HDG mode. Dial course selector D.G. to new course. Dial OBS to new course and position coupler mode selector to OMNI mode.

(5) VOR Approach

Track inbound to station as described in VOR navigation section. After station passage:

(a) Dial outbound course on Course Selector D.G., then dial same course on OBS.

(b) After established on outbound radial, position coupler mode selector to HDG mode and select outbound procedure turn heading. After 40 seconds to 1 minute select a turn in the desired direction with the Course Selector D.G. to the inbound procedure turn heading.

(c) Set OBS to inbound course.

(d) When aircraft heading is 45° to the inbound course, dial Course Selector D.G. to inbound course and position coupler mode selector to OMNI mode.

NOTE

For precise tracking over OMNI station, without "S" turn, position coupler mode selector to HDG mode just prior to station passage. If holding pattern is desired, position coupler mode selector to HDG mode at station passage inbound and select outbound heading in direction of turn. After elapsed time, dial inbound course on Course Selector D.G. When aircraft heading is 45° to radial, position coupler mode selector to OMNI mode.

(6) LOC Approach Only
   (a) To intercept dial ILS outbound course on Course Selector D.G. When stabilized, position coupler mode selector to LOC REV mode.
   (b) After interception and when beyond outer marker, position coupler mode selector to HDG mode and dial outbound procedure turn heading. After one minute, dial inbound procedure turn heading in direction of turn.
   (c) When aircraft heading is 45° to ILS inbound course dial inbound course on Course Selector D.G. and position coupler mode selector to LOC NORM mode.
   (d) At the missed approach point (M.A.P.), or when missed approach is elected, position coupler mode selector to HDG mode and execute missed approach procedure.

(7) LOC Approach - Back Course (Reverse)
   (a) To intercept dial ILS Back Course outbound heading on Course Selector D.G. When stabilized, position coupler mode selector to LOC NORM mode.
   (b) After interception and when beyond fix, position coupler mode selector to HDG and dial outbound procedure turn heading. After one minute, dial inbound procedure turn heading in direction of turn.
   (c) When heading 45° to inbound course, dial inbound course on Course Selector D.G. and position coupler mode selector to LOC REV mode.
   (d) Approximately 1/2 mile from runway, position coupler mode selector to HDG mode to prevent "S" turn over ILS station near runway threshold.
   (e) Missed approach - same as Front Course. (See (6) d)

c. EMERGENCY OPERATION

(1) In an emergency the AutoControl can be disconnected by placing the A/P ON/OFF switch to the OFF position.

(2) The AutoControl can be overpowered at either control wheel.

(3) An Autopilot runaway, with a 3 second delay in the initiation of recovery, while operating in a climb, cruise or descending flight could result in a 60° bank and 100 foot altitude loss.

(4) An Autopilot runaway, with a 1 second delay in the initiation of recovery, during an approach operation, coupled or uncoupled, could result in a 10° bank and 100 foot altitude loss.

3. PERFORMANCE

No change.

GENERAL SPECIFICATIONS

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GENERAL SPECIFICATIONS

PERFORMANCE

Published figures are for standard airplanes flown at gross weight under standard conditions at sea level, unless otherwise stated. Performance for a specific airplane may vary from published figures depending upon the equipment installed, the condition of engine, airplane and equipment, atmospheric conditions and piloting technique. Each performance figure below is subject to the same conditions as on the corresponding performance chart from which it is taken in the Performance Charts Section.

Takeoff Ground Run (minimum) (ft)	1065
Takeoff Distance Over 50-ft Obstacle (25° flaps) (ft)	1760
Best Rate of Climb Speed (mph)	87
Rate of Climb (ft per min)	649
Service Ceiling (ft)	12,700
Absolute Ceiling (ft)	14,960
Top Speed (mph)	135*
Optimum Cruising Speed (75% power, optimum altitude, leaned to best power) (mph)	133*
Cruising Range (75% power, optimum altitude, leaned to best economy, no reserves) (mi)	720*
Optimum Cruising Range (55% power, optimum altitude, leaned to best economy, no reserves) (mi)	785*
Stalling Speed (flaps down) (mph)	50KTS – 58
Stalling Speed (flaps up) (mph)	55KTS – 64.5
Landing Roll (flaps down) (ft)	595
Landing Roll Over 50-ft Barrier (flaps down) (ft)	1115

WEIGHTS

Gross Weight (lbs)	2325
Standard Empty Weight (lbs)	1331
Maximum Useful Load (lbs)	994

*With Optional Wheel Fairings installed.

POWER PLANT

Engine (Lycoming)	O-320-E2A
Rated Horsepower	160
Rated Speed (rpm)	2700
Bore (inches)	5.125
Stroke (inches)	3.875
Displacement (cubic inches)	319.8
Compression Ratio	7:1
Dry Weight (pounds)	276
Propeller	
McCauley	1C160/EGM7653
Sensenich	74DM6-0-58

FUEL AND OIL

Fuel Capacity (U.S. gal) (standard)	50
Fuel Capacity (U.S. gal) Usable	48
Oil Capacity (qts)	8
Fuel, Aviation Grade	
Minimum Octane	100 91/96
Specified Octane	100 91/96
Alternate Fuels	Refer to Fuel Requirements, Section 10 - Page 10-9

DIMENSIONS

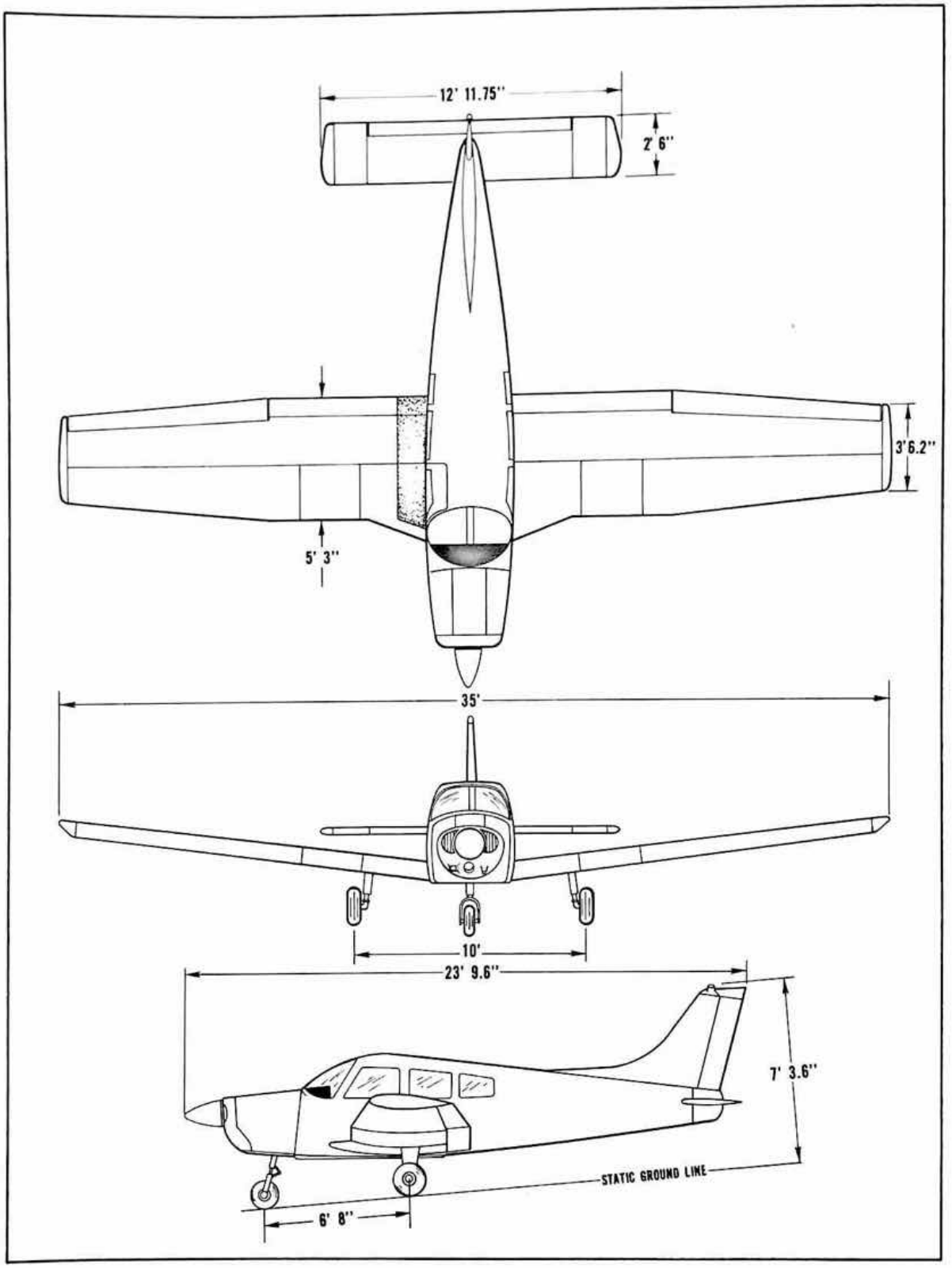
Wing Span (ft)	35
Wing Area (sq ft)	170.0
Length (ft)	23.8
Height (ft)	7.3
Wing Loading (lbs per sq ft)	13.7
Power Loading (lbs per hp)	15.5
Propeller Diameter (in.)	
McCauley	76
Sensenich	74
Turning Radius	13.0

BAGGAGE

Maximum Baggage (lbs)	200
Baggage Space (cubic ft)	24
Baggage Door Size (in.)	20 x 22

LANDING GEAR

Wheel Base (ft)		6.7
Wheel Tread (ft)		10.0
Tire Pressure (psi)	Nose	30
	Main	24
Tire Size	Nose (4 ply rating)	5.00 x 5
	Main (4 ply rating)	6.00 x 6


12' 11.75"
2' 6"
3' 6.2"
5' 3"
35'
10'
23' 9.6"
7' 3.6"
STATIC GROUND LINE
6' 8"

DESCRIPTION
AIRPLANE AND SYSTEMS

DESCRIPTION
AIRPLANE AND SYSTEMS

DESCRIPTION

AIRPLANE AND SYSTEMS

THE AIRPLANE

The Cherokee Warrior is a single-engine, fixed gear monoplane of all metal construction with low semi-tapered wings.

The fuselage provides a spacious, four-place interior with optional features to ensure individual comfort during short or extended cross-country flight.

The Cherokee Warrior can serve as a rental or cross-country airplane and also as a training and utility airplane. Performance and loading characteristics combine with economical operation to make the Warrior a versatile airplane in the business or personal aviation fields.

AIRFRAME

The **primary structure**, with the exception of the steel tube engine mount, steel landing gear struts and isolated areas, is of **aluminum alloy construction**. Tough fiberglass and thermoplastic are used extensively in the extremities - the wing tips, the engine cowling, etc. - and in nonstructural components throughout the airplane.

The **fuselage** is a conventional semi-monocoque structure. On the right side of the airplane is a large cabin door for ease of entrance and exit and a large baggage door to provide effortless loading into the 24 cubic foot compartment. Maintenance has been reduced to a minimum with advanced fuselage design.

The **wing** is a conventional semi-tapered design incorporating a laminar flow, NACA 65_2 415, airfoil section. The cantilever wings are attached to each side of the fuselage by insertion of the butt ends of the main spars into a spar box carry-through which is an integral part of the fuselage structure. The spar box carry-through structure, located under the rear seat, provides in effect a continuous main spar with splices at each side of the fuselage. There are also fore and aft attachments at the rear and at an auxiliary front spar. This type of wing structure provides unobstructed cabin space for the rear passengers and allows for a lighter wing structure to improve the useful load of the airplane.

Both **ailerons** and **flaps** are of modern, all metal construction for smooth control of the aircraft. The ailerons are tapered to accommodate the semi-tapered wings. In the fully retracted position, the right flap locks to provide a step for cabin entry. The flaps have three extended positions: 10, 25, and 40 degrees.

A horizontal stabilator, vertical fin, and a rudder make up the **empennage**. They utilize a lightweight metal construction with fiberglass tips.

ENGINE AND PROPELLER

The PA-28-151 is powered by a Lycoming O-320-E3D four cylinder, direct drive, horizontally opposed engine rated at 150 HP at 2700 RPM. It is equipped with a starter, a 60 amp 14 volt alternator, a shielded ignition, dual magnetos, vacuum pump drive, a fuel pump, and a wetted polyurethane foam induction air filter. A recommended overhaul period of 2000 hours is based on Lycoming service experience. Operation beyond the recommended time is the decision of the operator. Since Lycoming from time to time revises the recommended overhaul period, the owner should check with his dealer for the latest overhaul period on his engine as well as any additional Lycoming Service Information.

The engine compartment is easily accessible for inspection through top-hinged side panels on either side of the engine cowlings. The engine cowlings are cantilever structures attached at the fire wall. The engine mounts are constructed of steel tubing, and dynafocal mounts are provided to reduce vibration.

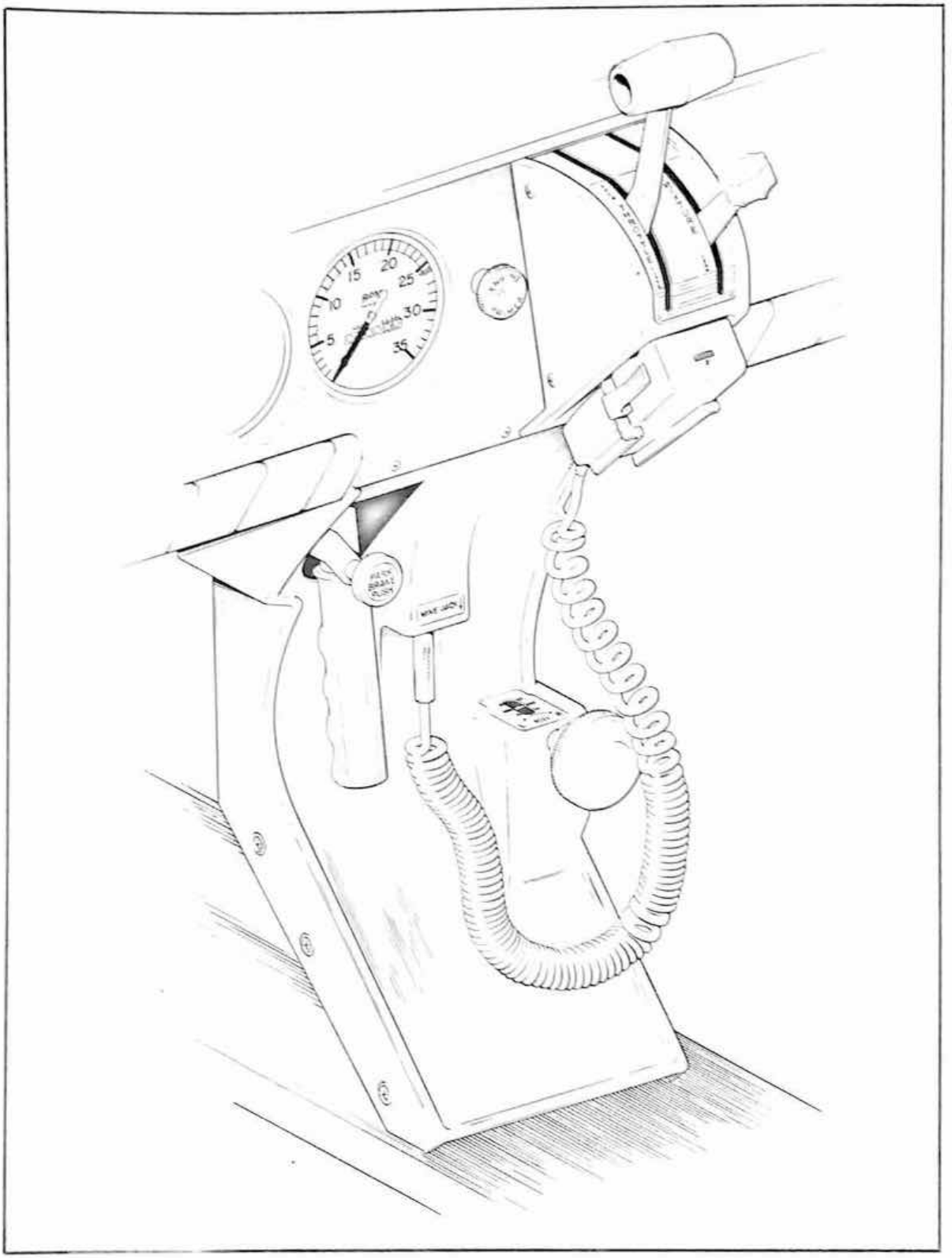
The exhaust system is constructed of stainless steel and incorporates a single muffler with heater shrouds to supply heated air for the cabin, the defroster system and the carburetor deicing system.

An oil cooler is located on the left rear of the engine mounted to the engine baffling. Engine cooling air, which is picked up in the nose section of the engine cowling and carried through the baffling, is utilized on the left side for the oil cooler. A winterization plate is provided to restrict air during winter operation. (See Winterization in Handling and Servicing.)

Engine air enters on either side of the propeller through openings in the nose cowling and is carried through the engine baffling around the engine and oil cooler. Air for the muffler shroud is also picked up from the nose cowling and carried through a large duct to the shroud. Carburetor induction air enters a chin scoop on the lower right cowling and is passed through a wetted polyurethane filter to the carburetor air box. Heated air enters the carburetor air box through a hose connected to the heater shroud.

A McCauley 1C160/EGM7653 or a Sensenich 74DM6-0-58 fixed pitch propeller is installed as standard equipment. The McCauley propeller has a diameter of 76 inches with a pitch of 53 inches and the Sensenich has a 74 inch diameter with a 58 inch pitch. The pitch of both propellers is determined at 75% of the diameter. Both propeller units are of an aluminum alloy construction.

The pilot should read and follow the procedures recommended in the Lycoming Operator's Manual for this engine in order to obtain maximum engine efficiency and time between engine overhauls.



Throttle Quadrant and Console

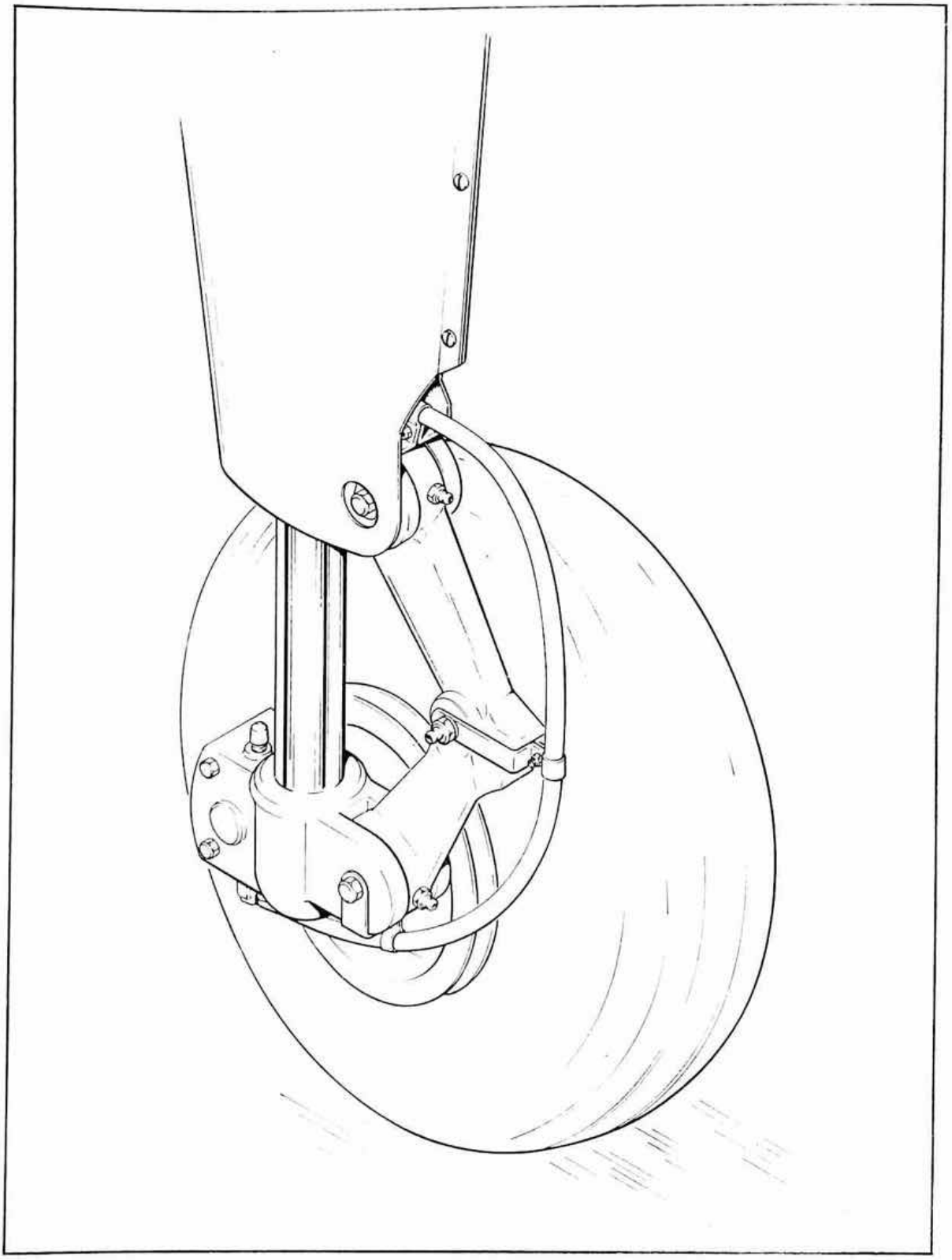
LANDING GEAR

The **fixed gear** PA-28-151 is equipped with is a Cleveland 5.00 x 5 wheel on the nose gear and a Cleveland 6.00 x 6 wheel on each main gear. Cleveland single disc hydraulic brake assemblies are provided on the main gear. The nose gear has a 5.00 x 5 four ply tire, while the main wheel assemblies have 6.00 x 6 four ply tires. At gross weight, the main gear tires require a pressure of 24 psi, and the nose gear tire requires a pressure of 30 psi.

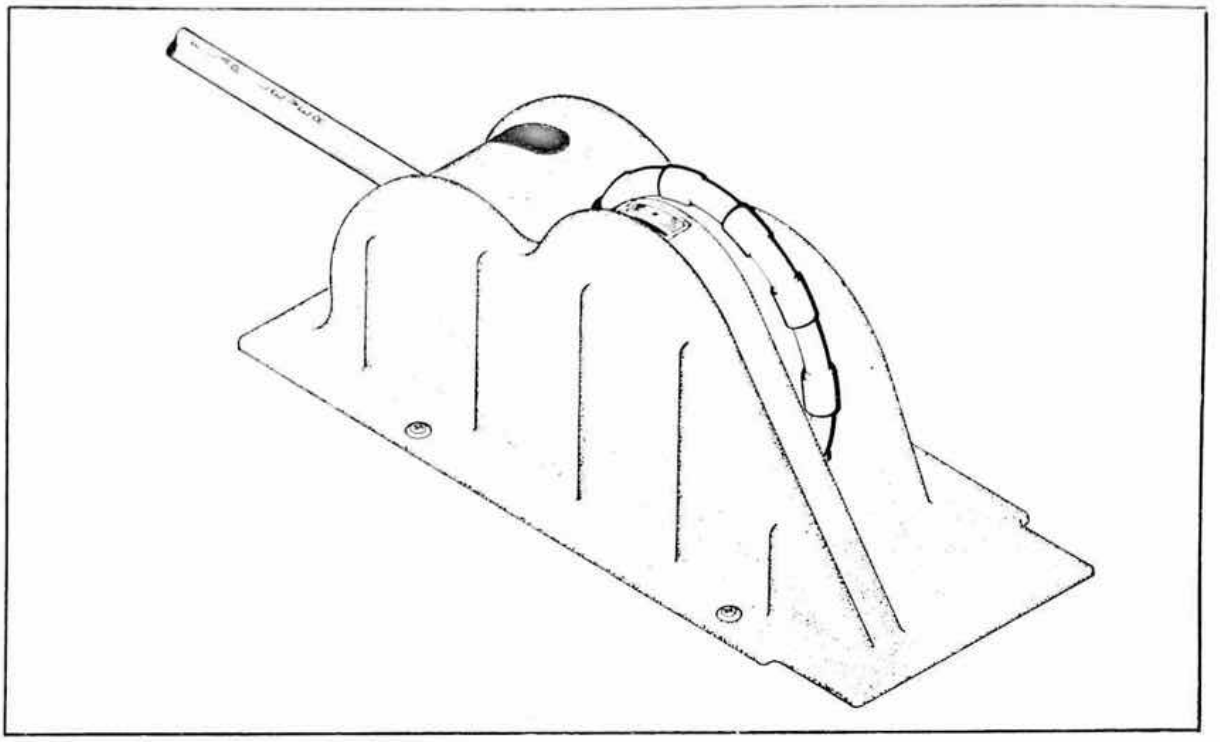
The **nose gear** is steerable through a 30 degree arc each side of center by the use of the rudder pedals and toe brakes. A spring device is incorporated for rudder centering and to provide rudder trim. A **bungee** assembly on the nose gear steering mechanism reduces ground steering effort and dampens shocks and bumps during taxiing. The steering mechanism also incorporates a **shimmy dampener.**

The three struts are of the **air-oil** type with the normal static load extension being 3.25 inches for the nose gear and 4.50 inches for the main gear.

The **brakes** are actuated by toe brake pedals which are attached to the rudder pedals or by a hand lever and master cylinder located below and behind the center of the instrument sub panel. Hydraulic cylinders are located above each pedal and adjacent to the hand brake lever. The brake fluid **reservoir** is installed on the top left front face of the fire wall. The **parking brake** is incorporated in the master cylinder and is actuated by pulling back on the brake lever and depressing the knob attached to the left side of the handle. To release the parking brake, pull back on the brake lever to disengage the catch mechanism and allow the handle to swing forward.



Main Wheel Assembly



Console

FLIGHT CONTROLS

Dual flight controls are provided on the Warrior as standard equipment. The flight controls actuate the control surfaces through a cable system.

The **horizontal surface (stabilator)** is of the flying tail design with a trim tab mounted on the trailing edge. This tab serves the dual function of providing trim control and pitch control forces. The trim tab is actuated by a trim control wheel located on the control console between the front seats. Forward rotation of the wheel gives nose down trim and aft rotation gives nose up trim. The stabilator provides extra stability and controllability with less area, drag and weight than conventional tail surfaces.

The **rudder** is conventional in design and incorporates a rudder trim. The trim mechanism is a spring loaded recentering device. The trim control is located on the right side of the pedestal below the throttle quadrant. Turning the trim control clockwise gives nose right trim and counterclockwise rotation gives nose left trim.

Ailerons are provided with a differential deflection. This feature reduces adverse yaw in turning maneuvers, thus reducing the amount of coordination required. An aileron centering spring incorporated in the aileron control system on early models centers the aileron by returning the control wheel to neutral.

Manually controlled **flaps** are provided on the PA-28-151. The flaps are balanced for light operating forces and spring loaded to return to the retracted (up) position. A control handle, which is located between the two front seats on the control console, extends the flaps by the use of a control cable. To extend the flaps, the handle is pulled up to the desired flap setting of 10, 25 or 40 degrees. To retract, depress the button on the end of the handle and lower the control. When extending or retracting flaps, there is a pitch change in the airplane. This pitch change can be corrected either by stabilator trim or increased control wheel force. When the flaps are in the retracted (up) position the right flap, provided with an over-center lock mechanism, acts as a step.

NOTE

The right flap will support a load only in the fully retracted (up) position. When the flap is to be used as a step, make sure the flaps are in the retracted (up) position.

FUEL SYSTEM

Fuel is stored in two twenty-five gallon (24 gallons usable) **fuel tanks**, giving the airplane a total capacity of fifty U.S. gallons (48 gallons usable). The tanks are secured to the leading edge of each wing with screws and nut plates. This allows easy removal for service or inspection.

On serial numbers 7415001 through 7515449 each fuel tank has two **outlets**, one forward and one aft, to ensure an even fuel flow. Fuel is pumped from the tanks through the forward and aft tank outlets to **fuel manifolds** in the inboard section of either wing. Each manifold is a small collector with an inlet hose from each of the tank outlets, and an outlet hose to the fuel selector valve. On serial numbers 7615001 and up there is only one outlet on each tank and no fuel manifolds are used.

The **fuel tank selector control** is located on the left side panel forward of the pilot's seat. The button on the selector cover must be depressed and held while the handle is moved to the OFF position. The button releases automatically when the handle is moved back to the ON position.

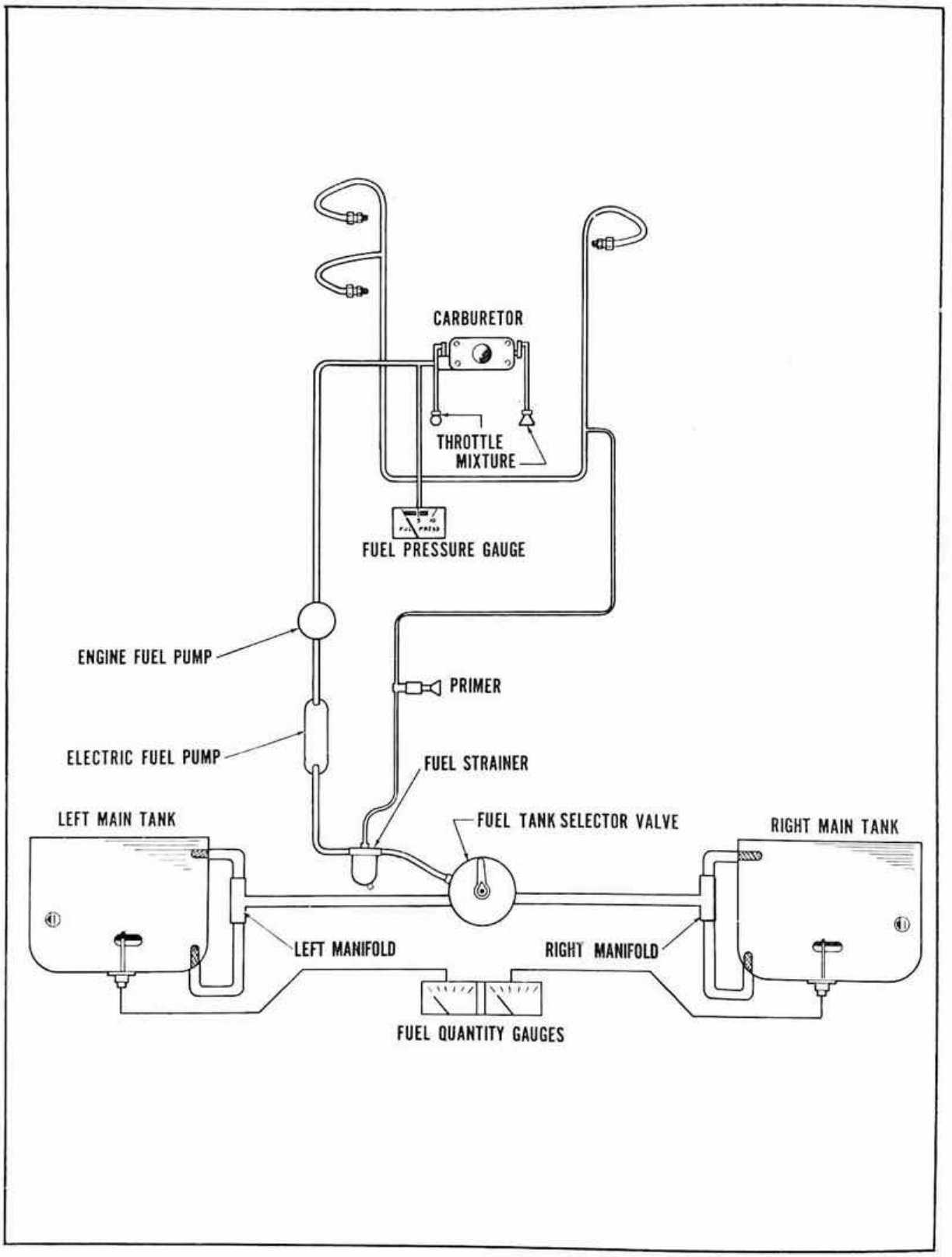
An auxiliary **electric fuel pump** is provided in case of the failure of the **engine driven pump**. The electric pump should be ON for all takeoffs and landings and when switching tanks. The fuel pump switch is located in the switch panel above the throttle quadrant.

The **fuel drains** should be opened daily prior to first flight to check for water or sediment. Each tank has an individual drain at the bottom, inboard rear corner, and each fuel manifold (on early models only) is equipped with a drain. The outlets are located on the underside of the wings.

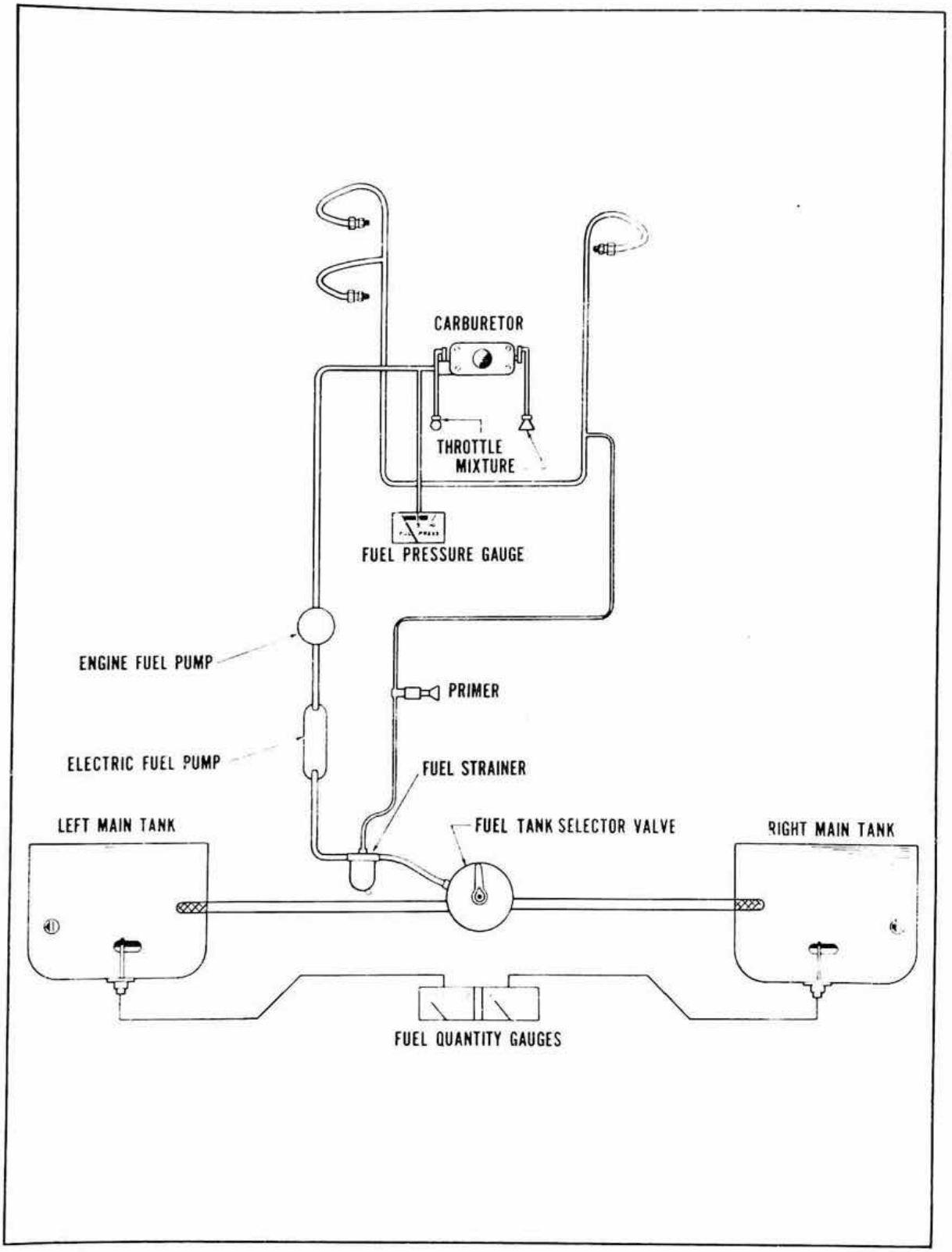
A **gascolator**, located on the lower left front of the fire wall, has a drain which is accessible from outside the nose section. The gascolator should also be drained before the first flight of the day. (See the Handling and Servicing Section for the complete fuel draining procedure.)

Fuel quantity and **fuel pressure gauges** are mounted in a gauge cluster located on the left side of the instrument panel to the right of the control wheel.

An optional **engine priming system** is available to facilitate starting. The primer pump is located to the immediate left of the throttle quadrant.



Fuel System Schematic (Ser. Nos. 7415001 through 7515449)



Fuel System Schematic (Ser. Nos. 7615001 and up)

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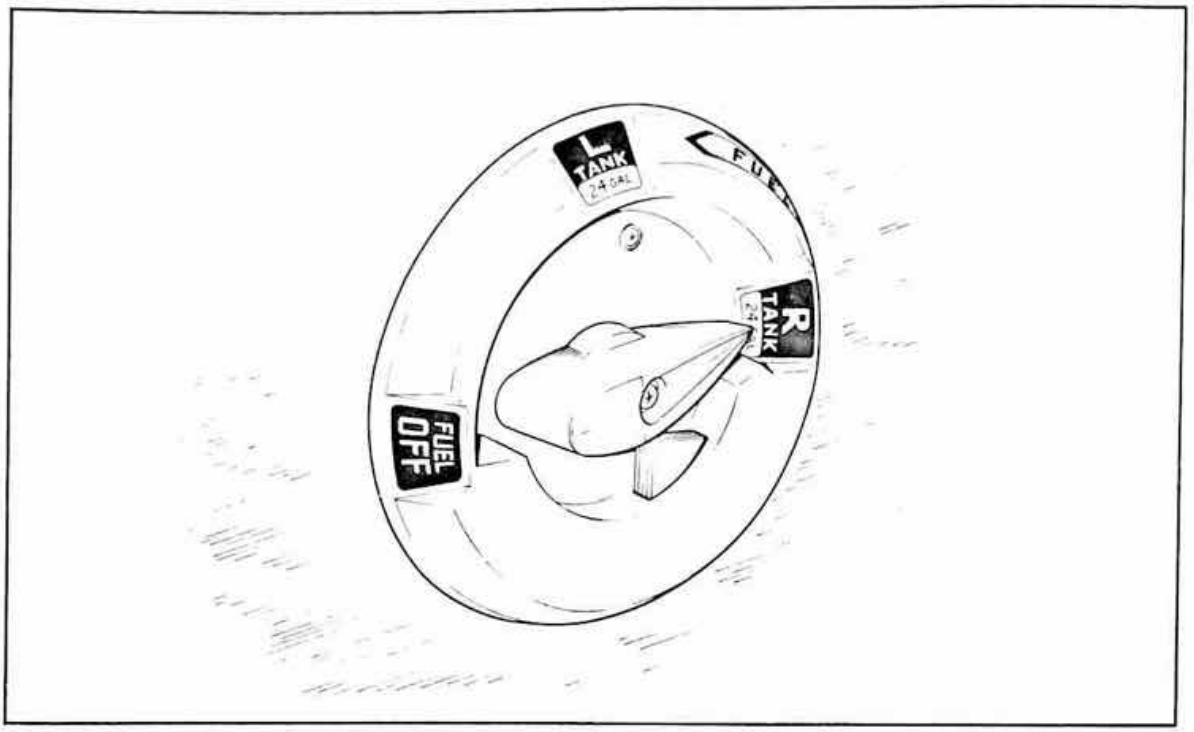


Fuel Selector

ELECTRICAL SYSTEM

The Cherokee Warrior is equipped with a simple but highly efficient electrical system that can be easily operated.

The electrical system includes a 14 volt 60 ampere alternator, voltage regulator, overvoltage relay, battery contactor and a standard 12 volt 25 ampere hour or an optional 12 volt 35 ampere hour battery. The battery is mounted in a thermoplastic box located immediately aft of the main spar on the right side of the fuselage below the rear passengers seat. The voltage 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 left side of the switch panel controls the optional navigation lights and the radio lights. A similar switch on the right side of the switch panel controls and dims the optional panel lights. The master switch, anti-collision light, landing light and fuel pump are also located on the switch panel and are controlled by rocker type switches.

WARNING

Strobe lights should not be operating when flying through overcast and clouds since reflected light can produce spacial disorientation. Do not operate strobe lights in close proximity to ground, during takeoff and landing.

A hinged door protects and gives easy access to the circuit breaker panel. Each circuit breaker on the panel is of the push to reset type and is clearly marked as to its function and amperage. Circuit provisions have been included to handle a full complement of communication and navigational equipment.

Standard electrical accessories include a starter, an electric fuel pump, an audible stall warning indicator, fuel gauges, ammeter, and annunciator panel*.

The annunciator panel* includes alternator and low oil pressure indicator lights. When the optional gyro system is installed, the annunciator panel also includes a low vacuum indicator light. The annunciator panel lights are provided only as a warning to the pilot that a system may not be operating properly, and that he should check and monitor the applicable system gauge to determine when or if any necessary action is required.

The system also provides for such **optional electrical accessories** as additional lights and gauges, a heated pitot head, and communication and navigational equipment.

The master switch is a split rocker switch. One side of the switch is the battery side ("BAT") and the other is the alternator side ("ALT"). Henceforth, the words **"master switch"** used in this manual will mean both "BAT" and "ALT" switches and they are to be depressed simultaneously to OFF or ON as directed.

Primary electrical power is provided by the 14 volt 60 amp alternator. The alternator system offers many advantages over the generator system both in operation and maintenance. The main advantage is full electrical power output at lower engine RPM. This provides improved radio and electrical equipment operation and increased battery life by reducing battery load. This will make cold weather starting easier.

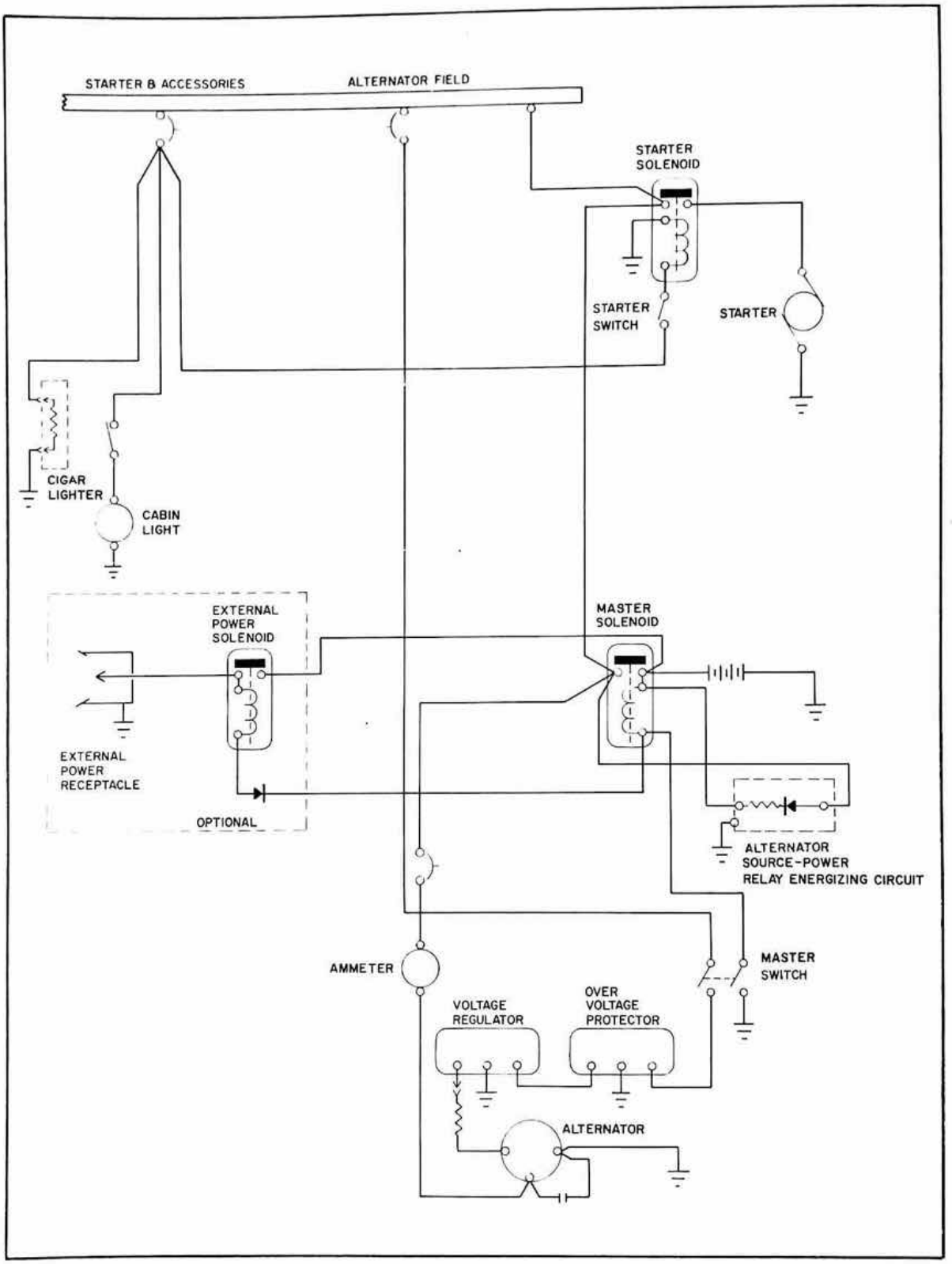
Secondary electrical power is provided by the standard or optional battery.

Unlike previous generator systems, the **ammeter** as installed does not show battery discharge: rather, it indicates the electrical load on the alternator in amperes. With all the electrical equipment off and the master switch on, the ammeter will indicate the charging rate of the battery. As each electrical unit is switched on, the ammeter will indicate the total ampere draw of all the units including the battery. For example, 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 amount of current shown on the ammeter will tell immediately if the alternator system is operating normally, as the amount of current shown should equal the total amperage drawn by the electrical equipment which is operating.

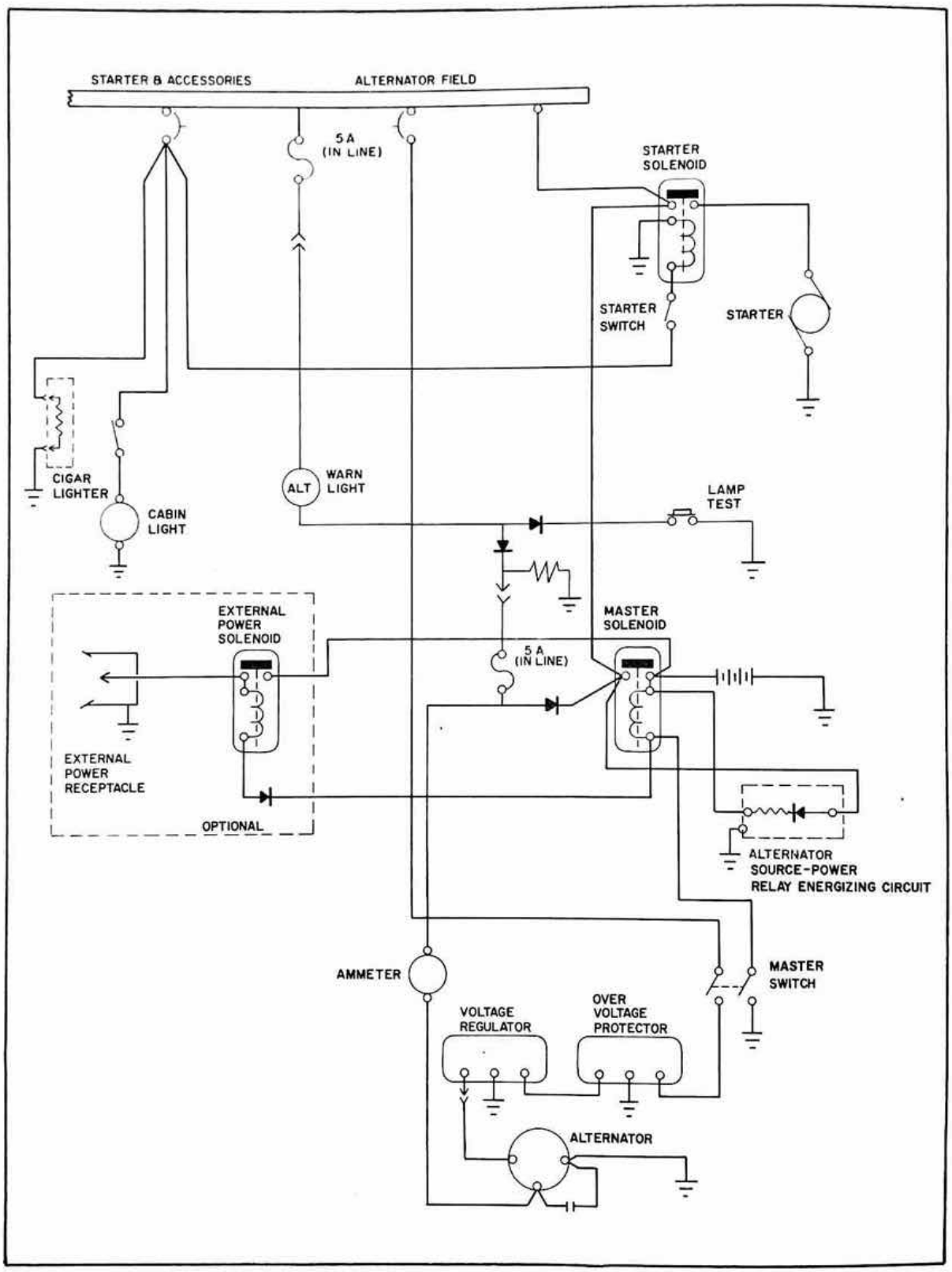
If no output is indicated on the ammeter during flight, reduce the electrical load by turning off all unnecessary electrical equipment. Check both the 5 ampere field breaker and the 60 ampere output breaker and reset if open. If neither circuit breaker is open, turn the "ALT" switch off for 1 second to reset the overvoltage relay. If the ammeter continues to indicate no output, maintain minimum electrical load and terminate the flight as soon as practical.

Maintenance on the alternator should prove to be a minor factor. Should service be required, contact the local Piper Dealer.

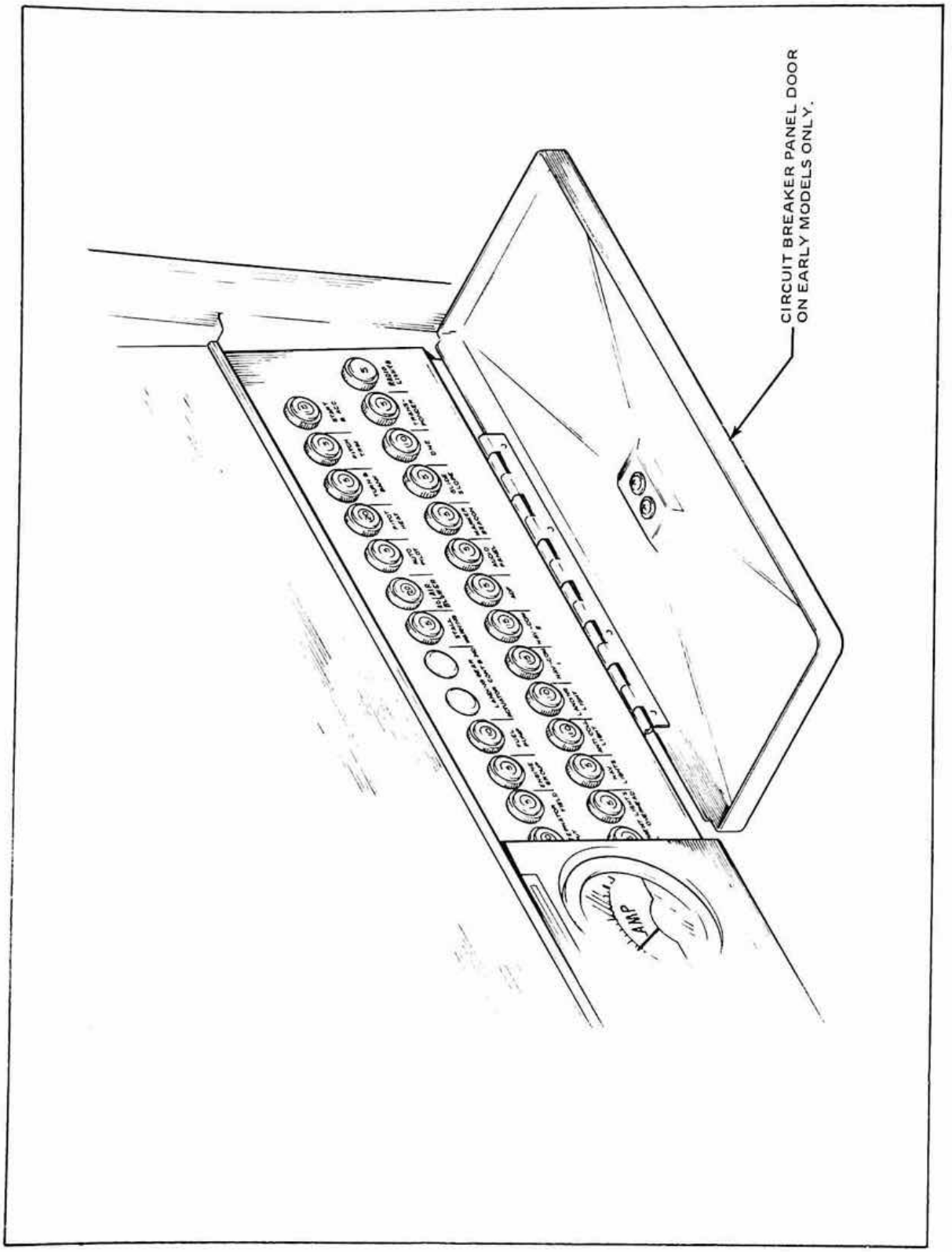
*Serial nos. 7515001 and up



Alternator and Starter Schematic (Ser. Nos. 7415001 through 7415731)



Alternator and Starter Schematic (Ser. Nos. 7515001 and up)



Circuit Breaker Panel

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VACUUM SYSTEM*

The vacuum system is designed to operate the air driven gyro instruments. This includes the directional and attitude gyros when installed. The system consists of an engine driven vacuum pump, a vacuum regulator, a filter and the necessary plumbing.

The **vacuum pump** is a dry type pump which eliminates the need for an air/oil separator and its plumbing. A shear drive protects the pump from damage. If the drive shears, the gyros will become inoperative.

A **vacuum gauge**, mounted on the far right instrument panel provides a pilot check for the system during operation. A decrease in pressure in a system that remained constant over an extended period may indicate a dirty filter, dirty screens, possibly a sticky vacuum regulator or leak in the system (a low vacuum indicator light is provided in the annunciator panel**). Zero pressure would indicate a sheared pump drive, defective pump, possibly a defective gauge or collapsed line. In the event of any gauge variation from the norm, the pilot should have a mechanic check the system to prevent possible damage to the system components or eventual failure of the system.

A **vacuum regulator** is provided in the system to protect the gyros. The valve is set so the normal vacuum reads 5.0 ± .1 inches of mercury, a setting which provides sufficient vacuum to operate all the gyros at their rated RPM. Higher settings will damage the gyros and with a low setting the gyros will be unreliable. The regulator is located behind the instrument panel.

INSTRUMENT PANEL

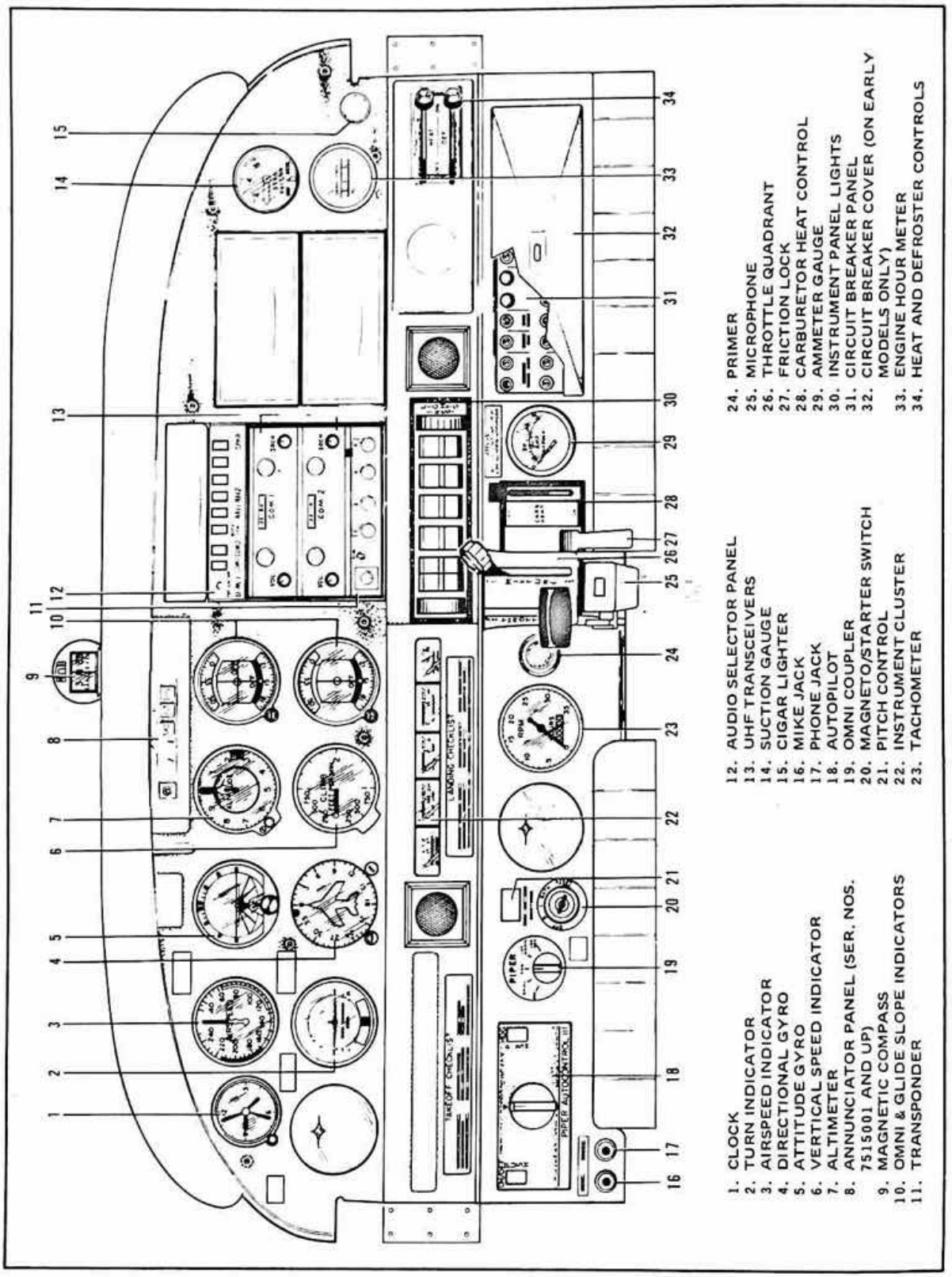
The **instrument panel** is designed to be functional and professional, accommodating complete instruments and avionics equipment for VFR and IFR flights. A wide range of optional instruments and avionics permit an equipment selection to suit individual needs.

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 center and lower instrument panels. The **radios** and the **circuit breakers** are located on the upper and lower right panel respectively, and have circuits provided for a complete line of optional radio equipment. An **engine cluster** is located to the right of the pilot control wheel and includes a fuel pressure gauge, a right and left main fuel quantity gauge, an oil temperature gauge and an oil pressure gauge.

Standard instruments on the Warrior panel include a compass, an airspeed indicator, a tachometer, an altimeter, an ammeter, an engine cluster, and an annunciator panel**. The compass is mounted to the top of the instrument panel in clear view of the pilot. The annunciator panel is mounted in the upper instrument panel to warn the pilot of a possible malfunction in the alternator, oil pressure, or vacuum systems.

A complete line of **instrument options** available for the panel includes a suction gauge, vertical speed indicator, attitude gyro, directional gyro, clock, tru-speed indicator and a turn and slip indicator or turn coordinator. The attitude gyro and directional gyro are vacuum operated through the use of a vacuum pump installed on the engine, while the turn and slip indicator is electrically operated. The vacuum suction gauge is on the far right of the instrument panel.

*Optional equipment
**Serial nos. 7515001 and up



Instrument Panel

PITOT-STATIC SYSTEM

The system supplies both **pitot** and **static pressure** for the airspeed indicator, altimeter, and the optional vertical speed indicator.

Pitot and static pressure are picked up by a **pitot head** installed on the bottom of the left wing and carried through pitot and static lines within the wing and fuselage to the gauges on the instrument panel.

A **static valve**, which is mounted to the knee guard below the instrument panel on the left side, provides an alternate static source for the system when opened.

Both the pitot and static lines can be drained through separate **drain valves** located on the left lower side of the fuselage interior.

A heated pitot head, which alleviates problems with icing and heavy rain, is available as optional equipment. The switch for the heated pitot head is located on the electrical switch panel to the left of the right control wheel.

To prevent bugs and water from entering the pitot and static pressure holes, a cover should be placed over the pitot head. A partially or completely blocked pitot head will give erratic or zero readings on the instruments.

NOTE

During the preflight, check to make sure the pitot cover is removed.

HEATING AND VENTILATING SYSTEM

Heat for the cabin interior and the defroster system is provided by a shroud attached to the muffler. The amount of heat can be regulated with the controls located on the far right side of the instrument panel.

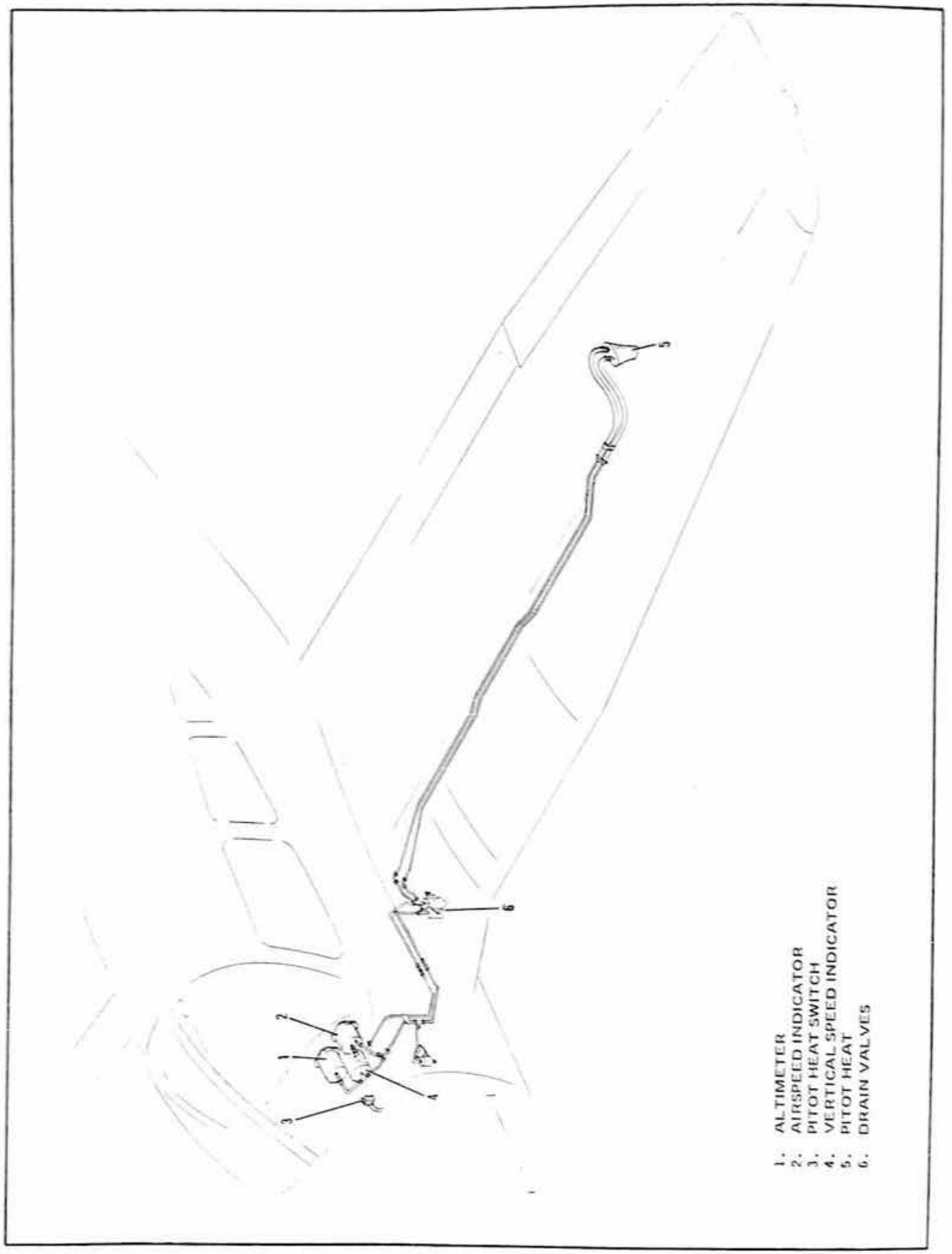
The airflow between front and rear seats can be regulated by the **heat diversion controls** located on either side of the console atop the heat ducts.

CAUTION

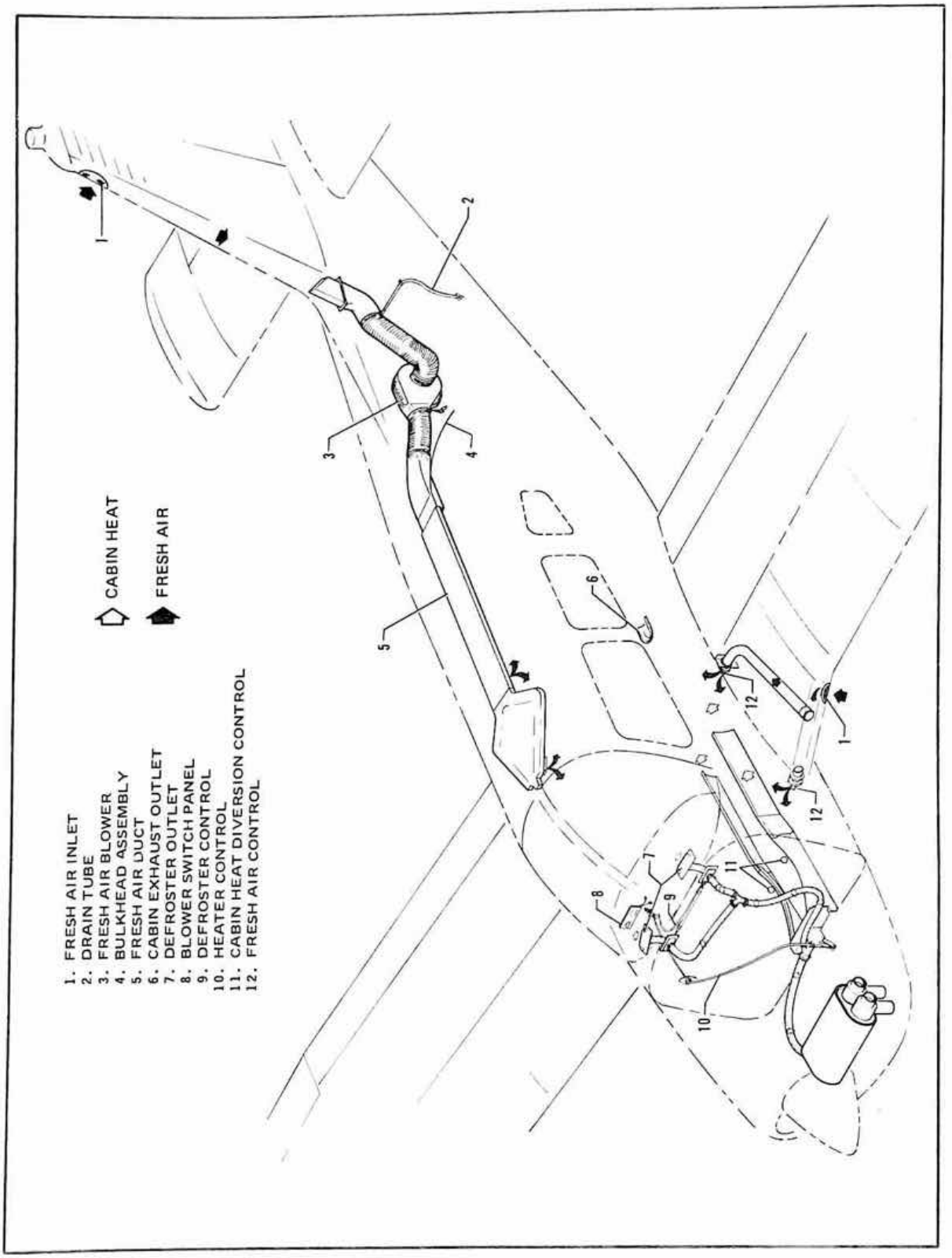
When cabin heat is operated, heat duct surface becomes hot. This could result in burns if arms or legs are placed too close to heat duct outlets or surface.

Fresh air inlets are located in the leading edges of the wings on the fin. At each front seat location there is a large adjustable **fresh air outlet** on the side of the cabin near the floor. Rear seat vents are optional. Cabin air is exhausted through an outlet located below the rear seat.

An **optional overhead ventilating system** with outlets over each seat is also available. An additional option to aid in fresh air circulation is a **cabin air blower** to force air through the overhead vent system. This blower is operated by a fan switch with four positions - "OFF," "LOW," "MED," and "HIGH." The switch is located on the right side of the instrument panel with the heater and defroster controls.



Pitot-Static System



Heating and Ventilating System

CABIN FEATURES

For ease of entry and exit and for pilot-passenger comfort, the front **seats** are adjustable fore and aft. The right front seat tilts forward to allow easy entry to the rear seats. The **cabin interior** includes a pilot storm window, ash trays and armrests on each front seat, two map pockets and pockets on the backs of the front seats.

The front seats can be equipped with optional headrests and optional push button vertical adjustment.

Seat belts are standard equipment for both front and rear seats. The shoulder straps controlled by **inertia reels** are standard equipment on the front seats and are offered as an option for the rear seats. The shoulder strap is routed over the shoulder adjacent to the window and attached to the seat belt in the general area of the occupants' inboard hip.

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

BAGGAGE AREA

A 24 cubic foot **baggage area**, located behind the rear seat, is accessible from the cabin or loaded through a large 20 x 22 inch outside baggage door on the right side of the fuselage. Maximum capacity is 200 pounds. Tie-down straps are available and they should be used at all times.

NOTE

It is the pilot's responsibility to be sure when the baggage is loaded that the aircraft C.G. falls within the allowable C.G. range. (See Weight and Balance Section.)

STALL WARNING

An approaching stall is indicated by an **audible alarm** located behind the instrument panel. The indicator activates at between five and ten miles per hour above stall speed.

FINISH

All exterior surfaces are primed with **etching primer** and finished with a durable **acrylic lacquer** which is available in a variety of colors and combinations. To keep the finish attractive, economy size spray cans of touch-up paint are available from Piper Dealers.

PIPER EXTERNAL POWER*

An optional starting installation known as **Piper External Power (PEP)** is accessible through a receptacle located on the right side of the fuselage aft of the baggage door. An external battery can be connected to the socket, thus allowing the operator to crank the engine without having to gain access to the airplane's battery. Instructions on a placard located on the cover of the receptacle should be followed before using the external power. For instructions on the use of the PEP see; **STARTING WITH EXTERNAL POWER** under the Operating Instructions Section of this manual.

*Optional equipment

GENERAL SPECIFICATIONS

GENERAL SPECIFICATIONS

PERFORMANCE

Published figures are for standard airplanes flown at gross weight under standard conditions at sea level, unless otherwise stated. Performance for a specific airplane may vary from published figures depending upon the equipment installed, the condition of engine, airplane and equipment, atmospheric conditions and piloting technique. Each performance figure below is subject to the same conditions as on the corresponding performance chart from which it is taken in the Performance Charts Section.

Takeoff Ground Run (minimum) (ft)	1065
Takeoff Distance Over 50-ft Obstacle (25° flaps) (ft)	1760
Best Rate of Climb Speed (mph)	87
Rate of Climb (ft per min)	649
Service Ceiling (ft)	12,700
Absolute Ceiling (ft)	14,960
Top Speed (mph)	135*
Optimum Cruising Speed (75% power, optimum altitude, leaned to best power) (mph)	133*
Cruising Range (75% power, optimum altitude, leaned to best economy, no reserves) (mi)	720*
Optimum Cruising Range (55% power, optimum altitude, leaned to best economy, no reserves) (mi)	785*
Stalling Speed (flaps down) (mph)	58
Stalling Speed (flaps up) (mph)	64.5
Landing Roll (flaps down) (ft)	595
Landing Roll Over 50-ft Barrier (flaps down) (ft)	1115

WEIGHTS

Gross Weight (lbs)	2325
Standard Empty Weight (lbs)	1331
Maximum Useful Load (lbs)	994

*With Optional Wheel Fairings installed.

POWER PLANT

Engine (Lycoming)	O-320-E2A
Rated Horsepower	160
Rated Speed (rpm)	2700
Bore (inches)	5.125
Stroke (inches)	3.875
Displacement (cubic inches)	319.8
Compression Ratio	7:1
Dry Weight (pounds)	276
Propeller	
McCauley	1C160/EGM7653
Sensenich	74DM6-0-58

FUEL AND OIL

Fuel Capacity (U.S. gal) (standard)	50
Fuel Capacity (U.S. gal) Usable	48
Oil Capacity (qts)	8
Fuel, Aviation Grade	
Minimum Octane	100 91/96
Specified Octane	100 91/96
Alternate Fuels	Refer to Fuel Requirements, Section 10 - Page 10-9

DIMENSIONS

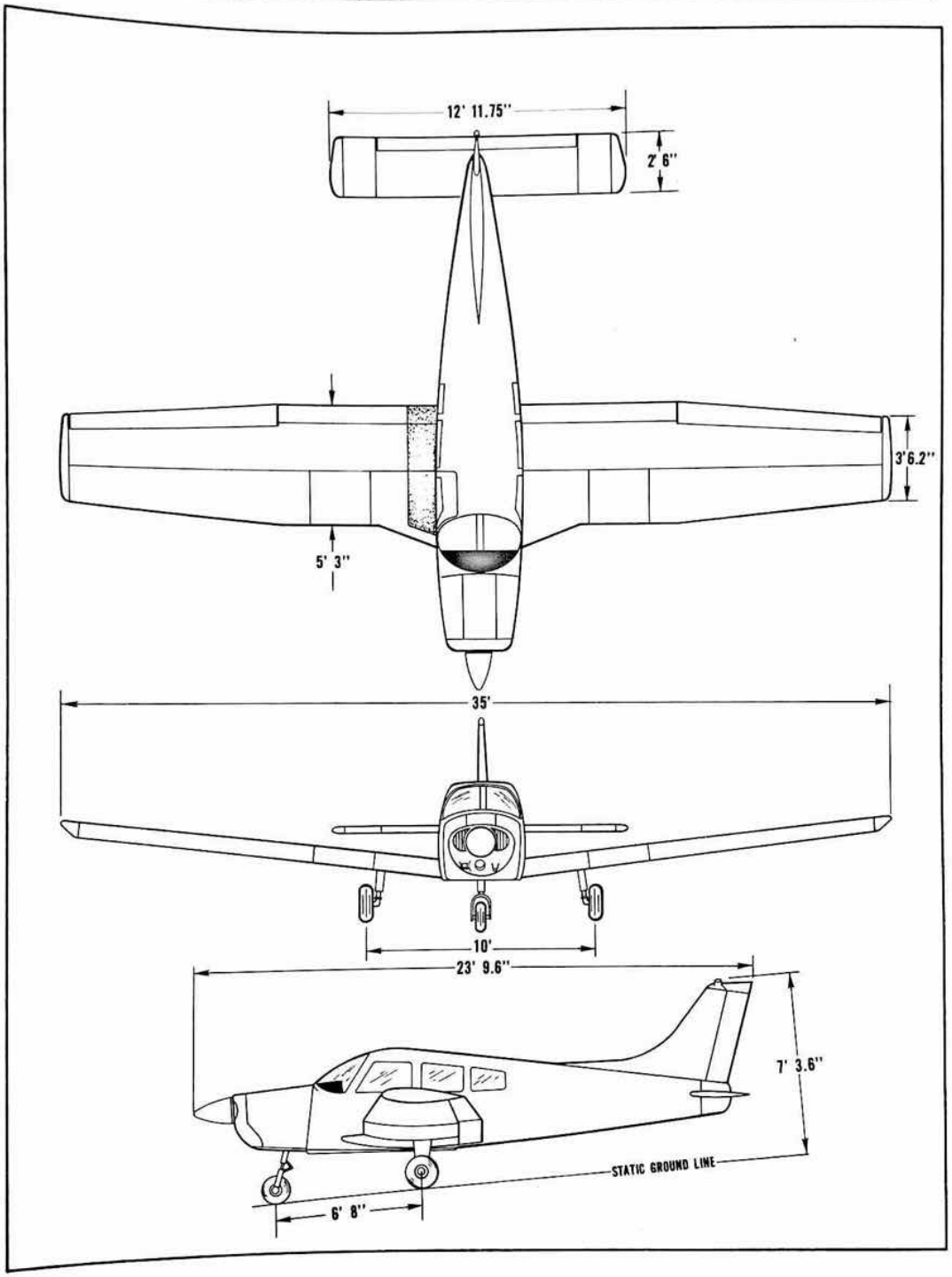
Wing Span (ft)	35
Wing Area (sq ft)	170.0
Length (ft)	23.8
Height (ft)	7.3
Wing Loading (lbs per sq ft)	13.7
Power Loading (lbs per hp)	15.5
Propeller Diameter (in.)	
McCauley	76
Sensenich	74
Turning Radius	13.0

BAGGAGE

Maximum Baggage (lbs)	200
Baggage Space (cubic ft)	24
Baggage Door Size (in.)	20 x 22

LANDING GEAR

Wheel Base (ft)		6.7
Wheel Tread (ft)		10.0
Tire Pressure (psi)	Nose	30
	Main	24
Tire Size	Nose (4 ply rating)	5.00 x 5
	Main (4 ply rating)	6.00 x 6


12' 11.75"
2' 6"
3' 6.2"
5' 3"
35'
10'
23' 9.6"
7' 3.6"
STATIC GROUND LINE
6' 8"

F.A.A. APPROVED
EMERGENCY PROCEDURES

NONE APPLICABLE TO THIS AIRPLANE

EMERGENCY PROCEDURES

EMERGENCY PROCEDURES

INTRODUCTION

This section contains procedures that are recommended if an emergency condition should occur during ground operation, takeoff, 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 judgment 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 here, 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 pilot review standard emergency procedures periodically to remain proficient in them.

ENGINE POWER LOSS DURING TAKEOFF

The proper action to be taken if loss of power occurs during takeoff 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 if necessary 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.

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 85 MPH, 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 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 the 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 restored 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 procedure.

POWER OFF LANDING

If loss of power occurs at altitude, trim the aircraft for best gliding angle 85 MPH, 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 1000 feet above the field at the downwind position to make a normal approach. When the field can easily be reached, slow up to 76 MPH for the shortest landing. 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 and Shoulder Harness in place.

SPINS

Intentional spins are prohibited in this aircraft. If a spin is inadvertently entered, immediately use the following recovery procedures:
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 Warrior 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 engage the lower latch, the door may spring partially open. This will usually happen at takeoff 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.
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.

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.

1. Source of Fire - Check
   a. Electrical Fire (Smoke in Cabin):
      (1) Master Switch - Off
      (2) Vents - Open
      (3) Cabin Heat - Off
      (4) Land as soon as practicable.

   b. Engine Fire:
      (1) In case of engine fire in flight
         (a) Fuel Selector - OFF
         (b) Throttle - CLOSE
         (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.

      (2) In case of engine fire on the ground
         (a) If engine has not started
            1. Mixture - IDLE CUT-OFF
            2. Throttle - OPEN
            3. Turn engine with starter (This is an attempt to pull the fire into the engine.)
         (b) If engine has already started and is running, continue operating to try pulling the fire into the engine.
         (c) In either case stated in (a) and (b), if the fire continues longer than a few seconds, the fire should be extinguished by the best available external means.
         (d) If external fire extinguishing is to be applied
            1. Fuel Selector Valve - OFF
            2. Mixture - IDLE CUT-OFF

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 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 practical and have the fuel system 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 practical 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.

1. Reduce electrical load.
2. Alternator Circuit Breakers - Check
3. "Alt" Switch - Off (for 1 second), 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 power 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 OFF. 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 pilot's discretion.

NOTE

Partial carburetor heat may cause partial melting of ice which will refreeze in the intake system; therefore when using carburetor heat, always use full heat and when ice is removed return to the full cold position.

WEIGHT AND BALANCE

WEIGHT AND BALANCE

WEIGHT AND BALANCE

for

CHEROKEE WARRIOR

MODEL: PA-28-151

ISSUED: MAY 14, 1974

REPORT: VB-935
MODEL: PA-28-151

INDEX - WEIGHT AND BALANCE

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WEIGHT AND BALANCE LOG OF REVISIONS

Revision	Revised Pages	Description and Revision	Approved Date
1	5-8	Revised Arm and Moment values and Fuel capacity for Sample Loading Problem.	V. Jeanart Aug. 30, 1973
2	5-10	Revised C.G. Range and Weight Chart.	
	5-17	Added Vacuum Pump (79399-0).	
	5-27	Revised Ground Ventilating Blower.	Jan. 25, 1974
3	Title	Added PAC Approval Form. (NOTE: AIRCRAFT DELIVERED WITH MANUALS PRIOR TO THIS REVISION DO NOT REQUIRE THIS REVISION.)	May 31, 1974
4	5-5, 5-7	Revised Unusable Fuel Moment (graph).	
	5-12	Revised Engine Driven Fuel Pump and Prestolite Starter Cert. Basis; added Chrysler Alternator; added Oil Filters and footnote.	
	5-13	Revised Landing Gear Cert. Basis.	
	5-14	Revised Battery Weight, Arm and Moment; added Annunciator Lights and footnote.	
	5-16	Revised Inertia Safety Belts Weights, Moment and part no.	
	5-17	Added Lycoming LW13743, Champion (H-48110) Oil Filter; revised Vacuum Regulator Weight and Moment; revised Prestolite Starter Cert. Basis; added Low Vacuum Annunciator Lights, Airborne Vacuum Regulator and footnotes.	
	5-18	Revised Battery Weight, Arm and Moment.	
	5-19	Revised Red Strobe Light Cert. Basis.	
	5-20	Added Encoding Altimeter and footnote.	
	5-21	Revised AutoControl III; added AutoControl IIIB and footnotes.	
	5-22	Revised King VHF Transceivers; added footnote.	
	5-23	Added footnote.	
	5-24	Revised UGR-2A Glide Slope; added footnote.	
	5-25	Revised Narco Marker Beacon and King Audio Panel; added footnote.	
	5-25a	Added Page.	
	5-25b	Added Page.	

WEIGHT AND BALANCE LOG OF REVISIONS (cont)

Revision	Revised Pages	Description and Revision	Approved Date
4 (cont)	5-26	Revised Inertia Safety Belts part no.; revised Main Wheel Fairings and Adjustable Front Seats Weight, Arm and Moment; added Assist Strap.	R. Hamlin June 14, 1974
	5-27	Added Corrosive Resistant Kit.	
5	5-15	Revised Engine Cluster Dwg. No.	C. E. Rickl. Jan. 17, 1975
	5-26	Revised Fire Extinguisher Weight and Moment; deleted Baggage Tie Down Straps.	
	5-27	Added Overhead Vent Systems (76304-9 and 76304-10).	
6	5-15	Revised Airspeed Indicator info; added footnotes.	M. Y. Johnson July 14, 1975
	5-18	Revised Rotating Beacon; revised Piper Pitch Trim Dwg. No.; added 67496-3 and footnote.	
	5-20	Revised Tru-Speed Indicator info.; added Engine Hour Meter; added footnotes.	
	5-21	Revised AutoFlite II, AutoControl IIIB and Omni Coupler Cert. Basis; added footnotes.	
	5-26	Added 79591-0 (Left) Vert. Adj. Front Seats; added 79591-1 (Right) Vert. Adj. Front Seat.	
	5-27	Added Stainless Steel Control Cables; relocated Exterior Finish to page 5-28.	
	5-28	Added Exterior Finish from page 5-27.	
7	5-20	Revised Clock.	C. E. Rickl. Dec. 1, 1975
	5-25	Revised Automatic Locator Transmitter	
	5-25a	Added King KN61 and KN65A DME's.	
8	5-25	Added Automatic Locator Transmitter; moved info to page 5-25a.	C. E. Rickl. July 20, 1976
	5-25a	Added info from page 5-25.	

WEIGHT AND BALANCE LOG OF REVISIONS (cont)

Revision	Revised Pages	Description of Revision	Approved Date
10	5-1 5-3 5-4	Revised Weight and Balance info. Added Caution; relocated para. 2.b. to pg. 5-4. Added para. 2.b. from pg. 5-3.	April 6, 1979
11	5-12	Added Oil Cooler alternate vendor info.	Nov. 10, 1988

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WEIGHT AND BALANCE

In order to achieve the performance and flying characteristics which are designed into the airplane, it must be flown with the weight and center of gravity (C.G.) position within the approved envelope. The aircraft offers a tremendous flexibility of loading. However, you cannot fill the airplane, with the maximum number of adult passengers, full fuel tanks and maximum baggage. With the flexibility comes responsibility. The pilot must insure that the airplane is loaded within the loading envelope before he makes a takeoff.

Misloading carries consequences for any aircraft. An overloaded airplane will not take off, climb or cruise as well as a properly loaded one. The heavier the airplane is loaded, the less climb performance it will have.

Center of gravity is a determining factor in flight characteristics. If the C.G. is too far forward in any airplane, it may be difficult to rotate for takeoff or landing. If the C.G. is too far aft, the airplane may rotate prematurely on takeoff or try to pitch up during climb. Longitudinal stability will be reduced. This can lead to inadvertent stalls and even spins; and spin recovery becomes more difficult as the center of gravity moves aft of the approved limit.

A properly loaded aircraft, however, will perform as intended. Before the airplane is delivered, it is weighed, and a basic weight and C.G. location is computed. (Basic weight consists of the empty weight of the aircraft plus the unusable fuel and full oil capacity.) Using the basic weight and C.G. location, the pilot can easily determine the weight and C.G. position for the loaded airplane by computing the total weight and moment and then determining whether they are within the approved envelope.

The basic weight and C.G. location for a particular airplane are recorded in the weight and balance section of the Airplane Flight Manual. The current values should always be used. Whenever new equipment is added or any modification work is done, the mechanic responsible for the work is required to compute a new basic weight and basic C.G. position and to write these in the aircraft log book. The owner should make sure that it is done.

A weight and balance calculation is necessary in determining how much fuel or baggage can be boarded so as to keep within allowable limits. Check calculations prior to adding fuel to insure against improper loading.

The following pages are forms used in weighing an airplane in production and in computing basic weight, basic C.G. position, and useful load. Note that the useful load includes fuel, oil, baggage, cargo and passengers. Following this is the method for computing takeoff weight and C.G.

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WEIGHT AND BALANCE DATA

WEIGHING PROCEDURE

At the time of delivery, Piper Aircraft Corporation provides each airplane with the licensed empty weight and center of gravity location. This data is on Page 5-7.

The removal or addition of an excessive amount of equipment or excessive airplane modifications can affect the licensed empty weight and empty weight center of gravity. The following is a weighing procedure to determine this licensed empty weight and center of gravity location:

1. PREPARATION

   a. Be certain that all items checked in the airplane equipment list are installed in the proper location in the airplane.

   b. Remove excessive dirt, grease, moisture, foreign items such as rags and tools from the airplane before weighing.

   c. Defuel airplane. Then open all fuel drains until all remaining fuel is drained. Operate engine on each tank until all undrainable fuel is used and engine stops.

CAUTION

Whenever the fuel system is completely drained and fuel is replenished it will be necessary to run the engine for a minimum of 3 minutes at 1000 RPM on each tank to insure no air exists in the fuel supply lines.

   d. Drain all oil from the engine, by means of the oil drain, with the airplane in ground attitude. This will leave the undrainable oil still in the system. Engine oil temperature should be in the normal operating range before draining.

   e. Place pilot and copilot seats in fourth (4th) notch, aft of forward position. Put flaps in the fully retracted position and all control surfaces in the neutral position. Tow bar should be in the proper location and all entrance and baggage doors closed.

   f. Weigh the airplane inside a closed building to prevent errors in scale readings due to wind.

2. LEVELING

   a. With airplane on scales, block main gear oleo pistons in the fully extended position.

b. Level airplane (see diagram) deflating nose wheel tire, to center bubble on level.

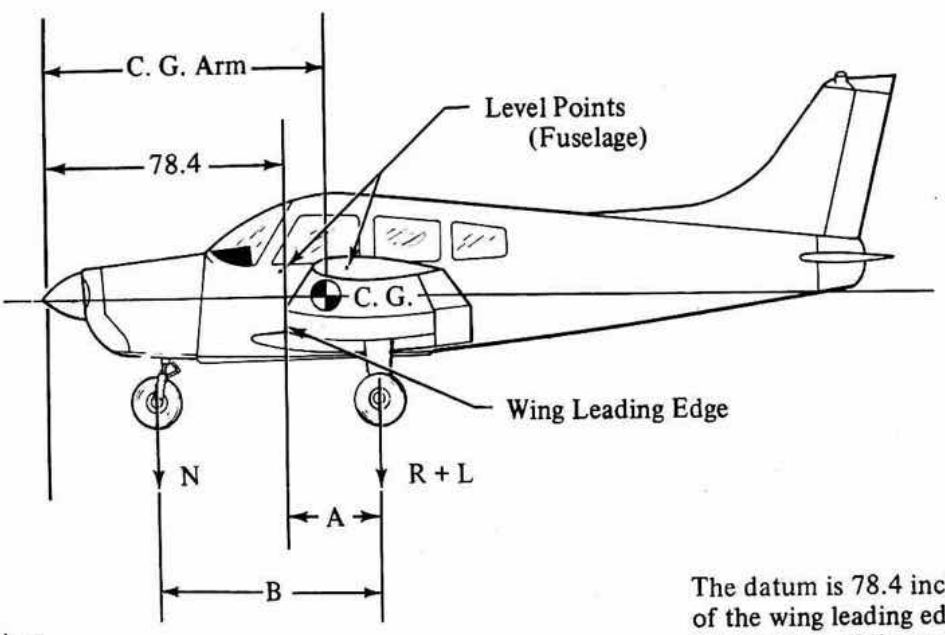
3. WEIGHING - AIRPLANE EMPTY WEIGHT

a. With the airplane level and brakes released, record the weight shown on each scale. Deduct the tare, if any, from each reading.

Scale Position and Symbol	Scale Reading	Tare	Net Weight
Nose Wheel (N)			
Right Main Wheel (R)			
Left Main Wheel (L)			
Airplane Empty Weight, as Weighed (T)			

4. EMPTY WEIGHT CENTER OF GRAVITY

a. The following geometry applies to the PA-28-151 airplane when airplane is level (See Item 2).



The datum is 78.4 inches ahead of the wing leading edge at the intersection of the straight and tapered section.

A =

B =

b. Obtain measurement "A" by measuring from a plumb bob dropped from one wing leading edge, at the intersection of the straight and inboard tapered section, horizontally and parallel to the airplane centerline, to the main wheel centerline.

c. Obtain measurement "B" by measuring the distance from the main wheel centerline, horizontally and parallel to the airplane centerline, to each side of the nose wheel axle. Then average the measurements.

d. The empty weight center of gravity (as weighed including optional equipment and undrainable oil) can be determined by the following formula:

$$\text{C.G. Arm} = 78.4 + A - \frac{B(N)}{T}$$

$$\text{C. G. Arm} = 78.4 + (\quad) - \frac{(\quad)(\quad)}{(\quad)} = \quad \text{inches}$$

5. LICENSED EMPTY WEIGHT AND EMPTY WEIGHT CENTER OF GRAVITY

	Weight	Arm	Moment
Empty Weight (as weighed)			
Unusable Fuel (2.0 gal.)	12 lb	103.0	1236
Licensed Empty Weight			

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