

OWNERS' HANDBOOK
FOR
Operation and Maintenance
OF
THE PIPER TRI-PACER

PA-22-160

PA-22-150

1960

•

PIPER AIRCRAFT CORPORATION

LOCK HAVEN, PA., U. S. A.

DESIGN FEATURES

I. Specifications:

	PA-22-150 Landplane	PA-22-150 Seaplane
Engine	Lyc. O-320	Lyc. O-320
HP and RPM	150 at 2700	150 at 2700
Gross Weight (lbs.)	2000	1950
Empty Weight (Standard) (lbs.)	1100	1280
Useful Load (lbs.)	900	670
Wing Span (ft.)	29.3	29.3
Wing Area (sq. ft.)	147.5	147.5
Length (ft.)	20.6	22
Height (in.)	100	103
Propeller Diameter (max. in.)	74.0	74.0
Power Loading	13.3	13
Wing Loading	13.5	13.2
Baggage Capacity	100	100
Fuel Capacity (Standard)	36	36
Fuel Capacity (Optional)	44	44
Tire Pressure (lbs.)	Main 22 Nose 15	—
Top Speed (MPH)	139	115
Cruising Speed (75% power at sea level MPH)	123	105
Optimum Cruising Speed (75% power, 7000', MPH)	132	110
Stalling Speed (MPH)	49*	58
Take-off Run (ft.)	1220*	—
Take-off over 50' barrier (ft.)	1600*	—
Landing Roll (ft.)	500*	—
Landing Distance over 50' barrier (ft.)	1280*	—
Best Rate of Climb Speed (MPH)	84	75
Rate of Climb (ft. per min.)	725	675
Best Angle of Climb Speed (MPH)	70	65
Best Angle of Climb (ratio)	1:11	1:9
Service Ceiling	15,000	13,850
Absolute Ceiling	17,500	16,200
Fuel Consumption (gal./hr.-75% power)	9	9
Cruising Range	492	420
Cruising Range (Optional Tank)	600	515

* Flaps Extended

Performance figures are for standard airplanes flown at gross weight under standard conditions at sea level.

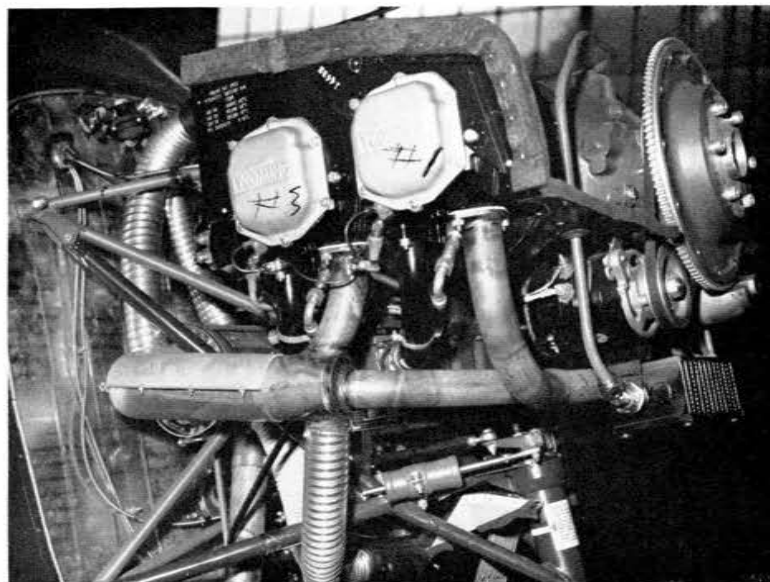
DESIGN FEATURES

I. Specifications:

	PA-22-160 Landplane	PA-22-160 Seaplane
Engine	Lyc. O-320-B	Lyc. O-320-B
HP and RPM	160 at 2700	160 at 2700
Gross Weight (lbs.)	2000	1950
Empty Weight (Standard) (lbs.)	1110	1290
Useful Load (lbs.)	890	660
Wing Span (ft.)	29.3	29.3
Wing Area (sq. ft.)	147.5	147.5
Length (ft.)	20.6	22
Height (in.)	100	103
Propeller Diameter (max. in.)	74	74
Power Loading	12.5	12.2
Wing Loading	13.5	13.2
Baggage Capacity	100	100
Fuel Capacity (Standard)	36	36
Fuel Capacity (Optional)	44	44
Tire Pressure (lbs.)	Main 22 Nose 15	—
Top Speed (MPH)	141	117
Cruising Speed (75% power at sea level MPH)	125	107
Optimum Cruising Speed (75% power, 7000', MPH)	134	112
Stalling Speed (MPH)	49*	58
Take-off Run (ft.)	1120*	—
Take-off over 50' barrier (ft.)	1480*	—
Landing Roll (ft.)	500	—
Landing Distance over 50' barrier (ft.)	1280	—
Best Rate of Climb Speed (MPH)	84	75
Rate of Climb (ft. per min.)	800	750
Best Angle of Climb Speed (MPH)	70	65
Best Angle of Climb (ratio)	1:10	1:9
Service Ceiling	16,500	15,300
Absolute Ceiling	19,000	17,500
Fuel Consumption (gal./hr.-75% power)	9	9
Cruising Range	500	430
Cruising Range (Optional Tank)	610	525

* Flaps Extended

Performance figures are for standard airplanes flown at gross weight under standard conditions at sea level.



II. Engine and Propeller:

The Tri-Pacer is powered by a Lycoming engine, Model O-320-B, rated at 160 HP at 2700 RPM or Model O-320, rated at 150 HP at 2700 RPM. The O-320-B engine has a compression ratio of 8.5 to 1 and requires 91 octane fuel minimum, whereas, the O-320 has a compression ratio of 7 to 1 and requires 80 octane fuel minimum. Refer to the engine manual for operational details.

A stainless steel cross-over exhaust system, incorporating an effective muffler, provides efficient exhaust elimination for the engine, as well as heat for the cabin and carburetor heating systems.

A thirteen plate oil radiator in the nose cowl assures adequate oil cooling under the most severe heat conditions. When outside temperatures drop below 40°F during cold weather operation, the oil radiator baffle supplied with each airplane should be installed. This baffle raises the indicated oil temperature about 30 to 40 degrees.

The carburetor air box on the Tri-Pacer is fitted with a quickly removable air filter. Removal of the filter is accomplished by de-

taching an access plate on the bottom cowl, then pulling the filter from the face of the air box. The filter should be cleaned regularly, at daily intervals under very dusty conditions, and less frequently under less severe conditions, according to instructions listed in Section III, Paragraph VII.

A Sensenich metal propeller, design M74DM with a 74 inch diameter and a pitch of 61" is standard equipment.

III. Fuselage and Wing Structures:

The fuselage frame of the Tri-Pacer is constructed of steel tubes welded together to form a rigid structure. A number of highly stressed members are of chromemolybdenum steel (4130). Other members are of 1025 steel.

Repairs to the fuselage can be made in the manner approved by the Federal Aviation Agency Manual No. 18, and repair facilities for this type of construction are available universally.

The fuselage is made corrosion resistant by the application of a coat of zinc chromate, followed by a sealer coat of nitrate dope. A third coat of dope-proof lacquer is sprayed on the fuselage members wherever fabrics comes in contact with the structure. If the airplane is to be used in salt water areas, the fuselage can be metallized prior to applying the zinc chromate and dope; at the same time the interior of the tubing is coated with linseed oil to prevent internal corrosion.

The wing framework consists of riveted aluminum ribs mounted on extruded aluminum spars with tubular drag and compression struts and high strength stainless steel drag wires. Aluminum sheet is used to form the leading edge and the aileron false spar. An ash wing tip bow provides a light tough member which can withstand considerable wing tip shock without failing.

The wings are attached to the fuselage at the wing hinge fittings on upper fuselage members, and by means of the lift struts which bolt to the lower fuselage members and to the wing spar fittings. The lift struts can be adjusted in length by turning in or out the forked fittings at the lower ends. This adjustment is used to set the rigging of the wings. Any lifting of the airplane at the struts should be done at the extreme end of the strut and not in the center, to prevent bending the struts.



IV. Landing Gear and Brakes:

The Tri-Pacer main gear incorporates Cleveland 600x6 wheels, Model C-38500-H, fitted with hydraulic brakes, Model C-2000H-7, and 4-ply 600x6 tires. The brakes are actuated by a hand brake control located under the center of the instrument panel. The brake handle is connected by a cable with a master cylinder which is mounted under the pilot's seat.

A parking brake valve is attached to the forward side of the firewall with the control located on the left side of the instrument sub-panel. In applying the parking brake, first pull the brake handle back, next pull out the parking brake control, then release the brake handle. To disengage the parking brake simply push in its control.

Also incorporated in the main gear are hydrasorb shock units, consisting of automotive type hydraulic shock absorbers combined with light shock cords.

The nose gear uses a rugged oleo strut bolted to the engine mount at the firewall. The nose wheel is the same as the main wheels except for the absence of a brake drum, and is Model C-38501-H.

The nose wheel is steerable through a 40° arc by the rudder pedals which actuate steering rods attached to steering arms at the top of the nose wheel unit.

V. Control System and Empennage:

The units which make up the empennage are the fin, rudder, stabilizers and elevators. They are all constructed of tubular steel with steel channel ribs. The control surface hinges have bronze bushing inserts and should be oiled with light oil occasionally. Cadmium plated steel tie rods brace the stabilizer to the fin and fuselage. The tail brace wires should not be used for lifting or handling the airplane.

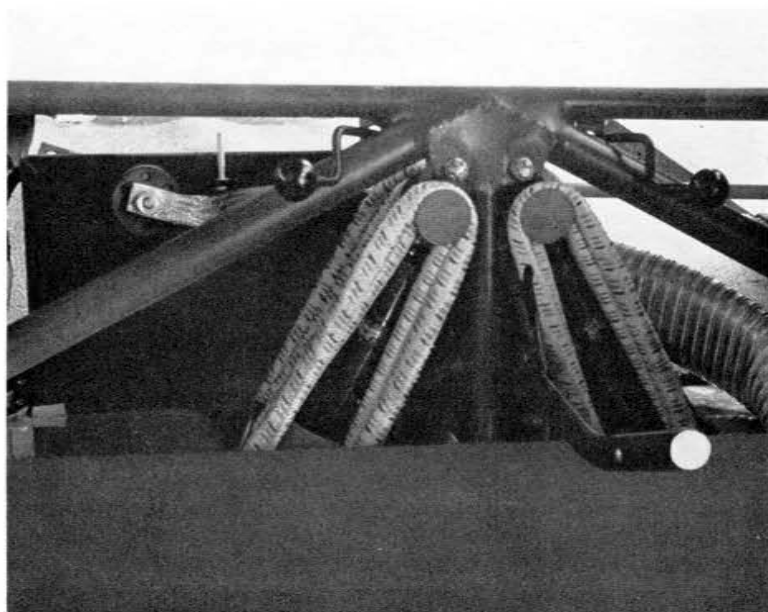
Caution must be exercised in using the stabilizers for lifting or lowering the tail of the airplane. The stabilizer adjusting mechanism is easily damaged by application of excessive handling loads on the stabilizer.

On the Tri-Pacer, steering during ground handling should not be done with the rudder, which may become distorted if mishandled. A steering handle is provided with each airplane, anchored in the baggage compartment, and should be used for moving the plane on the ground.

The Tri-Pacer is equipped with conventional dual wheel flight controls. The flap control handle is located between and ahead of the front seats. The flaps have three positions—up, one-half down, and full down. The full flap position is used for maximum effect in landing and take-offs, while the half flap position is used when intermediate results are desired.

The stabilizer adjustment control is located overhead between the front seats and is connected to the stabilizer adjustment mechanism at the stabilizer by an endless cable. A permanently automatic tension adjustment, which consists of an idler pulley held in place near the rear main pulley by a tension spring, maintains correct tension on the stabilizer cable and prevents cable slippage. The system normally requires no attention except for lubrication and inspection.

In the control system of the Tri-Pacer, the rudder pedals are connected directly to the nose wheel for ground steering, and the aileron cables are interconnected with the rudder cables to provide automatically coordinated aileron and rudder controls for simplified handling in the air. The interconnection incorporates a spring, located behind the baggage compartment, and is arranged so that although in level flight a movement of the ailerons results in proper



rudder action to give coordinated turns, still the controls can be crossed if desired to obtain slips or skids.

VI. Fuel System:

Two eighteen gallon fuel tanks located in the wings provide fuel storage in the Tri-Pacer. Both tanks have outlet lines at the front and the rear, providing positive flow in all normal flight attitudes. The tanks are drained individually according to the position of the fuel selector valve on the left forward cabin wall.

The rear fuel line from the right tank has a low point under the right front seat at which point is located a quick drain gascolator. The drain in this gascolator, which should be checked frequently for water or sediment, is reached through an opening in the right landing gear belly fairing.

An electric fuel gauge for each tank is located on the lower right side of the instrument panel.

The main fuel strainer, through which all fuel going to the carburetor flows, is located on the lower left engine side of the firewall. It is provided with a quick drain and should be drained regularly.

Fuel screens are provided at tank outlets, in the strainer and at the carburetor.

The engine primer pump on the right side of the instrument panel takes fuel from the main gascolator and pumps it directly to all four cylinders of the engine. To prevent malfunctioning of the engine, the primer must be locked in at all times except when in use.

An idle cut-off is incorporated in the mixture control so that full extension of the control stops the flow of fuel at the carburetor. The cut-off should always be used to stop the engine.

An eight gallon reserve fuel tank which fits under the rear seat is available as optional equipment. The fuel from this tank is pumped by an electric pump under the co-pilot's seat to the fuel strainer for the right main tank. From the strainer the fuel passes up the main supply line to the right tank.

To use the reserve fuel supply, first use the right tank until it is at least half empty, preferably completely empty; this must be done while sufficient fuel remains in the left tank to continue to operate the engine until the right main supply is replenished. When the right tank is half full or less, switch the selector valve to left tank and pull the reserve fuel knob. The reserve fuel will then be pumped into the right tank, in a period of about 25 minutes. Then turn the reserve pump off.

Fuel should not be pumped from the reserve tank to the right main tank while the selector valve is at the right tank position.

VII. Electrical System:

The master switch for the electrical system is located on the master switch fuse box under the left side of the pilot's seat. In the "up" position of this switch the main fuse is engaged; the "down" position is for the spare fuse, and the central position is "off".

The starter button is located on the bottom of the master switch fuse box. The starter cannot be operated unless the master switch is on.

Circuit breakers for the radio, lights and generator are in a bracket under the left side of the instrument panel. These units auto-

OPERATING INSTRUCTIONS

I. Preflight:

The airplane should be given a careful visual inspection prior to flight, covering tires, landing gear, control surfaces, fuel tank caps, cowling, propeller, and gascolator. Upon entering the plane, the pilot should ascertain that all controls operate normally and are in proper position and that the door is closed and latched.

II. Starting:

When the engine is cold, (under 40° F.) prime three to five strokes after turning fuel valve to the proper tank. Push mixture control to full rich, carburetor heat off, and open throttle one-eighth to one-quarter of an inch. If the engine is extremely cold, it should be pulled through by hand four to six times.

Next turn the ignition switch to "left" and, with brakes set, engage the starter. If the engine does not start in the first few revolutions, open the throttle while the engine is turning over with the ignition on. When the engine starts, reduce the throttle.

If the above procedure does not start the engine, reprime and repeat the process. Continue to load the cylinders by priming or unload by turning the engine over with the throttle open. If the engine still doesn't start, check for malfunctioning of ignition or fuel system.

When the engine is warm, (over 40° F.) do not prime, but turn ignition switch to "both" before engaging starter. The engine should start after it has rotated through about four compression strokes.

III. Warm Up and Ground Check:

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.

Warm up the engine at 800 to 1200 RPM for not more than two minutes in warm weather, four minutes in cold weather. The magnetoes should be checked at 2000 RPM, the drop not to exceed 125 RPM. The engine is warm enough for take-off when the throttle can be opened without engine faltering.

Carburetor heat should be checked during the warm up to make sure the heat control operation is satisfactory and to clear out the engine if any ice has formed. It should also be checked in flight occasionally when outside air temperatures are between 20° and 70° to see if icing is occurring in the carburetor. In most cases when the engine loses speed without apparent cause, the use of carburetor heat will correct this condition.

IV. Take-off, Climbs, Stalls and Taxiing:

Before take-off, it is very important that the fuel selector be checked to make sure it is on the proper tank. If the take-off is made with fuel flowing from a nearly empty tank, engine failure during or immediately following take-off may occur. In the event of engine failure after take-off, full power can be regained within a few seconds, and normally without loss of altitude, by switching rapidly to the opposite tank. In any case of engine failure which could possibly be caused by faulty fuel flow, always change to the other tank immediately.

The carburetor heat should be off for take-off, and the mixture rich unless field elevation requires leaning to obtain maximum RPM.

Take-off in the Tri-Pacer is accomplished as follows:

(1) Set stabilizer trim to approximately neutral with exact setting determined by the loading of the plane.

(2) Apply full throttle, allowing plane to maintain its level attitude until take-off speed (50-60 MPH) is approached, then ease back control wheel to obtain climbing attitude.

(3) For take-offs in heavy grass, snow, or in other speed retarding surfaces, drag on the landing gear can be reduced by raising the nose wheel off of the surface during the take-off run by applying back pressure on the control wheel shortly after the throttle is opened.

(4) The application of full flaps as take-off speed is approached, will reduce the take-off run about 20 percent. Flaps can be pulled down before the take-off run is started but will reduce the acceleration of the plane somewhat if kept down throughout the take-off.

(5) Crosswind take-offs in the Tri-Pacer should be made similarly to those in normal winds, with directional control maintained during and after the take-off roll by use of the rudder pedals. It may be desirable to hold the nose wheel on the ground somewhat longer than usual in strong crosswinds.

The best rate of climb airspeed at gross weight is 84 MPH. At lighter weights the best climbing airspeed is reduced somewhat. A climbing speed of 100 MPH is recommended for climbs to cruising altitudes, in order that a good forward speed may be maintained while reaching the desired altitude efficiently.

The gross weight power-off stalling speed with full flaps is 49 MPH; with flaps up the stalling speed increases about 4 MPH.

Visibility and control in taxiing the Tri-Pacer is so improved that the usual tendency is to taxi at excessive speeds. The apparent speed of the plane on the ground is deceiving, so that on a hard surface a ground speed of 60 MPH can easily be reached at about 1500 RPM, with the pilot under the impression that he is traveling much more slowly. 1000 RPM will eventually give a ground speed of about 40 MPH, and even a high idling RPM may result in excessive taxi speeds.

Considerable care should therefore be taken during taxiing to hold down engine RPM and to maintain reasonably low taxi speeds. High speed taxiing causes undue wear and strain on tires, brakes, and landing gear, and may result in damage from collision, upsetting, or other accidents. **DO NOT TAXI FAST.**

A limited amount of directional control during taxiing can be effected with the control wheel. If gradual turns are to be made during taxiing, or during the landing roll or take-off run, steering with the wheel may frequently be desirable.

V. Cruising:

The cruising speed of the Tri-Pacer is determined by many factors including power setting, altitude, temperature, and equipment on the airplane such as antennas, venturi tubes and fenders.

The normal cruising power is 75% of the rated horsepower of the engine or 120 HP for the O-320-B and 112.5 HP for the O-320 engine. The specification cruising speed at 75% of power at sea level, under standard conditions, are 125 MPH and 123 MPH respectively. For altitude cruising speeds and power curves see pages 25 and 26.

Maintaining 75% of power at altitudes up to 7,000 feet, above which this power setting can no longer be obtained, results in an increase in true air speed of about 1.3 MPH per thousand feet of altitude over sea level. Indicated airspeed will normally decrease about 1 MPH per thousand feet if 75% power is maintained. If the True Air Speed at sea level at 75% of power is 123 MPH therefore, at

7,000 feet at 75% of power the True Air Speed will equal 132 MPH, while indicated air speed equals 116 MPH.

With a fixed pitch propeller 75% of power can be maintained at altitude by increasing the RPM as altitude is increased. The maximum continuous engine speed for all operations is 2700 RPM.

Fuel consumption during sea level cruising is given on the chart. The consumption is determined by the various flight conditions. At 75% of power at altitude, fuel consumption will be somewhat higher than at that power setting at sea level, even with the mixture properly leaned.

Correct use of the mixture control will reduce fuel consumption very appreciably. The mixture should be leaned during cruising flight at all times over 5000 feet and at lower altitudes in accordance with engine manufacturer's specifications. The mixture should also be leaned at full throttle at any time at which an increase in RPM can be obtained.

To adjust the mixture properly, pull out the control slowly until a decrease in RPM is noted; then push the control forward just enough to regain the lost RPM.

A cruise-stop is incorporated in the throttle mechanism of each Tri-Pacer. This stop is set to give 75% of power at low altitudes under normal conditions. If a higher or lower power setting is desired, it can be obtained by installing or removing small spacers in the throttle friction lock according to instructions attached to the throttle.

The cruise-stop is intended to give consistent power settings at lower altitudes without reference to the tachometer. It also provides a more or less fixed RPM, the variance of which indicates the presence of ice or other causes of malfunction.

To determine the proper cruising RPM for 75% of power, fly the aircraft as near sea level as practicable at full throttle until maximum speed is reached. Note the RPM at top speed, level flight. Then reduce the maximum RPM by 10% and cruise at 90% of full RPM. The correct cruising RPM, which is the proper setting for the cruise-stop, will give specification cruising airspeed and fuel consumption.

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

VI. Approach and Landing:

The approach technique is as follows: Trim the plane to a 75-80 MPH glide, after flaps have been lowered at a speed of 95 MPH or less. Mixture should be full rich, fuel on proper tank, and carburetor heat off unless carburetor icing conditions prevail. Reduce the speed during the flareout, and touch the ground in a standard three point position approximately at stalling speed (50-60 MPH).

On the Tri-Pacer, the control wheel should be held back far enough to keep the plane in a nose high attitude as long as possible. This shortens the landing run by producing maximum drag on the wings. As the plane slows down, allow the nose wheel to drop to the ground and apply brakes.

In high wind conditions, particularly in strong crosswinds, it may be desirable to approach the ground in a more nearly level attitude at an airspeed which assures ample controllability regardless of gusts. In this case the ground can be contacted at airspeeds appreciably higher than in normal landings, and the airplane held in a level attitude at all times on the ground to reduce wind effect. It is always best to contact the ground at the minimum practicable speed consistent with landing conditions.

Crosswind landings in a Tri-Pacer should be approached with drift being compensated for by holding the windward wing down or by crabbing into the wind. The airplane should be straightened out the instant before ground contact, and then controlled on the ground with the steerable nose wheel which should be held on the ground with forward control wheel pressure.

VII. Ground Handling and Mooring:

Moving of the Tri-Pacer is most easily accomplished with the nose wheel steering handle provided with each plane.

Tie-downs are provided at the wing-strut intersections and the tail skid should be used for tail anchorage.

In windy conditions the flaps should be lowered fully and the control wheel restrained with a safety belt to prevent the control surfaces from becoming damaged.

VIII. Weight and Balance:

For weight and balance data see the weight and balance form supplied with each airplane, which gives the exact weight of the airplane and permissible center of gravity conditions.