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PIPER

TRI-PACER OWNER'S HANDBOOK

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OWNERS' HANDBOOK

FOR

Operation and Maintenance

OF

THE PIPER TRI-PACER

PA-22-160

PA-22-150

•

PIPER AIRCRAFT CORPORATION

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

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NOTICE

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

THE HANDBOOK IS DESIGNED:

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

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

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

Additional copies of this manual, Piper No. 753 526, may be obtained from your Piper Dealer.

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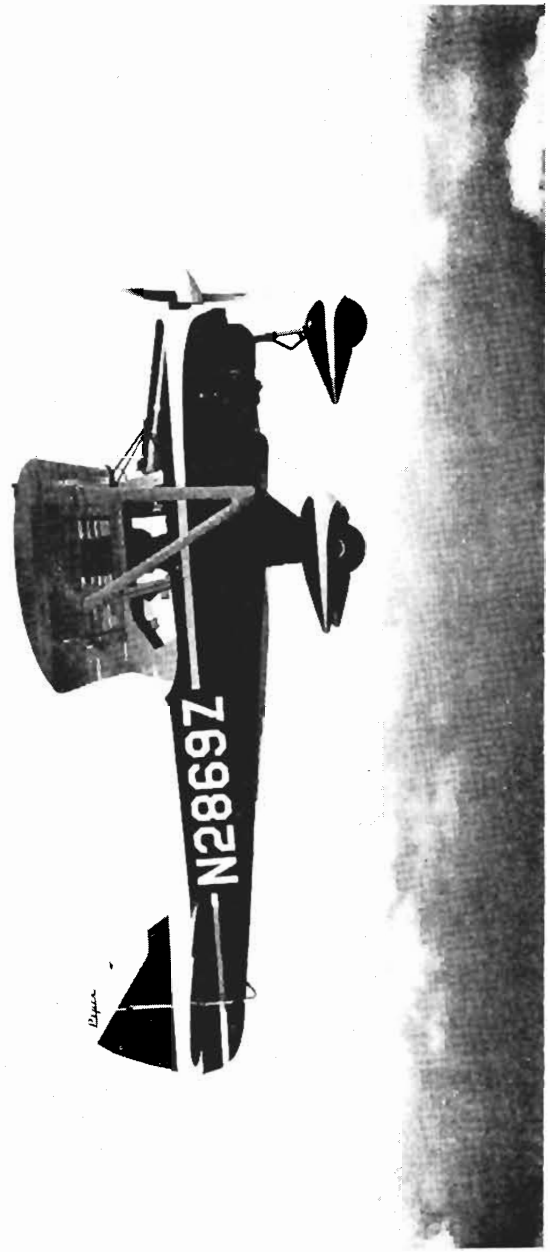

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Design Features

SECTION ONE

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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.

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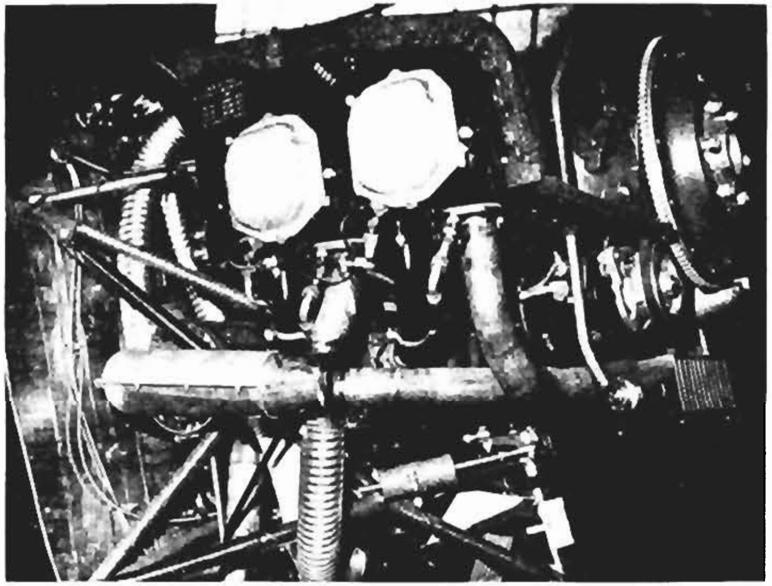

II. Engine and Propeller:

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. The O-320 has a compression ratio of 7 to 1 and requires 80/87 octane fuel minimum, refer to Fuel Requirements, page 40 when using alternate fuels. 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 F.A.A. Advisory Circular 43.13-1, 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.

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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

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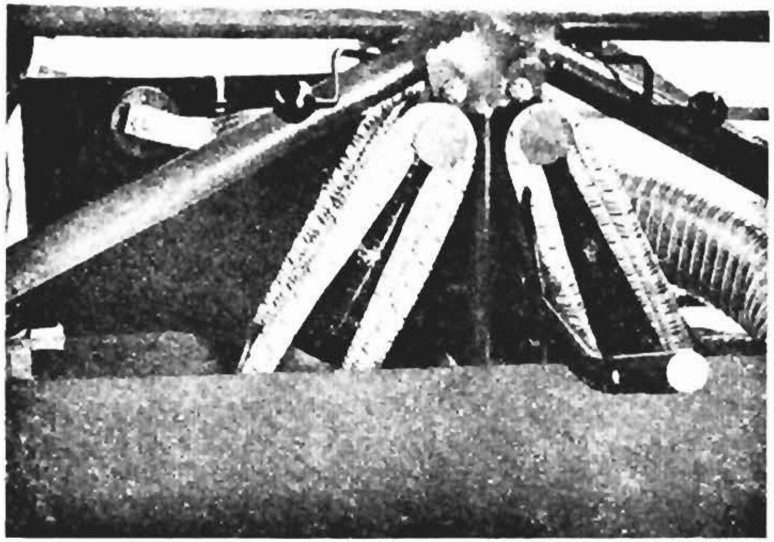

rudder action to give coordinated turns, still the controls can be crossed if desired to obtain slips or skids.

VI. Fuel System:

Two eighteen gallon fuel tanks located in the wings provide fuel storage in the Tri-Pacer. 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-

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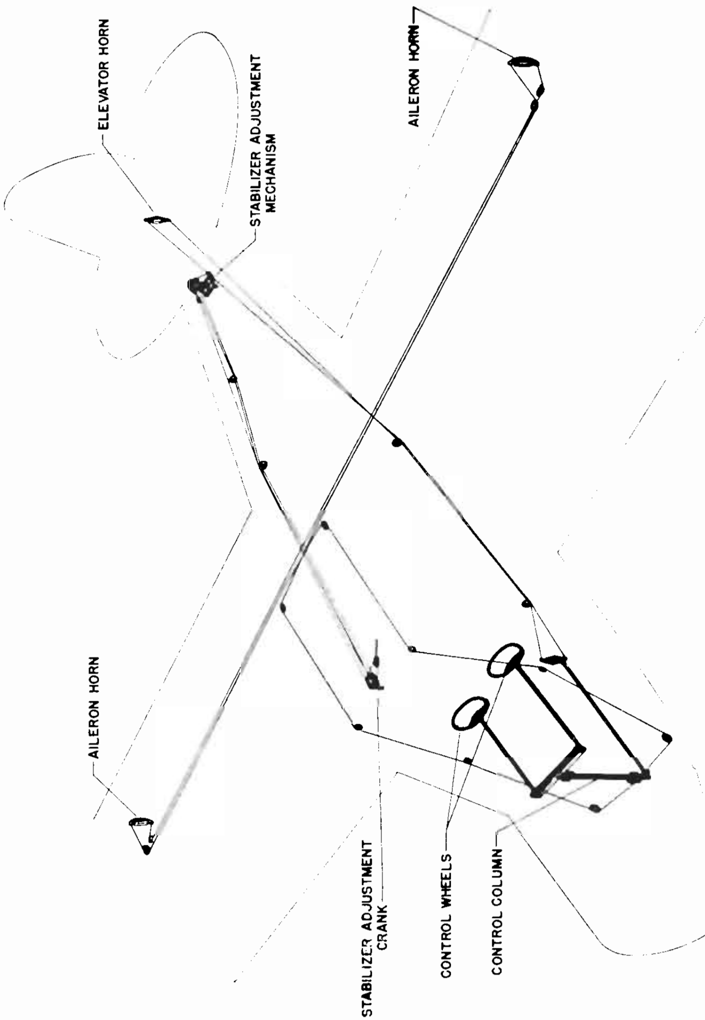
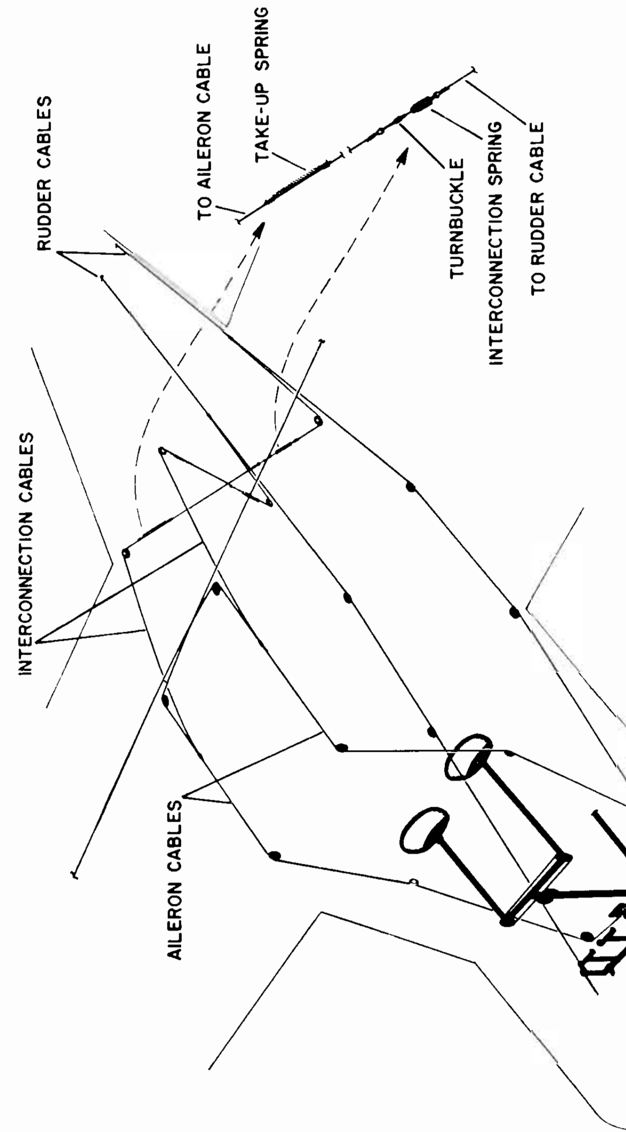


AILERON & ELEVATOR CONTROLS
TRI PACER



AILERON & RUDDER
INTERCONNECTION SYSTEM
TRI PACER

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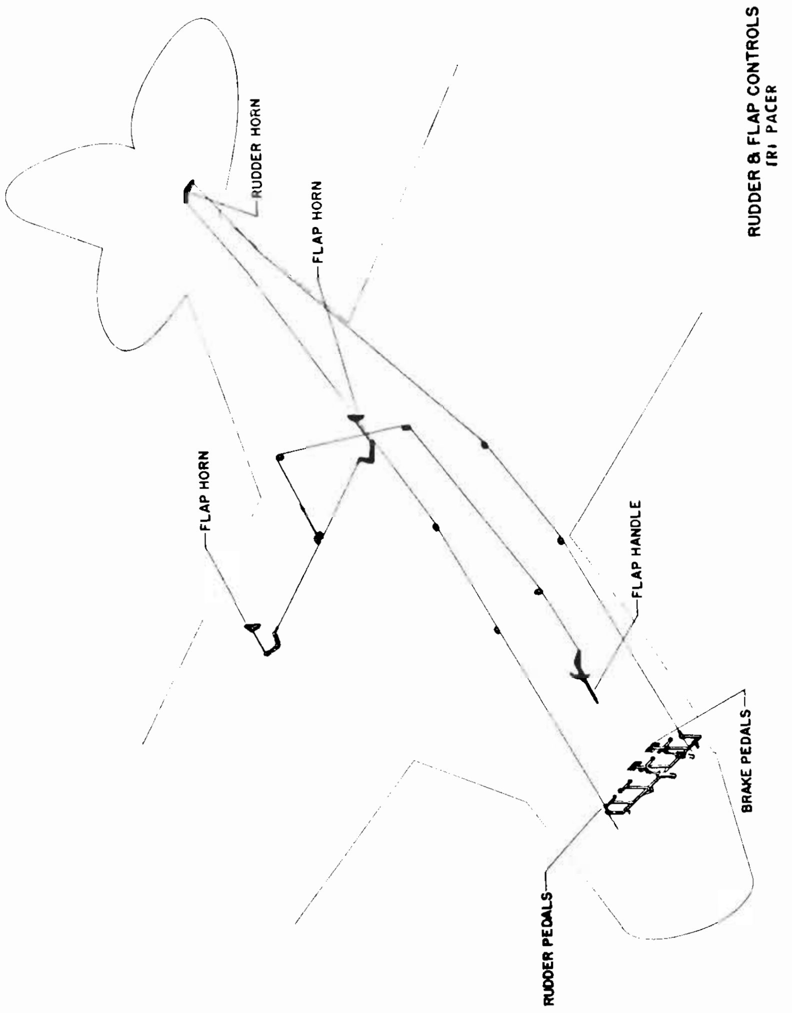

matically break the electrical circuit if an overload is applied to the system, preventing damage to any electrical component. To reset the circuit breakers, simply push in the buttons after they have cooled. Continual popping out of a circuit breaker button indicates trouble in the electrical system and should be investigated immediately.

A 12-volt 33-ampere hour battery, enclosed in a stainless steel battery box, is mounted under the right front seat.

The position and panel lights are operated by a rheostat switch on the left side of the instrument panel. The position lights are turned on with the first movement of the knob; panel light intensity is increased by further rotation of the control. A dome light switch is incorporated in the speaker-dome light unit in the center of the cabin ceiling.

The landing light switch, on the lower left part of the instrument panel, controls two landing lights in the left wing. These lights are installed at different angles, the one directed downward to be used for taxiing and the upper beam for landing.

A voltage regulator, attached to the engine side of the firewall, is incorporated in the electrical system to maintain the required voltage of the battery.

VIII. Cabin Features:

The instrument panel on the Tri-Pacer is designed to provide the utmost in flexibility of arrangement with a maximum of utility. All flight and engine instruments may be installed by removing the appropriate face plate. Easy access to the back of the instruments is available through a large removable panel on top of the instrument panel.

Face plates and insert panels are available for two panel arrangements. The standard panel consists of the required engine instruments plus airspeed, altimeter and compass. The standard arrangement also includes a large map compartment on the right side of the panel. The gyro panel accommodates the above mentioned instruments plus a manifold pressure gauge, artificial horizon, directional gyro, bank and turn indicator, rate of climb and a clock. Blank holes are available for the inclusion of radio navigation indicators or other instruments if desired.

Radio equipment is mounted in the center of the panel convenient to both pilots. Space is provided here for a variety of combinations of radio units (See Radio Manual for detailed instructions).

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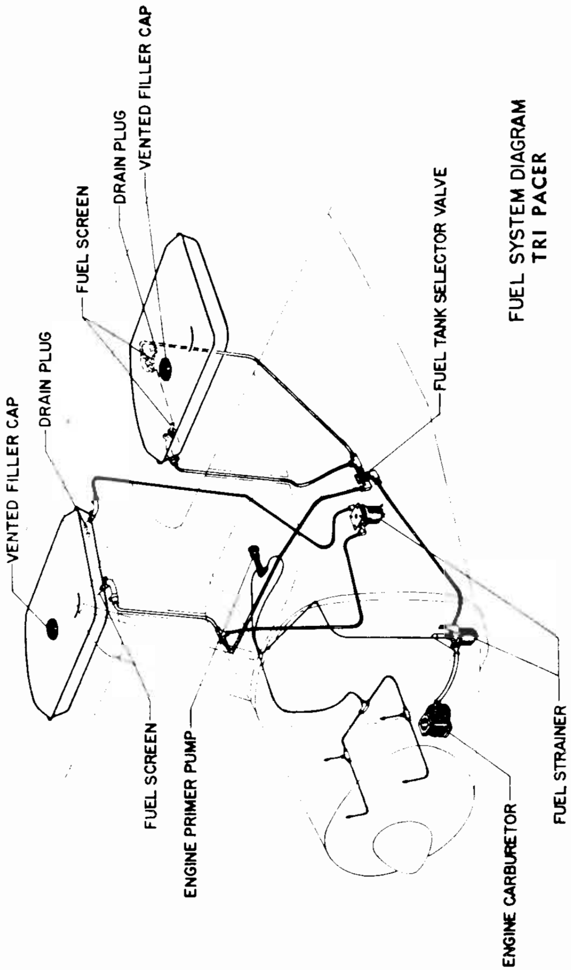
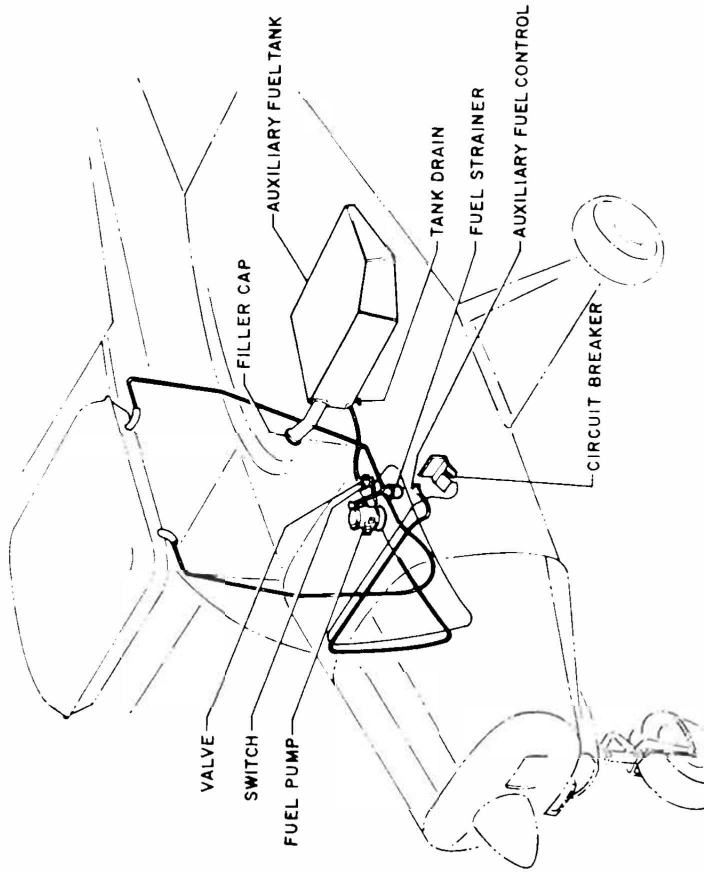


FUEL SYSTEM DIAGRAM
TRI PACER



AUXILIARY FUEL SYSTEM DIAGRAM
TRI PACER

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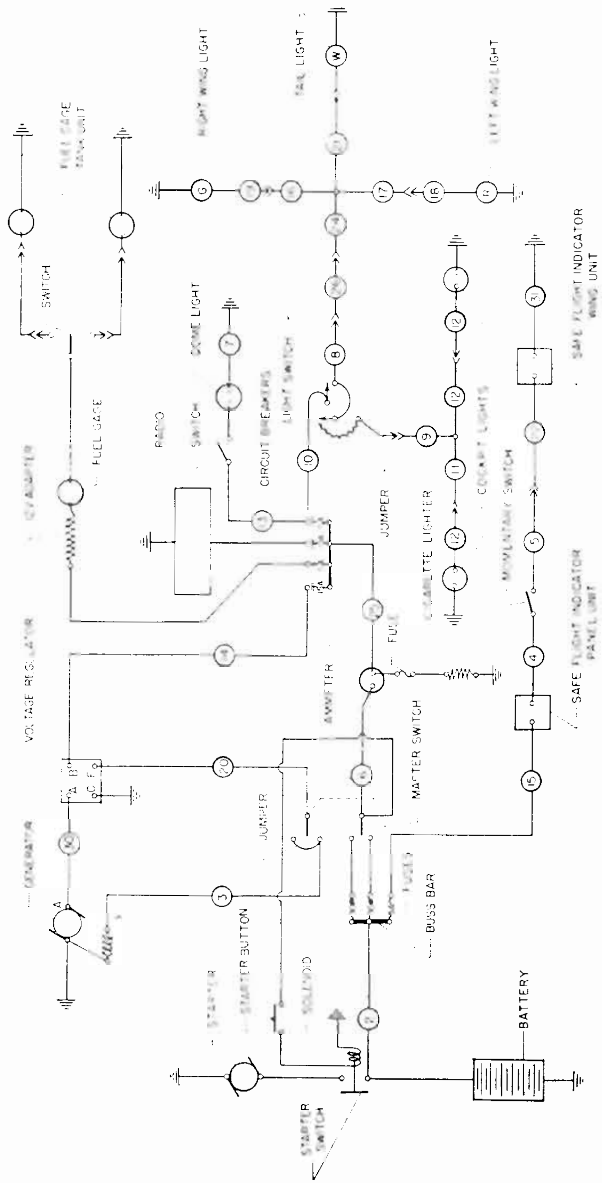
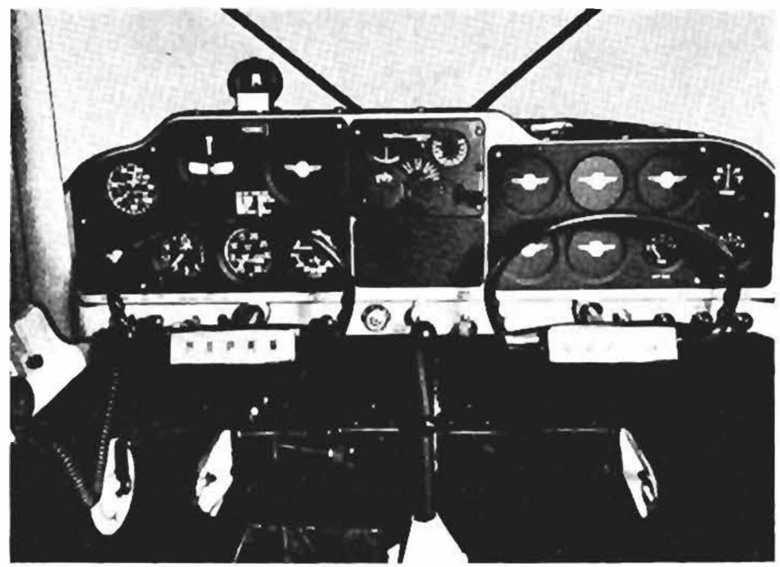


ELECTRICAL SYSTEM DIAGRAM
TRI PACER

The separate front seats are individually adjustable through a 6″ range. To adjust the seats, pull up on the seat adjustment handles, located under the front center corners of the seats, and move the seats to the desired position. In fixing the seat in any given position, be sure that the locking pin is securely engaged.

To remove either of the front seats (the brake master cylinder is under the left and the battery is under the right), slide the seat all the way forward until it is against the stop, reach under and to the rear of the inboard seat track and locate the stop pin which protrudes through the bottom of the seat tube, depress this pin and slide the seat on forward until it is free of the track.

The rear seat area is readily converted to a cargo compartment by removing or folding the rear seat. To remove the seat, detach the cushion from the lower support tube, remove the support tube from the rear, then the front sockets, and unlace the back cushion and canvas from the upper support tube. If desired, the back cushion and canvas can be folded rearward into the baggage compartment instead of being removed completely.



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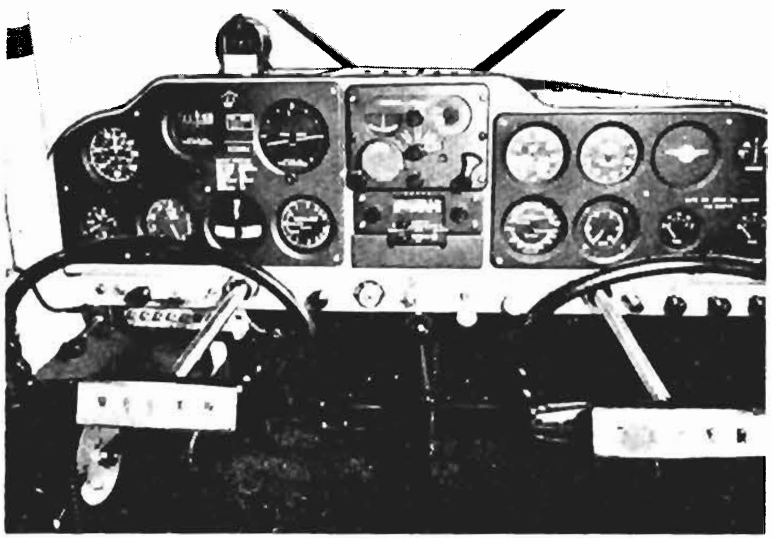
Although access to the baggage compartment is normally through the baggage compartment door, it may occasionally be desirable to load baggage through the rear door by raising the rear seat forward. To make room for bulky packages in the baggage compartment, the compartment top can be detached by snapping out the spring clips which hold the top panel in position.

IX. Finish:

The Duraclad finish on the Tri-Pacer consists of fire resistant butyrate dope on the fabric surfaces, and enamel on all metal surfaces. Duraclad provides, in addition to the fire resisting qualities, a high-luster, more attractive finish which has a much longer life than earlier nitrate finishes.

All of the surfaces, inside and outside, are finished in Duraclad. This finish must not be covered over with any incompatible materials. The use of different material from those originally applied will damage the finish.



Operating Instructions

SECTION TWO

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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.

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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.

CAUTION

When fuel quantity in right tank is 1/3 or less use only in level flight.

The carburetor heat should be off for take-off, and the mixture rich, except a minimum amount of leaning is permitted to obtain smooth engine operation when taking off at high elevation.

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

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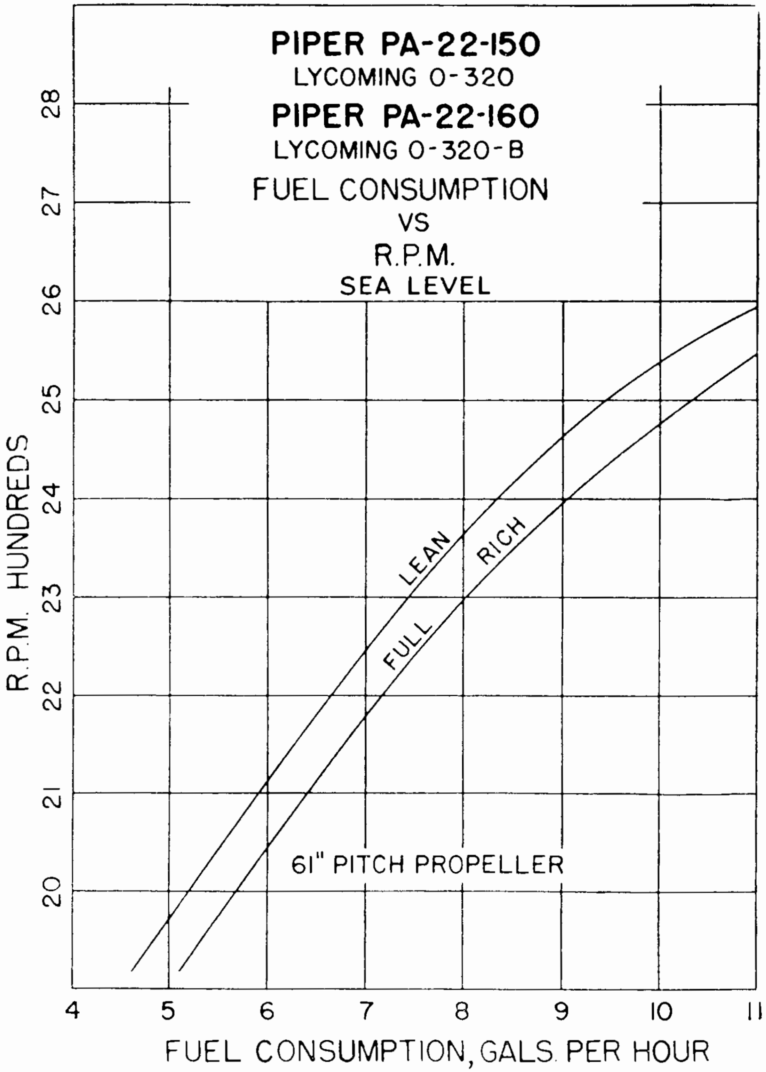
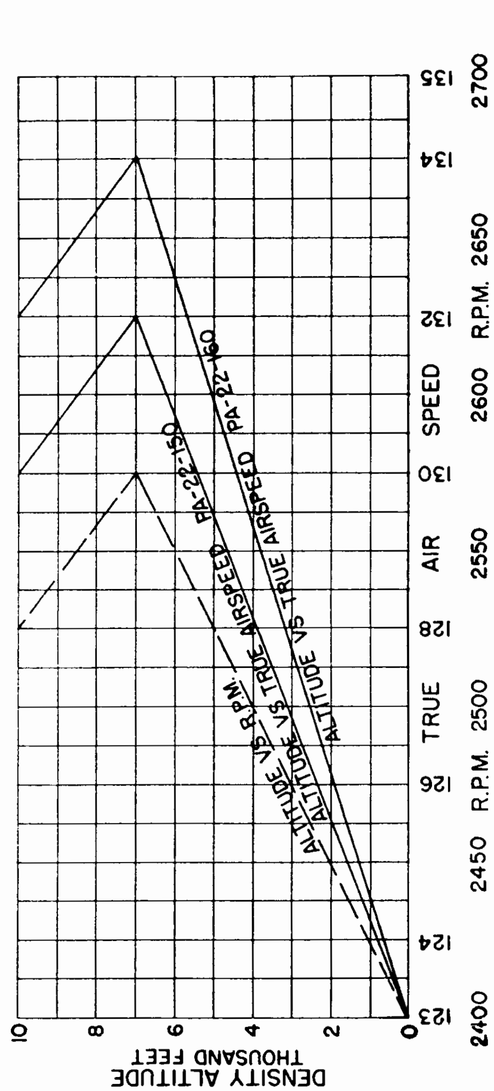


ALTITUDE VS TRUE AIRSPEED & RPM AT 75% POWER CRUISE

Model—PA-22-150 and PA-22-160 Propeller—Fixed Pitch, 61"

Mixture—Leaned to Maximum RPM Max. Level Flight RPM, Sea Level—2700 RPM

To Maintain 75% Rated Power With Increased Altitude, Starting at 2400 RPM at Sea Level, Increase RPM by 25 Per Thousand Feet of Altitude



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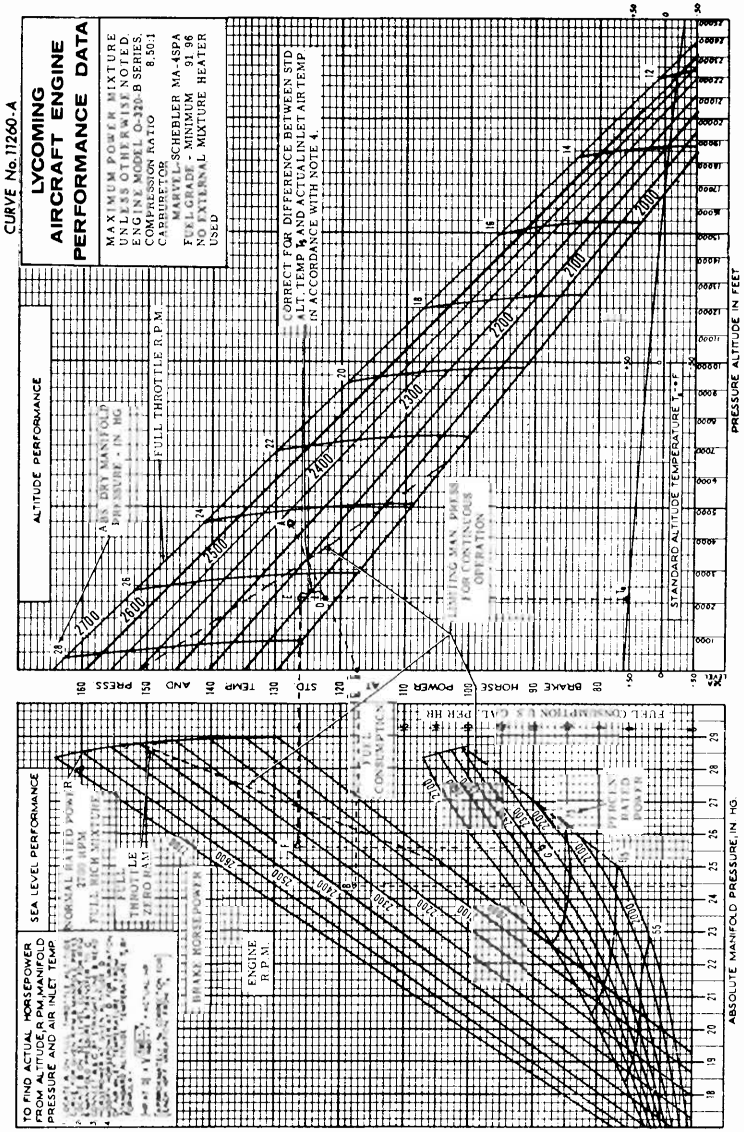

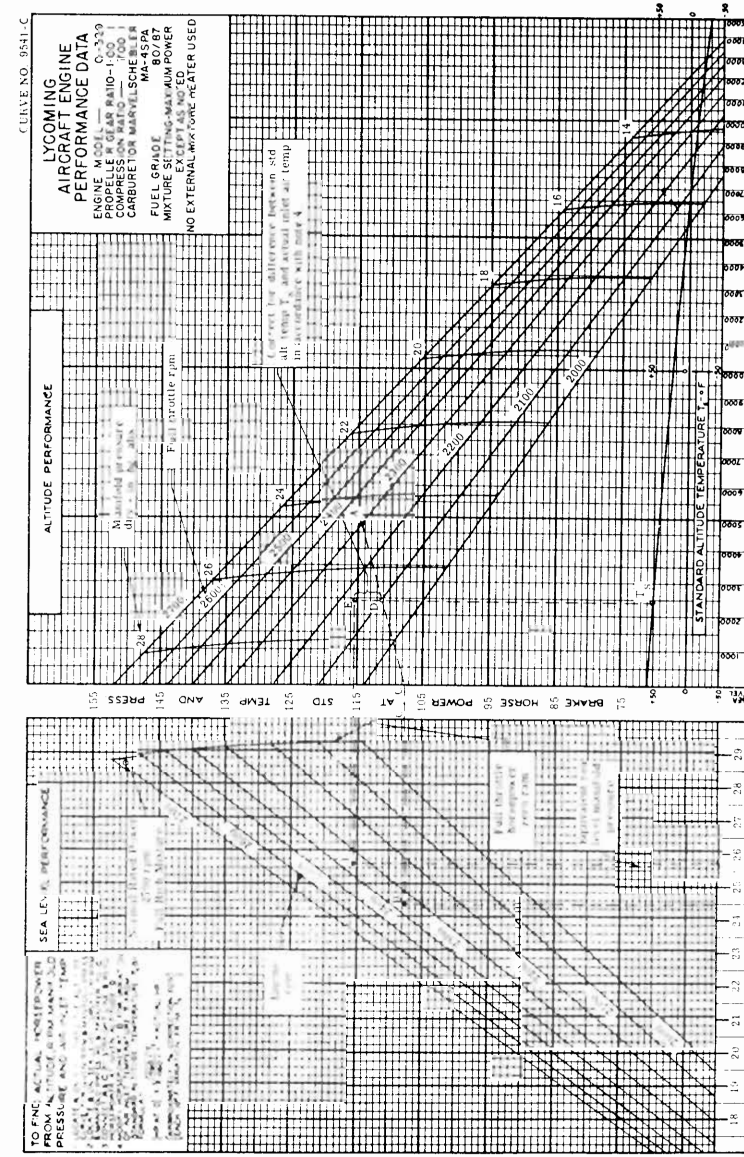

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7,000 feet at 75% of power the True Air Speed will equal 132 MPH, while indicated air speed equals 116 MPH.

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.

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

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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.

To stop the engine, after landing and when clear of the runway, pull the mixture control full out to idle cut-off. When using alternate fuels, the engine should be run up to 1200 RPM for one minute prior to shutdown to clean out any unburned fuel. After the engine stops, turn the ignition and master switch off and retract the flaps.

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.

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Maintenance

SECTION THREE

GENERAL MAINTENANCE

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GENERAL MAINTENANCE

I. Leveling and Rigging:

(1) Leveling—Place adjustable jacks or blocks under the axle extension so that the jacks or blocks do not touch the brake lines or connections. Raise each wheel by pushing up on the lift struts on one side and pulling down on the opposite side. All lifting or pulling pressure must be applied as near to the wing attachment points as possible so as to be sure that the lift struts will not be bowed.

To level the airplane laterally, remove lower right wing root fairing, drop a plumb bob on a string from the hole located on the side of the upper door frame member approximately 5¾ inches aft of the front door frame member, to the center punch mark located on the seat front tube just inside the door. Adjust the jacks or blocks until the plumb bob centers over the mark.

The airplane is longitudinally leveled either by raising the nose wheel with blocks or lowering it by releasing air from the tire until the plumb bob is centered.

(2) Dihedral Angle—Stretch a length of string from wing tip to wing tip along the top of the wing at the front spar location. Measure down from the string to the top of the fuselage front wing hinge fittings a distance of 4⅞ inches. Adjust the front lift strut fork fittings in or out to produce this dimension.

To check for equal dihedral in each wing use a 30-inch level held spanwise against the underside of the wing at the front spar location. Note the amount of off level on one wing and see if the other wing has the same amount of off level. Adjust the front lift strut forks in on one side and out on the other to get the same amount of off level in both wings. Check the 4⅞-inch dimension after this adjustment to see that it has not been effected by the equalizing adjustment.

(3) Wash-Out—Place a 1⅜-inch block under the wing at the rear spar location at the outboard aileron rib. Place a 30-inch level chord-wise across this block with the front end of the level at the front spar location. The bubble will center if the wing has the proper 2½ degree washout. Adjust the rear lift strut forks in or out to bring the bubble to center.

(4) Tail Assembly—Level the stabilizers at the rear spar with the airplane in level position. Adjustment is accomplished by the

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tightening and loosening of the tail brace wires. Take up as many turns as the opposite wires are let out, to keep the same tension on the wires. Do not scratch or mar the wires with pliers or wrenches as this may cause the wires to fracture. Plumb the rudder hinge line. Slight adjustments can be accomplished by firmly pushing against the fin rear spar in that direction required to bring the hinges in line. The streamline tail braces wires should be lined up with the air-stream or a whistling noise will result.

(5) Control Surface Travels:

Aileron	15° up	15° down
Elevator	24° up	12° down
Rudder	16° R	16° L
Stabilizer	1° up	6½° down
Flaps	40° down	

Control System Rigging:

In the control system of the Tri-Pacer to provide automatically coordinated aileron and rudder controls for simplified air control, and to increase stability in flight, the aileron control cables are connected to the rudder cables by means of an interconnecting cable. The interconnection incorporates a spring and is arranged so that although in level flight a movement of the ailerons results in the proper rudder action to give coordinated turns, still the controls can be crossed if desired to obtain slips or skids.

In rigging the control system of the Tri-Pacer, this procedure should be followed:

(1) Center the nose wheel, rudder pedals, rudder and ailerons with the interconnecting cables slack at turnbuckles, located behind the baggage compartment.

(2) Check the airplane in flight for proper trim with the interconnecting cables slack.

(3) During the flight check, if ailerons do not line up with the flap trailing edges equally, adjust the aileron tab to obtain proper aileron position.

(4) If airplane is wing heavy with ailerons in proper position, adjust the rear strut fork on the wing heavy side inward to obtain correct trim. Each ten degrees of wing heaviness in flight requires approximately one turn of the strut fitting.

(5) If the airplane skids in flight when the wings are level, it is out of rig directionally. To correct this condition, bend the leading edge of the fin in the direction towards which the airplane skids. Be careful not to depress the fin far enough to cause fabric wrinkles.

(6) After the plane is trimmed properly directionally and laterally, tighten the interconnecting cables with the coil springs just beginning to become extended.

(7) Check the trim of the plane in flight again to see that trim has not been affected by step 6, and to see that interconnecting cables are at correct tension to give properly coordinated controls. If the interconnecting cable tension is excessive, too much rudder movement will result from aileron movement, causing a skid. If the cables are not tight enough, the rudder will not move far enough when the control wheel is rotated to give coordinated turns. Proper tension will give coordinated turns at cruising speeds when either the wheel or the rudder controls are moved.

II. Tire Inflation:

For maximum service from the tires, keep the Tri-Pacer main wheels at 22 lbs., and the nose wheel at 15 lbs. Reverse the tires on the wheels, if necessary, to produce even wear.

III. Battery Service:

A 12 volt, 33 ampere hour battery is installed under the right front seat in a stainless steel battery box. Access to the battery is obtained by removing the seat.

The battery should be checked frequently for proper fluid level, but must not be filled above the baffle plates. All connections must be clean and tight.

If the battery is not up to proper charge, recharge starting with a charging rate of 4 amps and finishing with 2 amps. If a quick charge is desired for the battery master switch must be off during charging.

IV. Brake Service:

The brake master cylinder in the Tri-Pacer is a dependable diaphragm type requiring a minimum of servicing. It can be refilled

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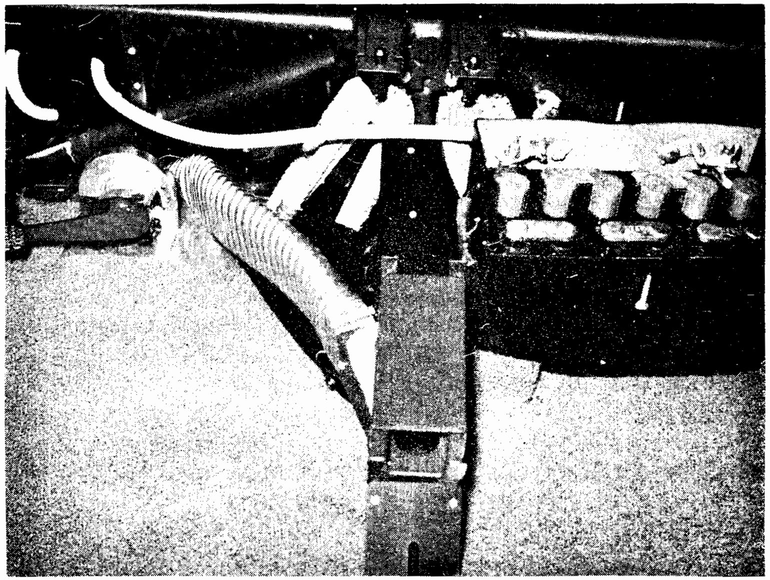

when necessary at the filler plug on top of the cylinder. MIL-H-5606 (petroleum base) hydraulic fluid is used here as in the hydraulic units on other Piper products.

To refill the cylinder (1) apply hand brake hard, forcing fluid into brake lines and shoes; (2) apply parking brake to lock fluid in position; (3) remove filler plug and add oil until cylinder is full; (4) replace plug, release brakes, and check wheels to see that they still turn freely—if not, release a small amount of fluid at the brake bleeder valve at the wheel, and recheck.

To fill the brake system with fluid initially, (1) loosen brake bleeder valves at wheels; (2) add fluid at cylinder until fluid flows from bleeders, then tighten valves; (3) install plug at cylinder; (4) apply brake and parking brake to force fluid downward in system; (5) open bleeder valves to allow air to escape at wheels; (6) continue to add fluid at cylinder and bleed air from valve until air is eliminated, then refill cylinder and check wheels for free movement.

The position of the hand brake control should be such that hand movement in the cockpit is nearly horizontal rather than upwards. An adjustment of the cable length is provided at the cylinder to po-

sition the brake handle. Usually an excessive travel of the brake handle indicates that brake fluid needs replenishing.

The brakes can be adjusted for clearance between the brake shoes and the drums by rotating two cams located on the brake flange as follows:

(1) Place the axle of the wheel to be adjusted on a jack or block so that the wheel turns freely.

(2) Loosen the lock nuts which lock cams in position.

(3) Rotate the cams until the wheel can just be turned without brake friction.

(4) Tighten the lock nuts, making sure that the cams do not change position while being locked in place.

The main wheels are removed by detaching hub caps and dust caps, removing the axle nuts, and sliding the wheel from the axle. To remove the nose wheel, remove one axle nut, slide the axle through the nose wheel fork, and drop the wheel from its fork. In reinstalling the nose wheel, the axle nuts should not be drawn up tight enough to bind wheel bearings.

Tires (600x6 balanced four ply on all wheels) are dismounted from wheels by (1) deflating tubes; (2) removing wheel from axle; (3) taking stop nuts from wheel through-bolts; (4) withdrawing the two halves of wheel from tire.

V. Landing Gear Service:

The Hydrasorb units on the Tri-Pacer incorporate a hydraulic shock absorber unit and two 8″x5/8″ shock cords. The units can be removed for servicing as follows: (1) raise the airplane until the main wheels do not touch; (2) tilt the front seat back; (3) remove the upper Hydrasorb attaching bolts and allow the gear to drop down; (4) detach lower end of units.

The shock cords on the Hydrasorb units should be replaced if they become weakened. The hydraulic units cannot be repaired and must also be replaced when worn.

The nose wheel mounting on the Tri-Pacer is readily removed for service as follows:

(1) Push tail of plane down until tail skid rests on ground. Hold tail in this position with tie down or by resting a load on the stabilizer. (It is suggested that sand bags be laid on a plywood sheet on the inboard part of the stabilizers. Care must be taken not to damage

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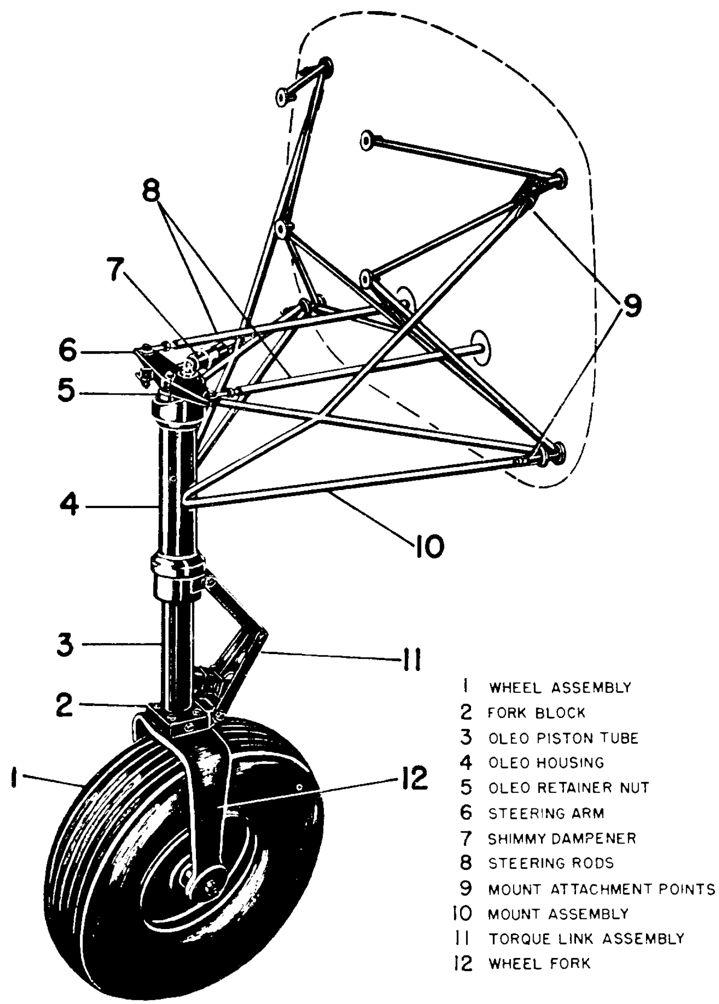

NOSE WHEEL INSTALLATION
TRI PACER

the stabilizer adjustment mechanism or the fabric.) This raises nose wheel from the ground so that it can be removed.

(2) Remove bottom cowl.

(3) Detach steering rods from nose wheel steering arms at top of strut.

(4) Remove nuts from lower motor mount bolts, on firewall, and drive the bolts back to the motor mount bushings, being careful not to drive the bolts completely through the bushings as all the engine weight will be applied to upper motor mount attachments, causing damage to the mount. Then remove bolts from upper attachment of nose wheel mount to motor mount.

(5) Slide nose wheel unit forward and down to clear it of motor mount.

The nose wheel shock absorbing unit is an oleo-pneumatic strut in which the air operating under pressure serves as the taxiing shock absorber, while the oil absorbs the major loads. The entire oleo can be detached from the nose wheel mount as follows:

(1) After detaching bottom cowl, unsafety the oleo retainer nut on top of unit, and remove cap screw in top of steering arm assembly.

(2) Remove through bolt from steering arm assembly and detach assembly.

(3) Insert screw driver in slot in retainer nut and hold screw driver against the oleo housing to prevent the nut from turning.

(4) Rotate oleo unit by turning nose wheel to unscrew the unit from the retainer nut. When the nut is free the oleo may be removed from its housing.

Replacement of the oleo is done by reversing this procedure. A dust shield is located on top of the upper bearing and should be properly in place there after the oleo is reinstalled. At this time the sealing of the bearings should also be checked, and the retainer nut pulled down to the proper position. To get a snug fit of the oleo strut on the bearings, pull the nut up tight, then back it off enough so that the oleo can be rotated freely but has no play.

The chrome-plated oleo piston tube is removed in order to replace seals, which consist of 2 "O" rings and a rubber wiper strip, located on the bearing block assembly. The oleo unit can be disassembled with the nose wheel housing and the outer tube of the oleo strut in place on the airplane as follows:

(1) Let air escape from air valve at top of unit, then remove valve core.

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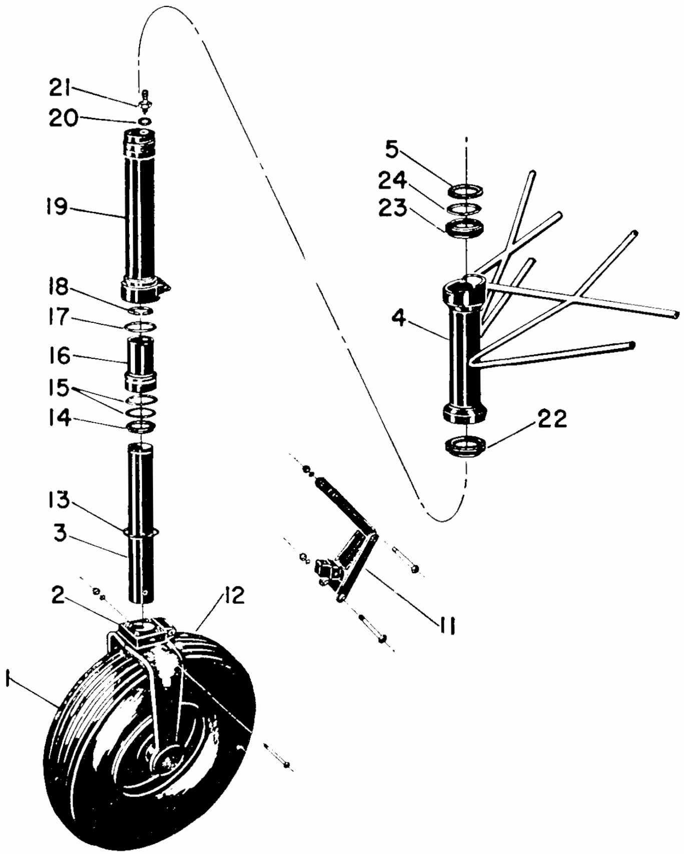
1 WHEEL ASSEMBLY
2 FORK BLOCK
3 OLEO PISTON TUBE
4 OLEO HOUSING
5 OLEO RETAINER NUT
11 TORQUE LINK ASSEMBLY
12 WHEEL FORK
13 LOWER SNAP RING
14 WIPER STRIP
15 INNER "O" RING & BACKUP WASHER
16 BEARING BLOCK
17 OUTER "O" RING
18 UPPER SNAP RING
19 OUTER OLEO TUBE
20 AIR VALVE GASKET
21 AIR VALVE
22 LOWER BEARING
23 UPPER BEARING
24 DUST SHIELD



NOSE WHEEL OLEO BREAK-DOWN
TRI PACER

(2) Detach lower end of oleo torque link assembly from fork block.

(3) Remove lower snap ring, located inside and at bottom of outer oleo strut tube, with small nosed pliers.

(4) Slide piston tube and bearing block assembly out of outer tube. Oleo fluid will flow from the outer tube and much of it can be caught in a container and reused.

(5) Remove upper snap ring on piston tube.

(6) Slide bearing block off top of piston tube, taking precaution not to damage "O" rings in the process.

To reassemble the oleo unit, reverse this procedure, being very careful to see that the snap rings are properly reinstalled.

MIL-H-5606 petroleum base hydraulic fluid is used in the nose oleo. To add oil to the unit, first release all the air through the air valve, allowing the oleo to compress fully. Next remove the air valve core and fill the unit through this opening, extending the strut slowly while adding fluid. Compress the oleo again to within 1/4" of full compression, allowing excess oil to overflow and working out any trapped air. Then reinsert the air valve and pump up the strut.

The nose wheel oleo strut of the Tri-Pacer is properly extended when 3½ inches of the chrome plated tube is exposed with the plane in normal ground attitude at normal flight weight (no occupants or baggage). This dimension is controlled by changing the air pressure in the unit.

To add air to the nose gear, first unfasten the right side of the bottom engine cowl. Unscrew the air valve cap on top of the oleo unit and attach a high capacity air hose or pump. Increase the air pressure in the oleo until five or six inches of the chrome strut is exposed. Then release air from the valve in short spurts until the 3½" dimension is obtained. Rock the airplane longitudinally, working the nose wheel oleo to make sure of proper extension after normal operation.

Shimmy of the steerable nose wheel is controlled by means of a shimmy dampener which is attached to the right side of the nose wheel mount. This dampener should require no servicing other than routine inspection during periodic checks. In case of damage or malfunctioning, the dampener should be replaced rather than repaired. In installation of the dampener, vertical alignment of the piston rod with nose wheel steering arm must be maintained to prevent binding of the rod during its full travel.

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If found to need additional oil, the dampener can be filled with Univis No. 40 as follows:

(1) Remove unit from its attachment.

(2) Remove cotter pin from end of piston rod.

(3) Slide piston rod forward as far as possible until aft end is completely inside cylinder.

(4) Refill with hydraulic oil, making sure that all air is excluded from the cylinder.

(5) Push piston rod back in place, replace cotter pin and then replace unit.

Steering of the nose wheel is affected by use of the rudder pedals which actuate steering rods connected to steering arms at the top of the nose wheel unit. The length of the steering rods can be adjusted at either end by turning the threaded eye bolts in or out. Adjustment is normally accomplished at the forward end of the rods, and should be done in such a way that the nose wheel is in line with the fore and aft axis of the plane when the rudder pedals and the rudder are centered. Alignment of the nose wheel can be checked by pushing the airplane back and forth with the rudder centered to determine that the plane follows a perfectly straight line. Turning arc of the nose wheel is 20 degrees in each direction and is adjusted at stops on the steering arm.

VI. Fuel Requirements:

Aviation fuel with a minimum grade of 91/96 octane must be used in the O-320-B and a minimum grade of 80/87 octane must be used in the O-320 engine. Since the use of lower grades can cause serious engine damage in a short period of time, the engine warranty is invalidated by the use of lower octanes.

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

The continuous use, more than 25% of the operating time, of the higher leaded fuels can result in increased engine deposits, both in the combustion chamber and in the engine oil. It may require increased spark plug maintenance and more frequent oil changes. The frequency

of spark plug maintenance and oil drain periods will be governed by the amount of lead per gallon and the type of operation. Operation at full rich mixture requires more frequent maintenance periods; therefore it is important to use proper approved mixture leaning procedures.

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

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

FUEL GRADE COMPARISON CHART

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

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

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

The tank and line sumps should be drained regularly to remove water or sediment.

VIa. Oil Requirements:

The oil capacity of the O-320 series engine is 8 quarts, and the minimum safe quantity is 2 quarts. It is recommended that the oil be changed every 50 hours and sooner under unfavorable operating conditions. Intervals between oil changes can be increased as much as 100% on engines equipped with full flow cartridge type oil filters, provided the element is replaced each 50 hours of operation and the specified octane fuel is used. Should fuel other than the specified octane rating for the power plant be used, refer to the latest issue of

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Lycoming Service Letter No. L185 and Lycoming Service Instruction No. 1014 for additional information and recommended service procedures. The following grades are recommended for the specified temperatures:

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

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

VII. Care of Air Filter:

The carburetor air filter must be cleaned at least once every fifty hours and depending on the type of condition existing, it may be necessary to clean the filters daily or every five hours. Extra filters are inexpensive and should be kept on hand and used for rapid replacement.

The following cleaning and reoiling procedure is recommended by the manufacturer of the filter.

(1) Remove filter from carburetor air box.

(2) Wash thoroughly, soiled face down in cleaning fluid and allow to dry. (Cleaning fluid may be gasoline, kerosene, or naphtha.)

(3) Immerse filter in mixture of three parts oil, specification MIL-L-6082, grade 1100 SAE 60 and one part corrosion preventative compound, specification AN-VV-C-576, and allow to drain for two to four hours. (SAE 50 may be used in lieu of grade SAE 60.)

(4) Wipe off excess oil and reassemble to carburetor air box.

VIII. Care of Windshield and Windows:

The windshield and windows are made of plexiglas and a certain amount of care is required to keep them clean and clear. The

following procedure is suggested:

(1) Flush with clean water and dislodge excess dirt, mud, etc., with your hand.

(2) Wash with mild soap and warm water. Use a soft cloth or sponge (Do not rub.).

(3) Remove oil, grease or sealing compounds with a cloth soaked in kerosene.

(4) After cleaning, apply a thin coat of hard polishing wax. Rub lightly with soft dry cloth.

(5) A severe scratch or mar can be removed by using jewelers rouge to rub out scratch, smooth on both sides and apply wax.

IX. Serial Number Plate:

The serial number-plate on the Tri-Pacer is located on the right front floorboard under the carpet.

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PIPER

TRI-PACER OWNER'S HANDBOOK