SUPER CUB
OWNER'S HANDBOOK

SUPER CUB

PA-18-95 PA-18-135 PA-18A-135

Owner's Handbook

Piper Aircraft Corporation, Lock Haven, Pa.
U. S. A.

NOTICE

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

THE HANDBOOK IS DESIGNED:

1. TO HELP YOU OPERATE YOUR SUPER CUB 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 SUPER CUB'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.

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PREFACE

THE PIPER SUPER CUB is a versatile high performance airplane, designed to provide the maximum in utility, efficiency and safety. Because of its unusual design and performance, it is in fact a replacement for many types of ground machines. It is available in two models of the basic design, the 90 H. P. Continental version and the 135 H. P. Lycoming version of the Standard PA-18. It is also available in a specialized agricultural version, the PA-18A with the Lycoming 135 engine.

This owner's handbook has been compiled to provide a convenient source of information on the operation and maintenance of all of these Super Cub models and to help the owner obtain the utmost in pleasure and utility in the use of his airplane.

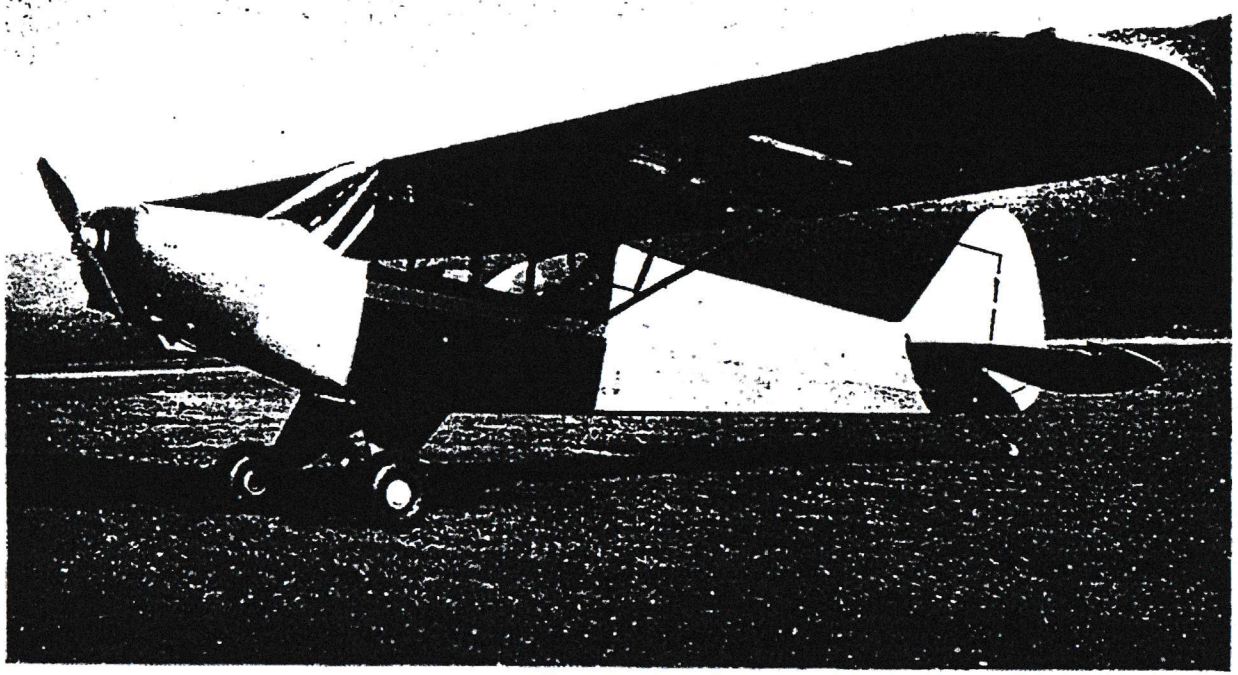


Figure 1

SECTION ONE

DESIGN FEATURES

I. SPECIFICATIONS:

	"95"	"135"
Engine	Cont. C-90	Lyc. O-290-D-2
HP and RPM	90 at 2475	135 at 2600
Gross Weight (lbs.)	1500	1500
Empty Weight (Standard) (lbs.)	800	895
Useful Load (lbs.)	700	605
Wing Span (ft.)	35.3	35.3
Wing Area (sq. ft.)	178.5	178.5
Length (ft.)	22.4	22.5
Height (ft.)	6.7	6.7
Prop Diameter (max. in.)	74	74
Power Loading	16.6	12.0
Wing Loading	8.4	8.4
Baggage Capacity	50	50
Fuel Capacity	18	36
Tire Pressure (lbs./sq. in.)	18	18

Performance	"95" Wood Prop	"95" Std. Metal Prop	"135" Metal Prop 1500 lbs.	"135" Metal Prop 2070 lbs.*
Top Speed (mph)	110	112	127	125
Cruising Speed (75% power mph)	100	100	112	110
Stalling Speed (mph)	42	42	38**	45**
Take-off Run (ft.)	452	390	200**	305**
Take-off over 50′ barrier (ft.)	952	750	500**	950**
Landing Roll (ft.)	385	385	300**	410**
Landing Distance (over 50′ barrier) (ft.)	800	800	600**	875**
Best Rate of Climb Speed (mph)	71	71	71	75
Rate of Climb (ft./min.)	624	710	1,050	680
Best Angle of Climb Speed (mph)	63.5	63.5	57	65
Best Angle of Climb (ratio)	1 to 9.4	1 to 8	1 to 5	1 to 9
Service Ceiling	13,500	15,750	20,500	15,800
Absolute Ceiling	16,000	17,750	22,500	18,100
Fuel Consumption (gal./hr.) (75% power)	5	5	7.7	7.7
Cruising Range (75% power)	360	360	500	500

* Gross weight over 1,500 lbs. is now permitted for special purpose uses under Part 8 of CAR.

** Flaps extended.

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

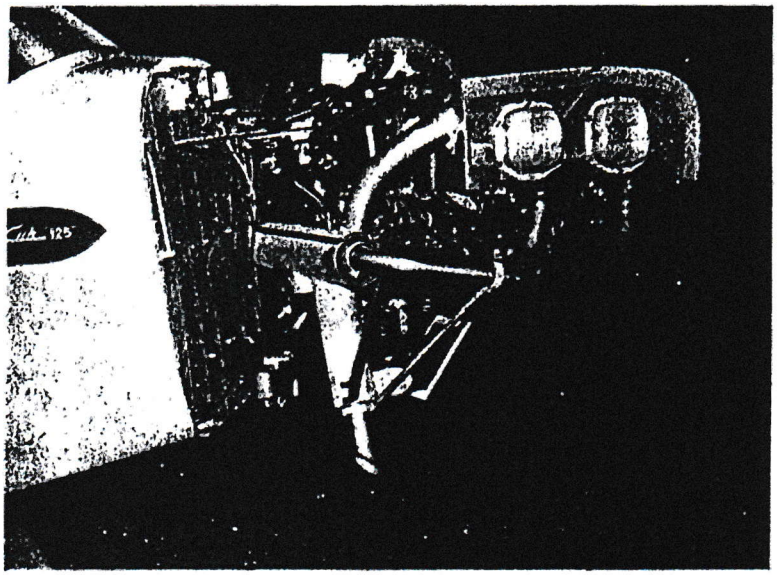


Figure 2

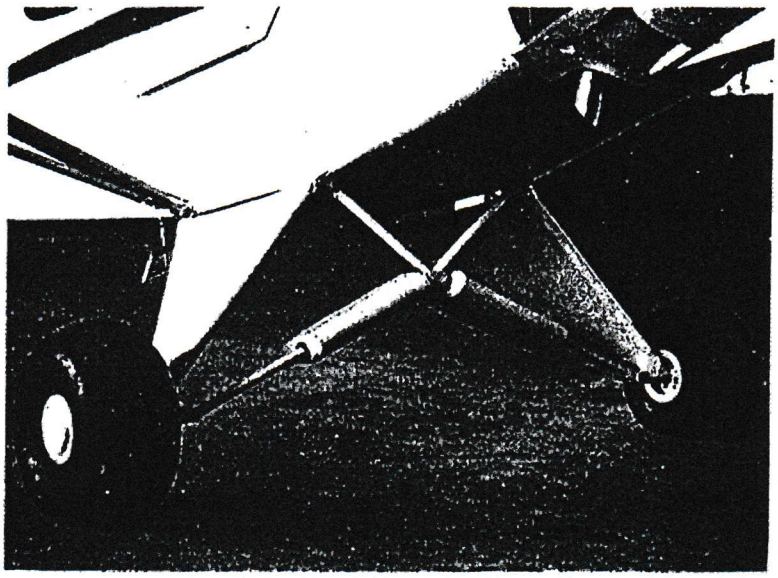


Figure 3

II. POWER PLANT AND PROPELLER:

The Super Cub "95" is powered with a Continental C-90-8F engine or a C-90-12F if starter and generator (optional equipment) are installed. These engines are rated at 90 H. P. at 2475 R. P. M.

The Super Cub "135" is powered with a Lycoming 0-290-D2 engine, with a rated horsepower of 135 at 2600 R. P. M. The standard installation of this engine is also without electrical system, which is available optionally.

The steel tubular engine mount on the Super Cub models is mounted to the fuselage at the firewall on hinges, so that the rear of the engine can readily be made accessible for service. To hinge the motor mount, first remove the top, side and bottom engine cowl panels, which are quickly detachable by means of cowl fasteners. Next detach the rear end of the cowl support channels from their firewall brackets, extract the right hand hinge bolts, disconnect the tachometer shaft at the engine and swing the right side of the engine forward until the stop mechanism is extended.

The standard propeller on the Super Cub "95" is the Sensenich wood propeller design 72-GK-50. A Sensenich metal propeller design 76-AN-2-42 is available as optional equipment. On the "135", the standard propeller is the Sensenich metal design 76-AM-2-52. In general, propeller designs selected for the Super Cub models emphasize take-off, climb and economical cruising performance rather than high speed cruising. If propellers with higher pitches are used, the cruising speed can be increased somewhat.

A stainless steel cross-over exhaust system is employed on the "135" to scavenge exhaust gasses effectively. This permits the use of an efficient muffler without any loss in engine power output due to exhaust backpressure. The muffler is shrouded to provide sources of heat for the cabin and carburetor heating systems.

III. FUSELAGE AND WINGS:

The fuselage frame of the Super Cub 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 Civil Aeronautics Authority Manual No. 18, and repair facilities for this type of construction are available universally.

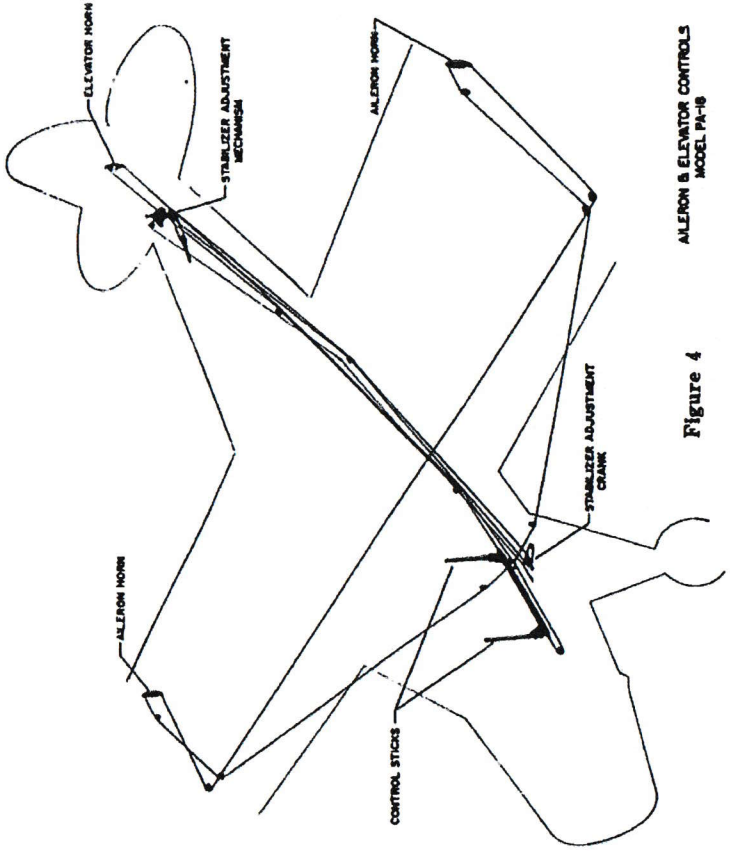

ELEVATOR HORN
STABILIZER ADJUSTMENT MECHANISM
AILERON HORN
STABILIZER ADJUSTMENT CRANK
AILERON HORN
CONTROL STICKS
AILERON & ELEVATOR CONTROLS
MODEL PA-16

Figure 4

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 fabric comes in contact with the structure. If the airplane is to be used in salt water areas, the fuselage can be metalized 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 tublar 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.

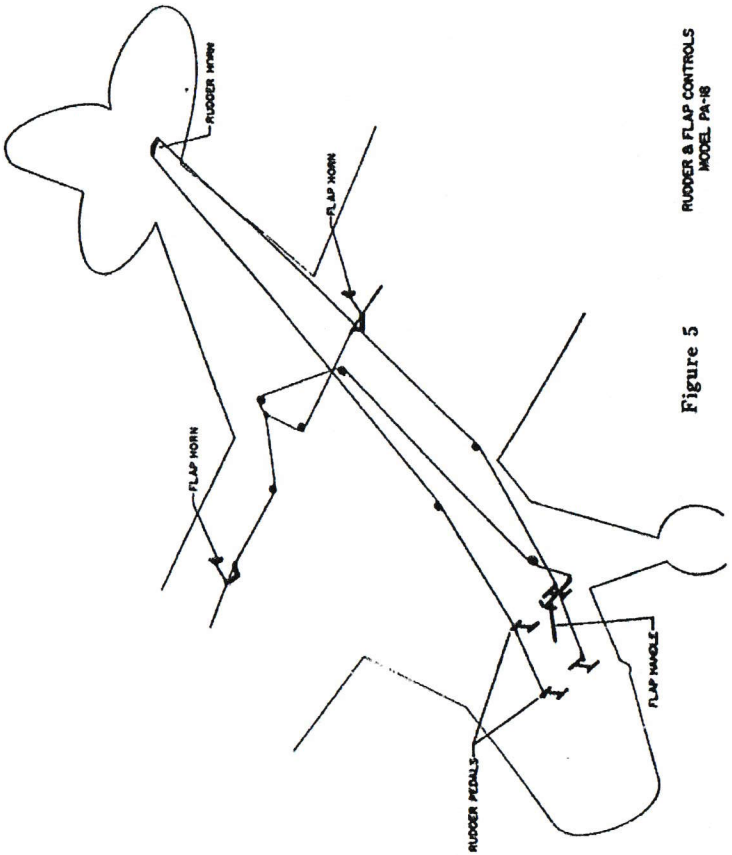
IV. LANDING GEAR:

The Super Cub landing gear is the well proven maintenance-free-shock cord type, which employs two 8″x¾″ shock rings on each shock strut. The only maintenance required on this gear is occassional greasing of the hinge bolts and shock strut members, and inspection of the steel hinge bolt bushings, which can be replaced if worn.

Hydrosorb shock units, which consist of automotive type oleo struts combined with light shock cords, are available optionally.

The Scott 2″ steerable full-swivel tail wheel, model 3-24B is standard equipment on the Super Cubs. This tail wheel can be replaced with an 8″ Scott model which provides greater floatation, provided that the tail wheel leaf springs are changed with the wheel. The standard tail wheel tire is 6:00x2 of the solid rubber type.

Main wheel assemblies are Goodrich D-3-13-A-1, on which are mounted 8:00x4 four ply tires. The tire inflation of 18 lbs. must be maintained, reasonably consistant to prevent tire slippage on the wheel and to produce even wear.



RUDDER & FLAP CONTROLS
MODEL PA-18

Figure 5

V. 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. Stainless 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.

Although the fin and rudder are identical on both models of the PA-18, the stabilizers and elevators are different in that the Super Cub "135" has a larger span on the tail surfaces to provide extra longitudinal stability, and the elevators are designed with an aerodynamic balance to increase stability and reduce control forces. On the Super Cub "95" the tail surfaces are almost identical with those of preceding tandem models.

VI. CONTROL SYSTEM: (See Figures 4 and 5)

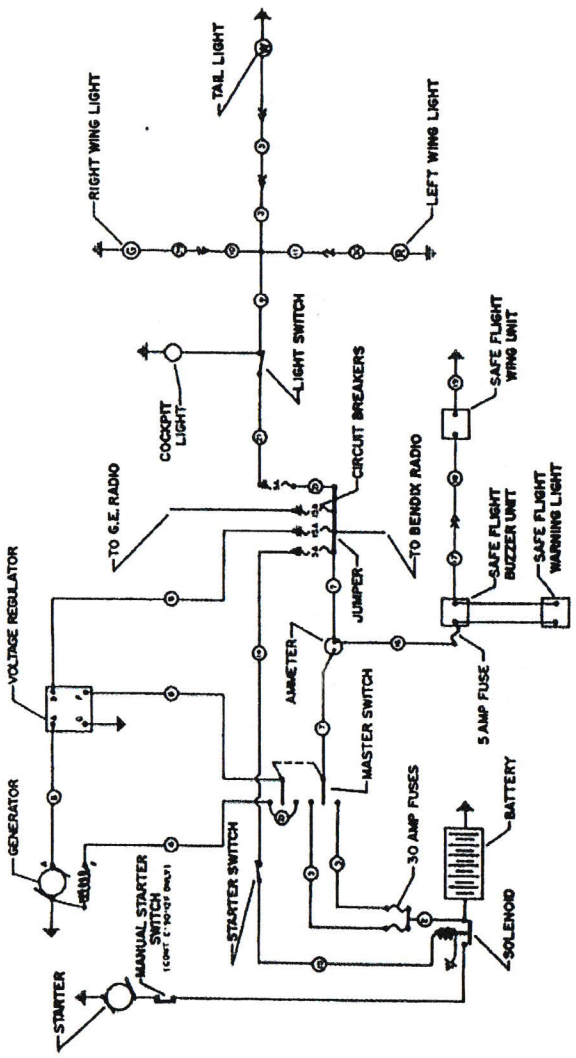
Conventional dual flight and engine controls are provided in the Super Cub. In the Model "135", which is equipped with flaps, the flap control is located for front seat operation only. Solo operation of both models is normally from the front seat although rear seat operation is entirely feasible.

The flap lever can be set in any one of three positions, for full up flap, half flap, or full down flap. Full flap is recommended for minimum speed landings. Half or full flap can be applied to reduce take-off run, the more flap used the shorter the run. A minimum take-off distance is obtained by beginning the take-off with flaps up, then applying full flaps when take-off speed (30-35 m. p. h.) has been reached. The best angle of climb is attained with full flap. The best rate of climb is without any flap extended.

The stabilizer adjustment crank is located on the left cabin panel adjacent to the front seat. 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. This system normally requires no attention except for lubrication and inspection.

VII. FUEL SYSTEM:

An 18 gallon fuel tank located in the left wing is the main fuel supply for the Super Cub "95" in the standard installation. A second 18 gallon tank can be installed as optional equipment in the right wing. On the model "135", two 18 gallon tanks are standard equipment.



ELECTRICAL SYSTEM DIAGRAM
MODEL PA - 18

Figure 6

A small (approximately 2 quarts) header tank which serves to maintain constant fuel flow to the engine regardless of the normal attitude of the airplane, is included in the installation of each fuel tank. The header tank for the left or main fuel tank is located forward of the instrument panel, for the right tank is concealed behind the headlining aft of the rear seat.

Fuel indicator gauges are installed in the upper cabin panels and are easily discernible from either seat. The fuel shut-off valve is in the left cabin panel near the front seat.

The fuel strainer, on the lower left side of the firewall in the engine compartment, traps water or sediment that may collect in the fuel system and should be checked regularly. Fuel screens are provided at each tank outlet, in the strainer, and at the carburetor.

The engine primer pump on the right side of the instrument panel takes fuel from the top of the fuel strainer and pumps directly to all four cylinders on the engine. The primer should be locked in at all times except when in use to prevent malfunctioning of the engine.

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.

In the two tank fuel system, it is recommended that the left tank be considered the main tank and that fuel be used from the right tank first on long flights, saving the left tank until the last. To get the maximum range, use the fuel from the right tank until the engine falters from lack of fuel, then switch to the left tank.

VIII. ELECTRICAL SYSTEM: (See Figure 6)

An electrical system, consisting of starter, generator, battery, voltage regulator, ammeter, starter solenoid, circuit breakers, fuses, switches and related wiring, is optional equipment on either model of the Super Cub.

A 12 volt Reading battery is mounted in the fuselage aft of the baggage compartment, and a master switch and circuit breaker panel on the cabin panel over the right door. The circuit breakers automatically break the electrical circuits if an overload is applied. To reset the circuit breakers simply push in the buttons. A continuous popping of the circuit breakers indicates a short and should be investigated.

The master switch is connected with a main and a spare fuse, located near the battery box. The starter solenoid is also mounted near this box.

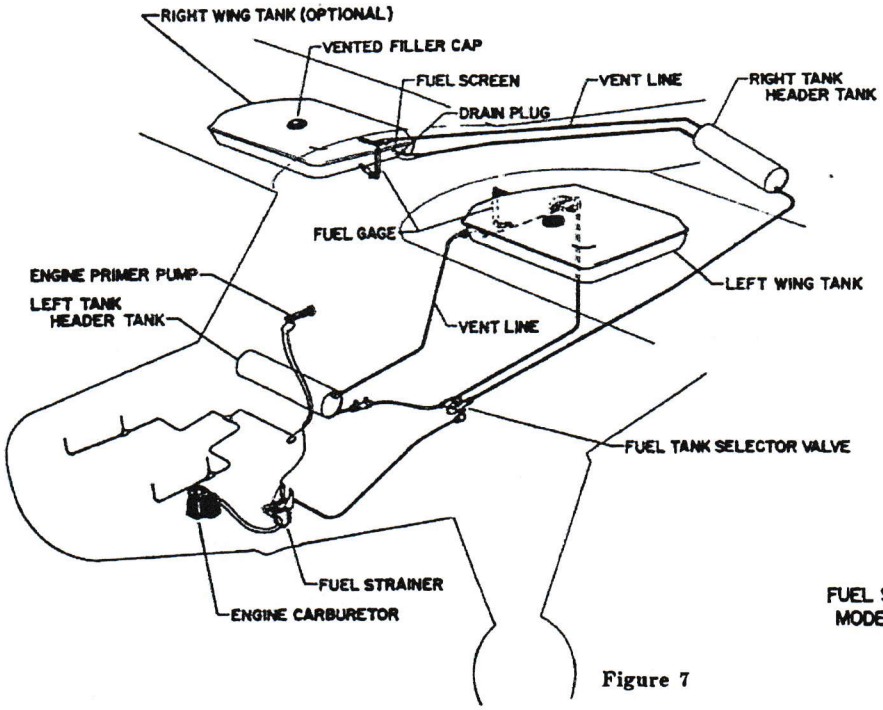

RIGHT WING TANK (OPTIONAL)
VENTED FILLER CAP
FUEL SCREEN
VENT LINE
RIGHT TANK HEADER TANK
DRAIN PLUG
FUEL GAGE
ENGINE PRIMER PUMP
LEFT TANK HEADER TANK
LEFT WING TANK
VENT LINE
FUEL TANK SELECTOR VALVE
FUEL STRAINER
ENGINE CARBURETOR
FUEL SYSTEM
MODEL PA-18

Figure 7

A voltage regulator attached to the engine side of the firewall is incorporated in the system to maintain the required voltage of the battery. Position and instrument panel lights (extra equipment) are operated with the same switch on the electrical panel.

IX. FINISH:

The Duraclad finish on the Super Cubs consists of fire resistant butyrate plastic material on the fabric surfaces, and enamel on 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 fabric, inside and outside, on the new models is treated with butyrate plastic. All of the exterior metal surfaces are finished with enamel. The Duraclad finish must not be covered over with any incompatible material. The use of different materials from those originally applied will damage the finish.

X. CABIN FEATURES:

The standard instrument group in the Super Cub includes the following: Altimeter, Airspeed, Compass, Oil Temperature and Pressure Gauge, and Tachometer. Special panels which provide complete instrumentation are available as optional equipment. A sensitive altimeter or recording tachometer is also available in the standard panel.

The front seat is adjusted fore and aft by depressing a lever on the left side of the seat frame. To remove the seat entirely, remove the forward stop pin on the left rear corner, then release the adjustment lever and slide the seat forward off its mounting channels.

To increase the space available for cargo carrying, the rear seat back can be easily removed. First pull out the spring clips at the top of and behind the seat back, which hold the seat back in place. Then lift the back out of its lower sockets.

Shoulder harness kits are available for both seats of the Super Cub.

The control of the flow of hot air for heating the cabin is obtained through the use of the cabin heat control in the left side panel control box. Cooling air is admitted through the sliding windows on the left side of the cabin. For special purpose flights, such as photography, hunting, etc., the right door and window can be opened in flight, but care should be taken not to impose high air loads on the window in the open position.

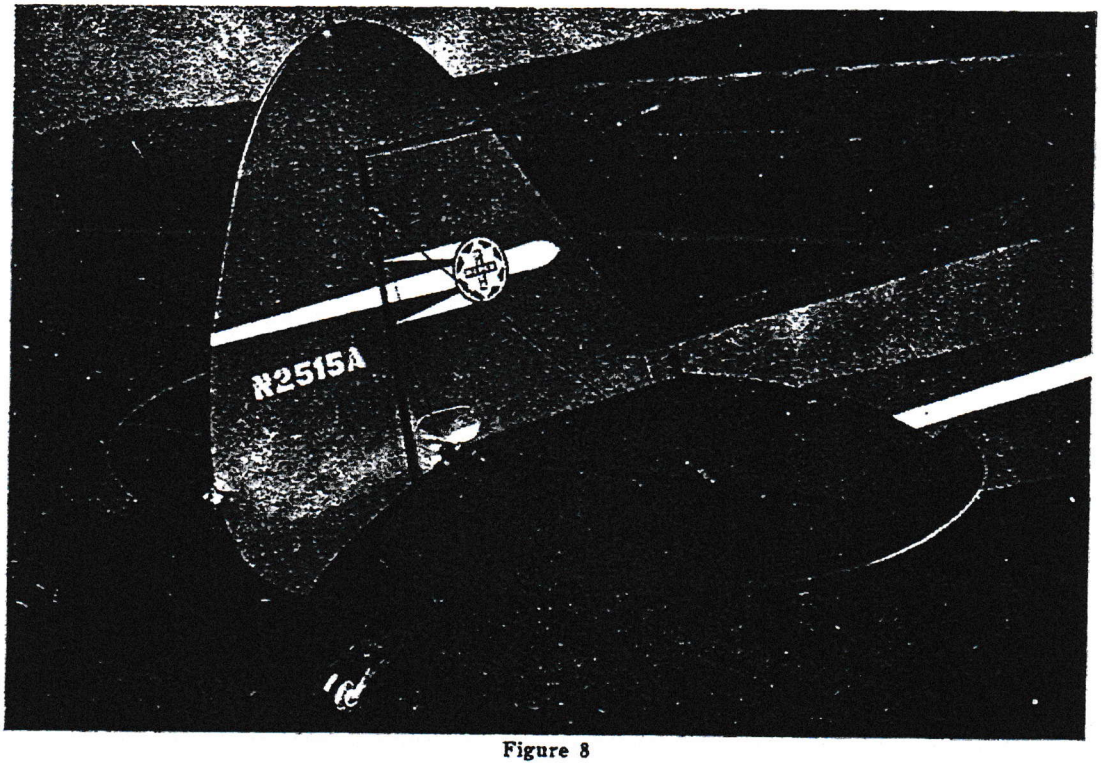


Figure 8

SECTION TWO

OPERATING INSTRUCTIONS

I. FLIGHT PROCEDURE:

1. STARTING:

When the engine is cold, 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 about one-eighth of an inch or until the intake of air at the carburetor can be heard when the engine is pulled through by hand. Engine should be pulled through at least four times.

Next turn the ignition switch to "both" and with brakes set, have engine pulled through by hand or engage starter if installed. If the engine does not start in the first few revolutions, open the throttle while the engine is turning over with ignition on. When engine starts, reduce throttle.

If the above procedure does not start the engine, reprime and repeat process. Continue to load cylinders by priming or unload by turning over the engine with the throttle open.

If engine still does not start, check for malfunctioning of ignition or carburetor system.

When the engine is warm, do not prime, but turn ignition switch to "both" before pulling propeller through. Engine should start after it has been rotated through four compression strokes. If turned over more than four times the engine will frequently "load up", after which it should be started with the throttle well advanced.

2. 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 1000 R. P. M. for not more than two minutes in warm weather, four minutes in cold weather. The magnetos should be checked at 1800 R. P. M., the drop not to exceed 100 R. P. M. 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

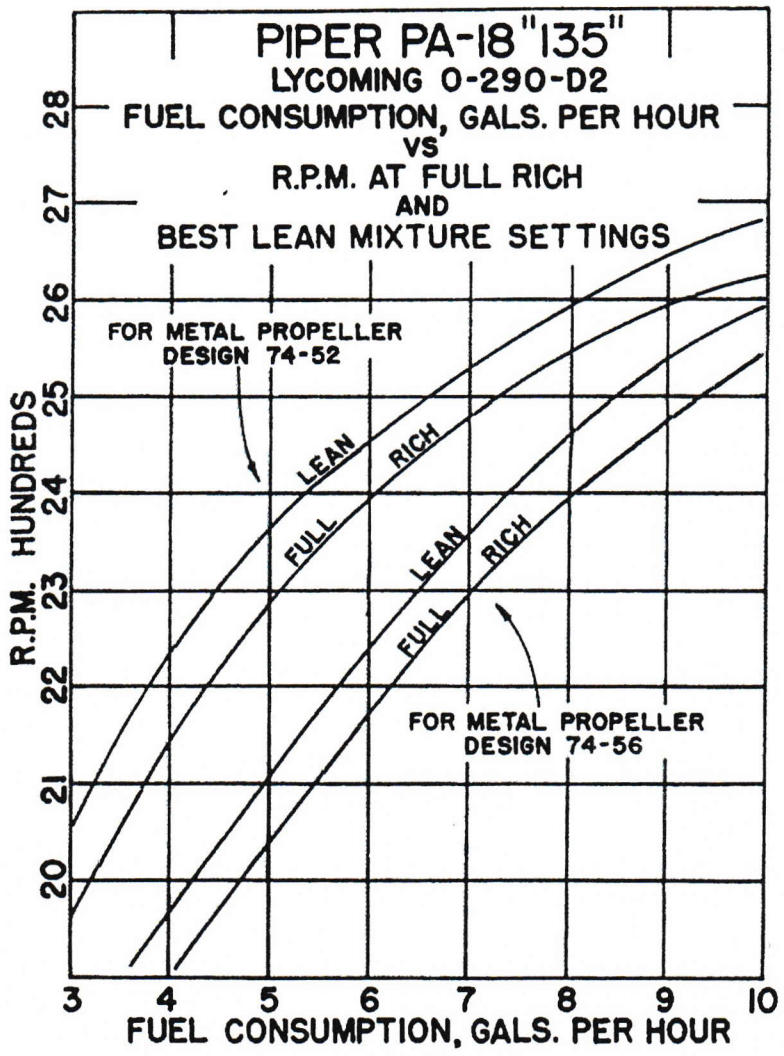

PIPER PA-18 "135"
LYCOMING O-290-D2
FUEL CONSUMPTION, GALS. PER HOUR
VS
R.P.M. AT FULL RICH
AND
BEST LEAN MIXTURE SETTINGS
FOR METAL PROPELLER
DESIGN 74-52
LEAN
RICH
FULL
LEAN
RICH
FULL
FOR METAL PROPELLER
DESIGN 74-56
R.P.M. HUNDREDS
20
21
22
23
24
25
26
27
28
3
4
5
6
7
8
9
10
FUEL CONSUMPTION, GALS. PER HOUR

Figure 9

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 the condition.

3. TAKE-OFF, CLIMB, AND STALLS:

The stabilizer adjustment should be set approximately in the neutral position for take-off. Fuel selector should be on the correct tank, carburetor heat off, mixture full rich, except a minimum amount of leaning is permitted for smooth engine operation when taking off at high elevation. The flaps can be lowered if desired, but should be retracted as soon as climbing airspeed has been reached to achieve maximum rate of climb. The best rate of climb airspeed at gross load is 71 M.P.H. on both models of the PA-18. At lighter weights, the best climbing airspeed will be reduced considerably.

The gross weight power off stalling speed with full flaps in the Super Cub "135" is 38 M.P.H.; with flaps up the stalling speed increases about 4 M.P.H.

4. CRUISING:

The cruising speed of the Super Cubs at 75% of rated engine power, at gross load under standard sea level conditions, is 100 M.P.H. for the model PA-18 "95" and 112 M.P.H. for the model "135." Cruising airspeed and engine R.P.M. will depend on the propeller installed on the airplane.

Normally the "95" should be cruised at 2275 R.P.M. and the "135" at 2400 to 2450 R.P.M., but the 75% of power R.P.M. (low altitudes) can be determined as follows:

1. Fly the aircraft as near sea level as practicable at full throttle until maximum speed is reached. Note R.P.M. at top speed, level flight.
2. Reduce the maximum R.P.M. by 10% and cruise at 90% of full R.P.M. The correct cruising R.P.M. will result in a

cruising airspeed of 100 M.P.H. with a fuel consumption of approximately 5 gallons per hour at full rich mixture on the "95," and an airspeed of 110 M.P.H. with a fuel consumption of approximately 7.7 gallons per hour on the "135." If the "135" is slowed down to the same cruising speed as the "95" or about 100 M.P.H., approximately the same amount of fuel, about 5 gallons per hour, will be used. (See fuel consumption chart, figure 10)

The metal propeller with which the PA-18 "135" is equipped as optional equipment is, unless specified otherwise, a 50 inch pitch propeller which favors take-off and climb rather than cruising speed. The use of this propeller reduces engine power output at normal cruising R.P.M. and therefore improves fuel economy considerably. At 2400 R.P.M. under standard conditions, the engine equipped with this propeller will be producing only about 60% of power rather than the 75% normally used. Fuel consumption will approximate 6.1 gallons per hour instead of the 7.7 gallons consumed at 75% of power.

For training and other purposes which do not require use of full power settings to obtain satisfactory performance, it is recommended that this propeller be operated, during take-off, climb, and cruise, at 2200 R.P.M. or less. This will still provide more performance than was formerly available in 65 H.P. trainers, and will reduce fuel consumption and engine wear very appreciably.

The fuel consumption chart, (Figure 9) should be consulted to determine most economical cruising R.P.M. for specific requirements.

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 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.

5. APPROACH AND LANDING:

During the approach, trim the plane with the stabilizer adjustment until no force is required on the stick to maintain a gliding speed of 70 M.P.H. Lower the flaps at an airspeed not to exceed 80 M.P.H. The mixture should be full rich, fuel valve on correct tank. The carburetor heat need not be used unless icing conditions prevail, but the engine should be cleared occasionally by opening the throttle.

During the landing roll the steerable tail wheel should be used for directional control, and brakes used as little as possible to avoid excessive brake and tire wear.

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 R.P.M. for one minute prior to shutdown to clean out any unburned fuel. After the engine stops, turn the ignition and master switch (if any) off, and retract the flaps.

6. WEIGHT AND BALANCE:

For weight and balance data, see the weight and balance sheet which gives the exact weight of the airplane and permissible center of gravity conditions.

SECTION THREE

GENERAL MAINTENANCE

I. LEVELING AND RIGGING:

The Airplane Should Be Leveled As Follows:

Suspend a plumb bob on a string from the hole in the rear of the upper door frame channel. The hole is exposed by removing the wing root fairing at this point. The airplane will be leveled longitudinally and laterally when this plumb bob hangs directly over a depression in the horizontal door frame tube, about one inch ahead of its rearward end.

Lateral leveling: Place jacks or blocks under the inside portion of the axles, adjusting them until the plumb bob is roughly in line laterally with the mark on the door frame.

Longitudinal leveling: Support the tail on an adjustable jack or stand so that the airplane is approximately in level flight. Adjust the jack until the plumb bob is in line longitudinally with the reference mark.

Next readjust the lateral leveling jacks until the plumb bob hangs directly over the designated mark. The airplane is then leveled on both axes.

Rigging Of The Aircraft Is Done As Follows:

1. Dihedral angle: Place a block 3/8" high on one end of a 30" level. Hold the level between the jury strut and the main strut attachments under the front spar with spacer block outboard. When the bubble is centered, the front spars have an angle of 45 minutes off level.

Normally the correct dihedral will be obtained when about seven threads on the lift strut adjustment forks are exposed. (A maximum extension of 15 threads is permissible). If proper rigging does not result from this procedure, check the fuselage for lateral leveling by holding a level between the front landing gear bolt heads, using this means to level the fuselage laterally, rather than the plumb bob. Then recheck for equal and proper dihedral of the wings.

2. Wash out: Place a 3/8" spacer block on top of a 30 inch level at one end. Working on the outboard aileron rib, hold the level fore and aft with the spacer block at the rear and the front end of the level under the front spar. The correct wash out will exist when the bubble is centered. Adjust the rear struts in or out to obtain this condition.

3. Tail Assembly: With the airplane in level position, the stabilizer should be leveled at their rear spars by adjusting the tail brace wires. The elevator hinge line should be straight from tip to tip. The fin should be vertical at the rudder post.

II. TIRE INFLATION:

For maximum tire service, keep the tires inflated to the proper pressure, which is 18 pounds on the Super Cub. Reverse the tires on the wheels, if necessary, to produce even wear.

III. BATTERY SERVICE:

A Reading S-24 12-volt 24 ampere hour battery is installed with the electrical equipment as optional equipment. The battery should be checked frequently for proper fluid level *Do not fill the battery above the baffle plates.* Be sure all connections are clean and tight. If battery is not up to proper charge, recharge, starting with a charging rate of four amps and finishing with two amps. If a quick charge is desired for the battery, be sure master switch is off while charging.

IV. BRAKE SERVICE:

The brake system is filled with MIL-H-5606 (petroleum base) hydraulic brake fluid. This should be checked at every 100 hour inspection, and replenished if necessary.

Do not use or mix mineral or vegetable base brake fluids when refilling system. When it is necessary to refill brake system, or when the brakes seem spongy, probably due to air in the lines, the following procedures are to be followed:

1. To fill the brake system, remove filler plugs on right wheel brake master cylinder. Remove bleeder screw from tee on right wheel brake unit and attach line from brake fluid pressure can. Fill system until master cylinders are full. Repeat procedure for left wheel brake. If pressure can is not available, an open can with line attached may be used, providing can is held higher than master cylinders. When all master cylinders are full, replace filler plugs and bleeder screws. Check brakes for satisfactory operation.

2. Air in the brake lines causes faulty operation which can be corrected by bleeding the brake system as follows:

   a. Check entire system for breaks or leaks.

b. Remove bleeder screw from particular brake unit and insert bleeder hose. Place free end in a clean receptacle.

c. Remove filler plug from master cylinders of the particular brake which is being bled.

d. Fill master cylinders with MIL-H-5606 hydraulic fluid and keep cylinders full during bleeding process.

e. Work the brake pedal rapidly to force fluid through bleeder hose into receptacle. Pinch hose shut during return of pedal to off position. Release pressure on hose, and push pedal on rapidly again. While fluid is flowing, restrict bleeder hose and allow brake pedal to return slowly to off position. Continue this process until no more air bubbles are observed coming through bleeder hose. The system is then properly bled.

f. Replace bleeder screw; check to see that master cylinders are full, and replace filler plugs. Check brakes for satisfactory operation.

No adjustment of the brake clearances is necessary on the Super Cub brakes. If, after extended service, the brakes become less effective, the brake segments can be easily replaced as follows: Remove the wheels to expose the brake shoe blocks; then slip blocks from their retainer clips with a screwdriver. Replace with new brake segments and reinstall the wheels.

Wheels are quickly removed by taking off the hub caps, removing the cotter pin from the hub nut and unscrewing the nut. The wheel can then be pulled freely from the axle.

Tires are dismounted from the wheels as follows:

1. Deflate tube.
2. Remove safety clevis pin from outer wheel flange.
3. Extract lock ring which holds the outer flange in place.
4. Slide flange, tire and tube from the hub.

V. FUEL REQUIREMENTS:

The minimum aviation grade fuel for the PA-18 is 80/87. Since the use of lower grades can cause serious engine damage in a short period of time, the engine warranty is invalidated by the use of lower octanes.

Whenever 80/87 is not available, the lowest lead 100 grade should be used. (See Fuel Grade Comparison Chart, below)

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.

Refer to the latest issue of Lycoming Service Letter No. L185 and Lycoming Service Instruction No. 1070 for care, operation and maintenance of the airplane when using the higher leaded fuel. On Continental Engines reference Continental Service Bulletin M77-3 when using alternate fuels.

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 fuel gauge glass should be cleaned occasionally so that the fuel level indicator will always be readily seen. To clean or replace the fuel gauges, first remove lower wing butt fairings. Pinch the rubber line to the lower gauge fitting so that fuel cannot drain from the tank. Then remove the fuel gauges by pulling the fittings from the connecting rubber tubes.

Va. OIL REQUIREMENTS:

The oil capacity of the O-290-D2 engine is 8 quarts, and the minimum safe quantity is 2 quarts. The C-90-8F or 12F has a capacity of 5 quarts. It is recommended that the oil be changed every 50 hours and sooner under unfavorable operating conditions. Intervals between oil changes can be increased as much as 100% on engines equipped with full flow cartridge type oil filters, provided the element is replaced each 50 hours of operation and the specified octane fuel is used. Should fuel other than the specified octane rating for the power plant be used, refer to the latest issue of Lycoming Service Letter No. L185 and Lycoming Service Instruction No. 1014 for additional information and recommended service procedures. On Continental Engines refer to Service Bulletins M77-3 and M75-2. The following grades are recommended for the specified temperatures on the O-290-D2:

Temperatures above 60° F	S.A.E. 50
Temperatures between 30° F to 90° F . .	S.A.E. 40
Temperatures between 0° F to 70° F . .	S.A.E. 30
Temperatures below 10° F	S.A.E. 20

The following grades are recommended for the specified temperatures on the Continental Engines:

Temperatures above 40° F	S.A.E. 40
Temperatures below 40° F	S.A.E. 20

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

VI. 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.

NOTE: Do not use gasoline, alcohol, benzene, carbon tetrachloride, lacquer thinner, or window cleaning sprays.

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 jeweler's rouge to rub out scratch, smooth on both sides and apply wax.

VII. LANDING GEAR SERVICE:

The landing gear shock cords, which are enclosed in streamlined shock cord covers, should be inspected regularly for signs of wear. Shock struts and landing gear hinge bolts should be kept properly lubricated with light grease or oil.

SECTION FOUR

INSPECTIONS

ENGINE SECTION

ITEM 1—OPERATION:

Run engine to minimum 120° oil temperature—check full throttle static R. P. M. both magnetos.
Check magnetos 100 R. P. M. drop at 1800.
Check carburetor heat 100 R. P. M. drop at F/T.
Check ignition switch for operation.
Check idle R. P. M. 550-600 carburetor heat off.
Oil Pressure (PA-18 "95"—Minimum idle 10# Normal 30-35#).
(PA-18 "125"—Minimum idle 25# Normal 65-85#).
Master switch on, check generator and voltage regulator for operation.
Battery fully charged will show very slight indication on Ammeter at F/T.
Check idle cut-off at 800 R. P. M.; engine should cut off clean.

Continental C90-8F or C90-12F **Rated R. P. M. 2475**

Static R. P. M. Wood Fixed Pitch ---------- 2100-2400
Static R. P. M. Metal Fixed Pitch ---------- 2200-2350
Static R. P. M. Koppers F200/00-73 ---------- 2375-2425

Lycoming O-290-D2 **Rated R. P. M. 2600**

Static R. P. M. Wood Fixed Pitch ---------- 1900-2400
Static R. P. M. Metal Fixed Pitch ---------- 1900-2475

ITEM 2—ENGINE MOUNT:

Check engine mount for damage and cracks at gussets or in corners.
Inspect protective finish on mount; sand and touch up bare areas.
Inspect rubber shock mounts for rubber deterioration and tension.
Engine mount bolts should be tightened to 60 to 80 inch pounds.
Check mount bolts for safety.

ITEM 3—COWLING:

Clean and inspect engine cowling for dents and cracks at hinges and reinforcement.
Check for tension adjustment on cowl doors at latch.
Tension prevents vibration and cowl cracking.
Check baffles for cracks and leather installation to prevent chafing.

ITEM 4—MAGNETOS:

Check magnetos for secure attachment.
Check breaker point housing for excessive oil.
Check points for gap and pitting. Gap setting .012".
Check plug wiring connections at magneto and wire insulation for deterioration and chafing.
Check grommets at baffles.

ITEM 5—OIL DRAIN:

Drain oil and check for metal particles.

Remove, clean and check oil screen drain plug and inlet oil temperature housing for metal particles.
Reinstall and safety oil drain plug.
Check oil cover for leaks and flexible lines for deterioration.

ITEM 6—SPARK PLUG:

Remove plugs, bomb blast and clean.
Plugs with badly burned electrodes should be replaced.
Reset gap to .025".
Reinstall using thread lubricant to prevent seizing and torque to 300 to 360 inch pounds or 30 foot pounds.

ITEM 7—STARTER:

Check starter motor for mounting security.
Check commutator for excessive wear and bridging.
Inspect wiring insulation for deterioration and connections.
Check ring gear for damaged teeth and nose cowl clearance.
Check starter shaft bushings for play.
Check brush retention and tension springs.

ITEM 8—GENERATOR:

Check generator mounting for security.
Check brush retention and condition of tension springs.
Replace worn brushes before there is any danger of brush failure.
Brush worn over 3/16 of an inch should be replaced.
Check generator drive belt for ¾" hand deflection.

ITEM 9—CARBURETOR AND HEATER:

Check carburetor for mounting security.
Inspect carburetor bowl for cracks, particularly at inlet.
Drain carburetor float chamber and check inlet finger screen-resafety.
Operate throttle in cockpit to be sure that throttle arm hits stops in open and closed positions without binding or sticking.
Check operation of mixture control for binding or sticking and full rich position.
Inspect carburetor air box for security and cracks—heater valve for full travel.
Check rubber intake hose connections for deterioration and clamp security.
Check intake system for leaks and cracks.
Clean air filter in kerosene and saturate with #10 oil and allow to drain before installation.

ITEM 10—FUEL LINES:

Check fuel lines for leaks and hose deterioration.
Check hose supports for security and chafing.
Drain and clean fuel strainer and resafety.
Check for stains around fuel system indicating leaks.
Check all connections for tightness.

ITEM 11—EXHAUST STACKS:

Check stack flanges for security, cracks and leaks.
Remove all heater and muffler shrouds and inspect for corrosion, cracks and leaks that might transfer gas to the cockpit, particularly through the cabin heater system.
Check tailpipe, muffler and stacks for security at all clamps and slip joints.
Check cabin heater box and control valve for operation.
Check cabin and carburetor heat flexible tubing for security and general condition.

ITEM 12—FIREWALL:

Check firewall for open holes and gas leaks from engine compartment.
Check all controls for grommets and sealing putty.

PROPELLER SECTION

ITEM 13—ALIGNMENT:

Remove spinner and check for cracks or dents in spinner and back plate.
Check wood propeller for separated laminations, cracks, loose metal tipping and protective finish. Blades are to track within 1/16".
Wood propeller hub bolts are to torque from 140 to 150 inch pounds.
Metal propeller hub bolts are to torque from 250 to 275 inch pounds.

COCKPIT, PASSENGER AND CARGO SECTION

ITEM 15—SEATS:

Check rear seat cushions and attachments for wear or deterioration.
Check front seat fore and aft adjustment and lubricate track.
Check condition of safety belts and operation of buckles.

ITEM 16—WINDSHIELD:

Check weatherstripping for security in channels and for weather leaks. Visual check for cracks, crazing, distortion and discoloration.

ITEM 17—POWER INSTRUMENTS:

Check power plant instruments for mounting security.
Check connections and plugs.
Check placards and limitation markings.

Continental C-90 Series Engine:

Tach:

Red Line	2475 R. P. M.
Yellow Arc	2350—2475 R. P. M.
Green Arc	2000—2350 R. P. M.

Oil Pressure:

Red Line	Minimum 10 lbs. Maximum 40 lbs.
Yellow Arc	10 lbs.—30 lbs.
Green Arc	30 lbs.—40 lbs.

Oil Temperature:

Red Line	225°
Yellow Arc	40°—90°
Green Arc	90°—225°

Lycoming O-290-D2 Series Engine:

Tach:

Red Line	2600 R. P. M.
Yellow Arc	2450—2600 R. P. M.
Green Arc	2200—2450 R. P. M.

Lycoming O-290-D2 Series Engine:

Oil Pressure:

Red Line	Minimum 25 lbs.	Maximum 100 lbs.
Yellow Arc	(25 lbs.—65 lbs.)	(85 lbs.—100 lbs.)
Green Arc	(65 lbs.—85 lbs.)	

Oil Temperature:

Red Line	240°
Yellow Arc	40°—120°
Green Arc	120°—245°

ITEM 18—FLIGHT INSTRUMENTS:

Check flight instruments for mounting security.
Check connections and plugs.
Check placards and limitation markings.

Air Speed:	*PA-18 "95"*	*PA-18 "135"*
Red Line	138 M. P. H.	138 M. P. H.
Yellow Arc	110—138 M. P. H.	110—138 M. P. H.
Green Arc	49—110 M. P. H.	45—110 M. P. H.
White Arc (Flap operation)		40—80 M. P. H.

ITEM 19—SWITCHES—LIGHTS—FUSES:

Check battery cable connections for security.
Check circuit breaker wire connector for security and insulating sleeves.
Check position and landing light switches for placards and operation.
A circuit breaker is used on all circuits except the Stall Warning Indicator.

ITEM 20—INTERIOR TRIM:

Check cockpit post fairings and all metal trim for security.

ITEM 21—DOOR LATCH AND HINGES:

Check door hinge and rivets for looseness.
Check door latch plunger for complete extension to prevent doors opening while taxiing.
Check door for improper fit or damage resulting in air leaks.

ITEM 22—ENGINE CONTROLS:

Check mixture control for panel placard and operation for smoothness.
Check carburetor heat for panel placard and smoothness of operation.

Check throttle for smooth operation.
Check primer for operation and leaks behind the panel.
Check cabin heat for panel placard and full travel of heater butterfly valve.
Check ignition switch for panel and terminal security.
Check for placard– Off, Left, Right and Both.

ITEM 23—CONTROLS:

Check aileron and elevator control torque tube for excessive play.
Check pulleys and cable attachments.
Check aileron arm attachment on torque tube.
Check control stick bolts.

ITEM 24—RUDDER PEDALS AND LINKAGE:

Check rudder pedal assembly for play and travel freedom.
Lubricate hinges and torque tube bearings and check for safety.
Check rudder pedal return springs for attachment.

ITEM 25—FLAP CONTROLS:

Check flap handle for placard and condition of rachet for flap positions.
Check flap torque tube for excessive play.
Check flap cable attachments.
Remove rear baggage compartment cover and check flap pulleys at the top and bottom of fuselage.
Remove rear wing butt fairings and check cable fairleads.
Through wing inspection openings check the attachment of flap return springs.

ITEM 26—CABLES AND PULLEYS:

Check all cables for broken strands.
Check reversing and idler pulleys on elevator control.
Check aileron pulleys outboard from control arm.

ITEM 27—FLIGHT CONTROL OPERATION:

Check aileron, rudder and elevator controls from cockpit for smooth operation.
Check stick for neutral position with control surfaces streamlined.

ITEM 28—TRIM CONTROLS:

Check stabilizer trim control for smooth operation.
Check indicator against stabilizer for proper position.

ITEM 29—FUEL VALVES:

Check fuel valve for smooth operation.
Check placard for "ON" and "OFF" positions.
Check valve for leaks.

LANDING GEAR

ITEM 30—SHOCK STRUTS:

Check shock cords for deterioration.

ITEM 31—WHEELS AND AXLES:

Remove wheels, wash, check and relubricate bearings.
Check brake shoes for wear and drums for scoring.
Check brake expander tube for leaks.
Install wheel and axle nut only tight enough to remove end play.

ITEM 32—TIRES AND FAIRINGS:

Check tires for 18 pounds of air pressure.
Replace tires that have cord showing.

ITEM 33—BRAKES:

Check brake reservoirs for fluid and assembly for leaks.
Check operation and holding ability of brake and parking brake.

ITEM 34—LANDING GEAR VEES:

Hoist aircraft and check gear bushings; vee bushings are replaceable if worn.
Check for skin wrinkles indicative of inside damage.

ITEM 35—TAIL WHEEL:

Check tail wheel and spring assembly for looseness.
Check condition of tail spring pad.
Remove wheel, wash and repack bearing.

FUSELAGE

ITEM 36—FABRIC:

Check condition of fabric with the eraser end of a pencil, particularly on top surfaces.
Check the finish for cracks or checks. Sand out and repaint all checks or cracks to preserve the fabric.

ITEM 37—WING FITTINGS:

With wing root fairings removed, inspect wing fittings with a flashlight and magnifying glass for minute cracks in the ears. Check bolts to be sure that there are no threads in bearing and that bolts are properly safetied.
Check wing fitting holes for elongation by having some one pull up and down on the wing tips.

ITEM 38—LANDING GEAR FITTINGS:

Inspect all fittings with flashlight and magnifying glass for signs of cracks or hole elongation.

ITEM 39—FUSELAGE STRUCTURE:

Through inspection openings and through the baggage compartment rear plate check the condition of all tubing for rust, damage and protective coating.
Check all wood stringers for damage and security.

ITEM 40—DEBRIS—IN FUSELAGE:

Check the bottom of the fuselage and fabric under floor boards for bolts, nuts and other objects that might jam controls or pulleys.
Check the rear of fuselage for open drain grommet.
If considerable dirt or oil exist on the fuselage bottom, use a non-caustic soap and wash out the dirt to prevent fabric rot.

ITEM 41—CONTROL CABLES:

Check for broken control cable strands by sliding a cloth over the cable in vicinity of Fairleads.
Check upper and lower elevator turnbuckles for safety and maximum of three threads showing outside of barrel.
Check bungee spring attachment at upper elevator horn and pulley at stabilizer yoke for wear and safety.
Check rudder cable fairleads and cables for wear aft of baggage compartment.

ITEM 42—FAIRINGS:

Check tail assembly fairings for cracks and missing metal screws.

WING, AILERONS AND FLAPS

ITEM 43—WING FABRIC:

Check left and right wing fabric for holes, cracks or checks in the finish and open drain grommets at each rib bay trailing edge. (Fabric usually deteriorates first on the upper surface of the wing or along the trailing edge).
Install inspection grommets at drag wire fittings to inspect drag wires for tension and wing ribs and compression members for damage.

ITEM 44—STRUTS:

Check right and left wing strut fittings for elongation by lifting up and down on the wing.
Check bolts for fitting attachment to the spar.
Check struts for dents or cracks. Sight down strut trailing edge to ascertain that struts are straight.
Check strut end forks and fork lock nut. The maximum number of threads allowed outside of the strut end is fifteen.

ITEM 45—BOLTS:

Check strut attachment bolts to be sure that there are no threads in bearing and bolts are properly safetied.

ITEM 46—AILERONS:

Check both ailerons for wrinkles which are possible signs of structural damage.
Check each rib bay for an open drain grommet.
Check condition of fabric and finish, refinishing any dope cracks, checks, or ringworm.

ITEM 47—AILERON HINGES:

Check aileron hinge legs for security at rear spar and false spar.
Check hinge pins for wear and safety. Worn or loose pins must be replaced.

ITEM 48—AILERON CONTROL:

Remove inspection covers and check the cables in each wing for interference and chafing.
Check the pulleys in each wing for condition, wear and safety and lubricate pulley bearings.
Check wear and safety of the fairleads in each wing.
Aileron travel—18° up 18° down ±2°.
Stop at aileron should engage first to allow for full travel of ailerons.
Check the four aileron horn bolts for wear, threads in bearing and safety.
Check the turnbuckle in left wing to see that it is safetied and not more than three threads are showing outside the barrel.
To locate broken strands at fairleads or pulleys slide a cloth over the cable, all cables with broken strands to be replaced.

ITEM 49—FLAP COVERING:

Check fabric condition of both flaps with a pencil eraser end for deterioration.
Check condition of finish for cracks, checks, or ringworm and refinish any that exist.
Any internal structural damage will cause wrinkles on the fabric surface.

ITEM 50—FLAP ATTACHMENTS:

Each flap has two hinges and two hinge legs that are riveted to the wing false spar and attached with a single bolt to the wing rear spar. Lowering the flaps at over 80 M. P. H. can cause possible damage to these hinge legs so a careful inspection is recommended.
Check stop in up position for streamline of flap.
Check the hinge pins for wear and installation of washers and safety.

ITEM 51—MECHANISM—FLAP:

Check fafnir rod end bearings and push pull tube for clearance through hole drilled in the fafnir bearing rod to check minimum distance the push pull tube is screwed in the fafnir rod. Be sure lock nut is tight.
Ascertain through inspection that both flap return springs are secure and in good condition. Operate flaps and check springs to be sure they do not chafe, bind or interfere with other controls or adjacent structure.
Check travel: Full Flap 50° ±2°.
Check bellcrank casting for cracks, particularly at the ears and for safety and security of the bracket.

ITEM 52—WING ROOT FAIRINGS:

Check left and right top wing root fairings for tension, adjustable through a hole at the trailing edge.
Check all metal screws for security and the fairing for cracks.

EMPENNAGE

ITEM 53—FABRIC—STABILIZER:

Check stabilizer fabric condition and drain grommets for restrictions.
Check stabilizer rear hanger tube and front link tube for hinging action.
Small holes are drilled in the fuselage tube and stabilizer link tube to drop oil in for lubrication. Lubrication of these tubes is very important and often neglected, resulting in freezing up of the tubes.
Lift up and down on the stabilizer checking for excessive play in the stabilizer yoke screw. The nut on the bottom of the screw pulley will take up play if excessive.
Check stablizer yoke casting for cracks and link tube ears for worn bolts and safety.

ITEM 54 -FABRIC--FIN:

Inspect vertical fin for fabric condition and finish.
Check for wrinkles, dents and signs of internal damage.

ITEM 55—FABRIC—RUDDER:

Inspect fabric cover on the rudder for fabric and dope condition.
Check bottom of rudder for an open drain gommet.
Check rudder for alignment and possible internal damage usually indicated by a wrinkle in the fabric.
Inspect rudder hinge pins for wear and safety.
Check hinge bushings for play; these bushings are pressed in and should be replaced when worn.
Check rudder stops to ascertain full travel:
20° Right and 20° Left ±2°.

ITEM 56--ELEVATORS:

Check fabric condition and finish on the elevators.
Check for open drain grommets along the elevator trailing edge.
Sight one elevator against the other for alignment.
Check hinge pins and bushings for wear and replace any worn pins or bushings.
Check elevator cable horns for safety, worn bolts and clearance in travel.
Check elevator stops to ascertain full travel:
25° up 15° down ±2°.

ITEM 57--TAIL BRACE WIRES:

Check empennage rigging wires for corrosion and cracks or nicks that might result in failure.
Check fittings for alignment with the wire and bolts for safety.
Rigging wires should be taut with little hand deflection.
Check each wire to be sure there are no loose fork lock nuts.

ITEM 58—EMPENNAGE CONTROLS:

Check rudder and elevator horns for worn bolts and safety with no threads in bearing.
Check horns for alignment with the cable and freedom of travel.
Check top and bottom cable turnbuckles for safety and a maximum of three threads showing outside of the barrel.
Sight the cables through the fuselage for interference and chafing.

ITEM 59—ELECTRICAL SYSTEM:

Check wiring for chafing, clamping.
All terminals tight.
Bonding straps secure.
Landing lights—mounting and operation.
Battery installation terminals secure. Charged, no acid spillage.
Radio installation for security and operation.
Safe Flight Indicator for operation.
Circuit breakers or fuses for security.

ITEM 60—FLOATS:

Sight check rigging.
All brace wires tight and safetied.
Water ballast, if carried.
No leaks in floats. Check structure.

ITEM 61—

All C. A. A. Mandatory Bulletins complied with.