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SECTION V

GENERAL MAINTENANCE

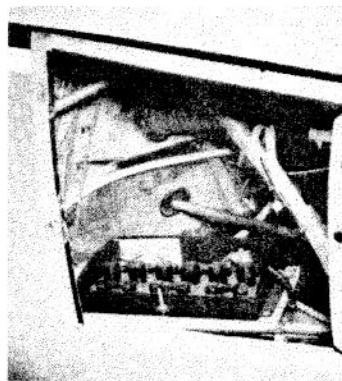
TIRE INFLATION

For maximum service from the tires, keep the Apache main wheels inflated to 42 lbs. and the nose wheel to 27 lbs. Reverse the tires on the wheels, if necessary, to produce even wear. All Apache wheels and tires are balanced before original installation, and the relationship of tire, tube and wheel should be maintained upon reinstallation. Out-of-balance wheels can cause extreme vibration in the landing gear during take-off and landing. In the installation of new components, it may be necessary to rebalance the wheels with the tires mounted.

BATTERY SERVICE

Access to the 12-volt, 35-ampere hour battery is obtained by removing a quickly detachable access plate on the right side of the nose section. The battery is installed in a sealed stainless steel box, opened by removing wing nuts. The box has a plastic drain tube which is normally closed off with a clamp and which should be opened occasionally to drain off any accumulation of liquid.

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. The battery and box should be flushed with soda and water in the event of any seepage from the battery.





If the battery is not up to proper charge, recharge starting with a charging rate of 4 amps and finishing with 2 amps. Quick charges are not recommended.

BRAKE SERVICE

The brake system is filled with MIL-H-5606 (petroleum base red) hydraulic brake fluid. This should

be checked at 100 hours inspection and replenished as necessary.

Do not use vegetable base brake fluids (blue) when refilling the system. When it is necessary to add fluid, open the left nose access panel, exposing the brake reservoir. Then add fluid to the reservoir, bringing the fluid to the indicated level.

If it is necessary to bleed the brake system to get air out of the lines, fluid should be added under pressure at the bleeder attachment on the brake unit.

No adjustment of brake clearances is necessary on the Apache brakes. If after extended service, braking action requires too much movement of the toe pedal, new brake linings can easily be installed by removing the four bolts which attach the brake units, then replacing the brake linings held in place by brass rivets.

Main wheels are quickly removed by first cutting the safety wire and removing eight bolts to drop the brake lining. Remove the dust cover, cotter pin and axle nut. The wheel will slip off the axle. The nose wheel is removed by taking off the hub nut and withdrawing the axle bolt, the axle retainer cups, and the axle from the nose wheel fork.

Tires are dismounted from the wheels by deflating the tube, then removing the wheel through-bolts, allowing the wheel halves to be separated. In reassembling the wheels, care should be taken to torque the bolts properly, according to instruction on the wheels.

LANDING GEAR SERVICE

In jacking the Apache for landing gear and other service, the Jack Kit (available through the Piper Distributor Service Department) should be used. This kit includes two hydraulic jacks and a tail support; the jacks are placed under the jack pads on the front wing spar, and the tail support attached to the tail skid.

Approximately 250 lbs. of ballast should be placed on the base of the tail support to hold the tail down. Then the jacks should be raised until all three wheels are clear of the floor.

The right and left landing gear units on the Apache are completely interchangeable by reversing the nutcracker units on the gears. The oleo unit on the nose wheel gear contains parts that are also entirely interchangeable with the oleo parts on the main gear, although the oleo housing forging and the fork and axle are different on the nose wheel unit. The nutcracker parts and all inside components are identical on both nose and main gears.

The operation of the landing gear oleos is standard for the air-oil type; hydraulic fluid passing through an orifice serves as the major shock absorber while air compressed statically acts as a taxiing spring. The piston tube has a total travel of 8", and about 3" of tube should be exposed under normal static loads.

All of the oleos are inflated through readily accessible valves on the top of the unit, at the front. The nose wheel unit is steerable through the rudder pedals, and incorporates a shimmy dampening device at the bottom of the outer housing. All major attachment and actuation bearings are equipped with grease fittings for lubrication of the bearing surfaces, and should be lubricated periodically with medium lubricating grease.

To add air to the oleo struts, a strut pump is attached at the air valve and the oleo pumped up until 3" of piston tube is exposed with normal static weight on the gears. To add oil, first release all the air through the valves, allowing the oleo

to compress fully. Next remove the air valve core and fill the unit through this opening, extending the strut by rocking the airplane 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 valve core and pump up the strut.

If a landing gear oleo has been completely emptied of oil during servicing, the following procedure should be used to refill it, to make sure that no air remains trapped in the unit. First, a clear plastic tube should be attached to the valve stem, from which the core has been removed. The other end of the tube should be placed in a container of hydraulic fluid. When the oleo is extended, fluid will be sucked into the oleo cylinder. The oleo should be compressed and extended until it is full of fluid and no more air bubbles appear in the plastic tube. About one pint of fluid is required to fill the oleo.

To check shimmy of the nose wheel, if it should develop, tighten the bolt on the dampening device at the base of the nose wheel forging. The bolt should be tightened just enough to keep the nose wheel from moving freely, but not enough to require excessive pressure to move the wheel by hand. It may be necessary to remove shims from the shimmy dampening collar to permit tightening of the device.

The steering arms from the rudder pedals to the nose wheel steering torque shaft arm are adjusted at the rudder pedals or at the torque shaft rollers by turning in or out the threaded rod end bearings. Adjustment is normally accomplished at the forward end of the ribs, 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 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. The turning arc of the nose wheel is 15 degrees in either direction and is factory adjusted at stops on the bottom of the forging. The turning radius is twenty-eight feet.

In adjusting the steering arm stops, care should be taken to see that the nose wheel reaches its full travel just after the

LUBRICATION CHART

HOURS	LUBRICANT	LUBRICANT
RUDDER HINGE AND HORN 100		850 STABILATOR & RUDDER TRIM PULLEYS (SEE CAUTION)
STABILATOR & RUDDER TAB HINGE RIGHT & LEFT 100		850 HYDRAULIC FLUID LEVEL MAINTAIN LEVEL TO FILLER NOZZLE
STABILATOR RUDDER 100 ADJUSTMENT MECHANISM		1000 FILTER AND 3 HYDRAULIC ELEMENT
STABILATOR & RUDDER 100 CONTROL PULLEY		1000 CONTROL COLUMN
BAGGAGE DOOR & MAIN DOOR HINGE 100		850 BRASS RESERVOIR MAINTAIN FLUID LEVEL INDICATED ON THE SIDE OF RESERVOIR
AILERON & FLAP HINGE PULLEY BELLCRANK RIGHT & LEFT 100		1000 HOSE WHEEL STEERING
HINGES MAIN GEAR DOORS 100 RIGHT & LEFT 4 EACH		1000 HOSE WHEEL GREASE FITTINGS 8 TOTAL
MAIN LANDING GEAR CROSS-STRUTS RIGHT & LEFT 7 EACH		850 HOSE WHEEL BEARING
MAIN WHEEL BEARINGS 250 RIGHT & LEFT		1000 HINGES HOSE WHEEL DOOR 4 TOTAL
ENGINE OIL TANK DRAIN 50 REFILL (NON-DETERGENT) RIGHT & LEFT		1000 SEAT ADJUSTMENTS RIGHT & LEFT
CARBURETOR AIR FILTER REPLACE WHEN NECESSARY		1000 PROPELLER GREASE FITTINGS 4 EACH

NOTES

1. FUEL SYSTEM: THE FOLLOWING POINTS REQUIRE REGULAR SERVICING- FINGER STRAINER LOCATED IN WING CELL OUTLET- FILTER BOWL- QUICK DRAIN UNITS- CROSS-SECTION DRAIN- 3. LANDING GEAR STRUTS- FOLLOW INSTRUCTION PLACED ON AIR OIL STRUT
2. HEATER SYSTEM- CLEAN FILTER BOWL AT LEAST ONCE PER YEAR.
3. LANDING GEAR STRUTS- FOLLOW INSTRUCTION PLACED ON AIR OIL STRUT
4. MISCELLANEOUS- DURING ROUTINE MAINTENANCE CHECKS APPLY LUBRICATION TO MISCELLANEOUS LINKAGES.
5. BATTERY- CHECK BATTERY FLUID LEVEL, 8 BATTERY CONDITION EVERY 25 HRS.

MIL-L-7870 OIL- GENERAL PURPOSE- LOW TEMPERATURE

MIL-L-7711 GREASE- LUBRICATION GENERAL PURPOSE ACT

MIL-L-3545 GREASE- LUBRICATION HIGH TEMPERATURE

MIL-G-3278 GREASE- AIRCRAFT INSTRUMENTS

MIL-H-5606 HYDRAULIC FLUID

SEE PAGE 82 FOR SPECIFIED GRADE OF OIL

CAUTIONS

1. DO NOT USE A HYDRAULIC FLUID WITH A CAUTION OIL OR ESTER BASE.
2. DO NOT OVER-LUBRICATE PEDESTAL CONTROLS
3. DO NOT APPLY LUBRICANT TO RUBBER PARTS
4. UNDER NO CIRCUMSTANCES SHOULD THE CABLES FROM THE COCKPIT TO THE REAR OF THE FUSELAGE BE LUBRICATED- AS THIS MAY CAUSE SLIPPAGE.

rudder hits its stops. This guarantees that the rudder will be allowed to move through its full travel.

Adjustable rod end bearings are present on each of the hydraulic cylinders that actuate the landing gear legs. These rod ends should be set so that the cylinders move the landing gear retracting links just far enough to engage the spring loaded down locks and make contact at the stops. Too much extension of the adjusting screws will overload the links, and too little extension will prevent the links from going to the required past-center position.

At each of the landing gear legs, micro-switches are installed so as to close after full movement of the gear in either direction. The down switches are connected individually with green indicator lights on the pedestal, and the up switches are in series so that all three contacts must be made before the amber "gear up" light on the pedestal lights up. The micro-switches must be adjusted carefully so that contact is made just as the gear reaches the required position of extension or retraction.

Other micro-switches on the landing gear warning system are installed inside the control pedestal at the throttles. The warning horn is also located here, and the landing gear knob flasher unit is attached to the left side of the pedestal forward of the instrument panel.

The main landing gear legs are dismantled from the airplane by (1) removing the top engine nacelles, (2) detaching the lower end of the lever retracting link from the gear leg, (3) detaching the brake line at the lower end of the flexible line, and (4) withdrawing the half-inch landing gear attachment bolts.

The nose gear unit is dismantled by (1) removing the nose access panels and the canvas boot covering the top of the nose gear, (2) detaching the lower retracting link, and (3) extracting the landing gear bolts.

Disassembling of the landing gear oleos is done as follows:

1. Release air from air valve at top of unit and remove core.
2. Detach lower end of oleo torque link assembly (nut-cracker) from fork.

3. Remove snap ring, located inside and at bottom of forging, with small-nosed pliers.

4. Slide piston tube and bearing assemblies out of forging. Oleo fluid will flow from the forging and much of it can be caught in a container and if clean reused.

5. Remove the upper bearing retainer pins and slide both upper and lower bearings from the strut. The "O" rings and wiper strips are then exposed for inspection.

To reassemble the oleo unit, reverse the above procedure, being very careful to see that the snap ring and the upper bearing retainer pins are properly reinstalled.

In the event that the oleo strut slowly loses pressure and extension, the most probable source of trouble is the air valve attachment to the leg, or the core of the air valve. These parts should be checked first to determine whether or not air leaks are occurring. If hydraulic fluid is evident on the exposed chrome-plated oleo strut, the "O" rings on the piston tube bearing units may need to be replaced.

HYDRAULIC SYSTEM SERVICE

The hydraulic system is filled through a filler tube located inside the left nose access panel. Only petroleum base hydraulic fluid, MIL-H-5606, should be used.

To add fluid to the system, remove the cap from the filler neck and fill the system completely while holding the filler tube extension level. Then turn the elbow on the filler tube down until the excess oil has drained out. (See separate instructions for filling and cleaning the complete hydraulic system.)

FUEL REQUIREMENTS

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

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

latest issue of Lycoming Service Instruction No. 1070 for additional information.

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

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

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

FUEL GRADE COMPARISON CHART

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

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

OIL REQUIREMENTS

The oil capacity of the O-540 series engine is 12 quarts, and the minimum safe quantity is 3 quarts. It is recommended that the oil be changed every 50 hours and sooner under unfavorable operating conditions. Intervals between oil changes can be increased as much as

100% on engines equipped with full flow cartridge type oil filters, provided the element is replaced each 50 hours of operation and the specified octane fuel is used. Should fuel other than the specified octane rating for the power plant be used, refer to the latest issue of Lycoming Service Letter No. L185 and Lycoming Service Instruction No. 1014 for additional information and recommended service procedures. The following grades are recommended for the specified temperatures:

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

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

CARE OF AIR FILTER

The carburetor air filters 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 procedure is recommended by the manufacturer of the filter:

1. Remove filter, inspect, and clean by tapping it against a hard surface to remove grit, sand and dirt. (Do not blow out with an air hose, soak in oil, or cleaning fluid).
2. If the filter is found to be in good condition and is not obstructed after being properly cleaned, reinstall filter.

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 a 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.

SERIAL NUMBER PLATE

The serial number plate on the Apache is located on the top of the tail stinger, underneath the rudder. The serial number of the plane should always be used in referring to the airplane in service or warranty matters.

LEVELING AND RIGGING

Leveling the Apache for purposes of reweighing or rigging is accomplished as follows:

1. Partially withdraw the two machine screws located on the side of the fuselage just forward of the right stabilator. These screws are leveling points, and the airplane is longitudinally level when indicated by the leveling instrument placed on the screws.
2. Put the airplane on jacks to obtain the longitudinally level position.
3. To level the airplane laterally, place a bubble-protractor on a straight-edge held along the front spar on the

under surface of the wing. Raise or lower the wing by pushing up or down on the tip until five degrees of dihedral is indicated on the protractor. The smooth, easy action of the landing gear oleo units makes it possible to position the wing laterally with very little effort. After checking the first wing at five degrees dihedral, the opposite wing should also be checked to make sure it has equal dihedral.

Rigging Instructions:

Although the fixed flight surfaces on the Apache obviously cannot be adjusted in position for rigging purposes, it may be necessary on occasion to check the positions of these surfaces. The movable control surfaces, with the exception of the flaps, all have adjustable stops, as well as adjustments on their cables or push-pull connections, so that their range of movement can be altered. The positions and travels of the various surfaces are as follows:

1. Wings: 5° dihedral, washout 1° in 70" of distance along the front spar. (Total washout approximately 2°).
2. Stabilator: No dihedral. Incidence is 0° in relation to horizontal. (Neutral position).
3. Fin: Should be vertical and in line with centerline of fuselage.
4. Ailerons: Travel - 30° up, 15° down.
5. Flaps: Travel - 50° down.
6. Stabilator: 9° up, 9° down. (at leading edge)
7. Rudder: Travel - 30° left and 35° right.

For the purpose of adjusting the lateral trim on the Apache, aileron tabs are incorporated on both ailerons. These tabs can be bent to position the aileron in flight, changing the lateral trim as desired.

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