

MAINTENANCE

INSPECTION AND SERVICING OF LIGHT-AMPHIBIAN HYDRAULICS

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First step-by-step information on line work for Electrol hydraulic system of Seabee and Trimmer amphibians.

(Reprinted from Aviation Magazine, September, 1946)

Although the simplicity and ruggedness of the Electrol hydraulic system design has eliminated almost all chances of malfunctioning, it is nevertheless as necessary to perform systematic inspections of parts as it is in the case of any other accessory, regardless of proven reliability.

The system consists of (a) the Powerpack or pump-distributor unit, (b) the actuating cylinders, operating wheels, brakes, and flaps, and (c) the landing gear, which includes the shock-absorbing cylinders.

Because all joints are sealed by the same methods used for retaining hydraulic pressure in Grumman F8F Bearcats, actual trouble from leakage is unlikely. As long as clean, dirt-free fluid is used in the system, there is small likelihood of any malfunctioning of the valves. The two factors—leakage and dirt—cause such large

percentage of hydraulic troubles that their elimination will reduce maintenance almost entirely to inspection at the usual periods.

Inspection is begun by checking amount of fluid in the reservoir of the Powerpack. Replacement, if any, should be made at the filler shown in Fig. 1. The fluid level, in the shock-absorbing cylinders (Fig. 2) is then checked with the gear lowered. To make this inspection, the air is first bled through the air valve in the elbow connecting the cross tube and piston.

When the cylinder has reached the point where further travel is prevented by the spacer, the gear is in its fully compressed position and the valve may be screwed out to permit inspection of the fluid level. If level of liquid is below the bottom of the pipe, enough fluid should be added to bring it up to that point. The

valve is then replaced, and the cylinder is charged with nitrogen to 75 psi. If nitrogen is not obtainable, air may be used.

To facilitate introduction of air or nitrogen, the gear should be brought to fully extended position by pulling down on the opposite wing tip.

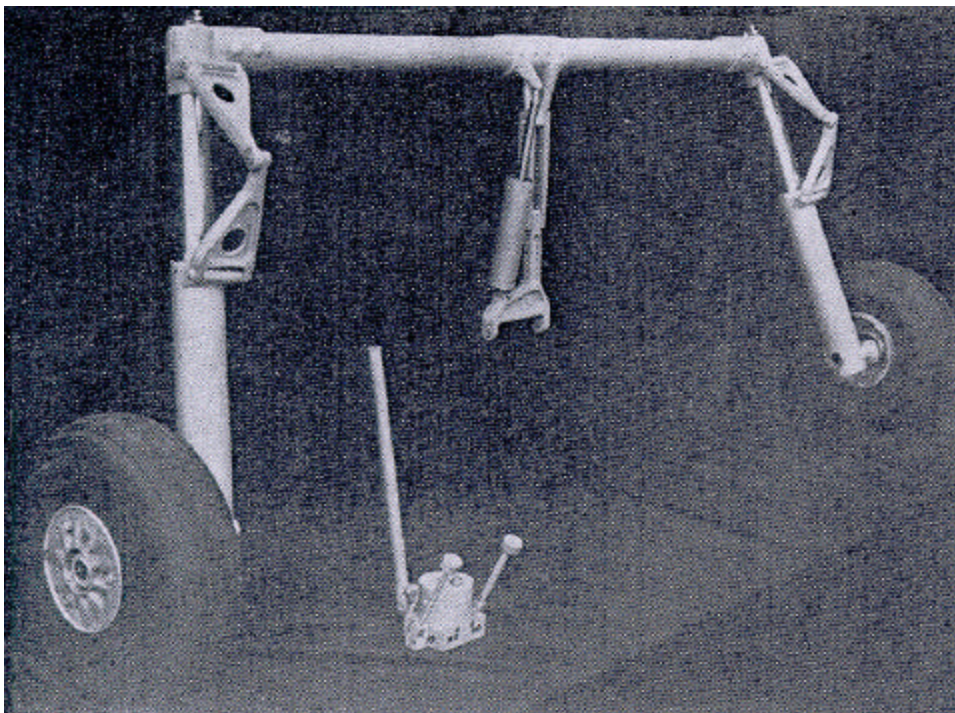
Landing Gear

Three points on each cylinder of the landing gear which require inspection for leakage are: Lower end of cylinder and around axis, piston and bearing seals where piston enters cylinder, and joint where piston enters elbow on cross shaft. Presence of oil indicates that a seal ring should be replaced.

Master brake cylinder and brake cylinders on wheels are inspected for oil on the exterior. Brake should be set hard, then left that way until the remainder of the airplane has been inspected. If brakes have "softened" by that time, there is probably dirt under the "on-and-off", or parking, valve shown in Fig. 3. This valve may be cleared by setting in the "off" position and working the brake lever back and forth rapidly. If this fails to remedy the trouble, the seal ring in the brake cylinder should be inspected, since it is probably leaking. If the brake pedal can be forced down slowly to the limit of its travel, it is a sign that the small seal ring which bears against the piston of the master cylinder has become worn and should be replaced. (see Fig. 4).

Tailwheel cylinder and flap-operating cylinder (Fig. 5) require inspection only at the end snap rings and where the rod leaves the cylinder. If there is no sign of leakage at these points, and if each cylinder does not require more than three double strokes of the pump for complete operation in each direction, then these parts can be considered in good condition.

If any external leakage is found, the cylinder may be dismantled by taking out the snap ring at that end. This ring is removed by inserting round-nose pliers in the holes at the ends of the ring and compressing the ring until it can be lifted out. Before this is done, the pipe connections must be removed to allow the ends to slide out. New seal rings should



Electrol landing gear designed for Republic Seabee amphibian. Hand pump, with gear and flap levers, is shown in foreground.

be oiled with hydraulic fluid before mounting.

Powerpack consists of hand pump together with flap-and wheel-operating levers, which activate camshafts controlling the pressure and return valves to both ends of their respective cylinders (see Fig. 1). Fluid (*mineral base only*) is contained in a reservoir of 12 cu. in. capacity. Situated above the pressure or delivery valves are ball check valves to hold pressure on that unit when the other is operated. Otherwise, the second unit to be operated would tend to draw pressure from the opposite one.

Inspection is started by setting both flap and wheel levers in central position and making a double stroke on the pump lever. Strong resistance should be felt with only very slow motion while fluid is forced through the relief valve. Retain the pressure for a few seconds, then examine all exterior joints and also around the pump piston rod for signs of leakage. If everything is tight with this pressure, which is about double that used in working, the pump can be considered to be in first class condition.

If leakage develops along the ends of the camshafts, behind the operating levers, it indicates leakage around the plungers, which open the valves (in most cases, the pressure valve). This calls for a new seal ring on the plunger. Valves, springs, and plungers are inspected (only if leakage is indicated) by removing the headless plugs, which close the valve chambers.

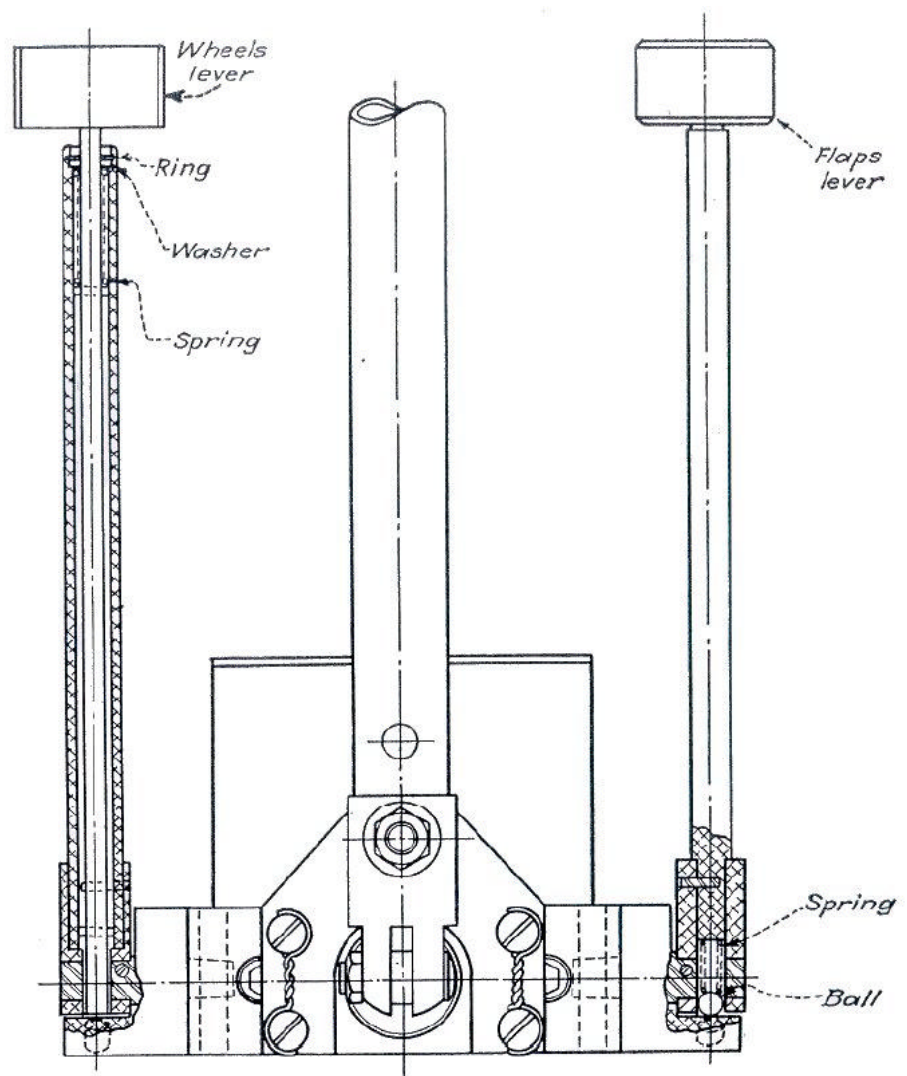
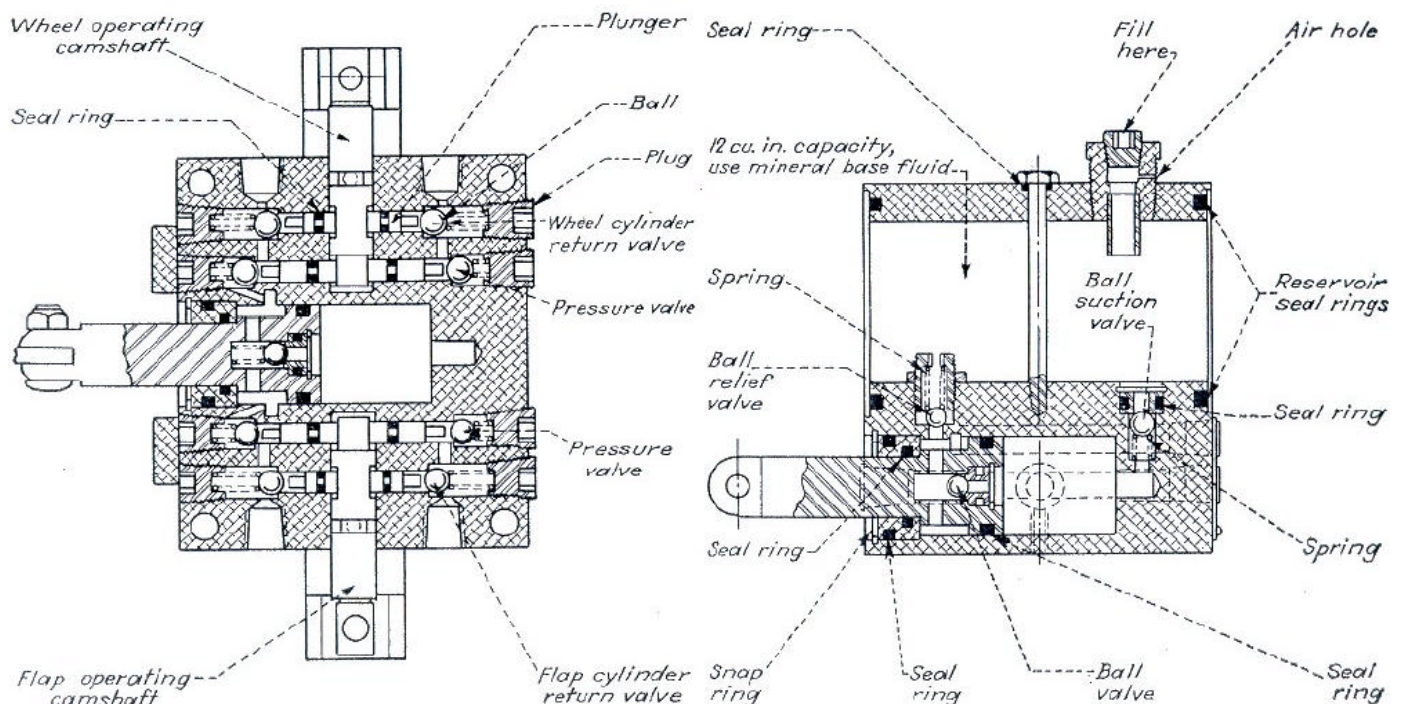


Fig. 1. Power pack consists of hand pump (top), selector valves and camshaft (left), and reservoir (right). Valve leakage can usually be traced to dirt beneath valves. Remedy is to clean entire system and refill with clean, filtered, mineral-base fluid. Leakage externally indicates worn or damaged seal rings, which should be replaced.



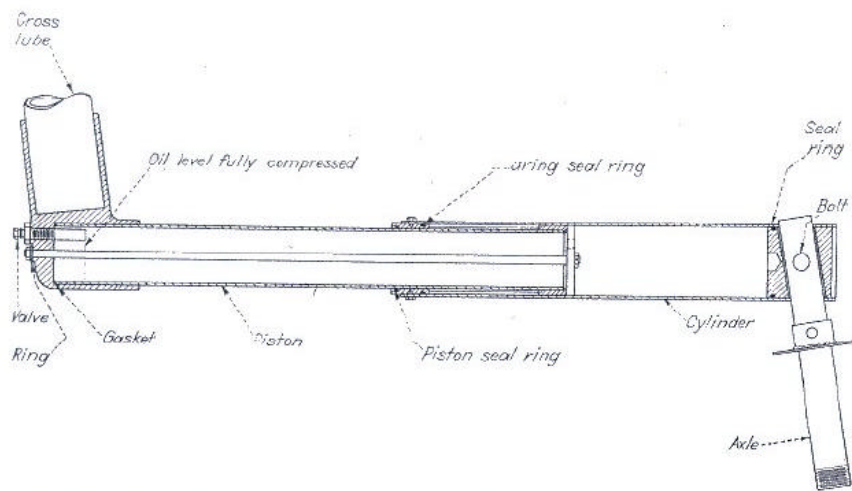


Fig. 2. Oleo shock absorber cylinder should be inspected for external leakage, indicative of worn seal rings. Cylinder is filled in fully compressed position to point indicated by broken line at base of air valve. Air at 75 psi. is then injected after oleo is fully extended.

Levers should be checked at both ends of their travel to be sure that fluid flows freely in the required direction when the lever is locked in position. The landing gear lever is locked by a spring extension of the shank, which drops into holes opposite each end of its travel; but the flap lever is held by a spring-operated

ball, which should go down at each position.

Because these hydraulic systems are all of recent manufacture it is unlikely that wear will develop for some time, except on seal rings subject to sliding friction or because of rough landings. If serious, this wear will manifest itself by exterior

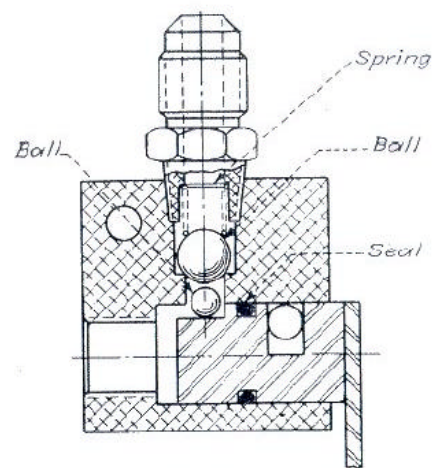


Fig. 3. On-off brake valve leakage calls for new seal ring. Slow softening of brake when lever is "on" usually is sign of dirt under valve.

leakage or slow "softening" of steadily applied pressure. In the case of the hand pump, which operated for as long as all the other units combined, slight leakage past the piston after a long period of use will not be serious, because pressure is retained by check valves immediately beyond the cylinder.

Any internal leakage can be taken as an indication of dirt in the hydraulic fluid, rather than as a mechanical defect. The system should be flushed out periodically – every engine overhaul period – and refilled with absolutely clean mineral-base fluid (AN-VVO-366). Castor base fluid should not be used, because it affects the seal rings.

Landing gear cylinder (Fig. 6) can be inspected when the airplane is in the water. If no external leaks are evident and if the gear can be operated in either direction with 10-11 double strokes of the pump, it requires no further attention beyond lubrication of the Alemite fittings on the scissors.

Final step in each inspection is wiping clean all external sliding parts, such as piston rods, to remove any dust which may have accumulated during the time spent on land. Dust will destroy the seal rings faster than years of use – in fact, the life of these seals is more dependent on cleanliness of parts and fluid than upon the amount of work they are called upon to perform. Therefore, the first rule during inspection should be: *Use only clean fluid in a clean (flushed) system, and wipe every moving part clean – both before and after testing.*

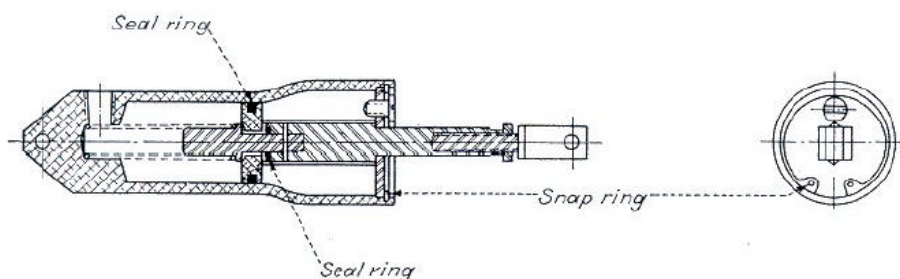
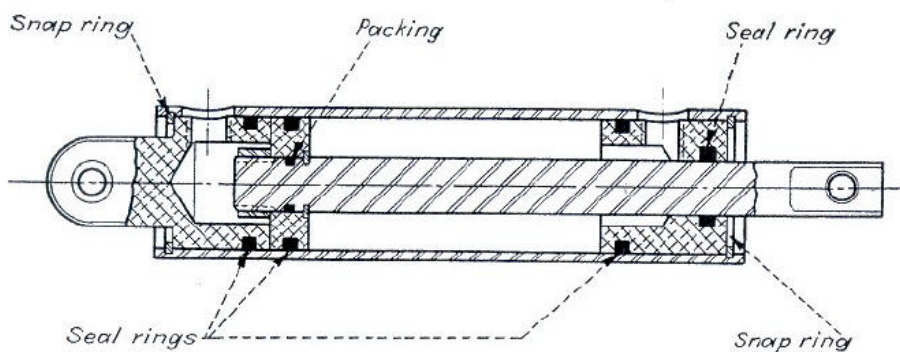


Fig. 4. Brake master cylinder is filled through screw in cover. Damaged center seal ring would permit gradual downward movement of piston when brakes are fully applied.



Figs. 5 and 6. Tailwheel, flap and landing gear cylinder seals should be checked for wear if external leakage or "soft" action are present.

