

Give Me A Brake!

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The brakes on our aircraft are something many of us take for granted, as they work good, and last a long time. Eventually however, the friction surfaces will wear out and must be replaced. This month I would like to discuss replacing the pads on Cleveland hydraulic disc brakes, which are very common on light GA aircraft and very popular with amateur aircraft builders. First though, lets examine how the system works.

The modern hydraulic disc brake assembly usually consists of a sliding piston which fits into a housing and is sealed against leakage with an "O" ring. Fluid pressure in the brake system is created when the pilot presses on the brake pedal, and is transmitted through the brake fluid to this housing. That pressure is applied to one side of the piston, forcing the brake pad against a steel disc which rotates with the wheel. A fixed brake pad is held against the other side of the rotating disc. This enables the two brake pads to squeeze the disc and the friction created converts the energy of the moving aircraft to heat energy, slowing the aircraft. Figure 1 is an exploded view of the brake assembly and disc.

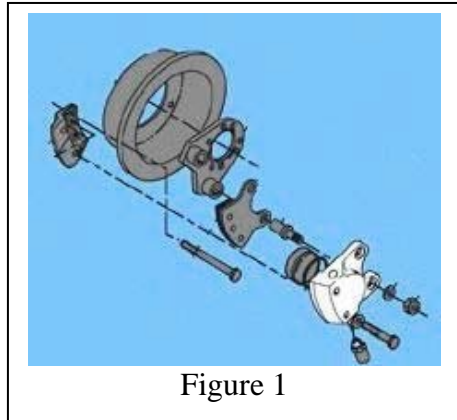


Figure 1

These brake pads, which are consumable, are riveted to steel backing plates, which are not. When the brake pads are worn out (usually considered worn out when the lining thickness is less than 0.10 inch thick), they can be removed from the backing plates and replaced with new pads. This involves driving out the rivets which hold the pads to the backing plates and riveting new pads onto the plates. Before we can do that, however, we must remove the brake pads and backing plates from the aircraft.

Removing the brake pads and backing plates from the brake caliper assembly is very easy. First, remove the wheel fairing (if so equipped) so as to expose the brake assembly. Then, simply cut the safety wire and remove the two bolts holding the assembly together. Figure 2 shows a typical brake assembly and these bolts. Do not disconnect any hydraulic lines as this is not necessary and will simply make a mess. It will also require "bleeding" the brakes and lines to remove any air that may be introduced. Remove the "fixed" backing plate (the one between the disc and the wheel), then pull the caliper slightly away from the disc and remove the "moveable" backing plate from the pins upon which it slides. You should now have two backing plates in hand.

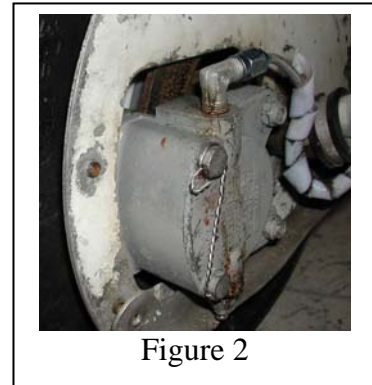


Figure 2

Once the brake pads and backing plates are removed from the brake housing (which should remain connected to the aircraft by the brake line), we can remove and replace the pads. This is another of those jobs which really require the proper tool. Luckily, the tool is neither expensive nor hard to find. It can be obtained from any of our usual aircraft suppliers such as Aviall, Wicks, or

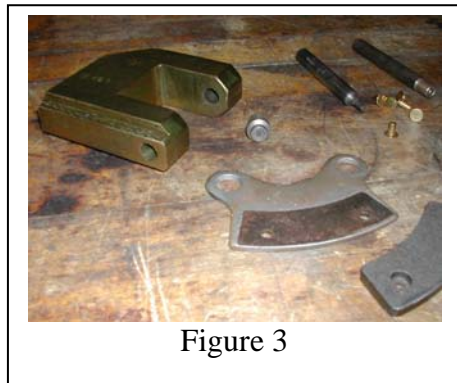


Figure 3

Spruce. Figure 3 shows this tool, a new brake pad, and some rivets.

To remove the pads from the backing plate, put the tool in a vise, place the backing plate and pad in the tool (pad down), and use the punch supplied with the tool to drive the rivets out. Do this with all the rivets holding the pad to the backing plate. Figure 4 shows how this is done. Once the rivets are all driven out, the pad can be separated from the backing plate, and we can rivet a new brake pad to the plate.

Riveting new pads to the backing plate is just as easy. Begin by placing the anvil (the little round piece that came with the brake tool) into the hole in the base of the tool. This gives us a firm surface against which we can set the new rivets that will hold the new pads to the backing plate. Then hold the new pad against the backing plate (the writing on the pad should be against the backing plate) and place a new rivet in the holes (lined up) of the pad and backing plate. The flat side of the rivet (manufacturers head) should be in the recess counter bored in the brake pad. Now place the brake pad and backing plate assembly over the anvil in the brake tool. The anvil should fit nicely into the counter bore of the brake pad and ride against the flat head of the rivet. Next we use the setting tool supplied with the brake tool to form the shop head of the rivet. Figure 5 shows this operation. We simply repeat the procedure for the remaining rivets and the pads and backing plate assembly are ready to reinstall.

Reinstalling the new pads and backing plate assembly is just the reverse of removing them. Put the moveable backing plate over the pins so the backing plate is against the piston and the pad faces the disk. Then hold the fixed backing plate in place (on the other side of the disc) and replace the bolts holding the assembly together. Be sure to properly torque and safety the bolts. The wheel should now turn freely with only a slight brake drag. Replace the wheel fairing (if so equipped) and most of the job is done. The new pads however, must be reconditioned prior to use.

Breaking in or “conditioning” new brake pads is easy but very important. The conditioning procedure will wear off any high spots and generate enough heat to create a thin layer of glazed material on the lining friction surface. To condition the lining, proceed as follows.

If you have installed non-asbestos organic linings (most common), taxi the aircraft for about 1500 feet with the engine set at 1700 RPM. While doing this, apply enough brake pressure to maintain a 5 to 10 MPH taxi speed. Then allow the brakes to cool for 10 to 15 minutes and do a static run-up. If the brakes will hold the aircraft at a high power setting, they are properly conditioned and ready for service. If the brakes will not hold the aircraft at a high power setting, allow them to cool completely and reaccomplish the procedure. Also note, in service, light brake



Figure 4



Figure 5

usage may cause the glaze to wear off and thus require reconditioning, and this procedure may be done whenever necessary to restore effective braking.

If you have installed metallic linings, simply make two consecutive full stops from a speed of 30 to 35 MPH. Do not allow the linings to cool between these stops. Then allow the brakes to cool for 10 minutes and try a static run-up. If the brakes will hold at a high power setting they are ready for service. If they will not, allow the brakes to cool and repeat the above procedure.

This all sounds complicated but and once you do a “brake job” you will be amazed at just how easy it really is. As always, feel free to call or Email if you have questions. Also, I am available for an “over the shoulder” if you would like. After all, that is what Technical Counselors do! Till next month then, fly safe and keep the workshop warm.