



Photos: Dennis Shattuck

Brakes "Go" Instead of "Whoa?" Install a Pair of Chromed Discs

by Dennis Shattuck

EVER HAD THAT sinking feeling that comes when you're three-quarters of the way down a short airstrip and the brakes aren't slowing your airplane down enough to make the last turnoff? Well, I have, and it wasn't any fun, I can tell you. Fortunately, I had enough speed to stagger back into the air and complete a go-around. The second approach was lower, slower and I didn't need so much braking power to get the plane stopped.

As the owner of an 18-year-old airplane, I guess I didn't pay much heed to the gradual deterioration of my braking system. After all, it held sufficiently well during runups, and I was almost always able to make the 1500-foot turnoff on our local, 3000-foot strip. Hard braking never was required... at least not until that time I needed the brakes the most, and discovered their power had atrophied to a puny slowing action.

I decided I needed new linings. And, because replacing the brake linings is one of the easiest jobs an aircraft owner can do, I took it on. I went to my local aircraft parts store and acquired a set of replacement linings (it takes four) and the necessary rivets. I also bought one of those low-cost riveting tools that can be used to drive out the old rivets and install the new ones. I was ready.

New linings weren't the answer. The

brakes were still weak, though marginally better than before. A closer look at the brake discs showed the reason: the discs were heavily pitted from corrosion and actually worn off on a bevel so that only part of the new linings made contact. What I was getting was only partial contact of the linings with the discs, and then an inadequate contact because of the eroded faces of the discs. I estimated I had about 10% of the braking power I should have been getting.

Discussion with the Aircraft Wheel and Brake Division people gave a clear picture of what was needed to restore my brakes to the original effectiveness, and perhaps a bit more. Aircraft Wheel and Brake is a division of Parker Hannifin Corporation, a conglomerate of aerospace manufacturing companies. Aircraft Wheel and Brake makes and markets Cleveland wheels and brakes, variations of which are found on virtually all general aviation aircraft.

Consultation revealed the need for two new discs, plus new linings and a general clean-up of the brake components. John Bakos, aftermarket sales manager, suggested that I try some of the new Cleveland chrome-plated discs just coming on the market. These, he felt, would give better service in the corrosive atmosphere in which I mostly fly, and

Compare the new chromed disc on the right with the pitted relic it replaces. Smoother surface guarantees more effective braking.

would both restore and improve my plane's braking power.

We also decided to match up the chromed discs with some of the heavy-duty linings now available to create a set of super brakes. Aircraft Wheel and Brake Division has recently produced some heavy-duty alternatives to the standard linings, so we elected to use these in our brake refurbishment, too.

The chromed brake discs are a relatively new product for Wheel and Brake Division, though the concept follows one that's been used in the field with some success. There, some A&Ps were reconditioning pitted and worn brake discs by having them hard-chromed back to original dimensions. A similar technique is used for worn cylinder barrels. In both cases, the item to be reconditioned was machined to the proper dimension (approximately equal to the depth of the layer of chrome to be installed) and then chromium plating was deposited by an electrolytic process. In the case of the cylinders, a finish honing is performed before the part is ready for service. Brake discs, of course, are much less critical.

Wheel and Brake Division, however, starts with brand-new discs and chrome plates them before they can get worn or develop imperfections. This guarantees both high quality and good performance. The old discs are regarded as nonsalvageable, throw-away items.

It should be noted that this is industrial-grade chrome plating, not the polished-finish grade we're used to seeing as decoration on car bumpers, hubcaps and grilles. So when you take the discs out of the box and they show a smooth but lustreless finish, you should not be disappointed; they do have the right stuff!

Wheel and Brake sells chromed discs and other components only through distributors and dealers, so you have to order them through your local aircraft parts source. The 164-09 brake discs to fit my particular aircraft (a Mooney M20C) have a suggested list price of \$119.00 each. The four sections of 66-58 linings were another \$5.00 each, or \$20.00 total. Rivets were 8 cents each, and 12 were needed for an additional \$.96. Total parts price for the conversion: \$354.

While the brake pads may be installed without removing the wheel from the axle, the installation of the chromed discs requires that the whole wheel be removed from the aircraft. Doing both jobs at the same time simplifies matters, however, and allows a good bit of inspection and clean-up at the same time.

The first step is to remove the brake assembly from the wheel, and that can be accomplished by clipping off the safety wires and removing the clamping bolts that hold the brake halves together. Once removed, the halves can be extricated from around the disc and slid off the two anchor bolts. The floating pressure plate and the back plate can be



With new heavy-duty brake pads riveted to the backing plates and the chromed disc ready to be attached to the wheel, this brake refurbishment is nearly complete.

taken to your workbench where the old pads can be removed and the new pads installed.

The second step is to remove the wheel, and this is done easily by unscrewing the large, castellated retaining nut on the end of the axle, removing the washer and the outer bearing (this also is a good time to pack the wheel bearings, if that hasn't been done within the last 12 months). With a little wiggling back and forth, the wheel will slide right off. The front and rear bearings may be retained by snap rings, which need only be removed if you're going to clean and repack the bearings.

The third step is removal of the brake disc, and that requires just a bit of caution. The disc is held in place by the through-bolts which hold the wheel halves together. *The tire must be deflated before these bolts are touched!* Conversely, the bolts holding wheel halves and disc together must be tightened and torqued to specification before the tire is inflated. The disc nests into the back of the wheel assembly and is clamped in place by the through-bolts.

Take a serious look at the tire at this point... it doesn't take much more work to replace it, now that the wheel is off and can readily be pulled apart. It also is a good time to clean up the wheel and brake area with solvent and a brush, and check the brake piston for leakage. If it appears that hydraulic fluid (usually red in color) is seeping out around the piston, then the O-ring needs to be replaced and perhaps the cylinder needs honing. Such judgments, however, are best left to your local A&P, as is the repair and refurbishment.

Assuming that all items are clean and acceptable, it's time to step over to the workbench and put together the new brake shoes and their mounting plates. First, however, you've got to have the right tool, and that's one of those little riveting tools sold by all the aviation parts supply houses, both local service and mail order. Prices range from \$10 to \$15 for this tool, and it is well worth the cost. It's both a rivet-removing and a rivet-clenching tool, so it is doubly handy. Clamped into your shop vise, it uses a guided punch that you whack a couple of times with a hammer to poke out the old rivets and remove the worn brake pad.

It's a good idea to clean off the brake mounting plates with a steel brush to remove any residue and permit the pads to seat

squarely on the surface. Solvent can be used to clean up the area, too, but be sure that none of it reaches the new brake pads or you'll have even more problems. Once the plates have been cleaned, the new pads may be riveted in place and the brake re-assembled on the wheel.

The reassembly order requires that the wheel and disc assembly go onto the axle first and be snugged into place before the brake halves are remounted. Before the brakes are reunited, however, take a good look at the anchor bolts that guide the brake assembly on the torque plate. These should be clean and dry as the tolerance between the bolt shank and hole in which it slides is quite small. If these bolts have corrosion or dirt on them, they won't slide in and out as the brakes are applied, and the brake can't "float," which is necessary for it to center itself over the disc. Without the floating and centering, the pads will not contact the disc squarely and consequently will not wear evenly nor provide optimum braking effort.

With all items back in their assigned places, safety-wired, cotter-pinned and double-checked, it then becomes necessary to break in the new brakes. Contrary to popular belief, brake linings need on-the-job conditioning to be at their best. Because the linings are asbestos-based organic material in a resin matrix, it is necessary to cure the resins before the excessive heat of hard braking can carburize the pad material. Aircraft Wheel and Brake recommends a specific procedure for this, which should be applied before the aircraft is released for service. The plan is to make an extended taxi run, reaching up to 45 mph before braking to a smooth stop using light pedal effort. Let the brakes cool for a moment or two before you make the next run and stop. It is recommended that you make six of these run/stop/cool cycles before you consider the brakes ready for hard use.

There's a different procedure for aircraft using metallic linings, and that's to make three consecutive hard stops from 45 mph without allowing the brakes to cool. This procedure glazes the surface of the linings and reduces the chance of uneven wear. With proper conditioning, the brakes should last a much longer time before replacement is needed.

We've had the chromed discs in operation for nearly six months, now, and nearly 100 hours of flying. Stops have never been better, surer and straighter. An inspection of the discs the other day showed no signs of corrosion, pitting or grooving, and the pads looked as good as the day we put them on. We're convinced that Aircraft Wheel and Brake Division has created a "super brake" for airplanes with this combination of heavy duty linings and chrome-plated discs.

(For more information on chrome-plated brake discs and specific applications, contact Aircraft Wheel and Brake Division, P.O. Box 158, Dept. A, Avon, OH 44011; telephone 216/934-5221.)

Article reprint from Aero Magazine, October 1982

Cleveland
Wheels & Brakes

Parker Hannifin Corporation
Aircraft Wheel & Brake Division
1160 Center Road, P.O. Box 158
Avon, Ohio 44011, USA
(216) 934-5221, 800-54424

AERO