Accurizing The Editor's Ruger 17 HMR

By Gordy Gritters

John Anderson, the long-time editor of **The VARMINT HUNTER Magazine®**, purchased a new Ruger 77/17 rifle chambered in the new and very popular 17 HMR cartridge. He is planning to use it as a lightweight little walking varminter (primarily for ground squirrels and young prairie dogs early in the season) as well as a little plinking rifle ... just for fun. He decided he wanted to make it as accurate as possible without going to the extra expense of installing a custom barrel, a custom stock, or doing any serious and extensive machining work.

So at Jamboree 2004, he asked me if I would be willing to work on his rifle to make it more accurate and write an article about what I did.

As most of you know, I am a self-employed gunsmith and have owned and operated Gordy's Gunsmith Shop in Pella, Iowa, for the past 18 years. I do all sorts of general gunsmithing, including rebluing and refinishing guns, but the main part of my business is building very accurate hunting and competition rifles, and accurizing factory rifles. I also started and am part owner of the Iowa 1000 Yard Benchrest Association, a club which sponsors registered 1000-yard rifle matches.

John had a new stock bedding kit he wanted me to use on his rifle and write what I thought of it in this article. It is a "Bedrock" epoxy bedding kit by Miles & Gilbert, a Battenfeld Technologies company. It is a bedding kit that contains all the components needed to do a top-notch bedding job except the pillars themselves if you are going to "pillar bed" the stock. There are two tubs of epoxy – resin and hardener – that are easy to measure and mix in a 1-1 ratio, brown and black dyes to color the epoxy to look good with whatever stock it is being used on, a bottle of a special plastic powder that can be mixed into the epoxy to thicken it up, measuring spoon, rubber tubing that can be used to help hold the barrel and action together if desired during curing, and a very complete instruction booklet.

This lead lap was coated with abrasive to smooth the bore.

John told me I was free to do pretty much whatever I wanted to do to this rifle – basically anything and everything that I normally do to factory rifles to make them accurate. We discussed it and went over the options. We decided to do my "accurizing package," which consists of pillar bedding the stock, free-floating the barrel, recrowning the muzzle, lapping the bolt lugs, lapping the scope rings, and blueprinting the trigger. We also decided to do a couple of other things to

take it a little further – lapping the bore and installing an overtravel adjustment screw into the trigger system.

These basic accurizing steps, that I call an "accurizing package" in my shop, are basically those things which will bring out about as much accuracy as the factory barrel will be capable of without doing a lot of expensive machining and rechambering work. These steps are pretty much the same no matter what brand of bolt-action rifle I am working on, and most of these steps apply to other action types as well (like AR-15s, for example). In most but not all cases, I believe that these basic accurizing procedures will get you the most "bang for your buck" when using factory barrels and that spending the extra bucks on doing a bunch of serious machining to the action and barrel is best done when installing a good custom barrel, which will show the benefits of this extra work much more.

So when I started to work on John's rifle, I checked it out and found that there were a few things that definitely needed to be corrected. I will tell you what I found and then describe each step I took to complete the work on this rifle.

I checked the bolt lug contact and found that only one lug was touching its seat in the receiver, so I lapped the lugs until they both had good contact with their seats. Lapping the bolt lugs on a rifle is a pretty standard procedure that gunsmiths have performed since the early days of accurizing rifles. The simplified version of this is you put an abrasive paste on the backs of the bolt lugs, then install and cycle the bolt repeatedly. This process removes the high spots and causes the surfaces to wear into nice, even contact with each other. The importance of this is that it causes less bolt, action, and barrel flex when the forces of high chamber pressure during firing the rifle forces the bolt lugs back against their seats in the receiver. If the lugs don't bear nice and evenly against their seats, the action flexes and the barrel (which is attached to the action) is whipped slightly and has an unwanted vibration thrown into it, which detracts from the accuracy.

This type of an action, which has a two-piece bolt with the lugs on the rear half of the bolt, is not as prone to cause action flex and accuracy problems if it has uneven contact as will an action with a solid bolt with the lugs up front like you find on most centerfire bolt-actions. But it still is best to lap the lugs and make everything in the action as stress-free as possible.

The headspace, like most factory rifles, was not as tight as I'd like to see it, but was within the factory's acceptable safety limits. But the headspace could not be changed without some machining, so I left it as is. Another thing to remember here is since this is a rimfire, you cannot handload to compensate for less than perfect headspace, but are stuck with whatever the factory ammo gives you. Again, if you are going to spend quite a bit more money installing a custom barrel, you can correct this and also gain the benefit of a tighter, truer chamber as well as a better quality bore.

The crown on the muzzle of the barrel appeared visually to be slightly off center, which is almost always the case in factory barrels, but this is really hard to tell with the naked eye. In this case, it was verified after I got the barrel into my lathe and dial-indicated the bore to run true within 0.0001", which is way truer than any factory crowns I've seen. But there is no way the factories could take all the time necessary to get every barrel running this true to cut their threads, chambers, and crowns like a custom accuracy gunsmith can. When I had the bore dialed in true and started cutting the crown, it began cutting on one side of the crown before the other, verifying that the crown indeed had been off-center and crooked. I cut an 11 degree target crown and slightly recessed it for protection.

The next thing I did was to pillar bed the stock and free-float the barrel. The stock had no bedding whatsoever in it, but was just machine inletted big enough so the barreled action would go in without binding. The barrel had a lot of contact with the stock, especially at the forward end of the stock, which is how most factories get their slender barreled hunting rifles to shoot all right. I used the Bedrock kit to bed this stock and I was very happy with how it worked. Their instructions are easy to follow for those hobbyists wanting to do this type of project themselves. I never buy pre-made pillars but make all my own pillars from aluminum bar stock to match each individual rifle I am working on. So I made the pillars, bored the holes in the stock

for the pillars, mixed the two-part epoxy bedding material, and added stain and the plastic thickening powder to achieve the proper consistency per the instructions.

After the bedding had cured, I opened the barrel channel to free-float and center the barrel and give it room to vibrate freely. I did leave about an inch or so of bedding-to-barrel contact under the chamber, which I usually do on non-switch barrel guns with factory barrels. This seems to help dampen the barrel harmonics that are more pronounced in factory barrels.

Just opening up the barrel channel to free-float a factory barrel often makes the accuracy worse than if you'd left it alone. Every barrel vibrates and oscillates when fired and this is accentuated and less predictable in a barrel that has less than perfect bore dimensions (like factory barrels). An imperfect bore makes the barrel dance and vibrate more as the bullet goes through loose and tight spots in the bore, causing the accuracy to deteriorate accordingly. The fore-end contact with the barrel tends to dampen out these vibrations and helps them shoot acceptably from the factory. Controlling these vibrations is a major thing that competition shooters deal with and why barrel tuners (similar to the Browning BOSS system) work so well and are almost mandatory to be competitive in rimfire benchrest (centerfire benchresters also are really starting to experiment with barrel tuners now, which is going to be very interesting).

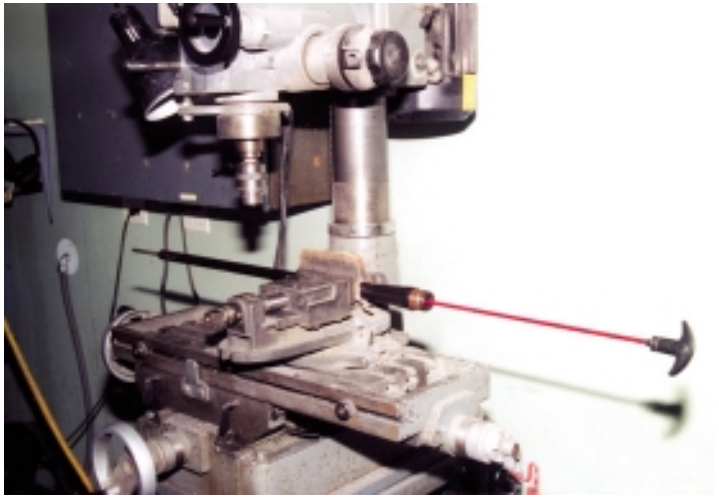
Custom barrels have much truer bore dimensions as well as more uniform twist rates. This makes for fewer barrel vibrations/harmonics while the bullet is passing through it, which is why they shoot better. So I find that almost all custom barrels shoot better when free-floated, but only some of the factory barrels do, unless they are quite good internally either as they come from the factory or if they are lapped to make them this way.

Another problem with having the fore-end contact the barrel, especially with wood stocks, is that the fore-end warps and moves around because of temperature and humidity changes from one season to the next (or even from one day to the next). This causes your point of impact to move around also. So you may be all sighted-in for your big hunt and later find you can't hit a thing because your rifle is not shooting where you are aiming, which can be rather frustrating.

Miles Gilbert Bedrock Glass Bedding Kit was used by the author to bed the stock of the Ruger 77/17 described in text.

Lapping the scope mounting rings causes the rings to be straight and true to each other so when you install the scope it is aligned perfectly. If the rings are not lapped they are almost never aligned to each other very well as they come because of manufacturing tolerances in the receiver, rings, and bases. When a scope is installed in misaligned rings, it will be distorted when the rings are tightened up around the scope. This often will cause ring marks on a scope since the edges of the rings dig into the scope body when they are tightened up on it.

If ring misalignment is not corrected, accuracy will be compromised because the action is getting flexed right



Lapping rod through bore - ready to lap the bore.

along with the scope, causing the action to not fit the bedding properly any more. This can be measured quite often with a dial indicator. Have the action perfectly bedded into the stock with zero stress showing on the dial indicator when the action screws are loosened and tightened. Now install the scope in a set of rings which are not lapped and recheck the bedding stress. Usually you will find that the indicator now shows stress present in the bedding that was not there before the scope rings were tightened up. This can and will affect the accuracy of that rifle.

One other fairly common thing I found with John's rifle is that the rings did not align the scope to the bore very well at all. When this happens, the scope can be off center either horizontally or vertically and would have its windage or elevation screws adjusted clear to the ends of their travel to be able to get the rifle sighted-in properly, and that is not good. In this particular case, John had a Burris 4-12x Compact scope for me to install. I saw that it was going to be close to the end of its elevation adjustment but the rings were so poorly aligned I couldn't tell for sure until I lapped the rings and then checked it again. I found that the elevation adjustment had to be completely bottomed out to get the scope to bore sight correctly.

So I angle-bedded the scope into the rings to bring this adjustment into line where I wanted it. This is the same procedure I often use on long-range rifles to be able to use more of the scope's elevation adjustment than is possible otherwise without going to special rings or bases. I shim the scope to get it centered in the rings where I want it and then epoxy bed the scope into the rings. When the epoxy cures, the scope is now held solidly and stress-free right where I want it. I used a release agent on the scope so it could be removed in the future if needed, but the epoxy becomes a permanent part of the rings.

Blueprinting the trigger consists of going through it completely, making sure the engagement angles of the trigger and sear are neutral and all working surfaces are highly polished, as are the springs, pins, and pivot holes in the trigger. I slightly "crown" the trigger and sear contact surfaces to allow them to maintain even contact even though the parts can flex because of the tolerances of the pivot pins in their holes. Then I set the pull weight where the customer wants it – in this case I set it at 24 ounces. A properly blueprinted trigger will release every shot within 1 or 2 ounces each time, which is very important to accuracy. A trigger that has been tuned improperly or not at all often will vary from 6 to even as high as 12 ounces from shot to shot, which hurts accuracy accordingly. You, the shooter, usually will not feel this difference in pull weight, but the gun sure knows the difference in the pressures that are getting released when the trigger breaks, and this shot-to-shot uniformity (or lack thereof) is what affects the accuracy.

John also asked me to install an overtravel adjustment into this trigger system, which I did. I drilled and tapped the trigger hanger, which is cast as part of the receiver, and installed an adjustment screw to be able to limit and adjust the amount of overtravel of the trigger, which makes it feel a whole lot less sloppy than it did before.

The last thing I did was to lap the bore. I sometimes do this to factory barrels to help them shoot better and foul less, especially if you can tell there is a problem that needs to be corrected and the owner doesn't want to go to the extra expense of having a custom barrel fitted. This basically is the same procedure that custom barrel makers do

to their barrels to make them true inside and also to give the bore the proper surface finish to minimize fouling. I don't have the special air-gauging or other equipment the top barrel makers do to measure their barrels, so a custom barrel still will be better than a lapped factory barrel, but this procedure seems to work rather well on factory barrels in most cases.

When I lap a barrel, I put a specially formed ball bearing rod (made from a high quality cleaning rod) into a well-oiled bore, stopping it about 4" from the end and pour molten lead into the bore to form the lap. I let it cool, then can push and pull it through the bore, feeling for loose and tight spots. Then I put some abrasive onto the lap and lap the bore, making sure to even out any high spots and keep measuring to make sure that the bore doesn't become bell-mouthed at the muzzle. It works best to keep the bore the same size all the way through or have it taper ever so slightly so it becomes just a little tighter (about 0.0001"or so) at the muzzle than it does at the chamber end.

The most dramatic example I can think of where lapping a barrel really helped is on a Remington 700 Sendero that a customer brought me to accurize and cure a fouling problem. This rifle was chambered in 7mm Remington Magnum and had a tight spot about halfway down the barrel that you could feel with a patch on a cleaning rod. It had such a buildup of copper that it took two days of soaking and scrubbing to get rid of the copper fouling that had built up in the bore in the 10 to 12 shots that the customer had fired through it before bringing it to me. After I cleaned the fouling out I then test-fired it and found it would copper foul so badly in this same spot that even after only one shot it would leave a hard ring of copper that would take hours to scrub back out.

This poor guy had just bought this rifle brand new to shoot in the Stock Class of our 1,000-yard matches, but we thought the barrel was so bad as to be almost unusable. I told him he could either return it to the factory and hope they would do something about it, or I could do the basic accurizing allowed by our rules and then lap the barrel to try to get it to quit fouling so badly. Our matches were only a few weeks away and he did not want to wait however long it would take to send it back to the factory, so he told me to just do what I could. I lapped the tight spot out of the barrel and although it still seemed to want to foul there, it was much better. So I told him to carefully break-in the barrel again one shot at a time and just see what happened.

A couple weeks after he got it back, he shot this rifle in our next 1,000-yard match. I walked over and asked him how it was doing and he told me it seemed to be very accurate and the fouling pretty much went away after the barrel was broken-in. About an hour later the target crew came back with the fired targets from the Stock Class relay. They were all excited, talking about the great group that was fired by the shooter on bench No. 1. They handed the targets to the scoring crew to be scored. A few minutes later the scoring crew was all excited, talking about the new Stock Class record, 2.86" with a perfect 50 score, that had just been fired by the shooter on bench No. 1. When we looked up who this shooter was to tell him the happy news, it turned out to be the same guy who was shooting this Remington with the repaired barrel on it. I don't think the man's feet touched the ground the rest of the day!

So, now that I had the work completed on John's rifle, I decided to shoot it a little to see how well it shot. I wish I'd have shot it before I started to work on it so I would have known what the accuracy was like before any work was done on it, but I didn't think about doing that until I had most of the work done already. I had three different samples of ammo to try: Hornady 20-grain XTP, Hornady 17-grain V-Max, and CCI 17-grain TNT. I did all the shooting at 100 yards even though the wind really can affect these lightweight bullets at such a distance.

The best groups measured 0.242" with the Hornady 20-grain XTP, 0.389" with the Hornady 17-grain V-Max, and 0.455" with the CCI TNT. The average was around $^{3}/_{4}$", counting the windblown fliers, which I thought was quite good for a little slender-barreled hunting rifle. I think John is going to enjoy this reliable and accurate little rifle for many hunts and years to come!