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# PRECISION ARMS WORKSHOP

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A TECHNICAL JOURNAL OF CRAFT, REPAIR & RESTORATION

01

ARCHIVE ISSUE NUMBER

INSIDE THE ARCHIVE

# WORKING THE PARA-ORDNANCE LDA CARRY COMPANION, PART 2

SPORTSMEN'S VOICE PREVAILS IN ELECTIONS • THE POOR MAN'S METHOD FOR SCOPING EX-MILITARY RIFLES • MAKI...

ORIGINAL METHODS. MODERN ACCESS.

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## FROM THE ARCHIVE

# Sportsmen's Voice Prevails in Elections

BY AMERICAN GUNSMITH EDITORS JANUARY 2005

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**A**lthough the recent election results came just before this issue went to press, George W. Bush's reelection as president is old news by now. What might not be clear is how loudly the voices of hunters and shooters were heard across the country.

Election-day victories by candidates who share the values of hunters and shooters set the stage for a period of sportsmen-friendly leadership in Washington. "With pro-gun leadership in the House and Senate, as well as the White House, we're very optimistic about our prospects for protecting 2nd Amendment freedoms and hunting traditions, and advancing legislation to protect firearms makers and sellers from frivolous lawsuits that threaten their businesses," said Doug Painter, president of the National Shooting Sports Foundation.

Victories for sportsmen include a net gain of four pro-gun seats in the U. S. Senate, with gains in Florida, Louisiana, North Carolina, South Carolina and South Dakota, against one loss in Colorado. An important highlight was South Dakota's

ousting of Senate Minority Leader Tom Daschle, who supported the poison-pill amendments that prevented passage of the lawsuit immunity bill that would have blocked junk lawsuits against firearms manufacturers.

Of the 251 candidates endorsed by the National Rifle Association (NRA) for the U. S. House of Representatives, 241 were elected. The 109th Congress will begin with 235 members given an "A" rating by the NRA. Twenty-seven are rated "B," 15 rated "C," 17 rated "D," 138 rated "E," and 3 have no rating. In state-ballot initiatives, anti-hunting proposals were defeated in Alaska and Maine, and Louisiana citizens overwhelmingly passed a measure guaranteeing the right to hunt, fish, and trap.

But it was Ohio that proved to be the epicenter of sportsmen's influence on the 2004 elections. In a tight presidential race that came down to the Buckeye State in a winner-take-all finale, Ohio gun owners apparently gave Bush the votes he needed for reelection. Early indications from exit polls showed a solid majority of Ohio sportsmen

voted for the President. In Ohio and nationwide, heavy sportsman participation validated the efforts of the Hunting and Shooting Sports Heritage Fund's "Vote Your Sport" campaign.

Both Bush and Senator John Kerry had avidly courted votes from hunters and shooters. A recent survey by the Congressional Sportsmen's Foundation showed the wisdom of those efforts. In Ohio, 75 percent of sportsmen were considered "likely voters" according to the survey, and a majority said it was essential for a candidate to share their views on hunting and fishing. For many, gun rights were atop concern.

Most, however, remained unconvinced by Senator Kerry's staged waterfowl hunts and other campaign theatrics intended to win their favor. "Kerry couldn't hide a 20-year anti-gun, anti-hunting career behind 20 weeks of hollow pandering. We thank America's sportsmen for their vigilance and for voting their sport," said Painter. Editor Keith Lawrence Technical

## FROM THE ARCHIVE

# Working the Para-Ordnance LDA Carry Companion, Part 2

*Last month we covered the disassembly. In this issue, we'll reassemble the LDA and troubleshoot it.*

BY CHICK BLOOD JANUARY 2005

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In the last issue, I made a polite request that you do not fully disassemble an LDA as described in Part 1 of this article until you had read this month's installment on reassembly. If you instead yielded to temptation, and ended up with parts all over your bench, you may be missing a few. This is why certain homo sapiens—better known to the gunsmithing community as “parts ferrets”—should be barred from your work area at all times. As long as you're not missing the receiver, you're in luck.

It's the only restricted component on an LDA and the only one missing from Brownells list of Para-Ordnance pistol parts.

Check that; catalog #56 does not list a hammer assembly, though it probably will be included in future catalogs because Para-Ordnance is going to be offering the assembly as a unit. (Para-Ordnance's customer-service phone number is This latest bit of info is provided just in case you knocked out the hammer pin during take-down, and you're holding a handful of small items but are short a couple because a parts ferret did his dirty deed.

Warning has been fairly given about these evil doers, so let's get on with reassembly of the pistol. I'll expand on the subject of the hammer assembly toward the end of this discussion. The Slide Referring to the schematic in last month's issue, you'll begin with the extractor; in this case, the PXT.

Insert that assembled unit in its slide channel, making certain to align the slot in the extractor body with the slide's firing-pin stop slot, but leaving the PXT about 1/16 inch to the rear of being fully seated. “Fully seated” means the back end of the PXT is flush with the back end of the slide. This will enable installation of the firing-pin safety spring (#37) and safety (#10). This simple task is made simpler with a dab of light grease.

The grease is applied to one end of the spring, the spring is placed in the safety plunger, and the two are installed simultaneously. Press down lightly on the plunger. At the same time, push the PXT fully forward. You may have to tap it flush with a wooden, plastic, or rawhide mallet. The PXT will now retain the safety plunger in the slide. Reassemble the firing pin to its spring. The small end of the spring

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Figure 1. Reassembly of the Trigger Pin, Trigger, and Trigger-Return Spring goes on last to create the friction fit mentioned in Part 1. Depress the safety with a punch and insert the firing-pin assembly into its slide channel. Hold the safety down and use a second punch to push the firing-pin assembly fully forward. Release the safety, then the firing pin. The safety should hold it inside the slide, but that's all that's holding it.

Be careful not to jar it loose as you insert the firing-pin stop, rounded end first, into its slide slot. You may have to use a punch to align the PXT so it doesn't interfere with the stop. Once the stop is completely seated, depress the safety. The back end of the firing pin will pop to the rear and stick out from

the stop. The Receiver Check out Figure 1. The trigger (#51) is inserted downward through its opening in the receiver and held in place by its pin (#53).

The pin is partially installed through one side of the trigger leaving the center opening in the trigger clear for the trigger return spring (#54). Factory assemblers use a special tool to hold and position the spring for this next step. It's pictured in Figure 2. I used a pair of paddle-end tweezers because I didn't feel like making up the tool from sheet metal or plastic. A few words about the drawings in this article are appropriate here.

All were made available to us from our friends at Para-Ordnance—for which I thank them. The only way Figure 3. Reassembly of

the Slide-Stop Plunger, Plunger Spring, and Slide-Lock Safety Figure 2. Reassembly of the Trigger Pin, Trigger, and Trigger-Return Spring some of them could have been duplicated would have been to cut a receiver in half and photograph it. And slicing up a brand-new pistol frame would not have been practical. Returning to Figure 2, when you position the spring, both its legs face downward.

The longer leg gets flexed forward into the receiver. The shorter leg flexes in the opposite direction and seats in the slot located at the upper rear of the trigger. When the trigger pin gets fully installed, it

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should end up slightly recessed from both sides of the receiver. The trigger should pull and return smoothly and without hesitation. The slide-stop plunger (#50), plunger spring (#36) and slide-lock safety plunger (#44) are, hopefully, still an assembly. If not, assemble them as shown in Figure 3 and push them, rear to front, into their housing on the receiver's left side.

If you have included the magazine-catch assembly in your premature disassembly of the pistol, insert the catch spring (#24) into its hole in the catch (#22). The end of the catch lock (#23), resembling a pin, fits in the center of the catch spring. Align the lug on the catch lock with its slot in the catch. A small screwdriver can be used to push the lug into the slot and compress the spring. Turn the lock a quarter turn counterclockwise, securing it in the catch. Install the Figure 4.

Hammer Assembly catch assembly in the receiver from the right until its left side protrudes from the left side of the receiver. Turn the catch lock a quarter turn clockwise to secure it. As promised earlier, it's time to discuss the hammer assembly. This assembly is treated as a modular unit by the manufacturer. When damaged, it is replaced as a single component rather than replacing

its parts. I've been told that considerable adjusting, precise inspection, and hand fitting of hammer assembly parts is required.

Even law-enforcement armorers who are well schooled in the LDA are not authorized to replace hammer-assembly components. However, they are cleared to reassemble existing parts into a complete assembly. With that in mind, I'm going to assume that your hammer assembly has come totally apart and tell you how to put those same parts back together Figure 5. Hammer and Return Spring Insert the hammer strut into the cam and secure it with the hammer strut pin. Take care here.

When you drive in the pin, support the cam to avoid crushing it. Now install the hammer-return spring into the center of the hammer as shown in Figure 5. The short leg of the spring has to be trapped in the space at the rear of the hammer. correctly. Orient the parts as shown in Figure 4. I know you're working with a spurless hammer, but position it the same way as the one in the drawing. Now put your dexterity gloves on.

The downward-extending leg of the hammer-return spring must be positioned forward of the hammer-strut Figure 6. Reassembly of the Hammer Assembly, Firing-Pin Safety-Plunger Lever, Drawbar, and Hammer

## WORKING THE PARA-ORDNANCE LDA CARRY COMPANION, PART 2 CONTINUED

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Figure 7. Reassembly of the Drawbar pin in the cam. Slip the straddle over the hammer. Insert the cam, strut attached, into the opening in the center of the hammer. Align all parts and lock them together with the hammer-assembly pin, making sure the pin's flared end is seated in the chamfered side of the hammer. The pin shouldn't protrude in either direction. Hold the hammer assembly as in Figure 6, and work from the left side of the receiver. Install the assembly through the grip-safety opening.

Move the assembly upward to align the hammer and receiver-pin holes. Insert the hammer pin (#18) just far enough to hold the hammer in place. Prevent the pin from falling out as you maneuver the receiver over to its right side. Now, holding the drawbar as in Figure 7, pull the hammer rearward if necessary to insert the drawbar down into the receiver just forward of the hammer. Pull the trigger sufficiently and spear the drawbar on its trigger Figure 8. Reassembly of the Firing-Pin Safety-Plunger Lever stud.

Figure 8 shows you how to orient the firing-pin safety-plunger lever to the receiver. It is installed downward between the right side of the hammer and the left side of the drawbar. When the hole in the lever lines up with the

hammer-pin hole in the receiver's right side, push in the hammer pin until it's fully seated. Pivot the hammer strut and hammer-return spring to the rear, and insert an empty magazine. This will keep those parts from entering the magazine well during the next step in reassembly.

Hold the sear as in Figure 9, push it upward into place, and lift the leg of the hammer-return spring onto the groove in the left rear of the sear. Install a 3/32-inch-diameter slave pin, right to left, through the sear-pin hole to temporarily retain the sear. Back the slave pin out slightly left to right. How much is "slightly"? Enough to allow the curved arm of the grip-safety lever, which is being held pointed upward between two of your fingers, to slip into the left of the sear.

Push the slave pin right to left to hold the sear and lever in position, then insert the non-flared end of the sear pin in the left side of the receiver and push out the slave pin. Use a punch to carefully nudge the sear pin about 1/4 inch into the receiver from right to left. This is done to move the sear and safety lever to the left side of the receiver. Hold the drawbar platform angled-side up, round-end down, and install it to the right side of the sear.

The top of the platform should rest immediately under the rear end of the drawbar. Then you can push the sear pin back in to hold everything in position. If you have disassembled the mainspring housing, put it back together as you would the housing from an M1911 and set it aside. When you return to the receiver, you'll have to keep it facing right-side up. Otherwise, the sear and hammer pins could fall out. Remove the empty magazine.

Position the drawbar-platform spring (#59) on its stud on the right side of the sear-spring. Pivot the hammer strut out of the way, and insert the sear spring into the receiver with the drawbar spring to the right. Move the sear spring upward. The drawbar spring has to slip over the bottom stud on the drawbar platform. The tab at the bottom of the sear spring fits into the horizontal slot at the lower end of the receiver, and the grip-safety lever is engaged in the notch in the long leg of the sear spring.

Hold the sear spring in place with a finger, and partially install the mainspring housing to temporarily secure it. The end of the hammer strut is placed in its



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detent in the mainspring cap, and the bottom of the housing is pressed down very firmly on your bench. This action forces the housing up into the grip frame, and you start in the round end of the housing pin from right to left. You can tap it the rest of the way in from there with a non-marring mallet. Figure 10 shows how to position the “lollipop,” or safety-lock lever. Slide it into its recess in the right rear of the receiver until its hole lines up with the slide-lock safety hole.

Align the same hole in the grip safety and install a slave pin. Keep the receiver facing left side up. Look into the slide-lock safety cutout to be sure the bottom corner of the straddle is forward and upward. If it isn't, move it into that position with a small tool. Push out the slave

pin with the pin section of the slide-lock safety, and maneuver the safety by wiggling it into contact with the safety-lock plunger.

Press the plunger into its housing with a small screwdriver blade to allow the safety to be fully depressed. It may be necessary to pull the hammer to the rear and/or reach into the receiver with a dental pick to pull the straddle up and to the rear in order to snap the safety down completely. Problems and Solutions No Primer Hit. This could be caused by a broken or worn firing-pin tip, an obstructed firing-pin channel in the slide, or perhaps the firing-pin safety plunger isn't disengaging.

**REPLACE THE FIRING PIN, CLEAN THE CHANNEL, AND REPLACE THE DRAWBAR**

## RIFLES

# The Poor Man's Method for Scoping Ex-Military Rifles

*Here's a quick and dirty method for drilling and tapping any receiver for which scope bases are available that positively ensures the scope is aligned with the bore.*

BY RUSSELL CORBITT JANUARY 2005

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Many owners of military-surplus rifles would like to have a scope mounted, but there is no available drilling jig for the receiver. Or, you may not want to invest a truckload of money in drilling jigs for stuff you don't see very often. When I started doing serious gun work (as opposed to tinkering around), I got regular calls to drill and tap guns that were not drilled and tapped at the factory. It didn't take me very long to realize I was losing business and repeat customers because I didn't offer this service.

However, a look at the prices of jigs or fixtures (some of which require barrel removal) told me that if I didn't use this stuff frequently, it would take along time to pay for itself. If you are in this position, or if an oddball shows up and you don't want to invest a fortune in a fixture to mount a scope, here's how the poor folks do it. I have long said that the "first rule" of working on anything is that you must be at least 5-percent smarter than the item you are attempting to fix.

Keeping this foremost in mind, I deduced that I didn't really need those fancy jigs and fixtures. It could be done with the simplest of tools. Since that epiphany, I have mounted scopes on all kinds of rifles (and shot-

guns), with excellent results. It really is as simple as the "first rule." Items You Will Need The first thing you'll need is a bubble level attached to a piece of 1/8- or 5/32-inch square key stock (see Figure 1). You will also need an optical collimator (not one of the laser thingies).

Get the standard type with the interchangeable spuds; the new magnetic-type units don't guarantee that the scope and the bore are aligned. You will need a padded vise that allows you to level the firearm's barreled receiver and clamp it in place. Other required items include some rapid-setting adhesive such as a cyanoacrylate ("super-glue") or 5-minute epoxy and a good-quality #31 twist drill. Two drill are even better. I suggest you buy them from a tool supply, not a hardware store.

Better yet, get them from Brownells or Midway. A set of 6-48 taps are required, and again two sets are better than one. A set includes one of each type—taper, plug, and bottom tap. (Taper taps have a 6-8 thread tapered lead that makes it easier to start and run true in a hole. Plug taps have a 3-4 thread taper, and bottom taps vary from 0-2 threads taper.) Get them in high-carbon steel, not high-speed steel. If you

should break a carbon-steel tap, you can shatter it with a punch and pick or blow out the pieces.

High-speed steel taps do not shatter; they justpeen over and are nearly impossible to get out.

It's been my experience that broken-tap extractors for machine screws this small are nearly worthless. (If you've been at this for awhile, you know that you only need to buy taper taps; you can make them into plug or bottom taps easily enough on the belt sander.) You will also need a tap wrench (or tap handle, for the non-machinist types out there), some high-quality cutting oil, and a transfer punch made especially for accurately marking the center of the base-mounting holes, even those with very shallow bases (see Figure 2).

The final items required are a 4-ounce ballpeen hammer and a roll of cheap electrical tape. In addition to the required items listed above, there are several tools and fixtures that are nice to have if they're available. These include a milling machine or good drill press, a vise for the mill or drill press, a crosshair (reticle) alignment gauge, and ring-alignment gauges and tools. A couple of #31 solid-carbide Figure 1. Leveling Tool

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drills, for those receivers that eat HSS drills are also nice to have. You should have two if you are drilling the holes with a hand drill; it's almost guaranteed that you'll break one. A tapping fixture to ensure the threads are true is a good tool to have on hand. And I recommend that you secure a piece of 1-inch aluminum or cold-rolled steel round-bar stock about 10 to 12 inches long. It needs to have a smooth surface finish, so hot-rolled steel isn't very suitable.

How to Go About It First, remove the bolt or otherwise ensure the gun is not loaded. For guns such as shotguns or older pump and semi-automatic rifles, you will need to remove the receiver's major internal parts (such as the bolt assembly and so forth). Thoroughly degrease the scope base or bases and the areas where they will be mounted. It all needs to be completely oil-free and dry. Place the gun in a padded vise and level it both side to side and lengthwise.

The bubble level tool is used here; most guns have some place that you can lay the key stock across to get a reading. Next, attach the proper spud to the collimator and insert it into the bore. Stand it up and get it close to vertical using the old Mark 1, Mod 0 "eyeball." Now it's time for a bit of planning ahead. Place the appropriate screw in the forward hole in the front base. Get your #31 twist drill, and use a couple of wraps of electrical tape around the drill to indicate how deep your hole needs to be.

Ideally, you would measure the front screw protrusion through the base and drill a hole accordingly, taking into account that the area between the drill point and the drill's diameter is essentially wasted space.

Realistically, unless you are using a milling machine and can control your drill's depth exactly, you eyeball the drill against the screw's protrusion and mark your drill at the top of the base with the tape. Yes, at the top. That means you need to include the base's thickness.

The reason for this will become apparent later. Once the drill is marked, remove the screw. Attach the rings to the base or bases. If your front ring is a turn-in type, you can buy a turning tool from several sources. If you don't want to spend the money, you can use a piece of 1-inch round bar stock (my tool of choice), an old or broken scope, or a suitably-sized object such as a piece of broom handle.

Ensure the ring is as close to square to the base as you can, and center the rear ring on its base if it's adjustable. Place the scope in the rings, leaving the rings loose enough to adjust the scope. Now place the whole assembly on top of the gun's receiver and adjust the bases to the appropriate positions. Be sure to check inside the receiver to make sure that you won't be drilling into something important.

Note: On bolt-action rifles with front locking lugs, do your absolute best to ensure that you do not drill a hole through a locking-lug seat. You want one hole through the receiver ring in the barrel thread area and the other hole into the cutout area that the bolt's locking lug occupies when the bolt is closed.

If this is not feasible, drill the hole in the lug seat blind (holes that are not drilled completely through an object are called blind holes), so as to remove as little metal as

possible from this highly stressed area. Once the bases look to be in position, use the level across one of the bases and adjust the scope and base assembly to level from side to side.

If you have a reticle-alignment tool, use it to square the scope's crosshairs. (If you don't, you can do a fairly good job with the collimator's grid later.) Carefully make several wraps of tape around the entire gun—including the vise, if necessary—at the front scope-ring area. Re-level as needed. Look through the scope and find the grid. If you need to move the scope, be careful to keep the front base in place and level. Swing the back end to adjust.

If you have squared the reticle with an alignment tool, rotate the collimator until its grid lines match the scope's reticle, and swing the scope sideways as necessary for alignment. If you haven't squared the reticle, rotate the collimator and the scope until the grid lines and reticle are coincident. Back away from the scope and check to see if the vertical reticle stadia line appears perpendicular to the gun. Adjust as necessary. Move the back end of the scope side to side to center the reticle on the grid.

Don't worry about elevation now. Now that you have established a reference point, you need to mechanically zero the scope. To do this, you look through the scope and rotate the windage adjustment until it stops or the reticle stops moving on the grid. From whichever point you just stopped, turn the windage adjustment in the opposite direction, counting the turns (or clicks) until the other extreme is reached. Mechanical Figure 2. Transfer Punches

## THE POOR MAN'S METHOD FOR SCOPING EX-MILITARY RIFLES CONTINUED

ORIGINAL PAGE 11

windage zero is midway between the hard stop and the point where the reticle stops moving. Adjust the windage to that point. The same process is used for the elevation adjustment. With the scope mechanically zeroed, adjust the scope's position to realign the reticle's vertical stadia line with the grid's vertical centerline, and tape around the gun/scope assembly at the rear ring area. Recheck both windage zero and scope-base level. Don't worry about elevation.

When all is as it should be, apply the adhesive of your choice to the base or bases where they contact the gun. My favorite is Loctite Black Max #380 adhesive (available from Brownells). Don't overdo it with the "superglues," as they don't cure well if applied in a thick blob. After the adhesive cures, carefully remove the electrical tape and then remove the scope and rings. Leave the bottom half of the ring in place on the turnin type as the adhesive will not take the strain of trying to remove the ring half.

Use the appropriate transfer punch to mark the screw hole locations. The best-case scenario is marking all the spots without breaking the base loose. Should a base break loose before its holes are completely marked, clean the area and the base again thoroughly, removing any contaminants and the old adhesive. Replace the scope in the rings, realign as before, snug the screws, and glue again. Now you can drill the holes. Use a drop of cutting oil on the drill tip and drill the blind holes first.

Drill until the tape is even with the base and stop. It's far easier to cope with a hole that's a bit too shallow than to replace a barrel because you've drilled a hole into the chamber. (I haven't done that, mind you, but I've seen it.) After any blind holes are drilled, remove the tape and drill the rest of the holes. A tip: Easing up on drill pressure just as the twist drill breaks through makes a neater hole without excessive burring and it keeps you from breaking your drills.

If you want to remove the bases and clean the adhesive from every thing, this is as good a time as any. Should you break a

tap, the base will only be in your way as you are trying to remove it. Remove the rings from the bases as well. Keep everything segregated. In other words, keep the ring halves together and oriented so that they go back in the same place they were when the aligning was done. Tapping is next. Make liberal use of cutting oil when tapping.

Tap the through-holes with a taper tap, being very deliberate and attentive to keep the tap perpendicular to the work and going straight into the hole. As the tap is entering the hole to its full diameter, turn the tap carefully, backing it out one-quarter turn for every one-half to one complete turn in. This breaks the chips off that are building up on the cutting edges of the tap, and allows the tap to cut cleaner threads.

Use a shot of compressed air or solvent to clean the majority of the chips and stuff from the tap before removing it. For blind holes, you will most probably not be able to get a taper tap to even touch the edge of the hole because of its long lead taper. Use a plug tap here, and get a few threads started. You won't get much before the tap bottoms out, but anything you get will greatly assist the bottom tap in its work.

The plug tap is more difficult to start and keep straight than the taper tap, so even more attention should be paid to keeping the tap straight. When the plug tap bottoms out, remove it, and clean the hole with a shot of air or solvent. Start the bottom tap carefully, ensuring that it is following the existing threads and make absolutely sure that it is going straight into the hole. Remove the tap after each full turn or so, clean out the hole, and relubricate the tap.

When all the holes are tapped, it's time to clean the chips, burrs, cutting oil, and such from the gun. There will be burrs around the new holes inside the gun. They need to be removed as they can cause all sorts of problems. Now it's time to attach the bases to the gun. Screws that go into a blind hole need to be checked one at a time to see that they tighten the base be-

fore bottoming out. Just run the screw in until it's fairly snug and try to wiggle the base.

No wiggle means the screw is tight and not bottomed out. If it moves, the screw is bottomed in its hole. You can shorten the screw a bit or you can put the head in a drill chuck, spin the drill, and use a file to "point" the screw a bit until it holds the base without bottoming. Screws that go into through-holes need to be checked to ensure that they're not protruding through to interfere with the gun's operation.

Any that are too long can be shortened or replaced with shorter screws, if you have an assortment on hand. Tighten all screws snug, but don't overdo it or use any thread-locking compound yet. Once the bases are attached, reinstall the bottom ring sections. If you have the 1-inch round stock, it's time to see what else it does besides turn tight dovetailed rings. Lay the bar (or a cheapo scope) on the rings and put the upper ring halves in place, leaving the screws loose three or four turns from snug.

Now tighten the ring screws on the front ring evenly. Check to see if the bar or scope has lifted in the rear ring. If it has, you'll need to shim the rear base by the amount the bar or scope has raised to align the bases. If it hasn't, loosen the front ring screws and repeat this procedure with the rear. You can make your own shims from steel or brass stock (I prefer brass, it doesn't rust and discolor the receiver) or you can buy shim kits from Brownells.

When your shims are in place, remove the base screws one at a time and reinstall them with a small drop of thread-locking compound. Replace the scope, square the reticle and tighten the ring screws evenly and tight. If you're unfortunate enough to be installing vertically split rings, you tighten the rings on the bar or scope and play the adjustment game with the base-mounting screws.

It's more difficult because you have to remove the rings in order to do any base adjustments, unless you use the 1-inch (continued on page 22)



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round bar; it slides in and out of the rings without having to disassemble them. If you've done everything correctly, the scope should be pretty close to the center of the collimator's grid. Adjust as necessary. If the scope rings or bases have windage adjustment screws (such as the Leupold/ Redfield-type bases), I use a drop of thread-locking compound on one of the screws. I then fill that screw's a sample slot with red paint. If this screw stays set, the scope can be removed and replaced with excellent return to zero.

Conclusions I have used this method for mounting scopes for well over 10 years. Even though I now have drilling jigs, I used it again recently to mount a scope

on a sporterized 7.7mm Arisaka for which I had no bases. The customer didn't want to wait for them, so I cut and adapted a one-piece base to fit the cylindrical Arisaka action, and installed it all using this method. There was no need for barrel removal—no fuss, no muss. The hardest part of the job was bending the bolt handle, as the Arisaka bolt didn't fit my forging blocks very well.

As long as you take care every step of the way to keep everything level, and if you align the mechanically zeroed scope reticle with the collimator's grid, the scope must be parallel with the bore. This is something that no jig or fixture can ensure. ■

## RIFLES

# Making a Quick-Change Buttstock-Attachment System

*For changing the buttstock on a rifle or shot gun, a simple quick-change attachment bolt can make the job quick and convenient.*

BY NORMAN E. JOHNSON JANUARY 2005

ORIGINAL PP. 14-15

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*Original caption: Right top: The quick-change buttstock-attachment system is used on this switch-barrel rifle designed by the author. The stock can be removed or reattached in less than 30 seconds.*

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*Original caption: Right bottom: This is the original stock-attachment bolt (below) with the partially completed quick-change stock bolt designed by the author. Note the length of 1/4-28 bolt stock which is threaded into the 3/8-inch full-length bolt, and the threaded collar positioned at the proper length corresponding with the original through-bolt. venience is easily remedied where a stock must be removed and replaced at frequent intervals.*

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There are a number of reasons why a shooter might want to remove or change the buttstock on a typical shot-gun or rifle with a two-piece stock. The stock may be a poor fit for the intended shooting purpose. One stock may have too high or too low a comb, or the stock may be too short or too long for the shooter. Seldom does one stock fit every shooter who might want to use the gun. And in cases where the gun can be used as either a rifle or a pistol, the quick-change feature is a real plus.

Normally, to gain access to the stock-attachment bolt, the time-consuming task of removing the recoil pad or buttplate is required. Following this, an extra-long screw-driver or socket wrench extension is needed

to remove and replace the buttstock. The recoil pad or buttplate must then be replaced before shooting. This incon

**Making the Through-Bolt Assembly** The quick-change bolt assembly is made from readily available materials and with common shop tools. I used a 3/8-inch steel rod as the main bolt which just fit through the forward hole in the stock. The main bolt is cut a bit long and squared at one end for drilling and tapping. A stud bolt, with the same thread size as the original stock bolt, is then screwed into the end of the main bolt. This is all done in the lathe so the stud bolt is in perfect alignment with the main bolt.

The stock bolt thread I used was 1/4-28. I used a 1-3/4-inch stud of hardened bolt steel. Brownells Accu-Weld was applied to the stud threads to bond the stud permanently in position. Be sure sufficient thread extends beyond the end of the main bolt to fully thread into the action. Next, a collar is made and attached to the main bolt. This is positioned to form the same bolt length beyond the collar corresponding to the length of the original stock bolt, including the new stud thread.

The collar can be threaded onto the main bolt or attached permanently with a pin and/ or cold weld bonding. A thin washer can be used between the collar and the stock wood, but may not be necessary if the collar is smooth and square. A 3/8-inch threaded rod could also be

## MAKING A QUICK-CHANGE BUTTSTOCK-ATTACHMENT SYSTEM CONTINUED

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The Allen wrench is seen in position. The unit is ready for installation by simply screwing the buttplate in position. The smaller 1/4-28 bolt is threaded into the larger 3/8-inch through-bolt, used as the primary bolt and a double nut securely tightened to attain the proper thread depth. A washer would be used in this application at the nut juncture. Next, a hole is made in the buttplate for access to the socket head for use of an Allen wrench to turn the main bolt.

This hole must be precisely located to correspond with the exact stock hole center. I simply used a 3/8-inch rod with a pointer to mark the underside of the rubber buttplate. I then used a sharp end mill to cut through the plastic surfaces and a circular cutter to neatly

cut through the outer surface of the rubber from the opposite side. The outer hole is made exactly the same size as the 1/4-inch socket head which I used to extend the main bolt.

The buttplate hole is cut at the same angle as the main stock bolt to ensure a non-binding passage through it. Finally, the terminal end of the main stock-bolt assembly is made up with a 1/4-28 socket-head bolt, threaded in line into the 3/8-inch shaft. Carefully mark this length by laying the buttplate in position at the end of the stock, allowing for final thread depth. When you are sure of the exact socket-head position, this bolt can be bonded permanently in place.

But before I did this, I put an ultra shine on the socket head for smooth contact with the buttstock rubber. The idea is to keep things neat so all you'll see is the socket head positioned just beneath the surface of the buttplate. Conclusions Where a stock can conveniently be changed, this simple modification can offer worthwhile advantages to the shooter. Stock fit is very important, and in this way one gun can satisfy the needs of more than one shooter.

Perhaps most importantly, removing and replacing the buttstock can now be accomplished in less than half a minute.

## PEOPLE &amp; COMPANIES

# Installing and Testing The Pac-Lite .22 Receiver

*The Tactical Solutions Pac-Lite aluminum upper receiver turns the Ruger into a lighter, more accurate .22-caliber plinker.*

BY ROBERT K. CAMPBELL JANUARY 2005

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The Ruger 10/22 rifle has received its fair share of modification in the form of special barrels, stocks, and other operating mechanisms, but only lately has the Ruger semi-auto pistol received the same attention. The pistol, first introduced in 1948, is a great little gun, accurate, reliable, and generally responsive to custom touches. It's not the easiest handgun to assemble and reassemble, though the manual is simple enough, and anyone familiar with handguns will master the maneuvers in short order.

The owner of the Ruger MK I and MK II, and now the new MK III, would be well advised to learn to field strip the piece on his own. The only malfunctions I've observed with this pistol seem directly related to cleaning and maintenance, and this is often because of the difficulty in taking the gun down for a thorough cleaning. Recently, I had the chance for a refresher course on field stripping when I tested anew upper receiver for the Ruger pistols.

The Pac-Lite upper unit, manufactured by Tactical Solutions is a well-made barreled upper receiver manufactured of aluminum for the most part, with a steel insert for the barrel. As such it is very light. Even on my Ruger MK I, the unit barely tripped 23 ounces, and it

would go under 20 ounces on the polymer frame .22/45. The Pac-Lite bull barrel offers good balance and excellent accuracy (see Figure 1). With quality ammunition such as Winchester's T 22, I was able to secure a 25-yard five-shot group of one inch.

Even garden-variety promotional ammunition such as the Winchester Wildcat seldom strayed over 1-1/2 inches for five shots. This is approximately the same level of accuracy displayed by my 6-inch bull barrel Ruger target model! This is unheard of for such a light assembly, but modern technology is achieving things that were unheard of a generation ago. The Pac-Lite assembly also sports excellent fully adjustable sights and a rail designed to accommodate an optical sight.

I am not a fan of optical sights on handguns, but here is a lightweight .22 accurate enough to make good use of the light handgun scopes currently available. When I received the Pac-Lite unit, it was obvious the assembly was of high quality. I followed the standard field-stripping procedure for all Ruger pistols. All went smoothly. Units are made to fit the Ruger MK I, II, and III series, as well as the .22/45. The pistol at the bottom of the photo sports the standard Ruger bull barrel.

## INSTALLING AND TESTING THE PAC-LITE .22 RECEIVER CONTINUED

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*Original caption: Right top and bottom: Seen here from both sides, the quality and precision manufacturing of the Pac-Lite uppers are impressive, and the assembly was mounted on the pistol and ready for testing in roughly 15 minutes. It doesn't always go that quickly, however, as I was to learn later. To install the unit, first make certain the pistol is unloaded. Remove the magazine; work the bolt three times to ensure the gun is unloaded and the chamber is clear; then visually inspect the chamber.*

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When the bolt is racked to clear the pistol, the gun will be cocked. If the gun is cocked, you will not be able to disassemble the pistol. Carefully point the pistol toward a safe backstop and press the trigger. (The safety must be off, of course.) The Ruger has a firing-pin stop that allows safe, non-destructive dry fire, uncommon in .22-caliber handguns. The point of the mainspring housing can be caught and pulled with a paper clip or even a strong string.

Screwdrivers have been used, but they will mar the surface. I use the hooked end of a Smith and Wesson mainspring. The pointed tab on the rear of the mainspring housing should now be pulled out. This will unlock the bottom of the mainspring housing. The housing can now be swung out and pulled down. Some will be quite tight, even on a wellused handgun. As I mentioned, many Ruger owners never take their guns down for a thorough cleaning due to the supposed difficulty of the field-strip procedure.

The Ruger .22 semi-auto Figure 1. Accuracy Results (25 yards, firing five rounds from a bench rest) Winchester T 22 2.4 in. 1.0 in. Winchester Wildcat 2.5 in. 1.25 in. Winchester Powder Point 2.6 in. 1.3 in. PMC Zapper 3.5 in. 2.0 in. CCI Mini Mag 2.4 in. 1.5 in. is not as simple as a Glock, but is not a problem with a little practice.

The mainspring housing sometimes must be rocked on a table top or other sturdy stabilized surface.

The retaining button on the top of the receiver may need to be pressed down to help get the housing out. (The retaining button is simply the top of the mainspring housing.) Remember, pull straight down on the mainspring housing. It must clear both the upper and lower receivers, sometimes referred to as the frame and receiver. Once the mainspring housing is broken down, the receiver can be moved forward off the frame. I've run into several that were very tight. Some were new and others had picked up corrosion.

Tapping the frame while supporting the receiver will usually work with stubborn frames. Once the receiver is clear of the frame, the bolt will back out of the receiver easily. Note: When reassembling the pistol with the Pac-Lite unit, be certain the firing-pin stop is in place. If the pistol is fired without the stop in place, the receiver can be damaged. Factory w/Pac Lite 6-inch Barrel 4.5-inch Barrel aged and the aluminum Pac-Lite unit could be ruined.

The hammer and strut are now visible from the rear of the pistol. The hammer can be pushed forward with a small punch or screwdriver. You need to press the trigger while doing this. When fitting the mainspring housing to the gun, the typical problem encountered will be a hammer strut in

the way of the mainspring housing. The gun should be pointed down and shook to ensure proper positioning before fitting the housing.

To properly engage the mainspring and hammer strut, you must point the gun into the air and swing the mainspring housing closed. There will be considerable spring tension, but you should be able to pop the mainspring housing back in place. The final move is to slide the locking tab into place and you're done. Pull the trigger to check that the gun dry fires properly.

I was able to go through the process several times without a hitch, but in the final few drills, when I repositioned the original Ruger Standard Model upper, I found that I had mis-positioned the hammer strut no less than three times. After a half dozen successful attempts earlier, and with no problem from the very first attempt, I was convinced I had broken something. Not so, I simply was experiencing difficulty with the hammer strut. After a few relocations, all was well.

Overall, I found the Tactical Solutions Pac-Lite barreled receiver to be a good addition to any .22-caliber Ruger. The increase in accuracy, combined with a decrease in weight, is a considerable achievement. This makes the lightweight .22 a very capable field gun, well worth consideration for any task a .22 is up to. ■

## MAINTENANCE &amp; REPAIR

# Repairing and Restoring the Crosman Power Master 760

*This type of rebuilding project can be a valuable learning experience for anyone who wishes to learn the mechanics of pneumatic air systems.*

BY ROBERT DAMOTH JANUARY 2005

ORIGINAL PP. 18-22

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I wouldn't think that the Crosman Power Master 760 would need an introduction, since this air rifle has been in continuous production since 1966. Briefly, the 760 is a single-shot bolt-action air rifle, propelling a .175 caliber BB or a .177-caliber pellet. Crosman calls it a short-stroke level pump, or multi-pump pneumatic. Over 11,000,000 have been produced to date in many variations. To make the identification of air guns a little easier, there are several fine books. I found *The Blue Book of Airguns* by Dr.

Robert D. Beeman and John B. Allen to be particularly useful. The Blue Book gave me the information I needed to identify the variant I had acquired. It's the Second Variant, which is self-cocking, with a styrene stock and forearm, and scope-mount grooves. The Second Variant was produced from 1971-74. That would put its age at 30 years or thereabouts, and believe me, it looked that old and then some. Until I intervened and rescued it, this air rifle was destined for the scrap heap.

Abuse and years of neglect were written all over it. I decided that, if I could obtain the parts to restore it, fine; and if not, I could still gain some useful knowledge. In addition to an overabundance of rust, there was a piece of the forearm missing. The air system was kaput—totally incapacitated. But with the exception of the missing forearm piece, it appeared to be complete.

First on my agenda was to contact Crosman Corporation East Bloomfield, NY 14443; for a copy of the schematic, parts and price list, and an owner's manual, if possible. All big "ifs." Imagine my surprise when the young lady on the other end of the line said: "Yes, we still carry parts for that variant, and yes, we have the literature. I'll mail it right out." Ten days later, I had the literature from Crosman.

But, unfortunately, there was one very important section missing from the owner's manual—the disassembly instructions. That, of course, did not discourage me. Disassembly and Inspection Crosman recommends a maximum of ten pumps to pressurize this air system.

Upon trigger release, air pressure forces the sear block rearward, Top of page: The Crosman Power Master 760 air rifle has been in continuous production since 1966, with over 11,000,000 produced to date, which allows the valve cap to move forward off its seat on the exhaust valve body. This releases its charge of air upward, and out the hole in the top of the exhaust-valve ring.

Because we lack the specific disassembly instructions, I'm going to be using the time-honored gunsmith's method; that being, pay close attention to what you're doing and to the schematic. Thinking things out, using a logical sequence for disassembly, and keeping parts in order as they are removed, makes reassembly that much easier. I've used this method many times in the past, with complete success. As always, use screwdrivers that fit the slots, and roll-pin punches that fit the roll pins.

I first removed the front and rear sights, putting these in a small bag to keep them from getting lost. The front sight was still in good condition; the rear was a little rusty.

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(I'll attend to this later.) Next to be removed was the stock. This required a thick-blade screwdriver. The stock appeared to be in good condition, but needed a good cleaning, and the stock bolt was in surprisingly good shape and had no rust. The stock does not necessarily have to come off for disassembly; removing it just makes the gun easier to work on. Up next is the forearm. You'll need a 1/8-inch roll-pin punch. I used wooden blocks to support the receiver, and one to support the forearm.

Be careful, you don't want to bend the lever or link assembly, so make sure your support is good. Drive the pins out in either direction. My forearm was broken off at the rear pin hole. How this got broken is a mystery. From this point on, all parts should be placed on the bench in the order in which they are removed. Subassemblies can be placed in bags if need be, to keep them from getting lost. There are some small springs and other small parts that you'll have to keep a close eye on, so be on guard.

The exploded drawing included here is for the variant made after July 1975. There were a few minor changes made at that time, mostly to the pump rod assembly. Disassembly continues with removing the front barrel guide (760-0080, but before you can do that, you have to remove the pivot pin (760-071). The barrel guide serves two purposes. First, it gives forward support to the barrel, and second, it gives forward support to the compression tube.

Removing the roll pin frees the barrel guide and will also free the lever (761A023). The lever pivots on this roll pin. Using my wood blocks again for support, I removed this pin with a 5/32-inch roll-pin punch. Here again, be careful, you don't want to disfigure the end of the tube. A small Allen wrench will be needed. At the bottom is the left half of the receiver half with the trigger assembly in place. To loosen the set screw (788-004) on the top of the barrel guide.

Slide the guide off to the front and set it aside. All support to the forward part of the barrel and compression tube have been removed, so don't let them flop around. The lever and link can remain as is for now. When you separate the receiver halves, keep an eye on the BB detent (760-018) and its spring (760-029). Now remove the two receiver screws (760-025) on the right side, then the clamping screw (760-024) along with its lock washer (140-095). Remove the two clamping screws along with their washers.

On the back of the receiver you will see the BB retainer button (760-021). Attached to this button is its spring (760-036). Cup your right hand over the top of this button, reach down to the trigger with your right thumb, and disengage the trigger from the sear block by pulling it slightly to the rear with your left hand, and lift up on the left half. The BB detent and its spring will no doubt fall into the receiver half. There is a trick getting these back in the gun upon reassembly, which I'll explain later.

The barrel (760-004) and the compression tube (760-003) remain in the right receiver half; take note of their location. Also take note of how the breech bolt aligns through the right side of the receiver. Fix it in your mind, for it will help you greatly when it comes time for reassembly. With your left hand, grasp the barrel and compression tube and move them forward until the breech bolt clears the barrel. You can now lift them out.

What we have left in the receiver halves are the trigger assembly in the left half, and the bolt-latch assembly in the right half. Let's not forget the stock-bolt nut (99-007). The stock bolt nut is something you don't want to forget, especially when it comes time for reassembly. To disassemble the trigger group, with a small screwdriver lift up on the bottom of the trigger spring (760-030). This spring also doubles as the safety-button spring (760-017). Take note of the relationship.

Let the safety button fall free, and pull the spring, pivot pin, and trigger clear of their recess. The BB-port cover (760-020) and its spring (760-028) can be removed if necessary. To remove the bolt-latch assembly in the right side, first remove the spring nut (760-039), bolt-latch spring (760-038), bolt latch (760-035), and the pivot-pin bushing (760-040). Place the barrel and compression tube in front of you and take a good close look.

Notice what appears to be a piece of rubber between the barrel and compression tube. This is the

## REPAIRING AND RESTORING THE CROSMAN POWER MASTER 760 CONTINUED

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*Original caption: Left top: This is the compression tube showing the center hole. The threaded hole in the check-valve body must align with this hole. Left bottom: The hole in the top of the exhaust-valve ring must align with its corresponding hole in the top of the compression tube. is not, reassembly will be impossible.*

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breech gasket (760-037). Inside this gasket you will find the gasket sleeve (1930-016). Remove the barrel set screw (761-015) and let the breech gasket, along with the sleeve, fall into your hand. If the gasket seems hard or brittle, replace it with anew one. We now come to the part that makes this rifle tick, the compression tube. It just might take some effort to pull this down, and a little more to put it back together. Before you pull this unit down, look it over very well.

At the rear of the tube, on the underside, you will notice a slot. Inside this slot you will see a portion of a spring. This is the sear spring (111-030). You will also see the rear end of the sear block (760-011). This is the location where the cam that's at the top of the trigger makes contact with the rear of the sear block. When the air system is pressurized, the cam stops the sear block from moving rearward. Take note of the center hole on the left side of the tube.

This is a very important hole as you might guess. Don't forget to check out the hole in the top where you removed the breech gasket. Now, remove the cross pin (760-034) at the rear of the tube. Tip the tube up and the sear-block stop (760-013) should fall out, along with the sear spring and sear block. Go to the other end of the tube, grasp the lever-link assembly, and being careful to avoid bending the link, pull it straight out.

This might take some effort—mine certainly did—as you're pulling out the piston assembly and related parts. It's all attached to the link and will come out as a unit. Once removed, take a good look at the piston assembly (760-042). The cup and felt wiper are what you want to inspect. If the cup looks chipped or cracked or if the wiper is worn out, order new ones. Also, check the condition of the link-pivot pin. Set this aside for now.

You're going to need a length of 1/4-inch dowel or something similar to force the rest of the air system components out of the compression tube. Go in from the sear-block end, and force them out the lever-link end of the tube. They will come out as one unit. This is the only direction they will come out. If you look on the bottom of the tube you will see a slit, just forward of the sear block, that keeps these components in this area of the tube. We're now looking at the final components of this system.

Take note of the threaded hole in the check-valve body (130-005). This hole must be aligned with the center hole in the left side of the compression tube. If it

The left front clamping screw (760- 024) anchors the check-valve body in place inside the compression tube. Also take note of the O-ring (130- 035) on the front of the valve body. Inspect it for flat spots. If it looks good, you can leave it in place, if not, remove it.

The exhaust-valve body (140-004) screws onto the checkvalve body (right-hand thread). You might be able to unscrew this with your hands. If not, vise grips might be in order, but be careful not to mar the components.

Once removed, you will find one O-ring (130-034), the check valve (1400A29), valve spacer (760-041), and the check-valve spring (111-026). My components would not come out of the check-valve body. They were frozen in place from dried up oil. A small shot of penetrating oil took care of this nicely. Also, the O-ring was shot, which is why the air system had failed in this gun. Inspect your components well. If you have any doubts, replace them. Next we have the valve cap (130-057) and its O-ring (140-058).

Again, check for flat spots. Last we have the exhaust-valve ring (140A056). Have you taken note that it slips over the valve cap, and that it has a hole in one side? Upon reassembly, this hole should align with the hole in the top of the compression tube. Study all these components well, and get them set in your mind for reassembly. Reassembly Tips If you have to order parts, be sure of the variant that you have.

Due to the age of my 760, plus the abuse and neglect it had received, I chose to order the complete air-system seal kit; that set me back \$12.51. I also ordered anew forearm (\$3.26), plus

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Crosman Power Master 760 Bolt-Action Air Rifle (Specifications subject to change without notice) 99-007 Nut 99-055 Front Sight Hood 101-019 Lock Nut 101-033 Plunger Guide Pin 111A026 Check Valve Spring 111-030 Sear Spring 130-005 Check Valve Body 130A005 Check Valve Body 130-034 O-Ring 130-035 O-Ring 130-057 Valve Cap 130-059 Forearm 140-004 Exhaust Valve Body 140A056 Exhaust Valve ring 140-058 O-Ring 140-095 Lock Washer (2) 160-028 Front Sight Screw 160-029 Rear Sight Screw (2) 262-200 Rear Sight 600-024 Screw 760D008 Front Barrel Guide 760-009 Pump Guide 760-010 Forearm, Wood 760G010 Forearm, A.

B. S. 760-011 Sear Block 760-012 Gold Trigger 760-013 Sear Block Stop two forearm pins (\$.50 each). With shipping and handling (\$4.00), it came to a grand total of \$20.77.

Just for the fun, on a recent trip to my local Wal Mart, I looked for the Crosman 760-015 Stock Screw 760-016 Trigger Pivot Pin 760-017 Safety 760-018 BB Detent 760-020 BB Port Cover 760-021 BB Retainer 760-024 Clamping Screw (2) 760-026 Receiver Screw (2) 760-027 Barrel Set Screw 760A027 Barrel Set Screw 760-028 Cover Spring 760-029 Detent Spring 760-030 Trigger Spring 760-034 Cross Pin 760-035 Bolt Latch

760-036 BB Retainer Spring 760-037 Breech Gasket 760-038 Bolt Latch Spring 760-039 Spring Nut 760-040 Pivot Pin Bushing 760-041 Valve Spacer 760A041 Valve Spacer 760-042 Piston Ass'y 760D043 Lever & Link Ass'y 760-044 Breech Bolt Ass'y 760-046 Exhaust Valve Ass'y 760A046 Exhaust Valve Ass'y 760B, and found it selling for \$19.95.

Crazy, I suppose, but think of all the knowledge I gained. Before reassembly, be sure that all the air components are clean.

No 760-050 Bolt Knob 760-053 Lock Washer 760-054 Lock Washer 760-058 Space Washer 760-059 Trigger 760-061 Lock Washer 760-070 Stock Screw 760-071 Pivot Pin 760-072 Pivot Pin Retainer 760A106 Forearm Pin (2) 760-140 Pump Cup 761-005 Trigger Spring 761-006 Front Sight 761-015 Barrel Set Screw 761A023 Lever & Link Ass'y 766-107 Sight Elevator 781-A012 Barrel Band Screw 788-004 Barrel Band Screw 788-005 Barrel Band Nut 1322C020 Pump Rod Ass'y 1400A029 Check Valve 1930016 Breech Gasket Sleeve lubricant should be applied inside or outside the air-system components, other than a very thin film on the O-rings.

**YOU CAN PUT A LITTLE LUBE INSIDE THE COMPRESSION TUBE, BUT DON'T**



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get carried away; use just enough to protect the metal. While I waited for my parts order to arrive, I had a little restoration work to do. I cleaned the barrel with #0000 steel wool, degreased the metal with some isopropyl alcohol, and to match the factory bluing, I used some Formula 44/40 Instant Blue from Brownells (a perfect match). I did some touchup on the compression tube, a little on the pump lever and rear sight, and the little air rifle looked darn good. When my parts arrived, I had to refit the forearm.

Pin location was not the same, which required drilling anew hole for the rear pin. This forearm was ABS; the original factory styrene one was not available. By the way, don't forget to put the stock-bolt nut back in the receiver before you button everything back up. If you forget, you'll be sorry. Just ask me. I also promised you a reassembly tip concerning the BB retainer and its spring, as well as the BB detent and its spring.

With the right receiver half down, and everything in its proper place, put the BB detent in place in the side of the barrel. (Don't forget its spring.) Place the BB retain-

er and its spring in position, and with two small strips of masking tape, tape it in place, front and rear. When you set the left receiver half in place, be sure the BB detent spring is in its recess in the receiver, pull the trigger back slightly to clear the sear block, line it up, and pull the tape free.

The receiver screws come next, then the clamping screws. Conclusions/Recommendations I enjoyed this project, and gained some useful knowledge. The guidelines and methods used here can be used successfully with other makes and models of multi-pump pneumatics, as long as you're willing to pay close attention during disassembly. I've heard it said that the air system in the Crosman 760 is complex. Nonsense, I say. I can almost put it together blindfolded.

Old junkers, like the one I ran across, can be found at yard sales, pawn shops, and through friends or neighbors. When you run across one, don't pass it up. It's one good way to gain knowledge of air guns and how they function. ■

## METALWORKING

## Reader Forum

BY AMERICAN GUNSMITH EDITORS JANUARY 2005

ORIGINAL PP. 23-24

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**W**inchester Model 77 Clip I have a Winchester M77. When the rifle is fired, it ejects the empty, but does not cock the gun. The bolt hangs up on the new cartridge as it goes forward, and because it is not cocked the ejector sticks out and catches the end of the rim on the new cartridge. I think the springs are too strong for the fired cartridge to cock the mechanism. I would like to cut off the spring, but there are two springs which could be cut—one on the operating rod and the other on the hammer rod.

**Dick** After speaking with a Winchester/USRA technician who remembers the M77 autoloader well, we believe the problem is caused by ammunition or dirt, and not the clip. The rifle is showing definite signs of short cycling with high speed .22 LR. Try using standard-velocity roundnose ammo after a thorough cleaning of the action. It is very probable your 40-plus-year-old rifle (it went out of production in 1963) is seriously fouled. Such fouling can solidify and slow down the action.

**Stuck Barrel-Jacket Bushing** I'm trying to remove a rusted-in barrel-jacket bushing from a Remington Model 8 barrel jacket. Your April 03 article on the Model 8 refers to this part as "a slotted ring." I've tried heating the barrel jacket and dousing the joint with Break Free, and standing it on end and soaking it in a cup of Kroil for four months, and it still won't budge.

I'm holding the barrel jacket in fitted wooden blocks and using a piece of scrap metal that fits the notches in the slotted ring, and applying as much hand pressure as I can to turn the bushing, and it will not budge at all. I don't want to damage the bushing or

the barrel jacket, but in order to do a decent job of cleaning this old rifle, that bushing really should come out. I really have been working on this for six months. Any suggestions?

Is there a choketube wrench that is a good fit and could be used to apply more torque without tearing something up? As a last resort, I'm willing to sacrifice the bushing, figuring that I can probably get another one pretty cheap, but how do I get it out without tearing up the barrel jacket?

**Ben Wolcott** Our response comes right from the pages of an early Remington field-service manual: "Use a spanner wrench on the barrel nut at the muzzle and hold the barrel extension from turning by inserting a screwdriver blade in the slot of the extension. Turn off barrel nut. Pull the barrel to the rear and out of the barrel jacket. Use a spanner wrench on the barrel-jacket bushing and unscrew it from the barrel jacket.

Do this carefully so as to control the recoil spring and prevent it flying from the barrel jacket." We recommend you locate and have a replacement barrel nut on hand before following these instructions. Finding one may not be easy. Source for Owner's Manuals I've noted that there are a lot of folks looking for documentation on various firearms.

While looking for a manual for my Remington 742, I stumbled across a site ([www.noldensfirearmsresearch.com](http://www.noldensfirearmsresearch.com)) authored by a man named Harley Nolden who has a modest collection of manuals for various arms and will email.jpg versions at no charge—a tremendous service to offer. While he doesn't charge anything, he appreciates a note of gratitude. He does this out

of the goodness of his heart (he professes to be an "old guy" and this keeps him thinking and busy).

A nice way to say "thank you" might be to take the time to scan any firearm manuals he does not have listed, and email them to him so he can help others. Dusty Baker Thanks, Dusty, for the tip.

**Iver Johnson Stock** I have a customer who brought me an old Iver Johnson shotgun with a cracked stock. I went to Numrich, but they do not have any stocks on hand. Any suggestions on where to find one? If you can't repair it by pinning, filling, and refinishing, try Boyds Gunstock Industries. They may have a pattern for the stock of your customer's gun. If so, they can turn out a fresh stock for a reasonable price. If they don't have a pattern, they can still make a stock off the old one.

That, however, would cost considerably more money. Lathes and Mills I've purchased the American Gunsmithing Institute Professional Gunsmithing Course and have taken a basic machine-shop course at our local community college. I am now in the process of building a garage/workshop, and have been looking at lathes and mills to put in my shop. I've looked at the Grizzly Model G4003 and Enco Models BD110-1353 and BD110-2038. Prices run from \$2,100 to \$2,500.

Would either of these be suitable for a small gunsmithing shop, or can you recommend a more useful machine? I will be retiring from my equipment repair tech job with the state of Virginia in about three more years, and would like to do more gunsmithing work besides replac

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(continued from previous page) ing small parts, stock work, minor adjustments, and scope mounting. Any information would greatly be appreciated. Robert Adams We suggest you contact Blue Ridge Machine & Tool Talk over your goals with them and don't forget to mention you are planning to do both metal and woodwork with the lathe. These folks are much more knowledgeable on current machine tools than we are. Also ask them about a vertical milling/drilling machine.

S&W Followup Referring to the letter titled "Mistimed S&W" in the Reader Forum in the May 04 issue, I have some additional information to provide. The S&W 629 is not "mistimed"; it's suffering from the same problem that all N-frame revolvers in .41 & .44 Magnum had before the Magnum Improvement Program (M. I. P.) at S&W was initiated.

The problem has two parts, neither of which can be corrected by fitting an oversized hand or leveling the ratchet lugs: First, during the recoil from heavy loads, the cylinder stop bounces out of its notch in the cylinder, unlocking the cylinder. And second, cylinder end play allows the cylinder to "rattle" longitudinally along its axis of rotation, bouncing the hand away from the ratchet, and essentially freeing the cylinder completely.

The cylinder, unimpeded by either the hand or the cylinder stop, essentially sits still (it's called inertia; it comes from Newton's Second Law) while the revolver rises and twists in recoil. Because of S&W's RH rifling twist, the revolver rotates "away" from the fired chamber, leaving it ready to be brought up for firing when the action is next cycled. The solution to this problem has three parts: First, remove the cylinder end play. S&W's M. I.

P halved allowable tolerances in production revolvers—you don't see this problem occurring in newer S&Ws. You can stretch the yoke or use Powers' shims (from Brownells) after truing the end of the yoke. I prefer the shims, because each shim added doubles the wear area and creates a longer-lasting repair.

The ideal range of end play is 0.0005" to 0.001 inch, but beware — if the gun's owner likes to go to the range and burn a couple of hundred Magnum loads as quickly as possible, heat expansion may cause cylinder binding. I rarely have any problems with S&Ws with end play approaching 0.0015 inch, but heavy handloads can still cause sporadic "backups." Second, increase spring tension on the cylinder stop. The easiest way is to put a small steel ball (a ball bearing or such) inside the cylinder-stop spring pocket.

Don't overdo it; it doesn't take much once the end play problem is resolved. And third, don't shoot maximum loads in the older S&W N-frames. Heavy loads simply beat the revolver to death. If you just must shoot the absolutely hottest load you can cook up, get a T/C Contender. If you need more power than factory loads provide (and they're plenty hot for the pre-M. I. P. revolvers), get more cartridge. Sorry, but the Smith & Wesson design and construction won't allow you to make a .454 Casull out of your .44 Magnum.

Russell Corbitt CZ Rifle Safety CZ is manufacturing a fine rifle on their Mauser action. The problem is, the safety works backwards (rear to fire, forward on safe). Is there a reliable way to convert the safety to work forward to fire? This is important on a dangerous-game rifle, since you may not have time to remember which way the safety works. Thanks for any ideas. Greg Horne CZ tells us there is no way to "reverse" the safety. It was manufactured to operate one way and one way only.

What you might do is affix a red dot to the stock or action to indicate the "fire" position. The other way—though not ideal for carrying a rifle—is to place the safety on fire and remember to keep your finger off the trigger until you bring the gun to bear.

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