



JUL 2022

DIGITAL ARCHIVE
EDITION

PRECISION ARMS WORKSHOP

AND THE AMERICAN GUNSMITH ARCHIVE

A TECHNICAL JOURNAL OF CRAFT, REPAIR & RESTORATION

07

ARCHIVE ISSUE NUMBER

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MUZZLE ATTACHMENTS

BANTAM CNC TOOLS • SPRINGFIELD ARMORY M1A MAINTENANCE • MINI BENCH MILL FOR GUNSMITHING • THE 45 MA...

ORIGINAL METHODS. MODERN ACCESS.

ARCHIVE EDITION 223

DIGITAL ARCHIVE EDITION

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MACHINING

Bantam CNC Tools

BY AMERICAN GUNSMITH EDITORS JULY 2022

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Bantam Tools builds desktop computer numerical control machines with professional reliability and precision. These machines are easy to set up and ready to use right out of the box. The Bantam Tools base machine is a three-axis desktop CNC milling machine ideal for machining aluminum parts, has a working volume of 7×9×3.5", a 250W 1/4 HP motor, ER-11 tool collet, and is fully enclosed and ready-to-use right out of the box. The base price is \$4,999.

In response to customer demand, Bantam Tools has added accessories to make CNC milling even better. Made for the Bantam Tools desktop CNC machine, the Air Blaster Accessory allows the CNC machine to increase chip evacuation and airflow at the same time. This increases tool life, decreases cycle times, and improves material finish, making in-house prototyping and part making better. It is ideal when working with heavy debris materials like aluminum or when machining larger chips.

Attached to an air compressor, the Bantam Tools Desktop CNC Air Blaster Accessory has a powerful air flow that can be adjusted using a flow-rate knob.

It can also adjust the nozzle to make sure you are blowing air at the right angle for your cuts. "Our customers have been asking for an air blaster and we delivered," said Bre Pettis, CEO of Bantam Tools. "The Bantam Tools Desktop CNC Air Blaster Accessory helps improve a part's finish, increases

spindle life, helps increase material removal rates, keeps temperatures down, and overall, increases the lifespan of your machine and helps make better parts." Nicholas Manousos, executive director of the Horological Society of New York is a Bantam Tools remote resident and beta tester. "The air blaster accessory helps me see toolpaths during longer jobs and makes it easier to catch problems while prototyping that are hard to uncover when simulating in my CAD/CAM software." The Air Blaster is available for \$199.

The CNC Vacuum Accessory attaches to the Bantam Tools Desktop CNC Milling Machine, allowing for live vacuuming to increase chip evacuation and decrease clean-up time. The vacuum accessory allows for better material visibility, decreased iteration time, decreased clean-up time, a smoother, better finish and helps maintain the life of end mills.

The Bantam Tools Desktop CNC Vacuum Accessory is available for \$169. "Our customers have been requesting more accessories to go with their Bantam Tools Desktop CNC Milling Machines, and we have been hard at work creating new accessories such as the Air Blaster and Vacuum Accessory. Both integrate seamlessly with our milling machines," said Bre Pettis, CEO of Bantam Tools. To learn more, visit BantamTools.com or follow on Instagram, LinkedIn, Twitter, and Facebook at [@bantamtools](https://www.instagram.com/bantamtools), or on Medium.com [@CNC-Life](https://www.medium.com/@CNC-Life).

MAINTENANCE & REPAIR

Springfield Armory M1A Maintenance

Here's how to disassemble and service the action and gas system of the M1A rifle.

BY GLEN CALVERT JULY 2022

ORIGINAL PP. 3-7

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The M1A is one of my favorite rifles. It's an old school battle rifle made of steel and wood. The version I own is the Loaded model in 308 Winchester and it has proven to be very accurate. It has the 22" National Match barrel, NM front sight blade and rear aperture sight, and a 4.5-pound twostage trigger. There's a common perception that along barrel is more accurate than a short barrel. Ballistically speaking, this is not true.

A short, stiff barrel is less likely to be affected by harmonics, temperature, etc. than a longer, less rigid barrel. A longer barrel helps accuracy when using iron sights by increasing the sight radius. A longer barrel also generates higher velocity, depending on the type and amount of powder. I enjoy hitting steel plates at 200 yards with the iron sights; it's more of a challenge than using a scope.

Another benefit of the 308 Winchester is that a 168 grain bullet launched at 2600 feet per second makes a much louder clang when it hits steel compared to a 69 grain bullet from a 5.56/223 Remington rifle. Let's get into maintaining M1A

rifles. Disassembly Remove the magazine if installed. Fully retract the bolt and make sure the chamber is empty, then let the bolt go forward. Invert the rifle and rest the receiver on a wood block to ensure the rear sight doesn't hit the bench.

Unlatch the trigger guard by pulling the rear of the guard rearward and upward. It may be necessary to install around tool like a punch in the hole in the rear of the trigger guard to get enough leverage to unlatch it. Rotate the trigger guard forward to release it from the side plates and pull it from the receiver. Typically, the stock can be lifted off the action with it inverted.

If it doesn't want to come off, hold the stock and action together while still inverted and tap the butt of the stock on a padded surface. The action will drop free. Bolt Disassembly The only tools needed to disassemble the bolt are an empty 30-06 Springfield case, a 1/8" diameter punch, and a hammer. After removing the action from the stock, set it on the bench, lock the bolt

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Receiver is sitting on a wood block to protect the rear sight. Trigger guard is pulled rearward and upward to unlatch it. Around tool may be needed to provide adequate leverage. open and install the empty case in the chamber. The 30-06 case is obviously longer than a 308 case and will protrude. Allow the bolt to go forward and push the operating rod handle forward to get the extractor to clamp onto the rim of the case. Invert the action and locate the bottom of the extractor in the bolt.

Place the punch on the extractor and tap it with the hammer until the extractor pops out. I put a shop towel under the receiver to catch the extractor. The firing pin is released when the extractor is removed. The punch is held in the bolt by the ejector and spring. Pushing the op rod handle forward compresses the ejector spring and releases the punch. The ejector, spring, and firing pin can now be removed from the bolt and the 30-06 case removed from the chamber.

The extractor spring in my rifle was stubborn and didn't want to be removed; I didn't want to force it so I left it in the bolt. Op Rod Removal The recoil

spring and guide are removed with the action inverted. The end of the guide is retained by a pin in the receiver. Compress the recoil spring slightly and pull the pin to the side so the end of the guide can be lifted out of the receiver. The spring and guide are then removed.

The op rod is moved rearward until the handle lines up. Far removed, pushing forward on the op rod handle allows the punch to be removed. The ejector is visible at the front of the bolt. Ejector, spring, and firing pin can be removed.

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with the notch in the receiver below the rear sight windage knob. The notch can be “felt” by pulling up on the op rod while moving it rearward. Depending on the rifle, it may be possible to pull upward on the handle and pop the op rod loose. Grease is added to the cup and it’s pressed onto the roller. My rifle required the use of a flat blade screwdriver with tape wrapped around the blade and a plastic hammer.

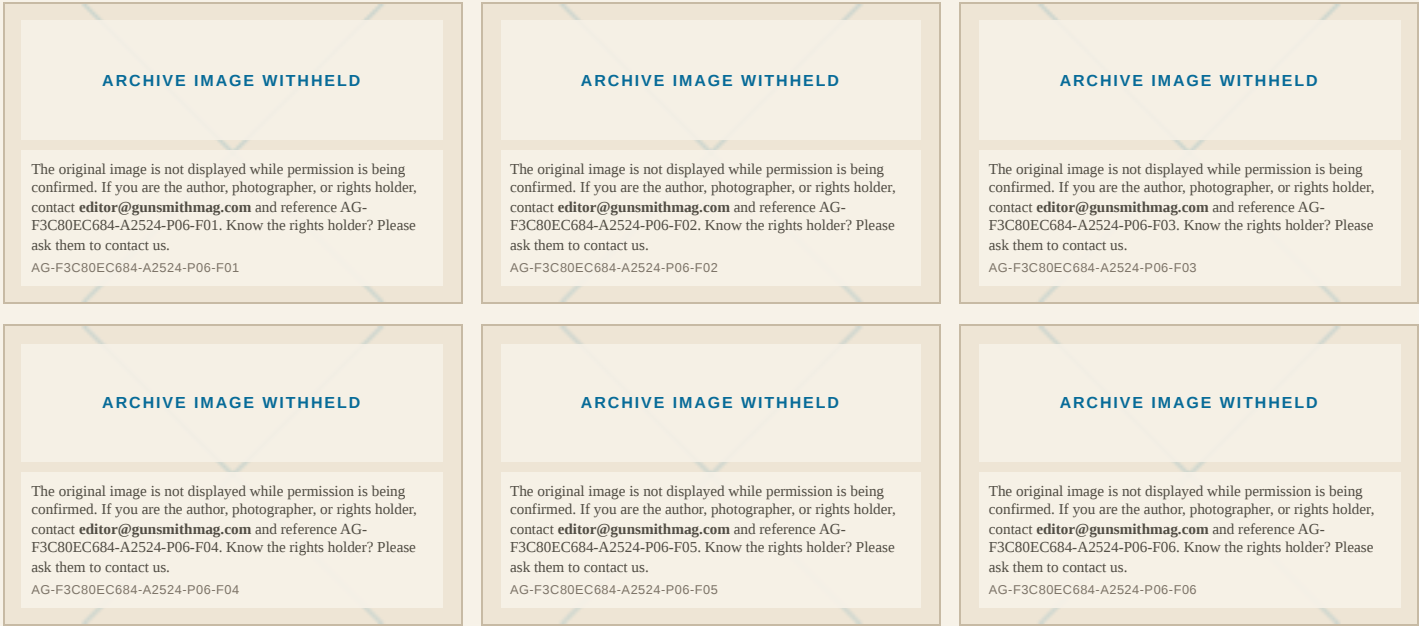
The action is set on its left side with the op rod handle pointed up and located at the notch in the receiver. The blade of the screwdriver is inserted

between the op rod and receiver by the stripper clip guide dovetail and the screwdriver is twisted to apply torque to the op rod. The bottom of the handle is given a sharp tap with the hammer and the op rod will pop loose. It is rotated and pulled from the receiver.

The bolt is removed by pulling it forward and tilting the front of the Below far The screwdriver is twisted to apply torque and a sharp blow to the op rod handle with the hammer will disengage the op rod from the receiver. Extractor spring and plunger are still in the bolt. bolt upward. Note, the

bolt does not have to be disassembled to remove it from the receiver. Inspection and Lubrication The parts can now be cleaned and inspected.

A very light layer of grease, like Lubriplate, is applied to the appropriate areas on the receiver, op rod, and bolt. On the receiver, it’s the inside top of the receiver and sides where the bolt rides and the op rod groove. On the Bottom far The ejector has a small notch that points to the right of the bolt; it must be aligned with the hole when the extractor is installed. Firing pin is installed.



Ensure that the extractor spring and plunger are in place. Push the op rod handle forward until the bolt face is against the case. Extractor is installed and pushed in until it snaps into place. It may require a tap with a hammer to fully seat it. op rod, it's the bolt roller groove. Grease is applied to the top of the bolt on each end and the bolt roller is greased using a handy little tool, aptly named a bolt roller greaser. The cup is filled with grease and pushed onto the roller to force the grease into it.

Any areas that show metal to metal contact are greased as well. The tubular section of the op rod that slides in the guide under the barrel is given a thin coat of oil. The trigger group is cleaned and oiled as needed. Reassembly Install the bolt into the receiver and push it to the rear. The receiver is set on its left side and the front of the op rod is installed into the guide under the barrel. Make sure that the bolt roller is in the angled notch on the op rod that cams the bolt open and closed.

Align the op rod handle with the notch in the receiver, push the op rod toward the receiver and it will snap into place. With the receiver inverted on

the wood block, in- Piston can be held with the “D” shaped hole in the gas cylinder wrench if so equipped. stall the recoil spring and guide and engage the pin that retains the guide. Set the receiver upright and lock the bolt to the rear. Install the ejector and its spring into the hole on the bottom of the bolt face.

The ejector has a small notch that faces to the right; it must be aligned with the hole for the extractor. Install the 30-06 case in the chamber and slowly let the bolt go forward. The extractor spring and plunger are installed in the angled

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15 Bolt Stop Pin 16 Bolt Stop 17 Bolt Stop
Spring 18 Connector Lock 19 Connector Lock
Pin 20 Operating Rod Guide 21 Operating
Guide Rod Pin 22 Barrel Band 23 Gas Cylinder
24 Spindle Valve Pin 25 Spindle Valve 26
Spindle Valve Spring 27 Piston 28 Gas Cylinder
Lock 29 Gas Cylinder Plug 30 Castle Nut 31
Front Sight Set Screw 1 Barrel 2 Receiver 3
Bolt 4 Firing Pin 5 Extractor - Extractor
Plunger, NI 6 Extractor Spring - Ejector, NI 7
Ejector Spring 8 Rear Sight Aperture 9 Rear
Sight Base 10 Sight Cover 11 Elevation Knob
12 Windage Knob 13 Clip Guide 14 Clip Guide
Pin 32 Front Sight 33 Castle Nut Set Screw 34
Flash Suppressor 35 Operating Rod Spring
Guide 36 Operating Rod Spring 37 Operating
Rod 38 Buttplate Assembly 39 Buttplate Screw
40 Buttplate Screw 41 Sling Swivel, Rear 42
Stock Liner Screw 43 Stock Liner 44 Stock 45
Sear Pin (Small) 46 Hammer Spring Housing 47
Hammer Spring Springfield Armory M1A
(Specifications subject to change without notice)
48 Hammer Spring Plunger 49 Hammer 50
Trigger Housing 51 Safety Spring 52 Trigger

Pin 53 Safety 54 Trigger Guard 55 Hammer Pin
56 Magazine Catch 57 Magazine Catch Spring
58 Magazine Catch Pin 59 Handguard 60
Swivel, Front - Swivel Rivet, Front, NI - Swivel
Washer, Front, NI 61 Ferrule, Front 62
Handguard Clip hole in the bolt if they have
been removed.

The firing pin is installed; the rear of the firing pin fits into a notch in the rear of the bolt. The bolt is pushed forward and held against the case head to compress the ejector spring. Check that the ejector notch is lined up correctly. You should be able to see completely through the extractor hole in the bolt. The extractor is inserted into the hole and pressed until it snaps into place. It may require a tap with the hammer to fully seat it. Retract the bolt and the case will eject.

Gas System Service If the operating rod is installed, lock the bolt to the rear. The plug is removed from the end of the gas cylinder using a gas cylinder wrench and a 3/8" box wrench. The gas piston is pushed forward out of the

cylinder. Any carbon in the gas plug and piston can be removed by using the correct size drill bits. The gas plug requires an "O" size bit (0.316") and the piston requires "P" (0.323") and #15 (0.180") bits. Carbon on the piston should be removed as well.

After the parts are cleaned, they are installed in the reverse order. The piston extension has a flat on one side, the piston is installed with the flat facing up. A slight amount of anti-seize compound is added to the plug threads and the plug torqued to 150-170 inch-pounds. The assembled action is dropped into the stock and the trigger group installed. The rear of the trigger guard is pushed into the trigger group to latch it. I then cycle dummy rounds through the action to verify proper function. A final note.

When cleaning the barrel bore, invert the rifle so that the solvent and debris don't get into the gas system. I use a cleaning rod guide that fits on the flash hider to prevent damaging the muzzle. AG

MACHINING

Mini Bench Mill for Gunsmithing

A large floor mill is nice but not necessary for many gunsmithing projects. Here's how I make optimum use of a bench top machine.

BY JERRY SPADORCIO JULY 2022

ORIGINAL PP. 8–9

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'm I'm a certified gunsmith with 18 years of service. In that time I have found a mini bench mill, the type of machine that fits on a bench, is ideal for me and my shop — and probably for you as well. As gunsmiths, we work on small metal gun parts. We usually don't work on large metal machine parts or make large tools.

There are large bench mills and large floor mills. Featuring a 1/2-inch drill chuck and drawbar, table locks, column lock and drill stop, power supply with feedback-sensing power boost circuitry, spring-assisted headstock return, V-way chip guards, chuck/collet chip guard, safety cut-off switch, and wrench set. The table has 0.050 inch-per-turn feed screws and dials and the column can be tipped for angled milling and drilling.

There are indicator scales for the X (8 inches of table travel) and Z (7 inches headstock) directions with a fine-adjust knob for the

Z direction. The cross slide travel (Y direction) is 4 inches and the column angle tilts from -45 to +45 degrees. Mills costing a staggering amount of money. They are great tools, however, most of the time in service you will not recuperate the money spent on such large mills or lathes.

If you are good at using a hand file and a floor drill press, then you can do a lot to shape the metal to fit and work into a firearm repair without using a mill. Of course, if you are a machinist you will need a large lathe and/or mill. Yes, you will likely learn how to work a lathe and a mill as a required course in gunsmithing school. That course shows what is needed when building guns or to make a large part or a tool.

When there is a need to turn a barrel, cut a groove on the side of the barrel or cut a dovetail, or to rechamber a barrel, a large lathe or mill is needed. However, in my nearly two decades in this field I have not needed to do this for the

kind of work most common in my shop. Even if a job requiring such work does come up, it can be out sourced. Unless your shop is specifically structured that way, as a gunsmith we are not dedicated machinists.

There is no good reason to go into debt to buy a large, expensive floor mill to prove you're a "real" gunsmith. There are many large machine tools out there for sale, new and used. If you have the money and if your consistent demand for jobs shows a genuine need (as in on a profit and loss statement, not because you want one so bad you "need" it) then go for it. When you come out of gunsmith school, money is very tight for a little while—maybe for along while.

If you need a mill, I'd recommend to start by looking into a mini bench mill instead of a large floor model. I use a mini bench mill and it works just fine for me. With the mini bench mill, the parts I make for the gun fit and work just as great as if I had made them on

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a more expensive machine. If the part needs case hardening, I do that also. Even if you envision a large model needs to be in your future, I truly think a mini mill is a great investment. The mini bench mill fits on my bench and is out of my way. If I want to move it to another place I can do that also. Depending on the jobs you get, you may find that it is all you need. I have been using a mini bench mill for a number of years now.

The model I use and like is the Micro- Lux R8 Miniature Milling Machine from Micro-Mark (MicroMark.com). This machine has a base price of about \$1,400, including shipping, and I have been very pleased. It can do the same thing as a large mill on the small metal parts I normally work with. The R8 cuts in 0.001" increments and is very accurate. It has the same XYZ axes and you also can get it in a CNC mode.

Even though I only use it on steel parts, this also handles aluminum, plastic, and wood with the appropriate bits. There are a lot of mill tools for the mini bench mill to make work easy and accurate for firearm jobs. The collar is operated in thousands of an inch, allowing micrometer adjustments for setting the work in a given position to the cutter. You can do a lot of milling operations as there are a number of milling tools to purchase for the mini bench mill, the same as any big mill.

Quality mini bench mills are built sturdy, heavy, and with plenty of rigidity. They can also be bolted to a bench for even more stability. The

weight of my bench mill is 110 pounds with dimensions of 30 inches high and twenty inches of depth and width. I use it for drilling, tapping, reaming, boring, slots, and shaping. It's a horizontal mill and is a versatile machine tool capable of accomplishing a variety of mill machining tasks. You can use a collet or a drill head, the same as a large mill.

The mini bench mill does not have a knee to elevate the work to the cutter. Instead, you bring the head stock down to the XY table and the work piece. While offering the precision of a larger machine, the R8 like most mini mills operates on a standard 110V plug-in. Bigger mills typically operate on a larger voltage that needs to be wired into the shop. Once a bigger mill is placed, it is where it will stay as they're way too big and heavy to move once placed, even without the special power requirements.

There are two types of mini bench mills: one operates with a gear drive and the other operates with a belt drive. Mini mills also come in high power. It's a great fit, by size and cost, for my shop, or low power. Be sure to research each machine's specifications to ensure it meets your needs. While they are not cheap to purchase, they are much cheaper than a large mill.

I am not going to quote specific price differences here as they have a habit of changing (don't ask me how I know that) and will fluctuate based on new or used condition, location, shipping, and other factors. You need to check the features that come with the mini

bench mill and the cost factor to help make your decision. If you get on the Internet and search for "mini bench mill" you'll find many of them listed side by side and the price.

They all look very much the same, the difference is the companies that sell them and specific specifications as different makers have their little twist attached to them. Despite different vendor brand names, many are made in China and in the same factories. A mill in a gunsmith shop will sit more than it is used. You need to think about that. Unless you're into manufacturing guns or making large items, a large mill is likely not needed.

If I need a large mill, I am fortunate to have a friend that is a machinist and owns a commercial machine shop and can contract use of his large mill but I have rarely used it. I've found I only use a large machine for chambering, lining in a barrel, or for cutting threads on a barrel or for a compensator. Such a large machine (and investment!) would never pay off in my shop. If you're not so fortunate as I am to have a machinist friend, such work can be contracted out.

My mini bench mill is my favorite machine to use and for most usage on making gun parts. I'll bet it is an ideal choice for you as well. Oh, and don't forget the cutting lubrication! AG

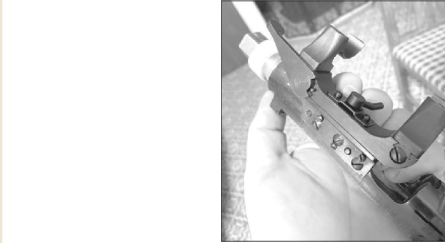
FROM THE ARCHIVE

The 45 Mauser Mystery

Addressing the issues I found when using an adapter to convert a Mauser 98 to 45 ACP.

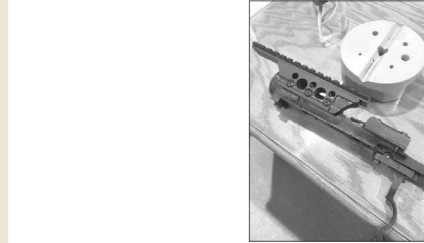
BY ROBERT M. LAYNG JULY 2022

ORIGINAL PP. 10–11



Below left: The first build with the Numrich reproduction SSR scope mount installed. Notice the two dowel pins and the staggered threaded holes. You will either need time and patience or a qualified gunsmith, with or without the jig, to properly locate these holes in your receiver. This puts the scope directly over the receiver, so you will need the "sniper" safety wing fitted to prevent the wing from hitting your scope. Below right: Rhineland Arms scope mount installed on the second rig. Notice toward the ejector there is a step machined into the mount. This is on both sides to allow flexible mounting options but that step had to be bumped back by 3/16" on the opposing side to allow flush mounting on the receiver.

ORIGINAL ARCHIVE IMAGE · PERMISSION CONFIRMED



Below left: The first build with the Numrich reproduction SSR scope mount installed. Notice the two dowel pins and the staggered threaded holes. You will either need time and patience or a qualified gunsmith, with or without the jig, to properly locate these holes in your receiver. This puts the scope directly over the receiver, so you will need the "sniper" safety wing fitted to prevent the wing from hitting your scope. Below right: Rhineland Arms scope mount installed on the second rig. Notice toward the ejector there is a step machined into the mount. This is on both sides to allow flexible mounting options but that step had to be bumped back by 3/16" on the opposing side to allow flush mounting on the receiver.

ORIGINAL ARCHIVE IMAGE · PERMISSION CONFIRMED

This article pertains to an issue I ran into when assembling a Mauser 98 adapter kit to convert it to chamber and fire the 45 ACP cartridge.

Before I get into the article at hand, I would like to say that the first kit I purchased from Rhineland Arms (Troup Systems. com) was a true drop-in fit, and the instruction booklet they included with the kit is perfect for getting the carbine up and running in less than a day—minus the minimal stock work needed to get the parts to fit and function, but that will be covered appropriately later on. Notice the two dowel pins and the staggered threaded holes.

You will either need time and patience or a qualified gunsmith, with or without the jig, to properly locate these holes in your receiver. This puts the scope directly over the receiver, so you will need the "sniper" safety wing fitted to prevent the wing from hitting your scope. Notice toward the ejector there is a step machined into the mount. This is on both sides to allow flexible mounting options but that step had to be bumped back by 3/16" on the opposing side to allow flush mounting on the receiver.

This article covers the second kit I purchased from them. The threads on both the receiver end and the muzzle end were both oversized. It was evident that while the thread pitch was correct, the root diameter was just slightly too large. My final tally was 0.007" too large. While that number doesn't seem like a very large excess, just the tiniest glut in size of a root diameter of a thread will cause it to bind.

I attributed it to the finish added to the exterior of the barrel as the included Savage-style locknut was bereft of this surface treatment. While I tried to simply chuck it up in a lathe and hit it with a three-cornered file and a thread repair file, nothing seemed to be doing the trick. It just would not go on past a single thread!

I checked the size of the threads in the receiver itself, but I surmised that if the barrel that I just ripped out of there had fit that well, I highly doubted the tenon threads to be the culprit. I measured them with a custom made thread gauge and they checked out, not even a thousandth oversized. I chucked the barrel up in

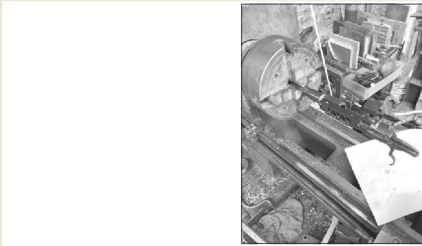
a four-jaw chuck in my small lathe and took the time to dial the bore in to true "0", both rotationally and longitudinally.

Next step was to engage the half nuts to the 10 threads per inch that the 98s are known for, and then gradually dial the tip of the threading tool in until it just scraped the back of any given thread and set the machine's dials to "0". Side note, I set the compound on my lathe to the standard 60 degrees for threading so I could move in ever so gradually to just true up the existing threads and take tiny cuts off the root diameter, 0.001" at a time until the receiver snugly threaded on.

It did take some of the finish off the one side of the threads, but the receiver covered all of that finish loss. Blue Loctite also covered any finish loss that was outside the lock nut, too. As for the muzzle end, I have a 0.578- 28 thread chasing die that I used on the muzzle end. I had the same finish loss, so I made a custom brass thread protector (as one does not come with the kit), knurled it, and threaded it on.

THE 45 MAUSER MYSTERY CONTINUED

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Above: The barrel in the lathe, chucked up, and the chamber dialed in to true "0" both rotationally and longitudinally. Needed to touch up the threads and cut down the root diameter of the threads to fit into the tenon threads on the action. This was after a successful fit. You'll notice threads extending past the receiver ring and these are for the Savage-style lock ring to set your desired headspacing upon assembly.

ORIGINAL ARCHIVE IMAGE · PERMISSION CONFIRMED

Needed to touch up the threads and cut down the root diameter of the threads to fit into the tenon threads on the action. This was after a successful fit. You'll notice threads extending past the receiver ring and these are for the Savage-style lock ring to set your desired headspacing upon assembly. When I got the first kit in, the factory mentioned getting a spanner wrench for a certain size ring to be able to snug the lock ring down.

I have had terrible luck with this, so I took a micrometer to the outside diameter of the lock nut, measured the slot cut into it, and designed a custom wrench to allow me to do this with a torque wrench. I used a water jet to cut the outside contours of the custom tool, a square hole for the torque wrench, and the pocket with an integral finger to grab the slot on the nut. Twenty-five footpounds and some blue Loctite once I set the desired headspacing, and I was back to finishing the build!

I would seriously suggest you do the same, should you have the capacity to do so, or have a good friend or local shop that will make the part for you. Next was the scope mount. I ordered one of the Mauser Scope Mounts for the Large Ring Action directly from Rhineland Arms. This is a great product and I highly suggest getting one to compliment your build. This is especially true if your donor action is one of the many straight handled bolts as the mount allows scope clearance to work the action.

Few things on this planet are as cringe-worthy as smacking your glass with the bolt handle! I took the time to measure all the dimensions to drill and tap the three holes into the side of the action. The one thing I found out was that I would need to bump the shoulder nearest the front-most hole back by 3/16". This would allow the needed clearance to mount the scope base flush to the action and clear the large front ring. Your action may vary, and this may not be necessary.

Note, I used a reproduction SSR mount and shim set from Numrich for the first kit build. The bolt handle was turned down and I felt I had the necessary clearance to allow this setup. Next up, and this may not necessarily pertain to your build, is the wing safety. Both scope mounts used are low profile, placing the scope pretty close to the action, so the factory three-position wing safety will most likely hang up on the scope.

Numrich sells the "sniper safety", more formally listed as the "Safety, Extended, 98k Sniper, Blued- Steel, New Reproduction" at Gun-PartsCorp.com, to avert the scope issue. This is legitimately a fantastic retrofit but be ready to fit it. The included manual does mention that you may or may not need to take a small amount off of the tip of the firing pin.

Ninety percent of the time this is not needed, but the one build I just finished up had an aggressive firing pin protrusion, so I took it out,



Above: The barrel in the lathe, chucked up, and the chamber dialed in to true "0" both rotationally and longitudinally. Needed to touch up the threads and cut down the root diameter of the threads to fit into the tenon threads on the action. This was after a successful fit. You'll notice threads extending past the receiver ring and these are for the Savage-style lock ring to set your desired headspacing upon assembly.

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popped it into a collet in my lathe, and under power I filed off a little bit. I then took some 400 grit sand paper and a Scotch-Brite pad to refinish the tip of the pin. Be extra careful not to take too much off, or to induce too much heat into the tip and anneal the part from its heat treat. Lastly was the stock work.

No matter what stock you plan on using, have a rotary tool handy for the small amounts of trimming you will need to do around the receiver. Consider a barrel bedding tool for the barrel channel if your stock isn't opened up for the larger military contour barrels. Brownells has barrel bedding tools that make short work of this. As to the receiver pockets, let's first focus on the bottom metal.

You will need to mark up and cut out two semi-circular pockets in the existing magazine well to accommodate the 1911 magazine release on both sides. You will need to cut these same shapes into the stock itself to allow access for magazine changes. Let's move up top. Depending on what scope mount you choose to use, you may well need to remove a little bit of stock material where the scope mount would be interfering with the action dropping in as designed.

Take small cuts, and sand off any sharp edges created with at least 120 grit paper, preferably finer. Many thanks to the wonderful folks at Rhineland Arms for a great conversion kit and for making this article possible. AG

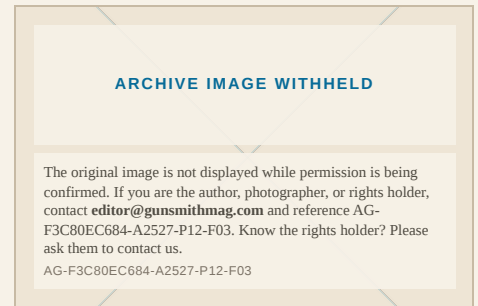
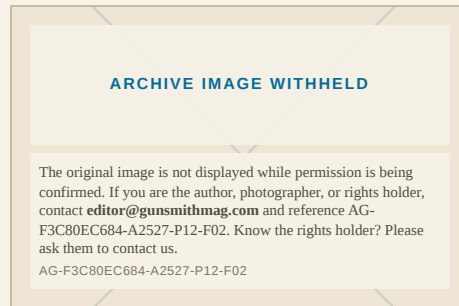
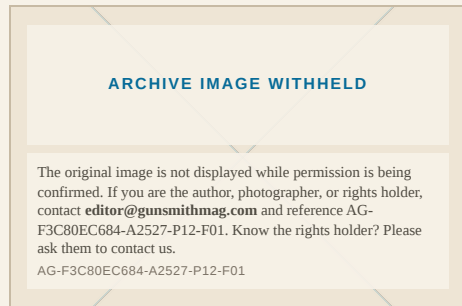
RESTORATION

Mossberg 42M Restoration

The restoration of an iconic World War Two training rifle took some skill and a little research. Here's how I refurbished a Mossberg 42M.

BY PAUL MAZAN JULY 2022

ORIGINAL PP. 12–14



The Mossberg Model 42M is a Mannlicher-stocked variation of the Model 42 bolt action .22 caliber rimfire rifle with a seven-shot box magazine that was manufactured from 1940 through 1944. There were many variations of the model 42 manufactured between 1935 and the end of production of this model in 1949. They include target, sporter, heavy barreled, left-handed, and even smooth bored versions with a Targo tube.

Targo was a trap shooting system made by Mossberg with a clay target launcher attached to the barrel of the gun. The shooter launched the clay target himself and then engaged it with a .22 shot load. It was introduced in 1941 and dis-

continued This WW2 era trainer shows over 70 years of use with worn finish and bluing. continued in 1942 after the Second World War broke out.

The 42M variation has a twopiece Mannlicher-style stock with the forend extended by the use of a sheet metal piece allowing a wooden extension to be added to the stock. These were used as training rifles during WW2 and a slight modification of the model (42MB) was sent as part of the Lend-Lease Program as rimfire trainers to the British. With the large number of variations, restoration requires some research to identify the model you have so it can be restored with the proper sights and accessories.

The rifle I had to restore was very well used with little bluing left on the barrel and a very beat up stock with many dents and scratches. After disassembly the trigger group was removed, disassembled, and cleaned. The barrel and receiver were stripped and polished to remove the abuse of many years of service and prepped for rebluing. I reblued the metal parts using Brownells Dicropan IM (082-008-032WB) which is a hot water "Belgian Blue" system.

Brownells Dicropan IM gives the small and home shop a method of bluing that gives professional results.



Disassembly of the trigger group is quick and easy. The center screw adjusts trigger engagement. that is basically an accelerated rust bluing method that I have used for years because it is easy, much more durable than cold bluing, extremely adaptable to the small shop, and gives me excellent results. If you area hobbyist or run a small shop and don't have a hot caustic salts bluing system this is a good way for you to get professional results.



Finding original parts and sights for restoration of any old firearm is a continuing challenge. Parts houses like Gun Parts (Numrich), auction sites like Gunbroker.com, estate auctions, and even using Internet search engines such as Google and Duck Duck- Go can lead to the parts you need.

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The old bluing is stripped from the part and then degreased and placed in boiling distilled water to heat it. Once heated, remove the part from the boiling water and allow the water to evaporate. The hot and now dry part is then coated with the Dicoproan IM. A flash of rust appears on the part and that is carded off using a soft wire wheel or 0000 steel wool. This is repeated until you have achieved the color you want. The part is then coated with oil and left overnight.

Generally speaking, five or six repetitions will produce a good black color and 10-15 will produce a deep black. The number of coats is determined by the alloy of the steel and the finish you want. Moving on to the stock, the old finish was gone in several places and what remained was spotted with paint. I removed that remaining finish using a paint stripper.

It is generally not recommended that you sand a stock that is being refin- It looks great but will it function, how is that trigger, and will it shoot? ished as it is very easy to round over edges and reduce enough wood that it leaves things like the buttplate and trigger guard standing higher than the wood. If you must sand the stock, do it as lightly as possible. I would normally have sanded out the dents and scratches in the wood but, in this case, I was trying to let the gun show its age and use.

The idea was to refinish the gun without it looking refinished. I left the dents and dings and stained the stock with a waterbased walnut stain. When it was dry, I buffed the entire stock with 0000 steel wool. This evened out the color. After wiping it down I coated it with boiled linseed oil mixed 50/50 with turpentine. The linseed oil provides a military-style finish and the turpentine allows the oil to penetrate the wood and dry faster than linseed oil alone.

Each coat was allowed to dry for 24 hours and hand rubbed with 0000 steel wool before the next coat was applied. After reassembly I took the gun to my local range to see how well it shot. It showed very good accuracy considering I was using iron sights, my 74-year-old eyes, and inexpensive promotional ammunition. I am pretty darned impressed with this seven-decades-old rifle. The action is smooth, the feeding reliable, and the accuracy is very good even with promotional ammunition.

I just have to wonder what the rifle might be capable of with a good scope and match grade ammunition. AG Even with old eyes, iron sights, and promotional ammunition, this old war horse can still do pretty well at 50 yards. Squirrels and raccoons raiding my bird feeders are in grave danger from this old Mossberg 42M.

TOOLS & FIXTURES

Gun Part Sources

Some useful sources for gun parts and gunsmithing tools.

BY PAUL MAZAN JULY 2022

ORIGINAL PP. 15–16

One of the most often asked questions I see online and in person involves locating parts for firearms. Based on the questions on Facebook, in the American Gunsmith group and others, most people new to gunsmithing have no idea where to go for parts or tools. For that reason, I made an effort to compile a list. Some days I spend more time chasing parts to complete repairs than I do actually repairing guns.

That seems to be a common problem for many of us and I finally decided to put together a list of the suppliers I use on a regular basis. Here are some of the most useful sources I use. Manufacturers If you have a firearm that is still in production the most obvious place to search for parts is the manufacturer. Even if the model is no longer in production the factory might have parts or can sometimes tell you who can supply those parts for the firearm.

This is a list of some of the major firearms manufacturer's web sites. Some sell parts directly, others may simply direct you to suppliers that sell their parts. Even if the model is no longer in production the factory can sometimes tell you who can supply parts for the firearm. Factory Parts Contacts Factory contact sites can help with current production firearms. Armalite.com, Armi Sport di Chiappa (ChiappaFirearms.com/parts.php, Barrett (store.Barrett.net). Benelli USA (ShopBenelli.com/ parts.html).

Beretta Corp. USA (Beretta.com/ en-us/spare-parts-1). Browning Arms Co. (Browning.com/support/parts-service.html). Charles Daly (CharlesDaly.com/ parts.php). Cimarron Firearms (CimarronFirearms.com/accessories/parts. html). CMMG (CMMG.com). Colt's Manufacturing (Colt.com). Cooper Firearms (CooperFirearms.com/pages/options-and-accessories). CZ-USA (shop.CZ-usa.com). Glock Inc. (store.teamglock.com/ gun-parts). Heckler & Koch (us.hkwebshop.com/hkstorefront/?site=hk). Hi-Point Firearms (Hi-Pointfirearms.com).

Ithaca Gun Co. (IthacaGun.com/ internal-parts). Kimber Mfg. Inc. (store.KimberAmerica.com). Marlin Firearms (MarlinFirearms.com). O. F. Mossberg & Sons (Mossberg. com/store/parts.html). Pedersoli Davide & Csnr (shop. Davide-Pedersoli.com/en/14-spareparts) Perazzi Inc. USA (Perazzi.it/en/ perazzi-usa.php). Remington Arms Co. (Rem Arms. com). Ruger Firearms (Ruger.com/service/partsService.html). SavageArms.com. SIG Sauer Inc. (SigSauer.com/ parts.html).

Smith & Wesson (store.smithwesson.com/parts-and-magazines) Springfield Armory (store.Springfield-Armory.com/Shop/pc/home.asp) Taylors Firearms (TaylorsFirearms.com/accessories/parts.html). Thompson Center Arms Co. (TCarms.com). Traditions Performance Firearms (TraditionsFirearms.com/support/ product-

schematics). Uberti (ShopUberti.com/parts.html). Walther Arms (Walther Arms.com/parts). Weatherby Inc. Weatherby.com/shop-home/gun-parts).

Winchester Repeating Arms (WinchesterGuns.com/support/ parts-service/parts.html). Parts Houses Next are the sources I use to for parts that are no longer in production, aftermarket custom parts, and gunsmithing tools. This also isn't a complete list but has proven to be consistently good over the years. Apex Gun Parts area good source of rifle and pistol parts, including some current firearms and many older military arms. ApexGunParts.com, contact information omitted in this digital edition).

Bob's Gun Shop Inc. has parts for many out of production firearms. Royal AR 71968. Fax orders or phone gun- Brownells Inc. is obvious for gunsmithing tools and supplies but they also stock current production factory and aftermarket parts. Brownells.com). eBay.com. Fellow author RK Campbell once made a reference to this long-time online site as a sort of pirate's cove.

Well, not in the sense of being illegal but it can feel that way. e Bay is a multinational e-commerce site that has facilitates consumer-to-consumer and business-to-consumer sales through its website since 1995. While obviously not just a gun parts site, many shop owners, companies, and individuals with parts often use the site to sell and trade used gun parts at auction.

GUN PART SOURCES CONTINUED

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Jack First Gun Parts is a “name” gun part supply house with a large selection Jack First-Inc.com). Numrich Gun Parts Corporation. Another big name in used gun parts. GunPartsCorp.com). GunBroker.com. An auction site similar to e Bay that focuses on firearms, including gun parts. (GunBroker.com). John Gunderson Antique Militaria. A source of original parts for antique and historic firearms. GundersonMilitaria.com). International Military Antiques.

As you can guess, they handle mostly antique guns and accessories with an emphasis on collectibles, including some parts stripped from old guns. IMA-USA.com). Midway USA. Probably best known for retail sales, Midway also stocks aftermarket parts for modern firearms and gunsmithing tools. MidwayUSA.com). Popperts Gun Parts. Popperts has a large selection of parts for modern firearms. (1 Limeklin Pike, Glenside PA 19038, Popperts- GunParts.com). S&S Firearms.

S&S stocks parts for original and reproduction antique firearms, including uniforms and reenactor supplies and accessories. (74-Glendale NY 11385, SSFirearms.com). Pecatonica River Long Rifle Supply. Known for their selection of single shot and antique repeater stocks and muzzle loading guns and parts. Rockford IL 61132, LongRifles-PR.com). Richards Microfit Stocks Inc. Richards stocks gunstocks for most modern rifles from classic to wild. Rifle-Stocks.com). Track of the Wolf, Inc.

Muzzloading parts, stocks, barrels, and kits. NW, Elk River MN 55330, Track Of The-Wolf.com). Treebone Carving has a great selection of parts for Winchester and Marlin lever guns, rolling block action rifles, Ruger #1 and #3, and Trapdoor and Sharps stocks.

Wellington NV 89444, TreeBoneCarving.com). Wisner’s, Inc. for more modern gun parts that might not be carried by the original manufacturer. Adna, WA 98522, WisnersInc.com). Wolff Gunsprings. Wolff makes replacement springs for most modern firearms.

Newtown Square PA 19073, GunSprings.com). Womacks Rolling Block Parts. As the name implies, they stock original Remington Rolling Block parts. Fallon NV 89406, Rolling-BlockParts.com). Searching Beyond I’ve found this go-to list to be consistently good for my projects, however, if you are still unable to locate the part you need you’ll need to look further. Some tips for searching. Use more than one search engine. Google.com is the most popular and obvious but far from the only one.

Others worth using are DuckDuckGo.com (which also emphasizes user privacy), Bing.com, Yahoo.com, AOL.com, Ask.com, Excite.com, and Lycos.com. While all search engines index publiclyavailable websites, the approach each one takes differs a bit and can result in different results during a search. Vary your search terms. A good way to begin is typing in the manufacturer name, model number, and any other part names or any particulars you know.

For example, a search for “Remington 700 parts for sale” should get you a number of listings of parts sellers. You can then refine that by modifying key words, such as replacing “parts” for more specific part names and variations. Look up the manufacturer’s schematic and/or owner’s manual to know the exact name the maker used to call their part. Understand common search engine syntax. Surrounding a word or phrase in quotation marks prioritizes results having that exact word or phrase.

Example, a search for “Remington 700” “parts” will be more specific with results having an exact match to specific phrase “Remington 700” that also includes the word “parts” in the result. Dropping the quotation marks indicates a search for results that have these words or numbers anywhere in the result and not necessarily together, which may not be what you want. Exclude results by adding a “-” to a word or phrase. For example, Remington is also a brand name of electric razors and shavers.

So, a search of “Remington” -shave would exclude any result having Remington that also has the word “shave” in it. Searches can also be confined to a specific site, replacing http: with site: as the protocol. If you’re only interested in results from Gun- BlabForum.com, try typing site: GunBlabForum.com “Remington” into the address bar of your browser to find pages, posts, or comments with the word “Remington” limited to that specific site. Don’t be afraid to ask for help in an online forum but be smart about it.

Before posting a question, search on your own and then include what you searched for, how you went about it, what the results were, and what you’re looking for but haven’t found. Before asking on a particular site or forum, do a site-specific search on that forum (site:ForumName.com) to double check your question or something similar hasn’t already been asked and answered. Include the fact you did this to show that you were thorough in searching on your own before asking for help.

As I said, for some projects the search for needed parts can take as long as the repair itself. Knowing some great supply places and how to search further on your own can help make finding what you need a little easier. AG

RIFLES

Muzzle Attachments

From humble beginnings, here is a history of muzzle attachments for the AR-15 and other firearms.

BY JOE CARLOS JULY 2022

ORIGINAL PP. 17–22

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Give a shooter a barrel with threads on the front and he will find something to screw on there. Give him a barrel with no front threads and he will find something to clamp on. The M14 had a flash suppressor screwed on. With the AR-15/M16, Stoner made the choice of front-end devices for us. AR-15 rifles appearing in the early years of Viet Nam were equipped with three prong flash suppressors. That was later replaced by a “birdcage” design with vents all around.

Further along in history when the M16A2 was developed one of the differences between it and its predecessor was that the flash hiders on the newer version had no vents on the bottom which helped deal with the “dust signature” when firing prone in dry environments. All three of these devices work to disperse burning gases, reducing the firing signature, and retaining night vision better in during dim light engagements.

Now that I am retired from the military I am glad that we civilians really don’t need flash suppressors. “Need” notwithstanding, at least 9 out of 10 of my customers want front threads and want something screwed onto them. In fairness, the suppressors do help guard against damage to the crown of the muzzle in case of guns being dropped. While the military has pretty much stuck with the A2 suppressor design, civilians have the choice of a wide array of flash hider varieties.

One of the more popular versions for civilians is the Vortex. Think of the original Stoner design but with four fingers instead of three. Manufacturers of the Vortex claim that it is superior in dealing with flash. Some shooters report tighter groups when replacing stock flash suppressors with a Vortex. Let’s look at some options.

Lessons Learned I am pretty sure that when arms manufacturing plants are first being stood up the upper management lines up all the new hires against a wall, walk the line like a drill sergeant, and pick the burliest of them in charge of flash suppressor installation. Decades back, shooters and gunsmiths posited that excessive torque on flash suppressors was distorting the muzzle and causing fat groups.

They discovered that if they unscrewed these gorilla-torqued units and reinstalled with modest torque the groups improved. I researched the matter on my machine rest and found these claims were valid. Chrome-moly and stainless steel barrels responded best and chrome-lined issue barrels improved to a lesser degree. I suspect that the chrome lining is less elastic and not behaving as favorably. It is still to our advantage to relax the torque on all barrels, however.

In true American fashion quite a few gunsmiths over-reacted early on by installing suppressors only hand tight and relying heavily on red Loctite to hold things in place. A bunch of those units came loose, causing shifts in zero and all

sorts of may- S. service rifle, the M14, came equipped with a rather long flash suppressor. hem.

To add insult to injury some barrel makers heard about the flash suppressor issues and applied the “hand tight standard” to barrel extensions, resulting in disaster when barrels began to unscrew. I had it personally happen to me with a barrel I had purchased from a big-name custom maker. Before that, I had a revolver barrel start to unscrew and was able to apply lessons learned to diagnose and correct the rifle issue promptly. Shooters with less experience were puzzled and I ended up fixing their problems.

I don’t know any gunsmiths or barrel makers still installing flash suppressors or barrel extensions hand tight. Military technical manuals recommend 20 foot-pounds of torque for the front end, which is excessive for tight groups. I thoroughly degrease all threads and use lots of red Loctite with three ft-lbs. of measured torque and have never had one come loose. For barrel extensions, 150 ft-lbs. is problem free. The use of peel washers on ARs has declined being replaced with crush washers.

Those devices can result in some really excessive torque settings and the sight of them raises the hackles on the back of my neck. I wrote about them in my “AR-15 Fliers” series in the February through April 2021 issues. My admonition then, and now, is complaints of fliers

MUZZLE ATTACHMENTS CONTINUED

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or fat groups should begin diagnosis by replacing peel washers and use a lighter torque. Even with improved groups, this will probably cause a zero shift. I covered flash suppressor torque in “Improving Rack-Grade AR-15s” (December 2014) along with other tips to improve battlefieldgrade rifles. Email me at NCC1701@ penn.com and I’ll be happy to help you with this. Next on the flash suppressor learning curve is barrel harmonics.

The first that I heard of barrel harmonics was with Browning hunting rifles equipped with their Ballistic Optimizing Shooting System. The BOSS came in one version without exhaust holes as an accuracy tuning device accomplished by screwing part of the unit in and out. Graduation marks kept track of the settings. The other and more popular version model achieved better accuracy performance as well but also had vent holes to lessen recoil. As a former Pennsylvania Game Warden, I saw this one the most.

In my 28-year career in the woods, I don’t recall encountering a BOSS that didn’t have the gas vent holes. Browning claimed that the vents reduced felt recoil by about 30%. What they may have reduced in terms of recoil they more than made up for with noise. Browning included a chart of recommended settings to dial in for different commercial ammo and various popular bullet weights.

After dialing in the factory recommended setting the owner was free to fine tune the setting by firing groups and comparing them to arrive at the tightest. Some smart hombres in the AR community started to move flash suppressors in and out on the front threads in an effort to tighten groups. I have always assumed that they got the idea from the BOSS but I can’t prove it. I even named the process of using the flash suppressor this way as the “Poor Man’s BOSS”.

I was a firing member of the Army Reserve Marksmanship Program at the time and we used issue M16 rifles in Service Conditions

events, so being able to improve performance by just changing the suppressor’s position was useful. This entails using an issue, nondirectional flash suppressor; the A2 unit has a solid section that needs to line up at about 6 o’clock and isn’t an option, leaving the A1 suppressor with vents all around. I installed and A1 unit with no peel washers at three ft-lbs.

After a test group, I removed the suppressor and added a peel washer, which area paper-thin 0.004". One washer moves the position of the suppressor about “one hour” from the no-washer 12 o’clock initial setting to about 11 o’clock for another test group. I continue this process while closely watching group size to determine a sweet spot. Group sizes will begin to shrink at some point, and then start getting bigger. This normally happens before adding enough washers for a full revolution back to 12 o’clock again.

While not offering BOSS adjustability, this accomplishes the same thing. Lowering the crushing torque on the suppressor and tuning the suppressor position can be done by shooters on the range with the appropriate tools and time and ammo to test. From those humble beginnings so many decades back I developed other, even more effective tuning techniques for Stoner rifles, documented in “AR-15 Barrel Harmonics” (October 2016).

What I detail in that article requires a greater level of gunsmithing skills and tools in addition to range time. Before we leave the topic of flash hiders there is one bit more of history to discuss. When guys first began to experiment with trying to get greater precision with the AR they copied many tricks that worked with the previous M14. Gunsmiths working on the M14 almost always bored out their flash suppressors a bit but this doesn’t usually do anything with the AR.

It may have to do with keeping the “bore” of the flash hider properly centered. We will discuss this further with regard to the topic of other screw-on devices and problems with their

group sizes. For sure, if you area do-it-yourself home hobbyist I would strongly discourage clamping a suppressor in a vise and attacking it with a hand drill! In full disclosure I have to tell you that I have not set up any scientific studies regarding before and after groups with flash hiders subjected to boring.

I figured that gunsmiths decades back discarded the technique for a reason and I have not seen fit to resurrect it. Pre-Ban vs. Post-Ban The Left hates guns, especially handguns and anything resembling an AR- 15. You already knew that. In 1994 they scored a victory over us when then President Bill Clinton signed the “Assault Weapons Ban” into law. To this day, Joe Biden proudly boasts that he wrote a significant portion of that legislation.

It lapsed ten years later but some states adopted similar laws that are, unfortunately, still on the books. Due to that legislation, the terms Pre-Ban and Post-Ban were coined and are still used today. Pre-Ban ARs have bayonet lugs and flash suppressors and Post-Ban guns do not. Gunsmiths can’t use the barrel harmonic tuning as previously described on Post-Ban firearms as they lack threaded muzzle accessories. Clamp-on items are an option to be discussed later.

Pre-Ban ARs universally have flash suppressors and military shooting teams could ignore this. Since I was a member of a military shooting team during that time, my experience with unthreaded barrels was minimal until I started working on civilian guns. The vast majority of my customers today want threaded barrels but I’ve worked on many Post-Ban configurations, such as Bartlein gain twist barrels.

I machine rest test and harmonically tune every gun that I build or rebarrel and haven’t noticed any accuracy difference between Preor Post-Ban but haven’t set up a scientific study to prove it. Other military

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shooting team armorers conducting machine rest testing have reported the same. Unfortunately, civilian gunsmiths with more Post-Ban experience usually don't conduct as much machine rest testing. For now, the available data indicates no advantages either way. The gun community has a small but growing segment that spends more time near air conditioners and keyboards rather than shooting ranges and competitions while remaining all too certain in their assumptions.

Collectively they have beaten this Pre-Ban/Post-Ban accuracy topic to death. Their concern seems to have to do with the significant step down from the 3/4" diameter of the barrel behind the threads to the skinnier 1/2" at the threads. They posit this influences barrel harmonics to the detriment of group size. This might be a more valid concern if AR shooters were shooting with just the bare threads exposed, but when does that realistically happen?

As stated previously, barrel threads will find amounted accessory, which will likely be metal and have a diameter greater than 3/4". For those readers not averse to range testing sessions, don't take my word for it. Begin tuning with the barrel threads exposed and continue with amounted accessory adjusted as previously detailed to compare groups. Of course, a single experience is a useful start but doesn't prove a rule.

Also, I suggest spending more time in testing and collaborating with those that do instead of online forums. Screw-On Muzzle Devices We'll

start with recoil reducers. The first I ever experimented with venting for recoil reduction was Mag-naporting (MagNaPort.com). The company uses electrical discharge machining to cut small trapezoidal ports near the top of the barrel on either side of the front sight, claiming this had no negative effect on precision.

I purchased my first new Colt Python in 1972 for the then outrageous sum of \$190, including tax. About a year later I bought my first machine rest for pistols and tested my Python, sent it to Mag-naport, and then retested with the same ammo. Group size was the same, as advertised. I've since performed this testing with customer firearms showing the same results. The only downside I've seen (pardon the obvious pun) with the ports was a bona fied Roman candle display with the muzzle flash!

Guys used to love watching me shoot my Python with full 357 Magnum ammo during night police firearms qualifications. A lot of pistol shooting in the early 1970s was single hand at bullseye targets. Police officers of the era were discovering that this practice was inadequate. Two handed grips and silhouette targets gained more favor. Soon semi-automatic pistols began turning up more often and time limits became shorter.

The ability to shoot fast is hampered by recoil and shooters soon wanted something more effective than Mag-na-porting so compensators on the front end of pistols (mostly 1911s) gained popularity, effectiveness, and numbers. The race was really on. An interesting side note: Recoil pushes the gun back and causes the muzzle to

rise. Recoil is not the only factor that hampers the shooter in getting back on target for the next shot. Rotational torque is also important.

As the twist of the rifling is putting a spin on the bullet the firearm is reacting in the opposite direction and trying to twist. Generally speaking, the fatter the bullet the more pronounced this rotational torque. Faster twists also exacerbate the problem. Watch somebody shoot a 45 ACP one handed and see the pistol rise up in the air and twist toward the side.

Gain twist barrels that start out with a slower twist and progressively increase the rate of twist lower rotational torque, allowing shooters to get back on target faster. A fellow member of the Reserve Shooting Team had a 45 ACP 1911 equipped with again twist barrel and won the National Matches at Camp Perry more than once with it. He credits part of his success to the gain twist allowing him to get back on target faster. I cover gain twist in depth in the November and December 2013 issues.

Service rifle shooters really lagged behind in compensator development. The first reason is that National Rifle Association and Civilian Marksmanship rules disallow compensators. Where forward thinking pistol shooters formed the International Practical Shooters Confederation headed up early on by the smartest person I have ever known, Jeff Cooper, pistol compensators found utility, even Far

MUZZLE ATTACHMENTS CONTINUED

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after creating different equipment divisions putting such use in Open Division. Until rifle shooters began in various 3 Gun and Multigun events, they had no place to go. A second reason was that onerous Assault Weapons Ban stifled innovation and its notion that anything screwed onto the front of ARs was inherently “evil”. Finally, it could be that pistol shooters are just inherently smarter. Naw, scratch that! Although rifle shooters came to the compensator dance late, they sure have made up for it.

The latest catalog from Brownells has six pages of items that attach to the front end of AR-15s and that’s a fraction of the total population. I concentrate on building National Match Service Rifles. Occasionally, when time permits, I allow myself to be talked into something different and receive some AR compensators of various makes and models. Sometimes the owners identify the parentage of these devices and sometimes the manufacturers remain anonymous.

The first time this happened I shot the rifle on the machine rest with the device in place and groups were awful! I replaced the compensator with a regular A2 flash hider and groups shrunk to acceptable levels. There was a weight difference between the two items which influenced harmonics. I reattached the compensator and went through my normal harmonic tuning process. Although this improved groups they remained unacceptable.

Since that initial experience this scenario has repeated itself with different compensators. My conclusion is that there is a manufacturing or design flaw on some compensators causing them to shoot fat groups. I have not tested every compensator and suspect there are some good ones and I’ll eventually happen upon some, however, none of these are legal in NRA/CMP Service Rifle matches. The message for gunsmiths: Warn your customers wanting compensators installed this might increase group size.

I’d recommend a standard A2 flash hider, a simple thread protector, or one of the tuner/brakes described below instead. There are other ways to reduce felt recoil that don’t make groups fat. One is to bed a mercury recoil reducer in the hollow portion of standard AR stocks. This adds about 3/4 pound and changes the balance a little but I’ve never found this to be a problem during shooting.

The second option is a shock absorber that replaces the buffer and slows the bolt carrier at the end of its cycle, lowering the jarring impact as it impacts the back of the buffer tube. Brownells carries several models of both. Unlike a screw-on recoil reducer, these are both internal modifications and not in violation of NRA or CMP Service Rifle rules. There are two categories of devices that purport to offer more than one improvement. One attachment is a tuner/brake such as the BOSS.

It’s claimed the porting lessens felt recoil by about 30% while allowing the owner to tune barrel harmonics. Harrell’s Precision (HarrellsPrec.com, offers a similar device with standard 1/2x28 threads. My tests show this works and it is offered in two configurations: one has round holes all around the outside and the other has two large ports at 3 and 9 o’clock. The second configuration gave better groups for me and having no vents at the bottom reduces the dust signature.

While they’re easy to tune, the units don’t include instructions. Numbers with long tick marks are engraved on reading 0, 50, 100, and 150 with shorter tick marks in between. I begin by shooting a group at each of those four long tick marks and identify the best group. From that setting, I shoot a test group a short tick mark above and below it. If either of those two new groups are tighter, I continue following the bread crumbs with additional groups on the next tick mark until groups start getting fat again.

After tuning a bunch of these on barrels of different contours, lengths, and calibers, I usually hit a sweet spot around the lower numbers of 0 or 50 and haven’t a best group around 150. I always use plenty of red Loctite on the barrel threads and lock in the number settings as dependent on whether you plan more testing in the future.

Tuners and brakes are not permitted in NRA or CMP Service Rifle events but the Harrell’s Tuner Brake has a contour similar to A2 flash suppressors with regard to maneuvering in pucker brush. It goes without saying that you should perform the tuning process using the same ammo that the gun is going to fire later in real life. The second category of dualpurpose devices has to do with the mounting of suppressors. In spite of the hurdles of the National Firearms Act to own these devices, they are growing in popularity.

Older models simply screwed onto front barrel threads but some ingenious folks have since invented devices that screw onto those front threads, which serve as flash suppressors on their own, and permit quick attach/detach of compatible silencers. However, there isn’t a universal standard and different company’s units probably aren’t compatible. Also, any large muzzle device gets stuck in pucker brush and none of them are NRA/CMP legal. The main problem with most of these devices is their impact on precision.

Of all of these that I have machine rest tested to date only the OSS Model 1677 produces consistent tight sub-minute groups from across section of ARs. All of the other models from other manufacturers I’ve tested shot fat groups larger than MOA when mounted on the same firearms. Their groups can run from half again the size of groups from the OSS to two or three times as great. This is without the actual silencer being in place.

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What about these combination flash suppressor/silencer mounts causes so many of them to shoot really fat groups? Most of these units weigh about double that of a standard A2 flash hider and weight has an influence on barrel harmonics. I have applied tuning techniques to guns outfitted with these combination units and still can't get decent groups from them. I have also tried tuning the harmonics of ARs equipped with many of the screw-on recoil reducers with the same dismal results.

I am, therefore, inclined to believe that the problem with both of these devices is not just barrel harmonics. Harrell's Precision is a company I respect. They make tuners and combination tuner/brakes that work and improve groups. They stress that the threads need to be CNC cut on a lathe as opposed to being tapped as this helps get screw-on devices square with the bore of the firearm. It is easy to imagine what would happen if a device was set at an angle to the bore.

Most of us likely don't have any way to measure this alignment so I can't say for sure that thread issues are the cause of so many of these screw-on units shooting fat groups. If a customer brings in a firearm with either a screw-on recoil reducer or a combination flash suppressor/silencer quick mount and is complaining of fat groups, this is a good place to start looking. These devices are not Author prefers the model on the right. the only potential cause of precision problems.

I discuss further in my three-part February-April 2021 series. Given a threaded barrel, if a shooter wants a screw-on device removed, install a thread protector. These are available in standard 1/2x28 thread, 3/4" diameter, and match normal AR barrel dimensions to look like a Post-Ban barrel. I use red Loctite if installing a thread protector for a customer with no plans to use a screw-on device; otherwise, I use a knurled thread protector with blue Loctite.

Brownells, Midway USA, and Yankee Hill (among others) offer a variety of these at reasonable prices. Clamp-on Devices With clamp ons, we'll start with stand alone accuracy (harmonic) tuners. Although some predate the BOSS, they never achieved much popularity on Stoner rifles. My only experience with them has been Harrell's Precision units for .22 caliber rimfires, which also work with 223 Remington rifles and I've seen 30% group reductions. Harrell's devices have hash marks to use as described above.

This unit is made for any 0.750" barrel, will fit Post-Ban AR- 15s, and work equally well on Pre- Ban configurations because it goes completely over the front threads and hides them. Too easy! I recommend the use of some green Loctite on the surface of the barrel if you are mounting one of these permanently as well as blue Loctite on the threads of the clamp screws. An Internet search will locate other makers offering tuners for larger caliber rifles. Bloop tubes are another clampon device.

For some competitive shooting, match rifles are equipped with expensive (about \$1,000 per set) iron sights. In the case of Stoner rifles, the rear sight clamps onto the upper receiver rail section and the front sight clamps onto the front of the barrel which, in most cases, is stepped down to 3/4" diameter. Match Rifles barrels are typically longer than the 20" found in Service Rifles, with 26" being common and increasing the sight radius for improved alignment and scores.

Some shooters wanted the advantage of an even longer sight radius without going to the significant expense and added weight of replacing existing barrels with longer ones. The first bloop tubes were born of this need and began appearing on bolt gun Match Rifles and Smallbore rifles. Imagine a piece of hollow pipe with an inside diameter to perfectly match the outside diameter of the barrel.

That piece of pipe has a clamp on the end that fits over the barrel and could be of most any length depending on the desired sight radius. Some of this bloop tube tech has found its way onto match grade Stoner rifles. Imagine a normal 20" barreled Service Rifle upper equipped with a 10" bloop tube resulting in the same sight radius as a Match Rifle with a 30" barrel. Using this bloop tube approach does lengthen sight radius but it does not increase bullet velocity (with its lowered

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wind drift improvement) the way a longer barrel would. So, my admonishment to those choosing to use a bloop tube is to couple it with a high ballistic coefficient bullet that will buck wind changes. In the case of most AR-15s that will likely be a 90 grain match boat tail seated longer than magazine length. The Sierra Match King and Berger are two such bullets available and both are very user friendly shooting out of barrels with a 1:6.5" twist.

My customers are split between these two choices, or rather, their particular rifle shows preference to one or the other. Both of these 90s and most all other bullets will perform better out of again twist barrel that has the proper rate of gain, which is to double from the front of the chamber to the muzzle. In the case 20" Service Rifle barrels shooting 90 grain .223 caliber, that will be again twist of 1:13" increasing to 1:6.5".

Many of you have likely already fast forwarded to a potential issue with bloop tubes: the weight of the tube and front sight has a significant influence on barrel harmonics. Handload development needs to take this into account. Some tubes come with integral harmonic tuners like the tuners previously described. Conclusions I've discussed a wide variety of muzzle devices here and most of them do exactly what they were designed to do with no repercussions.

Unfortunately, some recoil reducers and combination flash suppressors/silencer quick mounts negatively influence accuracy. I don't currently know of anyone else researching these problems and most of my gunsmithing is focused on National Match Course Service Rifles that disallow them completely. I'm limited to testing the occasional customer rifle that has one while the devices on the market seem to be multiplying like rabbits!

Given that so many of them look better suited as a prop in a Mad Max movie instead of being a useful accessory for a good shooting rifle, I question if their makers ever shot a group with them to see what impact they have. Customers see these things on websites or online forums, think they look cool, and buy one without considering potential consequences. Then, a box full of parts arrives at your shop with a customer wanting you to make a silk purse out of a bunch of sows' ears.

This makes me appreciate why so many auto garages and custom gunsmiths refuse to accept customer supplied parts. It is none of my business to try to tell you how to deal with this conundrum. If I get one of these muzzle attachments that I am in doubt of I contact the customer and let him know that often these parts cause groups to be overly big.

If the customer is going to be shooting in some discipline that requires really fast recovery time but only modest accuracy he may be okay with

moving forward; likewise, if he really "needs" quiet shots as opposed to precision, that is his choice. At the very least, I tell the owner that accuracy issues can be fixed by replacing the offending muzzle device with an A2 flash suppressor or a thread protector.

If the customer has made other questionable purchases of major components I have little hesitation to just declining the project, period. For builders of National Match Service Rifles the front end of the barrel is pretty much over looked. It gets either an A2 flash suppressor with lots of red Loctite and modest torque or the barrel choice is for a Post-Ban with no front threads at all. Those are the only options that are legal by NRA/ CMP match rules.

This article points out that you builders of guns for other disciplines have many more options. Hopefully, what you have read will help you make more informed choices. Getting the muzzle device right is only one of many critical decisions involved in building good rifles. Getting the muzzle right along with the other variables will usually result in a stellar gun. Unfortunately, getting the front-end right while making mistakes elsewhere will likely not save you.

You may lessen the impact to precision but that is all. I'm always happy to discuss issues presented in all my articles. Email me at Good luck! AG

PEOPLE & COMPANIES

Reader Forum

BY AMERICAN GUNSMITH EDITORS JULY 2022

ORIGINAL PP. 23–24

Ghost Gun Misunderstanding Polymer80, Inc. was villainized by an NBC News article as a maker of so-called “ghost guns”. “Nevada-based Polymer80 is one of the largest manufacturers of do-it-yourself ghost gun kits in the country. But that success has also put the company in the crosshairs. Apolinar and Perez-Perez sued the company last year. Their suit—which alleges Polymer80 acted negligently and violated firearms laws—follows cases brought by the city of Los Angeles and by Washington, D.

C., which also accuse the company of disregarding state and federal gun laws. The Nevada-based company accounted for nearly 90 percent of handmade guns recovered in Los Angeles last year, records show.

Amid civil lawsuits, Polymer80 says it follows the law.” So reads the NBC News article titled “Polymer80’s name has become synonymous with ‘ghost guns.’ Now it’s in the crosshairs.” To none of our surprise, the article attempts to distort facts, sensationalize crime statistics, and turns a law-abiding company into a villain. Anti-Second Amendment politicians, advocacy groups, and members of the media use the label “ghost gun” to strike fear and trick the public.

Those individuals and groups want the public to believe that privately made firearms are synonymous with crime, even though thousands, if not millions, of Americans have lawfully engaged in this right and freedom for centuries. There is along, storied tradition of

firearms use and innovation in America, including the freedom to participate in the build and customization of firearms.

Americans have, for centuries, participated in this great tradition in compliance with federal, state, and local laws applicable to them and American Gunsmith is proud to be a part of this. Polymer80, Inc. has been operating and continues to operate lawfully, in compliance with local, state and federal laws. The company’s name alone indicates this—at least to those understanding the law instead of fear mongering.

The 1968 Gun Control Act was passed to regulate interstate and foreign commerce in firearms, including importation, “prohibited persons”, and licensing provisions. It included the provision to create federally licensed firearms dealers banning mail order sales of complete firearms. This included the definition for the purposes of federal law that the receiver or frame is legally the firearm, and as such it is the controlled part with a serial number.

Of course, anyone that makes, repairs, or modifies firearms (or has basic common sense...) realizes receivers and frames don’t just materialize; they have to be made from raw materials. So, when does a piece of raw material reach the stage of being a frame or receiver?

Given that the Bureau of Alcohol, Tobacco, Firearms and Explosives is the government’s official arbiter of such things (justified or not)

they made a ruling, which remains on the ATF’s website in their Question and Answer section: [ATF.gov/qa-category/receiver-blanks](https://atf.gov/qa-category/receiver-blanks) (direct: bit.ly/3jltLdU) “Are ‘80%’ or ‘unfinished’ receivers illegal? Receiver blanks that do not meet the definition of a ‘firearm’ are not subject to regulation under the Gun Control Act (GCA).

ATF has long held that items such as receiver blanks, ‘castings’ or ‘machined bodies’ in which the fire-control cavity area is completely solid and un-machined have not reached the ‘stage of manufacture’ which would result in the classification of a firearm according to the GCA.” Polymer80, Inc. continues to challenge these misunderstandings and encroachments, including attempts to co-opt the term “ghost gun” for political purposes whether it be through outright bans on privately made firearms or illconceived restrictions.

Free Ballistics Calculator Winchester has released anew and improved ballistics calculator, relaunched as the Winchester Ballistics Calculator app. After listening to feedback from hunters and shooters, they made the tool easier to navigate and more customizable. The calculator can compare up to four different kinds of ammunition at a time via high-tech ballistic charts and trajectory graphs.

Users can enter custom shooting conditions for variables like elevation, wind speed, and ambient temperature and choose from seven different firearm categories including center-

fire rifle, handgun hunting, handgun target/defense and more. Variables include sight-in range, target range, cross wind effects, sight height, and elevation. The results are calculated and presented in an easy-to-read ballistics graph that illustrates bullet drop, flight time, line-of-sight drop, and more. Different cartridges can be instantly compared and the results printed or saved. Try the new and improved Winchester Ballistics Calculator free online at Ballistics Calculator. Winchester.com.

A free app version can also be installed on your mobile device at the Apple store or Google Play store. Faxon EXOS Compensators A compensator is a device attached to the end of a barrel to help reduce muzzle flip and felt recoil. Muzzle flip occurs on nearly all handguns due to the bore axis (the longitudinal centerline of the barrel) being above the center of mass of the firearm while the grip is below the center of mass. When a handgun is fired, the bullet and escaping propellant gases create a reactional recoil.

This recoil travels backward along the bore axis. Since the shooter's hands are on the grip of the handgun, below the bore axis and center of mass, it creates a rotational force. The force of the recoil combined with the countering pressure of the shooter's grip creates torque. Faxon's EXOS compensators (FaxonFirearms.com/PistolComps, help counter this with a series of ports. The first is located on top of the comp which uses the upward path of escaping gasses to push down the muzzle.

Further, the chamber at the muzzle end of the EXOS comp is angled, tapering up, which uses the escaping gas to push the muzzle forward. This is replicated on the two side ports. Instead of straight, vertical ports on the sides which only push gas out (side-to-side), EXOS ports are angled forward which aids in reactional downward force. By angling the side ports you trade some of the forward push you usually get for more downward push, which can reduce the need for tuning the gun for reliable function.

Constructed of 6061 Aluminum then black anodized, EXOS compensators feature a uniquely angled front port single chamber design, enabling the compensator to improve consistency while reducing muzzle climb and recoil. The angled side ports allow gas to deflect upwards as opposed to only deflecting sideways, reducing up and down muzzle movement and improving reliability. The barrel protrusion is designed to fit flush with the slide and has been optimized for Faxon branded barrels.

During the development process, Faxon recorded the muzzle flip with a bare muzzle as the control measurement. Using a Glock 19 Gen 3, the bare muzzle averaged 21.1 degrees, a competitor compensator averaged 15.9 degrees (24.6% muzzle flip reduction compared to bare muzzle), and the EXOS-513 averaged 15.1 degrees (28.43% reduction).

Using a Smith & Wesson M&P 9mm, the bare muzzle averaged 23.7 degrees, a competitor compensator averaged 19 degrees (19.81% muzzle flip reduction), and the EXOS-514 averaged 18.1 degrees (23.62% reduction). AG

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Precision Arms Workshop

The American Gunsmith Archive

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