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TAMING HK G3 RECOIL

MILLRIGHT CNC • SHOTGUN FITTING • GUNSMITH SURPRISES • THE GUNSMITH'S GUN SHOP

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FINISHING

MillRight CNC

BY AMERICAN GUNSMITH EDITORS NOVEMBER 2021

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Mill Right CNC specializes in desktop CNC and tabletop CNC machines at affordable prices. Made in the United States, Mill Right CNC machines can mill wood, plastics, printed circuit boards, aluminum, brass, carbon fiber, and many other materials. With appropriate tooling, jobs can range from engraving surfaces to cuts all the way through the material. Both 2D work and 3D carvings are possible.

While not explicitly rated for steel and stone, Mill Right customers have successfully used these machines on these materials with success. Mill Right CNC Mill Right works with various software, including free options. The company recommends Autodesk Fusion 360 for designing and generating tool paths as it is an industry standard. Autodesk provides free licenses for Fusion 360 to hobbyists and small businesses.

Interfacing with the machines can be done with Universal G Code Sender Platform, available on Mill Right's website. While Fusion 360 and Universal G Code Sender Platform will serve most user's needs, other free programs such as Maker CAM, Inkscape, F-Engrave, dmap2gcode, and Grbl Panel also work. Some customers have successfully used paid programs such as V Carve, Aspire, Cut 2D, or Cut 3D. Mill Right is a Vectric software dealer and can sell options if Fusion 360 does not suit your needs.

One popular machine in Mill Right's lineup is the Mega V. Constructed of 1/4" steel bearing plates, the Mega V features high performance NEMA 23 motors along with large digital stepper motor drivers and a 48VDC power supply. The Mega V traverses at 650 inches per minute (16,510 mm/minute) on the X and Y axes, giving a diagonal traverse rate of almost 920 inches per minute (23,368 mm/minute). Acceleration is fast and has a maximum cutting rate of 500 inches per minute (12,700 mm/minute).

The overall footprint depends on whether you put the control box to the left of the machine or on a shelf underneath. Not counting the control box, the 35×35" machine is 42" deep by 48" wide and the 19×19" machine is 27" deep and 33" wide. The electronics control box is about 12×12". The router version is 19" tall. The weight of the machine depends on different factors, such as whether you have a Tplate bed or standard MDF bed. Generally speaking, the 19×19" router weighs about 100 pounds.

The 35×35" router weighs about 175 pounds. Depending on options, the Mega V Router Bundle is priced at \$1,574- \$2,907. Financing is available. Contact or MillRightCNC.com.

PEOPLE & COMPANIES

Taming HK G3 Recoil

How to prevent or fix excess recoil in Heckler & Koch Gewehr 3 pattern rifles.

BY MARC WHITACRE NOVEMBER 2021

ORIGINAL PP. 3-8

Heckler & Koch Gmb H Gewehr 3 pattern firearms (G3, HK-91, PTR-91), particularly those chambered in 308 Winchester or 7.62 NATO, have a widespread reputation for excessive, abrupt recoil. Excess recoil can make the gun very uncomfortable to shoot and lessen the life of the gun. This article will discuss the means of preventing or lessening excess recoil. I will assume the reader has access to one of the several HK repair or armorer's manuals available online.

First, it is necessary to understand the mechanical principles of operation of the gun. The best article for this is a US Army study that is available online for free as BRL Memorandum Report No. 1953, A Comparative Evaluation Of The 7.62MM And 5.56MM, G-3 Assault Rifles published January 1969 by Thomas E. Carlson and David A. Golm at the U. S. Army Research and Development Center, Ballistic Research Laboratories, Aberdeen Proving Ground, Maryland (bit.ly/2Vfkr2k).

Some of the information in this article comes from that study and anyone interested in the G3 should read it. For purposes of understanding the recoil generated by the G3, the operation of the G3 action can be summarized as follows. First, the hammer falls and the firing pin strikes the primer of the cartridge, causing the powder to ignite and chamber pressure to rise.

As the chamber pressure rises, pressure is exerted on the face of the bolt which is transmitted to the locking rollers which are engaged in recesses in the trunnion and also rest on an inclined plane (the locking piece), which is connected to the more massive bolt carrier. The shallow angle of contact between the rollers and the

locking piece reduces the backwards pressure on the bolt carrier to about 1/3 of that exerted on the bolt.

The bolt does not immediately open in response to the pressure on the bolt face because the locking lever latches the bolt to the bolt carrier. The grip of the locking lever is provided by the locking lever spring. Until the push exerted by the locking piece exceeds the force exerted by the locking lever and smaller forward pressure from the recoil spring, the bolt rollers cannot move from their recesses near the trunnion, and the bolt and bolt carrier cannot move backwards.

When the pressure on the locking piece is high enough, the locking lever slips over the lip on the bolt, the locking piece retracts and the rollers collapse inwards, allowing the bolt to open and the bolt carrier to be blown back by the residual chamber pressure. To repeat: when the backwards pressure on the locking piece exceeds the strength of the grip of the locking lever on the bolt and the comparatively smaller forward pressure of the recoil spring, the bolt is free to move backwards, and the action opens.

The unlocked bolt carrier moves backwards towards the shooter at approximately 25 feet per second, the fired case is stripped off the bolt face by a stationary ejector held within the trigger assembly, and the hammer is cocked for the next shot. The backwards movement of the bolt carrier is slowed by the recoil spring. The bolt carrier continues its backwards motion, usually far enough so it strikes the buffer pin protruding from the front of the buttstock.

The buffer spring is compressed, then extends, pushing the bolt carrier forward. The bolt carrier is also pushed forward by the compressed recoil spring. The forward movement of the bolt is concluded when the bolt face strikes the posterior surface of the barrel, pushing the bolt and bolt carrier together.

As the bolt and bolt carrier are pushed together, the locking piece forces the rollers outward to engage the recesses in the trunnion and the locking lever latches over the lip of the bolt, sealing the bolt and bolt carrier together, locking the bolt face against the chamber for the next shot. The engagement of the locking lever of the bolt carrier over the lip in the bolt also helps prevent bolt bounce. Within this description are some very important points.

The rollers in the bolt do not by themselves lock the action. They only help secure the bolt head against the barrel when the bolt is latched in place by the locking lever. The rollers, in conjunction with the inclined plane that they contact on the locking piece, reduce the backwards-directed force applied to the bolt carrier assembly. The angle of the locking piece (which the rollers push on) determines how much force is directed rearward onto the bolt carrier, which contains the locking lever.

The shallower the angle of the locking piece, the less force is directed rearward. The less force that is directed rearward, the longer the locking lever can hold the action closed. If there is no separation between the bolt head and the bolt carrier, the rollers and locking piece cannot play their proper role reducing the backwards thrust on the bolt carrier. The bolt carrier would be subject to

TAMING HK G3 RECOIL CONTINUED

ORIGINAL PAGE 4

The locking lever fits over the lip of the bolt, holding the bolt and bolt carrier together. This keeps the rollers in their recesses. Above center: In middle, when a cartridge is fired, pressure builds in the chamber and presses on the bolt. Most of this pressure is diverted to the trunnion by the rollers touching the locking piece, but about 1/3 of the pressure pushes rearward on the locking lever, which pushes the locking lever and bolt carrier back away from the bolt.

When the pressure on the bolt carrier exceeds the grip of the locking lever on the lip of the bolt, the locking lever slips off the lip of the bolt and the bolt carrier is free to move back. This pulls the locking lever out from between the rollers, releasing the bolt from the trunnion. Once the rollers have disengaged from their recesses, the residual chamber pressure and the inertia of the two-pound bolt carrier assembly propel the bolt carrier assembly fully open.

These drawings are only intended to represent the basic principles of G3 bolt operation. the same thrust as the bolt, and bolt carrier velocity would be greatly increased. Hence the emphasis in the various G3 manuals about checking the bolt gap frequently. The locking lever spring controls the force of the locking lever. The strength of this spring is the largest determinant of when the action opens and is more important than the angle of the locking piece.

Changes in the angle of the locking piece affect the force necessary to unlock the bolt by 10% or less; a greater than 10% change in the strength of the locking lever spring has as large or larger effect than any change in the angle of locking piece. To repeat: minor changes in the strength of the locking lever spring have a larger effect on when the bolt opens than the angle of the locking piece.

Bolt carrier recoil velocity is affected by the chamber pressure at the instant the bolt unlatches, as the chamber pressure is pushing on the bolt at the moment of unlocking. Anything that slows bolt opening from the chamber pressure will slow bolt carrier velocity. Conversely, anything that prolongs a high chamber pressure, such as a longer barrel, a slower burning cartridge propellant, or (more importantly) the addition of a suppressor, will increase bolt carrier velocity.

The recoil spring helps slow the backwards movement of the bolt carrier but plays a relatively minor role in controlling when the bolt opens, as the force needed to unlock the bolt and the impulse propelling the bolt carrier backwards are much larger than the force of the recoil spring against the closed bolt. A weak recoil spring may cause faster rearward bolt carrier velocity but does not cause a faster forward bolt carrier velocity.

Provided the bolt recoils the same distance for each shot, the recoil spring releases the same energy as it extends, regardless of how quickly it was compressed. Excess bolt carrier velocity is absorbed and released by the buffer assembly. If the bolt carrier velocity is too high the bolt carrier bottoms out and strikes the buffer housing, fully compressing the buffer spring.

Unlike the recoil spring, which is substantially compressed for all but near-squib loads, variations in buffer spring compression will cause variations in forward bolt carrier velocity. Understanding Recoil Now that some principles of operation of the G3 action have been explained, let's look at the important forces that generate recoil. The first is the forward motion of the bullet and combustion gases and their exit

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Computed from data by T. E. Carlson and D. A. Golm in 1969. From Norwegian Army TM 9-1005- 25/225-14, cited at MG-42.net/G3info.htm. from the muzzle creating recoil. The backwards movement of the bolt carrier compresses the recoil spring and the impact of the bolt carrier against the buffer pin compresses the buffer spring, both of which pushes against the shoulder of the shooter. The bolt carrier is propelled forward by the buffer and recoil springs, also pushing against the shoulder of the shooter.

Finally, if the bolt carrier velocity is very high and the bolt carrier overcomes the buffer spring and strikes the buffer housing of the stock, a very abrupt and unpleasant recoil is felt, as the momentum of the bolt carrier is transferred directly and quite suddenly to the stock and thence to the user. With the exception of the forward motion of the bullet and combustion gases exiting the muzzle, recoil is worsened by high bolt carrier velocity.

Reducing the speed of the rearward movement of the bolt carrier is the single most important factor in reducing the recoil of the G3. An adequate buffer that prevents contact between the bolt carrier and the buffer housing is the second factor and should be addressed after bolt carrier recoil velocity reduction has been attempted. So, what can be done to evaluate and adjust a G3 rifle for proper recoil? Talking to the user is sometimes useful. What ammunition is used?

Different makes of ammunition may cause very different recoil. Does the gun recoil abruptly or excessively? The normal recoil of the gun I would describe as a “push” rather than an abrupt slam. With a double buffer in the buttstock assembly the recoil may have two pulses to it. Is brass thrown too far? Fifteen yards is too far. Has the user occasionally found the bolt carrier not seating fully forward with misfires (bolt bounce)? How easy is it to reassemble the bolt by hand?

A locking lever that does not put up a bit of a fight when reassembling the bolt on the bolt carrier is a sign of a weak locking lever spring. Commonly, anew or even somewhat experienced user may not know the answers to these questions. Even if the gun was working properly years ago, there may have been a gradual change in functioning and the user has become accustomed to it. Finally, is a suppressor used?

Adding a suppressor will lessen the thrust created by the combustion gases, but at the expense of prolonged chamber/barrel pressure, which causes higher bolt carrier velocity and more violent recoil. Examination The gun should be examined for barrel length. Guns with barrels longer than the standard 18" or guns used with suppressors will maintain a high chamber pressure for longer and will produce higher bolt velocity.

These guns may need a shallower angle locking piece and anew G3 or even an up-graded version such as the PSG-1 (Präzi-

sionsschützengewehr or “precision shooting rifle”) locking piece spring. Anew locking lever spring may also help prevent bolt bounce on suppressed guns. Next, the bolt gap should be measured, even if the shooter has no complaints about excessive recoil.

The bolt gap is the distance between the bolt and bolt carrier in an assembled, unloaded gun when the bolt slams home on an empty chamber as measured with a feeler gauge. If the gap is less than 0.1 mm, there is a higher chance the pressure on the bolt face may be directly transmitted to the bolt carrier, causing premature unlocking with high bolt velocity. If the bolt gap is too large the locking lever may not be properly engaged on the bolt lip.

When a standard 45 degree locking piece is used, the suggested gap is 0.1 to 0.5 mm. It is not clear to me that different angle locking pieces require a different bolt gap in a G3. A different bolt gap is recommended in a PSG-1 and HK-21 but the roller geometry is different in those guns. The proper bolt gap can be obtained by adjusting roller sizes or (less often) replacing a worn locking piece with a newer one. A 0.1 mm change in gap will occur for each step up or down in roller size.

Rollers are sized in even numbers. For instance, going from a +2 (8.02 mm diameter) roller up to the next size roller (+4 – 8.04 mm diameter) will increase the bolt gap by 0.1 mm.

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The firing pin recess is aligned with the firing pin, while the buffer pin only contacts a hemispherical region of the lower bolt carrier (buffer strike zone). HK recommends regularly checking the bolt gap, so even if a gun is apparently functioning normally, this should be done as a good gunsmithing practice. There is a huge fascination with bolt gap in the HK community, far out of proportion to its importance, and many an online argument has been spawned over a disagreement of less than 0.2 mm.

I suspect this is because factory manuals insist on measuring the bolt gap, stating that it is a safety issue, but hardly ever discuss spring strength. Very useful clues about excess bolt carrier velocity can be obtained by inspection of the receiver and buffer housing. The buffer pin does not strike the center of mass of the rear of the bolt carrier, but only touches the lower edge of the carrier.

This concentration of force on the lower rear of the bolt carrier tilts the front of the bolt carrier up so the upper front of the bolt carrier strikes the inside of the upper

receiver. The abrupt strike can be so forceful that an impression is made on the receiver by the machined grooves on the head of the bolt carrier tube.

While some wear in this area is inevitable, if there is widespread gouging of the upper receiver this is evidence of repeated forceful impact with the buffer pin from excessive bolt carrier velocity. The buffer housing should be checked for signs of bolt carrier impact, which is a sign of excess bolt carrier velocity or weak recoil or buffer springs.

There is a hole in the buffer housing to accommodate the firing pin, so the flat back surface of the bolt carrier can come to within 1 to 0.5 mm without the firing pin bottoming out in this hole. As the bolt carrier comes closer to the housing the firing pin will strike the bottom of the hole, marring the finish of the housing at the bottom of this hole or even creating an indentation.

I have not seen a firing pin relief hole in a housing that would permit the bolt carrier to strike the housing without the firing pin touching first. Hence, the firing pin relief hole in the buffer housing should be the

first point to inspect when looking for contact between the bolt carrier assembly and the housing. When the buffer spring is completely overpowered by a too-fast bolt carrier, the back surface of the bolt carrier will stamp an impression of itself on the housing.

In extreme cases, the abrupt stop of bolt carrier at its most rearward travel may attempt to force the bolt head into a locked position, which will push the rollers out against the stamped guide rails of the receiver, leaving marks or even indentations on the rails. A too-fast recoil velocity may even damage the cross-pin holes that secure the buttstock. One trick to look for how close the bolt carrier comes to the buffer housing is to put a thin strip of modeling clay on the front of the housing.

In theory, it would be best if the buffer contributed to the forward bolt carrier movement as little as possible, and the recoil spring did almost all of the work returning the bolt carrier to the forward position. Indeed, the contribution of the buffer is totally unnecessary for

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The wear on the finish of the buffer pin is evident as well. On the right is the buffer housing from a moderately used gun. The bolt carrier has not marred the housing. There is a subtle impression from the firing pin (inset), which shows the bolt carrier is beginning to overpower the recoil spring and/or buffer, permitting the firing pin to touch the bottom of its hole in the housing. This is an early sign that the gun needs attention.

There is also less wear on the finish of buffer pin than on the buffer on the left. Buffer pins are the among last parts to show finish wear from excess recoil. chambering of rounds. In Carlson and Golm's Army Memorandum Report mentioned above it was demonstrated that full compression of the recoil spring was not needed for reliable operation of the gun. In many well-maintained guns the face of the buffer pin has little or no wear.

However, all of HK's technical literature states that the buffer helps propel the bolt carrier forward. Sufficient bolt carrier velocity with the ensuing bolt carrier-to-buffer contact is necessary for reliability in the varying conditions in which the gun was intended to be used. Addressing Recoil If it is believed that the recoil is excessive for the shooter or ammunition used, or the examination of the gun reveals signs of excessive bolt carrier velocity, then the following steps should be performed.

First, inspect the locking lever and locking lever spring. If the tip of the locking lever is worn, it may slip over the bolt lip too early in the firing cycle. A worn locking lever

would be a rare occurrence in civilian guns. The locking lever spring is far more likely to be weak. If it is easy to reassemble the bolt to the bolt carrier by hand, or if the back of the locking lever can be pushed down even a small amount by strong finger pressure, the locking lever spring should be replaced.

Most of the time, simply replacing the locking lever spring is all that is necessary to greatly improve the recoil. In exceptional circumstances, such as when along barrel is present or a suppressor used, a stronger locking lever spring (made for the longer-barreled PSG-1 precision shooting rifles) can be used and will provide even more delay on bolt opening and a slower bolt carrier recoil velocity. The stronger locking lever spring will also lessen the occurrence of bolt bounce.

If the locking lever spring is in good condition and excess recoil is present, the locking piece can be changed to one with a shallower angle. This will reduce backwards force on the bolt carrier and is very helpful if the gun is to be shot suppressed, or if the barrel is longer than 18". After changing the locking piece the bolt gap should be remeasured. Sometimes it will be necessary to replace the rollers to adjust the bolt gap to the recommended range.

Bear in mind that changing the locking piece angle is not a substitute for a fresh locking lever spring, as the locking lever spring has just as much or more influence on bolt velocity as the locking piece angle. Once the bolt unlocks the recoil spring provides the principal resistance to bolt recoil and helps return the bolt forward.

However, based on Carlson and Golm's report on the G3, the components of the bolt carrier assembly (i.e., the rollers, locking piece, locking lever and locking lever spring) have much more influence on bolt carrier velocity than the recoil spring. Nonetheless, if the recoil spring is weak a fresh recoil spring may further reduce the bolt velocity so the contact between the bolt carrier and the buffer pin is a gentle "kiss".

The recoil spring can be tested by using a scale with a hook attached to the bolt carrier retracting handle to measure the force necessary to keep the bolt carrier fully retracted. Changes in opening bolt carrier velocity caused by the above alterations to the gun (or simply changes in ammunition) can be shown by where and how far brass is thrown by ejection. Of course, it is necessary to use the same ammunition in monitoring for changes in the ejection pattern.

A grossly excessive bolt carrier velocity may throw brass to the four o'clock direction while an excessive velocity may throw brass to two o'clock 15 yards or more away from the gun. In many cases, this distance can be reduced by a third by changing the locking piece angle from 45 degrees to 36 degrees. The angle the brass is thrown will not change, as the two o'clock direction is the normal direction for ejection.

If the buffer itself is weak and strikes of the buffer housing continue to occur after bolt recoil velocity has been reduced, the buffer spring

TAMING HK G3 RECOIL CONTINUED

ORIGINAL PAGE 8

or even the entire buffer assembly can be replaced. The latter course of action is usually faster and replaces all the vulnerable parts. There is a good demand for enhanced buffers and I suspect they are over-ly used as a panacea for excess bolt velocity.

It is simpler and better for the gun and shooter to keep the bolt velocity down by replacing the locking lever spring, adjusting the angle of the locking piece or replacing the recoil spring, rather than trying to mask the symptom of high bolt velocity with a stronger buffer.

Further, if upper receiver scarring is occurring because of bolt carrier tilt, a so-called double buffer does not solve this problem because this buffer strikes the bolt carrier in the same region as the original G3 buffer pin, tilting the front of the bolt carrier up in the same manner. Also, with an enhanced buffer, an excessively fast bolt carrier may be propelled forward so efficiently Quick guide to fixing G3 excess recoil I. Assess for excess recoil A. Ask shooter regarding - 1. Abrupt recoil 2.

Excessively forceful ejection 3. Easy assembly of bolt carrier 4. Bolt bounce 5. Suppressor use B. Examine gun for - 1. Barrel length 2. Bolt gap 3. Scoring on upper receiver 4. Damage to receiver/buffer housing II. Minimize recoil A. Reduce bolt carrier velocity 1. Adjust bolt gap 2. Assess/replace locking lever 3. Assess/replace locking lever spring 4. Reduce locking piece angle 5.

Assess/replace recoil spring B. Assure adequate buffer 1. Replace buffer or buffer spring 2. Change type of buffer C.

Address other factors 1. Change brand of ammunition 2. Add buttpad 3. Change model of stock 4. Use reduced-power ammunition 5. Muzzle brake that the gun shudders obnoxiously. At very high bolt velocity speeds, an enhanced or double buffer may make bolt bounce more frequent. Hence, an enhanced buffer should be one of the last steps in moderating recoil.

If bolt bounce remains a problem in a 308 Winchester or 7.62 NATO G3, a tungsten-buffered bolt carrier (now uncommon and available at a premium cost) might help lessen it. Bolt bounce is a known problem in 223 Remington or 5.56 NATO versions of the G3 and all of these bolt carriers are buffered. After any adjustments/repairs are made to the bolt carrier or buffer I touch up the paint on the buffer housing so future strikes can be detected.

Finally, if the G3's recoil is still excessive for the user, different brands of ammunition should be tried. The normal buttpad can be replaced with a thicker and wider HK-21 buttpad. This will increase the length of pull and may prevent the shooter from seeing the "ring within a ring" sight picture that these guns are famous for. A slip-on recoil pad can be added.

Smaller recoil pads sized for the AK-47 stock fit well, however, they interfere with the normal sling attachment points, increase the length of pull, and may also interfere with the sight picture. The butt-

stock can be changed to a Spuhr G3 Stock Assembly (SpuhrWebshop.com) also sold through Mile High Shooting Accessories (MileHighShooting.com, but this will require that optical sights be mounted to the gun, adding more weight. Reduced power ammunition can be obtained or handloaded.

The G3 was originally designed for a less powerful cartridge than current NATO cartridges so using reduced loads is one way of returning the gun to the roots of its design. A muzzle break can be substituted for the flash hider, though I wonder if this might not prolong a high chamber pressure. G3s are so rugged, reliable, and long-lasting that they have been called the "AK-47 of .308's".

Part of the reason for this is that the soul of the gun is a well-built, large bolt carrier assembly which is made of wear-resistant parts. The gun remains reliable over wide variations in bolt carrier velocity—and the neglect that caused it. With long-term use the bolt carrier velocity gradually increases until the bolt carrier strikes the buffer pin at high velocity or even contacts the buffer housing, abruptly increasing the felt recoil.

This pattern of slow change in the recoil may prevent the gun's user from identifying increased recoil until it reaches absurd levels, disillusioning the shooter and damaging the gun. The maintenance and/or repairs to keep the gun more comfortable to shoot are easily done. When a customer complains about the recoil of this gun, now you know how to evaluate and fix it. AG

SHOTGUNS

Shotgun Fitting

Fitting the shotgun to a shooter. An overview of how a master gunsmith molds a shotgun to a customer.

BY SERGEY LYALKO NOVEMBER 2021

ORIGINAL PP. 9-12

Shotgun fitting is becoming a more popular custom gunsmithing service.

This is a result of growing understanding among shooters that fit of the shotgun plays a major role in placing the shot where it is expected. Shooting at flying target requires pointing rather than aiming and pointing is a rapid, intuitive motion, combined with concentration on the flying target, leading it, and pulling the trigger.

In such conditions, with limited time and multiple variables, only the correct fit of the gun ensures that the impact is where the shooter intends to put it. Well, all other mistakes excluded. I would like to exactly define what the fit is but at this point it is easier to explain what it is not. Misfit means a physical inability of the shooter to line up the aiming eye with the top rib of the shotgun.

In other words, the projection of the rib-line cannot be placed into the center of the eye or can only be achieved with an awkward position of the shooter's head, neck, and shoulders. If this is so, then either the geometry of the stock is inappropriate for the body proportions of the shooter or the way of shouldering the gun is incorrect. The "correctness" of shouldering requires explanation.

The competition for the highest scores in the shotgun shooting sports have developed a pretty standard way of shouldering the gun. There are several basic requirements: First, keep weight of the body on the front foot. Second, keep the cheekbone firm on the comb without tilting the head. Third, keep the stock firm on the height of

the shoulder. Fourth, relieve unnecessary tension on the neck and shoulders. With certain practice these requirements become a second nature.

While I am not trying here to teach a shooting technique—this is a task for instructors—my goal here is to stress that fitting the gun cannot be done to any body position and requires a certain, developed consistency of shouldering. For example, to fit the gun to a sitting shooter is very different from doing the same for a standing one. Again, if the cheek is not firm on the stock and the head is not tied with the gun, then one of the major stock dimensions—drop at comb (DAC)—cannot be determined correctly.

The same goes for the other dimensions discussed below. Body position is important. This is why when fitting the gun to a beginning shooter I first spend time on achieving the shooter's correct shouldering and body position or sort of it. Note that shouldering of the beginner will be gradually changing with shooting experience. Fitting Dimensions The major fitting dimensions of the stock geometry defining the fit are the Length Of Pull (LOP), Drop At Comb (DAC), Drop At Hill (DAH), Cast, Pitch, and Twist.

It is interesting to note that after achieving correct body position and shouldering, some shooters do not need to proceed with fitting work as the gun actually fits correctly as-is. So, what is the whole goal of fitting? Here is the exact definition as I pursue it in my practice: Fitting the gun to a shooter is a process of changing the stock geometry so that the aiming eye of

the shooter can be lined up with the top rib of the shotgun, while the gun shouldered comfortable and correctly.

This puts the shooter's eye directly over the rib, which is the only correct position. To judge the position of the shooter's eye the gunsmith-fitter first makes sure that the gun is correctly shouldered. Then, staying in front of the shooter several feet away he looks along the rib from the muzzle side, projecting the rib-line onto the shooter's eye. If it does not look like the shooter's eye is directly over the rib-line after several shoulderings, the stock geometry should be changed.

Yes, procedure requires the gun to be pointed directly at the head of the fitter, so all safety precautions must be in place. It is also important that the shooter keeps his finger on the trigger as this allows assessment of the length of the palm rest on the gun with the pistol grip. This parameter is seldom changed and I do not list it in major dimensions, however, in cases of a shooter having a very small or very large palm, adjustment here is in order. The mentioned comfort of shouldering requires attention.

It is not the way of pleasing the shooter but a necessary feature of making correct shots. A very important and not widely known rule is that starting the shot with any discomfort will cause error. During the time spent concentrating on the target and pulling the trigger will let the body move to a less uncomfortable position. The recoil makes that movement unnoticed and leaves the shooter wondering why the target is still flying.

SHOTGUN FITTING CONTINUED

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Original caption: Top: The major fitting dimensions and their position on the stock. LOP, Length Of Pull. A, Drop At Comb (DAC). B, linear position of the head on the stock. C, Drop At Hill (DAH). P, Pitch. G, Central rib line. W, cast off. Q, twist. Center: Different positions of the shooter's eye relatively to the top rib. It is important to shoulder the gun with closed eyes from the low position and open eyes after shouldering is complete.

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To exclude uncomfortable gun positioning, always ask the shooter to shoulder the gun from the low position having his eyes closed. With closed eyes the shooter does not intuitively force himself into lining up with the rib. After shouldering, check the correctness of the alignment and ask the shooter to open their eyes. Do this several times and watch the position of the aiming eye relative to the top rib. This exercise is the most effective in establishing the necessary steps of any needed stock modification.

The desired position of the eye is directly over the rib. Each stock dimension has its own particular role. Let's discuss them one-by-one assuming that shouldering is correct. Note that in the past most stock modifications were done with bending via means of heat. This technique is still used but stocks on shotguns became quite bulky with a central bolt inside which makes this approach

less popular. Instead, a number of fit adjusting devices have become popular and are considered here.

Length Of Pull (LOP) defines the linear position (B) of the head on the stock and position of gripping hand with the trigger finger. The rule for adjusting LOP is that the distance between the shooter's nose and thumb knuckle is about 1". If this distance is much less or allows the nose to overlap with the knuckle, then the stock is short and the shooter will have tendency to relieve the firm contact of the stock with the shoulder or even distant the stock out of shoulder.

WHEN THIS

Only position 1 is correct as this puts the shooter's eye directly over the rib. is happening, the semi-auto shotguns fail cycling and single-trigger shotguns with inertia mechanism fail switching to a second shot. On other hand, the too long stock is always uncom-

fortable but is simple to adjust—just shorten the stock. To adjust LOP for a short stock, install a wooden or plastic spacer. However, a more advanced way is to use an adjustable butt plate such as the Gra Coil from Graco Corporation.

Drop At Comb (DAC) defines vertical position of the head on the stock. The standard averages around 1.5" but often needs a custom change. If DAC is too big, then the shooter has his aiming eye too low—below the rib line. If DAC is too small, the shooter has his eye too high above the rib line. The popular way of modifying the DAC is installation of an adjustable comb. In fact, the adjustable comb is quite versatile as it moves up-down and also left-right. More on that later.

Drop At Hill (DAH) defines vertical position of the stock on the shoulder. The standard is about 2.5" although this parameter greatly depends on the length of

com, adjustable buttplate. 1, the shock absorbing cylinder with coil for absorbing recoil. 2, the thread for adjusting Length Of Pull. 3, four-way adjusting sliding plate for adjusting Drop At Hill and Cast. com,) Rectangle Comb Adjuster provides four way adjustable comb hardware. Vertical adjustments establish DAC, horizontal adjustments adjust cast on or cast off. neck and face of the shooter. Tall shooters with long neck often need DAH increased as they are trying to place the butt pad above the shoulder.

Popular devices for this change are butt plate adjusters made by 100 Straight Products, Stock Positioning Systems, and Gra- Coil-type device from Graco with an additional sliding plate. There are several kinds of these devices which have to be chosen to match the circumstances and price. Cast (angle W) defines horizontal position of the head on the stock. Some shooters with wide faces need a significant cast. The illustration here shows cast-off, which is required for right hand shooters.

It also is shown as the distance Lseen from behind the stock butt. For the lefties this angle and distance Lare called cast-on and should be by the other side of the center-line G. Note that with a four-way adjustable comb combined with a sliding buttplate, the cast-off or cast-on can be established by shifting the comb and butt-plate right or left. Pitch (angle P) defines whether the gun is for high-flying or lowflying targets.

For example, Skeet shooters require smaller or even negative pitch as the gun is mostly pointed up for the shot while Trap shooters would be better with a bigger angle Pitch as the gun is pointed at targets much lower. This parameter can be adjusted by shaping the stock butt or installing an appropriate pad. The goal of this adjustment is to provide the most complete contact of the butt pad with the shoulder during the shot.

Some pads, like the Rocker Pad shown on the next page, can be good for shooting both low and high targets.



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3dcartstores.com, Adjustable Plate. This allows adjustments through the pad with one wrench. As with Gra Coil, the sliding plate on this device can establish DAH and Cast, which is very convenient when LOP does not need to be changed. Bis a Trap Pad, suitable for mostly low shots. The bump on the top helps to fill the distance with the shoulder. Twist (angle Q) defines the cant of the gun. Some shooters significantly cant the gun and it may be corrected with adding more Twist and angle Q to the stock-pad.

However, the canting mostly happens not because of the butt-pad position on the shoulder, as many would think, but because the shooter is intuitively moving the rib-line closer to his eye when the cast and DAC are incorrect. Note that both 100 Straight Products plate and the Gra Coil have the ability of adjusting Q.

Conclusion This article may be a starting guide for the beginning fitter. The rest comes with experience. My goal here is to point out the role of each stock dimension in gun-fit to a shooter and also mention the most popular devices for stock modification. There are multiple publications on shotgun fitting and I would like to name two good ones: Stock Fitter's Bible by Rollin Oswald and Gunfitting: The Quest for Perfection for Shotguns and Rifles by Michael Yardley and Paul Roberts.

I think that these books promote understanding of the gun-fit and uncover hidden reasons behind the lost targets. Finally, a brief note on try-guns. Though they are useful for establishing optimal dimensions of the stock for the particular shooter, their role is diminished by the existence of adjustable devices described earlier. These devices convert almost every gun to a try-gun anyway. AG

PISTOLS

Gunsmith Surprises

Some surprises in my recent gunsmith work. The first occurred during a 1911 beavertail installation and the second from an unexpected source of new and useful tools for my bench.

BY CHARLIE BRIGGS NOVEMBER 2021

ORIGINAL PP. 13-15

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Gunsmith work is endlessly fascinating that gives us all the opportunity to learn new things and expand our skills. Here were a few pleasant surprises I had in my recent gunsmith work. Beavertail Surprise The first surprise came during a beavertail installation while working a 1911 Series 80 handgun to install anew beavertail grip safety led to a surprise during the project. Here's how I fixed it.

I'm working on an article about modifying my milling machine to add an electric power lift of the approximately 300 pound mill head to avoid having to use a labor-intensive crank. However, this project, like others, had to take a back seat to work on customer's guns.

One customer is a former Green Beret turned contractor (common here in the Mac Dill Air Force Base/Tampa, Florida area) who brought in his early Series 80 1911 Colt complete with gorgeous grips adorned with the Special Forces crest insignia to be "modernized". He wanted a beavertail grip safety, lightweight hammer and trigger, night sights, tightened slide to

frame, titanium firing pin, etc. Of course I complied. The mill project and related article would have to wait.

I've done lots of 1911s and many of those with beavertail grip safeties but this one, perhaps due to its age and it being an early Series 80, would not cooperate with this gunsmith. Perhaps you detect a little prejudice here about my dislike for Series 80 pistols? Bingo! Anyway, sometimes the trigger wouldn't function or the hammer wouldn't fall. Nothing in my extensive gunsmith library had a single word about this problem. And I was worrying, even losing sleep about whether or not I could remedy this problem.

The issue, after extensive study, turned out to be the thickness of the front extension on the new grip safety. See the exploded parts diagram I've included in this article. Note, I'm not talking about the length of the extension or the "stepped" shape of it, but the thickness. The left side of it was interfering with the plunger lever (part #30 on the parts diagram). It was simply too thick.

After a lot of measuring with my very best micrometers I determined the difference between it and the original grip safety extension to be about 0.009". I started polishing the left hand side using a Cratex wheel (Brownells #190-025-743) in my 1/4 HP Foredomstyle flexible shaft grinder. While it would be possible to use a Dremeltype tool here, but from what I've heard this much work would lead to the Dremel's early death due to the vast difference in horsepower.

Now, sometimes, this leg of the beavertail grip safety needs to be lengthened by peening but this was not the case here. And, while beavertail safety fitting jigs from Midway or Brownells make this part of the job much easier, be careful. These jigs are not adjustable, meaning they are specific as to the grip safety manufacturer. For example, the dimensions of the beavertails are different for Colt, Ed Brown, Wilson Combat, Kimber, etc. On replacing the notorious Series 80 parts, my preferred method is as follows.

FOR THE TRIGGER BAR LEVER (#56 ON THE DIAGRAM) I ASSEMBLE

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IV Series 80 1911. It physically blocks the firing pin until pressure on the trigger pivots the lower sear lever, actuates the uppers sear lever, and presses the firing pin lock plunger out of engagement to free the firing pin to move when struck by the hammer. The author is not a fan of this design. the sear and disconnect on a longer-than-usual slave pin, then add a layer of assembly grease as a temporary “glue”.

From there, add the trigger bar lever, effectively making a three layer “sandwich”—four layers if you count the grease. Holding the whole sandwich at the rear bottom area of the disconnect behind the trigger, with a pair of needle nose pliers I insert the nose or top of the disconnect into its recess in the top of the frame. The sear pin can then push out the slave pin, and the whole mess is now installed. The Series 80 plunger lever (30) is much easier.

Start the hammer pin into the frame from the left and insert the hammer, holding it with the pin. Then, place the plunger lever to the right of the hammer and push the hammer pin to the right, holding the

plunger lever. Next, scoot the plunger lever down until the hammer pin will pass through and you’re done. Note, plunger levers are specifically numbered, and are not interchangeable. There are three part numbers for this lever: #567671, 567672, and 567673, which are stamped 1, 2, and 3. Don’t mix these up!

When ordering a replacement part, identify it by the ending number. Now I can go back to my mill modification project. Surprise Tool Supplier Micro-Mark is probably not a company you’ve heard of. While they may be an unusual source of gunsmithing tools, Micro-Mark has useful items for your shop.

At least once a month one of my many firearms enthusiast buddies and I get together for lunch or whatever to invariably swap whatever gun magazines and/or catalogs we’ve just finished—except for American Gunsmith, of course, which, like the rest of you, I put into annual binders for later reference. Then, when I’ve finished these now twice-read volumes, I “accidentally” leave them in my doctor’s waiting room, or at the tire store, whatever.

I figure, what the heck; spread the news, and increase the interest; particularly with the NRA publications, where I want to spread our pro-Second Amendment views. During a recent visit where in addition to the usual publication mix traded at lunch was a catalog from Micro-Mark (Micro-Mark.com, While I think I knew the name, I had never studied their catalogs. In paging through this one I thought, “Wow!

I wish I had seen one of these twenty-five years ago when I had been ‘smithing long enough to know what I needed but didn’t know where to get it.” This is not to short-change Brownells or Midway, but this little more than a dozen specialized tools I wish I had known about years ago, or at least could have afforded. Please understand, this is not an advertisement for Micro-Mark. They don’t even know me and certainly don’t compensate me for promotion.

I just think they are a source of interesting tools at interesting prices and I’ll bet many gunsmiths don’t know about them.

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For drill press or mill, this wonderful gadget precisely locates your drill chuck over the exact center of around work-piece. While each page in their catalog features 10-20 items, but to be fair, many of the pages and items are intended for model railroaders, model shipbuilders, jewelry repair, costume and prop building, and a variety of similar hobby pursuits.

Micro-Mark has countless unique items from specialty paints and epoxies, to small hand-held tools for cutting, polishing, and measuring, up to and including milling machines and lathes, etc. As some examples, I'll go over four such items that caught my eye as they are particularly useful for gunsmiths. First was the #82281 Center Finder (\$14.95).

For a drill press or mill, this wonderful gadget precisely locates the drill chuck over the exact center of around work piece and is ideal when working on a rifle action or barrel for scope mounts. There's also a smaller

one suitable for front sights. A second useful item is the #83338 Micro Flow Coolant System. At \$59.95, this is a well-designed combination for milling machine, drill press or lathe. The kit includes a coolant pump, three nozzles with magnetic base, 32" hose, and a four liter tank.

With a magnetic base it can be moved from mill to lathe, etc. with ease. The company also offers #83340 coolant concentrate for \$9.95, which when mixed with tap water makes four gallons of coolant at 62 cents per quart! Next, their #89252 All-Position Universal Clamp With Base (#89252). This is a cleverly-designed clamp, designed to hold irregularlyshaped objects for filing, polishing, and even soldering things like 1911 safeties, beavertails, Browning Hi-Power safeties, etc.

Eight (included) steel pins can be located wherever into any of 60 pre-drilled holes on the face of the unit to hold your odd-shaped part before the two halves of the

clamp are tightened together with the knurled screw head. Cost is \$29.95. There's also a handheld model (Universal Clamp, #21129) for \$24.95. Last in this cursory list is Micro-Mark's #85653 (fine), #85654 (Med.), and #855655 (coarse) series of silicon carbide impregnated nylon belts for sander/grinders.

They're three for \$11.95 and said to outlast ten standard belts. Given the durability, and in addition to the savings in cost-per-belt over time, consider the hassle saved in belt changes. Again, these are just four items out of the hundreds that caught my attention that will be of great use to any gunsmith. Micro-Mark is worth checking out to either save money, to get tools otherwise not available, or both.

It may get you unknown tools you want or need, or it may save you money on the ones you've been meaning to get. There's a form on the website to request a free catalog. Now back to the bench! AG

FROM THE ARCHIVE

The Gunsmith's Gun Shop

Sales can be a great way to increase revenue for your gunsmithing business, but only if you're smart about it. Here are some tips on managing retail sales of items in your shop.

BY BILL SMITH NOVEMBER 2021

ORIGINAL PP. 16-18

I normally keep from talking about the second potential income-producing feature of gunsmiths shops—gun sales. While additional income can be had from selling guns, my rule of thumb is to recommend against selling new guns and shooting accessories. However, as with any broad generalization, this is hardly a rule. Retail of new guns and accessories may make sense in your shop provided you put some serious thought in before rushing into buying a stock of guns. Please read carefully.

The biggest mistake a gunsmith can make is to get carried away because some customers start telling you they would like to buy anew gun from your shop. You could make a mistake and put in a bunch of your money based on someone's casually-stated intention. Even a small inventory will easily sink five figures that you have to hope someone will actually buy. Right off you are faced with several things.

First, the customer who tells you he is wanting to buy anew gun may eventually find someone else with an FFL and get it through them to save a few dollars. The second is that it is cheaper for him to go to a big chain retailer that has selection and pricing you'll never be able to match. Third, and most dangerous for you, even if by some miracle you successfully move your entire inventory, you'll do well to gross only 25% on your money.

That means it takes a \$10,000 investment upfront to make \$2,500, which you'll only make if everything works in your favor.

Doing it twice successfully in a year yields a gross (not net) profit of \$5,000 a year. I'm guessing that isn't enough to keep you and your shop going. You might be tempted to think that's not so bad. After all, retail sales are secondary income and might bring people into your shop to consider your gunsmithing services which is the main point.

Even if you ignore how much money is needed upfront and the cost to secure and maintain that inventory while those well-intentioned customers find discount FFL services, you also need to take into account the time taken from your shop work which reduces your income from the primary reason you opened your shop in the first place. There's also additional time to shelve, maintain, demonstrate for a customer, and then record keeping to bring the inventory in and then again upon sale.

Most gunsmiths would net more money by investing in equipment to expand their shop services. If you grossed \$80 on anew gun and had to spend the better part of an hour on it in total, you lost, anyway you look at it. I'd rather have that money in a stock index fund passively earning even 4% (and most will do double or better than that!) and still have the \$10,000 in principal.

Should you decide to sell new guns, I recommend by special order only with the sale of the gun at wholesaler/dealer cost plus shipping, taxes, and a reasonable FFL fee for handling it in line with your normal hourly rate. Your customer pays, in full, up

front, and you get a clean brokerage fee without risking any of your money carrying an inventory.

This requires no upfront money from you and the only new guns for sale in your shop were bought with your customer's money who is pending pickup, reducing the time and risk of securing items in your shop. The thing wrong with inventories of new guns is that you buy several guns that you like and that your customers say they want. Then you find they don't sell. I don't know of anyone smart enough to buy an inventory that will sell out completely within a short period of time to make the turnover profitable.

If I could do it I would be a highly-paid buyer and not a gunsmith. There is always a change in the market. Every time anew gun comes out and the factory sends them out to the gun writers there is a flood of stories that makes people buy the new ones so you keep adding to your inventory until you wake up and realize that all the profit from your shop is held up in inventory. Maintaining a shop front business makes maintaining your FFL reasonably easy.

The few remaining small stocking gun shops are doomed as there just isn't any need for them and if they try to stay they won't for long because the sales are

THE GUNSMITH'S GUN SHOP CONTINUED

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going elsewhere. Between the FFL holders and big chain and discount stores you will, in a short period of time, see fewer retail gun stores. Where there is money—bigger money and less inventory—is in used guns. Buy all you can get, but buy them right. You probably know the market, but do you know what margin you should work on? Let's assume for discussion that a particular gun lists at \$600 and after it is used it will market out at around \$450-\$470.

If you use your head you will tell the customer what it is worth on the used market. If he is reasonable he knows he can't sell it as new and will listen to you. Now, if you want the gun because you think you can sell it, talk straight to him and tell him you work on a 40% margin. Figure this out. The gun should be bought for \$300 or so. If he doesn't want to sell, you are out no money. If he does, you can mark it up to \$470 and see where you go.

Remember, when someone brings a gun into your shop they want to sell it's likely because they need cash quick and don't know anybody willing to buy it. Short of handing him a tissue to wipe his eyes, you show some feeling for his position but that you don't really want the gun as sales are slow but long ago you made up your mind that you just don't want to lay out cash unless you are prepared to take a chance on not selling the gun right away.

If he doesn't agree, it's likely the only immediate alternative is a pawn shop that will likely offer less than \$100 for it. In other words, if you can't make good money on it—forget it. When your sales are likely to gross 40% or more, which is double the new gun margin, you are at least happy with yourself and now you can have a Happy Meal for lunch. Then too, you

might get in that broken gun that is going to cost more to repair than the customer wants to spend, which you can pick up for even less.

New gun and retail sales grosses (not nets) a margin of about 25%, usually less. That means it takes a \$10,000 investment upfront to gross less than \$2,500, which you'll only make if everything works perfectly. With smart purchasing, used gun sales can readily allow for a margin twice as much, more if the gun requires repairs which you're in a position to make. Something else to consider with this angle.

With BATFE now saying that if you repair guns for resale you are subject to an excise tax and are considered to be a producer or manufacturer, your shop could be liable for the tax AND not having a manufacturers license. As I look at these regulations, BATF is telling us that we're subject to penalties to repair guns for resale. This may limit you to repairing guns owned by someone else. If you buy them after they have been repaired then that is alright. The same applies to custom jobs.

If you want to consider sales in a small, independent shop, the ideal situation is to slowly go into having a stock of used firearms and take in trades that you can sell at a high margin, which makes the return on investment about double. It also ensures your shop is offering unique items rather than selling the exact same recent manufactured goods as the big chain stores. Stay away from strangling new gun inventories. Stick to this along with your gunsmithing and you should do well.

Oh, one word on carrying ammunition for sale: Don't. If you need four words instead: It isn't worth it. You, Records, and the Law Unfortunately, we have to keep

records. We have to keep receipts, we have to keep records from birth onward, and the burden of keeping these records lies with the individual for a womb-to-tomb period of time. What we are most concerned with here is keeping good records that keep the law (any form of same) from being able to criticize us or even penalize us.

We are all familiar with the federal requirements as to the purchase and sale of guns. I don't think we have to spend much time on this one. You simply have to learn to comply if you don't already know. The important thing here is to better understand how properlykept records can work on your behalf. Let's examine repair records. I'm what the kids call "old school" and still maintain records on paper.

I like using numbered cards such as Brownells offers or some similar sort of work sheets to fill out and keep in a loose leaf binder. BATFE and most everyone else will accept this form of repair record keeping. Or, you may simply want to keep an in-and-out bound book. Of course, there are any manner of digital storage options as well. While I prefer the first as the complete records I need stay with the gun from receipt to done, the important thing is to have records to show what you do in your shop.

The in-and-out bound book is all that is required by law. The repair records are for the time being a house secret. These repair tickets can be a life saver in case of a liability suit or to satisfy any claim by a law officer. They are your proof of what you did to the gun. Yet, if you so desire, you can refuse to show any repair ticket without due cause (warrant) and simply because a law officer asks you to. I don't take this position simply

THE GUNSMITH'S GUN SHOP CONTINUED

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because I have nothing to hide and very simply, "why not?" In all your repairing of guns, it is possible that one day you'll either get in a stolen gun or have a convicted felon bring one in for repair. Now we are not policemen and the law does not (yet) require us to have each customer checked or each gun checked to see if it is on the hot sheet. The assumption that all guns and customers are clean is the prevailing mood and I hope it stays that way.

Suppose you get a visit from a duly authorized law enforcement officer who asks if you did work for a particular customer or if you repaired a particular firearm. The answer from me is quickly forthcoming as soon as the law officer complies with my request to provide his request in writing and on some sort of official letterhead. I state that I need the request in writing in order to provide any and all requested information so that I have the exact, formal request to keep as apart of my records.

The written, formal request to note the specifics of the visit and my compliance with it keeps everything straight if the issue should ever arise in the future. I do this for a few reasons. First, such a request is not out of reason. Second, it gives me an opportunity to make notes just in case I need to demonstrate my cooperation. No respectable law officer would refuse such a request from you.

Remember, the possibility of the gun being stolen and some law officer deciding that you are repairing stolen guns is not entirely impossible, so get the request and then show them anything. Again, let me say that we have no positive way of knowing who or what position the customer or gun is in. We could be in the middle. The customer could lie to the law, involve you, and then you would be put in a position to defend yourself. It could happen. These situations can apply to the purchase of stolen guns also.

You have to examine each offer to sell very carefully. If the asking price is too low, the skunk oil on the gun will begin to smell.

While the point of retail is to have the highest possible margin, don't jump just because the price is cheap. There are a lot of older guns that have been stolen and the crook wants to get rid of them quick, which is why he picked your little shop. He is counting on your greed to buy them cheap. Let me give you a true story just to prove a point.

I had a nice appearing young man come in one day. He said his father had died some few months before and some of the guns in the estate needed refurbishing. His mother had put them in the garage and they could not be sold or disposed of until the estate was settled. Now he wanted them all fixed up. While I empathized for him and his family, my place in this and the interest of my shop was in doing the work.

He brought the guns in, eight in total, and an order to have them all reblued with repairs and refurbishing as needed. This was a nice order but not unusual in my shop. I completed all of the work and tried to contact the customer to tell him they were done. He had moved from the address I had first been given and was now at a different address. I talked to him and he said he was happy the guns were done and would come in to pick them up.

The time now jumps to three months and several phone calls later with no additional contact or reply. I finally sent him a registered letter and received no reply or return receipt. He was gone. Now I had eight refurbished guns on my hands and an unpaid bill. I've never liked this situation. Sure, I could take legal steps to sell them but there is something in me personally that causes me to spleen away from doing this. Fast forward another 30 days.

A local law enforcement officer came into my shop, showed me a picture the man, and asked if I knew him. Naturally, I told the officer that I did not know him personally but he was a new customer that had brought in eight guns to be refurbished, having told me they were from his father's

estate. I'm sure you won't be surprised to learn those eight guns were stolen. My "customer" was now in jail and he had told them where the stolen guns were—at my shop.

In his warped mind he figured he would put the stolen guns someplace where they were out of his possession, have them fixed up in the interim, and later pick them up to sell. It was a workable plan up until he got arrested before he got the guns back. Of course, the officer initially wanted to pick them up right then and there.

I replied that I would be happy to turn the guns over but only after receiving a formal, written request explaining the situation and listing the guns by description and serial number along with the fact they were stolen and then surrendered from my shop with refurbishing work complete. They did, which provided me a legitimate and complete tax deduction as well as proof of my compliance in surrendering the stolen goods to law enforcement. So it can happen.

Until we live in a perfect world, it will continue to happen and there is not much any of us can do to prevent it. In all my time in gunsmithing, prior to the last six years, I averaged about one stolen gun in my shop every decade. However, in the past six years I've had eleven. This will obviously vary by region greatly but your shop should plan that it will eventually happen to you.

Again, always cooperate with any law enforcement officer's request for information but don't just lay down and put your feet in the air—cover yourself at all times. The fact that all law officers should remember is that we are both trying to do the same thing—we try to uphold the law but the stigma—and yes, there is a stigma, undeclared—of dealing in any form with guns makes all of us a little suspect in the eyes of too many in law enforcement. AG

PEOPLE & COMPANIES

Deleting Smith & Wesson Locks

The product of recent work performed with a focus on practical safety issue. Here's how to remove the factory Internal Locking System on Smith & Wesson revolvers and why you might want to.

BY ROBERT K. CAMPBELL NOVEMBER 2021

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As a rule, I would never remove a safety feature whether a manual safety, firing pin block, or other device. I recall the first time in my experience when a safety feature became controversial. When the Colt Series 80 first came out with its hammer block/firing pin safety the pundits were quick to condemn the change. In my opinion, the safety block doesn't prevent a good trigger action as that problem just doesn't exist with a properly manufactured firearm.

On the other hand, I prefer a lightweight firing pin and an extra strength firing pin spring as a drop safety. Once SIG introduced the P-series with their positive firing pin This is a great revolver that may be marred by a factory lock. block, anyone wishing to make institutional sales would have to offer a similar product. Of course, the Series 80 was seen as an add on as it was not originally

engineered into the pistol. Many folks also don't like the grip safety on 1911 handguns and that was in the original.

If you don't like the grip safety of the 1911 pistol do not pin the safety in place or deactivate it. Choose another firearm! We have seen some of the disastrous add on safety levers morphed into the Tokarev, as an example, simply to gain import points. Some safeties, like that of the modern SAR 9, may be used or ignored as there is no point in removing. Another safety that seems to have given shooters a bad taste is the push button safety of the Marlin rifle. The Mossberg 464 features a neat tang mounted safety.

With these safeties, you can use them or ignore them. Modest prying of the lock broke the "wing" of the part.

DELETING SMITH & WESSON LOCKS CONTINUED

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This brings us to safeties that are truly detrimental to firearms use. A few years ago, atop company designed a frame mounted combination safety/decocker that was counter indicated for many. The HK USP pistol was prone to being decocked during a firing string by some hand sizes. The Taurus PT92 was much the same.

Adding Hogue grips to the Taurus solved the problem, eliminating the decocker function by blocking travel simply by using The trigger, bolt stop, and trigger return spring need not be removed. old style PT 92 grips. Again,

choose another firearm if this is a problem. A problem often discussed is the liability issue of removing a safety.

If you remove the Series 80 firing pin block or a lever action rifle safety and an accidental discharge or a questionable personal defense incident occurs, then you could find yourself in legal trouble. Your conduct may be described as reckless. I agree. If you have a serious problem with these guns and their operation, purchase another. It isn't difficult to find a handgun that suits you well. One example of safety device tampering was one of the worst examples I have seen.

An individual at the gun club was trying to sell a double barrel shotgun. It was well made and in good condition. I noticed, however, that the shotgun's tang mounted safety lever had been removed. The shooter competed in Cowboy Action Shooting and had slicked the gun up and removed the safety. His reloads and shooting were faster as the safety of this shotgun automatically went into the on position as the piece was cocked.

Forgetting to hit the safety would be disastrous to his scores and at best it slowed him down. I told him it would be irresponsible to sell

DELETING SMITH & WESSON LOCKS CONTINUED

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something like that to anyone. He replied that he would fully inform any potential buyer of the modification—although he had neglected to inform me as he harked the gun for sale! I bought the gun as it was quite well made and sold at a fair offer. However, I knew I would not get in any trouble as I know how to use it and will not sell the piece unless it is fully restored to correct operating order. The same safety concern goes for competition trigger jobs.

This brings us to the Smith & Wesson revolver and its Internal Locking System. Smith & Wesson has along history of “safety” revolvers. The Safety Hammerless models and similar were intended to protect children from unintentional discharge and they are very well made revolvers. The problem is the

much later Internal Locking System was designed into existing designs at a time when Smith & Wesson was in the throes of considerable controversy due to unsavory dealing with the Clinton Administration.

I should stress that the company was nearly bankrupted by the subsequent boycott. The present owners are not the same owners and had no part in the previous dealings and have reinvented the company. The S&W ILS features a small hole in which a key is inserted to lock the revolver located near the cylinder release. Surveys indicate the lock is mostly ignored. A few revolvers have been manufactured in modern times without the lock but most Smith & Wesson revolvers feature the locking components.

There have been revolvers with manual safeties including the Webley and a few others, but the Smith & Wesson revolver action lock isn’t a safety—it is an internal gun lock. That is the point of an argument for deleting the device: you aren’t removing a safety intended to enhance safe function during normal use, you’re removing a lock that is only used during storage that happens to be internal to the revolver.

Any external measure (cable lock, trigger lock, gun safe, etc.) provides the same feature and I strongly prefer a separate trigger lock for the Far The original spring will be re-used when installing the Lock Delete.

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intended purpose of rendering the revolver safe in storage. As time went on, there were reports of the revolver ILS moving during firing and locking the action. At first I did not give much credence to the reports. I felt that while the lock was unattractive and not needed, surely Smith & Wesson had fired several examples to the tune of a few thousand rounds of Magnum ammunition to ensure the lock was a valid design. Maybe, maybe not. However, I then learned there were real, documented problems.

Most of the problems seem to occur with very lightweight Magnum revolvers. I have personally examined two incidents in which the revolver lock malfunctioned. One of these was a personal gun, a 357 Magnum with a five-inch barrel, a full sized, all steel revolver. The other was a lightweight 44 Magnum. I do a lot of shooting and I am "in the loop" on problems with firearms at schools and things that come into the shops. There are other credible reports other than my paltry pair.

They do seem rare but the possibility is certainly there and important to personal defense shooters. In one case I witnessed the revolver was easily made operational by turning the key to the fire position. In the other case the revolver remained locked and the key would not turn the lock. The revolver had to be disassembled, not something I like doing with a loaded revolver. So, how serious is this problem? The percentage of failure seems low but not zero as the number of credible reports has shown.

If the revolver is used for plinking, hunting, or competition, I would not be concerned, however, if personal defense is the agenda then I am concerned. The problem isn't as easy as simply buying a different 1911 if you do not like the Series 80 firing pin safety. There really isn't anything comparable to Smith & Wesson revolvers in most roles and their J-Frame, K-Frame, and N-Frame revolvers are very well suited to personal defense. We have to look further.

Is the safety lock a flawed design or are there individual weak locks turned out? An excuse an associate put forward is that per-

haps the cause is operator error. Perhaps they had turned the lock from the locked to unlocked position and not secured it in the fire position? I write this off as highly unlikely. Quite a few new shooters seem unaware of the lock, and most experienced shooters simply never use it. Neither of the revolvers in my personal experience had ever been locked using the locking key.

Operator error is not possible in these cases. If you do not trust the Smith & Wesson internal lock then you have Ruger, Colt, and Taurus as alternatives. However, many are convinced that a Smith & Wesson model is the finest choice for personal defense. I certainly feel that way and feel there is nothing quite like the Smith & Wesson Performance Center 625 45 ACP for all around use. The good news is there is a device called the Lock Delete.

Offered by Original Precision (OriginalPrecision.com), the Lock Delete takes the place of the original gun lock. Since this

device is available and the safety lock so controversial I would wager you will see these in the shop. The Lock Delete is well made of good material. I elected to test one in a personal revolver having wanting to replace one of the single action 45 Colt revolvers I have as a trail and hiking gun on the Appalachian Trail and other areas. I strongly prefer a revolver for defense against animals.

Ammunition for the 45 Colt is scarce, especially the high performance type, and I thought I might step up my defensive ability. This moved me to the double action Model 625 that uses moon clips. While a very good revolver, the safety lock, coming on the heel of earlier incidents, left me cold. Removing the lock isn't difficult. Disassemble the revolver in the normal manner. With the mainspring and hammer removed I took a look at the lock. Interest-

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FINISHING

Reader Forum

BY AMERICAN GUNSMITH EDITORS NOVEMBER 2021

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Joe Carlos AR-15 Update I am finishing up an article tentatively titled “AR-15 Muzzle Attachments” but before I can finish it I have to fire test groups on the machine rest with these devices. Unfortunately, the range is not usable at present for one of the most bizarre reasons I have ever encountered, so I’m writing up the details as the story is sort of funny and might be of interest to the dozen or so readers that follow my articles.

So... excuses. ingly enough, I could supply pressure and move the lock with the tip of a hardened screwdriver bit from my Real Avid tool kit. When the hammer is in place this may not be true but it isn’t a very rigid part. Also, the lock is of cast metal. I actually broke a wing off the lock lever itself by exerting pressure. The lock is removed by pressing the spring and tiny lever that butts into the lock mechanism itself. The lock then lifts out.

My example was stuck in the frame and did not want to lift out easily. This wasn’t a great concern as I did not intend to keep it on hand to return the revolver to original condition. Also, I don’t intend to sell the 625. I finished breaking up the action lock as I removed it. My advice is if you take this job in at your shop, try not having the heavy hand I used. Even then, I don’t guarantee you will be able to save the original action lock.

My primary interest is precisionbuilt AR-15 rifles for competition shooting. I machine rest test all the rifles I build and all the barrels I sell. The bullet impact area on my test range is at the bottom of a tall railroad grade that goes through my property. The few persons who see my operations universally offer the observation that many tens of thousands of bullets fired have landed into a very confined area that has really drilled quite a hole in that bank!

Once the lock is out it is a simple matter to slide the Lock Delete lever into the original spring and then slide the small hole cover in place. Original Precision offers the Lock Delete for J, K, L, Nand X-Frame revolvers. The fit is good and I’ve had no issues in installing several Lock Delete kits. For many of us, the S&W ILS revolver lock is more than a theoretical concern. If you wish to lock the revolver for safety, keep it in a safe or use a trigger lock.

The percentage of Smith & Wesson revolver locks that have malfunctioned is very small. However, I don’t wish to be the man that drowns in a creek with an average three foot depth either. If you are not willing to remove the locking device that is understandable. For those that wish to deploy a well made revolver with what some feel is a minor character defect, the Lock Delete is a good solution.

AG I live in a very rural area in mountainous north central Pennsylvania right in the middle of our elk herd which numbers an estimated 1,400 animals. I have mentioned in the past that I have to frequently either delay range testing or gently “encourage” elk to move so I can conduct my testing. When you choose to live in an county that is 97% forested with only one traffic light and twice as many deer as humans, wildlife is all around you and an important consideration in day to day life.

I have had a female groundhog living under my garage for years. She has given me many litters of lovely “grand-babies” over the summers. This year she had five and I have been enjoying watching them all summer. In late summer the babies are nearly full grown and they disperse and dig their own dens. They will be hibernating through the winter in those dens beginning around late October. Mom lays sole

READER FORUM CONTINUED

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claim to the original den under the garage. This year one of the babies discovered the tunnel in the bullet impact area. I guess it figured it could save effort as my rifle testing provided the “den excavation” and has since taken up residence, effectively closing down my test range. I realize that some people hunt groundhogs and I did as well when I was a kid.

However, my high school “senior trip” was spent in Viet Nam and after being hunted myself for a year, I no longer shoot anything that I do not intend to eat. Once I am satisfied those groundhogs are in hibernation, I’m going to block that hole to prevent any animals from wandering into a bullet. I’ll also pivot the machine rest base enough to move to a new impact area a couple of feet to the side to resume testing. Many of you who wear a shop apron began life as I did by relying on others to work on your firearms.

After spending years listening to gunsmiths making excuses for not completing work I had contracted for—and too often receiving substandard quality when I finally got my guns back—I finally started doing some of my own work and that finally blossomed into a career. In remembering those excuses for why my firearms were tied up for months on end, none of those excuses were as original as mine! So when

my customers start receiving firearms from me again, they’ll know that my groundhog issue has been resolved.

That will also let me finish up my muzzle attachments article as well. When you see that in print, you’ll know my groundhogs are safe. Sabatti Stock I have a Sabatti (Sabatti.it) thumbhole M98 stock for my Voere rifle (Voere.com). When I first assembled this there was lots of space between the stock and my rifle’s bull (16mm thick) barrel. Should I fill this space? If so, what is a suitable fill material? From Mark Hollensen.

I am not familiar with this brand of stock, however, in most cases bull barrels (or any other rifle barrel style or profile) can be free-floated in the stock. This means that when the barreled action is secured in the stock (screwed down tight), you should be able to slide a dollar bill down the full length of the barrel in between the stock and the barrel until you get to within a couple of inches of the barrel shank, just forward of the receiver.

If the dollar bill will not slide down that far, you will need to remove any excess stock material in the forearm area until you can perform the above test. If you choose to fill the gaps, first check with the stock manufacturer to determine what the stock is made of and whether or not Brownells Acraglas will stick to that mate-

rial. The reason for this is that there are some aftermarket stocks made that Acraglas will not adhere to and will come loose during use.

If it cannot or will not bond with Acraglas or something similarly suitable, you’ll need to keep it free floated or replace the stock with something made of a different material that can be glass bedded. Joe Carlos If the stock can be glass bedded, then you might consider Acraglas to fill the void. Not a simple job as you must make sure that the barrel and action do not get glued to the stock permanently.

If you are not familiar with glass bedding a rifle, or with relieving a barrel channel (free floating), then I highly recommend that you take it to a reputable gunsmith to get the work done properly. From Sergey Lyalko. Since you have a bull barrel, I would start with making sure that the action (receiver) with two screws and recoil lug are tightly sitting in the stock. Leave the barrel free-floating and not touching stock.

If there is a space around action and recoil lug, use Acraglas with metal powder filler to glass bed the action. It may be enough for providing sufficient accuracy. Nayyer Janjua This is best done professionally. If after this work is complete and accuracy is still not good, you’ll need to address other issues. AG

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