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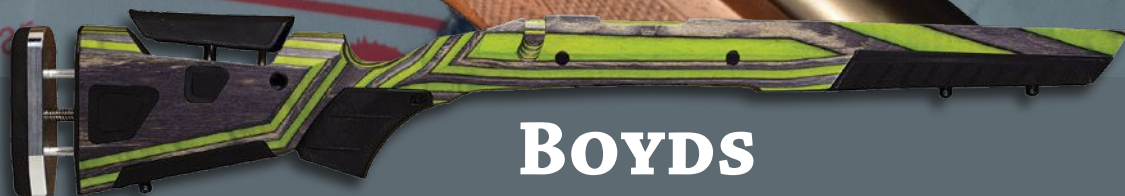
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This issue's cover rifle is a Mauser 1898 Expert 8x57JS with a Swarovski Z3 3-10x 42mm scope. Photo by Terry Wieland.



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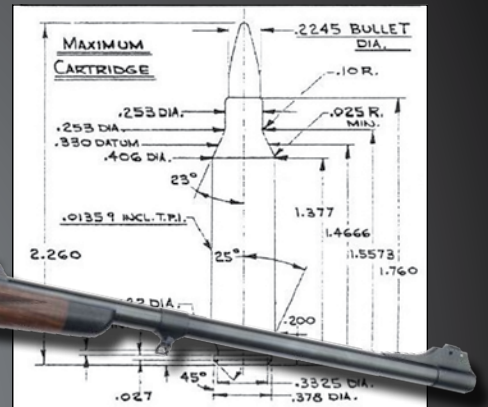
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THE BULLET

SPOTTING SCOPE by Dave Scovill

RIFLE

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There is a photo in the 1955 issue of the *Ideal Hand Book* on page 25 that shows a .30-caliber jacketed bullet with the base expanded to what appears to be about .40 caliber. The bullet was fired from a .30-caliber barrel cut off in front of the receiver. The text next to the photo states: "It will be obvious to the reader that the gases were driving the base faster than the point after the bullet left the short barrel, causing the decided upsetting of the base."

The text goes on to state expansion, aka upset, at the base of the bullet is common to flatbase bullets. The base of boat-tail bullets does not expand, owing the gas pressure around the surface of the tapered portion, but explains why boat-tail designs must be of heavier construction at the base, with thicker jackets and harder cores, to prevent collapsing.

The implication is that the base of the bullet must be tough enough

to withstand the shock of the pressure that pushes the bullet forward, but the rear half, which for a moment (less than 1.5 millionth second) wants to remain at rest as well, but is confined by the gilding metal jacket that is supported by the barrel wall. The ogive, however, that is not supported by the barrel, wants to expand owing pressure from within by the lead core.

If all that is not enough to give engineers a headache, a bullet should expand, but not blow to pieces or behave like a monolithic solid, when it hits the intended target, the chest of a deer, for example.

Of course, this all assumes the bullet is capable of some measure of acceptable accuracy from a run-of-the-mill sporting rifle. The problems associated with achieving accuracy were summarized in the *Hornady Handbook of Cartridge Reloading, 3rd Edition*, and has been printed in each edition since then. The graphic illustrations show how the center of the bullet form may vary from the center of gravity, causing the bullet to veer from its intended path. The challenge is to maintain near flawless jacket thickness as it is progressively formed from what was originally a flat sheet of metal. As the text in the successive Hornady handbooks indicates, we're talking about maintaining jacket thickness, which routinely tapers from the base to the nose, to within .0001 inch for millions of bullets.

Other problems surface as well. It is normal for tooling used to form jackets to wear out, making it necessary to retool for up to 10 or 12 stages of the forming process. Where a handloader sets his/her dies up for a particular bullet,



the bullet seating punch normally contacts the bullet ogive to prevent the punch from putting too much pressure on the nose, especially if the bullet has a lead tip.

If bullet seating depth is set up to touch or come within a couple thousandths inch of the lands (rifling), it is quite possible that another batch of the same bullets from a different lot may have a slightly different ogive shape as the result of retooling by the manufacturer. This may not affect the overall loaded length to the tip of the bullet but might result in the ogive being jammed into the lands or backed off more than expected. This sort of problem is rare, but variations from one batch of bullets to the next, or with bullets packed in the same box, do occur.

In the earlier days of jacketed rifle bullets, it was not unusual for the lead core to shift forward upon impact in an animal, which in effect fed the core forward, feeding the mushroom at the front while leaving a void at the rear of the jacket. The Speer Hot-Cor was an effort to minimize core shift. Hornady ultimately introduced the InterLock, a shelf around the inside perimeter of the jacket designed to restrain core movement. Then Speer came up with the dual-core Mag Tip. Custom bullet makers like Jack Carter resorted to bonding, soldering the core to the inside of the jacket. More recently, we have the Swift A-Frame, which emulates the design of the Nosler Partition, both of which allow the front of the bullet to expand while holding the rear half intact.

Of course, the other problem associated with lead core bullets was the lead tip was/is easily deformed while being slammed back and forth while riding out the effects of recoil in the magazine box. The lead tip also had a tendency to become soft by absorbing heat due to friction generated by acceleration in the barrel and by high velocity in air.

Canadian Industries Limited, as I recall, was one of the first, if not *the* first, to install a polymer tip (SabreTip) to minimize defor-

mation due to bouncing back and forth in the magazine box, and we might assume, enhance ballistic efficiency. Nosler adopted the idea as the Ballistic Tip. At that time, Remington already had its Bronze Tip, and Winchester had the Silvertip, actually a cap covering the tip of the lead core. Since then polymer tips are commonplace, with Sierra being one of the most recent to add the green tip MatchKing (TMK), while Remington added an AccuTip and Winchester has the XP. To steal and paraphrase a rebuke offered by a friend on occasion: "It appears you cannot toss a dead cat around here without hitting a polymer tip bullet."

Polymer tips, or concepts thereof, are not immune to their own problems, however, since they too can flatten somewhat or break off while waiting respective turns up to bat in the magazine. So, like the old nemesis lead core designs, it pays to rotate cartridges with

polymer-tipped bullets through the magazine to avoid deformation or breaking off.

With the advent of monolithic bullet designs, problems resulting in excess pressure surfaced. When the Nosler Partition was made on screw machines back in the late 1940s, a bore-diameter groove was cut on the outside of the bullet over the solid wall between the front and rear cores, an apparent effort to abate pressure when the wall encountered the rifling. When production was switched to forming dies, the groove was eliminated. Years later the Nosler Zippido had a solid base, up to the ogive, and grooves were added around the solid shank to mitigate pressure. The more recent monolithic Nosler E-Tip, however, has one shallow groove to accommodate a crimp. Notes in the *Nosler Reloading Guide No. 8* state loads for the E-Tip should begin with

(Continued on page 56)

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NOSLER HERITAGE .22 NOSLER

LOCK, STOCK & BARREL by Lee J. Hoots

Unlike many traditional shooting sports companies, Nosler has remained a family-run operation for three generations, having gained its true notoriety first with Partition (1948) and then Ballistic Tip hunting bullets. It has continually expanded its product line over the years and its ammunition and brass offerings have been significant, as has the company's evolving and growing stable of sporting rifles and proprietary cartridges.

The limited edition NoslerCustom .300 Winchester Short Magnum, introduced in 2005, was the first. Rifle options have changed and expanded since then, but the Legacy model caught my eye due to its classic walnut stock said to be shaped to founder John Nosler's ideal specifications. That model was unfortunately discontinued in 2013 before I had the opportunity to shoot one. The more recently introduced Heritage is a nearly identical rifle and features a "fancy-grade," oil-finished walnut stock with 20 lines-per-inch checkering; a shadow-line cheek-piece and a very slight palm swell; a narrow forend that measures about 1½ inches wide at the front sling swivel stud; a soft recoil pad and a comb tall enough to keep the shooter's head erect – the bolt clears the nose of the comb by about ⅛ inch.

This nicely shaped comb is not unimportant, given the fact



Nosler Varmageddon factory loads containing 62-grain flatbase hollowpoint bullets shot well in the Model 48 Heritage .22 Nosler test rifle. Shown is a 100-yard, 10-shot group.

that today's shooters and hunters are increasingly gravitating to riflescopes with larger objective lenses, requiring increasingly taller mounting hardware. Of course, stock design is purely a personal preference, but a comb that starts out too low and continues to drop as it nears the butt of the stock is not very advantageous when using a scope mounted high up off the receiver.

Other features are standard

Nosler: The Model 48 receiver (more or less a derivative of the Howa twin-lug design) has flat sides and a flat bottom with an integral recoil lug, and a pleasantly unobtrusive bolt release lever opposite the bolt. The trigger is made by Timney and is adjustable; from the box, the test rifle used here provided an average pull weight of 3 pounds, 2.5 ounces. It features a two-position, lever-type safety of traditional "forward-to-fire" design but without any means of locking the bolt closed. This point is recognizably a stickler for some riflemen who will only hunt with a rifle having a safety that locks the bolt, yet more and more rifles are made without this feature.

The bolt has a plunger ejector and a large hinged extractor. After shooting several boxes of factory

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ammunition and a few handloads through the sample rifle, the rear-facing surfaces of the lugs were polished to a shine, indicating complete, or nearly complete, contact with the receiver. There are also two large ports at the bottom of the bolt shank to expel gas in the unlikely event of a ruptured case. Barrel length is 24 inches, and total bare-bones weight is said to be 7.25 pounds. With a favorite old Weaver 6-24x 42mm AO varmint/target scope attached, the test rifle weighed about 9 pounds, a suitable heft for a prairie dog rifle that most likely will be shot from a portable bench.

With the decade-long growth in the use of AR-15 and -10 rifles in the U.S., and Nosler having a solid relationship with Oregon-based Noveske Rifleworks – plus focusing heavily on the engineering of its own cartridges – the company set out to design an offering that would function in an AR. By the end of 2016, the result was the .22 Nosler with a maximum overall

cartridge length of 2.260 inches. It fits neatly in the AR-15 and is said to offer better downrange ballistics than the .223 Remington.

Nosler has never indicated that the new cartridge has a parent case, thus fueling Internet speculation that it was loosely based on the 6.8 Remington Special Purpose Cartridge (SPC). While the 6.8 SPC is similarly shaped, the .22 Nosler case is much closer in design to the .224 Winchester E-5 experimental cartridge. Depending on sources, the E-5, with its rebated rim, is believed to be one of many cartridges Winchester experimented with after (or perhaps during) the company submitted its Winchester Light Weight Military rifle and .224 E-1 and E-2 cartridges to the U.S. Army for trials in the 1950s. That story ended when the military chose ArmaLite's design and the .223 cartridge.

Wolfe Publishing tested the .22 Nosler in a Noveske Model N4 Nosler Varmageddon with an 18-



Bullets tried in the Heritage rifle include (left to right): the Nosler 55-grain E-Tip shown with a bullet recovered (47.1 grains) from a pronghorn, a 55-grain Ballistic Tip Varmint boat-tail and a handloaded Barnes 50-grain Varmint Grenade hollowpoint.

inch barrel. The results were published in the 2017 edition of *Varmint Rifles and Cartridges* (1-800-899-7810). Velocity with Nosler 55-grain Trophy Grade Varmint

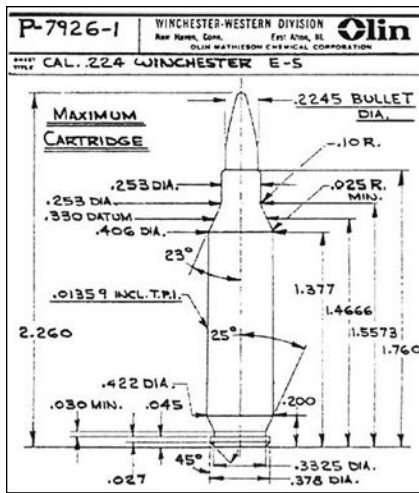
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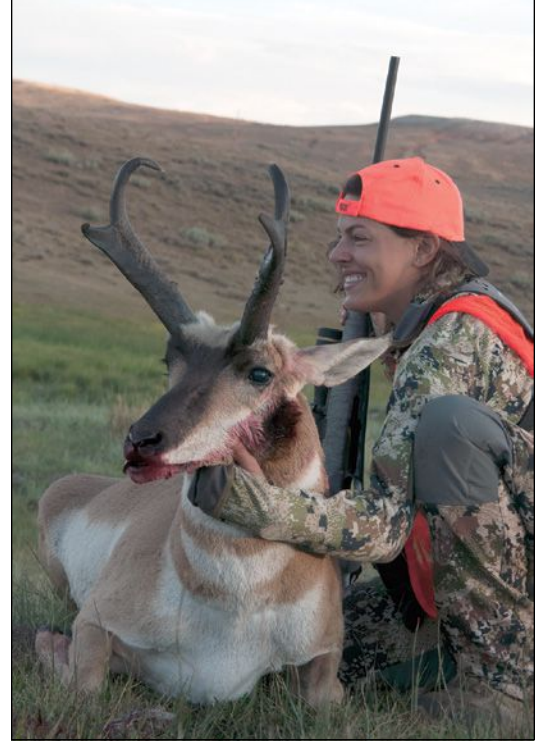
The .22 Nosler's case dimensions are very close to the old .224 Winchester E-5 experimental cartridge.

Ballistic Tip and 77-grain Match Grade Custom Competition factory loads ended up being 3,288 and 2,839 fps, respectively. High-end velocities with handloads included 3,229 fps with a Nosler 55-grain Ballistic Tip; 2,991 fps with a Nosler 64-grain Bonded Solid Base; 2,903 fps with a Nosler 70-grain Reduced Drag Factor bullet and 2,798 fps using Sierra 77-grain HPBT Match bullets. Cumulative, five-shot group size for 15 different loads (powders/charges, bullet weights and two factory loads) shot at 100 yards was 1.13 inches.

Since its introduction, interest in the .22 Nosler has been continually growing, so it seemed sensible to offer it in a bolt action. Some enthusiasts with strong preferences

for one rifle type over another may cringe at this idea, but it makes perfect business sense. It's no different, really, than selling the same pickup truck in multiple colors. Another great example can be recognized when ammunition designers neck the same basic case up and down to different calibers, like the 6.5mm and 6mm Creedmoors or all the long and short cartridges based off the .30-06 case. One may not be significantly different from the other, but cartridge tinkerers want something to fiddle with.

Because the M48 Heritage .22 Nosler test rifle arrived only a few weeks ago as this is written, tinkering is about all I have been able to do with it so far, shooting a couple hundred rounds consisting of Nosler factory ammunition and a couple handloads. Prior to receiving it, however, a completely different rifle was used on a pronghorn hunt, along with recently introduced 55-grain E-Tip bullets. At just under 300 yards, the bullet struck high, shattered the buck's spine then traveled several inches downward along the offside ribs under the skin before coming to rest. A second buck, shot by another hunter with a different rifle, was hit nicely through the ribs just behind the foreleg at a distance of about 150 yards. It ran 50 yards or so before piling up, but that bullet did not exit and was never recovered. The bullet found under the



The .22 Nosler loaded with a 55-grain E-Tip is undoubtedly useful when hunting pronghorns.

hide of the buck I shot weighed 47.1 grains.

During the short hunt there was no time, or a proper facility, to test the rifle and load for consistency, and since it belonged to someone else, a second rifle was used here to shoot the same lot of E-Tip factory ammunition. The best groups ran about 1.4 inches with an average velocity of 3,482 fps and an extreme spread of 45 fps, but groups were more triangular than round. Not having any of the new 55-grain E-Tip component bullets on hand, bullets were pulled from factory loads until there were enough mostly unmarred samples to be resealed to a slightly longer overall length after resizing the brass and dumping back in the original factory powder charges. Doing so generally reduces pressures and velocity, provided bullets are not seated right up into the rifling. It also can give a handloader an idea of what might work best in a given rifle as new handloads are tried.

Factory E-Tip loads measured 2.243/44 inches, and the pulled bullets were resealed to an overall loaded length of 2.253 inches, resulting in a velocity average of 3,457 fps and a more or less round,



A borrowed Nosler M48 Heritage rifle with a Leupold VX-5 HD 3-15x 44mm CDS-ZL2 scope was carried during a pronghorn hunt last fall. Heritage stocks feature better-than-average walnut and classic sporting rifle lines.

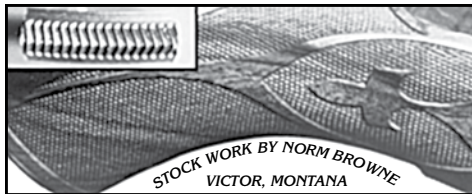
five-shot group of .951 inch. The magazine measures 2.370 inches front to back, so there remains some room to seat E-Tip bullets out even farther when there is time.

Several five-shot groups were also shot with Nosler 77-grain Custom Competition loads (average velocity, 3,089 fps), but this particular rifle spread 100-yard groups beyond the 2-inch range. Whether these loads will respond to the same treatment given the E-Tip loads has yet to be explored. Trophy Grade Varmint loads containing 55-grain Ballistic Tips gave an average velocity of 3,669 fps, an extreme spread of 45 fps, and consistently grouped about an inch, with the smallest group measuring .627 inch. Varmageddon 62-grain flatbase hollowpoint loads provided an average velocity of 3,283 fps and an extreme spread of 56 fps. Accuracy was generally better than that of the Ballistic Tip load and included a 10-shot group of .741 inch.

Viewing the .22 Nosler mainly as a varmint/predator cartridge, it was difficult to keep from trying a handload with a favorite coyote bullet, the Barnes Varmint Grenade, because it has provided good accuracy and terminal performance in the past when shot with handloads and the rare factory load. With an unopened bottle of Ramshot TAC on hand, a few loads were assembled in batches of five using 50-grain Varmint Grenade hollowpoints over powder charges ranging from 30 to 31 grains. The best 100-yard group measured .790 and resulted from the 31-grain charge; cartridge overall loaded length was 2.260 inches, the SAAMI recommended maximum length. Unfortunately, that was the last load shot late in the evening, and the angle of the sunlight did not allow my chronograph to record velocities and extreme spread. It should be noted, however, that this charge weight for TAC powder is listed by Nosler as a maximum for bullets in the 50- to 52-grain weight range. **R**


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HENRY REPEATING ARMS BIG BOY .45 COLT

MOSTLY LONG GUNS by Brian Pearce

The Henry Repeating Arms Company Big Boy lever-action rifle is offered in .357 Magnum, .44 Remington Magnum and .45 Colt, and is manufactured in the U.S. It has been in production since 2003 and has become popular with shooters, hunters and those who appreciate lever-action rifles. I have received many requests to review this rifle, along with technical questions, so decided to purchase one.

From 1973 to 1978, Ithaca Gun Company began importing the Model 72 Saddlegun lever action chambered in .22 Long Rifle and .22 Winchester Magnum Rimfire. It was designed and built in West Germany by Erma Werke, who also imported the same rifle from 1976 through the 1990s, but it was known as the Model EG-712. These rifles were modestly priced and were generally accurate and reliable.

During the 1990s the Imperato family acquired the tooling, blueprints, etc., for the previously mentioned rifles and moved manufacturing to Brooklyn, New



The Big Boy .45 Colt produced respectable accuracy with both factory ammunition and handloads.

York (now located in New Jersey), where production commenced in 1997. The resulting rifle was simply known as the Henry Lever Action. Most dealers were able to sell them for less than \$200 – with prices currently under \$300. In

addition to .22 LR, it soon became available in .22 WMR and .17 Hornady Magnum Rimfire. Variations began appearing that included octagonal barrels, youth models and even a brass frame version at a higher cost and added weight. At around 5.5 pounds with an 18.25-inch barrel and a smoothly-working action, respectable accuracy and modest price, the original Henry Lever Action rimfire rifle has rightfully become popular.

The huge success of the Henry Lever Action allowed the company to expand and begin offering centerfire rifles, such as the Big Boy and similar designs chambered in .30-30 Winchester and .45-70. The Big Boy was designed by Henry RAC and is not based on any previous design; however, it shares some similarities with rifles made by other companies.

For this article a Big Boy .45 Colt was obtained. The first feature that is most distinguishing is

Henry Big Boy .45 Colt Loads

bullet (grains)	powder	charge (grains)	overall loaded length (inches)	velocity (fps)	50-yard group (inches)
240 Sierra JHC	2400	23.0	1.580	1,710*	2.00
250 Hornady XTP/HP	A-9	23.0	1.590	1,745*	2.30
		24.2	1.590	1,786*	1.80
250 Nosler JHP	Power Pistol	9.0	1.575	1,074	2.25
250 Oregon Trail RNFP	A-2	7.1	1.578	1,065	2.95
	Unique	9.0		1,244	3.05

factory loads

225 Winchester Power Bonded JHP	1,082	3.70
250 Speer Gold Dot HP	1,037	2.65
250 Remington lead	922	3.55
255 Hornady Cowboy lead	788	3.10

* Exceeds SAAMI pressure

Notes: A Henry Big Boy .45 Colt with a 20-inch barrel was used to test all loads. Starline cases and CCI 300 Large Pistol primers were used throughout. Maximum overall loaded length: 1.600 inches; maximum case length: 1.285 inches; trim-to length: 1.275 inches.

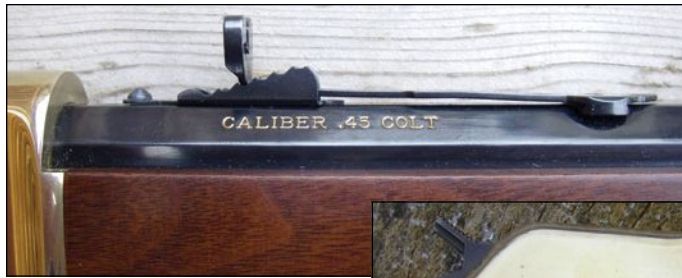
Be Alert – Publisher cannot accept responsibility for errors in published load data. Listed loads are only valid in the test firearms used. Reduce initial powder charge by 10 percent and work up while watching for pressure signs.



At left is a Henry Repeating Arms Company Lever Action .22 LR, and the Big Boy .45 Colt is at right.

the highly polished, solid brass receiver. The carbine-style buttplate and forearm barrel band are likewise constructed of brass, with all remaining parts consisting of a hot tank-style blue finish. Henry has certainly tried to associate its rifles with the original Model 1860 Henry rifles that were the foundation to the Winchester Repeating Arms Company. However, other than the Big Boy's brass receiver, and being a lever action, there are no design similarities. (Henry has recently introduced a copy of the 1860 Henry, but this rifle should not be confused with the Big Boy).

It should be noted that the Big Boy's stock has noticeably greater drop than most modern Winchester and Marlin leverguns and is more similar to the original Henry 1860.



Brian's sample Big Boy was chambered in .45 Colt.



The lever pivots from a single screw, resulting in fast and smooth operation, but also allows easy removal of the lever and bolt for barrel breech cleaning.

I favor the more modern dimensions, but that is a personal taste. It is constructed of high-quality American walnut and features a nice satin finish.

The rifle's receiver features side ejection and a solid top (similar to Marlin rifles) that is drilled and tapped for scope mounting or top-mounting XS or Skinner aperture sights. There is no loading gate; instead the rifle features a removable inner magazine tube and is loaded in the same fashion as a rimfire rifle with a tubular magazine. I do not care for this design for several reasons: Two include that the shooter should not (for safety reasons) load additional cartridges when a live cartridge is in the chamber, and when carried in a rifle scabbard, the inner tube can unlock and dislodge.

The design is rather cumbersome when compared to a levergun fitted with a loading gate.

The lever operates from a single hinge screw and extends to operate the bolt, control timing, etc. This design feature is similar to Marlin leverguns. Incidentally, by simply removing the lever hinge screw, the lever can be removed while the bolt assembly, ejector assembly and other parts can be removed rearward, providing access to the barrel breech for proper cleaning. From a shooter's standpoint, this design allows for minimal lever movement without moving linkage, smooth operation and performs well when used for rapid fire applications such as cowboy action competition or hog hunting.

A question that has been asked

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The tubular magazine features an inner tube.

many times is in regard to the strength of the Henry Big Boy .45 Colt, and to what pressure levels it can be handloaded. I spent time discussing this with the manufacturer, but no one could provide the technical information I was looking for. After carefully studying the design, and considering that the same action (with slight dimensional changes) is offered in .44 Magnum with an industry maximum average pressure of 36,000 psi, I have concluded that the Big



The Big Boy hammer features a transfer bar that must be managed correctly.

Boy .45 Colt can handle loads that generate 30,000 to 32,000 psi. Loaded to that pressure level, case-head thrust and bolt pressure is similar to the .44 Magnum.

There is no half-cock hammer position; the hammer is fitted with a transfer bar that is only visible on the face of the hammer. It is very important to understand how to manage the transfer bar correctly, or the rifle will fire if dropped or if the hammer is even slightly bumped or struck. Most shooters who have been shooting traditional leverguns for a long time will work the action, then lower the hammer all the way down, then pull it back to the half-cock (or "safety") position, but only if a cartridge is present in the chamber. Since there is no half-cock position on the Big Boy, this method will result in the hammer and transfer bar resting directly on the firing pin, which in turn rests directly on the primer. By placing a live round in the chamber, lowering the hammer as described above and using a plastic mallet to lightly tap the hammer, the cartridge would fire every time.

To reliably engage the transfer bar, when lowering the hammer the trigger must be "released" by



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the finger as soon as the trigger and hammer are disengaged, then let the hammer down. This method will engage the transfer bar, and the test rifle would not fire when the hammer was again struck with a plastic mallet. The above procedure is not described in the owner's manual, but it should be!

The octagonal barrel is nontapered, measures .830 inch in diameter and is just under 20 inches. This results in some muzzle heaviness and mild recoil, especially when the rifle is fully loaded with 10 cartridges. Empty, empty it weighs 8.68 pounds. The deep-cut rifling features six lands/grooves, and produced virtually no barrel leading with a variety of cast bullets. The rifling twist rate is 1:38, which will best stabilize bullets of around 200 to 260 grains. A few loads were tried that are not listed in the accompanying table as they were too long to feed through the action and included bullets weighing up to 300 grains. These had to be fed singly into the chamber and

were loaded to velocities of over 1,500 fps to obtain respectable accuracy.

Nonetheless, best accuracy was obtained with 240- to 260-grain bullets. I would encourage Henry RAC to change the twist rate to 1:16, and certainly no slower than 1:20, which would increase the accuracy with all bullet weights and velocities. This statement is based on my own experiments with custom barrels with varying twist rates and testing with a variety of loads.

Industry maximum overall cartridge length for the .45 Colt is 1.600 inches; however, most six-guns and many rifles will easily handle cartridges that exceed this length. Using bullets with longer noses, or those that can be seated out to exceed industry overall cartridge lengths, increases powder capacity and performance for this fine, old cartridge. The Big Boy, however, would not feed any cartridges that even slightly exceeded industry limits. This is unfortu-

nate, as doing so would have made it more appealing to hunters and performance-minded shooters.

From a sandbag rest, with my left hand gripping and separating the forearm from the sandbags and with no other support, the rifle provided several five-shot groups in the 2- to 2.5-inch range at 50 yards using select handloads. These groups were obtained by removing the factory installed semi-Buckhorn rear sight and installing a Skinner Big Boy Express aperture (www.skinnerights.com) used in conjunction with the factory gold front bead. Perhaps with a plain, black square post front sight, groups could have been tighter. Regardless, it was good enough accuracy for hunting hogs or any cowboy action event this type of rifle would be used for.

I would like to see Henry implement some of the changes as outlined here. Nonetheless, the Big Boy exhibited good machining, respectable fit and finish, flawless function and adequate accuracy. **R**



BUYING AND OWNING FULL-AUTOS

DOWN RANGE by Mike Venturino

Several weeks ago, I returned from Prescott, Arizona, where I took a couple of my World War II-era full-autos. Specifically, they were an M2 .30 Carbine and an M1 .45 Thompson submachine gun. The purpose was to participate in Wolfe Publishing's company shoot, held on Columbus Day every year. This was the third time I've attended with some of my full-autos, and they have always been a big hit. The reason is simple: Full-autos make for fun shooting. I have yet to see anyone without a big grin or a belly laugh after pulling the trigger on one for the first time.

Besides their high prices, how difficult is it to legally own a *machine gun*? Like most of the uninitiated, for decades I felt the red tape was too complicated. It is not. You do not have to have a special license – as so many people assume. What is needed is a Class III license, and it is only required if someone desires to become a dealer in full-autos, rifles with barrels less than 16 inches, shotguns with barrels shorter than 18 inches, or suppressors.



This photo shows Wolfe Publishing's Becky Pinkley shooting an M1 Thompson Submachine Gun.

Legally owning those things is far easier than becoming a dealer. First, a potential buyer must determine if such items are allowed

by their state's laws. For example, California and Washington do not, but Oregon does. After that it becomes a matter of federal paperwork. What is required is registering the item with the Bureau of Alcohol, Tobacco, Firearms and Explosives (BATFE). There are several paths to reach that point.

Let's say you spot a full-auto in a gun store with a Class III license in your state of residence. You make the deal for it. The dealer and you must fill out two Form 4s. They both must be submitted. The forms require both the buyer and seller addresses, the firearm model, its caliber and serial number. The back of Form 4 lists the same basic questions as on the Form 4473s we all fill out for regular over-the-counter gun sales. Also asked is the reason the buyer wants to own the firearm (collect-



Here's Mike shooting a World War II vintage U.S. Browning Automatic Rifle (BAR).



Mike has several full-autos in his vintage WWII firearms collection including a (right) German MP40, a P-08 "Luger" and a P-38. All are 9mm Parabellum. The K98k 8mm Mauser (top) is a vintage bolt rifle.

ing, etc.) Finally, on the back is a section that must be signed by your local law enforcement agency stating it has "no information indicating that the transferee will use the firearm or device described on this application for other than lawful purposes." While at the law enforcement agency, you must get two fingerprint cards. A nominal fee is likely due for that service.

When sending the Form 4s, the buyer includes the fingerprint cards and two passport photos along with one check for \$200 (a one-time fee), and mails them to the proper address. When approved, one Form 4 will be returned to the seller affixed with a special tax stamp. The dealer can then hand over the firearm to the buyer. The Form 4 must be with the firearm *ALWAYS*. If leaving your residence with the firearm, the Form 4 (or a copy) must accompany it. I've had Form 4s approved in as little as six weeks, and others have taken as long as six months.

Here's another scenario. Let's say you have an acquaintance who is a resident of your state. He owns a full-auto and decides to sell it to you. Again, this requires a Form 4, which can be printed directly off of the National Firearms Act (NFA) section of the BATFE's website. It is filled out and submitted exactly as above. When approved

it will be sent to the seller, and you can then receive the firearm in person. That is the way I obtained my first full-auto, a German MP40 9mm submachine gun made in 1941, which I spotted at a Montana gun show.

Here's the third manner by which full-autos can be transferred. Let's say one is spotted on an Internet website in another state. Likely, it will be advertised by someone with a Class III license. A prospective buyer must then make arrangements with an in-state dealer to obtain the transfer from the out-of-state dealer. Then the process can proceed for your in-state dealer to transfer the firearm to you by way of the Form 4. Your dealer will likely have a set fee for the service.

Before buying a full-auto it would behoove the new owner to check out where it can be safely and legally fired. Many public shooting ranges prohibit firing full-autos. A friend once owned a 5.56mm select-fire M16 that he occasionally took along on ground squirrel-shooting forays. After a while he sold it, because nearly every time he fired it someone called law enforcement. He said the responding sheriff's deputies were always agreeable, only asking to see his paperwork. Still, he gave up and sold it. (I have a small area set aside on my Montana acreage

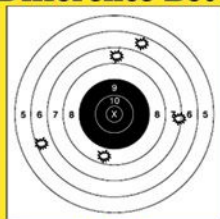
for shooting mine, and the local law enforcement folks know me.)

Once you have the Form 4 paperwork and have possession of a full-auto, you are free to travel around the state of your residence with it, keeping in mind that you must adhere to all local laws and ordinances. Besides shooting mine, I've taken some to gun shows to set up displays of World War II small arms.


To leave your state with the gun, a Form 5320-20 must be obtained from the BATFE/NFA that details travel plans, guns being transported and purpose for the trip. If traveling by ground, full-autos cannot be taken through states that prohibit them. For me to drive to Prescott means passing through Idaho, Utah and into Arizona, so I'm good.

Several friends and acquaintances have joked that I've "gone to the dark side." Not at all. I consider myself a firearms historian, and I'm simply following my interests. R


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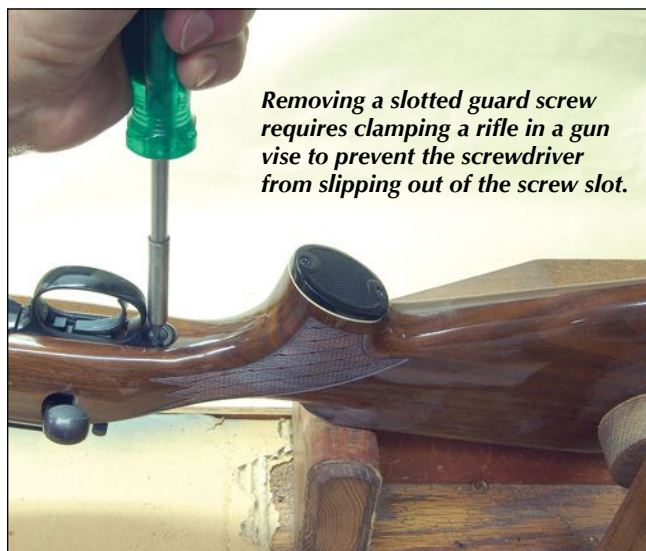
LIGHT GUNSMITHING by Gil Sengel

Replacing parts is a familiar operation for anyone who enjoys old rifles. Firing pins and extractors are probably the most commonly encountered repairs. Many firing pins won't stand much dry-firing before the tip breaks off or the pin becomes battered and deformed enough to no longer work freely in its recess, thus causing misfires. Extractor breakage is usually traced to handloads that are either too hot and stick in the chamber or have been improperly resized and stick tightly in the chamber before the bolt can close completely. Both situations lead to a broken extractor when attempting to extract the case/cartridge.

Then there are parts that aren't broken but are changed on a whim. Stocks, barrels, triggers, scopes and mounts come to mind. But what about something that isn't broken, defective or worn and adds nothing to appearance? This part is the common guard screw. Reasons for giving a bit of thought to replacing it, at least for some bolt guns, follow.

Guard screws are nothing more than slotted, fillister-head machine screws, most having a .250-inch diameter shank. All they do is clamp the trigger guard/floorplate assembly to the receiver, with the stock sandwiched in between. It would be impossible to break the shank or twist off the head in this application without damaging or destroying the bottom metal, and probably the stock as well. There is certainly no reason to do so.

The problem here is with the screws' slotted head and the fact that guard screws are entirely different animals than the other screws used to assemble firearms. Everyone has been told these fasteners are supposed to be drawn up tightly – very tightly. For at least 100 years gun writers, gunsmithing books



Removing a slotted guard screw requires clamping a rifle in a gun vise to prevent the screwdriver from slipping out of the screw slot.

and shooters of various target games have preached that for best accuracy, the front guard screw must be turned in as tight as possible, or nearly so. The rear screw was then to be either the same or “very firm,” “nearly as much,” etc. – whatever all those somewhat less-than-scientific terms are supposed to mean.

One thing everyone does know, however, is that attempting to tighten a large slotted screw to this degree requires a large amount of *downward* force as well as torque. This is because the first time that screw was tightened the vertical sides of the slot were deformed, making them slightly tapered with the slot wider on top. The same applies to screwdrivers designed for such screws, even the so-called “hollow ground” or parallel-sided gunsmith type. Since the screwdriver is made of tough, heat-treated steel, it will be deformed little, but the screw a little more, each time assembly/disassembly takes place. After as few as eight to 10 cycles the screw slot may not look too bad, but it will be a bit wider at the top. A screwdriver can “walk” right up out of the slot when heavy



Socket-head guard screws are usually mandatory to prevent the driver bit from slipping off the screw when using a torque wrench to firmly tighten them.



Socket-head screws don't have to be plain; engraving adds to their appearance.

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Scratches on this old Springfield stock show signs of a screwdriver slipping out of the screw slot.



Socket-head guard screws can be tightened or removed (no matter how tight) with just one hand on the rifle and one on the wrench.

torque is applied unless a lot of downward force is also exerted. If this downward force is not *straight* down, the screwdriver tip will slide sideways out of the slot, acting much like a dull wood chisel when it contacts stock wood (or stock plastic). Is this unimportant? Consider a couple stories I have heard.

One example is a fellow whose cased rifle slid over the side of his boat. By the time it was found, the sun was going down, deer season opened the next morning and he was hours from home. With no screwdriver to remove the stock, the rifle was hung muzzle down in a tree overnight. When the stock was finally re-

moved about a week later rust had destroyed the bluing underneath.

Another chap was caught in a frog-chokin' thunderstorm on a mountain with no trees or other cover. Of course, there was no chance of rain that week, according to the weather report. His very expensive custom rifle got thoroughly soaked. However, proper tools were available to get it apart. Sitting in a camp chair with the rifle upside down and scope between his legs, the screwdriver slipped out of the guard screw slot and stabbed the owner in the thigh. Fortunately it was only an ugly flesh wound, but the location was just a couple inches south of being really serious.

The point is that these things happen. They can also be easily prevented by simply replacing the guard screws with socket-head machine screws. These look just like a guard screw but instead of a cross-slot, the head contains a deep, six-sided hole. An L-shaped hex wrench, hex key or Allen wrench fits into the screw head. Its great advantage is that the wrench can't climb out of the screw or slip and stab its owner. The screw can be tightened as much as desired, then loosened a thousand times without damage to the head (but *not* the little scope mount screws).

Why aren't all guard screws made like this? Good question. No doubt the idea that if a bolt gun must be disassembled and no screwdriver is at hand, it would be easier to find a common driver that will work than a proper hex key. This is unfortunate thinking, however, as hex keys are cheap (less than \$2) and avail-



Brownells long blank socket-head guard screws can be turned and threaded to fit most rifles.



Drivers for socket-head guard screws include (left to right): insert bits for magnetic screwdrivers, heavy duty ratchet wrenches for 3/8-inch drives and a common L-shaped Allen wrench.

A slotted guard screw (left) as compared to a socket-head screw.



able. Buy three or four; put one in with the jointed cleaning rod that goes on every hunt, maybe one in the field first aid kit and another in the truck toolbox so a key will always be available.

Please don't misunderstand. I am not suggesting replacement of all bolt-action guard screws; however, those of favorite hunting rifles taken on several day hunts or expensive, guided affairs far from home, where unexpected exposure to water, mud or sand would put the piece out of action, should be considered.

Even heavily used rifles that do not get carried far from home benefit from removing the stock at the end of the season to get at debris that somehow got inside, or to remove a rust spot or two that somehow got started during the season.

Many hunters don't do this because they lack properly ground screwdrivers to fit heavily torqued, slotted guard screws or the proper equipment (a gun vise) to clamp the rifle upside down for removing the screws. Socket-head guard screws make the job absurdly simple. The rifle can just be laid on a tabletop for disassembly.

Where can socket-head guard screws be found? Gunsmithing supplier Brownells lists them for Mauser, Winchester M70 and Remington 700 rifles. The company also sells a long-blank, socket-head screw that can be shortened and threaded to fit most any bolt gun. I believe more specialized outfits like B-Square and Forster also sell them, as do many custom gunsmiths. An Internet search will turn up several sources. A friend also told me that he found replacement screws for some of his imported rifles with metric guard screws in the "Metric fastener" section of a local Ace Hardware store!

All in all, the lowly guard screw is a part that is never considered until it becomes necessary to disassemble a rifle somewhere other than on a workbench. At that point the importance of the socket-head variety cannot be overstated. **R**

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TRIJICON ACCUPOINT 2.5-12.5x 42MM

A RIFLEMAN'S OPTICS by John Haviland

Trijicon's AccuPoint 2.5-12x 42mm riflescope looks like it belongs on an elk-hunting rifle. The scope has an ample magnification range for close shots in the dark timber or far across a mountain park. Its 42mm objective lens is the right size for the scope to sit low on a rifle, yet it provides plenty of light for a bright view with the scope set on higher powers.

Trijicon is known for its sights with reticles illuminated with fiber optics and tritium. The AccuPoint continues that tradition with a fiber optic brightness dial that adjusts the illumination level of the reticle's aiming point to accommodate available light, and a tritium phosphor lamp lights the reticle in low- to no-light conditions.

A trustworthy scope on an elk rifle must endure rugged rides and the heat of horse sweat in a saddle scabbard, deflect rain, snow, ice and the knocks that may occur. It must be reliable when that one shot of the season appears.

With a retail price of \$1,300, the AccuPoint should stand up to some harsh treatment, so I was rather cruel to the test sample on hand. The scope took an hour-long bath in a sink of hot water. No tell-tale bubbles rose from the scope.



Turning the brightness dial on top of the AccuPoint's ocular lens housing adjusts the illumination level of the reticle's aiming point.



A Cooper Model 22 .243 Winchester was used to test a Trijicon AccuPoint 2.5-12x 42mm riflescope with an MOA-dot crosshair reticle.

The dripping wet scope was then put in the freezer for several hours. It came out with a coat of frost on the outside. The center of the lenses is thickest and retains cold the longest, and that is where any moisture inside the scope shows up. No frost appeared on the inside of the objective lens, indicating the scope had been purged of moisture and well-sealed during assembly.



Windage and elevation turrets allow adjustments of 90 minutes of angle. The dials can be pulled out and reset to zero.

The parallax dial was frozen, and it took a bit of force to break it free. The fiber optic brightness dial, focus dial and magnification dial turned somewhat stiffly compared to their unfrozen state.

The scope has eye relief of 3.9 inches. I held a piece of white paper that distance from the scope's ocular lens and shined a flashlight through the scope's objective lens. With the scope set on 10x, it projected a 4.2-millimeter diameter circle of light, or exit pupil, on the paper. That showed there was no aperture next to the objective lens to restrict view to the center of the lens where the view is the sharpest.

Trijicon notes the scope's "multi-layer coated lenses provide superior light transmission." A flashlight shined into the objective lens showed small circles of colored, reflected light, indicating all the lenses were coated. I looked through the AccuPoint, set to various magnifications, at a 1951 USAF resolution test chart at 100 yards. The scope provided as sharp a view as other scopes of similar power, objective lens size

and price. As I moved the scope to the outer edge of the view, left to right and up and down, the vertical and horizontal bars on the chart dimmed only ever so slightly.

One gloomy evening I looked through the scope every few minutes as the day turned to night. Fifteen minutes after sundown, the largest set of bars on the test chart placed at 50 yards were plainly visible with the scope at all power settings. Fifteen minutes later, however, the grid was only visible on 4x and higher. Set on 8x, the scope seemed to provide the brightest and sharpest view. Fifteen minutes after that, the chart vanished through the scope set to any power, and it was difficult to even see the scope sitting on the table.

The AccuPoint test sample was mounted on a Cooper Model 22 .243 Winchester and was sighted in with Hornady 105-grain A-MAX bullets hitting dead on at 100 yards. The AccuPoint has screw-on caps that protect the



The parallax dial can be set from 10 yards to infinity.

windage and elevation dials. Each tactile and audible click of the elevation and windage adjustment knobs moved bullet impact $\frac{1}{4}$ minute of angle (MOA) at 100 yards. Pulling the turret dials out allows them to move freely, and the zero on the turrets can be aligned with the indicator hash mark on the scope, providing a reference to re-

turn to the original settings after dialing in windage and elevation changes.

To check the scope's reticle adjustment reliability, a couple of bullets were shot on a target at 100 yards. A couple more shots were fired each time after turning the windage turret left 28 clicks; the elevation turret up 28 clicks; the windage 28 clicks right and the elevation turret down 28 clicks. The result was a 7-inch square box, punctuated by bullet holes at each corner. The first and final bullets formed a 1.40-inch group.

Seven models of the AccuPoint riflescope are available, from 1-4x 24mm to 5-20x 50mm. Reticle options include a triangle post, standard crosshair, German No. 4 and crosshair and circle in the lower-power models. Higher-power models can be had with reticles with dots on the vertical and horizontal wires, with dots spaced apart in milliradian or minute of angle. The AccuPoint's reticle is

(Continued on page 57)

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Terry Wieland

Fans of Mauser '98 rifles now have a place to put that spare \$10,000 that has been sitting in the bank doing nothing: The Mauser 1898 sporting rifle is back, manufactured by Mauser in Germany and featuring the iconic "Original Mauser" banner on the barrel.

It is a very strange feeling being handed a rifle that has been in nonstop production – one way or another – for 120 years, and being asked to review it. Where to start? The Mauser '98 has nothing left to prove to anyone. It is the most widely used and successful military bolt action in history; it has been produced commercially in a dozen countries for 100 years; some of the early benchrest rifles were built on Mauser actions and delivered prize-winning accuracy; Mauser actions have been the basis for some of the finest custom rifles ever made. Its record as a hunting rifle is unsurpassed.

For more than 70 years, however, what has been

The new Mauser '98 Expert 8x57JS was fitted with a Swarovski Z3 3-10x 42mm scope in Mauser's new detachable mount. The stock combines the best features of the old Mauser Model A (English) sporting rifle with American classic looks.



The New Mauser

missing is a Mauser '98 manufactured by the Mauser company itself. Now, after a couple of hesitant starts, Mauser is once again making its iconic, emblematic, signature rifle.

Since the Mauser '98 has nothing to prove to anyone, the main questions regarding this new model are: Is it original in every respect? Secondly, how well made is it?

In answer to the first, an immediate difference is a change in the bolt shroud and safety. Otherwise, the rifle is mechanically true to the original. Other parts, like the bolt stop, ejector mechanism and the floorplate are pure '98. The barrel is hammer forged – another departure, but a welcome one.

In its 2017 catalog, Mauser of-

The Continuing Return of the **Model 1898**

fers two action lengths (standard and magnum) in two grades (Expert and Diplomat). Magnum rifles are available in .375 Holland & Holland, .416 Rigby and .450 Rigby; Standard calibers are 8x57JS, 7x57, 9.3x62, .308 Winchester and .30-06. The essential difference between the Expert and the Diplomat is the grade of walnut used for the stock – “grade 5” for the Expert, “grade 7” for the Diplomat.

My test rifle was a standard

Expert in 8x57JS. The fact that Mauser chambers the 8x57JS at all was a welcome surprise, and doubly so that I was able to get my hands on one. Whether this is nostalgia or an appeal to traditional European hunters is hard to say. It was also a surprise that the chamberings do not include such American favorites as the .270 Winchester, 7mm Remington Magnum or .300 Winchester Magnum. Perhaps later.

The barrel is 22 inches long and of a rather heavy profile. The entire barreled action, with the exception of the bolt, has a black plasma-nitride finish rather than conventional blueing. The bolt and bolt handle are in the white, polished. The rifle has a barrel-band front sight ramp, a barrel-band sling swivel and a barrel-band island for the rear sight, which is a standing leaf with a wide, shallow “V.”

The length of pull is 14 $\frac{3}{8}$ inches; in 8x57JS, the four-groove rifling has a twist rate of 1:9.4. Total



'98 Expert

Mauser '98



hang up and *clicks* firmly into each of its three positions.

The floorplate release is Oberndorf style with a push button inside the trigger bow. For reasons I don't quite understand, the floorplate does not open all the way. This may be to prevent cartridges from spilling out when it is opened, inadvertently or otherwise. You can get at the cartridges in the magazine to remove them, but it is a bit awkward.

The trigger is wide, smooth and breaks at exactly 2 pounds, 12 ounces, every time, without a hint of creep. This is the best factory trigger I have ever encountered, and that includes the fabled "glass rod" Sako triggers of 30 years ago. It is also better than any after-market trigger I have tried in the last 10 years.

Fortunately for purists, Mauser resumed production of the Mauser '98 with the original round-top receiver rather than square-bridge or double-square. The magnum rifle the company introduced two years ago had a double-square configuration with an integral detachable mount. While it was well done, there are those who would prefer a different mount, and that configuration does not allow it.

For the new rifle Mauser has

weight with a Swarovski Z3 3-10x 42mm scope is 9 pounds, 9 ounces unloaded. Unscoped, however, Mauser rates the rifle at exactly 8 pounds.

These are the straightforward specifications, but in such a rifle it pays to devote some attention to ancestry and lineage. In its overall form it owes a great deal to the configuration of the original Mauser Model A sporter, which in turn was modeled on the best London magazine rifles of its time. However, there are some touches that are pure American classic and others that are drawn from the modern custom ideal of a bolt-action rifle.

The stock is a blend of London and American classic, with a straight buttstock (no Monte Carlo comb) and an old-fashioned cheekpiece. It has a stylish recoil pad, ebony forend tip and steel grip cap. No purist could find the slightest cause for complaint, aesthetically speaking. The guard screws and the two screws holding the grip cap are impeccably timed. Checkering is in a classic point pattern at 24 lines per inch.

One major departure from both the original Mauser design and later commercial actions is its bolt shroud. It employs a Winchester Model 70-style, three-position wing safety in a beautifully sculpted bolt shroud. This is a feature that is *de rigueur* on fine custom rifles today. The safety moves easily and smoothly with no grit or



The company began using the term Original Mauser as early as 1935, and it is engraved on all new actions.



The detachable mounts are sleek, unobtrusive and quick to operate. The receiver will accept standard bases for a large-ring Mauser action.



The front sight has the classic express rifle barrel band.



The bolt shroud is nicely sculpted and features a Model 70-style, three-position wing safety. It is crisp, smooth and snaps into place at each stage.

designed a scope mount unlike any I have seen before. It has front and rear bases with a turret. A com-

parable turret on the scope rings fits over top, and each is fastened in place by a discrete lever on the left side. When the levers are locked in position they are tucked safely out of the way, partly beneath the scope itself, with nothing projecting to snag or catch. Each scope ring is held firmly together with four tiny screws. The receiver will, of course, accept conventional scope mounts as made for a large-ring Mauser by every known scope-mount manufacturer.

When the scope is removed the iron sights can be viewed clearly over the bases. Altogether, it is a well-engineered, elegant answer to the scope-mounting question.

The question on everyone's mind with a new rifle – my own not least of all – is how does it shoot? The 8x57JS presents a problem in that regard. Testing an out-of-the-box rifle with factory ammunition is difficult. Although 8x57JS ammunition is readily available, there is nothing *really good* readily available. If one were sent a .308 Winchester, for example, it would be a simple matter to call Federal, Hornady, and one or two manufacturers, buy some of their superb match ammunition and go to work. The ammunition is a proven quantity and a real test of the rifle's capability.

Alas, what is available in 8x57JS is, in my experience, run-of-the-mill at best, and selection is limited. Because of the wide variety

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Mauser '98

Mauser '98 Expert 8x57JS Handloads

bullet (grains)	powder	charge (grains)	velocity (fps)	extreme spread (fps)
1) 180 Nosler Ballistic Tip	BL-C(2)	46.5	2,416	13
2) 180 Nosler Ballistic Tip	CFE 223	52.0	2,752	11
3) 196 Hornady HPBT Match	Varget	45.5	2,295	15
4) 200 Sierra MatchKing HPBT	IMR-4064	42.0	2,165	21

Notes: All loads shot from a Mauser '98 Expert 8x57JS with a 22-inch barrel. Federal 210M primers were used throughout.

- 1) A mild starting load that delivered a 10-shot group of 1.37 inches.
- 2) A good hunting load; its 10-shot group measured 2.7 inches.
- 3) The best load of the bunch. Its 10-shot group had one flyer and measured exactly 2 inches with the flyer and exactly one inch without; nine shots into an inch.
- 4) This load fired a 2-inch group with two flyers. The other eight shots were clumped into 1.4 inches.

Be Alert – Publisher cannot accept responsibility for errors in published load data. Listed loads are only valid in the test firearms used. Reduce initial powder charge by 10 percent and work up while watching for pressure signs.

Two 10-shot groups with generic handloads that were not tailored to the rifle are shown. The group at left measures 1.377 inches; the right group is exactly 2 inches with the flyer, and exactly one inch omitting it.



of military and sporterized rifles in this caliber, some of them dating from 1888 in an unknowable range of condition, ammunition makers try to keep cartridges inexpensive and as low pressure as they can get away with.

The problem is compounded by the fact that loading manuals subscribe to modest SAAMI pressure limits for the 8x57JS. In order to get the very best from this cartridge in a new rifle like this Mauser, a handloader may find himself exceeding maximum loads prescribed in manual. At *Rifle*, we generally do not publish loads that exceed printed SAAMI maximums.

Faced with this situation, I decided to try the rifle with four handloads made up with the best available components, including new brass, and choose midrange loads with different powders. They would be neither the hottest nor the most anemic. I would then

take them to the range and shoot one, 10-shot group with each. Separate targets were used to shoot five rounds of load A, five of load B, five of C and D, then five more shots of each.

I am not a believer in the three-shot group as evidence of anything meaningful, and if you are going to average three, three-shot groups, why not just shoot a 10-shot group? I have yet to see a gilt-edged hunting rifle that does not open up when asked to put 10 shots into a tiny area, but in my opinion it is still the best measure of what a rifle can really be expected to do.

Incidentally, in three trips to the range, shooting well over 100 rounds, not one shot from a cold barrel went anywhere except right in the center of the group that followed. This is an extremely desirable trait in any hunting rifle. In fact, there were only a couple of shots that could be called fly-

ers, and those strayed but an inch or so.

The accompanying table shows the loads used. The rifle shot very well with Hornady 196-grain HPBT Match bullets, and also did well with both Sierra 200-grain MatchKings and Nosler 180-grain Ballistic Tips. The only load of the four that was not so good (and even it was not bad) was the Nosler 180-grain Ballistic Tip with CFE 223 powder.

These were completely random loads in which I took data straight from several sources with no modification whatsoever. As well, there was no attempt to improve results by working up loads. After three trips to the range and shooting well over 100 rounds of several different loads, my overall impression of the rifle is of rock-solid consistency. Since the test loads were fired consecutively, the rifle was required to deliver the goods for 40 straight shots. I cannot remember ever seeing a rifle that did so quite so well. I'm looking forward to seeing what it will do with tailored handloads.

Mauser unveiled its first steps toward a resurrected Model '98 sporting rifle two years ago, with a .375 H&H and .416 Rigby built on the magnum action. Now, the standard action is back as well. John Rigby & Co. of London, which is owned by the same parent company as Mauser, is once again making the famous .275 Rigby on genuine Mauser actions, and from all reports they are excellent rifles.

It would be nice to be able to say for certain that there is a "K" (*kurz*) action in the works at Isny. Given the current – and deserved – popularity of shorter cartridges like the 6.5 Creedmoor, such an action should get a warm reception. After that, if Mauser wants to pursue it, the sky's the limit: an intermediate action, maybe a light (G33/40-type) action or some other small-ring variations. As far as the Mauser '98 is concerned, there is virtually nothing left to invent, but there is a great opportunity to bring back some masterpieces. R



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REDUCING RECOIL

John Barsness

Most humans react to being struck by a moving object, and a recoiling rifle is a moving object striking the shoulder. We often react by flinching while pulling the trigger, but with practice our brain can override the flinch/cringe reaction, especially if recoil merely startles us instead of causing pain.

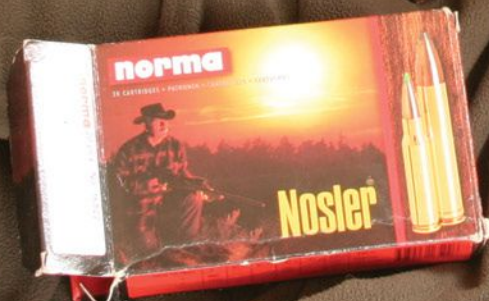
Some iron-shouldered shooters believe that shooting a harder-kicking firearm a *lot* is the secret to overcoming a flinch, but considerable evidence points in the opposite direction. Serious shotgun competitors often shoot more than 1,000 rounds a week, and many eventually develop a flinch so start using a “release trigger.” Pulling the trigger merely sets it, and the gun goes off when the trigger is released. This eventually convinces the shooter’s brain that pulling the trigger doesn’t result in a whack on the shoulder, so they quit flinching – though the flinch comes right back when they try to use a conventional trigger.

I once went dove hunting in Argentina with the late Bob Brister, a well-known shotgunner who won numerous serious shooting contests. He had long ago

Without Sacrificing Downrange Performance



The 6.5x55 Mauser always had a great reputation as a big-game round early in its history due to heavy, moderate-velocity cup-and-core bullets. Today it is even more effective with lighter, faster premium bullets.





The stocks above were made by the same custom stockmaker for two different customers, and fit each shooter so well felt recoil was noticeably reduced – unless they shot each other’s rifle. Right, the stocks of most big-game rifles once had relatively hard rear ends, like the steel buttplate on this custom stock that increases felt recoil considerably.

switched to a release trigger for competition but brought a semi-automatic with a conventional trigger to Argentina because he was afraid somebody else might pick up one of his release-trigger guns and have an accidental discharge. Unfortunately, Bob’s subconscious often wouldn’t allow him to pull the conventional trigger. On the first day I watched him stagger forward several steps while pointing his shotgun at a bevy of doves, his entire body jerking every time he tried – and failed – to pull the trigger.

In fact, the most effective way to “cure” a flinch is to not allow one to develop in the first place. This is one reason softer recoil pads and stocks with adjustable dimensions started appearing over the past few decades, even on factory rifles. Most previous factory stocks had dimensions that supposedly fit the “average” shooter but were often painful for nonaverage people. Most also had buttplates made of metal or plastic, or rubber hard enough to knock out a grizzly bear.

However, during the same period when truly soft recoil pads appeared, a more effective preventive method also evolved. Unfortunately, many hunters are too stuck in the past to believe it can work.

To understand its effectiveness, examine the physics of recoil, a prime example of Sir Isaac Newton’s third law of motion: For every action there is an equal and opposite reaction. In rifle recoil the initiating action is firing a bullet through the barrel. Recoil is the opposite reaction, pushing the rifle into the shoulder.

Some shooters might assume that Newton’s third law means recoil energy of the rifle equals the muzzle energy of the bullet. If this were true, a 180-grain .30-06 cartridge would result in around 3,000 foot-pounds (ft-lbs) of recoil energy – but the recoil energy of an 8-pound .30-06 firing a typical 180-grain factory load generates about 22 ft-lbs. This number comes from the calculator in Sierra’s Infinity computer ballistic program and is based on the re-

REDUCING RECOIL



These .30-caliber bullets were recovered from mule deer bucks. The “traditional” bullet (left) did not make it through the ribs on a broadside shot. The Barnes TSX (right) entered the flank of a big buck angling almost directly away and was found under the hide on the front of the chest.

coil formula used by ballisticians for decades.

This vast difference occurs because of the vast difference in weight between a 180-grain bullet and an 8-pound (56,000-grain) rifle. The kinetic energy of a moving object is the product of the object’s weight multiplied by the square of its velocity. While the .30-06 bullet leaves the muzzle at 2,700 fps, the rifle moves backward at only 13 fps.

A .300 magnum results in far more recoil than a .30-06, and not just due to more velocity but more powder. The extra powder essentially adds more weight to the “ejecta,” the total weight leaving the muzzle.

My calculation of .30-06 recoil energy used a typical 55-grain powder charge. A .300 magnum cartridge using 75 grains of powder to push a 180-grain bullet 3,000 fps generates about 35 ft-lbs of recoil in an 8-pound rifle. This is 59 percent greater than the .30-06’s recoil energy, but the muzzle energy of the .300’s bullet is 3,596 ft-lbs, only 23 percent more than the 2,913 ft-lbs of the .30-06’s bullet. Yet because of what their shoulders feel, many hunters believe a .300 magnum must be *far* more powerful than a .30-06.

Many experienced observers have concluded that most hunters can handle the recoil of a .30-06 but start cringing at .300 magnum recoil. These observers include the late Finn Aagaard, who guided

in his native Kenya until he was 45 then moved to Texas and guided there for many more years. Finn estimated only a third of his clients could shoot .300 magnums accurately. John Stuver, a long-time Montana outfitter who once guided Finn, puts the number at 20 percent. This obviously doesn’t apply to you and me, but observations of other hunters force me to agree with Finn and John.

Once upon a time I firmly believed in the “vast” extra killing power of cartridges larger than the .30-06, but that was 30-odd years ago, when I’d only hunted in Mon-

Some hunters still don’t believe the .375 H&H is enough for Cape buffalo, but that opinion was primarily formed back when cup-and-core “softs” often failed to penetrate.



The .308 Winchester has a reputation for superb accuracy as demonstrated by this CZ 557, but it also beats the original ballistics of the .30-06.

tana with a half-dozen cartridges, only one of which was larger than the .30-06. Since then I’ve hunted with dozens of cartridges and have seen many others in action. Eventually I gradually (and grudgingly) came to the conclusion that bullet placement is by far the most important factor in killing power, with the specific bullet second and the cartridge far behind in third.

This insight is far from original or unique, but restating it makes some hunters pretty upset. They counter by stating correct bullet placement is *obviously* necessary, so why emphasize it over and over again? They then claim a “magnum” bullet in the same place is *obviously* more effective and provides more margin of error.

Unfortunately, I’ve seen far too many big-game animals refuse to flop just because they were hit correctly with faster and bigger bullets, even some animals pushing the definition of the word “big.” One was a springbok that weighed 80 pounds on an accurate livestock scale.

This took place during a cull hunt in South Africa, where I traveled partly to field-test a brand-new Nosler bullet, the .375-caliber, 260-grain Ballistic Tip that was on the market only a year before being turned into an AccuBond. The muzzle velocity of my .375 H&H handload was 2,700 fps, for 4,208 ft-lbs of kinetic energy.

The springbok stood broadside, just about 100 yards away, and the



Above, John's best elk was taken with a .30-06 and a 180-grain Tipped Trophy Bonded bullet; the bull went about 20 feet before falling. Right, some hunters claim the .243 Winchester is inefficient for big northern whitetails. Eileen Clarke used a .243 to drop her biggest-bodied buck instantly by putting a 100-grain Nosler Partition through the shoulders and spine.

bullet landed where I aimed, behind its shoulder. The springbok took off running and kept going for 100 yards before falling. Now, many hunters would guess the big bullet simply didn't expand much on such a small animal, but the hole through the springbok's lungs could have easily accommodated a softball.

The next year I went back to South Africa for a month-long cull hunt. One companion used a 7mm-08 Remington to place a 140-grain AccuBond behind the shoulder of a 600-pound blue wildebeest bull, considered perhaps the toughest of all African plains game. The bull ran about 50 yards and keeled over dead.

Those are two extreme examples, but hundreds more could be cited, not just from Africa but from Europe, North America and New Zealand. Sometimes lung-shot big game drops quickly, and sometimes it runs a ways, but as long as the bullet expands and penetrates sufficiently there just isn't that much difference.

The past few decades have also seen the introduction of far more "premium" big-game bullets, plus the improvement of bullets already

on the market. The Barnes X-Bullet appeared in the late 1980s, and while it worked well on big game from the beginning, often the early bullets didn't shoot very accurately – partly due to considerable copper-fouling – and occasionally didn't open up much, if at all. All three problems eventually disappeared due to the grooved shank of the Triple-Shock X-Bullet and the addition of a plastic tip.

Many power advocates point out that not all animals stand perfectly broadside, where bullets from "standard" cartridges can be placed carefully through the heart/lung cavity. Often they

cite the last day of an expensive guided hunt, when the "bull of your dreams" appears, heading in the opposite direction.

This sometimes happens. Friend Jim Gelhaus took a huge Alaskan moose on the last day of a guided hunt – using a .30-06 with Federal factory ammunition loaded with 180-grain Trophy Bonded bullets. The bull suddenly appeared from the tall brush along a small stream, walking directly away, and Jim decided to put the bullet in the middle of its butt. The Trophy Bonded ended up in the moose's heart, and while the bull didn't immediately fall (most moose don't) it stopped, angled slightly and dropped to another round in the neck. The bull's antlers were large enough for the

(Continued on page 58)



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A *Modular Handle* for Your Favorite *Bolt Rifle*

Stan Trzoniec

Having used more than my share of shotguns in casual trap shooting, it's easy to see that competitive shooters will do anything to get that winning clay busted. The right shotgun is paramount of course, but then competitors like to tinker with making a full or personalized stock for themselves. They will carve the comb down, dish out the stock to fit their face and even add an adjustable recoil pad as to fit them better no matter the weather or the clothes they are wearing.

While rifle shooters have been slow in getting into adjustable stocks, things are picking up for sure. Just surfing the web I found a long list of stock makers and rifle manufacturers that indulge in making adjustable stocks for both sporting and AR-15 type rifles. While some are just basic in adjustments, others go full tilt on the changes the shooter can make to the cheekpiece and the comb and buttstock. There is no argument here that since the synthetic stock has come of age, all the modifications necessary to tailor a stock to an individual user can be made right in the mold, saving laborious time with altering and refinishing a wood stock. With the dozens of colors and patterns presently available, it is painless to choose something right off the shelf.

By now, some readers must be asking, "Why do I need an adjustable stock when mine fits me just right?" Indeed. For the most part, hunters go through life (like me) with one stock attached to one action. They are comfortable with it, it shoots in the same place time after time if it is taken care of, and even if you have a synthetic-stocked production rifle right



Boyd's STOCKS

off the shelf, for the most part you are happy.

It's these four words that seem to bother most people: *for the most part*. The phrase gets a majority of people rethinking the adjustable stock. Maybe the rifle does not change, but the shooter does over the years. Your facial features may either become larger or smaller, and when you went hunting I'm sure there were times when you wished you had a shorter length of pull simply because of the heavy field jacket you were wearing. With an adjustable stock a rifleman can alter all of the minor corrections with just a push of a button. Such a stock may also be perfect when you want to teach your wife, son or daughter to shoot with the same rifle while making it fit them more comfortably.

New to the fold is an adjustable stock from Boyds, the At-One stock. From the start, the stock is well thought out with 30 layers of



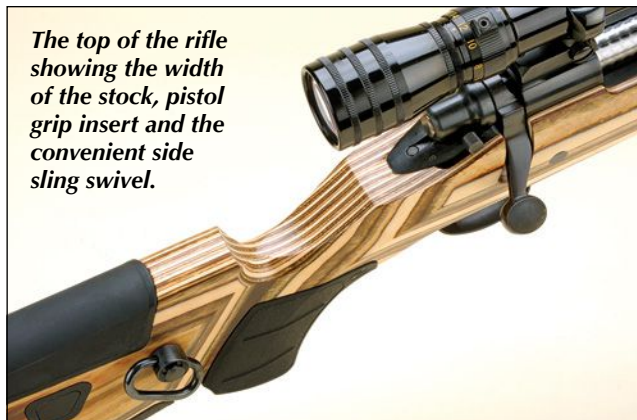
With the Remington action installed, the completed rifle makes for a handsome presentation. Out of the box, the black forend insert and the insert on the pistol grip are stock "sporter" items.

hard maple as the laminate, along with an assortment of colors and inlaying to include dozens and dozens of rifle makes, providing a wide selection for any hunter, target shooter or weekend plinker. Looking at the company's literature, the At-One stock is available in 11 different colors, from mild to wild, all with a satin, water-resistant finish.

To try out the At-One, the Coyote laminate was chosen for a Model 700 .222 Remington Magnum, and the Forest Camo version was chosen for a long-action Weatherby Vanguard. Close examination of each stock showed

attention to the details that make for a precision fit. Everything was cut cleanly and precisely, there was no sign of dust or sawdust and the inlaying was finished with a satin coating (like the exterior) for weather resistance. Both barreled actions dropped right into the stocks with no effort.

When it comes to the overall design of the At-One stock, in general it follows the classic line of thought, but with some options, which I will get to further on. Looking at the stock for the first time, a more traditionally minded rifle enthusiast might have con-



The top of the rifle showing the width of the stock, pistol grip insert and the convenient side sling swivel.



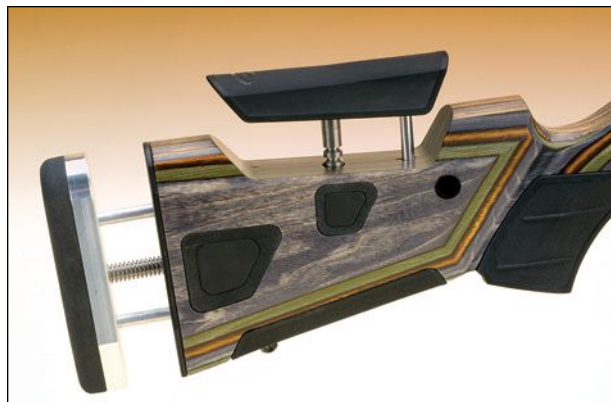
The modular grip insert fit perfectly to the inletting.



The forend's shape adds a touch of class to the rifle stock.

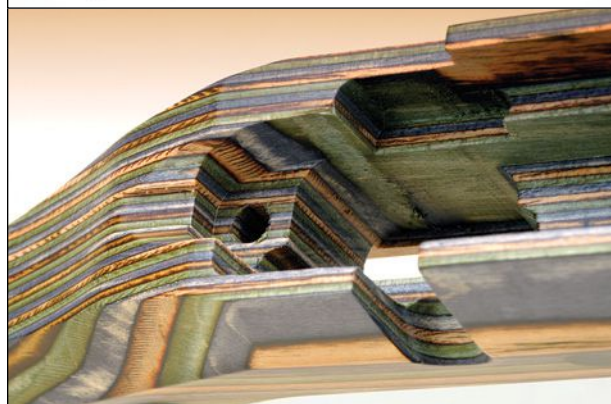


Left and right, the At-One buttstock is highly adjustable, and the comb can be raised to fit an individual shooter's needs.



cern for its sharp lines. Holding the stock (with or without the action), you will note hard angles around the tang, which to some shooters might be a little uncomfortable to grasp for extended periods, as might be the case during extended varmint shooting sessions. If I had some minor criticism of the stock, it would be right at the tang, or wrist, of the stock where the outer edges could be rounded off for a better grip. The same goes for the front area of

Precision inletting was evident; every nook and corner was razor sharp. Dropping in the Remington Model 700 action presented no problems.



the comb, as here comfort may be compromised when shooting harder-kicking cartridges.

Starting from the muzzle end, there is no forend tip, but this part is cut at a steep, downward angle

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Boyd's STOCKS

to prevent the stock from being caught on anything in the woods. Moving back on the forearm and along the rest of the stock, there are over-molded inserts made from high-impact nylon or thermoplastic elastomer. This particular part is removable, is available in a sporter, polymer rail or varmint width and simply attaches or detaches via a 1/8-inch hex or Allen wrench. For convenience, there are twin sling swivel studs; one for a bipod and one for a carry sling, with finger grooves on the varmint insert and serrations on the sporter version for good hand purchase in the field.

The stock starts to widen toward the rear to accommodate the receiver, magazine and trigger group. To add strength to this section of the stock, dual through-stock screws are included and fit on both ends of the main receiver inletting. At the pistol grip, the sweep is about right for both off-hand and prone shooting, and again there is a trio of interchangeable inserts. One is for a traditional-type feel (a little small for my average hands) but affords the opportunity to change grip panels to fit your hand size or hunting style. Next is the target grip, which is a little larger. The varmint inserts are larger, due to the fact that they



The forearm insert is interchangeable from sporter taper (bottom) to a wider version for varmint shooting.

have less of an outward sweep and extend downward by a good half inch for comfort. Like the forend inserts, the grips are interchangeable with a common 1/8-inch hex wrench. Prices on these inserts run from about \$15 to \$17.

All that aside, this stock really shines from the pistol grip back. First, the comb adjusts up and down with a quick push of a button on the upper part of the stock. This I find to be an interesting feature in that when shooting prone, I always like a lower comb as I don't have the body flexibility when compared to shooting from a bench or offhand. Comprised of a plastic assembly with a top section of over-molded rubber, adjustments can be as little as 1/8 inch up or down for a total of 3/16 inch. The movable comb varies in width from about 1.50 inches at the front to 1.46 inches at the rear, making it comfortable for most shooters.

Boyd's At-One Stock Specifications

length of pull:	12.5 to 14 inches
comb adjustment:	3/16 inch
overall length:	30.25 inches minimum, 31.75 inches maximum
forearm insert width:	
standard:	1.75 inches at rear, 1 1/16 inches at front
target style:	2 inches at rear, 1 1/4 inches at front
recoil pad:	.5-inch thick, over-molded rubber
weight:	approximately 3 pounds
price:	\$189
	extra sporting or target forearm or pistol grips range in price from \$15 to \$17.

There is no cheekpiece, but I never had a hard time in getting used to shooting my rifle when attached to the At-One stock.

While the adjustable comb is an asset, the recoil pad also offers varying degrees of adjustment. According to Boyd's, length of pull can be set for as short as 12.5 to as long as 14 inches. Again, the adjustments are simple: push the black button and pull or push the pad to accommodate your favored shooting position. The recoil pad has an aluminum "spacer" with an over-molded rubber body to absorb recoil. When moving the pad – like the comb adjustment – after you have finalized the setting, push down or in on the comb or pad to confirm and stabilize the setting.

For carry convenience, Boyd's has thoughtfully included a quick detach connection (or socket) on

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Grip inserts can be changed to suit any shooting style. On the stock is the sporter insert shown with the longer, fuller, target-style insert.

the bench. Since the stock was a bit heavier less recoil was noticed, and adjusting the comb did help as I leaned in and down when shooting from the static position.

Overall, I think Boyds has a great product for those shooters who need or want a rifle stock like this. Be aware that it will add a little weight to your present rifle; with the BDL stock, the .222 Remington Magnum action came in at 10.5 pounds; with the At-One stock attached, weight was 11 pounds. This is not enough of an increase to be troubling, and long-range hunters and shooters might welcome it. Although the stock's sharp lines could use some smoothing out, for anyone who needs some stock adjustment in the field or when shooting from a bench, and can spare the reasonable sum of \$189 (starting price), the At-One stock is worth consideration. For more information, contact Boyds Hardwood Gunstocks or log onto www.atonegunstocks.com. **R**

either side of the stock. While there are sling swivel studs on the stock, I like this idea as it allows the user to carry the rifle flat on your back when moving around.

Taking my Remington Model 700 .222 Remington Magnum to the range, I checked the accuracy of the rifle bedded in this stock against the accuracy of the factory wood stock with commercial ammunition. With the factory stock, Remington 55-grain pointed soft-

points hit the 100-yard mark at just around an inch for three shots, which according to my records was exactly how it performed the last time I shot it. A few handloads grouped a little more tightly, but for the time being I had none on the shelf. With the Boyds stock the results were the same – no surprise there, as the action did not change – but I did experience a different degree of comfort with the At-One when shooting from

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LONG RANGE

How to



Left, scopes with tactical military features, like the Leupold Mark 6 3-18x 44mm, are becoming popular with long-range hunters. Below, target shooters commonly dial their scopes to make necessary compensations for wind and distance. Hunters often do not have time to dial in the field and rely on reticle designs and ballistic calculators to make quick “hold” adjustments.

Brian Pearce

In my early days of shooting rifles at extended ranges, it was quickly discovered that ballistics charts and handloading manuals from ammunition companies were often incorrect – enough so that making reliable, vital hits on game was very difficult. In essence, they listed a given cartridge and load zeroed at a specified distance, which would drop an estimated number of inches at 300, 400 and 500 yards, etc. However, actual testing proved said charts were often inaccurate.

They also calculated for constant wind drift at extended ranges, something that is rarely encountered in the field as wind typically gusts and varies during the bullet’s flight. Forward-thinking scope companies, such as Redfield and Weaver, offered optics with reticle options to help with range estimation and hold-over, but again those were estimations rather than precision measurement devices. That has all changed.

Those ballistic charts have been replaced with advanced, highly accurate ballistic calculators that have been thoroughly tested using advanced soft-



ware, Doppler radar and other precise measurement methods (rather than being calculated or estimated), and modern scopes are offered with a variety of reticle options; first focal planes, dials with zero stops and more. Advanced, low-drag hunting bullets have been designed to retain high velocities at extended distances while offering reliable expansion.

Rifle manufacturers also have significantly improved out-of-the-box accuracy, and most ammunition companies offer hunting loads that are more accurate than previous offerings. New cartridges have been introduced that are accurate and offer low extreme velocity spread variations and in some instances improved ballistics. Powder technology has been developed that provides consistent velocities when subjected to variations in temperature, humidity and elevation.

There are many other tools that help the hunter extend his effective range, but his needs are distinctly different than those of a long-range target shooter. Competitors know the distance to each target and will not need a rangefinder. They also usually have a spotter to help read the wind and coach as needed.

VARIABLES

Improve Your Field Shooting

LONG RANGE

Many target ranges feature flags positioned downrange to help identify wind speed at various distances. Perhaps most significant is that target shooters have the luxury of sighting in their rifle before shooting for score. It will not matter that they zeroed their rifle at home before traveling to a new range, knowing the rifle's point of impact will almost always change.

By contrast, a hunter does not get practice shots but needs to place the first shot correctly, or game may be wounded or flee, making subsequent or "corrected" shots very difficult. Bullet impact changes are not usually significant at typical 100-yard, sight-in distances, but when shooting at extended ranges of 500 to 1,000 yards or beyond, it becomes especially critical to have the rifle and load perfectly zeroed to correspond with drop charts or ballistic calculators.

One of the most critical tools for long-range shooting is a chronograph. Just because an ammunition company lists a given load at a specified velocity does not indicate that it is actually producing that velocity from your rifle. The same comment applies to handloading data. I bought my first chronograph back in the 1970s and have fired many tens of thousands of rounds across several chronographs, and velocities can vary significantly from claimed figures, as well as from different rifles. A chronograph will help hunters se-

Factory ammunition has been steadily improved, with some loads designed to enhance performance at long range.



lect a load – factory or handloaded – that can yield very low extreme velocity spreads – a critically important ingredient for making reliable hits at long range.

A load that has a 200-fps extreme spread, which is common with many traditional factory hunting loads, will change point of impact enough to completely miss the kill zone of deer at long range. A random example includes a bullet with a ballistic coefficient (BC) of .420 shot at a muzzle velocity of 2,900 fps. With a 200-fps extreme spread calculated at 2,800 and 3,000 fps, respectively, its change of impact at 400 yards is 4.8 inches; however, moving out to 700 yards (a distance that many dedicated long-range hunters discuss as though it is short range), the same load changes point of impact by 21.5 inches! At longer distances, changes in point of impact become significantly greater. By contrast, the same load with an extreme spread of 20 fps – common with quality ammunition – at 400 yards has an impact difference of just .5 inch, while at 700 yards it

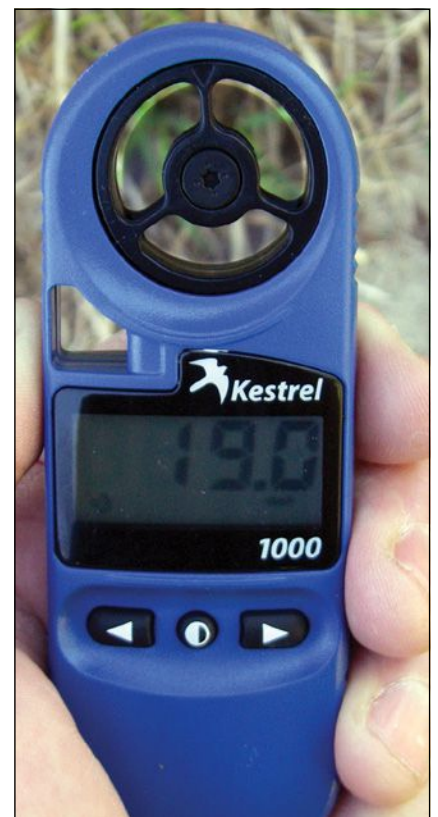
is just 2.2 inches. The importance of using ammunition with a narrow shot-to-shot velocity consistency is a critical ingredient for success.

The development of practical "field" laser rangefinders has played a huge role in aiding long-range shooters by virtually eliminating guesswork. If the distance is not precisely determined, most likely the shot will miss. Using the above bullet with a .420 BC at a velocity of 2,900 fps, if the animal is at 400 yards but is incorrectly estimated at 350 yards, the bullet will strike 8.9 inches low; if the distance is estimated at 450 yards, the bullet will strike 10.8 inches high. Moving out to 700 yards, if the distance is estimated



Laser rangefinders are hugely important tools for the long-range hunter, such as these versions from SIG and Gunwerks.

Wind speed can be difficult to judge, is constantly varying and can cause bullets to drift off target. An anemometer is a valuable tool.



at 650 yards, the bullet will miss by 24.2 inches. If the range is miscalculated by 100 yards, the bullet misses by nearly 60 inches!

Not all rangefinders offer ideal performance. In trying dozens of models, they often fail to record a distance in snow-covered conditions and various other lighting conditions, and most are target-surface sensitive. I have been especially pleased with the Swarovski EL Range binocular; its built-in rangefinder gives accurate readings and compensates for uphill or downhill angles which change a bullet's point of impact at long range.

There are several "pocket" rangefinders, such as the SIG Kilo 2000 7x25mm, that can regularly record distances out to 1,600 yards under a variety of field conditions. It is compact and weighs 7.5 ounces. Another interesting rangefinder is the Laser Technology Trupulse G7 BR2 marketed by Gunwerks. It can measure out to 2,500 yards under perfect conditions and offers a "corrected" yardage for atmospheric conditions.

Wind is an obvious factor that affects the bullet's flight; however, an experienced and skilled long-range shooter can usually read the wind well enough to compensate and achieve respectable accuracy. This is a skill that must be learned, and tools will play an important role in developing that skill.

Kestral (www.kestralmeters.com) offers several excellent lightweight, handheld precision anemometers that start at less than \$100; such a tool is important for the long-range shooter. Spotting scopes are especially valuable in "seeing" distant heat waves as well as the movement of trees, grass and brush, but only the experience of practicing in windy conditions will help estimate how fast the wind is actually moving and how it affects a given bullet and load. A high-quality 10x to 12x binocular can also be a tremendous tool in identifying wind patterns at long distances.

While downrange wind is always of interest, correctly reading wind currents in the first 300 yards is especially important. If the bullet gets blown off course in the first few hundred yards, its direction is more or less set for the remainder of its flight, and it becomes greatly magnified at longer ranges and almost always results in a miss unless the shooter makes proper compensation.

Most hunters sight in their rifles at home, or on a range near their home, then travel to a hunting location, which usually includes climate changes and other variables. At a typical 100-yard range, point-of-impact changes are usually minimal (although I have seen them change considerably). At longer distances that slight im-

Ballistic Calculator									
INPUT VARIABLES									
Ballistic Coefficient:	0.29	Velocity (ft/s):	3613	Weight (GR):	53				
Maximum Range (yds):	1200	Interval (yds):	50	Drag Function (I):	G1				
Sight Height (inches):	1.5	Shooting Angle (Deg.):	0	Zero Range (yds):	100				
Wind Speed (mph):	0	Wind Angle (Deg.):	90	Altitude (ft):	0				
Pressure (hgt):	29.53	Temperature (F):	59	Humidity (%):					
Ballistic Results									
RANGE (YDS)	VELOCITY (FT/S)	ENERGY (FT-LB)	TRAJECTORY (IN)	DRIFT (IN)	DRIFT (IN)	DRIFT (IN)	DRIFT (IN)	DRIFT (IN)	DRIFT (IN)
0	3613	1536	-1.5	0	0	0	0	0	0
50	3423	1379	-0.4	0.7	0.2	0	0	0	0
100	3242	1236	0	0	0	0	0	0	0
150	3068	1108	-0.5	0.3	0.1	0	0	0	0
200	2901	991	-1.8	0.9	0.3	0	0	0	0
250	2741	884	-4.2	1.6	0.5	0	0	0	0
300	2586	787	-7.8	2.5	0.7	0	0	0	0
350	2437	699	-12.7	3.5	1	0	0	0	0
400	2292	618	-19	4.5	1.3	0	0	0	0
450	2152	545	-27	5.7	1.7	0	0	0	0
500	2017	479	-36.9	7	2	0	0	0	0
550	1887	419	-48.9	8.5	2.5	0	0	0	0
600	1763	366	-63.3	10.1	2.9	0	0	0	0
650	1646	319	-80.6	11.8	3.4	0	0	0	0
700	1535	277	-101.1	13.8	4	0	0	0	0
750	1431	241	-125.2	15.9	4.6	0	0	0	0
800	1336	210	-153.7	18.3	5.3	0	0	0	0
850	1251	184	-187	21	6.1	0	0	0	0
900	1177	163	-225.8	24	7	0	0	0	0
950	1115	146	-270.9	27.2	7.9	0	0	0	0
1000	1064	133	-323.2	30.9	9	0	0	0	0
1050	1021	123	-383	34.8	10.1	0	0	0	0
1100	985	114	-451.2	39.2	11.4	0	0	0	0
1150	954	107	-528.2	43.9	12.8	0	0	0	0
1200	926	101	-615.2	48.9	14.2	0	0	0	0

Ballistic calculators have improved and are now far more precise than they were just a few years ago.

change will be magnified and should be corrected before attempting a long shot.

In spite of the rifle being correctly zeroed at hunting camp, changes in atmospheric pressure (air pressure), humidity, temperature and elevation often change a bullet's flight, which is further magnified at long range. These conditions can be felt (aches and pains associated with air pressure changes) but usually are not seen or identified without tools. In other words, a hunter may know air pressure and humidity have changed but may have no idea how to compensate when the time comes to make a long-range shot.

My son was recently working up loads and dialing in a ballistics chart for a new Savage Model 10 .22-250 Remington for the rapidly approaching coyote season. His loads were regularly grouping inside .250 inch at 100 yards. Over a period of several days, bullet impact was tested at distances out to 750 yards. As is typical with Idaho's fall weather, temperatures, humidity and air pressure were changing up and down daily. Without changing the scope's zero, point of impact was shifting by 6 inches or more from day to day.



Long-range capable .30-caliber cartridges include the (1) .308 Winchester, (2) .30-06, (3) .300 WSM, (4) .300 Winchester Magnum and (5) .300 Weatherby Magnum.

LONG RANGE

Nothing else had changed except for air pressure, temperature and humidity. His handloads had an extreme velocity spread of less than 20 fps for a five-shot string, and velocity scarcely changed with day-to-day temperatures.

The above subjects deserve much further discussion, but it shows changes in humidity, barometric pressure or temperature can change how wind affects a bullet's flight. Another common misconception is that humid air is heavier than dry air, but in actuality the molecular weight of dry air is greater than that of water. Even if an informed handloader develops loads that change velocity very little with large tempera-

ture swings, as the temperature changes, so does air density, which will influence a bullet's flight.

There are great pocket tools for measuring barometric pressure (which is essentially the same as atmospheric pressure, but depending on how they are used may have different connotations), altitude, density, relative humidity, temperature and crosswind all in a single device. I have been pleased with the performance and reliability of the Kestrel 5500, which usually sells for just over \$300. At 4.3 ounces it is a practical and valuable field tool.

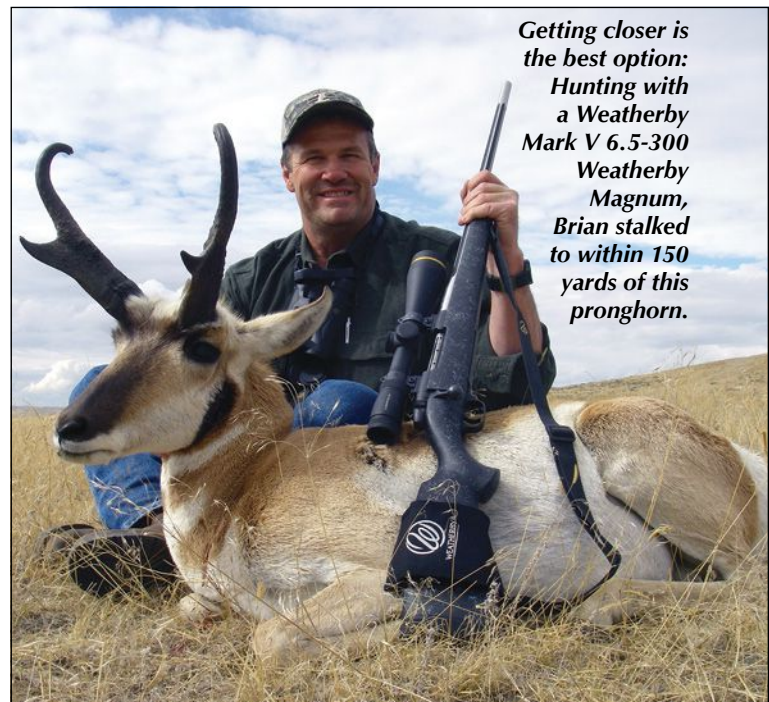
The earth's rotation and its effect on bullet impact is something that is rarely spoken of, but

it can be a significant factor. Recently, scientific tests were conducted wherein a given cartridge and bullet were fired exactly due east, then due west, at 1,000 yards. The point of impact changes were more or less 15 inches. In short, the earth rotates enough during a bullet's flight to change point of impact, which becomes greater at longer distances. The problem is that this is not a predictable number. In other words, depending on location and the angle of the shot, the rotation amount will vary.

Long-range rifles should be superbly accurate and stocked so that changes in temperature and other variables will not change barrel pressure and therefore the point of impact. The stock should also be designed to be fired from a variety of field positions, including prone, sitting with a bipod or makeshift rest and so on. A quick-attach bipod is especially useful as it will serve as a positive rest. The barrel twist should be fast enough to fully stabilize bullets at any distance that a shot may be taken, and since most long-range bullets are heavy for caliber, a fast twist is generally favored. Precision shooting will naturally require a trigger pull that breaks crisply and without creep or after-travel.



Popular long-range hunting rifles include (left to right): a Gunwerks LR-1000 .300 Winchester Magnum, Weatherby Mark V 6.5-300 Weatherby Magnum, Nosler Model 48 .28 Nosler and a Savage Model 111 Long Range Hunter 6.5-284 Norma.



Getting closer is the best option: Hunting with a Weatherby Mark V 6.5-300 Weatherby Magnum, Brian stalked to within 150 yards of this pronghorn.

Proper scope mounting is crucial. The number one reason most scopes are returned for repair is from overly tightened rings, which can bind adjustments and cause damage. Most specifications call for ring screws to be tightened to 28 inch-pounds. Scopes should also be mounted without stress and without binding in the rings. Lapping rings for a nearly perfect fit is almost always beneficial. Reticles must be precisely level with the rifle's receiver, or as ranges increase the bullet will fail to travel true with the axis of the bore. An anti-cant level device mounted to the scope tube, such as those offered by Mounting Solutions Plus (www.mountsplus.com), is an important tool to prevent rifle canting that will surely result in a miss at long range.

Scope technology has advanced remarkably in the past couple of decades, especially for the long-range shooter. While scopes with second focal plane reticles can work very well, they do have certain disadvantages for many long-range shooting applications. A reticle located in the first focal plane will change the size of the target to correspond with the changing size of the reticle as the magnification selector is rotated. In other words, the target grows or shrinks simultaneously with the reticle as the magnification is changed. As a result, hold-over is exactly the same regardless of the power selected.

For several reasons, scopes with 30mm tubes are of significance to long-range shooters, but primarily they feature greater MOA adjustments when compared to scopes with one-inch tubes, allowing the rifle to be zeroed or dialed at extended ranges.

Reticle choices seem nearly endless and cannot be discussed in this space. However, there are many different types of bullet-drop compensators, and companies such as Leupold will custom manufacture any reasonable feature or reticle to exactly match the ballistics of a cartridge and load.

High-quality scopes feature pos-

itive click adjustments and are often fitted with finger adjustable turrets with zero stops, which has made dialing to compensate for trajectory and wind drift very popular. The advantage is that tools and equipment help the shooter determine how much to "dial" to compensate for range, wind drift, atmospheric conditions, etc., then place the crosshairs on the target and squeeze the trigger.

This method works well but there are a couple of drawbacks and potential risks. In the field there is not always time to take all of the compensation readings, then dial the scope and get back on target before the animal moves a few yards or the wind changes, both of which can result in a miss. It is generally not a good idea to take your eyes off the game to make scope adjustments. Although top-of-the-line scopes are near perfection with positive adjustments, I have had failures to fully adjust (or dial) until a shot had been taken.

Another great option is to place a ballistic chart with drop and wind drift calculations on the rifle and select a scope that has a reticle with known reference hashes or dots for instant hold-over and

drift correction. This is a notably faster and practical aiming method for hunters.

There are literally dozens of excellent long-range hunting cartridges that offer adequate power and accuracy. Long-range hunting bullets have advanced considerably in the past couple of years, with special mention given to Hornady, Nosler, Berger, Swift and Barnes. The general focus has been to increase BC and reduce drag, which flattens trajectory, reduces wind drift, increases impact velocities and better facilitates reliable expansion.

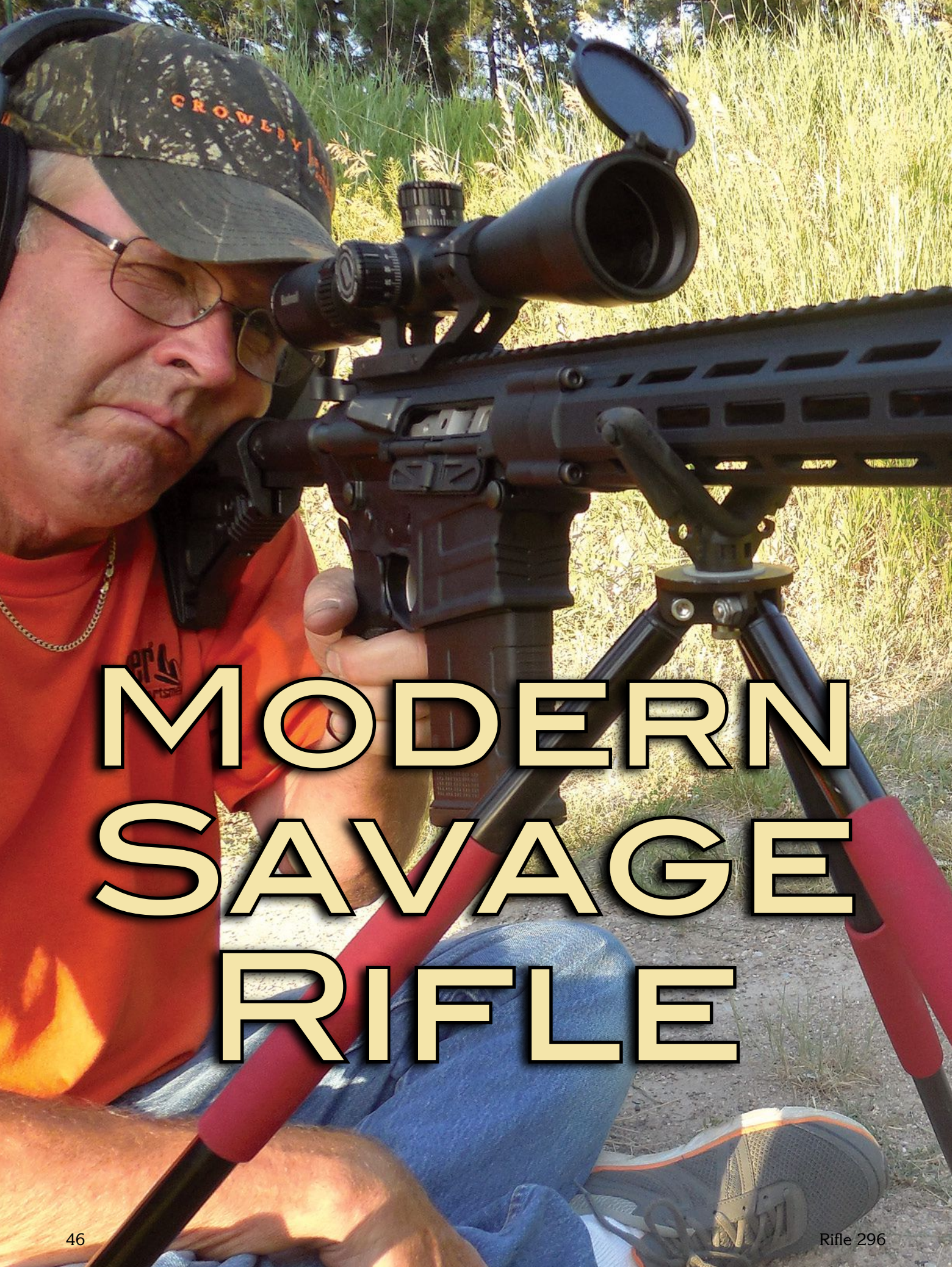
Due to space limitations, many important details will have to be discussed in another issue. It must be mentioned that as a dedicated hunter and former guide, it is my nature to get as close as possible for a clean shot at game animals. However, with accurate rifles, precision scopes, greatly improved bullets and ammunition, and many tools to measure distance, wind and atmospheric conditions, it is easier to place bullets at extended distances than at any previous time. Still, hunters must practice extensively and learn their own limitations before taking any shot at any distance. **R**

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The advertisement features a collection of leather gun accessories, including two vertical holsters with a deer head logo and the word 'LEUPOLD' written vertically, a brown leather belt with a buckle, and two small leather pouches with a deer head logo and the name 'James' written on them. The background is a textured, light-colored surface.



MODERN SAVAGE RIFLE

A LOOK AT THE NEW MSR 10 HUNTER

John Haviland

The phrase “Modern Sporting Rifle” was coined in an attempt to improve the image of AR-type rifles among the general public. Savage Arms has tweaked the term to “Modern Savage Rifle” to introduce four models in its new line of autoloading rifles. The MSR 15 Recon and Patrol are derivatives of the AR-15 and are chambered for the .223/5.56 NATO, while the MSR 10 Long Range and Hunter are offshoots of the AR-10.

Phil Mason had no trouble shooting the Savage MSR 10 Hunter rifle.

The Hunter .308 Winchester was chosen for this review; it's also chambered in 6.5 Creedmoor and .338 Federal. The Hunter uses the familiar direct-impingement system of gas operation and a short, 16 $\frac{1}{8}$ -inch barrel. Other common features include a two-position safety, forward assist button and takedown pins. The Hunter also has a few innovative features, such as two ejectors on the bolt face, a muzzle brake, 5R rifling and coatings on the barrel, bolt and trigger.

The original AR-10 design has been evolving for about 20 years, mainly to shrink and lighten the rifle. Savage has continued in that direction, with the Hunter weighing 7.8 pounds. That's nearly a pound lighter than many other such rifles. Savage did this by ever so slightly lightening the upper receiver. The bolt release lever and magazine release button located on only one side of the receiver shave a few more ounces of weight. Of course, a short 16 $\frac{1}{8}$ -inch barrel is obligatory. The M-LOK handguard is relatively slender and slotted all the way around to reduce weight and provide holes to attach all manner of accessories. A Picatinny rail extends the length of the receiver top and handguard to mount optics and other sights.

The 12-inch, free-floated handguard attaches to the upper receiver with four Allen-head screws instead of the common delta ring or barrel nut clamp. The forward extension of the upper receiver is a thick, 1.90 inches in diameter, to which the handguard attaches and adds stiffness to the chamber area.

Removing the handguard reveals a fluted, .88-inch diameter barrel behind the gas block. The barrel tapers to .75 inch forward of the gas block and ends with a muzzle brake with four vents that direct gas upward to reduce muzzle flip and prevent a cloud of dust when shooting prone.

MODERN SAVAGE MSR 10 HUNTER

A gas regulator screw is threaded to the front of the gas block. It can be turned with a pin to adjust gas flow. The screw can also be adjusted through a gap in the top of the handguard. The gas block was correctly set, and the rifle never bobbled a single cartridge while



The addition of a Bushnell Engage 3-12x 42mm scope brought the weight of the MSR 10 Hunter up to 9 pounds, 14 ounces.

cycling. There was no sign of case head swipe, so I left it alone.

The barrel has a Melonite coating that hardens and improves the corrosion resistance of the metal

surface. Its 1:10 rifling twist has 5R-type rifling. A look in the bore with a Lyman borescope showed five lands and grooves, with the tops of the lands sloping toward the grooves. This slant is believed to distort bullets less as they pass down the bore and reduce fouling buildup at the junction of the lands and grooves. After firing 80-some rounds through the barrel, copper-fouling streaked the tops of the lands here and there in the bore. The entire length of the bore showed crosswise tool marks.

There are a few differences between the Hunter and a similar Colt LE901. The Hunter's upper is about an inch longer than the Colt's. That length comes from the Hunter's extension to attach the handguard. The Hunter's lower is also thicker around the magazine well, the rear of the receiver at the pivot pin and around the bolt raceway housing. The Hunter's forward bolt assist is about 1.5 inches forward of the rear of the upper. The Colt's is even with the rear of its upper.

It has been reported that the Savage's bolt carrier is slightly shorter and lighter than other carriers. However, the carrier of the MSR 10 and the LE901 appear to be the same length and weight. The carrier key on the Savage is integral with the bolt carrier, and the key is pinned in place. The Colt's key is one piece and is locked in place on the carrier with two screws.

One attention to detail is a nylon-tipped screw that bears against the bottom of the rear lug. This prevents any movement be-

BUSHNELL ENGAGE 3-12X 42MM SCOPE

In the tactical world, targets are not shot, they are engaged – thus Bushnell's name for its new Engage scopes. Nine available scopes vary from a 2-7x 36mm to 6-24x 50mm. The Engage 3-12x 42mm scope used with the Savage MSR 10 features tactical-style windage and elevation turrets with ¼-minute of angle (MOA) adjustment clicks. Lifting the turrets allows for adjustment, and pushing them down locks them in place. After the scope was sighted in I unscrewed the turret caps and aligned the "0" on the dials with the indicator mark on the scope tube and screwed the caps back on.

The scope has an adjustment range of 60 MOA and 15 MOA of travel per revolution of the turrets. A side parallax adjustment dial focuses the scope down to 10 yards. The Deploy MOA reticle has one-MOA hash mark spacings with the scope set on 12x. The reticle has 4 MOA-wide hash marks every 5 MOA to aid in windage and hold elevation. For the hunter enduring inclement weather, the EXO Barrier lens coating is bonded to the lens and fills the microscopic pores in the glass. The slick coating repels water, oil, fog, rain and snow.

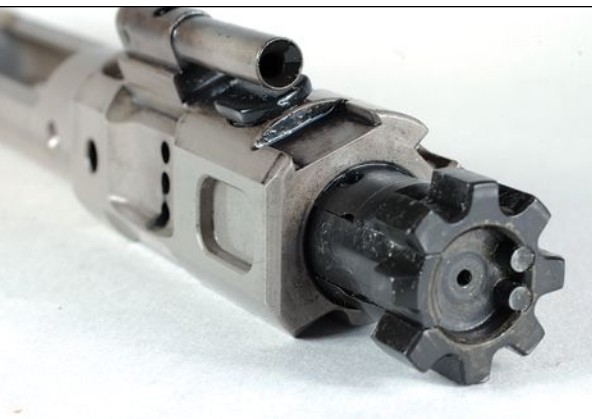
I dialed the scope's elevation turret back and forth quite

a few times while shooting at 100 and 300 yards. Bullet impact came right back after each twist. To further test reticle reliability, three shots were fired at 100 yards, then three more shots were fired each time after dialing 20 clicks up, 20 right, 20 down and 20 left. The result was a 5-inch square box punctuated by three holes at each corner.

Looking through the scope at a 1951 USAF resolution test chart at 100 yards, its resolution was a touch less sharp than a another scope with similar magnification and objective lens that cost three times the price. The Engage's retail price is \$349.99. R



Pulling up the turrets on the Bushnell Engage 3-12x 42mm scope allows for adjustment; pushing them back down locks them in place.



Left, the MSR 10's bolt face houses two ejectors. Right, the Hunter's gas block can be adjusted through a port in the top of the handguard.



tween the upper and lower, stopping any rattle that some shooters find as annoying as fingernails dragging across a chalkboard.

With the MSR 10 Hunter reassembled, I mounted a Bushnell Engage 3-12x 42mm scope on it using a Weaver SPR Optics Mount. An electronic fish scale indicated the complete rifle weighed 9 pounds, 14 ounces.

The Hunter's trigger is made by Blackhawk, one of Savage's sister companies. While the scale was still turned on, I weighed the Hunter's trigger pull. It varied from 6

when shooting 130- to 185-grain bullets loaded in seven Federal .308 Winchester loads.

The forward slam of the recoil buffer was about the only thing that caused the sight picture through the scope to blink out.

The Hunter cycled about 125 Federal .308 cartridges without a hitch. Those cartridges included an assortment of bullet types, from the blunt hollowpoint of the American Eagle Varmint & Predator loads to the pointy plastic tips of Edge TLR bullets and the church steeple taper of Berger

Juggernauts and Sierra MatchKings ending in a tiny tip.

Average accuracy was somewhat over an inch for two three-



The Blackhawk Axiom Carbine stock on the MSR 10 Hunter features a rubber recoil pad and is adjustable for length of pull.

The rifle features a muzzle brake to reduce recoil and muzzle flip.



pounds, 9 ounces up to 7 pounds. It also had four stages of creep before the trigger tripped the hammer.

Pulling back the charging handle was only required once or twice during a shooting session; but reaching under the scope's ocular lens to grasp it and pull it back was annoying. The more expensive MSR 10 Long Range has a charging handle on the left side and I looked longingly at pictures of it.

The Hunter's recoil was mild

Savage MSR 10 Hunter .308 Winchester Accuracy Results

bullet (grains)	stated velocity (fps)	actual velocity (fps)	100-yard 3-shot groups (inches)
factory loads			
130 Federal American Eagle Varmint & Predator JHP	3,050	2,925	1.19
150 Federal MSR Fusion	2,770	2,704	1.48
165 Federal Fusion	2,700	2,572	3.31
168 Federal Premium Gold Medal Sierra MatchKing HPBT	2,650	2,474	1.01
168 Federal Premium Tactical Tip MatchKing	2,700	2,492	.94
175 Federal Premium Edge TLR	2,600	2,445	1.44
185 Federal Premium Gold Medal Berger Juggernaut OTM	2,600	2,400	1.39

Notes: Velocities were recorded 10 feet in front of the muzzle of a Savage MSR 10 Hunter .308 Winchester with a 16½-inch barrel. Temperatures varied between 75 and 85 degrees Fahrenheit.

MODERN SAVAGE MSR 10 HUNTER



Right, a 100-yard group shot with Federal Premium Gold Medal Berger 185-grain Juggernaut OTM loads.



Left, this group was shot at 100 yards with Federal American Eagle Varmint & Predator 130-grain JHP .308 Winchester loads.

shot groups with most of the loads at 100 yards. A lighter trigger pull would have helped shrink some of the groups. A few times my concentration remained on the trigger instead of the crosshairs, and a shot got away from me.

The Federal Premium 168-grain Tactical Tip MatchKing load shot the best. The MatchKing bullets were shot while sitting with the rifle supported on a tripod. A five-shot group measured 2.53 inch at 100 yards. At 200 yards a three-shot group measured 1.32 inches. That was pretty good, so I went back to the bench and shot six of the Sierra bullets at 200 yards. The group measured 1.46 inches.

The Engage scope was dialed to compensate for the drop of Sierra bullets at 300 yards. Sitting with the rifle braced on the tripod, I

whacked a steel plate a half dozen times in a row. That became sort of boring, so I switched to rocks on a hillside. The puffs of dust from hits were immediately satisfying.

The handguard got hot enough that I needed to wear a glove when the ambient temperature was 90-some degrees Fahrenheit and the Savage had been shot quite a few times in a row.

The Hunter name suggests the Savage rifle is intended for hunting. The rifle has no specific hunting features, however, and is more of a tactical design. At least there should be sling swivel studs or loops for attaching a sling. The rifle comes with a 20-round Magpul PMAG, but a low-capacity magazine may be required to legally hunt big game in some states. For

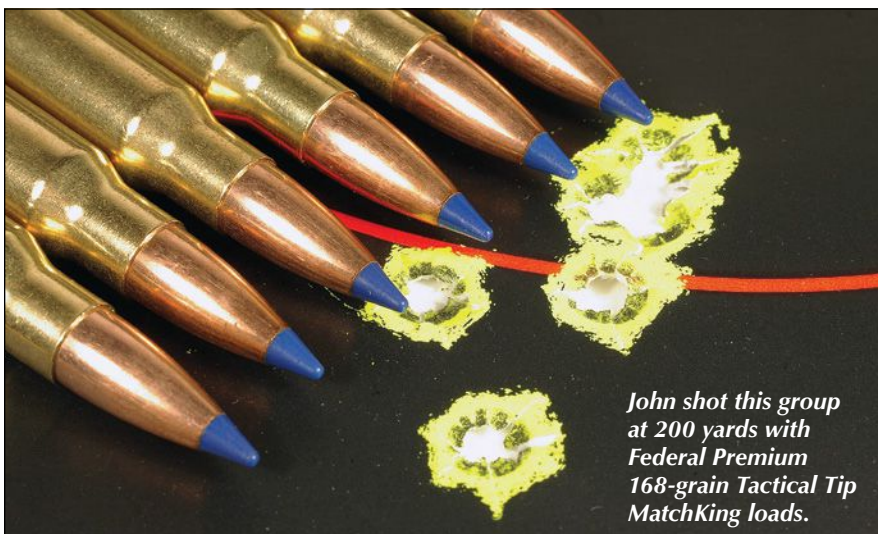


The MSR 10 Hunter is chambered in multiple cartridges, including the 6.5 Creedmoor, .308 Winchester and .338 Federal.

instance, deer hunters in New York are limited to a magazine capable of holding up to five cartridges. The rifle's muzzle brake and short 16½-inch barrel made muzzle blast extremely loud. I would remove the brake while hunting with the rifle. It would be nice to replace the brake with a longer, 18.5-inch barrel.

The .308 Winchester needs all the velocity it can generate for hunting, and such a short barrel bleeds quite a bit of velocity. For example, 185-grain Berger bullets loaded in Federal Premium Gold Medal cartridges reached only 2,400 fps compared to the 2,600 fps listed on the Federal box. On the other hand, Federal 150-grain MSR Fusion loads chronographed 2,704 fps, which was not all that much slower than the 2,770 fps stated by Federal.

Savage Arms certainly designed the MSR rifles its way, with familiar operating controls and innovative features. The long-standing company can certifiably call its new line of firearms Modern Savage Rifles. The MSR 10's retail price is \$1,481. **R**



John shot this group at 200 yards with Federal Premium 168-grain Tactical Tip MatchKing loads.

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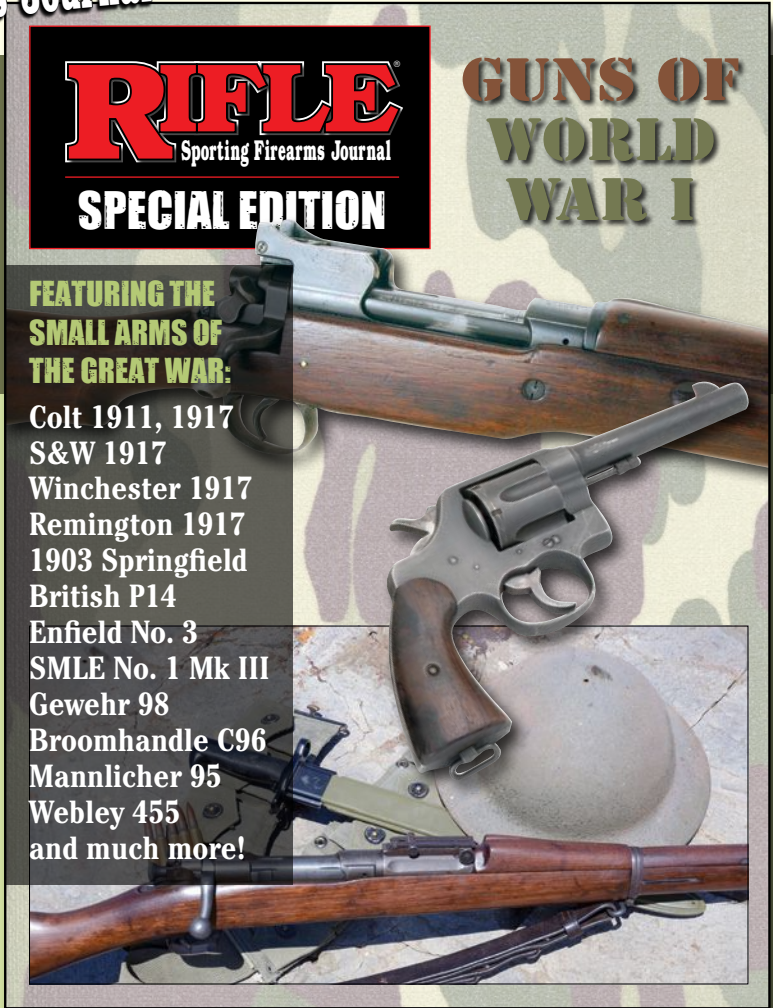
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HORNADY M-1 CASE TUMBLER

PRODUCT TESTS

It was a crowded range and a fellow wandered over to look at what I was shooting. I handed him a shiny .270 Winchester round, and he nodded approvingly. Okay, that was out of the way; he was a .270 fan, but he held on to the cartridge while looking at it. I thought he was going to ask about the bullet and load, but instead he asked, “How do you keep your brass this immaculate?” He twirled the cartridge in his fingers. “It looks new – better than new.”

I laughed, mostly at his unexpected use of the word “immaculate.” But I explained that I tumble my brass after every shooting. Like a lot of shooters – but especially hunters I know who reload – he said he just wiped down his brass before sizing and loading them again. He was like many shooters who don’t own tumblers or other brass cleaning equipment.

Does clean brass have a practical application? Well – theoretically – clean, smooth brass will feed and chamber better than grungy brass, especially in autoloading firearms. I’ve never noticed any difference, but for the past couple of decades I have tried to keep my brass immaculate for one primary reason: It looks as good as, or better than, factory ammunition.

More than 40 years ago when a buddy and I were going deer hunting, a box of my .243 Winchester handloads spilled in the bed of the truck as we were heading out on an evening hike. He picked up a couple of the reloads and handed them to me. They were pretty dirty and smoked up, having been reloaded at least four times without cleaning. He said something to the effect that he would never shoot that dirty ammunition and that he could never trust reloads. He associated “clean” with “functional.” I knew they were better than factory loads and was proud of that fact. That was when I decided appearances do matter. I bought my first case tumbler not long after that hunting trip to show that my reloads look as good as they shoot. I’ve used a tumbler ever since.

The motor burned out on my last case tumbler, so I ordered the new Hornady M-1 tumbler to get more



A Hornady M-1 case tumbler was tested with several batches of filthy brass.

capacity. What I also got was the quietest tumbler I’ve ever owned, and the three rubber feet keep the machine from dancing and walking around on any surface (a problem with other vibrating tumblers I’ve owned).

By a happy coincidence, a friend who had saved all his .270 Winchester brass for years – waiting for that day he was going to reload – came to the realization that he wasn’t going to live long enough to shoot up his inventory of factory hunting ammunition. So I inherited more than 200 rounds of once-fired brass of all different types. This was perfect to test out the new tumbler.

Hornady says the capacity of the new M-1 is 180 cases of .30-06 brass, or 400 cases of .38 Special brass. I took 100 of the sized and deprimed .270 brass, loaded the tumbler with Hornady ground corncob tumbling media and added some of the company’s One Shot Metal Polish. The machine was turned off a little more than two hours later. A few of the cases that were really dirty with oil-stained fingerprints and grunge still had some residue on them, but most of the brass looked like new.

The M-1 was filled with another 80 pieces of .270 brass and turned back on after adding more of the One Shot Metal Polish to the existing media. This time I let it run for 3.5 hours. Even the dirtiest once-fired cases came out really clean and polished.

The next batch, using the same media with another shot of the liquid polish, included more than 100 .30-06 cases that I ran for an hour or so, followed by another batch of 60 or so .30-30 Winchester cases that ran for about another hour. They were all nice and shiny with just an hour of run time – but I have to admit, the ’06 and .30-30 brass had only been fired once since the



The .250 Savage brass included the dirtiest cases tested.



The .250 brass came out pretty well considering how neglected it had been.

last cleaning and were in pretty good shape to start with. (That is why you want to tumble after each firing.)

Last, there was some really dirty .250 Savage brass that had been loaded and shot two times. However, the first loads were reduced-recoil loads that had smoked the case necks very badly, and the second time – without brass cleaning – they were loaded with full-power varmint loads and shot on a damp, foggy spring day while ground squirrel hunting, baking the soot into the neck. They also got a patina of splotchy stains from the moisture. Those 100 cases were loaded into the M-1 Case Tumbler with media that had been used five times. I added the One Shot polisher and let the tumbler run for at least four hours. This brass came out surprisingly clean. I could still see some of the staining from the moisture on most of the case bodies, but most of the smoked necks were much cleaner.

(As a test, I threw a couple of the worst .250 cases into cleaned batches since the initial test. Even after five more runs through the tumbler – 10 additional hours of tumble time – they still have some of the staining. I even tried to scrub out the stains with my line of last defense – doing it by hand with an auto-

motive polish called Nevrr-Dull – and even that was futile. Moral of the story: Some brass stains just won't come out.)

There was dust from the worn down media with each tumbling session, but the media itself was still pretty sizable. I've now run 10 total batches of brass through the same media, with the last five runs consisting of smaller batches of brass. I'm going to keep using it as long as the cases are coming out clean, but the grains are getting pretty small now, and the volume is probably half of what I started with; the corn media lasts a while.

Not long after this extensive tumbler test, I was at the range shooting my heavy-barreled .250 Savage, checking its zero for an upcoming varmint hunt. A fellow asked what I was shooting and I handed him a cartridge out of the block of reloads sitting next to the rifle. He admired the round. It seems like all shooters, especially older shooters, have dreamed of having a .250 Savage, and this guy was looking at the round for a long time. I thought that was the conversation we were going to have, but then he asked, "How do you keep your brass this shiny?"

Retail price is about \$55. For more information, go to www.hornady.com. – Jim Matthews

LYMAN AUTO ADVANCE REMOTE CONTROL TARGET SYSTEM

Many years ago I saw a prototype target system that used perforated fan-fold computer paper that could be advanced remotely, but it never made it to market. A few years later another appeared and I bought one, but it was very flimsy and survived only a few errant bullets. Unfortunately those are almost a fact of life, especially when using a Ransom rest, because the gun needs to settle in the rest inserts, and it will shift around for the first shot or two.

Lyman's Auto Advance Target System is advertised to withstand hits from .22 rimfire rounds and I, sadly, can testify to the accuracy of that claim. The instructions say that anything other than rimfire calibers will void the warranty, but if you hit only the target roll, who's to know? The possibility prompts the use of a plain paper target as an alternative until everything is stabilized, and then bring in the Lyman target.

The unit is sturdy, weighs 30 pounds and is easy to assemble. A 50-foot target roll is located in the top-most section, and the battery-powered takeup is housed in the lower part of the frame. It requires eight AA batteries for power. The upright structure is made from standard conduit tubing. The package contains enough tubing for an overall height of 60 inches but other lengths can be substituted as needed. The hand-



The handheld remote control uses a 9-volt battery.

Chronograph and accuracy measurements can be done simultaneously when the Lyman target is set up and ready to shoot.



held remote control is powered by a standard 9-volt battery and is a simple on/off switch. The target can be advanced as little or as much as needed. There is no fixed distance to advance.

Target rolls are 50 feet long and are made of a plastic material that is more substantial than paper and leaves very well-defined holes that are easily measured and seen with a spotting scope. There are four different types of targets available: bullseye, small bore rifle, silhouette and varmint.

The unit is thoughtfully designed and works exactly as advertised. Considering today's crowded ranges, the time saved changing targets is priceless. The MSRP is \$179.95, and extra target rolls are \$19.98. For more information, visit Lyman Products Corporation at www.lymanproducts.com. – Charles E. Petty **R**




SITEK ARMS

CUSTOM CORNER by Stan Trzoniec

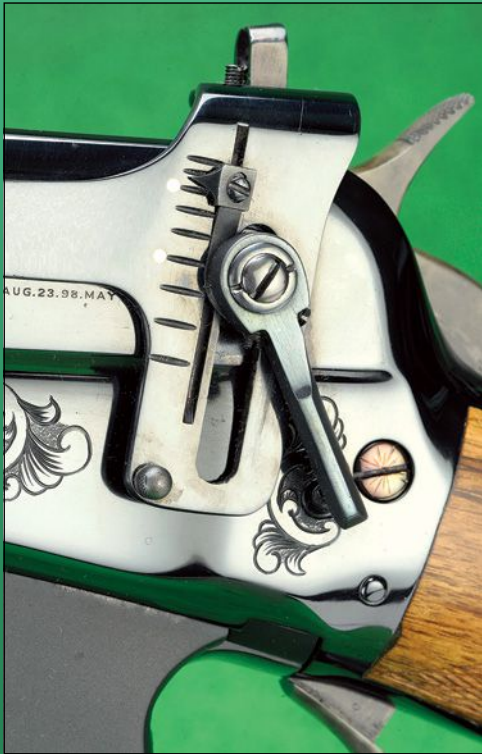
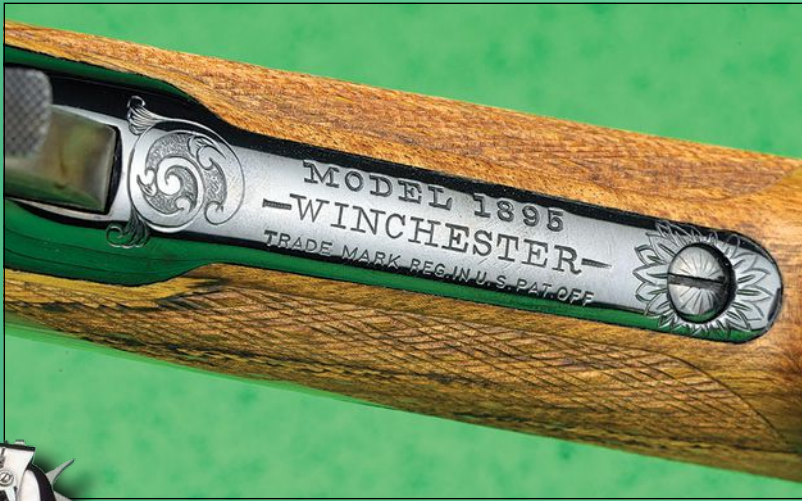
While most custom rifles today are built from existing actions, it is interesting to see how a one-of-a-kind rifle was created from a badly pitted, field-worn and distressed Winchester Model 1895 takedown. Considering this is one of only 837 rifles made, it was indeed worthy of a complete makeover by Sitek Arms.

Considering that the original wood was all but destroyed, starting from scratch was the only alternative. Checking his stock of premium wood, John Sitek found a piece of 40-year-old spalted Myrtlewood to begin his project. Since the rifle's owner wanted a Lyman No. 21 sight, the stock was profiled with a thicker comb, a more robust cheekpiece and a slight Monte Carlo shape to raise the eye for a better sight picture when using the peep assembly.

The stock is finished with oil and rubbed by hand. The checkering is a skip-line, ribbon pattern checkered at 24 lines per inch (lpi). There is an Asiatic buffalo horn Schnabel forend cap with a widow's peak. For field carry – if the owner takes this rifle in the field – there is a two-screw sling swivel stud on the buttstock while a barrel band holds the front stud forward of the forend tip. To complete the stock, a curved metal buttplate was installed and checkered by hand at a conservative 29 lpi.

While the stock was a challenge, the metalwork on the rifle took many hours of hard work. To maintain all of the original markings, master metal smith Ted Sitek removed all the heavy pitting by draw filing and “papering” to ensure all of the lines, markings and the final details were preserved. In addition, all action components were hand-honed for smoothness, and the trigger, hammer and stock screws were color case hardened. The original Winchester three-leaf rear sight was refurbished, a barrel band and hooded front sight was added with Alex Sitek finishing up the polishing and matte contrasting. Master engraver Rachel Wells of Prescott, Arizona, did all the engraving in a standard scroll pattern, keeping with the age and period of the rifle. For more information, contact Sitek Arms at www.sitekarms.com or 800-485-9508. 



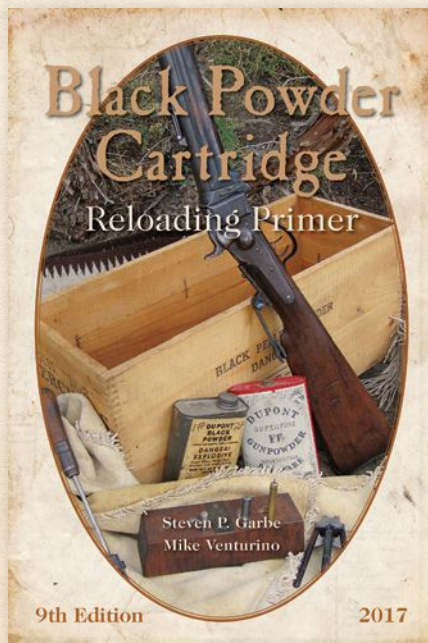


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Spotting Scope

(Continued from page 7)

suggested starting loads for its other designs of the same weight.

The late Fred Barnes, Colorado Bullets, came up with an all-copper, monolithic bullet design sometime after the introduction of the Nosler Partition but encountered accuracy and fouling problems. When Randy and Coni Brooks acquired the company from Barnes, the copper bullets resurfaced as the Barnes X-Bullet. Grooves were added a few years ago in an effort to reduce pressure and fouling while improving accuracy. The Triple-Shock (TSX) is a hollowpoint design, and a polymer tip was added to the Tipped Triple-Shock X (TTSX).

When the Arizona Game and Fish Department requested that hunters on the Arizona Strip use bullets with nonlead cores, recommending the Barnes TSX/TTSX as a readily available option, outfits that avoided monolithic bullets for whatever reasons got the hint, although the lesser-known North Fork designs, originally offered by Bob Fulton of Hawk Bullets, were available at the time as well. Then the state of California banned the use of lead and lead-core jacketed bullets across the board, which pretty much opened the flood gates for monolithic bullets.

It is interesting to survey the evolution of hunting bullets over the years, mostly because the original challenges, regardless of the "cool" factor associated with polymer tips, monolithic designs, etc., sometimes appear to be overlooked. That is, a bullet must hold together and penetrate at relatively high velocity at close range and still do the job downrange where velocity drops accordingly, for as far out as might be required, which from what we see on TV and read in print in the last few years, seems to be evolving toward infinity. **R**

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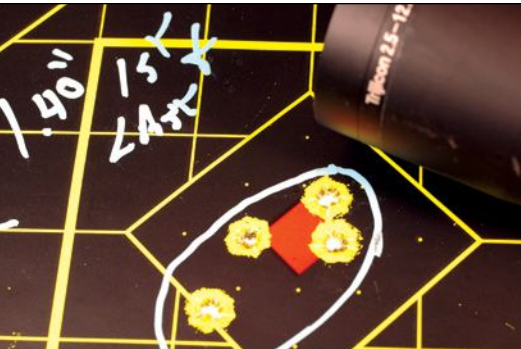
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A Rifleman's Optics

(Continued from page 23)

placed in the second focal plane, so dot spacing is correct with the scopes set on their highest power.

The AccuPoint 2.5-12.5x 42mm came with a MOA-dot crosshair. Dot diameters are .65 inch, with three on each side of the center of the reticle on the horizontal wire and six on the bottom vertical wire. Dot spacing is 2 MOA at 100 yards. That spacing provides an uncluttered view.



This group contains the first and last shots fired after repeatedly turning the windage and elevation turrets.

The Cooper .243 Winchester grouped three Hornady 105-grain A-MAX bullets into an inch at 300 yards with a drop 10 inches below aim. A touch over 3 MOA of elevation was required to compensate for that drop, so I centered the 300-yard target between the second and third dots on the lower wire and shot three more A-MAX bullets. That aim was not as precise as using a dot. The next three bullets hit 2 inches below the target center in a 1.57-inch group.

The battery-free, illuminated reticle is unique to the AccuPoint. Turning the brightness dial on top of the ocular lens housing adjusts the illumination level of the reticle's aiming point to coincide with available light. The green dot, about the size of a pinhead, is barely visible during full daylight. As evening approaches, the green dot readily appears. The tritium phosphor lamp lights the reticle as the crosshairs fade in the dark. That's perfect for hunting the doghair timber where elk hide. Now if I can just find an elk this season. R

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REDUCING RECOIL

(Continued from page 33)

Boone and Crockett Club to invite Jim to its triennial awards banquet, where his moose was honored as one of the top North American trophies taken over the previous three years.

A few years ago I got into a discussion about big-game cartridges with a guy who had suddenly acquired a considerable amount of money late in life and used the dough to go on expensive guided hunts, including several for trophy elk. He started with a .30-06 but switched to a .300 Winchester

Magnum. He claimed he had taken “almost ten elk,” but those he shot with a .30-06 always traveled farther than 100 yards before falling, and those shot with the .300 went less than 50.

I’ve taken elk not only with the .300 Winchester Magnum but the .300 WSM and .300 Weatherby Magnum, and have taken at least as many with the .30-06. None of the .30-06 elk traveled farther than 45 yards before falling, including the biggest bull, which went about 20 feet. One of the elk shot with a .300 was deliberately spined because only the top half of its back was visible above thick brush. It fell on the spot, but none of the elk that were chest-shot with .300 magnums dropped any quicker than the .30-06 elk. This has also been my experience when observing elk-hunting companions, and the total number is more than “almost ten elk.”

Some generous fans of larger cartridges will concede that lesser rounds will work, but only out to a certain range, usually some arbitrary number like 250 or 300 yards. This is also not my experience, having seen far too many animals, from big deer on up, taken neatly at longer ranges with lesser cartridges, often even with (gasp!) factory ammunition.

American hunters became obsessed with muzzle velocity more than a century ago, when smokeless powder replaced black. Smokeless doubled the average muzzle velocity of black-powder rounds, flattening trajectories enormously and making accurate shot placement much easier beyond 150 yards. This frequently resulted in less penetration however, because the new-fangled jacketed bullets often over-expanded or broke up when hitting big game.

By the middle of the twentieth century, new powders and cartridges added even more velocity. That’s when the Nosler Partition appeared, guaranteeing deep penetration even at high-impact velocities, but since then newer premium bullets with higher ballistic coefficients (BC) have also increased *retained* velocity. As a result, they don’t have to be started as fast to

perform at longer ranges. Even 2,700 fps is usually plenty, and since high-BC bullets don’t lose as much velocity, terminal performance is more consistent across several hundred yards – even with “nonpremium” bullets.

Despite both improvements, many hunters still believe in “rules” about big-game cartridges formulated 50 to 100 years ago. This is only natural because, like most humans, hunters tend to stick with what works. But if all humanity always stuck with what originally worked, we’d still be walking everywhere, and hunters would still be using rocks.

The history of hunting rifles has been an overall trend toward smaller calibers and lighter bullets. That trend continues today, primarily due to improvements in bullets, but there is a natural generation gap between hunters who stick to what they learned early on – often from their fathers – and the reality of *now*. Many cartridges developed well into the mid-twentieth century were designed around the relatively poor performance of available bullets, a classic example being the .338 Winchester Magnum. Its original factory loads included a 300-grain roundnose at 2,450 fps, to assure at least some of the bullet reached the vitals of larger animals.

Partly because of growing up during that era, I have plenty of experience with cartridges more powerful than the .30-06, probably the most with the .338 Winchester Magnum, and again not just my own hunting but those of several companions. There has also been plenty of field time with several .300 magnums, the 9.3x62 Mauser and .375 H&H. My safe still contains rifles chambered for all those rounds, and sometimes they go hunting – but only for animals big or dangerous enough to perhaps require more power than a .30-06. Otherwise I use even milder rounds because they are the most effective recoil-reduction technique of all, and at this point in life I don’t particularly feel like being a living demonstration of Newton’s third law. **R**

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1. The name of the publisher is Don Polacek and the editor is Lee Hoots, Prescott, Arizona.
 2. The owner is Polacek Publishing Corporation, 2180 Gulfstream, Ste. A, Prescott AZ 86301.
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 5. The average number sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown was: (This information is required by the act of June 11, 1960, to be included in all statements regardless of frequency of issue.) 76,290
- DONALD R. POLACEK, President

Walnut Hill

(Continued from page 62)

The stock was trimmed back by about an inch on the forend, which gave the rifle a cohesive appearance. It was advertised as weighing 6.5 pounds, although Hatcher said the samples he handled ran slightly heavier.

This brand-new, ground-breaking rifle was offered in just one cartridge, the new .308 Winchester. They were literally made for each other.


During the preceding five years there had been an increasing demand from writers and the public for rifles that were smaller and lighter, and the Featherweight was Winchester's response. It was a major change for American gun-makers and exerted enormous influence. It should have been Winchester's greatest postwar triumph. So why, 11 years later, did Waters say it had been abandoned?

One can simply imagine the committee meetings of engineers, managers and marketing people after the Featherweight sprang on the scene. The new .308 cartridge was greeted with hosannas and has never looked back. But the Featherweight? Well, there's the rub. Seeing the success of its new baby, Winchester very quickly offered it in both .270 Winchester and .30-06. When the .243 Winchester came along in 1955, it was added to the list. So far, so good – or at least, not all that bad.

For the Featherweight, the absolute low point – the date in history when it was subjected to the ultimate indignity – was in 1961, when Winchester announced it would henceforth be offered in the new .264 Winchester Magnum. The .264 was one of the original "short magnums" with a belted case. It was Winchester's answer to demands for a small-bore, ultra-high velocity, long-range rifle for the plains.

The company needed a cartridge to counter Weatherby's hot-shots and Philip Sharpe's 7x61 Sharpe & Hart, and the .264 Winchester was it. It fired a 140-grain

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bullet at a reported 3,200 fps and a 100-grain bullet at 3,700 fps. This is all well and good. With the powders of the day, however, such a cartridge required a minimum barrel length of 26 inches to come anywhere near delivering these velocities.

The mating of the .264 to the Featherweight was announced at the 1961 Winchester writers' conference, in conjunction with a couple of other changes, as reported by *Gun Digest* Editor John Amber. To try to make its barrels more uniformly accurate, Winchester

said it was adopting a revolutionary new barrel-making technique pioneered in Europe, called hammer forging. The first barrels made this way in New Haven would be in the shiny new .264 Winchester Magnum. What was more, they would be made of stainless steel, 22 inches long and destined for fitting into a new variation of the Featherweight.

Amber and his colleagues (as he admitted) had to accept some of the blame, since they had generally agreed that a 26-inch barrel was simply too long for a rifle to be carried in the mountains. At the same time Winchester announced a new type of recoil pad for the .264 Featherweight. No details were released since the pad was top secret, but Winchester knew what it was creating.

Pairing the red-hot .264 with a 6.5 pound rifle with a 22-inch barrel turned the stylish Featherweight into a bucking, booming, fire-breathing monster. And yet the end product of all this *Sturm und Drang* would be a muzzle velocity so far short of advertised velocity that it hardly matched the .270 Winchester.

Amber took one of the .264 Featherweights to Wyoming in 1961 to hunt elk. He reported that



An original .308 Winchester Silvertip (left) from the 1960s is shown beside a .264 Winchester Magnum of the same era. The idea of chambering identical rifles for both of these cartridges seemed absurd – and it was.

his handloads, measured with an Avtron chronograph, achieved 3,050 fps with a Nosler 140-grain Partition. Considering you could get 3,130 fps with a 130-grain bullet in a .270, it was hard to see an improvement.

With the great Model 70 redesign of 1963, the Featherweight was swept away, but the Standard model was altered to such an extent that it looked like the old Featherweight in all but name. Weights were listed as 7 pounds and up. Gone was the original, 6.5-pound, .308 Winchester. The Featherweight name did not return to the Model 70 lineup until 1981.

I'm not sure what all of this means, except that it is further proof that companies who make a good thing seem incapable of leaving it alone and letting it prosper. For my part, I would like one day to have the chance to handle one of those original 1952 Winchester Model 70 Featherweights in .308 Winchester. It must have been a gem of a rifle. **R**

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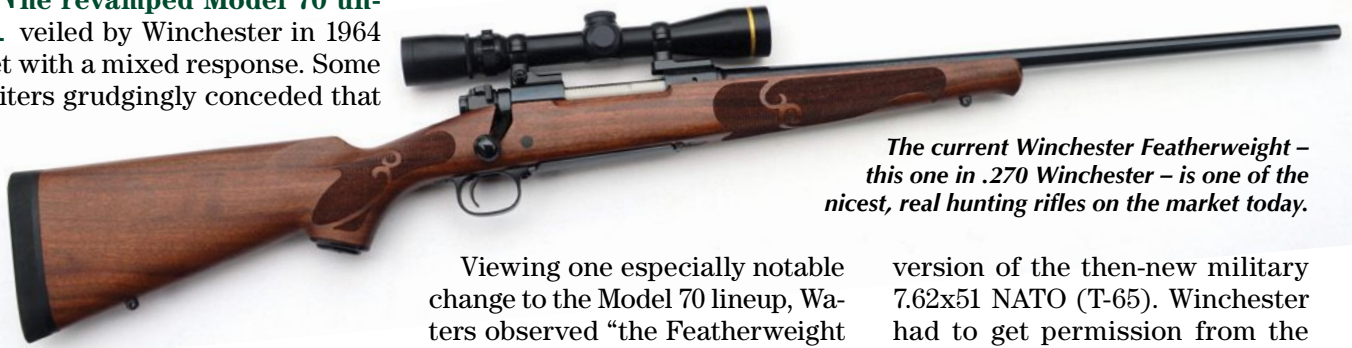
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REQUIEM FOR A FEATHERWEIGHT

WALNUT HILL by Terry Wieland

The revamped Model 70 unveiled by Winchester in 1964 met with a mixed response. Some writers grudgingly conceded that



The current Winchester Featherweight – this one in .270 Winchester – is one of the nicest, real hunting rifles on the market today.

it was mechanically superior to the pre-'64 rifles, and most agreed it was generally more accurate, but this was lost in the condemnation of its modern looks.

In the 1965 *Gun Digest*, the new line was examined by three prominent writers: Ken Waters, Bob Hagel and Pete Kuhlhoff. Waters and Hagel would go on to become stalwarts of *Rifle's* writing staff for almost 40 years; Kuhlhoff was gun editor for *Argosy*, a prominent (and respected) general interest magazine for men.

Hagel compared an old Model 70 with a new one, both in .300 Winchester Magnum, shot head-to-head with the same batches of ammunition. Kuhlhoff's purpose was to review what was new that year, while Waters was given the job of test firing the new stuff.

Viewing one especially notable change to the Model 70 lineup, Waters observed "the Featherweight has happily been abandoned . . ." Happily? Why happily? That is a little mystery that requires some digging.

In 1963, the Model 70 Featherweight was only 11 years old, a very recent addition to a line dating back to 1936. In that decade, however, Winchester had managed to take a superb idea, and a marketing triumph, and screw it up royally. There is really no other way to put it. The engineer at Winchester who dreamt up the Featherweight in the first place – his name having been lost to history – probably resigned in disgust.

To understand what happened, we have to go back to the summer of 1952 and a joint announcement from Winchester of both a new cartridge and a rifle specifically designed for it. The cartridge was the .308 Winchester, a civilian

version of the then-new military 7.62x51 NATO (T-65). Winchester had to get permission from the army to do this, and it was a big deal.

Maj. Gen. Julian S. Hatcher, reviewing the development in the 1954 *Gun Digest*, paid more attention to the cartridge than the rifle, which made use of a Ball powder developed by Olin, Winchester's parent, for the M1 Carbine. It allowed the smaller .308 case to match the original performance of the .30-06 (150-grain bullet, 2,700 fps). It was a ballistic breakthrough, and the hunters and shooters of America would benefit.

Winchester's rifle for the new cartridge was no less notable. The company took the Model 70 and put it through extensive reengineering just to match it to the cartridge. The most notable change was a free-floating barrel that was shorter (22 inches) and had a narrower profile. The integral boss, which provided a platform for the rear sight, was gone, as was the barrel-tension screw. With the barrel-tension screw gone, the barrel could be free floated its entire length. This was a term that gained considerable currency over the next several decades.

The Model 70's steel bottom metal was replaced with aluminum alloy. This was usually referred to as "duraluminum," or simply "dural," which has caused some confusion. It did reduce weight.

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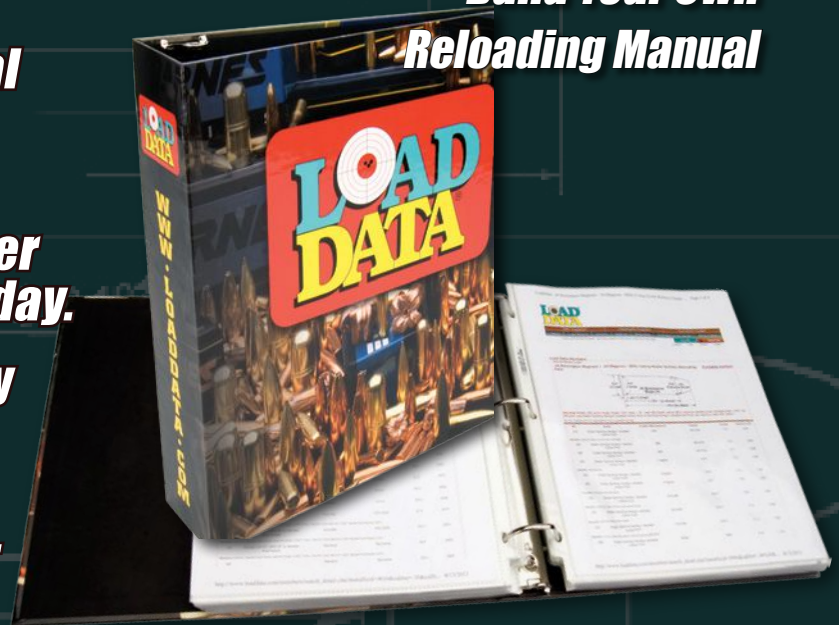
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