

**John Barsness**

**B**efore World War II, many shooters fired 10-shot groups when testing rifles or ammunition, including Col. Townsend Whelen, author of the oft-quoted “Only accurate rifles are interesting.” Even hunters typically fired five-shot groups when sighting in, yet today three-shot groups have become almost universal outside of formal competition. What happened?

# Three-Shot Groups

Before the war, most hunters used factory ammunition and iron-sighted rifles. Few owned a deer rifle capable of grouping less than 2 to 3 inches at 100 yards yet still killed deer, so nobody worried about tiny groups. Another factor may have been the war itself. As shooting supplies for civilians became scarcer, it made sense to use fewer rounds.

Many older gun writers (including Whelen) were professional military men who helped develop rifles and ammunition. Many newer gun writers were primarily hunters, thanks to big-game populations rising considerably after a low point around 1900. The most influential postwar writer was Jack O'Connor, who in his book *The Hunting Rifle* stated: “I consider the



With riflescopes, center the crosshair reticle 5 to 3.0 inches high at 100 yards. This will depend on actual velocity and bullet weight. For iron sighted rifles, aim at the bottom of the blue circle, a common 6 o'clock hold, and adjust your loading manual for exact trajectory and range.

*Rifle and Handloader* Call Toll Free 1-800-899-7810, Suite A, Prescott, AZ 86301. Wolfe Publishing Co., 2625 Stearman Rd., Suite A, Prescott, AZ 86301.

For use with riflescopes, center the crosshair reticle in the lower white circle, a common 6 o'clock hold, and adjust your loading manual for exact trajectory and range. For iron sighted rifles, aim at the bottom of the blue circle, a common 6 o'clock hold, and adjust your loading manual for exact trajectory and range.



H. RIFLE  
Sporting Firearms Journal

HANDLOADER  
JOURNAL OF AMMUNITION RELOADING

crosshair retical in the lower white square, adjusting the sights to print a group in the white circle above. This will produce a point blank range of 250 to 300 yards for .30-06 and 7mm bullet weight. Consult the manufacturer for actual velocity and bullet weight. Consult the manufacturer for actual velocity and bullet weight. Consult the manufacturer for actual velocity and bullet weight. Consult the manufacturer for actual velocity and bullet weight.

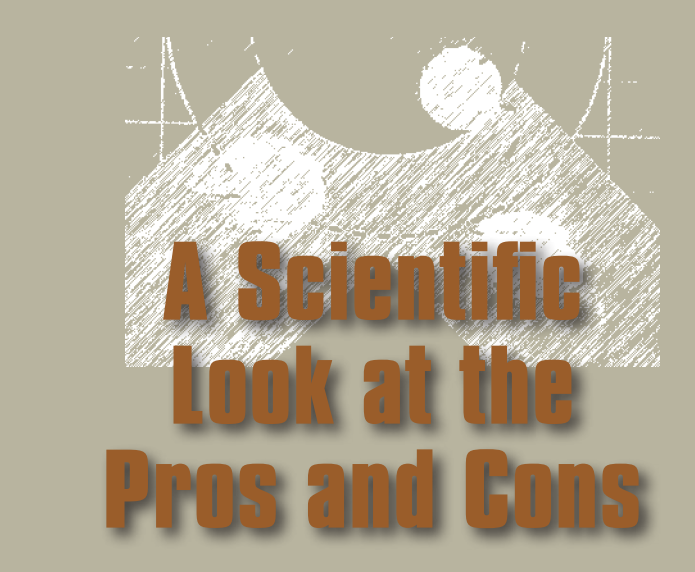
*This series of three-shot groups from a Kilimanjaro 7x57 includes one of those magic sub-.5-inch groups – and the average of all three groups is .8 inch. Superimpose the targets on a clean target, and the nine-shot group measures over 1.5 inches.*

square, adjusting the sights to print a group in the white circle above. This will produce a point blank range of 250 to 300 yards for .30-06 and 7mm bullet weight. Consult the manufacturer for actual velocity and bullet weight. Consult the manufacturer for actual velocity and bullet weight. Consult the manufacturer for actual velocity and bullet weight. Consult the manufacturer for actual velocity and bullet weight.

three-shot group fired from a cold barrel indicative of the practical accuracy of a big-game rifle.”

During the 1950s, handloading, riflescopes and benchrest shooting all became far more popular. Many new handloaders read articles about using benchrest techniques to turn their scoped rifles into minute-of-angle wonders and discovered tiny, bragging-size clusters occurred more often when they only fired three shots. This is exactly why so many twenty-first century deer hunters own “half-minute” rifles. The super-accurate handloads for most of these half-minute deer rifles are often range-proven by shooting handloads with slightly different powder charges, then picking the smallest cluster as “the load.” I know this, because so many friends and acquaintances “work up” hunting loads this way.

Recently, some friends and I had a short discussion after one guy showed off targets shot with a new .223 Remington using handloads with different powder



## A Scientific Look at the Pros and Cons

charges. The three-shot groups ranged from slightly over .5 inch to just under an inch, and the shooter wondered if free-floating the rifle’s barrel might improve accuracy. Another guy said, pointing at the smallest group, “You’re not happy with a half-inch rifle?” I suggested (based on some experience) that *all* the groups probably represented the overall accuracy of the rifle – at least with three-shot groups. The second guy looked at me like I had two heads, neither with a brain.

Another friend gets irate whenever anybody suggests three-shot groups don’t reveal a rifle’s accuracy level. He’s been testing ammunition and sighting in his big-game rifles with three-shot groups since reading Jack O’Connor as a kid and has taken a bunch of animals out to 350 yards, mostly with one shot.

So what’s the deal? First, let’s look at the positives.

# Three-Shot Groups

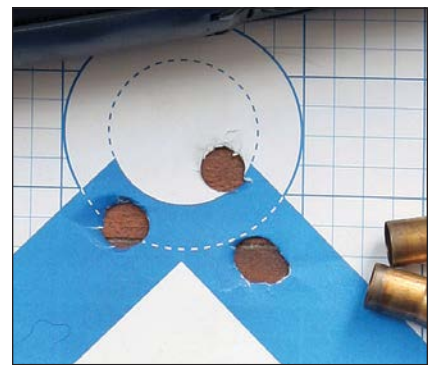
Three-shot groups work for typical big-game hunting, because big game is, by definition, big. Even pronghorn and South Texas white-tails have a vital area the size of a volleyball. (The diameter of an official volleyball is slightly over 8 inches.) As a result, any rifle aver-

aging three shots in less than 1.5 inches at 100 yards will cleanly take big game out to 400 yards and even farther. (While 1.5 inches may seem like pretty sad accuracy, especially for a gun writer, we're often forced to hunt with factory ammunition in factory rifles. It's tough work, but somebody has to do it.)

For the same reason, three-shot groups are sufficient for sighting in the average big-game rifle, whether scoped or not. Plus, several of my rifles are so accurate a single bullet hole at 100 yards reveals whether they're still sighted in. Why shoot twice more?

Now the negatives of three-shot groups: Superaccuracy is sometimes required for shooting distant targets, whether paper, varmints or big game, and three-shot groups aren't enough to predict the spread of *all* shots from a rifle and load. With any rifle, 5-shot groups will average larger than 3-shot groups, and 10-shot groups larger yet.

Many hunters believe this oc-



*This .35 Whelen group isn't even under an inch but is certainly small enough to kill any big game neatly at .35 Whelen ranges.*

curs due to thin barrels heating up. While some barrels will warp when warmer, a properly stress-relieved barrel keeps laying bullets in there even when *hot*. A good example is the New Ultra Light Arms rifles built by Melvin Forbes, because the Douglas barrels he uses are correctly stress-relieved. After a fellow gun writer test-fired his first NULA sporter, he simply had to call me, because he'd shot a group of 30+ shots into about an inch, never pausing to allow the barrel to cool.

This doesn't mean some barrels aren't correctly stress-relieved, but the contour doesn't really matter. The worst warper I've ever owned was a varmint-weight barrel on a .22-250 Remington made by a company known for accurate rifles. The first three or four shots went into tiny clusters, but after that they could land anywhere within a 3-inch circle – and yes, the barrel was free-floated. This doesn't work when shooting prairie dogs, so the rifle was sent down the road.

The real reason five-shot groups average larger is chance and applies to superaccurate benchrest rifles as well as light-barreled sporters. Assuming a single three-shot group represents the widest spread of any rifle's shots is like driving a pickup from Boise to Spokane and averaging 15.2 miles per gallon, then assuming the pickup will always get 15.2 miles per gallon, no matter the road, speed or weather.

Even averaging several three-shot groups doesn't provide a real look at the possible spread. If you

.....► *Polished*  
**PERFECTION**

**IOSSO Case Polish**

- Cleans and Polishes to a High Luster.
- Removes Powder Residue Discoloration and Oxidation.
- Drastically Reduces Tumbling Time.
- Protects from Future Tarnish.
- Available in 8 oz. bottles up to 55 gal. drums.



**NEW!**

**Bio-Based Formula**  
No Petroleum Distillates  
No Shipping Restrictions

**IOSSO PRODUCTS**  
**847.437.8400**  
**www.iosso.com**



MADE IN THE U.S.A.

WE CARRY THE **LARGEST** & **MOST IN-DEPTH** INVENTORY OF **SPECIALIZED** RELOADING **EQUIPMENT & COMPONENTS** **IN THE WORLD!**

**WE ARE YOUR SOURCE FOR:**

- Barnes Bullets
- Bertram Cases
- BELL Cases
- Custom Jacketed Bullets
- Forster Products
- Hornady Bullets & Cases
- Jamison Cases
- Lapua Cases
- Norma Cases
- Nosler Bullets
- RCBS Products
- RWS Cases
- Sierra Bullets
- Starline Cases
- 8mm Nambu Cases
- Woodleigh Bullets



**SEE OUR ONLINE CATALOG**  
**HUNTINGTON**  
**DIE SPECIALTIES**  
SERVING HANDLOADERS - SINCE 1947  
TOLL FREE: **1-866-RELOADS**  
VISIT OUR NEW WEB SITE!  
**www.huntingtons.com**



*When final testing loads for rodent rifles, John uses 10-shot groups, because it provides a more realistic idea of 300-yard accuracy.*

doubt this, on your next range visit shoot three, three-shot groups with the same ammunition, using a different target for each group. At home, place each three-shot target carefully over a new target, and use a pen to make a cir-

cle inside each bullet hole, ending up with a drawing of a nine-shot group. I'd be willing to bet a brick of .22 Long Rifle target ammunition the nine-shot group will be larger than the average of the three-shot groups; it will also be a better prediction of the load's true accuracy.

So when do we really need to know the *maximum* level of accuracy of a rifle and load? One example might be 1,000-yard benchrest shooting. The world record for a single 10-shot group was set in 2014 by Jim Richards at the Northwest Sectional Competition in Missoula, Montana, for the annual matches held by the Original Pennsylvania 1000 Yard Benchrest Club. The group was officially measured at 2.659 inches, smaller than the three-shot groups most hunters shoot at 300 yards.

Jim is a member of the Broadwater Rod and Gun Club in Townsend, Montana, of which I happen to be a life member, and I've talked to him about his group. He's actu-



*In recent years, John switched to four-shot groups for initial load work-up then switches to five-shot groups (lower right) for final tweaking.*

ally a comparative latecomer to long-range benchrest shooting but learned quickly and, like all serious competitors, goes to extreme lengths to make every round exactly alike. But he differs from some other benchresters, since



# Trusted

When your reputation is on the line, trust in the industry leader in performance and accuracy.



**Oregon Trail® guarantees your satisfaction unconditionally.** As shooters, we have absolute confidence in Laser-Cast® bullets, the confidence you need when your shot has to count.

- No leading
- Silver alloy yields extreme accuracy

MONTANA  
**XTREME**

THE NEW  
**STANDARD**

THE NEW STANDARD

MONTANA  
**XTREME**

**COPPER KILLER**

**SUPER-STRENGTH  
COPPER REMOVING SOLVENT**

20 FL. OZ. (591 ML)

BECAUSE YOU'VE NEVER  
**REALLY CLEANED YOUR GUN.**

**WESTERN  
POWDERS**

RAMSHOT ACCURATE BLACKHORN XTREME

norma

**MONTANAXTREME.COM**

## Three-Shot Groups

he set the record with a used 6mm Dasher purchased from a fellow competitor!

The main point, however, is Jim Richards did not depend on three-shot groups to develop the record-setting load. Instead, he depended on firing more than three shots at various ranges. (For those desiring more details, the rifle has a Krieger barrel, Borden action, Shehane synthetic stock and Nightforce Benchrest scope; the bullets were Berger 105-grain Hybrids, weight-sorted and then tip-uniformed with a meplat tool.)

I'm not interested in competing in benchrest matches, preferring to spend my "spare" time hunting, but do like to see what sort of groups can be shot at distances from 100 to (occasionally) 1,000 yards. But I do a lot of small-varmint shooting, and after the experience with the barrel-warping .22-250 Remington started final-testing my rodent rifles by firing 10-shot groups as fast as possible, both to test group size and to see if the barrel kept laying them in there.

In the process, I learned that any rifle/load combination that couldn't put 10 under an inch at 100 yards wasn't accurate enough to consistently hit Richardson's ground squirrels at 200 yards or prairie dogs twice their size at 300 yards. Today I try to work up loads that put 10 shots inside .8 inch at 100, which converts to 2.4 inches at 300 yards – about the diameter of a tennis ball or the width of a mature prairie dog. *Consistently* hit means hitting more than missing. I've shot prairie dogs with record-setting benchrest shooters, gunsmiths who build record-shooting benchrest rifles, top-notch military snipers and instructors and nationally successful bulls-eye competitors. In a typical 5- to 10-mph breeze, none ever hit more prairie dogs than they missed much past 300 yards – and even at 300

you'd better have a very accurate rifle to hit more than you miss. Another thing learned over the decades is most prairie dog shooters *think* they hit far more often than they actually do.

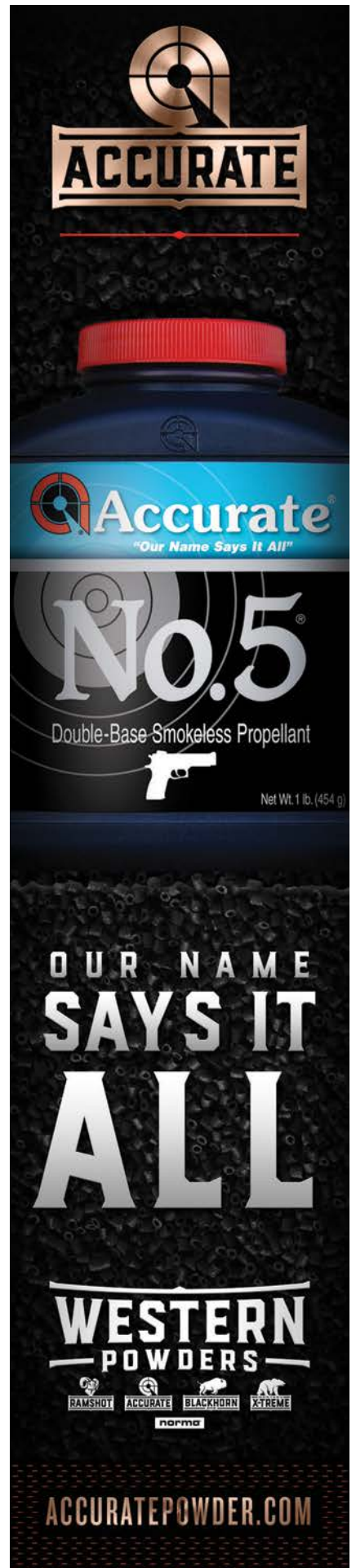
Eventually I abandoned three-shot groups when seriously testing any ammunition, because subsequent groups with any load that shot an initial tiny cluster almost never matched that first group, and the instances when they did were so rare they really stuck out. One of those rarities occurred when testing a bunch of different .25-06 Remington loads in a Ruger No. 1AH. The first three-shot group with Hornady 75-grain V-MAX bullets and 58.0 grains of Accurate 4350 measured .39 inch, so I loaded up nine more rounds and shot three more three-shot groups. They measured .41, .39 and .37, for a four-group average of .39, but that's rare. More typical was the first group with the Norma 156-grain Oryx and 60.0 grains of H-4831 from a .280 Ackley Improved. The three shots spanned exactly the magic .5 inch, but three more groups with the same load averaged .93 inch, still good but not magic.

So how many shots are required to truly predict the accuracy of a given rifle and load? A couple of years ago, a guy named David Bookstaber contacted me about some new statistical analysis being done on exactly this subject. He's a professional statistician who realized no major work had been done on accuracy analysis for a number of years. Eventually he was joined in the research by an actual rocket scientist (the director of one of the major U.S. government research labs), plus two more professional statisticians from Europe. You can look up the technical stuff on the website [www.balistipedia.com](http://www.balistipedia.com), but here are some of Bookstaber's main points:

First, statistical analysis of groups is designed to predict within a certain confidence level how a particular rifle/load will continue to perform. This confidence level is expressed as a percentage, such as 60 or 95 percent, with 95 per-



*A Nosler 48 .300 WSM was used to take this New Mexico elk at just about 100 yards. The rifle grouped three shots well under one inch, far more accuracy than required.*



cent obviously preferable to 60 percent.

Bookstaber confirmed my empirically derived distrust of three-shot groups, but one of his main points is that measuring the widest shot spread in a group is a relatively poor way of analyzing accuracy. It assigns the same value to a one-inch group whether all the shots are evenly scattered inside that inch or several cluster very closely together with a single “flyer” outside the cluster. Instead, computing standard deviation of the radius of each shot from the center of a group results in more confidence in any prediction of future accuracy.

Bookstaber mentioned the standard rifle accuracy test used for decades by *American Rifleman*, the average of five, five-shot groups at 100 yards. Statistically, he found this pretty good, but if it used the standard deviation of all shots in a group, rather than extreme spread, the same confidence level could be determined by shooting fewer shots. Shooting fewer shots is exactly what most hunters are after with three-shot groups, but they don’t understand how the size of a typical big-game animal masks errors. What we can say is three-shot groups averaging an inch are sufficient to produce a 100 percent confidence level for shooting volleyballs at 400 yards,

but not enough for 100 percent confidence in shooting tennis balls at 300 yards.

Many prairie dog shooters think three-shot groups work because they expect to miss some prairie dogs anyway, but Bookstaber found “a single three-shot sighting group will, on average, be .6 MOA from the true center,” which is why three, three-shot groups almost always result in a much larger nine-shot group.

Over 25 years ago, ballisticians at Speer calculated a 7-shot group provided the same confidence level as a 10-shot group. Bookstaber points out the “analysis was based on key parameters from very small Monte Carlo simulations done by Frank Grubbs in the 1960s. When you use better numbers – like those from the million-iteration simulations I ran for ballistipedia – you discover that six-round groups are actually the optimum and five-round groups are practically as efficient.”

Most shooters, however, may not understand or even care. It’s even been so long since 10- or 5-shot groups were standard, very few shooters understand they will always average larger than 3-shot groups from the same rifle. And neither results in many bragging-size “half-minute” groups from a deer rifle!