Building Accurate Rifle Reloads

By Gary Zinn

I began reloading ammunition relatively late in my shooting career, when I was into my fifties (or a bit less than twenty years ago). Before that, my rifle shooting and hunting experience was largely with .22 caliber rifles (small game and varmints) and .30-30s for hunting whitetail deer. Even after I bought a rifle chambered in .308 Winchester as my go-to deer rifle, I was not shooting enough ammo to think seriously about reloading.

I began reloading shortly after I began shooting handguns. This was not coincidental, because once I got my first pistol, a 9mm autoloader, I caught the fever and quickly added .45 ACP and .40 S&W pistols to my arsenal, plus a lever action carbine chambered for .357 Magnum. It was time to put together a reloading setup and get in the game, so I did.

As I worked up the first few loads for my .308 Winchester and .357 Magnum rifles, I began seeing a pattern. As I fired incrementally larger powder charges, moving up from the starter load, group sizes would decrease for a while. However, as the powder charge approached the maximum charge level, group sizes would increase.

Put another way, l was seeing a sweet spot, where group sizes were smaller with a given powder charge (or small range of charges) than with lighter or heavier charges. Looking back over my load records, this sweet spot has generally occurred with a charge weight from one to three percent below the maximum charges for most loads.

This was a different perspective on the benefits of hand loading. Over the years, I had formed the impression that the main advantages of reloading were cost savings (relative to commercial ammo) and the ability to sometimes build loads that could better the velocity of standard factory loads.

The idea that working up a load recipe could lead to a highly accurate load in a given rifle was something that generally was mentioned in passing, but not really stressed or explained in the sources I had studied. I had seen occasional articles about special loading tools and techniques to build highly uniform loads for competitive accuracy shooting, but a strategy for achieving accurate load recipes for everyday shooting seemed to get overlooked.

After discovering the sweet spot accuracy phenomenon, I have always looked for it when working up new rifle loads. In addition to my .308 Winchester and .357 Magnum rifles, I have developed loads for .223 Remington (three rifles), .260

Remington, 8x57mm Mauser and .44 Magnum carbine. My rifle load development experience runs to well over a hundred specific recipes and in all but a very few cases I found the most accurate loads to be with powder charges at least slightly below the specified maximum charge.

A Hypothetical Example

I will use a hypothetical load workup to illustrate how I discover and confirm the sweet spot load for a particular rifle. I am going to use the .270 Winchester cartridge for this example. This is a caliber for which I have not loaded, so my example will not be cluttered by any biases based on personal experience with this particular cartridge.

For a baseline, suppose that my rifle shoots standard 130 grain factory loads with consistent 5-shot groups from a bench rest measuring about 1.2 M.O.A. (1.2 inches at 100 yards). Standard loads, such as the Hornady American Whitetail, Remington Core-Lokt and Winchester Super-X, have a catalog muzzle velocity (MV) of 3060 f.p.s. with jacketed spitzer bullets.

To build a comparable load, I must choose one of the many available 130 grain jacketed bullets in the caliber. For the purposes of this example, I will go with the Hornady InterLock Spire Point. Then I must choose an appropriate powder; suppose I decide to use Hodgdon H414 powder. Let's say I have Winchester cases and will use Winchester WLR primers.

I am now ready to find a load recipe. The Hodgdon data center quotes a recipe of 50.0 to 53.5 grains of H414, under a Hornady 130-grain InterLock SP bullet, in Winchester cases and using Winchester large rifle primers. The maximum load is quoted as producing a MV of 3003 f.p.s. and chamber pressure of 50,800 CUP in a 24 inch, 1 - 10 twist barrel.

When I work up a new load, I always compare the first suitable recipe I find with a load from at least one other source. In this case, the *Lyman Reloading Handbook* (49th ed.) has loads for 48.5 to 54.0 grains of H414 behind a 130 grain Sierra GameKing SBT bullet, again with Winchester cases and primers. This load is rated at 3033 f.p.s. MV and 50,500 CUP pressure from a 26 inch, 1 - 10 twist barrel. Both sources quote a case length of 2.530 inches (trim) to 2.540 inches (maximum) and a maximum cartridge overall length (OAL) of 3.340 inches.

Based on this information, I decide to use 50.0 grains of H414 as my starting load and 54.0 grains as a maximum. My personal rule of thumb is to always use a starting load that is six to eight percent below the maximum powder charge.

The Hornady bullet I am using has a cannelure, so I will use it to set bullet seating depth. I will work up loads from 50.0 to 54.0 grain powder charges, in three phases, as follows.

Phase 1: 50.0 to 53.0 grains, by 0.5 grain increments (35 rounds in seven 5-shot groups). Suppose the results are as follows, where the first number in each set is the powder charge in grains and the second number is M.O.A. group size in inches.

50.0 gr., 1.3"; 50.5 gr., 1.3"; 51.0 gr.. 1.2"; 51.5 gr., 1.1"; 52.0 gr., 1.1"; 52.5 gr., 0.9"; 53.0 gr., 0.8"

I am mainly interested in the group sizes I get, but also watch for signs of abnormal pressure (either low or high), or any other performance anomalies.

Phase 2: 53.3 to 54.0 grains, by 0.3 and 0.2 grain increments (20 rounds in four 5-shot groups).

53.3 gr., 0.8"; 53.6 gr., 1.0"; 53.8 gr., 1.1"; 54.0 gr., 1.2"

I use smaller increments of charge weights here, because I am approaching the maximum load level. I feel more comfortable using small charge increments, so that I can detect any signs of excessive chamber pressure as soon as possible.

Phase 3: From the groups I have fired, it appears that the accuracy sweet spot for this rifle/bullet/powder combination falls somewhere between 52.5 and 53.6 grains of powder charge. Thus, I decide to do further testing of the loads within this range, say from 52.6 to 53.4 grains by 0.2 grain increments. This would require 25 rounds in five 5-round groups.

Without listing another string of hypothetical charge weight and group size numbers, say this phase of testing shows a powder charge of 53.0 grains, with a group size of 0.8", to be the best of the lot. I have isolated the sweet spot for this load in this rifle.

I have loaded and fired 80 rounds to get to this point. I would likely make another 20 rounds of the load I have isolated, to further confirm its performance and adjust my scope to a desired zero with the new load. After that, I will load however many additional rounds I need.

Incidentally, I always load and shoot cartridges in groups of five when working up a new load. Some shooters/reloaders use three shot groups to save ammo, but I favor 5-shot groups. I feel these give me more accurate information on group size and location.

Effects on Performance

The 130 grain factory load, with a MV of 3060 f.p.s., has a +/- 3 inch maximum point blank range (MPBR) of approximately 297 yards, with retained energy of 1652 ft. lbs. at 300 yards. By comparison, the estimated MV of the 53.0 grain hand load is 2985 f.p.s., yielding a MPBR of 290 yards and retained energy of 1565 ft.lbs. (Estimated muzzle velocity is based on a velocity reduction factor for the load, found in *Modern Reloading*, 2nd ed. revised, by Richard Lee.)

Now for benefit vs. cost considerations. The benefit is finding the load that is most accurate, given the rifle and components used. The cost is the reduction in downrange performance whenever the most accurate load yields a MV lower than that of factory loads or maximum reloads. Every situation is unique and only the shooter can decide if a given reload yields accuracy benefits that are more important than any loss of performance.

In the hypothetical example developed here, my call is that the gain in accuracy (1.2 M.O.A. to 0.8 M.O.A.) is more significant than the marginal decreases in MPBR and downrange bullet energy. I say this, because I know myself as a shooter and I know that my accuracy is not as good when shooting under field conditions (sitting, kneeling, or standing) as when I am shooting from the bench. From informal experimentation, I know that my field group sizes generally increase by at least 50 percent over bench rest groups. This is very significant, especially if one contemplates the possibility of longer shots in the field, such as beyond 200 yards.

Changing Load Components

Obviously, I would need to do a complete new load selection and workup if I change the powder I use for this load. The same goes if I change the bullet weight. For example, the Hodgdon data center lists a charge weight range of 46.0 to 48.9 grains for a 140 grain bullet with H414 powder.

Another situation that cannot be overlooked is developing loads for solid copper or solid gilding metal bullets. These are different animals from conventional jacketed bullets, so they have their own unique recipes.

For instance, Hodgdon lists loads for the Barnes TSX 130-grain bullet, with H414 powder, ranging from 48.0 to 52.5 grains for the .270 Winchester cartridge. A load workup with this bullet should employ the full routine, from the starting to maximum loads, keeping track and looking for the sweet spot along the way. When using homogenous metal bullets, always use recipes that are explicitly intended for them.

Changing the primer might seem to be a minor thing, but it can affect the performance of a load. The *Lyman Reloading Handbook* (49th ed.) reports the results of firing .308 Winchester loads that were otherwise identical, except for the primers used. Testing with five different primers gave a total variation of 1.5% (37 f.p.s.) in MV and 4.9% (2600 p.s.i.) in chamber pressure. Differences such as this could change the most accurate charge for a load, so some retesting is in order if the primer is changed.

In the example load I developed above, if I changed from Winchester WLR primers to CCI #200 primers, I would do what I think of as a "quick workup." I would start with a 50.5 grain charge and work up to 53.5 grains by five increments of 0.6 grains per increment, loading and firing three cartridges for each increment. If this retest indicated any significant change in the sweet spot for the load, I would load and test more rounds in the vicinity of the suspected new sweet spot.

Rifles are Individuals

A particular load recipe that performs very well in one rifle may or may not do as well in another of the same caliber. For example, I own three rifles chambered in .223 Remington. They have different action types, barrel lengths and rifling twist rates. I have developed one or two pet loads for each rifle, and generally a load that shoots best in one of the rifles does not do as well in the other two. However, I came up with one load recipe that does very well in all three, although it is not the absolute best in any of them. I consider it my universal .223 Remington load, because it is more accurate than factory ammo in all three rifles.

As another example, I have a rifle, chambered in .260 Remington, which is finicky about bullet weight. When I bought it, I got a couple boxes each of 120 and 140 grain factory ammo. The rifle fired groups of about 1.2 and 1.4 M.O.A., respectively. Feeling that I could do better with tuned reloads, I began experimenting. I started with 120 grain bullets and soon developed a load that reduced my group size to about 0.8 M.O.A.

I then moved on to 129 grain bullets, where the best groups I could develop averaged 1.0 to 1.1 M.O.A. Try as I might, I could not find a load using 140-grain bullets that got less than 1.2 M.O.A. I concluded that this particular rifle prefers lighter bullets, so my pet loads for it feature 120 grain bullets.

Conclusion

The best thing about reloading is the versatility it provides. Besides developing top accuracy loads for each of my .223 Remington rifles, I have built economical plinking loads for them, using relatively inexpensive bulk bullets and mild powder charges. I have discovered and accommodated the preference of my .260 Remington for lighter bullets, and have developed very effective deer hunting loads for both that rifle and my dependable .308 Winchester.

I have found an accurate and mild load that I shoot for fun in my vintage 8x57 Mauser. I have a full power load for my .44 Magnum carbine that maximizes its potential as a short range deer rifle. I have built both .357 Magnum and .38 Special loads for my second carbine. The .38 Special recipes include jacketed and lead bullet loads that shoot well in both the carbine and a companion revolver.

Although I have stressed loading rifle cartridges for accuracy in this article, I want to mention that reloading provides advantages when loading for handguns, too. For instance, I have developed loads that are tuned for each of my autoloading pistols. By tuned, I mean that the loads I have developed perform flawlessly in my individual pistols, even though few of them are maximum or equal factory ammo ballistics.

Ultimately, the only limitations on what can be accomplished by hand loading cartridges are the inherent performance parameters of any given cartridge and the idiosyncrasies of individual firearms. Within these boundaries and with time, patience and prudent experimentation, one can usually develop loads that meet any primary objective or blend of objectives.