LOADING RECOMMENDATIONS

FOR THE JP SERIES OF SELF-LOADING RIFLES

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INTRODUCTION

You might be a very experienced reloading, but if that experience comes from reloading for bolt guns, you'll need to leave some of that knowledge behind. Loading for your gas gun is a very different animal. Here are three fundamentals of gas gun ammo you ***must*** abide by:

1. The finished round must be a drop fit to the chamber to ensure that the bolt will reliably close over the cartridge.
2. You must load to an overall length (OAL) that will never interfere with the magazine's interior dimensions.
3. The round must provide a pressure curve upon ignition that will reliably cycle the action without dropping a primer or causing excessive case head flow into the ejector cut.

In other words, the functional aspect of the ammunition in a semi-automatic platform precludes some of the accuracy tricks that you might be accustomed to employing on your bolt gun ammo. In addition, gas guns will not tolerate the pressures that a bolt gun often will without detrimental effects on reliability. In the end, if the rifle does not function, it is of no use.

Once, I asked one of my shooting partners what his priorities were for his gas guns. His response nailed it: "First, reliability. Then, reliability. After that, reliability and then, accuracy." Need I say more? But don't fret. You can still achieve both and live in harmony. As part of this discussion, you should also watch our presentation, ***GasGunBasics***, both for a laugh and to be fully informed. It's a bit dated at this point, but the information is still good. You can find ***GasGunBasics*** on our **YouTube** channel (www.youtube.com/jprifles), and I'll be referring to it at times throughout this document.

This is more than just a document on loading and ammo selection. I have also included some observations I've made over a career in the shooting sports and the firearms industry, for what they're worth. This is a living document and I attempt to keep it current with what I learn from year to year. If you find this content interesting and useful, it's worth your time to check for updates from time to time.

Finally, remember that reloading is done at your own risk. JP Enterprises, Inc. is not responsible for injury, death or damage to your equipment due to poor loading technique or load incompatibility. Use any recommended load data at your own risk. The load data given here applies only to JP rifles, manufactured by JP Enterprises, Inc. and should not necessarily be used in other rifles.

CASE SELECTION AND PREPARATION

As with any other semi-auto application, every case you intend to reload needs to be full-length sized with a small base die. I recommend Dillon full-length carbide resize dies (available in .223 and .308). They're a bit expensive but worth it. I've also had good luck with Redding, RCBS and Hornady, all of which make good quality reloading tools. Quality cases, properly sized and prepped, are an essential part of the reliability/accuracy equation on any self-loading platform. For the 6.5 Grendel®, 6.5 Creedmoor and .260 Remington, a good quality, small base, full-length resize die is required. The cases must be as close to the unfired dimensions as possible.

You should use a case gauge that accurately represents your chamber or at least know how your gauge relates to your chamber. Most gauges will give good readings on the head space and case length dimensions but usually not the case body. With most case gauges, it is entirely possible to have rounds that appear to gauge perfectly and still not fit the chamber of your rifle. They are just too fat.

There is even an interference overlap between ammo spec. and chamber spec. in the SAAMI specifications, which makes matters more complicated. In other words, you can have a round and a chamber that are within SAAMI specifications and still have a failure to go into battery with a gas gun. That's because a gas gun really requires a "drop fit" in the chamber. Chambering can't require any significant force to cam the round into battery. In a gas gun, the round needs to be smaller than the chamber for everything to work every time.

In a similar vein, gunsmiths that are not experienced in gas gun workings might conclude that we cut our chambers a little long on the head space compared to what might be done in a bolt gun setup. However, there has to be some allowance for dirt, fouling and the next round chambered after extended live fire. The benefit of the semi-auto action requires certain compromises elsewhere that the shooter/reloader needs to account for.

Gauging and Sizing Your Brass

Ensuring reliable function in a gas gun is what makes our new generation **JP Semi-Auto Case Gauges** unique. Our gauges are actually slightly smaller than the chamber in the diameter of the case body.

You will notice that any good factory round will drop fit our gauge, but you may find that your reloads occasionally sit proud and need to be pressed in to check head space. You may also find that some commercial reloads do not drop-fit the gauge. If you encounter a round that will not go into battery, save it as a gauge indication round so you know how your chamber relates to the gauge. Know how far "out of gauge" your ammo can be to still chamber and allow you to unload the chambered round without firing. This is essential for obvious safety reasons. At a competition, you must be able to unload the rifle without firing the round.

Bottom line, if your loaded round drops into a JP case gauge, by God, it will fit and function in the rifle. When reloading for your gas gun, you should strive for rounds that fully gauge in a **JP Semi-Auto Case Gauge**. That may require buying an alternative size die and altering your shell holders. See ***GasGunBasics*** for a full demonstration of this gauge's use.

Setting up the size die is the most critical part of this gauging process. You must be able to set the size die down far enough to allow the sized case to drop between the min-max shelf features on the gauge. If you cannot get the head space short enough to meet that criteria, you must modify either the die or the shell holder (plate) to allow the die to set the shoulder further back. This is a much more common problem than you might imagine. Again, this is all demonstrated in ***GasGunBasics***.

Sorting and Evaluating Your Brass

You may want to think of your cases—particularly .223 and .308—as being in three classes:

1. **Serviceable for reliability purposes only:** These cases would consist of range brass of mixed head stamp but with no splits and tight primer pockets, hence ensuring primer retention. They may vary widely in interior capacity and neck tension but will still be within the serviceable range. In other words, you should be able to load reliable, functional ammo with this type of case without expecting maximum accuracy potential for the rifle. That said, I still get better than MOA accuracy (@ 100 yards) with these mixed bag cases when loading something other than FMJ projectiles. Expect a flyer here and there. Case prep may be only a full-length size and check for case length with those falling outside the OAL range discarded or trimmed to length. Note that military cases with crimped primers may also have significantly less case capacity and not be acceptable for loads approaching max. recommendations.

2. **Match-grade once- or multi-fired cases:** This type of case would be of uniform head stamp and preferably of the same vintage, as many manufactures cases will change in some dimension or metallurgical property over time. This ensures a fairly high degree of consistency for internal capacity and neck tension leading to fairly high internal ballistic consistency, assuming a good load choice. We suggest a more rigorous prep process to obtain maximum accuracy from such cases. This should consist of cleaning, resizing and de-capping, cleaning of primer pockets and inside/outside chamfering of case mouths. A motorized case prep station takes a lot of work out of this process when large numbers of cases need processing.

   Even after sizing, once-fired brass will usually have a burr on the inside of the case mouth. This can scrape jacket material off the outside of the projectile from the base up, leaving tell-tale copper curls at the case mouth. This will degrade accuracy. A chamfer allows smooth seating of boat tale or even flat base bullets without damaging the jackets. If you

see these jacket peals around the neck, remove them so they do not foul the chamber and cause a stoppage. Use this ammo only for practice or non-critical applications where you can tolerate a flyer.

For further consistency, cases can be weighed. Cases falling outside a standard deviation should be demoted to the "serviceable" bucket. Consistent weight equates to consistent internal volume (indirectly that is; actual volumetric testing is very tedious and more work than it's worth). It's all a matter of how much time you're willing to invest.

3. **New brass:** New brass should give the highest degree of consistency. However, peak accuracy might not be achieved until the second loading, after the initial stretch is out of the case and it has been pressure formed (worked) one time. That said, neck sizing alone is not an option for self-loaders. The ammunition must drop fit the chamber. A press fit is possible in a bolt gun but is not acceptable for a gas gun.

   Note that new brass is usually misshapen in the neck area and does need to be run through the size die to uniform the necks. I would not bother full-length resizing. Rather, drop the expander ball down so that it trues the neck area without having to press the case all the way up into the die. New brass typically also needs an inside neck chamfer. Primer pockets may have burrs which need to be removed. This function is also included on most motorized case prep centers.

   One benefit that the new brass should have is highest reliability. If your application is bench shooting only and you have the luxury of collecting most of your cases, new brass may be a good investment. However, if your primary use is in competition at which you are expected to leave the brass (otherwise known as a "lost brass" match), once fired cases probably make the most sense and will give excellent results. You may find that data collected from loads in new cases does not correspond to data collected from the same load in fired cases. New cases will generally chrono a little slower than once-fired cases.

Annealing Brass

We have been asked about the advantages of annealing cases prior to reloading and whether it is worth the effort. This all depends on your ability or dedication to recovering the cases. Personally, I have never annealed any of my cases other than one particular batch of .308 that I have dedicated to a specific bolt gun. With a semi-auto rifle, the recovery rate on the cases may be such that you only average 1-3 cycles on a case since many competitions are "lost brass" events. If you don't shoot in competitions that have a lost brass rule or are always able to recover most of your cases, then that is a horse of a different color. If your recovery rate is high, then it is certainly worth the effort on a precision rifle such as a 6.5 Creedmoor, .260 Remington or .308 that you are using for some long-range or precision application.

Before getting involved in any annealing processes, it is important to understand the basics of cartridge case metallurgy. The case is a technically complex device

that accomplishes a difficult task. It must be **malleable** enough to form itself exactly to the walls of the chamber during the firing process and create a tight seal between the case and the chamber to prevent high pressure gasses from escaping the chamber and flooding the action. But, it must also be **rigid** enough to prevent the unsupported portion of the base from extruding into the bolt face or literally giving way during the pressure peak. It accomplishes this by having alternately soft and hard areas, with the base being significantly harder than the upper case body, especially the neck and shoulder area. Every time the case goes through a cycle of firing or reloading, the area of the case that must remain malleable becomes work-hardened. After a number of cycles, it will eventually crack in the neck. For what it's worth, I have cases that I have fired over a dozen times without seeing this failure. On the other hand, records have been set by people that anneal every reloading cycle for consistent neck tension on the projectile, and there can be no argument that consistent internal ballistics are very dependent on neck tension.

There are several accepted annealing methods depending on what kind of investment in time and funds you are willing to make. Some time back, the typical method was to place the cases base down in some kind of pan (such as a cake pan) with about an inch of water covering the base of the case. Then, using a propane torch, the upper part of the case would be heated until it changed color. However, it is difficult to get the heat consistently applied on the case over 360°.

Improved methods involve the use of a variable speed drill rotating a long socket wrench of a diameter that will hold the case while you spin and heat it to the appropriate temperature. This is followed by a water quench. However, for about $600 you can buy a well-designed machine to handle the cases in an automated fashion with the BC Automatic Case Annealer. If you really want to get into this, that's the way to do it. This device provides a consistent result and eliminates the possibility of over annealing, and in particular, the dangerous result of accidentally annealing the base of the case. If you soften the base of your cases, they will no longer function as designed. This can lead to ruptures, splits or release the high pressure gases into the action and ultimately in your face.

Before you get involved in this endeavor, understand that it has many pitfalls that range from just wasting your time to the extreme of causing a catastrophic case failure due to improper annealing technique resulting in severe injury. If you want to explore this topic to its ultimate conclusion, I'd recommend this outstanding dissertation written by Ken Light and Jim Harris. Definitely read this before going any further: http://www.6mmbr.com/annealing.html

COMPONENT SELECTION

Bullets

Bullet selection is completely dependent on load application and to some degree the rate of twist of your barrel. I will discuss this here in generalities and later specifically relating to individual cartridges and loads.

Inside 300 yards, ballistic coefficients (BC) are nearly irrelevant because trajectory is almost entirely velocity driven. In other words, if you could throw rocks at 3000 FPS, their trajectory would not be all that different from match grade bullets with high BCs at shorter ranges, accuracy notwithstanding. When we start shooting to 400 yards and beyond, BC does play a significant role in trajectory, and retained energy then becomes a real consideration. The further out, the more significant BC becomes. For extreme long-distance shooting, any projectile worth considering should have high BCs for their weight range. Therefore, inside 300 yards, you have the luxury of selecting bullets based on other criteria such as terminal performance or peak accuracy.

For example, flat-based bullets with low BCs are known for yielding some of the best accuracy in the 100-200 yard range. Polymer-tipped bullets and full metal jackets have the best feeding characteristics in self-loaders. However, FMJ-type projectiles, which are formed from the tip rather than the base, will typically not yield the accuracy potential of any rifle and often will not shoot into a minute of angle. Polymer-tipped bullets, exposed lead soft points and specially designed hollow-points give the best terminal performance on varmints or game. Polymer-tipped bullets also seem to yield some of the best accuracy we've seen in our testing. You'll want to pick and choose bullets based on what your application requires.

Your barrel's rate of twist will have a bearing on the length of bullet that can be stabilized. Some think this has to do with the bullet weight, but the weight is actually a function of the length vs. the material. The longer a projectile, the faster it must spin to stabilize. There are now rifle bullets that are not lead-cored, so they have lengths that are similar to lead-core bullets of greater mass and may require faster rates of twist due to the length. In general, slow rates of twist work well with shorter (lighter) projectiles. Fast rates of twist allow the stabilization of longer (heavier) projectiles. However, many assume that a fast rate of twist is not compatible with a lighter bullet. This is a myth. Generally, a faster rate of twist will not only stabilize the longer bullets but will work very well for shorter bullets also.

The real question is whether the bullet can structurally tolerate the centrifugal load due to higher RPM in the faster rate of twist. There are specialty bullets designed to give good terminal performance at lower velocities, such as from single-shot pistols in rifle-type calibers. These bullets will self-destruct if the RPM exceeds their limitations. However, faster rates of twist increase bullet resistance in the bore and may require lower load densities (powder charge) relative to barrels with slow rates of twist. Some factory ammunitions for certain types of cartridges have been developed for barrels of slower twist rates, which are

common among larger manufacturers. Low-volume custom builders often use faster rates of twist on their rifles, and this leads to incompatibility issues with some factory loads due to excess pressures. Custom builders usually assume that the end user will hand-load. Barrel selections are made with this in mind, resulting in superior performance for those willing to put in the time on loading their own ammo.

Sectional density relates to the mass vs. length of a projectile. The higher the sectional density, the more a bullet is likely to penetrate. If you intend to load for large game, penetration to a vital organ is mandatory, and this relates to sectional density. As a rule of thumb, the longer a projectile, the higher the sectional density and the further it will penetrate. This has to be balanced against the expansion characteristics of the bullet. We now have the advantage of a huge selection of bullets by many manufactures with terminal performance characteristics tailored to specific applications. Choose wisely and read the manufacturer's information on this subject.

The Ballistic Triangle

Since we've broached the subject of ballistics, let's take a minute to define our terms. There are three categories of ballistics that factor into overall performance. For the sake of clarity, it's important to acknowledge which one we're speaking of in any given instance.

Interior Ballistics: This relates to the behavior of the projectile while in the bore and the pressure curve of a given load.

Exterior Ballistics: This relates to the behavior of the projectile in flight, between the rifle and the intended target and quantifies trajectory and wind drift, spin drift and other in-flight behavior.

Terminal Ballistics: This relates to the behavior of the projectile after impact on the target. It is usually only a concern on game or human targets in the military/police context.

Powders

Selection of powder (or propellant, in industry jargon) is based primarily on case capacity and projectile mass and bore diameter. We talk about "burn rate" of various propellants and most good loading manuals include some kind of burn rate chart. The term "burn rate" is not really a good descriptive term for a complex material behavior question, but it will do for now. These tables should be considered a rough yard stick of what is really internal ballistic behavior of various propellants. In general, the smaller the case capacity, the lighter the projectile and the larger the bore diameter, the faster the rate of burn on the propellant would need to be to yield optimized performance. Conversely, the larger the case capacity, the heavier the projectile and the smaller the bore diameter, the slower the burn rate needs to be to achieve maximum velocity potential at a safe working pressure.

Some cartridges of very different proportions actually fall in a similar overall compromise between these qualities and therefore use powders of similar burn rates. A perfect example is the .223 and the 308. They may look very different but the compromise they represent between these three qualities of capacity, bore diameter and projectile mass is very similar and for that reason, most powders in the medium burn rate range would perform very well in either cartridge. On the extremes, take a pistol cartridge such as the .380. With very limited case capacity and a rather light projectile relative to a fairly large bore diameter, it performs best with propellants that have very fast burn rates. On the other end of the spectrum, the 7mm Rem. Ultra Mag will only perform well with some of the slowest burn rate powders. It has very large case capacity for the bore diameter and the projectiles used are typically in the 150-165 grain mass range with results in a long bearing surface and high bore friction and inertial considerations when the bullet is accelerated down the bore. The powder must ignite and build pressure in a more controlled fashion to accomplish the task at hand.

After you study the rate charts and load data for many cartridges, you will eventually have a feel for this and be able to look at just about any cartridge and know just what propellants will make that cartridge perform to its potential.

Note that a great deal of development has been done on propellants in recent decades and we now have high-tech powders with much greater ranges of performance in terms of application versatility, temperature stability and obtainable velocities at workable pressures.

Once you have worked up a load with a given propellant, it makes sense to make a commitment to a recipe and buy a keg (or more, if you can afford it). The point is that canister grade powders can vary significantly from lot-to-lot, even as much as 10% in burn rate I've been told. So every time you change powder, it is necessary to test that recipe again before you load any quantity.

Here's a personal story to demonstrate the point. One of my pet loads for the .308 uses the 110 V-MAX on top of H335. I worked up a load using 49 grains of this powder and loaded about 1000 rounds which I continued to consume over a couple years of competitive shooting on the multigun circuit. I yielded about 3000 FPS MV out of my 18" LW rifle, which was totally reliable and sub-MOA accurate.

I was getting ready for the 2012 JP Rocky Mountain 3-Gun when I realized that I did not have enough of this ammo left and proceeded to load up another hundred rounds with a new lot of powder. I ended up getting into this new lot on the very last stage of the match, which was the long-range stage and my strong point. Halfway through this stage I made a reload with a mag. that contained this new batch of ammo and my rifle stopped functioning. I now had a manual rifle requiring me to butt stroke it on the ground to fire each round. Needless to say, I timed out and that stage ruined my match for that year.

After all these years, you'd think I would know better, but I failed to test that new lot of powder. When I got home, I pulled some of the bullets and measured the charge. They ranged up to 50 grains. This new lot of powder was not only dramatically different in its density/volume, causing it to throw heavy, but when

I backed off the load to the original 49.0 grains, it was still way over pressured and about 100 FPS faster than the previous lot over the chrono. I had to back all the way down to 47.5 before I came up with a load that was within a workable pressure range and in the same velocity range as the previous batch. Note that the published max load was 50 grains. Well, not with ***this*** lot of powder!

So, every time you change powder lots, you may potentially end up starting the load development process from scratch. Therefore, if you have a load that works, buy as much powder as you can justify if you intend to continue using that recipe.

One approach many reloaders take is to duplicate some particular factory load. They may ask around or pull a bullet on a factory round and take a guess at the propellant that is used. In many cases, that may not be possible as canister powders sold over the counter to reloaders and powder sold to ammo manufacturers are two different things. What we call "canister grade" propellants must fall into a rather narrow range of burn rate variation in order to hopefully match up with the data published in reloading manuals. Despite this, you can still have disasters like my anecdote mentioned earlier. Any powder that doesn't make the "spec" for a canister powder is sold to a manufacturer. They don't care if the burn rate is in some narrow range defined for the canister powders as they will develop a load for a particular bullet/cartridge using this specific powder and "make" it work. They will just request a batch of something that resembles some known powder and take it from there. Even if a box of some factory ammo lists a "duplication load" on the box, that may have little connection to the actual ammo ***in*** the box.

Primers

We will only address rifle reloading application for the purposes of primer selection. If your intent is to load the least expensive functional practice ammo, any rifle grade primers from reliable manufacturers will suffice. However, I have experienced primer/case incompatibility issues on rare occasions in which a particular primer is not a good fit for the pocket of a particular case. For example, the S&B .308 cases have shallow pockets that cause US-manufactured primers to sit proud causing a headspace issue due to a high primer that cannot be seated any further. Primers should be seated just below flush with the case head. For another example, I once acquired some Winchester large rifle primers that fit too loosely in my Federal multi-fired cases where Federal primers fit perfectly. At first, I thought all my cases had been over-stressed, but it was actually a component compatibility issue.

If you intend to load for maximum accuracy potential, spend the extra money and get "match" type primers as they are formulated and manufactured to give a higher degree of consistency in ignition. Personally, I prefer the Federal "M" or match primers but just about every manufacturer has something called a match or benchrest primer series for accuracy applications.

Ignition reliability is also affected by the choice in primers with "military" grade primers having lower ignition sensitivity. In other words, a less ductile cup

material to prevent accidental ignition from hard handling. In general, Federal primers have the highest ignition sensitivity. Wolf primers have been popular with some shooters. They also have very low sensitivity and are harder to seat properly. This becomes a problem with some trigger setups as insufficient kinetic energy may be available to press the cup into the anvil to insure ignition. If you have a JP rifle with a competition trigger setup or most any aftermarket match-type trigger system, use only commercial grade primers or domestic ammunition to avoid ignition failures.

LOADING TECHNIQUE AND EQUIPMENT

I have nothing against high-volume progressive reloading equipment for use in loading pistol ammo. We shoot a lot of it, and we need to load it in the fastest way possible. The quality in terms of accuracy and reliability of pistol ammo reloaded on progressive machines is great. However, if you really want to achieve peak performance on rifle ammo, you need to have a little more "feel" as to what is happening with your cartridges and progressive machines sacrifice the tactile quality for speed to a great extent. This is a judgment call you have to make. It's a matter of how much time you're willing to dedicate to the task and what your expectations are for the end result.

I know some people think I'm a little eccentric, but I do all my rifle reloading on C&H 4-station presses. I want to "feel" the primer seating force and the neck tension of the bullet as it is seating into the neck. Not to mention that the feel of the case sizing gives you some valuable information about the condition of the case and a yardstick for case rejection. The C&H press offers a good compromise between production speed and tactile feel on each round and at each operation, as would some turret type presses on the market. I also own a Redding Turret press which I really like for certain types of loading. The point is that you give up the feel of what is happening to each case at each station on most progressive presses that I'm familiar with. This is valuable information that will help you produce the most reliable and most accurate ammunition possible for an amateur loader.

On the extreme end, benchrest shooters commonly load right at the bench using some kind of "nut-cracker" press so they maximize the tactile feel of every aspect of the loading process.

Single-station presses certainly work just fine but require the "batch" process of reloading, and this does get to be a bit tedious. The production rate on a C&H or a turret press is on the order of 200 rounds per hour. Considering that most of us don't shoot as much rifle ammo as pistol ammo, this is a pretty good compromise. It's your call.

A few words about the C&H press: I'm not giving this as a sales-pitch as I have no dog in this fight. I just happened to have an attachment to this particular esoteric piece of equipment as I used to sell them when I had a retail store front and currently have three of them set up for my primary cartridges. The C&H happens to be an "H" type press primarily designed for pistol loading quite a few years back, pre-Dillon. Because of this, it doesn't have quite the leverage advantage of a good single-station press like an RCBS Rock Chucker. But, it has more than adequate leverage to size any rifle cartridge in the medium size range such as the .308 and its many relatives. In fact, I load and full-length size .300 Win Mag cases on mine. The press is more than up to the challenge. It just doesn't have the long lever bar or linkage setup that a single-stage press would have. Basically, you resize and de-cap in the rear center station (middle of the H which is structurally the strongest part of the press), then move the case to the re-prime and powder drop station on the left, then all the way to the right for

the bullet seating station. The center front is not used on typical rifle loading but could accommodate some other specialty die if needed. Once this procedure is committed to the subconscious, you can load error-free while half asleep. But, if you want to use it as a "single station" press for individual batch procedures, you have that option also.

My ultimate loading technique depends on whether I'm loading "functional" ammo or loading for maximum accuracy potential. For functional ammo, I use the first category cases I mentioned above, tumbling them and running them through the complete loading process on the C&H press for one complete round on each pass. For my accuracy loading, I use my second category cases which are already sized and de-capped, and I delete the sizing operation. I pay attention to the force needed to seat the primers. You will be surprised at how many cases may have inadequate primer seating tension. I further grade my ammo at this point with cases that require virtually no seating tension at all as rejects. I keep a .050 hex driver at hand to pop these primers out and re-use them. They will practically fall out of the case if I can't feel any seating tension on the press. You may choose to discard the case with primer to the trash heap, but I've been poor and I don't waste anything.

If you don't cull these cases out now, you will have a dropped primer in your rifle. That can bring everything to a halt and result in a stoppage that cannot be solved in a course of fire. Or even if you're at the range testing and don't have access to compressed air, you may not be able to remove a primer stuck in your barrel extension piece. Your day at the range will be wasted, and yes, I'm speaking from hard experience, as you can imagine.

Next, assuming the case has been successfully primed and you are satisfied with that operation, the case is charged with the powder. It's a good idea to visually inspect the case when you switch to the next station, making sure that the level of powder in the case is what you expect. You may have run out of powder or the powder may have "bridged" in the hopper or in the drop tube causing a partial load. Fully automatic loading equipment used by big manufactures and re-manufacturers has a check for this also. ***Do not*** assume that the charge dropped correctly; checking takes but a fraction of a second. This is a recipe for a catastrophic rifle failure.

Finally, you move to the seating station. Pay close attention to the force required to seat the bullet as this indicates the neck tension of the bullet in the case. Neck tension is one of the most critical factors in accurate reloading. If the case has a split, you will feel virtually no seating force, and that round is a total reject. You may pull that bullet and re-capture the powder. If you notice that the neck tension seems to be widely variable between the cases, you probably have an issue with case consistency, and you cannot expect good accuracy potential with this ammunition.

Each element is dependent upon the preceeding one. Consistent neck tension results in consistent ignition of the propellant which results in consistent internal ballistics which results in consistent velocity which results in a consistent trajectory which results in consistent accuracy. Am I getting through on this? The longer the range, the more important all this is.

Some benchrest shooters will be loading the same five cases at the bench and shooting all the groups with the same cases which have been selected and loaded with a technique specifically to insure consistent neck tension. That's how they shoot groups that are measured in tenths of an inch.

For extreme long range applications, managing the extreme spread and the standard deviation on the velocity is a huge factor. At 1000 yards, every 10 feet of velocity spread results in an additional 3-4 inches of vertical dispersion. Think about that for a moment. A load that has a 50 FPS extreme spread will have at least a 15-20" additional vertical spread beyond whatever your shooting skill dictates. This velocity consistency is one of the most difficult qualities to achieve with our reloading and is the result of the internal ballistic behavior of the ammunition as a result of good propellant choice and overall loading technique such as case prep. Fanatics demand ES in the single digits. I'm not ***that*** fussy as I value my sanity.

After you have loaded a batch of ammo, another quality control check must be taken. Each round should be gauged and visually checked. Using a case gauge for that cartridge, the round must be within the min-max levels for head space and case length. It should drop fit the gauge, assuming the gauge is a true representation of your chamber. As you gauge each round, run your thumb over the case head to feel the primer seating depth. You will immediately feel a high primer and this must go into the reject bin. If it passes these inspections, it should fit and function in your rifle.

Note that many gauges may not represent the chamber of your rifle. In other words, some gauges are larger than the chamber in the case diameter dimension just in back of the shoulder or in front of the web. A fat case will lock your rifle up just as well as a dropped primer. A slightly fat case may strip and feed into battery but not allow you to unload safely without actually firing that round as it will wedge into the chamber. Most long-range matches now have a rule that your ammo ***must not*** need to be fired to be unloaded from the rifle. This is what they are talking about.

Even for bolt guns, if you want your ammo to have an extremely tight chamber fit as you think this will give some incremental improvement in accuracy, you will find that you cannot easily close the action. That takes time, and time is of the essence at a precision tactical match. You just can't afford to waste time fighting the action with tight ammo. Every second spent doing that is one more second you don't have to spend on finding the next target, coming up with your fire solution, composing the next sight picture, prepping the trigger, exercising optimal trigger control, etc. I load the same for my bolt guns as I do my gas guns at this point.

After all this, you should have a new appreciation for what goes into making effective factory ammo. High-quality, brand-name ammunition manufacturers have very tight quality control standards that require huge investments in ballistic development and testing, large inventories of testing samples from many gun makers, statistical analysis of both accuracy and reliability standards, multi-level QC checks and even cosmetic hand checks that result in many factory "seconds" that cannot be sold into the retail market. No wonder factory ammo is expensive!

RELOADING CONCERNS

Cartridge Dimensions

For loading of cartridges chambered in the small-frame platform such as the AR-15-type rifles, maximum overall length (OAL) should be something less than 2.260". Most magazines will handle OAL of about 2.265", but if you expect high reliability, you must allow for some leeway here. I'd recommend staying in the 2.250-2.255" range with most projectiles. When using jacketed hollow-point, match-type projectiles, the 2.250" is the recommendation as the bullets themselves may have as much as .010" in runout due to tip variations. If you measure ten rounds with this type of bullet, you'll be surprised at the runout. Don't be concerned about this. The important thing is that the relationship of the ogive of the bullets to the lead will be consistent as the seating stem of the die determines that relationship, not the tip of the bullet.

Polymer-tipped bullets, on the other hand, should be highly consistent in length, which in turn allows you to seat closer to the maximum magazine feed length. However, this may have no bearing on accuracy whatsoever, so sticking to the 2.250" rule will always result in functional ammo that will usually shoot very well.

Some projectiles, such as pointed soft points or FMJs with canalures should just be seated with the case mouth edge somewhere in the groove of the canalure, which may result in OALs in the range of 2.240" or less. Again, this is not a concern. Do not use OALs that result in the engraving of the bullets by the lands when chambered as this may lead to difficulty unloading the rifle and may even result in bullets being pulled from the cases in the unloading process. This is a mess you don't need. Once again, many loading techniques used on manual rifles do not apply here. This problem is most prevalent in the .223/5.56x45 with barrels that have been chambered to the SAAMI commercial .223 Remington specification, which has a very short throat. Barrels used on self-loaders should not use this chambering.

Some other hollow-point projectiles designed for bolt guns and varmint applications are problematic in gas guns if the opening of the tip is too large. If the tip is too large, that may cause the tip to impact the rear of the locking lug feature on the extension piece, crushing the bullet back into the case. The cartridge may feed and go into battery, and you will not know that this condition exists until you squeeze the trigger and have a catastrophic overpressure case failure. We've seen this happen, and it is not a pretty sight. Typical match-type, open-tip bullets (OTM) usually have smaller tips and are gas gun compatible.

The .204 Ruger and the 6.5 Grendel® should also adhere to the 2.250-2.260" range maximum OAL.

When loading the .308 or 7.62 x 51 NATO designation, the max OAL is 2.810", but stay at 2.800" or less depending on the projectile. Note that the M118LR military long-range ammunition is loaded to about 2.820", which is longer than SAAMI spec. It will not feed in some magazines such as older Magpul polymer mags. One trick is to run M118LR through your seating die and take it down

to 2.800-2.810". Magpul has addressed this issue, and more recent mags will accept the factory 118 without interference.

Chambers: The Eternal Debate

I'm sure you heard or read about the differences and safety concerns of the .223 Remington commercial chamber vs. the 5.56 NATO chamber. I'll try and get to the bottom line of this for once and for all.

First, the difference is in the body with the lead with the 5.56 chamber a bit more liberal in the body using a longer lead. Meanwhile, the .223 Remington commercial chamber is a bit tighter in the body with a short lead as it assumes the use of shorter, lighter bullets not exceeding 60 grains. In my opinion, this chamber should be considered completely obsolete in today's market. Any manufacturer should expect that military ammo will find its way into any firearm chambered in .223 Remington, and NATO-spec ammo, along with some commercial ammo using the VLD type bullets (77-80 grains), may have pressure issues in such a commercial chamber.

Here's the history. Back years ago when manufacturers like us were first starting to produce rifles for the civilian market, we all used the .223 Rem commercial chamber in barrels with 10-12 twist rates. At first, this seemed to work because the customer was either reloading or buying commercial ammo with projectiles in the 45-55gr range perfectly suited to these barrels. Later, military ammo became inexpensive and popular for use in these rifles, and many decided not to reload. This proved problematic with some NATO-spec ammo and ammo using the longer bullets like the 77 SMKs. What's more, people wanted to exploit the long-range capability of the rifles and the longer, high-BC bullets required faster twist rates to stabilize. Faster twist rates also exacerbated the pressure problem.

About that time, Bill Wylde came out with his chamber variation for high-power shooters specifically designed to allow use of the 80 SMKs. This chamber happened to tolerate all ammunition (NATO or commercial) without pressure issues due to the longer lead. We tried this chamber and found it did not give up anything in the accuracy department. So, we made it our default, and most other manufactures followed suit.

We've been using the Wylde chamber for so long now with such a great track record that I feel confident that it will deliver excellent reliability under high-use conditions. As you know, people that buy our rifles don't just stick them in a vault and drag them out to show their buddies every now and then. They actually use them, extensively. Many of the top pros use our rifles and put tens of thousands of rounds per year through them with nearly flawless reliability. I've often joked about this. The fact is that many gun manufactures sell to people that seldom use the product and therefore really don't know if it works or not.

I heard a story from an employee of another major firearms manufacture that had a problem with guns coming back for warranty work at a rate that was problematic. Their take on the issue was that people were just shooting them too much. Seriously.

We do offer the 5.56 NATO chamber on a small number of our shorter, duty-focused barrels as law enforcement sometimes specifies that chamber. These aside, the .223 Wylde chamber designation will do all things well and should probably be the default on any commercially produced firearms in that caliber be they manual or semi-auto configurations. In the black rifle world, I doubt if any major manufacturer still uses a .223 Remington commercial chamber.

Pressure Indications & Catastrophic Failure

The average person typically does not have the means to measure chamber pressure but you need to have some perspective on this to stay out of trouble. I tend to use one case to work up a load while chronographing subsequent loads using that case. Starting low, increasing the charge a few tenths at a time, and on each reloading of that case, pay attention to the primer seating tension. If you notice a change in primer tension before you get to your intended velocity range, you need to start thinking about switching to a different powder, assuming that your velocity expectation is realistic.

A noticeable change in primer seating tension means that the case head has expanded indicating that your chamber pressure is excessive. This will typically occur before you see the primer cup flow or case head flow into the ejector pin hole in the bolt face.

As for catastrophic case failures, these are like the accidental discharge (AD or ND, if you prefer). There are only two kinds of shooters, those that have experienced this event, and those who will. Shoot long enough, and you will eventually experience a blown case. Likewise, if you reload, you will experience this sooner than later as that one bad case or mistake on your part will eventually turn up. Although unpleasant and always a surprise, the usual result is a destroyed magazine. In some cases, you could see damage to the upper and/or lower receiver or destroy the bolt or bolt carrier in more extreme incidents.

AR-type rifles are inherently designed to direct the results of catastrophic failure away from the shooter, and it is very rare that any serious injury occurs, assuming you wear eye protection when you shoot. If you don't, and are more than a casual shooter, I can guarantee that eventually you will pay a high price for this oversight. I'd have been blinded a long time ago without proper eye protection.

If you don't have the luxury of having your loading equipment and your chrono in the same place, you might take a page from the benchrest shooters. They take one of those "nutcracker" hand-loading tools to the range and assemble loads right at the bench. This isn't as inconvenient as it might sound. Just bring several sized and primed cases, a little battery-powered digital scale, the hand press with your die set and your powders to the range. With that, you're in business.

In general, best accuracy at safe pressure is usually achieved at something less than maximum recommended loads. I'd recommend getting a manual from each manufacturer. In particular, get ahold of the Sierra ballistic software that has load data for not only Sierra but ballistics for just about every projectile on the market. Stay about 5-10% below the maximum recommended charges, observe any pressure indications and take change your recipe as needed.

Velocity, Extreme Spread and Long Range Shooting

If you are shooting inside 100 yards, muzzle velocity (MV) or velocity extreme spread and SD are not all that critical. However, the greater the range, the more important consistent velocity becomes. Long-range shooters know that the extreme spread on their MV must be held to a minimum when shooting beyond 700 yards or so.

On one hand, I can say that velocity is one of the pillars of long-range, unknown distance (UKD) shooting. In other words, the higher your MV with any bullet, the higher your probability of being on target at long-range or extreme long-range engagement. Higher MV reduces the "plunging fire" effect and allows you to be further off in your ranging estimations while still being "on the target" in the vertical plane, and you ***will*** be off on your ranging no matter what.

Ranging unknown distance targets in actual field conditions is a difficult proposition no matter what the makers of the rangefinders say. Accuracy will depend on how much you spent on your rangefinder and the atmospheric conditions that day. In many cases, you may not be able to get a range off the target at all and will have to settle for ranging some object that is close to the target. "Close" may be 25-50 yards off when attempting to range targets at 1000 yards. A 25-yard variation at 1000 yards with M118LR (175 SMK) military ammo results in an additional 30+ inches of drop! It should be easy to see that hitting something with a .260 Remington using a 140 Hornady ELD traveling at about 2700 FPS MV is much more probable as it drops about 20" per 25 yards at 1000 yards.

Now, on the other hand, the highest MV obtainable with any load recipe is seldom the most accurate or consistent, i.e., producing the lowest possible extreme spread (ES) in MV. So, load development for extreme long-range engagement must strike a compromise between measured accuracy and minimal ES on the MV.

Traditional wisdom has dictated that the longest projectiles with the highest BCs were the only way to go for extreme long-range shooting. If you have the luxury of engaging known distance targets, this may be the answer. However, in the world of UKD shooting in the natural terrain, like those we run at the **JP Blue Steel Ranch**, my experience has shown that higher MV at a slightly lower BC may be the better compromise. Remember that in any case, the supersonic range of the projectile is the limiting factor in the accurate range potential. Once the bullet has entered the transonic range—which can vary widely depending on atmospheric conditions—predictable accuracy is no longer possible. If you start out subsonic (i.e., .300 Whisper/BLK or similar platforms), it's a completely different story. We will only discuss supersonic ballistics here.

Let me briefly discuss my firsthand experience with this regarding the ITRC (International Tactical Rifle Championship), the predecessor to many modern long-range team matches. For each two-man team, one shooter used a bolt gun or large-frame gas gun to engage targets from 200 to 1000 yards. The secondary "carbine" shooter engaged targets from 50 yards to 500 yards with a semiauto. All targets were unknown distance and unknown location. You had to find, range and compute your solution for all targets in the natural terrain over a walking

course in rough terrain that could stretch between 1.5-3 miles. The match consisted of two of these long stages and one high-volume stage on the D&L square range and shoothouse.

The first time I shot the ITRC in Gillette, WY, my partner used a .300 Win Mag with 175 SMKs with an MV of about 2900 FPS, which was typical of what other bolt gun shooters were using at the time. Some even used bullets up to 220 grains. When I got home, I researched this and confirmed my suspicion about the MV as it related to trajectory and hit probability. There was no doubt in my mind that highest possible MV using a lighter projectile was the better combination for engaging unknown distance targets in a natural environment.

The next year, Chad Peterson, the primary shooter on my team shot the ITRC, used my recommendation of a 155 SMK at about 3200 MV. Bullets such as the Sierra .308 155 SMK or the Hornady 155 Amax offer a compromise of highest possible BC at lowest possible weight yielding the compromise that I was looking for, namely maximum velocity with acceptable accuracy for a .30 caliber cartridge. The following year, Chad and Kurt Kisch (on carbine) then proceeded to win the event as no one seemed to be able to duplicate their performance on the long-range targets. Then, the year after that, Chad kicked it up another notch and shot a .300 Remington Ultra Mag using the 155 SMK at 3400 MV. Chad and Kurt won again, proving that indeed, velocity is king when it comes to unknown distance shooting.

Taking this a step further, the 6.5 Creedmoor or the .260 Remington loaded with 123-130gr. VLD-type bullets at about 2900 FPS MV offer extremely flat trajectory out to 1K and beyond with high accuracy and minimal recoil. This is a direction that unknown distance shooting has gone. However, the .308 or 7.62x51 NATO will continue to be a cartridge used to its maximum potential with many military or LE shooters required to use it and to understand its limitations. Using a Sierra 175 SMK loaded in the .308 to a typical MV of about 2600 impacting at 1000 yards, a 20-foot velocity variation equates to another seven inches in vertical spread. It's not uncommon to see extreme spreads in the 50-60 FPS range with such loads, and that adds in an additional 21" in vertical spread at 1000 yards. So, if you expect to hit something at 1000 yards, you really do need to go the extra mile on case prep and load development to achieve this elusive quality to your ammo: minimal extreme spread on the MV. Most of this pursuit goes back to case prep and selection. There are no short cuts. If you manage to get in the 10 FPS range on the ES, you're either very lucky, or you've really done your homework.

To Moly Coat or Not

I've vacillated between using moly coat and not over the years, but now I'm committed. At the very least, I feel that his added step drastically reduces my bore cleaning duty, and I really hate to clean my guns.

I've found that with certain loads, my accuracy has been dramatically improved at higher velocities. In some cases, I can achieve higher MV at a safe working pressure. In other cases, I end up with the same MV but have to use significantly

more propellant as it significantly reduces the bore friction of the bullet. This sounds counterintuitive, but a reduction in bore resistance will yield a reduction (not increase) in MV with the same powder charge as peak pressure drops.

When using moly coated bullets, you will find that the load data in most manuals will no longer be accurate and you will be loading to a higher load density to achieve a given velocity. And, if nothing else, you'll be able to fire more like 400-600 rounds between cleaning intervals without bore cleaning. There is plenty of discourse about this online, naturally.

As for the process, Midway USA sells a kit that includes a cheap vibrating polisher, several bowls and a tube of powdered molybdenum disulfide. While this disgusting black powder will inevitably get on everything, it's still worth it in my opinion. The vibrator included in the kit will not last long as it is a cheap POS, so eventually you'll end up buying a good one like a Thumler's Tumbler. These last forever since they're designed to polish rocks and run continuously. It's easier if you're like me and buy bullets by the 1000 or more rather than just a box at a time. This allows you to do a batch that will last you for a while.

I deviate from the instructions and use about a quart or so of ground corn cob that I also use for case cleaning. I impregnate the cob mix with the moly, and then every time I run a batch of bullets, I add about 1/8 teaspoon of the moly to make up for what's lost on the bullets. Then, I just use this impregnated corn cob repeatedly. This seems to impregnate the moly and polish the jackets as opposed to running just the bullets, which come out rough and nicked.

I have one of the medium-sized vibrators, and it will run a 1000 .223 or 500 .308-type projectiles in a batch without overloading due to the weight. A runtime of two hours is plenty to accomplish the task. I also have a sifter made from wood box with a heavy-duty screen (1/4") screwed securely to the bottom. Note that some .223 bullets do make it through but you can just grab them from the tailings. If you follow this approach, make sure to wear a mask when you empty the tumbler as the fine powder will be everywhere. You don't want to get this noxious stuff in your lungs or you'll be coughing up black stuff like you work in a coal mine.

The Ladder Test

Taking your load development a step further, you might choose to do a "ladder test." This is a testing method designed to find the "accuracy node" of any powder/bullet/primer combination. Actually, you can use it to test any parameter of your recipe as long as you only change that parameter and leave all others constant. But most typically, it is used to divine the accuracy node relative to the propellant charge. I could go on for pages about this but an excellent discourse is available here: http://www.6mmbr.com/laddertest.html

Jason Barney goes into depth on the methodology he has developed that has allowed him to achieve vertical dispersions in the range of only 2" at 1000 yards. Incredible! As his discipline is 1000-yard benchrest, minimizing vertical dispersion is one of the fundamental foundation blocks of his sport. At the time of this writing, he holds 4 of 17 smallest groups at his home club of Williamsport.

One of the great attributes of the practical shooting sports is that those who excel understand that it is essential to look at the achievements and techniques of other more tightly focused shooting disciplines and draw on that experience to improve their performance in the practical/real world. This is a great example of a development technique that can enhance the performance of the long-range UKD shooter.

In the end, a great practical shooter represents the pinnacle of shooting prowess. He can apply all the disciplines, technology and hardware to make first-shot hits on UKD targets in the real world under a wide range of conditions from compromised positions in the shortest time frame possible.

CONCLUSION

So, what's the bottom line here?

Over my shooting carrier, I have often seen shooters waste their time and become obsessed with aspects of their shooting, equipment or ammunition to the exclusion of the end goal. This first occurred to me as a small-bore shooter in high school. My father involved me in a junior rifle club as a young boy and set me up with a Mossberg .22 bolt gun with a decent receiver sight and sling. I used this rifle to lay the foundation of my shooting skills for the rest of my life.

When I started high school—a military academy with a small-bore rifle team—I was shooting my qualification target one day for ROTC training while the coach for the rifle team was walking up and down the line, observing. When my target came back, he pulled it from the carrier and said, "Cadet, report to the range at 14:00 hours." I obeyed that order, and here I am today. I was immediately placed on the varsity team under the instruction of two senior team members who taught me the ropes. Between them and my coach, I excelled at this and eventually captained that team and went on to the University of Notre Dame, shooting on their ROTC team.

One of the things that occurred to me around the second year of this sport was the relative values of the three position targets in the aggregate: prone, kneel and off-hand. We were expected to shoot a perfect or near-perfect score in the prone, maybe 5-7 points less in the kneeling position and the off-hand was more of a crap shoot. I observed my teammates spending most of their time practicing the prone and kneeling as they became obsessed with shooting that perfect 100-point score. Meanwhile, most of them were shooting in the 70s or less in the off-hand. So, I decided to spend very little time on the prone and kneeling and to be perfectly happy with a mediocre 97-98 in the former and a 90-93 in the latter. Instead, I concentrated on the off-hand. Soon, I was shooting 85-90 in the off-hand position and pulling away from everyone on the team.

In other venues, such as NRA High Power Silhouette, I saw people obsessing over getting ¼ MOA accuracy out of their rifles and spending all their time on load development and benchrest testing. Once again, I was satisfied with a rifle that shot something under a minute and spent all my range time practicing the off-hand position. I held both the High Power and rimfire titles in this game for about seven years in my home state.

The moral of this story is that a good practical shooter can win any event with a rifle that shoots somewhere between ½ and ¾ MOA—something under a minute. In fact, a good shooter can make a one MOA rifle look good. You don't need a benchrest rifle to be a great practical shot. It's really the rest of the skill set that adds up to the end goal. This includes the ability to shoot accurately from a compromised position, a feel for the wind and what it's doing in the natural terrain with hills and valleys, the ability to range targets using both electronic devices and field-expedient methods such as mil-ranging your targets and many other skills and techniques. So, choose wisely when it comes to the allocation of your time and resources. Doing so prudently, you will maximize your potential.

LOAD RECOMMENDATION BY CARTRIDGE

It is beyond the scope of this document to specific recommendations for every cartridge I've ever shot, let alone all the cartridges anyone might want to shoot out of a gas gun. For that reason, I'm limited this section to cover those cartridges we currently chamber for in our rifles as well as some we've retired from our lineup.

In addition to reloading recommendations, I've included some factory loads that have worked well for me personally. That said, before committing to large quantities of any factory ammo, it's always best to buy a few boxes and test it in your rifle for accuracy and reliability.

.204 Ruger

No longer offered as of this writing, our barrels in this caliber ran a standard SAAMI chamber and a 1:12 twist. They favored the bullets in the 30-32gr. range. I'd recommend 32gr. polymer-type bullets by Nozler, Hornady or Sierra with H-335. Start at 27.5 and work up to a maximum of 28.5 grains using a Federal 205M and Hornady cases. We have seen accuracy in the ¼ MOA range with this combination. The 40gr. (or similar) bullets still shoot under a minute but are not as well stabilized in the 1:12 twist barrels. We do not recommend anything heavier than 40 grains. Heavier bullets defeat the intended purpose of this cartridge anyway, which is the pursuit of Holy Grail of hyper-velocity and a super flat trajectory out to 500 yards along with devastating terminal performance on varmints. This cartridge will separate the prairie poodles into their basic amino acids.

Factory ammo recommendations: Hornady 32gr. V-Max load

.223 Remington | 5.56 x 45mm NATO

We currently use a .223 Wylde chamber in our competition barrels and the 5.56mm chamber for some of our shorter LE duty rifle barrels. The Wylde chamber yields the best accuracy across the widest range of ammo in both commercial and NATO designations at safe pressures. Our twist rate is 1:8 (actually 1:7.8, but who's counting?). Many powders will do a great job in these barrels. Propellants in the medium burn rate category are typically best suited for both .223 and .308. Just a few excellent choices are IMR 4895, H4895, Win 748, H-BLC2, H-335, Varget, N-140, and Ramshot TAC and the CFE 223. There are too many to mention.

For factory ammo, stay away from foreign-manufactured ammunition, and don't be tempted by the low price. You get what you pay for. In particular, stay away from foreign steel-cased ammunition. There has been a tremendous investment in engineering, testing and actual real-world experience put into the brass case component. Here is an extensive test on brass case vs. steel cased ammunition

that is well worth watching: http://www.luckygunner.com/labs/brass-vs-steel-cased-ammo/#reliable

Hornady steel-cased ammunition is loaded by Hornady, so at least the propellant and projectile are of top domestic quality as compared to foreign steel case. We have achieved excellent accuracy and reliability using the Hornady SC ammunition, and we have customers running many tens of thousands of rounds of this ammo through JP rifles with excellent results. Still, we still feel that if you want to put away ammo for your "doomsday" rifle, make it brass case domestic ammo like Federal American Eagle or some XM193 equivalent.

Projectile choice depends on your application. Although we run a 1:8 twist rate, don't assume that you can't shoot the lighter bullets. Some of our best test groups have been with 50gr. polymer-tipped bullets such as the Nozler Ballistic Tips, and Sierra Blitz kings and Hornady V-Max, in particular the 53gr. V-Max. You can't over-stabilize a bullet, but you can cause some bullets to fail structurally. When used in high-velocity applications, spinning them up to high RPM in fast-twist barrels may result in self-destruction of these projectiles in flight. You will see a grey streak leaving the muzzle as the bullet sheds its jacket and vaporizes in flight, leaving no hole or impact on the target. However, most bullets, even some down to the 45gr. weight range, are constructed to take this centrifugal force without self-destructing.

As mentioned earlier in this discussion, bullet selection depends on application and expected range of engagement. Inside 300 yards, ballistic coefficients (BC) have no bearing. Trajectory is almost entirely velocity driven. Bullets down to the 50gr. range will perform very well inside this range. If your application is punching paper for groups or eliminating varmints, polymer-tipped bullets from 50-60 grains would be my choice. They give explosive terminal performance and outstanding accuracy. If you intend to activate steel reactive targets at ranges beyond 300 yards, I'd be choosing match bullets in the 69-77gr. range.

RamShot TAC and CFE-223 are propellants I would recommend with the heavier bullets, in particular the 69 or 77gr. Sierra Match king, although many favor Varget or N140. TAC powder was specifically formulated for this application and will deliver highest potential velocities at safe working pressures. A charge of 24.5 grains behind a 77gr. SMK will clock over 2700 FPS MV from a 20" barrel, and the cases can be used multiple times with this load. Start at 23.5 and work up. I use this same charge behind either the 77 or the 69 SMK with the 69 launching at about 2850 from a 20" barrel. Again, this is the velocity range that you should be looking for with the 69gr. bullets.

More recently, I've worked extensively with the CFE 223 and achieved excellent accuracy in the ½ MOA range with the 69gr. SMK loaded with 27.0 grains at MVs in the 2900 FPS range out of an 18"—outstanding if you ask me. Dropping to 26.3 with the 77gr. SMK at about 2770 in the 18" and still sub-MOA accuracy is another workable combination.

However, I recently acquired a large quantity of the Sierra polymer-tipped 69gr. and 77gr. bullets (TMK Tipped Match Kings), as their BCs are incredible. I was thinking these were going to make for the ultimate long-range precision bullets for my .223 rifles. However, I had to drop about three grains off the charges and

almost 400 FPS MV to get close to 1 MOA with these bullets using the CFE 223. 8208 turned out to be the answer with the TMKs with 24.5 for the 69gr. and 23.5 for the 77gr. TMK delivering fine accuracy and velocity.

Many powders will work fine with the 69gr. SMK. It is the 77gr. (or similar bullets) that are problematic in terms of powder application. Many powders will give fine accuracy at velocities in the 2600 FPS range. Getting to 2700+ results in blown or dropped primers, and you'll be outside the envelope. The Ramshot TAC or the CFE 223 are the solution for the heaviest projectiles in the .223 in my opinion.

I shot my personal best group ever (and I'm sure I'll never duplicate it) using this load in a new Win. case, 77 SMK, 24.5 of Tac, a Fed 205M with an OAL of 2.250". My 100-yard, 5-shot group measured .105" center-to-center from my 20" PSC-11 upper topped with a Leupold M4 4.5-14. I used this upper for a DMR rifle when I shot secondary in a long-range team match. Now, that's the kind of group you laminate and stick in your wallet next to the pictures of your kids.

Another newer bullet that I've had extremely good luck with is the Hornady 53gr. V-Max. This has the highest BC for any bullet in that weight class that I'm aware of at .291. That's not much less than a 69gr. SMK. I can push this bullet to about 3200 FPS out of an 18" with 26.8 grains of Ramshot TAC and accuracy under 1/2 MOA out of some of my uppers. At that MV and with that BC, it's a great go-to load for multi-gun competition, not to mention a great varmint load with the terminal ballistics of that projectile. This is a max load so start at about 25.5 and work up. Your barrel may not tolerate 26.8. Every barrel has its own personality.

If you're just punching paper at known distance with these loads, velocity is somewhat irrelevant, and you can use any accurate load combination that is within safe and workable pressure limitations for your rifle. However, in most of the tactical shooting games, we are engaging unknown distance targets, and the higher your velocity, the flatter your trajectory becomes. The flatter the trajectory is, the higher your hit probability is at long-range targets.

Factory ammo recommendations:

For lower-cost practice ammo, try the Federal American Eagle or the Hornady steel cased ammo. The Hornady 55 HP SC will give outstanding accuracy out to 200 yards. The 75gr. match SC load will perform pretty well out to 600 yards. At the **JP Blue Steel Ranch**, we have no problem using the 75 SC ammo out to 800 yards as we are usually shooting at over 5000 ft DA (density altitude) conditions. MV on the 75gr. load is only 2560 (as tested from my 20" upper), so a bit on the slow side, but accuracy is good.

The Hornady 55 HP SC ammo will also yield ½-¾ MOA performance at ranges to 200 yards. Black Hills has some great entries in both factory new and remanufactured rounds in the 69gr. and 77gr. Sierra Match Kings. The SMKs seem to shoot better in the BH than the Hornady for some reason.

I once acquired .223 match ammo loaded with the 69gr. SMK from Eagle Eye, and this was some very accurate factory ammo in my rifles.

.224 Valkyrie

This cartridge is a new development from Federal, creating a .22 caliber neck-down of the 6.8 SPC to achieve a higher external ballistic potential. The goal was to create a small capacity case using the new VDL-type bullets at higher velocities to achieve external ballistic performance in the range of the 6mm and 6.5mm medium-capacity cases such as the .260 Rem and 6.5 Creedmoor. Load development is still proceeding at the time of this writing but the cartridge shows some promise. Note that I said "exterior ballistic" performance. If you need to kill game, you might want to throw a larger projectile, but if you only need to hit steel, this could be your answer and result in a much more economical beast to feed.

At this time, Federal offers three loadings for the Valkyrie. First, a 60gr. Nozler ballistic tip for a high-velocity varmint load. Second, an economy load under the American Eagle line using a 75gr. plated bullet. Finally, a long-range load topped with the Sierra 90gr. SMK. Hornady will soon offer a factory load using their new 88gr. ELD and has several projectiles including the 88, 80 and 75 ELD types that should offer great performance in this cartridge. One route worth exploring is to buy the very affordable American Eagle 75gr. factory round and replace the bullet with a Sierra 77gr. TMK. The 75 grain plated bullet will shoot into about 1.5 MOA, and you may be satisfied with this. However, for a match load, this doesn't cut it. Years ago, this process used to be called making "Mexican Match" by the High Power shooters who had access to cheap or free military surplus 30-06 ammo and just replaced the bullets with a more accurate projectile.

As the street price of the AE Valkyrie 75gr. is about $10 a box, you can look at it this way: you paid 50 cents for a new, primed and charged case and just need to invest in a good bullet—still a good deal and easy to do using a collet puller such as the RCBS. I have a Mexican Match operation set up in a Redding turret press permanently as I not only use it for this but I buy cheap .308 FMJ ammo and replace the 150 FMJs with Hornady or Sierra 155 match bullets.

The result is a great match load with a bullet sporting a .420 BC launching at 3000 FPS MV and shooting into ½ MOA out of my rifle. I'll take that any day.

If you roll your own, I've found that H414 and CFE-223 work quite well with the 75-80gr. bullets. Hogden Superformance works well with the 88-90gr. bullets. The factory propellent is rumored to be Power Pro 2000, but I have not had a chance to work with that. Try 26.5 grains of Superformance behind the 88 ELD. With the 77-80 class bullets, try working in the 27-29gr. range with either propellent.

6.5 Grendel

This cartridge yields some of the best range and terminal ballistic potential possible out of the AR-15 platform. In other words, for a cartridge that will fit and function within the limitations of the AR-15. I can be supersonic out past 1200 yards with some loadings, and it delivers outstanding accuracy. Because of the high BCs of recommended bullets, it actually may surpass many common loads for the .308 in retained energy as we get past 600 yards.

For competition use, I have used a couple recipes. I realize that most of the factory loads use bullet in the 123gr. range, either the SCENAR or the A-MAX. However, once again, I prefer velocity over BC and go with the lighter projectiles.

I used the 108 Lapua SCENAR loaded with Ramshot TAC to the tune of 31.0 grains with decent results. Load to an OAL of 2.250-2.260" using a Federal 205M in a Lapua case. If substituting any of these components with those from another manufacturer or in a non-JP rifle, back down to 29 grains and work up from there. Load recipes are specific and changing any on parameter may cause excessive pressure. This load will yield 2700+ FPS MV out of our 22" **Supermatch™** barrels and excellent accuracy.

When Hornady came out with their 100 grain A-MAX bullet in 6.5, I gave them a try, and I prefer this bullet over anything else I've tried. With a BC of .394 and a MV just under 2900 and ½ MOA accuracy, this is a great recipe. I moly-coat the bullets using the Midway kit and load them with 33.5 grains of TAC to an OAL of 2.50. If the bullets are not moly-coated, you'll have to drop the charge a whole grain. Start at 31.5. It is interesting to note that the 32.5 grains with the non-coated bullet yielded 2900 FPS MV out of 20" and the moly-coated bullets dropped to 2650 FPS with the same charge. I actually came up to 34.0 grains of TAC to reach the 2900, but the accuracy node was at about 2850-2875. This indicates just how much bore friction the coating eliminates, and loading tables will not reflect the expected velocity. In some cases, you will be able to get higher than expected MV without exceeding a safe working pressure for the rifle. In other cases, you end up with the same MV at a higher charge.

Why do I moly-coat most of my rifle bullets? See my discussion of this above, but in short, It cuts down my cleaning intervals dramatically. I shot up about 500 rounds of this load in testing and verifying my dope without cleaning the bore once and never experienced a POI shift or accuracy degradation on my Grendel. On my .260 Rem LRP-07™, I use the Hornady 123 A-MAX, moly-coated with 47.5 grains of Hodgdon Superformance, and this load will print in the ½ MOA range pretty consistently. The exact same load with uncoated bullets prints into about 1.3 MOA. I have no explanation for that, but it works for me.

For hunting applications on mid-sized game like hogs and white tail, you will probably want to switch to a polymer-tipped bullet such as the Nozler 120 Ballistic Tip or Hornady 120 or 123 A-MAX. The Speer 90gr. TNT offers excellent performance on larger varmints with outstanding accuracy also. Refer to the Alexander Arms loading tables on the AA website for powder selections.

There are some compatibility issues with various factory ammunitions due the fact that the 6.5 Grendel is a specialty cartridge. It's still making the transition from wildcat to mainstream production, and some factory-loaded ammo may not be compatible with every rifle. If you prefer to buy factory ammo, we recommend using either the Alexander Arms ammo or the Hornady Ammunition. The Black Hills ammo is produced specifically for the Les Baer rifles and is named the 264 LBC, loaded with the 123 Hornady A-MAX. The LB rifles have a bit longer lead, and this ammo may have excessive pressure in some other chambers.

Factory ammo recommendations: Alexander Arms 123 Lapua, Hornady 123 A-MAX loaded ammo.

.260 Remington / 6.5 Creedmoor

After much load work with these two cartridges, I consider them to be a ballistic wash. In fact, my loads typically mirror themselves between the two cartridges with accuracy nodes and velocities being almost identical.

We consider the .260 Remington chambering in our **LRP-07™** platform a hand-loader's rifle. Much of the factory ammo is not compatible with gas-operated rifles as the loads are developed exclusively in bolt guns. Pressure curves on factory ammo are typically not well suited for use in gas-operated self-loaders because the manufacturers are targeting maximum velocity for marketing reasons. In addition, most commercially built rifles run 1:9 twist barrels, which will not stabilize bullets past 123 grains.

However, ammo for the .260 has proliferated, and I can now recommend the Black Hills .260 with the 136 SCENAR, which has good pressure characteristics for a gas gun and excellent accuracy. Also, the HSC .260 with the 123 SCENAR shoots well and is reliable. ABM ammo loads the Berger 130 AR Hybrid, and that should also be an excellent gas gun load since it was developed specifically for that application.

Our barrels run a SAAMI-type chamber with a 1:8 twist rate. The 1:8 makes it possible to stabilize the heaviest projectiles made in this caliber up to 142 grains, but it also generates higher pressures with a given load. Your load choice depends on your application. For known-distance shooting at long range (past 600 yards), the heavier bullets may be a good choice. For unknown-distance shooting, once again, velocity is king and the lighter, high-BC projectiles have the edge. I recommend the 123 Lapua SCENAR or the 123 Hornady A-MAX for a great all-around compromise between MV and BC for use in long-range, unknown-distance applications. Here are a couple loads I've had good luck with:

- 42.5 grains of Vihtavuori N-550 with the 123 A-MAX or 123 Scenar (moly-coated) and a Federal 210M. (Drop two grains if you want to use a uncoated bullet)
- 47.5 grains of Hodgdon Superformance with the 123 A-MAX (moly-coated) and a Federal 210M. (Drop two grains if you want to use a uncoated bullet.)
- 44.6 grains of Hodgdon Superformance with the 140 A-MAX (moly-coated) and a Federal 210M.

If you're cheap like me, you will probably think about trying to make .260 cases from some of that .308 brass you have laying around. Well, ***don't do it***. It's a waste of time and will causes pressure problems. Just buy some .260 Rem. brass, or if you really must, make it from something, start with .243 cases.

For game applications, the Hornady 120, 123 or 129 polymer-typed bullets would be an excellent choice along with the Nozler Ballistic Tips or Barnes TSX bullets.

When it comes to factory 6.5 Creedmoor, I have tested Magtech 6.5C 140gr. FMJ ammo and found it to be a great value at only 59 cents a round (at this writing). I shot a number of ½-minute, 3-round groups with it and also loaded some Mexican Match using my 140 A-MAX bullets. That shot as well as the Hornady

ELD. MV is a bit less however and stated as 2660 on the box. After those results, I ordered five more cases for use as function fire ammo for our shop.

6mm Creedmoor

The 6mm Creedmoor has come on strong in the long-range practical shooting community. I don't have as much personal experience with this round as some, but several of our employees and shooting team members do. Some of their recommendations are below. Note that all loads are for specific rifles, and your rifle may not digest these recipes at safe pressures due to slight differences in chambers and bores. Always start at least 5% below any published data and make note of temperature comments.

What's more, it is very important to note the brass used in these tests. To get accurate and safe loads, you'll want to try to match it as closely as possible. The actual case volume difference between different manufacturers of brass is very large. The H4350 powder and Reloader 16 are the two most temperature-stable powders. The Superformance, on the other hand, tends to be temperature sensitive. So, it is important for the shooter to keep this in mind and make sure to work up loads in warmer conditions if they live in a warmer climate.

Here are my personal recipes:

- 40.5 grains of Reloader 16 with the 107gr. SMK and a Federal 210M, reloaded in JP 6.5 Creedmoor brass necked down to 6mm. (3004 FPS)
- 41.6 grains of Reloader 16 with the 95gr. TMK and a Federal 210M, reloaded in JP 6.5 Creedmoor brass necked down to 6mm with an OAL of 2.775". (3151 FPS)
- 44.4 grains of Superformance with the 107gr. SMK BTHP and a Wolfe Large Rifle Prime, reloaded in Hornady 6mm Creedmoor brass with an OAL of 2.760-2.780". (3007 FPS)

From Team JP Shooter Alex Stricker:

- 40.8 grains of H4350 with the 107gr. SMK and a 450 CCI primer, loaded in Peterson 6mm Creedmoor brass with an OAL of 2.780". (3015 FPS)
- 41.1 grains of H4350 with the 107gr. SMK and a 450 CCI primer, loaded in Lapua 6mm Creedmoor brass with an OAL of 2.780". (3020 FPS)

.308 Winchester

The chambering in the **LRP-07™** will tolerate both military and commercial-type ammunition. However, the pressure curve must be compatible with the rifle, and there are more than a few commercial, and some military ammunitions, that are not compatible. We presently use a 1:10 twist rate, which is faster than some other manufacturers. This was done to ensure peak accuracy with the 175 SMK ammo (M118LR) used by our military customers. However, excellent accuracy with bullets as light as the Hornady 110 V-MAX is no problem.

In fact, for typical 3-Gun matches in the heavy divisions, the 110 V-MAX is a great choice, delivering high velocity and excellent accuracy with very low recoil and fast sight recovery. As most targets are inside 350 yards, the 110 V-MAX at close to 3000 FPS MV will get the job done. In fact, if you're shooting iron sights with a 25/300 zero setup, the flat trajectory of this load improves your hit probability with point-blank shooting to a little beyond 300 yards.

I load the 110 V-MAX with 47.5 grains of H335 in a Federal case with a Federal 210M primer to an AOL of 2.750". However, many powders will do a fine job with this bullet, including IMR4895, Varget and 8208. I have used this load effectively out to 750 yards. So, all that talk about light bullets not being useful at longer ranges is not necessarily true. Note that the terminal ballistic performance of the 110 V-MAX is spectacular, and for a varmint or hog rifle, it's worth considering.

Sierra introduced a 125gr. Match King in .308 that is well worth trying also. This bullet is 1.4" long (!) with a BC of .349. At my altitude density here (about 1000 ft. AD), that means it delivers supersonic performance past 900 yards. I've achieved outstanding accuracy with this bullet with MVs in the 2850+ range out of only 16" of barrel on one of my test samples.

If your application requires shooting beyond 400 yards, the various 15gr. bullets such as the Sierra 155 Palma or the Hornady 155 A-MAX offer the highest BCs in their weight class, resulting in very respectable velocity and accuracy with supersonic performance out to 1000 yards. I use 43.2 grains of IMR 8208 with the 210M at an OAL of 2.800".

The 168 class bullets are also extremely popular. Try 42.5 grains of RE-15 or 4064 behind the Sierra 168 SMK or Hornady 168 A-MAX. CFE-223 also works quite well with bullets in the 155-275gr. range.

By now, you probably noticed that I use a lot of certain types of powders like TAC or CFE. I like to keep things simple and although I have a wide library of powders, I like to settle on powders that have wider applications. Ramshot TAC is very unique in that respect. It was developed with the 77-80gr. .223 bullets in mind and is one of the only powders that will yield higher velocities (2700+) and excellent accuracy at safe pressures in faster twist barrels with these bullets. But, it will also drive the light bullets down to 50 grains in the .223 at 3200+ FPS. In a way, its behavior is somewhat like a "multi-viscosity" oil that performs with the properties of more than one viscosity, depending on temperature, to achieve greater versatility. TAC is able to deliver an optimized burn rate with a wide range of payloads in a given cartridge while most conventional powders are usually optimized for one end or the other in terms of projectile mass. It also happens to work just great in the .308 Winchester for a wide range of bullets. I recommend it. Many of our team shooters are migrating towards 8208 for its temperature stability. I don't have a lot of personal data to provide at this time, but I will add this in the future.

The ultimate long-range load for the .308 uses the 175 SMK or equivalent, which can be launched at velocities that remain supersonic out to 1200 yards or more. This load would be similar to the M118LR or MK316 (AB39) military long-range precision load. I'd recommend 41.5 grains of 4064 as an equivalency

load with a 210M loaded to 2.800". The downside of this load is that the MV is a bit on the low side resulting in the "plunging fire" effect at ranges beyond 600 yards. In other words, the bullet drop at each 25 yard interval traveled increases dramatically as you get out to 700-1000 yards.

Don't bother with the Sierra 175 tipped match bullet as it has be loaded out to about 3.300" before it groups in a gas gun barrel with a NATO chamber. Unless you intend to single load, this is not a good combination. On the upside, this new bullet has a very high BC for its weight class.

If you have the luxury of shooting at known distance, this is not a consideration as you can dial in an exact zero for your given range. However, in games or the real world that require us to dope in unknown distance shots, a flatter trajectory is beneficial. The 175 load in the .308 is down about 340+ inches at 1000 yards. A 6.5mm 123 Lapua SCENAR at 2900+ FPS MV out of the .260 Remington is only down about 220 inches at 1000 yards. You can see that this gives you a greater margin of error in your ranging to the target with a significantly greater hit probability.

Factory ammo recommendations:

- M118LR: ATK military long-range load or Fed GM175, the commercial equivalent. Note that it is loaded longer than SAAMI spec and will not feed in all magazines such as the Magpul PMAGs. It is also rather high pressure. Accuracy seems to problematic in many gas guns. As it was loaded specifically for the M-24 platform, this is not surprising.
- The AB39 (also known as MK316 SOCOM ammo): This load has a more extreme temperature stability specification, but otherwise is similar to the M118LR. Most report better accuracy with the AB39 than the 118. Our tests support this conclusion. It is also loaded using a 175 SMK.
- Black Hills 150 grain Hornady SST load
- Black Hills 155 grain A-MAX load
- Black Hills 175 SMK load
- Federal American Eagle M1A1 168 OTM
- Federal GM 168 grain SMK load
- Federal GM175 (M118LR)
- Hornady 110 V-max load
- Hornady 150 SST load
- Hornady 155 A-MAX load
- Hornady 155 BTHP Steel Case ammo
- Hornady 168 A-MAX load
- Hornady 178 A-MAX standard load
- ABM 7.62/308 168 Berger OTM

- ABM 7.62/308 175 Berger OTM
- Eagle Eye 175 OTM
- Freedom Munitions 155 A-MAX
- Freedom Munitions 168 A-MAX
- Freedom Munitions 175 OTM Nozler

Prepped Brass

In the last few years, a cottage industry has sprung up around selling prepped brass or prepping your brass, typically for the .223 and the .308. This has some real advantages, and it is well worth considering. These services clean, full length size and swage any crimped primer pockets and in some cases, pre-priming is as option. When you get the cases back, they are ready to charge and seat the projectile of your choice. You may have to chamfer the mouth depending on the bullet you seat. However, it saves a lot of time and effort and I find the real advantage is that the cases are like new and free of any case lube residue. Removing the case lube residue is essential for ammo you intend to use in dusty environments such as the southwest, whether in competition or hunting applications. If you fail to do this, your ammo will soon be nonfunctional and could even damage your chamber with the grit that has adhered to the sides of the case. So, for 4-5¢ apiece, I think this service is well worth it.

The 9mm Carbine (JP GMR/JP-5™ Series)

We now have people asking about loading and buying ammo for our 9mm carbines in order to take advantage of their outstanding accuracy and performance potential. Most people don't bother loading for this cartridge and opt for the factory ammo. However, being a masochist, I have loaded many rounds of 9mm over the years. I never imagined a day when the 9mm would become the mainstay of my pistol shooting, but I seldom shoot any other pistol cartridges at this point. The ubiquitous 9 has overtaken the market and has an accuracy potential in excess of our expectations. With modern propellants and improved projectile design, the terminal performance could be considered "respectable" if you are not a died-in-the-wool "big hole" advocate.

All things considered, we highly recommend using only factory ammo for your 9mm carbine. Obviously, we have to say that. But if you happen to have primers and prefer to ignore our warning, here is some useful information.

We have noticed an interesting phenomenon with the direct blowback carbines. It is too early to tell if this will be an issue with the roller-delayed **JP-5™**, but no sense in taking chances. We have seen a number of barrels come back stacked end to end with stuck bullets. The problem seems to be using ammo that was loaded to USPSA minor power factor with heavy jacketed bullets (147s). This combination may yield the most controllable pistol load, but it's a potential disaster in your carbine.

With the longer barrel and a powder charge that is just getting the bullet out the barrel in a pistol, the extra bore resistance combined with a very short pressure curve can actually catch a bullet before it gets out the door, so to speak. Once you have one bullet stuck, you will not realize what's happening as you launch one after another until the barrel is full back to the chamber. Yes, it really does happen. You hear the report coming from the ejection port, not the muzzle and think the carbine is working. The cases don't even rupture and may look normal due to the low chamber pressure. They'll often continue to extract and eject as normal.

I have a 147 minor PF pistol load I use for this same reason in my pistols. However, I chronographed it in my **GMR-15™**, and it had an extreme spread of 150 FPS. I realized that this meant the bullets were on the verge of stopping in the barrel. So, ***don't do that!***

If you do squib your barrel and then proceed to load and fire a full power load, then you will very likely have a catastrophic case failure, and most likely, some expensive damage (not to mention soiled underwear).

Another phenomenon I've noticed in the Steel Challenge venue is that many shooters think that loading to sub-minor PF gives them a big advantage while suffering occasional malfunctions due to the fact that the load is right on the edge of reliability. Trust me: throw a few more tenths of a grain to make sure it works.

It is essential to gage all ammo you intend to use for actual competition. If you want to skip that for practice ammo, then ok. You can get a statistical idea of your out-of-the-press reliability. But don't take any chances on your match ammo. It's something that is within your control.

What bullet you choose would be determined by what results you intend to accomplish with your ammo. Higher muzzle velocity will give you a flatter trajectory and a longer "point-blank-range" from the carbine. I've found that typical 115gr. loads will yield a 100-yard PBR from a carbine with a primary intersection of line-of-sight and trajectory at about 50 yards and the secondary intersection at about 100 yards. Pretty useful ballistics for competition purposes, I'd say.

My best accuracy has always been with jacketed HP projectiles with the Hornady 124 XTP loaded with HS6 giving some amazing results. However, the new polymer-coated lead bullets such as Blue Bullets give great performance using Allient Bullseye propellant. Faster burning powders are the best choice for lead bullets at lower velocities. I've found that the 135 Blue Bullet is a great compromise for both steel and USPSA venues.

Reloading recommendations:

- Freedom Munitions 165 RN: 4.3 grains of HS-6 for a minor pistol load that will also function in a PCC
- Montana Gold 147 Flat Point: 5.2 grains of HS-6, minor pistol power factor
- Montana Gold 147 Flat point: 8.5 grains of AA#7 for a major PF load

Factory ammo recommendations:

- Federal American Eagle 115 FMJ
- Federal American Eagle 124 FMJ
- Freedom Munitions 147 RN plated
- Freedom Munitions Hornady 124 XTP (most accurate load tested to date)
- Black Hills 115 JHP defense load