JP ENTERPRISES

Loading Recommendations for the JP Series of Self-Loading Rifles

(Note 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 date at your own risk. Load data her in given applies only to JP rifles, manufactured by JP Enterprises, Inc. and should not be used in other rifles.)

Forward:

If you've been loading for bolt guns, you'll need to leave some of that behind when you start loading for your gas gun. Here are three fundamentals that must coexist if you intend to load for your gas gun.

1. The finished round must be a drop fit to the chamber to insure reliability allowing the bolt to easily close over it.
2. You must load to an OAL that will never interfere with the magazine 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 will eliminate 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 might without detrimental effects on reliability. And if the rifle does not function, it is of no use. Once I asked one of my shooting partners what his priorities were on his gas guns. His response nailed it. He answered as follows: First, Reliability. Then, reliability. After that, reliability and then, Accuracy. Need I say more? However, don't fret. You can achieve both and live in harmony. Don't forget to watch our DVD "GasGunBasics", both for a laugh and to be fully informed.

This is more than 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 will attempt to update at every year.

Case selection and preparation:

Like any other semi-auto application, all cases need to be full length sized with a small base die. I recommend Dillon full length carbide resize die (available in .223 and 308). They're a bit expensive, but worth it. I've had good luck with Redding, RCBS and Hornady, all of which make good quality reloading tools. Good 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 non-fired dimensions as possible.

You must have a case gauge that represents your chamber, or at least know how the 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. That's why ours are cut with an actual finish reamer and are an actual chamber indication. In other words, if the loaded round drops into the gauge, it will by God fit and function in the rifle. See the DVD GasGunBasics for a full demonstration of the use of the gauge.

Setting up the size die is the most critical part of this 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 may imagine. Again, this is all demonstrated in the DVD.

You may want to think of your cases as being in three classes (this pertains more so to .223 and .308):

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 to insure primer retention. They may vary widely in interior capacity and neck tension, but still be within the serviceable range. In other words, you should be able to load reliable, functional ammo with this type of case, but not obtain the maximum accuracy potential for the rifle. However, 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 the same head stamp and preferably of the same vintage, as many manufactures cases will change in

some dimension or metallurgical property over time. This insures a fairly high degree of consistency of internal capacity and neck tension leading to a fairly high internal ballistic consistency, assuming a good load choice. We suggest a more rigorous prep process if maximum accuracy from such cases is to be obtained. This should consist of cleaning, resize and de-cap, cleaning of primer pockets and inside/outside chamfering of case mouths. One of the motorized case prep stations takes a lot of work out of this process when large numbers of cases need processing. Once-fired brass will usually have a burr on the inside of the case mouth even after sizing which may 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 and use this ammo for practice only or non critical applications where you can tolerate a flyer.

For further consistency, cases can be weighed, with cases falling outside a standard deviation 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 may not be achieved until the second loading, after the initial stretch is out of the case and the case has been pressure formed (worked) one time. That said, neck sizing only is not an option for self loaders. The ammunition must drop fit the chamber, not press fit the chamber as is possible in a bolt 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. It 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, the new brass may be a good investment. However, if you 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. Note that you may have to reduce a load in a new case or in other words, may accomplish a higher load density in a fired case at safe pressures. You may find that data collected from loads in new cases does not correspond to data collected from the same load in fired cases.

Annealing brass:

We have been asked about the advantages of annealing cases prior to reloading and if 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 one 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 as many competitions are "lost brass" in that you will not be allowed to recover any cases. If you don't shoot in competitions that have a lost brass rule or are always able to recover most of your cases, then it is a horse of a different color. If you're recovery rate is high, then it is certainly worth the effort on a precision rifle such as a 6.5CM, .260 or .308 that you are using for some long range application or precision application.

There are several accepted methods to accomplish this task, depending on what kind of investment in funds and time you are willing to make. 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 which 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 ridged 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, eventually it will crack in the neck. I have cases that I have fired over a dozen times that have not had this failure, so that is something to think about. 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 is very dependent on neck tension.

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.

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 degrees.

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 and then quench it in water. However, for about $325 you can buy a well-designed machine to handle the cases in an automated fashion, the BC automatic case annealer. If you really want to get into this, that's the way to do it as it 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 and rupture, split or release the high pressure gases into the action and ultimately in your face.

If you want to explore this topic to its ultimate conclusion, I'd recommend this outstanding dissertation on the 6mmbr.com web site written by Ken Light and Jim Harris.

http://www.6mmbr.com/annealing.html

Bullet selection:

Bullet selection is completely dependent on load application and to some degree the rate of twist of your barrel. We will discuss this here in generalities and later specifically relating to individual cartridges and loads. Inside 300 yards, ballistic coefficients (BC) are nearly irrelevant as 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 not being a concern). When we start shooting to 400 yards and beyond, BC does play a significant role in trajectory and retained energy and 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, FJM type projectiles which are formed from the tip rather than the base typically will 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 many pick and choose bullets based on what your application requires.

The rate of twist of a particular barrel will have a bearing on the length of a bullet that can be stabilized. Some think it has to do with the weight but the weight is actually a function of the length vs. the material and 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 and 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) and 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 that 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 and barrel selections were 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 length or 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 manufactures information on this subject.

The Ballistic Triangle:

While we're talking about ballistics, let's break it down into the three categories:

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.

Powder selection:

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 what would be the medium burn rate will 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 the last ten years and we now have high tech powders that have 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, 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 Vmax 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 multi gun circuit. I yielded about 3000 FPS MV out of my 18" LW rifle and was totally reliable and sub MOA accurate.

I was getting ready for the 2012 JP RM3G and 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. Half way through this stage I made a reload with a mag that contained this new 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. Not with this lot of powder!

So every time you change lots of powder, 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.

Many people want to duplicate some 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 previously in this section. Any powder that doesn't make the "spec" for a canister powder is sold to a manufacture. 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.

Primer selection:

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 which cause US manufactured primers to sit proud causing a head space 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 recently acquired some Winchester large rifle primers that fit to 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 manufacture has something called a match or bench rest primer series for accuracy applications.

Ignition reliability is also affected by the choice in primers with "military" grade primers having lower ignition sensitivity, or in other words, 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 and they also have very low sensitivity and are harder to seat properly. This becomes a problem with some trigger set ups 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 set up 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, 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 aware of and 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, bench rest 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, such as 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 it's 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 set up 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 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 my category one cases, tumbled, and run them through the complete loading process on the C&H press, resulting in one complete round on each pass. For my accuracy loading, I use my category two 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 can't waste anything.

If you don't cull these cases out now, you will have a dropped primer in your rifle and 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 and your day at the range will be wasted. I've learned all this the hard way 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-manufactures has a check for this also. DO NOT assume that the charge dropped correctly and 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 fell 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.

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 bench rest 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 over-all 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 of these long range matches I attend 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 and 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 as 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, etc. I load the same for my bolt guns as I do my gas guns at this point.

The ammunition MUST drop fit the chamber for a self loader. That's why neck only sizing, a common technique with bolt guns, is not an option with a self loader. The JP case gages in 223 and 308 are cut with the same type of finish reamers we use on our chambers and are true representations of the chambers in our rifles. For the .260 Remington or the 6.5 Grendel®, purchase case gauges from L.E. Wilson, Inc.

After all this, you should have a new appreciation for what goes into making high quality factory ammo. High quality brand name ammunition makers have very high 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" which cannot be sold into the retail market. No wonder factory ammo is expensive!

Other Reloading Concerns:

Cartridge Dimensions:

For loading of cartridges chambered in the short 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 run out do to tip variations. If you measure ten rounds with this type of bullet, you'll be surprised at the run out. Don't be concerned about this. This 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 FJMs with canalures should just be seated with the case mouth edge somewhere in the grove 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 which result in the engraving of the bullets by the lands when chambered as this may result in 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 over-pressure 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, longer than SAAMI spec and 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 the recent mags will accept the factory 118 without interference.

The never ending debate about chambers:

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 and the lead with the 5.56 chamber a bit more liberal in the body and using a longer lead and the .223 Remington commercial chamber a bit tighter in the body and 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 as any manufacture should expect that military ammo will find its way into any firearm chambered in .223 Remington and NATO spec ammo and some commercial ammo using the VLD type bullets (77-80 grains) may have pressure issues in the commercial chamber.

Here's the history. Back years ago when manufactures 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 45-55 grain range, perfectly suited to these barrels. Later, military ammo became inexpensive and popular for use in these rifles with many deciding not to reload. This proved problematic with some NATO spec ammo and ammo using the longer bullets like the 77 SMKs. Also, 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 the high power shooters specifically designed to allow use of the 80 SMKs and this chamber happened to tolerate all ammunition (NATO or commercial) without pressure issues due to the longer lead. We tried this chamber and did not give up anything in the accuracy department so we made it our default. Most other manufactures followed suit.

We've been using the Wylde chamber for so long now with such a great track record, I feel confident that it delivers 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. Most 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 his here. 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 (true) 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 our 16 and 14" carbon steel chrome lined barrels that we offer for agency patrol rifles as they often specify that chamber. However, 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 gun world, I doubt if any major manufacture is still using a .223 Remington commercial chamber in any barrels.

Pressure indications:

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.

A word about catastrophic case failure: It's 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. If you reload, you will experience this sooner than later as that "bad case" or mistake on your part will eventually occur. Although unpleasant and always a surprise, the usual result is a destroyed magazine. In some cases, damage to the upper and/or lower receiver, a destroyed bolt or bolt carrier can occur in more extreme incidents.

The AR type rifles are inherently designed to direct the results of catastrophic failure away from the shooter and it is very rare that anyone incurs injury, assuming you ware safety glasses when you shoot. If you don't ware safety glasses and are more than a casual shooter, I can guarantee you 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 equipment in the same place, you might think of doing what Bench Rest shooters do. They take one of those Lee hand loading (nut cracker) tools to the range and assemble loads right there at the bench. It's not as much of a pain as it might sound. Just take a bunch of sized and primed cases, one of those nice little battery powered digital scales and the Lee press with your die set to the range, along with the powders you intend to test and you're in business.

In generally, best accuracy at safe pressure is usually achieved at something less than maximum recommended loads. I'd recommend getting a manual from each manufacture and in particular, get the Sierra ballistic software which has load date for not only Sierra but ballistics for just about every projectile on the market. Stay about 5-10% below the maximum recommended charges and 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, MV or velocity extreme spread and SD are not all that critical. However, the further 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 the velocity is one of the pillars of long range unknown distance 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 as it 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 range targets in actual field conditions is a difficult proposition (no matter what the makers of the range finders say) and depends on how much you spent on your range finder and

atmospheric conditions that day. In many cases, you may not be able to get a range off the target at all and must 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+" of drop! It should be easy to see that hitting something with at .260 Remington using a 123 Lapua SCENAR traveling at about 2900 FPS MV is much more probable as it drops about 20" per 25 yards at 1000 yards.

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

Traditional wisdom as dictated that the longest projectiles with the highest BCs were the only way to go for extreme long range shooting. However, my experience has shown that higher MV at a slightly lower BC is the best 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 (ie: 300 Whisper/BLK or similar platforms), it's a completely different story, but we will only discuss supersonic ballistics here.

Let me briefly discuss my first hand experience with this. The ITRC (International Tactical Rifle Championship)is a two-man event, with one shooter engaging with a semi auto (known as the "carbine" or secondary shooter) from 50 yards to 500 yards. The second team member, known as the "long range" or primary shooter uses a bolt gun or a large format gas gun and engages targets from 200 to 1000 yards, all unknown distance and unknown location. You have to find, range and compute your solution for all targets in the natural terrain over a 1.5-3 mile walking course over rough terrain. The match consists of two of these long stages and one high volume stage on the D&L square range and shoot house.

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 time, Chad Peterson, the primary shooter on my team shot the ITRC, he 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. Chad and Kurt Kisch (on carbine) then proceeded to win the event that year as no one seemed to be able to duplicate their performance on the long range targets. The following year, Chad kicked it up another notch and shot a Rem 300 Ultra-mag using the 155 SMK at 3400 MV winning again and 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 grain VLD type bullets at about 2900 FPS MV offer extremely flat trajectory out to 1K and beyond with high accuracy and minimal recoil and 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 it is necessary to understand its limitations. Using a Sierra 175 SMK loaded in the 308 to about 2600 MV (typical) impacting at 1000 yards, a 20 foot velocity variation equates to another 7 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 to moly coat, that is the question:

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). Midway sells a kit which includes a cheap vibrating polisher and several bowls and a tube of powdered molybdenum disulfide, a disgusting black powder that will get on everything. Yes, it's a mess but it's worth it in my opinion.

It's easier if you're like me and buy bullets by the 1000 or more rather than just a box at a time, allowing you to do a batch that will last you for a while. The vibrator they sell you will not last long as it is a cheap POS, so eventually you'll end up buying a good one by Thumbler's Tumblers. They last forever as they're designed to polish rocks and run continuously.

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 the lost on the bullet. I hang on to this impregnated corn cob and use it 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 over loading due to the weight. A run time of 2 hours is plenty to accomplish the task. I 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. Ware a mask when you empty this thing out as the fine powder will be everywhere and you don't want to get this noxious stuff in your lungs or you'll be coughing up black stuff for a day like you worked in a coal mine.

I 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 and increase) in MV with the same powder charge as the peak pressure will drop.

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. If for 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.

The ladder test:

Taking your load development a step further, you might choose to do a "ladder test". What is a ladder test? It 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 on this is available at:

http://www.6mmbr.com/laddertest.html

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

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, draw on that experience and use those tools 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, and 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.

The bottom line:

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 high school 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 and under the care of two other senior team members who taught me the ropes. Between them and my coach, I excelled at this and eventually captained that team and then went on to the University of Notre Dame and shot on their ROTC team. One of the things that occurred to me in about my second year of this sport was the relative values of the three position targets in the aggregate, prone, kneel and off-hand. You 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 team mates spend most of their time practicing the prone and kneeling as they became obsessed with shooting that perfect 100 point score. It occurred to me that most of them were shooting in the 70s or less in the off-hand. I decided to spend very little time on the prone and kneeling and to be perfectly happy with a mediocre 97-98 in the prone and a 90-93 in the kneel, but concentrated on the off-hand. Soon, I was shooting 85-90 in the off-hand position and pulled 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 bench rest

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 rim fire titles in this game for about 7 years in my home state.

What's the moral of this story? 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 bench rest rifle to be a great practical shot. It's really the rest of the skill set that adds up to the end goal, such as 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 miling or estimating. So choose wisely when it comes to the allocation of your time and resources. In so doing, you will maximize your potential.

Load recommendation by cartridge:

Note that I limit this to the cartridges that we actually chamber for in our rifles.

.204 Ruger:

Our barrels in this caliber run a standard SAAMI chamber and a 1 in 12 twist. They favor the bullets in the 30-32 grain range. I'd recommend 32 grain polymer typed 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 40 grain (or similar) bullets still shoot under a minute, but are not as well stabilized in the 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 32 grain Vmax load.

.223 Remington or 5.56 x45mm NATO

We use a 223 Wylde chamber on our competition barrels and the 5.56 chamber on the 14" and 16" on our 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 turn in 8 (actually 7.8, but who's counting). Many powders will do a great job. 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. The following link leads you to an extensive test on brass case vs. steel cased ammunition and is well worth watching:

http://www.luckygunner.com/labs/brass-vs-steel-cased-ammo/#reliable

However, the Hornady steel cased ammunition is loaded by Hornady so at least the propellant and projectile are of top domestic quality and we have achieved excellent accuracy and reliability using the Hornady SC ammunition. In addition, we have customers running many thousands of rounds of this ammo through JP rifles with excellent results. But 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.

In any case, 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.

Projectile choice depends on your application. Although we run a 1 in 8 twist rate, don't assume that you can't shoot the lighter bullets. Some of our best test groups have been with 50 grain polymer tipped bullets such as the Nozler Ballistic Tips and Sierra Blitz kings and Hornady Vmax. 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 the 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 45 grain 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 50 grain range will perform very well inside this range. If your application is punching paper for groups or eliminating varmints, polymer tipped bullets from 50 to 60 grains would by 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 69-77 grain range.

RamShot TAC and CFE-223 are propellants I would recommend with the heavier bullets, in particular the 69 or 77 grain 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 77 gr. 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 69 grain bullets.

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

However, I recently acquired a large quantity of the new Sierra polymer tipped 69 and 77 gr bullets as their BCs are incredible thinking these were going to make for the ultimate long range precision bullets for my 223 rifles. However, I had to drop about 3 grains off the charges and almost 400 FPS MV to get close to a MOA with these bullets. So I'd recommend sticking with the tried and true, the BTHP SMK or Nozler equivalent.

Many powders will work fine with the 69 SMK. It is the 77 grain (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 (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 use this upper for a DMR rifle when I shoot 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 new bullet that I've had extremely good luck with is the Hornady 53 gr Vmax. This bullet 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 69 SMK. I can push this bullet to about 3200 FPS out of 18" with 26.8 grains of Ramshot TAC and accuracy in the sub half MOA range out of some of my uppers. At that MV with that BC, it will probably be my new load for multi-gun competition, not to mention a great varmint load with the terminal ballistics of that projectile.

If you're just punching paper at known distance with these loads, velocity is somewhat irrelevant and you may 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.

.223/5.56 Factory ammo recommendations:

For lower cost practice ammo try the Federal American Eagle or the Hornady steel cased ammo. The Hornady 55 HP SC ammo will give outstanding accuracy out to 200 yards. The 75 grain match SC load will perform pretty well out to 600 yards. MV on the 75 grain load is only 2560 (as tested from my 20" upper), so a bit on the slow side, but accuracy is good.

For match grade ammo try the Ultra Max 50 grain Nozler Ballistic Tip reloaded. I use this for a base line accuracy test load in our rifles as it is capable of ½ MOA or better performance from most of our rifles.

The Hornady 55 HP SC ammo will also yield ½-3/4 MOA performance at ranges to 200 yards. Black Hills has some great entries in both factory new and re-manufactured rounds in the 69 and 77gr Sierra Match Kings. The SMKs seem to shoot better in the BH than the Hornady for some reason.

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

6.5 Grendel®

This cartridge yields the longest range potential possible out of the small frame AR-15 type 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 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 123 range, either the SCENAR or the Amax. 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 manufacture 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 Amax 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 half 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 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? 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 Amax, moly coated with 47.5 grains of Hodgdon SuperPerformance and this load will print in the ½ MOA range pretty consistently. The exact same load with non coated bullets prints into about 1.3 MOA. I have no explanation for that but It works for me.

For hunting applications on midsized game, from hogs to 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 Amax. The Speer 90 gr TNT offers excellent performance on larger varmints with outstanding accuracy also. Refer to the Alexander Arms loading tables on the AA web site for powder selections.

There are some compatibility issues with various factory ammunitions due the fact that the 6.5 Grendel® is a specialty cartridge, still making the transition from wild cat to mainstream production, and some factory loaded ammunition may not be compatible with every rifle. If you choose not to reload and 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 Amax. The LB rifles have a bit longer lead and this ammo may have excessive pressure in some other chambers.

Factory ammo recommended ammo: Alexander Arms 123 Lapua, Hornady 123 A-max loaded ammo.

.260 Remington or 6.5 Creedmoor in the LRP-07

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 a hand loaders rifle as much of the factory ammo is not compatible with gas operated rifles as the loads are the product of development in bolt guns, not gas guns. Pressure curves on factory ammo are typically not well suited for use in gas operated self loaders as the manufactures are going for maximum velocity for marketing reasons. In addition, most commercially built rifles run 1 in 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 new Berger 130 AR Hybrid and that should also be an excellent gas gun load as it has been developed specifically for that application.

Our barrels run a SAAMI type chamber and a 1 in 8 twist rate. The 8 twist makes it possible to stabilize the heaviest projectiles made in the caliber, up to 142 grains, but is also will generate 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 Amax for a great all around compromise between MV and BC for use in long range unknown distance applications. Here is a couple loads I've had good luck with:

42.5 grains of Vihtavuori N-550 with the 123 Amax or 123 Scenar (moly coated) and a Federal 210M. (Drop two grains if you want to use a non-coated bullet)

47.5 grains of Hodgdon SuperPerformance with the 123 Amax (moly coated) and a Fed. 210M Drop two grains if you want to use a non coated bullet.

44.6 grains of Hodgdon SuperPerformance with the 140 Amax (moly coated) and a Fed. 210M

If you're like me, your cheap and 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 break down and buy some .260 Rem brass of 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.

308 Winchester in the LRP-07

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 in 10 twist rate which is faster than some other manufactures. This was done to insure peak accuracy with the 175 SMK ammo (M118LR) used by our military customers. However, excellent accuracy with bullets as light as the Hornady 110 Vmax is no problem.

In fact, for typical three gun matches in the Heavy Metal divisions, the 110 Vmax 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 Vmax at close to 3000 FPS MV will get the job done. In fact, if you're shooting iron sights with a 25/300 zero set up, the flat trajectory of this load improves your hit probability with point blank shooting to a little beyond 300 yards.

I load the 110 Vmax 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, such as 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 so. Note that the terminal ballistic performance of the 110 Vmax is spectacular and for a varmint or hog rifle, is worth considering.

Sierra just introduced a new 125 grain 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 the 400 yard range, the various 155 grain bullets such as the Sierra 155 Palma or the Hornady 155 Amax 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 Amax. CFE 223 also works quite well with bullets in the 155-275 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 77-80 grain bullets for the 223 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. 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 my team shooters are migrating towards 8208 for its temperature stability. I don't have a lot of personal date 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 which 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 per 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 you 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 plus inches at 1000 yards. A 6.5mm 123 Lapua SCENAR at 2900+ FPS MV out of the .260 Remington is only down about 220" 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.

308/7.62 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 Pmag. 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 is 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 Amax

Freedom Munitions 168 Amax

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 optional. 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 south west, whether in competition or hunting applications. If you fail to do this, your ammo will soon be non-functional and even damage your chamber with the grit that has adhered to the sides of the case. So, for 4-5 cents apiece, I think this service is well worth it.

The 9mm Carbine (JP GMR-13 series)

We now have people asking about loading and buying ammo for the 9mm GMR13 carbines we build 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.

Loading for the 9mm poses more problems than you might imagine. The cartridge is actually tapered and there are no dies that size to a taper but rather, a straight wall partial size. Most dies actually oversize the case creating a bulge when you seat the bullet. This is the case with the dies I have and I have tried several. The problem this creates is that this bulge from the seated bullet is often not concentric with the base of the case and is causes eccentricity run out with the bullet vs bore relationship. Obviously, this is detrimental to the accuracy of the system and in some extreme cases, detrimental to the function of the system as it may even cause out-of-battery failures on recoil operated pistols. This is seldom an issue with a blow-back action such as the AR-15 9mm carbines as they have tremendous impact effect on seating the cartridge and can overcome most sizing and out-of-spec cartridge issues.

Once upon a time, I decided to shoot 9 major in the USPSA open division and acquired a beautiful SVI open pistol for the job. The SVI features many technological innovations, one being the interchangeable breach face which was a stroke of genius by Sandy Strayer. This idea allows for the manufacture of a standard slide configuration that was multi-caliber in its versatility through the exchange of breach faces. So, for the first time, you could get a 9mm 1911 type pistol with a breach face that was not a compromise, but actually designed for the

cartridge. This created a bit of problem on this particular pistol as the cartridge/breach face alignment became a hyper-critical area on the ammunition. Factory ammo (new brass) would run fine. But the ammo I was loading which functioned in all my other sloppy 9mm pistols would exhibit a 5% failure rate in this pistol as the some of the rims were just out of alignment with the body of the case due to the aforementioned problem. The pistol was incredibly accurate and I had groups under 1.5" at 50 yards with it so I didn't want to lose that "Bianchi cup" level accuracy just to get it to work with my reloads, but I did open the breach face up a bit. This was still not the solution so I had to reevaluate how I loaded the ammo. I was using a Dillon Square Deal for which I happened to have a 38 Super size die. I replaced the 9mm with the 38 Super die and this got rid of this bulge in the case and I was able to load perfectly concentric ammo. The problem was that I had to use 147 gr bullets as the 115 or 124 would not reach the case web and had no neck tension in the case. This die would only work with the 147s or a 130 grain lead conical lead bullet that was sized to .358 for my revolvers. (No, you're not going to blow your gun up shooting an over-sized lead bullet if you develop the load for that bullet. It just swages down to size when you shoot it, giving an even better barrel to bullet fit.) In conclusion, I now had ammo that was near perfect and could exploit the full accuracy potential of this pistol with 100% reliability and this combination has netted exceptional accuracy out of all my other 9mm platforms.

So it was down the rabbit hole I went with that problem and once involved, I couldn't let it go until I followed it to its conclusion so I share that knowledge with you to save you some potential headaches. Let me say that my previous 9mm hand loads did function well enough in my other pistols such as my Glocks that I never thought to analyze the occasional ammo related blip. Note that this ammo did gage, but still caused this out-of-battery failure on my SVI open gun. (Don't ever go to a match with ammo you have not gaged, pistol or rifle.)

As I mentioned before, 9mm blow back carbines have tremendous impact effect when seating a round in battery so slight anomalies will probably not effect reliability. However, if you intend to shoot the lighter projectiles, you'll have to get a tighter size on the case and my technique will not work. 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 115 grain 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 I'd say for competition purposes. However, if you intend to use the carbine for home defense or to take game, the Hornady 147 XTP or equivalent is tough to beat as you can achieve some very respectable MVs and that bullets sectional density results in high penetration. For 357 magnum ballistics with these bullets, I'd recommend using AA-7. Note that good brass is essential as you reach the higher pressure levels for this cartridge, especially in a blow back

design which may start to extract while the case is still pressurized, resulted in a case failure. If you hear an unusual "pop" near the receiver, this may be a case rupture and you should stop shooting, unload and check to make sure that the bore is clear. These case failure type malfunctions seldom cause damage to the receivers or components of the system as they would in a 223/5.56 round as the working pressure of the 9mm is considerably less. But it is an issue that must be properly dealt with when shooting to avoid compounding the problem with an obstructed bore.

If you intend to get by cheap and load paper punching practice ammo with lead bullets, Bullseye or HS-6 would be my recommendation. Many people think that Bullseye is a dirty powder. This is not the case as it is the lube system on most cast bullets that causes the smoke, not the powder. The newer generations of polymer lubed lead bullets yield very little smoke on firing and I'd recommend going that route. The real advantage of Bullseye with cast bullets is that it develops a rapid initial pressure spike that upsets the base of the bullet in the bore, creating a better seal than some slower burning powders. Bullseye is a double based powder formula that has the highest percentage of nitroglycerin of any of the double based powders. Hence, its unique internal ballistics that lends itself for use with lead bullets. The down side is that this powder is only useful for lower velocity loading. It is the WRONG choice for high performance loads with jacketed bullets. The HS-6 is ideally suited for that application with the lighter bullets and the AA#7 with the heavy projectiles like the 147 and the new 165 plated bullet by Freedom Munitions. Incidentally, this 165 grain round nose from Freedom Munitions yields the lowest recoiling minor power factor load in a pistol that I've tried to date. You might think you're shooting a rim fire.

We finally had a GMR-13 come back for an accuracy work up. It was bound to happen. I was at the 100 yard range doing accuracy work with the LRP-07s in 308 and rather than go to the 50 yard range where I would normally do 9mm testing, I just decided to have a go at 100 yards with this rifle. I had some of the Freedom Munitions new ammo loaded with the Hornady 124 XTP. I purchased a lot for testing as I knew this was a bullet of choice for the Bianchi Cup crowd and they are fanatics. Their pistols must be capable of at least 2" accuracy at 50 yards to be competitive. I attached my usual test scope, a Leupold 6.5x20 VariX III target scope and proceeded to shoot a 2" 100 yard group. When I saw that, I really buckled down and then shot another 5 round group with 4 into an inch and a flyer at 1.5" which I'm sure was me. So it would seem that this load is capable of one MOA accuracy (at 100 yards!) out of a 9mm carbine if the shooter does his job. Incredible!

To conclude, here are some recommendations of factory ammo and some reloading recipes for those of you that are true masochists. Note that there are many 9x19 loads that will function just fine and yield acceptable accuracy out of the GMR-13 series carbines.

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

Freedom Munitions 165 RN: 4.3 grains of HS-6 for a minor pistol load that will also function in the GMR-13

Montana Gold 147 Flat Point: 5.2 grains of HS-6, minor pistol power factor

Montana Gould 147 flat point: 8.5 grains of AA#7 for a major PF load.