TRAIL BOSS K.I.S.S

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Forgive me father, for I have sinned. I have strayed from the gospel of published load data and delved into the dark side of trying things out for myself. What led to my fall from grace? Blame it on Charles E. Petty. In the 2007 Hodgdon Annual Manual, he penned an article entitled, “Trail Boss- It’s Not Just for Cowboy Action Shooting”. The article delves into developing home brew plinker loads using cast bullets and IMR’s innovative Trail Boss powder. Well, if a powder company is basically going to endorse at home load development of this type….we’re game.

We set out to make this an article on keeping things as simple as possible (hence the title). Our goals were several:

1. Look at several different calibers of mil-surp rifles in/around the .30 cal size.
2. Use ONE load of ONE powder keeping velocities down below 1400 fps
3. Use what we had on hand for bullets/bullet moulds
4. Make a good enough plinker round without optimizing for any one rifle or load
5. Save time and money

So, let’s look at the goals. In scouting out how we were going to do this, we started out with the .303 British by itself. Using the described technique from the Petty article about case capacity, a load was developed as a test. Using a No. 4 Enfield, a load of 9 grains of Trail Boss under a 185 grain .314” unsized cast bullet (Lee mould #C312-185-1R) was made. The results were so promising that we wanted to open up the field to other calibers. We chose around the .30 cal size of rifles because, well, basically, nearly all

mil-surps and especially the main mil-surps, are in this caliber range.

Would a single powder charge work across a spectrum of calibers? Let's look at it in a logical way. Nine grains of Trail Boss topped with a 165 grain LFP bullet is the listed max load for the 30-30 cartridge. This is the closest cartridge to our mil-surp family that is listed. The 30-30 has a case capacity of 2.45 cubic centimeters (cc). This is far less than any of the mil-surps. Petty lists a 9 grain load of Trail Boss for the 30-06. The 30-06 has a capacity of 4.38cc, the largest of the mil-surp cartridges. Since the 9 grains of Trail Boss is safe in the 30-30 and did not leave a bullet in the bore of the 30-06, it was assumed it would be safe in the rest of cartridges of interest. You can also see that the working pressures of the cartridges are at least 37,000 cup.

Cartridge	Case Capacity	Max working pressure
30-30	2.45 cc	38,000 cup
308 Win	3.43 cc	52,000 cup
30-40 Krag	3.49 cc	40,000 cup
7.62x54R	3.59 cc	57,000 psi
7.5x54 French	3.68 cc	40,000 psi
7.5x55 Swiss	3.90 cc	45,000 psi
30-06	4.38 cc	50,000 cup
303 British	3.28 cc	45,000 cup
8x57 Mauser	3.69 cc	37,000 cup (old rifle)
8mm Lebel	4.10 cc	37,000 cup (old rifle)

The final step for this article was to look at what we had access to. So, between us, we selected the No. 4 Enfield, Springfield 1903, Mosin Nagant 91/30, Swiss K-31, French MAS 36, and the Spanish FR-7. We figured that if this worked, a second article with other calibers would be in order.

Time. It's the one thing that no matter who you are, how much money you have or how ever old you are, you have a finite amount of it. So we set out with the question…is it possible to create ONE load with ONE powder with ONE bullet to be used across the board on several calibers of rifles. We wanted to cut down on the amount of time that you would spend on lubing, sizing and then re lubing the bullet again. And save on the money and effort of the copper gas check as well. Because we wanted to negate the gas check, we focused on keeping the velocity of our loads below 1400 feet per second (fps). We wanted to make a decent plinking round, one that would print at least as well as mil surp ammo with a lot less wear and tear on the shooter and rifle AND be cheaper. Could this be done?

We had on hand, already, a few moulds with acceptable bullets to use for the .30 cal family. All were Lee moulds. All bullets were cast of cleaned wheel weights and lubed with Lee Liquid Alox. None of the cast bullets were sized after casting, nor carried a gas check. One thing to keep in mind when using a non sized cast bullet is that there is a risk that the seated bullet will enlarge the mouth/neck of the case to the point it will not chamber easily. Upon firing, this can cause a pressure spike to form. Most likely, in the case of what we are doing with the load we are using, the pressure formed will still be way below the max pressure. However, it is better to be safe than sorry and you should check each load/bullet/rifle for chambering problems.

The moulds that we had on hand were:

160gr .312" Lee # CTL312-160-2R. A tumble lube bullet designed, according to Lee, to be used simply by lubing with Lee Alox and loading. This mould produces sharp pointed bullets

180gr .311" Lee # 309-180-R. A round nose bullet of traditional design. May be sized and gas checked if you wish.

185gr .314" Lee C312-185-1R. Another round nose bullet of traditional design to be used in the slightly larger .303 British or 7.7 Japanese rounds. This one may also be sized and gas checked if you wish.

And that is it. All the bullets fired came from one of these three moulds. Period. Simple and straightforward. You can learn about casting at the Surplusrifle.com article:

http://www.surplusrifle.com/reviews/castingintro/index.asp

Oh, and by the way, all of the casting equipment, reloading dies and the press used were made by Lee as well. Just cannot get away from the affordability of their equipment…. (plug, plug, wink, wink, nudge, nudge, say no more…..)

So, looking at the above list of things, that just leaves a few "minor" items to talk about. The brass was all either boxer primed commercial or re used mil-surp brass. All rounds were loaded with standard CCI 200 large rifle primers. And the powder we picked was, of course, IMR Trail Boss. What about costs, that is after all one of the main reasons we all reload.

In the past, I have reloaded a mild recoil round for my 1903A3 30-06 rifle that used 16gr of A2400 powder under the same 180gr bullet listed above, HOWEVER, I gas checked the round because the velocity was approaching the 1400 fps or more mark. Gas checking the bullet meant that I had to take the time to lube the bullet twice (once before sizing, once after sizing). I also have to add in the cost of time and money to install the gas check, which, by the way, is cost wise going through the roof like other copper items. Using these components and loads as a comparative example we can do some cost analysis for the powders using our designated loads.

A2400 powder runs about $18 a pound locally. Trail Boss runs $12 for 9 oz.

One pound is the equivalent of 7000 grains. So that means that we can get about 438 loads of 16 grs out of one pound of A2400 powder. A 9 oz. can of Trail Boss is the equivalent of 3938 grs. Using the 9 grain load of Trail Boss, you can see that you will get the SAME number of shots out of one 9 oz container of Trail Boss as the 16 oz container of A2400! BUT, Trail Boss will be about $0.027 per shot while A2400 will come out to be $0.041 per shot. So, yes, you are buying a smaller amount of powder (actual CONTAINER is the same size…we'll discuss that in a moment), BUT it is cheaper per unit than the A2400. One thing to remember though, we ARE reducing the velocity of the cast bullet between the two powders. That is not in the comparison. But will accuracy, the bottom line, be affected by this reduction in velocity….we'll see.

Figure 1

Left is a 16gr pile of A2400. On the right is a 16gr pile of Trail Boss. Note that the Trail Boss is made up of little "donuts".

Why use Trail Boss? Other than cost, some other reasons are appropriate to mention. Trail Boss was specifically designed to be used with lead cast bullets. You do not need to gas check the bullet because you will not be pushing that velocity envelope. Another reason is safety. Trail Boss was originally designed for pistol loading, it has a very high bulk density, which means that even a small charge takes upwards of 78% more volume in the case compared to other powders. It comes in a container that is physically the same dimensions as other IMR powders. It is therefore more safe for the reloader as it is harder to double charge a case, especially when it comes to pistol reloading. The powder also seems to be insensitive to position in the case. That is important when you are working with large case capacities and not filling it completely. Trail Boss can easily hit the 50% case capacity with a light load. We have also seen that it is a very clean burning powder as well. One thing we did notice was that SOME powder dispensers may have an issue dispensing this donut shaped powder. A Hornady powder dispenser was acting strangely, it would drop ½ a LOAD less one time, and a load and a ½ MORE the next. Apparently, the powder was being MEASURED correctly, however it was hanging up in the dispensing tube. We switched to a Lee Prefect Powder measure and that solved the problem. Apparently, the polymer construction or the physical engineering of the dispenser was such that the powder dispensed correctly each time. CHECK YOUR POWDER DISPENSER!!! (you should do that anyway, regardless of what powder/charge/dispenser you are using).

Figure 2

Our test panel. (L) .308 180gr, .308 160gr, 7.62x54R 160gr, 7.62x54R 180gr, 7.5x54 160gr, 7.5 Swiss 160gr, 7.5 Swiss 180gr, .303 185gr, 30-06 180 short, 30-06 180 long

Range Results

.303 British

The rifle used was a Savage contracted No.4. The barrel condition is near perfect. Sights were standard ladder type set for 600 yards. The bullet used was the 185gr cast bullet, again, no sizing, no gas check and lubed with Lee Liquid Alox. CCI 200 primer and the 9 grs. of Trail Boss powder. Over all length was set at 2.885" and the bullet was seated on the top lube groove.

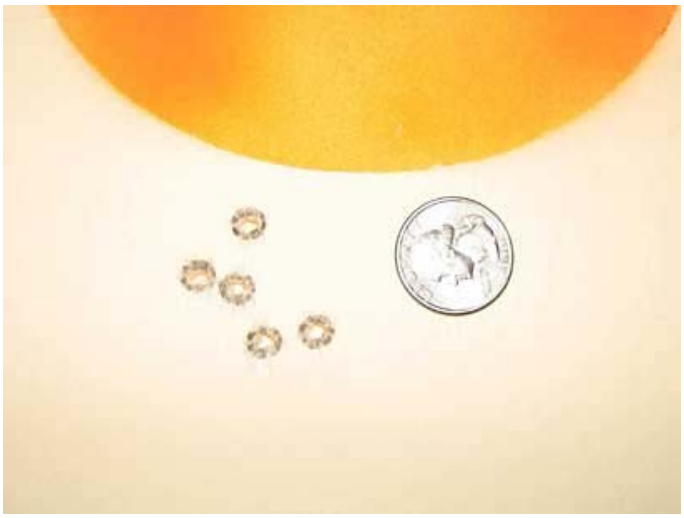

Figure 3

.303 British, 50 yards off the bench. Set the ladder sight up to 600 yards. Average velocity was 1088 fps.

This was the original test load that Jerry used to see if the idea was even feasible, and, as you can see, it is VERY feasible! Using the great sights on the No. 4 was a pleasure, and, in fact, it was the best shooter of the bunch. To test this round further, we took the same ammo and gun and popped over to the 100 yard range.

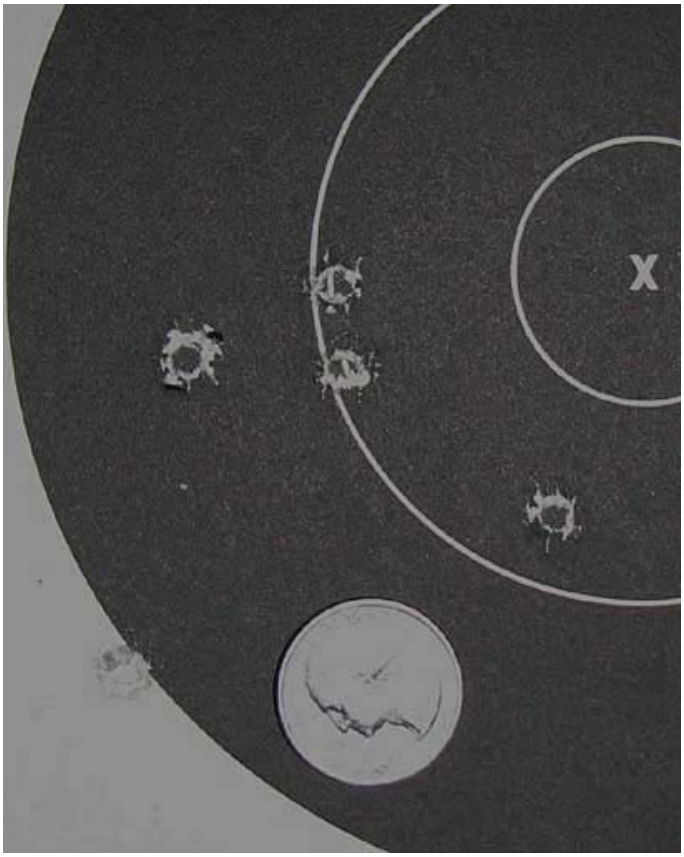

Figure 4

At 100 yards, the rifle printed this 5 shot group. The only adjustment was to move the sights to 650 yards.

Overall impression is that this bullet, this powder is SUPERB for this rifle. Recoil and muzzle blast is very light.

.308 Winchester (7.62 NATO)

Figure 5

The FR 7 was the subject rifle had the atypical near perfect mirror finished barrel. The rear peep was adjusted to the 300m aperture, which is the second, counterclockwise from the "V" sight.

The .308 load was made up with two different bullets. The 180gr round nose bullet was seated to an overall length of 2.603". The 160 gr pointed nose bullet (tumble lube) was seated to 2.673" overall length. What we tried NOT to do is seat the bullet base below the neck of the cartridge in any of the loads that were made. Results were good for the FR7. The major issue was that yours truly once again left the sight adjustment tool at home and we were forced to turn the target sideways because the rifle was shooting way right. Still, the rifle fired some nice groups with either of the bullets loaded.

Figure 6

5 shot group using the 180gr cast bullet and the FR7 rifle off the bench at 50 yards. Velocity was clocked at about 1100 fps.

Figure 7

5 shot group using the 160gr cast bullet tumble lubed and the FR7 rifle off the bench at 50 yards. Velocity was clocked at 1116 fps.

Overall impression, like the before, the recoil is mild and report is a bit louder than the No. 4., the shorter FR7 barrel no doubt is the cause. Compared to shooting full ball military ammo, it is a down right PLEASURE to shoot. The sights on the FR7 are easy enough to use, but you need the adjustment tool to move the windage! Duh….

7.5 x 54 French

Figure 8

Chambered in 7.5 x 54 (or 7.5 French), this MAS 36 rifle was our one “failure”. Part of the reasoning was that this $36 rifle is pretty beat up. The barrel condition is pretty crappy. The chamber on the rifle was more than roomy for even a mil-surp. The 7.5 French ammo was loaded only with the 160 gr pointed bullet seated to the crimp groove. The overall length was set at 2.785” and the bullet was lubed with Lee Liquid Alox. Average velocity was 1137 fps. The rear sight was adjusted to 600 meters.

Figure 9

This is the 50 yard off the bench target for the MAS 36.
Uh…can you say PATTERN?

I went back and slugged the barrel on the rifle and it came out at 0.306". However, the rifling is dang near non existent. It is very likely that we would never be able to come up with a decent accuracy load for this particular rifle. We will have to revisit this with a rifle that has a better barrel on it, or a different bullet. Oh well, you can't win them all.

30-06 Springfield

Figure 10

The 1903 used in the test was in excellent condition with a near perfect bore and had a Timney single stage trigger installed on it.

The 1903 rifle has about every type of sight you would want to use on it. You can use the U battle or the battle notch sight or the aperture peep. Jerry shot the rifle using the peep and I fired the rifle with the bottom U notch sight. Both were set to 600 yards.

Figure 11

We used only the 180 gr bullet in the 30-06 case, but the bullet was seated at a “long” (seated to top groove at 3.155”) and a “short” (seated to crimp groove at 3.056”) depth to see if there was any big differences.

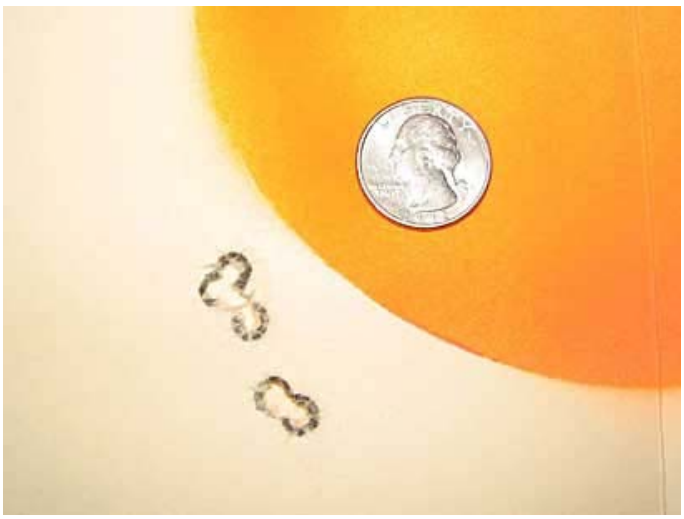

Figure 12

Jerry shot this target. The peep sights at 50 yards proved to be very accurate. This is the long seated bullet with an average velocity of a very consistent 1101 fps.

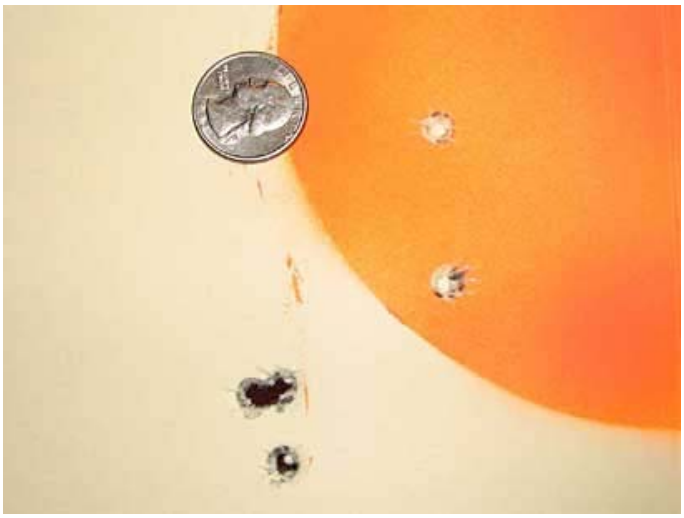

Figure 13

To be different, I shot the above target using the bottom U sight (set at 600 yards) of the rifle and used the deeper seated bullet. The first three shots were the cluster at the lower left, then I removed my shooting glasses (fogging over) and managed to ruin the group with the last two shots. Average velocity again was a very consistent 1097 fps.

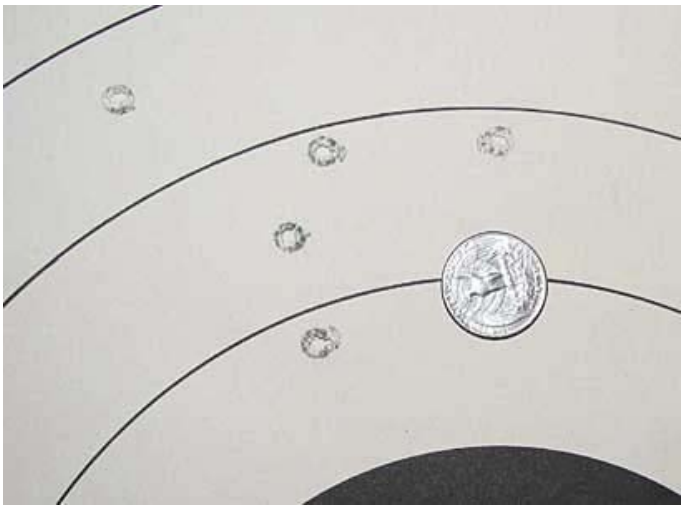

Figure 14

The Springfield, like the No. 4 Enfield, shot really well at 50 yards, so we took the same rifle and ammo over to the 100 yard range for a test. This was still using the peep sight set at 600 yards.

7.5 x 55 (7.5 Swiss)

Oddly enough, we expected more out of the Swiss K-31 rifle, but we did not see it. We figured that it could be a number of factors, some them shooter issues and some on the ammo. Shooter wise, both of us had some big time issues seeing the sights on the K-31

rifle. Both of us complained that the front sight was too narrow to see in the bright sunlight of the cloudless day against a brilliant orange target. Ammo wise, we figured that of all the rifles, the Swiss would be most dependent on bullet seating and overall length variables. Maybe we were too hard on ourselves after the great success of the Enfield and Springfield. The condition of this K-31 barrel would be very good to excellent.

Figure 15

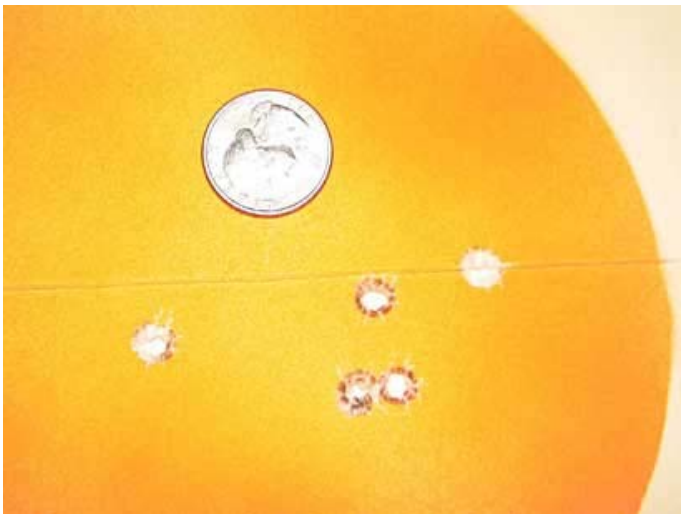

Figure 16

Two separate targets (figure 15 and 16) using the 180gr bullet seated to the crimp groove with an overall length of 2.719". Each of us shot one just to make sure that it was not just the rifle/ammo combo. Sights were set at 600m. Average velocity was 1096 fps.

Figure 17

Figure 18

Again, two separately fired targets (figure 17 and 18), this time using the 160gr bullet seated to the crimp groove, to an overall length of 2.858". Average velocity was 1136 fps

7.62 x 54R

Figure 19

The 91/30 Mosin Nagant pictured is the rifle of the “Mosin Burr” fame (see: http://www.surplusrifle.com/articles2008/mosinburr/index.asp)

Bore condition was arsenal nearly brand new….never fired because of bad chamber…! The sights on the rifle were again set for 600m and loads were made for both the 180gr and 160gr bullets.

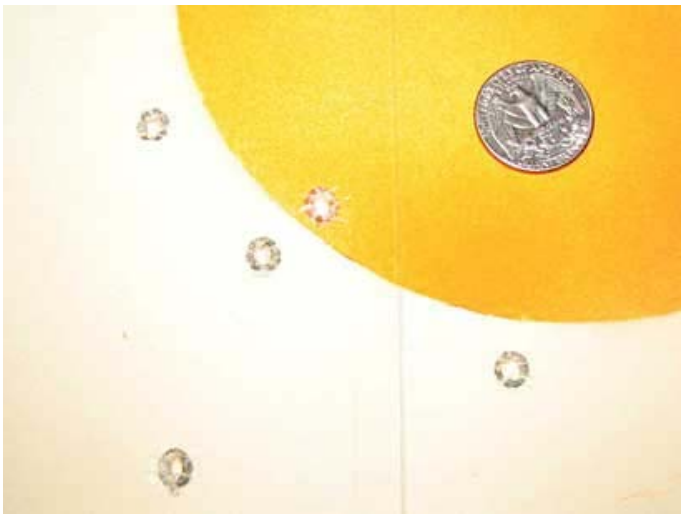

Figure 20

The 180 gr bullet had one of the more open groups of all the rifles tested (except the MAS 36). Overall length was 2.651”. Velocity was an average 1136 fps.

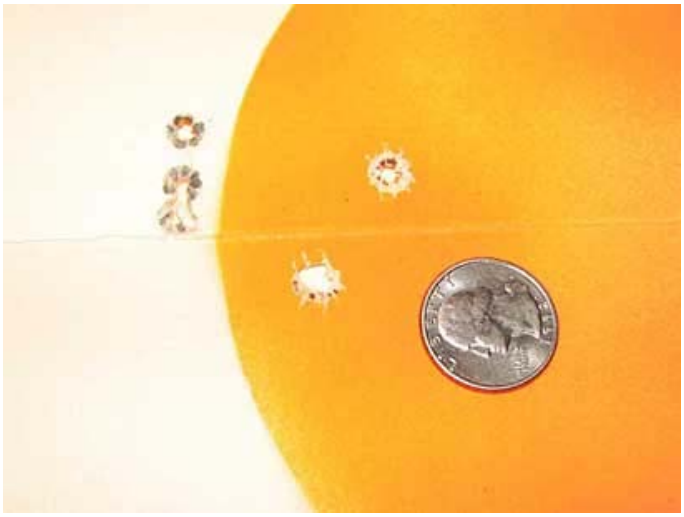

Figure 21

The 160gr bullet printed better groups. Apparently, the extra 0.001" in diameter agreed with the Mosin barrel. Average velocity was 1130 fps. The bullet was seated to a 2.782" overall length.

The Final Take

It would appear that we successfully accomplished what we set out to do. At least with what we have on hand and the particular rifles that we used. It is PROBABLE that the same loads and bullets would work in your rifles as well. (read the disclaimer at the top of the article). Use this article as a starting point. Adjust accordingly of course.

Remember, we set out NOT to optimize any component. Instead, we wanted it to stay as simple as possible. One thing that you have to understand, the photos of the targets above represent the ONLY targets fired. We did not load a 100 rounds of ammo and then shoot 5 shot groups on target after target to get the best target. We shot ONLY what you see. Sat down, loaded 5 (or however many shots) and just shot them for record. The only exception was the K-31 and 1903 rifles where we each fired one set of targets. You know, shooting paper targets is okay "fun". What we figure is that these types of loads would be IDEAL to shoot at gongs and swingers. The cast bullet is the only thing you should be shooting at steel targets anyway, and the velocity and accuracy of these loads/rifles ought to get the job done with no issue.

Basic observations across the board:

1. Less than 1200 fps across the board velocities does not require the gas check to be done.
2. Recoil and muzzle blast is very mild
3. Sights are nearly universally adjusted to 600 yards/meters on all rifles
4. Accuracy on the best rifles (No. 4 and 1903) held up to at least 100 yards
5. Little to no barrel heating shot after shot leads to no heat mirage rising off of barrel
6. Reduced cost for components and reduced expenditure of your time.
7. Extremely low wear and tear on the rifle and the shooter
8. Consistent velocities across the different calibers (average across ALL calibers/bullets was 1114 fps)

The final conclusion is that we need to try this again with some more calibers that are stored away in the safe. Stay tuned….

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