

# 6<sub>mm</sub> Competition Match

## Mission Statement:

1. Design of a cartridge capable of equal ballistics to the 6XC with 50% greater barrel life.
2. Design of a cartridge that is superior to the 6XC for 1000-yard competition.
3. The cartridge must have equal or better accuracy at all ranges, no more recoil than the 6XC
4. The cartridge must have the capability to shoot higher velocities for shooters that want a superior 1000-yard/long range cartridge.
5. Be able to use easily available commercial brass, bullets, dies and all other commonly available components and equipment.
6. The cartridge must require as little as possible fire forming. From the 1<sup>st</sup> sizing the brass should be able to be shot at all ranges giving equal accuracy to once fired brass.
7. Eliminate the need for bullet coating.

## The results of our research and experiences:

With over 10 years of experience shooting 6mm cartridges of all sizes the results have proven that the smaller 6mm cartridges like the 6XC, 6mm-22-250 and the 6BR do not obtain the longer barrel life expected from these cartridges.

Furthermore, the smaller of a case shot the lower the velocity you are able to obtain. Giving up a few hundred feet per second (like you do with the 6BR) doesn't pay back in the minimal barrel life you gain, if any barrel life is gained.

Shooters have resolved themselves to the fact that when shooting a 6mm the maximum average barrel life is 2000 rounds at best.

This is absolutely false.

The 223 and the 6.5x308 (260 Rem) can easily shoot 3000 round or more before the barrel is shot out. So why should the 6mm, that is between the two, get 1000 round less per barrel. **It doesn't!**

The perception among shooters is that smaller case capacity equals longer barrel life.

This is also false.

What our research and experience has shown is that barrel life is directly related to how much you push the cartridge. There is much we do not understand about barrel life, but our experience has proven that what we are doing works and works very well.

When you shoot a cartridge with less capacity you have to shoot faster burning powder to obtain equal velocities to a cartridge of the same bullet diameter with a larger capacity, or you are giving up velocity while still pushing the cartridge as hard as you can. (6BR, 6mm-22-250, 6XC).

Shooting the faster burning powder does three things to your barrel.

- 1) First; the faster burning powder burns at a hotter temperature. Steel, what all barrels are made from, is more malleable at higher temperatures. What this means is that the hotter the temperature inside the barrel the more metal that can be removed by the softer copper bullet. This is especially important in rapid fire strings and during practice where there isn't as much time between shots or strings. The difference in temperature from the faster burning powders to the slower burning powders is minimal, however over 2000 to 3000 rounds it does make a difference.
- 2) Second with the faster burning powder, the pressure behind the bullet goes up very fast and goes down very fast. The maximum pressure of the shot takes place very quickly in or around the throat area of the barrel. This puts the maximum force on the most important part of the barrel. Anyone who has ever bent a paper clip or wire back and forth understands that if you do it enough the material weakens and eventually breaks. Faster burning powder is doing this your barrel and overtime it weakens. This is obviously a factor in barrel life.
- 3) Third faster burning powder burns faster and burns more in the throat of your barrel. What this means is that the area where the bullet contacts the lands of the barrel takes all of the abuse. Not just from the bullet, but from the powder also.

What has been concluded from this is that faster burning powder stress the barrel more than slower burning powder, by the force of the pressure, by the heat that weakens the steel, and then by the burning of the powder.

To shoot a cartridge like the 6XC, 6mm-22-250 or the 6BR and obtain faster (desirable) velocities out of the larger 6mm bullets like the 107 or the new 115 you have to shoot the faster burning powders at higher temperatures and with more pressure being produced quickly. Subjecting your barrel to higher pressures, higher temperatures, higher stress and combusting all of the powder in the throat area of the barrel.

Our goal when we started this project. It was to shoot the 107 at 3000 fps period, no more. This equals the 300 Win Mag with a 190 grain bullet for 1000 yard shooting in ballistics (wind drift and drop). Since then the 115 has come on the market and it is the superior bullet for XTC and 1000-yard competition. This bullet shot at velocities around 3000 fps perform almost equally to the 6.5x284.

Remember all of this research was completed with the goal of developing superior cartridge for XTC matches. The added benefit to the cartridge is that you can shoot it at 1000 yards and not give up anything. In fact, it is equal to or superior to all of the commonly used cartridges for 1000-yard competition.

### **What our research and experience has proved:**

The initial goal was to shoot a 6mm 107 grain bullet at 3000 fps and obtain equal barrel life to the 308 Winchester.

What our research and experience has shown is that cartridges with larger case capacity, slower burning powder, loaded with a specific velocity goal in mind obtain much longer barrel life than the smaller capacity cartridges aimed at obtaining the same velocity, or in some cases a lower velocity.

### **The reasons for longer barrel life:**

- 1) First the slower burning powder burns at a cooler temperature than faster burning powders. These lower temperatures have a great affect on extending barrel life. The barrel is not subject to as hot of a temperature and therefore the bullets do not have as much of an affect on the steel as with faster burning powders. The barrel's steel is less malleable because of lower temperatures. You are not subjecting your barrel to the same temperatures you do with faster burning powder. Keep in mind that the temperature difference is minimal to you and I but to the barrel it is making a huge difference.
- 2) Second the pressure curve is much different with a slower burning powder. With a slower burning powder the pressure peak is down the barrel much farther. The pressure curve is much smoother and even though the peak pressure is about the same it stresses more of the length of the barrel. What this means is that you are subjecting your barrel to a lower average stress over the length of the barrel on every shot and the stress is spread over a larger portion of the barrel's length. Again, think of the paperclip, if you only bend it a little and bend it in different places it takes much longer to break it. The lower pressure and the pressure applied over a greater amount of the barrel adds to the life of the barrel.

- 3) Third, it burns slower. Therefore the powder is burning as it goes down the barrel. However, we want as much of the powder to burn in the case as possible and that is part of the design of the 6CM. The slower burning powder gives a more even affect to the barrel. The burning powder is less concentrated in one part of the barrel and barrel ware is more uniform.

### **Brass for the 6mm Competition Match:**

Custom brass is not necessary. Standard 243 Win brass should be used with this cartridge. The case is only slightly different in several areas. The changes made to the 243 Win were made with the goal of being able to shoot commercial brass, but increase barrel life and accuracy. All 243 Winchester cases can be shot in match condition either slow fire or rapid fire before being fire formed to the exact chamber dimensions. The design of the cartridge is such that positive headspace is obtained from un-fire-formed brass.

Trim to lengths and neck thickness is not an issue with this cartridge. We have designed the neck of the cartridge so that factory Remington or Winchester brass can be shot without turning down the necks. We do recommend turning the necks to an even thickness for long range.

### **Basic plan for loading for the 6mm Competition Match for XTC:**

In order to get the maximum life from your barrel there are three things you must do:

- 1) Shoot the 107 or 115 at or around 3000 fps. If you try to shoot faster than 3000 fps, and this cartridge will do that, you will decrease the life of the barrel. (because you will either have to use more or faster burning powder) 3000 fps is all that is needed out of either the 107 or 115 bullet for XTC shooting.
- 2) The powder you choose for this cartridge is a key. You must use a very slow burning powder that is of a single base design. The powders we recommend are N165, N170 and H1000. Using these powders you can easily achieve more than 3000 fps out of the 107 and 115. Using faster burning powders will obtain higher velocities, but will decrease the life of the barrel.
- 3) Cleaning the barrel is as simple as any other barrel you have owned. Simply use the solvent of choice and remove all of the copper and carbon fouling. (do not use a strong ammonia based cleaner as this does attack the metal as well as the copper) **Another key to longer barrel life is polishing the barrel every 200 to 300 rounds.**

As you shoot any barrel voids are created. Either from fire cracking or from regular ware of the barrel. These voids or cracks typically have sharp edges.

Polishing the barrel rounds out these sharp edges so that the bullets fired through the barrel do not remove any more steel from the area with the void or crack.

The polishing compound I use is JB.

**For loading the 6mm Competition Match for 1000 yard shooting:**

For 1000-yard/long-range competition many competitors do not consider barrel life. If you are shooting this cartridge for 1000-yard competition only it will equal or out perform the 6.5x284. Loading this cartridge with larger amounts of H1000 or N165 will obtain velocities at or above 3,100 fps with the 115 grain bullet. Possibly with little affect to the barrel life. Even greater velocities can be obtained from other powders, however barrel life will be decreased.

The loading for XTC (3000 fps) performs very well at 1000 yards and this is a cartridge that allows the shooter to shoot one gun XTC and at 1000 yards. **This is a huge plus to the shooter, that only shoot 1000 yard matches once or twice a year.**

You can shoot the same gun and the same load without giving up anything at 1000 yards. If you want to boost your load at 1000 yards you can get an advantage. The shooter can decide, depending on individual goals what loads to shoot for 1000-yard competition. However, you can shoot the same load at 600 and at 1000 yards and not give up anything to the 6.5x284's or the 300 Winchester Magnums.

For more information on this cartridge or to order barrels and dies contact Hendricks Shooting Improvements at 6CM@comcast.net *or 724-933-8110.*