



The 0.22 rimfire long rifle cartridge

Until recently contributions to the Welcome Pack have largely been of an instructional nature. However, I have received multiple requests to include articles of general interest to members of our club including something on the live firing ammunition we use in three of our disciplines. So here is my response. Enjoy!



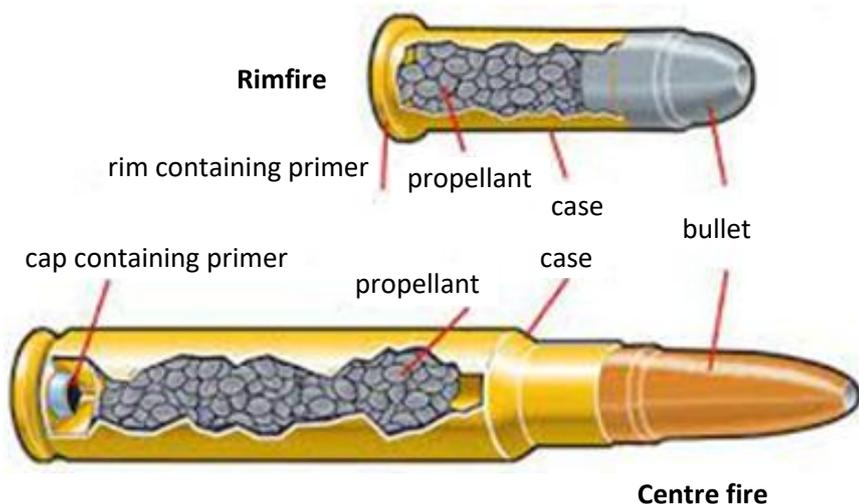
The story of the 0.22 rimfire cartridge began in 1887 when Stevens Arms & Tool Company made the first 40 grain (or 2.6g) bullet to fit their new long rifle which had a barrel bore of 0.22". In those days it was used mainly for light hunting. Today it is the commonest cartridge used all around the world. Many pistols, revolvers, rifles and semi-automatic rifles are now chambered to take the 0.22 LR cartridge. They are available in four velocity bands but only one should be used in target shooting; **subsonic**.

Why do we use subsonic ammunition?

Subsonic is below 1,100 feet per second (for younger members that is 335.28m per second.) The speed of sound is 343m per second. The ammunition I use (RWS Special Match) moves at a muzzle velocity of 330m per second, which is just under the speed of sound. How do I know this? Well if you look on your ammo box it may give you this information but it could be written in German! As objects move through the speed of sound they experience pressure disturbance waves. At these speeds a bullet's trajectory often becomes unstable and less accurate. Subsonic bullets do not experience this disturbance and are therefore more accurate. Subsonic rounds (why are bullets called rounds?), are also a lot quieter to use on indoor ranges than those travelling faster than sound. Have you ever experienced a much louder crack than usual when firing your rifle? Take a look at where it has landed on your target. It could be anywhere. Cheaper ammunition is not as precisely manufactured as more expensive stuff. A tiny bit more powder than usual in the cartridge will push the bullet beyond the speed of sound.

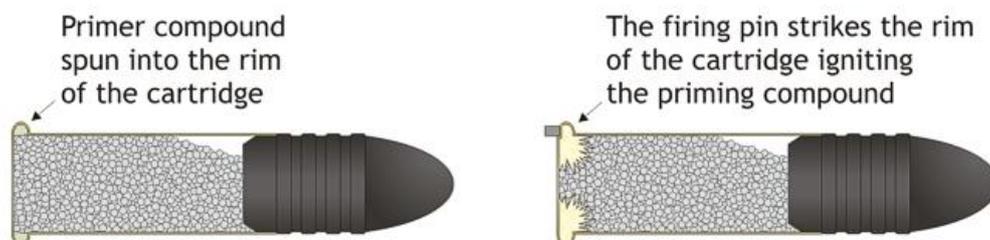


What is the difference between centre fire and rimfire ammunition?



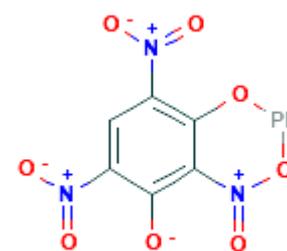
Centre fire cartridges are a lot more powerful than rim fire. This is because they contain far more propellant. The firing pin strikes the central cap of the cartridge igniting the primer. In **rimfire** cartridges, the firing pin strikes the rim which ignites the primer.

Rimfire ammunition primarily differs from centrefire ammunition because the cartridges are not reloadable. They do not have a central primer cap in the end of the case. Instead the rim of the cartridge contains priming compound spun into it which ignites when the rim of the cartridge is struck by a firing pin.



What are primers and propellants?

A primer is a chemical compound used to ignite the propellant in a cartridge. Do you remember the cap guns so popular when I was a young boy? The caps did not contain a propellant (thank goodness!), just a tiny amount of primer wrapped in paper. Primers ignite when they experience physical shock. The burn rate is very high with a lot of gases produced. When the rim of a 0.22 cartridge is struck by a firing pin, the shock causes the primer to ignite under pressure. The primer used in our 0.22 cartridges mainly consists of lead styphnate; molecular formula $C_6H_3N_3O_8Pb$. As you can see, the molecule contains a lot of oxygen which allows the primer to continue to burn in the absence of air. Unfortunately, it also contains lead (Pb). More on that later.



Molecular structure of lead styphnate

For the 'techies' among you, lead styphnate has an explosive velocity of 5.2km/s, and a detonation temperature of 265 – 280C. That's fast and hot! Powdered glass is added to the lead styphnate to increase the friction and to assist detonation when the mixture is crushed by the firing pin. The mixture also contains barium nitrate (source of extra oxygen) and the explosive tetra-zine; the latter being extremely impact-sensitive.

Ignition of the primer causes a detonation wave that in turn ignites the propellant. Most of the propellant in 0.22 calibre ammunition consists of nitrocellulose which is 'smokeless' and cheap. Nitrocellulose carries most of the chemical energy used to propel the bullet out of its casing and along the barrel.

Why do 0.22 rounds feel waxy?

That's because they are coated in wax! The wax acts as a lubricant for the bullet as it passes along the rifling in the barrel. It reduces the friction between the bullet and the barrel and increases muzzle velocity. Why some makes are waxier than others I know not, but they are. The wax does attract dirt along the barrel. This can build up over time. Why not ask how to



clean a rifle? Despite what you may hear from 'old hands', rifles do need to be cleaned from time to time.

How safe are 0.22 rimfire cartridges?

If handled and stored correctly they are very safe. However, do not let your curiosity overwhelm your concern for health and safety. **NEVER attempt to open a cartridge. It could be dangerous and is bordering on illegal!** Occasionally it is necessary to dispose of, and render safe, a live misfired cartridge. This is done in a controlled fashion by somebody who knows what he / she is doing. **Don't attempt this on your own.** Ask an experienced Range Officer or a Section Head to deal with the misfired cartridge. I sometimes get asked what happens if a live cartridge is thrown onto a fire. **NEVER, EVER do such a stupid thing.** The bullet will leave the case in an uncontrolled direction. Whilst it will have relatively low energy, it will still have ample to make a hole in somebody's head! Take a lesson from the limerick I used to hear 50 years ago:

*The Captain stood on the burning deck,
His pocket full of crackers.
One went off, the stupid toff,
and I'll let you fill in the blank!*

A 0.22 rimfire cartridge may look small, but it may surprise you to know that they are capable of travelling 2,000 yards or 1,800 meters, which is more than a mile. They are therefore officially classed as **dangerous to 1 mile.** Take a look at the construction of the backstop of our outdoor range. All of that to capture a 0.22 rimfire long rifle bullet!



Our outdoor range nearing completion

As mentioned a little earlier, the primer in 0.22 rimfire ammunition is lead styphnate. It is the lead in the primer which is the main cause for concern over lead pollution in indoor ranges. Most folks think the problem is the bullet which is made of lead. It isn't, although it does make a small contribution. Our indoor ranges are regularly cleaned to remove lead residues and are perfectly safe for us to use provided we all remember to **wash our hands before we leave the club and before eating or drinking.**

Happy and safe 0.22 shooting to you all.