

Application Of Fire

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NOTE: The following comments are written from a military sniper point of view. Although most apply to any/all long range shooting to include Police counter sniping, some may not.

Application of Fire is the science of rifle musketry or better said the applied science of rifle marksmanship. There are numerous aspects of the Application of Fire, many or all of which are familiar to experienced shooters. It should be noted that as with most things regarding shooting, there are as many opinions as there are people interested in the art. Basically Application of Fire brings all of the factors of long range shooting together. Here are the factors and what effect/s they have on shooting.

THE SHOOTER

Many times we take this specific aspect for granted and presume that anyone can be an accurate long-range shooter given the proper equipment and training. This is NOT true, many people do not have the psychological fortitude nor the discipline to pursue this art. Equipment and training are secondary to the mental well being of the shooter. The basic problem is that most people do not see this as an art, merely as a pass time or hobby. This is not to say that the vast majority of people interested in accurate shooting cannot achieve a high level of performance through training and practice over time, they can. The prospective shooter/sniper/counter-sniper must first understand the commitment they are undertaking. They must realize that shooting skills are what is termed "Use it or Lost it" skills. Meaning that these skills must be practiced religiously and frequently. Practice must be organized and methodic. Anyone who has ever been to a Bench Rest match can attest to the skill levels of the shooters.

THE EQUIPMENT

This aspect receives the most press. The gun, optics and accessories are constantly being reviewed and critiqued in gun related periodicals and books.

Rifle - Despite popular belief, most rifles can provide an adequate base for a precision rifle. The question is how accurate does it need to be. Racecar drivers have an expression that modified slightly applies to precision rifles, "Accuracy Costs". The basic of a precision rifle capable of out shooting the majority of shooters does not have to cost thousands of dollars. First thing to talk about is the barrel. It must be a quality barrel preferably of the heavy varmint type. This allows for repeated accurate shots as well as long life (depending on caliber). Second, the action should be of modern design, more for repair purposes than for accuracy. Third, the trigger should be in good repair and adjustable to some degree. The majority of commercial rifle triggers are suitable with a little tuning. Fourth, the stock should be strong, in good shape and allow for bedding and/or relieving. A wood stock although not "in fashion" today will deliver consistent performance while maintaining good looks. Lastly, the caliber should be something that is affordable and procurable. Wildcat cartridges offer some advantages but are far outweighed by their problems is chamber reaming, loading and component wear. Bottom line here is that an off the shelf Remington 700 BDL varmint in .308 will in most cases out shoot many people starting out. Additionally this rifle can be upgraded, as the shooter becomes proficient.

Sights – Another viciously contested area. Here again it seems the rule is that if it costs under \$1000 it cannot be any good. Depending on the application, many lower cost brand name optics will perform as well as the higher cost "World Class" scopes. The points to selecting optics are as with the rifle fairly simple. First, issue is the adjustments. The adjustments should be "Target" style to allow the shooter to make fine adjustments to shots and groups. Second, the tube size does not have to be 30mm, one inch tubes will work fine. 30mm tubes allow for durability and increased light transmission. However, most shooters cannot discern the difference between 1 inch and 30mm. Third is the reticle pattern. Most people getting into the sniper side of course want mil dots. This is primarily because the military and police use them.

Most people will never use the mil dots in the normal course of firing. A normal heavy duplex reticle will suffice in 90% of any shooting situations. Most people do not consider the use of any Iron sights when speaking of accurate rifles. This should not be overlooked and should definitely be included on any rifle being built. In fact the USMC does not include and iron sight capability with their M40A1. Their view is that without optics the sniper is just another rifleman.

BALLISTICS

There are 3 types of ballistics which affect long-range shooters. These are Internal, External, and Terminal. Each affects the shooter in different ways, but if understood they can be overcome and used to the shooter's advantage.

Internal – This deals with the action, magazine, bolt, chamber, loaded ammunition and barrel. The way the action is machined affects the way the bolt rides into and out of battery. If the action is off the bolt will not ride true and therefore affect the way that the round is picked up and placed into the chamber. The bolt although different in some respects between a semi-auto and a bolt action affects the accuracy potential of the weapon. If the bolt face is machined incorrectly or worn, the round will not be held true and straight. A magazine fed weapon will affect the accuracy of the weapon by placing pressure onto the bolt as it cycles. In many cases this will mean a lot of pressure when the magazine is loaded and reducing pressure as the rounds are fired, resulting in the bolt having more room in the action to move allowing it to strip rounds out at different angles. This all boils down to the loaded round in the chamber. The round must be straight, without angling up, down, left or right. The chamber must be clean to allow for the even expansion of the case, which affects flame/pressure travel inside of the case. The round itself (projectile) must not be pushed into the rifling, it should be barely touching or very close to touching. The chamber temperature must be monitored (will be discussed more in environmental factors) to not allow the round to heat as it sits in the chamber. The lands and grooves of the barrel must be uniform and of the proper twist for the bullet weight being fired. The type of rifling is of importance but in normal circumstances/applications will not be a major factor.

External – This deals with the projectile as it flies down range towards the target. The factors here are trajectory, humidity or air resistance or drag, gravity, temperature, altitude, barometric pressure, light and wind. All of the factors play a role in the flight of the bullet and the probability of hitting a desired point.

Trajectory – This is basically where the rifle is pointed in relation to where the sights are pointed. The terms here are “Line of Sight” and “Line of Bore”. Most rifles have a 1.5-inch difference between the line of sight and line of bore. Many people believe that a bullet flies straight while in fact it does not, a bullet “arcs” towards a distant target. When shooting at a target beyond 100 yards a bullet will pass the line of sight twice, once in front of the muzzle (actual distance depends where the sights are set and the distance to the target) and again at the target (or actually just past it).

Humidity/Air Resistance/Drag – The best way to describe this is to say that on a hot day the air is thinner, while on a cold day the air is denser. The “weight” or density of the air affects the bullet's flight. There are many differing opinions on this subject, but many shooters will agree that on nominal ranges (less than 1000 yards) humidity has minimal effect.

Gravity – Everyone knows what gravity and how it affects people on earth. However, many people do not understand how it affects a bullet in flight. As soon as a bullet leaves the muzzle of the rifle gravity is at work pulling it towards earth. The more the bullet slows the more gravity affects it, not due to more gravity but it has more time to effect it. Gravity is the reason we use sights to adjust for ranges (elevation). On a flat range the effects of gravity are fairly uniform and can be adjusted for. However, when shooting up or down hill the effects of gravity can be both confusing and deceptive. Without going into a long discussion on slant range shooting, suffice to say that when shooting at extended ranges or extreme angles, proper adjustment for gravity can be the reason for hitting or missing a target.

Temperature – This is probably the most misquoted and understood of all environmental factors. It has been written that a 20-degree temperature change will affect the strike of a .308 to 1 MOA. However, what many seasoned shooters know

is that the real rule is a 20-degree change in ammunition temperature will affect the strike a like amount. If the ammunition can be maintained at a constant temp than the strike will for the most part remain constant. The point of this which many shooters dispute is that they keep the ammo out of the sun and at a pretty mush constant temp, yet during firing the rounds begin to rise which they attribute to the increase in ambient air temperature. Actually what is happening is that through firing the chamber is getting hot, the shooter loads the round and goes through his shooting sequence, while the round in the chamber is increasing in temperature. The cure, don't load the round until the last possible moment and quickly attain the target and fire.

Altitude – This factor is normally over looked and seldom spoken of. This is due to the fact that most shooters can zero their rifle at the altitude they are going to fire at. Military snipers do not have this luxury and can find themselves at altitudes greatly different than that at which they are zeroed. Where this can become somewhat of a problem is when shooting in mountainous terrain over long ranges (exceeding 1000 yards).

Barometric Pressure – Barometric Pressure or BP is a function of altitude meaning that as you go up or down the BP will normally change accordingly. This is not always the case and should not be adjusted for unless you are sure of the difference between your zero BP and the new BP. Unless there is a drastic change in BP (in the neighborhood of 2 inches of mercury) which would normally indicate a very large storm coming.

Light/Terrain – Light affects the way the target is perceived. Many beginning shooters tend to purchase high magnification optics feeling that “more is better”. This is not normally the case. The higher the magnification the harder it is to see a target in high humidity or low light conditions. During high humidity days the “mirage” can cause the shooter to perceive the target in an entirely different location. The military commonly uses 10X as it offers good vision out to 800 meters. A back lit and a concealed target will appear farther away. A target viewed across a valley will appear nearer whereas a target viewed down hill will appear closer.

Wind – Ah, this is the argument of the century. There are many ways to calculate and “dope” wind, any or none of which work from time to time. Ten shooters in the same room will not agree what the best method is and few will ever admit to the method they use. The best method ever devised is “experience”, shooting in varying winds and taking note of the effects. The notes should include, direction, speed (derived from a measuring instrument if possible), gusts, and affect on the rounds. The argument remains which wind should the shooter use, his position, mid range or at the target. There is a fervent argument for each. But the rule is if possible take ALL winds into account and use that which you feel will most affect the round. Should you have a tail wind of 10 mph at the shooters position, a mid range full value wind of 8 mph and a 6 mph head wind at the target, the shooter must look at maximum ordinate (the maximum height the bullet attains in flight), velocity, time of flight and terrain. But again only experience will tell the shooter what he will need to do to secure a hit.

A NOTE ABOUT ACCURACY

Many shooters especially when they are beginning get wrapped around accuracy. They become frustrated when their group is 2 inches away from the center of the target or other point of aim. The first thing shooters MUST realize is that groups are RANDOM events. That is that each bullet travels towards the target spinning on its axis yawing and pitching about. The fact that multiple rounds hit anywhere near each other is in itself a miracle. Further more, most shooters lose sight of the standard to which they are comparing themselves. Benchrest shooters spend hundreds/thousands of dollars to achieve sub-minute accuracy out of rifles that have short barrel lives and are very heavy. Now before anyone gets upset, there are of course exceptions to every rule. Military and police sniper students go through great pains to try and move a group onto an exact point of aim. Many times expending hundreds of rounds in the attempt only to shoot to the left and right of the desired point. These shooters lose sight of the fact that their normal target is 36 inches high and 19 inches wide (frontal view). This translates to a target that is 18 MOA high and 9.5 MOA wide at 200 yards. Every precision rifle on the market advertises at least 1 MOA accuracy. The point is that a sniper does not have to be able to place a round at



an EXACT point of aim. Now I am sure there's someone out there who will contradict this statement and remark that a police/military sniper must be able to take a "No Reflex" shot if called upon. This is true but the exception rather than the rule. Besides the national average (USA) for police sniper shots is 71 yards, which means that with a production sniper rifle the shooter should be able to hit a target the size of a quarter without trouble. The trouble comes in with stress, ammunition, poorly maintained weapons, poor line of sight, etc.

I hope this helps someone and I am sure there will be a few who will disagree. To them I say, if what you know works, use it and teach it to others.