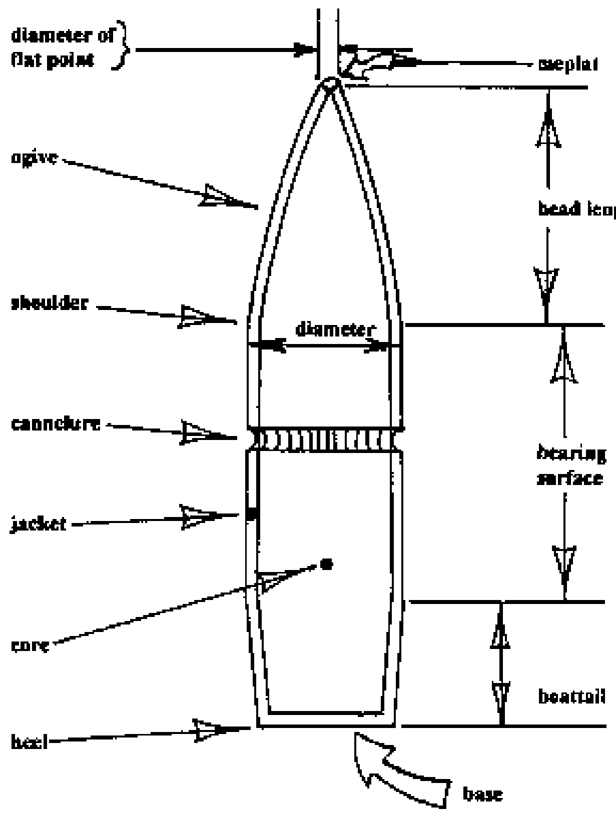
BULLET DESIGN & PERFORMANCE

The importance of the bullet to the performance of a firearm cannot be over-emphasised. After all, the sole purpose of a gun is to propel the bullet toward the target. The design of the bullet has an effect on performance from the moment of ignition, down the bore, through the trajectory, and onto the target. At that point, it must perform by either punching a hole in a piece of paper or by proper penetration and expansion in an animal.



Bullets come in many different styles, shapes, and materials. Some are solid lead. Many are assemblies with a lead or steel core and a covering called a jacket. The jacket may be either gilding metal, gilding metal clad steel, or copper plated steel. Some military calibre .30 and 7.62mm frangible bullets are moulded of powdered lead and a frangible plastic, which pulverises into dust upon impact with the target. Ball cartridges are military in origin and consist of a general-purpose combat cartridge for use against personnel and un-armoured targets. The bullet normally consists of a metal jacket and a lead slug. The .50 calibre ball bullet and 7.62mm, Ball, M59 bullet contain soft steel cores.

BASIC TYPES

There are four basic types of bullets for civilian use, nonexpanding, expanding, fragmenting, and partially fragmenting.

Nonexpanding bullets usually have the nose covered with one-piece metal jackets with the hard lead core not covered at the base. They are used where deep penetration is required such as African game. They also are useful with small game where minimum damage is desired. This bullet type is frequently difficult to locate.

Expanding bullets are very common because they are useful against the thin-skinned game that is common in North America. The bullet's nose is made weak so that it will split and be disrupted on impact. The bullet's design can control this to a large extent, but velocity and the type of target also heavily influence it.

The expanding nose increases the size of the wound, although the base has to be strong enough to hold together and the bullet requires enough weight and momentum to penetrate properly. There are numerous methods of making an expanding bullet These include:

1) Installing a hollow point in the nose.
2) Cutting or rolling grooves around the jacket.
3) Thinning the jacket near the nose.
4) Using a double jacket with the outer jacket on just the base.
5) Notching around the jacket in a ring.
6) Using a hard metal wedge to split the nose on impact.
7) Slitting the jacket longitudinally.
8) Covering the nose with soft aluminium that extends under the copper jacket as the Winchester Silvertip.
9) A wedge like point that is driven back as the Remington Bronze Point and
10) Combinations of the above and others not mentioned.

Fragmenting bullets intended to break up on impact. They are made mostly in the smaller calibres and require a high velocity to be as destructive to tissue as they are capable. Naturally, the pieces will not penetrate very well, so their principal use is on smaller animals. They are generally made with a hollow point or a very soft point. This will be covered with a thin jacket that will disintegrate on impact.

Partially fragmenting bullets are a compromise between fragmenting and expanding bullets. They are designed to break-up on impact but the base is expected to continue on into the target.

Jacket material may be either gilding metal, gilding metal clad steel, or copper plated steel, copper, aluminium, steel clad with a cupronickel alloy. The core will usually be either lead or steel. Both the core and the jacket may contain other components or chemicals to assist in the terminal ballistic characteristics.

LEAD BULLETS

The use of home made cast bullets by hand loaders has been well researched and tested. The results can be excellent from all ballistic details if the hand loaders guides and factory literature are followed closely. Care must be taken because a pit or mark on the bullet (the ogive area in particular) can change the trajectory and cause poor gyroscopic stability. A change in seating depth, sizing and design will all play an important role.

Hard cast lead bullets (antimony added for hardness) can be fired in firearms without major leading problems Some shooters claim more leading problems at lower velocities of about 1,000 to 1,100 fps. While heavy leading reduces accuracy, it can also increase pressure.

One advantage to ordinary lead bullets is the chance of reduced bore wear in old rifles. Many older barrels are made of steel that is not as good or as hard as the ones found on most weapons made since around the 1920's up to the present. There are exceptions, but generally, modem barrels are better suited for jacketed bullets than are older barrels. But at the low velocities, the wear from modern jacketed bullets in even a poor barrel so long as safety is not compromised, should not be excessive.

Fouling is another story. Also, lead may pick up the rifling better and as a result, stabilise better for increased accuracy. Of course, it could be too soft and rip through the rifling without picking it up at all. There are so many variables that no single answer will work for all situations.

Lead bullets, in most testing, have came up slightly short on velocity when compared to jacketed bullets, but not much, and usually in the range of about 2 percent. One of the problems with a test of this type is using ammo that is exactly the same except for the bullet jacket and firing enough shots for the answer to be meaningful. This information is not as accurate as desirable, but until more conclusive data becomes available, the 2 percent serves as an effective illustration.

PRESSURE & STRESS

The largest acceleration stress in both the firearm and the bullet occur at the peak pressure. The rear of the bullet will upset (expand) to tightly fill the bore if it is slightly undersized. The tensile strength of copper is about ten tunes that of lead, so copper, or a copper alloy, is frequently used to encase a lead bullet and assist in restraining the internal forces on the lead core. The elastic limit of steel is about 40,000psi. That means that it can be stretched to a tensile stress of 40,000psi and when the stress is removed, it will return to its normal shape without making a permanent change or set. Lead, copper, and tin, have an elastic limit that is almost zero i.e. the slightest change and the modification becomes permanent.

Although the peak pressure will be extremely short (somewhere in the neighbourhood of .001 second (one thousandth of one second), the bullet will expand and deform to fit the lands and grooves of the bore.

VARMINT BULLETS

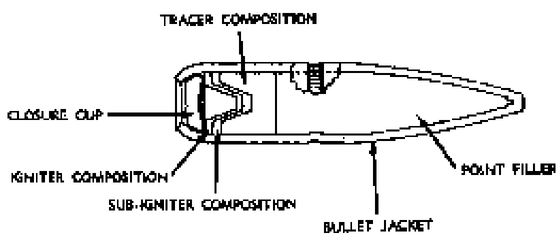
Varmint hunting is a specialised skill that requires bullets of a very special type. The hunted animals are small and usually far away, which demands a high level of accuracy. The hunter also must remember that only a hit in their small vital area will give a one shot kill. The lung, heart, and head of a varmint at 300 yards are a challenging target.

Also, these small animals have a thin skin and fragile bones. Very little resistance is offered by their anatomy and a normal bullet will not expand properly, if at all. Special varmint bullets are available that have thin jackets with exposed soft lead and sometimes a large hollow point. Accuracy for these loads will not good as some other designs, match bullets in particular. Also, it is important to keep velocity in mind. A varmint bullet that is designed to expand in soft tissue at 2,400 fps, for example, may not do well as the velocity deteriorates down range. Other bullets are designed to expand nicely at slower velocities, but there is a catch. Many of the bullets that expand well in soft tissue at moderate velocity are super sensitive, as they have to be. They can come apart in the barrel or in flight between the muzzle and the game. This is why many bullets that should have been clear impacts on the target seem to disappear in flight. It all boils down to the fact that with a bullet of this design, some accuracy will be sacrificed for expansion and killing power.

CONICAL BULLETS FOR MUZZLE LOADERS

It is a false idea that conical bullets are a modern invention and that patched round balls were better both in ballistics and at killing game. Conical bullets were in use before cartridges and date back to the late 1820's or early 1830's. By the late 1840's, Captain C. E. Minie of the French Army had invented the conical bullet that bears his name, the Minie Ball. It not only had better ballistic performance but also was quick to load. It also required about a third faster twist in the rifling to fly properly stabilised. But most conical bullets were used by the military instead of hunters. Then the same as today, money for new weapons was easier to obtain by the military than by the average hunter. Conical bullets are heavier than a patched ball m the same calibre. Therefore, they can maintain better velocity and energy for a longer range.

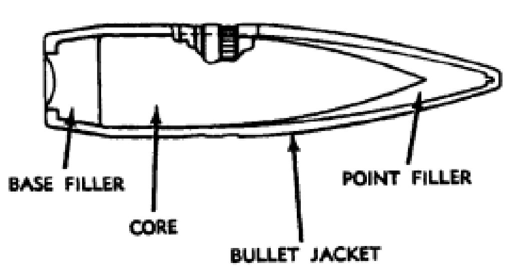
TRACER BULLETS-MILITARY



Tracer bullets are occasionally sold as military surplus and frequently owned and fired by civilians. Their purpose is to leave a trail of smoke or flame to permit a visible observation of the bullet's in-flight trajectory and the point of impact. It is used primarily to observe the line of fire, but it can also be used to ignite flammable materials and for signalling purposes. The tracer element consists of a compressed, flammable, pyrotechnic composition (chemical filler) in the base of the bullet. The propellant ignites this composition when the cartridge is fired. In flight, the bullet emits a bright visible flame. Burnout occurs at a range between 400 and 1,600 yards, depending on the calibre and elevation.

Tracers should not be used for any purpose other than as intended. They can start fires and for that reason, they are against the law in many places. Bore damage is very common and the ballistic performance is poor. The bullet's weight and centre of gravity change as the filler is consumed by the flame. As a result, gyroscopic stability is hard to maintain. While they are very dramatic, especially at night, tracers are dangerous and should be avoided.

ARMOUR-PIERCING, MILITARY



The armour-piercing cartridge is military and intended for use in machine-guns or rifles against personnel and light armoured and unarmoured targets, concrete shelters, and similar bullet-resisting targets. The bullet consists of a metal jacket and a hardened steel alloy core. In addition it may have a base filler and/or a point filler of lead. The military also has a cartridge type called an armour piercing incendiary that has an incendiary mixture as a point filler.

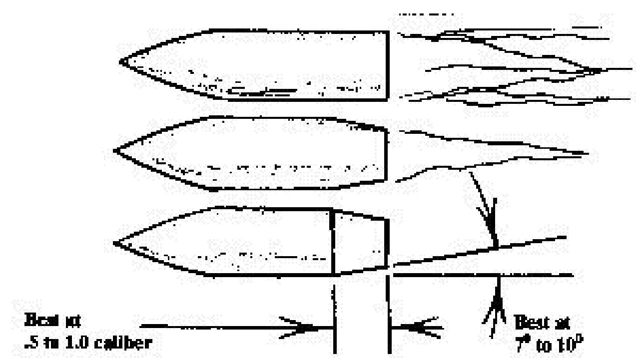
Upon impact with the target, the incendiary bursts into flame and ignites any flammable material.

OTHER MILITARY TYPES

There are many other types of military cartridges and bullets. They include the armour-piercing-incendiary tracer, duplex, high-pressure test, dummy & dummy inert load, line throwing cartridges, and various training and match bullets and cartridges.

BOAT-TAIL BASE

The base of a boat-tail bullet is tapered inward. Another name for this sort of projectile is taper heel, as the heel is where the side and base join. The boat-tail's advantages are largely ballistic. When a bullet flies, it creates a partial vacuum in the space directly behind it. This partial vacuum creates a base drag that helps to slow the velocity. The effect of this vacuum is less behind a boat-tail bullet than a blunt end. If the slope of the taper is too sharp or sudden (not long enough with a steep angle), the airflow behind the bullet will be turbulent and separate, and the advantage of the boat-tail will be lost.



The base drag effect is strongest at subsonic speeds. At supersonic speeds there will be a shock wave created at the boat-tail's shoulder which, combined with a low-pressure expansion, will kill some of the good effects of a boat-tail base. Above Mach 1.2, the advantage will be small. There will be a slight lowering of drag from side friction due to the shorter bearing surface but little from the drag at the rear. A boat-tail is fine at supersonic speeds, but it must be kept small. It is best at a boat-tail base diameter of 0.4 of the calibre, or less.

For short range shooting, up to 200 yards, the boat-tail benefit is not very noticeable. As the range increases, the benefit increases.

At 1,000 yards, the velocity difference can be improved by as much as 20% with up to a 3 or 4 foot advantage in wind deflection in a modest 10 mph cross wind. The boat-tail design has a much longer extreme range than a flat-base bullet if the velocity and weight are the same.

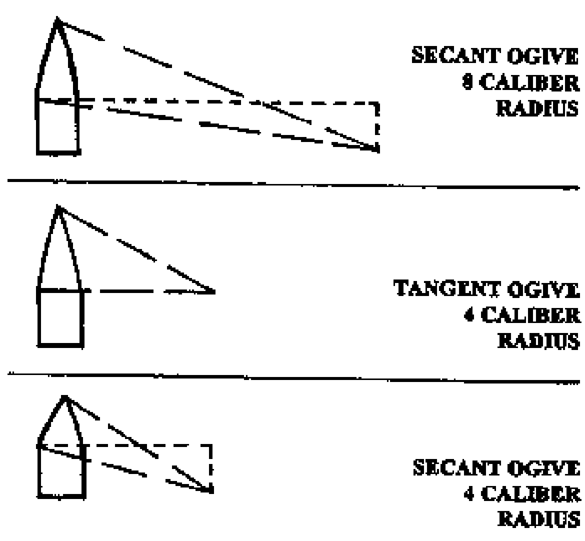
Even at supersonic velocities, the drag reduction is noticeable although there is some evidence to suggest that the benefit is near zero. A comparison of two bullets that are almost the same except that one has a boat-tail base and the other a flat base is useful to illustrate the point. For purposes of this experiment, let's look at a 55 grain .224" diameter bullet with a 7.5 degree boat-tail whose length of .134". The flat base is a 5.56mm M193 ball round. Both have the same shape, point configuration and weight, with a muzzle velocity of 3,000 fps.

Range in Yards	Boat-tail in f.p.s	Flat-base f.p.s.
0	3000	3000
100	2641	2633
200	2309	2267
300	1999	1921
400	1702	1659
500	1441	1309
1000	857	715

So far, the discussion has centred on rifle bullets. As mentioned, at ranges below 200 yards, the benefit is small. Handguns, even with scopes and with the best shooters, are not used at ranges long enough to show much advantage. For example, over a 50-yard range, the .45 ACP will take .0029 seconds longer in air than in a vacuum Cutting the drag by 20% would make little difference. The 810 fps that it started with will still be about 782 fps for a difference of only 28 fps. Other bullets will create other statistics, but the idea will be the same.

Boat-tail bullets do not wear a barrel more than any other design. That idea that they do has been around for years and has never been true. It is based on the theory that hot gas can enter the area of the boat-tail and damage the bore. It is sometimes called the jet effect, and it is supposed to wash away the surface of the bore and damage the rifling grooves. For years it was believed that any bullet that is undersized in relationship to the bore diameter would have that effect. With the extreme acceleration of the bullet, the gas is not there long enough to affect that area more than another area. If it did have an adverse effect, the steel and heat-treating are suspect more so than the bullet design.

OGIVE DESIGN THEORY



The ogive is the curve between the bearing surface and the point. The radius of the curve is usually given in respect to the calibre, which ties the picture together in the proper relationship. The ogival radius has significance only as it relates to the bullet diameter. The centre point of the radius also is important as it controls the length and helps define the shape. If the bullet has a tangent ogive, the centre point of the radius is at right angles to the cylindrical bearing surface and opposite the intersection between that surface and the curved ogive.

The secant ogive has the centre point of the radius lower and opposite a point on the cylindrical bearing surface. This gives a good ballistic coefficient for aerodynamic efficiency and usually retains a decent bearing area.
Ogive length is equal to the diameter of the bullet multiplied by 1/2 the square root of 4 N minus 1, where N is the calibre radius. Remember to subtract 1 from the product of 4 times N before finding the square root, then divide by 2, and multiply by the diameter of the bullet. This calculates to a sharp needlepoint but there will probably be a small flat or rounded section.

MEPLAT
The point of a bullet, the meplat, is generally a small rounded tip. Even a long nosed spitzer shape will have a meplat with a diameter of up to .16667 calibre, never larger. The drag will be a slight amount less than a sharp point and they are easier to make and handle. At first, it may appear a sharp point would have less drag, but it has to do with airflow, pressure, and shock waves.

BEARING AREA
The main body or bearing area that rides on the bore must be long enough to hold the bullet in proper alignment. An excessively short bearing area will create unreliable performance. The bullet can yaw while in the bore and exit the muzzle in a yawed or other than point on position. This is not as unusual as it may appear. (Keep in mind the tremendous force that is pressed against the base in milliseconds. This may or may not be perfectly equal across the entire base.) The yaw will not create instability, but will spread out the hits on the target. A long bearing area will also give an accuracy boost when shooting from a worn barrel and help to seal the gas pressure for better ballistics. The rifling can also strip away the surface of too short a bearing area when the bullet is suddenly forced to turn with the grooves. The length can be over done, though, and increase frictional drag in the bore. The rifling twist will be an influence. A slow twist will cause low stability and will consequently require a better alignment through a longer bearing surface.

SPITZER SHAPE
A spitzer bullet has a nose that is pointed and followed by an ogive radius of at least 7 or more calibres. In other words, there is some length behind the tip before the main body. It is obvious that the streamlining effect will give it a better ballistic efficiency. The primary advantage is in the aerodynamic shape, which reduces air resistance. It helps the velocity hold up well at long range.
Early spitzer designs were poor at expansion. The choice was usually a blunt nose with a large amount of exposed lead. Modern design has changed the spitzer so that the benefits can be used along with reliable expansion. Also, there is no evidence that this design is deflected more than other types in brush.
A study of the ballistic tables will show that with the .30-06, for example, two 180 grain bullets, one a spitzer and the other a short round-nose, both leave the muzzle at the same velocity and just a few foot pounds difference in energy. At 300 yards, the spitzer has an advantage of 300 fps in velocity and 475 foot pounds of energy, an impressive difference. The addition of a boat-tail base will change the figures again. Nevertheless, the spitzer, or a design that leans toward that direction, has good merit.

There is a controversy over which is the more accurate, a sharp pointed bullet, or a blunt-point. Most testing gives an edge to the sharp point. If everything else were equal and/or correct (that is twist rate, gyroscopic stability, etc.) then theoretically, there would be little or no difference.

TIP DAMAGE

Testing has shown that at ranges below 100 yards, minor damage to the tip of the bullet has little effect on performance. At ranges over 100 yards or for critical target work, performance is bound to suffer. For hunting at short range, it doesn't appear to cause any problems in trajectory or velocity.

The Norma factory in Sweden conducted tests with damaged bullet tips by filing the point flat. Different amounts of material were removed at an angle from the tip and ogive. Also, some were filed at an angle on the boat-tail base. None of these bullets performed badly in controlled tests at 100 yards. The damages were minor and in no case excessive, but it was enough that the results were surprising.

Long range testing by other laboratories has shown keyholing, flyers, and other expected results of instability. But for short ranges, up to about 100 yards, the performance should be satisfactory for hunting. Naturally, contest target work would require the best and no chance should be taken. The same applies for ranges beyond about 150 yards.

VELOCITY & WEIGHT

In the constant quest for higher velocities, it is well known that a large bore gives a large cross sectional area for the expanding gas to push against. That bullet weight also tends to go up in the larger bores defeats the strategy. A bullet could be made with a large cross section and lightweight for excellent high muzzle velocity. The bullet would also have terrible problems m trajectory and energy. The internal ballistics would be good and the external ballistics would be bad. As usual, a compromise is needed.

As the velocity increases, the efficiency of delivering energy goes down. Lightweight bullets require more velocity to deliver the same energy to the target, all other things being equal. The velocity to deliver a light bullet at the energy of a heavy bullet is beyond our present technology. There is a strong place for light fast bullets, but most hunters prefer a slow heavier bullet when a lot of stopping power is needed.

The mushroom effect is better at the higher speeds because of the energy involved. Lower speed bullets of proper design can also expand well and usually after deeper penetration. The energy delivered by a fast velocity light bullet can be high, but the actual stopping effect may be small. Large game such as elk and bear may not be impressed by it. A heavy slower bullet with good controlled expansion may do better.

Most bullet designs perform best in a narrow velocity range. Too fast or too slow and penetration and expansion will not be as expected. This is a problem for long range work where velocity will decay at the longer distances. Handloaders can also experience problems at short to normal range if the bullet choice does not match the expected velocity.

Stability is vital, and for proper gyroscopic stability, the ratio of a bullet's weight to the square of the calibre (or sectional density) should be between 0.15 and 0.35. If it is lower, the bullet is too short and if it is higher, it is difficult to impossible to spin it and properly stabilise it.

SYMMETRY

Symmetry, or the act of being symmetrical, is when an object, a bullet in this case, can be divided into similar or equal parts by a plane passing through the centre. Symmetry is vital for proper gyroscopic stability. The centre of the mass needs to be on the bullets axis or the result will be a helical flight path. Sometimes, blunt and round points stabilise better. Not because a blunt point or round point is more stabile or that the long pointed bullet requires more rifling twist to stabilise. It is simply hard to make long pointed bullets that are perfectly symmetrical and with a jacket that is precisely the same thickness at all points.

PRESSURE CONSIDERATIONS

Bullets of equal weight but of a different type and manufacture will not produce the same pressure. It would appear by casual observation that they would be interchangeable, and if the loads are moderate, that may be true. But as maximum pressure is approached in experimenting, the pressure may exceed safety limits. Of course, as with all ballistic explanations, the same powder, the same load, the same seating depth, and the equality of all other items are to be assumed equal. While the bullet’s weight may be equal, the length, core weight, jacket weight, bearing length, and even to a very slight amount, the diameter, may all be different. The variations between extremes can be as high as 15%. Generally, the highest pressure and velocity will be together, as we would expect.

EXPERIMENTS IN BULLET DESIGN

Many unsuccessful ideas in bullet design have been tried over the years. Experimenters always repeat some of them because they were not aware of the earlier failures. There are also old ideas where someone solves the problems so they will work. Most of the following ideas had a good solid theory behind them, but they were doomed to failure for one reason or another:

Streamlining the rear of a bullet with a long taper to a point does not serve a useful purpose. At the muzzle, the hot gas tends to turn or upset the bullet and cause poor stability and accuracy. The US Army tried this type with a sabot to hold in the gas and help with alignment in the bore. It was not successful.

There have been frequent attempts to design and make a successful bullet that has the powder and primer included but without a case. No rocket ball, as they have been called, has worked very well. Most have been weak and with a tendency to misfire. The early Voss system was patented in Europe in 1834. Several other European inventors patented ideas along this fine in the 1840’s and 1850's. The first U.S. Patent was by Smith & Wesson in 1856 for use in the Volcanic line of firearms. Some people call the items Volcanic instead of Rocket Ball. Either name is acceptable. The idea died out for awhile and was briefly revived again by the Germans during World War Two with a 7.92mm variant with no success.

The US military experimented during World War Two and also more recently with 5.56mm and 7.62mm caseless cartridges. Smith & Wesson tried again with a 9mm design that is electrically fired. Extensive testing in the mid 1960's showed much promise.

An unusual bullet design of the early 1900's carried bore lubrication to the extreme. A self-lubricated bullet was designed by Smith & Wesson and listed by Union Metallic Cartridge Company. The centre of the bullet was hollow. The base of the cavity had a lead plug. The nose end had four small openings into the ogive area. The centre was filled with a lubricant, which was forced out the holes as the expanding gas thrust the base plug up into the cavity. The bore was lubricated by this action, or supposedly it was. This unusual bullet was not on the market for long.

In the early 1960's, Malter Arms Co. of New York City made sub-calibre bullets inside a discarding Husk. The Husk, as it was called, was the same as a sabot. They were made in both .270 and .308 diameter. That is, the sabot was either .270 or .308 and made for that size bore. The bullets were smaller at .224 in 82 grain and .243 in 100 grain. They were advertised for a short time and then they also disappeared.

It is frequently suggested that a bullet should be tubular (an open hollow centre from the front to the rear) so the air resistance and the void at the rear can be reduced. Various types of plugs or caps at the rear are used to hold the pressure behind the bullet and seal in the thrust while in the barrel. The caps or plugs then drop off like a sabot as the bullet passes the muzzle. In 1893, the Frankford Arsenal conducted extensive tests on bullets of this design. The bullet was unsuccessful for two main reasons, both ballistic in nature. First remember that weight is an important part of bullet performance and the tubular design reduces the weight too much. Also, the flow of pressure waves will build up inside the tube and block or plug it. The final effect is the same as a solid bullet only of less weight and without a good streamlined nose.

In the early 1900's, Hoxie Ammunition Company of Chicago made bullets with an unusual feature. The hollow point of the jacketed bullet had a ball fastened in the opening. The opening tapered down smaller behind the ball so that at impact, the ball would ram back into the opening and force expansion. While the basic idea had merit the product was produced for just a short time. Today this type of ammunition would be illegal because it was too effective at what it was designed to do.

The use of darts or very small arrows as projectiles in guns is as old as the earliest firearms. It was a reasonable first step and they were used for many years, until the introduction of round balls or at the start, stones. The French word for arrow is flechette hence, we call darts and small arrows flechettes. The use of flechettes as projectiles in guns has not completely died. Occasionally people still experiment with this idea because of aerodynamic and ballistic advantages. They have excellent ballistic characteristics in the air but are difficult to launch.

NEW IDEAS

While most of the above mentioned experiments in bullet design were not very successful, some new ideas have worked very well. Development of new bullets is not an easy task. Naturally there are the ideas and drawing stages, where all the possible choices are discussed and either chosen or discarded. Then tooling and manufacturing methods have to be devised, and in some rare examples, a design has to be changed because the tooling engineers point out that it is not practical to make it as it was designed. After samples are made, there is extensive testing at different ranges and with different loads to determine if the bullet’s performance is as expected. Testing is conducted under conditions that attempt to duplicate actual field and hunting situations. Reduced loads are used to simulate terminal velocities at various distances. They look for qualities relative to expansion, penetration, and fragmentation, for example.

Generally, changes need to be made in the design as the experimentation discovers weak points. This frequently requires changes in the tooling and manufacturing process. Times have changed since a little lead was heated over a fire in a small ladle and poured into a bullet mould.
One American company produces a hunting bullet with a partition extending through the core about for about a third of the length forward from the base. At impact, the forward portion expands normally while the rear area remains solid to provide necessary weight and energy. This same company also makes a bullet with a plastic nose insert which because of its unique design, has both a high ballistic coefficient and sudden, violent expansion. This gives excellent expansion when the velocity has deteriorated down range. Of course as expected, rapid expansion reduces penetration depth, but this is required for some types of game.
Another recent product that is a nice improvement over older designs has the front half of the bullet made of solid copper with a small open point and an expansion chamber. The rear of the bullet consists of a lead core in a steel-lined pocket, which instead of being exposed at the back, is covered with a "closure disc." It has excellent expansion and deep penetration. The use of a large amount of copper reduces the weight to size ratio, so the bullet is made slightly longer than normal to maintain the same weight.

NOTES ON BULLETS
Bullets with grooves crimped around their body have lower accuracy because the bullet is deformed in an area that disrupts the flow of air and disturbs the aerodynamic stability. Even if the groove is perfectly even and uniform around its full length, which it rarely will be, it will still lower accuracy. It will also reduce the life of the case from over-working the metal. This can cause splits at the mouth are unnecessary. Factory ammo that is crimped is primarily for use in tubular magazines or by companies making a general-purpose cartridge for any type of rifle.

Light bullets have the highest muzzle velocities and the flattest trajectories, as compared to heavier bullets, but they will also have the lowest remaining energy down range. The heavier bullets will have excellent down range velocities and about 40% higher energy.

A blunt nose bullet should not be used for any distance in a wind, if it can be avoided. The wind deflection will be very poor because of its aerodynamic shape, or lack of it.

For accuracy, many experts consider the base of a bullet more crucial than the front. This is controversial and unnecessary. For accuracy, all aspects of bullet design are significant and which is more so is not important.

A bullet with a long point will hold its velocity and energy over a greater distance.

Separation of the core and jacket is a weakness of some bullet designs and high velocity can be a factor.

A soft point will break up quicker and not be as likely to ricochets (The pieces may ricochet, but not as a solid piece.)

A very sharp point is not as good (or as easy to handle and protect) as a bullet with a small flat area called a meplat.

Hand-loaded ammo that is carefully and properly loaded will have better accuracy than factory ammunition. Always. (This is not an insult to manufacturers, but all production work has to have tolerances. Hand- loaders can strive for perfection.)

Bullets will keyhole at long range from poor stability. One major cause is when the bullet is too heavy for the barrel twist A lighter bullet (shorter) or a faster twist is needed to stabilise the projectile.

Controlled expansion ammunition has been used for years for self defence and hunting. Ignorant people have begun to attack this type of ammunition as being offensive and disgusting. Most hunters, police officers and self-defence people want a bullet that stops (disables) or kills either instantly or as quickly as possible. After all, that is their one and only purpose when used for hunting or self defence.