Lethal Potential…What Is It?

Killing Power or the Ability to Put Down Game

For many years there has been a roaring debate as to the best way to compare one load against another, to determine it's Killing Power, and it goes on today! In this article, we will discuss the various methods…some good, some poor, and some just plain ridiculous! We must take into consideration that too many shooter/hunters put to much emphasis on Velocity. While Velocity and Ballistic Coefficient (the bullet's form) are very important for a flat long range trajectory, the combination does not guarantee to put game down cleanly. There are other important factors involved. To better understand all the factors, lets look at each:

Foot Pounds Of Energy (FPE)…This is the one the shooter/hunter sees most by those that lean toward high velocity!
The formula is - Weight of the Bullet (in grains) X Velocity (feet per second) X Velocity (feet per second) X .000002218 = FPE
It assumes that a full metal jacket bullet (non-expanding) will perform the same on game as a jacketed bullet (expanding) and will have the same Lethal Potential. Any experienced hunter knows better. It also assumes the bullet will hold together and not fragment. These are lots of assumptions in the real world of hunting! The actual definition of FPE is the "Force required to lift one pound of weight to the height of one foot" Many leading ballistic people questions how this really applies to Lethal Potential!

Momentum Theory. …Many shooters that advocate heavy bullets use this.
This formula is – Weight of the Bullet (divided by 100) X Velocity (divided by 100) = Momentum Value. This formula assumes the same assumptions that the FPE formula assumes as far a bullet design!

Pounds Feet Theory…. This is advocated by many big game hunters.
The formula is – Velocity X Bullet Weight (in grains) divided by 7000 = Pounds Feet. This is somewhat of an abstract formula and again assumes the same as the previous inasmuch as it ignores bullet design, basing everything on a non-expanding solid.

Hydrostatic Shock Theory…. We now arrive to one of the vaguest theories. This theory assumes that a very high velocity that hit game's tissue explodes and sends energy waves throughout the animal that causes a nerve shock that develops Lethal Potential. It is next to impossible to compare one bullet design against another. The results of this theory have been called many things…. nerve shock, hydrostatic shock, wave shock, among others. While examples of this seem very deadly on thin skin animals, it fails badly on large heavy animals.
There are many others that I will not discuss, but one that seems interesting,

The Peter Thornily Factor. Thornily was a well-known game hunter that set up a factoring system/number for various animals from the smaller thin skin to the big heavy animals. His system takes into consideration the diameter of the bullet, the weight of the bullet, and the velocity. It should be know that this factoring uses a round nose non-

expanding bullet. Beartooth Bullets (beartoothbullets.com) has the Thornily Calculator for your use.

So, what have we seen so far? One important thing is there are many formulas that attempt to establish Lethal Potential of one bullet over another. The problem with all these formulas is they do not take into consideration the most import factor in Lethal Potential…namely the Meplat Area (either an expanded jacketed bullet or non-expanding solids). As a bullet passes through tissue, the water in that tissue cannot be compressed, only moved. This uncompressed water acts as a solid and its movement is what causes tissue damage. The amount of water moved is directly related to the Meplat Area.

The speed of this movement is related to the Velocity at impact and through the tissue! This is precisely why a jacketed bullet that expands (increasing Meplat Area) causes more tissue damage than a solid non-expanding bullet albeit the same weight, diameter, and velocity!

So we can sum up with the following! Tissue Damage is caused by Velocity and Meplat Area.

Penetration…. Penetration is a product of Velocity and Sectional Density (the relationship of a bullets diameter to its weight). A good rule of thumb for non-expanding bullet is, the higher the SD, the deeper penetration if the impact Velocity is the same. The problem occurs when we deal with expanding bullets and those with a large Meplat Area.

General Bullet Designs ….It is sad, but a fact, that today's shooter stress more importance of velocity than Bullet design. The following are the basic bullet designs:

(1) Jacketed bullets – This bullet design has a gilding metal jacket with a lead alloy core, of varying hardness. Within jacketed bullets there are different concepts, all designed to expand to varying degrees.
   (a) The Jacketed Soft Point…This is the oldest design and has an exposed lead tip. The expansion is controlled by the amount of exposed lead. This design is still use on many of the older cartridges and performs excellent at lower velocity.
   (b) The Jacketed Spitzer…Basically this bullet's interior and jacket is the same as the Soft Point, but its shape is more aerodynamic. This means a flatter trajectory if the muzzle velocity remains the same as the soft point.
   (c) The Hollow Point…Basically this bullet's interior and jacket is the same as the Jacketed Soft Point and Spitzer. The difference is the hollow point nose. It is designed to expand faster than the two previous designs and is used most on smaller thin skin game.
   (d) The Partition Bullet…This design has a partition in the jacket that separates a softer lead alloy front part and a harder lead alloy rear part, with a partition in between. The concept is to allow the bullet to expand quickly, even at longer ranges and the rear portion to still penetrate. This design bullet was put on the market by George Nosler

(2) Jacketed Solids…These early designs have a gilding metal jacket of varying thickness, but the exposed lead alloy is at the base of the bullet. The best example of this bullet is the military style bullet

in use for many years. There have been various shapes, from sptizers to roundnose, depending on their use.

(3) Monolithic Solids…These designs are relatively new on the market. They have no lead alloy core and are seen most made from copper or brass with various nose designs. There are those non-expanding designs for deep penetration in dangerous game, along with expanding designs for thin skin game.

(4) Hard Heat Treated Lead Alloy Solids…These are the latest designs and need an in-depth explanation! Most comprise of an alloy of lead, tin, and antimony…heat-treated and water quenched. These bullets do not normally expand, except at very high velocity. Their Lethal Potential is directly related to their Meplat Area! The water in game tissue can't be compressed, only moved. The amount of movement is based on the Meplat Area. This violent movement of the water is what destroys tissue.

Some General Comments About Jacketed Bullets

The hunter is fortunate indeed to have the superior jacket bullets offered today! There was a time that the selection was somewhat limited to a basic soft point. There still are certain problems involved is selecting the proper jacketed bullet for your hunting situation. Jacketed bullets are designed to expand within a designed velocity envelope…. too fast and they fragment, too slow and they fail to expand! This problem becomes very critical when dealing with the bullets used in shotgun sabot loads. The velocity, in these loads, is slower than the average rifle. This means care must be used the selection. It appears that the best selection is the solid copper/brass bullets with a hollow point. Some loads have pistol bullets in them and these bullets are just too soft, leading to fragmentation.

A good rule of the thumb in selecting a bullet design for hunting, or reloading, is to look at the factory velocity levels at which the bullet is being used.

Hard Cast Heat Treated Solids

We discussed this design above and now we will see how the design related to Dixie Slugs. Over one hundred years ago, the British gun and ammo designers came up with bullet designs to be used in their far-flung Empire….mainly Africa and India. In the beginning of the period, black powder was the only propellant they had available. This meant there was only much pressure available for velocity. The soon learned from actual experience that a heavy hardened lead projectile, at a modest velocity, caused a great deal of Lethal Potential on heavy and/or dangerous game within reasonable hunting distances. At the time there were shotgun Gauge Paradox Guns (last few inches rifled) and full bore shotgun gauge rifles. A misconception today is that these guns took brass hulls. It has been proven that only about 10% used brass hulls (and had oversize lands and grooves) and 90% used paper hulls (and had smaller diameter land and grooves). Another design feature was they "squared" the bullet….meaning the length was very close to the length. This thought comes from their success with earlier round ball guns. With all this in mind, they can up with the popular 12 bore load of a .730"-730 gr. hard solid. The original black powder load had a velocity of 1000'/" from a 28" average barrel length and a gun

weight of 7 ½ pounds. Later, when smokeless Cordite became available, they increased the velocity to 1200'/". Dixie Slugs Original Terminator matches the Cordite load with a .730"-730 gr. hard cast heat treated slug/bullet from a 20" rifled shotgun barrel. The Dixie Terminator slug/bullet has a Ballistic
Coefficient of around .144 and you can run this through the various formulas for comparison to today's popular cartridges. The slug/bullet has a full .500" Meplat for tissue damage. Various penetration tests for this load, and others, can be found on Dixie's Forum.
While we have talked about bullet designs in general, further data is available on Dixie's Web Page.
It should be well understood that the original British rounds were designed for large and/or dangerous game within 100 yards! So is Dixie's ammo!
None of Dixie's ammo is designed to replace any other type of hunting firearms, but rather give the shooter/hunter a very powerful designed balanced series of ammo! The combination of Velocity, Bullet Weight, Reasonable Recoil, and used in easy to acquire firearms, is what it is all about!

Comments of Slug Guns In General

The selection of what type of slug gun to use is based on regional hunting situations. Slug shooting first became popular in Shotgun-Only-States. In these states, we now see a trend to what is called a Dedicated Slug Gun. Many are quite expensive! This regional trend seems to be striving for more velocity to extend their hunting ranges, with very little understanding of bullet performance.

By contrast, we see a growing market demand for Switch Barrel Guns in the Southern tier of states. These hunters are buying rifled barrels to put on their popular shotguns. There are many reasons for this, one being the heavier cover in the woodland and swamp areas. Another reason is the explosion of wild hogs! Many of these wild hogs are now many generations in the wild, having reverted to a different animal than their barnyard cousins. These wild Tuskers are tough and can be very dangerous! It only makes sense to have ammo in your gun designed for the maximum Knock Down.

This is where Dixie Slug's concept comes into play!

It should be well understood, when selecting ammo for slug guns, the big ammo makers have to swage their slugs from a softer lead alloy. While these softer slugs may (or may not) work on thin skin game, they will surely get you in serious trouble with heavy and/or dangerous game! I include the true wild hog in this classification! On the other hand, Dixie Slugs hand cast and heat-treat their slugs from an alloy of lead/antimony/tin. Various tests on our slug/bullets can be seen posted on the Dixie Forum. Further discussion on all these subjects can be reached at my email address…..
jcgates@bellsouth.net