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Terminal Bullet Performance

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Moderators: GeorgeS

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|----|-----|------|--------|-------|-------|--|

| **Terminal Bullet Performance** | | Login/Join |
|---|---|---|

| **ALF**<br>one of us | posted 16 February 2010 07:43 | Hide Post |
|---|---|---|

Physics:

The study of matter

Rendering explanations regarding observations of our physical world (matter) or the interactions of matter with each other in our physical world to a logical mathematical model.

So for the problem at hand: **The impact and behavior of a bullet (a dense solid) with a target and in the case of living tissue an admixture of matter with primary viscous and fluid behaviors.** or perhaps paper **layers of structurally firm materials with inviscid properties**

Targets can be broadly classified as Structurally Hard, Structurally Firm with Viscous properties, Structurally Firm with Inviscid properties, Structurally Firm but with mainly viscous and fluid properties and finally structurally Soft with primary fluid properties.

In each instance the observer who wishes to model penetration of a projectile into each of these respective targets needs to give credence to the mechanical properties of each and include it in a particular mathematical model.

In short then:

1. We need to understand the physical nature of "state of matter" as it pertains to mechanical properties of both bullet and target

2. We then need to choose a logical valid mathematical model to describe what we are Observing?

Importantly the field of mathematics chosen much match the behaviors of the state of matter we wish to describe. If the model is based in linear mechanics then stick to linear mechanics, if the model is based on thermodynamics then the applicable math has to be applied.

For someone to say Energy is of no value, or sectional density is of no value and then to try to offer explanation by crossing ad lib from one mathematical model to another without correct mathematical consideration is illogical.

If we look at penetration mechanics we see that there are models that choose to view both the bullet and target as fluids ( Alekseevski - Tait equations) where projectile diameter and mass are of no consequence ie SD is discounted so too nose shape; the same can be said of hydromechanics models where the density of fluid and its vapour is of importance again nose shape of no consequence.... when a traditional newtonian linear mechanics model is used however diameter and mass and nose shape is all important.

One of the major failings in the world of terminal ballistics in the lay realm at least has been a failure to understand fully what we are observing or misapplication of an appropriate mathematical model.

So in reality not what we "think we are seeing" but truly understanding what we are seeing based on logic and physics that govern the interactions between states of matter.

The modern terminal ballistics movement of the 80's, centered on both sides of the Atlantic, in no uncertain terms highlighted the flawed reasoning of centuries of "Lies, Damned lies and ballistics"

What is interesting though is that not only the lay hunting public but also academics where guilty of propagating ballistics pseudoscience.

It has not been that uncommon to see prominent medical Trauma textbooks and even police ballistics experts perpetrating error, not to speak of the lay hunting press written by self proclaimed expert hunters.

McPherson in his book Bullet penetration - Modeling the dynamics and incapacitation resulting from wound trauma Second printing, page 65 sums it up under the heading of "mystical effects"

This is of course not new, in fact it goes way back to the 1600's when one of the fathers of ballistics, Benjamin Robins who invented the ballistic pendulum also ventured into the world of terminal ballistics.

Once Robins was able to measure velocity he set out to determine the relationship of velocity to penetration of ¾ inch steel balls fired from a musket into Oak.

The assumptions that followed were as some would say ? "part right, part wrong" , much like a lot of the flawed reasoning we see today in the lay ballistics literature.

At the time when Robins did his work he and others had not yet formulated the effects of drag in terms of the state of matter of the target.

The assumed relationship indicated that penetration had a linear relationship to impact velocity.
Based on his assumption then a "physical rule" was created.
Euler who translated and expanded on Robins 's famous book confirmed this relationship albeit flawed.

What is interesting is that this "rule" held for almost 200 years. What is more interesting was that the rule was tested and strangely upheld even though observations to the contrary were made when projectiles were fired into all manner of material, bordering then perhaps on McPherson's realm of "the mystical"

What is abundantly clear today is that we need to define what phase of matter we are dealing with and when choosing a physical model to describe what we are seeing to make sure that the math fits to phase of matter.

To some issues raised here:

The aluminium bullet?

Not new at all in fact there are still some manufacturers that produce aluminium bullets. CDM A.S. of Mexico under the trade name Aquilla manufacture bullets made of Aluminium ( Cartouchos Deportivos de Mexico AS ) I believe Kynoch and others dabbled in aluminium bullets between the great wars, an attempt to add wounding capability to the diminutive 25 ACP and 32 ACP often used by covert agents in occupied countries.

The ballistic problem of the aluminium bullet falls under the forensics realm of "low Sectional density" or "low mass " projectiles.

Because of the low SD relative to caliber these projectiles can be shot at much higher velocities than their "normal" SD counterparts giving them high impact kinetic energy values.

This then creates at least two physical problems.

The first is that because of the low SD these projectiles have very poor BC and their usable effective range is quite small when compared to "normal" bullets. So for rifles at least they are of little value

The second problem has to do with the impact mechanics of such a projectile in a visco-elastic target and then in particular the way the target handles the energy imparted to it.

Because of the high velocity these projectiles have higher drag than their "normal SD" counterparts and they then tend to shed all of their energy in the early parts of the penetration path.

As stated before the nature of matter of the target determines what the target will do with this energy in terms of creation of a wound.

If it were pure muscle ie a firm target with high viscosity and elasticity, the aluminium bullet would be quite ineffective because it would simply dump energy and the energy would be absorbed by the muscle without causing much damage beyond what is contacted by the bullet.

On the other hand if the target were dense with water like properties, say liver, one would get a massive wound. Liver when impacted by high velocity projectiles tends to lacerate with cracks radiating out beyond the permanent cavity.

If anyone thought such a liver wound would give a long lingering death or give cause for a long tracking before downing a game animal. Think again. The liver puts trough roughly 27 ml of mostly venous blood per kg of body weight, for a 70 kg animal it means a volume of 1.89 liters per minute. That means the animal of 70 kg will have lost 40% of it's circulating blood volume within a minute after receiving a high velocity gunshot wound ! Unless there is a "animal" ICU out there that animal is toast !

In terms of the human target where the liver lies just behind an inch or so of skin muscle and fat these projectiles are devastating but only if dense vitals are hit, they do poorly in elastic targets such as lung or the gut.

In targets where substantial amounts of bone and muscle have to be traversed the aluminium bullets is quite useless More than often though they only produce very large shallow non fatal wounds and because of this have been banned from military use at least use under the Geneva convention.

What about kinetic energy? Again we need to go back to the basics of the physics at hand.
One of the oldest ballistics questions asked has been how much energy is absorbed by the target and how much and at what point in the bullet's path?

What follows then also is how does this energy contribute to the wound, because after all is said and done based on the physics of thermodynamics it is this energy that will do the work that damages the target.

Extensive research has been done to try and solve this important question.

Energy dump per unit of distance travelled is not linear.
It is drag dependent and drag in turn is velocity dependent. Drag is also a function of the state of matter in which it is measured.

Then there is the whole debate about the flat nosed bullet?

What penetrates better, a perfectly round sphere or spheres that have had surfaces flattened ( the science of shotgun pellet penetration) and which has the least drag at all velocities ? a flat nosed cylinder or a sphere of similar caliber ? Which is more or less stable in flight? a pointy low drag bullet of or a FN bullet and what exatly stabilizes the bullet. Is it the FN per se or is it perhaps the distribution of mass relative to the CG and the point of wind pressure ? Perhaps the answers may not be what some will want to hear?

It basically brings us full circle to the opening lines of my statement !

We need to clear about the physics and the state of matter we are discussing and comparing.

Posts: **7852** | Registered: **16 August 2000**

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**Gerard**
one of us

posted 16 February 2010 09:49   

Precautionary copy and paste.

> quote:
>
> ALF
> one of us
>
> Posted 16 February 2010 06:43 Hide Post
> sofa sofa
>
> Physics:

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**jeffeosso**
Moderator

quote:

Originally posted by ALF:

Physics:

The study of matter
(blah blah blah .. lots of disjointed but wordy things, mixing terms that are NOT related, but kinda sound cool together)

We need to clear about the physics and the state of matter we are discussing and comparing.

Good, you finally agree and have stated it. Physics and states of matter -- NOT medicene or opinions. once you start using NON PHYSICS terms to describe the event, you are leaving physics ... and picking and choosing words from different jargon, but trying to, as a lay person, lump them together, is silly. you can not quote 54 UNRELATED sources/disciplines and come up with anything coherent without YOU doing work. heck, even wikipedia would laugh at you "article" as being "not up to community standards/ needs to be proof read / subject to clean up"

organs are very close to Amorphous rubbery solids, bones are solids, blood is liquid, and there's no "simple" model to represent the body as a living, HIGHLY variable compostition thing

You've been blathering, for YEARS that no media represents game, without presenting anything REAL WORLD that comes close to being an idea model.

So, you are complaining without offering solution, which means all your posts are being part of the problem, not the solution.

media that offeres repeatable, even if variable, results is valid, FOR THAT MEDIA

accept that and move on ... no one says "paper is the same as animals" except the fools that try to argue its not.

Listen, and listen well

whelan proved, 100 years ago, that shooting animals in various states produced irratice results.. the same "animal" either dead, resting, drugged, or highly aggitated produced wildly different results. In other words, shooting animals is POOR MEDIA for understand ballastics ....

But, Alf, you are mixing bullet tests with wounding .. which is not what shooting paper is about.

sit down, read the results, and offer input .. you can stop the overly wordy bs.. you'll just delete it in a month any, ,annoying every involved

#dumptrump

**opinions vary** band of bubbas and STC hunting Club

Information on **Ammoguide** about
the416AR, 458AR, 470AR, 500AR
What is an AR round? Case Drawings 416-458-470AR and 500AR.
476AR,
http://www.weaponsmith.com

Posts: **37020** | Location: **Conroe, TX** | Registered: **01 June 2002**

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**Whitworth**
Moderator

quote:

Originally posted by jwp475:

quote:

Originally posted by boom stick:
The rounded nose to meplat is to aid in feeding right?

It's only purpose. In the 1800 the great British Engineer Whitworth concluded the supiriority of the flat point for penetration.

Nothing new in the shooting world, it is only re-visited

Hey, I had nothing to do with that! And I'm not that old....... 😬 Come to think of it, I'm not an engineer either...... ☹ ???

"Ignorance you can correct, you can't fix stupid." JWP

If stupidity hurt, a lot of people would be walking around screaming.

Semper Fidelis

"Building Carpal Tunnel one round at a time"

Posts: **13440** | Location: **Virginia** | Registered: **10 July 2003**

posted 16 February 2010 15:45 | Hide Post

Busy evening I see. Starting at the top.

Jeffe

Hammerheads have arrived. Good. For all, Jeffe is loading up some test loads using the hammerheads and we will conduct a test, slow hammerheads--fast hammerheads.

Now, Whitworth has an excellent point, one to consider. Should the hammerheads deform, or expand, at the higher velocity, test is invalid for what is intended. Fast/Slow penetration. This was proven with the cast bullets recently with the 45/70s. Too much velocity, expansion, deformation, less penetration. Slower, more penetration because no deformation of the nose. But that is not the point of the test. But is a very important point we must consider depending on if the hammerheads deform or expand any.

I am quite sure if the hammerheads do not deform, the higher velocity will penetrate deeper.


JWP475

That would be an excellent test, similar to what 465HH proposed with the different meplat sizes also. Still on order-75%-65%-55%-45% meplat size of caliber.

Taking the Barnes and changing it to a larger meplat would indeed be good. But it must be absolutely precise. I tried to do something similar here just with a grinder, no good, it made the bullet worse than a round nose, veered and went everywhere. So if someone would like to take that on, that has proper equipment to do so, I would be happy to put it in the box for a test. I don't have the equipment to make it proper.

Getting ready to test the 416 400gr Barnes Banded, I measured the meplat on them, 67%-68% meplat for caliber, same as the 458s. I am still a day or so out on that test Buffalo, but working on it. I have to do two completely new boxes for it, have not had time yet to get that done.


Whitworth

Well I was thinking to myself, you really didn't sound that old on the phone, and I did not pick up on the British accent at all.

Glenn
What a nice bedtime story! LOL

Alf

Glad to see you have returned and still just as disturbed and troubled as I am!!!!!!!!

Now don't get pissed off and leave again because I said that, it's in jest for christ's sake!

Your commentary concerning the aluminum bullets is very good, and I am in agreement with you concerning that issue for the most part. They are interesting to play with and investigate. But that's about the extent of them for my personal use anyway.

I do not have enough to test accuracy, range or anything else other than what I did. I think a very limited use bullet. Even for CQB/CQC (or whatever todays term might be) I would have concerns about penetration of heavy clothing and other factors involved.


Jeffe
Again, well stated, and thanks. No medium is perfect for terminal ballistics, not mine, not gelatin, and certainly not animal tissue. Nothing duplicates animal tissue, not even animal tissue!

As for consistency I do the best I can with what I work with. Most of the time results are very close from one session to another. Not a lot of difference. As for how a bullet reacts or it's "BEHAVIOR" in the medium, there is never a difference unless velocity is changed or a change made OUTSIDE of my test medium. A round nose still veers off course, regardless, a Swift A at 2100 fps impact still "behaves" in the same manner. The only change is "Compression" which Alf did bring up some posts ago I think, as he deleted those. Try as I might, most of the time very close, but sometimes I am sure the compression is not exactly the same from time to time. One of my control bullets is a 458--450 Barnes Banded at or around 2200 fps muzzle. Time after time this bullet will give between 55-58 inches, most of the time, 57 inches. As you see, compression is not exact, therefor giving me between 55-58. The only difference is the number of inches of penetration. Performance "BEHAVIOR" is the same each time. This is not a check that is done in every mix either, just from time to time. Need something like a BB test, not as destructive to the mix as a 450 Barnes Banded. But that really would not work anyway because you would only be testing the first few inches, which is fine with gelatin, maybe? I am trying to come up with a way I can compress the box the same each time, mechanical. I have an idea, but not the skills to be able to put it together.

Still trying to improve on what we do.

Michael

http://www.b-mriflesandcartridges.com/default.html

The New Word is "Non-Conventional", add "Conventional" to the Endangered Species List!
Live Outside The Box of "Conventional Wisdom"

I do Not Own Any Part of Any Bullet Company, I am not in the Employ Of Any Bullet Company. I do not represent, own stock, nor do I receive any proceeds, or monies from ANY BULLET COMPANY. I am not in the bullet business, and have no Bullets to sell to you, nor anyone else.

Posts: **8426** | Location: **South Carolina** | Registered: **23 June 2008**

posted 16 February 2010 15:59 | Hide Post

I have some Barnes monometal solids in .475 caliber, and access to a lathe.......standby......


"Ignorance you can correct, you can't fix stupid." JWP

If stupidity hurt, a lot of people would be walking around screaming.

Semper Fidelis

"Building Carpal Tunnel one round at a time"

**michael458**
One of Us

posted 16 February 2010 16:12                                    Hide Post

Brings me to a point I would like to make. In our world today, there really are very few bullet failures! What might fail in one area, is an attribute in another area. But what is a prerequisite for that is "consistency"!

Most of todays major bullet manufacturers consistency from one bullet to another is extremely good. There are occasions, but that is rare today.

For example way back when I was searching for proper .500 caliber buffalo bullets and solids for my .500s I worked a short time with two different small bullet makers, lead core jacketed bullets. Try as they might, they did not have the technology to be able to put it together for me at the velocities I was working with, 2000--2200 fps in the 50 B&M, for bullets weighing 425-500 grs. Several different generations of bullets and attempts and most all were true failures for what I needed. Either the bullet was too soft and blow all to hell, or too hard and do nothing. Out of hundreds of bullets tested, only 20% of them were a success. On the first outing with the guns I did not use those bullets on animals, with good reason. Lack of consistency. I never knew or could even predict what was going to happen with them.

If you have consistency with any bullet, you can most of the time find a use for it, if it behaves the same from one time to the next. If it expands too much at high velocity, then drop the velocity to where it performs the way you would like for it to. If high velocity it works as needed, then............adjust for that.

For me, reasonable, and consistent accuracy is a prerequisite. I must have confidence in the rifle, the load, the accuracy, and the bullet performance before going to the field with it. My rifles get the hell shot out of them before going to the field, if something just is not quite working right, it don't go! Feed, function, reliability, accuracy, terminal performance, all of these factors must be in line for the mission I want to embark upon. Shooting, testing, all start weeks, months, and even longer ahead of time. Then I look for consistency in all these factors, does it work every time the same. If so, and I need adjustments to suit my purpose, those are done and off we go! If not, then I make a new plan!

Consistency, part of the equation!

Michael

http://www.b-mriflesandcartridges.com/default.html

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**Warrior**
One of Us

posted 16 February 2010 17:11                                    Hide Post

quote:

> On the other hand if the target were dense with water like properties, say liver, one would get a massive wound. **Liver when impacted by high velocity projectiles tends to lacerate with cracks radiating out beyond the permanent cavity**.
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1. Again here the reaction of a hit to the liver is being reaffirmed by Alf himself, after I have been accused of a fake quotation by by Gerard and VVarrior. Their clutching at straw was quite hilarious, but should actually be quite evident now to one and all. I obviously copied and pasted that quotation from Alf at the time and kept it in my 'Drafts' folder.

2. It also appears that even though we seldom, if ever, aim for the liver, that it is still an effective shot. The medical explanation could not be clearer, but some here on AR (non-medical experts) will make a case of long follow-ups.
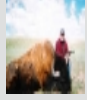
And so we go around the mullberry bush ...

This was a pretty neat medical explanation.

Warrior

posted 16 February 2010 18:51

Here is a picture of a Zebra's heart showning the resulting damage of a 210 grain TX fired from a 338 Federal range was about 100 yards at the shot the Zebra wheeled 180 degrees and ra about 50 yards became dioriented and ran back to about the same spot as it was when shot and fell over dead.



Here is a picture of the damage to the liver of a 6X7 Bull Elk that we no where when hit and bleed out in short order



_____

A 9mm may expand to a larger diameter, but a 45 ain't going to shrink

Men occasionally stumble over the truth, but most of them pick themselves up and hurry off as if nothing had happened.
- Winston Churchill

Posts: **5077** | Location: **USA** | Registered: **11 March 2005**

posted 16 February 2010 20:03

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**boom stick**
One of Us

posted 16 February 2010 20:34                                    Hide Post

Verrry interesting stuff. Thanks!

You mentiooned rifle bullets and small caliber pistol bullets.

I was thinking BIG BORE rifle carts and pistol/revolver rounds.

As demonstrated the first test done penetrated the same as the 45 APC so in home defense that could be ideal.

Small calber pistol bullets would weigh like 10 to 20 grains and a 30 cal rifle bullet would weigh about 40 grains. what I am suggesting is a 50 grain pistol bullet and at least 100 to 150 grain bullets for short distances and enough penetration for human to deer size targets.

Aluminum bullets only seem to have a value when shot out of a large enough bore.

Then we are getting into nominal rifle and pistol weight bullets at high velocity.

If you are shooting a 120 grain .500" Aluminum bullet with a non deforming .35" meplat that is like shooting an expanded 22 cal rifle bullet but twice the weight of a nominal 22 bullet.

I am not saying long range but short range under 100 yards. If an aluminum bullet of .35" meplat reaches its target @ 3,000 fps that should be good for deer or the two legged critters.

At a bare minimum these could be fun and for low recoil target shooting if not home defense and small game at close quarters.

Again so just to be clear.

A .500" S&W aluminum bullet will duplicate the weight of a nominal 9MM bullet but at high velocity.

A 140 grain .500" bullet out or a say 500 MDM @ 4,000 FPS will duplicate the weight of a 7MM bullet but the meplat of an expanded 22 cal bullet.

I think those bits of information are worthy of some bullet testing since we are talking about big chuncks of aluminum not itty bitty ones.

quote:

> The aluminium bullet?
>
> Not new at all in fact there are still some manufacturers that produce aluminium bullets. CDM A.S. of Mexico under the trade name Aquilla manufacture bullets made of Aluminium ( Cartouchos Deportivos de Mexico AS ) I believe Kynoch and others dabbled in aluminium bullets between the great wars, an attempt to add wounding capability to the diminutive 25 ACP and 32 ACP often used by covert agents in occupied countries.
>
> The ballistic problem of the aluminium bullet falls under the forensics realm of "low Sectional density" or "low mass " projectiles.
>
> Because of the low SD relative to caliber these projectiles can be shot at much higher velocities than their "normal" SD counterparts giving them high impact kinetic energy values.
>
> This then creates at least two physical problems.
>
> The first is that because of the low SD these projectiles have very poor BC and their usable effective range is quite small when compared to "normal" bullets. So for rifles at least they are of little value
>
> The second problem has to do with the impact mechanics of such a projectile in a visco-elastic target and then in particular the way the target handles the energy imparted to it.
>
> Because of the high velocity these projectiles have higher drag than their "normal SD" counterparts and they then tend to shed all of their energy in the early parts of the penetration path.
>
> As stated before the nature of matter of the target determines what the target will do with this energy in terms of creation of a wound.
>
> If it were pure muscle ie a firm target with high viscosity and elasticity, the aluminium bullet would be quite ineffective because it would simply dump energy and the energy would be absorbed by the muscle without causing much damage beyond what is contacted by the bullet.
>
> On the other hand if the target were dense with water like properties, say liver, one would get a massive wound. Liver when impacted by high velocity projectiles tends to lacerate with cracks radiating out beyond the permanent cavity.
>
> If anyone thought such a liver wound would give a long lingering death or give cause for a long tracking before downing a game animal. Think again. The liver puts trough roughly 27 ml of mostly venous blood per kg of body weight, for a 70 kg animal it means a volume of 1.89 liters per minute. That means the animal of 70 kg will have lost 40% of it's circulating blood volume within a minute after receiving a high velocity gunshot wound ! Unless there is a "animal" ICU out there that animal is toast !
>
> In terms of the human target where the liver lies just behind an inch or so of skin muscle and fat these projectiles are devastating but only if dense vitals are hit, they do poorly in elastic targets such as lung or the gut.
>
> In targets where substantial amounts of bone and muscle have to be traversed the aluminium bullets is quite useless More than often though they only produce very large shallow non fatal wounds and because of this have been banned from military use at least use under the Geneva convention.

577 BME 3"500 KILL ALL 358 GREMLIN 404-375

*we band of 45-70ers* (Founder)
Single Shot Shooters Society S.S.S.S. (Founder)

**Gerard**
one of us

posted 16 February 2010 20:44 | Hide Post

Pontificus Erroneus,

> quote:
> This was a pretty neat medical explanation.
>
> 😄 😄 😄

Pity that you were not paying attention when it was given.

Alf posted:

> quote:
> Liver when impacted by high velocity projectiles tends to lacerate with **cracks radiating out beyond the permanent cavity.**

See the radial cracks emanating from the bullet impact. See, no tumbling.

See, no radial cracks, just lacerated liver tissue from the tumbling bullet.

You just have to see enough of them to learn to tell the difference. You obviously have a ways to go still.

😄 😄 😄

Posts: **2848** | Registered: **12 August 2002**

---

**Macifej**
One of Us

posted 16 February 2010 21:02 | Hide Post

Is that correct foot orientation ...??

Posts: **13301** | Location: **On the Couch with West Coast Cool** | Registered: **20 June 2007**

---

**ALF**
one of us

posted 16 February 2010 21:13 | Hide Post

.

Posts: **7852** | Registered: **16 August 2000**

---

**VVarrior**
One of Us

posted 16 February 2010 22:37 | Hide Post

I was pretty sure that Pontificus Erronues is Gerard's name for Warrior.

VVarrior

Posts: **127** | Location: **South of the Zambezi 2** | Registered: **22 March 2008**

Good Afternoon Boys! I missed some of you today via phone. Sorry. I received 500 brand new .500 caliber 510 gr Solids yesterday afternoon, and had to put them in their place proper (JWP475 swears I am rolling naked in them, or

accuses me of it anyway). Only a photo will tell the truth! 😷

JWP475--got your message, good test, I agree, need someone to do us some bullets!

Been on the range the rest of the time, doing some cleaning up, bagging chewed up test medium, taking stock in what is left, and found I had just enough test medium left to conduct a little test today.

I have new test medium soaking overnight now and should be ready in the morning for the 416 caliber 400 gr Barnes banded tests! Be on the lookout Buffalo!

Y'all loaded some damn ugly photos today, blood and guts!

http://www.b-mriflesandcartridges.com/default.html

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Posts: **8426** | Location: **South Carolina** | Registered: **23 June 2008**

Todays Work involved once again the 400 gr Barnes Buster! BUT this time a .500 caliber Barnes Buster! The test rifles included a 50 B&M and two 50 B&M Super Shorts, the first one built blue and 1:18 twist rate and the second stainless with 1:12 twist rate. The 50 B&M is a stainless gun with 1:12 Twist.

50 B&M
400 Barnes Buster 2258 fps

50 B&M Super Short
400 Barnes Buster 1937 fps

First up was the 50 B&M Super Short with 1:18 Twist Rate.



**50 B&M Super Short**
**1:18 Twist**
**400 Barnes Buster**
**1937 fps Muzzle Velocity**
**22 yd Impact 1851 fps**
**#1-Straight to 31 Inches**
**Veer off course out of box at 35**
**Inches, 3" off course.**
**#2-Straight to 26 Inches, veer off**
**course to 30 Inches 3" off course**
**found sideways in medium.**

Next the 50 B&M Super Short with 1:12 Twist Rate.

50 B&M Super Short
1:12 Twist
400 Barnes Buster
1925 fps Muzzle Velocity
22 yd Impact 1847 fps
#1-Straight to 37 Inches, veer right to 42 inches exit medium
#2-Straight to 39 Inches veer right to 42 Inches found sideways 2" off course

And Last but not least the 50 B&M with 1:12 Twist Rate



50 B&M
1:12 Twist
400 Barnes Buster
2258 fps Muzzle Velocity
22 yd Impact 2170 fps
#1-Straight to 45 Inches Found Nose Forward
#2-Straight to 46 Inches Found Sideways 1" Off Course

Now what reasonable logic can come of this? I figure there are a few good points to ponder within this information!

Michael

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Posts: **8426** | Location: **South Carolina** | Registered: **23 June 2008**

**jwp475**
One of Us

posted 16 February 2010 22:58    Hide Post

The Busters unfortuately act about like I predicted to Whitworth, because IMHO the Meplat is small and they have too much radous in the nose section.

I was very glad when I heard that Barnes was going to come out with these bullet but very dissapointed with the bullets when I saw them

_____

A 9mm may expand to a larger diameter, but a 45 ain't going to shrink

Men occasionally stumble over the truth, but most of them pick themselves up and hurry off as if nothing had happened.
- Winston Churchill

Posts: **5077** | Location: **USA** | Registered: **11 March 2005**

---

**Warrior**
One of Us

posted 16 February 2010 23:05    Hide Post

Gerard,

Since I have not shot as many as you did, and a correction to to the actual number shot.

OK then, let us cut out the observed ones (several thousand of them), and just consider the 1,000 that you actually killed yourself, then the story goes as follows:

The claimed 1000 head of game you shot over the last 18 years gives us 56 animals on average per year. If shot for the pot, the Schultz family of 4 consumes an antelope every 6.5 days - this is in line with the killing of a pride of 4 hungry adult lions (see quote below). Bear in mind that a lion eats much more than a human being. If half was sold though, and only one half was destined for the pot, then it only makes your family half as hungry as the lions - it is still a hard act to follow to consume an antelope every 13 days. Could it be that you either sold or gave 500 animals away? If not, then you are truly a carnivore.

"An adult lion will kill in the region of 15 animals per year. The norm is for African Lions to kill only enough to sustain themselves, but they have been known to kill excessively in the case of prey animals that are weak or young lions that go beserk." ... [African Lion Hunting Habits in South Africa and Southern Africa:]



Warrior

Posts: **2273** | Location: **South of the Zambezi** | Registered: **31 January 2007**

---

**michael458**
One of Us

posted 16 February 2010 23:15    Hide Post

Warrior

In Australia last year I killed 27 buffalo (20 of my own, 7 others wounded) I never so much as tasted them, and never ate one morsel! Not quite sure what category I would go in? And, I forgot already what other animals I shot last year? But I can tell you this, I am ready to go for another run at those buffalo, but this time I am putting 50 on quota! Hell, if I go for 10 days that's only 5 per day! Piece of cake, let me get booked!

Michael

http://www.b-mriflesandcartridges.com/default.html

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Posts: **8426** | Location: **South Carolina** | Registered: **23 June 2008**

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**ALF**
one of us

posted 16 February 2010 23:39    Hide Post

.

Posts: **7852** | Registered: **16 August 2000**

**jwp475**
One of Us

quote:

> Originally posted by michael458:
> Good Afternoon Boys! I missed some of you today via phone. Sorry. I received 500 brand new .500 caliber 510 gr Solids yesterday afternoon, and had to put them in their place proper (JWP475 swears I am rolling naked in them, or accuses me of it anyway). Only a photo will tell the truth!
>
> JWP475--got your message, good test, I agree, need someone to do us some bullets!
>
> Been on the range the rest of the time, doing some cleaning up, bagging chewed up test medium, taking stock in what is left, and found I had just enough test medium left to conduct a little test today.
>
> I have new test medium soaking overnight now and should be ready in the morning for the 416 caliber 400 gr Barnes banded tests! Be on the lookout Buffalo!
>
> Y'all loaded some damn ugly photos today, blood and guts!

Whitworth is going to have some made I believe, if not I will get Jack to turn some on his lathe

_____

A 9mm may expand to a larger diameter, but a 45 ain't going to shrink

Men occasionally stumble over the truth, but most of them pick themselves up and hurry off as if nothing had happened.
- Winston Churchill

Posts: **5077** | Location: **USA** | Registered: **11 March 2005**

---

**someoldguy**
One of Us

quote:

> Glenn
> What a nice bedtime story! LOL

Thanks.
I feel it actually is time for me to put it to bed, but I'll still be watching the results.
Not angry, just tired of the pissing contests and the pontificating and the pedantry. Guess that does mean I'm somewhat angry, but I don't really have anything of substance to offer other than interest.

Later. But I'll still be watching.

_____

Glenn

Posts: **942** | Location: **Alabama** | Registered: **16 July 2007**

---

**michael458**
One of Us

quote:

> Originally posted by someoldguy:
> quote:
>> Glenn
>> What a nice bedtime story! LOL
>
> Thanks.
> I feel it actually is time for me to put it to bed, but I'll still be watching the results.
> Not angry, just tired of the pissing contests and the pontificating and the pedantry. Guess that does mean I'm somewhat angry, but I don't really have anything of substance to offer other than interest.
>
> Later. But I'll still be watching.

Glenn?    PPP--Pissing-pontificating-pendantry! Whew!

Pay it no mind! Focus on the mission, the rest will pass by barely noticed! Anything of import will rise above the rest!

Michael

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Posts: **8426** | Location: **South Carolina** | Registered: **23 June 2008**

**Phatman**
One of Us

posted 17 February 2010 05:06 — Hide Post

Damn,

Now I've got to buy a better dictionary

It is my deepest regret that I was to be educated in the public educational system. I find my personal diatribe to be lacking in so many ways.

(Enter music from Masterpiece Theater here)

How you gentlemen should suffer unto those whom you know to be your betters. The learned wise ones that speak, not for their own lust gains but for our own good for we do not know the way. Ya, we are lost but for the golden tongue of the One that will lead us. Verily I say, seek out his council for the work is spoken. So it is said, so it is written, so it shall be done !!

Hey, some body Beer Me !!! 🙂

John 🦆

Give me COFFEE and nobody gets hurt

Posts: **1608** | Location: **San Antonio, Texas** | Registered: **04 January 2010**

---

**Phatman**
One of Us

posted 17 February 2010 05:11 — Hide Post

It's OK,
I'm just OFF my Meds

John 🦆

Give me COFFEE and nobody gets hurt

Posts: **1608** | Location: **San Antonio, Texas** | Registered: **04 January 2010**

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**MikeBurke**
One of Us

posted 17 February 2010 05:48 — Hide Post

While waiting on powder for the 1700FPS test I tried something a little different.

The test consisted of 4" of completely saturated newspaper, 1 ¼" of HardiPlank nailed to 1 5/8" of pine all on a 20º angle, 28" of water with 9 newspapers suspended in the water with each paper containing 40 pages, 5/8" of HardiPlank nailed to a another 1 5/8" of pine on a 20º angle opposite of the first setup, and then the remainder of the 72" box filled with saturated newspaper.

This is the description of HardiPlank from there site:

First, what is HardiPlank made of? HardiPlank falls in the fiber-cement siding class, which means that it is a combination of cellulose fibers, along with cement-like materials. In other words, it's partly wood, partly cement.

It is also flexible.

I fired one .474 500 grain North Fork solid at 2070 FPS IV. It penetrated through everything in a perfect straight line. The measured deflection was less than ½" through the 71" of penetration. It stopped at the back of the box. I thought it would certainly deflect on the hardiplank at the angle particularly after going through 28" of water but did not.

The bullet looked like the other North Forks. It could be fired again.

Tomorrow it will be the Woodleigh's turn.

**capoward**
One of Us

posted 17 February 2010 06:03                              Hide Post

Very nice Mike...between Michael's testing and now your testing there are a number of FN bullets being identified as straight-line penetrators in combination mixes...and that should transend to the field based on Michael's buffalo testing. Many thanks, you and Michael are saving the rest of us many $$ in bullets. 🙂

Jim
*"Life's hard; it's harder if you're stupid"*
*John Wayne*

**RIP**
one of us

posted 17 February 2010 08:13     Hide Post

Alf,
One concept to master: Proper spelling of the name "MacPherson" as in Duncan MacPherson.
Not "McPherson."
Is there really a second edition of his book **Bullet Penetration**?
First Edition (December 1994 first printing) has "Mystical Effects" on page 65.

Letter Rip

Posts: **28032** | Location: **KY** | Registered: **09 December 2001**

---

**Gerard**
one of us

posted 17 February 2010 09:18     Hide Post

You know what to do by now, I hope.

Jay,

> quote:
>
> Is that correct foot orientation ...??

You know how it goes with Warrior. He gets very few things right. He does foot putting regularly but getting the orientation right is a real challenge for him.

Posts: **2848** | Registered: **12 August 2002**

---

**michael458**
One of Us

posted 17 February 2010 12:56     Hide Post

Mike

Holy Cow!

That Mix sounds like SUPER T'Rex!!!!!!!!!!!!!

Good test! Now what can follow that lead?

These "extraordinary" tests, like this one, like my T'Rex, they are tremendous "indicators" of what could happen with a bullet under tremendous stress! While some, like my T'Rex are difficult and near impossible to be consistent, that is the point, nothing in the field is consistent. This test of yours is more consistent for sure, very tough it would seem too. Three different mediums to pass through! Several different densities to contend with, lot's of things to throw it off course! And yet, some mystical hand (so they say) reaches down and guides the path of the great FN solids!

RN? No way pal! Not going to do it!

Excellent, thank you again!
Michael

http://www.b-mriflesandcartridges.com/default.html

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Posts: **8426** | Location: **South Carolina** | Registered: **23 June 2008**

**michael458**
One of Us

posted 17 February 2010 13:14

OK I am going to bring it to your attention. I left the conclusions out on the .500 caliber Busters on purpose, but seems you guys are lost in never never land! Get back on track here!

First, we see the same bullet, driven at two different velocities in two cartridges. Also we have two different twist rates. Some points to be derived from this.

OK, 1:18 twist and impact velocity of 1851 fps gave us 31 and 26 inches of straight line penetration before flying off in different directions. Why the difference in the amount of penetration? First and foremost, I thing the very definition of UNSTABLE sorts that question out to begin with. Inconsistent penetration is a pretty good indicator of Unstable conditions I would say! Next if you look at bullet number two, you will see where it did hit a staple that was in one of the catalogs in the mix! Looks like even two staples. It could be possible this had something to do with it's stability. Already being unstable, it might not have taken much to flip it?

Now moving to the same bullet in the same cartridge to a rifle with 1:12 twist that impacted exactly 4 fps less than the bullets with 1:18 twist. Close to the same velocity I would say. Now we have stability to 37 and 39 inches! What is different here? 1:12---1:18. That is a fairly substantial increase in straight line penetration. It sure seems to me, 1:12 has made a big difference? However, there is still that stability issue in that last bit of penetration! Meplat size? Velocity?

Next, we move up to the 50 B&M and still with a 1:12 twist rate we increase the IMACT VELOCITY by 323 fps. Now we find #1 Dead straight to 45 inches, and found nose forward! #2 veered ever so slightly off course by 1" and found sideways at 46 inches. Stability has now increased by yet another big margin by only increasing the velocity and nothing more. Still slightly unstable because of smaller meplat, still running about 57-58% of caliber.

Now with the same exact bullet we have shown AGAIN, that a faster twist rate, does in fact increase terminal stability of some solid projectiles. Higher velocity does also increase penetration, and further increases terminal stability to a point, dependent upon % of meplat of caliber. I calculate that should this bullet have a meplat size of 65% + of caliber, then you would have seen a different story in all three tests! Factors? Meplat size, twist rate, velocity. SD being exactly the same and has no bearing in this test.

Michael

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Posts: **8426** | Location: **South Carolina** | Registered: **23 June 2008**

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**RIP**
one of us

posted 17 February 2010 15:20

Michael,
Right on, right on, right on.

Faster twist: more revs at a given vel
Faster vel: more revs at a given twist

More revs: greater gyrostability ... seems to me that does not decrease penetration, at least in your test medium. 😊

More velocity: greater penetration with a nondeforming solid ... in your test medium. Even Alf would agree. 😊

Perfect FN solid nose shape: Your guess of 65% meplat nose seems good enough for most of us.
Your proposed test of that will be very interesting.

Are you going to be able to pull it off?

Posts: **28032** | Location: **KY** | Registered: **09 December 2001**

---

**michael458**
One of Us

posted 17 February 2010 15:40

RIP
I put in a request to David for the proposed test with I hope .500 caliber because I have the two different twist barrels--4 bullet designs all the same, same weight, different meplat size--75-65-55-45% of caliber. Brian is trying to get him to do it for us, but it takes some setting up of machines and what have you to get it done proper. Might take some time, but I suspect at some point it will come through. Working on Davids schedule too, hoping he can do it for us in between other profitable things????

I would estimate once that study is done, that will pretty much be the nail in the coffin on meplat size, and penetration. I say 75% and 65% will give straight line penetration and the 55% and 45% will struggle depending on twist rates, and 45% meplat may be of no consequence at all! Note it! We will see if I am correct when the bullets get done.

Michael

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Posts: **8426** | Location: **South Carolina** | Registered: **23 June 2008**

posted 17 February 2010 15:53

> quote:
>
> Glenn? bewildered PPP--Pissing-pontificating-pendantry! Whew!
>
> Pay it no mind! Focus on the mission, the rest will pass by barely noticed! Anything of import will rise above the rest!

Yeah, you're right. I know what to do with the three P's, after all.

Phatman has the right attitude:

> quote:
>
> How you gentlemen should suffer unto those whom you know to be your betters. The learned wise ones that speak, not for their own lust gains but for our own good for we do not know the way. Ya, we are lost but for the golden tongue of the One that will lead us. Verily I say, seek out his council for the work is spoken. So it is said, so it is written, so it shall be done !!

I guess I've been off my meds myself.

Anyway, I'm still here.

_____

Glenn

Posts: **942** | Location: **Alabama** | Registered: **16 July 2007**

---

posted 17 February 2010 17:02

Okay, I've had a couple of Flintstone vitamins, so now I'm good to go with more geek stuff.

I found something interesting from my personal long-version penetration estimator that I'd like to share. It's like anything else that's mathematical/scientific/somewhat simple. It's not always perfect at predicting real-world results, but it gets reasonably close IMO. And I think I've found the two missing variables that make the thing work: The density and the compressive strength of Michael's test medium. (Which, despite the obsessive nitpicking of the some of the "3P crowd," appears to be reasonably well consistent.)

For the .500 B&M Super Short with a 400 grain bullet and an impact velocity of 1851 fps and a twist rate of 1:18. My model says that the penetration depth "should" be about 45 inches. However, the bullet becomes unstable at about 31" penetration and goes out of the box at 35". Going back into the formula and using Newton's law, I find that the velocity at 31", where the instability occurs, would be in the neighborhood of 1025 fps. With a twist of 1:18, this means that the revolutions per minute would be 1025 x 720 / 18 or 41,000 rpms. Okay, remember that.

The next was the same bullet with an impact velocity of 1847 fps and a faster twist of 1:12. The penetration depth "should" still have been about 45 inches, but it veered off at 37-39 inches. The estimated velocities where the bullets went unstable was much lower at 764 fps and 657 fps respectively. In rpms, this would be between 39420 and 45840 rpms. (An average of just over 42000 rpms.)

Now, the last test with an impact velocity of 2170 fps. The penetration depth "should" have been just over 49", but it stopped at 45". At this depth in my model still showed a velocity of 667 fps or just over 40000 rpms.

What I'm trying to point out with all this is that there appears to be an rpm range where a bullet becomes unstable and doesn't perform in the way it should. (In this case, in the neighborhood of 41000-42000 rpms.)

I don't know how much more evidence one needs to show how twist rate bears at least an indirect relationship to penetration!

_____

Glenn

Posts: **942** | Location: **Alabama** | Registered: **16 July 2007**

---

posted 17 February 2010 17:08

Michael,
Right.
Something to look forward to, if it ever happens, the difference between 65% and 75%, if any, will be interesting.
If no difference then call it 70%.
IIRC some of the best bullets have been very close to 70% of caliber for the meplat on the FN.

It certainly will be tricky getting the bullets all the same weight, with different meplats.
Loading them all to the same velocity, not so hard.
Might use up a few samples though.

Recovered, rifle-engraved solids spread out in a pile on your lab floor might add an extra thrill for rolling in, especially during a full moon.

Posts: **28032** | Location: **KY** | Registered: **09 December 2001**

posted 17 February 2010 17:46    

Glenn

You may very well be on to something interesting for sure. Makes sense to me!

RIP

I think the weight of the samples will be off some, a few grains. I don't think it would be enough to make any difference. Same velocity, easy as you say!

Bullets do give me a thrill! You never know?

Trying to work my way to the range, still a bit chilly here this morning!

Michael

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Posts: **8426** | Location: **South Carolina** | Registered: **23 June 2008**

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posted 17 February 2010 18:36    

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Posts: **7852** | Registered: **16 August 2000**

---

posted 17 February 2010 18:42    

quote:

Originally posted by ALF:
Someoldguy:

A tip perhaps 🙂

The formula for the distance it takes a spinning Projectile to become unstable can be found in Munks formula

To anwser your riddle of the distance it takes for the bullet to tumble. You need to figure out the following.

1. what effect the resistance this target has on the impact velocity of your bullet ie the coefficient of drag for this paper target..... I have to warn you though that the most common source of error in testing is because the target ia often inconsistant.

Tests done by various defence contracted authors all confirm, the biggest cause of inconstatant data lies with the consistancy of the target.

2. you need to know more about your bullets. Length, transverse moment of inertia and where the CG is

3. You need to know what impact angle of attack is ? so unless you have a high speed camera that can capture moment of impact and its set up so you ccan do the measurement . good luck

One you have all the data, some serious math follows and you come up with something that looks like this.

The constants are "target medium" dependent.

$$\ell_{NC} = 31.6 \cdot \left(\frac{\ell_g}{J_q}\right)^{-0.212}$$

and graphs that look like this 😵
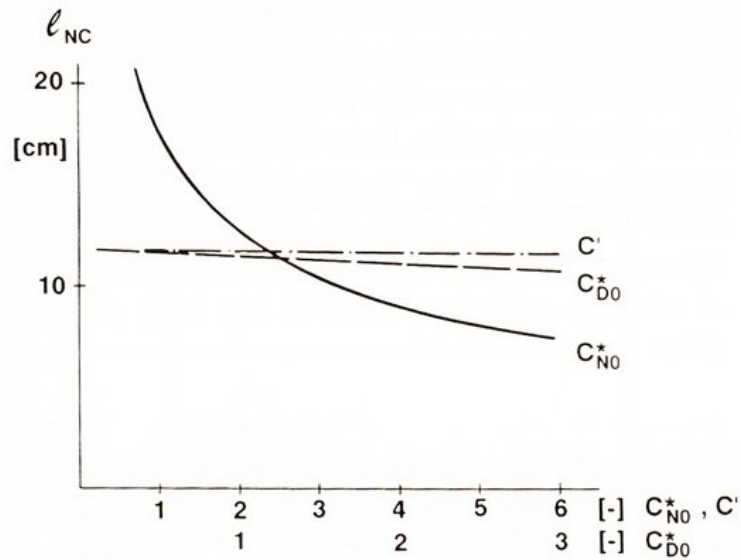
or one can all skip it and simply go to the various journals of trauma nand forensics and find the various articles and reports done on the very subject

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Reply

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