



E. Arthur Brown Company, Inc.

Your On-Line Source for Accuracy and Shooting Supplies



Hunting Bullets That Work! Understanding What Makes Hunting Bullets Effective for One-Shot Kills.

Single Shot Rifles * Thompson Center Arms * Savage Rifle Barrels * Riflescopes and Sights
Reloading and Ammunition * ViewCart/Checkout * EABCO Home



©2001-2021 E. Arthur Brown Co., **CONTACT US**, 4088 County Road 40 NW, Garfield, MN 56332
ph. 800-950-9088, FAX 320-852-2871, **Visit Our Online Store at eabco.net**

What makes a bullet effective for hunting?

Some think its all velocity. Some think it's all caliber and bullet weight. Of course, it has to hit what you're aiming at... it has to be accurate! The truth is, it isn't ALL anything... But, it IS something definite and knowable. Here's the approach I take to bullet selection...

1. **What we learn from the Swedish Mauser...**
2. **Bullet weight, velocity, sectional density, ballistic coefficient... what they mean.**
3. **Trajectory and Wind Drift... Momentum vs. Energy... The Myth of Bullet Expansion!**
4. **Modern Bullet Construction that Works.**



One Shot Caribou Kills at 130 and 180 yards respectively by Ron Koehn and Dennis Goodenough using the 180gr. Swift **Scirocco** and medium velocity 300 BRM cartridge. Their rifles are the Brown **Model 97D** Single Shot.

Influences of the Swedish Mauser. With velocities less than a 30-06, the mild recoiling 6.5X55 Swedish Mauser has been used widely to take game from varmints to deer to reindeer, caribou, and moose. Some say it was even used to kill elephants in Africa! Americans who've hunted with the Swede experience drop-where-they-stand effectiveness on game. The "magic" of this cartridge has garnered an almost cult following among it's fans. **Why it works so well has been attributed to the "Sectional Density" of the 6.5mm bullet, but that's only half of the formula.** The fact is, there are 7mm and .30 caliber bullets with the same or very similar sectional density. Why don't they have the same magic reputation of the 6.5mm? **Well, the only other factor in the mix is the medium velocity of the Swede.** The original 6.5X55 Swedish Mauser load throws a 140 gr. bullet about 2300-2500 fps depending on barrel length. Most 7mm and .30 caliber cartridges shoot 2700-2900 fps and faster with bullet weights of the same sectional density...



It is my belief that 7mm and .30 caliber bullets with the same sectional density as the 6.5mm will give the same effectiveness on game... if launched at the same 2300-2500 fps "medium" velocity.

Caliber	Weight	Sectional Density	Ballistic Coefficient	Best Twist
6.5mm	140 gr.	.287	.490	1:8
7mm	160 gr.	.283	.475	1:9
30 Cal.	180 gr.	.271	.474	1:10

Bullet Weight, Velocity, Sectional Density. If a baby squirrel falls out of a tree from 20 ft up, it doesn't get injured. But if a man falls that far, he'll break bones. The distance and speed (velocity) of the fall are the same but, the man weighs more and this gives him a lot more momentum than the baby squirrel.

Now, take the man's weight and shape it into a long, skinny rod falling end first (kind of like a bullet). The end of that rod exerts the full bone crushing momentum of the man into a much smaller "section" of ground... driving it deep into the ground. The "Sectional Density" of the rod is much more than that of the man, even though their weight is the same. From the chart above, you can see that in bullets: **The larger the impact area (caliber) the greater the bullet weight needs to be to maintain the same sectional density as the Swedish Mauser.**

The "Ballistic Coefficient" (BC) is a function of bullet shape and weight. Long, heavy, pointed bullets have high BCs. They sail further and huck the wind better than short lightweight bullets with low BCs

Since the Bench Rest Magnum cartridges use bullets with high Ballistic Coefficients, they are naturally superb at long range performance. **Why Medium Velocity is More Effective.** Here's a simple illustration: If you shoot an aluminum pop can with a 900 fps magnum pellet rifle, the soft lead (expanding) pellet will zip right through the metal without disturbing the can. Now, if you shoot the can with a slower 500 fps steel BB (non-expanding), it will also go through the can but, it will bend-in the aluminum on its way through, knock the can over and throw it back a foot or so. The slower velocity imparts more "hang time" of the bullet momentum on the target. Silhouette competitors are quite familiar with the concept of "Hang Time"... a bullet that holds its full weight and momentum on the steel silhouette target rather than losing it all to over-energized fragmentation or high speed penetration. **The medium-velocity (2400 fps) achieved by the Swedish Mauser (and EABCO Bench Rest Magnums) works in the same way to produce more "Hang Time" as it passes through animal tissue.**

What About Long Range Trajectory? A common misconception is that ultra-high velocity translates into enormous gains in long range shooting ability... but, it just isn't so. Look at the trajectories of the three medium velocity Bench Rest Magnums compared to the high velocity 308 and 300 Win Mag below. For hunting big game with all four cartridges, you can aim right on all the way out to 200 yards and a predictable hold over will hit at 300 yards. Beyond 300 yards, skill, accuracy, shootability, and sight settings will have more influence than trajectory.

Caliber (Chambering)	Velocity	100 yd	200 yd	300 yd
6.5mm/140 gr (6.5mm BRM)	2,400 fps	+2.8"	0.0"	-10.7"
7mm/160 gr (7mm BRM)	2,400 fps	+2.8"	0.0"	-11.0"
30 cal/180 gr (300 BRM)	2,300 fps	+3.0"	0.0"	-11.8"
30 cal/180 gr (308 Winchester)	2,700 fps	+2.0"	0.0"	-8.5"
30 cal/180 gr. (300 Win Mag)	3,000 fps	+1.5"	0.0"	-6.5"

Above: Comparing Same Sectional Density Bullets and Cartridge Capabilities

What About Wind Drift? Light bullets and high velocity don't hold any significant advantage over the medium velocity/heavy bullet approach when it comes to long range wind drift. But the trade-off for high velocity is over energized bullets that can either fragment and underperform (fail) on game or go completely the other way and destroy large sections of game meat. The chart below shows drift with a 10 mph wind on the three BRM cartridges vs. a popular high velocity 30-06 loading. **Note the intentional heavy momentum and lower energy combination in the BRMs.**

Caliber (Chambering)	Muzzle Velocity	100 yd Drift	200 yd Drift	300 yd Drift	300 yd Momentum	300 yd Energy
6.5mm/140 gr (6.5mmBRM)	2,400 fps	.82"	3.41"	7.9"	1.19 lb-ft/sec	1135 ft-lb
7mm/160 gr (7mmBRM)	2,350 fps	.88"	3.6"	8.2"	1.35 lb-ft/sec	1277 ft-lb
30 Cal/180 gr (300 BRM)	2,300 fps	.85"	3.51"	8.2"	1.47 lb-ft/sec	1350 ft-lb
30 Cal/150 gr (30-06)	2,900 fps	.80"	3.3"	7.9"	1.48 lb-ft/sec	1637 ft-lb

Wind Drift, Momentum, and Energy Chart

Momentum vs. Energy. Momentum is what drives a bullet through muscle, bone, sinew, and cartilage. Energy is what causes a bullet to expand or fragment. Energy is also what causes shock damage to living tissue. You can't really have too much momentum, but you CAN have too much energy... witness the explosive meat damage that occurs when a 30-06 passes through the shoulder of a deer.

One object of the Medium Velocity, Heavy Bullet (BRM) Approach is to Maximize Momentum without over-energizing the bullet.

The Myth of "Reliable" Bullet Expansion. The purpose of bullet expansion could be looked at as adding "hang-time" to a bullet that is moving too fast (like the pop can example above). But, bullets expand differently depending on what they strike and how fast they're moving. A bullet that expands well on soft tissue can fragment without penetration when it hits something harder... like a bone. A bullet that holds together on bone at high velocity will zip right through soft tissue. **Is high velocity needed?** I've seen **7mm rifle bullets expanded completely flat** after hitting 200 meter handgun silhouette targets and having had a muzzle **velocity of only 1,800 fps.**

Into this you have to figure that the bullet loses velocity the further it travels... it may expand well on game at 100 yards but not 200 yards... or vice versa.

Non-Fragmenting Bullet Expansion is good if it happens, but...the Bench Rest Magnum approach is to go with inherent "Hang Time" of medium velocity and Penetration you can count on from a well built, high sectional density bullet... It therefore works regardless of whether the bullet expands or not.

Loading for Accuracy - Influences of Bench Rest and Silhouette

Shaped Charges, Efficiency, and Bench Rest Accuracy. The modern Bench Rest cartridge originated with the 219 Donaldson Wasp and the research conducted by Harvey Donaldson. Donaldson's work was to find the most efficient and consistent cartridge for shooting the lightweight .224 caliber bullets. To keep the powder ignition consistent, the case needed to be full of powder. The full case needed to contain an optimum amount of powder to ignite fully within the barrel length, and the shape of the case needed to be optimized to accomplish as complete a burn as possible from shot to shot. Well, when you combine those features you get a powder charge that is essentially the same shape and density from one shot to the next... a "shaped" charge. And a cartridge so efficient as to burn all of the powder within the barrel presents no turbulent fireball to upset the bullet as it exits the muzzle. The result is Accuracy.

Harvey Donaldson's "219 Donaldson Wasp" was the ultimate case capacity and shape (30° Shoulder Angle) and you see the same characteristics in modern "BR" designated cartridges of many calibers.



Heavy Bullets and Bench Rest Cartridges. The original 219 Donaldson Wasp and later 22 BR cartridges fired lightweight bullets in rifle length barrels. When IHMSA (International Handgun Metallic Silhouette) began, they needed accurate cartridges that fired heavy bullets in short (handgun) barrels. As it turned out, the Bench Rest case capacity worked perfectly. First as the 7mm BR and then as the 7mm Ultimate Silhouette derivative of the original 219 Don Wasp. This little 7mmUS cartridge holds the world record set by Rich Mishler and his [BF Ultimate Silhouette Pistol](#) for 500 meter iron sight silhouettes... hitting and knocking over 9 out of 10 of the 60 lb. Ram targets at 500 meters!

Heavy Bullets and Case Capacity. The original 219 DW and 22 BR dimensional characteristics of case capacity and shoulder angle were designed for lightweight bullets in a rifle length gun barrel. Heavy bullets need slightly more case capacity to be efficient in a rifle. For our Bench Rest Magnum series of cartridges, we were looking for a case capacity that would give the "BR" shaped charge loading density and powder burning efficiency while launching a heavy bullet at a target velocity of 2,400 fps. The 6.5mm BRM cartridge achieves this with a slightly compressed powder charge. Derived from the 219 Donaldson Wasp and made from 30-30 Winchester brass, the Bench Rest Magnum cartridge has the same shoulder dimensions and 30° angle to burn the powder charge efficiently within the length of the rifle barrel. **There's very little muzzle turbulence, the same sectional density and velocity as the Swedish Mauser, mild recoil, and the long range accuracy is superb.**



Modern Bullets That Work Well for Hunting

P.O. Ackley, in his Handbook for Shooters and Reloaders, wrote about how the 22-250 came to be banned from big game hunting because of bullet failure... bullets that fragmented and didn't penetrate due to extreme velocity at impact. He went on to talk about hunting guides who's clients shooting 300 Winchester Magnum had similar problems: Bullets blowing a big surface wound without penetrating. He went on to write about some solid copper "Controlled Expansion" bullets he designed that solved a lot of these problems. The modern **Barnes X-Bullet** is a direct descendent of this bullet and an excellent design. However, being solid metal, it behaves differently as it is squeezed through the rifle barrel. I have had mixed success in achieving accuracy with the Barnes X, though I know others have had excellent results with it. It definitely holds together on game.



7mm Cal (.284") **Nosler** has taken a different approach with their "Partition" bullets. Encasing the rear portion of the lead core keeps it intact and assures good penetration. I've achieved excellent accuracy with the Nosler Partition and taken several heads of big game with one-shot kills. However, I had one occasion where the bullet did a lot of entry damage and popped out the back side of the animal making only a pencil sized hole. I concluded that the core in the nose had separated and the bullet tumbled and popped out backwards... I may be wrong on this conclusion. Until then, I had absolute confidence in the Partition bullet. Since then others have reported similar failures.

Jacket Separation... The Cause of Most Bullet Failures: Modern rifle bullets feature a lead core with a swaged copper jacket. While the copper holds together fairly well, it is thin and light. The core on the other hand is heavy but soft... it breaks up easy. In typical bullet failure, the jacket and core separate, fragment, and become a solution of much less heavy projectiles that don't penetrate.

Core Bonding... The Solution to Jacket Separation: Molecular bonding of the lead core with the copper jacket produces much better terminal performance in hunting bullets. I'm not an expert on the process but essentially the lead core is welded to the copper bullet jacket so it can't peel away. It's an expensive process and "Bonded" bullets aren't cheap. But instead of jacket separation and fragmentation, Bonded bullets hold together, retain their weight well, and penetrate deep.

Controlled Expansion WITH Bonding: By making the copper jacket taper from thin at the tip to thick at the base, the expansion becomes stiffer as it progresses. Combining this with a bonded core results in the [Scirocco](#) bullet from Swift Bullet Company. It gives good expansion over a wide range of velocities (1,440-2700+ fps) while it holds together and delivers great penetration.



Encasing WITH Bonding: If you take the Nosler partition approach and add core bonding, you get the Swift [A-Frame](#) bullet. The nose section expands without separating or fragmenting and the rear section holds its full weight together to drive the bullet through whatever tissue and bone it encounters. An extreme terminal performance bullet, the A-Frame has gained a solid reputation killing dangerous game.

A.P.E... How Good Do Your Hunting Bullets Have to Be?

A fellow named Odell Register told me about his A.P.E. acronym. It's the priority and criteria for hunting bullets: Accuracy is the first requirement. Penetration is the second. Energy is last on the list... all the energy in the world is useless if you miss or don't penetrate. The point is: When your shot of a lifetime comes along, the first thing you have to do is be able to hit the vitals. That means your bullet has to be accurate. The second thing you have to do is penetrate through the vitals. This means your bullet has to be heavy enough and hold together as momentum drives it into tissue and bone. Expansion will help... But only if the bullet holds together. A few dollars invested in a premium hunting bullet like the Barnes X, Nosler Partition, or [Swift Scirocco and A-Frame](#) is cheap insurance when everything is riding on your one good shot!

To Read More About [Long Range Trajectory and Knockdown](#) [Click Here](#)

[EABCO Home](#) * [Checkout](#) * [View Shopping Cart](#) * [Shipping/Ordering Info](#) * [Join NRA](#) * [Free Tech Reports](#) * [Email Bargains](#)
E. Arthur Brown Company, Inc, [CONTACT US](#) , 4088 County Road 40 NW, Garfield, MN 56332
ph. 800-950-9088, FAX 320-852-2871 , [Orders Only Toll Free 1-800-950-9088](#)