



Muzzle Energy vs Knock-Out Value

By Cal Pappas

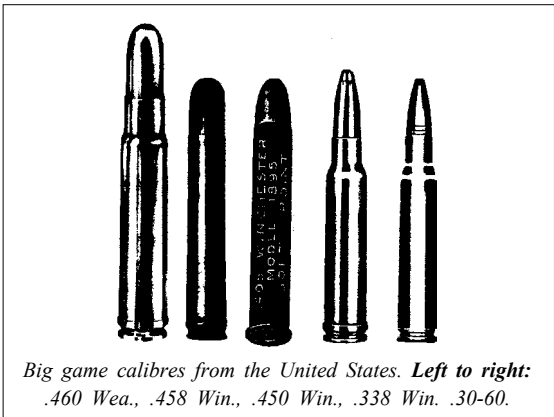
Is the muzzle energy calculation misleading in determining the ballistics of black powder express cartridges? The author thinks so!

My interest in antique firearms began with American lever action Winchester rifles. My grandfather's Model 1873, "the gun that won the west," caught my eye when I was in elementary school and did not let go. In wide-eyed wonder, I stood with anticipation dreaming of the day I would be big enough to shoot that Winchester. At that age I could barely work the lever, much less shoulder the rifle. But each week I was there with an oily rag and patches to wipe the dust from the exterior and swab the bore. The old Winchester didn't need the thorough going over each week, but grandfathers will do anything to please their grandsons.

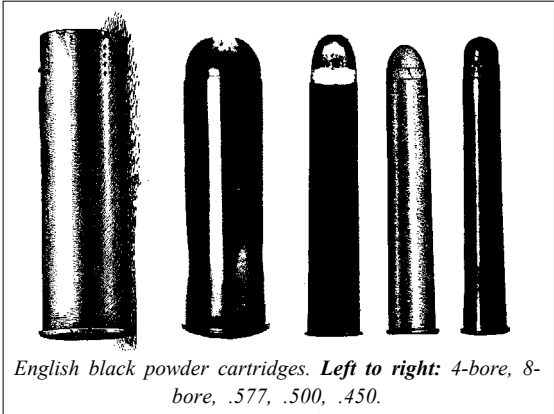
After college and six years of competitive Olympic weight lifting, I continued to shoot and began to collect Winchesters. After relocating to Alaska in 1984 to continue my profession of teaching at high school, my interest in firearms began to slowly change. Dreams of hunting the Dark Continent with a double rifle gradually replaced the wonder

of the American west and the famous Winchester rifles. And, while my interest in firearms and geography may have changed, one focus remained the same: that of the older black powder express cartridges.

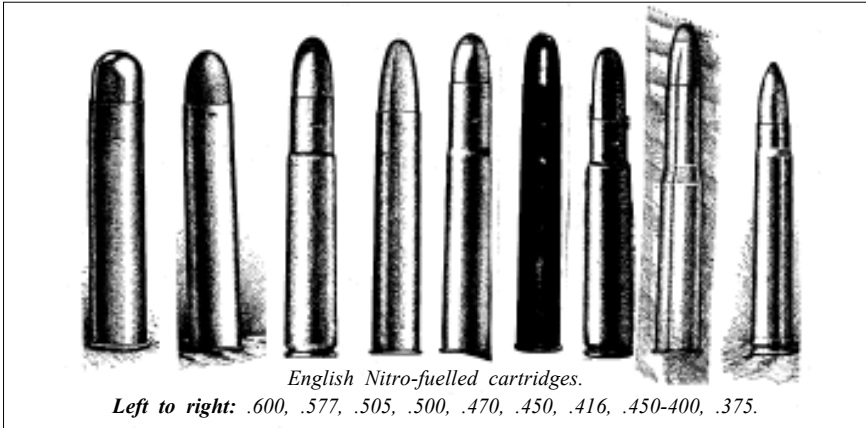
The term "express" originated in England with James Purdy. His "express train rifles" of the 1850s shot light-for-calibre bullets at velocities that were higher than normal for the day. The term 'express' travelled "across the pond" to the States in the 1870s and hitched itself to large calibre Winchester rifles firing a bullet that was much lighter than usual for the given calibre. .38-90, .40-110, .45-125, .50-95, and .50-110 were the five Winchester express cartridges. The first number representing the calibre and the second number the charge in black powder. The .38, .40, and .45 cartridges were three-and-a-



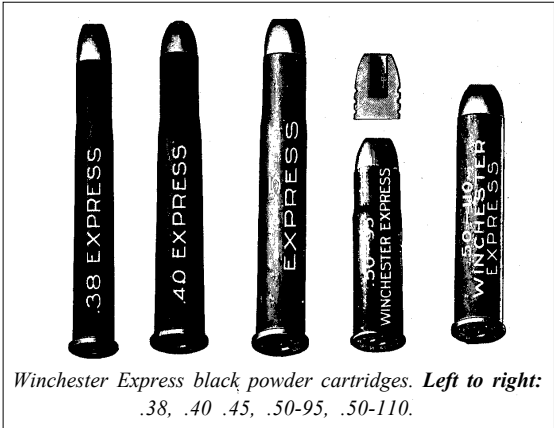
Big game calibres from the United States. Left to right: .460 Wea., .458 Win., .450 Win., .338 Win., .30-60.



English black powder cartridges. Left to right: 4-bore, 8-bore, .577, .500, .450.



English Nitro-fuelled cartridges. Left to right: .600, .577, .505, .500, .470, .450, .416, .450-400, .375.



Winchester Express black powder cartridges. Left to right: .38, .40, .45, .50-95, .50-110.

quarter-inch cases and were only suitable in Winchester's single shot rifle (Model 1885) while the shorter .50s were available in lever action repeaters.

Just before my conversion to double rifles, hours were spent on reloading, casting bullets, target shooting and hunting with the antique firearms. All this enjoyment led me to a disturbing question. How did these old cartridges drop big game in North America and Africa while having such low ballistic properties? My own experience showed a caribou was not partial to being shot with a .338 magnum or a .50-95. Subsequent chronograph tests equated the original ballistics of the original black powder rounds. Low velocity equalled low muzzle energy.

What initiated the above question (and what was responsible for the eventual answer) was the purchase of a Winchester Model 1876 rifle in .50-95 express. Made in 1884 with a 26-inch round barrel, half magazine, shotgun butt, and a case-hardened receiver, the rifle was "sighted, shot, and regulated by Holland and Holland..." in England and so stamped on the barrel just ahead of the H&H three leaf express sight. The rifle also has Holland and Holland bead-on-ramp front sight and English sling eyes.

Visions flashed in my mind of an English hunter of royal blood in pursuit of lion, leopard and buffalo in the Dark Continent or stalking a man-eating tiger in the jungles of India. But what hunter with a sane mind would attempt to hunt dangerous game with a rifle that shot a 300-grain bullet at 1550 feet per second with a muzzle energy of approximately 1600 foot pounds?

The answer, I believe, was found in John 'Pondoro' Taylor's *African Rifles and Cartridges*. Taylor was one of the best known African hunters in the pre and post-WWII era. He states the muzzle energy calculation is quite misleading as the formula puts too much emphasis on velocity. Rather, Taylor believed, the bullet's weight should contribute more, as should the bullet's diameter.

The formula for muzzle energy is velocity squared x bullet weight divided by 450240.

To make up for the lack of diameter, and to increase the bullet's weight in a calculation, Taylor developed his famous 'knock out' value. Based on the belief the largest African calibres would knock down and knock out charging beasts like elephant, rhino and buffalo, Taylor's new mathematics used the following equation: bullet weight x diameter x velocity divided by 7000.

Taylor had this to say about his knock out formula: "I am fully aware that many ballistic experts would look very much askance at these figures, but I do not care because I do not pretend that they represent 'killing power'; but they do give an excellent basis from which any two rifles may be compared... Theoretical, mathematical muzzle energy lays too much stress upon velocity at the expense of bullet weight..."

As I made the aforementioned transition to collecting and shooting double rifles, I kept my love of the older black powder express cartridges and the rifles that shot them. When I compared the older Winchester cartridges to modern Nitro (or smokeless) cartridges, I also calculated the older British black powder cartridges to compare them to the Nitro-fuelled cartridges of this century.

CARTRIDGE	BULLET WEIGHT	MUZZLE VELOCITY	MUZZLE ENERGY	MKO
.460 WEA	500	2700	8095	88
.458 WIN	500	2105	5110	69
.405 WIN	300	2250	3380	40
.338 WIN	250	2710	4080	33
.30-60	180	2710	2940	21
.600 NE	900	1950	7610	156
.577 NE	750	2050	7020	126
.500 NE	570	2150	5850	89
.505 GIBBS	525	2300	6180	87
.470 NE	500	2125	5030	71
.450 NE	480	2150	4930	67
.416 RIGBY	410	2350	5010	57
.450-400	400	2150	4110	50
.375	300	2550	4330	41
8-BORE	1882	1330	7400	361
4-BORE	1250	1500	6920	234
.577 BPE	610	1650	3690	82
.500 BPE	380	1850	2890	51
.450 BPE	365	1700	2340	40
.50-110 WIN	300	1605	1720	35
.50-95 WIN	300	1557	1615	34



Winchester's African rifles of the black powder era - the Model 1885 single shot and the Model 1886 lever action repeater.

To compare the above KO values, note there is no comparison with the 4 and 8-bore cartridges. For close range work they still rule the roost. Loaded with a heat-treated lead bullet with a Brinnell hardness of 20 to 22 points, the gauge rifles would be more than adequate for anything that walks within the range limitations of these rifles. The great and famous .600 and .577 do not even come close!

The .577 BPE is in the same ball park as today's highest velocity 450 calibre - the .460 Weatherby and is well ahead of the .485 Winchester Magnum. The .577 is just behind the .500 NE and the .505 Gibbs. Falling behind the .577 BPE are the .470 NE, .450 NE, and .416 Rigby rounds.

The .500 BPE is on par with the famous .450-400. A cartridge that was Taylor's choice as the best all-round cartridge for African hunting.

The .450 BPE, with a KO of 40 equals the .375 Holland and Holland Magnum and the .405 Winchester - Teddy Roosevelt's favourite for lion.

The two largest American express calibres, Winchester's .50-110 and .50-95, equal the ubiquitous .338 Winchester Magnum and are far ahead of the venerable .30-60.

The above comparisons may not be the last word in the ballistics game. Round table discussions about the merits of one's favourite cartridge will continue long after I'm gone. Agreed, there is no doubt about the advantage of smokeless powder, jacketed, solid and pointed bullets and telescopic sights. I do believe however, the Knock Out calculation well illustrates the reason the old time cartridges were able to take dangerous game in years past and why they should not be out of the picture for today's hunting adventures.

If you are ever on safari with your black powder express rifle and are getting odd stares from members of your party, show the doubting Thomas' the ballistics and knock out value of your rifle's calibre, hit what you aim at, and you will make a believer of the most die-hard Weatherby fan! 🐾

Good shooting!

About The Author

Cal Pappas was raised on a dairy farm in the state of Massachusetts. After

beginning a teaching career in New England, he located to Alaska to continue his profession and pursue his love of the remote northland. Africa has been a passion of his for several years and he plans to hunt and write about Zimbabwe in the coming years.

AFRICAN SPORTHUNTING PRODUCTIONS

1/5 P

B/W

NEW

BUSHTEC

1/4 P

B/W

REPEAT 4 - 3