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## Trajectory, Meat Damage, and Knock-Down

The Practical Realities of Effective, Long Range Hunting Cartridges.

by Eben Brown

There are two areas of modern rifle opinion that I think are not correct:

1. That extra high velocity rifle cartridges are necessarily so much flatter shooting than medium velocity cartridges... the Myth of the so-called "500 Yard Cartridge" and,
2. That high velocity and energy are necessarily desirable at knocking down game... They aren't.

**What follows is an argument in favor of using medium velocities and heavy bullets for hunting...**

We're going to look at the realities of bullet trajectory relative to velocity; Meat damage in relation to excessive energy; And Sectional Density as it relates to the Killing Power of a cartridge on big game.

**Practical, Useable Trajectory** - Prior to the distance at which your scope is zeroed, the trajectory has to be flat enough so that you don't have to concern yourself with it and can aim right on at deer sized game. This means that... The trajectory should rise and fall no more than about 3" prior to sight zero.

After sight zero, bullet drop accelerates. It's only predictable to the point where you can still estimate distance and a reasonable hold over to hit reliably... This is fundamentally true for all hunting cartridges.

So... The trajectory should drop no more than about 12" at the furthest hunting shot after sight zero.

Yards	0	50	100	150	200	250	300	350	400	450	500
180gr 300 BRM 2300 fps Path	-1.5	1.66	3.05	2.55	0.0	-4.76	-11.89	-21.6	-34.09	-49.6	-68.37
160gr 7mm BRM 2350 fps Path	-1.55	1.56	2.93	2.46	0.0	-4.61	-11.56	-21.05	-33.30	-48.55	-67.08
140gr 6.5mm BRM 2400 fps Path	-1.55	1.44	2.75	2.32	0.0	-4.35	-10.9	-19.84	-31.36	-45.69	-63.07
140gr 6.5mm Swede 2400 fps Path	-1.5	1.44	2.75	2.32	0.0	-4.35	-10.9	-19.84	-31.36	-45.69	-63.07
180gr. 308 2600 fps Path	-1.5	1.39	2.9	2.94	1.4	-1.84	-6.91	-13.94	-23.09	-34.52	-48.42
180gr. 30-06 2800 fps Path	-1.5	1.03	2.38	2.45	1.18	-1.55	-5.84	-11.8	-19.55	-29.24	-41.02
90gr. 6mm BRM 2938 fps Path	-1.8	.9	2.6	3.0	2.2	0.0	-3.7	-9.1	-16.4	-25.6	-37.0
140gr. 7mm Mag 3175 fps Path	-1.8	.8	2.4	2.9	2.1	0.0	-3.5	-8.5	-15.1	-23.5	-33.8
180gr Win Mag 3100 fps Path	-1.5	.86	2.26	2.63	1.9	0.0	-3.16	-7.66	-13.61	-21.1	-30.24
160gr STW 3300 fps Path	-1.555	.87	2.39	2.98	2.59	1.15	-1.44	-5.25	-10.38	-16.91	-24.98

**Gray = Shots Where Aiming is Beyond Practical, Useable Trajectory**

**BRM** = 300, 7mm, 6.5mm BRM Cartridges were Zeroed at 200 Yards

**Swede** = 6.5X55 Swedish Mauser Zero 200 Yards

**308** = .308 Winchester Zeroed for 225 Yards

**30-06** = 30-06 Springfield Zeroed for 225 Yards,

**Win Mag** = 300 Winchester Magnum Zero 250 Yards

**STW** = 7mm Shooting Times Westerner Zero 275 Yards

**Note:** Trajectories Were Calculated with Sierra Infinity Software and Sierra Boat Tail Bullets

**Energies that Cause Excessive Meat Damage** -- In several successful years hunting with the medium velocity 6.5X55 Swedish Mauser and the 6.5mm BRM, I never saw an animal shot where it ran away... and yet damage to the meat was small. Medium velocity kills without ruining your meat.

In contrast, I have observed that nearly every animal shot with a 30-06 exhibited excessive meat damage.

**Here's how we'll put a value on it:** On two different occasions, deer shot at about 150 yards had their shoulders completely ruined where the bullet exited. The energy of a 30-06 bullet at 150 yards is 2561 ft/lbs. So... Bullet energies of more than 2500 ft/lbs. can produce excessive meat damage.

Yards	0	50	100	150	200	250	300	350	400	450	500
180gr 300 BRM 2300 fps Energy	2114	1967	1829	1698	1575	1459	1350	1248	1153	1064	982
160gr 7mm BRM 2350 fps Energy	1961	1817	1681	1553	1433	1321	1216	1118	1027	942	863
140gr 6.5mm BRM 2400 fps Energy	1790	1664	1546	1433	1328	1228	1133	1044	961	884	812
140gr 6.5mm Swede 2400 fps Energy	1790	1664	1546	1433	1328	1228	1133	1044	961	884	812
180gr. 308 2600 fps Energy	2701	2524	2355	2196	2045	1902	1767	1640	1520	1407	1302
180ar 30-06 2800 fps Enerav	3133	2931	2741	2561	2391	2230	2077	1933	1796	1667	1546

180gr. Win Mag 3100 fps Energy	3840	3600	3373	3159	2955	2764	2584	2412	2250	2096	1950
160gr STW 3300 fps Energy	3868	3607	3362	3131	2913	2711	2524	2348	2181	2024	1876

**Pink = Shots Causing Meat Damage \* Gray = Shots Beyond Practical Trajectory**  
**Note: Energies Were Calculated with Sierra Infinity Software and Sierra Boat Tail Bullets**

**Sectional Densities and Velocities that Put Game Down** -- The 6.5X55 Swedish Mauser is famous for being an extremely reliable game stopper. I believe the reason it works so well is a combination of two factors: High Sectional Density Bullets and Impact at Medium Range Velocities.

**Here's a simple illustration of how it works:** If you shoot an aluminum pop can with a high velocity (800fps) air rifle, the soft lead pellet zips right through the can without disturbing it. Now, if you shoot that same can with a low velocity (non-expanding) BB gun at only 300-400 fps, it will make a dent, rip a hole through, and knock the can over. Medium velocity actually puts more whack into the target!

**BRM Cartridges:** The original Swedish Mauser 140 grain bullet has Sectional Density between .270 and .290 and Velocity UNDER 2,500 fps. These are the same characteristics of our BRM cartridges but, they're incorporated into a more efficient, modern cartridge design that's suited to modern powders and bullets.

Yards	0	50	100	150	200	250	300	350	400	450	500
180gr300 BRM .271 SD	2300	2218	2139	2061	1985	1910	1838	1767	1698	1632	1567
160gr 7mm BRM .283 SD	2350	2261	2175	2091	2009	1928	1850	1774	1700	1629	1559
140gr 6.5mm BRM .287 SD	2400	2314	2230	2147	2067	1988	1909	1833	1758	1686	1617
140gr 6.5mm Swede .287 SD	2400	2314	2230	2147	2067	1988	1909	1833	1758	1686	1617
180gr. 308 .271 SD	2600	2513	2427	2344	2262	2181	2103	2026	1950	1877	1805
180gr. 30-06 .271 SD	2800	2708	2619	2532	2446	2362	2280	2199	2120	2042	1966
180gr Win Mag .271 SD	3100	3001	2905	2811	2719	2630	2542	2457	2372	2290	2209
160gr STW .283 SD	3300	3186	3076	2969	2864	2762	2666	2571	2478	2387	2298

**Green = Sectional Density and Velocity Similar to Swedish Mauser...GOOD!**

**Pink =Shots Causing Excessive Meat Damage... Bad!**

**Gray = Shots Where Aiming is Beyond Practical Trajectory... Bad!**

**Note: Velocities Were Calculated with Sierra Infinity Software and Sierra Boat Tail Bullets**

**Conclusions:** Except for extreme situations, almost nobody needs a large magnum cartridge for big game hunting. Look at the green areas of the chart above to see the narrow range of suitability for the big magnums. Traditional cartridges like .308 Win and 30-06 are certainly more practical than magnums, but look at the green sections above... Even those cartridges aren't optimum for all hunting situations. On the other hand: **Our BRM Cartridges Shine Under the Most Popular, Practical Hunting Situations!**

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