BARREL LENGTH, ACCURACY AND MUZZLE VELOCITY

The longest the barrel is, better is the accuracy and higher is the muzzle velocity. I guess you already heard that **false** affirmation.

Accuracy is directly related to barrel stiffness.
For a given diameter and caliber, longer a barrel is, lesser it is stiff.
Conversely, for a given length and diameter, thinner a barrel is, lesser it is stiff.

As a general rule, a short and thick barrel is more accurate than a long and thin barrel.

On firing, the barrel vibrates like a tuning fork. There are two simultaneous vibrations:

- The fundamental vibration: the breech end of the barrel is the node of the vibration. The entire barrel vibrates as a single unit. The muzzle whips in any direction through 360°. The path may be circular, elliptic or other and not necessarily regular.
- The secondary vibration: it is independent of the fundamental vibration. It is a series of nodes and overtones travelling along the length of the barrel.

The powder gases apply their pressure equally in all directions and slightly expand the barrel behind the bullet. This expansion travels along the length of the barrel.
Everything must be done to minimize and regulate vibrations. What can induce vibrations variations? Almost everything:

- Variation of the powder charge.
- Variation of the barrel temperature.
- Support of the firearm.
- Constraints applied to the barrel.
- Etc.

So, for a given firearm, one must find THE ammunition which will induce a minimum of regular vibrations of the barrel. It is better to have a free floating barrel with a bedding of the receiver. But good results can also be obtained when applying a controlled constraint to the barrel. For example, some pressure at the tip of the fore-end, under the barrel or the Boss system from Browning, where a weight can be moved at the end of the barrel to adjust the vibration according to the cartridge used. For a rifle which definitively does not deliver good accuracy, it possible to try cutting the barrel half an inch by half an inch to find "the good vibration", delivering the bullet the same way at each shot. But the result will be for one kind of ammunition only.

The stiffer the barrel, short with a large diameter, the lesser the vibrations. It is less affected by external factors and the bullet is less disturbed when exiting the muzzle.

A falling block MOA pistol in 30-20 (but it is true for other calibers) with an 8" 7/10 (22 cm) barrel of 8/10" (2 cm) diameter can group under half a minute of angle at 200 (two hundred) meters (220 yards) from a Ransom rest. Most of the light barreled rifles commonly sold cannot pretend to such a degree of accuracy. It is the reason why long range precision rifles are fitted with heavy barrels.

Bullet velocity wise, the barrel length must be in accordance with the quantity of powder to burn.
For a given cartridge, if the barrel is too short for the volume of powder to burn, the maximum velocity will not be reached and a good quantity of powder will burn uselessly outside the barrel.
If the barrel is too long, the bullet reaches it maximum velocity inside the barrel and the rest of the travel is done by inertia. Not very efficient and the barrel could be shorter, and stiffer, with the same velocity performances.

For example, a 61 cm (24") barrel on a 22 LR rifle is much too long. A 22 LR cartridge gives all its potential in a 30 cm (12") barrel. Conversely, chambering a 50 cm (20") barrel in 300 Winchester is stupid. The performances will be of the level of a cartridge of less capacity.
Nevertheless and according to the caliber, it is possible to accept some velocity loss to gain some barrel stiffness and/or a better balance of the firearm.

Silhouette small bore rifles can have their barrels shortened to 20". There is no velocity loss (and sometimes 2 or 3 m/s are gained), the barrel is stiffer and with heavy barrel rifles, the balance is enhanced.

For the silhouette big bore rifles, the best calibers, I mean powerful enough to topple the ram at 500 meters but with an acceptable recoil, are these with a case capacity of the 308 Winchester class, with bullets of 6.5 mm, 7 mm, 30 (examples : 6.5x55 Swedish, 6.5x57, 7-08, 7x57 Mauser, 300 Savage, 308 Winchester, etc).
Rifles chambered for these calibers have generally 61 cm (24") barrels. If needed, these barrels can be shortened to 55 cm (22") knowing that the velocity loss is about 7 m/s (23 fps) for each centimeter (4/10") cut.

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