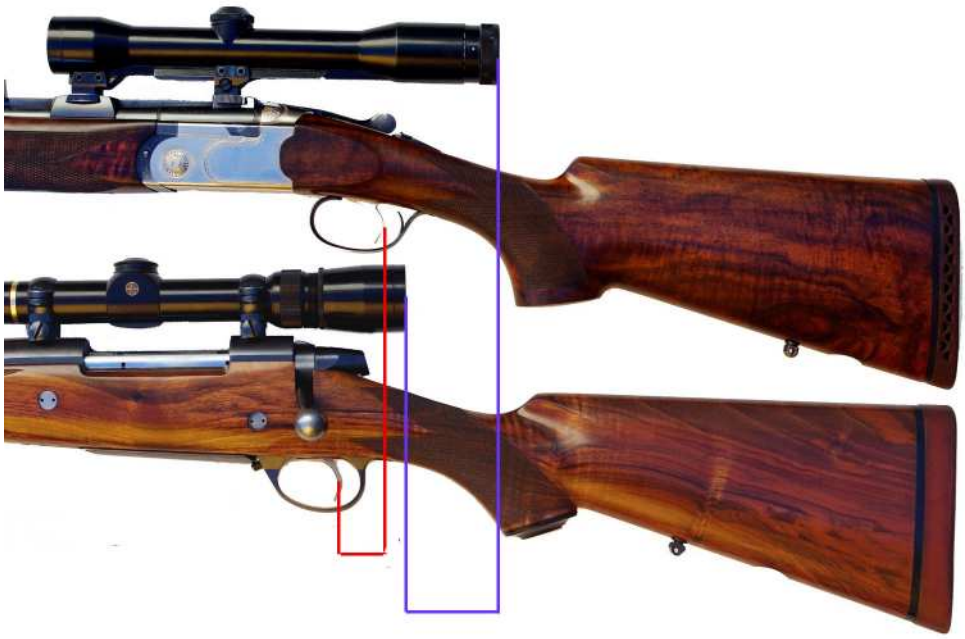
Rifle Fit and Function – Maximize your hunting opportunities!

Shotgun users have long known the importance of gun fit in maximizing the speed of acquisition of their target and the accuracy of their shot. However most hunters generally overlook gun fit with respect to rifle design.

Hunters, as opposed to target shooters, cannot rely on having a suitable a rest or sufficient time to take a careful second look and fast, accurate offhand shots are often required.
A well fitting rifle, both centrefire and rimfire, will provide you with much better results with a little work and attention to fit and function. It is essential if you ever wish to enjoy shooting heavy calibers.
However to achieve a well handling rifle actually requires much more attention than a shotgun.
As with shotguns, stocks require attention to length of pull, drop at heel and comb, cast on or off and general width.
The rifle as a whole should also be balanced between your hands.
However the rifleman also has to contend with several other variables: These are the function and feed of the action and the choice and placement of sights.
As with a shotgun the only way to achieve perfect fit is to have your rifle custom built to achieve the correct balance, stock configuration, sights and a smooth reliable action.
However there are several low cost measures that can be taken by any shooter to greatly increase the fit and function of any factory rifle.



Two "easy to change" variables that will greatly enhance the handling qualities of a rifle.

The red lines illustrate the variation in length of pull between the two examples. The fitting of a spacer or thicker butt pad can correct insufficient length of pull. Removing wood can reduce the length.

The blue lines illustrate the variation in distance between the heel of the butt and the eyepiece of the scope. Scope selection and mounting systems can vary scope position considerably.

Stock Fit
Most production rifles are manufactured with a length of pull too short for the average shooter.
The major American manufacturers product centrefire rifles with an average length of pull around 13 ½ to 13 ¾ inches. Their rimfire rifles, obviously manufactured with youth in mind, have even shorter stock lengths.

These dimensions have changed little over the past 50 years, despite the average shooter now being 6 inches taller and larger in body than his grandfather. This results in most shooters cramping their grip and having to consciously turn their head sideways and down towards the shoulder, before obtaining a clear sight picture. The result is a slower acquisition of their target, a cramped and unnatural swing when following moving game and a greatly increased proportion of the recoil being absorbed by the face!

There is also a fashion for well defined cheek pieces on rifle stocks, this give the impression that the manufacturer has given great thought to stock fit, nothing could be further from the truth in many cases.
Many cheek pieces are too wide to function properly; as a result the shooter needs to pull his cheek much more tightly into the stock in order to correctly align his eye to the sights.
In this situation his cheek will absorb a greatly increased proportion of the recoil.

Chart A illustrates the relative measurements of a random selection of 4 “out of the box” firearms along with two rifles custom built to my specifications. All measurements are in cm and illustrate the critical points.

Chart A

Factory Rifles	Drop @ 25cm	Drop @ 15cm	Drop @ Heel	Pull (front)
Merkel D/B	4	5	7.5	36.4
Rem BDL Sights	4.2	4.8	7.1	34.3
Rem BDL Scope	*6.3*	*6.9*	*9.2*	
Ruger No1 Sights	5	5.2	5.8	34.5
Ruger No1 Scope	*6.1*	*6.3*	*6.9*	
Marlin 1894 Sights	7	6.4	8.4	34
Variation	***3cm***	***2.1cm***	***3.3cm***	***2.5cm***

Custom Rifles	Drop @ 25cm	Drop @ 15cm	Drop @ Heel	Pull (front)
William Douglass D/B	5.3	5.8	6.3	36.9
404 Jeffery Scope	5.4	5.7	6.2	36.8
Variation	***0.1cm***	***0.1cm***	***0.1cm***	***0.1cm***

Stock measurements of 4 “out of the box” firearms along with two rifles custom stocked to my frame and facial structure. All measurements are in cm and illustrate the critical points.
There are three measurements of drop along the butt stock taken from the butt plate forward.
The first two measurements of drop correspond with the section of the butt that is in contact with my cheek when sighting the rifle. These distances will vary slightly for each individual shooter.
All measurements of drop are from the line of sight through the open sights or fitted scope.

The length of pull is the distance from the rear of the butt to the trigger in a line parallel to the line of sight.
It is obvious from the chart that stock design varies considerably from model to model. The chart also graphically illustrates the fact that a rifle stocked correctly for open sights will be far too low for good fit with a scope. Conversely it will be extremely difficult for the shooter to use the open sights on a rifle correctly built for the use of a telescopic sight.

I find with my facial structure that a drop of around 5.5 cm at the point where the front of my cheek makes contact with the stock is right to align my eye on the sights. At the rear of my cheek around 6 cm is appropriate. My ideal length of pull is around 37 cm. Comparing the charts it is obvious I am unlikely to ever find a factory rifle that goes close to my perfect fit. It is also obvious that double-barreled rifles or shotguns with double triggers are always going to be a compromise; no competition shotgun has double triggers for this reason.

The Marlin lever has far too much drop throughout the stock and as such the stock will not support the shooters face and accurate shooting will be a real task. The Merkel, chambered for 470NE, has insufficient drop at the comb and too much at the butt. The average shooter will need to force his cheek into the stock in order to obtain a correct sight picture and result will be his cheek absorbing a lot of the recoil rather than his shoulder.

The other key feature to note is the significant difference mounting a scope makes to the stocking of a rifle.
A rifle can only be set up well for one sighting system.

Most shooters who own a range of firearms have to live with the considerable variation in stocking illustrated here, as well as huge variations in their sighting devices. As a result they can never develop a sub-conscious memory of gun fit and possibly never have the opportunity to use a firearm that correctly fits them.

Your field shooting will improve out of sight if you go to the trouble of having all your firearms stocked to allow you to adopt the same, correct, posture for all of them. An expert stock maker, such as Jeoff Slee of Baccus Marsh, Victoria, can determine suitable measurements for an individual and produce a high quality, plain, walnut stock for around $700. Most shooters baulk at spending this sort of money on a new stock but often spend much more than this on an unsuitable telescopic sight for the same rifle!

Action Work
Most factory rifles function relatively well when not pushed to operate at speed. Hunting dangerous animals coming towards you or fast moving sambar disappearing into the bush may require a fast second shot. In these circumstances many “out of the box” rifles malfunction, particularly those without controlled feed.
Trigger and action work requires an expert to achieve significant and safe results. A trip to a qualified gunsmith specializing in rework, such as Melbourne’s Rolf Bachnick of Safari Arms, and the expenditure of less than $300 will have your Remington or Winchester feeding and working like silk under all conditions.
In summary, to maximize the fit and function of your new rifle will usually require the expenditure of around $1000 in addition to the cost of a quality telescopic sight and mounts. However you can you greatly improve your rifles fit and function buy ensuring the correct choice of telescopic or iron sights and adjustment of the length of pull.

Low Cost Improvements
Stock Work
Having established your correct length of pull you can readily standardize this on all your hunting rifles by simply adding a spacer, recoil pad or thicker recoil pad if you require more length or by cutting off wood if you require a shorter length of pull. A home handyman can probably DIY with reasonable results or a stock maker can do the job professionally.
To alter drop, width of stock and cast off or on will require considerable work and perhaps a new stock. So those on a budget will have to live with the existing stock. However rifle fit and drop can be modified by the choice of scope and mounts.

Sights
With iron sights there are two general rules that will maximize the speed with which you can align the sights to your target. With open or aperture sights the larger the front bead or post the easier it is to see and place. Most competent gunsmiths can readily replace a small front bead with a larger one for minimal cost.
With aperture sights the larger the aperture the quicker you will find the front bead. Apertures should be at least 3mm and preferably larger. I have sight rings of around 6mm on my lever guns. Your eye will automatically centre the front bead without conscious effort regardless of the size of the aperture.
Most open sights supplied with factory bolt-action rifles are simply woeful and cannot be reworked to improve performance. To have a good quality rear express sight and front bead fitted will probably cost as much as a reasonable scope and mounts so they cannot be justified on a factory rifle. This brings us to scope selection.

Telescopic Sights
In choosing the most appropriate scope there are three simple rules:

Buy quality, minimize the magnification, and maximize the eye relief!

Be prepared to spend as much as you can afford. In today’s market you should consider around $500 the minimum required to purchase a quality scope and mounts that will withstand the forces generated by a centrefire rifle chambered in 30 06 or similar and the inevitable knocks in the field. No cheap scope will last more than a couple of packets of ammunition on any rifle generating around 4000 ftlbs of energy or more.

Choose the smallest magnification you believe will suit the intended purpose; this will provide you with the greatest field of view and quickest acquisition of your target. For big game hunting of deer or larger species 6x is the maximum you should need. This is adequate out to 300 meters and no hunter should need to take big game at distances greater than this. I personally can neither shoot nor estimate range accurately enough to be certain of a humane killing shot on a deer at this distance. A variable of 1.5 to 5 power is the best option for almost all hunting in Australia. (Varmint shooting / professional spotlighting excluded).

Choose the scope with the greatest eye-relief you can afford, I have found Leupold has probably the best eye-relief for any given magnification. This will give you the quickest sight picture and the greatest margin for safety from the dreaded Weatherby eyebrow. Out and out optical quality is of less importance than eye-relief in big game hunting, indeed any game hunting, as in Australia most states forbid hunting of game outside 30 minutes before sunrise and after sunset. (Open sights can be used in this time span so any quality optical sight is more than adequate.)

Eye relief can vary significantly, depending on both the brand and magnification of a scope. Check the specifications of a scope before you purchase it. Always test the scope for actual eye relief. Hold the scope to your eye at the point where you have a clear sight picture, have a friend measure the actual distance from your eye. If it is a variable, test the eye relief at both minimum and maximum power, as it will vary considerably. For heavy recoiling rifles, producing over 4000 ftlbs of energy, you have at least 7cm of eye relief. For medium calibers producing around 3000 ftlbs of energy aim for at least 5cm of eye relief.

Mount your scope as far forward on the rifle as possible whilst still allowing a clear sight picture. Set up variable scopes on the highest magnification. Compact scopes provide the greatest clearance due to their small size. Compact scopes are also less inclined to be damaged, as they are generally not as wide as the gunstock and

hence less likely to be knocked out of alignment. Their light weight also means they are less inclined to move in the mounts under recoil.

The effect of eye-relief!
Notice the considerable variation in distance between the shooter's forehead and the Eyepiece of the scope in these two illustrations. Observe also the positioning of the shooter's thumb and nose.
The greater eye-relief of scope B provides quicker acquisition of the target and ensures that the shooter's eyebrow and nose are sufficiently clear of the scope and knuckle to avoid damage under recoil.

Scope Mounts & Scope Design
High magnification scopes with large objectives eg. 3-9 x 50mm require high mounts to clear the action. Scopes with 30mm tubes also mount higher than those with 26mm tubes. Compact scopes with small objectives, such as Leupold's 1.5 –5 Vari X 111 can mount much lower and closer to the action. If you find you are unable to snugly rest your cheek on the stock with a high mount scope you have too much drop and a low mount compact might solve the problem.
Large magnification and large objective scopes also tend to be longer and protrude further back behind the action not allowing the shooter to correctly position their head and eyes. If you find you that you are consciously tucking

your head back towards your shoulder in order to see though your current scope a move to a compact scope may solve the problem and allow you to get on target quicker.

In The Field

The secret to quick handling and rapid target acquisition in the field, in addition to good gun fit, is to always have your firearm ready for action. I do not have slings on any of my rifles when hunting. I know from early experience that you will have no chance of un slinging and mounting your rifle, removing the safety and taking an aimed shot at a moving sambar that is aware of your presence.

Keep your rifle in both hands whilst hunting and keep your variable scope on the minimum power at all times unless you are actually setting up to take a long stationary shot. This will provide you with the maximum sight picture in the quickest time.

I have lost track of the number of clients I have guided with 3-9 power variable scopes on their big game rifles. Invariably they seem have them set of 9 power and end up waving their rifles around trying to see their target. I would advise all budding big game hunters to ask themselves the following question before wasting their money on the dreaded and expensive 3-9 power variable.

"If I only need a 4 or 6 power scope to shoot a rabbit out to 100 meters why do I need a 9 power scope to shoot a sambar or buffalo, 100 to 200 times its size at 100 meters?"

When you are suddenly confronted by an angry buffalo at this range the importance of rifle fit and function is readily apparent.