

Rifle Stocks - the Dummies Guide

We get a lot of questions about how a stock should fit. ***The simple rule to remember is that it must be comfortable.*** What you want is a stock that you can pick up, close your eyes, shoulder the rifle, open your eyes and see the centre line of the sights or scope without having to adjust your body to fit the stock or move the rifle to fit your body.

You should be able to relax and hold the rifle comfortably without straining. The more you have to adjust your body to fit the stock, the more you are working your muscles.

The more you work your muscles the quicker you will fatigue. The faster you fatigue the sooner your shooting will start to deteriorate. It's that simple. Don't be afraid to experiment with fitting your stock.

There are no rules to stock shape only the negative results of when it's the wrong shape and size!

The truth of the matter, an air rifle stock is something most of us take for granted. It's just there. We grasp it between our hands, place our face against the comb, squeeze the pistol grip (if it has one) and concentrate on the sights, but never once do we give an ounce of thought about just what it is we are holding and why it's an important piece of the puzzle in the quest for consistent accuracy.

Air rifle stocks are similar in many ways to conventional rifle stocks. Their shapes are similar, their compositions are almost the same and their purpose is identical (i.e. they house and support the rifle action) but that's where their similarity ends. I have to make this comparison because air rifle stocks really descended from the stock designs of conventional firearms. And, as stock design in conventional firearms changed with the advancement of firearm technology, so did air rifle stocks.

For just a little while, lets forget that we are talking about either conventional rifles or air rifles and take a look at the basic elements of stock design and when we're done, you will be better able to identify what makes a rifle stock useable and efficient. We'll split this dummies guide into the following sections:

- **Composition**
- **Shape**
- **Forearm**
- **Wrist**
- **Buttstock & Comb**
- **Cheekpiece**
- **Buttstocks**
- **Law of Averages**
- **Length of Pull**
- **Drop**

Composition - The very first rifle stocks were made of iron, not wood. In primitive firearms, the early guns were braced against the ground or held in the air when they were fired so a comfortable stock was not needed.

As firearm design expanded to aimed fire, I'm sure some smart Spaniard or Englishman thought that his trusty arquebus could be much more comfortable to hold and subsequently more

accurate if the iron buttplate was exchanged for a wooden stock that he could lay against his face and aim down the barrel.

There you have it, the basic rule of rifle stock design. Make the rifle fit the shooter and accuracy will be improved. So wood became the long accepted standard for rifle stocks. To tell you the truth, wood has a lot of great things going for it as the ideal material to use if you want to make a rifle stock.

It's easy to shape, very durable, some varieties are beautiful to behold, it's warm and easy to grip, plus it's very abundant and economical to use. Wood grows the world over and it's as readily available now as it has been for centuries. Beautifully finished wood and polished blue steel are a natural match for one another.

I don't want to wax eloquent over this but when you think about memorable firearms, a gorgeous hunk of feather crotch walnut, finely finished with hand-cut checkering and not black fibreglass comes to mind.

Most air rifle stocks are made from beech. The beech tree grows in abundance in Europe and it is a superior hardwood for any air rifle stock. Beech is a straight-grained, very hard wood that resists dents and wear, is light in colour and also light in weight. It will take stain readily and can be stained to look like almost any other wood.

You will notice that most air rifles we sell have a walnut-stained hardwood stock. Those stocks are almost always made of beech. Over the years, walnut, ash, hickory and other native American hardwoods have been used all with various degrees of success. Walnut would be my second best choice but walnut comes in so many different grades and qualities. Walnut varieties grown in one area of the country is drastically different than walnut grown in another area. If you are thinking of having a custom air rifle stock made from walnut, look for a very uniform, dense and straight grain with uniform colour. Stay away from any stock that exhibits a vein of light wood running through it. Dark graining is fine and a little figure in the wood is desirable. That lighter-coloured wood is sapwood and it might be acceptable for a conventional rifle stock but do not select it for a break barrel, air rifle stock. By design, the stock of a break barrel air rifle is used as a leverage point when the air rifle is cocked. Sapwood lacks the strength for this application and will soon split.

For an air rifle, a stock made of European beech wood is difficult to top, but technology marches on and today if you want thoroughly modern air rifle you do have other choices. Composites, made of fibreglass and other man-made materials offer far greater strength and structural stability than natural wood.

Many high-grade target rifle stocks are made from composites because, once properly sealed, they do not absorb moisture, are highly resistant to wear and remain more structurally uniform regardless of where or under what conditions the shooter competes in.

Laminates or stocks made of layers of laminated wood that have been impregnated by pressure with chemically-cured resins offer a beautiful choice between the warmth of wood and the structural stability of the composites.

Feinwerkbau uses laminated wooden stocks on all of their high-end, Olympic, target-grade rifles both rimfire and air powered. They found it to be the very best choice for competitive rifles because of cost and availability. Today, rifle stock design has come full circle. Remember those iron stocks of yesteryear. They may not have been as out of touch with today's technology as you might think.

Just to keep you up to date on what lies ahead, I recently saw a Remington 700 varmint rifle that had a stock made completely from a solid block of CNC-machined aluminium. The barrelled action was clamped to the stock with a system that looked like oversized scope rings. The rifle shot superbly and was light in weight.

Not long ago, Tom Volquartsen offered an aftermarket stock for a Ruger 10/22 that was made from machined aluminium. For many years, benchrest shooters have used aluminium blocks as a basis for their rail guns. With the great advances in computer-numerically-controlled machining we have today, I predict that a production air rifle with an aluminium stock is not that far off.

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Shape - Remember what I said about the basic rule of rifle stock design, make the rifle fit the shooter and accuracy will be improved. This may sound like an over simplification but it's not. In an effort to affect change there have been a lot of really wild ideas about stock shape.

I think one of the worst ones that I have ever shot is the thumbhole sporter. I know of only a very few shooters that appreciate the thumbhole sporting stock and I'm not one of them. But, for some applications, the thumbhole design offers some real advantages.

Again, look at the FWB Model 2602 Super Match. With its highly-adjustable cheek piece and straight pistol grip, the only real way to retain strength and leave a place for the shooter to rest his thumb is to open up an exaggerated hole in the stock. So here you see the second piece of the stock design puzzle that falls into place, form follows function or if it works, it's beautiful.

Therefore, the stock of a spring-piston air rifle is limited in many ways by its function. When compared with a conventional rifle stock, the air rifle stock looks bulky and somewhat blocky, almost over engineered. This is because the stresses on an air rifle stock are completely different than they are on a conventional rifle stock.

But when all things are considered, the air rifle stock still must be comfortable to hold if we want to gain consistent accuracy.

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Let's take a look at the different parts of an air rifle stock and make some comparisons.

Forearm - The forearm of an air rifle stock must be wide enough to accept the air chamber. This is why you will seldom find a thin, graceful forearm on an air rifle. Not at all like it's conventional cousin where a slim, tapering forearm that ends in a graceful schnable forend tip is considered the epitome of elegant rifle design.

Even the pre-charged pneumatics are hampered from being objects of beauty by this design consideration. Just because you don't have a spring piston to contain in a large chunk of steel you still have an air reservoir that you have to wrap some wood around.

The Beeman Super 12 is a great example of design problematics. How do you combine a recoilless action with 12-shot magazine and a 400cc air bottle? Simple, forget the forearm and make the air bottle serve double duty. Again, it works but I doubt that anyone would use the

adjective beautiful to describe the Beeman Super 12. Highly functional would be a more appropriate choice of words.

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Wrist - The wrist section of a spring piston air rifle stock needs to be somewhat thick so they will be strong enough to resist breaking when the rifle is cocked. Remember that leverage principal, the farther away the end of the lever is from the pivot point, the greater the mechanical advantage of the lever.

The barrel is the lever, the barrel hinge is the pivot point. A thin, wimpy wrist section in the stock would be its weakest point and soon break. Side-cocking and underlever air rifles have an advantage in this regard and you will notice that the wrist sections of those types of air rifles usually exhibit thinner, more graceful designs.

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Buttstock & Comb - Most people lump these two parts of a stock together as one just because they are connected but actually they serve two entirely different functions.

The buttstock addresses your shoulder, the comb addresses your face. And I'm sure you can see the basic differences in your own anatomy. Let's start at the top and work down.

The comb is the top section of the buttstock and it will be either raised, dropped or straight. The actual shape of the comb depends on what type of sighting system the rifle is equipped with.

If your rifle has open sights that are mounted on the front of the receiver, at the barrel hinge, the comb will be dropped. This means that the top line of the comb falls away from the front to the rear. This allows the cheek to be placed against the comb and your eye will be in line with the open sights.

Some air rifles are equipped with a **cheekpiece**. A cheekpiece can be seen on any type of comb. It simply means that the wood below the top of the comb flares outward, to the left on a right-hand stock to the right on a left-hand rifle.

It helps support not only the cheek but the entire side of the face. A cheekpiece helps improve shooter comfort. Generally speaking, the more generous the shape of the cheekpiece, the more comfortable the rifle is to shoot. Some cheekpieces are completely detached from the buttstock and incorporate a built-in adjustment mechanism that allows the comb height to be adjusted to fit the individual shooter and or the type of sighting equipment being used. This feature is most often found on target stocks.

A cheekpiece is a nice feature but one drawback is that it does increase the weight of a rifle. This is why you don't find cheekpieces on lightweight field rifles and they're most often found on target rifles instead.

If your air rifle has a raised comb it means that it was designed for use with either receiver mounted target sights or a telescopic sight or scope. A raised comb places the top edge of the comb moderately above the top of the receiver and places your line of sight more directly in line with the centre of the scope or sighting aperture.

Placing your head in this position helps reduce parallax error when you use a scope and minimises eye strain when you use aperture sights. Again, raised combs can be found either with or without cheekpieces.

A straight comb is not found too often on air rifles because most air rifles have a fairly large diameter receiver so this necessitates either a raised or dropped cheekpiece depending on sighting equipment. A straight comb means that the top edge of the comb is either directly in line with the centreline of the bore or the top edge of the receiver depending on whose explanation you go with.

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Buttstocks - The shape of a buttstock really depends on the degree of pitch or angle of the buttplate. Most air rifles have negative pitch which means that the buttplate angles forward at the toe (bottom) of the buttplate and rearward at the heel (top) of the buttplate.

As you increase the amount of negative pitch the rifle feels as more muzzle heavy. Decrease the amount of pitch and the rifle feels heavier in the buttstock. Pitch angle helps to balance the rifle and makes it easier to hold steady.

Your body dimensions will play a big part on just how much pitch angle you need. This is why trap and skeet shooters pay so much for a custom-designed stock that fits their individual body.

A shotgun is pointed, not aimed and to be consistently accurate with a shotgun the stock must be an extension of the shooter's form. The same is true for a rifle shooter. The better the stock fits, the more consistently accurate you will shoot.

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We have covered the basics of gun stock design, nomenclature and composition. Now I'm going to introduce a few more terms and give you an overview of how these basic concepts apply to the stock on your air rifle and what you can do to improve the fit of your air rifle and hopefully improve your accuracy.

The law of averages - I'm going to start by telling you the stock on your air rifle was built to fit the average adult shooter. I call him Joe Average. He works for just about every air gun manufacturer. This means that the major dimensions of the stock were fashioned to fit a person that is 5' 6" to 5' 10" tall.

Also a person that has average length arms, average length neck and face that's not too full in shape. If this description fits you to a "T" then you are in luck, you don't need the information contained in this tech article. If you're like me and not so average then read on.

If you fall into the definition of non-average what you do when you shoot that stock designed for Joe Average is you compensate for the measurements that do not fit your body. If you are tall you bend your neck way over to gain a correct cheek placement. If you are shorter, you strain your neck to see the sights and struggle to reach the trigger because the buttstock is too long.

All of these problems in stock fit lead to a loss in consistent accuracy. You need to be comfortable when you shoot. If the stock does not fit you, you won't be comfortable.

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Length of Pull - The length of pull or LOP is measured from the forward face of the trigger to the end of the butt plate or butt pad. It should be measured to the point halfway between the heel (top) and the toe (bottom) of the butt plate.

LOP is considered a very important measurement for any stock because the length of the buttstock will greatly affect how well you can hold your rifle and how well you will shoot.

If the LOP is too short, you will tend to pull your shots to the right if you are a right-hand shooter. If the LOP is too long, the rifle will tend to ride upward and outward during recoil which will usually make you shoot low and to the left if you are a right-hand shooter. Reverse these directions if you are a left-hand shooter.

For the air gun shooter, correct LOP can be determined by placing the buttstock along your forearm. Slip your trigger finger onto the trigger and the rest of your fingers around the pistol grip or wrist just like you would do if you were shouldering the rifle. Look down and see if the face of the butt plate or butt pad rests against your biceps.

If it is just touching the surface of your biceps then the LOP is very close to being correct. You can further test for a correct LOP by shouldering the rifle and relaxing your right arm and letting your elbow drop as low as possible without being uncomfortable. Your elbow should be approximately in the centreline of the side of your body.

If it's too far forward the LOP is too long. If it's too far rearward, the LOP is too short. These tests are just initial indicators of correct LOP. Because of variations in shooting styles you may still need to lengthen or shorten the buttstock to gain a correct fit.

If you suspect the LOP is too short, you can experiment by using masking tape to affix pieces of 1/8" thick cardboard to the butt to see if this improves your hold. If the LOP is too long you can remove the butt plate or butt pad and see if this helps.

Before cutting a buttstock to adjust LOP I would suggest referencing a few gunsmithing manuals to find out the correct tools for the job. Cutting a buttstock to shorten the LOP is not a difficult job but it does require specific tools and some specific knowledge on how to properly refit the butt plate so it will look correct.

Whatever changes you make, remember to test them out thoroughly before making them permanent.

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Drop - The amount of drop a stock has allows your head to fit the stock correctly. A stock needs some amount of angled drop along the top of the comb to allow the shooter to place his shooting eye directly in line with the centreline of the sights or scope.

Since a scope will usually sit higher on top of the receiver than a set of open sights, the stock for scope sighted rifles should have less drop than a stock for a rifle equipped with open sights. Also the type of open sights will make a difference in the amount of drop that is required.

Actually, drop is two different measurements, drop at comb and drop at heel. Technically, this measurement is taken by placing an imaginary line through the centreline of sight and measuring from the line to a point at the top of the front of the comb which is drop at comb; and a point at the top of the butt plate or heel which is drop at heel.

Some people simply make this determination by placing a straight edge on top of the receiver and making the measurements. This is the simple way to do it but you need to take into account how far the sights or scope will sit above this line so you can make the necessary changes in comb height to allow for correct head placement.

Most open sights require about 1/2" to 3/4" above drop at comb to be effective. Most scopes require about 1 1/2" of drop to fit correctly. Another aspect to take into account for finding the required amount of drop is the length of your neck.

If you have a long neck you will need more drop, short neck, less drop. Also, if you don't want to scrunch your neck downward when switching between open sights and a scope, try to figure out how you will be using your air rifle the most and try to dedicate the rifle to just one type of sighting system.

If you find you need more drop, the only way to achieve it is to shave some material off the top of the comb. You will want to start slow, don't remove more than 1/16" at a time. A sanding block with some 80 grit works well. Be sure to shoot your rifle after every alteration to check for proper fit and performance. The bare wood will have to be refinished after you are done. It's been my experience that most drop corrections can be achieved by removing stock material at the comb and not the heel. Start your changes at the comb and only move to the heel if it becomes absolutely necessary.

Nowadays it is much easier to add a little more comb height than it used to be. Several companies offer strap-on nylon pads in different thicknesses that allow you to experiment with comb height without making any permanent alterations to your stock. There are also some stick-on, soft-rubber pads that will increase comb height. Details of these accessories relating to stock modifications can be found by clicking on the link to Leigh Wilcox's website at Airgun Express Inc.

<http://www.ft-designs.com/takingstock.html>