CHAPTER 20
FAULT ANALYSIS

Coming off the firing point after a particularly disastrous shoot someone was heard to remark that his shooting was a 'Comedy of Errors'. That may be an amusing turn of phrase but there's many a true word spoken in jest, and most of our shooting consists of one error or another

If you're going to try to analyse your errors then *don't* - at least not without a great deal of careful thought.

It's fairly obvious that you can't get very far in your shooting career without some attempt to correct whatever it is that stops you getting a perfect score. However, fault analysis can be a trap for the unwary, not to mention an area full of myths and legends perpetrated by the more experienced shots.

The only person really capable of accurate fault analysis is you, and 90% of the time even *you* don't know what happened; the problem is that you think you do.

You might think, for example, that the shot went up into the '8' ring at 2 o'clock because of some dimly-remembered advice given when you were a beginner, stating that tensing your left arm would cause the shot to go up there.

That advice was probably passed on by one of your more experienced club members who was trying to be of assistance when you went to him for help. It's not that he was wrong, more that - like everything related to target shooting – it's not the whole story.

If you wish to hear the whole story, read on - these are some of the things that could happen when you make a mistake.

First of all: even that dead-centre perfect carton bull wasn't necessarily error-free. That's obviously where you'd like your shots to go and if you could re-create the same 'errors' every time they probably would.

Similarly, if you only made one error at a time life would be much simpler, but the human body isn't always the finely-tuned piece of machinery you'd like it to be. Usually it's a wobbling mass of living tissue, incapable of exact repetition even after many years of training.

Your body is designed to survive in its environment – it's not a precision instrument, so expecting it to act like one without a great deal of effort is asking a bit too much.

Most of you will probably know what it's like trying to throw a rolled-up piece of paper into a waste paper basket across the room - some days you make it and some days you don't. Shooting's a bit like that; it would be impossible to ensure that your body functions in exactly the same way every day and for every throw of the paper ball.

However, before you all pack up shooting, there is an 'up' side to all this, which is that the champions are the ones who've worked out what they need to do to minimise their body's ineffectiveness and inconsistencies - half the battle is knowing what you're up against. So now let's return to that 'Comedy of Errors' to try and quantify what the errors are.

Firstly, no rifle is perfect. That's an obvious statement, but how many of you keep repeating the phrase "the rifle shoots all right, it's just me"? How do you know that it *is* just you? You probably think that because you occasionally do manage to get five shots together, it's your fault when you don't, but it isn't that simple.

Every new rifle comes with a 50-metre test group, shot in the maker's factory in perfect conditions with the barrel and action clamped in a vice. Even under those conditions no rifle will put 10 shots through the same bullet-sized hole at 50 metres.

(Rumour has it that the test group doesn't belong to your particular rifle at all, but even if that *is* the case it's not so important - all the factory is doing is showing that the rifle reaches a certain standard.)

The rifle itself will be responsible for a certain size of group even if the ammunition is absolutely perfect (which is very rarely the case); that group may be very small, but it will still be a group.

It is, of course, possible that some rifles shoot better than others, but these days a modern factory can turn out such good consistent products that the differences between a standard rifle and a brilliant one are slight.

At Olympic standard those differences could affect the medal placings, whereas at club level the shooter has more potential for error than the rifle.

You should also remember that your barrel starts to wear out from the very first shot fired down it. You can't subject a piece of steel to the heat and pressure of an exploding .22 round without something eventually starting to wear out.

During the first years the wear is very gradual, but eventually as the steel starts to crack and break up and bits of it disappear down the barrel, so it starts to affect the way your rifle shoots. Therefore the first error created could come from your rifle and unless it's in its first flush of youth, it is *very much* on the list of suspects.

Next comes the ammunition.

You get what you pay for when it comes to ammunition and what you pay for is good quality control coupled with better and newer machines to make it on.

We've all heard stories about somebody who once had a batch of *Eley Club* which was brilliant and outshot any *Tenex* around at the time, or about a batch of top grade ammunition which was rubbish and had to be sent back because it wouldn't shoot.

No commercial manufacturer can guarantee to make perfect .22 ammunition – it's impossible, and it would be very time consuming and too laborious to make your own (although it can be done), particularly in the sort of quantities a target shooter uses. Therefore, you're going to have to accept that ammunition isn't perfect and that it varies from batch to batch. It's up to you to find the best combination.

Now you have two parts in your error formula.

The next is the weather. Obviously shooting indoors doesn't usually mean a wind-rain-sun-mist-mirage problem, but there are other problems such as inadequate lighting and having to move so much between aiming marks.

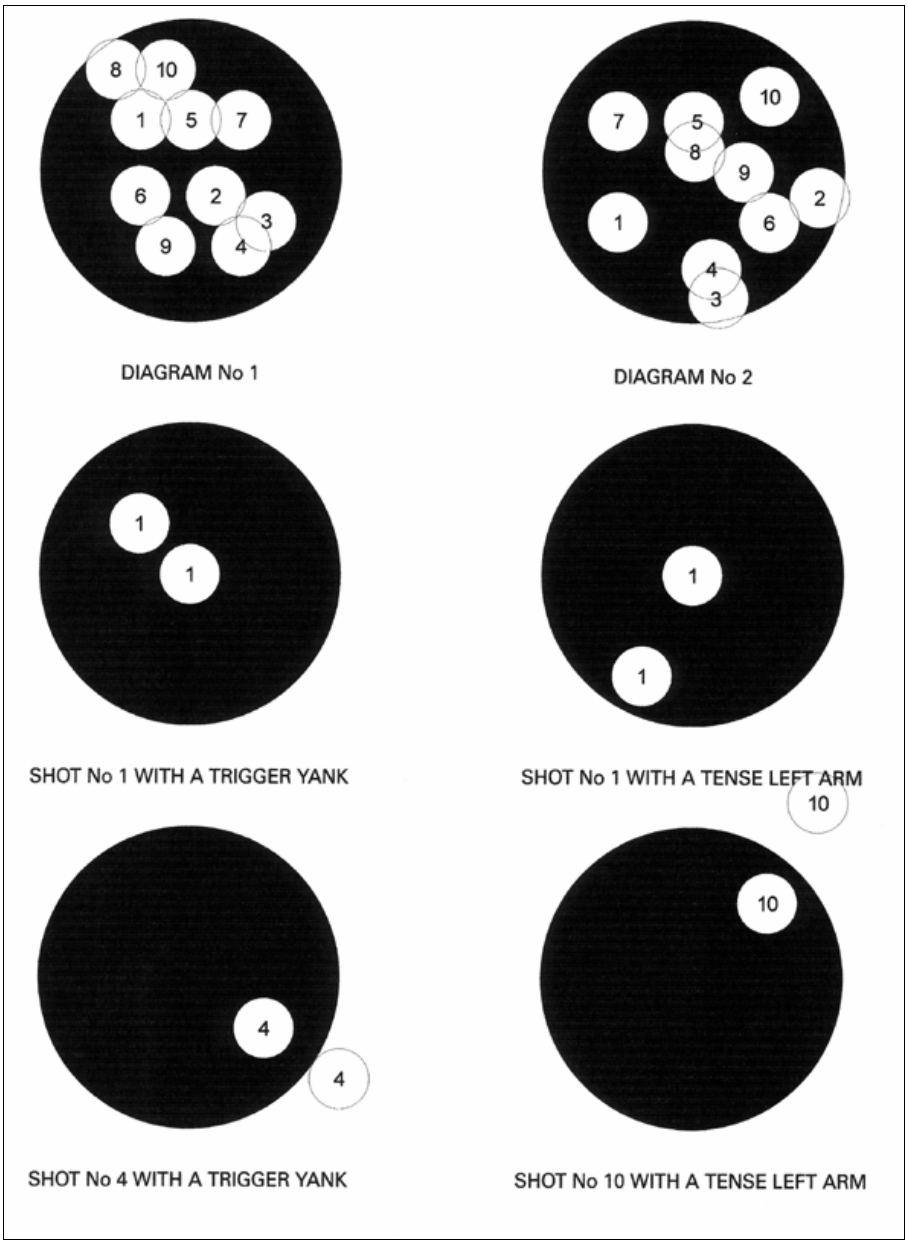
However, the most dramatic effect on your perfect shot is caused by the wind (well 4 inches at 100 yards from a 10 m.p.h. crosswind is pretty dramatic, isn't it?)

So, there's three things which affect your group size; now comes the biggest - ***you***! You have a very dramatic effect on the size of your group, because even the fittest athlete in the world is still a quivering mass of nerves and sinews.

When you release the trigger and start the ignition process in your cartridge, the way you do this has an influence on where the bullet goes. Remember that shotfall in a group from just the rifle and ammunition is purely random, and you have no way of knowing where the first or last shot is going to go. That's why you need more than a couple of shots to define your group.

As you take the various elements that influence the group and start to add them in, so the group gets larger; however, it can be possible for some of these elements to have a cancelling-out effect.

Consider diagrams 1 and 2; they show purely random shotfall from a rifle and ammunition. The group and shotfall has been enlarged and spread out to make it clearer, but you can liken it to the size of group you may get at 100 yards.



Errors can add or subtract from our group size

Because it is purely random, the bullet travelling down your barrel could be going anywhere in your group. Now, supposing that at the time of releasing the trigger there was a right-to-left crosswind which speeded up slightly just as you released the trigger, but at the same time you made an error (perhaps twitching the right shoulder) just as you let the shot go.

If you noticed the wind change, if you noticed the slight shoulder twitch, if you knew which shot in the group you had just fired then maybe (just maybe) you could give some sort of reasonable estimate as to where you think the shot may end up.

If that sequence of events coincided with shot No.1 in diagram No.1, it's possible that the shot could have gone where shown in diagram No.3. However, if the bullet going down the barrel had been No.3, then the shot could have ended up as shown in diagram No.4.

So with a modicum of thought it's probably occurred to you that the shotfall is subject to a series of pluses and minuses. Let's say, for example, that you wish to shoot a carton bull and let's say that every error which helps you in that direction is a 'plus', and every error which doesn't is a 'minus'.

Assuming you've zeroed in correctly, every error is going to take you away from the bull, but what if some of the errors cancel each other out?

For example: you've just fired shot No.8 in the group from diagram No.1. As you can see, left to its own devices that bullet would go to the top left-hand corner of the group. But suppose that, at the same time, you were a bit careless with your trigger technique and had poor follow-through, or had snatched the trigger; that *could* have dragged the rifle down to the right.

This would have counteracted the group shot and it may, if the influences were equal, result in a perfect carton bull. You would then congratulate yourself on being a brilliant shot and try to repeat the exercise.

You might remember vaguely that there was something different about the trigger release and try to re-create it, only this time it coincides with shot No.9 from the same group and low and behold - you have a '9' because this time all the errors worked against you. Now, are you confident you know how to analyse your groups?!

To make matters worse, there are lots of things which you can do to your rifle while the bullet is travelling down the barrel which will influence where it goes, so here's a list. This is by no means complete, but by just looking at it you'll soon appreciate that you could combine any of these together without realising it.

Basically, any part of you which touches the rifle will have an influence on it, so we have a wide variety to choose from.

Assuming you shoot right-handed:

<u>Left hand</u>

1. Tensing the left arm
2. Clenching the left hand

3. Touching the stock with the fingers
4. Heavy pulse beat because of wrong sling adjustment
5. Sideways pressure because elbow is in the wrong place
6. Sling in different place.

Right hand

1. Grasping the pistol grip
2. Right elbow in the wrong place
3. Gripping the stock with fingers
4. Sideways pressure from thumb
5. Hand bent into 'S' shape, resulting in twitchy trigger finger

Head

1. Varying cheek pressure
2. Cheekpiece too low - head lowering during shot release
3. Cheekpiece too high - too much pressure on stock
4. Locating cheek in different place after reloading

Shoulder

1. Butt too high - pushing forward to get head down
2. Butt too low - craning neck to see through sights
3. Butt too long - varying pressure on butt when loading
4. Butt too short - pulling shoulder away from butt

Eye
(Whilst, strictly speaking, the eye is not in contact with the rifle, it's nevertheless important that it's in the right place and is relevant to the cheekpiece)

1. Too much, or too little eye relief
2. Eye not central in aperture
3. Eye not focussed on foresight

The other parts of your body which aren't in contact with the rifle still have an influence; your breathing, for example, could affect where the shot goes.

If you take all the areas where errors could occur and mix them all together you get an enormous potential for mistakes, but sometimes all these things work against you and sometimes they cancel each other out.

A shoulder twitch could cancel out a trigger pull; the trouble is that your brain may only register one error, so how can you analyse what caused the shot to go where it did, when you may have made three or four mistakes, each one to a lesser or greater degree?

Now let's hear your explanation of why that shot went into the '9' ring at 8 o'clock!

By now you're probably wondering how on earth anybody manages to get a bull with all those possible errors you can make.

A champion will still make lots of mistakes but his group will be so small that those errors will still result in bulls (i.e. if you could shoot a group a quarter of the size of the bull, and you were sure you were zeroed in on the middle, if you made a mistake which doubled the size of your group, the shot would still be in the bull).

So how do you get your group size down to a quarter of the bull? Well, the first thing you have to do is to appreciate that *this* is what you're trying to do.

You might say "it's obvious that's what I'm trying to do", but if you were totally honest with yourself, how often do you go up the range with a target with the scoring rings blocked out and spend the day trying to get the smallest group you can?

How many clubs have a competition for the smallest group shot at 100 yards regardless of where it is on a target? The problem is that everyone's become score-orientated and the quest for the magic 'ton' becomes paramount; then there are league cards to be shot, projects to be done on the range, families to look after, jobs to go to, etc, etc.

Of course, if you were to practise as well as shoot league cards, you may well need to double your time on the range and that could be difficult for some people. However, if you want to improve your shooting, practice has to be done, although *not* on league cards or at open shoots.

(Certainly not on league cards because you're probably in a team and you'd be letting everyone down if you didn't try to get your best score; and who would admit at an open shoot that they threw away points because they were practising? Nobody wants to look incapable in front of others.)

So, going back to all the errors that you keep making, how do you set about reducing them?

The Rifle

Firstly, it's important that your rifle is performing at its peak, so regular checks on its condition should spot a cracked stock, bulged barrel, loose sights, loose butt plate, sling swivel handstop and all the other million-and-one things that could go wrong.

As mentioned earlier, your rifle is always in the process of wearing out and that's obviously a deterioration which you can't do much about, because the only way to halt it would be to stop shooting it and that's rather self-defeating.

Don’t think that, by not practising, and shooting as little as possible, you’re prolonging the life of your rifle; you may be, but your shooting will get worse a lot quicker that way.

No manufacturer is going to say how long a rifle will last because it depends so much on its use, cleaning, ammunition, etc, and it would be extremely stupid to say that any rifle over a certain age is not shooting its best.

So regular checks are essential; it may be boring, but getting into the habit so that it becomes routine, helps enormously.

The decline in the first part of a rifle’s life is very slow, so if you’ve bought a new gun in the last few years you should have nothing to worry about. If, however, you calculate that your rifle has shot 100,000 rounds or more, it will definitely be suspect.

The deterioration will have started before that figure, so that number is not engraved in stone, but if you regularly shoot 100 rounds a week you'd reach 100,000 in 20 years. That seems a long time, but now look for the date stamped on the barrel of your *Anschutz:*

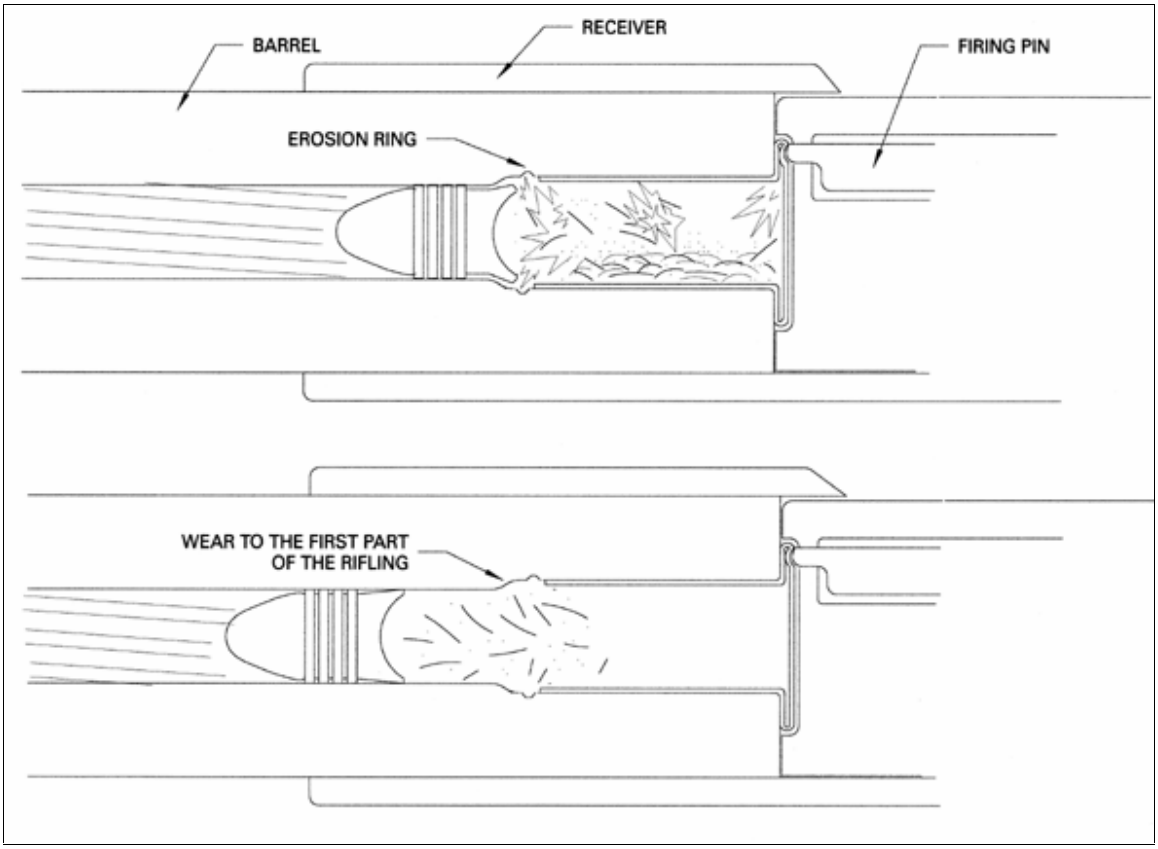
If it actually *has* a date then it’s more than 20 years old (they stopped putting dates on in 1976), and 100 rounds a week isn’t very many.

You may, of course, have a rifle which really hasn’t been used very much, in which case, don’t panic. In fact, don’t panic at all – there’s still the possibility that you're shooting worse than your rifle, however old it is!

Nevertheless you’re still coping with a variable that a top shooter doesn't have because he replaces his rifle (or, at least, his barrel) at regular intervals. You may baulk at the cost of replacing your rifle, even if you go for one that's slightly newer than yours rather than a new one, but balance that with the cost of, say, fitting a new barrel into your old stock or action.

If you go the route of replacing your barrel, then be extremely wary; question everybody you can find with a replacement barrel. Ask where it was done, who by, and whether they’ve seen a notable improvement in their scores since the work. Replacing barrels is a very skilled job and needs to be done by a well-qualified gunsmith.

The problem with old barrels is that they lead up and that means they are stripping lead from the bullets. Obviously there’s a limit as to how much lead comes off each time: if it was a continuous process then eventually your barrel would close up, but unfortunately every so often the lead gets blasted out and the process starts again.



Despite what people might tell you .22 barrels do wear out

This means that there's a variation in the velocity of the bullets exiting the muzzle, which could result in a height variation on the target. It could mean an extremely wild shot followed by a couple of others (also not in the middle) then the group returns to the middle and things settle down until the lead builds up again, and gets blasted off once more

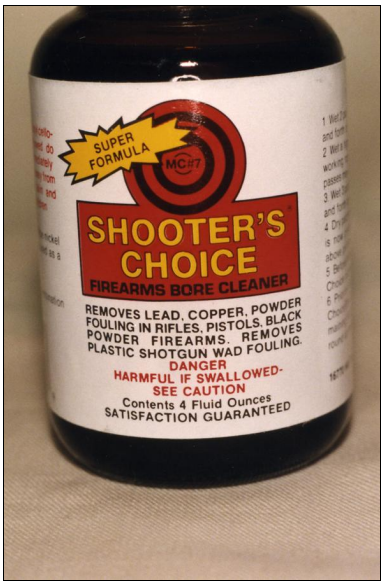
It would be nice to say that the effect is a purely up-and-down error and, in older books on shooting, it's been suggested that the bullets gradually climb up the target and then suddenly fall back into the bull. The theory is that each bullet gets successively slower owing to the restriction in the barrel, until the lead's blasted out, when they all start going faster again and consequently arrive lower on the target.

Things are never that simple; what is more likely is that things go on as normal until suddenly one bullet picks up a great lump of lead (because it's grown too big for the bullet to get past) and comes out of the muzzle with a carbuncle of lead stuck to it.

Where that bullet goes depends on where the extra weight is added, but one thing is for sure, it *won't* go into the centre of the group!

So, while you're shooting, if you suddenly get an unexplained shot followed by a couple of others which gradually get closer to the group, and your barrel is getting on a bit, this may be your problem. However, before you dash down to your local gunshop with the housekeeping money, hold on - there are a couple of things you can do to confirm, or even help, the situation.

Firstly give your barrel a thorough scrub with a phosphor bronze brush and a lead-dissolving oil such as *Hoppe's No.9, Parker-Hale 009, Shooter's Choice*, etc. (If you're not sure, read the label and if it says it removes metallic fouling, then that's the stuff.)



It says it removes lead
and that's exactly what it does,
without harming your barrel

Neither the oil nor the brush will do any harm to your barrel; the oil only attacks non-ferrous metals and your barrel is made of steel, which is ferrous.

'Scrub' really means scrub, but not backwards and forwards (your brush won't last very long like that); take it right out of the muzzle and then pull it back again, but do it lots of times - at least 10 (if not 20). After that, thoroughly soak up all the residue with patches or cleaning felts, and get onto the range and shoot it.

It may take some time to settle down and the longer that is, the worse your barrel is likely to be. If it isn't shooting to the centre of its group within five shots, you could have a problem.

Now what you have to do is decide whether your barrel shoots better clean or dirty; obviously you can't clean it after every *shot*, but you may have more confidence if

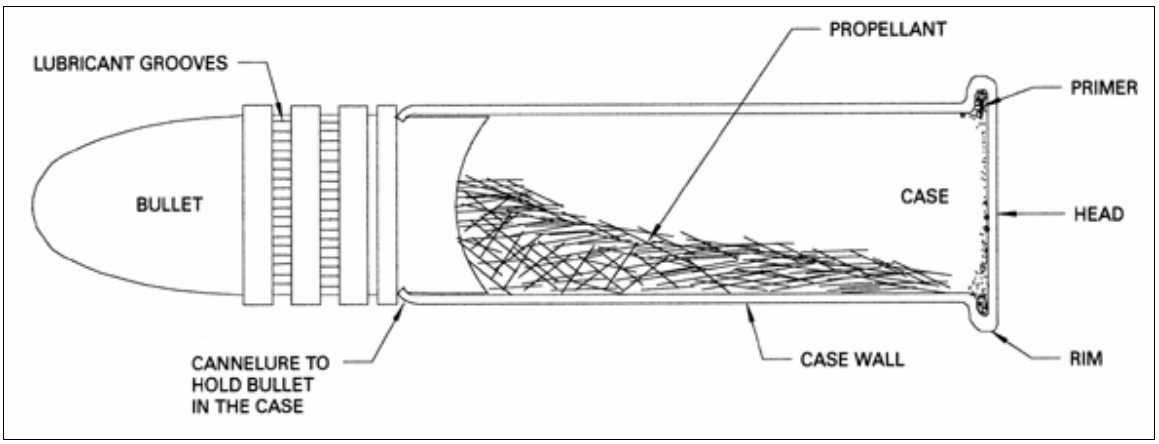
you clean it after every *shoot*.(Again, 'clean' means the above phosphor bronze brush treatment, not just a quick patch down it to remove the residue.)

By following the above procedure you will at least have some control over the situation until you can invest in a new barrel; by carefully monitoring how it shoots you can get the best out of it when you need it.

It's important to emphasize here that it's the *size* of the group which is important; that's the *only* measure of your barrel's performance.

The Ammunition

The next variable over which you apparently don't have a lot of control is the ammunition.



The .22 round of ammunition and what's inside

You may consider that you have to take what the manufacturer hands you and nothing can be done to improve upon that, but you'd be wrong. There's a lot you can do.

There is no suggestion that you should in any way tamper with an individual round. *Don't*, under any circumstances, be tempted to wipe off the lubricant; it's there for a good reason, which is to reduce the leading in your barrel, so bearing in mind the above, the lubricant is the last thing you should be interfering with.

The first and obvious thing to do is buy the best you can afford.

Every old club marksman could entertain you with stories of how he once had a brilliant batch of *'Brand X'* which nearly got him to the Olympics, and how much better it was than the expensive ammunition, or the modern stuff you get nowadays.

These are very entertaining *stories*…….

Ammunition manufacturers have one object in life and that's to sell ammunition, make a profit and stay in business.

So what *is* the biggest selling point in the ammunition world? The fact that a shooter wins medals with it, which proves it's good ammo, so everybody wants to use it. Therefore, it's in the manufacturer's interests to produce the best he can, but the best is usually expensive.

Logic dictates that no manufacturer will produce rubbish ammunition and get top price for it, so put your faith in the manufacturer.

But (yes, there's always a 'but') making ammunition - even with today's technology- is still a bit of a black art. It requires a certain mixing of the right ingredients, whose own inconsistencies produce variations in the final product - the bit you buy.

Because of this you'll need to select the best ammunition for your rifle and the way to do this is to constantly check the size of your groups; don't leave anything to chance.

Keep a note of every batch number that you use (it's on the box somewhere). Two boxes of the same brand of ammunition with different numbers could shoot differently through your barrel; that's because they may have different velocities (there may be other differences, but velocity is probably the one which affects performance the most).

Rumour has it that top shooters get special ammunition (and certainly it's in the manufacturers' interests to make sure that a potential world champion is going to use the best) but there's still no guarantee that it would suit *your* rifle.

Top shooters have also been known to 'grade' a particular batch of ammunition by measuring the rim thickness, and even weighing each round. You'd have to be shooting really well to notice the difference, but championships can be won or lost on a point and that could be as little as one thousandth of an inch at 50 metres, so don't dismiss anything which may gain you even one point.

At club level it's important to use the best you can, but you can also do a little more to help yourself by adjusting the torque setting of your bedding bolts and seeing what dramatic effect it has on your group size.

If you have a batch of ammunition that you're not happy with, please don't go back to the manufacturer complaining that it's rubbish (unless there is something obviously wrong with it, such as the shape, caused by a machine malfunction). You may be rejecting ammunition that another club member thinks is the greatest stuff since sliced bread.

Any half-decent gunshop which sells target shooting equipment will be able to offer you or your club a selection of at least two different brands of top-grade ammunition.

Be prepared to experiment and don't rely on other people's experiences; the fact that one person had a bad shoot with '*Brand X*" doesn't mean that *you* will. Even if several people reckon that a particular batch isn't right, it doesn't mean that it won't suit you, so try it for yourself.

All ammunition is made in batches and in the case of *Eley's Tenex* that's only about 25,000 at a time, i.e. only five boxes of 5,000 for the whole of the country.

Another habit to avoid, is using one grade of ammunition for practice and another for competitions. There's no problem with you practising a technique which doesn't involve any interest in where the bullet goes (is there such a technique?), but if you use different ammunition in different circumstances how on earth are you going to know whether the shot in the '9' ring was you or the ammunition?

You should be so used to how your rifle-and-ammunition combination works that you *know* that the shot in the '9' ring was *your* mistake because you read the wind wrong, or whatever, instead of wondering whether it was the ammunition.

It is expensive to use top grade ammunition when you're practising, but part of what you're practising is how to win a competition, and if you then use something different you defeat the object of practising.

Other equipment

It's easy to label everything which doesn't result in a good shot as a mistake, but you aren't really making mistakes you're just being human and that means being inconsistent, because you're not a machine and therefore you're not capable of exact repetition for any length of time.

Any musician will tell you that he never ever plays a piece of music exactly the same way each time he performs; it will be the same tune and in the same time, but there will be slight variations which maybe only he notices.

So how does a top shooter get to be so good? He reduces his inconsistency to a minimum and strives to repeat each shot exactly, but how are *you* going to do that? Obviously you need to learn what causes these inconsistencies in the first place.

You may have done away with all the tenseness in your arm, but was your sling in the right place to start with? The sling around your upper arm shouldn't be too tight, in fact you should be able to get at least three fingers down inside the front of it so that it pulls from the back of the arm, but doesn't crush or squeeze the main artery running down inside.

If your sling is loose enough to do this, it will move around on your arm, so you must be ultra careful to ensure that the last thing you do before lifting the rifle into your shoulder is position the sling correctly, before it has to support any weight.

It will be impossible to move it properly once the rifle is in your shoulder, so look down at your sling as you're ready to lift the rifle butt, make sure that it pulls from the middle of your arm, and make sure that it's always in the same place.

While on the subject of the sling, it should follow the same path under your hand every time, and take care that there are no bundles of jacket sleeve caught up in it which could affect the tension.

Those of you with telescopic sights know all about pulse beat and how dramatic it looks, but it's there for everyone and the problem is that you tend not to notice until you suddenly realise something's wrong half way through a card, so get it right before you start!

Still on the subject of that arm, it's very important to get your elbow in the same place every time; you say you always do, but how do you know?

Bundled up in a thick jacket with a sling and a glove, you can't exactly measure your elbow position to the nearest quarter of an inch, yet even that small amount will vary the tension in the supporting triangle of your arm and sling, and your rifle will notice.

You can, of course, argue that it doesn't particularly matter as long as it's in the same place all the way through the shoot, and you'd be right - up to a point. However, an elbow in the wrong place can lead to more sideways pressure on the rifle which will open the group up.

You'll probably then try to compensate and on the next card you may think you've got it cracked, but the elbow goes somewhere else and your compensation is, this time, causing its own errors.

Of course, because you don't roll over to reload (you don't, do you?), there's no chance that you're going to be moving that elbow while you're shooting, is there?

Your elbow should go anywhere between the sling and rifle. However it shouldn't be outside the sling because that puts too much side pressure on the rifle, nor should it be too far under the rifle, because that makes it unbalanced and puts too much sideways pressure on you, leading to possible interference with the rifle.

So where exactly is the right position for you? It will vary, of course, depending on your size, but generally the right place is just inside the sling at a point where you're balanced.

Being in balance is extremely important; you know you aren't going to fall over, but when everything is balanced it means you can relax and nothing will move, because you're in a state of equilibrium. Therefore you need to learn what your elbow feels like when it's positioned correctly so that you can repeat it from memory.

The prone position is all about triangles and how they inter-relate. There's a triangle formed by your other arm and the rifle, there's a triangle formed in plan view between the rifle and your supporting arm and there's almost a triangle formed by your body and legs.

Get the triangles right
and your groups will improve

All these must be balanced without one having any undue influence on the rifle, so that when it recoils it does so straight backwards without wanting to leap off to one side.

Crossing over to the other side of the rifle you come to one major source of shooters' errors - the trigger hand.

You should keep a relaxed grip with your trigger hand – it's not there to hold the rifle in position (that's done by your shoulder and the other hand), it's there to enable your finger to reach the trigger, so keep it as straight as possible.

If you're lucky enough to have a thumbhole stock, put your thumb through it- that's what it's there for. It doesn't have to go all the way through, in fact if the pad of your thumb was to stop in line with the trigger you could ensure that squeezing between finger and thumb would result in a straight backwards trigger pull, couldn't you?

Grasping the pistol grip tightly gives something else for the rifle to react against when it recoils. You could argue that this doesn't particularly matter if it's the same every time, but it's easier to be consistent with a very light hold than a heavy one.

Cheek pressure is important

During the excitement of a match you could get tense and vary your grip on the rifle, but it's more difficult to get tense with a relaxed loose hand and, therefore, it's much safer.

The next item on the list of things to analyse is the elbow of the trigger hand. There should be no weight on that elbow at all, otherwise that's something else which could influence how your rifle recoils.

After carefully placing your hand in exactly the right position, the elbow is gently lowered to the mat as the last operation, then you're ready to concentrate on the shot.

If your sights aren't aligned exactly or your bubble isn't central, you can raise it and lower it again until you get it right. If your position is correct, raising and lowering that elbow won't affect your balance.

Gripping the stock with the fingers and thumb (which wasn't on the list) has already been dealt with.

Next we move on to the head, which can be quite a heavy item, and when lent on the cheekpiece of a rifle it can have a dramatic affect on its recoil. It could be responsible for a vertical shift in the group by effectively adding weight to the back end, thereby reducing its upward movement, or increasing it, as the case may be.

How you get it right is all down to feel - consistent pressure is the answer. That sounds obvious and, if you have a method of ensuring that your cheek pressure is always constant, do continue with it. If not, read on.

Cheek pressure is all about the relationship between the sight line and your eye, and the position of the butt in your shoulder; getting all that right gives you a consistent cheek pressure. Therefore you need to do a lot of experimenting in position, totally relaxed, with your eyes closed, so when you open your eyes you're exactly in the centre of the rearsight, not just once but every single time.

If your cheekpiece is even only slightly wrongly adjusted, your cheek pressure could increase if it's too high, or your head could sink down during shot release if it's too low.

If you didn't have to take your cheek off the rifle when you reload, life would be a lot easier. For example, one of the reasons why so many people shoot better with a telescopic sight is that they don't have to move their head to look through a spotting scope to see where the shot has gone.

As most of us have a cheekbone somewhere under our eye, it helps if the rifle has an edge which is just the right shape to fit under the cheekbone. It's also a great advantage if you cant your rifle, because that takes it away from the jawbone which has some very strong muscles attached, which are prone to tenseness (hence clenched teeth).

The old *BSA* stocks had a great expanse of wood as a pad to lay your cheek against, without anything to use as a location aid and you'll often see that these have been adapted to provide some sort of reference point.

Canting the rifle towards you will stop you pushing your head over in order to see through the sights. Don't be tempted to carve out an enormous amount of wood just so that you can keep your head upright and get your eye behind the sights - this is a waste of time. However much wood you take out, it will never be enough, because

your eye isn’t in line with your shoulder (just look in the mirror if you aren’t sure about that).

It’s much better therefore to lay with your head level, so as not to disturb your balance or your vision, and bring the rifle over to you. By making everything as natural as you can, you’ll be reducing the areas of conflict or tension which your rifle will react against when it recoils.

The shoulder

The next major area of error is the shoulder - that great bulge of muscle and sinew at the top of your arm, joined to the neck and containing one of the few bones in your body which can get in the way of your shooting, namely the collar-bone.

Many’s the time you’ll hear people complain of a wrongly-shaped butt plate contacting and pivoting on their collar-bone. In a perfect world you’d just push your shoulder into your butt plate and it would mould itself to your shape, but unfortunately that's not easy to organise.

At least 25% of shooters are shooting with a wrongly-shaped or wrongly-adjusted butt plate, so give some careful thought to yours.