

# A GUIDE TO BETTER SCORES

A pocket guide for target rifle shooters



This guide covers many aspects of shooting what is known as "Target Rifle" in Australia. It describes basic equipment, physical preparation, the shooting techniques and mental control required for high performance prone position shooting.

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This book is dedicated to my wife Sandy, whose many years of patient support has made my enjoyment of the sport and these notes possible.

It contains my personal opinions or interpretations of things I have learned, read or heard about but is heavily based on the coaching guidelines accumulated by shooters involved in the Australian Coaching Council accreditation scheme for Shooting - Full Bore, to whom I am indebted.

This is not coaching as most shooters are used to it, assisting with wind judging during a match but is coaching as Football, Basketball, Tennis and Cricket know it. It is helping the shooter to understand, control and improve his/her performance and satisfaction with the sport.

Shooters need to understand what they are doing so they can identify which areas need work and devise ways to improve. They need to think about training programs and performance monitoring and using the knowledge of trained coaches and experienced shooters.

There are a large number of items which contribute to a single good shot and even more to achieve a series of good shots for a match and more still to get a number of match scores for a competition. Some of these things will be covered in detail, some just outlined and some merely mentioned so shooters can follow up with their local club coaches or relevant experts.

The guide is broken up into four basic areas.

EQUIPMENT - PHYSICAL - TECHNIQUE - PSYCHOLOGICAL

These are presented in this order because success from the later areas can only come if the earlier parts are fully and carefully implemented. If all the variables in all of these areas are eventually made right, good scores are easy. What is not easy is getting all these variables right.

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# A GUIDE TO BETTER SCORES

## EQUIPMENT

The first of the four basic areas will brush through equipment. It will only be a quick overview as a thorough look at all the equipment available to Australian shooters would take a very large book of it's own and require constant updating but if your equipment is not capable of delivering a shot into the centre bull every time, all other preparation will be wasted.

### THE RIFLE

As the central part of equipment used in this sport, you need to understand your rifle. I will not go through the detailed workings of any of the rifles used in Australia but each shooter does need to know a bit about all the features which make their particular rifle an accurate tool.

You need to be confident that your rifle is well bedded, has correct head space, has good trigger and bolt operation and that the barrel is in good condition and that it all fits within the standard shooting rules. If you are not competent in all these things (most people are not and some have no interest), you need the services of someone who can set up and regularly check and maintain the rifle.

Barrel tuning was made easy with the technique developed by Graham Mincham in 1996 and all target rifles should be carefully tuned for maximum accuracy. Failure to do so could leave you at a serious disadvantage. The technique is outlined as an appendix to this booklet.

Current rules allow for stocks to be well fitted to individuals and you should take advantage of this flexibility as a well fitted rifle is easier to control and requires less effort to operate, leading to better results in long competitions. More on this when we get to Technique as it ties in with the basic prone position.

Cleaning is an essential part of maintaining function and accuracy and as it needs to be done regularly, is the shooter's responsibility. Be sure you know how to clean and oil both the bolt and trigger, including any stripping and assembly necessary and do it several times a year. The barrel needs to be cleaned after each day's shoot at least. There are nearly as many different recommendations about cleaning barrels as there are shooters but most barrel manufacturers provide recommendations for their products and these would be a good place to start. Get a copy for your make of barrel.

## **SIGHTS**

I list sights independently from the rifle as they need to be treated separately. While Central is the most common type, it is not the only one. You need to understand how your particular sights work and ensure the movement is free but without any slack, where a move on the wind arm or an elevation adjustment can produce no change in the position of the sighting element. They need to be zeroed to a single rifle and used only with that rifle, preferably with matching identification on rifle and sight.

Sights should be removed from the rifle for transport and protected well. They are the link between the shooter and the rifle and nobody needs to be misled by that connection. The use of lenses and filters will be covered in a later section.

## **SPOTTING SCOPE**

Each shooter needs their own scope, which should have about X20 magnification and good focus adjustment to allow assessment of mirage. A large front lens diameter will be a benefit in low light conditions and a front lens protection tube will help retain a clear image in rain or frontal light.

The non aiming eye should be used for the scope if possible. This helps maintain the pupil dilation in the other eye between shots for more consistent aiming.

Many shooters prefer "straight" designs as the eyepiece points towards the target as one would naturally look but a 45° angle eyepiece allows the scope to be placed low and the shooter can then see wind flags which would otherwise be obscured.

This type also allows the scope to be positioned so the image can be viewed just by swivelling the eye, without any movement of even the head. This can be an advantage when shooting with mirage as the major condition to be assessed as it allows a shot very quickly after a mirage assessment.

The scope stand must be wide based and secure in all conditions. It needs to be positioned to allow the shooter to look easily through the eye piece without bumping the scope or stand and certainly without having to move out of the correct shooting position. Many people still use poorly designed stands or position them awkwardly and some clearly inadequate scopes can still be found on our ranges.

You need to know where your shots are going and why they are there, to make the correct adjustments and a good scope, well positioned, will make this easier.

## **PERSONAL EQUIPMENT**

Here I include things like a shooting coat, hat, glove, ear protection, wet weather gear and mat.

Ear protection is essential and should provide the necessary noise reduction while allowing the shooter to hear the scorer properly. Too many shooters fail to hear the scorer, for a variety of reasons but disputing the score after the event should not be necessary. Make sure you can hear each score.

None of the other items is absolutely necessary but all provide some advantages. A well fitting coat will provide significant advantages. The fit is more important than the material and it should be firm across the shoulders when you are in the correct shooting position, with adequate pads in all the right places. Beyond this a stiffer material will add to stability and secure fastening at the front will provide a consistent fit and make repeatable performance easier.

A hat which will provide consistent sighting conditions with light and rain protection and a mat with good elbow grips to prevent slipping in wet conditions or on grassy mounds will also help. A glove or mitt could improve the comfort of your front hand and allow you to concentrate more effectively on the real job.

As current Australian shooting rules do not allow shooters any external protection from environmental conditions, having your own well fitted wet weather gear can similarly provide vital improvements in comfort in adverse conditions and should be part of your regular shooting kit, not something you add when you think it might rain. It can be very useful protection against cold wind as well as rain.

You should consider making a wet weather cover for your rifle action while on the mound, as water in the action can wet the bullet case and reduce the grip it gets on the chamber when fired resulting in inconsistent chamber pressures as well as some very high pressures against the bolt face. Protect your bullets on the mound for the same reason.

## **CONCLUSION**

Most of this would be known to regular shooters but it is included to remind you of things you may not have thought about for a while. May be some of it has been neglected recently.

For new shooters it is a very basic guide to what you will need to have and to learn about equipment. Local coaches or other shooters at your club will be the best source of detail.

# PHYSICAL PREPARATION

This is about how you need to prepare yourself to be able to get the best out of your equipment.

There are a multitude of ways that a shooter's physical state will interact with the process of putting together a series of good scores to complete a competition. Of the many elements to Physical Preparation, some are critical and some almost irrelevant.

## ISSUES OF SMALL INFLUENCE

**SEX** The sex of the shooter is of little consequence with both male and female shooters performing at all levels in the sport. Competition results by women in shooting are slightly above proportion to their ratio to men participating.

Most women have to cope with regular fluctuations in hormones which can influence mental skills but do not drastically alter physical capacity in most cases. A well kept diary will identify if changes in skill arise from this or other causes so modification can be planned appropriately.

The other aspect of sex often discussed in relation to more physical sports is participation in sexual intercourse. There is no evidence that this is harmful to sporting performance and may be beneficial to shooting where a calm and relaxed attitude is important but the drinking, dancing and lack of sleep so frequently associated with the pursuit of a partner can have dramatically damaging effects on performance.

**AGE** Age is only important in that at the extremes it is associated with limits on the physical capacity of individuals to achieve good technique.

On average, shooters under 14 years lack some of the fine motor skills required for precise control and shooters over 70 years can have failing fine motor skills, eyesight or physical fitness which may limit performance potential. So long as the individuals identify and work to reduce these limits, there will be great satisfaction in performing to realistic goals.

**BODY SHAPE** Whatever a persons natural body shape, it is relatively easy but very necessary, to adapt equipment and shooting technique to make this an irrelevant issue. Unlike long distance running or gymnastics, there is no evidence of advantage in one body type for full bore shooting performance.



There is no natural advantage in different body types to shooting performance.

**PHYSICAL HANDICAPS** The sport of full bore shooting is within the capacity of many people who are unable to perform many other sports. Rules allow for shooting aids to be used in special circumstances so individuals can be competitive.

### **ISSUES OF IMPORTANCE**

**KINAESTHESIS** This is the capacity to feel where all the parts of the body are in relation to each other. It is considered vital in sports like diving & gymnastics where the body is rotating in the air and in fast action sports where good physical control is vital.

In full bore rifle shooting it is important to know that position on the mound is precisely right for each shot. Changes in position during a match will make consistently good shots difficult or impossible to achieve. A well trained sense of kinaesthesia is required to feel when position is right.



This capacity to "feel" when your position is right will allow you to do a mental check as part of your every shot routine and also ensure you have your natural point of aim directed at your target. More on this under Technique.

Training this sense can involve moving one part of the body to touch another part, such as touching your left elbow with your right little finger, or moving one part and touching the spot that it came from with another part, such as moving your left foot and touching the spot where the little toe was with your right thumb, all done with the eyes closed.

**BALANCE** A good sense of balance is closely related to this kinaesthetic sense and similarly important in achieving a good and consistent position on the mound. This is a much more vital aspect of three position shooting but some training program for this may be useful for many prone position shooters. Good balance ensures pressure on elbows, chest and cheek-piece are consistent. A good test is to try doing up shoe laces while standing on one leg and with your eyes closed. If you can't do this you should consider some balance training.

**AEROBIC FITNESS** Our sport does not require extreme levels of physical fitness for participants to achieve maximum performance. At the same time there is a minimum required to avoid having physical difficulties interfering with good technique and reducing performance.

The minimum fitness level required will depend on how close to personal maximum the shooter chooses to perform.

Regular club shoots are often seen as practice or social outings and are over quickly with little real concern for the outcome. In many cases, maximum performance is neither expected nor attempted. With modest goals and frequent opportunities to compete at this level some adverse physical interactions can be tolerated quite readily.

Club prize shoots require more effort and attention. A higher level of performance is attempted but physical interactions are common. However with frequent opportunities to compete at this level, some below potential results are still acceptable to most shooters. Individuals with higher expectations will be concerned that they are not reaching their potential and may train physically to benefit their shooting.

Queens shoots, teams trials or matches and state or national teams performances frequently take several days in poor weather, often require shooters to cart their gear long distances, usually involve many separate matches and can involve long waiting times. They are physically much more testing and require near maximum results to be satisfactory.

Most shooters looking for top results will train physically. You don't have to do this but you will have to compete against those who do.



Competitors at Mackay in the 2008 NQRA Queens.  
One of the most enjoyable competitions in Australia.

Training for aerobic fitness involves doing exercise which raises the heart rate to over 80 % of maximum for 15 - 20 minutes at least four times a week. Some shooters may fulfil this requirement during their regular work. Others will need to have a special training program.

Theoretical maximum heart rate is estimated by subtracting your age from 220. The training rate is 80% of this.

Actual maximum heart rate for individuals can be tested for by medically trained people with some equipment and involves monitoring heart and blood pressure under load. This is a useful precaution before starting a physical training program, particularly for people over 35 and individuals who have done little physical hard work or strenuous exercise for some time.

Commonly used exercises are running, swimming, cycling or "power" walking. A program should be planned with input from an accredited coach and should involve warm up and stretching routines as well as the main work out. Allow at least three months to see a significant improvement in aerobic fitness. It takes time for the body to adapt to the new work load being expected of it.

As well as providing good blood oxygenation levels for fine muscle control and eye function and for some endurance in long matches or competitions, physical training has some very useful side effects.

The discipline required to hold to a training program aids in maintaining mental control during a shoot.

The commitment required to establish and hold to a fitness program leads to greater attention being given to other aspects of the sport so the training effort will not be wasted and this provides cumulative increases in performance.

Physical training provides an opportunity to practice positive mental skills useful to shooting. More about these in the section on Psychology.

The training routine also creates a mental distraction from the stresses of life and increased blood flow helps remove the residues from stress. Feeling less stressed and more physically capable improves self confidence, which if balanced with good technique and good mental skills provides the base for maximum performance.

**MUSCLE TONE** As with aerobic fitness, our sport does not require extreme levels of muscle tone for maximum performance but fine motor skills are aided by good muscle tone and endurance for long matches requires good muscle tone.

The prone position used in full bore shooting requires upper body muscle tone but little use of the lower body. While any aerobic exercise being undertaken will have some effect, leg exercise and running are not ideal conditioning for upper body muscle tone. Swimming, weight training, push-ups and sit-ups would be appropriate. Input from an accredited coach should be sought and a program could be worked out to provide for both aerobic fitness and muscle tone training together.

**FLEXIBILITY** There is no need for great flexibility in full bore shooting but a full range of movement in the neck, shoulders, arms and back will allow maximum comfort to be attained with a good position and provide for full attention to be given to the challenge of the competition.

Assistance from a Physiotherapist might be needed if flexibility is a concern for individual shooters.

**EYES** This is a province for experts and if in doubt, consult one but without a good sight picture any other preparation is wasted. The eyes need to be prepared along with the rest of the body.

If reading a 'phone book without optical aids is difficult, seek the advise of a good Optometrist who understands the requirements of prone position shooting and preferably who is prepared to test you in the prone position, with your rifle.

There is some basis to suggest that if long sighted, shooting optical aids need a half dioptre less correction than used for reading or if short sighted, a half more than for normal use.

In ordinary glasses frames, lenses can be ground with the optical centre higher and towards the nose, in line with the eye to sight alignment when shooting or preferably, special adjustable frames can be used.

Some shooters have lenses fitted into a carrier on the rear peep. On the plus side, this means you must look through the same part of the lens each time to be looking through the centre of the peep. On the minus side it makes the lens difficult to keep clean and dry and it can fog up in heavy humidity conditions. Take care the carrier does not become loose, allowing the lens to move. This results in you looking through a different part of the lens, getting a different sight picture and a wild shot.

Dioptres have helped some shooters who have difficulty getting a clear image but as well as the down side of a lens in the peep, they are themselves difficult to adjust well and very few shooters have found long term sustained improved scores with their help. If you intend to try a dioptre, talk to everyone you can find who has used one.

In the mean time the best advice I can get says you should adjust dioptre settings to get a clear picture of the target, focus back until the front sight just comes clear. Leave this setting until your eyes change or for six months at a time. Use the aperture to adjust the amount of light required for each range.

Eagle Eye lenses have been approved for use in Australia. They come in two strengths, 0.3 and 0.5. They magnify the target image and so require larger front ring sizes than would otherwise be the case. The 0.3 element needs front rings to be increased about 10 points. Ie if you usually use a 3.5mm, try a 4.5mm ring. The 0.5 will need larger still.

These have proved to be very successful in allowing shooters who would otherwise not see with sufficient clarity to again aim for centre bulls rather than aiming for bulls and hoping for centres.

A major disadvantage for Australian shooting is that they are not permitted in most International competitions and it will be difficult to select teams which might do well without their use as we will have no record of performance without them. Also they are another thing to go wrong and occasionally will.

Another suggestion for improving sighting has been that blue filters could assist in sharpening the front sight picture if long sighted and red filters if short sighted. Amber can be used to cut glare if no correction optics are needed. All filters reduce light transmitted to the eye and use of filters should only be undertaken if all other adjustments fail to provide a good image.

It is vital to get a clear image of the front ring and a useable aiming mark spot within it and as eyes change over time, often subtly, they should be included in any planned preparation program, checked regularly and correction applied.

**DIET**        Apart from controlling weight, diet contributes to general well being by allowing all essential functions of the body to have the resources needed.

Energy, protein, vitamins, minerals and water are all needed but the balance is important. Extras such as caffeine and alcohol can be tolerated in small doses but for absolute maximum performance should not be taken within 24 hours before a match.

Other drugs should only be used on medical advice. Many are banned substances in sport and particularly if international competition is considered, should be checked with the Australian Sports Drug Agency (current hotline phone number 008 020 506) and alternatives found if necessary. There are legal alternatives for most prescription drugs and for all "over the counter" medicines.

Diets should contain minimum fats and oils, including that contained as ingredients in prepared foods, adequate but not excessive protein and high levels of carbohydrates, particularly complex carbohydrates and fibre. A diet of varied foods within these will usually contain adequate vitamins and minerals. Regulating intake and taking adequate exercise will control weight.

#### **PLANNING FOR A COMPETITION**

As well as a good background physical preparation, shooters need to plan for their physical well being during the period of a competition.

**DEHYDRATION** This is a very common cause of physical interference with shooting performance. It appears in mild and even cold weather conditions and can be very quick to affect performance in hot conditions, less than one hour.

The body is showing effects of dehydration before you feel thirsty. Unfortunately the eyes are one of the earliest parts to be effected and are so essential to good shooting. A degree of fine motor control is also an early casualty.

A good test is urine colour. If your urine is any darker than the colour of canola cooking oil, your dehydration levels are probably affecting performance.

Liquid replacer should be low or nil salt, low sugar and tasty. It should be cold but not freezing if weather is hot and warm if weather is cold. Taking very hot or very cold liquid requires the body to alter blood flow to reach a balance again. Often this takes blood away from the parts that you need in your performance.

Usually intakes of 100 - 200 ml at a time are best and should be taken at intervals of 30 - 60 minutes, depending on perspiration loss.

Alcohol, caffeine and high sugar liquids will all aggravate dehydration, not improve it as the body will need to take water from tissues to filter and excrete these substances or their derivatives. Salt is not a concern in the short term.

There are a variety of commercial "sport" replacer liquids, but all are designed for high perspiration loss situations. They do contain essential minerals and some energy material so they could be used occasionally but use straight water as the main liquid to avoid dehydration.

**FOOD** During a competition, eating regularly and foods of similar type to normal is a sound policy. If away from home, particularly overseas, there are strong temptations to try new foods but changes to diet can cause a variety of upsets to physical well being.

Eating small meals but regularly spaced throughout the day will ensure optimal energy for the muscles. Big meals alter blood flow for a long time to achieve digestion and going without food requires the body to process body fat to get essential energy, again with blood flow directed to areas other than the parts being used in a shooting performance.

**HYPOTHERMIA & HEAT STRESS** These are potential problems in very cold or very hot conditions. As they are difficult and take a long time to recover from, you need to prepare a strategy to prevent these conditions developing.

Adequate and appropriate clothing should be part of your shooting kit, kept apart from every day use and taken to the range along with your other gear.

**RELAXATION** Physical relaxation is necessary to maintain stamina throughout a long competition, particularly over several days and can be useful during a single match if there are periods of waiting between shots such as can be found in Bisley style matches or in teams competitions. Many top shots use a short routine before every shot in all matches.

Shooters should be prepared with a well practised routine. There is some detail on relaxation training in the Psychology section later in the booklet. Accredited coaches should also be able to provide a routine to assist mental centring as well as physical relaxation.

Sleep is also part of the relaxation program during long competitions and should be carefully planned and the plan adhered to for maximum performance.

**CONCLUSION** There are two parts to the equipment used in full bore shooting, the rifle and associated gear and the person. Neither can fire a shot without the other. This section on PHYSICAL PREPARATION has been only a brief outline of getting the person into good working condition. Shooters will need to ensure their rifle and other gear is also in top shape and will need to develop the physical technique and mental skills necessary to operate them both to their maximum.

# TECHNIQUE

There are a lot of individual items which come into technique and most are connected in one way or another but I will discuss the major considerations in isolation as this allows us to concentrate on the aspect or effect required. Just remember that if you change one thing, a number of other things may be affected as they really are all connected.

## BASIC PRONE POSITION

The first step in good technique is establishing a sound POSITION. It is like the equipment and Physical Preparation. Without it, all else can be wasted.

The essential requirements of a good position are stable, repeatable and comfortable - and within the rules.

Stability is achieved through having the rifle supported on the bone structure of the body and having the skeleton distributed to create a wide based platform with three main points of ground contact through the two elbows and the rib cage of the lower chest.

This allows the minimum use of muscles to control the rifle and provides support in all directions. A good position is such that if the shooter were to suddenly fall unconscious, the position would largely be maintained.

Repeatable. We all know good results are made from doing a series of good shots, one at a time. This means a repeatable position from shot to shot. To be repeatable the position must have some easily followed guidelines and checks. Good results require the shooter to test for correct Position before every shot. This is where that Kinaesthesia comes in.

Comfort. To be maintained for a series of shots, particularly for a number of ranges in one day, the position must not place strain on the body. It must be comfortable.

## A PLACE TO START

Most modern full bore rifle shooters use the basic Estonian position, with very minor changes to suit their build and ensure comfort in long matches. The following description will be for a right handed shooter. Left handers will have to turn the description around to suit.



Begin by placing the shooting mat at an angle of about 30 degrees to the target and with the rest of your gear on but without the rifle. Lie face down, arms folded forward of the shoulders, where you can put your forehead on your forearm.

Move the left leg so the knee and ankle are in line with the left shoulder and hip and the toes point inwards, to the right. The left heel is just allowed to fall outwards comfortably. This stretches the muscles of the leg and hips slightly and tends to lock the lower body in position. Avoid having the heel of this left foot straight up in the air. This leaves you prone to varying the position between shots and will make consistency difficult. Similarly avoid digging the toes into the ground. It is too easy to vary the pressure on the toes and so change the position.

Without moving the elbows, open your arms and hold your hands in about the position required to accept the rifle. Most people will need to move the right elbow back and out very slightly, about 10- 20 mm.

Now move the right leg into any position that is comfortable and that helps with stability. Usually just drawing the knee up a little and pointing the toes out to the right will do. This tilts the body very slightly to the left and lifts a little weight off the ribs, allowing easier breathing for long term comfort and reduces the chances of your heart beat creating a pulse when aiming. It is here that most variation in position occurs with shooters of differing build, some needing to draw the leg up more than others.

With a good position, the spine should be straight, shoulders level, left wrist, elbow, shoulder, hip, knee and ankle should all be in line. The distance between the left shoulder and hip should be the same as the distance between the right shoulder and hip. The head should be upright with eyes level.

Now it is time to add the rifle into the position. Modern rules allow personalised stocks with very few restrictions. Best results will be obtained from adopting the standard position as just described and fitting the rifle to yourself, within current rules.

The rifle should fit, without moving any of the position, so the sights are level and about 5 - 10 cm in front of the right eye, the trigger rests where the right index finger can reach with the first joint and the fore end wood passes over the left wrist along the base of the thumb, carrying the weight of the rifle directly over the bones of the wrist.

A common problem is not having this hand far enough under the rifle, resulting in the forend resting on the palm of the hand, requiring the use of muscles to hold it up.

This provides an opportunity for variation in muscle tension and elevation errors. Similarly, the fingers of the front hand must not be used to steady the rifle as any variation in tension will create errors. Occasionally shooters curl the fingers enough to touch the barrel, a guarantee of wild shots. A fingerless shooting mitt can help avoid these errors.

The sling should pass around the top of the left arm, above the triceps muscle to avoid a pulse beat, leaving a gap at the front to provide good blood flow to the left arm and be tight enough to support the weight of the rifle. It must not be so tight that it distorts the good position but tight enough to maintain the left arm and rifle still in position even if the shooter went to sleep. While I believe a two point sling will have a very small advantage in gusty wind, single point slings provide great results for many shooters and are a requirement of UIT shooting.

The sling needs to have adequate adjustment in length to allow it to be adapted to the slope of each mound and altered for differences in clothing worn under your coat. Holes spaced about 1cm apart for a length of 10cm either side of the normal position will be required and the buckle should be positioned so it is over the left elbow and facing in, so adjustments can be made while in position on the mound. Checking sling adjustment should be a part of your routine when setting up your position for every range you fire.

With a well adjusted cheek piece to support the head with the right eye in line with the sights, you should be able to slump into the position without anything changing. Maintaining good position should not rely on muscle tension.



A shooter showing good basic position.  
Note the straight left side.

#### CHANGING FROM THE BASIC

You may want to make minor changes from this basic position to suit your individual body build but always remember the reason for creating a position - to have a rifle support system that is stable, repeatable and comfortable - and within the rules. Any changes should enhance these features.

#### TESTING THE POSITION

As mentioned earlier, it is necessary to check the position before every shot to ensure absolute consistency and in the section on Physical, mention was made of Kinaesthesia or the sense of feeling where the parts of the body lie in relation to each other.

A position check should just be a mental look around your body to see the left wrist, elbow, shoulder, hip, knee and ankle are in line and that the shoulders are level, head level and right hand comfortably on the butt so the index finger is in the correct position to squeeze the trigger, just reaching forward a couple of mm from the zone of comfort. It should all result in having your natural point of aim being at your correct target, with the aiming mark somewhere inside the front ring as a default position.

#### ABOUT ADJUSTING A STOCK

While I am a firm believer that the stock must be adjusted to the shooter when in a good position, be careful not to make too many radical changes until you have had time to consolidate a position for a while. You may make minor changes to the basic position in the first few months - but please, only one change at a time and test each thoroughly to be sure it is an improvement.

Unless you have a stock custom made to your measurements, most stocks will be too long and too 'fat' in the cheek piece for most shooters. They are deliberately made this way to accommodate the extremes in body shape and shooters are expected to modify stocks to suit themselves.

The ideal is to have a stock which can be cut about and added to until it fits well once your position is settled. Then used for some time to ensure no further changes are required. If that can be used as a model for a stylish new stock and the old one discarded results and aesthetics will both be satisfactory.

If you can't do this, make only half the change that seems to be required as alterations are usually irretrievable and sometimes where a change appears to be required it turns out not to be so or a very small change will bring the rifle into line with the position.

A couple of starting points might help.

For most people the length of stock from the front of the trigger to the end of the butt will need to be the same distance as the tip of the thumb to the inside of the elbow. The front edge of the front hand will be positioned about the same distance again in front of the trigger, with the sling attachment just forward of that point.

To get the head upright and eyes level behind the sights you will need someone to assist. Get into position with the rifle and then close your eyes. Have your assistant move your head till it is upright and level but not necessarily with your aiming eye behind the sights. Adjust the cheek piece height to get your eye at the correct level. Next have them move the sights on the wind arm till you can see through the centre of the rear peep. The difference from this setting to the zero wind setting is what needs to be added to or shaved from the width of the cheek piece so your eye will naturally fall into line with the eyepiece.

If a thumb hole stock is being used, be careful that it has enough space around the thumb so the stock does not come back onto the thumb under recoil. This will cause occasional high shots with heavier calibre rifles. Similarly the use of a front hand stop can create inconsistent recoil and high shots and is not recommended with 7.62 mm rifles. It is best if the rifle can recoil straight back for a few cm, allowing time for the projectile to exit the barrel before encountering resistance.

### **NATURAL POINT OF AIM**

The second step in achieving good technique is orienting the good basic position described earlier so the rifle points at the target. While this seems to be an obvious statement, it is amazing how many experienced shooters ruin a good position at this step by using muscles to force the rifle onto the target.

When the shooter has adopted a good position and has the rifle fitted properly and the correct target identified, the aim can be tested.

If position is right, the rear and front sights should be aligned and level and the right eye in position to centre everything. Simply slump into the position with your eyes closed and relax, breathing out comfortably. Take a look through the sights and note where the front ring is encircling. This will rarely be the centre of your target.

Keeping the front elbow in place, move the whole of your body around the elbow, left or right, to get correct alignment on the right target. Check that your position has been re-established properly, as described earlier and test again.

Repeat until the left/right alignment is correct and position checks out. Sometimes if only a fine degree of adjustment is required small movements of the feet, legs or hips will provide the correction and it will not be necessary to move the chest and right elbow.

Next move the front hand forward or back to achieve the correct up/down alignment so the target is centred with the breath at the point of natural, comfortable exhale. You may need to adjust the sling. This may also alter the left/right alignment as the front arm moves in a slight arc with the position as described so a further adjustment could be necessary. Repeat as often as required but ALWAYS CHECK POSITION after any change.

The goal is to have a perfect position, aligned so the front sight is moving up to and down through the correct target as you breathe relaxed in the correct position. It should require no conscious muscular effort at all and should have the target centred when breath is out.

All this adjusting sling, orienting position and relaxing take time. Be on the mound as early as possible in a competition to have the necessary time. It is vital to good results.

#### READY TO SHOOT

With a good basic position, a well fitted stock and proper alignment of the natural point of aim, you are ready.

During a match you should check both the Position and the Natural Point of Aim before every shot. It takes just seconds after the rifle is loaded to think about where everything is and test the natural point of aim and only a few more seconds to fine tune if necessary.

It is impossible to consistently use muscle effort to align the rifle and hold it steady through firing a series of shots but a good position and proper alignment means the rifle rests on the bone structure of the body and naturally rises onto aim as the shooter breaths out.

Some shooters have been known to test their position and natural aim in practices by continuing on to fire the shot with their eyes closed. If things are right, a bull should result and if you can shoot bulls eyes with your eyes closed, think what you can do with them open.

I think everyone should do this test about every six months to check their position and orientation routine.

## **BREATHING**

When it comes to firing a series of good shots, breathing has two very important functions. The first is to ensure the body has a good supply of oxygen in the blood. This allows proper functioning of the small muscles used in fine motor control and ensures the eyes can focus to their maximum as well as allowing clear thought and focused concentration.

Any reduction in oxygen in the blood will result in reduced function and both physical and mental stress. The second function of proper breathing is to bring the rifle onto aim.

Good breathing starts before you get down on the mound. Take the time to relax and take some deep, slow breaths, in through the nose, using the stomach to ensure full lung capacity is used, hold for three seconds and out through the mouth, relaxing as you breath out. This provides time for maximum oxygen uptake and helps muscles relax.

Do a few more deep breaths after the physical exertion of getting into position and orienting the natural point of aim on the target. This refills the blood with oxygen.

Aim and hold is aided by breathing. During the shooting sequence breathing should be normal while checking the last shot position, conditions, reloading and the body position and natural aim checks. It may be helpful to use the slow deep breaths at one of these stages if feeling stressed during shooting but it is best to follow a definite routine in the final stages of preparing to fire.

As you do a final check of conditions take a couple of deeper breaths and as you go to final aim breathe more shallowly. Finally when aim is right, hold a natural exhale and squeeze the trigger slowly and smoothly until the shot is away.

This last exhale and squeeze should not last more than about five to six seconds. The body will be affected by reducing oxygen in the blood by this time and if the shot is not away in time, stop and start back at the position and point of aim check and do a couple of deeper breaths.

## **SIGHTING**

This is one of many vital aspects of good shooting performance. The goal is to get a sight picture which will provide a clear indication of when the rifle is pointed with absolute accuracy at the desired spot.

Firstly, sighting should be done with both eyes open. Attempting to close the non aiming eye will create tension in the face and neck which is difficult to do uniformly from shot to shot but more importantly it creates a mental distraction which takes the mind from what it should be thinking.

If necessary use a blind in front of the non aiming eye, either by attaching something to the sights or by utilising a hat or cap to obstruct this eye while aiming.

While some coaches are very specific about what shooters should try to have crystal clear in their sight picture, I am not concerned if shooters have a clear front ring or a clear target picture, so long as one is clear and they can identify when the two are no longer aligned perfectly.

It does appear that younger shooters find it easiest to focus on the target and older shooters find it better, not necessarily easier, to focus on the front ring.

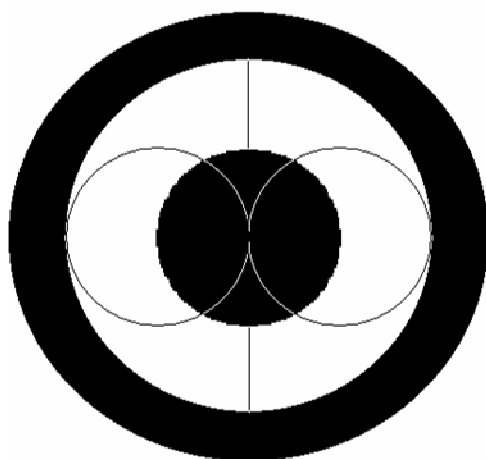
I will assume all shooters are using ring front sight elements as these do not provide an opportunity for increased error with light variation, so long as they are chosen carefully. The old rule for blades of "light up, sight up etc" does not apply with concentric sighting.

My rule of thumb in selecting ring and rear aperture sizes is, "the largest you can put up with in the front and the smallest you can get away with in the back" but to explain more fully;

#### **RING SIZES**

Attempting to use too small a front ring will result in the natural indistinct edge inside the ring, caused by the light which enters at an angle bouncing from the edge, encroaching on the aiming mark and making it impossible to see when the aiming mark is centred. Shots will be lost in all directions.

If a minimum size is chosen in mild or dull light and brightness increases, the result will be the same.



A front ring which allows the aiming mark to fill half the width of the ring is *the minimum* that should be used.

If too large a ring is chosen, it will be difficult to identify when the aiming mark is exactly in the centre. Again shots can be lost in all directions but more commonly you get only an odd one out and usually at the same place.

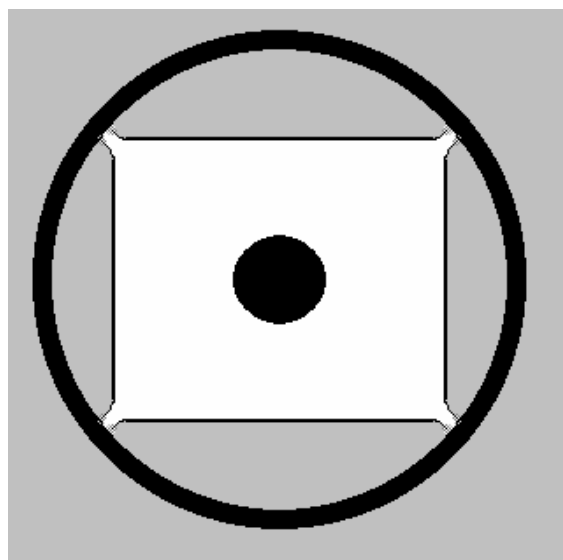
This may be caused by a slight error in position or by objects showing up in only small portions of the background causing a natural pull in that direction as the mind tries to centralise the balance of light and dark coming to the eye.

Because a clear separation of lines for the human eye to register requires that light from each side of the line fall on separate cones in the retina, it is unlikely that objects closer than two minutes of angle can be separated effectively.

Also the eye does not actually see black but registers white (or colours) and an adequate level of light must be available to allow a clear separation of objects. This means that choosing front rings should allow for at least two minutes of angle between the aiming mark and the inside edge of the ring.

It gets complicated as at some distances a front ring with the same MOA as works well at other distances will have the whole target almost inside but have the ring cutting the corners.

The fuzzy inside edge mentioned above will make it difficult to identify when the corners are equidistant and aiming errors will result. In this case larger rings will be required, getting right off the target.



A 'framing' aim, often used with great effect. Note the corners drawing out into the fuzzy zone allowing an exact positioning to be achieved.

Be careful of background where blotches of light or dark could interfere with centralising the aim on the target.



## **REAR APERTURE**

The flare effect on the inside of an aperture is readily seen and can be used to advantage in selecting rear aperture size.

Take the rear sight off the rifle and hold it up to an area of even colour, often a patch of blue sky is available. Looking through the aperture, using any eye correction used in shooting, move the slide (or size control) till you see a "grey" spot in the centre. Keep reducing the size till this "grey" spot disappears and go back up one hole (or size). This is the size to use in that light.

The grey spot is the area of true light transmission; the surrounding whiter area is the zone of flare coming from the edge of the hole. When aiming it is important to be viewing through this grey spot area of true light transmission and as we have just made this as small as possible to get a long depth of focus and have maximum chance of seeing the front ring and aiming mark clearly, this means sighting through the exact centre of the rear peep is critical to good results.

**FILTERS** - I make special mention of these as they are the subject of much debate amongst shooters. I believe that they should be avoided as much as possible.

Anything placed between the eye and the target must reduce light transmission by at least 15 per cent so it is impossible to "brighten up" a target with filters.

All you can do is alter the contrast between objects of different colours and as our targets are black and white, a very high contrast combination, filters will rarely help.

If aperture and front ring element selection can not reduce glare sufficiently because you do not possess a suitable range, an amber or yellow filter may help in the short term but acquiring a wider range of elements would be better in the long term.

If you use the 'frame the whole target' aiming technique on all targets, often used with great success, filters which contrast with the background around the target may be useful on occasions.

The colour to use will depend on the background but green or blue are the most likely choices. If the stop butts are grassed and green, a blue will increase contrast between the background and the target. If the butts are bare or dry grass, a green could be better. The goal is to increase the sharpness of the target edge. Be careful not to reduce the clarity of the front ring, so it can be centred accurately.

## TRIGGER RELEASE

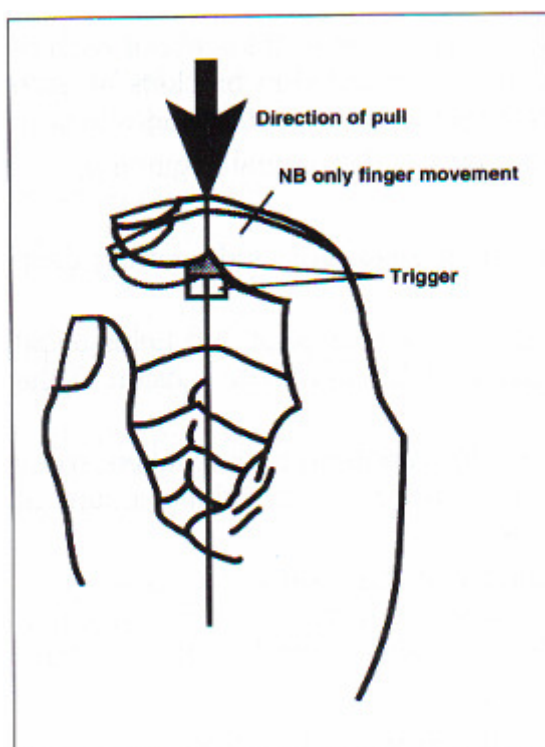
I consider this to be **THE MOST VITAL** part of good technique. All the considerations to date are 'static' elements. Once they are properly established they remain the same. We have put a lot of planning, preparation and effort into setting up equipment and establishing a position, orienting that position and aiming with precision so we can then remain perfectly still. Trigger release involves movement.

The only part of the whole body that can move is the top two joints of the trigger finger.

This finger must contact only the trigger. If it touches the rifle anywhere else, moving it will move the rifle off aim as the tendons inside the hand tighten - a point to remember when fitting the stock.

Having the trigger hand resting so the finger has to reach very slightly forward to have the first joint centred across the trigger results in the zone of maximum comfort aligning with the pull being straight back at the point of release.

The natural tendency of the body to move to the zone of maximum comfort aids smooth control and reduces a tendency to "frozen finger". If you start with the finger already in the zone of maximum comfort you will have difficulty getting it to move out to activate the trigger. You need to start with the trigger slightly forward.



The trigger finger should start out forward of

the zone of maximum comfort for a smooth squeeze.

Now with the rifle on perfect aim through good position, good orientation and correct breathing, trigger hand ready, it is time to act.

Simply increase the pressure on the trigger, moving only the top two joints of one finger, as smoothly as possible to reach the minimum trigger weight (or slightly more) required in about two to three seconds. It should be like wiping the bottom edge of that finger slowly over a piece of oiled glass in one continuous movement.

You should see the front ring jump straight back momentarily when the release pressure is reached and the rifle does its own thing. Continuing recoil with heavier calibres then moves it off the target. Now you can release the trigger and start thinking of the next shot.

This reaction of the rifle must be similar to that of a bench rest rifle. It must be free enough to slide straight back under recoil until the projectile has cleared the muzzle. Allowing 10 - 15 mm of free space in front of the front hand before a stop or sling attachment and keeping the shoulders relaxed should provide for the required straight recoil.

Some coaches place considerable emphasis on "follow through" but in shooting, any more than noted above is irrelevant. With modern full bore rifles the projectile is out of the muzzle in about 1/100th of a second from the trigger sear drop. If you are doing everything right up until then you will not have the time to react and make a mess of it after. "Flinching" as a reaction to the shot going off will not affect the result.

The problem comes if you anticipate the shot. After a while your body learns to recognise that when you have about this much pressure on the trigger finger there will be a loud noise and a thumping of your shoulder.

Unless you are thinking of the right thing and working on operating the trigger as smoothly as possible your body can tense in preparation of the recoil. Tensing up quickly is flinching; tensing slowly will alter the travel of the rifle under recoil so it may not be straight back. Both must be avoided by controlling what you think and do before the shot goes. Follow through after it has gone has no influence on the direction it takes, though it may indicate all was well.

There is a two part trigger release technique. This involves taking up most of the pressure, about 2/3 of that required, and holding this through the final stages of aiming, smoothly taking up the final pressure in about 1 second when accurate aim is achieved. Some shooters use a two stage trigger to make

this technique easier to achieve in a repeatable manner.

This is good for buffeting winds as it minimises the potential for exposure to a buffet at the critical time.

It has a down side (without the two stage trigger it is worse) in that it is extremely difficult to achieve a smooth increase up to the final pressure over a short time. Any jerk or snap can cause a lost shot and the technique is only recommended for truly trying conditions. Stick to the one smooth increase in pressure over 2 - 3 seconds if at all possible. Certainly do all your training with the slow and smooth technique.

Top shots or people finishing a really good shoot will often report that they never had to think about trigger release, when everything was right it seemed to just go off. This is the perfect situation and is a consequence of mental control which we will cover later but even when "in the groove", smooth continuous movement trigger release does take place, because these people have put a lot of training into getting it right. Don't expect it to happen automatically unless the training has been put in.

#### **THE SEQUENCE OF A SINGLE SHOT**

This could be considered the start of PSYCHOLOGY in some ways as it is closely linked to good mental control but more of that later. A developed sequence is also necessary to ensure you remember all the factors used in good total technique.

A good well grounded routine should control both your thinking and your actions while firing a single shot.

The goal is to have the rifle go off as a slight interruption towards the end of a perfectly executed routine.

If your judgement of conditions is adequate and you follow a good routine you will have a bulls eye or better and if you do the same thing every time, you will get the same result every time. Just run the routine over and over.

Analysts of shooting have identified about 50 items in getting through firing a single shot. Grouping many of these into just six main steps allows the use of little memory jogging 'self talk' which helps you to think about each of them as they come into play.

A suggestion is provided in brackets at each item but you should choose your own words which bring the right mental images to you.

If we start with loading a bullet into the rifle as the natural beginning;

**1. Load and relax. (Relax)**

Just before you close the bolt, do a muscle relaxation and centring deep breath as described earlier.

This maintains an even amount of tension for each shot and helps avoid high or low shots which are often a result of differing muscle tension in the shoulders, arms and hands.

As this first part of the routine has space for variations in time taken, some may also include a mental rehearsal of trigger release or breathing routine at this point if these are proving difficult.

From the close of the bolt, the remainder of the routine should be completed with a definite rhythm if possible. Having a rhythm helps ensure uniformity from shot to shot and helps with fine muscle control for the eyes and trigger finger, just as a rhythm helps dancers with their steps and balance.

**2. Check position and orientation. (Naturally mine)**

A quick mental look at your shooting position and then begin aiming, checking the natural point of aim is centred and on *the right target*.

Take a lot of care to get your position and orientation exactly right before the first shot, then it is just a matter of checking before each shot, fixing if necessary.

**3. Final check of conditions. (Conditions)**

They may be different from those prevailing just after the last shot was fired and need sight adjustments. Doing this as close as possible to firing the next shot provides a good chance of getting it away before more changes occur.

**4. Breath and aim. (In the middle)**

Follow the recommended breathing routine outlined earlier to bring the rifle onto final precise aim.

Stay alert for changes in conditions but centre concentration on what you are actually doing, putting the aiming mark as precisely as possible in the middle of the front ring, which is in the middle of the rear peep.

**5. Smooth on the trigger. (Oiled glass)**

Concentrate mostly on operating the trigger 'like wiping the bottom edge of your finger slowly over a piece of oiled glass'.

Having decided the aim is right, this will only take a few seconds. You have committed yourself to going with the sight adjustments you have made and should put that aside for now.

If you have a good position and natural point of aim and you have followed a breathing routine to achieve final precise aim, it almost requires conscious effort to move off aim so that can become background. Look at the perfect aim but think of the smooth trigger action.

If you practice enough and achieve a high degree of mental control, the trigger action may become a subconscious reflex, only operating when everything is perfect and not requiring any conscious thought to initiate. It should be just a matter of thinking "Yes that is perfectly centred" and your subconscious initiates your trigger finger movement, smoothly. This is ideal but requires considerable, effective training to achieve.

In the meantime, go back to item 2 if you have difficulty in getting the shot away in six seconds or so. If you are having trouble, there is likely something wrong with your position or natural point of aim which is creating an abnormal tension and your subconscious is telling you all is not right.

#### **6. Analyse the last shot. (Conditions and result)**

This includes taking a mental note of aim and recoil from the shot, checking conditions as soon as possible so the result can be compared with that expected in those conditions, with that aim and recoil. Take a deep breath to refill your blood oxygen as you eject the spent case and put a new one in, without closing the bolt fully. Then spot the result in the scope, listening for the score to match what you see.

I'll slip a bit of real sport psychology in here as this is where it can be applied if needed.

If you have made a mistake and get a lower value than you expected for this shot, firstly keep calm, do a cold analysis to find ways to avoid a repeat of the error. When you have decided on the corrective action and are ready to resume your routine, deliberately and using some physical action like touching your fingers to your forehead then placing your hand flat on your mat, mentally put the error aside to be more closely examined later.

This is called "Error Parking". It helps prevent you from dwelling on a mistake when you should be thinking through your routine during the next shot. It is closely related to "The Black Box" which will explain the process in the Psychology section.

This period of analysis is also the time for the major assessment of conditions for the next shot. Decide and apply correction as necessary. When you get round to item 3 again, check for any differences to the conditions from this time and fine tune if necessary.

In really rough conditions the item 3 check may be the major assessment, as close to firing the shot as practical.

This formalised sequence for each shot ensures nothing is overlooked and that you are actually thinking about the right thing at the right time.

The sequence outlined here is brief but can be used as a basis for developing your own routine. You should do your own, use your own words; it will mean more to you. Write it down and check that you are following it at the end of each range until it becomes a habit. Then continue to check it regularly. It is a matter of saying what you do and then doing what you said.

Just one note of caution. The connection of what you are THINKING and what you are DOING is absolutely vital to good performance. This is the purpose of the 'self talk', to ensure the mind is on track at each stage. Be wary of the routine becoming fully automatic.

A lapse in concentration can result in the routine being set off by sights, sounds or situations when it is usually followed but which are not appropriate this time.

I suspect this is the major cause of shooting on the wrong target, in association with a poorly aligned natural aim. A good sight picture develops while the shooter is thinking about something else and they just jump into the automatic routine at item 3 or 4, may be do a quick condition check, or straight into the final aim and usually fire a good shot but in the wrong place.

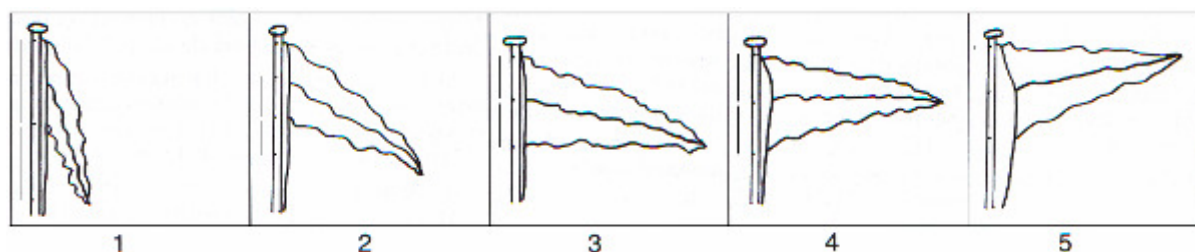
If you need some time to deal with a distraction or unusual development, always start your routine at its beginning and follow it right through. A well practised routine should take less than 20 seconds.

## BASIC WIND JUDGING

There is no substitute for experience and whole big books have been written on wind effects in shooting and every shooter should study more than is contained here but this basic guide can get you in the right region to get a hit every time.

There are three basic factors which control the effect of wind on the flight of a bullet. The strength of the wind, the direction it is blowing and the distance the bullet has to travel (as this controls the time the bullet is being exposed to the influences of the wind). Some other things become important at extreme distances, 1000 yards or more, but for most shooters most of the time, their effects are slight enough to be ignored.

Strength can be judged from the appearance of range flags and then apply a factor to the relative speed of the wind.



Factors for wind strength.

In 1, the tip is about the width at the base below that base. In two it is about half the width of the base below. In three it is about level with the bottom of the base. In four it is about half way up the base and in five it is about level with the top of the base.

Note: Flags hoisted with the rope secured other than at the bottom of the pole will move differently, as will non standard weight or wet flags. All these situations can be found on Australian ranges and you will need to adjust your assessment accordingly.

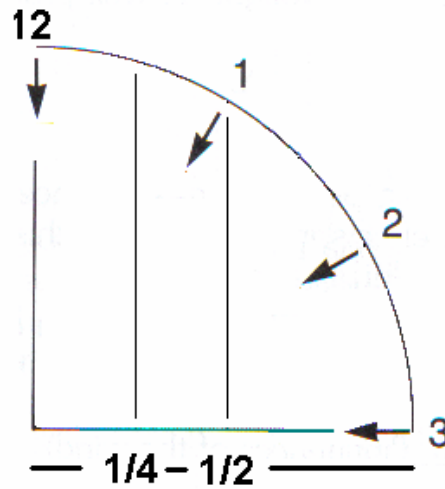
There are many other indicators of wind that considerable experience can make into effective supplements to flags.

Direction is also determined from the flags. Using the simile of the shooter being in the centre of a clock face with the target at 12 o'clock, the numerals around the clock are used to indicate the direction the wind is coming from.

Naturally wind at right angles to the direction of flight of the bullet (3 or 9 o'clock) has the most effect and wind from 12 or 6 o'clock has no sideways effect.



If we break the clock face up into quarters and look at one of these quarters, we can see the relative effect wind will have.

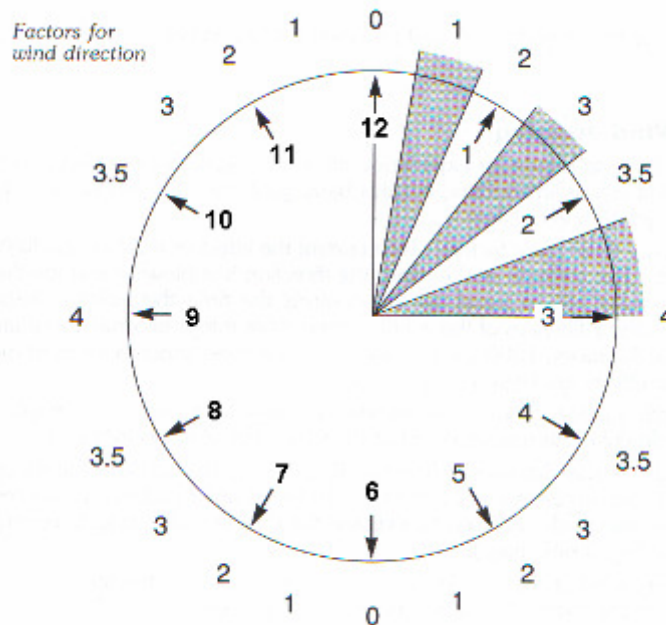


From 12 o'clock, no influence, but from 12.30 it is already  $\frac{1}{4}$  of the sideways distance that a 3 o'clock direction would have and by 1 o'clock it is half the distance. This allows us to apply direction factors in calculating the effect.

Direction	12.00	12.30	1.00	1.30	2.00	2.30	3.00
Factor	0	1	2	3	3.5	4	4

(It is interesting to note that the change from 12.00 to 1.00 is from 0 -> 2 while from 2.00 to 3.00 is only 3.5 -> 4. This is why front or rear fishtail winds are so difficult. Small changes in direction from these angles have dramatic effects on the flight of the projectile.)

You can apply these factors right around the clock.



The third factor is distance. Again we can allocate factors to the relative effects of distance.

For any ranges using distances measured in yards, the factors to use with current (2008) HPBT 155 grain projectiles are:

Distance	300	400	500	600	700	800	900	1000
Factor	2	3	4	5	6	7	9	10

(Using 7.5 for 800 yards is slightly more accurate but is difficult to do the calculations for. The difference is usually less than half a point in most circumstances or you could add 10% to the result of your calculations for 800y)

Now to estimate the effect of wind, estimate the strength and note the factor number, estimate the direction and multiply this factor number by the first, multiply the result by the distance factor and divide that result by 10 to have the correction required in points.

For example

Wind at strength 3 (bottom edge of the flag about horizontal)  
Direction from 1.30, factor 3  
Distance at 600 yards, factor 5  
Calculation is  $3 \times 3 \times 5 = 45 / 10 = 4.5$  or four and a half points right correction required.

If shooting at a metric range, simply do the calculations as for yards and add 10 %. In this case if shooting 600 meters,  $3 \times 3 \times 5 / 10 = 4.5$  plus 10% (0.45) = 4.95 or 5 points.

Many shooters can use this system using mental arithmetic while on the mound but it could be used to calculate out a wind judging reference guide if you would rather look up a table.

Note that the spin of the projectile causes an elevation change when wind corrections of five points or more are being used. About  $\frac{1}{2}$  for each five points, down for left wind and up for right wind.

There is some very minor rounding done with this system but the resulting errors are less than most people have with wind strength and direction estimations. It will get you on the target every time and in the bull 9 times out of 10, depending on your accuracy of estimating wind strength and direction.

Shooters using barrels longer than 28 inch have an increased sight radius, requiring more adjustment to achieve the same minute of angle change. If the above proves unsuitable, adding 5% would come very close.

## MIRAGE

Mirage can be thought of as simply wind that you can see. It is the result of heated air from the ground mixing with cooler air in the atmosphere, the different temperatures having different densities and refraction of light passing through them. The movement you can see is actual air movement.

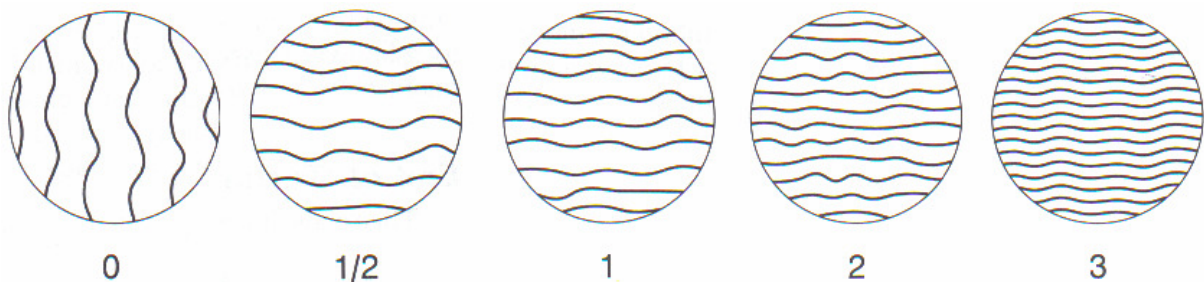
Sometimes it is difficult to find but usually focusing about 100 - 200 yards short of the target will find it and still have the target in sufficient focus to see the spotter and value lines.

At ranges greater than about 600 yards, most scopes do not have the depth of focus to discriminate that finely and you can focus as clearly as possible on the target and will still see any mirage that is present.

Mirage is usually overridden by flag readable wind of strength 2 or more but some ranges have flags above the flight path of the bullet and mirage still operating lower down and it then continues to control what correction is required.

Mirage corrections are read from the apparent speed and direction of the flow of waves across the target, often easiest to see along the top edge.

Again experience is the best teacher about mirage but as a guide try the following, making corrections against the flow.



Mirage and the corrections required.

## AND THEN WHAT

If you are firing good shots and conditions are steady you can adjust for any inaccuracy judging the wind or mirage by making the full correction from your first sighter to the middle of the target and half any required correction for the second. This will centre the group. Further sight adjustments should only be made if conditions change or your assessment of centre is proved wrong.

If conditions are not steady it may be useful to fire one sighter at one extreme of the changes and the second at either the other extreme or at the time when the most repeatable conditions are occurring.

This will allow you to refine your assessment of the sight settings required for conditions which might be critical to your eventual score. You might need to spend some time before you get on the mound to decide what the extremes and most repeatable conditions look like.

#### **END OF TECHNIQUE**

This ends the section on technique. This should provide the basis of a technique for excellent scores if your equipment is good, your physical preparation has been adequate and you remain mentally in control. There has been a lot of material to get around and a lot of detail not included but you can utilise a local coach to refine the detail.

## **SPORTS PSYCHOLOGY**

This is an area of sporting management which has not traditionally been applied to full bore rifle shooters but it has regularly been applied very successfully to many other sports since the 1948 Olympics.

It is about being in control.

It is about getting your mind in line with what your body is doing and having both working together.

Thousands of shooters come to our ranges with very good equipment, nearly all are physically capable of using it properly and most have developed and practice a very good technique and read conditions well. Mental management is the part that sorts the best from the rest.

Firstly let me say, I am not a sports psychologist, have not been trained in psychology of any sort. What I present here is my understanding of what I have heard or read, as it makes sense to me. I find it a difficult subject and others may have a different understanding or may be able to explain concepts better. Consult with other coaches and use coaches and writings from other sports if you want more insight. Individual sports such as golf where no one else's performance has a direct effect on your own will have the most applicable material but any sports psychology material could be relevant.

One last point. Mental management contains no miracles. To obtain any of the enormous benefits possible from this area requires careful thought and considerable practice, just like the other parts of our sport. I don't say that it will be easy but it will work.

### **HAVE A PLAN**

Target shooting. Why are you doing this? What do you want it to give to you? A little effort given over to seriously setting some goals for yourself will go a very long way to putting you in control and will provide the motivation to continue during the inevitable dips in performance.

You need a number of different levels of goals to get the maximum benefits. Long term (3 - 5 years), medium term (1 year or less), short term (today) and immediate (the next ten seconds). All of these need to be SMART goals. Specific, having clear details, Measurable, preferably objective measures but assessment or rating systems are sometimes necessary, Attainable, capable of being achieved eventually, Related, to each other and Timed, with a definite start and end time.

The shorter term goals are progressively smaller pieces of the long term goal so you need to start at this longer end when setting goals.

Where do you want your shooting to be in a few years? State team, regularly getting Queens badges, could win a club prize shoot any day now, club champion, moving up to A grade or a few points left in your average. You pick a goal which you think is definitely possible, with a bit of work, but which will stretch your skills to achieve. You need to set a goal which is out of reach now but which you see as definitely not beyond you and be clear about what it is.

Similarly one year goals should be an intermediate step which would be part of the longer term goal. If you set the state team as a longer goal you might have the city or country teams as a one year goal. If you set the club champion as a longer goal you might have, renegotiate your family and social time to allow you to shoot every match at your club, as a medium goal. There will probably be more than one medium term goal but choose whatever are the most critical steps in getting to the long term goal. They may need to cover personal and financial aspects as well as shooting performance if they are to be achieved.

These two levels of goals should be discussed with a local coach or confidant and should be written down in your diary, where you keep your list of ring sizes etc. They also should be reviewed annually or if there is a major change in your circumstances, so you always have major goals.

The short term "today" goal could change every time you venture to the range but should always keep the longer term goals in sight (Related). It might involve changing equipment, it could be a change in technique or to practice a particular step in technique flawlessly or could be about improving your physical fitness for shooting. It could be almost anything (Attainable) but whatever you choose, write it down first (Specific), do it and then evaluate how well you have done it (Measurable). This evaluation can also give you pointers to other short term goals which might need work to get to your major goals.

You might have a number of short term goals on any one day, one in each of the major elements of shooting (equipment, physical, technique and psychology). If you have a good coach, these short term goals should be chosen and evaluated with their input to ensure you are working on the important things, that your work is providing an improvement and your evaluations are realistic.

Your short term goals will help you avoid many pressure situations as you will be concentrating on your Today goals.

This keeps your mind away from Winning, getting High Scores or Your Results relative to others. You will be working through some Today goals towards a future major goal, which is not reliant on this one result.

The next level of goal is good at controlling pressure in situations where one performance is critical and some of the techniques coming up later will also help.

These long, medium and short term goals provide direction and motivation and have you working to improve your skills. They are the answer to why are you doing this and what you want.

They give you a high level of control in that they break the long term goal up into manageable steps, each of which you do control and can achieve and which will eventually add up to the completed long term goal.

The last level of goal, the immediate, gives you the most control of all. It must be set in the technique area. How you go about firing a single shot.

Many of us have heard that you do not shoot a possible, you shoot one bulls eye at a time, that you should not think about the final score, or that you should not listen to the crowd, should not think about winning, should not worry about the last inner four or some other should not.

As there is no way you can "not think about" something, this leaves you with the problem of what do you think about.

Fortunately the conscious mind can only concentrate on one thing at a time. If you are thinking about the right thing, you can't possibly be thinking about the wrong thing. Having a definite goal for the next ten seconds provides the clue to the positive thought you need to have in your mind.

In the section on technique I mentioned that having a defined sequence for each shot was the beginning of mental control. It outlines the goals for the next ten seconds as you follow through the routine.

As you follow through your prepared sequence you can check up and see if you are thinking about the right thing at each step and you can exclude all the irrelevant stuff which seems to appear in your mind, just when you need it least.

We need to work more on this last point later as it is not easy to keep other thoughts from intruding but without having a planned immediate goal for the next ten seconds it would be impossible. If you have not got your routine sorted out in great detail you will need to do this before anything else.

You may need to check back on the Technique section for a guide and write down your routine, the way you do it now and add in the thoughts you should have at each step and some trigger word or phrase which will get your mind onto that right track. Practice using these words at the right places so they will come to you when you really need them. Your subconscious will then be able to help control your body to achieve the action these words are associated with.

Never, ever, use negative words. Your subconscious will picture the negative outcome and try to ensure your body provides just that. Keep your thoughts and actions positive.

Some coaches recommend you go as far as not ever discussing what you did when you lost points in a match. This only provides a mental rehearsal of doing something wrong and makes it more likely you will repeat the error. Certainly do not use negative words during a match and definitely do not have them in your prepared sequence.

You also need to get your long and medium term goals defined so you can choose appropriate "today" goals to work on at each shoot from now on. This will help define what you should be thinking about during the match and make mental control easier.

### **CONFIDENCE**

To succeed you need confidence in proportion to your preparation. If you have good gear, you have tested it to know it will put every shot in the centre bull, you have checked your physical preparation and know your body is up to the task, right to the last shot and you have practised your technique till it is a smooth controlled sequence, you can be very confident of producing all good shots and getting a top result.

If you approach a competition with an excess confidence, an attitude of "I can do this easily", you will almost certainly neglect a part of your preparation, most likely your mental preparation but possibly equipment or physical also. An early loss of a point or two may not be enough to crack your confidence and you could repeat preventable errors. You have set your self up for a fall and there are plenty of people around capable of ensuring you get it.

A lack of confidence has you raising doubts about your gear or your technique and results in chasing problems which are not there. So often shooters think "was that last inner four a misread wind, faulty gear or a bad shot?" A lack of confidence often results in choosing the wrong "cause" or more likely in firing another shot to sort things out, probably with another point lost.



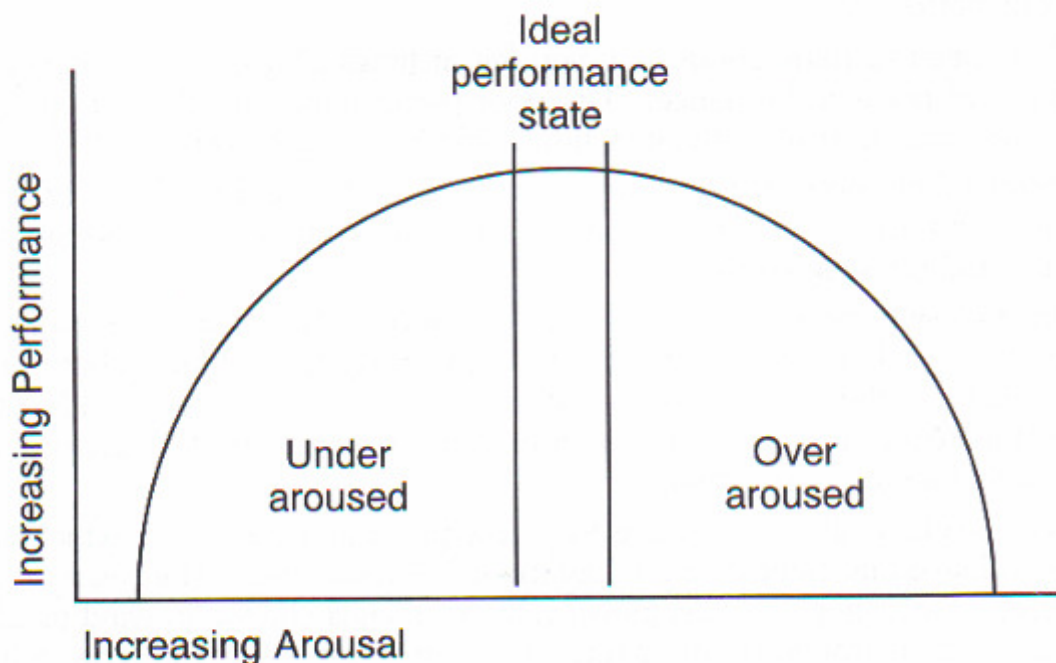
If you have put in the background work, got good gear, are physically fit for the competition and know you can fire a long string of good shots, readily noticing any that are not perfect, you can trust your judgement, be confident. When you fire one a bit to 10 o'clock and get a skinny bull at 10, be happy. It is where it should be. If the wind picks up more from the left, make the correction more to the left and fire the next one perfectly. Be confident.

If you have not done all these things you should not be confident of a high placed finish but you should be confident about those parts of your preparation which you know have been done well. You may be in the competition to meet other short term goals, such as to improve match fitness or practice a part of your technique or test your gear or some other goal. In doing this, have faith in the aspects of your shooting you know to be right and work on the goals you have set yourself.

### **GETTING PSYCHED UP**

In the sports psychology jargon this is called "achieving the Ideal Performance State".

The IPS is mostly a mental state. It is a position on the arousal curve from being half asleep, through being awake but not alert, to being excited, then anxious and ending in hysteria.



A theoretical Arousal curve

Somewhere in the middle, each person has a level of excitement which results in focussed concentration and excellent performance.

Some have described it as being in a mental fog, where only the important is clear and easily recognised and all the trivial sights, sounds, smells and feelings are there but somehow out of touch. The really exciting thing is that as any one thing changes from trivial to important, it suddenly and automatically becomes clear that this is so and without any mental effort, concentration shifts straight to this until it is dealt with and then it fades again just as quickly and automatically, concentration shifting to the new priority.

Many shooters will be able to recall the one range or even a day when everything went perfectly. Wind changes were easy, like they knew what was going to happen before it actually happened and they did not have to consciously do anything about it. They could almost watch as their hand reached up and made what they knew, without any second thoughts, to be the right adjustment and then the perfect aim seemed to appear and the rifle went off without any conscious effort. Another bull or centre. It was disappointing when the scorer called "all out".

What we are trying to do is get to this mental state whenever it is needed, to make it a part of the preparation, not just a lucky accident.

Unfortunately there is still a lot of art and not much science in getting to the IPS and each person needs to be at a slightly different point around the excitement curve for best results. What we do know is that if you can get there, the same easy flow of concentration will return and a peak performance will result.

### **IDENTIFYING YOUR IPS**

The first step in making an IPS mental arousal level a repeatable thing is identifying what your physical and mental arousal levels are, at any time.

The physical and mental arousal levels are connected. If you are mentally relaxed, not too concerned about anything at all, your body will be relaxed, heart rate low, muscle tension low, things can happen around you and go unnoticed. If you are very excited or concerned about something, your adrenalin levels rise, the heart rate goes up, the muscles become tense and the senses sharpen. You hear more detail and see more detail and are more alert for small changes in your surroundings even though they may not be important to your performance.

You need to think about how you felt at times of good performance and at times of poor performance. The poor performances could be from either under or over arousal so think of times when each one occurred.

Start taking note of your arousal at each match and think about how it helps or interferes with performance. Keep a record and plot the arousal against the result. Try to separate your assessment of mental and physical arousal.

In explosive sports like weight lifting it is good to have extremely high mental and physical excitement, just on the verge of hysteria. Having both on the high end of the scale means the natural connection is an advantage. Unfortunately in rifle shooting it is important to have muscles very well controlled and largely very relaxed.

This leads to shooters aiming for a low physical arousal level which is too often achieved by establishing a low mental arousal level. The result is often insufficient attention to detail (never noticed a small change in wind till after I fired) or concentrating on the wrong things (thinking about the score a friend got and was slow to centre the group) and just average performance.

If shooters fail to control arousal, they commonly get excited because they are doing unexpectedly well or angry because they are doing unexpectedly badly and muscle tension rises and things get rapidly worse. With over arousal people tend to concentrate on the wrong things. We all have our strengths in this sport, some are great at reading conditions, some fire perfect shots, and some are good strategy analysts. In times of crises we will be drawn to our strength, which is not usually the area where the problem is arising.

Success relies not just on doing a thing right but also on doing the right thing.

Best performances in rifle shooting will come from a moderately high mental arousal and a low physical arousal, maintained throughout each match in a competition. Not easy to achieve and the subject of the next topic.

In the mean time you need to learn to recognise your arousal levels, both mental and physical and particularly what each of these are at times of good performance. The skill in manipulating arousal is of no use unless you can recognise where you are now and also know where you need to get to, or at the very least, which direction you need to go.

## **CONTROLLING AROUSAL LEVELS**

If you have been taking note of the arousal levels in your body as you shoot and finding what level gives you the best result, these techniques can be used to quickly adjust arousal to your Ideal Performance State.

## **REDUCING PHYSICAL AROUSAL**

After a bit of training this can be achieved in seconds but you must put in the training first.

Practice either lying or sitting down, with eyes closed, and at least twice a day, until you master the technique. Practice in quiet surroundings where you will not be disturbed. A good time is just before going to sleep.

## **STAGE ONE**

This stage involves progressively tensing and relaxing various muscle groups while controlling breathing rate and depth. An important part of the technique involves "thinking into" or concentrating fully on the **feelings** associated with tension and relaxation in each of the muscle groups.

It is easier if there is a pattern of muscle relaxation, starting with the head and moving progressively through the body, ending with the feet. This uses any gravity effects during the sitting or standing practice of later stages. It is easier to feel a muscle group relax, sinking down and feeling heavier, using this head to toe pattern.

Breathe in (using a deep chest breath) while tensing the muscle, hold for two or three seconds, then breathe out slowly and fully while gradually relaxing the muscle. Be sure to breathe all the way out. The greatest reduction in muscle tension occurs during the pause between the end of one breath out and the beginning of the next breath in.

Begin by focusing on the feelings of increased tension in the muscles of your forehead and jaw as you breathe in (chest breath). Increase the tension by frowning and clenching your teeth. Hold for two to three seconds, then let the breath go, focussing on the feelings of reducing muscle tension. Continue focussing on the feelings of relaxation and shallow breathe (using your stomach only) a few times.

Repeat the tension and relaxation for the head area then move to the muscles of the shoulders and upper back (squeezing the shoulder blades together as though you were holding a pencil between them), the upper arms (biceps and triceps), forearms and hands (clench the fists as hard as possible on the breath in), then the upper chest (brace the muscles of your chest and between your ribs on the breath in), the stomach area (tense the stomach muscles as hard as possible), the buttocks and lower back, upper leg, calf muscles and finally the feet.

Work through each muscle group twice. Breathe in as you tense the muscle group as hard as you can, hold the breath and tension for two or three seconds then breathe out slowly while gradually relaxing, making sure you breathe all the way out.

Try to isolate the muscle tension to only the muscle group you are working on. Stomach breathe (relaxed) for a few moments between contracting and relaxation for each muscle group.

As you work down the muscle groups, check that those higher up are still relaxed. Conduct a final "systems check" when you have completed the exercise at the feet. These "systems checks" are extremely important for later stages of the training.

Remember to "think into" each muscle group as you tense and relax and into each of the muscle groups as you do the "systems check".

When you have been through all the muscle groups you should be quite relaxed and comfortable, breathing slowly and evenly. At this stage, see if you can tune to your heart beat. Try to slow it down by relaxing even further and breathing in a smooth, shallow manner (relaxed stomach or diaphragm breathing only).

It may take several weeks practice to become quite skilled at tensing and relaxing individual muscle groups, tuning into your heart beat, conducting "systems checks" and eventually at exerting control over your heart rate. Stay with it as it is important to become good at this part before moving on.

## **STAGE TWO**

When you have achieved satisfactory performance in the progressive relaxation technique (two or three weeks of regular daily practice) try to speed up the process by using total body tension.

Breathe in and hold tension in as many muscle groups as possible but still breathe out slowly and relax progressively through the muscle groups from head to toe. When you have achieved a relaxed state try to slow the heart rate by maintaining relaxed stomach breathing and feeling your centre of gravity (the centre of your body, behind your navel) sink lower and lower. Practice this several times a day for about two weeks or until you have mastered the process.

### **STAGE THREE**

When the first two stages have been mastered, but not before, you can further speed the process by eliminating the tensing on breathing in. Simply take one or two slow, deep stomach (not chest) breaths, relaxing down through the muscle groups as you slowly breathe out. You should be able to feel the tension draining out from your head down, as you breathe out.

The control which you develop will depend on how much you have mastered the previous two stages and how much serious practice you have put in. You need to have developed the recognition of tension and relaxed states in all the muscle groups and the heart rate control to get maximum benefit.

This stage three (called CENTRING) can be extremely useful when confronted with any high pressure situations, in everyday life as well as in shooting and can be practised lying down, sitting or standing. It takes only seconds, and can be used before or during competition, as often as needed. Practice as often as you can so that it becomes second nature.

To use Centring most effectively;

1. Recognise the inappropriate too-high level of arousal.
2. At the first opportunity, take a deep stomach breath (a deep chest breath will increase upper body tension).
3. Focus on your centre of gravity, and feel it sink down and become a little heavier as you breathe slowly out
- 4 Repeat step 3 if you need to or have the time
- 5 Now REFOCUS on the next skill you have to perform, first shifting your focus out onto something external.

### **INCREASING MENTAL AROUSAL**

Getting "up" can also be relatively quick. Simply take 6 to 10 short, relatively shallow breaths, in through the nose and out through the mouth but only using the chest to control the depth. They should be done at the rate of about one breath a second. You might also use some self talk to get your focus onto the task ahead, remembering to use positive words.

To "hype up" usually drags along a slight shift in physical arousal which must be reset again after the mental arousal is at the right level.

Stop and do one slow deep stomach breath to bring muscle tension back under control.

Repeat either the "up" or relaxing breaths if arousal is not where you need it to be.

## **CONCENTRATION**

There are two aspects of concentration that I would like to cover. The first is clearing away all the distractions so you can concentrate on the right thing, what you are supposed to be doing at each ten second "immediate" goal. The second is how you concentrate and move between different forms of concentration.

## **PREPARING YOUR MIND**

Life involves a number of simultaneous processes. We all have a home life, work or an educational pursuit, other recreational interests, financial management issues and usually personal relationship issues. To produce the best target shooting performance at one specific time we need to be able to keep all these other issues from intruding on the time we need to prepare for and carry out the performance, one single range.

The best approach I have encountered was termed "The Black Box Technique".

It involves setting aside 30 minutes or more, preferably late the day before the critical performance but up to a couple of hours before will still be beneficial.

Find a quiet spot, away from all distractions, people, TV, radio or unusual noise and let your mind wander. Day dream.

As issues from your life become the focus of attention, as they inevitably will, identify as clearly as possible just what the issue is and write it down. Set a date and time and if possible a place and any other people who will be involved, where you can deal with this issue AFTER you have completed your shooting performance.

Then put this in "an escape proof Black Box". It may actually be anything close to hand where you can retrieve it again later but think of it as an escape proof black box where this issue will be safely kept till you are ready to deal with it.

Continue to identify and put issues into your Black Box until there are no more serious and especially no more threatening issues left. Five or six issues are enough for most people to get the serious ones sorted out. You are now ready to concentrate on your shooting. It has become the most important issue of your life, for a short time.

If one of the now irrelevant issues creeps into your concentration it is easy to just say "back in the box till your time", you know what they involve and that you have them written down so you can't forget about them. You don't have to keep them in your head. You can now focus on the task at hand.

## **HOW TO CONCENTRATE**

Concentration has three main aspects to it. The focus of the concentration, the intensity and the duration.

John Crampton, a sports psychologist from Sydney, has described people's concentration as being like a TV producer, where the producer must continually scan a dozen or more cameras and choose which camera to take the picture from and then choose how close to hold the shot, wide angle or zoom in for a close up and how long to hold it.

In terms of our concentration this converts into choosing what to concentrate on, how intensely do you focus on the centre of your concentration, which restricts how easily another area of concentration might intrude but increasing the depth of information we are drawing from our focus and finally how long do you keep this focus.

### **A NATURAL FOCUS**

Each of us has a natural tendency to focus on one area of mental information input. Usually it is one which has served us well in past experiences.

When we get into difficult situations we fall back on our strengths. In concentration this means our natural area of focus. In shooting some people go to a very precise aim, some to trigger control, some to assessing conditions, some to selecting a strategy such as rapid fire or waiting for conditions and so on.

Unfortunately our personal strength may not be the cure for our present difficulty. We must develop the skill of moving between areas of focus.

### **AREAS OF FOCUS**

Mental focus can be divided up into four main types.

1. Broad external - being aware of everything around you, particularly so you will notice when something changes. For example, noticing all the indicators of wind, flags, trees, smoke or dust, grass, feeling it on your face, the fall of other shots on adjacent targets etc.
2. Broad internal - analysing a situation, fitting current information with past experience, often dealing with a large number of issues at one time. Dealing with some interruption to your normal shot routine like a target breakdown or two spotters on your target or a dramatic change in conditions would be broad internal issues requiring you to develop and implement a new strategy.



3. Narrow internal - Focusing on a single thought or idea and following it to a conclusion. Following a planned shot routine or doing a muscle tension check are in this class.
4. Narrow external - Focusing on a single source of information, often with extreme depth but usually for a short time. Things like taking final aim or examining a single flag for small changes or listening for the scorer to call the value.

Target shooting requires all these types of concentration and we must be able to switch between them as relevant.

It is relatively easy to devise focus shifting exercises with two people, one calling things to focus on and one doing the exercise, swapping positions every five minutes. A good wet day training exercise. Be careful to include all the four focus styles and swap from internal to external often and the person doing the exercise should say their thoughts out loud so a proper evaluation can be made.

### **THE INTENSITY OF FOCUS**

This can vary from just a general awareness to being the only thing on your mind.

Many shooters have noticed that during their best shoots they do not hear what people behind the mound are saying, they do not feel their legs or feet, they have no idea of what score the person next door was getting, though they may have checked some of their shots for conditions effects. They were focused on what they needed to do for their own shoot.

As intensity goes towards the fine detail of a single thought, we get more information from the subject of the focus but it is harder for other issues to intrude. Having the Ideal Performance State is critical to having important issues interrupt when they become more valuable than the current focus.

Still there are parts of a good shooting performance that require a very intense focus, final aim is one. Every shot requires the intensity that would be used if the entire shoot consisted of just one shot. Many people would benefit from practising their intensity of focus.

One exercise which can be done with basic fitness training is to focus on specific objects as you walk.

Pick out a relatively small object 50 to 100 meters in front and look at this. Do not look at any thing else, no matter what, until you have reached it. You do not need to stare,

blink as necessary but look only at the chosen object. You will need to employ other senses, hearing, touch, to walk safely and you may need to stop for some danger but continue looking only at the chosen object.

Repeat with a new object when you reach the first. As skill improves the number of times you do this can be increased. A base number of 20 repetitions without looking at something else would be a good goal.

You can make up other exercises to focus other senses and practise them in increasingly distracting situations or increasing the repetitions.

Remember to evaluate and record your training program as you go. You won't know if you are getting better if you don't.

### **THE DURATION OF FOCUS**

Must be relevant to the task. Modern life demands concentration be shifted quickly from one subject to another but best results in shooting require concentration be maintained till the associated action is really complete.

Again, duration can be trained. Just choose a subject of focus and extend the time of uninterrupted concentration over a number of repetitions.

Using the earlier exercise, choose objects further in front, that will take longer to get to.

An exercise which can be done in front of the TV is to count your breaths.

When you are relaxed and breathing normally, begin counting when each breath is completely exhaled. At the natural pause before inhale begins add one to the count till you reach ten. Begin at one again and repeat till you have five lots of ten breaths. Sounds easy.

If you forget where you are up to, go past ten in the count or miss counting a breath, start from one again for that set. I have not met anyone who can complete this exercise first time.

Notice these exercises are related to shooting skills. The walking and visual focus is helpful in final aim, the breath counting is related to following a planned shot routine for a range. Try to make any exercises you devise for yourself relevant to the sport as well as specific to the mental skill which needs improvement.

This whole area of concentration is one which could improve many shooters results if given some time and attention. It may be outside our experience to train in mental skills but it can pay big dividends.

One way of improving performance is

### **MENTAL REHEARSAL**

This is something most shooters would have heard of but very few have seriously tried. It is a form of practice, without any equipment or facilities, just all in your mind.

Benefits have been clearly documented in a number of sports, from individual sports like diving and golf to team sports like basketball and hockey. Shooting should be no different.

It should be part of a complete training program, mixed in with regular live fire practice but it allows more frequent practice. A mental rehearsal twice a week would be good for most shooters.

A good mental rehearsal program requires some planning.

It should be done in a quiet environment, free from distractions and allowing plenty of time to complete the prepared exercise.

The exercise should follow through a full activity. In full bore shooting I would recommend you start with your pre range preparation, both arousal control to get to your Ideal Performance State and physically putting your coat on, checking your rifle and bullets and whatever else you normally do. Go right through settling onto the mound, waiting for the previous shooter to finish, go through a full 10 shot match in great detail until you finally pack up ready to leave the mound.

The exercise must include all the senses, sight, sound, touch, smell and even taste. You need to experience the shoot just like it is really happening. Every action, every response, every thought, fully and completely (except it is all in your head).

It will be most effective if it is done from an internal perspective. Don't watch yourself do the shoot like it had been on video, experience it. Feel it from the inside.

It must be under your control. If you find yourself imagining something which is not right, you must be able to stop, go back and replay that bit with everything right and you must do this. You should do the exercise in real time, not slow motion or fast forward.

The exercise need not be the same every time you do one. You can prepare different exercises but each must be prepared and fully completed to be most effective.

Your mind will learn from your mental rehearsal and mixed with some physical practice, your body will respond to the directions of your mind when competition comes around. It will lead you to do what you have been imagining.

You need to understand the actions required and have a clear image of the ideal action so you can rehearse it. Do not use this technique unless you first have this clear image of what is required. Practising the wrong thing will help you do the wrong thing.

Mental rehearsal provides a way of practising at your convenience. Dry firing with your rifle and all your gear is excellent mental rehearsal but it can be done sitting on a train or anywhere, without any gear. All it needs is a bit of time and a distraction free spot.

### **SLUMP BUSTING**

Firstly you need to be sure you are having a serious and sustained slump in performance. You need to have some records of results and the circumstances of the performances over a reasonable time to be sure it is not just a natural variation within your expected range of results.

If there is a problem, there are four steps to getting back on track.

The first is to **stop**.

Don't shoot for a few weeks. Don't do mental rehearsal. Preferably don't even go to the range.

You need time to let the concern about poor performances fade a bit and to let the bad habits which could be the cause fade away a bit too. Practising harder and more often will only make things worse. Someone else said "the first step in getting out of a hole is to stop digging".

The second step is to **set new goals**.

Set new and realistic long term goals, new one year goals, new short term goals. They need not be less than your last set of goals but you need to refocus your direction and the steps in achieving your goals. Do ensure your goals fit with all the non shooting factors in your life.

The third part is to **go back to basics**.

Start your new campaign to top results with a revision of all that goes to making a good shot.

Check equipment thoroughly, ensure you are physically capable, eyes OK, fitness up to the task, muscle tone OK.

Take the time to go through your technique fully and carefully. Have someone look at your basic position; ensure you have a sound shot routine, especially orienting the position and the final step of moving the trigger slowly and very smoothly.

Part four is to **ensure your mental control** is working. This is a vital part of producing consistently top performances.

You need to do a revision of all the mental control issues raised previously, especially having a clear shot routine, achieving an Ideal Performance State and the concentration issues.

Slump busting relies on forgetting the past and refocussing to new goals and preparing thoroughly to achieve these.

There are a range of written articles explaining what the problem was which caused a stray shot in one particular direction or another. (Eg; shots at 5 o'clock from jerking the trigger). I prefer not to chase errors as even knowing what the problem was does not fix it. It is impossible to 'not do that' when firing a shot.

The only thing to do is focus on doing the right thing by following a well prepared routine that has your mind on the job for the few seconds it takes to complete the associated action. If you are doing the right thing you can't possibly be doing the wrong thing.

If you do everything right and 'have a good shoot' but still get errors you should suspect your equipment and have it checked thoroughly.

### **Preventing a slump.**

Of course prevention is better than cure and shooters should avoid having problems by a **planned maintenance** program for their equipment, their physical status, their excellence in technique and their mental control.

Have a program of regular checks on these four basic aspects of performance. Use a coach or club mates to help keep an eye on your technique. Use a careful evaluation and recording system to ensure you can identify changes in performance and the reasons for these changes, up or down.

Allow time for rest without training. Overtraining will entrench bad habits and create frustration with continuing below expectation performances, making mental control even harder to achieve. Both mind and body recover with rest. In full bore shooting where live fire practice is rarely done daily or for a high number of shots in one day, physical burn out is unlikely. Do set some limit on dry firing or mental rehearsal to avoid overtraining.

Have a practice program that reduces the amount of practice but improves the quality of skill required as you go towards important competitions. Using reduced size scoring value rings on a target will be better than training more often. Try using the target centre for a distance less than you fire.

Have a sensible competition schedule to avoid burn out. The mental stress of high level competition can be extreme and although some is good training, it can be overdone.

Do not make radical changes to equipment or technique, especially close to a competition and never more than one change at a time so it can be evaluated properly.

Keeping an eye on the basics and thoughtful training and competition should be able to prevent a slump.

### **The end**

This brings me to the end of all the items I consider make up the essentials for establishing and practicing to achieve top results in prone position shooting. Any developments beyond what is here will require the services of a qualified and thoughtful coach to tailor things to suit the individual.

It would be beneficial to re-read this booklet as it all ties together and issues raised early will have more meaning in light of things raised later.

Good shooting and keep working towards better scores.

### **TUNING A RIFLE FOR ACCURACY**

Shooters who do not take immediate advantage of this technique may have a serious handicap compared to those who very definitely will use it.

The technique is fully legal, involves no new parts or machining, takes about an hour, no more than 50 rounds and can halve the group size from many rifles.

It was developed in 1995 by Graham Mincham, a level 3 coach from South Australia but was released in 1996 after the Australian team to Bisley had a chance to use the advantages in international competition.

### **WHAT IT DOES**

The system relies on using the weight of the front sight block and tunnel, with all attachments, to tune the natural vibrations in the barrel so there is a vibration node at the muzzle. (Current rules allow the use of a specially fitted tuning weight to perform the same function).

Once complete, the muzzle is not moving as the projectile leaves, although there may be measurable movement at other points along the barrel as the rifle vibrates. The result is consistent guidance to each bullet, even if vibrations are operating in different directions in the rifle from shot to shot, as they usually are.

Many shooters using hand loads are achieving the same thing by varying the loads and so changing the frequency of the vibrations to end up with a node at the muzzle. These shooters can now take advantage of this technique to load to achieve elevations similar to factory or to achieve specific velocities or to get desirable pressures or any other goals for the load and can tune the vibrations for group size later.

For those not hand loading, this technique provides the facility to achieve groups that are likely to be just as small, from factory ammunition.

### **HOW IT IS DONE**

Various methods could be used to get the node in the right place, alter the length or profile of the barrel, change the powder or the load, change the weight of the fore sight system or vary the position of the sight system. In disciplines where projectile specifications have some latitude, this could also be a factor.

This method uses a testing technique to select the best position for the front sight but it must be remembered that if any of the other things just listed, which affect vibration, are changed it may upset the tune you have achieved with the sight position.

### **TESTING**

The front sight must be capable of movement along the axis of the barrel so the front edge of the sight mount can slide up to 10 mm (1/2") back from the muzzle. If this is not possible some machining of the barrel may be necessary but this is rare. You will need a calliper capable of measuring thousand of an inch or tenths of a millimetre.

Testing is best done from 100 meters or 100 yards using a sandbag to minimise shot release errors and if it is easy to attach, use a telescopic sight to minimise aiming errors.

Have a target with at least six scaled down aiming marks. 6" at 100 yards or use patch out stickers if you have a telescopic sight. Scoring rings are not necessary.

Start with the front sight flush with the end of the muzzle. Fire a five shot group at the one mark. They need not be centred. We are looking for a group, not a score.

Move the sight 0.025" or 0.6mm back from the muzzle and fire a second five shot group at a second mark.

Move the sight again to 0.050" or 1.2 mm from the muzzle and fire the third group at the third mark.

Go to 0.075" (1.9mm), 0.100" (2.5mm) and 0.125" (3.2mm) firing five shot groups at marks four, five and six.

These distances are not absolutely vital but larger movements can miss the evidence of a node. Try to get close to the right distance and measure and record as accurately as possible what each setting actually is.

### **SELECTING THE TUNED SETTING**

Examine the groups on the target. As wind can affect the latitude, just measure and record very accurately the depth of each group.

Plot the group depth against the sight distance from the muzzle on a prepared sheet of graph paper. You need to identify one group which is the smallest and there should be a trend away to larger groups on either side of it. If the smallest group is at one end of a trend line you need to patch out the target and fire some more groups moving the sight 0.025" further from the muzzle each time.



When the pattern is identified with the smallest group having at least two larger ones on both sides, draw in the trend lines till they cross at the small end of the scale. This pin points the optimum setting of the front sight, which need not be the same as that giving the smallest group but could be a little to one side or the other of this.

Reset the front sight to the optimum distance from the muzzle as accurately as possible, ensuring it is aligned vertically and fire a test group to check the zeros and so you will be confident the setting is right when you are in competition. You need to have confidence in your equipment.

### **SOME WARNINGS**

The technique can be used on any rifle, with any sight or any barrel and with any consistent bullet but it must be remembered that if any of the other things which affect vibration, sight weight (including attachments), barrel length, powder load, projectile specifications, bedding location, are changed the vibrations will change and it may upset the tune you have achieved with the sight position.

Also, sight mounting blocks which use two grub screws located one behind the other along the line of the bore will create changes to the vibration pattern which make it impossible to use the technique just described. Clamp types or grub screws at a single distance from the muzzle are OK, even if there is more than one screw.

If using one of the two screw, one behind the other, types simply take out one screw or re fit the second exactly opposite the first at 180° around the barrel, before tuning.

DO NOT use Loctite® or glue in the final fitting of the sight mount to the barrel or the vibrations will change again.

### **THE EFFECT**

The net result is a tuned rifle which will consistently produce the smallest possible groups at any distance.

The improvement any individual can expect depends on how well tuned their rifle is at present, probably by accident. The difference between maximum and minimum group sizes produced while going through the technique is regularly a factor of three and nearly always more than two.

Using factory ammunition (not even batched by weight), telescopic sights and a sandbag, groups significantly less than half minute of angle have been achieved with several makes of standard target rifles and common barrels. You would not expect to repeat this in competition if you were following the rules but if the rifle can produce these groups, the rest is up to you.

### **COUNTERBORING OR TUBES**

This is a second barrel modification technique which could improve the accuracy of rifles.

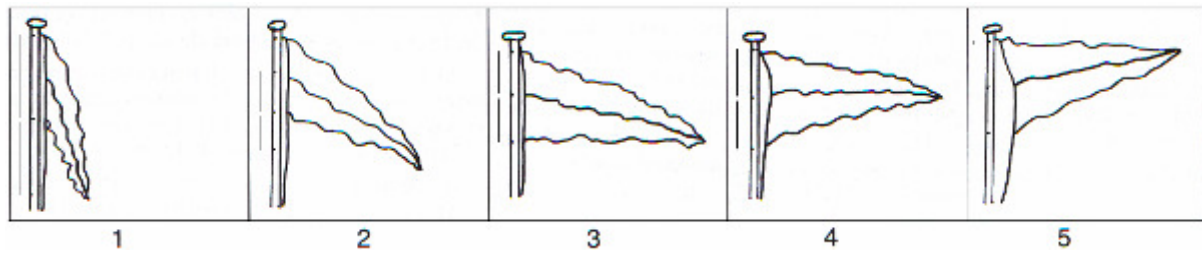
This involves drilling out the end of the barrel so the sight clamp can not deform the final length of the barrel or fitting a short tube in place of the sight clamp and putting the sight on the tube.

Counterboring leaves you with the problem of crowning the end of the bore. A good machinist can do the job with the right tools or a ball bit can form a good crown.

The benefit of using these alterations would be expected to be about 20% of that to be gained from tuning and it is doubtful if it is worth while in long range full bore shooting.

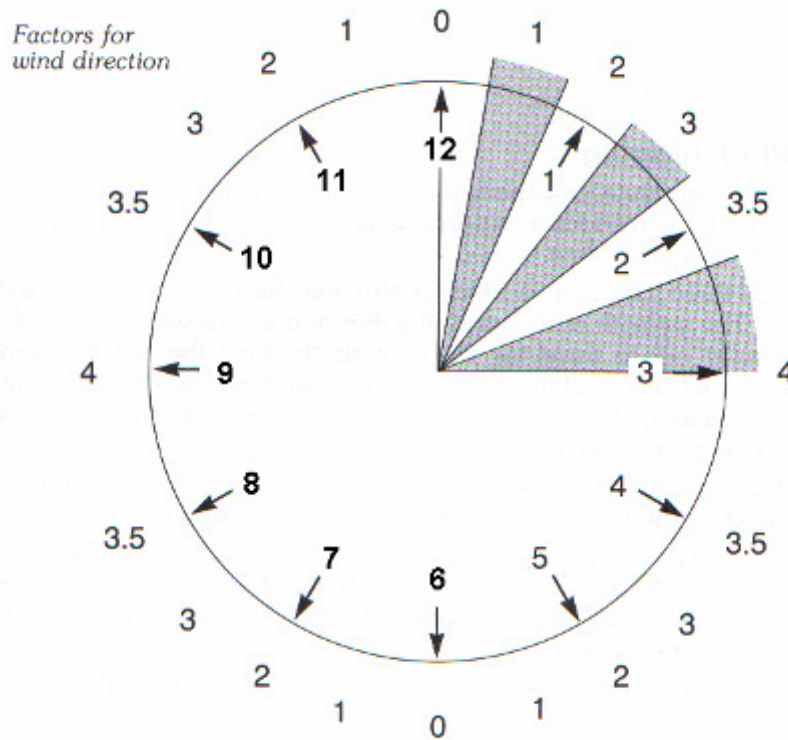
A GUIDE TO BETTER SCORES - Appendix B  
 Summary of **Assessing wind**.

**Strength** factors



Be aware of Flags hoisted with the rope secured other than at the bottom of the pole, wet or non standard weight flags.

**Direction** factors



**Distance** measured in yards the factors are:

Distance	300	400	500	600	700	800	900	1000
Factor	2	3	4	5	6	7	9	10

Calculate by multiplying out the factors and dividing by 10.

EG; Wind at strength **3**, direction from 1.30, factor **3**  
 distance at 600 yards, factor **5**.

Calculation is  $3 \times 3 \times 5 = 45 / 10 = 4.5$  or four and a half points.

**For metric ranges add 10% to the result.**

( $4.5 + 0.45 = 4.95$  or 5).

Refer to main text for more detail.