CHAPTER 15
OUTDOORS

In the UK smallbore target rifle is shot both indoors and outdoors. Outdoor shooting is usually at the longer ranges, because we tend to have small buildings in this country, and anything longer than 25 yards is unusual.

Beginners tend to start indoors and then progress to the longer ranges outdoors as they gain more experience; that's not a rule written in stone, just the way most clubs work. It's been shown over the years that, getting your technique right before you start trying to tackle the vagaries of the weather is good practice.

Remember, however, that shooting outdoors requires a little bit more equipment than indoors, so check through your bag to make sure you have wet-weather gear, bulldog clips, stop watch and possibly thermal underwear, even for the start of the 'summer' season.

What could be more inviting

For those of you embarking on your first season outdoors, here are a few tips:

IT'S NOT THAT DIFFICULT

Firstly, it's not as difficult as you may imagine. It *is* true that you have a lot more things to consider before your bullet arrives in the bull, but basically although the targets are further away they're also much bigger.

One other psychological difference is that outdoor targets are 'inward' gauging which can occasionally mean that something which looks like a 'nine' can still get you a 'bull' because, if the inner edge of the hole breaks the line, the shot scores 'in'.

Also, instead of one shot being fired at an aiming mark, you get to fire 5 or 10, which gives you a chance to see how your group is forming and do something about it if it isn't in the middle. Also, because you're firing more shots per aiming mark there's less moving around between shots, so it's easier to get settled into a rhythm.

You may have heard all sorts of horror stories in the clubroom about nasty winds that sneak up on you, or sun that disappears behind a cloud when you least expect it; even rain, hail and snow have been known to stop some club member somewhere from shooting a perfect score!

These are mostly just stories to entertain the troops around the fire on a cold winter's evening, designed to strike terror into the heart of the novice.

If you are a relative newcomer attempting your first summer season shooting outdoors, be reassured – it's not that difficult. It's true that your score ex 100 is going to be lower outdoors than indoors, but then so is everybody else's.

It's also true that you will have more things to contend with, but a good technique indoors will make for good shooting outdoors. There are far more points lost through bad technique than by adverse weather conditions.

EXTRA EQUIPMENT

However, before you start, here's a breakdown of some of the extra equipment you're going to need.

First and foremost, discuss with your fellow club members how exactly *they* fix their targets to the outdoor frames. Most people use bulldog clips and even if your club supplies them, or uses a different system, they are still essential for open shoots on other ranges and, of course, Bisley. They come in a variety of sizes, but in this instance, biggest is not always best.

Targets have been shredded by the wind because people were using the wrong type of clip; for example, the traditional clip is much more suitable than the fold-back type as the latter usually only grips on the very edge (unless you're using very small ones) as they're designed to hold large sheafs of paper. (They're also very powerful, with a mind of their own - particularly when you have cold wet fingers!)

So, go for the traditional style, but don't choose anything too large. The most effective clip is the one that, when opened to its maximum, just slides comfortably onto the target board; that way it lays flat against the target and holds it more securely. The most suitable size is 40mm-50mm (1½-2 inches)

You're likely to need at least 16 on ranges where you use backing sheets behind the targets and you'd be advised to carry some spares, as a clip which springs off unexpectedly can be gone forever. Also consider having some back-ups in a larger size (50mm-75mm) in case you encounter a range which uses thicker target board than you're used to.

Some people prefer to use coloured ones, which might help you to make sure that your scope is lined up on your target and not someone else's (hands up those experienced shooters who have tried to zero in on their neighbour's shots!).

Next you'll need some waterproof gear; it may seem obvious, but at some time or other you're going to get caught in the rain. One of those lightweight waterproof suits can mean the difference between comfort and misery, and they fold up very small, so they don't take up much room in your shooting bag. Keep a pair of waterproof boots in your car as well - you never know when you're going to need them. Even in the height of summer the early morning dew can soak through your trainers

Whilst on the subject of rain, keep a small cotton hand towel in your shooting kit - not for wiping down your rifle, but for wiping yourself down or for tucking in round your neck in really cold or wet weather.

You should also keep a can of *WD40* (or other water dispersant oil) in your kit. You can't stop shooting in the middle of a detail because it starts raining, so there's every possibility that your rifle is going to get wet.

Don't, whatever you do, put away a wet rifle; if you do, the next time you get it out it could be red with rust. If your case is foam lined, it will soak up water like a sponge and it will never dry out, so keep a rag in your kit, spray it with *WD40* and wipe down your gun; spray it again and wipe it down again before putting it away.

(Remember to take off your sights - or protect them - before you spray everything in sight, because oil residue is very difficult to remove from lenses and filters, not to mention adjustable foresights if they have perspex in them!)

COLD WEATHER

In the sort of weather which we usually get at the beginning of the season, you may find your trigger hand getting very cold, and this will affect your trigger technique.

Your local gunshop will have shooting gloves if you ask, but unfortunately they're not exactly suitable for target shooters. Theyre designed for shotgun shooters and are usually made of very thin leather with a fold-back cover for the trigger finger, but unfortunately you also need your other fingers exposed in order to pick up those tiny little .22 rounds.

As an alternative you could try a pair of fingerless woollen mitts; they're very cheap and will keep your trigger hand warm (you only need one, of course, as the other hand is encased in a big thick padded shooting glove).

TIMING

Now we come to another fairly essential piece of equipment. On an indoor range, firing 10 shots to count per detail, you're probably used to a range officer giving you 'start' and 'stop' instructions every 10 minutes. Outdoors you'll still have such a system, but the details are usually 20 minutes for 20 shots and it's therefore much easier to lose track of time, so a stopwatch is absolutely essential.

It's now quite difficult to find the traditional watch with a 'sweep' second hand, and you'll probably have to settle for one of those new digital timers, which not only tells you how many micro seconds have elapsed, but will also tell you which phase of the moon we're in and when your mother's birthday is!

Anyone with older eyes will find one of those electronic kitchen timers with huge numbers very useful. A word of advice here: a number of these have bells or bleepers which sound when your time is up, and this can be most upsetting for your neighbours if they're about to take their final shot just as your bell goes off.

Some ranges are now talking about banning such devices (they are not allowed under international rules anyway), so it might be worth investing in a timer which counts up as well as down, so that you can simply start from zero and keep an eye on how much time you're using.

THE SPOTTING SCOPE

The next thing to consider is your spotting scope. Something good enough for 25 yards may not be up to coping with a dark wet morning at 100 yards.

However, before you rush out and spend hundreds of pounds on a new scope, give the old one a bit of a clean – it's amazing how many people neglect their scopes.

Don't take it to pieces unless you really know what you're doing, but at least give the lens a good polish (using the right equipment – don't just attack it with the nearest thing to hand, use a proper lens-cleaning cloth).

If that doesn't work, you may even be able to replace one of the lenses, which could have a magic effect on the scope's efficiency, but if that fails, then you may be in for a new scope.

Remember, you really do get what you pay for: a £300 scope is going to be twice as good as one costing £150; scopes do wear out, they lose their edge definition and this goes unnoticed by most shooters for years. It's not until you try to read your name on the card at the edge of your field of view that you realise what's happened.

Try this simple test the next time you're setting up your equipment. Focus your eyepiece so that you can *just* read some of the writing on the card if it's in the centre of the scope, then move the scope so that the writing is at the edge of the lens; can you still read it?

Be critical and honest – it's *you* who's going to suffer when you can't spot your shots because you can't get the right eye relief, or because the sun is in the wrong position (as so many people found out at Bisley one sunny year).

THE MAT

Your shooting mat takes on a much more important role when you're shooting outdoors. Indoors you could be laying on a nice smooth dry floor, but outdoors it could be anything but!

Most ranges have covered firing points, but many of them have at least one side exposed, which lets the rain in, so don't expect that every firing point you shoot on will be dry. This means that a shooting mat with at least a waterproof underside is an asset.

Also remember that outdoor firing points can have sharp nobbly bits just where you want to put your elbow, so a thicker mat would be advisable, or you could consider having an extra width of rubber to go under (or on top of) your existing mat. Under NSRA rules you're allowed a certain amount of extra padding on shooting mats provided it extends across the whole width of the mat (i.e. you can't just have a couple of patches where your elbows go).

Going back to the really cold weather at the start of the season, you might find a handwarmer useful. There are a variety of types available: one has a stick of charcoal inside which you light; there's also a throwaway chemical one, or a reusable one which you boil in water - they can make a wonderful difference to your hands on a cold day.

Don't let all this talk of cold wet weather put you off outdoor shooting, because it's not all like that, there are plenty of compensations. Shooting on a warm summer's evening in nice clear light, with not too much breeze, the birds singing, and all your shots going in - what could be nicer?

Despite what you may have heard, the sun does shine on rifle ranges

Just remember that for every miserable shoot there are plenty of wonderful, exciting, warm comfortable shoots to be had, and whilst we may not always have blazing hot summers, the weather really does warm up in June, July, August and September, so go out there and enjoy yourself.

WEATHER

In this country you're unlikely to meet any major weather phenomenon which would have a serious effect on your shooting. You may find yourself shooting in a snowstorm occasionally, but don't be put off by that - remember that biathlon shooters do it all the time.

Snow, ice, frost and even heavy dew will increase the amount of extraneous light bounding around all over the range (particularly if the sun comes out as well). But remember that, if you're at an open shoot, everybody else is suffering from the same problems, and the winner is usually the person who overcomes those difficulties and just shoots to their average.

If you tell yourself that you like shooting in a snowstorm, you may begin to believe it, and eventually you'll shoot better in those conditions.

The varied climate of the British Isles makes the weather forecast one of the most watched programmes on the television and to you, as a shooter, it can provide a lot of information. Wind direction and strength are always given, along with temperatures, likelihood of rain, etc. However, don't forget to take into account the distance you might be travelling to an open shoot (it's no good watching the local forecast then driving 100 miles or so westwards, only to find the weather's completely different!)

To most shooters 'weather' means wind, because they quite rightly believe that it is this element which has the greatest effect on their shooting, but there are other weather conditions which influence the group size.

THE SUN

Take, for example, the sun. It does occasionally appear in this country - in fact some people have been known to complain about *too much* sun during some national meetings. This is principally because they have trouble spotting their shots (particularly at 100 yards) as they can't see the shot holes until a group of two or three together forms (usually in the '8' ring).

All this means is that you *must* have the best possible spotting scope you can afford - in this instance money spent on buying the best is definitely not wasted.

The sun's effect on shooting tends to be more of a nuisance than anything - generally it doesn't actually force your shots out of the bull like the wind can.

On showery days the sun can be in and out quite quickly, particularly if it's breezy as well, and the clouds are scudding across the sky. In these circumstances there can be tremendous differences in light levels, which have an influence on where your shots go.

Exactly how much is difficult to say, but for example, if you've zeroed in on a dull light condition and the sun suddenly breaks through just as you're about to start on your match card, you'll need a certain period of time while your eye settles down to the new intensity of light.

(Of course, if you wait to let your eye adjust to the new level, the next cloud will obscure the sun just as you're ready to let the shot go, but that's life.)

We all know what the problems are, but how you cope with them? The first thing to remember is your Boy Scout training and 'be prepared'!

So many shooters at open meetings meticulously get their kit ready, or stand chatting to each other behind the firing point, without giving even the briefest glance upwards. A survey of the sky *before* you shoot could prepare you for what's likely happen during your squad.

If you're shooting a 20-minute detail, it would be a great help to know whether there's going to be 10 minutes' shade and 10 minutes' sun, or 5 and 15, or whatever. Watching the weather patterns before you shoot could give you a clue as to what might happen.

If you reckon on the 5 and 15 option, you could afford to wait for the sun to go in (or come out depending on how you've sighted in). If you think the former seems more likely then, unless know you can complete your card comfortably in 10 minutes, you're going to have to be prepared for some dramatic changes in light

There used to be an old saying about 'light up - sights up' but that probably doesn't apply to modern aperture sights. It was probably more relevant when people shot with a blade foresight. Just be aware that there could be a shift in the point of impact as the light changes.

What you can do to prepare yourself for such eventualities is pick the right sort of sunny day on your home range to experiment. With modern iris-and-filter backsight units, you can work out what the conditions are likely to be and make the necessary adjustments before you start shooting, but *only* if your survey of the sky tells you that you're going to get several minutes of one condition or another.

On some ranges the sun can get under the canopy (assuming the range has a canopy at all) in either early morning or late afternoon, and for that reason it's always a good idea to have a shooting hat in your bag. Even if you don't generally use one, in such extreme conditions you can shade your eyes when the sun is beating down on your head.

You may also have trouble spotting your shots if the sun's at the wrong angle, particularly if you're not using a backing card; a good quality scope will help here, not only because of its better lens system, but because most of them also have a sunshade which pulls out, to shield the front lens and help cut down the glare. However, a torn-up bit of target and an elastic band will serve the same purpose.

MIRAGE

Not only does the sun provide light, but it is also the principal source of warmth, so when it does appear from behind a cloud, there can be a major increase in ground and air temperature, which can mean the sudden appearance of mirage. (If you want to *see* the mirage, set your scope off to one side at 50 metres and you should see the air moving alongside the target; or slightly de-focus the scope until you're actually focussed on the air rather than the target).

If the ground is wet, the mirage will be slower to appear, but on a hot dry range it can happen in seconds; *then* your shots can lift up on the target and wander from side to side as the wind moves the mirage.

Mirage is often misread, and very misleading. But what is it?

Most people know that light travels in straight lines - that's a basic schoolboy fact - but there are qualifications to that statement which bear examination. School physics taught you that the reason a stick appeared bent when poked into water was because the light reaching you from the far end of the stick was refracted at the water's surface, i.e. at the point of change in density.

This refraction occurs with all density changes; it appears to 'bend' the light (or move the image of an object away from where it really is), and when this occurs in air masses of differing densities we call it 'mirage'.

The sun heats up the ground to different temperatures depending on the material involved (grass, concrete, etc.), so the air above gets heated by differing amounts and, as warm air is less dense than cold air, so light will be refracted at the change. It may, of course, be a gradual change but it's still refraction.

The parcels of warmer air are moved around by the wind and, in turn, create more wind. Storms, hurricanes, etc. are all created on the same basis and although you're unlikely to be shooting at the hurricane end of the scale, your shooting *is* liable to be affected by these embryo heat engines at the other end.

Imagine there's a bare patch of earth surrounded by grass halfway down the range. When the sun comes out the bare earth heats up quicker than its surroundings, so the air above it rises and its density changes, but the light from your target has to reach your eye through this warmer column of air, which causes the light to bend. Therefore, like the stick in the water, the target will appear to be in a different place to where it actually is.

In theory, this should be no problem, because all that happens is that your shots appear in a different place on the target and you adjust your sights accordingly but, nature being what it is, nothing is ever that simple.

The column of less dense, rising warm air won't keep still - it keeps drifting backwards and forwards which means that your target image is constantly moving. Inevitably this doesn't just occur in one spot, it's going on all over the range, so it's impossible to analyse exactly what's happening, or to find a foolproof solution.

Of course, it's not just the sun, which creates mirage; different densities will occur when a cold block of air moves across the range; this may not be quite so noticeable, but it's still there.

So how do you cope with all this? Firstly, don't panic!

If you've been shooting outdoors for some time you'll have already encountered mirage without realising it, but it doesn't always occur in the same way. You may have been avoiding wet ground and strong sun because you'd heard that this causes mirage, but there are other conditions which are worse: one of these is a gentle breeze, when the wind tends to change direction constantly, blowing the columns of air in all directions.

However, wind is also liable to gust, which could blow the mirage away and cause the wind's effects on the bullet to be reduced because the mirage has gone. Constant strong winds mix the air up much more, so there are no real blocks of air of differing densities to affect your sight picture.

Cool wet ground *reduces* the risk of mirage initially because the ground takes longer to warm up, but when it does, the humidity increases and so does the effect of mirage. Obviously, in strong sun with wet ground, you may get steam rising, but that's a different problem.

Grass also tends to reduce the chances of mirage, but as the grass gets shorter and drier, so it reduces insulation and the ground heats up more.

Hard, dry soil, clay and sand (particularly dark coloured) are all likely to produce terrible mirage, because they absorb heat on hot, sunny days. As most of these effects are related to temperature, mirage is always worse in the summer, when the sun's at its hottest.

Humidity has an effect on air movement because moist air is less dense than dry air (think of steam rising). So even in damp cloudy conditions there may be moving air out on the range interfering with your sight picture, which starts to explain why you sometimes have difficulty in shooting in apparently still conditions.

The height of the target above the ground also affects the amount of mirage you get because, as it rises, the air becomes more mixed up by the wind, and the mirage effect lessens. Therefore as you work your way down the three aiming marks on a 100 yards card, mirage will usually have the greatest effect on the bottom diagram.

HOW TO COPE

Understanding all of the above is all very well, but how do you cope with it and still shoot bulls? First examine the range you're shooting on; does it have large areas of hard ground with very little grass cover, is the grass short, etc.? Knowing what to expect before you start shooting is half the battle, then you won't waste time worrying about why your shots keep wandering from side to side on the target.

When you were shooting in a mirage without realising it, all you did was adjust your sights to compensate for the shots being high on the target and just watched the wind flags. Shooting successfully in a mirage is not that different, in fact mirage can be used to your advantage as a wind indicator.

Now you know what mirage is, you know what to look for, but how do you find it? It's very difficult to see with the naked eye, but it's much easier with a spotting scope. Remember: the more air you look through, the easier it is to see the mirage. So if you're shooting at 50 metres, you should look to one side of the target frame; the mirage between you and the stop butt will be much more noticeable there than in front of the target itself.

It's often said that defocussing the scope back from the target will help, but it's almost impossible to focus on a moving column of air, so the idea of defocussing is to make it easier on your eye. By not being focussed on the target it's easier to see the air moving. Watching this moving air through the scope is a much more reliable wind indicator than your wind flags, because you're watching the air move all the way down the range, not just in one spot.

On most ranges it's a little more difficult to spot the mirage when you're shooting at 100 yards because the targets are usually close to the stop butt. However, on some ranges (Century Range at Bisley, for example) the stop butt is a much further behind the targets and you can see the air moving around quite clearly on a hot day.

With no wind at all, the air tends to rise straight up, elongating the aiming mark in your foresight, and tempting you to shoot higher. This is simple enough to correct - just wind down a few clicks and you're in the bull. But if a wind flag starts to stir, although the breeze may not be enough to move your bullet, your next shots creep out of the bull. A quick glance through the scope will show the air streaming away in the direction your shots have gone, so it must be the effect of mirage, but what can you do?

You have two choices: either wait for your original condition to return, or aim off and generally treat the mirage like a wind which is being indicated by the air movement you can see. Wind blowing towards or away from you will change the direction of air movement quicker than a wind blowing across the range, as the crosswind tends to be more constant, whereas wind up and down the range will make the columns of air sway one way and then the other.

WOBBLY AIR

Try thinking of the aiming mark as a long black soap bubble attached at the bottom. A wind from the left would make it wobble off to the right and, because it's fixed at the bottom, it would slightly elongate upwards as well, causing you to take a slightly higher aim to the right. This is similar to the effect created between your eye and the target by those shifting wobbling masses of air.

The total effect on the target is slight - if you're accurately sighted in, you're talking about 'nines' at worst - but the problem occurs when you've allowed for this shift to one side and there's a sudden movement the other way. This will cause a dramatic change in point of impact on the target - now we're talking about 'eights' unless you spot this change and compensate for it.

There is a theory that using a larger foresight may also help because you may not follow the image quite so much as you would with a smaller foresight. This is quite possible, but for every theory there's a counter-theory, i.e. in typical mirage conditions (bright sun), the aiming mark appears much smaller anyway, so it's all a question of degree and comparison. By all means, try a larger foresight and see if it makes life easier.

You may find that a different colour filter helps, or try closing down the rearsight aperture by 0.1 mm, which increases the depth of field and helps your eyes to focus better.

Altering your sights could help you cope with mirage, but don't forget that an aperture sight is still an optical instrument, so although you can't actually see the mirage with the naked eye, you may still get some blurring because of the air movement in front of you.

It's all a question of experimenting - just find the combination which works best for you.

THE DREADED WIND

Then there's the wind itself.

Shooting in a wind usually strikes fear and terror into the heart of the average shooter, but don't despair, help is at hand! In this chapter, we're also going to tackle the problem of how to shoot in a wind.

Remember, its not always the brilliant shot who wins, it's the shooter who copes best with the conditions on the day. The wind affects everybody on the range so although your score may be abysmal by your standards, if it's better than everybody else's then you win!

First of all we're going to examine what wind is, then how it affects your shooting, and then how you can cope with it.

Think of air as being an invisible, gaseous medium which is fluid and elastic, making it fairly unstable and easily moved. Differences in temperature (and therefore density and pressure) cause the air to move from one place to another, creating what we know as wind.

The main problem with wind is that it's not constant in either speed or direction, and it's very difficult to see. If you watch a field of wheat waving in the breeze, or the smoke from a chimney, you'll soon discover that it's very erratic and difficult to predict. So what can you do about it?

SMOKE

Obviously a thorough understanding of the capricious nature of wind will help. If you watch smoke from a very tall chimney, it tends to stream across the sky in a fairly straight and predictable line; compare this with smoke from a domestic chimney, which is usually far more erratic, then compare them both with a camp fire or barbecue, when the smoke gets in your eyes wherever you are. This shows that the nearer you get to the ground, the more wind variation you get.

Meteorologists call the prevailing wind which is smooth and unaffected by the terrain below it, the geostropic wind and it occurs at 2,000 feet and above. Anything below that is affected by buildings, trees, hills, etc., as well as by friction with the ground. Unfortunately, we shoot at ground level where wind is at its most variable, although it's a bit slower because of friction with the ground.

Once you accept that wind is just air movement, it's fairly logical to accept that wind doesn't suddenly appear out of nowhere - it gives you some warning of its arrival. As a gust of wind comes towards you, it pushes other air along in front of it, so whatever wind indicators you're using will start to move, increase, and then drop away. However, the drop-off will be quicker than the rise, so some people prefer to shoot on a rising wind flag, as more points are dropped by not noticing a lull than by firing in a sudden gust of wind.

If you imagine that the wind or air moves like water, you can get an idea of what's involved by watching the swirls and eddies around piers and obstructions in a river's flow.

Each obstacle produces its own characteristic pattern, dependent upon its shape; a smooth, streamlined shape won't disturb the flow as much as an angular one, (which is why car manufacturers are so careful to smooth out the shape of their cars). So, how does this help the shooter?

Well, a quick look at the terrain upwind from your firing point may give you a clue as to the behaviour of the wind flags on the range. Open flat terrain might provide a constant wind which is fairly easily read, whereas broken terrain (trees, buildings, etc.) will cause eddies and turbulence, which are difficult to see until suddenly your chosen flag reverses direction, just as you let a shot go!

WAVES OF AIR

Understanding the way in which the wind behaves will help when going to a strange range. If you imagine waves of air pouring over an obstacle, this will give you a clue as to why wind flags by a bank behave differently to those in the middle of the range. However, if you draw a firing point next to a bank or wall, don't despair, it could work to your advantage if you make it.

You'll need to know the prevailing wind direction and then re-examine what you're shooting alongside. If you're on the downwind side of a wall, you can expect turbulence, downdrafts, and even wind at 180 degrees to the general wind direction; this will affect several firing points downwind.

If the wind is strong, there may be some shelter to be gained from the wall, it may protect you from the gusts, but what you will have to contend with is alternating and very twitchy wind flags. As you move further across the range, so the air flow will even out, but you need to remember that the higher the wall is, the greater the disturbance to the air flow, and the faster the air flow is, the greater the disturbance.

If you're on the upwind side of a wall, you'll also have difficulties as the wind bounces off the wall and creates eddies and turbulence, but the disturbance is much less and does not extend so far along the range as if you were downwind. You can determine the extent of disturbance across the range by reading the wind flags – that's what they're there for!

Other shapes obstructing the air flow will create differing types of turbulence. Think about a river flowing around square pier legs, compared with round ones, or even those specially designed not to hinder water flow, and you'll soon see that air flowing over a bank which gradually rises and falls, is not disturbed so much.

Most ranges are surrounded by trees, bushes, etc., and there are two things to remember about the effect of such vegetation on air flow: one is that it doesn't disturb the flow quite so much, and the other is that it actually shows the movement of the air over and around it.

It also tends to make a noise, giving you some warning of movement, although on a strange range you won't find this so easy to interpret as the locals do.

The problem with using vegetation as a wind indicator is that its effect varies depending on the thickness of the foliage, so wind flags are generally more reliable. A thick hedge will act like a solid wall or bank, but a sparse lumpy hedge will tend to vary the wind and create patches where any flags downwind will react differently to those over the rest of the range. How do you cope? The answer is to develop an awareness of your surroundings and their possible effect.

If you ever shoot on a range that's also used for fullbore shooting, you may find that the main wind flags are very high up and will tend to be more constant in direction than any flags near to the ground.

As a general rule, the eddies and turbulence enlarge your group and the main wind direction pushes the whole group to one side.

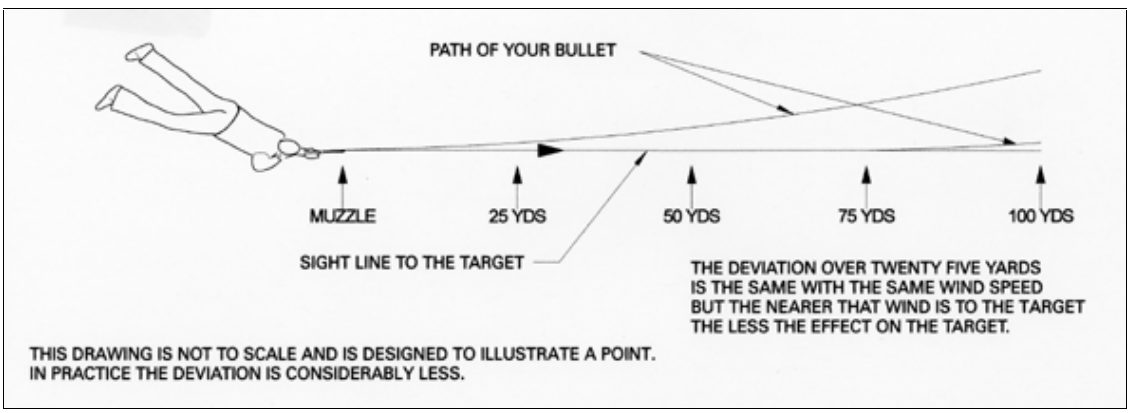
A sideways wind doesn't actually blow a bullet off course in the same way as it would a sailing boat. As the bullet exits the muzzle a wind coming from the left will cause the pressure on the bullet's left side to be increased by the pressure of the wind, and the bullet will veer towards the area of lower pressure. This is similar to the sailing boat, except, of course, that the bullet is spinning at something like 50,000 r.p.m.

Because most .22 target rifles are rifled clockwise, the bullet spins clockwise and, therefore, the high pressure area acting on the side of the bullet creeps upwards. Consequently, the low pressure area appears slightly below the centre line at about 4 o'clock and this is the direction in which the bullet will veer as it travels down range. A wind blowing from the right will tend to have the opposite effect and the bullet will veer to the left, and upwards.

As a shooter, you're obviously much more interested in what actually happens on the target, and most of you know that a wind from 9 o'clock or 3 o'clock creates a 4-10 o'clock wind group.

That part is simple - the problems arise when your technique for dealing with the wind is to 'aim off'. You must remember to allow for some elevation change, as well as sideways change (but more sideways than elevation – remember: it's 10 to 4, not 10.30 to 4.30).

For anybody who's still uncertain as to which wind flag to watch, it's important to realise that it's the wind nearest the muzzle that has the most effect on a bullet's path; the sketch graphically illustrates this.



If you have a choice watch the nearest wind flag

In the hypothetical case shown, the wind will deflect a bullet an equal amount over the first 25 yards, but once the bullet is pushed off course, it continues in a straight line, getting further from its original path all the time. It would require an equal and opposite force to push the bullet back onto it's original course and that's extremely unlikely to happen.

When shooting through a circular wind it's important to react to the *nearest* flags, as the wind nearer the target would have to be many times stronger to blow the bullet back towards the target. So, watch a wind flag as near your muzzle as possible.

WEATHER FORECASTS

Watch the weather forecasts the night before your shoot - they always include information about wind direction and strength, but remember that this doesn't take into account local ground conditions at the range; these you'll have to sort out either when you're sighting in, or by studying the above and working out what effect buildings etc. are having on the prevailing wind when you get there.

Some people maintain that they shoot better in a wind and this can very often be the case, because a stiff breeze can sometimes be more readable. You can hear it and feel it more, so you can allow for it - and the only thing to be really wary of is a sudden lull, which can be hard to detect but has a very dramatic effect.

Some people have shot good cards by ignoring wind flags and relying on the feel of the wind on the rifle. This can be a very reliable method in strong winds: "I just fired when the rifle stopped blowing about", is a comment often heard around the more open ranges. The effect of wind on the bullet is nothing like as dramatic as the effect of the wind on the rifle itself: if your barrel is blown off target, then you'll certainly get a low-scoring shot, but if the bullet is blown off course, the result is rarely so bad.

LIGHT WINDS

While a strong wind can be dealt with by feel, what should you do about light winds?

With today's highly competitive standards every tenth of a millimetre (1/1000 inch) counts: the bullet either touches the line or it doesn't, and that difference can be as little as 0.10mm. There was an old rule of thumb guide which said that a 10 mph wind blowing constantly over 100 yards moves a bullet 4 inches off centre. So it's fairly obvious that even a light breeze is a potential loser of points, and any wind which exerts more pressure on one side of a bullet than the other is going to influence its direction down the range.

The trickiest wind to deal with is the light, switching wind, swirling and eddying across the range, making the wind flags twitch from side to side; however, like water

flowing down a river, these swirls and eddies do repeat themselves, so by watching the wind flags before you shoot, it's possible to determine an overall pattern.

The prevailing wind doesn't often make any major change in its direction during the period of the shoot, so the swirls and eddies will generally repeat themselves.

WIND FLAGS

If there are plenty of wind flags on the range, it's possible to follow the movement of the wind, by spotting flags upwind, watching what they do, and then seeing if that pattern repeats itself across the range. Watching a wheat field in the wind will show similar patterns of movement - air movement is the same, whether over a field or range, and the only difference is that the range isn't covered by so many wind indicators as the wheat field is.

When analysing wind flags and their performance, be sure to take into account their texture, material and weight; different ranges use a variety of flags and a 5mph wind will produce differing reactions from different wind flags, although its actual effect on your bullet will be the same.

UIT rules specify a certain construction of wind flags to ensure competitions shot under their rules all use the same material, but some competitions are shot under local rules and you may find all sorts of different types of flag.

If you're on a range without automatic target changers, you have the opportunity to walk along the path your bullet is going to take. Racing drivers and professional golfers 'walk the course', why not do the same? You'll be carrying your own personal wind indicator with you (i.e. your target) which will flap about while you feel the direction and strength of wind on your face.

A light breeze of 2-3.5 metres per second (5-8 mph) is the easiest wind to read, as it's strong enough to give a good wind flag movement, yet not quite strong enough to blow the rifle off the bull.

One thing to remember is that *no* wind is constant and there will be occasional gusts which will increase according to the average wind speed. For example, a wind speed of 4.5 mps (10 mph) may produce gusts of up to 7 mps (15 mph).

Gusts are sudden, but they don't last long because they're brought about by air rushing to fill an area of low pressure caused by the wind blowing around an object. They can quite often be heard or seen coming, and because of their short duration there's usually time to wait for their demise.

Having established that air moves in these repeating patterns, you're in with a chance of coping with the wind conditions; what you have to do now is determine which shooting method you're going to adopt in order to deal with them. There are nine

basic ways of shooting in a wind, but before examining them in detail, we need to adopt an approach which is going to bring success in dealing with the problem.

Most of you will have begun your .22 target rifle career indoors, and will have established yourself with suitable equipment and some sort of average before venturing outside, but, once outdoors, you'll also need to make some drastic changes to your approach and possibly your equipment. You need to develop an awareness of your surroundings, so it's no good being encumbered with a shooting hat with flaps, ear muffs, eye blinder, scope, etc. if you can't see the wind flags.

Be prepared to change your headgear: instead of a hat with flaps try a sweatband - it keeps the hair out of your eyes, stops the sweat running down your nose, and gives you somewhere to attach a small eye blinder if you need one. (Only a *small* eye blinder – it's important that you see as much of the range as possible, so if you need to use a blinder, keep it small).

Now look at your scope. Because most ranges face north, the prevailing winds are usually from the left, which is where, if you're a right-handed shooter, you'll find a spotting scope blocking out most of the field of vision. (Left-handers have an advantage over right-handers here, as in these conditions they can see the wind coming). Unfortunately no one yet makes a micro spotting scope with good enough optics for 100 yards, so the scope itself (and the way in which you use it) needs to be examined briefly.

Don't block your vision with the scope

Choose an angled spotting scope and position it as low down as possible, with the eyepiece angled up towards your non-shooting eye. This enables you to watch the flags upwind, with the left eye above the scope. Then, assuming you have a fairly straight position with your head level, you can look almost straight down the range, and easily see the movement of the flags to your left. (If you shoot in the old military 45-degree-angle style, then you are, in effect, turning your back on a lot of winds, and can expect to be caught out.)

Most people have about 180-degree peripheral vision, which allows you to register a flicker of a flag out of the corner of your eye, heralding a change in conditions. Of course, you *can* watch wind flags with your right eye, but only when the wind is coming from the right - you need to know what's approaching, not what's just gone past your rifle.

A wind coach, who sits with the wind behind them, calling direction and velocity to their team, using the flags *down* range is asking for trouble. By the time the condition has got through to the shooter's brain and thence to the trigger, most of the wind has reached the target and a new condition is affecting the muzzle.

Not using some form of ear protection is foolhardy, but the type you use is a matter of personal preference, as neither muffs nor plugs are likely to interfere with your view of the range. However, aspiring wind shooters may like to consider using plugs containing valves which shut down as the gun goes off, allowing you to hear the wind and to feel it whistling around your ear lobes.

Obviously concentration is of paramount importance, so there's no point listening to the wind rustling in the trees when you should be shooting, but at least it makes you more aware of your surroundings and of any possible changes in conditions. After all, while a particular condition prevails, then your shots stay in the group – it's a *change*, which is likely to cause a dropped shot.

You'll quite often find that in a competition with other shooters, you're waiting for a wind change so you can start shooting, only to find that almost everyone else is doing the same. The silence is eerie until the wind suddenly changes back to something you can shoot on, and you all start again. This shouldn't be a reliable source of information, but it can confirm your own judgement.

However, enough of general attitude and equipment, now down to the nitty gritty. How *do* you shoot in a wind? This sounds like the original question, but without some background knowledge and understanding of what causes the problem, how are you going to work out an answer?

Here now are nine basic methods of shooting in a wind - all of which are capable, to a greater or lesser degree, of producing the results on the day

Method 1: The "What Wind?" Approach (shooting through it)

This method assumes you can zero correctly so that, even when there's some wind about, you still get a nice '10 to 4' group across the ten ring, with shots on high and low winds still falling inside the bull.

Take extra care to ensure that the centre of the group is right in the middle of the bull as it's very easy to get eight shots in the bull and two in the nine ring, and dismiss the odd two as mistakes, by assuming the group is central. This may not be the case - the two 'nines' may be there because of condition changes, which will occur again with disastrous results.

Care taken on the sighter pays dividends later: the sighting target should be used to zero the rifle in the condition prevalent at the time of the shoot. Don't rush it, and don't make any hasty decisions about where the centre of the group is.

International rules don't allow you to return to the sighter, so you have to get it right while you have the chance, but this doesn't mean you should fire a whole box of ammunition at the sighter; there's no point in blasting away until a large ragged hole appears, then dashing round the actual card in the same way. Sighting shots should be shot with care.

By surveying the conditions first, you should be able to make adjustments before you even start on your sighter, so that your first shot arrives in the bull (or pretty close!). This saves a lot of time winding across the aiming mark trying to find the bull.

The next time you're shooting in a 'no wind' situation, take the trouble to set the windage knob on zero so you have a datum point to work from, then by careful judgement of wind speed and direction, you can add the necessary clicks onto the sight before you fire your first sighting shot; this leaves you more time to study the size of the group and the effect of any change in conditions.

Providing you're happy that the group is central and the conditions are staying constant, then the 'What Wind?' principle applies. Be alert, however, to any potential changes that may occur while you're shooting – don't wait until shots start creeping out of the group before you realise something's changed.

This method can work well in the right conditions and underlines a comment made some years ago by a well-known national coach that "good technique is worth two minutes of wind". It's all too easy to worry about *Will-o' the-Wisp* changing wind conditions, which have no effect on the group size.

There is another form of 'shooting through' wind, which I wouldn't recommend to a higher-averaged shooter, but which often works for those with a lower average: this involves totally ignoring the wind (as you have very little experience of it anyway), and, by luck or instinct, you can sometimes hit a rhythm which coincides with the

changing wind patterns and results in a clean respectable card, while more experienced shooters are struggling because they may be over-compensating. This is *also* known as the 'What Wind?' principle.

Method 2: Clicking off

Apart from adjusting your sights before starting on your sighter, this method isn't usually recommended for smallbore target rifle shooters, as it involves calculating wind strength and direction and applying the necessary number of clicks to the sights for those conditions, *for every shot*!

Because of the speed at which the average smallbore shooter has to perform (as compared with the fullbore shooter, for example) it becomes impossible to adjust quickly enough, or even to remember where you are.

Method 3: The Rhythm Method

This involves zeroing in on the sighter, starting on the match card and when any change in conditions occurs you return to the sighter and keep shooting until the shots go back in the bull (indicating that 'your' wind condition has returned) and then continue with your match card.

There are 'pro's.' and 'cons.' of course, as with any method. One of the advantages is that you retain a nice steady rhythm, instead of stopping and starting; the disadvantages are that it is expensive on ammunition, the sighter may get shot to pieces so eventually it's difficult to tell where the shots are going anyway. You could also run the risk of 'forgetting' where you are and cross-shoot on your own card or fire more (or less) than the correct number of shots to count. International rules, of course, don't allow you to return to your sighter once you've started on your card.

Method 4: Chasing shots

This method is practised by a lot of people, including some very experienced shooters who should know better, (despite it being wrong it *is* very tempting) – it's the lazy man's way of reading the wind.

It involves shooting until a shot drops out of the group, then looking at the conditions to see why; you then compensate until it happens again, or wait until your chosen condition returns and carry on shooting until you drop another shot, when you look at a wind flag and find it's changed through 180 degrees.

However, this system *has* been known to work in mild conditions (as described in **Method 1**) or in very changeable weather when you may consider shooting quickly to avoid suffering as many condition changes as those slower shooters alongside you.

‘While they’re going in, keep shooting’ is the attitude required to make it work, but the problem occurs when your rhythm is broken and the shots start spreading without you knowing why. In this case, because you haven’t analysed the conditions correctly, you’re afraid to part with the next shot in case it's an ‘eight’.

If it’s good, keep shooting

Method 5: The Waiting Game

This is played by a large percentage of smallbore shooters; it involves zeroing in on a particular wind condition and only releasing a shot when that condition is present. It’s a reliable method, as far as it goes, but it does have its drawbacks.

One is time: how often have you zeroed in on a wind that changes immediately you fire your first shot to count? Of course, if you’d been doing your job properly, then you would have studied the conditions beforehand and known not to trust a wind blowing from a strange direction for the 5 minutes you were on the sighter. It would have been better not to shoot at all during those 5 minutes if you knew that those conditions were unlikely to recur during the next 20 minutes.

If you use this method, it’s important to shoot quickly, so that when the conditions you’ve sighted in on actually arrive, you’re able to fire a number of good shots before they disappear and then have time to wait for them to return.

Practising any quick-firing discipline helps enormously here - if you've ever shot 10 shots in 90 seconds, or managed to get 15 shots off in a minute on a skirmisher target, then you'll realise that the 20 minutes allowed for 20 shots is ample, so don't panic. It's a good exercise in self-control to have only 5 minutes left to shoot your last 10 shots – you'll lose more points by panic spoiling your technique than you will by calm, calculated, rapid-fire shooting.

It's even more important with this than with any other method, to understand the capricious nature of the wind, because you're analysing the conditions for the whole range from perhaps just one flag. Your brain should be in 'computer' mode, good shooting technique should be automatic, shot release and sight picture must be perfect; then you can release all your spare concentration into analysing the flags and the sounds around you, while you're waiting for your condition to return.

Time spent reloading and scoping is lost time, so quick, accurate reloading is vital and don't waste time calculating your score through the scope!

This method of shooting has varying degrees of success, depending on wind direction and the number of wind indicators available. If you're watching a flag to your right and the wind is blowing from 3 o'clock, then by knowing the average duration of the conditions you'll have a fair idea of how many shots you can release before the wind changes. (Don't push your luck and let a shot go thinking it won't make much difference – that's not the way champions are made!).

Remember that it may also take a second or two for the condition which has affected your flag, to actually affect the path of your bullet, which is why it's obviously essential to watch flags *upwind*.

The major problem with watching one flag with only one eye is that it's more difficult to spot the changes in direction, which alter the wind's influence on your bullet. You rely on binocular vision to judge distance and it's much more difficult to tell whether a flag is blowing away from you or towards you if you're only using one eye. (Unfortunately, because of the obstruction caused by your sights, it's impossible to focus both eyes on a wind flag without lifting your head from the stock).

So how do you solve this problem? It all comes back to general awareness of your surroundings: listen to the wind, feel it on your face, or more on one ear than the other, see how the other flags are behaving and decide whether they indicate that your chosen flag needs watching more closely.

Now you begin to realise how busy the computer in your head can get. However, concentration is the real name of the game and while you're busy thinking about the changing conditions, you're not thinking about what you're going to have for tea or, even worse, what your score is so far.

You may find that your chosen condition coincides with everybody else's, and that you're waiting when they're waiting, but don't be lulled into a false sense of security, stick rigidly to your own calculations and analysis of the conditions, and don't start shooting just because everyone else has.

Assessing the conditions from behind the firing point before you shoot is invaluable, but be careful not to analyse the performance of any shooters who are already shooting. You may be able to spot their targets and try to work out what effect the conditions are having, but how would you know whether the shooter concerned was aiming off, or whether he made a mistake?

Also, you may start to get an impression of how well you ought to be shooting (particularly if you're in a higher class than the shooter you're watching), but if you begin your card and it starts to go wrong, it will go doubly wrong because you think you should be shooting better than you are.

Method 6: Coaching

This method can only be used for practice on your home range, or in special team events where allowed by the rules. It involves two people - one shooting and the other reading the wind conditions and calling out information to the shooter. The wind coach becomes the 'computer' and the shooter is just a machine whose only job is to release a perfect shot every time without taking any notice of the conditions at all.

There are lessons to be learnt from both jobs; if the coach is freed from the pressure of concentrating on the shooting techniques, he can analyse wind conditions easily. Likewise the shooter, freed from the constraints of trying to fathom out the conditions, can release perfect shots, but it's important to establish a form of communication, so that each of you understands what the other means.

Having served as wind coach a few times, you'll find that, while doing your own shooting you'll start to analyse the wind in the same manner; with lots of practice, reading the wind will become automatic and the computer between your ears will take over, freeing you to concentrate on shooting techniques.

Having been the coached shooter, you should be firing in the same conditions each time and will therefore be shooting very tight groups. Knowing that it's *possible* to shoot such tight groups in tricky conditions will help build your confidence when you're next faced with a difficult wind.

With two shooters of similar standards, it's interesting to see which of you reads the wind conditions better. With shooters of differing standards, say A Class and C Class, it would be interesting to see whether it's *analysing* the wind conditions which makes the difference, or whether it's the actual shooting technique.

As a club exercise it would be even more interesting to get your best shooter to wind coach a number of members of varying standards and see who improves their average.

Method 7: Aiming off (i.e. not aiming at the middle)

You may hear a shooter claim he could never aim off because he couldn't hit the bull when he was aiming at it, let alone when he wasn't. (A bit like the person who once claimed he'd never learn to ride a bicycle because he couldn't balance on it when it was standing still, let alone when it was moving!)

If you've never tried aiming off, do have a go; if you've tried it unsuccessfully, have another go. It's not easy and it takes a lot of practice but the rewards are considerable. Many good shooters have remarked that, in tricky wind conditions they've aimed off the whole time and have been amazed at how well they shot.

When the wind is blowing towards you or away from you, up or down the range, then it tends to 'fish tail', - i.e. switch direction repeatedly and quickly - and is very tricky to shoot in. Aiming off allows you to adapt to the conditions and use them to guide your shots into the bull.

Before starting to aim off, there are a few basic principles that must be understood. The first thing you should consider is your foresight size. It's important to use a size large enough to enable you to locate the aiming mark over to one side of the ring without it distorting or changing shape.

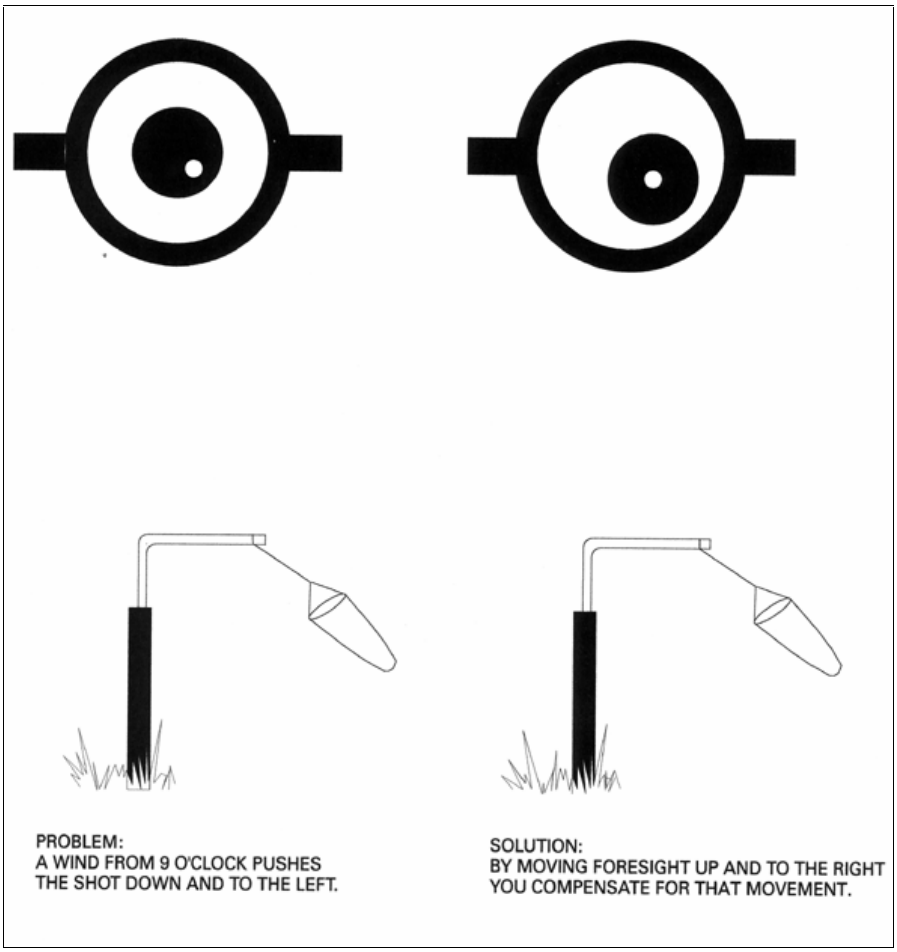
The problem with foresights is their ability to distort the sight picture by light refraction. For example, at 50 metres some people put their warming shots in between the two sighting diagrams, saying they can get both aiming marks inside their foresight and still get white around the outside edges of them. They're very distorted and oval in shape, but the 'white' is still there; however, it's not the white of the card they're seeing, but light being refracted round the inside edge of the foresight ring.

The amount by which you can aim off is governed by the size of your foresight: a larger one can allow the aiming mark to be moved further to one side (but this doesn't mean that a smaller foresight will make you adopt a central sight picture).

Next time you're practising indoors, try aiming off – you'll be surprised how far you have to go to get an eight. Then try it again with a larger foresight, say 0.4mm bigger than you usually use, was it easier to move the aiming mark around inside the foresight?

Or, try winding your sights 20 clicks to the right, sight in by aiming off (not clicking) and shoot 10 shots to count. Next, ask someone to alter your sights without telling you by how much, and do the same again. These exercises show the importance of your sight picture, and aiming off makes you concentrate on getting it exactly right.

Because you rely on concentric circles to align your sights, your brain can sometimes see what's not there, so if you stare at a sight picture for too long, the image can become burnt on the retina and the brain thinks the correct sight picture is there when it isn't.



There are occasions when an off-centre aim is successful

But by putting the aiming mark in the bottom right hand corner, you'll disrupt this cosy 'think it's all right' sight picture and suddenly you have to concentrate that much harder; consequently you could well be impressed by how small your groups are when you aim off. So next time you're on the outdoor range, don't zero in by altering the sights, do it by aiming off. It will be difficult, but by making it difficult on a practice card, you'll find it that much easier on a match card.

However, as mentioned earlier, because of the wind's effect on a bullet, very seldom should you make purely sideways adjustments in aiming off, there usually has to be some elevation adjustment as well.

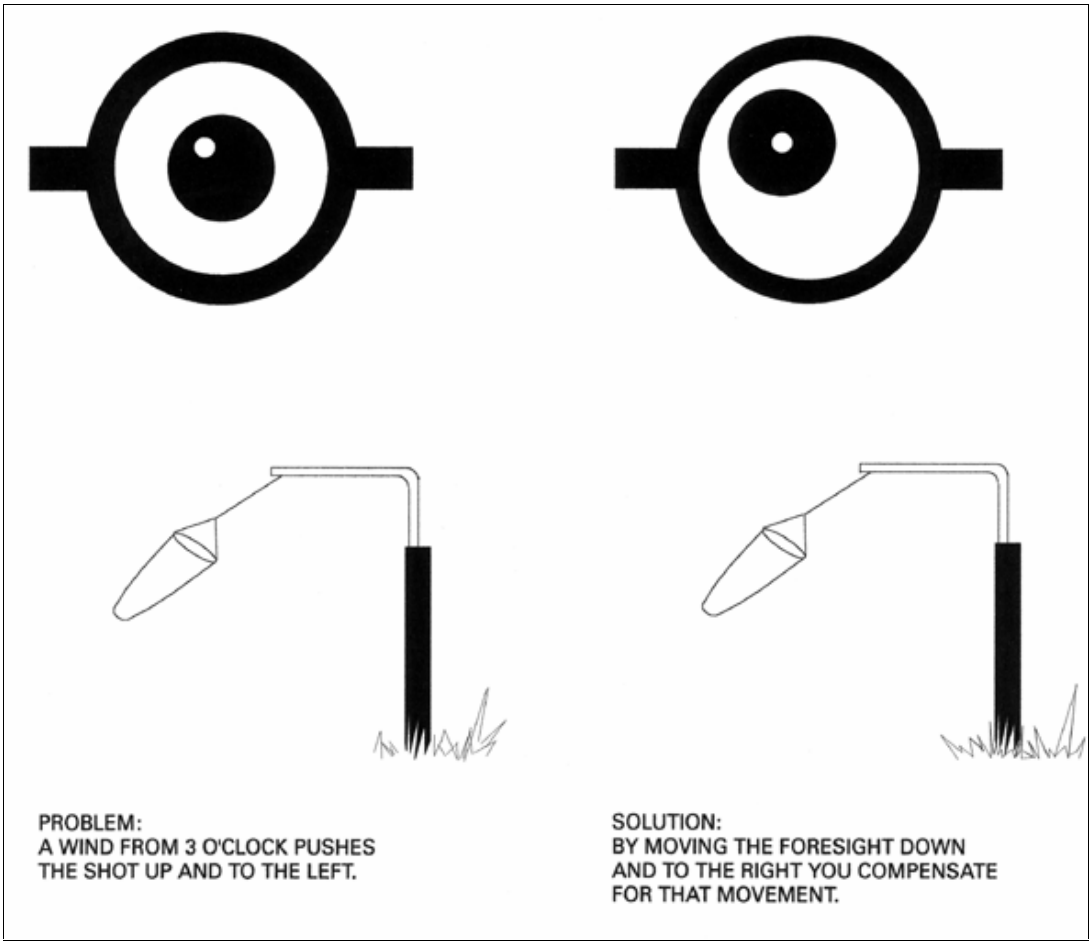
There are two basic levels of aiming off; one is to aim off, launching a bullet into space upwind so that the wind pressure blows it into the bull. This can be very successful, but can also be a bit 'hit and miss', particularly in a strong wind if you're relying on one wind flag to tell you what's happening over the whole of the range.

It is possible to shoot a neat group of carton bulls by aiming at the eight ring, which is no problem with a telescopic sight but with aperture sights it's not so easy to judge the amount by which you're aiming off. Therefore, great care must be taken to get the sight picture right.

Time spent on the sighter is important; this is where you choose the most prevalent wind condition, see where the shots are going, and measure how much to aim off. It's possible to pick a strong but steady wind condition which produces an 'eight' at 10 o'clock when you aim centrally, and by progressively aiming further to the right and down, you should be able to 'walk' the shot holes into the bull.

Reducing the amount of aim off can cater for a change in conditions, such as a drop in velocity; a change in direction may require a different aim point or a pause until the prevailing conditions return.

Most people hesitate to aim off because of the apparent amount needed to turn an 'eight' into a 'bull', but in strong windy conditions, when there's no alternative, it has been known for top shooters to aim at the edge of the target board and still shoot bulls. The problem is that, the further you have to aim off, the more guesswork creeps in.



Get used to shooting left and right winds by aiming off

There is a more reliable way of aiming off but it really only works in the sort of light wind conditions, which cause a 'squeaky nine' at the worst. This is generally referred to as 'shading', where the degree of aiming off is much less and it's a case of favouring one side more than the other. This demands even more concentration on the sight picture, because the change in shape of the white surrounding the aiming mark is so slight.

Where it comes into its own is when the group starts to build up on one side of the bull, uncomfortably close to the line, with the risk that the group might spread across into the 'nine' ring. 'Shading' to spread the group into the bull can work wonders then, but overdoing it can result in a 'nine' on the other side, so until you've gained confidence in this technique, tread very carefully.

It's vital when aiming off to ensure that everything else involved in the shot release is perfect. Errors in trigger release, etc. could cause total confusion when a hole appears on the card in a totally different place to where you've just calculated it should be.

Don't be tempted to use the rearsight for aiming off, as this doesn't produce a true picture. You should still keep the foresight exactly in the centre of the rearsight – it's just the aiming mark which can be displaced.

Method 8: Induced Error

If you could release a perfect shot every time, then obviously your group would be as small as the rifle and ammunition would allow. However, the fact that very few people shoot groups that small means that some errors must be introduced into this combination, which result in a shot drifting out of the group. Therefore the next logical step is to wonder whether you can induce the shot to go where you want it to by introducing a predetermined error.

Aiming off is one example, but another area where this can be carefully controlled is in the use of cant. Everybody shoots with some degree of cant (it may be zero degrees of course!) and most people cant the rifle towards themselves, to keep their head upright and their eyes level. Therefore, you need some device to ensure that your cant is constant - hence the spirit level or levelling bars, which some people use.

Altering the degree of cant will move the point of impact on the target. Six minutes of cant will move the bullet from 'bull' to 'nine' ring, or *vice versa*; the first movement is sideways and this then gradually falls away in an arc from the bull.

If you sight in on the downwind side of the bull on the basis that a drop in the wind will cause the shots to fall into the bull, you could find that an increase in wind strength will move them out towards the 'nine' ring. If this happens, the thing to do is, cant into the wind, *just enough* to force the centre of the group back towards the middle (if you do it too much you'll lose some elevation). You can treat winds from the left or right exactly the same, and with a foresight bubble the amount of cant you use can be judged consistently.

Naturally, people all over the country are exclaiming in horror at the idea of introducing errors into shooting when they've spent so long trying to eliminate them, but these methods are used very successfully by some people, so don't dismiss them out of hand.

Of course, they're not in themselves the total answer, but they may provide an insight into what's happening when you shoot, and the moment you give up listening to ideas, or experimenting, then you start to stagnate.

One top shooter lifts his shots up on the target by tensing his left hand (he's right-handed of course); another varies the pressure on his cheekpiece to move the point of impact. Both these people have reached the stage where they're capable of releasing perfect shots, which means they can be sure that the error they've introduced is the only one influencing the path of the bullet.

Method 9: The Ultimate

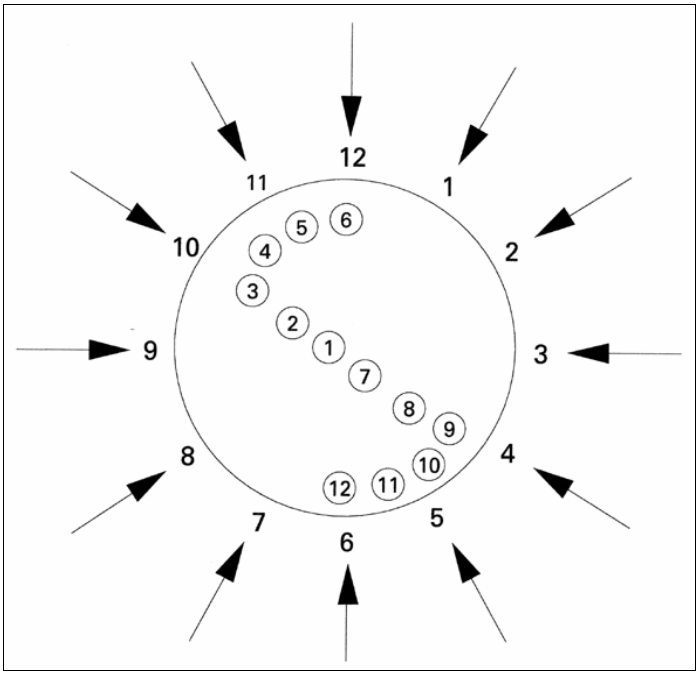
This is by far the best method. Basically, it involves using all the previous methods, or parts thereof, or any combination from 1 to 8. Likely combinations might involve waiting (Method 5) and aiming off (Method 7) - to some extent, Method 7 will involve using Method 5 anyway, because very few people dare shoot in a gust. If you've tried them all, there will be some you get on with and some you don't, but if you don't try them, you'll never know!

Keep your eyes open: a wind coming towards you will have an effect on 90% of the bullets path before it even reaches your wind flag, particularly if the only one you're watching is at 10 metres from the firing point. In this case you might like to consider modifying your shot release technique if you're shooting in a tricky wind.

In some wind conditions the changes come so quickly that, if you have a slow, steady trigger release and you're shooting by waiting for the wind or aiming off, you may find the conditions actually changing while you're releasing the shot.

There are two ways of coping with this; the first and most obvious is to speed up the shot release by practising shooting quickly. Plenty of practice at this will pay dividends in a match, but don't be tempted to rush or to snatch the trigger, as this will drop you more points than the wind. The second solution lies in the ability to read a wind flag out of the corner of your eye while letting the shot go (*and* holding off when you catch a changing flicker from that wind flag).

Winds coming up the range towards you or down the range from behind you don't have the same sideways effect on your bullet. Generally, a wind group on a target spreads from 10 o'clock to 4 o'clock, to a greater or lesser degree, depending on wind strength and/or direction. This is where the picture being built up on the sighter while you're testing all the different wind conditions pays off, as the wind's effect can be gauged very accurately. There's a neat little diagram, which shows this:



The wind clock

The numbers are hours on a clock face, where a 6 o'clock wind comes from directly behind you. As mentioned previously, the 3 o'clock wind moves the shot up and to the left and the 9 o'clock *vice versa*. Don't however, gauge wind strength and direction by the smoke from your barrel, because the bullet is already on its way by then (but your neighbour's smoke might give you a clue).

In really strong winds, be prepared to grip the rifle more tightly (preferably without introducing grip errors) to cut down the possibility of the wind blowing your rifle onto your trigger finger, which could be disastrous. Once a bullet leaves your rifle going in the wrong direction, you can't call it back!

If it's that difficult in windy conditions and you can still put up decent scores, then why can't you shoot better in perfect conditions? The answer is that, very rarely in this country do we ever get perfect conditions for shooting.

There may not be much wind blowing, but the air never stays still, it's a very fluid medium which is always on the move and which is constantly changing its density, temperature and pressure. Think of apparently still air as jelly, which wobbles invisibly across the range.

Smoke canisters have shown, when lit in *apparently* still conditions on a range, that the smoke swirls everywhere and the amount of movement is difficult to believe when the wind flags are absolutely still.

This movement is not sufficient to blow a bullet off course, but things are very often not what they seem, and you may be having difficulty because you're looking through several layers of moving wobbly air at different temperatures and densities. The wind flags may be hanging limply, but there is still movement out there, so tread warily and shoot carefully.

Remember it's the increase in pressure on one side of the bullet that influences its course, *not* that it gets *physically* blown in a different direction.

Apparently-still conditions can also induce a feeling of overconfidence and lack of attention to the basics of shooting, allowing your brain to wander, simply because it's not watching the wind.

There's another wind phenomenon which can have a dramatic effect on your shooting during the summer, and that's the wind associated with *Cumulonimbus* cloud formations.

The section on mirage explained how wind gets started by warm air rising and being replaced by cooler air. As the temperature rises, this simple convection current increases until eventually the warm air rises so high that it's cooled down again sufficiently for the moisture in the air to be condensed to form clouds.

During the summer, when the sun can get very hot, these cloud formations can become enormous, and the rising current of air beneath them (so loved by glider pilots) can be quite strong. Consequently, when the air rushes in at ground level to replace the rising air, quite strong wind speeds can be reached. The problem which will affect you most is that this 'heat engine' sucks air in from all directions and yet still gets blown around by the general wind direction.

Therefore, if the summer sky is showing signs of producing large bulbous white clouds, you can expect these to develop into *Cumulonimbus*. The really big ones will be very dark underneath and so high that the top has flattened out into an anvil shape. This cloud could be up to nine miles high, and anything that pushes upwards to that height will be sucking air in at ground level at a prodigious rate!

So, beware as this monster approaches, because you could get a total wind reversal as it draws in air from in front of itself. There will come a time when the wind peaks, then drops off to near-calm conditions and then starts off again but from totally the opposite direction.

However, this heat engine is being blown along by the general wind direction so you shouldn't necessarily expect all this to happen immediately under the cloud – you're dealing with a leaning column of air caused by the wind being stronger higher up in the sky.

Beware of strange ranges which appear to give shelter from the wind, as ranges which are built in seemingly ideal conditions (e.g. in a quarry rather then in the middle of open fields) can generate their own little idiosyncrasies, designed to catch out the unwary.

As mentioned earlier, when a large mass of moving air meets an obstacle, its path is interrupted and turbulence is created; the same thing happens when it comes across a hole in the ground, i.e. a quarry. If the wind is very strong, it will rush across the top, dragging air out; if the wind is slower, then it may tend to go in at one end and out the other; if there's a temperature difference, which is quite likely if the sun is out, then warm air may rise up the walls like smoke going up a chimney.

What the quarry is doing is introducing an upward or downward air movement, which causes even more problems, and it's creating a circulating effect, which causes the wind flags to spin round in a most disturbing manner.

This may sound terribly difficult to cope with, but at least the air movements tend to be lighter in a quarry than on a cliff top. There's one theory in this situation which has some success, and that is: the more confusing the wind, the more you ignore it! Adjusting for conflicting wind flag movements can leave you constantly chasing your shots all round the diagram and making other errors in your frustration.

Trying to analyse these twitchy wind flags before you shoot may cause brain fade but whatever you do, don't panic; if you really can't figure out what's happening beforehand, then wait till you get on your sighter and see what's *actually* going on. You may find the conflicting flag movements are doing no more than enlarging your group slightly, so, with a great deal of care (ensuring your group is central) you should be able to keep the dropped shots to a minimum.

Circulating winds don't only occur in confined spaces, they can also appear on wide open ranges. Wind eddies created by an obstruction will continue downwind of the obstruction for some distance, and wind created by rising warm air currents can start a circular motion which is then blown along in the general wind direction.

Remember, whichever way the wind flags are blowing, it's the one nearest your muzzle that will have the greatest effect on your shot.

It's a well-known fact that, when you're shooting well, the wind seems to have less effect on your group size; at other times, when nothing seems to be going right, the wind blows your shots from nine ring to nine ring, however hard you try to contain them.

When this happens, it's important not to forget your basic techniques; if you can guarantee shooting 'possibles' all the time in perfect indoor conditions, then outdoors at longer ranges you can make allowances for the wind, knowing that if you haven't hit the middle, it's a result of the wind conditions, *not* your shooting technique.

Unfortunately not many people can make that sort of guarantee, so you end up constantly analysing your performance as well as reading the wind conditions, but you have to know that the shot was a bull when it left you, before you can analyse the wind's effect on it.

These are some of the methods used by top shooters to cope with the varying wind conditions, which occur in this country.

Finally, don't be afraid of the wind, it doesn't select you as its personal target; it affects everybody equally and, as mentioned earlier, it's the shooter who best copes with the conditions on the day who wins, so don't give up however badly you *appear* to be shooting it's not over until the last shot is fired.