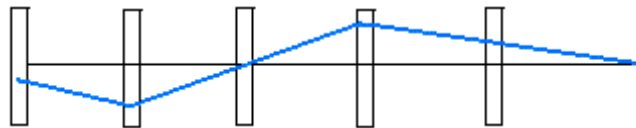


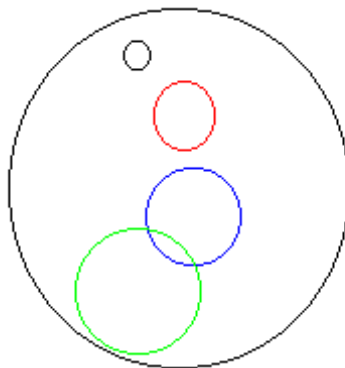
### Walk Back Tuning

When you shoot an arrow it is not possible to see the details of how the arrow flies as it's going too fast and because of the distance and perspective. The walk back approach is a method of looking at the the flight of the arrow through the air.



arrow flight path

When you shoot an arrow, where it hits the target is where the arrow is in the air at that particular distance. If you shot an arrow through a set of paper sheets, as illustrated, then the holes in successive sheets would give you a record of the arrow flight. Another, practical way, to do much the same thing is to have a fixed target and for the archer to shoot successive arrows at increasing distances. What defines the approach as a walk back is that the aimed at point is the same for all distances. The arrow pattern on the target is a record of the arrows' flight through the air. Note that there is in reality no actual point on the target which the archer is trying to hit. The 'target' if any is the center of the group for the arrows at the longest distance. Because the arrow pattern is derived not from a single arrow's flight but from a number of different shots (and each shot by the archer is invariably going to be slightly different) you cannot look at a single arrow set pattern but have to look at the pattern of arrow groups at each distance.



Assuming you aim at the same point on the target at each distance you end up with something like the following;- the arrow groups will tend to get larger and hit lower on the target with increasing distance and the left to right movements of the groups

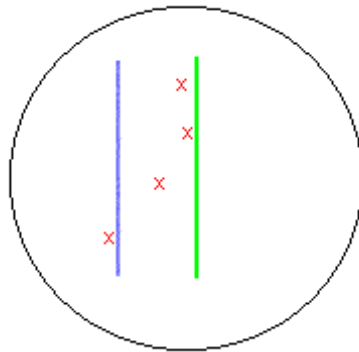
represents, for a non tuned bow, the effect of the arrows' fishtailing/porpoising.

Having got a visual picture of how the arrows fly can anything useful be got from it?

The first description of using a walk back approach for bow tuning I am aware of was in a pamphlet, 'Bow Tuning', by Roy Matthews published in 1984. The 'theory' described is that the shape of the arrow pattern on the target indicates to the archer whether an adjustment to the pressure button position or spring tension is required and in what direction to improve the tuning of the setup. Following Matthews' description of the idea is a comment that boils down to that at least for him the idea doesn't work. Whatever its origin, the idea that you can determine whether a change in button position **or** spring tension to tune the setup can be determined from a walk back arrow pattern is nonsense. As mentioned in the introductory section on arrow flight you can't tell from how the arrow flies whether or not the bow even has a pressure button fitted let alone discriminate between the effects of button position or spring tension. Despite the fact that it doesn't work this tuning method has proved remarkably durable in terms of being put forward as a viable method in archery magazines, catalogues etc.

My guess is that the origin of the walk back pattern-what you do with the pressure button myth originated as a piece of false logic. If you have a perfectly tuned bow then the arrow pattern is a straight line down the target. As you mistune the bow more and more then the arrow pattern you get becomes more and more curved. A 'tweak' of the button position will mistune a bow more than a 'tweak' of the spring tension. So if you start with a perfectly tuned bow you get a more curved pattern if you change the button position then if you change the spring tension. The false logic is reversing this observation - if I change the button position (from tuned) it gives me a curved pattern, therefore if I have a curved pattern changing the button position will give me a tuned bow. This cock up is usually presented as "a cow has four legs, therefore everything with four legs is a cow". Anyone you see trying to milk a table is likely to be an archer who advocates this walk back tuning approach.

In order to get anything out of a walk back arrow pattern we need to start with a viable pattern in the first place and this requires establishing the pattern baseline and having the correct setup for the bow sight and the mark aimed at.

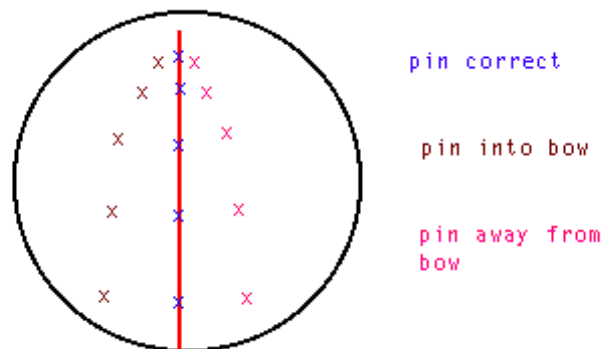


The baseline is where the vertical plane corresponding to the string running down the

center of the (vertical) bow limbs cuts the target. Unless the arrow pattern is looked at with reference to this line then the pattern can be misinterpreted.

In this and following diagrams the 'x' represents the center of the arrow groups at different distances. The baseline for this pattern could be anywhere e.g. the blue and green lines. The pattern needs to be looked at with respect to the right baseline. The top of the baseline represents where the arrow would hit at no distance. Looking at the pattern with respect to the first (highest) arrow hit is meaningless.

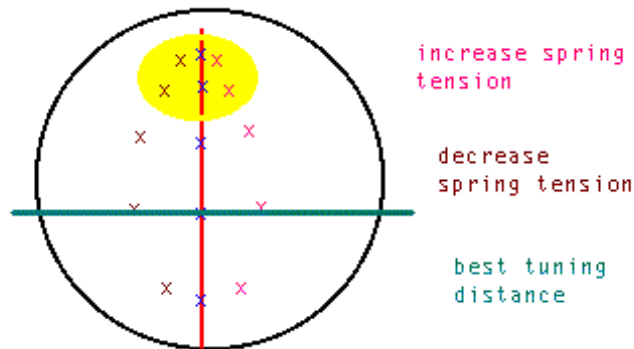
The sideways position of the bow sight should be such that the pin lies in the plane of the baseline i.e. with the string centered on the bow limbs the string should 'cut' through the pin.



This results in the baseline being a line dropped vertically from the mark being aimed at on the target. Any sideways movement of the pin away from this position will have the effect of a rotational distortion of the arrow pattern on the target. e.g. suppose you have a perfectly tuned bow and the pin in the correct position. The arrow pattern will be a straight line down the target. If you screw the the pin in towards the bow (RH archer) and repeat the walk back then the arrows will hit increasingly more to the left as the distance increases. The following diagram illustrates the effect. - lots of different arrow arrow patterns and all with a perfectly tuned bow!

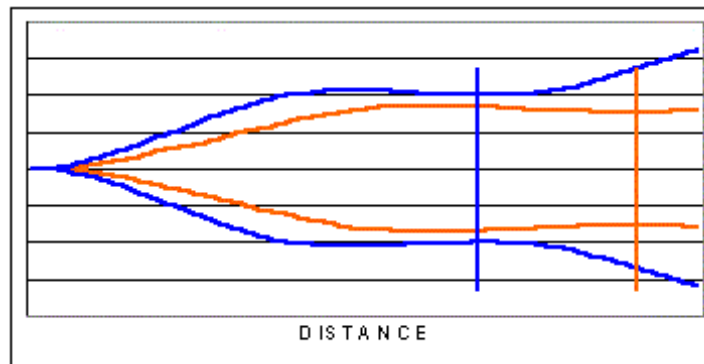
You get, at least in theory, a similar distortion of the arrow pattern with a vertical movement of the pin. In order to get a true arrow pattern then the pin position and the height of the mark on the target should be such that the arrow leaves the bow horizontally at all distances (so don't try a walk back on a hill). If say the bow is canted up and you shoot each arrow the same way then as you walk backwards the arrows fly higher and the arrow pattern is bent upwards. Alternatively if the bow is say canted up and you keep aiming at the same mark then the bow angle has to be continuously reduced as you walk backwards. In practice, over the short distances involved in a walk back, the bow being canted up (or down) will make little difference.

As an aside, unless you are doing a walk back with bare shaft arrows which naturally fly in a curve (see the section on bare shaft arrows), it is physically impossible to get a concave arrow pattern i.e. one that bends in towards the baseline. You sometimes see write ups on walk back tuning illustrating this pattern (the reason being of course that no consideration is given to the baseline, only to the first arrow hit).



Having got the correct set up for a walk back arrow pattern it can now be used for basic bow tuning. The method is pretty much the same as bare shaft tuning of the pressure button. The difference is that instead of using a bare shaft arrow to 'point' towards the position of the baseline, you know where the baseline is. Because a bare shaft arrow behaves differently to a fletched shaft both on the bow and through the air the walk back approach is a more reliable tuning method. If the walk back arrow pattern moves away from the baseline and then curves back towards it, the shooting distance which gives the maximum horizontal displacement of the group from the baseline is the most sensitive distance with respect to tuning. The actual tuning approach is much the same. With a sensible button position if the group pattern starts off going to the right of the baseline then (RH archer) increase the spring tension and vice versa.

A variant of walk back tuning is to shoot arrows at different distances and look at the sizes of the arrow groups at each distance. Arrow groups result from the variation in how the archer shoots. One way the archer's shot varies is in how much rotation the arrow has leaving the bow which gives rise to fishtailing. The effect of fishtailing is that the group size varies in area with distance in an oscillatory fashion. For an archer of given ability the variation with distance depends on the rotational properties of the arrow e.g. its weight, FOC, fletching area etc.



The chart illustrates the variation in the area of the arrow group with distance for a blue arrow and a red arrow. In this example the only difference between the two arrows is the FOC value. For the blue arrow the group size is a minimum for the blue target distance. If the target is nearer or further away then the arrow group size will

be larger. The same effect happens with the red arrow with respect to the red target. The point is that because the characteristics of the two arrows are different the optimum target distance with respect to arrow group size is different. This raises the possibility of 'arrow tuning' i.e. selecting/designing an arrow with good characteristics for the specific distance and fine tuning the arrow by e.g. changing the pile weight or fletching size to minimize the groups at that distance. The arrow flight profiles above represent the worst shot arrows. The better shot arrows will have less rotation and the optimum distance re group size will be further than for the worst case. The better arrows will however always be inside the worst arrow envelop.