



RECURVE BOW TUNING Blank Shaft Method

THE RECOMMENDED METHOD

Archery Australia Inc
Coaching and Standards Committee

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INTRODUCTION

Setting up and tuning your equipment is a vital part of archery although the outcomes related to tuning your equipment are directly related to your shooting technique and skill.

Tuning should be a quick and relatively easy process if you follow a few simple steps. This method has been used for many years and is very simple and straight forward having clearly defined steps.

In the promotional tuning material of Easton Aluminium they detail a combination of the methods, and elements of the method described below and also a method that requires adjustment to the plunger button spring tension.

The method that requires the adjustment of the plunger button spring tension may work but history has shown results can be hit and miss and does not allow you to accurately set your centreshot or determine your correct arrow size.

The method described below relies on you setting and forgetting the spring tension in your plunger button and then making adjustments to your bow draw weight as required. The method also allows you to accurately set your centreshot.

If you are using a bow that does not allow you the facility to adjust your draw weight then you may need to use the alternative method described by Easton Aluminium in their promotional material.

Bow Set Up

It is very important no matter what tuning method you use, that the bow is set-up correctly with all accessories and components correctly installed.

In detailing this tuning method or any tuning method the assumption is that the bow has been set up correctly, for example :

- Ensure the correct string length is being used, this ensures the correct amount of string is sitting around the recurve on each limb and the brace height is within manufacturers specifications.
- If the bow has adjustable tiller/bow weight set the bow weight to mid location and set the tiller, making the top tiller about 1/8" greater than the bottom tiller.
- Attach nocking points to the string (top and bottom), ensure you can easily adjust the nocking points during the tuning process. Initially set the nocking point about 1/8" above square, the difference of the limb tiller.
- If the bow has the ability to make side to side adjustments with the limbs then you need to align the limbs. The limbs should be aligned and set up with the string running centrally down the limbs and the riser. The rise should be square to the string and not twisted off to one side.

For consistency you should be using a bow sight and clicker, this also applies to Barebow archers.

ARROWS

Select the arrows you plan to shoot, you must choose carefully to ensure you are using the correct size arrow for your bow weight and arrow length. To do this, weigh the bow, measure your arrow length and consult the manufacturers arrow chart. Never guess your bow weight, ensure you know the exact bow weight you are using.

HOW ARROWS LEAVE A BOW

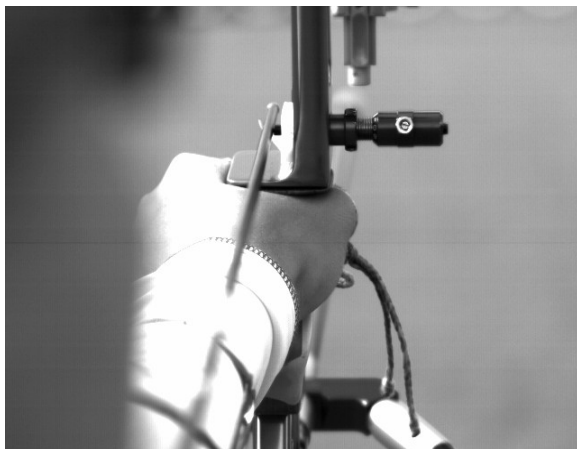
Arrows vibrate (flex) as they are shot; this is normal reaction and is very important to allow an arrow to pass the bow without interference. This degree of flexing may be increased depending upon the ability of the archer and the quality of their release.

Arrows vibrate at about 50 vibrations (cycles) a second and an arrow takes about 20 one thousandths of a second to leave the bow. What you are attempting to do when selecting the correct arrow size and then tune an arrow is to ensure the arrow takes one vibration cycle to go from anchor to the point where it passes the bow. If an arrow takes more or less then a single cycle the tail of the arrow will strike the bow or arrow rest as it passes.

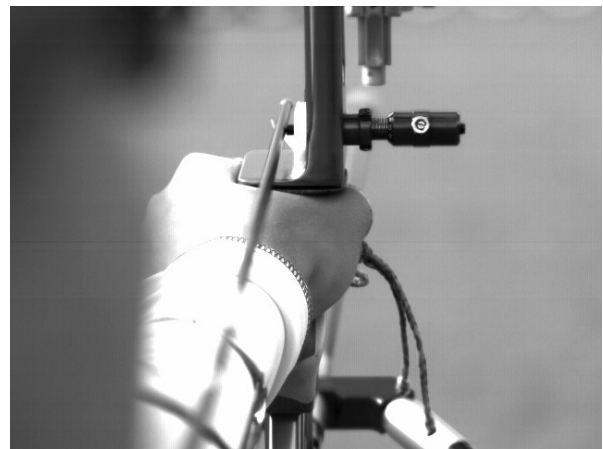
This vibration cycle is important as it allows the tail of the arrow to pass the bow without touching or interfering with the rest, creating clearance problems. It should also be noted that the flexing (vibration) continues in the arrow as it moves down range and hits the target, it does not stop flexing after it leaves the bow, as commonly thought.

Many people believe when you tune a bow you are attempting to remove this flexing action from the arrow, this is not correct as it is desirable to have the arrow flex to give clearance.

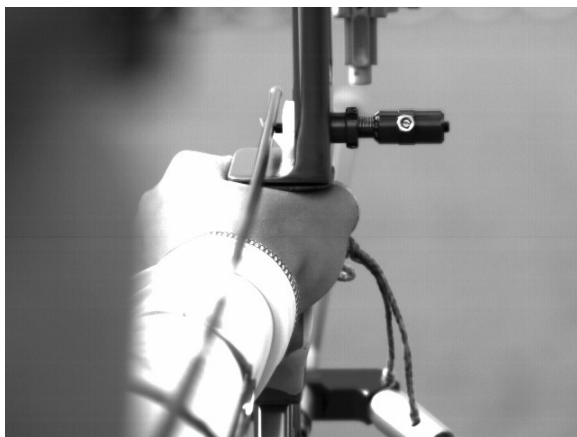
Below is a series of still photos from a slow motion video that clearly demonstrates this flexing cycle.



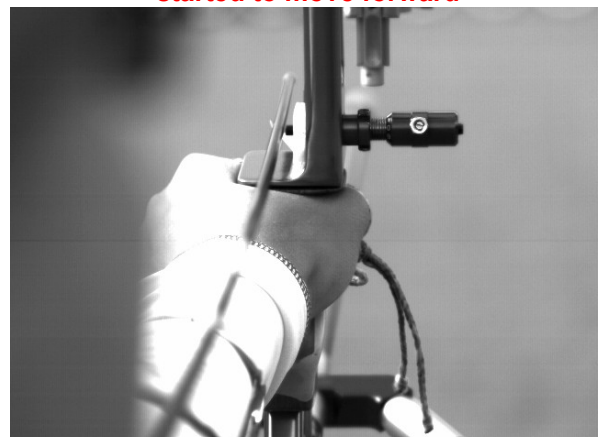
Full Draw



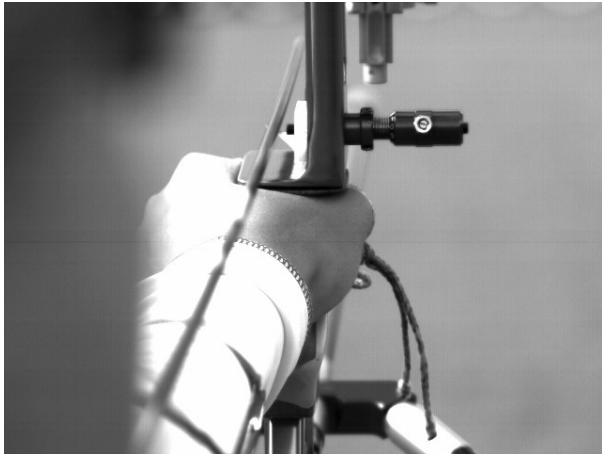
Release – initial flex of arrow and arrow has started to move forward



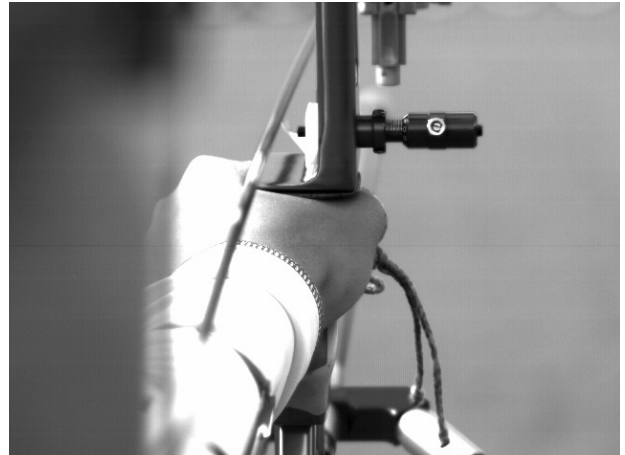
Arrow pushes against Plunger, moving plunger in about .5 mm



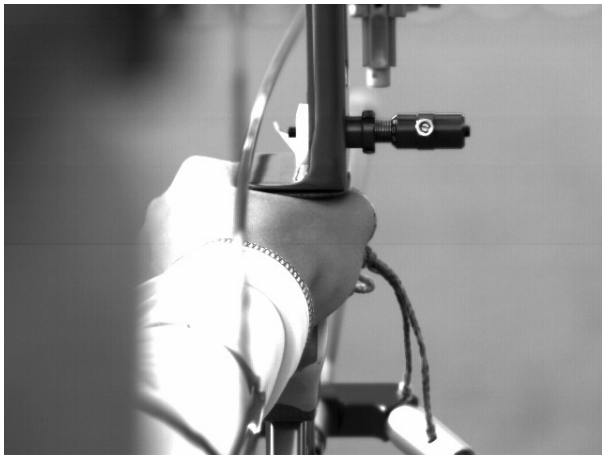
Arrow has started to move away from Plunger



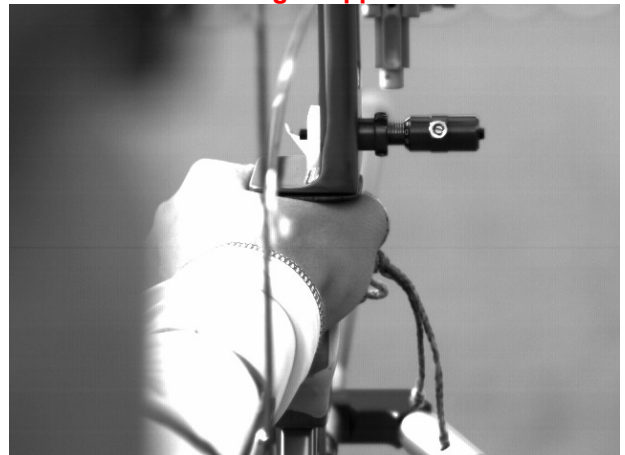
Arrow begins to straighten



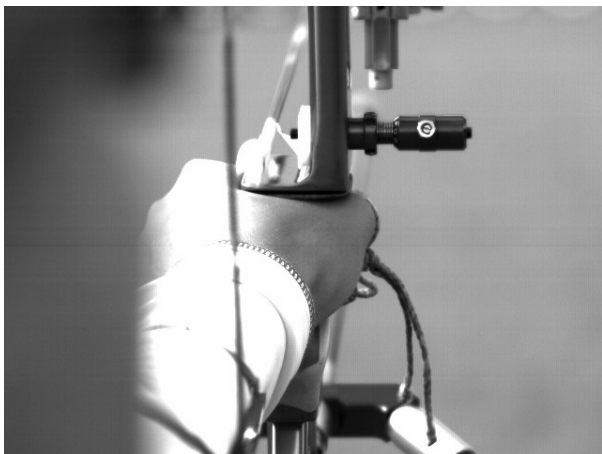
Arrow now flexing in opposite direction



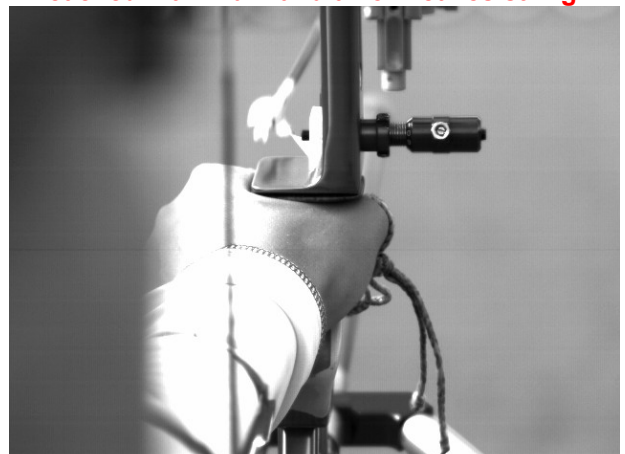
Opposite flex increases



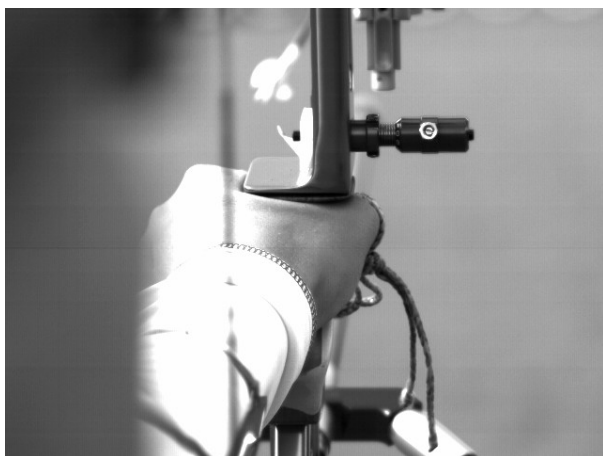
String has reached brace height, flex has reached maximum and arrow leaves string



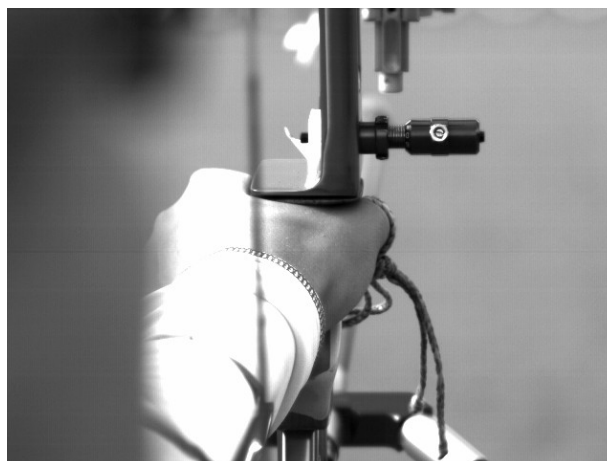
Arrows tail approaches the bow handle and arrow rest



Arrow passes arrow rest without contact



Arrow leaves bow



Arrow commences next flexing cycle

Slow motion video by Lloyd Brown and photos by Jim Larven.

From the images above you will note the arrow has almost no contact with the plunger button upon release.

Just after release and about 20 mm to 30 mm into the forward travel of the arrow, the arrow pushes against the plunger, usually the arrow moves the plunger about .5 mm although this amount may be increased for the less experienced archers who's release may not be that good.

This pushing against the plunger lasts for about 30 mm to 40 mm of the arrows travel and then the arrow moves away from the plunger and rest as the flexing action increases, they arrow does not come into contact with the plunger or rest again as it leaves the bow, unless the tuning is not correct and the tail of the arrow strikes the rest or plunger, which is not a desirable outcome.

People spend a lot of money on very expensive plungers to get a smooth long action but given there is only about .5 mm and up to .75 mm to 1 mm of travel for the lease experienced archer why is a plunger with a long smooth action necessary.

The reason we use a plunger needs to be understood: at the arrow starts to move forward the point of the arrow must be in centreshot, that is the arrow is in the true centre of the bow.

As the arrow wants to initially push against the side of the bow as the start of the flexing action if the arrow is set up in centreshot the arrow will start to move forward inside centreshot.

The arrow must be in centreshot to ensure it is travelling in a straight line at all distances, if the arrow leaves the bow either in or outside of centreshot shot it will not travel in a straight line to the target and you will get left to right sight positions at different distances.

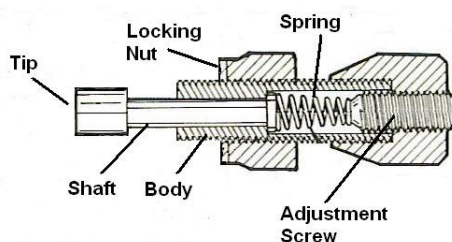
This is why the arrow is set up somewhere between half an arrow to a full arrow width outside of centreshot. As the arrow initially pushes against the plunger the arrow moves into centreshot for its travel past the bow.

The amount of centreshot you need to set up the arrow depends on the ability of the archer. Experienced archers set up centreshot about half an arrow, while the less experience archer about a full arrow outside of centreshot. The release of the less experienced archer usually causes the arrow to flex more pushing more against the plunger, hence the need to extra centreshot.

The spring tension should be set about mid tension although for the more experienced archer it may be necessary to set much stiffer.

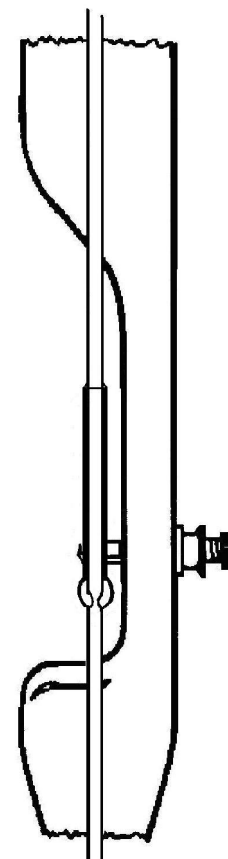
TUNING PROCESS

1. We firstly need to make the plunger button rigid (no spring movement). Disassemble the plunger button (ideally use a spare button for this) and remove the string and replace with a piece of wire or wood (a match stick).

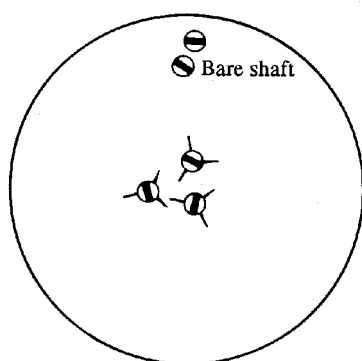


2. Now reassemble the plunger and install in the riser and adjust so the arrow is sitting exactly in centreshot, the plunger should have no spring movement.
3. Now shoot a number (2 or 3) fletched arrows and a number (2 or 3) unfletched arrows at about 15-20 metres.
4. Firstly you are checking your nocking point position; adjust the nocking point so the fletched and unfletched arrows hit the same height.

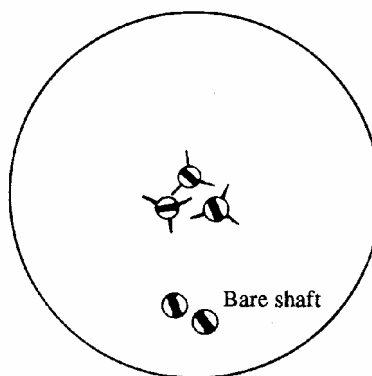
If the unfletched arrows are hitting high this indicates the nocking points are low and must be raised; alternatively if the unfletched arrows hitting low this indicated the nocking points are high and must be lowered.



Arrow set up in centreshot



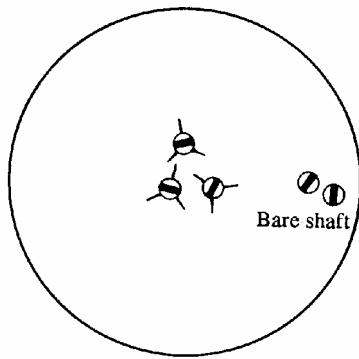
Move nocking point up



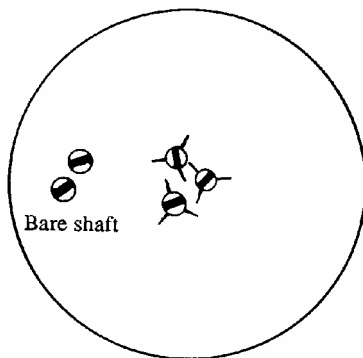
Move nocking point down

5. The unfletched arrows may also be landing to one side of the group of fletched arrows.

You want to have the fletched and unfletched arrows land together. To adjust the position of the unfletched arrows, adjust the bow's draw weight increasing or decreasing the bow weight until the unfletched arrows land with the fletched arrows.



Indicates soft spine arrow decrease bow weight



Indicates stiff spine arrow increase bow weight

Note - Adjustments suggested above are for a right hand archer, so adjustments should be reversed for a left hand archer

It should be noted, if the arrows are not the correct size you can never achieve this step, and there will be little you can do to fix it other than sell the arrows and buy new ones - with a recurve bow you must have the correct arrow size, one size wrong will not tune correctly even with much frustrating tinkering.

If the bow draw weight will not go high enough you can try using a lighter string. If the bow draw weight will not go low enough you can try using a heavier string.

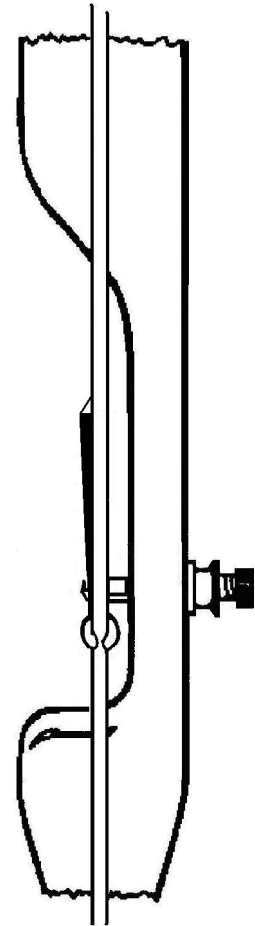
6. Now with the solid pressure button, shoot a number of arrows at say 20 metres and adjust your sight so that you are grouping around the centre of the target.
7. Without changing the sight setting, replace the plunger button (or remove the wire or match from the pressure button and replace the spring) adjust the spring tension to about a mid setting.
8. You now need to install the plunger but now adjust the plunger so the arrow is positioned about $\frac{1}{2}$ an arrow width outside of true centreshot. The assumption here is upon release there will be some side pressure of the arrow on the plunger and this will bring the arrow into centreshot.

9. Now shoot some arrows and see where the centre of the group is in relationship to the centre of the target. If the arrows group to the left then move the pressure button position bringing it in to the right (into the bow), until the arrows land in the center of the target.

Alternately if the arrows group to the right, move the plunger button to the left (out from the bow) until the arrows land in the center of the target.

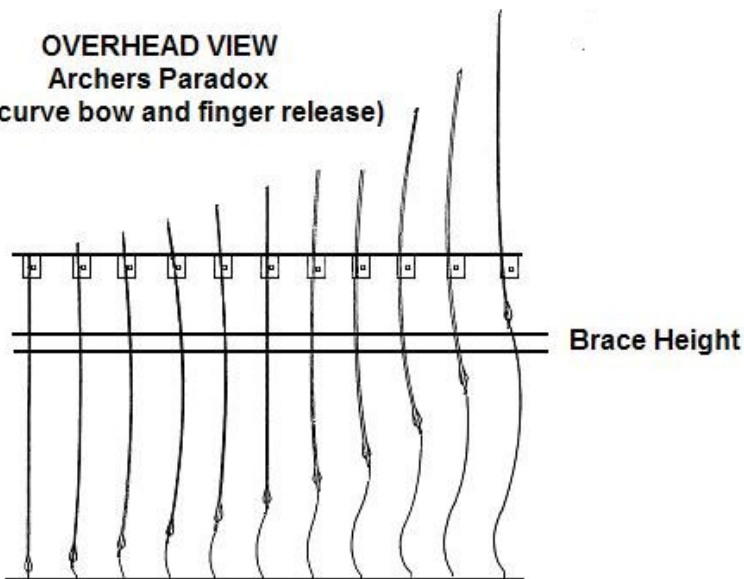
This is now the correct position for the plunger and allows the arrow to be in centreshot as it pushes sideways on the plunger during release.

Slow motion video shows that the arrow is only in contact with the plunger for about 30 mm to 40 mm of the initial forward movement following release, the arrow then moves away from the plunger as it moves forward and commences the oscillation cycle past the bow (Archer's Paradox).



Arrow set up 1/2 arrow outside of centreshot

**OVERHEAD VIEW
Archers Paradox
(Recurve bow and finger release)**



10. The final step is to shoot some fletched arrows at a longer distance (50 m) and check that they appear to be flying well.

NOTE

If you are not getting the results you require then you can "Powder Test" to ensure that the rear of the arrow is not striking the rest or pressure button.

To do this purchase from a chemist or supermarket a spray can of powder foot spray. Spray

the powder on the rear of the arrow and around the arrow rest and plunger, allow the powder to dry and shoot a test arrow. If there is any contact of the arrow, fletch or nock with the rest, plunger or riser you will see a strike mark.

This may indicate the wrong size arrow or you may need to change the position of your fletches on the arrow as the arrow moves forward. The easiest way to do this is to rotate the nock of the arrow maybe a ¼ turn which changes the fletch position as the arrow passes the bow.

REMEMBER

This method does not require any adjustment or fiddling with the spring tension to try to get the fletched and unfletched arrows to group together. If you do this you are only compromising trying to get the wrong size arrows to shoot with some degree of efficiency but in truth it does not work like that. The key adjustment with this method is changing the bow's draw weight.

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Written and images by Jim Larven

Tuning method originally developed by Dick Tone

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