

Another (yet) Tuning Technique

TexARC's Titration Adjustment (TATA) (pronounced tah-tah) or "How to find your bow's sweet spot"

A very big part of shooting well for beginning and intermediate archers is the "tune" of the bow. For the top expert archers, I suspect they can put some twine on a broom stick and still shoot 1300. But for the rest of the archers it's important that their "kit" help and not hinder their efforts.

I've come to the conclusion that there is no perfect way to tune a recurve bow. After four years of trying to find the best mix of tuning methods for a recurve bow and my JOAD archer, I've found some small hybridizations work best for us. One of the biggest quandaries for me to figure out was the plunger, aka "button", or "cushion plunger". It is very confusing to try and figure out how to use it in the right way. Most tuning guides just start by "setting it to medium". Medium what?

A couple of quick definitions: "Plunger" is a device that absorbs some of the arrow's flexing at the moment of acceleration, so that the arrow doesn't bounce hard right and then left. It cushions the flex so the arrow doesn't wobble as much in the early phase of flight. That in turn makes the arrows tend to fly more consistently towards a common point ALL OTHER THINGS BEING EQUAL. "Tuning" a bow is the process of trying to set each of the parts of a bow, including the archer, to a place where they work more or less equal - in harmony. But that's the rub - "more" or "less"! And by the way, "titrate" is to make small, incremental changes all the while watching for reactions to the change. That's the best way to tune a bow, in small steps...

As a complete newbie just a few years back, I had the mistaken notion that all one had to do was set the hardware up perfectly without the archer, and the tune would be done. Not so! The archer is the most important part of the "arrow delivery system", and you cannot expect to tune a bow up and get wonderful results unless the archer is involved in the process and is indeed PART of the tune. And as the archer gets better/changes, so changes the tune.

My goal is to get a tune that lets the archer shoot at her longest distance, and in the course of moving from say, 70 meters to 60 to 50 to 30 meters, to NEVER have to adjust the plunger nor the sight from left-right in order to hit gold, just up-down. It can be done! I've seen archers that keep several aperture/mounts in their quiver, and each one is set to a particular distance - when the distance changes, they swap apertures in order to compensate for the arrow moving left or right - that's not a good tune in my book, but if it works for you and that's what you like, skip the rest of this article. This article tries to help you find the "sweet spot" for your bow.

I've relied on [Tuning For Tens Acrobat file](#) and it's hard to go wrong with it, from basic to advanced techniques. (CAUTION: clicking on this link will get you a large acrobat file of around 1 meg in size). If you don't have a copy of TFT then you need one - it's free courtesy of Rick Stonebraker of the TSAA.

I decided I wanted a more precise way to select the plunger tension setting with some more confidence so after following the first steps in TFT, when it came time to go from stiff plunger to spring-loaded plunger, I decided to try something different. The problem for me has always been that Beiter includes three different strengths of spring in the package with their plunger, and until recently I didn't really understand when to use which one and why. I now think that the three different springs are included because there is a wide range of bow weights used by archers, and one spring will be "best" of the three depending on the spine of the arrow and the weight of the bow. But how do you know which one is the one for you?

For best results I think you/your archer should be able to shoot consistent and reliable groups. You can still do this technique without shooting really good groups, but your results just won't be as precise. I suggest you do it first with the weakest spring, then the middle spring, and then the heaviest spring, to determine which spring gives you the best, widest range of adjustability. One spring will give you a small window of adjustability, another will give you a bigger window, and the third will probably NOT give you any complete window of adjustability. Trial and error will tell you which will do which for your poundage and technique. If you get tired and start getting sloppy releases and poor consistency, then STOP and pick it up again after you've rested. No need to rush through this.

REMEMBER: Like everything else in archery, there is no one "right" way to tune your recurve bow, there are numerous right ways. You may want to try this one, and see if you like the results. And while everyone wants to have the perfect spine shaft for their kit, it is rare that you will. So you have to adapt.

Order of tune for outdoor season: generally each item listed below affects the items on the list below it. IOW, set one item and then changing it causes a ripple effect on other items.

1. **sight bar** - make sure the vertical bar holding the aperture is perfectly parallel to the bowstring by flipping the sight 180 degrees so that the aperture is close to your bowstring and adjust accordingly.
2. **arrow rest** - arrow should touch the plunger in the center of the plunger rod.
3. **brace height** - many use the sound of the shot to adjust this. Sound is a symptom of energy - bad sound is possibly wasted energy. Change a part of the bow, i.e. stabilizer, and the sound changes. So make the sound pleasing.
4. **poundage** - Most archers don't consider that they can make small adjustments to the weight of draw to improve cast or to get a better dynamic arrow spine/stiffness. They should.
5. **arrow length and tip weight** - you want as long of an arrow as you can deal with, but you retain the ability to stiffen the shaft by cutting a little off if need be, as long as it was long enough to begin with. Remember that on average the best 2000 Sydney Olympic archery scores were with slightly stiff arrows.
6. **sight extension** - I think it is best to have the aperture as far away as possible and still reach the top of the target. Before you fine tune the other items below, you need to assure yourself that you can reach your furthest distance with your bow "as is". This is a test for #3 as well. Accuracy isn't important at this point - cast is. Simply put, can your bow reach far enough? If not, pull the aperture in towards your eye till you can safely reach the top of the target with your arrows when you aim at the gold. Remember that recurve aiming has to be a subconscious effort more than an active thoughtful attempt, so you want to have the aperture extension where it suits your mind's eye.
7. **nocking point height - see Tuning for Tens**
8. **sight lateral adjustment = ditto**
9. **centershot - ditto ditto** and this article
10. **plunger tension** - see this article
11. **The archer** - as your technique improves, you will/may alter the tune of the bow substantially. Be prepared to re-tune as needed. See: Archery Anatomy, Golf Is Not A Game of Perfect, The Simple Art of Winning.

In short, you will use this to insure your centershot is right and the plunger spring tension is in the middle of it's effective range.

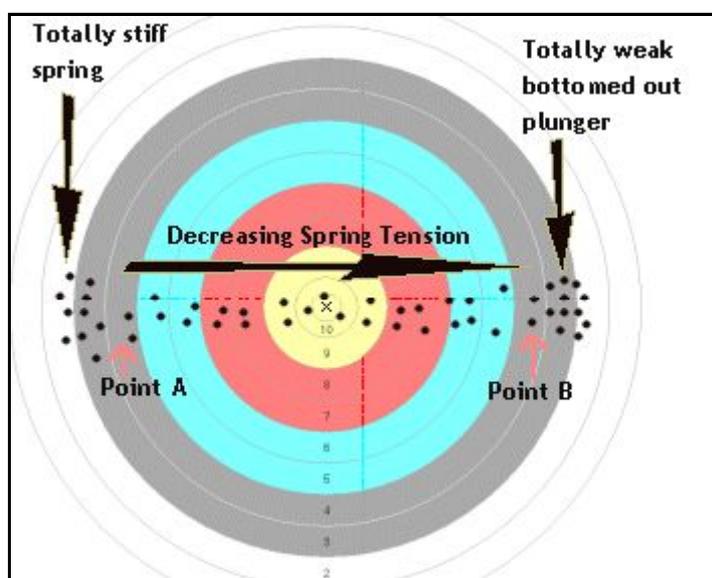
This assumes you have used [Tuning For Tens](#) by Rick Stonebraker to set the nock height, sight, and center shot using the stiff matchstick technique. I'm writing this from the right-hand archer's perspective, so if you are a left-hand archer (you pull the bowstring with your LEFT hand), then switch the words "left" and "right" in the text below. This also assumes you have verified that the vertical bar holding your sight's aperture is perfectly parallel to the string of your bow, and that the limbs are "true" and not warped or improperly seated in the riser. Nocking height should be perfect to insure good clearance and maximum thrust through the arrow's vertical center.

Start with whichever thickness spring you want in the plunger. Screw the plunger down (Clockwise) to maximum tension, which on the Beiter means that it is totally stiff just like it was with the matchstick.

Now shoot two or five arrows, and if you have a good group, you're ready to start. Back off a full revolution on the plunger's tension by turning it counter-clockwise (CCW) and shoot again. The arrow will likely stay in the group, and it will be on the LEFT side of the target.

Repeat the CCW revolution and shoot one or two arrows, repeat the CCW revolution, shoot, repeat, tracking your arrow's impacts and the number of turns. I usually ignore the numbers on the cylinder and focus on the "o'clock" position of the lockdown nut.

Eventually two arrows move noticeably to the right. (Point A in the diagram) You are "fishing" for just the right place in the revolutions where the spring's tension begins to be soft enough to influence where the arrow impacts the target. When they start to move, make a note of how many turns were needed to get to this point. This is your hardest/stiffest position, your starting point, Point A in the diagram. You now have the point of beginning influence of the plunger for this spring and it's time to find the range of adjustability for this particular spring you are using.



Now you will titrate for the (assuming you are right-handed) right-most point for the spring at its weakest setting.

Continue to back off the plunger spring one CCW revolution at a time, shoot a couple of arrows, repeat, and watch the arrows slowly migrate from left to right across the target as the spring tension weakens.

At some point the arrows will quit migrating because the plunger is bottoming out and the shaft of the arrow is hitting the body of the plunger. You've now gone PAST the softest point, the plunger is bottoming out because the spring is too soft, and you need to slowly stiffen it back till the arrows begin to move BACK to the LEFT again (Point B in diagram). Use 1/4 turns CW so that you don't move too far back in

one single adjustment.

Let's say that you find it took 4 revolutions from totally stiff to point A and it takes 6 revolutions from Point A to Point B on the target, a total of 10 turns to get to point B. Put the plunger in the MIDDLE of this range, say, 5 revolutions from the totally stiffed point. This gives you the "center" or "mid" point of spring tension and SHOULD put you in the middle of the range on the target, i.e., the cute little X ring. If your centershot is set right, you are now in the sweet spot.

As in the diagrammed example above: When the spring is totally stiff the arrows group in the 3 to 4 ring at 9 o'clock. When you've unscrewed the plunger spring tension to the point that the arrows STOP migrating and start bunching into a new group in the 3- to 4 ring at 3 o'clock, then the arrows are evenly distributed to both sides of the X and you know now that you have the center-shot just right, and if you divide the revolutions of the plunger by 2 and put the plunger there, your arrows will be in the xring and so your basic plunger tune *for this distance* is good.

"Hey!", you say - "my arrows don't look like the above picture!" At this stage, if you shoot a group of arrows, and the entire range is NOT evenly balanced in the middle of the target or if you look at your arrow distribution and it goes from say, 2 ring at 9 o'clock to 8 ring at 3 o'clock, you need to make a TINY adjustment in your plunger's depth (to change the "center shot") so that the center of the spread of arrows is over the x ring. In such a case you would unscrew the plunger BODY (not the plunger button) so that the arrow tip moves further to the right while on the arrow rest. By the way, during this process you do NOT adjust your sight left/right as this will defeat your tuning efforts.

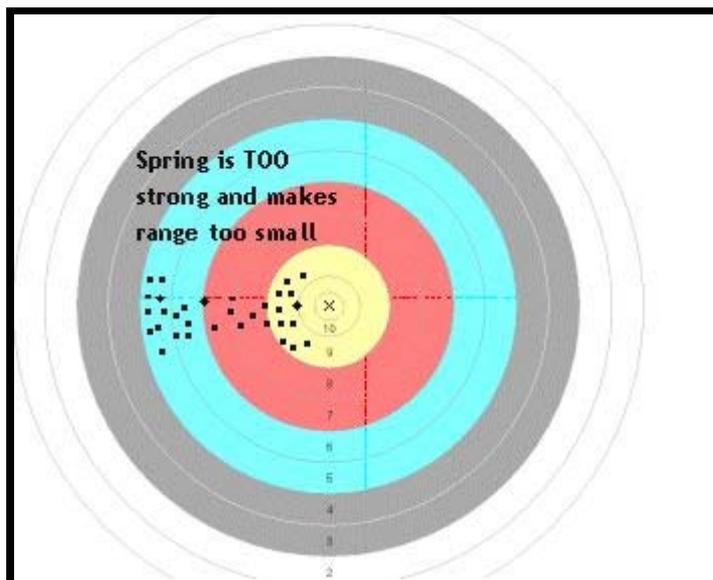
Now, change the spring out for a different spring size, and again screw it down so the button doesn't give at

all, and start shooting again, backing the plunger spring tension off bit by bit till the arrows again start their migration.

You will find that one spring will give you a much bigger range of "play" or number of revolutions from the left Point "A" to the right point "B". That is, it will have more revolutions for the range than the other spring will. I think that you want to choose the spring with the widest latitude of adjustment so that you can make finer adjustments without throwing the arrows off a huge amount to one side or the other.

Now shoot at 30 meters and record the group. NOT THE SCORE, but rather the group.

In other words, you are interested in tracking where each arrow arrives on the target. A tool like Target Plot is IDEAL for this, or else use a fresh paper target for each group you shoot. Add a couple of clicks back on to the spring tension (KEEP TRACK OF HOW MUCH AND IN WHICH DIRECTION), shoot another end of arrows and again record the group appearance. Do this at least twice, always keeping track of both how many clicks' adjustment and what the group looks like. Some clever folks will use a paper plate, and write on each one the adjustment and distance, and then compare plates to see what gave the best groupings.



Then put the plunger back to the midpoint, and go in the other direction using the same technique. The groups should demonstrate some sort of trend that is a function of the spring tension, with the groups either tightening up or loosening up. Pick the best group.

You should repeat the process at your furthest distance in order to verify you have set the centershot properly. If your centershot is not "right" then the "best point" at the short distance will not be the "best point" at the long distance. This is similar to the "walk-back" or "drop" test, but I suspect that this technique gives you a more precise setup. If you get this right, you will nail the walk-back test.

Done right, a proper tune should enable you to go from 90 meters to 30 meters and back without a huge change in your sight settings' lateral adjustment. In other words, you will not have to adjust the sight in the sideways direction (nor the plunger) to stay in the gold. Of course, you will make vertical adjustments. I'm always interested in feedback and enhancing things - if you find something doesn't work for you or another way works better, let me know at webmaster@texasarchery.org

For insurance, once you find the ideal setting on the plunger, carefully screw the tension of the plunger DOWN until it can't go any further, precisely counting along the way **exactly** the number of revolutions so you can put it back to this best point easily in case it gets moved accidentally (or someone plays a practical joke on you). WRITE THIS NUMBER DOWN so you can easily put it right back where it needs to be. I've heard horror stories of someone in a big international shoot leaving their bow for a minute to go to the can, and when they get back their arrows are suddenly hitting way off. hmmm...knowing where your plunger should be set would allow for quick recovery from such a "joke".

Good luck and may your arrows always tune easy.

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