

Powder and Paper Testing

FACTS MA'AM, JUST THE FACTS! That's a great line from Dragnet's Joe Friday, remember him? But that's just what bow tuning needs if you're going to make a difference for your customers. So here's what to do to get the facts and how to use the information when you get it.

Facts about arrow flight as the arrow passes the bow handle and arrow rests are essential if you want the best flight and groups possible. If you're a dealer, you must have an effective method for collecting and showing facts about arrow flight if you expect your customers to believe in what you're doing for them.

In order to improve flight you must first identify the flight problems and that means powder testing and paper testing arrow flight so that makes building a powder and paper testing station in your shop essential to your business. Even if you don't help them you should at least provide a place for them to do it in order to keep them coming back. A picture frame, newspaper, can of white-powder spray and some test arrows

HOW TO POWDER TEST
NOCK ROTATIONS
REPOSITION REST PARTS
NOCKING POINT
SIDE TENSION
BOTTOM TENSION
NOCK FIT
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SAMPLE HOLES
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ADJUSTMENTS FOR LEFT/RIGHT

are all that you need to get started.

Powder and paper tests tell you exactly what the arrow is doing as it passes the arrow rest and travels the first eight yards down range. With

this knowledge you can make tension adjustments to your arrow rest, adjust nock fit, nocking point and alter the center-shot location of your rest just to name a few.

POWDER TEST:

The powder test is best done using an aerosol can of white-powder foot spray; make sure it's powder and not the clear liquid spray. Spray powder on the last six or eight inches of the fletched end of the arrow (photo below left) and shoot the arrow into a relatively dense back-stop. Next, check the fletching for contact marks because these marks come from contact with the arrow rest, sight window of the bow or even the cables.

Since this contact disturbs arrow flight you must take steps to elimi-



To make the powder test effective use a common athlete's foot spray on the fletched end of the shaft. Before you buy it be sure that it is the "powder" type and not a clear liquid so that any contact marks can be easily seen.



The contact marks of the arrow rest are seen on the bottom vane of the lower arrow. The launcher of the arrow rest has made a long mark on the shaft. Near the vane it leaves the shaft but marks a streak along the vane that must be eliminated for good arrow flight. The top arrow is free from any fletch contact with the only difference being a simple nock rotation.



Rotating the nock can eliminate vane contact with the arrow rest. The nock on the left is set for a launcher-style rest and would allow the bottom vanes to pass on either side of the launcher blade. The center nock is set for a shoot-through style arrow rest while the nock on the right is set for a two-prong style rest allowing the bottom vane to pass between the two prongs. All of these will work for the surround-style rest where all of the vanes pass through bristles.

The top-left arrow rest by NAP is a shoot-through style requiring the bottom-right vane to pass between the side-plate and the bottom-plate. The top-right arrow rest is the Millennium single launcher – this is the most commonly used target rest. The bottom arrow rest is the QAD Ultra drop-away rest that does not require any specific nock rotation but all of your arrows should still be set the same.

nate it or dampen it as much as possible. As long as this contact exists you can't proceed with other tuning steps because of the likelihood of false indicators created by the contact.

ADJUSTING NOCK ROTATION: You can often eliminate contact between the arrow rest and the fletching (see photo previous page) by rotating nocks to reposition the fletching. Rotate one nock and retest with powder to note improvement or lack thereof. When you get clear flight, set all arrow nocks to match the test arrow.

Some common nock positions are shown in the photo at the top of this column. All of these should work for a drop-away style rest.

ADJUSTING THE ARROW REST:

If nock rotation doesn't eliminate the contact then examine the arrow rest. Many rests can be repositioned to allow more space for the fletching as it passes through or over it. Twin launcher prongs can be spaced further apart to allow more room for the bottom fletch but not more than 2/3 as wide as the arrow shaft. The launcher/plunger rest can be spread apart also as long as some of the launcher is always under the middle of the shaft.

TUNING ADJUSTMENTS: Occasionally, some simple adjustments can correct fletch contact. Raising the nocking point can eliminate contact on the bottom fletch while changing the tension on the cushion plunger or side spring will help eliminate contact with the sight window and cushion plunger.

When a launcher is too weak the arrow tends to ride low across it allowing the bottom fletch to strike it on the way by. Using a stiffer launcher can help raise the fletched end of the arrow and eliminate contact. This will also help tighten arrow groups that have been vertical in shape.

Some popular rests surround the arrow with bristles. These bristles hold the hunter's arrow in place at all times and guide the arrow through the rest but don't give clear results with a powder test. You may give the powder a try looking for equal con-

tact all around the fletched end of the shaft but this is often difficult to ascertain.

POWDER TESTING THE DROP-AWAY REST: Shooting a drop-away rest requires some extra powder testing. The front-end of the arrow shaft should contact the rest for only about three or four inches before the rest falls away from under the shaft. About the only way to check this is with a high-speed camera. We've done this at one of my shooting schools at Lancaster Archery with their camera and obtained some very interesting results – so many bow and rest parts move, bounce and shake that it was a real eye opener.

Sometimes the drop-away rest can fall down and then bounce up making contact with the shaft or fletching near the back of the shaft. To check for this you have to spray powder on both the rest and shaft and look for contact. To combat the bounce-up you may have to place a rubber dampener device under the rest or raise the rest location upward to allow it to drop further downward and well below the passing arrow shaft.

The high-speed video showed arrows launching with a low nock whose fletching contacted the fallen

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rest. Some of these arrows bounced upward causing a nock-high paper test. Talk about confusing! You can uncover this problem by powder testing the fletching and the rest to find that the rest is being struck by the fletching as it passes over the fallen rest. The solution is simple, raise the nocking point – the opposite of what the paper test indicated.

ADJUSTING NOCK FIT: Nocks that fit too tight tend to act stiff as they leave the bow. In other words, they leave nock-right for right-handers and sometimes strike the sight window or arrow rest. Nocks that are too loose may leave nock-left or nock low and result in fletch contact with the arrow rest.

To get the proper fit you may have to change strings and/or center serving. When the fit is correct you can easily pull the nock from the string with index finger and thumb and the nock should slide, but not too easily, up and down the string when pushed. Paying attention to this detail will improve groups and flight greatly just because contact has been eliminated.

ADJUSTING THE ARROW SIZE: If none of the simple adjustments work then you'll have to get radical and change the arrow and fletching combination. The easiest to change is the fletching angle. Contact may be due to the angle of the fletching on the shaft and reducing it slightly may help eliminate contact. Don't put it on straight down the shaft since some angle is necessary to stabilize the arrow, especially when shooting broadheads.

The very last resort is to change arrow sizes. Stiff and/or weak arrows won't clear the rest as well as an arrow whose spine is matched to the draw weight and arrow rest. As a shop owner you should have a selection of arrows on hand for customer testing so you can quickly sort out which size shoots and clears best.

ADJUSTING SHOOTING FORM: Some archers have form flaws that cause bad arrow flight. Before you can correct arrow flight you have to

do a little form coaching to improve bow-hand placement to prevent handle torque. Finger placement, if they shoot with fingers, must be corrected to prevent twisting the string to the side at full draw.

The most significant flaw is centered in the archer's bow hand placement. Fully 95 percent of the archers that attend my shooting schools or come for private coaching do not have correct bow hand placement. They, instead, grip the bow handle in some way, fail to rotate their knuckles to a forty-five degree angle, tense their hand and fingers or do some combination of all of these. This, of course, means that during the power stroke when the arrow is crossing the arrow rest the bow handle is being torqued in some direction instead of being free from torque. This torque on the handle rotates the handle resulting in the arrow rest rotating into the fletching. (see photo above)

When these form flaws are corrected your customer is going to get more reliable test results from powder testing.

PAPER TEST:

Paper testing is the art of shooting arrows through a piece of newspaper from close range. That creates a hole in the paper that tells how the arrow was oriented in three-dimensional space as it passed through the paper. Reading this orientation and making adjustments to dampen any excessive tearing can improve arrow flight and arrow grouping by positioning the arrow's nock-end behind and in-line with the point-end.

To start paper testing, you need a picture frame or similar wooden frame about 15 x 15 inches or bigger



A properly placed and relaxed bow hand is essential for getting a consistent powder and/or paper test. Tightly gripping fingers and a bent thumb indicate that torque is being transferred to the bow handle when the bowstring is released. The bow hand shown should be a model for your customers – the fingers are relaxed and the relaxed thumb is pointing toward the target.

if you expect a lot of people to use it. Hang it three or four feet in front of your target and cover it with newspaper. You can use a roll of plain paper if it has the same density as newspaper; heavy paper can alter the arrow's flight and give false readings. Art supply stores may have newspaper or newsprint stock in economical rolls or pre-cut pads. (see photo next page)

Stand at least 3 yards away from the paper frame when shooting your arrows through the paper. I find that 5 to 8 yards gives the best readings because that is where your arrows are usually at their worst and if you get good results there you can be sure that your arrow flight is good at any distance. You should have completed all powder testing at this point and have uninhibited arrow passage since contact with the arrow rest definitely affects arrow flight and how the arrow passes through the paper.

Shoot several arrows through the paper making sure that you or your customers are using good relaxed hand position on the bow handle. Inconsistent bow hand position will drastically alter the paper test. Test at several distances back to about 8 yards before you jump to any conclusions about arrow flight.

A typical hole looks like those in



A picture frame covered with some newspaper or wrapping paper is all that is needed for paper testing. The one shown has been around for - - - well, a long time. Be sure to hang it about two yards in front of a dense backstop so the arrows pass completely through the paper but stop quickly with the powder marks undisturbed.

the photo below. Once you read the hole you then must decide on a course of corrections to improve the arrow flight.

ADJUSTING NOCKING POINT:

If the arrow holes have any high or low tearing then you must adjust the nocking point location first. If the tear is high then the fletched-end is passing through the paper higher than the point – the vanes will create paper-rips that are above and larger than the tiny rips created by the point. To correct this condition move the nocking point down the bowstring a small amount and retest.

Continue lowering the nocking point and retesting until you get good results through the paper or until the nocking point positions the

The left-hand hole shown is from my PSE MoneyMaker and shows a slight nock-right tear. To improve this stiff-acting arrow flight I will test heavier points in the same .500 spine Maxima shaft. The hole on the right is from a Mathews Apex and shows a slight nock-left and low tear. This setup needs a slightly stiffer shaft and a higher nock point.



bottom of the shaft level with the arrow rest. Generally, you don't want the nock-end setting lower than the point-end but sometimes that's what it takes to get good flight. Be careful however, as this may create contact between the fletching and the arrow rest and give false results – powder test again to be sure.

If the fletched-end rips lower through the paper, move the nocking point up the string a little and retest.

Don't knock yourself out trying to get a perfect hole. Instead, look for a hole that has crisp vane slices through the paper. Another caution, if you have to move the nocking point below level then start looking for another solution to the high knocking point indication. Sometimes a over-stiff launcher will keep the arrow tearing high through the paper and changing it to a slightly weaker one will solve the problem.

Arrow tears of less than a half-inch are good. Just be sure that the vane slices are crisp which indicates a stable arrow. Perfect holes are great if you can get them but the "proof of the pudding" is

always the groups you get in the target. Paper testing is going to help you most with eliminating arrow sizes that don't work well and getting that correct shaft closer to good arrow flight; it's not the last step in tuning.

SINGLE CAM TUNING: Arrow spine can affect the high/low ripping of the paper test for one-cam bows. My good friend Dietmar Trillus of Canada and 2007 World Target Champion instructed me that weak-spined arrow shafts out of his Mathews bow will tend to tear nock-high when paper testing. The stiffer spined shafts will tend to show a low nock tear through the paper. That's one reason why some bow setups continue to tear nock high no matter where you adjust the nocking point location – the arrow is acting weak and needs to be switched for a stiffer shaft.

Once Dietmar set me straight on this tuning indicator I was able to greatly improve my setup with my Mathews Conquest 4. Mostly I was getting a slightly left nock-low tear through the paper so I switched from 90-grain to the 108-grain points and





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immediately improved my paper test, arrow flight and arrow groupings. Remember, the bottom line is always about the groupings!

ADJUSTING FOR LEFT AND RIGHT ARROW TEARS: Correcting arrow flight for nock-right and nock-left tearing traits through the paper is more difficult than correcting for up and down. An arrow tears left or right because its spine is not properly matched to the bow system. (Remember, we already eliminated arrow rest contact.) These adjustments are numerous and don't always get results if the arrow isn't the proper spine or something major is wrong with the bow system.

I remind you again that this is not a perfect world and you should not beat your head against the wall trying to get a perfect hole. Close is



C.W. Erickson sells this tuning rack with illustrated instructions.

good especially if the vane slices through the paper are crisp and all test shots produce the same hole. A

little high-left or a little high tear, less than a half inch from 8 yards, is very acceptable and tells you that the arrows are flying well. All that remains is to shoot for groups from some distance that matches the archer's ability level.

If your customer continues to get mixed results with nock-right and nock-left then his bowhand position needs inspection and improvement. Torque on the bow handle from the bowhand can cause wide variations in how the arrow leaves the bow and until hand placement is addressed and improved the paper testing won't yield consistent results. My guess is that you'll have lots of coaching to do in the area of hand placement.

Some archers I know spend hours and hours paper testing. I use it to determine if I'm close on shaft selection. Spending a lot of time on it isn't my idea of

tuning. Group shooting tells me more and, after all, that's where good scores come from. However, paper testing is a great timesaver for the archery dealer if you use it properly.

Shoot straight, keep well.

Larry Wise

EDITOR'S NOTE: Larry's books are available from Larry Wise Archery, Rural Route #3, BOX 678, Mifflintown, PA 17059 for \$11.95 + \$1.50 S & H. Titles available are "Tuning Your Compound Bow", "Tuning and Silencing Your Bowhunting System", "Tuning and Shooting Your 3-D Bow" and "Bow and Arrow: A Complete Guide". Larry is also available to conduct one and two day CoreArchery Academies on shooting form. To contact him by email, use larry@larrywise.com. The new phone number for Larry Wise Archery is (717)436-9168. ←

Nock-left holes in paper (for right-handers) can result from weak-acting spined arrows. The corrections for weak arrows are:

- Less draw weight
- More horizontal plunger tension
- Less point weight
- Move center-shot of rest slightly left
- Stiffer (lower spine value) arrow shaft.

When your arrows are indicating "weak spine" it may take a combination of these adjustments to correct the flight but try one at a time so you can identify which one made the change and make a note for future reference. (NOTE: These same corrections apply to Nock-right holes from left hand bows.)

Nock-right holes in paper (for right-handers) can result from stiff-acting arrows. The corrections for stiffness are:

- More draw weight
- Less horizontal plunger tension
- More point weight
- Move center-shot of rest slightly right
- Weaker (higher spine value) arrow shaft.

Again, make a combination of these adjustments to correct stiff arrow flight but make them one at a time. (NOTE: These same corrections apply to Nock-left holes from left hand bows.)