

Making a Matched Set of Wood Arrows



by Jeff Challacombe

Wood arrows!!! I just love them as they have what I call character. No two are exactly the same. Each one is an individual with its own special characteristics. This is the case with most things made from a natural resource. No man made arrow material can look or feel like wood, or even come close to it.

When it comes to shooting a traditional bow, I believe you do the bow and yourself an injustice if you shoot anything but wood arrows out of it. Contrary to what a lot of people think, I believe that well made wood arrows matched to the bow that they are being shot out of, will shoot every bit as good as any arrow constructed from man made materials.

I've seen a lot of wood arrows over the years. Some were works of art and others, well, I'd best say they had a character of their own. Speaking of character, I saw a set at the Longbow Muster one year that the paint wouldn't even dry on. I'm not joking, just ask me O'I mate Col Graham as he was shooting them!!! I laugh every time I think about that.

As I said above each wood arrow has its own individual characteristics, so to make a matched set takes a considerable amount of time and effort. I feel the rewards are well worth it though. Shooting your own hand crafted arrows makes shooting a bow more personal. It adds something special to the Traditional Bowhunting experience. I really enjoy getting in my workshop and immersing myself in the task, or I should say enjoyment, of handcrafting another matched set of wood arrows.

Although I have always shot wood arrows out of my longbow, I haven't always made my arrows fancy or properly for that matter. It took me a long time, years in fact, to make arrows which I considered to be of good quality. It was in 1987 that Dave Richardson, a friend of mine from Canada, sent me an arrow that he had made. It was the most beautiful arrow I had ever seen and since then I have endeavoured to make my arrows the best I can. By the way, Dave is well known for his prowess in handcrafting wood arrows. At one Pope and Young Convention in the USA, a set of twelve of his arrows were auctioned and they sold for \$750.00.

To make your own set of matched arrows you will require a number of specialised tools. These include a Spine Tester, Tapering Tool, Fletching Jig, Grain Scales, and if you want to crest your arrows, a Cresting Machine. Each of these tools has a specific and very important job to do. Except for the Cresting Machine, I would say that it would be near impossible to make a matched set of arrows without them. You can make the Spine Tester and Cresting Machine yourself with a little effort but you will probably have to purchase the other tools.

Ordering Your Wood Shafting

The biggest problem the Traditional Bowhunter faces today, is finding a source of quality wood shafting. Port Orford Cedar has been the most common shafting material available for many years. In recent times though, sources of it have become very limited (at least here in OZ). It is still available but from what I've seen the quality of the shafts have not been good. However Whiting's Warehouse (see link) specialists in traditional equipment and carries a good range of different types of wood shafting. This means you have a choice in the weight of your finished arrows. Choose Port Orford Cedar if you want a light target arrow or use Victorian Ash if you want a heavy hunting arrow.

Wood shafting usually is available in various diameters, 5/16 inch, 11/32 inch, 23/64 inch and sometimes 3/8 inch. They usually come in spine weights that range in five pound increments, i.e. 60-65 pounds, 65-70 pounds, etc. The spine of the shaft is normally determined by measuring the amount of bend it exhibits when a two pound weight is placed in the centre of the shaft whilst it is suspended on two supports 26 inches apart.

You will have to try a number of different spine weight arrows to find which one will suit you. I mostly shoot laminated longbows of my own making and as a general rule of thumb I find it is better to have too much spine than not enough. For this reason I take my draw weight and then add ten to fifteen pounds of spine weight. For example, if I had a bow weight of 60 pounds then I would use shafts in the 70-75 pound spine range. Also if you have a long draw length, add another five pounds of spine weight for each inch of draw over 28 inches. However, when using my self bows I find arrows equal in spine to the weight bow I'm shooting to work best.

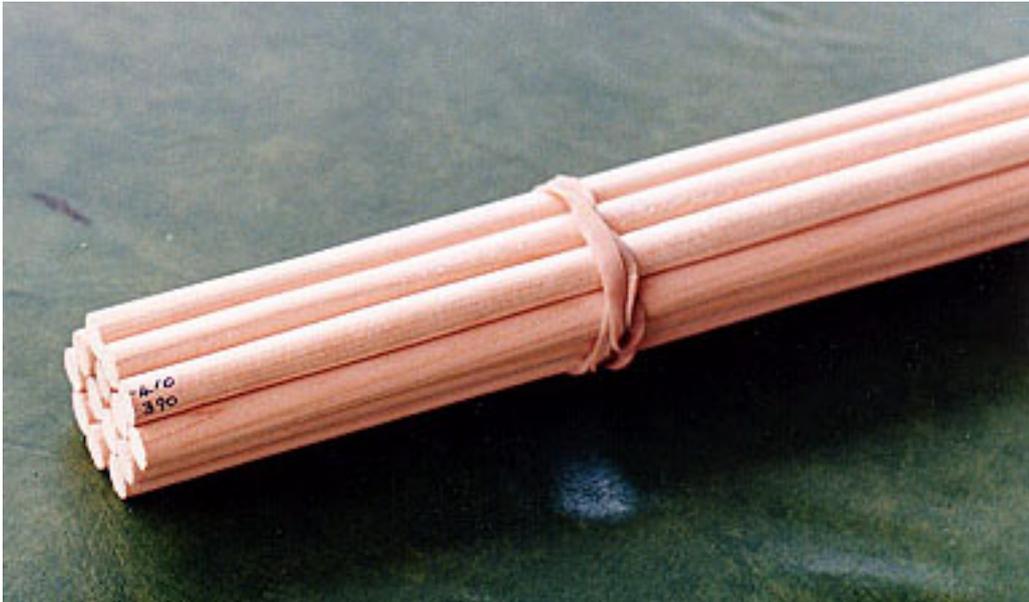
As stated above you will have to find which arrow is best suited to your shooting style when using your bow. The spine arrows that work for me may not work for you. Only by trying arrows of differing spine, weight and diameter is it possible to find what best suits your needs.

With your arrow requirements worked out you now have three options. You may purchase your arrows custom made from your preferred traditional archery dealer and negate the rest of this article. You may order your shafts already spined, weighed and graded, and skip the next three steps. Lastly you can order in bulk and do all the work yourself. Since we are dealing with making our own set of matched arrows I am going to continue as if you went with the last option.

I would suggest that you order at least a hundred shafts at a time. The reason for this is that unless you buy your shafts already graded - option two above - they are most likely going to vary greatly in both spine and weight. You may find that only half of the shafts will be matched to your preferred spine and weight.



Clockwise from bottom left: Grain Scale, Cresting Jig, Fletching Jig, Spine Tester (at rear), Feather Chopper, Tapering Tool.



Raw Shafts, with grain and spine weight marked. Note the rubber bands keeping shafts tightly secured: This helps to keep them straight over time.

Grading the Shafts

Once you have purchased your hundred shafts the fun really begins. Take one shaft at a time and inspect it for straightness, tightness of grain and faults. The grain lines should run the full length of the shaft and the closer together the better. If a grain line starts on the side of the shaft and runs across to the other (cross grained) toss it. It will be no good for making a quality arrow - tomato stake material. Some shafts may have minor faults such as a splinter of timber torn out in the machining process. This will most likely not affect the shaft other than in looks. These can be used for stump shooting.

Spining and Weighing

Once graded it is time to spine the remaining shafts. Place a shaft on your spine tester and rotate it. You will notice that more often than not you will get a different reading when the grain runs horizontal as opposed to when it is running vertical. The shaft is usually stiffer when the grain is in the vertical position. It is very important that you spine all shafts with the grain. That is, the grain lines on the ends of the shaft should be running vertical from the 12 o'clock to the 6 o'clock position. The rift in the shaft should be in the 9 o'clock and 3 o'clock positions.

The rift of the shaft that is facing you when the shaft is placed in the spine tester will be pointing to the intended point end of your finished arrow. If you are right handed have the rift pointing left, and if you are left handed have the rift pointing right. By doing this you are ensuring that you are testing the spine (amount of bend) of the arrow in the direction in which it is going to be bending around the side of your bow when shot.

Spine each shaft and write the spine weight on the shaft near one end. When you have finished spining them all, you will notice that you have a broad range of different spine weight shafts before you. Place them into groups according to their spine, i.e. 60-65 pounds, 65-70 pounds, 70-75 pounds and so on. I have had the spine weights of a hundred shafts vary as much as 20 to 30 pounds and sometimes more.

The next step is to weigh each spined group of shafts. Write the weight of the shaft under where you wrote the spine weight. When you have done this you will notice that you have even more groups of shafts. The number of groups will depend on how accurate you want to be. I find a range of 20 grains, in any one group, to be acceptable but you can lower this to a 10 or even 5 grain range if you wish. You will see that the grain weights can easily vary 100 grains or more over the whole batch. Once you have the groups sorted, pick out the ones that suite you. The rest you can sell to someone else whose spine and weight requirements are different to yours. You are now ready for the next step.



Weighing the shaft on a grain scale.



Using the spine Tester to find a shaft's spine rating.

Straightening the Shafts

The next process is straightening each shaft. Most good shafts will be reasonably straight but a fair percentage will require some straightening. Sight down the shaft and locate the bend. Place the shaft between the thumb and first finger of your left hand (if you're right handed). Now place the bend in the shaft on the base of your thumb and use the first finger to force the shaft in the opposite direction of the bend. Use your right hand to stop the opposite end of the shaft from moving. Repeat this process until all the bends are gone and the shaft is straight. You may not be able to get the shaft perfectly straight but you should get it close. Tests have shown that a slightly crooked shaft will fly just as well as a straight one. You may have to do this straightening process a couple of times. If a shaft continues to go back to its crooked state, toss it - another tomato stake.

Cutting to Length

Now you should have before you a bundle of straight, spined and weighed shafts. At this point I usually pick out how many shafts I wish to make into arrows. I normally make a dozen or so at a time. It's up to you how

many you want in a set. You now cut the shafts to the length you want. Don't forget to allow enough length for the taper of your point. Some broadheads may require a longer taper than others. I also add another inch for clearance purposes, when making a hunting arrow. You can cut your shafts with a fine saw or a sharp knife.



Straightening the shaft.

Tapering the Shaft

Once you have your shafts cut to length, it's time to taper the ends for the nock and broadhead or field point. There are several tools on the market for doing this job. They work similar to a pencil sharpener. **WARNING:** When using these tools ensure that the shaft is a firm fit in the guides. If the guide is too big it will allow the shaft to move from side to side and cause the taper to be out of alignment with the axis of the shaft. This in turn will cause the nock and broadhead to be out of alignment and the finished arrow will not fly correctly. I prefer to taper my shafts by using the sanding belt of a linisher. I use an adjustable wooden jig which can be set at the correct angles to guide the shafts whilst the tapers are being sanded. I find that I get near perfect tapers when using this method.

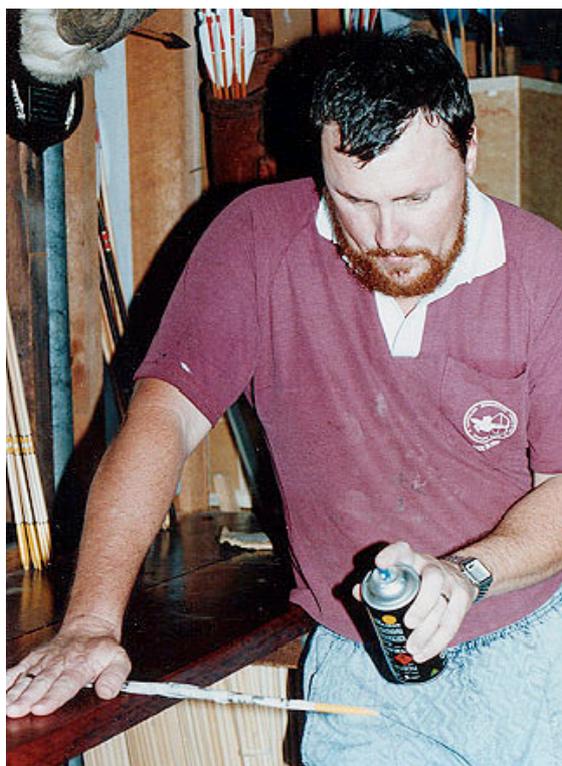
Sealing the Shafts

Firstly I sand the shafts with 320 grit sandpaper. This gives them a nice smooth surface ready for sealing with the finish of your choice. The finish you choose will depend on the type of look you want; natural wood or stained, crown or cap colour with a crest etc.

In America there is an archery company by the name of Bohning, which supplies a full range of compatible lacquers and glues solely for use on arrows. To my knowledge their products are unavailable here in Australia. We must therefore improvise. There are a number of products available but I will tell you what I have found to work well for me and how I go about using them.

After sanding the shafts I seal them by applying a coat of clear varnish (Estapol or similar). I take a piece of clean cotton cloth, soak it with varnish and then rub it up and down the shaft until it has a nice even coat and then let it dry. Some varnishes may need to be thinned which is something you will have to decide for yourself. If I wanted to stain my shafts I would do that prior to applying the varnish.

I nearly always have a coloured cap or crown (painted area at the nock end of the arrow) and crest on my arrows, so after sealing them I am ready for this step. If you don't wish to do this you would simply apply the finishing coats of varnish.



Left, tapering, and Right, spraying the cap.

Painting the Cap

There are a number of ways to achieve this; Dipping, Brushing or Spraying. Dipping is when you have a container, usually some form of tube filled with paint. You simply dip the shaft into the paint, pull it out and let it drip dry. This way can be tricky as you have to thin the paint just right so that the excess drips off and doesn't leave any runs. Air bubbles can also be a problem. Brushing, as the name infers, is simply putting the paint on with a brush. With this method you can have problems with brush marks. Spraying is by using a spray gun or spray can to apply the paint. I am presently using spray can paints to paint the capping on my arrows. Your choice of colours may be limited using this method but I have used red for many years now so I don't have a problem.

Once my sealing coat of varnish is dry I rub it back well with steel wool. I then mark the length I want my capping colour to be. I use masking tape and news paper to protect the parts of the shaft I don't want paint on. Now I spray the shafts, allowing each coat to dry before rubbing it back with steel wool and applying the next. Don't rub the final coat back though. Once the top coat is dry I remove the tape and news paper and I am ready for the next step.

HINT: No matter what colour you want to paint your cap, always use a base coat of white. This allows you to cover the shaft with one or two top coats. Without the white base coat you may need four or five coats, especially if you are using a light colour. When you do this the capping will end up being too thick.

Cresting

The Crest is a series of coloured bands usually painted on an arrow just forward of the feathers. In the past the crest was mostly used to identify the owner of an arrow. Today its use is more to make an arrow look better. I feel a crest adds some of that "Character" I mentioned at the start.

To crest a shaft you will need some type of machine to spin it while you apply the paint. There are commercial ones available but most people make their own using an old sewing machine motor or the like placed on a board with some form of V-block to support the shaft. A piece of rubber hose can be used to connect the drive shaft of the motor to the arrow shaft or a small chuck, designed specifically for this purpose, can be purchased from your traditional archery dealer.

It doesn't really matter what type of machine you use so long as it spins the shaft at a reasonable speed. I have even seen an electric drill used. However it is important that the shaft spins true, without any wobble. If the shaft wobbles the cresting lines will not be a uniform thickness around the shaft.

To paint on your crest you will need good quality brushes. The finer you want your lines the finer your brush will need to be. I use a water based acrylic paint for my cresting. It comes in a wide range of colours and is available from most hobby shops. Once you have your machine, brushes and paint you can go ahead and create your own personal crest. It's a good idea to put a thin crest line on the shaft where the capping paint ends. This assists in covering up any irregularities at this point and also looks good.



Cresting the shaft.

Finishing coats

Once the crest is finished and the paints are dry you are ready to apply the final coats of varnish. I usually apply two more coats over the entire shaft covering the capping and cresting paints in the process. Ensure that you let each coat dry well before applying the next. For a better finish don't forget to use the steel wool between coats. I find it is much better to apply a couple of thin coats than one thick coat. Once this is done your shafts should have a beautiful smooth gloss finish.

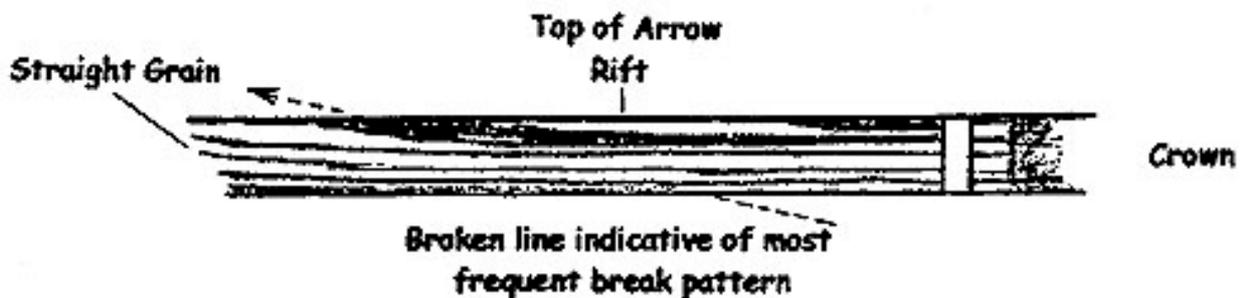
Installing the Nock

Nock alignment is one of the most important processes in arrow making. There is one and only one correct position for a nock in relation to the grain of the shaft. Firstly the nock should be aligned with the grain of the shaft (see photo) so that when it fits on the string, the grain side of the shaft should be against the sight window of the bow. In other words the grain should be horizontal, in the 3 o'clock and 9 o'clock positions. The rift of the shaft should be in the 12 o'clock and 6 o'clock positions. The rift on top, or 12 o'clock position, should be pointing forward towards the bow hand - (see illustration).

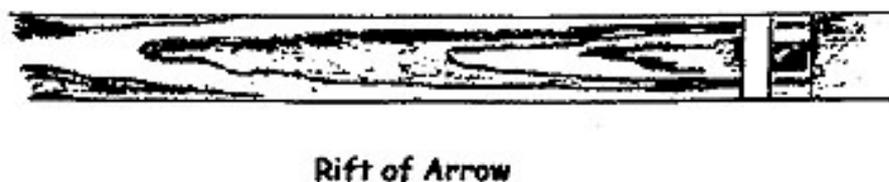
The importance of having the rift situated as described above is one of safety. You will notice that the rift on the bottom of the shaft runs in the opposite direction. The weakest point in the wood of the shaft is where the rift comes to a point. A split in the shaft usually starts at one of these rifts. Having the rift on top of the shaft pointing towards the bow ensures that, should the arrow splinter upon release of the string, the back end of the shaft will be directed upwards away from the bow hand. If the rift was the opposite way around the back end of the shaft would be directed downward and could cause serious injury to your bow hand. This is a good argument for using an indexed nock and three fletches. Both the index of the nock and the cock feather help you to easily identify which way the arrow should be placed on the bow string.

To attach the nock to the shaft, apply a small amount of glue to the nock taper and put the nock in place. Rotate it a couple of times to spread the glue. Align it with the grain (as above) and sight down the shaft and ensure that it is in alignment with the axis of the shaft as well. If it is put on crooked it can cause erratic flight. This is because the nock throat will not be dissecting the arrow. Therefore the string will be pushing unevenly to one side of the arrow.

SIDE VIEW OF ARROW



TOP VIEW OF ARROW



Fletching the Shaft

To complete this task you will need one of the many fletching jigs available on the market. For my money you can't go past the Bitzenberger jig. Sure it is more expensive to purchase than most but I feel it does the best job. It is entirely constructed of metal and you can make very fine adjustments to get your fletches just the way you want them. It is also one of the easiest jigs to use. Before you purchase a fletching jig you must decide whether you want to have straight or helical fletch and purchase a jig with the appropriate clamp.

The next decision you must make is what type of fletch to use. The first choice is whether to use feathers or plastic vanes. Other things to consider are type of cut (parabolic or shield), colour and length. The choice is yours and you will have to decide what suits you best. What is important is good arrow flight so your decisions will be dictated by this.

Personally I will only use feathers on my arrows as plastic has no appeal to me. If you are shooting off the shelf then you will have to use feathers as vanes will not collapse as they pass over the arrow shelf and will make the arrow kick sideways. Feathers are also more forgiving and will straighten the arrow faster than plastic vanes. I would recommend a minimum of three 4" feathers on lighter bows shooting 5/16" shafts and three 5" feathers for shafts bigger than this.

I am a bowhunter and good penetration is of great importance to me. I want my arrows to straighten up as soon as possible after release. To help ensure this happens I use three rather high profile 5" feathers. Incidentally I use shield cut feathers for no other reason than I like the look of them. Some say they are noisier in flight but I haven't found this to be a problem.

When fletching, ensure that the entire length of the feather is in contact with the shaft. Check this before you apply any glue. When applying the glue to the feather use a thin even bead. Use an excessive amount and it squeezes out from under the feather and looks terrible. Too much glue can also cause your clamp to stick to the feather or even the shaft.

After all the fletches have been glued in place I put a small dab of glue at the front of each. This will stop them snagging on grass and the like when you miss. If you shoot off your hand it helps prevent the front of the feather burying into your finger - OUCH!!!

One last thing about fletching; always make sure that your glue is compatible with the finish on your shaft. Some glue's may seem fine at first but as soon as it rains, or the feathers get bumped you end up having arrows without feathers. I had a mate on one hunting trip that had all his feathers fall off while out on a morning's hunt. It was a mad rush back in camp at lunch time (between much laughter) trying to get his arrows fletched again. I won't mention his name for fear of embarrassing him, hey "Swamp"?



Bitzenberger Fletching Jig.

Installing the Broadhead

Last but not least is the installation of the broadhead or field point. This process, like with the nocks, is very important. If the broadhead is not in proper alignment with the axis of the shaft it can cause bad arrow flight. When this happens a lot of people mistakenly say that the type of broadhead they are using is no good as it wind planes. In most cases it is an alignment problem, not a broadhead problem at all.

I use twenty four hour Araldite to glue my broadheads and field points on. I mix a small amount on a piece of cardboard and take a shaft and dip the taper into the mix. I then put the broadhead on and turn it a few times to spread the glue around. I then place it so that it will be in a vertical position when the arrow is on the bow. Some people have them horizontal - it is a personal choice. I then look down the shaft to see that the head is in alignment. If it appears to be I then spin the shaft on its point to check for wobble. If it doesn't I place it aside to dry. If it does, turn the head on the shaft a couple of times and then repeat the above steps. Make sure the cause of the wobble isn't a bent point.

Well there you are a matched set of wood arrows. These are special arrows because you made them yourself. You can't buy them like this from any archery supply shop. I always feel a sense of achievement at this time and you should feel proud of your efforts as well. Now go and use them for what they were made for, shooting from your favourite bow.



The Finished Product: A Purposeful Work of Art!