



Quivers & Quarrels



*The Official Publication for the Archery Community of the
Society for Creative Anachronism, Inc*

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ARROW-BUILDING SPECIAL EDITION

Also Inside:

Fall SSAC Scores
Winter SSAC Rules
Local Practices

Quivers & Quarrels is the official publication of The Archery Community of the **Society for Creative Anachronism, Inc.**

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Previous issues of Quivers & Quarrels are available in the "files" section of <https://www.facebook.com/groups/QuiversQuarrels/>, at newsletter.sca.org/archery-community.html, from <http://scores-sca.org/qnq>, or by request from the Chronicler at qqchronicler@gmail.com

The Modern Year Comes to a Close

Mighty Archers of the Known World,

Winter has made a harsh early arrival in the realms of An Tir. Novembers are supposed to be wet and mild here where the lands of the Kingdom meet saltwater, and we have already had two snaps of hard freezes and a smattering of snow. Not very conducive to shooting, even in the shelter of my basement. Bowstrings and cold fingers are mortal enemies, I think, though it would seem that fingertips suffer much more pain than bowstrings. But, it's also possible that I'm just a big wimp... I haven't been shooting nearly as much as I should be, and my hard-won calluses on the fingertips of my string hand are all gone. I will have some toughening-up to do in the spring for sure.

I have already been thinking about what 2015 will bring, and what goals I hope to meet within this SCA hobby and archery. Modern circumstances for me will be different this coming summer than they were last summer, so I am determined to get more shooting time in the saddle with my mare and my horsebow. I unfortunately don't anticipate being able to attend many events this coming year as my modern life will continue to be quite demanding. I suppose we all go through periods when we must curtail hobby time, no matter how much we love the hobby. Nonetheless, I have been collecting materials to finally build myself some armor and add combat archery to my list of awesome stuff to do. Maybe I will be able to finally start the armor project in 2015. I am *really* looking forward to the day that I can start shooting at moving targets.

If winter is not conducive to practice, it is always a good time to make or maintain equipment while we wait for friendlier weather to arrive. It occurred to me the other day that the timing of the arrow-building special edition is serendipitous for most parts of the Known World. I do plan to spend some time this winter repairing arrows that can be salvaged. I'll break them again or lose them this summer, or pass them around as loaners. The rest will be cannibalized for parts, except the one that broke when I Robin-Hooded it several years ago. That one's a keeper. I'd like to say I Robin-Hooded it on purpose... On purpose. Yeah. That's my story.

This edition of *Quivers & Quarrels* will also include a section that I have dubbed my "Wish List". There is an enormous amount of potential for articles to share knowledge with our missile community, so please feel free to pick a topic from the list, or use it to get your creative juices flowing to come up with your own. If you need a little help with the writing part, we can do that too! If writing is not your forte, please don't let that intimidate you. Just do your best, enjoy the journey, and we will edit for form and style. Knowledge, experience, and wisdom are too precious not to share.

As this year comes to a close and a new one begins, may each of you be richly blessed during this season of love, sharing, and renewal, however you celebrate it. More archery will certainly be among my resolutions when the calendar changes and we begin the march towards spring.

Yours in Service,
Sayako Enoki



This edition of *Quivers & Quarrels* features four articles dedicated to arrows and arrow building, and will hopefully demystify this skill for those who are curious, and further the knowledge of others who already have some skills. Building arrows offers unlimited potential to customize aesthetically and functionally what the archer carries in his or her quiver. There are many more articles yet to be written and featured on the topic of arrows, but the articles herein offer a solid foundation of basic knowledge as well as some of specialized interest.

Within this section, two articles are specifically dedicated to building modern wooden target arrows for SCA use. While the subject of each of these articles is the same, each author offers a different perspective for the archer to explore the craft of making target arrows.

The other two articles feature Turkish flight arrows and Medieval-style arrows for those who are more inclined toward exploring period accuracy on a practical level for archery in the SCA.

The articles in this section are not intended to be inclusive of variations that may exist in the rules that govern archery between kingdoms, though most of the basic requirements for target equipments are standard in all kingdoms. Be sure to consult your kingdom rules and your local archery marshals or rangers if you have any questions.

Please enjoy this special section of *Quivers & Quarrels*.



Modern Wooden Arrow-Making

by Conrad Engelhart (MKA Robert Long)

The Kingdom of Meridies and the SCA require arrows to be made of wood or bamboo shafts, and have feather fletches. Exceptions are allowed for beginners and children (up to age 14). Pre-made wooden arrows can cost upwards of \$125 a dozen. Making your own arrows can reduce the cost to \$5-6 each. It also lets you personalize and repair your arrows, while having the option of making smaller quantities. With the proper tools and know-how, arrow making can be relatively simple and enjoyable.

Step 1: Select shaft material.

The most common wood for arrow making is Port Orford cedar (POC), but other woods such as Douglas fir, Sitka spruce, birch, poplar and bamboo can be used. 11/32 inch is the most common diameter, but 23/64 inch is also popular. Standard shaft length is 32 inches. See Figure 1 for shaft diameters.

Step 2: Select the appropriate spine weight.

The spine weight is the stiffness, or the “flex”, of the arrow shaft. Ideally, the shaft should be spine weight-matched closely to your bow’s draw weight, which is typically measured in pounds when drawn to 28 inches. For example, a bow that is 45# @ 28” takes 45 pounds of force to draw the bow string back 28 inches. If your draw is 26 inches, you may only be pulling 40 pounds even though you are using a bow with a 45 pound draw. A bow or luggage scale, which has a hook on one end, can be

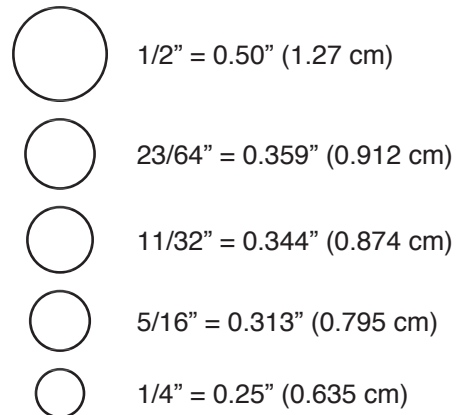


Figure 1: Shaft diameters, actual size. 1/4 inch dowels should only be used for children’s arrows. Mary Rose* “bobtail” arrows were 1/2 inch in diameter tapered to 3/8 inch and made of aspen, poplar or ash. In contrast, modern carbon arrows are typically 5/16 inch in diameter.

used to measure your exact draw weight. Matching the draw weight will provide for a consistent flex as your arrow is released and stabilizes. If your arrows are hitting the target at an angle, your arrows are likely under- or over-spined.

Shafts are purchased in 5 pound spine groups. For example, a bundle of one dozen shafts may be sold as “40-45 lbs” as their spine weight. If you are on the cusp between two groupings, I would recommend the higher spine weight.

CAUTION: Using a grossly under-spined arrow with a higher poundage bow can result in a catastrophic failure, breakage, and injury. Never shoot arrows with a light spine weight out of a bow with a heavy draw weight.

*The Mary Rose was an English Tudor Navy warship under King Henry VIII, which sank in 1545 off the coast of Portsmouth in southern England. It was discovered in 1971 and salvaged in 1982. It is the most important archeological discovery of Renaissance archery artifacts, including 137 well-preserved longbows and 3,500 arrows. It provides invaluable insight into medieval archery. Reproduction Mary Rose longbows have draw weights of 80 pounds to 120 pounds @ 30 inches. Longbows with a draw weight of 80+ pounds are sometimes referred to as warbows.

The Archer's Paradox

The archer's paradox describes the phenomenon where an arrow does not travel in the direction it is in pointed when drawn, but instead strikes the center of the target when the arrow is pointed slightly to the side of the target (see Figure 2). When the arrow is fired from the bow, the thrust of the string on the back of the arrow shaft means that the back of the shaft is momentarily traveling faster than the front of the shaft. This is what causes the arrow to flex, and is precisely why spine weight is important.

When the spine weight is correct for the draw weight of the bow when drawn to the draw length of the archer, the flex created by firing the arrow is corrected by the stiffness of the spine during flight. Underspined arrows will create too much flex, may wobble or "fishtail" in flight, and will strike the target to the right. Grossly underspined arrows will flex far too much, and can splinter apart when fired. The potential for grossly underspined arrows to catastrophically fail when fired is what makes them dangerous. Overspined arrows will not flex enough, and will strike the target to the left.

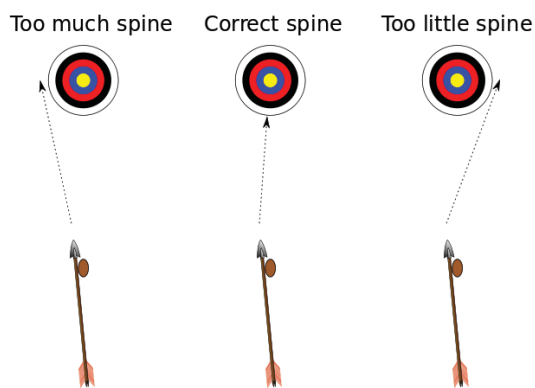


Figure 2: Illustration of the archer's paradox and spine weight.

Step 3: Stain the shaft (optional).

If you choose to stain your shafts, it must be done before sealing. Alcohol-based, water-based, or oil-based stains can be used. Water-based stains are easy to apply and have low fumes. Alcohol and oil-based stains create more vibrant colors, but can be messy and require a well-ventilated area. Regarding color choice for your stain, black, brown, green, or gray stains can make finding missed shots in the ground more difficult. Staining is not recommended for beginners.

Step 4. Seal the shaft.

Sealing is required to protect the shaft and prevent moisture and humidity from warping the arrow. Gasket lacquer requires a rubber gasket tool, but dries quickly. Fletch-Lac requires a dipping tube, thinner, and longer drying time. For making occasional arrows, I recommend alcohol-based spray polyurethane. Clip clothes pins on one end of the shaft and suspend them from a taut string, wire, or clothes hanger. Apply 5-6 thin coats, waiting 30 minutes in between each coat. Be sure to use a well-ventilated area when spraying. Pre-finished shafts can also be purchased, but they are more expensive. Medieval arrows were sealed with a drying oil, such as linseed or flaxseed.

Step 5. Mount the nock.

The nock is the part of the arrow that snaps into the bow string. Modern nocks are plastic and come in a variety of styles and colors. I recommend using white or brightly colored nocks so that your eyes can follow the arrow down range after its release. It is also easier to find missed shots in the ground when the arrows have nocks that are brightly colored.

When installing the nock, the grain of the shaft's end should be perpendicular to the bow string to provide for more consistent flex from one arrow to the next (see Figure 3).

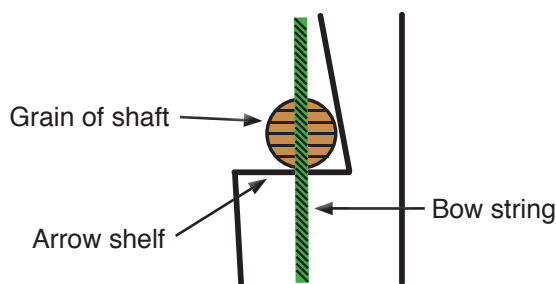


Figure 3: Illustration of the proper alignment of grain in a wooden arrow shaft.

Before you can attached the nock, the end must be tapered. A simple taper tool that resembles a pencil sharpener is required. A taper tool has an 11° taper for the nock (the short cutter), and 5° taper for the point (the long cutter). Once the shaft has been tapered, I recommend using Bohning Fletch-Tite Platinum fletching glue to attach the nock to the shaft. Place glue on the bottom two-thirds of the taper, and twist the nock onto the taper to ensure even

distribution of the glue. Use a paper napkin to wipe away excess glue. Hold the nock firmly in place for 30 seconds to allow the glue to set. Mary Rose arrows had reinforced “self nocks”. In other words, the nock was not a separate piece that was attached to the end of the arrow. A self nock is cut directly into the end of the shaft. In Mary Rose arrows, the self nock was reinforced with a 2-inch sliver of horn.

Step 6: Cut the shaft.

Shafts come in a standard length of 32 inches, which will create up to a 33-inch arrow after the nock and point are attached. Ideally, you want the arrow cut so that it is 1 inch past the end of your bow at full draw once complete. This reduces the arrow’s weight, which increases its speed and accuracy. Measure from the end of the nock, but subtract a 1/2 inch to compensate for the point’s length. Use a miter box and miter back saw to cut the shaft and provide a clean cut. Mary Rose arrows had an average draw length of 30” because the medieval archer would pull the string to or even past the ear.

Step 7: Select points.

The points are the tip of the arrow that impacts and penetrates the target, and come in a variety of styles and weights. A point’s weight is measured in grains. Weights are available in 70, 100, 125, 145, 160 and 190 grain, with 125 grain being the most common. Points must be matched to the diameter of the shaft, i.e. 11/32 inch points for 11/32 inch shafts. For basic target archery, “field points” are the most common, but “target tips” are also suitable. Steel glue-on points are inexpensive and durable. Brass bullet nose points add flair, but are more than twice as expensive. I do not recommend screw-on or crimp-on points.

Medieval points had a variety of shapes for different applications, and they evolved with armor improvements. Broadheads with barbs were used against lightly armored opponents and horses. Long bodkins were used against chainmail. Short bodkins were used against plate armor. If you would like to use Medieval-style points on your target arrows, be sure to check your local kingdom rules or with your local archery marshal before using them in target archery. Many styles of tips are not permissible for target archery because they are destructive to targets, target backings, and target butts.

Step 8: Mount the points.

Use the long cutter of the taper tool to taper the end of the shaft to 5°. Pour water into a cup. Light a candle, heat glue stick and smear the warm glue thoroughly over the bottom two-thirds of the taper. Place the point in pliers and hold over flame for a moment before placing it on the taper while twisting the shaft to ensure even distribution of the glue. Next, heat the point over the flame while rolling the shaft in your fingers to ensure even heating. Place only the point over the flame, not the wooden shaft. Place the point on a block of wood and push the shaft downward until you have a snug fit with no taper remaining. Roll the shaft in your fingers to ensure that the point is on straight. Dip the arrow into water to set the glue. Scrap off the excess glue and discard. Wipe with a paper napkin to remove any soot.

Step 9: Add crestring, cap or cap wrap.

Adding crestring, or a decorative pattern of lines, to the arrow shaft is noted in artwork as far back as the 16th century (portrait of Gabriel de Luetz, c. 1542). Cresting personalizes and distinguishes one’s arrows. It requires a crestring machine or jig to spin the shaft as it’s painted, paints and brushes, and a lot of practice. Painting the entire end of an arrow is referred to as a cap, and requires a dipping tube with a rubber gasket. Cresting and cap dipping are not recommended for beginners. A simple alternative is a “cap wrap”, which is a thin vinyl sticker that is applied to the nock end of the shaft. Place the cap wrap sticky-side up on a mouse pad, line up your shaft, and roll the cap wrap on. Bright crestring or cap wraps also aid in finding missed shots in the ground.

Step 10: Select a fletching jig.

Attaching the fletching to an arrow requires a fletching jig. Fletching jigs come “left wing” helical, “right wing” helical, or “straight” helical. A feather has a lip along the quill that is determined by which side of the bird the fletching came from (*see Figure 4*). Jigs that are specified for a left or right wing have a slight offset down the length of the fletching to make the arrow spin right or left after its release. Which way the arrow spins is not important because the arrow does not begin to spin in flight until after it has cleared the bow. However, most fletching jigs will be right-helical. Straight jigs can use either wing. Some

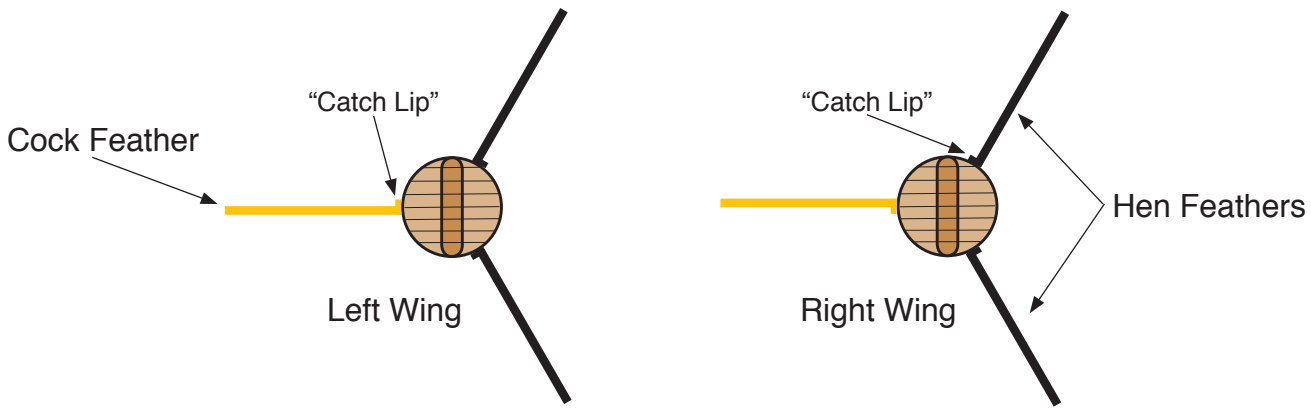


Figure 4: Illustration of “left wing” helical and “right wing” helical fletching. The “cock feather” faces out from the bow when the arrow is nocked. The “hen feathers” rest against the bow when the arrow is nocked. The cock feather is usually a different color than the hen feathers to visually aid the archer in nocking the arrow on the string correctly.

jigs can only apply 3-fletch, whereas some can do 3 or 4-fletch. The most affordable jig, the AAE Fletch III, is a 3-fletch jig that is designed for right wing feathers.

Step 11: Select fletches.

Pre-cut feather fletches are available parabolic or shield cut (see Figure 5), and come in 4 inch, 5 inch, and 5.5 inch lengths. For beginners, I recommend 3-fletch arrows using 5 inch fletches, which are the most common. I also recommend brightly colored feathers to aid in finding missed shots in the ground.

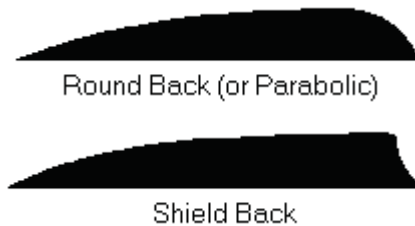


Figure 5: Illustration of common shapes for fletching.

For 3-fletch arrows, the “hen feathers” are the two that point towards the bow at an angle, and are commonly a solid color. The “cock feather” is the one that points away from the bow, and is commonly barred or a contrasting color. Fletches are sold by the dozen, thus, one dozen 3-fletch arrows will require three dozen fletches. Medieval fletches were typically 6 inches to 7 inches long, 3/4 inches wide, and made from goose feathers. Modern feather fletches are almost exclusively made from turkey feathers. A simple way to create traditional “medieval-looking” fletches is to cut the last 1/2 inch off of the nock end of a 5.5 inch pre-cut shield fletch. This creates an angle to end of the fletching rather than a shape. Be sure to cut only the quill and not the barbs.

Step 12: Fletch the shafts.

Place the shaft’s nock into the dial cradle of the fletching jig, making sure it is inserted completely. Place the fletch in the clamp and line it up with the built-in “ruler” so that all fletches will be the same distance from the back of the nock, or follow the instructions for your fletching jig for placing fletching in the clamps and aligning them. The rear of the feather should be 1 inch to 1.5 inches from the end of the nock to allow enough room for your fingers (see Figure 6).

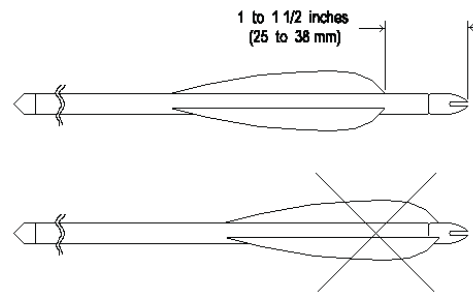


Figure 6: Placement of fletches from the nock end.

Apply fletching tape along the bottom of the feather’s quill, using scissors to trim the tape, or use a suitable glue like Duco Cement. Fletching tape has a colored backing to assist with alignment. Peel off the tape backing, leaving the clear double-stick tape behind. If using glue, allow the glue a little time to become tacky. Start with the cock feather by turning the dial and shaft to the appropriate position and slide the clamp down until the fletching adheres to the shaft. Remove clamp and slide fingernail down the lip of the quill to ensure good adhesion. Rotate the dial and repeat the steps with the hen feathers. (Alternatively, follow the instructions for your fletching jig for attaching

fletching to your arrow shaft.) Finish the arrows by adding a drop of fletching glue the ends of each feather. The arrow is now complete, but I recommend waiting at least an hour before shooting to allow the glue to fully set. Medieval fletches were attached to the shafts with pitch, and reinforced with a thin linen binding called “whipping”.

Required Materials:

Shafts - \$30-\$39/doz. depending type of wood
Fast-drying polyurethane spray - \$8-9/can
Nocks - \$2.50/doz.
Fletching Glue - \$6/tube
Steel glue-on field points - \$5/doz.
Hot melt point glue - \$2/stick
Cap wraps (optional) - \$10-\$12/doz.
Fletching tape - \$8.50/roll
Feathers - \$8-\$12/doz. (or \$24-\$36 for a doz. 3-fletch arrows)

Required Tools:

Taper tool - \$6.25/ea.
Fletching jig - \$26-\$90/ea.
Miter box - \$8-\$15/ea.
Miter back saw - \$7-\$10/ea.
Pliers - <\$10/ea.
Pillar candle - \$1/ea.
Scissors - \$1/ea.

Suggested Links:

<http://3riversarchery.com/> Largest online supplier specializing in traditional archery
<http://www.trueflightfeathers.com/guide.htm>
Excellent fletching guide
http://en.wikipedia.org/wiki/English_longbow
<http://www.english-longbow.co.uk/> Richard Head Longbows, maker of fine English longbows
<http://www.hectorcoleironwork.com/Arrowheads.html> Images of the different types of medieval arrowheads.
<http://www.youtube.com/watch?v=WzWrcpzuAp8>
Slow-motion video of the archer's paradox

Designing and Building Target Arrows

by Carolus sine nomine (MKA Chuck Cochran)



“There are nine and sixty ways of constructing tribal lays, And every single one of them is right.”

-- Rudyard Kipling “In the Neolithic Age”

Designing Your Arrows

Material

SCA standards call for wood arrows, but what kind of wood? In the US, the default wood is Port Orford cedar (POC) from the Pacific Northwest. POC is light, straight, reasonably strong, and wonderfully aromatic! (Unfortunately, after you finish your arrows, probably you'll smell that aroma only when you

break one!) Other useful woods include Sitka spruce, Douglas fir, and Ponderosa pine.

In period, arrows were made from woods such as aspen (poplar), ash, and even oak. Heavier ash and oak were used mainly for war arrows, where strength and high mass were virtues.

I have made arrows from POC and spruce, and both seem to work well. My impression is that POC tends to be a little straighter, but spruce also seems quite good. I have not been impressed with “economy hardwood” arrows (probably poplar.) They're inexpensive but not very straight. On the other hand, they're probably good enough if you tend to lose or destroy lots of arrows.

Length

Your arrows should be long enough that you can pull your bow to full draw, plus an inch or two for safety. There's no firm upper limit to arrow length; use what works with your bow and looks good to you. Usually I leave my arrows a bit long so when I break them and replace the point, I'll still have arrows of usable length.

You can measure your draw length most accurately by drawing your bow with a measuring arrow, which is a headless arrow marked with distances from the nock groove. Most vendors will sell shafts at full length (probably 31-32 inches) or will cut them to length for you.

Weight

Target archers aren't trying to bag large game or unhorse an armored enemy. Typically we're shooting light bows at relatively short ranges. Usually, light arrows are desirable for this purpose. Compared to a heavy arrow, a light arrow will leave the bow faster, arrive at the target sooner, and lose less elevation on the journey. However, heavy arrows may be less affected by wind because their weight gives them greater inertia.

Along with other arrow components, shaft weights are measured in the traditional unit of grains (1/7000 lb). Often, vendors will sell a dozen shafts matched within ± 10 grains, although usually they don't specify the actual weight.

Diameter

For adult-length arrows, standard shaft diameters are 5/16 inch, 11/32 inch, and 23/64 inch. Rarely you may also find 9/32 inch shafts. Child-length shafts can be found in 1/4 inch diameter. I favor 5/16 inch diameter because they are the lightest commonly available shafts to suit my bows and draw length. When available, I use 9/32 inch shafts, and would try 1/4 inch shafts if I could get them.

Each diameter is available in a limited stiffness range. Generally, larger-diameter shafts are stiffer and heavier than small-diameter shafts, although this naturally varies.

Stiffness

Arrow stiffness, or "spine", should be matched to the bow. All other factors being equal, a bow with a heavier draw weight should use a stiffer shaft, and a lighter bow should use a more flexible shaft. Often however, "other factors" are not equal.

Many modern compound and recurve bows are "center-shot" bows, where the riser of the bow is deeply cut-out so the arrow rests on the bow's centerline. For all known period bows, the arrow rests against the side of the bow's riser, sitting directly on the bow hand, and is significantly offset from the bow's centerline. For these "side-shot" bows (I think I just invented the term "side-shot bow."), correct arrow stiffness is important for accurate shooting. For center shot bows, arrow stiffness is less critical than for side shot bows.

When you shoot a side-shot (offset) bow, the arrow flexes to pass smoothly around the bow. This describes a phenomenon known as the "Archer's Paradox", which may be understood as "the arrow doesn't go where it's pointed". I won't go into mind-numbing detail about the mechanics of this phenomenon; the point is that correct stiffness is important. The arrow needs to flex an appropriate amount. Once released, the arrow will oscillate from side to side like a swimming fish. If the stiffness is correct, both the arrow's midpoint and its tail will be flexed outward when they pass the bow. YouTube has a number of high-speed videos showing arrows bending on release, and continuing to subtly "swim" through air all the way to the target.

There is a standard method for measuring arrow spine, however it can be difficult to interpret the results. Most wood arrow vendors rate their arrows in 5-pound ranges, 45-50 pounds or 25-29 pounds for example, which implies that your bow's draw weight should fall within that range. Arrows are also spined at 28 inches, so for full-length arrows at 31 or 32 inches, subtract 3 to 5 pounds of spine weight for every inch the arrow is long past 28 inches. For example, if one dozen arrows are grouped as having a spine weight of 40-45 pounds, uncut at 32 inches, the spine weight of the group will be in the range of 25-33 pounds. If you cut them to 29 inches, the spine weight of the group will be in the range of 35-42 pounds.

Consider the rated spine weight as a starting point for experimentation. A side-shot bow with a relatively large offset from center, such as a period longbow, may need a lighter spine weight than its draw weight would suggest because its arrow needs to flex more when fired. Of course, it is hazardous to use arrows with a very light spine weight in a bow with a heavy draw weight because the arrows are likely to break.

It is more common for arrows to be too stiff than not stiff enough. An arrow that is too stiff will flex too little, and it will strike the target farther to the outside than it should. By “outside” I mean toward the side of your bow hand, so it would strike to the left for a right-handed archer.

Static shaft stiffness, or “static spine”, is only the place to begin. Other influences can make an arrow act stiffer or more flexible. A heavier point or a longer shaft will make the arrow effectively more flexible. A lighter point or a shorter shaft will make it act stiffer.

Balance

When an arrow in flight yaws (swings its tail from side to side) or pitches (swings vertically), it is rotating around its center of mass, or balance point. You can alter the center of mass (CM) by the weight or location of the point, the fletching, and/or the nock. Nocks and fletching are relatively light, so they don't have much effect. However, the relatively heavy point does strongly affect CM.

Generally, it's good for CM to be located well forward on the arrow, I think largely because this give the fletching greater leverage to correct pitch and yaw. You can move CM forward by using a heavier point, or move it rearward with a lighter point. Using a heavier point may create more stable flight, however, it also makes the arrow heavier and slower, as well as effectively more flexible. Consider those trade-offs.

Straight or Tapered?

Shafts may be straight, or they may be tapered from larger at the point end to smaller at the nock end. Tapered shafts may have a constant taper from point to nock, or only the rear segment of the shaft may be tapered.

In principle, and maybe in practice, a tapered arrow may shoot better than a cylindrical arrow. The CM of a tapered shaft is naturally farther forward than that of a straight shaft, and a tapered tail is more flexible. Typically, tapered shafts are a little more expensive than straight shafts.



Figure 1: Period and modern examples of various arrow points.

Points

The standard point for wood target arrows is a glued-on steel field point. You may also buy brass points or very lightweight crimp-on steel points. I have used steel “modkin” points, which imitate the shape of a bodkin war point. A few reproductions are available of period war and hunting points. However, SCA archery marshals won't let you shoot these points at their targets. (Go figure!). Most such period-style points are relatively heavy, and fit only larger-diameter shafts (see Figure 1). For a given shaft diameter, points may be available in a range of weights.

Usually I go with the lightest weight available.

Fletching

The purpose of fletching is to stabilize arrow flight, and to ensure that the arrow travels point-first. Modern fletching is commonly made of soft plastic, but SCA requires traditional feather fletching. You can buy pre-cut fletches in a few standard shapes and lengths from two to five inches, in various colors, and usually in quantities of one dozen (see Figure 2). The “parabolic” or “banana” shapes resemble period styles. More authentically, you may also cut your own fletches from full-length feathers.

Larger fletches will better stabilize the arrow at the expense of greater drag. Drag will slow the arrow, particularly at longer distances. For a combination of period appearance and low drag, I use hand-cut fletches about 1/2 inch high by 4 inches long, or 7/16 inches high by 3 1/2 inches long.

Fletches may be attached with a variety of glues. I favor cyanoacrylate (CA) glue, also known as “superglue”. Also you may whip (wrap with thread) the fletching at its leading and trailing ends. This can prevent fletching from peeling away from the shaft.

Medieval war arrows, and many modern interpretations of medieval arrows, also feature thread wound helically through the feather body. This is unnecessary with modern glues, and may be damaged in the normal course of shooting, but you can do it if you like the look.

Feathers have natural curvature, designated “right-wing” or “left-wing” depending on which direction they curve. All fletches on an arrow should curve in the same direction. Viewed from the rear, an arrow with right-wing fletching will spin clockwise in flight, and an arrow with left-wing fletching will spin counterclockwise.

Fletches may be glued on the shaft straight, in alignment with the axis of the shaft, or skewed in either direction. If skewed, the direction of skew must match the curvature of the feather.

Unless you are a practiced craftsman tying fletching by hand, you will need to use a fletching jig to hold fletches in position on the shaft while the glue sets.

Most fletching jigs hold one fletch at a time. Others hold three at once. Some jigs can work only with right-wing feathers; others can be adjusted or adapted to work with either right-wing, left-wing, or straight feathers.

Period fletching may have been aligned straight or skewed. Modern fletching often is strongly skewed, causing arrows to rotate rapidly in flight. This too causes greater drag, but the trade off between drag and rotation is accepted with powerful bows. If a fletching jig is advertised as “right-helical” or “left-

helical,” that probably denotes a large skew angle. Even “straight” jigs usually skew the fletch a small amount left or right.

Nocks

Your arrow will have a nock, which is a groove or slot at its string end where the bow string sits to drive the arrow forward when the bow is fired. For wood arrows, the most common choice is a glue-on plastic nock, which is strong and easy to install.

In an unobtrusive color like black, plastic nocks don’t detract from period appearance. I like Martin Nirk nocks for their traditional straight style. If you would like a lighter nock, try the Bohning Classic or Marco BJ (see Figure 3).

Plastic nocks can also be selected as “locking” nocks or regular nocks. “Locking” nocks have a string slot that is shaped on the inside so that the nock clicks onto the string and prevents the arrow from falling off the string as the bow is drawn, making them a good choice for the beginning archer who is learning technique. Be aware, however, that the degree of grip that a locking nock has on a string

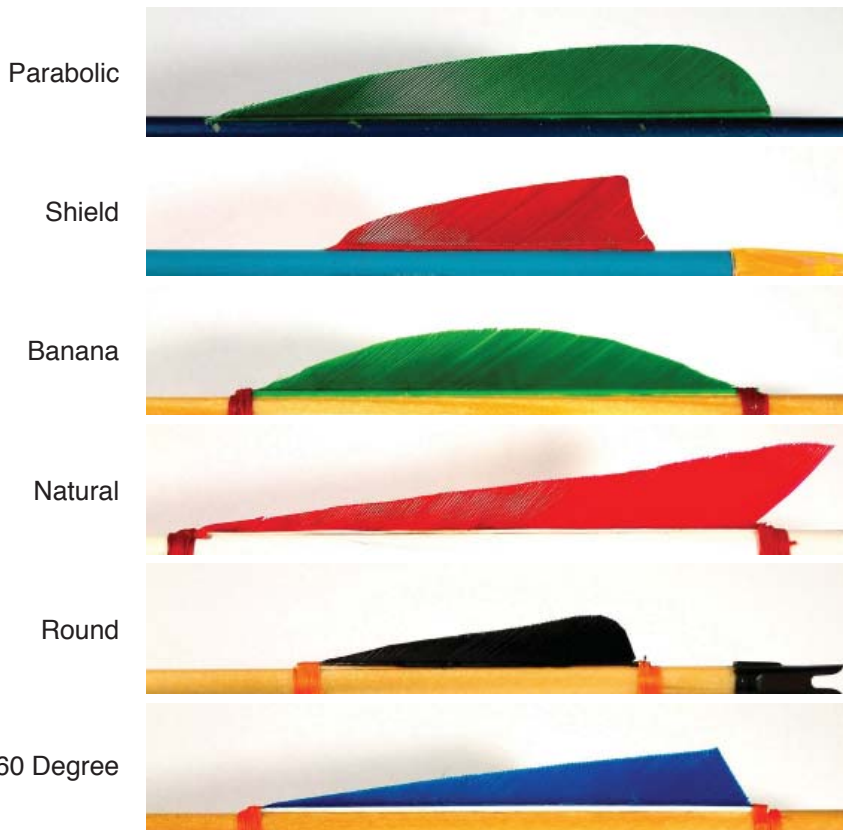


Figure 2: Examples of various shapes or cuts for fletching.

can vary as the nocks wear with use. As you become a more proficient archer, you may notice variance in your shots if there is variance in the wear among your locking nocks because they will release slightly differently from the string when fired. It is possible to adjust the grip of locking nocks by gently prying the tines apart to loosen the the grip on the string slightly, or by gently pinching the tines together slightly to tighten the grip. Many archers eventually choose to avoid using locking nocks in order to avoid the need to tune them as they wear.

Before gluing plastic nocks in place, it's a good idea to verify their fit on your bowstring. The nock should not pinch your bow string too tightly. Classic and modern sources suggest that an arrow should barely hang by its nock from the bow string, and fall off if the string is tapped. You can enlarge the groove in a nock with file or sandpaper.

As an alternative to a plastic nocks, you may prefer self-nocks, horn/bone nocks, or something of your own invention.

The classic period war arrow uses a self-nock, that is, a string slot cut directly into the shaft. Often, self-nocks are reinforced with a thin transverse sliver of horn. You can try cutting self-nocks if you wish, but keep in mind that 5/16 inch shaft is probably too small for a self nock.

Some vendors sell horn or bone nocks intended for cane arrow shafts. These may be useful if you can accurately drill a hole in the end of your arrow shaft. You may also be able to buy small cylinders of horn, which could be used to make nocks.

A Suggested Configuration

Shaft material: Spruce or Port Orford cedar

Length: Cut to suit your draw length and personal preference.

Diameter: 5/16 inch or 9/32 inch. Possibly 1/4 inch for a short draw or for children.

“Spine” or Stiffness: Make your best guess based on the draw weight of your bow, your draw length, and then experiment. Favor a slightly lighter spine for high-offset bows, and spine matched within about 5 pounds for center-shot bows.

Point: 70 grain field point (5/16 inch for 5/16 inch shafts), 63 grain modkin (5/16 inch or 9/32 inch) historical target point

Fletching: Pre-cut 3 inch or 4 inch parabolic, or custom cut 4 inch x 1/2inch or 3-1/2 inch x 7/16 inch

Nock: Martin Nirk, Bohning Classic, Marco BJ

Bohning Classic



Marco BJ



Martin Nirk



Self Nock



Horn Nock



Figure 3: Period and modern examples of arrow nocks.

Making Your Arrows

WARNING: These operations use flammable and toxic substances, high temperatures, and sharp objects. Please exercise reasonable care not to injure yourself or others, burn down your house, or poison your dog. The following section will explain the processes that I use. However, I cannot guarantee they will work for you, or that you should even attempt them. Please make that determination using your own judgment and accepting your own risk. All of these supplies and tools are commonly available, and none are unusually hazardous when used responsibly and according to the manufacturer's instructions. However, even the most innocuous stuff can be misused. Please be careful.

Sequence of Operations

Your choice of finish will influence sequence of operations. The below sequence of steps suits an alcohol stain and varnish wipe, which I use. At the end, I'll suggest alternate sequences for other finishes.

Inspect, Smooth, Taper

Inspect shafts, and reject them if they are damaged or unusably bent. Smooth the shafts with fine steel wool (000) or sandpaper (600?). Cut tapers for the point and nock with a taper tool. The taper tool will cut tapers at two angles. The long, gradual taper (5°) is for the point, and the shorter, steeper taper (11°) is for the nock.

Stain the Shaft

Mix powdered (not liquid) Rit fabric dye in denatured alcohol, and test the color on a piece of scrap wood. If you have cut your shafts to a shorter length, the scrap pieces of shaft will be ideal for testing stains. Wipe the arrow shaft with a dry cloth, paper towel, or tack rag to remove any sanding dust. Wipe the stain evenly on the shaft, including the point and nock tapers, and allow the stain to dry. The stain will dry quickly. Apply a second coat for more intense color.

Glue Point and Nock

Wipe the point and nock tapers with a clean cloth to remove excess stain.

Steel points are oiled to prevent rust. Clean the interior tapered surface of the points to remove oil before gluing. Many degreasers will work, such as denatured alcohol, brake parts cleaner, or soap and water. To apply the points:

1. Begin the process of gluing the metal point onto the long taper of the arrow shaft with hot-melt glue (e.g. Bohning Ferr-L-Tite) by heating the glue stick with a clean flame from an alcohol burner, gas stove, or a propane torch.
2. When the glue is hot enough to be soft, wipe a small amount of glue on the taper for the point. Be very careful not to drip glue on your hand while doing this. The glue will be very hot and will cause a painful burn.
3. Hold the point in a pair of pliers, and heat the point with your clean flame until the point is hot

enough to melt glue. Using an alcohol burner, this should take about 10 to 15 seconds.

4. Slide the hot point onto the shaft taper, melting the glue that is on the shaft. Try not to have gotten the point too hot while heating it. If the hot point chars the shaft or falls off because the glue is runny, it's too hot. If the point glows red, it's way too hot.
5. Bearing against a scrap of wood, press the shaft into the hot point. Rotate the shaft to check the alignment of the point, and to make sure that the point is fully seated. The rim of the point should come up to the edge of the taper cut. If the point is not fully seated or is not straight, reheat the point for a few seconds with your clean flame, apply pressure again, pressing the shaft into point, adjusting with pliers as needed, and recheck the alignment of the point.
6. Wipe off any excess glue, taking care not to burn your fingers as the glue and the point will still be hot.
7. Allow the point to cool in the air, or dip the hot point into water to cool. Remember not to lay the arrow shaft down on any surface that is not heat-proof until the point is cool.

Nocks usually don't need cleaning, but it couldn't hurt to wipe out the internal taper with a little denatured alcohol. You could also scuff inside the taper of the nock with steel wool or sandpaper so the glue will hold better.

The only tricky part about gluing on a nock is deciding where to locate it.

Your arrow shaft once was part of a tree. If you look closely at the end of it, you'll see the tree's annual growth rings. If you were cutting a self-nock in the end of this shaft you would cut the nock groove across or perpendicular to, not parallel to, the growth rings. That's also how your glue-on nock should be oriented (*see Figure 4*).

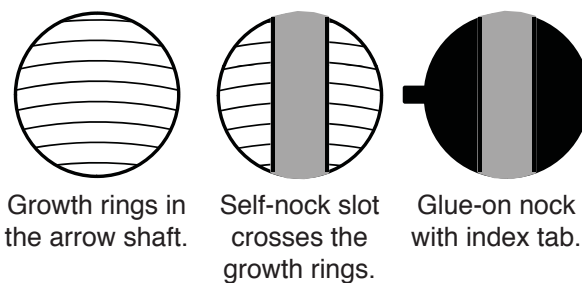


Figure 4: Correct orientation of growth rings.

Additionally, look at patterns where growth rings intersect the shaft surface. If the shaft cuts across growth rings, you'll see diagonal lines across two opposite sides of the shaft. (Ignore for now the question of how a cylindrical shaft can have sides.) Ninety degrees around from these diagonal lines, you'll see a pattern of narrow V's pointing toward the shaft ends. The nock index tab should point away from the bow while the upper pattern of V's points forward (see Figure 5).

Glue the nock onto the short nock taper with gel cyanoacrylate (CA) glue (superglue.) Other glues may work, but superglue is what I use.

There are two reasons to orient the nock and the index feather in this way:

1. *Safety.* If an arrow shaft breaks along a growth ring plane when you fire the bow and the grain was properly oriented during construction, the driven fragments of wood will most likely travel up and away from the bow hand, thereby reducing the risk of injury from the flying splinters of wood.

2. *Uniformity.* Shaft stiffness parallel to growth rings is different from stiffness perpendicular to growth rings. Ideally, all shafts in a set should have about the same stiffness, so all nocks should have the same orientation relative to grain.

Mark your shaft on the side where you want the nock index tab. This mark is known as a "witness mark". Apply a thin ring of gel CA glue to the middle your shaft's nock taper. Press the plastic nock firmly onto the taper, rotating it to align it with the witness mark. Wipe off any excess glue, taking care not to stick your fingers together.

Varnish

Smooth the stained shafts with fine steel wool, and wipe to remove dust. Wipe tung oil varnish onto the shaft with a piece of scrap cloth, taking care to wet the crevices around the point and the nock. Allow the varnish to soak into the shaft for a few minutes (5 - 30 minutes, depending on the formula. Be sure to read the manufacturer's directions on varnish can), then wipe off the excess varnish. Allow the varnish to dry for about 12 hours. Repeat the process for three coats, or more if you prefer.

Fletch

Now the fun part!

"Fletching" denotes both the group of feathers on an arrow, and the process of applying those feathers. There are practically endless possible ways to fletch an arrow, but the most common is to have a three-fletched arrow. Briefly and generally, we want to glue three feathers onto the shaft near the nock end, oriented so that the fletching stabilizes the arrow's flight.

Usually, we use two feathers of the same color and one contrasting feather. When we fit an arrow to our bow, the contrasting feather should point straight out away from the bow. This contrasting feather may be called the "cock feather", the "nock feather", or the "index feather". The remaining feathers may be called "hen feathers".

A three-fletched arrow generally has feathers that are equally spaced radially at 120° intervals around the shaft. The index feather aligns with the nock index tab.

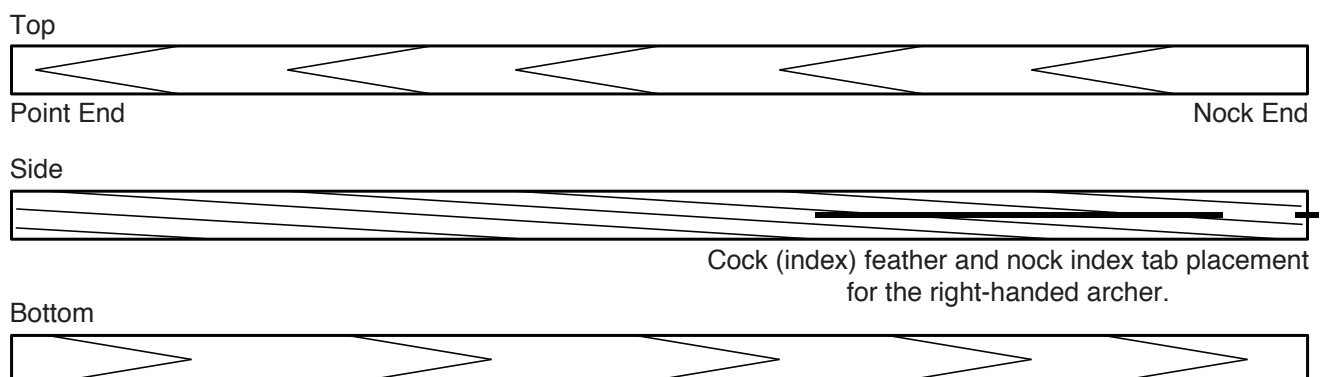


Figure 5: Correct orientation of wood grain around the arrow shaft.

A fletching jig or fixture aligns feathers correctly to the shaft, and spaces feathers correctly around the shaft. There are many styles of fletching jig. Most jigs apply one feather at a time. I use an Arizona E-Z Fletch, which applies three feathers simultaneously. I'm not endorsing this jig or any other. The E-Z Fletch has good and bad points, but really I selected it because I thought it looked interesting and different.

The E-Z Fletch jig works only with right-wing feathers, which seems to be the modern standard. Whatever alignment tool you use, all feathers on an arrow must have the same curvature. They must be all left-wing or all right-wing.

If properly adjusted, your fletching jig aligns and spaces feathers correctly. It also sets them an appropriate distance from the nock, which is something like 1.25 to 1.5 inches from the base of the nock groove to allow some clearance for your fingers.

Before gluing fletches, it's a good idea to scuff the shaft lightly with fine steel wool, and wipe with denatured alcohol to remove any oily residue.

Be sure to follow the manufacturer's instructions for your fletching jig. The basic process of fletching is:

1. Adjust the jig to fit your shaft, nock, etc.
2. Insert a feather or feathers into the fletching clamp or clamps on the jig.
3. Apply glue or fletching tape to the feather quill.
4. Insert the arrow shaft into the jig.
5. Hold the feather in contact with the shaft until glue or tape sets.

I use CA glue, but other solvent-based glues such as Duco Cement seem to work well too. Fletching tape doesn't work well with my fletching jig, but probably would work with other models. Use glue sparingly. It's more common to use too much rather than too little.

Cutting Fletches

To make your arrows look more like period arrows, you can cut your own fletches from full-length feathers. Often you can cut two fletches from one feather, which can save you a little money. To cut your own fletches:

1. Split your feathers in half along the quill with a sharp hobby knife.

2. Measure your fletch length with ruler or gauge.
3. Cut the quill of the feather to length with scissors. Be sure to cut only the quill, not the feather barbs.
4. If you want whipping tabs, trim the feather barbs from quill at the leading and trailing ends. For consistency, it is helpful to mark tab length on scissor blades with tape.
5. To cut shape of the fletching neatly, tape the feather to a cutting plate. I use 2-inch masking tape and a brass plate from Ace Hardware. Before taping, push the quill tightly against the plate edge. I use another brass strip for this purpose.
6. Mark fletch shape on the masking tape, and cut with a craft knife and straightedge. I use a 1/2 inch wide brass strip for a layout gauge and for cutting the straight edge. This produces a fletch around 1/2 inch high at the tail, depending on the shape of the fletch's trailing edge.

If this layout process becomes tedious, a wood jig block speeds the work. Also, a gauge is useful to measure fletch length and whipping tabs.

On 5/16 inch shafts, I use a 4 inch fletch with 1/8 inch whipping tabs, for a total length of 4 1/4 inches. On 9/32 inch shafts, I use a 3 1/2 inch fletch with 1/8 inch tabs.

Whipping

If you'd like, you can wrap the leading and trailing ends of the fletching, known as "whipping". Whipping can prevent the fletch leading end from tearing loose as it might if the arrow passes through a bale of straw, and also looks like period practice. To prepare fletches for whipping, trim feather barbs away from the quill for a short distance at each end, as described in the previous section. Traditional whipping materials include linen and silk, though modern polyester thread works as well.

Tie the thread to the shaft in front of the fletching using a clove hitch or constrictor hitch. Wind the thread tightly around the shaft, progressing toward the nock end until you cover whipping tabs. Secure with another clove hitch. Similarly whip the trailing end. I find it difficult to tie a hitch around tabs in the confined space under tapered fletching, so I tie the hitch around a tube, slide the tube over fletching tabs, then slip the hitch off the tube's end. Hobby brass tube from Ace Hardware works well for this. Saturate whipping wraps with white glue for security.

You may wind the thread helically through the barbs to bind fletching to the shaft. This isn't necessary with modern glues, but you may like the look.

Other Finishes

To protect from dirt and moisture, arrows may be finished with varnish, lacquer, enamel, or many other products. A sequence of operations different from that described above may be required, as well as the use of different adhesives for your fletching.

Point and nock glues will generally adhere better to bare wood than to paint. For a painted finish, you may want to paint the shaft first, then cut point and nock tapers, install point and nock, and then touch-up damaged paint. Alternatively, you might mask point and nock tapers with tape before painting. Also, you may need to mark nock/fletching orientation before you paint the shaft, maybe by scoring the shaft at the index location.

Similarly, glues may not adhere well to oil-based stains. If you're using oil-based stains, you may want to glue point and nock in place before you stain the shaft.

Linseed oil behaves much like tung oil. Allow the oil to penetrate for a few minutes, then wipe off the excess and allow it to dry. **Use caution if you choose to use linseed oil as it can pose a fire hazard. Linseed oil releases heat as it dries. If that heat cannot dissipate, such as in a pile of oily rags, the unreleased heat can build up enough to start a fire.**

If you want to finish your arrows with a thoroughly traditional product, such as tallow and/or beeswax, then it is best to assemble the arrow completely, including fletching, before finishing. The completed arrow can then be *carefully* heated high above a clean flame, with a heat gun, or with a hair dryer to melt the tallow or beeswax into the shaft.



Period-style target arrows.



9/32" Sitka spruce with 3 1/2" fletches and modkin points.



5/16" German spruce with 4" fletches and field points.



Sources

Arrow Components and Supplies

3 Rivers Archery Ashley, IN

<http://www.3riversarchery.com>

Full line of traditional archery supplies: bows, arrows, arrow components, tools, etc.

Kustom King Traditional Archery Schererville, IN

<http://www.kustomkingarchery.com>

Full line of traditional archery supplies including German spruce shafts.

Richard Head Longbows Melksham, UK

<http://www.longbowandarrow.co.uk/>

Traditional archery supplies. Shafts in ash, pine, poplar; historical target points, tools, etc.

The Longbow Shop Birkenhead, UK

<http://www.thelongbowshop.com>

Traditional archery supplies. Shafts in ash, pine; "modkin" points, tools, etc.

Hildebrand Arrow Shafts Port Angeles, WA

<http://www.hildebrandarrowshafts.com>

Manufacturer of Sitka spruce and Douglas fir shafts. Sells low-spine and 9/32" shafts.

Allegheny Mountain Arrow Woods Coudersport, PA

<http://www.arrowwoods.com>

Manufacturer of shafts and arrows from unusual woods, e.g. ash, hickory, laminated birch.

Arrows

Wapiti Archery Grants Pass, OR

<http://www.wapitiarchery.com>

Manufacturer of Port Orford cedar arrows and shafts, straight and tapered.

All Wood Arrows Christiana, TN

<http://www.allwoodarrows.com>

Rose City Archery Myrtle Point, OR

<http://www.rosecityarchery.com>

Red Mountain Archery Ivins, UT

<http://www.redmountainarchery.com>

Other Supplies and Tools

Gutermann #30 silk for whipping Red Rock Threads

<http://www.redrockthreads.com>

Clover #50 silk -- finer than #30

<http://www.amazon.com>

Crown marking knife for cutting fletches

Highland Woodworking Atlanta, GA

<http://www.highlandwoodworking.com/>

K&S brass tube and sheet

Ace Hardware

Target Arrows with Medieval Features for Tournament Shooting

by Lord Mungo Napier, the Archer of Mallard Lodge (MKA Garth G. Groff)

Introduction

The purpose of this article is to encourage building “medieval-style” arrows at an appropriate weight and length to fit our light sporting bows. Because these are downsized arrows, they are already a compromise with their historic counterparts. To keep this project as simple as possible, I suggest using purchased supplies and substituting materials where needed. It is the feel we’re after here, not strict historical accuracy. Medieval-style arrows are fun to make, can be an extension of our garb and personas, and are an easy introduction to making more accurate full-sized arrows for A&S projects. I recommend you save these arrows for tournaments, rather than getting them all banged up at practices.

Shafts

Only a small number of fancy decorated arrows were made for the very wealthy for sporting or recreational use during the middle ages (I know of just two examples in portraits). The vast majority of arrows were plain wood, without any color or cresting. They were sealed, often with boiled linseed oil or a mixture of melted beeswax and lard (yecch!), which gave them a mellow golden color.

Shafts were not turned on a lathe like the shafting we buy today. They were made from square billets, with the edges planed off using a float, then likely smoothed with a file or a rough stone. This left them with frequent flat spots, tool marks, and sometimes not perfectly round. Originally, I used unsanded Sitka spruce with its prominent grain to suggest hand worked shafts. My sealants left the spruce almost as smooth as my modern cedar “pretty arrows”. I have since switched to using

unsanded cedar for these medieval arrows, and no longer worry about the grain.

I do not cut the shafts to my draw length or taper the point ends until after the nock reinforcements and self-nocks are cut and finished. If I blow either of these steps, the botched part can be cut off for another try. If the shafts are cut to length first and a shaft is damaged, it is ruined and only useful as an expensive garden stake.

Nock Reinforcement

During the Tudor era, shafts were strengthened with a 2 inch sliver of cow horn inserted in the nock end parallel with the grain. This was needed to prevent splitting with the extremely powerful yew war bows of the time. Whether lighter arrows for civilian use or war arrows from earlier times had these reinforcements is not known. No true medieval arrows survive; most of what we know is based on the Mary Rose shipwreck arrows from 1545.

Cow horn is often too thick for our target shafts, and is rarely flat. To keep this project simple, try using substitute materials. My choice is piano key ivory, which is very thin, but strong. Another possibility is .030 styrene plastic. Styrene is very easy to work. Just score it twice with a sharp hobby knife and snap. It can also be cut with a craft saw, and is easily filed or sanded.

The nock reinforcement is closely tied to cutting the nock directly into the shaft (a “self-nock”). Whether to take these two steps depends on the size of the arrow and your confidence. For shafts with an 11/32 inch diameter, reinforcing the shaft is optional, though recommended (and it looks

way cool!). With 5/16 inch shafts, reinforcement is strongly recommended if you plan to your cut nocks into the wood. This will demand considerable care to cut the slot exactly in the center of the shaft, possibly requiring a mechanical scroll saw or jigsaw with a table and fence. If you have any doubt about getting this right on 5/16 inch arrows, substitute plastic nocks and skip these two steps until you have better tools or more confidence.

Mark your shaft on both sides parallel to the grain with a pencil line to the depth you plan to cut. For our size arrows, 1 1/4 inch is a good depth. Make sure your lines are square. If working by hand, wrap your shaft with a rubber jar lid opener or similar material, and clamp it into a vise just tight enough so the shaft can't move, but not tight enough to crush the wood. Cut *parallel* to the grain. Use a hacksaw or other fine-tooth saw and work slowly to avoid having the blade wander. Widen the slot using a broader tooth saw, hobby knife, thin files, emery boards, and sandpaper. Test-fit your reinforcement material frequently. You need a firm fit, but you must not take out too much wood, nor too little. Either would bend the wood at the base of the cut and cause a weak spot. When you are satisfied with the fit, glue the reinforcement in place with epoxy or slow-setting "super glue". Squeeze the shaft in a soft-jaw clamp and leave it for 24 hours. When completely dry, trim off excess reinforcement material and smooth the edges and end with a fine file. If you see small gaps, fill them with thick epoxy or "super glue" applied with a toothpick, and sand again as needed.

Self-Nocks

Cutting a self-nock into the shaft is much like making the reinforcement slot, but a whole lot easier. Make your cut *across* the grain and the reinforcement (if present). It should be 1/4 to 5/16 inch deep, just deep enough to take your string. Deeper nocks will weaken the arrow shaft. Make your initial cut with a hacksaw in the vise as before. Widen the cut with a broader tooth saw, hobby knife and files. A small round ("rat tail") file is very useful here. Check your nock frequently on a strung bow. With a flat file, take off a small amount of the square edge around the shaft end to prevent splintering, but don't make the end into a dome. Also remove about 1/32 inch from the mouth of the slot on each side to a depth of about 1/32 inch. This will give you a slight funnel shape at

the nock mouth that will help guide the string into the slot. Smooth everything with fine sandpaper.

Sealing

Sealing is not a visual feature of your arrows, but is very important to prevent warping, and makes the arrows easier to clean. This is a good time to do the sealing step. You can use polyurethane for a hard seal. I suggest at least two coats of Minwax Wipe-on Satin for a flat finish. This will tend to smooth out the rough grain that you worked so hard to preserve. An alternative is Minwax Polycrylic Satin, a water-base sealant that may actually roughen up the grain a bit more. Polycrylic is not as tough as polyurethane, but is easy to apply and cleans up with water. Be sure to work the sealant into the nock, but don't overdo it. Remember that for each coat in the nock, you are actually reducing the nock width by two coats, one coat on each side. You want to be sure your shots are not retarded by a nock that is too tight.

Fletching

According to Roger Ascham's *Toxophilus* (1545), the proper fletching colors are a black or gray cock feather and two white hen feathers. These are the colors of the lag goose, widely raised in Olde England. This isn't much of a color pallet, but it is doubtful that feathers were dyed in bright colors at this time. We can expand our choices to natural barred, gray barred, and brown barred, representing feathers gathered from pea hens, pheasants, or kept birds of prey. You should avoid bright colors. Remember, we're going for the typical look here. My arrows are fletched with a white cock feather and two natural barred hen feathers, a pattern I have used on nearly all my personal arrows since I began fletching seven years ago. This is not truly period, but I see no reason to change.

Fletches on my arrows are cut from TruFlight 5 1/2 inch shield-back feathers (*see Figures 1 and 2*). Shield-back feathers will have a slight "Roman nose" curve, but this will hardly be noticeable. If it bothers you, consider cutting your own fletches from full-length feathers. You may choose either a "traditional" swallow-tail shape, or a simple square-end triangle shape for your feathers. When cutting your feathers, be sure to leave about 1/4 inch of feather base on "traditional" feathers at the nock end, or about 1/8



Figure 1: Cutting and measurement diagram for a simple square-end style fletch cut from a shield-cut fletch. Trim the quill to 4 7/8 inches long (1), and trim the barbs into a square shape and trim the excess barbs from the quill at the nock end (2) to create a tab for whipping (the space between 1 and 2).

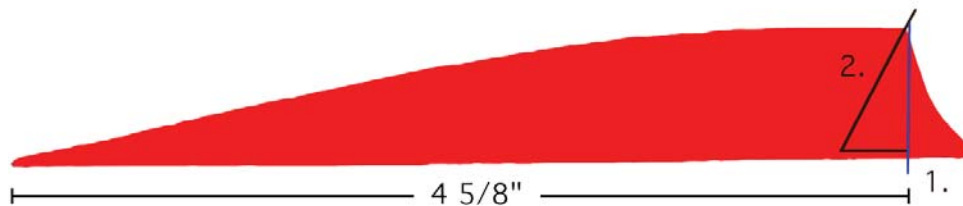


Figure 2: Cutting and measurement diagram for a swallow-tail style fletch cut from a shield-cut fletch. Trim the quill to 4 5/8 inches long (1), and trim away the barbs from the quill without shaping the remaining barbs at the nock end (2) to create a tab for whipping (the space between 1 and 2).



Figure 3: Example of whipping using blue thread, square-end style fletching (top), and swallow-tail style fletching (bottom).

inch if using the squared triangle shape. This tab will be needed for tying down the feathers in the next step.

Your feathers may not turn out to be exactly the same length, and this can cause problems with the step later. Match your feathers by length in groups of three as closely as possible, and make sure the pointy ends are aligned at the same distance from the end of the shaft.

Glue your feathers to the shaft using your favorite method. I use an AAE Fletch III fletching tool, which

will accept a self-nocked arrow in its rotating collar. For glue I always use Bohning fletching tape. This tape is easy to use, and needs no drying time. I carefully run a flat tool along the feather base after removing the clamp to make sure the glue has good contact with both the feather and the shaft. The rounded back end of tweezers works well for this. If you are mounting “traditional” feathers, move the fletching forward 1/4 to 3/8 inch toward the point to give you some extra room where your fingers grip the shaft.

Whipping

Binding the feathers onto the shaft is not hard, though it does take a bit of practice and some patience. The effect is worthwhile, since nothing says “middle ages” more than a whipped arrow. Most arrows were whipped with a fine linen thread. This is hard to find, so you can substitute crochet thread, or any heavy sewing thread (jeans-weight). Try to find a thread that shows the least weave. Thread can be colored if you wish, or choose ecru to represent undyed linen. Colored thread can set your arrows apart from those of other shooters (assuming

you are not the only one with period arrows), but try to pick a color that is typical of the time and not too wild (see Figure 3). Consider using your principal heraldic color. The best-quality arrows were whipped with silk, often red or green. Silk thread is available in most fabric stores.

Snip off about 7 feet of thread. Begin wrapping at the point end of your feathers with the knot shown in Figure 4. If you can’t get the thread to stay put, try placing a dot of bow wax on the shaft right where the

thread will cross. Take four or five turns around the shaft at the feather's point end, then work your turns up onto the feather base. About 1/8 to 3/16 inch is all the wrap you will need. Before you begin spiraling the thread into the feather barbs, stop for a moment. Draw the "working part" of your thread through that loop you left sticking out to the right and pull it tight. Draw the "bitter end" (sticking out to the left) tight, and you will have a tight knot under the wraps. Begin spiraling your thread up the shaft, working it into the barbs as you go and rising about 1/16 inch with each feather. The actual space between each wrap of the thread should be about 3/16 inch. This will give you approximately five turns to the inch, the proper English military whipping. Any less than four turns will look barren, and more than six turns will look excessive (and is a waste of thread and time). The width between the wraps tends to grow wider near the nock end, and may take several tries to find the right place between the barbs. The thread should rise in an even spiral, but if you get a uneven spacing, it isn't too much to worry about. You can unwrap the whipping back to where you went wrong and try again if you wish. Finish the whipping by wrapping the thread around the small tab of the feather base at the nock end of the feather. To secure this last part, thread on a small curved needle and sew two stitches around the last two or three wraps. Pull tight. Cut off the excess at both ends, except for about 1". We will trim this later. If you cut the ends close now, your knots may unravel.

Some fletchers run their whipping along the shaft to the nock end and add another 1/8 to 1/4 inch wrap just below the nock. I don't like having this thread running along the shaft. It could potentially come loose and catch on something, sending your arrow wild. It is better to start a completely new wrap at the nock. This needs to be tight if it is really going to reinforce your nock. Use the same loop you started with at the point end of the feather, and finish by going through the loop and pulling the "bitter end" tight. Again, trim the tags back to 1 inch.

More Sealing

Now it is time to get out that Minwax Polycrylic again. With a 3/8 inch brush, paint the sealant on the wraps you made at the ends of the feathers and below the nock. Allow the sealant to soak into the threads, which will bind them into a tight mass that isn't likely

to unravel. Also paint the shaft and the thread between the feathers with the sealant to bind the whipping to the shaft. Try not to get any sealant up

onto the feather barbs. When the sealant is dry, snip off all those little tag ends of thread you left hanging just a tad above the knots.

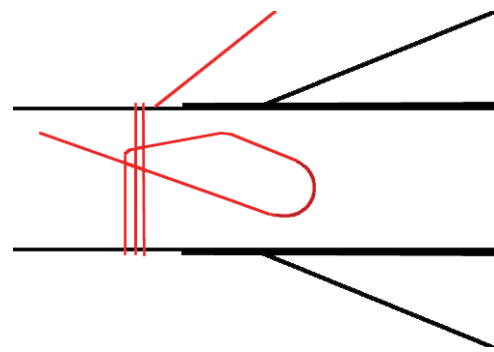


Figure 4: How to form the knot in the thread to begin whipping the fletching.

Points

We'll finish up by applying the points. Use your favorite method. I prefer to mount my points using 2,400 lb. (so-called "two ton") slow-setting epoxy. I use Devco brand in the twin applicator.

Points should be appropriate to the shaft size and length of your arrows. Most of us will be using 100 or 125-grain points. Some specialty points like hand-forged medieval replicas and the 3Rivers Archery "long bodkin" are too heavy for target use, and will cause your arrows to plunge.

3Rivers sells a short bodkin, and also the well-known Ace Classic Medieval Point, both at 125 grains and fitting an 11/32 inch shaft (*see Figure 5*). Due to the large surface area on the trailing face of these points, they are prone to pulling off in targets when removed. Any rubberized foam, and bag targets with a plastic "burlap" material, are particularly hard on arrows with these points.



Figure 5: Modern, Medieval-style adaptations of period points, the "short bodkin" (left), and variations of the "round bodkin" and "Ace Classic" points (three on the right).

My current favorite is the Bearpaw brand “Modkin”, available by mail order from the Longbow Shop in England. These come in 100 and 125 grain weights for 11/32 inch shafts, and 65 or 100 grains for 5/16 inch shafts. The streamlined design of these points makes them easy to remove from a target. These points are like nothing actually made in the middle ages, but they have a very cool look. They are also about half the cost of other comparable points.

I have also had good luck with steel bullet points from the Longbow Shop. These are actually the most accurate points for this project, representing a type in the Museum of London and British Museum collections that were used for target practice. These are available as glue-on or screw-on. The screw-on points have a straight socket, rather than one that is tapered like American points. Instead of tapering the shaft with a 5-degree taper tool, I carefully file the ends of the shaft slightly, just enough for the threads in the socket to bite the wood. I also use epoxy, and a 3Rivers screw-on tool was used to set these points.

Also of interest are the less expensive generic “Modkins” (also known as “Med-heads” or “Mod-bods”), available in black or bare steel and fitting both 11/32 inch and 5/16 inch shafts at various weights. These are slightly less streamlined than the Bearpaw points, and I have had some catch in targets. They are also sold by the Longbow Shop, and by Richard Head Longbows. When ordering from either vendor, plan to buy several dozen points to make shipping worthwhile.

If you aren’t comfortable ordering from England, the good old PDP field point is the best default choice.

Recently, 3Rivers has added some interesting Top Hat brand points, including a bodkin. Although I have some of these, I have not had a chance to mount them yet.



Suggested Supplies

The Longbow Shop
<http://www.thelongbowshop.com/>
Faux-medieval points.

Richard Head Longbows
<http://www.english-longbow.co.uk/>
Faux-medieval points.

3Rivers Archery
<http://www.3riversarchery.com/>
Arrow shafts, including Sitka spruce; 5 1/2” or full-length TruFlight feathers; full-length AMG feathers, AAE Fletch III fletching tool (available in right wing only); Bohning fletching tape.

FS Discount Archery
<http://www.fsdiscountarchery.com/>
Acme arrow shafts (cedar only); 5 1/2” or full-length TruFlight feathers; Bohning fletching tape.

Walker Piano Key Service
<http://www.walkerpiano.com/>
Ivory piano key tails.

Lowes, Home Depot, or other hardware/paint stores for Minwax Wipe-on Polyurethane Satin; Minwax Polycrylic Satin, acetone.

Drug store or supermarket cosmetics section for fingernail polish remover (get pure acetone, without aloe or vitamin E).

Any good hobby store for Evergreen styrene sheets #9104, .030 thick, package of two sheets.

Turkish Flight Archery with Notes on the Construction of Flight Arrows

*by Magister Arion the Wanderer, OL, Order of the Gray Goose Shaft
Dragon's Lair, An Tir*

What is Flight Archery?

Flight archery is the art of shooting an arrow the greatest possible distance. It is the only form of archery that doesn't involve hitting a target. One of the first questions a novice archer thinks about is, "I wonder how far I can shoot this arrow?" This simple query put bowyers and fletchers throughout the world on a pursuit of the perfect bow and that will shoot the perfect arrow the greatest distance. The importance of being able to shoot arrows farther than your enemy was certainly not lost on the warlords!

The essence of successful flight shooting is this: "If, in shooting, it is your wish to outdistance your competitors, you should use a bow with short limbs and choose a light arrow." ¹

A History of Flight Archery

Flight archery contests can be done with any archery equipment. It is inconceivable that any culture practicing archery didn't have distance shooting contests. The best accounts of flight archery written in English are found in Turkish Archery², Saracen Archery³, and Arab Archery⁴. Flight archery competitions continue today in the SCA and the modern archery community. In the pursuit of perfection, modern archers have experimented with a wide variety of materials not available in earlier times.

In the Ottoman Empire, they took flight shooting very seriously. In the reign of Mohammed II (1431 - 1481), he established the Ok Meydan as a flight archery field. The field had five "wind" ranges laid out so one could always shoot with the wind at his

back. The Constantinople Guild of Archers had four classes of members: the seniors, the 900's, the 1,000's and the 1,100's⁵. These numbers represented the distances⁶ the archer must exceed to qualify for the class. The distances are approximately 610 yards, 680 yards and 750 yards. Since the 1,200 gez distance (820 yards) was only rarely achieved, these archers were ranked with the 1,100 group. Stone monuments were set up with great ceremony to mark the record shot on each range⁷. The greatest distance marked by a stone monument on the Ok Meydan and was about 874 yards, shot by Toz-Koparan in 1550⁸. In 1798, Sultan Selim was observed by a British Ambassador to shoot a flight arrow 953 yards⁹. The current record using modern equipment is 1222 meters (1336 yards), shot by Dan Brown in 1987¹⁰.

The Turkish Bow

The Turkish composite bow had a maple lathe core. A double layer of sinew was glued on the back. Two strips of horn that abutted at the grip were glued on the belly. The unstrung bow curved back on itself to form a tight "C" shape, with the back of the bow on the inside of the C. The elements of the bow were glued with fish glue. Building this bow took almost one year. A typical bow measured 44 inches between the nocks along the belly when unstrung. The handle was 6 inches long. The working parts of the limbs were about 10 inches long. It has two siyahs carved from single pieces of wood attached to the ends of the working limbs to nock the string. The limbs vary from 1-1/8 inches to 1/2 inch in width. When strung, the bow had a high brace height and draw weights of 90 to 150 pounds¹¹. Modern bowyers, using the same materials and techniques as the Ottoman Turks, can make

composite bows with similar draw weights¹².

For more information about Turkish bows read:
<http://www.turkishculture.org/military/weapons//inheritance-turkish-bowyer-829.htm?type=1>

The Turkish Flight Arrow

Isles¹³ measured two groups of Turkish flight arrows totaling 55 in number. A summary and averages of these measurements includes:

Shaft	Conifer (typically pine)
Length	24.5 inches
Shape	Barreled
Pile	Sharp ivory or bone point - 0.25 inch long
Fletching	Feather or parchment (calf skin) attached straight at 120°
Nock	Brazil wood or wild goat horn, glued to shaft and wrapped with sinew
Shaft dimensions	Base of pile = 0.11 inch 6 inches from pile = 0.22 inch 12 to 18 inches from pile = 0.27 inch Base of nock = 0.19 inch
Weight	162 - 236 grains
Balance point	Behind center at 13.5 inches from pile
Spine	Varies from 32 to 80 pounds (supported at 22 inches)

For a detailed discussion and diagrams refer to Isles' original article: <http://www.turkishculture.org/lifestyles/turkish-culture-portal/turkish-flight-arrows-554.htm?type=1>

The Siper¹⁴

The Ottomans used an overdraw device called a siper to allow a longer draw with the short arrow. The siper (see Figure 1) is a long and shallow trough that straps to the thumb of the bow hand. In its most elaborate form, the trough is mounted on a wooden base and has a movable plate below the trough to protect the archer's hand should the arrow be overdrawn too far. The word "siper" is Persian for "shield".

The trough was made from horn or ivory. The ivory was sometimes dyed various colors. A siper measured by Klopsteg was 4 3/4 inches long by 1 1/16 inches wide. The middle of the groove was about 5/32 inches higher than the ends, curving in an approximately circular arc of about 18 inches. The trough was lined with very thin Moroccan leather, glued in with fish glue. The shield was an oval plate measuring 3 3/4 inches by 5 inches. It was made of tortoise shell or sheet metal (brass, copper or silver).

The wooden base was made from linden wood or maple. The strap was made from the best Moroccan leather and carefully fitted to the wearer's hand and buckled at the wrist.

The Thumb Ring

The Ottomans shot with a thumb ring made of leather, horn or metal. The last two had a piece of leather glued in place with a protruding leather flap to protect the thumb joint. A thumb ring must fit well to prevent blisters or the loss of the ring when shooting. Anyone seriously considering the use of a thumb ring should read Kay's Thumbring Book, available at <http://www.amazon.com/Kays-Thumbring-Book-Kay-Koppedrayer/dp/B000XMBW02>

Factors affecting arrow flight:

- Velocity - Faster arrows go farther.
- Angle of release - For maximum distance the angle of release should be between 44 and 45 degrees.
- Arrow mass - Lighter arrows go farther.
- Arrow diameter - Increasing arrow diameter increases drag on the shaft. Thin arrows go farther.
- Balance point - A balance point slightly behind center allows arrows to fly farther.
- Arrow length - Longer arrows are heavier. A short, overdrawn arrow is best.
- Fletchings - Very thin, rigid and straight fletchings with minimal area are best.
- Fletching position - Moving the fletchings forward from the nock within a very small range marginally increases distance.
- Air density - Increasing humidity decreases distance.
- Wind speed - Always shoot with the wind at your back to achieve maximum distance.

How to Build a Turkish Flight Arrow

I've made four flight arrows to date. The first one was built to Turkish standards, including a bone pile, Brazil wood nocks glued on with fish glue and wrapped with sinew, and parchment fletchings. In my quest for purity of design, I didn't paint this 24 1/2 inch toothpick of an arrow. I shot it and never found it! The second one was made exactly the same except for the day glo orange paint. I shot and found that one!

I have since built two longer flight arrows. The first of these measured 28 1/2 inches long. This was built using the same diameter measurements listed above recalculated to proportionally fit the greater length of the shaft. For a number of years, I've shot this arrow 230 - 250 yards from my 44 pound Korean hwarang bow in An Tir's annual flight shoot competition in October. Up until last year, I always won in the 40 - 49 pound draw weight class. Since I was bested by a few yards last year, I built my newest flight arrow at 31 1/2 inches long, a 1/2 inch longer than the maximum draw length of my Korean bow. Again, I used the same diameters as above recalculated to proportionally match the arrow's length. I won this year's flight shoot with a 301 yard shot. It was rather lonely standing by my arrow waiting for the distance reading with the range finder since the rest of the shooters were between 70 and 230 yards!

You want a flight arrow spined correctly for your bow for optimal results. If you start with the shafts you normally use for your bow, they will end up underspined once you reduce the diameter to about 1/4 inch at the center section of the flight arrow. That

can be dangerous ... think exploding arrows here. The last flight arrow I made started as a 47 pound spined shaft and finished up as a 24 pound spined flight arrow after all the wood was removed. That was OK for my 44 pound non-center shot Korean bow. The perfect starting shaft spine and final arrow spine for your flight arrow will need a bit of experimentation. Make a bunch and shoot them all to see what works.



Figure 1: The siper, which is an overdraw device that allows a long draw length with a short arrow.

of the shaft, leaving a 1/2 inch exposed (see Figure 2). To remove the wood from the parallel-sided shaft, I used a combination of a small block plane, a cabinet scraper, a couple of small wood files, and sand paper. Initially, I worked the shaft down to a 1/4 inch++ diameter with the block plane by removing wood along the length, first from each quarter, then



Figure 2: Example of the end of a 3-penny nail placed in a drill hole in the tip of the arrow shaft (shown on the right), replacing the traditional field point (shown on the left) or target tip.

from the opposite quarters to get an 8-sided shaft. From there, I removed wood more carefully with a cabinet scraper. I used a hole gauge to check the diameter to make sure that the shaft stayed fairly uniform at about 1/4 inch+. Then, at about 3 inches from the pile end, I started to taper the shaft. I continued tapering with the cabinet scraper going back about 3 inches farther from the pile each time and working all the way down to the pile. Between 15 inches and 23 inches from the pile, I left the shaft at 1/4 inch+ diameter. Then I worked the opposite end into a bulbous nock. I filed just past the nock area to reduce the

Post your results back to the list.

Very important: Start with a straight shaft and end with a straight shaft. Check this frequently as you remove wood.

For my last 31 1/2 inch-long flight arrow, I started with a 31 inch-long shaft and inserted the cut off end of a 3 penny nail into a hole drilled into the end

of the shaft, leaving a 1/2 inch exposed (see Figure 2). To remove the wood from the parallel-sided shaft, I used a combination of a small block plane, a cabinet scraper, a couple of small wood files, and sand paper. Initially, I worked the shaft down to a 1/4 inch++ diameter with the block plane by removing wood along the length, first from each quarter, then from the opposite quarters to get an 8-sided shaft. From there, I removed wood more carefully with a cabinet scraper. I used a hole gauge to check the diameter to make sure that the shaft stayed fairly uniform at about 1/4 inch+. Then, at about 3 inches from the pile end, I started to taper the shaft. I continued tapering with the cabinet scraper going back about 3 inches farther from the pile each time and working all the way

diameter to about 3/8 inch. Then, I shaped the nock with files. Next, I tapered the nock end starting at 23 inches from the pile to the base of the nock to a uniform taper using the cabinet scraper. I used 100 grit sand paper to remove the high spots left behind from the previous work. You can find high spots and unevenness by running the shaft through your fingers. Finally, I checked the balance point. My goal was 17 inches from the pile for this 31 1/2 inch-long arrow. I removed more wood as needed to get close to the correct balance point, keeping in mind that the fletchings would add a little weight.

To finish the flight arrow, I reinforced the nock by wrapping it with very fine polyester thread using liberal amounts of Duco cement to hold this in place. After the Duco dried, I cut the string blocking the nock opening with a razor blade. I attached real calf skin parchment fletchings with Duco cement, hand held in place until it dried. The fletchings were 1 1/4 inches long and 1/4 inch high. I painted the arrow to seal the wood. Next, I checked the balance point again. Since it was a bit front heavy, I repainted the back end of the arrow to add a bit more weight until the balance point I wanted was realized. Finally, I coated the entire arrow, including the fletchings (see Figure 3) and nock (see Figure 4) with clear finger nail polish to make it as smooth as possible to reduce drag as it flies through the air.

A Cautionary Note

If you are thinking of building a siper, keep in mind that if something goes wrong when you use it, you can get hurt quite badly. Shooting an arrow through your hand, having the arrow blow up, or slap you in the face are all a very bad ideas.

The siper I made to Turkish specifications did not work well with my Korean bow. Unlike a Turkish flight bow, the grip of the Korean bow curves inward toward to shooter. It doesn't leave enough clearance for the siper. The bow's recoil at the end of the shot caused the string to hit the brass plate and almost cut it. My second attempt launched the arrow almost straight up due to holding the siper higher on the

bow to gain clearance for the recoil. Instead of a clean shot, the arrow got pinched between the back of the siper and the string at the end of the shot, flipping the arrow upwards. I stopped there and will not continue these experiments until I can get a properly shaped bow!



Figure 3: The fletchings of the finished flight arrow (bottom), compared to a period-style target arrow (top).

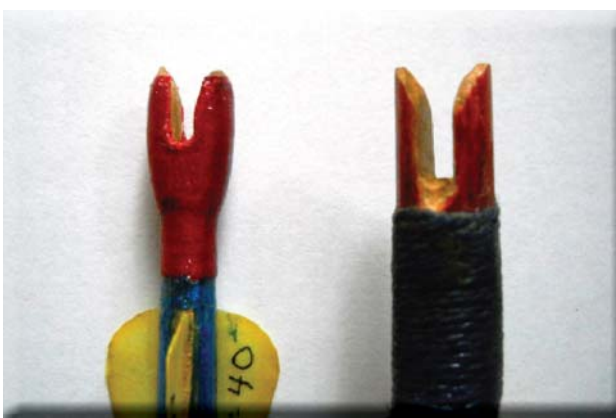


Figure 4: Close-up of the nock of a finished flight arrow (left), compared to a period-style target arrow (right).

Endnotes

- ¹ Latham, J.D. and W.F. Paterson. 1970. *Saracen Archery*. The Holland Press, London. This book is an English version of a Mameluke archery text written in 1368.
- ² Klopsteg, P.E. 1987. *Turkish Archery and the Composite Bow*, 3rd Edition. Simon Archery Foundation, Manchester. This book relies heavily on a German translation of a Turkish text written by Mustafa Kani published in 1847. An electronic copy is available: <http://bookzz.org/book/1253331/3e771a>
- ³ Latham op.cit.
- ⁴ Farris, N.A. and R.P. Elmer. 1945. *Arab Archery*. Princeton University Press, New Jersey. This book is a translation of an Arab manuscript written about 1500.
- ⁵ Klopsteg op.cit., page 107 ff.
- ⁶ These distances were measured in Turkish "gez" estimated to be 23" to 25" long. Since we don't know that exact length of a gez, reported distance estimates vary.
- ⁷ Klopsteg, op.cit., pages 22-23.
- ⁸ Klopsteg, op.cit., page 30 ff.
- ⁹ Klopsteg, op.cit., page 31.
- ¹⁰ <http://www.worldarchery.org/RESULTS/Records/Flight-Records/Men, Oct 2014>.
- ¹¹ Klopsteg op.cit. page 139.
- ¹² Karpowicz, A. 2008. *Ottoman Turkish bows manufacture and design*. <http://www.ottoman-turkish-bows.com/>
- ¹³ Isles, F. 1961. *Turkish Flight Arrows*. The Society of Archer-Antiquaries, Vol 4, 1961.
- ¹⁴ Klopsteg op.cit. pages 59 ff.
- ¹⁵ <http://www.youtube.com/watch?v=96KGWC0PB6s> - start at the 5 minute mark.
- ¹⁶ <http://www.koreanarchery.org/classic/hwarangbow.html>
- ¹⁷ The correct bow shape and a good discussion of Turkish flight bow construction can be found here: http://www.atarn.org/islamic/akarpowicz/turkish_bows.htm

Quivers & Quarrels

Article Ideas & Wish List

Would you like to contribute to *Quivers & Quarrels*? Here is a list of possible topics for ideas that you might write about. Possible topics for *Quivers & Quarrels* are not limited to those listed here. If you would like to write about anything at all related to archery in the SCA, your written work is most welcome!

Features:

- Interviews with anyone who is accomplished or influential in SCA archery
- Anything about horseback archery
- Anything about crossbow
- Anything about combat archery
- Anything about target archery
- Anything about youth archery
- Features on other historical archery societies or groups outside of the SCA.

How To:

- How to build combat arrows - with the kingdom-specific caveat.
- How to make period archer's garb. (This could be a VERY big topic to write about, so simple is probably best. Feel free to consult with me [Sayako] on this topic if you'd like to write about some part of it. I have been sewing since I was 10 years old. I won't tell you how many decades that's been, but if you want to guess, the lower the number, the more I like you.)
- How to make archery stuff out of leather (quivers, bow cases, bracers, etc.)
- How to make archery stuff from horn (bracers, nocks, reinforcements for self nocks, thumb rings, etc.)
- How to make archery stuff from wood (quivers, what else?)
- How to make archery stuff from what else? PVC (not bows, but PVC as a modern substitute for ivory or similar use)? Bone? Metals?
- Cresting and how to do it.
- How to make an inexpensive cresting machine (old sewing machine motor anyone?)
- How to cut your own fletching from raw feathers.
- Pictorial how-to on whipping.
- How to make bowstrings.
- How to set up your new bow.
- Illustrated explanation of how to measure draw length.
- How to test spine weight of bare shafts.
- How to straighten arrows and maintain them so they stay straight.
- How to make other archery equipment (target butts, bow stands, storage racks, dipping racks, etc.)
- How to get into combat archery on a budget? Have you built your own armor and can share the experience?
- How to string static-eared recurves that can't be strung with a simple stringer because they curl up when unstrung (like Korean SERs)

History:

- History, development, and evolution of archery in the SCA.
- Social history of archers in society.
- History of archery and/or archery equipment in any culture.
- Composite bows and their development in history.
- Historical recurves.
- About the Battle of Agincourt, or any other archery/crossbow-dominated historical event.
- Role/life of military archers.

Garb/Persona:

- Archer's garb for any SCA-appropriate time period or territory.
- Comparative carriage of arrows across different cultures.
- Comparative archery from different cultures.
- Comparative archery accessories from different cultures.

Technical Stuff of Archery:

- Proper shooting techniques with photos/illustrations.
- Comparative shooting techniques (draw lengths, placement of arrows, various styles, etc.)
- Alternative releases (thumb release, releases favored by archers of various cultures, etc)
- How bows are made. (Maybe not "how to build a bow", but an explanation of the process with pictures. Let's stay away from PVC bows on this topic for now, please. There are currently strong pro and con arguments regarding the role and use of PVC bows in the SCA.)
- In-depth discussion about the Archer's Paradox.
- Bow tuning
- Arrow tuning
- Refinishing bows
- Proper techniques for drawing arrows from various styles of quivers.
- Proper stringing techniques, and discussion of improper stringing techniques and their consequences.
- Proper storage and maintenance of bows and arrows.
- Experiences and critiques of different shaft woods for arrows.

Newcomers:

- Archery newcomer FAQs and answers.
- Getting into archery on a tight budget.
- Who are the "People of Archery" and what do they do? (Range marshals, marshal-in-charge, kingdom archers, local champions, archery orders - for the kingdoms that have them, etc.)

SCA Archery Basics:

- Range rules, range etiquette, range traditions, and safety basics.
- Explanation of shoots in the SCA for newcomers (what's a Royal Round, IKAC, SSAC, York, period, fun shoots, etc.)
- Comparative ranking of archers among kingdoms.

Scholarly/Academic:

- How to critique sources for validity or bias.
- Examinations of artwork in history and what knowledge can be gleaned from it. (Any photos from museums or third party providers must be open-source, or the author must provide the appropriate photo release from the owner of the photos.)
- How to critique books as resources.
- Curricula for off-range archery classes.

Any requests or suggestions for articles you would like to see? Let me know! Send me an email at qqchronicler@gmail.com, and I will add your request to the wish list. -Sayako



COMPETITIONS & HIGHLIGHTS

Society Seasonal Archery Competition (SSAC)

“Lucky Target”

This competition seems to have begun in the Netherlands in the 1400's. There is a period illustration showing part of a circular target where there are numerical values in arcs of the circle. And there is mention of square targets with a series of smaller squares of different values

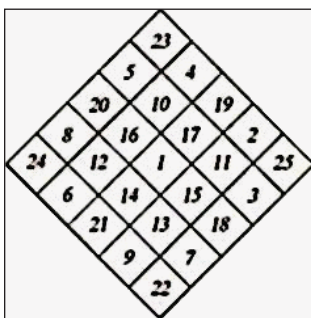
Shoot Begins Wednesday, October 1, 2014
Shoot Ends Sunday, November 30, 2014

Scores must be Submitted by: Monday, December 7, 2014 and within 30 days of being shot.

Rules

Please read the SSAC General Rules, as these apply to all SSAC shoots. Below are the additional rules for this specific shoot.

Target Construction



The target face is 20 inches on a side and the small squares are 4 inches square. There are twenty-five squares in total. The target is placed with one corner pointing upward, as per the drawing below. The numbers are placed as shown in the

drawing and should be large enough to be read at twenty yards. The lines should also be visible but no wider than 1/4 inch. A printable pdf has been kindly provided by Lord Cameron de Grey of Atlantia, and can be found at http://scores-sca.org/ssac/images/ssac_169_target.pdf.

Ends

The number of ends is two, each of six arrows.

Scoring

The Adult distance is 20 yards.
Youth division distance is 10 yards.

The scoring is value of the box hit. Lines count as the higher score. A square may only be hit once for score. Repeated hits to the same square by the same archer do not count for additional score in the end being shot. The archer may hit any or all of the same numbers in next end for score. The maximum score per end is 135, for a maximum total of 270 points. The score sheets should provide space for each arrow's score (1-6) in each end (A, B) in a vertical column for ease in totaling. There should be a total for each end and a grand total.

Please record the scores for each End starting with the highest scoring arrow to the lowest, with zeros entered for repeats or misses for any remaining arrows.

A scoresheet (PDF) is provided courtesy of HL Iurii Levchenich of An Tir, and can be found at http://scores-sca.org/ssac/images/ssac_169_scoresheet_b.pdf.

This shoot was suggested by:
Sir Jon

Fall SSAC Results

Origins

Archers are used to targets where the highest point value is in the center of the target such as a concentric circle, the peg in a roundel target, and so on. With these types of targets, if your aim is a bit off, you still can get the next highest point value. With the “triangle” target, which is an equilateral triangle with one of its points straight up and divided into three equal width horizontal bands, the highest point value is the top part of the triangle. So, if you are aiming for the highest value and your aim is a bit high, left, or right, you can miss completely and receive no points. Those who try for the highest value have a greater chance of making no score if they miss than those who aim for the lower value areas. This provides a high scoring area for the advanced archers, and still has the larger lower scoring area for all others. The three parts of the triangle target from Medieval Japan were said to represent a warrior on horseback. The top, high-scoring triangle was the head of the warrior, the middle band was the body, and the largest band, the bottom, was the horse.

Rules for this Shoot

The target for this shoot will be a triangle that has a 24-inch horizontal base. From the center of the base, draw a vertical line 21 inches tall, then draw the side lines of the triangle from the ends of the base to the top of the center line. Measuring up the center line, mark off what will become the scoring bands of the target starting from the base line. See below for the measurements for each of the scoring bands. If lines are drawn in between the color bands, the line should be no wider than 1/8 inch. When the target is complete, the center line should **NOT** be visible as it could be used as a reference line or an aim point. The “horse” is the bottom 7 inches, and colored black. The “body” is the next 7 inches, and colored red. The “head” is the next 5 inches, and colored yellow. The “visor” is the top 2 inches, and colored Black.

Final scores for the Fall SSAC “Triangle” competition.

For compete scores, please visit http://scores-sca.org/public/scores_current.php?R=25&Shoot=206&DL=Y

Open Handbow

1.	Konrad von Alpirsbach	Outlands, Caer Galen	112.0
2.	Don the Archer	An Tir, Adiantum	102.0
3.	Landon Lovel	Trimaris, Starhaven	95.0
4.	Francisco di Grazzi	Artemisia, Loch Salann	92.0
5.	Kateryna atte Hagenes	Trimaris, Starhaven	90.0
6.	Johanna Trewpeny	An Tir, Adiantum	87.0
7.	Erika Bjornsdottir	Trimaris, An Crosaire	87.0
8.	Cristiana Hunter	Trimaris, Oldenfeld	86.0
9.	OEngus ua Faelain	Outlands, al-Barran	84.0
10.	William Cristofore of Devonshire	An Tir, Adiantum	84.0

Period Handbow

1.	Stephan Sorenson	Outlands, Hawk’s Hollow	101.0
2.	William Hawke	Outlands, Caerthe	100.0
3.	Alaricus Simmonds	An Tir, Dragon’s Laire	93.0
4.	Arion the Wanderer	An Tir, Dragon’s Laire	68.0
5.	Patrick of the Quiet Woods	Outlands, Caerthe	67.0
6.	Timmur Jochen	Artemisia, Loch Salann	66.0
7.	Sigmund Spelmann	Lochac, Politarchopolis	65.0
8.	Katherine of Anglesey	Caid, Naevhjhem	60.0
9.	Bryce MacManus	Outlands, Nahrun Kabirum	57.0
10.	Wintherus Alban	Lochac, Politarchopolis	56.0

Youth Handbow Division

1.	Summer of Starkhafn	Caid, Starkhafn	22.0
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Open Crossbow

1.	Karl von Königsberg	Atlantia, Dun Carraig	119.0
2.	Jonathas Reinisch	Atlantia, Dun Carraig	104.0
3.	Gladus the Alchemist	Middle, Cleftlands	89.0
4.	Tymme Lytefelow	An Tir, Wyewood	85.0
5.	Kaitlyn McKenna	Ansteorra, Shadowlands	62.0
6.	Plachoya Sobaka	Ansteorra, Shadowlands	53.0
7.	((CJ Morton))	Atlantia, Dun Carraig	29.0

Period Crossbow

1.	Jonathas Reinisch	Atlantia, Dun Carraig	113.0
2.	Karl von Königsberg	Atlantia, Dun Carraig	112.0
3.	Erik Erikson the Scout	Middle, Havenholde	112.0
4.	Kaitlyn McKenna	Ansteorra, Shadowlands	75.0
5.	Stephan Sorenson	Outlands, Hawk’s Hollow	64.0
6.	Eric Morrison	Outlands, Hawk’s Hollow	61.0
7.	Garvin the Slow	Middle, Gwyntarian	57.0
8.	Mary Garrett	Middle, Flaming Gryphon	47.0
9.	Plachoya Sobaka	Ansteorra, Shadowlands	33.0
10.	Eirik the Elder	Middle, Flaming Gryphon	26.0



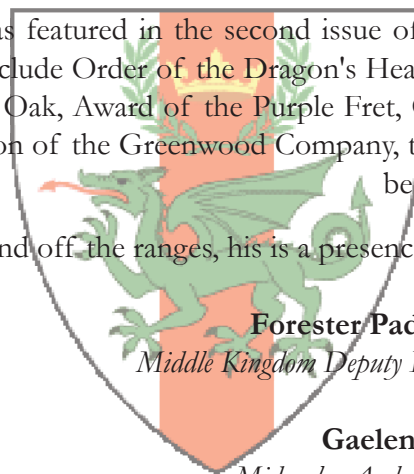
THL Ambrosius filius Merlinus, C.G.C. (mka Gary Kingston) 1931 - 2015

It is our sad duty to inform all and sundry of the passing of Gary Kingston, ThD, known in the Society as Forester Ambrosius Filius Merlinus, or more generally just "Merlin." He had struggled with ill health for several months, but still kept up his duties as one of five Regional Archery Marshals in the Middle Kingdom, continued to teach and to mentor other archers until his last few weeks. He passed to the next world at 9:50 pm, EST, January 4, 2015 at the age of 84 years.

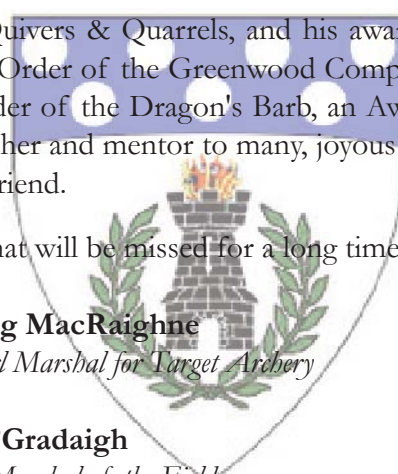
Among the many accolades and experiences one might expect, Merlin was a student of the legendary Howard Hill, who did the shooting for the classic Robin Hood movie with Errol Flynn. Though confined to a wheelchair from an accident while he served in the Armed Forces, Merlin was several times a member of the Pennsic Middle Kingdom Champions Team, held the high scores for longbow shooters many times over in the Society Seasonal Archery Challenges and was in second place in the present SSAC when he last shot.

Merlin was featured in the second issue of *Quivers & Quarrels*, and his awards within the Society include Order of the Dragon's Heart, Order of the Greenwood Company, Order of the Silver Oak, Award of the Purple Fret, Order of the Dragon's Barb, an Award of Arms, Companion of the Greenwood Company, teacher and mentor to many, joyous presence, and best friend.

On and off the ranges, his is a presence that will be missed for a long time to come.



Forester Padraig MacRaighne
Middle Kingdom Deputy Earl Marshal for Target Archery



Gaelen O'Gradaigh
Midrealm Archery Marshal of the Field

The Merlin Archery Challenge

For the entirety of 2014, Merlin (mka Gary Kingston) held the first place ranking in the SCA's Grand Archery Tournament. Due to his illness, his rank fell to 2nd place on January 1st, 2015, three days before his passing.

The Merlin Archery Challenge is extended to all of the archers of the Middle Kingdom. Archers who undertake this challenge agree to shoot in the four Society Seasonal Archery Competitions (SSAC's), and if possible, to also shoot the Inter Kingdom Archery Competition (IKAC) as well as in one or more of the kingdom's several Grand Archery Tournaments. The intention is to place members of the Middle Kingdom in the ranks of the top ten archers of the SCA in honor of Merlin, and on behalf of his legacy, to reclaim Merlin's first place rank by January 1st, 2016.

Archers from other kingdoms who wish to honor Merlin alongside their Middle Kingdom brothers and sisters may participate by indicating "Friend of Merlin" or "to honor Merlin" on their scoresheets.

A Facebook group has been created as a place for challengers to gather online. Please come join "The Merlin Challenge" group at <https://www.facebook.com/groups/306630432880217/>



Local Archery Practices

*Editor's Note: This list is a work in progress. Please send your submissions and updates for local practices to qqchronicler@gmail.com, or contact me via the *Quivers & Quarrels* Facebook group. *Quivers & Quarrels* is only published quarterly, so it is highly recommended to include contact or web information along with a brief description of your archery practice arrangements. YIS, Sayako*

Ansteorra

Northkeep

Missile practice scheduled every Sunday from noon until whenever people go home.

9737 W 61st Street S, Sapulpa, OK.74066 (918) 200-5584
Calling first is a good idea, as I may be gone to an event.

Random cook out / pot lucks. Thrown weapons practice from noon till 2pm. Children's archery practice from 1pm till 2:15pm. Adult archery practice from 2:30pm till people go home.

Submitted by Arthur Blackmoon, Baronial Missile Marshal - Barony of NorthKeep.

Cancellations: For major regional archery events and if the temperature is below 40 degrees.

An Tir

Barony of Montengard (Principality of Avacal, Kingdom of An Tir Calgary, Alberta)

Archery practice is held at the Calgary Archery Centre 4855 47 St. SE Calgary, AB.

This is an indoor range space with multi distance ranges, 3d course and pro shop.

The SCA hosts practices Tuesday and Friday evenings from 6:30 - 9 pm.

capt.archers@montengarde.org
www.montengarde.org

Barony of Dragon's Laire (Kitsap County Area, WA)

Fall and winter practices are held at the VFW Hall at 9981 Central Valley Rd NW, Bremerton, WA, on Sundays, from 1-4pm, weather permitting. Thrown weapons practice is held every Tuesday at this location, from 6 pm to 8 pm.

No loaner gear will be readily available, though the Barony has developed a loaner program for those who are new to archery and do not own any equipment.

The facility is open for bathroom use only. We will not be using the hall or grounds for other activities during archery practice.

For more information about the archery newcomers program and for updated information about practices throughout the seasons, please visit www.dragonslaire.org

Barony of Wyewood

By Ikea in Renton, WA. Saturday 10am-1pm, Wed will be 4:30pm-7:30pm.
Please contact t_a_geyer@yahoo.com for more information.

Wyewood also has a Yahoo group for announcing whether practice is on or cancelled, and that is "wyewood_archery".

Tymme "Prodkiller" Lytefelow
Chief Archer, Barony of Wyewood
Arcuarius to HL Evrard de Valogne, OGGs

Summits (Principality of An Tir)

Shire of Glyn Dwfn

Archery, thrown weapons, and At'lal practices are currently the second and fourth Sundays of each month from 1pm to dusk in Shady Cove, OR. In inclement weather, we do equipment repairs and construction. As darkness falls we have a potluck dinner and socialize. Check Glyn Dwfn's website at <http://glyndwfn.antir.sca.org/> for address or more information.

Atenveldt

Baronies of Sundragon and Atenveldt

The baronies practice together on Sundays at El Oso Park. This is for royal rounds and tournaments only at this time for target archery. October thru April 9 AM and May thru September 7 AM

Caid

Altavia

1st, 3rd, and 5th Sunday of every month at Woodley Park 11:30am-3:30pm

Angels

See webpage at <http://www.sca-angels.org/>, or contact Lady Rayne Archer of Annan at raynearcherofannan@gmail.com.

Calafia

Sundays from 10:00 am to noon, and on Tuesdays and Thursdays at UCSD Thornton Hospital from 5:30pm to 7:00pm

Dreiburgen

1st and 3rd Sundays, 10am at House Montrose in Pedley, 2nd and 4th Sunday at Paganus and Rekon's

Dun Or

Unofficial practices Mondays, 6:30-8:00pm at H&W Archery on Trevor St. in Lancaster and last Sunday of the month at 2:00 in Littlerock

Gyldenholt

Every Sunday at 10:30am in Mile Square Park Archery Range in Fountain Valley.

Lyondemere

El Dorado Park (north of Spring Street), Long Beach 7550 E Spring St, Long Beach, CA, 90815 - Sundays from 1-5; and Thursday nights from 7-9 PM at Rancho park in Cheviot Hills.

Navehjem

At Baldwin's keep, a private residence. For more info contact jotl2008@wildblue.net

Nordwache

No Info

Starkhafn

Clark County Archery Range (6800 E. Russell, Las Vegas, NV 89112) located behind Sam Boyd Stadium/Old Silver Bowl Park. Tuesday: 6:00pm until 7:30pm (or dark) Saturday: 10:00am until noon.

Western Seas

No info

Shire of Al-Sahid

Same as Dreiburgen

Shire of Carrweg Wen

On Hold

Shire of Darach

No Archery Practice

Kingdom of Lochac

Barony of Southron Gaard

Weekly practices from 2pm to 4pm every Sunday, weather permitting, on the back field of Kirkwood Intermediate.

Submitted by Darayavaush Ah.r.r. Captain of Archer for Southron Gaard and current Baronial Archery Champion, MKA Damon Daines

Meridies

Barony of Thor's Mountain (Knoxville, TN)

The Barony of Thor's Mountain holds its practices on the 2nd and 4th Sundays, 3:30pm to 5:30pm, with reservations (no practices on weekends with Kingdom-Level Events or TM events. We post updates on our website calendar.)

Midrealm

Barony of Ayreton (Chicago Area)

Wednesdays: 6:30PM, 7240 Madison Street, Forest Park
(708) 366-4864
Confirm with: Forester Lukas Mesmer
Stoutmaker@hotmail.com

Barony of Cynnabar (Ann Arbor, Michigan)

"Official Archery Practice in the Barony of Cynnabar is held Sundays from 2-4pm, weather permitting, at the archery range of The Honorable Lord Forester Dillon ap Dillon.

More information regarding archery in the Barony of Cynnabar can be found at our Website: <http://www.cynnabar.org/archery>

For all questions regarding practice dates, times, and the location of the official Baronial archery range, please contact Lady Godaeth se Wisfaest, GM, archery@cynnabar.org

Barony of Flaming Gryphon

Archery practice at Wildlife District 5 at 1076 Old Springfield Pike in Xenia, OH. As of November, indoors.

Madame Bertrande Fresneau, CDB, AOA Order of the Flaming Brand June 2007 Flaming Gryphon Deputy Archery Captain mka Kristen Allen-Vogel

The Shire of Eastwatch (Cleveland Ohio area)

The Shire of Eastwatch has archery practice every Sunday from 4:00 to 7:00 p.m. at Free Spirit Farm located at 13987 Watt Road, Novelty, Ohio 44072.
If people would like to contact us

about attending, they can email me at whgkingstone@ameritech.net or they can call me at (216) 246-0085.

Our practices sessions are announced on the Facebook Pages for Eastwatch, Barony of the Cleftlands, March of Gwyntarian, Northern Oaken Archery, as well as the Eastwatch Yahoo group page. Besides archery, horseback riding is also available at Free Spirit Farm .

Shire of Mynydd Seren (Bloomington, IN)

When: 2:00 P.M. every Saturday
Where: Shire of Mynydd Seren
5501 South Rogers St, Bloomington Indiana
Contact: Eogan - Baiorofred@gmail.com

Cancellations: For major regional archery events and if the temperature is below 40 degrees.

Barony of Sternfeld (Indianapolis, IN)

Wednesday evenings 7:00 to 9:00 PM at Yurts of America, 4375 Sellers Street, Indianapolis, IN 46226.

Outdoor practices will be announced on the Sternfeld Facebook page and on the Yahoo group page. Come have some fun!

Trimaris

Barony of Darkwater (Orange, Osceola, Seminole, and Lake Counties)

When: Darkwater archery practice
Where: 8545 Treasure Island rd Leesburg, FL 34788
Address: 8545 Treasure Island Rd Leesburg, FL, 34788
Contact: Ld Willaum of Willowbrook 352-326-0083

Notes: Practices are the second and last Sunday of the month. We do a potluck after practice if you wish to attend you are more than welcome to join in. We do ask that you bring a little something to add to the meal.

Barony of Marcaster (Pinellas County, Florida)

Marcaster Archery dates have been set. The following dates are all Sundays. They all start at noon and go until 3pm-ish, and they are all at Camp Soule. This is a free, non-garbed SCA/Baronial archery practice. SCA Archery rules and equipment must be followed and used.

Jan. 18, 2015
Feb. 8, 2015
Mar. 8, 2015
Apr. 19, 2015
May 10, 2015

All practices are Camp Soule, 2201 Soule Rd., Clearwater, FL 33759

Some loaner gear is available for folks who wish to try out the sport.

Honorable Lord Gavin Kyncade
Marcaster Archery & Thrown weapons
Ranger
gavin.kinkade@yahoo.com

Barony of Oldenfeld (Tallahassee, Gadsden, Wakulla)

When: Oldenfeld Archery Practice
Where: Ox Bottom Hollow
Address: 2020 Ox Bottom Road
Tallahassee, FL 32312
Contact: Jay or Jancie Ter Louw
(850) 668-3807

Notes: We will practice at 3 p.m. on any Sunday that does not have an SCA event or mundane schedule conflict. Please call or email to confirm the actual dates of practices.

Canton of Peregrine Springs (Seminole County)

When: Darkwater East Archery Practices
Where: Springdale Farms, Longwood FL
Address: Bay Meadow Lane
Longwood, FL 32750
Contact: Bennett Redstone (407) 456-0077

Notes: First, third, and (optionally) fifth Sunday of the month. No practices the Sunday of a Kingdom event. Check postings on Trimaris-Archers board on Yahoo for cancellations.

Shire of Southkeep (Miami-Dade County/Florida Keys)

When: Every Other Sunday @ 1:00pm
Where: Homestead
Address: 20420 SW 319th Street
Homestead, FL 33030
Contact: Cian mac Cullough
(305) 213-3732

Notes: We practice every other Sunday (weather permitting), provided there are no events or modern conflicts. There may occasionally be additional practices scheduled, depending on availability of a ranger. Please call or e-mail to confirm, or check Facebook. There are usually other activities going on for those who don't want to shoot. Practices are potluck, and we ask that you do bring something to contribute if you can. However, if for some reason you cannot, please don't let that stop you from coming.

Shire of Trysel (Ft. Myers)

When: Sunday @ 2:00pm
Where: Fort DeNaud Archery Range
Address: 506 Trader Road
LaBelle, FL 33935

Contact: Juliana Strangewayes
(239) 839-8333

Notes: All are welcome. We will practice on Sundays unless an event or mundane scheduling conflict arises. Please contact by phone or email to confirm and avoid disappointment.

West Kingdom

Barony of Eskalya (Anchorage, Alaska)

We usually hold practice Sundays at 2pm at the public range in Kincaid Park during the summer/fall. During the winter we occasionally visit an indoor range. This year we will also be going to the Northwest Archers classes (non-

sca.) We will have to use their equipment, (compounds) but at least it will be free target time.

For more information, please contact Dawn Quick at c_textrix@yahoo.com

Province of the Golden Rivers (Sacramento Area, California)

Target archery practice is held from 10 am to 1 pm, non-event Sundays at Creekwood Equestrian Park in Elverta, CA (Sacramento area). This is an outdoor range on a horse ranch.

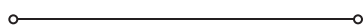
In addition to IKAC, Royal Round, and Seasonal shoots, we have also thrown weapons and mounted archery available, depending on interest. Some loaner gear is on-hand, more in the works.

Archers of Golden Rivers have a Facebook Group for discussion of upcoming practices and other activities:
<https://www.facebook.com/groups/735450109809751/>

For additional information, contact our Target Archery Marshal, Brigid O'Connor, email: arcmarshal@goldenrivers.westkingdom.org



Submission Deadlines



Spring 2015 Edition

February 28, 2015
(for publication March 2015)

Summer 2015 Edition

May 31, 2015
(for publication June 2015)

Fall 2015 Edition

August 31, 2015
(for publication in September 2015)

Winter 2015 Edition

November 30, 2015
(for publication in December 2015)



Submissions, including photographs and releases, are due by the submission deadlines above. Questions about submissions may be directed to the Chronicler, at qqchronicler@gmail.com.

Advertising in *Quivers & Quarrels* is not available at this time, but is in development. Questions regarding advertising may also be directed to the Chronicler, at qqchronicler@gmail.com.

Submission Guidelines

All submissions require releases.

Written submissions may be of any length. Very lengthy feature articles may be broken up over two or more editions.

Written submissions must be in .doc, .docx, .txt, or .indd (backwards-compatible for CS3) format. PDF files may be acceptable, but are not recommended. No other typeset formats. Document formatting for style is optional. Submissions should be minimally formatted with headings so that sections are clear. Academic-style papers with referenes should be submitted in MLA or APA style with all appropriate citations. Footnotes will be reformatted into endnotes, and tables of content will be omitted.

Photographs and illustrations must be submitted seperately as .jpg, .jpeg, .bmp, or .ai (backwards-compatible for CS3) files, though they may also be included within the text of the article to indicate placement. Photographs and illustrations of a useable file size and resolution generally cannot be extracted from .doc, .docx, or .pdf files, so the original, full-size files are needed.

In-text photographs should be a minimum of 2048x1536 pixels at 300 dpi. Full-page or cover photographs should be 2736x3648 pixels at 300 dpi. Sizes are approximate. Photos with a resolution of 150 dpi or less cannot be used.

Questions about submission guidelines may be directed to the Chronicler, at qqchronicler@gmail.com.

