Basic Primer on the Crossbow

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Introduction

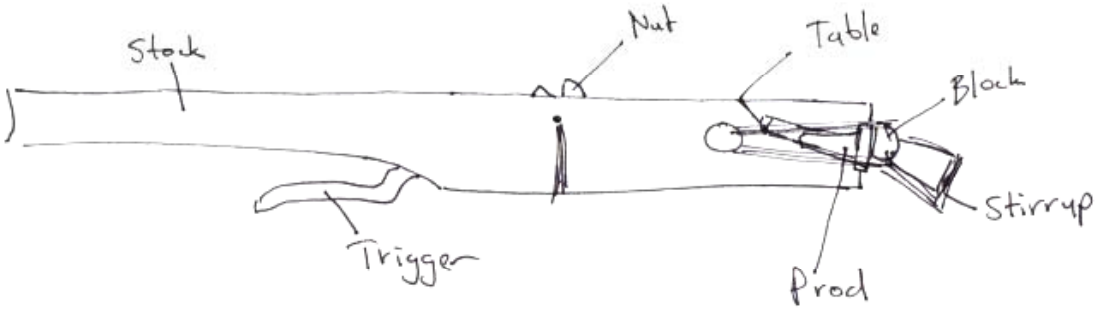
While there are plenty of opinions about the crossbow, much of what you hear is based on prejudice rather than opinion. In this short class, I'd like to offer you the chance to become familiar with what a crossbow actually is like, not so much so that you'll run out and buy one, but so that you'll appreciate the crossbow for its differences and its similarities to other types of bows. We'll also spend some time actually shooting crossbows.

The Crossbow: A Glossary

While crossbows come in a variety of forms, most period-style bows follow the same basic pattern and have the same parts:

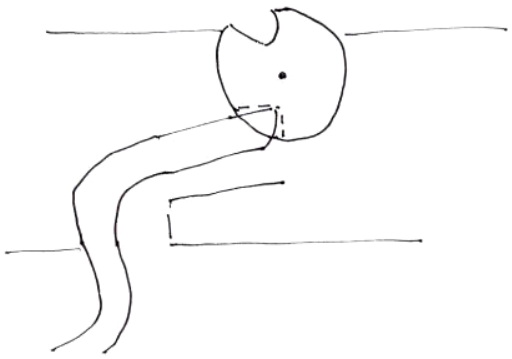
Stock – the stock is usually a single wooden piece (or a single piece with inlays) that serves as a permanent part of the crossbow. It's possible to break them, I suppose, but for the most part they aren't going anywhere. They can be made out of any number of hardwoods (cherry, ash, oak, and so on).

Prod – the prod is the "bow" part (i.e., the part with the string) and the business portion of the bow. It is attached to the stock with cord (linen, hemp, or other sturdy twine) or clamped in with "irons." If tied in with cord, there will be a block holding it in place. It's the prod and, in particular, the part of the prod where it is bound to the stock that takes the greatest beating and which is most prone to breakage. In period, prods were made of wood, bone, or iron. In modern days, most prods are made of aluminum (although steel or fiberglass is sometimes found) and are often covered in rawhide.



Stirrup – a stirrup is attached to the bow, often through the block itself, and is used to provide an anchor point that the crossbow shooter can use to hold the bow while "spanning" or pulling the bow, either by putting their foot or a winch into the stirrup.

Nut – the nut is another hard-working part of a crossbow and probably the most critical part. The nut is a circular piece that holds the string of the bow when it is cocked and ready to fire. It also holds the bolt in place. The nut is controlled by the trigger. The mechanism used in Western European crossbows for most of period is a very simple (but effective) design:



The nut is fixed within the bow but can rotate fully within its chamber. On one side of the nut is a set of claws that the string attaches to. On the other side of the nut is a groove that the trigger attaches to.

Trigger – sometimes also called a "tickler." The trigger is a shank of metal fixed into the bottom of the stock. On one side, it runs deep into the stock and catches on the groove on the underside of the nut. On the other side, it runs out of the stock and is pushed up by the shooter to release the nut. Most period bows do not have a safety.

Table – the top of the stock is called the "table" and it may or may not have a groove running down for the bolt to rest in, or it may be smooth and "trackless."

How a Crossbow Works

To fire a crossbow, the shooter follows the following steps:

1. Position the nut so that the claw is upwards and the trigger has engaged and caught the groove on the underside of the nut. With most crossbows, a properly locked nut should be easy to recognize.
2. If the bow does not have a winch, place your foot into the stirrup firmly and then grasp the string on either side of the stock. Pull the string back evenly (applying equal stress against the prod as you span the bow) onto the claws of the nut. (Winches come in a variety of styles and have their own particular needs and instructions). The nut is now holding the string in a "cocked" position.
3. Raise the bow and load the bolt against the string. Most crossbows have a clip to hold the bolt in place against the string.
4. Aim the bolt and fire the bow by pushing up on the trigger. This releases the nut, which in turn releases the string and fires the bolt.
5. Repeat as necessary.

Variations

Not all crossbows are the same, of course, and some of the variations are worth mentioning:

Tracks – some bows are "trackless," that is, they have no groove on the table for the bolt to sit in. Instead they have a small rest at the front of the stock that the bolt (along with the clip) sits in. The trackless bow is largely an Eastern European style (while the grooved, or "tracked" bow follows Western European fashions).

What does it mean in terms of performance? Trackless bows are harder to shoot. The bolt must be placed carefully under the clip and on the stand, or else you run the risk of a misfire as the string misses the bolt. That means it takes longer to load. A scientific survey is lacking, but common sense would dictate that the bolt would probably shoot smoother (having less friction lost against the stock on release) and might also release with more force on a trackless table. So, what you lose in ease of use, you might make up with accuracy.

Nuts – the nut is a crucial part of the bow and there is a great variety in their materials. Nuts can be made of wood, metal (usually brass), bone, or plastic:

Wood – the wood nuts tend to be cheap and lightweight. They wear out easily and have to be replaced more often. They also swell up in humid conditions and can stick when they do so.

Brass – brass nuts are sturdy and slightly more expensive. They rarely need to be replaced, usually outlasting the rest of the bow. Their primary disadvantage is that they are heavy and release sluggishly. Some of the force of the release gets spent merely moving the nut. Brass nuts LOOK nice.

Bone – by far, the preferred material for the nut is carved bone. The problem is that bone is expensive (mostly because of the sheer agony involved in carving it to the correct shape), but bone is strong and lightweight. It has a nice clean release and it looks great. It's also a good period material.

Plastic – while suffering in the period-looking department, plastic nuts conquer most of the other materials' problems. They are lightweight, sturdy, and cheap. Reinforced with a metal rod down its center, a plastic nut is as indestructible as just about anything (other than brass, of course).

Prods – while period bows frequently had wooden or iron prods, you won't see many of those on the field in use. Almost everyone shoots aluminum prods. Aluminum is sturdy and has the advantage of breaking cleanly when it decides to go. And the prods generally have a lifespan of about 150 hours of active usage. If you shoot twice a week for an hour or two, you'll break an aluminum prod within a year or two. It sounds traumatic, but a breaking prod is actually a fairly gentle affair (they usually snap off as you are spanning them, and rarely – if ever – when they are fully spanned or releasing).

Occasionally, you will see heavy steel prods. These are the allegedly "unbreakable" prods – a nickname that is more an exaggeration of their longer lifespan than any reflection of the truth. They will eventually break as well. Note on all metal prods: you really won't be able to tell when a metal prod is weakening and about to snap, and a visual inspection will reveal nothing. Experienced shooters will comment that they can "feel" the limb weakening (and very rarely one limb will in fact weaken noticeably), but most of the time, a snapping prod will come as a surprise.

An alternative that does not appear to be as popular as it once was is the fiberglass prod. Fiberglass prods are generally much more powerful than a similar bow with an aluminum prod. Like any fiberglass bow, these prods need to be inspected for cracks and gouges that may indicate a weakened state. When they break, it is a much more glorious affair than an aluminum prod, but it's also much easier to tell when it is about to happen.

Covered prods – most aluminum prods is the SCA are covered in rawhide. This was originally done for two reasons. First of all, it protects the prod from scratches and dents that could shorten its lifespan. The second reason was a belief that the rawhide would protect people from flying prod shards if the prod snapped. The problem with this second reason is that prods don't really shatter. Instead, they just snap in two. And the force with which they snap is rarely enough to cause any worry. While some kingdoms still require rawhide wraps, it is largely out of ignorance. A rawhide wrap is mostly aesthetic.

Sights – if people who shoot "normal" bows have a distinct problem with crossbows, it is that sights are allowed on them in SCA shooting (as if marking your limbs on a longbow wasn't a form of sighting!). There are two types of sights allowed: one is an L-shape piece of metal with holes drill in it and the other is the "Flemish" sight – an adjustable brass circle with pinholes in it. Both are attached at the back of the stock. The shoot aims through the holes of the sight to determine where to point the bow. I personally don't use them and have not noticed any significant advantage of having one.

Bolts

A few random notes about bolts.

In general, bolts are more finicky than arrows. That is because they are smaller and more prone to differences in performance from rather minor variations in construction. I often make my bolts from scrap arrows, but serious shooters should consider making sets of bolts that are carefully measured to the same exact length and weight.

Bolts usually have two fletches, although a third fletch on "top" (i.e., two fletches on either side and a third in between them at a 90 degree distance) is seen. I prefer straight fletches myself, but I haven't noticed major performance differences there. I do find that heavier shafts work best. Bolts made from thinner shafts not only misfire more often, they also tend to "dovetail" more frequently.

The major area of variation on bolt design is seen in choice of end caps. Most crossbows do not fire nocked bolts. Usually, the end of a bolt is simply flat. The easiest thing is simply to cut the end of the bolt flat, but bolts without any reinforcement on the end wear out quickly. The alternative is to attach some sort of end cap. End caps can be metal (frequently large shell casings are used). These are sturdy but have a tendency to chew up the table of the bow unless very smooth. A lightweight alternative is plastic, which I create on my bolts by attaching a standard nock to the bolt and then sawing off the ends to create a smooth surface to butt up against the string. An added advantage of going this route is that it is easier to fletch bolts in a jig if there is a nock on the shaft.

Some Common Myths

Finally, a few short rants about crossbows. When you have been shooting for a while, you get tired of hearing the same old stories about crossbows, usually told by people who really don't know much about them. I'll stick to only two popular myths in particular (although there are plenty more):

Crossbows Are Powerful – thanks to the movies, everyone thinks that crossbows are some sort of super-weapon. And for this reason, they are banned in some municipalities and archery ranges. I suppose that if you had a 450lb draw, you might actually be shooting with some significant power, but the type of lightweight bows we tend to shoot (in the 55 to 90lb draw range) just don't measure up. Folks will also point to how deep a bolt sinks into the target, while forgetting that the bolt is a lot shorter in the first place.

Let's talk some basic physics here. The energy behind the projectile is a result of at least two factors – the strength of the bow (measured in draw weight in our case) and the arc of the bow (measured in its length). The second factor is pretty important. After all, remember that the long bow was an excellent weapon because it was so long, not necessarily because of a higher draw weight. How does a crossbow measure up? A crossbow prod is roughly a third of the length of an average recurve or longbow and thus its available energy is probably about a *third* of the energy of a recurve with a similar draw weight. In other words, my 66lb crossbow has the equivalent firepower of a 22lb recurve! My example is a bit oversimplified, but you get the idea.

Crossbows Are Easy – this second complaint I often consider to be the "sour grapes" gripe of archers. They see a beginner crossbow shooter score some ridiculous score (like 15 points at 20yds) on their third time out and they start screaming foul. What they don't recognize is that that crossbow shooter spends a *long* time getting any better after that.

Crossbows are easier than bows on two fronts: they have a consistent pull and a consistent smooth release. The struggles that a beginning archer has with learning to hold, pull, and release the bow consistently are unknown to a crossbow shooter. However, crossbow shooters have other concerns (greater volatility of shots, temperamental release mechanisms, slower set-up and loading times, etc.). Shooting a crossbow may be easier, but shooting it *well* is just as difficult.

In sum, I would argue that the skill curve is just as long, but shaped differently. A crossbow beginner will enjoy initial scores that most intermediate archers would be pleased to have. But unless the person practices regularly and really learns to appreciate the subtle nuances of shooting the bow, they will never go very far, and they will remain an "intermediate" archer forever.

Finally, it always bothers me when I hear archers tease people with crossbows for not using a "real" bow, and for claiming that they don't have to work hard to be good. It sends the wrong message to people picking up a crossbow. After all, what happens when the crossbow *doesn't* have a good round? If crossbows are so easy and if *anyone* can shoot one well, then how does one explain it when you don't? The message that such archers are broadcasting is clearly that if you can't shoot a crossbow, then you're not much of an archer. And that is a message that we should never hear on an archery range!

Conclusions

To conclude, I hope my little introduction to the crossbow has proved informative and interesting. It is hardly comprehensive. I've skipped by large sections of topics (for example, how to inspect a bow), but I'm hoping that this small piece is enough to whet your appetite and, at the least, help you understand a bit more about the crossbow.