HOW TO SELECT AND MAKE THROWN WEAPONS

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December, 2014.

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INTRODUCTION

These instructions are intended for Society for Creative Anachronism members who are interested in selecting and making their own throw weapons and equipment. The sections below are selected appendices from the report ADVANCED THROWN WEAPONS INSTRUCTIONS FOR AXE, KNIFE, JAVELIN AND THROWING STICKS. For additional details, see that report.
SECTION 1

HOW TO SELECT
A
THROWING KNIFE OR AXE

INTRODUCTION

Almost any thrown knife or axe can be stuck in a target, but some weapon designs, sizes and weights will be much easier than others for you to stick consistently and accurately. This discussion is intended to help beginning and intermediate throwers pick a suitable knife or axe design. If you intend to throw these weapons in SCA competitions, check your local kingdom regulations for any limitations or design requirements. Also check your state laws regarding possession and use of dangerous or concealable weapons.

Thrown weapons are no different than any other sport you are starting to learn – it is generally best to pick your initial equipment in the mid-range of suitability rather than at the extremes. The general ideal range for knives is about 10-16 oz. in weight and about 10-16 inches in total length (not blade length). For some knife designs, the total length may be increased to about 18 inches. For axes, the general ideal range is about 16-24 oz in weight (up to 32 oz for reasonably fit throwers) and about 14-18 inches in total length. Longer ax handles may be used for long-distance throwing (15 feet or longer). In general, weapons near the middle of the above range recommendations are best, as they will have reasonable weight and be less sensitive to poorer throwing techniques. However, personal throwing techniques, weapon preferences, and your physiology may allow weapons that fall outside the above recommended criteria to work well for you.

There are two approaches to buying a throwing knife or axe:

- Pick a weapon that falls within the recommendations listed above and learn how to throw it;
- Throw as many different weapons as you can and then pick the weapon style, weight and length that work best for you.

The internet is a good place to find discount cutlery companies – many have a large selection of reasonably priced throwing knives and axes. Inexpensive, good quality throwing knives and axes will range in price from about $15 to $35. Very inexpensive weapons (under about $15) may work for you, but they tend to have fragile wood handles (axes) and may be poorly tempered. Home-made throwing knives and axes made from mild steel flat stock purchased from large hardware stores like Home Depot or from a metal fabrication shop are a good way to get started. These weapons can be made with simple hand tools for about $2 to $4 each. Instructions for making basic throwing knives and axes are included in Section 3.

Some modern knives and axes can be very close in style to period weapons. An example is the modern roofing hatchet, which is very close in style to axes used in 7th to 9th century...
Scandinavia (see Section 3). A good-quality, period-looking axe is the Cold Steel Norse Hawk®, at around $25-$30, plus shipping. Most high quality, period-correct axe reproductions will be in the $40 to $65 range. Good-quality throwing knives will range in price from around $20 to $35. High-quality commercial knives strong enough for extensive throwing can be expensive; from $40 to over $100!

Most people have two axes and two knives for throwing – this is not necessary, but it does give you something else to throw if your first one doesn’t stick. Some competitions will require you to throw two axes or knives before you are scored, so this is another reason for having several weapons. The main reason for having two matched axes or knives is to have a replacement if a weapon is lost or is too damaged to throw safely.

WEAPON SELECTION

The guidelines below are intended to help a person starting out in SCA thrown weapons competitions select weapons that will be reasonably easy to learn with. A more advanced thrower can use these guidelines to help define criteria that they already have experience with. Your ‘perfect’ throwing knife or axe probably does not exist. All weapons will be a mix of good personal fit and the thrower’s need to adapt their throwing techniques to the particulars of the weapon. Thrown weapons expertise is partially technical skill and partially art, with a lot of personal preference thrown in. These suggestions are not the final word on weapons selection - use this information as a general guideline only!

KNIFE SELECTION

Most knives used in SCA competitions are single pointed and fairly straight-bladed. Multiple-pointed knives like the Japanese shaken or Indian chakram are usually considered specialty weapons and allowed only in events intended for that type of knife.

WEIGHT

Ultra-light knives (3-9 oz). Ultra-light knives are difficult to throw, as they tend to ‘float’ (behave erratically in response to minor inconsistencies in throwing techniques). They also do not have the mass to resist strong side winds or to stick consistently when thrown with a moderate force unless they have very sharp, acute points. Ultra-light knives are usually short, so their very short sticking arc makes them harder to stick unless the thrower is very consistent. Knives in the upper portion of this weight range may throw well, depending on their overall design. With a lot of practice, ultra-light knives can be thrown well, but for beginners, a little heavier knife is usually a better choice.

Moderate-weight knives (10-12 oz). Knives in this weight range are usually a very good choice. They are easier on the arm than heavier knives and are more forgiving of inconsistencies in technique compared to ultra-light knives. Many of the larger commercial throwing knives are in this weight range. The heavier knives in this weight range tend to be a little easier to throw accurately, depending on style.
Heavy knives (13-16 oz). Knives in this weight range are solid stickers, and can be a very good choice, but they will require a little more arm strength to handle accurately for a long throwing session. A minor drawback to heavy knives is their slight tendency to ‘lever’ themselves out of the target with a less than solid, point-on stick, as their weight may keep them spinning slightly after sticking.

Ultra-heavy knives (17 oz or greater). Knives in this weight range are generally for experienced throwers or for those who need a period-correct knife. They stick with authority, but their weight may make them hard to throw accurately towards the end of a long session. A minor drawback to ultra-heavy knives is their tendency to ‘lever’ themselves out of the target with a less than a solid, point-on stick, as their weight will tend to keep them spinning slightly after sticking.

TOTAL LENGTH (not blade length)

Short knives (4-9 inches). Single-blade knives in this length range can be difficult to stick consistently because of their fast rotation - the rotation arc in which they can stick is very short. Throwers who successfully use knives in this length range tend to be very experienced throwers. Many inexpensive commercial throwing knives are in this length range. With a lot of practice short knives, particularly those in the upper portion of this length range may throw well. However, a longer knife is usually a much better choice for beginners.

Moderate-length knives (10-12 inches). Knives in this length range are usually very good throwers. They are easier to stick compared to shorter knives because of their moderate rotation speed. Many of the larger commercial throwing knives are in this length range.

Long knives (13-16 inches). Knives in this length range are usually very good throwers, particularly if they have point-heavy blades like the bolo or kukri designs. Some knife designs in this length range have very light and narrow blades – examples are period-design daggers, modern military fighting daggers and throwing spikes made from SKS bayonets. These relatively light-bladed knives may be challenging to throw!

Ultra-long knives (17 inches or greater). Knives in this length range can be good throwers, but need to be selected with care. Point-heavy styles like kukris are preferred by many throwers. The relatively slow rotation of these knives generally makes them very easy stickers. Excessive weight might be a concern for knives in this category. Ultra-long knives tend to be used by throwers who need a long, period-correct knife or who just want to throw something different!

STYLE

The style of knife you throw is your personal choice, but two basic style characteristics should be considered when selecting it:
Point Shape - Point shape and point weight influences how easily a knife will be to stick. Beginning throwers should pick fairly symmetrical blade shapes and avoid strongly curved blades that place the tip significantly above or below a line drawn through the center of the grip and main portion of the blade. Knives with strongly curved points like the kukri design can be good stickers, but it is usually best to start with a fairly symmetrical, straight-bladed design when first learning to throw. See Section 3 for suggested knife designs.

Point shapes that place some of the blade weight near the knife tip, like the spear-point and drop point designs (see page 24) generally will be easier to stick consistently compared to narrow, light-bladed dagger designs like the stiletto and Scottish dirk. Modern knives in this category include narrow-bladed fighting daggers. These knives can be good stickers, but the light blade usually doesn’t give a strong sense of blade position during a hilt throw and the thrower may have to work harder to achieve consistent accuracy. Many light-bladed knives are hilt-heavy and are best thrown from the blade.

Grip Shape – The shape of a knife’s grip will influence how consistently the knife can be released during the thrown. Ideally, a throwing knife should have a fairly straight, smooth grip (but not polished, which will feel ‘sticky’ if the hand is moist). A straight, smooth grip allows a clean and consistent release of the weapon during the throw. Grips with pronounced finger grooves, heavily textured, high friction surfaces (like rough leather) and/or large or strongly hooked pommels will be difficult to release consistently due to drag on the hand by these features. Knives with some of these features can be thrown well, but they will require a very consistent grip pressure and a clean release.

The basic style categories of knives are:

Generic knives. Generic knives are modern or home-made knives of no specific style. The thrower usually doesn’t care what a knife in this category looks like as long as it throws well. Most knives in this category tend to have no hand guards or grips, as these items break or fall off fairly quickly in use. Home-made versions tend to be made from mild steel flat-stock, military surplus bayonet blades or from partially-finished commercial knife blanks. Commercial knives in this category are usually made from the less-expensive, lower-carbon content varieties of stainless steel and some can be very futuristic looking!

Modern military or civilian combat and utility knives. Generally, these are knives made during or post World War One. Most of the knives in this category are: (1) military bayonets, either commercial versions or military surplus; (2) military general utility knives, either military surplus or commercial versions; or (3) true combat knives, of either civilian or military design. Combat and utility knives usually make good throwers, as they are designed and made to withstand the rigors of combat. Select knives with a fairly thick blade and those that do not have fragile hand guards or grips. Grips made from smooth leather or high-impact plastic are preferred. Bayonets may require the removal of various bits of hardware. This can be very easy to moderately hard, depending on the bayonet’s construction.
Military surplus knives can be inexpensive ($20-$30) while the better commercial examples can be fairly expensive ($50-$120). Make sure you buy a true military surplus or a military specifications version (if new) – cheap knock-offs that probably wouldn’t last a day of throwing are common! In general, avoid sportsman’s hunting knives – they are designed to cut up big game, not for throwing. Most tend to be too fragile to stand up to prolonged throwing. However, some heavy-duty hunting knives can be good (but expensive!) throwers. A basic rule of thumb in thrown weapons is to only throw weapons that you are willing (and can afford) to either see break when they hit the target or disappear forever in the grass!

**Historic patterns.** Typically, these knives are simplified commercial or home-made reproductions that are patterned after historic knives but are not exact reproductions. Knives in this category might have a blade that is a close reproduction of the original style, but will lack the hand guard or fancy grips, as these usually will not stand up to continuous throwing. Many of the knives in this category tend to be home-made, as the user will have specific ideas about what he/she wants. Avoid true reproductions, as they are usually too fragile and expensive for throwing. Consider this category if you want a knife that fits your SCA persona and time period.

**CONSTRUCTION MATERIALS**

Self-made throwing knifes are typically made either from: (1) **tempered steel**; or (2) **mild steel (fabrication steel)**. Tempered steel makes the sturdiest throwing knives but mild steel is very inexpensive, easily obtained and is the easiest to work using common tools. See Section 3 for suggestions on making throwing knives.

**Tempered steel.** Tempered steel knives are typically made from commercial, partially-finished knife blanks, military surplus bayonet blades or from flat stock obtained over the Internet or from a local metal fabricator. Partially finished knife blade blanks are an easy way to go if you can find the style you want. If you have a bench grinder, commercial blade blanks can be ground into a more desirable shape, but the blade should be water quenched frequently during grinding to preserve the temper. Most blade blanks from discount cutlery companies are in the $7 to $20 range. Full-tang styles are preferred, as rat-tail tangs tend to bend during throwing. If steel stock is obtained from a metal fabricator, tell them what you are making so they can pick the right steel. The blade will have to be tempered after you fabricate it. A springy temper is best; if the steel is tempered too hard, it will be brittle and the knife point might break in use. This is also a potential problem with knife blade blanks, unless the Rockwell hardness is known.

**Mild steel.** Mild steel, called fabrication steel, is sold by large hardware stores like Lowes and Home Depot or can be obtained from local metal fabrication shops. This material is commonly used in the SCA to make inexpensive loaner knives and personal knives (see Section 3). Knifes made from mild steel should be considered semi-disposable. Cold-rolled mild steel is the best non-tempered steel to use for throwing knives. A durable, reasonable-weight knife can be made from 1/8 to 1/4-inch thick by 1 to 2-inch wide flat stock, but depending on blade shape, length and handle configuration,
expect some bending, especially if 1/8” thick flat stock is used. Generally, 3/16-inch thick by 1-inch to 2-inch wide stock is a good balance between strength and weight.

Many times, hot-rolled mild steel is the only fabrication steel available in some hardware stores. Hot-rolled mild steel bends easier than cold-rolled mild steel, but is usable. Expect the knives to bend occasionally, but bent knives are easily straightened by hammering them flat.

**AXE SELECTION**

The cheapest commercial axes suitable for throwing will cost about $15-$20. If the advertisement doesn’t say ‘hickory handle’, expect the wood handle to break after a few throws! Make sure that a wood handle can be easily changed – some inexpensive axes will only accept replacement handles similar to the one they were designed for. Well-designed and constructed axes are available for about $20 to $35 from discount cutlery companies. True reproductions of period axes are usually more expensive and are typically in the $45 to $65 price range.

Most axes used in SCA competitions are single bladed and without spikes on the head, haft or pommel. Some throwers are intrigued with multi-bladed axes, but their use in SCA competitions is not warranted, as their multiple sharp edges do make them a more dangerous weapon to handle safely. In most cultures that used them, multi-bladed throwing axes were specialty military weapons, intended to maximize the strike potential of the axe under adverse battlefield conditions. These conditions are not present on SCA thrown weapons ranges, where throwing distances can be picked to fit a weapon’s rotational characteristics. The emphasis in the SCA is not on simply sticking the weapon in the target, but doing so with precision and personal skill. There is really no compelling advantage or reason (other than novelty) to use multi-bladed axes in a SCA competition.

**WEIGHT** *(total weight, not axe head weight)*

**Ultra-light-weight axes (less than 10 oz).** Ultra-light axes can be thrown successfully, but they usually require a very consistent throwing form. Unless you have a reason for selecting an ultra-light axe, a heavier one would be a much better choice.

**Light-weight axes (10-15 oz).** Light weight axes may be a good choice for smaller throwers, but for many people they are still a little light for consistent performance, particularly with blade belly strikes. Axes in the upper portion of this weight range are usually a better choice, as they tend to stick better than the lighter ones. Axes in this weight range will demand consistent throwing techniques. With training and practice, light weight axes can be thrown well, but for beginners, a slightly heavier axe is usually a better choice.

**Moderate-weight axes (16-24 oz).** Moderate-weight axes are the best weight range for the average thrower. They have the heft to be forgiving of minor throwing technique inconsistencies and will usually stick with authority. Many period-correct axe
reproductions are in this weight range. A thrower may start out preferring axes in the lighter weights of this range, but move to heavier ones after gaining some experience.

**Moderately heavy-weight axes (25-32 oz).** Moderately heavy-weight axes are a good choice for many people if they don’t find the weight excessive. The extra weight allows these axes to stick with authority even when the blade angle is marginal or wood knots are hit. Many of the larger period-correct axe reproductions are in this weight range.

**Heavy-weight axes (heavier than 32 oz).** Heavy axes stick very impressively, but you will need to be in good physical shape to throw them accurately for long periods. Unless you have a need for a period-correct axe in this weight range, a lighter axe is usually a better choice. Heavy axes will destroy target butts with surprising speed, so check with the marshal-in-charge before using one on the throwing range!

### AXE HAFT CHARACTERISTICS AND THROWING DISTANCE

Wooden axe hafts should be considered semi-disposable – they *will* break eventually! Axe handles of steel or synthetic materials are nearly indestructible, but except for a few steel-handled axes intended mostly for melee use, they are not period thrown weapon styles. Some kingdoms require axes used in their competitions to have wood hafts, others allow almost any material. Most people select a wood-hafted axe that allows a quick handle change. These hafts have an oversize section at the top that prevents the head from slipping off. A wedged haft works even better, particularly if the shaft has an oversize section just below the axe head, like that found on machinist or blacksmith hammer replacement handles. The lower, oversized section prevents the axe head from slipping down the haft and the wedge prevents the head from slipping up and off the haft. However, wedged hafts are harder to change out after they break.

Grip friction of unfinished wood axe hafts can change quickly during a throwing session if the haft alternately gets wet and then dry. An example of grip friction changing very quickly is a dry axe haft landing in wet grass. This effect can be reduced by oiling or waxing the handle or covering the grip area with copper pipe fittings.

Most of the weight of an axe is near the head, so selecting an axe haft length is mostly personal preference and the distance you want to throw from - the longer the haft the further from the target you will need to stand. Some people like the feel of short-hafted axes, while others prefer the feel of a long-hafted axe. The choice is yours! The listings below reflect my personal experiences using moderately to moderately-heavy weight axes thrown with a hammer grip. The throwing distances noted are approximate; the type of grip you use (hammer grip, modified hammer grip, or other style) and your personal throwing techniques can significantly alter these distances. Haft lengths listed are for the entire haft - depending on design, this may or may not be the location of the ax head tip.

**Very short-hafted axes (less than 9 inches).** Axies in this length range are usually more difficult to stick compared to longer-hafted axes because of their very fast rotation. Commercial throwing axes like the Gill Hibben Pro Thrower® are in this category.
Compared to a single rotation for longer-hafted axes, very short hafted axes may rotate several times when thrown from typical SCA throwing distances and will require very consistent form for best accuracy. With training and practice, very short-hafted axes can be thrown well, but for beginners, a longer haft is usually a much better choice.

**Short-hafted axes (9 to 13 inches).** Axes with hafts in this range tend to stick (for me) from about 10 to 11 feet from the target. Depending on the axe design and weight, hafts in this range may require a very consistent form to throw well. With practice, short-hafted axes can be thrown well, but for beginners, a longer hafted axe is usually a better choice.

**Medium-hafted axes (14 to 18 inches).** Axes in this length range are a good choice for most beginners. Axe hafts in this range tend to stick (for me) from about 11 to 14 feet from the target. This is a common throwing distance for axes in SCA competitions.

**Long hafted axes (over 18 inches).** Axes with hafts in this range tend to stick from around 14 to 16 feet or more (for me) unless throwing techniques are used to reduce this range. If you are throwing them in a short-distance event, you will be slightly handicapped, as you will be throwing with people standing 10-12 feet from the target.

**STYLE**

**Generic axes.** Generic axes are modern axes of no specific style. The thrower usually doesn’t care what an axe in this category looks like as long as it throws well. Inexpensive lighter-weight camping, carpentry and shingling hatchets work very well.

**Modern throwing axes.** Commercial axes specifically made for throwing (Gil Hibben Pro Thrower®, Cold Steel Norse Hawk®, etc.) are popular with some SCA throwers. Most are well-designed and made. Beginners may find some of these axes too short and light for consistent accuracy, but they can work very well for experienced throwers. Some of the commercial throwing axes in this category can be very futuristic looking!

**Historic patterns.** Sturdy reproductions patterned after historic axes are relatively inexpensive and easily obtained. Some modern axes can be fairly close to period designs and can be easily shaped with common hand and/or power tools to better resemble period axes. Consider this category if you want an axe that fits your SCA persona.

**CONSTRUCTION METHODS**

Unless you are a skilled blacksmith, making forged, eye-type throwing axes is not an option. However, modification of commercial axes to a more period design or construction of **single piece axes** and **tang-type axes** are fairly easily done by throwers who have basic tools and metal-working skills. The latter two axe types are period weapons in some cultures. The mild steel used to construct single piece axes and tang-type axes can be obtained from large hardware stores (Lowes or Home Depot) or from metal fabrication shops. Axes of these types are discussed in Section 3.
MATCHED KNIVES AND AXES

Most throwers initially pick axe and knife designs that appeal to them or that are inexpensive. After gaining some experience, a thrower may find a particular axe or knife design that they can consistently throw very well. This weapon just seems to fit their style of throwing. Throwers who have consciously developed or accidentally found such a ‘best fit’ weapon can select or construct a complimenting axe or knife that matches the characteristics of this weapon. The weapons of a matched knife and axe set may not look similar, but they will have nearly the same feel when thrown and usually can be thrown from about the same distance. This is a benefit in timed and alternating weapon events.

CONCEPT OF MATCHED KNIVES AND AXES

Assuming reasonably similar over-all weight and length, how the weights of two weapon’s points are felt by the thrower during the throw will have an important effect on their compatibility. A knife and an axe of equal weight and length but of significantly different relative point weights will ‘feel’ very different when thrown and most throwers will need a few throws to adjust to this difference when switching from one to the other. If two weapons have a similar point weigh feel, this is not necessary, as they will ‘feel’ very similar during the throw, and usually can be thrown from the same distance.

Matched weapons are not necessary when throwing Royal Rounds, as a thrower can practice with each weapon style before throwing for score. In competitions, however, the thrower may be required to throw one or two axes, followed by one or two knives at each target station before the station is scored. A thrower using matched knives and axes can switch from axe to knife and back again and throw each accurately without changing their technique or throwing distance. In a competition, these throwers will have a better chance for accurate weapon strikes compared to throwers using mis-matched weapons.

PERSONAL PREFERENCES IN WEAPON POINT WEIGHT FEEL

A weapon’s point weigh is felt as its mass in front of the throwing hand working through a lever arm. This lever arm extends from the top of the throwing hand to the center of the weapon’s mass in front of the throwing hand. For a given point mass, the longer this lever arm is, the heavier a weapon’s point will ‘feel’. A weapon is moving its fastest at the top of the throwing arc, so point mass coupled with the length of the lever arm it is moving through will strongly influence the ‘feel’ of the weapon just before it is released. Some throwers like a point-heavy ‘feel’ to their weapons during the throw, while others prefer a point-light ‘feel’. If the point feels too heavy to a thrower, their throwing shoulder or wrist will tend to ‘break’ slightly during the throw, causing lateral and vertical dispersion of strikes and difficulties in sticking the weapon. If the point feels too light to a thrower, they can not feel what the weapon is doing at the moment of release, so accuracy and the ability to stick the weapon usually suffers. The goal in matching personal knives and axes is to select weapon designs that have: (1) the point weight ‘feel’ preferred by the thrower; (2) the over-all weight preferred by the thrower; (3) nearly the same ‘feel’ when thrown; and (4) the same throwing distance.
EXAMPLES OF MATCHED KNIVES AND AXES

Initial weapon selection should be between weapons that have reasonably similar over-all weights and balance points. The weight difference should be no more than about 4-6 ounces (ideally under 4 ounces) and the balance point difference (measured from the pommel) should be no more than an inch or so. Weapons that differ more than this may be difficult to match.

Figure 1 illustrates a large knife and axe that look quite different but are actually fairly well matched. The kukri-style knife is 18” long and weighs 18 ounces. The Viking-style axe is 11” long, has a copper-clad grip and weights 24 ounces. The balance point for both weapons is marked with the dowel. These two weapons have the same length from pommel to balance point and both throw from 11.2 feet. While the axe does feel slightly heavier over-all compared to the knife, the pronounced weight-forward design of the kukri and the short lever arm that the axe head moves through gives these two weapons a fairly similar ‘feel’ when thrown. When alternately thrown ‘back-to-back’ without interim practice throws, both strike fairly consistently near the same aim point.

Figure 2 illustrates a better axe match with the large kukri knife. Again, the kukri-style

Figure 1 – Fairly well-matched large knife and axe set.

Figure 2 – Well-matched large knife and axe set.
knife is 18” long and weighs 18 ounces. The francisca-style axe is 15” long, is made from 3/16” thick mild steel and weights 18 ounces. The balance point for each weapon is marked with the dowel. These two weapons have different pommel to balance point lengths, but the **grip shape** of the axe forces the thrower to grasp it in such a way that both weapons have nearly the same **distance** from the top of the hand to the balance point. This distance determines the final throwing arc length of a weapon, so both weapons throw from 11.2 feet. The weights of these two weapons are identical and they have a very similar ‘feel’ when thrown. When alternately thrown ‘back-to-back’ without interim practice throws, these weapons consistently strike near the same aim point.

Figure 3 illustrates a knife and an axe that were specifically designed and constructed as

![Figure 3](image)

**Figure 3 – Very well-matched medium knife and axe set.**  

a very well-matched set. The francisca-style axe is 12” long, weighs 12.4 ounces and is made from 3/16” thick mild steel. The dagger is 11-3/8” long, weights 11.9 ounces and is also made from 3/16” thick mild steel. Although not obvious, both have the same grip shape. The balance point for each weapon is marked with the dowel. The weight and balance point of these two weapons are very similar and they have the same ‘feel’ when thrown. Both throw from 10.5 feet. When alternately thrown ‘back-to-back’ without interim practice throws, these weapons consistently strike near the same aim point.

**SELECTING MATCHED WEAPONS**

The three examples above illustrate that selecting matched weapons is subjective and can’t be fully analyzed. Weapons are best matched by simply picking them up and swinging them. Their comparative ‘feel’ will tell you how well matched they are for throwing. The key parameters that influence over-all ‘feel’ (in order of importance) are:

- Point weight and the lever arm the point moves through during the throw
- Over-all weight
- Grip shape

To compare two weapon’s **point weight feel**, grip the first weapon lightly with a modified hammer grip, the wrist held horizontal at waist level. Move the wrist and fingers slightly
up and down a few times to sense what the weapon’s point weight feels like. Repeat with the second weapon. With practice, a thrower can tell how closely matched in point weight the two weapons are. To compare the over-all weight difference between two weapons, weight them on a scale. If a scale is not available, place the balance-point area of the first weapon across the first finger joints of the throwing hand, thumb on top of the weapon. With the hand at about waist level, heft the weapon a few inches while allowing the fingers to flex slightly. Repeat with the second weapon. Again with practice, a thrower will be able to tell how closely matched in over-all weight the two weapons are.

Figure 3 illustrates weapons that were designed to have essentially the same over-all lengths, weights, point weights, pommel-to-balance-point lengths and point lever arm lengths. Even without testing, these two weapons should be a well-matched set.

In Figure 1, the kukri knife is an accurate and consistent thrower, so the axe was matched to the knife. This combination illustrates that while total point weight is important, the length of the lever arm the point moves through during the throw strongly influences point weight ‘feel’. In this example, the heavier axe head moves through a shorter lever arm length compared to the longer lever arm length of the kukri’s lighter point weight. This difference in lever arm length makes the weight of each weapon’s point ‘feel’ very similar during the throw even though there is a large difference in actual point weights. The axe was balanced to the kukri by shortening the haft, which moved the balance point closer to the head, shortening its lever arm. The haft was shortened until the balance, throwing distance and point weight ‘feel’ of the axe closely matched that of the kukri.

The weapons described in Figure 2 illustrate that while a similar grip shape is desirable, how a particular grip is grasped will also influence over-all compatibility. There is a 2-inch difference between the balance points of the two weapons in Figure 2, but when the best grips are taken on each weapon, there is only a 1-inch difference in the locations of the index finger. The distance from the index finger to the balance point is what determines the final throwing arc length for a weapon. Both weapons are also thrown with the same grip angle in the hand. These two factors reduce the effects that the differences in over-all weapon lengths and initial balance points would suggest. Both weapons throw from 11.2 feet, with essentially the same ‘feel’. The difference in grip shape does have a slight influence to the over-all ‘feel’ between them, but it is minor.

Taking the time to find a matched knife and axe set is worth the effort. The best way to have a matched set is to find or make two weapons that have nearly the same lengths, weights, point weights, pommel-to-center-of-balance lengths and point-lever-arm lengths, like the weapons described in Figure 3. Trying to ‘critically analyze’ the differences between two weapons is not worth the time, as there can be subtle differences that initially seem logical (or illogical), like the examples described in Figures 1 and 2. Additionally, a slight difference in over-all weight or point weight is not that critical to performance. Two throwers can also have very different opinions on what is a ‘matched set’, depending on their style of throwing! The easiest way to match weapons is to: (1) pick up several axe and knife designs and compare their ‘feel’ by hefting them; and (2) not assume an axe and knife combination is a poor match simply by looking at them!
SECTION 2

JAVELIN SELECTION AND CONSTRUCTION

JAVELIN SELECTION

Beginning throwers will usually start with a basic javelin. Instructions for making these simple, inexpensive javelins are given below. When a thrower gains experience, they may want to construct a javelin that better fits their SCA persona and their style of throwing.

Criteria for selecting any javelin design include:

- Total length
- Over-all weight
- Point weight
- Balance Point Location (Forward Balance or Center-Balance)

**Total Length** – Most infantry javelins in period were about 4-6 feet long. Broom or rake replacement handles in these lengths can be found in most hardware stores and make excellent javelin shafts. Longer javelins, up to about 8 feet, were used by some cultures, particularly by light cavalry. Suitable shafts of spruce or hemlock (lighter woods than ash) can be found at many large lumber yards. These longer javelins are usually a little harder to throw compared to the shorter lengths, but some people like them.

**Over-All Weight** – Javelins in period needed to be light enough to be thrown about 25 to 30 yards but with enough weight to penetrate well, so they usually weighed around 1 to 2 pounds. Spears, by contrast, were longer, heavy-duty thrusting and hewing weapons that typically weighed 3-1/2 pounds or more. These weapons were only occasionally thrown. Some throwers can do well with a javelin lighter than 1 pound, but most throwers will prefer a slightly heavier javelin. Most SCA throwers do best with javelins in the 1-1/4 to 2 pound range.

**Point Weight** – Like throwing axes and knives, a javelin’s point weight will influence how accurately the weapon can be thrown. Some people prefer a relatively light ‘feel’ to their javelin’s point, while others prefer a relatively heavy ‘feel’.

**Balance Point Location** – The location of a javelin’s balance point in relation to its overall length will influence its throwing characteristics. Some throwers do best with a nearly center balanced javelin. An advantage to a center-balanced javelin is that the balance point can be quickly felt by simply hefting the weapon. This can be a benefit during timed events. Other throwers prefer a forward balanced javelin. A forward balance puts a fair portion of the javelin’s weight in front of its center point, which helps smooth out minor throwing errors. Period javelins commonly used this type of balance. A javelin with the balance point behind its center point has poor stability and is usually difficult to throw accurately.
A javelin’s balance point is influenced by: (1) point and ferrule weight; (2) shaft length; (3) shaft diameter along the length (shaft tapered or not tapered); and (4) butt cap weight (if used). Examples of javelin lengths and balance point locations are shown below.

Examples of Different Javelin Lengths and Balance Point Locations – The black lines mark the balance point locations of the javelins. The upper javelin is center balanced; note the black counter-weight on the javelin’s butt that balances the point. This javelin is 45 inches (3.75 feet) long and weighs 1 pound, 11 ounces. The middle javelin is slightly forward balanced. Its length is 60 inches (5 feet), weighs 1 pound, 4 ounces and it balances 2 inches in front of the center point. The lower javelin is forward balanced. Its length is 64 inches (5 foot 4 inches), weighs 1 pound 4 ounces and balances 9 inches in front of the center point.

LIGHT JAVELIN CONSTRUCTION

Materials
- 5 foot by 7/8” to 1” diameter broom handle, threaded aluminum hexagonal head.
- 10 to 12 inch long, 3/8-inch diameter steel rod, nail (galvanized best) or SKS bayonet.
- 3/4” copper pipe end cap (if used for a butt cap)
- Upholstery tacks (if used to mark balance point and anchor point)
- Epoxy.

Construction
- Cut bayonet, steel rod or nail to desired length (point length plus about 1.5”). Use 8-10” length for straw bales, shorter for wood butts. Lightly sharpen with a file. Do not put a thin, sharp point on the head – it is not needed.
- Hacksaw off the threaded section of the aluminum broom handle fitting. Cut flush with the main portion of the fitting.
- Mark center of the shaft head using circle template and small straight edge. Prick center with awl, then center punch. BE AS PRECISE AS POSSIBLE!
- Place the shaft in a vise and level it with a bubble level. Pre-drill through the wood shaft and aluminum fitting with a 1/8” or 5/32” drill, taking care to keep it centered and parallel to the shaft. Counter sink (by hand) with a 1/4” drill.
• Drill out shaft with a 3/8-inch drill, taking care to keep the drill motor straight. If a SKS bayonet is used, follow with a 7/16-inch drill bit and then a 1/2-inch drill bit. The total drilling depth is about 1-1/2” inches. Test the straightness of the drilled hole by inserting the rod or nail to be used for the javelin head.

  o The rod or nail can be bent slightly in a vise if needed for a straighter installation. Rotate the shaft while looking down the shaft at the temporarily installed point. Note the location and direction of any needed bend and mark it with a permanent marker. Place the point in a vise to the depth of the drilled hole, and carefully bend, using a long piece of pipe as a lever – it usually does not take much of a bend! Test frequently.

  o The SKS bayonet is asymmetrical in shape and will need to be placed in the hole at the best angle possible – it won’t be perfectly straight. The hole can be reamed out on one side to correct a crooked drilling operation.

• File the edges of the aluminum fitting round (if desired). Cut spear shaft to desired length (if you want it less than 5 feet) and round the butt end with a knife and file. Reduce shaft diameter at the butt to accept the copper end cap (if used).

• Drill out pressed-in crimp dimples on aluminum fitting with a very small drill and epoxy on upholstery tack ‘rivets’ to cover dimples up (if desired). Wait until the epoxy had almost set up – rivets will stay in place better until epoxy sets.

• Epoxy javelin point to shaft. Epoxy on the butt cap (if used).

• Place javelin on a knife-edge and find the balance point. Mark with an upholstery tack (best), sting (glue on or tie tightly) or burn the location with a hot nail.

**HEAVY JAVELIN CONSTRUCTION**

**Materials**

• 5 foot by 1-1/4 inch diameter rake handle (handles with a steel ferrule are best).
• SKS bayonet or 10 to 12 inch long by 1/2 inch diameter steel rod.
• Epoxy.

**Construction**

• Cut 1/2” steel rod to desired length (10” to 12”) or disassemble and degrease SKS bayonet. Sharpen steel rod with a file or on a bench grinder. Do not put a thin, sharp point on the rod – it is not needed.

• Rake handles usually come pre-drilled. Place shaft in vise and level it with a bubble level. Carefully drill out the shaft hole with a 3/8-inch drill bit (if not
already that size), taking care to keep the drill motor straight. Follow with a 7/16-inch drill bit and then a 1/2-inch drill bit. The drilling depth is about 1-1/2 inches.

- Test the straightness of the drilled hole with a rod or dowel of known straightness.

  - The 1/2” rod can be bent slightly in a vise if need be for a straighter installation. Rotate the shaft while looking down the shaft at the temporarily installed point. Note the location and direction of any needed bend and mark it with a permanent marker. Place the rod in a vise to the depth of the drilled hole, and carefully bend, using a long piece of pipe as a lever – it usually does not take much of a bend! Test frequently.

  - The SKS bayonet is asymmetrical in shape and will need to be placed in the hole at the best angle possible – it won’t be perfectly straight. The hole can be reamed out on one side to correct a crooked drilling operation.

- Epoxy spear head to shaft. A centering jig can be made to keep the point aligned straight while the epoxy is setting. This jig is made from a piece of pipe that fits the shaft tightly (use Duct tape or a pipe insert if needed). A large fender washer whose center hole fits the javelin head tightly is taped to the other end.

- Javelin scabbards can be made from leather or from copper or PVC pipe and caps. Use a leather thong to keep the pipe-type scabbards on during transport.

**PERIOD-CORRECT JAVELIN CONSTRUCTION**

Typical SCA javelins have narrow heads made from steel rods, large nails or SKS bayonets, but most period javelins had 1-1/2” to 2” wide, leaf-shaped blades. Bladed javelins in period were sharp-edged, but a sharp-edged blade will quickly cut the twine on straw bale target butts, so their use is not allowed in some kingdoms.

Unsharpened mild steel flat stock can be used to make an inexpensive, more period-correct javelin that doesn’t cut straw bale twine. A 1-1/4” to 1-1/2” wide by 7” to 8” long piece of flat-stock about 3/16” to 1/4” thick is shaped into a tang-type javelin head (see figure below) and attached to a shaft with epoxy. Basic construction is similar to that
described above for light and heavy javelins. Installation of a shaft ferrule is recommended to strengthen the joint (see photo below). Excellent steel ferules can be found on some replacement rake handles.

![Bladed Javelin Head Construction Diagram]

**BLADED JAVELIN HEAD CONSTRUCTION**

Blade about 7” to 8” long

Unsharpened edges

Blade is made from 1-1/4” to 1-1/2” wide
3/16” to 1/4” thick mild steel flat stock and epoxied into shaft.

TANG-TYPE CONSTRUCTION

Tang is about 3/8” wide and 1-1/2” to 2” long

Self-Made Bladed Javelin – Mild steel (fabrication steel) blade is 1-1/4” wide, 7-1/4” long and 3/16” thick. Ferule is from a replacement rake handle. Blade is unsharpened except at the point. (Author’s collection).

Bladed javelins may not be suitable for use on wood target rounds as the tang may bend or break, but they work very well on straw-bale target butts. Depending on the size and thickness of the blade, the finished javelin will be slightly heavier to significantly heavier over-all than the typical rod or nail-headed javelins and will likely be forward balanced unless a matched-weight end cap is used. Some throwers feel these point-heavy javelins are more accurate, as a forward balance design better overcomes and controls minor shaft wobbles during the throw.
SELF-MADE THROWING KNIVES AND AXES

SELF-MADE KNIVES

Throwers with basic metal-working skills can make very adequate throwing knives from fabrication steel. Fabrication steel is an inexpensive mild steel that is easily worked with common hand or power tools. A thrower can make and try many different lengths and styles of throwing knives for around $3-$5 a knife, plus his/her labor. By contrast, good-quality commercial throwing knives cost about $15-$30 per knife, and unless the thrower has an acquaintance who owns the knife, a commercial knife must be bought untried.

Mild steel flat stock is sold in the hardware section of the larger hardware stores like Lowes or Home Depot or can be purchased from local metal fabrication shops. Suitable throwing knives can be made from 1” to 2” wide by 1/8” to 1/4” thick flat stock. Mild steel flat stock from hardware stores usually comes in 3 foot and 4 foot lengths and costs around $8 to $12 per piece, depending on length, width and thickness. Cold rolled mild steel (usually marked with blue paint on one end) is preferred for throwing knives, but many stores carry only hot-rolled steel (marked with red paint on one end). Hot-rolled steel bends easier than cold rolled steel, but it is usable.

Mild steel has two minor draw-backs when used for throwing knives – it is very malleable (it bends easily) and it can not be tempered (it does not contain enough carbon). Malleability can be an asset, as mild steel throwing knives will bend but they will not break, chip or crack like tempered knives. No matter how wide a mild steel throwing knife is, it will eventually bend. Bending usually occurs when the knife hits hard and flat on the edge of the wood target. A knife with a minor bend can still be thrown accurately. When the bend becomes too severe, the knife is placed on a hard, flat surface (concrete sidewalk, etc.) and hammered flat.

Mild steel can’t be tempered, so thin-bladed knives (1/8” thick) may bend excessively, depending on the design. Mild steel throwing knife blades can be sharpened, but it won’t be a durable cutting edge. This is usually not a problem, as sharp edges are a cutting hazard to the throwing hand and most throwers prefer to use dull blades. Only the last 1/4” to 1/2” of a throwing knife’s tip needs to be sharp for effective sticking.

Large iron knives (which is similar to mild steel) were used during the early Migration Period (around 300-600 CE), so throwing knives made from this material is period correct. Steel (made by the pattern welding of iron) was expensive and usually reserved for high-quality swords and for small utility knives that needed a sharp blade. The typical warrior rarely used his large war dagger, so it could be made from cheaper iron.

Mild steel throwing knives are most easily made with power tools. A 4-1/2” angle grinder or a die cutter (both using a thin cut-off disk) and a 6” or 8” bench grinder are ideal tools. Unless a very intricate design is made, most throwing knives can be
completed with these two power tools in 1/2 to 1-1/2 hours. If power tools are not available, mild steel throwing knives can be cut out by hand with a hacksaw. If a hacksaw is used, simple knife patterns with mostly straight lines are recommended to minimize the construction time and effort. Alternately, a metal fabrication shop can cut out the knife for a nominal fee. All knives are finished with a file and sandpaper.

Mild steel flat stock is usually coated with **mill scale**. Mill scale is a natural oxide coating that forms after mill rolling; it is very hard and is difficult to sand off. Mill scale can be left on as a rust-proof coating, but eventually it will abrade or flake off and the underlying steel will begin to rust. Mill scale is easily removed by soaking the steel in inexpensive white vinegar for about 12 hours, then rinsing and lightly scrubbing the surface under running water with steel wool, fine sandpaper or a scouring pad. A short piece of capped PVC pipe set vertically makes a handy, inexpensive soaking container. Bare mild steel will eventually rust, so throwing knives should be painted or wax coated. Flat black or flat grey automotive primer works well, but metal paint of any color will work. Hardwood floor paste wax or other metal preservatives can also be used.

**EXAMPLES OF SELF-MADE MILD STEEL THROWING KNIVES**

Mild steel throwing knives can be patterned after a commercial throwing knife or they can be a personal design that the thrower wants to try out. The simplest and easiest to make mild steel throwing knife is the straight blade, flat-stock knife described below.

**CONSTRUCTION OF SIMPLE THROWING KNIVES**

1. Buy a 3 to 4 ft. long piece of cold-rolled flat stock steel (Home Depot). Hot rolled will work, but will bend more. A 12” knife is a good starting length, so a 4 ft. piece will make 4 knives. 1/8” thick flat stock will make 6 oz. knives (not recommended – too light and easily bent); 3/16” flat stock will make 9 oz. knives (probably best) and 1/4” flat stock will make 12 oz knives. 1” wide stock works best.

2. Using a ruler and a fine-point felt-tip pen divide the flat stock into 1 foot lengths, then draw the points at about 20 to 25 degrees. Make all cuts with a hacksaw. See pattern below.

3. With a file or a grinding wheel, slightly thin and round off all cut edges on the tip (except for the actual point). Thin the tip slightly more on both sides of the flats for about 1/2” back. File a sharp point on the knife, but keep the point edges rounded. They do not need to be sharp to stick well. Slightly round hilt corners also.

Two knife point options are shown in the pattern above – a spear point (#2, right) and a straight point (#2, left). Throwers with large hands may want to make their knives from 1-1/4” wide by 3/16” flat stock for a better grip. These simple knives are easily made with a hacksaw and a file in about 15 minutes and cost about $3 to $4 each. They are very accurate throwers, being well balanced both laterally and longitudinally. An
example of a finished straight point throwing knife is shown in Figure 1. The black ‘hilt’ shown on this knife and on several of the following knives is painted on using flat-black automotive primer. The mill scale has been removed from these knives.

Figure 1 – Simple straight-point knife. This knife is made from 1” wide by 3/16” mild steel flat stock and has a cosmetic, unsharpened ‘edge’ filed on the point for a more knife-like look. The knife is 12” long and weighs 9 ounces.

Examples of other mild steel throwing knife designs are shown in figures 2, 3 and 4. All are made from 3/16” thick flat-stock; weights range from 12.1 to 12.7 ounces. The knife in figure 2 is made from 1-1/2” wide flat-stock and is 12-3/8” long; the knife in figure 3 is made from 2” wide flat-stock, is 11-3/8” long and 1-7/8” wide. Figure 4 (page 22) is a

Figure 2

Figure 3
throwing knife design for a Middle Eastern persona. Upswept point dagger designs are common in the Middle East (called Persia in period) and in India. The knife is made from 2” wide flat-stock and is 15-1/4” long and 1-1/2” wide near the center of the blade. This design can be thrown with the point either up or down and is an excellent performer.

Inexpensive mild steel throwing knives also can be patterned after commercial throwing knives. The lower knife in figure 5 is a Gil Hibben Pro-Thrower®, a stainless steel, tanto-pointed commercial knife made by United Cutlery. The upper knife is a self-made, mild steel copy of the Hibben knife. The copy is made from 3/16” thick mild steel flat-stock and has the same dimensions as the commercial knife except it lacks a finger cut-out at the blade heel and the weight reduction holes in the hilt. The copy is painted with flat-black automobile primer for rust protection. This knife weights 1.5 ounces more than the commercial version but throws to the same point of aim and is as accurate. The mild steel versions cost about $4 each or about $12 for a set of three knives. The commercial knives cost about $12 to $15 each and are sold only in sets of three, for a total cost (with shipping) of about $35 to $45.

Figure 4

Figure 5 - Commercial stainless steel throwing knife (bottom) and a self-made mild steel throwing knife (top) patterned after the commercial knife.
DESIGNING YOUR THROWING KNIFE

Throwing knives come in a bewildering array of sizes and shapes, reflecting the individual thrower’s ideas of what works for them and what they think looks good. Some examples are shown on page 26 and a dagger pattern is shown on page 31. The following discussion will help you get started designing your own knives.

KNIFE DESIGN PARAMETERS – Many experienced knife throwers recommend that for best performance, throwing knives should be around 11 to 14 inches in total length and weigh about 11 to 14 ounces. Five parameters should be considered when designing a mild steel throwing knife: (1) knife thickness; (2) knife length (3) knife width; (4) knife weight; and (5) knife balance.

Knife Thickness – For the average thrower, bare hilt mild steel knives should have a minimum thickness of 3/16” for best grip and resistance to bending. A long knife of reasonable weight can be constructed from 1/8” thick flat stock but some throwers may want to put grips on these knives, as the thin material is hard to grasp. Some knife designs if made from 1/4” thick flat stock may be too heavy for some throwers when made in the recommended 11” to 14” lengths.

Knife Length – Most people find that knives shorter than about 10” to 11” and longer than about 14” to 18” are difficult to throw accurately. Some experts recommend designing your knives for about 1.0 to 1.2 ounces of weight for every inch of knife length. Using these recommendations, a 12” knife weighting about 12 to 14.5 ounces should work well for most people. Many knife designs will meet these recommendations if they are made from 1-1/4” to 1-1/2” wide by 3/16” thick mild steel flat stock.

Knife Width – Owing to mild steel’s malleability, a throwing knife width or any portion of the knife’s width that is less than 1” will usually bend too easily for practical use. A 1” width is usable if the knife is a simple, straight piece of flat stock, but a minimum width of 1-1/8” to 1-1/4” is usually better for any wider-bladed design.

Knife Weight – For medium-length knives (11” to 14” long), 3/16” thick stock will give acceptable weights for most designs. Throwing knives that weigh at least 11 ounces and are no heavier than about 14 ounces (15 to 18 ounces for throwers who like a heavy knife) are ideal. If 1/4” thick mild steel stock is used, knife weight may be excessive, depending on the design and the length. Mild steel flat stock usually can be found in widths up to 3”, but knife widths over 2” usually result in quite heavy knives.

The cutting areas of tempered blades are usually thinned and beveled for easier sharpening. Mild steel can not be tempered and the knife can not have a usable edge, so thinning bevels are not necessary unless the blade needs to be lightened to center-balance the knife or the thrower does it for cosmetic reasons. Unsharpened blades are preferred for throwing knives, as they are safer to grip and throw. A cosmetic bevel can be ground into the blade, if desired, to make it look more like a practical knife (figure 1, page 21),
but most people don’t bother. Only the tip of a mild steel throwing knife needs to be beveled, sharpened and pointed for adequate sticking (see figure 6, below).

**Figure 6 – The most durable point for a mild steel throwing knife is diamond shaped. The diamond’s edges are thin and sharp; the central spine prevents point bending.**

*Knife Balance –* If you intend to throw at extended distances (over about 12 feet), the knife should be designed to throw equally well from either the hilt or the blade. These knives will have about the same feel and rotation arc during the throw, irrespective of which end is gripped. Ideally, a knife designed for both hilt and blade throwing should have hilts and blades of similar basic shapes and be *center balanced*. A knife is considered center balanced if the difference between the center of the knife and its balance point is 5/8” (1.5 cm) or less. Center balancing a knife that will be thrown only by either the hilt or the blade is desirable, but it is not a critical factor.

**BLADE AND POINT DESIGN** – Mild steel is not strong enough for knife designs that have very narrow blade tips, so the following point designs are recommended:
The ‘Turkish clip point’ and the ‘California clip point’ designs as drawn above may be too fragile to be made from mild steel but the upper edge of the clip point can be straightened a little to make a more sturdy point. Very thin, narrow spear points like the stiletto and some dagger designs are not practical when made from mild steel, as they will bend excessively. These very narrow-bladed knives must be made from tempered steel. Unless you want a point design to match a specific period knife pattern (see Figure 4, page 22) one of the three symmetrical point shapes (drop point, spear point or recurved blade) is recommended. These points give the knife good lateral balance (side-to-side balance), a desirable feature on a throwing knife. The symmetrical point designs also give a firmer, more consistent grip for blade throws. Asymmetrical shapes like the clipped and upswept points can be good throwers, but most throwing knives will have symmetrical or near-symmetrical points (see examples on page 26). Asymmetrical points usually reflect the uses the knife blade was originally designed for (skinning animals, stabbing through armor joints, etc.). Most of these uses don’t include throwing the knife!

Experienced throwers usually prefer a knife’s total weight to be within a personal comfort range. However, a throwing knife’s point weight can also have an important effect on the knife’s performance. Two knives of equal length and total weight but of differing point weights will feel different when thrown. Some throwers like a point-heavy ‘feel’ to their knife, while others prefer a point-light ‘feel’. This concept is discussed in Section 1 - MATCHED KNIVES AND AXES.

**DRAFTING YOUR DESIGN** – When you find a knife design or concept you like, draw and cut out a pattern from thin white cardboard or stiff paper stock. A thin cardboard mock-up will allow you to check the knife’s center-balance and what the finished knife will feel like in your hand. The hilt, blade length and over-all shape of the cardboard mock-up can be easily modified or re-done. When you are satisfied with your design, trace the pattern onto the steel with a felt-tip pen and start cutting.

**KNIFE GRIPS** – Many throwers do not bother putting grips on their mild steel throwing knives, as grips add cost, weight and construction effort to what is supposed to be an inexpensive, easily made knife. It is also easy to break most grip scales with a bad hit! Pick a full-tang hilt design when adding grips, as thin rat-tail tangs will bend too easily. Leather scales attached with epoxy to a full tang hilt and bolstered with two or three rivets makes a durable, period correct throwing knife grip (see examples on page 26). If thicker leather is needed, epoxy two thinner pieces together. Cut the grip scales slightly narrower than the hilt, particularly at the pommel, to protect the scales during a hilt hit. Roughen the leather and the hilt area, apply epoxy and clamp until the epoxy cures. Drill the hilt holes and install double-headed rivets (obtained from an internet cutlery supply shop) or use regular rivets. Sand the scales smooth (but not polished) and apply a leather preservative.

Simple, durable (but non-period grips) can be made from 5/8” or 7/8” ID washing machine pressure hose (about $8 to $11 for 10-foot lengths, Home Depot or Lowes). This material gives very consistent grip friction and holds up well. Knife hilts using hose grips should have two 1/8” to 3/16” steps in front of the hose section to keep it from...
sliding forward during use (see axe pattern on page 31). Cut the hose about 1/2" longer than needed and heat hose in boiling water to make it more pliable. Press hose over an oversize hilt (7/8” oversize for 5/8” hose, 1” for 7/8” hose). As the hose cools, it forms a very tight friction fit to the hilt (5/8” ID hose grip shown below). Trim hose grip to fit the pommel and round off the pommel edges. Sand the grip with 150 grit sandpaper to remove the smooth surface. If left on, this surface will feel “sticky” when used with moist hands. The pommel area can be filled with epoxy and painted flat black to match the grip or left open to make the grip easier to replace if it is damaged.

Unless you have very large hands, 5/8” ID hose makes the best grip. A hose hilt can be custom fit to your hand by cutting short pieces of doweling in half or quarter sections and inserting them into the hilt from the pommel area to add slight palm or finger swells.

Ricochet’s Collection - From Tim Jester
(Copied from http://www.throwzini.com/ricochet.htm)
SELF-MADE AXES

MODIFIED COMMERCIAL AXES - One option for making a reasonably period-correct throwing axe is to modify a modern commercial axe. An example is shown below. This modern roofing axe costs about $26 and is very similar to a pattern used in 6th to 7th century Scandinavia. The rubber grip was removed and replaced with 3/4" and 1" copper pipe and pipe fittings with a core of wood doweling and PVC pipe, then epoxied together. The under portion of the axe head was ground into a more period-correct shape.

Example of a modern roofing hatchet with a rubber grip converted into a more period-correct throwing axe. (Author’s collection)

Another way to construct a fairly period-correct axe is the **stock removal method**. With this method, a modern axe head is reshaped into a more period-correct design. Although it is possible to modify a commercial axe using only hand tools, an angle grinder and a bench-mounted grinding wheel will do a much quicker job. Below is an example of the conversion of a modern hatchet to a more period-correct axe (Author’s collection).

Original commercial axe

Converted axe (Norse bearded axe)
Two other easily-made axe types are: (1) single piece axes and (2) tang-type axes. Both axe types are made from mild steel flat stock (fabrication steel) using the tools and techniques discussed above for constructing mild steel throwing knives. The wide pieces needed for these axes sometimes can be found at large hardware stores (Lowes and Home Depot) but are usually cheaper if bought from a metal fabrication shop. Simple shapes can be cut out with an angle grinder or a hacksaw and finished with a bench-mounted grinder or a file. If you don’t have basic hand and power tools or want to construct an intricately-shaped axe, most metal fabrication shops will cut out your design for a nominal fee.

**SINGLE-PIECE AXES**—Single-piece axes are easily made from 3/16” or 1/4” thick mild steel plate. The two examples below are based on the early period francisca throwing axe used by the Franks, but single-piece axes can be cut in any shape that the thrower desired (see page 31 for patterns of slightly modified versions of these axes).

Two single-piece axes modeled after the early period francisca bent-haft throwing axe. Both axes were cut from a 3/16” thick by 18” long by 4” wide piece of mild steel flat-stock bought from a metal fabrication shop for about $6. Blade widths are 3-1/2” and hilts are styled after the Gil Hibben 1st generation throwing knife hilts. The upper axe is 15” long and weighs 18 ounces. When made from 1/4” thick stock, this axe weighs 25 ounces. The lower axe is 12” long and weighs 13.2 ounces. (Author’s collection).

The advantages of single-piece axes are similar to the advantages of mild steel knives:

- Single-piece axes are inexpensive, typically costing about $3 to $5 each. A thrower can have 3 or 4 mild steel axes for the same cost as one high-quality commercial axe. If one of these axes is lost, another can be inexpensively made!

- Single-piece axes are fairly easy to make, are almost indestructible and can be made in any shape the thrower wants. A thrower can economically test several designs or make an inexpensive copy of a high-priced commercial axe.

- The mild steel used for these axes won’t chip, crack or break like tempered axes.

- Rubber hose or wood or leather slab-type grips can be added if a grip is wanted.
These axes do have some limitations:

- Mild steel axes can’t be tempered, so a very thin blade edge is usually not practical, as it will eventually bend. The blade edge can be sharpened, but the slightly thicker edge typically used with these axes makes blade-belly sticks slightly harder to do reliably. Blade-belly strikes will usually stick well in willow or poplar wood end-cut target rounds but are slightly less reliable compared to tempered, very thin-bladed axes when thrown at side-cut lumber target panels. However, axe weight also influences belly sticking ability – the upper ax design in the photo on page 28 will do belly sticks much more reliably when made from 1/4” thick mild steel (axe weight = 25 ounces) compared to the same axe made from 3/16” thick mild steel (axe weight = 18 ounces).

- Single-piece axe designs that have a sharp upper point nearly in-line with the haft work best (see photo on page 28), particularly if the thrower relies on sticking the point instead of the blade-belly. Point sticks are best for any throwing axe design! Axe designs with light heads and long head-length (back of head to blade-belly length) and/or hafts perpendicular to the head are not recommended. Axes with these characteristics do not have the head weight to drive the blade deeply into the target and their head and haft geometry causes them to rotate out of the target after the strike. These designs will usually have a very narrow rotation zone in which the weapon will stick well.

- Like all mild steel weapons, these axes will bend if they take a bad hit. However, they can be easily straightened by hammering flat.

- Except for West-Central African throwing axes and the desperation use of late period European melee axes, all-metal throwing axes were not used in period.

**TANG-TYPE AXES** –Tang-type axes consist of a blade and integral tang, which is inserted into a slot cut into a reinforced haft (see photo below). Tang-type axes are


usually a little more difficult to make compared to modifying commercial axes or making one-piece axes. The tang-type axe (above) is an ‘authority axe’, and is a status symbol weapon. To prevent bending during throwing, a tang-type axe should have the head
positioned close to the haft and have a moderately wide tang. Tang-type axe heads can be of any shape, keeping in mind the design limitations discussed above.

Tang-type axe heads are cut from a single piece of mild steel plate. A minimum thickness of about 3/16” to 1/4” is recommended. A shoulder on the blade side of the tang is used to keep the blade from moving back into the haft. The tang many times was tapered down to about 1/2” wide or so and the tang end bent over the shaft to lock the head in. The bent tang is just visible in the axe above. Other tang axes use a wire or leather wrap over a rectangular-shaped tang. The tang area on a tang-type axe haft is highly stressed and will need to be reinforced in order to stand up to continuous throwing.

A more practical tang-type axe for SCA use is shown in the figure below. It can be made from 3/16” to 1/4” thick mild steel plate; the hickory wood haft is 1” to 1-1/4” diameter.

Ash replacement rake handles can be used for the haft, but ash is not as tough as hickory and may break sooner. These axes are fairly inexpensive and can be made in whatever shape the thrower desires. They can be constructed in a couple of hours with an electric drill, an angle grinder and a bench grinder for under $10 per ax. If hand tools are used (hacksaw and files), construction time will be longer. Mild steel can not be tempered, so a very thin blade is usually not practical. Tang-type axes made from mild steel should have a fairly acute, sharp upper point to insure good sticking.

To construct, cut a slot in one end of the haft the same width as the axe head thickness and insert the axe head. Drill two 1/8” diameter holes through both the haft and the axe head, and then ream them out with a 1/4” diameter drill. The head is attached with two 1/4” diameter bolts. The iron pipe support is recommended for 3/16” thick axe heads as it adds needed weight to the axe. This support piece will also strengthen the joint and hide the bolts on any axe. If the support piece is used, the bolt heads and nuts should be filed down and counter-sunk into the handle to allow the pipe to slip over them. The bolts and support pipe should be epoxied together to keep the joint from working loose.
SUGGESTED MILD STEEL KNIFE AND AXE DESIGNS

Knife pattern can be expanded up to about 16” by increasing the length in front of the balance point; axe lengths can be increased slightly. Use hilt dimensions below for a 5/8” ID rubber hose grip on any weapon.

FABRICATION DRAWING - 11-3/8” by 1-3/4” by 3/16” MILD STEEL WIDE SPEAR POINT DAGGER

FABRICATION DRAWING - 14” x 3/16” MILD STEEL FRANCISCA AXE

Weight = 11.9 ounces

12” x 3/16” MILD STEEL FRANCISCA AXE
SECTION 4

SCABBARDS

INTRODUCTION

Scabbards are not needed for thrown weapons if they are used for Royal Rounds and simple competitions, as the weapons will not need to be carried any distance. For period authenticity and for competitions that require the thrower to move from target to target, some sort of weapon carry system is recommended.

Weapons in period were carried either tucked into a belt or carried in a belt, neck, arm or boot scabbard. In some cultures (e.g. Norse), axes were tucked unsheathed in the belt or carried in the hand; scabbards were rarely used. For SCA competitions, a scabbard is the safest and most secure method of carrying thrown weapons and scabbards may be required for some events. A scabbard used primarily for court wear or Royal Rounds can be of any design the thrower wants, but for competitions the scabbard and its carry position should be secure but allow a reasonably quick and consistent weapon draw. This is usually best done with a waist-belt scabbard. Scabbards designed for competitions will have slightly different requirements compared to general wear scabbards.

Most long weapons can be simply tucked in the belt. This open belt carry is a good method for axes, as the head will keep it from sliding off the belt, but it is not as desirable for knives. Minor cuts are possible with an open belt carry of any weapon and the draw angle may change from throw to throw depending on how the weapon rides in the open belt. Four belt-carry methods can be used: (1) hip carry, (2) small-of-back carry; (3) kidney carry (weapon is positioned half-way between the hip and the small of the back); and (4) cross-draw carry.

DESIGN AND CONSTRUCTION

COMPETITION SCABBARDS – The easiest and quickest weapon carry for competitions is the cross-draw scabbard carry. With this carry, as the hand draws the weapon, the throwing arm will be moving through a smooth, short arc that naturally flows into the aiming position. Competition scabbards also should be designed to carry two weapons, as the more realistic competitions will allow two weapon throws before scoring, but will not allow retrieval of the first-thrown weapon for the second throw (a real enemy wouldn’t give you that opportunity!). A simple cross-draw scabbard has a single belt slot on the scabbard’s outside edge - the belt is passed through the slot from the back and crossed over the front of the scabbard. This design gives very secure weapon retention, precise positioning of the weapons on the belt and a fairly quick draw.

TOOLS AND MATERIALS – Thrown weapons scabbards are best made from 1/8” thick split leather (one side is smooth). Tools and materials include:

- Leather pieces of suitable size;
• Heavy paper to lay out and test-fit the scabbard pattern;
• Soft-lead pencil to trace the pattern;
• Utility razor knife or box cutting knife;
• 1/4” long double-headed brass or nickel rivets (“rapid rivets” – both sides dome-shaped);
• 1/16” diameter leather punch or an awl;
• Medium-weight hammer;
• Small block of wood or plywood;
• Medium-cut file;
• Leather preservative (Hubbard’s shoe oil or hardwood floor paste wax);
• Leather dye (or you can leave the leather its natural color).

SCABBARD DESIGN – Thrown weapon scabbards can be of any design, especially if the thrower is a skilled leather worker. For unskilled leather workers, two easily constructed designs are the **two-piece scabbard** and the **folded scabbard**. Both designs are put together with double-headed rivets, which are simpler and easier to use than sewing. Rivets were occasionally used on early period scabbards, so they are period-correct. **Tandy Leather®** is a good source for leather supplies, rivets and tools.

Three basic scabbard designs are shown below. For clarity, these scabbards have been set slightly more to the front than they would be during use. Figure 1 shows a two-piece scabbard hung from two belt slots. This design is good for large knives and large single-piece axes; the scabbard mouth can be made wide enough that most weapon handles can be set in a cross-draw position even though the scabbard hangs straight down.

**Figure 1** – Two-piece vertical scabbard with large knives in a cross-draw position. The upper hilt is tilted up slightly so it rides above the lower hilt (a high/low carry). This allows a clean grasp of the higher knife, which will be the first thrown. The upper knife is
drawn first to minimize hilt interference during the draw. The very wide points of these kukri knives require a wider than usual scabbard (see Figure 4). Figure 2 shows a cross-draw folded scabbard, a good design for small to medium knives.

**Figure 2** – Folded cross-draw scabbard for small to medium length knives. The outer knife’s hilt protrudes slightly more from the scabbard mouth compared to the lower hilt (a side-by-side carry). This allows a clean grasp of the outer knife hilt, the first thrown.

Figure 3 shows a cross-draw folded scabbard that is a good design for small to medium single-piece axes. Eye-type axes are usually too bulky for this design and will require either an open belt carry or a belt loop carry.

**Figure 3** - Folded cross-draw scabbard for small, single-piece axes. Note that the upper hilt is tilted up slightly so it rides above the lower hilt (a high/low carry). This allows a clean grasp of the lower (outer) weapon, which will be the first thrown. This scabbard is
designed so that the upper axe will drop down into the first axe’s position after the first is drawn. This gives the same draw angle for both weapons.

SCABBARD CONSTRUCTION – Leather is bulky and tight folds are not possible without damaging the leather, so lay out your paper pattern with generous allowances for any fold. Place your weapon(s) on the paper and decide how you want the finished scabbard to look and function. In all cross-draw designs for two-weapon carry, the weapon hilts need to be separated slightly to allow a clean grasp of each weapon. This is done by: (1) making the scabbard a little tight (front to back) so that the weapons can be set one on top of the other, with one hilt protruding slightly more from the scabbard (a side-by-side carry); or (2) making the scabbard wide enough so that the upper hilt can be tilted up slightly to ride above the lower hilt (a high/low carry);. A high/low carry is a good method for weapons with grips, as grip interference is minimized. Size the belt slot(s) wide enough to fit your preferred belt when setting the scabbard in the cross-draw position. Typically, this slot will be slightly wider than your belt. Cut, modify and/or start over until you have a paper pattern that will fit your weapon(s).

Trace your paper pattern on the smooth side of the leather and cut out. Mark the rivet hole locations. Depending on weapon point shape, rivet spacing between 3/4” and 1-1/2” work well; make sure rivet locations and spacing look artistically “balanced”. Use a leather hole punch (ideal) or an awl to punch a rivet hole in one side of the leather. Position the other side of the leather in its correct location and mark through your first hole to locate the second rivet hole. Punch out the other hole, insert the rivet’s shank, cap it and place the base on a block of wood. Smartly tap the cap end with a hammer to set the rivet. Repeat until the scabbard is done, taking care to keep the edges aligned.

Two-Piece Scabbard – A two-piece scabbard consists of two leather pieces laid rough-side to rough side and then riveted together. This is a good design for large weapons (see Figures 1 and 4).

Figure 4 - Two-piece vertical scabbard for large knives (see Figure 1). Scabbard is 11-1/2” by 6-1/2” wide. Rivet spacing is 1-1/2”, adequate for wide-point knives. The rivets
on the central portion of the scabbard and in the upper corners are decorations only. The scabbard was dyed dark brown before a leather preservative was applied.

**Folded Scabbard** – Folded scabbards are the best design for a true cross-draw carry (*Figures 2, 3, 5 and 6*). Some adjustment of your pattern likely will be needed to insure that friction on the weapons is adequate to hold the weapons in the position you want to use (high/low carry or side-by-side carry). Friction will be a little tighter in actual use when the belt is tightened over the scabbard. Make sure that the scabbard will allow positioning the weapons so that there will be no hilt interference between them during the draw. It is usually best to design your scabbard a little over-size and then trim as needed.

First cut out your pattern, then fold the leather over your weapons and test how tight they are held. The fold can be tightened a little by lightly hammering the fold. Don’t make an excessively tight fold or surface tears or cracks may form in the leather. A tighter fold can be made if the leather is soaked in water to make it more pliable. Let the leather dry completely before continuing construction - this may take several days.

![Figure 5](image)

*Figure 5 – Folded cross-draw scabbard for small to medium knives. Knife is shown in its scabbard carry position. Scabbard is 10” long by 4-1/2” wide and will hold two knives at least 11-1/2” long. The upswept point mild steel knife shown is 14-1/2” long. Rivet spacing is 3/4”. This scabbard will hold two upswept-point, bare hilt daggers in a side-by-side carry (see Figure 2) or two straight blade daggers, either bare hilt or with grips, in a high/low carry. A scabbard used only for the side-by-side carry of two straight blade, bare-hilt daggers would not need to be this wide. The scabbard was dyed dark brown before a leather preservative was applied.*
Figure 6 – Folded cross-draw scabbard for two small to medium size, single-piece francisca-style axes set in a high/low carry (see Figure 3). Axe is shown in its scabbard carry position. Scabbard is 8-1/2” long; the bottom is 3” wide and the widest part is 5”. These last two dimensions are sized to fit your particular axes and whether you want to use a high/low carry or a side-by-side carry. Rivet spacing is 3/4”. This scabbard will fit axes with head lengths (the blade belly to back of head length) between 3-1/2” to 4”. The head length on the axe show is 3-1/2”; total length is 12”. This design can be used with axes up to about 16” to 18” long. The scabbard is the natural tanned leather color, which was slightly darkened by the leather preservative.

FINISHING THE SCABBARD – Trim all scabbard joints flush with the utility knife. Carefully bevel and file smooth all leather edges and joints. If the utility knife is used, be careful not to over-trim! If the scabbard is to be dyed (Figures 4 and 5), wipe off any oil with rubbing alcohol or a leather cleaner, let dry and then dye (use rubber gloves!) After letting it dry about 24 hours, coat the leather with a leather preservative. If not dyed, (Figure 6) coat scabbard with a leather preservative, let dry 24 hours and then re-coat.

WEAPON DRAW – There are two basic weapon draws from a cross-draw scabbard or cross-draw open belt or belt loop: (1) throwing-hand draw; and (2) alternate-hand draw.

Throwing-Hand Draw – This is a good draw method for small to medium axes and knives. The weapon hilt(s) are carried in the correct orientation for throwing when the hand grasps and draws them.

Alternate-Hand Draw – This is a good draw method for the open belt or belt loop cross-draw of large axes and the scabbard cross draw of large knives if their hilts can not be positioned across the body. The weapon blade edge(s) are carried facing forward (axes in open belt or belt loop) or to the back (knives in a scabbard). The throwing hand is held straight ahead in the throwing position while the alternate hand draws the weapon, rotates it into the correct position and pushes it forward into the waiting throwing hand.
SECTION 5

TARGET STAND AND TARGET PANEL CONSTRUCTION

THROWN WEAPONS TARGET STAND
(SUITABLE FOR END-CUT ROUNDS OR SIDE-CUT PANELS)

45 Degrees

3/8" hole (ream out slightly)

3/4" holes in short legs allow legs to be spread out when the stand is set up. Target support arms and short legs can be notched and the pieces inset together. Notching is not necessary if the braces are used.

2" by 2" brace, and 2 dry wall screws (one on each leg)

45 Degrees

12" galvanized nail

Target support arm

66"

Constructed from three 2"x4"x8 ft pieces
Stand held together by a 6" long, 3/8" diameter carriage bolt, wing nut and two 1" diameter washers
Target support arms and 2"x2" braces attached with dry wall screws.

2 FOOT BY 2 FOOT AXE AND KNIFE TARGET

1-1/2" DRYWALL SCREWS AND WASHERS

3-4 FOOT OF 1/8" ROPE - USED TO HOLD TARGET PANEL TO STAND.

TARGET PANELS CONSTRUCTED FROM SIDE-CUT LUMBER

MATERIALS:

2 - 2" by 10" by 2'

4 - 2" by 8" by 2'

20 - 2-1/2" DRYWALL SCREWS

2 - 1-1/2" DRYWALL SCREWS

2 - 1/8" ROPE

2 - SMALL WASHERS

WHEN THE CENTER PANEL BECOMES TOO DAMAGED FOR USE, LOOSEN THE 4 SCREWS ON THE PANEL BACK AND REVERSE THE PANEL. WHEN THE SECOND SIDE BECOMES DAMAGED, REPLACE THE PANEL.
Two-foot by two-foot axe and knife target panels made from finished pine lumber can be used when suitable end-cut tree trunk sections are not available. They also provide a larger target area for competitions. However, the side-cut grain of the wood and the occasional small knot do require the thrower to throw with at least moderate force. Side-cut lumber is less forgiving of poor weapon strikes compared to soft wood, end-cut target rounds. In the Kingdom of Artemisia, target panels are not allowed for Royal Rounds but they are used for selected competitions, where they better mimic real-life conditions.