

Choosing Butterfly Swords

By Jeffrey D. Modell, Esq. and Aaron Cantrell
September 6, 2013

Many Chinese martial arts use “Butterfly Swords,” but they are the jewel of the Wing Chun system. Practitioners who reach their level of study are expected to practice intensely, thoughtfully and achieve an understanding that recursively improves their empty hand abilities.

Butterfly Swords are a variety of Chinese saber with only one edge sharpened, a blade wider than that of the typical two-edged long sword and a specialized Guard. The single edge and wide blade categorize them firmly as “*Dao*” (“*Do*” in Cantonese), a term that commonly means knife. Below are a few different words you may want to take note of for the purposes of this article:

Hudiedao – Butterfly Swords or Butterfly Knives

Baat Jaam Do (& variations on spelling) – Wing Chun Butterfly Swords/Knives (Eight Slash/Cut Swords/Knives)

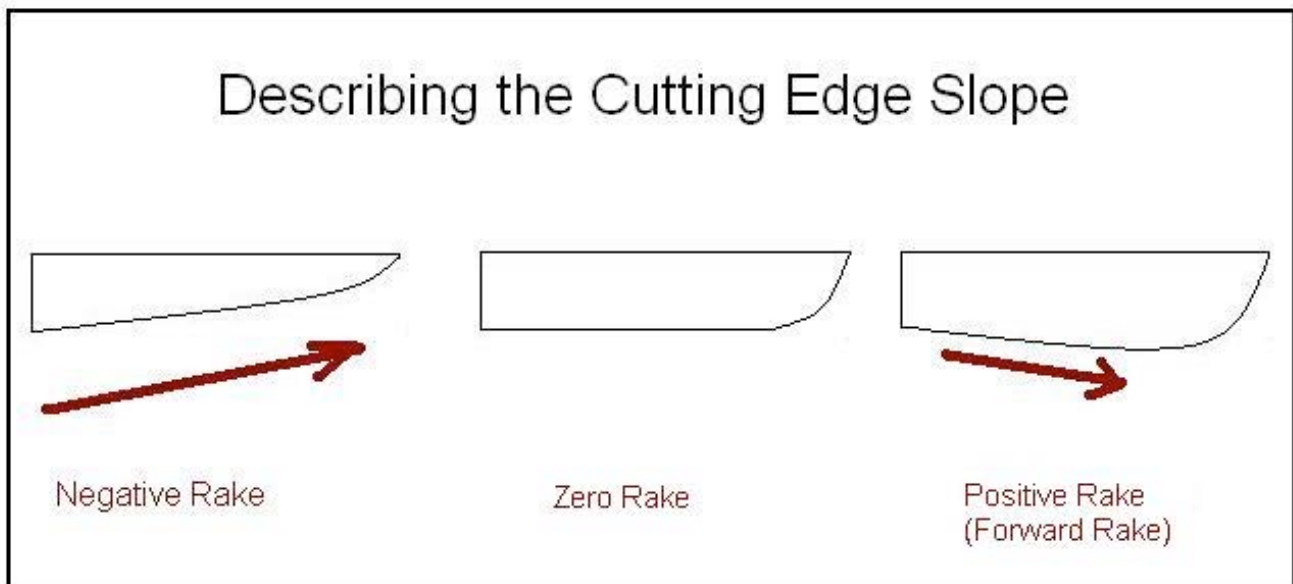
Butterfly swords and especially *Baat Jaam Do* (“BJD”) are not a one size fits all item. Each style and lineage emphasizes different techniques. The swords must be designed to accommodate and facilitate those movements. Some schools require a weapon based on tradition regardless of whether or not it is appropriate for today’s usage. Individuals develop personal preferences, and each set of swords would ideally be fitted to the specific person’s body.

There are a lot of low quality swords on the market. They are not, and do not behave, like the true weapons they seek to imitate. To gain proficiency and understanding of Wing Chun movements, you need BJD that have the weight and feel of the weapons your techniques are designed for.

This article should help you better understand what it takes to craft a true weapon – quality steels, tactical-grade construction methods and correct design. This article is not intended to be an advertisement, but we are not going to hide that Everything Wing Chun.com (“EWC”) and Modell Design LLC (“Modell Design”) pioneered methods to create superior quality swords.

1. The Sword Blade

Blade Edge: Cutting Slope



The cutting edge of antique stabbers generally rises on a diagonal to the tip. This rise, called a **negative rake**, provides for a sharper point. It trades off some efficiency on slices, chops, and covers (or blocks) with the cutting edge in order to improve stabbing effectiveness. Eliminating the rake (called a **zero rake**) better supports slices and chops, which are emphasized in Wing Chun, but reduces the acuteness of the tip and increases the weight of the blade. The **positive rake**, which is common in modern Wing Chun circles chops very well, slices well, but has a limited ability to pierce. Hung Gar practitioners prefer top-notch stabbing ability, so will always go for the negative rake. Wing Chun practitioners use a mix of the three, depending on the lineage.

Blade Shape/Style

Blade Style: Refers to blade shape.

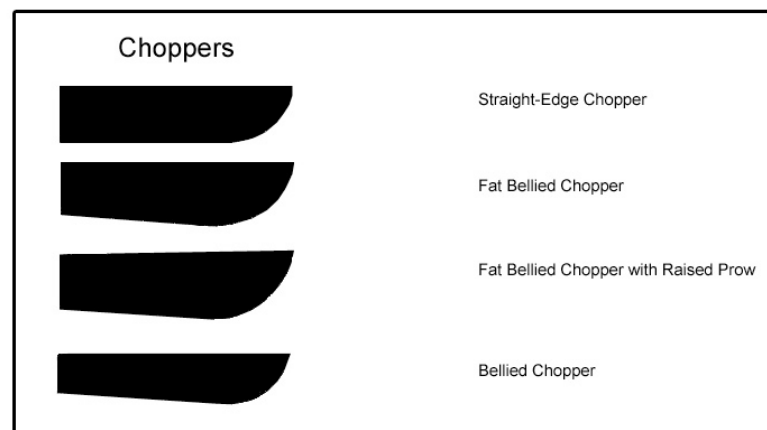
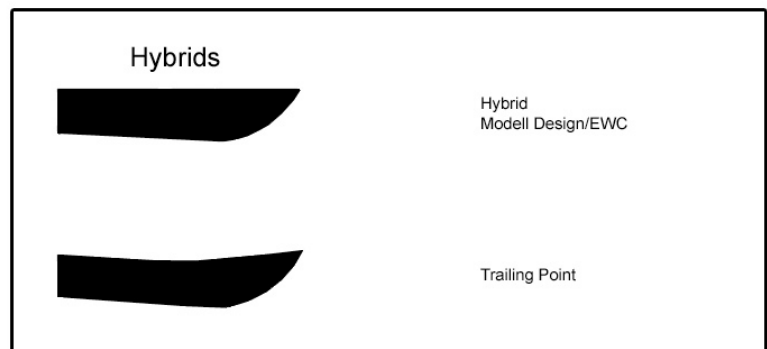
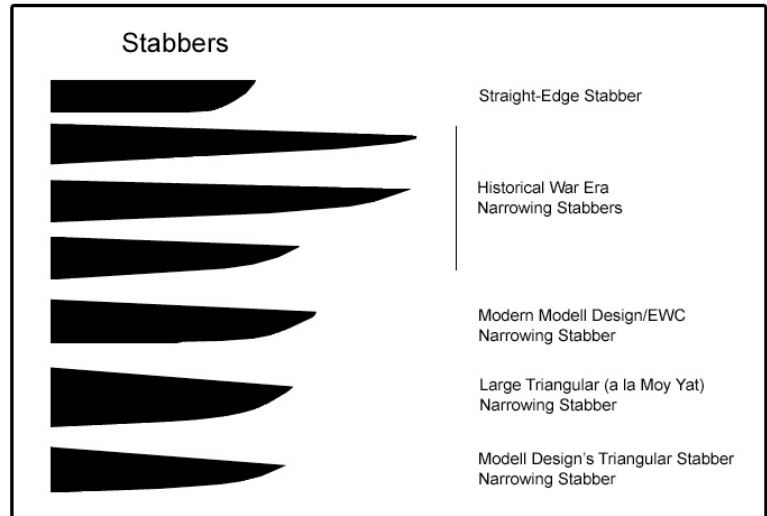
Hudiedao come in three basic styles: a stabber designed primarily for thrusting, a chopper lacking a pointy tip and intended solely for slicing and chopping, and a combination of the two able to do both but not optimal for either. You should prefer a blade shape that will accommodate your full repertoire of techniques and facilitate the most important movements. In some cases tradition mandates use of a particular blade style; for example, if you subscribe to the lore that Monks used knives intended only to maim, you may need a chopper so pure it is incapable of piercing. In the end, it all comes down to what works best for you. That said, your personal style or lineage might require a different type of blade.

Narrowing Stabber: Blade style with pointy tip where the top of the blade (the spine) slopes down to the tip, the sharp edge (the cutting edge) rises up to the tip or both.

Stabbers have a variety of profiles. Most surviving antique *Hudiedao* are elongated triangular shaped blades from the War Era with a negative rake and spine angled down to produce an acute tip. The Narrowing Stabber is optimized for piercing opponents. The narrower blade and sharper point facilitate this. Putting aside the length issue, a triangular shaped blade is similar to how they made the swords in the Red Boat era of Wing Chun's history. They are lighter and faster than choppers of the same length. While they can still chop and slice, the chopper blade styles do so more efficiently. That is not to imply that a narrow sword cannot be great for cutting – just think of a vicious Napoleonic Saber –, rather it is just a comment on specific *Hudiedao* designs.

There are a few surviving examples of Wing Chun-length narrow width stabbers but a lot of the shorter triangular bladed Butterfly Swords tend to look more like a wide cake knife. There is even a photo of a Grandmaster Moy Yat posing over a birthday with his swords (see photo below)! The shorter, fat stabbers saw historical use in the USA as well as China. Photographs and accounts from San Francisco's China Town encourage Ben Judkins, to speculate that the "shorter, more easily concealed, blade was becoming popular at the start of the 20th century. These knives seem to be more designed for chopping than stabbing and are reminiscent of the types of swords (bat cham dao) seen hanging on the walls of most Wing

Blade Styles



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Chun schools today.” Ben Judkins, *A Social and Visual History of the Hudiedao (Butterfly Sword) in the Southern Chinese Martial Arts*. posted January 28, 2013 in Kung Fu Tea <http://chinesemartialstudies.com/2013/01/28/a-social-and-visual-history-of-the-Hudiedao-butterfly-sword-in-the-southern-chinese-martial-arts/> (March 2, 2013).



Antique War Era Stabber; 18” Blade



Moy Yat Posing over his Birthday Cake



Modell Design Zero Rake Narrowing Stabber

Both the historical Narrowing Stabbers and our Narrowing Stabber designs feature a tip that is lower than the point where the spine intersects with the D-Guard. The tip is lowered to make it easier to align the handle and wrist with the tip (picture a central axis running through the blade) to improve power on thrusts. Aligning the hand with the tip also improves control over the blade. The spine is sloped down on a diagonal to accommodate that tip placement.

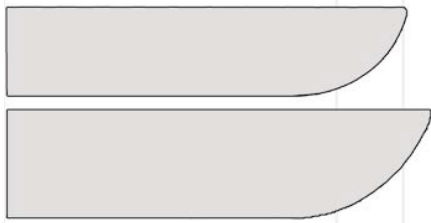
Straight-Edge Stabber: A proportionately narrow rectangular shaped blade with the spine and cutting edge parallel and a pointed tip in line with the spine.



Another variety of stabber is a rectangular blade, basically a relatively narrow strip of steel until the point. We call this a Straight-Edge Stabber. The tip is aligned with the spine but seldom very pointy. This style blade sacrifices ease of piercing in favor of better slicing and chopping. The long straight cutting edge is also fine for covering or blocking. This blocky blade shape is more of a lineage specific design, but one that is quite popular.

Martial arts weapon pioneer Dr. John Lee believes this simple blade style is the original shape used for Wing Chun. While it does not appear to have been used by Chinese War Era militia, Judkins proves it found a home with criminal gangs in San Francisco’s China Town and theatrical performers prior to its modern mass-manufactured resurgence. The primal blade style is favored by Shaolin monks in Henan, China.

Straight-Edge Chopper: A wide rectangular shaped blade with the spine and cutting edge parallel and a non-acute tip in line with the spine.



If the width of the blade of a Straight-Edge Stabber is increased the blade becomes a Straight-Edge Chopper. As blade width increases, the arc of the cutting edge to the tip rounds so much that the tip is no longer capable of piercing.

Choppers are mainly used for slicing and chopping techniques, trading off piercing ability in favor of improved efficiency slicing and chopping.

A Straight-Edge Chopper is heavier than a Straight-Edge Stabber of the same length, blade thickness, tapers and grind. An upside to using a heavier knife is more natural resistance due to its mass (and hence you need use less muscle and feel less impact shock) when covering or blocking. The additional mass also adds energy to your strikes. The downside is slower acceleration which means slower slices and chops. The negative impact of the drop in speed on the rotational kinetic energy more than offsets the bonus from the increased mass. You also may have more difficulty covering or blocking in time and outmaneuvering an opponent with blade work.

Most vendors' choppers are heavier than stabbers of the same length and some are essentially just a larger sheet of flat steel. With a finely ground high quality blade, the smith can make adjustments so the two blades weigh the same though each knife will have its own distinctive "feel" when used.

Bellied Chopper: A blade shape with the cutting edge sloped away from the spine as it nears the tip and a non-acute tip in line with the spine.

A more complex chopper design features a cutting edge that slopes down on a diagonal as you move from the handle towards the point. This is called a positive or forward rake. It results in a belly akin to that on a Guppy near the front of the blade when the cutting edge arcs up to the tip. In knife terms, the curving portion of a blade under the tip is the actual "belly" but for purposes of this article we are referring to that Guppy chest. The curvature "presents an ever-changing angle to the material being cut, and this means slicing efficiency is preserved across the cut." The positive rake provides more edge for the blade length.

If your form has even a single stab, a pure chopper is probably the wrong blade shape and functionally you need either a hybrid or stabber style. That said, on a well made chopper (like EWC's) you can see that a stab to the right area will penetrate an inch or two.



Bellied Choppers: EWC Flagship on top and 2 from Other Vendors.

Hybrid Blade: A hybrid blade shape that combines a tip capable of stabbing with the bellied chopper blade style.

The Hybrid Blade style was introduced to the modern martial arts community by EWC and Modell Design in 2010. We now regard this innovation as a rediscovery since Dr. John Lee's continuing field work in China has led him to conclude this blade shape, in a different length, was the original White Crane Butterfly Sword style. The Hybrid Blade is a mix of a bellied chopper and stabber.

We feel strongly that even though most Wing Chun lineages use choppers, they still need the ability to occasionally stab. Most choppers BJD are too blunt and rounded at the tip to stab effectively, while most stabbers are too thin and insufficiently rounded to accommodate the major emphasis on slicing and chopping of the majority of Wing Chun lineages. This design is also in harmony with San Soo.



EWC Flagship Line 12" Hybrid in D2 Steel

TIP: The Hybrid Blade is a more versatile substitute for a pure chopper.

While the point on a Hybrid Blade's tip cannot be as acute as that of a pure stabber, it is sharp enough to pierce and mean enough to do a lot of damage on a thrust. The Hybrid Blade does sacrifice some belly and cutting edge length to facilitate stabbing point, but is still an excellent blade style for slicing and chopping.

On the blade shape chart, you may have noticed a blade profile with the point higher than the spine. We reluctantly classified it under the hybrid header because it is pointy and has a belly but it is a different animal than our standard Hybrid Blade style. The geometry is known as a trailing point. The tip is smaller than an ordinary tip concentrating the force for an easier penetration. The area near the spine can be flat, ground but not sharpened or sharp; it is a trade-off between strength and sharpness. If the spine is unsharpened, it will force the primary cutting edge down into the target so it does more damage. This blade style is extraordinarily rare on modern *Hudiedao*.

FOS: Far out stuff – cool non-traditional designs by Modell Design, such as recurved bellied choppers, hybrids and Nightmare grind swords.

Every so often Modell Design comes out with some really crazy but functional modern *Hudiedao* designs. They are usually challenging to make, expensive and aimed at the knife collector market. Many are too far out for Wing Chun practitioners but a number have found a home with EWC and are up for sale to the Wing Chun community.

In 2012 Modell Design made 14 pair's of BJD patterned (with permission) from Doug Kennefick's famous Randall Sasquatch knife design. The recurved hybrid blade shape combined a proven Chinese weapon with one of the best (and most difficult to grind) modern



Nightmare Grind BJD Prototype



Sasquatch BJD

Western knives. It further features a compound grind that has the appearance of a hollow grind but a far sturdier grind at the cutting edge. These knives were featured in the September 2013 issue of Blade magazine.

For 2013 Modell Design made a "Nightmare Grind" BJD. The grind is also based off a Western knife design and is named due to the fact it is very challenging to make. These are now in production. The prototype pair sold for \$1,695 in just a few days. Don't worry, EWC has commissioned an affordable professional martial artists' version!

Blade Length

Blade Length: Approx. length of actual blade from base to tip.

The correct blade length is determined based on style, lineage and body size. As a general rule you want the longest blade which allows you to safely perform all the techniques in your repertoire.

Between two equal matched opponents, a few extra inches of reach can easily be decisive. Bowie knife expert Bill Bagwell notes that in knife fighting, speed coupled with reach is lethal. The traditional *Hudiedao* blade designs and lengths take this into account. Most Kung Fu styles prefer a fairly long blade but Wing Chun uses additional techniques that limit safe blade length.

Wing Chun lineages typically require a BJD length measured from the: (1) outside wrist to the outside the elbow (covering the entire forearm), known as "outside measure;" (2) tip of the biggest knuckle of a closed fist to the back of the outside elbow, which is the measure for Grandmaster William Cheung's lineage, among others; (3) inside wrist to the inside of the elbow, known as "inside measure;" or (4) pocket of the thumb joint to the inside of the elbow, also known as inside measure. Wing Chun lineages can substitute a shorter blade, but the greater the differential from the correct length the less realistic the training.

Inside measure is necessary when the inventory of techniques includes flipping the knife inside the arm in the *Guan Sao* and *Quan Sao* movements. With longer blades the user would either cut their own arm or have to open their elbows too much, thus

giving up valuable time and power generation in the movements. Historically each Wing Chun blade was custom fit for the practitioner, making both speed and power a non-issue.

An EWC survey of over 30 *Sifus* indicated inside measure lineages want a blade length of 12" or less. Twelve-inches is close to the longest traditional length for Wing Chun. This shorter version of a *Hudiedao* is rooted in the Red Boat days when the swords had to be concealed on the person, drawn rapidly without fault and used in close-quarter combat. A longer blade could be a disadvantage in many of these scenarios.

Custom knives are too expensive for most modern practitioners so the majority of students and *Sifus* make due with commercially available blade lengths. The 12" length blades are most commonly mass-produced, but there are also 11" models in a square D-Guard style discovered by Dr. John Lee in a Chinese tomb. This style BJD was adapted by the Leung Ting lineage and mass-produced in 11" and 13" lengths at the mid-grade quality level. In 2013 EWC began to offer its own luxury grade quality version "Tomb Warrior" BJD with several popular blade styles as limited editions.



EWC's Tomb Warrior Style Stabber BJD w/12" Blade. 2-in-1 Handle, Trapping D-Guard, Leather 2-in-1 Sheath

Outside measure BJD do not accommodate many common Wing Chun techniques but offers greater reach. Longer swords also generate more rotational kinetic energy on slices and chops. Most Wing Chun lineages specify inside measure but before passing judgment on the balance struck by outside measure recall that the majority of martial arts styles prefer even longer *Hudiedao* blades.

Many chopper blade style lineages require a 13" blade based on historical precedent. Ip Man's bellied chopper knives were near this length. The Ip Man/Chun/Ching, Wong Shun Leung, Koo Sang and other popular lineages commonly use this length on their blades.

The standard production blade lengths for other Southern styles range from 14" to 15 ½". Hung Gar lineages vary; either outside measure or a blade length a few inches past the elbow when the swords are held in a reverse grip. The appropriate blade length for a 6' tall 180 pound modern Hung Gar stylist could easily run 16 ½". San Soo prefers a blade length about 1" past the elbow in a reverse grip, or roughly 15" on the same size person, but the style permits practitioners to use the blade style and length they prefer. The blade length for Shaolin is to the end of the elbow when the knives are held in a reverse grip. A 14" to 14 ½" stabber blade is most appropriate for a practitioner in William Cheung's Wing Chun line, but again the proper length is specific to the individual.

War Era Butterfly Swords had blade lengths that could easily run 18" to 24." These *dao* are actually relatively longer since individuals were smaller then. There are a few surviving examples of War Era knives with more Wing Chun-like lengths, but the vast bulk of the swords from that time were for militia and other defense personnel rather than martial artists.

TIP: Your *Sifu* should be able to tell you the correct measure for your lineage.

Blade Length Guidelines:

10 inches: For lineages that measure from inside wrist to elbow.

Advantages: Allows for many Wing-Chun in-fighting close-quarter sword techniques. Little danger of cutting own arms on in-fighting techniques and easy to conceal.

Disadvantages: Does not cover to elbow on the outside of the forearm if flipped and limited reach.



10" Blades. The forearm pictured measures 10 inches from wrist to pocket of elbow, and 13 in from wrist to tip of elbow.

12 inches: Generic Hybrid length for mass-produced swords.

Advantages: Not too bad for close combat, and still had some reach and heft. A good general choice for a school sword.

Disadvantages: Depending on the user's size and the use it could be too long or too short.



12" Blades

14 inches: Common for lineages that measure the blades along the outside of the forearm (wrist to elbow).

Advantages: Covers to the elbow or past the elbow when flipped. Extra length is good for stabbing and reaching an opponent. Long enough for excellent torque.

Disadvantages: More difficult to wield in enclosed spaces. Tougher to carry concealed and draw in an emergency. Cannot be used for some Wing Chun in-fighting techniques.



14" Blades

Longer: Some martial arts, like Hung Gar, require a blade that goes several inches past the elbow. This is uncommon in Wing Chun.



2. Blade Steel

Blade Steel: Heat Treatment

Heat Treatment: Heating and cooling a material in a controlled manner for the specific purpose of altering its properties.

TIP: The steel's heat treatment is critical for the quality of the blade.

Blade steel starts out relatively soft and requires heat treatment after it is shaped to achieve its true potential. Assuming you selected the correct steel quality, a proper heat treatment is more important than the steel itself. It is not about making the cutting edge hard, it is about making the whole blade the optimal balance between hardness and resilience. Just keep in mind there is a trade off that varies steel-by-steel. Too soft and it will not be able to cut combat targets. It will also dent easily, which is more annoying than life-threatening. Too hard and the blade will rapidly nick or break, possibly in a catastrophic fashion.

Once you move into the weapons-grade steels a certain percentage of blades crack during tempering. Some of these fractures are so tiny they make it through several rounds of inspection (including inspection prior to purchase by the client). One famous maker of expensive Western knives (a single knife from his shop generally costs more than a pair of BJD) uses a fluorescent dye and black light to make it easier to inspect, but that process is too expensive for martial arts equipment. If you receive a new blade and see a scratch that appears on both sides of the blade, even if it is only a few millimeters long, that is a hairline fracture that makes the blade unsafe to use. Return it immediately. While having to return brand new swords is definitely annoying, remember this is a high class problem you are unlikely to experience with a wall hanger.

If you differentially heat treat a blade so the spine side is softer than the cutting edge side to absorb impact, you can get away with a far harder cutting edge. Various methods of accomplishing this can create a beautiful wavy line on carbon steels though a knife tempered to maximize aesthetics will probably be too soft for use. This is really overkill for Butterfly Swords, which are relatively thick and squat. Modern BJD are hardened uniformly.

A lot of factors go into deciding the most appropriate cutting edge hardness for a specific sword. We will leave it at that.

The heat treatment is the area where most Butterfly Swords fail miserably. Our high end forge associate, Iron Man Steel, uses a third-party specialist for weapons requiring uniform heat treatment.

Blade Steels: Carbon, Stainless, and Others

We give our opinions on the most appropriate steels, grinds and construction for Butterfly Swords used for various degrees of contact, including weapon vs. weapon training, because it needs to be said. ***Be advised here and throughout this article that we never recommend any sword for weapon vs. weapon training because all weapons fail at some point (with potential catastrophic effects) and even if the weapons perform as intended such training can result in injury or death. The odds of sword failure are greater in steel on steel contact. Never train using steel against steel!***

Blade Steel: Type of steel the blade is made from.

The most appropriate steel for the blade depends on how the swords will be used. From a purchaser's standpoint the relevant factors are the intended use, tolerance for performing maintenance chores, and budget. All weapons-grade steels, including weapons-grade stainless steels, rust. Weapons-grade stainless is low maintenance, not no maintenance. Basically you have to prioritize and decide what your true needs are.

Carbon Steels

If you are doing contact work – weapon vs. weapon or cutting exercises – the best options are in the carbon steel family. Carbon steels require intensive maintenance. You need to clean the blade after touching the steel or training with the weapon, and keep the steel coated with sword oil when it is not in use. That means you must also strip the oil prior to each training session. Several top custom knife makers believe it is better to coat carbon steel blades with non-acidic Renaissance® wax instead of oil. Oil captures dust particles that can facilitate corrosion. Do not leave the blade dirty or unprotected, not even

overnight. Very few martial artists are willing to put in the time and effort required to maintain carbon steel. Many knife collectors prefer the high carbon steels for their resilience and feel it is well worth the extra effort.

Medium carbon steels have 0.30% to 0.59% carbon content. High carbon steels have 0.60% to 0.99% carbon. Steels with 0.55% to 0.59% carbon tend to be ideal for “beater” swords.

“Spring steel” is highly elastic, high yield strength steel that returns to its original shape after significant bending or twisting. A number of carbon steels can be processed in this manner. EWC’s testing showed American Iron and Steel Institute (“AISI”) 9260 “Spring Steel” augmented with hammer forging was outstanding for beater use. The hammering realigns the grain of the steel resulting in improved strength characteristics. Hammering can be accomplished with an old fashioned hammer and anvil or using a mechanically assisted “power hammer.”

TIP: Avoid recycled “Spring Steel.” Just think about it.

AISI 1075 and 1095, with 0.75% and 0.95% carbon respectively (the last two digits are the carbon), can produce superior blades for actual combat but they are no longer appropriate “to beat on.” These high carbon steels need to be properly heat treated and water quenched to get their additional benefits. There is no sense upgrading to 1075 or 1095 without the water quench. Water quenching results in a higher rate of blades cracking than oil quenching so it is seldom used.

Some of the mass production Butterfly Swords use a medium or high carbon steel because ordinary carbon steels are cheap. Good quality raw carbon steel for a pair of 12” blade BJD of adequate thickness is only about \$30 at retail from a reputable U.S. knife supply house. The odds are miniscule of a manufacturer actually paying for heat treatment sufficient to create a true weapon if they do not advertise the steel type. It might even be low carbon steel.

D2 Tool Steel is a carbon steel used to make dies that cut other steel and hence a “tool steel.” Many experts regard it as the top carbon steel for knife blades. EWC was the first to make BJD out of D-2. Testing by EWC and experience have proven that properly heat treated high quality D-2 has an outstanding combination of characteristics for Butterfly Swords capable of hard use. It is tough, has excellent wear resistance, takes a fine edge and holds it. Let’s talk resilience.

There is an impressive video out there of Iron Man Steel’s third-generation Forge Master, K. Ali, bending back one of EWC’s German Böhler D-2 Butterfly Knife blades and it springing back to shape. In the same video he lightly chops a piece of shop equipment and cuts into it without nicking his blade. (Do not do this yourself!) There is some relevant flexibility in the composition of steel that qualifies as D-2 so it is critical to only purchase from a reputable steel maker.

D-2 is so corrosion resistant for carbon steel that it is known as “semi-stainless.” Its maintenance needs are closer to those of weapons-grade stainless steel rather than ordinary carbon steel. Aaron purposefully (as a test) has neither oiled nor waxed his personal pair of EWC Flagship line BJD. He just wipes off finger oil with his tee shirt and has seen no corrosion. Acidic fingerprints will etch into D-2 steel so we suggest a more thorough cleansing regime than Aaron’s. There are some trade-offs.

Raw D-2 blade steel costs almost three times the price of ordinary carbon steel. It is very hard to work with when making blades and production costs as well as time increase significantly. Using D-2 added about six months to EWC’s 2012 Christmas production run which, admittedly, was a hefty sized project. D-2 is a grainy steel that looks odd when mirror polished and is best left with a satin finish. Because D-2 is so tough, it takes a diamond or sapphire hone and far more time to sharpen. Finally, and we recognize that many of you will not regard this as a problem, it tends to damage other weapons it is used against.

Stainless Steel

If you are just doing forms practice or open air demonstrations, stainless steels are a better choice since they are more stain resistant than carbon steels and, consequently, require less intensive maintenance. The weapons-grade stainless steels have more carbon than wall hanger grades and so are more susceptible to corrosion. Aaron once left an EWC Flagship Line BJD immersed in water for several weeks. The handles expanded/swelled but the weapons-grade German Böhler 440C stainless steel blade was fine. On the other hand, we know of a case where the acid from a pregnant woman’s touch stained high quality 440C stainless steel. Do not touch your steel unless you must.

If you keep stainless coated with a non-acidic wax, clean lightly after each use. First remove the physical debris from the blade. Consider gentle tapping, rinsing and/or a soft toothbrush; do not rub debris because it causes scratching. A damp soft clean cloth with a non-abrasive, non-acidic detergent (check out dish washing liquids) is usually fine for cleaning stainless steel but you need to rinse well. Do not use soap to clean weapons-grade stainless or carbon steel blades as soap has a caustic etching quality that may produce immediate tarnish lines. Dry completely with a soft clean cloth when done. Strip the wax and clean seriously on a periodic basis.

Stainless steels are more brittle than carbon steels and very inappropriate for a long narrow sword like a *Jian* but fine for the majority of Butterfly Swords. Butterfly Swords are really just big knives and these days used mostly for non-contact practice.

Most modern Butterfly Swords are made of low quality stainless steel. The advertising seldom identifies the precise blade steel. Would it surprise you to learn that a famous design Butterfly Sword advertised as “combat steel” is actually a stainless steel of a type unknown to the importer rather than medium or high carbon steel? Anyway, the less carbon (other elements also impact this but carbon is the primary one for the affordable steels), the softer and easier for manufacturing.

If an advertisement just says “Stainless Steel” then it is almost always inexpensive AISI 420 stainless, which is very soft and often referred to as “Butter Steel.” Chances are the heat treatment is sub-par, but even with the right heat treatment this low end steel is incapable of producing a cutting edge hard enough for combat. The good news is that lower grade stainless steels tend to have high chromium content and are very rust resistant. Some blades are advertised as “surgical grade stainless steel.” While there is no specific definition, surgical instruments require steel that is corrosion resistant, easy to clean and sterilize, unlikely to leak carbon molecules into the wound, and need only hold an edge for a short period of time.

TIP: “Surgical Steel” Butterfly Swords are probably made of Butter Steel!

There are two notable higher grades of stainless steel in the 420 series. Quality Japanese AISI 420J2 with carbon on the high end of the permissible classification range can theoretically be heat treated to the bottom of the historical weapons-grade range, which has a lower threshold than what we can achieve and prefer today. It will not hold a cutting edge and so cannot serve as a real weapon. You see it on a lot on inexpensive knives sold online to individuals who do not use them.

Expertly heat treated quality 420J2 is the lowest grade stainless steel suitable for Butterfly Swords and justifiable primarily due to negligible maintenance requirements. It should be used only for non-contact training but, to be frank, is harder than wood so usually ok for the occasional light work against Wing Chun long poles. We do not trust very many forges to get this steel right (ethics and expertise being the issues). Moving up the quality chain, AISI 420HC can easily be hardened into a real weapon. The next step is the AISI 440 series.

A lot of knife snobs regard the 440 series (and the 420 series) as lousy steel. While there are many steel makers with product we would not trust, odds are these disillusioned individuals experienced a knife that simply had poor heat treatment.

TIP: If an advertisement lists 440 steel and the 440 is not followed by a letter A through C you should get a very bad feeling.

AISA 440A is a weapons-grade stainless steel commonly seen on entry level Western-style knives. The characteristics of 420HC are arguably more attractive. Randall Made Knives is the most respected name in the Western style knife industry. Their waiting list usually runs about five-years. They smith their stainless steel blades from AISI 440B or AISI 440C so you know that a good quality, professionally heat treated 440B is weapons-grade.

EWC and Modell Design were the first to use AISI 440C stainless steel on non-custom Butterfly Swords. It is a weapons-grade tool steel that was adapted by the custom knife making industry. Its extraordinary balance of martial capability with corrosion resistance set the standard for weapons-grade knife steels. It takes a sharp edge and is easy to re-sharpen. The top U.S. custom knife maker does most of his military work in 440C (bead blasted for a non-reflective finish), it is favored by several U.S. makers of custom Butterfly Swords, and we have excellent experience using German Böhler 440C on BJD.

As with D-2, the precise mix of components for good quality stainless steels permits some relevant variations so it is once again critical to purchase from a reputable source. The Germans really know their steel and Hitachi also makes good 440C.

TIP: Always ask “Who made the steel?”

We have tested our 440C BJD hollow grind blunts chopping trees and wood poles and, while we do not recommend contact for hollow grind, we experienced no problems against wood. We have also done some truly abusive and destructive testing. Nothing any rational person should repeat including: sword on sword, and sword against granite (granite is a tough customer). We would not hesitate to use one of our 440C models that is sharp in a life-or-death situation.

Quality AISI 440C stainless steel (just the raw steel, not the labor) is slightly more expensive than D-2. It is roughly three times the cost of ordinary carbon steel.

Many of U.S. custom knife makers now use the new “super steels,” such as ATS-34, S90V, and third-generation powder metallurgy steel Elmax. These new steels are tweaks on and compared to 440C. They usually trade off corrosion resistance in return for different factors such as better edge holding capability or lateral stress resistance. A friend left an ATS-34 Western

knife in his car trunk for about a week and it rusted. That's part of the turn off of trade off. The raw steel cost of the latest super steel can top five times that of ordinary carbon steel and after a few years it is out of style.

Damascus Steel

"Wootz steel is a steel characterized by a pattern of bands or sheets of micro carbides within a tempered martensite or pearlite matrix," states Wikipedia. It was also called "Damascus Steel." The technique for making authentic Wootz steel was lost, though some individuals claim to have rediscovered it.

The so-called "Damascus Steel" you see advertised on eBay and available on some Butterfly swords is not Wootz, rather it is a series of thin layers of steel, often different kinds, forged together. Originally in China even cheap Butterfly Swords were made of laminated steel at the village smith to compensate for low steel quality -- the blades were more resilient just like modern plywood.

Ebay knife "Damascus" lamellar steel is mostly made from two contrasting high carbon steels composed to form decorative patterns rather than optimize resilience. It is usually too soft for a true weapon.

While you can find weapons-grade lamellar on a number of quality Japanese and Chinese style long swords, weapons-grade modern mono-steels are as good as or better than most modern "Damascus." There are only a handful of sources offering weapons-grade lamellar on Butterfly Swords. Because stainless steel is tougher to forge than high carbon steel, weapons-grade stainless lamellar is exceedingly rare.



High quality Lamellar Blade

3. Blade Sharpness, Edges, Grinds, Tapers, Ricassos, Choils, & Fullers

Blade Edge: Sharps and Blunts

Sharp: Sword with a sharpened cutting edge.

Blunt: Sword with a cutting edge that is not sharp.

Historical *Hudiedao* were intended for actual combat including fighting individuals equipped with a shield and armor. While they were well sharpened, the cutting edge could not be razor fine because it would too easily nick. For weapon vs. weapon practice, a blunt edge is preferable both to increase its useful life and to avoid needless danger. A really thick rounded edge will last the longest but the sword looks ugly and behaves differently due to weight and balance.

A good number of martial artists practice with a sharpened Jian because they can feel the difference in balance and behavior between blunts and sharps. Jian are long narrow straight swords, with even slight differences potentially noticeable due to leverage, whereas *Hudiedao* are shorter and wider. One is a race horse, the other a working equine.

While there is a major difference in feel between a Butterfly Sword that is essentially a toy and weapons-grade, the difference in behavior between EWC's true weapons arising from blade sharpness will almost always be immaterial, an exception being thicker edge blunts designated for heavy training. The standard EWC/Modell Design blunt generally has a 1 mm edge and is ground so that it looks sharp to bystanders. EWC's new training swords have a 2mm rounded edge for additional durability. We do not make the same assertion with products by other vendors since their blade may be a simple sheet of steel with the cutting edge of a blunt the same width as the flat.

TIP: Be careful of Butterfly Knives of unknown origin, especially sharpened blades, if you value having all your original body parts. If you can see that someone else is practicing with sharps, you are in the wrong room!

Sharpened Butterfly Swords that are true weapons can easily cut through tendon into bone with a single lapse of concentration and should be used for display and self-defense only. Sharpened low quality swords are even scarier since the blade has a realistic chance of flying off the handle. The danger of practicing with sharpened Butterfly Swords is not an urban myth; there is a post on one of the Knife Forums by an individual who cut his own tendon with a non-EWC product. **We recommend only blunt BJD for training to help assure the safety of students and individuals in their environment.**

The great Japanese Samurai Miyamoto Musashi won many sword duels by killing his opponent with a single blow from a rounded wooden training sword. Our blunts are true weapons, remain inherently dangerous and must be treated seriously.

Cutting Edge

The cutting edge of a historical *Hudiedao* runs the full length of the blade from the D-Guard to the tip. Benny Meng and Richard Loewenhagen write that Shaolin Monks preferred to avoid killing and so only sharpened the 3" of cutting edge closest to the tip leaving the remainder blunt. War Era knives suffered no such scruples.

In Western saber fencing, the strong half of the sword edge closest to the hilt (some define it as the bottom third of the blade), known as the "forte" and traditionally used for defensive parrying, is left unsharpened. The same is true of some antique *Hudiedao*, but most are sharpened along the entire edge from guard to tip. In Hung Gar gung fu, the philosophy is to block with whatever part of the blade or "D" guard is handy. Since you cannot leave the entire edge unsharpened, there is little reason to leave the forte dull. Jeffrey Modell, Esq., *History and Design of Butterfly Swords*, Kung Fu Tai Chi magazine p.59 (April 2010).

In nearly all cases the spine is flat – there is no grind. Red Boat Era knives were designed for killing and had a swage.

Swage: A ground area on the spine of the knife commencing at the tip.

Swages are frequently blunt, the grind being sufficient to reduce the tip so as to concentrate force in a smaller space and ease penetration without removing much supportive steel. As already noted, a blunt swage tends to push the blade down onto the

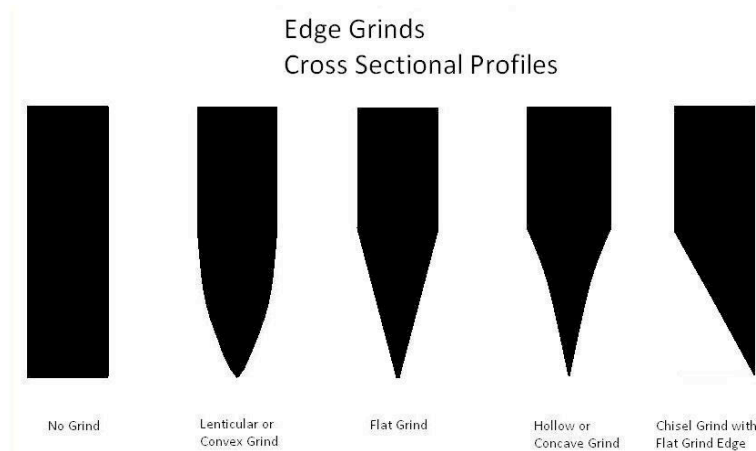
primary cutting edge so it can do more damage. A sharpened swage is itself a cutting edge that can be used for a deadly reverse cut that can disable a hand in the blink of an eye. The trade-off is that the tip is thinner and more easily damaged.



Sifu Wayne Belonoha's Custom BJD. Unsharpened Swage, Shaped Choil.

Grind Profiles

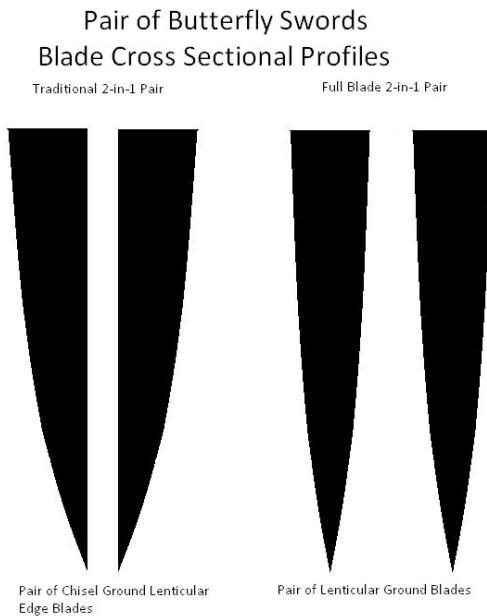
Blade Grind: Type of grind used on the cutting edge.



Traditional Butterfly Swords had a lenticular (convex) grind that has extra steel supporting the cutting edge to minimize nicks when the knife hits bone and other hard targets. More precisely, a single or pair of full handle *Hudiedao* would have lenticular grind blades but 2-in-1 swords, which are mirror image swords that when held in one hand look like a single weapon, had a chisel grind with the inside edges a flat grind and the outside edges convex.

A chisel grind has the twin advantages of being easy to make and sharpen. The downside is that the flat interior side generates significantly less drag than the outside so the knife cuts on a diagonal toward the flat side rather than straight.

While at least one wag has opined the traditional chisel grind was intended to increase the damage when penetrating the ribcage, we believe you are better off being able to hit the intended target. Modern practitioners prefer a pair of blades each of which has the major grind on both sides. The chisel grind may have been adapted because it takes less talent and effort than grinding two sides of a blade with perfect symmetry, important factors for weapons made by a village smith for locals.



A hollow (concave) grind allows for the finest possible cutting edge – the sharpest cutting edge – and is therefore best for use against soft targets like flesh. Done well a wide hollow grind is extraordinarily beautiful and a feature commonly requested by clients purchasing expensive custom Butterfly Swords. The problem is the hollow grind has far less steel supporting the cutting edge.

We design some models with a combination of grinds to offer the beauty of a hollow grind with the strength of a more purpose-specific grind by the cutting edge. Compound grinds require more skill and work.

The grind should be selected based on the use. If the intention is just display, then a traditional grind or wide hollow grind are fine choices depending on your preference.

A wide hollow ground stainless steel blunt blade is the best choice for BJD used solely for individual practice and demonstrations for aesthetic and maintenance reasons. We would prefer a wide blunt cutting edge on hammered spring steel for a two person demonstration with choreographed contact assuming wood trainers fail to impress. Optimally hardened D-2 is too likely to damage opposing equipment.

TIP: Free sparring with steel Butterfly Swords is nuts. Even our blunts are true weapons and inherently dangerous.

The general design of a chopper BJD is already pretty good for defense against a tree but if your intention is cutting exercises, the steel and grind should be designed for that purpose rather than combat or training. An ugly flat sheet of medium carbon steel, well polished and uncoated to slide through easier, with a squat flat grind edge is a pretty smart choice from toughness and cost perspectives.

Tapers

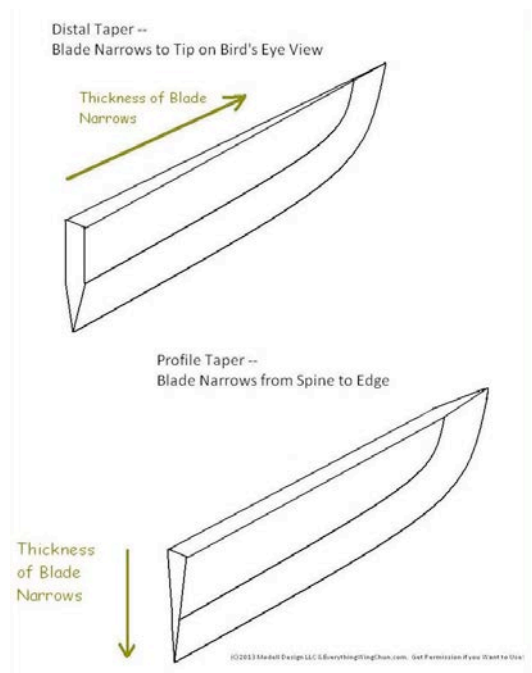
Distal Taper: Generally means the blade thickness gets thinner toward the point.

Profile Taper: Blade thickness gets thinner toward the cutting edge.

Tapers adjust the weight, point of balance and handling characteristics of a blade.

A taper can turn an otherwise ungainly piece of steel into an elegant weapon. War Era *Hudiedao* exhibited both distal and profile tapers. While some blade styles and lengths can be crafted to a properly balanced combat weight using an expert grind, a lot of our work relies on tapers.

Most modern Butterfly Swords are a flat sheet of thin cheap steel with perhaps a small grind area to save manufacturing costs. Not a problem. No amount of tapering could rescue a good chunk of these poor designs. Adding a taper to a Butterfly Sword obviously increases its cost. On high end swords the work is done by hand and a major reason for two blades of a pair to differ somewhat in precise weight.



Ricasso and Choil

Ricasso: The unground area of the blade between the D-Guard and the ground area of the blade.

Choil: The area of the blade between the cutting edge and the tang, frequently but not necessarily cut-out, ground or otherwise shaped.

War Era *Hudiedao* typically had a cutting edge that went all the way to the front of the D-Guard. That is where the blade steel, except for the tang, would stop. Put another way, most of the blade was not secured to the D-Guard. A number of modern Butterfly Swords recess the base of the blade into a slot in the D-Guard. In most cases the fit is loose. Our work has an extremely tight fit that helps hold the blade in the D-Guard. Using the D-Guard to further support the base of the blade is an important improvement over traditional construction methods.

A Ricasso helps assure a good fit by providing a rectangular cross section that fits into a simple rectangular slot. The hard part is getting the tight fit. The base of the blade needs to start out slightly thicker than the slot and there is a blade inconveniently located where you would like to grab when doing the fitting.

The thick blunt bottom edge of the Ricasso, or Choil, is less likely to nick if used to counter a serious impact head-on. Some marital artists put a finger on the Choil or run one past the Choil on its way further towards the center of the blade, so for them it is important that the first few centimeters of the blade either be unsharpened cutting edge or Choil. Blunting this cutting edge is obviously of little concern on BJD that would normally be unsharpened on part of the cutting edge for covering or blocking but some schools like to slide their swords down an opponent's staff along the D-Guard. Having a Choil eliminates the sharp edge that would otherwise be there but it is still no fun having a small piece of steel rammed into your index finger.

Modell Design occasionally adds modern flourishes to FOS Butterfly Swords such as a Choil shaped into a half circle, quarter circle or tear drop (see picture of *Sifu Wayne Belonoha's* knives under the "Cutting Edge" section). The purpose of a Choil on a knife is to make it easier to re-sharpen the knife without getting on odd spot at the grind termination. A Butterfly Sword Choil can be designed, however, to help slow the opponent's weapon from sliding off the knuckle bow.



Ricasso



Choil

Fuller

Fuller: A groove or slot running along the blade.

The purpose of a fuller is to lighten the blade without sacrificing strength, maintaining rigidity despite the removal of material like an I-beam. Contrary to popular belief it is not to stop a vacuum from keeping the blade stuck in an opponent. Americans sometimes (incorrectly) call fullers “blood grooves.” While a true fuller does make it easier for the target to bleed out, that is incidental to the actual purpose. To be functional the fuller must be deep enough to actually impact the weight.

Throughout history, swords have been made with no fuller, a fuller on one side, a fuller on both sides, or more than one fuller per side. Very few antique Chinese *Hudiedao* required or exhibit fullers because of their relatively short length and tapering. Think about the differences between a Butterfly Knife and a huge European medieval sword or a Napoleonic saber. Given the improved steel quality and reduced length of modern BJD, fullers are even less of a necessity but can add to the aesthetic of the design and help control weight.

A lot of the fullers on modern Butterfly Swords are so shallow that their sole ability is decorative. Decorative fullers are more typical on thinner blades. They are comparatively easy to add, especially if one end is run into a shoddy D-Guard slot since only the other end need be finished. Running a channel into the D-Guard, creating an open space, is a super-highway for liquids and debris facilitating rust on the tang which cannot be cleaned.

TIP: Decorative fullers say something about the owner’s lack of expertise.

4. Blade Finishes and Coatings

There are a number of different finishes that can be put on a blade: mirror finish, glossy finish, satin finish, bead blast finish, various methods of bluing and coatings. Top custom knife maker Jay Fisher writes “Most makers simply don’t have the patience to execute a fine finish. Factories and manufacturers never properly finish a blade or metal fittings and components of the knife, ever.”

Mirror Finish

The most expensive finish is the perfect “mirror finish” you may see on expensive custom knives by top custom knife makers. It cannot be achieved by a polishing machine and must be done by hand. It takes a very high degree of skill and patience. The process involves 10 to 13 steps (depending on how you define them), working with progressively finer grits. If there are any scratches, the knife maker needs to go back and repeat starting with the step that should have knocked out a scratch of that size. It almost invariably requires an American or European sense of quality control to catch every scratch. This high workmanship can add \$1,000 or more to a sword and is the main reason U.S.-made custom Butterfly Swords usually cost over \$3,000. Some steels are extremely difficult or impossible to bring to a clean mirror finish.

The chief advantage of a perfect mirror finish, other than beauty, is that the finely polished surface better resists corrosion. A long piece of shiny sharp steel also has an intimidation factor. The disadvantage is that it shows every scratch. Few individuals have the skill to polish them out. Because mirror finish knives are so reflective, a photographer needs a light box offering diffuse light and reducing reflected images to shoot a good photo.

Glossy Finish

We define “glossy finish” as a high polish finish sufficient to provide a reflection. It is not the reflection of a glass bathroom mirror. We categorize most attempted production “mirror” finishes here, regardless of where made, including both low quality work and shiny work just a few fine scratches away from a perfect mirror finish.

Although Böhler 440C will take a mirror finish and the polishing on EWC’s lines is done by hand, no one can provide the finish of \$3,000 or \$4,000 pair of Butterfly Swords at production sword prices. EWC’s production run glossy finish is the best non-custom finish we have seen. There is a YouTube video of Master Wong repeatedly becoming



EWC Choppers in 440C with Glossy Finish 16

entranced by his reflection in a pair of the Integral Knives to make the point.

Satin Finish

A “satin finish” consists of fine scratches lined up in the same direction to produce a low luster, non-reflective sheen. The steel looks like it has been brushed. The category allows for some scratches that look deeper than the others. That is the current satin finish offered by Randall Made Knives on their Sasquatch knives. D-2 looks its best with a Satin finish. Satin finished ordinary medium and high carbon steels, left unprotected, rust very quickly.

A lot of custom knife makers call a satin finish a “hand rubbed finish” and many knife collectors prefer it. It can be done quickly and requires far less effort and skill than a demanding mirror finish. Scratches and fingerprints are less visible on a satin finish.

A lower level of skill is required to remove scratches from a satin finish. It is also easier to photograph a *Sifu* holding the swords! The so-called mirror finish produced on a polishing machine or by insufficiently skilled labor – work generally done overseas due to cheaper labor -- may look more like a satin finish.



EWC Stabbers in D2 with Satin Finish

Bead Blast Finish

A “bead blast finish” is achieved by pressure blasting a satin finish with an abrasive material like bead or sand to create a uniformly rough, non-reflective surface. The texture is more susceptible to corrosion than a finer finish but if you pick a steel that naturally resists corrosion such as high quality 440C and use a modicum of common sense it is not a problem. Bead blasted 440C is outstanding for a knife used in a military environment as is satin finish D-2.

Coatings

The best coating or blade treatment is none. There is no panacea besides using inherently corrosion resistant steel, which is why most of EWC’s carbon steel offerings are made from expensive D-2.

Coatings are used to make less expensive carbon steels palatable on ordinary carbon steel Western knives that should have used a quality stainless steel, on some of the rust-prone super steels, and to dull reflective surfaces in a military or law enforcement environment. They are also used to hide poor quality work from potential buyers. With swords and extremely long knives carbon steel can easily be the best or only steel for an anticipated use.

The first thing to remember is that all coatings and treatments may help prevent corrosion but cannot stop it since the cutting edge must be exposed and both wear down with use. They reduce the impact of sloppy maintenance but are not a license to forgo reasonable care. The next thing is that water or debris can slip between a coating and the steel and do more damage than if there were no coating. If you have a full tang product, the tang edges may or may not be coated. You must remain aware of the status of the coating or treatment and adjust maintenance accordingly.

The scariest coating is decorative chrome plating (which should be distinguished from industrial hard chrome). It is usually found on swords that have the wrong steel, hides poor finishing, and chips and flakes off with time and use.

Powder coating is applied as a dry powder to a specially prepared surface then baked. It can be applied as a thin layer or used to create a thicker coating than possible with conventional liquid coatings. A thick powder coat will exhibit a textured surface. If the sole object for the blade is a smooth thin surface that



EWC “Tough-as-Hell” Line w/Black Powder Coat

will easily penetrate, a textured coating might not be the best idea. If the weapon has enough heft to do the job regardless (e.g., a *Hudiedao*) and the priority is reducing corrosion, you may prefer the initial wear limited to the higher area that is part of a textured powder coat.

EWC uses a powder coat on many of its carbon steel products. It is an affordable technique used to help prevent rust. It will chip during steel on steel contact (including attempted extrication from a quillon trap) but is pretty good against wood. That said, the powder coat is not intended for use against any weapon or hard contact. Check out “*TESTING BJD PROTOTYPES – SMASHING WOOD AND CONCRETE*”, EWC Blog (Sept. 22, 2012), <http://www.shopwingchun.com/testing-bjd-prototypes-smashing-wood-and-concrete/> (March 22, 2013), for more information and photographs.

Parkerizing is a treatment that can be used on carbon steel. It basically involves dipping the steel in a phosphate bath with zinc or manganese, inducing an electrochemical reaction. It is a simple and inexpensive process but not very helpful since the Parkerized surface further needs to be kept covered with a light oil coat or painted with an epoxy or molybdenum finish.

True bluing is used on guns to inhibit corrosion. The process is another electrochemical treatment, not a coating. It soaks into the steel. Done right it is extraordinarily beautiful. It can be done poorly, too. We have not seen it on a Butterfly Sword.

Titanium Nitride (TiN) is an extremely hard ceramic material that can be applied as an ultra-thin coating. The steel surface has to be specially treated prior to application. The coating is applied using a physical vapor deposition vacuum system. It comes in several colors and has the added advantage of providing a slippery surface. It has been called “pretty expensive” but the real problem is that the coating is regarded as fairly porous and not a good choice if the primary intention is corrosion resistance. There are a number of variations.

Several good high-end firearms coatings are also used on knives. These include KG™ Gun Kote, DuraCoat® and Cerakote™. They require meticulous pre-finishing consisting of cleaning and sandblasting with aluminum oxide. The coatings are then applied by spray. They generally come in air cure and/or bake dry versions. KG Gun Kote is a polyurethane resin. DuraCoat is a urethane. Cerakote is a polymer based liquid ceramic coating. Each product has its fervent supporters but independent testing commissioned by Cerakote showed the product superior to two competitors in a number of respects including corrosion resistance by a factor of 10. These methods are prohibitively expensive for production Butterfly Swords.

5. Tangs, Handle Types, Alignment, Ergonomics, Handle Materials

Tang

Tang: The metal blade piece that extends into or connects to the handle.

The blade is attached to the D-Guard and handles with a tang. There are a number of conflicting definitions for tang-related terminology. “Full tang” is sometimes defined as tang that runs through the full length of the handle grip, with a “partial tang” being a tang that runs some fraction thereof. Top quality Butterfly Swords have a tang that runs from the blade into the rear of the D-Guard. Some of the mass production mid-grade knives have a really stubby partial tang that we can tell you from experience should not inspire confidence.

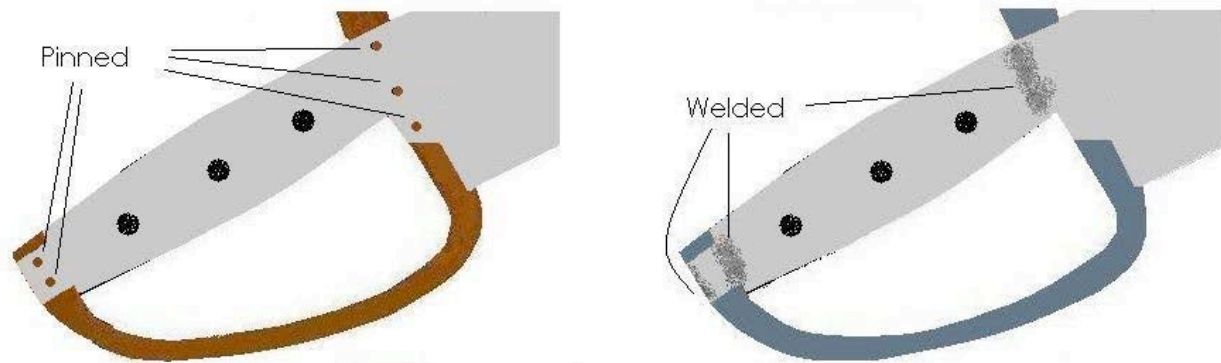
U.S. custom knife makers generally define a full tang as a tang that extends the full length and width of the handle so the metal edges are exposed ice cream sandwich-style. We will use that definition going forward.

Full Tang: A tang that runs the full length of the swords and is visible between the handle scales. You can see the part of the blade steel that runs through the handle all the way to the butt, like the center of an ice cream sandwich. D-Guard is attached with pins or welding.



Integral Knives. Photo by *Sifu* Wayne Belonoha.

American Full Tang



The modern full tang is the strongest tang. Although the tang might be drilled to adjust weight, seeing its outline size is a good indication you are getting what you are paying for when you are unsure of the manufacturer's reputation. The downside is that the tang edge is exposed to corrosive skin oils. This is of little import with stainless steels and D-2 (just clean normally), but there are maintenance implications for carbon steel. It is also a dirty little knife maker's secret that handle scales eventually shrink so the hand can feel the tang's edges.

Integral Tang: A blade, tang and D-Guard made from the same piece of steel.

Integral Tang



The integral tang is one that is made from the same piece of steel as the D Guard and blade. It is made by hammer and anvil or what is called "hot-drop forging, where molten steel is slammed into a mold at a high-pressure. It is the same way hammers and other tools are made.

One advantage is that the sword is one solid piece of steel so the blade and D Guard cannot loosen. Also, the steel becomes stronger due to alignment of the crystalline structure of the steel.

There are several disadvantages. The cost of hammer and anvil forging is shocking. The cost of hot drop forging is high and the method frequently leaves some very small black pitting marks on the sword that cannot be polished out cost effectively. The D-Guard must be made of same type of steel as blade so if blade

is carbon steel, then the D Guard will also be high maintenance.

Hidden Tang (Full or Partial): A tang completely hidden within the handle material. A full hidden tang properly welded or peened to the base of the D-Guard is usually very strong. A partial tang is not as strong as a tang that runs from end to end.

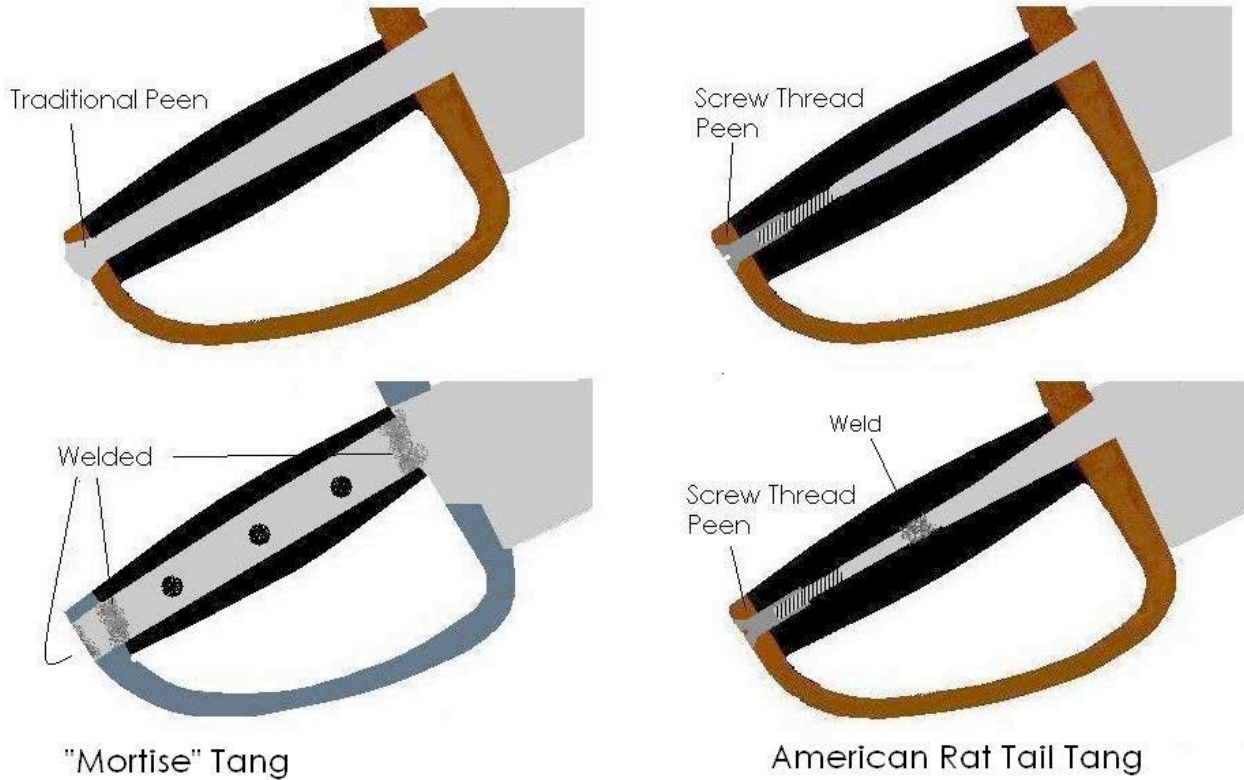
Historical *Hudiedao* used a narrow tang hidden entirely within the handle. It is a combat-proven design. From a designer's perspective, the hidden tang allows for a lighter knife, prevents oils from the hand from touching tang steel, permits the use of a single block of wood to carve a decorative and highly shaped handle, and offers some extra decorative options using spacers of different colors or materials. You just glue the spacers in order on your block of material prior to carving the handle. It is a lot tougher decorating a full tang knife handle. Plus, you never have to worry about feeling the tang with your hand after handle shrinkage.

A hidden tang can be made so wide that it is impossible to drill and carve a slot down the handle to slide the tang in. Instead two scales each with an impression indent carved for the tang are joined around the tang. Some knife makers refer to this kind of wide hidden tang as a mortise tang but it is actually a mortised grip.

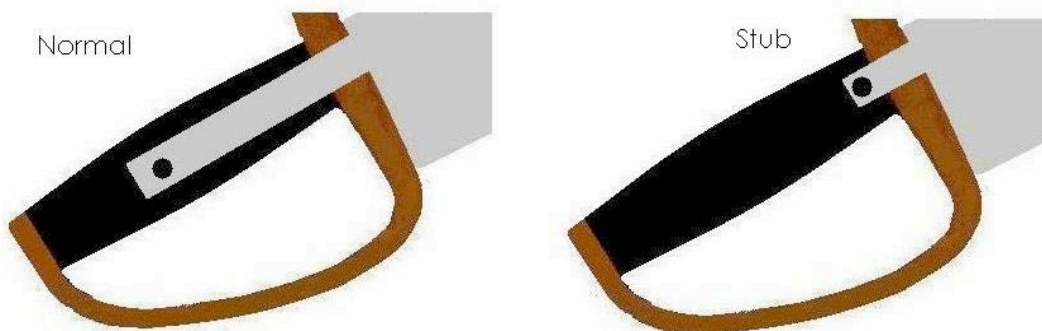
On the downside, because the tang is hidden you cannot see what is going on inside the handle. The quality can range from good to horrific and the buyer cannot see what is going on... and many more things can go wrong than with a full tang. There are many mass produced Butterfly Swords you would not use if you knew what it looked like on the inside. There is usually

some space when a hidden tang is fitted through a cavity in a solid block handle. That space creates a risk that the tang will move and loosen the pommel or break the weld. It can even happen to luxury grade War Era swords. On our Long Stabbers Iron Man Steel did a superior peening job, slotted the base of the blade into the D-Guard and filled the cavity between the tang and the handle with resin to add support to the tang. The resin also augments the strength of the tang and helps the entire sword feel solid.

Hidden Tangs



Partial Tangs



“Rat Tail” Tang: Partial tang welded to a threaded cylinder that is screwed at the pommel.

In most of the world a “stick tang” or “rat tail tang” is a narrow tang (it looks like a rat’s tail). It is a species of hidden tang. Historical swords of all kinds mostly used a narrow tang. Done right it is not only light but so strong the blade more likely to fail than the tang.

The term “rat tail tang” is commonly used in the U.S. to refer to a small diameter rod or bar welded on to a normal tang. You will even see low quality Butterfly Swords with the rod welded to a tang that barely goes through the D-Guard or even welded to the base of the blade. With the wrong steel, an insufficient diameter, or a poor weld, the extension or the weld is prone to break. You tend to see a lot of shoddy rat tail tangs on inexpensive Chinese swords, including “razor sharp” *Jian*. Properly constructed – with a thick blade, a soft quality steel stick just as thick, and a solid weld – an attached rat tail can be quite adequate.

More American Rat Tail Tangs



TIP: A razor sharp sword with a weak tang is definitely a wall hanger.

Handle Alignment

Handle Alignment: Relationship between the point on the handle that will be covered by the center of the closed hand around the grip and the tip of the blade.

Locating the handle on an axis with the tip maximizes control over the blade and improves thrusting. The *Jian*-style handle on War Era knives was near universally centered in the base of the blade and aligned with the tip. The blades on most War Era knives were so narrow, however, that the handle would not fit anywhere else. There are more places to fit the handle on wider blades.

The sword's primary use dictates the best location of the handle relative to the blade. For thrusting, it should be aligned with the pointy tip. For percussive impact against armor, the handle should be centered on the blade. For chopping and slashing, it should be aligned near the spine to produce better, more effective blows. Spine alignment of the handle facilitates a reverse grip. Affixing the handle away from the spine makes it far more difficult to hold the knife properly in a reverse grip. The intended uses of the knife should dictate the optimal handle alignment. Jeffrey Modell, *History and Design of Butterfly Swords*, Kung Fu Tai Chi magazine p.60 (April 2010).

Many modern mass production butterfly swords have handles in the middle of the blades out of alignment with the tip. In 99% of the cases this is completely wrong and functionally incorrect (you don't see a lot of folks training to down armored opponents these days), the product of ignorant or uncaring manufacturers.

Since modern Wing Chun is heavily dependent on slicing and chopping, the best place for the handle for most lineages is by the spine to be close to the tip rather than centered on the blade. Lineages that emphasize stabbing should insist on tip alignment whether the tip is at the spine or lower.

TIP: The most obvious design error is a misaligned handle.

Handle Type

Handle Type: Refers to if the swords have full handles, slim line full handles, or 2-in-1 handles (i.e., half handles).

The handle needs to facilitate retention and manipulation of the sword and the projection of force. That means sensible, comfortable and solid.

Full Handles



Full handles are the most comfortable type. These days having a better grip on the knife during training and combat is more important than a quick single-handed draw and holding both swords in one hand. Full handles also offer the greatest control over the sword and create less fatigue during extended use. The net result is fewer training accidents. The main downside is awkwardness and potential danger at the beginning of forms that require holding both knives in one hand if the full handles are too wide to be held safely in one hand. We design our full handles to be comfortable but not too thick for most individuals hold both in a single hand.

Slim Line Full Handles



Modern offerings also include really slim full handles. They are pretty much in between full handles for comfort and 2-in-1 handles for ease of single handed use, but can fit in a single sheath. Design and selection of materials is especially important with slim line handles as done incorrectly they produce rapid hand fatigue as you are forced to constantly apply extra pressure to assure a firm grip. EWC only makes these by request since its line of true full handled BJD are a superior option.

2-in-1 Handles



Most antique *Hudiedao* had a *Jian*-type straight handle, typically 2-in-1, but there are also full handles out there. There is a semantic debate whether a pair of antique full handled knives could truly be called “Butterfly Swords” – and many of the full handle versions were used as a single in conjunction with a shield -- but the modern answer is a resounding yes.

Two-in-one handles are designed to be used as a pair. The inside of each handle is flat and the outside rounded such that each knife basically has half a full handle. Consequently the two swords can be stored in a single sheath, drawn with one hand from that sheath, held comfortably in a single hand, used as though they were a single sword (at least theoretically) and spread dramatically in front of onlookers who did not realize there were two knives. Many martial arts Butterfly Sword forms require both knives to be held in a single hand during the opening sequence.

A lot of modern 2-in-1 handles have wrapped brass edges, exposed brass edges or wood edges so sharp that they are very uncomfortable. The common work around is to wrap tape around the handles. Too many martial artists have had a bad experience with poorly constructed, ill-designed modern half-handled BJD.

TIP: If you aren't confident a maker's 2-in-1 handles are comfortable, don't buy.

The problems are the result of corner cutting, not a flaw in the concept. The War Era antique *Hudiedao* photographed for this article (below) has a wood handle that has sanded rather than sharp edges. The EWC Tomb Raider line 2-in-1 handles were carefully designed with this in mind (photo on the left). Good 2-in-handles are fine for extended use though not quite as comfortable as full handles.



2-in-1 Handle Rear



2-in-1 Handle Front

Sheath Systems from a Handle Perspective



EWC's Leather 2-in-1 Sword sheath with a divider for the blades, but not the handles.

Traditional 2-in-1 knives were carried in a single leather sheath. The belt loop (if there was one) was beneath the mouth rather than rising up behind the handle Western style. Southern martial artists could tuck sheathed shorter knives into their pants using the quillon and conceal them with a jacket, hide them inside a Lion Dance troop's lion head and strapped to the side of the drums in case of altercations between rival schools, or tuck them into a boot. While this single sheath design is fine for a working knife, if your BJD are gloss finish they can scratch each other in a highly noticeable fashion while going in and out of the traditional design sheath. That's why EWC added an

additional panel between the two blades in their 2-in-1 sheath designs. Also be aware that whenever two knives are held in a single hand or sheathed side-by-side, the handles rub together and, if made of hard material, scratch (though you may not notice it).

EWC has a specially designed nylon double sheath that will accommodate many of its blunt full handled BJD (but not on all models a single-handed draw). Nylon is a better covering material for BJD than leather because the tanning acids and vapor associated with leather promote corrosion. However, a sharp cutting edge will rapidly shred a ballistic nylon sheath and you need to exercise care inserting pointy knives into nylon sheaths lest the point stick or edge slice through (perhaps even into you).

EWC also offers the best nylon BJD carry case on the market with its Flagship Line and for sale separately. Practitioners might also wish to consider using an inexpensive *Sai* case, though the zippers do break on their own and a stabber could slide around until the point impales a zippered side.



EWC Nylon 2 Sword Sheath w/Divider

Be cautious placing “sharps” in even an EWC carry case. If you do so try to face the cutting edge up to reduce the chances of unknowingly slicing the pocket. If the knife manages to go through the pocket, it still needs to penetrate the zipper to cause mischief.



Swords stay secure in case. When carried by the strap the blade edge is up so it won't cut the case. Cudion can be put in or left out (pictured).

Inside and outside of the EWC Carrying Case for 12-13” blades.
When carried, the swords sit spine-side down so that they do not cut the case.

A downside of many true full handled BJD is the common need for two sheaths. You will likely to receive two Western-style leather sheaths for the same side. In the U.S., long bowie knives were carried in a leather sheath with a metal stud on the outside a few inches beneath the mouth. The bowie knife's sheath would be slipped inside a belt with the stud preventing it from falling out, and then a shirt or jacket used to cover the knife. For a pair of sharp full handled Butterfly Swords we recommend two mirror image sheaths made of heavy leather, one for the right side and one for the left.

Handle Ergonomics/Shape

Ergonomics: The science of design to maximize productivity by minimizing fatigue and discomfort.

Handle Shape: How the handle is shaped.

Handles should be ergonomically designed to be comfortable and reduce the odds of slippage. Straight handled *Hudiedao* were the most common historically and remain so today. Many modern martial artists prefer them because they were trained on straight handles or have certain techniques they prefer executing with a straight handle.

Modern Western knife makers have come up with innumerable handle tweaks, some of which are actually functional. These include concave, convex, single through multiple finger indent handles, and variations on the standard *Jian* handle shifting the widest point forward or backward.

TIP: Some instructors dislike ergonomic handles because they wish to honor tradition.

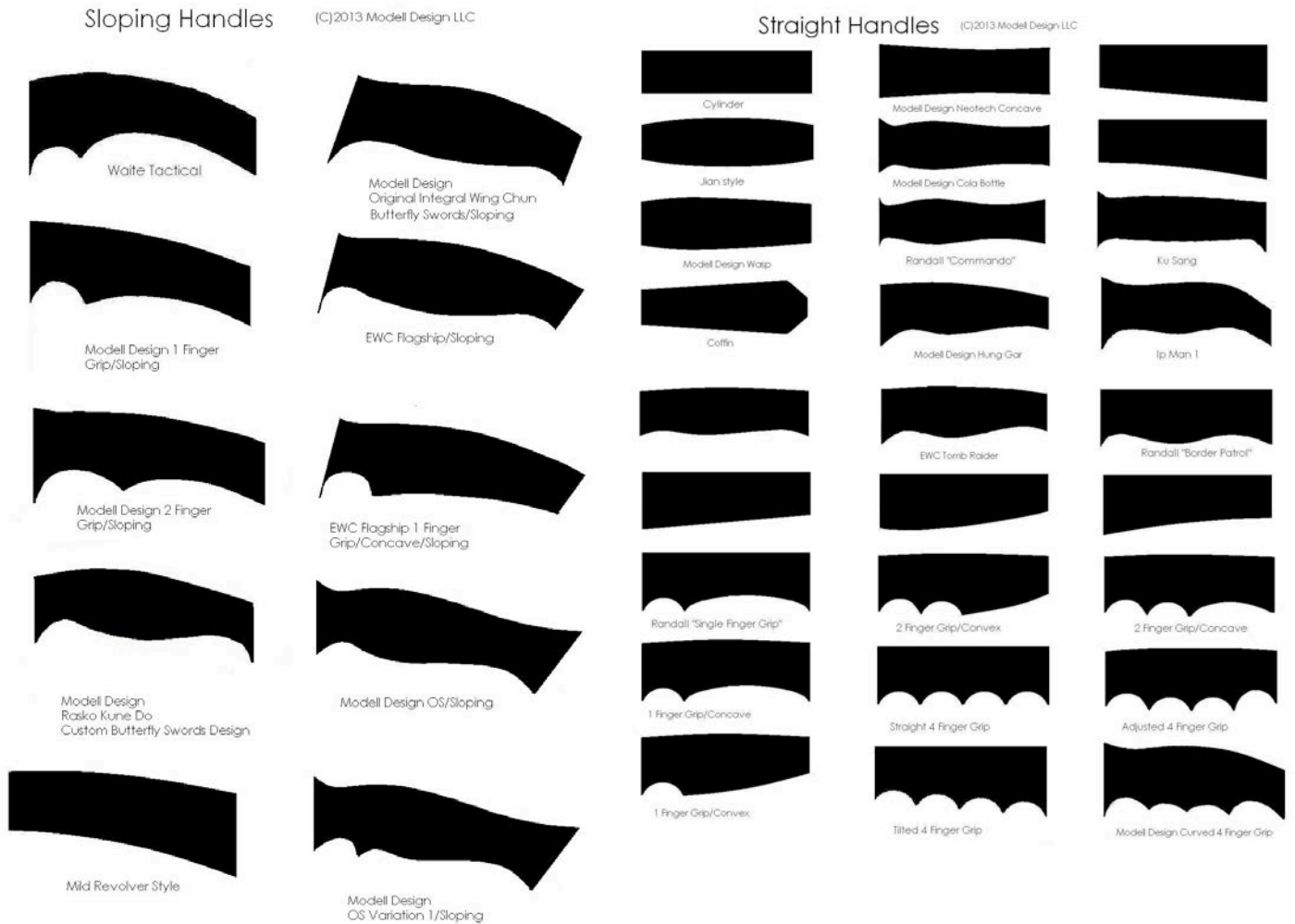
The *Jian*-style straight handle on many luxury-grade antique Butterfly Swords has some ergonomic characteristics. There is a belly that fits either the cup of your fingers or results in a slant towards the blade that pushes your hand to a tight placement against the D-Guard. The flower motif landscape carving on a lot of the luxury grade antique knives is the ancient equivalent of the modern pistol grip checker. The biggest drawback of a straight handle is the need to bend the wrist to an extreme when stabbing.

The ergonomic characteristics of a *Jian*-type handle can be improved by adjusting its spine and belly to more closely conform to the hand. This should also increase ease of retention.

There is a beautiful example of a revolver shaped ergonomic 2-in-1 handle on an antique Butterfly Sword, though unusual handles on surviving knives are rare. Angling the handle down on a slope increases wrist comfort and power when thrusting due to the more natural alignment of the wrist and inherent placement of the hand and forearm behind the blade. It also increases torque on slices and chops. Greater torque results in more speed and thus more rotational kinetic energy at impact or, in non-physics, terms, more power. The downside of an angled handle is the shorter range of motion on a reverse cut, which would be relevant only if your knife had a sharp swage like on certain Red Boat knives.

These angled handles were made illegal in Hong Kong during Ip Man's time because the knives were too deadly due to the extra power. They hit the main-stream again when EWC offered Modell Design's famous Integral Knives for sale in the U.S.A. in 2010. Buick Yip also makes BJD with an angled handle.

There are a lot of potential handle shapes for Butterfly Swords. Ideally the handle is designed for the use and the specific practitioner, a feature of full custom *Hudiedao*. Some of the handle shapes are versatile and will work with most users. Others, such as grips with multiple single finger indentations, need to be fitted rather precisely to the owner's hand taking into account whether a tactical glove will be worn. They are therefore inappropriate for even a limited production run.



Handle Materials

Handle Material: Type of handle material used.

There are a variety of traditional and modern materials used for handles on *Hudiedao*.

"Butterfly sword handles were traditionally made out of hardwood, horn, or wood wrapped with leather or cord. Wood is a traditional, classic choice and the standard for normal knife handles. Wood is comfortable, warm, easy to obtain and carve, and – depending on the variety – can have a lot of cachet. An appropriate wood – a beautiful hardwood (hard for durability and retention of fine details) with a fine grain – can produce an excellent grip. Woods do, however, absorb moisture (and oils), and are impacted by temperature changes. Horn is also a good traditional handle material, but it is porous, requires care and not suitable for all combat environments. Leather wrap is an excellent handle treatment if done right. Unfortunately if the wrong tanning method is used, the leather can get slippery. Modern *Hudiedao* tend to use a greater variety

of materials, mostly to reduce production expense. Some very expensive modern custom *Hudiedao* use artificially stabilized wood that is highly resistant to moisture, expansion and contraction.”
Jeffrey Modell, *History and Design of Butterfly Swords*, Kung Fu Tai Chi magazine pp.64-65 (April 2010).

The critical requirements for a handle are that it stay solidly in place and provide for a firm, comfortable grip. You may have experienced a sword handle that begins to move around or rattle on a product manufactured in China. In some cases that is simply poor design – protruding screws and nuts come loose, wraps come undone – or bad workmanship. In other cases it is a bad choice of materials.

Most inexpensive woods used for imported sword handles are materially affected by humidity-induced expansion and contraction that becomes irksome in a Western environment. A few hardwoods such as Arizona Desert Ironwood and Cocobolo are naturally resinous and stable. Many beautiful non-resinous woods can be artificially stabilized by injecting them with resin under pressure. Most of the good looking naturally or artificially stabilized woods are expensive, but colored stabilized plywood products, such as Dymondwood® and Pakkawood, are affordable. Technically it is “Fused Phenolic Thermoset Resin-Impregnated Layers of Select Dyed Veneer Wood.” This material is better than ordinary wood for kitchen knives because there are fewer cavities for microbes. It takes a great polish that adheres well to the hand. The latter point is important. Jeff has a pair of slim line swords with natural wood handles so dry it requires extra effort to keep a stable grip.

A few years back Jeff placed two full tang Modell Design Porthau Bread knives in the trunk of his car for several days during a very cold Michigan Winter. One knife had very high quality resinous ebony handle scales, a gorgeous pricey wood but not in the league with presentation grade Ironwood. The other had the laminate. Shrinkage of handle scales on full tang knives is part of the price for having the strongest possible tang and highly unlikely to be a functional problem. If the single-piece handle of a hidden tang knife shrinks away from the D-Guard so the handle is no longer firmly in place, that is serious. Anyway, the ebony should have cracked but it was so good it just contracted a bit. The less expensive laminate scales contracted less.

TIP: EWC believes stabilized laminate scales offer the best combination of quality and value for BJD.

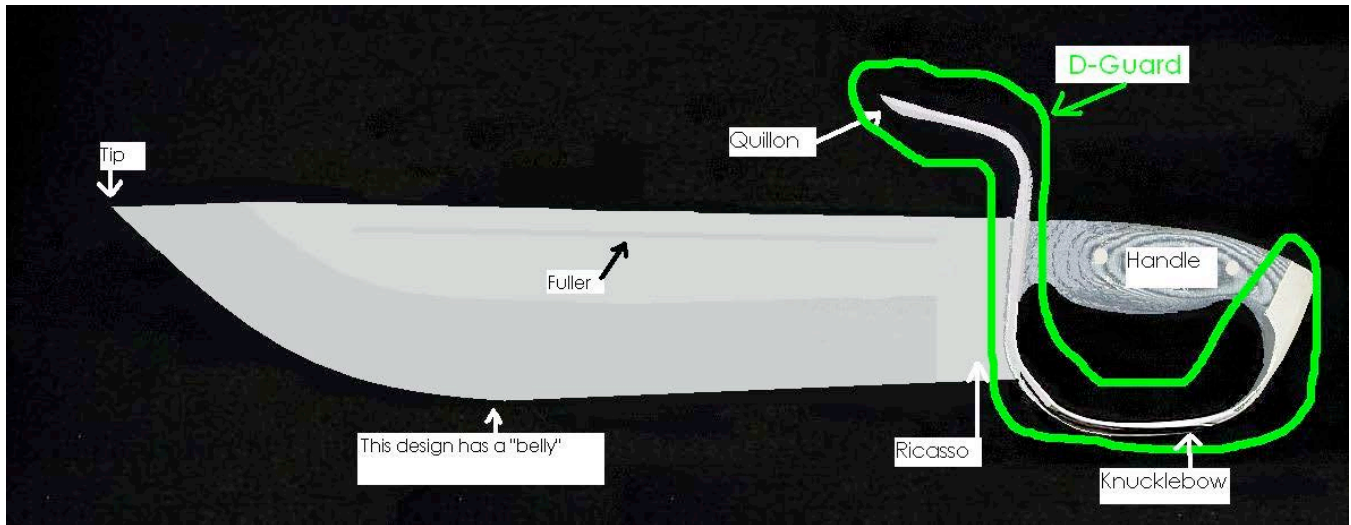
Some martial artists in Hong Kong prefer metal handles to minimize the expansion and contraction. You can find these in aluminum, brass and soft steel. Steel handles actually can be comfortable.

Modell Design believes the best material for tactical knife handles is Micarta™, a brand-name that has become synonymous with phenolic generics made the same way. The material consists of layers of canvas, linen, paper, fiberglass or carbon fiber molded together under high pressure in thermosetting plastic. It is highly resistant to environmental impacts and hard, tough material. Jeff prefers the canvas and linen substrates since the matrix is exposed during grinding and facilitates a good grip. The layered paper phenolics polish up the best and adhere well to the bare hand but are slippery versus a gloved hand and show scratches. The fiberglass substrate is worrisome since after a bit of wear and tear loose glass fiber ends may float into someone’s lungs. Carbon fiber is the latest Western knife maker rage, and rather expensive. It looks best if left in relatively flat panel form which makes it difficult to shape a handle in three dimensions.

The phenolics tend to be a bit more expensive than common sword handle wood and stabilized laminated wood products. While readily available in the U.S.A., the developed world and China, they are harder to come by in some of the other locales with good sword forges. Knife collectors tend to snub phenolics, preferring Ironwood, Cocobolo or stabilized wood. They also dislike the stabilized laminates.

TIP: Knife collectors and Butterfly Sword users have different priorities.

6. D-Guards, Quillons, Knucklebows.



D-Guard

D-Guard: A cross-guard with a quillon on top and a knuckle protector that runs to the pommel on bottom.

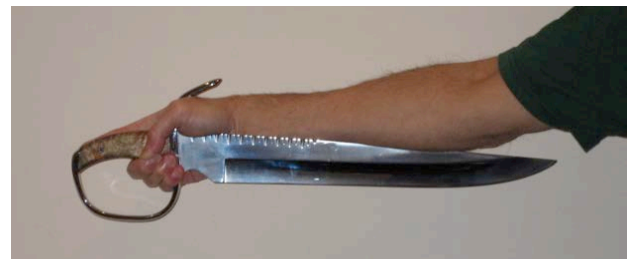
The D-Guard is a major distinguishing characteristic of *Hudiedao*. It gives the weapon significant additional capabilities. Half-handles are another key feature historically, but you also see them on *Jian* and the D-Guard can add more functionality.

D-Guards function best when optimized for a specific use. Very few custom knife makers, sword forges or manufacturers truly understand D-Guards. The D-Guard is the reason many highly talented U.S. custom knife makers decline to produce Butterfly Swords.

Trappers, Hybrids, Flippers

Flipping vs. Trapping D-Guard: Refers to the Quillon and if it is designed for flipping or trapping.

Flipping the butterfly sword to a reverse grip (done arcing on the inside of the forearm) offers additional techniques especially suited to close-in fighting. One can punch with the pommel, cover or block with an Iron Arm, forward elbow using your body mass to create a powerful slice when the opponent is too close to build up speed for a forward grip technique and if the blade extends past your elbow (non-Wing Chun styles) stab with a reverse elbow.



Reverse Grip/Flipping



Trapping

Although the Cantonese Hung Gar Butterfly Sword form does not flip the knives from the forward to a reverse grip, Ha Say Fu Hung Gar forms and Shaolin do. A number of individual Wing Chun practitioners also like the option of flipping the knives.

To make flipping viable, the D-Guard needs adequate room between the quillon and spine of the blade to fit the webbing of the hand between the thumb and index finger (referred to here as the mouth of the hand). San Soo practitioners also flip using an arc on the outside of the forearm, a technique that requires even more hand space. The quillon should also ride forward enough to add safety during the flipping process. The best pure flipping designs are inherently least protective of the hand and more dangerous for inexperienced users attempting to cover or block with post of the quillon.

D Guard Design Spectrum



- *Quillon Close to Spine
- *Quillon Parallel to Spine
- *Quillon Can be Long
- *Easy to Make Protective of Hand

- *Need Room for Hand
- *Modest Quillon Angle
- *Quillon Length Restricted by Hand Fit
- *Most Comfortable Shape "S" Curve

- *Blend of Trapping Only and Flipping Only
- *Not Optimal For Either
- *Can Tilt Towards Either Extreme

- *Quillon Open Catcher's Mitt
- *45 Degree Quillon Angle
- *Quillon Short
- *Thick Post Protects Hand

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Some lineages trap and secure an opponent's weapon between the quillon and the spine of the blade. There is always a trade-off between flipping ability and trapping ability. The more you can do of one, the less you can do of another. The quillon on a trapper needs to be just far enough from the blade to fit the opponent's weapon and as parallel as possible to maximize trapping effectiveness. If the only weapon accommodated is a blade there need be very little room between the quillon and spine. If the intention is to also trap a staff more room is required but the optimal distance remains insufficient to accommodate the hand as needed for flipping.

EWC's trapping quillons are very effective and so can easily "mess up" the opposing weapon. In between the two extremes of trapping only and flipping only is a hybrid quillon capable of doing both but not perfect for either.

Certain schools that train weapon vs. weapon regard trapping as too slow and dangerous. Many of the War Era knives have a quillon that angles away from the blade for just a short distance and is incapable of trapping but especially well adapted to covering with the quillon (i.e., better at blocking).

The discussion above makes D-Guard design sound easy but it is anything but. Achieving the objectives in the most optimal manner possible is intrinsically complex and must be integrated with all other aspects of the sword design. It takes great expertise to create a Butterfly Sword with geometry that works well in both a forward and reverse grip and can naturally flip back and forth smoothly. And while many vendors offer trapping designs, there are optimization issues there too.

3D vs. Steel Strip



EWC Flexible Quillon Moy Yat

Most Kung Fu styles and Wing Chun lineages prefer a solid three-dimensional D-Guard. Done right this method of construction can reduce the chance of catastrophic weapon failure during quillon based interception and trapping techniques or when the knuckle bow or pommel are used for bashing or punching.

An alternative method of construction is the metal strip. Nearly all brass or steel strip D-Guards are made that way to reduce manufacturing costs and actually as lacking in merit as they look.

Certain Moy Yat lineages prefer a steel strip D-Guard with a sophisticated flexible quillon specifically designed to facilitate trapping. These sticky quillons can be tailored to catch staffs and blades, or more narrowly aimed at just blades. EWC's Moy Yat stabbings feature a flexible quillon able to trap blades and poles.

Knuckle Bow

Knuckle Bow: The curved portion of a sword guard that covers the fingers.

The knuckle bow part of the D-Guard protects the hand. While the knuckle bow of a D-Guard must connect to the pommel or there would be no "D" some knuckle bows stop short.¹

War Era knuckle bows had a rectangular cross-cut profile. There are a few modern limited production Butterfly Swords with historical replica D-Guards that exhibit that profile but martial artists greatly prefer modern designs focused on the needs of their style and lineage.

The higher quality modern style full handle sword knuckle bows generally have a cross-cut profile that looks like an oval or has a curved exterior to reduce weight. The better modern half-handle sword knuckle bows are rounded on the outside but left at right angles on the inside (side held adjacent to the other knife of the pair) with the edges sanded.

There are a variety of knuckle bow shapes, each with different qualities. A perfectly symmetric "D" curved at the corners, with a nearly straight run in between the curved corners, can be used to minimize surplus space between the knuckles and the knuckle bow, reducing the width of the weapon. Non-flipping lineages prefer the least hand space necessary, but if the sword will be flipped a modest safety margin is prudent. If extra space is added the front corner becomes more prominent and possibly better able to catch a weapon that has slipped down the cutting edge; of course the weapon profile increases.

Given that the rear of a fist is smaller than its front, some knuckle bows skew towards the pommel in accordance with the profile of a fist, eliminating surplus space inherent with a perfectly symmetric design.



¹ According to Dr. Yang, Jwing-Ming the Chinese short sword with an "S" shaped guard (quillon, cross-guard and knuckle bow that does not connect to the pommel) was still a *Hudiedao* but also referred to as a Son-Mother Saber (*Zo-Mu Dao*), Hand Protection Saber (*Hu Shou Dao*), or Wrap Elbow Saber (*Bao Zhou Dao*). Dr. Yang, Jwing-Ming's *Ancient Chinese Weapons A Martial Artists Guide* p.77 (YMAA Publication Center, ©1999 Yan, Jwing-Ming).

Rounding out the knuckle bow to eliminate any straight runs increases its structural integrity so it is better capable of surviving an impact when covering, blocking or bashing with any portion. This can be done on a symmetric or skewed basis, and with minimal or surplus space. Some knife designs add surplus space to permit a straight run of D-Guard adjacent to the blade where the blade must be attached for easier construction. The best way to accommodate a minimal space rounded knuckle bow is to continue rounding the front of the knuckle bow past the Choil. That means the piece of steel used to make the blade must be longer and additional difficulty (read expense) when joining the blade to the D-Guard and polishing. EWC's Flagship Line offers the highest quality rounded knuckle bow available.



EWC/Modell Design D Guards



D Guards by Other Makers

The knuckle bow on War Era *Hudiedao* was thinnest where it met the rear of the handle. That is also where the tang was peened, making that spot structurally weak and a risky portion of the sword to use for punching or bashing. A Butterfly Sword can be designed to align the butt portion of the D-Guard with the forearm for strong punching while holding the knife with a reverse grip. If the tang is peened, which is typical of hidden tang construction, impact may weaken the peen. If there is a welded or laterally pinned full tang the impact is less likely to harm the sword.

If the tang is peened, it is possible to round and thicken the rear of the knuckle bow so a different area can be used as the impact surface. The rear of the knuckle bow on the Long Stabbers is rounded like on Ip Man's knives causing a section beneath the peen to be the primary impact point for punches or bashes with the rear of the knife.

The prong on the Tomb Warrior line square D Guard can be used to help catch an opponent's blade slipping off the D Guard or as an offensive impact concentration point.



Knuckle Bow with Prong on EWC's Tomb Warrior Swords.

D-Guard Material

D-Guards were traditionally made of brass alloy, bronze, wrought iron or steel. Today they are made from brass or steel. Tough steel is stronger than brass, but substantially increases the difficulty and cost of construction so much that lesser steels are commonly used. Steel provides the additional option of welding the tang to the D-Guard, a process we cannot do with a brass D-Guard.

The best steel for knife bolsters is AISI 304 stainless steel. It is extraordinarily durable, takes a great polish and highly resistant to corrosion. It is so difficult to work that nearly all of the individuals who make expensive custom Western knives cut a corner and use AISI 416 instead. In 2010 EWC determined AISI 304 was the best material for three-dimensional D-Guards and began to use it routinely.

Three-dimensional D-Guards are typically made by casting, a solution proven adequate in combat and used by both Asian manufacturers and custom Butterfly Sword makers. They can also be made by bending rod stock, as is the case with Ip Man's choppers, bending and grinding bar stock, or cutting then grinding thick plate.

The processes that produce the absolute best D-Guards are hammer forging and hot drop forging. Like hammer forging, hot drop forging realigns the grain of the steel resulting in improved strength characteristics. Both methods are more expensive than simple casting, with hammer forging of stainless steels a rare skill. Although there are some inexpensive carbon steels that smiths could work by hand to make a strong D-Guard, carbon steel is a poor choice because it must be kept oiled in between use and cleaned every time it comes in contact with skin. EWC uses hot drop forged AISI 304 stainless steel D-Guards on its Flagship Line.

Surface pitting is a problem inherent with castings and forgings, especially factory made D-Guards. One of the methods Iron Man Steel uses to minimize these potentially annoying blemishes is to intentionally make molds and dies slightly larger than the final shape so blemishes that occur can often be ground out. The additional grinding is an added labor expense. The forge inspects at several stages in an effort to weed out D-Guards that will never make the cut as early in the process as possible and reduce the cost of the scrapped swords. The alternative for a reputable forge is to make more precise molds then reject a higher percentage of the rough product. Ethically challenged manufacturers have a financial incentive to use the less labor intensive more precise molds and retain D-Guards that should have been rejected.

EWC classifies swords as cosmetic seconds if the pitting reaches fairly tight threshold, then sells them for a lower price. These seconds are an outstanding value since an EWC second is likely to be far nicer than a competitor's first. They sell rapidly.

A lot of D-Guards are made from cast brass, which is easy to cast and work. While nowhere near as tough as AISI 304, brass saw frequent historical use with Butterfly Knives whereas AISI 304 stainless steel did not. Some Asians based designers dislike brass because it smells. The smell can rub off onto your hands.

Brass has a beautiful golden hue when freshly polished. Pure brass technically cannot rust but it gets dull over time and the oxidation of the copper looks a lot like rust. It is probable that the D-Guard on purchased swords that were sitting in a warehouse will lack the shine of the D-Guard in the advertisement. There are several easy methods to restore the original luster. One preventative solution is to lacquer the brass.

Another is to use gold-plating but care is required during the production process. It is not cheap to do well. Gold plating really adds a touch of class, whether your D-Guard is brass or high grade stainless steel. EWC offers this option only on sharpened swords sold for display purposes. They should not be used for training since the plating can wear off with stress and ordinary use. Lacquer and other coatings can also wear off.

7. Sword Balance

Point of Balance

Point of Balance: The physical point of balance of the sword.

A poor point of balance, or misbalance, will be instantly apparent when a Butterfly Sword is used as intended. The ideal center of balance applicable to a longer sword like a *Jian* is generally one-third from the hilt up the blade toward the tip. This placement can be inappropriate for a Butterfly Sword that must be flipped 180 degrees between a forward and a reverse grip because a center of balance too far down the blade makes the weapon difficult and dangerous to flip.

There is no formula that determines the best point of balance for a Butterfly Sword. The optimal point of balance is typically in the center of the blade width within an inch of a point about as far down from the handle towards the tip as the end of the quillon, but it all depends on the sword. This commonly preferred point of balance provides a good combination of speed and heft, allowing for powerful slices and chops as well as quick covers or blocks. It also permits knives with hybrid or flipping D-Guards to be flipped with the greatest ease and least risk.

At least one Wing Chun lineage and the occasional *Sifu* experimenting desires a point of balance further down the blade towards the tip – well past the point of balance of a War Era sword -- creating a weapon with characteristics more like a machete. The forward point of balance makes the knife effectively much heavier and slower, with all that entails.

The combination of a heavy weapon and an extended center of balance can turn a fine instrument into a bludgeon that can be characterized as a “wrist breaker” and injure the attempted user. If you are going to practice with one, ease into it carefully. Although you may prefer a more traditionally balanced Butterfly Sword for combat, when your physical conditioning improves so much that properly balanced combat weight knives feel light you may occasionally prefer heavy knives to get a good workout. Just remember to train diligently with knives weighted and balanced for combat so that your trained responses are those of a warrior rather than a weight-lifter.



A Butterfly Sword with the point of balance moved backwards to the front of the handle is effectively lighter and faster than a normally balanced knife, with all that entails. This point of balance also makes it more difficult or dangerous to flip.

8. Other Considerations: Quality, Forge, Materials, Techniques, Fit, Finish, Balance, Design, & Service.

Quality

It is now possible to make better quality Butterfly Swords today than the Chinese could historically. We have better materials, the additional knowledge of Western knife making techniques, and better tooling. Sadly most modern product is so far below the standard of antiques as to not be comparable.

Most importers make 500 swords of a single low quality model in a cheap Asian factory. This segment of the market is the most profitable. EWC has a practitioner-oriented philosophy and instead does small runs (in many cases only 5 to 10 pair) of focused high quality designs in a family run forge to better support the varied needs of the community. This is a bit more expensive and often less profitable but gives the community a lot of options as well as a ground-breaking level of quality in hand-made weapons.

It is our strong belief that EWC's BJD are the best you can buy outside of full custom. They are affordably priced by EWC for martial artists rather than tagged at their true value as appraised by custom knife makers and demonstrated in sales through knife collector venues.

It is worth recapping some of the innovations discussed previously in this article that you should consider when evaluating Butterfly Swords. The sections on fit, finish, balance, design and service below are adapted from Jay Fisher's web-site discussion of what you should expect from a fine custom knife. Prior to the 2010 revolution in Butterfly Sword quality started by EWC and Modell Design with the Integral Knives reference to custom knife standards would have been futile.

The Forge

Modell Design was originally formed to bring some of the key features of custom Butterfly Swords to high quality knives affordable by most serious martial artists. It took over three years to find a forge willing and able to do this specialized work. Qualifying forges is an expensive process. The road kill along the way included, but was not limited to a Chinese forge making custom *Jians*.

EWC's Butterfly Sword lines are made at Iron Man Steel, a third-generation overseas family forge run by Forge Master Khurram Ali. The operation has modern equipment including a CNC machine but is at heart a blacksmith able to make any metal tool or weapon. They are experienced making high quality and luxury grade Butterfly Swords using the stock removal method, hammer and anvil, and hot drop forge production.

Iron Man Steel has more experience making high quality BJD than any factory, forge or custom knife maker in the world. They also make an excellent hoof pick exported to Austria and custom knives used by U.S. law enforcement, military and contractor personnel.

While skill is essential, will is equally important. Forge Master Ali wants to make the best Butterfly Swords in the world, and his work shows it.

Materials

EWC routinely uses thick high grade weapons quality blade steels which are identified, including Böhler 440C stainless tool steel and D-2 carbon tool steel, as well as hammered new AISI 9260 Spring Steel. You can find these fine steels in the catalogues of custom knife maker supply houses. The blade is sent out for professional expert heat treatment (and by now we all know the heat treatment is critical).

Most Butterfly Sword manufacturers do not use weapons-grade steels and do not identify their steels. They apparently aren't too concerned with the quality of heat treatment, either.

EWC makes extensive use of AISI 304 stainless steel for D-Guards, an outstanding material far better than anything available historically. It is so tough and difficult to work it is seldom used by even custom knife makers. The D-Guard on EWC's Flagship Line is hot drop forged, a process that produces a stronger D-Guard than common casting.

While fine naturally stable woods have always been available for a price, these are not what you see on mass produced Butterfly Swords. Modern stabilized wood and laminated stabilized wood are good looking, adhere well to the hand when polished, more stable than what was previously available and, in the case of the latter, affordable on production Butterfly Swords. EWC's standard handle material is a laminated stabilized wood product in black, brown, or red/black (a martial artist favorite).

Construction Techniques

The combat proven Chinese historical method of construction was a quality hidden tang running the full length of the handle. Many modern Butterfly Swords have a low quality hidden tang, generally a separate piece of rod poorly welded to a stub tang or the base of the blade. The tang on some is a just the stub. EWC offers full tangs and mortise tangs – both stronger than the original Chinese tang – as well as strong hidden tangs.

The historical tang was quality peened. Many modern BJD use a protruding cheap nut that can easily be stripped. EWC uses a high quality recessed peen that is both strong and attractive in appearance. On full tang and mortise tang swords with a steel D-Guard the tang is properly welded to the D-Guard beneath the handle. Welding is a superior construction method to peening.

Modern custom knife makers generally use two pins and glue to attach handle scales on a full tang knife. EWC's full tang and mortise tang scales are triple pinned or screwed and glued. Special projects and custom work is sometimes pinned with eight smaller pins in the same manner as the best custom tactical knives. One vendor's "premium" 2-in-1 BJD features a scale that has merely been glued on.

While it is pretty easy to imagine how little effort goes into making cheap factory Butterfly Swords, martial artists seldom understand what it takes to craft a true weapon. Here is the process used at Iron Man Steel to make a standard limited production run EWC Flagship Line Butterfly Sword:

1. Cut the blade on a power press with D-2 steel cutting die;
2. Straighten the blade with hammer and anvil;
3. Drill holes in the tang for the pins using a high speed steel Dormer Drill;
4. Grind a distal taper using a manual hand cup grinder ;
5. Re-straighten the blade with hammer and anvil;
6. Scribe the center of the future cutting edge;
7. Mark the bevel with a jig and paint marker;
8. Make the rough bevel with a 16 inch grinding stone wheel;
9. Make functional fullers on the both sides of the blade using a milling machine;
10. Re-straighten the blade with hammer and anvil;
11. Third-party expert tempers the blade using a vacuum heat treatment specific for each steel;
12. Re-straighten the blade with hammer and anvil at 350 degrees. This also anneals the blade to make it strong. The process is very sensitive as blades can and do break or generate hairline fractures and need to be scrapped.
13. Grind and polish the blade flat surface in a 13 step process of increasing refinement ranging from stone wheel to polish;
14. Grind and polish the bevel in a 13 process;
15. Polish the functional fullers, which is very difficult to do
16. Hot drop forge the D-Guard out of AISI 304 stainless steel. Make forging oversize so surface imperfections can be ground out.
17. Slot D-Guard with the end mill cutter on a milling machine;
18. Finish the inside of the slot with a hand file for a perfect fit;
19. Reduce D-Guard to size on a belt sander using belts of increasing refinement;
20. Fit the blade into the D-Guard using a chisel;
21. Punch number the blade and D-Guard;
22. Remove the blade from the D-Guard the polish the top side of the D-Guard;
23. Refit the blade into its specific D-Guard;
24. Grind the blade and D-Guard inside the handle using a 1 inch stone pin grinder;
25. Expertly weld the tang to the D-Guard using an argon welder;
26. Grind the inside of the handle with a 1 inch stone pin grinder;
27. Polish the inside of the D-Guard using belts;
28. Fill the pits arising from the heat of the welding with 304 stainless steel electric welding;
29. Polish the welds to eliminate potential structural weak spots;
30. Fit the scales to the full tang with glue and pins;
31. Make the handle profile on the belt sander by hand. This takes real skill.
32. Polish the entire sword by hand (12 to 13 steps); and
33. For sharps, do a final sharpening of the cutting edge.

If that sounds like a lot of work, you understand correctly.

Fit

Fit: Components put together and assembled must be so with very close, even tight tolerances.

Gaps should be minimized with increasing vigor based on intended quality and non-existent at the full custom level. The blade and handle must be solid with no rattles or wiggles. Jay Fisher notes "Anyone can notice it, fine fit it is difficult to produce, and it sets fine knives, swords, and art apart. It is very important."

Martial artists have had plenty of experience with poor fit. There is often a gap between the base of the blade and the D-Guard on modern production Butterfly Swords. The common generic brass Chinese D-Guard has wide gaps between the blade and

slot. Handle blocks and scales must be solidly affixed to the tang (assuming there is a decent tang). The manufacturer may use a handle material that expands and contracts loosening the blade and creating a rattle. Full tang scales will eventually be felt by the hand, but they should join smoothly on the tang edge at the moment of completion and appropriate materials to minimize the contraction should be used given the product's price point.

EWC's luxury-grade Flagship Line blades are expertly inserted into the D-Guard by skilled hand. You won't see this level of craftsmanship (or diligence) on any of the other production Butterfly Swords because it is too difficult and expensive to do. The fit on the Long Stabber-based D-Guard lines is also a material improvement. Those martial artists who cannot afford custom Butterfly Swords now have the opportunity to understand good fit.



Comparison of Fit on EWC Flagship and 2 Other Vendors' Knives

Finish

Finish: The final treatment of the material.

Each material usually requires a different process to finish, and there are a handful of finishes that look good. "Fine finish is appealing, professional looking, and enhances the individual material as well as the value of your investment," notes Jay Fisher.

Poor finish can make the weapon unfit for use. Failing to sand the interior of the knuckle bow or the flat side edges of the remainder of the D-Guard can leave them jagged and sharp enough to cut the user's hand. Doing a poor job polishing the blade increases its susceptibility to corrosion. Poor quality control or low standards on cast pieces can result in annoying pitting on the D-Guard. You can also find imperfect gold-plating.

Butterfly Sword blades are a lot of steel; they take a lot of work to polish and it is easy to spot poor quality work. It takes skill and patience to apply a perfect mirror finish, outstanding glossy finish or great looking satin finish to the blade. The best finishes cannot be done by polishing machines, a common corner cutting method. Iron Man Steel finishes each production EWC blade by hand and does an extraordinary job.

The sheath system is another area where finish is important. EWC's nylon carry case is the best Butterfly Sword case ever offered, period. EWC originated the nylon 2-in-1 sheath to avoid exposing BJD to corrosive leather tanning oils and vapors.

Leather sheath finish is the area where we admittedly have the most room for improvement. Our leather sheaths are made by third-parties overseas since making them in the U.S. is prohibitively expensive.

Balance

Balance: The physical point of balance of the sword and the aesthetics of the entire project, including the scabbard or holster.

We are martial artists and understand the importance of the properly balancing Butterfly Swords. Chinese factories that mass-

produce most Butterfly Swords typically give clients a single prototype to approve. It is difficult to understand how that process can provide an outstanding weapon.

Each EWC project goes through a vigorous process that starts with decades of experience using martial arts weapons, three generations of blacksmiths, and ends with making as many expensive prototypes as needed to get it right.

TIP: No one has spent more money or time designing and testing advanced BJD than EWC and its Wing Chun knife design consultant Modell Design LLC.

The visual characteristics relating to balance are important for aesthetic appeal. "Some [swords] look rudimentary, some look refined; this is a balance characteristic." Jay Fisher.

Butterfly Swords should present themselves like true weapons with each element related to each other and an integrated whole. Modell Design designs Butterfly Swords that have style as well as lethal functionality. Martial artists need not be satisfied with ugly and clunky Butterfly Swords.

If you are going to devote your life to martial arts, use weapons worthy of your time and sweat equity. If you won't be proud to own it and display it, don't buy it.

Design

Hudiedao design is a complicated process based on knowledge of historical precedents, martial arts experience with and understanding of Butterfly Swords, experience and understanding of weapons with related features such as the Double *Gen*, *Sai* and military knives, modeling at a variety of levels, extensive testing, an understanding of historical and modern materials and their characteristics, methods of production used at appropriate quality levels as well as the capabilities of the proposed forge or manufacturing facility. A miniscule difference in a line on a schematic can profoundly change the weapon. Even a great design can be ruined by inadequate execution. Sanding half a millimeter in excess of the dimensions specified can remove a key design element, or drop the sword from top-quality to something as useful as the typical mass produced sword. Not even a Master Smith can predict the point of balance of a weapon he has yet to complete so there must be good communication and understanding between the forge and the design team.

As previously mentioned, you need the correct design Butterfly Sword for your style/lineage and body size. We are martial artists designing weapons for martial artists. As of December 2012 EWC had offered over 100 different models with a cue of upcoming projects and concepts at least as large. A lot of these sold out and many were one-time only projects. Compare the quality and breadth of EWC's designs to everything else out there.

TIP: The time to buy good weapons is when they are available.

If you need a specific design for your school, a few students or a signature pair yourself, EWC can handle that via its Custom Shop Program. Modell Design provides Wing Chun BJD design services exclusively to EWC but is available if you need a single full custom Wing Chun pair that cannot be run through the Custom Shop Program or design services for a different style.

Service

EWC previously ran an archive with a list of BJD posted by outside vendors intended to be a service to the community, for no compensation, but there was so much negative feedback on those non-EWC products and vendors that in 2009 the archive was terminated. Caveat Emptor: nearly all of those outside vendors are still in business today. Jeff once bought a high end pair of BJD from an importer in the U.K. as a gift for an associate. The edges of the 2-in-1 D-Guard were so sharp that the knives were unsafe to use. He emailed the vendor requesting they repair or replace the knives. They never answered. He purchased a *Miao Dao* that had a problem from a reputable vendor located in New Jersey and was promptly offered a full refund.

TIP: The time to consider potential difficulties with a vendor is BEFORE you buy.

Know who you are doing business with. Think carefully prior to purchasing weapons from an overseas manufacturer or importer, especially generic Chinese-made Butterfly Swords on eBay.

9. Conclusion

We hope this article has added to your understanding of Butterfly Swords, and wish you the best in your martial arts endeavors.

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