Equix Biomechanics

841 Corporate Drive, Suite 201 * Lexington, KY 40503 * (859)-224-4488

MARE ANALYSIS

FOR:
EQUIX Client

STAKES PRODUCING MARE 1997 (Sire: **Tabasco Cat** - Dam: **Mare Name**)

BIOMECHANICAL EFFICIENCY SCORE™ AT AGE EVALUATED (11 years): **97.3**

PREDICTED BIOMECHANICAL SCORES AT AGES 24 MONTHS TO 72 MONTHS

AGE IN MONTHS	PREDICTED SCORE
24	96.1
30	97.0
36	97.3
42	97.5
48	97.5
60	97.5
72	97.4

POWER:STRIDE FACTOR	0.625 : 6.75 : 0.625
PHENOTYPE	I
COORDINATES	(0.6 , 270.0)
MUSCLE RESONANCE	A
HEART EF SCORE™	6.9
INTERMANDIBULAR WIDTH	average

Conformation Analysis:

Faults and other physical characteristics are graded from (1) almost imperceptible *to* (5) extreme.

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Wide bodied front (1.25); high withers (1.5); heavy neck (1.5); deep back (1.25); tied-in at the knees (1.0); flat knees (1.5); turns out at the knees/elbows right (2.5), left (2.5); offset knee left (1.25); straight (hind) legged (1.25).

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SUMMARY OF THE OVERALL ANALYSIS OF THIS INDIVIDUAL

A SHORT REVIEW OF THE MECHANICS OF THIS INDIVIDUAL:

This mare had good BASIC MECHANICS at 30 months of age, increasing to good to very good in her third year, and it remained at this level thereafter. She had very good to excellent BASIC GEOMETRY at 30 months of age, increasing to excellent in her third year, and dropping back to very good to excellent by the end of her fourth year. She has excellent STRIDE RHYTHM, with good EXTENSION. Her BASIC POWER is fairly good to good, with excellent back triangles [ilium + femur + tibia]. She has an excellent gaskin, with very good to excellent muscling in the gluteal muscles and in her hamstring group. She has very good to excellent leverage from a nice ischium, very good leverage from straight hind legs, and excellent leverage from a tuber calcis that is advantageously long relative to her moderately long back cannon. She has a significant amount of K-Factor [a combination of physical characteristics conducive to great speed at lower middle distances.]

She has a heart capacity that is average in stroke volume relative to her size, age, sex, and conditioning. It is within the elite range on both indicators. The heart walls show very good muscling.

SPECIAL CONSIDERATIONS:

This medium-sized mare has very good basic mechanics and excellent body proportions. Overall, her mechanics are suited to sprints and up to the lower middle distances.

She has excellent stride rhythm [balance of front legs to back legs].

She has good body length, giving her extension that is normally better suited to the longer sprints and beyond.

Her power is good and she has excellent balance to her hindquarters. The relationships of the other bones in her hind leg gear her for good speed and quickness, while in motion and from a standing start. She also has an excellent gaskin.

She is of Phenotype I and a very good example of the type. She has a strong hip and gaskin, both excellent traits with high heritability.

Based on how her particular mechanics match with those most commonly found in the stallion population, her OptiMatches® indicate high blendability with the stallion population. Of stallions standing in Kentucky at stud fees of $10,000 and up, 77.4% show acceptable potential matings (average BME Scores of 96.5 or above).

This gives her a large selection of stallions to choose from.

Her previous matings include:

Belong to Me at 7.0 (MLF) and 6.5 (Avg BME 10,000 foals) = B+ very good.
This foal is a multiple SW/GRSP earner of $576,894; sold as a yearling for 53k.

Red Ransom at 7.3 (MLF) and 6.7 = A- very good to excellent.
This foal is a GSW of $181,720; sold as a yearling for 22k.

Grand Slam at 7.7 (MLF) and 6.6 = A- very good to excellent.
This foal is a SW/GRSP earner of $306,656, and sold as a weanling for 650k.

Unbridled's Song at 7.3 (MLF) and 7.0 = A+ excellent.
This foal is a winner of $182,000 and sold as a yearling for $475k.

Pulpit at 7.3 (MLF) and 6.7 = A- very good to excellent.
Unraced, was fast but fragile Pulpit legs, a 260k yearling and a $575k 2yo.

(Next page)

Ghostzapper at 7.6 (MLF) and 6.7 = A- very good to excellent.
Unraced, a 140k RNA weanling.

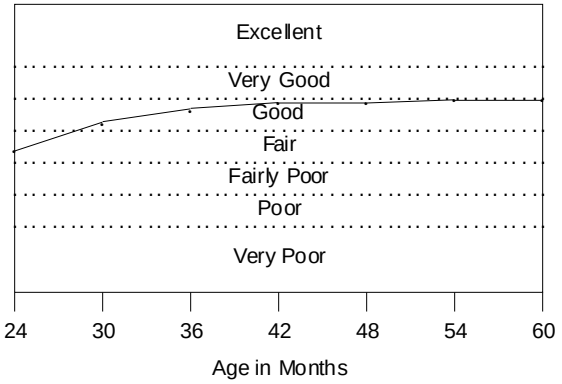
A mating to Bernardini, to whom she is in foal, scores 7.5 (MLF) and 6.7, A- very good to excellent.

OVERALL RATING:

	very poor	……	well below average
	poor	……	below average
	fair	……	slightly below average
	fairly good	……	about average
	good	……	slightly above average
•	***very good***	……	above average
	excellent	……	well above average
	outstanding	……	unusually well constructed (rare)

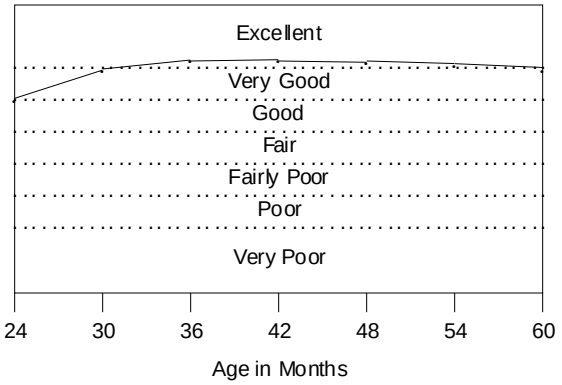
Note: If two consecutive boxes are marked, the rating is between the two.

BASIC MECHANICS:



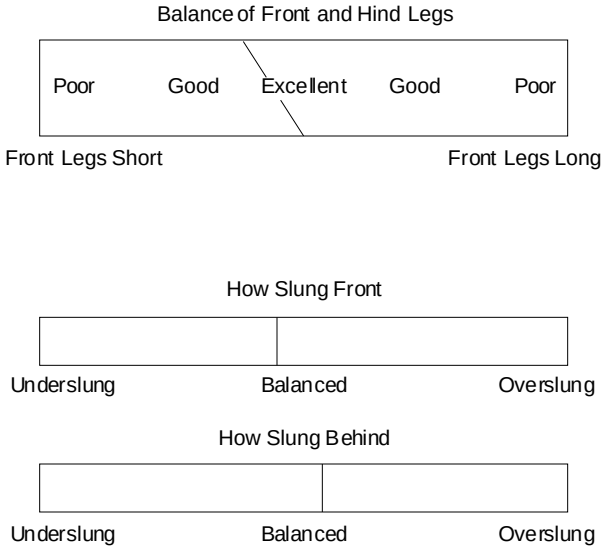
The *BASIC MECHANICS* for a horse is an indexed value of the different individual mechanical systems that determine how the horse runs. It represents about 75 percent of the BME Score. The primary emphasis is on the mechanics of each system rather than on how well the systems will work together or the geometric balance of the horse. As a horse grows from an early two-year-old to adulthood, the mechanics will change, sometimes improving, sometimes deteriorating. The graph to the left shows how this horse's basic mechanics will change over that period of time.

BASIC GEOMETRY:



The *BASIC GEOMETRY* for a horse is a measure of the overall balance of the individual systems, and how the individual systems work together in general. It represents about 25 percent of the BME Score. The primary emphasis is on the geometry of the total system rather than on how well each system will work as an individual unit. As a horse grows from an early two-year-old to adulthood, the geometry will change, sometimes improving, sometimes deteriorating, just as with the basic mechanics. The graph to the left shows how this horse's basic geometry will change over that period of time.

STRIDE RHYTHM:

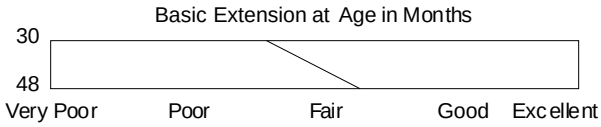


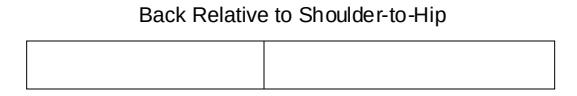
Sprinters can have very good *STRIDE RHYTHM* with front legs shorter than ideal, and stayers can have very good Stride Rhythm when the front legs are longer than ideal. K-factor permits horses to run effectively with comparatively short front legs (or long hind legs) in proportion to the degree of K-factor present. The line in the diagram to the left joins the values of two indicators, one at the top and one, the more influential, at the bottom of the diagram. The net influence will lie between the two.

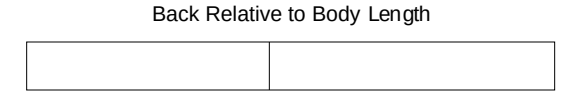
Underslung horses [body slung low relative to the position of the elbows and stifles] have centers of gravity low, giving greater stability, but at the expense of proportionally less staying capacity. Overslung [body slung high relative to the position of the elbows and stifles] horses have high centers of gravity, giving them less stability, but generally greater efficiency carrying their weight. When overslung in front and underslung behind, there can be confusion in the mechanics causing a climbing action, whereas in the opposite case a heavy forehand (early foot strike) might occur. Both are considered very inefficient action, but often are at least partially correctable.

EXTENSION:

The *EXTENSION* for a horse is a measure of how well the horse can extend his stride length without fear of interference. If the BASIC EXTENSION is poor, he will tend to strike himself when at or near full gallop. This would likely cause him to lose his stride rhythm as well as hurt himself, unless he adapts a mode of gallop that allows him to avoid the problem. This usually requires him to shorten his stride and take more strides to compensate, or to two-track [front and back legs moving in parallel, but separated tracks]. For horses running under North American racing conditions on dirt, the second mode is not generally practical. Rarely do horses compensate by straddling front legs with their hind legs, like a foal runs.





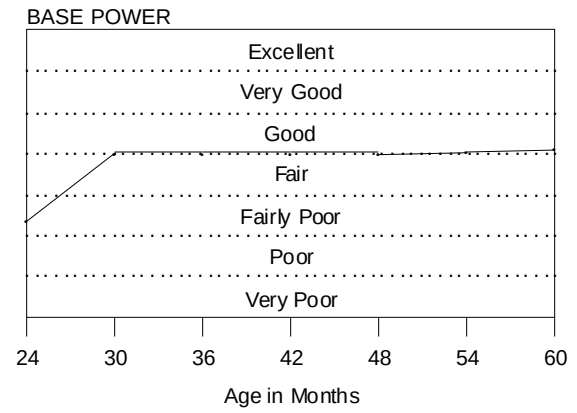


A horse with a back that is short relative to the shoulder-to-hip will tend to reach out more than the average horse, particularly when accompanied by a relatively long humerus; this can be advantageous for short sprints, but becomes a disadvantage as distances require a less-than-maximal stride effort, and becomes wasted motion. A back that is short relative to body length allows a horse to stride out more than his basic extension would indicate; Quarter Horses running at very short distances are well served by this mechanical configuration, but Thoroughbreds are disadvantaged significantly if this fault is severe, and the longer the race the greater the deliterious effect.

A long back relative to the shoulder-to-hip tends to reduce stride length, particularly when accompanied by a relatively short humerus. It is often accompanied by straight shoulders, goose rump, or both, and relatively straight hind legs. Among successful Thoroughbreds, this type of mechanics tends to be present more often in sprinters and lower middle distance runners (6.0 to 9.0 furlongs). A consistent pattern would demand that pasterns also be comparably upright and not short. Good power and leverage factors can overcome the mechanical problem, but there tends to be greater strain to joints, tendons, and ligaments because of a reduction in the shock-absorption properties that comes from good angulation.

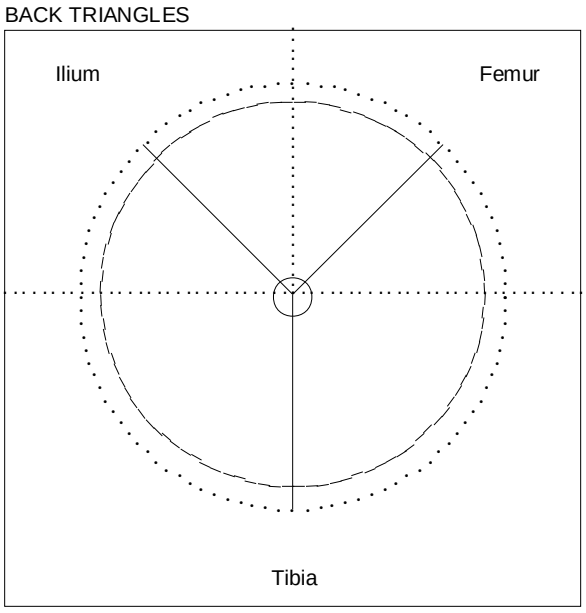
POWER:

The BASE POWER is a figure representing just one aspect of the power component. It represents a relationship between the back cannon, through which the propelling force to drive the horse forward must come, to the muscle and leverage of the upper leg and hip, through which that power must act. Other factors within the power structure can alter the effectiveness of this aspect significantly. The BASE POWER changes over the course of the horse's life. Normally, it should rise consistently or remain relatively constant after reaching a certain level. If it drops after reaching a maximum, the horse becomes over-powered at that point (if not before). Horses of this type may have too much power for their own good and can injure themselves. Such injuries can occur in almost any area of the body that might be affected by stress from application of power or vibration. Areas that are likely to be affected are the lumbo-sacral area of the back, the hocks and stifles, and the front legs and ankles. When compounded by other faults, such horses will tend to break down early. Care must be taken in many instances to control the excessive power in training and racing in order to prevent injury.



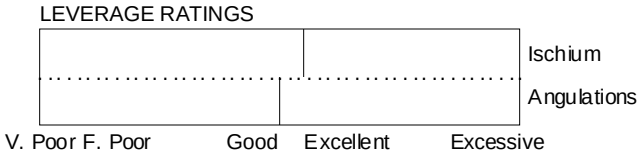
POWER (Continued)**:**

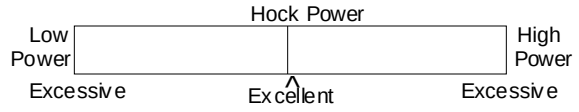
The BACK TRIANGLES [ilium + femur + tibia] determine most of the power and much of the efficiency of action of the horse. The hind leg attempts to model both the whip and the wheel in its action. As a whip, it is designed to transfer angular speed along its length from a relatively powerful upper end (like the handle) along a successively lighter length to obtain maximum speed at the end, which is as fine as the strength of materials necessary for the job will allow. Simultaneously, the hind legs act like spokes of a wheel, with the center of rotation high in the upper leg and hip. In the figure below, the small circle near the center of the picture simulates that center of rotation. The solid circle with center at the junction of the ilium, femur, and tibia represents the ideal sizes and proportions for the three components of the back triangles for a well-proportioned middle-distance horse of this horse's general size. The dotted circle represents the sizes for this horse. It goes through the ends of the three components of the triangles. The small circle is centered at its center and illustrates an element of how the horse is geared (as low-to-high gears in an auto) and the degree of eccentricity of the wheel the hind legs model.



If the small circle is *below* the dotted horizontal line, the gearing of the triangles is relatively *high*, which would mean that his acceleration is reduced by this relationship, but his ability to maintain speed over distance, once his speed is achieved, is enhanced. The small circle above the dotted line indicates the reverse — his acceleration is enhanced at the expense of sustainable speed. This is significant to the degree the small circle is below or above the line.

If the small circle is to the left or right of the vertical line, there is an eccentricity to the wheel-like action of the hindquarters. If the circle is to the left, the effect is a falling away of the hindquarters that the jockey can feel with each stride. This causes a slight rise to the front, but generally is not as serious a problem as the case when the small circle is to the right of the vertical line. In this latter case, there is a *rise* to the hindquarters with each stride, felt by the jockey as a rough pounding, which can be extremely uncomfortable to a seated rider when the condition is severe. It also causes a dipping of the front end and a resulting pawing action of the front legs in extreme cases. While both cases are faults, the latter is a severe fault that, when the circle is completely to the right of the dotted verticle line and *above* the horizontal line, can virtually guarantee that the horse will be unable to compete effectively among the top-quality runners, regardless of other factors.

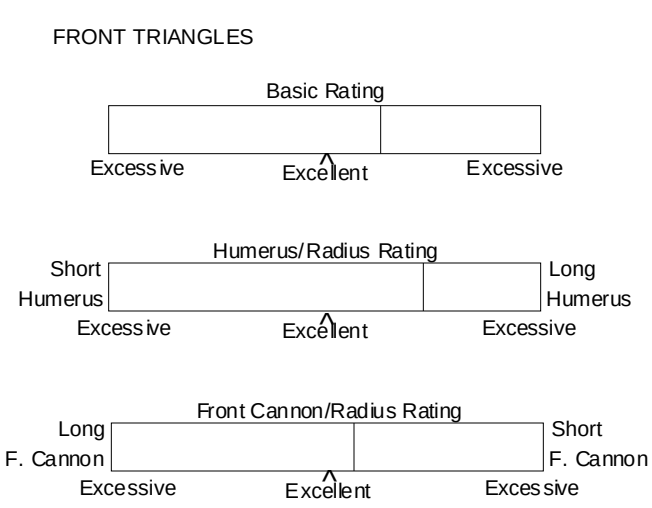




The leverage factor given as HOCK POWER is determined by the relative length of the tuber calcis [counter lever to the back cannon] to the length of the back cannon. This is another aspect of the gearing for the horse. This gearing ratio can be so low that the horse has difficulty generating sufficient sustained speed, or so high that he has insufficient acceleration and will require time to attain his speed, and then cannot maneuver through a crowd of horses effectively or recover quickly enough if he has to take up during a race. In the diagram, sprinters should be powered a bit toward the *High Power* rating and distance runners should be toward the *Low Power* rating (which is opposite to their *gearing*).

POWER (Continued)**:**

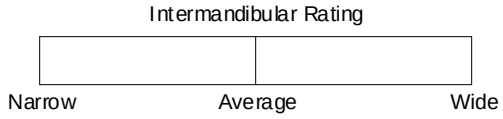
The FRONT TRIANGLES [scapula + humerus + radius (and front cannon)] play a very different role from the back triangles. Their function is primarily one of timing. They, too, attempt to be wheel spokes, and the whip analogy also applies in their case. The timing must be such that the weight of the horse is taken by each leg at the moment that is most efficient to maintain the horse's speed. Very little, if any, thrust comes from the front legs. Basically, two problems can occur with how efficient the front legs do their job: (1) they can cause a braking action when the full force from the horse's momentum is taken when the front leg is forward of the verticle position, and (2) they can take those forces too late, thereby losing some of the potential stride length.



The *Basic Rating* of the front triangles is a rating of the *balance* of the four components of the front triangles as they relate to one another. The *Humerus/Radius* rating rates how these two components relate with one another, and the *Front Cannon/Radius* rating is a measure of how the front cannon length fits that of the radius. Generally, **sprinters** will tend to have ratings to the **right** of the indicated *Excellent* range and **distance runners** will tend to have ratings to the left. Where that is not the case, it is an indication of mixed mechanics (usually the result of breeding across these categories). While there are many examples of horses with mixed mechanics in their front triangles becoming successful racehorses, often mixed mechanics here implies the same elsewhere, and that can, in turn, imply that the horse may be handicapped at every distance.

INTERMANDIBULAR WIDTH:

Horsemen long have felt that ''the wider the *jaw* the better'' and reject a sales yearling with inter-mandibular space insufficient to allow room for the fist (four fingers). Some have claimed that there is a correlation of intermandibular width to neuropathy, and thence to performance. Our work shows no discernable difference in performance levels for fillies and mares. For male horses, there is a slight *negative* correlation of endurance to width, and especially to the ratio of width to height. Until more is known, we recommend that little, if any, weight be placed on this variable. There may be a relationship of this width to certain other skeletal characteristics, and thereby relate indirectly to the consistency of the mechanics for one or another running style and/or distance.



HEART:

While there is no single *key* that opens a secret lock on what makes a horse a champion, certainly having a good heart is one of the most important of the many elements that do. It is the pump that takes oxygenated blood to the muscles to be transformed into the energy required to fuel the machine. It must pump a large quantity of blood in a short amount of time, yet it is not always a *large* pump that is required, but rather an *efficient* one for the requirements — requirements that differ with the mechanism being fueled. Generally, the distance horse is better served by a slower pump with large stroke volume, whereas the sprinter finds a faster, hence smaller and more powerful pump more suitable to his needs.

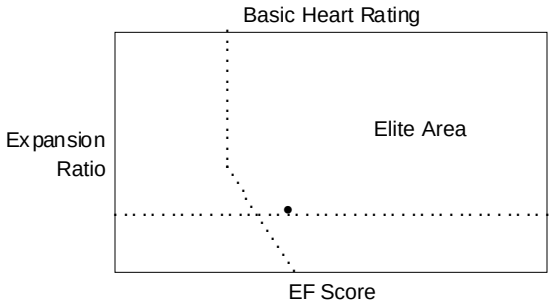
The dots on the two diagrams on the next page show the location of the measurements of this horse's heart in relation to its **stroke volume** (as measured by the EF Score™) and **stroke power** as measured by the thickness of the heart walls and the ratio of diastolic to systolic volume.

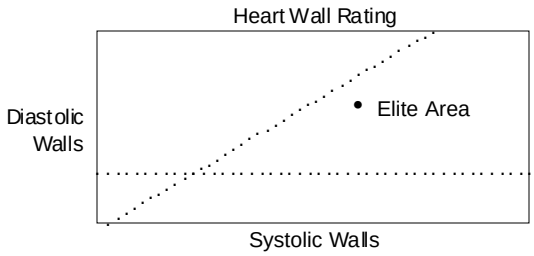
To have the most efficient biomechanical system, the heart should be compatible with the mechanics: a sprinter's mechanics should be coupled with a sprinter's heart; distance-horse mechanics should be matched with a distance runner's heart. Ideally, the sprinter's heart will be relatively high in the elite area of both diagrams, whereas the classic horse will be further to the right and lower.

HEART (Continued)**:**

According to our data, 63.6% of stakes-winning horses have hearts in the elite range on *both* diagrams, whereas only 26.1% of the non stakes-winning horses have hearts in these areas.

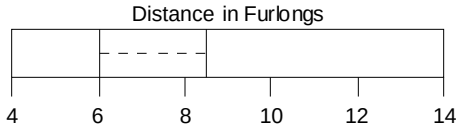
Based on our present data, the EF Score for Thoroughbreds averages about 6.5 (6.6 for colts, 6.4 for fillies), with the middle 68% of the population having EF Scores between 5.8 and 7.2.





Only about 2.5% have EF Scores above 8.0. The EF Score is adjusted for age, body size, and fitness, and is a relative measure of the heart's innate capacity to supply the oxygen needs of the horse. Studies by EQUIX indicate that the EF Score can be used to estimate distance capacity and graded stakes potential. Horses with EF Scores below 6.0 can win stake races, but generally at shorter distances. The bulk of the stakes horses and virtually all of the graded stakes horses seen to date have EF Scores of 6.0 and above and have tended to race at longer distances. Caution should be exercised in evaluating this variable. While it is true that great horses tend to have large and powerful hearts, it is *not* true that larger is necessarily better. Indeed, it is the average and only slightly above average size hearts (EF Scores) that show the highest success rates. Our data indicates that an excessively large heart may well be an *impediment* to success except in the fairly rare cases where it is served by related physiological strengths.

DISTANCE RANGE:



The Projected Best Distance is determined by the nature of this horse's mechanics, augmented by how his heart capacity matches those mechanics. Confused mechanics can prevent a horse from racing effectively at any distance, or require the use of very special techniques under limited conditions.