

USER MANUAL





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1 Introduction

The PAX Graphic is an algorithm created and designed by the Groupe France Elevage in collaboration with the CIRALE (Research and Imagery Center on the Equine Locomotive Affections). His aim is to help breeders to find the most compatible sire according to objective characterization of the mares.

The scoring of characteristic covers morphology, gaits, natural jumping technic and temperament. We advise to wait the age of 3 years to characterize the morphology and gaits.

The Pax Graphic has 21 criteria, evaluated with half points from 1 to 4 (this notation is not a judgement, it is only the measurement of the objective characteristics of your mare):

- 11 morphological criteria (evaluated by measurements directly on the mares)
- 3 criteria of locomotion (evaluated visually or by discussion with the rider or the breeder)
- 4 criteria of jumping ability (evaluated by discussion with the rider or the breeder)
- 3 criteria of behavior

All our sires are noted on these 21 criteria, according to their particular characteristics when they are young, and the ones they transmit when enough of their offspring are known. The program gives you the opportunity to evaluate your mares on the criteria you can measure and to choose one sire or more to compare their compatibility. A graphical presentation would be given to you for each criterion, showing the probable score of the foal to come regarding this criterion.

CAUTION

The PAX program works with an algorithm

- It's better not to evaluate a criterion rather than to enter a wrong characteristic. The program will make you a restitution on the rated criteria and the others will be neutralized.

2 Los criterios

GEOMETRY

The horse must be stopped on a flat surface and in a well-balanced position.

There are two vertical lines:

- Tip of the shoulder (the fore cannon should be vertical)
- Tip of the hock (the hind cannon should be vertical)

The measures taken are:

- Size at the top of the withers (4th thoracic vertebra)
- Size at the sacro-iliac junction
- Overall length between the point of the shoulder and the point of the croup

Geometry shape	Length/ Height	< 0.96	Squared	1
		0.96 at 1.03	Rather squared	2
		1.03 at 1.10	Rather rectangular	3
		> 1.10	Rectangular	4
Geometry Orientation	≠ Size at withers and sacrum	> 3cm	Downhill	1
		3cm at 0	Rather Downhill	2
		0 at -3cm	Rather Uphill	3
		> -3cm	Uphill	4

A rectangular shape helps to increase the length of the path but in excess makes balance more difficult to manage. An uphill silhouette facilitates the balance, but in excess it requires more efforts to the hindquarters.



THE HEAD

The head is evaluated subjectively from front and size. The head criterion depends on the breeders taste as well as the characteristics of the mare's approbation Stud book. Above all, it is a commercial criterion.

Evaluated criteria:

- Expressive eyes
 - Elegancy
 - Large ears
 - Good head carriage
 - Large nostrils
 - Good mouth
- The excessive weight of the head makes more difficult the movements of the neck
 - A too small mouth does not facilitate the comfortable installation of the curb bit
 - The size of the nostrils is determinant for the air intake in the lungs
 - Small ears often go with anxious horses
 - The form and space between the lower jaw influences the flexion of the poll



THE NECK LENGTH

It is measured in natural position, in balance and awoken (without external stimulus). The neck is measured between the top of the neck (passage of the headpiece which corresponds to the atlas) and the 7th cervical vertebrae (approximately 20 cm above the point of the shoulder - an open hand above the point of the shoulder in the withers direction). It is compared with the dorsal segment that goes from the top of the withers (4th thoracic vertebra) to the lumbosacral articulation (hollow of the sacrum).

Neck Length	≠ neck length and back length	< 7cm	Short	1
		-7 at 0cm	Rather Short	2
		0 at 7cm	Rather Long	3
		> 7cm	Long	4

Ideally, the neck length has to be equal or superior to the back length in order to balance the two segments which play an important part in the jump trajectory. It is not easily effective if it's too short, and can be difficult to manage if it's too long.

THE SHOULDER

The shoulder orientation is measured with the angle between the vertical, passing by the point of the shoulder and the line which goes from the withers (4th thoracic vertebra) to the forefront point of the shoulder. The shoulder must be measured on a flat ground with the fore cannon vertical. Be careful to the mare's orientation "standing under"

Shoulder	Scapula angle with the vertical	< 30°	Vertical	1
		30 at 35°	Rather vertical	2
		35 at 40°	Rather Oblique	3
		> 40°	Oblique	4

The inclination of the shoulder is always a positive criterion.



THE WITHERS

The wither is formed by the spinous apophyses of the 9 first thoracic vertebrae. The measurement of the withers is done from its top (4th thoracic) to its base (9th thoracic). The length of the withers defines also the placement of the saddle compared to the gravity center of the horse (advanced for a short withers and behind for a long one) and thus the position of the rider.

Withers	Distance T4 (top withers) to T9 (base withers)	< 12cm	Short	1
		12 at 17cm	Rather Short	2
		17 at 22cm	Rather Long	3
		> 22cm	Long	4

Large and well pronounced, it has more strength but to the extreme it can make difficult to place well the saddle.

THE TOP LINE

It corresponds to the segment between the top of the withers (4th thoracic vertebra) and the sacro-iliac junction. The curve of the top line determines if it is straight or hollowed. The tension of the top line helps the energy transmission from the back hand to the forehand. It is evaluated taking into account the age and the horse training. The hollow backs are in general more flexible but harder to work than the straight ones. The straight backs can also drive to the extreme rigidity.

CROUP LENGTH

The croup form and length correspond to the position and size of the iliac bone. The measurement of its length is made from the point of the hip to the point of the buttock. Its orientation corresponds to the angle formed between the horizontal and the segment point of the hip - point of the buttock.

Croup length	Pelvis length / Size to sacrum	< 27%	Short	1
		27 at 31%	Rather Short	2
		31 at 35%	Rather Long	3
		> 35%	Long	4
Croupe orientation	Rapport entre l'horizontale et l'axe du bassin	< 21%	Horizontal	1
		21 at 27%	Rather horizontal	2
		27 at 33%	Rather oblique	3
		> 33%	Oblique	4

With equal muscular tone, a long pelvis makes possible to develop more energy. The two extreme orientations of the croup disrupt the orientation of the propulsion by the hindlegs.

BONES

The quality of bones is determinant but non-observable to the naked eye. We appreciate the heaviness or lightness of the skeleton by the form of the articulations, their relief and the diameters of the long bones. A too light skeleton weakens the articulations, and too heavy penalizes by its weight.



SIZE

The size observation is made thanks to a measure stick at the tip of the withers.

Size	Size at withers	< 1m60	Small	1
		1m60 at 1m67	Medium - Small	2
		1m67 at 1m72	Medium Tall	3
		> 1m72	Tall	4

It depends on the breeder's taste and it can be correlated with the amplitude of the gaits although the latter is also related to the lines and the suppleness of the horse.

WALK

The walk is a four-beat gait.

left hind leg, left front leg, right hind leg, right front leg, in a regular 1-2-3-4 beat.

- If the hindleg print cover the foreleg print or if the fore print is ahead from the hind print => the horse engage the haunches
- If the posterior is behind the former => the horse doesn't engage the haunches

Walk	Amplitude and flexibility of the walk	Hind print don't cover the fore print	Stiff	1
		Hind print cover the fore print	Rather Stiff	2
		Hind print ahead of the fore print 0-10cm	Rather Flexible	3
		Hind print ahead of the fore print >10cm	Flexible	4

It is important to look at the decontraction of the base of the tail which also determines the flexibility of the top line. The suppleness of the walk is a good predictor of the canter which is not always easy to evaluate with horses not at work.



CANTER

The canter is a 3 times gait (Example: Left Canter: posterior biped right then diagonal foreleg right then foreleg left spaced of a time of suspension).

The flexibility is evaluated by engaging the hocks under the body and the inflection of the back.

The canter balance is evaluated by the duration the phase of suspension and by observing the general movement of the silhouette. In most situations, a good balance is a facilitator factor of the jump.

The canter amplitude is measured by the distance separating on the ground two successive footprints from the same foot. The amplitude is measured on a minimal distance of 30 meters. It is small if it does not exceed 3m30 and then larger by slice of 30cm to reach the maximum distance of 3m90. The amplitude of the canter is a quality, even if it is sometimes difficult to manage for an amateur rider.



FORELEG TECHNIQUE

The foreleg technique is observed by:

- The rising power of the withers
- The speed and the amplitude of the articulations bending (shoulder and knees)
- The mobilization of the neck to take forwards the shoulders mass.
- The coordination and the effectiveness of implementation of these 3 elements determine the quality of the front technique.



HINDLEG TECHNIQUE

The hindleg technique is observed by the evaluation of:

- The quality of the hindleg rise
- The back bending and the articulations of the stifle, the hock, fetlocks and of their opening to determine an ideal path.

Warning: A good looseness of the hind legs is a positive point to determinate the form of the path, but exaggerated, it can be a problem for the balance at the reception.



ELASTICITY

The elasticity is evaluated with the facility of the horse to modify his natural path over the jump whatever the approach conditions. Elasticity is subjective and measured in situations related to a hazardous approach or an unexpected obstacle. It is the result of the use of the trajectories correctors which are:

- the neck
- the knees
- the sacro-iliac articulation
- the fetlocks

Warning: The elasticity is different from the flexibility! It is a quality but its excess can result in “getting rid of its jumps”.



STRENGTH

The strength is the capacity to activate forelegs and hindlegs levers and to mobilize the back and neck muscles to be pushed with a maximum of energy to the top and forwards. The observation is subjective. As far as it remains manageable, the strength is essential to compete in high level classes. It is measured with the capacity of the horse to produce the same form of jump whatever the height or the width of the obstacle and the quality of its approach (distance, balance...) and appreciates itself in a subjective way. The mental, the technique and the training can compensate a lack of natural strength.

BLOOD

The blood is measured at the same time by the capacity of the horse to feel an “emotion” and his capacity to answer by a neuromuscular transmission within a very short time. The observation is subjective, it is thus “the impression of blood” which is evaluated.

WILLINGNESS AND CAREFULNESS

Willingness and Carefulness are observed at the breeding and training by the capacity to absorb without stress the new or unexpected situations. The carefulness of a horse is its natural aptitude to jump clear and to correct himself when making one.

Warning: A horse cannot be at the same time extremely brave and extremely respectful. He will choose at a given time to stop or to make the fault.



We mostly try to have a horse with a competitive temperament and strength enough to access at the highest level

3 Restitution

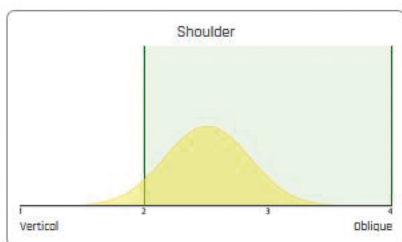
THE DESIRABLE ZONE

For each criterion inside the notation range from 1 to 4, is defined a desirable zone. The horses whose note of a criterion is in the desirable zone have, all other things being equal, more facility with being effective in the jump than those whose note is located out of this zone.

For example, for the criterion of the shoulder angle, more oblique it is, more is naturally easy to the horse raising his knees to the top and forwards. The favorable zone for the criterion will thus be between scores 2.5 and 4. It is materialized by a green zone in the graphic restitution. For the size, there is no ideal one to facilitate the performance: We considered thus the totality of the grades inside the ideal zone but preserve this criterion so that the breeders who want "to grow" or on the opposite "to reduce" their production can take it into account. It is the same for the elegance.

We remain attentive with the evolution of knowledge; these zones are thus likely to evolve.

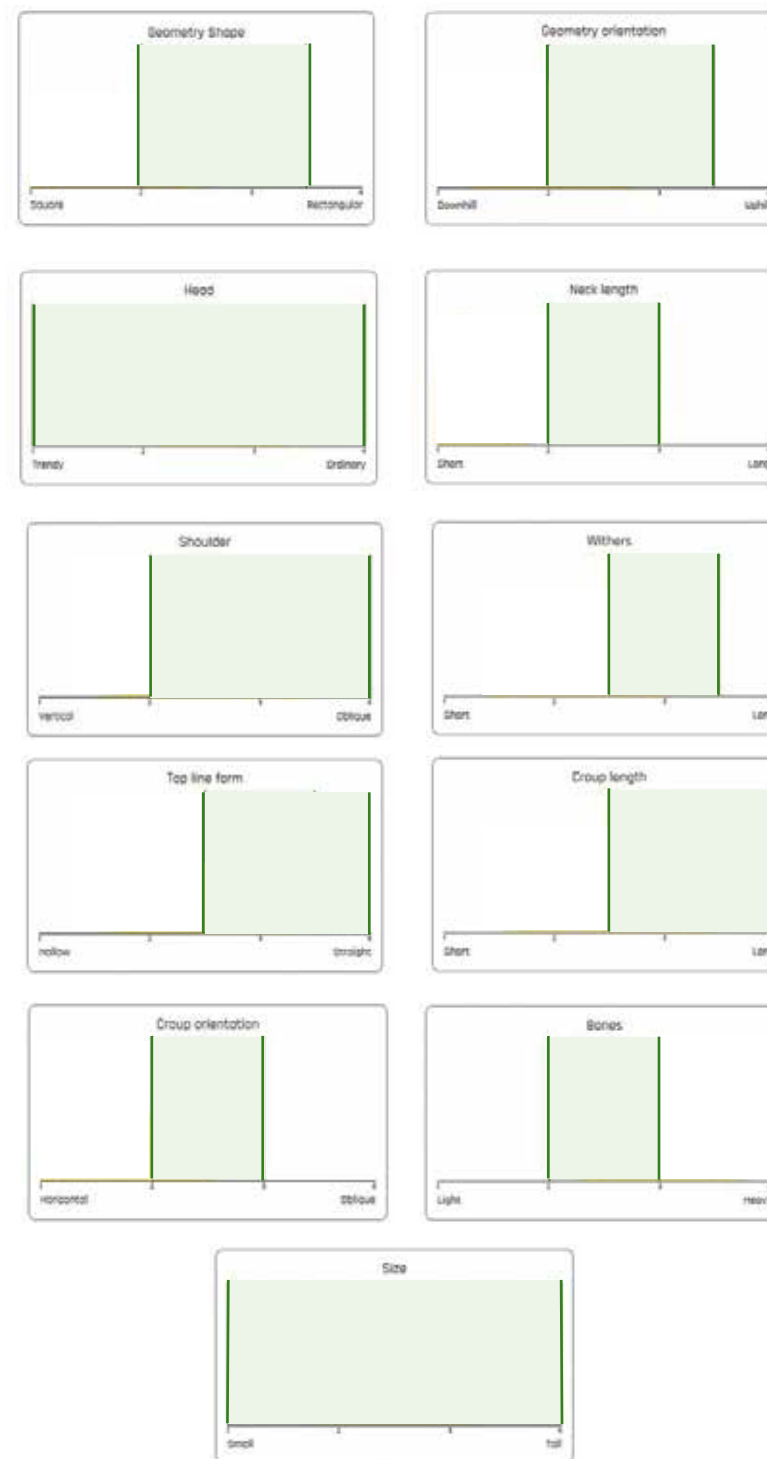
COMPATIBILITY



If we reproduce many times the same crossing, all the offspring will not have the same characterization for the 21 PAX criteria. For each criterion, the grades of the products will be mainly distributed in the interval separating the marks of the parents or close to the marks of the parents if they have the same one.

Based on the experience, we consider that the distribution of these marks will be done according to a normal Gauss curve centered halfway between the two parents. This one is represented by a yellow curve in the graphic restitution.

The percentage of the "yellow" surface in the "green" zone indicates the probability of the foal to be born with a grade located inside the "desirable zone" for the studied



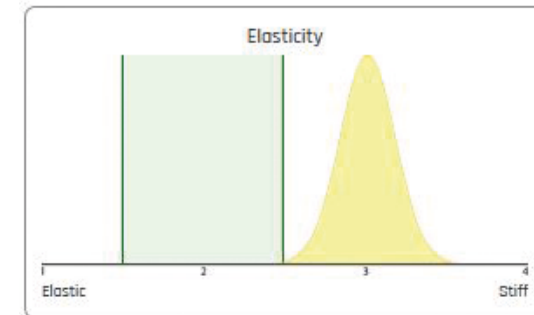


criterion. This percentage is retained like “compatibility percentage” between the parents for the criterion considered.

The average of the grades on the whole morphology criteria gives a general compatibility. It is the same for the gaits, the jumping technique and the temperament on which the breeder scored his mare.

RELIABILITY

More the parent's criteria are close, more the Gauss curve will be narrow and pointed, closer the foal grade will be to the median of this curve. For example, for two parents measuring 1m65, the size of the foal will be distributed according to a Gauss curve centered on 1m65. The same applies if the father measures 1m75 and the mother 1m55! The probability of having an adult of exactly 1m65 is more important in the first case. This precision, measured by the form of the Gauss curves, results in a note of total reliability of the probable result.



4 Advices

STRENGTHS AND WEAKNESSES

Once the completed characterization of your mare, take the time to think about:

- Which are, on the evaluated criteria, those which seem to be the mare's strength, that I want to see consolidated by the sire.
- Which are, on the evaluated criteria, those which seem to me to be the mare's weaknesses that I want to correct through the crossing choice.

B) QUESTIONING

You have many possibilities to question the PAX graphic program:

- You can question it on the whole range of sires or a restricted choice selected by yourself in the list.
- You can also question it with the whole criteria on which you noted the mare, or on a reduced choice of criteria.

To learn a maximum from the program, it is useful to question it several times. If you have already few sires in your mind, it will then be necessary to restrict your interrogation with the list of sires by extracting them from the list. You can then question the program on the whole criteria which you noted then to start again by noting only the "strengths" and finally by noting only the "weaknesses".

The sire which would be in the three cases among the best will be most relevant. You then must, for these sires, look in detail the graphic restitution for each criterion to finalize your choice.

If you do not have any idea on the sire choice, it is to better to look at the list of the proposed sires on the only basis of the strong points then on the only basis of the weak points. You would need to extend your research to the whole criteria for the stallion retained resulting from the first two results.

In both cases, the detailed analysis of the graphics for the whole criteria is strongly recommended before the final choice.

THE INDIVIDUAL ACCOUNT

he Pax Graphic can be used without creating an account, you will then have a direct result after the characterization of your mare, but this one will not be registered. Creating an account makes possible to save the mares' data like returning above to refine the characterization if needed. Your logins will give you access to your mares and also to use the reversed Pax.

The screenshot shows the PAX website interface. At the top is the PAX logo, which consists of the letters 'PAX' in a stylized font with a globe icon. Below the logo, the text reads 'WELCOME TO THE PAX' and 'TEST YOUR MARES COMPATIBILITIES WITH OUR STALLIONS THANKS TO OUR CROSSBREEDING ASSISTANT'. There are three main buttons: a gold button labeled 'TEST THE PAX GRAPHIC (NO LOGIN REQUIRED)', a dark grey button labeled 'CREATE AN ACCOUNT IT'S FREE', and another dark grey button labeled 'LOG IN (ACCESS TO MY MARES REQUIRES AN ACCOUNT)'. Below the 'CREATE AN ACCOUNT' button, there are input fields for 'Your email' and 'Your password', each with a placeholder text. A link for 'Lost your password?' is located to the right of the password field.

THE REVERSED PAX

The reversed PAX can be used after an account creation, when it has more than one registered mare.

After having created your account and having stored the whole notations of your mares, you can question the program with the reversed PAX indicating a sire while asking the algorithm to classify the mares by order of compatibility or reliability with this given sire. It will tell you which one of your mares is the most compatible/ reliable with the chosen sire.

You will always have the possibility to check all the graphics for each crossing.

Ejemplo de interpretación gráfica

Una Yegua con Amant du Château

MY MARE

REVERSE PAX

Delete all the selected mares

<input type="checkbox"/>	Name of the mare	Mother	Father	father of mother	Age		
<input type="checkbox"/>	REBELLION SPECIAL	DOLAR DELA PIERRE	LIBERTINE DU REVERDY	ORNALETTA	15		
<input type="checkbox"/>	SPILLINGS	ALONK 2	REKUND 2	REBEL H 2	9		
<input type="checkbox"/>	SPARKLING	BALOU DU ROUET	EXX	CHARICI	9		
<input type="checkbox"/>	BURNING LOVE	TRIE LOVE	CAUZ 2	CARDOR 2	9		
<input type="checkbox"/>	COEUR DES NORMES	SARLE	WAXA	XXX	9		
<input type="checkbox"/>	FLIPPY DAYS	NUMERO UNO	AMAZON 2	ALBERTUS 2	3		

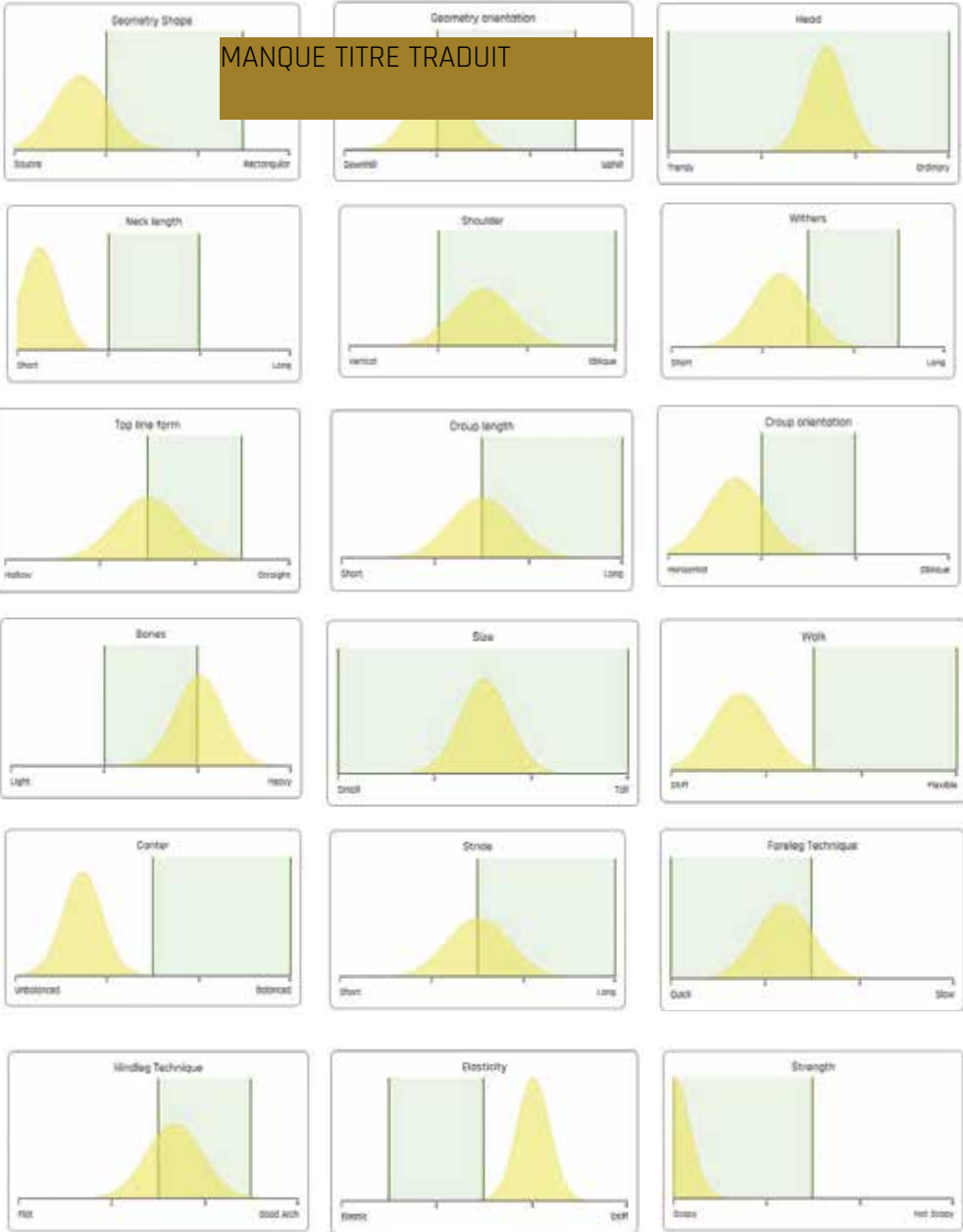
PAX PAX GRAPHIC

Select 1 to 2 stallions

AM JORDAN'S'FE	ORION -
ALL STARS -	RAIDROCK 2 -
AMANT DU CHATEAU'S'FE	HERALD RY'DGE
BALOU DU ROUET -	IDEAL DE CA LOISE
BALOUSSIN	KAMMAN'S'FE
BISQUET BALOU C VO MISPEL'S'FE	KRAQUE BOOM
CALVARD'S'FE	LAUTERBACH
CANDY DE NANTUEL'S'FE	LUX 2
CARAMBOL -	MITTENDER -
CABALL -	NORMAN PEE NEE
CATOG -	NUMERO UNO
CHAZZLY	ORAWOOD
CHACON BLUE -	PETRUS DE BRANDESEM'S'FE
DCAVE DU TAURIN'S'FE	PEZTAS DU ROUET'S'FE

GENE COMPATIBILITY

Name of the mare	Father	Total		Microbiome		Data and jumping technique		Others		Detail
		C	F	C	F	C	F	C	F	
<input type="checkbox"/> rebellion special	dolar delo pierre	79.24	0.87	76.21	0.80	89.3	0.75	60.70	0.85	Detail
<input type="checkbox"/> burning love	trie love	76.97	0.84	76.07	0.84	NC	NC	NC	NC	Detail
<input type="checkbox"/> coeur des normes	sarle	73.64	0.89	74.82	0.80	76.90	0.72	62.3	0.80	Detail
<input type="checkbox"/> spallonia	shock 2	72.46	0.85	74.46	0.86	58.4	0.78	NC	NC	Detail
<input type="checkbox"/> flippy days	amazon au rieur	72.28	0.86	72.57	0.86	66.9	0.85	NC	NC	Detail



Breeders have the possibility to see graphics in detail for each crossing. It's also possible for the breeder to add a mare's photo and to print the complete characterization.

DISCUSSION

The program gives a global compatibility of 42% and a reliability of 0.72. There is a weak compatibility for the morphology, gaits and jumping technique. This is an example of a rather non-compatible crossing.

AMANT DU CHATEAU*GFE

Morphology 52.62 (0.69)

Gaits and jumping technique 35.18 (0.72)

Others 57.71 (0.73)

Either a total compatibility of 48.61 (0.70)

The shoulder angle, the neck length, the croup orientation are the most problematic problems. The walk, foreleg technique and elasticity are also probable weakness for the future foal.

The strength, braveness, bones have a very good complementarity.

LIMITS OF THE SYSTEM

The differences between the notes of compatibilities and/or reliability of several sires for a crossing with a given mare are sometimes small and not very significant. Beyond the detailed analysis of the graphic restitution by criterion, the breeder has many other tools, because the PAX does not consider several significant factors in a crossbreeding choice:

- Pedigree of the parents
- Age and results of the parents and their production
- Coat color
- Fertility
- Pregnancy fee
- Feeling of the breeder.

All these criteria can be considered to select the sire's list for which the graphic PAX will be questioned and/or to choose in the final list after successive interrogations.



CONCLUSION

If the Pax Graphic is not an exact science to choose a sire, it is a valuable tool which invites to the reflection and which help the breeder in the crossing approach. It results from the experience of the GFE experts and the results of the most recent work to evolve and be increasingly more relevant. The notes of the standards evolve as one can observe their production and better quantify what they transmit. The Pax Graphic is an evolutionary tool which testifies to the will of the GFE to be transparent, demanding and powerful to propose to the breeders a choice of quality and to help them to be directed in this abundant offer.

TABLEAU FAUX CAR MANQUE LES TITRES

MEASUREMENT CALCULATIONS

Critério	Calculo	Resultado	Morfología	Nota PAX
Geometry shape	Length/ Height	<0.96	Square	1
		0.96 à 1.03	Rather squared	2
		1.03 à 1.10	Rather rectangular	3
		>1.10	Rectangular	4
Geometry Orientation	≠ Size at withers and sacrum	>3cm	Downhill	1
		3cm à 0	Rather Downhill	2
		0 à -3cm	Rather Uphill	3
		>-3cm	Uphill	4
Head	Visual appreciation	Expressive	Good nostrils	Large ears
		Good throat	Elegancy	Good eyes
Neck Length	≠ neck length and back length	< 7cm	Short	1
		-7 à 0cm	Rather Short	2
		0 à -7cm	Rather Long	3
		>7cm	Long	4
Shoulder	Scapula angle with the vertical	<30°	Vertical	1
		30 à 35°	Rather vertical	2
		35 à 40°	Rather Oblique	3
		>40°	Oblique	4
Withers	Distance T4 (top withers) to T9 (base withers)	< 12cm	Short	1
		12 à 17cm	Rather Short	2
		17 à 22cm	Rather Long	3
		>22cm	Long	4
Top line form	Visual appreciation	Base of the withers to the tip of the sacrum	Hollow	
			Straight	
Croup length	Pelvis length / Size to sacrum	<27%	Short	1
		27 à 31%	Rather Short	2
		31 à 35%	Rather Long	3
		>35%	Long	4
Croup orientation	Angle Pelvis and horizontal	<21%	Horizontal	1
		21 à 27%	Rather horizontal	2
		27 à 33%	Rather oblique	3
		>33%	Oblique	4
Bones	Visual appreciation	Without break	Good fetlocks and good Knees	Good dry Hocks
Size	Size at withers	<1m60	Small	1
		1m60 à 1m67	Medium - Small	2
		1m67 à 1m72	Medium Tall	3
		>1m72	Tall	4
Walk	Amplitude and flexibility of the walk	Hind footprint behind front footprint	Stiff	1
		Hind footprint covers front footprint	Rather Stiff	2
		Hind footprint ahead of front footprint 0-10cm	Rather Flexible	3
		Hind footprint ahead of front footprint >10cm	Flexible	4

ENTRY FORM

Owner	
Email	
Mare	
Identification number	
Sire	
Dam x Dam' Sire	
Birth Year	

	Measures	Grade	
Total Length			Geometry (R/S)
Height at the Withers			
Height at the top of croup			Orientation (M/D)
Neck Length			Neck (L/S)
Back Length			
Shoulder Angle			Shoulder (O/V)
Length of the withers			Withers (L/S)
Croup Length			Croup (L/S)
Croup angle			Croup (O/H)
Height at the Withers			Size

		1	1,5	2	2,5	3	3,5	4	
Head	Chic								Ordinary
Back line	Creux								Straight
Frame	Légère								Heavy
Walk	Rigide								Flexible
Canter	Sur nez								Balanced
Canter	Court								Long
Foreleg technic	Quick								Slow
Hindleg technic	Flat								Good Arch
Elasticity	Elastic								Stiff
Strenght	A Lot								Not Scopy
Blood	A Little								A Lot
Bravery	Brave								Timid
Respect	Careful								Not careful



Untouchable 27

Sire : Hors la Loi II

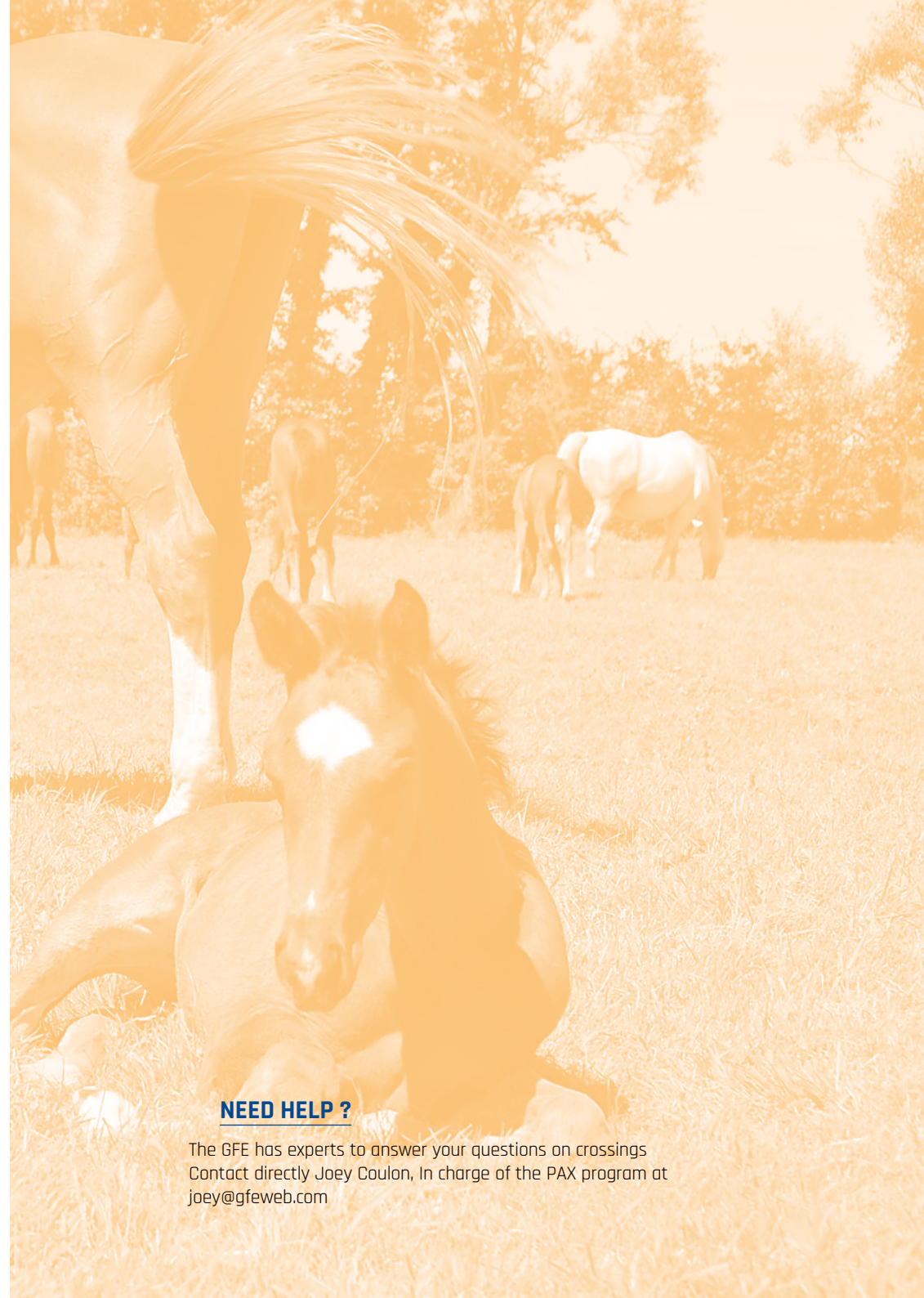
Dam : Promesse

Dam Sire : Heartbreaker



This description takes in consideration the proper characterization of the Sire. It's also adapted according to his offspring, so it can change.

2020



NEED HELP ?

The GFE has experts to answer your questions on crossings
Contact directly Joey Coulon, In charge of the PAX program at
joey@gfeweb.com

EASY



EFFECTIVE



SIMPLE



@PAXGRAPHIQUE

USER MANUAL