Thesis 1

The Horses Natural Balance Mechanism

And The Effects Forelimb Misalignment

And Fore Feet Imbalance

Have Upon It

MC Jones

THE HORSES NATURAL BALANCE MECHANISM AND THE EFFECTS FORELIMB MISALIGNMENT AND FORE FEET IMBALANCE HAVE UPON IT.

1. Opinions have been expressed regarding lateral medial hoof capsule imbalance related to poor farriery, limb misalignment and clinical changes within the limbs and hoof capsules.

2. A point which seems not to be considered are the effects of forelimb misalignment and fore feet imbalance on the horses natural balance mechanism and what acts of farriery can best be applied to assist or improve a horses natural balance mechanism. This natural balance mechanism is brought about by the non bony union between the shoulder and the trunk of the horse. The trunk and shoulders are bound together by means of muscle and ligaments. This construction allows the scapulae to move upon the ribs and the trunk to move about between the scapulaes. This movement is vital because a horses spine is almost rigid and this action enables the horse to maintain its balance when worked at speed, cornering and moving over uneven terrain.

3. The movement which enable the horse to maintain its natural balance is the adduction of the forelimb which is supporting the greater weight and the abduction of the forelimb bearing the lesser weight.

4. The formation of the forelimbs are column like so that they can hold up a vast proportion of the horses body weight. Ideally when viewed from the front the forelimbs should conform and a straight line should be able to be drawn vertically downwards dividing the knee through the centre and continuing through the centre of the fetlock, pastern and hoof. Viewed from the side the principles are similar because a line dropped from the point of shoulder should divide the knee and fetlock centrally. However to indicate the hoof pastern axis a line is taken from the centre of the fetlock through the centre of the pastern and hoof to the ground, this should produce an angle of 50-55°. A horse with the fore leg conformation mentioned should naturally be well balanced and will indicate this by wearing its shoes evenly and uninterruptedly, using all its limbs in order that the foot related to anyone of them could be placed at the horses will upon the precise spot to ensure the best possible support for its moving body. A horse that is unbalanced will wear its shoes irregularly and move its limbs away from a set pattern impeding its natural balance mechanism.

5. Young horses that are unridden naturally learn to co-ordinate and balance their body and limbs. When burdened with a rider the young horse has to be taught, through progressive training, to rebalance its self to accommodate the increase in weight. Young horses, when under training, frequently lose their balance when changing direction or pace due to too little or too much impulsion. (IMPULSION - ENERGY ASKED FOR BY THE RIDER.) A horse that is balanced will distribute its own weight and that of its rider in such away that it can function with maximum ease and efficiency.

6. Factors which will affect the balance of the horse whether it be young or old are:

a. Impulsion: Impulsion is energy supplied by the horse and asked for and controlled by the rider

b. Rhythm: Rhythm is the regularity and evenness of the hoof beat. At all times a horse must maintain its rhythm, this is achieved by the horse maintaining its balance and if ridden, by the rider being aware of the slightest alteration and making the necessary adjustment to either the speed or impulsion.

c. Tempo: Tempo is the speed of the rhythm. The tempo of each pace should remain the same. A horses tempo is maintained when it stays in balance. This is achieved by the rider's careful adjustment of speed, impulsion and correct farriery procedures.

d. Balance Mechanism at Slow Walk: Initially, when moving off, the horse effects forelimb movement by transferring its centre of gravity slightly backwards. Upon transfer of weight the forelimb can move upwards and forwards allowing the foot to be lifted from the ground. After the limb has sufficiently moved forward the foot will be brought back on the ground permitting the horses body to pass over the limb and foot. While carrying out this movement the horse sustains its balance at the slow walk by leaving three feet on the ground while the fourth is suspended in the air. This indicates that the horses centre of gravity is located in the middle region of the triangle formed from the three feet remaining on the ground and because of this three point balance mechanism the limb and foot that is in flight should move straight and be balanced in accordance with the body movements.

e. Balance Mechanism at Extended Walk: During the slow walk the horse is supported by a three point balance mechanism, as the speed of the walk is increased the frequency of the horse's limb movement increases, indicating that the pattern for a faster walk requires that each foot is lifted before the foot following it in sequence actually makes contact with the ground. Subsequently the three point balance mechanism has to give way to a situation at times when the horse adopts a two point balance mechanism. As a vast proportion of the horse's body weight is already distributed over its forelimbs, the adoption of the two point balance mechanism will only further increase this mass of weight, resulting in the horse's body rolling and moving slightly forward creating a sequence of instability in the limb movement because clearly only two feet on the same side of the horse's body are on the ground.

f. Balance Mechanism at Trot: Upon the horse changing its gait from walk to trot there is a carry over of the two point balance mechanism and the sequence of instability. The important factor being that two supporting feet are diagonals. Trotting at a fully synchronised pace, a forelimb and its diagonal hindlimb should work together to drive the body forwards. When the speed of the trot increases the tendency is for only one foot to be on the ground at any one time which will affect the horse's natural balance.

g. Balance Mechanism at Canter: The Canter is more or less a slow gallop. However in the gallop there is an alternation between both front feet and both hind feet, whereas in the canter the lateral support phase is still in evidence and the first front foot fall tends to coincide with the last hind foot fall, creating a moment of suspension.

7. To determine whether horses' natural balance mechanism is affected (ADDUCTION and ABDUCTION of its forelimbs) by limb misalignment and hoof imbalance, the factors mentioned have to be considered along with the information gathered from observing the horses at rest, walking and working and how this information could be utilised to correct or improve the horses natural balance mechanism should it be impeded.

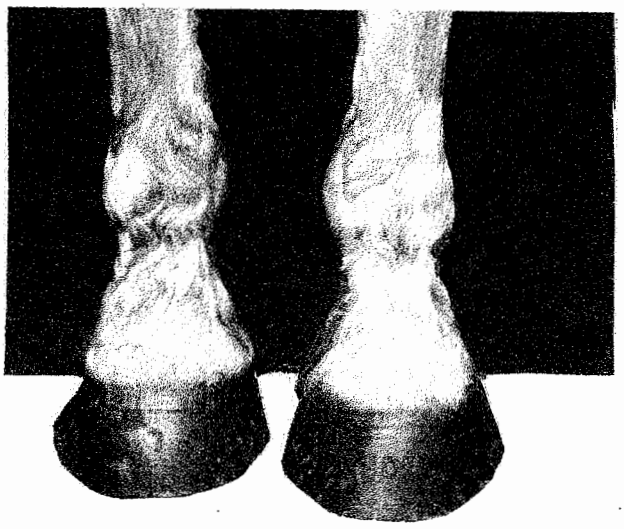
8. The information gathered on the two cases during the essential period of observation of the moving and standing horses, highlighted the forelimb misalignment, fore feet imbalance and the effect the faults caused to the horses natural balance mechanism. Collation of the facts gathered on these two horses determined the principles and methods of shoeing which were employed to benefit the horses long term and assist in improving the animal's natural balance mechanism.

9. CHARACTERISTICS OF CAUSE OF IMPEDIMENT TO HORSES' NATURAL BALANCE MECHANISM

a. Case No 1.

(1) Horse's Regimental No : 7109
Name : JEOPARDY
Colour : GREY
Classification : RIDER
Age/Height : 10 yrs. 16. h

(2) Forelimb Conformation Description: Base narrow, toe-in conformation. Broken back pastern axis Misalignment of large metacarpals. (Off set knees).



(3) Hoof Conformation: Wry, lateral and medial sides having different lengths and slopes.

(4) Horse's Gait:
The movement pattern of the animal's fore feet was towards the inside (winging-in). Breakover and footfall was inclined to be towards outside, toe quarter.

(5) Annex A: Identifies the faults the equitation instructor found when testing 7109 JEOPARDY for the first time.

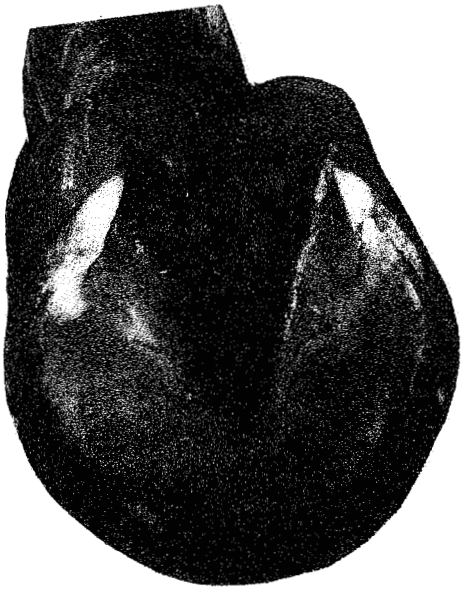
(6) Cause of Imbalance: The impediment to the horse's natural balance mechanism is attributed in this case to the misalignment of the carpus and metacarpus and toe-in conformation. This particular fault interfered with the adduction movement of the forelimbs but exaggerated the abduction phase of movement creating a sequence of instability when turning and circling.

(7) Treatment:

(a) FOOT PREPARATION - Due to the lateral, medial fore feet imbalance and limb misalignment the ground surfaces of 7109 JEOPARDY's fore feet were trimmed to correspond as safely as possible to the horse's true foot and pastern axis. The high medial aspect of the ground surfaces were reduced and any abnormal toe growth and flair were removed from the outside wall.

(b) To dress JEOPARDY's fore feet in union with the foot fall would only cause greater stress to the lateral aspect of the Carpal and Fetlock joints and also the angulation of the joint surfaces would change, causing compression of the medial aspects. Attached at Annex B are Xrays of the carpal joint showing misalignment.

(c) SHOEING - It was decided that as the horse required heel support and the breakover had to be improved in order that an improvement to the horse's natural balance mechanism could be achieved a pair of squared toed egg bar shoes were applied. These shoes would give the required heel support and also change the heels point of ground contact and the squared toe would facilitate easy breakover.



(d) The use of lateral toe extension bar shoes was considered but it was deemed that they would be too severe in that they force the foot to breakover to the centre thereby causing more trauma to the already stressed region of the animals's fore feet.

(8) Prognosis: 7109 JEOPARDY's forelimb movement pattern became cleaner. The winging in fault became less apparent and the horse's natural balance mechanism was improved.

(9) The improvement to the horse's gait and natural balance mechanism were achieved by evenly distributing over its fore feet the body weight they have to carry and the application of squared toed egg bar shoes. These shoes assisted the horse to breakover toward the centre, which in turn reduced the work and stress the flexor support structures had to carry out.

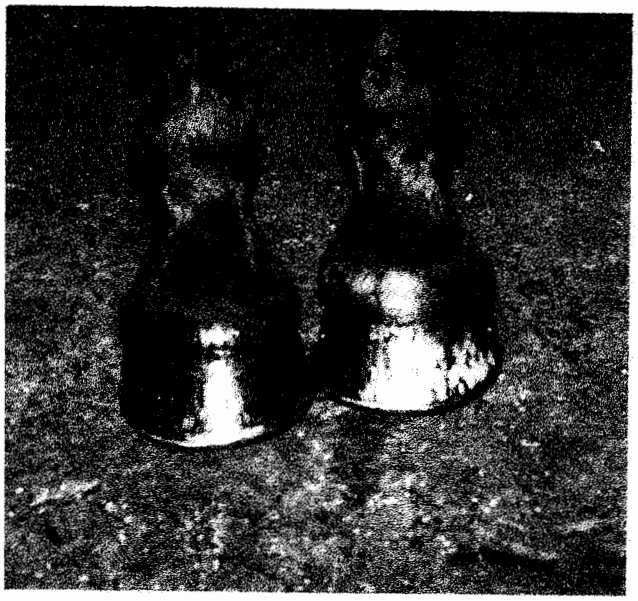
(10) Since the egg bar extends past the flexor region it improves the horse's foot pastern axis by providing additional support and increasing the ground surface area of contact which dissipates the compressive forces over a larger area. This establishes a state of equilibrium between hoof, limb and the animal's natural balance mechanism.

(11) Attached at Annex C is the second work test report by the equitation instructor stating the improvements he found in 7109 JEOPARDY.

10. CHARACTERISTICS OF CAUSE OF IMPEDIMENT TO HORSES' NATURAL BALANCE MECHANISM

a. Case No 2.

(1) Horse's Regimental No : 7167
Name : LUCAN
Colour : BAY
Classification : RIDER
Age/Height : 10 yrs. 16.0hh
Work : Riding School and Winter Training



(2) Forelimb Conformation Description: Base narrow, toe-in conformation. Pastern foot axis upright. Misalignment of large fetlock joints.

(3) Hoof Conformation: Lateral and medial sides of fore feet have different lengths and slopes.

(4) Hooff Condition and Growth Rate: Good.

(5) Horse's Gait: The movement pattern of the animal's fore feet was short and choppy and towards the inside, landing in front of the opposite foot (plaiting). Breakover and footfall was inclined to be towards outside toe to quarter.

(6) Annex D: Identifies the initial problems encountered by the equitation instructor when work testing 7167 LUCAN.

(7) Cause of Imbalance: The misalignment of the metacarpo-phalangeal articulation (Fetlock Joint), toe-in conformation and plaiting foot flight pattern caused the impediment to the horse's natural balance mechanism. The decisive factor which exacerbated the imbalance in the horse's gait was the plaiting movement of its forelimbs. This caused the horse to place one fore foot directly in front of the other. Since this movement can produce interference from the advancing forelimb hitting the limb placed in front of it the horse adopts a higher stepping action with its forelimbs in order that the advancing leg will clear/avoid the leg before it. This higher stepping action creates the choppy movement which causes the shortening of the horse's length of stride. Combined with the limb and fore feet misalignment the horse is unable to cleanly abduct its forelimbs when initiating and completing turns.

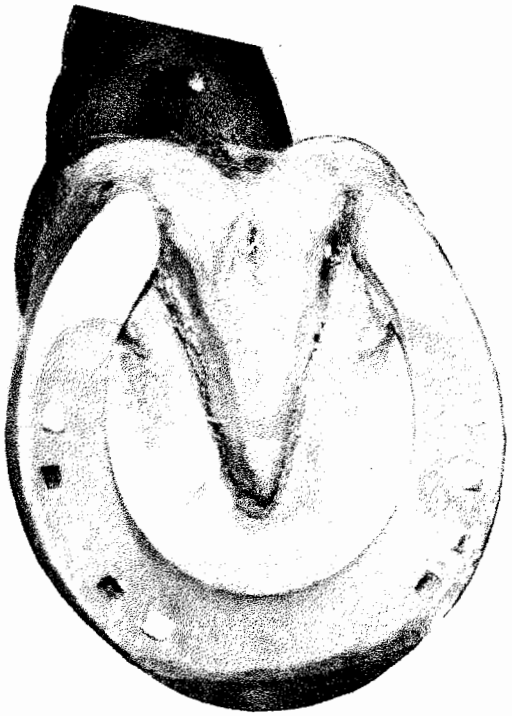
(8) Comparison of Limb Misalignment: Visual comparison of the limb misalignment of Case 1 and 2 indicated that the degree of misalignment of Case 2 was more severe.

(9) Treatment:

(a) FOOT PREPARATION - On account of 7167 LUCAN's foot pastern axis being upright, its suspensory, tendon and ligament apparatus should be less taxed, however this throws the horse's weight directly onto the bones and joints, consequently the impact and trauma to the forelimb is exacerbated. To alleviate the compressive forces from the bones and joints the levelling and bringing the ground surfaces of the fore feet to the necessary length - equal in both sides from toe to heel and justly proportioned the depth at the toe and heel were crucial to enable the distribution of the stress and concussive forces more effectively over the whole of the forelimb.

(b) Attached at Annex E are Xrays of the fetlock and pastern joints indicating misalignment.

(c) SHOEING - To dissipate the compressive forces over a larger area, improve the horses length of stride, natural balance and afford a firm foot hold on the ground the shoes that were applied to 7167 LUCAN had the ground surface seated out, interfering as little as possible with their resistance to wear. By seating out the ground surface of the shoes so that they imitated nature by copying the concavity of the sole would reduce the suction encountered in heavy going, also the soles would be well supported, as well as the wall, by the wider surface of metal above, while the narrow rimmed surface toward the ground affords security of grip. At the toe of the shoe the cover gained by seating out was broader than the heels, the toe was rolled to promote an advancement in breakover. The outside border of the shoes were safed off to ensure that if any interference did occur injury would be minimal. The foot surface of the shoes were flat and the web of the shoes gradually narrowed towards the heels where a broader rim is formed to correspond with the foot surface. The heels of the shoes were fitted to give modest cover so that they do not present a surface to be trodden upon.



(10) Prognosis: The improvement to 7167 LUCAN's initial forelimb movement pattern was sufficient. Whereas before the horse placed one fore foot directly in front of the other (plaiting), it now enables the horse to place its advancing forefoot slightly abaxial of the fore foot before it.

(11) In achieving this improvement to the horse's forelimb movement the animal was able to lengthen its stride thereby reducing the choppy action of its forelimbs, dissipate the compressive forces over a larger area, reduce the possibility of forelimb interference and affect substantial abduction movement when commencing and finishing turns.

(12) Annex F identifies the improvements the equitation instructor found when he carried out the second work test on 7167 LUCAN.

ANNEX A

REPORT ON 7109 JEAPARDY

AGE: 10
SEX: G
COLOUR: Grey
JOB: Riding School

First impressions of the ride this horse gives is that of an active horse who comes up at you from the wither as opposed to going forward smoothly.

In his basic paces walk, trot and canter he has very deliberate footfalls and puts much energy in placing his feet. He has an even rhythm in all paces. He feels quite straight and looks that way too when working up the centre line for instance. Most of the time he is much on the forehand and lacks engagement.

Through turns and circles he tends to lose balance, his weight definately going through his outside shoulder. Instead of going forward through the turn he tends to come up and back at the rider.

In canter he has little flexability in his hocks and more or less hops with his outside hock on a circle.

He moves laterally well in all paces showing only sufficient crossing over.

He does not lengthen his stride that well but does attempt too. He appears restricted in his shoulder to go through with the complete movement.

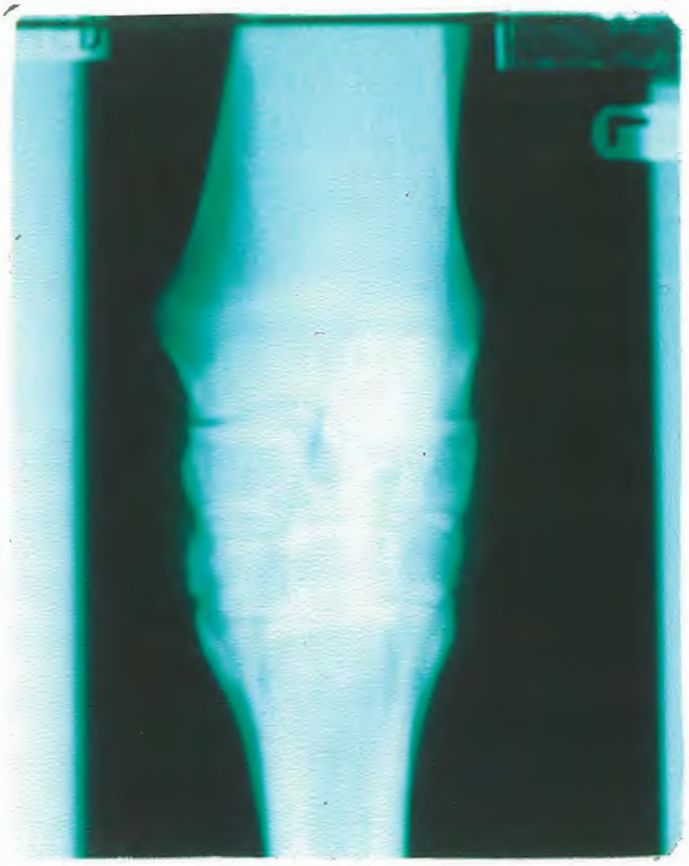
The horse is very much the same on the soft as the hard surfaces although due to his very deliberate action it feels alot more energetic on the hard. The problems highlighted are felt due to his age and his work, that of a riding school horse. This would indicate he has been restricted due to ride work and much of his forwardness has been held back and he has come up in his action. Due to an assortment of riders of varying ability would mean he has not followed a progressive training curve. With work and suppling exercises this horse improves.

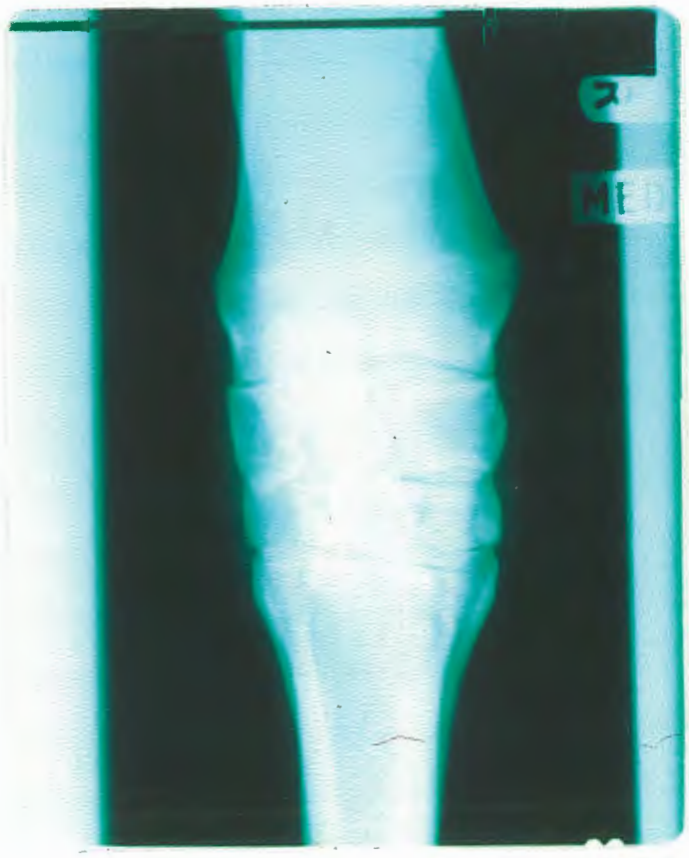
Jeapardy is an ideal trained horse for the Army School of Equitation being average at everything and capable of being ridden by beginners as as well as advanced riders.

13 June 1993

RT Lyne

ANNEX B





ANNEX C

DEFENCE ANIMAL CENTRE

Welby Lane Camp
Melton Mowbray
Leicestershire
LE13 0SL

Tel : 0664 63281
Chilwell Military Ext...8674
Fax: 0664 410694

Please reply to Melton Mowbray

Royal Air Force
Newton
Nottinghamshire
NG13 8HL

Tel : 0949 20771
RAF Newton Ext .....
Fax: RAF Newton Ext 7480

WORK REPORT ON ARMY HORSE 7109 JEOPARDY

After riding this horse I found improvement in the following areas:

The horse has more freedom in all paces. As opposed to a choppy action before, he now has more length of stride. The footfalls are lighter and he works with more of an elastic feel. This in turn has improved his turns and circles, possibly because the hind legs are more engaged.

The most marked improvement is in the pace of canter where the outside hind is coming through as opposed previously when it marked time.

17 November 1993

R T LYNE
WO2

ANNEX D

ARMY HORSE 7167 - LUCAN
RIDING REPORT - 1 & 2 JULY 1993

I rode Lucan, Army Horse 7167 and found him to be quite short in his action. In particular, when the horse was worked in trot on the right diagonal, his left hind leg did not engage well. This was probably due to uneven work being done on both diagonals, resulting in a different muscle build up.

It was found that work on circles caused the horse to shorten in his action during the first few strides of the circle on both reins and especially in the pace of trot.

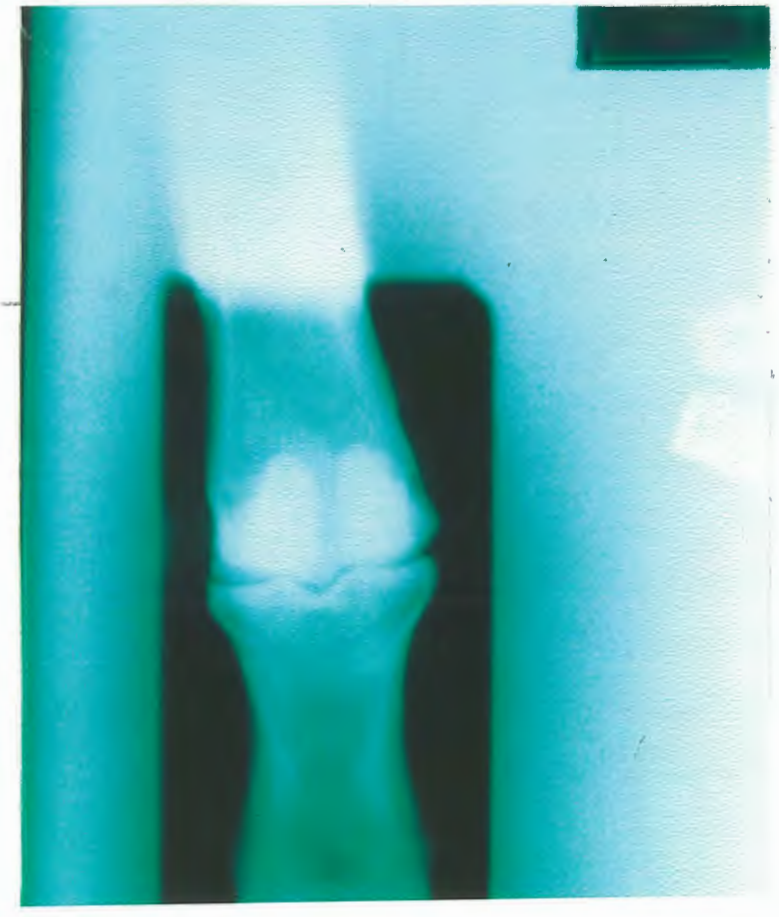
Also on completion of a circle, when the horse was asked to go straight, he shortened his strides for the first few yards until his balance had been established.

His trot work generally was very short in ground covering even when the horse was asked for some lengthening in outline and stride.

8 July 1993

C Haywood
WO2

ANNEX E



ANNEX F

ARMY HORSE 7167 - LUCAN
RIDING REPORT - 3 DECEMBER 1993

I rode Lucan, the abovenamed Army horse and found a marked improvement in the length of his action. When worked in trot or the right diagonal the left hind leg was found to be equal in engagement to the right hind.

The strides of this horse had noticeably improved in length when asked to go straight, on completion of a circle.

The work in trot on a circle also covered more ground than on 1 & 2 July 1993.

Generally the balance and length of his stride has improved since 1 & 2 July 1993.

3 December 1993

C Haywood.
WO2

11. CONCLUSION

a. The identification by the two equitation instructors of the defects they found with the two horses while carrying out the work tests verified that forelimb misalignment and fore feet imbalance cause functional disorders to the horses arc of foot flight and their natural balance mechanism.

b. The structural condition of the horse's limbs and feet are the key to its progressive usefulness. It is realized that faulty gait in mature horses can rarely be totally corrected but with time and persistence and the employment of sound trimming and shoeing principles, modification and improvement to the gait can be achieved allowing the horse to reach its full potential.

c. It is the unbalanced horse which swerves away from the straight course. Envisage a horse in motion and balanced, its body supported in safe equilibrium by four limbs at what ever pace the horse is travelling, whether it be moving over the ground or being propelled through the air. The state of equilibrium must be maintained between the horse's body and limbs so at no time is there a danger of the horse overbalancing in any direction to interfere with efficient performance, even when the body is tilted over one or the other side, as it may well be when the horse is negotiating a turn at speed.