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Mr. Rob Foster
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Dear Rob;

The following is a summary of my conclusions derived from my examination of the stall at Calumet Farm where Alydar sustained his life ending injury and of the floor sample from the barn floor sent to me by the FBI laboratory.

An explanation of the cause of Alydar's injury was presented in the trial transcripts. It is suggested there that he kicked the stall door with such a force that it broke off a steel bracket bolted into the cement floor outside the stall. The bracket houses a roller against which the aisle side of the door moves as it slides back and forth on opening and closing. The roller also prevents the door from moving outward from the stall. This is a heavy bracket fashioned from steel strips of approximately 3/8 ths inch thickness and two inches wide. Two 3/8 ths inch diameter steel bolts were used to fasten it into the cement floor. One end of each bolt was anchored in the cement. The other end of each bolt would have extended above the cement floor for approximately one and one half inches; first, so as to pass through a rubberized mat that covered the floor of the aisle outside the stall, second, so as to pass through the steel retaining bracket, and third, so as to provide a threaded end so that a nut could be threaded onto it to hold the bracket against the mat covering the floor.

It was claimed that this bracket was torn out of the floor by the force of Alydar's kick. This permitted the stall door to move outward from the stall thereby opening a gap between the dislodged door and the wall of the stall. It is further suggested that Alydar caught his leg in that gap and was unable to pull his right rear leg back into the stall. In his struggle to get free, Alydar is supposed to have broken his leg. This occurred about 10

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pm in the evening of November 13, 1990.

The same night that the injured horse was discovered, an insurance adjuster took photographs of the bracket which he had discovered in the aisle outside of the stall. Those photographs show the upper portions of the broken bolts which were still attached to the bracket. One bolt showed the clear signs of having been sheared off and the other showed signs of heavy corrosion as if it had been broken off rather than having been sheared. The bottom part of each bolt which remained in the cement floor would have to match the upper parts of the bolts still attached to the bracket. Thus there should be one sheared off bolt extending out from the cement floor. The other bolt was very heavily corroded and it appeared as though it had more crumbled than sheared. It was very short which would indicate that the part of the bolt remaining in the cement would stick up somewhat further above the cement floor than the sheared bolt. The photograph suggests two separate mechanisms of bolt failure, shear and corrosion.

However, the old bolts that now remain in the cement floor sample as I received it do not correspond to the pictures taken by the insurance agent the evening of the event. If it is true that the original bolts in the cement were never disturbed and new bolts were simply installed next to the old bolts, then the broken bolts shown in the adjuster's pictures could not have been the upper portions of the bolts that now extend from the cement floor sample.

Both bolts still in the cement extend close to 3/16ths of an inch above the cement. This is not at all compatible with the photographs. To further discuss the condition of the bolts still in the cement a set of directional coordinates is now defined. Looking in from the aisle towards the stall door, let the door be at 12 o'clock and the aisle at 6 o'clock.

The right hand bolt, facing the door, is clearly bent towards 11 o'clock, ie almost towards the door. Its surface is sloped downward and towards 11 o'clock and there is a "lip" of metal that was pushed off the top surface of the bolt by a shearing force. That lip is at 11 o'clock, again towards the door. If the bolt had been sheared by the door pushing outward due to a force coming from inside the stall, then the bolt would have been bent towards 6 o'clock and the lip would be at 6 o'clock. The right hand bolt could not possibly have been sheared off by a force coming from inside the stall.

The left hand bolt does not show as pronounced a bend but there is a lip of metal at 2 o'clock, not at 6 o'clock where it would be from a shear force coming from the door. The left hand bolt could not have been sheared off by the door pushing outward.

In addition I used a small magnet to probe the area in the floor sample where the old bolts protruded from the cement. I was able to gather some metallic dust like particles and a few metallic flakes. This material would be consistent with the debris that would be created by a cutting operation on the embedded bolts but not with a shearing of those bolts. On the top surface of the embedded bolts there was a slight depression that would be consistent with the mark left by a drill. A common method of removing bolts embedded in cement is to drill a pilot hole axially down into the protruding bolt. Then guided by the pilot hole, a larger diameter drill is used to drill out the body of the bolt. Finally, a chisel could be used to cut off any remaining portions of the bolt at the depth of the drill hole. A bolt removal method of this nature would explain why the remaining stubs of both bolts were of the same length ie 3/16 ths of an inch and the metallic grains and flake. The bulk of the debris created in drilling and cutting must have been removed at some prior time leaving behind just this small residue.

I next considered the force necessary to shear off the bolt and used "Introduction to Structural Engineering; Analysis and Design" by John M. Biggs for the calculation, (see page 311, line 9). The **maximum** allowable load in shear on a 3/8 ths steel bolt is given by the expression:

$$F = [(\pi d^2)/4]*30000$$

where d is the diameter in inches. Substituting d = 0.375 one finds 3310 pounds for one bolt. Thus two bolts should sustain a maximum shearing force of 6620 pounds. However, the bracket is at floor level and outside of the extreme right hand side of the door. A violent kick could not be delivered at this point but would be higher up on the door and more towards the middle. One needs to know, therefore, with how much force must the horse strike the door at a point X,Y on its surface to deliver at least 6620 pounds to the lower right hand corner of the door. That calculation is included as an appendix to this letter. Taking the most probable points for the back hoofs to strike the door with maximum effectiveness for dislodging the bracket, one finds that the total force delivered against the door by the two back hoofs delivers just one half of that force against the lower right hand corner. Therefore, in order to deliver a 6600 pound force at the lower right hand corner of the stall door, Alydar would have had to strike the door with a force of 6600 pounds per leg. If a horse could develop such a force from his rear legs, he would be able to jump to a height of 12 feet. No horse has ever cleared such an enormous jump.

In view of the above calculation, it is my conclusion that Alydar could not have kicked the stall door with anything like the force that would have been required to shear off the steel bolts that retained the bracket holding the door.

Because of the total inconsistency between the photographs of the bolts in the retaining bracket and the bolts remaining in the cement floor and in view of the impossibly large force that Alydar would have had to kick the door to dislodge the retaining bracket, it is my conclusion that the stated explanation of how Alydar's leg became injured cannot be true. Moreover, the failure of the bolts in the photograph to match the bolts in the floor must mean that the bracket was prepared beforehand and placed in the aisle with the intention that it be found and serve as an explanation of how Alydar came to break his leg while confined to his stall.

I believe that before Alydar's injury the scene was prepared. First, the roller bracket was unbolted and removed. Then the original bolts were drilled out and trimmed off with a chisel or other cutting implement as close to the cement as possible. Next, two fake bolt ends, one half of a sheared bolt and the stub of a corroded bolt were attached to the bracket which was planted in the middle of the aisle where it was meant to be found and remarked upon. The original bolts had to be removed since otherwise these intact bolts would be sticking up out of the flooring by approximately three quarters of an inch. Their appearance would be completely incompatible with the bracket and the fake bolts which were fitted to it. By cutting off the bolts remaining in the cement, they became hidden below the rubberized flooring and it would be unlikely that anyone would check to see if those hidden bolt ends actually matched the bolt ends in the bracket. As soon as possible, that is within hours, after the discovery of Alydar's injury, a repair was made. New bolts were fastened into the cement and the bracket was re-bolted to the floor. In doing so, the ends of the original bolts became hidden underneath the rebolted bracket.

In addition, each stall has steel rings mounted in opposite walls which are used to cross tie the horse. This means of restraint is absolutely essential so that a horse can be attended to in a safe manner. Every stall in the barn had these fixtures except Alydar's. There was only one quite loose ring in one wall and there was no ring in the opposite wall. That wall had been plastered over and painted where a ring had previously been. Thus the stall as seen when visited could not be used to cross tie a horse as in all the other stalls. The loose ring and the missing ring suggest that some unusually large force pulled one of them out and loosened the other. It would be interesting to have an explanation for the missing cross tie ring and to know when the wall was repaired.

In my judgement Alydar was restrained in his stall, probably by the cross tie which he would be completely used to. A rope was placed around his right hind ankle and then passed into the aisle outside the stall through the steel bars in the door. The rope was used to pull Alydar's leg up and back towards the grill in the door. This could have been done by a vehicle in the aisle. A vehicle must have been in that aisle to deposit a piece of track grooming machinery which had been placed there. The presence of this track equipment was remarked on as having been very unusual. With Alydar's leg drawn out, up and behind him, he was probably thrown by knocking another leg out from underneath him. The twist and force of the falling animal was then used to break the leg. On leaving the scene, the pre-prepared roller bracket was left in the aisle to explain how it all happened.'

Sincerely;

G.W. Pratt

George W. Pratt

This is file Kick1.mcd

This is a calculation attempting to find the force on the lower right hand corner of a door subjected to a kick at a point X,Y with the origin taken at the lower left hand corner. Starting at the lower left corner of the door as seen from inside the stall looking at the door, the corners are numbered counterclockwise from #1 to #4. Thus corner #2 is the lower right hand corner outside of which is the retaining brackett/roller fixture.

Door height H, door width W. D2 equals distance from corner #2 to diagonal from corner #1 to #3. Dk(X,Y) is distance from point of a kick to that diagonal. Fkick is force of kick in pounds. F2(X,Y) is force at corner #2 due to a kick at point X,Y.

$H := 8$ $W := 4$ $\theta := \operatorname{atan}\left(\frac{H}{W}\right)$ $Fkick := 3300$

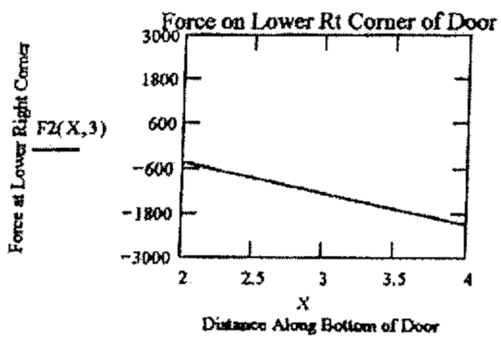
$\theta = 1.107$

$D2 := H \cdot \cos(\theta)$ $D4 := W \cdot \sin(\theta)$ $Dk(X,Y) := \left(\frac{H}{W} \cdot X - Y\right) \cdot \cos(\theta)$

$D2 = 3.578$ $D4 = 3.578$ $Dk(3,3) = 1.342$

Force at the lower right hand corner is F2(X,Y) from a kick at point X,Y.

$$F2(X,Y) := -\left[Fkick \cdot \frac{\left[\left(\frac{H}{W} \cdot X - Y\right) \cdot \cos(\theta) + D2 \cdot \left(\frac{X}{W} - \frac{Y}{H}\right)\right]}{(2 \cdot D2)}\right]$$



$$F2(3,3) = -1.238 \cdot 10^3$$

Here the kick is 3 ft from the left edge and 3 ft up from floor

$$F2(4,3) = -2.063 \cdot 10^3$$

Here the kick is 4 ft from the left edge and 3 ft up from floor

In order to produce 6600 pounds at the lower right hand corner kicking with both feet, and hitting at the points 4,3 and 3,3, the horse would have to have to kick with 6600 pounds per leg or 13,200 pounds total. If a horse could do that, then how high could he jump?

In jumping over fences a total 6000 pound force from the rear legs would produce a jump close to 6.25 feet in height. This is about the maximum in competition. Then 13,200 pounds would produce a jump of 11 feet which is impossible. The calculation is sketched below.

Mass of Horse: $\frac{1100}{32} = 34.375$

Takeoff velocity assuming a 6000 lb force for 0.1 sec = FxTime/Mass: $\frac{6000 \cdot .1}{34.375} = 17.455$ ft/sec

The center of mass would be raised by a height of $v^2/2g$: $\frac{(17.455)^2}{64} = 4.761$ ft

Because the horse tucks his legs up under him, he can clear a jump about 1.5 feet above the height to which he raises his center of mass. Adding 1.5 to 4.75 we get 6.25 feet

Height a horse could jump if it produced a 13,200 pound force $\frac{13200}{6000} \cdot 4.761 + 1.5 = 11.974$ ft