Appendix 17 – Biomechanical Analysis of Selected Race Horses

BIOMECHANICAL ANALYSIS OF SELECTED RACE HORSES

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This study is a follow-up to the study entitled "COMPUTERIZED BIOMECHANICAL ANALYSIS OF THOROUGHBRED RACING" of September 1980. In that initial project, biomechanical analysis was explained, and its application to the field of racehorse evaluation was demonstrated. Subsequent to that study, the horse that was selected as having superior potential based on biomechanical parameters proceeded to verify this method of evaluation by its excellent performance in actual races. The purpose of this second study is to apply the analytical methods developed for and described in the initial study, to additional horses, and to make Practical Recommendations regarding the potential and training of these horses.

RESULTS:

Four horses have been analyzed in this study: **Marionly**, **Gotham Hour**, **Gentle Knight,** and **Lt. Bert**. Film sequences were taken May 4 and 5, 1981, and were subsequently digitized and analyzed at both the Amherst and Coto laboratories of CBA. Two types of analyses are included in this study: *gait analysis*, which considers the foot-fall patterns

and timing during a full stride; and *kinematic* (motion) *analysis*, which considers the motion parameters of selected segments and joints within the body. Tables 1-6 show the results of the gait analysis on the four horses studied, as well as both **Spectacular Bid** and **Arkansas Bev** from the previous studs for comparison purposes. Figures 1-14 are graph representations of pertinent kinematic parameters for the four horses in this study.

DISCUSSION:

In considering the results of the gait analyses, **Spectacular Bid** (Table 5) is chosen as the model for comparison. **Bid's** stride length of almost 900 cm, and average velocity of over 2000 cm/sec, shows a clear superiority over **Lt. Bert** (Table 4), **Gotham Hour** (Table 2), and **Arkansas Bev** (Table 6). These latter three horses, however, when considered as a group, show the most similarity of the six horses in this study. All have a stride length between 720 and 750 cm, and a velocity between 1780 and 1865 cm/sec. Of the three, **Arkansas Bev** has the best gait pattern of the three due to longer stance phase (feet pushing against the ground longer), and a shorter suspension phase (time in the air). Because of this, **Bev** has the longest stride length and highest average velocity of this group. Conversely, **Gotham Hour** has the shortest stance phase, the longest suspension phase, and the lowest average velocity.

The two other horses in the study stand out as being remarkably different in the gait analysis. **Marionly** (Table 1) demonstrates the shortest stride length and the lowest average velocity of any horse in the studs (about 60X of our model, **Spectacular Bid**). Though probably lacking the genetic potential of the other horses, much of **Marionly's** problems arise through poor gait structure. An extremely short stance phase, and an