ANOMALIES WITH CONVENTIONAL BALL EXIT VELOCITY MEASUREMENTS

Cosine Effect

For accurate radar measurements, the principle of radar requires the transmit/receive radar vector to be in direct alignment with the velocity vector of the moving object, in this case the ball off the bat. Any mis-alignment of the two vectors creates an angle, the cosine of which reduces the magnitude of the EV speed reading . It is very difficult to assure the alignment of the radar vector with the three-dimensional flight vector of the ball off the bat, so the cosine effect can introduce inaccuracies in the EV measurements.

Ball In-Flight Deceleration Effect

To provide an opportunity for the radar vector to align with the ball velocity vector, the radar will often be positioned rearward from the batter in an attempt to align with the in-flight ball. Alignment can possibly occur some distance after the ball leaves the bat—perhaps after the ball has travelled 20 to 50 feet from the bat. Professor Adair, in his book "The Physics of Baseball" indicates that a baseball or softball (by telephone) will decelerate at a rate of about one mph for every 7 feet of flight. Environmental effects such as the air temperature, altitude, air density, etc. can vary the deceleration, but the point is that the distance from the bat will reduce the measured ball Exit Velocity, typically 3 to 7 mph.

Example of Erroneous BEV Measurements

As an example, suppose a player has a SS of 70 mph, a relatively efficient CF of 1.17 will produce an EV of 82 mph off the tee. However, if 2 mph is lost due to the cosine effect and another 5 mph due to the ball inflight deceleration, the resulting EV measurement will be only 75 mph, indicating a relatively inefficient swing producing a CF of only 1.07. This lower, erroneous CF can change the player's focus—or that of the instructor—on ways to

improve EV. Also, variations in how the EV measurements are made from one physical location to another, can affect the integrity of EV history data compiled for each player.

The Radar Tee™ will provide more consistent, accurate data by utilizing two radars appropriately spaced for SS and EV measurements of ball flights within the boundaries of the Exit Velocity radar field-of-view. Players can be trained to hit hard line drives through the FOV by focusing on increasing their swing speed and improving their swing efficiency.

Instructors understand swing mechanics qualitatively; however, the Radar Tee™ provides Conversion Factor data which is a quantitative measure of swing efficiency.