SPORTS SENSORS, INC.

# MEASURING BAT SWING SPEED WITH THE SWING SPEED RADAR (SSR)

## Benefits of Using the SSR

- The immediate quantitative feedback provided by the SSR reinforces instructions for improving hitting mechanics.
- The SSR provides a basis for measuring improvement.
- Use the SSR with your coach or instructor, at the practice facility, field, or at home, while practicing on your own.
- The SSR measures the speed of the bat barrel, not the tip, out front, in the ball contact zone. The hitter needs to learn to hit the ball on the "sweet area" of the bat, not the bat tip.

## Considerations of Radar Transmitter Power

- All of the Sports Radars created by Sports Sensors Inc. are intentionally designed to be extremely low power, less that 1/1000 of the power allowed by the FCC in the allocated frequency band. Therefore, absolutely no hazard is present due to radiation.
- Low transmitter power results in a relatively short detection range compared to traditional sports radar guns and police radars, for example.
- The SSR measures the barrel speed of metal bats at a typical range of 6-7 feet and non-metal bats at a distance of 4-5 feet.
- To enhance the radar reflectivity and detection range of non-metal bats, metallic stickers are available from Sports Sensors at no cost for emplacement on the bat barrel, in the "sweet area", a few inches from the bat tip.

## Geometry of the Bat Swing Plane Velocity Vector Relative to the Radar Transmitter Vector

- It is a principle of radar that the radar transmit-receive vector be in direct alignment with the velocity vector of the object for which speed is being measured. Any mis-alignment creates an angle between the two vectors, the cosine of which reduces the measured speed.

## Using the SSR to Measure Bat Swing Speed

- The SSR is used to measure bat swing speed in a static, not dynamic, relationship. That is, the SSR is stationary and the bat swing plane is aligned with the SSR transmit-receive vector. Accurate dynamic bat speed measurements with a moving ball are complicated by the unpredictable swing plane of the bat relative to the radar vector.
- The SSR can be placed forward of the bat-ball contact zone and is perceived by the batter as a pitched ball approaching home plate. The batter swings directly toward the radar as if to hit the approaching ball. If the bat swing plane is not aligned with the SSR, the cosine of the resulting angle reduces the bat swing speed measured by the radar. Thus, the batter realizes that to achieve a maximum swing speed reading the bat must be directed toward the SSR, perceived to be the ball. IT IS OF LITTLE VALUE TO GENERATE A STRONG BAT SPEED IF THE BARREL OF THE BAT CANNOT BE PLACED IN LINE WITH THE APPROACHING BALL, IN THIS CASE THE STATIONARY SSR.

- Two plastic snaphooks are furnished with each SSR to facilitate hanging, via the wire bale, on a batting cage net, pop-up net, or chain link fence, for example. A threaded insert is also molded into the bottom of the SSR case for attachment to a camera tripod. Locate the SSR in a forward position, with the display facing the batter, at a height corresponding to the simulated ball position for the swing plane practice.
- Tripod mounting facilitates locating the SSR in a rear location to measure bat speed when hitting balls off a tee. The distance separating the SSR from the tee corresponds to the detection range previously discussed. The SSR will not be hit by the bat if the batter has been taught to release the bat out front, in the ball contact zone, and not cast the bat early in the swing. The hitter must avoid hitting the SSR on the swing recoil when the bat is brought back when preparing for the next swing.
- Some instructors use the SSR in the rear location to measure bat swing speed during soft toss drills. It is important to recognize that measured speed variations can occur due to cosine effects resulting from differences in swing plane from swing to swing.
- When charting swing speed progress over time, it is desirable to use a statistical approach to establish a benchmark for each training session or period. We recommend ending the session by measuring 10 swings--eliminate the high and low readings--and average the remaining 8 speeds for a benchmark.
  GOOD BAT SWING MECHANICS SHOULD PRODUCE MAXIMUM SWING SPEED "OUT FRONT" IN THE BALL CONTACT ZONE--WHICH IS WHERE THE SSR MEASURES BAT BARREL SWING SPEED!