

# UNDERSPIN THE BALL AND GET MORE DISTANCE

We've all observed a well struck home run that just seems to keep rising up and up and then landing out in the parking lot some 350 feet or more away from home plate. How did he do that, we ask? Well, aerodynamics may have had a lot to do with it. What's this say about the hitter? With the same bat speed a hitter can essentially hit the ball farther using the same effort by under-spinning the ball.

The long ball hitter typically chooses to let the incoming pitched ball descend to about waist high or slightly above. Swinging level at the bottom of the ball will provide the necessary back-spin (or under-spin) which creates what physicists refer to as the "Magnus" effect or force (see diagram).

There is a mistaken belief held by many of our senior hitters that if you desire to hit the ball up in the air trying for a home run, you must swing up at the ball and lift it into the air. This is an absolute falsehood. All that's needed to hit the ball up in the air is to strike the bottom portion of the ball at contact.

Understand that where the barrel of the bat meets the edge of the ball is what actually determines whether your hit goes up in the air, on a line, or on the ground by either hitting the upper hemisphere, at the equator, or the lower hemisphere of the softball.

Another common misconception with hitters is that those guys that launch long home runs are just doing it all with superior bat speed. A more analytical explanation would be that their hitting mechanics should be given a lot of the credit. By applying an under-spin action to the softball allows the ball to travel farther as compared with an over-spin or a knuckling type hit as the atmospheric differential pressures above and below the ball will keep it aloft longer.

A slight downward swing at the ball also allows gravity to assist and add to the hitter's bat speed and at the same time creating that good backspin on the softball that makes it go up, up and away. Never drag the barrel head upwards to strike the ball.

What exactly is the Magnus force? It's the same phenomena that make a curveball curve in baseball. Physicists explain it as follows: "a spinning ball moving through the air with spin creates a boundary of air that clings to the surface as the ball continues its flight. On the underside of the under-spinning ball, the boundary layer of air collides with the air passing by causing a high pressure to form. On the top side of the ball, the boundary layer is going in the same direction as the air passing by, so there is no collision and the air moves collectively faster setting up a low-pressure zone".

This high-pressure zone on one side of the ball and the low-pressure zone on the other side creates a lift force (see diagram) as the Magnus effect causes the ball to move in the direction of the pressure differential keeping the ball flying further down the field. Under-spinning the softball has advantages other than just home runs. Line drives will now rise over the infielder's heads and not right at them for outs. Drives between the outfielders will carry farther getting to the fence quicker without being cut-off.

So why does the Magnus force make the softball rise? It's due to the fundamental physical law that air pressure flows until it finds an equalization position; higher pressure areas are always drawn towards lower

# UNDERSPIN THE BALL AND GET MORE DISTANCE

pressure areas until equilibrium is established resulting in the ball lifting and seemingly defying gravity thus travelling farther down field when underspin has been applied.

An everyday example of the Magnus force is an airplane wing that's designed with a particular shape that creates a pressure differential below and above causing the wing to provide a lifting force thus keeping the plane airborne. The weather maps on TV show high pressure and low pressure regions and how highs flow to lows causing winds.

So how can a player learn and incorporate this technique of under-spin into their game? I would start by hitting the ball off the tee (a high tee preferably) to obtain a feel for how more effectively the ball flight is for long fly balls when striking the lower portion of the ball producing an underspin Magnus force. Then move to doing the same in batting practice hitting the bottom portion of the ball producing underspin lift until you're ready to try it in a game.

To understand how the Magnus force actually works in nature, I've included a link to Wendy Sadler's demonstration with conjoined Styrofoam cups and a rubber band. She shows how the Magnus force lifts and keeps the cups in the air for a period of time. When Wendy releases the elastic energy of the rubber band the cups begin to rise as higher pressure below the cups and lower pressure above them causes a lifting affect; it's almost like magic.

Magnus demo link: <http://www.youtube.com/watch?v=DIO774GyRrw>

Art Eversole (*Senior Softball Contributor*)

# UNDERSPIN THE BALL AND GET MORE DISTANCE

