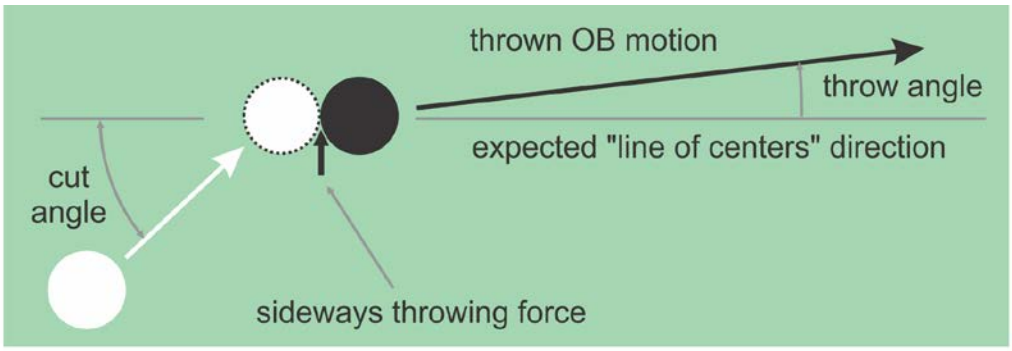
*Supporting narrated video (NV) demonstrations, high-speed video (HSV) clips, technical proofs (TP), and all past articles are available online at **billiards.colostate.edu**. Reference numbers used in the articles help you locate the resources on the website.*

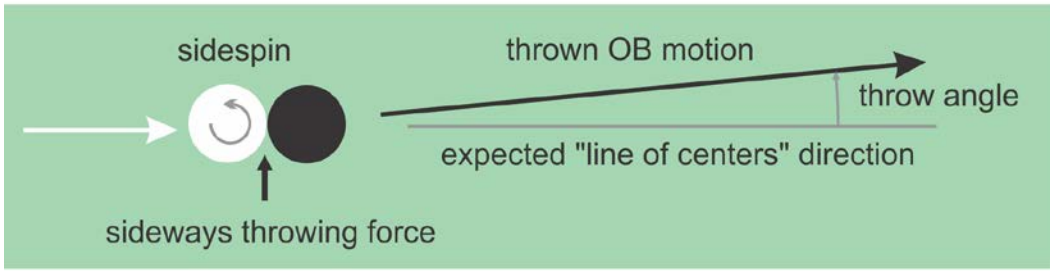
This is the third article in a series dealing with the "System for Aiming With Sidespin" (SAWS), a full-length instructional video I released recently on DVD and for stream or download. SAWS covers a new system to compensate your aim for cue ball (CB) deflection and object ball (OB) throw when using sidespin. It uses combinations of Back Hand English (BHE) and Front-Hand English (FHE), and it can be applied to any cue, bridge length, and shooting style. A detailed table of contents of SAWS along with a video overview can be found at DrDaveBilliards.com/saws. This month, I will cover the basics of throw, which SAWS presents in detail.

Most good pool players are aware of the effects of net CB deflection resulting from squirt and swerve when using sidespin, and top players are good at adjusting their aim to compensate for these effects, which vary with shot speed, distance, and the amount and type of spin. Another important effect one must also adjust for at times is throw. Even top players sometimes fail to compensate for throw when aiming certain types of shots. In fact, I believe than many shots missed by top players are due to a failure to adjust their aim for throw.

As illustrated in **Diagram 1**, throw is caused by friction between the CB and OB during contact, resulting from either cut angle or sidespin. With a cut angle (see Diagram 1a), the CB rubs against the OB during contact, which causes a sideways friction force that pushes the OB off the expected line-of-centers direction. This is call cut-induced throw or CIT. With sidespin (see Diagram 1b), the CB can also rub against the OB during contact, which again causes a sideways force that pushes the OB off the expected line-of-centers direction. This is called spin-induced throw or SIT.



a.) Cut-Induced Throw (CIT)



b.) Spin-Induced Throw (SIT)

Diagram 1 Cut and Spin Induced Throw

To experience the effects of throw and to learn how to adjust your aim when necessary, I recommend a drill using the ball setup shown in **Diagram 2**. The OB is in the center of the table with the CB set up for a ½-ball hit. Two "sentinel" balls make the pocket opening smaller to demand more accuracy. The goal is to pocket the OB cleanly for a wide variety of shot speeds and spins. With the right amount of outside spin, called "gearing" outside english, the OB will not throw at all, and the OB will head in the expected "line of centers" direction into the heart of the pocket. If there is less outside spin than the gearing amount, or inside spin, or no spin, the OB will throw to the right, as a result of CIT (see the blue shot). And if the amount of outside spin is greater than the gearing amount, the OB will throw to the left due to SIT (see the red shot). To prepare for the drill, place balls on the table at all positions in the diagram and choose the pocket sentinel ball gap based on how accurate you hope to be during the drill. Then tap and mark each ball position with a donut (self-adhesive reinforcement label) to make it easy to re-spot the balls quickly and consistently. I recommend also placing a donut at the ghost-ball position, to give yourself a clear aiming target, and another centered between the sentinel balls to help you see where the OB enters the pocket.

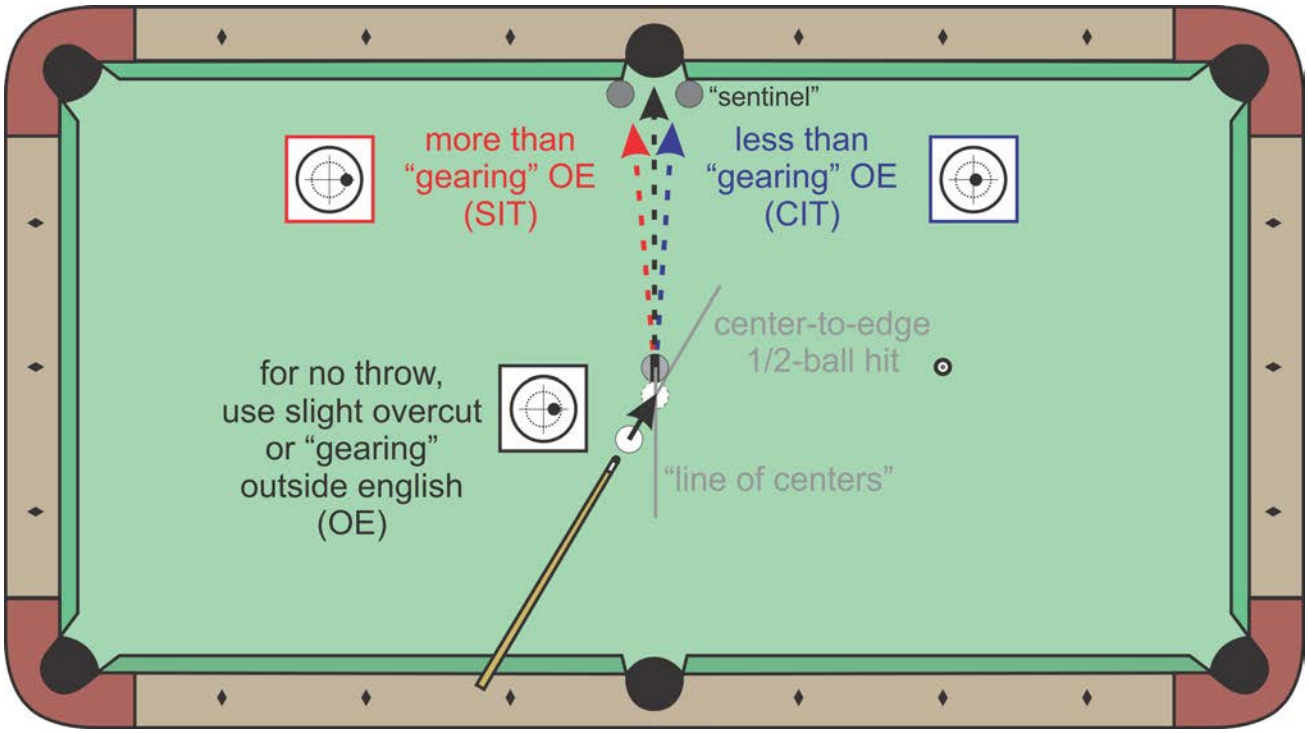


Diagram 2 Throw Drill

A good way to visualize throw is to think about the direction the CB is rubbing against the OB. The OB gets thrown off line in the direction of the rub. With no sidespin, the rubbing and throw is to the right. For a large amount of outside or right spin, the rubbing and throw is to the left. For inside or left spin, the rubbing and throw is to the right. And for just the right amount of outside or right spin, there is no rubbing or throw whatsoever, in which case the OB heads exactly in the line-of-centers direction. Be sure to use a striped ball for the OB, with the stripe oriented vertically as shown in Diagram 2. With a perfect gearing hit and accurate aim, the stripe will remain vertical during the entire OB motion to the pocket. If there is any throw, spin will transfer to the OB, which will cause the OB strip to wobble.

Maximum CIT occurs at a half-ball hit with soft stun, where the CB is sliding with no top or bottom spin at OB impact. Try to see how much you can throw the OB with an accurate hit. Also vary the speed to see that there is less throw with more speed. Also vary the cut angle and experiment with how speed affects throw at different angles. At small cut angles (about 20° or less), speed has no effect on throw. At larger cut angles, speed has a big effect on throw (especially at 30° or more).

As part of the drill, try a range of spin directions and amounts to see the effects on throw. You need to be careful to compensate accurately for net CB deflection (the combined effects of squirt and swerve); otherwise,

the drill results might be misleading. Make sure you are sending the CB to the center of the ghost-ball position (at the placed donut). A video camera can help you verify the accuracy of your hits. If you use the BHE/FHE calibration method presented in SAWS, you will know what percentages of BHE and FHE to use to get an accurate hit.

With inside spin, you might think there would be more throw since both the cut and spin effects are in the same direction. However, this is not the case … CIT and SIT effects do not add. There is actually a little less throw than with straight stun since friction between the balls is actually a little less when the sliding speed between the ball surfaces is greater. Remember, with a small amount of outside spin, throw is still to the right, in the CIT direction. And with more outside spin, the throw is to the left in the SIT direction. And with even more outside spin, you get even more throw. With top or bottom spin, there is less throw than with stun. With full top or bottom spin, the amount of throw is about half as compared to stun at the same CB speed.

To determine the gearing amount of outside spin that results in no throw, it helps to know the "40% rule" illustrated in **Diagram 3**. To use this rule, you first visualize the line to the pocket, called the "line of centers," which goes through the centers of the OB and the imaginary ghost-ball target. Then you shift this line parallel to the center of the CB. This helps you visualize the OB contact point, shifted to the CB (see the red dots in the diagram). The 40% rule states that to achieve "gearing outside spin," the tip contact point must be 40% of the distance from the center of the CB to the shifted contact point. So distance "x" must be 40% of distance "L." And this works for any cut angle! Note that since the tip and CB have curvature, the contact point is not at the center of the cue (see the blue dot in the diagram). If you want to be accurate, you need to be careful to visualize the actual tip contact point when shifting the 40% distance.

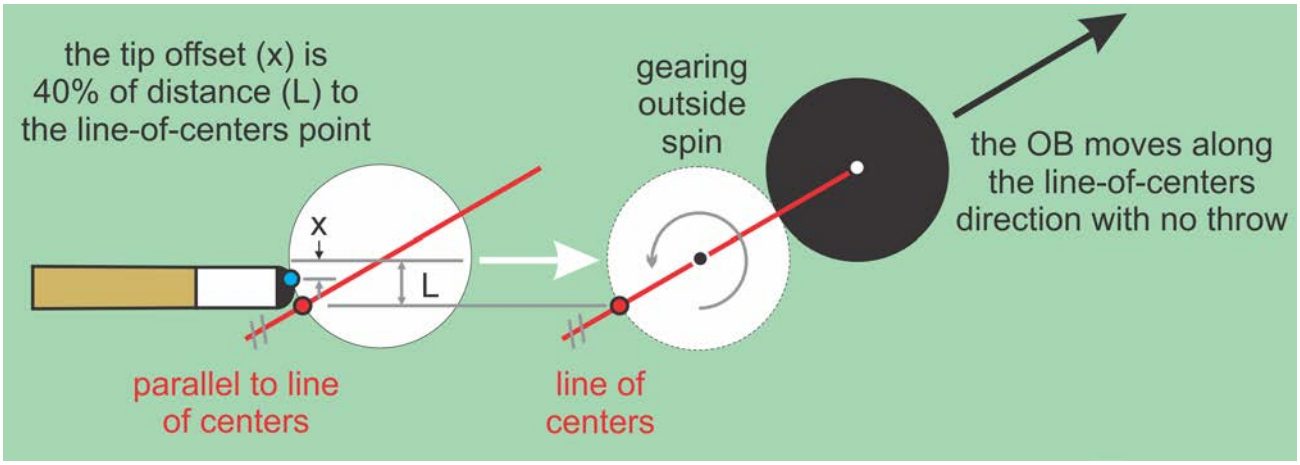


Diagram 3 Gearing Spin 40% Rule

As demonstrated on SAWS, when you first practice the 40% rule, it helps to align the OB so the center of the number is at the necessary contact point, with the stripe pointing to the pocket. It also helps to use a CB with a dot or other marking. If you do not have one, you can just use another OB as the CB, with the center of the number as the dot. Align the CB so the dot is at the projected contact point. It helps to first visualize the full distance from center to the projected contact point before visualizing the 40% distance.

For more information and demonstrations related to the 40% rule, see the "gearing outside spin" resource page in the FAQ section at ***billiards.colostate.edu***. The page also provides guidance on how to make adjustments to account for draw and follow effects, and for spin changes due to shot distance and drag. If you start using the system, you might want to refer to this page to be more accurate over a wide range of shots.

To adjust your aim to compensate for throw, it helps to know the maximum amount of throw. With typical ball conditions, maximum throw is about 1" per foot of ball travel, or about ½ a ball per diamond on a 9' table. Therefore, with a soft stun shot, you should expect about 2" of throw with the throw drill since the OB is travelling about 2' to the pocket. And to compensate for that, you will need to aim the OB 2" to the left of

pocket center to have the OB enter the center of the pocket. Obviously, with a longer shot on a table with tight pockets, if you do not compensate for throw with soft stun shots, you will not have much success.

I hope you are enjoying and benefiting from my series of articles dealing with the "System for Aiming With Sidespin" (SAWS). If you want to learn more, visit DrDaveBilliards.com/saws. Also check out online video **NV J.9** that shows examples of the SAWS system being applied to a wide range of interesting game-situation examples.

Good luck with your game,
Dr. Dave


normal video

NV J.9 – "Got English?" – How to Aim Using Sidespin, With Game-Situation Examples

PS:

- I know other authors and I tend to use lots of terminology, and I know not all readers are totally familiar with these terms. If you ever come across a word or phrase you do not fully understand, please refer to the online glossary at ***billiards.colostate.edu***.

Dr. Dave is a PBIA Advanced Instructor, Dean of the Billiard University, and author of the book: The Illustrated Principles of Pool and Billiards and numerous instructional DVD series, all available at: ***DrDaveBilliards.com****.*