

# Sink More Combinations

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Combinations are difficult. They really are. We've all been fooled into shooting combinations that were way harder than we thought. There are Two Big Reasons for combinations being so tough, and most of us have never thought about the second one. Adjusting for it requires more thinking, but if you take the time to work through your combos in this more conscious, thorough way, you will sink a lot more of them.

Let's call the ball to be pocketed the Target Object Ball (TOB) and the other object balls OB1, OB2, etc., as determined by the sequence in which they are struck. First, a quick review of what generally makes one combo easier than another:

- The fewer OB's, the easier.
- The closer the TOB to the pocket, the easier.
- The closer the OB to the TOB, the easier.
- The closer the whole shot is to straight in, the easier.

Let's consider a two-ball combination: Cueball (CB) hits OB1. OB1 hits TOB. TOB goes to the pocket. The traditional way to work out how to shoot this is to begin by imagining that OB1 is the CB and line up that segment of the shot, using OB1 to pocket TOB. Then, when you're confident of the shot alignment, sight the spot on the rail or pocket where OB1 is actually aimed, ignoring the TOB for the moment. Now, your job is simply to line up the CB to shoot OB1 to that exact spot on the rail or pocket. Forget about the TOB – focus completely on sending OB1 down the right line, and TOB has to go in.

The First Big Reason combos are tough is that, since there are more balls involved, there is a much higher accuracy requirement. If you are off by a couple of degrees on OB1, you could be off by many degrees by the time TOB moves. Ya gotta be *really* precise. The error multiplies rapidly.

The Second Big Reason is the subtle one. It's that same complicating factor we deal with every time we cut a ball – throw, good ol' collision-induced throw (CIT). CIT is caused by the friction between two balls at the moment of impact. It causes the OB to be thrown as much as 4 or 5 degrees off its "natural" line, depending on speed, angle, ball slipperiness, and so on. Throw occurs as a cut angle change right at the moment of impact, so the farther the ball has to travel, the more "error" you get from the angle change. This is why cut shots are usually missed by undercutting – you cut the ball "correctly" but did not allow for throw. Simply put, if you don't adjust for CIT, you hit everything too thick.

The not so obvious problem is that, because of the extreme accuracy needed on each ball hit, throw makes an *enormous* difference in combinations. You probably have a rule of thumb suggesting overcutting the first ball of a combo. This is why. You're going to have to correct for more throw effects than you would on a single ball cut.

There are two general classes of combination shots. Let's call them **Zigzags** and **Zigzigs**. In a Zigzag, OB's are cut in opposite directions. If OB1 is cut to the left, OB2 is cut to the right. In a Zigzig shot, each OB is cut in the same direction, e.g., OB1 is cut to the left and then it cuts OB2 to the left. This is an important distinction because each ball in a Zigzig will throw in the same direction, while the OB's in a Zigzag throw in opposite directions. Most players' natural tendency is to not cut balls thin enough to allow for throw. On a Zigzag, this causes you to hit OB2 too thick. On a Zigzig, you will tend to hit OB2 too thin. Think thin on OB1, because error multiplies through each ball in a combination shot.

How can you apply this knowledge? Using the traditional segmented aiming system described above, work your way back to the CB shot line, but **pay close, conscious attention to the CIT effect on each segment of the shot.**

On regular cuts, you only have to worry about sinking the ball. **For combinations, you need much more accuracy because the first OB has to land *precisely* on the next OB, so you have to allow for throw in each segment of the shot.** Shooting firmly will reduce the throw, making the shot a little easier to figure. The simplest way to find the true aim line is to aim to overcut each segment by a little. And oh yeah – actually practice.