Bob Jewett

# Sources of Evil

## Sometimes solid skills aren't powerful enough to deter mishaps.

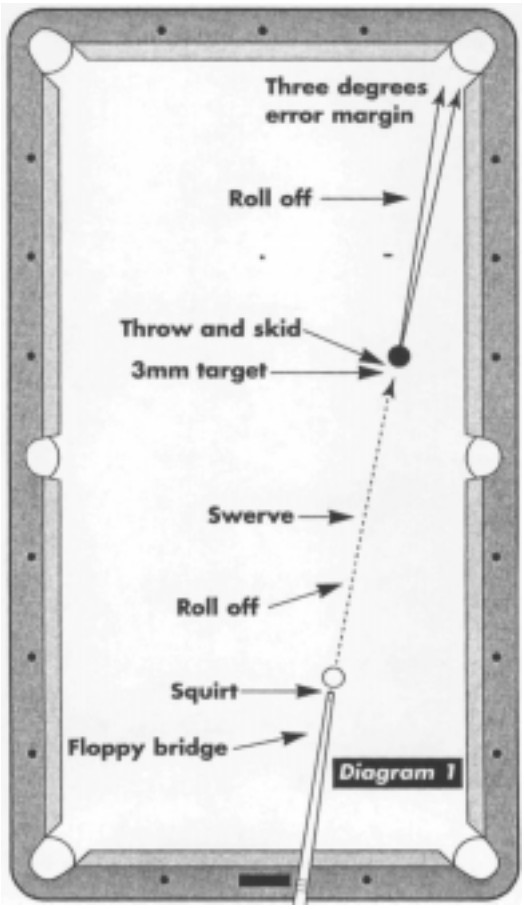
**Have you ever** thought about all the sources of error that cause your shots to be less than perfect? Some of them are under your control, but others aren't. For the major categories of incorrect alignment, bad delivery, wandering cue ball, and wandering object ball, let's look in detail at some' contributors.

For the initial stick alignment, errors can be due to bad visualization of the cut angle; inconsistent approach to the shot; an awkward stance, perhaps from stretching or leaning; inaccurate sighting from head misalignment, or vision inaccuracy; and bridge hand misplacement for the spin you want. These are all things you can work on — can you see how for each one? Can you think of other sources in this category?

Bad delivery of the stick through the ball results from another set of sources. While a perfectly straight stroke is the ideal, what is really needed is for you to bring the stick through the ball precisely where you expected to, based on your previous practice. Anything that causes your grip hand to depart from its usual, practiced path will lead to a result you didn't expect. Let's stretch our imaginations for this list: You haven't eaten in six hours; the shot is elevated more than normal, and your stroke is slightly "sidearm"; you hit the cue ball at the peak of your heart's pulse; you are inhaling as you stroke; you failed to take your usual pause at the end of the back stroke; your bridge hand is sticky; your grip hand slips on a power shot; the stick wobbles a little in your loose bridge; your arm is tired from carrying your suitcase through the airport, and the resulting timing is a little off. Some of these may seem completely negligible, but consider target shooting on long rifle ranges where the shooter's pulse can take the shot out of the bulls-eye.

The cue ball's path brings in another set of errors. It is rare that the cue ball will go in a perfectly straight line along the axis of the cue stick. Did you get as much squirt or deflection as you expected? Is the table flat? Are there lumps in the cloth? Is the cue ball round? (I owned a cue ball that would roll off left or right three inches in a table length, depending on where the heavy side was.) Did the swerve due to sidespin happen as expected, or were you surprised by the slippery cloth or sticky cue ball? Or maybe some extra elevation on the shot gave extra curve. Did the direction of the nap cause a roll-off?

For the object ball, we see about the same set of problems, but swerve due to sidespin is missing. Added is the very significant effect of throw — the object ball will be pulled to the left or right of the expected line by the rubbing of the surface of the cue ball. The extreme case of this is when a spot of chalk on the cue ball happens to arrive at the contact point between the two balls. The effect is called "skid," "cling," or "kick," and the result is usually a missed shot. Even without skid, judging throw can be tricky. Did you know that there is less throw with plain follow than with a sliding cue ball? While you might put "throw planning" mistakes under the "alignment" category, I think it's fair to blame the object ball for them.




How much margin for error does a typical shot have? Consider the shot in Diagram 1 with the cue ball at the line and the object ball halfway to a corner pocket. From the point of view of the object ball, the pocket is about three degrees wide. That is, the angle between the two extreme paths that still gets the object ball into the pocket is about three degrees.

How large a target does this represent on the object ball for the cue ball? The geometry works out to a simple result: For each degree of pocket width, there is a corresponding one millimeter of target for the center of the cue ball. For the shot above with a 3-degree-wide pocket, if the center of the cue ball arrives anywhere within the correct 3-millimeter zone, the object ball will be pocketed. That's a margin of plus or minus 1.5 millimeters around a perfect hit.

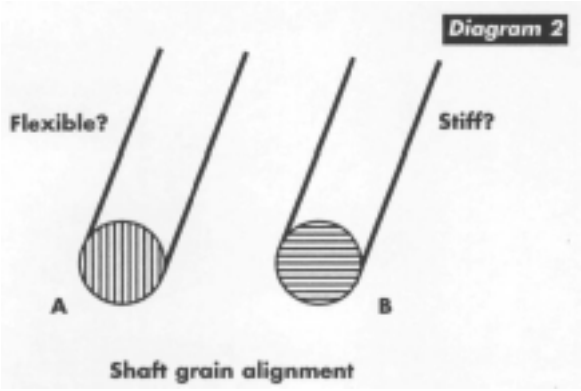
How big are each of the error sources discussed above? Let's consider them in relation to staying within the 1.5 millimeter maximum error. (Note: A penny is nearly 1.5 millimeters thick.) For the alignment category, the distance from your grip hand to your bridge hand is about how far the cue ball will travel. This means that if your alignment is off by 1 millimeter, the cue ball will land 1 millimeter off at the target. Take out that penny again and think about how thin it is.

For the "delivery" errors, we need at least the same level of accuracy. In fact, if errors have already crept in during the alignment, we need to keep the delivery errors even smaller to avoid reaching the 1.5-millimeter limit. How much does your stroke loop left and right? Almost certainly more than a millimeter. Your only hope is to have a consistent loop. In addition, I'd recommend removing as much as you can of whatever loop you do have. How firm is your bridge? Can the stick easily wobble one millimeter side to side? Even if you have only a half-millimeter of slop in your bridge, that's a major part of the allowed error in this shot. Could your heartbeat change alignment during the shot by a tenth of a millimeter? Maybe. That's the thickness of a piece of notebook paper. Could breathing change it by two tenths? I would-

n't be surprised. One tenth here, two tenths there; they start to add up and pretty soon you're seated, and it's your opponent's turn to shoot.

Now for the ball errors. The worst case is if you're using sidespin, since this will cause squirt and swerve. How big a factor is squirt? For some sticks, one tip of English — 12-millimeter offset from a centered hit — will result in 3 degrees of squirt. That is, the initial path of the cue ball will be on a line 3 degrees away from the line of the cue stick. If not compensated for, how much error would that be when the cue ball arrives at the object ball? Well, I picked the numbers so the arithmetic is just as before. Three degrees of error and three diamonds of travel results in two inches of offset when the cue ball arrives at the object ball. What's that in millimeters, you ask? About 50. How is it possible to make such a shot? Simple: You compensate by aiming differently; many players compensate unconsciously. You need to get that 50-millimeters-of-squirt error down to 1 millimeter or less by adding a compensation to your aim to the other side. Of course, such compensation is easier if the initial squirt is less, and some sticks have less than one degree of squirt for one tip of English.

For sticks that have a lot of squirt, here is something else to worry about: is the squirt the same regardless of the rotation of the shaft? That is, will the squirt angle change some if the grain is aligned vertically versus horizontally? I've never done the experiment myself, but someone has reported a 30-percent change with rotation. For our shot above, this might mean 40 millimeters of squirt with the grain like Diagram 2A, and 52 millimeters when the grain is like Diagram 2B. With a plus and minus 6 millimeters of uncertainty in where the cue ball will land with sidespin, you would learn quickly not to use any. The good news is that most sticks aren't as squirty or inconsistent as this example, but it would be a shame if you tried to play the game with one that was.




I hope the above has convinced you of the importance of fundamentals and that you will resolve to work on your major flaws. I suggest that you concentrate on only one at a time, and take them up in the following order, skipping the ones that are already perfect: your stick, your bridge, your approach to the shot (pre-shot routine), the straightness of your stroke, the timing and speed accuracy of your stroke, and your use of sidespin. You should immediately demand new, round balls, clean cloth and level slates from your billiard-room proprietor, so you won't have to worry about that.

Next month, I'll go into more deeply into some of the errors above and look at some of the math related to how lots of small errors add together. Until then, you have lots of practice to get in. Remember that penny.