by Dr. George Onoda

Coping With Skid

Sometimes the cue ball grabs the object ball and throws it off line. Here's why it happens and what you can do about it.

IT DOESN'T MATTER if you shoot like me or you shoot like Earl Strickland, Nick Varner, Mike Sigel or Allen Hopkins; we are all cursed occasionally by the dreaded "skid" shot. In a skid shot, an object ball that is cut toward a pocket travels in a direction as if it were cut less thin. At the same time, the object ball seems to skid (slide) more than normal. Judging from color commentaries in various taped matches, many top professionals find skid a mystery. Skid only happens occasionally, perhaps once during a long 9-ball set or during a straight pool match. This would amount to around one in 100 to 200 shots (as a rough estimate).

I believe that the skid phenomenon has already been explained correctly by Robert Byrne *(Byrne's Standard Book of Pool and Billiards, 1987 Ed., page 129)*. He calls this phenomenon "cling," but I will stay with "skid" since players seem to use this term frequently. Byrne's theory is that skid occurs when the normal friction between the ball surfaces is increased. The increased friction causes the ball to be thrown in a more forwardly direction than normal in most types of shots. In *Byrne's Treasury of Trick Shots in Pool and Billiards*, pages 152 and 153, he describes several insightful experiments by Robert Jewett and Bill Marshall. When chalk marks were placed at the contact points between two colliding or frozen balls, throw of cut shots was greatly increased. Since chalk increases the friction between two balls, the experiments support Byrne's theory.

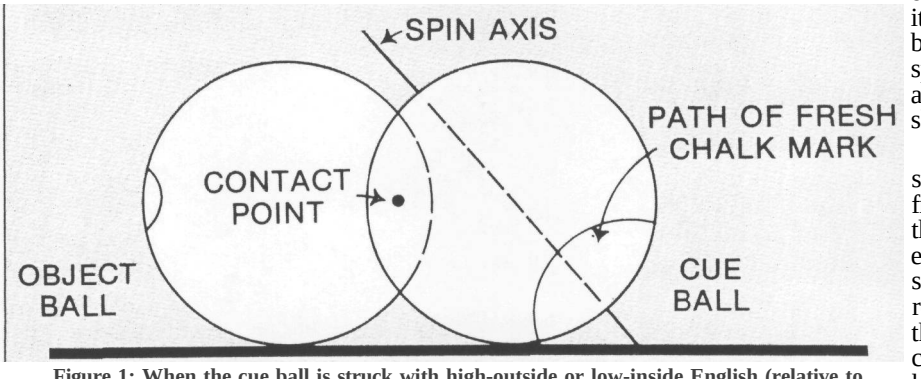

Figure 1: When the cue ball is struck with high-outside or low-inside English (relative to the object ball) there is no chance of the fresh chalk mark being at the contact point.

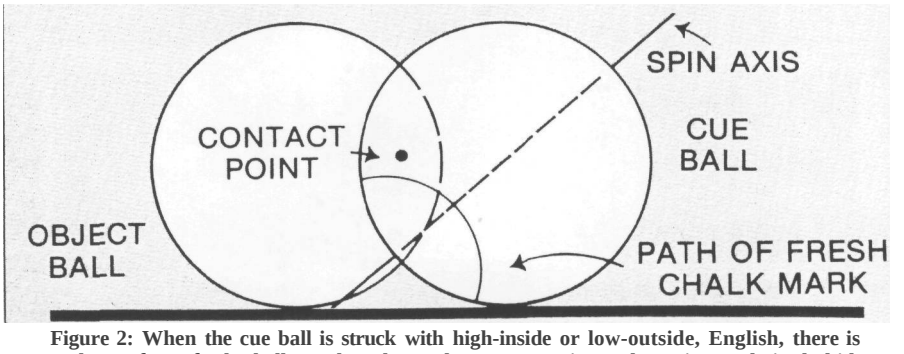

Figure 2: When the cue ball is struck with high-inside or low-outside, English, there is a chance for a fresh chalk mark to be at the contact point and causing undesired skid.

One or more chalk marks always exist on a cue ball. The mere act of striking the ball with a chalked cue produces a fresh chalk mark on the ball. Typically, a fresh chalk mark is around a quarter of an inch in width. As the ball moves along the table, a chalk mark becomes duller and smaller with time. But it may take a half dozen shots before a particular chalk mark completely disappears. Therefore, beside the fresh chalk mark produced by a shot, several older and weaker marks are usually present on the surface of the cue ball.

If the contact point of the cue ball with the object ball just happens to coincide with a chalk mark on the cue ball, then enhanced throw can be expected. And if the cue ball has forward roll, a pronounced transfer of English occurs, giving the object ball some initial back spin. The transition from back spin to zero spin and forward spin of the object ball is lengthened, accounting for the appearance of skidding.

Byrne (in his first cited book) suggests that sweat, hair oil and grease from french fries could also increase the friction between balls. But most evidence indicates that these substances by themselves should reduce friction. It seems more likely that these foreign substances cause chalk to cling more strongly to a cue ball and last longer as the ball moves around the table.

Just what are the chances that a chalk mark will be present at the point of contact with an object ball? A quarter-inch mark covers 0.5 one percent of the surface of the ball. If the location of one chalk mark is random when two balls collide, the chance that the chalk mark is at the contact point is around 1 in 200 . If other chalk marks remain from prior shots, more of the ball's surface is covered with chalk, and the odds for chalk at the contact point increase, perhaps to better than 1 in 100.

The greatest likelihood of skid occurring is expected when a succession

of shots are taken where the cue ball has traveled only short distances. This is because less chalk is rubbed off from previous shots, because the total distance traveled by the cue ball is smaller. This expectation seems to be confirmed by watching tournament tapes.

In shorter shots, the odds that a fresh chalk mark will be at the contact point with an object ball are much less random. The odds depend on how the cue ball spins as it moves toward the object ball. When the cue ball is shot without side spin, the fresh chalk mark cannot come into contact with the object ball for a cut angle greater than a few degrees. The forward or backward spin causes the chalk mark to remain located somewhere along a vertical circle around the center, oriented in the forward direction. The contact point lies to either side of this path and therefore cannot coincide with the location of the fresh chalk mark. Of course, an older mark could still cause a problem.

When a cue ball is sliding with side spin over a short ball-to-ball distance, the path of the chalk mark is a horizontal circle about the center. This gives it a chance to be at the contact point and cause skidding. It can be approximated (using advanced theory) that a cue ball with maximum side spin will complete half a revolution sideways over a distance of around 4 inches and one and a half revolutions over 12 inches. With less side spin, the distance for these particular revolutions become greater.

When a cue ball is struck high and outside (relative to the cut), it spins about an inclined axis, leaning toward the side of the object ball (Fig. 1). The same axis inclination occurs when a ball is struck low and inside. A fresh chalk mark travels along a small circle, as illustrated in Fig. 1. We see that the fresh chalk mark cannot be present at the contact point. Thus, only an older chalk mark could possibly cause skidding for this type of shot.

When a cue ball is struck high and inside, or low and outside, the spin axis is inclined away from the side of the object ball (Fig. 2). The path of a fresh chalk mark is illustrated in Fig. 2. Depending on the angle of the cut and the amount of English applied, there is a chance that the fresh chalk mark would be located at the contact point between the balls.

While we have no control over where an older chalk mark will lie on a cue ball, we do have some control for fresh chalk marks, which are the most damaging. Summarizing the effects of spin, a fresh chalk mark will not contribute to skid when an object ball is cut if the cue ball has no side spin, if it is struck high and outside or if it is struck low and inside. Beware of shots where the ball is struck high and inside, low and outside, or when the cue ball slides with side English, since the possibility exists that the fresh chalk will cause skid.

In theory, the best preventive for the harm done by an older chalk mark is to clean the ball before each shot. But in a game, this would hardly be practical. It would slow the game down too much and would cause arguments over the ball placement in cases where a very small error in replacement could critically affect making a shot.

A number of practical precautions could be instigated, however. Wiping the cue ball with a clean cloth at every practical opportunity would make sense. Possible opportunities include before each game and after each scratch when the ball is in hand. Also, perhaps in a refereed match, a player can request the cleaning of the cue ball where it lies. The referee would allow the request if he judges that a slight error in replacement of the ball is not critical to the next shot. Another important precaution, already carried out in some tournaments, is that balls should always be racked by referees wearing clean, white gloves. This would reduce placing moisture, oil or grease on the balls.

Two final precautions could also be taken. One is to wash all balls thoroughly before each day. The other is to use balls that are relatively new. This reduces the chances of a ball having a local rough spot, which would also cause increased friction between balls because of its roughness or because it readily collects chalk particles. If a ball with a damaged rough spot is found, it should be replaced.

The phenomenon of skid is perhaps the most unfortunate accident in pool. It occurs irrespective of the ability the player. It could lose a match for a player through no fault of his own. Currently, we just accept it as an unlucky incident that is part of the game. However, it still seems unfair if it is not the fault of the player. I believe that the precautions that I have mentioned should be given serious consideration for tournament play.

Dr. George Onoda is a research scientist at IBM and an avid pool and billiard player.