
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.

Do you know how to predict and control object ball (OB) direction when it is kissed off another frozen or nearby OB? I cover this topic in detail in online video [NV L.60](#), and I summarize the useful principles below.

Straight Shots

It helps to first understand a basic stop shot. With a square hit, a sliding cue ball (CB) delivers all its speed to the OB and stops in place. If there is another OB a small gap away from the 1st OB, with all balls along the same line, both the CB and 1st OB nearly stop in place as the CB speed is delivered to the 2nd OB. If the two OBs are frozen instead, with no gap, a sliding CB drifts back slightly and the 1st OB moves forward slightly. If you want to know why this happens, see online analysis [TP B.29](#). You might find the concluding results at the bottom of the analysis interesting. When hitting into frozen OBs, the CB and 1st OB motions are more pronounced with faster shot speed. Backspin on the CB can also help send the 1st OB forward even more. The video demonstrates all these effects along with interesting game-situation examples.

Remember, with even a tiny gap between two OBs, the action of the shot is totally different from a frozen-OB shot. With a gap and more speed, the 1st OB goes forward a little, but not like with a frozen-ball shot. Even with backspin, it is very difficult to push the 1st OB forward very much if there is a small gap between the balls. Again, see the video for clear demonstrations.

Angled Shots

With a small gap between the OBs, the angle of the 1st OB does not vary much with the incoming CB angle (with a square hit on the 1st OB). The 1st ball heads very close to the tangent line off the 2nd ball. Although, backspin or topspin on the CB has a small effect on OB direction. Backspin transfers a small amount of topspin to the OB, sending it slightly forward of the stun line. And topspin transfers a small amount of backspin, pulling it back from the stun line. The video shows some interesting game-situation examples where you can take advantage of these effects.

When the balls are frozen instead, with no gap, the incoming CB angle has a big effect (see **Image 1**). With a very thin hit of the 8 off the 13, the 8 heads along the tangent line direction (1st line on the right side of the image). With a small angle into 13, the 8 gets pushed forward slightly (2nd line). With a more direct hit, the 8 is driven more forward of the tangent line (3rd line). And with an even fuller hit, with the aim shown in the image, the 8 is driven well forward (line on the left). As demonstrated in the video, backspin sends the 8 slightly forward of the expected lines, and topspin pulls the 8 slightly back from the expected lines.



Image 1 Frozen-ball kiss direction changes

10-Times Fuller Aiming System

There is a useful aiming system that helps you predict kiss direction of the 1st OB when hitting into a frozen pair at different angles. It is called the 10-times-fuller system, and it was created by fellow-columnist Bob Jewett. As shown in **Image 2**, you start by visualizing where you want the 8 to head, in this case to the corner pocket. Then you visualize a line through the balls (upper black line). To get the 8 to head to the pocket, you need to hit the 8 into the 13 10-times fuller than the desired 8-ball direction implies. To put it more simply, you need to aim at a point 1/10 the distance from the ball line to the target line. Here, the line through the balls points 6 diamonds up from the pocket. 1/10 of that is 6/10, so you need to aim slightly more than a half diamond from 6 to get the 10-times-fuller aim (yellow line). Over such a long distance like this, your measurements, aim, and stroke need to be near perfect. Any error basically gets multiplied by a factor of 10, and even a tiny angle error can cause a miss over such a large distance. But if you are extremely careful with everything, the 10-times-fuller system can be very effective.



Image 2 10-times-fuller system

For shots like the one in **Image 3**, where the 8 is being driven in a direction much closer to the tangent line, it is easier to measure things differently. First visualize the tangent line (white line), and then the desired OB direction (black line to the corner). Then take the distance between the lines (yellow line labelled "1") and add 9 more to make the hit 10-times fuller (where the cue is pointing off the left side of the image). The 8 will head 1/10 of the way from the tangent line to the shot line, in the desired direction. Again, a detailed demonstration can be found in the video.



Image 3 Alternative 10-times-fuller aim

Off-Angle Shots

For many of the examples in the video, I placed the CB along the required aiming line for a square hit on the 1st OB, as you would do with ball in hand, but the system also works with angled hits. **Image 4** shows a game situation example where an angled hit is required. This is a frozen spot-shot that can come up in any game where balls are spotted on the foot spot (for example, One Pocket). The line through the OBs heads into the middle of the foot rail. I want to pocket the 8 in the corner, which is 2 diamonds away. The 10-times-fuller system predicts that to send the 8 in this direction, I need to aim the 8 ten-times fuller into the 13. 1/10 of 2 diamonds is 1/5, so the 8 needs to be aimed 1/5 of a diamond (or 2 tenths) inside the middle diamond (yellow line). The CB is not on this line, but I can still cut the 8 (white line) to create the required direction. Again, if you are very careful with everything, you should pocket the 8 in the corner. Online video [NV L.60](#) covers many other examples that shows how to use the system in many different types of interesting game situations.



Image 4 Off-angle 10-times-fuller example

I hope you now better understand how to control OB direction when it is close to or frozen to another OB. I also hope you think the 10-times-fuller system is worth learning and practicing. Be sure to check out and try everything in the video if you want to be able to use this information effectively.

Good luck with your game,
Dr. Dave



normal video

NV L.60 – Useful Direction Control with Small-Gap and Frozen-Ball Kiss Shots



technical proof

TP B.29 – Simulation of a CB striking two frozen OBs along their line of centers

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](https://billiards.colostate.edu) at billiards.colostate.edu.

Dr. Dave is a PBI Master Instructor, Dean of the Billiard University, and author of the book: [The Illustrated Principles of Pool and Billiards](https://DrDaveBilliards.com) and numerous instructional DVD series, all available at: DrDaveBilliards.com.