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*Note: Supporting narrated video (NV) demonstrations, high-speed video (HSV) clips, and technical proofs (TP), and all of my past articles, can be accessed and viewed online at [billiards.colostate.edu](http://billiards.colostate.edu). The reference numbers used in the article help you locate the resources on the website. If you have a slow or inconvenient Internet connection, you might want to view the resources from a CD-ROM or DVD. See the website for details.*

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This is the third article in a series on fundamentals. In the last two months, I've covered the stroke and basic aiming. This month, I want to explore aiming systems a bit more. First, I have a very exciting announcement:

*I have recently developed an amazing new aiming system called DAM (“Dave’s Aiming Method”) that will revolutionize pool playing around the world. DAM is the best and most complete aiming system that has ever been devised. The DAM system will radically improve the shot-making abilities of those who spend the time to learn it. DAM will eventually become the “aiming standard” and will significantly accelerate your learning curve. There are those who will eventually learn the system, and there are those who will not and be beaten by those who do. I make almost every shot with this system ... I rarely miss. Isn't that proof of how good it is? Don't you want to be as good as me? If you want to master the DAM system, you must visit me in person and pay outrageous sums of money to learn all of the required intricacies. If you don't believe me or if you doubt the validity of my system, you will be persecuted and ridiculed by all of my followers.*

Well, I hope you know I was being facetious with my “announcement.” I was just trying to get your attention. Believe it or not, it is not uncommon to hear sometimes-exaggerated claims like these when people are trying to promote their “aiming system.” Here are some examples of other outrageous statements I've actually heard and read over the years about basic cut shot “aiming systems.”

- Many of the pros use my system. If you ask a pro and he tells you otherwise, it is because he doesn't want you to know his secrets.
- Don't tell us why it doesn't work. Tell us how it does work ... because it does! Stop being so negative.
- You can't use 2D diagrams to illustrate how the system works, and it can't be explained with the written word ... you can learn it only in person.
- Cut-induced throw makes all shots work with only a few lines of aim.
- It works every time for every shot, regardless of the distance between the balls, and regardless of the angle and distance to the pocket. Just pivot, and the ball goes in.
- There are six pockets on the table so you only need six lines of aim.
- My system only requires N (e.g., 3 or 4 or 5 or 6) lines of aim.

Have you heard some of these statements before? I sure have. Some people seem to think an “aiming system” (for basic cut shots) can help somebody play better overnight. I think this is a nice dream, but it is not a practical reality. Aiming is tough because it involves 3D visualization, visual perception, and physical and visual alignment. One must also compensate for cut-induced

throw when no English is used, and squirt, swerve, and throw when English is used. And as we know from all of my past articles on throw effects, the amount of throw depends on shot speed, cut angle, the type and amount of English, how much top or bottom spin the **cue ball (CB)** has at **object ball (OB)** contact, ball conditions, etc. If precise aiming were simple, pool would be a much easier (and much less fun) game. If somebody claims he or she has a limited-lines-of-aim system that will work for all or most shots, without any compensation, I would recommend you be a little suspicious. Having said that, any "system" that helps a person focus on aim and alignment consistently and with concentration will be beneficial to many people (especially people who currently don't focus well or long enough), even if the system isn't perfect.

Concerning the limited-lines-of-aim "systems" people have proposed over the years, the OB can only go in only N different directions with only N lines of aim. So if somebody claims a system with only a few lines of aim can be used to pocket any or most shots, they are not telling you the whole story. With only a few lines of aim, intuitive compensation based on lots of experience and practice must be part of the aiming and aligning process to use the system successfully. In **TP A.13**, I work through some math and geometry that shows how many lines of aim are required for different types of shots. For those not interested in mathematical details, here are some of the highlights for large (5 1/4") pockets:

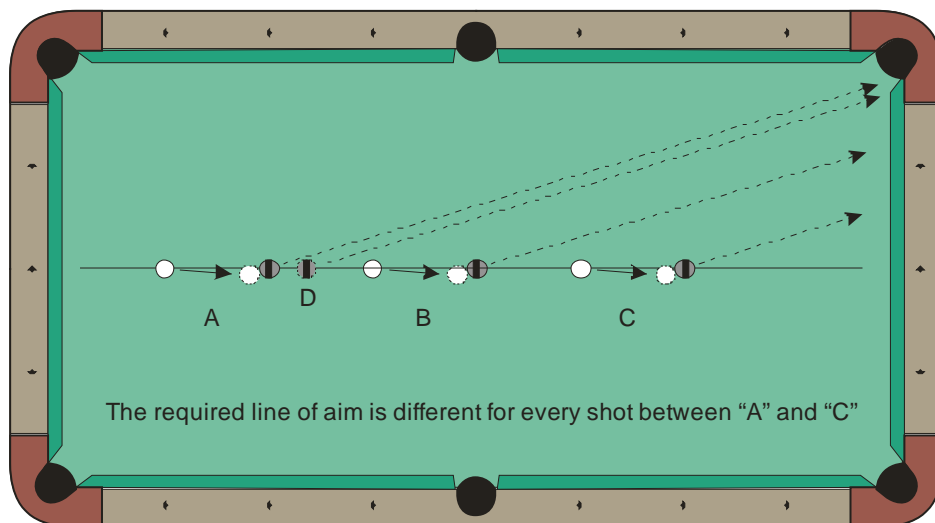
- To be able to pocket an OB into a pocket about 3 feet away, with any cut angle, the required number of aiming lines is about 19!
- If you consider cut shots only within a typical range (e.g., 7.5 to 52.5 degrees), and use only three equally spaced lines of aim (e.g., with a fractional-ball aiming system):
  - If the OB is less than a foot from the pocket, every shot can be pocketed with the three lines of aim.
  - If the OB is more than two feet from the pocket, less than 50% of all cut shots in the typical range can be pocketed with only three lines of aim.

With "tighter" pockets, the situation is much worse (i.e., even more lines of aim are required).



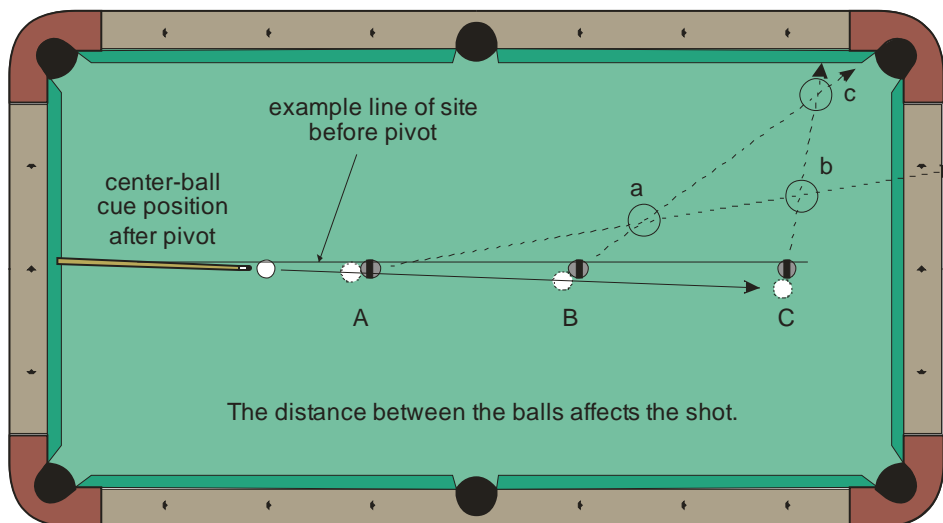
#### **TP A.13** – Number of lines of aim required for different types of shots

Diagrams 1 and 2 illustrate some basic concepts important to understanding the limitations of some aiming systems. **Diagram 1** shows what I call a parallel shift of the same line of aim. Shots "A," "B," and "C" all have the same line of aim. In other words, the eventual contact point on the CB is aimed at the same point on each OB. Therefore the cut angle is the same for each shot. The point of the diagram is: If an aiming system has a method to achieve a line of aim based on the relative position of the CB and OB, not taking into consideration the angle to the pocket, the system-generated aim will result in a well-defined cut angle that won't work for every shot. Only shot "A" in the diagram will result in pocketing the ball. If the same line of aim is used for shots "B" and "C," the ball will not be pocketed. Even if the balls are only shifted a small distance from position "A" to position "D," the ball will not be pocketed. So the next time somebody proposes a system to you, show them this diagram and ask them how to aim shot "A." Then ask them how to aim the shot if the balls are in position "D" instead (or even closer to "A"). If they tell you the aim is the same, then their system is not complete. To make the large number of shots possible between positions "A" and "C," shifting the balls together as shown, you need a large number of lines of aim, or you need a method to compensate your aim between a small number of lines of aim. There is no way around this!



**Diagram 1** Parallel shift of same “line of aim”

**Diagram 2** shows the effects of ball separation distance on an aim-and-pivot system. Some systems establish an initial cue line using ball-hit fractions or some other method. For example, see the line in the diagram going through the same fraction of both the CB and the OBs. It’s not important for now how the line is established. Various systems have various ways of establishing lines like this. What is important is that the line is exactly the same for all three shots: “A,” “B,” and “C.” The next step in many systems is to pivot the cue (with the body or with the back hand) to bring the cue in line with the center of the CB. Often, the system proponents say this technique will work for a wide range of shots. It turns out this is true in certain situations. For example, if the pocket happened to be at position “a,” both shots “A” and “B” would be pocketed with the same aim. Likewise, if the pocket happened to be at position “b,” the same aiming procedure would work for both shots “A” and “C.” Finally, if the pocket were at position “c,” both shots “B” and “C” could be pocketed with the same aim. Isn’t it interesting and even a little unexpected that the same aim can be used to make two radically different shots? That’s probably one reason why aim-and-pivot systems like these seem very attractive at times. However, as you can see in the diagram, this amazing result only occurs for certain distances and angles to a pocket. So the next time you hear claims about using the same aim for multiple shots with an aim-and-pivot system, pull out this article and show the diagrams to the person making the claims. If the person gives you a full-proof method to circumvent these issues, please let me know so I can give them due praise and write a follow-up article (with their permission).



**Diagram 2 Same pivot-based aim with different ball distances**

At the beginning of the article, I announced a new aiming system with snake-oil-salesman style. I was partly joking, but I actually do recommend a “system” I call **DAM (“Dave’s Aiming Method”)**. I think it has some good guidance for players wanting to improve their aiming skills. Unlike with the beginning of the article, I’m being serious now. Here’s how the DAM system works: You visualize the required “angle of the shot” and required “line of aim” (per the advice below), you then align your cue and vision with the line of aim as you drop into your stance, you then follow all of the **recommended stroke “best practices”** (see [billiards.colostate.edu/resources/stroke\\_best\\_practices.pdf](http://billiards.colostate.edu/resources/stroke_best_practices.pdf)). Be sure to maintain “quiet eyes” both at the “set” aiming position, checking both the CB tip contact point and your aiming line, and when focusing on your OB target during the final forward stroke. If you have a good stroke and maintain focus and don’t do anything wrong during the entire DAM process, you will make every shot.

I think good pool players use all visual information available to them to help see the required angle of the shot and the necessary line of aim. They might use any or all of: ghost-ball visualization, ball-to-ball contact-point visualization, impact-line (or “target line” or “line of centers”) visualization, center-to-edge (CTE) 1/2-ball-hit line visualization, etc. They also intuitively **make adjustments where necessary for squirt, swerve, and throw** (see [billiards.colostate.edu/threads/aiming.html#compensation](http://billiards.colostate.edu/threads/aiming.html#compensation)) based on shot distance, shot speed, cue elevation, ball and cloth conditions, amount and type of spin, etc. I don’t think a good player needs a mechanical “system” to help with the visualization part. If you don’t fall into this category, there are drills and techniques you can use to help develop your visualization skills so you can improve your ability to “see” the shot. For example, see **NV 3.1**, **NV 3.2**, **NV B.3**, and my article last month. Also, I have a useful **ghost-ball aiming summary and drill** on my website (see [billiards.colostate.edu/resources/ghost\\_ball\\_aiming.pdf](http://billiards.colostate.edu/resources/ghost_ball_aiming.pdf)). Well, that’s it ... that’s the whole DAM process.



- [NV 3.1](#) – Practicing contact point and ghost ball visualization
- [NV 3.2](#) – Using the cue to help visualize the impact and aiming lines
- [NV B.3](#) – Mike Page’s aiming video (part 1, part 2)

Regardless of what I or anybody else says, the most important components for success with any "aiming system" are:

**PRACTICE ... PRACTICE ... PRACTICE!!!**

and

**FOCUS ... FOCUS ... FOCUS!!!**

FOCUS implies you concentrate and spend time on establishing your aim. Not all people do this. Another aspect of FOCUS is keeping your eyes "quiet" so you have a clear and stable vision during the aim. Also, maintain full concentration on stroke execution during the final stroke. During the stroke, you should not be second-guessing any of the stuff about the shot (e.g., speed, spin, CB path, strategy, etc.) you should have decided and figured out before you settle into your stance.

I worry (and know) some people will think this article is disrespectful to some of the well-known instructors out there that promote and teach basic cut-shot aiming systems. This was certainly not my intent. I sometimes disagree with some of the well-known instructors, but I still have tremendous respect for them and their abilities to help people improve their games. However, I think people should be more honest and realistic when promoting or teaching "aiming systems." For example:

*System X will help you focus and make balls you haven't made before. It won't work for every shot over a wide range of distances and cut angles, but it does "help get you in the ballpark" for many shots. You still need to make small adjustments between the reference aiming lines, especially to compensate for squirt, swerve, and/or throw, but the system provides a good framework of reference lines that serve as good points of departure. With lots of practice, the system will be less necessary as you develop your visualization skills and adjustment intuition to better see the angle of the shot and know how and when to compensate.*

If you want more information and opinions about why various aiming systems are helpful, despite some of the critical information in this article, see the answers to the 2<sup>nd</sup> question under "aiming systems" in the FAQ section of my website. Basic cut-shot "aiming systems" can help some (if not many) people, and there is much anecdotal evidence on the Internet forums to back this up.

Well, I hope you are enjoying and benefiting from my series of articles on fundamentals. Next month, we will look at important issues related to CB control, unless I feel like writing another article on aiming systems.

Good luck with your game,  
Dr. Dave

PS:

- If you want to refer back to any of my previous articles and resources, you can access them online at [billiards.colostate.edu](http://billiards.colostate.edu).
- I know other authors and I tend to use lots of terminology (e.g., squirt, throw, stun, impact line, etc.), and I know not all readers are totally familiar with these terms. If you ever come across a word or phrase you don't fully understand, please refer to the online glossary in the "Instructor and Student Resources" section of my website.

*Dr. Dave is a mechanical engineering professor at Colorado State University in Fort Collins, CO. He is also author of the book, DVD, and CD-ROM: "[The Illustrated Principles of Pool and Billiards](#)," and the DVD: "[High-speed Video Magic](#)."*