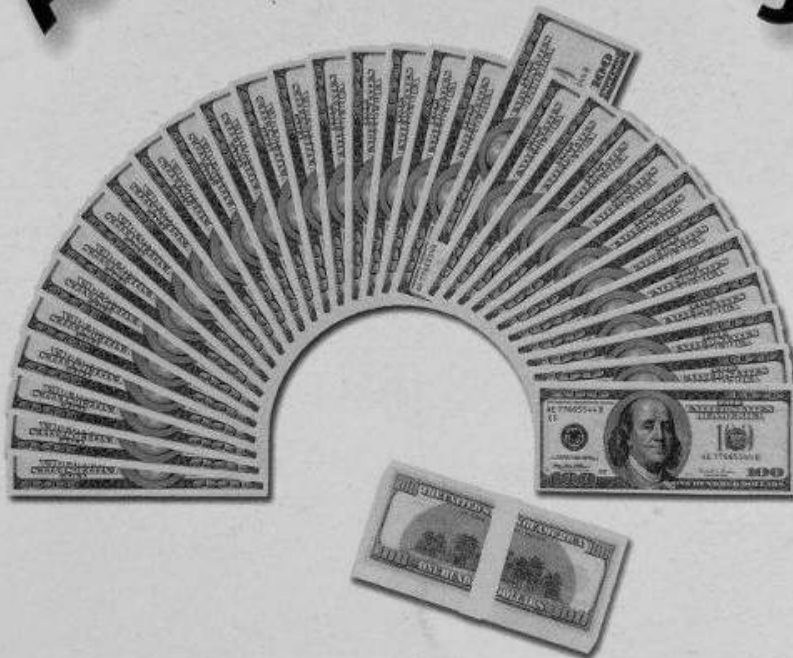
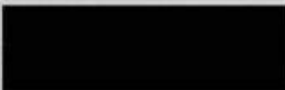


Advantage Play



**For The
Casino Executive**

By



Advantage Play for the Casino Executive

By

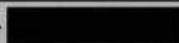


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Dedication Page

I would like to dedicate this book to two individuals:

To my friend [REDACTED]: A great friend, one of the truly honest persons I have ever known, and an inspiration to us all.

To the late [REDACTED]: A true expert in the game protection and the surveillance field, and a true friend that I dearly miss.

Special Thanks



Also, special thanks to my editors [REDACTED] and [REDACTED] layout and printing expert [REDACTED], and my dealer-model in the numerous pictures, [REDACTED].

Table of Contents

Title page	i
Dedication Page	iii
Special Thanks	v
Chapter 1: Introduction to Advantage Play	1
Chapter 2 Blackjack: An Advantage Player's Playground	9
Chapter 3: Reading the Dealer's Hole-Card.	15
Chapter 4: Shuffle Tracking	33
Chapter 5: Playing Card Location	57
Chapter 6: Other Advantage Plays in Blackjack: Past and Present.	69
Chapter 7: Defending Against Roulette Wheel Bias	89
Chapter 8: Rhythm Rolling: A Dice Control Technique	107
Chapter 9: Final Thoughts about Advantage Play	113
Appendix A – Optimal Hole-Card Strategy	131
Appendix B - Warp Hole-Card Strategy 2-9	132
Appendix C - Warp Hole-Card Strategy 10/A.	133
Appendix D - Conservative Tell Strategy	134
References	135
About the Author	137

Chapter 1: Introduction to Advantage Play

The Gaming Executive's Worst Nightmare

The best way to start a thesis on advantage play in the casino industry would be to recount a situation that I was involved with several years ago in [REDACTED]

[REDACTED] This situation involved a couple of key elements that facilitated this casino's vulnerability to advantage play. There was a dangerous combination, first being a knowledgeable player with the ability to observe casino functions and to find a legal method of exploiting a procedural weakness. This was then mixed with an under educated casino management that directed their attention toward the symptom of the problem and failed to address the problem itself. Fortunately, the situation was corrected before it cost a third party (a major playing card manufacturer) millions of dollars in lost and cancelled contracts. Unfortunately, the situation was not properly analyzed and over a three-month period the casino lost close to \$1 million to the advantage player.

The incident occurred at a major [REDACTED] property in the late 90's. The exact location is not important. However, the regulatory restrictions regarding blackjack procedures make it important for me to identify that it did happen in [REDACTED]

[REDACTED] What's important to remember is that [REDACTED] gaming regulations (unlike many other regulated gaming jurisdictions) requires the casinos to deal to all players and can only prohibit play if the customer is intoxicated or disturbing the peace, is a confirmed problem (addicted) gambler, or is committing a fraudulent act. The games in question were eight deck blackjack tables located in the high limit room. The player was a well-known card counter with a lengthy reputation as an advantage player on the [REDACTED]

The player (let's call him "Dick") started playing blackjack at this specific casino late one night on grave shift. His playing pattern consisted primarily of limit bets in one to three hands in the first round off the top of the eight deck shoe with table minimum wagers placed from there after until the shoe was shuffled. He always played on the late shift and requested a high limit table where he played alone. Obviously, management knew Dick as a knowledgeable player and immediately instituted one of the only techniques available to [REDACTED] casinos to combat counters—restricting card composition information by limiting deck penetration to 50%. This technique didn't seem to affect Dick in the least and after several weeks of play he was winning close to \$100 thousand.

After weeks of playing eight deck shoes dealt to 50% penetration, Dick was ahead of the casino a significant amount of money. Based on past experience management knew a 50% penetration point did not provide enough card information to successfully count down an eight deck shoe. Subsequently, they incorrectly assumed that Dick must be using a technique like shuffle tracking. It was then decided by management that they would decrease deck penetration further; dealing only one deck and cutting off seven decks of cards. Management rationalized "if Dick could beat a 12% penetration game, well then good for him". There was only one problem—Dick kept winning and at a greater pace. By the end of the second month of play Dick, with a smile on his face, had carted off over \$500,000.

This presented an extreme problem. The casino was not allow to back Dick off from playing blackjack because of [REDACTED] regulations, so they had no other alternative but to keep dealing to him. The casino was now worried beyond belief because management couldn't figure out what he was doing or how to stop him from gaining whatever advantage he must be getting to beat the game. Management decided to apply for a change in the shuffle with the [REDACTED] Casino Control Commission in an attempt to thwart off any attack on their shuffle procedure. They decided to pull out their final shot on their limited deck penetration scheme by giving Dick the least amount of cards possible. They dealt him one round of the table and shuffled. That night Dick accepted their deck penetration change and kept right on playing. For some reason, he had now developed a very sizeable grin on his face. Not only was Dick un-frazzled by the restriction but he seemed pleased, almost ecstatic, with the one-round-and-shuffle procedure.

What could Dick be doing and when would the blood letting be stopped? Management did the only possible thing they could think of and that was put pressure on their surveillance department to come up with a solution. I can just visualize the meeting between executive casino management and the director of casino surveillance. "I don't know what he's doing, but he's doing something. Find out what he's doing, because what ever he's doing you need to find out. You're the surveillance department and it's your job to get to the bottom of this!" Or some kind of dialog along those lines. I can imagine the frustration of the director of surveillance because he hasn't figured out what has been happening either. All he can do is direct his surveillance operators to examine and break down Dick's play in an attempt to come up with something...anything! And surveillance came up with something. But alas, they discovered the symptom to the problem and, as usually happens, not the problem itself. So close but yet so far away.

When Dick's blackjack play was closely examined a question arose concerning the process Dick used to cut the cards. By reviewing hours of videotape surveillance operators noted three things that apart were nothing, but put together could be an indicator of what Dick might be doing. First, Dick only played late at night. Second, he seemed to be taking an unusual amount of time to insert the plastic cut card into the eight decks held by the dealer. And lastly, Dick seemed to insert the cut card immediately in front of cards that appeared darker then the rest of the cards in the deck. Surveillance examined the tape more closely. They noticed that the longer the dealer held the deck before the cards were cut, the more dark lines of cards appeared. Even though the cards were examined later while in the hands of the surveillance department operators, nothing appeared to be wrong (even though on the videotape the lines and shadows were very visible.) When compared to other videotapes of cards, especially cards that hadn't been on the table as long, the lines and discolorations either were not apparent or non-existent. Surveillance came up with an assumption as to how Dick was beating their high limit blackjack games. He must have discovered an inherent flaw in the playing cards and was using that flaw to beat the house!

This is the point where I get involved. I received a call from the card manufacturer who was in dire straits. They had been informed that a major flaw had been found in their playing cards. One of their clients in [REDACTED] had found that their product has a tendency to alter its shade of white with extended play—specifically the ten value cards. The card company had just hired a manufacturing consultant who had gone through their entire printing plant and had examined their playing card printing process from top to bottom without finding a problem. The card company, although fully immersed in the gaming industry, had limited knowledge of game protection and issues surrounding the nature of surveillance

camera. They desperately needed someone with expertise in that area. I asked the card company to provide me with a sample of the used playing cards, a videotape of the play and any statements or reports they deemed important. I also contacted another consultant named [REDACTED] to assist me. [REDACTED] had worked surveillance in [REDACTED] and was very familiar with [REDACTED] gaming rules and regulations.

Once the cards and tape arrived it didn't take [REDACTED] and I long to figure out what was wrong with the cards. After viewing the videotape it became immediately apparent Dick was using some type of information to locate key cards (ten value cards and aces) during the cutting process. Once the key cards were located, he would insert the plastic cut card a card or two before the apparent key card. The dealer then transferred the cut, put the cards in the shoe, and burnt a card. Dick, who was playing alone, would then make one to two limit bets. When the cards were dealt, invariably Dick would receive a ten-value card or an ace as the first card on one of his hands. We also reviewed the tape and noticed what surveillance had seen—lines and shadow appearing on the cards as the dealer held them for Dick to cut.

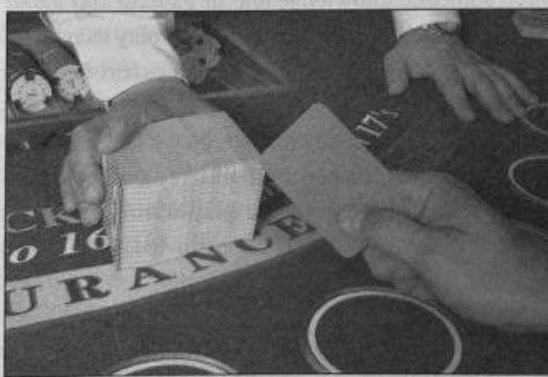


Photo 1.1 Cutting the cards in a shoe game

During the viewing of the surveillance tape we noticed that the lines appeared as Dick held the cut card above the deck and waited to cut. It soon became

apparent what Dick was accomplishing. By waiting before inserting the cut card, Dick was trying to induce the dealer into relaxing his or her grip on the eight decks so Dick could more easily introduce the cut card. When the dealer relaxed, the cards didn't change color—they gapped open! For some reason, the tens and aces had become bent during play and once the dealer relaxed his or her grip, the bent key cards could be seen because the slight corner bends would create a small area between the key cards and other cards. The spacing appeared as lines or discolorations on the two-dimensional video-tape imagery. We later discovered that the slight corner bends were made when the dealer placed his or her hand into the table hole card optical reader bending ten and ace value cards on one corner, while slightly bending the laterally opposite corner of non-ten/aces. At first, analysis indicated the casino improperly installed card reads and that's what was creating these bends—an old advantage play situation known as "dealer warps". This is a situation that the optical card reader was designed to eliminate. Further investigation proved it wasn't faulty installation but poor maintenance. [REDACTED] discovered that the "No Peck" readers were properly installed but the casino did not properly maintain them. Units not properly maintained resulted in dirty switches or low batteries, causing the dealer to put the card into the reader three to four times quickly to get the light to come on. This rapid multi-motion would result in bent corners in the cards.

How Did This Situation Go So Terribly Wrong?

Dick had gone on a three month winning streak because he had discovered readable cards and was using that information to give himself an approximate 22% advantage off the top of the shoe every time he cut the cards. This technique is a known blackjack advantage play commonly referred to as a "location and steering technique". Dick was locating key cards and through the manipulation of

the cut, was steering those cards into his hand, and by the way, in a totally legal manner. The casino provided Dick with the information (bent cards) and the tools (cutting the cards). They even provided him with the best possible conditions an advantage player could ever hope for when they kept reducing deck penetration—providing him with more chances per hour to cut the cards. First he smiled, then he grinned, and then he laughed his way to the bank. What was the final damage? By the time the true problem was discovered and corrected Dick had walked away with a little under \$1 million.

To the card manufacturer's relief and to the executives of the casino's horror, it wasn't anything as complicated as a production problem in the manufacturing of the playing cards after all. It was as simple as bent cards and key card play that the casino should have spotted in a more timely manner. Why didn't they identify this problem sooner? Why weren't the associated advantage play techniques isolated for what they were and corrected accordingly? And what steps could the casino have taken to prevent the loss of so much of their bankroll? There are several ways this situation could be viewed differently.

First, the management was so wrapped up in the symptom of the problem they failed to understand the real problem. In other words, they were more intent in Dick winning ("I don't know what he's doing, but he's doing something") than in how he was accomplishing it. Why did he want to play alone on a table? Why did he play on a later shift (the cards were on the table all day and weren't changed until the beginning of day shift)? Why did he only bet limit wagers off the top of the shoe after cutting the cards?

Second, [REDACTED] law never allowed the dealers to hand check their hole cards for blackjacks. Since this technique is the primary cause of "dealer warps" (discussed in later chapters), it's doubtful if anyone

would have thought about bent cards presenting a "dealer warp" situation. However, [REDACTED] was quite aware of location and steering techniques. While they might not have "snapped" to bent card information, they should have seen evidence of playing key cards off the top of the shoe.

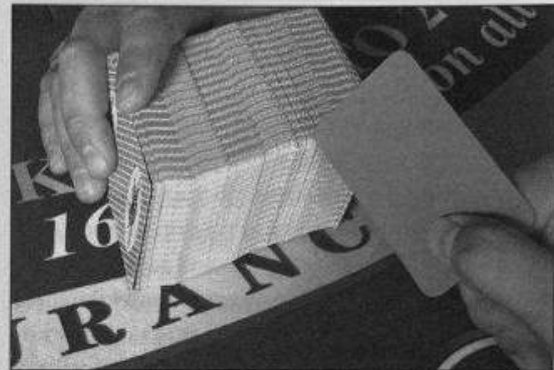


Photo 1.2 See the lines that "Dick" is targeting

Third, I can't believe a major casino on the [REDACTED] did not have anyone on his or her staff that couldn't properly analyze suspicious play. In this situation, neither the VP of Casino Operations nor the Director of Surveillance had formal casino experience. You would think a major gaming operation would have hired someone knowledgeable in gaming and game protection or at the very least, had the play examined by a gaming consultant who was an expert in game protection. And Training? What about training for their staff? I hate to say this but they could have put their entire surveillance staff and key pit personnel through extensive advantage play training courses for a fraction of what Dick extracted from their tables.

What's Worse, the Problem or the Cure?

This is another example why knowing and being able to identify how advantage play truly affects your casino is important. It is sad that this statement even has to be made. In many cases it's not the attacks

from knowledgeable players that cost the individual casino the greatest loss in revenue annually—it's the perception of being attacked and the numerous failed and costly procedures used for falsely preventing these perceived assaults. I would be willing to say that the prevention procedures used to fend off expected advantage play (and card counting) cost blackjack (and the gaming industry as a whole) many times more money than the occasional situation brought on by Dick and his peers.

Soon after the new millennium began, I was hired as a consultant to examine the low hold percentage in blackjack at a medium size casino in [REDACTED]. The executive who hired my service had just taken over the reins of the live game department and was quite concerned about a trend in blackjack that indicated a steady decline in revenue and the hold percentage over an 18-month period. The hold percentage had dropped from approximately 14% to under 12% during this period of time and had yet to show signs of leveling off. Another concern of the executive was the drop in hold had meant the demise of his predecessor; it was his understanding that he would meet the same fate if "things" weren't reversed soon.

When starting a project regarding a specific game and possible underperformance, it's important to gather all significant pieces of financial data as well as information about any changes in procedures, internal controls and changes in the specific market and other external threats that may have existed or might still exist. I've found that certain documents and memos relating to changes in game procedures and casino conditions contain the same, if not more important information as the monthly and daily game statistical reports. In this example it was a combination of the financials and memos that led to the isolation of the problem. Or should I say "problems", in the plural?

After conducting a hold percentage and revenue trend analysis I discovered several unexplained dips over the 18 month period—one fifteen months previous, one twelve months previous and another just three months ago. When conducting trend analysis it's best to use some type of smoothing tool that allows the analyst to see if the trend is breaking out upward, breaking out downward or staying the same. In this situation I used a six-month moving average, which eliminates severe up and down motion of monthly operation and smoothes the statistics into workable trend information. This trending tool found serious downward turns around the three before mentioned time periods indicating an occurrence of importance happened during each trend move. What happened during these dates that might have caused a downturn in the hold percentage? Was it due to external changes in the market or to something done internally? Or was it a combination of several effects, both internal and external?

Based on intradepartmental memos and an interview with the casino shift managers, I discovered that the casino had suffered a losing period approximately 14 months prior and management had decided something had to be done to stop the problem. They decided to get rid of their simple one pass shuffle on their six deck games and institute a triple pass shuffle. The reason? To deter the shuffle tracking teams of course. Management felt their shuffle was attracting too many shuffle trackers and it was these advantage players that were decreasing revenues and the hold percentage. This change was deemed a correct decision even though no incident of shuffle tracking of any nature was documented by surveillance or in the table games master activity log book management maintained in the pit.

Next, the investigation noted that the continuing poor hold percentage dictated a second change around a year ago. This time management decided they would institute the policy of "No Mid-shoe

Entry" in their six deck blackjack games. This was followed soon after by the same policy in their two deck games. The reason this time? The low hold percentage was due to back-counters and advantage players jumping into games when the decks were in the player's advantage. Again, an examination of the surveillance and pit logs did not indicate a problem with card counters and advantage player counting down decks from off the table and then jumping into games. If there wasn't a real indication of back counting being a problem, why did management opt to institute "No Mid-shoe Entry"? Was it because "something had to be done" and isn't "every other casino prohibiting mid-shoe entry?"

The final trend downturn dropped off at the same time as the last change that was made to the blackjack games. This drop in hold percentage was the most severe, dropping from an average of 13% to just below an average of 12%. Since the hold percentage still hadn't return to its original level, management had decided to decrease the deck penetration of their six deck games from 4.5 decks to 4 decks and their two deck games to 50%, i.e., one deck and shuffle. It was management's reasoning that the reducing deck penetration would prevent the card counters and the shuffle trackers from taking advantage of their blackjack games.

No one can beat this casino blackjack game, right? This assumption is both right and wrong. These three previous game protection changes had rendered their blackjack game virtually unbeatable by the player. However, in their frustration to correct a falling hold percentage management slowed the pace of the game. The number of hourly decisions diminished to a point where the loss in potential revenue greatly overcame any gain from discouraging advantage players. The casino's attempt to correct their problems, either real or imagined, ended up creating problems surrounding time and motion issues. In their efforts management lost close to a million dollars in anticipated revenues

to save maybe a couple of hundred thousand dollars (that is if their advantage play problems were real) in game protection savings—still not worth the cost trade-off. This situation has been commonly referred to in the past as "throwing the baby out with the bath water".

Advantage Play Extends Past Blackjack

Here's one more example why casino executives need a better understanding of the techniques used to gain a legal advantage over the casino. In this example the casino in question placed itself in both legal and financial jeopardy by not properly analyzing an advantage play in the game of Three Card Poker. These errors actually led to charges of false arrest and illegal detention being filed against the casino. The final outcome was an embarrassing court trial and a final judgment believed to be in excess of \$400,000.

In April 2000 two customers entered a major [REDACTED] casino and proceeded to play Three Card Poker. These two customers were advantage players looking to gain an edge by gaining bottom card information. They would obtain this vital information by taking advantage of under trained dealers they knew were dealing Three Card Poker at this location. This occurred before the casinos started to use shuffling machines on the alternative games. Subsequently, the advantage players knew they could count on seeing a dealer's hole card or two (dealers dealt themselves three separate hole cards at this time). This knowledge would give the advantage player an edge when making decisions on whether to make additional wagers and stay in the game or fold their hand and lose their original bet. By doing so they could grind out a good amount of the casino's chips over a period of play. At this specific game, the advantage players made a tremendous find. They found a dealer that was so poorly trained at placing his cards face down on the

table; they could spy all three cards most of the time. This weakness provided exact hole card information and gave them an advantage of over 30%!

During a three-hour period of play, management didn't pay any attention. Not until one of the two players hit three jackpot hands (strictly by chance) for over \$15,000, over a short period of time, did the casino shift manager want to know how someone playing a grind game like Three Card Poker could be winning so much money. Then someone in the pit found the player's picture in a publication that contained known advantage players, card counters, thieves, and gaming cheats. Under his picture was a list of his alleged methods he was known to use in the casino. Along with card counting and advantage play (specifically known to play the dealer's hole card) the list included that he allegedly had been involved in "card bending". At that point the cards were pulled from the Three Card Poker table and examined by the shift and pit manager.

The examination produced six cards that could be possibly marked (bent corners). In most cases six bent cards would not constitute card marking. However, supported by the publication's information about "card bending", it was immediately assumed that the two players were winning due to card cheating. The [REDACTED] Gaming Control Board was contacted and the players were detained, their money seized and cards and tape held as possible evidence pending the Gaming Board agents' arrival.

At this point the casino should have done their due diligence and reviewed the play to make certain the suspected players had committed the gaming crime of marking cards. However, no steps were taken. The two players were subsequently arrested by Gaming Control based on the casino's interpretation of the evidence regardless of what had happened on the table. A later review of the case by Gaming Control and the District Attorney's office determined there

was no evidence that would lead them to believe a gaming crime had occurred and all charges against the two players (one player spent some time in jail) were dismissed. Not only were the players given back all the winnings that were seized, the incident opened the door for a costly lawsuit against the casino and against the author of the suspicious player publication.

I had the opportunity to review the videotapes from this case and it was extremely apparent to me that the players were getting the dealers exact hole card information. In fact they were near perfect reads of all three cards in almost every situation due to a weak and under trained dealer. What if management had taken time to train their dealer and given their supervisors the knowledge of the techniques surrounding advantage play? It would be safe to say that their staff would have recognized the situation for what it was— an annoying and somewhat embarrassing attack against their Three Card Poker game. Instead, the casino got into costly litigation because this play was totally legal in nature and it was their lack of dealer training and knowledgeable game supervision that created the situation in the first place.

What Really is Advantage Play?

Advantage play occurs when knowledgeable players discover a weakness in a casino's procedures and rules, employee training, apathetic supervision, or in the nature of the casino game itself and uses this weakness to develop a long-term advantage. The casino is providing the playing field and the advantage player is turning the tables around and creating an environment where they make the money and the casino is the player. The techniques of advantage play takes on many forms. Card counting is one form of advantage play. Although I use the term card counting liberally throughout this text, I will not go into detail on how card counting achieves an

advantage. My past book titled [REDACTED] goes into detail on the mechanics of counting, so I won't banter the point around in this book.

Shuffle tracking, especially zone tracking, is a form of card counting and will be discussed at length. There are several variations of shuffle tracking that will allow the studious player to achieve an advantage based on the nature of the game of blackjack and procedural weaknesses. Determining the value of the dealer's hole card in card games is another form of advantage play. Revealing information about the dealer's hole card creates a significant advantage for the knowledgeable player and is strictly legal as long as a device is not used to observe the value of the hidden card. Different methods of locating key cards in the deck or shoe and using this information to determine the amount the player will wage is yet another method of gaining an edge over the casino. In this situation, the advantage player manipulates the act of cutting the cards in order to force the located key card into his hand, and sometime the dealer's hand.

Of course, we've seen that advantage play is not limited to blackjack. Do you know that a group of gaming authors and playing experts claim they can

beat casino craps legally by controlling the throw of the dice? They are also claiming that they have been beating the game of craps for years and as of the writing of this text are giving presentations to the public regarding the method used to achieve an edge in dice? How about incidents of exploiting roulette wheel bias? Are these techniques legal and what can the casinos do to thwart these threats? Another area for attack is wagering through oral contract. The dealer hears the player ask for \$15 on the "Player" in baccarat but when the bet wins the player informs the dealer he said "fifty" not "fifteen". What about full pay video machines and club point systems? Can a player take advantage of bonus point promotions?

There are advantage players that don't win their money across the table. They beat you with your own comping system. In the past decade a number of books have been written about getting the edge in gaming through the manipulation of the casino's comping system. This method of beating the casino isn't limited to the pit but encroaches into slots and other areas of the entire gaming/resort complex. The enterprise-wide reward systems offered by some of the major gaming companies possess another unique situation—an advantage player can now create his edge in [REDACTED] and can collect it in [REDACTED].

Chapter 2 Blackjack: An Advantage Player's Playground

When an executive first thinks of advantage play he or she tends to envision the casino card game of blackjack. Why? Because the game of blackjack is a virtual playground for a majority of advantage players who plot, practice and attack the casino. The game of blackjack, as it is dealt in the casino environment, suffers protection-wise from the same element that makes the game interesting and attractive to the standard everyday casino customer. It's structure is different from other casino games because it is not subject to independent trials like games of roulette or craps, where a previous gambling result does not influence or affect future gambling results. We can calculate the probability of the roulette ball falling into a specific number on the wheel head. We can establish a payoff that creates a house edge and establish odds that can easily be understood by both customer and operator. We can establish a similar line of calculations for the game of craps, although more extensive, but we can still calculate exact probabilities and establish true odds. In roulette and craps, once the rules of these games are determined, the probabilities they create remain true with every decision. With these games the same set of variables are involved with every decision. This is not so in the game of blackjack. Blackjack does have rules that affect the mathematics of the game, i.e. how many decks are being dealt, does the dealer hit 17 and does blackjack pay 3 to 2 or 6 to 5. However, blackjack has two factors that make it very unique. This uniqueness is what opens the playground gates for the advantage player. The first fact is that the game of blackjack is played with a depleting deck. And the second fact is that the player's skill level has a direct outcome on the mathematics of the game. Blackjack is not a "black and white" game and subsequently provides knowledgeable players with a number of avenues to exploit.

Examining the possibilities

There are several elements that create opportunities for the advantage player. These elements that need closer examination are:

1.) Constantly changing deck composition

Blackjack is dealt differently from other gambling card games (except for baccarat) because the cards are not shuffled immediately after each round of play. Shuffling the cards after each round of play occurs in other casino games such as poker, pai gow poker, Caribbean Stud Poker, Three Card Poker, and Let It Ride but not in blackjack. Since the cards are not shuffled after each round, it's perfectly understandable that the standard deck composition has been altered based on card depletion.

If we take six standard decks of 52 cards and use standard rules of play (such as: stand on all dealer hands of seventeen, double down on any first two cards, split like value cards up to three times (four total hands), not re-split aces, and pay \$3 for every \$2 wagered when a player receives a blackjack) we can then designate the player to strictly utilize a perfect "basic" strategy when making playing decisions. Based on these criteria, we can calculate that the house will have a slight edge over the player of 0.54% or a theoretical win of fifty-four cents for every one hundred dollars wagered. However, because blackjack is being dealt in a continual manner and not every round is dealt off the top of a freshly shuffled six decks, this house advantage will fluctuate with a depleting card set.

After the original round of cards is dealt and as the composition of the remaining cards changes, so does

the house advantage. Because some cards (tens and aces) have a greater value to the player it can be assumed that in some situations the remaining card composition no longer creates an edge for the house. In fact, based on the ratio of tens and aces the house advantage could actually change to a point where the player has the advantage. This ever-changing card composition situation is the backbone for the theory of card counting. Card counting is a process that assigns a value to the playing cards and counts them as they are dealt from the deck. This count information is then used to determine the composition of the remaining cards of the shoe or deck that remains unseen. After the card counter collects enough information, they then have the ability to determine whether or not the remaining unseen cards of the deck provide them with a positive return on their wager. This method is also applied to different methods of advantage play such as shuffle tracking.

Advantage play is defined as a technique that legally takes advantage of weakness in either issues related to the rules of the casino or the nature of the game. Card counting is definitely a form of advantage play and I will refer to this technique liberally throughout this text. I do not intend to examine it in any great degree. The executive who is reading about advantage play really needs to understand the basics of card counting in order to properly grasp this concept. For further details on the theory and mechanics of card counting I strongly suggest reading one of my previous books written on the topic, [REDACTED]

2.) Mechanics used to mix the cards

Cards in blackjack are still mixed for the most part through the human performed process of shuffling. This method, although considered "random", for most practical purposes is far from perfect. Shuffling the cards by hand is adequate under normal conditions

and versus most players. Most dealers do not possess the ability to perfectly riffle the cards together making their mix imperfect. This imperfection adds an element of variation to the nature of the process that you will see later on in this text is actually a two-edged sword. With the addition of extra decks to the game of blackjack, the shuffle process itself has changed. It is no longer a direct mix of one single set of cards ending in one complete batch like the shuffling process creates in the single deck and most double deck games. This segregation of several batches of multiple decks creates sub batches of cards that can be exploited through a technique known as zone tracking.



Photo 2.1 Standard Dovetail Riffle shuffle

The standard intermixing of cards through the "riffle" process also provides a situation that can be exploited by the advantage player. Several years ago a study was conducted by a college professor on the East Coast who tested the riffle shuffle process and developed a theory that most casino executive are not aware. After examining both simulations and actual dealer hand shuffles, he determined that it requires seven complete riffle shuffles before the mixture can be declared truly random for casino use. This means that any casino can riffle shuffle a deck seven times and guarantee that the result will not create a bias, either for the player or the house, and can't be exploited. The problem with this theory is

that the time wasted, by the casino shuffling a single deck or double deck seven complete riffle shuffles, between rounds would be too time consuming and the multiple decks physically impossible based on the size of the human hand. Subsequently, the riffle shuffle generally is performed in only two to four repetitions, whether used to mix the hand held deck(s) or sub-batches of the multiple deck game. This situation creates openings for a couple of techniques that can be utilized to exploit blackjack: sequential tracking and key card tracking.

3.) Different rules and procedures

The advantage players will review the rules and procedures of a casino in order to pick and choose their avenue of attack. Just go to several different casinos and you will see many different rule variations—sometimes within the same casino. Blackjack is dealt from one to eight decks of cards and is dealt under a variety of rules. These variations range from simple rule changes such as having the dealers hitting soft seventeen, to more complicated rules like late or early surrender and automatic win on six cards or more. Another area that presents variation is the actual dealing procedures established by management that govern the dealing mechanics of the game. For example, most casinos utilize a hole card reader to identify if the dealer has a blackjack when having an up-card of ace or ten value but some do not. Some casinos still allow their dealers to check the hole card by hand while others don't allow hole card checking at all. Sometimes combinations of different procedures provide unique loopholes for the knowledgeable player to attack profitably.

Casino promotions are also targets for the advantage player. A promotion to increase play on the blackjack table might create a situation that can be exploited based on misunderstood statistical metrics or a failure to properly structure restrictions. One situation that comes to mind happened several years

ago at the [REDACTED] with known "comp-clipping" player. The player exploited a coupon promotion by wagering a large number of coupons across the blackjack tables during a twenty-four hour period by artfully wagering in different pits and on different shifts.

4.) Three important secrets: the hole card, the top card of the deck and the cards the player is about to receive

Although not totally unique to the game of blackjack, exploiting these three important "secrets" is the backbone to much of the advantage play. If the player can spy the identity and value of the dealer's hole card he or she can play with an extremely strong advantage over the house. If I know how to get hole card information on just one out of every three hands I can play blackjack with an average advantage on every hand of approximately 3%. In other words, the advantage player can expect to win \$3 for every \$100 I wager in this situation. Playing with this much advantage would be severely detrimental to the long-term wealth of the casino. Compared to other techniques that give the advantage player top card knowledge or the value of one or both of the player's cards before they are dealt, three percent is a minute drop in an extremely large bucket. These techniques will be examined later in this text.

5.) The human element

When I mention the "human element", I'm talking about the dealers and the supervisors—the casino's frontline employees. These employees handle the mechanics of the game, make initial contact with the customers, conduct duties that keep the games operating smoothly and (sometime during their spare time) protect the games. I do agree with the present trend of gaming table and pit duties. Customer service comes first and game protection is a sidebar task that is normally relegated to the surveillance

department. For all practical reasons, it's more important to identify the good casino customer than it is to detect the cheater or advantage player. The reason for this position being that approximately 99% of the customers entering your casino are there for the gambling entertainment features and are not concerned with achieving some type of long term edge.

My biggest concern with front line employees would be within their different types of human traits. These human traits range anywhere from the degree of hand dexterity possessed by the person dealing cards to the attentiveness of the dealers and supervisors in regards to following the prescribed game procedures. Other issues include whether the dealers are experienced or are they break-ins? An inexperienced dealer could be attacked successfully due to their inability to follow or perform procedures allowing the bottom card of the deck to be seen. Even the more experienced dealer, who has performed the same mechanical motion day in and day out, can allow the advantage player to see their hole-card if their mechanics are slightly amiss. Certain dealers and supervisors are attentive and others can be distracted easily. Other dealers are neat and precise while some are sloppy and weak. For example, an advantage player using a zone tracking technique does not look for the sloppy, unpredictable dealer. They are looking for a dealer that is precise in their grab size when shuffling the cards. This allows the shuffle tracker to have a greater degree of tracking accuracy when following the target zones through the shuffle. The advantage player who is attempting to locate a key value card looks for a dealer who uses a high riffle shuffle or fails to protect the deck during the cutting process. Regardless of the situation, certain human traits of the employees are as valuable to the advantage player as procedure loopholes and mathematical knowledge used to create the advantage player's edge.

6.) The fallibility of equipment used in blackjack



Photo 2.2 High Stripping motion exposes cards

Take the paper cards for example. They can get bent, warped, and waved during play and may be subject to providing information that can be read by the advantage player. Card backs are printed under some of the same standards as our government currency but the card backs can still produce blemishes and slight differences that can be used by the advantage player to gain an edge over the casino. Are shuffling machines totally random? Do optic devises provide information to the observant player? Whenever certain equipment and devises are used to determine the outcome of the game, even the slightest irregularities can create avenues of attack for the patient and continually calculating advantage player.

Why are most advantage players successful in their attack on Blackjack?

Advantage play is similar to siege warfare; the defender holds a strong but static position on the battlefield. The defender gets to pick the location of the battle and gets to use his siege knowledge and

Chapter 2: Blackjack: An Advantage Player's Playground

tools to build an impregnable fortress. The attacker isn't restricted to staying in one place. He gets to probe the defenses constantly looking for weaknesses and chinks in the defenders armor. As the defender gets to choose the location and strengthens his defenses, the attacker has the flexibility to seek out the weakest point of the fortress and amass all his resources on the attack of that point. If the assault fails, the attacker gets to retreat to a safe haven and plot his next move.

As a casino executive you get to choose your blackjack game type and procedures. You get the chance to select and train your blackjack dealer and floor staff and you also have input on surveillance coverage for all your blackjack games. However, you're still locked

into a static situation where you will not be able to counter any attack until the barbarians are virtually at your gates. Even with the best procedures and a well-trained staff of supervisors and surveillance operators any casino is still open for the occasional advantage player to ply his or her trade. Given the nature of the game of blackjack in the casino environment, all casino executives will have their hands full keeping the chips in the rack and the bundles of hundreds in the cage. Since you now have an understanding why blackjack is such a lucrative game for the advantage players, the next step is to examine all the various weapons that are available to the knowledgeable player and how the executive can parry each and every thrust successfully.

Chapter 3: Reading the Dealer's Hole-Card

Let's cut to the chase. I'm a blackjack advantage player and I want to get the dealer's hole-card. If I can get that information I know I can play with an approximate 10% advantage on every hand—if my intention is to go for the casino's throat. That means I'm playing very aggressively based on the hole-card information. Playing an aggressive hole-card strategy I will attain an edge that allows me to win \$10 for every \$100 I wager. By getting the dealer's hole-card every hand I will have an eight times greater advantage than the casino has against their regular customers.

The problem I face is that if I play a strategy aggressive enough to achieve a 10% edge because I won't have play longevity. How can I hit a hard 19 or 18 against a dealer-combined hand of 20? I can't. How long will it take the casino's supervisors to figure out what I'm doing if I double down with a five and a two against the dealer's up-card of ten when I know he has a six in the hole? I can't. So I have to sacrifice many aggressive decisions if I expect to play more than a handful of rounds without being ejected from the table. I become less aggressive. This will lessen my win rate but it will increase my play longevity. I still maintain a reasonably good advantage and I'm able to average a theoretical \$6 win for every \$100 I put in action on the blackjack tables.

The question is can I get this information every time from every dealer? No, I need to find dealers that will expose their hole-card during the hole-card delivery process. So I scout every dealer on the hand dealt games on every shift during every day of the week. I will travel to every casino in my area of operation and I scout as many of the dealers as I can. I scout the dealers by standing outside the games and watching their deliver mechanics. Do they hold the deck too high when they start their hole-card delivery? Do

they tilt their hand when they take the hole-card or do they tilt the hole-card immediately before they slide it under the up-card?

Then I spot a dealer holding the deck too high on her delivery. I find a position on the table where I believe I can spot a flash of the index corner of the hole card. As I play at a position just left of the center of the table, I fix my eyes on the spot where the dealer's deck hand stops and the hole-card come off the top of the deck. By sitting at this spot with this dealer I am able to catch a small flash, maybe a quarter of the index corner of the card. Most people wouldn't think a quarter flash of the index is enough but I've practiced reading index corners and a quarter corner flash to me isn't any different than having the whole index shoved in my face. I concentrate on the same location until I'm confident I'm getting a good, usable index read.

Though I can see the index flash, I don't see it 100% of the time. I estimate I can see the index one out of every three times. Is this enough to gain an advantage over the house even with using a less aggressive playing strategy? You bet it is. If I can get readable information at least one out of three hole-cards I can still play with an average gain of approximately 2% (33% time 6% equals 1.8%). Now I start to play this dealer. I remember her name and mentally record the table, shift and day of the week. I also note whether the dealer is on an assigned game, is the table relief dealer or is bouncing off different tables because the casino is using a "rubber band" assignment method. I determine how long to play on her table each time and how to position myself on other games when she comes back from her break. I try to make my movements look random and not planned since this will help me gain play longevity.

When I wager I don't spread my money. I either flat bet or use a progressive betting system. I don't want to use a wide bet spread because I don't want to be thought of as a card counter. The pit is on constant vigil for counters and spreading my wagers might get me categorized as one. On my second wager I catch her hole-card. It's a six and her up-card is a picture card for a total of 16. I have a total of nine and elect to double down. Although this might be considered an aggressive play, doubling on nine versus an up-card value of ten will more than likely make me appear to be a weak player. I might get a better player rating because the floor supervisor might rate my play as "soft". The dealer finally plays her hand and busts out. This was expected and will happen approximately 40% of the time. This is actually more important to me than what card I will receive on my double down.

Several hands later I watch as the dealer flashes an index corner of a king while showing an ace as her up-card. I make an insurance bet without looking at my cards (but I do). I know before the dealer asks for insurance that she has a blackjack. On the very next hand I see the dealer deliver a six as her hole-card to go along with the five she has showing. I have a total of nine. Basic strategy would dictate the best play for the average player would be to double down but I don't. I hit out my hand because I know the dealer holds a total of eleven and will more than likely make her hand. I will also hit until I get no less than a hard seventeen because of the valuable hole-card information I have received. By this time I realize I'm seeing a greater number of hole-card flashes than I first expected. I'm actually playing with a greater advantage—a win rate per hand closer to 4%.

This previous story was an example of an advantage player who plays the spied index corner of the dealer's hole-card. This information is utilized to reverse blackjack's normal house advantage. It

allows the advantage player to gain a sizeable edge even though they are only seeing a flash of the card's index once every few hands. In most situations, hole-card play is not identified because most pit personnel either don't think of or don't know how to look for dealer hole-card delivery weaknesses. If the hole-card play is discovered at all, it's because the advantage player played too aggressively making radical variations in playing strategy versus what is considered normal. Most players, whether they play a good playing strategy or not, usually make consistent play decisions that don't incorporate outrageous play variations.

In this section we will examine different methods of seeing the dealer's hole-card. We will examine different table angles known for reading the dealer's hole card and review the different playing strategies employed with the advantage play technique. I will also discuss the legal issues surrounding hole-card and the communicating of this information to other players on the target table. I will follow up with some points and suggestions that the casino executive needs to know.

Remember that the use of a device such as a mirror or reflective surface (both known as "shiners") or employing the use of a camera lens is considered in most regulated gaming areas as illegal or prohibited. Collusion with the dealer is also illegal. Although still a threat to the casino, collusion will not be discussed in this subject context. The true advantage player uses legal loopholes in the casino's procedures and will not use devices or enlist inside help to gain the mathematical, long-term advantage over the house. Why risk getting caught committing a felony when the advantage player can get the same information for free?

Index reading

The hole-card playing story at the beginning of this section is a perfect example of an index read

Chapter 3: Reading the Dealer's Hole-Card

technique. The advantage player scouts different dealers in order to find a dealer that will allow him to glimpse at the index corner of the soon-to-be hole-card as it leaves the hand held deck. This flash is usually created when the dealer holds the deck too high off the table when dealing the hole-card (usually about chest level). It can also be read when the dealer tilts the deck slightly as the hole-card is



Photo 3.1 Reading the index corner from the center of the table

pushed off the top by his thumb prior to delivery. When the dealer holds the deck too high the index can be read for a miniscule moment or flash as the dealer's thumb pushes the card to the dealer's right, a split second before they lower their deck hand to the table to complete the hole-card delivery under the

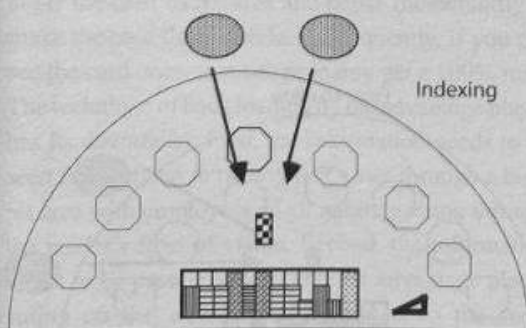


Diagram 3.1 Table positioning for indexing

up-card. In most cases, at least half the index corner can be peeked from the center or player's center-left seats on the table (on a seven spot table it would be



Photo 3.2 Index read of an "angle" dealer

wagering boxes four and five). Visual consistency from the center table index read is usually better than other forms of hole-card techniques.

Another index read (angle) is possible when the dealer severely tilts the deck before dropping his or her deck hand to the table to deliver the hole-card. The angle index read is generally spotted from the center of the table and up to several spots to the player's right. The index corner can be seen the moment the dealer's thumb pushes the card slightly off the top of the deck. Many angle index read dealers will also be readable from the player's left side of the table. This is known as "front loading".

Front loading

Front loading is a term given to this method of reading the hole-card because the card face, or a portion of the card's face, is visible as it is being placed or "loaded" under the up-card. Since all but a few dealers hold the deck in their left hand and deliver the cards with their right, front loading is visible for the fifth, sixth, and seventh wagering positions on the blackjack table. Front loading reads are usually found in dealers that

tilt the hole-card upward moments before the card is loaded into the hole. Sometimes the card can only be identified based on the evidence of a picture card or the amount of spots or lack of spots seen during the process. This means a player might only be able to tell if the card is a face card (ten value), higher card (many spots), low card (fewer spots) or an ace. Even with this limited information, the advantage player can still gain a substantial edge of between 4% or 5%. Spotting and reading a front load dealer is not an exact science. The flash of the bottom side of



Photo 3.3 Peeking the hole-card as it's being front loaded

the hole-card varies. It can be seen anywhere in the delivery process from the point it's removed from the top of the hand held deck to moments before its placed under the up-card.

Once during my professional playing career, I found a readable front load hole-card dealer who at first viewing looked like there was no possible way I could get his card. During the delivery process the dealer would drop his hand directly down on the table and snap the hole-card flat onto the felt. It wasn't until he loaded the card that he slightly raised the card corner and outer edge and flashed the bottom face of the card visible from the last two positions on the table. Although the dealer was obviously aware of the importance of dropping his hand and getting the hole-card flat onto the table, his cautious training was rendered useless during the last few seconds of



Photo 3.4 Front loading when the dealer raises the card's index corner

the loading process.

Since front loading is best seen if the reader's head is at a lower altitude with the top of the blackjack table, most front load readers have a tendency to slump low in their seats. Another characteristic of a reader is that of a smaller person (usually a woman) who doesn't have to slump so low and is less obvious to the semi-knowledgeable blackjack supervisor. A similar technique is for the reader to push their chair back away from the table. This way they increase their angle of view and can see the front loader easier without contorting their bodies. Taking this idea a step farther, I've known of some advantage players who actually sit off the table and read the hole-card from the second or third position from the next table over, signaling their information back to a confederate player wagering on the target table.

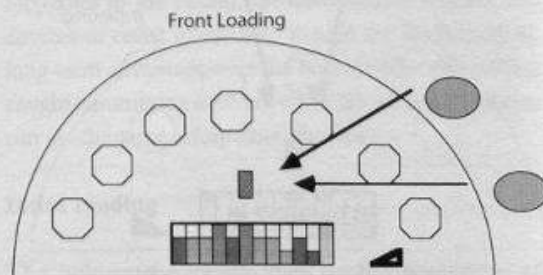


Diagram 3.2 Table positioning for front loading



Photo 3.5 Front loader's body and head positioning to read the front load



Photo 3.6 Back loading the dealer's hole-card

Back loading

Sometimes a dealer will tilt the hole-card during the delivery but the card face will not be visible from the front or side positions on the table. In this situation the card might be readable from behind the table. Although you are not allowed to stand behind the dealer in the blackjack pit, you can position yourself across the pit on opposite blackjack tables. If the hole-card is glimpsed in this manner, the technique is referred to as "back loading" or seeing the hole-card from behind and off the target table. Although not as common as other hole-card reads, back loading usually is a more consistent read because the dealer needs to angle the card backwards and pause momentarily to make the card flash visible. Subsequently, if you can see the card once, you can probably get a 100% read. The technique of back loading by the advantage player has its downfalls. First, the information needs to be seen from fifteen to twenty feet away through a busy pit area with employees of all nature passing through the reader's field of vision. Second, the information needs to be passed back to another advantage player sitting on the table which is subject to the same problem as the read.

Spying the dealer's hole card when hand checking for a blackjack

In years past the casinos had their dealers hand check the hole-card to make sure he or she didn't have a game stopping blackjack. This method had numerous down falls; one being the dealer's inability to properly shield or protect the hole-card when peeking. Today most casinos utilize an optical device in blackjack that allows them to check the value of their hole-card when their up-card is either a ten value card or an ace. By checking for a possible blackjack, the casino increases the number of rounds and hands per hour which is extremely important to the profitability of the game. At one time casinos completely stopped looking under their hole-card because of attacks from advantage players. During this period the casinos realized that the time and motion issue from not looking for the possible blackjack out-weighed the losses in revenue from advantage players seeing the dealer's hole-card. The hand checking process also created adverse situations from unintentional and intentional information passing from dealer to player and from bends created during the peeking process that provided another form of hole-card information to the knowledgeable player (discussed later in the text).

During the mid 1990's several companies developed devices that could be attached to each blackjack table to provide the dealer with enough information to determine whether or not they held a blackjack in a manner that did not bend or alter the playing cards. (Note: the play described in the introduction regarding the [REDACTED] player is contrary to this statement. However, that instance was a result of improper maintenance of the device and not the device itself). As of 2005 very few casinos hand peek their hole-card, even though knowledge of how this information can be gained is very important and needs to be covered in some detail. For many years a number of advantage players made a nice living from information gained from glimpsing the dealer's hole-card during the hand peeking process.

First basing

Probably the most used technique to glimpse the dealer's hole-card during the hand checking process was known as "first basing". This technique got its name from the position on the table where the advantage player either stood or sat—the first position of the table directly left of the dealer. When some dealers checked their hole-card for a blackjack, they did not protect or shield the hole-card peek from the person positioned at first base. Depending on how bad the hole-card was exposed, a player at first base would position sit or possibly stand so that the index corner of the hole-card could be read. This provided the advantage player with an approximate 6% advantage on the hand they were able to spy; giving them an overall average advantage of about 2% or a theoretical win of \$2 for every \$100 wagered [REDACTED]. In some cases, the advantage player had to move a half step to their left or right (rightward positioned them slightly inside the pit) in order to see the card. Because of the short distance between eye and index corner, the first base read was usually 100% every time the dealer had a ten value card or an ace as his or her up-card.



Photo 3.7 First basing the dealers hole-card while standing in first position

During my advantage playing days I found a girl dealing at a small casino in [REDACTED] who I could read standing up a half a step to the right side of first base position. After several profitable playing sessions, the dealer asked me how I know what she had in the hole every time she had a ten or ace as her up-card. Even though she had the feeling I was getting hole-card information, she had no idea how to prevent me from getting it. Many times a weak dealer will never improve and years later they are still readable from the same table position. When I first started working at the now defunct [REDACTED] in [REDACTED], I ran into a dealer who I had "first based" during my blackjack playing days several years before as she dealt at the [REDACTED] in [REDACTED]. After watching her deal several hands, I noticed she still had the same problem. It had been several years and she had

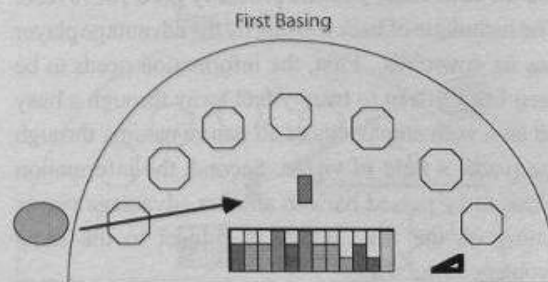


Diagram 3.3 Table positioning of the first baser

Chapter 3: Reading the Dealer's Hole-Card

worked at several casinos during that time and not one casino supervisor had figured out that she was weak at protecting her hole-card. After she came off the blackjack table I took her to an inactive pit and on a closed table showed her what she was doing wrong and what she had to do to correct it. During the impromptu training session she told me over the years a number of times customers would play on her game and always seemed to know what she had as a hole-card. After our correction session she had no further problems.

Spooking the hole-card

Spooking is very similar to the advantage play hole-card technique known as back loading because spooking is done from behind the game. When "spooking", the advantage player is trying to spy the dealer's hole-card only when he or she is checking their hole card for a blackjack. The information obtained from spooking is the same information obtained when a dealer can be first based. Although with spooking, the player is off the table position requiring him or her to signal the information across to another advantage player positioned on the target table. Just like the back load read, the reader is faced



Photo 3.8 Spooking the hole-card from off of the table

with the problem of reading and communicating across a somewhat busy pit (which could be quite detrimental since the spook reader is working with a much smaller advantage) and needs at least one good read out of every two chances to maintain a doable return on their money.

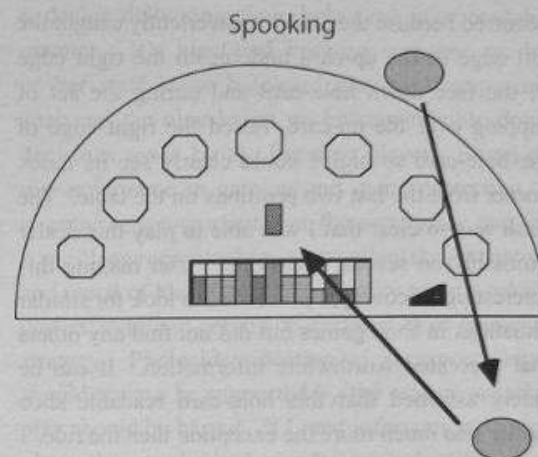


Diagram 3.4 Table positioning for spooking

Glimpsing the hole-card in the shoe game

OK—so you don't have to worry about giving up your hole-card because your casino does not deal from the hand, only from a dealing shoe. The dealer never picks up the face down hole-card but slides it across the table and flips the up-card face up on top of it. The hole-card's face never leaves the table felt until all hands have been acted upon and the dealer reveals the total count of their hand, right? Let me give you two examples why this is a fair assumption but from time to time situations develop that provide the advantage player with solid hole-card information even though the cards are dealt from a dealing shoe.

Back in the my days as an advantage player, I accidentally stumbled across a shoe dealer at a major [redacted] casino who was giving up hole-card

information between 50-75% of the time. It was an extremely subtle flash that I probably would have missed if I hadn't been looking for a playable "dealer warp" game. While watching this specific shoe game, I noticed the dealer would expose or flash the top right index corner of the hole-card when flipping the up-card face on top of the hole-card. The flash occurred because the dealer inadvertently caught the left edge of the up-card underneath the right edge of the face down hole-card and during the act of flipping over the up-card, raised the right edge of the hole-card so high I could clearly see its index corner from the last two positions on the table. The flash was so clear that I was able to play this dealer profitably on several occasions. After making this interesting discovery, I proceeded to look for similar situations in shoe games but did not find any others that presented worthwhile information. It can be safely assumed that this hole-card readable shoe dealer was much more the exception than the rule.

In the 1990's several companies experimented with the development of hole-card reading devices. One such company pioneering this field was a major



Photo 3.9 Front loading the hole-card in the shoe game

casino corporation that operated several hotel/casinos in the [REDACTED] area. Management at this corporation understood a need for determining

blackjacks based on time and motion issue and developed a reading device to be trialed at several of their gaming locations. It was apparent management didn't believe in creating anything simple and the eventual device that was produced took up a fairly large area on the blackjack table to the immediate front-left of the dealer. The device took up so much table area that a dealer using a dealing shoe couldn't always slide their cards in front of them and sometimes had to lift their up-card and hole-card over the device when customers played in the center three or four positions. On a number of occasions these games were vulnerable to hole-card play from a reader sitting in the last two table position glimpsing the hole-card during the "up and over" movement, completely nullifying the use of a shoe and optical reader used to protect the game.

Hole-card playing strategies

If the advantage player is wagering in lower units he or she is more likely to both read and wager using the hole-card information since their monetary earning power is low and won't support the existence of more than one player. If an advantage player wishes to wager high denomination chips he or she will most likely choose to employ one or more additional players. This becomes a necessity if the advantage player wants playing longevity with that dealer and in that casino. When playing higher value chips the player making the wagers needs to act separately from the person reading the information. The reason is that most floor supervisors and surveillance operators pay more attention to players wagering \$100 chips and/or winning larger amounts of money. When the casino's staff closely observes a player who is sitting erect away from the logical position normally associated with glimpsing the hole-card, even though the customer may be making erratic playing decisions, the play might not appear to be suspect. They might also look over the player on the last position of the table wearing a baseball

cap pulled down over his eyes while slouched down in his chair. But because he's a flat \$5 better, their attention will only be cursory. This is a common situation for most damaging hole-card plays: the reader is positioned to glimpse the hole-card and signals the information to his confederate sitting on the opposite side of the table, wagering two hands of \$200 each.

Blackjack expert and author [REDACTED] included an interesting example of observed play strategy that has had many casino supervisors scratching their heads. In his book, [REDACTED], [REDACTED] makes a challenge to all casino pit bosses by establishing a game situation listing the play of four separate hands and daring them to figure out why the hands were played in that many. [REDACTED] comments that, "Any capable pit boss should be able to give you the right answer, but I doubt that there are two pit bosses in the state [REDACTED] that could give you the right answer" [REDACTED]. Word for word here is the situation and the challenged hands. Can you figure it out?

"A very good player is playing blackjack, the player is winning, he never makes a bad play. He knows how to play and he plays every hand perfectly. Then you notice:

1. On the first hand dealt, dealer has a ten up; he splits two 2's.
2. Next deal, first hand, he has an eleven, dealer has a 6, he does not double.
3. Later he splits two sevens, when the dealer has a ten up.
4. First hand, he doubles on nine, dealer has an ace up.

Every play is correct. There was an exact reason why he made each play." [REDACTED]

If a player's identity isn't found in a cheat/advantage player catalog of pictures first, most hole-card plays discovered by the casino's floor or by surveillance staff are through the identification of the big player's hand decision strategy. Subsequently, the attack is not originally identified based on play characteristic such as a slumping player with a baseball cap or a dealer delivering their hole-card in a readable manner. It's identified because someone on his or her staff knew hole-card playing strategy and analyzed the play based on hit/stand/double down decisions made by the big chip player. Based on my experience in gaming and game protection, it is extremely important that the supervisor and the surveillance operator have an excellent understanding and recall of blackjack basic strategy and a working understanding of certain characteristics of hole-card strategy. Photo identification of a suspect player should always be supported by the reasons why his play should be barred. If I read information about a player that says he or she is a known hole card player, I want to back that information by witnessing the actual suspect play. Remember, there is a lot of bad information floating round because of misdiagnoses of a winning player's actual method of play. I know a lot of players that have received the label "card counter" simple because they were winning at blackjack.

Included in Table 3.1 is a simplified hole-card strategy from card counting guru [REDACTED] book [REDACTED]. [REDACTED], a pioneer in advantage play, developed this strategy to make it easier for the hole-card reader to pass information along to the big player on the table. The simplified hole-card strategy is broken down into four decision categories: "big pat" (dealer combined total of 17 through 20, 11, & ace-6 through ace-9), "big stiff" (dealer total of 12 through 16), "little pat" (dealer totals of 7 through 10, ace-ace, & ace-two), and "little stiff" (5 through 7, and ace-3 through ace-5). [REDACTED] felt the simplified version was easier to

Situation	Dealer has:	Player Strategy
Big Pat	17 thru 20, 11, A-6 thru A-9	Hit until hard 17 or more; Double down and Split nothing; Soft hands – hit until 18 (or 19 with 9 and ten as up-card) Surrender A-5 thru A-8 and all pairs vs. 20; 7 thru 9, & 12 thru 16 vs. 19 & 20*
Big Stiff	12 thru 16	Hit until hard 12; Double down and Split everything without attention; Double down on 5-5 (don't Split)
Little Pat	7 thru 10, A-A, A-2	Hit until hard 17; Double on 10 & 11; Split A-A & 8-8
Little Stiff	4 thru 7; A-3 thru A-5	Play basic strategy as if the dealer has a "5" as up-card

* There are other surrender plays, but they aren't included because they're too aggressive.

Table 3.1 – Simplified Hole-card Strategy

remember and easier to use in play without giving up too much of the edge gained through spying the hole-card value. You would think that since this worked for [REDACTED] that all the casino supervisors, surveillance operators and executives would be well versed in this simplified strategy and be able to detect hole-card play. (Note: A more detailed version of hole-card strategy is included as an appendix.)

Legalities of playing hole-card

To most people the laws that govern our society, both criminal and civil, are vague and quite confusing. This confusion comes from the fact that our laws are written by scholarly individuals and left for the common person to decipher. Subsequently, what one

would think should be a translation that results in a "black and white" understanding turns out to be loaded with layers of gray. Just look at the latest product liability laws and everyone can see what I mean. This is not different with gaming regulations and laws governing gaming, in fact it is more so. In most jurisdictions gaming statutes that define cheating at gaming are somewhat vague and left to the eventual interpretation of the courts. This is accomplished through lower court actions, appellate decisions or appellate jurists written comment or dictum. Subsequently, the interpretation of a specific gaming law related to "cheating" can more readily be understood by the common person (i.e., casino executives and gaming law enforcement agencies) if a large number of cheating cases have

Chapter 3: Reading the Dealer's Hole-Card

been prosecuted successfully (or unsuccessfully) or land mark supreme court decisions handed down based on challenges to criminal statutes related to gaming. For example: the elements in [REDACTED] Revised Statute [REDACTED] that defines cheating are [REDACTED]:

To alter the elements of chance, method of selection or criteria which determines:

1. The result of the game
2. The amount or frequency of payment in a game
3. The value of a wagering instrument; or,
4. The value of a wagering credit

Standing by itself this [REDACTED] does not provide the average gaming executive with enough information to determine whether or not a person sneaking a peek at the dealer's hole-card is committing a crime or legally exploiting a casino's weakness. So how does casino management know when suspicious play falls under the category of cheating or legal (but undesirable) advantage play?

Since the topic of this section is hole-card play we need to search for and review any previous court decisions concerning this edge-gaining player technique. Based on [REDACTED] and [REDACTED] book [REDACTED], several cases exist that influence the situations surrounding hole-card play and communication of hole-card value information. If we wish to cut quickly through the legal clutter, we can refer to the one primary legal case that involved the arrest of two players in the early 80's which has the greatest influence in a court of law regard hole-card. [REDACTED] and [REDACTED] explain the situation and the result of the [REDACTED] Supreme Court finding on page [REDACTED] of their text:

[REDACTED] and [REDACTED] were arrested at the [REDACTED] Casino in [REDACTED] on [REDACTED]

[REDACTED] and also charged with cheating. [REDACTED] sat at first-based and viewed (without a device) the hole card of the dealer, while placing table minimum bets. [REDACTED] signaled the hole card information to [REDACTED], who was seated at the same table making bets. [REDACTED] and [REDACTED] were cleared of their charges, in large part because the sloppy dealing was attributable the casino, not cheating by the players."

There was a further comment made by [REDACTED] and [REDACTED] attorney [REDACTED] that I feel needs to be noted. After arguing his clients case before the [REDACTED] Supreme Court and reviewing their appellate decision [REDACTED] issued the following comment which was printed in the [REDACTED]:

"In the [REDACTED] decision the facts were that they were lawfully seated at the table and used no artificial devices to aid their vision. I believe those are the key facts upon which the decision was based."

[REDACTED] comment and the [REDACTED] explanation suggests that hole-card play is legal and as long as the player glimpsing the card is not assisted through the introduction of an "artificial device to aid their vision" and all players involved (the reader and the bettor) remain on the same table. In other words, if the information is available on the table to at least one player, even though it's something that management detests and wants to avoid, no criminal act has taken place. Not even if the reader mashes his face into the table trying to catch the hole-card. But what about advantage play techniques from off the table such as back loading, spooking and reading a front load dealer from the next table over?

Although no previous case law exists, it is assumed by most gaming experts from both sides of the gaming table that gaining information from off the target table could probably be considered illegal. According to blackjack author [REDACTED], "In [REDACTED] spooking is illegal and front loading is legal" [REDACTED]. [REDACTED] bases his opinion on discussions with [REDACTED] attorney [REDACTED]. [REDACTED] thinking is that the moment you no longer obtain the inadvertently exposed information about the value of the hole-card from the table at which you're playing, it's not considered "information available to everyone on the table". The previous statement "information available to everyone on the table", has been accepted verbiage by persons involved with the gaming industry as being the primary criteria for determining whether the information was obtained legally (without the use of an artificial device, of course).

Gaming expert [REDACTED] supports the same opinion. In his book [REDACTED], [REDACTED] outlines a technique used to glimpse the dealer's hole-card from off the table during a front load play. He calls the technique "Express Play" and explains that the term covers all forms of catching the hole-cards value from off the target table by gaining a greater view angle of the exposed hole-card; sometimes from as far as twenty feet away. [REDACTED] states:

"The express play is not an advantage strategy; it's clearly cheating, and is no different than spooking. It requires help from a confederate not playing on the same game, so this information is not available to all players on the game, as the laws allows" [REDACTED]

What about the issue of signaling? Isn't "signaling" the hole-card information across the table to another player a "surreptitious act" that does not allow

information to be shared by "anyone at the table"? Even though the casino's perception that signaling information is an act of deception (similar to signaling in the card game of Bridge – which is considered cheating by the players), the legal opinions at this present time is it's legal. [REDACTED] quote, "If it is legal to verbally discuss the proper move on a given hand...it has to be legal to make the same communication in a non-verbal manner" [REDACTED]. Where signaling information about a dealer's weakness is possibly considered cheating when off the table, signaling between players on the table is considered part of the local community interaction.

Remember just because the expert opinion is that gaining hole-card information from off the table and signaling this to another player on the target table is considered illegal, it's still considered legal "gray area" since there has not been any court decisions indicting this as such. This means if the casino executive gets over anxious and places "suspected" players in hand cuffs, they could be involved in a situation of wrongful arrest if a later court decision defines the situation differently. It's strongly advised that the executive follow standard legal procedures regarding to detention and the involvement of legal authorities. The executive's primary responsibility is to protect the casino's bankroll. This can be accomplished in most jurisdictions by simply barring the advantage player from future participation in live casino games and by correcting the problem leading to the game protection weakness the advantage player was exploiting. In many situations, cases against the casino for wrongful detention and/or arrest result in thousands of dollars in attorney fees and possibly great cost in court awarded monetary damages. In the face of some of the latest wrongful detention litigations, it's better to lean towards caution then to leap into aggressive legal actions.

Some last thoughts on hole-card play

As we enter the second millennium, most casino executives place less and less emphasis on game

protection regarding hole-card. This is quite understandable with more multiple deck games being used on the casino floor, as well as, a majority of blackjack games utilizing optical hole-card reading

Side Bar – ADVANTAGE PLAY AND THE [REDACTED] LAW JOURNAL

Gaming consultant [REDACTED] informed me that the [REDACTED] Law Journal (winter 2005) discussed the legalities surrounding advantage play and commercial casinos in an article co-written by attorneys [REDACTED] and [REDACTED]. The article discusses several different legal positions regarding advantage play, including the player's right to play without harassment and whether or not playing skills such as card counting and shuffle tracking should be considered illegal. The area that interested me the most was [REDACTED] and [REDACTED] interpretation regarding the legalities of hole-card play. The duo opined that learning the dealer's hole-card by accident was incidental and legal, while players "entering a casino with intent" to gain hole-card information "not typical or readily available" should be interpreted as "cheating". [REDACTED] and [REDACTED] expressed their opinion about a player's characteristics while seated at the table:

"Therefore, attempting to acquire knowledge not typically or readily available to other players that provides an advantage in determining or predicting what was intended to be a random event should be illegal and unenforceable if the player uses any artificial or deliberate means to gain the advantage such as mirrors or spotters (2005)."

Although I have a lot of respect for [REDACTED] and [REDACTED], I have some personal reservations

as to their views on these issues. First, [REDACTED] and [REDACTED] place a lot of weight on their article's mantra, "Is the advantage play consistent with the defined rules of the game"(2005). It appears to be their belief that the game is dealt with the dealer's hole-card as one of the game "secrets" that makes twenty one the game it was designed to be and any attempt to discover this secret is illegal. However, they overlook other "rules and procedures" that require the dealer to "protect" the hole-card. Other common rules also allow the dealer to expose the hole-card (Double Exposure blackjack) or to not take a hole-card at all (European no hole-card). By insinuating there is a difference between "seeing" the hole-card and "getting" the hole-card, the legal duo has dropped the casino executive (the person making the ultimate decision to detain suspected cheaters) into gray-area purgatory.

Remember information found in law school law journals is just that—information. And should not be viewed as a legal decision. Although it might sound interesting, just because a player slouches down in his or her seat to get hole-card information or enters the casino to play hole-card, it doesn't mean the casino executive can detain and/or arrest advantage players for cheating without being held liable. Unless [REDACTED] and [REDACTED] have an agreement with your casino (and you personally) to defend unlawful detention cases "Pro Bono", I would stick to correcting the weak dealer and/or banning the advantage player's blackjack play (if allowed in your jurisdiction).

devices. The chance for inadvertently giving up hole-card information is less now than ever before. However, diminishing risk gives way to protection apathy. It's important that you as a casino executive, supervisor or surveillance operator to review and consider the following points about this section's topic:

- Establish one procedure for delivering the hole-card in hand held blackjack games. Since dealers are now trained to deal cards at a variety of locations and regions throughout the country, it is understandable that there are various methods taught for hole-card delivery. It's important you get all your blackjack dealers on the same page. Find the best technique for delivery and make it your casino wide procedure (or enterprise wide for the major corporations).
- Provide training for your pit supervisory and surveillance staff on hole-card play, especially on hole-card strategy. Hole-card strategy knowledge will assist your personnel in identifying a host of advantage play (and cheating) situations. Certain forms of shuffle tracking and location/steering techniques involve developing information about the hole-card. This also holds true when marked cards are employed in some cheating situations.
- When considering whether or not to take legal actions against players you feel could be cheating, don't make the decision exclusively by yourself. Collect evidence of their play and notify your local regulator agency that handles gaming crimes. Provide these agencies with information but don't force your viewpoint on their decision making process. Answer questions and offer opinions when asked. But making compelling arguments that land players/cheaters in jail may not be so compelling when you are

testifying as a witness in court. Assist the gaming regulators in making their decision regarding the arrest of the suspected players. Do not insist they do.

- Because of past problems from advantage players attacking the hole-card, most casinos have changed their dealing procedures that all but eliminate the possibility for weak or sloppy dealers. However, in the past six months I had a conversation with two card counters who have switched over to playing hole-card. They claim that sloppy hole-card deliveries are back because most dealers have gained dealing experience on shoe games and when put on hand held card games requiring hand delivery of the hole-card, they're having some serious problems.
- If you do identify a hole-card team, it may be prudent to let them play for a while so that you can note what other dealers they play. If you let a hole-card team play for a couple of hours, you may find two or three other dealers that are inadvertently flashing their hole card.
- A frequently asked question is "Do advantage players count cards in conjunction with playing hole-card?" For most practical purposes players reading the hole-card DO NOT count cards. The gain from counting is fairly minuscule compared to the gain from seeing the hole card. [REDACTED] writes about employing a count system in [REDACTED], and includes indices for play hands based on the count and hole-card information. The only time I've known of teams combining counting with hole-card play was when the count play was the main avenue of attack and the hole-card was treated as peripheral information.

A final hole-card story: In the mid 1980's I worked as a live game floor supervisor at the [REDACTED] Hotel/

Chapter 3: Reading the Dealer's Hole-Card

Casino in [REDACTED] (it closed in the late 90's and reopened as the [REDACTED]). At that time the [REDACTED] offered a majority of its blackjack games in the hand held format, both single deck and double deck, and it was always known for good rules and playing conditions. On this one specific night/early morning, I had just started the shift working the dealer break list. When working the list my main duty (as well as watching four blackjack games) was to assign dealers to tables as dealers came back from break and to make sure swing shift dealers went home on time. I also handled the break schedule of the floor supervisors. Subsequently, it was not unusual for me to look around the casino in an attempt to locate employees, note what games were being closed and how the general flow of business was moving with the casino's business day starting to slow down. Anyway, I wasn't just stuck in a pit section where I was only expected to pay attention to my games only.

I was scanning the main pit that ran separate but parallel to the pit I was standing, when I noticed two players sitting at our main hand held game that caught my attention. One player was sitting on the second seat of the game and betting \$100 chips in two betting spots on the table. He was well dressed and looked like a quality player, concentrating on his cards and not really appearing out of the ordinary—a typical black check player. The second player on the table was sitting in the last chair of the table wearing jeans, a knit shirt and a baseball hat. He was thumbing a small stack of \$25 chips, which he bet one at a time—the table minimum. What made this situation appear strange was the way the player in the last seat was slumped backwards in his chair (which was pulled out away from the table allowing him to rest his head at an angle that was just a little above table level). I thought to myself, "If this guy's not looking for the dealer's hole-card, someone should teach him how because he has the position at the table down pat". And sure enough, as soon as

the dealer delivered her hole-card, I saw it was taken off the top of the deck at too high an angle. Again I thought to myself, "I'll bet I could read her from the exact position the player on the third base side is sitting."

After assigning the next group of relief dealers to their games, I returned to observing the double deck game in the main pit that had previously attracted my attention. After the dealer completed the shuffle and cut procedure, and started to pitch the cards around the layout, I placed all my concentration on the player at third base. He sat at ease while he received and picked up his first card, but then I noticed his shoulders tighten as he reached in to pick up his second card. The reaching-in action allowed him to dip his head slightly so that his eyes would be at an angle equal to about an inch above the same level as the table. Immediately after the dealer placed the hole-card under her up-card, the third base player double tapped the side of his face. Was this a signal? Did third base just glimpse and signal the hole-card's value to the black chip player on the other side of the table? From my position it was difficult to see what actions were being taken on the table. I could tell that the black chip player had tucked both of his hands without taking a hit and the dealer had taken a single hit card before turning over the player's hands and paying every bet on the table. Did third base know the dealer had a "big stiff" hand and signal that fact to the black chip player who decided to stand pat? After watching several incidents of third base dipping his head slightly and signaling, and black chip making good decisions, I was pretty sure a hole-card team was attacking us on our main double deck game.

In those days the casinos did not have the surveillance systems that they have today so I knew calling the casino's "eye" was all but worthless. So I looked to the end of my pit and I saw the grave casino shift manager sitting on a dead game with his head

in his hands. Our shift manager "Nick" had years of experience in gaming and was considered very knowledgeable. I was confident Nick could go over and watch the game for a few hands, either confirm or reject my assumption, and handle the situation accordingly in a professional manner. What I failed to take into consideration was that Nick was in the throes of an ugly divorce and hadn't had a decent amount of sleep in days. He was wound up like a tight spring and was extremely volatile at that moment.

Innocently enough, I walked down to the opposite end of the pit and got Nick's attention. "What?" he asked. "Ah...I think those two guys on BJ 9 are hole-carding the dealer", pointing in their direction. Just as Nick glared in that direction, the dealer just happened to be in the process of delivering her hole-card and third base just happened to decide to make an exaggerated head dip motion to read the card. What they were doing was so apparent I was surprised the other players in the casino hadn't noticed the peek. Nick exploded. He must have been

sitting there internalizing his marital problems and the opportunity to vent his emotions in a different direction was too much. I've never seen a person travel that many linear feet without touching the floor. In a split second Nick vanished before my eyes and reappeared at the outside rim of BJ 9's like his atoms had been transported directly to that location. Nick looks at both players, first the reader at third base and then the black chip bettor wagering on second and third position. I know somewhere in the world at that moment Linda Blair felt a twang of jealousy. "You guys want to see the hole card? I'll show you the hole card!" roared Nick. Then he reached down and grabbed both the up-card and the hole-card with one hand, made a fist and strangled the life out of the cards (to my relief— at least not a flesh-and-blood object). He lifted the mangled and now non-readable clump of cards high above his head emitting a low howling sound. The two players, realizing this rare opportunity, took that moment to evacuate the area. The black chip player took a nanosecond to scoop up a few \$100 chips, while his counterpart opted to leave his green chips as a tip for the dealer.

Side Bar – TRUE HOLE-CARD ADVANTAGE

I've been using the figure of 9.9% player gain when the player alters his or her play when seeing the hole-card 100%. This number was originally calculated by computer genius [REDACTED] in 1963 and has been used by most card counting and advantage play experts as their base number. This gain percentage is based on a single deck game with rules of standing on all dealer 17's and double on any two cards but most importantly fails to take into consideration of gains for 100% correct insurance every time the dealer shows an ace as their up-card (gain of 2.4%). Subsequently, [REDACTED] number is somewhat defective even for games in the early 1960's. His advantage should be 12.3%. This deficiency was noted by statistic wizard [REDACTED] and documented in his work [REDACTED]. [REDACTED] original calculations indicated a 100% hole-card strategy would gain a player 13.4% when the player throws play longevity to the wind and uses the information optimally. [REDACTED] calculations took into consideration insurance

gains and the addition of the house procedure of doubling after split. Below is a list of hole-card strategy advantage percents based on game rules, optimal play sacrifices and hole-card technique.

[REDACTED] original calculations on the true advantage from conservative players (approximately 6%) were based on several factors. First, [REDACTED] quickly understood that certain plays (as mention previously) were too aggressive and attracted unnecessary attention and needed to be abandoned. Second, [REDACTED] realized front load reads were not 100% effective and a read percentage of 80-90% would decrease to baseline percentage gain further. And third, because errors can be made during the reading, bad plays will be very costly to the advantage player. If a hole-card read indicates a "big stiff" because the hole-card was read as a "6" and a hand of 6-6 is split in accordance to proper hole-card play, and then it's realized that the card was actually an "8" making the hand a "big pat", the 6-6 hand mistake pays a big penalty ([REDACTED]).

Conditions	Rules	Estimated Player Edge
100% hole-card information	1D, DOA, DAS	13.4%
Playing conservative*	1D, DOA, DAS	10.8%
Playing conservative*	1D, DOA, DAS, 6/5 BJ	9.6%
First base – conservative*	1D, DOA, DAS, Peek A&T	3.3%

* Not hitting certain hands to avoid detection and increase play longevity. These hands entail: not hitting 17, 18, or 19 against better pat hands, not splitting T-T when dealer has 7 thru ten up-card and not doubling with hands of 7 or less.

Chapter 4: Shuffle Tracking

The maxim "necessity is the mother of invention" was never so true as it is with the creation of zone shuffle tracking in blackjack. Zone tracking is nothing more than an extension of the principles of card counting with the intention of creating more play longevity for the counter/advantage player. When you look back at different methods used to camouflage card counting in the casino, zone tracking is a natural progression from techniques like back counting, "big player" team play and depth-charging the single deck game. These concepts were created to allow the counters to play in the casino without the casino identifying their play as a threat to the casino's bankroll. Once each deceptive technique is used past its effectiveness, another method is developed to take its place. Subsequently, when counters were experimenting with new card counting approaches (if rumors are true), the theory behind zone tracking, and then other tracking techniques, was discovered purely by accident. Nevertheless, necessity was there to extend play longevity and the next new discovery was a technique that still leaves many casino executives (and advantage players as well) scratching their heads.

The intention of zone tracking cannot be pinpointed to one specific person or advantage-playing team. The zone tracking could also have resulted from the contributions of a number of players. I don't know. If one of the most common rumors is correct, a card counter who was trying to come up with a deck-cutting technique developed zone tracking. He hoped this technique would provide the best place to cut a four-deck shoe game to provide him with consistent plus-deck situations. The idea came after the counter cut the cards in a thin manner off the front of a four-deck game and received several positive-count shoe games in a row. Maybe he was on to something, and so could this technique provide continual plus situations? Even if it could just

increase the number of advantageous shoes and limit the number of negative or neutral shoes it would be extraordinary. He reasoned that by increasing the number of positive situations with this cutting technique, he would be able to obtain a higher win percentage than by simply counting cards.

It wasn't until he played around with the concept did the player realize what he was actually starting to accomplish. He had developed a method for identifying ten- and ace-rich sections of the deck from the previously played cards. He could then follow these sections through the shuffle and then manipulate the location of this clump of cards with the cut. This cutting technique would ensure that this ten/ace rich clump of cards would not fall behind the casino's pre-established shuffle point. Well, if he could locate and track rich plugs of cards through this one specific four-deck shuffle, then why not use the information and cut the rich section to the top of the shoe? He was now able to play a ten/ace rich section off the top of the four-deck shoe, making his maximum bets right from the get go. He could now make maximum bets at the start of the shoe; continue making them as the count went minus and spreading down towards the middle of the shoe. With this betting pattern, no one from the casino side of the table would ever think he was attacking the game through the use of card counting. Brilliant!

Zone Tracking

In order to totally understand this concept, we need to cover a few factors involving the mechanics of card counting. The first being card depletion. After the first round, and with every subsequent round dealt from a deck or shoe, the card composition changes. A player can use a card-tracking technique (card counting) to estimate the composition of the remaining cards in the shoe. They can then determine whether or not

they have a mathematical advantage over the house based a surplus or deficiency of ace- and ten-value cards. The only problem with card counting is that it takes a number of viewed and expended cards before the counter has enough information to make a worthwhile decision. The volume of cards needed to be seen and their variations limit numbers of rounds that will be dealt in favorable situations.

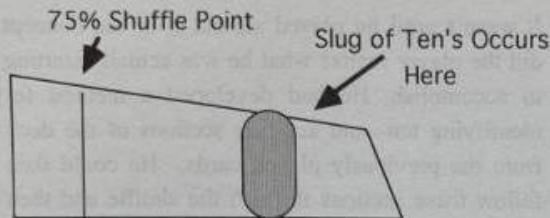


Diagram 4.1 Location of ten/ace slug that the counter cannot play profitably.

Consequently, when a "plus" section of the remaining cards in a shoe are identified, it will normally occur toward the middle or late part of the deck or shoe. Not to mention the fact that a large group of cards toward the end of the deck or shoe will never come into play based on the shuffle point. Based on these facts, the card counter can expect only a few favorable situations and they will never occur off the top of the deck or shoe. Sometimes the counter won't be able to play into the favorable section of cards because it rests beyond the shuffle point. Wouldn't it simplify the situation if the counter knew where those profitable plus sections were located at the completion of the shuffle, and through the act of cutting the cards, transferred the group of forty or fifty cards to the top of the deck or shoe?

At one time, the now defunct ██████████ Hotel/Casino offered a four-deck game that became the first trackable game in the history of advantage play. The ██████████ wasn't the only casino that offered a four-deck shoe blackjack game in the late '70s but its shuffle offered perfect conditions for the first successful

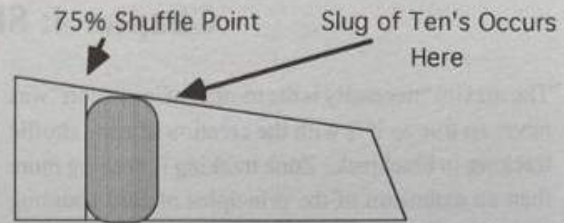


Diagram 4.2 Location of ten/ace surplus the counter can play profitably.

tracking play. The game they offered was a standard ██████████ multi-deck game: standing on all seventeens, double after splitting and 3 to 2 on player blackjacks, with a 75% deck penetration. When the dealer reached the shuffle point, he broke the shoe and placed the remaining cards located behind the cut card into the discard holder on top of the cards that had been already dealt and used. The dealer would remove the entire four decks from the discard holder and place them in the middle of the table. The dealer would then perform the ██████████ procedure for shuffling the four decks by:

1. Break the four decks in half, into two separate two deck piles (approximately 104 card stacks).
2. The dealer would grab approximately 50 cards from each of the two piles (left and right) and shuffle them together using a riffle, riffle, strip, riffle shuffle procedure.
3. Once those cards were shuffled, the dealer would place them between the two unshuffled piles.
4. The dealer would then pick up the remaining cards from each of the remaining piles and shuffle those together as well, afterwards placing the shuffled cards on top of the other shuffled cards in the middle of the table.

This shuffle, as described by blackjack expert ██████████ is as an R&R or "riffle-and-restack" shuffle (2003). To the normal person, this appeared

Chapter 4: Shuffle Tracking

to be a good shuffle. To the advantage players, this appeared to be a great shuffle. The advantage players, armed with information the normal person would not identify as being relevant, were able to take advantage of the casino. The advantage player has watched the previous shoe and mentally tracked the card values as they entered the discard rack. The advantage player then observes as the dealer grabs approximately 50 cards with his left and right hand each time. The grab size translates into the size of beginning zones that the advantage player will then track. Remember these zones that will be tracked have been counted during the previous run of play and mentally logged as they entered the discard rack. They keep these side counts either mentally or through the use of indicators such as angled chips or foot positioning by the player.

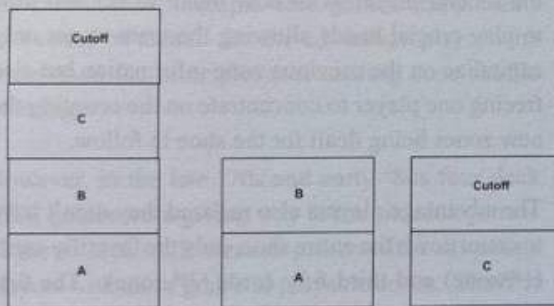


Diagram 4.3 Determining Trackable Zones by Grab Size (50 cards)

The amount of cards shuffled together by the dealer then equals the size of playable zone that the advantage player will analyze. Armed with this information the advantage player will then develop a strategy for cutting the cards to manipulate the positive slug to the front of the shoe. They can now use this information for determining size of bet and playing strategy. In this situation the amount of cards shuffled together will consist of two approximate fifty-card grab sizes for a total playable zone of approximately 100 cards (note: I use rounded numbers like 50 and 100

instead of 52 and 104 for simplicity reasons which is the most common conversion number used by professional players).

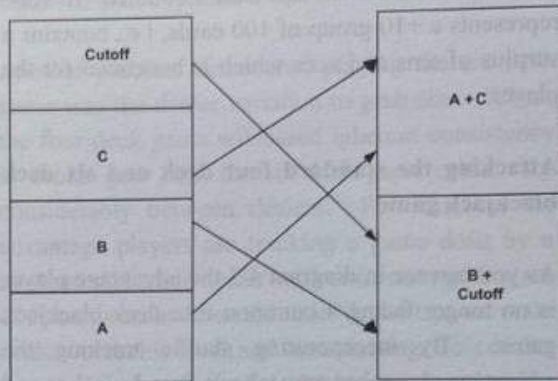


Diagram 4.4 Following the Four Zones through the Shuffle

The advantage player will now decide which of the two playable zones is most beneficial and then cut the cards accordingly. They are looking to cut a zone that is rich in "minus" cards to the front of the shoe. Remember when a card counter tracks cards he or she attaches either a plus or minus value to each card type. Card counting is primarily used to determine the value of the remaining cards in a deck by tracking what card values are removed from the deck. Important cards like aces and tens are assigned a minus value because their depletion from the deck indicates the remaining subset of cards more than likely can not be played profitably by the card counter. Since zone shuffle tracking seeks out sections that are rich in tens and aces, the tracker is looking for playable zones that correlate with a minus count.

For example: if the first dealer grab zone of 50 cards has a running count of minus five and the third dealer grab zone is has a running count of minus five then the 100 card playable zone created when the first and third zone are shuffled together will equal a minus

ten. At first appearance the normal casino executive would say a minus ten value zone is good for the house, he or she is wrong. When tracking the shuffle, the value of that zone is the inversed or flip-flop of the counted value. In this case a counted -10 zone represents a +10 group of 100 cards, i.e., contains a surplus of tens and aces which is beneficial for the player.

Attacking the standard four deck and six deck blackjack game

As you can see in diagram 4.5 the advantage player is no longer facing a common four-deck blackjack game. By incorporating shuffle tracking the advantage player has now taken a four deck shoe and broken it into two "double deck" sections. In this situation the player has the chance to play either a double deck game that is +10 (long in small cards) or a double deck game that is -10 (rich in tens and aces) and very profitable. By cutting the deck optimally, the advantage player gets a chance to always play the richest half of the four deck shoe never having to play into anything less than a neutral situation. And remember this optimal cut will bring the rich section to the front of the shoe allowing the advantage player to make their large bets at the start of the shoe. Oh and by the way, did I mention that the advantage

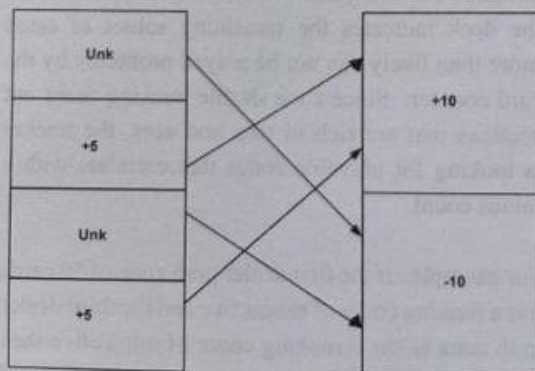


Diagram 4.5 Identifying zone tracking values

player gets to play the rich double deck down to the last card?

After realizing how the [redacted] four deck R&R shuffle can be exploited, all the advantage player needed to do was practice counting the grab zones and study their playing strategy. They had developed one of the best methods for attacking the game under actual casino conditions. If at this point you are thinking that to play the information you collect from the previous shoe while you are gathering information for the next shoe would be a superhuman feat—you are correct. That is why the advantage player decided to bring another player into the project. While player #1 was tracking the shoe that would come into play after the shuffle, player #2 would use the information from the previous shoe to cut and play the current game optimally at the same time. One player could signal the second player as to how much to bet and how to play crucial hands allowing the team to not only capitalize on the previous zone information but also freeing one player to concentrate on the counting the new zones being dealt for the shoe to follow.

The advantage players also realized they didn't have to count down the entire shoe, only the first fifty cards (1st zone) and third fifty cards (3rd zone). The first and third zones are shuffled together to create the primary playable zone while the combination of the second and fourth grabs zones cannot be thoroughly counted since the fourth zone falls behind the shoes shuffle point. However, by counting the first and third zones only, the advantage players can determine the combined value of both second and fourth zones. If the counted zones are -10 then remaining zones have to be +10 because the players are using a balanced count system.

Another situation was noted about the [redacted] two-zone shuffle. Because the four decks are split in half to begin the shuffle, the dealers could accurately divide the cards in two approximate 100-card stacks,

Chapter 4: Shuffle Tracking

and since the grabs are approximately half of the remaining two-card pile, the grabs and zones were consistently around the 50-card mark. The players discovered that dealer consistency and accuracy was a positive element regarding play success. Consistent grab sizes made shuffle mapping a breeze. This need for "dealer consistency" being completely opposite of conditions needed to successfully gain an advantage when playing the dealer's hole card and other advantage-play techniques.

Zone shuffle tracking becomes possible when groups of cards are not shuffled together to create one final group of totally intermixed cards similar to the shuffle of a standard single deck, but several distinctive non-diluted zones. In the previous example, the shuffle produces two separate deck groups of cards that are never intermixing together. This is also the case in most multiple-deck games and presents an avenue of assault for the advantage player who understood the principles surrounding zone shuffle tracking.

However, in the late '70s and early '80s four deck R&R games were giving way to the six deck games. These six deck R&R versions presented the advantage players with more grab and playable zones. The first six deck shuffle tracking techniques used the same idea for attacking the four deck shuffle but did not reveal the same type of information as found in the four deck game. In this case the players had to take into consideration six grab zones and three playable zones with approximately a grab zone and half falling behind the shuffle point, never being seen and counted. The trackers decided the best way to attack the standard six deck R&R shuffle would be to count the first and fourth 50 card grab zones; thus creating two uneven playable zones: a primary zone of 100 cards and a secondary of approximately 200 cards. The advantage players then applied the same principle of cutting the favorable section to the front of the shoe. If the primary zone was calculated

to be +10 (presenting a poor playing situation), the secondary zone (although twice as large) could still be played profitably because of the surplus of ace and ten value cards (-10) determined because of the balanced count system.

Another problem discovered playing the six deck game was the dealer variation in grab size. Where the four deck game witnessed inherent consistency in dealer grab size, the six deck game could vary considerably between dealers. For instance, the advantage players are tracking a game dealt by a medium size male dealer with consistent grab sizes of 50 cards each. Then the relief dealer taps the male dealer out for his break and starts dealing. This dealer is a smaller female dealer who is more comfortable using 35-card grab sizes and produces both smaller playable zones and more playable zones as well. The advantage player needs to be able to adjust to the change in grab sizes or they need to scout the games and decide before their play which dealers are consistently using the grab size of choice. Another problem is noted. Some dealers vary on grab sizes

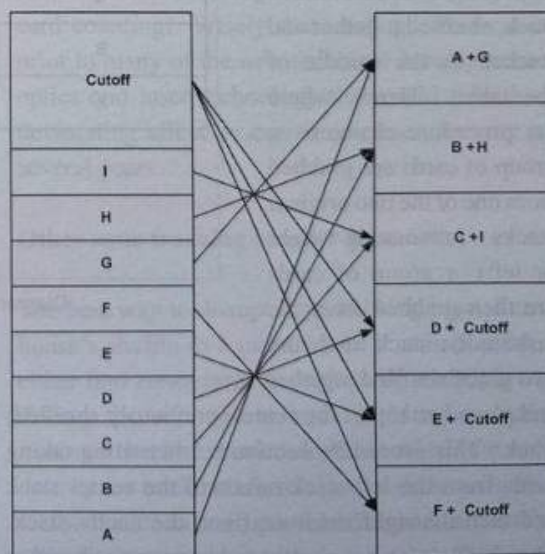


Diagram 4.6 Tracking Zones in the 35-card Grab Six Deck Game

between their right and left hand and others vary in a more random manner with grab sizes differing as much as 10 to 15 cards. Throughout the '80s and into the '90s the advantage players were able to find shuffles and dealers that allowed the zone shuffle tracking teams to make money. With the natural variations of the hand shuffled game and casino countermeasures, zone tracking opportunities started to quickly diminish.

Tracking the "Stutter" shuffle

Like all advantage play techniques, sooner or later the information about these techniques gets back to the casinos and they begin to institute various anti-advantage play measures. One such measure is known as the dilution, stepladder or "stutter" shuffle. The first step of this shuffle is performed by splitting the decks of cards in half just like the previous multi-deck shuffle. Next cards are grabbed from each stack, shuffled together and stacked in the middle of the table. Here's where the procedure changes: a group of cards are grabbed from one of the two original stacks (alternating right or left), a group of cards are then grabbed from the just-shuffle-stack and the two grabs shuffled together and placed on top of the center (previously shuffled) stack. This procedure continues, alternating taking cards from the left stack next and the center stack and then the right stack next and the center stack. The shuffle continues until no cards remain in either the right or left stack and all cards have been shuffled and stacked in the middle of the table. By marrying

the grab selection with grabs from the previously shuffled cards, the process eliminates strictly defined zones and actually dilutes the grab zones throughout a majority of the finished group of shuffled cards.

At first appearance the dilution process seems to destroy one of the necessary criterion for profitable zone tracking. It gives the appearance that all cards can be interlaced together into one group of cards. This assumption is not correct. Although many of the grab zones are integrated throughout a majority of the total cards, the first few grab zones shuffled together aren't diluted. These cards do present a reasonable opportunity the shuffle tracker will be able to attack. Although this shuffle procedure will not prevent zone shuffle tracking it does limit the

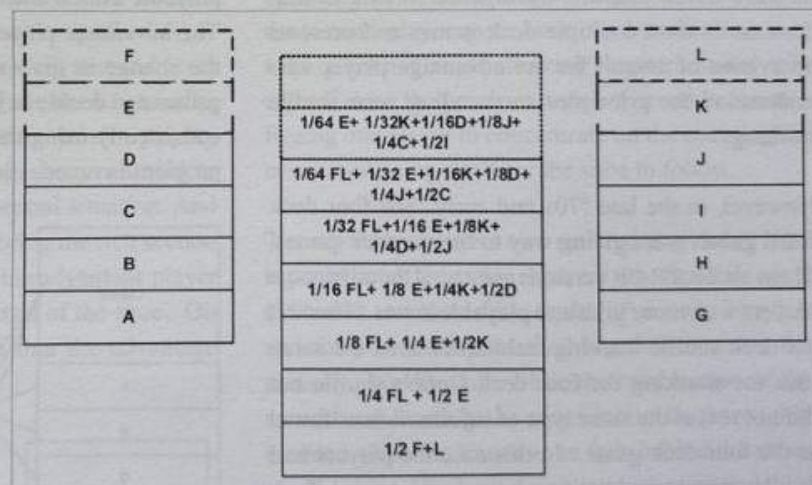


Diagram 4.7 Tracking Zones in a Six Deck Stutter Shuffle

number of opportunities where the shuffle tracker can glean an edge based on tracked information.

Zone tracking goes high-tech

Because of the variation in multi-deck shuffles and the inherent problem from inaccurate deck splitting

and grab sizes shuffle tracking became a more and more inefficient method of beating twenty one. How can an advantage player be expected to count down specific tracks of cards just to have the information rendered useless because a new dealer with a different grab size entered the game or the normally proficient target dealer was having a bad day staying consistent? It would be almost impossible for a player to keep track of different combinations of track sizes mentally. Would this mean the end of zone shuffle tracking? Not quite. About this time more advanced card counters were experimenting with a concealable computer that had been programmed to keep track of cards played and to assist the player in making wagering and playing decisions based on the composition of the cards remaining in the deck. This use of a compact computer had been quite successful in attacking the straight count game. Could the computer be reprogrammed and used to assist the zone shuffle tracker as well?

The first thing that needed to be altered was the order the cards were inputted into the computer. The card counter input each card as it was glimpsed so the counter would have the most current and exact information for their wagering or playing strategy decision. The zone tracker needed to input the cards as they were being picked up and in the order they would be stacked in the discard holder. By using this procedure the tracker knew the exact composition and location of all cards sitting in the discard holder, excluding the unseen cards that were behind the cut card. The computer was also programmed to take into consideration the varying grab sizes and deck divisions with this information being input into the computer the moment it occurred. Because the computer held exact card location before the shuffle and since all deck divisions and grabs could be input by numbers, the computer could analyze the results to determine the richest zones of the stack. For example: a six deck card stack is cut almost in half, the tracker inputs 158-154 for the number of cards

estimated in each stack. Later the dealer makes grabs with his left and right hand. The left grab from the 158 card stack is estimated and input as 48 cards while the right grab from the 154 stack is input as 51. The computer's ability to accept deck division and grab size estimations virtually eliminates the problem with variation in the shuffle process. The computer can now analyze and recognize the most advantageous point where the decks should be cut. It informs the advantage player through a series of buzzes and clicks where to insert the cut card. Once the cards are cut the computer indicates the value of that section or zone of the shoe and may also be programmed to give optimal strategy playing decisions base on zone composition.

Fortunately for the gaming industry, in the mid 1980s the use of a concealed computer was deemed either illegal (like XXXXXXXXXX) or prohibited from use in the casino. Although original legal steps were taken to prohibit the concealed straight card counting computer, the laws and regulations did more damage to shuffle tracking advantage players and roulette wheel clocking teams than it did to prevent card counting. Wisely these rulings were enacted prior to many of the new technical developments in optics and laser technology that could have had a devastating affect on casino revenues over the past several years.

Other zone tracking counter-measures

The best way to disrupt zone tracking is to alter the house's shuffle to a point where it is impossible to either find zones large enough to be profitable or to destroy the information entirely. Many executives reasoned that an extended shuffle would dilute and/or destroy the tracked information, so various shuffling methods such as multi-pass shuffles and card wash or scrambles were added to their casino's house shuffle procedure. While this is true to a point, the extended shuffle also creates time and motion issues, which

are important to the profitability of blackjack. Even though a three minute shuffle may limit any gained value by the advantage player from zone tracking, it does more damage to the casino's bottom-line than it's worth. Using a three minute shuffle could cost a casino six to eight rounds of the blackjack table every hour, which translates into a loss of as much as \$1 million in revenue annually to a medium size casino. Compare that loss with the possibility of losing several thousand dollars per month due to shuffle tracking, and the tradeoff is obviously one sided.

The problem with this illustration is that our industry leans toward the cautious and in most instances casino executives don't consider losses from slowing down the game—only perceived losses from an undetermined number of zone tracking teams. Most casino executives don't know enough about shuffle tracking to make an educated decision and believe primarily in the "better-safe-than-sorry" school of thought, and don't understand the crippling effect from limited blackjack rounds and hand production. Unfortunately, the advantage player can still attack many two pass and three pass shuffles profitably. Just because an executive decides to extend the house shuffle by more passes does not ensure the shuffle cannot be exploited through zone tracking. It would be wise for the executive to first map his or her original shuffle and analyze exactly what weaknesses their shuffle naturally possesses before any shuffle procedural changes are considered.

Another method designed to stop shuffle tracking is through diluting the pre-shuffled cards by "plugging" sections of the discards with the unseen and supposedly uncounted cards, immediately behind the burn card indicating the shoe's shuffle point. It was felt that an equal distribution of plugs of un-dealt cards would present too much of a barrier for the zone shuffle tracker. This is also not true. "Plugging the deck", as it is called, represents additional deck divisions

prior to the shuffle and can easily be adjusted for. Remember the unseen cards from behind the shuffle point are still counted since they are the difference between the running count at the end of the shoe and zero. For instance, if I know the first 4.5 decks prior to the shuffle point equal a minus ten then the cards behind the shuffle point equal plus ten ($X - 10 = 0$; $+10 - 10 = 0$). When the advantage player utilizes a computer to track the cards, the "plug" situation is treated similar to a deck division and is inputted before the grab portion of shuffle begins.

At the ████████ Hotel/Casino in the 1990s, we used a fairly fast and a somewhat limited trackable procedure on my six deck games, which was a form of a "crisscross" shuffle. Since varying grab sizes causes havoc with zone tracking, we instituted a quick, clumped strip of the cards at the very beginning of the shuffle process. Our procedure instructed the dealers to break the six decks into three even piles which were quick stripped with a three to four times stripping manner. Then the dealers were instructed to "crisscross" or take different grab sizes from each of the three piles (approximately 30 to 35 cards) and shuffled (riffle, box, riffle, strip, riffle) together. The grab and shuffle procedure was continued until all cards were shuffled. We also instructed dealers to stay inside the procedure instructions but to vary their grab sizes thus changing the number of grabs per shuffle (five to six times). Even with a bit of randomness installed in the process the shuffle still produced some zones that could be exploited.

Another way to discourage zone tracking is through the utilization of mechanical shuffling machines, both batch and continual shufflers. Batch shuffling machines thoroughly mix the entire group of cards, whether one deck or eight decks. This shuffling mannerism violates the primary criteria of zone shuffle tracking which is the need to create two or more playable zones. The batch shuffler either mixes the cards completely from five to seven times

in a similar fashion to a single deck shuffle by hand, or through the use of a card ejector that randomly mixes cards based on a computer and its random number generator.

A continual shuffling machine is attached to the delivery device or shoe, and mixes the cards in a continual manner. Typically any card used on the previous hand can reappear anywhere over the next several hands or rounds dealt. In theory this is true, but in practice this claim is slightly altered because of an issue called "latency". The term latency is used to describe the effect of a number of cards that are located in the delivery device of the continual shuffler and are no longer subject to the shuffling process. They are no longer available for intermixing with the rest of the cards in the machine. [REDACTED]

[REDACTED] continual [REDACTED] machine keeps approximately 12 to 15 cards in a "reservoir" so the next hand can be dealt without disruption from the mechanical shuffling motion. When the dealer picks up a hand that has just been played and places them directly into the machine, although those cards will quickly be shuffled into the cards in the shuffling machine, they will not mix into the cards in the reservoir. And because of the machine's design, may also not influence the card composition of the one or two dozen cards immediately above the reservoir. Based on standard operating procedures this card latency situation does not pose a problem. However, some casino operators have altered this procedure and have created their own problem with zone shuffle tracking.

Several years ago I was conducting outside observations and operational evaluation of a small casino on the island of [REDACTED]. During my stay I found out a friend of mine named [REDACTED] was conducting an annual gaming audit at another casino and I agreed to meet with him at that casino for dinner. Before we dined [REDACTED] and I sat in the casino lounge and discussed some issues about gaming and other

similar topics. While looking out across the casino floor, I noticed the casino was utilizing several continual shuffling machines on their blackjack tables. The tables were full of players and I know the machines had to be increasing the number of rounds of the table and hands in a very profitable manner. And then I saw the discard holders held a group of previously used cards. Why would they place the previously used cards in discard holders? Standard procedures require the dealer to place each previously dealt hand directly into the top of the continual shuffling machine. I also noticed that the dealer would pick up and keep in the discard hold as many as four full rounds of used cards before dumping the approximate deck and a half of cards (80-90 cards) into the shuffling machine.

I asked [REDACTED] why they held out several rounds of cards before putting them into the machine. He explained that the casino catered to a large number of cruise ship customers, and since they were mostly novice players, there were a lot of disputes as to what the dealer had for a hand total and also what the players had as well. Because the players usually requested this information after they had a chance to think about their hands and after the cards had been picked up, the cards couldn't be brought back and used to recreate the dealer's and player's hand. Once the cards were placed into the shuffling machine the information was lost. In order to placate the customer's requests the casino decided to place several hands into a discard holder, not considering any other ramifications this procedure might create. I explained to [REDACTED] that this addition to the normal latency problem created a good tracking situation. If I count down the cards placed into the discard holder I know the value of the remaining cards held in the shuffle machine. Since the machine held a total of four decks this situation presented an advantage player with two tracks after the fourth round of cards were dealt. The first playable track would be the 80 to 90 cards held in the discard holder, with the cards

in the shuffling machine making up the second. If the cards in the discard holder total +10, based on a balanced count system, we know the cards in the shuffling machine are -10 (or rich in aces and ten value cards). Since there remain two and a half decks of cards in the shuffling machine, we divide the +10 by 2.5 (two and a half decks) and realize the next hand can be played profitably—worth a percentage gain of approximately 2% for the advantage player. This holds true even when the clump of 80 to 90 discards are placed into the shuffling machine since the natural latency created by the reservoir does not allow for dilution (or limited dilution which won't affect the estimated advantage) of the cards used in

the next round of play, even to a full table. The next day Ralph explained the situation to management and the practice was changed to holding out only one round.

Mapping the multi-deck shuffle

The most important aspect of shuffle tracking for the casino executive is their ability to understand the elements of their own house shuffle. This is done by mapping your shuffle or working out a diagram of each step on paper or through the use of shuffle tracking software. By mapping your shuffle you will learn exactly what an advantage player will learn

Side bar – FINER POINTS OF ZONE SHUFFLE TRACKING

Once the value of a specific zone is determined the advantage player can now use it to determine the correct playing strategy. For instance, if a two deck slug (approximately 100 cards) has a true composition value of plus ten (the inverse of the counted value of -10), then the advantage player starts counting that section as a plus ten. He will continue a running count based on that two deck section. If this section represents half of a four deck game, then the end of the two deck track should result in a total of -10 (the composition value of the next playable zone). The advantage player uses the estimated count throughout that isolation target zone. In addition, all true count conversions take into consideration the existence and duration of that playable track only. For example: the running count off the top of this +10 playable 100 card track is divided by two (decks), calculating the true count as a +5. As the zone depletes, the true count conversion number also changes. If 50 cards remain in the track, the true count is equal to the running count. If 25 cards remain, the true count is equal to twice the running count. Converting from a running count to a true count is just as important in zone tracking as it is during straight card counting plays. The zone tracking advantage player uses the true count during

wagering decisions, playing decisions and for taking insurance profitably.

The advantage player tracking the shoe with a concealed computer needs to input deck divisions and dealer grab sizes as accurately as possible. This requires the advantage player zone tracking to visually practice reading divisions and grab sizes. Reading can be practiced by hand dividing and grabbing cards at home. The cards used should be marked with a number indicating its position in a six or eight deck stack. For example: during practice a tracker reaches out and divides a six deck stack of cards in half. He completes the division and announces the cards in the bottom half stack to be 155 cards. Next he turns over the top card of that stack and the number written on the face of the card should correspond to the exact number he estimated. This same system can be used to estimate grab sizes, however the numbers start with number one as the top card of the stack and the rest in declining order. If the grab size is estimated to be 38, the bottom card of the grab should read number 38. After numerous hours of practice the tracking advantage player should be able to estimate divisions and grab sizes within one or two cards.

and be able to correct apparent shuffle weakness or understand its strengths and be able to sleep better at night. Basically, mapping allows you to define areas of the shuffle that are the weakest and the size of your playable zones. By looking at the mapping of the first shuffle example (the XXXXXX R&R shuffle), it is easy to see how ineffective the shuffle really is when it comes to zone tracking. Another example worth looking at is the "stutter shuffle". At first it looks like a solid, non-trackable marriage of cards

dealer by 10 or more cards.

The second step is to arrange these grab size zones, as they would be placed into the discard holder prior to shuffling. Usually you will have all grab zones stacked first, followed by the plug of cards found behind the shuffle point stacked on top. The slug of unused cards behind the shuffle point needs to be mapped also. Normally this zone will be larger than the other zones but still needs to be assigned the same

label as the other zones since it represents one group of cards just like the grab zones. (Note: I usually assign the grab zones an alpha label, A, B, C, etc). If your procedure is to plug the unused cards into the discards, do so at this point using the same labeling for each plug since they come from one specific group.

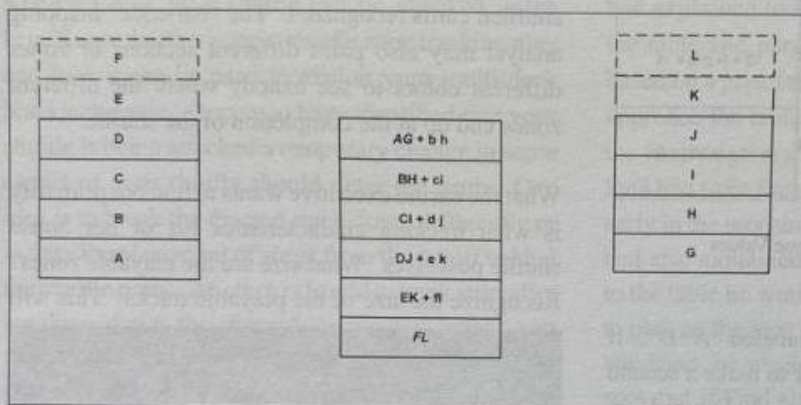


Diagram 4.8 Simple Mapping of the Six Deck Stutter Shuffle

but closer examination indicates specific areas or zones of the shuffle that are vulnerable to classic zone tracking. I find it extremely important to take the time to map out each multi-deck shuffle used by your casino in blackjack and to determine exactly how you would attack the shuffle if you were an advantage player.

The first step to mapping your shuffle is to determine dealer grab size. If your house procedure indicates grabs of half a deck then break your original zones into groups of fifty. It's also prudent that you examine live blackjack games and compare the house procedure with the actual grab sizes used by the dealers. You may wish to conduct several mappings on the same shuffle if grab sizes vary from dealer to

For the third step, break the stack down into shuffling units. If your procedure instructs the dealer to break the pre-shuffled stack into two piles then break the mapping sample down accordingly. If your procedure requires a crisscross shuffle then break the mapping sample into as many separate piles as required. Remember you need to stick as closely as you can to the action of a real shuffle. So if your procedure requests the dealer to place the bottom third of the pre-shuffled card stack to the dealer's extreme left then place the stack on the left of the mapping sample.

The fourth step will require you to shuffle or combine different grab zones of cards together. This step will either create or start to create the playable zones. This is done by adding together labeling from each specific grab zone. For example: if we marry 35-card grab zone A with 35-card grab zone

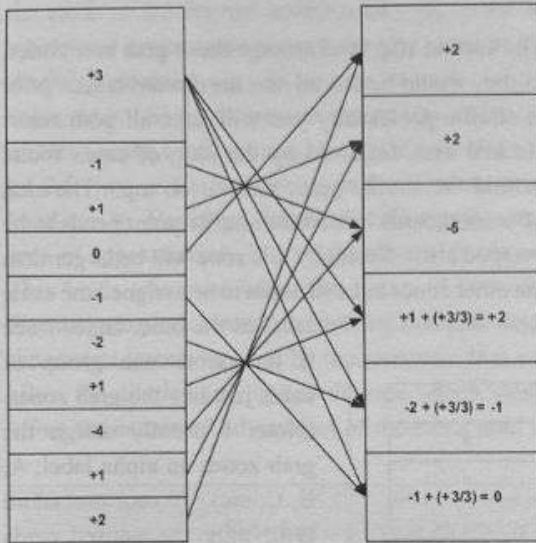


Diagram 4.9 Tracking the Zone Values

D, we now have a 70-card zone labeled "A+D". If your procedure requires the dealer to make a second pass R&R shuffle using $\frac{1}{2}$ of zone A+D and $\frac{1}{2}$ of zone B+E, then the final product zone would look like " $(\frac{1}{2} A+D) + (\frac{1}{2} B+E)$ " creating a 70-card zone from the previous two different 70-card zones. When marrying combination zones like shown in the previous example, the use of alpha lettering in conjunction with fractions helps to provide the casino executive with a clear picture of "what went where", especially when mapping multi-pass and stutter type shuffles. As interesting as it may seem, the mapping of a complicated shuffle like the stutter only illustrates the point that a once thought of "perfect shuffle" can still be tracked. As complex as this shuffle is, it still has limited dilution in early and late shuffle segments as well as the limited actual affect from earlier zone dilution after the third stutter riffle.

Another method for mapping a shuffle is to paint or color one side of the playing cards in a grab size so the

cards can be visually identified after the actual shuffle has been completed. In his book, [REDACTED] blackjack expert [REDACTED] uses card painting to help explain his theory for tracking the non-played slug of cards found after the shuffle point which he calls "cutoffs". [REDACTED] refers to this identification process as reading "bar codes" because that's what the marked cards look like after the deck has been shuffled. By painting a group of cards, this segment or zone can be followed through the shuffle and their influence in certain areas of the shuffled cards recognized. The "bar code" mapping analyst may also paint different sections or zones different colors to see exactly where the different zones end up at the completion of the shuffle.

What the casino executive wants to find out primarily is what tracking characteristics his or her house shuffle possesses. What size are the playable zones? Recognize the size of the playable tracks. This will

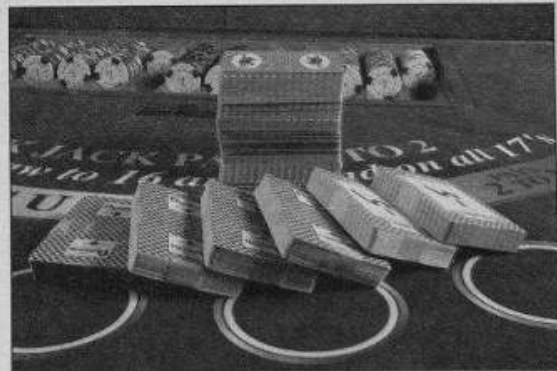


Photo 4.1 Example of "barcoding" and tracking aides

give you an idea how many hands an advantage player will attack a section of the shoe when that section is rich in ten value cards and aces. Does the second and third pass shuffle actually reduce tracking information or is it a waste of time? Why use a multi-pass shuffle if the time wasting process does not help deter shuffle tracking? Stick to faster shuffles whenever possible unless the longer shuffle makes a big difference in the tracking information.

Chapter 4: Shuffle Tracking

Also, be aware of the effect on your shuffle when the dealer grab sizes differ. Changes in grab sizes may either hind or help the tracker, and you need to know how it affects your game protection.

To my knowledge there is no one sure-fire way to totally eliminate multi-deck zone shuffle tracking short of using mechanical shuffling machines. Every hand shuffle that does not intermix all the cards equally will be vulnerable in some capacity. As a casino executive your best defense is knowledge. Knowing how your shuffle can be attacked is the key. Know the characteristics of a zone tracking play and how it can be used to exploit your multi-deck blackjack game. Once you have identified that your shuffle is being attacked a temporary change in some aspect of your shuffle should deter the team. One idea is to break the discard stack down differently or to vary the placement of slugs from the cutoff behind the shuffle point. Another is to add a quick strip after breaking down the discard stacks and before you shuffle the cards. Sometimes the slightest temporary alteration to the shuffle will force the shuffle trackers to rethink their attack strategy and quite possibly discourage them from any future attempts.

Sequential Tracking

This story starts out inside a medium size casino located on the corner of the [REDACTED] and [REDACTED]. Two off duty casino floor supervisors are sitting at the bar enjoying a late night/early morning beer. One of the guys (lets call him Paul) notices something different about the way the dealer on a double deck blackjack table beside the bar is shuffling the cards. After studying the girl's shuffle mechanics for quite some time, Paul figures he might have discovered a way he can beat this casino out of plenty of beer money. After working on his theory at home, Paul is ready to try it at the casino but first he has to convince the other floor supervisor (one of his best buddies) that his technique is worth investing in

to the tune of \$100. After a brief explanation of his new discovery and an arranged agreement between both friends, the pair entered the casino in the early morning hours to test their new system. This wasn't any type of betting system. If successful in the casino environment, this technique was a sure thing.

Once inside the casino Paul looked around for a double deck and the oriental girl he had seen dealing several days prior. And sure enough there she was dealing cards on the same double deck game as before. Paul had explained to his partner that he would approach the table and play through a few decks first. Then based on a prearranged hand signal, the friend would approach the table and stand behind Paul playing in the first wagering spot. For this technique to work Paul had to be the only player at the table, so playing early in the morning hours was quite beneficial. Paul had also explained that after calling his friend over to the table he would let him know how many hands to play on the next deal. If Paul signaled him to play one hand, he would bet \$200 on the second betting spot and if Paul signaled him to play two spots, he would split the money and play \$100 in each spot. The friend was also instructed to watch Paul for signals on how to play each hand.

It wasn't long before Paul signaled his buddy over to the table. As he approached the table he noticed the dealer was dealing the first hand after an apparent shuffle. Paul played a single hand betting the table minimum of \$5. After the hand was finished, Paul signaled his buddy to play just one hand while Paul sat out that round. The friend wagered \$200 as he was expected to and received a winning blackjack worth a \$300 payoff. Paul got up and walked out the door and headed for a small bar located off the property on the far side of the casino's parking lot followed by his partner.

Once they were comfortably seated at the bar, Paul let his friend in on the entire play. Paul explained that he noticed the dealer had a small problem with her shuffle. The casino used a quick shuffle procedure

for their double deck game of riffle, riffle, riffle and didn't utilize a strip or a box with the double deck shuffle. Paul discovered that the dealer had small hands and had trouble shuffling the double deck. Because she was having trouble shuffling the cards, the dealer had a tendency of dropping a group of cards off her right thumb before performing each riffle. Paul guessed that she was probably right handed, so her right thumb was dominant, and began each riffle by dropping between 10 to 15 cards before the riffle started interlacing the cards. Paul realized that the bottom 10 to 15 cards that were picked up during the previous deal would not get shuffled with any of the other cards of the double deck and represented an un-shuffled slug of cards.

Based on this discovery, Paul would record the first 15 cards that were placed into the discard holder in the order they were picked up. Paul would write the card's order on a bar napkin that he brought over from the bar, and once the shuffle was completed before the next deal, would look for specific cards to reappear. Once he saw cards from the previously recorded 15-card order, he knew what cards in sequence would be dealt next. All Paul had to do was refer to his list scribbled on the bar napkin and he could tell how many hands to play to give his partner a guaranteed winner. Paul opened his hand and inside was a crumpled bar napkin with the card series he had recorded. That morning the cards recorded on the bar napkin indicated that his friend had to play one hand because the first and third cards were a Jack and an Ace which would guarantee a "blackjack" bonus winner. Paul and his friend made a series of plays in this smaller casino but several months later the casino changed their double deck shuffle and their sequential tracking scheme went out the window.

This little scheme, discovered by accident like many advantage play techniques, is a variation of sequential tracking. In this situation the players took

advantage of a weak house procedure (using three riffles without incorporating a strip or box), a dealer weakness (hands that were too small to properly riffle 104 playing cards) and an unshuffled slug of ten to fifteen cards. Because the cards were not shuffled the advantage player was able to record and use that exact information to determine the total number of hands to play so he was all but guaranteed a winning outcome. The true technique of sequential tracking is quite similar, however instead of following one slug of cards that fails to get intermixed, the tracker identifies and uses information about the sequence of cards after they have been riffle shuffled. Sequential tracking mechanics can also be used to attack the game through a third shuffle tracking technique, key card tracking.

The mechanics of sequential tracking

In the mid 1980s, [REDACTED] took me aside and did a quick demonstration of an advantage play technique he had been experimenting with that had to do with exploiting casino shuffling procedures. Upon request, [REDACTED] had me put a single deck of cards in ace through king, spades through diamonds order. He then had me shuffle the deck by performing three "fine" riffle shuffles. After cutting the deck somewhere near the middle, [REDACTED] had me deal ten cards from the top of the deck, turning each one over and placing them in a row. Next he requested that I place the next card face down on the table, unexposed similar to a dealer hole card. Finally, he had me turn up ten more cards face up in a row below the dealt down card. After several moments of studying the cards I had placed both face up and face down on the table [REDACTED] proclaimed, "The down card is a five of diamonds". Not just a "five" but a "five of diamonds". "Seriously?", I commented. "Seriously", [REDACTED] replied. I turned over the down card. And sure enough, it was the five of diamonds. "Let's do it again", he insisted. "Just deal ten more up cards, a down card and ten more up cards using

the same deck". [REDACTED] studied the new sampling for no more than a few seconds and proclaimed, "The down card this time is an eight of spades". And when I turned it over sure enough it was the eight of spades. How did he do it? Not only figuring out the value of the card but also being able to identify the suit as well.

During the next half of the session, [REDACTED] showed mw how he was able to determine the suit and value of the down card. He explained that the first part of the technique had to do with knowing the order of the cards and that's why he had me put them in ace through king and suit order. By putting the deck in some sort of identifiable order we would be able to visually pick out card sequences after they were riffle shuffled. The second part of the technique related to the shuffle mechanics itself. [REDACTED] explained that the act of riffling cards together interlaces different groups of cards, but does not take the cards out of sequence. If the ten of clubs comes before the jack of clubs and the queen of clubs, the riffle shuffle will never chop up their order and although after the shuffle several cards might separate them, they still remain in the same order (ten, jack, and queen). For example: I've taken a single deck of cards and put in the same ace through king, spade through diamond sequence as I had years ago during my session with [REDACTED]. After riffling the deck three times I've grabbed a twenty card segment from the middle of the deck and turned them over one card at a time left to right and the sequence appears as follows (it may help if you use a deck of cards and lay the cards out in the same order as listed below):

9c-10d-4s-2c-Js-10c-4h-4d-5s-Qs-5h-5d-jh-3c-Jc-
6h-Ks-4c-6d-Qh.

(See Photo 4.2)

If you look at the first card you will see the 9 of clubs (9c) as the first card on the left. You will notice the 9 of clubs is followed five cards later by the 10



Photo 4.2 Sequential series after 3 riffles

of clubs (10c) and nine cards later the jack of clubs (Jc). This is a prime example of how the sequence gets separated but stays intact during the riffle shuffle process. The next good sequence starts with the jack of spades. Its sequence is Js...Qs...Ks. Can you find any other three-card sequences? Sure. And if you know what to look for you can spot a couple of two card sequences as well. If you look at the 10 of diamonds and are wondering why it's sitting there alone its because when further examining the deck of cards the 9d is positioned eight cards before the 9 of clubs and jack of clubs is positioned eleven cards after the Queen of hearts—both cards appearing outside the twenty card sample.

Let's conduct a second test but this time let's leave one card face down and see if we can estimate the down card's value (and suit). I'll lay the cards out with the first ten cards face up, followed by a face down card (X) and then again followed by ten more face up cards.

4c-5h-9s-5c-Qh-As-Ad-7d-6c-qd-X-2s-10s-7h-3s-
2d-8d-7c-Kh-8h-Js.

(See Photo 4.3)

If you start from the left and look for card sequences, it shouldn't take long before you notice a card missing from one of the sequences. Remember since

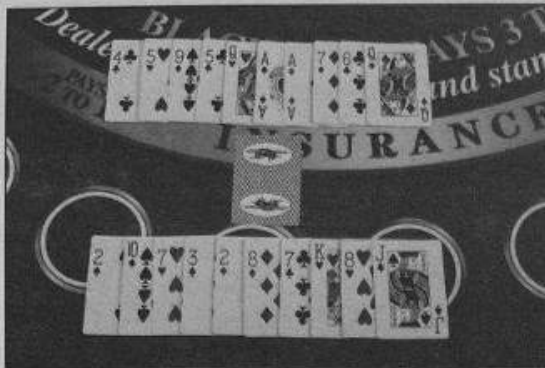


Photo 4.3 Can you guess the value of the down card?

the cards will stay in a widely spread sequence, you are looking for a missing middle card. Do you know what the down card is? Here are the sequences you will be able to identify:

4c-5c-6c-7c
5h-7h-8h
9s-10s-Js
Qh-Kh
As-2s-3s
Ad-2d
7d-8d
Qd

What card is missing? How about the 6h? Where did it go? Even though there are two 2-card sequences, and one 1-card, there's one 4-card sequence that's incomplete. And if you guessed, or should I say estimated its value and suit based on the missing card from the 5h – 8h sequence (the 6 of hearts), you are correct. See how easy it is to spot missing cards in a sequence. This is the same theory advantage player's use when tracking sequences for identifying the dealer's hole card. By knowing the pick up sequence of the cards before the shuffle and using this theory when the deck (or decks) is riffled shuffled three or less times, it provided enough card information so that the advantage player can gain a 6% edge. This is accomplished by knowing the

value of the card the dealer has in the hole and by playing this information accordingly.

So how does the sequential tracker play using this information in the casino environment? It's not that easy. First, the advantage player will need to utilize a computer to keep track of the order of cards as they are being picked up and placed into the discard holder by the dealer. In our example we used a deck placed in ace-king suited order. In real play this isn't going to happen and unless someone with a fantastic memory can be employed, the advantage player will need to rely on electronic assistance to keep track of cards as they are picked up and placed into the discard holder by the dealer. Then after the shuffle is completed and as the cards are being dealt from the shoe, more information is input into the computer. The computer can be programmed to do exactly what the human mind did when looking for the down card using the previous example. Once it locks in on a missing card in one of the multiple sequences, it signals the value of the hole-card to the money player and the information is used in conjunction with the dealer's up card (see Hole-card Strategy in Appendix A).

Second, the tracker will have to see a good amount of cards before and after the target card has been delivered into the hole. This will require players in early table positions (1st through 4th table position) to take as many cards as they possibly can. In this case hitting and splitting hands will be prevalent while standing short on stiff hands and receiving a one card double down will need to be avoided. This means the money player will need to play the last three hands on the table, and might sacrifice the fourth and possibly fifth hand to get best case information. When looking at a blackjack table under attack by the sequential tracking team the casino executive may be looking at the five first position players wagering the table minimum, while the player in sixth and seventh position might be wagering table limit.

Chapter 4: Shuffle Tracking

There is also a slight twist to this type of play. Because a concealed computer is utilized to determine the dealer's hole-card, why not use the same information and determine a playing strategy that takes into account what hit cards are likely to appear. If we can determine the hole-card, couldn't the computer also determine the likelihood that five or six cards might appear next off the top of the deck or shoe as potential hit cards? Yes, the computer can be programmed to function in this manner, and sequential tracking teams identified this added advantage not long after practicing beating the game. Not only could they lock in on the hole card but they could optimally play their larger wager hands based on estimations made about the next dozen or so cards to be dealt off top of the shoe.

For the next example I will use a single deck in the same ace-king suited order as before but I will use a shuffle of "riffle-box-riffle" which is a common shuffle procedure for many multiple deck single pass shuffles. I will also play seven spots with the first five spots played by the table minimum, card eating player and the last two spots taken up by the maximum limit big player. The cards are shuffled and the hands are dealt and appear as seen in photos 4.4 and table 4.1.

By looking at the cards on the table we can start developing a list of all sequences. They are:

7c-8c-9c-10c-Jc-Qc-Kc-?

3h-4h-5h-6h-?

As-2s-3s-?

7d-?

At this point the hole-card could be one of the follow question-mark cards: ace of diamonds, seven hearts, four of spades, seven of diamonds, or another card to be



Photo 4.4 Example of player cards on the table

Table 4.1 – Cards as They Appear On the Layout

Position	1st	2nd	3rd	4th	5th	6th	7th
Wager	\$25	\$25	\$25	\$25	\$25	\$1K	\$1K
1 st card	7c	8c	9c	3h	As	10c	7d
2 nd card	4h	2s	5h	Qs	3s	6h	kc

Dealer	
Up card	Jc



Photo 4.5 Example after players receive hit cards

Table 4.2 – After receiving player hit cards

Position	1st	2nd	3rd	4th	5th	6th	7th
Wager	\$25	\$25	\$25	\$25	\$25	\$1K	\$1K
1 st card	7c	8c	9c	3h	As	10c	7d
2 nd card	4h	2s	5h	Qs	3s	6h	kc
1 st hit	5s	Ad	6s	2d	7h		
2 nd hit	8d			7s			

Dealer	
Up card	Jc

determined later. Now the card eaters go to work and the first five positions create as much information as they can as seen in photos 4.5 and table 4.2.

With our sequence information increased can you determine the value of the dealer's hole-card?

7c-8c-9c-10c-Jc-Qc-Kc
3h-4h-5h-6h-7h
As-2s-3s-?-5s-6s-7s
7d-8d
2d

Based on this information we can tell the dealer has a 4 of spades in the hole and a starting hand total of hard 14. Based on this information we are in an extremely advantageous position and would stand on our 16 and 17. But what about using the immediate card information of the top of the shoe and what does this information mean to the advantage player? Based on the sequential information the pool of possible hit cards are:

Ad-8h-8s-9d-3d-?

Since the advantage player knows the dealer has a hard 14 there is only one out of five cards that can make the dealers hand, the 3 of diamonds. Three of five cards will instantly bust the dealer and one card, the ace of diamonds, won't really hurt or help his hands by itself. The ace could help his hand if he hits again and catches the 3 of diamonds; he would beat both big hands. The computer determines all of these possible options and then directs the big player to stand. The player signals "stand" on both of his hands, and the dealer reveals the previously estimated four of spades and acts on his hand accordingly:

8h

The dealer busts out when he hits his hand with the anticipated 8 of hearts and pays out over \$2000 to

the sequential tracking team. The way the team played their hands doesn't appear to be out of the ordinary and would not attract attention from the pit. However, standing on the sixth position's hard 16 allows the tracking advantage team to win \$2000. By being able to estimate the dealer's hole-card and by determining information about potential hit cards, the tracker was signaled to stay on his two hands, which he won. If the information had been detrimental the computer would have considered the option to hit or surrender in an attempt to cut the advantage player's losses.

So if it's that easy and that powerful to track card sequences why isn't everyone doing it? First, sequential tracking is not that easy to do. In the previous examples I have used a deck that has been put in ace-king suited order to make the cards easier to follow and identify through the shuffle. Under a real casino situation the order of the cards will have to be tracked through the use of a computer. Even some of the more memory superior experts like [REDACTED] can't mentally organize the various sequential card tracks created through by the multi-deck shuffle process. With electronic assistance a must, the advantage player needs to consider the ramifications. Most gaming regulator agencies deem the use of computers either illegal or prohibited. Why commit a criminal act to get hole-card and occasional hit card information? If the players need to commit a gaming crime to gain an advantage they might as well step their scheme up a notch and stick a cooler deck into the game which has a much higher risk/reward ratio.

The one factor absolutely necessary for sequential tracking is that one must maintain the sequential positioning of virtually all of the cards in the deck or shoe. Therefore a casino executive can easily disrupt sequential tracking by the introducing a common card-shuffling procedure known as "stripping the deck". If a simple deck strip is implemented

anywhere in the shuffle process the sequential card tracks are chopped into useless groupings. These groupings cannot be used to provide the necessary information needed to determine the hole-card and subsequent hit cards. During a sequential tracking demonstration one of the members of the seminar asked what would happen to the order of the cards when a strip is utilized during the shuffle. To the class's surprise a simple strip of the deck between the two riffle shuffles, normally used to demo sequential tracking, chopped the sequences into two or three card runs and could not provide enough information for the class to make an educated guess as to the value of the hole-card. Although we can now relegate sequential tracking to the gaming threat category of "possible but not probable", we can't completely ignore all issues surrounding the theory of card sequencing.

Key card ace tracking

Based on ideas developed in the original experimentation with sequential tracking, similar advantage play opportunities have been developed that profitably exploit the game of blackjack. Instead of concentrating on total card sequencing, some experts decided that bigger wasn't better and that smaller sequencing can be not only profitable but can be accomplished by the average person. Blackjack expert [REDACTED] outlined the elements of the riffle shuffle and how it can be attacked profitably by the advantage player. In his book [REDACTED] [REDACTED] states, "The riffle shuffle always leaves sequences in the same order, and adjacent cards in close proximity to each". If we examine this theory a little further we notice that the act of riffling cards together doesn't mix the cards in a truly random manner, but in an interlacing manner that separates their sequential order. It is also a known fact that given enough riffles the cards will finally reach a reasonable proximity to randomness. In 1992, mathematicians [REDACTED] and [REDACTED]

[REDACTED] printed their study of the riffle shuffle in a report titled, [REDACTED]. This report published in the periodical, [REDACTED], offered that a single deck would not be truly random until it has been riffle shuffled seven times. Unfortunately, if every casino riffle shuffled each grab seven times they would lose an unfathomable amount of revenue through decreased playing decisions, rendering the principle unacceptable for practical purposes.

Based on this premise, how far apart do adjacent cards move when the dealer riffles a specific selection of playing cards? Several experts have given their opinions as to the number of cards that are inserted between adjacent cards per riffle shuffle, and although they differ a little they don't differ much. [REDACTED] summed it up:

"With perfect single-card interleaving riffles, this is what you must remember" (2003):

#Riffles	#Cards Between Keys
1	1
2	3
3	7

Table 4.3- Interlacing Cards Per Riffle

[REDACTED] also points out that the prediction of final adjacent cards locations are quite accurate when the casino house shuffle procedures use one and two riffle shuffles, even when considering the "variations in levels of human imperfections" (2003). Three riffles separate the adjacent cards even farther apart and may render card prediction inaccurate. (Note: Do your own experiment. Select two cards from a single deck and insert them back into the deck adjacent to each other, about five cards from the top. Perform one riffle shuffle and see how many cards are now between the two selected cards. Riffle one more time and see how far they have moved apart



Photo 4.6 Key card and target ace on layout



Photo 4.7 Picking up target card

after the second riffle. Next perform a third riffle and check the cards again. It doesn't take long before you start to understand the theory and how [redacted] riffle shuffle statement applies.)

So how is this information used in the real world? If the number of cards interlaced during each riffle shuffle can be reasonably estimated, adjacent cards can be remembered, and the first few adjacent cards used as "key cards" to predict the appearance of the last card. The advantage player can target "player valuable" cards and use key card information to determine when the targeted card will come into play. If manipulated correctly, the advantage player can force the valuable target card into the first two cards of his or her hand. For instance, if the advantage player memorizes the identity of two key cards that are picked up adjacent to an ace, and is armed with the knowledge that a specific shuffle procedure will insert three to four cards between the adjacent cards, the advantage player knows when the first key card appears in play the second card will appear approximately four to five cards later, with the ace

appearing approximately four to six cards after the second key card. If the advantage player has an idea when the targeted ace will appear during play, he or she can alter the number of wagering positions they're playing and force the ace into one of their hands.

We all know that an ace is a very advantageous card for the player to have in his or her original two cards. The ace not only combines with any ten value card to create a bonus blackjack payoff of 3 to 2 but the ace is also extremely flexible and does not put the player in a bust-out position when drawing a third card. But how valuable is the ace and what advantage percentage can the player expect for every dollar wagered when the ace is expected? Mathematics and blackjack expert [redacted] calculated the value in percentage gain for every card in the deck when received in the hand of the player and published the results in his classic blackjack book titled [redacted]

By using [redacted] calculations (see table 4.4) we can see the advantage player expects a 52% advantage

2	3	4	5	6	7	8	9	T	A
-12	-14	-16	-19	-18	-17	-9	0	+13	+52

Table 4.4 - [redacted] Calculations of Player First Card in Percentages

gain over the casino when forcing an ace into his or her two-card hand. If this situation occurs and the advantage player can successfully target and receive one ace each shoe when wagering \$1,000 on the target hand and only \$100 on all other hands, he can expect to gain a theoretical win of approximately \$500 each shoe played. Based on the average of 4 shoes per hour and based on the previous metrics, the advantage player can expect to win an average \$2,000 an hour. The problem with this theory is it is based on 100% location accuracy that rarely occurs. The ace tracker utilizing two or three indicator cards still needs to find a dealer with an extremely clean one-card riffle shuffle. Dealers who shuffle with one hand stronger than the other have a very inconsistent riffle and will be hard to exploit. It is extremely important that the advantage player find a very clean and consistent riffle shuffling dealer before he or she can expect a reasonable percentage of tracking and manipulating an ace into their hand.

Ernie takes on the [REDACTED]

One afternoon I was sitting in my office at the [REDACTED] Hotel/Casino when I received a call from surveillance regarding one of our player's questionable blackjack play. [REDACTED] Director of Surveillance had been watching a player who [REDACTED] knew from a previous encounter as a card counter/advantage player. [REDACTED] explained that the player (let's call him "Ernie") was not counting or zone tracking. [REDACTED] thought his betting patterns closely resembled someone locating aces, estimating when they would appear in the shoe (six decks) and using that information to wager more given the ace's occurrence. The problem was [REDACTED] wasn't sure how Ernie was calculating when the aces were going to appear. Observed play indicated he was very accurate. I proceeded to surveillance where [REDACTED] and I examined about three hours of Ernie's blackjack play before it dawned on us as to how he was tracking aces.

From the videotapes we noticed that Ernie would play in the first position on the blackjack table with an unknown woman standing to his left. After playing through a complete shoe betting \$25 on one hand, he would change his strategy during the second and subsequent shoes by wagering the table limit on multiple hands (two to three wagering positions) twice during that shoe's play. (Note: Ernie used the unknown woman to hold the second seat at the table and would have her play the third hand when he spread that many hands). By examining his play it became apparent that Ernie was predicting the appearance of two different aces through key card tracking. [REDACTED] and I were both under the assumption that a quick strip at the beginning of the shuffle would destroy a player's ability to successfully track sequences. The problem with that assumption is an early, quick shuffle does not affect key card tracking of aces because of the size of the original targeted tracked sequence (3 to 4 cards depending on the number of identifying keys).

During the sequential tracking procedure a player tracks all cards through a series of riffle shuffles. If the original card sequence (after pick up) is chopped apart with a stripping action, the player will not be able to identify the sequences after a series of riffle shuffles. However, key card tracking of aces does not require tracking a large number of cards, just a three or four card grouping attached to the targeted aces. Subsequently, if the cards are stripped before the riffing process begins the chance for destroying the three or four card sequence is highly unlikely. Since the [REDACTED] house procedure required the dealer to quick strip each of the three two deck piles before grabs from each of the three piles are riffled together, key card ace tracking can still be accomplished. What we needed to do was place a card stripping action sometime late in the riffing process. By using a strip late in the process when the sequence length is extended because of the cards now positioned between the key cards and the ace

(now extending 7 to 15 cards in sequence as a result from the two proceeding riffle shuffles), the strip becomes much more effective.

The next day when Ernie sat down to play I had the casino shift manager instruct his dealers to implement a card stripping process between the second and third riffle in addition to the original quick strip at the beginning of the shuffle process. It was test time for us at the [REDACTED] and we were sure the change to the shuffle would send old Ernie packing. This new procedure definitely had a positive effect because Ernie did not make a large wager, played only a couple of shoes and didn't come back to play blackjack at the [REDACTED].

A Final Word on Shuffle Tracking

Following is an article I wrote several years ago for a now defunct gaming magazine. I later published this article through my [REDACTED] website's electric magazine or as it's known to Internet surfers an "E-Zine". The article is based around a discussion about shuffle tracking during a website chat and the subsequent e-mail communication I had with one of the chat room participants. The article explains different methods for deterring shuffle tracking which can still be used effectively today.

Short and Simple Method of Detecting Shuffle Tracking

Several years ago I was the key speaker for a chat room discussion on [REDACTED], a web site maintained by the author of [REDACTED]. [REDACTED] I fielded numerous questions from a mainly pro-card counter audience with a smattering of casino executives, who, as [REDACTED] would say, were "lurking in the shadows." One of the questions asked was, "As a casino manager, what do you look for to detect a player who is shuffle tracking?" I was hesitant to reply. First,

the answer would be quite lengthy for a chat room session. Second, I wasn't sure if I wanted to share that information with the large number of Blackjack players who were viewing my replies.

I told the person asking this question to e-mail me if he really wanted to know the answer. This would give me time to type out a proper response and, at the same time, greatly reduce the recipients of the sensitive information. (Note: my stance on answering questions from people on the Internet has always been to be as open as possible. However, if I feel certain information is detrimental to the gaming industry, I will not release it.)

For those of you who aren't familiar with the term "shuffle tracking" or are uncertain what shuffle tracking is, I will explain its most basic points. Shuffle tracking is different from standard card counting due to the fact that the information gathered is done during the play of hands previous to the shuffle. This information is noted and then tracked through the shuffle. After the cards are cut and play starts, the tracked information is used to determine where certain slugs of high cards or certain combinations of cards are located.

Talking more specifically, there are three major systems of tracking the shuffle. The first system is known as "zone" tracking. In this instance the tracker watches for zones of high value cards, follows them through the shuffle and estimates where they will reappear. By tracking the zones the player knows where the rich sections of the deck are located and bets into them accordingly.

The second system is known as "key card location," "ace location" or by a myriad of other names. The tracker watches the cards being played until he spots an ace that is preceded on the pick-up by certain key cards. Example: on the pick-up the tracker notices an ace is preceded by a queen of

Chapter 4: Shuffle Tracking

hearts, a queen of spades and a jack of clubs. After the cards are shuffled he watches the cards until he sees a jack of clubs. If, several cards later, he sees the queen of spades, and several cards later the queen of hearts, he can assume that the ace will appear within the next several cards. If the tracker can narrow the ace's appearance down to about one or two cards, he can wager more and gain a substantial edge. Knowing on which hand the ace will appear gives the player a 52% edge on any amount wagered on that hand.

The third system is known as "sequential tracking." In this situation the player records all of the cards as they are picked up by the dealer. It is necessary to use a specially designed computer in concert with this technique. Due to loopholes in certain shuffling procedures, the player will be able to estimate the dealer's hole card based on the cards that have been exposed during previous play. Some shuffles are so poor the value of subsequent hit cards can also be estimated.

As it turns out, I was contacted by the same individual and I e-mailed him a summary of what indicators I looked for while I was at the [REDACTED] Hotel and Casino. The e-mail is as follows:

Dear [REDACTED],

Shuffle track (zone tracking) is the same as counting cards except you know where the rich slug of cards are before the cards are dealt and you can play into the rich sections or cut into them. When a zone tracker plays into a rich zone, he bets more and varies his hit-stand-double-split-insurance strategies accordingly. If I see a player moving his money from one to 12 units in a six deck shoe, I will take the time to watch his playing strategies. If he bets six or more units, I watch to see if he stands on 15 and 16 against a 10, aggressively doubles nine versus two, 10 versus 10, 11 versus ace, etc. and I

watch to see if he takes insurance. (This strategy applies unless surrender is offered. Surrender is the next biggest indicator of a counter/track play after insurance.) At this point, I don't know what the running count is. However, I can assume if the player has a bigger bet in the circle, it must be a plus count. If I see the correlation of bet and strategy, I first check to see if it's a straight count play. If it isn't, I check to see if it's a zone tracking play. At the [REDACTED], I knew my six deck games were trackable. (I could make more money with a quicker shuffle than I could ever lose to tracking.) However, my zones were only 12 to 15 cards wide, the shuffle machines notwithstanding. If I saw someone making count plays for one or two rounds, backing off and then making possibly another one or two round count play, I was almost guaranteed that person was zone tracking.

Sequential tracking, the tracking of card series', is harder to detect. Sequential tracking looks like a cross between a marked card play and a hole card play. This depends primarily on the configuration of the sequential tracking team's computer. Some use it strictly for hole card information. Others use it to predict hit card probabilities. Another indicator is a full table, with the big player in the last seat and small players eating cards in the early seats. At the [REDACTED] because of the shuffle in both the six deck shoe and the double decks (again, sans the shuffle machines), sequential tracking could not be used effectively. If I suspected sequential tracking while at another property, I would have the dealer incorporate a couple of strips during the shuffle. I would then look for a reaction from the players (usually the dazed and confused look) and then watch their play during the next deck or shoe.

Key card tracking is the hardest to detect. However, it appears similar to a location play. A player will sit through several hands at a minimum to small wager. He will then leap to larger wagers on two

or three hands. Key card tracking lets the player know the approximate location of a tracked ace. Depending on the accuracy of the dealer's shuffle (precise shuffles are good; clump shuffles are bad) and the location on the table of the first indicator card, the player can estimate the appearance of the key card (ace) within one or two cards. This player will typically sit in the first seat and try to control the first three spots. (A female accomplice is always nice.) If I see this pattern once or twice during a shoe, for several shoes, I will have the dealer alter the shuffle. Extra riffles and a strip will usually do the trick. I will again watch for a reaction. In this case it's usually contempt and bewilderment.

Sincerely,

One more tidbit of information: many casinos are paranoid about being attacked by shuffle trackers. Some have resorted to long, drawn out shuffles that might prevent profitable tracking, but cost the casinos thousands of dollar in lost revenue due to the decrease in the number of hands dealt. Very few players are capable enough to make money tracking cards in Blackjack. It would take a team of players, most likely with concealed computers and a large bankroll, to be considered any type of threat to the casino's bankroll. In highly competitive markets the casinos will need to increase their ability to detect trackers instead of relying on costly methods of deterrence.

██████████ has published probably the best material on shuffle tracking that is available to the public ██████████

Information on the different methods of

tracking the shuffle in this chapter is limited to basic understanding of the techniques, how these methods can be identified when used in the casino environment and which game protection measures are the most optimal. For further information about the finer points of shuffle tracking from the player's point of view, it is highly recommended that you refer to ██████████

██████████ makes two comments about shuffle tracking that I feel are important for the casino executive to read and consider. The first quote is a word of caution to the player wanting to add shuffle tracking to their advantage playing arsenal and the second quote is more of a word of caution to the casino.

██████████ explains that while shuffle tracking can be used profitably against the casino, only a few players actually possess the abilities needed to gain a solid long-term advantage over most casinos.

"Frankly, most card counters should stick with traditional card counting and ignore all attempts at shuffle tracking. The possibilities for errors so increase with tracking strategies that any player who is currently struggling with a traditional count system would be foolish to enhance the level of strategic complexity by adding to his mental workload.

"Almost every blackjack game available today that is dealt and shuffled by a human dealer provides a profit opportunity for the skillful player. There are so many viable methods of attack that only technology can ultimately prevail over the expert. Until the auto-shufflers dominate the tables, if you've got skill, the dedication, and the bankroll, the time to get the money is now, good luck!"

Chapter 5: Playing Card Location

So you're sitting on the first position of a blackjack table waiting for the hand to get over. You've waved off on your two card twenty and are sitting back waiting for the other players to finish their hands. Confidence has you since the dealer shows an up card of six and unless she gets real creative you should win the hand and press your bet from \$10 to \$15. Just then the dealer turns over her hole-card, and just like in the book, it's a ten-value card. The dealer quickly takes a card from the top of the shoe and hits her hand with an ace for a standing hand of seventeen. But she doesn't stop there. By mistake she draws another card and just before she hits her hand realizes that the next card is unnecessary. She quickly places the card under the corner of the shoe for use during the next round of play. While you were sitting there watching her stumble through the quick corrective move, you catch a glimpse of the errant card and realize the starting card for the next round. Your first card will be a queen of hearts. As she finishes paying and taking the wagers on the table you start to wonder. Knowing that you will receive a ten value card, how much of the \$90 sitting in front of you should you wager? Should you bet all of it or should you sit out the next hand? Receiving a ten as a first card puts you one card short of a blackjack or a strong hand of 19 or 20. But it also puts you one card short of a 15 or 16. So what do you do?

If you know much about the game of blackjack you will know that blackjack expert [redacted] calculated the value of every card in the deck when the player knew he would receive that specific card as one of his first two original cards. What was [redacted] motivation for calculating these numbers? I'm really not sure. [redacted] might have just been curious to know what those values were. However, I think [redacted] might have had ulterior motives. Regardless of his reasoning, we are still placed in a position of whether or not we bet all the chips or

bet nothing. Knowing that the queen of hearts was going to be our first card, we would now need to examine [redacted] results for a player receiving a ten value card as his or her first card. (See Table 4.4 on page 52)

Based on this intriguing information we should bet big. Maybe even digging out our wallet to invest more money because we're staring at a 13% advantage on every chip we place in the first betting position. I mean, how often does this happen? The dealer makes a simple addition error, exposes the next card of the shoe and innocently allows us to bet whatever we want on the next hand. Not very often, right? So we thank our lucky stars for giving us this once-in-a-lifetime opportunity and go on playing blackjack like all normal players. Not the advantage player.

[redacted] information on the value of the player's first card opened a lot of eyes (as did a number of avenues [redacted] discussed in [redacted]). What if the advantage players could just come up with different ways of identifying their first card? Or better yet, what if they could manipulate or "steer" a valuable card into their hand? If so, then they could create a new way to exploit blackjack. As I stated previously, "necessity is the mother of invention" and various advantage players burned the midnight oil coming up with methods that could be used covertly and profitably to beat the casinos.

Attacking the hand held game

Advantage players understand that the easiest type of blackjack game to gain an edge in is the hand held single and double deck games. Natural weaknesses exist because the hand held games contain less cards than their shoe bound cousins and because the dealer is required to use more dexterous movements

handling the cards. For instance, it has been noted that some dealers have a tendency of tilting the deck of cards immediately after the shuffle has been completed and just before the cards are to be cut. If the dealer tilts the post-shuffled deck at a specific angle the bottom card of the deck can be spied by some players at the table. This information can then be signaled to the player cutting the cards, and if a valuable card is seen on the bottom of the deck, the player can then thinly cut the deck and bring the card into play.



Photo 5.1 Tilting the deck and exposing the bottom card in a hand held game

Another method of spying key-valued cards is when the dealer performs the riffle motion of the shuffle. If during the last riffle motion the dealer just happens to lift the cards higher than normal with their thumbs, it would expose several card index corners to an observant player sitting in the end positions of the table. Although several cards can be seen quickly as the deck receives its last shuffle, the advantage players still can estimate how far into the deck the key value card finally came to rest. This method can be played with a great degree of accuracy if the spotting advantage player puts in a minimal amount of practice time spotting and estimating depth of the target card. Once the deck is cut the estimated cards above the target card are added to the estimated cards cut to the top of the deck. The total number of cards prior to the target card indicates its approximate location for future use. Of course, if you can get

information off the high riffle shuffle you can also get information off the high strip. A target card glimpsed off the high strip must also be tracked through the final riffle shuffle before a location can be determined. Although estimating the target card's location through this method would be considered highly inaccurate, it still allows the advantage player additional information that they normally wouldn't possess and could be exploited in some situations.

One final method for getting information on the



Photo 5.2 High Riffle exposes key card near the top of the deck

bottom card of the deck is mentioned in [REDACTED] [REDACTED] discusses how an advantage player can get useable key card information after the cut of the hand held game. In this scenario the advantage player is unable to see the bottom card of the deck prior to the cut. The player cuts the deck in a thin manner that would allow him or her to accurately estimate the number of cards from the bottom of the deck they have cut off. During the transfer of the cut the dealer inadvertently flashes the bottom card of the deck and this information is used in conjunction with the estimated number of cards cut to determine the spotted card's location. If the spotted card presents a positive expectation for the advantage player, he or she manipulates the card into one of their hands. If the card happens to be of negative value, the advantage player may consider either sitting out or

betting minimum in this situation or manipulating the negative card into the dealer's up-card position.

Placing the key target card into the advantage player's hand

So far I have discussed how to spot cards in the deck and how that can be used to locate a key target card like a ten value card or an ace. I've used the term "manipulate" as the process that takes place after the key card is located but so far haven't gone into any of the actual techniques as to how the key card is "manipulated". In most cases this process is broken into two steps: (a) manipulating the target card into the top ten or fewer cards of the deck, (b) manipulating the target card into a predetermined betting position (or dealer position) on the table. In some instances the counting process can be utilized to put the key target card in the top ten or fewer cards of the deck and this step can be ignored.

The manipulation of the key target card is done through the management of hands played on the table. One of the most important factors necessary for estimating how many hands need to be played to position the card correctly is based on the average number of cards used per player per round. It is widely accepted by gaming experts that the average number of cards used per player is 2.7. This means if the advantage player bets in two player spots with no one else on the table, he or she will eat up approximately 8 cards during that next round (don't forget the dealer's cards). For example: if the advantage player spots a king of spades three cards from the top of the deck after the final riffle of the shuffle, they estimate that the ten card cut he then used is probably eleven cards. It can be estimated that the target king card will be fourteen cards from the top of the deck; thirteen cards once the top card is burnt by the dealer. If the advantage player is the only player on the table and if he wagers on two hands, in theory the target card will be positioned

approximately five cards from the top of the deck for the second round.

Once the key card is in a position where it will come into play during the next round, the advantage player needs to develop a strategy that will steer the target card into his hand. The strategy they will use is altering the number of hands played. In this situation they would play two hands. With the key card, fifth from the top of the deck by playing two hands, it should fall into the second hand as the second card. The advantage player places a larger wager on the second hand or can place large wagers on both hands if he feels the card might be fourth or fifth from the top of the deck. Another strategy would be to play three hands if the advantage player feels the key card could be sitting five or six cards from the top of the deck. Although the advantage player puts more money into action when betting three hands, he or she creates a safety net in anticipation of one card estimation errors without causing too much of additional cost. The advantage player knows the value of steering the ten into one of the hands is 13% on the hand the card falls into while paying 0.5% percent disadvantage on the other two "safety" hands. In his book [REDACTED] [REDACTED] explains that the player spotting and steering a card will want to leave the key card "hanging" within five cards of the top of the deck, and based on its estimated position he will use the following strategy;

"Now, if the player thinks the ace is one or two cards down, he plays one or two spots respectively; at three cards down, he plays one hand, looking to catch the ace on his second card; at four cards down, he plays two spots with a bigger bet in the first position; and at five cards down, he also plays two spots, with a bigger bet in the second position"(2004).

by "center cutting" the single or double deck game. If the advantage player has the ability to use visual reference points when cutting the deck, their accuracy for manipulating the key target card and estimating the card's position afterward greatly increases. It becomes apparent that thin deck cutting can be quite accurate because a small sample of cards is easier to estimate than a large sample. Cutting a deck of cards in half is also quite accurate because the person cutting has a point of reference (the mid-point of the deck) by comparing the relevant distance between the bottom and top of the deck of cards ([REDACTED], 2004). By cutting to the middle of a single deck the player can safely estimate the key target card. The target card is now located approximately 25 to 27 cards from the top, plus its original spotted location. Center cutting the double deck will add between 50 and 54 cards above the spotted target card.

Attacking the shoe game



Photo 5.3. Using the center cut technique on a single deck

Locating a target key card in a shoe game isn't any tougher than accomplishing the same technique in the hand held game. It can also be argued that glimpsing cards in the shoe game might even be easier based on the nature of the shuffle process and the cut. The down side to playing the shoe is location and key card steering techniques generally occurs only once per shuffle, and since the hand held decks are shuffled more times per hour the advantage player

has more profit making opportunities per hour when playing the single or double deck games.

The most common method for glimpsing a key target card is during the cut of the four to eight decks used in the shoe game. Actually all the advantage player has to do in the first few seats of the shoe game is just open his or her eyes. All multiple deck games are turned on their sides when they are presented to a player for cutting, and since most dealers roll the decks over towards their right, anyone sitting in the first few table positions has a perfect view of the bottom card. This "bottom peek" information can be seen or signaled to the player cutting the shoe and he or she can place the cut card according to the desired placement of the targeted key card.

Another method for glimpsing a card is when the final deck grabs have been shuffled and are being placed on top of the previously shuffled cards in the center of the table. Since the previously shuffled cards represent a stack of cards sometimes five to seven decks high, the final shuffled group needs to be elevated before they are placed on top of the other cards. During this placement most dealers have a tendency to tilt the group to get them on top of the others and this tilting may "flash" or expose the bottom card of that group to the advantage player (usually visible from center position of the table).



Photo 5.4 Exposing the bottom card on the final riffle

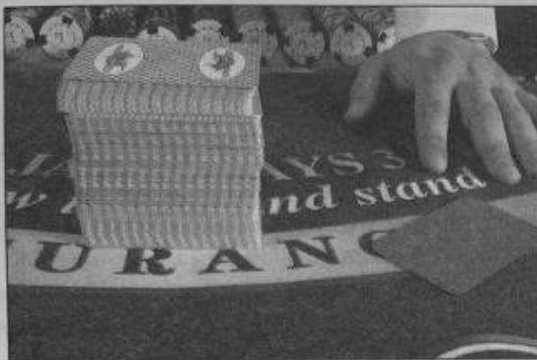


Photo 5.5 Last shuffled group appears offset from the stack

As the dealer places the different shuffled groups of cards into one pile they usually do not align correctly. During the stacking process the player not only gets a "high stack flash", but also increased accuracy for the cut based on the piles being ajar. (██████ 2004).

Now we've come to the point where the advantage player needs to manipulate the spotted key card into play. The most common methods used for spotting the key card will place that card either at the very bottom of the stack deck (bottom peek) or somewhere around the top several cards (stripping flash or high riffle). Based on the target key card positioning the advantage player will need to cut the decks somewhere near the bottom of the stack in order to bring them into play during the next round or two. Up until recently, almost every casino's house procedures restricted the cutting player to cutting at least ten cards from the top or ten cards from the bottom; giving the player five and a half decks in which to insert the cut card. If the advantage player is attacking the bottom card he or she would best serve their purpose by inserting the cut card between 8 to 15 cards from the bottom of the decks. Unfortunately for the casinos, this thin cut was rarely questioned since it was close to being inside the house's procedure and usually fortified with the placement of a substantial wager for the dealer. Deck cuts of 8 to 15 cards provided the advantage player

with greater accuracy based on the small number of cards cut off. This also provided the player with an opportunity to steer the key target card into his hand or into the dealer's hand if needed utilizing a variation of player wagering spot on the tables.

It wasn't too long before a few casino executives identified that the thin cut could be used to beat the casino. House procedures were adapted to restrict all players from cutting less than a half of a deck (approximately 26 cards) from either end of the multiple decks. This change in procedures presented short-term problems for the advantage players. It wasn't long before advantage players learned how to accurately cut to and read cut card insertions of up to 50 cards. One professional I knew could cut 25 cards almost every time. He practiced inserting the card while using his thumbnail and upper thumb as a template. I and several other casino executives watched him demonstrate his cutting technique and the accuracy was amazing. He made a series of 25-card cuts from the bottom of six decks, right on the money five out of six attempts. The one he missed was off by one card and he told us he had missed by one card before we counted the cards down for confirmation. Other advantage players were able to be fairly successful by going after 50 card cuts. Although never holding the same accuracy as seen using the thinner cutting technique, they were able to cut within 50 to 54 cards every time).

Demonstration of bottom card location and key card steering technique

Here is a narrative of what a location and key card steer play looks like from the advantage player's point of view. The advantage player generally puts together a team of players to properly exploit a bottom card move. The team is usually made up of a big player who will bet in the middle three spots of the table and two smaller players who will eat cards during play (but more importantly), spot the bottom

card, perform the cut, and confirm the exact location of the cut card after the cut card has been inserted. The team could also incorporate one player to act as a spotter to watch for any increased attention or "heat" from the pit during the play.

The team enters the casino and disperses prior to selecting a table to perform the cutting move. The big player will buy in for cash on one of the blackjack tables and make a couple of wagers on different games to establish his legitimacy as a "player" in the casino. The smaller players will find a dead shoe game and position themselves to the left and right of the table. While the dealer shuffles the cards, the big player will roam over toward that game awaiting the cut. Once the deck has been shuffled, the dealer will present the cards to be cut. If the deck is passed to

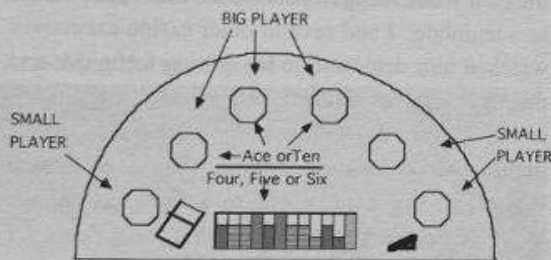


Diagram 5.1 Player table positioning for card location and steering

the player in the first several positions of the table, he will pass and request the player in the last few positions cut the cards. With this configuration the player sitting or standing in the early table positions spots the bottom card of the six (or four or eight) decks. He then signals the value of that card to the player seated or standing near third base. The spotting advantage player informs the cutting player

whether the bottom card is an ace or ten, a small card such as a four through six or any other value card.

If the spotted card is a ten or ace the player cutting will shoot for a 12-card cut. By cutting twelve cards from the bottom of the decks the cutter will manipulate the higher card into the center hand of the table (fourth position on a seven spot layout) on the second round of the dealt cards when all position are being played. If the bottom card happens to be a four through six, the player will try to either drive the card into the dealer's up-card position by making an eight card cut, or may choose to cut 14 cards and force the card into the dealer's hole card position. Giving the dealer a weak card will place him in an approximate 18% to 24% disadvantage on that hand (See table 5.1). If the bottom card is any other value the cutter simply places the cut card in the decks, makes a token bet on the next hand and leaves the table.

If the cutting player is cutting to manipulate the cards, he cannot go on assumed accuracy of the inserted card alone. Both he and the other player at the table estimate the number of cards they individually witness and estimate exactly where they feel the cut card was actually inserted. If the two players on the table agree, they signal the big player it's OK to enter the game. Usually the big player is the team leader on this play. I know one group that used to label the team leader "the Field Marshall". The small players signal the big player as to the value of the key card and its estimated cut card position. It is his decision how many hands the smaller players and himself need to play to achieve the desired targeted key card position. Regardless of the value of the targeted key card, the big player will wager in the three center spots of the table (positions

2	3	4	5	6	7	8	9	T	A
10%	14%	18%	24%	24%	14%	5%	-4%	-17%	-36%

Table 5.1 Calculations of Player's Advantage When the Dealer's Up-Card is: (1979)

Chapter 5: Playing Card Location

three, four, and five). He will then use the number of hands played by the smaller players as his tools to position the key target card where he wants it. The smaller hands on either side of the big player also serve another purpose. If the targeted card is an ace or a ten value card and the cutting player is off by one or two cards the high advantage card will not fall to the dealer. Giving the dealer an ace or ten would be disastrous to the tune of 17% to 36%. Also, if the big player is trying to force a small card into the dealer's hand, the smaller betting players act as a buffer just in case the four, five, or six happens to fall early or late. Following are examples of the number of hands played and the amount of wagers depending on the value of the targeted key card and the estimated cards cut. The first example shows the number of hands played by the big player and the smaller players and their wagers when the cut has been inserted 13 cards from the bottom of the decks.

Dealer						
9						
7th	6th	5th	4th	3rd	2nd	1st
\$25	\$25	\$2K	\$2K	\$2K	\$25	\$25
8	7	6	5	4	3	2
			(A-T)	12	11	10

Table 5.2 Ace/Ten (A-T) with a 13 card cut

Remember, the first card is always burned and placed into the discard holder, and the first card dealt is actually the second card in the shoe. In this case the big player has positioned himself with a chance to catch the targeted key card in 4th position; however a one-card error either way will still put the ace/ten target card in the money. If the cut is errant by several cards the smaller wagers act as a buffer keeping the card away from the dealer. If an ace is the target key card and falls into any one of the money positions, the advantage team, in theory, will win \$1,040 on the ace hand and lose \$21 on the other hands (playing basic strategy with a disadvantage of

0.5%), for a net win of approximately \$1,000. If the target key card is a ten the theoretical net win will be approximately \$240.

Dealer						
8						
7th	6th	5th	4th	3rd	2nd	1st
\$25	\$25	\$2K	\$2K	\$2K		\$25
7	6	5	4	3		2
		(A-T)	11	10		9

Table 5.3 Ace/Ten with an 12

Dealer						
7						
7th	6th	5th	4th	3rd	2nd	1st
\$25		\$2K	\$2K	\$2K		\$25
6		5	4	3		2
		(A-T)	10	9		8

Table 5.4 Ace/Ten with an 11

If the advantage player has the opportunity to drive the targeted key card into the dealer's hand the team has an opportunity to make money, not on one, but all three hands. Where the advantage team receives a 52% advantage on the hand where the ace finally lands, the team receives 24% on every bet when the dealer gets stuck with a five or six (see table 5.5). Playing three wagers of \$2,000 would give the team a theoretical win of \$1,440.

Dealer						
(5 or 6)						
7th	6th	5th	4th	3rd	2nd	1st
\$25	\$25	\$2K	\$2K	\$2K	\$25	\$25
8	7	6	5	4	3	2

Table 5.5 Target Card of 5, or 6 with a 9 Card Cut

Dealer						
8						
(5 or 6)						
7th	6th	5th	4th	3rd	2nd	1st
\$25		\$2K	\$2K	\$2K	\$25	\$25
7		6	5	4	3	2
14		13	12	11	10	9

Table 5.6 Target Card of 5, or 6 with a 15 Card Cut

Advantage players admit that steering a small value card into the dealer's hand is "tricky" at best because there is no margin for error. The cut and estimate has to be "right on the money" or the small card misses the dealer's hand completely. Even though the smaller wager hands would absorb the negative affect of the near miss, the advantage players come away with a small loser of approximately \$35. Since a smaller cut sample is easier to read, the cutter will choose to drive the targeted key card into the dealer's hand and up-card position during the first round. Forcing the targeted key card into the dealer's hand during the second round would be optimal since the players have an additional advantage knowing the dealer's hole-card.

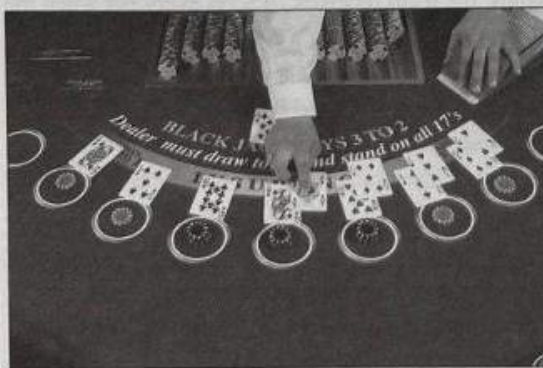


Photo 5.6 Ace being manipulated to the center spot on the table

Usually a team play of this magnitude is a "hit-and-

run" situation. The advantage players will stay in the casino until they can take one shot at locating a target card and steering it into the optimal position. If the big player wins his wager(s) he might make a couple of "cover bets" before leaving the table. In most cases the casino does not realize they have experienced an advantage play and if they do the team is long gone before closer scrutiny of their play can be accomplished. Sometimes the player acting as a lookout during the play will act as a "trailer" once the play is finished and the players leave the table. The job of a "trailer" is to stay behind and monitor the activity in the pit to see if the pit staff was aware of the play. Many times the pit will give away the fact they suspect the play through the pit personnel's overt comments and reaction, allowing the advantage players to elude detection by avoiding that shift until it safe again to play.

Using the cut card to get key card information

Many years ago the casinos offered hand held blackjack games which did not utilize a cut card. These hand cut decks were subject to a number of cheating moves that after several sessions of bankroll loses to deck manipulations, subsequently dictated the use of a plastic cut card. During that time one move that advantage players could use to get target card information was know as the "drop cut". When the advantage player went to cut the deck he would flash the bottom card of the slug of cards in his hand being cut to another player at the table. Once the card was flashed, the player would riffle the cards with his or her thumb and drop two cards off the bottom of the slug back onto the remaining cards on the table. If done smoothly and quickly the advantage player would know the value of the second card from the top of the hand held deck after the cut had been transferred.

Since the top card is burnt and placed into the discard holder, the first card to be dealt is the target key card.

advantages for the house. However, don't think the advantage player can't perform the same technique. One advantage player in particular has created an advantage-playing niche for himself using the plastic cut card as his main tool of attack. When the dealer presents the multiple decks to be cut the advantage player takes the cut card, holds it out towards the cards like he intends to cut the cards, and then pauses. When the player pauses the dealer has a tendency to loosen the cards hoping to give the player a better opportunity to cleanly cut the cards. The dealer is actually providing the player a slight opening. When the dealer holds the cards loosely, the cut card can be inserted slightly, twisted, and removed. If the deck is held loose enough, using this technique will allow

At this present time there is an argument regarding the legality of this technique. One jurisdiction in particular claimed that the player is in the act of manipulating the cards and believe the action is conducive with card cheating. Following is the exact verbiage used by the [REDACTED] Division of Gaming Enforcement on their website which deals lists excluded persons. Since the player mention in this bulletin has never been convicted of a gaming crime, I have chosen to omit his name ([REDACTED]).

as he tried to influence the game of blackjack by manipulating or attempting to manipulate the cut card in the deck to determine what card would be the first card dealt. Rather than place the cut card back into the deck in the manner required, DOE would place the cut card in the deck in a manner that would enable him to determine what card would be dealt to him after the shuffle, thus giving him an unfair advantage. On January 13, 1992 and August 13, 1994, DOE was observed employing the same il-

legal tactic at the [REDACTED] in [REDACTED]. Charges were pending against DOE in [REDACTED] for cheating at blackjack, a felony offense."

To my knowledge DOE was never charged with a gaming crime in [REDACTED] and is not on their list of excluded persons. I find it extremely unusual that [REDACTED] would place a non-convicted blackjack player on their exclude persons list. The fact that they did this leads me to believe [REDACTED] officials felt his play in [REDACTED] was a potential threat to their casino industries bottom-line profits. There is however some grounding for this technique's legitimacy. Because the player is creating his own information by manipulating the cut card, the information is not available to everyone on the table. And if the information is not open to everyone, then it should be considered cheating at gambling.

Personally, I might detain a person for the governing regulator agency personnel but I would be very uncomfortable recommending that this person should be arrested for cheating. I look at this in the same light as I would a person trying to slide dice or manipulate the handle on an old electric-mechanical slot machine. If we the casino provide a player with a plastic card with which to cut the deck, it should be our obligation to stay awake and make sure the player does not use the card to riffle through the cards and pick the one he or she wants.

Some last thoughts on playing card location

Let's digress for a moment and go back to the narrative in the introduction section concerning the advantage player who attacked an [REDACTED] casino. Based on the preliminary information about his play: betting big on the first round off the top of the deck, wagering on one to three hands when playing the first round and always demanding to

cut the cards you now observe this player getting noticeably strong hands when he placed larger wagers. After reviewing this section, do you have a better idea how to identify the advantage play technique? Armed with top card and card location information would it have taken you as a casino executive three months to figure out what the player was doing? Would you have dealt him one round and then shuffled the cards?

At this point you may have analyzed the play a little differently. Questions you might have asked yourself as the executive of that casino would have been:

- Why does the player insist on playing alone?
- Why does he bet big off the top and drop down to table minimum bets there after?
- Why does he insist on always cutting the cards?
- Why does he hesitate before inserting the cut card?
- Why does he always play late on swing shift or early grave?

Based on this thread of questions you should be able to establish some preliminary answers to why he plays the way he does. In effect you're taking a path that is backwards of that of the advantage player. He or she develops a plan to read information about the identity of the target key card. Next the advantage player decides the best way to manipulate the target card into play and last, how to bet into the situation optimally.

The casino executive on the other hand must start with determining how the player betting strategy is related to other possible techniques he employs. To begin with: "Why does he bet big off the top of the shoe?" By betting big off the first round and positioning himself so he gets to play the first several cards off the top of the deck, you should develop a

strong suspicion he is playing top card information. The next question you should ask yourself is: "How is he manipulating the target card so it will appear in the first round off the top of the shoe?" The manipulation has to occur during the player's function of cutting the deck before the beginning of that round. And lastly, the executive needs to ask the question, "How is he obtaining key card information?" Since he isn't using a "twist and turn" technique, but still hesitates and studies the deck before carefully inserting the cut card, he must see something in the cards. It has to be some blemish or subtle mark in the cards. Have the cards been marked or bent in some fashion or manner? These questions have led the casino executive to the heart of the issue: "How are the cards altered to give the advantage player key card information?" Answer this question and you have all the answers to this problem.

The funny thing about the gaming industry is we look at the symptom of the problem and try to analyze the situation as if it is the problem. In most cases what we need to do is understand the symptoms and follow them to the actual problem, which in this situation is how are the cards being altered. When I first started work on this case I was given a videotape of the play and eight decks of cards that had come off the table. After analyzing the information viewed on the videotape I came to the conclusion that something has to be wrong with the playing cards, so I moved on to the playing cards samples. After performing several tests on the cards, I noticed slight corner down turns on diagonally opposite corners of ten value cards. I also found similar corner turns on the opposite diagonal corners of the smaller, non-ten cards. These corner bend patterns appeared similar to patterns I once knew as "dealer bends" or bends placed into cards by the dealer when looking at their hole card for blackjacks (discussed in more detail later in this book). Since ██████████ casinos did not manually look under their hole-cards, the corner bend patterns

indicated the marks had to come from the optical card reading device installed on all blackjack games of the casino.

Once I had a chance to fly ██████████ and go to the casino in question, I soon noticed that there was a strong chance the readers were the problem. Although I was not privileged to the casino's final investigation of the problem, I would suggest the problem came from one or a combination of two problems. First, not one dealer I watched used the same motion to insert their cards into the reader, many jamming the cards roughly into the device. Second, the readers appeared to be sitting high on the layout and the cards bent slightly when rising up and into the reading device. This realization also answers the last question regarding why he played late in swing shift. He did so because the cards had been on the table all day and the cards were all bent and more readable from extended usage. He usually terminated his play on grave shift just before the eight decks were changed.

The solution to the problem had nothing to do with bad cards or illegal manipulations. At first the casino thought the solution to their problem would be best served by buying different playing cards or by changing the eight deck on all games every few hours; both solutions representing very costly experiments. The true solution to the problem would be nowhere near as costly—dealer hole-card training and hole-card device readjustment.

Chapter 6: Other Advantage Plays in Blackjack: Past and Present

In early 1980 I found a terrific book on different methods of beating blackjack, other than counting cards, written by blackjack expert [REDACTED]. [REDACTED] book interestingly titled [REDACTED] was selling at the time for the "nice" price of \$200. This was seriously well out of my price range but considering the material contained within its covers, the book was still worth every dollar. Fortunately at the time I happened to have a good friend who didn't mind spending \$200 on [REDACTED] book to complete his gaming library and he allowed me to borrow it for a couple of weeks. I found the book's information a real eye opener and spent much of my free time thoroughly digesting its contents. It just happened that during this time I was employed by the State of [REDACTED] as an agent with the Enforcement Division of the [REDACTED] Gaming Control Board and was not allowed to gamble in [REDACTED]. However, agents were permitted to play during gaming related investigations so I was extremely eager to test some of the techniques I had learned during a future blackjack investigation cases.

It wasn't long before my opportunity appeared in the form of an undercover assignment at the [REDACTED] Hotel/Casino. Management at the [REDACTED] had good reason to believe that a cooler deck (presorted deck brought into the game from sources outside the casino) would be introduced into a six-deck shoe game during a specific weekend. As soon as the [REDACTED] management contacted the Gaming Control Board with this information it was decided that several Enforcement agents would be assigned to roam the casino floor acting as players, on the lookout for cheaters involved in the scam or the actual introduction of the cooler itself. Being an ex-gaming employee it was decided I would be one of the agents working the floor. I was assigned \$1,000 in undercover funds

to be used as I saw fit over the weekend. I would get to play until the cheaters were either caught or the undercover assignment was called off. Whichever happened first didn't matter; my excitement was due to the fact that I finally had my opportunity to play blackjack. I could now see how I would fair utilizing an interesting blackjack advantage technique known as playing dealer "warps".

Let me take a second and give you a little background on "warps". Dealer warps are bends that the dealer unintentionally puts into specific cards as they look at their hole-card when checking for a blackjack. The dealers on games without hole card readers would peek under their "tens and aces" to check for a blackjack. This process of bending the cards up to look underneath would place a bend (warp) in the cards. Usually a good readable dealer warp occurs when dealers aggressively check their hole-card. It also seems to be more prevalent in shoe games than hand held games, possibly due to the dealer checking for a blackjack using both hands. Of course, most cards get bent backward (when face down) by this process because every card in the deck will at sometime be the hole-card. However, ace and ten value cards are the only cards that ever get bent towards the face of the card. Since the "tens and aces" are the only cards bent in this manner they become noticeable, especially when bent aggressively. Subsequently, when looking at the dealer's hand and seeing a hole-card bent in a manner that looks like a "bridge", you can bet that it's either a ten or an ace. There are several applications for using warp information (as you can imagine) but it's best application is for determining when to take insurance.

So here I stand in the middle of the [REDACTED] Casino with playing money and twenty plus six deck shoe games and because its 1980, all the blackjack

dealers are using two hands to check their hole-card. It wasn't long before I got settled in and found a number of real good wrap games where I could read ten/ace hole-cards successfully about 90% of the time. During the course of Friday evening, I was able to keep lookout for the suspected cheaters and still had plenty of time to experiment with [REDACTED] warp strategy while perfecting my own card reading ability. When we returned the next evening we were informed the cheaters were planning on hitting late that night. This was great news for me—I now had time to burn and I spent this time ogling hole-cards information. While playing on one of the blackjack games against this one specific dealer, I happened to nail several hole-cards during blackjack situations. I called three positive insurance plays within twenty or so hands and then spotted a non-ten/ace on the fourth opportunity and didn't take it. After the dealer peeked his hole card he looked at me and commented, "What are you, some kinda mind reader?" "No", I replied, "I guessed correctly before you looked. How could I read your mind?" The dealer gave me the evil eye and went back to flipping pasteboards. I figured it was time for me to leave that table since I'm supposed to be "undercover" and it's hard to stay unnoticed when some dealer thinks I have the inside track at guessing when to take insurance.

I played a little while longer and then positioned myself in preparation for the night's main event. Unfortunately, the cooler scam never went down. The cheaters got cold feet and decided to call off the play. A few months later they were finally nabbed putting a cooler deck in at another casino while I was working a case in [REDACTED]. With the culmination of the operation, all agents got together for an after action debriefing where we talked about good and bad points of the operation. We also turned in what was left of our undercover funds. "Agent [REDACTED], how much undercover funds do you have left?" asked the operation supervisor. "I have \$800".

"Agent [REDACTED], how much do you have left?"

"I have \$750, sir".

"Agent [REDACTED], how much funds do you have left?"

"I have \$1,300, sir".

"How much?" he asked with a surprise. "I have \$1,300, sir". And then I began to cut the checks down into denominations of nine black checks and sixteen green checks. "I have \$900 in \$100 chips and \$400 in \$25 chips, sir".

Oops! I didn't realize it at the time but very few gaming agents even turn in more money than they originally draw. Most agents have backgrounds in law enforcement and don't really know how to play the different games. They use the undercover funds to blend in with the crowd, making a few bets, tipping dealers and buying the occasional drink. They don't really play, they just "buy a presence" in the casino and turn in less money than given for their minimal gaming effort. I, on the other hand, was utilizing an advantage playing strategy and betting with both hands.

"Thirteen hundred dollars, huh?" "You won \$300 bucks?"

"Well...nope. I was given \$1,000, but \$500 of it went to agent [REDACTED] so I actually won \$800."

You would have thought I just robbed the place all because I ended the undercover operation winning money. With my supervisor already acting nervous over an \$800 win, I wasn't about to explain to him that I made the money using an advantage play technique. Especially one that involved reading the dealer's unexposed card in the hole-card position, that incidentally had been marked by the dealers.

Dealer bends or "warps"

Paper based playing cards get bent and warped all the time. If the game is dealt face down the players will bend them innocently through normal handling. If the game is dealt face up the dealer will bend the cards as they're being delivered to the players. The

Side Bar – ADVANTAGE PLAYS FROM THE PAST

Taking advantage of dealer bends and reading dealer tells are no longer playable since most casinos utilize optical hole-card reading devices. Since the dealers in the modern casino environment use these devices, the principals no longer apply. However, it's still extremely important that all knowledgeable casino executives review these techniques and have a working understanding of how in theory they have been used to gain an edge over the casino. One never knows when a technique considered "passé" will make a return appearance in some form or another. Take for instance the story about ten/ace cards corner bent when inserted into an optical hole-card reader. A bend created by the dealer looking at the hole card was considered as an obsolete problem. It then returned in a different form and was exploited for a large sum of the casino's bankroll.

dealer will also bend cards when they are manually shuffled during the riffle process. The corners of the cards will be slightly upturned through pressure placed between the cards grabbed and the thumbs controlling the riffle interlacing action. There are a number of actions that bend, warp or mar paper playing cards during normal play. Normally this is not a problem if these distortions are done in a random manner without leaving a pattern that is biased to any suit or card value. In the case of dealer bends, the bends are created during the specific act of gaining information about the value of the hole-card. The dealer only performs this function with an up card of a ten or an ace thus creating a bend in cards of a specific value. The ten value cards and aces now become uniquely bent in this pattern and thus vulnerable to detection and exploitation.

In the case of hand peeking under ten/ace cards,

the action has a tendency to bend the cards in an identifiable manner. When placed face down on the gaming table the difference between well-used, previously peeked ten/ace and 2 through 9 cards is apparent. The ten/ace card is bent in a manner that causes it to "bridge" upward in the middle of the card while the lengthwise four corners are touching the table. This bridge bend can also be slightly distorted since all ten/ace cards will also find themselves in the dealer hole-card position. This distortion, while still appearing as a bridge bend, will possess a slight "wave" placed by the occasional opposite twist. When a bridge bent ten/ace card is situated in the hole-card position it can be read best from player seated towards the side of the table. It will appear as an obvious gap between table and card, or may appear as a dark shadow depending on the degree of the bend.



Photo 6.1 Ten/Ace card on top of Ten/Ace card and Non-Ten on top of Non-Ten card

Because the 2 through 9 cards are never face up during the peeking action they are bent in the opposite direction as compared to a ten/ace card. When positioned face down on the table the 2/9 card bends will show an upward turn of the lengthwise ends, lifting them slightly off the table, with the center of the card firmly against the felt. If one were to push down on either end of the card and release, the card would momentarily rock slightly. When placed in the hole card position the 2/9 card will show the read



Photo 6.2 Example of Ten/Ace cards with Non-Ten cards

a slight gap or shadows at either ends of the card.

With specific values of cards bent in opposite directions, different combinations of gaps and bridges are formed making the dealer's hole card readable. For example, if the dealer's up-card is a ten/ace and appears to rock back and forth slightly on top of the hole-card, it can safely be determined that the dealer has a ten/ace card in the hole (See photo 6.1). If a ten/ace up-card appears to "cup" on top of the hole-card, completely touching the bottom card, the player reading this combination can estimate the ten/ace is sitting on top of a 2/9 card (See photo 6.2). In an inverse situation, if the up-card is a 2/9 and cups nicely with the hole-card it can be assumed that the hole-card is a ten/ace. If the 2/9 up-card and the hole-card appear to create a slight tunnel, side to side through the middle of the two cards, the reader can safely determine the dealer holds a pair of 2/9 cards.

The question you should be asking right now is "Wouldn't the casino establish procedures that prevent cards from being bent during the peeking process?" In most cases the answer is "yes". Casinos established procedures that either limited the bending process, or at the very least, positioned the ten/ace up-card so it wasn't part of the peeking process. Because the original games were dealt

from the hand and not from the shoe, the peeking procedure had to include holding the deck in the left hand (or right in the case of a southpaw). The deck hand was used to lift the cards upwards and slightly to the dealer's left, while the right hand was brought in flat and palm up underneath the cards to conceal the hole-cards identity from everyone except the dealer. If done correctly the two cards are lifted together and are not bent in any manner. The problem occurs when the dealer fails to exactly perform the manual operation and starts to place pressure to the front of the cards and bend the cards upward with his or her left thumb. As with any other skill, the person performing it tends to become sloppy over a period of time. If the supervisory staff did not continually evaluate each dealer's hole-card procedure, the dealer would turn their sloppy procedure into a habit. Many of the dealers who created very readable warps were veteran dealers, the rookie or break-in dealers too inconsistent for the advantage player to use profitably.



Photo 6.3 Sloppy dealer aggressively checking the hole-card

Another method casinos used for peeking at the hole-card was conducted by sliding the top-card forward before performing the peeking procedure. This method pushed the top card out of harms way; the dealer could now peek the hole-card while not subjecting the up-card to the bending motion. As

Chapter 6: Other Advantage Plays in Blackjack: Past and Present

long as the dealer slid the top-card forward before peeking, it didn't matter how aggressive the dealer looked at the hole-card because all cards were being bent in the same pattern. The only time this dealer got into trouble is if he or she started being lazy about pushing the top card forward, bending the top card.



Photo 6.4 By pushing the top card forward the dealer demonstrates the correct way to peek at the hole-card

When shoe games became more prevalent the dealer was free to use both hands to peek at the hole-card, total unencumbered from holding a single or double deck. At first glance it seems when the dealer peeked with two hands it would produce a lighter touch and to some degree, lessen the chance of bending cards. The left hand could slightly lift the dealer's cards and the right hand could properly shield the value of the card from players at the table. What many of the shoe game dealers got into a habit of doing was to plant their right palm sideways to the right of the cards and use their left hand to snap the two cards upwards with their left thumb creating extremely readable dealer bends. Again the floor staff's failure to police this simple routine procedure led to a period of extremely profitable dealer bend games throughout the State of [REDACTED]

How profitable is reading and playing dealer bends or warps? This depends on how readable the bends are and what degree of accuracy you have at estimating

Decision	Up-Card	Gain from 100%	Gain from 65/74%
		Accuracy	Accuracy
Insurance	Ace	2.10%	.71%
Not doubling 11	10	.20	.06
Double on 10	10	.21	.06
Stand on 16	10	.13	.04
Stand on 16	7	.10	.02
Hit hard 17	8	.03	.02
Not doubling 10	9	.05	.02
Not doubling 11	3	.05	.01
Not splitting 8-8	10	.04	.01
Stand on hard 16	8	.07	.01
Hit hard 17	9	.06	.01
Stand on 16	9	.04	.01
Not doubling 10	8	.03	.01
Stand on hard 15	7	.09	.01
All other plays		.22	.05
Total		3.48%	1.05%

Table 6.1 - [REDACTED] Gains from Readable Dealer Bends (2000)

the correct category as ten/ace or 2-9. Remember other than using the information for insurance plays (which would give the advantage player an overall positive advantage of 2% if you can read the ten/ace in the hole with 100% accuracy), other plays based on this information provide a weak gain at best. Table 6.1 illustrates the point.

If the dealer has a six as his up-card and the bend indicates a ten/ace in the hole, four out of five times the dealer will be stiff. The advantage player provided with this information will now double down on eight including a pair of fours. This is a smart play because only one time in five the dealer won't have a "stiff" (because of the appearance of the ace (████, 2000)). What if the advantage player knew the dealer has a readable 2/9 card in the hole with a six showing? Based on ██████████ strategy the advantage player will not vary from basic strategy at all in this situation. The ability to identify the 2/9 cards gives the advantage player very little useable information. The card values of two through five place the dealer in a good position for making their hand. The card values of six and seven, and eight and nine will create small and large stiff hands respectively. The elimination of a ten/ace card adds very little to the "stiff/pat" hand situation. Take time to look at appendix B and C to get a better idea of the limited number of deviations from basic strategy warp information allows the players to make.

When █████ established this playing strategy he not only performed calculations but also ran a simulation to substantiate his index numbers. He used two assumptions when developing estimated player advantage tables (see Table 6.1). █████ knew that under real casino environment situations the advantage player would rarely find a game that provides 100% readability. This is especially true on games that are dealt face down where the cards are handled by the players. Based on his own playing experience █████ estimated that ace/ten hole-cards

could be read accurately 65% of the time while 2/9 hole-cards could be read accurately 74% of the time (████, 2000). By examining Table 6.1, you can see the difference between the two assumptions. Reading at 100% accuracy, the advantage player can expect to win approximately 3% of every dollar he or she places in the wagering circle, while the "real world" example gives the advantage player only a 1% total edge (████, 2000).

Different methods of cutting to dealer bends

If you're an advantage player you may use dealer bends in conjunction with card counting to give your advantage over the casino a slight increase. Most likely you would use it to disguise your count play, especially by taking insurance when the remaining deck composition does not contain a high number of ten value cards. But would you stop here? Would you be satisfied with a 2% edge from counting and camouflaging the play with an occasional warp strategy decision? The answer is no! How could an advantage player stay satisfied when he or she could exploit the dealer bends farther? The question is, "How else does the advantage player use dealer bends to beat the game of blackjack?"

If you take a deck of cards that are subject to dealer bends and cut the deck with your hand by grabbing at the sides of the deck, you will notice the cards will cut to a spot where a "bridged" card is located. This happens because the deck tends to break at a point where two cards make the least amount of physical contact. Subsequently, if a player reaches out and hand cut a dealer bend single deck, the deck will break just below the bridged a ten/ace card a majority of the time. Once the cut has been transferred the bottom card of the deck will be the ten/ace and will not enter into play. Considering this theory holds true (which it does), a hand cut single deck will always place the player at an immediate natural disadvantage. This is because a ten value card or an ace, the most valuable



Photo 6.5 Warped top card indicates there's a Ace or a Ten on top of the deck after the cut.

cards in the deck, will always be cut out of play and will cost the player approximately 0.5% in increased house advantage. It would be similar to removing an ace or a ten card from the deck before the deck was put on the table.

The advantage player understands this situation and over the years was able to develop a technique that would not only erase this problem but also reverse the situation. This technique actually ends up giving the advantage player an unbelievable edge over the house. This technique of cutting the cards to gain an advantage is known as a "two card drop". The advantage player would hand cut the deck to the bridged card break and then allow two cards to



Photo 6.6 Player utilizes dealer warps through the "2 card drop" cutting technique.

drop from the bottom of the cut portion of the deck. After the cut was transferred this method would position the bridged ten/ace card the second card from the top of the deck. If the advantage player sat in the first position of the table he or she would be guaranteed either a ten value card (13% advantage) or an ace (52% advantage) as their hand's first card immediately after the dealer burnt the top card of the deck. The advantage player took a natural player disadvantage and turned it around in his or her favor by utilizing a key card location strategy.

Using a variation of dealer bends to identify the decks top card

In the early 1980's a medium size casino located [REDACTED] had an interesting blackjack dealing procedure that lead to the exploitation of their single deck blackjack game. At the time my roommate "Johnny" was considered a good advantage player. Johnny discovered that this [REDACTED] hotel/casino did not burn a card after the deck was cut. Because of this variation of house procedure, he came up with a unique method for obtaining top card (of the deck) information. When he showed me how he gained this information, I was shocked at how simple it was. All Johnny had to do was wait for a seat to open in first position on one of the casinos single deck games. After the deck was shuffled and presented to Johnny to be cut he simply pressed down slightly on the deck and cut. After finishing the cut Johnny would watch the top card of the cards remaining after the cut portion was removed. If the card popped up into a bridged position he knew it was either a ten or an ace, and if it didn't pop up he knew it wasn't. Since the casino did not burn a card after the cut, the top card was the first card dealt to the player in first position. If the card "popped" after the cut, Johnny would bet \$100 and if it didn't he would bet \$5 to \$10. Johnny had come across a technique that allowed him to theoretically win approximately \$22 every time the top card appeared

to pop and he wagered \$100. He also got a good read when other players cut the deck as well and was able to get at least a dozen good reads for every hour of play. After playing this casino for thirty-two straight winning days, the casino finally gave Johnny his walking papers. Even though they still had no idea what he was doing they backed him off all blackjack games on general principles.

Creating and reading dealer tells

Many years ago I was working as a floor supervisor on grave shift at the ██████████ Hotel/Casino in ██████████. During that time we had a dealer working on grave named "Walt". Walt is what some people would call a "house dealer". Even though he didn't own points in the ██████████, Walt still took any losses accrued when dealing blackjack personally. If Walt was dealing winning blackjack he was fine but if he were losing he would "bleed" just like the shift boss and floor bosses standing behind him. Walt was a product of smaller, ██████████ casinos and from the day he started dealing was taught the house should always win and when it didn't then there was hell to pay. The ██████████ was a small "grinder" joint owned by a favorite gaming family. Even though the patriarch of the family was a true gambler and didn't "sweat" wins and loses, the philosophy of his family's properties was to put a lot of pressure on their organizations to win. Walt loved being employed by the family and was truly a working stakeholder.

One night I happened to be watching Walt dealing a double deck game to medium level blackjack play when I notice something interesting about his body language. Normally Walt was a very proficient and smooth blackjack dealer that was a delight to watch. Tonight Walt was totally involved in the game since he was losing a fair amount of money to three players on his table. Then I noticed Walt's slight change in body language every time he peeked his hole card.

On some occasions I'd see Walt gently give hit cards to the player and in the next instance he delivered the hit card in a rough, snapping motion. I then noticed there was a correlation between Walt's body language and his hole card. When Walt was "pat" with a seven through ten in the hole, he would gently deliver a signaled hit card to a player. In Walt's mind he knew he had a hand he couldn't improve and didn't want the players to improve theirs either i.e., softly delivered hit cards. This said to me in essence, "Don't make your hand". When Walt peeked and knew he had a small card in the hole and had a bad hand for hitting out successfully, he wanted the players to bust out first. Now he delivered with force; his snapping hit-card motion meant "Bust! Bust!" Walt's body language reads were so strong I could easily tell whether he had a pat hand or a weak hand just by watching his player hit card motion.

After making this interesting observation, I thought back to when I broke in dealing blackjack for another casino owned by the same family. Their philosophy about winning and losing was that when the dealers and the floor supervisors all wanted to mentally win, the casino would win more money. Subsequently, there was a lot of pressure put on the employees to win. If for some reason a game was losing, the anxiety level could be cut with a knife. I remember dealing on a game with a player who had the casino beat for thousands of dollars. Behind me were no less than three of our casino supervisors with arms crossed and scowls on their faces, virtually breathing down my neck. I'm dealing to one player wagering table limit on all seven betting spots and I have just lost the last several rounds of play. On the next round I deal myself an up-card of "ten" and proceed to peek at my hole-card. To my dismay the hole card is a five. I think to myself, "Oh God, why a five?" My knees actually buckle slightly, I turn pale in the face and (you guessed it) I bust the hand. Sometime after this play I was recalling the situation when I realized that because of the pressure to win and the stress placed on my

shoulders I must have shown my anxiety physically, i.e., face pale, knees buckling. I start to think, "Could a player read my reactions to the identity of the hole-card and use that information against me?" "Could he see me all but faint when I saw the five in the hole and could I be subconsciously "telling" the player information to help him beat the game?"

There have been several blackjack books published that discuss reading dealer "tells". In [REDACTED] book [REDACTED] which has been re-published in a combined work on blackjack titled [REDACTED]; he describes how dealers have a tendency to emit subconscious information about their hole card. This happens especially if they have some involvement in the player's performance, either emotionally or financially. Some dealers are naturals at giving off tell information. Walt is a perfect example. He's a dealer that gets emotionally involved in almost any game because he wants to win badly for the house. Walt notably gave off what [REDACTED] calls "discouraging" tells. Walt's body language is contradictory to the player's benefit and must be read in the opposite context. If the advantage player wants to use dealer discouraging tells, every time the dealer transmitted the signal to hit, the advantage player would consider standing or doubling down aggressively. When the dealer emits a passive playing tell, the advantage

player would consider either hitting or surrendering stiff hands and act conservatively on double down situations. In Walt's case he was a naturally readable dealer that could be played practically anytime. On the other hand a dealer like me didn't give off tells unless I was being pressured to win, rendering my information too inconsistent.

On the other side of the gambling coin is the dealer who gives off "encouraging" tells. This is a dealer who has some emotional or financial involvement in the success of the player. This situation most likely occurs when the player is wagering for the dealer. Encouraging tells are read just as they appear. The brief hesitation before the dealer moves on to the next player may indicate the "tipping" advantage player should consider hitting their hand. While the slight hand gesture to the advantage player before quickly moving to the next player, may signal dealer hand weakness. I've also witnessed this phenomenon in situations where a dealer has helped a novice player with strategy decision questions. The dealer has an emotional link to the player as tutor-student. If the player does well, the dealer gains some respect as the wise teacher. "Wax on, wax off."

Since in many cases it's difficult to get readable tells from dealers, the advantage players have come up with techniques to create profitable tell situation. This is



Photo 6.7 Example of encouraging dealer tell.



Photo 6.8 Example of discouraging dealer tell.

done by seeding the dealer's emotions by employing psychological tactics. [REDACTED] details several different methods that can be used to create good tell games in his book titled [REDACTED].

[REDACTED] lets the readers know about the advantage player that creates discouraging tells by turning the dealer against him. The advantage player arrives at the table and puts on an obnoxious air. Then the advantage player looks at the dealer, holds up a fifty cent piece and tells the dealer, "I don't care if I win a million dollars I wouldn't tip you lousy dealers 50 cents!" I know this kind of comment would have set me off my normally pleasant mood and I may have made Walt look like an uninterested third party.

In other situations, the advantage player can create tells by using psychological tactics to get the dealer on his or her side. Even the best tell situation will never provide the advantage player with anything greater than a 1% to 2% when varying their playing strategy (see Appendix D). It is therefore quite impractical to use tipping as an "encouraging tell" motivator ([REDACTED] 2000). Any dealer takes in excess of \$1 for every \$100 wagered, even under perfect tell conditions, would render the technique useless. Without the ability to use money as a motivating factor the advantage player needs to build camaraderie with the dealer, and give them some reason for cheering for the player to win. My favorite scenario for creating encouraging tells also comes out of [REDACTED] book. [REDACTED] tells about the advantage player who sits down on a blackjack table with a young, female dealer and proceeds to lay a sob story on her about his personal problems. "My wife can't drive anymore because her eyesight's getting worse because of this disease, and my daughter is sick and needs to go to the doctor and I need to get home. If I can only win enough to buy a ticket back to Ohio, I'd leave tonight. I don't know what to do. Oh...should I double down on my eleven". I remember back to a time when I was dealing to a player who was in dire straits and needed a break. I came very close to giving up hole-

card information, just because he needed a little good fortune.

The advantage player is also aware that tell situations can occur naturally without any manipulation or involvement from the advantage player. The advantage player will look for tells created by another player at the table. One example is the advantage player who walks around the casino looking for a high action game where he can get discouraging tells off dealers emotionally involved in a big check game. Another example is illustrated by [REDACTED] in [REDACTED] (2000). [REDACTED] tells the story about stealing a "subtle tell" off a blackjack game back in the early 80's.

"One time at the [REDACTED] in [REDACTED] a young female dealer showed a queen. A friend of hers in the middle seat hit fourteen and busted, whereupon the dealer said, "Turkey!" I sat in third base and stood on thirteen. I was not surprised when the dealer's hole-card turned out to be a 6".

Another favorite of mine is the double peek with a ten up-card and a four in the hole. During a quick peek the four looks almost like an ace, so the dealer might give it a second peek just in case. I also used that to my own advantage as a dealer. I would sometimes double peek a four hole-card on purpose with someone I disliked on the table. They would see me double peek the four and then think, "a-ha, he has a problem telling fours from aces". On the next opportunity with a ten-card face up and a ten-card in the hole, I would double peek and catch the player guessing wrong. Oh, shame on me!

It's obvious that reading tells is a lost art in blackjack and cannot be cultivated for a playing edge. With the utilization of an optical hole-card device the

Side bar - WHY USE AN OPTICAL CARD READING DEVICE?

Time and motion issues surrounding any gambling game, especially blackjack, are the most important aspects in maximizing gaming revenues. With that theory accepted as fact, all casinos should utilize some type of twenty one hole-card peeking device to determine the likelihood of a dealer blackjack. The hole-card reader allows the dealer information necessary to move the game along to the next hand without jeopardizing basic protection of the hole-card and the game of blackjack. Other than viewing the hole-card, what does the reading device do to help protect the game? Let's make a quick list from what we have learned so far in this text:

- **Prevents first basing and spooking the hole-card by players**

Because the dealer no longer has to physically peek the hole-card, the dealer will not be able to expose the value of the hole-card to players on or off the table.

- **Eliminates dealer bends or warps**

Since the dealer doesn't have to physically lift and bend the cards to peek, the dealer will no longer create dealer bends or warps (improperly maintained peeking devices notwithstanding).

- **Prevents dealers from giving out hole-card information either intentionally or unintentionally (tells).**

Peeking devices tell the dealer whether or not they have a blackjack while not indicate the value of the hole-card. The dealer does not gain enough information about the value of the hole-card to be of any value to the players, legally or illegally.

Some executives claim the procedure of not looking under a ten value card prevents the previously

mentioned problems from occurring without experiencing the cost of purchasing or leasing hole-card device (looking under the ace only still has some weaknesses but none that can be exploited profitably). This belief is far from the truth. Actually the cost from lost revenue due to time and motion issues is many times greater than the monthly lease cost from having a reading device on every blackjack table in the casino. Why? Because every time the dealer plays out an entire round when possessing an unknown blackjack, it cost's the casino 1.5 rounds per open tables per hour. This loss in rounds can be quite costly in lost revenue.

The dealer, like all other participants at the table, will receive a two-card blackjack once approximately every twenty hands. If one uses sixty rounds an hour as a basis for an average blackjack game, then the dealer should receive an average of three blackjacks an hour. Each round consists of the delivery of cards which takes up 20% of time spent dealing a round, awaiting player hand decisions in turn which takes up 50% of the round and finishing out the dealer's hand and settling all player hands which takes up 30% (or the remainder of the round). Taking these percentage numbers into consideration, the house saves 50% of the time used per round when peeking the hole card and stopping the round when a blackjack is discovered. This means that 1.5 rounds (3 rounds times 50%) per table per hour can be gained an hour by the casino who utilizes a peeking device as compared to the casino that refuses to peek. [Note: the casino that peeks only when the dealer has an ace as the up-card can gain 1.2 rounds when using a devise to peek under the ten value cards (1.5 rounds minus 20% because the ace is peeked).]

What is a one round an hour gain per blackjack table

worth to the casino? First, we need to establish several parameters before we can correctly calculate theoretically win per each round of blackjack dealt. These parameters are:

- Average number of blackjack tables open at any time
- Average number of players seated at the table at any time
- Average amount wagered per player at the tables
- Estimated house advantage the blackjack games produce based on the game rules, decks and customer skill levels

If we multiply all these variables together we will come up with theoretical revenue won per each round of the table (see Table 6.2).

Table 6.2 – Theoretical Revenue Won Per Each Round of the Table

Avg. tables open 24hrs	16
Avg. number players	4.5
Avg. bets	\$ 18.00
Est. House Advantage	1.3%
Revenue per round	\$ 16.85

This is a good example of a blackjack operation in a medium size casino that operates 24 hours a day, caters primarily to a local population rather than a destination-resort and has approximately twenty five blackjack tables (of which sixteen are open at any time on the average). If you multiply the averages together and then multiply their product by the estimated house advantage of 1.3%, the casino executive will develop a workable number that represents theoretical revenue won per each round dealt on all of the open blackjack tables. In this case the amount of \$16.85 can be used to project expected changes in revenue for every round gained over the benchmark of 60 rounds an hour.

Table 6.3 – Theoretical Gains in Revenue by Dealing One Additional Round per Hour

Gain for one round	\$ 16.85
Gain per day	\$ 404.35
Gain per month (30.5 days)	\$ 12,332.74
Gain per year	\$147,992.83

By multiplying \$16.85 by the desired period of time in days, months, and years, the executive can develop a better picture of the value of increasing productivity through time and motion issues. In this case the number \$147,993 appears as a sizeable increase in revenue created by increasing the number of rounds per hour in blackjack from 60 to 61 rounds. This number still doesn't represent the total theoretical gain in revenue from using an optical hole-card reading device since estimated rounds gain are 1.5 rounds per hour. By multiplying \$148,000 (rounded) by 1.5 rounds, the executive can safely assume an increase in revenue by \$222,000.

What is the net result of using hole-card readers? If the readers cost \$35 a month per devise the total cost for a blackjack pit of twenty five tables calculates out to \$10,500 annually. In most cases the casino executive looks for a return on investment (ROI) on all major investment and normally ROI is figured as an annual percentage of the total investment. In this case ROI isn't figured as a percentage but as a multiplier. Investing \$10,500 for one year of reading devises will result in a return 21 times greater then the investment! Bottom-line: The medium size casino with twenty five blackjack tables will increase their departmental net income by approximately \$211,500 by installing hole-card readers (the casino that peeks under aces only will increase their annual departmental income by approximately \$167,100). If the price of leasing optical hole-card reading devices has been a past stumbling block for installing the readers, then these numbers should dispel all concerns.

dealer is no longer placed in a position where they gain hole-card information crucial to the game. It's still important that this technique was included in this section. The casino executive never knows when a new game will be placed on the casino floor that requires the dealer to peek at their cards and keep that information secret from the players at the table. Even if the dealer doesn't give up information subconsciously, now you can understand there are methods an advantage player may use to unlock this mentally maintained information and can be alert for potential problems.

Reading manufactured playing card sorts

In 1980, as an agent with the Enforcement Division of the [REDACTED] Gaming Control Board, I was required to conduct a number of route interactions with gaming licensees. While with the Board I routinely entered licensee properties to conduct table and slot device counts, work card checks, random slot machine inspections, dice pick-ups and inspections, and playing card pick-ups and inspections. Mostly we conducted these tasks when we weren't involved in major gaming cases and had time to allocate to chores that were considered not important and not urgent. One night I came to work knowing that I had nothing important or urgent on my desk. I informed my senior agent "Ron" that it would be a good night to catch up on card and dice pick-up of casinos located on [REDACTED] and nearby casinos located in [REDACTED]. Ron agreed that it needed to be done. However, he did comment that to the best of his memory he couldn't remember the last time a card and dice pick-up resulted in anything other than a waste of agent time and State money.

Once cards are picked up from the casino they are dropped into evidence bags and taken back to the Gaming Control Board office and analyzed for composition and examined for card marking. A number of different tests are done to determine

whether the cards have been altered either by players or by the house; one such technique is known as a "riffle test". To perform a riffle test the agent holds the cards between the fingers of one hand and uses the other hand, specifically the thumb, to pull back the cards and let them riffle one card at a time. The purpose for conducting a riffle test is to look for any marks or alterations to the backs of the cards. As the cards are being riffled they duplicate the affect caused by different frames of a movie, and if there are any marks or defects on the cards these defects will appear to jump around. While I was testing a deck of cards picked up from [REDACTED] Hotel/Casino using the riffle test, I noticed an inconsistency surrounding one of the letters in a word in [REDACTED] (which was used in the logo printed on the back of the playing card). Normally I don't mention the name of casinos or the individuals involved in the narrative. However, using the name of the casino in this story is important and the casino was never suspected of wrong-doing or called to question for any improprieties.

After conducting the riffle test several times I noted that the letter [REDACTED] on one side of the card back appeared different then the opposite side. The [REDACTED] in the word [REDACTED] was formed through the blending of red and black ink on a white back playing card. On one end of the card the [REDACTED] the red and black colors blended properly. However, on the other end the colors didn't quite touch at the top-middle of the [REDACTED], forming a blemish (revealing a portion of the card back which appeared as a white speck or dot). Since the blemish appeared only on one end of the card, these cards possessed a passive form of marking known as "sorts".

The technique of locating sorts and using the information to gain an advantage over other players is something cheaters have been using for centuries. The word "sorts" actually comes from the process of looking through different decks of cards coming from

the same manufacturer that are either cut improperly or are faded and are slightly different in color. Old time "cross-roaders" would buy up dozens of decks printed by a certain manufacturer and the cards would be categorized or sorted based on different inconsistencies. Then the cheaters would combine these natural inconsistencies to create sorted, marked decks of cards. Sorts can be formed from inconsistencies in the card back pattern, card color or hue, or apparent differences due to the method used in cutting the cards after printing.

After discovering the blemish on the [REDACTED] cards, I organized them into new deck order (ace through king suited), then proceeded to "point" all the blemished [REDACTED] in the same direction and finally, reversed the direction of all ten value cards. I took the deck to my supervisor Ron and told him I had found something interesting on the cards. I then had him shuffle the deck several times, followed by the cutting of the deck. I glanced at the top of the deck and noticed the blemished [REDACTED] was pointed away from me and when Ron turned it over it was an eight of hearts or a non-ten. The next card on top of the deck had the blemished [REDACTED] pointed in my direction. I announced to Ron, "Ten value card", and when he turned it over it was a king of spades. I stood there and called off several other cards in order, "Ten, ten, non-ten, non-ten, ten,...". I thought Ron's jaw was going to hit the floor. I then explained how I was able to read the cards, pointed out the problem with the blemish, and explained that sorts could be exploited by nefarious individuals but doubted it was the case in this situation. The Board later informed the casino operator and the unintentional defect was changed before the next print of cards.

What causes playing card sorts?

Primarily, card backs have three types of back patterns. The cards mentioned in the previous narrative were all white back cards with the casino's

logo placed towards either end of the cards. The logos are placed in a manner that one logo's appearance is a mirror image of the other at the opposite end. That way the cards cannot be "turned" in a specific direction to indicate card difference. Drug store or airline type cards have a single logo on their backs and represent a "one-way" design and because of their nature are unsuitable for use in the casino environment. Casino playing cards have a pattern of interconnecting patterns such as diamonds (like [REDACTED] cards), rosettes (like [REDACTED]) or other similar designs that extend across the entire back of the playing card. These cards also possess the mirror image logos that you should find in all casino playing cards. The final casino card is very rarely used but can still be found primarily in the plastic card and that's the border card. This type of card has a plain border surrounding a back of various patterns with mirror logos similar to the other cards.

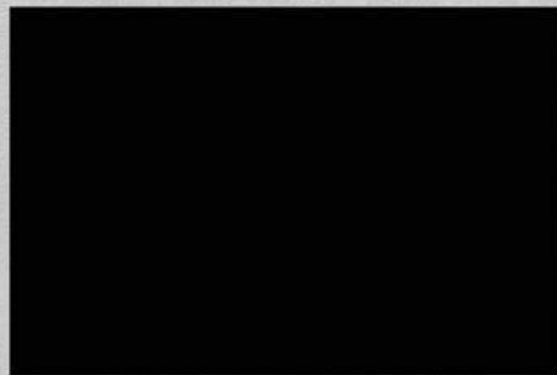


Photo 6.9 One way design vs. mirror image card backs.

Regardless of the manufacturer or the type of card back pattern, sorts can still be a problem. In most instances, the problem results from inconsistent cutting of the cards after printing. The all white or plain back cards would be the least likely to result in sorts through cutting because of their design and the inability of the human eye to discern minute cut variations on the plain back design. Cut variations

of both border and full patterned designs are much easier to read since the border edge and the patterns shapes give the reader a point of reference. For example: a diamond pattern design rarely is cut so that both sides (or top and bottom) of the card end in the same diamond proportion. Some cards will be cut "dead on" and the edge on both sides will end with a half diamond design. Others cards will be cut just "off center" and will end with a quarter diamond on one side and a three quarter diamond on the other. This same situation occurs with all full pattern backs to some extent; bordered cards are no exception. Bordered cards can be read by comparing the difference in border width from one side to the other (and top from bottom as well). Even with today's card printing and cutting equipment, most cards have some off center cut variation. Although in most cases the difference is all but impossible to read on a blackjack table in a real casino environment, some readable sort can be found.

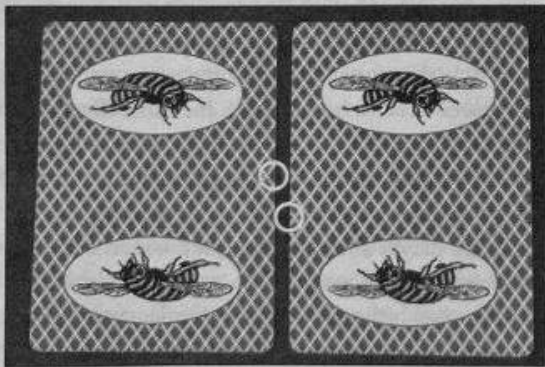


Photo 6.10 Examples of sort designs in the diamondback design.

Playing turned sorts

Can the average everyday player use sort information to beat the game of blackjack? No. Most players will not recognize the difference from one card trim cut to the other; if they did, they wouldn't have any

idea how to use it. In the past, I've heard of sorts being used by casino personnel to cheat the house. Before placing new decks of cards on the table, the dishonest casino floor supervisor rotates all the tens and aces and places them in the same direction. Once the new deck was on the game and shuffled, the supervisor's partner would sit at the table and use the sort information to play his hand based on the facing direction of the sorted cards. This could only be accomplished once through the new deck, since the simple functions of dealing the game will not maintain the pattern of the previously arranged deck. Can the advantage player use sorts to beat blackjack? Unfortunately, depending on the type of games dealt, house procedures and the degree of discrepancy in the cards, the answer is "yes".

Several years ago a group of advantage players used sorts to attack a number of casinos' hand held blackjack games on the [REDACTED]. These players used a technique known as "playing the turn" to create a profitable "sort" game. This process starts with the team scouting casinos for card patterns that are cut off center and can be read on the table while playing, without much difficulty. Next they need to make sure the casino provides hand dealt game with house procedures conducive to a successful sort play and dealer's who abide strictly by these procedures ([REDACTED] 2004). If all these factors hold true the advantage players will construct a plan of attack.

The advantage player team takes up an entire table. They need to take up all player positions because they initially need to handle as many cards per round as possible. They'll start play by wagering small bets while at the same time start to arrange the cards in an previously agreed upon specific directional pattern. As the cards are delivered by the dealer, the players note the sort direction on the backs of the cards prior to picking them up off the table. After they pick up their cards, as covertly as possible, they arrange or turn the cards to take advantage of the improperly

cut patterns. The players can arrange their cards in this manner during the process of tucking them under their money, sometimes through the simple action of changing hands used to tuck the cards. Also, any change in the direction or arrangement of tucked cards during the dealer's process of picking up, turning over the cards, and placing them into the discard holder is planned prior to the advantage players tucking their cards under the money. By taking up the table and asking for the least amount of hit cards in preliminary rounds, the advantage players can control and turn approximately 50-55% of the cards during the first deal through the double deck (based on 3.5 rounds to a seven spot table, 75% penetration). (Note: Cards used as hits and hits to split hands are not touched by the player and cannot be turned. Double down cards are delivered behind the bets and can be manipulated by the player). If all elements remain constant, by the completion of the fourth or fifth round over 90% of the cards will be

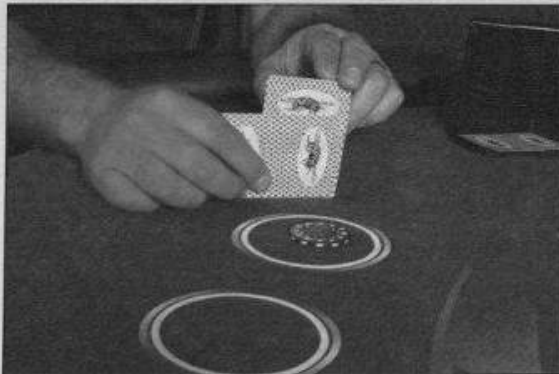


Photo 6.11 A sort player turning a card in his hand.

turned in the desired direction.

Some confusion exists in the process following the first round of card positioning play. During standard play any card delivered to the player will be continually arranged and continue to stay "readable". All cards delivered by the dealer using a "hit-card" motion which are outside the players control capability will automatically be "reversed".

This reversal not only occurs with all player hit cards but also any dealer hit cards and the dealer's up-card (which is delivered in the hand held game like a hit card). In order to overcome this "reversing" problem, the advantage players will also reverse the direction of sorts in all player control cards during the next shuffled round. This strategy dictates that each sequential shuffled round of cards dealt will require the team to continually alternate desired sort direction. By continually altering the direction of their controlled cards after each shuffle, the advantage players are able to compensate for the "hit card reversal" problem and will continue to build readable sort information. One card that cannot be controlled or maintained is the dealer's hole-card. The dealer's hole-card does not reverse during play and subsequently creates several incorrect "rouge sorts" cards each round. Once sort information is built to a point where it is exploitable, the advantage players increase their wagering and start taking hit cards as needed based on their hands and sort play strategy.

Before they approach the table the advantage team will decide how they intend to attack the game and which card values need to be turned in the same direction. If the players decide to use the information to help bust out the dealer, high cards such as nines and tens will be turned. These cards are important to the advantage player sitting in the last position because it will be his responsibility to cause the dealer to bust out when hitting stiff hands. For instance: if the player in the last position (betting table minimum) knows the dealer has a stiff hand, he will either eat cards or stand short on hands in an attempt to provide the dealer with a hand busting nine or ten. During the period of play the third base player might stand on hands like ace-four or hit hard seventeen in order to manipulate the order of cards and bust the dealer's hand. This allows the big player or players sitting in early positions on the table to stand short and win their hands. During this sort exploitation situation,

the only person whose play attracts attention from the floor or from surveillance is the person sitting in the last wagering position betting table minimum. Activity in this manner will usually allow for greater play longevity since the person(s) betting big money on the table lacks enough deviation from standard play to warrant advantage play suspicion. One upside, this technique appears exactly the same as an "anchor play" used by professional card marking teams to cheat the game of blackjack. Any surveillance operator or floor supervisor familiar with marked card cheating may suspect a problem with this play much sooner than the average operator or supervisor.

Another method used by the advantage players would be to turn all the smaller cards (2 through 5 or 6) and use this information for making playing strategy decisions. The problem with this strategy is that all advantage players on the table make unusual play decisions and will draw scrutiny from the pit and surveillance much quicker. Surveillance may investigate this style of sort play as "marked card" cheating since the deviations from basic strategy are the same as strategies used to exploit crimped or daubed cards. A third method for playing the sorts is to turn all the aces and tens and use the information to bet big from the top of the deck in the first position when an ace or ten-value card is identified. The only advantage player receiving benefit from this sort information is the player in first position. However, the other advantage players at the table still are needed to perform the function of turning the cards and maintaining the sort order of the deck. Remember, the entire team must control every wagering spot at the table and continue to turn the cards the entire length of the play regardless to the method of attack.

In most situations, this type of advantage play is strictly impractical. The need for improperly cut cards that are readable from an approximate distance

of three feet and a blackjack game that's dealt face down to the players is very difficult to locate in today's casino environment. Another reason this method is impractical is due to the fact it can be easily defeated. All the casino executive is required to do to defeat playable sorts is to implement a change to the shuffling procedure. This procedural change requires that half the deck or shuffled group of cards to be spun or turned around prior to a riffle motion. The "spin the deck" procedure will reverse half the cards in the deck and once the cards are interlaced through the riffle, any intentional card positioning is destroyed (█████ 2004). This protection procedure can also be used in conjunction with the shuffling machine; half the deck or decks need to be spun prior to their insertion into the shuffling machine.

A last thought about blackjack advantage play



Photo 6.12 Starting to spin the deck.



Photo 6.13 Spin completed.

After reading through this section it should seem reasonable to believe the information learned about dealer bends and dealer tells is just that—information. Modern procedures all but eliminate these problems from ever happening. However, it's good to have this knowledge locked away in your mental arsenal of game protection information. The technique examined previously as playing sorts is something that is still happening around the gaming industry today. The details of the technique need to be kept within arms reach as long as the casino executive is responsible for games that are dealt face down to the players. I have no idea how much sort play is going on at this time but it's still possible and can be exploited, very profitably, while being accomplished legally.

There is one technique used to some extreme at this present time in blackjack that we haven't discussed. Why? Because I intended to stay away from card counting and this method of play is considered strictly counting but with a new twist. Gaming and surveillance consultant [REDACTED] insisted that I include this counting-advantage play technique in this text if I expected to provide casino executives with a complete understanding of how casino games can be beat using legal techniques. For the first and only time in this text, I will outline a count play used today to defeat the game of blackjack based on [REDACTED] request. The technique is called "correlation betting" and it allows a team of counters to play on a blackjack table without appearing as typical card counters ([REDACTED], 2000).

Generally the biggest indicator that a player is counting cards, especially on a multiple deck game, is his or her bet spread. A player counting cards on a six deck game with 75% deck penetration (cutting off 1.5 decks), playing on every hand needs a bet spread of one to sixteen units in order to gain a 1% advantage over the house (game starting basic strategy house advantage of 0.5%). If the bet spread

is less than 1 to 16 units the counter's expected advantage drops drastically, decreasing hourly win and increasing win-lose volatility. Because the range of the multi-deck spread is so great and is also necessary for overall success, casino surveillance personnel and floor supervisors use "bet spread" as the key indicator that a player could be counting cards. In his book titled [REDACTED] (2000), statistician and blackjack expert [REDACTED] indicates what the players think about the casino staff, and unfortunately, much of what he claims is true:

"Many casino bosses cannot count, and do not even know basic strategy, but they are trained to look for bet variation and correlation. A suddenly large bet on a table covered with Tens and Aces is a hint to the most obtuse boss."

Although I believe most casino floor supervisors (and practically all surveillance operators) know the basic mechanics of card counting and basic strategy, many do not have the same degree of knowledge the professional counter or the advantage player possesses. It goes without saying that a counter who can disguise their bet spread from the casino staff will achieve greater play longevity.

The technique [REDACTED] coined as "correlation betting" probably should be called "combination betting" since the detection cover it creates comes from the use of several team counters. These counters will vary their individual bets from high to low regardless of the count but have a combined total or "bet sum" which is in direct correlation with the count composition of the cards remaining in the deck. When observed as individual players, their betting pattern will not indicate any single team member as a card counter.

For example: let's say three counters approach a blackjack table and play individually. Each player

Chapter 6: Other Advantage Plays in Blackjack: Past and Present

will start out betting a minimum amount and will progress upward with a plus count of the cards. If they need to maintain a bet spread of one to sixteen units (\$25 to \$400) each player will be seen increasing their bets with the positive count until each player is wagering a top bet (or spread bets) of \$400. This scenario will attract attention from the floor and surveillance and their play longevity will be limited. In most cases these team players would not play on the same game because their similar betting patterns can be spotted much more easily and all three players will be subject to the same win-loss fluctuation due to playing against the same dealer, creating greater bankroll up and down swings.

On the other hand, what will happen if the counters play a combined bet spread of \$75 to \$1,200? The three players sit and bet minimum bets off the top of the shoe but when the count indicates the players need to increase their bets to a combined total of \$300, they make different wagers that equal \$300. The first player bets \$200, the second player stays at \$25, while the third player bets the difference between the first and second players wager and the \$300 target amount or \$75. On the next round the true count increases and the combined team wager is calculated as \$600. Now the first player wagers \$100, the second player wagers \$400 and the last player makes up the difference and wagers \$100. As you can see, while the second and

third players increase their bets in correlation with the count, the first player actually decreases his or her wager in complete opposition to the count information. Regardless of how each individual wagers, the combined total bets of the team equals the target wager amount of \$600.

If you examine Table 6.4 the counting player's betting pattern and their combined wagering pattern speaks for themselves. Not one of the three players has a betting pattern in complete correlation with the count, even though the combined wager is in 100% parity. It's easy to see that play analysis of each player separately will not indicate beyond any doubt that the observed player is counting cards. However, if we were to add together the players wagers we would develop a different opinion and would start considering giving these three players the hook. Another reason this technique works so well for the counting team players—it defeats the card counting software. Most counting software takes into consideration the amount of bet spread and the correlation of that bet spread to the true count. In the above situation the computer would return three negative evaluations based on this correlation factor and the team might receive increased play longevity based on the faulty computer analysis.

Rounds	True Count	Player 1	Player 2	Players 3	Comb. Wager
1	Less than +1	\$25	\$25	\$25	\$75
2	Less than +1	\$25	\$50	\$0	\$75
3	Less than +1	\$0	\$25	\$50	\$75
4	Less than +1	\$25	\$25	\$25	\$75
5	+2	\$100	\$100	\$100	\$300
6	+2	\$200	\$75	\$25	\$300
7	+4	\$300	\$500	\$400	\$1200
8	+5	\$100	\$750	\$350	\$1200
9	+3	\$400	\$150	\$50	\$600
10	+2	\$100	\$100	\$100	\$300
11	Less than +1	\$100	\$0	\$0	\$100
12	+2	\$0	\$200	\$100	\$300
13	+3	\$200	\$100	\$300	\$600
14	+5	\$300	\$100	\$800	\$1200
15	+2	\$50	\$50	\$200	\$300

Table 6.4 – Bet Combination of Three Team Counters on a Six Deck Shoe

Chapter 7: Defending Against Roulette Wheel Bias

In June 1986 sports bettor and gambler [REDACTED] approached the [REDACTED] in [REDACTED] with an interesting proposition. [REDACTED] wanted to play high limit roulette. He was willing to put a cashier's check for \$2 million in their cage if they were willing to raise their single number limit on their roulette games to \$2,000. Normally a player of [REDACTED] caliber would request a single zero wheel head but [REDACTED] stated that wouldn't be necessary. However, he wanted the ability to choose one of the existing twelve roulette wheels presently found on the floor. [REDACTED] management thought this proposition through, and in their greed to pick up a new "high roller", agreed to all concessions. What they didn't know or didn't consider was that [REDACTED], through his sports betting syndicate, had access to some of the best computer programmers and statisticians in the business. One more detail that might have slipped their reasoning process—[REDACTED] had already made the same proposition to [REDACTED] and was turned down.

[REDACTED] selected his game and started play Saturday morning by wagering \$2,000 on each of the following numbers: 7-10-20-27-36 ([REDACTED], 1992). At \$10,000 a rattle [REDACTED] and an accomplice continued to place equal wagers on all five numbers for most of Saturday and Sunday, playing a total of eighteen hours. Betting \$10,000 per spin for eighteen hours at a house advantage of 5.26%, [REDACTED] theoretically should have been losing \$947,000 ($\$10,000 \times 100 \text{ spins per hr} \times 18 \text{ hrs} \times 5.26\%$), close to one half his money on deposit. Instead based on a mutual agreement, [REDACTED] retired from the table after winning \$3,800,000. Wow, \$3.8 million dollars! [REDACTED] had won an average of \$211,100 per hour with an average of \$2,111 per spin, giving him a win rate of 21.1% ([REDACTED] calculated [REDACTED] win rate at 20% in his book [REDACTED] 2002). To my knowledge \$3.8 million dollars is the

most money ever won at a single roulette table in the history of gambling.

Three years later [REDACTED] et al made a re-appearance on the [REDACTED], this time at the [REDACTED]. This time [REDACTED] didn't approach [REDACTED] management before he played with any type of proposition. After his win three years prior at the [REDACTED], [REDACTED] knew [REDACTED] executives would not be receptive to any type of agreement. Based on [REDACTED] regulations, [REDACTED] knew that if he sat down at one of the [REDACTED] eight roulette tables, management would have to deal to him just like any other [REDACTED] customer. [REDACTED] selected his table and started play wagering \$200 straight up again on five numbers on Friday evening, June 23, 1989 and played into Saturday morning. At the end of his eight hour play, [REDACTED] and his syndicate cashed out \$200,000. On June 30th the syndicate returned to the [REDACTED], selected another roulette game, wagered \$200 straight up on five different numbers and after a similar playing session won over \$300,000 ([REDACTED], 1992). (Note: Management enlisted a gaming consultant who after inspections recommended two specific wheel heads should be removed from the casino floor. Management chose not to remove the selected wheel heads, one of which [REDACTED] played several days later and beat for \$300,000 during his second session.)

[REDACTED] was not the [REDACTED] syndicates' only target. During 1989 several casinos in [REDACTED] and [REDACTED] were subject to [REDACTED] "system" play. It has been mentioned that [REDACTED] et al won over \$1.5 million between three casino wheels in [REDACTED] ([REDACTED] indicates the win to be \$400,000 based on tax records from [REDACTED]). At one of the [REDACTED] casinos management was so mystified by [REDACTED] winning roulette system that they took the roulette wheel head out to the parking lot and broke

it apart with a sledgehammer. Management ordered this to be done in an attempt to discover some type of internal gaff or device that would explain ██████ consistent success. He also added a different twist to his roulette play in ██████. ██████ asked and received the procedure of having one of the zeros eliminated from a specific double zero wheel head (instead of playing a single zero wheel the casino had in storage). This was accomplished by placing a piece of white tape across the "zero" (not the double zero which is usually done) with any ball falling into the "zero" pocket resulting in no action, plucked from the pocket, and re-spun. If all information is correct, during playing sessions in ██████, ██████, and ██████ in 1986 and 1989, the ██████ syndicate won in excess of \$5,000,000 playing their roulette "system".

██████ System

If you haven't guessed already, I'll make it clear that ██████ did not use a roulette system to beat roulette. He didn't cheat or have the equipment altered in any manner. ██████ syndicate was able to beat these roulette games by identifying minor impurities in each roulette wheel that caused certain numbers to occur (and certain numbers not to occur) more often than probability would dictate. This is known amongst advantage players and a few gaming executives as roulette wheel bias. ██████ used a team of spotters or "wheel trackers" to compile thousands of spin results for a number of different roulette wheels throughout the country. Because his syndicate was involved in serious sports betting, ██████ had access to a team of computer programmers and probability statisticians. He used their knowledge and experience to develop a computer program that could analyze thousands of winning numbers in an attempt to identify ones that were biased. These identified numbers were found to be biased to a degree that created a positive expectation for the advantage player when wagered. Armed with this information ██████ entered specific

casinos where bias roulette wheel heads had been located and proceeded to exploit these bad numbers until management threw in the towel, removing the wheel heads from the casino floor.

How strong was the bias ██████ et al found on normal, well-serviced and maintained wheel heads? Based on the after action analysis the five numbers played at one casino provided ██████ with an average theoretical advantage of 12.6%! By betting \$10,000 a spin it is easy to see how ██████ posted such serious winning sessions.

History of roulette wheel bias

The ██████ syndicate was not the first group to successfully assault the roulette game utilizing number bias information. In the winter of 1873, an English engineering clerk with a head for numbers named ██████ took on the ██████ casino in ██████ to prove a theory he had regarding device imperfections. After hiring six people to track winning numbers and analyze a week's worth of number data, ██████ discovered one of the ██████ six single zero roulette wheels exhibited the bias characteristics that he was hoping to find. Over the next several weeks of play and after several attempts by management to subterfuge his play, ██████ returned to England \$325,000 richer. After ██████ began to win a noticeable sum of money, casino inspectors realized ██████ had discovered a weakness in a specific wheel head and secretly shuffled the wheel head amongst the other five tables. ██████ figured something like this might happen and had previously spied a discerning mark on the bias wheel head he used for later identification. ██████ finally called off his play after the casino gave up on the wheel head shuffle and replaced all the pocket walls or "fret" on every wheel head. Since ██████ had proven his point, he returned home reportedly never to play roulette again.

Years later and more closer to home, two University of [redacted] students [redacted] and [redacted] made several assaults on roulette wheels in [redacted], first in 1947 in [redacted], [redacted] and then again the next year, 1948 in [redacted], [redacted] and [redacted] had a very up and down wheel bias experience to say the least but they learned how to successfully identify wheel bias through trial-and-error. At one point they even entered into an unusual partnership with the owners of one of the target casinos. After playing at the first [redacted] casino successfully, the duo experienced a large negative fluctuation of their bankroll at their second casino. Based on playing "phantom" numbers identified from too small a sampling, they lost a large amount of their bankroll and had to terminate their play. Their venture in [redacted] was not in vain—[redacted] and [redacted] had received a better education than math and statistic courses could ever have provided. Despite their mistakes they had received national publicity during their original winning streak and although they lost at the last casino, they still left town a slight winner.

The very next year the two students were back in [redacted] but this time they headed to sunny [redacted]. The first of several casinos they attacked provided reasonably biased wheel heads but not as reliable as they had hoped. The last casino on their list provided a more advantageous game but the two students suffered from a severe negative fluctuation and decided to suspend play and head home to [redacted]. Before they could get their bags packed the owners of the casino approached them with an interesting proposal. The owners would provide them with a "grubstake" bankroll of \$500 if they continued to play roulette. [redacted] and [redacted] had become famous for their roulette play and had attracted attention from local and nation media and their continued play would be well worth a risk of \$500. Returning to the table the duo concentrated on determining which numbers might be the most bias for the player. Knowing that their past failures were

probably due to a lack of patience and their inability to identify the true player bias numbers, the duo collected greater information before determining bet worthy numbers. After three days of clocking the wheel and eight days of playing the most frequent numbers, [redacted] and [redacted] paid back their "grubstake" and split \$30,000 in winnings with the owners of the club and returned to their studies in [redacted]. (Note: [redacted] eventually received a doctorate in medicine while [redacted], who earned a Masters in mathematics, went on to become a top scientist with NASA in the 1960's.)

There have been no less than another six teams that have turned the roulette tables against the house in the last 100 years (and probably a lot more that we don't know about). It also goes without saying that there are many more groups that comprehended wheel bias theory but were unable to apply the technique of identifying numbers and playing them successfully under real casino conditions. Why do groups like [redacted] and [redacted] do so well winning millions, while others struggle to break even? Since all it takes to find player bias numbers are a number of observations and simple mathematics why would any group fail at exploiting wheel bias? In his book [redacted], [redacted] lists several significant questions that [redacted] and [redacted] considered before starting play in [redacted] in 1947. Some of these questions were:

- How long must we clock a wheel to discover a biased number?
- How much capital will we need to play that number?
- How should we apportion our wagers?
- What is the frequency of the longest losing run between occurrences of our biased numbers?
- Should we stay with the winner that we've already clocked or should we switch to another number that has emerged as more promising?

Even though these are all good questions and would all have had to be determined before ██████ and ██████ could have expected to leave ██████ winners, the primary answers surround the statistical process for identifying a true bias number or numbers that will provide the advantage player with a long term winning expectation.

Determining which numbers are player biased

Although we do have access to quite an amount of information about ██████ activities in ██████, we don't have much information on how he truly arrived at the positive bias numbers. ██████ and ██████ are quite different because they documented most of their trials and tribulations, enabling us to better understand the thought process that went into their calculations. We also know a lot about how they failed and because ego didn't enter into their records, we know how they learned from their failures. This can also be said about ██████ and his experiments in roulette wheel bias. In his book ██████ (1965, enlarged edition 1970), ██████ writes about his experience with wheel bias in ██████ and ██████ during the late 50's and early 60's. It can be considered one of the first gambling books that takes a reasonable look at the events and mathematics surrounding wheel bias.

Based on past experiences of the roulette wheel trackers we can look back and see how the theory for identifying bias evolved over the years. Thus better illustrating both the difficulties that have masked the true identity of bias numbers and the best methods the casino executive can use to identify any weakness in their casino's roulette wheel heads.

- **Frequency of original appearance**

Rational thinking would dictate that the original method used to locate bias numbers is by recording winning number occurrences as they happen. After

an arbitrary number of spins you could deem the number(s) appearing most often as being bias. This theory has several drawbacks, especially if the sample used to make this determination is too small. The major problem is how large a sample must the tracker need to provide accurate information? This single factor alone probably doomed numerous amateur-tracking teams.

- **Length of streak of non-appearance**

██████ and ██████ started looking at the length of losing streaks after they experienced several downturns when betting what they identified as bias numbers. Their theory was that a bias number shouldn't experience long periods without appearing if in fact the number was truly biased. During their streak examination ██████ and ██████ decided to test this theory by combining their records for zero and double zero (0/00), treating them as one number biased to appear once every nineteen times ($2/38$ or $1/19$). By breaking their records into 1000 spin groupings, they noticed that "0/00" ranked first or second in total subgroup appearances in all but a couple of groupings. However, in one 1000 subgroup the 0/00 ranked 17th in appearance. This meant that sixteen $1/38$ numbers appeared more often than a number normally appearing $1/19$, relegating this theory to the "close but not perfect" file.

- **Ratio of total numbers and number appearance**

Both ██████ and ██████ compared the total numbers observed with the number of individual occurrences to come up with a hit ratio. For example: if the frequency of the appearance of the number 2 occurred 325 in 9,971 total spins, the ratio could be expressed as 30.7 to 1. The normal ratio for any number on a double zero wheel is 38 to 1. These ratios could be easily translated into player advantage by subtracting the ratio by the payoff and

then dividing it by the ratio $(36 - 30.7) / 30.7$ or 17.3% player advantage. Based on ██████ experience for determining wheel bias, he established that a 29 to 1 ratio would determine a favorable bias when observing at least 5,000 spins and 32 to 1 ratio would determine favorable bias when observing more than 10,000 (██████, 1970).

- **Appearance in sections**

Most previous bias tracking teams understood the importance of the location of positive and negative numbers on the roulette wheel head. If one number was truly biased, receiving more hits than other numbers in that wheel head area should reflect this situation as well. Cold bias number(s) should be neighbored by a hot bias number. While colder numbers should surround a cluster of hot numbers. Instead of looking for number of occurrences and winning/losing streaks, the trackers were finally starting to associate wheel bias with possible physical properties of the wheel head.

- **Testing numbers using standard deviation and chi square fitness of good**

Since mathematics was ██████ strong suit he eventually resorted to using statistical testing to support his observations. By using individual number standard deviation to determine the likely range a number will appear during a specific number of observations, ██████ could establish better parameters for determining whether a number was more likely to be random or bias. ██████ and ██████, as well as ██████, also flirted with using the chi square fitness of good test to test the overall bias of a given wheel head.

What physical properties cause wheel bias?

I'll be upfront with everyone—no one knows for sure what causes wheel and number bias. There

are several theories regarding this problem and we will examine different possibilities. Every book and article written attempts to better define which physical irregularities of the roulette wheel head result in some number acting erratically. In many cases the "experts" discuss possibilities that include ball size, unlevelled tables and unbalanced wheel heads. I have my druthers about these factors since ██████ & ██████ and ██████ experienced continual play on wheel heads that management had leveled and balanced and which the size of ball was changed with no apparent change in performance of the targeted roulette tables (██████, 1970; ██████ 1992).

Some point a finger at ball speed and speed of the rotating crown. None of these can truly insight number biases since these factors change constantly. For these arguments to have legitimacy you would need to have a "one dealer, one wheel head" situation. Different dealers have different characteristics such as spinning the ball; the dealers also rotate from games to go on breaks or on different games. Roulette expert ██████ identified potential problems due to a warped ball track and wheel bowl (1992). These two areas affect the delivery of the ball to the interior crown but their possible affect there after is questionable. From first appearance it seems that in their haste to define which physical elements create bias, they have used all common problems associated with wheel mechanics; it seems that they "tossed the whole mess onto the wall to see what sticks."

Based on research and experimentation, I've concluded that these previous factors have a minor affect at best. The true bias factors must occur once the ball breaks the threshold between the outer stationary bowl apron and the interior rotating wheel crown. At that point all other influences give way to the properties of the cylinder apron (illustrated with the pocket numbers), the pocket and pocket pads, the frets (pocket walls) and the interior cone. If physical

factors exist, in my method of thinking, they have to exist on the area of the device where the ball must come to rest.

From past research into one of the roulette wheels [redacted] syndicate played in [redacted], I know that the "cylinder apron" (the first section of the interior wheel crown with which the ball comes in contact) has some influence on number bias. Located next to and slightly in front of a section of "hot" bias numbers was discovered a small patch or decal that was used to repair a marred number originally imprinted on the cylinder apron. Although it appears as only a slight increase in height compared to the other imprinted numbers, it's properties as a "speed bump" cannot be over looked, especially if we take into consideration its relative positioning on the cylinder apron and its immediate proximity to bias numbers. It seems rational to believe any mars, scratches or alterations to the cylinder apron surface will have some influence on bias.

After the ball passes the numbered apron it enters the area of the pockets that exudes the most influence of where the ball will eventually come to rest. The walls of the pockets are known as "frets". In some wheel models the frets are individual pieces of metal set into place by screws. If frets become loose they represent a difference in physical condition compared to other frets that maintain a consistent tension. In more modern wheel heads the frets are constructed as one metallic piece instead of thirty-seven separate pieces (thirty-six in a single zero wheel) in an attempt to provide more pocket wall continuity. Since they're made of a single piece construction, some manufacturers design these pocket rings to be unscrewed and can be rotated. This allows casino game mechanics to change the positioning of the pockets to confuse any possible bias tracking attempts. The conditions of the frets probably have the biggest affect on wheel bias. When the [redacted] wheel was examined

through test trials (9,971 spins), "hot" number bias was discovered to match four of the five numbers he and his syndicate had played. Since this wheel head had a rotating single pocket ring, the ring was re-positioned and another trial of approximately 10,000 spins was conducted. The results of this trial confirmed the affect of frets on wheel bias; three of the previous five pockets from the first trial remained "hot".

Another area of the interior crown that needs to be considered is the pocket pads and the material immediately under each pocket. Although I don't have personal knowledge of biased events associated directly to pad and material problems, there have been several references to this possibility. [redacted] & [redacted] claimed to see a difference between black numbers and red numbers during their bias tracking observations in the late 40's. They claimed that red numbers seem more likely to absorb the roulette ball while the black numbers were tighter and seemed to bounce the ball out more readily ([redacted] 1970). One must remember that wheel heads used during the 1940's were constructed primarily from wood and the floor or pads of each pocket were finished wood, painted the color of the corresponding number. [redacted] and [redacted] also made a compelling argument that the condition of the underlying wood effected the roulette ball's performance when they discovered a wheel head that had a visible crack running it's diameter of the crowns underside (viewed when the mechanic had serviced the wheel head) that was not visible from above. It was their feeling that the buried crack in the wood caused a certain number positioned above the crack to occur more frequently since it must have lessened the tension beneath the number's pocket ([redacted] 1970).

Closing in on roulette wheel bias

When the teams started channeling their interests into physical number placements and mathematic testing,

they established better measuring and detecting systems for establishing positive bias numbers. Although testing a number frequency using standard deviation never totally rules out the possibility of randomness, it does place its likelihood of being random into proper prospectus. There are several things to consider when searching for wheel bias:

- **Most numbers alternate being hot and cool**

When broken into 1000 spin grouping, numbers that over performed in one group might under perform in another. It also became apparent the total of numbers over performing was approximately equal to the total under performing. This indicates that smaller samples will give off false indications of leaders and lagers (██████, 1970).

- **Declaring a numbers bias based on occurrences alone will lead to mistakes**

██████ and ██████ in their book titled ██████ noted that it would be wise for the bias tracker to perform several statistic tests before concluding a number is biased. ██████ and ██████ use a "Dual-p" binomial test that takes into consideration the performance of a specific number as related to the individual occurs as well as the occurrence of all number possibilities (██████ & ██████, 1996). For example: let's say a number appears "hot" and when calculating its frequency of occurrence, we find this situation happens 3 times out of 1,000. This would lead us to believe the number was bias because of the extremely unrealistic chance of occurrence, right? In actuality it's incorrect because we only focused on this one number and we failed to take into consideration it's occurrence based on all thirty eight possibilities. Now we find out this numbers occurrence will happen 1 out of every 10 times when considering its occurrence one time in thirty eight numbers versus one time in one number.

- **Be sure to collect a sufficient amount of data first**

There are several references in articles about wheel bias that refer to mistakes made when determining bias numbers due to insufficient sample sizes being gathered. Several sources recommend the collection of no less then 5,000 spins and more optimally, 10,000 spins or more before bias number should be determined.

- **Consider wheel placement of bias numbers**

Bias numbers, both hot and cold, need to be plotted on the wheel head to determine location with each other. Past successful roulette wheel records have reflected a correlation between clusters of hot and cold numbers (██████, 1992, & ██████ and ██████ 1996).

- **Look for total wheel bias first before looking for individual numbers**

In many cases phantom bias numbers will appear "hot" but the statistical characteristics of the roulette wheel head will be within a normal range. If the statistical evaluation of the wheel head indicates that all numbers taken together don't show signs of overall bias, then apparent bias numbers might be experiencing temporary fluctuation.

The advantage player needs to take into consideration several possibilities before risking his or her bankroll on bias numbers. Although the example given concerning the ██████ syndicate appeared to have the "Midas touch", it is unknown how much money they lost before developing the correct parameters for determining wheel bias. Since our position is one of protection, we don't need to commit to the process of complete and total number accuracy. What the casino executive needs to accomplish is a statistical methodology that will help him or her protect their

roulette games from wheel bias advantage players. First, however, we need to look at actual records of different roulette wheel heads and understand the intricacies of their operational randomness (or lack there of).

Different roulette wheel head examples

Now that we understand the theory and metrics behind roulette wheel bias, let's look at actual examples of roulette wheel heads and get a first hand feel for tracking numbers to determine wheel head bias. The following example is comprised of the numbers collected from our surveillance department at the ██████████ Hotel/Casino back in the 1990's (Table 7.1). To better help you conduct your analysis let me explain the different categories of this table/model and how they apply to location bias numbers.

- **Column 1, "Numbers"**

These are the numbers as they appear on the roulette wheel head starting with double zero. I've taken the pattern from one of ██████████ examples found in the appendix of his book (1970). The pattern shows the location of any number pocket to its neighbors on the wheel head crown. Since the ball travels clockwise and the crown spins counter-clockwise the path the ball takes would cross numbers from the bottom up (don't forget that double zero is followed by twenty seven). Immediately under the word "Numbers" in this column is the word "Norm". This is a label for the number immediately to the right that represents the normal occurrence for each number based on total spins recorded.

- **Column 2, "Occurrence"**

This column is a list of the numbers and their occurrences and corresponds to the "numbers" listed to their immediate left.

- **Column 3, "Deviation"**

"Deviation" represents the difference between normal

statistical occurrence and the actual occurrence and is illustrated as a positive number, negative number or zero.

- **Column 4 & 5, "Ratio" & "To"**

This column indicates the hit ratio for any number. ██████████ used ratios to help him locate "hot" bias numbers. ██████████ used 29 to 1 (or less) as the maximum ratio for determining hot numbers with observed trials of 5,000 total spins and used 32 to 1 as the maximum ratio when observing trials of 10,000 total spins (1970).

- **Column 6, "Stan Dev"**

This number is achieved by determining the standard deviation for a single number occurrence (norm) and then dividing that number into the "deviation". For example: the standard deviation for 255 normal occurrences is approximately 16. Double zero's deviation from normal occurrence is $260 - 255 = 5$. The standard deviation for this number is $5 / 16 = 0.31$. Standard deviation represents the distance of departure of any number result from the norm. One standard deviation from a number, in this case both hot and cold departures, will occur 67% of the time while departures of two standard deviations occurs approximately 95% of the time. These departures represent normal everyday number fluctuations. Three standard deviations take us basically to the edge of normal expectation because they cover 99.7% of all occurrences. However, anything past 3.0 standard deviations does not immediately guarantee that a specific number's appearance is unfathomable. Anything past 3.0 SD is prima face evidence of bias only and needs to be investigated further. Because we as casino executives are looking to protect our equipment instead of attacking it, I recommend using 2.0 SD or greater as standard point of investigation.

- **Column 7, "Chi sq"**

Chi square fitness of good test is used to calculate the possibility of bias of the entire wheel head. It takes

Chapter 7: Defending Against Roulette Wheel Bias

Table 7.1- Wheel Example Showing Moderate Bias

Numbers	Occurrence	Deviation	Ratio	To	Stan Dev	Chi sq
Norm	255					
00	260	5	37.2	1	0.31	0.10
1	261	6	37.1	1	0.38	0.14
13	252	-3	38.4	1	-0.19	0.04
36	261	6	37.1	1	0.38	0.14
24	232	-23	41.7	1	-1.44	2.07
3	241	-14	40.2	1	-0.88	0.77
15	259	4	37.4	1	0.25	0.06
34	225	-30	43.0	1	-1.88	3.53
22	256	1	37.8	1	0.06	0.00
5	249	-6	38.9	1	-0.38	0.14
17	245	-10	39.5	1	-0.63	0.39
32	280	25	34.6	1	1.57	2.45
20	249	-6	38.9	1	-0.38	0.14
7	256	1	37.8	1	0.06	0.00
11	245	-10	39.5	1	-0.63	0.39
30	250	-5	38.7	1	-0.31	0.10
26	301	46	32.2	1	2.88	8.30
9	257	2	37.7	1	0.13	0.02
28	223	-32	43.4	1	-2.00	4.02
0	257	2	37.7	1	0.13	0.02
2	257	2	37.7	1	0.13	0.02
14	259	4	37.4	1	0.25	0.06
35	216	-39	44.8	1	-2.44	5.96
23	255	0	38.0	1	0.00	0.00
4	263	8	36.8	1	0.50	0.25
16	300	45	32.3	1	2.82	7.94
33	282	27	34.3	1	1.69	2.86
21	233	-22	41.5	1	-1.38	1.90
6	255	0	38.0	1	0.00	0.00
18	271	16	35.7	1	1.00	1.00
31	286	31	33.8	1	1.94	3.77
19	240	-15	40.3	1	-0.94	0.88
8	253	-2	38.3	1	-0.13	0.02
12	265	10	36.5	1	0.63	0.39
29	234	-21	41.4	1	-1.32	1.73
25	235	-20	41.2	1	-1.25	1.57
10	262	7	36.9	1	0.44	0.19
27	255	0	38.0	1	0.00	0.00
Total	9,680		38.2			51.36

into consideration the frequency of occurrence of all thirty eight numbers (thirty seven on a single zero crown). Although standard deviation is a good tool for determining bias probability in single numbers, it fails in like effectiveness when taking into consideration all possible out comes. This reason is due to standard deviation being registered as a positive or negative figure when estimating departure. If one number is "hot" and represents a positive departure, another number (or group numbers) has to correspond in the opposite direction. No matter how wide the range of individual number variance, the sum of all events will always equal zero. By using the chi square test we develop a workable number because chi square is the product of squaring the standard deviation number. For example: standard deviation for double zero is 0.31 and squaring that number produces chi square of 0.10 ($0.31^2 = 0.31 \times 0.31 = 0.10$). The sum of all squares or chi square produces a number that identifies the degree of departure of all 38 numbers and can be used as a tool to identify possible wheel bias.

Casino executives are looking to protect rather than attack, so we don't need to be as precise in our estimates as the advantage player. We need to identify the location of possible bias wheel heads and then determine which numbers could possibly be biased, either hot or cold but especially hot. The two metrics I use to detect the possibility of wheel bias is single number SD of approximate 2.0 and a total wheel bias of 55.0 chi square. The following example in Table 7.1 shows a roulette wheel head with possible hot number bias. Take a moment and based on the previous information locate any bias numbers.

If you used the metrics I previously listed you would have located four numbers that have a standard deviation equal to or greater than 2.0.

Table 7.2 – Possible Bias Numbers

Number	SD	Ratio
26	+2.88	32.2 to 1
28	-2.00	43.4 to 1
35	-2.44	44.8 to 1
16	+2.82	32.2 to 1

At first appearance the two hot numbers are very close to 3.0 SD and in most cases would be assumed to be bias. Two problems are noted regarding this hypothesis. First, although the numbers are greater than 2 SD, criteria which [REDACTED] established, 32/1 minimum with 10,000 spins, even though very close is not met. Second, the chi square of the wheel is less than 55.0 and indicates that the wheel head is within standards and is probably non-bias. In addition, by inspecting the possible hot numbers and their placement on the wheel head with cold numbers does not really tell us anything. Although cool numbers can be located before and after each hot number, there is no real logical connection. If a hot number or two was followed by seriously cold numbers, it might be enough for us to consider more data collection before we put this wheel head to bed.

The next example (Table 7.3) comes from a wheel head from the now defunct [REDACTED] ([REDACTED]) that I personally tracked in the early 90's. As before, look over the numbers on this example and see if you can determine whether numbers on this wheel head demonstrate bias characteristics.

Chapter 7: Defending Against Roulette Wheel Bias

Table 7.3- Wheel Example Showing Strong Bias

Number	Occurrence	Deviation	Ratio	To	Stan Dev	Chi sq
Norm	221					
00	196	-25	42.9	1	-1.68	2.83
1	225	4	37.4	1	0.27	0.07
13	258	37	32.6	1	2.49	6.19
36	198	-23	42.5	1	-1.55	2.39
24	202	-19	41.6	1	-1.28	1.63
3	209	-12	40.2	1	-0.81	0.65
15	195	-26	43.1	1	-1.75	3.06
34	239	18	35.2	1	1.21	1.47
22	249	28	33.8	1	1.88	3.55
5	198	-23	42.5	1	-1.55	2.39
17	218	-3	38.6	1	-0.20	0.04
32	207	-14	40.6	1	-0.94	0.89
20	250	29	33.6	1	1.95	3.81
7	242	21	34.8	1	1.41	2.00
11	188	-33	44.7	1	-2.22	4.93
30	239	18	35.2	1	1.21	1.47
26	241	20	34.9	1	1.35	1.81
9	216	-5	38.9	1	-0.34	0.11
28	213	-8	39.5	1	-0.54	0.29
0	190	-31	44.3	1	-2.09	4.35
2	216	-5	38.9	1	-0.34	0.11
14	204	-17	41.2	1	-1.14	1.31
35	250	29	33.6	1	1.95	3.81
23	203	-18	41.4	1	-1.21	1.47
4	199	-22	42.3	1	-1.48	2.19
16	272	51	30.9	1	3.43	11.77
33	242	21	34.8	1	1.41	2.00
21	256	35	32.9	1	2.35	5.54
6	214	-7	39.3	1	-0.47	0.22
18	232	11	36.3	1	0.74	0.55
31	206	-15	40.8	1	-1.01	1.02
19	208	-13	40.4	1	-0.87	0.76
8	219	-2	38.4	1	-0.13	0.02
12	246	25	34.2	1	1.68	2.83
29	236	15	35.6	1	1.01	1.02
25	220	-1	38.2	1	-0.07	0.00
10	211	-10	39.9	1	-0.67	0.45
27	205	-16	41.0	1	-1.08	1.16
Total	8,412		38.4			80.14

After examining this wheel example you should have come up with more bias possibilities than were found on the previous wheel head example. Using 2.0 SD to find possible bias numbers you should have discovered the following:

Table 7.4 – Possible Bias Numbers

Number	SD	Ratio
13	+2.49	32.6 to 1
11	-2.22	44.7 to 1
0	-2.09	44.3 to 1
16	+3.43	30.9 to 1
21	+2.35	32.9 to 1

What have you concluded from this example? If you estimated number 16 is probably bias you're right. Number 16 met all three criteria. It's over 2.0 SD, it's ratio is less than 32 to 1 (even though the sample isn't 10,000 spins) and the chi square of the entire wheel head is greater than 55.0. You may

also notice a cluster of hot numbers surrounded by cold numbers on the crown section 21-33-16. This could be an indication that these numbers are subject to a physical problem on the crown itself that helps support the probability that 16, 21 and possibly 33 are bias.

This next example is what I would call the "grand daddy" of wheel bias. These numbers came from one of the wheels that [REDACTED] et al took advantage of in [REDACTED]. These aren't the numbers that came up during his play but numbers resulting from 9,971 trial spins conducted immediately there after. Take a peek at this wheel head and see if you can determine which numbers are possibly biased (see table 7.5).

Oh, boy! Is this wheel head biased or what? What numbers did you find that meet the 2.0 SD criteria? If you found twelve you were correct.



Chapter 7: Defending Against Roulette Wheel Bias

Table 7.5- Wheel Example Showing Very Strong Bias

Number	Occurrence	Deviation	Ratio	To	Stan Dev	Chi sq
Norm	262					
00	212	-50	47.0	1	-3.09	9.54
1	269	7	37.1	1	0.43	0.19
13	259	-3	38.5	1	-0.19	0.03
36	233	-29	42.8	1	-1.79	3.21
24	275	13	36.3	1	0.80	0.65
3	278	16	35.9	1	0.99	0.98
15	291	29	34.3	1	1.79	3.21
34	251	-11	39.7	1	-0.68	0.46
22	283	21	35.2	1	1.30	1.68
5	275	13	36.3	1	0.80	0.65
17	284	22	35.1	1	1.36	1.85
32	227	-35	43.9	1	-2.16	4.68
20	219	-43	45.5	1	-2.66	7.06
7	231	-31	43.2	1	-1.92	3.67
11	289	27	34.5	1	1.67	2.78
30	312	50	32.0	1	3.09	9.54
26	298	36	33.5	1	2.22	4.95
9	205	-57	48.6	1	-3.52	12.40
28	218	-44	45.7	1	-2.72	7.39
0	280	18	35.6	1	1.11	1.24
2	325	63	30.7	1	3.89	15.15
14	282	20	35.4	1	1.24	1.53
35	245	-17	40.7	1	-1.05	1.10
23	260	-2	38.4	1	-0.12	0.02
4	253	-9	39.4	1	-0.56	0.31
16	280	18	35.6	1	1.11	1.24
33	328	66	30.4	1	4.08	16.63
21	297	35	33.6	1	2.16	4.68
6	255	-7	39.1	1	-0.43	0.19
18	222	-40	44.9	1	-2.47	6.11
31	236	-26	42.3	1	-1.61	2.58
19	233	-29	42.8	1	-1.79	3.21
8	261	-1	38.2	1	-0.06	0.00
12	294	32	33.9	1	1.98	3.91
29	293	31	34.0	1	1.92	3.67
25	227	-35	43.9	1	-2.16	4.68
10	247	-15	40.4	1	-0.93	0.86
27	<u>244</u>	-18	40.9	1	-1.11	<u>1.24</u>
Total	9,971		38.6			143.22

Table 7.6 – Possible Bias Numbers

Number	SD	Ratio
00	-3.09	47.0 to 1
32	-2.16	43.9 to 1
20	-2.66	45.5 to 1
30	+3.09	32.0 to 1
26	+2.22	33.5 to 1
9	-3.52	48.6 to 1
28	-2.72	45.7 to 1
2	+3.89	30.7 to 1
33	+4.08	30.4 to 1
21	+2.16	33.6 to 1
18	-2.47	44.9 to 1
25	-2.16	43.9 to 1

Notice the difference with the more bias examples. You see the presence of more numbers with a greater degree of variance as compared to the first example and you should note an increase in the number of negative numbers as well. Although only three of the positive bias numbers exhibit a ratio of 32/1 or less, the chi square condition of the entire wheel head and the location of hot/cold number clusters on the crown indicate extreme occurrence of number bias with physical characteristics reinforcing these findings.

I seriously doubt you will find a wheel head that exhibits similar characteristics but I find it important that any executive who wishes to learn how to detect wheel bias witness the widest spectrum of possibilities. By examining these examples it is easy to see that the first wheel head example is not subject to attack by bias, the second wheel head needs to be examined further while the third wheel head needs to be converted into someone's expensive coffee table.

That brings us to the question, "What do I do as a casino executive when I discover wheel bias?" First, be sure the wheel represents a truly bias wheel. Many times all you're looking at is a temporary

situation based on frequency anomalies. Second, wheel heads that exhibit some bias should "stay" on the floor of the casino. Wheel bias has nothing to do with win-loss performance unless someone knowledgeable enough in the theory of bias discovers this information. Because of this factor, a bias wheel head can be operating for a long period of time and not reflect this problem through our much regarded and highly overrated hold percentage. Don't rule out the existence of wheel bias just because you've been oiling the spindle ball bearing on a regular basis and your game hold percentage is 25%.

Our procedure at the [REDACTED] put surveillance on the lookout for anyone betting moderately to heavy while nesting their wagers with previously identified bias numbers. If someone were seen wagering on these numbers we would swap that wheel head with another in storage (in five years it never happened). Since the exact causes of wheel bias are still vague at best, it would be a waste of money to have a moderately bias roulette wheel head refurbished by the manufacturer. If a wheel head exhibits extreme bias characteristics, then I would recommend that it be removed from the casino floor and placed in obsolescence or destroyed.

Final thoughts about wheel bias

By now you should understand that wheel bias is real. You should also have a good understanding that it can sometimes be elusive and takes more than just compiling numbers to isolate probable roulette wheel head bias situations. From my studies on this subject I have learned that many tracking teams have been caught chasing the wrong numbers based on poor analytical reasoning and improper data gathering. I'd be willing to bet that there is far more groups that wagered bankrolls and went broke then doubled their money. Although don't think for a minute that wheel bias can't be identified and utilized by the advantage player to beat casinos on a regular basis.

Chapter 7: Defending Against Roulette Wheel Bias

Several reasons exist why I don't think roulette wheel bias problems are extensive. First, roulette wheels are constructed more differently today than in the past. One of the most important changes to wheel design has to do with improvements made on the interior crown. Today frets are no longer individual metallic pieces but single metal pocket rings. These rings also have the ability of being rotated periodically which makes tracking by advantage players much more difficult (although I doubt any casino utilizes standards for random rotations). Where as switching wheel heads throughout the casino was once considered a doable protection process, this system had limited success since wheels could still be identified by wood designs or incidental scratches or marks. Pocket rings can be rotated randomly and unless the tracking team has a person standing in the vicinity when the ring is moved, the advantage players will have no way to determine where any pocket flaw bias will eventually come to rest.

Second, the shape of the crown has changed significantly. Today crowns are designed with a lower profile creating more ball scatter. Previous wheels were designed with high profiles as well as high frets to decrease ball scatter and time per individual game in an attempt to increase the number of game decisions. Also, modern wheels are constructed from better materials and harder wood and are not subject to as much wear and tear as past wheel heads made from softer wood and more wearable metal alloys.

Third, today we have a better understanding of mathematics and statistical methods that can be employed on a regular basis due to different roulette software packages. Ever since gaming manufacturers started placing tracking systems on their wheel heads and utilizing electronic number totems to increase play, they have had the ability to collect spin data. Almost all software-tracking programs have the ability to store copious amounts of number data and automatically search for number bias. Most of these

programs have the ability to analyze data through the use of standard deviation and chi square testing, dual-p testing, and different forms of linear and multiple regressions that cannot be handled properly through the use of spread sheets alone. Any short-coming in these analytical test systems comes from lack of utilization. You're a casino executive— what is the wheel bias status of your tables? See what I mean.

For those of you that do not have a tracking software package from which to evaluate your roulette wheel heads there are programs available for bias analysis. Several years ago [redacted] and [redacted] published a book titled [redacted] (1996) that included a PC based toolkit for analyzing the roulette wheel. All you have to do is provide the data. I used to have a copy of the book and software package, however at the time I was unable to run the software because I used a Macintosh computer. From what I understand, even though the software was written for attacking bias wheels, the software package does an excellent job from the casino executive's point of view as well.

For those of you who are interested in using a simple spread sheet program written in Excel and usable with both Windows and Macintosh computers, I have one available free of charge. If you e-mail me at [redacted] I will be more than happy to e-mail you a copy. The Excel tester uses chi square to determine entire wheel bias and to identify individual number bias as well. It's an easy to use model and again only requires you to collect your own data. An easy way to collect data is for the surveillance department to run video on a specific wheel head and then have an operator review the tapes (or DVDs) and record the hits. It won't take long to collect enough spin information to perform a bias test using 10,000 spins. Usually this information can be collected in 10 to 14 days of past roulette results.

One question I have received in the past is how

one can compute an expected player advantage a tracker might actualize given a hot bias numbers frequency of occurrence. This conversion isn't as difficult as one would first believe. Expected player advantage can be calculated by subtracting the observed frequency from the payoff return and then dividing by the observed frequency. For instance, the observed frequency is 32 to 1 and the pay off 36 for 1, the calculation is: $(36-32)/32 = 4/32 = 12.5\%$ player advantage. A list of the different percentages is as follows with house advantage expressed in positive percentages and player advantage expressed in minuses.

Table 7.7 – Player Advantage Based on Hit Ratios

Payoff	Hit	HA%
36	38.0	-5.26%
36	37.0	-2.70%
36	36.5	-1.4%
36	36.0	0.0%
36	35.5	1.4%
36	35.0	2.9%
36	34.5	4.3%
36	34.0	5.9%
36	33.5	7.5%
36	33.0	9.1%
36	32.5	10.8%
36	32.0	12.5%
36	31.5	14.3%
36	31.0	16.1%
36	30.5	18.0%
36	30.0	20.0%
36	29.5	22.0%
36	29.0	24.1%

If we look back to Table 7.5 the example of Very Strong Bias (which just happens to be a roulette wheel that was successfully played by the [REDACTED] syndicate), we can calculate an approximate player advantage as follows:

Table 7.8 – Estimating the Player's Advantage

Number	Hit Ratio	Player Advantage
30	32.0 to 1	12.5%
26	33.5 to 1	7.5%
2	30.7 to 1	18.0%
33	30.4 to 1	18.0%
21	33.6 to 1	7.5%
Total		12.7%

Based on these metrics an advantage player can expect to win at a rate of 12.7% or \$12.70 for every \$100 wagered. If [REDACTED] et al were wagering \$2,000 per number on the above five numbers, their theoretical win per spin would have been \$1,270.

Finally, some thoughts on the present situation of wheel bias and the possibility it is a threat to the casino industry. I am not sure how wide spread wheel bias advantage play is occurring in today's gaming industry. I could make a good argument that it isn't bad at all. In the last dozen years I haven't heard much about wheel bias problems, at least not in [REDACTED].

Between the improved construction of roulette wheels and the use of analytical programs, I doubt there are very many exploitable opportunities. The last time I had to analyze a wheel head was in the late 90's for the [REDACTED] Casino near [REDACTED] (unfortunately, the entire casino burnt down not long afterwards) and have not had anyone interested in wheel analysis since then.

One argument I can make as to wheel bias existence comes from an advantage player's ability to collect vast amounts of information on wheel numbers more than in the past. One problem with the number totem utilized by many casinos is that the player no longer has to sit on the table to collect numbers. Now all the tracker has to do is position himself or herself in an area close enough to read the totem, possibly in the bar or lounge near the roulette wheel pit. If the advantage player wants to take this situation a step farther, the tracker has the freedom to record

several roulette wheels. Since many totems hold up to approximately twenty numbers, the tracker can roam through the casino writing down information of all roulette wheels on the floor. If the tracker is working in an area like the [REDACTED] or [REDACTED] or the [REDACTED], he or

she could continually orbit between several casinos just as long as they get back to each casino before more than twenty numbers have been spun. In this manner a tracker no longer spends ten to fifteen days tracking one roulette wheel. Now he can be tracking a dozen games at the same time.

Side bar – DIFFERENCE BETWEEN WHEEL BIAS AND WHEEL CLOCKING PREDICTION TECHNIQUES

Prediction wheel clocking is quite different from playing wheel bias. Wheel bias numbers are chosen because they exhibit a greater frequency of occurrence based on past performance. Prediction wheel clocking (known as "wheel clocking") takes into consideration several elements of physics that occur immediately after the roulette ball is released by the dealer, and based on the computation of these elements, sectional numbers are chosen and wagered before the ball drops. The advantage player who clocks the wheel is looking for information that will predict an approximate area on the wheel where the ball is likely to come to rest. Elements that are taken into consideration in order to make this prediction are:

- The speed of the ball as it travels in a clockwise path around the wheel head. If the size of the ball and the diameter of the wheel head track are known, the person clocking can estimate the speed of the ball, the ball's rate of deceleration and it's approximate location on the wheel head ball track, and where it will reach escape velocity and start it's decent to the interior crown of the wheel head.
- The speed of the interior crown as it rotates counter-clockwise inside the wheel head. After the crown has rotated completely twice the person clocking can determine the speed of the crown, any change in the speed as it

slows down (which is minute at best) and an approximate pocket section that will intersect with the descending ball.

- The pattern of ball "scatter" once it leaves the ball track. Depending on a number of elements the path of the ball can be estimated based on obstacles it must pass, the height of the crown and fret walls and the speed of collision when entering the pocket area.

Information on this subject seems to be available but the level of success without the use of computer equipment is suspect. I'm aware that several teams have tried to attack the roulette wheel using prediction methods but have had limited success even under laboratory conditions. Another gaming consultant has told me that prediction advantage players are presently experimenting with the [REDACTED] roulette wheels since the majority are single zero, reducing house advantage and having a much slower rotor speed than their [REDACTED] cousins. I'm also told that improvements in optics and concealable computers may make "wheel clocking" a possible threat in the near future. (Note: Don't get confused by the term "wheel clocking". Wheel bias players have used the term to describe the data collection process as "clocking the wheel" while prediction players need to "clock the wheel" to collect the necessary information to make their wagering decision.)

Chapter 8: Rhythm Rolling: A Dice Control Technique

(Note: This section is an extension of a magazine article I wrote for [REDACTED] October 2005.)

[REDACTED] (aka [REDACTED]) claims he can beat the casino game of craps legally. He says he has been beating the game for years. [REDACTED] claims he can beat casino craps, too. He says he has been playing with a team of players who has regularly beaten the game for several years. So has [REDACTED], an unquestionable blackjack expert, claims he practiced for several months before he could beat the game consistently. So has [REDACTED], known as the [REDACTED]. [REDACTED] states she has been playing with [REDACTED] et al and has come away a winner on most occasions. [REDACTED] told the whole world he can beat casino craps. He did it on the [REDACTED] series. The [REDACTED] claims he can control the dice and influence the game's outcome, and has won thousands over the last several years.

Have these players, several of them respected gambling authors and gaming experts, discovered a method of turning the dice tables on the casino? Can they walk into any casino, play at any crap table and extract whatever sum of money they want based on some special skill they have developed? Is this dice skill or system capable of severely lowering the casino's dice profit potential, especially if regular customers awaken to this technique and start applying it in large doses?

These and several other dice controllers are so confident they can control the outcome of dice rolls that they have written books and articles on the subject. [REDACTED], author of several books and articles, has also established a dice control seminar

that turns out hundreds of new dice controllers or "rhythmic rollers" annually. Is dice controlling becoming the wave of the future? Will rhythm rolling change the game of craps like card counting did to the game of blackjack?

Dice controlling can be described as a method of setting and throwing the dice that allows the shooter to alter the odds of the game. The shooter alters these odds by reducing the number of rolls resulting in "seven" after the shooter has established a point. By reducing the probability of seven combinations the shooter can gain a mathematical advantage over the casino.

By reducing the number of sevens rolled, the shooter will benefit by the higher percent of "numbers" rolled and passes made successfully. Out of thirty six possible rolls of the dice, six combinations result in a seven. In other words, a seven can be expected to appear once ever six rolls of the dice (1:6). Since the house advantage on the pass line bet (without odds) is calculated to be 1.41% once a point has been established, the rhythm shooter only needs to reduce this ratio to one seven every 6.2 rolls (1:6.2) to nullify any house's estimated mathematical gain. By reducing the ratio to 1:7, the skilled dice controller not only eliminates the house edge but can also achieve a 4.4% edge over the house.

Brief Description of the Control Technique

The first step in investigating the validity of this technique is to understand what steps the control shooter needs to take when throwing the dice. First, the control shooter will position his or herself either immediately right or left of the stickman. This position shortens the distance to the opposite end of the dice table and reduces the amount of energy

used to toss the dice close to the far end of the table. When the dice are thrown they will be tossed straight down the table, not on an angle. Tossing the dice on an angle will decrease the dice chance of landing together evenly.

Second, the dice are set in a specific configuration before they are tossed. While the dice are lying on the table the two cubes are placed together with the "ace" face kissing the "six" face. One die is rotated until a hard way combination appears on their top sides (2-2, 5-5, 3-3, or 4-4). This positioning of the dice known as the "hard way set" will help facilitate the elimination of ace-six combinations of seven while increasing the possibilities for eventually rolling 4, 6, 8, and 10's.

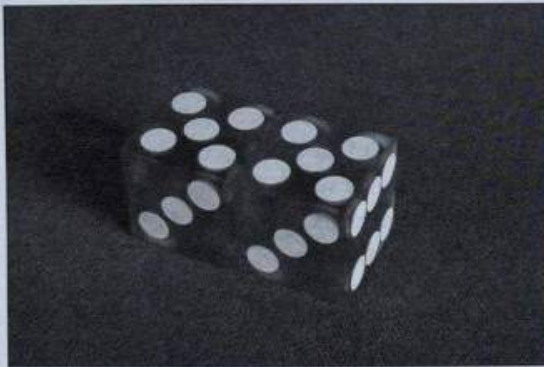


Photo 8.1 Example of a "hard-way" combination

Third, before the dice are thrown they are locked together with a specific grip. One of the grips recommended is performed by positioning three fingers in the front of the dice with the pinkie hanging in the air, while the thumb is firmly placed on the back side. When the dice are released they are thrown in a manner that allows them to leave the hand together and rotating with a slight backspin on the ace-six axis.

Fourth, the shooter tries throwing the dice so that they are square to the table, stay together while in the air

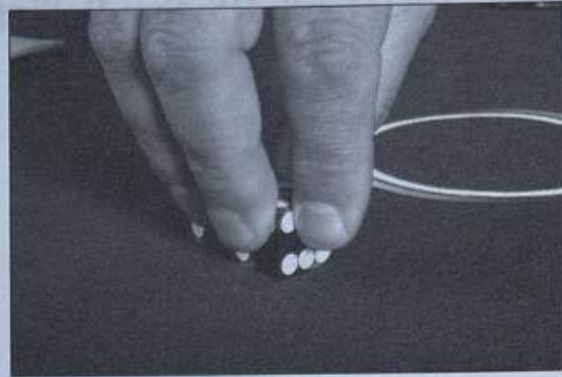


Photo 8.2 Example of "three finger locked grip"

and rotate evenly together and don't wobble or yaw. The shooter wants the dice to land on a face surface or straight edge as much as possible in an attempt to absorb most of the energy from their flight both horizontally and vertically so that they will lightly touch the back wall. It is the control shooter's desire to toss the dice with the least amount of expended energy possible. The dice are supposed to "float" through the air after leaving the shooter's hand. If the dice land correctly and with a majority of the flight energy expended upon landing, they should glance lightly off the back wall and roll back towards the center of the table on their ace-six axis with both dice rotating equally.

If the dice act as expected they will rotate several times and stop with both top faces showing two 2's, 3's, 4's, or 5's; hard totals of 4, 6, 8, or 10. The roll will also finish successfully if one of the dice face rotate plus or minus one face (totals of 5, 6, 8, or 9) or if one dice yaws producing an ace or six side (totals of 3, 5, 6, 8, 9, 10, or 11). Where the shooter runs into trouble is if one dice rotates plus or minus two faces (known as "double pitching" with totals of 7 only) or if both dice yaw to produce totals of 2, 7 or 12.

Naturally these control throws are also married to a specific betting system. This system will take

Chapter 8: Rhythm Rolling: A Dice Control Technique

advantage of the increased total of non-seven numbers rolled because of the alleged manipulation of the dice. Beginning control shooters are advised to stick to the pass line with odds wagers and placing the 6 and 8, since those wagers have the lowest house advantage and can be overcome with a lower seven to total roll ratio. Shooters that consider themselves more accomplished are encouraged to make additional place bets on more difficult numbers like 5-9 and 4-10 and to use optional dice set combinations which are more effective during come out rolls.

Can the Rhythm/Controlled Throw Technique Successfully Work in the Casino?

The theory seems sound, the mathematics make sense and the technique is backed by several authors and gambling experts but is dice control a legitimate strategy for beating casino dice? Since this question cannot be answered one way or the other at this time, there is plenty of room for skepticism.

First, all the information about the success of rhythm throws and dice control is based primarily on anecdotal information. I have yet to see independent

studies illustrating a large number of recorded throws and the ratio of sevens (known as "sevens to rolls ratio" or SRR). [REDACTED] (who is known and highly respected for his analytical skills in blackjack) omitted any supportive statistical analysis or records in his book titled [REDACTED] (2005); as did [REDACTED] in his books [REDACTED] (2004) and [REDACTED] (2003) along with [REDACTED] in his book [REDACTED] (2005).

Secondly, none of the dice control experts address in detail what affect the pyramid wall padding has on their ability to control the dice. Casinos use pyramid padding around the inside of the dice table to prevent exactly what these experts claim that they can do. The pyramid design will alter controlled dice shots by deflecting the dice in an angled direction. Most of the available articles discuss the need to throw the dice all the way to the far wall. Only [REDACTED] book mentions, in very vague terms, the affect of the dice bouncing off the pyramid pattern. [REDACTED] advises the shooter not to "hit the pyramids on the fly" and states if the dice do strike the pyramids

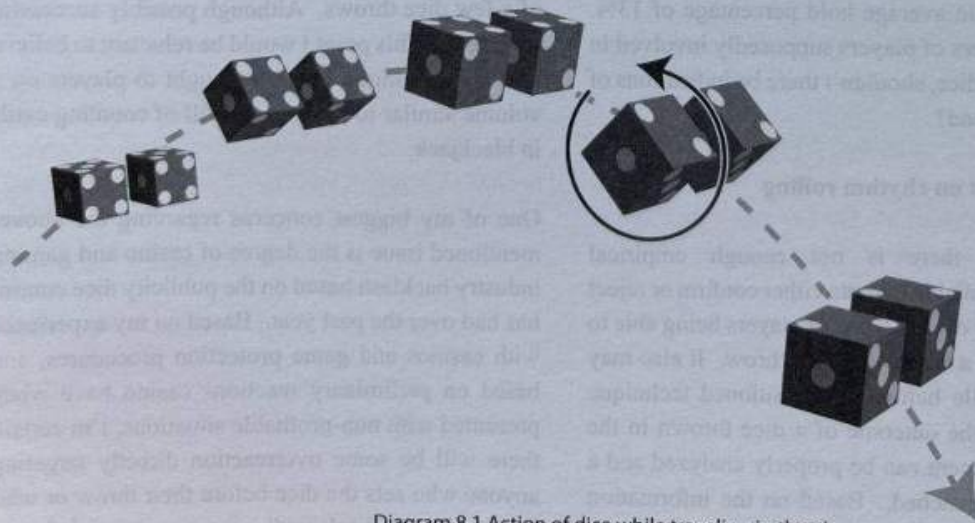


Diagram 8.1 Action of dice while traveling in the air

it will "add variety" to the result and "not complete randomness". [REDACTED] then goes on to admit that he doesn't know "exactly how that happens".

Third, a consulting group known as [REDACTED] posted an article on their website regarding control dice throws [REDACTED]. Their position, based on factors regarding the dissipation of mass in motion, concludes that regardless of how the dice are thrown or how much back spin is utilized "the force of the throw is over 222 times greater than the force required to move the die off its trajectory" and subsequently, dice controls as described cannot be successful. [REDACTED] conclusion was made without even taking into consideration possible contact with the pyramid padding.

Fourth, if this system has been so successful and there are a number of players earning thousands of dollars on a regular basis, why don't the gaming figures reflect a financial downturn? Unfortunately, specific game information from [REDACTED] is limited. In [REDACTED], the [REDACTED] dice revenues and hold percentages have held a stable level for the past ten years, hovering around \$3,700 daily win per table with an average hold percentage of 13%. With the numbers of players supposedly involved in controlling the dice, shouldn't there be indications of a downward trend?

A final thought on rhythm rolling

Unfortunately, there is not enough empirical information available that can either confirm or reject the authenticity of the claims of players being able to alter odds with a controlled dice throw. It also may be quite a while before this mentioned technique of controlling the outcome of a dice thrown in the casino environment can be properly analyzed and a valid decision reached. Based on the information gathered from books, articles, and Internet sites two

opinions can still be drawn as to the validity the dice control techniques.

The first opinion is that it's a bunch of hokey with this published technique being just another way to separate players from their money. Someone has developed a system that appeals to the masses and sounds credible enough to interest players looking for some edge over the casinos. For a small investment anyone interested can sign up to take a dice control seminar that will teach them how to shoot dice and "gain the edge through skill" ([REDACTED]). The lack of statistical analysis based on recorded information and the large amount of anecdotic material casts a doubtful eye on the overall success of control dice through combination setting and rhythm throwing.

The second opinion is that there may be some validity to this technique. However, the number of players who can successfully scrap a small advantage in the long run is limited to a handful of highly practiced people. With enough practice it's understandable that a limited number of talented people could get good enough to toss dice to a specific place on the table where they stand a chance to alter the randomness of a few dice throws. Although possibly successful for a few, at this point I would be reluctant to believe that this technique could be taught to players on a volume similar to the mental skill of counting cards in blackjack.

One of my biggest concerns regarding the above-mentioned issue is the degree of casino and gaming industry backlash based on the publicity dice control has had over the past year. Based on my experience with casinos and game protection procedures, and based on preliminary reactions casino have when presented with non-profitable situations, I'm certain there will be some overreaction directly targeting anyone who sets the dice before their throw or who fails to hit the back wall on an occasional throw.

Since any successful dice control attempt would result in a small advantage gain by the shooter at best, it would be extremely prudent for management to take a position of play analysis concerning any suspicious play before taking punitive action. If not to prevent chasing off good players but also to learn from situations that may legitimately involve professional dice control players.

It may also be prudent for the casino take some proactive steps in discouraging possible dice control shooters. First, the casino needs to make sure their pyramid padding is in good shape. Some casinos never replace pyramid padding and certain points around the table have been worn down though use over the years. These rounded off points need to be replaced. Second, several articles on dice control have indicated that a hard dice table creates more random bounce. This is due to the die having a tendency to catch on a corner and tumble. Some tables are underlined with several layers of old layouts and in some instances, thin foam padding. It may be beneficial to the casino to eliminate any additional material that may "soften" the table, especially

near the table's ends. Third, although I wouldn't recommend "bird dogging" people who occasionally miss the end of the table, I would recommend the casino adhere to the procedure that requires the player to reach the back wall of the table in a friendly and professional manner. There is no doubt that if the dice bounce off proper pyramid padding on the craps table, the dice will roll randomly.

Although no solid conclusion can be reached at this time, two opinions do exist with one opinion concerning how a casino should treat this situation. In addition, regardless of which opinion is correct both opinions present the gaming industry with great financial opportunity. If players believe they can beat casino craps by taking seminars or by purchasing books on the subject, it may peak player interest in the dying game of craps. It might peak enough interest to create an increasing market for the game that could be similar to the increased interest we've seen in the last several years concerning casino poker. It may even be prudent for the casino industry to embrace the theory of dice control in an attempt to repopulate a dying casino game.

Chapter 9: Final Thoughts about Advantage Play

Let's see now. As a casino executive I have to worry about advantage players attacking my blackjack games and my roulette table and whether there is any merit rhythm rolling on my dice table. Are there any other games that I need to be concerned about? Are there any other live casino table games? Hopefully, there isn't any other game. What about slot machines? Advantage players can't beat slots machines, can they? Will I ever again get a good night sleep?

By now it should be apparent that practically all casino games can be attacked somehow and the best tool for defending against this problem is knowledge. The more the casino executive knows about all casino games the better chance he has to train his or her casino and surveillance personnel. They can be provided with the best possible rules that optimize each game's best profit potential and because they are educated they will now patiently wait out frustrating but statistically normal negative decision fluctuation. Remember the old maxim "chance favors the prepared mind". Knowledge is power and it always will be. The casino executive who possesses superior knowledge of their casino games and game protection and an understanding of statistical fluctuation will have a strategic advantage over the competition. Gaming is becoming more competitive everyday. Wouldn't the ability to increase gaming knowledge be an invaluable tool for any executive, whether he or she is the CEO of a large corporation or the Vice President of gaming operations at a small gaming venue?

Enough said about gaming knowledge. Let's take a look at some other areas of gaming where the advantage player could be lurking at this moment, ready to pounce on the still unsuspecting but quickly learning casino executive.

Three Card Poker

The game of Three Card Poker (TCP) is a non-drawing, "dealers qualify" type game that is dealt face down from a single deck. The player must make a wager on the "Ante" and has the option to also wager on a side bet known as "Pairs Plus" which is a single parameter wager not related to the main game. Once the player looks at his cards he has the option of folding his hand and losing his "Ante" or placing an additional and equal "Play Bet" to stay in the game. Since TCP is a qualifying game, regardless of what the player holds, the dealer has to have a qualifying hand of Queen or better before hand comparison comes into play. If the dealer fails to qualify and the player has stayed in the game by making a "Play Bet", the dealer pays off the player's "Ante" wager only with equal money. If the dealer qualifies with a "Queen" or higher, the two hands are compared and the highest three card hand wins (player vs. dealer). In addition, if the player wins with a three-card combination higher than a pair, the player receives a multiple play bonus as well. The "Pairs Plus" is paid when a player holds pairs or better in multiples and is not subject to the dealer's hand result.

The advantage player can gain an edge over the basic game and does so by spying one, two or all three of the dealer's cards in a similar fashion as getting the hole-card in blackjack. The purpose of gaining this information is to determine the likelihood that the dealer's hand will not qualify. If there is a strong likelihood that the dealer will fail to qualify, the advantage player will keep his or her hand regardless of it's value and will place a "Play bet" to stay in the hand. This additional information will increase the number of "Ante" wagers the advantage player will

win and will grind out a small percentage win over a period of time. The advantage player cannot achieve an advantage over the "Pairs Plus" bet and will not wager on the option unless a minimum wager is made as camouflage.

The Three Card Poker example given at the beginning of this book illustrates advantage play by gaining dealer hole-card information of up to three cards. This occurred primarily because the dealer was under trained and while the casinos were not yet utilizing shuffling machines on their peripheral games. In recent years casinos have either leased or purchased shuffling machines that drop three cards at a time, not providing the player an opportunity to see the hole-card placement of three separate cards. Even though the machines have made the game safer for the casino, gaining information about one of the dealer's hole-cards is still a possibility. During the movement of the three card stack from the machine to the card position on the table (if the card stack is unintentionally tilted by the dealer) the bottom card of the stack can be peeked. Advantage players have been known to scout casinos for dealers who might expose the bottom card during transfer and then play on the tables in an attempt to find the best vantage point in which to spy bottom card values.

Does the knowledge of only one card provide the advantage player an exploitable edge in Three Card Poker? Yes, it can! If the advantage player glimpses the bottom card of the stack, he or she can expect a 3.48% edge over the house when successful. Table 9.1 illustrates the different advantages for

the house (and advantage player) based on strategy and additional dealer hand information (██████, 2000).

The best player strategy in Three Card Poker (when not getting any additional information) indicates it's best for the average player to stay in the game and make a "Play Bet" when the player holds a three card hand of queen-6-4 or better. While always making a "Play Bet" and staying in grants the house a tremendous edge (██████, 2000).

If the player is able to see just the bottom card of the dealer's three cards the player will always remain in play if he or she spies a 2 through Jack, will stay in with a queen-9 when seeing a queen, will stay in with at least a king-9 when seeing a king, and also will stay in with an ace-9 or better when seeing an ace (██████, 2000). Of course, it goes without saying that getting all three of the dealer's hole-cards leads the advantage player to make decisions based on an optimal strategy. All three-card knowledge actually allows the player to stay in on all dealer non-qualifying hands and folding when the dealer holds three qualifying cards higher than what the advantage player holds. Since shuffling machines have replaced the manual shuffle, catching two or three cards is really a non-issue.

The biggest problem regarding advantage play at Three Card Poker is that it's extremely difficult to detect. Unless the house procedure dictates that the player's cards are revealed regardless of whether the dealer qualifies, a bottom-card playing strategy

Player Strategy	House Advantage
Always making a "play bet"	+7.65%
Making a "play bet" w/ Q64 or better	+3.37%
Playing a single bottom card strategy	-3.48%
Knowing all three cards/optimal strategy	-34.03%

Table 9.1 - Three Card Poker House Advantage

Chapter 9: Final Thoughts about Advantage Play

pattern is all but impossible to recognize. An advantage player could be viewing the bottom card of the dealer's three-card hand every time. Unless someone on the casino floor spots the flash from the tilted deck, I doubt any employee would realize that an advantage play was going down. Subsequently, it is extremely important that all dealers are instructed to keep the dealer's three-card group level with the table during the transfer between the shuffling machine and the position on the table where the cards are finally placed. If the bottom card cannot be seen, advantage play will not become a problem.

Caribbean Stud Poker

This is another "dealer qualifies" game but one offering a progressive jackpot based on a minimal side bet of one dollar. After each player makes an ante bet and elects to place a dollar on the progressive jackpot (you don't have to bet on the progressive pot), all players and the dealer receive five cards face down. The dealer then turns his last or top card of his hand face up. The players look at their hands and based on what they hold and information provided by the dealer's single up-card make a playing decision. They can either fold and lose their ante or stay in by making an additional bet twice the value of their ante. The dealer turns over his hand and if it qualifies with an ace-king or better, turns over the player's hands in order, comparing theirs to his hand to determine

the winning hand. Any tie hands constitute a "push" hand and any winning player hand is paid a premium when winning with two pair or better. If the dealer fails to qualify he pays each remaining player's ante bet even money. Regardless of whether the dealer qualifies, if the player's hand is a flush or higher and the player has wagered a dollar on the jackpot, he or she is eligible for a bonus which can either be a fixed amount, a percentage of the present jackpot amount or the entire jackpot (multiple winners divide money in the progressive jackpot).

When first viewed it seems Caribbean Stud Poker provides players with an advantage once the progressive jackpot reaches a certain level similar to progressive jackpots in slots. This is quite true, although there are several natural hurdles that have to be taken into consideration before a correct jackpot level can be determined. First, the house advantage of the primary game and the minimum ante wager needs to be considered. This is because a player must make an ante bet before the progressive \$1 wager can be accepted. The player should stay in the hand when holding at least a pair or with other lesser hands when the dealer's up card matches the player's third, fourth or fifth cards. By using this accepted basic strategy the player can anticipate a negative expectation of -5.34% (██████, 2000).

Second, jackpots are subject to federal income tax

Pay Schedule	A	B	C	D
Flush	100	75	50	50
Full House	250	150	100	75
4 of a Kind	500	500	500	100
Straight Flush	10%	10%	10%	10%
Royal Flush	100%	100%	100%	100%
Break-even Amount	\$201,822	\$267,888	\$309,322	\$376,008

Table 9.2 - Minimum Jackpot Amount to Break-even (30% tax & \$5 ante)

when their amount is greater than [REDACTED]. Higher jackpots are usually subject to a [REDACTED] tax rate. Third, jackpot payout schedules for flush, full house and 4-of-a-kind sometimes vary between casinos. Lower payout rates for these categories dictate a higher jackpot amount needed before the advantage player can expect to break even. Fourth, even if the advantage player can achieve a positive expectation, the chance of receiving a royal flush in five cards is so small the variance in win-lose would make playing for a royal flush a very long and tiring ordeal ([REDACTED], 2000). (Note: Remember catching a royal flush in Caribbean Stud Poker will happen with the same frequency of a video poker player catching a royal on the original five card draw.)

Based on these adverse elements surrounding jackpot chasing in Caribbean Stud Poker it is extremely doubtful that advantage players will try to exploit any possible positive situation. Can you see a group of advantage players camping out on a CSP game for months at a time waiting for one of the 649,739 to 1 royal flush to appear?

Another avenue of attack by the advantage player is through glimpsing the dealer's hole-cards in the same manner as seen in Three Card Poker. The problem with using this type of information to gain an advantage in CSP is the information itself. The advantage player needs to see the dealer's up-card and two of the dealer's hole-cards before the player can gain an advantage. This may have great implications when the hole-cards are delivered by hand but most casinos utilize a shuffling machine that drops groups of five cards at a time, eliminating the exposure of all but the bottom card even under the sloppiest delivery conditions.

Table 9.3 - Player's advantage When Glimpsing Addition Dealer Cards ([REDACTED], 2002)

Information	Player Advantage
Dealer's Up-card	-5.3%
2nd Exposed Card	-1.7%
3rd Exposed Card	11.6%
4th Exposed Card	35.2%
All Cards Exposed	64.30%

Since being able to see the dealer's up-card and an accidental bottom card of the five card stack does not provide enough information to overcome the game's natural advantage, it's highly unlikely that Caribbean Stud Poker will be attacked through advantage play. However, if the game is dealt by hand the possibility greatly increases. Be sure the dealer is trained in the delivery of a well protected hole-card. (Note: Some machines only shuffle the deck of cards and do not drop the cards in five-card groupings. These single deck shuffling machines still require the dealer to place the deck in their hand and deliver the cards through a pitch and hole-card motion).

Advantage play in the slot department

There are three ways the advantage player can gain a small but substantial advantage in your slot department. Long thought of as the "sucker's" game, slot machines are neither peripheral games for wives and girlfriends nor are they the high hold percentage games they once were. Because of various factors, the slot department has surpassed live games as the majority bread winner of the casino. It is also subject to the same additional problems of market competition and additional operational cost as it's live gaming cousin. In an attempt to attract more of their competitors' customers to their casino and the vital slot department, casino executives have increased machine payback. They have actually lowered the house edge to blackjack and baccarat levels (1% to 1.5%). At the same time casino executives have been

developing player reward systems that return both soft (comps) and hard (cash back) dollars to a wide gambling spectrum of slot customers. Over the last several years the competitive nature of coin operated gaming devices has created an interesting situation for the advantage player who was once limited to exploiting live games only.

Advantage players can now make a good living by attacking the slot department through three different avenues of opportunity: (1) "wong-able" progressive machines, (2) full-pay video poker machines and (3) combining low house advantage percentage machines with comps, cash back, and direct mail promotions (cash back). The number of disadvantages (alternating payout variance due to statistic fluctuation, limited numbers of low PC games and fighting to gain a small overall mathematical edge) is overcome by one advantage—minimal heat from the casino as compared to heat experienced when attacking live games (██████, 2000). Although slot departments don't embrace the professional players other than progressive jackpot "chasers", they do very little to discourage them.

Full-pay video poker machines

Full-pay games are video poker machines that have pay tables that represent the top or full-pay schedule for that specific game type. This does not necessarily represent a payback of 100% or more. However, it can also refer to the common or original game type pay schedule as well. For example: 9/6 Jacks or Better is considered a full-pay schedule, although the percent of payback is 99.5%.

Two other types of video poker pay schedules the casino executive should be aware of are short-pay and super-pay. Shorting an original payout schedule in one or two payout categories (two-pair, flush and/or full house are common) creates short-pay schedules. The lesser pay schedules provide the casino with a higher return for what the average player thinks is a common or full-pay machine. Super-pay schedules increase one or two categories of common pay video poker games that decrease or erases the casino's edge and provides the perfect strategy player with a slight advantage over the house (100%+). These machines are placed on the casino floor in an attempt to gain a competitive edge over the casino's competition

	"9/6"	"8/5"	"8/5 Bonus"	"7/5 Bonus"
Royal flush	250/4000	250/4000	250/4000	250/4000
Straight flush	50	50	50	50
4-of-a-kind	25	25		
Aces			80	80
2's,3's,4's			40	40
5s - Kings			25	25
Full house	9	8	8	7
Flush	6	5	5	5
Straight	4	4	4	4
3-of-a-kind	3	3	3	3
Two pair	2	2	2	2
Jacks or better	1	1	1	1
Payback %	99.55%	97.30%	99.17%	98.01%

Table 9.4 – Jacks of Better Pay Schedule

and subsequently are limited in availability (█████, 2002).

There are several styles of video poker games that provide the advantage player with the lowest house advantage and the greatest rate of payback. The machines are primarily full-pay Jacks or Better, Double Bonus, Double Double Bonus, Deuces Wild, and Jokers Wild. These games provide the advantage player, who understands and plays each machine type using perfect computer analyzed strategies, a payback of 99% or better. The following game type and pay schedule examples are the ones that will be the most advantageous to the knowledgeable customer. Understand that there are other short-pay schedules that are much less liberal and provide the casino with a much better return. The first video poker machine pay schedule we will analyze is that of Jacks or Better (Table 9.4).

Pay schedule with "full house/flush" of 9/6 gives the advantage player the best possible payback for this type of video poker game. You will also notice that the "8/5 Bonus", which has a varying pay schedule for specific 4-or-a-kinds, has the next highest payback with perfect strategies play and five coins played to receive the maximum jackpot payoff of

4000 coins. Although Jacks or Better do not give the advantage player a mathematical long-term edge, the low house advantage allows the advantage player a gain through the optimal use of cash-back and complementaries.

By playing maximum coins and playing perfect strategy on a double bonus video poker machine the advantage player has the opportunity to gain a slim advantage over the house. All categories place the advantage player in positive or potentially positive territory except the "9/7/4" Double Bonus pay schedule (see table 9.5).

On a double bonus machine the advantage player will target the "10/6" pay schedule. However, the availability of this pay type is limited. Some slot departments will offer one or two 100% games so that they can advertise "100% payback". Advantage players understand the potential of any machine with a 100% or better payback schedule and will know the location of every super-pay/full-pay machine within their area of play (see table 9.6).

With deuces wild machines both the "9/5" and the "10/4" are optimal for the advantage player, while the "9/5+" could be exploited under certain system's

	"10/7/5"	"9/7/5"	"9/7/4"	"10/7/+80SF"
Royal flush	250/4000	250/4000	250/4000	250/4000
Straight flush	50	50	50	80
4-of-a-kind				
Aces	160	160	160	160
2's,3's,4's	80	80	80	80
5s - Kings	50	50	50	50
Full house	10	9	9	10
Flush	7	7	7	7
Straight	5	5	4	5
3-of-a-kind	3	3	3	3
Two pair	1	1	1	1
Jacks or better	1	1	1	1
Payback %	100.17%	99.11%	97.74%	100.52%

Table 9.5 – Double Bonus Pay Schedule

Chapter 9: Final Thoughts about Advantage Play

	"9/6"	"9/5"	"8/5"	"10/6"
Royal flush	250/4000	250/4000	250/4000	250/4000
Straight flush	50	50	50	80
4-of-a-kind				
Aces/w 2,3,4	400	400	400	400
2's,3's,4's, w/A-4	160	160	160	160
Aces	160	160	160	160
2's,3's,4's	80	80	80	80
5s - Kings	50	50	50	50
Full house	9	9	8	10
Flush	6	5	5	6
Straight	4	4	4	4
3-of-a-kind	3	3	3	3
Two pair	1	1	1	1
Jacks or better	1	1	1	1
Payback %	98.98%	97.87%	96.79%	100.07%

Table 9.6 – Double Double Bonus Pay Schedule

	"9/5"	"9/4"	"9/4/4"	"9/5+12(5)"	"10/4"
Royal flush	250/4000	250/4000	250/4000	250/4000	250/4000
Deuces	200	200	200	200	200
Wild royal	25	25	25	20	25
5-of-a-kind	15	15	15	12	16
Straight flush	9	9	9	9	10
4-of-a-kind	5	4	4	5	4
Full house	3	3	4	3	4
Flush	2	2	3	2	3
Straight	2	2	2	2	2
3-of-a-kind	1	1	1	1	1
Payback %	100.76%	94.34%	98.91%	98.94%	99.73%

Table 9.7 – Deuces Wild Pay Schedule

club point bonus situations. Deuces Wild video poker games use a very different play strategies than Jacks or Better, or Bonus games, and probably will attract advantage players specifically attacking Deuces Wild games (see table 9.7).

Table 9.8 – Jokers Wild Pay Schedule

	Classic	Super-pay	Atlantic City
Natural Royal	250/4000	250/4700	100
5-of-a-kind	200	200	800/4000
Joker Royal	100	100	100
Straight flush	50	50	100
4-of-a-kind	20	20	16
Full house	7	7	8
Flush	5	5	5
Straight	3	3	4
3-of-a-kind	2	2	2
Two pair	1	1	1
Kings or better	1	1	No Pay
Payback %	100.65%	101.00%	97.19%

Jokers Wild machines are extremely limited because of their mathematical return to the players. Obviously, the “super-pay” version could be played profitably without perks or cash-back, and the [REDACTED] version is not an option for the knowledgeable player (see table 9.8).

Table 9.9 – All American and Pick’Em Games Pay Schedules

	All American	Pick’Em
Royal flush	250/4000	1000/6000
Straight flush	200	200/1199
4-of-a-kind	40	40
Full house	8	18
Flush	8	15
Straight	8	11
3-of-a-kind	3	5
Two pair	1	3
Jacks or better	1	No Pay
9’s or better	No Pay	2
Payback %	100.72%	99.95%

Pay schedules in table 9.9 represent two different video poker games that are available, which provide the knowledgeable player a break-even game or better. Both games are limited. I’ve never seen an

“All American” game and I’ve only seen a “Pick’em” game on one occasion.

These types of video poker machines provide the advantage video poker player with the ability to gain a long-term advantage over the casino because of their liberal payback percentage and through the proper use of slot club points used to collect cash-back, incidental player comps, and bounce-back mail promotions ([REDACTED], 2002).

[REDACTED], known as the [REDACTED] Comments about video poker and comps:

“Many VP machines, if you learn even a simplified basic strategy, have a casino edge of only about 1% - 1.5%. And this can be lower. For example, the casino edge in 9/6 Jacks or Better is .46% with computer-perfect play, 8/5 Bonus Poker .83%, and 9/6 Double Double Bonus is an even 1%. By using the slot club and comp system heavily, playing the games listed above can get you pretty close to an even gamble. Better yet, players who are skilled in getting the extras can get into positive territory” (2003).

Including progressive video poker jackpots returns to gain an advantage

Advantage players can gain an additional edge by understanding the effect royal flush jackpot payoffs over the normal 4000 coins can provide. There is a simple formula that can be used to calculate addition gains ([REDACTED], 2000):

Schedule payback – 1.1 x short full house and flush pays + 0.5 x number of coins in thousands jackpot is above 4000 coins

Chapter 9: Final Thoughts about Advantage Play

For example: a Jacks or Better progressive machine with 7/5 pay schedule with a progressive jackpot of 12,000 coins would calculate to:

$$99.55 - 1.1 (3) + 0.5 (8) = 99.55 - 3.3 + 4.0 = 100.25$$

In other words, it would take a royal flush jackpot payoff of 12,000 coins before this 7/5 Jacks or Better machine becomes a break-even proposition (based on maximum coins and perfect playing strategy). This formula will usually hold true when short-pay occurs to flush and full house pay categories. Listed in Table 9.10 are the minimum jackpot levels to achieve a breakeven situation for the various Jacks or Better video poker games (██████████, 2000).

Table 9.10 – Minimum Jacks or Better Jackpot Levels to Break-even (in coins paid)

Pay Schedules	9/6	8/5	7/5	6/5
Minimum JKPT	4889	9440	11766	14091

In the past teams of advantage players have attacked progressive slot and video poker machines that gave them a mathematical edge. Sometimes they would take up complete banks of slot machines that were tied into a progressive jackpot that had surpassed the break-even level. What's wrong with advantage players taking up an entire bank of slot machines and inserting the maximum number of coins while playing as fast as they can? Isn't that what the slot department wants? The jackpot is going to hit sometime sooner or later. What's wrong with having a group of customers who are willing to play continually until the pot is won? This is every casino executive's first impression. The increased level of play will produce more gaming revenues until the jackpot is hit. Isn't this the reason why casinos offer progressive jackpots in the first place? Not really. The people playing the progressive jackpot machines

are not really customers. The true customers are the individual players who have built the jackpot up to it's present level by frequent play, not the team of professionals who take over the machine once the jackpot reaches a profitable level. Regular players who have been playing these machines from the start may take exception with being squeezed out of a chance to win the jackpot and this negative situation can go against the casino's reputation of fair play. In the past at the ██████████ we would limit the number of professional players allowed to play on a bank of machines allowing regular players a chance at the jackpot. I've seen a number of slot department managers actually eject professional jackpot chasing teams from their property because of this reason.

Calculating cash-back

Ever since the slot club went to "cash-back" as a marketing tool, they unknowingly assigned the advantage player another weapon for their arsenal. When comping players to free food and rooms was not enough to get the player's attention, giving back cash for points became a reality. As ██████████ the ██████████ says "Gaming wins are iffy; cashback is the surest thing in the casino (2003)". The criterion for earning cash-back has changed over the last several years. In the beginning casinos used a portion of a player's slot play to justify cash rebates but as player interest in cash-back grew (as well as complaints over amounts rebated) specific guidelines were drawn up that spelled out what players had to do get specific levels of rebates.

In an attempt to create a "cloak of secrecy" surrounding their cash-back policies, slot clubs turned to a highly analytical and confusing "point" system to determine a player's "cash worth" based on dollars played and time on machine. No one was sure whether these secret systems were designed to confuse the competition or to confuse the players but in the end the only ones who knew

the exact method for calculating cash rebates were the advantage players. It didn't take long before the slot clubs refined their slot point systems and settled on a common method for calculating cash-back. Presently most slot clubs assign one player point to a specific dollar amount played in a machine and use two different levels for determining how many player points represent one dollar in cash-back. If a customer is playing on a slot machine or short-pay video poker machine some casinos award the customer one dollar of rebate for every 200 points they accumulate. If a customer plays a video poker machine using a full-pay schedule he or she gets the same rebates based on twice the normal points (400) since the machine payback rates hover around the 100% mark (to perfect computer play).

What is this worth to the player? A player who gambles for one hour on a \$1 Jacks or Better 7/5 video poker machine can expect to play 450 games while experiencing a total handle of \$2,250. Based on 400 points equaling \$1 in rebate, that player can expect to earn \$5.63 in rebates. An easier way to estimate a player's return is to simply divide the rebate of \$1 by the number of points since each point is equal to \$1 of play. By doing the calculations we see that

\$400 in play equals 400 points or \$1 in rebate. In other words the video poker player earns a quarter of one percent (0.25%) rebate on every dollar played. If a customer is playing the 7/5 Jacks or Better video poker game with a payback established at 98.01%, his or her actual payback is 98.26% if they collect all their points earned as cash-back.

Several different casinos use different methods for calculating cash-back based on dollars played and points redeemed. To understand this subject better I will refer to an e-periodical that is published by [REDACTED]. [REDACTED] produces a monthly list of casino promotions for various areas of the country. I find [REDACTED] information invaluable and recommend their service (which includes a variety of services and information) to every casino executive who wants to stay up with the gaming industry or to keep a step ahead of the competition ([REDACTED]). Following is a list of several casinos in the [REDACTED] area and their published policies for cash-back and complementary rebates (see table 9.11).

Please notice that not all casinos offer cash-back rebates on play. Several operations are trying to move

Casinos	per 1pt slots	per 1pt VP	pts per \$1	\$ rebate%	Comp rebate%
[REDACTED]	\$ 1.00	\$ 2.00	600		0.08%
[REDACTED]	\$ 1.50	\$ 3.00	100	0.33%	0.33%
[REDACTED]	\$ 5.00	\$ 10.00	100	0.10%	0.10%
[REDACTED]	\$ 1.00	\$ 1.00	1000	0.10%	0.10%
[REDACTED]	\$ 1.00	\$ 1.00	600	0.17%	0.17%
[REDACTED]	\$ 1.00	\$ 2.00	600	0.08%	0.08%
[REDACTED]	\$ 5.00	\$ 10.00	80	0.13%	0.13%
[REDACTED]	\$ 200.00	\$ 400.00	1	0.25%	0.25%
[REDACTED]	\$ 10.00	\$ 20.00	20	0.25%	0.25%
[REDACTED]	\$ 1.00	\$ 1.00	500		0.20%
[REDACTED]	\$ 20.00	\$ 50.00	10	0.20%	0.20%
[REDACTED]	\$ 3.00	\$ 9.00	50	0.22%	0.22%

Table 9.11 - Points and Rebate Policies of Several [REDACTED] Casinos (12/05)

Chapter 9: Final Thoughts about Advantage Play

away from cash-back incentives. These casinos' primary motivation for halting the distribution of cash comes from their desire to lower incentive costs. Although most dollars that are rebated are played back through the machines, the distribution of hard currency represents a hard cost or dollar for dollar cost. Rebates paid out in comps are soft costs because the rebated amount is less than the actual dollar cost. For example: an \$18 buffet dinner probably costs the casino \$10 to \$12 in actual costs but the player looks at the comp as having a real \$18 value.

Some casinos are using different strategies in an attempt to move away from cash-back. In some cases management has elected to distribute cash rebates through "bounce-back" programs. Bounce-back coupons are mailed to their regular customers' home and are used for free play or cash-on-card when they return to the casino over a specific period usually within 30 days. Sometimes the bounce-back coupons are used outside the standard points/rebate tracking system. Normally when bounce-back is used outside the system, the customer's only rebate option is to take their earned points in comps only. Almost all bounce-back coupons are used as marketing tools to provide the players with an incentive to return back to the casino on specific dates set by the management.

Many [redacted] casinos are offering cash-back rebates that cannot be collected on the date that they are earned. In this manner the customer redeems the cash-back on their next trip, increasing the chance that the cash will be played back through the machines and not carried out the casino door. One [redacted] casino offers cash-back but requires the customer receiving the rebate to play it through a machine once before they can convert the rebate into currency.

Although [redacted] do not offer cash-back, they offer a very interesting option in their "Jumbo Jackpot". This enterprise-wide jackpot is a progressive amount tied to all play throughout all [redacted] casinos. It possesses two award methods. First, the winner of the jackpot can win up to \$150,000 (if the jackpot reaches 150,000 it is forced through a regressive award-level system). Second, anyone playing a slot or video machine on any of their properties (including both [redacted] casinos) with a [redacted] club card inserted in their machine card reader will receive \$50 the moment the Jumbo Jackpot is hit. How an advantage player would calculate the true cash-back value of this promotion is beyond me. However, I can imagine there are advantage players who monitor the jackpot limit and have established some advantage edge angle.

Reflecting back to table 9.11, we note the factor used to calculate the percentage of cash-back rebate and see how these factors translate into an additional percentage of payback return. As you can see the levels of payback return on video poker machine play in the [redacted] area vary from 0.08% to 0.33% for every dollar wagered. These variations are due to the philosophies of the host casino and their interpretations as to what motivates their players for a specific cost of marketing. The consensus appears to place a medium payback for video poker play in the area of 0.20%. It can be assumed that percentages greater than 0.20% would be more attractive to the professional video poker player. Higher percentages don't always represent a lack of understanding of player reinvestment by management but can indicate the casino has a shortage of full-pay video poker machines.

Another method for establishing slot player points is by relating point accumulation to the amount of money paid to the players as wins. For example: [redacted] calculate points on a one-to-one basis with the amount paid out as winners by the machine.

If the player receives winning hands paying \$1,000 during an hour of play, the customer receives 1,000 points. These points can be redeemed for cash-back or comps at a rate equivalent to \$12 for 4,000 point or a cash-back percentage return of 0.30%. Because we can still compute the percentage of return, the advantage player can determine this method of rebate's effect on their estimated payback percentage return.

Another factor to consider is the affect that bonus point promotions have on the video poker machine payback percentage return. Most casinos offer bonus point days or time periods that are stated as multiples. It is standard for casinos to offer "2X" (two times) and "3X" bonus points on a regular basis in order to attract customers during slower periods. At the writing of this book the [REDACTED] was offering "5X" bonus points on Sundays and "2X" bonus points from midnight to 8 AM Mondays through Saturdays. Obviously management is trying to entice customers to play during their slowest day and during their slowest time period. The [REDACTED] takes bonus promotion one step further by offering "2X" bonus points on Tuesdays and Thursdays on all slot and video poker machines but restricts their "5X" bonus point promotion on Wednesday to slots and short-pay video poker machines. Several casinos offer "6X" bonus points on specific dates in an attempt to increase play on historically slow business days or dates projected to have a low occupancy rate in the hotel.

Calculating advantages

Super-pay and full-pay video poker machines paying back 100% are few and far between. Several periodicals such as [REDACTED] or websites like [REDACTED] video poker homepage [REDACTED] keep track of all the 100% + machines and provide the slot advantage players with a monthly updated list of these juicy VP games. Even armed with this knowledge there still aren't enough 100% + payback machines available that alone would support a long-term advantage play video poker customer. Because of this the advantage video poker player must come up with other extra advantages to make playing video poker worthwhile. This is accomplished by combining full-pay video poker machine play with cash-back and other casino perks offered either as a direct promotion or an incidental incentive.

To assist the player in accomplishing this task they must first join the slot club or clubs where profitable full pay machines can be found. In addition many casino slot clubs offer special promotion directed at attracting new customers. Management of some casinos place a high priority in signing up new customers and use extremely lucrative signing bonuses to entice new customers and customers who have not returned to that casino over the last year. These promotions can add as much as \$500 in redeemable cash-back to any new member who earns the equivalent in points during the first month of play ([REDACTED], 2003).

Normal Payback Value	2X	3X	5X	6X
0.20%	0.40%	0.60%	1.00%	1.20%
0.25%	0.50%	0.75%	1.25%	1.50%
0.30%	0.60%	0.90%	1.50%	1.80%

Table 9.12 - Value on Bonus Point Dates as a Percentage of Payback

Chapter 9: Final Thoughts about Advantage Play

Table 9.13 - Calculating Real Advantage Player Payback %

Payback of target machine	99.55%
% of cash-back (full-pay machine)	0.25%
Estimated % of comps	0.10%
Estimated % of Bounce-back	0.20%
Promotion: 3X points	0.50%
Advantage Player Payback	100.60%

There is probably more advantage players in the slot department than there will ever be found lurking around the live games. This group of professional video poker players is considered for the most part as "the cost of doing business". Since this type of player is seeking either a break-even situation or a slight advantage at best, most casinos basically ignore their presence. They just blend in with the other regular slot department customers. The most important point to this section is to do with the effect all the different promotions and rebates have on the profit potential of the slot floor. Multiple bonus point days might drive more revenue but is the revenue worth the cost of creating additional business? It may be wise to put pencil to paper and see exactly what the trade-off is between cost and revenue from time to time and to periodically examine department revenue (gross) versus department income (net) margins.

Something you wouldn't think about

As a common courtesy many casinos either insert or rack up five coins on a player's video poker machine after making a payoff by hand. This is considered a small perk for the player since he or she gets a free play on their next hand. Most casino executives feel this procedure works great to enhance customer relationship because practically all hand pays on quarter machines occur on royal flush jackpots. I agree with this policy where quarter

machines are involved since the royal flush is the only payoff that is over the taxable plateau of [REDACTED] and requires human intervention. The casino creates a problem when this policy is carried forward to higher denomination machines. On a \$10 Jacks or Better machine hand payout are necessary when the player receives a 4-of-a-kind or better. The casino is automatically giving the player a five coin bonus (\$50) every time he or she hits a 4-of-a-kind, straight flush or royal flush if this procedure is in affect. In his book titled [REDACTED] (2003), ex-advantage player and video poker expert [REDACTED] tells about a situation he encountered at a casino in [REDACTED]

"On one occasion (casino's name omitted) put in a \$100 machine with a horrible pay schedule - it must have been 7/5 Jacks or Better. This game returned 96.15%, which means it costs about \$19 to play one hand. But if you throw in a generous salting policy, this game gets real good real fast. Due to the policy..., players were getting an extra \$500 for every 3-of-a-kind, straight, flush, full house, 4-of-a-kind, straight flush, or royal flush, making it one of the most lucrative games ever - a 107%+ return worth more than \$35 per hand. If you could get 30 or more hands an hour (the low number is due to the frequent hand pays), the hourly return exceeded \$1,000! ([REDACTED], 2003)"

Probably the most important lesson learned through [REDACTED] narrative is that every extra coin awarded to the player adds up. Many times special promotions are devised to drive business but what they really drive are costs (not to mention attracting the professional slot players).

Thoughts about problem solving concerning live games

On a number of occasions I have been asked what steps I take when I examine suspicious casino play. What paths do I take to properly analyze play either during or after a player has walked away with thousands of dollar and common logic can't explain what had happened? The two most important steps a casino executive can take are to (1) collect all the information you can involving the suspected player and the play and (2) break the different characteristics of the play down to basic elements and keep asking the question "why?"

For example: a \$100 black check player has been coming into your casino and beating double deck games on a regular basis. The player is brand new to your property and has just recently received a player's card. The player always comes into the casino late at night, looks for a dead double deck game and always sits in the first or second seat. He is betting small amounts at first and then progressing up to several hundred on two to three hands, never playing longer then two hours. During his play one of your floor supervisors claims he is joined by two or three other players that she doesn't think play on any other table then the one that he occupies.

You and your shift manager have reviewed his play and at first have come to a tentative conclusion that he might just be "very lucky". During the observed play it seems like the dealer can never make a hand while the big player plays a very weak strategy for hitting but doubles down on many hands that would be considered poor playing. While reviewing the video of his play, one of your surveillance operators points out that the player and the other customers at the table have a tendency of picking their cards up one at a time. The operator has also observed that whoever sits in the last table position always seems to be an extremely terrible player because he has

seen that person hit hard seventeens and stand on soft hit-able hands.

At this point break the play down into a series of different elements. For instance:

- The player comes in late at night, finds a dead game and sits in the early positions
- The player also plays a double deck game even though there are a lot more shoe games
- The player progressively increases his bets
- The player quits within two hours of beginning
- He might be joined by the same players each time
- The player stands short and doubles and splits more then normal
- The one or more players at the table pick their cards up one at a time
- The player sitting in the last seat plays much different then normal

Once you have listed all the elements of his playing characteristics then start asking a series of "why" questions. Why does he play late at night? Why does he like dead games? Why does he sit in the first few seats? Keep asking yourself these questions. Remember, some questions might have several logical answers. List the answers for each question and see if different answers relate to answer compile from other questions. Then keep asking "why" questions. Why this and why that? Why is he standing short and doubling down aggressively?

Some question will lead to further investigation. Consider the other players at the table. "Why do they play on the same table?" "Are they the same players?" Going back and reviewing the video are you able to recognize the same players who rotate between sitting on the end of the table and playing several hands in the middle. You also ask yourself "What was funny about the way they picked up the playing cards?" After reviewing the video you notice

that all the players including the big player have a habit of turning cards in their hand. "Why do they turn the cards? Why would it make a difference?"

Things start to make sense especially after you ask yourself, "Why does the player at last position play such an erratic strategy?" Then you realize his unusual play has to be related to the dealer's inability to make hands. "Why is there a connection? Is the player varying his play in order to provide certain cards for the dealer that will make him bust out? If this is the case the cards must be marked so that the third base player knows their identity, but how are they marked? Are they marked while on the table? Are the players marking the cards or are they marked already?"

Based on these questions you look at a deck of cards that has been in play and have come off the table in question. After performing a series of tests you notice during the riffle test the edge of the cards appear to jump around. "Why is that happening and why is it on all the edges?" Then you notice the cards have been cut poorly and the diamonds edges aren't symmetrical. Now it all should fall into place. The big player is part of a team that is playing "sorts" and you arrived at this solution based on the questions you asked yourself. By following up on your assumptions and testing your hypothesis you should be able to confirm the presence of advantage play and with a simple turn of half the deck during the shuffle, correct the problem.

Unfortunately, all problems aren't that easy to solve but if you follow that line of thinking and ask the right questions you should come up with an answer for a majority of your perceived problem. Remember a majority of the time the solution to the problem is that no problem exists and the game's natural fluctuation is the culprit. One last thing to add—more heads are better than one. I've found that using a round table question and answer session

with one or two other persons works the best. Many times you will mentally establish parameters that provide subconscious barriers that doesn't allow you as a single person to analyze the situation properly. By involving others with different view points the solution to any problem will be achieved much quicker and with a greater degree of success than "going it alone".

Cost of losing a player

This next and final part of this text begins with an exam question I developed to help test a floor supervisor's ability to properly protect their blackjack games. This question was one of twenty-one questions that covered areas of card counting and advantage play. (Note: The article containing these questions can be found on my website: [REDACTED]). Here's the question:

If you see that a player who is standing by a 21 table and, after a while, suddenly makes a big bet, the first thing you as a pit boss should do is:

- A.) Take some time and analyze the play
- B.) "Break" the deck
- C.) Cut the shoe (or deck) in half from now on
- D.) Tell the player that you don't want his play

When I ask supervisors and casino executives this question during classes and seminars I get every answer except the correct answer. Many supervisors and casino executives are quick to make snap judgments in order to protect the bankroll, forgetting they may be insulting a good customer who can represent plenty of future revenue potential. The

most common answer given for this question, "Tell the player that you don't want his play" or can't play until the cards are shuffled at the end of play. Amazing!

This question deals with a customer who is standing by the table and jumps in with a big bet. It's always assumed he must have been counting the deck down and has just noticed a high positive count. Why else would the player plunge in with a big bet? But if he is counting and finds an extremely plus situation he's all but guaranteed to win the hand, right? Wrong.

If he is counting cards in this situation, the highest "true count" he can expect to achieve on a six deck shoe game is around a +8 using a single parameter count system (notice I stated it as a true not running count). This occurs about once every 200 hands in the six deck game and translates into a player edge of 3.5% (1987). Wait! 3.5% edge? That's not a guarantee. That's less than the casino's house advantage on even money bets on the roulette table. If a player places a wager on black is the casino guaranteed to win it? No. So what does this percentage tell us? Don't sweat the small potential loss situation. What's it going to cost the casino if we're wrong and the player is counting and making a big bet in a plus situation; practically nothing or \$3.50 per hundred dollars wagered. What's the best answer to the question? "Take some time and analyze the play".

Today more and more supervisors and casino executives are gravitating toward the philosophy of "analyzing the play" instead of immediately labeling suspect players as "persona non grata". What about the players who are given the boot unjustly? What does that cost the casino in lost revenue? Back in the early 80's I worked with a casino owner who prescribed to the theory that anyone moving their money in an up and down manner had to be counting cards. He wanted anyone who the pit even suspected

of card counting ejected from the property. "Don't worry about throwing someone out; there will be two more new customers walk in through the front doors when you do". I believe this argument held little validity then and I definitely know it doesn't in this day and age. In today's highly competitive gaming market every player is valuable. If a player is ejected or harassed to a point where he or she will never come back to your establishment, the loss will cost your operation revenue today and in theory for a number of years into the future as well.

Based on the previous example, let's say management has put pressure on the live game manager to maintain no less than a specific hold percentage and let's say this live game manager has put even more pressure on his management staff to produce. This type of negative motivation always breeds paranoia and the floor supervisors will probably be looking for anyone who might represent a threat to the casino's bankroll (especially an unknown player who jumps into the middle of a six deck game with a handful of one hundred dollar chips).

Now let's look at this from the player's standpoint. This player doesn't like to just walk into a casino and sit and play but he likes to walk around until he finds a friendly dealer. This customer loves to gamble and has plenty of disposable income and has a good personal income flow with a bright future at the company that he is employed. The only problem is he likes to wander around a new casino just testing the water, looking for a fun table with a dealer who will make his stay on the table an enjoyable experience regardless of whether he wins or loses. After buying in for chips and testing his luck once or twice he spies a blackjack shoe game that seems to have a group of players and a dealer having a great time. So he approaches the table and watches for several hands. Then he decides to enter the action, says "hi" to everyone and proceeds to make a \$200 bet. Just then he notices a floor supervisor give him

Table 9.14 - Player's Worth per Trip

Average Bet	\$100.00
Time playing per trip	12 hours
Estimated house advantage	1.3%
Player worth per trip	\$936.00

a suspicious once over and whisper something to the dealer. Suddenly the atmosphere at the table turns cold, especially the dealer's attitude, and he decides that maybe this isn't the best table after all for his tastes. He soon notices that every table he goes to turns "unfriendly". Since this casino seems to be cold and unfriendly, the player cashes out his chips at the cage and heads elsewhere. The games pit manager lets out a sigh of relief because a suspected advantage player just got the message that he won't be able to ply his trade at "his" casino and decided to take his action elsewhere.

Whether a casino runs a potentially good player off verbally or through their actions really isn't important. The fact that they have miss-diagnosed the situation and that the player will never again enter their establishment becomes a problem. So

what's the cost of losing this potential player? First, we must establish some parameters of play regarding what the players' worth based on his average bet and time played per session.

Based on this information we can assume that this player will be worth \$936.00 every trip he makes to the casino. If he makes six trips to the casino per year we can calculate his annual worth to be approximately \$5,600. This means that our casino had just mistakenly ran off one player who might be worth about \$5,600 over the next year, not to mention an undeterminable number of years to come. This doesn't seem like that big a deal, right? But what happens if your casino chases away one player like this a month? Or what about one player a week? It's easy to see a problem of this kind can escalate quickly into thousands if not hundreds of thousands of potential revenue chased down the street to the competition. As a casino executive, make sure that your desire to raise the hold percentage or avoid advantage players and card counters does not translate into unacceptable revenue potential chased out the door. Remember: in the casino business knowledge is king and patience is a virtue.

Appendix A – Optimal Hole-Card Strategy

[Taken from (1980, p.206)]

Dealer's Hand	Hit till Hard	Hit till Soft	If Possible Surrender Holding	Double Down	Pair Split
Hard 20	20	20	5 - 9; 12 - 17; A5 - A8; Pairs	-	-
Hard 19	19	19	12 - 16; 7, 8, 4-4, 7-7, 8-8	-	9
Hard 18	18	19	-	-	2, 3, 7, 8, 9
Hard 17	17	18	-	-	2, 3, 6, 7, 8
Hard 14 - 16	12	18	-	5 - 11; A2 - A9	All except 5's
Hard 13	12	18	-	7 - 11; A2 - A9	All except 5's
Hard 12	12	18	-	8 - 11; A2 - A9	All except 5's
Hard 11	15	18	14, 15, 16, 7-7, 8-8	-	A
Hard 10	16	19	15, 16, 7-7, 8-8	11	A
Hard 9	17	19	-	10, 11	A, 8, 9
Hard 8	17	18	-	10, 11	A, 7, 8, 9
Hard 7	17	18	-	10, 11	A, 2, 3, 7, 8
Hard 6	12	18	-	9, 10, 11	A, 2, 3; 6 - 9
Hard 5	13	18	-	10, 11, A2 - A8	A, 2, 3; 6 - 9
Hard 4	14	18	-	10, 11, A6, A7	A, 7, 8
Ace-9	20	20	-	-	-
Ace-8	19	19	-	-	9
Ace-7	18	19	-	-	2, 3, 7, 8, 9
Ace-6	17	18	-	-	A, 2, 3; 6 - 8
Ace-5	13	18	-	9, 10, 11, A6, A7	A, 2, 3; 6 - 9
Ace-4	13	18	-	10, 11	A, 2; 6 - 9
Ace-3	14	18	-	10, 11	A, 7, 8
Ace-2	15	18	-	10, 11	A, 7, 8
Ace-Ace	16	18	-	11	A, 8

Appendix B - Warp Hole-Card Strategy 2-9

Taken from [REDACTED] (2000, pp.200-201)

Warp Hole-Card Strategy

(Hands that Deviate from Basic Strategy the Dealer's Hole-Card is 2-9)

No Doubling after Splitting

		Dealer's Up-card									
		2	3	4	5	6	7	8	9	T	A
6,6			H								
3,3				H							
2,2				H							

Doubling after Splitting

		Dealer's Up-card									
		2	3	4	5	6	7	8	9	T	A
7,7								SP	SP		
6,6							SP				
4,4					H	H					
3,3	H							SP			
2,2								SP			

Both Doubling and Not Doubling after Splitting

		Dealer's Up-card									
		2	3	4	5	6	7	8	9	T	A
Soft 17			H				DBL				
Soft 16				H							
Soft 15				H	H						
Soft 14					H						
Soft 13					H						
Hard 16										SUR/S	
Hard 15										H	
Hard 12				H							
Hard 10										DBL	
Hard 9			H				DBL				
Any 2 Cards											Don't Insure

H = hit • DBL = double down • SP = split • SUR = surrender • SUR/S = surrender; otherwise stand
 Don't Insure = don't take insurance when dealer has shows an ace

Appendix C - Warp Hole-Card Strategy 10/A

Taken from [REDACTED] (2000, pp.202-203)

Warp Hole-Card Strategy

(Hands that Deviate from Basic Strategy the Dealer's Hole-Card is 10/A)

No Doubling after Splitting

	Dealer's Up-card									
	2	3	4	5	6	7	8	9	T	A
8,8								SUR	SUR	
4,4				SP	DBL					
3,3		SP								
2,2		SP								

Doubling after Splitting

	Dealer's Up-card									
	2	3	4	5	6	7	8	9	T	A
8,8								SUR	SUR	
5,5							H	H		
4,4		SP	SP		DBL					

Both Doubling and Not Doubling after Splitting

	Dealer's Up-card									
	2	3	4	5	6	7	8	9	T	A
Soft 18	DBL/S						H			
Soft 17	DBL									
Soft 16	DBL	DBL								
Soft 15	DBL	DBL								
Soft 14		DBL	DBL							
Soft 13		DBL	DBL							
Hard 15								SUR		
Hard 14									SUR	
Hard 13									SUR	
Hard 11							H	H	H	
Hard 10							H	H		
Hard 9	DBL									
Hard 8				DBL	DBL					
Any 2 Cards										Insure

H = hit • DBL = double down • SP = split • SUR = surrender • SUR/S = surrender; otherwise stand
 Don't Insure = don't take insurance when dealer has shows an ace

Appendix D - Conservative Tell Strategy

Taken from [REDACTED] (2000, p.177)

Conservative Tell Strategy

(Hands that Deviate from Basic Strategy when Dealer Signals "Pat" or "Stiff")

Player Hand	DLR Pat	DLR Stiff
ace-ace	H	SP
T,T	bs	bs
9,9	bs	bs
8,8	SUR/H	SP
7,7	SUR/H	bs
6,6	H	H
5,5	H	DBL
4,4	H	H
3,3	H	H
2,2	H	H
Soft 19 +	bs	bs
Soft 18	H	bs
Soft 17 -	H	H
Hard 17	bs	bs
Hard 16	SUR/H	bs
Hard 15	SUR/H	bs
Hard 14	SUR/H	bs
Hard 13	H	H
Hard 12	H	H
Hard 11	H	DBL
Hard 10	H	DBL
Hard 9	H	H

H = hit

DBL = double down

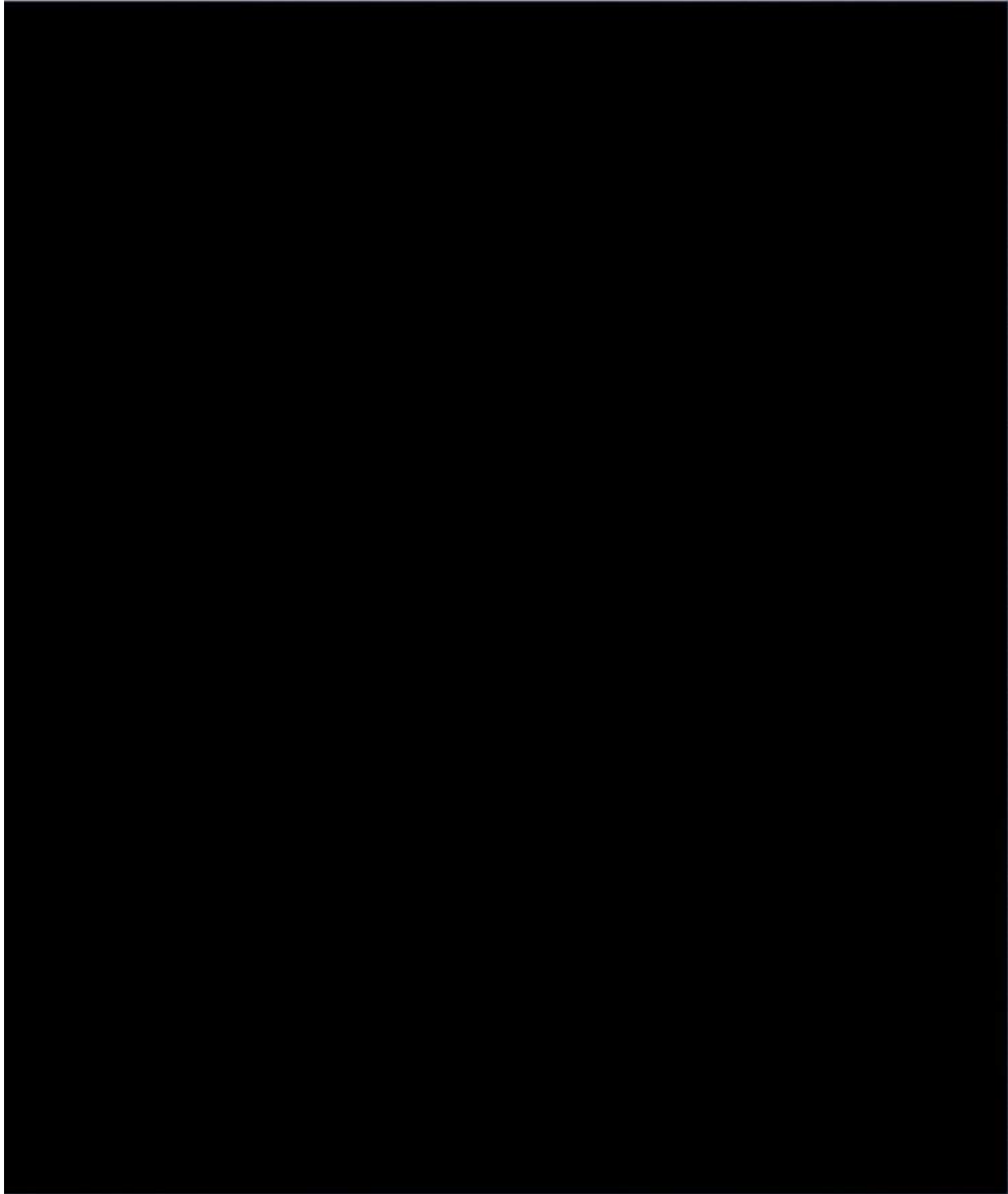
SP = split

SUR = surrender

SUR/H = surrender; otherwise hit

bs = play hand based on basic strategy

References



About the Author

As former [REDACTED] Gaming Control Agent, casino operator, professional card counter, and present gaming consultant, [REDACTED] has been involved in various areas of gaming and hospitality since 1976. In the past, [REDACTED] has instructed courses on game protection, card counting, advantage play, and gaming operations at various colleges and institutions throughout the country. As a member of [REDACTED] was an owner and operator of the [REDACTED] Hotel and Casino, and has additional operational experience in card room casinos in [REDACTED]. Besides his practical gaming experience, [REDACTED] holds a Bachelors degree in Hotel Administration and a Masters in Business. As a gaming author [REDACTED] has penned five non-fiction books on gaming including [REDACTED], [REDACTED].

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