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GOLF TODAY

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2003

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Here's How to Tune the Magic Driver

by Leith Anderson

LAST MONTH I USED our Golf Achiever launch monitor to pare a bag full of drivers down to four candidates for the new Magic Driver. The selection criteria were carry distance, clubhead speed, ball speed, launch angle, spin rate and several indicators of accuracy. I compiled the results of several test sets of ten drives each recorded with the Achiever. If you missed that article in *Golf Today* and can't find a back issue, you can download a copy from www.calgolftech.com.

After hitting several hundred drives with seven different drivers over a four-day period, performing modifications and then testing each club at the range the survivors were:

- Titleist LFE 9.5°, stock ultralight, PCS Equalizer 6.6 flex at 45°
- Nicklaus JNP 8.5°, SK Fiber Lite Revolution, PCS Equalizer 6.3 flex at 45°
- Sonarte Super CV 10°, stock Penly, PCS Equalizer 6.7 flex at 44.75°
- La Jolla 350 9°, Fujikura Speeder 757, PCS Equalizer 5.8 flex at 45°

THE SHORTCUT TO FINDING THE MAGIC DRIVER

After working with the Achiever for the last couple of months, I'm impressed with the accuracy of the data and the incredible efficiency of using a launch monitor to measure and compare the performance of seven different clubs. I have often felt sorry for golfers (including myself) who took an armful of drivers to the

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range and tried to choose among them by hitting balls into space. The most obvious problem is that if you're trying to find the one that goes the farthest you can't see where the ball is coming down at 200+ yards out. You also can't see the effect that trajectory might have on roll. In addition, if you slap shots randomly, before long you can't even remember which club is giving the most consistent results. It's really just blind luck if you pick the best one. The correct method is to winnow the choices down to two or three, based on measured performance. Then, you must take the club to a course that you play regularly and see where you end up in play. It's better to be disappointed before you pay your money than after.

TUNING THE MAGIC DRIVER

The idea for this month was to see how much a stock driver can be improved after you decide that it is "the one." Tuning is something that you can do with a driver, after you are satisfied that the shaft flex is good, trajectory is good and distance is great. This is not about finding a driver you can play with, it is about making the driver that you are playing with better.

I was hoping that by using the Achiever, I would be able to measure the effect of the tuning modifications and quantify the actual improvement, if any, in the performance of the new Magic Driver. I was able to do just that.

"Tuning" by my definition involves two operations. First, I planned to realign the shafts in their most stable plane to promote consistent feel, better control and increased average distance from solid contact. In my world, this is SST PURE™, a patented procedure invented by Dick Weiss, the founder and president of Strategic Shaft Technologies (SST). Second, I planned to add counterweight to the grip of the club to change the balance to

improve feel and top off the distance.

I made the arbitrary decision to keep things simple by tuning just two of the drivers from the first round of testing. All of the candidates from the first round were formidable, but I thought that the Sonarte and the LaJolla would take too much work to finish fitting the shafts for flex to be included in this month's article. I decided to focus on the Titleist LFE and the Nicklaus JNP. We'll come back and work with the other combinations.

My middle name should be

"Byron." Over a month's time, I hit almost 200 drives with the two drivers and recorded every one. First, I hit several sets with each driver to provide a baseline. Then, I PURE™d the shafts and took another set of data. Finally, I added the Balance-Certified counterweight system and tested each of the weights. The results were surprising.

I need to make my disclaimer. I'm not presenting this exercise as scientifically correct. However, it is the kind of testing that any golfer with access to a launch monitor can do himself. It only takes a few hours. In that way, it is a realistic test. For anyone who is interested, the spreadsheets with the complete data are available on my website. Go to www.calgolftech.com if you want to see all of the detail from each of the sessions.

SST PURE™

It might sound like voodoo that you can take a shaft out of a golf club, test it, and then reinstall it in the club in a new position and improve performance. It turns out that this procedure was a "dirty little secret" among leading edge clubmakers for years. The problem was that USGA rules prohibited realigning shafts until very recently so any clubmaker who tried to make a better set of clubs by "spinning" the shaft was forced to keep a secret between himself and his customer.

About six years ago, Dick Weiss set out to invent a method to "PURE" the shafts in a set of clubs by using computerized instrumentation. Along the way, he had to convince the USGA that realigning shafts in a set of clubs should not be against the rules as long as the result was to "neutralize" the natural inconsistencies in shafts. The USGA bought the argument and issued a ruling that SST PURE™ technology was legal.

Today, PURE™ is a well-accepted procedure with a solid following among touring professionals. Over 300 PGA, LPGA and Champions Tour professionals have had their clubs PURE™d. About two-thirds of the current PGA Tour has had their clubs PURE™d. It is a procedure that is gaining momentum rapidly. A few years ago, you would get a lot of argument from clubmakers about whether orienting the shaft was worth the trouble, whatever they might have called the procedure. Today, there is little argument. Clubmakers believe that shafts need to be aligned properly in the club. The main value of the SST PURE™ system is that it is the only computer driven engineered system on the market. As such, it is much more precise than any other method.

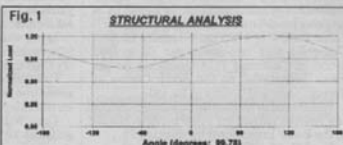
I was looking for some physical indication that would prove that PURE™ actually changed the performance of the club and I found it. With the LFE, there was a dramatic decrease in sidespin that occurred immediately after PURE™ing. I concluded that was the result of stabilizing the shaft. Other accuracy indicators were positive, but not as dramatic. These included launch angle, and some Achiever accuracy indicators. At the range and on the golf course, my main conclusion was simply that the shots felt more solid and I had no catastrophic misses. There were no distance surprises because the course was

still playing wet and long so we're not close to summer distances.

HOW PURE™ WORKS

—THE FIRST TEST

Golf shafts are inconsistent. The first SST test is designed to measure that inconsistency. The butt of a shaft is clamped in a lathe chuck and tensioned at the tip under a load cell. The shaft is rotated 360° and the results are measured and graphed. (For an example



graph, see Figure 1.)

The graph reveals two important facts about the shaft. First, it shows how consistent the shaft is. The presentation measures the force exerted around the circumference of the shaft. A perfect shaft would graph as a straight line. In that case, the force exerted by the shaft would be exactly equal around its circumference. This never happens. The SST system expresses the inconsistency in terms of a percentage. In the example shown in Figure 1, there is approximately a 7% variation in "strength" around the shaft. This might result in as much as half a flex difference just depending on how the shaft gets placed in the clubhead.

The second fact that the system reveals about the shaft is precisely where the shaft exerts the most force. In the SST system, this is called the "hard side." In the example graph, this point is located at exactly 99.78 degrees. The computer remembers this position.

The basis of the SST patent and subsequent USGA ruling is that the hard side should be located in the line of flight to promote stability in the shaft. If you think of yourself as addressing a shot, the line of flight position would be at nine o'clock.

There are some competing opinions put forth by clubmakers that assert the hard side (or spine) should be located in a different position, sometimes at 12 o'clock and sometimes at 3 o'clock. It is important to note that no scientific testing has been performed to prove these theories. The only USGA sanctioned procedure is the SST procedure. The only meaningful testing to prove the benefits of PURE™ in ball striking have been performed by Golfsmith utilizing the SST system.

THE SECOND TEST

With the "hard side" located in the line of flight, the computer then takes over to find the precise position where the shaft is in its most stable plane.

To fully understand this second operation, you might try an experiment yourself. If you clamp the grip of your driver in a vise with the toe at 12 o'clock and then pull the shaft back horizontally, you will make the club oscillate in the same plane as hitting a golf ball. What you are likely to see is that the head of the club will "bounce and wobble." This is because the torsion inside the shaft causes it to distort, sometimes in wild patterns. Just such a pattern is shown in Exhibit 2.

The second phase of the SST PURE™ procedure begins by testing the shaft in the position that it comes out of the club. In the example shown in Exhibit 2, the shaft vibrates wildly, distorting by almost an inch. From there, the computer finds the orienta-

tion where the hard side is located in the line of flight and proceeds to "look" up and down from that position a few degrees at a time until it finds the most stable plane. This position is illustrated in the flat line graph of Exhibit 2. The beauty of the SST system is that finding the stable plane is instrumented. This is impossible to accomplish with the same accuracy using only the naked eye.

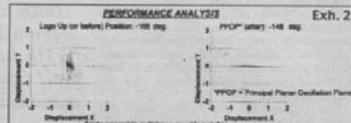
To sum up the SST PURE™ procedure, it's a two step process. The first step is to find the "hard side" of the shaft and locate that in the line of flight. The second step is to find the point with the hard side in the proper position where the shaft will oscillate in its most stable plane. The shaft is then reinstalled in the club in its most stable orientation.

BENEFITS OF PURE™ A SHAFT

The idea behind PURE™ a shaft is that by locating the hard side in the line of flight, each shaft in the set will feel as much like every other shaft in the set as possible. Inconsistencies in shaft flex are eliminated. By finding the most stable oscillation plane, the shaft will distort less during the downswing. The result is that you hit the ball closer to the center of the clubface.

In real life on the golf course, this means that you will get better AVERAGE distance because you hit the ball more consistently. I have already noted that in my testing this was reflected in a dramatic decrease in sidespin. I think that the electronic evidence shows that the ball goes straighter as a result of PURE™ing. This testing data was confirmed outdoors at the range and on the course.

For more information on PURE™ing, you can go to the SST website at www.pureshaft.com. Golfsmith International has done the most scientific testing. You can find those results at www.golfsmith.com.



ALTERING THE BALANCE OF THE MAGIC DRIVER

In the last few months, I have written about the Balance-Certified Golf Company and their Pro-Balance System. A simple description of the Pro-Balance system is that it is an easy way to backweight a golf club. Backweighting is placing one to two ounces of weight under the hands, preferably as close to the end of the grip as possible. The Pro-Balance System does just that.

The most likely question you might have is "Why would you want to do that?" Readers of my generation would remember that backweighting has been discussed since Jack Nicklaus popularized the concept back in the sixties. I recently found out that Jack only stopped backweighting his clubs a few months ago.

Here is what we have found out in the last several months of testing and play. Backweighting definitely changes the feel of the club. Some players describe it as "more solid." Some describe the feeling of weight in the grip as promoting the ability to "drop it in the slot." We have heard dozens of different descriptions. The testing that we have done clearly shows that backweighting increases the ball speed off the face of the club. We use the system to gain the last few yards of distance after every other tuning technique has been applied. For our purposes, we were trying to get more distance "for free."

The principal advantage of the Pro-Balance system is its simplicity. It consists of a machined adapter that fits down in the shaft.

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Tuning the Magic Driver

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of the club. An opening is cut through the butt end of the grip to provide access for a set of interchangeable weights. The adapter weighs 25 grams. The weights come in 5, 10, 20 and 30 gram sizes. By installing weights, you can add from one to two ounces at very end of the grip.

A common question is "What about swingweight?" It is true that adding weight at the grip lowers swingweight as measured on a swingweight scale by about one SW point for each four grams of additional backweight. However, swingweight is meant to measure "head feel". Because of the location of the weight, the feel of the head in your hands does not change. I think of backweighting as providing a little additional leverage.

The surprising result of the testing that I just completed is that results are very sensitive to the amount of weight used. As I experimented with different weights, I found that my results might not improve with certain weights, and in some cases might deteriorate.

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Specifically, the 20-gram weight that I thought felt the best resulted in a decrease in swing speed and consequent decrease in distance. The 5-gram weight was a little better. The surprising result came with the 10-gram weight (counting the weight of the adapter, a total of 35 grams or a little under 1.5 ounces.) The right weight gave me an extra five yards with both drivers. Frankly, that result was surprising. I simply can't understand why a 5-gram difference would produce such a different result. What this experiment does show is that a very small adjustment in balance can produce a significant result measured in additional distance. "Why" is part of the mystery of golf.

QUANTIFYING THE RESULTS

Here's what happened. I established a pretty consistent baseline. One of the nonscientific choices that I made is I switched balls. I was interested in whether a "seamed" Titleist tested differently than a Titleist in random orientation. I clearly introduced an extra variable into the system. In at least one case, with the Callaway Red, it appeared that the ball alone made a significant difference in the results. I'll answer this question next month by conducting a ball test. Now that we have the Magic Driver and we know exactly what performance to expect, it will be a simple

matter to hit a few hundred drives with different balls and record the results. "Ball fitting" will be a better way to answer the question "which ball works the best for me?"

The data shows that PUREing has no provable effect on distance but a clear effect on factors that indicate increased accuracy such as decreased sidespin. Sidespin was reduced by over 60% with the LFE. The data presented physical evidence that PUREing improved accuracy, as has been the claim. I would like to say that it improved feel, but you can't quantify that.

The data also shows that the Pro-Balance System, with the correct weight, increased swingspeed, ball speed and carry distance for me. Swingspeed increased by one or two miles per hour. Ball speed off the face increased by four or five miles per hour. Carry distance increased by five to seven yards, a factor of two to three percent.

The caveat is that it was very important to get the right weight. I don't think it would be possible to determine which weight performed the best without a tool like the Achiever. If you intend to optimize the Pro-Balance backweighting system, you will need access to a launch monitor.

THE DATA—BEFORE AND AFTER—TITLEIST LFE WITH STOCK UL SHAFT

The following table presents the first and last data set from the LFE. The complete data are found on the Golf Lab website. Small increases in swingspeed and ball speed resulted in a 3% increase in distance. Pretty

Table 1	Feb 8 03	Mar 10 03
		PURED 10g
Ball Speed	149	153
Club Speed	110	112
Distance	236	244
Launch	12.3	12.3
Backspin	3645	3733
Sidespin	751	2
Swing Path	-2	-3
Face Angle	4.4	-2.7
Face Impact	7/3/0	4/6/0
Flight Time	6.9	7.1
Off Line	44	-11.2
Distance to Pin	133.8	52
Smash	1.34	1.35
2.2 % TMX	97	97.9

cool results for simply tuning a driver I already thought was great. The accuracy indicators such as off line and distance to pin increased dramatically. The shot pattern changed from a fade right to straight. More

testing would be interesting, but like we used to say: "where there's smoke..."

THE DATA—BEFORE AND AFTER—NICKLAUS JNP WITH SK FIBER LITE REVOLUTION

The JNP data was similar. Over the course of the tuning exercise, we managed to squeeze an extra nine yards of distance out of the driver. That's a 3.7% increase from tuning. Accuracy indicators such as sidespin, off line and distance to pin also showed marked improvement. The tuned driver is a better performing driver.

Table 2	Feb 8 03	Mar 10 03
		PURED 10g
Ball Speed	150	154
Club Speed	111	114
Distance	237	246
Launch	13	13.3
Backspin	3299	3389
Sidespin	539	209
Swing Path	-2	-4
Face Angle	1.9	-2.5
Face Impact	6/3/1	3/7/0
Flight Time	6.8	7.1
Off Line	26	-3.1
Distance to Pin	100	44
Smash	1.35	1.35
2.2 % TMX	97.1	98

THE DATA—THE NEW MAGIC DRIVER REVEALED

It's time to choose a winner. The JNP was just a hair ahead of the LFE on most of the distance statistics. The two clubs were very close when comparing the accuracy indicators. The final factor in favor of the JNP is the lower backspin value.

Last month I expressed a strong preference for the shape and balance of the JNP. I still feel that way. I simply haven't seen a driver head that I like the looks of better. On the physical tests, the JNP was the winner by a nose. On performance and looks, the JNP is a hands-down winner. It's in the bag.

THE FINAL WORD ON THE PELZ WEDGES (FOR NOW)

They're officially out of the bag. I finally just gave in on a couple of points. First, they're diggers. On a tight lie with a soft fairway, I

hit too many fat shots, especially with the sand wedge. I found myself taking bogeys on holes where I was seventy yards from the pin in the middle of the fairway. Also, in the end I just couldn't get used to the radically different balance caused by the huge and heavy grip.

Table 3	Titleist LFE/stock UL	Nicklaus JNP/SK Fiber
Ball Speed	153	154
Club Speed	112	114
Distance	244	246
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Backspin	3733	3389
Sidespin	2	209
Swing Path	-3	-4
Face Angle	-2.7	-2.5
Face Impact	4/6/0	3/7/0
Flight Time	7.1	7.1
Off Line	-11.2	-3.1
Distance to Pin	52	44
Smash	1.35	1.35
2.2 % TMX	97.9	98

I have also seen several of my friends who bought into the Pelz frenzy a few months ago make the same kind of mistakes. Don't get me wrong, you can hit brilliant shots with these clubs. It's just that I think they're too dangerous.

THE PENINSULA TOURNAMENT SEASON IS ON

We had our first 36-hole tournament at Paly—the NCGA Low Net Qualifier. Maybe part of the reason I feel the way I do about the Pelz wedges is that I took three shots to get on the green from 15 feet on the third hole in the first round. (I'm looking for a scapegoat.) If I could have had two of those shots back along with a few more benevolent plays, I would have had a chance. In the end, I crawled on to the very end of the money list. It's nice to be thinking about playing on Sunday afternoon instead of watching the players on television. It's going to be a great season. ♪

Leith Anderson is a partner in the Golf Lab in Palo Alto.

He will answer any questions about golf equipment and clubfitting. Contact by email: Leith@golftech.com. Contact by phone: (650) 743-2816.

New Muni

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a golf ball can easily roll back into the fairway if the green is cut down to a lightning speed.

And they might be. The grass used for these greens is bent, which often invites poa annua. Superintendent Gary Ingram, late of Elden Park and Moraga, hates poa. But he was reminded that Augusta National installed the slick poa some years ago on its hallowed putting surfaces. Once a weed to be scorned, poa is now "In" as a defining surface.

I enjoyed the bunkers in the middle of the 13th and 16th fairways, which allowed for some risk/reward opportunities. From the tee it is evident that you could go left of these bunkers to shorten the hole, or to the spacious area on the right which would create a safer, albeit longer shot to the green.

But I really enjoyed the par-5s. The 10th and 17th holes can be reached, but there is water in fronting the green. Real water. Very pretty. Quite intimidating. But the bailout areas were clear—to the right of the 10th green, to the left of the 17th.

On the front nine, the third and sixth holes can be reached in two. But the greens are slightly to the side of the fairway, behind mounds. The safe play is to lay up in front.

The fairways were perfect the day I

played. A pure rye grass was conducive to imaginative shot-making alternatives. The ball sat up nice on the surface, inviting and delicious. The rough was thick fescue—a grass that has been tried before in Northern California with mixed results. Perhaps it will take in Oakland.

My only criticism of this new course is that the 18th hole seemed rather ordinary—not particularly long as a par-4, playing downhill, and not a particularly challenging approach shot to the huge green. I would give yardages, but no yardages had been taken at this writing. We played by feel all day.

The best news is that the green fees on this course will be kept down. No figures were released in March, but it is well known that Oakland City Manager Robert Bobb wants to compete directly with the Chuck Corica Golf Complex in Alameda, home of the twenty-dollar-range green fees and substantially discounted monthly cards.

I felt refreshed and invigorated after playing The Met, not all beat-up and worn down. I lingered for a moment before walking to the car, searching my synapses for something that was there, something I could not quite put my finger on.

Then it hit me. This is what old Galbraith should have been, right from the start. ♪

Award winning golf writer Ron Salsig can be reached at rsalsig@pacbell.net

A real golfer knows that golf is a contact sport.

Kyle Phillips

From Page 24

- Outlining of sand bunkers and fairway mowing patterns
- Provide maintenance equipment consultation
- Ongoing consultation and design review services
- Prepare a color rendering of the golf course, scorecard information and completed facilities, suitable for framing
- Cooperate with owner in the publicity and promotion of the golf course
- Presence and participation in the grand opening.

It's clear that a "full service" program is available to developers. But perhaps most interesting aspect of advance decision making occurs when the developers are interviewing Kyle and getting a feeling for his style and his portfolio of work—but at the same time, Kyle is interviewing the developer to get a feeling for "what kind of story they want to create here" and whether it will lend itself to a finished product of which Kyle can be proud.

One thing is sure. Bet on a winner—that's what Kyle Phillips is in golf design. ♪
How to reach Kyle Phillips:
5516 Rivera, Granite Bay, CA 95746
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Tuning the Magic Driver

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meaningful testing to prove the benefits of PUREing in ball striking have been performed by Golfsmith utilizing the SST system.

The Second Test

With the “hard side” located in the line of flight, the computer then takes over to find the precise position where the shaft is in its most stable plane.

To fully understand this second operation, you might try an experiment yourself. If you clamp the grip of your driver in a vise with the toe at 12 o’clock and then pull the shaft back horizontally, you will make the club oscillate in the same plane as hitting a golf ball. What you are likely to see is that the head of the club will “bounce and wobble”. This is because the torsion inside the shaft causes it to distort, sometimes in wild patterns.

The second phase of the SST PURE™ procedure begins by testing the shaft in the position that it comes out of the club. In the example shown in Exhibit 2, the shaft vibrates wildly, distorting by almost an inch. From there, the computer finds the orientation where the hard side is located in the line of flight and proceeds to “look” up and down from that position a few degrees at a time until it finds the most stable plane. This position is illustrated in the flat line graph of Exhibit 2. The beauty of the SST system is that finding the stable plane is instrumented. This is impossible to accomplish with the same accuracy using only the naked eye.

To sum up the SST PURE™ procedure, it’s a two step process. The first step is to find the “hard side” of the shaft and locate that in the line of flight. The second step is to find the point with the hard side in the proper position where the shaft will oscillate in its most stable plane. The shaft is then reinstalled in the club in its most stable orientation.

Benefits of PUREing a Shaft

The idea behind PUREing a shaft is that by locating the hard side in the line of flight, each shaft in the set will feel as much like every other shaft in the set as possible. Inconsistencies in shaft flex are eliminated. By finding the most stable oscillation plane, the shaft will distort less during the downswing. The result is that you hit the ball closer to the center of the clubface.

In real life on the golf course, this means that you will get better AVERAGE distance because you hit the ball more consistently. I have already noted that in my testing this was reflected in a dramatic decrease in sidespin. I think that the electronic evidence shows that the ball goes straighter as a result of PUREing. This testing data was confirmed outdoors at the range and on the course.

For more information on PUREing, you can go to the SST website at www.pureshaft.com. Golfsmith international has done the most scientific testing. You can find those results at www.golfsmith.com.

Altering the Balance of the Magic Driver

In the last few months, I have written about the Balance-Certified Golf Company and their Pro-Balance System. A simple description of the Pro-Balance system is that it is an easy way to backweight a golf club. Backweighting is placing one to two ounces of weight under the hands, preferably as close to the end of the grip as possible. The Pro-Balance System does just that.

The most likely question you might have is “Why would you want to do that?” Readers of my generation would remember that backweighting has been discussed since Jack Nicklaus popularized the concept back in the sixties. I recently found out that Jack only stopped backweighting his clubs a few months ago.

Here is what we have found out in the last several months of testing and play. Backweighting definitely changes the feel of the club. Some players describe it as “more solid”. Some describe the feeling of weight in the grip as promoting the ability to “drop it in the slot”. We have heard dozens of different descriptions. The testing that we have done clearly shows that backweighting increases the ball speed off the face of the club. We use the system to gain the last few yards of distance after every other tuning technique has been applied. For our purposes, we were trying to get more distance “for free”.

The principal advantage of the Pro-Balance system is its simplicity. It consists of a machined adapter that fits down in the shaft of the club. An opening is cut through the butt end of the grip to provide access for a set of interchangeable weights. The adapter weighs 25 grams. The weights come in 5, 10, 20 and 30 gram sizes. By installing weights, you can add from one to two ounces at very end of the grip.

A common question is “What about swingweight?” It is true that adding weight at the grip lowers swingweight as measured on a swingweight scale by about one SW point for each four grams of additional backweight. However, swingweight is meant to measure “head feel”. Because of the location of the weight, the feel of the head in your hands does not change. I think of backweighting as providing a little additional leverage.

The surprising result of the testing that I just completed is that results are very sensitive to the amount of weight used. As I experimented with different weights, I found that my results might not improve with certain weights, and in some cases might deteriorate.

Specifically, the 20 gram weight that I thought felt the best resulted in a decrease in swing speed and consequent decrease in distance. The 5 gram weight was a little better. The surprising result came with the 10 gram weight (counting the weight of the adapter, a total of 35 grams or a little under 1.5 ounces.) The right weight gave me an extra five yards with both drivers. Frankly, that result was surprising. I simply can't understand why a 5 gram difference would produce such a different result. What this experiment does show is that a very small adjustment in balance can produce a significant result measured in additional distance. “Why” is part of the mystery of golf.

Quantifying the Results

Here's what happened. I established a pretty consistent baseline. One of the non-scientific choices that I made is I switched balls. I was interested in whether a "seamed" Titleist tested differently than a Titleist in random orientation. I clearly introduced an extra variable into the system. In at least one case, with the Callaway Red, it appeared that the ball alone made a significant difference in the results. I'll answer this question next month by conducting a ball test. Now that we have the Magic Driver and we know exactly what performance to expect, it will be a simple matter to hit a few hundred drives with different balls and record the results. "Ball fitting" will be a better way to answer the question "which ball works the best for me?"

The data shows that PUREing has no provable effect on distance but a clear effect on factors that indicate increased accuracy such as decreased sidespin. Sidespin was reduced by over 60% with the LFE. The data presented physical evidence that PUREing improved accuracy, as has been the claim. I would like to say that it improved feel, but you can't quantify that.

The data also shows that the Pro-Balance System, with the correct weight, increased swingspeed, ball speed and carry distance for me. Swingspeed increased by one or two miles per hour. Ball speed off the face increased by four or five miles per hour. Carry distance increased by five to seven yards, a factor of two to three percent.

The caveat is that it was very important to get the right weight. I don't think it would be possible to determine which weight performed the best without a tool like the Achiever. If you intend to optimize the Pro-Balance backweighting system, you will need access to a launch monitor.

The Data – Before and After – Titleist LFE with stock UL shaft

The following table presents the first and last data set from the LFE. The complete data are found on the Golf Lab website. Small increases in swingspeed and ball speed resulted in a 3% increase in distance. Pretty cool results for simply tuning a driver I already thought was great. The accuracy indicators such as off line and distance to pin increased dramatically. The shot pattern changed from a fade right to straight. More testing would be interesting, but like we used to say: "where there's smoke . . ."

	Feb 8 03	Mar 10 03 PURed 10g
Ball Speed	149	153
Club Speed	110	112
Distance	236	244
Launch	12.3	12.3
Backspin	3645	3733
Sidespin	751	2
Swing Path	-2	-3
Face Angle	4.4	-2.7
Face Impact	7/3/0	4/6/0
Flight Time	6.9	7.1
Off Line	44	-11.2
Distance to Pin	133.8	52
Smash	1.34	1.35
2.2 % TMX	97	97.9

The Data – Before and After – Nicklaus JNP with SK Fiber Lite Revolution

The JNP data was similar. Over the course of the tuning exercise, we managed to squeeze an extra nine yards of distance out of the driver. That's a 3.7% increase from tuning. Accuracy indicators such as sidespin, off line and distance to pin also showed market improvement. The tuned driver is a better performing driver.

	Feb 8 03	Mar 10 03 PURed 10g
Ball Speed	150	154
Club Speed	111	114
Distance	237	246
Launch	13	13.3
Backspin	3299	3389
Sidespin	539	209
Swing Path	-2	-4
Face Angle	1.9	-2.5
Face Impact	6/3/1	3/7/0
Flight Time	6.8	7.1
Off Line	26	-3.1
Distance to Pin	100	44
Smash	1.35	1.35
2.2 % TMX	97.1	98

The Data – The New Magic Driver Revealed

It's time to choose a winner. The JNP was just a hair ahead of the LFE on most of the distance statistics. The two clubs were very close when comparing the accuracy indicators. The final factor in favor of the JNP is the lower backspin value.

	Titleist LFE/stock UL	Nicklaus JNP/SK Fiber
Ball Speed	153	154
Club Speed	112	114
Distance	244	246
Launch	12.3	13.3
Backspin	3733	3389
Sidespin	2	209
Swing Path	-3	-4
Face Angle	-2.7	-2.5
Face Impact	4/6/0	3/7/0
Flight Time	7.1	7.1
Off Line	-11.2	-3.1
Distance to Pin	52	44
Smash	1.35	1.35
2.2 % TMX	97.9	98

Last month I expressed a strong preference for the shape and balance of the JNP. I still feel that way. I simply haven't seen a driver head that I like the looks of better. On the physical tests, the JNP was the winner by a nose. On performance and looks, the JNP is a hands-down winner. It's in the bag.

The Final Word on the Pelz Wedges (for now).

They're officially out of the bag. I finally just gave in on a couple of points. First, they're diggers. On a tight lie with a soft fairway, I hit too many fat shots, especially with the sand wedge. I found myself taking bogeys on holes where I was seventy yards from the pin in the middle of the fairway. Also, in the end I just couldn't get used to the radically different balance caused by the huge and heavy grip.

I have also seen several of my friends who bought into the Pelz frenzy a few months ago make the same kind of mistakes. Don't get me wrong, you can hit brilliant shots with these clubs. It's just that I think they're too dangerous.

The Peninsula Tournament Season Is On

We had our first 36 hole tournament at Paly – the NCGA Low Net Qualifier. Maybe part of the reason I feel the way I do about the Pelz wedges is that I took three shots to get on the green from fifteen feet on the third hole in the first round. (I'm looking for a

scapegoat.) If I could have had two of those shots back along with a few more bonehead plays, I would have had a chance. In the end, I crawled on to the very end of the money list. It's nice to be thinking about playing on Sunday afternoon instead of watching the players on television. It's going to be a great season.

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