CLUBMATE GOLF AUSTRALIA
GOLF CLUB COMPONENTS

eTECHREPORT

April 2004 eTECHreport - Welcome!

In April's issue of the TW eTECHreport:

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  Forgiveness Factors 1-4 and more. [continues below]

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  Launch monitors have gained in popularity over the past few years for good reason. [continues below]

- **Why You Have to Say Good-Bye to Using Butt Frequency as a Reference for Shaft Flex**

  I know, the first thing you're going to say after reading the title is something to the effect of, "Fine, you're one of the people who got me to use butt frequency to make flex judgments. Now what do I do?" [continues below]

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Tips to Follow for Making Golf Clubs More Forgiving

Forgiveness Factor #1 - Shorter Length and More Loft with the Driver.

There is an old adage in clubfitting that says, “The Longer the Length, the Less the Loft, The Stiffer the Shaft, and the Heavier the Club, the harder it will be to hit.“

Today, over 90% of the drivers sold “off the rack” are made in lofts from 8 to 11 degrees, and in lengths of 45” to 45 1/2”. However, only 10% of all golfers have the required swing movements and the athletic ability to achieve their optimum distance and accuracy with such longer and stronger lofted drivers. If you swing “over the top”, if your tempo is not smooth as silk, if the distance from your wrist to the floor is less than 40”, then a 45” driver is too long for you to play your best. And if you swing the driver at 95mph or under and hit your driver with a low to average trajectory, then 9, 10 and even 11 degree loft drivers will not allow you to reach your maximum distance off the tee.

Playing better is a matter of improving your percentages. I used to kid Harvey Penick that what he really meant when he wrote “the woods are full of long drivers,” was a definition for the term ‘long driver’ that was measured in inches and not yards!” Want another indicator whether you are a candidate for a more forgiving driver of higher loft and shorter length? If you hit the 3-wood on-center more than your driver, if you hit the 3-wood within 5-10yds of your driver in distance, you are definitely short changing yourself by not going to a shorter and higher loft driver. You’ll be thankful you did, and by beating your partners like a drum off the tee, you’ll quiet any teasing about your playing with such a driver.

Forgiveness Factor #2 – Wood Face Angle is THE Best Equipment Corrector for Accuracy Problems Off the Tee.

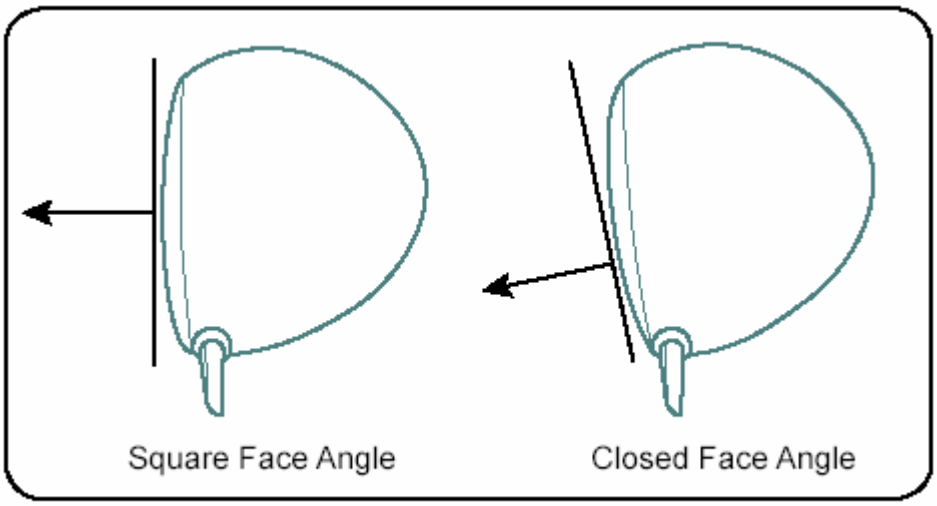

Figure c1

Many golfers do not know what the specification called Face Angle is. Many more golfers who do, don’t have the opportunity to see how much the proper Face Angle for their swing can improve their accuracy off the tee,

because very little in the way of Face Angle options exist among “off the rack” drivers and woods. Face angle, or the direction the face of the wood points when soled, is a design factor in woods that directly offsets medium errors in the swing path and/or the ability of the golfer to rotate the clubface back to square at impact with the ball. (Fig. c1)

Let’s face it – the vast majority of golfers with accuracy problems slice or push/slice the ball off the tee. But most of the drivers made today are designed with a square to very slight 1° closed face angle. The reason is because ego, fed by the opinion of lower handicap golfers, has taught us that a definite hook face angle wood “looks bad” in the address position. If your average slice is 20-35 yards of sideways ball flight, a square or very slightly hooked face angle driver will NOT put you in the short grass. While you may have to hunt for one, driver heads do exist which are designed with 2 to 4 degrees of hook face angle to cut that slicing movement down to 5-15 yards. And while also rare in the golf industry today, open face angle woods can also be found for those golfers whose opposite flight tends to stretch the desirable definition of the word, ‘draw’.

Forgiveness Factor #3 – There are Many Different Club Designs intended to hit the ball the same distance – Find the ones easiest for YOUR swing to hit.

Between 5 and 15 years ago, the “boys in the back room” for one of the club companies got the bright idea if they decreased the loft on all the irons, people would buy their clubs because they would automatically hit the ball farther with each numbered iron. And when the first one did it, every company had to follow. As a result, the 7-iron in your bag today has very close to the same loft as the 5-iron in your first set of irons! Now, do the math – irons are supposed to change in increments of 3 to 4 degrees of loft. If you struggled with a 2-iron in your youth, now you know why your current 3- and 4-iron shine more than the rest of your irons!

Unless you possess a very fundamentally sound swing, including full turn, later release of the wrist-cock on the downswing, and the ability to use your body rotation to pull the club down and through the ball, don’t even think about trying to do battle with a #1, 2 and 3-iron. And if you also do not hit your current 7-iron at least 150 yards, don’t use one of the modern lofted #4-irons either. All of these low numbered irons today, with lofts of 16-24 degrees and lower, truly require a very solid and powerful swing to hit properly.

You have two options with modern equipment today that offer much more forgiveness to cover these shot distances in your game. First, high lofted fairway woods in the #5-, 7-, 9- and even 11-wood. Second, there are “hybrid” clubs, which also are designed to cover the distances of the long irons.

Which option for whom? Common sense says if you have great confidence with the accuracy and on-center hit percentage of your present 3- and 5-wood, then going further into the high loft fairway woods will make sense. On the other hand, if you are not as consistent with the fairway woods, the shorter lengths of the “hybrid” clubs may help increase your accuracy and on-center hit consistency. Each option has plusses and minuses, so you must compare your swing/playing strengths to each before making a decision. The lower and deeper Center of Gravity of the fairway woodhead, combined with a wood shaft that will bend more in the swing and will kick the ball higher will make the fairway woods easier to hit high in the air. But the shorter lengths of the “hybrids” should be easier to hit on-center and control. Either way, if you shy away from your 2-, 3- and 4- iron, get smart and start thinking more fairway woods or “hybrid” long iron replacement clubs.

Forgiveness Factor #4 – Use the Lightest, Most Flexible Shaft You Can Control.

Uh-oh, another tip that might put you in the cross-hairs of the 'slings and arrows' of abuse from your playing companions. Well, at least most of the shaft companies are making their graphics more understated these days, so maybe no one will be able to read the print on the shaft and notice you dropped down a letter in your flex. On the other hand, you can always slap some tape over the flex on the shaft like Harvey Penick used to do for his golfers!

Seriously, let's take a look at the worst things that can come from playing a shaft that is more flexible than what you think you should use. If the shaft is more flexible, you could hit the ball a little higher, you would receive the sensation of a little more solid feel at impact, and the face of the club might rotate just a smidge more closed at impact. On the other hand, if the shaft is more stiff, you could hit the ball lower and possibly lose a little distance, your feeling of impact will be a tad bit more "harsh", and the ball could "hang to the right". But with most golfers not achieving a high enough launch angle to max out their distance potential, and with most golfers only dreaming about hitting the ball with a draw, that doesn't sound too bad.

And when it comes to dropping down a flex, for sure think about the irons as well. It is a fact that solidness of feel, and height of the shot is very strongly influenced by how much the shaft bends in the swing. Because iron shafts are shorter and have a larger tip end diameter than wood shafts, they will only bend half as much in the swing as a wood shaft. So even if you think your wood shaft flex is comfortable, do consider moving down a flex in the irons and you'll likely be rewarded with a little higher shot pattern with a more solid feel of impact.

In terms of the lightest shaft, most of the club companies have been installing pretty light graphite shafts in their woods for a number of years, so you likely are there already with that part of this forgiveness factor. How to tell? If you have a relatively accurate scale around the house, lay your driver across the scale platform and note its weight. If it's 325g (11.5 oz) or lower, then you already are using a light enough shaft from a forgiveness standpoint.

Other Forgiveness Factors – Short and Sweet

1. Cavity Back Irons ARE More Forgiving.
   If you want to know how much, find a hole on your course where trouble hugs the front edge of the green. Take a cavity back and muscleback (non-cavity) iron that you would normally fly 20-25 feet on the green and hit 10 shots with each (when the greens keeper is not watching!). Plotting where the off center hits with each type of iron design land will convince you.

2. Front to Back Sole Radius is Good, as Long as There is Not Too Much Radius.
   Place your irons so the very center of the sole is in contact with a hard surface, like the top of a table. If the very bottom of the face is more than 1/4" above the surface of the table, the iron could produce a higher incidence of "thin" and/or "fat" shots. Sole width and sole radius together combine to determine how much the leading edge of the iron is above the ground. For players with an average to better swing, 1/8" for the leading edge to be above the ground is good for consistency of contact with the sole and the ground. For

players who swing over the top, and have an outside-inside swing path, more sole radius will be a little more forgiving.

3. If you Leave the Ball in the Sand, Go with a Wider Sole on the SW.
The sole of a SW traveling through the sand is much like the wing of an airplane during take-off. The wider the wing, the greater the lift, so less speed would be required to allow the plane to take off and get UP. If you have a slow swing speed, or if you tend to leave the ball in the sand from digging too deep under the ball, hunt for a SW with a much wider sole. And if you tend to swing down on sand shots very steep, go wide AND with more bounce sole angle together on the same SW.

4. If You're Inconsistent with the Length of Your Putts, Try a Much Heavier Headweight on the Putter.
Many players are starting to notice a more consistent stroke with the putter by changing to a putter with a heavier head weight. HOWEVER, some golfers have fallen into the trap with such heavier head putters of decelerating the putter through the ball. Therefore, if you move to a heavier putter, do constantly remind yourself to keep the putter head moving through the ball.

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Launch For Less

Launch monitors have gained in popularity over the past few years for good reason. When they first became available, launch monitors were very expensive, so only large companies and a few big retailers could afford the cost. But as prices for launch monitor (LM) technology have come down, more and more clubmakers are able to attain launch parameter information that previously was only available to a small number of golfers. As more and more golfers hear about tour pros being optimized through LM fitting, LMs have become a must-have for the full-time clubfitters. Still, LMs cost thousands of dollars, which puts them beyond the realm of affordability for many clubmakers. But that doesn't mean clubmakers without LMs are left out in the cold for measuring the important launch parameters in their fitting sessions.

THE SOLUTION:

For those of you that have purchased the Launch Angle Gauge and/or the Trajectory Modeling Software, you are well on your way to optimizing launch conditions for fitting. The one key piece of information that you are missing is something to determine Ball Speed. There isn't a cost effective way to do this, but there are a couple of radar devices that determine swing speed, and with this information, a rough idea of ball speed can be determined. The SwingMate™ has been around for years and many people are familiar with that. In addition, we have recently been working with a new radar unit from the Sports Sensors Inc., which we have found to be very accurate and user friendly.

THE PROCESS:

Determining the golfer's performance with their existing equipment is important so clubfitters can determine not only how to make the equipment change, but also what performance improvement can be expected. Five representative swings from the golfer are enough to determine an average launch angle and head speed (which can be converted to ball speed). During this time, clubfitters should also look at swing mechanics, which will help in both shaft fitting and head selection.

Launch Angle and Deviation

When the shot is hit, note the launch angle on the TWGT Launch Angle Gauge and the degrees of deviation left or right of the gauge centerline. Use impact tape to determine where the clubface makes contact with the ball and how that might affect launch angle because of the effect of vertical roll on the loft at the point of impact. Due to vertical roll, shots hit lower on the face will typically have a lower launch angle, while those hit above the centerline will produce a higher launch angle. This will help in loft selection for helping the golfer achieve their optimum launch angle.

Head Speed

Take the average of the swing speed over the five hits. For the impact locations from the impact tape which are quality contacts in the center of the face, use a multiplier of 1.43-1.45 times the clubhead speed to get a close approximation of ball speed. So let's look at this example:

The example golfer produces an average launch angle of 10.5 degrees with a head speed of 94mph – using the multiplier of 1.43 his ball speed is roughly 134mph. Take those two values and enter them into the Launch Parameter Mode of the TWGT Trajectory Modeling Software (Fig. d1). The results are shown on the screen image below with three different spin rates.

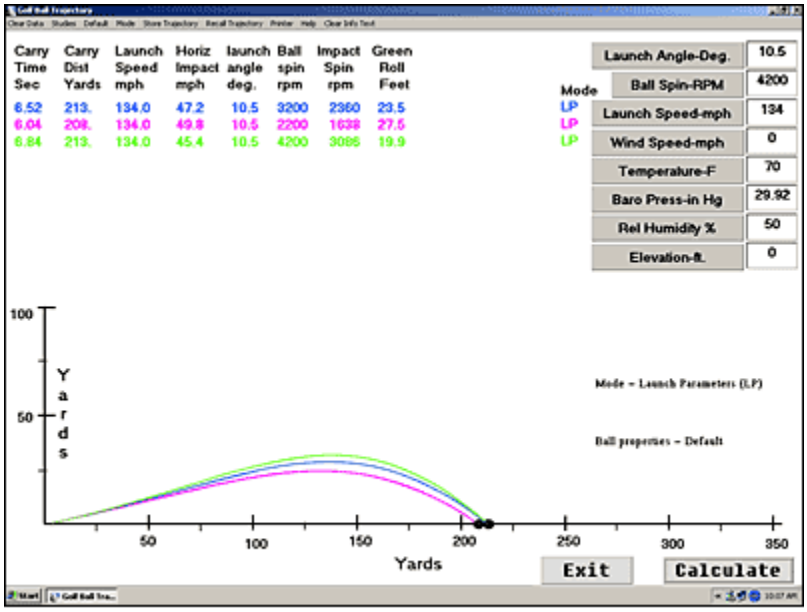

Figure d1

(click for a bigger image)

Since our Launch For Less methodology does not offer any information on backspin, we ran three different shot examples using three different spin rates (2200, 3200, 4200rpm) to see what the effect would be for different spin amounts. Because our Launch For Less equipment will reveal the golfer's launch angle and ball speed, the only variable that will further contribute to determining the result of the golfer's launch parameters is spin. As you can see from the three shots modeled on the screen above for this example of a golfer with a 94mph swing speed, backspin should be no less than 3200rpms to maximize distance. You can also see that a spin rate of 2200rpm costs this golfer 5 yards of distance. Thus, the thought that all golfers need less backspin for maximum distance is a myth.

We will use the Trajectory software to next determine the golfer's best launch angle for maximum distance. The next screen image below (Fig. d2) shows how we started with the golfer's real launch angle of 10.5 as determined by the Launch Angle Gauge, and then changed the launch angle by 1 degree increments to observe what launch angle results in the best carry distance.

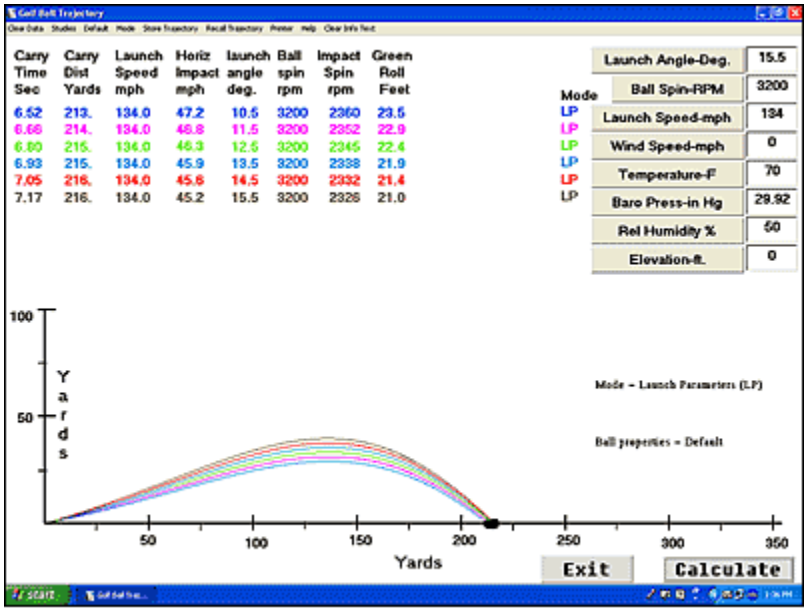

Figure d2

(click for a bigger image)

From the above modeling the recommended launch angle is 14.5° with a spin rate of around 3200rpms for the golfer's ball speed of 134mph. This is revealed by noting when the carry distance result stops increasing. Thus, the lowest launch angle that results in the greatest carry distance is considered optimal so that roll on the fairway can be maximized at the same time to get the golfer's greatest total distance of carry + roll.

THE NEXT STEP:

Armed with the knowledge that our golfer needs to increase his launch angle to 14.5°, we can make a recommendation for head and shaft that will get him closer to that. In referring back to the golfer's actual launch angle of 10.5° as determined by the TWGT Launch Angle Gauge, it is important to know the actual loft of the clubhead from which the launch angle data was gathered. In this example, let's say the golfer used a driver loft of 10.5° to obtain a launch angle of 10.5° from on-center hits. To get to a launch angle of 15.5° first consider an increase in loft to raise his launch angle. A secondary influence to consider will be the shaft, and depending on the shaft and his swing mechanics, the contribution of the shaft can be up to 2° of launch angle. Another potential influence on launch angle will be the CG of the Driver, in particular the distance of the CG back from the shaft bore centerline. The 919CCG and the upcoming 949 G/Ti are both designed with the CG further back in the head, which helps to increase the launch angle over and above what the loft contributes on its own.

In this case the options for this golfer could be selected from the following:

- 915CFE Driver with 14° loft matched with a higher launch design shaft
- 919CCG Driver with 13° loft matched with a higher launch design shaft

Notes to Consider:

- Angle of Attack (See Tom's article about this by clicking here)
- Impact Position on the face
- Ball Direction left or right of centerline and swingpath to help with the determination of face angle.
- Playing conditions: This should actually occur during the interview process to determine if you should fit the golfer to the high or low side of the recommended launch angle. If they play in the wind or on hard fairways, fit them on the lower end. If they play in wet conditions, thick fairways or anything that puts a premium on carry distance, fit them on the higher end.

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Why You Have to Say Good-Bye to Using Butt Frequency as a Reference for Shaft Flex

I know, the first thing you're going to say after reading the title is something to the effect of, "Fine, you're one of the people who got me to use butt frequency to make flex judgments. Now what do I do?"

Back in 1991 when I wrote The Modern Guide to Shaft Fitting, I did use butt frequency measurements of shafts to make a direct comparison to shaft flex. This was the first time that quantitative measurements of any type had been used in an attempt to classify and compare shaft flexes. Prior to this publication, very little was known about the real design differences between shafts that could be quantified in comparative measurements.

As a result, when I had stated the average butt frequency at that time was 250cpm for an R-flex wood and 260cpm for an S-flex, clubmakers began to make the judgment that all wood shafts with a 255cpm butt frequency

had a flex halfway between an R and an S. Or if a clubmaker encountered a shaft with a butt frequency of 240cpm, the conclusion was that it was going to be too flexible for a golfer used to an R-flex shaft with a butt frequency measurement of 250cpm. And today, many clubmakers desperate for a way to compare shafts still use single butt frequency measurements to make decisions on shaft suitability for their golfers.

Ever since the introduction of graphite in the early 1970s, shaft designers have understood the contribution of the shaft to the total weight of the club. However, more recently they have begun to realize their ability to design shafts that can more greatly influence the shaft's contribution to the launch angle of the shot. Over the past 2-3 years, shaft designers have begun to use more sophisticated modeling and design tools in their work to be able to ordain the precise stiffness at any particular point along the length of the shaft. And some of the more skilled shaft manufacturers in turn have recently developed the ability to produce shafts with specific stiffness measurements at any point on the shaft.

In the 1980s, shaft bend point was a commonly stated design specification of shafts. However, just as flex was described by a non-quantitative description of single letter codes, so too was bend point. Using the terms "low, mid and high" to describe bend point, in the 1980s and early 1990s bend point did not vary by more than 2" from high to low in its position. This was because shaft designers were trapped by the practice of always designing different performance shafts of the same letter code flex within a very narrow range of butt frequency/butt deflection. By having to make all of their 'R-Flex' shafts to have a similar butt frequency, shaft designers could not offer a very wide range in launch angle or ball flight differences.

In the last 2-3 years, some shaft designers have begun to understand that a wider range of flight, feel, and overallperformance differences could be created in shafts if it were possible to very specifically change the flex distribution over the ENTIRE LENGTH of the shaft. For example, previously, the only way shaft makers created two shafts that varied in trajectory was by changing the stiffness of the tip section of the shaft. Thus you had a butt-firm and tip-flexible shaft to hit the ball higher and a shaft with a firmer tip to hit the ball lower.

Today, it is possible to increase trajectory in shafts by changing the butt section of the shaft to be more flexible than what had been used in a particular letter flex code, and then making the center and tip sections a little firmer. The result is that the shaft bends more at a point higher up the shaft than in previous designs of the same flex letter code, with the lower 2/3's of the shaft all acting to "kick" the ball higher. By essentially, "turning the shaft around" in terms of the flex distribution, the firmer center and tip sections are also able to prevent the shaft from feeling as if it were very flexible. However, if such a shaft is measured for butt frequency only, it will have a much lower frequency than what older or other shafts of the same flex letter code have, and in the process, may "fool" clubmakers who are used to referring only to the butt frequency as their means of determining how 'stiff' or how 'flexible' a shaft will play for a golfer.

But with the shaft measurement world thus turned upside down and butt frequency no longer able to be used as a flex determinant, how are clubmakers supposed to make their own determination for judging how stiff or how flexible a shaft may be? In this time of shaft design transition, it is going to be tough until more information is published to act as a new "guide" for shaft flex fitting. Certainly we at TWGT are working on this with the development of our new form of shaft bend profile graphing. A good initial explanation of this methodology can be found on page 66 of the 2004 TWGT clubmaking catalog. I sincerely urge all clubmakers who have used butt

frequency to make flex judgments to read this discussion to become more familiar with this illustrative method of describing a shaft's bending profile characteristics.

But the graphs alone are not going to immediately build a new pillar of confidence in shaft fitting in clubmakers' minds until a great number of shaft to shaft bend profile graph comparisons are made and then compared to real golfer likesand dislikes in shaft feel and real golfer shaft flight performance results.

The best way I can put this for now is that we and some others in the shaft design industry have discovered new ways to distribute the stiffness of shafts about the entire length of the shaft which really do offer a wider range in shaft performance than ever before. We know it works because thousands of golfers using such shaft designs successfully show that. Now we have to work harder to be able to explain definitive methods to know when a more flexible butt stiffness is right for a strong fast swinging player, or a stiffer butt shaft might be best for a golfer with a much slower swing speed.

As we continue the work, it is very important that you no longer make actual flex conclusions on the basis of only a single butt frequency reading. Thus when you measure the butt frequency of an InterFlexx R wood and find it to be in the area of 230-232cpm, or an InterFlexx S wood in the area of 242-244cpm, you must accept that you are NOT looking at an L or an A flex wood shaft. TWGT is not the only company engaged in such overall flex design work in shafts. Other shaft companies and OEMs are as well. So as we continue to probe this very new and fascinating area of new shaft design, be patient with having to give up one aspect of your shaft fitting and learn along with us how to use a totally new method for recommending shafts for golfers that will stretch the bounds of shaft performance in fitting.

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