



CLUBMATE **GOLF** AUSTRALIA
GOLF CLUB COMPONENTS

eTECHREPORT

April 2005 eTECHreport - Welcome!

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Why Middle and Higher Handicap Players Need Custom Fitting MORE than Low Handicap Golfers

You can grab a clean copy of the standalone version of this article by [clicking here](#).

One of the most common misconceptions about custom fitting of golf clubs is that middle and high handicap golfers are convinced they are “not good enough to be custom fit.” Last year I had the chance to read a survey on custom clubfitting conducted by the leading golf information clearinghouse in the golf industry. One of the bits of information that just made me shake my head in disbelief was that the vast majority of middle to higher handicap respondents said, “as soon as I improve my swing a little more, I’ll think about being custom fit.”

The reason that average to higher handicap golfers seem to cling to this myth is because they feel they are not consistent enough in their swing to be able to gain benefit from custom fitting. What’s interesting about that mistaken belief is that one of the reasons they are inconsistent is because the standard made, “off-the-rack” golf clubs they bought and use are built to specs that make it much more difficult for them to become consistent!

Here’s an absolute fact about custom fitting – the less skilled the golfer, the more they need to be accurately fit to play to the best of their ability.

Low handicap golfers achieve their better playing ability because of two reasons – one, they were taught proper swing fundamentals and put in the time to practice and ingrain those swing skills, and two, they are good athletes blessed with good hand-eye coordination and solid control over their kinetic body motions, which enables them to train their body to develop the proper swing fundamentals. Because of their superior athletic and kinetic skills, low handicap golfers could play almost as well with quite a wide variety of different golf club specifications. Most don’t because in the process of becoming a good player, they develop a more acute sense of feel and ball flight perception that leads them to custom fitting to ensure greater consistency.

On the other hand, most middle and high handicap golfers do not have the same level of athletic coordination or control over their body motions. Certainly with enough monitored practice many of these golfers could improve their swing skills. But the vast majority will not achieve the same level of swing control and repeatability as the low handicap players because they simply are not blessed with above average athletic attributes. Because of that, if the middle to high handicap player ends up with woods that are too long, a wood face angle that is not matched to their swing path, a swingweight and total weight in their clubs that is not matched to their swing tempo and rhythm, and several other custom fitting parameters, they cannot possibly hope to play to the best of their ability.

Thus it is extremely important for middle to high handicap golfers to be accurately custom fit so that the clubs can be made to help overcome and offset many of their inherent swing faults. The following is a list of custom fitting parameters that are extremely important for middle to high handicap players to investigate in order to get the most out of their games. We urge clubmakers to use this information as a way to impress upon their middle and higher handicap customers not to put off custom fitting any longer.

1. Club Length

Hitting the ball more consistently on-center is THE most important key to playing better golf. The length of your clubs is one of the most critical fitting parameters that can change the success or failure rate of hitting the ball solid and on-

center. Unfortunately the “standard lengths” of drivers and fairway woods that most golfers buy are too long to allow the vast majority of golfers, especially middle and higher handicappers, to achieve their highest on-center hit percentage. Thus it is of **UTMOST IMPORTANCE** that middle and high handicap players are properly fit for the right length which will result in their ability to control the clubs more easily, and from that, increase their percentage of solid, on-center hits. Remember the keys for proper length fitting – start with the wrist to floor (WTF) measurement chart and only go longer than the WTF recommendation if the golfer has a smooth tempo, flatter swing plane and good swing timing and coordination.

2. Iron Lie Angles

No golfer, regardless of handicap or athletic ability, can hit the ball straight without the lie angle of each iron properly fit to their swing. Fitting the lie angle of the irons to each individual golf swing so every iron arrives at impact with the sole parallel to the ground is the only way the clubhead can come into impact and assure a straight hit. If all golfers were the same height, had the same arm length and swung the club through impact the same exact way, then the standard lie angles designed on clubs bought “off the rack” would be fine. But that is definitely not the case, so if golfers want to eliminate the inevitability of an improperly fit lie angle causing errant shots, every golfer must be custom fit for the lie angle of the irons. Every golfer.

3. Woodhead Face Angle

Good players have trained their swing to deliver the clubface square to the ball a very high percentage of the time. Thus, the square face angle of the standard made woods sold today is an acceptable fit for the better golfer. Middle and high handicap golfers typically cannot deliver the clubface square to the ball nearly as often as can a low handicap player. Thus hooks, but far more often slices, are a frequent if not constant companion of the middle and high handicap golfers when they play. Well over 90% of all golfers with misdirection problems using their woods do tend to hit the ball to one side of the fairway far more than the other. Custom fitting the face angle of the woods will offset this misdirection tendency and allow the middle to high handicap golfer to keep the ball in play a much higher percentage of the time. And remember, TWGT can Hand Select to wood face angles within a +/- 1 degree range of each woodhead’s face angle design to broaden your face angle fitting options.

4. Driver and Wood Loft

This is no BS whatsoever – at least 90% of all golfers are not playing with enough loft on their driver to fully maximize their distance off the tee, that goes for fairway woods as well. And I am not just talking about changing from your 9.5 loft driver to one with 10.5 or 11 degrees. If your driver swing speed is 90mph or lower, 90% of you are going to need a driver loft of 12, 13 or 14 degrees to be able to achieve the launch angle that will keep the ball airborne long enough to carry the ball as far as your swing speed will allow. At last check, 12 degrees is the highest loft the majority of the standard clubmaking companies even offer for men and 13.5 is the ceiling for women. That’s a pretty good indication that to get more distance off the tee, you need to be custom fit for the loft of your driver. See the accompanying chart for a very general recommendation of driver loft vs. swing speed. The reason for the ranges in loft for each swing speed is because your swing angle of attack affects the final loft recommendation. And to know that and really nail down the perfect loft for your swing and swing speed, get thee to a custom clubmaker with a launch monitor who can determine this precisely for you!

Driver Swing Speed	Driver Loft
50 mph	15 - 17 degrees
60 mph	14 - 16 degrees
70 mph	13 - 15 degrees
80 mph	12 - 14 degrees
90 mph	11 - 13 degrees
100 mph	9.5 - 11.5 degrees
110 mph	8 - 10 degrees

5. Swingweight/MOI and Total Weight

If all golfers were of the same physical strength and swung with the same tempo, rhythm and sense of swing timing, then all golfers could play with one standard swingweight and total weight. But again, this is obviously not the case. There are almost as many variations of strength/tempo/swing timing among golfers as there are golfers who play the game. No middle or high handicap golfer can hope to develop even a shred of consistency in their swing unless the total weight and the swingweight/MOI of their clubs is properly matched to their individual strength and swing tempo tendencies. While good golfers have the athletic skills to be able to adjust to a range of swingweight and total weight, middle and high handicap golfers do not. Thus it is more important for middle and high handicap golfers to be properly fit to the right swingweight/MOI and total weight for their individual swing characteristics to have any hope of developing shot making consistency.

6. Shaft Flex and Bend Profile

If there is one area in which the better player can gain a little more advantage in a fitting than the middle to higher handicap player, it is in the selection of the right shaft flex and shaft bend profile (the design of the shaft's stiffness over the entire length of the shaft). This is because better players usually have a more refined sense of feel for the bending action of the shaft during the swing than do middle to higher handicap golfers. However, it is true that if any golfer uses a shaft that is too stiff for their swing speed and swing mechanics, they will suffer from a lower launch angle, loss of distance, and a poor feeling of impact. Thus, it becomes very important for middle and high handicap golfers to also be properly fit to the correct shaft weight and shaft bend profile (overall flex design). With the mid-to-high handicap player, always "err on the side of" lighter and more flexible in the shaft.

7. Grip Size

No golfer can hope to swing with any sense of repeatability unless their hands and forearms are relaxed and not in tension when they begin the swing. The grip size is a key element in allowing all golfers to be able to feel as comfortable as possible holding on to the club. And from that, to be able to keep the tension in the hands and the forearms at a bare minimum from the address position to the execution of the swing. Because middle to high handicap golfers often grip the club too tight, fitting these players with a grip size that is more comfortable is a very important way for them to learn that grip tension is a very destructive factor in making consistent swings.

8. Vertical Roll Radius

The vertical roll radius/curvature that is typically designed on all woodheads today has the effect of making the loft angle completely different at the bottom, center and top of the face. Loft angle is a hugely important factor for controlling the launch angle of the shot. And the launch angle of the shot is THE most important factor for ensuring that any golfer hits the ball as far as their swing speed and athletic ability will allow. Middle to high handicap golfers will have much more of a tendency to miss hit the ball high and low on the face of the driver and fairway woods. Thus

if they are using woodheads with conventional roll radius, they will experience far more inconsistency in the launch angle of their shots than if they are fit into woodheads that have no roll radius, and thus have the same loft from the bottom to the top of the face.

9. Clubhead Center of Gravity

Middle and higher handicap golfers will always be more consistent in their shotmaking if they use clubheads in which the center of gravity is located as far back from the face as possible. Most less-skilled golfers think only of choosing clubheads with a low center of gravity. However, it is the rear location of the CG that has more influence over how high you hit the ball for any given loft on the face. In addition, woodheads with a more rear-located CG are more forgiving for off-center hits because the head tends to twist less when the CG is much farther back from the face.

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Wedge Fitting

Selecting the correct complement of wedges is of critical importance to all golfers because wedges are scoring clubs – their one and only function is to get the ball as close to the hole as possible to (potentially) reduce the number of putts. Far too many golfers simply choose a standard PW and SW and never take the time to think about the real requirements of wedge fitting to customize these oh-so important clubs to both their wedge swing ability as well as the design and conditions of the golf course.

Wedge fitting is best expressed through a series of specific “cause and effect” points rather than a long diatribe of explanation. This is because there are so many different points for clubmakers to be able to reference when looking at each individual golfer and the differences in the golf courses they play. TWGT hopes you take to heart the following points when fitting golfers to their wedges, and vice versa.

Golf Course Design and Condition:

1. If the golf course is designed with raised greens, small green size areas, or undulated greens, there is far more of a need for higher lofts in the golfer’s wedge set make-up. Such design conditions will require most wedge shots to be hit higher than average so the ball can settle down sooner. Thus golfers who play frequently at such types of courses must include a 59-61 degree wedge for flop type shots from grass. If the golfer has the skill to hit a 55-56 degree wedge higher than average, fine, but in most cases the SW loft on such courses will be better off set higher than 56 degrees.
2. If the golf course is somewhat the opposite, with the greens built level with the fairways, larger green size areas and few undulations, then the need for a much higher loft wedge is reduced. Such green design conditions are going to be more receptive to wedges that allow the golfer to land the ball farther from the hole utilizing roll to get the ball close to the pin. Better scoring may be enhanced by a gap wedge for “pitch and run” shots from the fairway or short rough, and the sand wedge will not have to have a loft any higher than 56 degrees. Sand wedges with lower lofts are possible if the distances from the bunkers to the pin are longer than 60 feet, and will benefit from roll after the ball hits the green.
3. The more firm the greens, the higher the ball has to be hit to reduce the amount of roll on the green. Thus if your greens are typically firm and do not receive normal backspin amounts very well, again, higher loft wedges are a better fitting choice.

4. The more firm the turf and the shorter the grass around the greens, the lower the bounce sole angle should be on the wedges. This is recommended to prevent the trailing edge of the sole from literally “bouncing” off the harder turf and “blading” the ball. The softer the turf and/or the longer the grass around the greens, the greater the bounce sole angle can be for the wedges. However, another important point related to this is how the golfer swings the wedge through the ball. If the golfer has a shallower swing into the ball, or has their hands even with or behind the clubhead at impact, less bounce is advised on the wedges regardless of the turf conditions. The only time more bounce can be used from firm, hard turf is when the golfer keeps their hands well ahead of the ball, thus reducing the actual bounce on the sole at impact.
5. If the turf on the golf course is lush and/or wet, at least a moderate amount of bounce is preferred on all the wedges to help prevent hitting behind the ball. Moderate is taken to mean no less than 4-5 degrees on the PW and AW, no less than 12 degrees on the SW and no less than 7-8 degrees on the LW when the turf is wet, very lush, or longer than average.
6. The more coarse and/or the more shallow the sand in the bunkers, the less bounce sole angle and the less the sole width is recommended. This is because the greater the bounce sole angle and the wider the sole, the deeper the sole has to travel under the ball to properly hit the shot. With shallow or coarse sand, too much bounce, or too wide of a sole will again “bounce” off the sand and increase the chance of hitting a “bladed” shot. Less bounce in these conditions would mean a wedge with no more than 7-8 degrees of bounce. However, this has to be a judgment call based on just how shallow or how coarse the sand may be.
7. The more “fluffy” the sand, the finer the sand granules and the deeper the sand, the wider the sole and/or more bounce sole angle is recommended. Under these sand conditions, the wider sole and/or greater bounce is needed to prevent the wedge from digging too deeply under the ball and potentially leaving the ball in the trap. Remember – sole width “magnifies” the bounce sole angle.

Golf Swing Particulars for Wedge Fitting

1. The two most important points of the golfer’s style of wedge play that has to be considered in making wedge specification recommendations are the golfer’s hand position relative to the clubhead at impact, and the angle of the clubhead coming into the ball.
 - a. The more the golfer’s hands are in front of the clubhead at impact, and the steeper the clubhead comes down into the ball, the less the bounce sole angle will be able to exert its influence when traveling through the grass or sand. Thus the more the golfer tends to do both these things in their wedge swing, the more bounce sole angle and/or wider the sole may need to be to allow their wedges to perform properly.
 - b. If the golfer demonstrates the opposite swing tendencies of the hands at the same position as the clubhead and/or a shallower angle of attack into the ball, this will cause the bounce sole angle to work to its full design intent.
2. If the golfer tends to blade the ball from the sand...

...first check to see if the sand is coarse or shallow and if the golfer is using a wedge with too much bounce for the sole angle. Significantly reducing the degrees of bounce may help the sole travel down far enough into the sand to prevent this shot making problem.

...and the sand is of normal consistency or depth, the golfer may be helped by moving the ball farther back in their stance to a point where the wedge is still traveling at a downward angle of attack to get under the ball.

...check to see if the wedge is too short in length, or too light in the swingweight, both could exaggerate a golfer's tendency to blade the ball from the sand.

3. If the golfer tends to leave the ball in the sand...

...a possible solution would be to switch the golfer to a wedge with a wider sole, a wedge with substantially more bounce for the sole angle, or a combination of both.

...the golfer may be helped by moving the ball position a little farther forward in the stance so the angle of attack will not be too steep as the wedge enters the sand, and so the bounce sole angle can do its job to prevent the head from traveling too deep.

...check to see if the wedge is too long in length, or has too high of a swingweight.

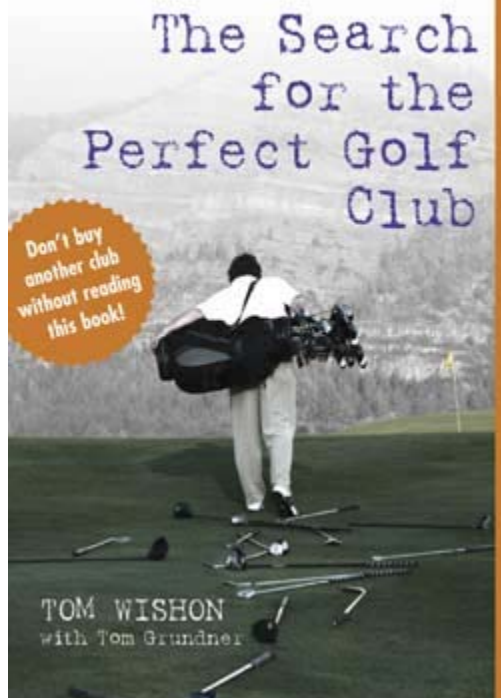
4. If the golfer tends to use the SW from the fairway for approach shots and pitch shots, it is advisable to not recommend a SW with more than 10-11 degrees of bounce for the sole angle. In addition, the firmness or softness of the turf also has to be considered. The rule of thumb in this case being the harder the ground and the thinner the grass, the less the bounce. It is acceptable to recommend two SW's for this golfer – one for use from the fairway, while the other is reserved for the sand.

Wedge Assembly Particulars

1. There are no set rules about the length of each wedge. While tradition dictates the PW be the same length as the 9-iron, the SW to be 1/2" shorter than the PW and the LW to be the same length as the SW, golfer comfort rules everything when it comes to the length of the wedges.
2. If the golfer uses the PW to hit a lot of full swing shots, it is preferable to build the length of the PW to be 1/2" shorter than the length of the 9-iron. This is recommended to help ensure the same distance increment between the 9 and the PW as exists between the other irons for full swing shots. However, if the golfer is not comfortable with this length decrease between the 9 and PW, don't worry too much because over 80% of the distance difference between the 9 and PW comes from the loft difference and not the length. Same thing for the gap wedge.
3. The more the golfer uses the PW and gap wedge to hit full swing shots, the more tendency there would be to keep the swingweight from being much higher than that of the 9-iron. In general, PW and gap wedges that are frequently used for less than full swing shots are easier to control when the swingweight is a little higher (+2 swt pts) than that of the 9-iron.
4. The main reason the SW is built to a much higher swingweight than the 9 or PW is to allow the SW head to overcome the resistance the sand will generate and thus to allow the SW head to get through the sand more easily.

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Helping Golfers Search for their Perfect Golf Clubs



Tom Wishon's latest book, **The Search for the Perfect Golf Club**, will be in stock at Clubmate Golf Australia on April 26. Never before has a book been written explaining the truths of golf club fitting and performance that is so easy to read and understand. Here's what an advanced clubmaker has to say about **The Search for the Perfect Golf Club**.

"As you may or may not remember, I got four books at the PCS Expo. My intention was to give one to a PGA teaching friend of mine, keep one for myself, and sell or loan out the other two. I loaned 'Bob' the book on Tuesday, as he is an avid golfer that asked me the following question: 'If I lined up ten guys at my golf club, how come no one, to a man, has ever been custom fit.' My answer was that they simply don't know and that ignorance isn't an excuse for poorly fitted clubs.

"I am happy to tell you that Bob came back in yesterday, practically drooling. Although he hasn't completed all of the book, he has set up a full bag fitting with me for April (I am booked with all the available time that I have in March!) He was saying things like 'The book is common sense!' 'I can't believe that I wouldn't think about things like this.' 'It

seems so simple.' He related to me that he used to play semi-pro baseball and would spend hours sanding down the handle of his bats to ensure the fit was correct. He had no idea why he didn't spend a little time getting his grips and the rest of his clubs fit for him. He also said that he had his heart set on a set of Callaway Fusion irons...but not any more! He wanted to be educated as to what else is out there.

"So Tom, I gotta thank you for doing the book: If you can get enough copies out there, and turn enough people into reading it, then I think custom clubmakers will be set for work for a long time."

DJ McIntosh, 2BROSGOLF

PCS Class A and GCA Accredited Clubmaker

The Search for the Perfect Golf Club is endorsed by such golf luminaries as Arnold Palmer, Carol Mann, perennial top ten teacher Chuck Cook, and the equipment editors of Golf Digest, Golf World and GolfWeek magazines. **The Search for the Perfect Golf Club** is a must for any clubmaker searching for help in their quest to convince golfers that custom-built clubs are better than standard-made brand name clubs bought off the rack. It is also a must for clubmakers who seek a less technical explanation for the most important fitting elements that will allow any golfer to get the most from their game.

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An Update on GRT Face Design

"I don't know why I was so stupid to doubt the performance of Wishon Golf's GRT face design. But I tell you the first time I caught the ball a little low on the face, I became a believer. And now I am a GRT evangelist for convincing every golfer that vertical roll on today's woods is what is stupid."

Kelly Wolfe, Ft Washington GC, Fresno, CA

Since TWGT introduced the concept of eliminating, or modifying the vertical roll radius on drivers and woods to improve launch angle consistency in 2004, we've had a number of very interesting conversations with clubmakers in the course of explaining our GRT face designs, why we did it, why the GRT is slightly different on some TWGT woodhead models than others, and why it works to improve launch angle consistency for all golfers. This month in the TWGT eTECHreport, I wanted to take the opportunity to talk a little more about the GRT face design concept, and update you a bit about this "common sense" change in woodhead face design.

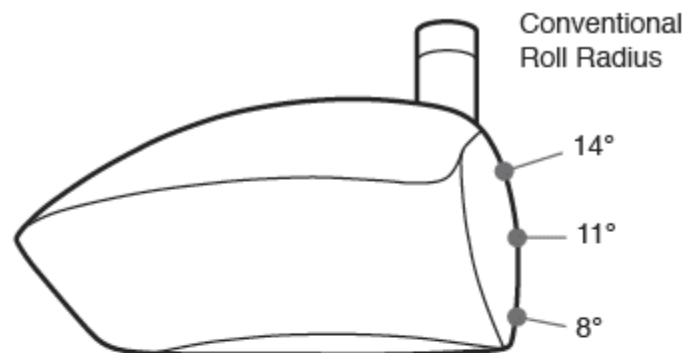
"How can you do this in the face of over 100 years of vertical roll radius design on woodheads? None of the big clubmaking companies do this so how can it be of any value?"

I had to start with this comment received last year from a clubmaker who called to inquire about our GRT face design concept. Behind this comment lies an incredible amount of misinformation that unfortunately seems to be prompted by the big brand name golf companies' marketing machine, and their ability to convince so many golfers (and even clubmakers) that whatever they create in their equipment design must be "the best."

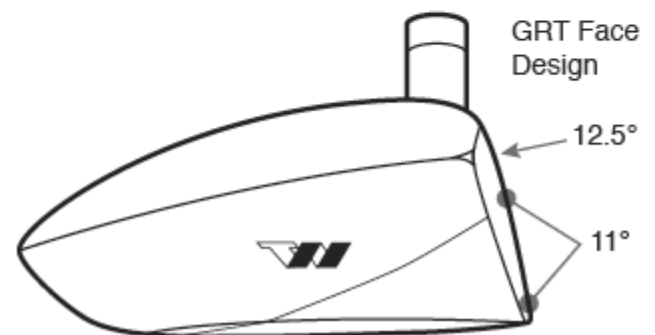
Yes, it is true that the vertical face curvature on woodheads has been around for more than 100 years. It is also true that to my knowledge, no other golf company has changed the typical amount of vertical radius on the faces of their woodheads. But I have to also add that until the size of woodheads began to increase dramatically in the past decade, and with it the height of a typical driver face, the presence of vertical roll on woodheads never really created a potential problem in ball flight.

Ever since vertical roll became a mainstay on woodheads, designers have known that the real loft of a woodhead can only be measured at a point precisely halfway up the face. In today's much larger driver heads, if you hit the ball high or low on the face the loft at the point of impact will be quite dramatically different than it is in the center of the face.

Loft is one of the most important head design specifications that controls the launch angle and height of a shot. And launch angle is one of the absolute most important launch parameters that controls the distance any golfer can achieve. If a driver loft of 11 degrees is the loft that generates the most optimum launch angle for a golfer for distance, it becomes pretty easy to see that making contact with the ball where the loft is as much as 3 degrees higher or lower won't allow the golfer to achieve their maximum distance.



Both examples for 11° loft driver



Leaving vertical roll on today's taller face drivers has in essence required the golfer to make impact in an area the size of the top of a thumbtack in order to achieve maximum distance. Why other companies have not realized this point is a question I can't answer. But there is no question that GRT works better to deliver a far higher percentage of consistent launch angle impacts for all golfers by making the loft angle the same over a greater vertical area of the face.

"I have noticed that some of the different driver and woodhead models you design now have a little different form of GRT face design. Some are totally flat on the vertical face plane while others are vertically flat on the bottom 2/3's of the face with a little more loft at the top of the face. Why is that?"

When I first conceived of the original GRT face design during the development of the original model 515 drivers in the spring of 2003, I considered the change only with the thought of the new face design's effect on the loft angle at the top, center and bottom areas of the face. At that time, I didn't take into consideration the potential relationship between the rear Center of Gravity position in the woodhead, or the production foundry's ability to radically change their method of manufacturing to produce this new design.

As we expand the use of the GRT face design into other driver and fairway wood models for 2005, I have slightly modified the GRT to correspond either to the face to back Center of Gravity position in the head, or to the designed loft of the head. For example, in the 515 fairway woods, I chose to make the faces with no roll because the face height of a fairway wood is so much shorter and the loft is much greater than that of a typical driver. That means the designed loft of each 515 fairway wood is the real loft over the entire vertical striking surface of the face. With a no roll design, each 515 fairway will provide the same launch angle within tenths of a degree no matter where impact occurs from the top to the bottom of the face. Reports from clubmakers and golfers who use the 515 fairways have verified the trajectory and flight of the ball to be extremely consistent because of this no roll version of the GRT.

On the new re-design of the graphite and titanium 949 G/Ti driver, I chose to make the GRT almost totally flat from top to bottom and not add much loft on the top third of the face because the face to back CG position on the 949 is now 44mm back from the face. This puts the CG farther back from the face by far than any other driver in the TWGT line, and farther back than any other driver in the golf industry that we've had a chance to measure. Remember, the farther back the CG, the higher the launch angle and trajectory for any given loft for the golfer who has a midway to later release of the wrist-cock on the downswing. Thus I did not want the much more rear CG position of the 949 to cause too high of a launch angle for shots hit from the top third of the face so I modified the GRT to reduce the loft increase at the top of the face.

On the 715CLC, clubmakers will notice a roll specification of 30". For the 715's face height of 52mm, a 30" roll radius is virtually flat and will not make the loft change more than 1/2 degree at the top and bottom of the face. Thus the 30" roll of the 715CLC is considered to be the same as a no roll face from the standpoint of its effect on loft over the height of the face. The reason I chose a 30" roll was a combination of this spec being more compatible with the foundry's production techniques, along with the fact I wanted any trajectory change in the 715 to come from the movement of the weight arm toward or away from the face.

I'm offering this information about the GRT concept of face design so clubmakers will have a chance to see how certain design changes (which are totally new to the industry) are features that I continually work on to ensure the best performance from each TWGT design.

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Pushing the Envelope of the 949G/Ti – A Case Study in Design

If you've spent a little time reading through our new 2005 catalog, you may have noticed that the 949 G/Ti driver has been totally re-designed for this year. Because most clubmakers are not used to a company doing a re-design of an existing model, let alone doing it 6 months after a model was introduced, we realize you may have questions about why we may choose to do this.

Simply stated, one of my goals is to offer clubmakers the best possible performance and quality in each of my original model designs. I want each design I create to offer a little different performance and look in order to cover your different fitting needs. I also want each of my designs to "be everything I envision and design them to be." In the case of the 949 G/Ti, one of my initial design goals was to use the mass that could be saved by replacing titanium with graphite to push the CG as far back in the head as possible. Another was to make the GRT design of the face correspond to the more rear located CG so that golfers would be able to experience a consistent launch angle increase from that rear CG.

By all means, the original 949 G/Ti driver that we introduced last summer was a good design – please do not get any impression that there was anything "wrong" that had to be "fixed" – it just was not pushed to the full extreme in rear CG location or GRT face design that I felt was possible to achieve. And being that I'm a bit of a "nut" about these things, especially seeing as how my name is on the models, I decided late last summer to head back to work and make a few changes.

Simply stated, the new 949 G/Ti is a superb driver head. The new GRT face reduces the loft at the top third of the face over what the original design had, and the CG is now located 44mm back from the face. In the original 949, initial testing samples had the CG at 42mm back. However, slight adjustments had to be made to the bonding of the top crown of graphite to the top section of the cup face that resulted in moving this CG position up to 40.5mm back. While that was still 2.5mm farther back than the rear CG position of the 919CCG drivers, and represented the most rear located CG in our driver line, I felt that I had fallen a little short of what I really wanted a graphite + titanium driver head to offer.

What I'm trying to say is that I am really pleased with the re-design and wanted to use this opportunity to tell you about it. Oh, and now this is the driver in my bag too!! The re-design of the face also improved the off-center hit ball speed and distance, which for me these days under my workload and lack of practice time is a definite must.

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The solid tungsten weight bar is just one of the improvements to the 2005 949G/Ti

Product Highlight – Smooth 6 & 7 Putter Fitting Options Expanded for 2005

The very popular Smooth 6 & 7 high MOI putter designs have been expanded for 2005 to include a new Center Bore version in both model styles.

The new Smooth 6 & 7 Center Bore designs will give clubmakers more options in fitting with the very soft feel and high MOI forgiveness of this design, but in a version that can be used for conventional, belly and long putter fitting. In addition, some golfers prefer the look of a putter with the shaft closer to the center of the head – for these players, the new Center Bore version of the Smooth 6 & 7 are ideal.

Smooth 6 & 7 Center Bore designs are manufactured with the .370" bore machined at a 74 degree lie angle to accept any conventional straight, belly or long straight putter shaft from the TWGT putter shaft line. These DO NOT require the use of a Double Bend shaft.

Smooth 6 & 7 Heel Bore designs are created with the .370" bore machined at a 90 degree angle to accept any Double Bend putter shaft in the TWGT shaft line for conventional or belly putter assembly. (Also available in left hand.)

All Smooth 6 & 7 putter heads are fully forged from high grade 6061 aluminum, CNC machined to precision specifications, and include the massive weight cavity in the rear sole that can accept up to five of the 14-gram tungsten weights. This additional weighting option allows clubmakers to customize the putter head weight up between 335g and 405g. The higher the rear weight addition, the higher the putter MOI becomes.



The new Smooth 6 Center Bore

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Product Highlight – P-Series Wedge Fitting Options Broadened for 2005

P-Series Wedges... Serious Sole



PCF-WS-56°

PMC-56°

PCF-56°

With the addition of the completely new PCF Wide Sole wedges and the new LH option for the PCF 60 degree wedge, TWGT's P-Series wedges now include a broad array of short game fitting options certain to appeal to a high percentage of golfers.

Players who tend to leave the ball in the sand, who play on courses with deeper or finer sand, and who encounter taller grass around the green are all candidates for the new PCF Wide Sole wedges.

Designed in a 56 degree SW and 60 degree LW, both PCF-WS wedges feature the very playable dual bounce sole angle design for far more short game shot making options.

The PCF-WS 56 has 14 degrees of primary bounce with only 4 degrees of bounce on the heel side of the sole. The PCF-WS 60 has 10 degrees of primary bounce with only 2 degrees of bounce on the heel side of the sole. This allows the player to roll the face open for flop or cut shots with far less fear of the leading edge rising up – thus the chance of “blading” the shot is greatly reduced.

TWGT wants to draw all clubmakers’ attention to the new photos of the face profiles of the P-Series wedges on page 43 of the 2005 catalog. Here you can see the exact shape and style differences of the different P-Series wedge designs.

PCF Mirror and Platinum Wedges possess a more rounded leading edge as preferred by traditional wedge design players.

PMC Mirror Wedges have the straightest leading edge profile of all the P-Series wedges.

PCF-Wide Sole Platinum finish wedges have a leading edge profile that is “in between” the straight leading edge of the PMC and the more rounded profile of the PCF.

Investment cast from the softest stainless steel alloy available for iron and wedge head production (304 stainless steel), all of the P-Series wedges have the same exact hardness as 1035 carbon steel. Easily bendable for any loft or lie custom fitting requirement.

WEDGE	Loft	Sole Angle	Sole Width at Center	Finish Options	RH/LH
PCF-52	52°	5° / 0°	20mm	Mirror or Platinum	RH
PCF-56	56	11 / 0	21mm	Mirror or Platinum	RH/LH*
PCF-60	60	6 / 0	22mm	Mirror or Platinum	RH/LH*
PMC-56	56	12 / 0	23mm	Mirror	RH
PMC-60	60	6 / 0	24mm	Mirror	RH
PCF-WS-56	56	14 / 4	27mm	Platinum	RH
PCF-WS-60	60	10 / 0	27mm	Platinum	RH

* PCF56, 60 LH in Mirror Chrome finish only

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The TWGT Difference

As we embark on our 3rd year as a company, we thought it would be a good time to look back to see how far we’ve come, while looking forward to clarify where we are headed. Our commitment to clubmakers who themselves are committed to doing the best work possible is as strong as ever. Our 2005 line represents the culmination of Tom’s many years as a designer and incorporates the best design and performance features that Tom has ever created. Top-to-bottom this is without question the best design work that Tom has ever done. There is more innovation in our designs and application of fitting knowledge than you will see from ANY company in the equipment industry – be it assembled club OEM, or component company.

In just two short years what other golf equipment company has created a line up that includes such an assortment of high performance, ground-breaking designs and technology...

- 0.830 COR Fairway woods (515GRT)
- Moment of Inertia Club Matching System
- The GRT face design (515, 949, 915 woods)
- High COR Irons (770CFE)
- 321Li Hybrids with their unique small tip iron shafts
- 715CLC Rotating Weight Adjustment Design
- CLF Series Interchangeable Loft Putters
- Smooth 6 & 7 High MOI putters with 70gram weight customizing

Original Designs and Thinking

Every head in the TWGT line up is original in both design and concept. Unlike many component companies that simply stamp a name on an “open model”, Tom takes extreme pride in his design experience and ability to create good looking and great performing heads. A deeper understanding of the real design factors at play on the golf course has resulted in a line up with more innovation than any other equipment company in the entire golf industry. And our industry-leading original design innovations will always be the hallmark of the TWGT product line.

Education of Clubmakers

TWGT continues to provide clubmakers with the best technical information to make them better at their craft. While some make claims, there truly is no other company that has the level of expertise and the willingness to share cutting edge information with clubmakers. In addition to the print TECHreport and online eTECHreport, our website Forum has earned the reputation as THE place for the hand's-down best technical information on the internet. And coming in a few months will be the long awaited sequel to Tom's milestone fitting book, Common Sense Clubfitting: The Wishon Method. One of the reasons Tom decided to start his own company was so he could remain working and communicating with clubmakers and maintain his passion for design and fitting. Everyone at TWGT shares this passion and we will continue to offer the best service and technical information in the world of golf equipment.

Shaft Design and Fitting

While many think of Tom first and foremost as a head designer, his years in shaft and fitting research has resulted in a deep understanding of how shafts relate to swing motion, and how best to design shafts for different swing characteristics. Our methodology for shaft profiling has been implemented by the top clubmakers in the world, including the Professional Clubmakers' Society. With this combined effort, the body of information about shaft profiles will continue to grow. We are establishing a comprehensive database of shafts so that clubmakers can make better comparisons from shaft to shaft to match the golfers' swing motion. Of course there will always be an aspect of “art” and experience in shaft fitting, but it is our intention to apply more science to the task to better help clubmakers find the best shaft options for each golfer.

Superior Matching of Clubs through Moment Of Inertia (MOI)

We continue to be pleased by the universally positive responses that clubmaker's customers are saying about their MOI matched sets. We've written so much about the MOI Matching System since it was introduced, and those

clubmakers that have joined with us in pioneering this new and more scientifically accurate way of matching swing feel to individual strength and swing characteristics are proving it's worth the effort. MOI Matching is yet another valuable service you can provide that assembled club retailers will never be able to duplicate. This year will see more and more exposure of this superior method of building a matched set. If you haven't tried the MOI System yet, you are missing out on another great advancement in clubmaking technology.

Growing the Awareness of Custom Clubmaking with the Golfing Public

TWGT has realized the ONLY way for real custom clubmaking to grow is to gain the respect of regular golfers. Custom clubmaking as practiced by committed clubmakers using our high quality designs is WITHOUT QUESTION superior to any OEM standard made golf club. More than any other company, we are working on building consumer awareness of true custom clubmaking and fitting so that people can experience first hand how together we can improve their game. The most recent book Tom has written, The Search for the Perfect Golf Club addresses the many issues of head, shaft and grip fitting directly to consumers and will be offered by Clubmate Golf Australia starting April 26.

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