



CLUBMATE **GOLF** AUSTRALIA
GOLF CLUB COMPONENTS

eTECHREPORT

May 2004 eTECHreport - Welcome!

In May's issue of the TW eTECHreport:

- **Launch Angle and Trajectory are Two Different Things**

Would it sound confusing to tell you that two golfers with the same launch angle would NOT achieve the same trajectory with their shots? [[continues below](#)]

- **How Does the Shaft Actually Bend and What Does it Really Do?**

One of the future products we are currently working on at TWGT is an incredibly interesting software program which will be used to predict the actual amount of bending of the shaft, and calculate the shaft's effect on launch angle for different golfer swing types using clubheads of different loft and center of gravity. [[continues below](#)]

- **The MOST IMPORTANT Fitting Specifications for Game Improvement**

When you list them on paper, there are more than 20 different specifications on a golf club that can be defined, measured and ultimately fit to the golfer. [[continues below](#)]

- **Specific Shaft Fitting with TWGT**

At TWGT we are continually working to provide you with more and better technical information to guide the fitting recommendations you make for your golfers. One of the most intimidating for clubmakers can be the selection of the shaft. . [[continues below](#)]

- **The Most Fun I Have Had in Decades**

In the past when clubmakers would ask what I enjoyed the most about my work, I used to say it has been the actual design process. [[continues below](#)]

- **The 949G/Ti Composite & Titanium Hybrid Driver will be here June 20th! [See description](#)**

- **More generous comments have been added to the [Feedback and Testimonials](#) section**

Launch Angle and Trajectory are Two Different Things

Would it sound confusing to tell you that two golfers with the same launch angle would NOT achieve the same trajectory with their shots? Would it also sound confusing to tell you that two golfers with the same swing angle of attack to the ball but totally different swing speeds using the same exact club would achieve the same launch angle? I think a fair answer to both would be a resounding YES.

But both statements are completely true. Launch angle is simply the angle at which the ball leaves the clubface and is determined by the golfer's swing angle of attack, the loft of the clubhead at the point of impact on the face, the forward flexing of the shaft and the effect of the clubhead's Center of Gravity on the forward bending action of the shaft. Swing speed has NO effect on the launch angle of the shot whatsoever.

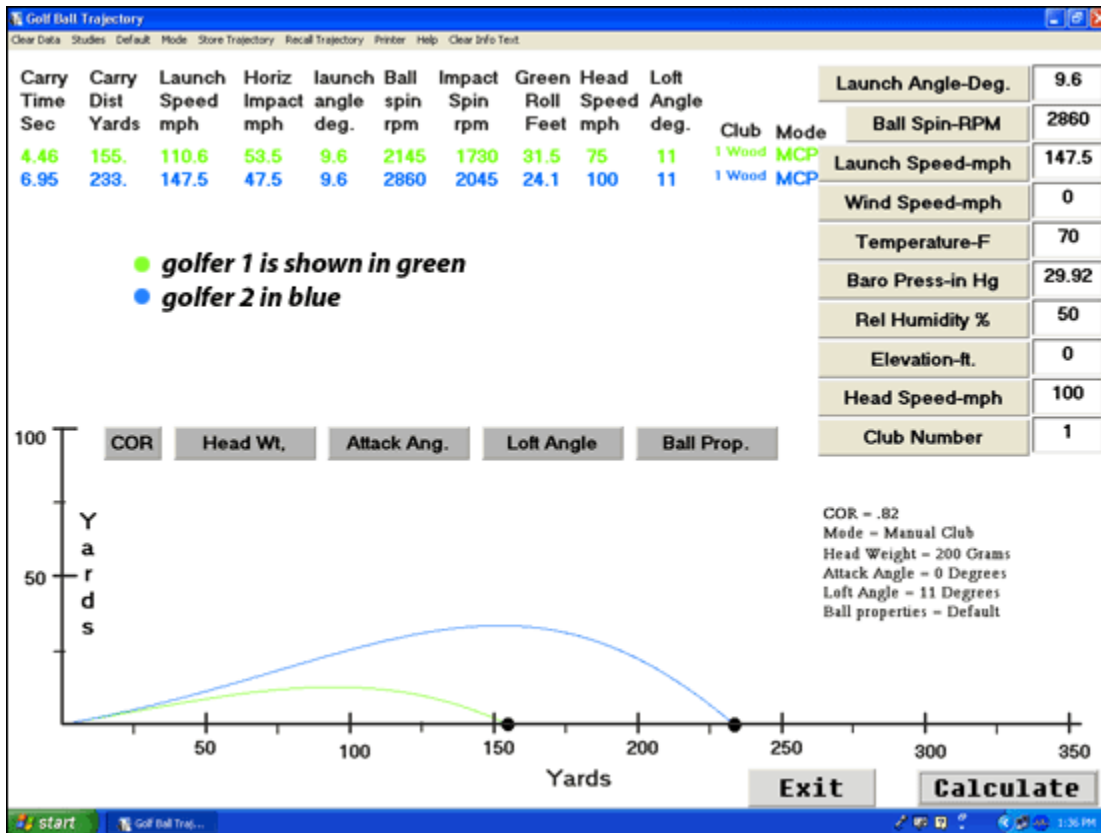
At this point you might furrow your brow and ask, "Then how can a golfer with a high swing speed hit the ball much higher than a golfer with a lower swing speed, if both golfers use the same club?"

The answer to that lies in the fact that launch angle and shot trajectory are two different things in the hitting of a shot. Shot trajectory, or the height that the ball flies is a product of the launch angle PLUS the ball velocity and backspin. If two golfers generate the same launch angle with the same club but have totally different swing speeds, the golfer with the higher swing speed will achieve a higher trajectory for the shot because his higher swing speed will generate both more ball velocity and more backspin. Thus the greater the ball velocity and backspin, the higher will be the shot for the same launch angle. Got that?

Let's look at an actual example to show what we mean in both cases.

Example #1 - How two golfers using the same club with the same swing angle of attack but with different swing speeds generate the same Launch Angle, but totally different trajectories.

Let's take two extremes here to better illustrate this point. Golfer #1 has a swing speed of 75mph, while Golfer #2 has a swing speed of 100mph. Both have a 0 degree or level Angle of Attack into the ball because they both make the same swing moves on the downswing. Both are using a driver with 11 degree loft



Using TWGT's Trajectory and Ball Flight modeling software to perform the analysis, look at the top line of numerical data in green which illustrates the launch results for the 75mph golfer compared to the launch output in blue for the golfer with the 100mph swing speed. Obviously, Golfer #2's much greater swing speed easily accounts for the much greater ball speed (147.5mph vs 110.6mph) and carry distance (233yd vs 155yd) of the shot. Golfer #2's higher swing speed also accounts for much more backspin (2860rpm vs 2145rpm) because the higher the swing speed, the greater the friction between the ball and the lofted surface of the face. But the two golfers, regardless of their vast swing speed difference, will achieve the same launch angle with the same 11° driver of 9.6 degrees, because in our example, they have the same 0° angle of attack.

Now, compare the blue and green line drawings at the bottom of the screen which indicate the trajectory of the two golfers' shots with the same club. As you can see, despite the fact both golfers hit the ball at the same launch angle, Golfer #2 (blue line) will end up hitting the ball more than TWICE AS HIGH as Golfer #1 (green line). This is because Golfer #2's 100mph swing speed generates a 37mph higher ball velocity AND 715rpms more backspin than Golfer #1 can achieve with his much lower, 75mph swing speed.

When two shots take off at the same launch angle, the shot with the higher ball speed and greater backspin will have more lift under the ball from the greater spin, and will remain in the air much longer because of the greater ball speed. The combination of the two results in a much higher shot trajectory. How much higher? If you look back at the two trajectory lines on the above screen image, you can see that the trajectory of the shot for the 100mph golfer is MORE THAN TWICE AS HIGH at its peak as is the height of the shot for the golfer with the 75mph swing speed. Yet both golfers used the same club with the same loft and same shaft.

So what does all this mean from a fitting standpoint?

- Changing trajectory for a slower swing speed golfer by changing shafts from a high to a lower flight design within the same flex and model of shaft will NOT achieve very much difference in shot height. Thus in fitting shafts to the golfers with slower swing speeds, focus your shaft fitting efforts on selecting the best shaft weight to improve swing speed and comfort for the golfer's strength and swing tempo, as well as on the best OVERALL FLEX for the best feeling of solid impact with the ball.
- Visibly changing trajectory for a slower swing speed golfer can best be accomplished by selecting a different loft and/or a more rear located CG in the clubhead.
- Changing trajectory for a higher swing speed golfer can be accomplished to a visible effect with different flight designs of shafts within the best flex for the golfer's swing speed and downswing tempo. However, loft first and a head with a more rear CG location are still going to be more influential in their effect on trajectory for the high swing speed golfer.

Now some of you may think about the influence of the shaft and ask the question, "Won't the 100mph golfer bend the shaft more than the 75mph golfer and thus create the higher trajectory?" And the absolute truthful answer to that is contained in the next tech feature of this month's TWGold E-TECHreport. Keep reading – the answer may surprise you!

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How Does the Shaft Actually Bend and What Does it Really Do?

One of the future products we are currently working on at TWGT is an incredibly interesting software program which will be used to predict the actual amount of bending of the shaft, and calculate the shaft's effect on launch angle for different golfer swing types using clubheads of different loft and center of gravity. When completed the program will allow clubmakers to input the clubhead's loft and CG position with several measurements of the golfer's swing movements, after which you would select the shaft by model and flex. The output would be a determination of the launch angle of the shot for that golfer with that specific head and shaft.

In the course of the R&D work required to make the program function properly, we have had to really dig into the physics of how the shaft bends in response to the various forces applied by the golfer in the swing. This work has also been important for the development of the new TWGT swing robot, to allow the robot to swing in a manner more similar to a human than other robots currently perform. As a result of this work, we have obtained a far better awareness of precisely how the shaft bends in the swing and how it can contribute to the launch angle and direction of the shot.

1. There are two different bending actions of the shaft in the downswing, each created by a totally different force generated by the golfer. The shaft's two different bending actions in the downswing are on completely different planes of bending.
2. The amount that the shaft bends back at the beginning of the downswing on its initial plane of bending does not determine the amount the shaft bends forward just before impact with the ball.

3. The forward bending of the shaft determines the shaft's entire effect on the launch angle of the shot.
4. The shaft cannot bend forward more than the distance that the CG of the clubhead is behind the center of the hosel bore.
5. It is possible to change the distribution of stiffness over the length of the shaft to further increase or decrease launch angle even though point #4 remains true.

1. There are two different bending actions of the shaft in the downswing, each created by a totally different force generated by the golfer. The shaft's two different bending actions in the downswing are on completely different planes of bending.

When the golfer begins the downswing, the force applied to the club/shaft is called RADIAL TORQUE. This force will cause the shaft to bend in a toe-up or 12 o'clock position with respect to the shaft, provided the golfer has rotated the club through the backswing to a square position at the TOP of the backswing, which is approximately 90 degrees open to the position of the club in the address position. A term that has been used to describe this bending is "loading the shaft". The amount the shaft bends in this plane is determined by how stiff the shaft is designed and how much radial torque is applied by the golfer. As long as the golfer holds their wrist-cock angle and rotates their body and shoulders on the downswing, radial torque is applied to the club/shaft.

Once the golfer begins to un-hinge the wrists and release the club, the radial torque lessens and the second force, called CENTRIFUGAL FORCE, is applied to the club/shaft. Only the centrifugal force applied as the wrist cock is released causes the shaft to bend forward – none of the bending of the shaft in the beginning of the downswing transfers to the forward bending of the shaft at impact because this bending was in a plane that is 90 degrees away from the plane the shaft bends forward just before impact.

2. The amount that the shaft bends back at the beginning of the downswing on its initial plane of bending does not determine the amount the shaft bends forward just before impact with the ball.

Because the initial bending of the shaft at the beginning of the downswing occurs from a different force as the forward bending of the shaft before impact, and because this initial bending of the shaft occurs on a plane that is 90 degrees away from the final plane of shaft bending before impact, there is no way within the laws of physics that the initial bending of the shaft transfers to determine the forward bending of the shaft at impact.

In fact, the initial bending of the shaft at the start of the downswing has very little to do with the performance of the shaft, but it will have a lot to do with the FEEL of the shaft as perceived by the golfer during the downswing. Feel and performance are two different factors in shaft fitting.



3. The forward bending of the shaft determines the shaft's entire effect on the launch angle of the shot, but the golfer's wrist-cock release combined with the shaft's stiffness design and the clubhead's CG position determines how much the shaft will bend forward before impact.

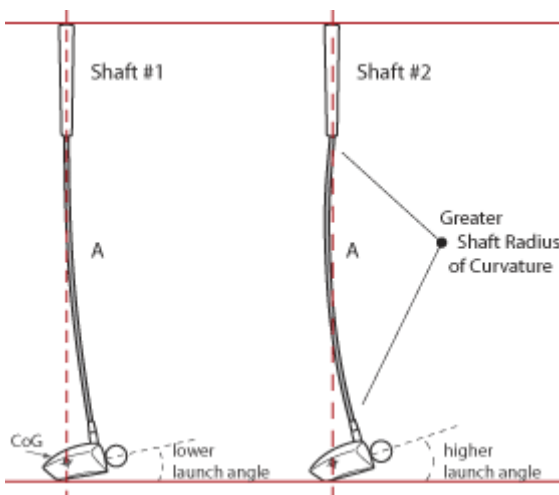
The time at which the golfer unhinges the wrist-cock on the downswing and the amount of centrifugal force generated by their wrist-cock release combine together along with the overall stiffness design of the shaft and the CG position of the clubhead to determine how much the shaft bends forward before impact, and thus determine the shaft's effect on the launch angle of the shot. If the golfer unhinges the wrists too early in the downswing, the shaft will not retain all of its potential forward bending by the time the club reaches impact with the ball, thus negating much of the shaft's potential effect on launch angle for this golfer. If the shaft is too stiff or too stiff in the tip section for the golfer, the shaft will not be able to bend forward as much prior to impact and thus cannot enhance launch angle as much. And if the CG of the clubhead is closer to the shaft centerline, the shaft will not be able to bend forward as much prior to impact and thus cannot enhance launch angles much.

4. The shaft cannot bend forward more than the distance that the CG of the clubhead is behind the center of the shaft.

This is perhaps the single most important realization of the work that TWGT has been doing in the area of shaft bending determination. From a pure physics standpoint, it is just not possible for the centrifugal force in the golf swing to cause the shaft to bend forward past a point where the CG of the head is in direct line with the centerline of the shaft. Regardless if this is the most flexible ladies shaft in the hands of Tiger Woods, the shaft cannot bend forward more than the distance that the CG of the clubhead is behind the center of the shaft.

5. It is possible to change the distribution of stiffness over the length of the shaft to further increase or decrease launch angle even though point #4 remains true.

Launch angle as contributed to by the shaft and amount of shaft bending before impact are two different things because of an aspect of the shaft's bending called the Radius of Curvature. Take a look at the two illustrations below:



These simple line illustrations have one distinct difference to note. Shaft #2 on the right is a shaft that is designed with a more flexible tip section than shaft #1. Note that when the radius of curvature increases on shaft #2 due to the more flexible tip section, point A moves backward as a product of the bending of the shaft remaining within the law of physics which dictates that the shaft cannot bend more than the distance the CG of the clubhead is behind the shaft centerline. Thus when the radius of curvature of the shaft increases, the launch angle of the ball off the clubface can increase slightly over that displayed in the action of shaft #1 which is more tip firm, and thus has less radius of curvature in its bending profile.

So what does all of this mean from a shaft fitting standpoint?

- The shaft's entire bending profile MUST be considered before recommending a shaft design and flex for a player to contribute to a desire for trajectory.
- When trying to increase trajectory for a player, don't be afraid to consider choosing shafts which are more flexible than what the golfer's swing speed might indicate. However, if the bending FEEL of the shaft is of high importance to the golfer, staying within traditional swing speed to flex matching will have to be followed.
- Players who release the wrist cock very early in the downswing will more than likely hit almost all shafts on the same flight path when a center face impact is made.
- Traditionally designed iron shafts have less ability to change trajectory for a player than wood shafts because they are more resistant to bending than are wood shafts of the same letter flex.
- Trajectory and launch angle are two different things when it comes to the shaft such that swing speed has to be consulted before estimating the height of the shot as per the shaft's contribution. High swing speed players using a much more flexible shaft will always hit the ball higher than a slower swinger using a more flexible shaft because the greater ball speed and increased spin that comes from a higher swing speed will cause the ball to fly higher for the same given launch angle.
- It is always possible to fit golfers into shafts which are much more flexible to what their swing speed might traditionally be matched as a means to further increase the height of shots through the shaft's contribution. But if fitting golfers with shafts whose flex is more traditionally matched with their swing speed, expect much more of a contribution to the trajectory of the shot from the loft of the clubhead than the design of the shaft. In short, shaft selection for trajectory enhancement is more of a sense of "fine tuning" the flight of the ball.
- Fitting shafts that are much stiffer than the golfer's swing speed match is not a good way to address lowering the trajectory of the shot primarily from the standpoint of the sacrifice in a solid feeling of impact when the ball is hit in the sweet spot of the clubface.

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The MOST IMPORTANT Fitting Specifications for Game Improvement

When you list them on paper, there are more than 20 different specifications on a golf club that can be defined, measured and ultimately fit to the golfer. Let's face it. Trying to precisely define each and every one of these intricately for the golfer's swing movements and manner of play would not only take too long, but would be an exercise in futility because each possible club specification will not visibly change the performance of the shot.

Thus, when trying to award priorities in your fitting to offer the most game improvement help for your customers, make the effort in your work to accurately fit the following club specifications and fitting factors. If you do, your success rate in fitting will increase, and with it, the level of satisfaction and word of mouth advertising from your customers.

1. Woodhead Loft Angle

The majority of golfers are using drivers with too little loft to maximize their distance potential. In general, if you see any golfer with a swing speed of 90mph or less with a driver of 11 degrees or less, you will likely be able to deliver more distance off the tee. Using aids like the TWGT Trajectory and Ball Flight software will help you pinpoint the driver loft decision accurately.

Use common sense on the fairway wood lofts. If the golfer does not achieve much height with a 10 or 11 degree driver, a 13-14 degree #3-wood will not be beneficial. Always keep in mind that a set of fairway woods can be #5, #7 and higher than that.

2. Club Length

45" long drivers are too long for 90% of the people who play golf. Fitting more drivers and woods shorter than what the OEMs build their woods today will bring you many, many happy customers. Tall people don't all need long clubs either. A good "wrist-to-floor" length advisement chart (in the printed TECHreport coming soon to your mailbox!) will be able to guide your initial length recommendations for comfort and control.

3. Set Make Up

Always replace hard-to-hit clubs with clubs that hit the ball the same distance but are easier to get up in the air. If the less skilled, less athletic, lower strength player is competent with fairway woods, push them into #7, #9 woods or even #11 woods and don't start the irons with a club longer than a #5- or #6-iron. Well-designed hybrids such as TWGT's 321LI with matching shafts are always going to be easier to hit than any conventional long iron, for ANY golfer. If the golfer has a very slow swing speed, forget a driver and start the woods with a #5-wood. Just remember – the longer the club, the stiffer the shaft, the heavier the club, the lower the loft, the harder the club will be to hit.

4. Ironhead Lie Angle

The greater the loft, the more off-line the shot will fly if the lie angle is not fit correctly to the physical stature and swing movements of the golfer. Do include a Dynamic lie fitting with ALL fitting sessions. If you can't bend the lie yourself, perform the test with a test iron and tell us what lie you need and we'll take care of the bending. But do NOT ignore proper lie fitting in the irons.

5. Woodhead Face Angle

No question, this is your #1 most effective path to accuracy improvement for golfers with the woods. ALWAYS look for the best face angle to counteract the miss-direction tendencies of your golfers. And remember, TWGT will hand select (for a small fee) any wood model for custom face angles within the +/- tolerance of each wood design.

6. Club Total Weight (shaft weight)

Fit your golfers with the LIGHTEST total weight clubs that they can control. Total weight is determined more by the shaft weight than any other specification. Remember, the definition of control to a 6'3", 215 lb athlete might be a 125g steel shaft. It might also be a 65g graphite shaft but with a higher amount of headweight. Talk to your golfers, ask them about what they perceive as comfortable or not in terms of the total weight of clubs they have used in the past. But when you encounter golfers who are not that strong or athletic, lighter is always going to be best.

7. Shaft Bend Profile

How the stiffness is distributed over the length of the shaft has a bearing on the feel of the shaft and the height of the shot. But when in doubt, err on the side of more flexibility overall and more flexibility in the tip section of the shaft. Keep the tip firm shafts only for the players with a late release of the wrist-cock and you can't go wrong.

8. Club MOI

If you are not building clubs to match the MOI of a favorite club from the golfer's past, you're missing a golden opportunity to increase the areas of game improvement for golfers. If you are building to matched swingweight, be sure to keep the general guideline of 'faster the tempo, stronger the player, higher the swingweight'.

9. Grip Size and Texture

Never underestimate the power of a new grip fit to the size that is most comfortable to the player. Remember, COMFORT in the grip is more important than whether the fingertips just brush the palm when the golfer puts their hands on the club.

10. Wedge Loft And Sole Angle Increments

Don't overlook short game fitting. After all, more than half the shots made in a round are with the short irons and putter. If they leave the ball in the sand, more bounce, or a wider sole, or both will help. If they play where the greens are raised, a 60° wedge is a must. If there are more than 6° between the golfer's PW and SW, add a gap or AW.

11. Putter Length, Lie and Loft

Very few clubmakers make it a point to push for a putter fitting when golfers come to their shops. There is no more important scoring club than the putter. Learn to fit putters for lie, length and really don't overlook the potential for loft fitting as perhaps THE key element for putting improvement.

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Specific Shaft Fitting with TWGT

At TWGT we are continually working to provide you with more and better technical information to guide the fitting recommendations you make for your golfers. One of the most intimidating for clubmakers can be the selection of the shaft. The reason I decided to create ALL of our own shaft designs—and not distribute shafts made and branded by the various shaft vendors—is because I am absolutely sure we can create shafts that are not only the absolute best in quality, but are INDIVIDUALLY designed for SPECIFIC golfer swing types.

Much of our R&D work over the past 2 years has been able to accurately identify which specific swing movements truly relate to the bending and performance of the shaft. We've had to do that as an integral part in the creation of an upcoming software program intended to predict the launch angle contribution of the shaft to the shot. We've also had to do that as part of creating our brand new "more human swinging" hit-testing robot.

That's why you've been reading so much from us lately that stresses the identification of swing movements as KEY for helping you to make better shaft fitting recommendations for your golfers. The next issue of our print

magazine, TWGT TECHreport (which is in the mail as you read this) will show the beginning of that in one of the feature stories on Shaft Fitting Specifics.

From our R & D studies, the following charts show the important swing movements/factors that you need to learn and observe in your golfers to match them to specific design differences in shafts. Because these points describe different parts of the downswing, you'll need to observe all of them in your golfers to decide what description of the swing moves listed below is most like what the golfer displays. Then check each movement's shaft design points and combine these together to best match how the golfer swings. Be sure to note the DIFFERENCES IN TIP TRIM INCREMENTS advised among the shaft recommendations. This is a key part of fitting with TWGT shaft designs for different golfer swing types.

Backswing to Downswing Transition

How smooth or quick is the transition between the end of the backswing and the beginning of the downswing? Here are the variations to look for:

1. The golfer has a distinct pause and begins the downswing with a smooth and even application of the downswing force.
2. The golfer has a fairly quick transition, or no pause at the top, is somewhat aggressive in beginning the downswing but is not quite yet really fast or super aggressive, where you slightly see the shaft bend a little at the very beginning of the downswing.
3. The golfer is very quick in the transition, and really gives the impression of "pulling" down hard on the club to start the downswing, and where you really see the shaft bend for that split second before it starts down.

Wrist-Cock Release

How early or how late does the golfer un-hinge the wrist-cock on the downswing? Here are the variations to look for:

1. The golfer un-hinges the wrists very early on the downswing, so the angle between the shaft and the arms begins to increase and un-hinge as soon as the downswing begins.
2. The golfer can retain most of the wrist-cock at the very beginning of the downswing, but begins to un-hinge the angle between the shaft and the arms shortly after beginning the downswing, and before the club reaches a point of being waist-high on the downswing.
3. The golfer is able to hold the wrist-cock until later in the downswing, with the angle between the shaft and arms beginning to un-hinge at or below the time the club reaches a point of being waist-high on the downswing.

After observing these two key elements in the swing of the golfer, combine what you see and follow these recommendations for shaft selection.

Transition 1 / Release 1

The golfer with the smooth transition and early release is better fit into a shaft with the following design characteristics:

- Rated in swing speed so the golfer's swing speed is at the lower end of the shaft's swing speed range
- Softer in the butt stiffness compared to what is average for other industry shafts of that swing speed range
- Softer tip section design for bend profile
- Not below 3.5 degrees of torque
- Lighter in shaft weight (<75g graphite, <110g steel)
- TWGT Shafts Designed for this Player are:
 - ZT Series High Flight Graphite with 0" (woods) and 1/4" (irons) tip trim increments,
 - GI335 Graphite with 0" (irons) tip trim increments,
 - LV Technology Graphite with 0" tip trim increments (woods and irons),
 - Series 5 Steel with 1/2" (woods) 1/4" (irons) tip trim increments (if the player desires steel)

Transition 1 / Release 2

The golfer with the smooth transition and medium release is better fit into a shaft with the following design characteristics:

- Rated in swing speed so the golfer's swing speed is at the lower to middle area of the shaft's swing speed range
- Softer in the butt stiffness compared to what is average for other industry shafts of that swing speed range
- Softer to medium tip section stiffness design
- Not below 3.5 degrees of torque
- Lighter in shaft weight (<75g graphite, <120g steel)
- TWGT Shafts Designed for this Player are:
 - ZT Series High Flight Graphite with 1/2" (woods) and 3/8" (irons) tip trim increments,
 - GI335 Graphite with 1/4" (irons) tip trim increments,
 - LV Technology Graphite with 1/2" (woods) and 1/4" (irons) tip trim increments,
 - Series 5 Steel with 1/2" (woods) and 3/8" (irons) tip trim increments (if the player desires steel)
- If this golfer does not flex the wrists forward at impact with the medium release of the wrist cock:

- InterFlexx High Graphite if they want to address a higher trajectory desire from the shaft, with 1/2" (woods) and 1/4" (irons) tip trim increments
- InterFlexx Mid/Low Graphite if they want to address a lower trajectory desire from the shaft, with 1/2" (woods) and 1/4" (irons) tip trim increments

Transition 1 / Release 3

The golfer with the smooth transition and late release is better fit into a shaft with the following design characteristics:

- Rated in swing speed so the golfer's swing speed is at the middle area of the shaft's swing speed range
- Softer to Medium in the butt stiffness compared to what is average for other industry shafts of that swing speed range
- Softer to Medium tip section stiffness design
- Not below 3.0 degrees of torque
- Lighter to Medium in shaft weight (<85g graphite, <120g steel)
- TWGT Shafts Designed for this Player are:
 - Series 5-SL Graphite with 3/4" (woods) tip trim increments,
 - GI335 Graphite with 3/8" to 1/2" tip trim increments
 - Series 5 Steel with 1/2" tip trim increments (if the player desires steel)
- If this golfer does not flex the wrists forward at impact with the medium release of the wrist cock:
 - InterFlexx High Graphite if they want to address a higher trajectory desire from the shaft, with 3/4" (woods) and 3/8" (irons) tip trim increments
 - InterFlexx Mid/Low Graphite if they want to address a lower trajectory desire from the shaft, with 3/4" (woods) and 3/8" (irons) tip trim increments
 - InterFlexx Tour Graphite if their swing speed is higher than 105mph, with 3/4" (woods) incremental tip trim

Transition 2 / Release 1

The golfer with the somewhat quick, slightly aggressive transition and early release is better fit into a shaft with the following design characteristics:

- Rated in swing speed so the golfer's swing speed is at the middle area of the shaft's swing speed range
- Softer to Medium in the butt stiffness compared to what is average for other industry shafts of that swing speed range

- Softer tip section stiffness design
- Not below 3.5 degrees, not above 6 degrees of torque
- Lighter to Medium in shaft weight (<85g graphite, <120g steel)
- TWGT Shafts Designed for this Player are:
 - ZT Series High Graphite with 3/4" (woods) 3/8" (irons) tip trim increments,
 - GI335 Graphite with 3/8" (irons) tip trim increments,
 - Series 5 Steel with 3/4" (woods) and 3/8" (irons) tip trim increments (if the player desires steel)
- If this golfer does not flex the wrists forward at impact with their early release of the wrist cock:
 - InterFlexx High Graphite if they want to address a higher trajectory desire from the shaft, with 3/4" (woods) and 3/8" (irons) tip trim increments
 - InterFlexx Mid/Low Graphite if they want to address a lower trajectory desire from the shaft, with 3/4" (woods) and 3/8" (irons) tip trim increments

Transition 2 / Release 2

The golfer with the somewhat quick, slightly aggressive transition and medium release is better fit into a shaft with the following design characteristics:

- Rated in swing speed so the golfer's swing speed is at the middle area of the shaft's swing speed range
- Medium in the butt stiffness compared to what is average for other industry shafts of that swing speed range
- Medium tip section stiffness design
- Not below 3.0 degrees, not above 5.5 degrees of torque
- Lighter to Heavier in shaft weight (<100g graphite, 115-125g steel) although if very light shafts are desired, do not leave the swingweight below D1-D2.
- TWGT Shafts Designed for this Player are:
 - ZT Series High Graphite with 1" (woods) 1/2" (irons) tip trim increments,
 - ZT Series Mid/Low Graphite with 1/2" (woods) and 3/8" (irons) tip trim increments,
 - GI335 Graphite with 3/8" (irons) tip trim increments,
 - Series 5 Steel with 1" (woods) and 1/2" (irons) tip trim increments (if the player desires steel)
- If this golfer does not flex the wrists forward at impact with their early release of the wrist cock:
 - InterFlexx High Graphite if they want to address a higher trajectory desire from the shaft, with 3/4" (woods) and 3/8" (irons) tip trim increments

- InterFlexx Mid/Low Graphite if they want to address a lower trajectory desire from the shaft, with 3/4" (woods) and 3/8" (irons) tip trim increments
- InterFlexx Tour Graphite if their swing speed is higher than 105mph, with 3/4" (woods) incremental tip trim

Transition 2 / Release 3

The golfer with the somewhat quick, slightly aggressive transition and late release is better fit into a shaft with the following design characteristics:

- Rated in swing speed so the golfer's swing speed is at the middle to slightly higher end of the shaft's swing speed range
- Medium in the butt stiffness compared to what is average for other industry shafts of that swing speed range
- Medium tip section stiffness design
- Not below 3.0 degrees, not above 5.5 degrees of torque
- Lighter to Heavier in shaft weight (<100g graphite, 115-125g steel) although if very light shafts are desired, do not leave the swingweight below D1-D2.
- TWGT Shafts Designed for this Player are:
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 - GI335 Graphite with 1/2" (irons) tip trim increments,
 - Series 5 Steel with 1" (woods) and 1/2" (irons) tip trim increments (if the player desires steel)
- If this golfer does not flex the wrists forward at impact with their late release of the wrist cock:
 - InterFlexx High Graphite if they want to address a higher trajectory desire from the shaft, with 1" (woods) and 1/2" (irons) tip trim increments
 - InterFlexx Mid/Low Graphite if they want to address a lower trajectory desire from the shaft, with 1" (woods) and 1/2" (irons) tip trim increments
 - InterFlexx Tour Graphite if their swing speed is higher than 105mph, with 3/4" (woods) incremental tip trim

Transition 3 / Release 1

The golfer with the definite quick, hard and very aggressive transition and early release is better fit into a shaft with the following design characteristics:

- Rated in swing speed so the golfer's swing speed is at the higher end of the shaft's swing speed range

- Medium in the butt stiffness compared to what is average for other industry shafts of that swing speed range
- Medium tip section stiffness design
- Not below 3.0 degrees, not above 5.0 degrees of torque
- Medium to Heavier in shaft weight (75-100g graphite, 115-125g steel) although if very light shafts are desired, do not leave the swingweight below D3-D4.
- TWGT Shafts Designed for this Player are:
 - Series 5-SL Graphite with 1/2" (woods) tip trim increments,
 - ZT Series Mid/Low Graphite with 1/2" (woods) and 3/8" (irons) tip trim increments,
 - GI335 Graphite with 3/8" (irons) tip trim increments,
 - Series 5 Steel with 3/4" (woods) and 3/8" (irons) tip trim increments (if the player desires steel)
- If this golfer does not flex the wrists forward at impact with their early release of the wrist cock:
 - InterFlexx High Graphite if they want to address a higher trajectory desire from the shaft, with 1" (woods) and 1/2" (irons) tip trim increments
 - InterFlexx Mid/Low Graphite if they want to address a lower trajectory desire from the shaft, with 1" (woods) and 1/2" (irons) tip trim increments

Transition 3 / Release 2

The golfer with the definite quick, hard and very aggressive transition and medium release is better fit into a shaft with the following design characteristics:

- Rated in swing speed so the golfer's swing speed is at the higher end of the shaft's swing speed range
- Medium to Firm in the butt stiffness compared to what is average for other industry shafts of that swing speed range
- Medium to firm tip section stiffness design
- Not below 3.0 degrees, not above 5.0 degrees of torque
- Medium to Heavier in shaft weight (75-100g graphite, 115-125g steel) although if very light shafts are desired, do not leave the swingweight below D3-D4.
- TWGT Shafts Designed for this Player are:
 - Series 5-SL Graphite with 1" (woods) tip trim increments,
 - ZT Series Mid/Low Graphite with 1" (woods) and 1/2" (irons) tip trim increments,
 - GI335 Graphite with 1/2" (irons) tip trim increments,
 - Series 5 Steel with 1" (woods) and 1/2" (irons) tip trim increments (if the player desires steel)

- If this golfer does not flex the wrists forward at impact with their medium release of the wrist cock:
 - InterFlexx High Graphite if they want to address a higher trajectory desire from the shaft, with 1" (woods) and 1/2" (irons) tip trim increments
 - InterFlexx Mid/Low Graphite if they want to address a lower trajectory desire from the shaft, with 1" (woods) and 1/2" (irons) tip trim increments
 - InterFlexx Tour Graphite if their swing speed is higher than 105mph, with 1" (woods) incremental tip trim

Transition 3 / Release 3

The golfer with the definite quick, hard and very aggressive transition and late release is better fit into a shaft with the following design characteristics:

- Rated in swing speed so the golfer's swing speed is at the higher end of the shaft's swing speed range
- Medium in the butt stiffness compared to what is average for other industry shafts of that swing speed range
- Firm/Stiff tip section stiffness design
- Not above 4.0 degrees of torque
- Medium to Heavier in shaft weight (75-120g graphite, 115-125g steel) although if very light shafts are desired, do not leave the swingweight below D4-D5.
- TWGT Shafts Designed for this Player are:
 - Series 5-SL Graphite with 1"+ (woods) tip trim increments,
 - ZT Series Mid/Low Graphite with 1" (woods) and 1/2" (irons) tip trim increments,
 - GI335 Graphite with 1/2" to 5/8" (irons) tip trim increments,
 - Series 5 Steel with 1"+ (woods) and 1/2" to 5/8" (irons) tip trim increments (if the player desires steel)
- If this golfer does not flex the wrists forward at impact with their early release of the wrist cock:
 - InterFlexx High Graphite if they want to address a higher trajectory desire from the shaft, with 1" (woods) and 1/2" (irons) tip trim increments
 - InterFlexx Mid/Low Graphite if they want to address a lower trajectory desire from the shaft, with 1" (woods) and 1/2" (irons) tip trim increments
 - InterFlexx Tour Graphite if their swing speed is higher than 105mph, with 1" (woods) incremental tip trim

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The Most Fun I Have Had in Decades

As a new business owner with my best friend and wife Mary-Ellen (who, if you excuse the clubmaking metaphor, is definitely the “epoxy” that holds all the “heads” and “shafts” together in our business!) it definitely is nice to be able to call the shots (whether good or “less good”!) In the past when clubmakers would ask what I enjoyed the most about my work, I used to say it has been the actual design process – from the concept of the performance intent, making the models, modeling the performance, checking the tooling masters, testing the prototypes, to giving the “go” for production when everything is as I want it.



But since starting our own business, it’s been interesting for me to note how that’s changed a little bit. Since we ‘opened the doors’ of TWGT last February, we have been fortunate to have received a ton of emails, letters and phone calls from clubmakers, even from the customers of the clubmakers, with incredibly nice compliments and kudos on the performance of our head, shaft and grip designs.

Over the past year and a half I have come to realize that I enjoy the feeling of pride in hearing how our

designs have been able to bring real enjoyment to golfers as much as the actual design process. OK, call that a little bit of feeding the ego, but it’s different now than it was for me in my previous work. In the past, I always took pride in trying to create the best component designs I possibly could because I have always had a real passion for my work. But now it’s different because my name is on the designs for the first time in my design career.

Maybe it’s because of that. Maybe it’s because I feel I have learned more from the R&D projects in the past 2 years than I did the 10 years before that have really helped me become a better golf equipment designer. I know a lot of the technical and engineering discoveries we have made recently have been incredibly fascinating and definitely make me feel that our present designs are the best I have ever been fortunate to be able to have created. . . so far, because there are new things on the ‘back burner’ all the time!

One thing that hit me the other day as well was the fact that we have received numerous “kudos” communications for each and every one of our TWGT models and not just a few. In my past work, there were always complimentary letters/emails/calls about models, but there were always 4-5 models every year that we never heard ‘boo’ about.

So to all of you who have taken the time to let us know how much you like our designs and how they have brought more enjoyment when you play, thank you very much!! It’s like gas in the tank to keep the car racing down the track trying to do better and better.

And for those of you who have yet to try any of our designs, you really need to because, well, for lack of a better way to say it – they really are the best performing models I have ever designed. If you’re not that familiar with all of the design differences, [call us](#) and let us help you select the right head, shaft, grip and assembly specs for your golfers, and I have a strong hunch you’ll have some real pats on your back for a job well done in clubmaking.

Thank you!!! [to top](#)