FRY STRAKA
GLOBAL GOLF COURSE DESIGN

6940 Raymond Drive
Dublin, Ohio 43017 USA

March 1, 2023

Mr. John Roper, COO
Dunn Capital Corporation
40 Huron Street, Suite 300
Collingwood, ON Canada L9Y 4R3

Re: Golf Safety Analysis
Georgian Bay Club – Enclave, Option 5

Dear Mr. Roper:

Per the request of Mr. Ken Hale of your company, Fry/Straka Global Golf Course Design submits this report of Golf Safety Analysis of the Enclave – Option 5 subdivision plan received on February 8, 2023. Attached is a Golf Spray Diagram, with an explanation of the diagram development offered below.

While there are no set standards for golf course design, there are generally accepted guidelines set by precedent of similar projects. While perhaps similar, these projects must individually take into account various conditions such as, but not limited to climate, prevailing wind, elevation, and elevation change. These guidelines have been memorialized by generally accepted golf course writings by practicing golf course architects in similar situations, in similar points in time. However, factoring in the guidelines and site conditions, it is impossible to provide 100% safety without netting, especially near a practice range where beginners often practice.

One of the more generally cited and accepted golfer spray analysis was published by the Royal & Ancient Golf Club of St. Andrews (R&A), one of the globally recognized governing bodies of golf, titled *Analysis of Amateur Driving Data 1996-2008*, which is attached. In this report, the R&A generally agreed that approximately 90% of golf shots fall within a 14 degree angle on either side of the intended centerline (target line) of a drive. Our company typically uses a 15 degree angle on either side of the centerline as the starting point for drives, which is expected to contain approximately 92% of the shots, and we adjust from there. We also generally use an offset of 61.0 meters (200 feet) from the centerline of a golf hole a radius of 45.7 meters (150 feet) from the center point of the green.

We prepared the attached *Golf Spray Diagram,* based on the above guidelines, depicting the relationship of the practice range and Hole 7 to the proposed Enclave subdivision. The diagram shows the angles from the western edges of the practice range tees. It is common for thousands of golf balls to be hit daily on a practice range during the peak season. Since most golfers are right-handed and a majority of less-skilled golfers typically mishit more shots to the right, as noted in the R&A report, typically more shots are hit out of the 'wedge' to the right than the left. If there was constant play from the northwest corner of the practice range tee aimed to the target green closest to the house lots and/or down the west edge of the practice range, it can be expected that approximately 5%-7% of the shots will fall outside of the 'wedge' depicted on the diagram to the west of the practice range.

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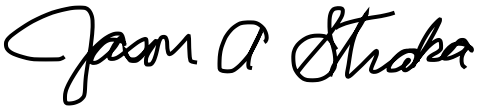
To this end, we recommend a building setback from the property line (we believe as shown in the plans received from you). Furthermore, no public or private activity should be permitted in that building setback to the west of the practice range, such as walking trails. Additionally, the existing thick vegetation and trees should remain in this area. This will help protect the home lots from errant golf ball strikes. As designed, we believe the home lots appear to be 'reasonably safe' from errant golf balls, and more so if the heavy tree vegetation is kept intact as a buffer.

Please contact us if you have any questions.

Sincerely,
FRY/STRAKA GLOBAL GOLF COURSE DESIGN



Jason A. Straka, ASGCA
Principal

FRY STRAKA
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March 1, 2023

GRAPHIC SCALE
(IN METERS)
16 0 8 16 32 48 64 80
1 : 800 (HORIZONTAL)

Georgian Bay Club

Clarksburg, Ontario

Golf Spray Diagram

Analysis
of
Amateur Driving Data

1996-2008

Important Note: Report Status

This document (the "Report") is a work of research by R&A Rules Limited. R&A Rules Limited makes no representation as to the accuracy or the content of the Report and any party relying on the content or accuracy of the Report should undertake its own verification.

Table of Contents

Abstract

Driving data for amateur 'club' golfers has been collected for the same 6 venues in the UK, visited for the most part annually since 1996. These data show that the overall average driving distance of those shots measured (totalling on average approximately 2,100 shots per year) is 6 yards longer in 2008 at 206 yards than measured in 1996. Over the 13 year range, there has been a small decrease in driving accuracy and a considerable increase in driver usage which is primarily manifested in high handicap golfers.

On consideration of drives hit only using driver, the measured average driving distance in 2008 is less than 3 yards longer than that measured in 1996 although annual variability means that these data points neither represent the longest nor the shortest yearly average driving distance measured over the 13 year study.

Considerable scatter has been demonstrated on the dispersion of the drives measured since 2006. Only 50% of drives measured finished within 20 yards of the centre of the fairway and typically only 90% finished within 40 yards of the centre of fairway. This dispersion appears to be mostly independent of distance category.

A preliminary study of driver launch conditions has shown an average club head speed (of 62 measured golfers hitting 269 shots between them) of 94.4 mph, producing an average ball speed of 136.8 mph, with a launch angle of 10.75 degrees and spinning at 3433 rpm. The median carry measured was 188 yards although the variation of all of these parameters was considerable.

Introduction & Experimental Method

Driving distance data has been collected for amateur 'club' golfers in the UK each year since 1996. The same six venues within the United Kingdom have been used each year, with each course visited once between May and September. Wherever possible, a similar time of year and competition is utilised for each venue as for preceding visits. Laser measuring equipment is used to measure the driving distances attained on two holes running in near opposite directions (to minimise the effect of the wind). On average, just over 2100 shots have been measured each year with the exceptions of a couple of years where events at two venues were unavailable for data collection.

In addition to distance from the tee, information is also recorded for each shot relating to:

a) Final location of the shot (fairway/rough/bunker etc). Since 2006, these data have additionally been recorded numerically (as distance from the centre of the fairway)
b) Handicap of the golfer hitting the shot
c) Club used for the shot (Driver/Fairway Wood/Iron etc)

A similar study has been undertaken by an independent researcher group in the USA at a single tournament in 2006. The results of the US study provides a useful and favourable comparison to the data presented in this study for that year. The details of the comparison between the two studies is presented in the Appendix to this report.

Furthermore, a preliminary study measuring the launch conditions of amateur golfers has been undertaken. Comments are contained herein on a sample of 269 shots, hit by 62 golfers, each using a driver. The shots were hit on a driving range and the launch conditions and carry of the shots measured using a Doppler radar tracking system.

Results & Discussion

Handicap Distribution

For the purposes of distinguishing trends by the ability of the golfers, the handicap categories were selected based on those defined by the Congress of National Golf Unions (CONGU). The handicap bounds for these categories were:

a) Handicaps of better than 6

b) Handicaps between 6 and 12 inclusively

c) Handicaps between 13 and 20 inclusively

d) Handicaps of 21 and over

Figure 1 shows the breakdown of shots into these categories. It can be seen that generally, there are around 10% of the golfers tested falling into each of the extreme categories (a & d) whilst around 40% of golfers were found to be in each of the intermediate categories (b & c). On average, over 2100 shots have been collected each year since 1996, with the exceptions of 1999 (1700 shots) and 2003 (1500 shots) where in each case, two events were unavailable.

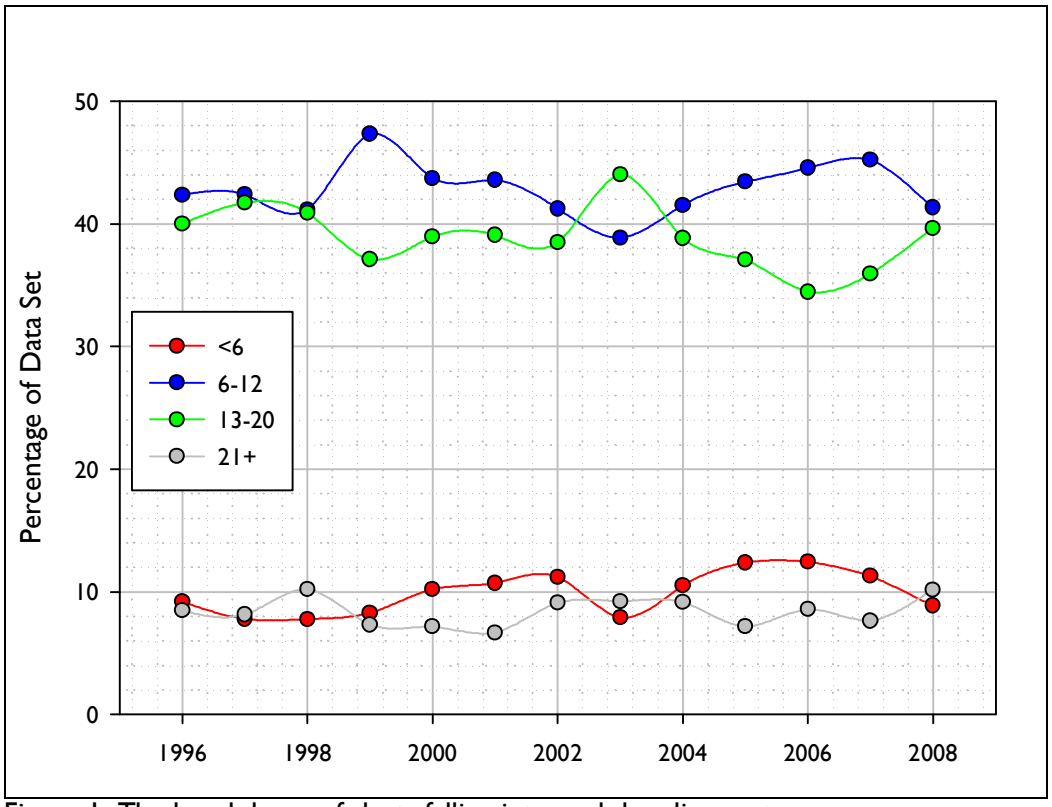

Figure 1. The breakdown of shots falling into each handicap category.

The average handicap of the golfers tested over the duration of the study has remained roughly static at an average of 12.5 but with an annual variation quantified by a standard deviation of 0.35.

Club Usage

In 1996, 73% of the shots recorded were hit using a driver. By 2006, this percentage had increased to roughly 90% and has remained at around that level since. Figure 2 shows the annual variation in driver usage along with the data broken down by handicap category for the cohort of shots measured. Whilst the average increase in driver usage has been reasonably steady up to 2006, there is negligible wholesale change in driver usage by the lowest handicap category (although there are yearly fluctuations). The most significant change in club selection occurs for the highest handicap category golfers with as many as 87% of these golfers selecting to use driver in 2006 (a slight decrease has subsequently been observed in both 2007 and 2008) compared to only 54% electing to use driver in 1996. The increase in driver selection for the intermediate handicap categories is less pronounced but significant nonetheless. In 1996, 6-12 handicap golfers tested hit 81% of the shots with a driver whilst 64% of their 13-20 handicap counterparts selected driver on the holes tested. By 2008, these percentages had increased to 93% and 89% respectively converging on the driver use percentage typical of the <6 handicap golfers tested since 1996.

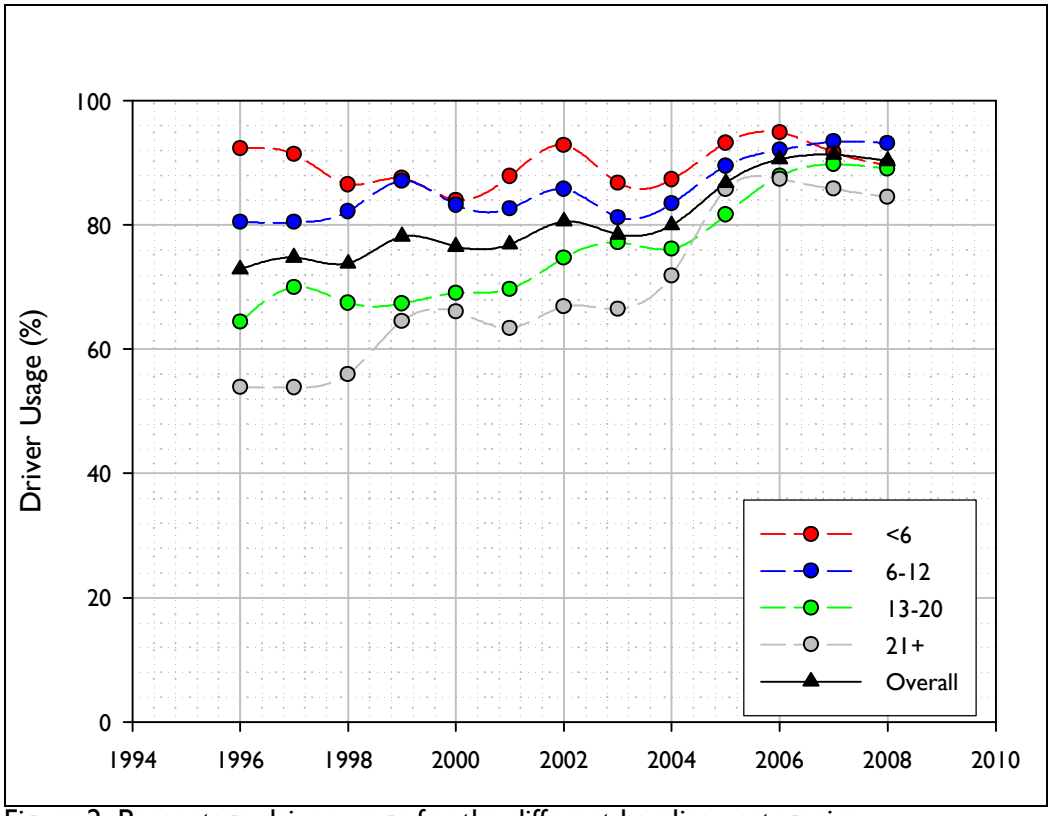

Figure 2. Percentage driver usage for the different handicap categories.

Driving Distance

The average total driving distance for the players tested was 6 yards longer at just over 206 yards in 2008 than the average of nearly 200 yards measured in 1996. The magnitude of this increase has been contributed to by all handicap categories, but by differing amounts, Figure 3. The smallest increase comes from the lowest handicap golfers where the average driving distance in 2008 at just under 234 yards is only 0.7 yards longer than the 1996 value which averaged just over 233 yards. The 6-12 handicap category golfers hit the ball on average 4 yards further in 2008 than they did in 1996, achieving an average driving distance of just under 217 yards in 2008. The largest increases in driving distance were observed for the higher handicap golfers with an increase of over 11 yards from 186 to 197 yards for the 13-20 handicap category and over 10 yards from just under 165 to just over 175 yards observed for the 21+ handicap category.

It should be noted at this point that invariably, annual fluctuations in these data are observed which can at least in part be attributed to variations in local environmental conditions. The distances measured in 2008 represent a decrease for all but one handicap category from the equivalent data measured in 2007 with the 13-20 handicap golfers showing negligible change in average driving distance. Combined, these decreases represented an average decrease of nearly 6 yards overall driving distance from 2007 to 2008.

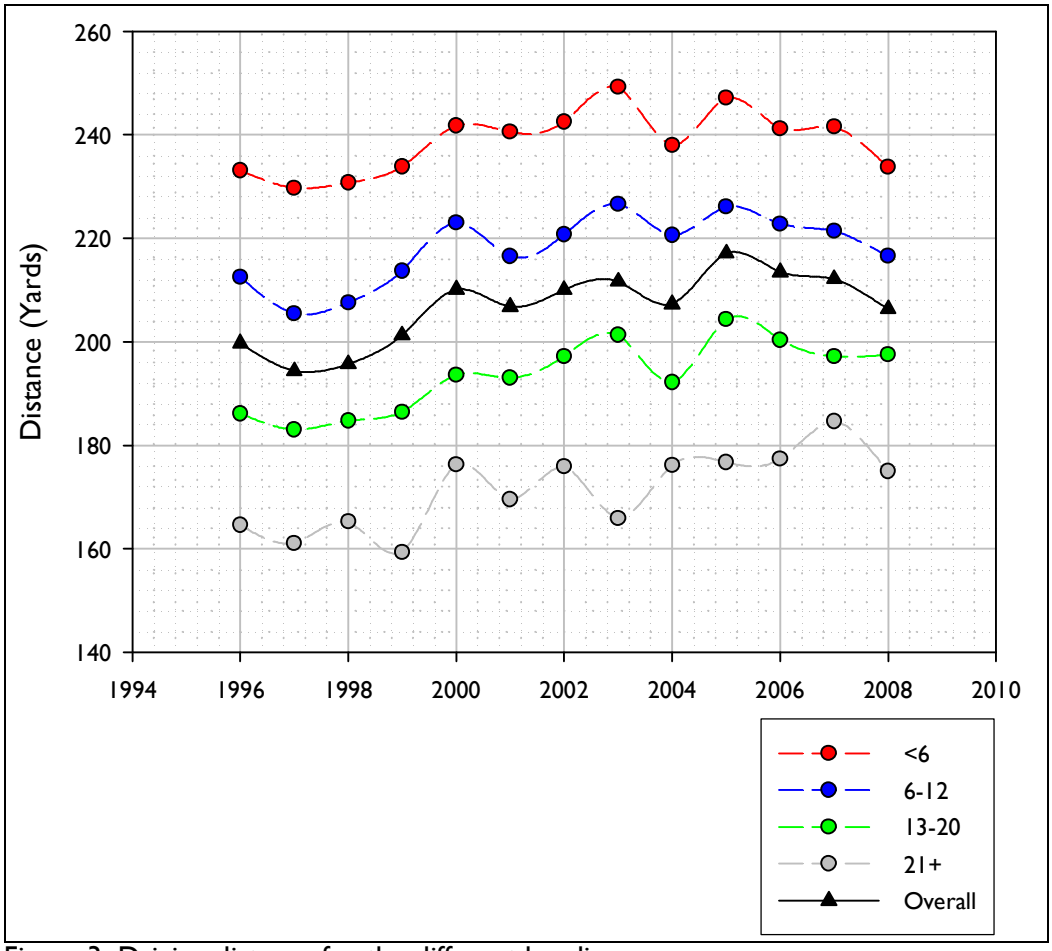

Figure 3. Driving distance for the different handicap groups vs. year.

If the data is further analysed by percentiles, Figure 4, it can be seen that in 1996, the median (50th percentile) was 205 yards whilst in 2008 it had increased to 210 yards. In both cases, these are higher than the mean driving distances, by 5 yards in 1996 and by 4 yards in 2008. This indicates that there is a skew to the data in terms of the distribution of driving distance.

Examining the longer than average drives, it can be seen that the longest 10% of drives were longer than 247 yards in 1996 whilst in 2008, 10% of drives went further than 254 yards, an increase of 7 yards and an increase of 2 yards relative to the increase observed for the median.

Conversely, whilst in 1996, 10% of drives measured shorter than 144 yards, in 2008, only 10% of the drives were shorter than 155 yards. This represents an increase of 11 yards, and an increase of only 6 yard relative to the increase observed in the median.

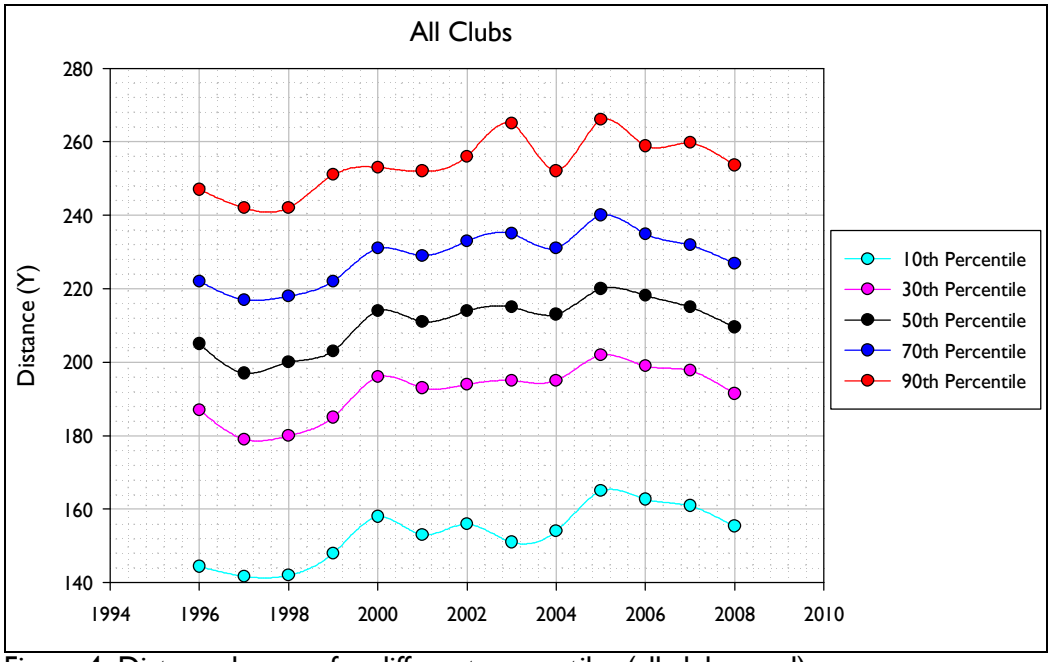

Figure 4. Distance by year for different percentiles (all clubs used).

Previously, the increase in driver usage for intermediate and high handicaps groups was highlighted. Thus to isolate the effects of club selection from the increase of driving distance due to other means, the driving distance data was re-analysed, excluding shots that were measured having been hit using clubs other than drivers. The separation of these data by handicap group are shown in Figure 5.

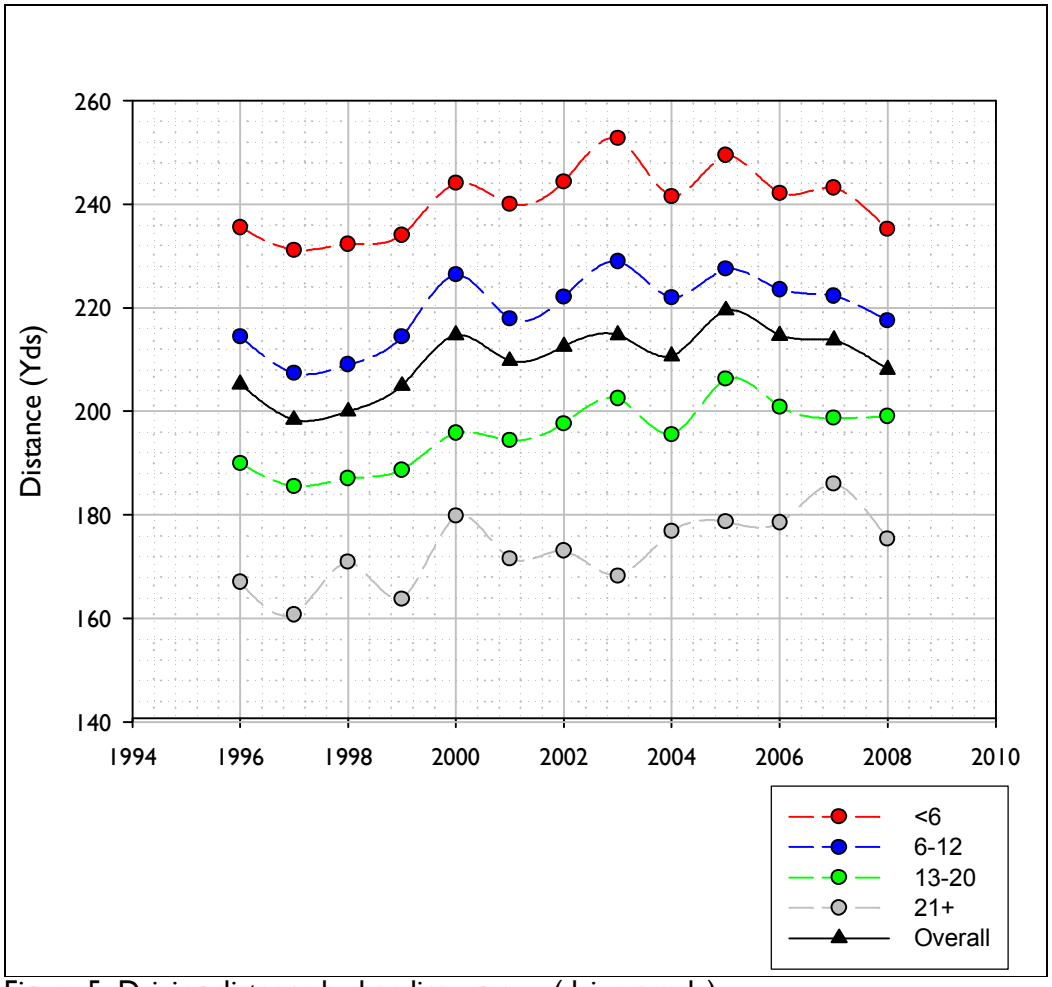

Figure 5. Driving distance by handicap group (drivers only).

It can be seen from these data that as with the data for all clubs, Figure 3, there is an increase in the average driving distance from 1996 to 2008. Again, this increase is observed for all handicap categories. The major difference between the distances measured for the complete data set and only these shots struck with driver is for the magnitude of these increases with time. When only drivers are considered, the increase of average driving distance from just over 205 to just over 208 yards represents an increase of only 2.9 yards, only 44% of the increase if all clubs are considered. The changes in driving distance by handicap vary from a decrease of 0.3 yards for the lowest handicap category, to increases for the other three categories amounting to a 3 yard increase for the 6-12 category, through to 9 and 8 yard

increases for the 13-20 and 21+ categories respectively. In all cases, the magnitude of the increase in driving distance was higher for the data presented previously relating to all clubs than the equivalent data presented for shots struck only using drivers.

It is useful to note that whilst the average driving distance in 2008 is only 2.9 yards higher than that observed for 1996, it is also 11 yards shorter than the longest annual average driving distance which was observed in 2005 at just over 219 yards. Conversely, the driving distance average in 1996 is nearly 7 yards longer than the shortest annual average which was measured a year later in 1997 at just over 198 yards. This merely serves to highlight the annual fluctuations.

Further considering these 'driver only' data by percentiles, Figure 6, it can be seen that whilst measurable increases in distance have been observed for the longest 10% and shortest 10% of drives, the median, 30th and 70th percentiles have exhibited negligible increase from 1996 to 2008 (the median actually shows a decrease of 0.4 yards, the 70th percentile increases by 0.4 yards and there is no change in the 30th percentile). For those percentiles which have shown measurable increases, the longest 10% of drives went over 255 yards in 2008, an increase of just over 5 yards from the 1996 equivalent. The shortest 10% of drives in 2008 measures shorter than 157 yards, 8 yards longer than in 1996 although only 2 yards longer than the 10% shortest shots in 2008 when considering all shots.

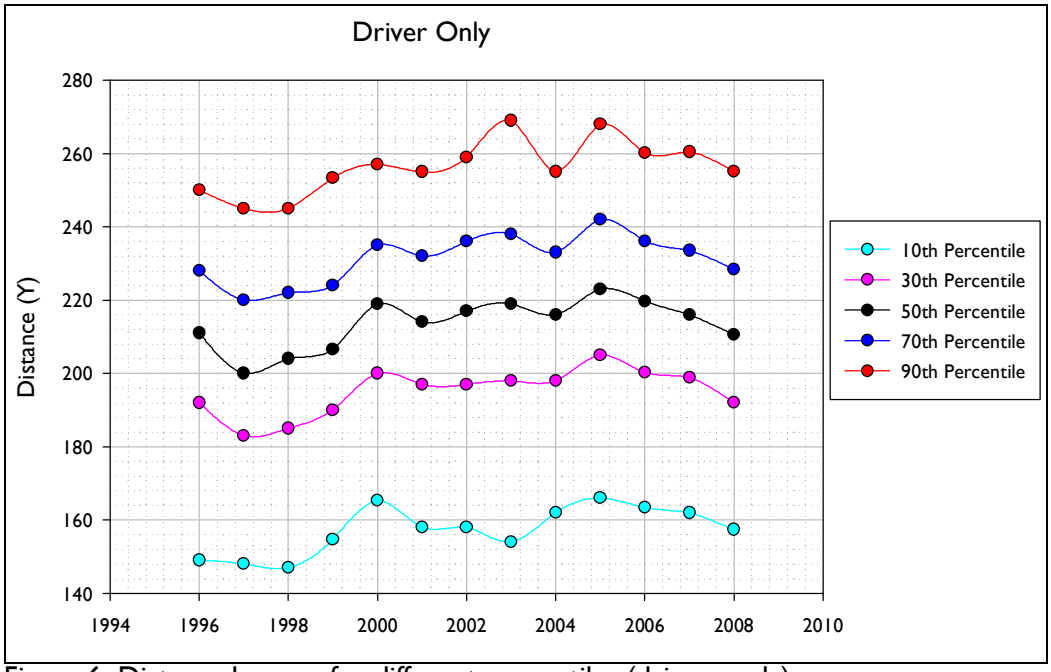

Figure 6. Distance by year for different percentiles (drivers only).

Driving Accuracy I – Fairways Hit

Historically, the measure of driving accuracy has been the percentage of fairways hit. Figure 7 shows these data, separated by handicap category for the measured drives between 1996 and 2008. In general, as might be expected, the driving accuracy of the lowest handicaps is higher than the higher handicaps, although this is not exclusively the case every year. Driving accuracy has decreased slightly over the last 12 years with the average fairways hit percentage decreasing from 49% to 44%.

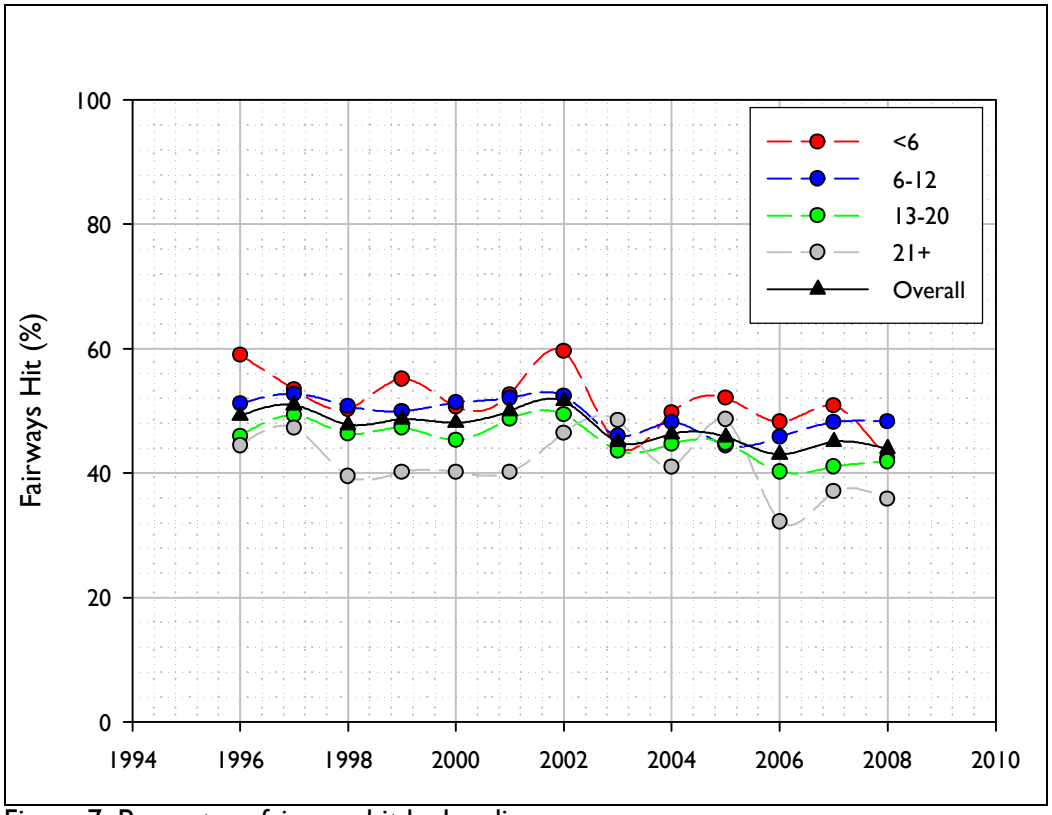

Figure 7. Percentage fairways hit by handicap group.

Driving Accuracy II – Shot Dispersion

Since 2006, data has been collected to allow more thorough analysis of driving accuracy through a measurement of the actual dispersion of the shots from the centre of the fairway. An example of the distribution of the shots on one hole on one day is shown in Figure 8. It can be seen that whilst the points are colour coded by handicap category, there is a considerable range of dispersions observed for all handicap categories with a number of shots not reaching the fairway.

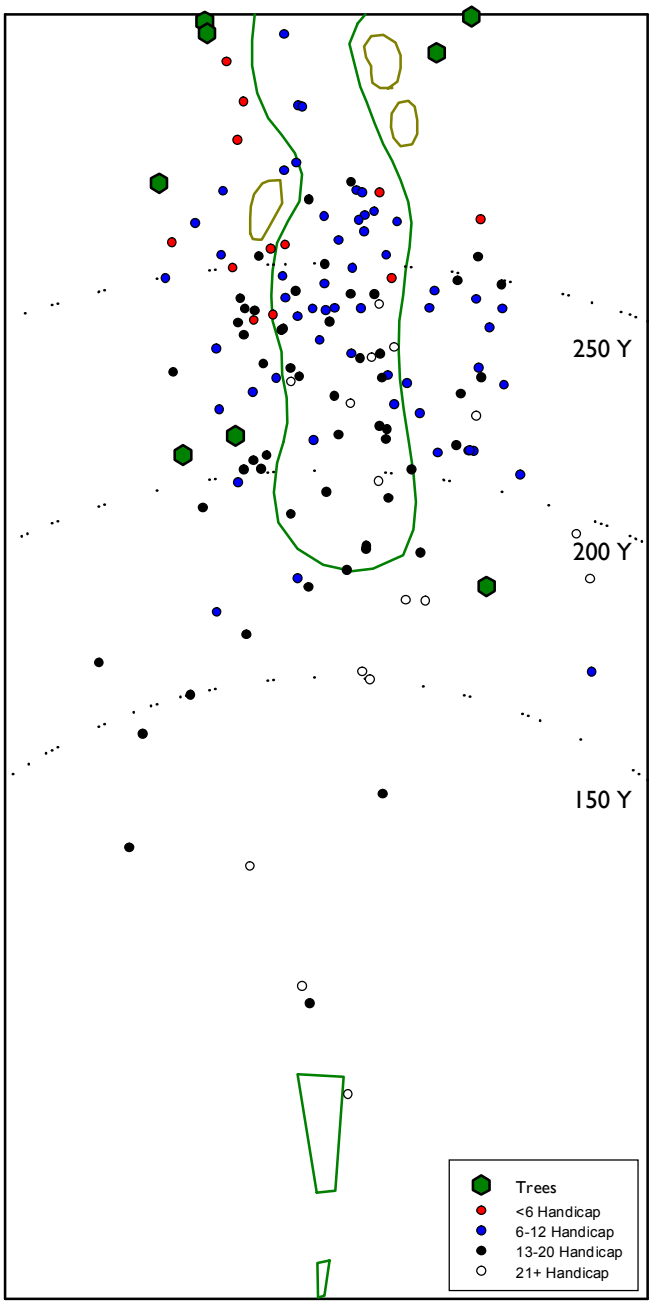

Figure 8. Map showing example dispersion of drives on one hole during one days data collection.

To further analyse these dispersion data, they have been plotted as the distance (in yards) perpendicular to the line connecting the tee to the centre of the fairway. Box plots representing these data for each course for 2006, 2007 and 2008, are shown in Figure 9, Figure 10 and Figure 11 respectively. In each case, the shoulders of the box

represent the 25th and 75th percentiles whilst the black and red lines contained within the box represent the median and mean values respectively. The whiskers represent the 10th and 90th percentiles and finally the circles the 5th and 95th percentiles. Finally, positive numbers represent those to the left of the centre of the fairway (as looking from the tee) whilst negative numbers are to the right of the centre of the fairway. So for example, when considering the dispersion for Course "A" in 2006, Figure 9, it can be seen that the median drive is 0.6 yards to the left of the centre of the fairway whilst the mean is 0.2 yards to the right. 50% of the drives (25th – 75th percentile) finished between 14.5 yards to the left and 15.2 yards to the right of the centre of fairway whilst 80% (10th – 90th percentile) were contained between 26.6 yards to the left and 27.3 yards to the right of the fairway. Finally, 5% of the shots were more than 33.6 yards to the left of the centre of the fairway (>95th percentile) whilst a similar number were more than 38.2 yards to the right of the centre of the fairway (<5th percentile).

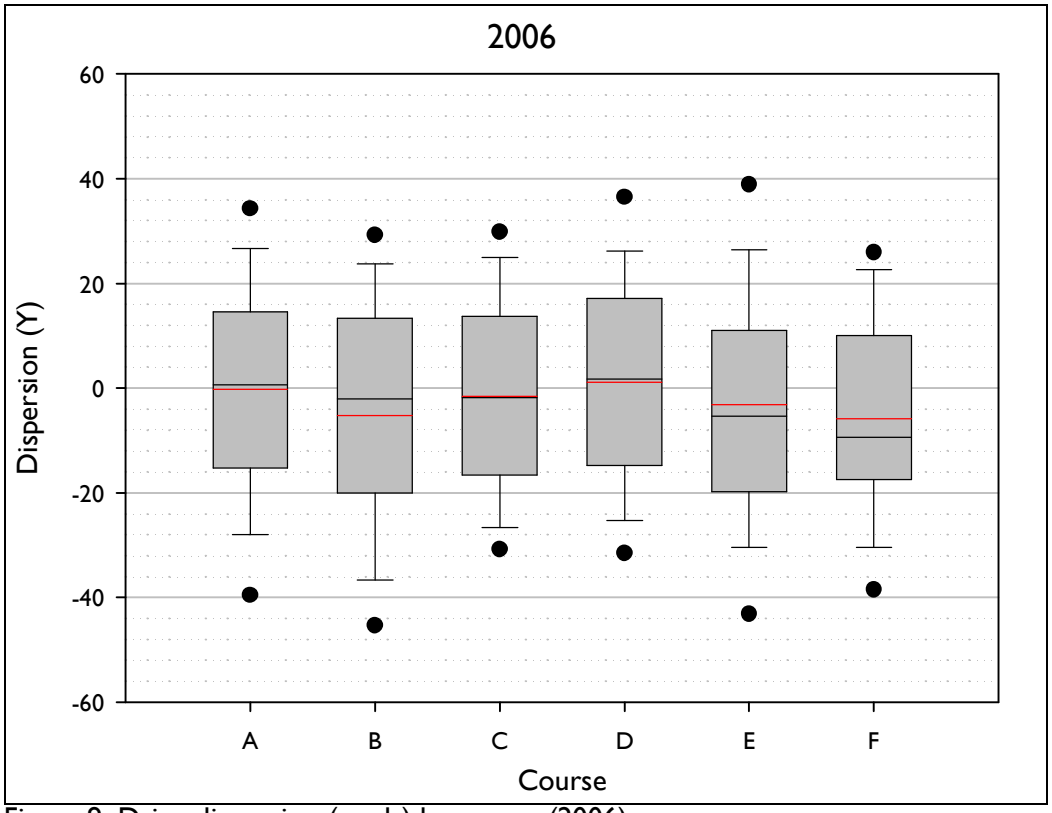

Figure 9. Drive dispersion (yards) by course (2006).

It can be seen from comparing these data that in for almost all cases, 50% of drives hit were within 20 yards of the centre of the fairway and that generally, 90% of drives were within an 80 yard spread (although the median values translate the population left or right depending on the hole). There are variations in annual median dispersion although for the most part, variability in the median drive tends to favour the equivalent side of the fairway (for instance at 2 yards from the centre of the fairway, the median drive at course F was 6 and 7 yards closer to the centre in 2008 than in 2007 and 2006 respectively but in all three years, the median drive favoured the right hand side of the fairway.

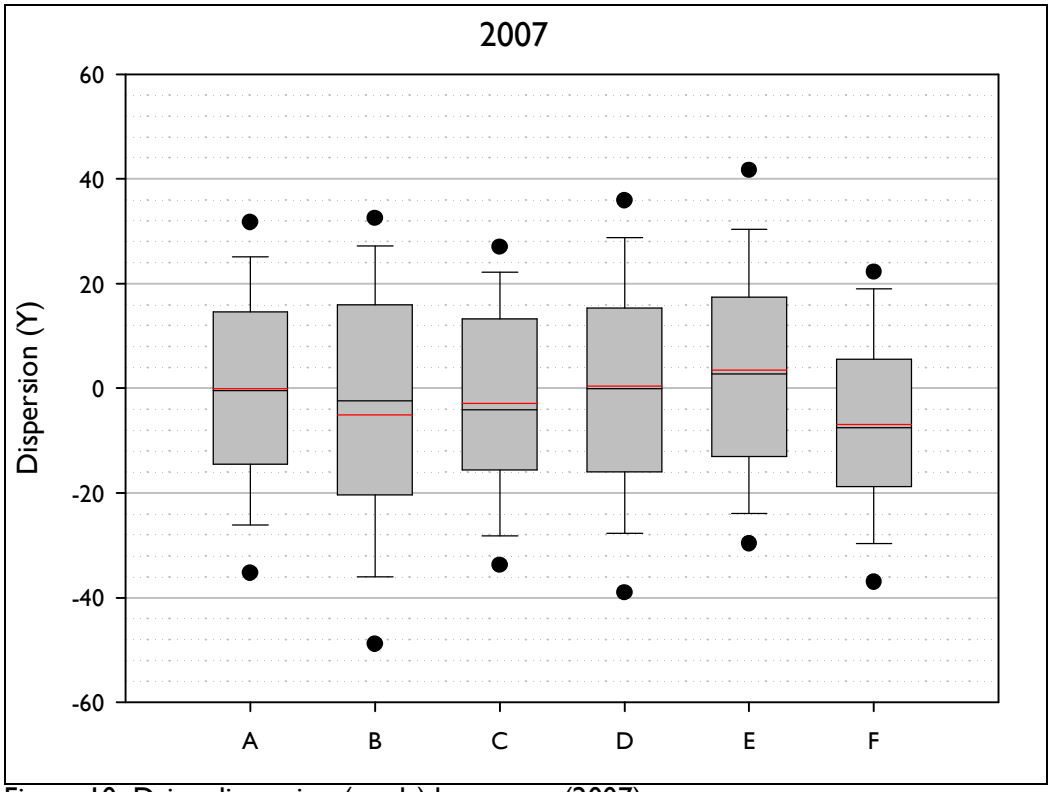

Figure 10. Drive dispersion (yards) by course (2007).

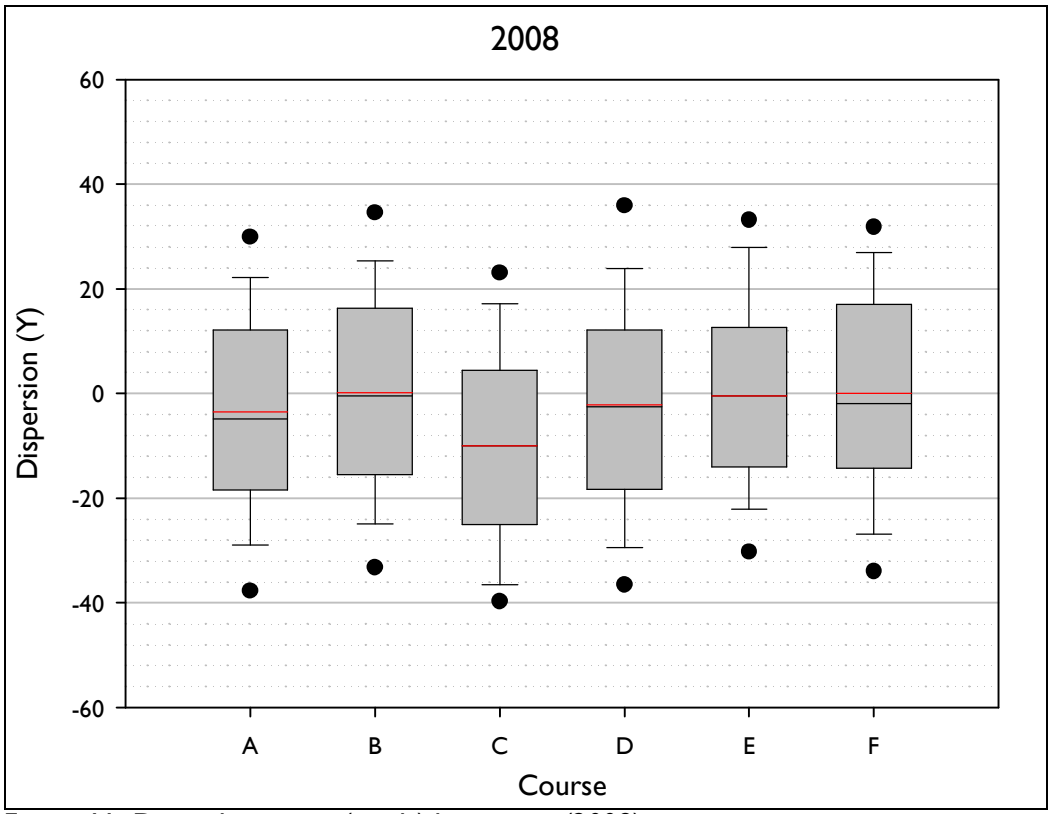

Figure 11. Drive dispersion (yards) by course (2008).

As a means of analysing dispersion as a function of distance from the tee, the angle from the tee to centre of fairway line to the balls final resting place was calculated for each shot. As for the absolute distance from the tee to centre of fairway line, these data were presented by course for each year as box plots, Figure 12, Figure 13 and Figure 14. In these cases, it can be seen that the dispersion of 50% of the shots is generally within 5 degrees of the centre line whilst 80% are within 10 degrees and 90% within 14 degrees.

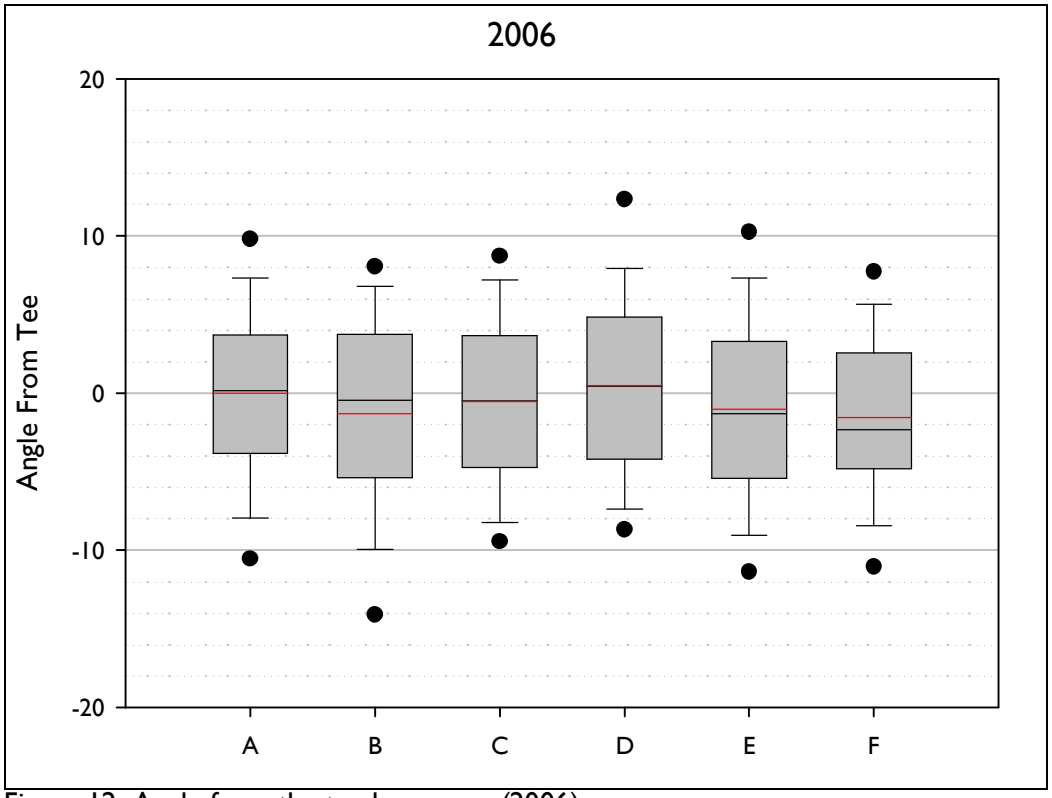

Figure 12. Angle from the tee by course (2006).

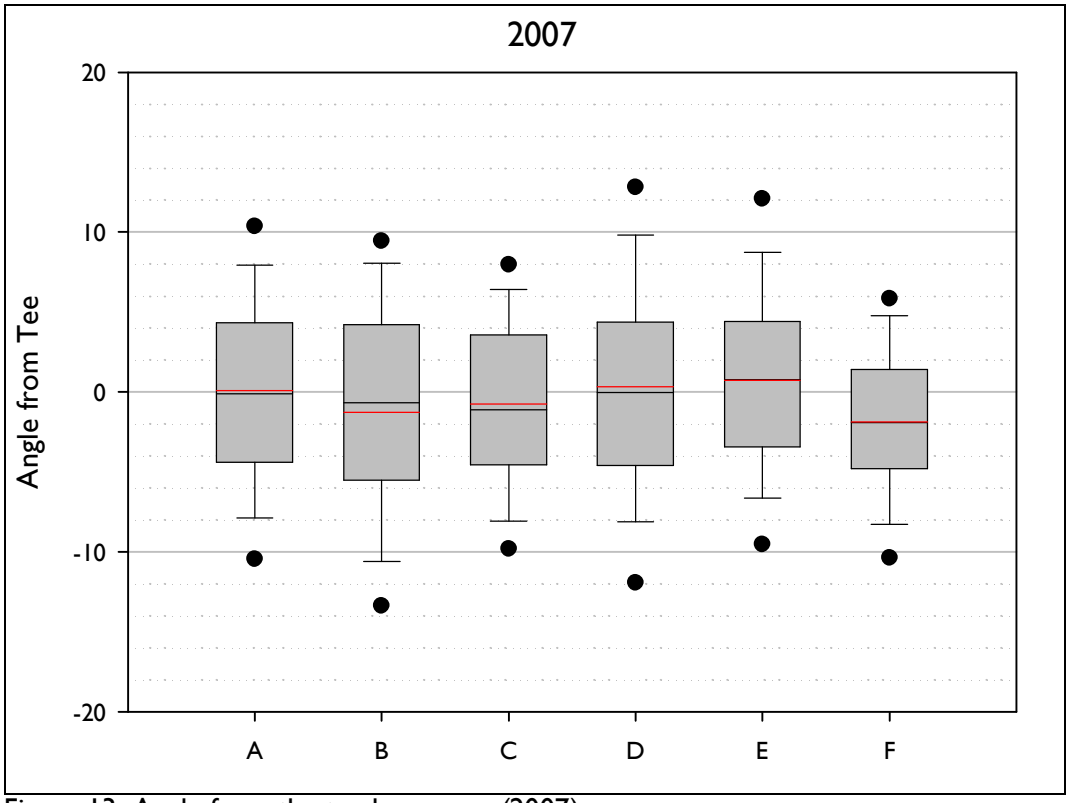

Figure 13. Angle from the tee by course (2007).

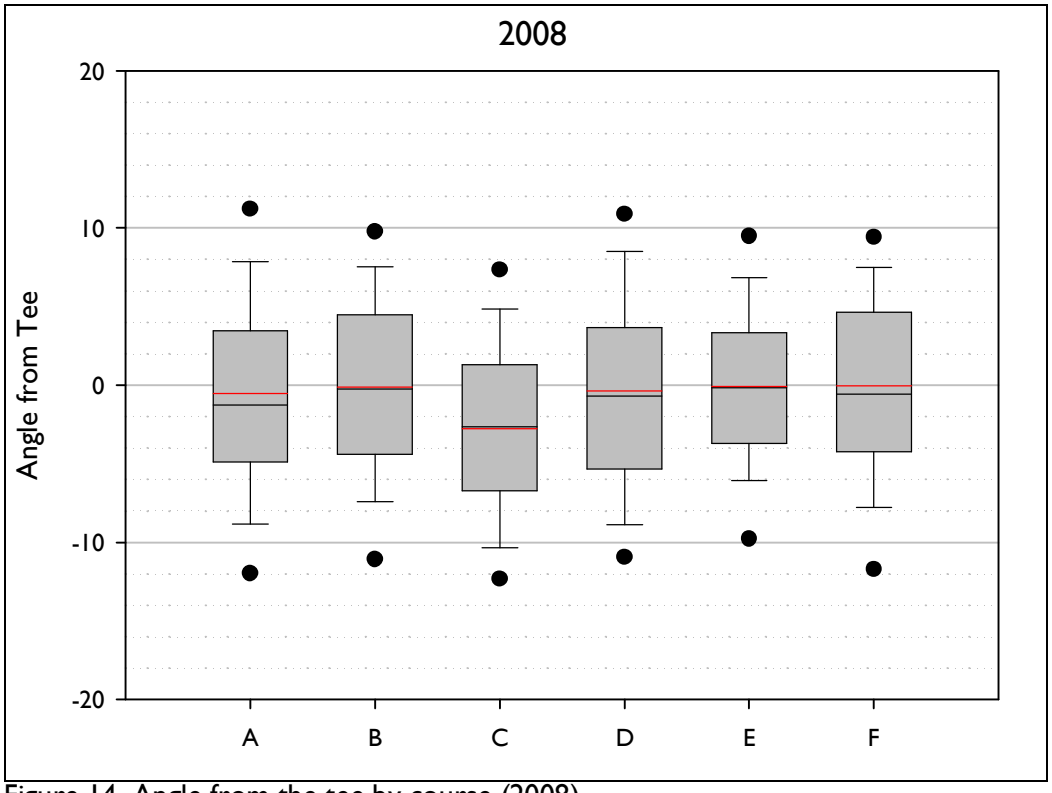

Figure 14. Angle from the tee by course (2008).

To further quantify the effect of distance on the dispersion, the data for all six courses were combined and differentiated by driving distance for the three years. Figure 15,Figure 16 and Figure 17 show these data for absolute dispersion (distance from the tee to centre of the fairway line). It can be seen that any changes in dispersion with distance indicate that the shots which finished furthest from the tee (top 25%) tend to have a slightly lower dispersion than the shorter shots.

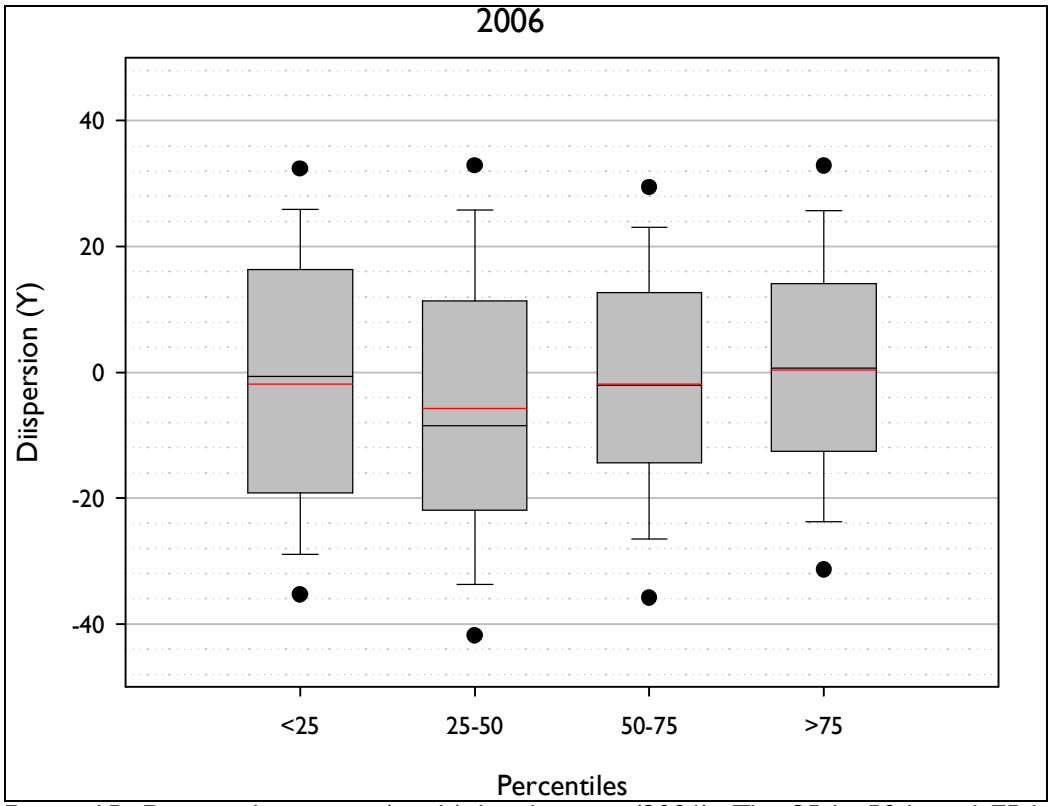

Figure 15. Driving dispersion (yards) by distance (2006). The 25th, 50th and 75th percentiles in 2006 were 194.1, 218.1 and 239.8 yards respectively.

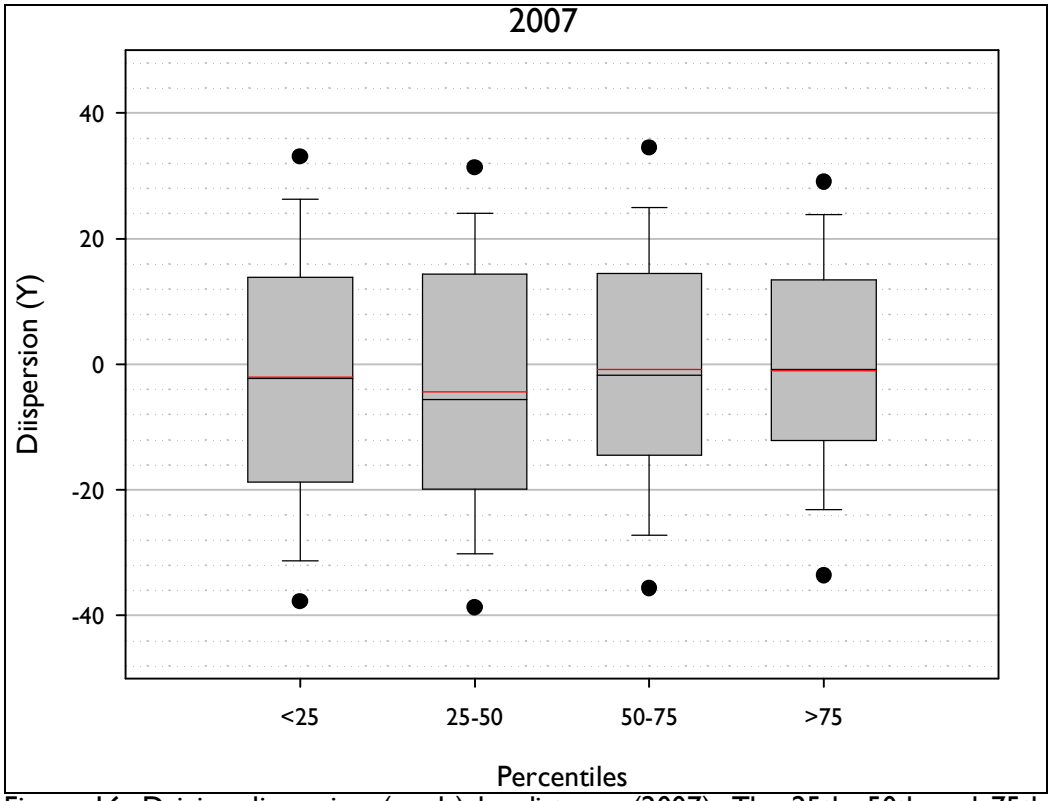

Figure 16. Driving dispersion (yards) by distance (2007). The 25th, 50th and 75th percentiles in 2007 were 192.6, 215.2 and 237 yards respectively.

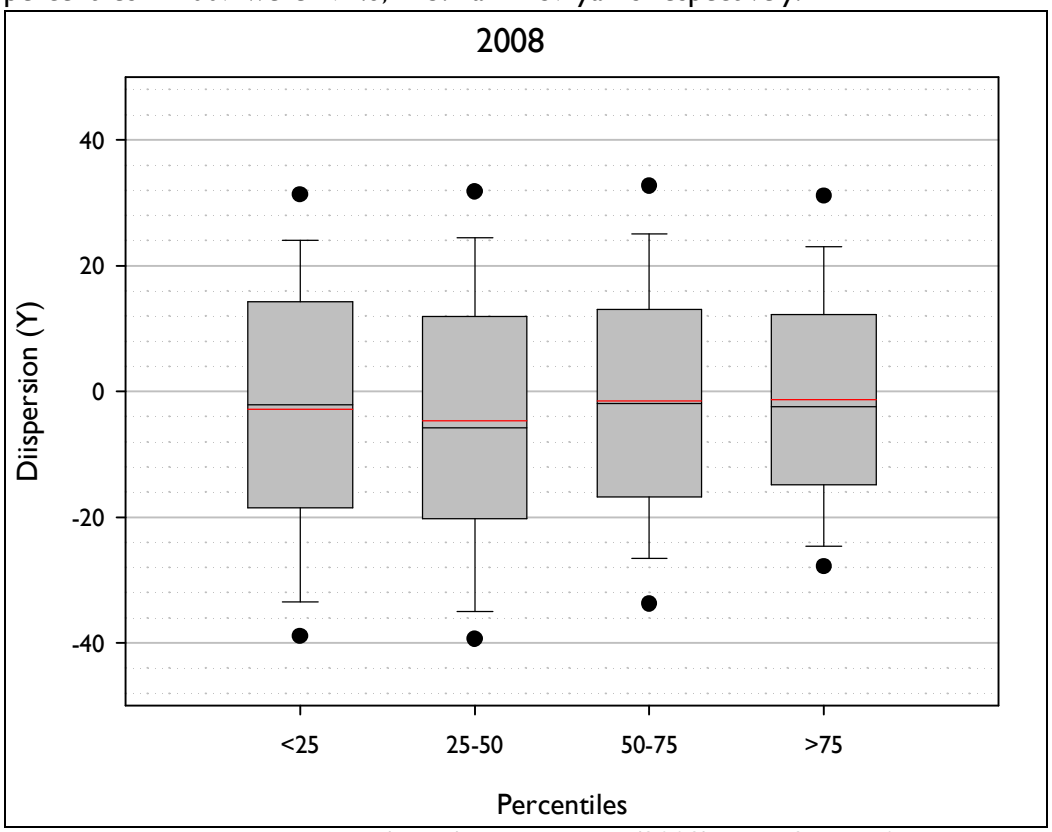

Figure 17. Driving dispersion (yards) by distance (2008). The 25th, 50th and 75th percentiles in 2008 were 185.0, 210.3 and 232.3 yards respectively.

These trends are further accentuated by looking at the angular dispersion by distance percentile category, Figure 18, Figure 19and Figure 20. It can be seen from these data that the angular dispersion for longer shots is clearly lower than for shorter shots. In all three years, 90% of the longest category of drives were within +/- 8 degrees of the centre whilst the shortest categories were within +/- 14 degrees of the centre line – considerably less accurate when considering angular dispersion.

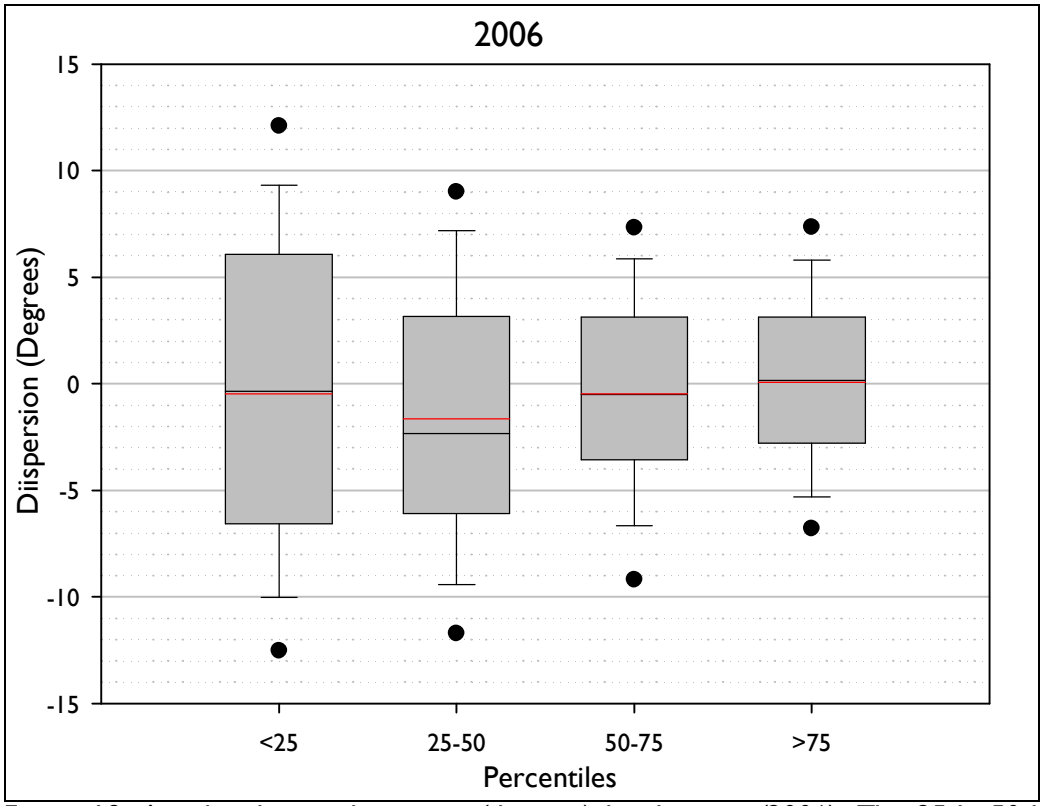

Figure 18. Angular driving dispersion (degrees) by distance (2006). The 25th, 50th and 75th percentiles in 2006 were 194.1, 218.1 and 239.8 yards respectively.

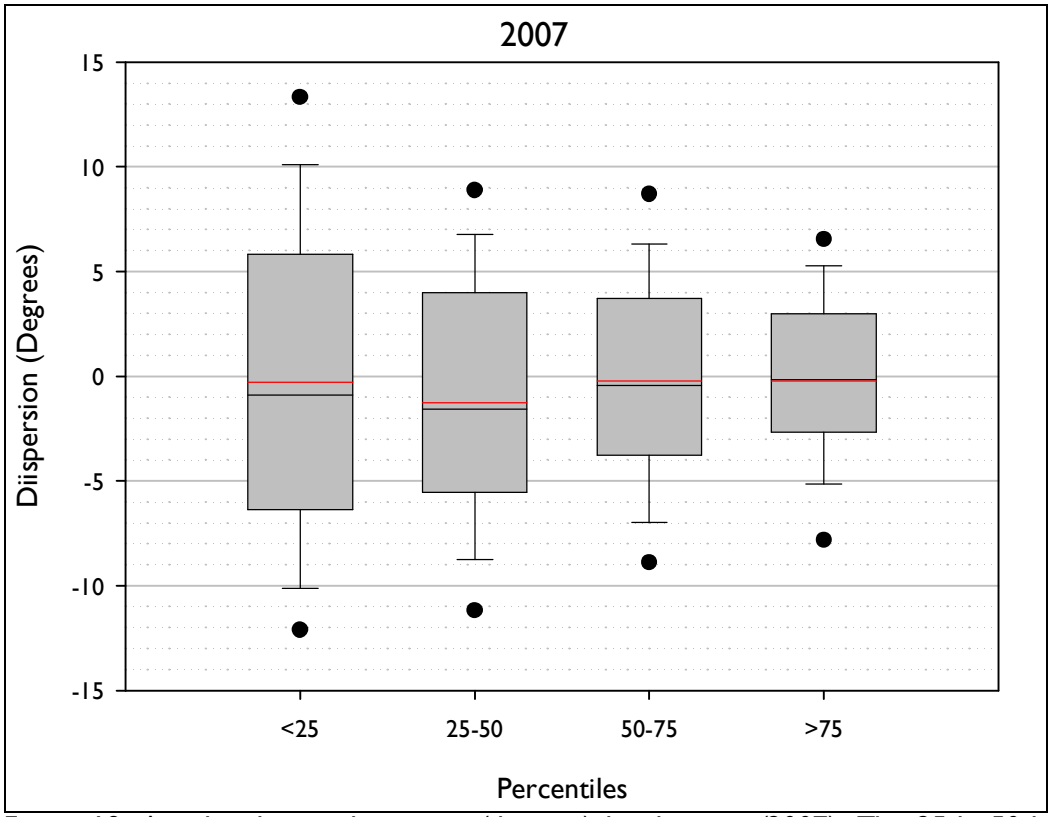

Figure 19. Angular driving dispersion (degrees) by distance (2007). The 25th, 50th and 75th percentiles in 2007 were 192.6, 215.2 and 237 yards respectively.

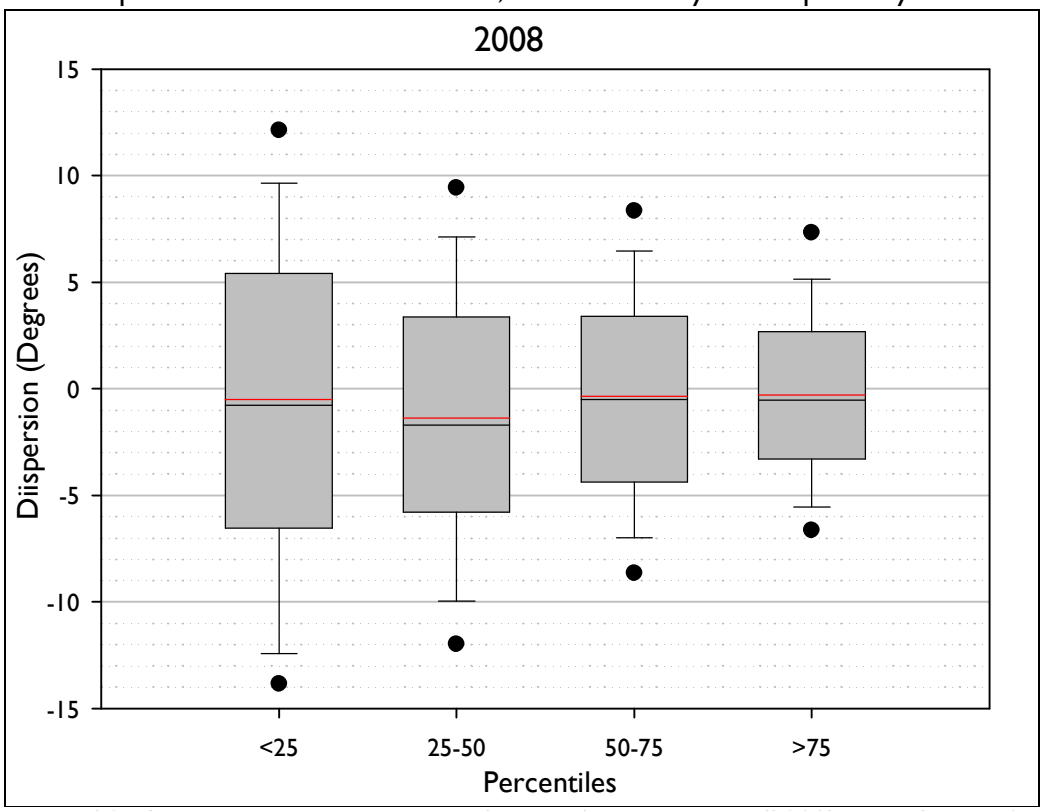

Figure 20. Angular driving dispersion (degrees) by distance (2008). The 25th, 50th and 75th percentiles in 2008 were 185.0, 210.3 and 232.3 yards respectively.

Launch Conditions

Data was collected from amateur golfers with their driver on the range using a premium ball towards a target. There was a considerable range of variability exhibited in the shots as measured by the ISG Trackman radar. The carry distances measured ranged from 10 to 264 yards, with a median of 188 yards, Figure 21.

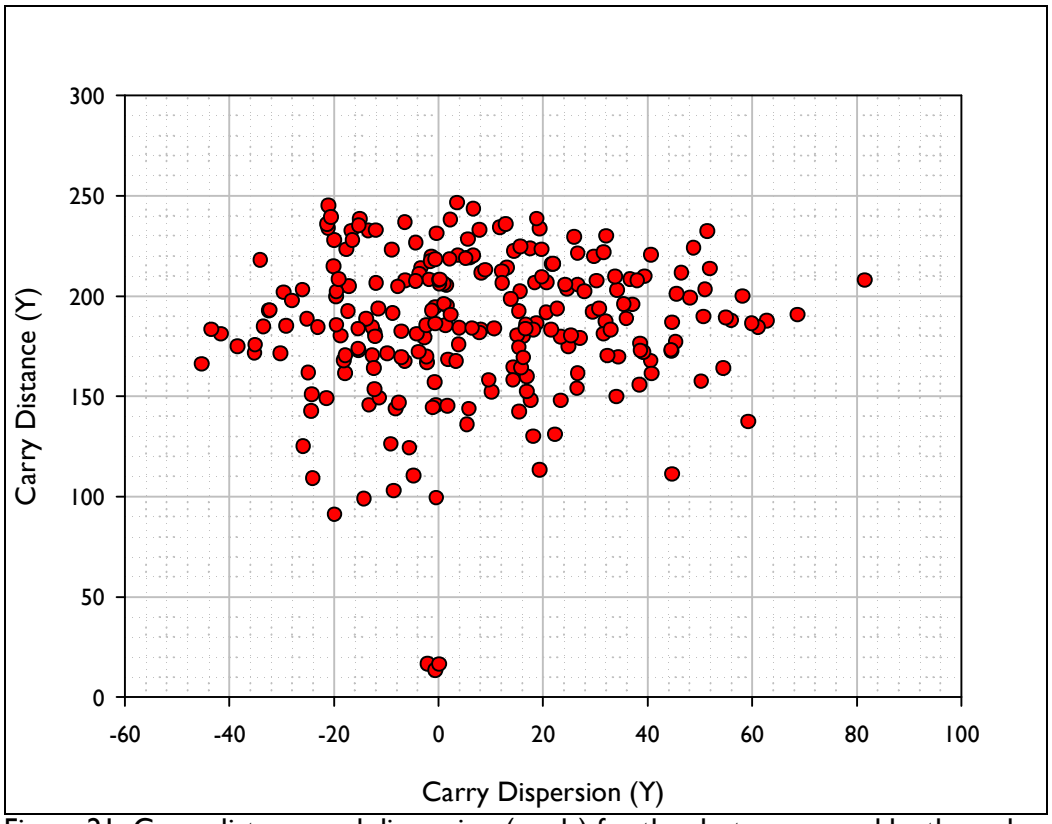

Figure 21. Carry distance and dispersion (yards) for the shots measured by the radar.

As with the on-course drive measurements presented previously, there was considerable scatter and variation in carry distance and dispersion. The scatter graph, Figure 21 shows and the box plot of the dispersion, Figure 22, confirms that there is a bias of the shots to the right of the target line, with the carry dispersion of 50% of the shots falling between 20 yards to the left and 40 yards to the right of the target line, an overall spread not dissimilar to the dispersion observed for on course

dispersion previously, albeit it is important to note that the reported values here are for the carry distance whilst the values reported previously were for the final position of the ball and as such, an increase in dispersion would be expected for the data presented in Figure 21and Figure 22 if final position had been recorded.

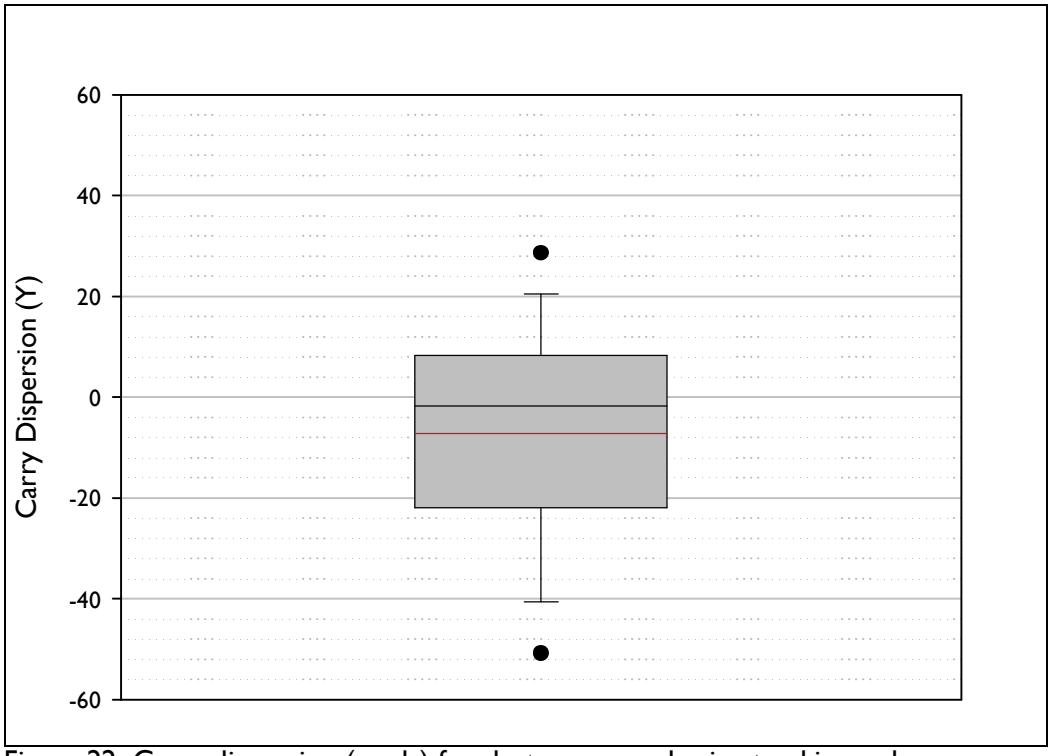

Figure 22. Carry dispersion (yards) for shots measured using tracking radar.

The clubhead speeds recorded by the radar have been plotted against the ball speeds of the same shots, Figure 23. These data have been partitioned by the carry distance of the resultant shot by the 25th, 50th and 75th percentiles. Thus it can be seen that whilst there is a considerable amount of overlap observed, the longest shots were predominantly produced from the highest ball speeds (and club head speeds), whilst the shortest shots were almost exclusively produced by the slowest ball speeds. Average clubhead speed was 94.4 mph whilst the average ball speed measured was 136.8 mph.

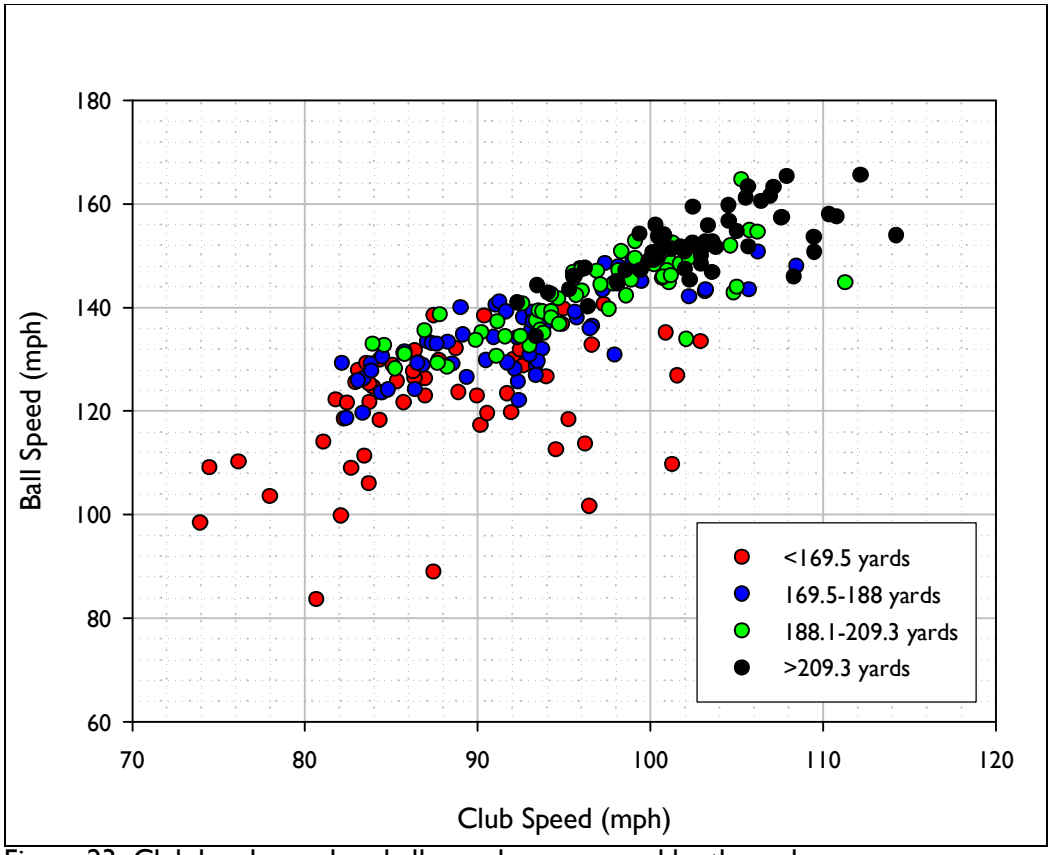

Figure 23. Club head speed vs. ball speed as measured by the radar.

The other two launch conditions essential to determining ball flight are launch angle and spin. These are interdependent and as such have been plotted against each other in Figure 24, again separated by carry distance percentile. Whilst there is considerable overlap and scatter exhibited by the data, the shortest groups do tend to exhibit considerably more variation in launch parameters with many spin values recorded of over 5000 rpm and launch angles over 16 degrees. The average spin was 3433 rpm whilst the average launch angle was 10.7 degrees.

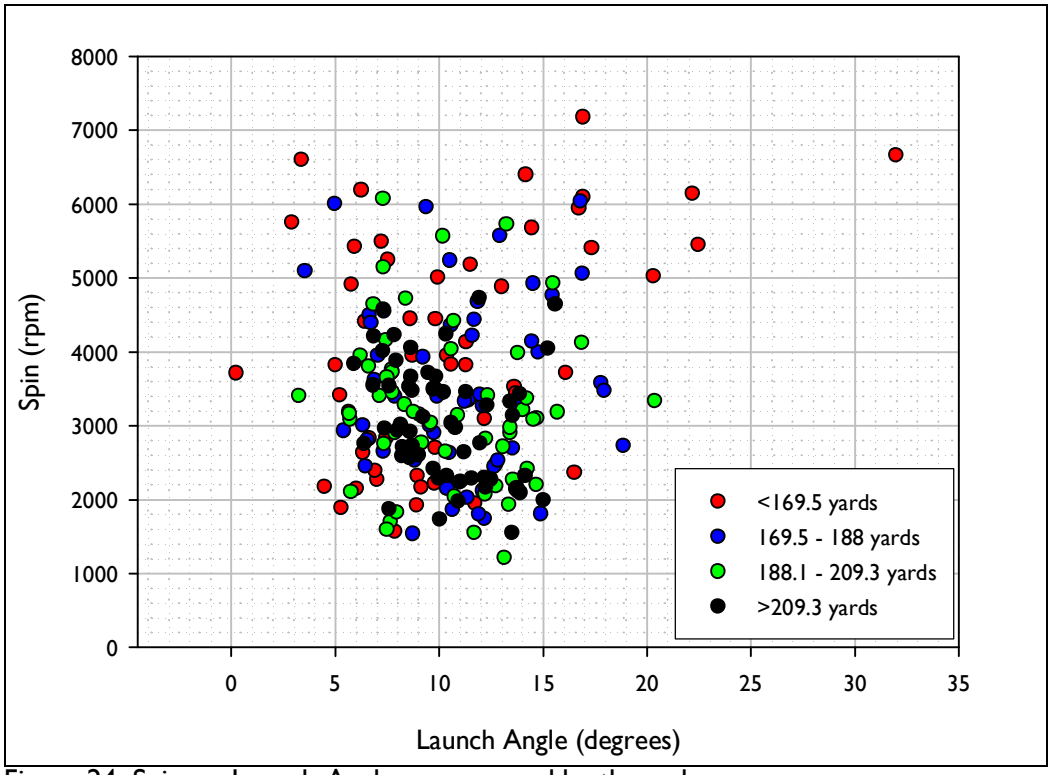

Figure 24. Spin vs. Launch Angle as measured by the radar.

Conclusions

The average driving distance measured in this study for shots hit with all clubs is 6 yards longer in 2008 than was measured in 1996. Over this 13 year range, there has been a small decrease in driving accuracy and a significant increase in driver usage, particularly for high handicap golfers.

When considering only drives hit using a driver, the measured average driving distance in 2008 is less than 3 yards longer than that measured at the start of the study in 1996 although these do not represent the extreme of the range of distances measured, with the shortest year averaging 198 yards in 1997 and the longest averaging 220 in 2005.

There is substantial scatter exhibited by 'club' golfers when considering the dispersion of their drives with only 50% of drives measured finishing within 20 yards of the centre of the fairway and typically 90% finishing within 40 yards of the centre of the fairway. This dispersion would appear to be mostly independent of distance category, although if angular dispersion is considered, then there is a considerable improvement in driving accuracy with distance category.

A preliminary study of driver launch conditions has shown an average club head speed (of 62 measured golfers hitting 269 shots between them) of 94.4 mph, producing an average ball speed of 136.8 mph, with a launch angle of 10.75 degrees and spinning at 3433 rpm. The median carry measured was 188 yards although it is imperative to note that the variation of all of these parameters was considerable.

Appendix

A Comparison of Amateur Driving Statistics between the UK and the USA in 2006.

A paper presented at the 2008 World Scientific Congress of Golf jointly by the Pelz Institute and the PGA Tour, (Pelz et al. 2008) has reported the driving statistics (amongst other data) of amateur golfers in the United States. Laser measurement equipment similar to that utilised by The R&A for collection of driving statistics and also used by the PGA Tour for collection of the Shotlink statistics was utilised to measure the driving distance and accuracy for 314 golfers on each of 3 holes during the 4 days of the 2006 PGA TOUR Superstore World Amateur Handicap Championship in South Carolina. Whilst not extending to the number of golfers, courses nor the number of shots recorded by The R&A over the course of the 2006 season as shown by the comparative summary data presented in Table A1, these newly presented data do extend over a similar handicap range and provide a very useful 'snapshot' of how amateur golfers in the United States drive the ball compared to those in the UK.

Table A1. The summary of the amateur driving data acquired for the UK compared to the newly presented data from the USA.

	UK	USA
Number of Courses Used	6	1
Holes used per course	2	3
Days for data collection	7	4
Golfers tested	>1000	314
No. of shots recorded	2035	Up to 942
Handicap Range	+2 - 36	+4 - 36.4

The data presented fall into four handicap categories, one of each playing the course on which the data was collected on each of the four days of data collection. Whilst the number of shots collected on each day was not published in the paper, the format of the tournament which breaks the overall field down by handicap category would suggest that the number of shots acquired for each group should at least be in the same order of magnitude (expected to be 220-230 shots). The average handicaps are presented for each group and these are presented along with the bounds of each handicap category in Table 2. It should be noted at this point that the handicap categories presented for the USA study are discontinuous and there are no data presented for handicaps within the limits of 5.4-9.9 and 11.5-19.5 (presumably as a consequence of the format of the tournament at which the data were collected). The data collected by The R&A cover the complete range of handicaps from better than scratch upwards. As such, Table A2 also contains summary data from all of the drives recorded for the 2006 drive measuring season presented in two forms, firstly using the same handicap category boundaries as for the USA study and secondly the number of shots falling into each of the slightly broader and continuous CONGU handicap categories usually used by The R&A for presenting these data (along with the averages of the shots falling within these categories). It can be seen that with the exception of the highest handicap category (25.1-36.4), there are a reasonable number of shots from The R&A study falling into each handicap category reported by the USA study whilst this number is significantly higher if the categories are expanded to represent the CONGU categories usually utilised for presentation of these data.

Table A2. Handicap categories utilised for the USA study along with the number of shots from the UK study to fall within each category. The appropriate equivalents for the CONGU handicap categories are also presented.

Handicap Category	UK		USA
	Shots	Average	Average
+4 – 5.3	253	3.8	3.1
10.0 – 11.4	278	10.6	10.7
19.6 – 25.0	193	21.8	22.3
25.1 – 36.4	35	28.4	29.0
CONGU			
<6	253	3.8	3.1
6 – 12	907	9.3	10.7
13 – 20	701	16.0	N/A
21+	174	23.7	N/A

Whilst the USA study comprised the collection of 'Full Shotlink' data over the 4 holes utilised (1 x par 3, 2 x par 4 and 1 x par 5), including putting and greens hit in regulation data, only the driving data were directly comparable to the data collected for the UK study. In particular, the average driving distance for each handicap category, the longest drive recorded for each handicap category and the average driving accuracy statistics were the ones which could be used to compare the two sets of amateur golfers.

Average Driving Distance

The average driving distances by handicap as reported for the USA study are shown in Figure A1, along with the equivalent data (using the same handicap category filtering) for the UK study. For completeness, the UK data separated by CONGU handicap category are also shown in the same chart. It can be seen that there is for the most part extremely good agreement between the two data sets with the largest difference being observed for the 19.6-25.0 handicap category where the USA driving distance is shorter than the equivalent UK category by approximately 10 yards. It is also noteworthy that the difference between the two classifications of handicap category for the UK data sees little difference between the average distance vs. average handicap category curves connecting the data points.

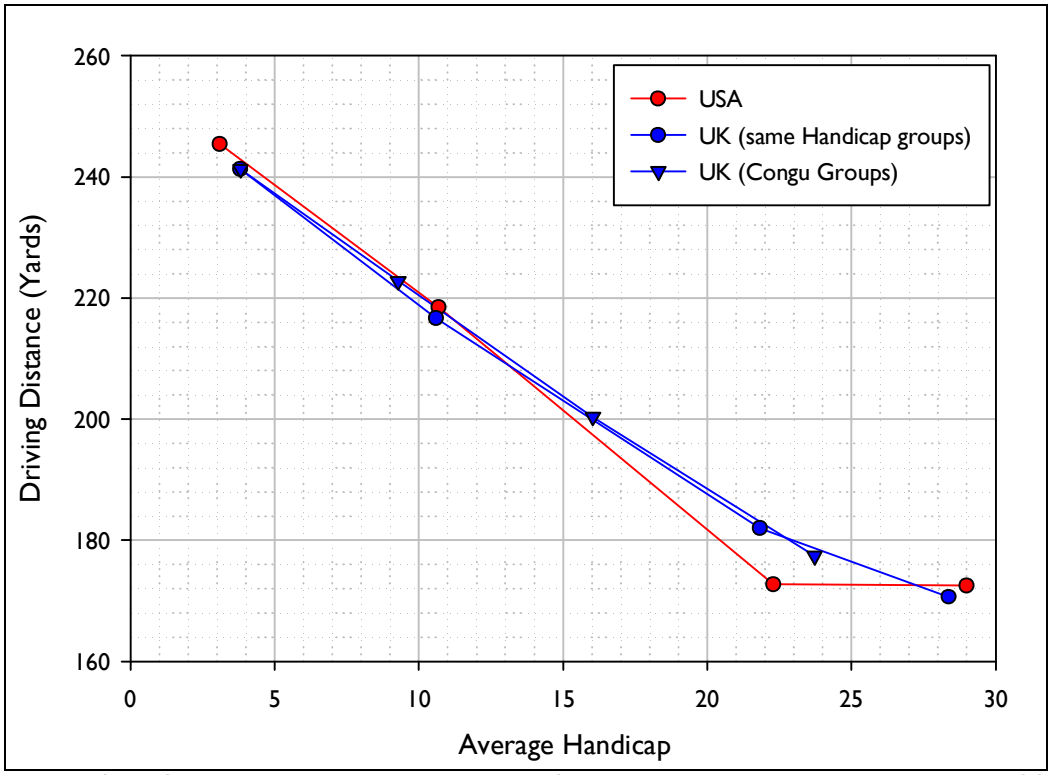

Figure A1. *Average Driving Distance vs. Average Handicap comparing the USA dataset to the UK dataset (with the UK dataset filtered by the same handicap categories as the USA dataset and also using all UK data points separated by CONGU handicap category).*

Longest Drive

The longest recorded drive for each handicap category for the USA data set is presented against average handicap (for each category) in Figure A2. Similarly, the longest drives from the UK data set both filtered using the same handicap categories and also using all drives (and CONGU handicap categories) are also presented. For three out of the four handicap categories, the USA longest drive is longer than that recorded for the UK equivalent but only for one category is the difference between the UK and USA longest drives more than 4-5 yards and in that case it is 13 yards.

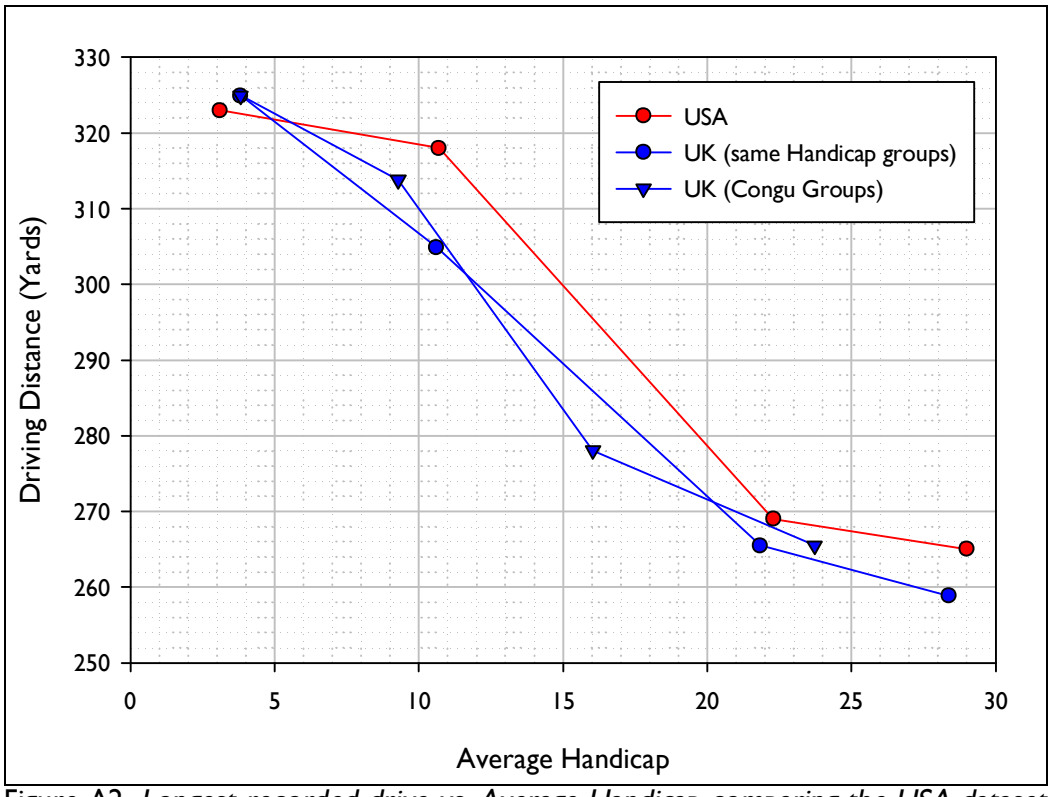

Figure A2. *Longest recorded drive vs. Average Handicap comparing the USA dataset to the UK dataset (with the UK dataset filtered by the same handicap categories as the USA dataset and also using all UK data points separated by CONGU handicap category).*

Driving Accuracy

The driving accuracy for the USA data set is presented in Figure A3, together with the equivalent data for the UK data set and the CONGU handicap categories for comparison. Again as with the average driving distance data and to an extent the longest drive data, there appears to be good agreement between the driving accuracy data for three of the four handicap categories with the 19.6-25.0 handicap category showing a lower accuracy than the UK equivalent by approximately 10%. It is interesting to note that the largest differences in both average driving distance and accuracy occur for the same handicap category. Given that the data for each handicap category for the USA study was collected on a single day (compared to the UK study where for the most part, the entire handicap range is sampled on each days testing), it could be postulated that there be some external factor in part responsible for the increased differences between the two data sets for that particular handicap category. For instance a greater influence of the wind on one day will affect the whole handicap category for the USA study whilst should exert similar influence across the handicap range for the UK study. It is unclear from the paper as to whether the direction of the holes was a consideration in their selection for the USA study with a view to negating the effect of the wind. Unfortunately, in the absence of any further information on this (and none is presented in the paper itself), this postulation can be nothing but speculative.

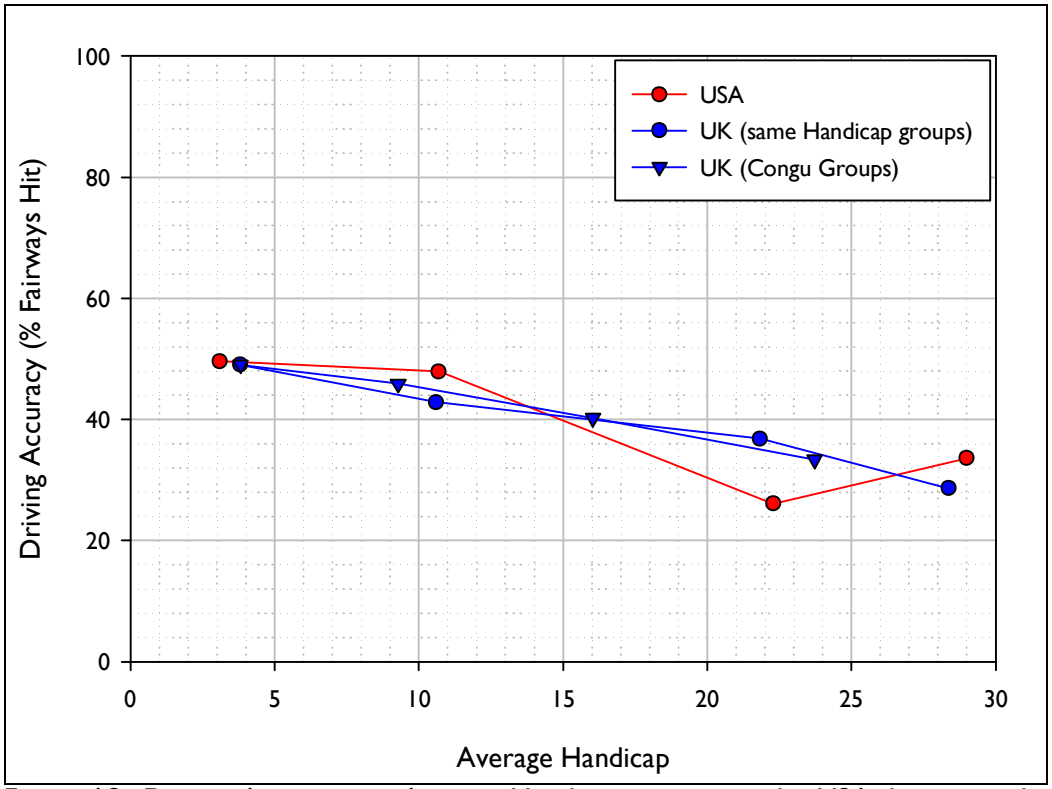

Figure A3. *Driving Accuracy vs. Average Handicap comparing the USA dataset to the UK dataset (with the UK dataset filtered by the same handicap categories as the USA dataset and also using all UK data points separated by CONGU handicap category)*

Conclusions

In summary, whilst the data collected by the USA study only comprises fewer than 50% of the shots collected by The R&A during amateur driving distance data collection in 2006, average driving distance and driving accuracy by handicap category agree very well between the two studies for 3 out of the 4 handicap categories investigated. The fourth handicap category (19.6-25.0) shows a reduction of approximately 10 yards driving distance and 10% driving accuracy from the UK to the USA studies. It is speculatively postulated that these differences may be accounted for by the difference in data set distribution between the two studies where the UK study samples most of the handicap range on each of the 7 days testing (over 5 months) whilst the USA study samples only one handicap group in its entirety on each of the 4 consecutive days tested. Nonetheless, this provides a very useful comparison of the driving statistics of amateur golfers in the UK and the USA, suggesting that for the most part the driving behaviour of the two populations of data is very similar on both sides of the Atlantic.

Reference

Pelz, D. T, Pelz, E, Evans, S and Bracey, D. (2008) *Golfer Performance: Amateurs vs. Pros*. In Science and Golf V, Proceedings of the World Scientific Congress of Golf. eds Crews D and Lutz R. pp146-153, Energy in Motion Inc, Arizona.