

This report documents an OptimalFlight ball flight analysis of questionable distance numbers from a published TrackMan launch monitor session in the Wall Street Journal. Additional data was gathered and OptimalFlight was able to reasonably reverse engineer the ball flight and validate results.

What was done:

The launch conditions of ball speed, spin, and launch angle were entered into OptimalFlight. TrackMan ball flight results were observed to be significantly shorter than expected.

References:

'Can You Take My Nine-Iron In Just a Bit?'

Custom clubs get more elaborate with radar, computers. How they measure up
July 14, 2007 GOLF JOURNAL By JOHN PAUL NEWPORT
<http://online.wsj.com/public/article/SB118436491546466263.html>

Video:

<http://link.brightcove.com/services/player/bcpid452319854?bctid=1116285894>

TrackMan Launch conditions:

	Ball Speed	Launch Angle	Spin	SpinAxis	Max Height	Carry	Side	Horiz Ang (push/pull)	Landing Angle
Driver1	149.5	9.4	3643	-4.3	27.4	225	17.2	-0.7	43.7
Driver2	155.0	10.7	2349	-5.8	25.3	237	20.0	2.2	(no data)

Spin and SpinAxis was translated into BackSpin and SideSpin components for data entry into OptimalFlight:

	Ball Speed	Launch Angle	Spin	SpinAxis	Backspin and Sidespin translated from Spin and SpinAxis data.		Max Height	Carry	Side	Horiz Ang (push/pull)	Landing Angle
Driver1	149.5	9.4	3643	-4.3	BackSpin	SideSpin	27.4	225	17.2	-0.7	43.7
Driver2	155.0	10.7	2349	-5.8	2337	-237	25.3	237	20.0	2.2	(no data)

Name: John Paul Newport Report ID: 575

Notes: WSJ 7/14/2007 article covering Trackman LM system on a driving range

Location: TrackMan @ Tappan Golf Ctr Date: 07/12/2007

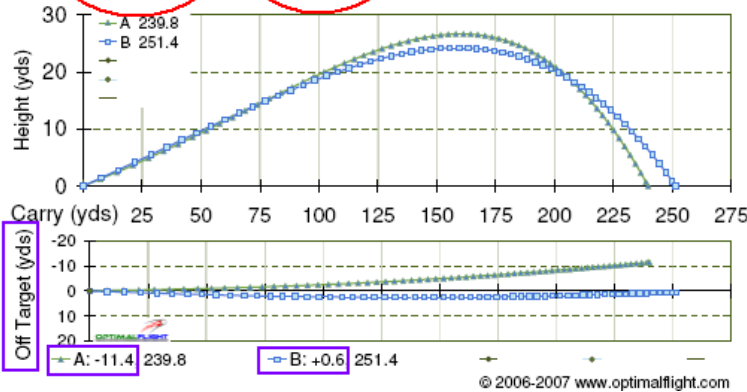
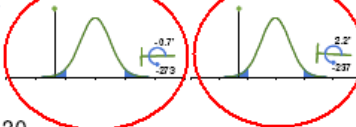
Club / Shaft:	Driver 1	Driver 2
FLIGHT:	A	B

 SPEED (mph):	149.5	155.0
 LAUNCH (deg):	9.4	10.7
 SPIN (rpm):	3,633	2,337
 Carry (yds):	225.0	236.9
OPTIMALFLIGHT	239.8	251.4

OptimalFlight says to expect approximately a 15 yard longer shot for both drives. (ex: Drive 1, TrackMan carry is 225, OptimalFlight result: 239.8 yards)

Flight Time, Wind, Altitude:	6.44, No Wind, Sea Lvl	5.85, No Wind, Sea Lvl
Landing Angle, Roll, Apex:	36.7 19.7 26.7	30.3 26.6 24.2

OPTIMALFLIGHT validation of CARRY:



The updated summary is as follows:

	Ball Speed	Launch Angle	Spin	SpinAxis	Backspin and Sidespin translated from Spin and SpinAxis data.		Max Height	Carry	Side*	Horiz Ang (push/pull)	Landing Angle
					BackSpin	Sidespin					
Driver1	149.5	9.4	3643	-4.3	3633	-273	27.4	225.0	-17.2	-0.7	43.7
							OptimalFlight Results (no wind):	26.7	239.8	-11.4	36.7
							Difference:	-0.7	14.8	5.8	-7.0
Driver2	155.0	10.7	2349	-5.8	2337	-237	25.3	236.9	-20.0	2.2	(no data)
							OptimalFlight Results (no wind):	24.2	251.4	0.6	30.3
							Difference:	-1.1	14.5	20.6	

*TrackMan uses right or left text feedback (R or L) instead of +or - off target (ex: negative #, left of target)
Both Trackman #'s are actually left of target and appropriately corrected.

The OptimalFlight's maximum height ball flight results are within a few yards of actual results and looks good. OptimalFlight says to expect a much longer carry (almost 15 yards!) and a flatter landing angle. Another discrepancy is the Off Target results or Side* Deviation (5.8 yards difference for Driver 1 and 20.6 yard difference for Driver 2).

It is easy to see how one can jump to an 'early' conclusion that the TrackMan numbers are questionable. Expected results for carry distance, off target, and landing angle expected are all off.

Let's review two possible causes and give radar launch monitor systems the benefit of doubt because of their unique in-flight ball tracking capabilities.

Possible Cause #1: Range balls were used, producing shorter than expected results.

- Why: Range balls can have reduced flight properties due to design or condition.
 - Insufficient information or data to rule out this cause. The brand, make, or a close-up picture of the range ball (showing it's condition) is not known.
 - Assumption: TrackMan fittings were done with range balls in very good to excellent condition.

Possible Cause #2: Weather data was not properly factored in.

- Why: Wind can shorten a ball flight. Additional data was gathered to explore this further.
 - Geographical data from GoogleEarth
 - Weather data from www.wunderground.com

Google Earth of Tappan Golf Center.

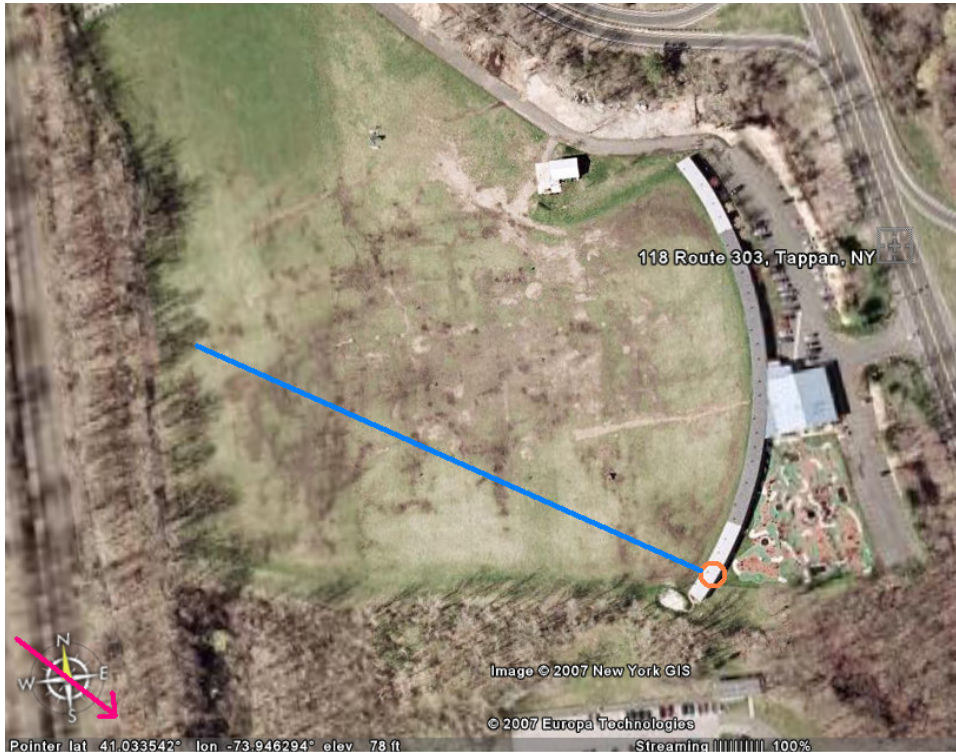


Note the compass in the bottom left corner, which will come in handy later.

A miniature putt-putt green shown in the upper left (within orange circle) permits correlation of the following video image to the 4th or 5th driving range stall from the bottom of the golf center.



A ball flight shot line can be drawn from the driving range stall, where the TrackMan range session was held, out onto the driving range area.



According to www.wunderground.com on 7/12/2007 – 12-3pm time period, the wind direction is coming from the NW direction and hourly wind average is between 7-13 mph.

Weather data:

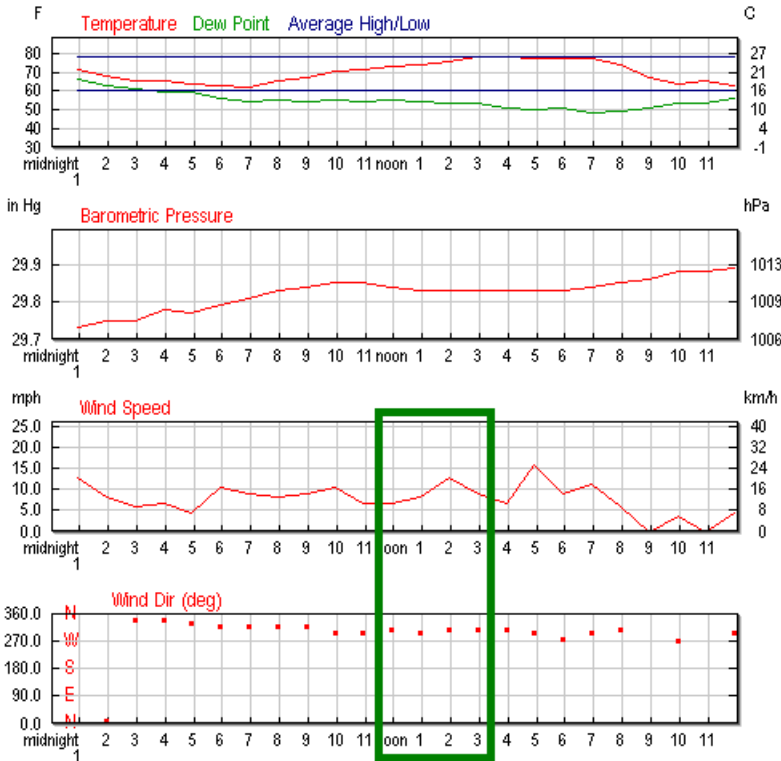
<http://www.wunderground.com/cgi-bin/findweather/getForecast?query=10983>

Tappan zipcode = 10983

Under Detailed History and Climate input area, the July 12, 2007 was entered.

History & Almanac			Show Hide
	Max Temperature	Min Temperature	
Normal (KHPN)	78 °F / 25 °C	61 °F / 16 °C	
Record (KHPN)	89 °F / 31 °C (1983)	52 °F / 11 °C (1977)	
Detailed History and Climate (KHPN)			
July	▼	12	▼
		2007	▼
			Go

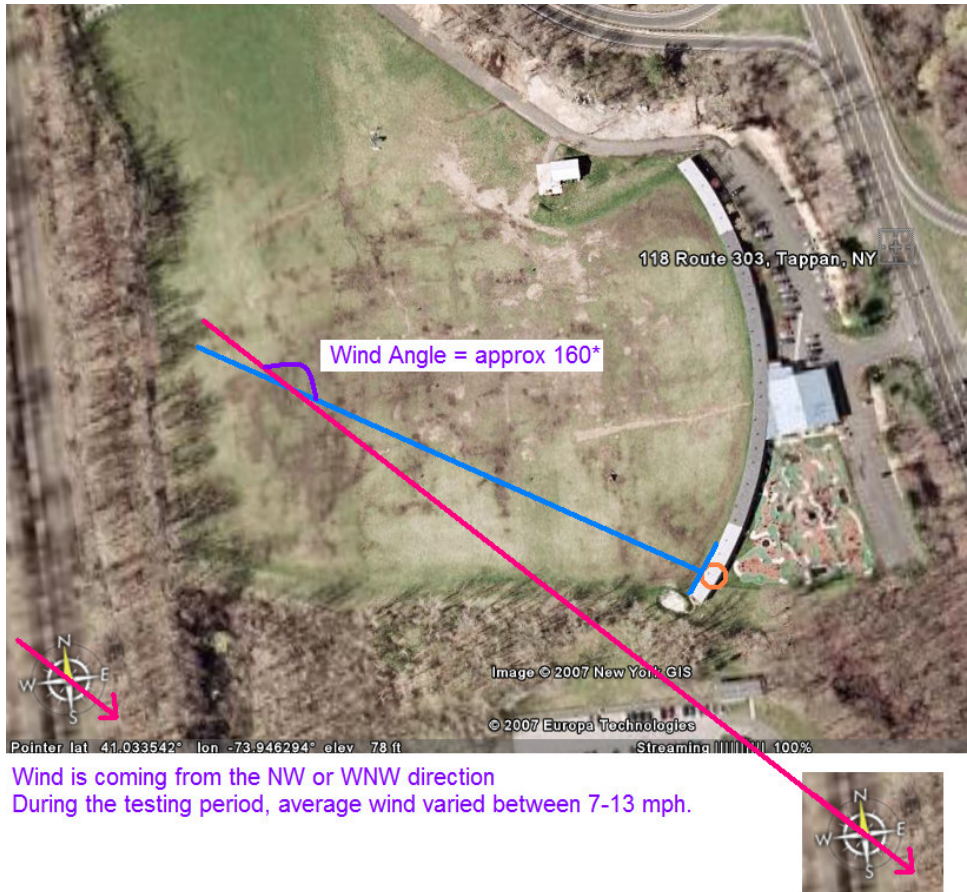
Seasonal Weather Averages



Revisiting the Tappan Golf Center aerial image on right, the wind directional angle at the time of the TrackMan session is approximately 160* degrees (180* is a pure headwind).

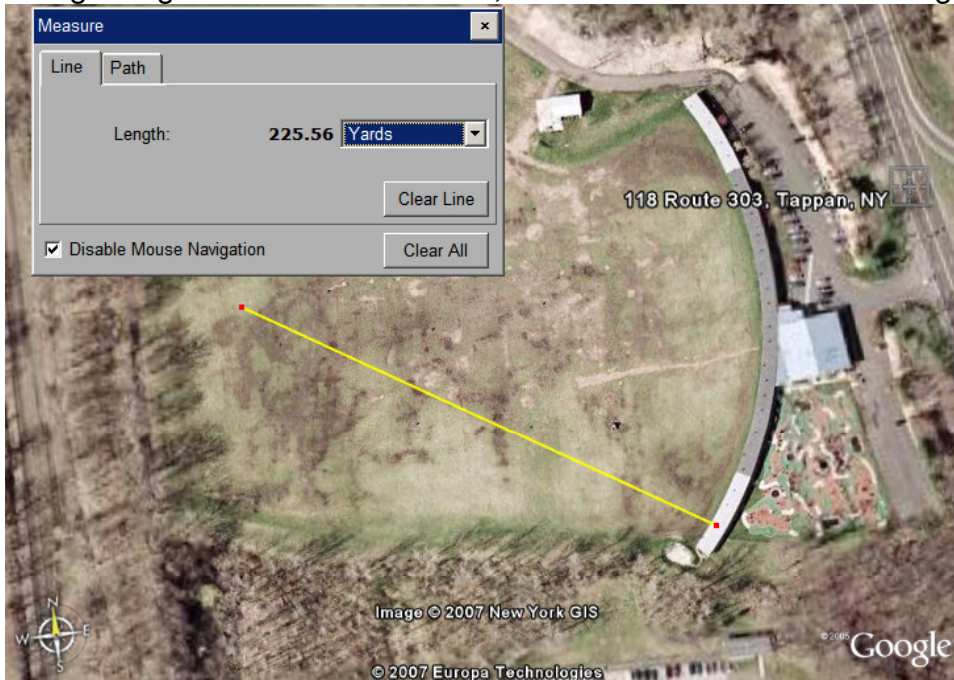
This wind directional effect on a golf ball produces shorter flights and land left of target.

OptimalFlight's ball flight creation tools permits a closer look at how much of an effect it has.

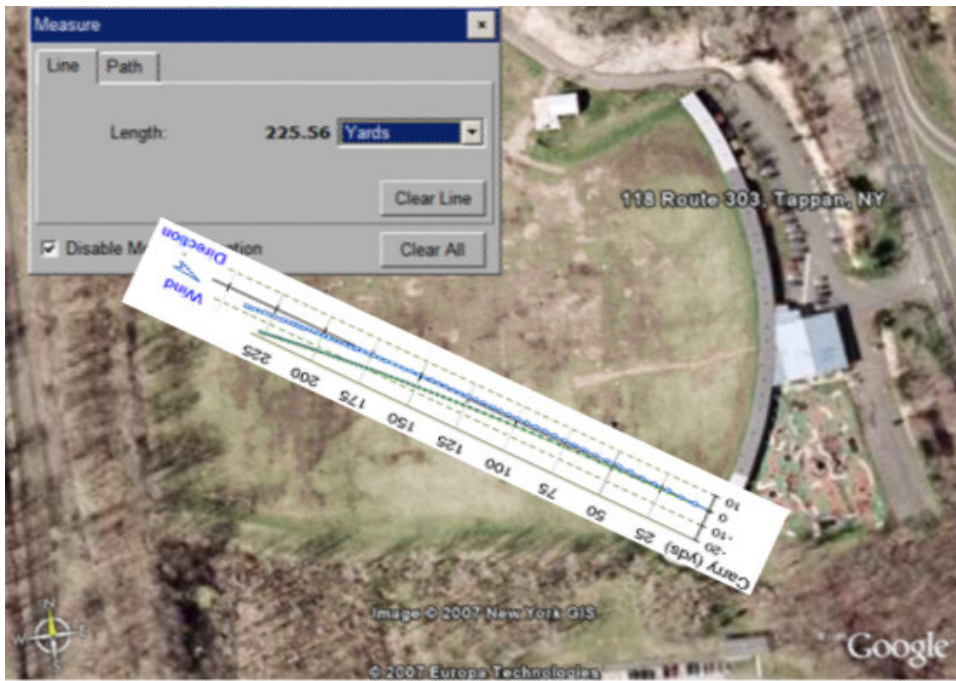


Wind is coming from the NW or WNW direction
During the testing period, average wind varied between 7-13 mph.

Using GoogleEarth's Measure tool, this screenshot shows the range of a 225 yard drive.



The historical wind speed and directional data were entered into OptimalFlight and ball flight graphs were re-generated. The top view summary graph was scaled to size and super-imposed on the driving range.



Name: John Paul Newport

Report ID:
576

Notes: WSJ 7/14/2007 article covering Trackman LM system on a driving range

Location: TrackMan @ Tappan Golf Ctr

Date: 07/12/2007

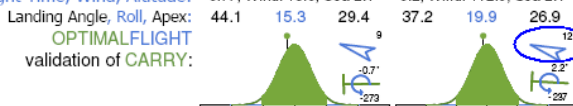
Club / Shaft: Driver 1 @ 9mph 160° wind Driver 2 @ 12mph 160° wind

FLIGHT: **A** **B**

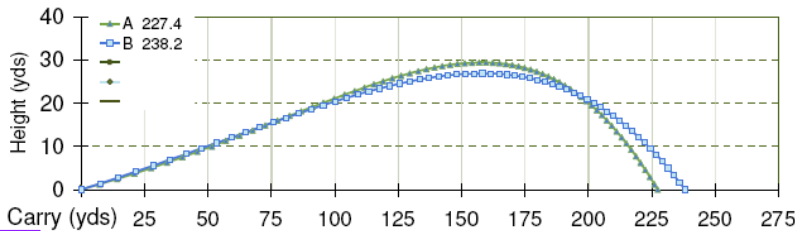
The ball flight distance estimate for both flights now match up very well with Trackman results!

	SPEED (mph):	149.5	155.0
	LAUNCH (deg):	9.4	10.7
	SPIN (rpm):	3,633	2,337
	Carry (yds):	225.0	236.9
	OPTIMALFLIGHT	227.4	238.2

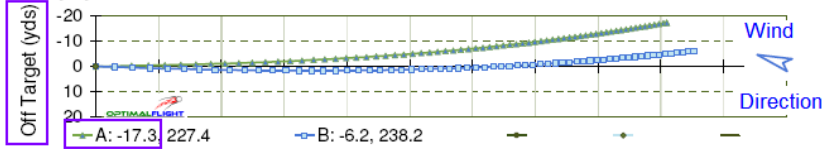
Flight Time, Wind, Altitude: 6.77, Wind: +9.0, Sea Lvl 29.4 6.2, Wind: +12.0, Sea Lvl 26.9



Wind directional @ 160°. The number above the arrow indicates wind speed in mph.



The Off Target results for Driver 1 is within the actual result by .1 yard.



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	Ball Launch		Backspin and Sidespin translated from Spin and SpinAxis data.				Max			Horiz Ang (push/pull)	Landing Angle	
	Speed	Angle	Spin	SpinAxis	BackSpin	SideSpin	Height	Carry	Side*			
Driver1	149.5	9.4	3643	-4.3	3633	-273	27.4	225.0	-17.2	-0.7	43.7	
OptimalFlight Results (9mph wind at 160°, right to left, almost headwind):							29.4	227.4	-17.3			44.1
Difference:							2.0	2.4	-0.1			0.4
Driver2	155.0	10.7	2349	-5.8	2337	-237	25.3	236.9	-20.0	2.2	(no data)	
OptimalFlight Results (12mph wind at 160°, right to left, almost headwind):							26.9	238.2	-6.2			37.2
Difference:							1.6	1.3	13.8			

All distance and landing numbers are reasonable and near spot (green shaded results) on except for an additional 13.8 yards of Off Target result observed for Driver #2. This anomaly may have been caused by an unusual gust of wind or a strange flight pattern due to a scuff on the ball's cover or a combination of both. We'll never know for certain. The good news with the recreated ball flight, a -6.2 yards off target deviation is much more acceptable and reasonable outcome than -20 yards!

In summary, the possible cause of weather circumstances (wind) has been validated to account for the questionable shorter ball flight by a radar-based ball flight tracking system. Six out of seven ball flight measurements were nearly replicated.

OptimalFlight's ability to handle environmental variables with basic ball launch conditions can reasonably reverse engineer a ball flight result from radar based systems. Golfers and club-fitters can translate these results to normal weather conditions (ex: the ball will land approximately 15 yards further if no wind was present) and benefit the equipment decision making process in a clearer manner.

A similar approach has also been used to reverse-engineer and validate launch conditions for Mike Dobbyn's world record drive of 552 yards in a July 2007 tournament! The result? It is very well within Mike's long drive professional hitting capabilities to make it happen.