TrackMan Parameter Definitions
TrackMan University
2013

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TPS – 26 Data Parameters

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TPS – 26 Data Parameters

TRACKMAN DATA

Club Data

- Club Speed
- Attack Angle
- Club Path
- Swing Plane
- Swing Direction
- Dynamic Loft*
- Spin Loft*
- Face Angle*
- Face-To-Path*

TrackMan Combine

- From Pin
- Score
- Target

Ball Data

- Ball Speed
- Launch Angle
- Launch Direction
- Spin Axis
- Spin Rate
- Smash Factor
- Height
- Carry
- Side
- Total*
- Side Total*
- Landing Angle
- Hang Time
- Last Data

* Calculated Data

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Ball Speed

- Immediately after impact
  - Use multiple coordinates, then calculate back to impact position
- Accuracy: +/- 0.1 MPH
- Contributors: Club Speed, Loft, Impact Position

- *The highest ball speed recorded during 2010 RE/MAX was QFist Ryan Louw @ 225 MPH, resulting in a 410Y drive.*
- *Jamie Sadlowski's best in 2010 was 224 MPH, during QFs*
- The Average Driver Ball Speed on the PGA Tour is 165 MPH
- The Average Driver Ball Speed for the LPGA Tour is 139 MPH

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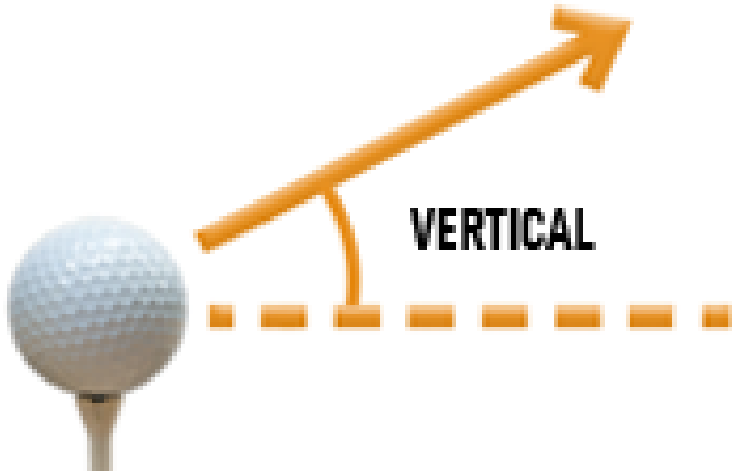
Vertical Launch Angle →Launch Angle

- Immediately after impact
- Reference = Horizon
  - ➢Not necessarily ground
  - ➢Electronic Level in radar
- Contributors: DyL, AA, Ball Type
- Accuracy: +/- 0.2 degree



•On the PGA TOUR, the driver launch angle varies among players from 6 – 15 degrees, not including special shots (stinger)

•Across all clubs, LPGA players launch the ball higher

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Horizontal Launch Angle → Launch Direction

- Immediately after impact
- Starting direction of ball
  - Reference = Target Line
  - (+) = Right
  - (-) = Left

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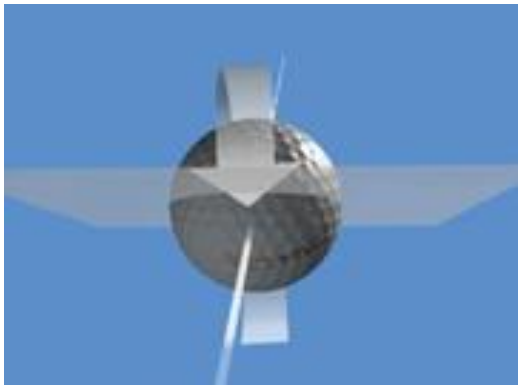
Spin Rate

- Immediately after impact
- Total Spin, around Spin Axis
- Accuracy +/- 15 RPMs



•Increasing spin rate by 1000 RPMs increases landing angle by 7 degrees, whereas decreasing spin rate by 1000 RPMs flattens landing angle by 7 degrees

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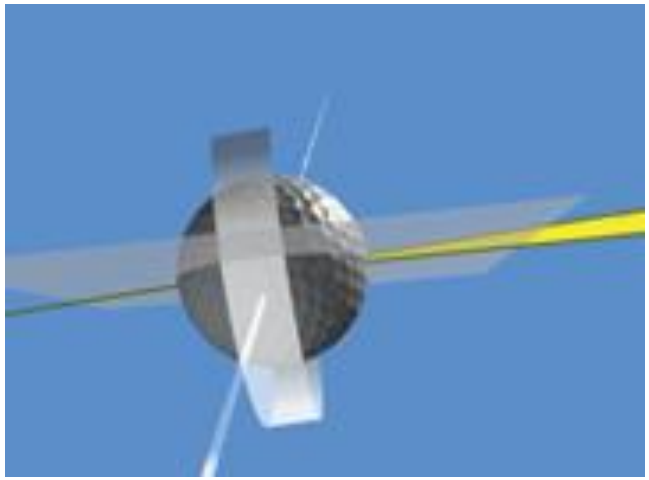
Spin Axis

- 0 degree spin axis = straight (no wind)
- Tilting of Axis results in curved ball flight
  - ➢(+) axis tilt results in fade/slice
  - ➢(-) axis tilt results in draw/hook



** Rule of thumb: a ball will curve 0.7 % offline per 1° spin axis*

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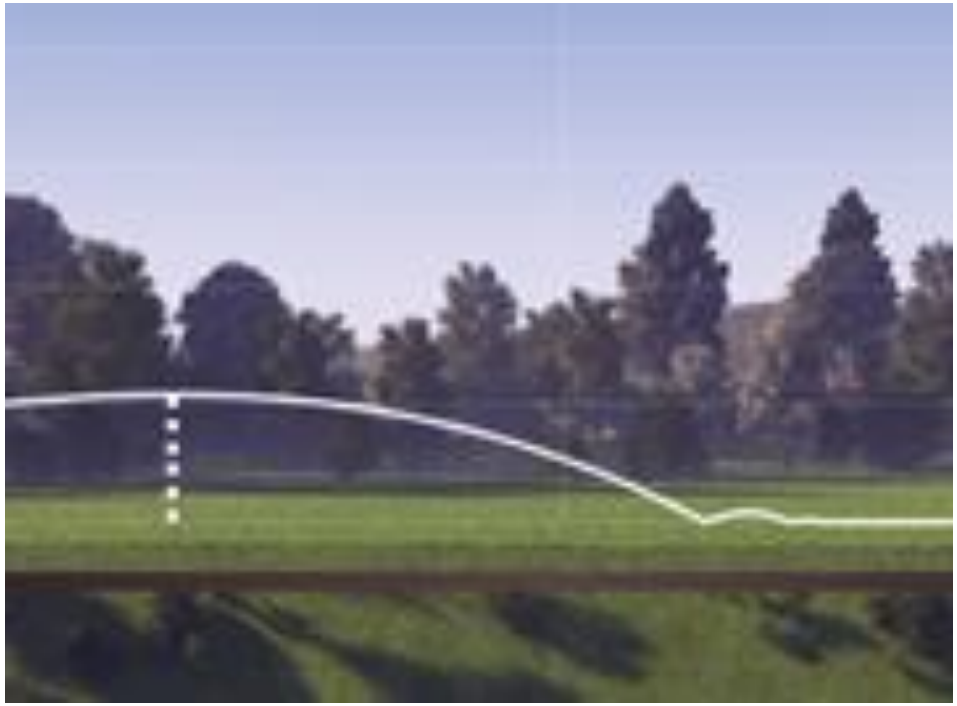
Max Height → Height

- APEX



- On average, PGA TOUR players apex all clubs at ~30Y
- On average, LPGA TOUR players apex all clubs at ~23Y

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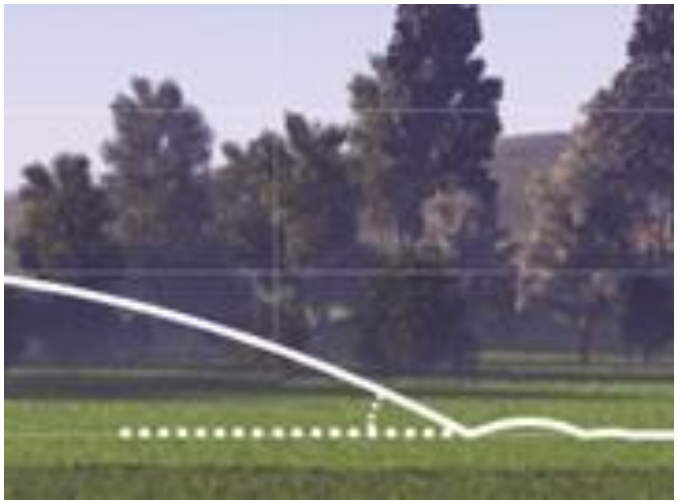
Land Angle

→Ball Angle into Carry Flat



DRIVER – 40 degrees

- More spin increases Land Angle
- Less Spin decreases Land Angle

APPROACH SHOTS – 50 degrees

- Be sure to moderate spin for controllable flight, predictable landing

→ *For every 1 degree flatter landing angle, a drive on the PGA Tour will bounce and roll an additional 1.5 to 2 yards*

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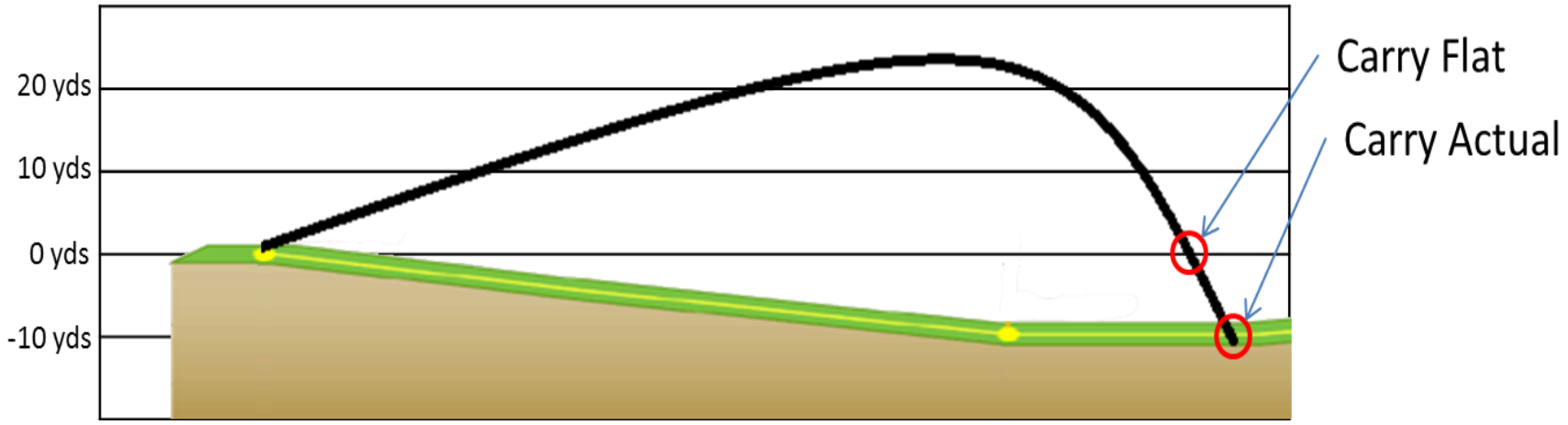
Carry

- Carry = **Carry FLAT**
  - ➢ @ Zero Elevation
  - ➢ 45 deg landing angle
    - 1:1 relationship

Landing Angle [deg]	Height difference between tee-off area and landing area			
	1	5	10	15
29	1,8	9,0	18,0	27,1
33	1,5	7,7	15,4	23,1
37	1,3	6,6	13,3	19,9
41	1,2	5,8	11,5	17,3
45	1,0	5,0	10,0	15,0
49	0,9	4,3	8,7	13,0
53	0,8	3,8	7,5	11,3
57	0,6	3,2	6,5	9,7
61	0,6	2,8	5,5	8,3
65	0,5	2,3	4,7	7,0
69	0,4	1,9	3,8	5,8



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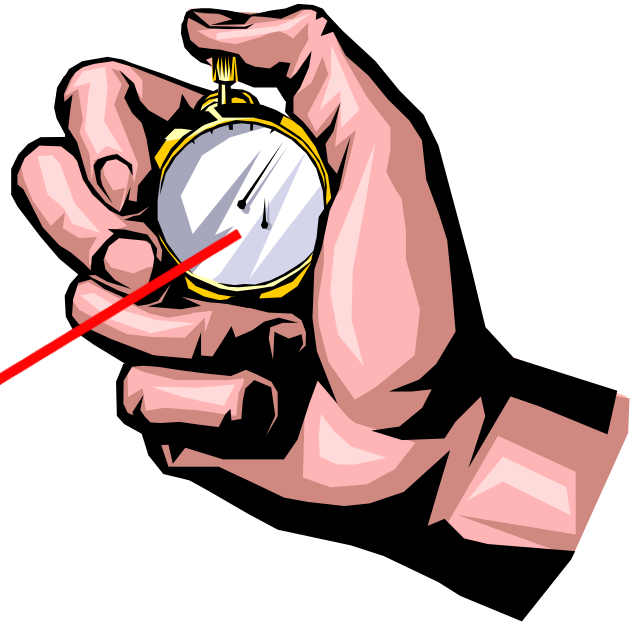
Time Flat → Hang Time

- Time in seconds to carry flat



- Average Drive on PGA Tour = 6.5 seconds
- Average Drive RE-MAX Quarterfinalist = 8.5 seconds

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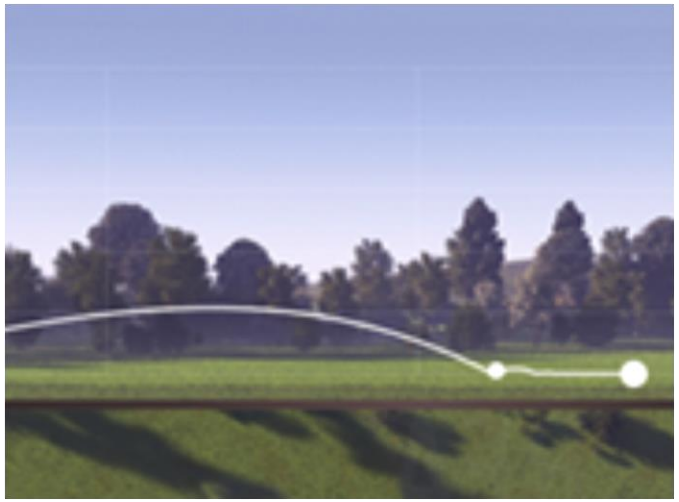
Total



- Total = **Total FLAT**
  - @ Zero Elevation
  - Bounce and Roll Model
    - Assumption: PGA Tour Fairways
    - Based on Ball Landing Speed, Landing Angle, Landing Spin Rate

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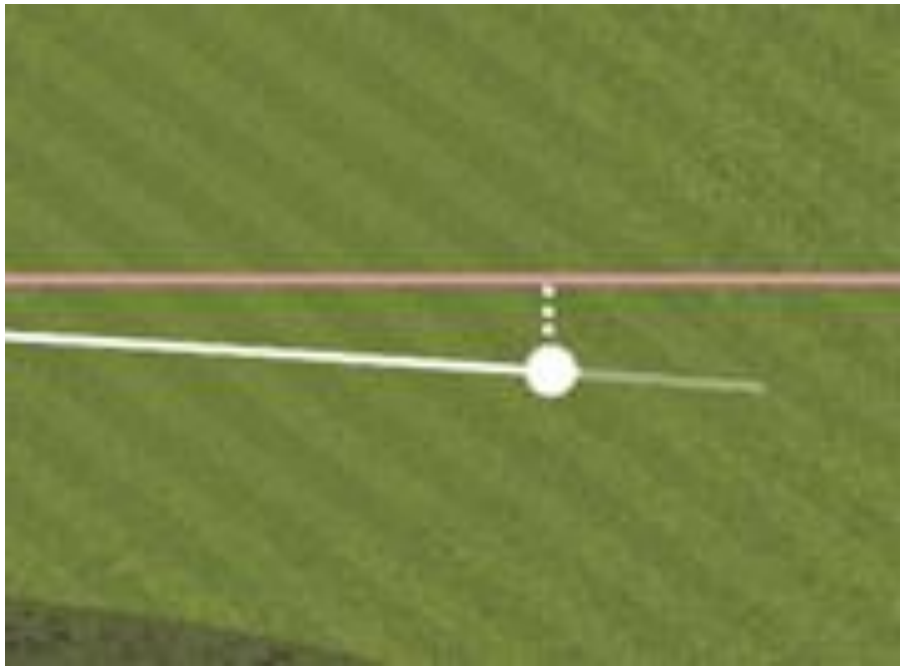
Side

- Side “FLAT”
- Reference is Target Line
  - (+) = right
  - (-) = left



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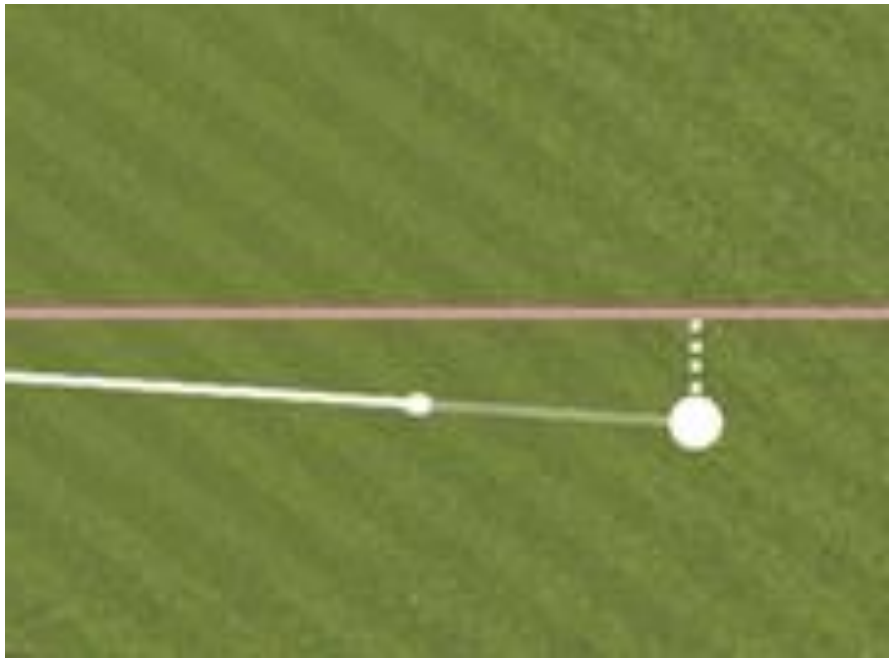
Side Total

- Side Total “FLAT”
- *Calculated*: Includes Bounce & Roll
- Reference is Target Line
  - (+) = right
  - (-) = left



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Last Data

- Last Measurement of ball flight
- Might be when ball impacts the ground

BUT:

- Player interrupts radar line of sight to ball
- Ball hits a tree
- Ball hits a driving range fence
- Hitting out of radar coverage
- ‘Noisy’ environment

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Club Speed

- Instant prior to impact
- Center of club face
- Consider face rotation
  - ➢Toe +7 MPH
  - ➢Heel -7 MPH

•Jamie Sadlowski recorded the highest clubhead speed during the 2010 RE/MAX with **150 MPH** (result Ball Speed 224 MPH)
•The average driver clubhead speed on PGA TOUR is 112 MPH
•The average driver clubhead speed on LPGA TOUR is 94 MPH

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Smash Factor

$$\text{SMASH FACTOR} = \frac{\text{BALL SPEED}}{\text{CLUB HEAD SPEED}}$$

→ *Describes how solid you hit the shot!*

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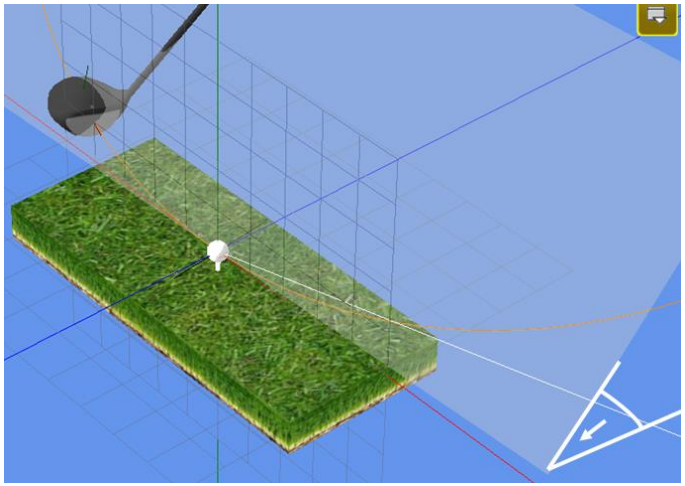
Vertical Swing Plane → Swing Plane

- Bottom half of downswing
- Relative to Ground
- Similar to video's "shaft plane"



- The average Driver VSP on PGA TOUR is 48 degrees
- The average 6-iron VSP on PGA TOUR is 60 degrees

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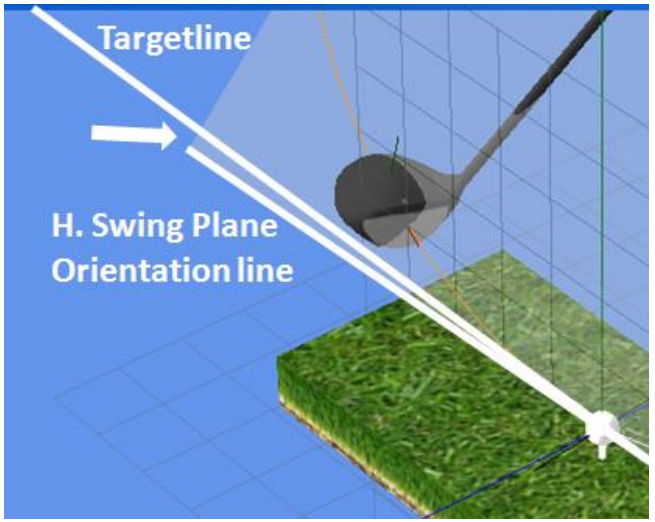
Horizontal Swing Plane → Swing Direction

- Bottom half of downswing
- Relative to Target Line
- 0 deg = parallel to target
- (-) = left; outside-in
- (+) = right; inside-out
- Visible on Video?
  - ➢Camera alignment!!!



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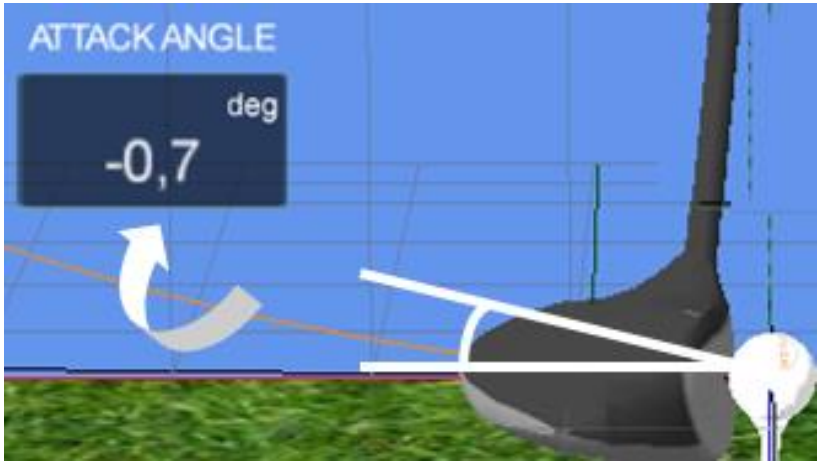
Attack Angle

- Vertical movement of the club through impact
  - Changes ~0.8 deg
- Relative to horizon
- (+) = hitting up
- (-) = hitting down
- Accuracy +/- 0.5 deg



- The average AA for 2009 RE/MAX Quarterfinalists was +5
- During 2010 RE/MAX: Min AA was 0 and Max AA was +13
- The average AA for PGA TOUR players is -1.3
- The average AA for LPGA TOUR players is +3

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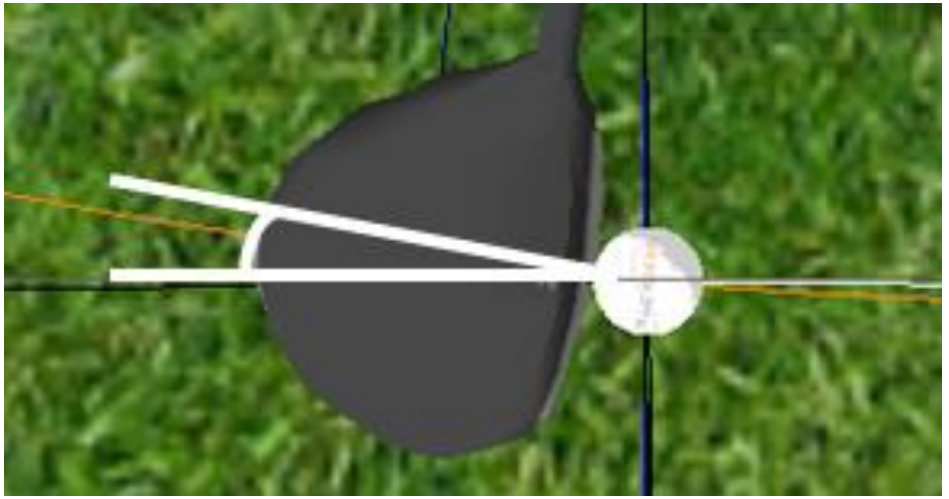
Club Path

- Horizontal movement of the club through impact
  - Changes ~0.8 deg
- Relative to target line
- (+) = moving right
- (-) = moving left
- Accuracy +/- 0.5 deg



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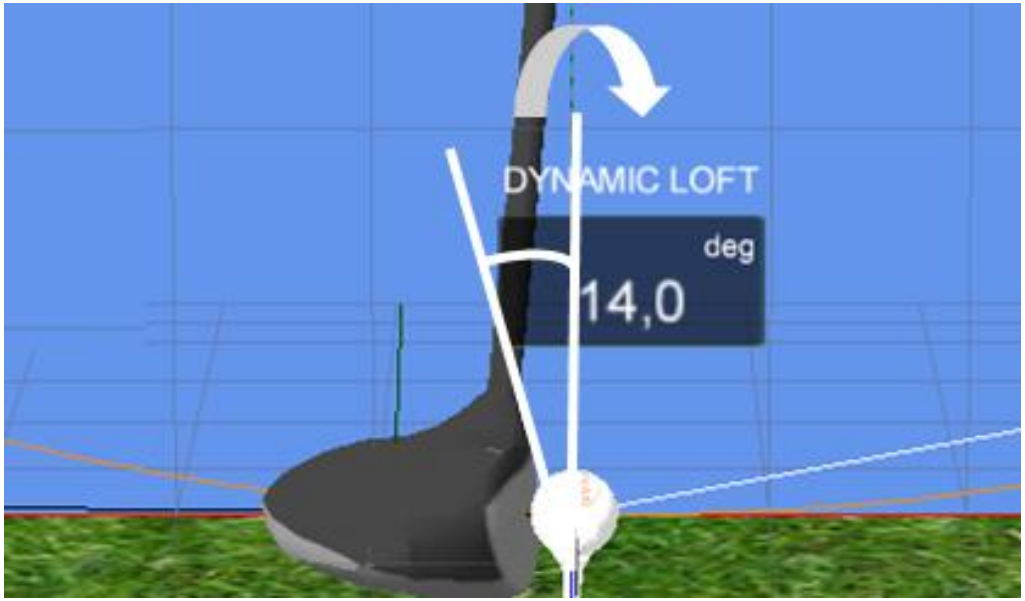
Dynamic Loft

- Orientation of club face at point of impact with the ball (Roll !)
- Relative to Plumb line
- Calculated from collision model
- Average through impact (0.5 ms)
  - Changes ~1 deg.



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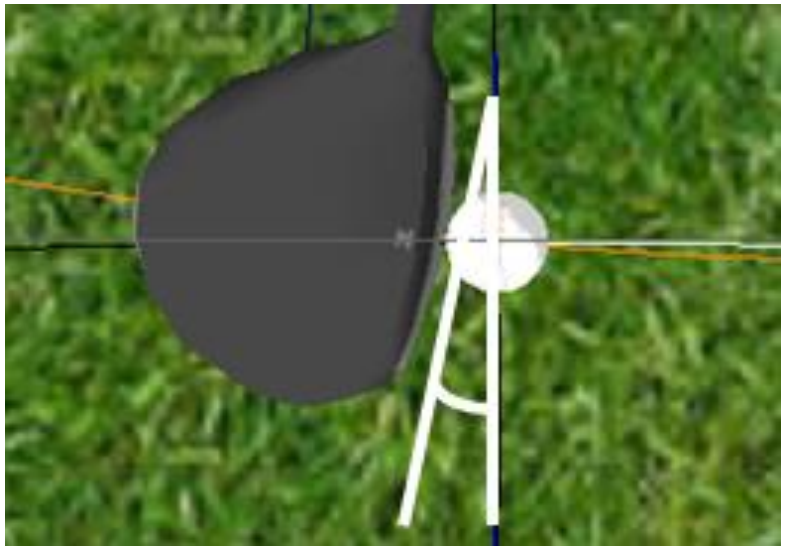
Face Angle

- Orientation of club face at point of impact with the ball (Bulge!)
- Relative to Target Line
  - (+) = Open
  - (-) = Closed
- Average through impact
  - Changes ~1 degree
- Calculated from Collision model



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Face to Path

- Orientation of club face at point of impact with the ball (Bulge!)
- **Relative to Club Path**
  - (+) = Open to Path
  - (-) = Closed to Path

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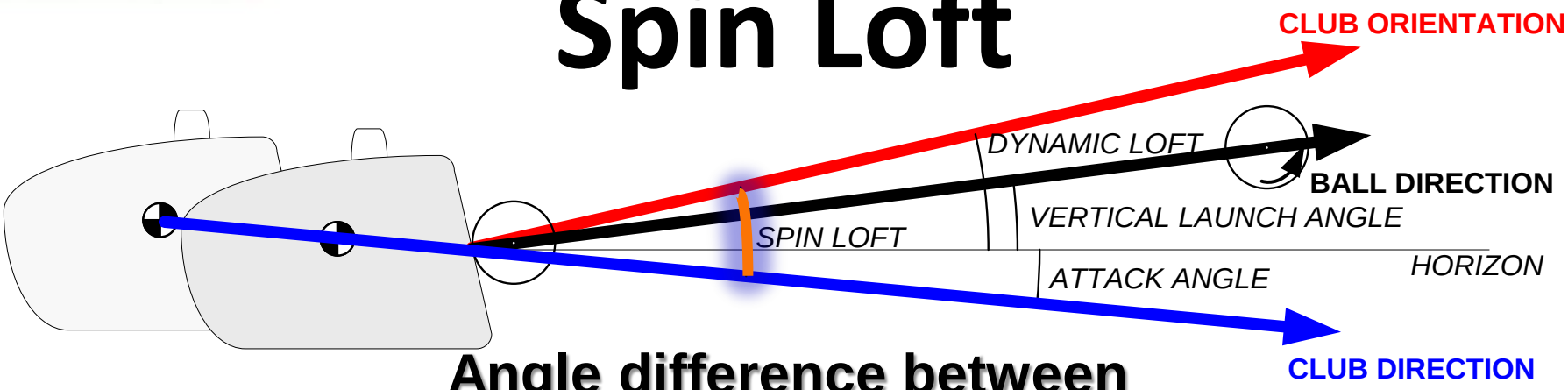
Spin Loft



Angle difference between
Dynamic Loft and Attack Angle

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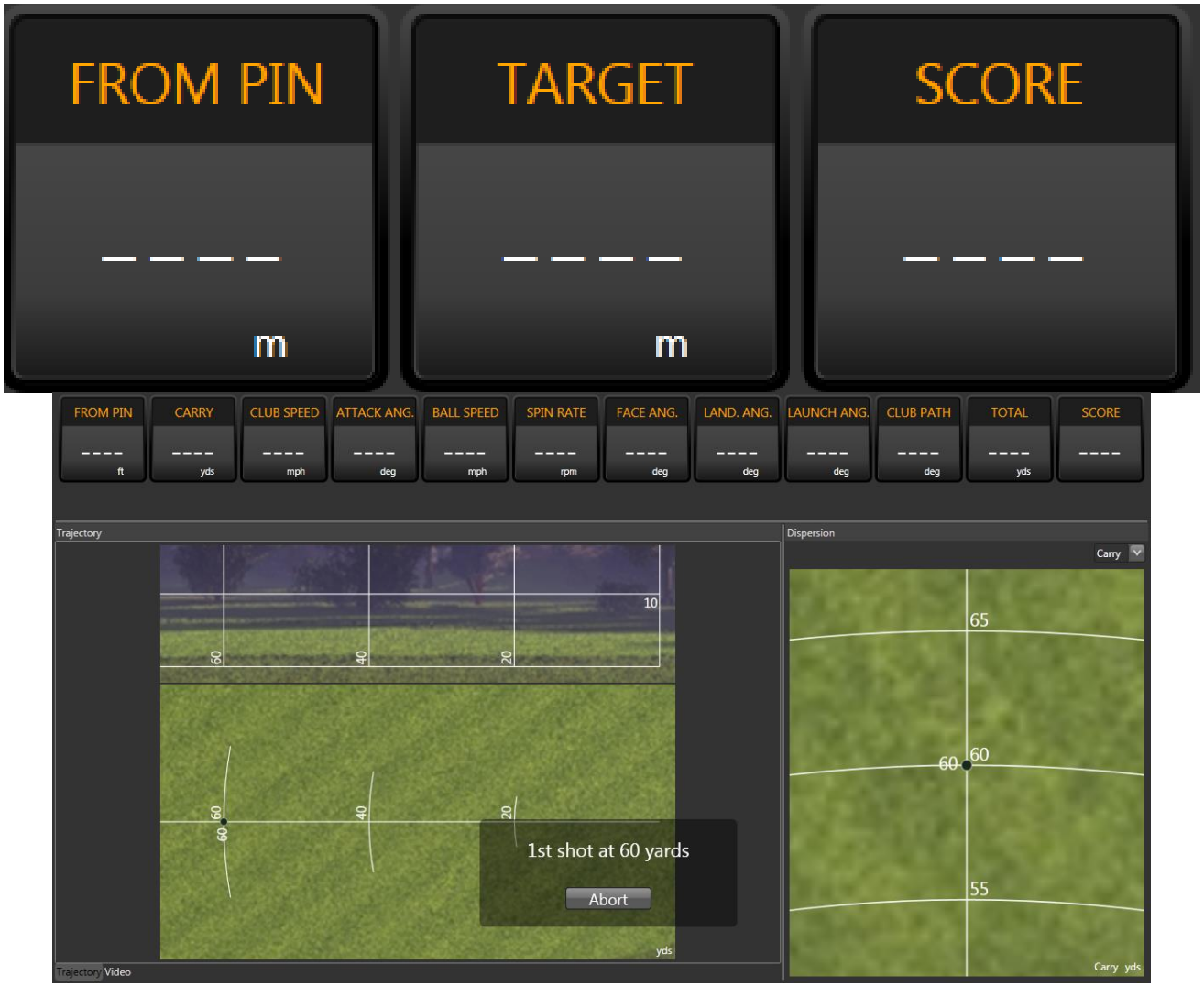
TrackMan Combine Specific Parameters