

RELEASE GEOMETRY AND PITCH SHAPE

The Last *Four Numbers*

Every mechanical change in this library is only worth what it does to four values at the hand: how high the ball leaves, how far to the side, how far out toward the plate, and which way it is spinning. Those four are what the hitter actually sees.

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A hitter cannot see your hips. He sees a ball appear at a point in space, travelling on an angle, spinning a particular way. **Four numbers, and everything upstream exists to set them.**

Which gives you a way to price mechanical work that mph alone does not. A change that adds a tick but flattens the angle on a pitcher who lives at the top of the zone may be a downgrade. A change that costs a tick and buys six inches of extension may be a clear win. The delivery is a means of producing release geometry, and release geometry is what produces outs.

The four

Release height

HOW HIGH OFF THE GROUND

Sets the steepness of the descent. A higher release produces a steeper angle into the zone, which suits a pitch working at the bottom. A lower release flattens it, which is what makes a fastball play at the top. Note that this is **not the same as being tall** — it is set by arm slot, sideways lean, stride length and how far the pitcher gets over his front leg.

Release side

Sets the horizontal angle and how much of the plate the pitcher can attack from an unusual line. Extreme values are what make a crossfire delivery or a low slot uncomfortable to face, because the ball arrives from a direction the hitter has less experience with.

Extension

HOW FAR TOWARD THE PLATE

The gap between actual velocity and **perceived** velocity. Releasing closer to the hitter shortens his decision time without the gun changing. It also flattens the approach angle slightly, because the ball has less distance in which to drop. Produced by stride length, forward tilt over the front leg, and how far the front hip travels.

Spin axis

WHICH WAY IT IS TURNING

Decides which direction the ball moves and how much of the spin is doing work. Set at the hand by finger pressure, seam orientation and how the forearm is rotating at release. The only one of the four that is not primarily a body position.

The four combine into approach angle

Height, side and extension set the line the ball travels on. Spin axis sets how that line bends on the way. Together they produce the **vertical and horizontal approach angle**, which is the geometry the hitter's swing has to solve.

This is why two fastballs at the same velocity with the same spin rate can play completely differently. The number on the gun and the number on the spin readout are inputs. Approach angle is the output, and it is what gets swung at.

Which mechanics set which number

The practical map. Change something on the left and one of the four moves.

MECHANICAL INPUTS TO RELEASE GEOMETRY		
MECHANIC	MOVES	WHAT HAPPENS, AND WHAT IT COSTS
Arm slot	height and side	The most direct lever on both. Dropping it lowers release height and moves release side, flattening the vertical angle. Covered in full in <i>Who Should Drop</i> .

MECHANIC	MOVES	WHAT HAPPENS, AND WHAT IT COSTS
Sideways lean at release	height	How a shorter pitcher manufactures a high release point. Buys the height, charges elbow load for it, and gets flagged past about 48 degrees.
Stride length	height and extension	A longer stride lowers the release point and adds extension at the same time. A short stride raises the release and steepens the angle, which suits a downhill sinker and hurts a four seam at the top.
Forward tilt over the front leg	extension	Where most extension comes from. Also the strongest positional correlate with velocity that Driveline found, though weak in absolute terms, and it raises elbow load, so it is a genuine trade rather than a free gain.
Front hip travel after landing	extension	Continuing to move toward the plate adds extension. It also costs block quality, so this one buys perceived velocity and charges actual rotation for it.
Finger pressure and seam orientation	spin axis	The only lever that changes shape without changing the body. Highest return per unit of effort in the whole library, and requires a ball flight unit to work on at all.
Forearm rotation at release	spin axis	Turning the hand over early cuts the ball and flattens it. Partly trainable, partly a built in preference.
Wrist tilt toward the thumb	spin axis	The gate on whether an arm slot change keeps its spin. Without the range, dropping the slot subtracts the pitch rather than reshaping it.

The trades nobody prices

Three cases where a change helps one number and hurts another, and the right answer depends on what the pitcher is trying to be.

TRADE 01 Longer stride, lower release Stride length is the best supported lower body velocity lever there is, worth roughly 0.7 mph per one percent of height in a study of 39 high school and college pitchers. It also drops the release point and flattens the angle. Great for a four seam at the top. Works against a pitcher whose value is a steep sinker.	TRADE 02 More lean, more height, more load Sideways lean is how a 6 foot pitcher gets a 6 foot 4 release. It is also positively associated with elbow load. If the ride on his fastball exists because of that lean, removing it removes the pitch.	TRADE 03 More extension, later block Letting the front hip travel adds extension and perceived velocity, and costs the block that converts momentum into rotation. Some pitchers ride out six inches of extension deliberately and it is the right call for them.
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The question that resolves all three

Not *is this mechanically better*. It is **what is this pitcher's pitch, and does the change help that pitch play**. A steeper angle is an asset at the knees and a liability at the letters. Extension is worth more to a fastball than to a slow curve. There is no context free answer, which is precisely why release geometry belongs in the conversation before the mechanical change, not after it.

Reading it backwards

The most useful thing about these four numbers is that you can start from them. Pick the shape you want and work back to the mechanics that produce it.

WANTS TO LIVE AT THE TOP

Flatter angle, high spin efficiency

Wants a **lower release relative to his height**, more extension, and a spin axis close to true backspin. The flatter the ball arrives, the more it plays as rising against a swing plane built for a normal descent.

- Longer stride helps twice: lowers release, adds extension
- Forward tilt over the front leg adds extension
- Less sideways lean, since height works against him here
- Spin efficiency matters more for him than for anyone

LIVES AT THE KNEES

Steeper angle, movement over efficiency

Wants a **higher release** and a steeper descent, with a spin axis tilted toward sink and run rather than pure backspin. Extension matters less because the pitch is not trying to beat a swing plane, it is trying to get under one.

- A shorter stride is not a fault for him. It raises the release
- Sideways lean earns its elbow cost here
- Seam orientation work often beats mechanical work entirely
- Do not chase spin efficiency he does not need

Measuring it

All four are measurable and three of them need nothing more than a ball flight unit, which most facilities already have.

WHAT TO CAPTURE AND WHAT TO DO WITH IT		
MEASURE	HOW	WHAT TO LOOK AT
Release height and side	Ball flight unit	Compare to his standing height rather than to a league average. The question is whether it is high or low <i>for him</i> , since that is what tells you the mechanics are producing something unusual.
Extension	Ball flight unit	Track it against stride length and forward tilt. If extension is short and stride is normal, he is finishing upright and there is velocity available there too.
Spin axis and efficiency	Ball flight unit	Per pitch, not averaged. A fastball at low efficiency is a bad fastball and a promising cutter, and that reframing is often worth more than any mechanical change.
Approach angle	Derived, or reported directly	The output the other three feed. This is the number to judge a mechanical change by, because it is the closest thing to what the hitter experiences.
Consistency, pitch to pitch	Ball flight unit, across a session	Some variation at release is a skill rather than a fault. Chase consistency at foot contact instead, which is the frame that predicts command.

Where this sits in the library

This is the document that prices the others

Every other document in this library describes a mechanical fault and what it costs in velocity, command or arm health. This one adds the fourth currency: **what it does to the pitch.**

That matters because several faults elsewhere in the library are only faults for some pitchers. A short stride is a velocity leak and a steeper angle. Sideways lean is an elbow cost and a higher release. A hand that cuts the ball is a flaw on a four seam and a weapon on a cutter. In each case the mechanics are neutral and the release geometry decides.

Which is the same argument *Deficiency or Adaptation* makes about compensations, applied at the hand instead of at the joint.

Sources

- Driveline — [Pitchers Are Going Low, And For Good Reason](#), arm slot and approach angle
- Driveline — [How We Interpret Biomechanics Reports](#)
- [The Effect of Trunk and Lower Body Mechanics on Fastball Velocity](#), SportRxiv, stride length and velocity
- Fleisig et al. — [Kinematic Parameters Associated With Elbow Varus Torque in Elite Adult Baseball Pitchers](#), trunk tilt and load
- ASMI — [The Clinician's Guide to Baseball Pitching Biomechanics](#), trunk tilt reference values by slot
- [Kinematic and Kinetic Comparisons of Arm Slot Position Between High School and Professional Pitchers](#)
- Driveline — [The Interaction of Biomechanics and Command](#), release variability and miss distance

Judge a mechanical change by what it did to the four numbers at the hand, not by whether the delivery looks better.