

RideDNA

Handling Index Analysis

Generated August 25, 2026

Valor

Size: XM | Configuration: Airborne Valor XM

Trail: 69.4mm	Wheel Flop: 21.4mm	HTA: 71.0°	Fork Offset: 47.0mm
Front Center: 615mm	Chainstay: 423mm	Wheelbase: 1027mm	BB Drop: 77.4mm

AGILITY INDEX™

Score: 74.3/100

32% Ground Trail	-23.5
26% Wheel Flop	+11.0
10% Front Center	-18.6
10% Chain Stay	-18.0
8% Gyroscopic MOI	+4.0
6% BB Drop	-11.5
4% Axle Height	+2.7
4% Pneumatic Trail	-1.8

STABILITY INDEX™

Score: 61.3/100

20% Wheel Flop	-6.6
15% Ground Trail	+19.8
15% Front Center	+14.8
15% Gyroscopic MOI	+15.1
10% Chain Stay	0.0
10% Axle Height	-2.7
8% BB Drop	+17.2
7% Pneumatic Trail	+12.4

AGILITY: Higher contributions → more reactive

STABILITY: Higher contributions → more planted

Airborne Valor XM | Dan — Endurance Road Analysis

1. First Impressions

This is an endurance road bike with a composed, confidence-inspiring personality—built for spirited long-distance riding where comfort and stability matter as much as engagement. The 69.4mm trail and 423mm chainstays create a platform that rewards patient riding: self-centering through sweeping descents, planted in corners, and supple over rough roads. Grade 9 Titanium's natural compliance and internal damping transform this geometry into a bike that feels fresher after 100 km than it does after 20—the frame attenuates high-frequency road buzz through elastic deflection and material hysteresis, letting the rider focus on the road ahead rather than the discomfort accumulating in their hands and neck.

2. Agility Index Analysis — Score: 74.3/100

The 615mm front center places weight moderately forward, creating a bike that responds to rider input without feeling nervous or twitchy. This isn't a race bike that lunges into corners—it's a deliberate handler that asks the rider to commit to their line and rewards that commitment with predictable, composed cornering. The 423mm chainstays sit squarely in endurance road territory, providing excellent climbing traction and a stable pivot point through corners without sacrificing the lively character that makes spirited group rides enjoyable. The front/rear balance produces a bike that feels engaged and responsive when the rider asks for it, but never demands constant attention—a 74.3 agility score that translates to "fun without being fussy."

3. Stability Index Analysis — Score: 61.3/100

The 1027mm wheelbase creates high-speed composure that builds confidence on fast descents and long, sweeping corners—the bike tracks true without wandering, and the rider can relax into the descent rather than wrestling the front end. The 77.4mm BB drop lowers the system's center of mass significantly, allowing deeper lean angles with confidence and creating a connected, planted feel through corners. The 74.3 agility vs 61.3 stability balance reveals this bike's character: it's responsive enough for spirited riding but stable enough to inspire confidence when speeds climb or road surfaces deteriorate. This isn't a bike that feels sluggish—it's a bike that feels composed, rewarding smooth rider input with predictable, trustworthy handling.

4. Steering Dynamics

The 69.4mm trail creates meaningful self-centering torque—at speed, the bike naturally tracks straight and resists small disturbances from crosswinds, road imperfections, or uneven weight shifts. This is the geometry value that makes long descents feel effortless: the rider can relax their grip, trust the bike to hold its line, and focus on braking points and corner entry rather than constant steering corrections. The 21.4mm wheel flop acts as "power steering" at turn initiation—the front end wants to drop into the turn, assisting the rider's lean input and making corner entry feel smooth and natural rather than requiring aggressive handlebar force.

In constant-radius cornering, this moderate flop geometry holds the rider's intended line beautifully—once committed to a lean angle, the bike maintains that arc without falling into a tighter radius or requiring mid-corner corrections. High-flop bikes (>30mm) tend to tighten their radius mid-corner, forcing the rider to countersteer and adjust; this 21.4mm flop provides just enough turn assistance without creating unpredictable cornering behavior.

The 71.0° head tube angle positions this bike for confident handling across a wide speed range—it feels neutral and composed at 20-25 mph cruising speeds, increasingly planted and stable as speeds climb into the 30-40 mph descent range. Trail effectiveness increases with speed: what feels moderately stable at 20 mph becomes deeply confidence-inspiring at 40 mph, as the self-centering torque grows proportionally with velocity. Countersteering inputs are smooth and predictable—the rider leans, the bike responds, and the geometry holds the line without surprises.

5. Comfort & Compliance

Titanium's material properties fundamentally transform how this geometry interacts with real-world road surfaces. When the front wheel encounters chip-seal, expansion joints, or deteriorated pavement, the impact energy follows two pathways: first, elastic deflection—the titanium tubes deflect under load, storing vibrational energy as elastic potential energy and returning it to the system as the frame rebounds, creating a spring-like compliance that the rider perceives as smoothness. Second, internal material damping—titanium's crystal lattice hysteresis converts residual high-frequency vibrational energy (5-50 Hz) into heat, attenuating the road buzz that causes hand and arm fatigue on long rides.

Airborne Valor XM

RideDNA AI Analysis

The 35mm tire volume handles the majority of impact energy through pneumatic deflection before it reaches the frame, but titanium's compliance and damping characteristics manage the remainder that the tire cannot. The result is a bike that feels butter-smooth on rough roads without sacrificing the road feedback that keeps the rider connected to the surface—the frame mitigates harshness while preserving the tactile information that matters for cornering confidence and traction awareness.

Long-ride freshness is where this compliance pays dividends: after 100+ km, the rider's hands, arms, and neck feel measurably fresher than they would on a stiff aluminum or aggressively race-oriented carbon frame. The reduced high-frequency vibration transmission—achieved through both elastic deflection and heat dissipation—means less accumulated muscle fatigue and more sustainable comfort. On deteriorated back roads or rough chip-seal, this bike transforms from "tolerable" to "enjoyable"—the titanium frame's ability to attenuate vibrational energy through engineered deflection zones and material hysteresis makes road surface quality less of a limiting factor for route selection.

6. Climbing & Endurance Profile

The 423mm chainstays create excellent climbing traction and stability—weight stays planted over the rear wheel on steep grades without requiring dramatic forward weight shifts that strain the lower back and arms. Seated climbing feels efficient and composed; the bike rewards smooth, steady power delivery rather than aggressive out-of-the-saddle efforts. Standing climbing is entirely capable but not this bike's forte—the longer chainstays and moderate BB drop create a slight mechanical disadvantage for explosive accelerations, but the trade-off is sustainable comfort on long, grinding ascents where seated efficiency matters more than sprint snap.

Long-distance comfort is where this geometry and material combination excels: the 1.48 stack-to-reach ratio creates a moderately upright position that reduces lower back strain and opens the diaphragm for easier breathing on sustained climbs. After 100+ km, the rider feels fresher and more capable than they would on a more aggressive race position—the bike encourages efficient, sustainable riding rather than punishing the body for comfort. Descending recovery is smooth and predictable—the bike transitions from high-speed descent to flat or climb without requiring dramatic weight shifts or position changes, allowing the rider to settle back into a steady rhythm quickly.

7. Fit Context

The 573.8mm stack and 388.5mm reach create a moderately upright, endurance-focused position—comfortable enough for all-day riding without sacrificing engagement or descending confidence. The 1.48 stack-to-reach ratio places this bike squarely in the endurance sweet spot: upright enough to reduce lower back and neck strain on century rides, engaged enough to feel connected and capable on spirited group rides or fast descents. This isn't a towering, ultra-relaxed position—it's a balanced, sustainable position that serves flexible riders who want comfort without complete disengagement.

The 165mm head tube length provides reasonable spacer flexibility without requiring an excessive stack of spacers to achieve a comfortable position—riders can start with 20-30mm of spacers and gradually lower the front end as flexibility improves, tuning the fit without replacing the frame. The 557mm effective top tube creates a moderately stretched cockpit that suits riders with proportional torso length; shorter-torso riders may want a shorter stem to bring the bars closer.

The rider comprises 80-90% of total system mass, and their position on this bike creates approximately 40% front / 60% rear wheel loading in normal riding position—a balanced distribution that contributes to the bike's predictable, composed handling. On descents, the rider can shift weight rearward to stabilize braking and increase front-wheel grip without fighting the geometry; the 423mm chainstays reduce the need for dramatic weight shifts on steep climbs, keeping the rider in a more sustainable position. This fit serves riders who value all-day comfort and long-ride freshness over aggressive race positioning—the kind of rider who measures ride quality in how they feel after 120 km, not after 20.

8. Competition Comparison

- ****Pinarello Dogma X (550)**:** Trail 62.0mm, HTA 72.0°, CSL 422mm
- 7.4mm less trail creates noticeably quicker steering initiation; this Pinarello requires more active rider input to maintain straight-line tracking
- 1mm shorter chainstays produce marginally snappier acceleration; handling character is nearly identical in cornering pivot feel
- Fork A2C 375mm rigid; this tight race geometry is highly fork-sensitive—switching forks must match within ± 5 mm or steering character shifts noticeably

Airborne Valor XM

RideDNA AI Analysis

- ****BMC RoadMachine (54)**:** Trail 62.9mm, HTA 72.2°, CSL 415mm
 - 6.5mm less trail means quicker turn initiation; this BMC feels more responsive to handlebar input but less self-centering at speed
 - 8mm shorter chainstays create a snappier, more reactive rear end; this BMC rewards aggressive pedaling style over steady endurance rhythm
 - Fork A2C 379mm rigid; geometry calibrated around this short fork limits replacement options—owner must match A2C precisely to preserve handling
- ****Airborne Zeppelin MK V (XM | 55cm)**:** Trail 63.0mm, HTA 72.0°, CSL 416mm
 - 6.4mm less trail produces quicker steering response; this Zeppelin initiates turns more eagerly but provides less high-speed descending composure
 - 7mm shorter chainstays create a livelier, more responsive rear end; this Zeppelin favors spirited acceleration over planted climbing stability
 - Fork A2C 376mm rigid; this race-oriented geometry is highly fork-locked—switching to a different fork must match within ± 5 mm to preserve calibrated handling
- ****Waltly Elegance (M)**:** Trail 63.0mm, HTA 72.0°, CSL 415mm
 - 6.4mm less trail makes steering initiation quicker; this Waltly feels more responsive to rider input but less confidence-inspiring on fast descents
 - 8mm shorter chainstays produce snappier acceleration and a more reactive cornering pivot; this Waltly rewards aggressive riding over steady endurance pace
 - Fork A2C 380mm rigid; geometry designed around this short fork severely constrains replacement options—owner must match A2C closely or accept handling shift
- ****Lauf Uthald (Medium)**:** Trail 64.0mm, HTA 71.5°, CSL 405mm
 - 5.4mm less trail creates slightly quicker steering response; this Lauf initiates turns more eagerly but provides less self-centering stability at high speed
 - 18mm shorter chainstays produce a significantly snappier, more reactive rear end; this Lauf favors spirited acceleration over planted climbing traction
 - Fork A2C 376mm rigid; this race-focused geometry is highly fork-sensitive—switching forks must match within ± 5 mm to preserve intended handling character

9. Versatility

This Valor platform offers exceptional configuration flexibility beyond the current endurance road setup. The VectorLok™ adjustable dropout system allows chainstay length from 408mm to 433mm—shortening to 408-415mm would create a more responsive, race-oriented feel with snappier acceleration and quicker cornering pivot, while lengthening to 430-433mm would maximize stability and tire clearance for true all-road capability with 38mm tires. The RideDNA Helix™ adjustable headset provides -2° to $+2^\circ$ head tube angle adjustment, allowing trail tuning from approximately 50mm (quick, race-oriented steering) to 80mm (maximum stability for rough surfaces and loaded riding).

Small geometry tweaks transform this bike's character: slackening the head tube angle by 1° increases trail by roughly 6-7mm, creating noticeably more self-centering torque and high-speed composure—ideal for riders who prioritize descending confidence. Steepening by 1° reduces trail for quicker steering response, suiting riders who want more engagement on rolling terrain. Tire size options range from 28mm (minimum practical width for smooth roads and maximum speed) to 38mm (true all-road capability for deteriorated pavement and light gravel)—the current 35mm setup sits in the endurance road sweet spot, providing excellent comfort with minimal rolling resistance penalty.

This platform spans the full endurance road ↔ all-road spectrum: configure it with 408mm chainstays, steeper HTA, and 28mm tires for spirited performance road riding; or maximize chainstays to 433mm, slacken the HTA, and run 38mm tires for confident all-road exploration. The Grade 9 Titanium frame will outlast decades of configuration experimentation—riders can tune this bike to their evolving needs without replacing the frameset, and the material's effectively infinite fatigue life ensures it will perform as confidently in year 20 as it does on day one.

10. Summary

This Valor configuration serves riders who value composed, confidence-inspiring handling and all-day comfort over aggressive race positioning—the kind of rider who measures success in how fresh they feel after 120 km, not how fast they finished the first 20. The 69.4mm trail creates the defining characteristic: self-centering stability that builds confidence on fast descents and long rides without sacrificing the responsive, engaging character that makes spirited group rides enjoyable. Titanium's ability to attenuate high-frequency vibration

through elastic deflection and internal damping transforms this geometry into a bike that feels supple, connected, and butter-smooth on real-world roads—a platform that rewards patience and endurance over explosive efforts.

Citations

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