RideDNA

Handling Index Analysis

Generated June 24, 2026

Arsenal 7°

Size: XM | Configuration: Airborne Arsenal 7° XM

Trail: 79.3mm	Wheel Flop: 26.4mm	HTA: 69.1°	Fork Offset: 57.0mm
Front Center: 662mm	Chainstay: 435mm	Wheelbase: 1084mm	BB Drop: 80.0mm

AGILITY INDEX™

Score: 63.9/100

32% Ground Trail	-29.4
26% Wheel Flop	+19.7
10% Front Center	-25.4
10% Chain Stay	-20.3
8% Gyroscopic MOI	0.0
6% BB Drop	-12.0
4% Axle Height	+4.3
4% Pneumatic Trail	-3.1

STABILITY INDEX™

Score: 85.4/100

20% Wheel Flop	-10.0
15% Ground Trail	+24.8
15% Front Center	+20.3
15% Gyroscopic MOI	+22.5
10% Chain Stay	0.0
10% Axle Height	-4.3
8% BB Drop	+18.0
7% Pneumatic Trail	+20.9

AGILITY: Higher contributions → more reactive
STABILITY: Higher contributions → more planted

Airborne Arsenal 7° (XM) — Gravel & Adventure Analysis

1. Trail Character

This is an expedition gravel machine built for the long haul—multi-day loaded adventures on remote terrain where reliability matters more than race-day speed. The Arsenal 7° delivers exceptionally high stability (85.4/100) through its 79.3mm trail and 1084mm wheelbase, creating a bike that tracks confidently through loose gravel, washboard, and technical fire roads while carrying full bikepacking loads. Grade 9 titanium brings crucial expedition advantages: vibration damping for all-day comfort on rough surfaces, impact resistance when debris strikes the frame, and corrosion immunity when mud, creek crossings, and salt roads are part of the adventure.

2. Agility Index Analysis — Score: 63.9/100

The 662mm front center creates deliberate, predictable steering—this bike doesn't dart nervously into corners but instead requires intentional rider input, which is exactly what you want when loaded bags shift your center of mass. The 435mm chainstay sits at the shorter end of expedition territory, providing better traction on steep climbs and more responsive cornering than ultra-long expedition bikes while still clearing 57mm tires. This front/rear balance produces a bike that's planted but not ponderous—it won't dance through tight singletrack switchbacks, but it changes direction with authority on fire roads and doubletrack, maintaining rear-wheel grip throughout the turn.

3. Stability Index Analysis — Score: 85.4/100

The 1084mm wheelbase creates exceptional tracking stability—on high-speed gravel descents and long straightaways, this bike holds its line with minimal rider correction, even when washboard tries to deflect the front wheel. The 80mm BB drop lowers the system center of mass significantly, improving cornering confidence on loose surfaces where you're leaning the bike while traction remains uncertain. The 63.9 agility versus 85.4 stability split defines this as a confidence-inspiring expedition platform: it won't be the quickest bike through a technical gravel race course, but it will be utterly composed when you're 60 miles into a remote route on deteriorating surfaces with 15 kg of gear aboard.

4. Steering Dynamics

The 79.3mm trail generates substantial self-centering torque—on loose gravel, hardpack with embedded rocks, or wet clay roads, the front wheel actively tracks straight and resists deflection from surface irregularities. This high trail value means the bike "steers itself" to a significant degree, reducing the constant micro-corrections required on lower-trail bikes and dramatically lowering rider fatigue across long gravel days. The 26.4mm wheel flop assists turn initiation despite the high trail—when you weight the inside bar and lean the bike, the flop helps the front wheel fall into the turn, making the steering feel more natural than the trail number alone would suggest.

Surface transitions reveal this geometry's expedition DNA: moving from pavement to loose gravel, the bike's personality shifts from slightly over-damped to perfectly calibrated—the high trail that feels conservative on smooth tarmac becomes ideal stabilization on unpredictable surfaces. When cornering on loose gravel or hardpack with a sandy top layer, the 79.3mm trail keeps the front wheel tracking predictably even when traction varies mid-corner, allowing you to trust your line rather than constantly adjusting.

The 69.1° head tube angle works best in the 10-35 km/h gravel speed range—fast enough that gyroscopic forces assist stability, slow enough that trail's self-centering torque remains dominant. On technical descents with drop bars, this geometry provides confidence: you can stay in the drops for control, knowing the front end won't deflect unpredictably when you hit a rock or rut.

5. The Key Trade-offs

The 63.9/85.4 agility/stability balance creates a bike optimized for loaded adventure riding at the expense of unloaded race agility—if you're riding fast gravel events with no bags, this geometry will feel stable to the point of sluggishness in tight corners. But add 12 kg of bikepacking gear, and suddenly the high trail becomes essential: it compensates for the slower speeds and higher center of mass, maintaining predictable handling when other bikes would feel vague and wandering.

The front-end personality (662mm front center, 79.3mm trail) dominates the handling character—this bike's steering is deliberate and confidence-inspiring, not nervous or twitchy. The rear end (435mm chainstay) provides just enough agility to keep the bike from feeling like a loaded touring rig. On mixed terrain, this means surface adaptability favors rough over smooth: the bike thrives on deteriorating gravel roads, technical fire

roads, and chunky doubletrack where stability matters more than quick direction changes.

6. Loading & Bikepacking Dynamics

Front loading is highly recommended with 79.3mm trail—adding 2-4 kg in a handlebar bag and 1-2 kg in fork cages enhances the already-strong self-centering torque, making the steering feel even more stable and predictable under load. This is one of the highest-trail gravel bikes available; front weight transforms it from "very stable" to "unshakably planted" on rough terrain. The geometry actively benefits from front loading rather than being compromised by it.

The 435mm chainstay handles rear loads capably but represents the shorter end of expedition geometry—a large seat bag (4-6 kg) plus frame bag (3-5 kg) will raise the center of mass noticeably. For true expedition loads (15+ kg total), consider the Arsenal's adjustable chainstay system to extend rear center length, which moves rear weight closer to the axle and improves loaded stability. Current configuration works well for fast-packing (8-12 kg total) with a 40/60 front/rear weight split.

Under full load, expect the high trail to become even more dominant—the bike will track straighter, resist cross-winds better, and feel more stable on descents, but steering inputs will require slightly more effort at low speeds. Titanium's predictable compliance under varying loads is crucial here: the frame's flex pattern remains consistent whether you're carrying 5 kg or 20 kg, unlike stiff frames that can feel harsh and unpredictable when heavily loaded.

7. Fit Context

The 620.6mm stack and 389.9mm reach create an upright, endurance-oriented position ideal for long gravel adventures—this isn't an aggressive performance fit but rather a sustainable all-day position that prioritizes comfort and control over aerodynamics. The 1.59 stack-to-reach ratio allows riders to maintain a relaxed upper body posture while still achieving proper weight distribution for off-road handling.

The 168mm head tube provides moderate spacer flexibility—riders can adjust stem height to fine-tune comfort without creating an excessively tall front end that would compromise handling. The 555mm effective top tube creates a cockpit that's spacious enough for confident control on technical terrain but not so stretched that it limits maneuverability.

Center of mass positioning on this geometry places the rider slightly more upright than on performance gravel bikes, which raises the system COM modestly but improves comfort and visibility on rough terrain. The upright position also facilitates active weight shifting on descents—riders can easily move rearward when the terrain gets steep and loose, using body position to maintain traction and control. The 69.1° head tube angle and high trail mean that even with significant rearward weight shift on descents, the front wheel maintains predictable steering.

This fit serves adventure-focused riders who prioritize comfort and capability over speed—bikepacking enthusiasts, gravel explorers, and riders who measure success in miles traveled and terrain conquered rather than average speed. If you're chasing podiums in gravel racing, this upright position will feel inefficient; if you're riding 10-hour gravel epics or multi-day loaded trips, it's perfectly calibrated.

8. Competition Comparison

- **Cannondale Topstone Carbon (58.0)**: Trail 67.0mm, HTA 70.7°, CSL 420mm
- 12.3mm less trail creates noticeably quicker steering but less self-centering stability on loose gravel descents.
- 15mm shorter chainstay and 52mm max tire versus 57mm limit bikepacking loads and rough-terrain capability.
- Fork A2C 429mm rigid; adding a 30mm gravel suspension fork slackens HTA ~0.7°—marginal suspension compatibility but geometry shifts noticeably.

- **Niner RLT 9 RDO (59cm)**: Trail 68.4mm, HTA 72.0°, CSL 430mm
- 10.9mm less trail makes steering more responsive but requires more rider correction on rough, loose surfaces.
- 5mm shorter chainstay and 50mm max tire versus 57mm reduce loaded stability and rough-terrain float.
- Fork A2C 401mm rigid; adding a 30mm gravel suspension fork slackens HTA ~1.9°—fork-constrained geometry fundamentally degrades with any suspension.

- **Salsa Cutthroat C (56cm)**: Trail 87.4mm, HTA 69.0°, CSL 445mm
- 8.1mm more trail creates even higher stability but steering requires more effort at low speeds.
- 10mm longer chainstay improves loaded stability; identical 61mm tire clearance; similar expedition capability but less adjustability.

- Fork A2C 483mm rigid; already designed for suspension-length fork; no upgrade path but geometry is suspension-ready from factory.

The Arsenal 7° distinguishes itself through geometry adjustability—the platform can shift from 435mm to 460mm chainstay and -2° to +2° HTA adjustment, allowing riders to optimize the bike for specific terrain and loading scenarios. The titanium frame ensures this versatility remains relevant for decades, while competitor carbon frames may degrade or become obsolete. The current 435mm configuration delivers expedition stability with better agility than the Cutthroat, while the Topstone and Niner sacrifice loaded capability for unloaded performance.

9. Considerations

With 79.3mm trail, front-end weight actively improves handling—a 2-3 kg handlebar bag and 1-2 kg in fork cages enhance self-centering torque and dampen the 26.4mm wheel flop, creating even more predictable steering on rough terrain. This is one of the few gravel bikes where front loading is genuinely beneficial rather than merely tolerable.

Handlebar width and flare: Consider 46-48cm bars with 16-20° flare for this geometry—the wider grip provides better leverage for controlling the high-trail front end on technical descents, while the flare improves control in the drops on loose surfaces. Narrower bars (42-44cm) will make the steering feel even more stable but may sacrifice descending control.

Tire pressure strategy: Titanium's natural compliance allows running slightly higher pressures than on stiff frames while maintaining comfort—for 57mm tires, start at 22-26 PSI (tubeless) depending on rider weight, lowering to 18-22 PSI for soft or sandy conditions. The frame filters high-frequency vibration, so you can prioritize rolling efficiency without punishing ride quality.

Tubeless setup is essential for expedition gravel—the ability to run lower pressures without pinch flat risk transforms rough-terrain capability, and the self-sealing properties provide critical insurance on remote routes. With 57mm tire clearance, you have enormous volume for comfort and grip.

10. Versatility

The Arsenal 7° platform delivers exceptional configuration flexibility beyond this current setup. The adjustable chainstay system (435-460mm range) allows riders to optimize rear center length for different missions: keep it at 435mm for fast-packing agility, extend to 450-460mm for maximum loaded stability on true expedition trips. Longer chainstays also increase tire clearance to 62mm, enabling the biggest gravel/adventure tires available.

Headset angle adjustment (-2° to +2° HTA range) provides 67.0-71.0° achievable HTA and approximately 75-105mm trail range—riders can slack out the geometry for maximum loaded stability or steepen it for more responsive handling on performance-oriented gravel rides. This transforms the bike's personality without changing the frame.

Tire size options fundamentally alter terrain capability: 45-50mm tires create a fast adventure gravel bike for maintained roads and hardpack; 50-55mm tires optimize for mixed surfaces and moderate bikepacking; 57-62mm tires (at longest chainstay) deliver maximum float and comfort for soft surfaces, sandy conditions, and heavy expedition loads.

The platform serves performance gravel to expedition spectrum: current configuration (435mm chainstay, 69.1° HTA, 57mm tires) sits in fast-packing territory—stable enough for loaded riding, agile enough for spirited unloaded adventures. Extend the chainstay to 460mm, slack the HTA to 67°, fit 62mm tires, and you have a pure expedition machine. Shorten to 435mm, steepen to 71°, fit 45mm tires, and you approach performance gravel territory (though the titanium frame's compliance will always favor comfort over race-day stiffness).

Titanium is a forever frame—this platform will serve riders through decades of evolving gravel goals, component standards, and riding styles. The geometry adjustability ensures the bike remains relevant as your adventures change.

11. Summary

This Arsenal 7° configuration serves adventure-focused riders and bikepackers who prioritize confidence and capability on remote, rough terrain over race-day speed. The 79.3mm trail creates exceptional loaded stability—this bike tracks predictably through loose gravel, washboard, and technical fire roads even when carrying full bikepacking gear, reducing rider fatigue across long days in the saddle. Grade 9 titanium's vibration damping, impact resistance, and corrosion immunity make it the ideal material for gravel exploration where durability and ride quality matter more than weight savings.

Citations

• [Meijaard et al. (2007): "Linearized dynamics equations for the balance and steer of a bicycle"](http://ruina.tam.cornell.edu/research/topics/bicycle_mechanics/FinalBicyclePaperv45wAppendix.pdf)
• [Rolo Bikes (2013): "The benefits of low flop geometry"](https://www.rolobikes.com/pdf/rolo-wheel-flop.pdf)
• [Fajans & Curry (2000): "Steering in bicycles and motorcycles"](https://physics.berkeley.edu/sites/default/files/bulk_3/SteerBikeAJP.PDF)
• [Jones, D.E.H. (1970): "The stability of the bicycle"](https://home.phys.ntnu.no/brukdef/undervisning/tfy4145/diverse/UnridableBicycle.pdf)
• [Schwab & Meijaard (2013): "A review on bicycle dynamics and rider control"](http://bicycle.tudelft.nl/schwab/Publications/schwab2013review.pdf)
• [Cain, Ashton-Miller & Perkins (2016): "On the Skill of Balancing While Riding a Bicycle"](https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0149340)