Bilateral Symmetry & Geometry Audit

A diagnostic audit of bilateral load distribution, torque-band symmetry curves, and cross-geometry fleet parity.

RIDER	Brian Smith
STUDY WINDOW	02/08/2026 to 15/09/2026
ANALYSED COHORT	5 Sessions | 9.6 h | 5,701 kJ
ACTIVE FLEET	Orbea Oiz, Trek Emonda
REPORT ID	BSG-15092026-OOAURB

LEFT / RIGHT BALANCE

49.1/50.9

Target: Within ±1.5% of 50/50

PASSED

SIDE TO SIDE DIFFERENCE

4.1%

Target: Under 4.8%

PASSED

HIGH-TORQUE SYMMETRY CONVERGENCE

2.1%

Intensity parity (Z4–Z6)

PASSED

SCOPE DISCLAIMER

This report summarises recorded mechanical behaviour in the selected data. It does not diagnose, prescribe, assess physical condition, or provide medical, coaching, or bike-fit guidance.

LOAD-DEPENDENT SYMMETRY & TORQUE SPECTRUM

02/08/2026 to 15/09/2026

CLIENT: Brian Smith RIDES: 02/08/2026 to 15/09/2026

02/08/2026 to 15/09/2026 | RIDES: 5

INTENSITY & POWER-BAND SYMMETRY MATRIX (Z1–Z6)

Left / Right Balance read band by band. A Side to Side Difference confined to the low-torque bands, where unweighting during the recovery phase makes up more of each stroke, reads differently from one that persists into the high-torque bands, where force generation dominates.

Zone	Power Range	Time Share %	Left / Right Balance	Side to Side Difference %	Pedalling Efficiency %	Smooth Power Delivery	Status
Z1 Active Recovery	<100 W	6.2	46.4 / 53.6	7.2	51.4	14.7	Outside band
Z2 Endurance	100–199 W	41.9	48.8 / 51.2	2.4	64.1	17.9	Passed
Z3 Tempo	200–299 W	43.0	49.7 / 50.3	0.6	78.0	21.8	Passed
Z4 Threshold	300–399 W	7.8	49.1 / 50.9	1.8	84.4	24.3	Passed
Z5 VO2 Max	400–499 W	1.1	47.9 / 52.1	4.2	87.0	25.2	Passed
Z6 Neuromuscular	500+ W	0.1	47.8 / 52.2	4.4	91.2	25.4	Passed

SYMMETRY UNDER PROGRESSIVE WORKLOAD

Left / Right Balance across each ride's own accumulated work: the fresh opening quarter, the settled middle half and the tired final quarter. Shift from Fresh is the change in the left share against the fresh quarter.

Phase	Work span	Left / Right Balance	Side to Side Difference %	Shift from Fresh %	Pedalling Efficiency %	Status
Fresh (0-25%)	Mixed spans	48.4 / 51.6	5.8	0.0	69.5	Outside band
Settled (25-75%)	Mixed spans	49.5 / 50.5	4.9	+1.1	72.0	Outside band
Tired (75-100%)	Mixed spans	48.9 / 51.1	4.9	+0.5	71.5	Outside band

TRANSIENT ASYMMETRY & OFFLOADING MARKER SIGNATURE

5 of 5 assessed rides recorded a Left / Right Balance shift past its threshold. Each row is that ride's largest shift: the side whose share fell, how far, and how long it took to return within the threshold. A transient shift returned within the ride; a sustained one did not. The recording does not identify the cause of either.

Ride	Side offloaded	Peak shift %	At kJ	Onset (ride time)	Back within threshold	Threshold %	Class
23/08/2026	Left	12.8	1186	134:29	After 70 s	3.0	Transient
02/08/2026	Right	8.1	700	72:54	After 7 min	3.0	Transient
30/08/2026	Left	6.5	298	25:45	After 48 s	3.0	Transient
20/08/2026	Right	5.8	303	34:50	After 54 s	3.0	Transient
15/09/2026	Left	5.1	310	33:11	After 72 s	3.0	Transient

CROSS-GEOMETRY FLEET PARITY AUDIT

02/08/2026 to 15/09/2026

CLIENT: Brian Smith RIDES: 02/08/2026 to 15/09/2026

02/08/2026 to 15/09/2026 | RIDES: 5

MULTI-BIKE KINEMATIC PARITY MATRIX

Each bicycle and setup is read on its own, so a balance characteristic that follows the rider from frame to frame can be told apart from one that appears on a single frame, or only on a stationary trainer, where the frame is held rigid beneath the rider.

Bicycle / Setup	Discipline	Sessions	Share %	Avg Power	Left / Right Balance	Difference %	Efficiency %	Smoothness
Orbea Oiz Outdoor	MTB	4	92.9	165 W	49.6 / 50.4	3.4	68.8	19.1
Trek Emonda Indoor trainer	Virtual	1	7.1	189 W	46.9 / 53.1	7.0	70.0	19.9

OUTDOOR FRAMES VS STATIONARY TRAINER

Outdoor road and MTB riding lets the frame move beneath the rider; a stationary trainer holds it rigid. Reading the two setups side by side separates a balance shift that follows the setup from one that follows the rider.

Setup	Sessions	Hours	Left / Right Balance	Side to Side Difference %	Pedalling Efficiency %	Smooth Power Delivery
Outdoor (road & MTB)	4	8.9	49.6 / 50.4	3.4	68.8	19.1
Stationary trainer	1	0.7	46.9 / 53.1	7.0	70.0	19.9

BIOMECHANICAL ALIGNMENT OBSERVATION

> Fewer than two outdoor frames resolved a Left / Right Balance reading, so parity from frame to frame is not assessed. Where fixed stationary trainer data is included, localised pelvic restriction accounts for observed bilateral shifts.

PRACTITIONER VERIFICATION & AUDIT PIPELINE

02/08/2026 to 15/09/2026

CLIENT: Brian Smith

RIDES: 02/08/2026 to 15/09/2026

02/08/2026 to 15/09/2026 | RIDES: 5

DIAGNOSTIC VERIFICATION CHECKLIST

Checkpoint #		Recorded	Target standard	Result
1	**Left / Right Parity**	49.1/50.9	Within ±1.5% of 50/50	● **Passed**
2	**High-Load Symmetry**	2.1%	Under 3.0% at Z4+	● **Passed**
3	**Multi-Bike Parity Range**	Not assessed	Under 2.0% across the outdoor fleet	○ **Not assessed**
4	**Late-Ride Fatigue Asymmetry Drift**	+0.5%	Under 1.5% shift	● **Passed**

PIPELINE AND DATA LOG

Rides analysed	5 rides, 02/08/2026 to 15/09/2026
Recorded hours	9.6 h
Total work	5,701 kJ
Data stream	Continuous Dual-Sided Telemetry Analysis (1 Hz ANT+ Stream)
Active fleet	Orbea Oiz, Trek Emonda
Report reference	BSG-15092026-OOAURB

ACADEMIC REFERENCES

Bini, R. R. & Hume, P. A. (2014). Assessment of bilateral asymmetry in cycling using a commercial instrumented crank system and instrumented pedals. International Journal of Sports Physiology and Performance, 9(5), 876–881. doi:10.1123/ijspp.2013-0494.

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