IB IAN BIBBY COACHING

The Science Behind Your Climb Time

Our climb calculator uses professional-grade cycling physics — the same mathematical models used by WorldTour teams — to predict your time on 90 of the world's most iconic climbs.

By Henry Goff · HG.Studio · Built for Ian Bibby Coaching

01 — THE CORE EQUATION

A Complete Power Balance Model

Every pedal stroke fights three forces: aerodynamic drag, gravity, and rolling resistance. Our engine solves the full steady-state power equation — there is no shortcut or approximation:

$$C_dA \cdot \tfrac{1}{2}\rho \cdot v^3 + (mg\sin\theta + C_{rr} \cdot mg\cos\theta) \cdot v = P \cdot \eta$$

C_dA	Aerodynamic drag area (0.40 m²)	ρ	Air density (altitude-adjusted)
v	Rider speed (what we solve for)	mg	Total weight (rider + bike)
θ	Road gradient angle	C_{rr}	Rolling resistance (0.005)
P	Sustainable power output	η	Drivetrain efficiency (97%)

02 — NEWTON-RAPHSON SOLVER

Speed can't be isolated algebraically from a cubic equation. We use the **Newton-Raphson method** — an iterative numerical solver that converges to `0.0001 m/s` accuracy in under 20 iterations. The same algorithm used in aerospace and engineering simulations.

03 — ALTITUDE-AWARE AIR DENSITY

Most calculators assume sea-level conditions. Ours uses the **barometric formula** to compute real air density at any elevation:

$$\varrho = 1.225 \times (1 - 0.0000226 \cdot h)^{5.256}$$

At 2,000m on the Galibier, drag drops ~20%.

Why does this matter? A calculator that ignores altitude might overestimate your Alpe d'Huez time by 2–3 minutes. On Mont Ventoux, where the summit sits at 1,912m in barren windswept terrain, accurate air density modelling is critical.

04 — FATIGUE-AWARE POWER MODEL

Your Power Fades. Our Model Knows.

Most calculators assume you hold your FTP forever. In reality, sustainable power decays with duration. Our piecewise model captures this physiological reality:

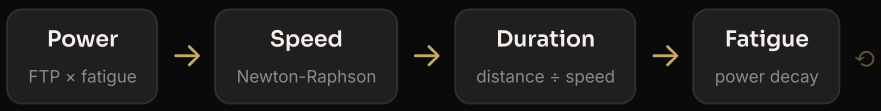
DURATION	% OF FTP	SUSTAINABLE OUTPUT
0 min	105%	
20 min	102%	
40 min	95%	
60 min	90%	
90 min	85%	
150+ min	78%	

A 2.5-hour climb like Mont Ventoux uses vastly different power than a 20-minute Hardknott Pass effort. Our model adjusts automatically.

05 — THE KEY INNOVATION

Iterative Coupled Power–Duration Solver

Here's the problem most calculators don't solve: power determines speed, speed determines duration, and duration determines how much power you can sustain. These are coupled variables — you can't calculate one without the others.



The solver iterates until power, speed, and duration reach equilibrium — typically in 3–5 cycles.

06 — 90 REAL-WORLD ICONIC CLIMBS

FRANCE 22
Alpe d'Huez, Ventoux
Tourmalet, Galibier
+ 18 more

ITALY 16
Stelvio, Mortirolo
Zoncolan, Tre Cime
+ 12 more

SPAIN 11
Angliru, Sa Calobra
Lagos de Covadonga
+ 8 more

UK 18
Hardknott, Winnats
Bealach na Bà
+ 15 more

BELGIUM 8
Mur de Huy
Koppenberg
+ 6 more

USA 7
Mt. Washington
Mt. Lemmon
+ 5 more

COLOMBIA 4
Alto de Letras
+ 3 more

CANARIES 4
Teide
+ 3 more

07 — PERFORMANCE CLASSIFICATION

Every result includes your W/kg performance tier — instant context for where you stand:

BEGINNER	RECREATIONAL	SPORTIVE	CLUB	CAT 3/4	CAT 1/2	ELITE	PRO
<2.0	2.0+	2.8+	3.4+	3.8+	4.2+	4.8+	5.5+

W/kg = Watts per kilogram of body weight. The single most important metric in climbing performance.