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The Factual Anatomy of Risk: A 14-Tier Framework for Classifying Mountaineering Autonomy, Technicality and Objective Hazard

The 14-Tier Unified Mountaineering Framework (MRT 1–14, with A/B technicality modifier)

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EDITOR'S NOTE · CHANGES IN V1.1

> **v1.1 corrects one central figure, reorganises the tiers by altitude band, and tightens claims.**
>
> - **Corrected:** v1.0 gave Annapurna I a "True Mortality Rate" of 13.4%. That figure is the deaths-to-summits ratio (75 deaths over 559 ascents), the metric the paper argues against. The per-member rate from the Himalayan Database is about 3.6%.[63,64] The K2 and Kangchenjunga figures are flagged for the same recheck.
> - **Corrected:** the micromort baselines (daily risk, skydiving) and the claim that one 8,000 m solo equals a lifetime of risk.
> - **Corrected:** Latok I was first climbed in 1979. Ueli Steck's 2005 Cholatse climb was the first *solo* ascent of the North Face.
> - **Added:** "Reading the tiers" (a tier is an autonomy class, not a danger rank) and "Four altitude bands" (0–2,000 m, 2,000–4,000 m, 4,000–6,000 m, 6,000 m+).
> - **Reframed:** the shilajit section, which now bounds each claim to its evidence and adds Mountaineer.fi field data. The "Shadow Alpinists" section is now history and ethics, not method.
> - **Marked:** population sizes and per-tier rates as model estimates. The method behind them is due in v1.2.

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1 · Introduction: the statistical illusion

Thirty years of commercialisation have distorted how the public understands alpine risk. Media still rank mountains by the **Summit-to-Death Ratio**, which divides total fatalities by successful summits. On that measure, Annapurna I sits at 13.4% (75 deaths for 559 ascents as of February 2025).[64]

The ratio fails in two directions. When one commercial operator puts fifty oxygen-supported clients on a summit in a single weather window, the denominator explodes and the mountain looks safer than it is for an independent climber. On rarely summited peaks, the same ratio overstates the risk of each person who tries.

The better denominator is **people who attempt** the peak, ideally members above base camp. On that basis, Himalayan Database records put Annapurna I at about 3.6% (75 deaths across 2,059 member records).[63] Across all Everest climbers above base camp from 1921 to 2006, mortality was 1.3%.[65] The same denominator should be applied to K2 and Kangchenjunga before quoting them.

Even a correct per-attempt rate hides the decisive variable. A guided client on the South Col route, with fixed ropes, a 1:1 Sherpa ratio and continuous bottled oxygen, faces a different risk from an independent soloist on a new route without oxygen on the same massif. Altitude alone no longer measures skill or hazard.

This paper proposes a standard **14-Tier Framework** with an **A/B Technicality Modifier**. It classifies climbers on three independent variables:

- altitude
- solitude, meaning whether the supply chain is internal or outsourced
- technicality

2 · The conceptual framework: the Locus of Logistics

The 14 tiers fall into three macro-classes, defined by the **Locus of Logistics**. The question is whether the climber internalises supply, decision-making, weather forecasting and risk mitigation, or outsources them to operators, guides and high-altitude workers. When logistics are external, the climber is a participant in a professionally managed endurance event. When they are internal, the climber is practising alpinism.

> **Reading the tiers.** A tier number is an **autonomy class**, not a danger rank, so a higher tier is not always riskier. A Tier 6 trekker at Everest Base Camp (0.015% per climb) carries less risk than a Tier 5 Aconcagua client (0.03%). A Tier 9A independent rope team below 6,000 m (0.05%) carries far less than a Tier 8a client on an 8,000 m peak (1.1%). Always quote a tier with its per-climb rate.

Macro-class I: The Foundation (Tiers 1–4), sea level to 4,000 m

This class covers basic skills, navigation and introductory alpine mechanics. It includes more than 300 million people, the base of the outdoor-recreation pyramid.

Tier 1, Group Hillwalker. Depends on guides, group consensus or well-built infrastructure on non-technical trails, such as Snowdon or the Appalachian Trail. Mortality is about 0.0002% per outing, and over 20 outings the cumulative risk is 0.004%.

Tier 2, Solo Hillwalker. Navigates independently off-grid on non-technical terrain. Without the group, risk rises about fivefold, to 0.001% per outing.

Tier 3, Group Low-Altitude. Glaciated terrain and rope-team travel, still dependent on guides. Tens of thousands of guided clients climb Mont Blanc's Goûter route each year. Grand Couloir rockfall makes it one of the deadliest standard routes in the Alps; about 100 deaths a year are reported for the whole Mont Blanc massif, not this route alone.[17]

Tier 4, Solo Low-Altitude. Independent, unguided glacier travel below 4,000 m. Requires self-arrest, crevasse recognition and self-sufficiency.

TIER	CLASSIFICATION	ACTIVE POP. (EST.)	PER-CLIMB MORTALITY	MORBIDITY	CUMULATIVE, 20 OUTINGS
1	Group Hillwalker	275,000,000	0.0002%	0.05%	0.004%
2	Solo Hillwalker	50,000,000	0.0010%	0.20%	0.020%
3	Group Low-Altitude	4,000,000	0.0050%	1.50%	0.100%
4	Solo Low-Altitude	400,000	0.0150%	4.00%	0.300%

Macro-class II: The Commercial Zone (Tiers 5–8), 4,000–8,849 m

This class is defined by hypoxia tolerance and an outsourced supply chain. Survival, summit success and evacuation are subsidised by commercial infrastructure.

Tier 5, Mid-Altitude Guided. Guided climbs of 4,000–7,000 m on peaks such as Kilimanjaro, Elbrus, Aconcagua and the Nepal trekking peaks. Aconcagua (6,961 m) issues about 3,500 permits a year and averages about three deaths, mostly from rapid ascent and HAPE.[20,22]

Tier 6, Group High-Altitude Trekker. Porter-supported treks to high base camps; Everest Base Camp (5,364 m) alone sees 40,000–50,000 trekkers a year. Deaths are mostly from AMS or cardiac events.

Tier 7, Solo High-Altitude Trekker. Carries their own shelter and food without porters on routes such as the Annapurna Circuit. They make up less than 5% of Himalayan trail traffic.

Tier 8a, Novice Client at 8,000 m. Fully dependent on guides, fixed lines and continuous bottled oxygen on Everest or Manaslu. The Everest royalty rose to USD 15,000 in 2025.[23]

Tier 8b, Experienced Client at 8,000 m. Has real alpine skill but uses commercial camps and fixed ropes to bypass logistics.

TIER	CLASSIFICATION	ACTIVE POP. (EST.)	PER-CLIMB MORTALITY	MORBIDITY	CUMULATIVE, 10 EXP.
5	Mid-Altitude Guided	100,000	0.030%	8.00%	0.30%
6	Group High-Altitude Trekker	50,000	0.015%	5.00%	0.15%
7	Solo High-Altitude Trekker	3,000	0.030%	10.00%	0.30%
8a	Novice Client, 8,000 m	1,000	1.100%	15.00%	10.47%
8b	Experienced Client, 8,000 m	2,000	0.600%	12.00%	5.84%

Macro-class III: The Independent Vanguard (Tiers 9–14)

This class requires autonomy, an unmediated supply chain and alpine style. From Tier 9 upward, climbers also carry the **A/B Technicality Modifier**, based on the International French Adjectival System (IFAS):

- **A (Fundamental), IFAS F to PD+.** Slopes up to 45°, snow and basic glacier travel. "No-fall" terrain, but not vertical.
- **B (Technical), IFAS AD to ED+.** Terrain from 50° to 90°, with sustained rock, blue ice or mixed climbing under load.

Altitude compounds technical difficulty. On a working heuristic (not a measured equivalence), a 4a move at 8,000 m, with about a third of sea-level oxygen and expedition loads, demands effort comparable to 6c/7a at sea level, and a fall is usually fatal.

Tier 9A/9B, Self-Sufficient Group Leader below 6,000 m. Unguided team ascents. Denali's West Buttress (6,190 m) is the model: about 3 deaths per 1,000 summit attempts, with 61% of fatalities on the descent.[25]

Tier 10A/10B, Self-Sufficient Group Leader, 6,000–7,000 m. Independent expeditions in remote ranges such as the Tien Shan or Pamirs. Here the logistics barrier alone filters out most climbers.

Tier 11A/11B, Independent Soloist below 6,000 m. No roped partner. 11B includes feats such as winter solos of Patagonian spires.

Tier 12A/12B, Independent Soloist, 6,000–7,000 m. The "Polymath Alpinist". The benchmark for 12B is Ueli Steck's 2005 first solo ascent of the North Face of Cholatse (6,440 m), a 1,600 m line graded M6.[60]

Tier 13A/13B, Solo at 7,000 m+. Barometric pressure falls to about 308 mmHg. 13B targets technical lines still unclimbed, such as the upper North Face of Latok I (7,145 m). Latok I itself was first climbed in 1979, and the 2018 north-side ascent left the upper face untouched.[61]

Tier 14A/14B, Solo above 8,000 m without supplemental oxygen. 14A covers standard routes. 14B covers technical or new routes, a level reached by fewer than 15 people in history, including Reinhold Messner and Ueli Steck.

TIER	CLASSIFICATION	ACTIVE POP. (EST.)	PER-CLIMB	MORBIDITY	CUM. 5 EXP.	CUM. 10 EXP.
9A	Group Leader <6k, Fund.	8,000	0.05%	6%	0.25%	0.50%
9B	Group Leader <6k, Tech.	2,000	0.15%	9%	0.75%	1.49%
10A	Group Leader 6–7k, Fund.	2,500	0.35%	11%	1.74%	3.44%
10B	Group Leader 6–7k, Tech.	1,000	0.80%	16%	3.94%	7.72%
11A	Solo <6k, Fund.	800	0.15%	7%	0.75%	1.49%
11B	Solo <6k, Tech.	200	1.50%	18%	7.28%	14.03%
12A	Solo 6–7k, Fund.	300	0.80%	14%	3.94%	7.72%
12B	Solo 6–7k, Tech.	75	3.50%	22%	16.32%	29.97%
13A	Solo 7k+, Fund.	30	2.20%	20%	10.53%	19.94%
13B	Solo 7k+, Tech.	10	7.50%	28%	32.28%	54.14%
14A	Solo 8k+, Fund., no O_2	6	5.50%	25%	24.64%	43.20%
14B	Solo 8k+, Tech., no O_2	<3	14.00%	35%	52.96%	77.87%

Open issue for v1.2. The framework has no tier for an *independent team* above 7,000 m, such as an alpine-style party on an 8,000 m peak without commercial support. Tiers 9–10 stop at 7,000 m, and Tiers 11–14 are solo only. A proposed fix is to extend the group-leader tiers to "10C" (7,000–8,000 m) and "10D" (8,000 m+).

3 · Four altitude bands: how mountaineering changes

The tiers classify the *climber*. The four bands below classify the *environment*: what changes in the body and on the terrain every 2,000 m. Our Nepal peaks (Island Peak 6,189 m, Lobuche East 6,119 m, Mera 6,476 m) summit just inside Band 4, but almost all of the trip, including acclimatisation, happens in Band 3.

BAND	MAIN HAZARDS	PHYSIOLOGY	TYPICAL TIERS	PER-CLIMB MORTALITY
0–2,000 m Valley	Falls, weather, navigation, hypothermia	No meaningful altitude effect	1–2	0.0002–0.001%
2,000–4,000 m Alpine	Glaciers, crevasses, rockfall, avalanches	AMS possible above ~2,500 m;[44] sleep and appetite start to suffer	3–4, 9, 11	0.005–0.015% (group/solo hikers); up to 1.5% (technical solo)
4,000–6,000 m High	Glacier and snow climbing, cold, weather windows	HAPE and HACE become real; ~50% effective O_2 at 5,500 m. Acclimatisation sets the schedule	5–7, 9, 11	0.015–0.03% (commercial); up to 1.5% (technical solo)
6,000 m+ Extreme	Expedition logistics, long exposure, descents	Above ~8,000 m the body deteriorates faster than it can acclimatise; ~33% O_2 on Everest	8, 10, 12–14	0.35–14%

Acclimatisation rule (WMS 2024). Above 3,000 m, do not raise your sleeping altitude by more than 500 m a day, and take a rest day every 3–4 days.[47,66] This rule alone is why a first 6,000 m peak such as Island Peak or Mera takes 16–18 days, not 6.

4 · Cumulative exposure and objective hazard

The mathematics of cumulative mortality

Risk compounds over a career. With per-expedition mortality p and n expeditions:

$$\mathrm{P(death)} = 1 - (1 - p)^{n}$$

At Tier 13B (p = 0.075), the risk is 7.5% after one expedition, 32.28% after 5, 54.14% after 10 and 78.97% after 20. That arithmetic alone explains why the top tiers are so small.

Micromorts and comparative risk

A micromort is a one-in-a-million chance of death. For an adult in England and Wales, the all-cause baseline is about 24 micromorts a day, and external causes (accidents, violence) add about 1 a day.[62] For comparison:

- A marathon is about 7 micromorts and a scuba dive 5–10.
- A skydive is about 8 per jump, falling to about 4.6 on 2025 USPA data.
- A BASE jump is about 430 per jump.[62]

A Himalayan 8,000 m expedition is on another scale: about 10,000–36,000 micromorts (1–3.6%) using per-member rates.[63,65] A Tier 14B solo is estimated at 140,000 (14%). That equals roughly 16 years of average all-cause risk compressed into a few days. v1.0 called it "a lifetime of risk", which overstated it.

The avalanche probability matrix

Avalanches are the most lethal hazard a climber cannot manage away, though their share of deaths varies widely by range and season. Risk climbs steeply with each step on the 5-level European

danger scale. Exposing yourself to 5–10 trigger zones (convexities, lee slopes, couloirs) in one day at Level 3, "Considerable", puts daily risk in the same league as technical high-altitude climbing.[34–37] Route choice, avoiding lee slopes after storms, and moving before the snow warms are therefore survival requirements, not preferences.

v1.1 removes the v1.0 claim of a "roughly 10-fold" increase from Level 2 to 3 until a primary source is attached. Most practical methods assume risk roughly doubles per level.

5 · High-altitude pathology

A common misconception is that air at altitude has "less oxygen". The fraction stays at about 21%; what falls is barometric pressure. Pressure is 760 mmHg at sea level, about 380 mmHg at 5,500 m (roughly 50% effective oxygen), and about 253 mmHg on the summit of Everest (8,849 m, roughly 33%).[7] Ascend too fast and the body's compensation (faster heart rate and breathing) fails, starting a chain of conditions.

Acute Mountain Sickness (AMS). Arteries in the brain dilate to increase blood flow, raising pressure inside the skull. Symptoms are headache, nausea, fatigue and poor sleep. A loss of appetite with insomnia is a strong warning sign. Ignored, AMS can progress to HACE.

High-Altitude Pulmonary Edema (HAPE). Blood vessels in the lungs constrict unevenly and pulmonary artery pressure spikes. Fluid leaks into the air sacs, causing breathlessness at rest, a wet cough, pink frothy sputum and blue lips. HAPE is the leading cause of death on non-technical peaks such as Aconcagua.

High-Altitude Cerebral Edema (HACE). The end stage of unmanaged AMS: fluid leaks into brain tissue. Signs are ataxia (failing a heel-to-toe line test), confusion and hallucinations. Without immediate descent it can kill within 24 hours.

6 · Medical mitigation

> **Informational only.** Doses below summarise the Wilderness Medical Society 2024 guidelines[47,66] and are not a prescription. See a physician before any trip to altitude. Descent is the definitive treatment.

DRUG	USE	WMS 2024 ADULT DOSING	NOTES
Acetazolamide	AMS/HACE prevention; AMS treatment	Prevention 125 mg twice daily, from the day before ascent. Treatment 250 mg twice daily	Speeds acclimatisation. Tingling and flat-tasting fizzy drinks are common
Dexamethasone	AMS/HACE prevention (rapid ascent); HACE treatment	Prevention 2 mg every 6 h or 4 mg every 12 h. HACE: 8 mg, then 4 mg every 6 h	Masks symptoms and does not acclimatise you, so do not ascend on it
Nifedipine	HAPE prevention (if susceptible) and treatment	30 mg extended-release every 12 h	Treatment supplements oxygen and descent; it does not replace them

7 · Training and supplementation for the upper tiers

Shilajit: what the evidence does and doesn't show

Shilajit is a mineral-rich resin from the Himalaya and Altai. It contains fulvic acid, dibenzo-α-pyrones and trace minerals.[52,53] In a randomised, double-blind trial of 63 active men, 500 mg a day for 8 weeks was associated with:[55]

- lower serum hydroxyproline, a marker of collagen breakdown
- better retention of muscle strength after a fatiguing protocol

Mechanistic studies suggest it may support mitochondrial function.[57] **No controlled trial has yet tested shilajit at high altitude.**

> **Mountaineer.fi field data.** A climber taking shilajit recorded a resting SpO_2 of 92% at 6,000 m (pulse oximeter, recorded on video). Climbers also reported training longer and harder. One reading cannot separate the supplement from the athlete; we are collecting more. Mountaineer.fi does not sell shilajit. We compare products on purity, testing and price.

Low-altitude preparation

The "Swiss Machine" approach associated with Ueli Steck uses long, low-impact aerobic blocks (cycling, rollerblading) of four hours or more, held below the aerobic threshold (Zone 2). Some alpinists add fasted sessions and night sessions to rehearse summit-day conditions. These are reported practices of elite athletes, not evaluated protocols. Train fasted or overnight only with medical supervision.

Kinetic Breath Synchronisation (KBS), a proposed protocol

This paper proposes KBS, adapted from Brazilian Jiu-Jitsu percussive breathing. It turns breathing from an automatic function into a deliberate technique matched to movement:

- **Phase 1, below 4,000 m:** nasal diaphragmatic breathing (8 in / 8 out at rest), moving to a percussive 2 in / 2 out under effort.
- **Phase 2, above 4,000 m:** nasal in / mouth out, at a 1-in / 1-out rhythm under load.

KBS has not yet been tested in a controlled study. Mountaineer.fi invites research partners.

8 · Unpermitted ascents: history and ethics

Some highly capable independent climbers in Tiers 11–14 operate outside permits and registries. Their reasons are high fees, closed borders or a wish for undocumented experience. The record of such climbs is long:

- Earl Denman's unpermitted Everest attempt in 1947
- Janusz Adamski's 2017 north-to-south Everest crossing
- Ryan Sean Davy's 2016 attempt to evade the permit fee

Nepal raised the Everest royalty to USD 15,000 in 2025 and now requires licensed guides on some previously open routes, which widens the gap between the cost of access and the cost of the climb itself.[23] This paper records the phenomenon because it skews the statistics: unpermitted ascents and deaths are under-counted in every database.

Mountaineer.fi's position: we do not advise or assist unpermitted climbing. Permit fees fund rescue capacity, liaison officers and local livelihoods. An unregistered climber is also, in effect, outside any rescue system. Speculation about secret ascents of closed peaks such as Kailash (6,638 m) is unverifiable and is not counted in this framework.

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9 · Conclusion

The 14-Tier Framework separates three variables that summit statistics blur together:

- altitude
- who carries the logistics
- technical difficulty

A client pulled up fixed lines on Everest (Tier 8a) and a soloist on an unclimbed 7,000 m face (Tier 13B) are not at different levels of one sport. They are doing different things.

A climber's calibre is measured by the logistics they carry, the supply chains they run, the terrain they solve and the solitude they bear, not by the height they reach on someone else's infrastructure.

Every number in this paper is meant to be checked. Corrections are welcome at contact@mountaineer.fi and will be versioned publicly.

This paper is for informational purposes only. For medical advice or diagnosis, consult a professional.

References

Numbering follows v1.0 so existing citations still resolve. References 60–66 are new in v1.1. The full v1.0 list (1–59) is kept at mountaineer.fi/whitepapers. The entries below are the ones cited in this edition.

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