Speedfly

a book for flying people

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Chapter 1. Theory

1.1 Introduction

This Guide Book is designed to support your training under the supervision of qualified instructors. It is NOT a manual for learning to fly a speedglider on your own.

Speedflying and speedriding are dangerous sports — they can result in serious injury or death. Improper use of equipment, overestimating your ability, and misjudging conditions all sharply increase the risk. Training with an experienced instructor is essential, regardless of any prior experience on paragliders, mini-wings or (especially) skydiving canopies.

1.1.1 Key terms

Speedglider (also wing, speedwing, mini-wing) — a small, lightweight paraglider up to ~18 m², built for fast descents from summits, often close to the terrain. **Speedflying** is flying it after a foot launch; **speedriding** is launching on skis and using the wing on steep slopes, staying partly in contact with the snow. Most of this manual applies equally to both.

Proximity flying — flying deliberately close to terrain to heighten the sense of speed. It is the signature of speedflying and the least forgiving: there is little or no room to recover from a mistake.

Angle of attack — how steeply the wing is tilted into the oncoming air. It is the single most important parameter in flight: too large and the wing **stalls**; too small and it **collapses** (see Chapter 3).

Glide ratio — how far the wing travels forward per unit of height lost in calm air. Speedgliders typically glide 2–4, mini-wings 4–6.

Stall — the angle of attack exceeds the maximum, the airflow separates, and the wing loses lift, shape and pressure. The most dangerous regime in speedflying; recovery takes real experience.

Collapse — the angle of attack drops too low and the leading edge tucks under, losing pressure and shape (frontal if the whole edge folds, asymmetric if one side does).

Surge (shoot) — the wing pitches forward ahead of the pilot when the angle of attack suddenly drops (e.g. exiting a dive or in turbulence). A strong surge can become a frontal collapse, so it is checked with the brakes.

Active piloting — the constant small brake (and weight-shift) corrections that keep the wing overhead, pressurised and flying smoothly through rough air. Best built by flying a paraglider in turbulence and on an SIV (incident-recovery) course.

1.2 Safety

> "Dying a hero takes no brains. Any idiot can fly into a tree."

1.2.1 Foundations of safe flying

We all want to fly "cool". But while ideas about what counts as cool differ, most pilots agree on one thing: **unsafe is not cool. A good pilot is an old pilot.** During training, safety rests on the following pillars.

Personal responsibility. Speedflying is a sport of independent decision-making. Whether or not your instructor or more experienced friends are beside you, the decision to fly or not to fly is always yours — and it must be made on a sober assessment of your skills, the weather, the site, and your psychological and physical state. If all your friends fly off in conditions that don't feel right to you, remember that they will not be lying in the hospital alongside you afterwards. In any group, in any situation, each pilot makes the decision to fly only for themselves. It is better to skip the flight and meet your friends at the bar than to push it and meet them in the emergency room. Following the group is natural human behaviour, but over time you'll notice that the pilots who command the most respect are the ones who can independently and confidently decide to call off a flight.

This is especially true for skydivers coming into speedflying. There is no jumpmaster on the mountain, no chief landing officer at the LZ, no doctor on standby. No one briefs you on the wind, reminds you which approach pattern fits, forbids you from doing something, or checks that you are ready. There is no arrow on the landing zone, often no windsock, and obstacles line the entire route — not just the landing. The habit of stepping out of the plane just because everyone before you did is dangerous in skydiving; in speedflying it is lethal. **The mountain will be there tomorrow. You might not.**

Looking after your body. The state of your body dramatically affects the quality of your decisions and, as a result, your safety. We fly in the mountains, where the strain is higher — bright sun, cold wind, long uphill walks — and it is easy to miss dehydration, exhaustion, overheating or hypothermia. Dehydration and overheating slow your thinking, dull reflexes and cause headaches, all of which lead to bad decisions; hunger scatters your attention. If you are cold at takeoff you start to rush, and your body dictates the pace of your decisions — raising the chance you forget a check or misread the weather. Drink water at least every 1–2 hours, carry snacks, bring the right clothes for every possible condition, and rest properly after flying. And, obvious as it is: use the bathroom on your breaks — a person desperate to pee will not do a thorough pre-flight check. Better before the fight than during it.

Staying fit. The flight itself doesn't demand much fitness, but every pilot should be in good shape for their own safety. The better your cardio, the less the hike tires you and the calmer and more level-headed you'll be when deciding whether to fly — if climbing wears you out to the point of tears, you're far more likely to make impulsive decisions just to avoid walking back down. Good fitness is also excellent protection against injury: a strong, mobile, well-coordinated body that knows how to tuck and take a hit gets hurt less and recovers faster. And running out takeoffs and landings on small wings is no easy task.

Alcohol and drugs — a hard NO. Fast, correct decision-making is incompatible with an altered state of consciousness, in any form, even a little. Stick to the rule: "Eight hours between boozing and cruising."

Sharing your plans and movements. When you fly in a group, well-organised communication multiplies overall safety: information from a friend who has just landed — conditions and traffic at the LZ, the quality of the air along the line, helicopters in the airspace — can be invaluable. Because coverage is often patchy, carry radios tuned to a common, agreed frequency. **EVERY group member must have the local mountain-rescue number — or the country's general emergency number — saved in their phone.** If you fly alone, inform people who can quickly organise a search if something happens; satellite trackers such as the Garmin inReach are popular for this. Many flying sites have WhatsApp or Telegram groups where locals share plans, weather and rule changes (some with a live-location feature) — find the local chat and join it.

Communication with your instructor. In speedflying, the key to longevity and progression is the ability to gather and process information: keep learning until everything feels clear, then keep learning some more. During training, your main source is your instructor, so good communication is critical. If at any point something has not been explained, or you do not fully understand it, discuss it immediately. Our golden rule: there are no stupid questions — the only stupid question is the one that wasn't asked in time.

1.2.2 Decision-making psychology

Rushing / anxiety. One of the main enemies of good decision-making is rushing — it leads to misread conditions, sloppy preparation, nervous takeoffs and a pile of in-flight problems. At launch, the imminence of the flight pressures many pilots: you feel an urgent need to take off *right now*, fearing the clouds will roll in or the wind will turn. The correct decision — even when you are fully ready — is to stop, breathe, and spend an extra 10 minutes observing the weather. And when there is real reason to think the weather might change dramatically, the correct decision is not to fly at all, so the change does not catch you in the air.

Another cause of rushing is the urge to squeeze in more flights, especially with lift access. So we **never plan more than one flight ahead**: we go up at a comfortable pace, study the conditions for as long as needed, launch when ready, land — and only then think about the next flight. Thoughts about catching the bus to the lift or fitting in one more flight before sunset are pushed aside. **The most important flight of your life is every flight.**

Rushing is also triggered by your physical state (cold, needing the bathroom) and by external pressure — group dynamics and the stadium effect. Flying with more experienced pilots, your pace may not match the group's, and you'll constantly try to keep up on the hike, at takeoff and in the air. This is a very dangerous state that has cost more than one pilot their health or life. **Move at your own pace!** If your friends are already turning on cameras while you're not ready, do not start skipping or rushing your checks — let them launch first and use the time to check your trimmers and study the conditions. In the worst cases, members of the group will actually pressure you to keep up; that is absolutely unacceptable and must be shut down immediately. And because we often fly in tourist spots, it is easy to find yourself with a crowd of onlookers holding their breath for your takeoff — the *stadium effect*. Here too: breathe, watch the weather another 5–10 minutes, and run your checks again.

The Rule of 100. Advice like "be careful, use your head, fly safely" is as correct as it is useless — it's unclear what "safe" actually means. Speedflying, for all its technical complexity, is first and foremost a sport of decision-making, and good decisions are not just safe — they are safe

with margin. At the early stage it is critical to maximise that margin: we don't fly on the principle "this should probably work out", we fly on "this can't *not* work out". We don't ask whether we have enough altitude for a manoeuvre — we ask whether we could spend *all* our altitude on it. A useful tool: ask yourself, **would I be comfortable doing this 100 times in a row?** If the answer is no, perhaps you shouldn't do it even once. Ego always asks, "Can I do this?". Our task is to rewire the brain to ask, "Can I do this 100 times in a row?"

Risk homeostasis. Each of us has our own criteria for acceptable risk, formed first under an instructor's guidance and then refined over a lifetime. Changing those boundaries is normal — but do it consciously and very gradually. A good rule for the first years is to move your safety boundaries only *upwards* — accumulate safety factors, not risk factors. If you usually fly without protection but today you arrived armoured up like a knight, that is not a reason to fly lower, in worse weather, or hung-over. We never use extra safety gear as an excuse to take more risk.

Progress and downsizing. For most people enjoyment is inseparable from progress, and because progress in speedflying is tied to flying fast and close to the terrain, many pilots end up flying at speeds they cannot control, at altitudes that make them uncomfortable. Done systematically, this makes serious injury only a matter of time. Progress in small steps, at your own pace, without comparing yourself to others — someone will always fly better, walk faster and smell nicer than you. Progress is also mistakenly equated with downsizing to smaller wings: the smaller the wing, the higher the airspeed and sensitivity, the greater the altitude loss in a turn, the higher the stall speed and the shorter the brake travel before that stall. But we fly fast first of all through correct line choice, manoeuvre planning and energy management — wing size is secondary. Experienced pilots take small wings not to fly faster but to make flying *simpler* (less work per manoeuvre, though that work must be more precise). Don't downsize until you've mastered every manoeuvre, in every condition, on your current wing without the slightest discomfort — and can reliably land it in a tight LZ downwind, crosswind, no wind, in turbulence and in sink. A good rule of thumb: **fly one size larger than the smallest you find comfortable** (comfortable on a 12 but not an 11 → fly a 13). There is nothing sadder than a pilot, terrified of his tiny wing, flying frozen and barely breathing — a statue to his own bad decisions.

Ego and the French schoolboy. We are all slaves to our egos. When you feel like the coolest pilot on the mountain, it's useful to remember that somewhere in the same mountains there is almost certainly an unassuming grey-haired old man with a bad knee who, 30 years ago, was doing things we will probably never have the health, skill or courage to do. Your ego may make decisions for you, but it definitely won't be the one lying in the hospital. And if it does take over and you feel you're the best pilot on this mountain — remember that your best line was probably flown yesterday morning by a French schoolboy between math and geography classes.

1.2.3 The most dangerous misconceptions

Fig. 1 — "That won't happen to me" (comparative optimism)

"That won't happen to me" (comparative optimism). Oh yes it will, and to you specifically. On my first speedfly course I argued that being hit by a bird during a proximity flight was vanishingly unlikely — since then I and several friends have dodged birds many times, and not always successfully. For every situation that "won't happen to you" there is a video online of it happening to someone. Treat any risk as a question of *when*, not *if* — it will happen, and you need to be ready. Each of us has two jars, one of luck and one of experience; your job is to fill the second before the first runs out.

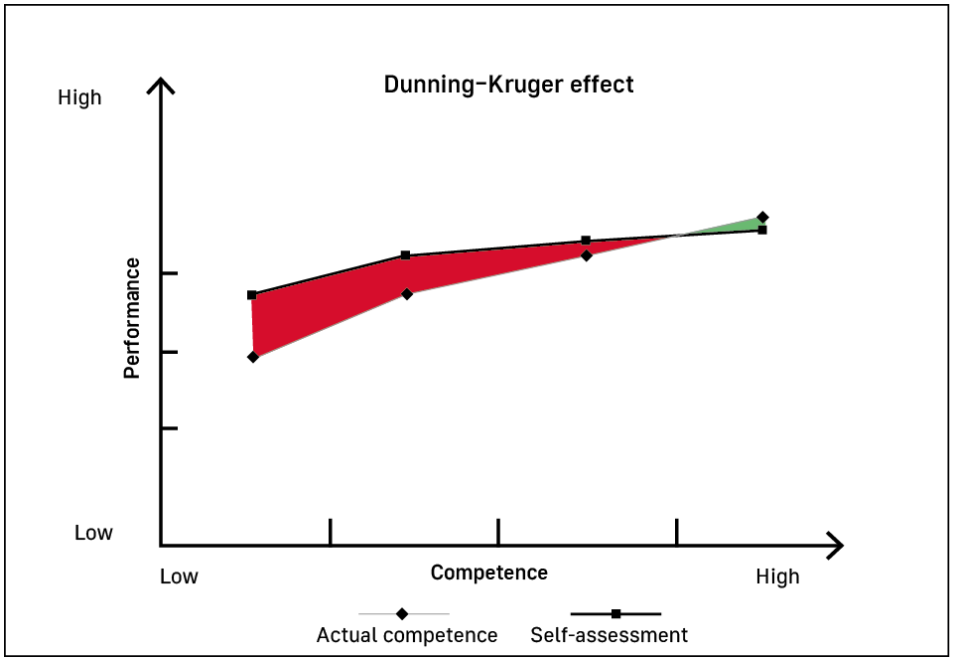

Fig. 2 — The Dunning–Kruger effect (intermediate syndrome)

"I've got this figured out" (intermediate syndrome). The most dangerous driver is the one who got their licence six months ago: they feel experienced, but their confidence far outstrips their skill. This is the Dunning–Kruger effect. A beginner knows they know nothing, is afraid of everything and stays in their comfort zone. A pilot who has worked through the beginner's fear and gained some experience falls into the most dangerous category — they don't know what they don't know, so they aren't afraid of anything, and you usually can't convince them it's happening. Warning signs you may be "in the zone": everything feels like it's working out; you don't understand why others are bailing on the flight; friends have pale faces after your landings; you often say "no no, I had it under control"; your flying regularly requires courage and reflexes; and — the big one — people keep telling you "friend, I think you're in the zone." Every pilot without exception goes through this phase. Your task is to recognise it in time and turn down the dial on your courage and complacency.

Risk multiplication — one change at a time. Aviation teaches that disasters are never caused by a single failure, but by a *combination* of risk factors and a chain of mistakes. Within the triangle "site — equipment — conditions", change only one variable at a time: a new site or line on familiar gear in good weather; new gear at a familiar site in good weather; harder conditions only at a familiar site on familiar gear. A camera, a selfie stick, a new helmet, new shoes, a head cold, hunger, dehydration, a sore knee, a hangover, wet socks — all are stress factors that, stacked together, can lead to catastrophe. Don't accumulate them; and if you already have, the right move is to call off the flight.

Tunnel vision. Often a single factor stands between us and the flight — a cloud closing in over the launch. All our attention narrows onto it: is it clearing, is a window opening? And the moment it seems to clear, we feel the only thing keeping us from flying has gone — losing sight of all the other risk factors that never went anywhere (the wind building in the valley, the thermal activity along the line). Keep the whole picture in view.

"I'll just be careful." When unsure whether they're ready for a smaller or more aggressive wing, pilots start chanting a mantra: "It's fine, I'll fly carefully, only in good weather, only at my home spot." "Carefully" quickly becomes "as usual", "good weather" becomes "normal weather" and then "well, it isn't a hurricane". Usually it means flying slow, deep in the brakes, afraid to turn, fighting stress the whole time — which is both dangerous and pointless. If you can only fly your new wing "carefully", put it back under the bed for another season.

"You don't lose mastery." The skills of safe speedflying — judging altitude and slope angle by eye, reading wind strength and direction from cues, feeling whether the air is lifting or sinking — fade quickly without regular practice. After a long break they don't come back instantly; plan a slow re-entry.

1.2.4 Protective gear

When something goes wrong in speedflying, it goes wrong fast. The best protection is avoiding incidents, but good gear significantly improves your chances of walking away.

- **Helmet** — always fly in a good, properly fitting, certified helmet (snowboard, BMX, mountaineering or skydiving models; full-face adds jaw protection). Avoid uncertified lightweight skydiving helmets that only keep wind out of your eyes.
- **Eye protection** — sunglasses or clear goggles to start; many switch to ski goggles on smaller wings and in winter.
- **Footwear** — sturdy shoes/boots that let you sprint over a rough launch and stop on a steep, loose slope if you abort. Your favourite sneakers look cool right up until you have to abort a takeoff mid-run.
- **Back protection** — strongly recommended; spinal injuries are the most common severe trauma.
- **Gloves, protective shorts, elbow/knee pads** — at the pilot's discretion.
- **Reserve parachute and airbag** — see Equipment.
- **Avalanche kit** — mandatory in the winter mountains when avalanche danger is significant.
- **Insurance** — take a paragliding travel policy with maximum coverage that explicitly covers speedflying; a complex series of operations after a bad crash in Europe can cost €500k–€1M.

Carrying more gear should never change your decisions: if you wouldn't fly without your reserve in poor conditions, *having* the reserve is not a reason to fly anyway.

1.2.5 Clothing

We fly in the mountains, so dress for the mountains and for the difference between launch and landing altitudes — cloud and wind up high can chill you in midsummer. Being cold at takeoff makes you rush. As the Norwegians say, "there is no bad weather, only bad clothing" (though in our case bad weather definitely exists — learn to read it). A sensible kit: base layer, fleece/mid layer, packable down jacket, shell, hiking pants, gloves, beanie or cap, buff, hiking boots (and poles for hike-and-fly), a headlamp, water and snacks, and sunscreen.

1.3 Equipment

1.3.1 Speedglider

A speedglider, like a paraglider, consists of a **wing, lines and risers.**

Wing. The leading edge has open air intakes; the trailing edge is sewn shut. In flight the oncoming air fills the wing and creates internal pressure. Upper and lower surfaces are joined by ribs that divide the wing into cells, with crossports letting air equalise between them. Modern wings mix fabric weights — heavier on the leading edge for durability, lighter elsewhere to save weight.

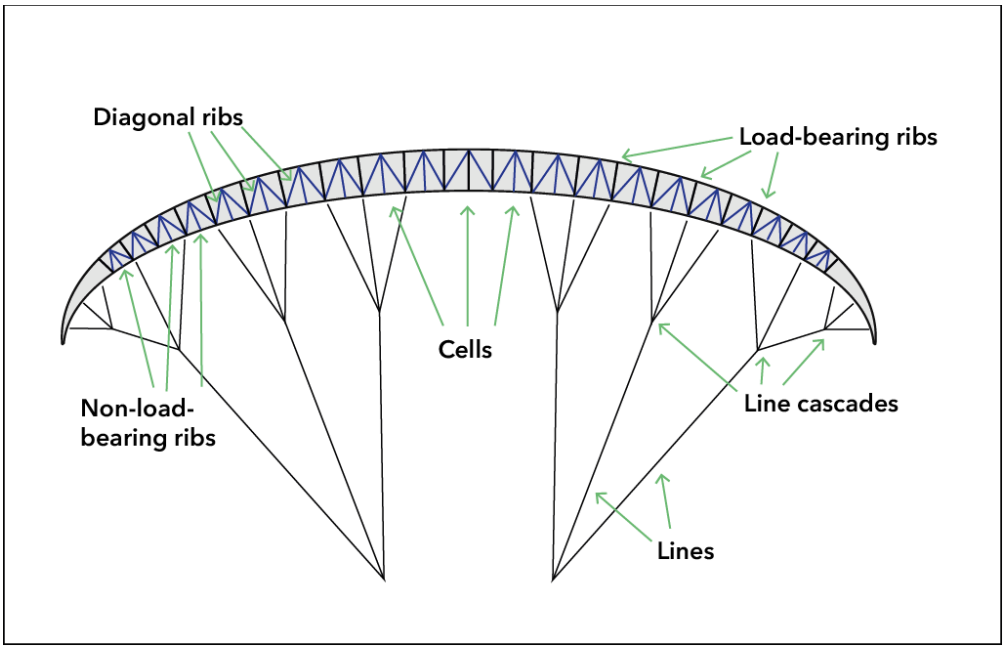

Fig. 3 — Wing construction

Lines. Attachment points run in groups from leading to trailing edge — A, B, C (and D on full paragliders) plus the brakes; most speedgliders use three groups. Lines may be sheathed (a strong core in a protective sheath) or unsheathed (thinner, less drag, more fragile). Dyneema is stronger but can shrink; Kevlar holds its length better.

Risers link the lines to the harness and gather into A-, B- and C-risers attached by carabiners.

> **IMPORTANT!** Unlike skydiving, where front risers are used to accelerate the canopy, in speedflying this is **absolutely forbidden and extremely dangerous.** Pulling the A-risers in flight will collapse the wing and very likely cause an uncontrolled fall. Never pull on the front risers or rest your hands on them.

Trimmers. Most speedgliders have trimmers — a pulley system on the rear risers that controls the angle of attack.

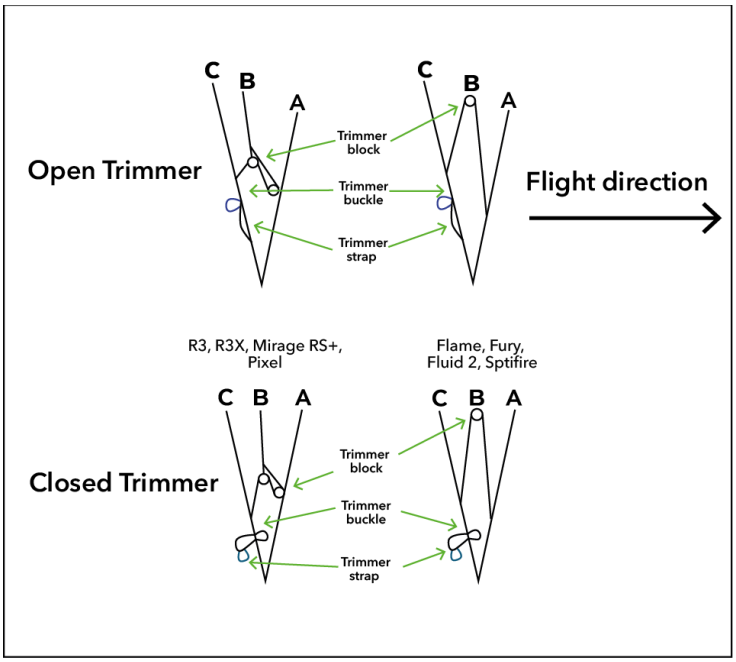

Fig. 4 — Closed and open trimmer

- **Closed (flat) trimmers** give the best glide and a high angle of attack — minimum (trim) speed. **We always take off with closed trimmers** (check your wing's manual for exceptions). Always close them right after landing and re-check at takeoff. Remember: *"Trimmers closed, mouth open!"*
- **Open (steep) trimmers** make the wing faster with a higher sink rate and a much greater tendency to collapse in turbulence. **Taking off with open trimmers is a no-no.**

(For trimmer use in flight, see Chapters 3 and 5.)

1.3.2 Harness

The harness's load-bearing webbing supports the body and carries the load to two attachment points where the carabiners — and the wing — connect. All speedfly harnesses have **separate leg straps**, which greatly improve comfort and weight-shift control; wider carabiner spacing makes the wing more responsive to leg input. Many harnesses are reversible (turning into a backpack); others are lightweight "naked" types used with your own pack. Choice comes down to how much you fly versus ride, and to comfort.

Airbag. Many harnesses accept an airbag — a protector that inflates in flight and cushions a fall on the back or seat. Because the pilot sits with the spine exposed, a fall on the back/tailbone is the most common cause of severe injury, so an airbag can genuinely save you. With experience, though, many drop it: in proximity flying it can snag terrain, it adds drag and bulk. Using one is a personal choice.

1.3.3 Reserve parachute

Because much of speedflying happens close to the ground, many believe a reserve is pointless. But it can save you when practising manoeuvres at altitude, after an accidental takeoff with a tangled wing, in violent high-altitude turbulence, in a mid-air collision, or when testing

prototypes. It's usually front-mounted on the main carabiners; some harnesses take a seat-mounted reserve. Most reserves aren't steerable; a packed reserve weighs roughly 0.9–1.5 kg.

1.3.4 Radio

There's nothing worse than being unable to reach a friend who has gone down where there's no phone signal. Beyond emergencies, a radio shares conditions along the line, wind and obstacles at the LZ, incidents or approaching helicopters, and lets an instructor coach a student through takeoff, flight and landing. A multi-channel radio (e.g. Baofeng UV-5/UV-82) on a shared or local emergency frequency is the common choice; many pilots now use hands-free units (e.g. Cardo) for in-air coordination.

1.3.5 Camera

Do your first 50–100 flights **without a camera** — the fewer distractions, the better. When you do film, mind the safety factors: anything that sticks out (GoPro horn, selfie stick) can snag a line, most dangerously at takeoff while the wing rises overhead; a camera turns you into a performer for an unseen audience and skews your decisions; and a camera tethered to your helmet that snags in the lines can interfere with control. Don't film at a new site or when you already carry other stress factors. And remember — flying without a camera is its own kind of freedom.

1.3.6 Choosing equipment

Choosing gear is hardest at the start, exactly when we struggle to judge our own level (see intermediate syndrome). The first thing to consult is **the opinion of an instructor or mentor you trust** — they know your strengths, character, plans and budget better than any spec sheet.

Wing flight characteristics depend radically on **size and wing loading**: the same model can be a safe first wing at 13 m² and a threat to life at 9 m², purely because the pilot's skill isn't enough to control it. Match the wing to your current level and main terrain (steep cliffs favour a low angle of attack and deep dive; flat ski slopes favour easy launch and best glide; hike-and-fly favours minimum weight). High-performance wings have thin, efficient profiles, fast reactions and less passive safety, and demand advanced active piloting.

A reminder against spec-obsession: **a speedwing is a rag on strings tied to a little human.** No spec sheet captures how a wing actually behaves — its dynamics, dive, turn and recovery. To know a wing, you have to fly it down a mountain a few dozen times. Choose a wing for your current level and goals, not "for life" — you'll replace many over the years.

For a used wing, learn where and how much it has been flown, request photos, check for damage and repairs, and ideally get a recent service inspection (porosity, wear, line lengths). When test-flying others' wings, read the manual, watch any model-specific tutorials, talk to the owner, and **ground-handle the wing thoroughly before the first flight** — especially when stepping up to a high-performance wing.

Chapter 2. Weather

Weather is the biggest variable in speedflying, and you have to learn to read it. Boiled down, you need to answer three questions before every flight:

- **Wind** — how is it blowing now, and how will it change? Its direction, strength, nature (meteorological or thermal), and how it differs between takeoff and landing.
- **Turbulence** — is the air smooth now, and will it stay that way? Growing clouds and gusty wind mean rough air.
- **Visibility** — can you see everything, and will that hold? Understand how cloud forms so you don't end up in the soup mid-flight.

Only three questions — but answering them correctly every single time is an advanced skill.

2.1 Meteorology

2.1.1 The essentials (global picture)

A few principles are enough for the global picture; save your real attention for the local weather below.

Pressure and density fall with altitude — exponentially. At about 3,000 m pressure is down by a third; at 5,500 m it is half of sea level. Thin air affects both you (risk of altitude sickness above ~3,500–4,500 m — watch how you feel and descend if unwell) and your wing, which flies faster and more dynamically up high, leaving you less reaction time.

Humidity and the dew point. Warm air holds more water than cold air. As air cools, its relative humidity rises, and at 100% the moisture condenses into droplets — this is the **dew point**, and it's how clouds form. Clouds appear wherever air rises and cools: over terrain (orographic), at fronts (frontal), over sun-heated ground (thermal), or against cold ground (fog).

Highs and lows drive the wind. The sun heats the ground unevenly (it doesn't warm the transparent air directly). Warm air rises, creating **low pressure** (a cyclone — clouds and bad weather); cold air sinks, creating **high pressure** (an anticyclone — compressed, drying, stable sunny weather). Wind flows from high to low, and the bigger the pressure difference over a short distance, the stronger it blows. Earth's rotation (the Coriolis force) deflects that wind so it runs at an angle to the isobars — clockwise around highs and counter-clockwise around lows in the northern hemisphere.

Fronts are transition zones between air masses, and a passing front always brings precipitation. A **warm front** is slow and brings a long spell of bad weather; a **cold front** is fast, wedges under the warm air and throws up powerful thunderclouds (sometimes hail), but passes quickly.

Wind strength — the Beaufort scale gauges wind from its effect on trees and water. The practical rule: **always carry an anemometer** and don't trust your gut, especially in strong wind. Launching into a wind faster than your wing is very dangerous.

2.1.2 Local weather

The first rule: ask the local pilots — they know this site's quirks better than anyone. But asking never replaces watching the weather yourself.

Thermals. The ground heats unevenly, and bubbles of air 2–4 °C warmer than their surroundings break away and rise, merging into columns called **thermals** that climb at 5–8 m/s, with cold air sinking around them at up to 5 m/s. At the boundary between rising and sinking air the turbulence is strong enough to collapse a wing. A heavily loaded speedglider is still a soft wing — it just needs stronger turbulence to collapse, and a hot mountain afternoon supplies it. **We strongly advise against speedflying in thermic conditions.** Small cumulus clouds forming overhead are a clear sign the thermals have started.

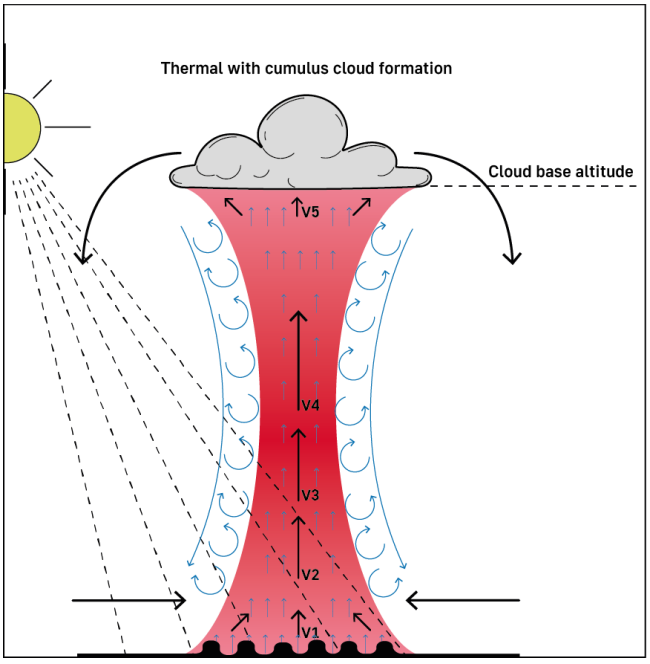

Fig. 5 — A thermal

Thunderstorms — dangerous from kilometres away. A storm is a fast-growing cloud that can build to 12,000 m, with strong gusts, heavy rain, lightning and hail. Watch for cumulus growing fast in tall columns with a darkening base. The deadliest part reaches out *ahead* of the storm: when it dumps cold rain, a mass of cold air falls and races outward along the ground as a **gust front** — fast enough to tear roofs off and turbulent enough to collapse any wing. The "calm before the storm" is exactly the lull before a gust front arrives. Never count on "flying down quick before it gets here".

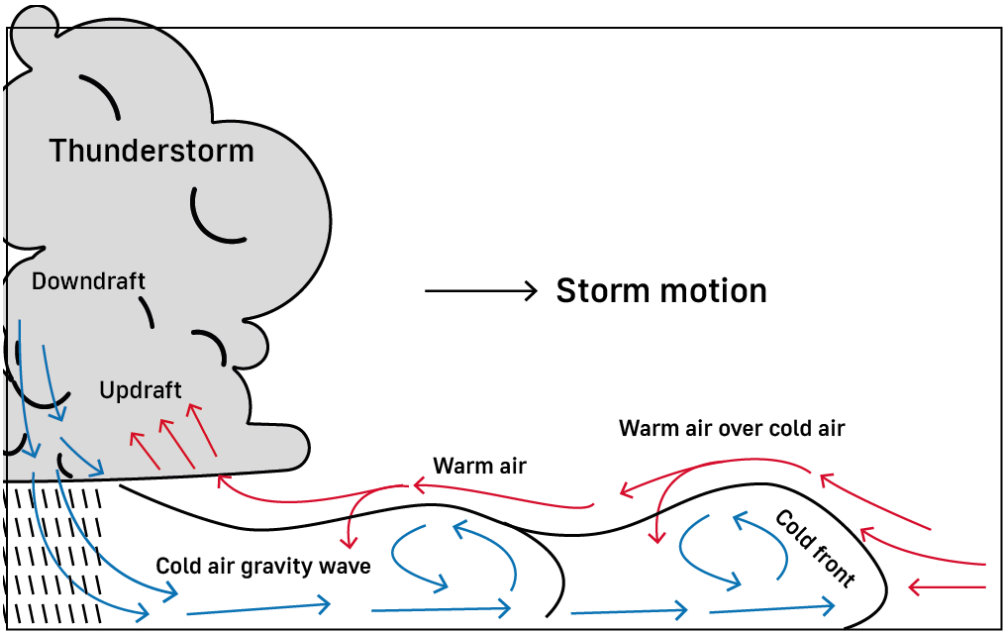

Fig. 6 — How a gust front forms

Anabatic and katabatic wind. A thermal current tends to run up the slope, creating an up-slope **anabatic wind** in the morning (earliest on east-facing slopes). In the evening the cooling ground chills the air, which sinks and flows down as the **katabatic wind**. On evening takeoffs the katabatic flow is barely felt at the top but means you'll run faster, the wing will feel lightly loaded, and the glide will be worse — so check you have enough takeoff room, a steep enough slope, and margin over any flat sections of the line.

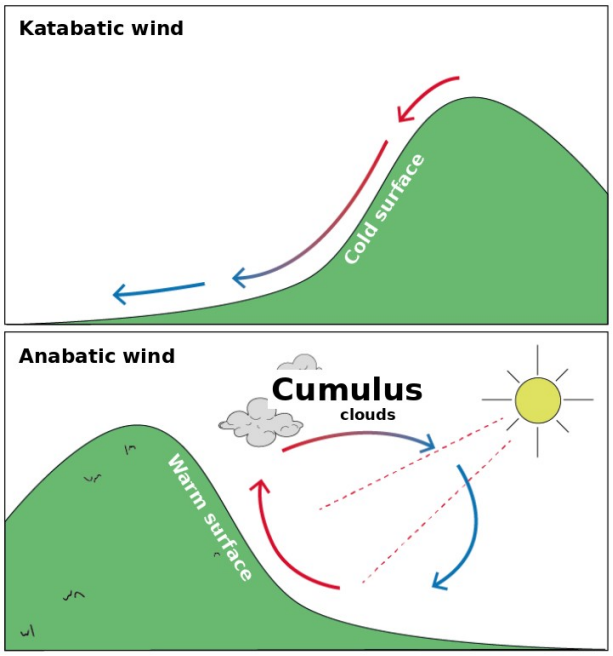

Fig. 7 — Katabatic and anabatic wind

Valley and mountain wind. As a valley warms, air flows up it (the **valley wind**, strong in narrow valleys); at night the cooled air flows back down (the **mountain wind**). The valley wind

isn't felt at a launch up the mountain — which is why you must find out the wind at the landing before you fly.

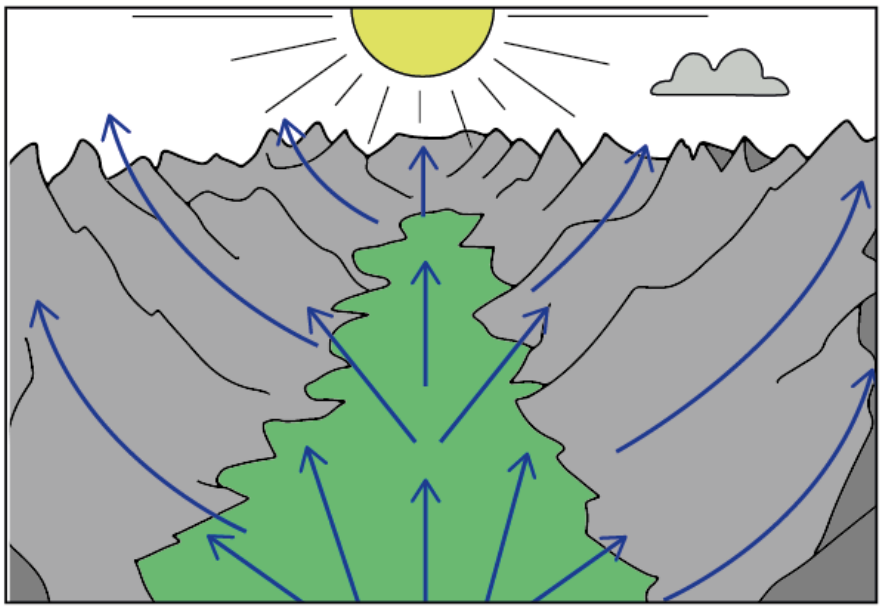

Fig. 8 — Valley wind (daytime)

Sea and land breeze. Land warms faster than water, so by day the wind blows in from the sea (**sea breeze**); at night it reverses and blows offshore (**land breeze**). The sea breeze only reaches a fairly low altitude, so when flying from high coastal mountains the wind at takeoff and at the landing can be completely different.

Foehn. A strong, gusty, warm, dry wind that pours down the lee side of a range when a low sits over one side and a high over the other. Lenticular clouds are its classic sign. Despite the seemingly clear weather, the valley becomes very turbulent, with wind reaching 130 km/h in valleys and 180 km/h on ridges. A Foehn day is a no-fly day.

Rotor. Air normally flows smoothly (laminar) and the wing is stable in it. When the flow meets an obstacle — a ridge — it speeds up the windward side, then separates after the top, leaving a chaotic, turbulent **rotor zone** on the lee side. As a rule of thumb the rotor reaches about three times the obstacle's height (strongest within twice its height), and it grows with wind strength and with how poorly streamlined the obstacle is. Rotors also form on stepped slopes, at sharp horizontal-to-vertical edges, on clifftop plateaus ("rock launches"), and in gullies in a crosswind. **Turbulence in a rotor is severe — it causes big collapses and heavy sink. Assess the rotor risk not just at takeoff and landing but along the whole line, and avoid rotor zones at all costs.**

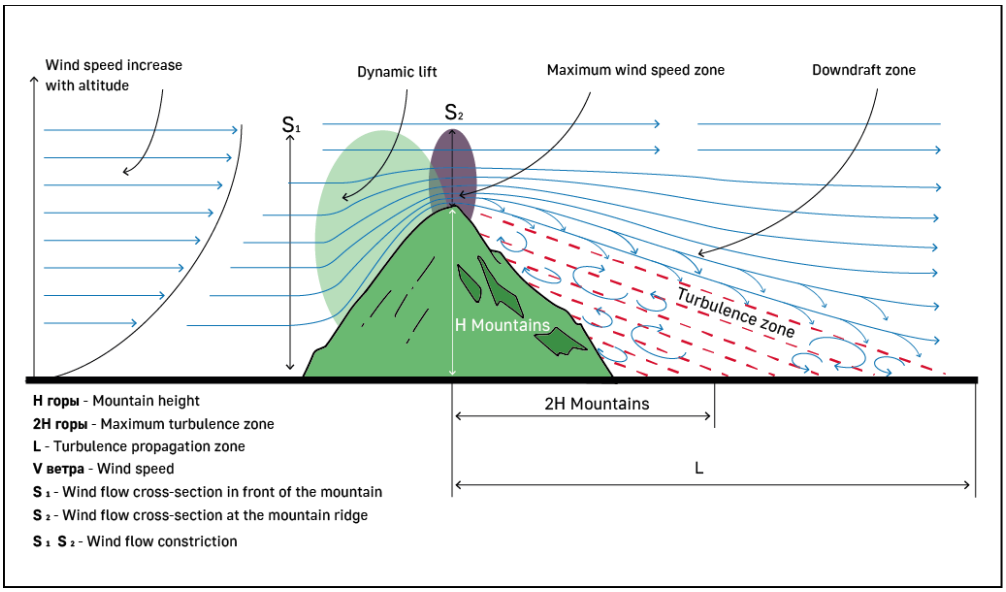

Fig. 9 — Rotor behind a slope

2.1.3 Forecast

A forecast is only part of the picture. Even at well-equipped airports accuracy is ~95% for the next 2 hours and drops sharply beyond that, so looking more than ~2 days out is nearly pointless — and no forecast replaces your own assessment at takeoff. Windy.com and Meteoblue.com are the common tools; in Europe the ECMWF model tends to match reality best. Check wind **and gusts**, rain, cloud cover, temperature (the day/night spread hints at thermal strength), and crucially the **wind aloft** — even on a 300 m hill the wind at takeoff can differ sharply from the surface, so always check it at takeoff altitude. Local forecast sites and lift webcams help you avoid driving up to a launch that's socked in.

2.2 Assessing the weather before takeoff

Make it a habit to spend **5–10 minutes watching the weather** whenever you arrive at takeoff, even at a familiar site — conditions change fast and not always obviously. Use every tool: anemometer, forecasts, nearby stations, and a radio-equipped friend at the landing. Assess with the **Three V's: Velocity (wind), Visibility (clouds), Vortices (turbulence — rotor, thermals, gust fronts).**

Velocity (wind). First work out the direction: ideally it blows straight up the takeoff. A crosswind brings the wing up banked — stand angled into the wind so it fills near 90°, expect more run-up speed and more sink, and check for obstacles downwind. A **tailwind** means changing takeoff or postponing; an evening tailwind is very likely katabatic, with strong downdraft right after launch. Always measure strength, ideally with an anemometer: if the wind is faster than your wing you may be blown back over launch, and gusty wind means turbulent air ahead. Use a reverse launch in moderate-to-strong wind, and read the wind at the landing too where you can (bending trees, whitecaps on water).

Visibility (clouds). Watch how cloud develops, especially along your line. You can see nothing inside a cloud — you lose all reference and the wing can turn without your input — so flying into

cloud carries a very high risk of hitting terrain (a mountain may appear only 10 m away, less than a second to react). Holes that are open now may close on you mid-flight.

Vortices (turbulence). Avoid **rotor** at all costs — its markers at takeoff are wind indicators pointing different ways (e.g. headwind low, tailwind up high), dust devils, or a single indicator hanging on the lee side of an obstacle to the side. Think about where rotors sit along the line, especially near flat sections where sink could stop you clearing them. Judge **thermal** strength from visible markers: other pilots' wings collapsing or shooting up off launch, paragliders soaring high, warm/cold gust cycles at launch, small cumulus, and the sun near perpendicular to the slope. And **rain**: a wet wing is heavier and stalls more easily, and rain anywhere near your line or landing can spawn a gust front — postpone and wait it out.

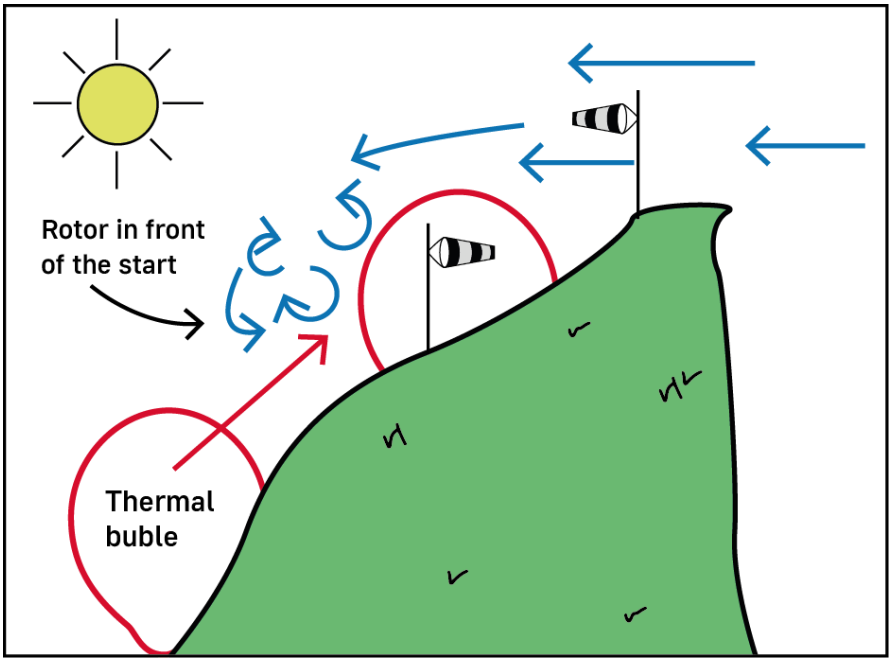

Fig. 10 — Rotor zones at takeoff

Chapter 3. Wing Physics

Knowing how a wing flies helps you predict its behaviour and control it.

3.1 Angle of attack

The **angle of attack** is the angle between the wing's chord (the line from trailing edge to leading edge) and the oncoming airflow; it doesn't depend on the wing's orientation to the horizon, and its range is fixed by the wing's design.

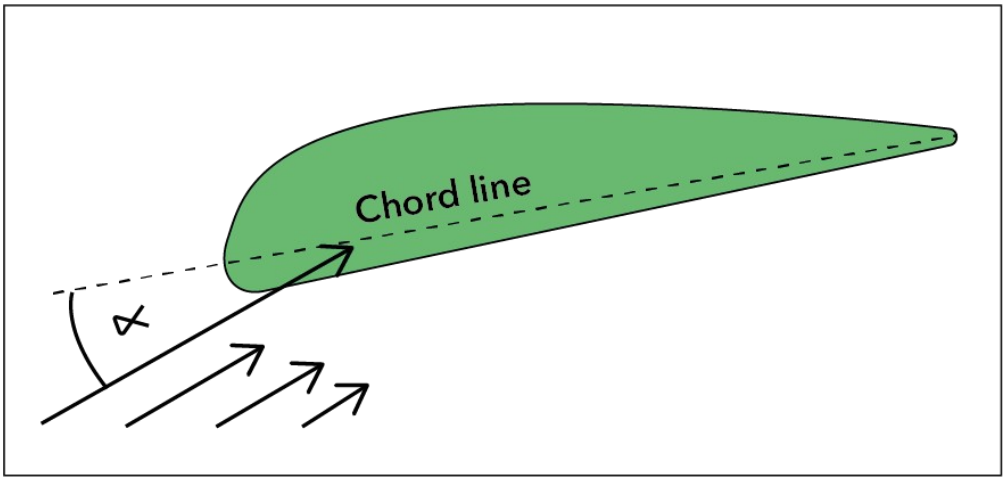

Fig. 11 — Angle of attack between the chord line and the oncoming flow

You change it three ways: the **trimmers** (open → lower angle of attack, faster descent; close → higher); **body drag** (standing up and spreading your limbs pulls you back and lowers it slightly); and the **brakes / C-risers** (dropping the trailing edge raises it — pulling the bridges acts like closing the trimmers). Push the angle outside its range and the wing fails: too high (over-braking, or an under-energised manoeuvre) → **stall**; too low (a downdraft pushing from above) → **collapse**.

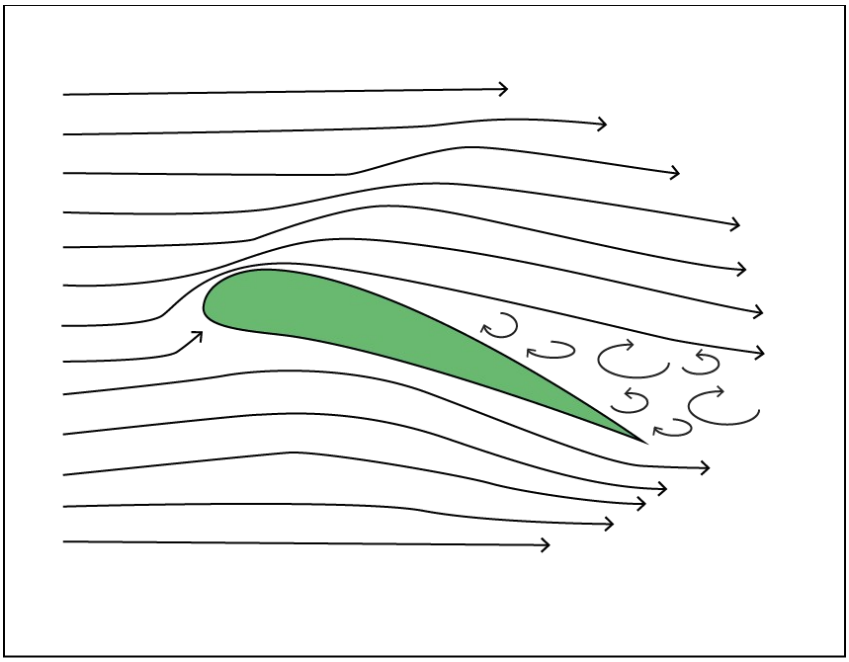

Fig. 12 — Flow separation when the angle of attack exceeds critical (stall)

3.2 Forces on the wing

Three forces act at the wing's centre of pressure: **gravity** (straight down), **lift** (90° to the direction of travel) and **drag**. Lift comes from the Bernoulli effect (faster, lower-pressure air over the top) and from the wing redirecting air downward (the flap effect when you brake). Drag splits roughly into lines ~50%, profile ~30%, pilot-in-harness ~20% — which is why makers fight to use fewer, thinner lines. In steady flight all the forces sum to zero, so in calm air the wing flies at a constant speed.

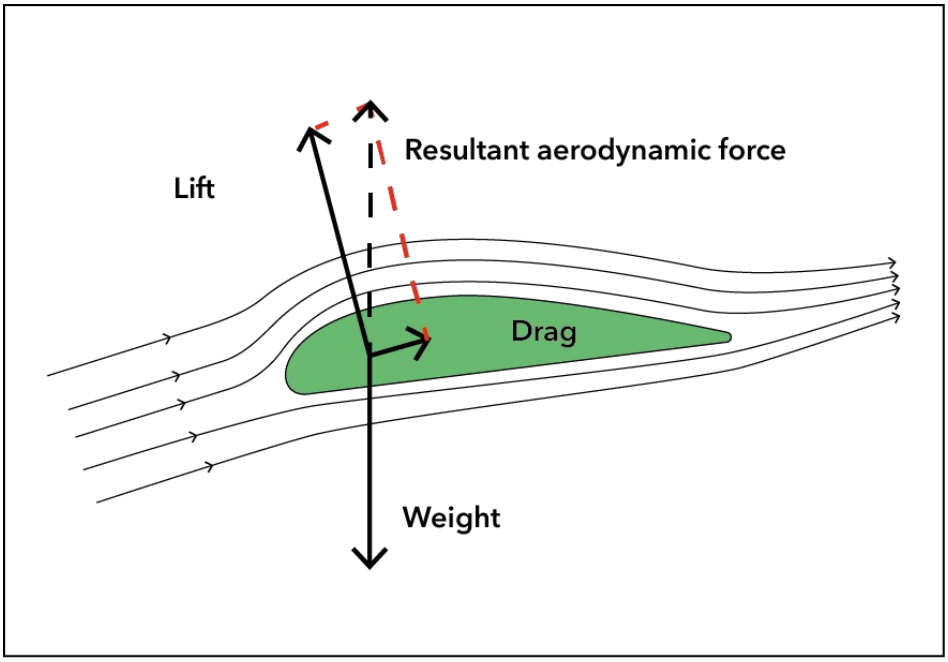

Fig. 13 — Forces on the wing: lift, drag, weight and the resultant

3.3 Glide ratio

Glide is forward distance divided by height lost in calm air (300 m forward per 100 m down = 3). Speedgliders glide about 2–4, mini-wings 4–6. Glide is worse at altitude and changes dramatically with any lift or sink along the line. You can also get it from speeds: 20 m/s forward ÷ 4 m/s down = a glide of 5.

3.4 Axes, wing loading and the polar

The wing rotates around three axes — **roll, pitch and yaw**. **Wing loading** (total flying weight ÷ area, in kg/m²) is critical: higher loading means faster flight forward and down, sharper reactions, a higher takeoff speed and less forgiving behaviour. The **polar curve** plots sink rate against forward speed and marks the key modes: **trim speed** (closed trimmers, hands up), **best glide** (a little brake), **minimum sink** (~30% brake), **minimum speed** (100% brake — the deepest brake that still flies; cross it and the wing stalls) and **open trimmers** (top speed).

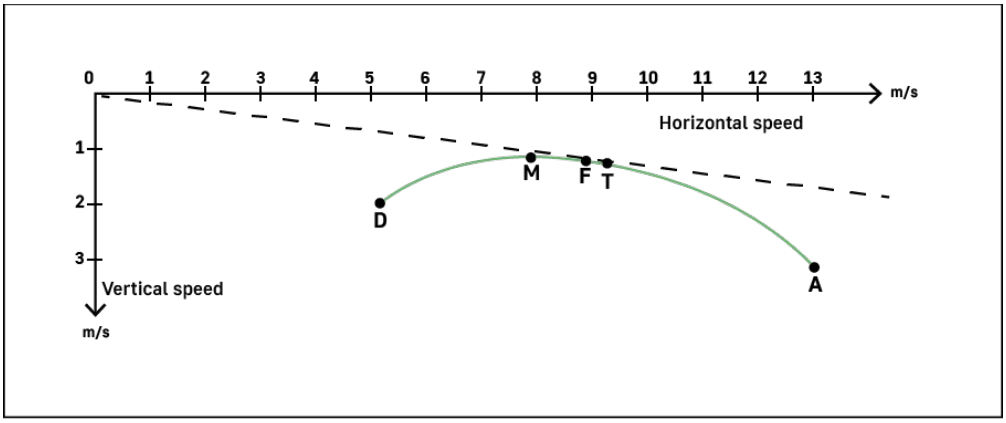

Fig. 14 — Speed polar curve: sink rate vs forward speed

3.5 Airspeed vs ground speed

Airspeed (relative to the air) stays the same regardless of wind; **ground speed** (relative to the ground) changes with it. At 20 m/s airspeed: in still air ground speed is 20; in a 10 m/s headwind it's 10; in a 5 m/s tailwind it's 25.

Chapter 4. Ground Handling

> "A victory in the air is forged on the ground."

Ground handling (kiting) is controlling the wing while still on the ground — laying it out, inflating it, balancing it overhead, walking it and killing it. It is the single biggest lever for cutting risk, because the launch is where most incidents happen, and launch skill *is* ground-handling skill. The most experienced pilots are the ones playing with their wings on the slope while everyone else waits for the air to settle — building automatic, intuitive control. **15 minutes of focused ground handling teaches you more than 15 sketchy flights.** Practise regularly on open, obstacle-free, steady-wind terrain (a beach, field or dropzone); leave slopes and obstacles for later. And know your harness as well as your wing — hang in a simulator to set it up, find a symmetric seat, and drill weight shift, brakes and the torpedo position.

Nil and light wind (≤ 2 m/s). There isn't enough airflow to park the wing overhead, so you must move forward to create it — the **forward launch** is the only effective method. It's the most exhausting and most neglected skill, and the cause of many injuries to pilots who rarely launch in nil wind. Drill minimum-speed inflation by the A-risers, finding the moment to release them and check the wing (passing "the wall"), roll control, a smooth jog-to-sprint run, and clean stops.

Moderate wind (3–7 m/s). Enough airflow to hold the wing overhead while standing still — the most comfortable conditions, and where we do most training. The **reverse launch** (facing the wing, risers crossed, controls inverted) is safer and lets you fully control the inflation and check for cravats and knots before committing. It's trickier at first but becomes your default whenever there's wind. Drill A/C-riser control, kiting in both positions, steering on weight alone, finding the stall and parachuting points, and recovering faked collapses.

Strong wind (8+ m/s). Everything happens lightning-fast. Practise only on flat, obstacle-free ground with nothing dangerous behind you, ideally with someone ready to hold your harness — falling even from 3 m can injure you. Drill trimmer and C-riser control and cobra / cells-down handling.

Chapter 5. Flight Training

5.1 Pre-flight preparation

A flight runs: assess the weather → go up → reassess at takeoff → decide → plan → prepare → take off → fly → land. The **takeoff is the most critical stage** — possibly more incidents happen there than everywhere else combined, and a scary launch poisons the rest of the flight. Plan how you'll launch, the line you'll fly, where you'll leave the terrain, and your landing approach and touchdown spot; the more you plan, the more mental capacity you keep for actually flying.

Run a fixed **pre-flight checklist** every time. Ours is **Helmet → Leg straps → Carabiners → Trimmers → Chest strap → "Whoosh!"** — helmet on and fastened; leg and chest straps fastened and untwisted; carabiners fully closed with the A-risers pointing forward and outward; trimmers closed.

5.2 Takeoffs

Forward launch (nil or light headwind): with the wing laid out behind you, start moving at the *minimum* speed needed to bring it up (rushing the run is the classic mistake), do a **visual check of the wing as it rises** (feel alone is NOT enough), stop it overhead on the brakes, fix any bank by moving under the centre, then accelerate progressively from a jog into a sprint.

Reverse launch (moderate wind): face the wing with the risers crossed and the controls inverted, bring it up and check it fully, then turn smoothly *while still moving downhill* — turning while standing still lets slack into the lines and can collapse the wing. From there it is identical to the forward launch. The reverse launch is safer and greatly expands the weather you're comfortable in; master it. In strong wind use the **cells-down** launch or **throw & go** (only on snow, grass or sand).

Commit only once the wing is up, checked, the airspace is clear, and you've started accelerating — after that, all focus goes to the run. **If there's any doubt, there's no doubt: abort.**

The **ideal takeoff** is energy-efficient: minimum inputs, timing over force, all the energy poured into the final 2–3 powerful steps, lifting off almost "hands up" rather than on a brake input.

5.3 In flight

After launch, fly 10–20 m clear of the terrain on light brakes, then sit into the harness (expect a brief dive).

Neutral position: sit symmetric, body in tone but not clenched, **hands fully up — and never hold the risers.** In a crisis pilots fly with whatever is in their hands, and leaning on the risers cuts your hands out of piloting and stunts your weight control.

Glide path: a symmetric brake input (up to ~15% of the active range) gives a steady, lasting flatter glide; a deeper input gives a strong but brief flattening followed by sink — useful to clear a short obstacle. Closed trimmers give the flattest glide, open trimmers the steepest.

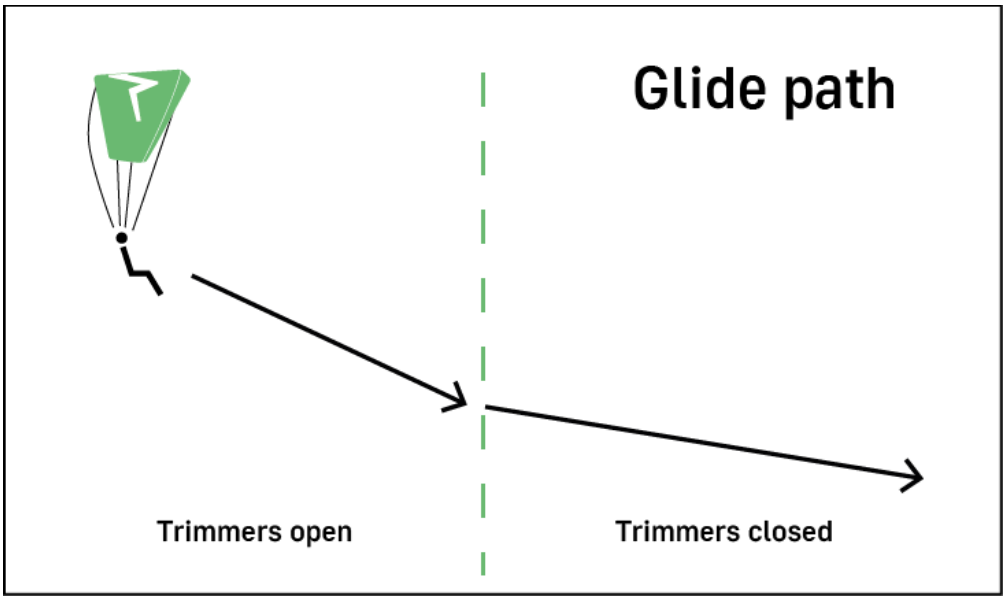

Fig. 15 — Glide path: trimmers open (steeper) vs closed (flatter)

Trimmers: open and close them smoothly, symmetrically, with the brakes still in your hands. Open trimmers add speed but make the wing less sensitive, dive more, lose more altitude in turns and collapse more easily; closed trimmers are more sensitive and recover faster.

Turns: keep the brakes at the **touch point**, and start every turn with **weight first, brake second**, keeping light tension on the outer brake. **Flat turns** lose minimum altitude (for low approaches and dodging obstacles); **diving turns** trade more altitude for more speed.

Spirals and barrel rolls: a barrel roll is *not* a trick where you sling the wing under you — it's simply a **spiral with a high entry speed** whose axis has tilted toward the horizontal. Learn single spirals exiting on heading at altitude (over water, with a reserve), then linked spirals, then spirals exiting at a chosen target altitude — always approaching that altitude *from above*, arriving "hands up" with speed in reserve, never having to save yourself.

Turbulence and active piloting: speed is your friend everywhere *except* in turbulence. In rough air, close the trimmers, fly on the brakes, avoid sharp manoeuvres, and **actively pilot** — keep constant pressure in the wing by following it with your hands (pressure drops → hand down to restore it; a surge → hands up), shifting your weight toward the loaded side if one half unloads. Build this on an SIV course and by kiting in strong, gusty wind. **Rough air = closed trimmers + brakes.**

C-risers and bridges give more speed and smoother, lower-drag flying, but much less feedback, a closer and more abrupt stall, and limited inputs — they suit experienced pilots in smooth air only, and are unsafe in turbulence. Being able to fly on the brakes is mandatory; everything else is optional. Good line choice and using the terrain gain you far more speed than switching risers ever will.

Energy management: a wing leaving a manoeuvre carries excess speed (energy) — build your line so each manoeuvre feeds the next.

5.4 Landing

Landings, with takeoffs, are the main source of broken legs and backs, so give them special attention. **Priorities, in order: (1) not into an obstacle, (2) not in a turn, (3) into wind.** Land obstacle-free first, even if that means landing in a turn or downwind.

Plan it before you fly: walk the landing zone for slope, surface, obstacles and near-invisible wires; set altitude and position reference points; work out how it behaves in different winds; note backup landings. Arrive with an altitude margin — dumping height is easy, gaining it is impossible. Learn to read the wind from the air (smoke, trees, grass, dust, water).

Pattern: dump excess height in a **holding area** (flat S-turns, figure-of-eights or gentle spirals — never so intense that you lose control of your descent rate), fly a **base leg**, then make the **final turn** onto the **final** into wind. Plan the altitudes by working backwards from the touchdown point, allowing 5–10 s of steady flight on both base and final to check and adjust the trajectory.

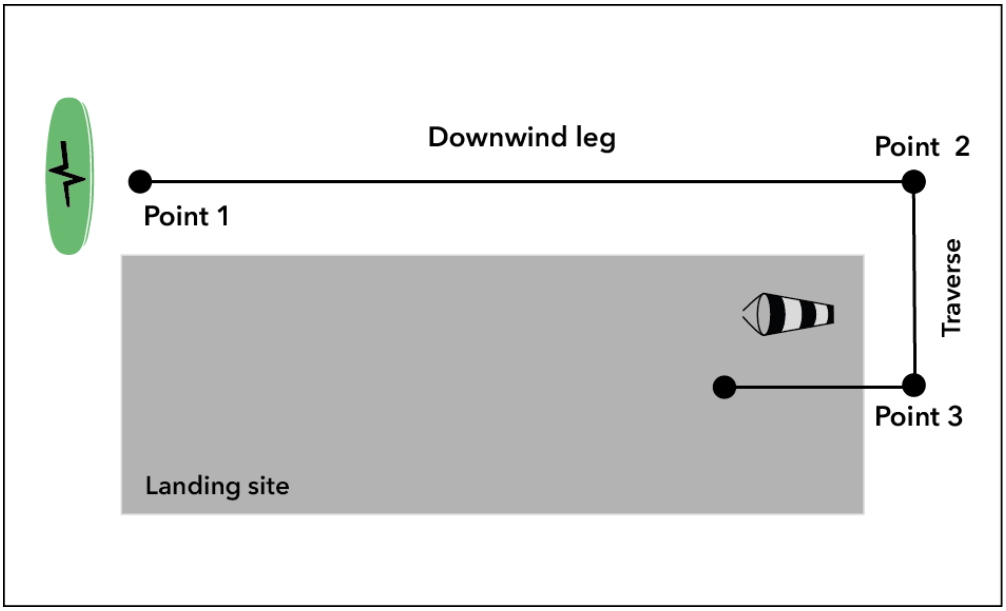

Fig. 16 — Box landing pattern: downwind leg → base → final into wind

Flare: learn with closed trimmers (slower and more forgiving). On final, give the wing **full speed with your hands all the way up** for 5–10 s — flying braked into the ground leaves no flare and risks an early stall. At ~5–8 m start pulling both brakes smoothly to level out at the height where, standing up in the harness, your feet would reach the ground; keep pulling to hold that height as speed bleeds off, and **start running before the wing stalls** (a stall even 20 cm up loads your legs). Watch for asymmetric inputs (don't reach a foot down — pilot to the last moment), stalling at touchdown, and the skydiver habit of laying out across the chest strap (unnecessary and dangerous here). Run or slide depending on surface, footwear, wind and slope — be able to do both, and learn it all on the brakes.

Chapter 6. Additional Information

6.1 Where to fly

Flying sites differ by infrastructure, difficulty, the type of flying available, and how legal speedflying is.

Infrastructure. *Ski resorts* offer lifts, rescue, medical services, prepared launches/landings, a local community, and weather stations and webcams — but strict rules and heavy helicopter traffic (which both saves lives and leaves turbulent air behind it). *Paragliding sites* are well-developed with active communities, documented weather and repair services, and often allow flying over water (great for practising manoeuvres safely) — but they impose speedfly-unfriendly terrain (long glides, flat sections, tight landings) and the most air traffic: slow paragliders descend far less aggressively, and the duty to keep clear is on you, so if the sky is full of paragliders it's thermic — time to land and have lunch. *Wild, unprepared sites* mean you're alone: no forecasts, no marked launches or landings, and no quick rescue — so fly there only when you're ready, with a bigger safety margin, constantly scouting backup landings, and equipped for a real mountain day.

Difficulty. *Beginner hills* (shallow paragliding sites) are best for learning and re-entry; *stand-alone low mountains* offer predictable conditions for self-reliant pilots; *big mountain systems* are the most complex and dangerous — fast-changing weather, big vertical, and thin air above 3,000–3,500 m that hurts both you and your wing. Experienced pilots only.

Types of flying. *Speedfly* sites (slope plus foot launch/landing and lots of calm weather), *speedride* sites (steep, lift-served, often not foot-friendly), and *speedsoaring* sites (low coastal hills with steady laminar wind). Speedsoaring in big mountains hides far more danger because of turbulent lift and thermals.

Legality ranges from officially permitted and regulated, to tolerated under paragliding rules, to outright forbidden, to wild sites where anything goes. Always check the local rules first.

6.2 Ethics

The wider mountain community often views speedflyers with suspicion — sometimes fairly — and the sport is balanced on the edge of being banned in many places, so keeping it alive is partly your responsibility. At a new site, contact the local pilots and learn the rules. A few hold almost everywhere: don't fly close to paragliders (especially tandems and their launches), don't scare hikers, bikers or climbers, don't fly near lifts, don't launch/land/fly close to prepared ski pistes, and **don't land near people — especially children. Just don't swoop the babies.** Follow the local rules so the whole community isn't punished for one tourist's stunt; welcome and brief newcomers; and politely speak up if someone is flying dangerously. There's no place in our sport for localism, hazing or elitism — we're all equal before the elements.

Chapter 7. Conclusion

We, the FLYLAB team, having been enthusiasts of this sport for many years, want to contribute to its development and safety — that's the whole purpose of this manual. Newcomers often discover sensations so sharp and new that they can't hold back in chasing more, and end up flying every flight like it's their last, breaking the rules, or refusing to believe the rules exist. The rest of the mountain community notices, and it breeds a negative image of the sport and restrictions on the freedom to practise it. So our one message is this: **don't just enjoy speedflying — take care of it.** If we look after its safety and its reputation, more and more people will get to share the utterly incomprehensible miracle of human flight.