WEATHER FORECASTING & FLIGHT DECISION-MAKING

A Practical Guide for Paraglider Pilots | 406 PARAGLIDING

Introduction: Find the Window, Evaluate the Risk

Successful paragliding begins long before arriving at launch. Forecasts identify potential opportunities, but they cannot guarantee safe conditions, especially in mountainous terrain. The goal is to understand the weather, recognize hazards, and decide whether conditions are appropriate for your experience and equipment.

Forecast the conditions. Verify what is happening. Continually reassess your decision.

1. A Five-Step Weather Assessment Process

Step 1 — Understand the Big Picture

Use Windy, NOAA/NWS, and longer-range forecasts to identify pressure systems, approaching fronts, prevailing winds, cloud cover, precipitation, thunderstorm potential, and whether conditions are improving or deteriorating.

Step 2 — Examine the Flying Site

Use XC Skies PointCast or similar elevation-based forecasts to compare launch, the valley floor and landing zone (LZ), mid-slope terrain, expected soaring altitudes, and nearby ridge tops. Mountain weather can change dramatically with elevation; one forecast point is not enough.

Step 3 — Review the Short-Term Forecast

Use HRRR and NAM 3 km for short-range hourly forecasts of wind, gusts, thermal development, clouds, precipitation, and changing conditions. Check the hours before, during, and after your planned flight. A detailed forecast remains a prediction, not a guarantee.

Step 4 — Compare Forecasts With Actual Conditions

Check local weather stations, radar, satellite imagery, launch cycles, and observations from experienced local pilots. Are winds increasing? Are launch cycles stronger? Are clouds growing? Do actual conditions match the forecast? Look for trends, not one isolated reading.

Step 5 — Make the Go/No-Go Decision

Assess the entire expected flight window, including launch, soaring, descent, and landing. Consider your ability, equipment, terrain, and alternate landing options. Ask: What could make this flight unsafe, how quickly could it develop, and what would I do? If margins are inadequate, do not launch.

2. Weather Forecasting Tools

Tool	Primary Use
XC Skies	PointCast, lift, winds aloft, shear, clouds, gusts, XC potential
HRRR / NAM 3 km	Short-range hourly wind, gust, and developing weather forecasts
SkySight	Thermal, convergence, and weather-layer visualization
Windy	Regional patterns, fronts, winds, and precipitation
Local weather stations	Observed winds, gusts, direction, and trends
Satellite / radar	Cloud growth, storm movement, and precipitation
NOAA / NWS	Official forecasts, hazards, and forecast discussions

Best practice: Compare multiple sources. Do not search for the forecast that gives you the most favorable answer. Disagreement between models is a reason to investigate uncertainty.

3. Thermal Strength, Lift Height & Launch Timing

Thermal Strength

- 2–3 m/s: May provide workable thermal conditions for appropriately experienced pilots.
- 4–5 m/s near launch: May indicate strong cycles that can make launching unsafe.

These are examples, not universal safe limits. Terrain, background wind, stability, thermal organization, and pilot ability matter.

Top of Lift

Use conservative lift-height estimates. Monitor how predicted lift height changes throughout the day; do not assume the forecast altitude will be achievable.

Cross-Country Potential and Launch Timing

XC potential may help estimate when thermal activity starts, peaks, or weakens and how cloud shadow affects lift. It is a planning indicator, not a safety rating. The strongest lift is not necessarily the best launch time. Good soaring conditions aloft do not make an unsafe launch acceptable.

4. Wind, Gusts, Shear & Changing Conditions

Compare wind speed and direction at launch, the LZ, and flying altitudes. Watch for stronger winds aloft, crosswinds, valley winds, terrain acceleration, and increasing afternoon winds.

Wind Shear

Changes in wind speed or direction over short distances can produce turbulence and difficult flying conditions. Treat forecast shear layers as warnings and interpret colors using the map legend, not assumed universal thresholds.

Prefrontal and Postfrontal Conditions

Winds may strengthen or become variable ahead of a front. Some postfrontal patterns offer flying opportunities, but residual wind, instability, and turbulence can remain dangerous. Verify conditions at the site.

Key question: Are winds trending toward manageable conditions, or becoming progressively stronger?

5. Clouds, Moisture & Overdevelopment

Convective Cloud Development

- Watch for rapid vertical growth, deepening cumulus, darkening bases, spreading cloud cover, and developing precipitation.
- High relative humidity aloft may favor cloud formation; compare it with cloud depth, stability, precipitation, and satellite imagery.
- Large cloud shadows can reduce heating, weaken thermals, and shift usable lift.

Satellite Imagery

Use animated loops to see whether cloud cells are growing, decaying, spreading, or moving toward your flying area. A developing storm outside the immediate launch area may still threaten the flight.

6. Critical Hazard: Thunderstorms & Gust Fronts

Thunderstorm outflow can travel far beyond a storm and produce sudden, powerful, turbulent winds. Rain does not need to be falling at launch for a gust front to be dangerous.

Warning Signs

- Growing thunderstorms, deep convective clouds, rain shafts, or virga nearby
- Increasing gust predictions or rapidly changing wind direction
- Developing outflow boundaries or abrupt changes at nearby weather stations

How to Evaluate the Risk

Use HRRR surface-gust forecasts to investigate possible outflow timing, then cross-check with radar, satellite loops, NWS information, local weather stations, and the actual sky. Models may miss the precise timing, location, or strength of a gust front.

Do not launch when thunderstorm development or outflow presents a credible threat. A temporarily calm launch does not eliminate the hazard.

Outflow can cause severe turbulence, backward ground speed, wind shifts, and dangerous landings. Avoid the setup rather than plan an escape after it develops.

7. Mountain Flying Weather Considerations

Late-Day Flying

Evening conditions may smooth out as strong daytime thermals weaken, but valley or background winds can remain hazardous. Observe multiple cycles and confirm stable conditions.

Valley Cold Pools

Overnight cold air trapped in valleys may produce inversions and initially light winds. As heating erodes the cold pool, winds and thermals can change rapidly. Verify the depth and evolution of the cold layer.

High-Altitude Launches

Lower air density, variable winds, crosswinds, and terrain may complicate launching. Light wind does not necessarily mean an easy launch.

Terrain Crossings

Plan adequate altitude, terrain clearance, alternate landings, and margins for unexpected sink. Have a plan if lift disappears. Never depend on a single forecast thermal or favorable wind prediction to complete a crossing.

8. Learn From Every Forecast

After each flying day, compare the forecast with reality:

- Review the NWS forecast discussion.
- Compare predicted winds with observed weather-station data.
- Compare cloud forecasts with satellite imagery.
- Review predicted lift against actual soaring conditions.
- Save screenshots of unexpected weather developments.
- Record what models predicted correctly and what they missed.

When traveling, verify forecast times are displayed in the correct local time zone. Treat every forecast as a hypothesis to test against reality.

9. Preflight Weather Assessment Checklist

☐ I understand the overall weather pattern and approaching systems.
☐ I checked winds at launch, the LZ, and expected flying altitudes.
☐ Wind speeds, gusts, and shear are within my abilities and margins.
☐ Launch cycles are manageable and trending favorably.
☐ Thermal strength is appropriate for my experience.
☐ I checked clouds, precipitation, and thunderstorm potential.
☐ I evaluated possible gust-front activity.
☐ Current observations support the forecast.
☐ I have adequate terrain clearance and safe landing alternatives.
☐ The entire flight window is acceptable—not just the launch moment.

10. Final Decision: Be Willing to Walk Away

Good judgment includes recognizing when forecasts are unreliable or conditions exceed personal limits. Do not let pressure from others or the desire to fly override your assessment. Conditions suitable for an experienced pilot may be inappropriate for a student.

FIND THE WINDOW. CHALLENGE THE FORECAST. WATCH THE TRENDS. KEEP YOUR MARGINS. BE WILLING TO WALK AWAY.

406 PARAGLIDING | 245 Rivers Run Rd, Belgrade, MT 59714 | 406-539-5118
406paragliding@gmail.com | www.406paragliding.com
Pilot Training & Continuing Education — Southwest Montana

Educational use only. Forecasts cannot guarantee safe conditions. Follow current USHPA recommendations, instructor guidance, site rules, and personal operating limitations. Each pilot is responsible for flight decisions.
Special thanks to J. Leusden for providing much of the original information.