



# GROUND SCHOOL

**PPG TRAINING UK**

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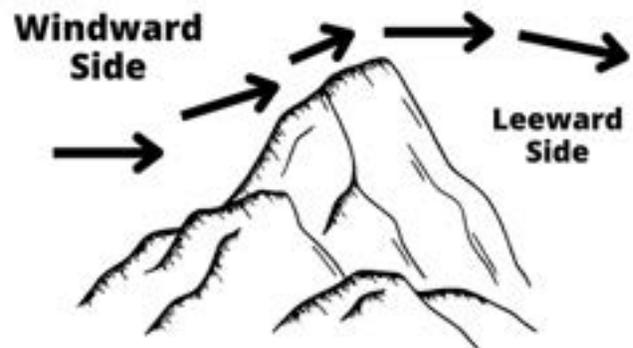
# Terminology & Definitions

**Paraglider** / Glider /  
Wing

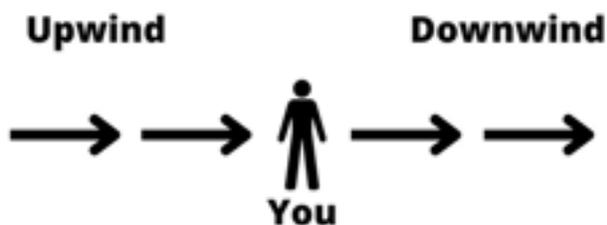


**Paramotor** / Powered  
Paraglider / PPG / Motor

Windward side &  
Leeward side / Lee



Upwind & downwind



**Leading Edge:**

The front side of the glider, or the side that's leading the wing forward, hence "leading"

**Trailing edge:**

The rear side of the glider, or the side that's following behind, hence "trailing"

MSL - (Mean Sea Level) Means the altitude in reference to sea level.

AGL - (Above ground level)  
Altitude from the ground.

FL - "Flight Level" will be used when looking at altitude when you reach a certain point.  
FL100 means 10,000 feet.  
FL140 means 14,000 feet.  
FL320 means 32,000 feet.

TFR - Temporary flight restriction



# Weather Apps

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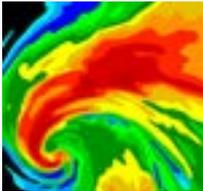
## MyRadar

Shows activity and precipitation movement. This app is free.



## Windy

Used to track and see wind direction, speed, temperature, and more. This app is free but has a paid upgrade.



## Clime

Another great weather app that is paid. Simply another way of displaying the information.



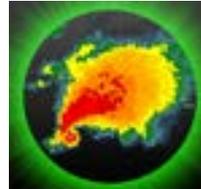
## AutoDens

This app shows you the density altitude of where you are. This app is free.



## UAV Forecast

Another weather app that displays information in a different way.



## RadarScope

Another weather app that displays information in a different way.



## WindAlert

Another weather app that displays information in a different way.

## PPG.Report

NOT an app. Website. We recommend creating a shortcut for it. Another weather app for checking winds aloft.

# Flight Log Apps

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## FlySkyHy

Flight log and dashboard while flying. This app is a paid app.



## XcNav

This app is a flight log and dashboard that shows your speed, altitude and other important information. You also can connect to your friends and see where they are. This app is free.



## Gaggle

Flight log and instrument panel with a social sharing feature that shows your friends recent flights. This app is paid.

# Other Apps

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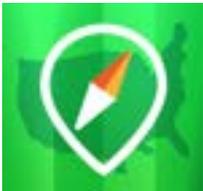
## OnX Hunt

Shows property boundaries for both public and private land. This app is paid.



## Easy Tension

This app allows you to identify how loose or tight your belt is based on the pitch it makes when you flick it. This app is free.



## Public Lands

Shows BLM land which is public land that we are allowed to launch and land from.

# Equipment Name

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Paramotor Frame



Paramotor Engine



E-Prop



Helix Prop



Off-Grid Throttle



Dudek Comfort Harness



APCO First Harness



Aluminum or Steel Carabiners



Full Size Paraglider



Kiting Glider



Yaesu ZYS-FT-60R



Universal Radio Chest  
Harness Lone Peak  
Packs



Reserve



ICARO 2000 Solar X



Motul 800 Oil

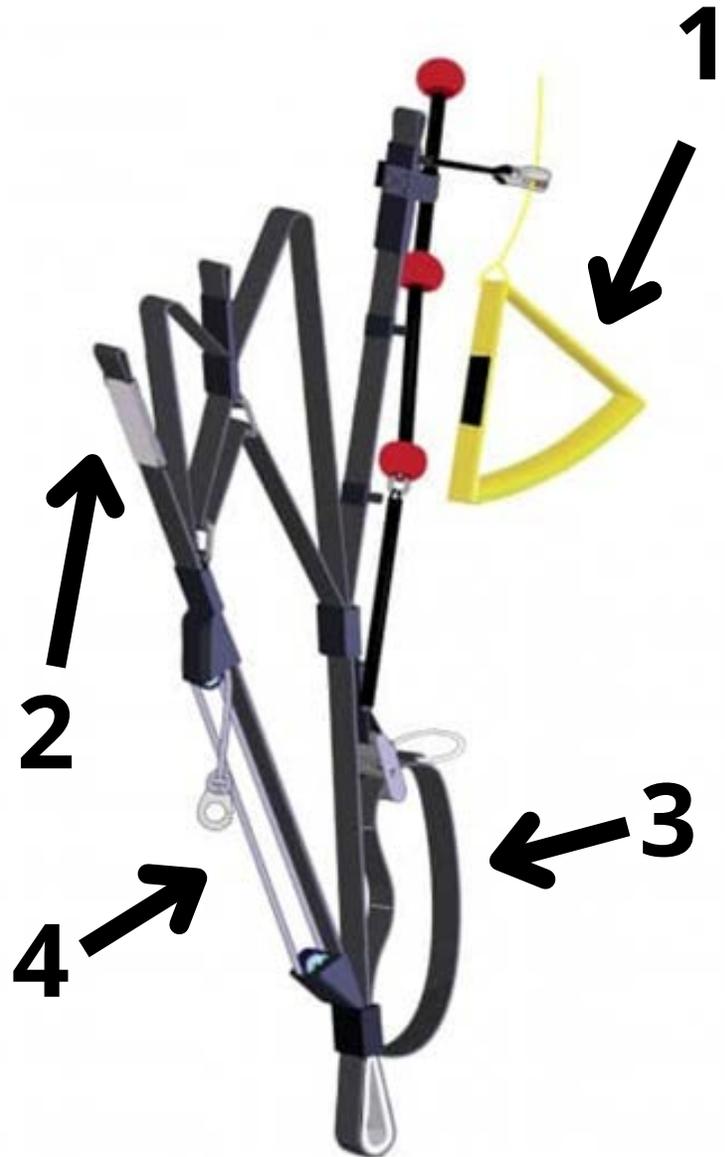


VP Racing Gas Can



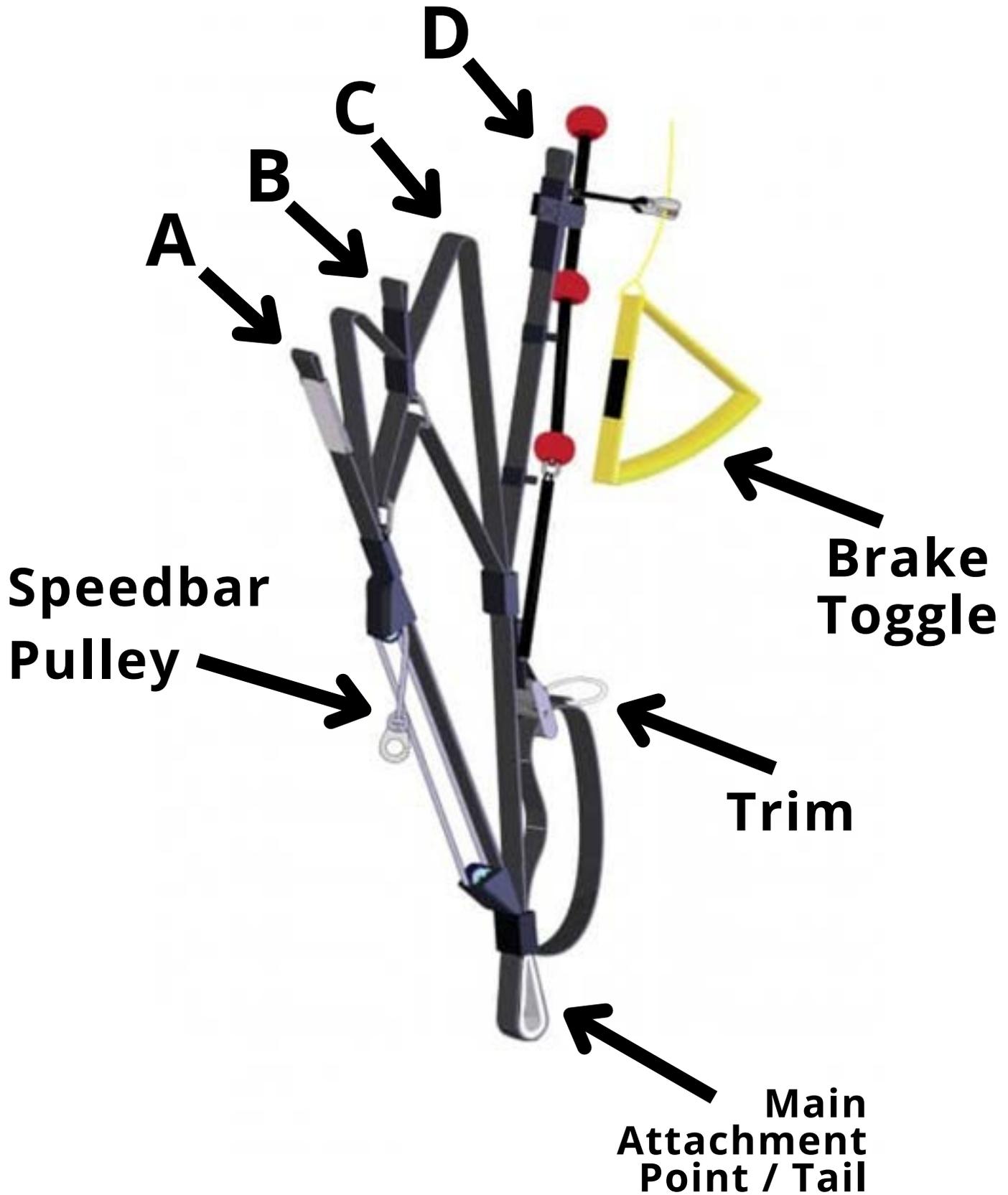
# Flight Controls

1. **Brakes** - The brakes are fabric toggles you hold in each hand. They control the trailing edge of the wing and are used for directional inputs as well as for minimal altitude control.
2. **A's** - The A's are the front most part on the risers and is used to inflate the wing.
3. **Trim** - The trim buckle is usually attached to the rear most part of the riser and is used to accelerate and decelerate the glider. The trim changes the angle of attack on the wing which can increase or decrease your speed.
4. **Speedbar** - The speedbar is usually attached to the front most part of the riser and is a pulley system that when pulled further accelerates/speeds up the wing. Like the trim, the speedbar changes the angle of attack.
5. **Throttle** - The throttle is what you use to add and reduce the power from the engine.



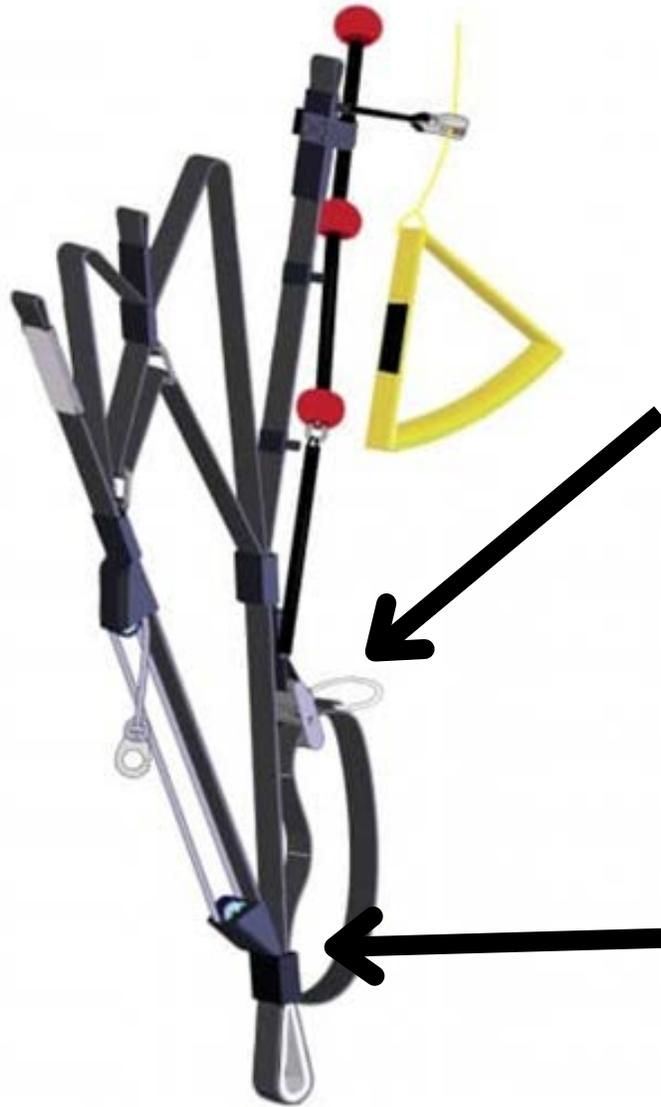
# Riser Breakdown

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# Trim's Breakdown

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Trims will be referenced and adjusted regularly and to make life easy, here's how we reference trim.

## **Trims (up / out / released):**

This means that you've let the trim buckle out as far as you can. Typically it's referenced as trims "up" because in flight this would put the buckle itself in the most "up" position.

## **Trims (down / in / closed):**

This means that you've pulled the fabric through as far as you can. Grab the fabric hoop and pull down with it until you've reached the stopper at the bottom.

Trims up accelerates the paraglider by changing the angle of attack. This makes it more unstable (unless it's a reflex profile) but faster. Trims up also reduces the efficiency of the wing as it's trading efficiency for speed.

Trims down slows the wing down by changing the angle of attack. This is typically the slowest and most efficient configuration. This is where most all of your flying will be performed.



Launching - Neutral or up  
 Landing - Neutral or down  
 Cruising - Neutral or down  
 Getting somewhere fast - Neutral or up  
 Maneuvers - Neutral or down  
 Bumpy Conditions - Neutral or down  
 Ridge Soaring - Down

## So when do you use what trim setting?

### **Launching:**

You will launch trims neutral on a reflex wing (read your manual for more information) or trims all the way up on a traditional glider.

### **Landing:**

You will land trims neutral on a reflex wing and trims all the way in on a traditional airfoil.

### **Cruising:**

Most commonly you will cruise trims neutral or trims down. You will trim up when you are wanting to get somewhere faster. It's best to only trim out when the weather is good/smooth.

### **Maneuvers:**

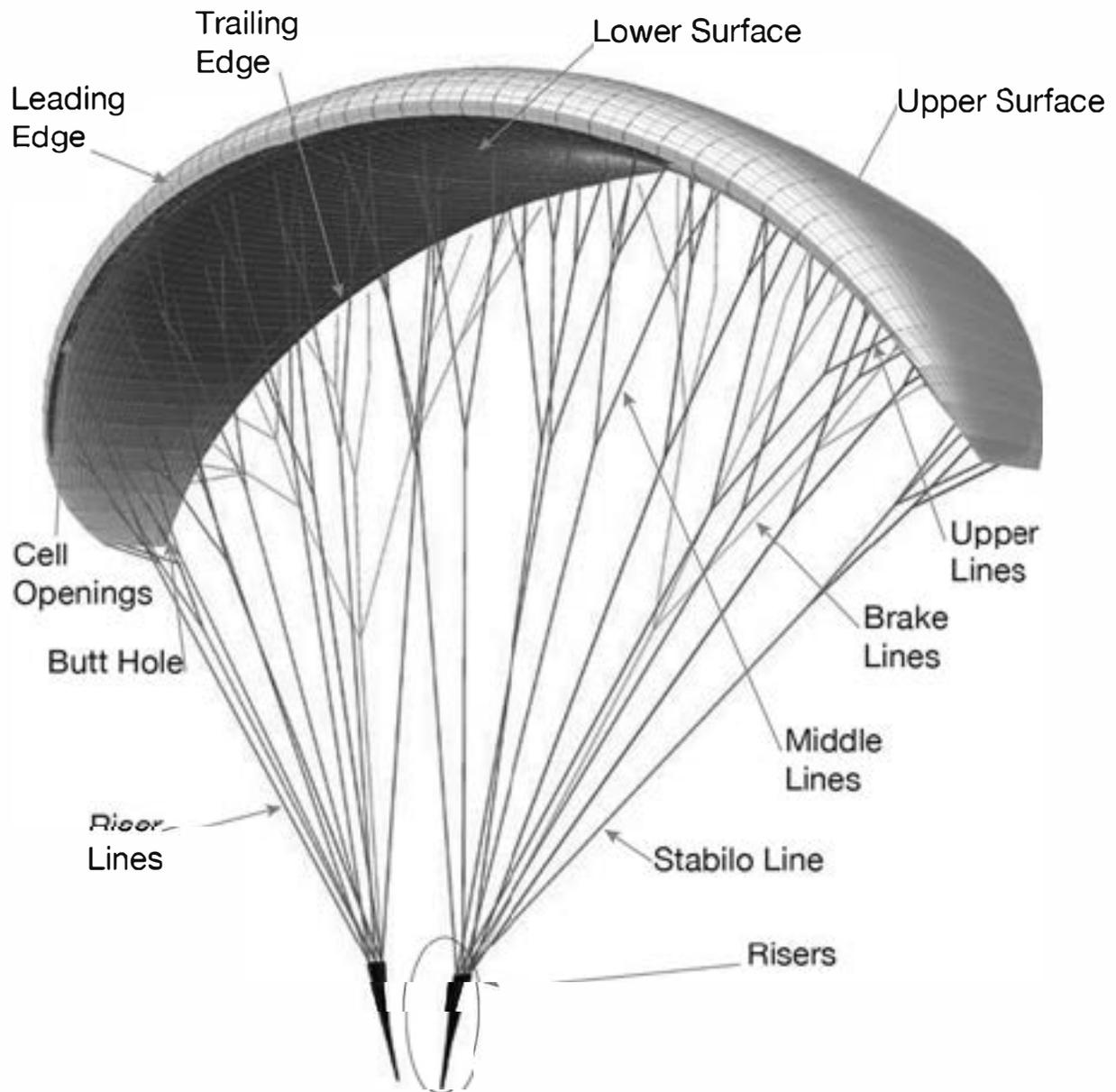
You will trim down or neutral for acro/maneuvers.

### **Bumpy Conditions:**

Trims down for bumpy conditions on all types of gliders.

# Paraglider Breakdown

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# Types Of Paragliders

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**Traditional Airfoil Paramotor Wings** - Typically beginner paramotor wings will be non-reflex wings. The only difference between these and "paragliders" is that these have trims.



**Reflex Paramotor Wings** - Reflex paramotor wings are most commonly used because of their stability and speed.



**Speedwings / Mini Wings** - These wings are most commonly used for speed flying which is low and fast ground skimming down a mountain or hill. Rarely used with paramotors.



**Paragliders** - These are non-reflexed wings without trim buckles. They are designed to be very efficient as they are used without motors.

# Paraglider Certifications

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## EN Certification:

EN certification is used to rate how safe a paraglider is. In order from safest to least safe is A, B, C, D, and Uncertified.

To receive a certification a paraglider must pass 128 separate tests and it will receive the lowest rating it got. Meaning, if 127 of the 128 were A-rated, but 1 was a B, the glider receives a B certification.



Not every paramotor specific wing receives EN certifications.

## DHV Certification:

DHV certifications are a load test. They are testing to see how many G forces the wing can handle at different weights before it breaks.

Every paramotor wing receives DHV certifications.

# All Up Weight Explained

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When trying to figure out which glider size is right for you, you're going to hear a lot about "all up weight." This is the measuring tool the glider manufacturers use to gauge which size is correct for you.

Here are all the things you need to add up to get your all up weight:

- Your weight with all clothes on
- Helmet
- Radio
- Phone
- Paramotor
- Fuel in paramotor
- Reserve parachute
- Glider weight

This can also include any camping gear, water, snacks, clothes, tools, etc.

When looking at a glider sizing chart you will see things like "110-130kg". This means that if your all up weight is between 110 and 130 kg then you are within the weight range of the wing.



When you are newer the goal is to be more so in the center of the weight range. As you progress us more experienced pilots prefer to be on the heavier size of the weight range. In the 110-130 kg example, 110 would be light on the wing and 130 would be heavy on the wing.

The reason more experienced pilots like to be heavy on the wing is because the wing will be more dynamic/maneuverable. Basically, it takes less effort to do the same maneuver. The lighter you are on the wing the more lift it will make, the slower it will go, and the less maneuverable it will be. When you are new you want it to be easy, and being lighter on the wing does just that.

# Sky Glider Lineup

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**BGD SEED (Ground Handling Wing)** - The SEED is the affordable, durable premier training wing, made for ground handling only. It feels and behaves like a full-size wing, and has three risers, so you learn better technique and more skills. As well being perfect for practising kiting, the SEED is great fun for parawaiting or just goofing around! Great pilots were first great ground handlers, so learn to kite and grow your skills!

**SKY CIMA PWR (BEGINNER)** - For those early steps into the air under power, ease, simplicity and fun must rank highly on the scale of priorities, and this is what CIMA PWR is all about. CIMA PWR's design thus dedicates itself to opening the world of Paramotoring to a whole new generation of pilots by offering simple launching, predictable pitch & roll stability along with a high lift profile for slow and effective take-off & landing and in-flight comfort. A wing that will take you from beginning to beyond, that's CIMA PWR.



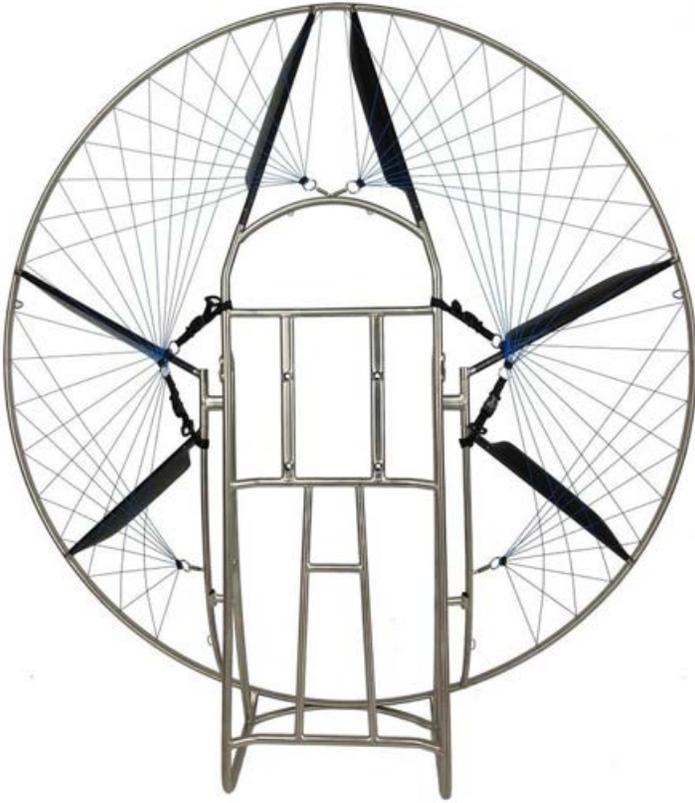
**SKY FLEXOR (INTERMEDIATE)** - is a 100% reflex wing but explicitly designed for its category. The soft reflex profile has the essential shape that provides stability and safety in flight. A wide range of speeds and a very efficient accelerator will allow you to make the most of this soft reflex profile.

**SKY ZORRO (ADVANCE)** - is for those pilots who are looking for a reflex wing that can be flown fast, yet with the ability to also offer efficiency and fun too, along with manageable take-off and landing speeds.

**SKY Z- BLADE (EXPERT)** - is a dynamic PPG wing that moves your horizons and pushes your limits. Z-BLADE is the performance, enjoyment and technological treasure that brings your flying to a totally new level.

# Paramotor Breakdown

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There are a few main parts to a paramotor. Let's talk about them.

**Frame** - The paramotor frame is basically the only difference between one paramotor and another paramotor. The frame manufacturer is the one who names the paramotor and who assembles and services the paramotor. The picture shown is a Limitless Paramotor manufactured out of Spain.



**Engine** - The engine is the powerplant of the entire paramotor. The most popular paramotor engine used is the Vittorazi Moster 185 Plus.



**Dudek Comfort Seat** - The harness used on most every paramotor out there is the Dudek comfort seat also known as the Dudek Power seat. It's widely used for a reason, and that's because it's well-made, lightweight, and comfortable.



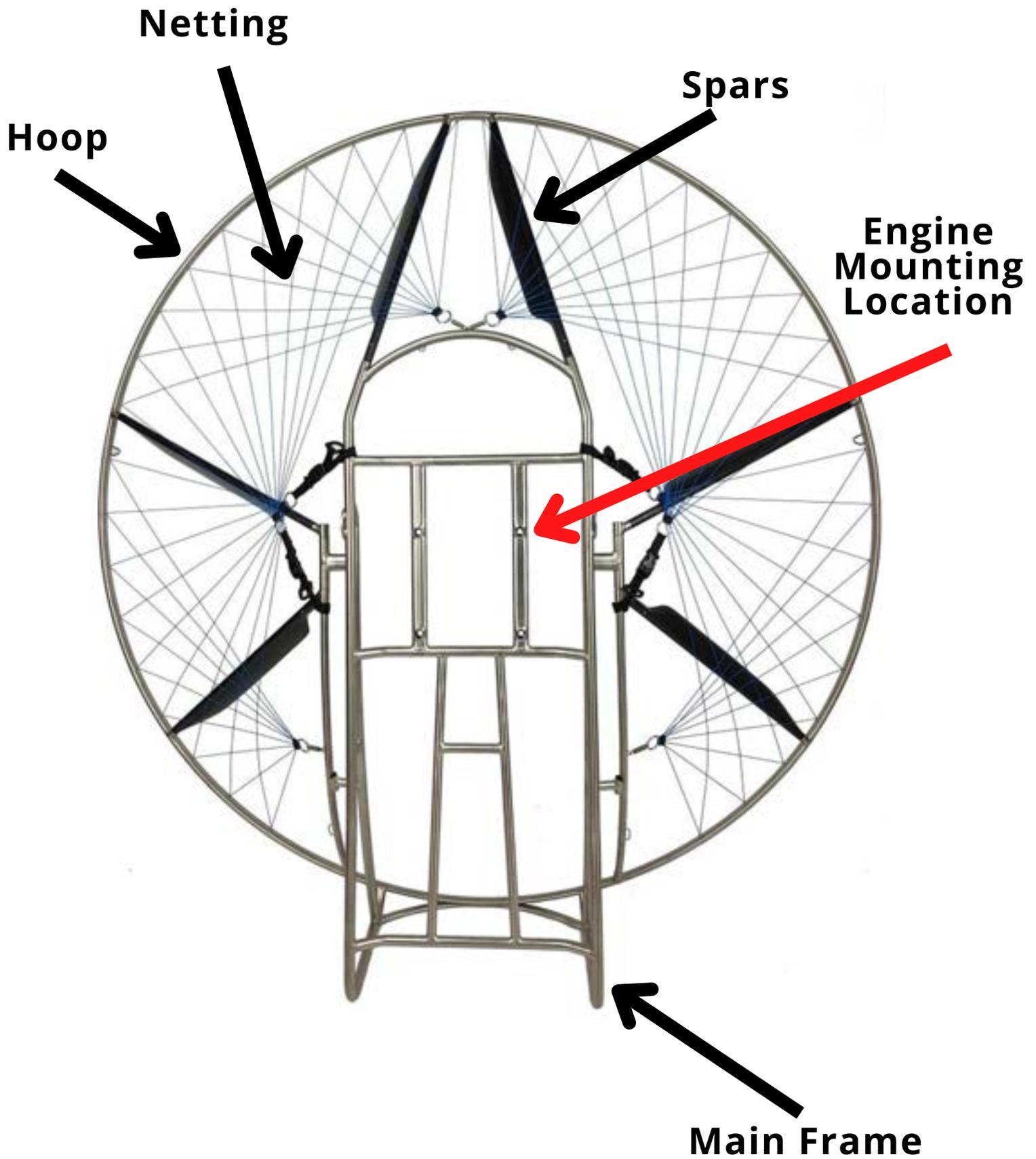
**Off-Grid Aviation Throttle** - The Off-Grid Aviation throttle is one of the most popular throttles on the market. It's simple, easy to use, comfortable, and has a fully adjustable cruise control.



**Props** - There are many different props available. The most common are E-Props or Helix Props. Sizes range from 125 cm to 140 cm with 2-blade, 3-blade, and 4-blade options.

# Frame Breakdown

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# Prop Breakdown

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**E-Prop** - E-Props is one of the two main paramotor prop manufacturers. They are made out of Carbon Fiber and are a very strong, and lightweight prop. They are known for quickly spinning up to full due to being lightweight.

**Helix** - Helix props are also made from Carbon Fiber but are much more durable and can handle a lot more abuse. They spin up slower due to being heavier but cruise at lower RPMs and have slightly more top-end thrust.



**Prop Variations-** There are a few different prop sizes that are commonly used. Generally speaking, the larger the prop the more thrust you get.

140 cm

135 cm

132 cm

130 cm

125 cm

2 Blade

3 Blade

4 Blade

# Air Navigation Order

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## UK Paramotor Law – Quick Summary (Like FAR 103)

**Legal Flight Times: From 30 mins before sunrise to 30 mins after sunset**

**Weight Limit: Max 70 kg empty weight (single seat) for minimal regulation (SSDR)**

**NO flying at night or in cloud**

**NO flying over crowds, towns, or congested areas**

**NO flying in controlled, restricted, or prohibited airspace**

**Fly in Class G airspace**

**Class E may be ok, but check first**

**NO flying in TFRs or MOD areas unless approved**

**NO tandem unless you're a certified instructor**

**Must maintain visual contact with the ground**

**500ft separation from people/structures**

**150m separation from open-air crowds (1000+ people)**

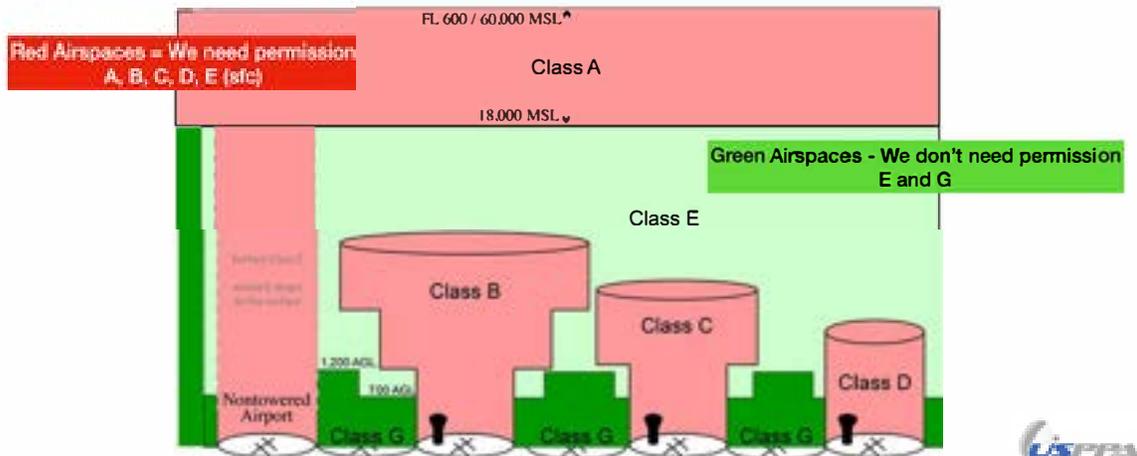
**Don't land or take off on private land Without permission**



# Airspace

## Understanding Airspace for Paramotors

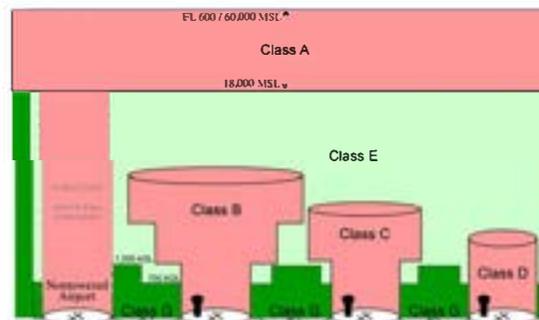
### Class A, B, C, D, Surface E, E, and G



## Class A

“Above”

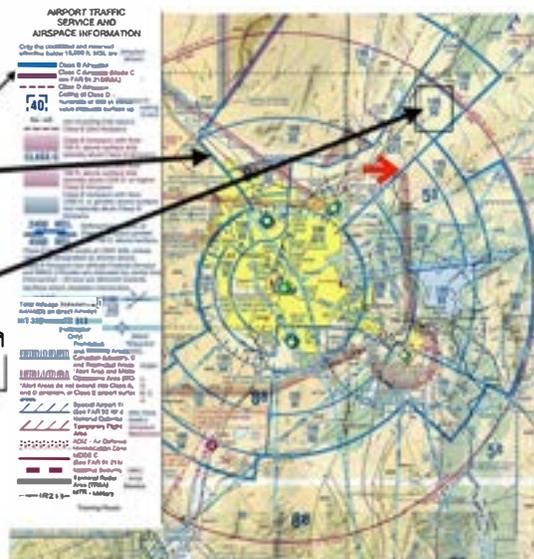
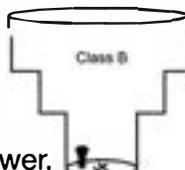
- It starts at 18,000 feet MSL and goes to 60,000 MSL (FL600)
- It's not visible on the sectional chart
- Visibility / Distance from Clouds: Not Applicable



## Class B

“Busy” or “Big”

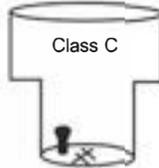
- Solid **blue line** in the sectional!
- It's like an upside down wedding cake. Each section shows the top and bottom altitude in MSL.
- We need permission.
- Permission is not likely.
- Airport with a control tower.
- 3 miles visibility / Clear of clouds



# Class C

“Communication” or “Caution”

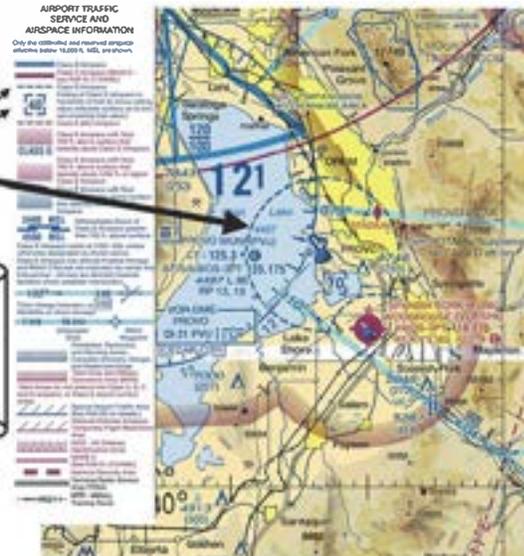
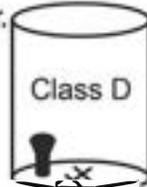
- Solid magenta line in the sectional chart.
- It's not busy enough to be Class B but it's still very busy!
- We need permission.
- Airport with a control tower
- 3 miles of visibility
- 500 ft below, 1000 ft above, 2000 feet horizontal of clouds



# Class D

“Directions”

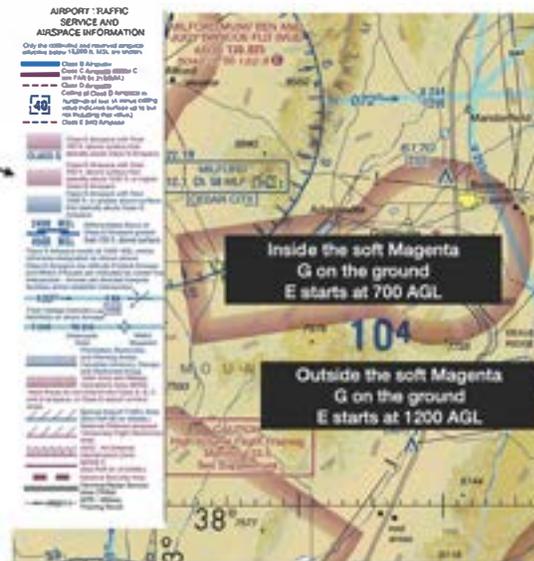
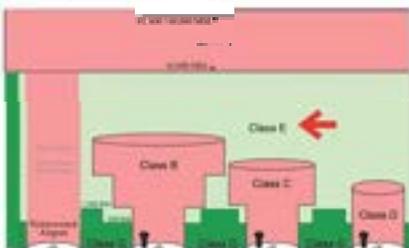
- Dashed blue line in the sectional chart.
- Airport with a control tower.
- We need permission.
- 3 miles of visibility
- 500 ft below, 1000 ft above, 2000 feet horizontal of clouds



# Class E

“Everywhere”

- It's the airspace everywhere that is not A, B, C, D, or G.
- It starts at 700 or 1200 AGL - Inside the soft magenta or outside the hard magenta line. It goes up to A airspace (18,000)
- 3 miles of visibility (Above 10k ft MSL it's 5)
- 500 ft below, 1000 ft above, 2000 feet horizontal of clouds (Above 10k MSL it's 1000 ft, 1000 ft, 1-mile horizontal)



## Class G

### “Ground” or “Go-For-It”

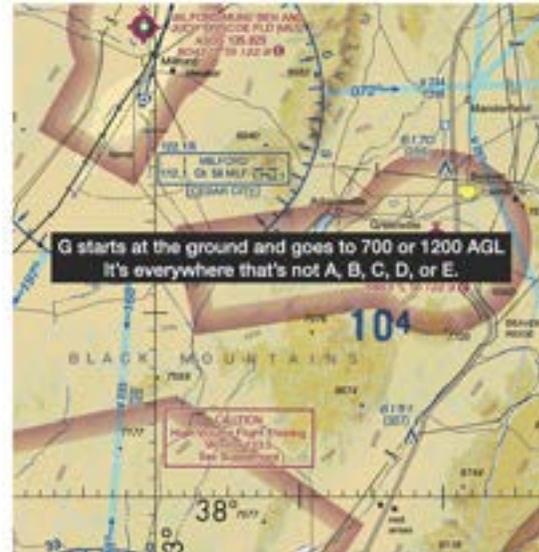
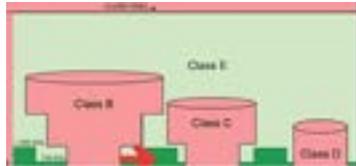
Starts at the surface and goes up to 700 or 1200 AGL (where E starts)

It's not depicted on the Sectional. This is our favorite airspace. Uncontrolled.

1,200 feet and under - 1 mile of visibility & clear of clouds

1,200 AGL - 10,000 MSL - 3 miles of visibility and 500 ft below, 1000 ft above, 2000 feet horizontal of clouds

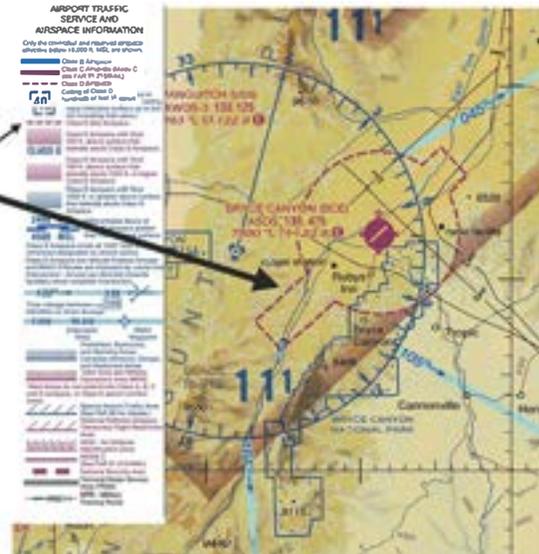
Above 10,000 feet MSL - 5 miles visibility and 1000 ft below, 1000 ft above, 1-mile horizontal of clouds.



## Surface Class E (sfc)

### “Everywhere” (surface)

- Dashed **magenta line** in the sectional chart. **-----**
- We need permission. From ATC facility (not the control tower)
- **There is no ceiling so we can't fly over it at any altitude (without permission).**
- 3 miles of visibility (5 above 10k ft MSL)
- 500 ft below, 1000 ft above, 2000 feet horizontal of clouds (1000 ft, 1000 ft, 1-mile above 10k ft MSL)



## IF you want to keep it simple ...

### Stay in uncontrolled airspace (G and E that's not surface E)

If you want to keep it simple ...

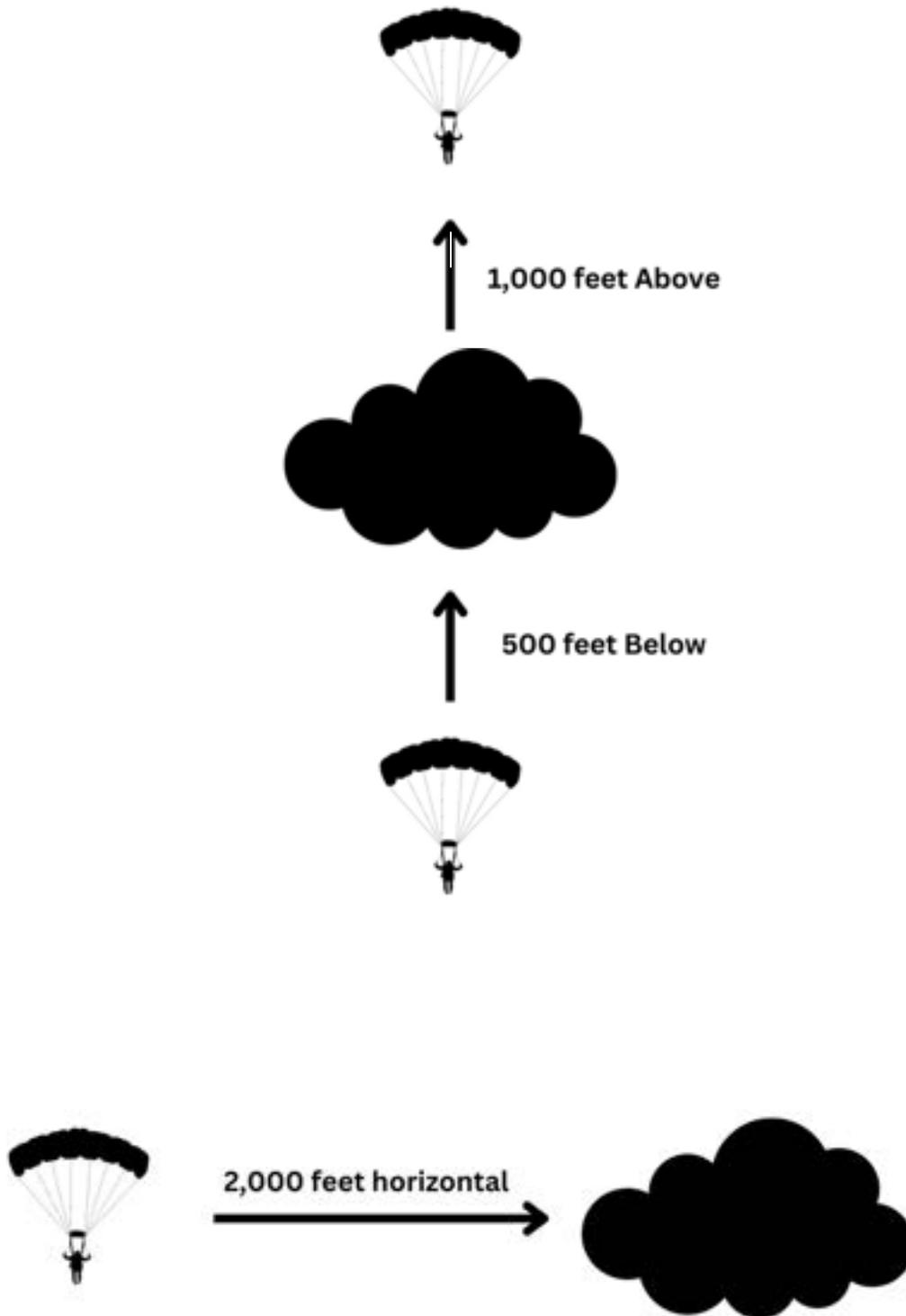
The most unrestricted place to fly is G airspace, below 1200 ft AGL. All you need is 1-mile of visibility and clear of clouds. For anywhere else, you need to know the rules.

You don't need permission to fly in G airspace and E airspace. But remember, where E starts at the surface, (around certain airports - magenta dotted lines) you do need permission as well as all the other airspaces (A, B, C, and D).

**See and Avoid** - It is our responsibility to continuously maintaining a vigilant lookout for other aircraft. Remember that **most midair collision incidents occurred during good weather conditions and during daylight.**

# Class E Cloud Clearance

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# Weather

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FLY WHEN IT'S FUN! Smooth conditions and calm wind are our favorite to fly in. Paramotors are very fair-weather aircraft and although they can handle a lot, it's not fun and you take on a lot more risk.

What to avoid:

1. Strong wind
2. Turbulence

Strong wind:

- 6 mph mountains
- 8 mph flatlands
- 12 mph beach

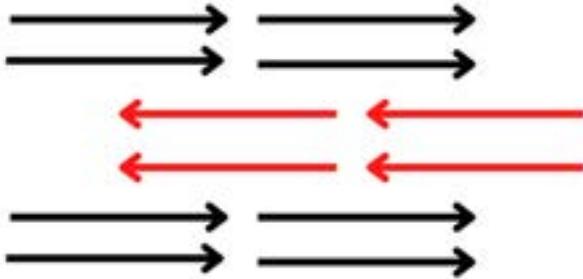
Turbulence: Wind changing in direction or speed.

Types of turbulence:

1. Wind shear
2. Thermals
3. Rotor
4. Gust Fronts



# Weather - Wind Shear



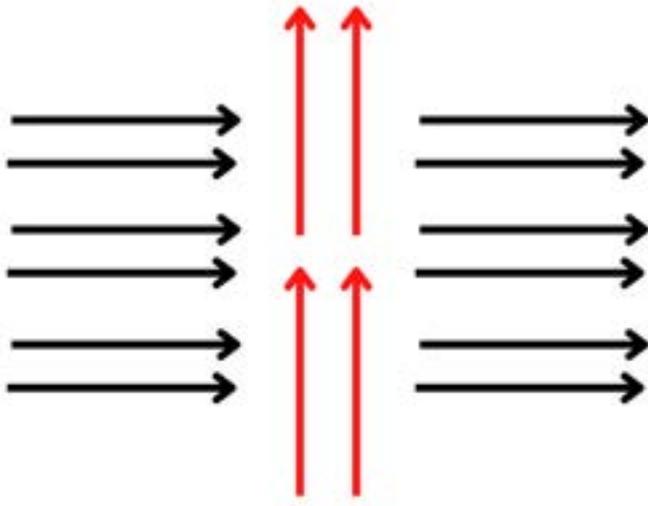
Wind shear is like highways of the sky. It's where wind at different altitudes is going in different directions at different speeds. The diagram next to me shows in an extreme case that wind can be going in two opposite directions. It can often be smooth in each "level" / "highway" but is going to be turbulent when going from one to the other.

A real-world example can be seen to the left that shows that between 4000 and 7000 feet the wind changes direction and speed quite a bit. This is an example of wind shear and it would be quite turbulent going through those layers of wind.

ALT. (AGL)	TEMP	DIRECTION	SPEED
Surface	25 °F	343 ↓	13 mph
89 ft	24 °F	346 ↓	18 mph
240 ft	23 °F	348 ↓	22 mph
489 ft	22 °F	350 ↓	24 mph
764 ft	20 °F	352 ↓	26 mph
853 ft	20 °F	352 ↓	26 mph
1,329 ft	17 °F	354 ↓	28 mph
1,896 ft	14 °F	356 ↓	29 mph
2,546 ft	13 °F	11 ↓	33 mph
2,733 ft	15 °F	16 ↓	33 mph
3,284 ft	22 °F	30 ✓	33 mph
4,147 ft	32 °F	24 ↓	21 mph
4,948 ft	38 °F	338 ↓	18 mph
5,154 ft	39 °F	326 ↓	18 mph
6,322 ft	44 °F	237 ↗	16 mph
7,664 ft	47 °F	238 ↗	24 mph
9,193 ft	44 °F	267 →	29 mph
10,180 ft	40 °F	275 →	31 mph
10,915 ft	37 °F	281 →	32 mph
12,854 ft	29 °F	273 →	43 mph
14,987 ft	22 °F	269 →	55 mph
17,201 ft	17 °F	269 →	63 mph
18,789 ft	12 °F	267 →	67 mph

# Weather - Thermals

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Thermals are pockets of hot rising air that are turbulent to enter and exit. They start to pop off around 10:00 am and die off around 6:00 pm.

Thermals are safe to fly in if you know what you're doing but it will be a turbulent flight. Most paramotor pilots avoid thermals because it is less fun to fly paramotors in.



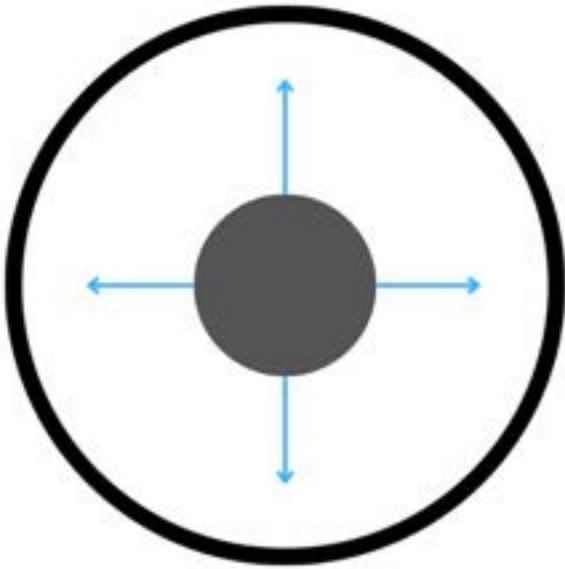
Paraglider pilots (no motor) seek out thermals because it's what produces the lift that keeps them in the sky. Some of my favorite flying is thermal flying but I rarely do it with a paramotor. I fly a paramotor because it's fun to fly within proximity of things and to take in the views and flying in strong thermal conditions is not calm nor smooth.



The cloud shown to the left indicates thermal conditions. Flat bottom with a slight grey to it, and an explosion-like building upward of the cloud.

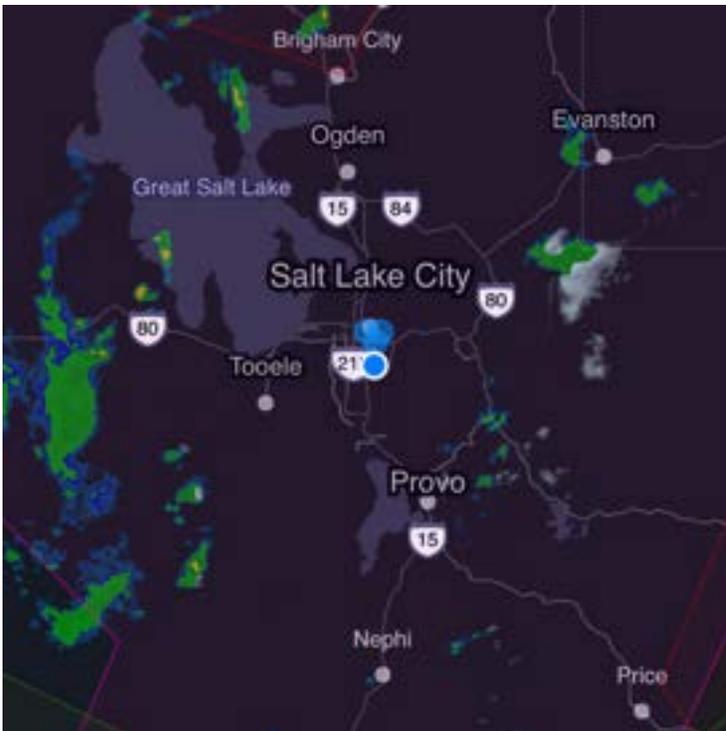
# Weather - Gust Fronts

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Gust fronts are a very dangerous thing for paramotor pilots and should be avoided at all costs. A gust front is created from a storm cell that is dumping and is predictable.

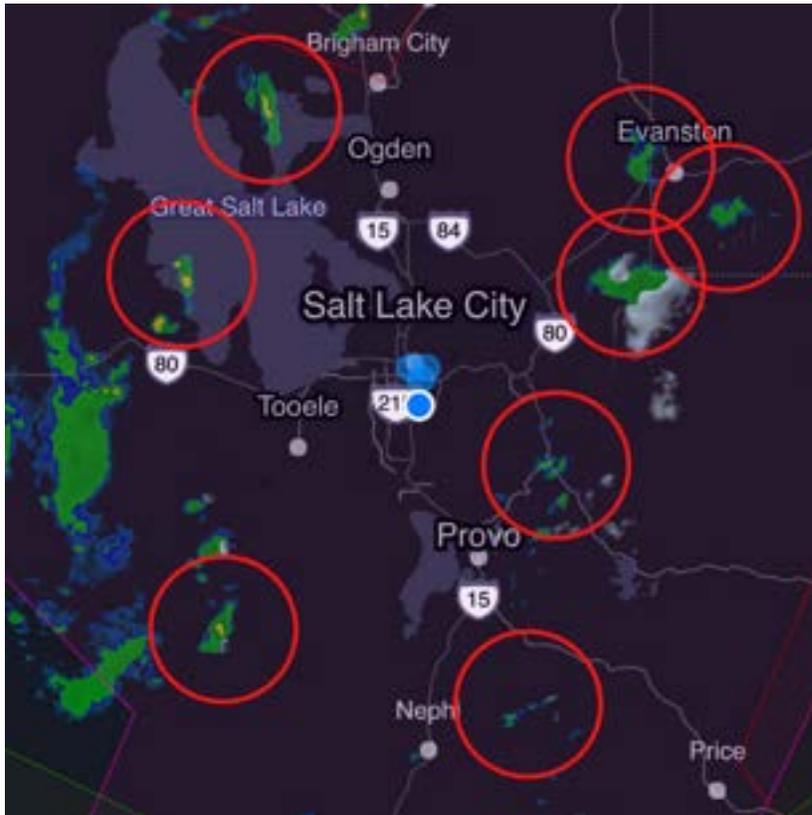
If you look at the diagram to the left, you will see a grey center circle with blue lines pointing in all directions away from it with a black outer ring. This is to show that gust fronts can be (not always) in all directions around a storm cell for up to 18 miles. There is no guarantee that it will be 18 miles or in all directions, but it can be.



To identify a possible storm cell the first thing you do is check radar activity to see if there is anything showing. As seen on the left, there is lots of radar activity in the area of the pilot, and as a result, the likelihood of gust fronts is high. A day like the one to the left should be avoided at all costs.

# Weather - Gust Fronts

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As pointed out, the green showing on the radar indicates storm cells. These storm cells are what produce gust front activity and for visual reference, below I paint a circle around them showing where the gust fronts might be.

It is best that you do not fly with any radar activity within 100 miles or even 200 if the storm is moving toward your location.

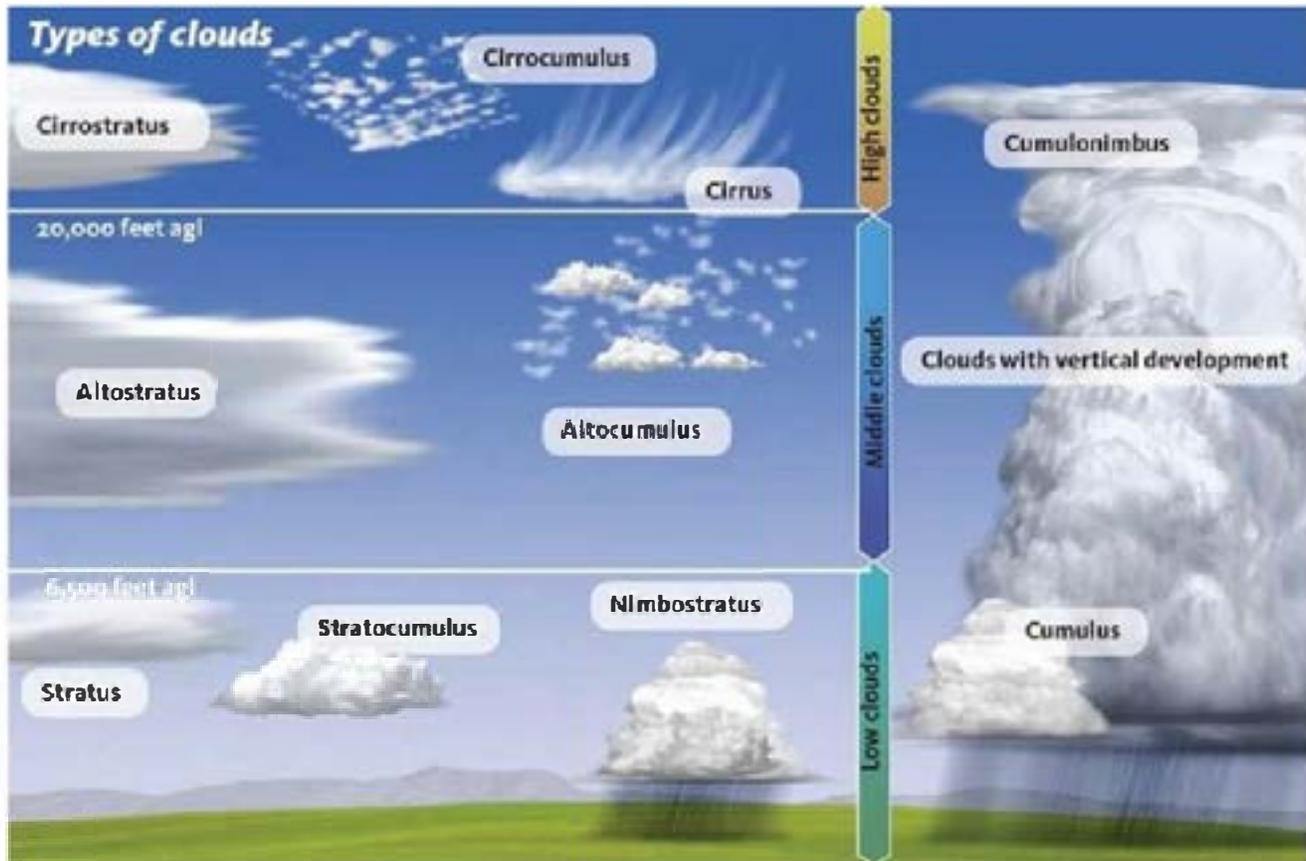
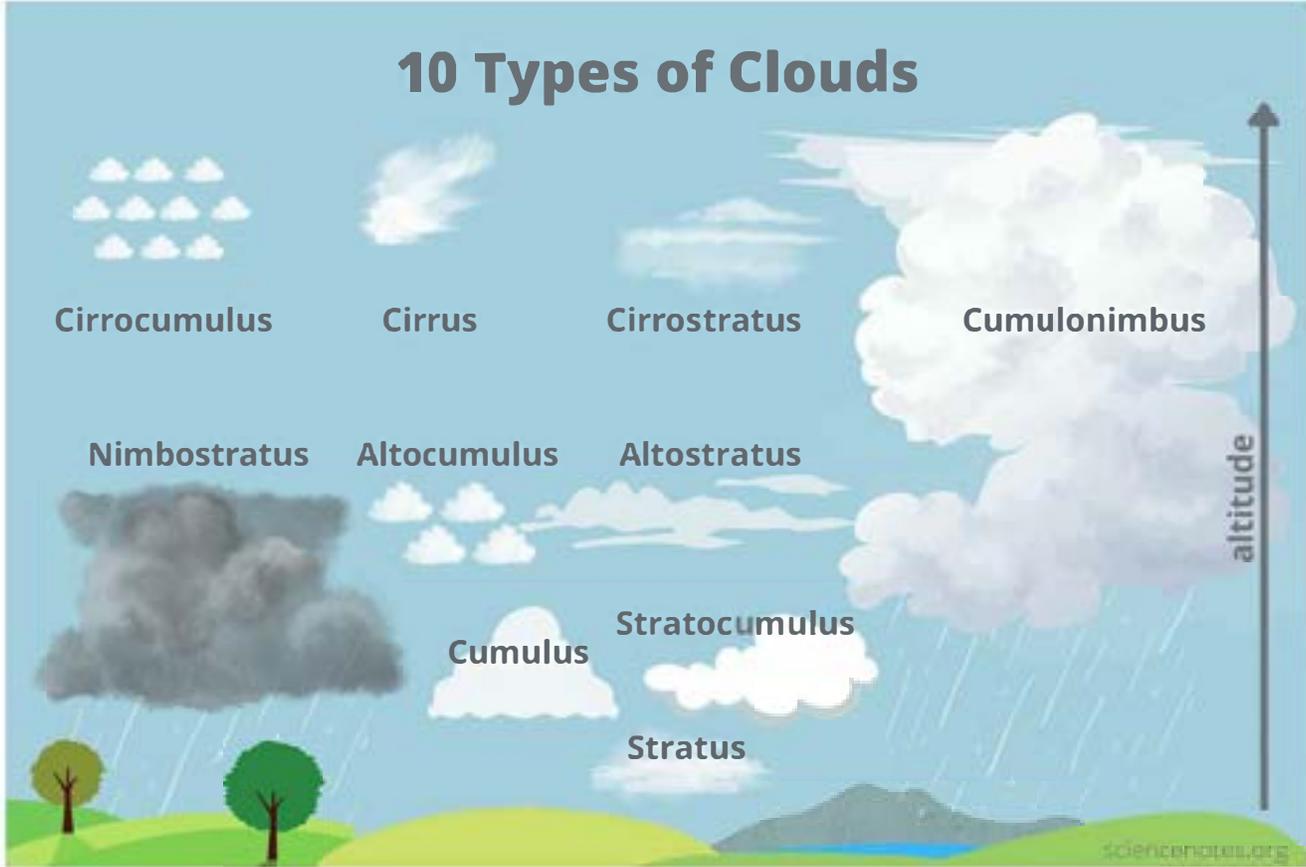


Not all cells that produce gust fronts are found on the radar activity and small storm cells can produce small gust fronts which are equally dangerous.

Clouds that can be dangerous are often dark, scary, thick, and tall. The height of the cloud is a key indicator that shows it is best to avoid flying. A tall cloud is often a very active cloud and best to be avoided.

Cumulonimbus clouds most commonly produce gust fronts.

# Cloud's



# Cloud's

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High Clouds = Cirrus

Above 18,000 feet

Cirrus  
Cirrostratus  
Cirrocumulus

Middle Clouds = Alto

6,500 feet to 18,000  
feet

Altostratus  
Alto cumulus

Low Clouds = Stratus

Up to 6,500 feet

Stratus  
Stratocumulus  
Nimbostratus

Clouds with vertical  
growth

Cumulus  
Cumulonimbus

# Cloud's

---



## Cumulus clouds:

The Cumulus clouds indicate thermic conditions are safe to fly around. They usually begin developing later in the morning as thermals begin rising.



## Cumulonimbus clouds:

The Cumulonimbus is the most dangerous cloud for aviation. They are the tall, thick, and explosion like clouds that commonly produce gust fronts and strong turbulence. They are best to be avoided.

# Other Cloud's

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Cirrus clouds



Cirrocumulus clouds



Cirrostratus clouds

# Other Cloud's

---



Altocumulus clouds



Altostratus clouds

# Other Cloud's

---



Stratus clouds:

Can bring fog and restrict visibility.



Stratocumulus clouds



Nimbostratus clouds:

The Nimbostratus clouds are what often bring rain and possible fronts. Best to avoid.

# Other Cloud's

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Mammatus clouds:

Stay out of the sky. DO NOT FLY.



Virga clouds:

Ultralights should stay out of the air or land when virga is observed.

# Wind

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Paragliders are very affected by wind. They are limited to only a certain amount of wind to be comfortable and to be safe.

## General rule:

15 mph at the beach

12 mph in the flat lands

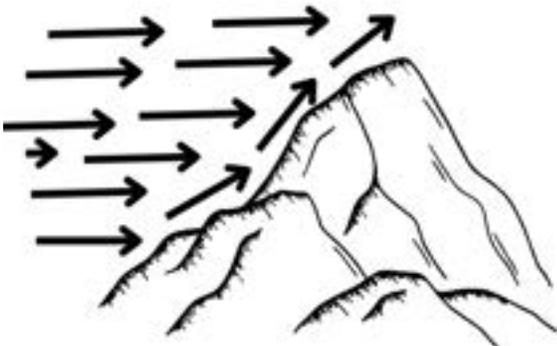
8 mph in the mountains



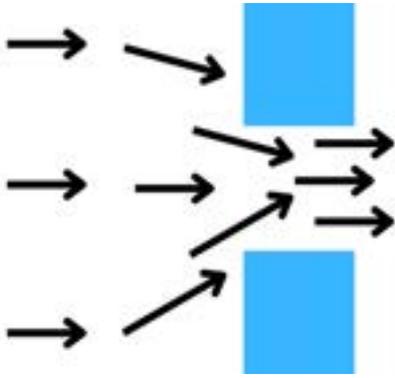
Paragliders are able to handle up to 30mph of wind but it's not safe to do so. These aircraft move between 25-50 mph and being in wind that strong is very unsafe.



Typically speaking, the stronger the wind is, the less smooth the wind is. At 8 mph inland it is rarely ever smooth air. At 15 mph at the beach, it is rarely smooth. It's possible, but not common.



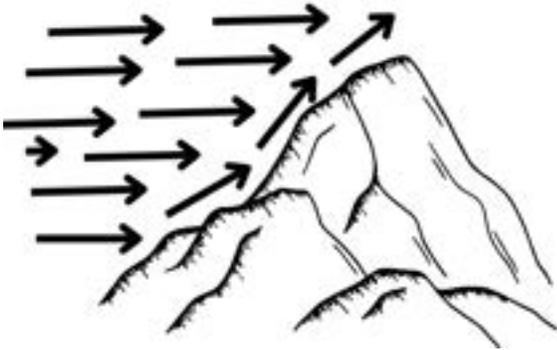
One thing to know is that as the wind blows up an object, it picks up in speed. The venturi effect starts to play a factor. If the wind is 5 mph at the base, it could be as high at 15 mph at the peak. If you plan to fly in the mountains, keep that in mind.



### **Venturi Effect:**

The Venturi effect is when air is forced together which results in an increase of speed.

Canyons, mountains, houses, trailers, cars, etc can all cause a venturi effect.



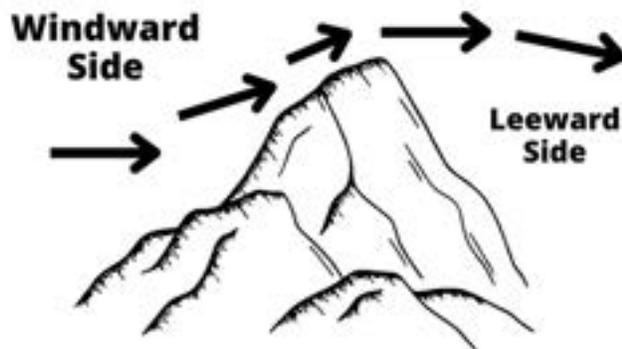
When air is forced together to flow through a smaller area, it will pick up in speed. This can happen horizontally and vertically.



### **Wind Shadow:**

The small area behind an object is protected from the wind. This can be a great place to setup.

# Rotor



Rotor is one of the most dangerous things for paramotor pilots. It can quickly cause your wing to collapse and if you are not prepared to control your wing, it could cause you to throw a reserve parachute and or crash.



Rotor can be found on the Lee side of objects like mountains, buildings, trailers, trees, bridges, etc. Any object that can block the flow of air will produce rotor.



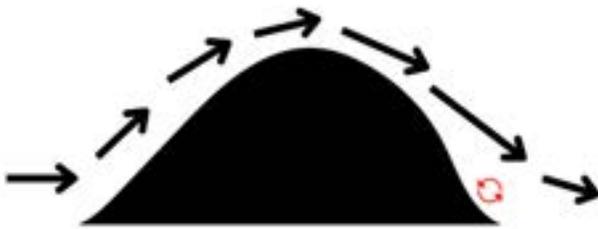
Wind and water move very similarly. If you think of what a rock does to the flow of a stream, it does the same to the flow of air.

Rotor will increase in intensity as the windspeed increases. Paragliders can handle rotor (uncomfortably) up to around 8-10 mph or wind. It is best to avoid it all together.

*Hypothetically* if there is no wind, there is no rotor.



The one tricky thing with rotor, is that the shape of the object which the wind is flowing around can change where and how the rotor is. If we look closely we can see that right at the edge of this cliff there is rotor. This is because the lip of the object is basically straight up which is changing how the air flows over it.



A more rounded object like a gentle hill could have no rotor because air can smoothly flow up and over the hill.



Rotor will slowly taper off the further you get from the mountain.



In the most basic way, avoid the lee side of ANY object. Keep an eye on the wind direction and don't put yourself in a situation where you may or may not be in the rotor.

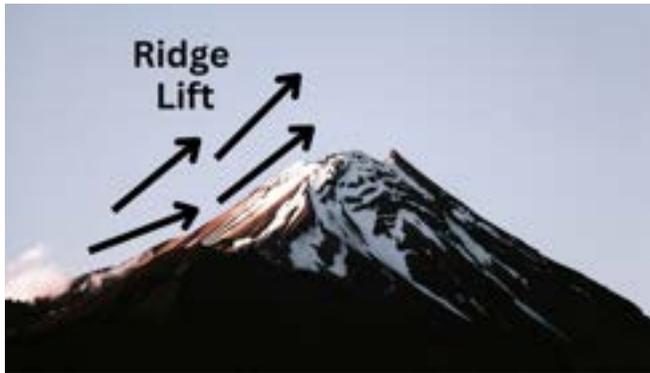
If you are not sure, turn around and fly to that location another day. Don't risk putting yourself in a dangerous situation.

# Rotor Examples

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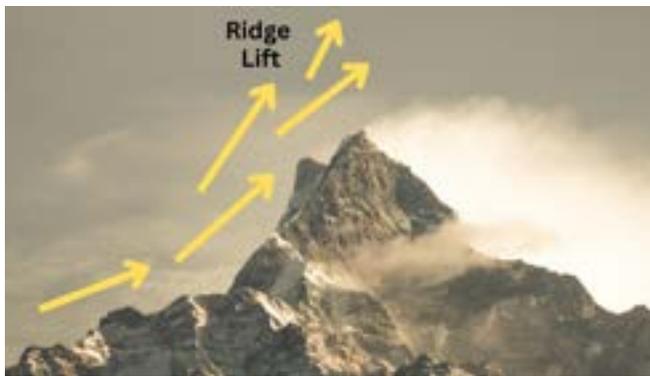
# Ridge Lift



Ridge lift is one of two main ways paraglider pilots stay up/fly. The upward wind caused by an object like a mountain or hill can be used to soar.

Although riding ridge lift is fairly safe, there are a few things you should know.

The first thing is that you want to stay as far away from the hill as possible. There is risk when ridge soaring that you might get pushed into the hill or over the hill. To avoid those two things it's best to stay as far away from the hill as possible.

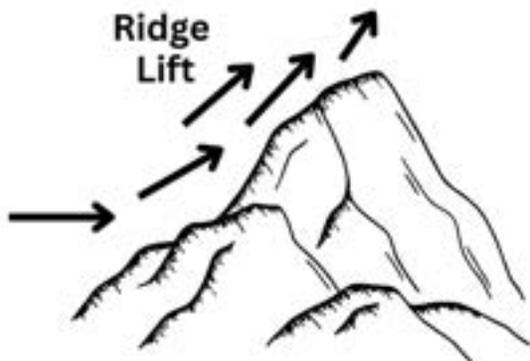


If you are getting enough lift to soar when 50 feet from the hill, then stay 50 feet from the hill. Don't get close unless you have to.

The second thing to look out for is high wind conditions. Ridge soaring can quickly turn dangerous if you are unable to penetrate the wing and are forced behind the hill.



If you are getting blown behind the hill with your paramotor, hit the throttle, gain some altitude, and stay facing into the wind. If the hill has some openings beside it then turn sideways and try and get away from the hill. If you are on a ridgeline, climb up a bit and try and fly behind the hill as far as possible.



You do not want to land directly behind the hill in the rotor. Try your best to find locations that are not effected by the rotor and land there.

The best thing to do is not to go ridge-soaring in higher wind conditions. If it's easy to stay up, you are probably in more wind than you should be.

# Thermals



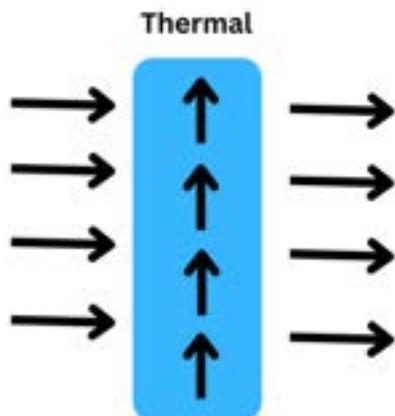
Thermals are a pocket of rising air. This is something that usually happens when the temperature increases and certain spots on the ground increase in temperature faster than other locations.



Thermals are one of the two main ways paraglider pilots stay up/fly. Riding thermals can be fun but you will experience bumps entering and exiting them.

It is safe to thermal when you have the skill and experience to handle them.

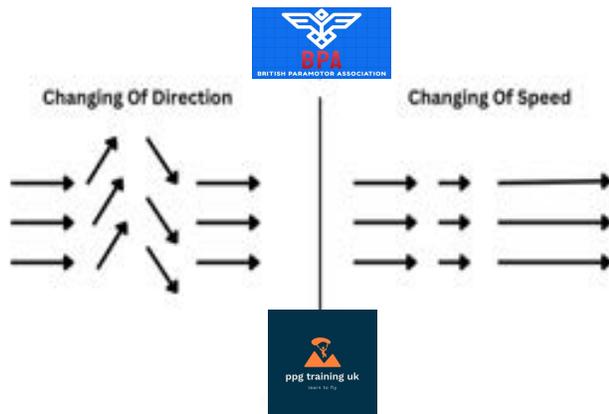
One of the main reasons paramotor pilots don't fly in the middle of the day is to avoid thermals. Not because we can't fly in them but because they are bumpy.



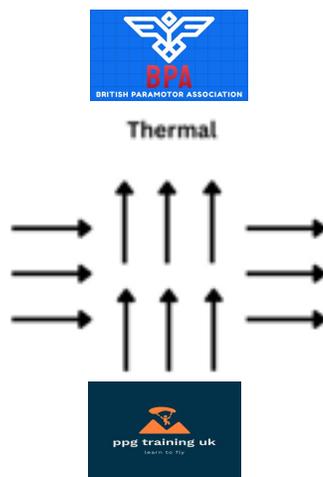
Thermals don't always rise vertically. They can rise sideways, slanted, and in many different directions.

Thermals can also produce rotor.

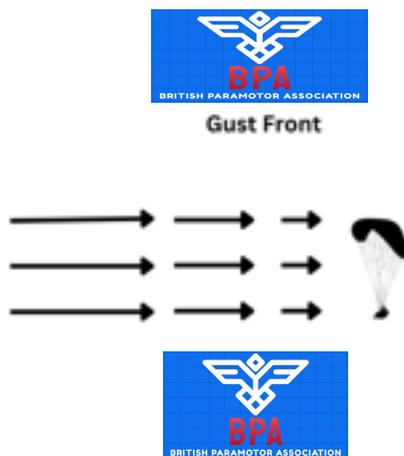
# Turbulence



Turbulence in the most basic form, is the air changing in direction or speed. This can be caused by a variety of things and often, the stronger the wind, the more turbulent it will be.



Example: Entering into a thermal and exiting a thermal is most likely going to be bumpy. This is because the wind/air is changing in direction and speed. Once in the thermal or out of the thermal where the air is consistent in direction and speed, it can be smooth.



Example: Being hit by a gust front can be very turbulent because the air is quickly changing in speed and possibly in direction. Once in the gust front, it can be smooth if the wind holds a consistent speed and direction.

# Turbulence

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Turbulence can be dangerous if the pilot isn't aware of what type of turbulence or how to handle the paraglider in that turbulence.

Types of turbulence:

- Thermals
- Sink
- Ridge lift
- Gust's
- Gust fronts
- Cloud suck
- Wind shear
- Rotor
- Wake
- and more



There are a bunch of different types of turbulence and it's important you know which ones are more dangerous than the others. Rotor is the most dangerous and the one to be most cautious of.



Worst case situations:

- Asymmetrical collapse
- Full frontal
- Cravat
- Stall
- Spin
- Parachutal stall

# Turbulence

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There are a few things you can do to become more comfortable in turbulence. Firstly, gaining a healthy knowledge about what it is and how it works. Understanding what is happening and why it's happening is the first real step. Once you do that, the second best thing you can do is learn to become a very good active pilot. This is the skill of keeping your glider loaded and above your head in turbulence. This skillset is best learned on the ground through kiting/ground handling. The feeling of the wing suddenly surging forward trying to collapse is the same on the ground as it is in the air.



Once you've learned that, it's also best to take an SIV clinic where you'll practice all the worst-case situations in a safe environment and practice recovering from them.



Turbulence is something you will encounter as you fly more and more. It's something you will experience as you fly in more dynamic and rougher conditions.

# Lake Effect

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A lake can create very smooth and fun flying conditions. Since water is perfectly flat and heats up at the same rate, very rarely will you have rough conditions over the water.



In addition to that, the ocean can create the most smooth and fun all-day flying conditions. The consistent and uninterrupted wind from the ocean can be smooth all day long.



Beach flying is very different from inland flying because of the smooth wind / conditions from the ocean.



# Preflight Checklist

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- Cage connections
- Cage netting
- Netting fasteners
- Prop tips
- Prop leading edge
- Prop bolts
- Airbox clamp
- Airbox rubber boot
- Airbox strap
- Exhaust silencer bolts
- Exhaust silencer brackets
- Exhaust cracks
- Exhaust springs
- Exhaust gaskets
- Spark plug torque
- Spark plug end cap
- Head bolts
- Carb check for fuel leaks
- Carb throttle return spring
- Throttle cable tension
- Throttle cable clamp
- Ignition coil wiring
- Starter cord tension
- Fuel line hand run
- Fuel line connections
- Gas
- Gas tank cap
- Gas tank breather tube
- Throttle kill switch
- Throttle cable feel / check
- Harness attachments high, mid, and low
- Harness overall condition
- Hook-in points
- Carabiner wear and tear
- Carabiner backup strap
- Reserve check
- Reserve bridal check

## Additional Checklist

- Weather
- Radio
- Runway
- Airspace
- Pilot
- Pocket
- Flight path

# Cage Awareness

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Cage awareness is something you need to take very seriously. Hitting someone or something with your cage can cause serious injuries and damage to people or property. I've heard stories of people getting their teeth knocked out because someone hit them in the mouth with a cage without even knowing it. I've watched students run into their truck and scratch and dent it because of it.

It's important that you constantly remind yourself that you are now 5 feet wider and 2 feet taller than you are used to. You do not want to find yourself hitting someone or something. Remind yourself that the cage can hurt someone.

# Prop Awareness

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Prop awareness is a much bigger deal than cage awareness. It's usually not the pilot that gets hit with a prop. It's usually the wife, kids, or friend who tries to help the pilot, or the unaware pilot who puts them in harm's way with a prop. It's the pilot's job to educate and keep others away from the prop. It's important to never put others at risk of being hit with a prop.

NEVER start a paramotor without clearing behind and around you. NEVER start a paramotor when you are near somebody or something that you are not willing to hit with a spinning samurai sword (prop). NEVER walk in a way that puts a prop near someone or something. NEVER put yourself or others in a situation where the prop can hurt you or someone else. NEVER ground start. Carelessness with the prop will lead to injury. Treat it with respect.

# Motor Out Awareness

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As paramotor pilots, we constantly need to fly as if our motor is going to die at any time. Here are a few things to keep in mind.

## **Never fly low downwind:**

If your motor dies as you are flying low downwind, you will be landing downwind which puts you at risk of falling and getting hurt. Always fly with enough altitude that if your motor dies you can turn into the wind and land safely.



## **Never fly low over water:**

If your motor dies and you are low over the water, your only option is to land in the water. This is very risky for paramotor pilots and is best to avoid it as much as possible.

## **Landing site in mind:**

Always fly with a landing site picked out in the back of your mind. At any point, if your motor dies you should know exactly where you are going to land. Always have an LZ in mind. Don't fly somewhere if there is no safe place to land.



# Flying Risk's

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## **5-15 foot danger zone:**

It is best to avoid flying between 5 and 15 feet. If your motor dies at that altitude you will dive into the ground and the landing will be rough. At 5 feet you can flare immediately and land safely. At 15 feet your wing will round out and you will land softly.

## **Never force a turn:**

Never force a paraglider to do anything. If it's not wanting to turn, don't force it. If you try to force a wing to do anything you could stall or spin the wing.



## **Altitude is your friend:**

When you are new you want to give yourself and much altitude as possible. The more altitude you have the more time you have to work out any unexpected issues.



## **Water:**

Water can be very dangerous. The risk of drowning is real and you want to avoid it if at all possible. Moving water is even more dangerous.



### **Low flying:**

Flying low is super fun and is probably one of the main reasons you got into flying. It's ok to fly low, but work your way into it. Things happen much quicker when you are low to the ground and every mistake you make will be amplified and can cause you to crash. Give yourself altitude when you are new. Low acro is one of the most common reasons for crashes and injuries.



### **Ground starting:**

NEVER start your paramotor on the ground. This puts you at risk of a prop strike and is not necessary. Always start the paramotor on your back.



### **Cameras & crowds:**

Everyone is a sucker for people watching and or filming. Once a camera or crowd comes out you will start flying differently and this can and will cause you to crash. Always fly at 50% or less when a crowd or camera comes out. Things change when people are watching.



### **Pushing limits:**

We all want to push limits and improve as pilots. There is a time and a place to push limits and learn new things. Take your time, build some experience, and don't push yourself too quickly. Many people have been hurt from trying to fly in a way they are NOT ready for.

### **3 Problem rule:**

If you go out to fly and 3 things go wrong, don't fly. Never force flying if something is not quite right. If you are feeling off maybe it's best to just sit out that evening of flying.



### **Self-managing:**

Always ask yourself how you are performing. Are you pushing limits you shouldn't? Are you doing things you shouldn't? Are you flying in ways you are not ready for?



### **Discipline:**

It pays off big time to be disciplined in aviation. Take your time, say no, and progress in the safest way possible.

# Intermediate Syndrome



Intermediate syndrome is something we all will battle with. This is a phase most everyone enters as they start feeling like they "got it." This is usually when pilots start pushing limits they shouldn't.

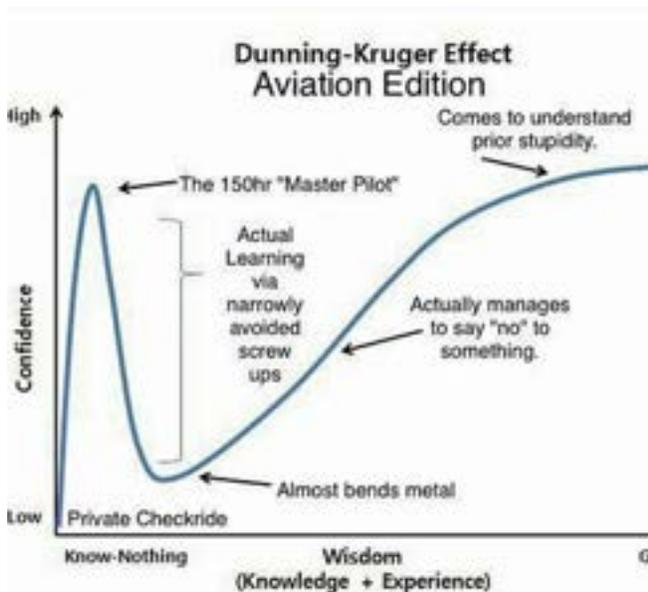
This is when pilots start flying in ways they are not ready for.

This is when you start feeling invincible.

This phase is super important to identify early and manage as best you can.

This is when it's important that you have discipline and hold yourself back from doing things you shouldn't do before you crash and get yourself hurt.

Personally - I have almost crashed a few separate times because of this. I thought I was invincible. I thought I could do it all without problems.



# Oscillation

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Oscillation is the natural rocking back and forth that most paragliders do. It is important that paramotor and paraglider pilots learn to manage and control oscillation.

It is dangerous when you are 5 feet off the ground.



Oscillation is dangerous on takeoff and on landing.

## How to control it:

Let's say the wing is rocking to your left, well as it comes above you tap gentle left brake. Do not pull the opposite side brake. Pull the side it is coming from as it reaches to top to stop it from going to the other side.

## Drill/practice:

Find a road, path, railroad, or any other thing to follow along the ground and follow it at 50 feet. This will force you to keep oscillation under control.



# Energy

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Energy can be very dangerous if you don't know how it's built, how to use it, and how to burn it.



Anytime you increase the airflow into the wing, you increase the energy. This energy can be used to do very fun maneuvers, pull G-forces, and scare you.



Diving, turning sharply, and spiraling are all ways energy can be built. Anything where you are increasing the airflow/speed of you and your wing.

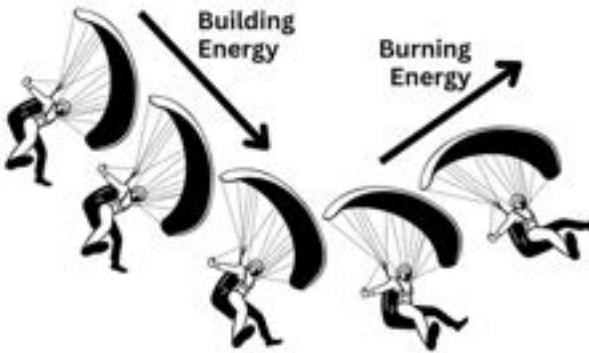
It is best when you are new that you avoid building too much energy as it can be dangerous if you do not know how to burn it off.

There are two main ways to burn off energy.



### **A slow turn:**

Let's say you did a few light wingovers and now you have a lot of extra energy. You can slowly burn it off by turning and gradually slowing down the turn until you are flying straight and level. This is the safest way of burning energy.



### **Exit straight up:**

If you build a lot of energy and start to pendulum upward, make sure you have no brake and no throttle. Wait until the wing starts to dive again and check the surge with a fair amount of both brakes. It's important when you exit straight up that you are going straight, and not slightly sideways.

**IMPORTANT** - Avoid self-teaching yourself maneuvers and avoid building energy until you've learned to manage it properly. It can and will get dangerous if you are not trained properly.

# Kiting

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Kiting / ground handling / glider control is the practice of keeping the glider under control while on the ground. There are many different ways and techniques to do so. It's difficult to effectively teach it through writing, so think of this more as a review.



## **Forward kiting:**

Forward kiting is when you are facing the same direction the wing is facing. This is how you will be orientated while flying.



## **Reverse kiting:**

This is where you are physically facing the wing and is most commonly used when launching and landing a wing in wind.

## **Hand kiting:**

This technique is where you are not actually attached to the paraglider but instead are holding onto the risers.



There are 3 main inputs used when kiting a paraglider.

1. Brakes
2. Weight shift
3. Walking



### **Brakes:**

The brake toggles are usually held by your hands and are used to control the wing. These change what the wing is doing by producing drag and slowing one side of the wing down.



### **Weight Shift:**

Weight shifting is the raising and lowering of one riser over the other. This essentially lifts one half of the wing and lowers the other half of the wing.

### **Walking:**

Think of this as if you are balancing something on your hand. As you move around you add loading and reduce loading on the wing.



## Brakes

### Reverse kiting:

When reverse kiting with the brake toggles everything is backward. As the wing falls to your right, you will pull your right brake and raise your left brake. As you apply one brake you always need to ease up on the other brake.

Falls right - pull right

Falls left - pull left



### Forward kiting:

While forward kiting brake toggles are "correct" in your mind. As the wing falls to your left you will pull right brake and ease up with your left brake.

Falls right - pull left

Falls left - pull right





## Weight- Shift

### Reverse kiting:

There is two different ways of weight shifting while reverse kiting. There's leaning, and there's turning. And if you lean when you need to turn and turn when you need to lean, they don't do anything. As the wing falls right, you will lean right. To do so your butt will pop out left and your chest will come down right.

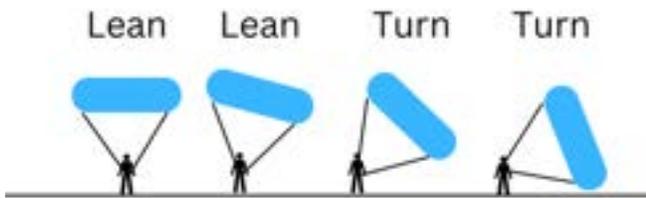
Falls right - lean right  
Falls left - lean left

### Forward kiting:

Although it is possible to weight shift while forward kiting, more often than not you won't do much of it.

Falls right - lean left  
Falls left - lean right





## Weight- Shift Continued...

### Leaning:

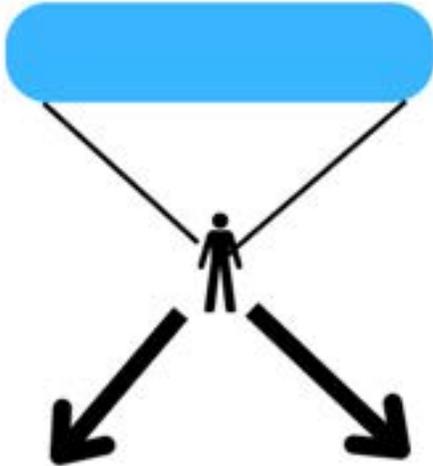
Anytime the wing is "above" you, leaning is effective. This is when you have to physically look up at the wing not forward at the wing. Leaning is a 3 step process. Hip pops, feet pivot and the chest comes down.

### Turning:

You will turn anytime the wing is "infront" of you. That anytime the wing is not above your head, you turn. During inflation and deflation when the wing is infront of you, turn. When the wingtips come down near the ground and the wing is not "infront" of you, turn.

Falls right - turn right  
Falls left - turn left

## Walking

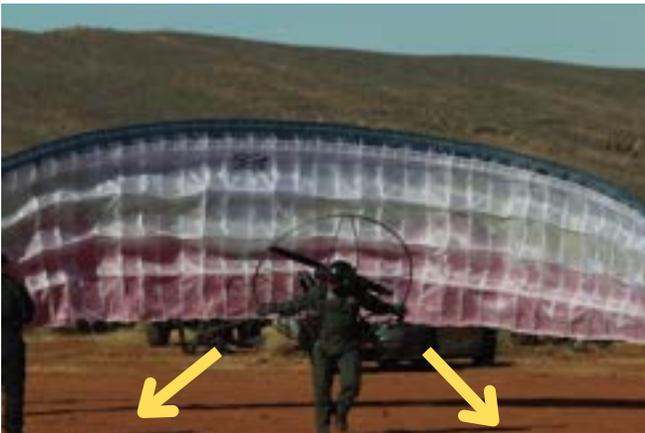


### Reverse kiting:

As the wing starts to fall to the right, you will walk right and into the wind at a 45 degree angle (see diagram). You do not want to back away from the wing for this will cause it to come down. You don't want to go directly under the wing for the lines will then go slack causing a collapse.

### Forward kiting:

With forward kiting it's equally important to walk under the wind and into the wind. It's important not to overwalk causing the wing to dove off the other direction.



## Other Things



### **Do as little as possible:**

The key to kiting is to be as smooth, slow, and lazy as possible. You want to do as little as you possibly can. The wing likes to respond to the energy you give it - meaning if you are running all over the place, it's probably moving all over the place. Try to relax, slow down, take some deep breaths, and be smooth.

### **Order of importance:**

This varies depending on wind speed and what wing you are on.



Perfect conditions

1. Brakes
2. Weight Shift
3. Walk

Light conditions:

1. Weight Shift
2. Walk
3. Brakes

Strong conditions:

1. Weight Shift
2. Brakes
3. Walk

# Forward Launches

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Forward launches are the most common way you will launch your paramotor. This is where you will hook in facing away from your wing and you'll run forward inflating the glider. This is the technique you will use when the wind is too light to reverse launch.



There are a few tricks to forward launches.

## **The setup:**

How you lay your wing out is one of the most important parts. You want to make sure of a few things. Firstly, you want to make sure your wing is facing directly into the wind. Secondly, you want to make sure your wing is laid out as open and cleanly as possible. Third you want to make sure you set the risers down directly in the center so when you are hooked in you are ready to go.



### **The Inflation:**

There are a few things that will make you successful on inflation. Firstly, it's important that you run in the direction your wing is facing, even if the wind is in another direction.

Once it starts inflating it's important that you run under it and keep yourself running the same direction it is moving. It's also important that you do not press the A's forward or pull on the A's. You are simply lifting the glider to the sky with the A's.



### **The Taxi:**

Once the wing is up it's important that you keep forward momentum and gentle brakes. It's common for people to stall or spin their wings because they use too much brake without realizing it.

# Launching Steps

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There are a few steps you want to follow for a smooth and quick launch. It can be important from time to time that you can launch quickly as the wind can change direction.



1. Check airspace
2. Walk the runway
3. Pick a stopping point
4. Preflight motor
5. Gear up (helmet, etc)
6. Layout wing
7. Pocket check
8. Strap into motor
9. Start motor up
10. Hook into wing
11. Grab controls
12. Run motor up
13. Check air above and around you
14. Launch
15. Climb out straight
16. Check lines and risers for a twist
17. Check reserve

# Peer Pressure

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Since we were kids we've been told to not give into peer pressure. I'm not your parent, but I will tell you if there is one place where you should resist peer pressure, aviation is that place. Too many times I've watched pilots go up and hurt themselves because they fall victim to peer pressure. This is especially true at large gatherings like Fly-In's or group flights.



There becomes this whole "he did it so can I" mentality as well as this "I need to show how cool I am" mentality. This usually is a subconscious thing and is nothing new to paramotors.

Now the reason I'm talking about this is because like I said, if there is one place where you need to resist giving into peer pressure, this is it.



Just because your buddies are throwing acro low, doesn't mean you need to.

Just because your buddy is flying in conditions you wouldn't normally fly in, doesn't mean you need to.

The better pilot is not always the pilot who is flying. The better pilot is the pilot who can make the good judgment calls, the pilot who can say no, the pilot who can keep themselves in line, and the pilot who self-manages.

# What To Strive For

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One thing I've seen in this sport over the last 10 years that I don't agree with is that we view the pilot who fly the most crazy, do the most intense acro, and throw down the hardest as being the "best" pilots. We see them as the pilots we want to become or grow into or fly like.



Sometimes those pilots are great pilots, but the really good pilots are the ones you never see doing that stuff. The pilots with decades of experience who really know what they are doing, are usually the ones who fly calm when others are flying crazy.



The really good pilots know how to keep themselves in line, self-manage themselves, and stop themselves. The pilots who have discipline and know when to push limits and not to push limits are the pilots we should strive to be.

By no means should you not go out and have fun. But you should learn when to, how to, and most importantly, when not to. There's clearly a time and a place where you can push limits and it's about learning when that is and when that isn't that will keep you safe.

I'm sure you've heard the saying "there are old pilots and bold pilots but no old bold pilots."

I disagree. There are old bold pilots who know when to and not to be bold. They know how to safely be bold and how to stop themselves.

# Self Management

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In paramotors it can be life or death to learn how to self-manage. It's critical you learn how to identify how your performing and what's changing your performance. It's important you learn how to keep yourself under control and stop yourself before it's too late.

I'll give you an example of what I do.



Every time I go flying I am constantly paying attention to my performance. I'm watching to see if how I'm flying is normal or if my performance is slightly off. Some days I go out and I'm just pulling way too much brake when I shouldn't, can't get timing right, or totally mess something up. As soon as I notice my performance is slightly off, I change how I fly. I calm down. I relax. I fly at 30% of my normal. I do not push any limits and I fly in a way to keep myself safe.



Sometimes I go out to fly and I have a buddy there who's watching and just because he is watching, I start to fly a little harder than normal. I go into a wingover and realize that I'm just messing up the timing, energy, and have to chill or I'm going to really screw something up. Once I notice this, I stop what I'm doing and fly in a very calm way.

This is extremely difficult but it's kept me from crashing more times than I can count. Manage yourself, monitor yourself, and stop yourself when you need to.

# Let The EGO Go.

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Ego... We all have it whether we are willing to admit it or not. In aviation, ego can and will kill if you do not keep it under check.

Ego is what has led me to do things I wouldn't normally do.

Ego is one of the main reasons I've broken equipment.



Ego is one of the main reasons for all of my crashes.

Ego is dangerous.

I suggest and personally work to keep my ego in check as much as possible. I refuse to EVER let myself fly if I realize I'm going up to please my ego. I refuse to do something if I realize it's rooted in ego.



You can be a great pilot and not have a massive ego. You can do cool things and not have a massive ego.

You have to manage and pay attention to your ego.

If you don't keep your ego in check, the universe will check it for you, and let me tell you, that's no fun.

# Fly-In Guide

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Paramotor Fly-In's are some of the most fun events you will go to! 50-100 of your buddies all getting together in the same place to do the one thing you all share in common - fly!

As fun as it is, and trust me it's a lot of fun, there are surely some risk's and thing you need to change.



For starters, fly-in's quickly become a "he did it so I too will do it" kind of thing.

It's important that you remind yourself and remember that it's NOT about showing how great you are to everyone else. You do NOT need to prove yourself to your buddies and surly not to everyone else.



Again, YOU DON'T NEED TO SHOW HOW GREAT YOU ARE.

The key at fly-in's is to try and fly like an old guy. Smooth takeoffs, calm flying, and smooth landings. Fly at 50% or less of what you normally do.

Once you get up and away from everyone else you can go about doing your normal flying stuff, but when your near the crowd, you have to calm down.

Relax, calm down, and enjoy the fly-in as safely as possible.

# Range Anxiety

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Range anxiety is definitely a thing you will face with paramotors. Here are a few things you can do to comfortably fly further on less fuel.

The reason we get anxious is because we don't know how much fuel we have left and how long we have left before we run out.



The solution is actually simple - know how much fuel you took off with, know what time you took off, and know what time it is now.

If you know you burn around 5-7 liters per hour and took off with 14 liters then you know you have 2 hours of flight time. 20 minutes in the air can easily feel like 2 hours so it's equally important to know what time you took off and what time it is now. Glance at your phone a few minutes before or after you take off as a reference that way you know about how long you've been airborne.



If you have 2 hours of fuel and it's only been 25 minutes, you know you are nowhere near out of fuel.

Now it's also a good idea to check how much fuel you have left while in flight and not just rely on the assumption that you will burn x amount per hour. There are a lot of variables that go into your burn rate and things can be very different from flight to flight.

# Fuel Burn Guide

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There are a handful of factors that play into how much fuel you burn, but here is a rough guide on how it works.

Here are the variables that play an effect:

1. Motor you have
2. Motor tuning
3. Glider you have
4. Glider size-to-weight ratio
5. Prop size and prop itself
6. Any prop damages
7. The altitude you are flying at
8. Density altitude that day
9. Cruising vs climbing
10. Trim setting
11. And so on...



As you can see, there are a lot of things that will change your fuel burn.

The most important factors that we will focus on is the altitude you fly at and what kind of flying you do. The largest factor is going to be what RPM you spend most of your time at during the flight. You will burn significantly more fuel climbing over 10,000 foot mountains for an hour than you will cruising down a beach.



The most important thing you can do when trying to be as efficient as possible is to try and keep your motor RPM's down as much as possible. Keep them low, cruise as much as possible, and avoid trying to climb over anything you don't have to. If you have to go over a mountain in the distance gradually climb you way up there and again, use as little throttle as possible.

# Fuel Burn Guide

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The second thing that makes a big difference is the altitude you are flying at. You will burn quite a bit more fuel at 7,000 feet than you will at 7 feet. This is important to keep in mind if you are planning an XC flight where your changing altitude or if you are flying in a new location at a different altitude.

For example, I burn 2-3 liters more in fuel when I'm in Utah than I am at the beach.



The next thing that does make a big difference is the motor you fly. Every motor is going to burn fuel differently so it will be important to learn what your average LPH (liter per hour) burn rate is.

The one thing people also don't tend to think about is how the motor is tuned. If your motor is running rich it will burn more fuel than if it's running lean.



The next factor is the wing and this changes in a few ways. The first thing is that some wings are more efficient than other wings. More efficient wings will allow you to cruise at lower RPM's which will bring down your LPH burn rate. The other contributing factor that people usually don't take into account is the size of the wing. You want to make sure you are flying within the weight range of the wing to ensure you are getting the best performance of the wing. The heavier you are on the wing the less efficient it will be.

As I'm sure you are seeing, everything makes a difference. The little stuff like props don't make nearly as big of a difference.

# How To Progress

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Once you leave training you will quickly realize that there is so much more to learn. The next question is how do you safely progress and become a better pilot at home. I regularly get asked "what drills can I do to get better" and although seat time and seat time alone will help you progress, here are a few things you can do to improve.



**Follow A Path** - One of the first skills you really need to master is oscillation control. Being able to track in a straight line as well as following a straight path and curved path is a test of your ability to control oscillation. Find a path, road, railroad, creek, etc that you can follow and start following it at 50 feet. Once you can track comfortably at 50 feet without falling "off" the path then bring it down to 25 feet. Once you can comfortably keep yourself in the path without dropping altitude, gaining altitude, or falling off the path side to side, then bring it down to 10 feet. Again, once you can stay on the path without gaining altitude, losing altitude, or swaying off the path side to side, bring it down to 5 feet. Once you can do 5 feet, bring it down to the ground, get out of the seat, and foot-drag the ground. Learning to foot-drag is not just a sweet maneuver that is insanely fun, it requires a lot of skill. You need to be able to keep yourself tracking straight without gaining altitude or losing altitude. Once you've mastered a straight line foot-drag, turn slightly from left to right and start making it more difficult.



**WARNING** - It is best to foot-drag safe surfaces where if you mess up you can just slide into the ground and relaunch. It's best to foot-drag smooth surfaces and to avoid water until you've mastered control.

# How To Progress

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**Barrel "racing" practice** - The next very important skill to learn is energy management. There are a few things to energy management, and the first one is swaying back and forth. It's important that you learn how your wing dives, carries energy, and maneuvers with energy. The first thing I like to have people do is find somewhere (or create) a small obstacle course for them to fly through. Find trees that are 50-100 feet apart and at around 50 feet or so, fly around one and back around the other. Change up the pattern, do full circles, and slowly learn to fly around these objects without gaining or losing altitude and while keeping oscillation under control. Imagine you are barrel racing and you've got to go left around that tree (or obstacle) and right around that one, and do a full circle around that one, and back to the other one. It's important to do this for a while with as little throttle as possible. As you start to get better and better bring yourself lower and lower to the obstacles until you are very low and close to them. Once you have gotten consistent control with as little throttle as possible, climb up to 50 feet again, and add additional throttle. The additional throttle will add new energy that you will have to learn to control. Continue this until you are at full throttle.

**NOW** - it's super important you do this at 50 feet or higher until you start to get the hang of it. You want to give yourself A LOT of room for error because you will mess things up and you want to have enough altitude to recover from the mistake.

**WARNING** - playing low to the ground like this is dangerous and it's suggested you keep yourself at LEAST 10-20 feet off the ground. This is considered "low acro" and is the leading cause of injury and death in paramotoring. This guide is not to encourage you to do it but instead to help you safely do so if you are already planning or doing so.

# Physical Energy

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Your physical energy is going to affect your performance more than you might think. Being tired can lead to you kiting worse, flying worse, and making mistakes you otherwise would not make. I've watched pilots do things they would normally never do, just because they were tired.



It's important that you are self-managing your energy level and be willing to say no, sit down, and rest. There is no rush to fly. Not during training or after training. This sport will be something you do for a long time, let's remember that and focus on being safe and having fun instead of pushing ourselves to our breaking point.



During our training program, we work hard to help manage our student's energy level. I'd rather a student leave with 5 less flights but every flight was great. It's OK to take some time to sit down, drink some water, and relax.

# Reserves

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Reserves are something we believe everyone should have. It's a "get out of jail free" card. To us, it's cheap insurance that if everything else fails/goes wrong, you'll still be ok. Reserves are something you should be excited about and grateful to have. They add some weight and cost some money, but if you ever find yourself needing one you'll be glad you had one.



Now the mindset around the reserve and when you use it is important. So first let's talk about the mindset.

You should be **EXCITED** to see your reserve and to use your reserve. If you ever find yourself in a situation where you need it, be excited for it. Don't dread the walk or swim. Don't worry about any of that stuff. Focus on getting the reserve out and being excited to use it and see it. Gear is cheaper than hospital bills, be willing to use the reserve.



Too many times I've seen people be hesitant to use the reserve because they didn't want to walk or get wet. That hesitation delays the deployment and sometimes seconds is all you have. Reserves have been known to work as low as 60 feet AGL. However, at 60 feet, you don't have any time to waste.

Now when would you need the reserve.

A reserve can be needed in a handful of situations. Generally speaking, you want to use the reserve when your primary wing is no longer flying correctly or flying at all.

Some examples of that would be - you and your buddy are flying and get tangled up together. This would make keeping your wing under control and flying correctly difficult. A reserve toss would ensure both you and your buddy make it to the ground safely.

# Reserves

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Some other examples would be - say you are flying in some borderline conditions and get caught in some nasty turbulence that causes your wing to collapse and tangle up in itself. Now your wing is no longer flying like it should and it would be better to throw your reserve.

Another example would be - say you are doing some acro maneuvers and end up going light on the wing and falling through some lines. Your wing is no longer flying correctly, a reserve toss would be smart.



Now a good thing to repeat to yourself is "when in doubt, chuck it out." If you are in a situation that is going south and you are not sure, get the reserve out. The only exception to this is if you have a lot of altitude. If you have lots of altitude it's ok to try and work things out before throwing your reserve.



Now there is one situation in particular that is important to talk about. If you EVER get into a spiral that is uncontrolled, immediately throw your reserve. Say you take a collapse and the wing starts spinning downward building up G-Forces, THROW. Say you do some acro and spin up in the lines causing you to spiral, THROW. Do not try to work out a spiral if the G-forces are starting to build. A straight-down spiral can build G-forces very quickly and it can go from manageable to passing out within seconds. If you start spiraling down, THROW.

Now let's talk about how you throw your reserve. One thing you should do on a regular basis until it's muscle memory is to reach for the reserve. You want to know exactly where it is before you ever need it. You don't want to find yourself reaching for it and not being able to find it in a time of need. Learn where it is and practice reaching for it. I reach for it and practice every flight, just to build up that reflex of reaching for it.

# Reserves

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Now when it is throw time, reach for the handle, grab firmly, pull side to side until you get it out, and then toss out away and behind you. Get it out, and get it out. You don't want to half throw it by pulling it halfway out of the bag and thinking it's out. Grab, pull, confirm, and release.

Once you have gotten your reserve out it's important that you disable the main glider. Grab the brakes and wrap them up in your hands until you've reached the fabric. You do not want the main wing to be producing any lift at all. Get it disabled and out of the sky. If the main glider and reserve are both flying they will pull against each other putting you into a straight-down spiral between the two wings. It's not good.

Another few important things to touch on.

Have your reserve repacked every spring right before flying season starts. Get it out, send it in, and get it repacked by a professional. When you do this, **MAKE SURE IT GET'S BACK ON YOUR PARAMOTOR.**



Quick story - I recently got a new reserve and didn't install it that day. I went for a quick flight that night and got hit with some of the roughest air I've ever been in. Fought off several massive collapses and thankfully landed safely. The first thing that cross my mind when I got hit with the bumps was "That reserve is doing a lot of good for me right now sitting in the back seat of my truck."

Don't get caught in a situation you need a reserve, without the reserve. Get it **ON AND KEEP IT ON.**

The last thing to talk about with reserves is to make sure that you undo and redo any velcro coverings. Might not make sense when reading this, but next time you are in front of your paramotor follow the bridals from the reserve to their attachment points and undo and redo any velcro you cross. Velcro gets more and more difficult to undo when it sits. You don't want to come down hanging sideways.



# High Wind



As the wind picks up the room for error goes down. More wind means the wing will drag you around more and you are at a greater risk of getting drug on your face. It's super important that you keep the wing under perfect control in high wind because things can get dynamic quickly. This is another reason we are such strong advocates for kiting and ground handling skills. The better control you have, the less risk you have.

## What classifies as "high winds"?

High wind is a loose term that changes from one person to another person, so allow me to define what I mean. To me, high wind starts after around 10 mph. High wind is where you pass that threshold where the wing will not stay on the ground when you try to disable it. This is when you cross from light/mid wind where if you disable the wing it stays on the ground, to high wind where the wing is constantly trying to fly.



## How to disable your wing in high winds:

There are several good ways to disable your wing and a few not-so-good ways, so let's talk about them.

1. Brake stall - this is where you wrap up the brakes in your hand and stall the wing as hard as you can. This is effective and works well, but be aware that when you apply the brakes to pull the wing down that you will produce lift and get drug/lifted off the ground. This can work well if you have room downwind of you to get drug or lifted. This is not my go-to and there are better ways. Once disabled walk cross wind to the wing and quickly wrap it up into a mushroom/ball and walk it back.
2. Flip the wing upside-down - This method is simple, you pull one brake until the wing is upside down and then you release all the brake and allow the wing to slam itself into the ground. When the wing is upside down it will be trying to fly into the ground which doesn't produce lift or drag. This can be damaging to your wing and be aware that you can be drug sideways as the wing is flipping upside down. This is best if you ever find yourself with the wing already on it's way to being upside down. Let it flip then do nothing. Pulling brake with the wing upside down will produce lift on the wing and continue to drag you. Drop everything and stare at the wing. Once it is upside down you can grab the Stabilo line and reel it in until you get fabric.



# High Wind



3. Pull your D-risers - this is one of the most tame and easy ways to disable your glider without being drug or lifted. You simply grab your D risers (rear set of lines) and pull them down. This kills the wing without producing any lift. Once you've pulled it down, transition to pulling the brakes to keep it down. This is my go-to method for disabling a glider in high wind conditions if I'm alone or don't have a wind shadow. It's safe, effective, and controllable.

4. Buddy system - The buddy system is a great method if your buddy knows how to safely handle a wing. Most importantly, they know not to touch the lines. There are two ways this can work. First you bring a wingtip down to the ground, they grab the wingtip and run it upwind. This disables the wing without producing any lift and is a quick and safe way to disable the wing. This is usually what we do in high wind conditions if we are not alone. As soon as someone has fabric in their hand there is little to no risk of the wing producing lift and flying away. The second way is to have the buddy grab your brake toggles and pull them behind you as far as they can. This will quickly stall the wing bringing it to the ground. This is good but can produce lift and knock both of you onto your butt if you're not paying attention.

5. Wind shadow - The wind shadow is the small pocket of dead air behind an object. It's just below the "rotor" area. This method is best to do when you have a trailer, truck, or car. You simply drop or disable the wing into the wind shadow however you would like to. Once in the wind shadow, it is hidden from the wind which will keep it on the ground.

## **Object and field awareness:**

In high wind it's even more important that you are aware of the objects around you. Most importantly, upwind and downwind of you.

Upwind objects, even small ones, will produce rotor that can making kiting very difficult and dangerous. You want to make sure that you have as much clear and free space upwind of you for the wind to smoothly blow.

Downwind you want to be aware that if the wind picks up or you lose control you will be drug through those objects. If your truck is downwind of you and the wind picks up, be ready to get drug into and over your truck. Keep as much space downwind of you as possible.

# High Wind

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## Wing size vs wind speed:

The larger the wing, the less wind speed you can kite and fly in (generally). If you have a 12m ground handling wing, you will be able to handle a lot more wind than if you try to kite your 25m flying wing. It's best to kite the smallest possible wing as the wind pickups.

## Landing going backward:

Let's say the worst case situation happens, and you get caught in a gust front or the wind picks up once you are airborne and you have to land going backward. This is a very dangerous situation and one not to be taken lightly. This will only happen if the pilot makes a bad judgment call and flies in weather or wind they shouldn't be flying in. Let's discuss the two possible situations.



Firstly let's say you get caught in a sudden gust front, what do you do? There's two options, wait it out, or land.

Waiting it out can be a possibility depending on the size of the gust front, speed of the wind, and what is downwind of you. If you are barely going backward, and have a lot of room behind you to slowly drift, you may be best to try to wait out the gust front. This is of course, depending on the size of the gust front which can be really difficult to identify. If it's a large, nasty gust front, land. If it's a small, tame one, you can consider waiting it out.



Now let's talk about how to land backward, as safe as possible. Firstly, it's probably going to be uncomfortable and there is a high chance you break some equipment. That's FINE as long as you are ok. First step is to find somewhere with some space to get drug. Once you find a place that you can land and get drug you want to try and time you landing to the most upwind spot of that location. Keep in mind you are going to be doing this by looking behind you. Do not turn downwind in a gust. Land in the most upwind location and expect to be turtled right away. You will not be able to turn yourself around in this amount of lift. Don't worry about the turtle, worry about disabling the wing. My best method would be either the D-riser disabling or flipping the wing over. You want to get it completely disabled and no longer producing lift. Once disabled you will most likely be laying on your back, in a turtle as we call it. Unhook from the motor while keeping the wing disabled and get the wing's fabric in hand as fast as possible. It may be best to just disconnect the wing and let it blow away.

# Horses & Livestock

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As you begin flying you may find yourself flying near some livestock and horses, which is cool, but there are a few things you need to keep in mind. Firstly, I'm not your dad and shouldn't have to say this, but they are not your animals, leave them be. Farmers can be very protective of their livestock and you do not want to upset them by chasing their livestock. Just stay away. 50 feet up is enough to fly right over them without upsetting them. Just stay away.



HORSES are a serious risk and should be avoided at ALL COSTS. If you are flying around and see a horse, immediately turn the other direction. No hesitation, just turn. Get as far away from the horse as possible. Horses are scared easy and if you fly close to a horse you can get them running really fast which can put people and the horses are a serious risk. If you scare the horse with someone on it, they can be killed or hurt quickly. **STAY AWAY FROM HORSES.**



There are cases of pilots who have been sued by horseback riders because they flew too close and the horse bucked the rider off seriously hurting them.

Again - stay away from HORSES!



# Line Safety & Risk

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Lines can be very dangerous and it's best you and those around you know the risks of them. I personally like to think of lines like razor blades because at the blink of an eye a line could cut you open and you won't even notice. While I write this I have a line burn/cut on my face from a line. They are insanely sharp and under the loading and pressure of an inflated paraglider, they can cut you open really fast.



From my experience, I've seen more non-pilots get line burn/cuts than pilots. This is because let's say you start to lose control and your buddy reaches over and grabs lines to try and help you. Boom, hand cut. Let's say you lose control of your wing right on top of your lovely wife while she's out watching you kite, boom possible line burn. You need to educate and inform those around you of the risk of the lines and you need to keep people out of them. Tell your buddy to never touch the lines. Ask your wife to move upwind of you, not downwind of you. Keep people in safe places and away from those lines at all costs.



Things to avoid:

1. People grabbing lines to help. This includes the brake lines. Do not grab lines!
2. People downwind of you or in a location where you might drop the wing on top of them. Keep people out of the lines.

# WATER.

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Water is dangerous, so let's talk about it.

Drowning is one of the largest risk paramotor pilots face. For whatever reason, water is very fun to fly over and even more fun to foot-drag. There are a few ways to reduce your risk of flying over water.

## **Fly next to the shore:**

The best thing you can do with water is to fly close enough to the shoreline that if the motor dies, you can flare/glide to the shoreline. Stay within 3-5 feet of the shore and only fly shorelines that have enough space to safely land. Never fly along a shoreline that is covered in trees and rocks. You want enough space to be able to land on shore and not have to land on rocks or in the trees.



## **Fly downstream, never upstream:**

When flying near a moving body of water, it's super important you fly with the flow of the water, not against it. If you go in, you want the wing to drift away from you, not toward you. Fly downstream.

## **Unbuckle:**

If you are going to fly over water, you may consider unbuckling everything but one of your leg straps. This will reduce the amount of time you have to spend getting out of the harness.

## **Do not flare into the water:**

This might be counter-intuitive but the best thing to do is to land in the water with speed so the wing overfly you and crashes into the water in front of you with air still in it. If you flare into the water, it might just come down on top of you.

## **Do not panic:**

Panic will kill. Remain calm. Solve the problem at hand.

## **Do not care about the equipment:**

Kiss the gear away. Focus on getting yourself to safety first, and then go back for gear. Don't try to swim to shore with the gear. Just go back.

## **Gear to have:**

1. Floatation
2. Hook knife
3. Quick release harness



# Educate Those Around You

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When you start flying, everyone is going to want to come watch and help you. Here are a few things to keep in mind.

## **Dogs:**

Dog's are great but for whatever reason, they love to chase and bark at you while launching. They are very prone to putting their head right in the props way and or getting right in your way. They also have a tendency to want to bite at the reserve handle because it's red. If there is a dog nearby you need to firmly ask the owner to keep the dog away while you launch and land. For your safety, and the dogs safety. Keep them away.



## **Kids:**

Kids are amazing but don't know the risk of a spinning motor. They can put themselves in harm's way very quickly and the parent might not realize or even know. Keep kids away from you while launching and landing for the same reasons as the dogs. They will get in your way. They will get close to the prop. They will run through the lines. Keep them away.



## **People helping:**

They want to help but put themselves in harm's way without realizing it. Inform them to stay away and not do anything unless instructed by you. If you crash, they should stay away until asked to come help. Keep people away at all costs until asked to come help.

# Goggles & Ear Plugs

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This is something most people don't take seriously enough. You only get one set of ears and eyes, take care of them.

## Goggles:

Glasses are not enough. If you do this long enough, glasses will not block enough wind to keep from damaging your eyes. The constant wind blowing into your eyes can lead to damage and I personally have damaged my eyes by not wearing good enough glasses or goggles. I now always wear goggles because they do the best job at wind protection and I can wear my prescription glasses under them. Protect your eyes!



## Ear Plugs:

Your helmet or ear muffs might have some noise cancelation but it most likely not enough. I always double my ear protection and wear ear plugs + noise canceling headphones. I try very hard to take good care of my ears because the constant noise over a long period of time will damage your ears.



# 3 Strikes, YOU'RE OUT.

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I have a rule of thumb... and that is that if I am going to go flying and 3 things go "wrong" before I take off, I don't fly. This can be things as little as me forgetting my camera, not having any fuel, getting my wing tangled up, the motor isn't running right, etc.

This rule of thumb is because if things are not flowing correctly, you may be performing weirdly and it's best to stop. I follow this rule religiously and recently had an evening where I was testing a new wing but had 3 strong strikes and had to stop.



Strike 1 was my belt slipped and I had to tighten it.  
Strike 2 was my gopro died and I didn't have another battery.  
Strike 3 was my starter that didn't fully retract.

Three strikes, you're DONE! I sat down, enjoyed some food, and went home that night.



# Frustration

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One thing you really want to be aware of when flying paramotors is the emotional state of mind that you are in. The state of mind you are in is going to change the way you fly and the choices you make. Being angry or frustrated is going to make you fly more dangerously, take bigger risks, and push even harder. This is something I find true in my life and anytime I am emotionally charged up or frustrated, or angry, I don't fly. I wait just 10-20 minutes until I cool down, then I go.



This may be a bit overkill, but I have personally pushed a little harder than I should have when frustrated. I have also personally noticed a big decrease in performance when frustrated. Maneuvers that I normally nail every single time without fail, I mess up. Anytime I notice that, I stop.

The other emotions I pay attention to is strong excitement and sadness. Being overly excited or even hyperactive can make you go a little harder without noticing. You pull harder, push harder, and fly more recklessly when that is the case. It's ok to fly under these emotions, but be aware of their effects on your choices and in-flight performance.

Sadness will make you more sloppy in your performance and more lenient in your choices. Things you would normally never do, you'll find yourself doing.



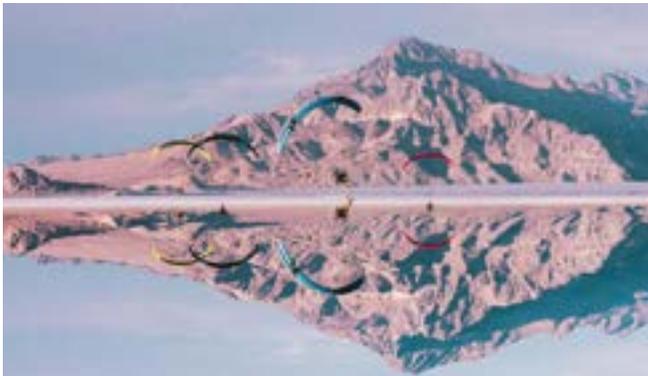
# Accountability

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This year I found myself pushing limits I had previously said were off-limits to me. Things that I knew were too risky for my level of comfort. But, I pushed those limits and I paid the price. You have to be VERY disciplined with your rules and your cutoffs. This is aviation, treat it like such.

If you have a cutoff and you find yourself ignoring or pushing past it, you need to hold yourself accountable to that. You need to pay attention to your performance and stop yourself. If you know better, then be better.



The other thing that is very important is to hold your buddies accountable and have them hold you accountable. This is usually a test of ego and can be difficult but you HAVE to do it. Again, this is aviation and things can and will go south quickly. If someone is doing something dangerous, stop them before it is too late. Hold yourself and those around you accountable, even if they don't want to hear it.



# Ground Starting

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RULE #1 - DON'T GROUND START.

Ok, so it's common knowledge at this point that you should NEVER under ANY circumstances ground start your paramotor. And most of you will never do that, which is good.

But there is a group of people that even though they know better, will still do it.



So let's discuss the risk points and how to safely navigate those situations.

Ground starting is very dangerous because in the off chance that your paramotor starts at full throttle, it will jump at you and can catch you with the prop. This is bad and will chop you up if it catches you. In order for something like this to happen, the throttle has to stick, or the pilot applies throttle, or the pilot loses control of the paramotor. Sounds like a slim chance, which it is, but several people a year end up in that situation.



Usually, the reason people find themselves in that situation is that they are frustrated that it won't start, or are tuning their engine and just want to quickly see if it's adjusted right. Both of these situations are VERY DANGEROUS.

There are 3 things you can do to reduce the risk of getting hurt if you do find yourself ground-starting the paramotor.

1. Tie the paramotor down
2. Tie the prop down or to the main frame
3. Remove the prop

If you are going to ground start, which you still shouldn't at least do one of those three things. Strap the motor to a trailer hitch, tree, or something that is strong enough and stable enough to hold against it at full power. Or strap the prop to the main frame of the paramotor. Even if the motor starts at full throttle, it will not be able to break the strap, even if it's a weak strap. Or remove the prop completely. It's not good to run the engine without the prop, but you can start it without the prop.

# LZ SAFETY

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When you are picking an LZ (launching/landing zone) there are a few things you need to keep in mind. Firstly you want more than enough space to get off the ground before you run into objects such as fences, trees, cars, soccer posts, etc. My rule of thumb is that I want at least double the distance it takes me to get off the ground between me and an object. Then if the object has some height to it, like trees, I want to be double their altitude before I reach them. So if the trees are 50 feet tall, I want to be able to launch and reach at least 100 feet before I get to them. The more distance/room the better.



One thing you really want to be aware of is the risk of a motor out right off the launch. When you take off, you want to make sure you are launching with a landing spot in mind at all times. If you get 15 feet up and your motor dies, you need to be able to make a safe landing. Make sure you have enough room to take off and climb straight into the wind until you reach at least 50 feet before you start making direction changes.



# Stay Away From People

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If you find yourself flying in an area with lots of people, try your best to get up in altitude and away from them. This is something that is really cool to us, but loud and annoying to other people. They may enjoy it for a minute, but 5 minutes of you buzzing around and they are annoyed with you.

There's a concept that we try and live by, and that is to be an eagle not a fly. A fly swarms your face and annoys you for hours on end. An eagle you see for a second as it passes you by.



As paramotor pilots we can choose how high we fly and where we fly. Which means, we do not need to fly near people. We can go up, and we can go away. Be respectful, be kind, and go above and beyond.



# Go The Extra Mile

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Whether it's prop safety, cage safety, low acro, or motor out awareness, I always try to go that extra mile for safety. What I mean by that is I don't just kinda worry about cage awareness, no I take it very serious and I'm very firm with my rules with it. I go the extra mile and clear around me EVERY time even if I am alone. When it comes to prop safety, I go that EXTRA mile to make sure nobody, no kids, no dogs, no nothing is at risk of my prop. When I fly low I go that EXTRA mile to make sure that I am hyper-aware of my motor out landing zones and all other factors. I always go the extra mile.



The places I see that being the most important are with cage awareness, prop awareness, and weather.

With cage awareness, it only takes being sloppy with it once and you hit your kid in the head when they are coming to give you a hug.

With prop awareness it only takes being sloppy one time for a dog to be right behind you when you start that paramotor.



With weather, it only takes being sloppy one time for bad weather to smack you right across the face.

# F\* yes or F\* no

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I have a rule of thumb, and that is that in the world of aviation, “probably ok” is not ok. The answer to a question like “is the weather good” needs to be a F\*\*KING yes or a F\*\*KING no. If your answer is “probably” than the answer is NO. “Probably ok” has slapped to many people across the face. If the weather is “probably ok” than it is probably NOT ok. If you “probably” can do that maneuver, you probably can’t do that maneuver.



I find this to be more of a test of discipline than anything else. You know when the answer is no, but you don’t always want to listen to it. If you have any sliver of a doubt about something, the answer needs to be NO. And not just a no but a F\*\*KING NO.

For example, we recently went flying and the weather wasn’t looking super great but we thought “it will probably be just fine.” Sure enough, we got caught in a gust front and had to land out 5 miles from our trucks. We were ok, but getting hit with a gust front is a huge risk that we did not need to take that night.



The answer should have been F\*\*KING no instead of “probably.”

THIS RULE is more important than you think. Anything you have to make a decision paramotor related, if the answer isn’t a firm yes, it’s a firm no. Want to fly to the top of that mountain but don’t like the clouds over there, NO. Want to try a maneuver but have nobody to help teach you, NO. Wanna sneak in a quick flight before it rains, NO.

**If the answer to your question is not F\*\*K yes, then it’s F\*\*K no.**

# Don't Care About Your Gear

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If you are about to have a hard landing or crash, prioritize keeping you safe over keeping the gear safe. If you are going to have a hard landing, lift your knees and let that paramotor destroy itself before you hurt yourself. New gear > new feet.

Usually, when people have a firm landing or downwind landing or some kind of crash, people try to keep the gear from getting damaged and instead hurt themselves. I will tell you from first-hand experience, it's a lot cheaper to replace paramotor parts than it is to repair broken bones.



If you are going to land fast or hard, let the gear take it. If you ballooned on landing and are coming down hard, let the gear take it.

If you are coming down sideways, let the gear take it.

You can't care about the gear. Put YOU first.

# Glasses or Contacts

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It is super important that when you are flying you can see as good as possible. If you wear glasses while driving, you should wear them while flying. You want to be able to see as well as possible.

Personally I wear glasses under my goggles which gives me the best vision and wind protection possible.