PPGLESSONS.COM BOOK

This book is a collection of all the curriculum documents used during paramotor training at Ppglessons LLC. All original documents were written by Nick Antonaccio and are published in the 'Tutorials' section of www.ppglessons.com/links.html . Please see www.ppglessons.com for more information about training, and call 215-630-6759 if you have any questions. Do not train yourself to fly.

PARAMOTORS! (also called Powered Paragliders, or PPGs)

The least expensive, simplest, and SAFEST type of private aircraft you can buy.

Climb to thousands of feet and perform extreme aerobatics, or fly low and slow to drag feet and explore terrain, or just boat around at a comfortable altitude and enjoy the most amazing sunset views, right from your local field.

No license required. Learn to fly solo in as little as 7 days.

No age, health, or weight limitations. Entire families can learn to fly. Up to 600lbs capacity.

Fly for 3+ hours on a single tank of normal automobile fuel from your local gas station.

Run into the air with a foot launchable backpack unit, or attach a 32lb packable wheeled trike to roll on the ground and sit in comfort throughout your flights.

No runway needed. Launch in just a few feet, from fields, beaches, farms, parks, back yards, small airports, etc., once you learn how.

Folds in minutes to fit in the trunk of your car, or fit several complete flying vehicles in a mini van. Some pilots even transport their units via motorcycle. Own and control your own gear, no hanger or rental fees required.

Add a reserve parachute and flotation for unmatched security and confidence compared to other forms of flight.

Fly legally under US ultralight regulations - just TWO simple pages of rules (compared to ~1600 pages of general aviation law that other aircraft must follow!). It's simple and quick to learn. Make your own adjustments to gear. No required maintenance logs, flight plans, or other similar restrictions apply. More than 99% of the US air space is available for unparalleled freedom of flight.

There is no other sport like this - it's a constantly amazing, life changing experience! One of the safest and most exhilarating forms of adventure available to humans. These units have been flown from coast to coast across the USA, from Alaska down to South America, and everywhere around the world. Fly with friends, using convenient headset communication, or fly solo. Turn your back yard into a mind bending port of adventure and a beautiful destination that regularly rivals any vacation spot.

Less expensive than a motorcycle. Blackhawk is America's #1 selling brand of paramotor. Complete packages, with motor, wing, and all accessories required to fly cost as little as $7900.

Training is based in Allentown and Montague NJ, but our equipment is mobile and can accommodate groups of students at virtually any location. New students are welcome to visit a training session and see the equipment, take an introductory lesson, meet some other students and pilots, watch a flying demo, ask any and every question you have, etc.

Training generally takes a minimum of 7 days, but that can be broken up into multiple segments that are convenient for your schedule. We can, for example, separate wing handling and engine-on portions into different short trips. It's also possible to complete much of the time consuming ground school instruction using online video conference. You can return to do additional instruction and certifications in the future. Your instructor can take you through USPPA PPG1, PPG2, and PPG3 ratings, and more if you're interested, and is always available to help with issues such as weather, air space, & site evaluation, equipment maintenance, etc. The cost for instruction is $300 for a full day, and you can use school equipment to complete the course. A daily weather-specific training schedule is kept at http://ppglessons.com/schefule.txt

If you have any questions about equipment, if you'd like to take a quick look at the air space in your area, or if you'd just like to chat at all about flying, don't hesitate to call, text, or email anytime!

CONTACT: Nick Antonaccio USPPA and ASC Certified Instructor 215-630-6759 nick@ppglessons.com

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CHECKLIST - TRAINING SUMMARY

Laws (FAR 103 & sectional charts), weather (online resources), operating within the ultralight/aviation community, finding locations & speaking with land owners, aerodynamics, prep for kiting/simulator/maneuvers.

Equipment Basics: wing size & beginner design, EN certification, standard paragliders vs reflex, visibility (color), if used - inspection to check hours of UV/abrasion/porosity/line length, engine weight/power/geometry

(evaluating thrust vs torque/weight, harness & connection types: low/high/weight shift, cage/netting designs), common engine/harness/propeller/throttle/component styles/brands, part availability/support, oil & gas mix, loudness. Choosing if/which wheels, freeflight/kiting harnesses, reserves, flotation, comms, helmet, clothing, wind socks, camera gear, GPS, variometer, etc.

Wing: parts (risers, connection loops, brakes, lines, maillons, trims, cells, speed bar), packing/unpacking, rosetting, untangling lines, pre-kiting (build wall without tilt, rotate to down side), hooking in, forward & reverse inflations in harness without oscillation or frontal collapse, inflations w/ engine-off on your back, taxi with running engine. Handling ranges of wind speed, managing cross wind control, steering around obstacles. Understanding how brake use, body & wing movements relative to wind work together. Helmet & glove use, line burns & catch hazards. Handling high winds/gusts. Checking brake length. Getting pushed & towed up.

Engine: starting, throttle control, leaning back into thrust while walking upright, full flight routine in simulator with comms & verbal/visual commands. Assembly & inspection, hang angle, harness adjustments, motor run-in, preflight of machine/suspension/wing, test flight. Maintenance - carb tuning, spark plug inspection, torque specs, common adjustments & part replacements. Prop contact injuries most common!

Weather - avoid mid day thermals (fly first/last 2-3 hours), no heavy winds/gusts, no dangerous thermal signs (cumulus clouds, soaring birds, shifting winds, devils), benign winds aloft, no strong wind sheer/gradient, no rain or nearby storms, no fog, good density altitude, check actual current conditions, use a wind dummy.

Location - LARGE ENOUGH AREA to launch & climb/turn over/past obstacles in the direction of torque, & to clear obstacles when landing. Runable terrain. No water, electric wire, rotor (big obstacle), ground or air traffic dangers. No TFRs. Pattern if at airport. Sunrise/sunset time. Water fatalities most common!

Preflight - machine fully assembled, all screws, wires, attachments, cage netting and spars tight, proper redrive tension, enough *properly mixed* fuel, (reserve parachute pins & flotation secure, radio & strobe check), loose items stowed, clothing/eyewear/weather protection secured, clear lines w/ A's on top, pre-kite wing level into wind (rows straight & untangled), no damage to wing or any hardware, wing set up forward or reverse directly into wind, cells pointing up, no line-overs at wing edges, carb primed, throttle not stuck, engine harnessed on back before starting, harness fully buckled (leg straps!), helmet strapped, hookin (dart, gate locked, road straight, trims even, brakes clear), "clear prop", run up engine, check idle not set too high or low, belt not slipping, survey nearby air traffic & ground activity to avoid, DOUBLE CHECK SUSPENSION CONNECTIONS & wing layout, thumbs up between leg & risers then check A's, or switchable hands in reverse & check turn direction (lines on top - turn

toward that shoulder).

Launch – arms at 10 & 2 cross – never in front, torpedo run, arms rise during inflation, CHECK SURGE (release A's, pull brakes at 11–12 o'clock – more wind, pull harder), POSTURE (run upright), HANDS UP, taxi wing squarely overhead, more thrust (run run), accelerate only, do NOT slow down, IF uncontrolled oscillation or frontal – ABORT/STOP/KILL, otherwise – more more, run run, do NOT jump into seat or stop churning feet below 20' (till above trees) BOUNCE – recontact ground & run/kick repeatedly, COMMIT to climb – once airborne do NOT release thrust (NO low surge), HANDS UP (full air speed), do NOT turn hard against torque, inspect wing & lines – carabiners locked, no cravats/catches/twists/kinks, FLY THE PATTERN to climb above 300', throttle to level flight. Get in seat (STOW BRAKE!). In an emergency, LAND INTO WIND if safely possible.

During Flight – HANDS UP, BRAKE TO SHOULDER, CONTROL PROGESSIVELY – use only *small/gradual/even* movements on brakes/throttle ('1234'), don't ever jerk or release abruptly, don't ever pull brake deeply enough to stall or spin the wing – BRAKES TO BUTT IN AIR IS DEADLY! (hands up on risers if you get tense), HANDS UP & REDUCE THROTTLE slowly if the wing rolls/pitches/yaws/oscillates unexpectedly (letting the wing gain full speed & correct itself is better than over-correcting with improper inputs), generally maintain at least 300' altitude, ALWAYS HAVE AN LZ into wind reachable in case of engine failure (know your glide & climb rates), more power is required downwind – don't get anywhere near ground downwind, do NOT fixate on obstacles – PICK HEADINGS & FLY TOWARD THEM, look ahead – don't get boxed in, keep lots of clear air space around you & simply steer away from (or thrust over) oncoming obstacles, PLAN where you want to go & observe with foresight – you can never stop moving in the air!, hold a turn to stop oscillations, learn to ACTIVELY FLY THE WING – maintain straight & even flight by steering the wing above your head with enough moving air speed & all lines pressurized – CHECK SURGE (MORE BRAKE, ADD POWER) CHECK LIFT (LESS BRAKE, REDUCE POWER), crab to adjust ground track up/cross/down wind, turns induce dive – weight shift/add power to level them then hands up to get back to full air speed, stay ABOVE & behind wake of other craft, clear turns around other pilots, turn to be seen by other craft, in case of collapse – let wing recover automatically or weight shift/steer/clear, in case of a locked-in spiral – outside brake or D's to bleed off speed gradually, never throw reserve unless in a completely unrecoverable situation (wing cascading completely out of control (diving beneath you) & crash imminent) toss reserve aggressively into clear air, be prepared for parachutal landing (knees together & bent). HANDS UP, BRAKE SHOULDER, CONTROL PROGESSIVELY, AVOID OBSTACLES, FLY HIGH.

Landing – pick a site INTO WIND, clear obstacles & electrical wires (straight lines on ground & space around buildings), fly the pattern & descend to final, line up & STOP turning, get out of seat, if you're oscillating or set up short/long – go around, kill engine 50–150', put 1 foot in front of the other, pressure to shoulder at 8', flair hard to butt at the last moment – no higher than 1'–3', RUN on landing, turn & run backward, drop the wing. Later, you can approach with the engine on, fly through sink if needed, & foot drag with increasing brake & thrust into a

near stall.

FEDERAL AVIATION REGULATION PART 103—ULTRALIGHT VEHICLES

Authority: 49 U.S.C. 106(g), 40103-40104, 40113, 44701.
Source: Docket No. 21631, 47 FR 38776, Sept. 2, 1982, unless otherwise noted.

Subpart A—General

§ 103.1 Applicability.

This part prescribes rules governing the operation of ultralight vehicles in the United States. For the purposes of this part, an ultralight vehicle is a vehicle that:

(a) Is used or intended to be used for manned operation in the air by a single occupant;
(b) Is used or intended to be used for recreation or sport purposes only;
(c) Does not have any U.S. or foreign airworthiness certificate; and
(d) If unpowered, weighs less than 155 pounds; or
(e) If powered:

(1) Weighs less than 254 pounds empty weight, excluding floats and safety devices which are intended for deployment in a potentially catastrophic situation;
(2) Has a fuel capacity not exceeding 5 U.S. gallons;
(3) Is not capable of more than 55 knots calibrated airspeed at full power in level flight; and
(4) Has a power-off stall speed which does not exceed 24 knots calibrated airspeed.

§ 103.3 Inspection requirements.

(a) Any person operating an ultralight vehicle under this part shall, upon request, allow the Administrator, or his designee, to inspect the vehicle to determine the applicability of this part.
(b) The pilot or operator of an ultralight vehicle must, upon request of the Administrator, furnish satisfactory evidence that the vehicle is subject only to the provisions of this part.

§ 103.5 Waivers.

No person may conduct operations that require a deviation from this part except under a written waiver issued by the Administrator.

§ 103.7 Certification and registration.

(a) Notwithstanding any other section pertaining to certification of aircraft or their parts or equipment, ultralight vehicles and their component parts and equipment are not required to meet the airworthiness certification standards specified for aircraft or to have certificates of airworthiness.
(b) Notwithstanding any other section pertaining to airman certification, operators of ultralight vehicles are not required to meet any aeronautical knowledge, age, or experience requirements to operate those vehicles or to have airman or medical certificates.

(c) Notwithstanding any other section pertaining to registration and marking of aircraft, ultralight vehicles are not required to be registered or to bear markings of any type.

Subpart B—Operating Rules

§ 103.9 Hazardous operations.

(a) No person may operate any ultralight vehicle in a manner that creates a hazard to other persons or property.
(b) No person may allow an object to be dropped from an ultralight vehicle if such action creates a hazard to other persons or property.

§ 103.11 Daylight operations.

(a) No person may operate an ultralight vehicle except between the hours of sunrise and sunset. (b) Notwithstanding paragraph (a) of this section, ultralight vehicles may be operated during the twilight periods 30 minutes before official sunrise and 30 minutes after official sunset or, in Alaska, during the period of civil twilight as defined in the Air Almanac, if:

(1) The vehicle is equipped with an operating anticollision light visible for at least 3 statute miles; and
(2) All operations are conducted in uncontrolled airspace.

§ 103.13 Operation near aircraft; right-of-way rules.

(a) Each person operating an ultralight vehicle shall maintain vigilance so as to see and avoid aircraft and shall yield the right-of-way to all aircraft.
(b) No person may operate an ultralight vehicle in a manner that creates a collision hazard with respect to any aircraft.
(c) Powered ultralights shall yield the right-of-way to unpowered ultralights.

§ 103.15 Operations over congested areas.

No person may operate an ultralight vehicle over any congested area of a city, town, or settlement, or over any open air assembly of persons.

§ 103.17 Operations in certain airspace.

No person may operate an ultralight vehicle within Class A, Class B, Class C, or Class D airspace or within the lateral boundaries of the surface area of Class E airspace designated for an airport unless that person has prior authorization from the ATC facility having jurisdiction over that airspace.
[Amdt. 103-17, 56 FR 65662, Dec. 17, 1991]

§ 103.19 Operations in prohibited or restricted areas.

No person may operate an ultralight vehicle in prohibited or restricted areas unless that person has permission from the using or controlling agency, as appropriate.

§ 103.20 Flight restrictions in the proximity of certain areas designated by notice to airmen.

No person may operate an ultralight vehicle in areas designated in a Notice to Airmen under §91.137, §91.138, §91.141, §91.143 or §91.145 of this chapter, unless authorized by:

(a) Air Traffic Control (ATC); or
(b) A Flight Standards Certificate of Waiver or Authorization issued for the demonstration or event.
[Doc. No. FAA-2000-8274, 66 FR 47378, Sept. 11, 2001]

§ 103.21 Visual reference with the surface.

No person may operate an ultralight vehicle except by visual reference with the surface.

§ 103.23 Flight visibility and cloud clearance requirements.

No person may operate an ultralight vehicle when the flight visibility or distance from clouds is less than that in the table found below. All operations in Class A, Class B, Class C, and Class D airspace or Class E airspace designated for an airport must receive prior ATC authorization as required in §103.17 of this part.

Airspace	**Flight visibility**	**Distance from clouds**
Class A	**Not applicable**	**Not Applicable.**
Class B		

3 statute miles

Clear of Clouds.

Class C

3 statute miles

500 feet below.
1,000 feet above.
2,000 feet horizontal.

Class D

3 statute miles

500 feet below.
1,000 feet above.
2,000 feet horizontal.

Class E:

Less than 10,000 feet MSL

3 statute miles

500 feet below.
1,000 feet above.
2,000 feet horizontal.

At or above 10,000 feet MSL

5 statute miles

1,000 feet below.
1,000 feet above.
1 statute mile horizontal.

Class G:

1,200 feet or less above the surface (regardless of MSL altitude)

1 statute mile

Clear of clouds.

More than 1,200 feet above the surface but less than 10,000 feet MSL

1 statute mile

500 feet below.

1,000 feet above.
2,000 feet horizontal.

More than 1,200 feet above the surface and at or above 10,000 feet MSL

5 statute miles

1,000 feet below.
1,000 feet above.
1 statute mile horizontal.

FAR 103 NOTES

.1 Ultralight rules apply to aircraft with these characteristics:

Single occupant only (unless you earn an instructor certificate and tandem waiver, and use it only for instruction)
Used for recreation only (never a contract to perform a commercial service while flying, but videos of fun can be monetized after the fact)
No airworthiness certificate (can't be N numbered and also fly as a GA craft)
Weighs <155 lbs unpowered, <254 lbs powered (not including passenger, gas, reserve parachute, floats, etc. – just the flying machine)
Carries maximum 5 gallons of gas
Can achieve maximum air speed of 55 knots (~61 mph) or less, 24 knots stall speed

.3 Must allow FAA representative to inspect if asked (ie., if someone thinks you're a GA and complains, for example, about flying below 500 feet). As long as you're following these rules, you're legal. They just need to see you're flying an ultralight.

.5 You need a waiver to deviate from any of these FAR 103 rules (tandem flights, events in special air space, etc.)

.7 No airworthiness maintenance certifications or N number registration are required (or allowed) for the vehicle. No knowledge, age, experience, or medical certificates are required of pilot.

.9 Don't create a hazard to people or property. Dropping items from craft is illegal if deemed a hazard (perhaps not if over an empty field). To be safe, and to avoid breaking a prop, empty pockets and secure loose items before flying.

.11 Never fly at night. 1/2 hour before sunrise and after sunset if you have a strobe visible for 3 miles, in uncontrolled air space.

.13 Avoid all other craft

.15 Avoid "congested areas". Undefined except 'areas of city, town, or settlement, or over any open air assembly of persons'. Stay away from concerts, sporting events, parking lots, and generally avoid homes and people who may get irritated.

.17 .19 .20 No flying in A, B, C, D, lateral surface E, restricted or prohibited air space (all around airports), or in TFRs, without permission from ATC.

.21 You must be able to see the ground at all times.

.23 Visibility and keep away from Clouds:

5 500 feet below
1 1000 feet above
2 2000 feet beside
3 3 miles visibility

more distance required above 10,000 feet
stay clear of clouds in class G

Advisory circular has more info about the thought and meaning behind the choices made in creating FAR 103 rules, and has some more specific guidelines, such as not towing banners.

AIR SPACE CHARTS, FOR PARAMOTOR PILOTS

FAR 103 grants ultralight pilots fantastic freedom, with only a few basic laws to abide. One of our obligations is to avoid flying in controlled air space, unless we have special permission from ATC (air traffic control) and radio contact with a control tower. Paramotors can fly freely in the overwhelming majority of the US air space, and there is typically no need whatsoever to launch or land at busy commercial airports, so it's not difficult to find places to fly. It's essential to learn how to read air space charts to avoid the select areas of the sky where you can get into trouble (almost entirely near large airports and government facilities), if you want to avoid legal hot water.

You can find free air space charts online at:

https://www.iflightplanner.com/AviationCharts/

https://skyvector.com/

Below are descriptions of the most important markings to be aware of on the charts:

Class A: *A*bove 18,000 feet. You need permission and radio contact to fly above 18,000 feet. Generally, the higher you go, the more large aircraft you are likely to encounter, and communication with a tower is a good idea if you'll be flying up at high altitudes, even if you're below the legal 18,000 foot limit. Be aware that, although it's not a legal requirement, any altitude above 12,000 feet generally requires supplemental oxygen. Staying up that high for a long period can lead to hypoxia and edema. Also, be aware that flying above 10,000 feet does involve some changes to the visibility and cloud clearance rules of the class E space below that altitude (see FAR 103).

Class B (blue rings): These are the *B*ig airports. They are enclosed in concentric thick blue (mostly circular) lines. The 3D shape of Class B air space is often described as looking like an 'upside down wedding cake'. You need to pay attention to the numbers which appear as fractions within these rings (one number over another). The bottom number of the fraction tells us the altitude at which the class B restriction starts, and the top number tells us where it ends. You need to add 2 zeros to those numbers to get the actual altitudes. For example, 40/70 means that you CAN'T fly between 4000 and 7000 feet in that section of the concentric rings. 'SFC' means 'surface', so SFC/70 means you can't fly anywhere from the surface to 7000 feet (typically, right around an airport's landing strip). The bottom number is the most important one for paramotor pilots. Generally, it's perfectly legal to fly anywhere BELOW that bottom number. In practice, however, it's typically a good idea to give some extra buffer and stay well beneath that altitude. If your ceiling (that bottom number in the 'fraction') is 4000, for example, it's probably best to go no higher than 3000', for example. Remember, there is most likely a lot of busy air traffic in that class B space, such as large commercial airliners coming in to land, and you should stay very far away from such big craft (their wake can collapse your wing and spin you around violently). Be aware that although large aircraft typically do fly within the listed class B altitude range, they are NOT REQUIRED TO. It is possible, for example, that during certain weather conditions such as low clouds and reduced visibility, general aviation craft MAY come down into the airspace below the listed range. Also, understand that although it is legal to fly above the top number in the 'fraction', if you have an engine out up there, for example, and are forced to descend in through the class B space, you will be breaking the law. Except in rare circumstances, just plan to stay below class B airspace, and be vigilant of air traffic.

Class C (magenta rings): These are often large *C*ommercial airports. The thick magenta rings and 'fraction' numbers mean the same thing to us as in Class B space. Add 2 zeros and only fly BENEATH the altitude indicated by the bottom number. Be aware that Class C and B towers are equipped with radar, and intruding into that space is potentially a very big problem. Expect potential fines and significant legal trouble if you break that law. There generally is no reason for paramotors to fly in these areas - they represent just a tiny fraction of the US air space (typically 15 miles or

less around the largest airports). Just stay away from them.

Class D (broken blue lines): These are smaller (*D*iminutive) commercial airports, typically indicated by a single, mostly circular ring of dashed blue lines (not as dark as class B or C rings). Inside this space, you'll see a number surrounded by a dashed blue square. Add 2 zeros to this number, and that is the altitude you must stay ABOVE in order to fly legally. Be aware of that difference in notation, as compared to the 'fractions' in class A and B space. Essentially, what that means to paramotor pilots is that we don't fly anywhere over class D space. Remember, if you have an engine out, or otherwise unintentionally fly down below the altitude indicated by the dashed number, you are flying illegally (unless of course, you have permission from the tower). In normal situations, we simply avoid those areas. Be aware, however, that most class D airports are smaller than those surrounded by B and C space. Often, you may see a note on the chart indicating that a specific class D space reverts to class E after a given time of day. You may also discover that certain such airports have specific operations organized for ultralight activities. If you plan to regularly fly near a class D airport, call them and speak to someone about how they would like you to fly in the area. If there is already a community of ultralight pilots in the area, they may likely have operating guidelines established for where, when, and how you fly around the class D space. You should not be hesitant at all to speak with management at the tower to understand how you can interact within their air space. It is a responsible thing to do, and your attention to their operations will most likely be welcome.

Class E (faded magenta boundaries): *E*verywhere else, not described by other air space markings. The blurred side of the faded magenta boundaries means that the lower shelf of the indicated class E space is at 700 feet, and the hard edge of the faded magenta boundary means that the lower shelf is at 1200 feet. The upper altitude limit of class E space typically extends all the way up to 18,000 feet (class A space). This is the space in which paramotors fly most often. You must follow FAR 103 visibility and cloud clearance requirements within this space ('5123'). There are some areas at which class E drops all the way down to the surface, marked by a dashed magenta line, typically around class D airports. Stay out of these areas - generally treat them as class D. In some remote areas, class D has a lower boundary of 14,500 feet, or some other altitude indicated on the chart. The space below E is most typically class G.

Class G: *G*round space, typically from the ground up to where class A, B, C, or E space begins. In most of the country this extends up to 700 or 1200 feet, following the contour of the ground. It is the least controlled space in the US, and the most comfortable in which to fly. Remember, general aviation craft must fly above 500 feet, unless they are launching or landing. Paramotors and other ultralight craft are not held to that law, so many PPG pilots enjoy flying below that altitude, as it's the least likely place to find other craft. Be aware, though, that flying low can become a nuisance for the community on the ground (the noise especially), and that obstacles and the ground are much closer, leaving you much less time to recover from incidents such as collapses.

Prohibited: Dark blue lines with a hash marks on the inside (sort of like the spokes of a comb). Typically around military, national security, and/or environmentally protected areas. Do NOT fly in these spaces under any circumstances, without permission.

Restricted: Blue with wide interior hash marks. Typically around military areas, there may be times when it's OK to fly in these areas, indicated by notes on the chart, or by obtaining permission from the controlling agency. If you're considering flying in these areas, call ATC to be sure you understand the guidelines, and to let them know your intentions.

MOA: Military Operations Area, magenta with interior hash marks (looks similar to the 'comb' around prohibited areas). You are permitted to fly in these areas, but there may be training operations which you should avoid. Call the controlling agency or 1-800-WX-BRIEF to be sure you won't be flying into artillery, large aircraft practice runs, or other military training operations.

National Parks: Blue lines with interior blue dots. Stay 2000' feet or more above these areas.

TFRs: Temporary Flight Restrictions, with NOTAMs ('notices to airmen'), marked by red circles in the charts online. You can also call 1-800-WX-BRIEF to ensure you're not flying within a TFR. When the president flies in an area, or when special events such as air shows occur in an area, flight may be restricted. It's a serious offence to fly in a TFR, so be sure that your space is clear before you launch.

Victor Airways: Faint blue lines with the letter V and a number. These are routes marked by navigation beacons, often taken by large aircraft. We can fly there legally, but they should be avoided, as they're typically busy paths filled with lots of heavy air traffic. Officially, they are 8 miles wide, from 1200 to 18,000 feet. If you live or fly regularly near these paths, you're most likely familiar with the normal air traffic in these corridors. Often, they line up with the launch or landing approach at big airports, and the typically involve jets flying high as they enter and exit the class B/C space around big airports. Get to know the traffic patterns and stay well away from big aircraft.

Yellow Colored Areas: Typically found around populated and developed areas, yellow colored areas on the chart are intended to show pilots how lights at night will appear from above. Although not a legal description, these yellow areas are a good indicator of 'congested' areas, which we're obligated to avoid by FAR 103. Generally, flying in these areas is a bad idea. You must be much more vigilant in these areas not to fly over open air congregations of people and anything else that could be considered a 'congested area'.

There are many more markings found on charts, many of which can be safely ignored by paramotor pilots. The most common are compass rose circles (with interior hashes and compass direction guides), used to help orient

navigation (although these days, most pilots just use GPS to navigate), and many altitude markings, which show the height of the tallest obstacles in each area of the map grid. For more information about the details of air space charts, see the 'Aeronautical Chart User's Guide", available for free here:

https://www.faa.gov/air_traffic/flight_info/aeronav/digital_products/aero_guide/media/editions/cug-complete.pdf

This document is a complete reference to every single detail found on all available air space charts. It is published and updated regularly by the FAA, so you can be sure everything it contains is the most definitive source of info about any marking you see on air space maps.

If you're going to fly at a special event, or for some other reason in controlled air space, you'll need to purchase an air band radio. You can find handheld units on Amazon, with headset connections that can be used by paramotor pilots, starting around $200 or more. Amateur and HAM radio units do NOT cover the necessary aviation band frequencies.

WEATHER FOR PARAMOTOR PILOTS

Weather is one of the most important topics to learn about, as you begin to fly. Paragliders are like leaves in the wind when conditions are rough, and new pilots can quickly find themselves out of control in bad weather. Learning to evaluate whether or not the atmosphere is benign at the time and place you want to fly, is one of the most crucial factors in maintaining your safety.

You can spend years learning about how weather works, and still find that your predictions don't pan out as expected. Even professional meteorologists get it wrong regularly! This article will explain where to find the information needed to make informed decisions, and what to look for, before you put yourself up in the sky under a piece of cloth.

Wind Speed:

The first thing to do, every time, before you fly, is to look at www.windmapper.com and www.windy.com. Those 2 web sites will give you a very good overview of what local weather conditions you can expect to find. Windmapper provides you with the expected average wind speed and expected gust speeds, as well as the temperature, precipitation, and barometric pressure in your vicinity. All those pieces of information play a part in determining whether or not you should fly. If wind speeds are lower than 6 mph on average, that's a good start at determining it may be generally

favorable even for beginners to fly. If the gust speeds are more than 6-7 mph above the average speed (no matter how low the average speed), then you're generally much more likely to be in for a bumpy and/or dangerous flight. Generally, flying in any average speed more than 10 mph is going to be uncomfortable and/or dangerous as a new pilot. There are situations in which higher winds are safe, especially at the beach where the laminar airflow keeps gusts to a minimum, and it can potentially be comfortable to fly even when the wind is blowing 14 mph average at the beach (because gusts will typically only be a few mph more). If you fly inland, though, where there are obstacles that can produce rotor, anything more than 10 mph wind can produce really rough air downwind of the obstacles. Serious turbulence and rotor behind obstacles can exist up to ten times as far downwind, as an obstacle is tall (that is, a 100' tall obstacle can create rough air 1000' downwind!). Flying behind (in the lee side of) hills, trees, buildings, and other tall objects in heavy wind, can be extremely dangerous, even for experienced pilots. Even in light wind, the Venturi effect over the top of a hill can lead to faster moving air currents, and to a washing machine tumbling effect on the lee side of the hill. Be aware of any obstacles in your upwind path (where the wind is coming from), and avoid the generated rotor. As a new pilot, USPPA recommends that you don't even kite your wing if winds are 12 mph or higher.

Thermal Activity:

It's not just wind speed you need to watch out for. Unless it's completely overcast, you should expect the sun's rays during the day to heat up buildings, blacktop, brown fields, and other spots on the ground. This causes invisible columns of air, called thermals, to rise. During the day, thermals can become powerful enough to carry a paraglider pilot all the way up to cloud base in just a few minutes. Free flight paraglider pilots accept the risk and potentially violent conditions which thermals can produce, in order to fly upwards without a motor (they also launch from mountain tops in heavy wind, to soar the ridge and gain height). Paramotor pilots do NOT need to put themselves in the way of the likely dangers caused by thermal activity. New paramotor pilots should only plan on flying during the last few hours of the evening, or the first few hours of the morning. Those are times when thermal conditions will be most benign. Be aware that morning hours very often mean that dew will be on the ground, and your wing will get wet. If you abort an early morning launch and need to reset, that can mean having to lift an extraordinarily heavy wet wing, and one which doesn't fly as safely in the air until it's dried out. During the day, thermals can cause dangerous upward moving columns of air that can fold your wing in half if you fly part of your wing through them. Thermals can also force you into dives, spins, stalls, or other various situations that are extremely hazardous, as you enter and exit them (your wing will pitch up on entry, and dive downward on exit). Until you've learned how to handle pitch control, collapses, spirals, and stalls in an SIV course, and through extended training/experience, it's much better to avoid thermal mid day flying entirely. On the ground, thermals can be deceiving. It's possible to feel like there is no air movement at all during the day, because thermals move the air vertically. If you see large

billowing cumulus clouds during the middle of the day, do not fly, as a beginner. You can often track where thermals may be - they generally originate at some heated source on the ground, and top out at a cumulus cloud base (where the water vapor reaches its dew point). They tend to angle upwards from source to cloud base, as they're blown downwind by the prevailing atmospheric wind currents. You'll get used to where they regularly form at your local flying sites. Another indication of thermals is regularly shifting wind direction. If the winds are low on the ground, and the wind appears to be changing directions, especially if it's shifting in 180 degree turns, that's often caused by thermals sucking the air upwards in their direction. Multiple local thermals can appear to shift wind direction regularly 360 degrees, as they alternately pull more air mass in their direction, to feed the upward moving column. Another great indication of thermal activity is soaring bird activity. If you see vultures or hawks circling with outstretched wings, you can be nearly certain they are following a thermal elevator upward. As a paramotor pilot, it's safest to just limit your flying to the first or last 2-3 hours of the day, in the beginning of your learning experience. Many paramotor pilots never fly mid day in all their experience, because doing so truly adds a tremendous potential for dangerous situations, and for some pilots, it's simply not pleasant to fly in those conditions. Making use of the extra half an hour after sunset in the evening and the extra half an hour in the morning before sunrise, using a strobe, is a great option. Those times often provide the calmest air to fly in, but be aware that no-wind forward launches are the most difficult to pull off, as they require the longest and fastest runs. Landing in absolutely no wind also requires the greatest skill and control, as you have no wind to fly into, to slow your descent. If you do fly at the very end or beginning of the day, just make sure to fly legally with a working strobe visible for 3 miles, and be sure that you can see your surroundings and the ground well enough to land and to avoid obstacles in the lower light.

Barometric Pressure:

When evaluating weather, HIGH pressure systems generally provide the best conditions for flying. You'll typically find the worst and most unpredictable patterns exist in low pressure systems. You should expect more storms, and more gusty conditions when pressure is low. You can watch pressure systems move across the country to get a general idea of how the weather will trend. Be sure to look at the pressure in your Windmapper.com overview, every time you fly. Lower pressure is typically associated with less stable air (nastier flights).

Temperature:

Be aware of temperature. High 'density altitude' produced by high temperatures, and exacerbated by high humidity, can make the air you launch in much thinner. In high density altitude (when it's hot) you'll have to run farther and faster than normal, and the flight characteristics of the wing will be similar to flying at a very high altitude. A density altitude

of 5000 feet means that you'll be taking off in the same conditions as on a 5000 foot mountain top, or for example, in Denver Colorado. It's much more difficult to operate your wing, and you won't get nearly as much lift in those types of hot and humid conditions. Launching and landing will require more skill. Using a bigger wing and a more powerful engine can be helpful in high density altitude conditions. If you're flying in hot and humid weather with a heavily weighted small wing, with a low powered engine, you may not be able to get off the ground. Be aware that large variations in temperature, with strong differential heat gains during the day are more likely to cause thermal activity (and not just in summer, you can experience strong thermals even in winter). You can find a temperature prediction in your Windmapper.com summary.

Winds Aloft:

Another important piece of information to look up before you fly is the winds aloft speeds. High winds aloft typically indicate conditions that can be problematic, especially if you're going to fly high. It's possible for fast-moving air in the upper atmosphere to swirl down and effect wind in the lower atmosphere, even if the average wind speeds near the ground look perfectly calm. Remember that there's nearly always a wind gradient as you move from lower altitude to higher altitude. If you take off in high wind conditions that are barely flyable near the ground, it's very likely that you will end up flying backwards up high. You should never fly in conditions which force you to fly backwards unintentionally. Even at the beach, or in conditions that are pleasantly windy without being gusty, be aware that the wind gradient will mean much stronger winds, even just a few hundred feet up. You never want to be in a position in which you have to fly down low over trees or power lines to land forward safely. Also, be sure to look for changes in wind direction at different altitudes. A change in vector at various altitudes can indicate wind sheer - a condition in which layers of wind shift abruptly, causing tremendous immediate speed and flight path changes as you cross between them. Hot air balloon sites tend to provide useful detailed info about air speed and direction at specific altitudes (this author prefers www.blastvalve.com/weather/). Checking the wind speeds aloft takes just a few seconds of your time, and it provides fantastic insight into the larger atmospheric picture. If winds aloft are dramatically high, don't fly, especially if the other information available leads to a questionable outlook.

Radar and Storms:

Be sure to check the radar every time you fly. If there are storms within even 40 or 50 miles, they can be preceded by violent gust fronts. You do not want to be up in the air if a gust front is anywhere nearby. That calm before the storm can whip up instantly into 20-60 mph swirling winds on the ground, as one front passes over another. Flying through rain can also lead to a degradation of your wing's performance in the air. A wet wing responds sluggishly, and is much easier to stall. Look for signs of large storms on the radar, and if you can actually see towering storm clouds

anywhere nearby (visually, at your flying site), do not fly. If you're in the air, and you see signs of an unexpected nearby storm or a gust front moving along the ground, land and unhook immediately. You can find storm and precipitation indicators on your Windmapper.com overview. Heed them well.

Fog:

Be sure to check for signs of fog. The 'Temperature Dew Point Spread' available at www.usairnet.com is a great indicator of the potential for foggy conditions. Low single digits indicate a very high likelihood of fog. If fog forms after you launch, you can find yourself in a dangerous situation. One quick check online, especially when flying in unfamiliar locations, can save you a world of trouble.

Actual Conditions VS Predictions:

It's important to understand that any weather website, or other source which offers predictions, can be wrong. DON'T TRUST ANY PREDICTION MORE THAN 3 DAYS IN THE FUTURE. It's more likely that predictions more than 3 days away are likely just historical averages. Don't make any decision to fly without checking conditions right before flying. Often, different sites will provide conflicting or different information. Windmapper and Windy, for example, typically provide different average and gust speeds, but you'll generally see that they follow a similar trend. If it looks like winds are going to be blowing much stronger on a given day, even if the numbers don't match up, that trend can likely be expected to be generally true. You'll get used to the different ways each site generalizes specific speed measurements. If you see radically different predictions from different sites, it could very likely mean that even the professionals don't know what to expect from a volatile set of circumstances that might follow any of several different models. Weather isn't entirely predictable, especially within the tiny micro climates in which paramotors fly. Even with all the fantastic tools available online, predictions are never as valuable as actual OBSERVED CONDITIONS. Looking at hourly data from your local weather station will give you a critically important view of what's actually happening in the air around you, right up to the current moment (you can find all these tools, such as www.usairnet.com/weather/conditions/?station=KDYL at www.ppglessons.com/links.html). The best option you have as a beginner is to find a community of experienced local pilots you can talk with about weather conditions, every time you fly. Whenever possible, have an experienced pilot be your 'wind dummy'. They can make the decision to fly, go up in the air themselves, and tell you how things actually feel. If they tell you not to fly as a beginner, follow that warning. Experienced pilots who are able to pilot actively (always keeping the wing in a position directly overhead), can make it look easy to fly in rough conditions, but as a new pilot, those same conditions can be uncontrollable.

In Short, Do This, At Least, Every Time You Fly:

The process you should follow every time you go to fly, at a minimum, is this: check windmapper, windy, winds aloft, and radar. Look for good average wind speeds, acceptable gust ranges, low wind speeds aloft, radar (and weather predictions) that show no dangerous storms in the area, high pressure that indicates generally stable and favorable conditions, and low temperatures that indicate low density altitude. Only fly during the last two or three hours of the evening, or the first few hours of the morning (remember, evening is preferable because grass won't be wet from dew). Follow the recommendations of more experienced pilots, and have a wind dummy fly first, if possible. Don't fly in foggy conditions.

It Gets Easier With Experience, Be Safe:

You WILL get better at judging weather conditions. Your understanding and intuition will improve as you fly in various weather situations. Your piloting skills will also improve, so that you can accept a much wider window of weather to fly in. You may become comfortable flying during mid day (always with a reserve, and only after significant experience, SIV training, etc.). But in the beginning, always choose to play it safe. Weather is one of the most dangerous potential factors in flying a paramotor. After hundreds or thousands of flights, you'll get used to evaluating conditions immediately, because you will have seen similar conditions many times before. A pilot who is comfortable maintaining directional control and flying with half a wing collapsed, who is perfectly happy flying in the turbulent conditions that can cause such a situation, is far more capable of flying during mid-day without distress. A pilot who regularly lands with the engine on, and who can naturally maintain perfectly consistent altitude while flying through heavy lift and sink conditions, directly above the ground, is much more capable of landing during thermal conditions that could slam an inexperienced pilot into the Earth on final approach. A pilot who can actively avoid surges, stalls, and spins caused by violent conditions, is also going to be much more comfortable flying in slightly uncomfortable weather that may make a new pilot not only frightened or even frantic, but also genuinely out of control and unsafe. A pilot who has experienced difficult launches due to high density altitude, will know to avoid that condition in the future. Follow the guidance of pilots in the area who can help you determine what is safe. Remember that combinations of potentially dangerous conditions can add up to a much stronger likelihood of trouble. For example, flying mid-day, with storms nearby, in heavy or gusty winds on the ground, with high winds aloft, in hot and humid (low density altitude) conditions, in low pressure, all at the same time, will almost certainly ensure a nearly 100% chance of serious danger.

Treat weather with respect, it can kill you while flying. At very least, bad weather choices can make for thoroughly unhappy experiences in the air. Wait to fly another time if you are at all unsure!

CHOOSING EQUIPMENT

Skill is Generally More Important Than Equipment Choice

The first burning questions you'll have when getting into paramotoring, will likely be about which wing and engine to buy. There is an absolutely enormous volume of confusing information in the PPG industry, about what you should buy, and it can become totally overwhelming when you're deciding how to make your first purchase. Luckily, when you get past the marketing hype and the noise made on social media by hundreds of opinionated beginner pilots who take their first flights every year, the topic of equipment is really not too complex when you understand the fundamentals.

Paramotor equipment is just so simple, that there's not much room for variation. Learning how to handle a wing in the air, and understanding how a backpack mounted propeller pushes you under the wing, is far more important than evaluating the mostly trivial functional differences between machines.

You do need to buy equipment that is sized properly for your weight, height, and eventually your chosen flying style, but your initial primary focus should be on building skill, much more than upon the details about differences between brands of equipment.

Similarities Between Equipment Options

For more than 95% of popular paramotor models, the motors, harnesses, propellers, carabiners, throttles, and other parts are all typically made by third party manufacturers, and assembled according to just a few fundamental categorical design choices. These days, most paramotor manufacturers use just a few well-known motor options: the Vitorazzi Moster 185a, the Per Il Volo Top 80, or a variation of the 125cc motor models by Corsair, HE, Ross and others (all fundamentally the same machine). If you buy a machine with a Moster 185a, you're getting the **EXACT SAME ENGINE**, whether your paramotor setup cost $6000 or $14000. Harnesses are most often made by Supair, Apco, or by the factories which produce those brands. Props are most often made by Helix, E-Props, or one of the other well-known manufacturers. Most wings are made from a combination of just a handful of fabrics from the exact same factories, in a shape and configuration that is more than 90% the exact same as every other beginner wing. Beginner wings all conform to the same basic design criteria, aspect ratios, number of cells, size and shape, etc. There are only a small handful of basic frame and suspension attachment geometries (weight shift, high hang point, low hang point, etc.), with the overwhelming percentage of machines sold these days using the same basic weight shift design. There are a couple of different ways the netting can

be attached to a round cage, and there are several choices between the materials a cage can be made of (aluminum, carbon fiber, and titanium), there are also a few options for throttle type, but none of those things make any significant difference in how a machine works, fundamentally. If you are a skilled pilot, you will quickly become accustomed to the aesthetic differences between standard designs by any manufacturer. It's true that every pilot becomes comfortable with their exact configuration of buckles on a harness, the placement of their engine's starter pull, and all the other details of the design they fly most, along with the look of their frame and cage, but the way a paramotor flies is extremely simple, and none of those differences in manufacturing change the fundamentals of a how a motor hangs below a wing.

The difference between paramotor brands, therefore, is absolutely nothing like the difference between car brands, for example. Ford and Ferrari each manufacture their own entirely different engines, body styles, safety features, comfort features, and fundamentally different mechanical and aesthetic designs which are dramatically and deeply different from one another. With paramotors, there just isn't much room at all for variation between the components that can be carried on a pilot's back. Standard 3rd party motors, harnesses, propellers, throttles, carabiners, and a small common variety of cage and frame designs, are what all paramotors consist of.

Low, High, and Weight Shift Geometries

High hang point geometries generally connect the carabiners above the pilot's head. They provide very little weight shift capability (the ability to turn the glider by leaning to each side of the seat), but do tend to feel more stable in rough air. If you shift your weight in your seat on a high hang point suspension, the wing will only make long, slow circular changes in trajectory. On some machines, the harness is not attached to the paramotor, but hangs from a 'J-bar' system, in which the weight of the machine and the pilot are separately hung from, and balanced between, a bar that connects to the wing above the pilot's shoulder.

A more common high hang point setup is the 'comfort bar' design, in which a harness is attached to the paramotor frame, and two metal arms project horizontally around the pilot's body, beneath the shoulders, to keep the harness pushed open during flight. In the comfort bar setup, the wing typically attaches to carabiner connection points on the harness above the pilot's shoulder.

On low hang point machines, carabiners typically connect to the wing at waist level, or to a seat beneath where the pilot sits. Low suspensions tend to bounce around more in rough air, and the pilot really feels the movement of his wing shifting the seatboard around. It's possible to pull your wing into steep wing-overs using just weight shift on a low suspension machine, especially when using harnesses with a wide seat board.

Weight shift (swing arm) designs try to balance the differences between low

and high hang points somewhere in the middle. They make use of two swinging gooseneck arms which typically connect somewhere beneath the pilot's armpits and pivot up and down to allow for some weight shift movement, as the arms swing in opposing directions.

It's probably safe to estimate that more than 90% of the machines sold these days are some cosmetic variation of the basic weight shift design, with virtually zero difference in fundamental capability, response, or handling. Unless you have a particular need for some other design, your default choice will almost certainly be a weight shift model.

There Are Only A Few Options, And You Can Swap Out Components As You Wish

Once you understand that paramotor manufacturers are really just makers who assemble parts produced by third party factories (usually much bigger international companies), your understanding of the choices you have available, becomes much simpler. You can swap out the engine, harness, propeller, throttle, carabiners, etc., on any paramotor, and it doesn't change the rest of the machine. The use of each of those individual parts is a choice, and there are a limited variety of mainstream options available when making those choices. There are significant limits to how a paramotor design can be altered. It needs to be light enough to carry, and powerful enough to push you up, and the range of sizes and designs which allow that to happen limits makers to a very narrow band of possibilities. There's just not much room for variation, given the extreme limitations upon weight and size. The thrust of the engine must push directly into the carabiner connection points, so there are only a few options in terms of how the engine can be mounted to the frame, and how the wing can be attached to the harness and frame (high, low, or weight shift geometries). The entire paramotor, harness, and all accessories must fit on your back and allow you to run freely on the ground (the sizes of propellers, frames, cages, and harnesses are limited). No paramotor manufacturer offers heated seats, entertainment systems, or other sorts of amenities that you find in other vehicles. They're all made up of the same small basic list of parts (motor, harness, prop, cage, frame, throttle, carabiners, etc.), with a few options and some mostly trivial feature variations. You can choose which design choices make sense to you, and you accept the fundamental trade-offs that are available between the given choices. Most paramotor manufacturers will offer you the same basic design choices (one of the various engine choices, high/low/weightshift options, cages made of aluminum/titanium/carbon fiber, etc.), because they want to have a competitive offering in each category, but the differences in those various options, is either negligibly different, or actually exactly the same between brands. In most cases, in all the most important ways, the choices are EXACTLY the same (motor, prop, etc.).

Be Aware of Maintenance Costs and Part Availability

Paramotor manufacturers do absolutely everything they can to differentiate the machines they sell, and to make as much revenue selling their units,

but the truth is, they're overwhelmingly similar, and learning to be safe and comfortable is much more a matter of training, skill, and experience, than equipment choice. The $14000 unit will get dirty and beaten up just as quickly after your first few flights as the $6000 unit. Be aware that many paramotor frames are expensive to repair, with sections of cages costing $300 or more (times 3-4, some full new cages cost $1500+ (just for the round part around the frame)). It's generally better to use a design that can be repaired by a welder for $50, or for which you can buy simple inexpensive replacement spars. Be aware that getting parts for many machines, especially older used machines may be difficult or impossible. Some brands are built overseas, and may require months to get simple replacement pieces if they don't have an active, well-stocked US dealer. You may also find that since many paramotor companies are small single person operations, they may take months to even obtain delivery of your initial machine. Be sure you have a way to get parts, or some other reliable means of making repairs. Needing the help of a local machine shop can become expensive.

Plan for Repairs and Maintenance

You should be aware that small 2 stroke engines are not reliable like cars. They need regular maintenance, and you should basically expect everything to break at some point. Perhaps you'll get lucky, but you should start with that expectation. Paramotor engines are very powerful (often more than 20HP), and they're extremely ultralight (usually 40-60 lbs without gas or reserve chute). In order to be able to carry such a powerful machine on your back, every single part has to be as light as possible, and that means they're significantly less durable than engines such as lawnmowers and other rolling machines. Pieces such as mufflers are paper thin. If you bang them on the ground, they will break easily. Two-stroke engines also vibrate more than four strokes, which means that bolts and other fasteners come loose regularly, and need to be replaced more often. If a single bolt or piece from the engine goes through a moving prop, you will have to replace the prop, and likely some pieces of cage, frame, netting, etc. If you trip and fall while launching or landing, you will likely break things, especially if the prop is moving. It's even possible to kick up pieces of rock and other items on the ground, just by walking past them with the propeller moving. Any such sort of projectile can destroy not only the prop, cage, and engine parts, but also the wing.

No matter what brand or type of motor you purchase, it's good to plan on spending at least $1-2k on repairs and maintenance during your first year or two flying.

You can dramatically cut down on the costs of machine repair by training thoroughly and flying carefully.

Wings Are More Important Than Engines

It's perhaps most important to understand that your choice of wing is

generally more important than the engine. The wing is what makes you fly. It's what lifts and moves you through the air and determines the aerodynamic flight characteristics of your craft. You fly the wing, not the motor. The engine just pushes you up. The engine can disappear from the equation up in the air, and you will still fly safely. It's the harness and the carabiners (and to a degree the weight shift connections which connect to the suspension), which hold you up. When an engine dies, you just glide down. The wing provides the lift and aerodynamic control that makes it possible to stay aloft and move through the air intentionally. Without the wing, you don't fly at all. Without the engine, you just stop going up. Focus your understanding on the wing.

Buy a Beginner Wing

The geometry of your first wing is especially important. You should only really consider learning on a well known and/or certified beginner class wing. Beginner wings have been tested to respond reliably in collapse, spiral, spin, stall, and other situations. For example, beginner wings will turn less than 90 degrees before reopening, after encountering a 50% asymmetric collapse, without the pilot providing any input, every time. Beginner wings will also turn fewer than 2 complete rotations, without pilot input, after experiencing a nose-down spiral, every time. Beginner wings also require dramatic sustained brake pressure input from the pilot to spin or stall. These are extremely important characteristics that keep you safe when you're learning to fly. On more advanced wings, you can pull brakes lightly, and fairly easily cause a spin, stall, or locked in spiral, all of which are extremely dangerous situations for a beginner pilot. The G forces encountered during deep spirals can make a pilot blackout and fall from the sky to the ground. In the past, that was a cause of fatalities. These days, a beginner wing can save you by making it much more difficult to unintentionally perform sustained or cascading maneuvers. They're much more likely to fix pilot errors automatically when the pilot stops inputting improper or dangerous corrections.

Wing Size Is A Very Important Factor

It's extremely important to size your first wing appropriately. Smaller wings fly faster than bigger wings of the exact same design. In the beginning, you are more likely to trip while running quickly, or to fall when landing, when you're not intimately familiar with the dynamics of the wing, the engine, and the air you're in. Remember, when you launch, you'll be running, likely on uneven ground (grass in a field, maybe with rocks, holes, etc.), while carrying 50-70 pounds on your back, while controlling a wing that's moving and pulling you around with the wind, while an engine is pushing 100-170 pounds of force into your back. It takes a lot of practice to even begin executing that routine successfully, and many flights to master it. The smaller a wing you use, the faster you have to run to launch and to land. You have to transition from running to flying 20-30mph, and then back again to running when you land. With a massive backpack on your back, it can feel like jumping from a picnic table when

you land. You want as much margin for error when you're first learning, and a bigger wing will make everything slower and softer. The difference is enormous. A 200lb man flying a 33 square meter wing will feel like he's boating around in a steerable balloon. That same man on a 21 meter wing will feel like he's flying a rocket. A bigger wing is a bit more weight to handle on the ground, but the trade-offs are dramatically beneficial until you learn how to handle the dynamics of the wing and engine during launch, landing, and in-air maneuvers.

There are many more properties to be aware of in wing sizing. For example, a larger wing provides more lift, so you can use less engine power to ascend quickly. This means you can carry a lighter engine, run more easily, use less gas, and/or put less wear and tear on whatever engine you choose. A small wing requires more speed to fly, glides down faster (at the same glide ratio, but everything happens faster), requires more power to ascend, puts more constant wear and tear on the engine to stay aloft, may require a heavier engine to stay aloft (which of course is harder to run fast with, while also requiring you to run faster), etc. For all those reasons, bigger sized wings for your weight have many benefits, especially when you're first starting to fly.

If you want to fly fast, you will need to fly a smaller wing. The truth about this is that you should really have several wings. You'll fly the smaller one when there's more wind and you need to be able to penetrate faster forward into a headwind. In those situations, you can use the wind to help launch and land without having to run as quickly. You'll use the bigger wing in calmer conditions, when practicing new maneuvers (a bigger wing responds more slowly in the air, so is generally less dynamic and more forgiving when you're practicing new maneuvers), or when you want to go easier on your engine. In the beginning, choose only a beginner model, err towards a larger size, and progress to smaller, faster, and more dynamic wings as your skills improve.

Beginner Wing Limitations and Comparisons

Be aware that beginner wings can be pushed to perform extreme aerobatic maneuvers. They just force the pilot to work harder (to pull harder on the brakes), in order to get the wing to do anything potentially unsafe. You should learn to perform any high-G maneuvers first on a beginner wing, and then move to more dynamic wings later in your career. It's entirely within the limits of beginner wings to perform dramatic wing-overs, SATS, and even full loops. In fact, until you're totally comfortable going completely upside-down on your beginner wing, you shouldn't even consider using another wing to perform such dynamic maneuvers. If your goal is to eventually perform complex aerobatics, first you must understand that you have a looooooong journey ahead of you. When you do reach the point at which such complex maneuvers are within your grasp, you should have enough experience and understanding about the dynamics of differences between wings, and the trade-offs between options, to make appropriate decisions about gear selection. In most cases, just using a smaller beginner wing will enable a great deal more speed, faster response, and other more

dynamic properties.

It's important to note here that there are ALWAYS trade-offs between design options. Wings made for free-flight paragliding are tuned to provide maximum lift in thermals (without an engine), slolem competition wings are made to zip around tight swinging turns, cross country wings are meant to go fast and far in a straight line, acro wings are built tough to withstand lots of high-G forces and to make pulling deep brakes easier to perform, etc. Intuitively understanding the aerodynamic properties of wings with different design goals is something that only comes with years of experience, thousands of flights in different conditions and with different goals, repeated SIV training, etc. You may be surprised, also, that the differences between wings are probably not as dramatic as you'd expect. A normal slow beginner wing may have a speed range somewhere between 20-40mph, where the fastest wings fly somewhere between 30-55mph at the outside extreme. The first time you fly an acro wing, you may be surprised that it feels almost exactly like a beginner wing when boating around, the cloth and suspension lines are just thicker, the brake handles are shaped and attached differently, and it likely actually flies slower than your beginner wing of the same size.

Differences in speed are generally not as important as you might expect, for most pilots. Paramotor pilots tend to lumber around casually, even when flying in groups. If one pilot flies faster than another, all it takes is for the faster pilot to do an occasional turn to line back up with the slower pilot. Adjusting trim slower on a fast wing and faster on a slow wing can also generally keep groups of pilots flying at the same speed. In practice, flying with others tends to be similar to the way a group of sightseers might walk together through a park. The tallest person doesn't automatically shoot ahead uncontrollably from the group, but instead adjusts the way he walks socially among the crowd. Generally everyone reconvenes as they see fit. For the most part, paramotor pilots tend to fly together in a similar way. The small variations between wing speed are just not a problem, even in groups flying together.

Reflex Gliders

'Reflex' gliders make use of a trimmer system which not only changes the wing's angle of attack, but also its shape. By arching the backside of the wing upward, the weight of the pilot is shifted to the front of the wing, almost entirely upon the A-lines. This configuration makes the wing more resistant to collapse, and also makes the wing fly faster, because much of the surface area of the wing is eliminated from producing lift. The reflex design is popular among pilots who like to fly long distance cross-country flights, because it enables a pilot to launch and land slowly in 'standard paraglider' mode, and then shift to the faster-moving reflex profile in the air.

In comparison to standard paraglider designs, reflex gliders feel solid when flying through turbulence, more like a truck rolling down a road than a boat floating on waves.

It's a common misconception that reflex gliders 'do not collapse'. Although it's true that they are harder to collapse, when a collapse does occur, it's typically far more violent in a reflex wing, than in a traditional paraglider. Reflex collapses are so uncontrollable, in fact, that most gliders manufacturer do not even test collapses in reflex configuration. At the time of this writing there is not a single reflex wing that is certified A-B (safe) in reflex mode. There are many 'semi-reflex' or mixed-mode gliders that are certified safe, but ONLY when flown in standard paraglider configuration. Most manufacturers tell you to return to paraglider configuration if you encounter dangerous turbulence in reflex mode. Despite what you may hear from pilots (especially those who've only flown for a few years, and who aren't experienced at stalling and performing extreme maneuvers), the manufacturers will all tell you the exact same thing about their own reflex designs. You do not want to collapse a wing in reflex mode. There are plenty of videos of deeply experienced professional test pilots demonstrating reflex collapse characteristics. No matter the level of pilot skill, it is generally not possible to control a reflex glider once it collapses. You need to read the glider manual and understand how to avoid such situation (especially, not pulling brakes and pushing speed bar at the same time on a glider in reflex mode)

Because reflex gliders change the shape of the rear of the wing, you generally can't use brakes to steer the wing when in reflex configuration. Instead, a separate set of 'wing-tip' steering toggles is used to adjust the profile of the outer wing tip, to affect a turn during reflex flight. The lack of primary brake use in reflex mode means that many activities, such as foot drags and other precise flying maneuvers should not be performed in reflex. It also means that the ability to flair and slow flight is not possible in the same ways as a glider in standard paraglider mode. You generally should never try to land a glider in reflex profile. It's important to recognize these limitations before choosing a reflex glider for precise flying activities.

When entering reflex mode, the area of a glider which produces lift is reduced. One of the main benefits of this is that the glider flies faster in that configuration. This allows the pilot to launch and land with a big, slow glider, and fly faster in the air by configuring it into an essentially smaller glider. There are two potential downside effects of this configuration which should be fully understood. First, your use of power will increase when the lifting surface is reduced. You'll need a lot more gas during the same period of time to fly in reflex mode. You'll also be flying a wing with a much higher aspect ratio, which is universally understood to have less stable aerodynamic properties than a wing with a 'stubbier' shaped aspect ratio. You should not plan on performing aerobatic maneuvers in reflex mode, especially considering that the recovery properties of reflex wings in a collapse, spin, or stall are totally unpredictable.

The truth is, if you're flying in safe conditions, very few pilots ever experience a collapse in reflex mode, and they do inspire a feeling of

confidence for many, but you should be aware of all aspects of reflex use if you consider flying a reflex wing.

Trikes and Quads

If you have trouble running or carrying a PPG, trikes and quads are a good option. Trikes are typically lightweight rolling platforms (~30ish lbs) which get attached to the base of a foot launch (backpack) paramotor. They're generally intended to be a lightweight option that can be broken down for easy transport without a trailer. The motors which power trikes can usually be removed in a few minutes, and flown as a foot launch unit. In a trike, the pilot typically hangs from the harness, exactly as he does in the foot launch configuration. There are trike options available for many different brands of paramotor, typically costing $2000-$3000.

Quads tend to be larger, more stable wheelbases with much larger engines and propellors that never get removed from the rolling frame. Pilots tend to sit in a bucket seat. Quads typically require a trailer wider than 6' for transport. They typically can be made with a 4 stroke engine option which runs cooler, requires less maintenance, no mixed 2 stroke fuel, etc. There are only a few 4-stroke models available from a small handful of manufacturers.

If you want to fly with wheels, quads are a much more stable platform to learn on, but they are much more expensive to purchase, and they do require a dedicated trailer and vehicle for transport. Trikes are more likely to flip if you don't have solid wing handling skills, but they're a nice option for pilots who no longer enjoy carrying a machine during launch and landing.

Electric and 4 Stroke Machines

There are a couple 4 stroke and electric engines, but they are mostly fringe/specialty options that satisfy the needs of a very small percentage of pilots.

Electric PPGs are mostly still hobbyist creations, not quite suited for general public use yet. Expect to DIY all, or at least a significant portion of an electric setup. The choice of batteries and other parts often need to be engineered by the user, with some 3D printing and other knowhow required. Electric machines tend to only get very short run times, nothing close to the several hours you can expect from almost every gas unit. Big improvements have been made over the past decade, but they're generally not appropriate for most pilots, especially beginners. Keep an eye on the OpenPPG designs, as their upcoming model is intended to be usable out of the box as a realistic replacement for gas models.

The Bailey 4 stroke has been around for years, and a few lesser-used options have entered the market. They are generally heavier and much more expensive than 2 stroke options. Very few mechanics and pilots are

familiar with those engines, and parts are harder to get. You will see 4 strokes commonly used used on larger trikes and quads, where weight is less of an issue, but in these setups, the machine is generally never flown as a foot launch unit, as those machines are generally too heavy to carry on your back.

Reserve Parachutes

The most common type of reserve parachute in use by paramotor pilots is the round 'pulled down apex' design. That style has been in use for many years, and has proven itself to be reliable, fast opening, inexpensive, and easy to get repacked. One known issue with round chutes is that they can tend to oscillate (swing), especially when the main paraglider wing is not pulled in by the pilot, after a reserve deployment. It's important to learn the proper paraglider recovery technique, to avoid too much swinging as you approach the ground. Round parachutes typically cost $600-1000.

Square parachutes eliminate some of the oscillation which can occur with round chutes, but they have a tendency to drift farther from their deployment location than round chutes. This tendency could potentially cause a problem if you risk drifting into trees, power lines, water, etc. Square parachutes are very commonly used by acro pilots who are more likely to throw their reserve than other pilots, because they tend to perform maneuvers within a 'play box' of air, where they know where they'll likely drift. Square reserves are also popular among pilots who want the smallest possible weight, as squares tend to achieve a very good sink rate for their size (so a slightly smaller chute can be used for the same size pilot). Square reserves tend to cost $800-1200.

Triangle, or 'Rogallo' reserves are steerable. The Beamer III model has become popular as it allows you to fly toward a preferred landing spot, avoiding tree landings and other dangers. Acro pilots will often choose to throw a triangle reserve when they are high enough to collect their paraglider, pull out the steering toggles on the reserve, and aim their glide path towards landable terrain. A backup round or square reserve is often carried as a last resort, or for when closer to the ground. Rogallo reserves cost $1000-$1500.

You will need to buy a carry bag, bridle lines, and carabiners or strong mallions to carry and attach a reserve to your harness. That hardware typically costs $100-200. Most modern bags will allow you to attach the reserve as either a front or side mount. Front mounts are typically reattached each time the pilot puts on the harness. They have the benefit of allowing either of the pilot's hands to reach the reserve handle. If you're falling in a high-G turn, or in some other uncontrollable situation, this can be a huge benefit. Side mounted reserves tend to stay out of the pilot's way more, typically hanging off the side of the comfort bar or weight shift arms, and they are only reachable by a single hand. They're typically mounted on the side opposite the throttle hand.

Most manufacturers recommend getting your reserve professionally repacked

once every year, or within 6 months before taking an SIV (emergency maneuvers training) course, where you'll likely be expected to practice throwing your reserve. The reserve is tightly packed within its bag, and needs to be aired out, and the rubber bands which hold the lines in it's tightly packed configuration should be changed out before they dry out or rot. Most packing services will only pack your reserve if it's 10 years old or less.

Paramotoring vs Paragliding Equipment

Both motor and free flight disciplines involve the use of a paraglider, but there are differences in skill requirements and equipment. Whereas paramotor pilots tend to fly from flat fields in the morning and evening on windless days, when thermal conditions are calm, free flight pilots generally launch from a tall hill or mountain during the middle of the day, when wind hits the hill directly from the front, and when thermal conditions are strong enough to lift the pilot to cloud base without power from an engine. Free flight pilots also often fly close to the sides of hills and mountain tops, to soar the 'ridge lift' which comes from wind currents hitting the side of the slope. Because of the proximity to often rocky terrain and active weather conditions required for free flight, pilots tend to use a well padded harness with back protection, so that there is some help in case of an unintentional contact with the ground. If a pilot launches into heavy wind on a mountain and gets spun around back into the hill, having every bit of protection possible is helpful. Also, when landing in the middle of a thermally day, without an engine to provide lift on demand, it's possible to hit sinking air when near the Earth, and get pushed hard down into a collision with the ground. Powered machines can counteract sink to avoid harder landings that require padding.

Free flight wings are generally sized bigger and are designed to eek out every bit of lift possible. Paramotor wings tend to be designed to fly faster and to best handle the dynamics of power being applied at the riser connections, without oscillating. For paramotoring, be sure to buy a wing that is meant to be used for powered flight.

There Is No 'Best' Machine, Only Trade-Offs

There are all sorts of details which you'll see manufacturers peddling. For the most part, the details tend to conform to the 95-5 rule. 95% of those differences will make perhaps a 5% difference in how the machine operates. And for every benefit, there is is a trade-off. Lighter machines are almost invariably easier to break and more expensive to maintain. Lighter wings don't last as long. Gas tanks on top don't require the carb to pull gas upward, but they're also not as reliable when you perform aerobatic maneuvers that introduce swinging G-forces. Composite props spin up more quickly and can be folded down to a small size for transport and storage, but they're much more expensive, harder to repair, and they are easily destroyed in sandy/rocky environments. Cages with riveted netting can support more weight, but if you bend them, they

completely lose all their structural integrity, and buying new sections for proprietary cage designs is always much, much more expensive than buying straight metal spars for simpler modular designs.

There is absolutely no 'best' among paramotor designs. There are only trade-offs. Every improvement in one area of design means giving up priority in another area. The extremely ultralight nature of the whole paramotor concept ensures that this will always be the case.

Don't get too caught up in the details. Safe, enjoyable paramotoring will always rely more on pilot skill than any specific detail available on a single machine. Go out and watch some local paramotor pilots fly. If you talk with anyone with experience, you'll get the same response. Every paramotor needs to be maintained regularly, and you need to focus more on building your own skills than on choosing any particular piece of equipment.

What About Buying Used Equipment?

It's generally a bad idea for beginners. You should focus on getting the appropriately sized, reliable and safe beginner equipment to perform your first flights. Later, when you've had a chance to try a variety of different styles and sizes of wings and engines, then it's certainly possible to find bargains that fit your needs. But buying gear with the first priority of saving money, is not a good way to have a positive experience when you're starting out. You will be able to handle engine outs more comfortably after you've had 100 flights, but you don't want that likelihood while learning to perform your first launches, landings, and fundamental maneuvers.

If you do buy used equipment, make sure that replacement parts are readily available. It's not uncommon at all that students get a 'great deal' on equipment, only to find that it's simply impossible to replace a broken piece. Having a machine shop engineer new pieces can become extremely expensive, and broken parts are much more likely on used machines. It's common to see repair and maintenance costs on old used machines quickly surpass the cost of the initial purchase.

If you do buy used, pay particular attention to the wing. Lines can stretch if they've gotten wet, fabric that has been exposed to UV light will degrade even more quickly than it will with use, abrasions and damage from contact with the ground, sand, insects, etc., are not always visible, and wings become more porous with use. You shouldn't fly a wing unless it's passed a recent inspection, or unless you can absolutely trust its history of use. The wing is what keeps you airborne. You don't want to be hanging from a piece of worn cloth at 3000', wondering if you've made a good purchase.

Under no circumstances should you buy a wing with advanced handling characteristics, until you have the experience to handle such a wing safely, whether it's used or new.

Be aware that the PPG industry has gone through absolutely dramatic changes, including many improved standardized design trends, during the past 5-10 years. Motors and wings from a decade ago perform quite differently than the newest models, and that trend continues to progress quickly. There's a reason the shiny 'new' motor on Ebay which the owner only flew a few times because it weighs 70 lbs dry and has a motor which is no longer made, is being sold for $2000. There's a reason that the nice crispy wing manufactured in 2004, which weighs 30 pounds, has no split-A's, has a glide ratio of 4:1, and locks into spirals or spins when too much brake is pulled, is being sold for $1000.

You absolutely should not be pushed into purchasing a new machine with 'features' that unnecessarily cost $13,000, but it's definitely better to start with a nicely priced new machine which you can trust and maintain easily, which is lightweight, safe, comfortable, and easy to handle, along with a completely trusted safe wing, while learning the ins and outs of powered paragliding. You are not ready, during your first flights, to handle emergencies that can (and do regularly) occur with older equipment. And it's just not any fun to be in the air with equipment that you don't trust 100%.

Summary

It can't be said enough, just get a beginner wing, sized for your ability, weight, and athletic ability, possibly with a leaning towards the style of flying you hope to enjoy, in terms of size. You'll grow into a flying style that will evolve and expand as you become more experienced, and perhaps you will find some benefit in trying more specialized wing designs later on down the road.

When it comes to engines, you should focus on getting one that's not too heavy to run with. Remember, you'll be running on uneven ground, while your wing is moving and pulling you with the wind, while the weight of the machine is pulling downward, and while the engine is pushing 100-170 pounds of thrust into your forward motion. A big engine is not only heavy, but it will also torque you much harder to the side, and it will most likely have a less smooth power band, which will jerk you around more dramatically than a small engine. You need to get an engine that will make you climb comfortably, without having to be run at its max all the time. You'll experience many more troubles caused by overheating and vibration if your engine is underpowered for your weight and the size of your wing. Remember, you can fly almost any size engine, if you fly a big enough wing. That whole equation needs to be balanced properly for speed, power, comfort, and safety. Your instructor can help you understand that equation more clearly, for your particular body type, health and fitness level, the altitude at which you launch and land, and other factors.

Be sure that you can get your equipment and replacement parts within a time frame that is acceptable to you, and be sure that you like and trust the people who work with and for the manufacturers, whom you'll have to deal

with for support.

KITING

During training you'll learn three primary ways of handling the wing: pre-kiting the wing without the harness on, inflating the wing with the harness on in reverse position, and inflating the wing with the harness on in forward position. You'll also learn pack, unpack, layout, and handle the wing on the ground.

Handling the Wing on the Ground:

Learning to lay out the wing on the ground, to ball it up into a rosette and carry it around, to bundle it for storage, and to keep the lines from getting tangled is a fundamental prerequisite.

When pulling the wing out of the bag, it's essential to keep the end loops of the risers (the connection points that hook into the carabiners) away from any of the paraglider lines. If the loops ever go through any lines, or through other parts of a riser, you will create a twist in the lines. Always pull the ends straight away from the wing, and point them like a dart away from the glider. While holding onto the end loops, toss approximately 10 ft of lines towards the wing to give some slack so that the risers don't get dragged on the ground while opening the wing.

To open the wing, point the leading edge openings up towards the sky, drag the wingtips out away from the center, then straighten out the leading-edge openings by walking each cell out hand by hand into a perfect tight arc, facing directly into the wind.

To ball the wing into a rosette, drape the ends of the risers behind your left leg, grab all the lines into a bundle in your left hand at the maillons, and wrap all the lines into coils of 8-10 inches with your right hand, until you reach fabric. Walk toward the wing as you coil the lines, and avoid pulling the wing toward you, as that will abrade the fabric. Lift the wing straight up as you coil the lines near the fabric, and pull it into a ball that you can lug over your shoulder.

To put the wing away, simply drop the rosette onto your open stuff sack on the ground, toss the entire coil of lines into the center of the wing, and fold wing fabric around all the exposed lines. Tuck all of the loose lines into the center of the wing, and place the riser ends on top of the fabric, as far away as possible from any lines. It may look like a mess of lines, but don't worry, as long as the riser loop ends don't ever go through a line, they won't get tangled.

Pre-Kiting:

The purpose of pre-kiting is to lay out the wing into the wind, to straighten the lines, and to inspect the wing before launch. Open the wing into an arch and extend the lines into the wind. Position the risers so the A lines are on top. Hold A's in one hand and grip brakes + D's with the other hand (put thumbs through the toggles to clasp brakes and risers together, so the brakes don't come unclipped).

To inflate and raise the wing, pull A's, release brakes, and walk backward. To deflate and drop the wing, release A's, pull brakes, and walk forward. Don't pull brakes and A's at the same time (this just cups the wing in the power band). Pop the wing up momentarily (for just a second or two) to inflate it ('build a wall'), and then drop it back down. Adjust your position and TURN the wing around the radius with you at the center, so that the wind line blows straight THROUGH YOUR BACK and into the CENTER of the wing. You will need to rotate towards the DOWNWARD SIDE OF THE WING (this is counterintuitive, and one of the toughest concepts to internalize). Toss some grass or dirt straight up to see the current momentary wind direction. Adjust the position of the wing so that the tips pop open perpendicular to the wind. Rotate and shuffle to BILLOW each side of the wing evenly. When the wing can raise up perfectly level, without leaning to one side or the other at all, then it is straight and ready to kite. For the wing to be ready to launch, it shouldn't need any correction to come up evenly - just pull the arched wing straight up squarely into the wind with A's.

You can practice the 'steering wheel' pre-kiting technique to help lay the wing out straight, but this doesn't help you learn to launch or fly. Avoid doing much pre-kiting practice without a harness. The goal of kiting practice is to get the wing above your head, while hooked into the wing, in a harness (as you will while flying), to stabilize it, and keep it centered over your head in forward position, as if ready to launch. The main challenges are learning to stop the surge as it's coming up to the 12 o'clock position over your head, and learning to stop left-right roll oscillations while you move forward with the wing over your head (keeping centered under the wing).

Reverse Inflation:

1. Lay the wing out into the wind, and pre-kite it before hooking into your harness, CLEAR THE 'A' LINES (and others). SLACK all the lines with the leading edge cells facing upward, ensuring no lines are lifted off the ground, so that the wing catches no wind at all.

2. To hook in, turn the risers 180 degrees - lines on top are the side you'll turn towards. Do not turn or separate the risers during this process. CLIP IN: check that the carabiners are inverted and straight (facing foward as they will fly), the gate is locked, the 'road' is not twisted (run your hand down the full length of the riser fabric and its entire assembly, ensuring the brake side of the risers are facing foward

when hanging down), then pull your arms outward so that lines run clear to the pulley.

Be ready - IF YOU GET PULLED BY WIND, RUN TOWARD THE WING (slack the lines *completely*), pull brakes, and run around the SIDE of the lines so feet don't get caught. Grab a wingtip and reel in the cells if wind is too strong.

3. Grab BOTH center A lines over the top of risers with the hand least likely needed for braking. Practice switching lines between hands - you can only use brake in the hand which is not holding A's.

4. Pre-kite the wing into the wind again in the harness. Determine wind direction by tossing grass or dusty dirt straight up. Pull A's and walk backward into the wind until the wing inflates completely and straightens into the wind (still on the ground). Bounce the wing a few times (pop and drop), using only 'A's, and ROTATING around the radius and/or shuffling side to side, to ensure it comes up straight WITHOUT ANY BRAKE INPUT REQUIRED, and your body directly in front of the wing center. You're now straight into the wind.

5. INFLATE the wing straight up with the A's, while walking directly backward into the wind. Push your butt into the seat. During the intial stages of practice, IF THE WING COMES UP UNEVENLY AT ALL, DROP IT BACK DOWN AND PRE-KITE AGAIN. If the wing is straight, with no tilt whatsoever, continue pulling A's to raise the wing overhead. If winds are strong, allow the wing to pull you slightly forward for just a moment (running forward slows the wing's ascent). Your arms should raise with the wing, and the A's should pull up out of your hand. At 11-12 o'clock, release the A's and BRAKE THE SURGE. The stronger the wind, the harder you will have to pull brakes, to keep the wing from overshooting you. Continue to WALK BACKWARD INTO THE WIND, and keep consistent tension into the wind as it's speed varies. Stabilize the wing roll: shuffle left/right to the low side of the wing (follow the center dot), PULL SAME SIDE BRAKE (while in reverse). Always continue moving backward into the wind.

6. Only when the wing is *stable* over your head for at least a few seconds, TURN forward, never stop moving directly into the wind. Drop your forward shoulder to help keep moving forward during the turn.

7. Shuffle to the lower side of the wing (follow the center dot) and pull *opposite brake to keep the roll centered (opposite side brake while facing forward). Never stop moving forward while shuffling - run diagonally. Pull both brakes to stop pitch surges. Always move forward into the wind to avoid stalls and to maintain control. Without wind speed, control inputs aren't effective.

8. If the wing falls back past 10 o'clock, TURN AROUND QUICKLY to face the wing, and let it fall. You can pull some A's to keep the wing from slamming down, or to pull the wing back up into the wind to continue kiting.

High Wind:

If the wind is strong, be prepared to RUN TOWARD the wing, pull brakes, and run around the SIDE of the lines so feet don't get snagged. Don't hold the wing in the power band - either pull it over your head to 12 o'clock to fly it, or pull it back to the ground and SLACK the lines.

It can help to layout the wing PARALLEL to the wind (or 10ish degrees into it). CUP JUST THE FAR CORNER CELLS into the wind (pull some brake attached to that corner before you pull A's). Pull the wing up cobra style, so that the entire wing is never in the power band.

In very strong wind, to avoid being dragged, WRAP brakes for more authority (wear gloves), and pull the back edge all the way forward with brakes. Pulling B lines can help reduce the surface area of the power band. RUN toward the wing as far as needed, do not fight it even for a moment. If winds are too strong, grab a wing tip, so that it blows parallel to the wind like a streamer, and reel in the cells so that the brake lines don't pull the opposite corner. Unclip carabiners, gather up the leading edge cells so that no openings can catch any wind, and bag the wing.

Forward Launch:

If there's no wind, lay out the leading edge of the wing in a PERFECT NATURAL ARCH (spread it out tightly and evenly, cell by cell, so that the wing's center is farthest from you, and tips are closest) and stand directly in front of it's center. If there is just a whisper of wind from variable directions (less than can be used to pre-kite), just lay out directly into the wind as well as possible.

To hook in forward, check that A's are on top, extend the riser loop connection forward like a dart, then bend the riser connection straight down 90 degrees and pull the carabiner straight up to join it. Do not turn the riser during this process. Give a thumbs-up sign, swing your arm behind you, then bring your thumb between your leg and the riser to scoop the A lines with your thumb. The split A riser fabric should touch the back of your thumb, the maillons should face upward on the thumb side of your hand, and the other risers should drop over your arm. Check that the A's have ended up on top all the way back to the leading edge cells, and that brakes are clear to the pulley. If the A's are not completely clear on top, redo your connection. Hold your hands up at 10 and 2 o'clock, then out in cross position. DO NOT PULL YOUR HANDS FORWARD to put undue pressure on the A's (this collapses the leading edge).

To raise the wing, torpedo and use the weight of your body falling forward. Keep your arms back. Pull the wing up, at 11 o'clock, release the A's and brake the surge very lightly (if there is any at all), then continue with step 7 of the reverse launch process. The faster you move, the more your control inputs will work as expected. If you stop running even for a second, the wing will not respond effectively, and will fall backward. AIR

SPEED over the wing is required to make the wing fly, and for the controls to function properly. Run, run, run.

To drop the wing, turn around and continue to move backward into the wind, pull brakes, release tension on the A's, and slack the lines on the ground.

SIMULATOR

The goals are to learn smooth and even throttle control, to become comfortable with the force of the engine pushing on your back and swinging your body forward and aft, to run through every segment of the first flights (inflation, launch, climb out, turns, getting seated, altitude adjustment, landing) along with the specific vocal and visual commands that are used for each input and response. Becoming comfortable with headset communication while the engine is running loudly is also important.

"Arms at 10 and 2 in cross position, ready?, 3-2-1 inflate (torpedo), RUN RUN RUN (track into wind, follow the wing's center dot), arms rise up, release A's and 'BRAKES' (pull both brakes to check the surge), POSTURE (stand up straight), RUN RUN, HANDS UP, stabilize and taxi straight (SHUFFLE left/right and correct LEFT/RIGHT with brakes to SHOULDER), IF the wing oscillates or surges, ABORT/STOP/KILL, inspect the wing and lines, run run, gently add a little MORE THROTTLE, lean back into power, a little more throttle, MORE MORE MORE ... more throttle, keep running, IF the wing oscillates or surges, ABORT/STOP/KILL, Otherwise - it's good, go go go, hands up, more throttle, more more, HANDS UP, more throttle, FULL POWER, bounce and run/kick, DO NOT SIT, bounce and kick/run repeatedly, FULL power, (let the seat scoop you above 50'), more more - all the way up to 300', hands up, reduce throttle gently to level flight, (less/more...), OK get ready to turn, look up/down/back right, lean right, pull right gently 1234 to SHOULDER and hold (gently release left), pull 1 inch harder if needed, OK slowly release right 1234, HANDS UP and a bit more throttle, practice level flight and altitude adjustment (more throttle and less throttle), more right turns (to SHOULDER, plus 1 inch harder as needed), fly the pattern turns to above 300', (are you seated? if not, STOW non-throttle brake, wave hand, and push into seat...), practice more level flight and altitude adjustment (more throttle and less throttle), hands up, you're doing great, the wing is over your head, you're safe, hands up, take a breath, look around and enjoy yourself, continue more turns/more/less throttle, (reduce throttle a bit before left turns), if the wing oscilates - reduce throttle and hold a turn, notice upwind/downwind speeds, notice torque on more throttle, notice wing pitching up/down forward/back with throttle adjustments, practice weight shift turns, hands up, set up for final approach into wind (go around if needed), get out of the seat (arch back and push your pelvis forward, hang upright from leg straps, with straight body, no bend at waist), one foot forward, hands up, kill the engine, hands up, do not turn, eyes on me (small corrections), wait wait wait, not yet, hands up, it feels screaming fast (too fast to run), but NOT

YET, ... wait wait wait... at 8' - pressure (shoulder), get ready, ... and... FLAIR NOW, HARD TO BUTT, run, run, turn around and run backward, pull both brakes to drop the wing, woohoo!"

BASIC FLIGHT CONTROLS AND AERODYNAMIC MANEUVERS PRACTICE

Learning how to set up, launch, and land are not the only important skills to gain during your first flights. Understanding how the wing's brake controls, engine thrust and torque, the environment's wind and air currents (thermals, rotor, etc.), weight shift, and other controls affect flight, should also be a primary goal. You'll practice eliminating oscillations, as well as some basic maneuvers, to better understand the dynamics of controlling your glider.

Hands Up, Reduce Power

Paragliders are trimmed to maintain straight and even flight when no control inputs are provided by the pilot. This is why 'hands up, reduce power' is the go-to safe response for absolute beginner pilots to enact, whenever a challenging condition arises. Always put your hands up and reduce power SLOWLY AND SMOOTHLY, to a count of 4. Your pendulum position below the wing assures that aerodynamic forces will equalize, if you simply stop inputting control adjustments, and do nothing at all, as long as you are using a beginner rated wing, and have enough altitude. Even in the rare case of a significant collapse, a safe beginner wing will simply turn a bit (less than 90 degrees), and resolve the situation automatically.

To stay aloft, however, you must provide thrust, and to control the direction of your flight, you must pull brakes and otherwise affect turns. You must also adjust to changes in wind direction, lift and sink, and avoid obstacles, etc. As soon as you do these things, you will affect the aerodynamic forces acting upon your flight. Understanding what to expect and how to handle those dynamic forces should be a primary goal and the focus of in-air practice during your first flights as a student.

Thrust

Adding thrust will push you forward and angle your body into a more reclined position (so that you are facing farther upward, looking higher up into the sky). In this configuration, your wing will move behind you, so that you must look farther backwards to see it over your head.

Reducing power has the opposite effect upon your movement - your wing will dive forward and you will face downward more toward the ground. If you time these inputs to build up forward and backward momentum, in the same way as pumping your legs on a swing set, you can build up dramatic pitch

oscillations (swinging forward and back). Don't do this to any significant degree, until you've gained much more experience controlling the wing.

Thrust also creates torque to the side opposite your propeller's direction of spin. On a powerful machine, especially if lightly weighted, that force can turn you dramatically. Simply reduce power to reduce torque effects.

In the beginning, the most important guideline to follow in handling all the forces and movements created by thrust, is to make throttle changes slowly and smoothly. Adding full power at any moment, or immediately dropping from full power to idle will almost certainly swing you hard unintentionally. Always increase and decrease power gently and gradually to avoid steep swinging (pitch and roll changes) and to avoid spinning torque turns.

Brakes

Pulling one brake toggle will slow down that side of the wing, making the other side of the wing move faster around it, affecting a turn. The faster you turn, the more G-force you will feel in your seat, as you swing around the center of gravity. If you pull too much brake on one side too quickly, or if you hold it too far for too long, you can potentially stall that side of the wing (stop it from flying), and spin the glider. It takes a lot of force to do this - you really need to pull - but as a beginner, spins are an extremely dangerous situation to avoid at all costs. If you stall both sides a wing, the glider will bunch up, drop out of site behind you, and fall straight down. If/when it re-opens, without proper control inputs, it can surge in front of you so hard as to end up beneath you. This is the worst possible situation to end up in, typically requiring a reserve toss, if that's even possible (being 'gift wrapped' in a wing likely means being utterly tangled in lines). Stalling a wing generally requires burying the brakes hard, to seat level, for at least a few sustained seconds, and requires lots of force on a beginner wing ... just be aware to never do that during your first flights. As an advanced pilot, you can practice stalls at an SIV clinic, but only with proper instruction, thousands of feet of altitude to burn, dual reserve parachutes, over water with flotation and a rescue boat waiting, and proper professional guidance. As a beginner, you should never approach anything close to a stall. Use a beginner wing, and only pull enough brake to flare and stall when you are landing, 1 foot or less off the ground. Be sure to stow your brake any time you need to pull your hand away from the pulley (such as when pushing yourself into your seat).

Be aware that any turn you make will pitch you progressively toward the ground, and you will lose altitude, unless you counter it with a bit of thrust. In the very beginning, it's safest to just keep your altitude above 300 feet, and take turns without increasing any thrust, then add some more power afterward to regain altitude. You can work with your instructor to add thrust during turns, as you progress.

Weight Shift

Any machine with weight shift bars or a low-medium hang point can be turned by shifting your weight to one side of the harness. Weight shift turns tend to be 'flatter' than turns induced by brakes (there is less dive), since neither side of the wing needs to be slowed down by the brake. Practice your first weight shift turns with hands up, and progressively learn how much force it takes on one side of the seat board to affect a turn. Note that high hang point machines will provide very little weight shift authority (more like gentle course corrections than turns).

Oscillations

One of the most common troubles during initial flights is oscillations. Oscillations are caused by unintentional swinging side to side and/or back and forth under the wing. Changes in thrust, as well as brake inputs can cause unwanted swinging, especially when inputs are entered or exited too quickly.

Your first response to unintentional oscillation should be 'hands up, reduce power', slowly and smoothly - make every change in brake pressure and thrust to a count of 4.

Your next option is to pull and hold a long continuous turn, preferably in the same direction as the engine torque. The forces generated in a long turn will move you consistently in one direction, which helps to more quickly eliminate any swinging back and forth beneath the wing. Be sure not to release the turn too abruptly, as that will immediately begin a new bought of oscillating swings. Count to 4 and release brakes slowly and smoothly. Generally, most basic brake movements in one hand should be countered by an opposite movement with your other hand. As you pull right brake, release left brake, and visa-versa.

Finally, you can practice intentionally stopping oscillating swings with properly timed brake inputs. This should only be done with the help of your instructor. If you time your inputs incorrectly (a potential problem experienced by virtually every beginner), you risk increasing an oscillation, instead of stopping it. The basic technique requires waiting for the wing to begin moving back towards the center above you, and pulling brake to stop its movement exactly overhead. If the wing is moving left, you'll pull right brake, and visa versa. You should pay attention to the wing's accelerating arc in the swing, and to the deceleration created by applying brake, and anticipate its movement, to properly time the oscillation correction. Your instructor can help you pull at just the right moment.

Recognizing Wind Direction and Ground Track

During your first flights, it's important to recognize how wind affects your flight path. As you fly into wind, your ground track will slow down,

and as you fly downwind, your track will speed up. Wind speed typically increases as you gain altitude, so in some cases you may need to lose height to move forward. To maintain a straight flight path at an angle to the wind, it is necessary to 'crab' into the wind, turning constantly away from the direction in which you're being blown, to maintain straight ground track. Work with your instructor to understand the dynamics of controlling your direction within a moving air mass. It's especially important to understand that turns downwind will require much more ground track than when moving into the wind.

Baby Wing-Overs and S-Turns

Turning in one direction, and then swinging out to the other side is a fundamental method used to create energy and G-forces needed to perform aerobatic maneuvers. You must be extremely careful practicing such a side-to-side swing during your first flights, and do so only with the guidance of your instructor. Timing a coordinated wing-over is accomplished by pulling brakes on one side, releasing, and then using the momentum of that release to enter a turn to the other side. To practice your first tiny counter-swings, you should be at a high altitude, in clear air with no other pilots and no obstacles around, engine at idle, in calm conditions, and you should watch the movement of your wing above you to time the movement of the counter-turn. After releasing your first turn, the wing will naturally move back towards the direction of the counter turn - at that point you should begin to apply break in the opposite direction. You'll feel the speed, G-force, and dive increase noticeably during the counter turn. Slowly and gradually release the brake, and apply a small amount of counter brake to stop the turn. You should make only the smallest possible turns while practicing your first such 'baby wing overs'. Do not make a third counter turn, as the forces can increase dramatically, and very quickly get well out of the safe range for your first flights. If you have any trouble, put your hands up gradually and stay off the power to resume straight and even flight. Your first tiny 'wing-overs' should really just be long back and forth turns around a forward path. With your instructor's help, you can progress safely to steeper bank angles.

Practicing S-turns is a fantastic way to learn to adjust altitude and direction. Turn more than 90 degrees away from your intended flight path, then perform a gentle baby wing-over back to the original point of your first turn, then perform that exact same maneuver to the opposite side. If you complete each of your elliptical turns properly, you should actually be flying slightly back away from your intended flight path before circling around forward. Practicing with reference to a line on the ground (perhaps a crop line, a row of trees, etc., but never near power lines) is helpful in orienting yourself around your intended flight path. Be sure to have lots of altitude when practicing s-turns. They're a great technique for losing height when approaching a landing zone, without using up forward motion (i.e., using the smallest runway length to glide to your landing).

360 Turns (Baby Spirals)

Pull the wing into a turn and hold it until you've gone around in a circle. Your initial attempts should only make use of extremely light break pressure, and should never see the wing angle more than 30 degrees to the horizon. Even with such a shallow turn, you'll feel a significant increase in G-force on your harness. Nose-down spirals should be avoided at all costs until you've developed advanced skills, and only initially practiced at an SIV course. Getting out of a nose-down spiral can lead to a wing collapse if not performed well, and the G-forces in such a spiral can very quickly lead to loss of consciousness. Blackouts during a locked in spiral can be fatal. Don't try them without professional help. Your first 'baby spirals' should really just be long 360 degree turns around a circular path. With your instructor's help, you can progress safely to steeper bank angles.

D Line Controls

In an emergency, you can pull on D lines as a replacement for brakes (i.e., if a brake line is entangled, twisted, or broken). To practice, stow your brakes, then pull gently and progressively on the D line riser (on only one side), to turn the wing. BE ABSOLUTELY SURE NOT TO PULL THE A LINES, as this can (will) collapse your wing, if you pull them with enough force. When attempting to re-grasp your brakes, you may find they move around in the wind too much to get your hand in the toggle. Simple grasp the entire brake toggle inside your hand, directly at the pulley, gain control, and then slip your hand in the toggle when they've stopped flapping.

Trim Tabs and Speed Bar

'Trim tabs' are buckles on the back of your wing's risers which allow you to tilt the angle of incidence of your wing. When you release the trim tab straps, the backs of the risers ('D' lines) get longer, and the wing angles down in front. When you pull the trims back in, the back of the wing is pulled back down, forcing the front and back edges of the glider to be pulled back into a straight configuration into the wind. When the risers are released, the wing descends more quickly, your forward speed is increased, and more power is required to maintain straight and level flight. With the trims pulled all the way in, the wing moves more slowly, and you maintain your best glide ratio, with slower forward motion, and less power required from the engine. In order to adjust trim settings, you must be completely comfortable letting go of the brakes, and feeling the changes to your flight settings, which occur as you physically alter the shape of your wing. You must be prepared that when pulling or releasing the trim tabs, your wing's flight path will be adjusted. If you release only one riser, your wing will turn in that direction, as that side of the wing will dive faster than the other. Be prepared to keep both riser settings even, so that you can maintain straight and level flight. You can use a slight pull on one side of the riser trims to adjust for constant torque in one direction, especially when taking long flights, so that your wing flies completely straight, despite a constant amount of torque created

by the engine.

In addition to the trim tabs attached to rear risers, most wings have a pulley system attached to the front risers, which the pilot can engage by pushing with feet on a 'speed bar'. The speed bar lines pull the front (leading edge) of the wing down, relative to the rear (brake edge), causing the wing to dive and fly faster, in the same way that releasing rear risers changes the angle of incidence. The pilot must maintain force with his legs, in order for the speed bar to stay engaged. Speed bar is much more often used by free-flight paraglider pilots, most to avoid being pushed back over the top of hills in windy conditions (the lee side of hills on windy days is an extremely dangerous place to fly). Paramotor pilots who fly with an engine, most commonly launch from fields where this danger is not present, but the bar is still useful in helping to increase the forward speed of the wing when needed. Care must be taken to follow your wing manufacturer's instructions, as the increased angle of attack when speed bar applied can lead to more dynamic maneuver responses, increased likelihood of collapse, Etc. Manufacturer's warnings are especially important with reflex wings, as it's possible to enter an extremely dangerous configuration when brakes and speed bar are applied at the same time in reflex mode.

Spot Landing

Spot landing is one of the most important skills to build. It enables you to fly from smaller fields with more demanding obstacle constraints, and makes it easier to always find a landable location if you encounter an engine out. Put a wing bag or a large hat on a field, and try to land several feet beside it (avoid getting your propeller anywhere near the target). Focus on having enough height to glide towards the landing spot. You can do short turns away from your glide path and back, or S-turns to either side, to bleed altitude gradually. Learning to judge your glide path and rate is the main goal. If you're landing with engine on, you can adjust your altitude upwards with some thrust. Be extremely attentive and careful not to hit the ground while attempting to reach your target location. Practice spot landing every flight, as long as there are no other priorities.

As your skills progress, you can practice approaching with the engine on, fly through sink if needed, and foot drag with increasing brake and thrust into a near stall on the landing spot. This is not a recommended way to land as a beginner, but it's a very useful technique once you can fly the wing precisely enough to foot drag safely.

In order to pass the PPG2 certification, you must be able to land within 15 feet of your target 2 out of 3 times with the engine on. For the PPG3 certification, you must be able to land within 5 feet of the target 2 out of 3 times with the engine on, and within 15 feet of the target 2 out of 3 times with the engine off.

Foot Dragging and Precise Maneuvering

One of the best ways to improve your precision maneuvering capabilities is to work your way up to dragging your feet on the ground. Once you understand all the basic dynamics of handling your wing in the air, and when you can maintain consistent altitude above the ground, you can begin practicing following the contour of the land a bit closer to the earth. Start 50 feet up, then move down to 20, to 10, 5, 3, etc. Practice leveling off just a few feet above the ground, and then gradually work towards touching the tip of your foot gently on the grass momentarily, then ascend again. Work on dragging your foot gently for longer and longer periods of time, always being prepared to ascend. Use the throttle as your main means of altitude adjustment, keep your hands up, and always be prepared to pull the brakes for extra lift, if you sink farther than you anticipate. Keep your knees bent and loose, only touch the ground with the very tip of one foot, and be prepared to run and flare if you ever drag with enough friction to slow down your airspeed. Always practice flying into the wind, never downwind, and don't ever practice precise flying maneuvers when conditions are thermally or gusty.

Big Ears

By pulling down hard on the outside split A lines (NOT the center A's), you can fold the outer half of each side of your wing inward. The first time you perform big ears, it can feel rather dynamic - it is actually a 50% collapse of your wing. You'll need to turn your palms up and forward, then pull down hard on both sides EVENLY and HOLD. If you unintentionally collapse only one side, you'll swing dynamically to that side. Release smoothly, and the wing will regain normal flight. When performed properly, this is a stable technique, used commonly in free flight to descend without losing forward speed. You should be able to perform all other maneuvers on this page before considering big ears. Be sure to have lots of altitude, have a reserve parachute ready before practicing, and only make your first attempts with the guidance of your instructor.

Planning Flight Paths, Situational Awareness, and Ongoing Skill Building

The point of practicing maneuvers is to become a more capable, safer, and more comfortable pilot. Perhaps the most important skill set to develop as a new pilot is the ability to plan and successfully maneuver through an intended flight path. A fundamental difference between aviation and other forms of movement has to do with the fact that when you're flying, you never get a chance to stop your motion. This requires always looking ahead and paying attention to the movements that you'll be required to perform in the immediate future (Situational Awareness, 'See and Avoid'). You can never stop and backtrack in the air. Stopping your motion means falling from the sky. You must always prepare to have enough room to make turns within any airspace you enter. You must be able to handle changes to your flight path imposed by wind direction and speed. You must be able to avoid collisions with obstacles and other moving air traffic. You must always be

able to judge how far your glide path will take you forward, given a certain drop in altitude. As you plan to launch and land in tighter fields, you need to be able to judge the bank angle of your turns required to avoid hitting trees, buildings, power lines, etc. You should be completely comfortable handling every control available on the wing and the engine. You should understand the dynamics of how your swing and the G forces generated by turns and counter-turns affect the wing's flight characteristics. You should be completely aware of how to avoid spinning and stalling the wing, and you should intuitively understand how the wing responds during every possible movement that it can make in every possible condition, including unintended configurations such as changes to the pitch, roll, and yaw of the wing created by weather conditions and your own control inputs, as well as surges, collapses, spins, stalls, etc. You must be able to imagine the full path that you are going to take when you launch and land, and be completely confident that you can safely perform the maneuvers required to realize your planned flight path, despite always potentially encountering unexpected conditions and situations you can find yourself in, up in the sky. You should always be aware of how to avoid boxing yourself into air space surrounded by obstacles that you can't avoid, canyons and hilly surroundings in which you don't have enough space to turn, etc. You should always be able to reliably judge glide distance and maneuverability to an open field, without power, in case your engine fails (and every single moment during every single flight, you should always be planning on exactly where you can land if your engine does fail). Learning to be completely in control of every movement you make in the air, as well as increasing awareness of how this control needs to be applied to maintain a safe and comfortable flight path, is a long learning experience which will continue to improve throughout your flying career. You don't want to be the guy who launched into power lines, or who broke a machine during a demonstration, or who crashed into a tree as a result of misjudged altitude or distance, or who landed on a building because there was no open landing space within gliding distance, etc. Practicing each of the individual maneuvers and dynamic flying elements during training, and during every flight, is absolutely essential to becoming a good pilot, and to have fun paramotoring.

AERODYNAMICS

There are 4 basic forces involved:

upward lift opposes downward weight
forward thrust opposes backward drag

When all forces are consistently equalized, the goal of stable straight and level flight is maintained.

For paramotor pilots, 3 of those forces hang below the wing, making

paragliders inherently very stable. The pendular nature of our weight under the lifting surface helps makes the wing naturally return to stable flight whenever it's disrupted (that's why they 'practically fly themselves'). That's why also, if the wing rolls/pitches/yaws/oscillates unexpectedly, we teach HANDS UP and REDUCE THROTTLE slowly and progressively (in the beginning it's always better to let the wing fly and correct itself than to over-correct with improper inputs).

Wings produce lift in two ways:

1) Newton's Third Law of Motion (for every action, there is an equal and opposite reaction) is put to use by the downward deflection of airflow when a wing's angle of attack increases (like turning your hand outside of a car window, you can feel it being pushed up). With enough air flow, you could fly a picnic table.

2) The airfoil shape creates higher velocity over the top of a wing and lower velocity over the bottom of a wing, so Bernoulli's venturi effect creates upward pressure (venturi effect says that as the speed of a moving fluid (liquid or gas) increases, the pressure within the fluid decreases), so the wing shape creates higher pressure beneath the wing, pushing up.

Lift Equation: l = cl ((r * v^2) / 2) a

Explanation: lift is equal to the lift coefficient (Cl) times the density of the air (r) times half of the square of the velocity (V) times the wing area (A).

The lift coefficient is a complex factor in the equation, but altogether, lift basically depends on the density of the air, the Square of the velocity, the air's viscosity and compressibility, the surface area over which the air flows, the shape of the lifting body, and the body's inclination to the flow.

An important takeaway from the formula is that Doubling air speed Quadruples lift. That part of the equation (v squared) is why it's so important to have speed to fly. Wings need to maintain relative air flow (air speed over the wing) to maintain stable flight, and more speed dramatically increases lift.

Another takeaway from the lift equation is that Halving air density Halves the force. As altitude increases, the air density decreases. This explains why air vehicles have a flight ceiling (an altitude above which they cannot fly). This also explains why on low density altitude (hot) days, we don't get as much lift - the air is thinner, and that directly affects the formula.

Another takeaway is that larger wings produce more lift at slower speed (greater lifting surface area in the equation), and smaller, more heavily loaded wings need greater relative air flow speed to produce the same lift. Beginners should generally start on slightly bigger wings, so that they

don't have to run or react as quickly (but not too lightly loaded that they can stall easily).

Probably the most important thing for new pilots to understand about lift is that adding thrust provides greater lift by increasing angle of attack (in the Newton's law way).

There are 2 types of drag:

parasitic drag – friction between of parts of the vehicle against moving air.
induced drag – a byproduct caused by lift (the angled wing 'scraping' forward through the air as it deflects downwards)

As with lift, doubling air speed quadruples parasitic drag. You would expect that lots of parasitic drag (we create lots of friction with air) would affect performance, but we fly so slowly, it's not as important as it is for faster aircraft.

Induced drag is the result of lift (a tilted wing is also causing drag), and that creates organized circular vortices off the wing tips that generally track down and out from each wingtip. The bigger and heavier the aircraft, the greater and more powerful the wingtip vortices will be. Stay away from them in flight – they generally last at least 2 minutes.

One of the most important things for new pilots to get about drag is that pulling one brake adds drag on that side of the wing, making the other side fly faster (then it's actually the centrifugal force of our banked swing that effects the turn – students need to learn to control that swing).

Another important concept is that flaring both brakes adds drag and changes angle of attack, to slow the wing and increase lift at the moment of landing. A large flair stalls the wing, so it must be timed correctly, at the right height. A light pull on both brakes also assists with added initial lift on launch, but then airspeed should be increased again immediately after launch.

Slowing the air speed too much with drag, or increasing the angle of attack too far upward (past the critical angle of attack) disrupts lift and stalls the wing (although paraglider wings typically deform before reaching CAOA). Stalling one side of the wing causes a spin.

On the subject of airspeed, there are only 3 ways to increase it on a pg: 1) change the angle of incidence (angle of chord to B line) 2) use a smaller wing surface, or 3) add more weight.

Changing trimmer settings and speed bar adjust angle of incidence, so that less lift is traded for greater speed.

Reflex profiles in a wing don't just change AOI, but change wing shape,

raising the back portion of the wing, so that the center of gravity moves forward, increasing stability, but also reducing the surface area which provides lift, so reflex generally requires greater thrust. Also, turning is performed with tip steering in reflex mode, because pulling on rear brakes disrupts the bent up rear shape of the reflex profile.

Also, about AOI, minimum sink is typically achieved with slowest trim setting, with none or slight pressure on brakes (trim speed)

Some more about wing shape: the more rectangular a wing, generally the more stable, but the less efficient. Thinner aspect ratio wings are more efficient, but less stable. (aspect ratio = wing span / average chord line). The arc shape of a wing helps keep it spread out spanwise, since lines can only pull. One thing for pilots to watch for is that line stretch on older wings can deform wing shape.

One thing to understand about thrust is that it's directional. Thrust line and torque can affect pitch, roll, riser twist, etc., and teaching pilots to respond with reduced thrust when it adversely affects flight, is critically important.

One important thing for students to understand is that turbulence, wind sheer and other environmental factors can change relative air speed, angle of attack, and other pieces of the lift and thrust equations. Active piloting is the process of reacting to these external forces, to maintain straight and level flight. To check surge: more brake, add power. To check lift: less brake, reduce power.

Rain or a wet wing slows collapse recovery and increases chances of parachutal stall, because the wing gets heavy and moves more slowly than designed.

More terms:

glide ratio: lift to drag (the number of feet you move down compared to the number of feet you move forward). BTW, l/d is reduced 10-20% by a windmilling prop!

axes of rotation: pitch (tilt forward back, up down), roll (around longitudinal axis), yaw (around vertical axis)

center of gravity: where all the forces come to a point (on a PPG, somewhere between wing and nearer the pilot). It's important to understand intuitively if you're practicing high G maneuvers, or if you design harness connection points, thrust placement on frames, etc.

ground effect: generally happens when a wing is at half the height of its span or lower, so paragliders generally don't experience it.

Obviously, None if these aerodynamic properties come into play properly until the wing is pressurized. This happens during the inflation and

launch process - then, during flight, greater pressure inside the parafoil than on the outside surfaces is automatically maintained by the ram-air design (don't stall it, because then all the aerodynamic rules go out the window).

downwind demon: imagine circling a boat in a moving river, the turn is just as circular, but the track on the beach is elongated. Turning into a tailwind feels like the brakes are not responding as much, but really ground speed is just increasing.

propellers: bigger diameters are better for efficiency and thrust, but less responsive.

Differences for 3 axis control pilots: pendulum swing behaviors such as throttle induced pitch changes, roll oscillations, different stall and spin behavior. We maintain stable flight without any control inputs. Lines can't push - we need to fly always in ways that maintain pressure on the lines. Rigid wings don't collapse, so there are some fundamental thoughts and patterns of flight which PG pilots need to ingrain, that GA pilots generally don't consider.

COMMS

Many new pilots have questions about what sort of helmets and communication systems to use.

After a decade and a half of trying every option, I just use a skate helmet together with behind-the-head 3M protectors:

https://www.amazon.com/dp/B00MYALHO2/

https://www.amazon.com/3M-Behind-Earmuffs-Conservation-H10B/dp/B009POJ1XY?th=1

To that I add a temporary Bluetooth comm unit whenever it's needed:

https://www.amazon.com/s?k=bluetooth+communication+for+helmet&ref=nb_sb_noss_1

My favorite kind of comms (made by Allros) are not currently available on Amazon, but any will work. When you do buy them for yourself, it's best to get whatever brand your friends are using, so that you can all connect to one another easily. Read reviews to be sure that the product you purchase will get loud in your ears. Sena brand is popular, but they're severely overpriced. You don't need to spend more than $50 for good Bluetooth comms.

If you just pressure fit the Bluetooth comm speakers temporarily into each ear protector, you can switch them out for other units in just a few seconds. Also, if you use behind-the-head hearing protectors (the kind with a temporary strap that goes over the top of your helmet), you can change helmets whenever you want, or fly without comms, whenever you want. Most PPG pilots don't use comms every flight. I typically just use some cheap squishy in-ear protectors to keep engine noise from hurting my ears. It's much more comfortable to fly without comms and heavy ear protectors, if you don't need them.

Some guys like to use the cap mounted versions of 3M or similar hearing protectors that get screwed permanently to the helmet, and rig the comm wires in permanently, so they look nice - that's exactly what you'll get if you buy an over-priced commercial PPG comm helmet, but I like to use different size helmets in the winter and summer, to accommodate extra hoods or hats in the cold, and to fly without those things in the heat. That's why I like the simple modular setup in which any piece can get quickly changed out, added, or removed. Also, be aware that the wires on most comm units are light weight, and when permanently mounted, they can be a real pain to fix if they break. I've had those little wires break just from transporting them during air travel. For all those reasons, I don't like permanently mounted comms.

Most pilots these days prefer Bluetooth comms over radios, because they allow 2-way hands-free talking, typically with very good noise reduction, and they can be used with cell phones for group communication, and for recording audio. During training I do demonstrate how to use 2-way short wave radios, but those tend to be more problematic, and are only really useful if you've got a large group of pilots far apart from one another, a long way from civilization. They can be trouble if anyone in the group accidentally presses and holds their push-to-talk button. Be aware that some radios require a license to use legally. If you want to use a radio and Bluetooth headset together, you can get hearing protectors with radio connectors already built in (the unit below is a behind-the-ear model):

https://www.amazon.com/Rugged-Radios-H41-CF-Headset-Control/dp/B0147PVPAW/

or use a temporary pressure fit unit:

https://www.amazon.com/CQtransceiver-Motorcycle-Helmet-Headset-Walkie/dp/B00UH266FY/

I do show students how to use aviation band radios when communicating with ATC, but you rarely need to do that during normal paramotor activities. If I ever need to carry an aviation radio, I just stick an earbud headset inside my hearing protectors, and push to talk directly on the handset, which I keep securely tethered.

I'd suggest looking at some of the different headset options during training, and seeing what makes most sense to you, after you've tried them all. Most of my time in the air, I haven't needed any comms at all - just a good helmet.

For training, just be sure to have a good fitting helmet. I'll provide comms.

DON'T SELF TRAIN

Contents:

1. Can Paramotor Flight be Self-Taught?

The difference between getting a little training, and none at all, is tremendous. If you're considering training yourself, please read some more and learn some additional details about what happens regularly to people who try to self train. Don't do it. Really. Just don't do it. It's not just about you, it's about how you can potentially affect the established community around you.

It is legal to teach yourself how to fly a paramotor, and some people actually do succeed, but learning to fly on your own is a truly horrible idea. Training can't guarantee that you'll avoid problems 100%, but accidents among self taught pilots are extremely common, and broken equipment, hospital bills, lost work, etc. are far more expensive than almost any instruction course. You're virtually guaranteed to run into many serious problems which you won't imagine by watching trained pilots who make the whole process look simple. Learning to just launch a paramotor typically requires at least a week of dedicated practice, in carefully presented stages, even for experienced GA pilots. And a week of dedicated practice, preparation, and equipment setup, with the help of an instructor, is really rushing it. Jumping into it alone nearly always goes very badly for people who think they can just try it out, because it looks simple. You need to hang check and configure your equipment for your weight and size, or you are asking for trouble. You need to learn how to time and control the movements of the wing, the throttle, the harness, the posture of your body and the frame, etc. in constantly shifting atmospheric air currents, while running, while carrying an oversized, heavy backpack. The muscle memory required to achieve that control really should be ingrained over weeks, with lots of guidance and help. Even the best students need a huge amount of practice on the ground to perfect that routine, before even considering launching. There are a wide variety of well understood bad habits which can become ingrained if you learn during this phase with improper technique. You also need to understand how the wind and weather conditions affect the way your wing handles on the ground and in the air. Having an instructor tell you that the moment is right for your first

flights, is one of the most critical bits of assistance you'll want. Ensuring that you're properly hooked in, that all the equipment is configured properly, and guiding you through every move of launch, maneuvers, and landing helps to really cut down on the potential dangers. Your instructor will make decisions for you which keep you from running into trouble, and will take you through the stages of learning which build necessary skills and understanding required to fly safely. Your learning process will be much shorter, and you'll enjoy yourself much more when you know that you're doing it right and staying safe.

2. What Can Go Wrong Without Training?

Without help, the problems which you could encounter in flight are numerous:

- taking off at the wrong time of day, in strong but invisible and imperceptible thermal conditions which can toss you around like a leaf in the wind, and fold your wing in half - this has injured and killed untrained pilots.
- having brake and/or throttle lines set too short to reach in flight or long enough to wrap up in a prop during flight - not being able to reach controls has killed at least one untrained pilot to be, and getting a brake caught in a prop has been the cause of at least one unsuspecting paramotor pilot's death.
- getting dragged/lifted/dropped hard (pulled into cars or power lines, etc.) in unexpectedly strong wind gusts has injured and killed pilots who didn't know what they were doing.
- getting hit by an enormous spinning prop which isn't started safely, or which gets out of control during launch or landing - this is the #1 cause of serious injury during paramotor activity. It has happened many, many times among the self-trained crowd.
- launching during a pendulum swing, or over-correcting a pendulum during low flight/landing regularly leads untrained pilots to machine damage and bodily harm.
- launching with a twist in the wing's risers, with a brake entwined in other lines, a knot, etc., can lead to serious problems in flight if you don't know how to handle the entire process properly.
- hesitating to use enough power on launch, or hiccuping on the power while leaving the ground - this can and has caused bad accidents very quickly.
- not running with straight body posture and a forward facing propeller angle - virtually no one does this properly without training, and the engine pushes the pilot straight down during the launch run, leading to broken equipment and body parts.
- sitting down too early and smashing directly into the ground on launch before enough speed and lift have been generated - this is a universal problem for nearly everyone who tries to fly without training.
- launching without legs straps properly secured has actually lead to pilots falling out of the harness in the air.
- having engine trouble over bad terrain or water (engine failures are very common while flying PPGs, especially among pilots who don't know how to properly maintain their machines) - water landings are the #1 cause of

fatal paramotor incidents!
- trying to get into your seat while holding a steering toggle - this can send you careening quickly into a deadly spiral.
- failing to dampen surge during launch or low flight (taking off under a collapsing wing, or diving into the ground during flight), has caused numerous serious injuries among untrained pilots.
- having an engine's hang angle set too far back and spinning backwards due to torque/gyroscopic precession - this is extremely dangerous and has caused multiple serious accidents among pilots who didn't know how to check it.
- flying too low and misjudging the dive characteristics of a turning wing is one of the most dangerous causes of untrained pilot accidents.
- not clearing turns when flying around other pilots - collisions can be deadly, even when reserve parachutes are thrown - you need to learn how to handle yourself around other air traffic.
- stalling the wing by slowing air speed with too much brake pressure, too much extended thrust input, turning against torque, etc. - stopping flight, spinning, and falling out of the air has happened many times, including fatal accidents, among pilots who just didn't know to avoid it.
- flying into mechanical turbulence downwind of objects, the wake of other wings, lee side rotor, etc. - in bad conditions, this can collapse your wing and make you plummet towards obstacles or straight toward the ground. There are numerous videos online of unsuspecting pilots who thought they knew what they were doing, getting caught in serious accidents due to this situation.
- blacking out during spiral maneuvers - this has led to death multiple times, as the wing 'locks in' to a spiral straight to the ground.
- accidentally deploying a reserve chute while launching or in flight - it's really easy to let this happen if you don't check a few tiny pins.
- misjudging how much gas has been used during a flight - you'd be amazed how often this happens among pilots who are otherwise sidetracked by misplaced concerns and who are improperly checking their equipment pre-flight.
- having loose items, hats, items from pockets, straps on the machine, etc. go through the propeller - this can cause instant loss of power, dangerous projectiles, etc. It happens all the time among untrained pilots.
- fires from improperly charged electric starter batteries have happened several times. You'd better know what you're doing with them before you take to the air.
- getting stuck above fog in a landing zone and being unable to find a safe LZ. There is so much to learn about weather!
- getting stuck in a gust front, wind gradient, or layer of atmosphere which pushes your ground track backwards, forcing you to land away from your LZ, in unknown, dangerous terrain, in water, etc.
- flying in high density altitude conditions, in which a wing and engine that previously provided enough lift and thrust to fly you comfortably, no longer can get you into the air, or keep you up safely - this is another one of those totally invisible weather situations which untrained pilots typically have no idea to watch out for.
- cloud suck - getting pulled up violently under strong clouds. This has even killed professional competitive paraglider pilots. You need to learn a lot about weather!

- getting fixated upon and flying directly into objects in your flight path - a weird but strangely common phenomenon.
- flying into unseen power lines - this has happened many times, even to experienced pilots who'd become complacent.
- attempting to land or turn low down wind, which can force you to move along the ground much faster than you can possibly run on foot.
- collapsing the wing with improper combination of speed bar, brakes, trims, etc. - a much more severe potential problem on today's popular reflex gliders.
- flaring too early or too high and falling hard to the ground on landing - this can easily break your legs, back, and other useful body parts.
- simply freezing up during flight, and making stupid control errors due to unexpected sensations, disorientation, fear, misunderstanding or ignorance of basic technique, etc. You'd better have an instructor in your ear when this happens.

Those are just a few common examples of ways untrained pilots regularly get seriously injured or killed, before they even know they are in danger. Do you really think you can guard yourself from all those potential issues, while just beginning to experience and handle all the different forces, pressures, and movements exerted by a wing, motor, and harness pushing your only living body around and lifting/sinking you up, down, and sideways in the sky, during your first flights, when you have no idea exactly what feelings to expect, without any training at all? Even for experienced general aviation pilots, a first paramotor flight is always a more intensely powerful sensory experience than expected. Do you really think that you should launch, fly, and land an aircraft with a spinning blade of death positioned several inches from your body parts, while running and carrying a massive amount of weight, and controlling an inflatable wing made entirely of cloth, flying high into air with potentially dramatically dangerous moving masses that are totally invisible, in an environment which gives you only several seconds to respond with exactly the correct movements if you're ever in a situation in which you could fall to your death ... do you really think that's a good idea to try, without any qualified instruction??

Paramotor accidents typically happen quickly and without warning, for those who don't know exactly what to expect and watch out for at every moment of a flight. You may only have seconds to make a decision, and even the first few moments of a launch can pose numerous dangers. Without training, you may not even know you're doing something wrong until it's too late. You don't get any second chances in aviation, and you will likely not be so incredibly lucky to just happen to do everything correctly. If you don't get real training, at some point, you will likely experience an 'unexpected' accident (only unexpected because you didn't learn to expect it). Such mishaps by untrained pilots often go unreported, especially when serious injuries occur, because embarrassment and liability force pilot silence, but they do happen all the time! Really, all the time, and most commonly among pilots without training. There's so much to learn about, which you simply don't know could potentially lead to severe problems, if you don't get legitimate training. Flying into illegal air space, or near clouds, or without a strobe in the evening, or during a TFR in the area,

for example, can create enormous risks of all sorts, and/or earn you fines and big legal trouble. Launching, landing, and flying in busy local air traffic without knowing the pattern at your field dramatically increases the likelihood of an in-air crash. The list of skills to practice and knowledge to gain, before getting in the air, is longer than you'd ever imagine, if you don't get the instruction you need. The old saying is true: 'you don't know what you don't know'.

3. There's So Much More To It. It's Not Just About You.

Perhaps even more important and commonly misunderstood among those who self-train, is that the privileges which ultralight pilots enjoy, both locally and nationally, have been hard earned by generations of responsible pilots who've worked with their governments and surrounding communities, to enable an amazing amount of freedom for everyone. Every misstep which a self-taught pilot makes, not only potentially hurts themselves, but also puts those precious privileges in jeopardy for all pilots. You need to learn not only how to operate a wing and a motor, how to evaluate potentially dangerous invisible weather conditions (which change by the hour daily), how to maintain equipment, etc., but also where, when, and how to fly within a busy general aviation environment, and among the well established ultralight community that surrounds you. You really don't want to be the person who destroys the current situation for everyone.

And it goes far beyond all the dangers and problems listed above. Every time a self-trained pilot comes out to a field (or even a pilot with minimal experience or questionable training background), there is a palpable sense of anxiety and stress among the crowd, because it's clear that they just don't know what they're doing. They're awkward, unpleasant, and often frightening to watch, as they try to hide their clear lack of knowledge and ability. Fitting in with a group and making new friends is much more difficult in this situation. It's never fun to watch someone make a whole series of potentially life threatening mistakes. Often, other pilots want to help, but will not, because it's clear that they will expose themselves to significant liability. And that understanding typically solidifies with experience, so the only people willing to help are those without any experience or understanding at all. That just makes the whole situation worse, and turns an enjoyable situation into a potentially miserable event for everyone.

Just get some instruction. The expense and work of passing through an established training program must be considered a small part of the essential cost of getting into powered paragliding. If you trivialize the potential ways you can run into trouble and think you can 'just try it', you will have problems, or you will be a problem for others. Don't be that person.

PARAMOTOR TUTORIAL: LEARN POWERED PARAGLIDING (2008)

A Basic Instructional Primer, Lessons For Beginning PPG/Paraglider Pilots

FOR LESSONS: call Nick Antonaccio at 215-630-6759 or visit http://ppglessons.com

Important: this text is not intended for self-training purposes. Do not practice these techniques without the guidance of a qualified instructor. By reading this text, you agree to not hold the author responsible for any injury, discomfort, financial loss, death, or other negative outcome experienced by practicing anything described in this text. Using a paraglider can be a dangerous activity, even when ground handling, and the intention of this article is NOT to cover safety topics in depth. You need to learn about those topics elsewhere before flying. The author claims no useful knowledge of these activities, and assumes no risk for any actions taken by anyone who reads this text. If you hurt yourself, someone else, or damage any property, it's entirely your fault. If you don't agree with that, do not read any further, and certainly don't try anything described here.

Contents:

1. Warning to Those Considering Self Training

There are skills and knowledge not covered in this text that, without an understanding, can lead to your death or the death of the sport. Airspace rules, many emergencies, weather, equipment adjustments and more are not included here. You must seek out that information separate from this primer. For lessons, see http://ppglessons.com. Even if you can't afford training, you can call to speak with an instructor: 215-630-6759. For more information, see http://footflyer.com. Reading the PPG Bible and watching Risk and Reward will help you understand why it's so critical to get training if you want to live through your first flights. Do not try to train yourself. It's not worth it.

2. Some Essential Definitions

"Wing"/"Kite"/"Paraglider"/"Glider": The piece of cloth that enables you to fly.

"Leading Edge": The 'front' part of the kite. The leading edge has a number of large openings that allow air to enter and inflate the wing.

"A", "B", "C", and "D" lines: The many thin 'ropes' that are attached to the bottom of your kite. "A"s are the row of lines attached near the leading edge of the kite. "D" lines are attached near the back of the kite, and the others are in between.

"Risers": Two heavy cloth-like webbing straps at the end of all the lines, where they come together near the pilot. Lines attach to the risers via small metal carabiners called "mallions". The other ends of the risers form loops which connect to the carabiners on your harness.

"Brakes": A special set of lines attached to the very back, trailing edge of the kite. They're used for stearing the kite in flight. They roll through pulleys which are attached to the risers. On the ends of each of these 2 lines, there is a single loop which the pilot holds on to, called the brake "toggle".

3. 1st Things 1st: Packing And Unpacking

The most important concern in packing your wing is assuring that your risers stay straight, so that no lines are passed through one another to form a tangle. Whether you fold or crumple your wing into a sack, if you keep the ends of the risers straight throughout the process, your wing will most likely be ready to fly, without line tangles, the next time you open

it up. The instant you pass one end of a riser through any of the lines, you're far more likely to experience a confusing, messy tangle. Some pilots like to pack one riser through the end loop of the other riser, so that either end is less likely to pass through the lines. Whatever packing procedure you use, just be sure to leave plenty of slack on the risers, so that they don't get dragged on the ground or twisted around unintentionally while you pack up. Pack your risers so that they are outside of the kite, away from the rest of the length of the lines, so that they don't accidentally get passed through one another, and you can be certain to avoid any generally messy situations.

If you do find that your lines are truly tangled, the way to work out the mess is to follow your "A" lines from the riser to the kite. Hold the "A" lines above all the others, and clear them, one riser at a time, so that there are no other lines hanging from them or twisted around them. If you have twisted the risers, turn them around until the "A"s are on top. In a normal situation, other lines will typically hang from the "A"s, but pulling them upwards and shaking them out will cause the others to fall away. Typically, if your "A" lines are straight, you will find that all your other lines are most likely arranged in proper order too, without doing anything else. If you've gotten yourself into a really tangled situation (this can happen if the wing ever lands on top of you and you walk through the lines), you may need to clear each additional row of lines, from the "B"s, through the "C"s, "D"s, and brakes. In this situation, it can help to have a friend hold up the cleared "A" lines above all the rest, along with the "B" lines next, and so on while all the other lines are cleared in order.

When packing your kite, be sure not to put undo stress on any particular seams. Fold or crumple your wing loosely, so that the Mylar separators on the leading edge are not crushed. Avoid repeatedly making tight folds along any particular seam, as this can weaken the stitches over time.

Make sure the fabric and lines are dry before storing for any long period, and keep the wing out of sunlight, in a cool, dry storage location.

4. Kiting

The point of kiting is to learn how to control your wing. When practicing kiting, it's helpful to keep in mind the imagined goal of launching. You should practice getting the kite inflated, raised into the air, and positioned directly over your head in the 12 o'clock position, with your body centered directly underneath. You should practice running forward and maintaining that centered position continuously for as long and far as possible. Developing that skill is not only required for safe launches, it also provides an absolutely essential understanding of how your wing "works", and helps to develop an instinctive "feel" and habitual response to managing the wing. Understanding the way your wing moves through the air, and how you can affect its movement and position is critical to all phases of flying.

4.1 Setting Up

Practicing kiting is easiest if you have a 5-9mph wind. Gusts above 10mph can easily drag you, and gusts above 14mph should be absolutely avoided if you're inexperienced. They can pull you up, over, sideways, and slam you downwards, all very quickly.

Look for fields that are as wide open as possible, with as few wind obstructions as possible in the direction from which the wind is blowing. Trees, buildings, hills and other obstacles will cause disrupted and unpredictable air flow, called "rotor". Be sure that the spot you choose has no sharp or hard objects on the ground that could cut or catch any part of your glider.

To start out, unpack and lay out the wing in its natural arch shape, with the back of the wing on the ground, and the openings on the leading edge of the kite facing up towards the sky. The wing should face DIRECTLY into the wind, so that when it's pulled up, the air flows straight from you, down the lines, and into the kite. Walk along the leading edge, straightening each cell, hand over hand, to make sure that edge is as evenly taught as possible from one side of the wing to another. The kite should basically be completely unfolded, without many significant wrinkles or loose folds. The trailing edge (where the brakes are attached) is less important - just make sure each of the cells of the leading edge is open and ready to fill evenly with air. Pull your risers out in front of the kite, making sure the "A"s are on top, and that there are no twists in the lines. All your other lines should drop clear of the "A"s when you pull upwards and shake a few times. If you've packed well, this should only take a few seconds. As you're setting up the kite, make sure none of the lines have passed underneath the wing, especially at the wing tips.

If there is a bit of wind, you can "pre-kite" the wing to help more quickly and easily inflate it and lay it out. To do this, unfold the wing loosely, and then grab the "A" risers in one hand, the brakes and "D"s in the other, and pull the wing up into the air using the "A" lines. With 5mph or more wind, the kite will pop open and raise up as soon as the openings on the leading edge get a gulp of air. Pulling on the "A"s directly into the wind, with both risers together in one hand, is all it takes to open the kite. Use your other hand to control the direction and movement of the kite, holding both brake toggles, together with the "D" lines in your other hand (keep the brake toggles snapped into their magnets/snaps, put your thumb through the brakes, and grab the "D" risers with your fingers). Walking backward into the wind as the kite raises up will help increase airflow over the wing, and will help improve the inflation. Pull the kite up, let the wind pop it open, and then gradually release pressure on the "A"s to let it down gently, with the leading edge facing upwards as described above. Leave a good amount of slack in the lines so that if the kite is moved at all by the wind, the risers aren't dragged, and the lines aren't tangled.

4.2 Reverse Kiting

Before doing any kiting, fasten yourself completely into your harness. Make sure that both leg straps and the chest strap are snapped together and locked closed.

When there's a little bit of wind, it's easiest to work with the kite by standing in a position in which you're facing the wing. To hook in this "reverse" position, lay the risers straight out in front of the kite, with the "A"s on top. Grab them in that position, and bring them right in next to each other, holding them together with one hand. Next, TURN THEM 180 DEGREES COUNTER-CLOCKWISE (from your view down the lines toward the kite). In this position, with risers turned upside down and the "A"s facing the ground, hook into your harness. With the carabiners pulled out in front of you, the risers should hook in exactly as they're positioned, with the "A"s pointing downward. Don't twist the riser loops any more than 180 degrees. Be sure to lock the carabiners closed once the riser loops are attached. The riser coming from the right side of the kite (as you look at it) should hook into the left carabiner on your harness, and visa-versa. The lines should criss-cross in front of you, with the lines from the right side of the kite passing over the lines from the left. In this configuration, after you've raised the kite above you, you should be able to turn your body around counter-clockwise (towards your left), so that you end up in a forward facing position, as if ready to fly. In that position, the "A" lines should be facing forward, with the brakes in back. There should not be any twists between the harness, carabiners, risers, or lines. If you're unsure that your risers are properly attached in reverse position, turn around to your left, flipping the lines from your left carabiner over your head, and check that they're all aligned straight in the forward position. If not, flip back around, and follow the directions above, until you've got the setup completely clear.

Before trying to raise the kite, make sure you've got plenty of slack in the lines. You don't want to pull the kite over onto itself, or raise it up into the air unintentionally. Walk with the risers in your hands toward the kite several feet, tossing the loose lines in toward the kite. Don't worry about tangling lines at this point. Unless you walk through the lines, or spin your body or the kite completely around, they will stay straight.

Grab one brake in each hand. In reverse position, with the lines stretched out in front of you, the "A"s should be pointing downward, and the brake snaps should be on top. Remove one toggle at a time from its snap, and pull it outwards (sideways, away) from your body, so that the brake lines do NOT wrap around any other lines. This is important. Next, with the brakes firmly clasped in both hands, reach DOWN BETWEEN the risers and grab both of the "A" risers in one hand. Your choice of hand will be determined by which hand will be most likely needed to brake first. If the wing is not laid out completely straight into the wind, one side of the wing with likely rise up first. Anticipate having to pull a little brake on that side, and be sure to leave that brake hand free - i.e., grab the "A"s with your OTHER hand. Be sure to grab the riser material immediately below the mallions. Don't grab the lines directly, as they can give you rope burn if a gust comes along. Be prepared to switch the "A" lines from one hand to another. You can't pull left brake if the "A"s are in your left hand, and

visa-versa.

With one of the brake toggles in each hand, and both risers together in one hand, you're ready to pull the kite up into the air. At this point, pay attention to wind around you. Use the air flow against your ears to judge the direction of the wind, and align your back DIRECTLY into the wind. Be sure to position your body so that YOU and the CENTER OF THE KITE form a STRAIGHT LINE INTO THE WIND. If the wind has shifted directions, you can pop the kite open again by pulling on the "A"s, as in pre-kiting. If you're positioned straight into the wind, in relation to the center of the kite, it will pop open and straighten out, aligning itself again into the wind. Keep tension on the "A"s while letting the kite down, so that the leading edge doesn't fall forward and fold over the rest of the kite.

When you are aligned into the wind, pull the kite up into the air by pulling on the "A" risers. At this point the kiting begins. Your goal is to pull the kite directly over head, and keep it centered there above you. To make this happen, there are several main factors involved:

The wind speed
The forward motion speed of your body as you run into the wind
The amount of tension you hold on the "A" risers
The movement of your body left and right under the kite
The amount of tension you pull on each brake line

Each of those factors affects the movement of the kite, and its position in relation to you. To keep it simple, you're just trying to pull the kite up, move your body straight into the wind to get the wing flying, and then stay under it, continuously moving the wing straight into the wind. Here are some of the things that will typically happen during your first attempts:

- One side of the wing will pull up first, move faster than the other side, and the kite will spin around upside down (or raise up vertically before crumpling back down to the ground).
- Not enough force will be exerted on the "A"s, and the kite will just fall back to the ground before getting over head.
- Not enough forward motion will be maintained to keep the kite flying, once it's positioned over head, and it will just fall back down to the ground.
- If too much force is exerted on the "A"s once it's overhead, and it will over-fly you, crashing down in front of you.
- If you move sideways in relation to the wind, it's easy to pull it away from the direction of the wind, and deflate it or spin it over sideways. If you pull too much brake, the glider will spin sideways, or get pulled back down to the ground.

To avoid these problems, here are some fundamental thoughts and responses you should always be working to maintain:

- Always keep constant pressure on all the lines, and make all body movements, brake inputs, etc. SMOOTHLY. The kite will very rarely pull straight up, and fly straight forward. Tiny shifts in wind movement and

your own input will force you to keep every motion in balance. It's a gentle, active dance, and it requires constant pressure and immediate, small adjustments to keep the wing up and moving forward.
- Pull the wing overhead right away - don't leave it hanging back below the 10 o'clock position. In order for the wing to fly, it needs to get all the way up to 12 o'clock, and have air flowing quickly over its top surface.
- Until the kite is overhead, keep constant pressure on the "A" lines. That's what pulls it up into the air. If you let go of the "A"s too soon, the kite will fall back down toward the ground. Don't let up on the "A"s until the kite is at the 11-12 o'clock position above you. Don't yank at it - just keep CONSTANT PRESSURE on the "A"s and move consistently forward into the wind.
- In order for the wing to fly (to stay above your head - that's the goal), it needs to maintain a constant speed through the air. That speed is typically 8-12mph for most wings. That means that if you've got a 5mph wind, you're going to have to move your body and the wing into the wind consistently at a speed of 1-7mph, the whole time you're kiting. If you have absolutely no wind, you'll need to RUN, the entire time you're kiting the wing.
- Trying to kite with even a slight tail wind is almost impossible for anything more then a few seconds. What this means is that you need to get the wing up, and then maintain CONSTANT forward motion on yourself and the wing, into the wind, the entire time you're kiting (in reverse position, walking/running backwards). The instant the air speed over the wing stops, it will fall back down to the ground.

There are two basic ways to control the side-to-side motion of the kite:

1) Move your body side to side to straighten out your position in relation to the center of the wing
2) pull brake.

Shifts in wind direction will also move it side to side. Remember, you're always trying to move the kite forward into the wind. One of the most common occurrences you'll experience in the beginning is that you'll tend to stop the forward motion while adjusting side to side to straighten out a tilting kite. Typically, because you always need to move forward to maintain the kite's air speed, when adjusting your position sideways, you should actually be thinking about pulling your body diagonally forward (running backward when in reverse position). That's absolutely critical to understand. Moving sideways is typically combined with pulling brakes to get the wing to move where you want it. Brakes work to slow the back side of your wing, for the side on which they're pulled. When you're pulling the kite up into the air, if one side raises faster than the other, you can pull a little brake on that side, and it will come back down towards the ground. Remember though, you're trying to pull the wing UP, so pulling too much brake is counter-productive. Just put enough gentle brake pressure on the side that is rising and overshooting the other. If you over compensate, the other side will over-shoot, and you'll need to brake it. Remember, your goal is to get that kite above you and moving though the air. Every time you pull brake, you're countering some of that forward motion. The key is to make gentle, smooth, and consistent corrections with a combination of

brakes and body moments to keep the kite going up and above you. When the kite is over your head, if one side dips downward or falls back, you can move your body to that side (run diagonally forward to that side) to center yourself with the wing, or you can pull a little break on the other side, so that both sides keep flying forward evenly. Conversely, if one side of the wing shoots forward, you can either brake that side and/or run diagonally forward, pulling the other side forward to speed it up. Either way, pulling brake on one side has a very similar effect to running diagonally forward in the other direction, speeding up the slower side.

Always keep this thought in mind: running one way sideways will get you centered in much the same way as pulling brake on the opposite side. Typically, you'll do a little of both at the same time, all the time trying to adjust your movement, and that of the kite directly into the wind. It's very simple once you get it: Move straight into the wind - if the kite veers to one side, center your body under it and pull a little opposite break to help direct it back into the wind.

Once the wing is directly over head, let go of the "A" lines and keep moving forward into the wind. If you hold the "A" lines too long, it'll over shoot you, and land on the ground in front of you.
If the wing shoots forward as a result of increased air speed (i.e., a wind gust), pull both breaks just enough to center it back over your head. Constantly managing both the side to side movements and the fore to aft movements of the kite, is what kiting is all about. Responses need to be constant, instantaneous, and fluid.
With all that said, the biggest things you should keep in mind are to keep moving forward, and stay centered under the kite.

If at any point you feel that a wind gust could drag you, be prepared to drop the kite the ground, pull both brakes hard, and simultaneously run toward the wing. Do not allow the kite to stay in the half-way up position. Allowing the wind to blow straight into a wall of cloth will drag you the hardest. Pulling the brakes will help keep the wing on the ground, and running toward it will keep it deflated. If you resist, it will stay inflated and pull you harder. In really serious situations, wrap your hands around the brake lines to pull in more line, and reach for any of the back riser lines to help pull the kite down - pulling "D" and "C" lines will also assist in dropping the kite to the ground. Reeling in one side more than another will also help disable the wing by forcing the wind to flow sideway across it, instead of straight into it. Try to get downwind of the wing as quickly as possible so that you can get it wrapped up. Always wear a helmet while kiting if there's any chance of significant winds.

4.3 Important!

Once you've got the kite moving in reverse position, your goal should be to turn around and kite the wing, running forward. Kiting in reverse position is fun and instructional because you can look at the wing and watch it respond. BUT YOU FLY IN FORWARD POSITION, so that's where most of your practice should really be spent. Get used to kiting in reverse to understand how the wing works, but to really "get" how the thing works when

flying, you should be able to keep it centered over you indefinitely in forward position.

Always plan on spinning around (to your left, if you set up as described earlier), and kite as if you're about to launch. You should be able to steer it side to side, and if the wind is strong enough, move with it backwards. You should eventually be able to do this completely by feel, without having to look up at the wing at all. When you can do that, you've got a good fundamental understanding of how to move and maneuver the wing.

4.4 Forward Inflations

When wind is low (less than 5mph), you'll need to pull the kite up in forward position. Pulling up the wing and running backwards in nil wind is not only extremely difficult to do, running backward quickly can also be dangerous in its own right. Hooking up in forward position allows you to run straight forward immediately to generate the required air speed to get the wing flying.

To perform a forward inflation, set the kite up as normal, with both risers on the ground and with the "A" lines on top. For a forward inflation, you want the kite to be laid out as straight as possible, directly into the wind, with the leading edge pulled taught along the entire length of the kite. Stand in between the risers, face forward (so that the wing is behind your back), and attach one riser at a time to the carabiners on your harness (be sure they lock in). Grab one brake toggle in each hand, pull them out of their clips, and be sure to pull them sideways, away from your body, so that the brake lines do NOT wrap around any other lines. Next, use the thumb and forefinger of each hand to reach around (outside) the risers and grab the "A" risers on each respective side, one in each hand (i.e., don't cross hands in front of your body - just reach each hand down and grab the "A"s). Be sure NOT to wrap the brake lines inside or around the others while you do this. With a brake firmly in each hand, stretch out your arms to either side (in crucifix position), and flip the rest of the risers over each forearm so that they hang down, back behind your arms.

Now center yourself with the middle of the kite, to form a line directly into the wind. Make sure your "A" lines are completely clear - hold them up, and shake any others free. Now walk forward and find the point where you can begin to put tension on the kite. Be sure not to pull the wing over on itself. When you're sure you're centered, and that you're lines are clear, lock your hands in front of you at shoulder height, and shoulder width, with arms bent and knuckles pointing toward the sky, and run forward with force. Focus all of your forward moving energy directly into the "A" lines, so that it lifts the kite up off the ground and into the air. As you move forward, alternate between watching where you are running, and glancing straight up to watch for the wing to get over your head. Once the kite is above you, let go of the "A" lines, and continue to run and kite it as usual. During the forward inflation, the wing relies entirely on the forward motion of your running to create "wind". This is what provides necessary air speed for the kite to fly. If you stop or slow down even for a moment, the kite will fall to the ground.

Forward inflations are tough work, and great exercise, and they're entirely necessary for flying ppg. Many of the calm conditions that PPG pilots prefer to fly in tend to involve slow wind speeds on the ground. Unless you regularly fly from a beach or some other place with consistently smooth laminar winds (or if you fly in rough air), expect to do the majority of your launches with forward inflations.

4.5 A Note About Harnesses

On many PPG setups, the harness is not removable from the machine frame. In this type of setup, you'll need to purchase a separate harness to practice kiting. In some setups, especially those with high attachment points and removable harnesses, the way you hook in for kiting is totally different than the way you hook in to actually fly. On machines with J-bars, the riser loops of your kite actually attach to bars that come over your shoulder, and a bit of meshing material hangs down from those bars - that material connects to your harness carabiners. Having the point of connection up over your shoulders feels much different than having it down near your waist. You'll want to practice kiting your wing in both configurations. Inexpensive adjustable practice kiting harnesses are available which allow you to change the carabiner connection point from low on the waist to high on the shoulders, and everywhere in between. Those harnesses are a worthwhile investment, as kiting is not just for beginners - it's great exercise, and continued kiting practice through the years only helps to improve your flying abilities.

4.6 Rosettes (Pulling Your Kite Into a Mushroom Shape to Move it Around)

In any kiting situation, you'll typically need to move the kite and reset it over and over again. When you get done running with it across a field, you'll need to move it back to your starting point. If the wind shifts, or if you flip your wing, or if it over-shoots and lands in front of you - all those things will require you to pick it back up and lay it out again.

You don't need to unhook from your harness - in fact, you shouldn't. Remember, every time you unhook, you run into the possibility of tangling the lines. If you stay hooked in, tangles are virtually impossible.

So to move your kite, put both risers together into one hand, so that all the lines come together into one bundle. Walk toward the kite and use your other hand to run down those bundled lines, and gather them into consecutive loops. Place each consecutive loop into the hand that holds the risers, until you get all the way to the kite fabric. As you get closer to the kite, the wing tips will come together - you'll need to pull on the lines with some force to bunch up the kite. Keep going until you can't roll up any more lines. Pick up the bunched up, mushroom shaped kite by its lines and put it over your shoulder so that it doesn't drag on the ground. Turn and walk with the kite, so that the openings on the leading edge of the kite face away from the wind. This will keep you safe, even in cases of the biggest wind gusts. If the opening on the leading edge faces away from the wind, the kite will not open up.

To open the rosette back up, put the still bunched up wing back on the ground, and drop the loops of lines directly in front of it. You don't need to worry too much about tangles, as long as you never walk through the lines, or spin the kite around its risers. If you've got enough wind to do a reverse inflation, you can typically pop the wing open with a little tug on the "A" lines, pulled directly into the wind. If you don't have any wind, just walk the wing tips out on each side. You don't need to get out of the harness - just try to keep all the lines in front of the kite as you walk around to each side.

5. Launching

Launching typically means just adding a bit of thrust to a properly moving, fully inflated kite, with a pilot moving in forward position. Being able to kite well is therefore a prerequisite to launching. You need to be able to either start with a forward inflation, or pull the wing up in reverse and spin around into forward position, keeping it stable the whole time. If you can't do that, don't even think about taking off.

DON'T TRY TO LAUNCH WITHOUT AN INSTRUCTOR'S HELP (visit http://ppglessons.com!). You should have plenty of training in a simulator (even if the "simulator" is just some straps hanging from a tree branch or cross bar). You should run through the entire flight plan many times in the simulator. You need to feel the motions of strapping in, starting the engine, running up the power with your hands on simulated brake toggles, getting into and out of your seat with the motor running, and really feeling that engine push you around as it will in actual flight. The whole flight plan should be completely habitual, and the feeling of the engine on your back and the force it exerts on you, should be natural before you ever actually try to fly. Your equipment should be properly configured for your body, especially the hang points (the angle you face when seated, so that your thrust line points forward/up/down appropriately). You should be used to kiting your wing with the engine on your back, the throttle in your hand, and the risers hooked in as they are in flight. Most important, you should have a qualified instructor there to help you set up and to guide you through every step of your first flights, by radio. You should have multiple flights with radio contact and assisted kiting and launching help (someone there to make sure your kite is not oscillating, hanging back, or shooting forward as you launch). An instructor should also be there to help you learn how to turn, maintain level flight, and adjust to changes in wind speed and direction while you're flying. He'll help keep you calm, and help you enjoy your first magical moments in the air. He'll also guide you into a landing path that's lined up straight into the wind at the appropriate height. He'll tell you when to shut off your engine, and exactly when to flare as you come in to touch down. All those elements are critical to staying safe. You should get as many such assisted flights as you need to become completely comfortable with the routine, before you ever try it on your own. DOING SO WITHOUT AN INSTRUCTOR IS A RECIPE FOR CERTAIN DISASTER.

5.1 Practicing

You can practice launches while kiting by having a friend push you into the wind. To do this you'll typically need wind conditions at least strong enough to easily pull up a reverse inflation. Once you've stabilized the wing over your head and are running as fast as possible, a strong push from behind should be enough to get you up in the air a few feet. Be sure to manage the fore to aft motion of the kite above your head while you're descending. Braking too hard can stall the kite. Allowing it to surge forward in gusts can make it tuck and dive in front of you. Either of those outcomes can have painful results, even if you're only a few feet off the ground.

5.2 Before You Do Anything, Check the Weather and the Launch Area

Before ever taking off, always check the weather conditions. Watch for dangerous fronts that can cause gusts. Watch for low pressure zones, high temperatures, and high humidity, which can cause high density altitude, reducing your available lift. Watch for middle of the day thermals, especially on days when temperature changes are dramatic between night and day. Watch for possible precipitation. Check the wind speeds aloft and make sure the conditions you're feeling on the ground aren't deceiving you about what's going on above. If the winds are shifting dramatically from one direction to another, you may very likely have strong thermal conditions, even if the winds on the ground seem entirely docile. If you kite your wing a bit, and it behaves erratically, collapsing and changing directions, expect those kinds of conditions up in the air too. Don't fly if you're not sure.

Check your launch area. Make sure you've got a completely clear flight path with plenty of clearance around any objects. Do not fly into rotor created by wind coming over and around trees, buildings, hills, or other obstructions. Rotor can knock you out of the sky and kill you very quickly. In heavier winds (8+ mph), expect powerful swirling, messy air to extend twice as high and ten times as far downwind of any object. That's no joke. Rotor can completely collapse your wing, and the stronger the wind, the stronger the rotor. Avoid it just as carefully as you avoid strong thermals and bad weather.

Most PPG pilots prefer to fly during the first 3 hours of sunlight in the morning, or the last 3 hours of light at night. For really calm air, you can wait for the last hour of sunlight - wind conditions tend to settle to almost nothing at the end of every day (you'll become very familiar with this daily cycle as you fly more). The middle of the day is characterized by stronger thermals and faster winds, and generally provides more dangerous conditions in which to fly. Until you're very familiar with controlling your wing in those conditions, you shouldn't plan on flying at all in mid day thermals. Flying in the morning, especially during the summer when the sun is shining straight down through the atmosphere, you need to be careful not to fly so long or far away that you encounter rougher air than you can handle.

Also, before you launch anywhere, be sure to check that you're flying in

legal airspace. Not only can you get in trouble for flying somewhere you're not supposed to, being anywhere near the rotor caused by a large aircraft coming in on final approach could likely knock you out of the sky. Talk to other experienced PPG pilots and learn to read FAA sectional charts to be sure that you're taking off in an appropriate location.

5.3 Committing the Deed

First, decide whether the predominant wind speed calls for a reverse or a forward inflation. Kite your wing a bit to feel the wind conditions, and then lay it out nicely. Complete all your preflight checks on your engine and other equipment. Hook in, and check that your leg straps, chest strap, carabiners, J-bars, and all other connections are locked tight, without twists. Check that your throttle is moving correctly, is solidly attached to your hand, and that the cruise control has proper tension. Be absolutely sure that your carburetor is not stuck in the open position (don't ever let the engine start out of control at full power). Position yourself for the inflation, check that there is no one in the path of your propeller (behind or beside the blades) and then start your engine, yelling "clear prop" to be sure everyone knows your intentions.

Get the kite inflated and stabilized over your head, running in forward position, and add some throttle to help push you forward and up. Add power gradually, and CONTINUE TO RUN until you are completely off the ground, and then continue to run some more :) Add a little bit of brake pressure to help you climb upwards (not much!). Be prepared for sinking air or other conditions that could bring you back down. Gain height quickly and smoothly to get out of the danger zone and up to an altitude of 300' or higher.

Be prepared for and aware of your engine torque. At full throttle, it will pull you hard in one direction. Make sure all of your throttle motions are smooth, and avoid spinning yourself hard in any direction. Whatever you do, do not apply full throttle and full brake at the same time to counter it and fly straight. That can cause a stall or a spin. Taking off and turning against your torque should be left until you have more experience understanding all the forces at work while you're flying, and when you know the limitations of your equipment. In the beginning, plan clear flight paths from extremely large fields, during which you can plan on comfortably turning the direction of your torque, without the possibility of approaching any obstructions.

Get up to a safe altitude, and get into your seat (you will be hanging from your leg straps until that point - that's safe, but not as comfortable as sitting). If you use your hands to pull the seat out underneath you, be very careful not to stop the engine by accidentally hitting the kill switch on your throttle.

Always, always be aware that you may need to abort your launch if something goes wrong. Don't take off if your wing is oscillating wildly. Don't take off if any of your lines are caught in places they shouldn't be. Don't take off if you're not 110% sure that you can clear the obstacles at the end of your run way. Don't take off if you know something in your equipment is

about to fail. Don't take off if you realize at the last moment that you forgot to latch a chest strap, helmet strap, or any other strap. Just kill the engine and kite the wing to a stop.

Launches are optional, landings are not.

6. Flying In Perfect Conditions

Once you're up in the air, the physics of your position underneath the kite helps to take care of many of the things you have to do manually when kiting. Because you're a pendulum under the wing, you will always tend to stay underneath it. Instead of having to run side to side to center yourself under the wing, you'll constantly swing toward that position automatically.

6.1 Turning: Brakes and Weight Shift

If you're flying in absolutely still air, the kite will respond to brake inputs very naturally and intuitively. Pull right to turn right. Pull left to turn left. Be aware that the harder you turn, the more quickly you will descend. This is an extremely important fundamental concept. In anticipating every move you make, you should expect that, without adding power, you will "dive" a bit into every turn. This effect becomes much more obvious with tighter turns.

You can also turn by shifting your weight from one side to another. Just crossing one leg over another and leaning your body to one side in the harness is enough to effect a turn. Weight shifting to the left will turn you left, and weight shifting to the right will turn you right. The effects of weight shift are slightly different than pulling brake, only because pulling brake slows down that side of the wing. Weight shift turns enable slightly higher airspeeds over the wing, and therefore, slightly less sink. Typically, most pilots combine some weight shift and brake to enable tighter turns.

6.2 Throttle and Wing Speed

Adding more throttle pushes you out in front of your wing, which changes its angle of attack (it tilts upwards), and you climb. Releasing your throttle allows you to hang directly below the wing, and you descend in a slow and steady glide. Maintaining level flight in still air, with no climbing or descending, typically requires approximately 1/4 to 1/3 throttle. It's important to understand that the speed of your wing through the air basically remains constant, whether you're adding throttle or sinking. Adding throttle simply pushes you out in front of the kite, and that energy is converted to increased height - NOT increased speed. The throttle does increase your relative speed and force against the wing, changing your entire craft's angle of attack, and moving you upwards, but you do not move faster in relation to the ground. In fact, the farther you tilt upwards, the slower you will move across the ground.

Remember also that your thrust line will never be exactly straight ahead. Adding more throttle will always turn you in the opposite direction of your spinning propeller, and you must compensate for that torque to fly straight.

6.3 Trim Tabs

**Trim tabs work by changing the relative length of the "A" lines, "D" lines, and all others in between. On wings that don't have any trim tabs installed, all of the riser lines always stay the same length, and the wing flies
in its slowest possible configuration all the time. When trim tabs are adjusted, the "A" through "D" mallions are moved into a position in which all the lines are set to different lengths, angled low to high from front to back. When you move both trim tabs into this uneven angled position, the trailing edge of the wing moves higher in relation to the leading edge. That changes the wing's angle of attack so that the front of the wing "dives", and the wing moves faster. Moving both trim tabs into the uneven position can be used to increase the wing's overall flying speed. This is helpful to penetrate more quickly into wind or to match the speed of other pilots flying different wings. A "speed bar" is another piece of equipment that has a similar effect on the wing's angle of attack, by pulling the leading edge down.**

Wings intended for PPG typically have trim tabs installed to counteract torque. By keeping one tab straight (flying slow), and one tab uneven (flying faster), the side of the wing with the unevenly set tab consistently "dives" and flies a bit faster than the other side of the wing, causing a consistent turn. This helps to maintain straight and level flight when the engine consistently torques slightly to one side. Without trim tabs, the only way to control torque effects when flying straight and level is to weight shift or turn slightly away from the direction of the torque. Typically, just crossing one leg over another is enough to counter the torque turn, but using a little trim relieves you entirely from that necessity, and makes for more comfortable flights.

Be sure to pull the trim back to neutral position (all lines even length) before you land. If your trims are left in the uneven position, your final glide with engine off and without torque will be slightly sideways. If you leave both trims in fast position, you are more susceptible to fast and active recoveries in situations such as collapses. The wing tends to be safest with both tabs set to slow, even position.

6.4 Being Aware of the Wind

The presence of wind does not necessarily mean that flying conditions will be bumpy. On days with high pressure, with no fronts near by, with little thermal activity, and with calm winds aloft, you'll often find that the air flow can be consistent and smooth to fly in, even with the presence of wind. Days like this provide some of the nicest flying conditions possible. Launches are easy, and landings are slow and soft.

Being aware of how you move with the wind, though, even if it's totally smooth, is very important. Be sure to set up, take off, and land directly into the wind. Don't try to execute forward inflations if winds are strong – you'll likely get pulled back and fall into "turtle" position on top of your engine. It's better to inflate in reverse position so that you can move easily toward the kite if the wind pulls you.

Be aware that flying in moving air will dramatically change your ground track when you make turns. As you fly into the wind, you'll move much more slowly over the ground. Very little throttle will be needed to climb. The airspeed over your wing is created not just by the motion of your glide through the air, but also by the movement of the air mass you're in, so you'll appear to glide downwards more slowly towards the ground (your wing's glide ratio stays the same – your forward motion is just slowed by the movement of the air you're in).

Turning downwind (so that you're flying in the same direction as the wind), you'll move faster along the ground. Be very careful to make downwind turns with plenty of height above the ground. As you turn downwind, you'll appear to sink, as your body needs to accelerate to a new flying speed, causing your kite's angle of attack to tilt downward slightly. Low turns downwind impose the greatest risk of impacting the ground hard if something goes wrong. Avoid them.

Be sure to practice turning up high before trying to fly close to the ground in any significant winds. In even a 7mph wind, the difference between your upwind and downwind speeds is dramatic. Flying with trims flat, your kite's consistent air speed is likely approximately 22mph. That means, upwind, you'll be traveling about 15mph over the ground – a runnable speed, even with you and your kite in full flight. Flaring in that situation will bring you to a virtual stop in relation to the ground. Downwind, in the same air, you'll be traveling 29mph. You do not want to accidentally come in contact with the ground at that speed. Even a full flare at that speed will likely not even be runnable.

Flying in smooth laminar winds on nice days, near beaches, and in other situations when wind speeds are consistent, can be fun. They're the perfect conditions to practice foot drags and other low/slow maneuvers. Just be sure to do all maneuvers INTO the wind, and make sure you are totally comfortable with the reactions your kite makes to turns into and out of the wind. You should respond to these reactions absolutely by instinct before flying anywhere near the ground in windy conditions.

7. Landing

Flaring is the procedure of pulling on both brakes simultaneously to slow your descent rate and the speed of your forward motion. It allows you to touch down slowly and gently. The biggest problem that beginners have with landing is that they invariably want to slow their descent rate by flaring too soon.

The process of landing softly is definitely counter-intuitive. In order to flare properly, you need a lot of air speed. That means you must come in with you're brakes completely off (hands up). In the beginning, the sight of the ground approaching quickly will make you instinctively want to grab the brakes too early. You need to wait until the last instant, when you're 1-2 feet off the ground, and then pull with smooth force. The instant you begin your flare, your flight path will level out - in fact, if you pull too hard, you will actually go back up in the air. As your wing slows to a stop and stalls, you will drop down to the ground. The key is timing that final glide ideally, so that you stall the wing at the exact same moment that your feet lower to the ground. Many pilots "skate" to a landing, and basically slide their feet over the ground until the wing stops providing lift.

The most dangerous possibility comes from flaring too soon, while still too high, and/or flaring too hard and rising back up too high, then falling down to the ground when the wing stalls.

One possibility that many beginners try is to land with the engine on, slowing the rate of descent, and then skidding to a standing stop. The problem with that is two-fold: 1) Unless you're flying directly into fast wind, your forward speed at the point of landing can be much too high (as much as 20-25mph ... can you run at 25mph?) 2) The moment you stop moving, the kite will fall down. If your prop is still spinning when that happens, it's very likely that you'll have some expensive repairs to make on your kite lines and/or fabric.

The solution is to follow this routine:

Line up for your landing approach directly into the wind. This makes an absolutely dramatic difference in your landing speed! With only 7mph wind, if you land into the wind, you'll land as softy and slowly as can be hoped for, even if your technique is not so good. If you land down wind (with the wind to your back), that same wind speed will almost certainly result in a painful crash.

Cut your engine absolutely no less than 50' above the ground - it's much better to do that even higher: 100-500ft. Cutting your engine causes your wing to dive, because the angle of attack is shifted down and forward towards the ground. If you shut off the engine too late, this final dive will slam you down into the ground pretty quickly, and with more force than your flare can counteract. The only danger in cutting your engine too high is that beginners may misjudge their glide ratio, and overshoot/undershoot their exact landing spot. Having a large landing area eliminates that danger. Cut your engine high enough that your final dive can straighten out into an even, predictable rate of descent.

Put your hands all the way up during your final descent (no brake at all!). This will create the maximum amount of energy to use in your flare. If you come in too slowly, with your brakes on, the wing will stall and drop you to the ground after only a short flare. On the other hand, if you're moving as quickly as possible, you have as much kinetic energy built up in the

wing as is possible. By going fast, your flare is not only capable of slowing your descent, but can actually lift you back upwards into the air.

Don't make any significant steering corrections near the ground. You should make all of your final course adjustments well before the 35' mark (preferably higher), and then glide straight in. Oscillating your wing during the final moments of approach can crash you sideways into the Earth.

The last important element is timing the final bit of lift from your flare so that you set down softly. Pull too soon, and you'll stop and fall from higher than you want. Pull too late, and you'll hit your feet harder than you want. You'll intuitively want to do it earlier because you will be moving downwards quickly. You must force yourself to counter that intuition, and wait until you're 1-2 feet above the ground. Trust your wing - the flare WILL immediately slow and the stop your descent. Don't pull too hard or fast, because you could rise back up and fall from there. Just pull solidly and smoothly, with force, at about 1-2 feet. If you're landing into the wind, you'll land soft and smooth :) Bunch up your wing into a rosette, and prepare to fly again!

8. Active Flying

"Active Piloting" refers to flying in anything but still, predictable air. Wind gusts, thermals, rotor, wind gradient, wind shear, and other natural factors require you to respond with proper brake, weight shift, and throttle adjustments to keep your wing flying straight and level, and to keep you out of danger. Most PPG pilots do their best to avoid dangerous conditions (by flying in non-thermic times of day, in calm weather conditions, in locations without rotor, etc.), but it's important to know how to handle such conditions if you want to stay safe. You can find yourself in troublesome conditions when you least expect it!

8.1 Wind Gusts

Gusts can come from approaching or receding weather fronts. They can also be created by thermal activity. They can even be caused by the changing temperature in the evening, when conditions are _supposed_ to be at their most calm. When wind gusts speed up the movement of air over your wing, they can push your wing in the direction of the gust, and it that will change the angle of attack of your wing. Gusts can also speed up the wing's air speed faster than your air speed, causing it to surge forward and dive. Knowing what to do when you feel a gust should be instinctual, and that requires practice.

The basic guidelines are as follows:

If the gust pushes your wing back, and makes you climb, let up on your brakes and reduce throttle. When you first hit a gust that changes your angle of attack upwards, if you are pushing the throttle and/or adding brake to climb, you could reach an angle of attack at which the wing stalls, or stops moving forward, and drop you parachutally. Reducing

throttle and letting up on brakes initially will keep you flying straight for the first moment.

If the gust creates wind speed over your wing that causes it to move faster than you, the wing will dive forward, and you'll descend. When this happens, stop the surge by pulling brake and adding throttle.

The force and drama of these reactions is determined by how quickly the wind speed changes, and how consistent that change is. A very quick airspeed increase on the front of your wing could cause a frontal collapse and a resulting quick dive, or if it comes at you from a different vertical plane, it could push you into a steep climb, which could result in parachutal stall. This is where lots of kiting practice can help. It's critical to have an intuitive feel for what to do when the wing surges forward or falls back, and kiting can really help build that instinctive feel. An intuitive understanding of how changing your position under the kite changes the kites movement, as well as how pulling brakes affects the kite's movement – that's essential for understanding how to deal with similar changes and inputs that occur when you're in the air, and it can be learned to a degree by kiting on the ground.

8.2 Thermals – Rising and Sinking Air

Thermals are upward rising columns of hot air. They form when spots on the Earth are warmed hotter than their surroundings. Thermals are strongest during mid-day, especially in the summer time, when the sun has baked the ground all day. Dark colored surfaces are most likely to get hot in the sun's rays. Black top gets particularly hot. When flying over a field of brown dirt, surrounded by fields of white flowers, on a hot day, you should anticipate some thermal updrafts. You can also expect to find thermals under big, billowing cumulus clouds. Those clouds are formed when hot rising air carries up moisture to the height at which the vapor condenses. If you see a big thunder cloud anywhere nearby, don't even think of flying. They can suck you up to deadly altitudes, and they're typically surrounded by very rough air.

Thermals can be fun when you know what to expect and how to handle them. Paraglider pilots, sailplanes, etc. can stay aloft all day on the rising air in thermals. But if you don't know what to expect, and if you don't understand just how hostile they can get on bad days, you can very quickly find yourself in real danger.

When flying into a thermal, be prepared for your angle of attack to point upwards. Flying out of a thermal, prepare to dive downwards. In general, put your hands up (release brake) and release throttle when entering a thermal. When exiting a thermal, pull more brake to slow the wing's surge forward. In dramatic situations, it's possible for the wing to surge all the way out in front of you, or in the worst case scenario, beneath you. If that ever happens, and you become "gift wrapped" by the wing, you're probably going to die.

The solution is to anticipate and understand where and when thermals are

likely to occur, and how to fly in them. Prepare to enter and exit them, keeping your angle of attack even, and your wing inflated over your head. Again, an intuitive understanding of how the wing will move in these situations can be helped by the first step of kiting practice. Beyond that, you should learn how to fly in light conditions – nothing dangerous, but requiring a bit of input and reaction to keep flying under control. Fly with more experienced pilots who can explain what to expect on any given day, and gain every bit of experience you can by being aware of the movement of the air you're in, and knowing how to react to those movements. Learn to slow surges by pulling brake and adding throttle, and dampen quick upward tilts in angle of attack by releasing brake and reducing throttle. Don't fly in conditions which more experienced pilots tell you may be beyond your skill level.

8.3 Rotor – Messy Swirling Vortices

Wind coming over obstacles can get messy and unpredictable. Think of water flowing over rocks in a creek. Even a small twig can cause serious disruption and violent spays of water, if the creek is moving fast enough. The same is true of the air you fly in. The faster the wind around the obstacle, the more serious the disruption.

You need to watch out for trees, buildings, vehicles – even little things like light poles when you're close to the ground. Watch out for hills, ridges, and mountains when you're up high. As a rule of thumb, the wind shadow of an obstacle can extend twice as high, and six to ten times as long as it is high, downwind of the obstacle.

Heavy winds coming over a mountain top at high altitude can very easily collapse your wing in an instant. Landing next to a building, with strong wind coming from the opposite side could put you in a violent down draft just as you approach the LZ. Taking off with a row of trees upwind will likely rock you around, even if the winds are light.

To really understand how rotor works, try kiting your wing on a day with significant winds, and do it in front of a hedge or some other obstruction. Move around the object as you kite, and you'll see just how violent and unpredictable rotor can be. Until you are comfortable managing collapses and many other serious situations, totally avoid flying anywhere near potential rotor on windy days.

8.4 Wind Gradient and Wind Shear – Changes in Speed at Different Altitudes

Wind traveling nearer the ground is slowed by friction with the ground. This effect is called wind gradient, and you can expect that winds will typically get stronger as you get higher. As you come in to land, and when you're launching, wind gradient can have a significant effect on your flight path. If it's blowing 10mph on the ground, its quite possible that the air at 500' will be moving 25mph, in which case, you'll be flying backwards along the ground. Being aware of this effect can save you the potentially dangerous situation of being blown back behind your safe landing site, and into dangerous territory.

It's also not at all unusual to see wind speeds on the ground at 5mph (that's beautiful), while winds at 6000' are blowing 50mph (that's deadly). The wind shear that can be experienced as you move from one layer of atmosphere to the next can be powerful enough to take down a jet airliner. It's possible for winds to be moving in one direction at one level of altitude, and a totally different direction at another level. The turbulence found between such clashing layers is likely too much to handle in a paraglider, no matter what your skill level. Be sure to check your local winds aloft predictions. They'll at least give you a ball park figure of what to expect. If winds aloft are dramatic down low (3000' or so), it's smart not to fly, even if the wind speeds on the ground are predicted to be slow and gentle.

If you do fly high, be aware of changes in direction and speed. Even if they happen gradually, fast moving air can blow you into unlandable territory, into flight paths of other aircraft, etc.

8.5 Prop Wash and Wing Tip Vortices

If you must fly behind another PPG, be sure to stay ABOVE the path of its prop wash and wing tip vortices at all times. Prop wash and other wake disturbances sink and travel down wind. If you fly behind and below another PPG, you're in for a nasty surprise. It's also possible to fly into your own wake if you're executing tight turns. It feels like a slap on the face when it hits you - try hard not to let your wing go through it.

Watch out for even the smallest planes. Their wake is much more intense than that of a PPG. And don't EVER get anywhere near the underside of a helicopter's prop wash - it'll knock you violently out of the sky.

8.6 Mechanical Failures

Always expect your engine to fail. It happens all the time to 2-stroke PPG machines. If your engine cuts out while you're pulling a tight turn 10 feet above the ground, the outcome will not be pleasant.

One of the fundamental tenants taught to all new PPG pilots is: don't ever fly any where a potential landing zone isn't within your potential glide distance. Landing on an open field with an engine out is hardly more than an inconvenience. Gliding down into trees, water, or power lines is a far different story.

8.7 Recovering From Collapses

In the case of small partial collapses, you may not even realize that they've occurred, and in such benign situations the glider will recover quickly with no more than a small turn.

To help deal with larger collapses, it helps to always fly with a slight amount of pressure on the brakes (dangling the weight of your arms on the brakes). This can help you feel the wing as it depressurizes, providing an

extra moment to react. If you experience any sort of large assymetrical collapse, your main focus should be on steering the currently inflated portion of the wing. A safe beginner wing will likely re-inflate on its own, but in the meantime, your efforts should be spent on avoiding any unnecessary spinning or stalling that could lead to further collapse, loss of control, or collision with obstacles. When an assymetrical collapse occurs, the wing will immediately drop and turn quickly towards the side that collapses. Weight shift as much as possible away from the collapsed side. That will help you avoid spinning, by turning away from the collapsed side. If the spin is severe, you may also need to pull some brake to slow the fast moving side of the wing (the side that's still flying), but be careful not to stall that side. Doing so could cause a complete collapse of the wing, the worst outcome of which would be having the wing drop below you and falling down into the wing. Getting gift wrapped like that is the worst possible situation to find yourself in.

8.8 Reserve Parachutes

In the worst case scenarios, having a reserve parachute, and knowing how to use it can save you from some certain death experiences. If your kite ever locks into a spin which can't be stopped (too fast to slow down even by doing a pull-up on the brake), throwing your reserve is one thing that can save your life. Gift wrapped falls are another situation where a reserve provides you a second chance to live. Know where your reserve handle is, and be ready to use it in such a situation. G forces in a spin are dramatic and can quickly make you lose consciousness. G forces also make it very hard to move around, reach, and grab for a reserve handle. You should practice finding the handle while in flight, and visualize grabbing/throwing your reserve into clear air. Every year when you get the reserve repacked, practice an actual throw on the ground so that you know how it feels.

Reserves are only meant for use when the absolute worst has occurred, and there are no other options. Throwing a reserve in any other situation is a dangerous gamble. The rate of descent is much faster than in a paraglider, the location you land is typically left to fate, and it's possible to get paraglider lines and reserve lines tangled. Only throw in an absolute emergency, and in the meantime, practice your PLFs (parachute landing falls) to avoid breaking your body any more than necessary if you ever do take a reserve ride.

9. About Wing Safety Ratings: DHV, Afnor, CEN, and DULV

The DHV is the German organization that tests paragliders for safety characteristics. DHV pilots run through a variety of intentionally induced deflations, dives, stalls and other maneuvers. They carefully record the specific responses to every maneuver, and give each wing a rating based on how it responds to all the tests. Wings that respond most benevolently, without requiring any pilot input to recover from collapses and other maladies, are rated "1". These wings are the safest to fly when you're just starting out, or if you only fly occasionally for leisure. DHV 1 gliders typically fly more slowly then those with higher ratings, and are harder to

zip around into acrobatic maneuvers, but they require very little skill to maintain stable flight. DHV 1-2 wings are slightly more responsive, and should be considered the upper limit which new and unskilled pilots should consider flying. DHV 2 and 2-3 wings should only be flown by experienced pilots who know how to handle quicker diving turns, how to actively recover from asymmetric collapses, and how to intuitively control every movement of the wing, since the wing will not automatically do the right thing on its own. It's much easier to lock into deadly spins and to unsuccessfully recover from collapses with these wings. Wings with a DHV 3 rating should only be flown by expert competition pilots. They move very quickly, and need to be controlled just to maintain a position above you. Unless you've been flying hundreds of hours per year, for several years, you could likely find yourself in a deadly situation in one of these gliders.

Afnor (formerly Acpuls) is the French organization that tests wings for safety. Instead of a number scale, they use three main ratings: standard, performance, and competition. Only standard rated gliders are appropriate for low air time pilots. CEN is another European organization that uses a letter scale: "A" for the safest beginner gliders, through "D" for competition wings. DULV is another German testing organization - they're the only ones who specifically test gliders for appropriate use in powered flight. DULV has 2 ratings: Standard, for beginner and leisure pilots, and Advanced.

Here's a basic listing that compares the rating systems of each organization:

Beginner Pilots:
    DHV 1 to low level 1-2, Afnor Standard, CEN A to B, DULV Standard
Intermediate Pilots:
    DHV 1-2 to low level 2, Afnor Standard to low level Performance, CEN B to C
Advanced Pilots:
    DHV 2 to 2-3, Afnor Performance, CEN C to D
Competition Pilots:
    DHV 2-3 to 3, Afnor Competition, CEN D
See this page for more information about wing ratings.

10. General Safety Guidelines

- Fly high enough that you can recover from problems. Dealing with collapses, dives, stalls, engine-outs, and any other maladies is far safer and likely to end well if you've got significant altitude. 300' feet is a good bare minimum, but higher is generally better.
- Know how to look for potential weather problems. Avoid hot thermally mid day activity. Avoid hot, humid, low pressure days, when the air is thin, and you can't get as much lift as normal. Avoid flying anywhere near storm fronts.
- Avoid flying into rotor caused by wind hitting and flowing around obstacles.
- Stay way away from power lines, water, trees and any other areas where landing would be dangerous.

- Learn to kite your wing. In the beginning you should be doing much more kiting than flying. Launching is very dangerous if you can't kite the wing stably and intuitively.
- Fly with others who are more experienced than you. They can help determine locations and conditions that are good to fly in.
- Practice landing safely and with precision. In an emergency, you may need to land somewhere unexpected.
- Carry a reserve and know how to use it.
- Learn to work on your machine, keep it well adjusted, and perform a pre-flight check every time you fly. Be sure that nothing is going to break or fail in flight.
- Wear a helmet and good boots.
- Get good training, and don't ever stop learning. The more situations you know how to handle and the more problems you know how to avoid, the better.
- Learn to abort launches if something goes wrong. Launches are optional, landings are not.

11. A Final Reminder

And just so it's absolutely clear ... here's your last warning:

WARNING: Attempting to use a paraglider and/or paramotor may result in serious injury or death. The reader of this document is solely responsible for his/her safety when attempting anything described in this document, and assumes all liability of risk. Using a paraglider and/or paramotor improperly greatly increases the risks involved. Never use a paraglider and/or paramotor without proper and thorough instruction from a qualified instructor. By reading this document, you accept all risks involved with attempting anything described herein. The author cannot and will not guarantee your safety when attempting anything described in this document. By reading this document, you agree to not hold Nick Antonaccio liable for any injuries to yourself or to third parties resulting from reading this document.

Just get some training. Don't try to do any of this yourself. Our PPG freedoms are treasured. If you do experience an accident, not only could you ruin it for yourself, you could potentially ruin it for the rest of the PPG community too. You don't want to be that person.

12. Contact

Call 215-630-6759 to speak with an instructor, or visit http://ppglessons.com for more information.

PREPARING FOR THE CLINIC

Contents:

1. Confirming Everything

Training is necessarily weather dependent, so please keep in touch with me by phone (voice or text), especially the last few days before the clinic. Note that any weather predictions only start to become reliable 1-3 days beforehand.

Please PREPAY for the session (Venmo, Zelle, Paypal, or check by mail), confirm the location, and check with me about the current schedule 24 hours before heading to any training event.

Please ensure I have your current height, weight and contact info before leaving for the event. YOUR INFO MUST BE SUBMITTED AT THE FOLLOWING LINK IN ORDER TO BE INCLUDED IN THE TRAINING SCHEDULE:

http://paramotr.com

Nick Antonaccio: 215-630-6759

2. Links to Submit, Read, and Bookmark

First, to be included in the training roster, please be sure to submit your info here:

http://paramotr.com

read:

http://ppglessons.com/clinics.html

and bookmark:

http://ppglessons.com/links.html

The 2nd link provides some basic info about what to expect during the clinic.

The last page contains all the resources we'll use during the clinic.

3. Waivers

Please read, print, initial each page, and sign the following waivers at www.ppglessons.com/links.html :

Tandem Waiver Nick Antonaccio (for working with me)

Financial Responsibility Agreement (in case you break any equipment)

USPPA Waiver (for the land owners)

Blackhawk Purchase Waiver (for working with their equipment)

Fitness Waiver

If you have any trouble printing the waivers, I'll have paper copies ready to sign, but getting them done beforehand saves us precious time at the field.

4. Things to Bring

Please bring good shoes that can grip the grass, with ankle support if you need it. A pair of trail runners is a common choice, as are hiking boots, although heavy boots can be tiring.

Most students use an inexpensive skate or bike helmet (~$25 at Walmart). I'll have comms that work best with helmets that have open ears, but you can use any other type you own (again, heavy ones can lead to fatigue, and you'll want to be able to hear well around you with your helmet on). I'll have a few extra helmets, but likly not enough for the entire group.

Please bring plenty of drinking water, snacks, sun and bug protection, clothing appropriate for running around outside all day, light work gloves, and a phone/tablet with an Internet connection, if you have one. We'll use Internet devices to look at all the ground school documents, weather links, air space charts, etc.

Since we'll be in a field, bringing a light weight seating pad or chair is also a good idea (though not necessary). I'll bring an 11'x9' tent and a small sun shade that we can share if needed.

I've likely spoken with everyone about bringing the right size engines, harnesses and wings, but please send me your current height and weight, to

ensure I bring everything required.

5. Location and Schedule

Training sessions typically get finalized during the week before a clinic. The next anticipated training session is kept updated at http://ppglessons.com/schedule.txt, usually 1-3 days before the event.

The only sure way to schedule with me, or to confirm any event/location, is to call or text: 215-630-6759.

Addresses for the most commonly used training and flying locations are listed below. Every one of these locations may require permission from the owner for access, signed waivers, certification verification, site briefing, rental fee, and/or other restrictions imposed by the property manager. Please do not ever show up at any location and begin flying without confirmation:

Montague:	150A River Road, Montague Township, NJ 07827
Allentown:	1369 Old York Rd., Allentown, NJ 08501
Lufker Airport:	115 Montauk Hwy, East Moriches, NY 11940 (Long Island)
Keymar Air Park:	1585 Francis Scott Key Hwy, Keymar, MD 21757
Woodsom Park:	208 Lions Mouth Rd, Amesbury, MA 01913
Allen Air Strip:	231 Landing St, Southampton Township, NJ 08088 (no training, flying only)
Van Sant Airport:	516 Cafferty Rd, Erwinna, PA 18920 (currently not in use)
Tyler State Park:	101 Swamp Rd, Newtown, PA 18940 (KITING-ONLY location)

If you have any other potential local site(s) that you'd like me to check out before training, if you want help speaking with any property owners, etc., please let me know as soon as possible.

Training typically begins at 10am, and we'll work outside until dark. We'll punctuate stretches of kiting practice with simulator work, engine-on practice, mechanical setup, and ground school throughout the day, as everyone takes turns getting physically tired. It's always a fluid schedule, you can come and go as you need, and take breaks whenever you need to rest.

Please check with me each day before the next morning's start time, to ensure that there are no special quiet hours which need to be observed.

6. Coming and Going

There are porta potties at most of the sites above, but often no source for water or food. We'll likely do a couple group meals at local fast food restaurants (to get some indoor rest, and to cover ground school topics

together).

You can leave from, and return to the field as you please, rest whenever you need, and bring friends to watch, but I will likely be occupied helping students the entire day, and will have very little time to hang out casually. Use your time as needed, I'll cover everything multiple times with everyone, we'll take turns doing simulator work and ground school between long runs of kiting practice.

7. Watching the Weather

You can find an overview of forecast winds and weather at:

https://windmapper.com/forecast/montague,%20nj (enter the city, state if other than Montague)

When weather doesn't allow for flying, kiting, or other outdoor activities, we will cover ground school materials (air space, weather, laws, etc.), simulator training, machine setup, and other study. If the clinic looks like it will get completely blown out, we'll make the call to reschedule.

Any flights will typically occur during the first few hours of the morning, and the last few hours before sunset.

8. Will You Get To Fly?

Safety is my #1 priority. If weather doesn't allow for safe flights, or if you can't keep the wing stable over your head while kiting, then launching will not be possible. Please be aware that if this is your first 2-day clinic, there is a strong possibility you may not get up in the air. I'll do everything possible to use our time together effectively, but if you rush to launch with an oscillating or pitching wing, you can be sure to rip expensive lines and fabric, break machine parts, and potentially hurt yourself. Please read http://ppglessons.com/clinics.html to ensure there are no surprises about what to expect during your first training sessions.

If weather allows, tandem flights are a great way to get practice in the air, but they are only possible if wind conditions are perfect. Running together in a dual harness setup, while kiting a massive 42 square meter wing and carrying the heaviest engine available, is only manageable if winds provide gently helpful air speed. Too much or too little wind, wind coming from a hazardous direction, high density altitude conditions, or any other weather which could hinder launch does limit the potential to take rare tandem flights.

Please understand that I'll do everything to get you flying as soon and as much as possible, but I will not take any chances with safety.

9. If You Want To Study More Before Training

The PPG Bible by Jeff Goin is the preeminent reference to study, but it's filled with a volume of info which can be overwhelming during your initial training. The following tutorials document the core ground school topics we'll cover to get you up in the air. If you want to spend time studying before training, these are the concise materials and dense checklists you'll need to learn in order to earn ratings and to fly safely:

Introductory Info (pdf)
Checklist (pdf)
Weather (pdf)
FAR 103 Notes
Air Space Charts
Choosing Equipment
Kiting-and-Simulator (pdf)
Flight Dynamics and Maneuvers
Aerodynamics (pdf)
Comms
Don't Self Train
Tutorial (2008)

10. Other

Training is a lot of fun, but also a lot of hard work. Please come well rested and completely sober. If you have any physical ailments, if you are taking any medications, or if you otherwise have any challenges that may impair your performance during our time together, please let me know before taking part.

I'm looking forward to meeting everyone! Please call me if you have any questions at all.

- Nick Antonaccio 215-630-6759

PARAMOTOR FLIGHT INSTRUCTION (www.ppglesson.com home page)

LEARN TO FLY A POWERED PARAGLIDER ('PPG')

CONTACT: Nick Antonaccio 215-630-6759 nick@ppglessons.com

Contents:

1. Getting Started

It typically takes 3 online groundschool sessions, plus 2-4 intensive full day sessions outside at the field, in addition to significant practice on your own between sessions, to be able to take your first solo flights. The total cost for PPG1 certification typically averages less than $1500 (it can cost less or more, depending upon how much you practice on your own).

To learn how to fly, follow these steps:

1) Please read through this website. The section below answers most of the common introductory questions about powered paragliding. The following sections describe how training works.

2) If you have any questions or if you want to chat about anything having to do with paramotors, please call Nick at 215-630-6759. You're welcome to visit a training session any time to meet and talk with pilots, to watch students take their first flights, to see equipment up close, and to witness the whole process.

3) Most students begin training with online groundschool classes, using Zoom videoconference meetings to complete essential bookwork about laws, air space charts, weather, aerodynamics, equipment and mechanical skills, simulator, kiting and maneuvers prep, and other necessary topics before training at the field. Ground school curriculum is the most dense and time-consuming work that we can get out of the way before you start physical training. A minimum of 8 hours of book work is required for certification, and it can take up to 12 hours, depending upon how much a class group asks questions and socializes. The rate for online ground school is $125 per person, for each 2-4 hour session, and a total of 3 sessions are typically required ($375 total). This includes all my fees for the USPPA certification signoff paperwork, whenever it's ready to be submitted. You can prepare for ground school by reading the tutorials on the resources page. Please see the schedule page, and call 215-630-6759 to sign up for ground school appointments.

4) Our most popular field training program is broken up into multiple single day intensive clinics for $325 per day (group discounts and pro-rated partial days available), which includes equipment rental, kiting instruction, simulator training, equipment maintenance/setup/preflight instruction, and potential tow, tandem, and comm-guided student solo flights (when student skills, schedule, and conditions allow). To begin

outdoor training at the field:

- Please read the clinics and preparations pages
- Fill out and submit the info form at www.paramotr.com
- Sign the waiver documents at www.ppglessons.com/links.html
- Call me at 215-630-6759 to confirm plans to train, and to answer any further questions you have
- Prepay the class rate (Venmo, Zelle, Paypal, or check by mail)
- Watch the schedule page www.ppglessons.com/schedule.txt and/or call/text me to see when weather conditions allow sessions to take place
- Confirm any training appointment the day before meeting
- Training is entirely weather dependant, so must be confirmed with a call or text prior to visiting the field.

In addition to ground school, most students require at least 2-4 training days at the field, with significant practice in between, to build the skills needed to launch safely.

5) Optional: If you have equipment and a place to lay out your wing, you can reduce training time at the field by learning to set up your machine and harness, to begin practice hooking into the wing, to work on basic inflation practice, and to complete simulation training, all using video conference. Since the pandemic began, this has become a popular and well established option. We can cover the exact same training requirements online that we dig into in person, and getting any of those time-consuming portions of training done will help get you up in the air much more quickly, as soon as you have a chance to come to the field. The cost of remote training typically works out about the same as getting practice done at the field, and online units help to ease the amount of work and fatigue you'll experience in a single day at the field. Please see the schedule page, and call 215-630-6759 to set any appointments for online work.

All published training rates are listed for group instruction activities at school field locations. The total cost of training depends entirely upon how much practice you accomplish with your own equipment between training sessions. Plan on at least $1200 to complete your first flights and to earn PPG1 certification. The most time-consuming portion of training is kiting practice, and you can complete 90% of that work at home on your own time. The most cost effective way to learn after ground school is to take a day or two of field training, followed by as much time at home as you need to perfect kiting skills, and then return for a day or two of field training to take your first solo flights. Please read the sections below, along with the clinics and preparations pages, to fully understand how the training program works.

We do travel to teach. Weekends are most common, but other days and longer/shorter sessions are available by contract. If you're interested in visiting a session before you begin training, or if you have any questions at all, please submit the form below, and/or call, text, email any time.

3. How is Paramotor Instruction Typically Taught?

Most paramotor schools have you visit to study for a week or two at the instructor's location. The weather in the northeast US generally dictates that it's best to complete your instruction over several long weekends, with periods of practice and study between. Traditionally, students spend a portion of their time indoors, doing 'ground school' lessons (book learning about weather, laws, aerodynamics, equipment, etc.), whenever weather conditions outside are unflyable. You'll spend most of your outdoor lesson time learning to 'kite' a paraglider wing, learning to handle it on the ground, and to position it overhead while running, ready to take off. You'll also learn to handle the motor on your back and while simultaneously kiting the wing. You'll practice the flight routine repeatedly in a simulator until you can run through every movement by habit. You may also get to take a tandem or tow flight before launching on your own. At the end of your study, when weather conditions permit, your instructor will guide you via a headset through the process of launching, moving through turns in the air, and landing. You'll spend as much time as possible getting in additional flights during every available weather opportunity.

You should chose an instructor with whom you can connect personally, whom you trust, and whom you enjoy talking with regularly, because you'll rely on them for support and equipment maintenance for years to come.

4. It's a Challenge!

Learning to fly a paramotor is extraordinarily fun and rewarding, but it's also quite a bit more difficult and time consuming than most people ever imagine. It looks deceivingly easy. Pilots just seem to pull up their wing, run a few steps, engage their throttle, and take off. How difficult could that possibly be to learn?

The answer is that it's harder than it looks, at least in the very beginning. Kiting a paramotor wing well can take anywhere from a few hours to a few weeks of instruction and practice, to build basic skills. Paramotor engines initially feel very heavy, and frames/harnesses feel strikingly awkward to pick up, let alone to run with, and kiting a wing at the same time is nearly impossible if you try to jump right into it. You need to learn to kite perfectly straight during take off, while running full speed on uneven ground, with the engine weighing you down, and also pushing 100-170 lbs of thrust on your back, without the wing oscillating at all during takeoff. This is the reality of learning to fly a PPG, and you need lots of training and practice to do it well. For most students, it's a tremendously challenging process, compared to expectations. Even experienced general aviation pilots discover that their previous training and knowledge prepares them little for the physical challenge of learning to fly with a propeller attached to a gigantic backpack, and a wing that needs to be inflated while running.

Flying a PPG is also extremely weather dependent. Unlike fixed wing aircraft which weigh thousands of pounds, are equipped with many times the thrust, and fly much faster, paramotors are much more like leaves blowing

in the wind. If you try to fly a paramotor during mid day thermal activity, or any time when wind conditions around obstacles are bad, you may find yourself in an uncontrollable situation, as a beginner. It can take years to learn to fly in rough conditions, and many paramotor pilots never even attempt it. The last 2 hours of the day, or the first 2 hours of morning light (before the local atmosphere heats up), are the only conditions in which a beginner should even consider flying (except at a beach, or in certain rare, calm conditions). Weather requirements pose real, hard limits to scheduled training. You'll need to plan for instruction with these realistic limits in mind.

There's more to the equation too. You'll most likely learn to fly on your own equipment. If you fall over and break anything on your machine, you'll need to get it repaired before you can fly again. You'll want to be prepared to handle mishaps quickly.

Please don't try to train yourself. There are just too many things that can go seriously wrong without instruction.

Hopefully, you can find a group of local pilots who are willing to help you regularly determine if flying conditions are good, and who can help sort and maintain equipment, repair 2-stroke engines, etc. Be sure to talk with some pilots about more than the normal 'it's awesome' conversation. It is truly awesome, but getting started is probably more complicated than you initially think. Having a realistic training plan is essential if you want to have a good time.

5. Phases of Training, and Various Course Options

PPGLessons.com offers traditional training courses, using the classic tried and true methods. We provide certified ratings through both USPPA and ASC. You're welcome to come visit and study at a school location for as long as you want. Or, if you prefer totally private and personalized instruction, you can potentially have an instructor come to you, and teach directly at your own flying site. Just call 215-630-6759 to ask questions and/or to schedule a training session.

You can perform each phase of instruction all at once during a long vacation, or take each bit of instruction during short visits, practicing and perfecting each phase at home, before moving on to new skills. For the book learning portions of initial ground school training, PPGLessons.com can also offer remote videoconference instruction - live, online distance learning - which allows you to complete some of the time consuming portions of introductory training at your home location.

5.1 Ground School

The first part of any PPG course, ground school, teaches you everything you need to know about how paramotors work, what it's like to fly, how the law governs our flying activity, how to determine flyable weather conditions,

how the equipment is operated and maintained, what the entire training process will entail, etc. However you decide to perform your ground school, you will need some personal attention, to get all your questions answered and to learn how everything works. You can receive ground school instruction in a class room, or in a live videoconference environment, privately, or with other students.

This portion of the training requires absolutely no equipment purchase. You will understand all of the 'book' knowledge required to fly, when you complete this portion of your instruction. During intensive training sessions, we perform portions of ground school curriculum during breaks from physical activity, whenever weather conditions aren't perfect, during meal times, and after dark at the end of the day. Book learning will be mixed in regularly to clarify all the details of each learning phase.

5.2 Kiting

Another initial stage of instruction is kiting practice. This is the most time consuming, and arguably the most important phase of training. You can learn the fundamentals of paraglider wing control in a short course at an instructor's location, or during a visit from a traveling instructor. The basics are easy to understand, but the skills can take weeks to master. Some PPG schools have produced videos to teach potential new students how to practice kiting on their own, but self study is really not recommended. It's important to have someone help you understand which weather conditions are safe for practice, how to hook into your harness correctly, how the various lines and controls (along with your body movements and the movement of the air around you) affect the way the wing moves, etc. It is much easier and safer to get started if you have help.

The most important skills which you'll need to fly are built during the kiting phase. Traditional kiting instruction will help you to keep away from bad habits, and help you gain the most fundamental knowledge about how your wing moves and lifts you into the sky. In your initial lessons, you will learn to simply kite your wing, to pull it up above your head, and run with it, as if launching. You will not fly at all, but you will feel how the wing responds to the movement of air, and how your movements, weight shift, the controls, etc. all affect how the wing flies. When you first begin this phase of training, you will practice only when weather conditions are absolutely perfect, with no chance of the wing pulling you out of control. This kiting stage may be completed quickly in a few days, or it can potentially require weeks to master, depending upon your schedule, your natural ability, and the conditions that your weather provides.

When you can kite with perfect skill, you can begin to strap into your paramotor, without the engine ever running, and learn to perform the same kiting and launch skills with the weight of the engine on your back. This portion of the training is the most physically demanding. You will likely lose some weight, and you will need to take regular breaks. In any school environment, your instructor will work with several students at the same

time, so you'll be able to take rests from running and watch others practice. Your instructor will help you determine a good location to fly in your local area, point out obstacles, space requirements, etc., and help assess that the practice space you use, the conditions in which you train, and the techniques which you use, are as safe and effective as possible.

You will learn the most critical skills needed to take off during this stage of training. You can learn at your own rate, take as many lessons as you need, and practice in your home location, as opposed to being rushed through a short training course during a limited vacation trip. You can take the days, weeks or months which are required to build habitual muscle memory, understanding, and skill needed to control the wing and fly safely.

It's best to buy a new wing and get thoroughly comfortable with it throughout the process. Despite the fact that you will expose a new wing to some wear and tear, UV degradation, etc. it's best to become thoroughly familiar with the wing that you will fly with, for the entire training period - that is the typical expectation in most training routines. During this phase, you'll get all the help you need to choose what to buy.

5.3 Engine-On Training and Initial Flights

The final stage of basic training is the 'engine-on' portion of your instruction. This phase requires a great deal of interaction with your instructor, either at your location, or at a school site. By the end of this stage, you will take your first flights. You can choose to use a school machine to perform this entire phase of training, or bring your own equipment. Your instructor will help you make a decision about what to buy, but that is ultimately your choice alone. If you choose to use the instructor's equipment, there is no additional rental cost, but you must agree to pay for any equipment which you break. You can try a limited variety of school machines, and decide which suits your tastes and priorities best. You'll do a hang check and learn how to configure the harness and all other in-flight settings. It's critical that you learn to do this specifically for your weight and size, on the same style paramotor that you'll eventually fly at home. You'll do 'simulator' training, in which you hang in the paramotor with the engine on, learning to feel how the engine thrust pushes you in the harness, how it feels to hold and pull brakes while running the engine up and down, etc. You'll learn to walk and run properly with the engine running on your back. You'll practice every move that makes up an entire flight, over and over again, until you can perform every move without thinking. You'll learn to perform more advanced kiting techniques. You can also choose to purchase tandem instruction flights, in which your instructor takes you into the air, preparing you fully for the feeling of paramotor flight, feeling how the controls affect turns, etc., before you ever have to do it on your own. You can also take a controlled tow flight, to learn how the wing feels in the air. And finally, you'll be guided through your first launches and landings, with your instructor helping every step of the way via private head set communication.

The most important requirement for this phase of training is that you're thoroughly practiced at kiting the wing. You'll spend the entirety of this portion of training working with the engine on, and then actually flying. The time consuming preliminary work should already have been completed fully, at your own pace, at your location and/or ours, according to your own schedule. You need to come to the engine-on stage of training largely ready to launch, confident in your kiting skills, and fully ready to practice with the engine, and then fly. You can choose to come for as short or as long a period as needed. Come for a weekend at a time, as many times as you want, or have an instructor come visit you. There's no need to schedule one or more extended vacation trips, but you're welcome to come and receive your first instruction for as many days, or even weeks, as you choose. Schedule short or long trips according to the weather, your schedule, your budget, and your instructor's availability.

5.4 Ongoing Support

When you're done with the full course, you'll receive ongoing help and support from a teacher you know and trust. Help evaluating launch sites, weather conditions, equipment choices, etc., is invaluable as you begin your journey flying alone. Throughout the course, you'll learn from a certified instructor with many years of flying experience. You'll learn to fly safely and comfortably, at your own pace, without any rushed pressure to get through the most time consuming and critically important phases of the learning process.

5.5 Advanced Training

Once you've completed the basic course, and have some hours flying in the sky, you can continue to learn more advanced maneuvers and more about how to fly in difficult conditions, if that's where your journey takes you. Learning to perform higher G-force aerobatic moves, how to free-fly from hills without a motor, how fly in mid-day thermals, how to prepare for long distance journeys, etc., can add tremendously to your ability and the joy which comes from flying a paramotor. As with every other phase of training, you can choose to perform the training at your location, or at an instructor's site, and receive a personalized program which is right for your needs.

6. Can Paramotor Flight be Self-Taught?

Please don't try to train yourself.

7. Contact US

If you have any questions, you can call or text any time: 215-630-6759. You'll speak with a friendly and patient instructor who's willing to spend lots of time answering every question you want to ask, before you begin any of the process. If you don't get a human answer immediately, please leave a

voice or text message. Except on rare occasions, you'll get a call back the same day.

INTENSIVE WEEKEND/WEEKDAY CLINICS and TRAVELING PARAMOTOR INSTRUCTION

Submit the form at www.paramotr.com or call 215-630-6759 for more info.

Contents:

1. Weekend, Weekday, and Traveling Clinics

1.1 The Cost and Process of Organizing a Clinic Near You

Training is most often held at our private field in Montague, NJ. The cost for an intensive 1 day clinic is $325, including gear rental ($300 per person if you bring another student to train with you). In order for me to travel to your area, there must be at least 2 students enrolled in training for at least 2 days - potentially more, if the trip to your location will be costly. Please be aware that practicing with a paramotor is entirely weather dependent. To be safe, you'll be limited to very specific weather conditions during your initial training. Since it's never possible to predict the weather more than 3 days ahead of time, rescheduled rain dates may be required if wind or other conditions create an unfavorable environment. It's also necessary to have a large flat field to use for training. I can help to establish a usable location, but that needs to be completely organised before booking any training days in your area.

1.2 What to Expect During Your First Clinic

During your first clinic, you'll typically learn all the PPG1 ground school topics (laws, airspace charts, weather, aerodynamics, machine setup and maintenance, etc.). We'll also do simulator training with the engine running and helmet communication on (to get you comfortable with the engine force pushing while you're seated in the harness, to work on refining throttle control, to familiarize the vocal commands you'll hear during flights, to repeatedly run through every move in the first flight routine - launch, turns, altitude adjustment, landing, etc.), as well as lots of kiting (wing handling) and taxiing training, and possibly a tandem flight

if conditions allow. You'll also get to watch repeated demo flights to see and understand how everything goes together.

Since the Coronavirus pandemic began, most students have chosen to complete ground school book work and other preparatory skill development workshops online, using Zoom videoconference meetings. That will likely continue to be the preferred way for new students to get started with lessons in the immediate future. Book work can generally be completed in 3 online sessions of 2-4 hours each, at a cost of $125 per person, per session ($375 total). The fee for those sessions includes PPG1 and PPG2 certification paperwork submissions, once physical air time and demonstrated skills requirements have been satisfied.

Most likely, you will NOT be able to fly solo during a first clinic, unless you've learned how to handle a paraglider wing somewhere previously. You do need to have kiting absolutely mastered before your first launches, if you want to avoid breaking equipment and hurting yourself. Unless you want to end up with lines and fabric ripped up by a propeller, it's essential to be able to keep your wing centered perfectly overhead, without oscillating side to side or pitching forward or backward at all, in a variety of wind conditions. Learning to handle a wing in no wind requires constant running. Working in 3mph wind, the wing begins to exert dynamic energy of it's own. In 6mph wind, your technique will involve turning in reverse, and the wing's actions will get much faster (requiring reflexive responses to the changes in air speed/direction). At 9mph, you'll be focused on not getting pulled across the field. You'll need hours of practice in each of these conditions just to get the wing over your head, and to keep it there consistently. It looks like a piece of cake, but kiting training is probably going to be much more time consuming than you'd expect. It's nearly always a humbling experience for new students.

1.3 Your Second and Subsequent Clinics

If you want to fly on your own as quickly as possible, the ideal way is to purchase your own equipment at some point before attending a second clinic. That'll allow you to practice kiting with your own wing, as much as you can whenever the weather allows, so that you have every opportunity possible to fly safely during your next clinic session. Kiting takes up a good 90% of practice time during training, and is extremely fatiguing (especially when practicing with the engine on your back - most students are limited to 2-3 engine-on taxi runs at a time, before becoming temporarily exhausted), so getting as much kiting practice done on your own will likely save you significant money on training sessions, and help keep you from breaking any expensive equipment. Training on your own equipment during clinics also helps to build your trust in the exact machine that you'll be flying, allowing you to get to know it intimately before going off into the air at your own locations.

Of course, you can take as many clinics as you'd like and perform your first flights on school equipment, if you're not able to purchase a wing and machine right away.

You can also choose to attend a traditional 7-10 day course, but multiple short weekend clinics tend to work best for most student work schedules, and they typically end up being less expensive in the end.

1.4 Steps To Take If You're Interested In Flying

1) Read through this web site, and call me if you have any questions, or if you'd like to chat about anything having to do with powered paragliding. I'm more than happy to talk and answer all your questions: Nick Antonaccio 215-630-6759. There's an absolutely enormous volume of material available on the resources page, tutorials, videos, FAA documents, manufacturer manuals, etc. All covering essential topics and free to read.

2) Schedule ground school online. That's the best way for us to get started. We'll have hours together to cover the legitimate topics that prepare you to get up in the air. Doing this work online is much more efficient, comfortable, and effective than sitting together outside at the field. Plan on 3 sessions of 2-4 hours each. The cost per each session is $125 per person. When you've completed this book work portion of the training, you'll have all the required written USPPA signoffs completed for your PPG1 and PPG2 certifications.

3) Complete any additional training you'd like online. I can provide much of the same preparatory instruction that would typically occur at the field, using Zoom video conference. Setting up your equipment, learning to hook in to the wing, performing inflations in still air and basic kiting skill development, simulated flight run-throughs, and more can be completed when weather and your schedule allow. This will prepare you to practice on your own, and save you a tremendous amount of precious time at the field, so that you can get up in the air more quickly.

4) Come to training sessions at the field. We'll hone your kiting skills, run through simulation drills in person, demonstrate launches, landings and in-air maneuvers to clarify how it all works, and then when weather conditions are right, and your skills are prepared, you'll be guided through your first solo flights. Depending upon student needs and other factors, you may also get a chance to take tow and/or tandem flights with your instructor.

NOTE: The training schedule is entirely weather dependent, and impossible to schedule with more than 3 days' notice in this area of the country (weather forecasts just can't be as specific as we need to stay safe, more than 3 days ahead of time). When you're ready to come to the field, please be sure to submit your information here, check the published schedule, call me several days beforehand to let me know your intention to take part, and be sure to confirm the day before the session: Nick Antonaccio 215-630-6759.

1.5 Call Me If You Have Any Questions!

If you're interested in scheduling any training, or if you'd like to watch any session before attending a clinic, please let me know which weekend

dates, and/or any other days you're available. I generally travel to each remote training location 2-3 times per season.

If you have any questions, I'm more than happy to talk about equipment, or anything related to PPG, before you decide to schedule any training time. Submit this form or call, text, email any time!

Nick Antonaccio 215-630-6759

2. A Note About How I Operate

You may have come across paramotor instructors who prey on the fears of new students, discrediting any equipment but their own brands, and insisting that any instruction but their own will get you killed. Or you may have seen ads offering free instruction, only to find that the machines you must purchase for training cost thousands of dollars more than comparable brands.

I've been an instructor for more than a decade, and no student I've worked with has ever experienced a serious accident under my care. I'm currently certified with both ASC and USPPA, and I'm an authorized instructor for Blackhawk paramotor, covering all of the US Northeast Coast. I provide certified PPG1, PPG2, and PPG3 ratings after you've completed training. If you search for "Learn Powered Paragliding" you'll see that my web site is the first genuine result in Google (not a paid ad), because my instruction pages have been linked more than any other on the Internet by other authoritative sources. That's been the case for more than 12 years.

Most US schools currently charge $2000-$3500 for a 7-10 day course, for which you need to miss at least a solid week of work, get airline tickets to a remote training location, pay for hotel accommodations and restaurant food, etc. Add this to the average $10,000-$14,000 total cost for an overpriced engine, wing, accessories, etc., and you're in for a very expensive vacation. Many sellers nickel and dime you for thousands of unexpected additional dollars, to buy required parts and 'accessory' hardware such as wing bags, your 'choice' of harness and propeller on a machine, oil mixing containers, wind socks, etc., plus exorbitant replacement prices for broken cage parts, suspension lines, etc., if you damage anything during training (often, thousands of dollars (!!) if you trip and bang your cage even a single time).

I you want to purchase equipment from me, I deal with the best selling paramotor brand in the industry, in business for more than 20 years, with manufacturing based in the USA and quick/inexpensive replacement part availability, your choice of any popular motor on the market (the EXACT same ones most paramotor brands sell for several thousand dollars more), for an average total price of $8300, including motor *and wing, with all accessories, and shipping. I don't play games with prices, I just offer reliable and comfortable equipment that has been used safely and put through the paces by thousands of pilots.