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PERFORMANCE DESIGNS ZERO

Performance Characteristics

This document describes the opening, flying, and landing characteristics of the Zero in comparison to a **similarly sized** Classic or Parafoil. This will help potential users of the Zero learn as much as possible about the canopy before deciding to jump it. The Zero is intended primarily for precision accuracy, but is also perfectly suited for demonstration jumps, and can certainly be used for fun jumping. It is designed for use by pilots who consider themselves proficient in flying landing patterns to a 10-meter diameter circle or smaller (i.e., the 5-meter foam/air mat "tuffet" used for competition). If this doesn't describe you, keep jumping and keep learning, but do not attempt precision accuracy with the Zero until you can fly a recreational canopy into the peas ten times in a row to a controlled stand-up landing. When you are ready to try the Zero, we suggest you make several solo jumps opening above 5000 feet. This should give you the freedom to really explore the canopy unencumbered by other traffic and prepare for your first target landings.
Please also remember that the Zero is a precision accuracy canopy and will open, fly, and land very differently than your modern everyday sport skydiving canopy like a Sabre2, Stiletto. The comparisons made in this document are to other accuracy canopies and not modern sport skydiving canopies.

I. Flight characteristics:

General Impressions:

The Zero has the best slow flight of any canopy we've ever jumped. It is rock-solid in turbulence and designed to fly a steep glidepath in deep brakes to the center of the tuffet, producing the ideal arrival angle to strike the electronic scorepad. The Zero has comfortable toggle pressure and is more responsive in turns than other accuracy canopies, but if this is your first accuracy canopy, you'll find the brake pressure higher and turn rate slower than typical 7-cell recreational canopies. The Zero sinks great, with crisp recovery in the first moments of sink with only slight (2 to 4 inches) upward movement. To recover from a more prolonged sink or deep stall, you'll need to raise

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your toggles to about half brakes—but only try this kind of more extreme maneuver above 1000 feet. The flight performance information below assumes you have picked a canopy size commensurate with the suggested wing loading table.

Straight flight at full glide:

The canopy is slightly faster at full glide than the same sized Classic or Parafoil, with approximately 10 m/s (22mph) forward speed at the suggested wing loading. The glide angle is slightly steeper than the Classic, and flatter than the Parafoil. Of course, to maximize your forward speed, we strongly recommend you use a collapsible pilot chute, or put a large grommet on your bag so that it collapses your conventional pilot chute. Perhaps the biggest advantage in forward speed the Zero offers is that it flies straight—you won't have to give up forward speed in full flight with constant turn inputs on one side, or because you've shortened one steering line. We have gone to great lengths to build your Zero so it flies straight. If you find you do have a slight veer or gentle turn in full glide, make sure your harness is even and you are equally loading both main lift webs.

Using the risers or individual lines to steer in flight:

The *Zero* has excellent rear-riser response. If you pull both rear risers down two to three inches and hold them there, it will flatten out your glide considerably. You can also use the rear risers to flare the canopy for landing. Prolonged large deflections of the rear risers will eventually put the canopy into a stall/sink, so large deflections should only last a few seconds. Pulling down a front riser (or pulling down the outside A-line) will produce a nice diving spiral, important for creating vertical separation on an accuracy stack. You can also spiral using the outer rear-riser (C/D) suspension line on either side. **Complete all spirals prior to a 1000-foot "hard deck" above the ground!**

Control range with brakes:

With a thick airfoil, the *Zero* has a long control range. That means that from full flight (with the tail fully up) to the stall point requires a control stroke that exceeds the arm length of most jumpers. Most serious accuracy jumpers insist their canopy enter full sink/stall with their hands at, or slightly below, waist level. This means the forearms are horizontal, or depressed slightly below horizontal, when the canopy first goes into a sink. (Note: this stall point setting is based on a slow, gradual, progressive entry into sink/stall, an exercise done above the "hard deck" of 1000 feet.)

To achieve the "waist high" stall point setting, the tail of your canopy will have to be pulled down about 25% while in full flight (see figure 1, below). Hence, you will feel tension on the toggles while they are in the keepers. The bottom factory mark on the lower steering line is an approximate setting, which you may have to adjust a few inches to achieve sink/stall at the desired point.

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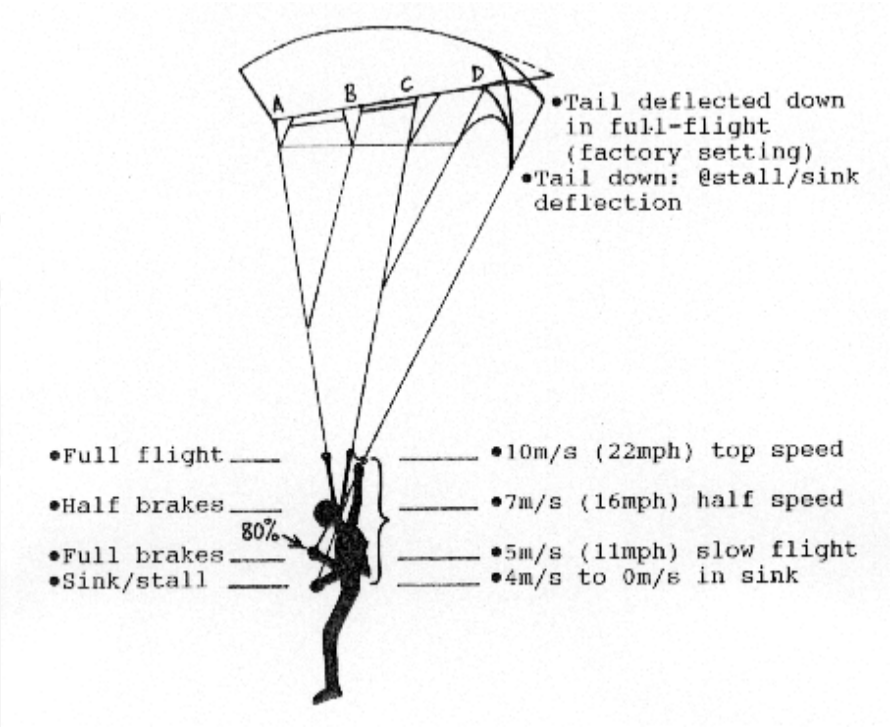
Figure 1, Control range and brake setting:



A "waist high" stall point (as opposed to what you may be used to, "full arm extension" stall point) allows experienced accuracy jumpers to "finesse" their entry into sink and control their glidepath as they complete the last seconds of their final approach (below 30 feet, landing on tuffet assured). This waist-high stall point also gives experienced accuracy jumpers a last-ditch "salvage" ability if they find themselves going over the top of the scorepad, because they have approx. 10-12 inches of control stroke below their stall point, allowing them to make a last-ditch "stop and drop."

With the stall point set at the above "waist high" setting, **be careful not to unintentionally stall your canopy at low altitude!** Below 500 feet, do not sink or stall the canopy unless you are an experienced accuracy pilot and know exactly what you are doing. Below 100 feet, do not sink or stall the canopy unless you are positive your glidepath will end with a safe landing on a cushioned landing mat. **A low altitude sink/stall onto hard terrain can cause serious injury!**

General steering with brakes:

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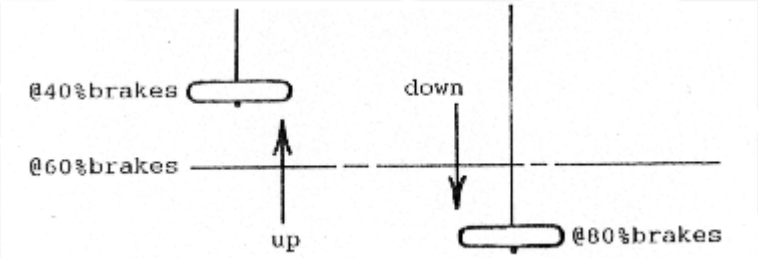
The *Zero* has moderate steering forces. You'll find that turns above half brakes require six to twelve inches of toggle deflection, and should be made with smooth but positive movements. Below 1/2 brakes, as the wingtips fill out, you will find that steering is more precise, and that a "cross control" turn is most effective at changing your heading. Instead of simply pushing down on the desired turn side toggle, let up on the "outside" toggle in equal measure, for a flat, responsive turn (See figure 2 below). In the last instant of an approach (below six feet), if you realize you are off the pad to one side or the other, letting up on the outside toggle (as high as the stop ring) will give you the most effective turn.

Figure 2, Cross Control Steering:



II. Landing the Zero:

Approaches:

It is assumed that the prospective *Zero* pilot is already proficient at landing their present canopy, so this is not a detailed "how-to" accuracy manual. If you are new to accuracy, you will find your *Zero* can be slowed down much more at the end of a landing than the typical recreational 7-cell canopy you may be familiar with, even more so than student canopies that may be slightly larger.

The second assumption is that you are shooting accuracy. If this is the case, then the most effective landing for precision accuracy is the parabolic, or "round off" approach. Before we get into that, please continue reading, **this paragraph is important!** If you are new to accuracy, it is imperative that your first jumps on a *Zero* not be a precision accuracy approach. This is a strong suggestion we would make to someone new to any precision accuracy canopy. As mentioned, these canopies land quite differently than your recreational sport canopy. The precision accuracy approach should only be attempted once you have done a number of demo approaches and have reached a comfort level where you can land in a 5-meter pea pit in varying wind conditions without question. The nature of precision accuracy canopies, when landing on a tuffet, is to discontinue your forward movement when applying the brakes. Now here's the

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important part, this input doesn't necessarily discontinue or slow the descent of the *Zero* the way you may have come to expect from your standard ZP sport canopy. Missing the tuffet while attempting a parabolic approach can be quite painful and an experience we would highly recommend avoiding. If you chose the *Zero* for demonstration jumps, you will want to fly a shallower, more conservative approach, one designed to end with a flare that reduces some, but not all of the descent rate, which should allow for a reasonable stand-up landing. We call this kind of approach the "demo landing approach." It also works great for sport accuracy.

Demo landing approach:

Fly your normal pattern at half-brakes (your hands will be even with your ears, if your brakes are set as depicted in figure 1). Turn final above 300 feet—we recommend at least 30 seconds of a steady, controlled final. Adjust your glidepath as necessary with S-turns or a combination of deep brakes and S-turns (no stalls or sink) until you are gliding toward the intended landing point at 1/2 brakes. Approaching 100 feet, slow the canopy to 2/3rds to 3/4 brakes, shifting your aim point to a spot 5m to 10m short of the intended landing area. Approaching 50 feet, let up to 1/4 brakes and let the canopy fly. This will give you good airspeed for the flare. Now you are focused on making a nice stand-up landing into the wind. If you land short or long of the original aim point, so be it—your goal is a stand-up landing in the vicinity of the target, not centimeter (or even meter) precision.

Parabolic accuracy approach:

The parabolic or "round off" approach is for serious accuracy. It was invented long before the *Zero,* but this canopy makes it a joy to fly. Complete your base leg to final turn so as to pass through the first "window" of your final approach at 300 feet up, on the appropriate angle for the winds. Spend the next 200 feet working to achieve a glideslope that will carry you beyond the target (to +5 meters) at 66% brakes. Work hard during this segment of the approach. Be a pilot, not a passenger!

If you are high, make braked S turns (recommended) or hold sustained deep brakes, or ease in and out of light sink—act early on final, rather than later (and lower)—to get to the ideal glidepath. Avoid stalling the canopy below 300 feet; it's dangerous and will only confuse matters.

If you are low on glidepath, smoothly let up and fly at 25% brakes (or less, if necessary). Keep correcting until you have both 66% brakes and a glidepath that will overfly the target by 5 meters.

As you approach 100', you are about 10 seconds from landing. It's time to aim closer to the pad, reducing your "overfly." Increase brakes to about 80%, hands level with your

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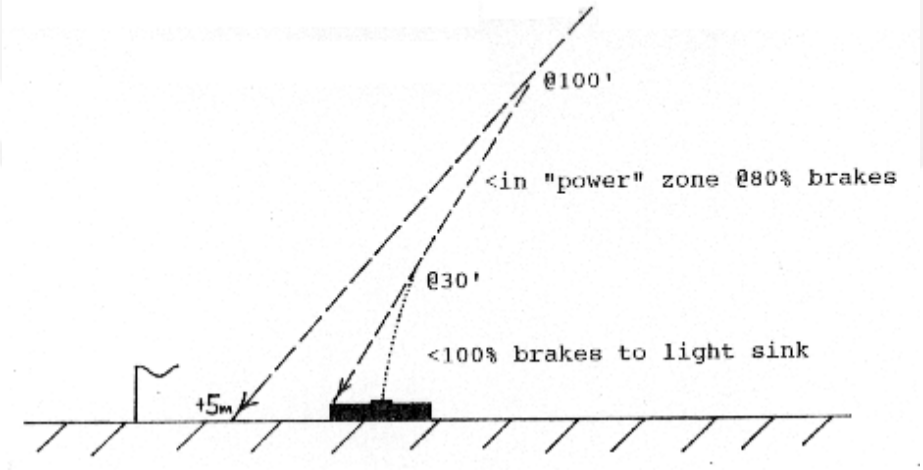
chest, elbows down and forearms angling about 30° above horizontal—sometimes described the "W" arm position.

This is also known as the "power zone"—the canopy is still flying, control pressure firm, and the canopy responds in linear fashion to your inputs. Let up, and you move forward. Push down, and you slow down, steepening your angle of approach. You are flying to just beyond the pad, aiming at a spot on the far side of the tuffet/landing mat, about +2 meters past dead center. Next, you will arrive at the third and final "window" of your approach: the transition point.

"Transition point" or "the transition" simply means transitioning down from your overfly glidepath by increasing your braking, steepening your angle, and aiming for the center of the scorepad, focusing on the dead-center dot. If you've flown your approach well, you'll land at 100% brakes, or very light sink. The canopy will remain vertically over your head, with no pre-stall "rock back" or acceleration. This steep but controlled arrival is designed to maximize foot placement accuracy.

Figure 3, The Parabolic approach & transition:



III. Opening characteristics:

Definitions

The first part of the opening force you feel is called the **snatch force**. It is the force you feel when the canopy first gets to line stretch. The second phase of the opening is

called the **snivel**, during which the canopy is overhead but the slider has not yet begun to travel down the lines. The third stage is the **inflation**, during which the slider travels down the lines and the cells finally pressurize.

Snatch force

The snatch force of the *Zero* is slightly less than the Classic or Foil because it is a lighter parachute. Neat flaking of the canopy during packing will also reduce the snatch force.

Snivel

The snivel depends on how you have set the DMPS (dual mode pocket slider). If the pocket is "engaged" (see the packing manual for instructions), you will experience a predictable one-to-two second snivel. The snivel is shorter when your airspeed is higher, and longer when going slower. With the pocket flap in the stowed position, the snivel will be about half as long at all airspeeds. The snivel is also affected by the degree of neatness of your pack job.

Inflation

In general, the inflation is similar to that of a Classic, perhaps a little slower, with a similar peak force. Of course, the opening may be slightly quicker if you are deploying at a higher airspeed, (because the snivel will be shorter, so you will not have slowed down as much before inflation.) It is quite common for the slider to stop about half way down the lines at the completion of inflation. Simply pump the rear risers a few times and the slider will travel the rest of the way to the top of the risers. You can also release the toggles and pump the steering lines to bring the slider down.

Heading control during opening

The *Zero* normally opens on heading, rarely turning more than 90 degrees. Body movements in the harness can cause a heading change, but how you fold the nose and the remainder of the canopy will have a greater influence (see packing manual for the recommended procedure). On occasion, you may experience a D-ring hang-up on one side, which can cause a rotation of up to 270 degrees on opening. Pumping the rear risers will free the "hung" D-ring and quickly stop any rotation.

IV. Size matters:

General

The *Zero* comes in eleven sizes—205, 215, 225, 235, 245, 255, 265, 275, 285, 295, and 305—more sizes than either the Classic or the Parafoil. For experienced accuracy jumpers, getting the right size is important, and we've sized our canopies to make your decision easy. As a simple rule, step up one half-size from the size accuracy canopy you have been jumping. For example, if you've be jumping a Parafoil 281 at normal wing loading, you will want to go with the *Zero* 285. If you have been jumping a Classic 259, step up to a *Zero* 265. The critical question here is what wing loading have you been

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jumping? If you are light under the canopy you are coming from (ex: 170 lbs with gear under a Classic 259), then you probably should step down to the *Zero* 255, to a more ideal wing loading. The following wing loading tables can help guide you towards the best decision.

PD *Zero*

SUGGESTED WING LOADING TABLES

PD Zero Wing Loading Chart											
CANOPY MODEL	AREA (SQ.FT.)	MINIMUM EXIT WEIGHT	MAXIMUM EXIT WEIGHT						SPAN (FT.)	CHORD (FT.)	ASPECT RATIO
			STUDENT	NOVICE	INT.	ADV.	EXP.	MAX			
Zero-205	205	103(47)	N/S	N/S	113(51)	123(56)	133(60)	185(84)	19.10	10.99	1.74:1
Zero-215	215	108(49)	N/S	N/S	121(55)	131(60)	141(64)	194(88)	19.55	11.25	1.74:1
Zero-225	225	113(51)	N/S	N/S	130(59)	140(64)	150(68)	203(92)	19.99	11.51	1.74:1
Zero-235	235	118(54)	N/S	N/S	138(63)	148(67)	158(72)	212(96)	20.42	11.75	1.74:1
Zero-245	245	123(56)	N/S	N/S	147(67)	157(71)	167(76)	221(100)	20.84	11.99	1.74:1
Zero-255	255	128(58)	N/S	N/S	158(72)	168(76)	178(81)	230(105)	21.25	12.23	1.74:1
Zero-265	265	133(60)	N/S	N/S	170(77)	180(82)	190(86)	239(109)	21.66	12.47	1.74:1
Zero-275	275	138(63)	N/S	N/S	182(83)	192(87)	202(92)	248(113)	22.05	12.70	1.74:1
Zero-285	285	143(65)	N/S	N/S	195(89)	205(93)	215(98)	257(117)	22.44	12.92	1.74:1
Zero-295	295	148(67)	N/S	N/S	208(95)	218(99)	228(104)	266(121)	22.83	13.14	1.74:1
Zero-305	305	153(70)	N/S	N/S	222(101)	232(105)	242(110)	275(125)	23.21	13.36	1.74:1

NOTE: "Exit weight" assumes your rig weighs 25-30lbs (12-14kilos). *ADV weight category is suggested for best competition results. Intermediate being the low end, expert being the high end of the range for competition accuracy.

Selecting the right *Zero* for your Weight

A *Zero* can be safely jumped at a wing loading as low a 0.50 pounds per square foot and as high as 0.90 pounds per square foot (.90 lbs/sq ft). The desired wing loading range for accuracy is generally between 0.60 to 0.80 lbs/sq ft, with suggested wing loading gradually increasing with canopy size. The tables show the suggested size *Zero* for use in the precision accuracy event, based on the weight of a jumper at exit. Subtract approximately 30 lbs (14 kilo) from the weight shown in the table to compare your "soaking wet" body weight to the suggested canopy size. Unusually light or heavy jumpers may find they fall outside the suggested accuracy wing loading range. The *Zero*

will perform very well for non-competitive purposes (i.e. demo and fun jumps) at weights within the safe min/max range.

If you're used to reading and understanding PD wing loading charts, you may want to think about the chart above a little differently. We've designed this chart with the advanced category as the suggested wing loading for the best competition results. This will likely continue to be the correct size as your accuracy skills improve. Unlike recreational canopies where downsizing with experience is somewhat the norm, downsizing accuracy canopies with experience is not going to be how you get better performance. Some accuracy jumpers prefer slightly smaller or larger sizes than we suggest for competition. These are reflected in the intermediate and expert columns above. The size you choose will be more reflective of your personal preference rather than your experience level.

Choosing the right sized canopy for the accuracy event is part science, part art. Many personal factors can drive your decision. The PD wing loading tables above are the right place to start. Our suggested sizes are based on extensive testing and field experience with a wide cross section of accuracy jumpers. NOTE: There are some easy adjustments you can make to correct for less-than-optimum wing loading on your canopy. As a general rule, if you are on the low side of the suggested wing loading, you will have to raise your tail slightly. If you are on the high side, you will have to raise the nose. See "Fine-tuning your Zero" and the FAQs for further guidance.

Pack volume

The *Zero's* pack volume is slightly less than a similarly sized Classic. To compare it to the Parafoil, the *Zero* packs approximately 15% smaller or about one size down. For example, a *Zero* 285 packs about the size of a Parafoil 2K 270. Of course, this varies from canopy to canopy according to neatness of packing, material and humidity variations.

V. Summary:

Remember, the comparisons described above assumed the canopies were sized the same. The *Zero* is a delight to fly and it was designed for precision accuracy, with a specific goal of making the transition to the *Zero* easy for either a Classic or Parafoil pilot, but it will not replace everyone's accuracy canopy. Canopy model and size are a personal choice. Choose your canopy while considering the information presented here, and reflecting on your present experience and desires. If you decide the *Zero* is for you, we certainly hope you enjoy it as much as we do!