



Katana Flight Characteristics and Frequently Asked Questions

Introduction

Performance Designs' Katana is a high-performance canopy designed for experienced canopy pilots. The Katana has been described as "a perfect fit between the Stiletto and Velocity," and a canopy that is "very suited to modern flying styles." In this document, we will describe the performance and handling characteristics of the Katana, and answer questions that jumpers frequently ask about the canopy.

How is the design of the Katana different from the Stiletto?

Like the PD Stiletto, the Katana is a highly tapered or "elliptical" nine-cell canopy made from zero-porosity fabric. Both the Stiletto and the Katana were designed using a conventional cell structure, without cross-braces or airlocksTM. The Katana may look similar to a Stiletto at first glance, but beneath the surface they are two completely different machines.

The Katana incorporates numerous advances in airfoil technology developed by PD in the years since the Stiletto was released. We experimented with a variety of planforms, line configurations, and other design elements, searching for the right combination to give the Katana the characteristics we wanted. Various prototype designs were tested, modified, and revised for over a year, then shaped and smoothed into a canopy that we believe is one of the finest in its class.

How do the Katana's flight characteristics compare to the Stiletto's?

When comparing the characteristics of two different canopy designs, several factors need to be considered. To make a truly accurate comparison:

- The canopies must be the same size and flown at the same wing loading. Comparing a Stiletto 135 to Katana 120 would not yield an accurate comparison.
- The canopies should be flown under similar conditions. If you jump one canopy when the winds are calm and another canopy in strong winds, this will also affect the comparison.
- The canopies should be "set up" the same way. Even two identical canopies will perform differently if one has the toggles attached at the location specified by the factory, but the other has had the steering lines shortened a few inches. There may also be a noticeable difference if the risers are different lengths. There may be significant differences between a canopy with new lines and one that has several hundred jumps on the line set.

Keeping these factors in mind, we can compare the characteristics of the Katana to those of the Stiletto.

Control Range: A canopy's control range can be described as "long" or "short" depending on the amount of toggle movement available between full glide and the stall point. It can also be described in as "high" or "deep" based on the amount of toggle input required to get a certain response. The Katana's control range is deeper than the Stiletto's, meaning you need to pull the toggles slightly farther on the Katana to get a certain reaction from the canopy; but the Katana's control range is also longer, meaning you can pull the toggles farther on the Katana before reaching the stall point, giving you a greater amount of usable control range.

Recovery Arc: “Recovery arc” is a term used to describe the amount of time and altitude a canopy takes to recover from a dive and return to normal flight after a maneuver such as riser or toggle turn. Even pulling both toggles down and letting them up quickly will result in a dive, and the canopy will need a certain amount of time and altitude to recover.

The Katana has longer recovery arc than the Stiletto, meaning it takes longer to recover from a dive and return to normal flight. The Katana’s recovery arc is not quite as long as the recovery arc of the PD Velocity, but you still need to be cautious until you become familiar with the Katana’s dive and recovery characteristics. It’s important to remember that a canopy’s recovery arc will generally become longer at higher wing loadings.

Straight Flight at Full Glide / Straight Flight in Brakes: At full glide the Katana flies at a slightly higher airspeed and at a steeper glide angle than the Stiletto. The Katana may feel a little “ground hungry” at first, but it actually has a greater speed range than the Stiletto. The Katana’s rate of descent will be noticeably lower when flying in brakes than it is at full glide, particularly when flying in deep brakes. The Katana and Stiletto have a similar rate of descent in deep brakes, but the Katana has a slightly higher forward speed. Once you’ve experimented with the Katana’s range of flight you will find it fairly easy to get back from long spots, or to hang in brakes after opening and let other canopies land before you. Just remember that we are comparing the characteristics of canopies that are the same size. If you downsize, your rate of descent in all flight modes will be higher and your range will be more limited.

Toggle Turns from Full Glide: As we mentioned earlier, the Katana’s control range is deeper than the Stiletto’s, so the Katana needs slightly more input to start a turn. We believe the Stiletto feels slightly more responsive than the Katana when making toggle turns, but only to a small degree. You will probably find that the Stiletto and Katana are both very responsive compared to many other canopies. If you have been flying a rectangular canopy like the original PD Sabre, or a slightly tapered canopy like the PD Spectre or Sabre2, toggle turns on the Katana will feel very quick.

Toggle Turns in Brakes (Flat Turns): Flat turns are an important technique to learn on any canopy. By pulling the toggles half way down, then slowly raising or lowering one toggle to start a turn, you will lose much less altitude than when making a turn from full glide. Like many “elliptical” canopies, the Katana can turn very quickly in brakes. If you move the toggles too far or turn too quickly the turn may not be very “flat” at all, but with practice you can learn to make very precise, flat turns in brakes with very little altitude loss. It is especially critical to perfect this skill if you will be flying a small canopy at a high wing loading. You should practice flat turns at higher altitudes and learn how the canopy reacts to these maneuvers. Try making flat turns after entering ½ brakes from normal full glide flight, then try flat turns at higher speeds, going to ½ brakes after a toggle or front riser turn.

Front Riser Characteristics: The Katana is very easy to control using front risers. The front riser pressure starts off very light, and tends to build up slowly. It is easy to keep the Katana in a front riser dive or diving turn, and to make adjustments to your turn rate and rate of descent while diving. By comparison, the Stiletto’s front riser pressure starts out noticeably higher and builds up more quickly.

Rear Riser Characteristics: You will find that the Katana’s rear riser control range is longer and deeper than the Stiletto’s, as is the case with the toggle control range. You may need to pull the rear risers down a bit farther to get a certain response, but you are also able to pull them farther before reaching the stall point.

In static flight with the back risers held at a certain position, the Katana will glide at about the same angle that the Stiletto does, but with a higher forward speed. The glide will be flatter than at full glide, but the rate of descent will not be as low as in deep brakes. In many cases, flying in deep brakes may still be a better option if you are trying to glide farther across the ground.

Stall Characteristics: As we mentioned earlier, the Katana has a relatively long control range. The toggle and rear riser stall points are both fairly deep, and the canopy can reach a low airspeed before stalling. If you are familiar with the stall characteristics of other zero-p main canopies, you will find that the Katana gives a fair amount of warning before entering a full stall. Compared to a Stiletto, it is easier to keep the Katana on heading as you approach the stall point, recover from a rear riser stall, or recover from an imminent toggle stall. In spite of this fact, we do not recommend allowing the Katana to enter a full toggle stall. Performing a full toggle stall with any “elliptical” canopy is likely to result in line twists, closed end cells, slack lines, or an uncontrolled diving turn. It is usually easier to maintain your heading during a rear riser stall, even on an “elliptical” canopy, although a rear riser stall will normally occur at a higher airspeed. Toggle stalls and rear riser stalls generally become more radical as canopy size decreases or wing loading increases, making it more likely that an unrecoverable situation will occur.

Landings: The Katana can generate more lift and reach a lower airspeed than the Stiletto during a flare. With practice, you can achieve longer swoops and softer touchdowns using either a normal, straight-in, full glide approach

or a high-speed approach technique. You will also find that, using the proper technique, the Katana creates an impressive amount of lift when flaring from a low-speed, braked approach.

It's always a good idea to try a few practice flares up high before landing a canopy that is new to you. Since the Katana has a deeper control range than some canopies like the Stiletto and Sabre2, practice flares will help you adjust to the control range more easily and get better results from your first few landings.

High-Performance Landings: High-speed approaches, also called high-performance landings or “hook turns,” are now fairly common practice among experienced jumpers. These are maneuvers where a front riser dive, riser turn, or toggle turn is used to increase the canopy’s speed during final approach. Ideally these turns should be started at a relatively high altitude, giving the pilot more time to make adjustments and giving the canopy plenty of time to recover naturally from the dive. Experienced high-performance pilots understand the concept of being “in the corner,” and know that it is both dangerous and inefficient.

The Katana’s light front riser pressure and long recovery arc make it very well suited to modern high-performance flying techniques, but a less experienced jumper, or one who is not familiar with the Katana, can easily be caught off guard by these same flight characteristics. Several factors should be considered before attempting a high performance landing on the Katana, or on any canopy that is “new” to you:

- **Even if you have made hundreds or thousands of high-performance landings, you need to be cautious when trying a new type of canopy or a smaller canopy than you are accustomed to.**
- **You should never attempt a high-performance landing on an unfamiliar canopy until you have experimented at higher altitudes and become familiar with the canopy’s control range, response to control inputs, and recovery arc.**
- **Flaring with rear risers during a high-performance landing is a highly advanced technique that can significantly increase your risk of being injured. You must become thoroughly familiar with a canopy’s rear riser control range and response characteristics before using rear risers during any part of your actual landing flare.**

What are the openings like on the Katana?

In two words: pretty sweet. To describe the openings in more detail, we need to agree on some common terms:

- **Snatch force:** the first part of the opening you feel, when the canopy first reaches the end of the lines and comes out of the deployment bag. This is the force that sits you upright in the harness.
- **Snivel:** the second phase of the opening, when the canopy is overhead but the slider is still all the way up. A significant amount of deceleration normally occurs during the snivel.
- **Inflation:** the third stage of the opening, when the slider travels down the lines and the cells finally pressurize.

The Katana generates a very low snatch force, so the transition from freefall to sitting upright in the harness tends to be surprisingly smooth. The Katana will snivel for a slightly longer time than a Stiletto of the same size, followed by a quick but comfortable inflation. By comparison, the Velocity tends to have a higher snatch force, but longer snivel and slower inflation, than either the Katana or the Stiletto.

The Katana’s design includes a number of airfoil, trim, planform, and inlet shape enhancements that create improved airflow inside the canopy during inflation. These enhancements make the Katana more resistant to heading changes during opening than the Stiletto or Velocity. If the Katana does begin to turn during the snivel or initial inflation, it tends to “lock on” to a heading once the slider starts to come down. But even though the Katana is more resistant to heading changes during the opening, packing and body position will obviously play a large role, too.

How should I pack it?

The Katana should be packed using the same neat, symmetrical PRO-pack we recommend for all of our main canopies. We find the Katana opens best when the nose is left completely straight, with the leading edge hanging just

below the front of the slider. We do not recommend pushing the nose into the center of the pack job on any canopy, even a little bit, as this promotes off-heading openings. The slider should be quartered evenly, with the edges spread equally from side to side and from front to back. Be sure to keep the slider fabric pushed well down in the center, and keep the grommets seated firmly against the stops on the stabilizers until the canopy is in the bag. Keeping the canopy symmetrical and maintaining good line tension while packing are important if you wish to have consistent openings.

When deploying any canopy, you will get the best results by keeping your shoulders level as the deployment bag lifts off of your back and keeping your weight even in the harness until the slider comes down. "Steering" with the risers before the slider comes down or allowing your weight to shift excessively can actually cause or exaggerate off-heading openings.

Additional "care and feeding" suggestions: We recommend using a kill-line collapsible pilot chute with all of our sport main canopies, since an inflated pilot chute reduces the performance of a canopy in flight and makes the flare less effective. **A kill-line pilot chute should be considered mandatory on any "elliptical" canopy or any canopy 150 square feet or smaller in size.** Bungee-collapsible pilot chutes have a tendency to hesitate during the deployment and re-inflate in flight, which is why we recommend kill-line pilot chutes.

It's necessary to have a certain amount of slack in the steering lines so you can keep your toggles in your hands when using front risers. If the steering lines are too short, the canopy may "hobble" or "buck" when the front risers are pulled. Like PD's Vengeance and Velocity, the Katana was designed with extra slack in the steering lines to prevent this, but if you allow your steering lines to become twisted they can quickly become too short. You should check your steering lines and remove any twists at least once every day that you jump. If the canopy still "hobbles" when you use front risers, you may need to have the steering lines lengthened by having the toggles attached at a lower position. Even if you don't use front risers it's important to keep twists out of your steering lines and to maintain a proper amount of slack in them.

If you have loops or blocks on your front risers, they should be positioned as high as possible. The block or bottom of the loop should be at least four inches (10cm) higher than the bottom of the toggle when the canopy is at full glide. If placing the loops or blocks this high makes them hard to reach, you probably need shorter risers.

Try not to get your Katana wet, and never feed it after midnight.

What type of jumper will want to fly a Katana?

Some jumpers who have been flying Stiletto's for a while might still prefer that canopy to the Katana, but others will find the Katana is exactly what they have been looking for. The Katana is also an ideal step between the Stiletto and the Velocity, and may be a better choice for some people. The Velocity is a terrific canopy, and its performance exceeds both the Stiletto and Katana in some areas, but it is also more demanding. You may find it easier to develop a "feel" for the Katana, and find that you can become proficient on the Katana in less time than it takes to learn the Velocity's characteristics. Some jumpers who are already flying a Velocity may even prefer the Katana if they want a canopy that is fun to fly, but somewhat less demanding than the Velocity.

As we mentioned in the introduction to this document, the Katana is intended for experienced canopy pilots. Most of the Katana's performance characteristics are specifically tailored for jumpers who make high-speed "swoop" landings using modern high-performance approach techniques. These same performance characteristics tend to make a canopy undesirable for novice jumpers, or those who consider themselves conservative. Even if you have a relatively large number of jumps and have put considerable effort into developing your freefall skills, but not as much effort into developing your canopy skills, we may have other canopies that you will find more suitable than the Katana.

Some of the sport's top canopy competitors, and others who have experience flying a wide variety of canopies, say that you will get the best performance from the canopy that best suits your personal skill level, experience, and style of flying. They will also tell you that it is better to jump a more conservative canopy and fly it to the limits of its performance envelope, rather than flying an aggressive canopy but only using a fraction of its capabilities. This is good advice to remember when deciding if the Katana is right for you.

What size Katana should I jump?

This question is best answered in relation to the canopy you are currently jumping. **If you are happy with the size of your current canopy then there is really no reason to downsize.**

Some jumpers mistakenly believe that it is necessary to downsize when you transition from a certain type of canopy to another. For example, many jumpers believe that if someone was flying an original PD Sabre they should drop down at least one canopy size if they want to jump a Stiletto. Many people believe you need to drop one or two sizes if you transition from a canopy like the Stiletto to a Velocity. In spite of popular opinion, we have never felt it is necessary to do this and in many cases we believe it is a bad idea.

When looking at our canopy sizing charts, you will notice that the maximum recommended weights for the Katana are higher than the weights for a Stiletto of the same size. For example, the maximum recommended weight for an “Advanced” jumper on a **Stiletto 120** is listed as 144 lbs. The same weight is listed for a **Katana 107** in that category. Does this mean a jumper who has been flying a Stiletto 120 *should* jump a Katana 107, and not a Katana 120? Absolutely not. It means that the Katana is capable of landing well with a slightly higher wing loading than the Stiletto is. A jumper with an exit weight of 144 lbs. who wants to fly a 107 square foot canopy will probably find that a Katana 107 lands better than a Stiletto 107. A jumper who likes the speed and responsiveness of the Stiletto 120, but feels that a Stiletto 107 is a little too “hot,” will probably want to stay on a 120 if he or she decides to jump a Katana.

This is how our canopy sizing charts are intended to be used. You need to remember that the weights listed are the **maximum** recommended limits. It is perfectly acceptable to jump a canopy if your weight is below the maximum limit, and there are often many advantages to staying below this limit. After getting caught up in the “smaller is better” mentality that dominated our sport for many years, some jumpers have found they can get much better performance from a canopy that is slightly larger than the one they have been jumping!

You should also remember that the Katana’s light front riser pressure, long recovery arc, and slightly higher rate of descent in full glide make it a somewhat “hotter” canopy than the Stiletto. If you have been flying a canopy like the Stiletto and want something more exciting, you may get everything you want from the Katana without downsizing at all. If you have been flying a slightly tapered canopy like the Sabre2, and are looking for your first “elliptical” canopy, there may not be any good reason for you to downsize and several good reasons why you should not. You need to be especially conservative about canopy sizing if you have been jumping a rectangular canopy like the original Sabre, because the flight characteristics of the Katana will be dramatically different.

The most important thing to remember is that calculating your wing loading or looking at a canopy sizing chart only gives you part of the information you need to make an informed decision. It’s more important to consider the skills you have demonstrated on your current canopy, as well as your experiences with bad spots, congested landing areas, variable winds, and other challenging situations, and decide if those skills and experiences have prepared you to handle a smaller, more advanced canopy.

The best way to decide if a particular size and type of canopy will be right for you is to actually jump that canopy. We encourage you to contact Performance Designs, contact one of our authorized Demo Centers, or visit our web site at www.performancedesigns.com for more information about our canopy demo program.

PD Katana wing load chart											
CANOPY MODEL	AREA (SQ. FT.)	MIN. (Lbs.)	STUDENT (Lbs.)	NOVICE (Lbs.)	INT. (Lbs.)	ADV. (Lbs.)	EXP. (Lbs.)	MAX. (Lbs.)	SPAN (FT.)	CHORD (root/tip) (FT.)	ASPECT RATIO
Katana-083	83	VLC	N/S	N/S	N/S	107 (49)*	142 (65)*	160 (73)*	15.08	5.94/4.04	2.74:1
Katana-089	89	VLC	N/S	N/S	N/S	116 (53)*	155 (70)*	175 (80)*	15.62	6.15/4.19	2.74:1
Katana-097	97	VLC	N/S	N/S	N/S	128 (58)*	171 (78)*	193 (88)*	16.3	6.42/4.37	2.74:1
Katana-107	107	VLC	N/S	N/S	N/S	144 (65)*	192 (87)*	216 (98)*	17.12	6.74/4.59	2.74:1
Katana-120	120	VLC	N/S	N/S	N/S	162 (74)*	216 (98)*	243 (110)*	18.13	7.14/4.86	2.74:1

VLC = Varies with landing conditions N/S = Not Suggested *(KG)
 All weight measures show the Maximum Exit Weight for that category