# Twenty-Five Ways TO BECOME A BETTER CANOPY PILOT

by **Alan Martinez**

Lots of people decide to quit skydiving because of their canopy skills—they're afraid of injury or perhaps just the embarrassment of a bad landing. And statistics show that the most hazardous part of a skydive begins once a jumper is under a fully functioning canopy. But don't let a lack of knowledge or skill keep you from the sport that you love—there are many ways to improve your confidence and safety under canopy. Even the people who win medals and dazzle crowds will tell you that they, too, have room for improvement.

Below is a list of simple things you can do to improve your canopy-flight skills. The list starts with the most basic ideas and gradually becomes more complex. Since some of the canopy drills could be hazardous if performed incorrectly, please consult your local canopy-flight coach or Safety & Training Advisor before you start and prior to attempting anything unfamiliar. Make some hop-and-pops and perform these drills up high before ever attempting them when landing.

## The Big Ones

### 1. Get Video of Your Landings

There's no better way to learn what you're doing (both right and wrong) than to see it from an outside perspective. Ask a buddy, a packer or even a non-jumper to capture three or four of your landings on film.

### 2. Get Canopy Coaching

Talk to your local instructors and canopy pilots or take a trip to a DZ that has experienced canopy pilots available to assist with your canopy progression. You don't need the world's best canopy pilot—what you want to look for is the world's best canopy *coach*. Talk to the locals and see who's really good at canopy coaching and go from there. Having video of your previous landings will help your coach know where to start. The money you spend on coaching from a professional will pay off tenfold.

### 3. Stay Current

Lack of currency may be one of the biggest culprits when it comes to canopy-related injuries and deaths. Whether you feel nervous after a five-month hiatus or not, the fact is that you're not as well-equipped as you were when you were current to deal with the innumerable situations that you may encounter. Jump often, and when you come back from a long break, dial it back a notch or two.

## The Basics

### 4. Practice Your PLFs

Unless you're an active coach or instructor or have recently attended military jump school, you probably haven't performed a parachute landing fall (PLF) in some time. But inevitably, there will come a time when you'll go for a roll in the dirt. There are lots of skydivers who attribute their survival of bad landings to their PLF abilities. Sitting there with a broken arm or tibia isn't the time to wish you had practiced your PLFs. You can practice them on your own on the ground, and you may even want to progress to practicing them on jumps.

A PLF is performed by keeping your hands down in front of your hips while flaring the canopy for landing, arms to the sides, and feet and knees together with knees slightly bent just before landing. Keep your chin down toward your chest. As your feet touch the ground, lean to one side or the other to roll down one side of your body. Contact should be made with the feet first, then the calf, thigh and hip of the same side of your body. Continue to roll onto your side and then, finally, diagonally across your back. Continue to roll as necessary to absorb the energy of the landing. If done correctly, a PLF will not hurt, and the practice may just save you a trip to the emergency room.

### 5. Toggle Stalls

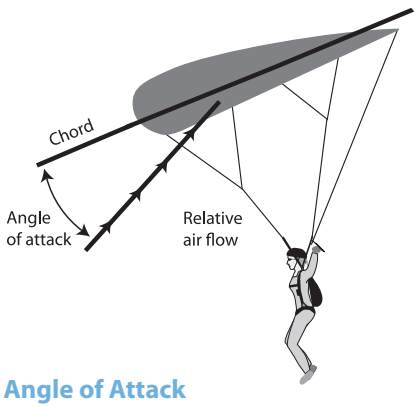
Before you learn how quickly your canopy can fly, you must learn how slowly your canopy can fly. Many people are uncomfortable flying their canopies in deep brakes because the canopy may stall, dropping the jumper back into pseudo-freefall. However, you should learn how much toggle input you can give before your canopy will stall. If you can't get your canopy to stall by using your toggles, throw on some gloves and wrap your brake lines around your hands. Sure, it'll be scary, but figuring out how slowly you can fly your canopy is a very educational experience. Check with the manufacturer about the stall characteristics of your canopy before performing this and the following drill. Stall drills should be performed up high, at an absolute minimum of 2,500 feet.

NIKLAS DANIEL

Toggle stall

## 6. Rear-Riser Stalls

This exercise is similar to performing toggle stalls, but now you'll be using your rear risers. Toggle lines (brake lines) are attached to the trailing edge of the canopy and actually pull down the tail until it begins to change the angle of attack (the relationship between the chord angle of the wing versus the angle of the relative wind). In contrast to a toggle stall, the rear-riser inputs will maintain the same shape of the wing until the angle of attack is reduced to the stall point. Again, you're really trying to learn the "feel" of the canopy before and during a stall—the look, the sound, the responsiveness that your canopy has compared to full flight. Perform above 2,500 feet. (Some people may not have the strength to perform this exercise, particularly if they are flying very large, lightly loaded canopies.)



Angle of Attack

## 7. The Sweet-Spot Drill

Every modern sport canopy has what the industry refers to as the "sweet spot," the point of toggle pressure at which the canopy levels out, stops descending and converts the perfect amount of forward speed to a matching amount of lift. The sweet spot will be different for each canopy and for different wing loadings of the same canopy. This spot will also change depending on the speed of the canopy. Start by finding this spot while the canopy is flying in natural, full flight without any additional speed induced with a turn or front-riser input. There are three different ways to find the sweet spot, and to be most precise, you should try them all.


NIKLAS DANIEL

The "Sweet Spot"

To use the first method, look at the horizon while applying steady toggle pressure. When the horizon appears to stop coming at you (or if you no longer feel you are moving toward it), this is the sweet spot.

The second method analyzes how far you pendulum forward while applying brakes. At full flight, your body will hang toward the back of the canopy, somewhere between the C and D lines. As you are applying toggle pressure, the point at which you are hanging between your A and B lines is the sweet spot.

The final method, which you should try only if you have plenty of altitude and clear airspace, is to close your eyes and feel the canopy stop its descent as you apply toggle pressure. This is the scariest but most efficient way to discover the sweet spot.

All three of these drills should require the same amount of toggle pressure. Once you've determined where the sweet spot is, look at where your hands are for future reference. The better you know this spot, the more secrets of canopy flight you can unlock.

## 8. Rear-Riser Turns

Jumpers are required to perform rear-riser turns before receiving an A license, but many forget about them as soon as that item on their card is signed. One reason jumpers are taught rear-riser turns is that they are the most efficient way to avoid an impending canopy collision immediately after opening.

Pulling on either of the rear risers when the brakes are stowed has a powerful impact, since the brakes are already pulling down on the tail of the canopy. In contrast, pulling on a rear riser once the brakes are released spills air off of the opposite side of the canopy while slightly bending or bowing it. Some jumpers call this a "fishtail" turn.

Practice making rear-riser turns with your toggles stowed and with your toggles released until you know the amount of input you'll need for a 90-degree turn using each method. Attempt to achieve a response with the minimum amount of input. Once you feel really comfortable, practice flying your pattern using only your rear risers, using as little input as possible. You may find that you need to lower your pattern altitudes because you'll be losing less altitude during your turns—or simply lengthen the legs of your pattern and keep the altitudes the same.

## 9. Harness Turns

Every high-performance canopy pilot knows about and uses harness inputs to make turns, but most other jumpers rarely do this intentionally. However, you'll find that as your canopy's size decreases and your wing loading increases, your canopy will become more and more sensitive to harness inputs, intentional or not. Fully articulated harnesses and elliptical canopies further intensify this effect.

NIKLAS DANIEL

Harness Turn


NIKLAS DANIEL

Braked Turn

Practice using your harness for 90-degree turns just as you did with your rear risers—try to use the minimum amount of input possible. Once you've dialed it in, try flying your landing pattern using only harness input. Then think about how different that feels from using toggles and different still from using rear risers.

Harness input produces very smooth and balanced turns, much more so than toggle turns. Your weight remains centered under the wing throughout the turn, and the wing does not distort as it does when a toggle or riser pulls at one area of the canopy. Figure out which of these maneuvers and combinations of maneuvers will yield the most efficient turns with the least input and minimal loss of altitude.

Keep in mind that harness turns will increase the amount of altitude a canopy loses the longer it is in a dive. For example, without adding any extra input, the second 90-degree portion of a 180-degree turn will be faster and steeper than the first 90-degree portion. Jumpers should start by practicing turns of less than 90 degrees and proceed very carefully from there.

### 10. Braked Turns

Braked turns allow you to change direction without losing much altitude. There may be times when this technique is more useful than using your harness, rear risers or toggles alone. First, find the sweet spot and limit your descent rate. Then, while you are in braked flight, use more toggle on one side, less toggle on the other or a combination of both to make your turn. Once you've finished your turn, slowly return to full flight. Changing your direction during a braked turn takes more time than performing a regular toggle turn, and the turn rate and descent rate will be slower—keep this in mind if you plan to use a braked turn to avoid an obstacle. Of course, the more altitude you have and the more aware you are, the more options you'll have at your disposal. Always plan ahead to be sure you have enough space and altitude to allow any maneuver you are using to work properly.

## Get on Target

### 11. Braked Approaches

This is a skill you should be somewhat familiar with if you've completed the student program during the past decade, since it is included on the A-license proficiency card. A braked approach means that you'll fly all or some of your landing pattern in brakes. Putting your canopy in brakes changes its glide path—if you are going into the wind, this will allow you to "sink in" a landing, since using brakes will decrease the canopy's forward speed but leave its descent rate near constant. Since you've already performed the toggle-induced stall drill, you should know how to keep your canopy from stalling and should have a good idea of what your control range is.

Start this drill by flying in 20- to 25-percent brakes during your regular pattern, keeping the same pattern altitudes, lengths and reference points. On your downwind leg, you'll notice that you cover more ground and lose less altitude than you would in full flight. Conversely, you'll cover less ground and have less forward speed when flying into the wind on your final approach leg than you would in full flight. The wind speed and amount of brakes you apply can create a wide range of glide paths, so get lots of practice in varying conditions.

As you approach your landing, slowly return to full flight. Leave plenty of time for the canopy to return to normal speed; shoot for eight to 10 seconds of normal flight before touching down. Soon, you'll be able to accurately predict where you'll be landing, even when flying in brakes. As you become more comfortable, reduce your target area or try flying in even deeper brakes (you'll probably want to use less than 50-percent brakes for safety's sake). The greater the amount of brake input you use, the more your canopy will surge when you release them, and you must be ready to respond quickly and correctly. Work on these skills gradually over dozens of skydives, remembering to keep a safe eight- to 10-second window for canopy surge before your landing flare.

### 12. Braked Landings

This skill, combined with the braked approach, will really help you on the day that you're flying your reserve into the middle of someone's backyard.

When practicing a braked landing, apply about 20- to 25-percent brakes as you turn onto final and hold it. You'll need to adjust your flare altitude and speed as you prepare for landing. As your canopy flies more slowly, it will respond as if it is a larger, less-responsive canopy, so if you're flying in 20-percent brakes, flare about 20-percent higher and about 20-percent harder. (Those numbers will become less and less reliable as you increase the amount of brake input you are giving the canopy.) Your flare will have a little bit more of a "stab" look to it. Make sure you have gotten the feel for this maneuver many times up high before trying it near the ground, but be aware that without a ground reference it may be difficult to visualize how the braked approach and flare will work during an actual landing. Start conservatively, and be prepared to PLF.

NIKLAS DANIEL

Coordinated Turn

### 13. Accuracy

An entire book could be written on the subject of canopy accuracy, so here are just a few of the top pointers to consider. First of all, if you want to improve your accuracy, develop a system. In the same wind conditions, flying the same canopy, fly the same pattern and see where you land. If you are off, adjust your pattern accordingly. Don't change the altitudes of your pattern—change your entry point and move the entire pattern. Some of this just takes time and practice as you truly begin to understand how your canopy acts in different wind conditions—strong winds, light winds, headwinds and tailwinds.

Another technique—one that can be very helpful when returning to the DZ from a long spot—is to look at a fixed point on the landscape ahead of you when you are on your final leg. There is always a part of the landscape that looks as if it is getting farther away from you and another that appears to be getting closer. There is also a point right in between that doesn't appear to move at all—that's where you're going to land if you don't do anything to adjust your glide path. If you have a long plane-out after your flare, adjust your toggles or risers, or swoop, then you'll be landing beyond that point. This technique can help you identify a landing hazard, and you can then use your other skills to land short, long or off-angle from it.

### 14. Handling Long Spots

Just about anyone with more than a dozen jumps has experienced a long spot. The best course of action may depend on what the winds are doing and your knowledge of your canopy. Sometimes a particular canopy at a particular wing loading will cover more ground if its pilot applies a small amount of brake input, while others will cover more ground with rear-riser input, and some will perform best when left in full flight. To further complicate the issue, the direction the wind is blowing—whether it is at your back or at your front—can make a big difference in the way your canopy performs. To find how your canopy performs best, fly it in various configurations in various conditions. Pay specific attention to how much ground your canopy covers given the variables.

### 15. Coordinated Turns

A coordinated turn—using your body weight to lean in the harness as you look in the direction of flight, rotating your hips and torso in the direction of the turn while applying toggle input—produces smooth and balanced movements. There are more than just safety reasons for looking in the direction of your turn—it also helps you focus your visual and physical attention to where you plan to move. While it may not seem like an accuracy skill, you will be surprised to notice how much effect it can have.

To make a coordinated turn, line up your head, shoulders and hips and lean in the harness, lining up the geometry of your rig to put as much weight on the correct side of the canopy before and during your toggle or riser input. This sort of coordination will give you maximum-performance turns and becomes increasingly important as you fly smaller and more responsive canopies. You may want to use a harness and container system with variable geometry (i.e., hip and chest rings) to help you emphasize your turns and improve your overall canopy flight.

Once you've opened, performed a controllability check and established where you are under canopy, you may want to loosen your chest strap, which will allow your risers to spread apart and the canopy to flatten out. A canopy flies better when it resembles more of a wing than the bowed shape caused by the tension of a tight chest strap. You may also want to collapse and stow your slider. Collapsing the slider reduces drag and allows you to see your canopy better, and stowing the slider helps the risers widen out and the canopy flatten.

## Small Steps

As always, discuss any new drills with an instructor or canopy coach before trying them in the air. Perform the drills in the following section only after you are able to land consistently well into the wind. If you find yourself in trouble—for example, heading for an obstacle or flying too quickly—remember to finish flying through your landing. Although you may not stand it up with precision and poise, always finish your flare and be prepared to PLF.

### 16. Land Crosswind

Don't get yourself banned from the DZ for landing perpendicular to every other jumper; rather, make a hop-and-pop or high pull, and let the other jumpers on your load know that you're going to intentionally land crosswind. Start off just slightly crosswind, only 30 to 45 degrees off the wind line. This landing requires you to flare almost normally but with more steady pressure on the side of the canopy that is toward the wind. You may also want to lean to that side slightly in your harness.

On crosswind landings, you should still be flying parallel to the ground but compensating for the wind pushing you at an angle. You're looking for the minimum amount of input necessary to fly straight and hold against the crosswind. Any less than the correct amount and you'll get pushed with the wind; any more and you'll be turning during your flare. Keep the wing level and over your head as much as possible. The more of these you do, the more you'll enjoy them. Initially, perform these exercises in light winds and work toward jumping in 10- to 12-mph crosswinds only once you've gained proficiency at lower wind speeds.

### 17. Land on a Slight Uphill or Downhill Slope

Even if your DZ is uniformly flat, someday it is likely that you'll have to land on a slope. If you practice your landings only on flat, even ground, then you'll never improve your techniques for the day you

land off at some boogie. Look for a slight uphill or downhill challenge, and as you flare, adjust your control input to land smoothly with the changing elevation. If you are landing on up-sloping terrain, you will need to flare with more input and possibly more quickly to make the canopy gain a slight amount of lift so your flight path will match the rising terrain. If you are landing on down-sloping terrain, you will need to flare with less initial input and most likely more slowly to allow the canopy flight path to continue to descend while trying to match the downward slope.

### 18. Land Downwind

This is another exercise you should perform on a separate pass and announce to the other jumpers on your load prior to attempting. Because landing downwind requires you to fly an opposite landing pattern from jumpers landing into the wind, it's critical that you perform this drill without other canopy traffic in the air with you.

Start off trying no-wind landings and slowly progress to making 4- or 5-mph downwind landings as you get better at flying your canopy. Because you'll be traveling across the ground more quickly and for a longer horizontal distance, you may need to flare more gradually so that you don't use up all your lift right away. As you slow down, make sure to flare all the way to arm's length and continue to fly your canopy until you come to a stop. Keep your feet off the ground as long as possible. Depending on your speed when you put your feet down, you may need to run out the remainder of the landing or slide to a stop. Since there is a greater chance of injury with downwind landings, proceed with extreme caution and be prepared to PLF if necessary.

Downwind landings can be scary, but this skill can come in handy on days with light and variable winds or in an off-landing situation where landing downwind is preferable to making a low turn to avoid an obstacle.

### 19. Flare-Turns

You should use flare-turns for those less-than-ideal situations when you need to avoid a dangerous obstacle (such as a gopher hole or another jumper) while flaring. It could mean the difference between having broken bones and walking away safely from a close call. Flare-turns are just what they sound like—turning the canopy during a landing flare—and are somewhat similar to flat turns. To make a flare-turn, line up your final approach into the wind, and as you begin to flare the canopy for landing, add slight additional input to one toggle to change your heading. This requires some finesse and is best practiced under the guidance of an experienced canopy coach.

Start off by flare-turning five to 10 degrees, and work your way up until you can safely make a 45-degree flare-turn. If you are too aggressive with this maneuver, you'll find yourself crashing and rolling; progress slowly, and you'll have a handy skill in your pocket. This is a skill that is essential to practice up high before attempting it anywhere near the ground. And remember to apply previously learned skills such as harness inputs to maximize your efficiency.

## Proceed With Caution!

Transitioning to more complex turns and control inputs, such as using a combination of front and rear risers while transitioning to toggles, requires coaching and practice. Make sure you receive training for any new maneuver and practice new skills in a clear area above 2,500 feet. Audible and visual digital-display altimeters can help you learn how much altitude you lose with a particular type of maneuver. Remember that you must always keep your toggles firmly in your hands when flying your canopy, especially when performing riser maneuvers.

High-performance maneuvers require riser inputs—not toggle inputs. Yanking on a toggle is not the way to initiate a high-performance dive. Although it may seem counterintuitive, a front- or rear-riser maneuver can actually be safer and more controllable than a toggle turn. Using toggles creates more drag on one side of the canopy and allows the opposite side to "out-fly" the braked side while the braked side loses its speed and therefore its maneuverability. This is known as differential braking.

The single most important factor in a canopy's maneuverability and flare power is the canopy's airspeed. A riser maneuver increases the canopy's airspeed and therefore increases its maneuverability. Every part of your canopy continues to fly during a riser maneuver, while a toggle turn leaves a window of time in which the canopy is not as responsive. (For example, if you quickly pull down a toggle and then try to fly the canopy in the opposite direction, the canopy may respond sluggishly or go into line twists. But if you attempt the same maneuver using front risers only or front risers followed by toggles, you'll still retain control of the canopy's heading and angle of attack.)

### 20. Land With Rear Risers

Landing without the use of toggles might seem daunting, but it is a practical skill that could come in handy. Since the canopy has the potential to stall more abruptly when flaring with just the rear risers, you should attempt it up high numerous times before trying to land this way. While it is possible to land many canopies by flaring with the rear risers, there is a higher-than-normal risk of injury if you perform it incorrectly. Ask an experienced canopy coach for advice, based on your skill level and canopy choice, as to whether you should perform this maneuver to land or should simply practice it up high. Remember that as your wing loading increases, so does the stall speed of your canopy. The higher the wing loading, the faster you will be moving when the wing finally stalls and drops you on the ground.

During this (and any) maneuver, be sure to keep your toggles in your hands, since you may need to quickly decide to use them to flare. Your brake lines should be long enough so that you can keep your toggles in your hands without deforming the wing or impeding your ability to perform any maneuver. Letting go of your toggles is a recipe for disaster.

Flaring with your toggles pulls down the back half of your canopy and changes its angle of attack; flaring with your rear risers changes

ORI KUPER

**Landing With Rear Risers**

the angle of attack without changing the shape of the wing. The range of motion of your rear risers is much smaller, and they will be much more sensitive to input than your toggles. Your canopy will also not slow down as quickly as it would if you were using your toggles. In other words, these landings will be faster, and you should initially attempt them on a day with about a 7- to 10-mph wind.

You can apply rear-riser input either by pushing outward on your rear risers or simply by pulling them downward. As your forward speed diminishes, you will need to gradually add more rear-riser input to change your canopy's angle of attack for landing.

### 21. Low-Turn Recovery

This drill teaches how to stop an aggressive dive, a critical skill to master prior to starting to make aggressive turns. This drill, which should be performed up high, is a continuation of a drill from the A-license proficiency card: "Perform a maximum-performance 90-degree toggle turn, followed immediately by a turn of at least 180 degrees in the opposite direction." This maneuver appears on the A-license cards so that students learn the limits of a hard turn, and it teaches avoidance of line twists at low altitudes. However, more experienced jumpers can perform the same drill to learn how to stop a radical turn, whether induced with toggles or risers.

To practice low-turn recovery, with plenty of altitude and space around you, place yourself into a hard toggle-induced 90-degree turn. Apply the opposite toggle at mid-turn, and then apply additional pressure to both toggles. In other words, pull down one toggle, match the other toggle to it, and then "punch" both toggles equally, stopping the turn and minimizing altitude loss. Try this several times with lots of space around you and altitude beneath you. You'll know you're doing it right by feeling the strain from your leg straps pulling up on you.

**Jumpers should consider making induced-speed landings only after receiving instruction and practicing extensively under the supervision of a trained canopy coach. Though canopy-flight education lowers the level of danger involved, the risk of injury or death still increases significantly when jumpers perform high-performance landings. Though some jumpers may wish to learn how to perform these types of landings, there is no requirement for any skydiver to do so.**

### 22. Arresting a Dive

This drill teaches recovery from front-riser maneuvers, since the speed induced by front-riser maneuvers can be hazardous, particularly when performed near the ground. You must learn to stop a front-riser dive before you ever consider using a front-riser maneuver to land. Also, remember that you should never, ever "whip" a toggle close to the ground, as you will only lose control of the canopy and risk serious injury or death.

To make sure you can recover from a poorly executed riser maneuver, try this drill at altitude with lots and lots of space around you: Induce a front-riser turn and arrest that turn with both toggles. Applying toggle input will pull your canopy out of the dive almost immediately. After you feel comfortable, continue the drill by experimenting with applying more of the toggle from the same side and from the opposite side of the front-riser dive. You will likely find that using your toggles appropriately will allow you to control both how quickly you come out of the dive and your heading. This maneuver may save your life if you ever initiate a turn too low and need to immediately stop it and get your wing level.

Though using rear risers can help you turn, flare or optimize a high-performance turn, it is not a safe or effective way to arrest a dive.

### 23. Double-Front-Riser Approach

The safest way to learn to land with front-riser input is by using both front risers. Since single-front-riser maneuvers accelerate you toward the earth by changing your canopy's pitch, it can be tough to adapt to the changing sight picture and the increased speed. Most skydivers are accustomed to looking over their shoulders to turn onto base and final during their patterns, but the radical increase in both vertical and horizontal speed can be disorienting.

A good way to add just a single new element—speed—into that scenario is by using both front risers. Using riser input for final approach feels very different to a jumper who has flown only with toggles. It requires plenty of practice to become proficient with using risers as a control input. Remember to keep your toggles firmly in hand as you perform these maneuvers. Start with very small inputs and build up from there. These maneuvers require patience and lots of practice.

First, try flying using double front risers above 2,500 feet. You'll be able to feel the amount of pressure it takes, as well as how long the canopy will hold its position before the front-riser pressure increases and the risers pull out of your hands. You should practice this maneuver repeatedly, using an altimeter to determine the amount of altitude you lose during each front-riser dive before trying it for landing.

For landing, pull down both front risers 3 to 5 inches for three to five seconds between 300 and 400 feet above the ground, and then gently let the risers back up to full flight. You may or may not feel the speed your canopy has gained, and you may even feel the canopy lose that speed and return to its normal flight. If your canopy still has the added speed when it is time to flare, you'll notice a more powerful and responsive flare.

As you progress, stick to the 3- to 5-inches and three- to five-seconds rule. Pulling down the front risers too much will not help your

NIKLAS DANIEL

**Double-Front-Riser Approach**

canopy go any more quickly; you'll only deform the canopy and make it less aerodynamic. And you probably won't be able to hold it more than three to five seconds, because your canopy will generate too much speed and will recover from the dive on its own (known as the canopy's natural recovery arc). After lots and lots of practice, you can begin to adjust the altitude at which you pull down on the front risers, but always remember to leave your canopy at least a few seconds of normal flight (i.e., don't pull on the risers for a few seconds) before landing. If you attempt to land while still applying front-riser pressure, you are likely to sustain massive injuries.

### 24. 90-Degree Front-Riser Maneuvers

Jumpers who are considering learning to perform front-riser maneuvers to land should have made a bare minimum of 200 jumps specifically devoted to canopy-control drills and must know how to arrest a dive properly before proceeding. In addition, jumpers must consult with their local instructors and Safety & Training Advisors for advice particular to their circumstances. Regardless of a jumper's experience level, he should perform these maneuvers near the ground only when using a canopy with which he is familiar, at a drop zone he knows well, in conditions with which he feels comfortable and when he is current.

As you begin, practice 90-degree front-riser turns at altitudes above 2,500 feet and clear of other jumpers. You'll discover that the canopy's natural recovery arc is much more noticeable with single-front-riser maneuvers than with double-front-riser maneuvers. If you find that you are unable to hold the riser down long enough for a 90-degree turn, use your toggles to brake the canopy first and then pull down the riser—you'll find that the canopy will stay in that dive longer (i.e., lose more altitude) and gain more speed. Remember to consult your altimeter frequently to assess how much altitude you lose with each maneuver.

As you start to learn how to use a 90-degree front-riser turn to land, fly into your pattern early. Turn onto final 100 to 200 feet higher than normal by gently pulling one riser down 3 to 5 inches. Remember to keep your toggles in your hands as you do so. You will gain speed and lose more altitude than if you had used a toggle to turn, because your canopy is flying more efficiently. Once you release the riser, the airspeed will quickly begin to bleed off, and your canopy will return to its normal airspeed a few seconds after you have let off the riser. If there is any residual speed when you land, your flare will be more powerful and more responsive. If you decide to lower the altitude at which you turn, do so incrementally and gently, and always make sure that your canopy has time to recover completely from the dive.

### 25. No-Contact Canopy Relative Work

Jumpers should perform this drill outside of the DZ's pattern area and well above 2,500 feet. Novices should fly with a much more experienced partner who is flying a similar wing at a similar wing loading.

Begin your no-contact canopy relative work by exiting at full altitude and deploying high, perhaps even right after clearing the plane. One person then flies base while the other tries to stay close and on level. The person flying base should then gently turn, apply toggles or make riser and harness inputs so that the person chasing has to use all of his canopy's control inputs to continue to fly relative. You'll become much more aware of how your canopy flies.

Set breakoff altitudes at which you will no longer attempt to fly near each other. The Skydiver's Information Manual Section 6-6, Canopy Formations, recommends that jumpers not initiate docks below 2,500 feet, and that's probably a good altitude to use for no-contact jumps, as well. It is absolutely critical that you plan a dive and then dive that plan—stick to either flying base or chaser on any given jump, and under no circumstances fly directly at one another. Keep in mind that the higher your wing loading, the more forward speed you will have and the more quickly you will close distances; keep your eye on the drop zone and mind your altitude so you don't have an off-landing.

You do not need to bump end cells, hook your feet in the lines of the other canopy or walk on someone's top skin to get the most out of this exercise. Simply do this drill several times with the same person, and try to refine how cleanly and smoothly you can control your canopy relative to him. This type of canopy relative work is one of the most challenging and beneficial things you will ever try in the sky.

## Moving Forward

These drills are intended to be both fun and challenging as you progress and learn more about how your canopy flies. Be sure to seek out a knowledgeable canopy coach. Practice each new maneuver up high until it is smooth and you are proficient before trying it close to the ground or progressing to other drills. If you feel uncomfortable with a drill at altitude or if an experienced local jumper advises you not to attempt a particular drill near the ground, take the safe route.

Most people manifest for a load with a goal for the freefall portion of a skydive but not for the canopy flight. If you plan for both the freefall and canopy portions of every skydive, you will find yourself becoming a much more talented and skilled skydiver than before. Be deliberate in your progression, and don't be afraid to try new things!

**About the Author**

*AFF Instructor and Coach Examiner Alan Martinez, D-29572, freely admits that he's not the world's best canopy pilot. However, he is always working to improve his skills and would like to help others improve theirs, too. He has made approximately 1,400 skydives and divides his time between Mile-Hi Skydiving Center in Longmont, Colorado, and the nearby SkyVenture Colorado wind tunnel.*

ORI KUPER