



Know your canopy

In this essay we present you with some recommendations, in order to assist you in learning more about your canopy, and how to use it in a better way, so that you can become a safer pilot. The subjects we will deal with include:

- Opening
- The canopy flies but has line twists
- Canopy flight
- Principle of flight
- Steering toggle inputs
- Typical brake positions
- Put the wing performance to good use
- The influence of air masses
- Landing
- Special situations

Opening

The deployment of your canopy is an anticipated action. Before we discuss any additional concerns regarding deployment, we would remind all readers that no considerations should take priority over the primary concerns of ensuring deployment of your canopy at a safe altitude. All other considerations should be considered secondary to this requirement.

It is wise to adopt good habits and plan your actions before deployment. The preparation in freefall: The first question one should ask is: "Where are the others?" (That is when you exited with more jumpers on the same pass). The more time in freefall, the more important it becomes to know your position relative to others. The second question to ask is "What is my altitude?" and "What is my position and distance from the landing target?" If these checks become a habit after a number of jumps, they will take only a couple of seconds and you will be more at ease since you have all the information at hand. "I have located the other skydivers who exited on the same pass, and I know where I am, relative to my landing area."

Action: Prior to deploying my pilot chute, I orient myself in a belly to earth position and decelerate as much as possible. After checking my surrounding airspace, I then grab my hand deploy handle and I deploy the pilot chute. As the bag and lines lift from your back it is recommended that you keep your body as symmetrical as possible and that you keep it horizontal with your shoulders and hips leveled. As soon as it comes in view, monitor the deployment of the

canopy overhead. The benefit of watching the opening is that you will gain a few seconds and be ready to check: Is my canopy flying?

If the canopy is not flying: Immediately commence your emergency procedure while checking for sufficient altitude, in accordance with the training you have received.

My canopy flies but it has line twists: If you have checked your altitude and it is sufficient, you have some time to deal with it. Leave the toggles on their brake setting for the time being. If you would release the brakes at this point, you might inadvertently release one brake on the wrong side and only make the twists worse. Wait for the twists to come out. There are various techniques for accelerating the untwisting of the lines, consult your local instructional staff. You are not in a comfortable position, but there is nothing you can do about it. It can happen even to the most experienced jumpers. Generally line twists will undo themselves, as long as it is not more than 3 or 4 turns. With more turns it becomes more difficult, especially on smaller canopies (below 150 sqft). Should this be the case and you are unable to undo the twists, check for sufficient altitude and commence your emergency procedures.

Line twists can be caused by:

- The last line stow being too close to the risers.
- A line stow in a double rubber band, which will retain the bag momentarily and induce a twist.
- A premature brake release on one side. This can potentially cause a dangerous situation, since the canopy will be turning which makes it very difficult to untwist the lines.
- The bag is retained by one of the container flaps.
- A riser and/or link catches the corner of the reserve container imparting a spin to the bag.
- A poor (asymmetrical) body position during deployment, for example one shoulder much lower than the other.
- The airflow around certain types of jumpsuits, causing extreme turbulence over your back.

The canopy is open and flies OK Visually check around you to immediately assess your position relative to others. This is a principle of safety for all involved. Once you have located the other canopies, grab your toggles firmly, by slipping your hands into them*.

*Many serious accidents have resulted from the jumper losing one or both steering toggles, especially if it occurred during landing and the jumper was unable to execute a proper flare. This is often caused by gloves. That is why we recommend slipping your fingers completely into steering toggle, to ensure that you don't lose a grip on them.

Once you have firmly grasped the steering toggles pull them to release the brakes, and while you let the toggles come up progressively the canopy will accelerate to its maximum speed.

Before we speak more about utilizing the performance of the canopy in order to land at the selected point, we will review a few essential subjects you should know in order to control the canopy and to understand its flight characteristics.

Note: The maneuvers suggested here (below) must be executed from an altitude of 4000 or 5000 ft. (minimum) and must cease at or above 1500 ft (500m). Also we recommend that you dedicate the entire jump to these exercises, and that you get in the air either alone or far away from other jumpers in order to prevent a collision.

Canopy flight:

A correctly rigged canopy will have slack in the steering lines requiring a short pull on the steering line before affecting the trailing edge.

Principle of flight:

A ramair parachute is a wing similar to the wing of an aircraft. It only obtains its rigidity through its airspeed, which compresses the air inside the cells (ram-air) and gives the wing its inflated shape. The steering lines are attached to the trailing edge at the rear of the canopy wing.

Steering toggle input:

Any pull on the steering lines will change the shape of the trailing edge, decrease the volume of the cell and push out some air, thereby decreasing the pressure inside. A pull on the left hand steering line will make the canopy turn left, and vice versa. The canopy turns because of the aerodynamic drag caused by the trailing edge on one side.

A slow and simultaneous pull on both steering lines will firstly decrease the forward speed and push the air from the cells. At the point, when the airspeed becomes very slow and the pressure inside the cells has also greatly decreased, the canopy will no longer generate enough lift to continue flying. Beyond this "stall point" the canopy no longer flies and the air will continue to spill.

When we continue to pull the steering lines beyond the stall point and keep them there, the canopy may start to "fly backwards". However, the canopy is no longer a wing, but little more than a piece of fabric. Vertical speed has increased significantly, and the slider may want to move up the lines. In some cases, the slider may come up even halfway the suspension lines.

By letting the toggles up slowly you will notice the exact point where the air inlets "catch" the airflow again. The canopy will now start to fly forward again,

generating lift, and picking up speed so that the cells are again well pressurized.

These maneuvers should be executed with calm and taking sufficient time so that you can carefully observe what is happening.

Note: Complete stalls with highly wing loaded or highly elliptical canopies can result in an unrecoverable situation and should be avoided!!!

Typical brake positions

Toggles up: Maximum forward speed

Toggles just below the shoulders: 50% brakes

Toggles just above the stall point: 90% brakes

Toggles at stall point: 100% brakes.

These brake positions will vary with canopy wing loading and size as well as pilot's body dimensions. These are only general guide lines and the actual toggle position required for your canopy must be determined on an individual basis.

There are other methods to maneuver the canopy. You can pull on the front risers which will increase the forward speed and cause a step diving turn resulting in **rapid altitude loss**. This maneuver should only be executed with care, and with sufficient altitude (not close to the ground), and without releasing the steering toggles at any point.

Put the wing performance to good use

Depending on where you opened over ground, you can use the forward speed and glide ratio of the canopy to reach the desired landing point. A combination of piloting techniques and flight line selection, based upon the prevailing conditions are often required to reach the desired landing area. Remember, you must reach the landing area with sufficient altitude remaining to execute a safe landing. If in doubt, select an alternate landing area as early in your flight as possible.

Maximum performance:

When facing into the wind (headwind), or when the wind is across your flight line (crosswind) you will typically cover more distance over the ground by choosing the best course and maintaining full glide (toggles all the way up) In some severe case (headwind) a small amount of front riser input (1") may even help.

In situations where you need to cover a lot of ground in order to reach the landing point and you have the wind at your back (tailwind), utilizing a slight brake setting often results in maximum distance covered. This position will increase the lift and reduce your vertical speed.

The influence of the air mass

Train yourself to assess your situation as soon as you verify your canopy's complete deployment. Determine wind direction, check your speed over the ground for each direction you take, and verify your assessment with the help of wind socks, flags or smoke trails on the ground. Remember upper wind direction may be different than ground wind direction.

Landing:

By visualizing the flight path you should follow in order to arrive on final approach to the selected landing area facing into the wind, plan for your landing as soon as your canopy is open. When you have prepared for landing shortly after the opening, you will have more time to watch other jumpers (traffic) during the descent, correct your approach as necessary, and set up for the final approach

Note: On a dropzone there are often more jumpers in the air simultaneously, and the landing target becomes the place where all flight paths converge, as everybody wants to land close to the target. This is a contributing factor in many canopy collisions.

Separation is obtained in a natural way through varied opening altitudes, causing jumpers to commence their landings subsequently (in sequence). But by being alert the participating jumpers also plan for more separation. Generally at bigger dropzones with a multi-plane operation and many skydivers in the air at one point, the management has set a standard landing pattern. Always attempt to follow such patterns while watching out for other jumpers.

When jumping at your home dropzone, you are familiar with the reference points and the landing procedures. When visiting a dropzone or jumping at a place for the first time, be sure to obtain information about landing patterns and any special procedures. Study an aerial photo of the dropzone (if available) and its surroundings in order to familiarize yourself with reference points.

In order to make a good, safe landing you need to know:

- wind direction
- the landing area
- location of the wind sock, tube, flags or other wind indicators.

Landing pattern:

Once on the downwind leg, check the current situation at the landing area: wind direction, presence of other jumpers and your position relative to the target.

On base leg (generally crosswind) determine at which altitude you will turn into the wind.

Normally the final approach is made into the wind with the toggles up, while you keep looking out in front and on the sides to verify that you are the only canopy on this track.

Keep your canopy facing straight into the wind, and carefully make small adjustments as necessary should the canopy show a tendency to turn away. At your pre-determined height commence the landing flare by pulling the toggles smoothly and at a speed that creates the desired pitch change of the canopy. Continue this smooth movement of the toggles, further decreasing forward speed. Your goal is to achieve a zero rate of descent and minimum forward speed at the same time your feet are at ground level.

If executed perfectly, the flare will stop most horizontal speed and all vertical descent with your feet at ground level.

Special situations:

Your slider remains up the lines:

Solution: Brake the canopy by pulling symmetrically on the steering lines. The slider will come down gently. Slowly let the toggles come up.

Collapsible slider:

After opening, and once you are clear from any traffic, it is recommended that you collapse the slider before releasing the brakes. There-after you can grab the toggles and release the brakes.

Landings in adverse conditions:

You find yourself flying downwind at an altitude too low to initiate a turn into the wind, and you realize you made a mistake in choosing the landing direction.

Solution: Above all, ***do not make a low turn***. Continue to fly on the present heading and make a normal landing flare. Keep your legs together and prepare for a landing roll (PLF). Contact with the ground may be less than comfortable, but it is not as dangerous as attempting a low turn (unintentional hook turn).

Turns close to the ground are dangerous and have caused many serious injuries and deaths.

You are on final approach and you observe another canopy on a collision course.

Solution: Watch the ground as well as the canopy. Steer your canopy to avoid the other using smooth, minimal control inputs. Return to your original heading if altitude permits. If you are too low after clearing the other canopy to accomplish this, continue to fly on your present heading and execute a normal landing flare.

Last turn before landing

This practice, which came into life with the advent of faster, more efficient canopies, has resulted in numerous fatalities while leaving a number of skydivers seriously handicapped for the rest of their lives. Even though these low turns are prohibited at many dropzones, we know that prohibition will not prevent the accidents that may occur.

Often we observe jumpers execute 180° or greater turns prior to landing. We feel this can be a very dangerous practice, as the jumper can lose visual contact with the ground and other jumpers.

Others make an aggressive or fast turn utilizing their toggles, thinking that a more aggressive toggle turn will yield more speed and greater landing performance. While speed does increase, so does descent rate. This maneuver is potentially very dangerous since the initial input will push the air out of the canopy, and it will need some time to become pressurized again and regain its shape to fully benefit from the airspeed caused by the maneuver. It must also be remembered that an aggressive toggle turn on a smaller canopy may cause a line twist. Please keep in mind that aggressive maneuvers are useless and inefficient. Naturally it is not our goal to make encourage you practice to low turns before landing; it is our mission to inform you of the risks involved.

If, however, you must make this type of landing, take note of the following before attempting them:

Please realize that in comparison to a normal landing, a low turn maneuver accelerates the chain of events that are observed visually. The speed at which things happen may be too great for the comprehension and the analysis of a less experienced jumper.

One of the safest solutions is to limit your turn to 90° and maintain visual contact with your surroundings, the landing target and the other jumpers around you. Commence the turn at 90° from the wind line. The turn should be made with in a smooth, continuous manner, so that after 3 or 4 seconds the canopy gains significant speed, and you find yourself facing the wind before starting the flare. This maneuver will keep your altitude loss to a minimum and you will maintain visual contact with your surroundings and be able to judge the flight path. If you realize that your flight path is wrong, you can stop the turn at any point and make a normal landing flare.

Thermal activity and turbulence

In certain periods of the year, particularly during summer months, you may encounter turbulent conditions, even severe ones. It is recommended that you do not jump in turbulent conditions. Even the best pilot's under the finest equipment can encounter turbulence which can cause their canopy to collapse. The safest choice is to avoid these conditions if it all possible. Remember turbulence generated by obstacles can often affect areas over a distance more

than ten times the height of the obstacle. If you find yourself flying in turbulent conditions, the following recommendations may help.

Recommendation: Keep your canopy pressurized by flying at full glide and utilizing smooth, minimal (small) control inputs. In this configuration the canopy will maintain internal pressure and airspeed and will be better able to withstand wind shear and air flow variations.

Upon landing collapse your canopy immediately and prevent it from re-inflating.

Thunderstorms

Normally jumps will not take place in stormy conditions. However, it is good to know that the phenomenon of low pressure will make the wind sock indicate a direction opposite to the movement of the thunderstorm.

Solution: If ever you find yourself in the air while near a thunderstorm, the only possible action is to evade the storm as much as possible and find a safe landing area (without obstacles) as quickly as possible.

High winds:

Sometimes winds may increase exceed your maximum limits while you climb to altitude and exit. If you have already exited you must deal with it. We recommend that you choose a more appropriate landing area if necessary. If the wind is very high, you may well find that you are backing up despite facing into the wind. In this case, you must carefully assess where you may end up and which landing area is available. While facing the wind, it is not easy to look straight behind you, so you may have to do small turns in order to check behind you, and then turn back into the wind.

Do not make a full turn, for the high winds may cause you to drift several hundreds of feet/meters downwind and you may be pushed passed the selected landing area. This is especially true if you fly a slower or more lightly wing loaded canopy.

Steer you canopy with calm, and keep the toggles all the way up so that you take advantage of the canopy's forward speed. Execute a minimal landing flare as ground effect will do the rest.

