Getting the Best Performance from Your Canopy
By Scott Miller

The way your main canopy performs is mostly determined by the size and type of canopy that you choose. No matter what type of main you fly, though, whether it's a hot new zero-p "elliptical" or a tired but trusted old "F-111" type canopy, there are several ways to get better performance from it.

A Real Drag

Collapsible pilot chutes have been available for a number of years. Most rigs being used today are equipped with one. These pilot chutes collapse after the canopy has deployed, which improves performance by reducing drag on the canopy in flight. A collapsible pilot chute will normally improve a canopy's glide, make it easier to land, and will often let the canopy turn more smoothly and handle turbulence better.

Some people believe that collapsible pilot chutes are not necessary on larger canopies, but the fact is they can improve performance on any size canopy. Even a relatively large canopy may have a full glide speed of 30 mph or more. At this speed, an inflated pilot chute creates a substantial amount of drag, and has a significant effect on the canopy's performance.

The most common type of collapsible pilot chute is the "kill-line" version. Other types have also been used, but the "kill-line" type is generally the most reliable and effective.

In addition to using a collapsible pilot chute, it's a good idea to find out what size pilot chute is recommended by the manufacturer of your main canopy. Pilot chutes that are too large or too small can lead to hard openings or other deployment problems.

Read Between the Lines

Each time a canopy opens, the slider creates friction as it slides down the lines, causing them to shrink over time. Once the lines have shrunk a certain amount, the canopy is considered "out of trim." A canopy that is out of trim may not perform as well as it should.

Most canopies need to be re-lined after every 400 to 800 jumps. This may vary depending on the type of line, the environment where you jump, whether you pack indoors or outside, and the specific recommendations of your canopy's manufacturer.

A rigger should be able to tell if your canopy needs to be re-lined by comparing it to specifications provided by the manufacturer. If your canopy's opening, flight, or landing characteristics start to change, that may also indicate that it needs to be re-lined.

Cut Yourself Some Slack

The length of the control lines in particular can have a tremendous effect on a canopy's flight and landing performance. Many jumpers are flying canopies with control lines that are too short. This can happen for a few different reasons. Like the other lines, control lines tend to shrink over time due to friction from the slider. Attaching the steering toggles farther up on the control lines will also shorten them.

If a jumper is having trouble flaring his or her canopy, a well-meaning rigger, instructor, or friend will often shorten the canopy's control lines at the toggles. It is thought that shortening the control lines will let the jumper get "more flare" from the canopy. This is a popular idea, but unfortunately it is not correct.

We often tell students and novice jumpers to put their toggles all the way up and "let it fly" on final approach. We know that letting the canopy fly at full speed allows it to produce more lift during the flare, which results in a better landing.

When a canopy's control lines are shortened, they may pull the tail down when the toggles are in full glide position. This means the canopy is always flying in some amount of brakes, even with the toggles all the way up. If we know that "letting it fly" helps a canopy flare better, does it really make sense to set the toggles so that the canopy is always flying in brakes?

If you are having trouble landing, look for solutions other than shortening your control lines. They might already be too short. Try a collapsible pilot chute if you don't already have one. Ask someone to video some of your landings, and look for any mistakes you might be making. You may also want to get help from a qualified instructor.

Some jumpers have had their control lines shortened because their canopies would not stall with the toggles pulled all the way down. It's important to realize that, if the control lines are the correct length, many canopies will not stall unless you take extra wraps on the control lines with your hands. Shortening the control lines to make a canopy easier to stall may actually make it more difficult to flare properly.

A properly executed flare results in a dynamic increase in lift. The canopy should level off and reach a minimum rate of descent, and the forward speed should also decrease, allowing for a soft landing. It is not necessary to stall the canopy to get a good landing. The canopy should keep creating lift until after you have transferred your weight on to your feet.

When a canopy stalls, there is a dramatic decrease in lift and a sudden increase in rate of descent. Basically, a stalled canopy stops flying and starts dropping quickly toward the ground. If your canopy stalls at some point during your flare before you have transferred your weight to your feet, your landing may not be very graceful.

Having your control lines too short may also be a problem if you use your front risers. Short control lines may cause a canopy to "hobble" or "buck" when the front risers are pulled down, reducing their effectiveness.

A canopy will perform best when there is a correct amount of slack in the control lines. As a general rule of thumb, when the canopy is flying with brakes released and the toggles all the way up, there should be a visible bow along the entire length of the control lines. You should have to pull the toggles down about two inches (5 cm) before the steering lines actually move the tail. Again, this is a general rule of thumb, and you may want to check with your canopy's manufacturer for more specific instructions.

Lengthening the control lines will usually cause a canopy to stay in a dive longer after a turn, and build up more speed in the dive. If you normally use some type of high-speed approach to land, such as a front riser turn, you should use extra caution for a few jumps if you lengthen your control lines, as you would when trying a new canopy.

One advantage to having shorter control lines is that they can make a canopy feel more responsive. If the control lines are lengthened, it may take noticeably more toggle input to start a turn. Most jumpers find that the improvements in other areas more than compensate for this slight disadvantage, though.

Since the canopies we use today can last for thousands of jumps, getting your canopy relined when it needs to be is an important step in maintaining your gear. It's an additional expense, like buying a collapsible pilot chute, but the results are worth it. Keeping your canopy in trim, setting the control lines to the correct length, and using a collapsible pilot chute will allow your main canopy to fly the way it should, and allow you to get the best performance from it.

About the author: Scott Miller is an AFF Instructor and Senior Rigger with over 7000 jumps. He currently works as a test jumper for Performance Designs, and operates The Canopy School at Skydive DeLand (www.skydivedeland.com).

This article first appeared in *Parachutist* Volume 43, No. 1, January 2002. Posted to Performance Designs' web site with permission of the author.