Ultra low Freefall

By Dwain Weston
(Dwain died in October 2003 but this article explains some of the methods he helped develop and depicts some of the depth in thought he put into BASE jumping.)
Additional notes/comments provided by Todd Shoebotham

There are six main phases in deployment (note:some of these phases overlap in sequence).
Phase 1 - Pilot chute (PC) is released (via BOC or Hand Held)
Phase 2 - PC reaches bridle stretch
Phase 3 - PC inflates
Another method being explored by ultra low altitude enthusiasts is a "pre-inflated pc" (typically with a shortened bridle). This involves holding the pc at the bridle attachment inflating the pc a couple of times then timing the exit with the inflated pilot chute. This method (when done properly) changes Phases 1, 2, and 3. With the pre-inflate method it's Phase1 "inflate", Phase 2 jump and "release", Phase 3 "bridle stretch."
Phase 4 - PC extracts canopy to line stretch (there are multiple sub-stages here such as container opening, extraction of canopy from container and lifting of the canopy to line stretch).
Phase 5 - canopy achieves bottom surface inflation (there are multiple sub-stages here).
Phase 6 - canopy achieves cell pressurization (there are multiple sub-stages here).
This original article was written by Dwain before the Vtec (bottom surface vents) was in full use. Therefore I felt it was important to mention that Phase 6 can be greatly enhanced by using a canopy fitted with Vtec.

The 52" p/c in very low airspeeds will speed up Phase 4 slightly compared to a 48" p/c. However, due to extra weight of the 52"p/c it can slow down Phase 2 slightly. Also due to the extra size of the p/c it can slow down Phase 3 slightly. So basically a 52" p/c (compared to a 48") will generally make Phase 2 and 3 worse, but improve Phase 4.

The net result of a 52" p/c is still positive, but only a small amount. From video analysis my conclusions were that a 52" p/c results in a higher opening of maybe 10-15 feet on average. Still, if you are freefalling very low objects then this can make a big difference.

I don't really care if I have a 48" or 52" until my exit height gets below 170 feet. However, this is with canopies around the 220- 245 square foot weight range. For bigger canopies (265+)I would probably recommend using the 52" p/c for anything under 190' to be safe (I'm just guessing here).

The construction method of the 52" p/c is very important. Weight (of the p/c) is a critical factor that will slow Phase 2, and to some extent, Phase 3. My 52" p/c does not have load tapes on the ZP material (as they are not needed for reinforcement as the p/c is only used in low airspeeds). Load tapes on the mesh are very important as they limit the mesh from stretching and therefore air from spilling out around the skirt. I have 8 load tapes on the mesh of my 52" p/c (same as the Apex BASE 48") and I think it is a good balance of weight versus the amount that the mesh can stretch.

The technique you use for freefalling very low objects is the most critical. It takes almost the same amount of time from Phase 1 to Phase 3 to occur as it does for Phase 4 to occur (about 1.3 seconds on average for Phase 1-3 and about 1.5 seconds on average for Phase 4, but this varies hugely from jump to jump). Using a 52" p/c will speed up Phase 4 slightly, but the biggest difference you can make is on Phase 2. If you just throw the p/c to the side it will go into freefall with you. You will then need to fall faster than the p/c to overtake it before it will reach bridle stretch. The p/c won't fully inflate until after it reaches bridle stretch and is being dragged through the air by your body (or the weight of the suspended canopy). However, if you throw the p/c up when you exit it will reach bridle stretch quicker and the p/c will begin to inflate sooner. The sooner, after the exit the p/c becomes inflated and starts doing its job, the better. Your acceleration is exponential, so something done up front which will shave off a fraction, will make a big difference in the end.

If you throw a 46" p/c up to bridle stretch on exit you will open much higher than if you throw a 52" p/c to the side. The best technique is similar to throwing a basketball through the hoop (a "jump shot"). You jump up in the air and you throw the basketball (p/c) upwards and forward when you are at the top of your jump. In a perfect ultra-low freefall the p/c should inflate above the exit point and already be starting to pull on the shrivel flap (or pop a pin) (leaving the pin protector flap open will help by allowing all the bridle force to transfer to the pin(s) rather than diverting any of the force to opening the pin pro flap) when it (the p/c) becomes level with the exit point. In a way it's cheating because you are getting part of the deployment to occur above the exit point.

There are other techniques as well that will help, such as the forward push on your launch, your body position in freefall (to minimize swing through on line stretch), and the way you release your brakes, but I won't go into them here. (Also the way the p/c is folded - best results for low freefalls involves a method that only folds the mesh and leaves the all ZP out of the folds/hand and toward the top relative to the ground.)

In summary, the 52" p/c will help a little but technique will make a bigger difference. I suspect a 52" p/c may make a more noticeable difference on heavier canopies (285+ square feet).

For you to notice the difference of a 52" p/c over a 48" p/c you will have to be really pushing the envelope of low freefalls. 99.9% of BASE jumpers won't freefall something low enough to need a 52" p/c.

If you are planning to freefall some very low stuff then I'd recommend getting a 52" p/c.

Also keep in mind that the opening height variability of low freefalls is huge, even when everything else is the same (pack job, p/c, canopy, technique, etc, etc). Sometimes you open super high (relatively speaking) and sometimes you open in the dirt. I've done 13 freefalls from 156' over hard earth and this height does have a small margin for error. On the best freefalls from this object I had enough height to pop my brakes and make a 90 degree turn before doing a nice soft flare. On my worst freefall I opened and then hit the ground straight away. Gear and technique remained constant but the opening height varies wildly (I also have about 80 freefalls from under 185 feet with the same results of wild variation in opening height). My point is to not draw any conclusions after just a few jumps. Hesitations will eventually occur during some phase of the deployment sequence so make sure you have some margin for error built in.

This is a snapshot of Dwains article on the Apex Base site (10. Feb. 2012), as it was not possible to get the original text.