

**From the Loft 25 April 2004**

## **Pilot Chutes – their construction and care**

During the first day of the Easter Boogie, a jumper from PA approached me in the packing area. He was having some major pilot chute hesitations, and he wanted me to look at his main PC. It was almost brand new.

I inspected it and immediately noticed two things wrong with the way the PC was constructed. Either factor alone could cause problems; taken together they were downright dangerous. The jumper bought and installed a new collapsible PC from the Downwind store, and was happy to report that his problem was solved immediately.

Some of our past newsletters have addressed collapsible PCs and their care, but we've never addressed issues with main PC construction. Since they're not TSO'd anyone can make them -- and quality varies considerably. I recently ran across an information-packed post on DZ.com by Bill Booth, in which he discusses the issue in depth. I've copied it here. (Sorry about the shading; I can't seem to get rid of it.)

Reply from Bill Booth:

What happened to you is getting more and more common. Although I hold the patent on the hand deploy **pilot chute**, I never charged anyone a royalty to use it, and therefore never published construction details. I'm afraid this has led to some poorly made **pilot chutes** as people have copied, but not copied EXACTLY, my original design. As a matter of fact, last Sunday, a jumper came up to me, said that he was having "**pilot chute** hesitations" on his Vector, and asked me to have a look. His problem, it turned out, was the same one I've seen countless times before...His **pilot chute** was made by "God knows who", and made incorrectly.

I don't know about you, but one of the the scariest malfunctions I can think of, is a streamered main **pilot chute** that has enough drag to open your main container, but not enough drag to lift out the bag. What do you do? If you just lie there and wait, the ground may "rise up to smite thee". If you pull your reserve, your main is going to simultaneously deploy, and main/reserve entanglements are rarely much fun either. What to do...Easy, don't jump an incorrectly manufactured or adjusted **pilot chute**.

So, how can you tell if your hand deploy **pilot chute** is OK? First, some basic definitions. 1. Apex - The center of the fabric part of your **pilot chute**. 2. Skirt - Where the mesh and fabric meet. 3. Base - The center of the mesh part of your **pilot chute**. 4. Centerline - One or two pieces of tape, of fixed length, that lead from the apex to the base. 5. Bridle - A piece of tape, doubled in the case of a collapsible **pilot chute**, leading from the base to the deployment bag. 6. Kill line - A single piece of line, on a collapsible **pilot chute** only, that runs from the apex, through the center of the **pilot chute**, and down through the bridle to the **pilot chute** attachment point at the bag, or in some designs, to the apex of the canopy. 7. Support tape - 4 pieces of thin tape, sewn to the mesh, leading from the base to the skirt. 8. Bias - Simply put, the direction the mesh stretches the most (a diagonal line, at 45 degrees to the little squares that make up most mesh used in hand deploy **pilot chutes**). Sorry for all that defining, but if you don't understand those terms, you won't understand what comes next.

OK, now the easy part. If you want your **pilot chute** to always function properly, simply make sure, in the inflated state, that no part of the skirt is above the apex. In other words, make sure neither your centerline nor your kill line is too short. I pulled the apex on my

hand deployed **pilot chute** for two reasons. 1. It makes them open faster. 2. It yields 11% more drag. However, IF THE APEX IS PULLED DOWN BELOW ANY PART OF THE SKIRT, THE **PILOT CHUTE** WILL NOT FUNCTION PROPERLY.

How do I check that? First cock your **pilot chute** like you would during packing. Now hold your **pilot chute** UPSIDE DOWN by the bridle at the base. Simultaneously pull downward on the apex (handle) and each support tape where it touches the skirt. The apex should be equal to, preferable slightly "below", but never "above" the skirt. (Please remember, the terms "above" and "below", in quotes, refer only to the "upside down" **pilot chute** you are holding in your hands for this test.) Now look how your support tapes are sewn to the mesh. If they are sewn "on the bias" your **pilot chute** is properly constructed. If they are not sewn on the bias it means that the mesh halfway between each support tape IS on the bias and will stretch more than enough to allow the skirt to get way "below" the apex. Try it. It's like a round parachute with several different line lengths. It simply doesn't work very well. This extremely common construction error might not let your **pilot chute** fully inflate, or in extreme cases, inflate at all. If your **pilot chute** is "borderline" when it is new, then things will get worse and worse as it ages.

Now to "adjusting" a correctly manufactured **pilot chute**. Kill lines are usually made out of Spectra (Microline). Friction generated during the collapse sequence causes heat, and Spectra SHRINKS when heated. This means that your centerline could eventually get short enough to prevent your **pilot chute** from inflating correctly. Use what you have learned above to recognize this situation, and correct it.

This is just a BASIC primer on **pilot chute** construction, and does not address several other important design considerations such as fabric and mesh choices, and how **pilot chute** size vs. the weight of your main canopy affects separation velocity, snatch force, opening shock, and malfunction rate. More about these another time.

Bill Booth

That was kind of technical, but had lots of good information. The problem with the PA jumper's PC was that the mesh was not sewn on the bias, and the apex was way below the skirt when the PC was fully cocked.

My favorite "PC hesitation" story is from last year's POPS CRW record. Again, someone approached me in the packing area and wanted me to look at his PC. He said he was having major hesitations, and it was interfering with his ability to video the record attempts (luckily they had more than one videographer.) I inspected his PC and it looked fine to me. He said there was always a major delay between when he threw out, and when his canopy inflated. I asked, "How long of a delay?" He answered, "Well, last time it was about 8,000 feet." I fell over backwards. "BUT " - he quickly added - "usually it's only between about 4 and 5,000." Then I watched him pack, and the problem turned out to be simple - he was misrouting the bridle to the left and underneath the side flap on his Vector. Good thing he was doing CRW or I would have been really busy.

As ever, if you have any questions about your main PC, the closing sequence of your rig, or about anything else, stop by and see us or drop us an e-mail at [cssriggers@earthlink.net](mailto:cssriggers@earthlink.net).

Stay safe,  
Dawn

