

Line wear:

We have noted over the last several years that line breakage in new High performance wings has changed in several ways.

In the past most lines were much larger diameter and produced much more visible signs of wear and were much stronger than needed. Modern high performance wings have cut these margins in order to achieve the speeds and amazing performance we now see. In the past most lines would break on opening and typically they would break at the cascade points where the A-B or C-D junctions occur. Now days we see a different pattern on ultra-high performance wings.

Firstly, the location of the line breakage has changed from the cascade points to the lower finger trap near the riser. The case with modern wings is that at the bottom portions of the lines seem to be a spot that wears often because of wear from Slider grommets or RDS rings, or rubbing on the container during deployment etc. We have found the way the slider flaps it can wear these lines first if you don't get it quickly. The middle lines have been seen to wear the fastest with sliders wear. We have even seen some competitors and others used sheathing and shrink wrap to protect the lines.

Second, the lines do not seem to break on opening anymore but instead in accelerated flight. This is in part because the wear is taking place after opening and thus the critical damage time happens after opening. Also, because we have nice soft openings and fly very hard once open. This means the critical load on the lines is not at opening anymore, and they break in flight and maybe in a turn or low to the ground. Unfortunately, the patterns of the wear in the A lines is the absolute worst place for a failure as the A-B line groups contribute significantly to the stability of a wing. Breakage can render a wing unflyable and it can easily become a useless ball of nylon if that happens.

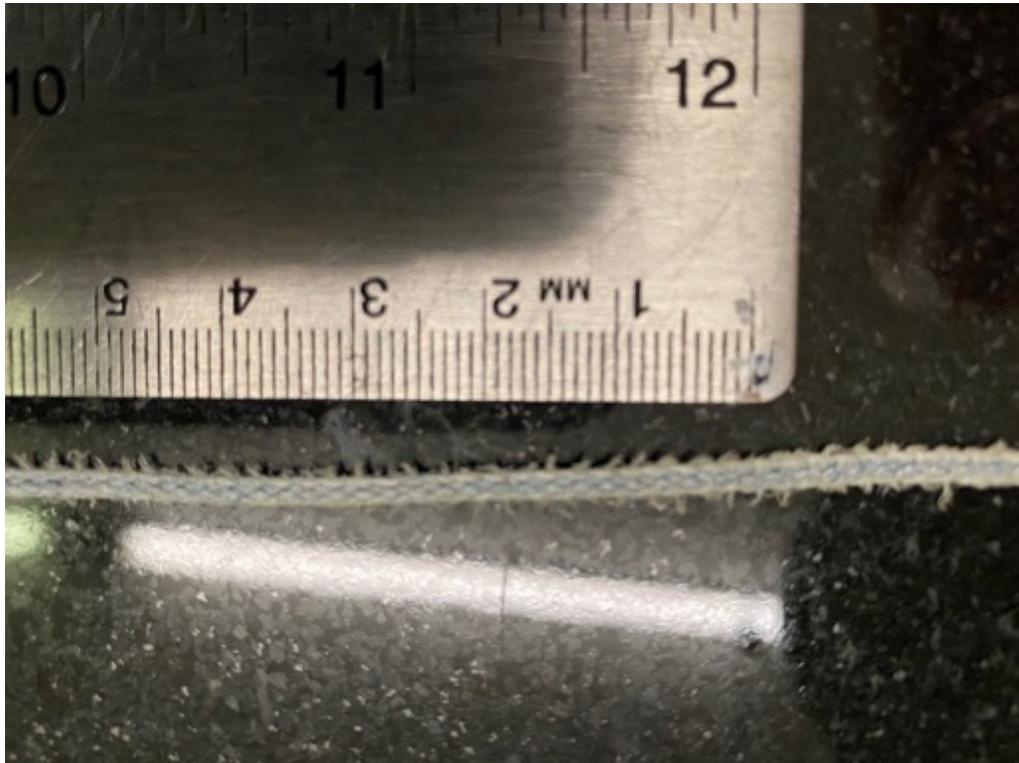
We have noticed that how people care for the lines has a big part in the durability. We have seen lines in the 300-400 lb. range last as little as 100 jumps when exposed to harsh conditions. Sand can be absolutely disastrous on lines. We have seen line sets last less than 100 jumps when jumped in sandy environments (beach jumps) or when ground in the mud (swoop competitions).

We have tested lines that come back with wear and noted that once the lines show wear (frayed or broken carriers) they often exhibit more than a 50% reduction in failure capacity. That mean your 400 lb. line could fail at 200 lb. That is not enough redundancy to prevent a line from breaking in normal use just flying around.

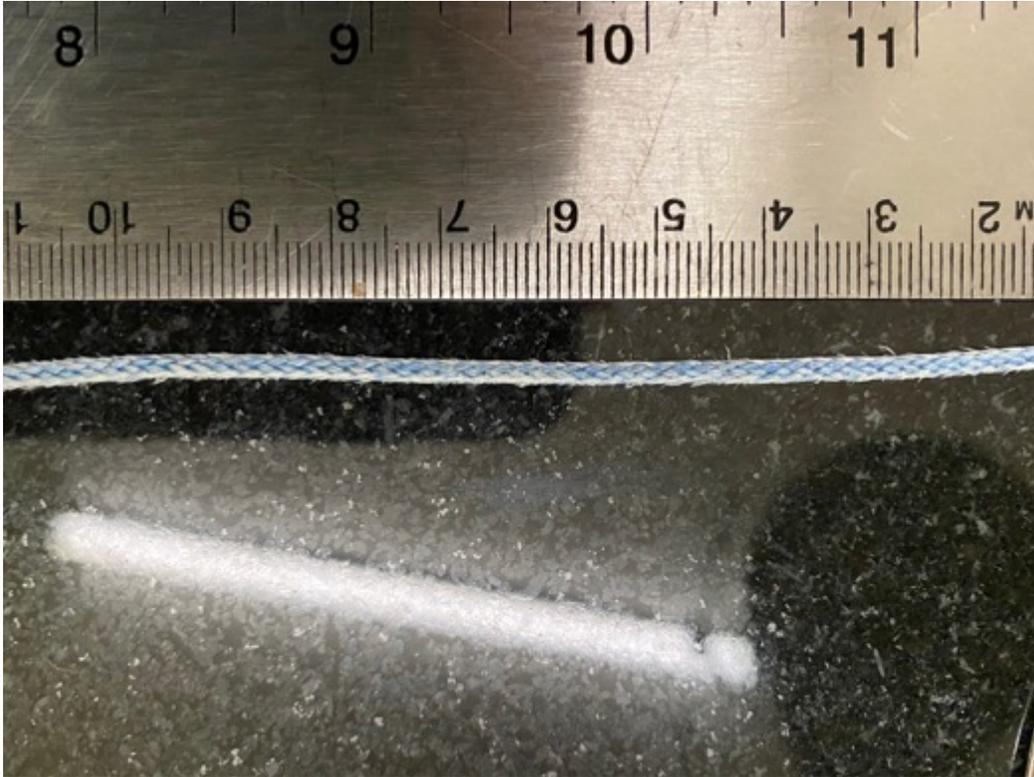
In order to understand how lines wear and then fail it is important to step back and understand a little about how they are made. The lines are woven by a machine that is loaded with a predetermined number of carriers. The carriers are most easily described as the groups of fibers that are woven into the braid. These multiple groups of fibers sere to distribute the load throughout the line as a whole and will stretch and the fibers reorient to allow the stress within the line to redistribute so that the fibers are loaded

more uniformly. This is done via strain compatibility of the fibers. If one of the groups of fibers becomes damaged, the weave as a whole is no longer able to redistribute the loading, and localized load concentrations within the line fibers will occur. This can lead to a cascading failure as each fiber is overloaded and before the load can redistribute.

We often see lines such as this where the carriers clearly have significant portions of the fibers broken or abraded and no longer continuous.



So that's all great but how can you tell when your lines are too work to jump?



This is off the same line as the picture above, just in a different position.

First there is no magic number for line wear. Where you jump and how you care for your lines matters a huge amount. Dirt and sand that are in or on the weave both abrade and make microscopic cuts on the fibers and greatly reduce the strength and durability of a line.

Lines should be replaced on condition, most of this must be evaluated on visible condition so there are few way to determine.

1. Is there visible ground in dirt or debris in your lines?
2. Have they significantly changed color? If so this may be a sign of dirt contamination or abrasive wear.
3. Are there carriers with broken or hanging fibers? Remember that once these become visible they lines are really reducing in strength.
4. If you ever what looks like a large portion of a carrier broken (more than 50%) stop and replace the lines, do not jump them again until they get replaced.

Check your lines and don't assume they are ok for another jump, a broken line on final could well be a fatal condition.