The How & Why of Wing Inspections

by Edward Poccia

Have you recently finished first in the "Who Can Land Closest to the Barbed Wire Fence ", competition? Has your wing functioned as a "mouse house" during the winter and the little ones have been treating your wing as if it were a Vegas buffet? Has your pull failed to exceed the tent peg's grasp? Does your inflated wing look like a lopsided banana? Or perhaps, having glanced at the manual that came with your wing, you have decided to follow the manufacturer's recommendations for a change and get your wing inspected.

Wing inspections are a good idea at several levels. Level One is that it could prevent a catastrophic failure and save your life. Level Two, for those not convinced that Level One was enough, is that having a successful inspection can make your wing worth more on resale or trade-in.

I had the opportunity to visit with Michelle Daniele recently at her glider inspection and repair shop at the **Paramotor City Glider Shop** in Albuquerque, NM in an effort to demystify the inspection process. The shop proprietor is a well-respected pilot who has been trained by Eugene Schussman of the German wing manufacturer ***Swing*** and its most skilled seamstress, Gabi Siegal in the techniques of wing inspection and repair. Eugene and Gabi have excellent reputations in Europe for wing inspection and manufacture.

The shop itself is cavernous. Two wing hangers are suspended from the ceiling allowing a wing's canopy to be pulled-up and hung vertically to facilitate the inspection process. Around the sides of the shop are sewing machines of different types, set up on their own worktables. Spools of colorful line stock are mounted on the wall in an organized and functional fashion with racks of equipment and wing storage cabinets filling out the wall space.

The inspection process starts off with a detailed look-see. The wing is hoisted vertically on hangers, leading edge down and each cell is cleaned out. She then checks the top and bottom of the canopy as well as the interior cell walls for wear, holes, tears, separating seems, and loose or broken stitching. Inflated wings falling to the ground leading edge first, perhaps on a blown launch, are harmful. The cell openings are sealed shut upon impact with the ground and pressure within the cell rises as the rest of the wing falls down upon the leading edge. This pressure can actually blow out a cell wall, and/or rupture the surface fabric. Damaged panels are replaced using matching color and fabric quality consistent with the manufacture's specifications.

The lines are inspected for wear along the sheath and more importantly, for inner core damage. Running each line through her fingers, Michelle says she can feel breaks by sensing a sudden thinning of the line's diameter. She will also use a technique known as "looping" to check for internal line damage through the entire length of the line if damage is detected. The line’s length is also checked against "line charts" supplied by manufacturers. Stretched lines or ones that have shrunk due to being put away wet, exposed to UV rays, exposed to excessive heat or other damaging environmental conditions are replaced. Stretched lines can cause a glider to change its profile and respond to circumstances differently than designed. This is a polite way of saying that the wing can collapse and you will die. Brake lines are particularly subject to wear and are carefully inspected, and adjusted for length according to manufacturer’s specifications. Brake lines are changed out automatically after the wing is two years old.

In order to check the strength of the lines, one of the "A" lines and a top line are taken off the glider at random and pulled until they fail. A meter on a special device designed for this purpose provides data on the line's strength. The meter reading is compared to manufacture's specifications to determine if the lines need to be replaced. Lines are attached to the risers by looping them through quick links that have a twist lock. Silicone "O" rings are slipped over the loops to further secure the lines. The wing inspection replaces

cracked or worn "O" rings and applies a thread compound to the threads of the joint to secure the connection before torquing them down.

Canopy fabric is made from a material that is designed to stop rips in order to eliminate the possibility that a small hole can enlarge through a stressed fabric and cause a catastrophic failure. To check this safety feature, the fabric is subjected to a "tear resistance" test in order to determine its strength. A small needle, attached to a meter is inserted into the fabric and pulled to a specific tolerance as determined by the manufacturer. Panels weakened by overexposure to the sun, humidity, mildew or other causes will tear unacceptably.

Another test of the canopy material is the porosity test. It is used to measure the amount of air that can pass directly through the fabric disrupting the ideal airflow for a paraglider wing. Using a device especially designed for this test, a piece of fabric, usually from near the leading edge, is placed over a cylinder and sealed. A weight draws down on a diaphragm and records it's ability to pull air through the fabric providing a score of 0 to 1,000. The findings are compared to manufacturer's specification listed on charts kept on file. If findings are less than optimal, additional tests are performed on other sights along the canopy. Poor results on the porosity test may be indicative of improper storage technique or the quality of the fabric used by the manufacturer. Pilots that notice that their wing is difficult to inflate or has changed in performance may mean poor porosity.

Each inspection comes with a written report detailing the findings on each of the tests. The report can be used during resale to articulate the glider's condition. It is the accumulation of all test results that determines the airworthiness of a glider.

Customers will be contacted usually by email regarding any needed repairs. Digital images will be taken of the damaged portions of the wing needing attention and sent to you with an explanation of the work required along with an estimate. The repair cost is calculated at a rate of $35 an hour plus materials.

Michelle regards UV damage caused by pilots leaving the wing out in the sun as the most unforgivable because it steals airtime. For every minute the wing sits in the sun, that's one less minute the wing will be flyable. The wing's colors fade and the fabric weakens. Michelle pointed out that another no-no is putting a wing away wet. Such an act would promote mold growth. Regarding wing storage, Michelle prefers stuffing a wing loosely into a storage bag to folding it. She reported that when folding a wing in the same manner repeatedly would cause dirt and debris in the wing's cells to rub against the fabric and cause unnecessary wear. New wings should be inspected every year or after 100 hours of use. With proper care and regular inspections to check on the wing's condition, it should last 500 hours or five years but individual results vary. Manufacturer's materials used in the wing's construction and a pilot's flying style contribute to the life span of a wing.

I was impressed with the time and attention to detail Michelle put into each phase of the inspection and repair operation. During my visit, I watched Michelle replace a panel on a wing that had been badly torn. She showed extreme diligence while attaching the new panel in order to maintain the integrity of the wing and the safety of the pilot. This, to me, demonstrated the professionalism and skill of the proprietor.