

## A Case of Unexpected Stress

or as Yogi Berra might ask: Why does reality have to be so real?

by Gordon Collyer

After two years of flying, my Hog Bipe developed unexpected cracks in the fuselage at the former where the sides begin the taper to the tail post. See below; forward is to the right in the picture.



What happen?

On the day this happened here is the sequence of events:

- 1) One normal flight, smooth landing.
- 2) Second flight, normal but a tip-up while taxiing; broken wood propeller.
- 3) Third flight, I got near one of the poles that border the field during landing. To avoid the pole, I did somewhat of a "high" speed left skid after touch down. The Hog did not tip-over, the wood propeller did not break, the wheel axel on the right side of the plane bent. The aluminum landing gear did not bend. Weird?
- 4) All flights: a snap-roll or two.....hmmm.

As I was putting the plane away, I noticed the Monokote on the right side of the fuselage was torn from the middle of the side up to the cockpit area, more or less following the former station. Did the broken propeller cut the Monokote? When I saw an almost identical

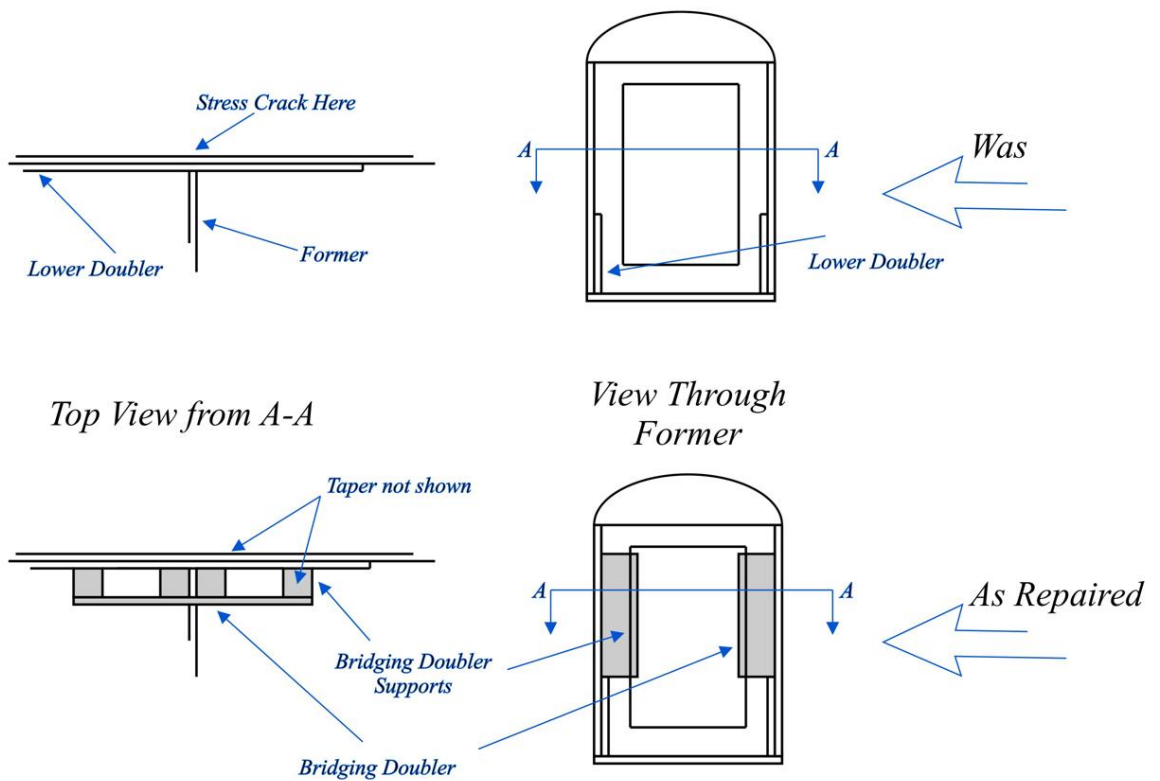
tear in the Monokote on the left side at the mirror location that theory had to be abandoned. These tears looked more like "ruptures", with the fabric "bent" or feathered outward around the tear.

So, after the required fabric peel, the nearly symmetric cracks on both sides of the fuselage were revealed. There were small hairline cracks, apparently just through the outer skin of the lite-ply sides. Pressure on the fuselage aft of the cracks showed that they would move/widen. This and the fact that the Monokote was stressed to rupture show this was clearly not just cosmetic.

Stripping more covering to facilitate the mandated repairs refreshed my memory of the design, namely that the fuselage doubler in the Hog Bipe runs along the bottom of the fuselage only. The bend that results from the taper to the tail results in a more rounded bend on the bottom verses the top of the fuselage....so wherever the load on the airframe came from it stressed the top of the fuselage where there is no doubler and a comparatively sharper bend. Did the cracks occur during build and only rip the fabric due to more motion experienced in the recent landings? Did the cracks develop as the wood dried during low humidity over two winters? Were my snap rolls to "snappy"? I guess it will remain a

mystery as I didn't note the fabric damage until the end of the flying day. See also: I guess I was lucky the tail didn't fall off.

So now to repairs. First, I wanted to stabilize the cracks, so I pushed a little on the tail to close the cracks and then wicked thin CA into them. I also re-CA'd the former joints to the sides. Wanting to strengthen things a bit, I epoxied basswood posts to either side of the former and about an inch forward and aft of the former. Across the four basswood posts I epoxied a rectangle of 1/8" aircraft plywood to serve as an interior "bridging" doubler. The aft post needed a little sanding in order to taper it slightly so the plywood plate would sit flat across the posts. The figure below shows these details. In the photo above you can see the rear post and the edge of the interior plywood doubler.



In a bit of related Zen, I'm "restoring" (see also: the front fell off) a f3a pattern airplane which requires grafting a new front end on to the remains of the aft fuselage. For this I used a similar approach to mate the fuselage "half's" together. So the Hog is now doing double duty now as a test subject. I've flown it successfully seven times since the repair.....including some gentle snap-rolls. So far so good.