Renovating the ABS/ASF Bonanza

Part 5: Window Frames

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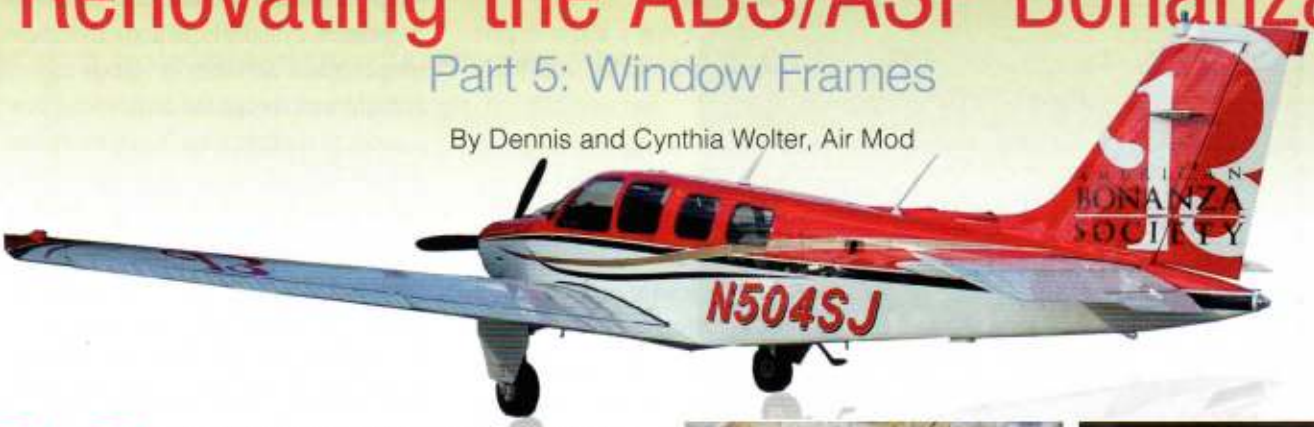

Hindsight is always 20/20. Have you ever heard that before? If there is any one area where this statement applies to aviation, it is in the use of plastic to produce interior components in 1970s-era production aircraft.


Photo 1


Photo 2

While I (Dennis) was going through the industrial design program at the University of Cincinnati in the 1960s, the potential advantages of using new miracle plastics to manufacture a wide range of products was all the rage. I got so wrapped up in this plastic euphoria that I built a four-foot wingspan, all foam and fiberglass flying model of a four-place airplane as my senior thesis, just to prove that plastic was up to the challenge of handling flight loads.

It's now been more than 50 years since Beech started fabricating interior components using a non-thermal setting, thin plastic known to the industry as Kydex. This relatively inexpensive material is light and easily vacuum-formed into almost any shape by even low-skilled technicians. That's the good news. The bad news, with exposure over time to heat and ultraviolet light, Kydex becomes brittle and cannot expand and shrink as it heats and cools. Where did Beech put this stuff? You guessed it – right where it is most exposed to sunlight and heat. The breaks and cracks we see in these components today are the result. Early in the game, Beech painted the window frames, which created a UV-reflective coating that actually helped protect the plastic. We are currently doing an interior in a 1974 A36 that has the usual amount of heat deformation in the window frames, but not one crack. Unfortunately, Beech installed unpainted window frames in later production airframes, and we know now how well that worked out.

The challenges these now 40-year-old window frames present fall in three groups. Each group is also affected by where the airplane lived, how it was cared for, how it was stored, and what previous repair and refurbishment attempts were made.

The first (and best) group is original **window frames that have never been worked on**, meaning they have not been painted or covered with anything. All we need to do when renovating or upgrading the interior is to carefully repair cracked areas, and re-form and reinforce any deformed areas. Then we can prep the plastic and apply three coats of an ultraviolet light-reflective finish.

First, we determine if it is more cost-effective to replace these frames or to repair them, starting with whether the plastic is still flexible. If the material is so sunbaked that it's brittle, once it's repaired and refinished it will crack the first time it is put under stress. If this is the case, the only thing to do is buy a new piece. We buy most of our replacement plastic trim from Plane Plastics (*www.planeplastics.com*). The new frames are made with thicker and improved material that remain more flexible over time. The second decision before buying new is to estimate the labor cost to repair an existing part based on the amount of damage needing attention. At some point, a new part may be the most cost-effective. It's important to also factor in the labor required to trim, fit, and locate mounting holes in the new part.

The second group involves **window frames that have been covered with vinyl or leather**. I do not believe it is a good idea to wrap plastic frames with any finish material. Leather shrinks as it ages and can cause cracking as it draws tightly around the compound shapes of this delicate plastic. Vinyl has chemistry in it that, when exposed to extreme temperatures, will "gas out" and accelerate degradation of the plastic. I have included a couple of pictures of what we often find under the covered window frames (**photos 1 & 2**). The only option here is to buy new frames.

The third group we see involves **window frames that were previously painted** without having been thoroughly prepped, or those that were finished with paint that does not bond well to plastic, such as catalyzed urethane or hardware store spray

enamel. Unlike acrylic lacquer, these products do not contain strong solvents that help the paint dissolve into and adhere to the surface of the plastic. Usually window frames with this problem have areas where the finish is flaking off.

To present a comprehensive look at the problems and issues with these plastic window frames, included in this article are some repair processes that go beyond the work we did on the ABS/ASF Bonanza. The ASF A36's window frames fell into the first category: untouched since new, no covering, no paint, and no previous attempts at repair. However, due to the age of the aircraft and the fact that for the past seven or more years it had been stored outside, the frames contained a significant amount of damage. They were as brittle as eggshells, making them well beyond practical repair (**photos 3 & 4**). The

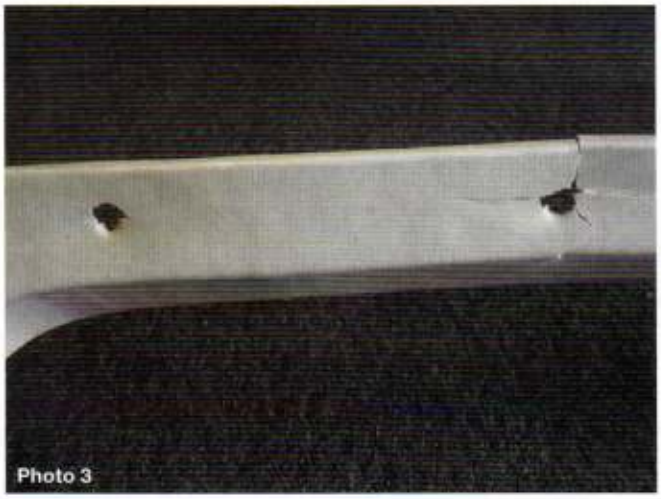

Photo 3

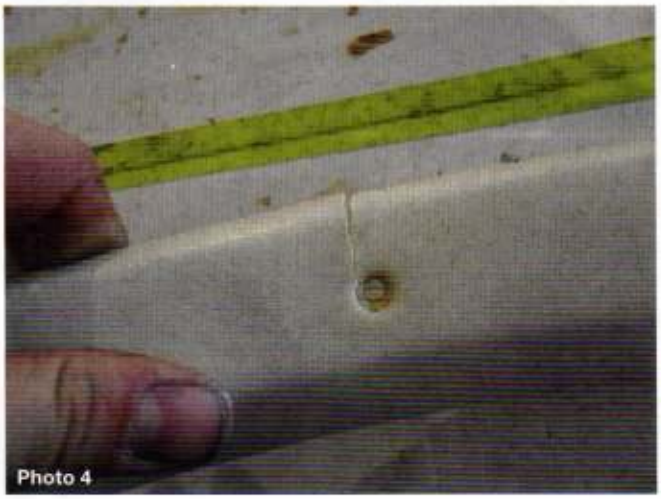

Photo 4

good news was that our shop has accumulated an almost complete set of repairable and flexible A36 window frames over the years that we contributed to the project (more on the repair of these components later). Plane Plastics also generously donated several new pieces to complete the set.

To Work...

The first step in the repair process is to thoroughly clean both sides of the window frames using a strong spray cleaner


Photo 5

(Simple Green, Fantastic, and 409 work well). Apply a generous coat of the cleaner and allow it to soak in for a while. Then aggressively scrub the surface with a short bristle brush followed by a thorough rinse with hot water. The repair process is identical to what was described in the previous spar cover article, but here it is again:

Heat and form the frames back to their designed shape using a 1500°F heat gun available at place like Harbor Freight (**photo 5**). Control the shape of the heated, soft plastic using aluminum or wood shapes and clamps.

With the component re-formed to its original shape, use water-thinned Polyfix adhesive (available at Aircraft Spruce) to temporarily tack-bond the cracked area together.

Apply two layers of two-ounce Hobbico fine-mesh fiberglass cloth (available from Amazon) and the Polyfix adhesive to the back surface of the area being repaired and one layer on the front surface. This fiberglass reinforcement will ensure a stable and strong repair (**photo 6**).


Photo 6

The final step is to apply a thin layer of automotive body filler and high-build, sandable primer to the finish side of the window frame. These items can be found at your local auto body or paint supply store. A little sanding and the application of final finish coats of acrylic lacquer will produce an invisible, strong, and durable repair (**photo 7**). Use either acrylic lacquer, available from auto paint supply stores, or SEM spray paint from Plane Plastics.


Photo 7

For those window frames that have been covered with vinyl or leather, the usual fix is to replace the frames with new components and finish them with acrylic lacquer or SEM coating. The labor required to carefully remove the cover material and bonding adhesive from the original frame, and then repair what damage you will find hidden underneath, can easily exceed the cost of buying and installing new frames.

For plastic frames that were painted with urethane or spray can enamels, the first challenge is to remove as much of the incorrect finish as possible *without damaging* the textured surface of the plastic. Once the frame is thoroughly cleaned, we carefully use a wire brush and an air nozzle to remove as much of the loosely bonded old finish as possible. Then it's time to repair the frame as described earlier. The final, very important step is to apply a coat of water-based barrier primer, which prevents possible adhesion or lifting issues when the new paint is bonded to the old finish. To ensure long-lasting results, we use a product sold under the name Barcoat (available at auto body supply stores).

Now that the window frames are cleaned, formed, repaired, and ready for final painting, it's important to reinforce them by

Photo 8

Photo 9

bonding 0.040" formed aluminum anywhere that has deformed in the past, as it will likely deform again in the future. One such area is the upper edges of the window frames where they meet the headliner. We bend a 3/16" lip along the edge of a two- or three-inch-wide piece of 0.040" aluminum. We sand both bonding surfaces with 80 grit sandpaper, then apply a generous coat of contact cement and allow it to tack up for 10 to 15 minutes. Be certain sure to use high-quality, brushable contact cement – we use MC5 brushable, sprayable contact cement that we purchase locally at Miami Corporation in Cincinnati. Do not use 3M 1300L weather strip adhesive; it will discolor the plastic and does not have the same bonding qualities as contact cement. Once the adhesive has cured, we clamp the formed aluminum reinforcements in place with spring clamps (**photo 8**), using paint sticks on the front side to protect the textured finish of the plastic. We heat the aluminum with a heat gun until it's hot to the touch, then allow the bonded area to thoroughly cool. After the clamps and paint sticks are removed, we have a thermally stable, very straight edge that will not deform in the future (**photo 9**).

We use this aluminum reinforcement process on new window frames as well to prevent them from warping like the originals.

One final step: Before applying the finish coats of paint, have a pan of clean lacquer thinner and a soft rag at the ready. Immediately before beginning to spray the first finish coat, wipe any bare plastic surfaces with the lacquer thinner. This makes the plastic surface slightly sticky, ensuring a very thorough bond between the bare plastic and the lacquer or SEM finish coat.

Following the steps outlined here will result in a very durable and attractive set of window frames.