

# Side Panels

By Dennis Wolter



We're all familiar with the term "hump day." During college we thought it was when midterm exams were over. For most working Americans, it's Wednesday; we're halfway through the week and looking forward to the weekend. Here at Air Mod, hump day has little to do with the halfway point in the job and a lot to do with the day that the cabin clean-up and chromating is completed. The nastier the task, the sooner we want to get that part of the renovation over with. So now that the inside of the cabin is clean it's time to get back to the fun part of fabricating and installing a new interior.

The big challenge in the side panel game is deciding what will be done with the armrests. As with seats and so many other interior components, there are many ways to improve the original, factory-installed armrests. We can also start at the beginning in designing and fabricating a completely new armrest system. In either case, we will show you all how to improve the comfort, durability, aesthetics and function of the side panels and armrests in your Cessna.

Since a lot of folks choose to undertake an interior themselves, I'm first going to discuss repairing and reupholstering the various side panel / stock armrest systems used by Cessna

from 1946 through the new airplanes being produced today. Our mission, as always, is to make these components better than new by making them easier to remove and install as well as more durable than when they first left the factory.

In the entire Cessna line of piston airplanes, the armrest designs fall into five categories, based on materials and method of construction and upholstery. Group One: From 1947 through the late 50's, Cessna fabricated the armrests in 172s, 182s, and twins using built-up aluminum components. Group Two: Plastic armrests came into the game in the early 60's in the form of fairly durable injection molded plastic armrest bases with a separate metal-backed screw-mounted pad; these were installed on 172s, 182s, 206s and a few 210s. Group Three: During the 1970's Cessna switched to a rubber molded, metal reinforced, painted type of (not-so-great) armrest for most of the single engine line. Group Four: Not to be outdone on the bad design scale, Cessna created a, shall we say, more challenging armrest design. From the late 70's through 1986, 172s, 182s, and 206s were built with composite armrests. These beauties were basically a vacuum-formed plastic shell with minimal aluminum reinforcement



***From top to bottom: 60's injection molded, 70's rubber molded, late 70's-80's composite, and 70's 210 all aluminum (three pieces - center one is discarded).***

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***Original factory finish, all aluminum 210 armrest.***



***The same armrest with the dented aluminum overlay removed, and the entire assembly covered in leather.***



*The old foam is easily removed with a router bit and a moto tool.*

and urethane foam filling for some hope of structural integrity (I think a cream filled donut stood a better chance of holding up over time than these guys).

Group Five: The lightest in weight, easiest to manufacture, and least durable armrest that Cessna came up with is the pure vacuum formed plastic type with little or no metal reinforcement, thank you. These components are truly just as described in the previous sentence – a hollow shell of the same plastic used to fabricate the window frames. Cessna first used this type of armrest in the 150 line during the 1960's. Today they are used in the new production piston airplanes. We do a couple of interiors a year in new airplanes, and usually find cracks in these nearly new all vacuum-formed armrests. The message

here is that the newer the airplane the more likely the armrests will be damaged and the more effort it will take to repair, reinforce, and restructure these factory components.

It was common for Cessna to use a combination of two armrest types in the twin engine line, most notably the 340 and 400 series airplanes. Back in the main cabin they used mostly all aluminum structured armrests, while on the flight deck they used later style pure vacuum formed plastic. These airplanes are blessed(?) with having both the best and the worst Cessna armrest designs.

In some cases it is very difficult to pin down which arm-



*The new steel tab being installed with machine screws and nuts. Note the access holes that we drilled through the rubber base to facilitate installation of the mounting screws.*

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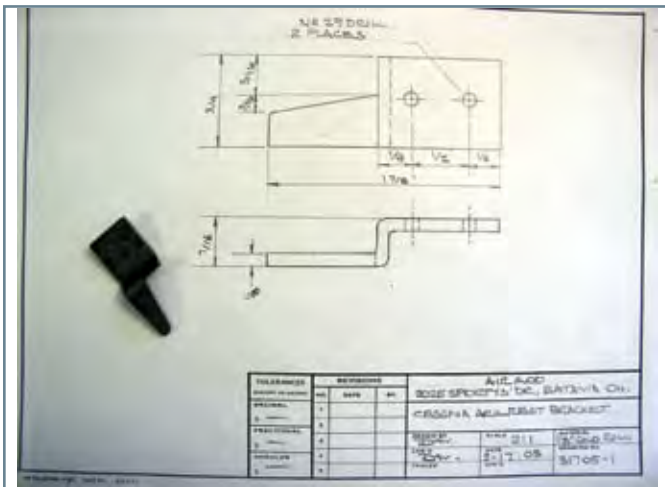
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rest types are in which airplanes. The above groupings is as accurate as my memory allows me to recall, however some aircraft may have armrests that do not fall in the above described groups. The mission here is to show how Cessna made armrests and how to handle repair of those armrests.

Hindsight being 20/20, it's easy enough for us to expose the problems mentioned above. The challenge is to improve things. Let's take each armrest group and go through how to repair, reinforce and re-structure each of these very different types of armrests.

In view of the fact that the late 40's and early 50's armrests in Group One were so well made, I really have no repair information to pass on, with one exception. The later 210 all-aluminum armrest systems, like the earliest 172-182 components, are padded and upholstered with traditional methods, but one 210 detail is worth mentioning. Cessna originally installed a sort of buffed full-length aluminum overlay panel and black rubber end plugs to





*An engineering drawing of the 1/8" steel mounting tab.*

trim out the aluminum armrest substructure. Here at Air Mod we send the usually dented and scuffed soft overlays to the landfill, and upholster the base structure with nice top-stitched ends to cover the unsightly black plugs. Looks great, and is quite durable.

The Group Two injection molded durable armrests usually only need to be painted and upholstered. Since most of the plastic bases were hot chrome plated, one must sand off the thin chrome plate from the base before applying primer and finish paint. We use sandable grey lacquer primer surfacer and a lacquer topcoat. I would be remiss if I did not caution you to follow the label's instructions for these products! I receive countless calls from people doing their own interiors who are experiencing problems with paint or glue application, and the proper procedures for problem avoidance are clearly detailed right on the can.

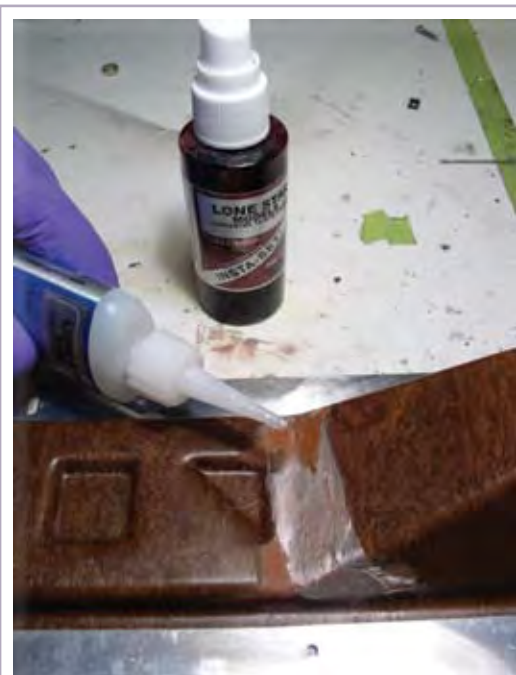


*Original factory finish-out for the 80's composite armrest.*

Moving on to Group Three, molded rubber armrests of the 1970's, we face a technical challenge. Cessna used a .032" flimsy aluminum locking tab to secure the cabin door armrests at their forward end. Not many technicians know that one must push the armrest into the door as they shove the armrest aft to release the very delicate forward mounting tab from its mounting slot. This means we usually find that these tabs are broken,

and every fastening known to man has been employed in an attempt to re-secure the armrest. The fix is to fabricate a more durable heavy-duty mounting tab that is secured to the original mounting tab structure using 4-40 steel machine screws and nuts. You gain access to this area by removing the surrounding foam rubber with a router bit on a Dremel rotary tool. Don't forget to open the slot on the door bracket to accommodate the thicker steel mounting tab. I have included a shop sketch of a 1/8" thick steel tab we think works quite well. Strong, durable and easier to remove and install – all good stuff!

With the mounting problem solved, it's time to address making these things look good. Cessna originally sprayed these nerfball-rubber armrests with a vinyl spray which, as everyone knows, didn't hold up. If you wish to re-spray them as original, the product to use is SEM Color Coat flexible coating, available at automotive supply houses. Just a reminder,



*Cyanoacrylate adhesive is being applied to the fiberglass-reinforced crack area.*

read the instructions on the can. It's a good idea to thoroughly scrub the entire finished surface with lacquer thinner and a soft brush and allow it to dry for an hour before applying the new finish. This will ensure proper bonding of the new finish to the old rubber armrest.

For better results, sew and install a form-fitting cover using vinyl or leather. Here's a neat trick. Do all of the fitting and sewing using the armrest as it came from the factory. Then apply a layer of 1/4" soft foam to the exposed armrest surfaces before covering. This thin layer of foam under the finish upholstery will help to create a wrinkle-free and plush looking armrest.

OK, it's time for the "big banana", the Group Four composite armrests. Here's your chance to show off your technical skills (you're going to need them!). The main challenge with this armrest design is that the plastic shell, like your window frames, cracks under the strain of normal use. Aging plastic



*Typical riveted aluminum reinforcement - very strong!*

issues isn't working in favor of these things either.

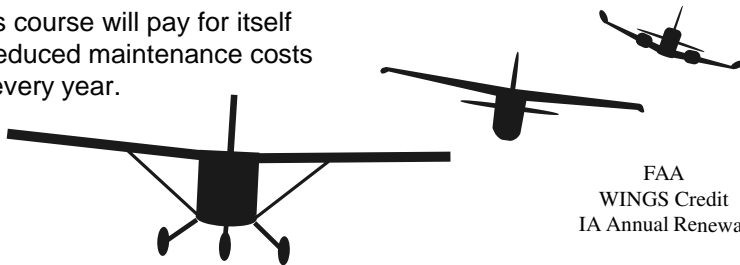
Start the repair by mining out all the old urethane foam and thoroughly clean any foam residue in the area that needs repair. On the finished side it's important to sand through the wood grain decorative finish. All this cleaning is necessary to ensure optimum bonding of the repair adhesives. What we have found to work best is a super thin cyanoacrylate adhesive, insta-set spray accelerator, and hobbico 2 oz. fiberglass cloth from Lone Star Models (972-218-9663). The first step is to allow capillary action to draw the thin adhesive into the cracks and then instantly cure the adhesive with the insta-set

accelerator. You will notice that a great deal of heat is generated as the curing process occurs. This heat helps to thoroughly bond the plastic so you end up with a strong thermal and adhesive bond. The next step is to reinforce the repair. This is done by cutting the 2 oz. fiberglass cloth into whatever shape will properly contour to the location of the repair. Bond the reinforcing cloth to the surface with the insta-cure adhesive. In high stress areas we will bond two or sometimes



*Composite armrest assembly, padded and upholstered. Looks great and is very durable.*

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three layers of cloth to both sides of the repair. Increase the size of the fiberglass cloth with each layer so as to eliminate having a pronounced relief of all three thicknesses of cloth ending at one edge of the repair. The final plastic repair step is to smooth out the surface by sanding the area with 150 grit sandpaper, and for an extra measure of strength, reapply a thin coat of post-sanding adhesive and catalyst. A safety note: use gloves, a charcoal painter's mask, eye protection and lots of ventilation as these chemicals contain some unhealthy stuff.

Now it's time to reinforce the armrest with aluminum so that it doesn't fail in the future. It's all about making it "better than new." Using .032" 2024 T3 aluminum, fabricate a formed metal backing piece that reinforces both the armrest and its mounting points. In most installations we secure these aluminum shapes to the plastic armrest with click fast 1/8" hardware store pop rivets. Always install the rivet with the big factory head on the plastic side and the field head (the one that forms when you pop the rivet) on the aluminum side. We like to fabricate a .040"-.050" aluminum armrest bracket





*Aluminum reinforcement on a vacuum formed armrest (this component had cracked after only 100 hours in service).*

that is mounted to the airframe. This hard-mounted bracket will ensure that there is enough structural integrity in the armrest / mounting bracket system to handle the loads imparted by even the heaviest of passengers.

With proper metal reinforcement, reinstalling a urethane foam core is not necessary. However, if the shape or the location of the repair is such that optimum strength cannot be



*A new 206 done in our shop, with reinforced and upholstered side panels*

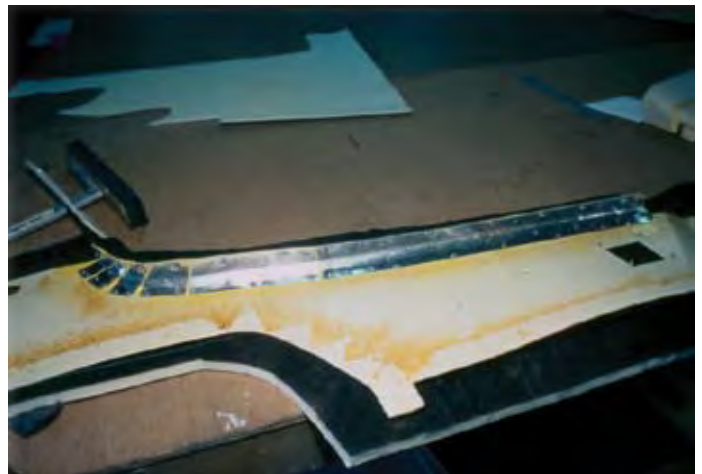
attained with plastic and metal reinforcement, then foam is your only option. Sometimes you gotta do what you gotta do. Here's a trick worth considering. We often will fill the back cavity of a difficult to reach repaired area with Bondo auto body filler. Talk about strong. The bad news is Bondo is heavy, so we use it only when necessary.

While I'm on this subject of bonding, reinforcing and filling, I want to stress a most important issue. Success with all of these plastic repair techniques starts with cleanliness and proper surface preparation. Always clean both sides of the part with strong detergent before beginning any repair work.

Sand the surface to be repaired or back filled to ensure that it is properly textured before starting a repair. The now-textured surface will go a long way to ensure a 100% bond with the adhesive. It's all about good prep!

We have found the best way to cosmetically finish these plastic based armrests is to cover them with vinyl or leather. Even though the plastic can be prepped and painted, upholstery is definitely better looking and more durable.

Finally, we are on to the last group of Cessna armrests, the Group Five un-reinforced, un-bracketed, vacuum-formed armrests. The first order of business is to clean, reform, and repair these components as described earlier. That at least puts you back where you started. The next thing to do is to reinforce the armrests with .020" or .032" aluminum and rivets. Finally, if at all possible, build an armrest support bracket that is secured to the airframe structure and supports the armrest when someone leans on it. It's got to be strong. Think of your



*Formed aluminum window sill lip riveted to the top of a plastic side panel in a 182.*

250-pound uncle pushing off of your armrests to get out of the back seat of your 182. Ouch!

One final note, since some of these armrests have exposed plastic in the un-padded areas, it will be necessary to properly fill, prime and paint these surfaces. Since painting these surfaces is the same process that will be discussed in a future article on window plastic repair, we will elaborate on this at that time.

Well, that's about it for the good, the bad, and the ugly

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*Re-designed and relocated heat outlet*

of Cessna factory armrests. I bet you never thought someone could spend so much time writing about this. Actually, neither did I until I sat down and started into this article.

Moving on to side panels, Cessna single engine airplanes are blessed with having side panels that, for the most part, are made of light, durable, and repairable materials. Piper chose to use a dreadful foam and paper composite material. Beech, in later airplanes, used a preformed delicate honeycomb material for their side panels. Thankfully, Cessna used either aluminum or Kydex plastic (of window frame fame).

The first step in the process of repairing the side panels is to carefully strip all of the old finish materials from the aluminum or plastic side panel backing panels. In last October's issue of this magazine I outlined that process. With the backing panels stripped, you must decide whether it's better to repair or replace each component. Whether you ultimately repair or replace, there are some considerations.

First, if the component has deformed or become damaged, what is the optimum repair procedure? Second, why did it fail? If it's a plastic part, can it be fabricated from aluminum, reinforced with fiberglass and adhesive, or reinforced with aluminum? Perhaps adding additional structural support in the form of more mounting points or an aluminum angle support strip would preclude another failure in

the future. We often solve a plastic deformation problem by bonding .020" aluminum to the back side of a plastic panel. We use 3M 8046 trim adhesive for this bonding (read the instructions on the label). 182 and 210 plastic upper aft side panels are particularly susceptible to heat-induced warping where the panel to be upholstered is formed to roll into the base of the long aft side windows. Most of the time the upper lips of these panels are so deformed that we remove the lip and rivet a .020" formed aluminum angle to replace the deformed and cracked plastic. The picture shows it all. Repaired this way, even summer weather in Phoenix, Arizona won't be a problem.

Can a damaged component be modified for easier removal and installation? In some cases we will modify either the side panel or something mounted to it to be less susceptible to failure or damage in the future. A good example of this thinking is to see how we deal with the forward side kick panels on 172s, 182s, 206s, and 210s.

Two very consistent problems exist in this area. One is the fact that Cessna installed a very flimsy stamped aluminum heat outlet too close to the edge of the door. Just removing and



*Heat outlet, re-trimmed and mounted 2" forward of its original location*

reinstalling the front seats requires jamming the seat frames hard against these delicate outlets. The fix is to move the outlets 2" forward, and fabricate a new outlet piece using formed .050" aluminum extrusion. We like to attach this new, sturdier outlet with two 1½" long screws that push against a .040" aluminum backing plate. This technique ensures that the outlet remains fully open, helping to eliminate a cold cabin during winter. Looks better, works better, isn't easily damaged, and easy to assemble and disassemble – enough said!

The other issue with these forward

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*New .025" aluminum side panel with the re-located original heat outlet cover riveted in place.*

side panels is that they extend too far up behind the instrument panel, making them difficult to remove and reinstall. Difficult means damaged. Here's your chance! Simply trim some of the offending and unnecessary upper bulk off of the metal side panel. Your mechanic will be thrilled. There are lots of other time-saving improvements and details to cover and I'll go over them as we continue.

It's time to start repairing any side panel components we've decided not to replace. The photo pretty much shows the problem. The condition of the 182 side panels shown here is pretty representative of the now 30-year-old interiors we see in our hangar. Between the metal work required to relocate the heat outlet, and numerous tears and dents as in the example shown, we most often end up replacing the forward side / kick panels on most Cessnas. Since this panel has to come in and out of the airplane frequently, we will fabricate it from slightly thicker .025" 2024 T3 aluminum in an effort to make it more durable.

In 1970-1980 Cessna 172s, cardboard side panels were used in the back seat areas. We fabricate new panels using .020" 2024 T3 aluminum. I strongly suggest using aircraft grade 2024 T3 for all side panel fabrications. Non-aircraft aluminum, such as the type sold at builders supply stores, is not tempered, meaning that it is very soft and will bend and wrinkle quite easily. Also, aircraft aluminum is coated with a thin pure aluminum coating, known as alclad, for additional corrosion protection.

For the aluminum side panels that we intend to reuse, the repair techniques are straightforward. After we strip off the old cover and backing materials, we grab a small ball-peen hammer and lightly begin tapping out the dents and creases in the thin aluminum. Working on a hard, flat surface is as important as employing proper hammering techniques. Using the rounded side of the hammer, lightly tap

the damaged area. Start at the outer portion of the deformation and work inward toward the apex of the dent. Don't pound the apex of the crease down first. Heavy blows with a flat hammer will stretch the metal, making it quite wavy. Practice makes perfect. Use a piece of side panel that you don't intend to reuse to get the hang of dent removal. It's all about not stretching the metal.

Rips and tears in the metal can be repaired using overlay patches held in place with 1/8" hardware store rivets. We like to tap the soft pulled rivets a little flatter and then disc sand both the factory and the pulled head to reduce the thickness of the heads. This makes for a smooth, unseen repair once the panel is padded and upholstered. Again, try this stuff on a junk panel first.

Adhesive repair techniques for the molded plastic side panel components are identical to those described earlier in the armrest part of this article, so I won't bore you all with it again.

Next month we will get into modified armrest and side panel installations. Changing the armrest design is a major



*Original forward side panel removed from a 182. The condition we see here is typical.*

factor in transforming your interior into something more modern as well as more comfortable. 'Til next time, fly safe.

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