



*The World's Largest Manufacturer of Light Aircraft Windshields and Windows*

## AIRCRAFT WINDSHIELD AND WINDOW CARE AND MAINTENANCE

You can keep your aircraft windshield and windows looking and performing like new by using the proper care products and techniques, and by understanding a little about the material you are working with.

First, most aircraft windows are acrylic plastic (as opposed to “Lexan” or polycarbonate), and acrylic plastic is scratchable. Proper care involves preventing scratches that are preventable and properly taking care of those that are not.

When cleaning a window, always remove as much abrasive dirt as possible without touching the surface. Ideally this would involve flushing the surface with water and allowing the accumulated bug residue to soak, possibly with a little dish washing liquid added to the water. If a little rubbing is needed, do it lightly with your bare hand. After a final flushing with more water and carefully drying with a clean soft cloth, use a good grade cleaner/polish intended for acrylic windows, following the manufacturers directions.

We need to step back here and take a look at cleaner/polishes. Everybody seems to have a favorite, from great and proper to poor and very dangerous. The good ones, at least those that are safe to use on acrylic plastics, tend to be the commercial ones, intended to be used on this specific material. The bad ones, including the very dangerous, tend to be materials never intended to be used as an aircraft window cleaner/polish, such as glass cleaners and furniture polish. Glass cleaners invariably contain ammonia, a killer of acrylics. **DO NOT** use anything containing ammonia on acrylic plastics. It will cause crazing (thousands of microscopic cracks) in short order. Furniture polish seems to be safer, but its long term use is undocumented and reports indicate it builds up and produces smears that are hard to polish off. Something to consider about furniture polish - it is intended to be used indoors, not outdoors, and on furniture, not aircraft windows. Furthermore, it's not much less expensive than many aircraft window products.

Good and safe care products vary in their ease of use and other properties, so if you don't like what you're using, give another a try. Talk with other pilots about what they are using, but be sure the product you select is intended for acrylic windows. Other products to keep away from your windows include any aromatic solvent, such as methyl ethyl ketone, acetone, lacquer thinner, gasoline (a minor fuel spill should do no harm), and, heaven forbid, paint stripper. If you have to remove masking tape residue or other sticky or greasy stuff, the safest solvents are 100% mineral spirits or kerosene. Some alcohols are safe, such as isopropyl alcohol, but not all.

Concerning the polishing cloth, use the softest cotton cloth available. One hundred percent cotton flannel is ideal and available in yard goods stores. Old washed-out cotton T-shirts are a good second choice. We at LP Aero Plastics have never found a paper product that did not scratch, even those advertised for cleaning plastics. One benefit of cotton cloth is that it can be washed, thereby effectively recycling the material.

Your choice of cleaner/polish should also be based on what is needed. Basically, you have to determine what type of care is needed and pick the best products to do the job.

First, it's best to understand what types of products are available. They can be loosely grouped into three categories:

1. Non-abrasive liquid sprays, in pumps or aerosols, that may or may not have scratch filling properties.
2. Non-abrasive creams that have scratch filling properties.
3. Mildly-abrasive creams that have scratch removing properties.

Since windows do accumulate minute scratches as part of everyday life (the kind you can't feel with a fingernail but can really see when flying into the sun), the products that fill fine scratches are great for regular use. If scratches still appear when flying toward the sun, the abrasive variety and some elbow grease is called for. This type of cleaner should be used occasionally only as needed. Most manufacturers of abrasive cleaners recommend following up with a scratch filling product as a second step.

So what happens when you have scratches that you can't take care of with the above methods and perhaps you can feel with a fingernail? You have to get more aggressive. The danger, though, is in getting too aggressive.

Practically speaking, the only way to remove a scratch from clear acrylic is to remove material from around the scratch down to the greatest depth of the scratch, then polishing the window back to clarity. There are two problems with this process. First, polishing back to clarity can be a difficult process especially if you started with a coarser than necessary abrasive. Second, it is very easy to induce an annoying and possibly dangerous optical distortion if you have not worked evenly in a large enough area.

Keep in mind that some scratches are best left alone because sometimes the cure is worse than the ailment. But if you decide to proceed, the morals of the story are to have the patience to work with only the finest abrasive necessary to remove the scratch, and to work in a large enough area to prevent optical distortions. Also, be sure to practice on scrap material before you tackle a windshield or window.

The 3M Company, Meguiars, Micro-Surface (Micro-Mesh), and others all supply kits that will do this job - with lots of your help. The kits consist of many progressively finer abrasive sheets or creams that are used in sequence to remove defects and to polish back to clarity. Another product, our favorite, is the Satinal pad made by Transelco. This one-time-use pad is dipped in water and makes a 5-micron slurry that will remove fine scratches and polish back to clarity in one step. For deeper scratches, it can be used in conjunction with 600, 1500, or 2000 grit wet sandpaper. Again, it would be best to practice on scrap material. By now, you have figured out this can be a lot of work, and you're right.

Another consideration, especially on light aircraft, is the feasibility of trying to repair some windows. The windshield on the Cessna 150, for instance, is .125 (or 1/8") thick, and some Piper Cherokee rear windows are only .080 (or 5/64") thick. So when you start to remove material, you have to be aware of what you will have left structurally. Keep in mind that most repairable windows, such as those found on pressurized air liners, have published specifications for minimum allowable thickness. Most light aircraft have no such specification. Sometimes, labor spent on a repair attempt would probably be better spent installing a new window.

Another word of caution. If you are working on a homebuilt with polycarbonate, or "Lexan," windows, there is no good way to remove scratches. Polycarbonate is so soft that any attempt to remove material by abrasion will do more harm than good. There are hard coated varieties of polycarbonate that are less scratchable, but trying to repair a scratch in these will only remove the hard coating. Your only option will be to fill minor scratches with a scratch-filling polish or replace the window.

#### OTHER CARE PROBLEMS

Occasionally, we hear reports of canopy covers and sun shields that do damage in ways that are surprising.

Canopy covers, the ones that cover the outside of the windshield and windows, certainly have to be made of a soft material on the side that contacts the windows, but they must also be cinched down tight to prevent fluttering in the wind. Keep in mind that minute abrasive particles between the canopy cover and the windows are practically impossible to eliminate, and any movement of the cover grinds away at the windows.

Sun shields, the reflective curtains applied to the inside of the windshield and windows, sometimes have sharp metallic edges (especially the home made variety) that can scratch severely enough to warrant window replacement in short order. Trying to remove scratches from the inside of a sharply sloping windshield can be especially trying.

But both canopy covers and sun shields can cause damage of a chemical nature also. Some plastics, especially vinyls, can release plasticizers that will attack acrylics. A common example of this type of reaction is a fresh photocopy placed inside a vinyl notebook with the ink touching the vinyl. Soon you have everything sticking together. On an aircraft, if you have a volatile plastic in close proximity to your windows and add the heat of the sun, you may soon have severely crazed and damaged windows.

Certainly not all canopy covers and sun shields cause this problem, but it is a good question to ask at purchase time. Just be sure you are not sacrificing your windshield and windows at the same time you are protecting the avionics and interior.

But for all that can go wrong and shorten the life of aircraft windshields and windows, many flying today are well over 20 years old. If properly installed and maintained, longevity can, and regularly is, attained. You need to understand the material and the processes, and the rest is easy.