

The Airframe

typically caused by deterioration of the weather sealant around the transparency. Water seeping past the sealant gets between the plies and the area takes on a cloudy or milky appearance. When this happens the entire transparency should be replaced.

Initially, delamination may only be a problem of visibility. Moderate delamination does not particularly affect the bending or tension capability of the windshield, so if the visibility is good enough, there is no urgent problem. Some delamination along the edges of the transparency is normal, as window edges have limited adhesion to allow for temperature expansion. With glass windows, if delamination expands into the window and develops an irregular or jagged boundary, that is an indication of a lack of uniformity of the separation. This situation causes the polyvinyl butyral inner layer to pull chips of glass from the inner glass surface, which will cause failure of the glass ply. If chipping is present, or if the problem becomes worse, the transparency must be replaced. Smooth-edged, clear delamination typically does not get worse, as it indicates that the original stress causing it has been relieved.

Crazing

Probably the most common transparency-related problem is the network of fine cracks, which appears to extend all over the surface. Crazing does weaken the strength of the transparency.

The individual cracks are difficult to discern, and you have to view them by looking approximately perpendicular to the transparency's surface. The cracks are narrow in width, typically not more than about 0.001 inch deep, and usually lie below the surface rather than on it. For that reason it is usually impossible to feel them with a fingernail. There are two categories of crazing: minor and severe.

With minor crazing you typically don't see the lines themselves because they are so small. Instead, you see a distinct discoloration or milky appearance reflected in the light. Severe crazing may actually have fewer scratches, but they are significantly larger, appearing to be deep gouges in the surface. Again, these are actually under the surface, and while they can be removed with heavy but even sanding, it will require the removal of a substantial amount of acrylic material to clean up the transparency, after which an industrial repolishing procedure is required.

As I walk around airports, I see a lot of owners use external window covers. When I inquire about them, I'm always told they are there to save the windows and block the sunlight from overheating the cabin and potentially frying the radios. The real value of such covers is debatable. It's a feel-good solution that may have more of a downside than an upside. While they will be useful inside a hangar to protect the transparency from birds, outside they can be downright destructive to your airplane as they flap wildly, beating dirt against the window and accelerating deterioration. If cabin heat is a real concern, use internal Velcro-mounted covers instead. They will act as a heat shield and security device because they prevent anyone from looking inside the cabin and seeing the avionics and other installed equipment. However, even they may still seriously raise the temperature of the heat-sensitive acrylic, which can cause crazing and, in laminated windows, bubbles. The best strategy is to hangar an aircraft and avoid using any window covers.