July 18, 2022

POTOMAC AIRFIELD VKX

Windshield center-strap on non-pressurized Cessna 337?

HISTORY – Most aircraft from the 1960's and earlier relied on a vertical center support down the middle of their windshields ('strap')to 1) Provide mounting for a 'wet compass' and, 2) Support 'through-the-windshield' standard temperature probes of the day. Windshields as thin as possible to minimize distortion and minimize weight. Early plastic window would inevitably become hazy, brittle, and crack over time. Most windshields have since been replaced.

In 1963 Cessna introduced the 336 fixed-gear Skymaster with a 0.187 windshield. Common practice to avoid stress cracking, brittle windshields were secured floating in a soft felt surround. Like early plastics, early adhesives would also predictably fail over time.

In 1965 Cessna introduced the 337 (retractable) with a thicker 0.250 windshield secured in the same manner as the 336.

In 1973 Cessna introduced the *pressurized* Skymaster with significant changes needed for pressurization: Rear cargo door was eliminated, rounded windows for better sealing, a split 'airstair' door, maximum altitude reduced to 25k, seating limited to five, and a *wider* windshield center-strap providing *additional restraint against airframe pressurization.*

Instead of manufacturing two 337 airframe styles, all Skymasters manufactured after 1973 adopted the same 'pressurized' airframe design, pressurized or otherwise.

IN THE LAST 30 YEARS – Most every windshield of every aircraft of that era has since been replaced using modern UV stable plastics and better adhesives to increase visibility and improve safety. Most aircraft owners, of all makes and models, chose to remove the center straps of the early windshields. Modern compass and temperature probes offer better mounting options that no longer require a center strap for mounting. Modern plastics are thicker, clearer, inert, 100% stable, no longer subject to the same haziness, brittleness, and UV degradation of earlier plastics (See notes following).

Around 2010, FAA safety inspector (and Cessna 336 owner) Alfonso D Castillo researched all FAA and NTSB records for *any* history of any windshield issues for the Cessna 337 *and found none*.

CONTINUED –

In 2022 Mike Busch of Savvy Aviation summarized, *"Part 43 Appendix A doesn't say anything about windows or center strips, you have to go to the definition in FAR 1.1. If the proposed alteration does not rise to the level of "major" per that definition, then in the immortal words of Phil Knight, "just do it."*

SUMMARY – Under FAR 1.1, removing the center-strap of a replacement windshield is a minor modification, at the discretion of the aircraft owner and installing IA, not requiring STC. Constraints may include 1) non-pressurized 337 airframes, 2) 0.250 thick windshields, 3) use of modern UV stable acrylics and, 4) modern, stable installation materials and adhesives, 5) relocation of compass and temperature probes elsewhere.

History has proven proven this *safe* over time in hundreds of installations, consistent with common practice, and *improves safety* by enhancing pilot's ability to see and avoid.

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FROM Mike Busch mike.busch@savvyaviator.com

TO David Wartofsky bigcheese@potomac-airfield.com

Tue 3/1/2022 12:56 AM

I think it is NEVER appropriate to ask anyone at the FAA to make a determination whether an alteration is major or minor. That's the job of the installing mechanic, not the FAA.

The determination of major vs minor alteration is basically the mechanic asking himself "is this within my authority to approve, or is it above my pay grade and do I need to get the FAA involved?"

If the mechanic consults with the FAA, he's already made the decision that it's above his pay grade and that he needs to get the FAA involved (or more likely that he WANTS to get the FAA involved so he doesn't have to take responsibility for defending the alternation as minor).

Minor alterations are becoming a lost art because mechanics are becoming weenies who don't want to take responsibility for anything they don't have to.

The mechanic's decision is to be guided primarily by the FAR 1.1 definition of "major alteration" and secondarily by the exemplary list of major alterations in Part 43 Appendix A.

The mechanic's decision is NOT to be guided by asking the FSDO! If the mechanic does that, it's not his decision any more.

Since I believe that Part 43 Appendix A doesn't say anything about windows or center strips, you have to go to the definition in FAR 1.1. If the proposed alteration does not rise to the level of "major" per that definition, then in the immortal words of Phil Knight, "just do it."

EARLY *NON-PRESSURIZED* STYLE 337 AIRFRAME

Pre 1973 CENTER STRAP ***ATOP AIRFRAME / NOT CONNECTED***

POST 1973 *PRESSURIZED-STYLE* 337 AIRFRAME (pressurized or non-pressurized)

EXPANDED CENTER STRAP *IS* ***PART OF AIRFRAME SURROUND***

MANY EARLY 337 HAVE ALREADY REMOVED THE CENTER STRAP

5. "INSTALL THE NEW WINDSHIELD FASTENING IN SAME MANNER AS ORIGINAL, ***EXCEPT FOR CENTER STRIP***

INS A-6

Great Lakes Aero Products, Inc
915 Kearsley Park Blvd.
Flint, Mi. 48503 (810) 235-1402

Installation Instructions A-6

One piece Windshield Installation - Elimination of center strip
For Cessna 310B, C, D, F, G, H, I, J, & K
& Cessna 320, -1, A, B, C, D

STC # SA 391 GL

& STC # SA1078GL

1. Remove the compass, O.A.T., center strip and the old Windshield.
2. Clean the windshield mounting surfaces and repair any distorted metal (as required).
3. Fit the new windshield in the opening, as required, using the trimming methods described in the attached trimming instructions.
4. Apply sealant to the mounting surfaces - silicone rubber, dichromate putty or other approved sealant.
5. Install the new windshield, fastening in the manner as the original, except for the center strip.
6. Clean excess sealant - VM&P naphtha or lighter fluid will not harm the Plexiglas but most other solvents will. Use a good grade of aircraft windshield cleaner to remove the thin film that will remain after cleaning the sealant.
7. Reinstall the O.A.T., it may be installed through the windshield, but it is desirable to relocate it elsewhere.
8. Relocate compass as desired, a C 2400 L4P compass may be mounted on top of the instrument panel.
9. Repair painted areas as required.
10. Fill out 337 form

Retyped 6-15-1993

DOES ACRYLIC (PLEXIGLAS® AND LUCITE®) YELLOW IN THE SUN?

Since the beginning of the creation of plastics, many myths have been perpetuated about the longevity of plastics, especially outside in the elements. All plastics come from petroleum and natural gas. Sunlight, especially ultraviolet radiation, has a disastrous effect on most plastics. Some plastics, like polyethylene (PE) milk jugs, degrade quickly in the sun – in a matter of months. PE can easily be recycled. Many children's toys are made from PE and get brittle and crack when left outside. Acrylic (Plexiglas®, Lucite®, and Acrylite®) comes from natural gas and *is completely inert when in solid form*. American-made acrylic does NOT yellow in the sunlight. Witness the protective canopies and bubbles in the World War II bombers- *they are still clear after 50 years in the sun*! *There are three other clear plastics that do yellow in the sun and get confused with acrylic- Styrene, PETG, and Polycarbonate*. They have their respective qualities that make this an acceptable trade-off. Ask your Emco Plastics salesperson for information on all of these plastic solutions.

Source: https://www.emcoplastics.com/acrylic-faqs/

During World War II, a huge number of plastics were developed and put to use. Many of these products, such as styrene plastic, are still around today. Plexiglas, which is often mistaken for a petroleum-based plastic, is actually an acrylic substance that is formed from natural gas processes. As a result, ***Plexiglas is completely inert***. There are still rumors about the effects that sun has on this material though, but these rumors can be easily disproved.

Yellowing

There are a variety of petroleum-based plastics, including styrene and polycarbonate to give a few examples, which will yellow and become cloudy when exposed to sunlight for long periods of time. Lucite and Plexiglas are both acrylic-based materials made from natural gas that have also been lumped into this category, even though there is no yellowing effect on either of them. When natural gas is made into an acrylic substance, it becomes inert, which means it doesn't react chemically to heat, sunlight or chemical contact. As such, Plexiglas, despite the rumors, stays clear and bright in the sun.

UV

Another urban legend is the ultraviolet rays have negative effects on Plexiglas over long periods of exposure. As mentioned above, Plexiglas is chemically inert and doesn't react at all to sunlight no matter how long it has been exposed (Plexiglas cockpit covers on WWII planes are still clear despite decades of sun exposure). However, what Plexiglas does regarding ultraviolet light is reduce its intensity. As ultraviolet rays pass through Plexiglas windows, they're refracted and broken up, made less intense so that those on the other side of the window aren't exposed to the full level of the radiation.

Bubbling, Peeling and Cracking

The supposed fact that exposure to sunlight causes Plexiglas to bubble, peel or crack is also purely fictitious. Plexiglas often does crack once it has been installed, but this cracking is usually the result of temperature changes that cause expansion and contraction of the acrylic. Bubbling and peeling don't happen to acrylic sheets (though they do tend to scratch and scrape fairly easily). Other forms of plastic, such as polycarbonate, may bubble or peel when exposed to sunlight and the elements. These plastics are often confused with acrylic materials.

Source https://www.theclassroom.com/effects-of-the-sun-on-plexiglass-12080213.html