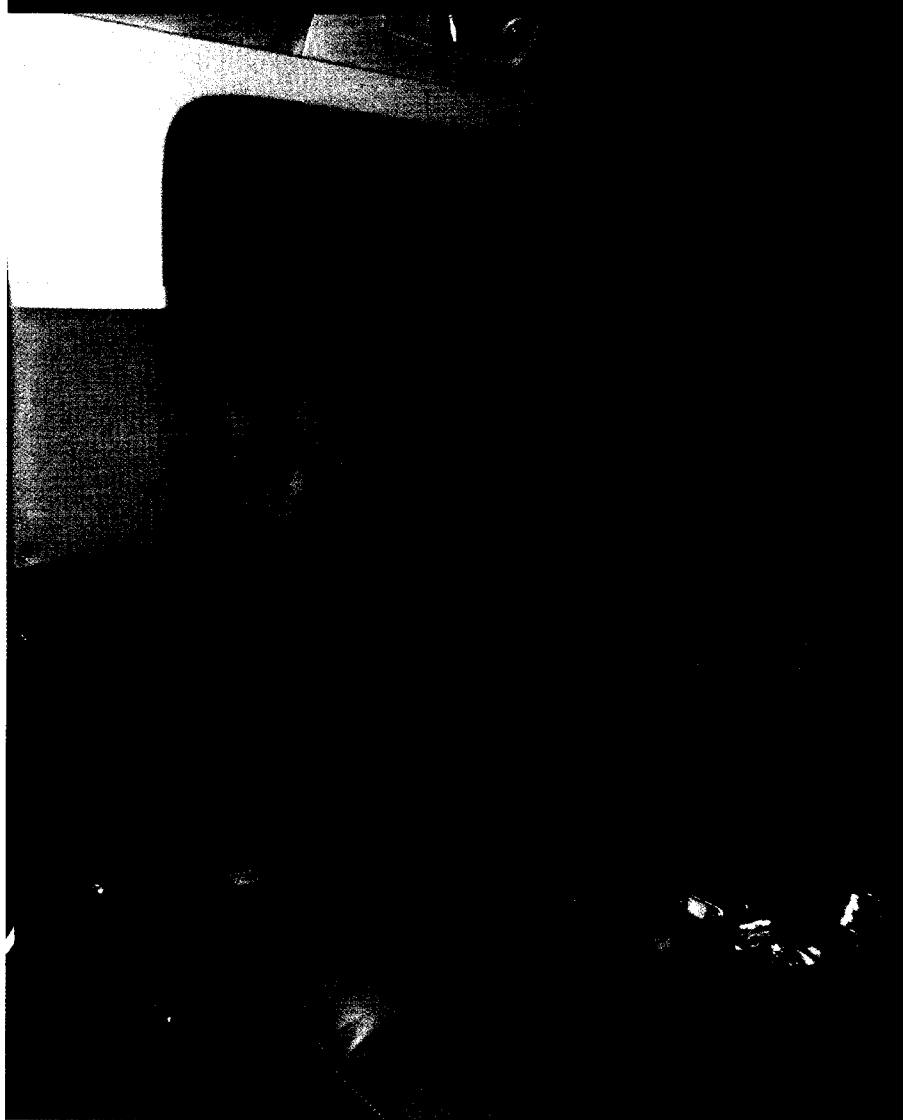


Renovating an Interior, Part One: Planning Comes First



Every owner has a unique list of needs and wants for their aircraft interior. Industrial designer DENNIS WOLTER explains how to prioritize your renovation for maximum efficiency and provides a list of key areas and items to consider before you upgrade your beloved airplane.

THIS month's renovation article is the first in a series that will address the planning, processes and execution of renovating interiors in light airplanes.

My initial intent was to save the interior articles until I've covered everything else; however, as I thought through the entire renovation process, I realized that totally removing an interior presents a great opportunity to efficiently perform other renovations and upgrades on your wish list.

Tasks such as installing new windows, avionics, passenger restraints, instrument panel mods, oxygen systems and other improvements can be undertaken with less difficulty if you're working in a corrosion-free, clean and open cabin area

that was cleaned and corrosion-proofed prior to the installation of new insulation and interior components.

Before moving on, I would like to address a very frequently asked question: "What should I do first, paint or interior?" The answer to this question can be predicated on many things. In an ideal world—funds and downtime permitting—the most efficient way to renovate an older airplane is to take it to a company who can do everything at one time.

For most owners, this is unrealistic. Money constraints mean most owners do what I did with my own 172: put together a plan that sequenced upgrade events based on condition and functional need. Since my original paint was cracking and peeling, allowing surface corrosion to start to develop, a new paint job became first on my upgrade list.

Putting new paint at the top of my list meant the condition of the aging windshield had to be addressed. Since windshield and window replacement often requires drilling out a great number of rivets, I decided to install a new windshield before taking my airplane to the paint shop.

The message here is, if any items on your wish list require disturbing the outside finish of the airframe, complete those changes prior to paint. Likewise, consider mods such as antenna changes, speed mods, passenger restraints and windows before doing your new interior. If removing a few interior panels reveals the presence of substantial cabin corrosion, a thorough cabin cleanup and new interior takes priority over paint.

If paint is done first, care must be taken by the interior shop to protect the new paint. If the interior is done first, the paint shop must keep paint chemicals and overspray from migrating into the cabin and onto doorjamb. Contact the professionals involved and ask questions. Good shops appreciate working with informed customers.

Renovation begins with planning

The first step in renovating your interior begins long before the airplane is in your hangar or the interior shop ready for the teardown process to begin. I'm referring to having a good plan in place. That starts with keeping a notepad and a camera in the airplane and making a list of items you want to address when you renovate the interior—whether on your own, with some help or by a professional shop.

As you cruise along, write down any-

thing that you feel needs to be improved or replaced, such as air leaks, ventilation issues, lack of storage, uncomfortable seats, poorly-latching windows and doors, water leaks, uncomfortable or nonexistent shoulder harnesses, deficient cabin and instrument lighting, awkwardly-located mic and phone jacks and similar concerns. Wish-list items can usually be dealt with (somewhat) painlessly while you are fabricating and installing your new interior.

At Air Mod, many of our customers have commented that, by taking the time to write down these details in advance, they were surprised at how lacking they felt the manufacturer was in detailing their interior and how lengthy that wish list became. The interior is probably the one major feature of an airplane that

...totally removing an interior presents a great opportunity to efficiently perform other renovations and upgrades on your wish list...

an owner or user relates to most. Here's your chance to really get it right.

Another helpful tip is to use your camera to document interiors as well as paint designs you see in the field that you really like. The intent is not to copy someone else's work, but to help you and the person doing the work to get an idea of what you really like from a design perspective.

Properly done, your new interior should be like a new airplane in detail and should actually be better than new in the areas listed below.

Safety

An interior renovation provides a perfect opportunity to increase safety, including:

- Using flame retardant insulation and finish materials that comply with FAR 25.853a will help make the interior part of the fire suppression system, rather than a "fire support" system.
- Improving cabin and instrument lighting to reduce eye fatigue and increase the quality of night vision.
- Adding state-of-the-art four-point inertia reel shoulder harnesses means better protection in case of an emergency.
- Using FAA-approved processes to build



Cessna 210 before renovation.



Cessna 182 thoroughly cleaned and ready for application of corrosion-inhibiting zinc chromate.



High-intensity glareshield panel lighting in a 172.



Four-point inertia reel shoulder harness from BAS Inc.

seat backs taller or add headrests to older seats to make seats more comfortable and safer.

- Thoroughly inspecting seats for structural integrity and function, and repairing mechanisms, frames and rails to alleviate seat-related safety concerns.

Comfort

Some of the details that add to overall comfort in an aircraft interior:

- Restructuring the foam and foam support system in the seats to achieve an ergonomically-shaped seat design with proper lumbar, thigh and thorax support that correctly and comfortably supports the occupant's skeletal structure.
- Using various FAA-approved flame retardant insulation materials reduces cabin noise levels and results in a warmer cabin in winter and a cooler cabin in summer.
- Major improvements in ventilation and heating systems can be achieved by replacing old, damaged ducts and feed hoses. Repair of worn heat and ventilation control systems and the installation of quieter, more efficient heat and ventilation outlets and nozzles is essential.
- Don't overlook improved eye comfort available by installing state-of-the-art sun visors and tinted, UV-reflective glass.
- Choosing breathable fabric for seating surfaces allows the pilot and passengers to feel cooler in the summer and warmer in the winter.

Convenience

Convenience is a matter of personal choice, and the only bad idea in this department is the one you didn't try to include in your interior project. Here's your chance to:

- Enhance storage through the addition of more map pockets and rigid storage boxes.
- Install fixed or fold-out cupholders.
- Create additional accessory plugs, USB ports, mic, headphone and music jacks.
- Add low-level but very effective reading lights.
- Include custom-built writing tables.
- Locate extended baggage compartments for loading of light but bulky items.

Customized, commercially-available storage units are accessorized with cupholders, armrests, fire extinguisher storage—you name it.



Certificated aviation maintenance technician thoroughly inspecting a seat for structural and mechanical condition.



New reinforced seat slings.

AIR MOD

SETTING A NEW STANDARD IN AIRCRAFT RENOVATION

ERGONOMIC SEATS

The most important link between you and your airplane is the seat you sit in. Renovating an aircraft's interior without properly rebuilding the seats would result in an incomplete job. As illustrated below, we recondition and restyle all of the seats in our interiors. We design and build these seats to dimensions known as "standard measure of man" (more than 90% of the population would be comfortable in a seat built to this standard). In addition, the pilot and co-pilot seats are usually built incorporating measurements taken during a fitting, insuring proper lumbar, thigh and neck support. Careful consideration is given to the use of different foam densities on all seats to insure a durable, comfortable support structure.

STEP 1 Strip seat to bare frame; mechanically recondition frame to like-new condition

STEP 2 Remove the canvas seat sling. Install heavy seatbelt webbing straps as reinforcement; stretch seat sling to insure against future sagging

STEP 3 Clean, mask, prime and paint seat frame to match new upholstery

STEP 4 Using aluminum, build seat back to proper height (unless headrests are desired)

STEP 5 Build the multi-density base foam

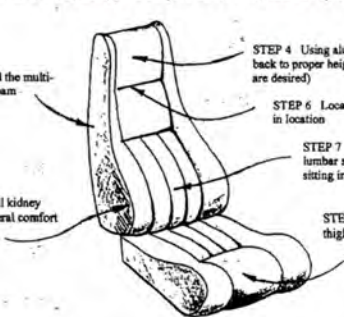
STEP 6 Locate and fit thorax pull-in location

STEP 7 Size and locate lumbar support with customer sitting in partially built seat

STEP 8 Install kidney support for lateral comfort

STEP 9 Locate and fit proper thigh support

STEP 10 Apply final trim foam as determined by new seat design and upholster with newly sewn cover material (fabric, leather, etc)



Handout describing how ergonomic seats are designed and constructed.



All-aluminum air vent nozzle flows more air with less noise and more control.

Durability

The use of modern foam and sewing techniques can help create a new interior that, in many cases, will outperform most factory interiors installed in new airplanes. Here are some ideas for increasing durability:

- Replace foam or cardboard side panels with new aircraft aluminum panels.
- Use of multi-density urethane foam allows the seat builder to put the extra support and higher density foam where it is most needed in a correctly-built seat.
- Be careful to only use UV-tolerant materials. This is a major factor in fabricating an interior that will be less prone to fading and eventual failure. I believe Old Man Sun is Air Mod's best salesman.
- Installing Velcro-mounted, serge-bound floor carpet in a number of smaller pieces allows for easy removal when it's time for cleaning. Clean carpet will last longer.
- Selecting durable fabrics made of sun-tolerant Dacron, polyester or wool fibers add longevity to a new interior.
- Choosing lighter, neutral colors such as beige or light gray that reflect rather than absorb hot sunlight and ultraviolet rays add to durability. Lighter-colored leathers, vinyls and fabrics also stay cooler in summer.
- Be sure that all interior components are sewn with Dacron thread. Never accept cotton.
- Using internal rigging in your seats and more durable sewing techniques help to eliminate misshapen seats and future seam failures.

Aesthetics

You get to pick exactly the materials that best suit your taste and how you will use the airplane. Even a hard-working bush plane can look plush—without delicate leather or fabric for upholstery choices.

Custom interior shops often have a person on staff who can design and render an interior concept that is aesthetically, functionally and ergonomically suited to your specific design taste, body shape and flying mission.

If you are ordering an owner-installed interior kit, many companies offer an array of sample materials from which to select your new interior. Enlist the help of a friend with some design skills to help you pick out materials and colors.

With good planning and research, your interior no longer has to look and feel like an economy car.



Double map cases on a copilot seat back.



Optional fold-out cupholders.



Custom-made Flight Boss storage unit with armrest.



Serge-bound, foam-insulated, Velcro-mounted carpet.

Maintainability

There are three interior design challenges for aircraft. The first is weight. To control weight, very light materials were used by the manufacturers, and light meant delicate.

The second issue is that aircraft interiors must be partially removed and reinstalled every year at annual time.

The third design challenge is age. Most cars have been sent to the recycling facility by the time they are 20 years old. Thanks to good maintenance and the passionate care of their owners, most light airplanes in service today are still going strong after 30 or 40 years.

Installing a new interior in your airplane presents a great opportunity in your ownership experience. You can extend the life of your new interior by making some design changes that will make components easier to remove and reinstall during inspections and maintenance.

As we go through an in-depth process of designing, fabricating and installing a new interior, I will describe options and processes that make the renovation, installation and reinstallation of seats, side panels, headliners and carpets so much easier.

The bottom line is, if a component is hard to remove and reinstall, it's going to make maintaining the aircraft more expensive and increase the probability of ending up with damage. I frequently receive calls from owners asking how to repair an interior component on an almost-new airplane after it has come out of maintenance. Here's your chance to prevent potential problems.

With all this planning stuff completed, let's get organized and start doing some renovation next month. Until then, fly safe!

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IMPORTANT: This article describes work that may need to be performed/supervised by a certificated aviation maintenance technician. Know your FAR/AIM and check with your mechanic before starting any work.

Industrial designer and aviation enthusiast Dennis Wolter is well-known for giving countless seminars and contributing his expertise about all phases of aircraft renovation in various publications. Wolter founded Air Mod in 1973 in order to offer private aircraft owners the same professional, high-quality work then only offered to corporate jet operators. Send questions or comments to editor@cessnaflyer.org.



A double-stitched seat cover ensures no opening seams.



Sewn-in rods and rigging twine that establishes a permanent structural connection between the finish upholstery and the seat frame.



A typical design sketch created with input from the customer.

Resources

FURTHER READING

14 CFR Part 25

Subpart D and Appendix F to Part 25
ecfr.gov

INTERIOR PARTS AND SERVICES – CFA SUPPORTERS

Cessna Flyer Yellow Pages
cessnaflyer.org/cessna-yellow-pages/interior-and-exterior-care.html