Seats and Rails

In this installment of his series on renovating Piper interiors, DENNIS WOLTER discusses seats and seat components, and offers tips for fixing commonly-found problems.

Now that we've repaired and painted all of those plastic components and interior trim, it's time to move on to renovating the cabin seats. At this time, there are six airplanes in our hangar going through the total interior renovation process. The oldest was built in 1959, and the newest left the factory in 2000.

The average age of the airplanes we work on is approximately 40 years old. One area that has been somewhat neglected over the years is the seats on which we sit. It's important to realize that, along with the seat belts and shoulder harnesses, these seats are considered as the primary structures, designed to safely hold an occupant in place in the event of an accident.

Years of service, and the apparent minimal inspection and maintenance, has allowed too many of these seats to fall into a state of safety-compromising disrepair.

The technical issues we will present in this article are a good representation of the most common problems we see as we prepare the seat frames for painting, and the installation of new slings, new ergonomic foam, and new custom upholstery.

Almost every interior renovation we run through our shop will require one or more of the seat repairs I'm about to discuss. The good news is that Piper Aircraft and aftermarket companies are doing a good job of supplying parts for these seats. So let's get started!

The No. 1 enemy

Accumulated dirt and lack of proper lubrication are the biggest enemies of Piper seats. Without question, the majority of seats we prepare for renovation are almost totally lacking evidence of recent lubrication, and we frequently find them covered with years of built-up dirt and dry lubricant residue.

Some mineral spirits, an old toothbrush, and compressed air will do the trick for cleaning. Clean anything that moves. Once cleaned, lubricate everything that moves. Good old 3-In-One or LPS 2 oil will do the trick. Cleaning and lubricating your seats once a year is an excellent owner-performed maintenance, rainy-Saturday project.

Tear down and inspection

Under the supervision of your maintenance technician, begin the seat renovation process by disassembling the seat and stripping it down to the bare frame. Reinstall the reassembled bare seat frame on the rails and inspect the seat by pulling the seat back and looking closely at the structure for cracks or flexing of mechanisms in either the back or base.

Any flexing of the seat frame or excessive looseness in reclining mechanisms, seat rollers, or seat stop locking mechanisms require repair by a licensed maintenance technician. Be prepared for the likelihood of a seat repair of some kind.

Cracked or broken seatbacks and base frames

The aluminum seatback frames installed in the late 60s and newer Pipers are prone to cracking. These cracks can be repaired and reinforced with approved materials, processes, and hardware. Cracks in steel seat frames require professional repair and reinforcement with the use of approved welding processes.

Seatback reclining mechanisms

Bent, missing or homemade seatback stops, seatback adjusting cams, and mechanisms require replacement with new correct factory components and proper adjustment to ensure cor-

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rect function and strength. Remember, your safety depends on all of these components holding you in the seat and seat belt in an accident.

In an effort to reduce injury, Piper designed seat bases to be energy-attenuating by curving the seat base supports to allow the seat to collapse in a more controlled manner if subjected to a high impact G-force. Great idea! Again, it's very important to check these seats for cracks.

Crack found in a 1970s Arrow lower seatback.

Structural repair of a cracked seatback.

Badly bent seatback stop.

Seat feet and rollers

Over the years, we've found some pretty strange substitutions for factory seat rollers. Talk about compromising safety. Incorrect rollers allow the seat to move laterally under load, bending the seat feet and reducing the foot's ability to track and latch properly, significantly reducing the ability to hold the seat on the rail.

Seat stops

Believe it or not, we rarely get an airplane in for renovation that contains the required number of approved seat stops. This is serious stuff. Should a seat latch let go on a seat with missing or incorrect stops, the seat and its occupant are likely to slide off the rail. Check the parts book to ensure your airplane has the correct type and quantity of seat stops.

Seat rails and seat stop latches

Inspect the seat rails closely for cracks and worn seat stop holes. The seat rails in some Pipers are also part of the floor support structure. A cracked or corroded seat rail can compromise the structural integrity of the airframe in the event of an accident.

In older airframes, it's a good idea to remove the rails and clean and treat any corrosion that can exist between the seat rail and floor structure. Also, be sure that the correct structural mounting screws are installed. Involve your maintenance technician in this process.

Seat height adjustment cylinders

For years, Piper used a combination of hydraulic and spring actuated height adjustment mechanisms. Over time these cylinder-type actuators lose fluid.

A direct after-market FAA PMA-approved replacement is available from AvFab (a regular advertiser in this publication). We've been installing these cylinders for years; they work great and cost less than Piper factory units.

Here's a plug for AvFab and other after-market approved parts manufacturers: This industry would be in dire straights if not for the many companies who have committed to reproducing expensive or obsolete original factory parts for our aging airplanes, providing much-needed FAA-PMA approved parts.

Taller seats and adding headrests

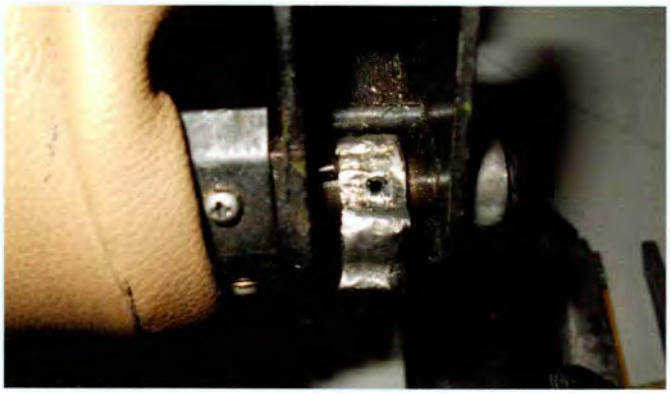
Many earlier Piper seats had low backs and no headrests. Some owners of these early airplanes want taller seatbacks or headrests. If the seat left the factory with headrest mounts, but no headrests, approved headrests can be installed.

But modifying the seatback by adding headrest mounts or extending the height of the seatback is a major modification of the seat structure. This process requires an engineering study by a DER (Designated Engineering Representative) to confirm that the seat and its mountings can withstand the load created by the additional leverage of a taller seatback or the addition of a headrest.

Often the DER will specify performing a pull test to verify that additional loads imposed on the seat frame and rails will not cause a failure of the seat structure and mountings. This approval process requires preparing a Form 337 and filing it with the FAA.

If someone offers to modify your seat, ask to see their copy of a 337 that verifies the approval of this modification for your make and model of airplane before authorizing the work.

We have received many frantic calls from airplane owners whose IA will not relicense their airplane because paperwork does not exist for their modified seats.



Badly worn seatback three-position cam.

Bent seat foot caused by the installation of an incorrect roller and a missing nut.

History lesson

Before moving on to next month's topic on how to prepare the seats for upholstery, I would like to put some aging seat issues into perspective. A little history lesson is in order.

When first designed, these seats were engineered to deal with a structural load of an approximately 170-pound occupant. Remember, they were dealing with the average weight of a 1960s person.

If you're anything like most of us, chances are your weight and body shape are a bit different from those high school and college days. And today's young people are not likely as trim as young people were in the sixties either.

Bottom line, many folks riding around in 40- to 50-year-old airplanes aren't hitting the scales at 170 pounds. The weight of the seat itself was a major concern in the design process. Decades of use, often limited maintenance and a possibly much heavier occupant, put all the stuff in this article into perspective.

The message here is, new interior or not, have your maintenance technician thoroughly check out the condition of your seats, passenger restraints, and seat rails as soon as possible. You rely on these components to hold you in position in the event of an accident.

If your seats are functioning in like-new condition, and you have good four-point inertia reel shoulder harnesses such as those available from BAS Inc., you

After-market AvFab seat height adjustment cylinder.

Pull test being performed on a seat frame.

have optimized the cabin safety of your airplane (more on shoulder harnesses in a future article).

(For three-point shoulder harnesses, contact Alpha Aviation.—Ed.)

Remember, you can't write the check on the way down.

Next month we will go through the process of re-slinging, re-foaming, and re-upholstering the seats. Until then, fly safe!

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@piperflyer.org.*

RESOURCES

Alpha Aviation
alphaaviation.com

AvFab/Aviation Fabricators
avfab.com

B.A.S. Inc.
basinc-aeromod.com

McFarlane Aviation
mcfarlaneaviation.com