Inspecting a seat frame for worn parts and cracks.

CLEANING AND REPAIRING SEATS

Interior restoration expert DENNIS WOLTER helps you ensure your Cessna seats will serve you well for many years.

Now that we've repaired all those plastic components, let's get into some seat work! Almost every Cessna we bring into Air Mod for renovation with an articulating pilot or co-pilot seat comes with a request to do something about the wobbly looseness in the seat. One customer actually said that if his pilot seat became any looser, he was going to put it on his front porch and rock away into his golden years!

Cessna began installing these desirable articulating seats in the early 1960s. That means that an original owner could easily be the grandparent of many of the current pilots flying these 40- to 50-year-old machines. Cessna owners are not alone in dealing with aging seats. The Air Force intends to continue flying its early Boeing B-52s for another 30 years. And I have a friend who still operates a fleet of 1940s Douglas DC-3s. Who would have thought? So, it looks like there is still some life left in these aging seats.

Of the five airplanes currently being renovated in Air Mod's hangar, the oldest was built in 1959 and the newest in 2000. With one exception, all appear to have been maintained to an above-average standard. That said, one area of maintenance that seems to have slipped through the cracks over the years is cabin seats. The complexity of articulating seats makes seats the one mechanical component in the cabin that I think needs the most attention.

New thrust washers from McFarlane.

In praise of Cessna seats

Before examining the wear points in these seats and associated repair processes, I feel it is important to say that these are unquestionably the best-designed, best-built, best-functioning, and most durable piston single-engine aircraft articulated seats in the General Aviation fleet. So, why have so many of them fallen into disrepair?

With the effort it takes to keep up with engine condition, landing gear maintenance, aging airframe issues, and AD notes, seats can get taken for granted and are often overlooked. Unless the owner/customer calls out a particular seat problem, maintenance technicians tend to ignore these seats, allowing the pilot and co-pilot seats, in particular, to degrade into a rocking and tracking mess.

The good news is the excellent build quality of these Cessna seats and the availability of new parts makes them very repairable and maintainable. Most of what it takes to keep seats clean and lubricated can be legally done by an aircraft owner under the provisions of preventive maintenance, FAR Part 43.3, Paragraph G, Appendix A.

So, let's get started.

The No. 1 enemy

Accumulated dirt and lack of lubrication are the biggest enemies of Cessna seats. Without question, the majority of seats we prepare for renovation are almost totally lacking evidence of any recent lubrication and are 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. Fully actuate the height and reclining cranks and thoroughly clean the jack screws. Remove the seat rollers, and clean the rollers, bushings, and mounting screws.

Once clean, inspect each component carefully. Any cracked or worn components should be evaluated by your maintenance technician. Not many people seem to realize that the seat we sit in is an important primary structural component. The seats can be a major factor in survivability in the event of an off-airport landing or serious accident. Imagine a seatback or seat latch letting go at a most critical moment of the flight.

With seat tracking rollers removed, install new, more durable side thrust washers (available from McFarlane Aviation). The originals from Cessna were made using the same plastic as your lovely window frames and are often totally shot by the time you inspect or upgrade your seats. The side thrust washers are there to reduce side travel and wiggle as the seat sits and tracks fore and aft on the rails. These washers also prevent metal-to-metal contact between the seat feet and the seat rails and help to ensure proper alignment of the seat latch pins and the seat track holes.

Lubricating seat mechanisms

With the seats cleaned and reassembled, lubricate the various moving parts. We use spray silicon to lubricate the tracking rollers. It doesn't leave an oily, dirt-holding residue that would eventually end up in both your carpet and seat rollers. Lubricate the jack screws with DC4 silicon grease; your maintenance tech will have some. Very little DC4 is required and your index finger is the applicator of choice.

Finally, using a light oil such as the old standby 3-IN-ONE or LPS 2, lubricate anything that moves, especially the large height-adjustment pivot tubes that pass through the cast aluminum main frame pieces. Don't forget the seat rollers and reclining mechanism on the non-articulating seat.

And remember, your aft seats have reclining components that will also need some attention. Thankfully, the aft seat lubrication can be easily done without removing the seat from the airplane. We all know the bench seats in some Cessnas can be difficult to remove and reinstall.

More complex seat maintenance, especially loose articulating seat issues, should be left to your maintenance technician, as they often involve somewhat complex disassembly and reassembly procedures.

Common Wear Points and Fixes

Here's a list of some of these common wiggle-generating wear points and the resulting fixes your maintenance technician will likely have to address.

Loose roll pins

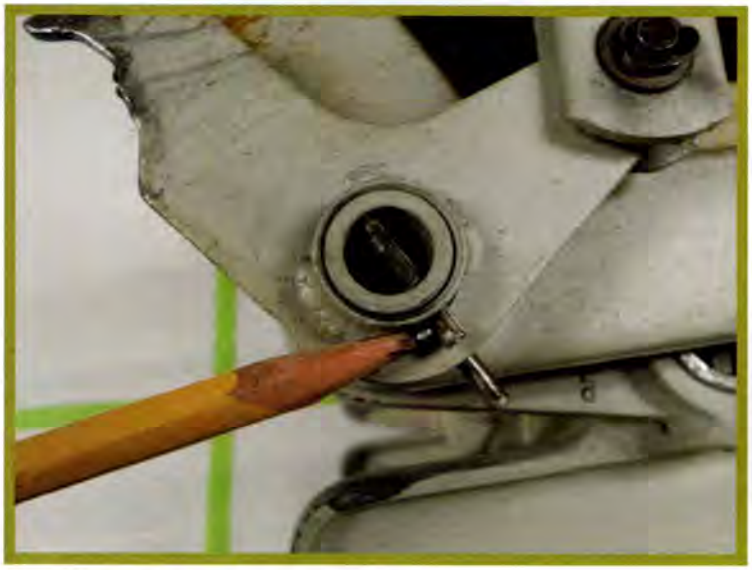
To save weight and space, articulating seats are held together with lots of roll pins. Any slippage of these pins must be corrected. The most common place to find loose roll pins will be the pins that secure the reclining bell crank to its supporting shaft. These small pins will often work their way halfway out of their holes, causing all the torsional load (and there is lots of it at this point in the mechanism) to be concentrated on only half of the bell crank attachment.

Inspect the bell crank for cracks or oversized holes. Due to close tolerances at this cam, oversized holes cannot be reamed to accommodate the next larger diameter roll pin. The only fix for a cracked crank is a new bell crank and roll pins.

If the pins and holes are in good condition in a crack-free cam, reset the roll pin so it is fully supporting both sides of the cam at the shaft, and use 0.032-inch safety wire to prevent future slippage. Check every roll pin in the seat base.

Jack screw wear

The crank-operated jack screws, for both height and reclining adjustment, can become worn. Longitudinal play in the jack screw will allow the seat to rock fore and aft. Most of this looseness can



Typical loose seat recline cam roll pin.

New roll pins secured with 0.032-inch safety wire.

be eliminated by adding additional shim washers to the existing stack of shim washers located close to the chrome crank. You can usually find the correctly sized shims from local machine shop supply companies. In a pinch, I will dimension the correct thickness of a washer spacer using a belt sander.

Worn clevis

The clevis and/or the clevis pin that connects the jack screw to the shaft that controls the angle of the seatback often becomes worn. Due to strength requirements, no upsizing of hardware is possible here, necessitating the installation of new parts.

Worn seat rollers and feet

Cessna used hard nylon or aluminum to fabricate their seat rollers. Wear can cause appreciable wobble in these rollers, requiring replacement, Don't forget to replace the previously mentioned thrust washers. Cessna has released Service Bulletins and AD notes that more fully address long-standing issues with seat tracking and rails. Of particular note is a new focus on the condition of the seat feet themselves. Two major issues are addressed by the recent Service Bulletin SEB11-4, one being the deformation of the foot caused by undue stress, the second being wear of the points of the foot itself. Have your maintenance tech check for these issues.

Worn large-diameter height-adjustment shaft pivot points

The least common but most difficult issue to correct is wear in the holes for or in the large-diameter pivot tubes that must rotate to raise and lower the height of the seat. Due to lack of lubrication, considerable wear can develop where these steel shafts pass through the aluminum seat frame. Correction of this problem can require in-depth disassembly of the seat.

Gap that needs shimming in a seat height adjustment crank mechanism.

Once removed, outside and inside micrometers will identify worn parts. If the shafts are worn, new components will do the job. If the seat frame holes are worn, custom-made bushings are in order. This level of repair will require a field approval since the seat frame is primary structure. In this case, I would either live with the looseness or look for a used seat that is in better condition.

Over the years, we've seen a number of articulating seats that have frozen-in-place height adjustment tubes, likely due to lack of use or insufficient lubrication. To correct this, we mix a very penetrating concoction of 50% ACF-50 or CorrosionX and 50% lacquer thinner. A couple of times a day, we brush on a generous amount of this penetrating mixture on both sides of the height adjusting tube where it passes through the cast aluminum seat frame. Continue this process for several days.

Use a heat gun (no open flames please) to heat the seat frame until it

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Seat height adjustment clevis that is often worn.

Checking the gap in a seat foot.

is hot to the touch and then actuate the height adjustment crank in both directions in an attempt to create some movement in the two shafts. Sometimes, we will also use a large crescent wrench on the bell cranks to break the frozen shafts loose. Repeated applications of penetrant, heat, and cranking will eventually do the job. Remember, if you lubricate your seats once a year, this problem can be avoided.

Once we break the height adjustment pivots loose, we remove the handle of the jack screw. Then use a nut driver with a slot cut into the socket end and a reversible electric drill to repeatedly run the seat up and down with a drill until the seat height adjustments function smoothly. This does take some time, but it works. Be persistent and success will be yours.

Cracks

While you're inspecting your seats, don't ignore the possibility of a crack in the seat frame, usually found in the seatback. With the bare seat frames on the rails, aggressively pull the top of the seat aft. If you can see any flexing in the seatback, remove the upholstery and look for a crack. We've found a few in recent years. Again, repairing cracks in seat frames is a job for your maintenance technician.

Non-articulating crew seats

It's very important to check the reclining mechanisms on non-articulating seats. Inspect the catch dog and the teeth of the seatback cam for proper engagement, cracks, and wear. The previously mentioned seat stops, roller issues, mechanism, tracking, and cracks also apply to these less-complex seats.

Seat stops

I can say without hesitation that most of the Cessnas we get in our shop for an interior have incorrect seat stops or are missing some. On most Cessnas, you should have four seat stops per tracking seat. Check the parts manual to confirm just how many and what type of seat stops your Cessna requires.

Think about it; most airplanes sit tail low. When you slide your seat aft to get out of the airplane, you often slam the seat into the stops. If there is only one stop installed, the seat comes to an abrupt stop on one side only. The inertia of your body and seat weight causes a strong asymmetrical load on the seat base that eventually leads to loosening of roll pins and other components.

Taller seats and adding headrests

Many earlier Cessna 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 that a pull test be performed 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 the filing of a major alteration and repair Form 337 with the FAA.

If someone is offering to modify your seat, ask to see the copy of the 337 that verifies this modification is approved 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.

Seat tracks

Over the years, Cessna has issued multiple ADs and Service Bulletins dealing with seat rails. Defective seat rails and tracking latches have been the source of some serious accidents. Imagine what could happen if, just at the point of rotation, the worn seat tracking latch lets go and the pilot suddenly moves aft. The resulting involuntary pull on the yoke at low airspeed very close to the ground will likely have a very disastrous result.

Ask your maintenance tech to inspect your rails and check your logbooks to confirm that all applicable ADs and Service Bulletins have been completed and properly documented.

Good news fix

Cessna has designed a foolproof

Large seat height adjustment shaft as it passes through the main aluminum seat base frame.

Damaged non-articulating seat mechanical reclining cam.

secondary seat stop system that eliminates the seat latching problem. Service Bulletin SEB07-5R06 involves mounting a locking reel and webbing strap assembly. The reel is secured to the pilot seat structure at the aft end of the seat frame and the forward end of the webbing is attached to the cabin floor.

When the original seat tracking lock lever is actuated, the reel allows the webbing to freely unlock and the seat can track fore and aft. When the handle is released, the reel locks up as the original seat tracking stop pin drops into a hole in the seat rail. The occupant is double-locked in place with the actuation of one lever. Beautiful.

The best news is that Cessna will supply the kit at no charge. An owner will need to cover the cost of installation. It takes anywhere between two to seven hours of labor. Contact a local Cessna service center for more information.

One final seat stop note: Cessna put

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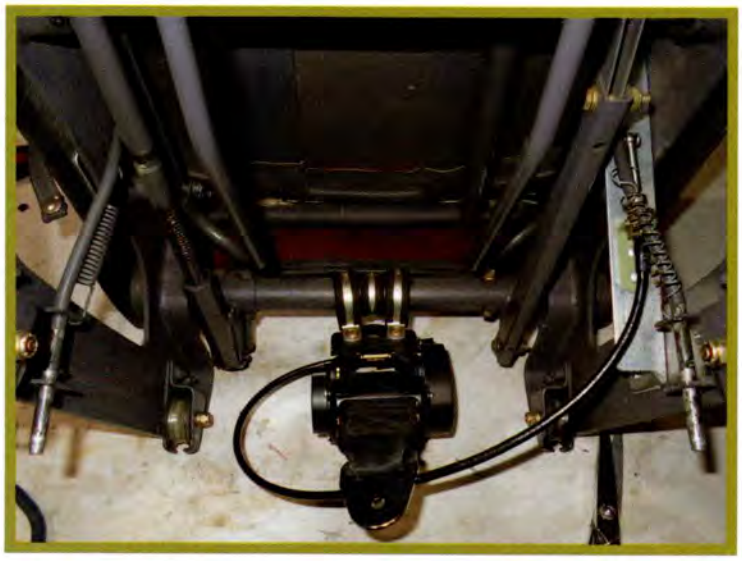

Cessna Service Bulletin SEB07-5R06 secondary seat stop kit installed on an articulating pilot seat.

A second locking spring installed on a Cessna front seat tracking latch mechanism.

one seat stop spring on only one side of many of the two latching pin seats. In the interest of added safety, I often install a second latching spring for the second pin, a simple, inexpensive, and safety-enhancing improvement. Every bit helps!

Corrosion

It seems like no discussion about old airplane parts would be complete without including corrosion in the conversation. One source of seat corrosion can be caused by improperly flameproofed upholstery materials. The flameproofing chemical that is often applied to aircraft finish materials is the salt-like solution of bromide. When materials that are overtreated with bromide are exposed to high humidity or rainwater from a leaking door, the corrosive salt-like acidic properties of bromide become active and will corrode aluminum. The severely corroded seat shown in the photograph (bottom left) has been eroded from overtreated fabric touching the seat frame. The damage located at this point makes the seat unairworthy.

It's also not uncommon to find heavy corrosion covering the surfaces of major cast or forged aluminum seat components. Seats that have lived in the humidity of the Deep South or coastal areas are the ones that most often have this corrosion issue. The fix is to remove the corrosion by bead blasting the frame followed by priming with zinc chromate and applying a good coat of finish paint. Don't ignore all the rust on the often-unlubricated steel parts of the seat.

A History Lesson

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

A weighty issue

When first designed, these seats were engineered to deal with a structural load of an approximately 170-pound occupant. Remember, we're 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 may not be as trim as young people were in the '60s, either.

Bottom line, many folks riding

Badly corroded seat back attach point as a result of coming into contact with incorrectly flameproofed finish fabric.

Heavily corroded seat frame from an aircraft based in Southern Louisiana.

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 pilot, put all the stuff in this article into perspective.

Cessna has done a really good job of enhancing safety in their new airplanes by designing and installing 26G, energy-attenuating, much heavier seats, as well as inertia reel shoulder harnesses for every seat in their new production airplanes. Our job is to optimize safety in our legacy Cessnas.

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 from BAS Inc.), you will have optimized the cabin safety of your legacy Cessna. *(For three-point shoulder harnesses, contact Alpha Aviation. —Ed.)* Remember, you can't write the check on the way down. I'll discuss more on shoulder harnesses in a future article.

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

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.

RESOURCES

CFA SUPPORTERS

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

McFarlane Aviation
mcfarlaneaviation.com

Further Reading
Service Bulletin SEB11-4
flybynorth.com/c175/SEB11-4.pdf

Service Bulletin SEB07-5R06
support.cessna.com/custsupt/contacts/pubs/ourpdf.pdf?as_id=44303