

## Reports of Geisse Axle "Wiggle" Following Service – And A Fix (sort of)

*Members: Here are the responses I received regarding the "wiggle" problem encountered in the crosswind landing gear axles:*

1. I had a similar problem about three years ago when I purchased a pair of NOS Geisse axles. I drained the fluid and refilled with new, mounted the axles, and noted a little wiggle - strange for brand new axles, I thought. I found I could tap on the axles with a dead blow plastic mallet and make the problem go away. But it would reappear after I would swing the axles through their travel range just once. So, I pulled them apart and replaced the original o-rings, but the problem remained. I believed there could be two possible reasons: 1) Springs that had not been exercised since the axles were built in the early '70s, or; 2) Trapped air that compresses before fluid starts moving through the orifice.

The springs had a touch of corrosion on them (or the Parkerized surface was too rough to begin with). The springs seemed to drag or get cocked in the bore when compressed. I think (important note: "think") that the springs were not quite returning all the way back to their fully extended position after the axles were exercised. That left a small amount of play that had to be taken up before the end of the spring was engaged enough to provide the "breakover" resistance. That created the wiggle room for the axle.

I pulled each spring and, because the cylinder bores looked good after cleaning - no roughness, no corrosion - I dressed the outer surface of each spring, particularly the edges of the last turns of the spring. Those are the edges that are the springs' leading edges as they move back to the fully extended position. With emery cloth, I lightly dressed those ends, the springs' ID where they mate with the plunger, and their outer surfaces overall. To make sure there was no debris that could plug the disc's orifice, I flushed the springs very well with MEK, then Stoddard solvent, then hydraulic fluid, and then reassembled the axles.

I filled the axles with the index mark about 1/8" beyond the reference position. Then - with the tapered end of the piston pointing up (so air would rise), I tapped on the axle to free any air. With a screwdriver positioned to tighten the plug, I pushed the piston down to the mark, bleeding air and fluid, and quickly tightened the plug. I remounted the axles on the axle plates (axle adapters), checked them, found the "wiggle" was gone - even after multiple cycles and it hasn't returned - even after servicing the axles several times, using the same filling method each time. Not sure which action fixed the problem. But, maybe the phase of the moon changed and they just healed themselves. At least the gyroscopic effect of the wheel and tire will want to keep them going straight down the runway! (I think that principle has saved a few landings for me.) Hope this helps someone. Edit as necessary.

2. MT: The trick to the axles is what AI talked about in the end... the phase of the moon. You have to overfill the axle and push the piston down to the mark. On mine, I leave the mark showing at the end of the axle. In other words, I don't push it down into the

axle until I can't see it anymore. You have to bleed the air out of the system by overfilling and being ready to secure the bleeder screw at the proper moment. If you push the plunger in too far, take it out and refill and start over. Remember grease is your friend. The parts aren't available as they were in years past, so if you want your expensive axles to last, grease them often and keep them clean. I grease mine at least every 15 hours of operation, and I could eat off them if I had to.

Minard

AJ: On the axles, I'd fill and set up the axles to not have any slop or wiggle - even if an apparent over-filling. I think the opportunity for shimmy and all the damage it can do - excessive tire wear, uneven tire wear, side stressing the bearings, potential ground control issues, distraction on landings and takeoffs, "shimmy and shake" stressing of gear attachment points and shimmy wear of the internal seals and packings in the axles - all that and more are the worse choice because it's an everyday, every TO and LDG issue. Breakaway is probably still OK if you really get the plane crosswise - and that's not an everyday occurrence. Just the old risk and reward thing. I'd go for the daily rewards and take the infrequent risks. My choice, tho - others could evaluate it differently and come to a different conclusion.

The drawing of the Geisse axle deflection test shown in the Organizational Maintenance Manual, TM 55-1510-202-20 (Dec 1968), does not call out the distance from the kingpin to the location of the spring scale's "pull" on the axle. The dimensional callout lines are there - they just failed to put in the numeric value, just as they failed to call out what units are being measured on the spring scale. Birddog owners and mechanics have assumed the scale represents "pounds." For the following reasons, they are correct:

The manual's text calls out 160 inch lbs as the force desired to hold the axle in a deflected position (or, to deflect it - according to the drawing's note. Another of the manual's apparent contradictions). 160 inch lbs is 13.33 foot lbs. The manual states minimum acceptable torque is 120 inch lbs. That's 10.0 foot lbs. Why the apparent difference between the text and the illustration? It's because the lever arm is only 6 inches long! In this case, the lever arm is from the center of the kingpin to the axle location where the spring scale is attached to pull on the axle.

*Because the lever arm is only 6 inches (half a foot) long, the force required is twice as much as if the lever arm was one foot long. Therefore, 13.33 foot lbs becomes 26.67 lbs at the spring scale's half-foot (6 inch) position. The minimum acceptable 10.0 ft lbs becomes 20.0 lbs at the spring scale's half-foot position. (As I recall, my loop's half-foot position on the axle was actually a little more outboard of where the drawing shows it.)*

So... what's it all mean? It means that everybody's right! (I feel all warm and fuzzy being able to say that.) Since 13.33 foot pounds is desired (per test), the scale will read around 26 pounds (per the word-of-mouth understanding). But it's all somewhat academic since the manual's so badly written. The text says: "Torque shall be *at least* (my emphasis added) 160 inch-pounds." If that's the case, it means anything above 26+ lbs on the scale is OK - as long as the axle will still deflect with a reasonable side load. What's reasonable? Since they give you 6+ lbs on the spring scale toward the downside from the desired value, how about 6 lbs on the scale toward the upside? That

would be approx 33 lbs max. Why not? But it's one of those things that none of us wants to find out for sure what's good and what's not.

**In summary:** Hook up the pounds-calibrated spring scale on the axle, locating it exactly 6 inches from the kingpin's center. Look for a scale value of 26+ to 33 pounds to break away and hold the axle's swivel. At a scale value of 20 pounds or less, the axle's got to be serviced.

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