

SERVICE BULLETIN 9B

SUBJECT: Nose Gear Shimmy

APPLICATION: All Glasair RG aircraft.

DESCRIPTION: Operator's of some Glasair RGs are still experiencing nose gear shimmy. This shimmy has occurred, in some instances, even with the hydraulic shimmy damper (described in Service Bulletin 9A) installed, and after the builder had taken steps to correct problems described in Service Bulletin 9.

DISCUSSION: In our continuing investigation of this problem, we have found several other factors that seem to have an effect on shimmy. The following is a discussion of these factors.

Eliminating Play in the Nose Gear Assembly

As mentioned in Service Bulletin 9, it is very important that all looseness or play be eliminated from the nose gear assembly. Looseness can be present in the wheel bearings, in the screws that attach the nose fork to the oleo cylinder, in the nose gear scissors, or in the shimmy damper linkage. Any such looseness or play reduces the effectiveness of the shimmy damper by preventing the transfer of the damping force to the wheel.

Make sure that your nose wheel bearings are adjusted properly. Adjust them to the point that there is no play whatsoever but are not overtightened which would lead to rapid bearing wear. There is a fine line between overtightening and play in the bearings--it will take some trial and error to get the adjustment just right. Also check the rest of the nose gear assembly for looseness and take corrective steps if necessary.

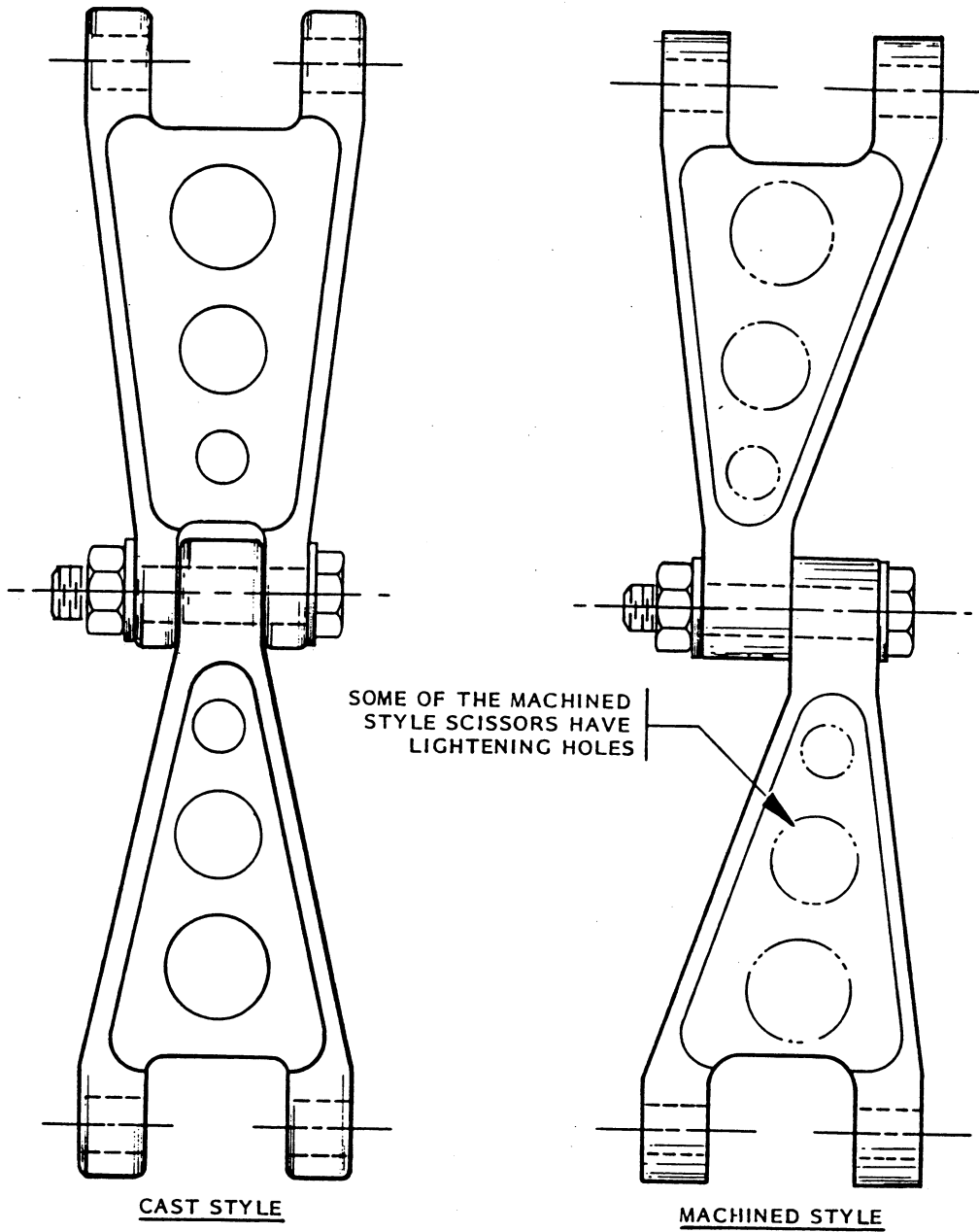
Landing Gear Scissors Bushings

Another possible source of play in the nose gear assembly is the Nyliner bushings used in the scissors pivot joints. If you are continuing to experience nose gear shimmy, and you have eliminated all the other potential causes discussed in Service Bulletin 9, you may want to consider replacing the Nyliner bushings in your nose gear scissors with aluminum bronze bushings.

On our 180 hp RG model, N84AG, we replaced the Nyliner bushings in the nose gear scissors with aluminum bronze bushings and noticed less play in the pivot joints. It is still inconclusive whether this procedure is necessary to help eliminate shimmy, but we mention it in case someone else with shimmy problems wishes to try it. We used NAS76A bushings and cut them to the proper lengths.


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NOSE GEAR SCISSORS

FIGURE (1)

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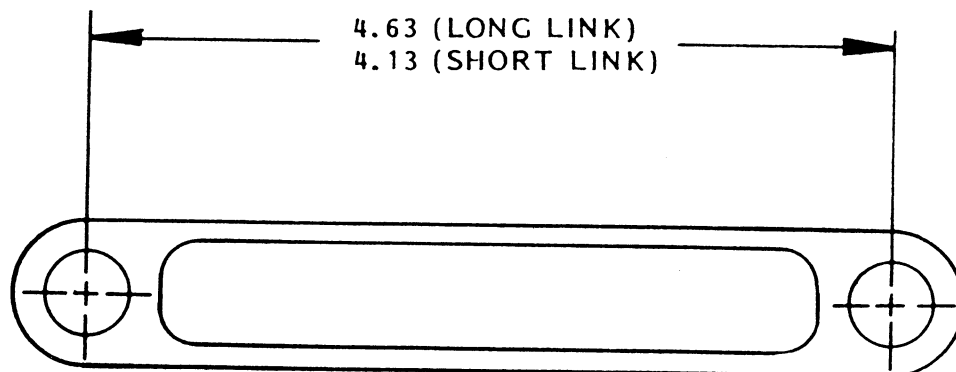
To press the aluminum bronze bushings into place, the scissors must first be drilled and reamed to accommodate the larger outside diameter of the bushings.

CAUTION: It is very critical when drilling and reaming the scissors for the larger bronze bushings that proper alignment is maintained and the scissor lugs are not flexed. A drill fixture should be made to hold the scissors and a specially ground pilot ream should be used. It is very likely that the scissors could be ruined if these holes are not properly drilled.

Two types of scissors have been used on Glasair RGs, as illustrated in FIGURE (1). An aluminum insert was used with some of the machined style scissors, allowing the aluminum bronze bushings to be pressed into place without any drilling or reaming.

Nose Gear Drag Link

The installation of a longer drag link may have had the effect of reducing nose gear shimmy on one Glasair RG with which we experimented. The longer drag link was standard equipment in the first 70 sets of RG landing gear but we went to a shorter link on later gear to make the airplane easier to steer. The effect of the longer link when the gear is extended is to angle the strut out farther toward the front slightly, increasing the amount of caster which may tend to stabilize the nose wheel.



NOSE GEAR DRAG LINK

FIGURE (2)

To determine if you have the longer or shorter drag link, measure between the centers of the two drag link pivot bolts, as shown in FIGURE (2). The short link is 4.13 in. between pivot centers; the longer link is 4.63 in. between centers, as shown.

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Shimmy Damper Friction Collars

We are also considering a redesign of the shimmy damper friction collar clamps to split them laterally rather than longitudinally so that the boss which is attached to the scissors is a single solid piece instead of two pieces held together with a pin. This redesign would have the effect of reducing play in the joint between the friction collars and the scissors and would also use two bolts to clamp the friction collar halves rather than relying on one bolt to provide all of the clamping force. If we decide to go with this new system, we will make retrofit kits available.

Hydraulic Shimmy Damper Attach Bracket

There have been several instances of the hydraulic shimmy damper attach bracket breaking as the result of shimmy. This is the bracket that is welded to the left shimmy damper friction collar when the hydraulic shimmy damper system is retrofitted to the airplane. The bracket has proven to be adequate if shimmy does not occur and has broken only if shimmy has actually occurred with the hydraulic damper installed. If you experience shimmy, you should inspect the hydraulic damper attach bracket for cracks or fractures.

We are investigating strengthening the hydraulic damper attach bracket to prevent breakage. We are not offering a reinforcement kit or service at this time, however. Since we are also investigating redesigning the friction collars, as mentioned previously, the hydraulic shimmy damper attach bracket would be redesigned at the same time. Until further information is gathered through continued testing, and if you experience cracking in your hydraulic shimmy damper attach bracket, you can strengthen the existing bracket by welding on stainless steel doubler plates.

Friction Collar Stabilization

Another area of possible contribution to shimmy is "racking" of the friction collar clamps. The lower edge of the friction collar is chamfered to clear the cylinder/gland weld which allows the collar to rack slightly when load is applied. Ideally, the collar needs to be captured snugly in a recess.

On the Glasair III nosegear, the recess was made by machining a deep groove into a larger diameter tube which gave the collar a deeper, tighter recess to ride in. Our Glasair III prototype nose gear uses the original scissors with Nyliner bushings and a stiffer machined aluminum friction collar (as described previously in this bulletin). So far, we have not experienced shimmy with the Glasair III prototype which is heavier and lands faster than existing RGs.


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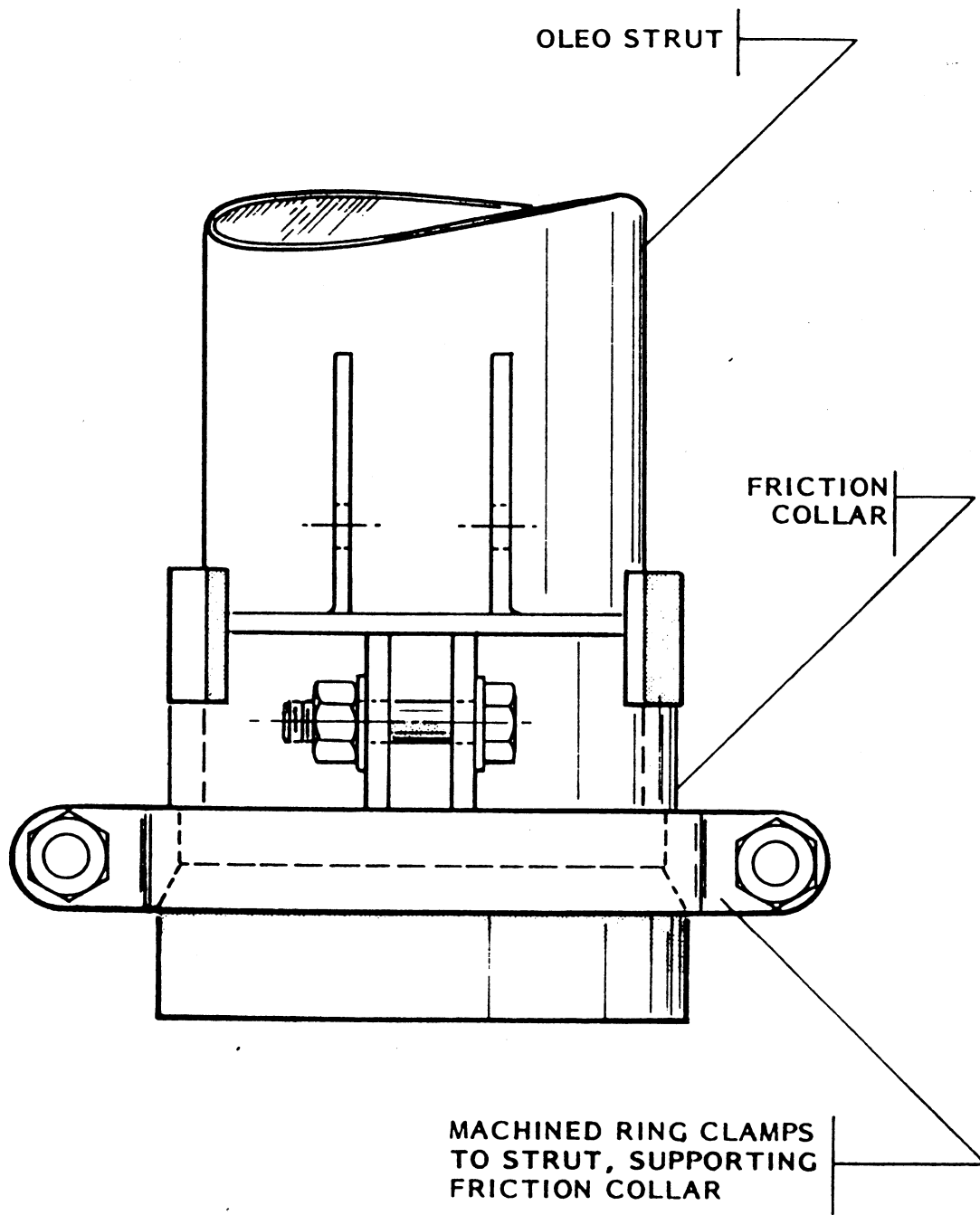


FIGURE (3)

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A possible method of stabilizing the friction collars is a lower clamping ring for the nose gear oleo strut. This ring would clamp around the strut just below the friction collar recess and would provide a surface for the collars to bear against, preventing the collars from racking under load. See FIGURE (3) for a clarification of this concept.

In summary, we are not really sure how widespread or serious the nose gear shimmy problem is. Our original prototype RG and our Glasair III prototype have had no problems whatsoever. Our 180 hp aerobatic RG has had minor problems that have been solved by use of the hydraulic shimmy damper and by rebushing the scissors. Some of our builders, however, have had serious shimmy problems, resulting in damage to nose gear hardware in some cases.

Much of what we have learned about nose gear shimmy problems and their solutions has either been information from our builders who have worked on the problem independently or the result of our experimentation with shimmy problems on airplanes belonging to local builders. The shimmy problem would be easier to solve if the problem affected all builders in the same way and had a single definite cause. As it is, there does not seem to be a single, definite cause but a whole variety of factors that influence whether shimmy occurs. Refer to Service Bulletins 9 and 9A for a discussion of some of these factors.

To help us decide on the most effective solution to the shimmy problem, we would appreciate hearing from all Glasair RG builders (who have finished and are flying their airplanes) concerning their experiences with shimmy. Please complete the enclosed questionnaire which is designed to facilitate your response and to provide us with information necessary to help us assess and solve the nose gear shimmy problem. Please complete the questionnaire even if you have not experienced shimmy--this information, when considered in relation to the differences in landing gear hardware, will help us isolate the factors most conducive to the onset of shimmy. We will continue testing and will advise of results in a future publication.


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