SERVICE BULLETIN 9

SUBJECT: Possible Nose Gear Shimmy Problems

APPLICATION: All Glasair RG Nose Gear Oleo Struts.

DESCRIPTION: Some Glasair RGs have experienced nose gear shimmy. In one instance, this shimmy was severe enough to break the nose gear scissors.

SOLUTION: There are numerous factors that influence shimmy. Some of these factors are:

1. The design of the landing gear trailing arm geometry
2. The roundness of the shimmy damper friction clamp
3. The tightness of the shimmy damper friction clamp
4. The amount of other damping available (hydraulic damping)
5. Tire pressure
6. Whether the tire is centered
7. Speed of the aircraft
8. Roughness of the runway surface
9. Looseness or slack in the system
10. Pilot landing technique

Some of these factors, such as the design of the landing gear trailing arm geometry and the runway surface, cannot be changed. Other factors, over which the builder has varying degrees of control, should be considered, and steps taken to reduce to a minimum the chance of shimmy occurrence.

Following is a discussion of some of the factors affecting shimmy.

Eliminating Wheel Bearing Play

The Instruction Manuals state that it is preferable to have a slight amount of play in the wheel bearings rather than tightening them excessively. This is incorrect--the play must be eliminated (without overtightening), otherwise nose gear shimmy could occur.

Adjusting the wheel bearings can be difficult because of the tightness of all the axle components. The inner races of the wheel bearings and the machined aluminum nose wheel axle hubs often fit so tightly on the axle that it is difficult to tell if there is play in the bearings. Bearing play that is not detectable by hand could exist because of a tight fit of the bearing races to the axle. This play would show up after a few taxi turns and the resulting looseness could initiate shimmy.

We recommend sanding the cadmium plating from the axle, using fine grit sandpaper, so that the axle hubs and bearing races slide easily on the axle before attempting to adjust the bearings. With the cadmium plating removed from the axle, it will be necessary to apply some other corrosion protection, such as a light film of grease or LPS 3.

Looseness in any other part of the nose gear assembly could also contribute to nose wheel shimmy. Check for play in the scissor pivot joints and for looseness in the screws that attach the nose wheel fork to the chromed oleo cylinder.

Nose Gear Tire Pressure

Another suggestion, by a builder who experienced nose gear shimmy, is to lower the air pressure in the nose gear tire. This builder reported that reducing the air pressure to 15 psi eliminated the shimmy problem completely. Although in this case the builder is temporarily satisfied, we are not recommending this as a permanent solution.

Nose Gear Tire Centering

Check the nose gear tire to make sure that the contact patch of the tire is centered between the arms of the nose gear fork. It may be necessary to adjust spacers between the nose gear axle hubs and the fork to accomplish this.

Shimmy Damper Friction Clamp

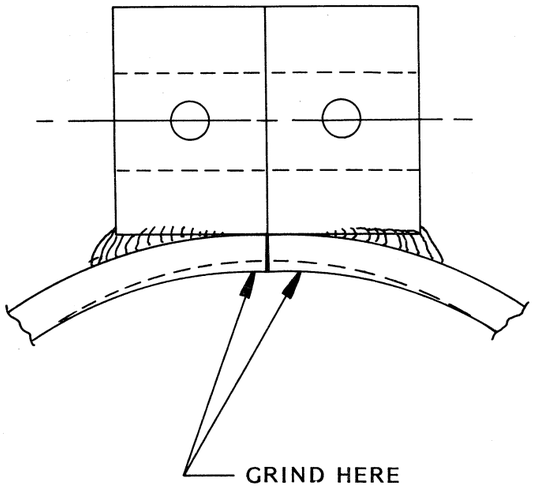
Another problem area that we have discovered is in the shape of the shimmy damper friction collars. The area contained by the friction collars may be slightly heart shaped, as shown in FIGURE (1), rather than circular, there may be a mismatch between the friction collars at their joining point, or high spots may exist in the areas of the pivot stops on the collars. Any such distortion prevents even clamping pressure around the circumference of the strut and can result in the friction material on the nose strut being damaged locally.

Remove the friction collars for inspection by driving out the roll pins that secure the upper scissors pivot pin and then driving out the pivot pin. Also remove the clamp bolt on the aft side of the collars.

CAUTION: Take care when driving out the pivot pin not to damage the Nyliner bushings.

After removing the friction collars, reinsert the pin, clamp the collars together in their proper relationship to each other, and file or grind any high spots in the areas of the joint and the pivot stops, as shown in FIGURE (1). Be careful to maintain smooth contours without any dips or gouges. When finished, remove any file or grinding marks with fine grit sandpaper.

Check that the friction material is well adhered to the strut, and replace any damaged material. Replacement friction material is available from Stoddard-Hamilton. Use five minute epoxy to bond the fresh friction material, and secure it with hose clamps or nylon wire ties while the epoxy cures.



DETAIL 'A'

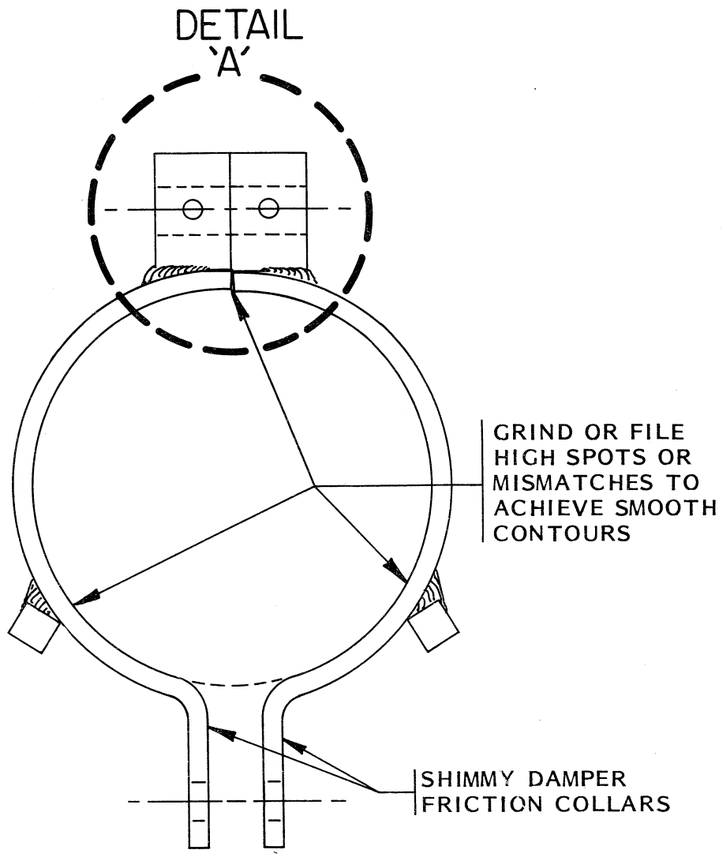


FIGURE (1)

STODDARD-HAMILTON AIRCRAFT, INCORPORATED

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When reassembling the shimmy damper, tighten the clamp bolt until it is very difficult to steer the wheel by hand. Even when tightened to this condition, the nose wheel should steer readily with the additional leverage of a tow bar or when taxiing.

NOTE: When reassembling the shimmy damper, also make sure that the pivot stops do not contact the retainer ring that is welded on the nose gear strut right above the friction material recess. Grind the stops, if necessary, to prevent contact.

NOTE: Make a check of the shimmy damper tightness as a part of every preflight.

Pilot Technique and Aircraft Speed

After completing the suggestions described in this bulletin for reducing the possibility of nose gear shimmy, we tested our 180 hp RG prototype at excessive ground speeds. We found that shimmy can still occur when induced by slapping the nose wheel down at high ground speeds. "Normal" or standard takeoff and landing speeds did not produce shimmy.

As with any tricycle gear airplane, it is important to keep the weight off the nose wheel as much as possible during the take-off and landing ground rolls. Early in the take-off roll, allow the nose wheel to remain down to help maintain directional control, but, as the speed builds and the rudder becomes effective, aft stick should be eased in to lighten the load on the nose gear. When landing, touchdown should always be made on the main gear first and back stick held to keep as much weight off the nose gear as possible.

Hydraulic Shimmy Damper

A possible problem with the friction type damper used on the Glasair RG is the possibility that oil from the engine will soak into the friction material and reduce the damping friction. As a design improvement, we are looking at other systems.

We have tested a small hydraulic shimmy damper which is much more successful at eliminating shimmy at high speeds than the friction damper. At present, we are designing and will prototype test a smaller unit than the one we tested that will fit inside the cowl when the gear is retracted. Our plans are to make this unit retrofittable to existing shimmy damper assemblies. We cannot forecast a completion date at this time, but will notify RG builders of availability and price when our testing is complete.