

Tailwheel Steering Chain Shackles: Prevent Rudder Arm Tab and Steering Arm Wear

V1b
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By installing cable shackles on each end of a Birddog's spring / chain tailwheel steering assembly, you'll avoid egg-shaping the holes in the rudder arm tabs and the tailwheel steering arm. The shackles are secured with AN3-sized bolts. That spreads the contact surface and wear over a much, much larger area than if the contact and bearing surface is just the width of the end of a tension spring or the small, thin metal loop that's designed to hold the chain to the steering arm.

Here are photos for installing cable shackles in the tailwheel steering system:



Note that one side of each AN115-21 (MS20115-4) shackle used on the steering arm has had two flats ground in one of the round areas that the AN3-5 bolt passes through. That permits the chain to slide over one side of the shackle. Don't use the triangular-shaped wire loop to secure the chain to the shackle. The wire loop will cause the same kind of wear as it causes to the steering arm. The grinding / filing to create flats has to be done on just the two shackles used at the tailwheel arm (chain) ends. No grinding / filing of the shackles is needed for their use at the rudder horn tabs.

An advantage with this setup is that if there is wear from the springs or the chains, you can simply replace the shackles. You don't have to remove the rudder to remove, replace and re-rivet the rudder horn tabs, or disassemble the tailwheel and replace the expensive tailwheel steering arm.

This approach has also been used by a few of the C-120 / C-140 people to avoid wear on Maule and Scott tailwheel components that are no longer available. I saw that and have now used this on my B'Dog for more than 500 hours. I've had no problems with it. I think the end links in the chains are lasting longer, too. The new-dimension, un-worn holes in the steering arm and the rudder tabs are both AN3-sized. That's convenient.

As a side note: The sash chain used in the tailwheel steering assembly must be the heavy-duty steel sash chain. There are available brass sash chains, but their strength is far less than the zinc-plated steel chain; brass chain is inadequate and potentially unsafe. Even all steel sash chains are not created equal. The length of the individual links varies from brand to brand. If the correct chain / spring assembly tension appears to need a length that falls in between two links, search out another brand. Another hardware store, home center, or aircraft supply house likely carries another brand. You will find that the resulting lengths of chain using the same number of links can vary significantly brand to brand. If at first it doesn't seem right, try another brand.

Parts List:

Here's the parts list for the full installation of two shackles on the rudder horn and two shackles on the tailwheel steering arm:

- (4) AN115-21 / MS20115-4 Cable Shackles
- (4) AN3-5 Bolts (standard bolt with cotter hole in threaded portion of bolt)
- (8) AN960-10L (Thin) AN3 / 10-32 Washers
- (4) AN310-3 Crown (Castle) Nuts
- (4) Small Cotter Pins

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Addenda:

1) Troy Cobb's photos of his use of the shackles on his tailwheel.





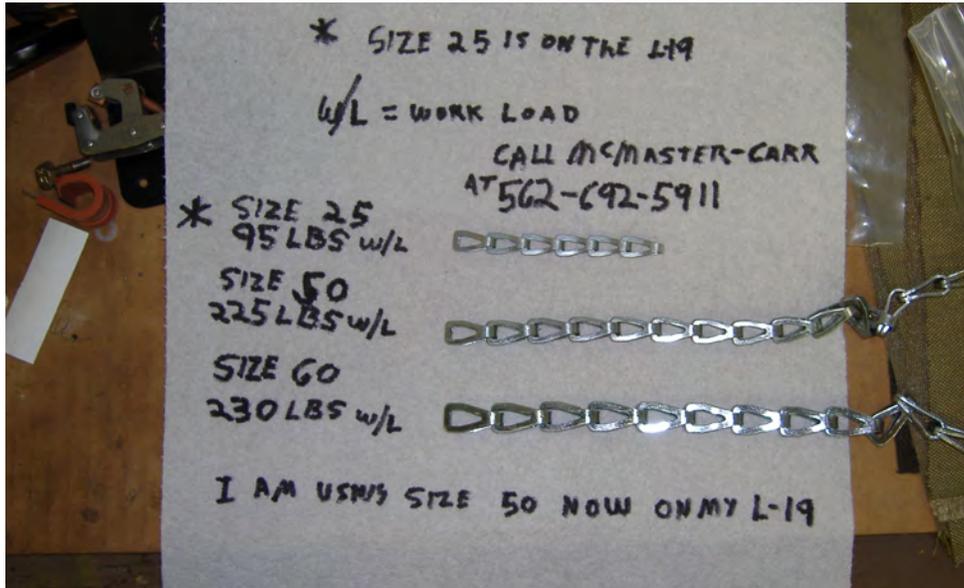
2) Sam Dawson's Use of Shackles

Sam utilized the shackles, too – with a twist. He made use of elastic stop nuts (AN364-3) instead of the crown nut / cotter pin method of retaining the bolts. His AP / IA approved the use of the stop nuts. Sam, who flies from grass, wanted to avoid the cotter pins and their collection of grass.



3) Correct Tailwheel Chain?

Recently, Gary Ancia sent a photo illustrating the different sizes of available sash-chain. He mentioned he'd been using the lighter weight chain but felt it had been stretching. He "upgraded" to a heavier gauge chain. This photo shows the differences in gauge and lists the working loads for which the chain is rated. Note: The chain supplied by Scott in their Model 3200 Tailwheel (external) Service Kit – the kit with a pair of new tension springs, two lengths of chain, and four of the triangular-shaped wire loops to attach the chain to rudder horns and tailwheel steering arms – is of the size called out in the photo as "Size 50." That, or the heavier chain, should be the size employed. The slightly smaller links of the "Size 50" chain (vs. "Size 60") will provide a better opportunity to adjust length for proper tension.



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