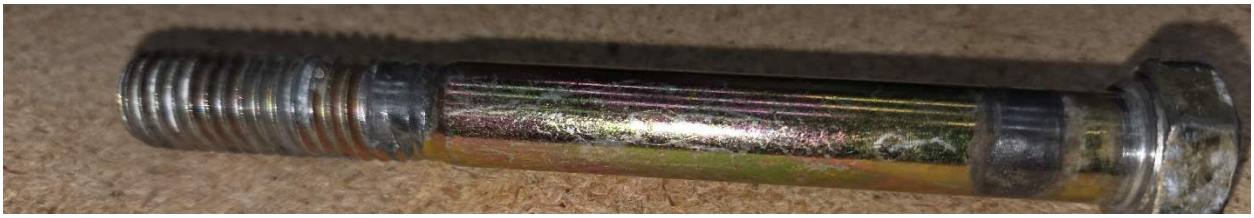
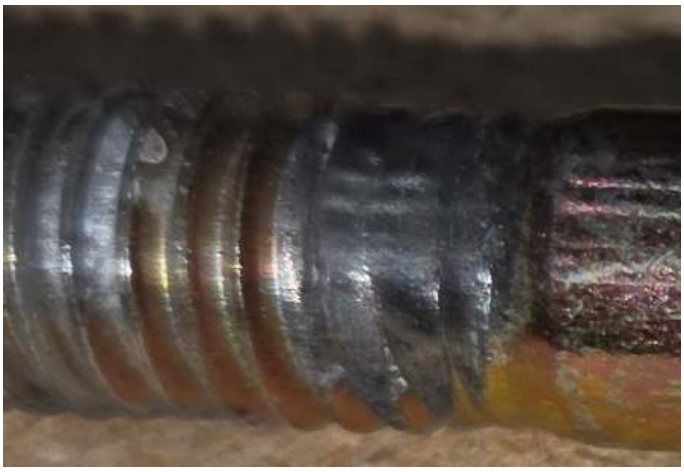
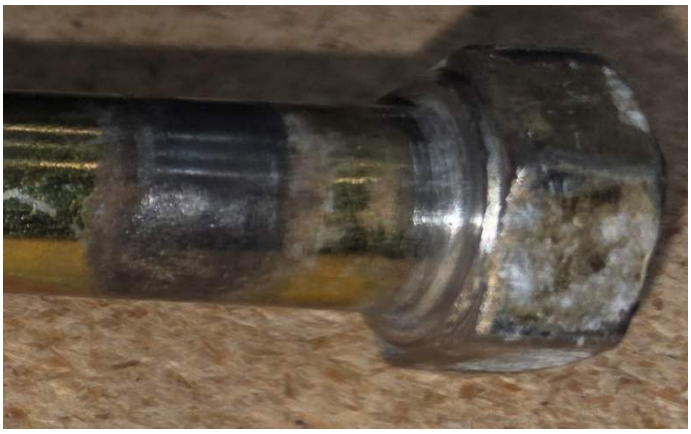
Fixing the Cobra Trailer Tongue Bolt breakage issue

Here is the picture of the front bolt I removed from my cobra trailer tongue.







This is not the original bolt, it's a 7/16" tractor supply special. Probably installed after the original bolt broke, as a field expedient repair.

The Fix

These are McMaster Carr part numbers. They are legendary purveyors of glider, and trailer parts.

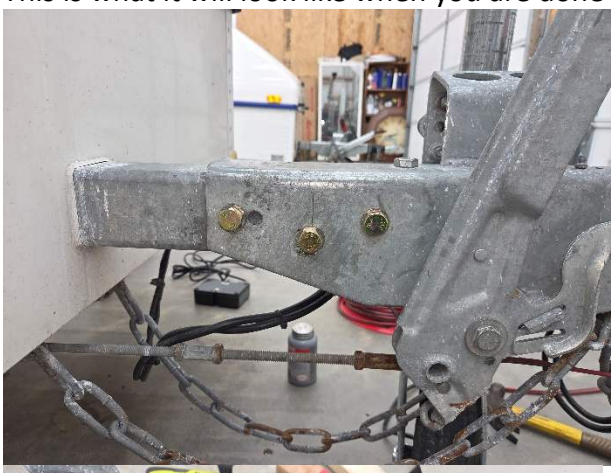
Order the following

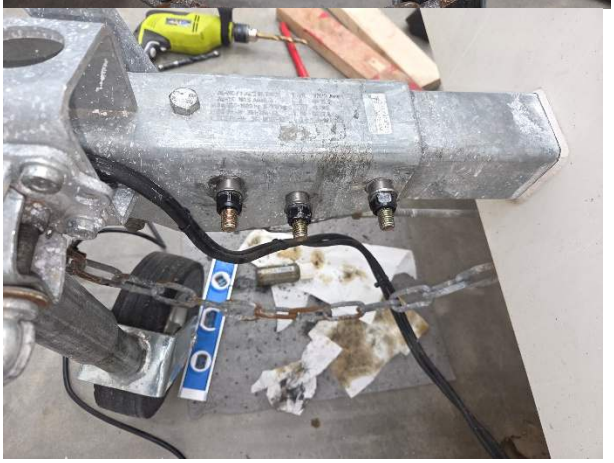
Qty	P/N	Description
3	95327A716	Zinc Yellow Chromate Plated Steel Hex Head Screw, High Strength Class 10.9, M12 x 1.75mm, 120 mm Long
2	94316A340	High Strength Bumax 109 Stainless Steel washers for 12mm Screw. (packs of 5)
3	90237A160	Hi-Strength Steel Nylon Insert Locknuts, black corrosion resistant Coated M12 x 1.75
3	92871A371	18-8 Stainless steel unthreaded spacer 19mm OD, 10MM long for M12 Screw size.

And if you don't have some already:

1	1821A3	Loctite LB 771 Nickel Anti-Seize

This is what it will look like when you are done





Procedure

One at a time, replace the existing (2) bolts with the new bolts with the new bolts.
Washer under the head, slide it through the hole. Fill the valleys of the threads completely with Anti-Seize, then slide on the spacer, another washer, then the nut. Jack stands under the front corners of the trailer, and a lightly tensioned bottle jack under the trailer coupler help keep things where they should be and assist with getting everything to line up. Then snug these up, don't torque them up yet.

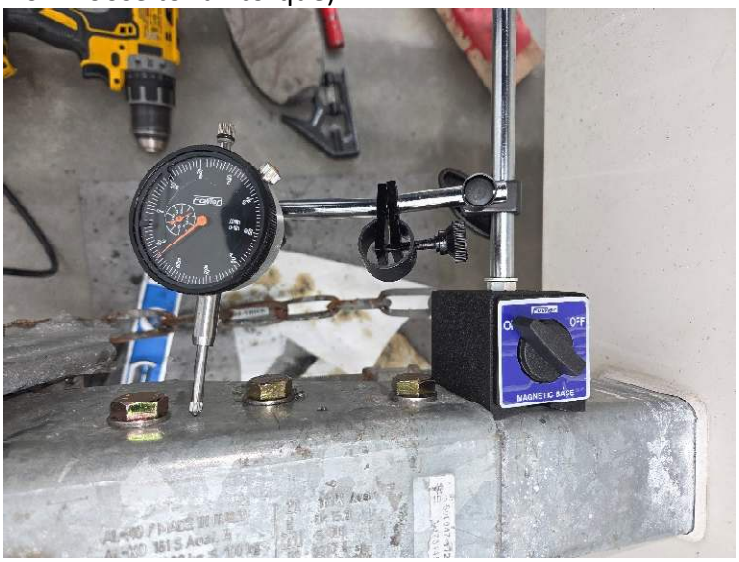
Drill a 13mm hole for the third bolt. You want to drill this hole roughly slightly aft of center of the original bolts. You want to drill through the side wall of the square tube, as close to the bottom of the square tube as you can get without drilling into the bottom of the square tube. You are probably doing this by hand, give yourself a little room above the bottom of the tube, it's not going to be, and it does need to be a precision hole. Drill it from one side with bits long enough to go all the way through. This is the toughest part of job, if you are inexperienced, seek assistance with this step. A broken drill bit inside the tube will ruin your week. Be very careful with that small bit that you use for that first hole.

Install the third bolt like the original two.
Torque them down to 70 Ft-Lbs
Pattern: middle-Aft-Forward
They tend to help each other a bit, so run through the final torque pattern, a time or two, before stopping.

Why

The original two bolts don't provide enough clamping force to keep the two pieces from moving with respect to each other.

Using a dial indicator on the original two bolts.
(this Picture is of the dial indicator setup used on final torque of front bolt, 0.0136" movement from Loose to full torque)



Dial indicator movement while torquing the bolt down indicates that you are moving the two pieces into contact with each other bending metal and consuming torque intended for clamping, once it stops, the bolt torque from that point forward is being used for clamping.

Doing this with the original two bolts indicated that the front bolt wasn't doing any clamping at full torque, and the rear bolt only started clamping very near the end of torquing it down. So… no clamping from the front bolt, and only a little clamping from the back bolt.

As the trailer went over bumps the two parts of the tongue moved with respect to each other and in my case hammered into the front bolt like an underpowered shear. Eventually the hammering gets all the way through the bolt, and it fails.

In my opinion it appears that the designer intended for the original two bolts to have enough clamping force to not end up in shear, and the actual shape of the Al-Ko hitch assembly was a looser fit than expected. The two bolts holding the hitch coupler on just forward of these bolts, are designed to be in shear, and they are not failing. The shear strength of the original two bolts is sufficient, however the unexpected hammering action in shear, is making them fail, in spite of this. The designer's originally specified bolt placed threads in the shear plane on the nut side. This reduces the bolt's shear strength by almost 1/3, and is a horrible design practice for bolts in shear, and in this case probably shortened time to failure, but didn't eliminate eventual failure.

If you changed your (2) bolts out with ½" bolts, are you good? The clamping force of a properly torqued ½" Grade 8 bolt is 12,771 Lbs vs. the M12's Class 10.9 clamping force of 11,792 Lbs. It is my opinion that this is not enough additional clamping force to stop the problem, you have just lengthened the time between failures.

I located the position of the third bolt to an area where the outer C-channel over the square tube is more flexible than farther up close to the top bend, and the bottom side of the square tube adds a considerable amount of stiffness. I wanted to get more clamping and less metal bending from the bolts. The dial indicator on the third (middle) bolt moved quite a bit at first, but about halfway through torquing it up, it started clamping. The rear bolt then started clamping almost immediately while torquing, and the front bolt started clamping about 2/3's of the way into its torque up.

I'm reasonably certain there is now enough clamping force applied that the two pieces of the trailer tongue assembly will not move in relation to each other, and as a result none of these bolts will get hammered in shear until failure.

I know that compared to the original bolts these are a bit ugly with the threads sticking out. Heat shrink on the exposed threads might pretty them up or at least cover up the sharp threads. And if you are inexperienced with Anti-Seize, you will never successfully get it off of your tools, it won't wash out of your clothes, and it seems to get all over everything in the shop, as if by magic. Lubricating the bolts is the only way to ensure that the specified torque achieves the desired clamping force, so don't skip that in critical applications. I define eliminating a bolt failure that will leave my trailer stranded in BFE, as critical.

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