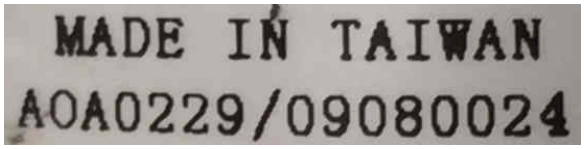
ArcusM Starter Motor Follies

05/10/17

Starter motors fail in ArcusM with excessive end-play caused by wear to front bushing. Multiple owners (including Dave ArcusM #125, Ian Cook ArcusM #66, Al Simmons, etc.) had failure before 12 hours of running time (estimated <150 cycles of starter when all short test runs and taxiing are counted).

Check: With engine open slightly, grab end of starter and see if you can move it side-to-side. Bernd says replace starter if >3mm end play.

Here's the starter from Dave's ArcusM #125:



From Bernd Mangold: Bushing wear is caused by high vibration of Solo. Pinion gear and Bendix is a weight with long lever arm to bushing. Swinging back and forth during vibration hammers and destroys front bushing.

Alledgedly, original starter motors were AOK, but manufacturing change (Denso moved manufacturing site?) used softer bushing material (which would be AOK for any application except Solo vibration).

Original starter motor is Denso part number 128000-1671 12V
Denso lists this starter as *"discontinued with no replacement"* here:
https://www.densoproducts.com/learning-center/article/493/discontinued-denso-starters

Replacement available in USA is:
Chinese mfg World Power Systems part number 17383N
In USA, sold by:
- http://www.stockers.com/index.php?dt=SK-101N
- http://www.obbstartersandalternators.com/snowmobile-starter-17383n-128000-128000-1670-128000-1671-995430-17383-p-1505.html

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- http://www.motorcityreman.com/nioe1212.html

Solo now buys WPS starter motors and changes bearings to harder material.

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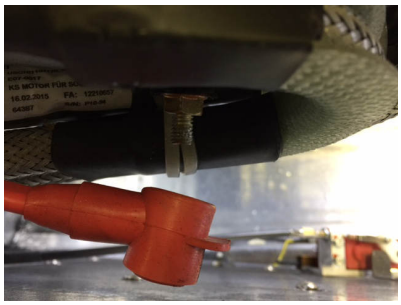
Removal/reassembly instructions (thanks to Bernd Mangold, Jorgen Thomsen and Max Dolfin):

1. Not necessary to disconnect the battery for safety; positive lead at starter motor is not live (behind starter relay).

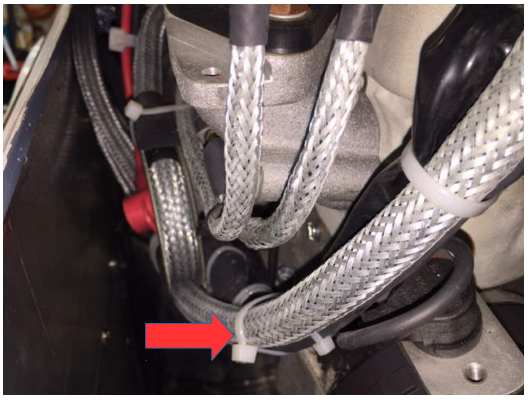
2. Open engine slightly, and disconnect fuel lines and large electrical connector at forward engine bay bulkhead.

3. Raise engine ~90% so starter is accessible but just below engine bay flanges. Press Menu button on ILEC controller to stop warning beeping while raising. Power off!

4. Disconnect positive (red lead) - 10mm socket.



5. Cut tiewraps to allow moving braided fuel lines and electrical bundle out of the way (cut only necessary tiewraps!).



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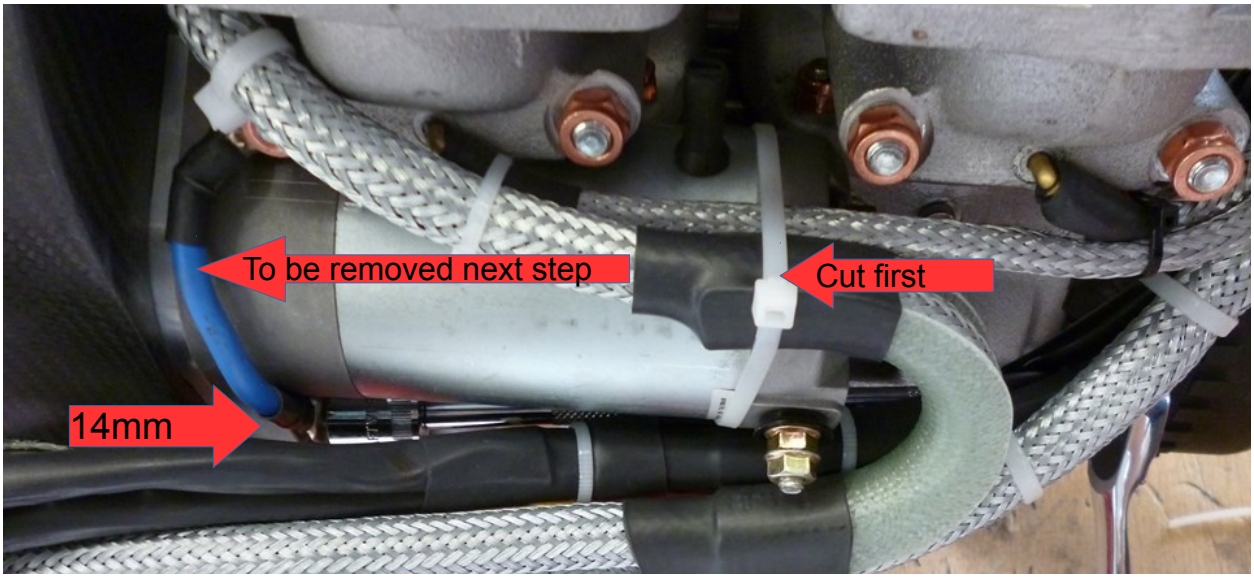
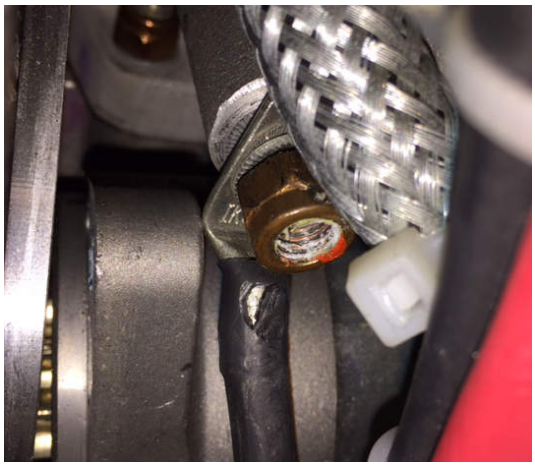
6. The negative lead is connected to the startermotor with a 14 mm nut at a difficult to reach spot on the underside (on the lower starter mounting bolt). To permit removing the starter mounting bolt, use a long extension, remove this negative-lead nut, and disconnect the negative leads (two, bottom lead not visible in picture).



7. The negative lead and its lug attached to the intake manifold blocks the starter motor from rotating and coming out (blue lead above).
   Remove lead (12mm nut plus lock washer):



8. Lower motor most way down, taking care that loose hoses and wires don't snag.

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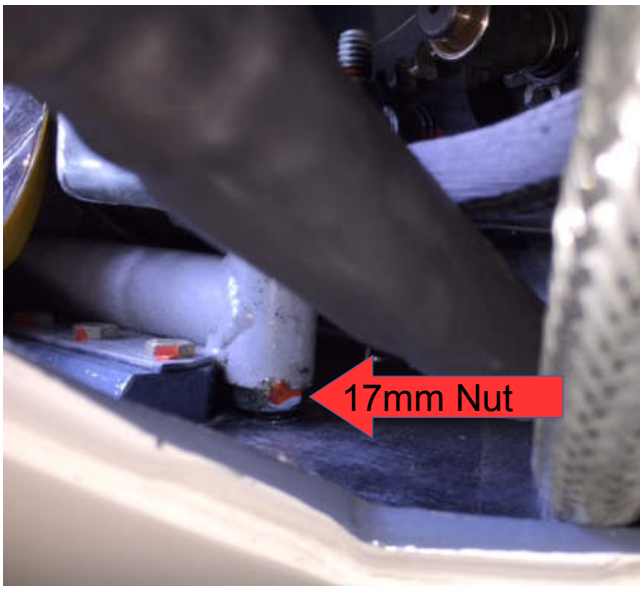
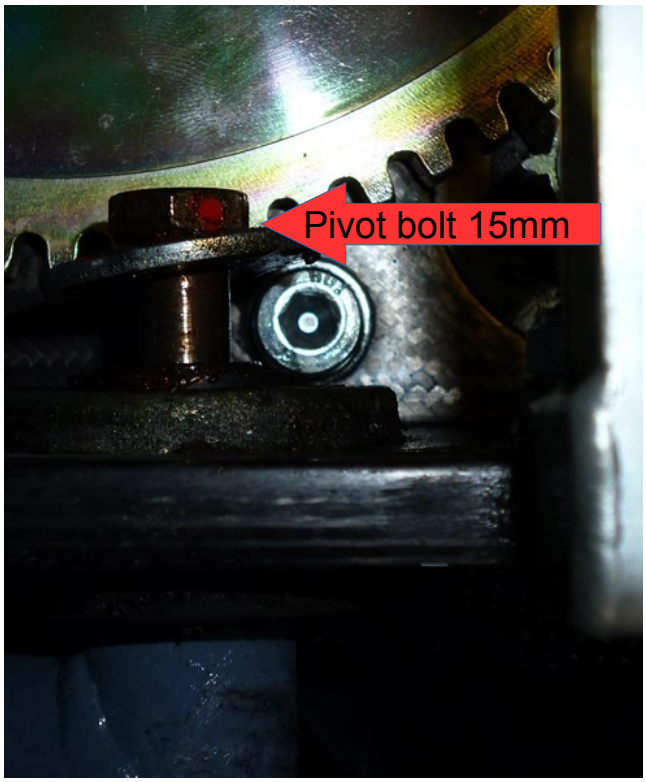
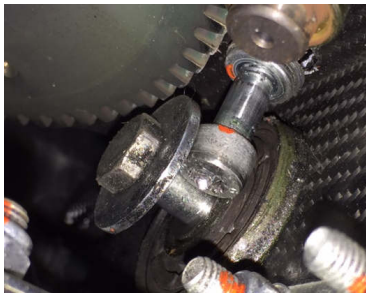




9. The head of the bolt on which the pylon pivots blocks removal of one starter motor bolt. Loosen pylon 17mm pivot bolt nut on the left side, then while holding nut with wrench, unscrew the pivot bolt just enough (careful here!) to let the starter bolt pass by.

10. Unscrew starter mounting bolts:



11. Raise motor (taking care not to snag or crush loose wires and hoses.

12. Rotate starter motor and wiggle out.

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13. Before inserting new starter, insert pair of new tiewraps through mounting holes in bracket under starter to avoid having to thread these in place later.

14. When mounting the new starter, it is a good idea to pull the starter into position with a string attached to the center axle, and also have a string into one of the bolt holes in the starter, spacer ring and up through the hole in the carbon mast, that makes aligning a lot easier with the cramped space.

15. Wiggle starter into position, lower motor, and pull strings?

16. Replace starter mounting bolts.

17. Tighten pylon mounting bolt.

18. Raise engine 90%.

19.