

Amel 54 # 40 - Replacing the steering cables (Bowden cables)

The following describes how to replace the steering cables if you cannot pull out the axle of the steering wheel to cockpit side. (The axle can supposedly be pulled out towards the cockpit if you can loosen the 44 mm nut there and the ball bearing inside the galley locker).

I apologize for my limited English knowledge. As far as possible I used the same terms as Bill Rouse.



Pic 1: Cause of all the work was an Orca attack on 01/05/23 near Barbate, Spain. This pic shows the damage of the aft steering cable.



Pic 2: First we cut the aft steering cable. Later we figured out, that the second cable was damaged too. The push rod was pulled off the inner cable.

Preparation

1. Check whether the holes at the end of the new steering cables fit the bolts on the quadrant. They may need to be drilled out.
2. Check whether the end terminals of the new steering cables can be pushed into and through the threaded tubes without any problems. The terminals may be slightly distorted by pressing

them on. If necessary, bend them straight or file them down until they can be easily inserted through the tube.

3. Attach pilot lines to the old cables.
4. Carefully remove the 24V switchboard and protect the edges to avoid scratches on the woodworks, remove the middle **furniture flap**, disconnect the port side switchboard (Onan, heating).
5. Mark one of the steering cables to make sure not to mix them up.
6. Take pictures of every step to have a reference if you are in doubt at a certain point.

Under the bed

7. Loosen the bolts of the steering cables and put them aside. Note the number of washers that were placed below and above the end of the cable to reduce the play at the quadrant (steering arm). Caution while mounting later: there must be play.
8. Remove the bolts of the plates holding the plastic balls to the bulkhead grommet.
9. Unscrew the black plastic caps on the threaded tubes. Be careful, there are o-ring seals under the caps. Do not lose it.
10. Unscrew the long brass nuts at the end of the threaded tubes.
11. Now the threaded tubes together with the teflon balls can be pulled off the steering cable.



Pic 3: Black plastic cap and the hidden o-ring at the end of one of the threaded tubes

Cockpit

12. Remove the cap with the Henry Amel signature. Unscrew the 24 mm nut. Remove the steering wheel, use a puller if necessary.
13. Remove the circlips, remove the washer.
14. With a bit of luck the filigree aft teflon insert will also come out. At least when you are moving the axle from the galleys side later.



Pic 4: This nice problem causes a lot of additional work: No chance to pull the axle to the front side, except you cut the wood work or you use a saw.

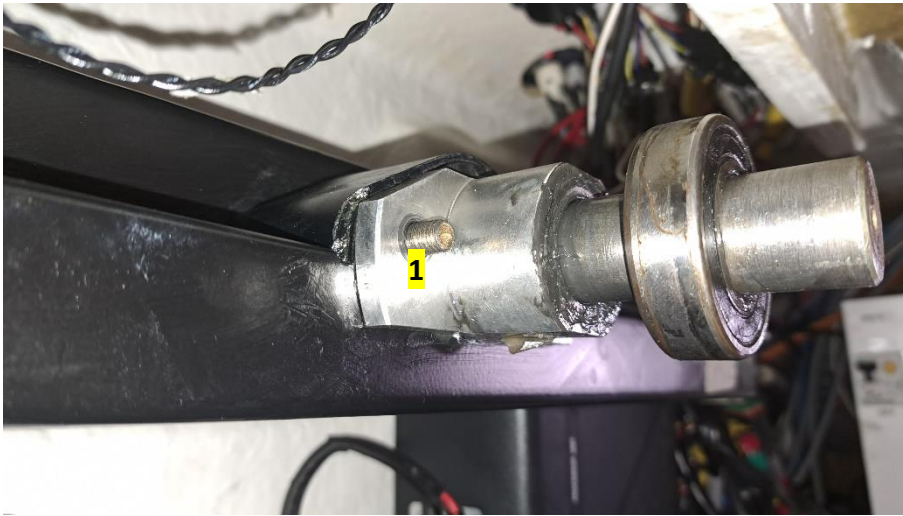


Pic 5: Jeffa autopilot (rotary drive), the chain, front support of the axle (#1) and support strut (#2)

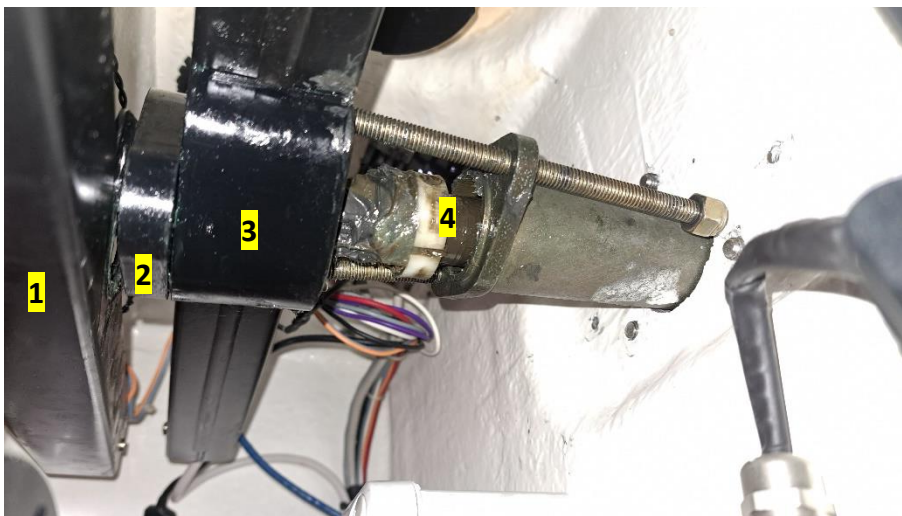
Pantry

15. Remove the chain from the wheel pilot, if present.
16. Remove the sprocket of the wheel pilot from the steering shaft, if necessary improvise a puller, as there is no place for a commercial puller.
17. Remove the front support of the steering axle (fixed by two bolts in the top, 17mm nut)
18. (Mago del Sur special): Remove the support strut of the Jeffa drive (1x 17mm nut, 2x2 13mm nuts in front, locked, and Allen key 6mm aft) to create working space. Pick up the spacers at the top (washer, plastic element, washer) and the rubber elements (noise isolation) at the lower bolts.
19. Remove the two cap nuts from the stud bolts for the rack drives. The rack drives are then free to move (well, with some jerking).
20. move the stud bolts as far aft as possible (I guarantee a lot of fun, but it works). If necessary loosen the nuts holding the bolts of the counter plate of the brass tube leading axle. This may create the last millimeters needed to pull out the stud bolts far enough.

21. As the studs are moved aft, the rack housings loosen from their position, but remain seated on the axle.
22. Remove the bolts fixing the stoppers of the racks (10 mm jaws).



Pic 6: Front support of the axle and sprocket of autopilot are removed. We could not pull off the ball bearing though it was loose on the axle. End of one of the stud bolts (#1), cap nut is removed



Pic 7: The studs are pulled back. The first (front) rack housing (#1) and the plate between both housings (#2) are free. The rubber cover (#3) is still in its place. Covered with grease the two teflon half rings (#4) can be seen.

General

23. Check if the steering cables are attached to some wiring or some holes by wire ties. This may be within the locker at galley side, behind the 230V control panel and outermost portside panel (onan ...), cockpit lazarette, behind the aft toilette and beneath the first cabinet in the aft cabin.

Under the bed

24. To pull the racks out of ist housings the steering cables has to be free of the quadrant. If not done yet, now is the moment to do this. This creates the manouverbility which makes pulling out of he racks easy.

Pantry

25. Pull the axle as far forward as possible to gain clearance for working and wiggling on the rack housings.
26. Pull the stud bolts - compare no. 10 – aft as far as possible and hold them there.
27. The brass stoppers oft he tracks can now be lifted out of their seats. The rack must be relatively far away from the stopper, i.e. pushed into the housing. Otherwise the stopper cannot be lifted out of its recess sufficiently to remove it.
28. Lift off the elastic rubber cover in the middle of each rack housing if it does not fall off by itself. This allows the rack housing to be raised or lowered from the axle and the rack to be moved freely.
29. Protect everything in the vicinity of the racks and the next working steps against grease (or clean afterwards 😊).



Pic 8: Immediately after pulling a rack we covered it to avoid a galley catastrophe

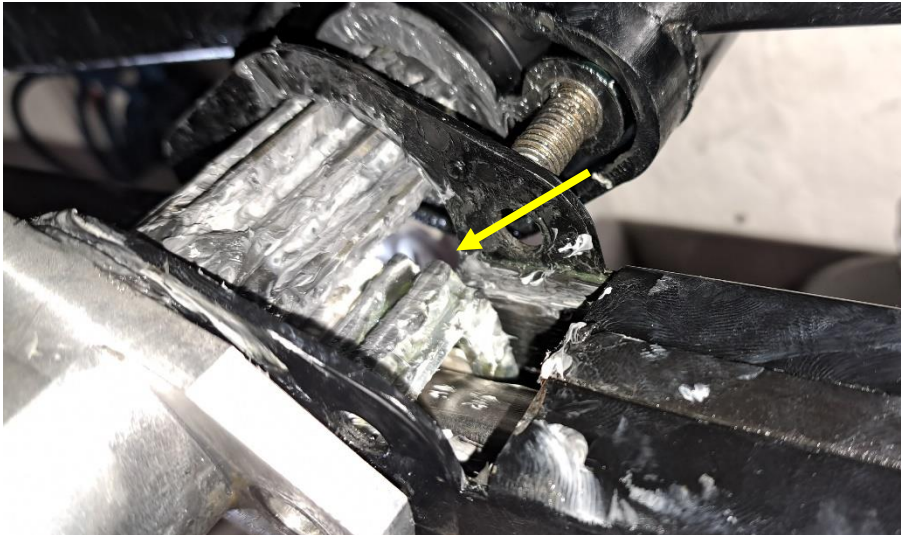
30. Now the racks can be pulled out of the housing. In order to have enough play for this, the cables must be moved in the direction of the quadrant. A second person pulling the cables from the cockpit lazarette is very helpful now.
31. When the racks are free, they can be pulled out of the galley cabinet. Now the second person in the cockpit lazarette pushes the cables towards the galley for support.
32. Remove the push rods of the old steering cables from the racks, unscrew the stopper.
33. Screw the stopper to the new push rod of the new cable. Secure the thread with teflon tape or Loctite.
34. Insert the push rods of the new steering cables into the racks. Check the position of the two plastic sleeves – they have to be at the outermost possible sits of the racks. - The inner nut at the end of the push rods has to be correctly placed in the rack, meaning it has to rest against the rear end of the rack, it cannot rotate there and acts as an abutment. (Note: The nut is "tight" against the end of the thread of the push rod. Do not loosen!)

35. The outer self-locking nut can then simply be screwed tight. So: tighten the self-locking lock nut on the outside of the rack. Make sure that the rack and stopper are correctly positioned in relation to each other to avoid torsional stress inside the cable. The "square" on the stopper for the enclosure process must point opposite to the teeth of the rack.
36. Mark the centre of the rack. This is best done on the side of the rack that will be visible when the mimic is installed. I.e. for the lower rack it is the side facing forward, for the upper rack the aft side (only visible with a mirror during installation) or from below, if necessary with the help of a mirror.
37. An alternative to marking is to count the teeth when adjusting within the housings. The racks have 35 teeth, meaning the 18th tooth is in the middle of the rack. To count, it has proved useful to push the rack forward tooth by tooth with a flat screwdriver until tooth 18 is exactly below or above the axle.



Pic 9: The front rack is in position. The second is on it's way – BUT: the brass stopper is mounted 180° wrong. In this case the bore has to be on the lower side to meet the holes at the end of the housing.

38. Run the cable from the galley to the quadrant with the help of the pilot line and pull it a little beyond the final position, this is the only way to get clearance for inserting the racks. Use the second man 😊. Check whether a more optimal course which requires fewer bends of the steering cables is possible.
39. Insert the racks as far as possible into the housings, at least up to the middle position, otherwise it will be difficult to move the stoppers into their recess.
40. Guide the stoppers into the recess.
41. Bring the axle of the steering wheel into the centre position - the spring/locking element of the steering wheel points upwards!
42. Now position the aft rack centrally. With the help of the marker and mirror, or by counting the teeth. We found the latter easier, although we had also made a mark.
43. To move the rack without unintentionally turning the axle, push the housing upwards.
44. When the 18th tooth is positioned centrally under the axle, put on the rubber cover (see 26.) This can be very difficult. If necessary, start with one side of the cover and push in the stud bolt as soon as it fits. (They are held in place by the two stud bolts s. 24).



Pic 10: It's not easy but you can check the teeth off he racks from the sides, from the top our from below. A mirrow might be helpfull. The yellow arrow shows tooth number one. With the help of a screw driver you can move the rack tooth by tooth slowly in position while counting the number of teeth.

45. Repeat the procedure on the front rack. Here the enclosure must be pushed down when positioning the rack. We had problems there to press the rubber cover sufficiently into the seat, this was finally achieved with the help of a pair of grip pliers, which helped to fix it.
46. Push the stud bolts from 24 further forward. Note that there is a plastic element between the two housings which must be aligned and through which the stud bolts must also pass. It may not be possible to simply push the stud bolts through. Therefore screw through if necessary.
47. Since the axle has been pulled out to the front, it is possible that two teflon half rings have fallen out of the tube. These sit in a groove on the axle. It may be difficult to reinsert the half rings into the tube. Check whether they are deformed and, if necessary, slightly chamfer the half-shells with sandpaper on the side facing the tube.
48. Push the axle with the rack housings sitting on into the tube as far as possible, be aware not to loose the teflon half rings. A wavy wahaer as mentioned by Bill never showed up.
49. Push the stud bolts further through and secure them with cap nuts (see 17).
50. Move the abutment (see 15) from starboard over the axle, then turn it upwards, press it onto the ball bearing. If necessary, place wide ringed washers between the abutment and the wall to adjust the abutment slightly aft and ensure a complete fit of the ball bearing in ist place. Bolt the abutment in place.
51. If existing, fit the sprocket for the autopilot drive - don't forget the spring/locking element - and position the sprocket in line with the drive sprocket.
52. Secure the upper sprocket with ist grub screw.
53. Fit the chain. Pull the chain ends to be connected together with a cable tie, insert chain lock.
54. (Mago del Sur special): Fit the support strut for the chain drive, not forgetting the rubber elements of the structure-borne sound insulation aand tension the chain if necessary.

Under the bed

55. The finalizing works under the bed inclusive connecting the steering cables to the quadrant and adjustment are childrens play, not worth to describe 😊