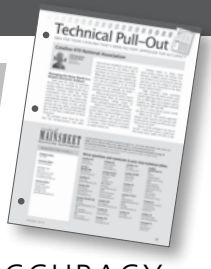
Technical Pull–Out



Q&A FOR YOUR CATALINA THAT'S BEEN FACTORY APPROVED FOR ACCURACY

Catalina 470 National Association

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Non-Starter Starter

Peg and I enjoyed a spectacular three weeks cruising *Onward*, along the coast of Maine and at the end of July we headed to Gloucester for a relaxing overnight visit with friends before heading to Boston for a few days. Departing Gloucester, it was a lazy day of light SSW winds making for a pleasant laid-back sail. On approach to Boston Harbor, the winds dropped and became directionally variable so I decided to be a prudent captain and forego trying to sail the narrow and new-to-me channel to an overnight anchorage in those under-recognized gems, the Boston Harbor Islands. I switched on the engine and pushed the starter button. But, instead of the normally almost-instantaneous engine start – I heard nothing! With a sick feeling in my stomach, I turned the helm over to Peg while I flew below. I assumed that the dedicated starter battery had somehow died in the last few hours because the engine started normally while weighing anchor that morning. I switched in the power from the 750 AH house bank and ran up to try again. More nothing; just a tighter knot in my stomach.

There was enough wind to sail to a safe place between the N and S shipping channels and anchor. I alerted the USCG of my status and where I was anchoring just so someone didn't misinterpret what was going on. I also contacted the local provider for my towing insurance to alert them to the potential need for a tow in the morning. Then, still thinking it might somehow be a power problem, I topped up the water in all the Trojan T1275 12-V golf cart batteries in both banks and ran the generator to be sure they were at full capacity. I decided I would do better trouble shooting in the morning and declared cocktail hour.

In the early morning I began the troubleshooting process again. What puzzled me was that most boat systems do not fail without giving some type of preliminary warning behavior and there had been no obvious symptom from the starter – its last start had been flawless. So, I verified the batteries were at full voltage and charge capacity. Then I checked all the power cables to be sure there were no loose or corroded connections. I used a DVM to verify there was no voltage drop to the starter solenoid input terminal. I then had Peg press

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the starter button while I had the companionway stairs open and could visually monitor the battery system voltage on the Heart control panel and listen. I heard the starter solenoid click and saw a voltage drop from ~ 13 V to ~ 7 V when the starter button was momentarily pushed. For one more test, I used a heavy screwdriver to mechanically short the solenoid terminals with the same result. The starter solenoid was working properly – and it wasn't the infamous voltage drop from the starter switched that plagued early hulls in the C470 fleet.

There was one more possibility: the engine was jammed either due to the starter pinion being jammed in the flywheel or even water having somehow filled the engine cylinders. After a phone conversation with my pal Ed Burke, I managed to grasp the fan belt to rotate the engine a partial revolution in each direction and could hear the valves functioning. So, the engine wasn't water-locked and the flywheel wasn't jammed. There was now incontrovertible evidence the starter itself had failed and there would be no quick fix.

Onward was towed into the Waterboat Marina where they graciously provided a berth that the towboat could maneuver *Onward* into. This being a Friday, I arranged for a mechanic to come aboard early Monday to replace the starter. I couldn't get a new starter from the Yanmar distributor in time. I did manage to find one on line that was supposed to be an exact duplicate of the Hitachi starter used by Yanmar. So I arranged for this to be air-freighted in by Saturday morning. Things in hand, Peg and I went off to enjoy touring Boston's historic districts and visit with her daughter and family.

The starter did not show up on Saturday; however the mechanic was right on time Monday morning. The difficulty with replacement of the starter on the 4JH3TE is that Yanmar had factory-installed two steel support brackets for a steel section of the oil cooler water line. The one closer to the front of the engine physically occludes the lower inside of the two starter mounting bolts. This bracket must be removed first. Getting a wrench or socket on its engine mounting bolt is difficult as is being able to apply sufficient force to loosen it. With all the 12-V power off and me providing a third and sometimes a fourth hand through the stern engine access panel to place and hold the socket in place, the very agile mechanic was somehow able to get the bracket unbolted and moved out of the way so that direct access to both starter mounting bolts was possible. Using long, articulated extensions on the socket he was able to remove the bolts and the starter came off easily. The engine flywheel gear looked fine and the starter pinion gear could extend and retract normally but the rotor had apparently internally welded itself to the stator.

Just as the mechanic was about to leave for another appointment, the replacement starter arrived. Once unpacked, it was immediately apparent that the "exact replacement" that matched the Hitachi and Yanmar part numbers was not exact. Luckily the mechanic knew of a local source and was quickly able to get the proper starter but it would have to be installed the first thing Tuesday.

Once the mechanic departed for the day, I immediately cut the problematic bracket off of the steel tubing. As there is another steel bracket only inches away to do the support job, I decided that ready access to the starter bolts was more important – a critical safety issue, in fact.

The mechanic and starter showed up at 0630 Tuesday and in less than 30 minutes it was installed and tested. This verified that the most time consuming and difficult part of the job had been dealing with the pesky bracket I cut off. What a wonderful sound a working starter makes! *Onward* immediately departed for the start of the Corinthian Cruise in Stonington CT.

What has given me not a few sleepless nights is that *Onward* spends a lot of time in the Bahamas where the "Cuts" can be treacherous and I transit under power just to be sure I'll have control. I realize that I have always assumed the "bullet proof" starter would come through and now that faith has been shattered.

I know of other cruising boats that have had starter failures that left them engineless for long periods while they waited for good conditions to sail to where they could affect a replacement. I am aware of only one starter failure on a C470 when Charlie MacNamara, *Lady* (C470-119) had a failure offshore in the US and was towed into a harbor for a repair. *Onward's* Yanmar had over 6100 hrs on it when the failure occurred and given that I use the engine mainly for long days of travel, one start every eight engine hours results in a conservative estimate of in excess of 700 starts and in excess of 1,000 is likely.

Had the starter given any warning? Could I have been able to avoid the failure? There were no starts where the starter sounded abnormal or had difficulty starting the engine. After the failure, I suddenly recalled just one strange incident: a few days before, nothing happened when I attempted a start. I assumed there was a problem with low voltage on the starting battery so I just switched in the house bank and the engine started immediately. I quickly disconnected the house bank but forgot to check the starter battery condition. The next several times it started normally and I forgot about the problem. In retrospect, I think this was the one warning signal of the incipient failure. Perhaps due to a small bad spot on a winding that later failed catastrophically. Not much to go on.

Is there an alternative way to start the engine in the face of a starter failure? My first inboard marine engine was a Yanmar YSM8 and there were many times that I had to use the hand crank to spin the engine while holding the decompression valve open with a line clenched in my teeth. Just crank, spin, open my mouth and start! No such luck with the 75-hp 4JH3TE. Following a hint from Mike Yorke, *Certa Cito* (C470-108), I found a company that makes a spring-operated starter for marine diesels (http://www.springstarter.com). It looked like a great thing to have until I found that it needed to be mounted in the same location as the electrical starter! I've also read of one offshore sailor who wrapped the end of the mainsheet around the flywheel and then let a wind gust act on the main to provide the torque to effect a start. I'll keep that in mind for Plan Z.

So what do I plan to do in the future? First and foremost, strive to never put the boat in a situation where safety requires the engine and then just assume it will start as normal. Anytime the boat will be in a potentially dangerous position, I plan to start the engine at a location where a safe alternative is available (anchoring, sailing away, etc.). Second, I will carry a replacement starter. Now that I know the drill, and that *&^% support bracket is gone, I should be able to replace it in an hour or so.

If your starter has as many cycles on it as *Onward's* and you will be operating away from ready access to a tow and/or mechanic, get rid of that support bracket! Look into a spare starter – a true OEM replacement unit. Be sure you have a complete set of the right sockets, extensions, and swivels to be able to get at the awkwardly placed mounting bolts. AND be on the lookout for subtle performance flaws.