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Catalina 470

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Latitude Adjustment, #13

The C470 list on Sailnet.com has become a very active site for discussion among owners about maintaining and equipping a Catalina 470. I encourage everyone to join the list and take a look. There is no charge for participation. Go to www.sailnet.com, and look at the site index on the left side. Click "Join E-mail List" under the Member's Center section of the index. Then click "Display All Active Lists", then click the "C470 Discussion List" and fill out the brief form to join. You will from then on receive copies of all mail sent to the list by C470 owners and will also be given instructions on how to submit mail to the list.

Safety at Sea - Preventing Boat Loss [part 2]

Last issue, we discussed that we have a high percentage of C470 owners doing fairly serious cruising, including several with fairly lengthy trips planned. Some have a lot of miles experience but many may be skilled sailors but are novices to long distance cruising. Most have never participated in an ORC race where they've had to meet the stringent requirements of emergency backup plans and equipment for significant boat threatening events. Those doing long distance trips need to know that several things can happen that can potentially result in boat loss. We discussed steerage loss and the need for emergency rudder capability and also the need for a sea anchor to "buy" time and sea room if steerage is lost.

This issue, we'll cover reefs as a cause of boat loss. Probably the number one cause of boat loss on reefs is course plotting error, particularly with the widespread use of electronic charting aids. The various chart plotters, computer programs for charting, and GPS units with charting built in have made point and click charting a marvel. The ability to have all needed charts on a disc or cartridge, the ability to zoom in and out on charts without having to dig through inventory of multiple scale charts has made navigation easier and more convenient than ever. Many cruising guides come with lists of waypoints making creation of a route almost brainless. The word choice 'brainless' is not a coincidence. Hazards abound with improper use of electronic navigation.

Think for a few moments about the following scenarios that could result in disaster. Take the cruising guide with waypoint lists for example. There might be an anchorage or port listed with an entrance waypoint given. Used as the waypoint in your route without examining the chart could result in a loss of boat in a reef situation. The waypoint in a list is given as part of a route in the cruising guide entering the port from a given direction. Use of the same waypoint as the entrance waypoint entering from a

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different direction might find reefs in the way from the new direction.

Another hazardous use of electronic charts involves the common practice of using a zoomed out chart to point and click multiple waypoints of a long route. If this is not followed up by loading zoomed in charts and following the entire route painstakingly at the fully zoomed in level to be sure there are not reefs or other hazards which did not show on the zoomed out chart can result in boat loss.

Finally, in electronic charting, it is tempting to not purchase paper charts at all as multiple scale charts of each portion of the trip are needed to be complete, and the cost of these for one trip sometimes equals the cost of a cartridge or disc for an entire region. But electronics do fail and the electrical sources that power them do fail, and no one can afford to be without a paper back up.

Another cause of loss of boat on reefs involves the ability to have total control of the boat when being in close proximity to reefs. Multiple factors affect our control of the boat. Wind, tide, and sea conditions can reduce our control whether under sail or power. Most of us are sensible enough to enter a reef hazard area under power rather than sail. But, even under power, there can be problems. Strong cross winds, currents, or tides can cause straying sideways from an intended rhumbline. The only prevention here is to be fully aware of the factors affecting your ability to steer an intended track. A GPS showing course over ground compared to the rhumbline of the course and also shows cross track error and drift, but you have to be paying attention to it. We must also be prepared to alter our plans if a wind or current condition makes the risk of entering the planned port too hazardous.

The other big factor affecting our control of the boat when motoring through a reef hazard is the possibility of power loss. Multiple possibilities exist here, sometimes even bizarre and unexpected ones. We were entering a break in the barrier reef in the Yucutan coast of Mexico when the engine died and would not restart. The cause eventually was discovered to be the fuel tank we had switched to shortly before entering the reef. We prudently checked the fuel level on the tank we had been using and switched tanks before entering the reef to the more full one. Later search for the cause after getting out of trouble turned out to be that the intake and return ports on the tank to which the hoses were attached had the downtubes inside the tank reversed. The intake for the engine fuel was supposed to have a downtube all the way to the base of the tank so that fuel would always be available until the tank was empty. The return did not need a downtube since fuel was simply returning to the tank. On our boat, the intake was missing the full downtube, and the return had one it did not need. However, in the reef entrance, all we knew was that the engine was now useless. Had we not had two anchors always in ready to deploy condition on the bow rollers, we may have lost the boat. But since we had been taught well, we quickly deployed the anchors to hold the boat safe until the problem was diagnosed and remedied. The critical safety factor is the ability to deploy anchors and stop the boat whenever in a tight situation, whether reefs, crowded harbor entrance, near shallows, crossing bridges, or on an intracoastal waterway or river where power loss would result in a shoreline grounding. Beside engine failure, other power loss problems include prop fouling or breaking, drive shaft uncoupling, transmission failure. Ability to rapidly deploy anchor is the best safety backup. *-Glen McIntosh, #13, Latitude Adjustment*

Dripless Shaft Seal

We have reported in a past issue that some boats have had the heavy stainless collar which provides the seal surface and tension position for the spring in the dripless shaft seal come loose, allowing a rapid water influx. The problem in the boats experiencing this was slipping of the collar up the shaft due to slipping of the three set screws that hold the collar in place on the shaft. Boats experiencing this found that there was one set screw in each of the three holes of the collar when the shaft seal manufacturer specifies two set screws in each hole, one on top of the other, such that backing out of the set screw is prevented. There have been recent reports from owners of this occurring again in some of the newer boats. Please check your collar to be sure there are two set screws in each hole. The only way to do this is to remove a screw with an allen wrench and check to be sure there is a second screw under it. Check each of the three holes in the collar, one at a time. Multiple owners reported adding a second security back up to slippage of the collar. One involves putting a stainless hose clamp on the shaft to keep it from sliding if both allen screws loosen. Some people use a donut type zinc instead of the hose clamp.

Battery and Electrical Management

I had a request to discuss 12 volt electrical management on the C470. The area of batteries, chargers, inverters, high output alternators, four stage regulators, and electrical monitors is an area of tremendous diversity of opinion, diversity and confusion of options, and is a wide open area for creativity and individuality of design. Because of this, it is difficult to make statements of absolute fact, but nevertheless, I'll share my knowledge, experience, and opinions.

In cruising usage, batteries typically operate between their 50% capacity level and their 75% capacity level. Why? We are taught to try not to deplete lead acid batteries below 50% because to repeatedly do so wears them out fast. The other factor is the way batteries accept charge in phases. The so called 'bulk' phase is the initial charging phase of a battery where it rapidly accepts charge up to 75% capacity. The next two phases, 'acceptance' and 'float' phases gradually restore the remaining 25% to charge the battery to 100% capacity. These two phases are slow, and require a long time of engine or charger operation, more than is practical for fuel usage at sea. Further, I can say without any reservation, that most lead acid batteries on sailboats have suffered from what is called sulfation, which is hardening of the coat on the battery internal plates that has caused loss of the ability to the battery to be charged to full capacity on normal chargers, even the chargers that claim to equalize batteries! Sulfation is so common on sailboat batteries, that I would challenge each of you to measure the specific gravity of your battery water after you feel the battery is fully charged, and let me know what it is. I offer the prediction that nearly 100% of the C470 batteries would give a specific gravity that correlates to 75% or less charge even when fully charged!

Therefore, if we are operating between 50% and 75% percent of capacity, we have only 25% of the battery rated amp hours available for use. Most size 8D batteries are rated at approximately 225 amp hours capacity. If your boat has three 8D batteries available for house bank use, the grand total is 775 amps. If we use only 25% in our operating range, this gives 194 amps available per day- and only if the battery is not sulfated and suffering from capacity loss. My boat consumes about 15 amps per hour during daytime, and up to 25 amps per hour if running at night with the nav lights, autopilot, radar, computer and plotter, and refrigerators

running. Thus, if sailing twenty four hours a day, ten hours in darkness, and fourteen hours in daylight, we can consume 460 amps per day, or over twice the amps available in a three battery bank. In other words, a lot of charging is needed! With a 105 amp output alternator, we must run the engine just over four hours a day, or with a 75 amp charging capability in our inverter, we must run the generator six hours per day to power the inverter. Since we are frequently operating in very hot country, we often opt for the generator to take advantage of the air conditioners as well. But this can only be done if heeling fifteen degrees or less so that the generator gets oil from the oil pan.

Therefore, electrical management is highly important. Several factors play into electrical management. Obviously reducing consumption is a big help. Secondly, having an accurate way of monitoring amps used is important. Thirdly, sorting through all the confusing information about switching between banks, charging systems and regulating systems is also helpful. Finally, extra charging power from sources such as wind generator can be helpful.

In the area of amp usage monitors, there are two well known systems available. The S.A.L.T. monitor uses loops around all the input and output lines of your battery to show the number of amp hours going in or out of the battery, the number of amp hours your charger or alternator are delivering to the battery, and the total amps remaining in your battery. I have this system on my boat. It is highly useful, but has one drawback. During periods of disuse of the boat, the total amps remaining becomes inaccurate and the batteries must be discharged to below 50% capacity and recharged to restore the accuracy of the amps remaining figure. However, we have not found this to be a problem because until the batteries do go through a discharge and recharge cycle, we simply use whatever figure the monitor gives as our baseline and then subtract the 200 amp capacity available for use from that figure to give our recharge point. The Link 10 or Link 20 and the Emon systems are the other brands and they also work very well. They use a parallel shunt system to measure amp draw and read battery capacity in percentage of battery used. I highly recommend using one of the monitoring systems to know your daily amp usage.

Batteries themselves are an area of choices and opinions. I have tried the Catalina supplied batteries, gel cell batteries, and the heavy duty lead acid batteries made by Rolls. I have not tried the newer AGM batteries. My experience with the factory supplied batteries is that they sulfated and lost capacity rapidly and did not work well for me in cruising usage. My experience with gel cell batteries also was less than satisfactory to me. I have had multiple gel cell batteries crack their case and fill the boat with battery fumes during charging. I have had the best luck with Rolls lead acid batteries, but they still suffer all the pitfalls of lead acid batteries. If not well taken care of, they also sulfate, like all lead acid batteries they consume much water and damage easily if the water is allowed to run down. The one advantage they have is very heavy duty plates that can be restored by equalization if the sulfation occurs. I would like to hear from someone who has used the AGM batteries for a long time to see how well they worked. Many experienced cruisers write of very positive experience hooking up multiple 6 volt golf cart batteries in series to get 12 volts. These batteries are made for deep discharge and apparently hold up very well in cruising conditions. The reason I did not do this in my boat has to do with my measurements of the battery wells in the boat compared to the 6 volt battery size. I found that I could not get the number of amp hours capacity I needed without modification of the wells or finding additional areas to store batteries. In this area, I would like to hear from any owners who have successfully done a 6 volt battery system.

Battery switching systems are another area of confusion. For years, the West Marine catalog has written about battery combiners which allow the batteries of multiple banks to be charged as one bank and discharged separately. The theory is good. Large battery banks resulting from multiple combined batteries accept bulk charge faster than individual smaller batteries. Discharging separately allows for power management by keeping at least one fully charged battery separate from the house bank. While I agree with the principle, my opinion is that there is a simpler, less expensive way to do the same result without adding the combiner switch, which gives yet one more device to potentially fail. What we did on our boat is use all three 8D batteries hooked up in parallel as the house bank. We separated the generator battery as the starting and emergency battery. We did this by reversing the two battery bank switches supplied with the boat. We used the simple on/off battery switch supplied with the boat to connect the house bank to the electrical panel. We used the two bank A/B/All/Off switch to connect generator battery to the engine as the starting battery. The "A" position connects the generator battery to the starter solenoid for engine use. The "B" position connects the house bank engine starter solenoid. The 'All' position connects both the house bank and the engine battery together. This allows the house bank to be used as the starting battery by switching the switch to either 'B' or 'All" in case the engine battery fails. In this situation, the house bank is charged together as one bank just as a battery combiner switch would do, yet is simple and fail proof unless you operate the

engine battery switch in the All position which would deplete the engine battery as part of the house bank.

Chargers are also an area for discussion. The Pro Mariner charger supplied with the boat is a 50 amp three phase charger and is adequate for charging the batteries. The only suggestion I have is that if you do add an inverter, pick one with 75 amp or higher charging capacity so that you'll have a second charger source and a higher output charger source. I tried one four stage charger which adds the equalization mode and found it useless. In discussing with a Rolls battery dealer why the equalization mode of the charger did not restore the batteries, he tells me that all the commercially available 'equalizaton' stage chargers are limited to too low a voltage to adequately restore a sulfated battery. Apparently the companies do this to avoid liability for a fried battery due to over charging. This also applies to the four stage external regulators sold for alternators. Apparently the only way to restore a sulfated battery is to buy a cheap unregulated small manual battery charger such as the various chargers sold in Sears. These if left hooked up to a single battery for extended periods of time build up a high enough voltage to restore a sulfated battery. This luckily happens to also be a cheaper and simpler solution than a fancy ineffective four stage charger. The process as far as operation and protection of the battery and the electricals of the boat is the following: The battery must be unhooked from the boat panel prior to high voltage equalization to prevent damage of boat items sensitive to higher voltage. Secondly, one must stay near to monitor the process to restore water to the battery as it boils out, and discontinue the charge once full specific gravity is reached.

High output alternators needs discussion. I have tried two of the most popular brands of externally regulated high output alternators. I learned that despite the well known names, these alternators and regulators were fragile and failed easily. One of the companies backed up the product, but multiple failures became a nuisance despite their support. The other well known name was miserable in terms of service and willingness to back up the product. I ended up using the Yanmar recommended Hitachi internally regulated high output alternator and have had no failure in the two years with this alternator. Further, I learned that in the hours of engine charging of the battery, that only the bulk phase of charging was used anyway, so a fancy multiple stage regulator was unnecessary.

Last for discussion is alternate sources of energy. I have tried high capacity solar panels and found them to be very little daily amperage benefit compared to the high cost of these units. I regret adding them to the boat. My next investment will be a wind generator and probably one that can be converted to a rail mounted generator turned by a towable propeller for long trips. The cost is fairly comparable to a multiple solar panel system and the daily output is much higher.

So much for my opinions. Please remember that they are my opinions borne out from my cruising experience, but there is room for much creativity and variation in electrical systems. I'd like to hear from others on their systems. Next issue, we'll discuss A.C. electrical management and shore power systems. *–Glen McIntosh, #13, Latitude Adjustment.*